

High-side Power Switch with Diagnostic Function SI-5155S

Features

- Built-in diagnostic function to detect short and open circuiting of loads and output status signals
- Low saturation PNP transistor use
- Allows direct driving using LS-TTL and C-MOS logic levels
- Built-in overcurrent and thermal protection circuits
- Built-in protection against reverse connection of power supply
- $T_j = 150^\circ\text{C}$ guaranteed
- TO-220 equivalent full-mold package not require insulation mica

Absolute Maximum Ratings

($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V_B	-13 to +40	V	
Input terminal voltage	V_{IN}	-0.3 to V_B	V	
DIAG terminal voltage	V_{DIAG}	6	V	
Collector-emitter voltage	V_{CE}	40	V	
Output current	I_O	2.5	A	
Power dissipation	P_{D1}	22	W	With infinite heatsink ($T_c = 25^\circ\text{C}$)
	P_{D2}	1.8	W	Stand-alone without heatsink
Junction temperature	T_j	-40 to +150	$^\circ\text{C}$	
Operating temperature	T_{OP}	-40 to +100	$^\circ\text{C}$	
Storage temperature	T_{stg}	-40 to +150	$^\circ\text{C}$	

Electrical Characteristics

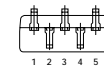
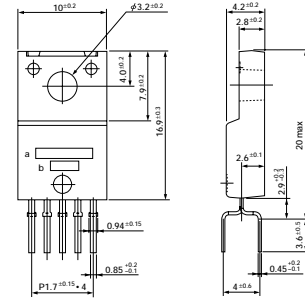
($T_a = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Operating power supply voltage	V_{Bopr}	6.0		30	V	
Quiescent circuit current	I_q		5	12	mA	$V_{Bopr} = 14\text{V}$, $V_{IN} = 0\text{V}$
Saturation voltage of output transistor	$V_{CE(sat)}$			0.3	V	$I_O \leq 1.0\text{A}$, $V_{Bopr} = 6$ to 16V
				0.72	V	$I_O \leq 2.5\text{A}$, $V_{Bopr} = 6$ to 16V
Output leak current	$I_{O, leak}$			2	mA	$V_{CE0} = 16\text{V}$, $V_{IN} = 0\text{V}$
Input voltage	Output ON	V_{IH}	2.0	V_B	V	$V_{Bopr} = 6$ to 16V
	Output OFF	V_{IL}	-0.3	0.8	V	$V_{Bopr} = 6$ to 16V
Input current	Output ON	I_{IH}		1	mA	$V_{IN} = 5\text{V}$
	Output OFF	I_{IL}	-0.1		mA	$V_{IN} = 0\text{V}$
Overcurrent protection starting current	I_S	2.6			A	$V_{Bopr} = 14\text{V}$, $V_O = V_{Bopr} - 1.5\text{V}$
Thermal protection starting temperature	T_{TSD}	150			$^\circ\text{C}$	$V_{Bopr} \geq 6\text{V}$
Open load detection resistor	R_{open}			30	k Ω	$V_{Bopr} = 6$ to 16V
Output transfer time	T_{ON}		8	30	μS	$V_{Bopr} = 14\text{V}$, $I_O = 1\text{A}$
	T_{OFF}		15	30	μS	$V_{Bopr} = 14\text{V}$, $I_O = 1\text{A}$
DIAG output voltage	V_{DH}	4.5		6	V	$V_{CC} = 6\text{V}$, $V_{Bopr} = 6$ to 16V
	V_{DL}			0.3	V	$V_{CC} = 6\text{V}$, $V_{Bopr} = 6$ to 16V , $I_{D0} = 2\text{mA}$
DIAG output transfer time	T_{PLH}			30	μS	$V_{Bopr} = 14\text{V}$, $I_O = 1\text{A}$
	T_{PHL}			30	μS	$V_{Bopr} = 14\text{V}$, $I_O = 1\text{A}$
Minimum load inductance	L	1			mH	

Note:

* The rule of protection against reverse connection of power supply is $V_B = -13\text{V}$, one minute (all terminals except, V_B and GND, are open).

External Dimensions (unit: mm)

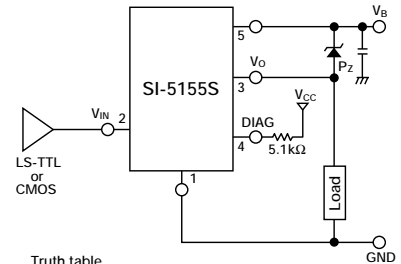


1. GND
2. V_{IN}
3. V_O
4. DIAG
5. V_B

a: Type No.
b: Lot No.

(Forming No. 1111)

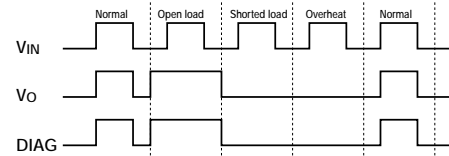
Standard Circuit Diagram



Truth table

V_{IN}	V_O
H	H
L	L

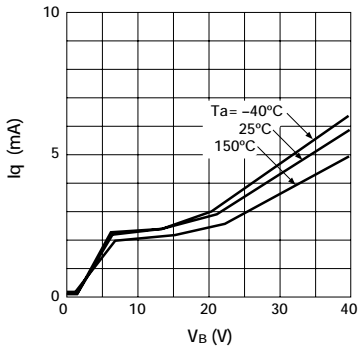
Diagnostic Function



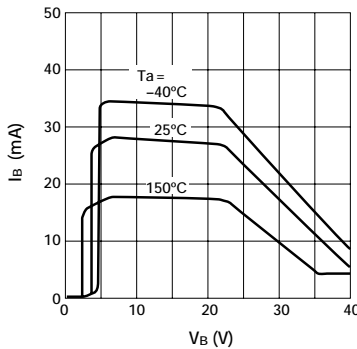
Mode	V_{IN}	V_O	DIAG
Normal	L	L	L
	H	H	H
Open load	L	H	H
	H	H	H
Shorted load	L	L	L
	H	L	L
Overheat	L	L	L
	H	L	L

● DIAG output will be undetermined when a voltage exceeding 25V is applied to V_B terminal.

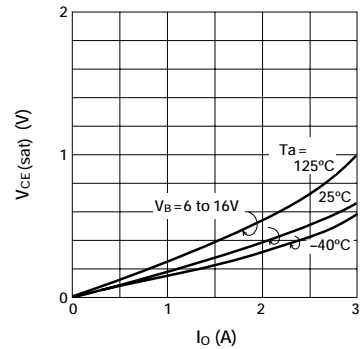
■ Quiescent Circuit Current



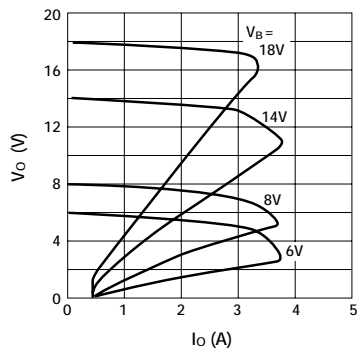
■ Circuit Current



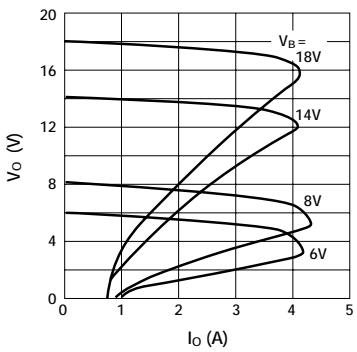
■ Saturation Voltage of Output Transistor



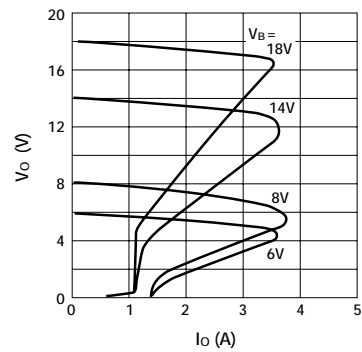
■ Overcurrent Protection Characteristics ($T_a = -40^\circ\text{C}$)



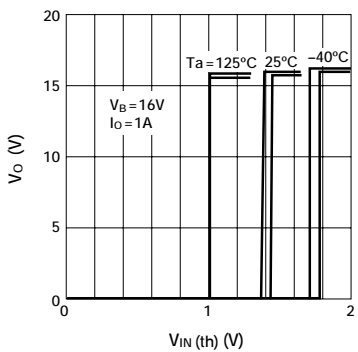
■ Overcurrent Protection Characteristics ($T_a = 25^\circ\text{C}$)



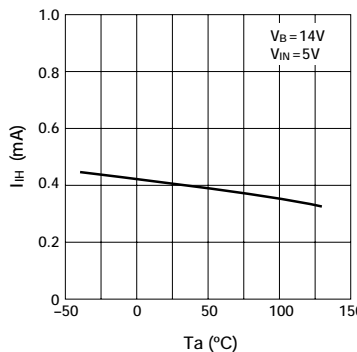
■ Overcurrent Protection Characteristics ($T_a = 125^\circ\text{C}$)



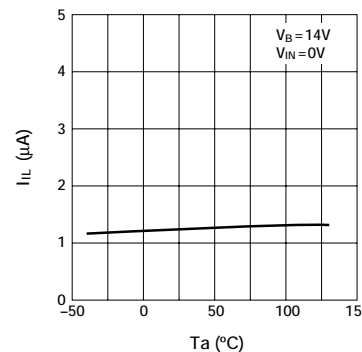
■ Threshold input voltage



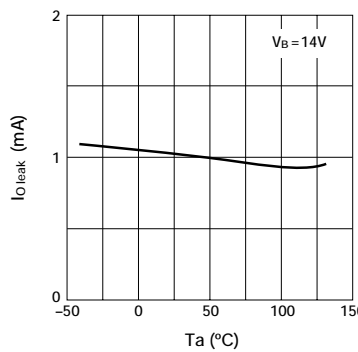
■ Input Current (Output ON)



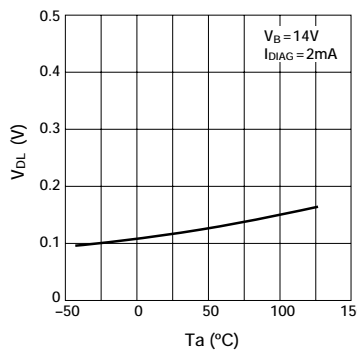
■ Input Current (Output OFF)



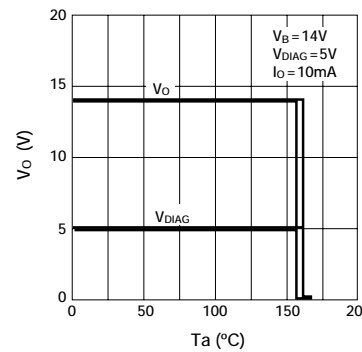
■ Output Terminal Leak Current



■ Saturation Voltage of DIAG Output



■ Thermal Protection Characteristics



Surface-mount Dual Circuit High-side Power Switch Array SDH04

Features

- Built-in diagnostic function to detect short and open circuiting of loads and output status signals
- Low saturation PNP transistor use
- Allows direct driving using LS-TTL and C-MOS logic levels
- Built-in overcurrent and thermal protection circuits
- Built-in protection against reverse connection of power supply
- $T_j = 150^\circ\text{C}$ guaranteed
- Surface-mount full-mold package

Absolute Maximum Ratings

($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V_B	-13 to +40	V	
Drive terminal applied voltage	V_D	-0.3 to V_B	V	
Input terminal voltage	V_{IN}	-0.3 to +7.0	V	
DIAG output applied voltage	V_{DIAG}	-0.3 to +7.0	V	
DIAG output source current	I_{DIAG}	3	mA	
Voltage across power supply and drive terminal	V_{B-D}	$V_B - 0.4$	V	
Output current	I_O	1.5	A	
Power dissipation	P_D	2.6	W	Without heatsink, all circuits operating
Junction temperature	T_j	-40 to +150	$^\circ\text{C}$	
Operating temperature	T_{OP}	-40 to +100	$^\circ\text{C}$	
Storage temperature	T_{stg}	-40 to +150	$^\circ\text{C}$	

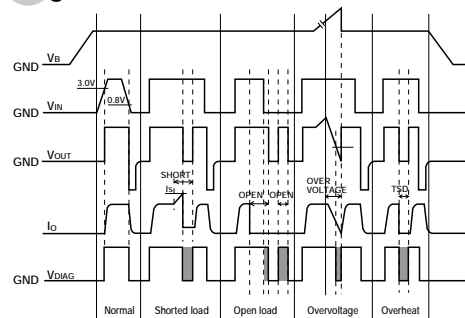
Electrical Characteristics

($V_{Bopr} = 14\text{V}$, $T_a = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Operating power supply voltage	V_{Bopr}	6.0		16	V	
Quiescent circuit current	I_q		5	12	mA	Lo output
Threshold input voltage	V_{INth}	0.8		3.0	V	
Input current	Hi output	I_{IN}		1.0	mA	$V_{IN} = 5\text{V}$
	Lo output	I_{IN}	0	100	μA	$V_{IN} = 0\text{V}$
Saturation voltage of output transistor	$V_{CE(sat)}$			0.5	V	$I_O \leq 1.0\text{A}$, $V_{Bopr} = 6$ to 16V
Output terminal sink current	$I_{O(off)}$			2.0	mA	$V_O = 0\text{V}$, $V_{IN} = 0\text{V}$
Saturation voltage of DIAG output	V_{DL}			0.3	V	$I_{DIAG} = 3\text{mA}$
Leak current of DIAG output	I_{DGH}			100	μA	$V_{DIAG} = 5\text{V}$
Open load detection resistor	R_{open}	1		30	k Ω	
Overcurrent protection starting current	I_S	1.6			A	$V_O = V_{Bopr} - 1.9\text{V}$
Thermal protection starting temperature	T_{TSD}	150			$^\circ\text{C}$	$V_{Bopr} \geq 6\text{V}$
Output transfer time	T_{ON}		8	30	μs	$I_O = 1\text{A}$
	T_{OFF}		15	30	μs	$I_O = 1\text{A}$
DIAG output transfer time	T_{PLH}		10	30	μs	$I_O = 1\text{A}$
	T_{PHL}		15	30	μs	$I_O = 1\text{A}$

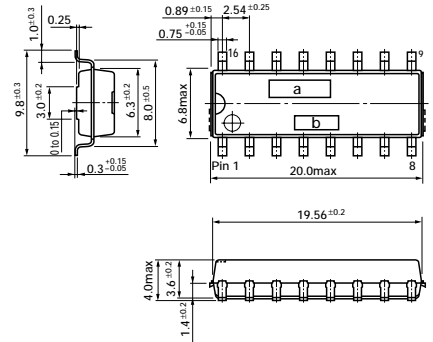
Note: * The rule of protection against reverse connection of power supply is $V_B = -13\text{V}$, one minute (all terminals except, V_B and GND, are open).

Diagnostic Function



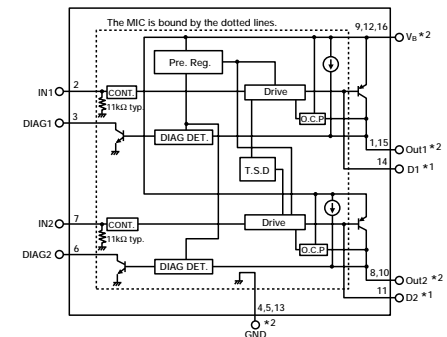
ERROR SIGNAL for CPU

External Dimensions (unit: mm) SMD-16A



a: Type No.
b: Lot No.

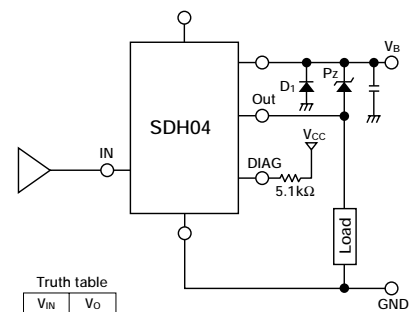
Equivalent Circuit Diagram



[Abbreviations]
Drive: Drive circuit
CONT: ON/OFF circuit
Pre.Reg: Pre-regulator
DIAG DET.: Diagnostic circuit
O.C.P.: Overcurrent protection
T.S.D.: Thermal protection

- *1. The base terminal (D terminal) is connected to the output transistor base. It is also connected to the control monolithic IC. Do not, therefore, apply an external voltage in operation.
- *2. SDH04 have two or three terminals of the same function (V_B , Out1, Out2, GND). The terminals of the same function must be shorted at a pattern near the product.

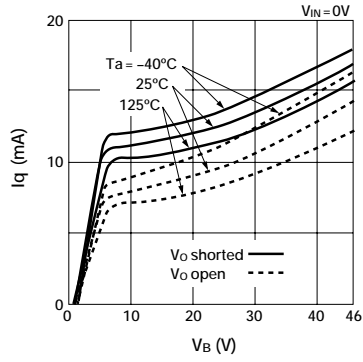
Standard Circuit Diagram



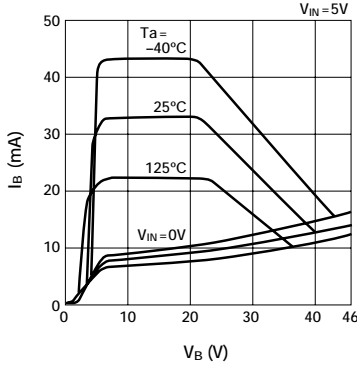
V_{IN}	V_O
H	H
L	L

Note 1: A pull-down resistor (11 k Ω typ.) is connected to the IN terminal. V_{out} turns "L" when a high impedance is connected to the IN terminal in series.

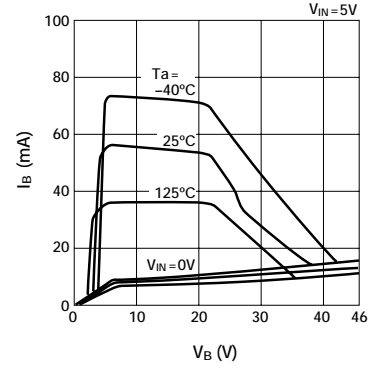
■ Quiescent Circuit Current (dual circuit)



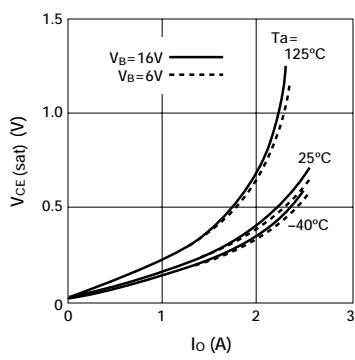
■ Circuit Current (single circuit)



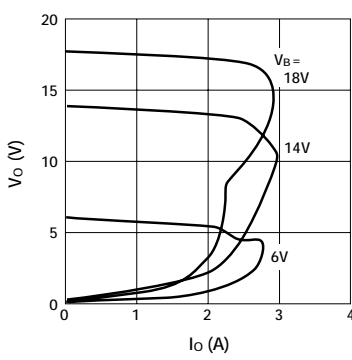
■ Circuit Current (dual circuit)



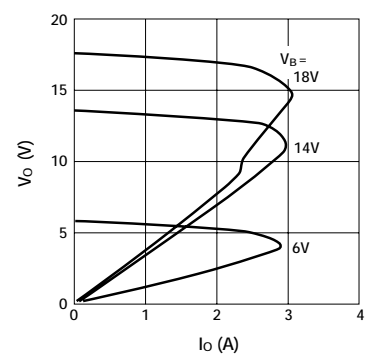
■ Saturation Voltage of Output Transistor



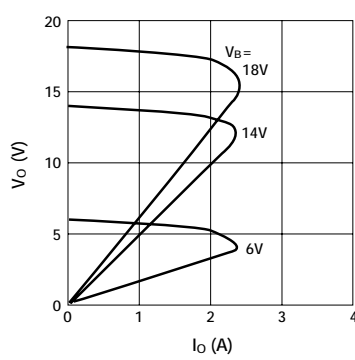
■ Overcurrent Protection Characteristics ($T_a = -40^\circ\text{C}$)



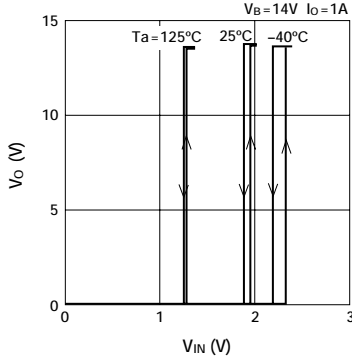
■ Overcurrent Protection Characteristics ($T_a = 25^\circ\text{C}$)



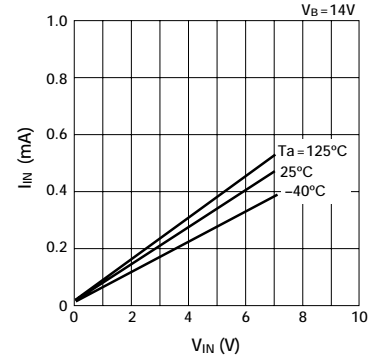
■ Overcurrent Protection Characteristics ($T_a = 125^\circ\text{C}$)



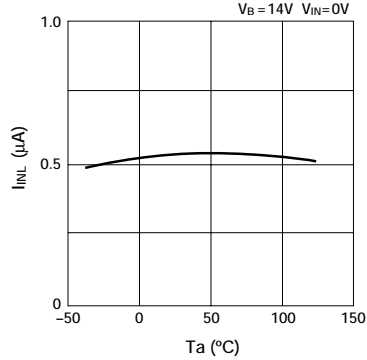
■ Threshold Characteristics of Input Voltage



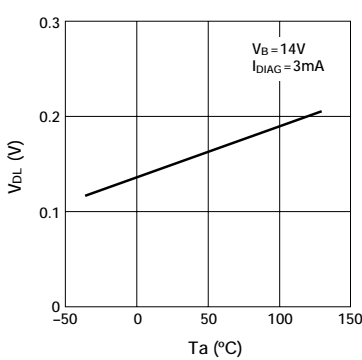
■ Input Terminal Source Current



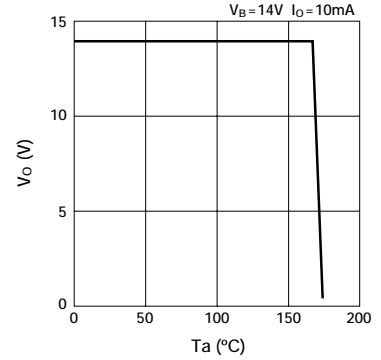
■ Input Terminal Sink Current



■ Saturation Voltage of DIAG Output



■ Thermal Protection Characteristics



3-circuit High-side Power Switch Array SLA2501M

Features

- Built-in diagnostic function to detect short and open circuiting of loads and output status signals
- Low saturation PNP transistor use ($V_{CE(sat)} \cong 0.2V$)
- Allows direct driving using LS-TTL and C-MOS logic levels
- Built-in Zener diode in transistor eliminates the need of (or simplifies) external surge absorption circuit
- Built-in independent overcurrent and thermal protection circuit in each circuit
- Built-in protection against reverse connection of power supply
- $T_j = 150^\circ C$ guaranteed

Absolute Maximum Ratings

($T_a = 25^\circ C$)

Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V_B	-13 to +40	V	
Drive terminal applied voltage	V_D	-0.3 to V_B	V	
Input terminal voltage	V_{IN}	-0.3 to +7.0	V	
DIAG output applied voltage	V_{DIAG}	-0.3 to +7.0	V	
DIAG output source current	I_{DIAG}	-3	mA	
Voltage across power supply and output terminal	V_{B-O}	$V_B - 34$	V	
Voltage across power supply and drive terminal	V_{B-D}	-0.4	V	
Output current	I_O	1.5	A	
Output reverse current	I_O	-1.8	A	
Electrostatic resistance	E_S/A	± 250	V	$C = 200pF, R = 0\Omega$
Power Dissipation	P_D	4.8	W	Stand-alone without heatsink, all circuits operating
Junction temperature	T_j	-40 to +150	$^\circ C$	
Operating temperature	T_{OP}	-40 to +115	$^\circ C$	
Storage temperature	T_{stg}	-50 to +150	$^\circ C$	

Electrical Characteristics

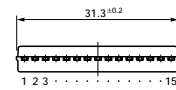
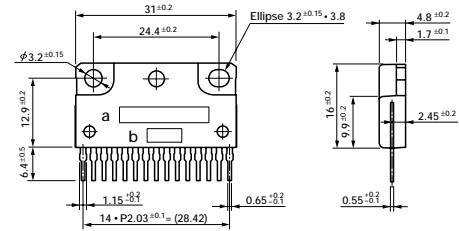
($V_{Bopr} = 14V, T_j = -40$ to $+150^\circ C$ unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Operating power supply voltage	V_{Bopr}	6.0		16	V	
Quiescent circuit current (per circuit)	I_q		0.8	1.6	mA	Lo output
Circuit current (per circuit)	I_a		19.3		mA	$T_j = 25^\circ C$
Threshold input voltage	V_{INth}	0.8		3.0	V	
Input voltage	Hi output	V_{IN}	3.7		V	
	Lo output	V_{IN}		1.5	V	
Input current	Hi output	I_{IN}		-1.0	mA	$V_{IN} = 5V$
	Lo output	I_{IN}	100		μA	$V_{IN} = 0V$
Saturation voltage of output transistor	$V_{CE(sat)}$			0.2	V	$I_O \cong 1.2A, V_{Bopr} = 6$ to $16V$
	$V_{CE(sat)}$		1.0		V	$I_O \cong 1.5A, V_{Bopr} = 6$ to $16V$
Output terminal sink current	$I_{O(off)}$		2.5	5	mA	$T_j = 25^\circ C, V_{CEO} = 14V$
	V_{B-O}	29	34	39	V	$T_j = 25^\circ C, I_C = 10mA$
Surge clamp voltage	V_{B-O}	28	34	40	V	$I_C = 5mA$
Saturation voltage of DIAG output	V_{DL}			0.4	V	$I_{DGH} = -2mA, V_{Bopr} = 6$ to $16V$
Leak current of DIAG output	I_{DGH}			-100	μA	$V_{CC} = 7V$
Open load detection resistor	Ropen	5.5			k Ω	
Overcurrent protection starting current	I_S	1.6			A	$V_O = V_{Bopr} - 1.5V$
Thermal protection starting temperature	T_{TSD}				$^\circ C$	$V_{Bopr} \cong 6V$
Output transfer time	T_{ON}			30	μS	$I_O = 1A$
	T_{OFF}			100	μS	$I_O = 1A$
DIAG output transfer time	T_{PLH}			30	μS	$I_O = 1A$
	T_{PHL}			100	μS	$I_O = 1A$
Minimum load inductance	L_O	1.0			mH	
Maximum ON duty	$D_{(ON)}$	0		60	%	

Note:

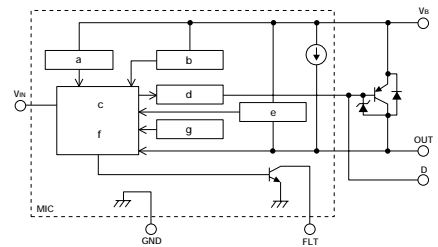
- * The Zener diode has an energy capability of 200 mJ (single pulse).
- * A start failure may occur if a short OFF signal of 10 ms or below is input in the V_{IN} terminal.

External Dimensions (unit: mm)



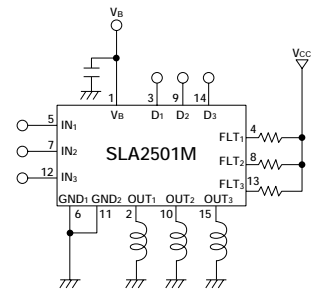
a: Type No.
b: Lot No.

Equivalent Circuit Diagram

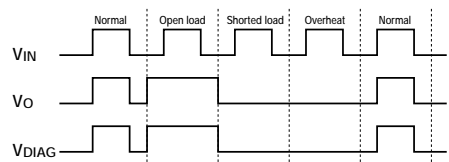


- a: Pre-regulator
- b: Overvoltage protection circuit
- c: Control circuit
- d: Driver circuit
- e: Overcurrent protection circuit
- f: Diagnostic circuit
- g: Thermal protection circuit

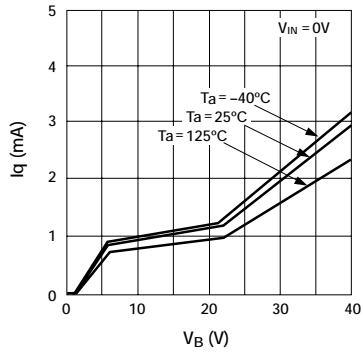
Standard Circuit Diagram



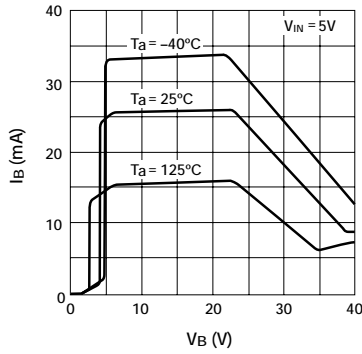
Diagnostic Function



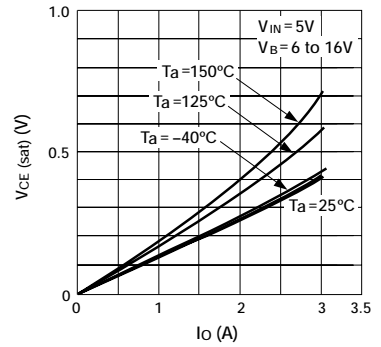
■ Quiescent Circuit Current (single circuit)



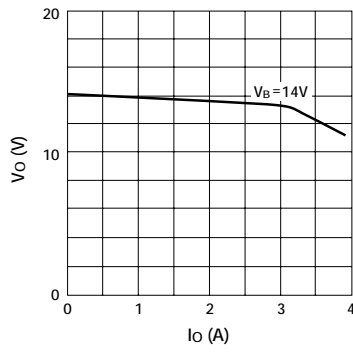
■ Circuit Current (single circuit)



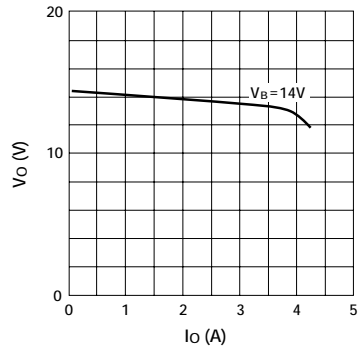
■ Saturation Voltage of Output Transistor



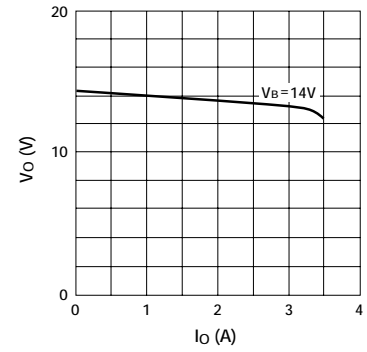
■ Overcurrent Protection Characteristics ($T_a = -40^\circ C$)



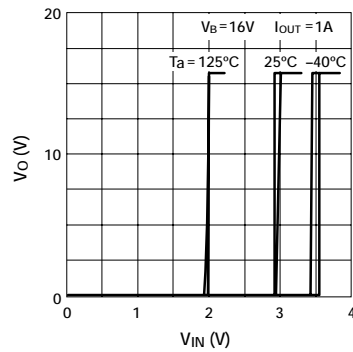
■ Overcurrent Protection Characteristics ($T_a = 25^\circ C$)



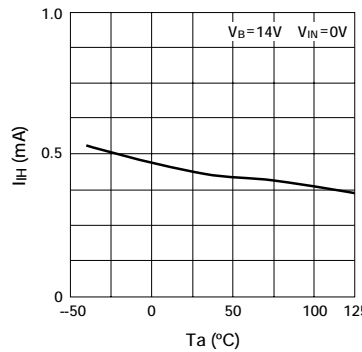
■ Overcurrent Protection Characteristics ($T_a = 115^\circ C$)



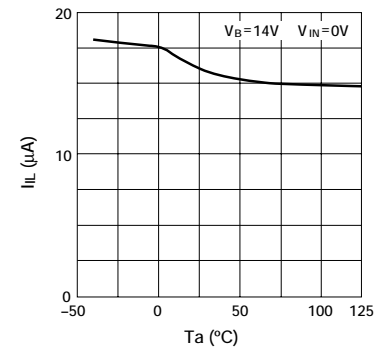
■ Threshold Input Voltage



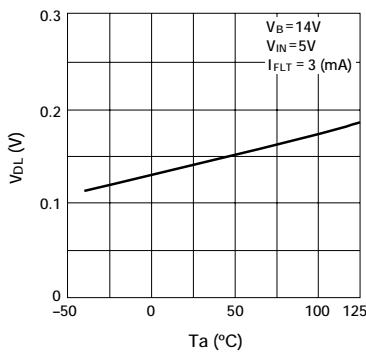
■ Input Current (Output ON)



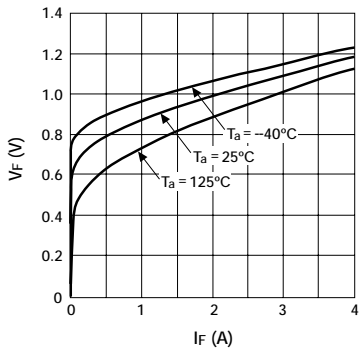
■ Input Current (Output OFF)



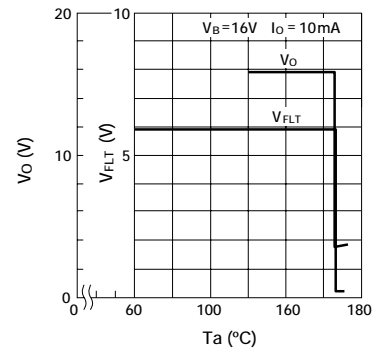
■ Saturation Voltage of DIAG Output



■ Output Reverse Current



■ Thermal Protection



4-circuit High-side Power Switch Array SLA2502M

Features

- Built-in diagnostic function to detect short and open circuiting of loads and output status signals
- Low saturation PNP transistor use ($V_{CE(sat)} \leq 0.5V$)
- Allows direct driving using LS-TTL and C-MOS logic levels
- Built-in overcurrent and thermal protection circuits
- Built-in protection against reverse connection of power supply
- $T_j = 150^\circ\text{C}$ guaranteed

Absolute Maximum Ratings

($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V_B	-13 to +40	V	
Input terminal voltage	V_{IN}	-0.3 to +7.0	V	
DIAG output applied voltage	V_{DIAG}	-0.3 to +7.0	V	
DIAG output source current	I_{DIAG}	3	mA	
Output current	I_O	1.2	A	
Power Dissipation	P_D	4.8	W	Stand-alone operation without heatsink; all circuits operating
Junction temperature	T_j	-40 to +150	$^\circ\text{C}$	
Operating temperature	T_{OP}	-40 to +100	$^\circ\text{C}$	
Storage temperature	T_{stg}	-50 to +150	$^\circ\text{C}$	

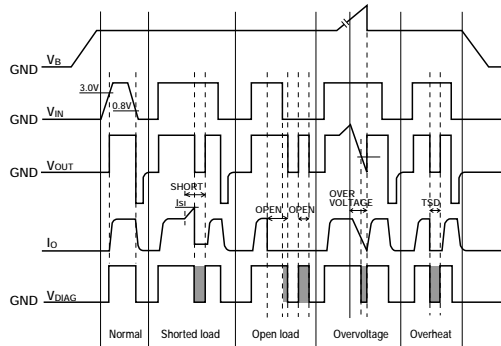
Electrical Characteristics

($V_{Bopr} = 14V$, $T_a = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Operating power supply voltage	V_{Bopr}	6.0		16	V	
Quiescent circuit current (per circuit)	I_q		5	12	mA	$V_{IN} = 0V$
Threshold input voltage	V_{INth}	0.8		3.0	V	
Input current	Hi output	I_{IN}		1.0	mA	$V_{IN} = 5V$
	Lo output	I_{IN}	0	100	μA	$V_{IN} = 0V$
Saturation voltage of output transistor	$V_{CE(sat)}$			0.5	V	$I_O \leq 1.0A$, $V_{Bopr} = 6$ to $16V$
Output terminal sink current	$I_{O(off)}$			2.0	mA	$V_O = 0V$, $V_{IN} = 0V$
Saturation voltage of DIAG output	V_{DL}			0.3	V	$I_{DIAG} = 3mA$
Leak current of DIAG output	I_{DGH}			100	μA	$V_{DIAG} = 5V$
Open load detection resistor	R_{open}			30	$k\Omega$	
Overcurrent protection starting current	I_S	1.6			A	$V_O = V_{Bopr} - 1.9V$
Output transfer time	T_{ON}		8	30	μs	$I_O = 1A$
	T_{OFF}		15	30	μs	$I_O = 1A$
DIAG output transfer time	T_{PLH}		10	30	μs	$I_O = 1A$
	T_{PHL}		15	30	μs	$I_O = 1A$

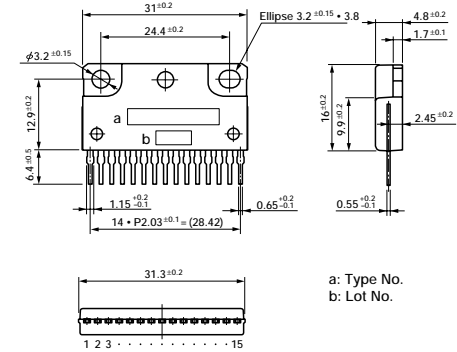
Note: * The rule of protection against reverse connection of power supply is $V_B = -13V$, one minute (all terminals except V_B and GND should be open).

Diagnostic Function



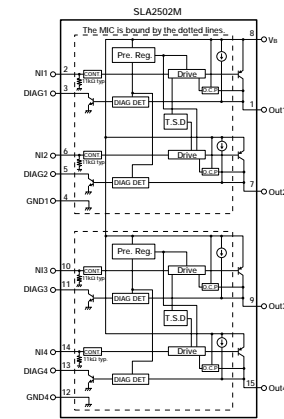
ERROR SIGNAL for CPU

External Dimensions (unit: mm)



a: Type No.
b: Lot No.

Equivalent Circuit Diagram

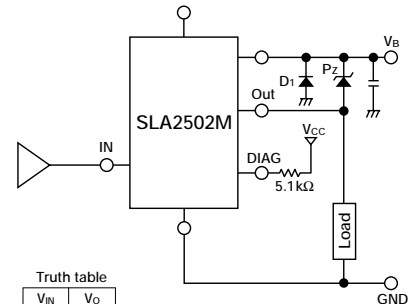


[Abbreviations]

Drive: Drive circuit
CONT: ON/OFF circuit
Pre.Reg: Pre-regulator

DIAG.DET.: Diagnostic circuit
O.C.P.: Overcurrent protection
T.S.D.: Thermal protection

Standard Circuit Diagram



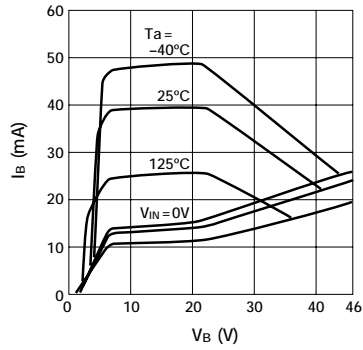
Truth table

V_{IN}	V_O
H	H
L	L

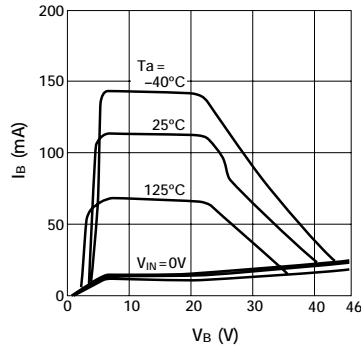
Note 1: A pull-down resistor (11kΩ typ.) is connected to the IN terminal. V_{OUT} turns "L" when a high impedance is connected to the IN terminal in series.

Note 2: Grounds GND1 and GND2 are not wired internally. They must be shorted at a pattern near the product.

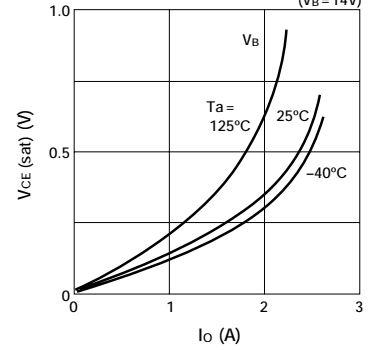
■ Circuit Current (single circuit)



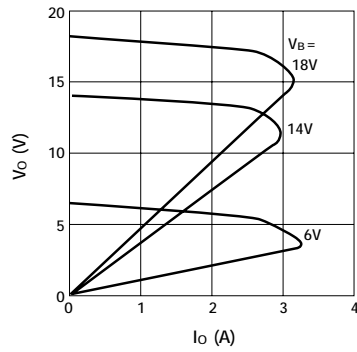
■ Circuit Current (4 circuits)



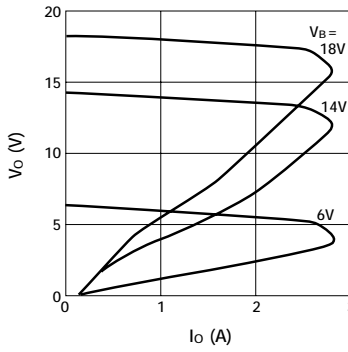
■ Saturation Voltage of Output Transistor (Vb = 14V)



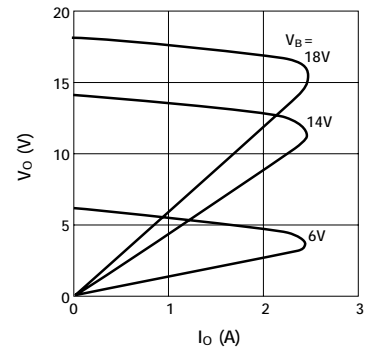
■ Overcurrent Protection Characteristics (Ta = -40°C)



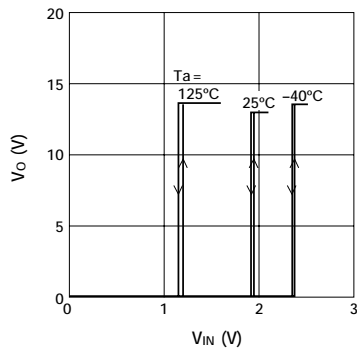
■ Overcurrent Protection Characteristics (Ta = 25°C)



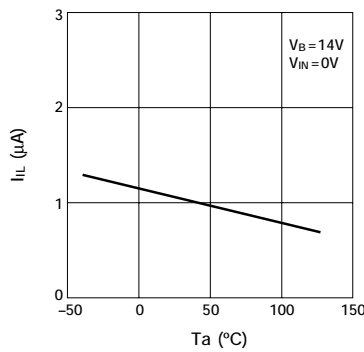
■ Overcurrent Protection Characteristics (Ta = 125°C)



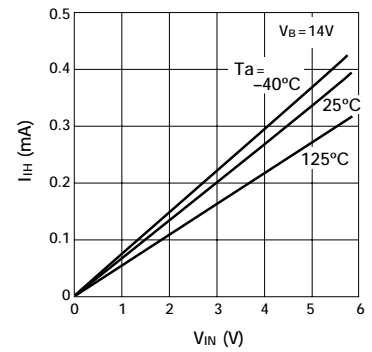
■ Threshold Input Voltage



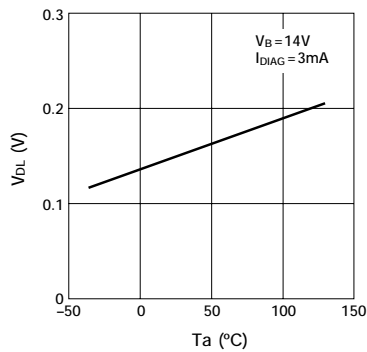
■ Input Current (Output OFF)



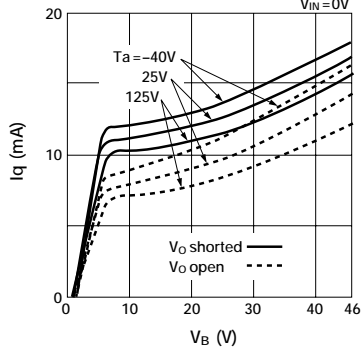
■ Input Sink Current (Output HI)



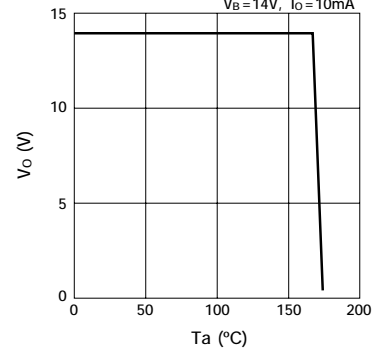
■ Saturation Voltage of DIAG Output



■ Quiescent Circuit Current (dual circuit)

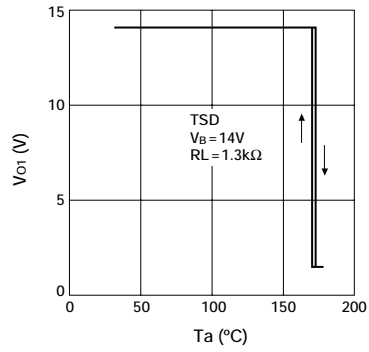


■ Thermal Protection Characteristics

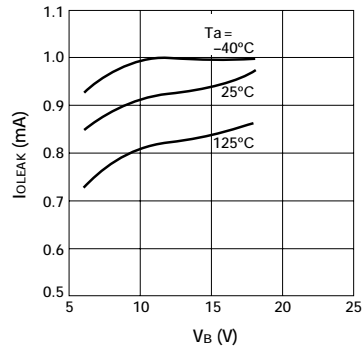


4-circuit High-side Power Switch Array SLA2502M

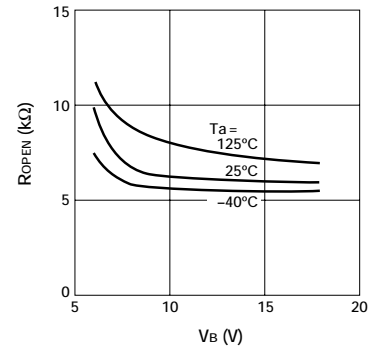
■ Thermal Protection Characteristics



■ Output Terminal Leak Current ($V_O = 0V$)



■ Open Load Detection Resistor





Surface-mount 4-circuit Low-side Switch Array SPF5001

Features

- DMOS 4ch output
- Allows ON/OFF using C-MOS logic level
- Built-in overcurrent, overvoltage and thermal protection circuits

Absolute Maximum Ratings

(Ta = 25°C)

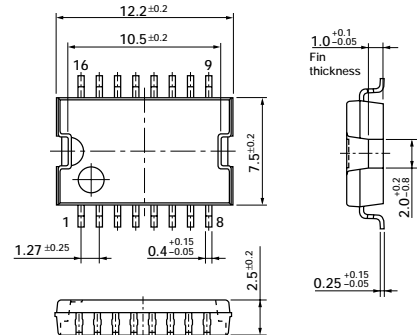
Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V _B	40	V	
Output terminal voltage	V _{OUT}	40	V	
Input terminal voltage	V _{IN}	-0.5 to +7.5	V	
Output current	I _O	1.8	A	
Power Dissipation	P _D	2	W	
Storage temperature	T _{stg}	-40 to +150	°C	
Channel temperature	T _{ch}	150	°C	
Output avalanche capability	E _{AV}	100	mJ	Single pulse

Electrical Characteristics

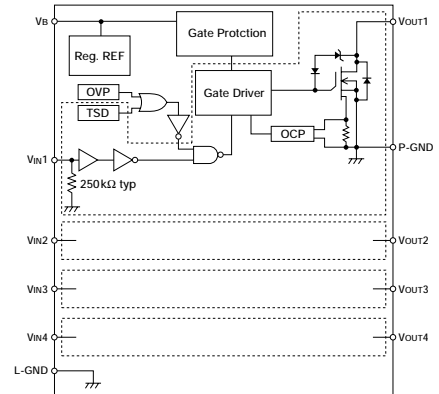
(V_B = 14V, T_C = -40 to +125°C unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Power supply voltage	V _{Bopr}	5.5		32	V	
Quiescent circuit current	I _q		4	6	mA	All outputs are OFF
Input voltage	Hi output V _{IN}	3.5		5.5	V	I _O = 1.5A
	Lo output V _{IN}	-0.5		1.5	V	
Input current	Hi output I _{IN}			50	μA	V _{IN} = 5V
	Lo output I _{IN}			30	μA	V _{IN} = 0V
Output ON voltage	V _{DS(on)}		0.42	0.55	V	I _O = 1A
			0.64	0.75	V	I _O = 1.5A
Output ON resistance	R _{DS(on)}		0.25	0.3	Ω	T _a = 25°C
			0.3	0.4	Ω	T _a = 25°C, V _B = 5.5V
Output clamp voltage	V _{OUT(clamp)}	41	45	55	V	V _B = 14V, I _D = 1A
Output leak current	I _{OH}			100	μA	V _O = 30V
Forward voltage of output stage diode	V _F			1.5	V	I _F = 1.5A
Overvoltage protection starting voltage	V _{B(ovp)}	32		40	V	
Thermal protection starting temperature	T _{TSD}	151	165		°C	
Overcurrent protection starting current	I _S	1.9			A	
Output transfer time	T _{ON}			15	μS	R _L = 14Ω, I _O = 1A
	T _{OFF}			15	μS	R _L = 14Ω, I _O = 1A
Output rise time	T _r			15	μS	R _L = 14Ω, I _O = 1A
Output fall time	T _f			15	μS	R _L = 14Ω, I _O = 1A

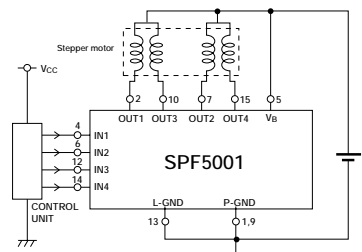
External Dimensions (unit: mm)



Equivalent Circuit Diagram



Circuit Example

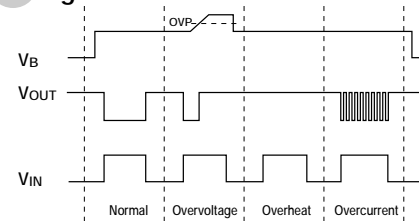


Truth table

V _{IN}	V _O
H	L
L	H

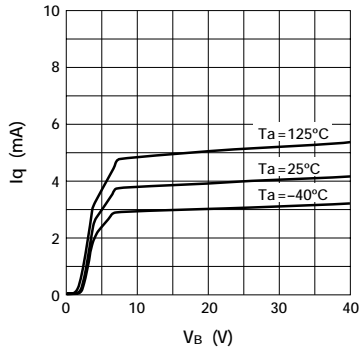
Use L-GND and P-GND being connected.

Timing Chart

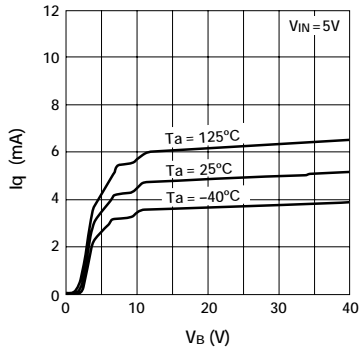


* Self-excited frequency is used in the overcurrent protection.

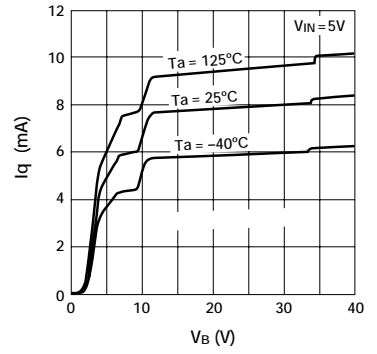
■ Quiescent Circuit Current



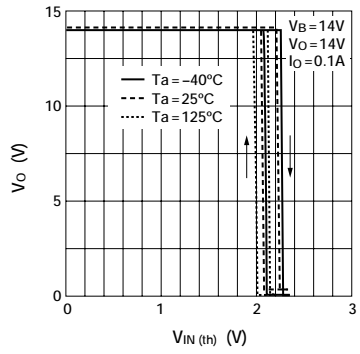
■ Circuit Current (single circuit)



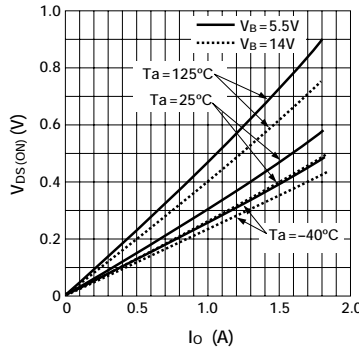
■ Circuit Current (4 circuits)



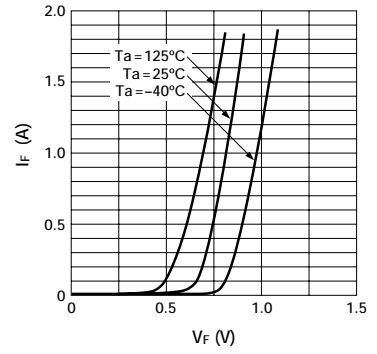
■ Threshold Input Voltage



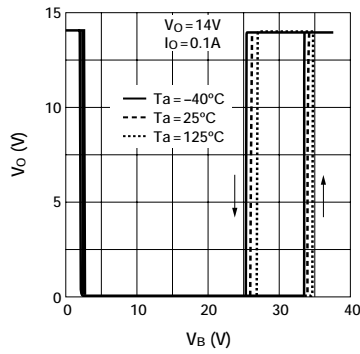
■ Output ON Voltage



■ Forward Voltage of Output Stage Diode



■ Overvoltage Protection Starting Voltage



Surface-mount 4-circuit Low-side Switch Array SPF5002

Features

- DMOS 4ch output
- Allows ON/OFF using C-MOS logic level
- Built-in overcurrent, overvoltage and thermal protection circuits

Absolute Maximum Ratings

(Ta=25°C)

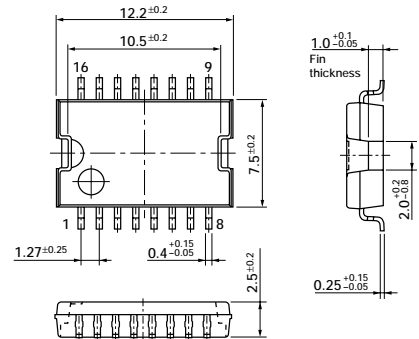
Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V _B	40	V	
Output terminal voltage	V _{OUT}	40	V	
Input terminal voltage	V _{IN}	-0.5 to +7.5	V	
Output current	I _O	1	A	
Power Dissipation	P _D	2	W	
Storage temperature	T _{stg}	-40 to +150	°C	
Channel temperature	T _{ch}	150	°C	
Output avalanche capability	E _{AV}	100	mJ	Single pulse

Electrical Characteristics

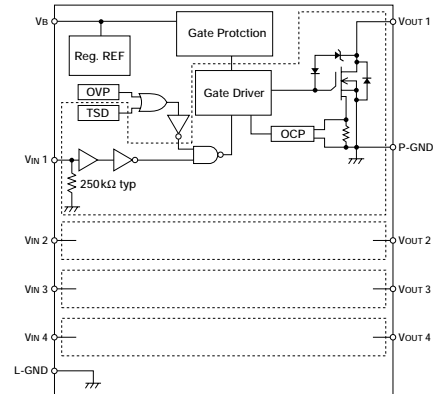
(V_B=14V, T_C=-40 to +125°C unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Power supply voltage	V _{Bopr}	5.5		32	V	
Quiescent circuit current	I _q		4	6	mA	All outputs are OFF
Input voltage	Hi output V _{IN}	3.5		5.5	V	I _O =1.5A
	Lo output V _{IN}	-0.5		1.5	V	
Input current	Hi output I _{IN}			50	μA	V _{IN} =7V
	Lo output I _{IN}			30	μA	V _{IN} =0V
Output ON voltage	V _{DS(on)}			0.4	V	I _O =0.5A
				0.7	V	I _O =1A
Output ON resistance	R _{DS(on)}		0.4		Ω	Ta=25°C
			0.5		Ω	Ta=25°C, V _B =5.5V
Output clamp voltage	V _{OUT(clamp)}	41	45	55	V	V _B =14V, I _O =1A
Output leak current	I _{OH}			100	μA	V _O =30V
Forward voltage of output stage diode	V _F			1.6	V	I _F =0.5A
Overvoltage protection starting voltage	V _{B(ovp)}	32		40	V	
Thermal protection starting temperature	T _{TSD}	151	165		°C	
Overcurrent protection starting current	I _S	1.9			A	
Output transfer time	T _{ON}			15	μS	R _L =14Ω, I _O =1A
	T _{OFF}			15	μS	R _L =14Ω, I _O =1A
Output rise time	T _r			15	μS	R _L =14Ω, I _O =1A
Output fall time	T _f			15	μS	R _L =14Ω, I _O =1A

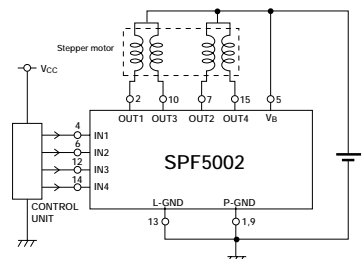
External Dimensions (unit: mm)



Equivalent Circuit Diagram



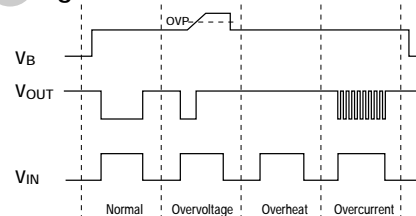
Circuit Example



Truth table

V _{IN}	V _O
H	L
L	H

Timing Chart



* Self-excited frequency is used in the overcurrent protection.



Stepper Motor Driver SLA4708M

Features

- High output breakdown voltage of 50V
- Affluent output current of 1.5A
- Built-in overcurrent, overvoltage and thermal protection circuits
- Low standby current of 50μA

Absolute Maximum Ratings

(Ta = 25°C)

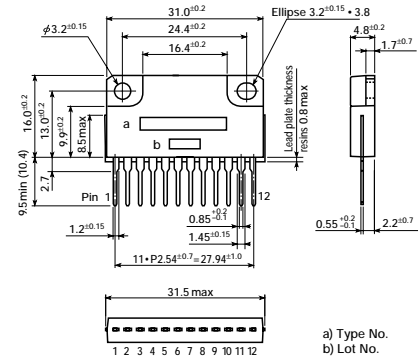
Parameter	Symbol	Ratings	Unit	Conditions
Power supply voltage	V _S	35	V	
Breakdown voltage	V _O	50	V	
Input voltage	V _{IN}	-0.3 to +7	V	
Output current	I _{O, AVE}	1.5	A	
Diagnostic output sink current	I _{DIAG}	10	mA	
Diagnostic output withstand voltage	I _{DIAG, H}	7	V	
Operating temperature	T _{OP}	-40 to +85	°C	
Storage temperature	T _{STG}	-40 to +150	°C	
Power Dissipation	P _D	3.5 (Ta=25°C)	W	Without heatsink

Electrical Characteristics

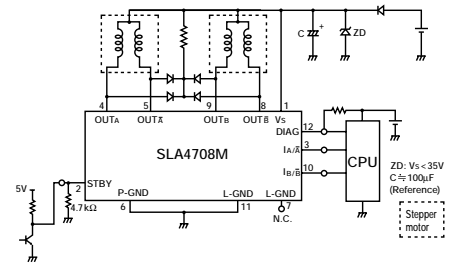
(V_S = 12V, Ta = 25°C)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Input voltage (I _{A/A} , I _{B/B} standby)	V _{IL}			0.8	V	
	V _{IH}	2.4			V	
Input current	I _{IL}			-0.8	mA	V _{IN} = 0.4V
	I _{IH}			50	μA	V _{IN} = 2.4V
Output saturation voltage	V _{O, STA}			1.3	V	I _O = 1A, Ta = 25°C
	V _{O, STA}			1.5	V	I _O = 1.5A, Ta = 25°C
Output leak current	I _{O, LEAK}			100	μA	V _O = 16V
Overcurrent detection	I _{SD}	1.8			A	
Overvoltage detection	V _{SD}	27.5			V	
Saturation voltage of diagnostic output	V _{DIAG, L}			0.3	V	I _{DIAG} = 5mA
Standby current	I _{STB}		50		μA	V _S = 12V

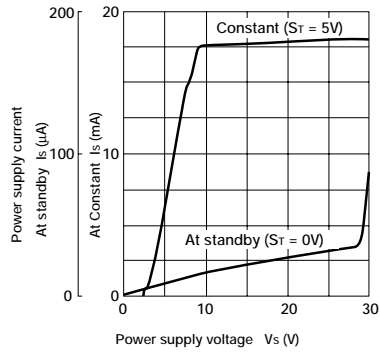
External Dimensions (unit: mm)



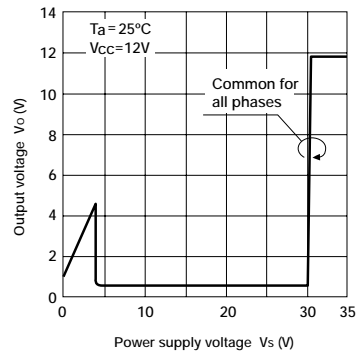
Standard Circuit Diagram



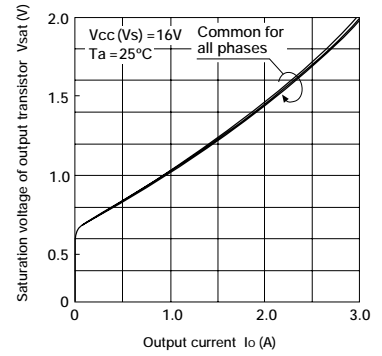
■ Power Supply Current Characteristics



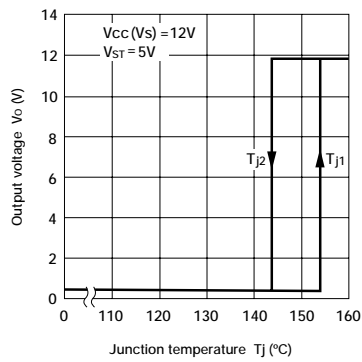
■ Overvoltage Protection Characteristics



■ Saturation Voltage of Output Transistor Characteristics

















■ Thermal Protection Characteristics









Hall-Effect ICs



















Unipolar Switch

Type No.	Absolute Maximum Ratings			Characteristics (Ta=25°C)					Package *2			External Dimensions		
	V _{CC} (V)	I _{OUT} (mA)	Top *1 (°C)	V _{CC} (V)		B _{OP} (mT)		B _{RP} (mT)		B _{HYS} (mT)	U		UA	LT
A3121  	30	25	E: -40 to +85 L: -40 to +150	4.5	24	25	45	12.5	38	7	○	○	○	1/2/3
A3122  	30	25		4.5	24	28	40	14	33	7	○	○	○	
A3123  	30	25		4.5	24	25	44	18	30	7	○	○	○	
A3141  	28	25		4.5	24	5	16	1	13	2	○	○	○	
A3142  	28	25		4.5	24	13	23	7.5	17.5	3	○	○	○	
A3143  	28	25		4.5	24	22	34	16.5	28.5	3	○	○	○	
A3144  	28	25		4.5	24	7	35	5	33	2	○	○	○	

Bipolar Switch

Type No.	Absolute Maximum Ratings			Characteristics (Ta=25°C)					Package *2			External Dimensions	
	V _{CC} (V)	I _{OUT} (mA)	Top *1 (°C)	V _{CC} (V)		B _{OP} (mT)		B _{RP} (mT)		B _{HYS} (mT)	U		UA
UG  	25	25	N: -20 to +85 S: -40 to +125	4.5	24	9.5	-9.5	3	○	○	○	1/2/3	
UG  	25	25		4.5	24	7.5	-7.5	3	○	○	○		
A3134  	30	25	E: -40 to +85 L: -40 to +150	3.8	24	-3	4.5	-4	2	1.5	○		○

Bipolar Latch

Type No.	Absolute Maximum Ratings			Characteristics (Ta=25°C)					Package *2			External Dimensions		
	V _{CC} (V)	I _{OUT} (mA)	Top *1 (°C)	V _{CC} (V)		B _{OP} (mT)		B _{RP} (mT)		B _{HYS} (mT)	U		UA	LT
A3174XU	18	15	-40 to +115	4.5	18	2.5	17	-17	-2.5	10	○			1
UGN3175 	18	15	-20 to +85	4.5	18	2.5	17	-17	-2.5	10	○	○	○	1/2/3
UGN3177 	18	15		4.5	18	5	15	-15	-5	10	○	○	○	
A3185  	30	25	E: -40 to +85 L: -40 to +150	3.8	24	17	27	-27	-17	34	○	○	○	
A3186  	30	25		3.8	24	7	33	-33	-7	14	○	○	○	
A3187  	30	25		3.8	24	5	15	-15	-5	10	○	○	○	
A3188  	30	25		3.8	24	10	18	-18	-10	20	○	○	○	
A3189  	30	25		3.8	24	5	23	-23	-5	10	○	○	○	
A3195LU	26	—	-40 to +150	3.8	26	5	16	-16	-5	13	○			1
A3197LU	26	—		V _{CC} (UV) 26	5	16	-16	-5	13	○				

Gear Tooth Sensor

Type No.	Absolute Maximum Ratings			Characteristics (Ta=25°C)				Remarks	External Dimensions			
	V _{CC} (V)	I _{OUT} (mA)	Top (°C)	V _{CC} (V)		B _{OP} (mT)				B _{HYS} (mT)		
UGS3059KA	24	25	-40 to +150	4.5	24	1	10	-10	-1	2	AC coupled	4
UGS3060KA	24	25		4.5	24	0.5	3.5	-3.5	-0.5	1		

Linear Sensors

Type No.	Absolute Maximum Ratings			Characteristics (Ta=25°C)				Over operating temperature range		External Dimensions			
	V _{CC} (V)	I _{OUT} (mA)	Top (°C)	V _{CC} (V)		V _{OO} (V)		SENS (mV/mT)			Δ SENS(ΔT) (%)	Δ V _{OO} (ΔT) (mT)	
A3506LU	6	5	-40 to +150	4.5	5.5	2.25	2.75	22.5	27.5	-6.3	7.5	±2.0	1
A3507EU	6	5	-40 to +85	4.5	5.5	2.00	3.00	20.0	30.0	-8.8	10	±3.5	
A3507LU	6	5	-40 to +150	4.5	5.5	2.00	3.00	20.0	30.0	-8.8	8.7	±3.5	
A3508SU	6	5	-20 to +85	4.5	5.5	2.00	3.00	20.0	30.0	-10	10	±5.0	

Subassembly

Type No.	Absolute Maximum Ratings			Characteristics (Ta=25°C)				Remarks	External Dimensions	
	V _{CC} (V)	I _{OUT} (mA)	Top (°C)	V _{CC} (V)		Air gap (mm)				Timing accuracy (°)
ATS610LSA	16	25	-40 to +150	V _{CC} (UV)	16	0.4	2.25	±0.1	Peak-Detect	5
ATS611LSB						0.4	2.5	±0.1		

External Dimensions (unit: mm)

Figure 1

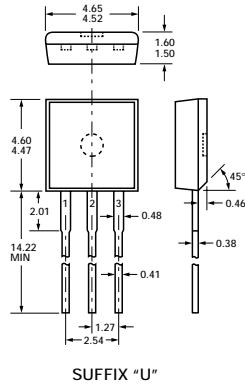


Figure 2

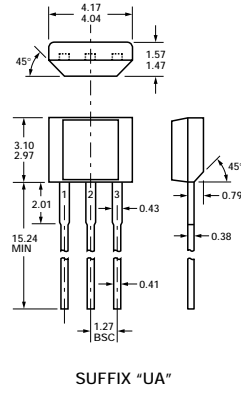


Figure 3

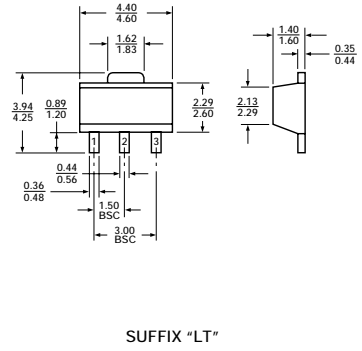


Figure 4

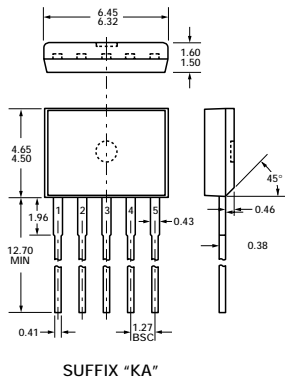
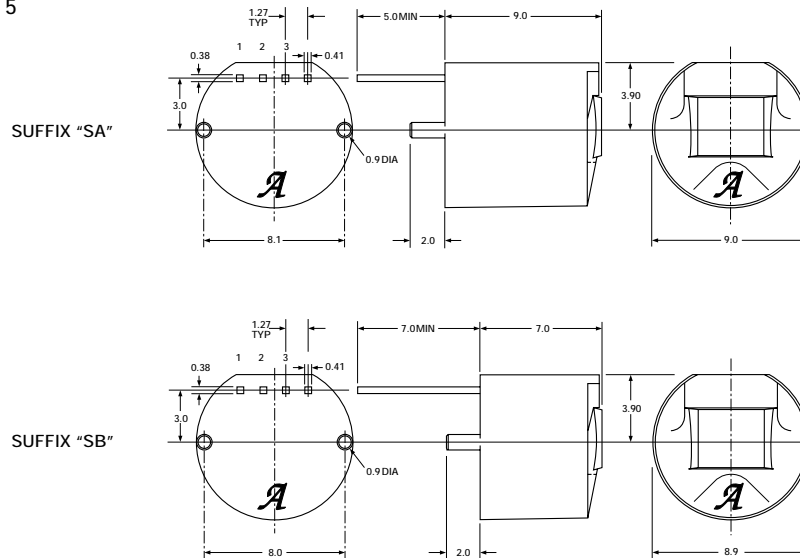


Figure 5



Custom IC

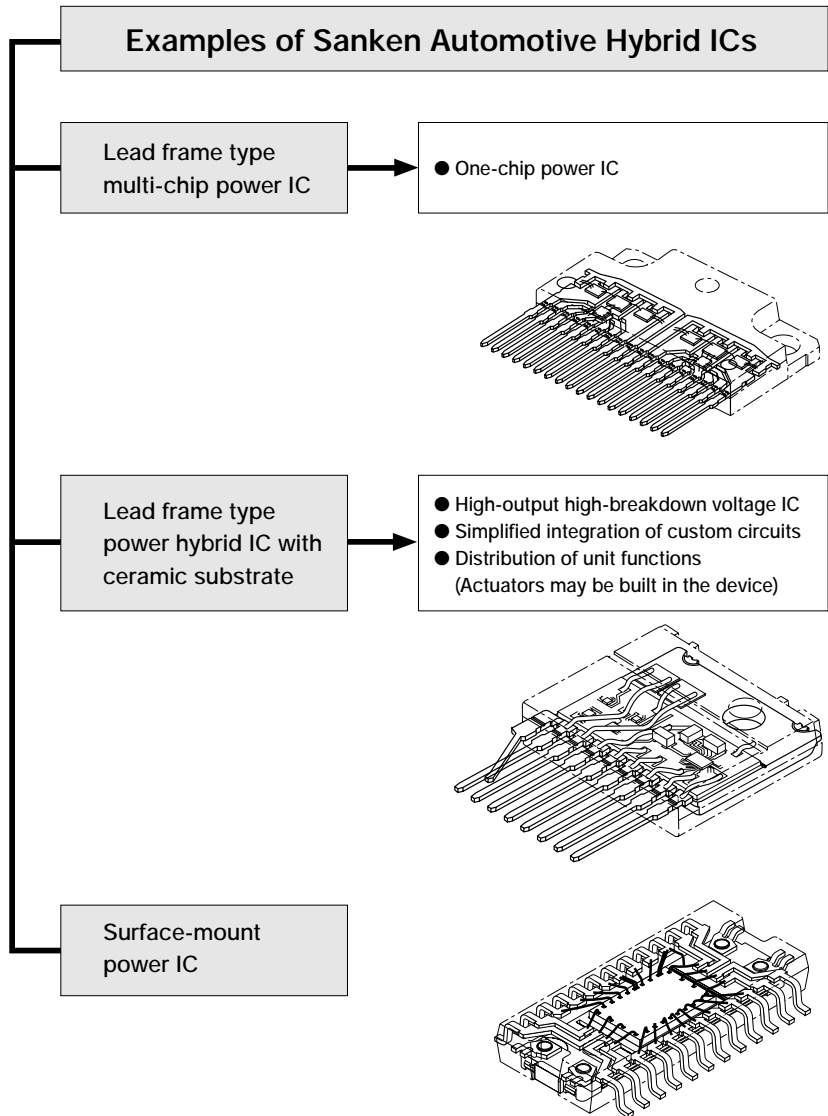
- Various processing technologies of BIP, BiCMOS, CMOS and BCD can be used for the semiconductor chips.
- Meets detailed user needs, especially power ICs. A wide range of general-purpose ICs is also available.
- Employs a monolithic chip with flip-chip construction for increased reliability making it ideal for car electronic devices.
- Also available in hybrid ICs with transfer mold construction, multi-chip IC configuration and power monolithic IC configuration.

Features

- All semiconductor chips used are manufactured by Sanken.
- Main product lineup consists of power ICs produced out of many years' experience of Sanken.
- Uses monolithic chips with flip-chip construction.
- Mainly available in miniature transfer-mold packages.

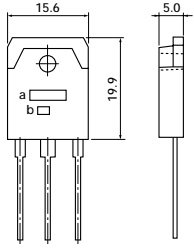
Examples of Custom Hybrid IC Products

- Regulators for alternators
- Igniters
- Power supply for microcomputer system
- Power steering control IC
- Motor and actuator driver
- Others

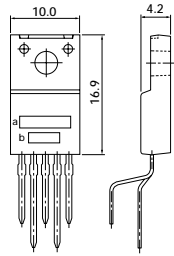


External Dimensions (unit: mm)

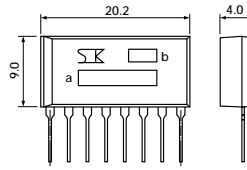
MT-100



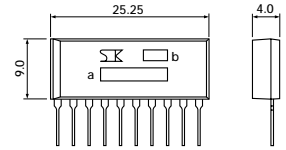
FM205



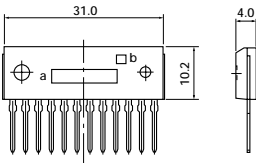
STA 8pin



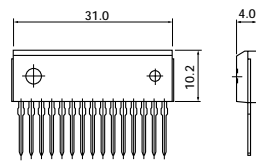
STA 10pin



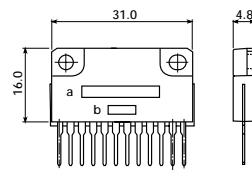
SMA12pin



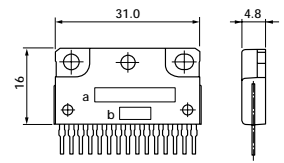
SMA15pin



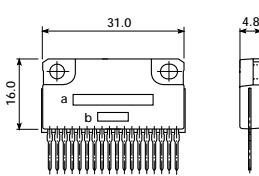
SLA12pin



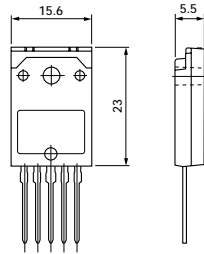
SLA15pin



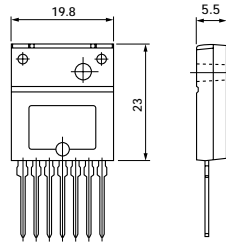
SLA18pin



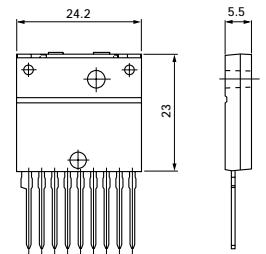
3GR-F



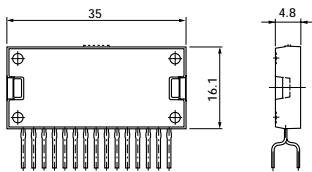
3GR-M



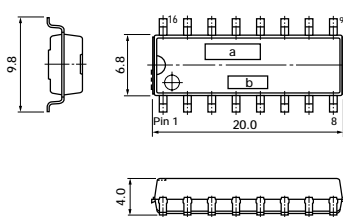
STR-S



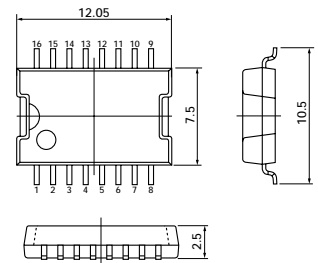
SPM



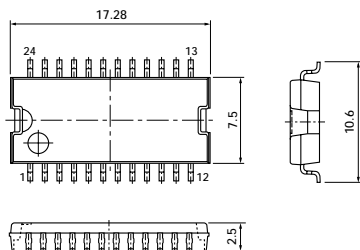
SMD16pin



SPF16pin



SPF24pin



Transistors and MOS FETs

Transistors and MOS FETs by Application

Application	Type No.	Page
Igniters	2SD2141	58
Injectors	2SC4153	57
	2SD2382	59
	STA461C	65
	STA463C	66
	STA508A	79
	SDC09	70
AT (Automatic Transmissions)	2SA1488	50
	2SA1488A	50
Cruise controls	2SA1568	52
	2SC4065	56
	SLA8004	67
Airbag systems	2SA1567	51
	SDA03	68
	SDA04	69
Boosters for power supply of microcomputers	2SA1488	50
	FP812	61
Power steering	FKV460	72
	FKV460FP	73
	FKV560	74
	FKV560FP	75
	FKV560S	76
	FKV660	77
	FKV660S	78
ABS	SLA5027	82
Electronic meters	2SC3852	54
Solenoid drivers	STA315A	62
	STA335A	63
	STA415A	64
	STA509A	80
	SDK06	83
	SDK08	84
Clutch controls	2SC4024	55
Lamp controls	2SK2701	71
	SMA5113	81
Others	2SC3851	53
	FN812	60

Transistors and MOS FETs by Load

Load Current	Type No.	Chip	Avalanche Diode	Single Package			Multi-chip Package				Remarks
				FM20	TO220S	FM100	SMD	STA	SMA	SLA	
Approx. 0.5A	2SA1488A	Single		25W							
	2SC3852	Single		25W							
	2SC3851	Single		25W							
	STA315A	Single • 3	35V					13.5W			Es/b = 50mJ
	STA335A	Single • 2	35V					12W			Es/b = 150mJ
	STA415A	Single • 4	35V					18W			Es/b = 50mJ
	STA509A	MOS • 4	52V					20W			E _{AS} = 40mJ
	SDK06	MOS • 4	52V				3W				E _{AS} = 40mJ
Approx. 1.2A	2SA1488	Single		25W							
	2SC3851	Single		25W							
	2SC4153	Single		30W							V _{CEO} = 120V
	SDA03	Single • 4					3W				
	SDC09	Single • 2	65V				2.8W				Es/b = 80mJ
	SDK08	MOS • 4					3W				
	STA461C	Single • 2	65V					18W			Es/b = 80mJ
	STA463C	Single • 2	115V					18W			Es/b = 45mJ
	STA508A	MOS • 4						20W			V _{DSS} = 120V
	SMA5113	MOS • 4							35W		V _{DSS} = 450V
Approx. 3A	2SA1567	Single		35W							
	2SD2382	Single	65V	30W							Es/b = 200mJ
	2SK2701	MOS		35W							V _{DSS} = 450V
	FP812	Single		35W							
	FN812	Single		35W							
	SLA8004	Single • 4								40W	
Approx. 5A	2SC4024	Single		35W							
	2SC4065	Single		35W							
	2SA1568	Single		35W							
	2SD2141	Darlington	380V	35W							Es/b = 210mJ
	SLA5027	MOS • 4								40W	
Approx. 10A	FKV460	MOS		40W							
	FKV560	MOS		40W							
	FKV660	MOS		40W							
	FKV560S	MOS			60W						
	FKV660S	MOS			60W						
	FKV460FP	MOS				70W					
	FKV560FP	MOS				70W					

Power Transistor 2SA1488/1488A

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings		Unit
	2SA1488	2SA1488A	
VcBo	-60	-80	V
VcEO	-60	-80	V
VEBO	-6		V
Ic	-4		A
IB	-1		A
PC	25 (Tc = 25°C)		W
TJ	150		°C
Tstg	-55 to +150		°C

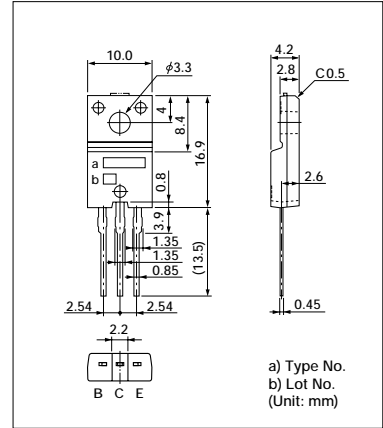
Electrical Characteristics (Ta = 25°C)

Symbol	Test Conditions	Ratings		Unit
		2SA1488	2SA1488A	
IcBo	VcB =	-100max	-100max	μA
IEBO	VEB = -6V	-60	-80	V
IEBO		-100max		μA
V(BR)CEO	Ic = -25mA	-60min	-80min	V
hFE	VCE = -4V, Ic = -1A	40min		
VCE(sat)	Ic = -2A, IB = -0.2A	-0.5max		V
fT	VCE = -12V, IE = -0.2A	15typ		MHz
COB	VcB = -10V, f = 1MHz	90typ		pF

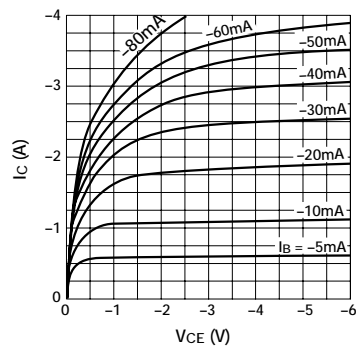
Typical Switching Characteristics (common emitter)

VCC (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (mA)	IB2 (mA)	ton (μs)	tstg (μs)	tr (μs)
-12	6	-2	-10	5	-200	200	0.25typ	0.75typ	0.25typ

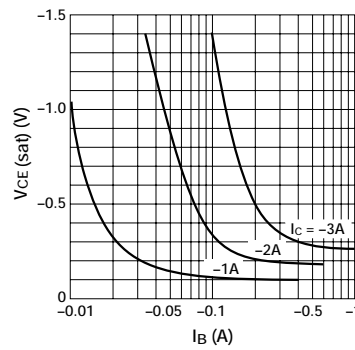
External Dimensions FM20 (full-mold)



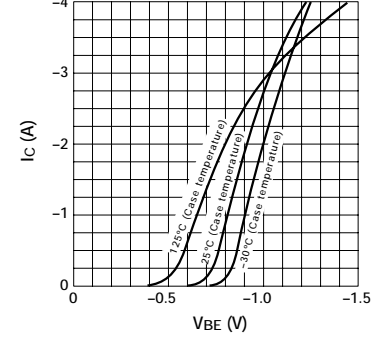
■ Ic—VCE Characteristics (typ.)



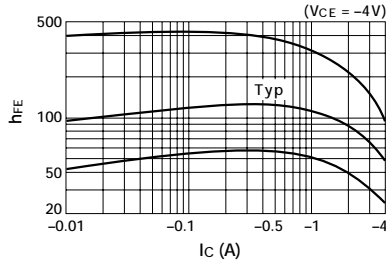
■ VCE(sat)—IB Characteristics (typ.)



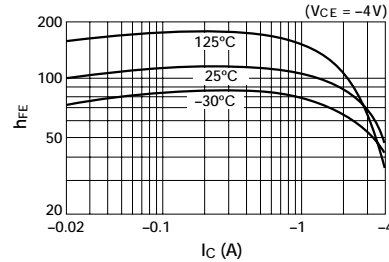
■ Ic—VBE Temperature Characteristics (typ.) (VCE = -4V)



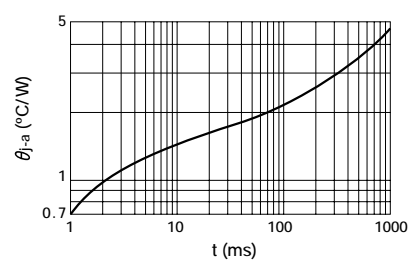
■ hFE—Ic Characteristics (typ.)



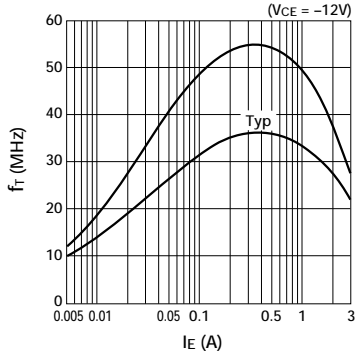
■ hFE—Ic Temperature Characteristics (typ.)



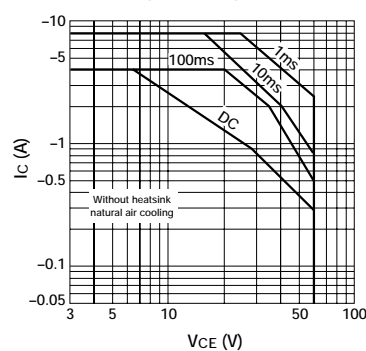
■ θj-a—t Characteristics



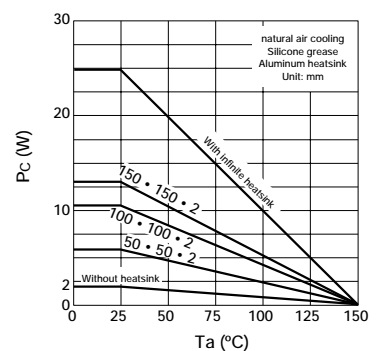
■ fT—IE Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ PC—Ta Derating



Power Transistor 2SA1568

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	-60	V
V _{CE0}	-60	V
V _{EB0}	-6	V
I _C	±12	A
I _B	-3	A
P _C	35 (T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

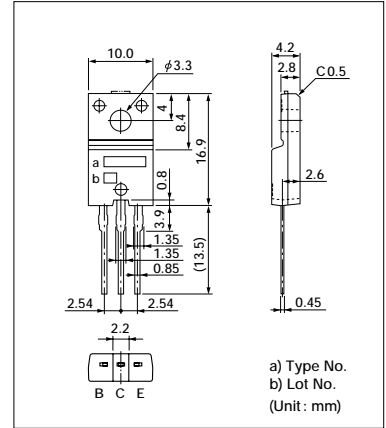
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = -60V	-100max	μA
I _{EB0}	V _{EB} = -6V	-60max	mA
V _{(BR)CEO}	I _C = -25mA	-60min	V
h _{FE}	V _{CE} = -1V, I _C = -6A	50min	
V _{CE(sat)}	I _C = -6A, I _B = -0.3A	-0.35max	V
V _{FEC}	I _{ECO} = -10A	-2.5max	V
f _T	V _{CE} = -12V, I _E = 0.5A	40typ	MHz
C _{OB}	V _{CB} = -10V, f = 1MHz	330typ	pF

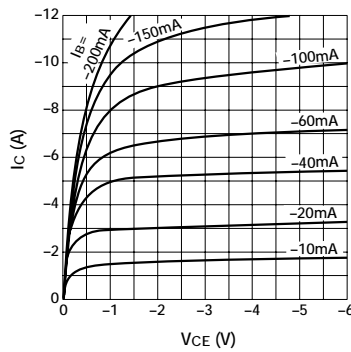
Typical Switching Characteristics (common emitter)

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _f (μs)
-24	4	-6	-10	5	-120	120	0.4typ	0.4typ	0.2typ

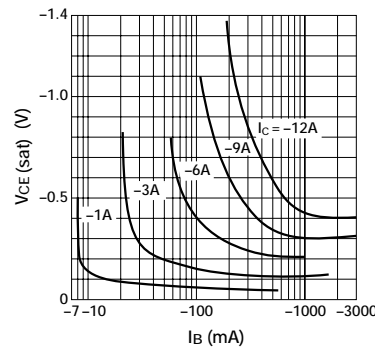
External Dimensions FM20 (full-mold)



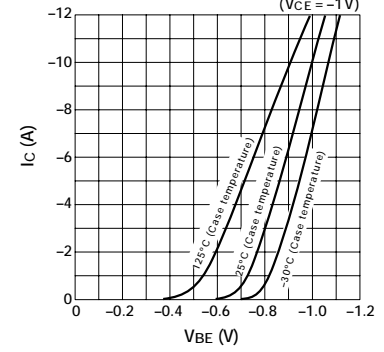
■ I_C — V_{CE} Characteristics (typ.)



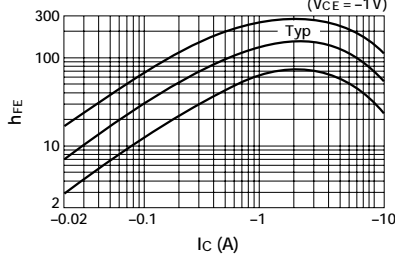
■ V_{CE(sat)} — I_B Characteristics (typ.)



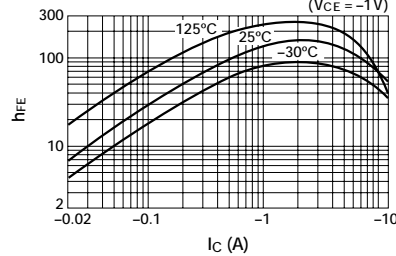
■ I_C — V_{BE} Temperature Characteristics (typ.) (V_{CE} = -1V)



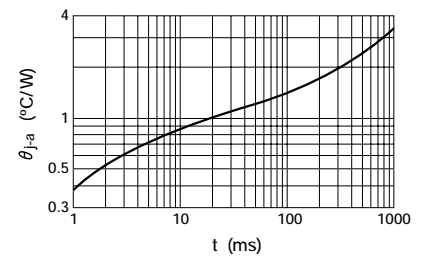
■ h_{FE} — I_C Characteristics (typ.) (V_{CE} = -1V)



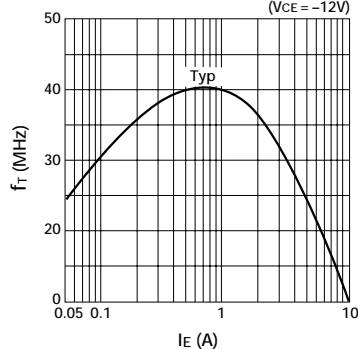
■ h_{FE} — I_C Temperature Characteristics (typ.) (V_{CE} = -1V)



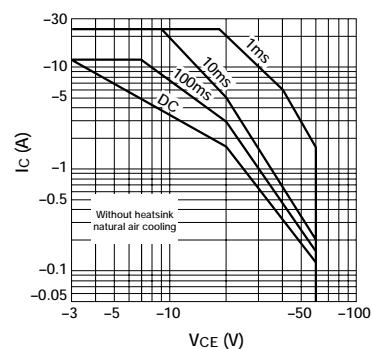
■ θ_{J-a} — t Characteristics



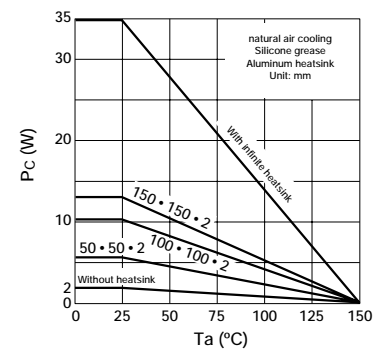
■ f_T — I_E Characteristics (typ.) (V_{CE} = -12V)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor 2SC3851

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	80	V
V _{CE0}	60	V
V _{EB0}	6	V
I _C	4	A
I _B	1	A
P _C	25 (T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

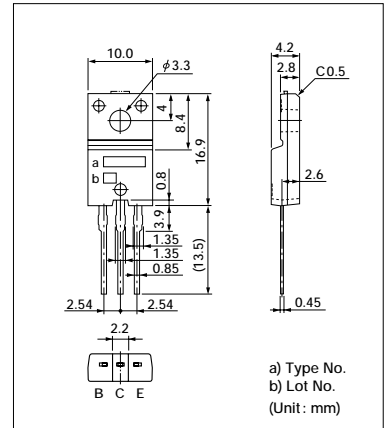
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 80V	100max	μA
I _{EB0}	V _{EB} = 6V	100max	μA
V _{(BR)CEO}	I _C = 25mA	60min	V
h _{FE}	V _{CE} = 4V, I _C = 1A	40 to 320	
V _{CE(sat)}	I _C = 2A, I _B = 0.2A	0.5max	V
f _T	V _{CE} = 12V, I _E = -0.2A	15typ	MHz
C _{OB}	V _{CB} = 10V, f = 1MHz	60typ	pF

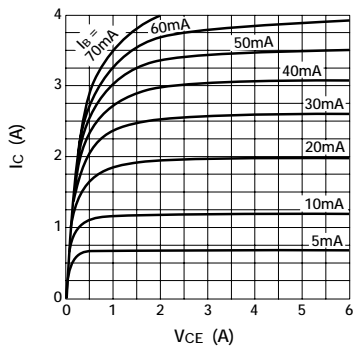
Typical Switching Characteristics (common emitter)

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _f (μs)
12	6	2	10	-5	200	-200	0.2typ	1typ	0.3typ

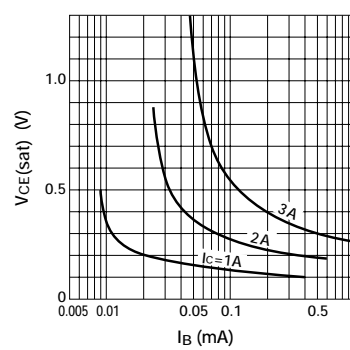
External Dimensions FM20 (full-mold)



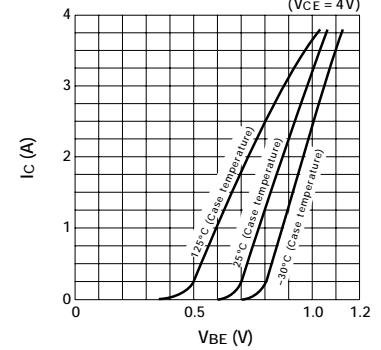
■ I_C — V_{CE} Characteristics (typ.)



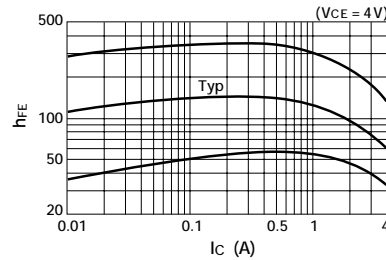
■ V_{CE(sat)} — I_B Characteristics (typ.)



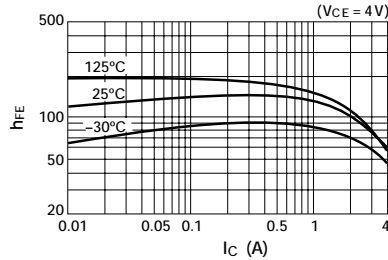
■ I_C — V_{BE} Temperature Characteristics (typ.)



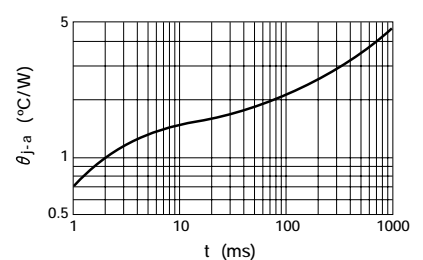
■ h_{FE} — I_C Characteristics (typ.)



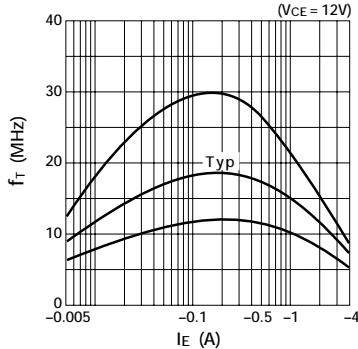
■ h_{FE} — I_C Temperature Characteristics (typ.)



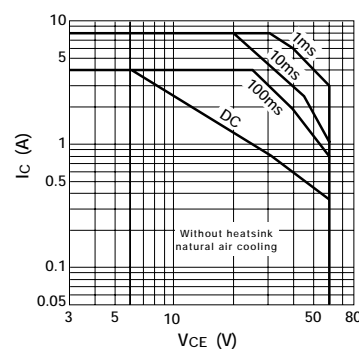
■ θ_{J-a} — t Characteristics



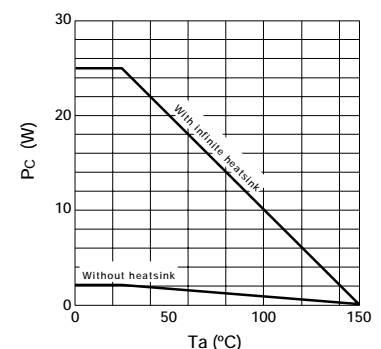
■ f_T — I_E Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor 2SC4024

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	100	V
V _{CEO}	50	V
V _{EB0}	15	V
I _C	10	A
I _B	3	A
P _C	35 (T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

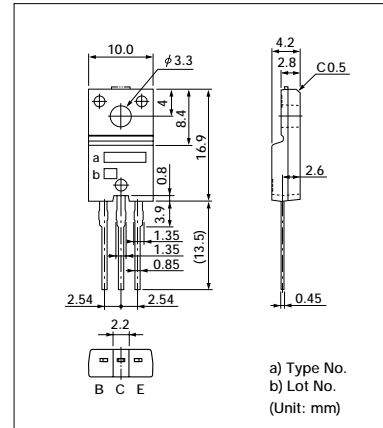
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 100V	10max	μA
I _{EB0}	V _{EB} = 15V	10max	μA
V _{(BR)CEO}	I _C = 25mA	50min	V
h _{FE}	V _{CE} = 4V, I _C = 1A	300 to 1600	
V _{CE(sat)}	I _C = 5A, I _B = 0.1A	0.5max	V
f _T	V _{CB} = 12V, I _E = -0.5A	24typ	MHz
C _{OB}	V _{CB} = 10V, f = 1MHz	150typ	pF

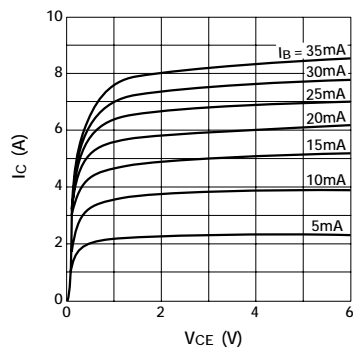
Typical Switching Characteristics (common emitter)

V _{CC} (V)	R _L (Ω)	I _C (A)	I _{B1} (A)	I _{B2} (A)	t _{on} (μs)	t _{sig} (μs)	t _r (μs)
20	4	5	0.1	-0.1	0.5typ	2.0typ	0.5typ

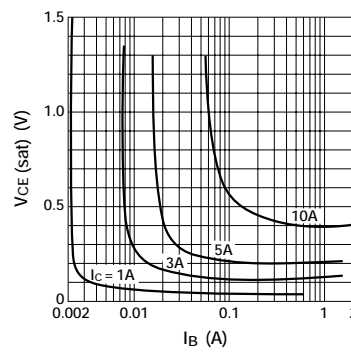
External Dimensions FM20 (full-mold)



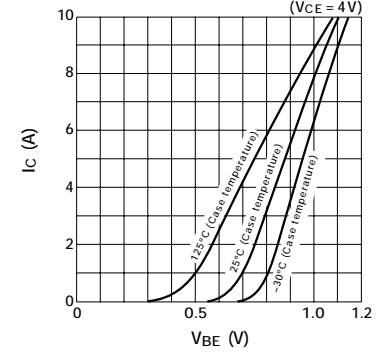
■ I_C — V_{CE} Characteristics (typ.)



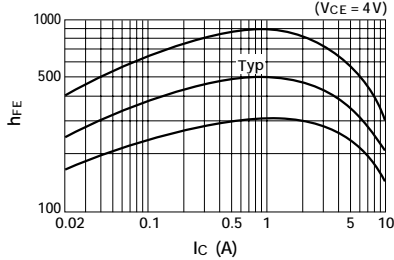
■ V_{CE(sat)} — I_B Characteristics (typ.)



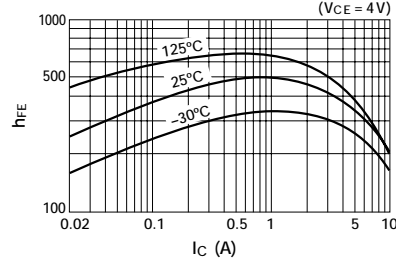
■ I_C — V_{BE} Temperature Characteristics (typ.)



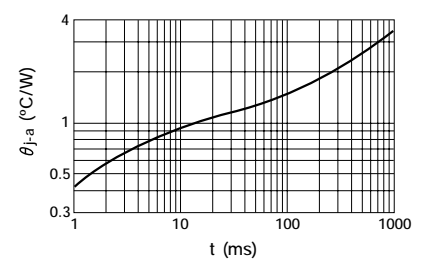
■ h_{FE} — I_C Characteristics (typ.)



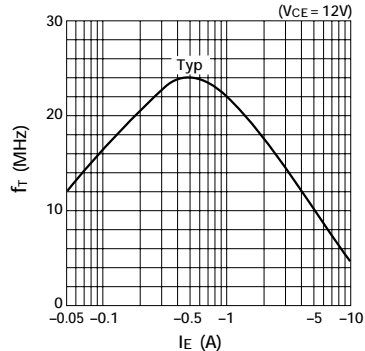
■ h_{FE} — I_C Temperature Characteristics (typ.)



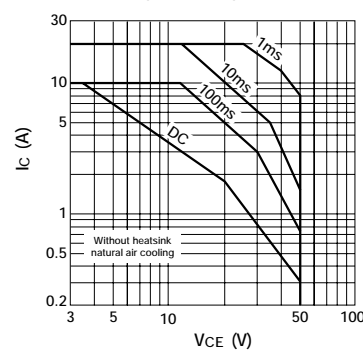
■ θ_{J-a} — t Characteristics



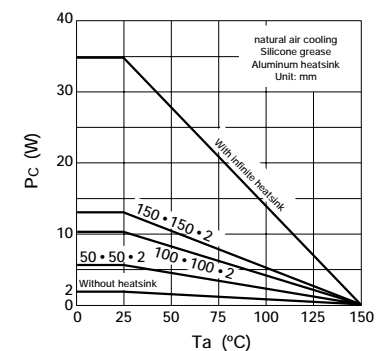
■ f_T — I_E Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor 2SC4065

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	60	V
V _{CE0}	60	V
V _{EB0}	6	V
I _C	±12	A
I _B	3	A
P _C	35 (T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

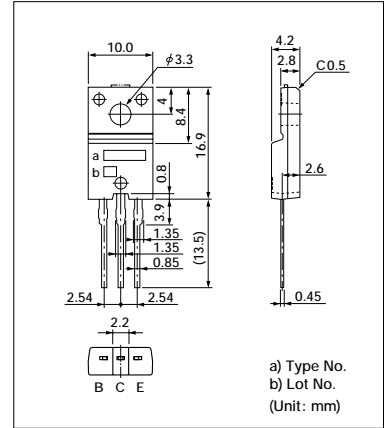
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 60V	100max	μA
I _{EB0}	V _{EB} = 6V	60max	mA
V _{(BR)CEO}	I _C = 25mA	60min	V
h _{FE}	V _{CE} = 1V, I _C = 6A	50min	
V _{CE(sat)}	I _C = 6A, I _B = 1.3A	0.35max	V
V _{FEC}	V _{ECO} = 10A	2.5max	V
f _T	V _{CE} = 12V, I _E = -0.5A	24typ	MHz
C _{OB}	V _{CB} = 10V, f = 1MHz	180typ	pF

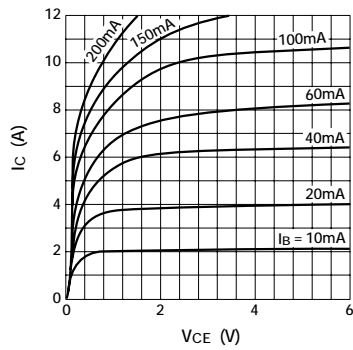
Typical Switching Characteristics (common emitter)

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (A)	I _{B2} (A)	t _{on} (μs)	t _{stg} (μs)	t _r (μs)
24	4	6	10	-5	0.12	-0.12	0.6typ	1.4typ	0.4typ

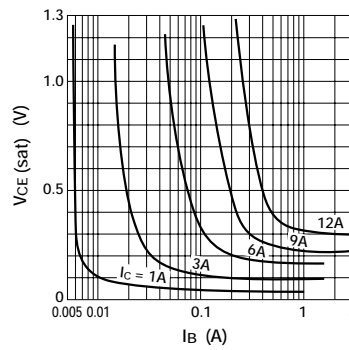
External Dimensions FM20 (full-mold)



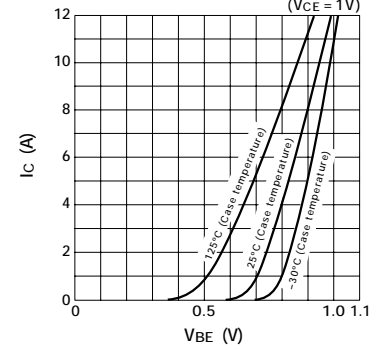
■ I_C — V_{CE} Characteristics (typ.)



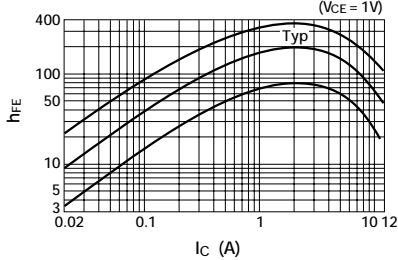
■ V_{CE(sat)} — I_B Characteristics (typ.)



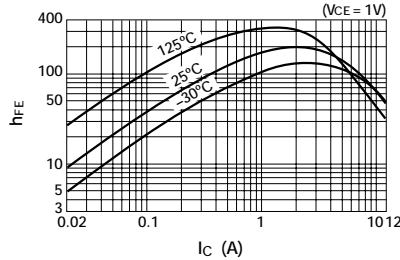
■ I_C — V_{BE} Temperature Characteristics (typ.)



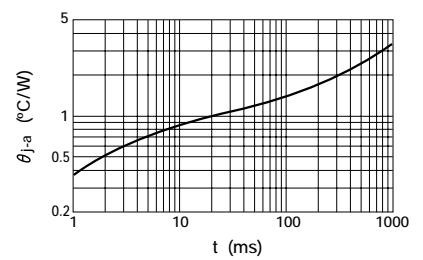
■ h_{FE} — I_C Characteristics (typ.)



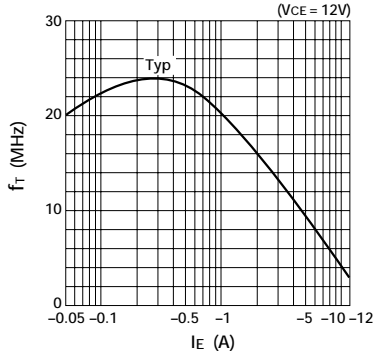
■ h_{FE} — I_C Temperature Characteristics (typ.)



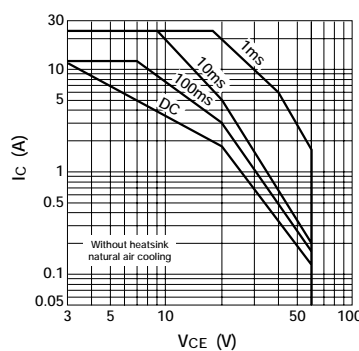
■ θ_{J-a} — t Characteristics



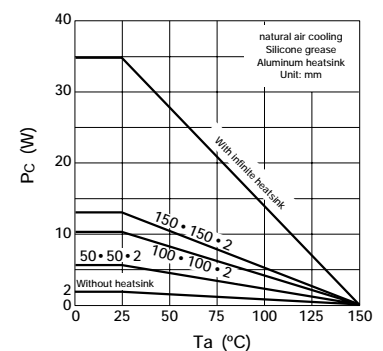
■ f_T — I_E Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor 2SC4153

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CEO}	200	V
V _{CE0}	120	V
V _{EB0}	8	V
I _C	7 (pulse 14)	A
I _B	3	A
P _C	30 (T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

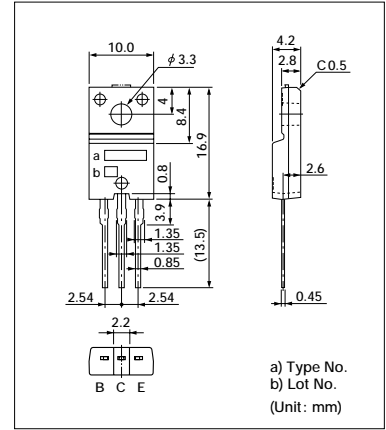
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CBO}	V _{CB} = 200V	100max	μA
I _{EBO}	V _{EB} = 8V	100max	μA
V _{(BR)CEO}	I _C = 50mA	120min	V
h _{FE}	V _{CE} = 4V, I _C = 3A	70 to 220	
V _{CE(sat)}	I _C = 3A, I _B = 0.3A	0.5max	V
V _{BE(sat)}	I _C = 3A, I _B = 0.3A	1.2max	V
f _T	V _{CE} = 12V, I _E = -0.5A	30typ	MHz
C _{OB}	V _{CB} = 10V, f = 1MHz	110typ	pF

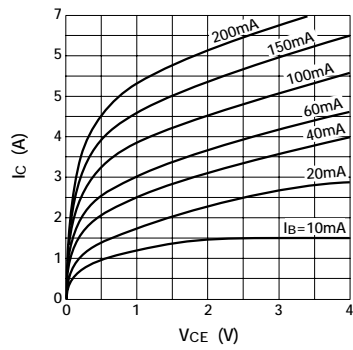
Typical Switching Characteristics (common emitter)

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (A)	I _{B2} (A)	t _{on} (μs)	t _{slg} (μs)	t _r (μs)
50	16.7	3	10	-5	0.3	-0.6	0.5max	3max	0.5max

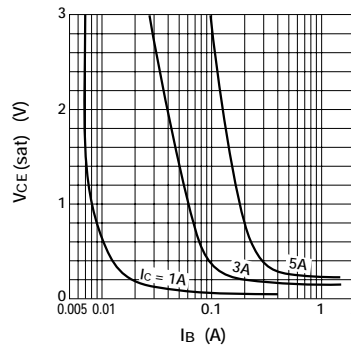
External Dimensions FM20 (full-mold)



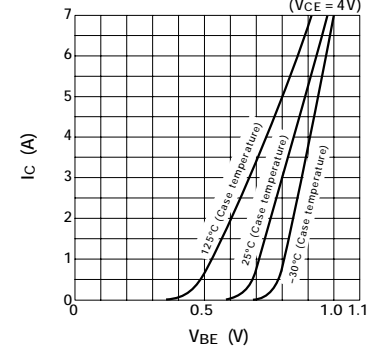
■ I_C — V_{CE} Characteristics (typ.)



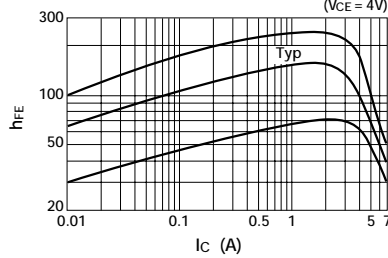
■ V_{CE(sat)} — I_B Characteristics (typ.)



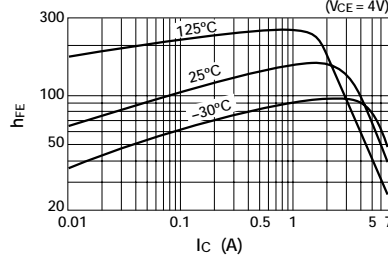
■ I_C — V_{BE} Temperature Characteristics (typ.)



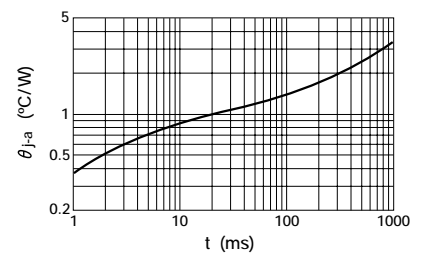
■ h_{FE} — I_C Characteristics (typ.)



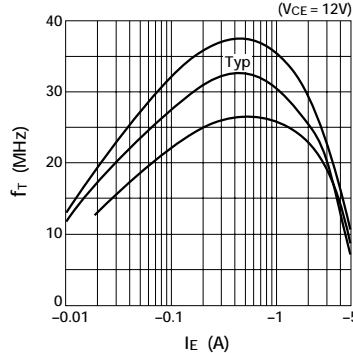
■ h_{FE} — I_C Temperature Characteristics (typ.)



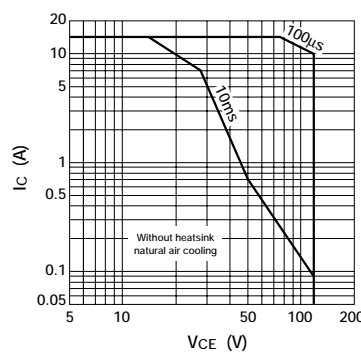
■ θ_{J-a} — t Characteristics



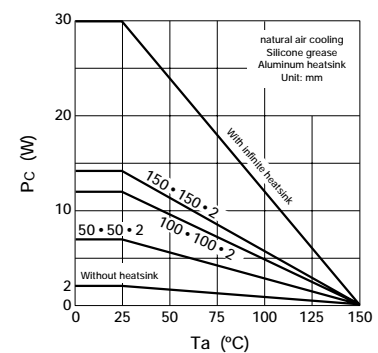
■ f_T — I_E Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor 2SD2141

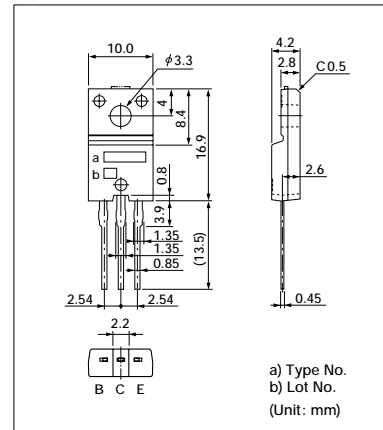
Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	380±50	V
V _{CEO}	380±50	V
V _{EB0}	6	V
I _c	6 (pulse 10)	A
I _B	1	A
P _C	35(T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

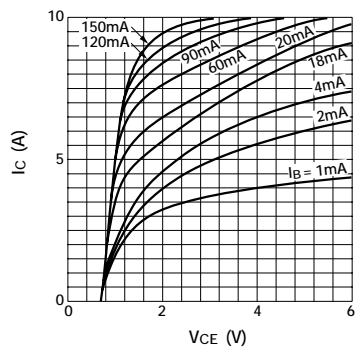
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 330V	10max	μA
I _{EB0}	V _{EB} = 6V	20max	μA
V _{(BR)CEO}	I _c = 25mA	330 to 430	V
h _{FE}	V _{CE} = 2V, I _c = 3A	1500min	
V _{CE(sat)}	I _c = 4A, I _B = 20mA	1.5max	V
f _T	V _{CE} = 12V, I _E = -0.5A	20typ	MHz
C _{OB}	V _{CB} = 10V, f = 1MHz	95typ	pF

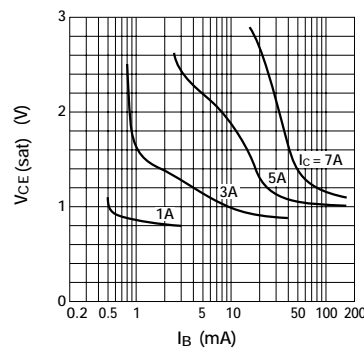
External Dimensions FM20 (full-mold)



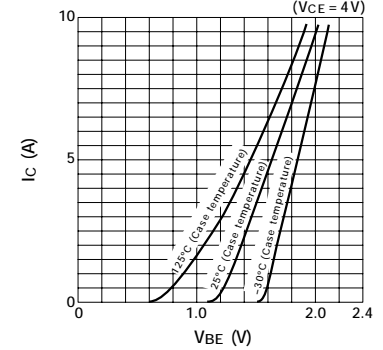
■ I_c — V_{CE} Characteristics (typ.)



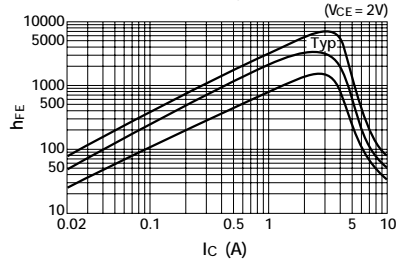
■ V_{CE(sat)} — I_B Characteristics (typ.)



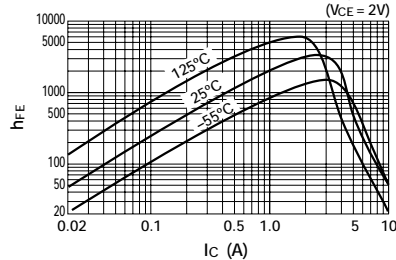
■ I_c — V_{BE} Temperature Characteristics (typ.)



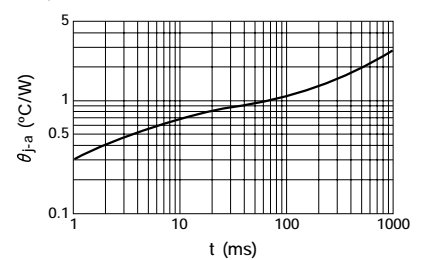
■ h_{FE} — I_c Characteristics (typ.)



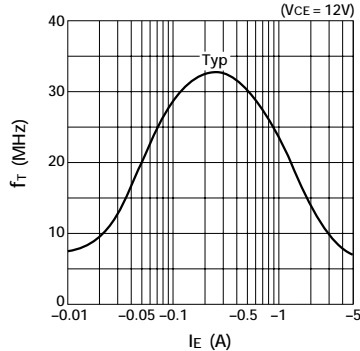
■ h_{FE} — I_c Temperature Characteristics (typ.)



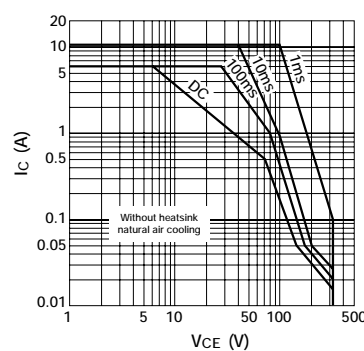
■ θ_{J-a} — t Characteristics



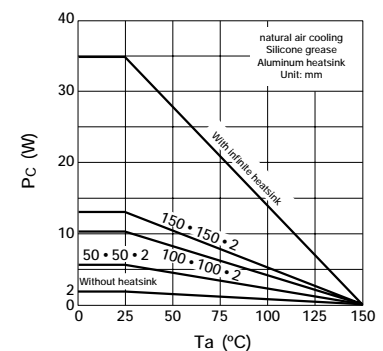
■ f_T — I_E Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor 2SD2382

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	65±5	V
V _{CEO}	65±5	V
V _{EBO}	6	V
I _C	±6 (pulse ±10)	A
I _B	1	A
P _C	30 (T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

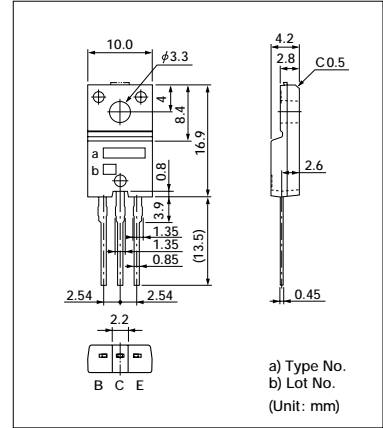
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 60V	10max	μA
I _{EBO}	V _{EB} = 6V	10max	μA
V _{CEO}	I _C = 50mA	60 to 70	V
h _{FE}	V _{CE} = 1V, I _C = 1A	700 to 3000	
V _{CE(sat)}	I _C = 1.5A, I _B = 15mA	0.15max	V
V _{FEC}	I _{FEC} = 6A	1.5max	V
Es/b	L = 10mH, single pulse	200min	mJ

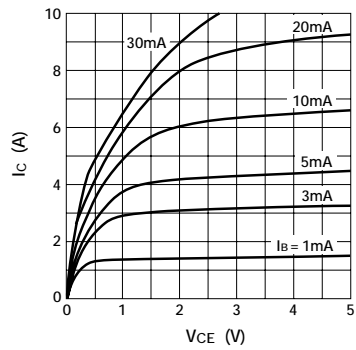
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _r (μs)
12	12	1	10	-5	30	-30	0.25	0.8	0.35

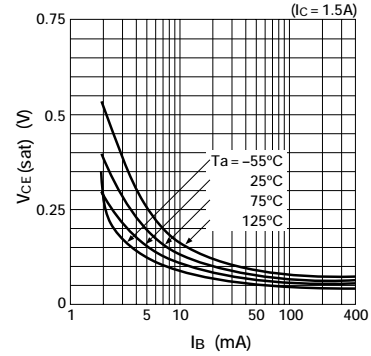
External Dimensions FM20 (full-mold)



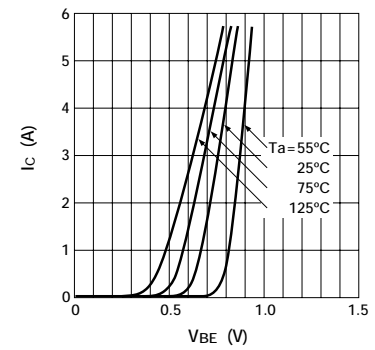
■ I_C — V_{CE} Characteristics (typ.)



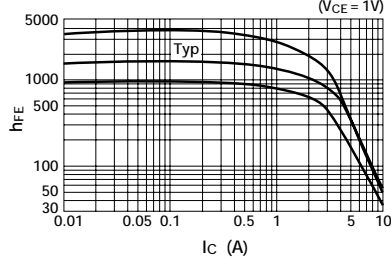
■ V_{CE(sat)} — I_B Temperature Characteristics (typ.)



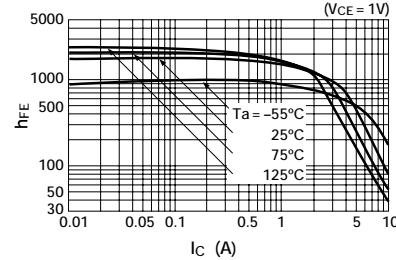
■ I_C — V_{BE} Temperature Characteristics (typ.)



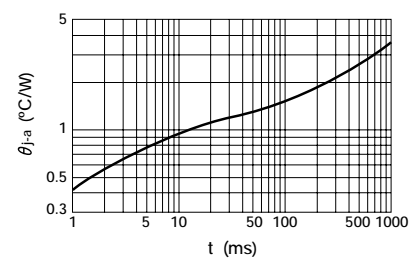
■ h_{FE} — I_C Characteristics (typ.)



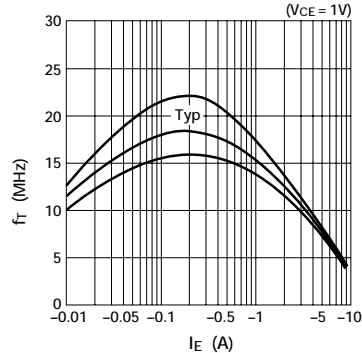
■ h_{FE} — I_C Temperature Characteristics (typ.)



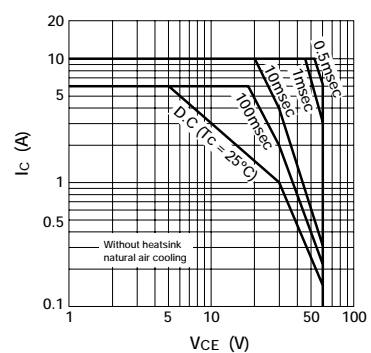
■ θ_{J-a} — t Characteristics



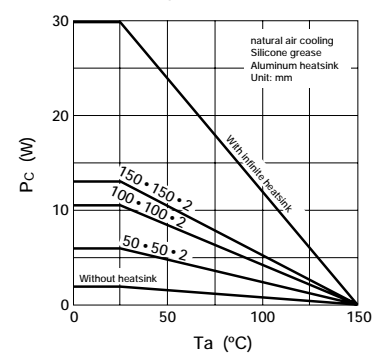
■ f_T — I_E Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor FN812

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	120	V
V _{CE0}	100	V
V _{EB0}	6	V
I _c	8 (pulse 12)	A
I _B	3	A
P _C	35 (T _c =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

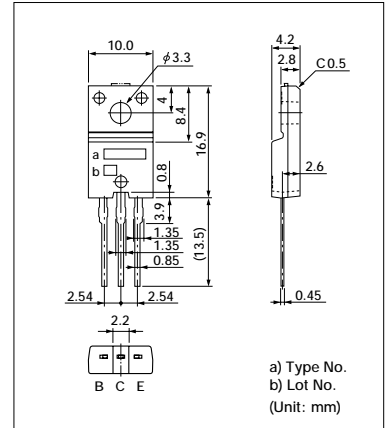
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{cB0}	V _{CB} = 120V	10max	μA
I _{eB0}	V _{EB} = 6V	10max	μA
V _{CE0}	I _c = 50mA	100min	V
h _{FE}	V _{CE} = 4V, I _c = 3A	70min	
V _{CE(sat)}	I _c = 4A, I _B = 0.4A	0.3max	V

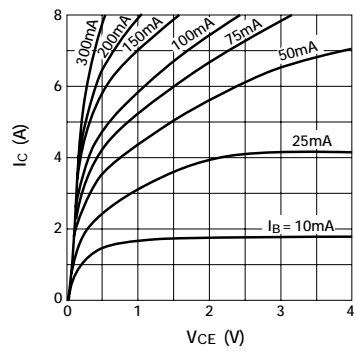
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _c (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _f (μs)
12	4	3	10	-5	30	-30	1.0	2.0	0.5

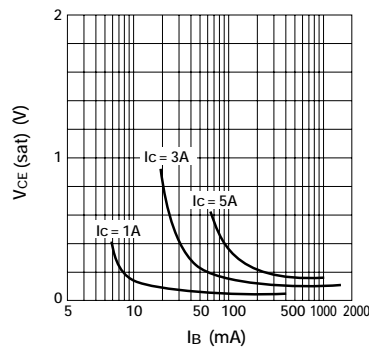
External Dimensions FM20 (full-mold)



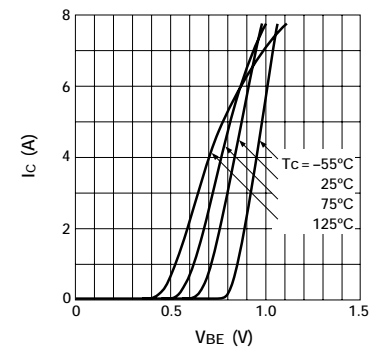
I_c — V_{CE} Characteristics (typ.)



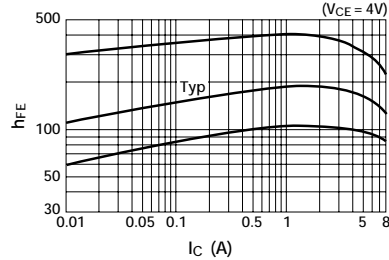
V_{CE(sat)} — I_B Characteristics (typ.)



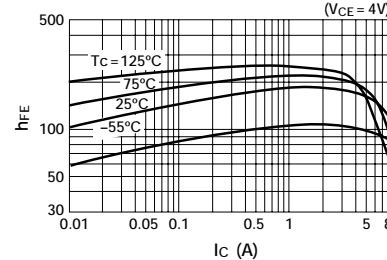
I_c — V_{BE} Temperature Characteristics (typ.)



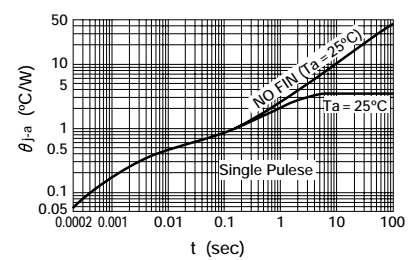
h_{FE} — I_c Characteristics (typ.)



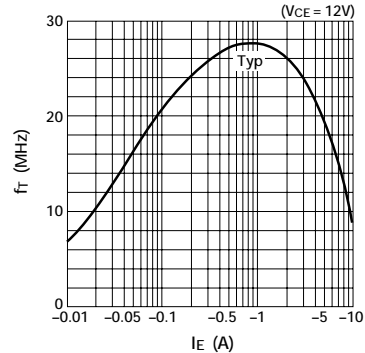
h_{FE} — I_c Temperature Characteristics (typ.)



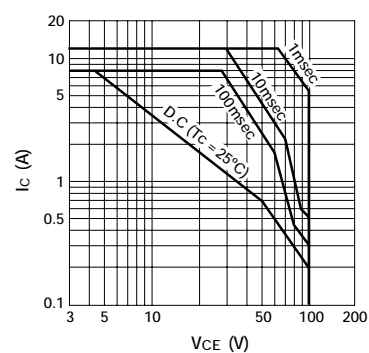
θ_{J-a} — t Characteristics



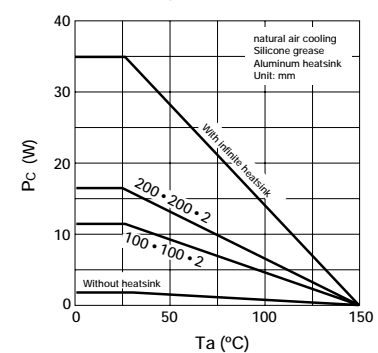
f_T — I_E Characteristics (typ.)



Safe Operating Area (single pulse)



P_C — T_a Derating



Power Transistor FP812

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	-120	V
V _{CEO}	-120	V
V _{EBO}	-6	V
I _C	-8 (pulse -12)	A
I _B	-3	A
P _C	35 (T _C =25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

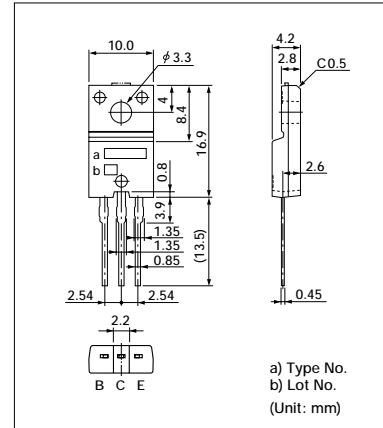
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = -120V	10max	μA
I _{EBO}	V _{EB} = -6V	10max	μA
V _{CEO}	I _C = -50mA	-120min	V
h _{FE}	V _{CE} = -4V, I _C = -3A	70min	
V _{CE(sat)}	I _C = -3A, I _B = -0.3A	-0.3max	V

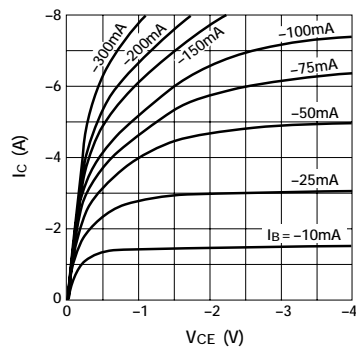
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _r (μs)
12	4	3	-10	5	-30	30	2.5	0.4	0.6

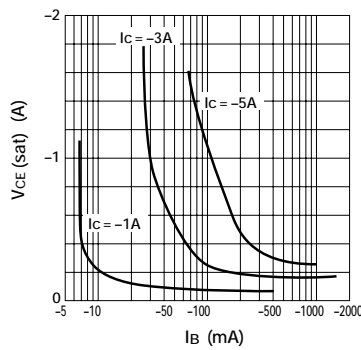
External Dimensions FM20 (full-mold)



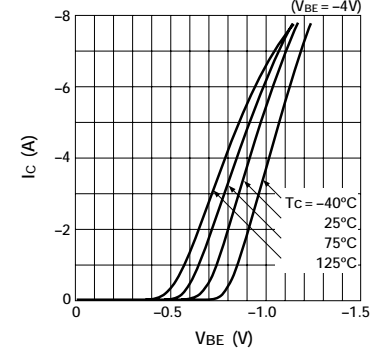
■ I_C — V_{CE} Characteristics (typ.)



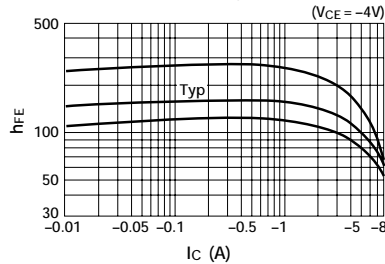
■ V_{CE(sat)} — I_B Characteristics (typ.)



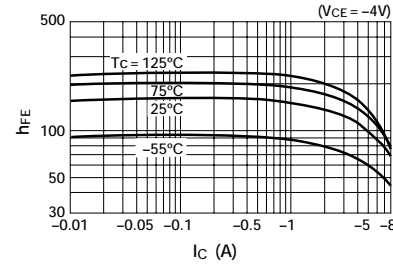
■ I_C — V_{BE} Temperature Characteristics (typ.)



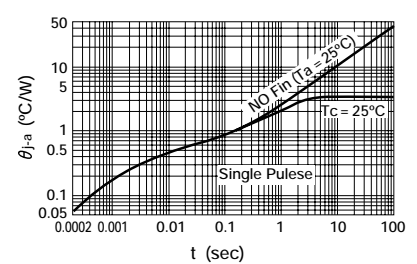
■ h_{FE} — I_C Characteristics (typ.)



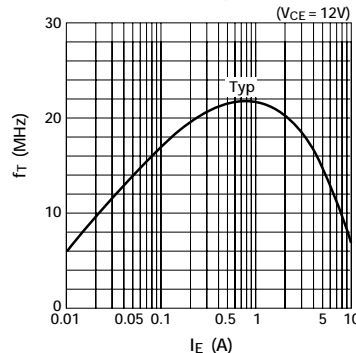
■ h_{FE} — I_C Temperature Characteristics (typ.)



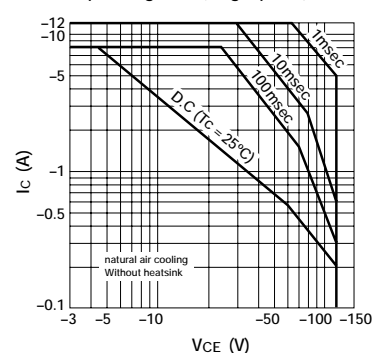
■ θ_{J-a} — t Characteristics



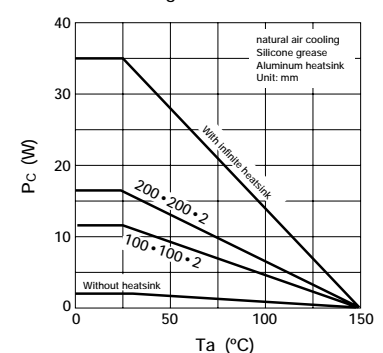
■ f_T — I_E Characteristics (typ.)



■ Safe Operating Area (single pulse)



■ P_C — T_a Derating



Power Transistor Array STA315A

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CEO}	35±5	V
V _{CE0}	36±5	V
V _{EB0}	6	V
I _c	2 (pulse 3*)	A
I _B	30	mA
P _T	3 (Ta=25°C)	W
	13.5 (Tc=25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

* P_w ≤ 1ms, Duty ≤ 25%

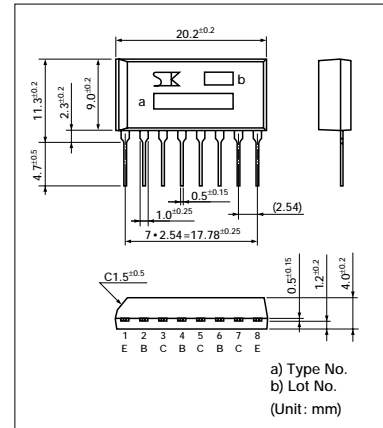
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CBO}	V _{CB} = 30V	10max	μA
I _{EBO}	V _{EB} = 6V	2.7max	mA
V _{CEO}	I _c = 25mA	31 to 41	V
h _{FE}	V _{CE} = 4V, I _c = 0.7A	400min	
	I _c = 0.5A, I _B = 5mA	0.2max	V
V _{CE(sat)}	I _c = 1A, I _B = 5mA	0.5max	V
V _{FEC}	I _{FEC} = 2A	2.5max	V
R _B		800±120	Ω
R _{BE}		2.0±0.4	kΩ
Es/b	L = 10mH, single pulse	50min	mJ

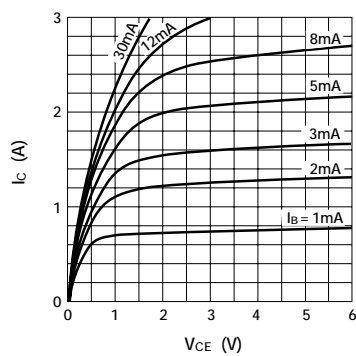
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _c (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _r (μs)
12	12	1	10	-5	5	0	1.0	8.5	2.5

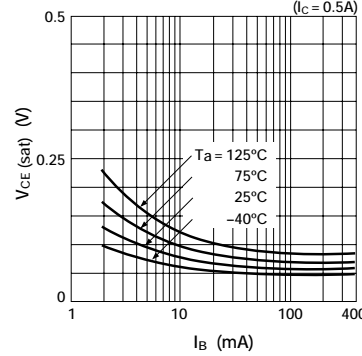
External Dimensions STA3 (LF400A)



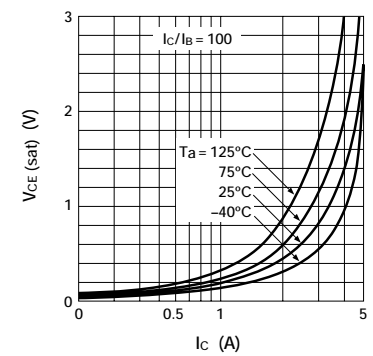
■ I_c — V_{CE} Characteristics (typ.)



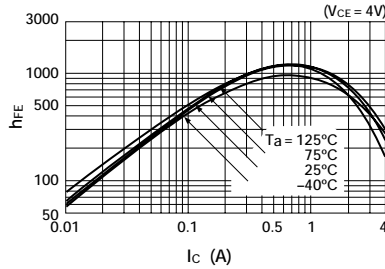
■ V_{CE(sat)} — I_B Temperature Characteristics (I_c = 0.5A)



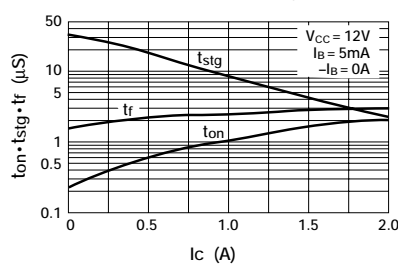
■ V_{CE(sat)} — I_c Temperature Characteristics



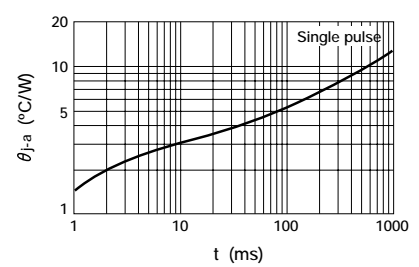
■ h_{FE} — I_c Temperature Characteristics (V_{CE} = 4V)



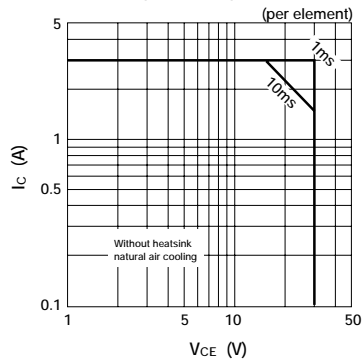
■ t_{on} · t_{stg} · t_r — I_c Characteristics (typ.)



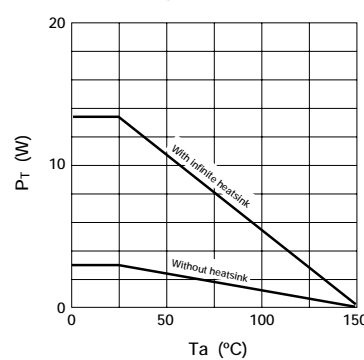
■ θ_{J-a} — t Characteristics



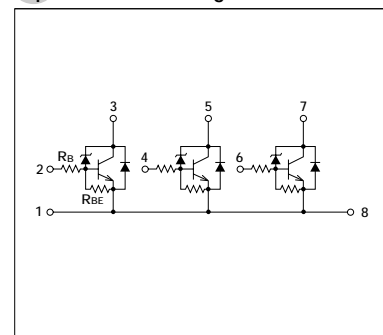
■ Safe Operating Area (single pulse)



■ P_T — T_a Derating



Equivalent Circuit Diagram



Power Transistor Array STA335A

Absolute Maximum Ratings (Ta=25°C)

Symbol	Rated	Unit
V _{CB0}	35±5	V
V _{CEO}	35±5	V
V _{EBO}	6	V
I _C	3	A
I _B	1	A
P _T	2.5 (Ta=25°C)	W
	12 (Tc=25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

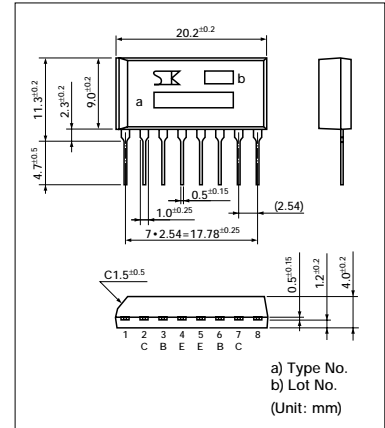
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Rated	Unit
I _{CB0}	V _{CB} = 30V	10max	μA
I _{EBO}	V _{EB} = 6V	10max	μA
V _{CEO}	I _C = 25mA	35±5	V
h _{FE}	V _{CE} = 4V, I _C = 0.5A	500min	
V _{CE(sat)}	I _C = 1A, I _B = 5mA	0.5max	V
Es/b	L = 10mH, single pulse	150min	mJ

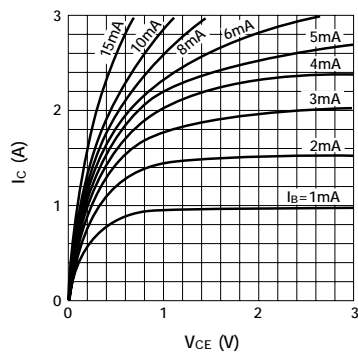
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _f (μs)
12	12	1	10	-5	5	5	1.3	4.7	1.2

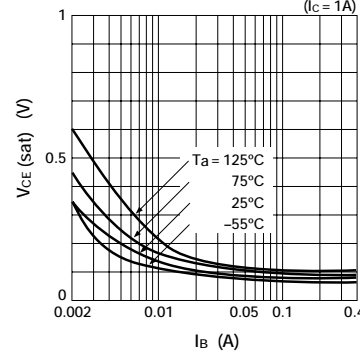
External Dimensions STA3 (LF400A)



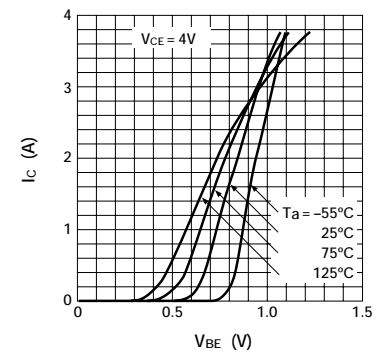
I_C — V_{CE} Characteristics (typ.)



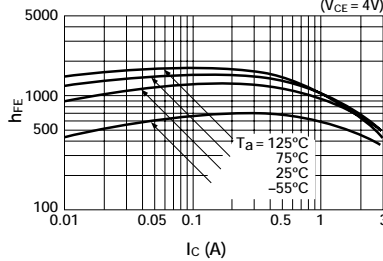
V_{CE(sat)} — I_B Temperature Characteristics (I_C = 1A)



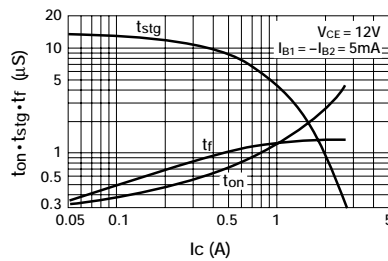
I_C — V_{BE} Temperature Characteristics (typ.)



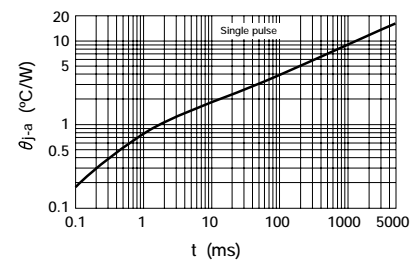
h_{FE} — I_C Temperature Characteristics (typ.) (V_{CE} = 4V)



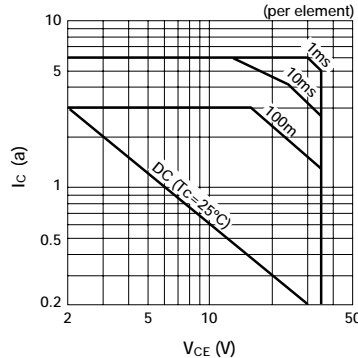
t_{on} · t_{stg} · t_f — I_C Characteristics (typ.)



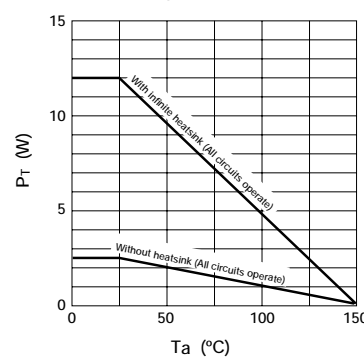
θ_{J-a} — t Characteristics



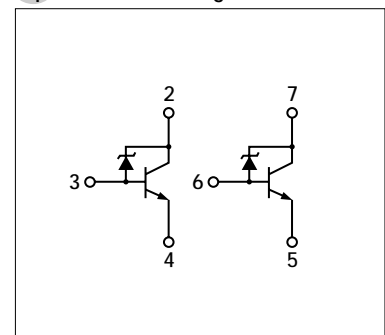
Safe Operating Area (single pulse) (per element)



P_T — Ta Derating



Equivalent Circuit Diagram



Power Transistor Array STA415A

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	35±5	V
V _{CE0}	36±5	V
V _{EBO}	6	V
I _c	2 (pulse 3*)	A
I _B	30	mA
P _T	4 (Ta = 25°C)	W
	18 (Tc = 25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

* P_w ≤ 1ms, Duty ≤ 25%

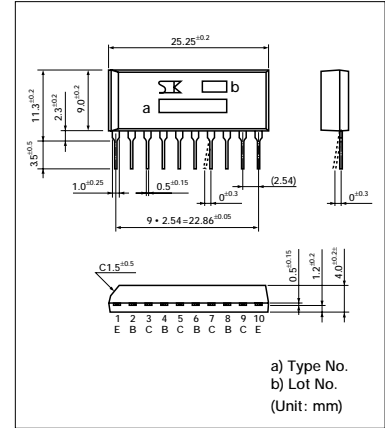
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 30V	10max	μA
I _{EBO}	V _{EB} = 6V	2.7max	mA
V _{CE0}	I _c = 25mA	31 to 41	V
h _{FE}	V _{CE} = 4V, I _c = 0.7A	400min	
V _{CE} (sat)	I _c = 0.5A, I _B = 5mA	0.2max	V
	I _c = 1A, I _B = 5mA	0.5max	V
V _{FEC}	I _{FEC} = 2A	2.5max	V
R _B		800±120	Ω
R _{BE}		2.0±0.4	kΩ
Es/b	L = 10mH, single pulse	50min	mJ

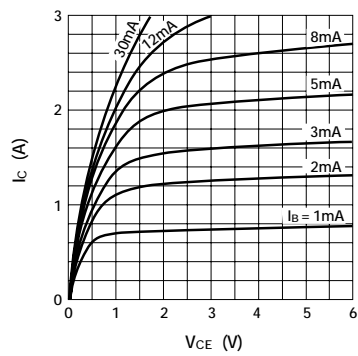
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _c (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _f (μs)
12	12	1	10	-5	5	0	1.0	8.5	2.5

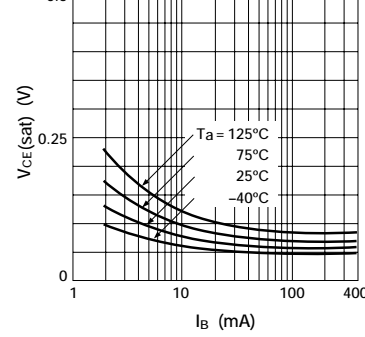
External Dimensions STA4 (LF412)



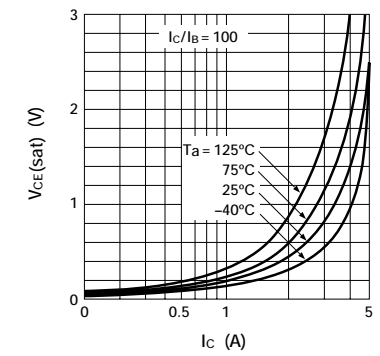
■ I_c — V_{CE} Characteristics (typ.)



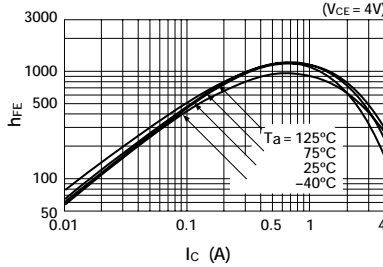
■ V_{CE} (sat) — I_B Temperature Characteristics (I_c = 0.5A)



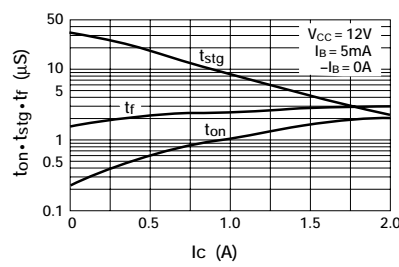
■ V_{CE} (sat) — I_c Temperature Characteristics



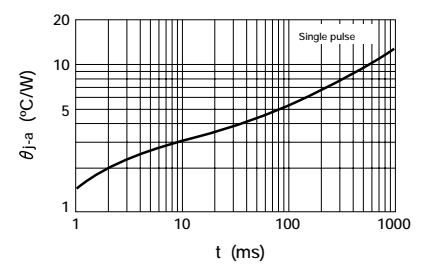
■ h_{FE} — I_c Temperature Characteristics (V_{CE} = 4V)



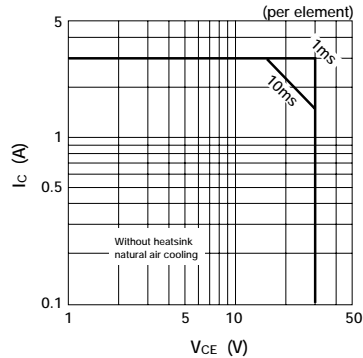
■ t_{on} · t_{stg} · t_f — I_c Characteristics (typ.)



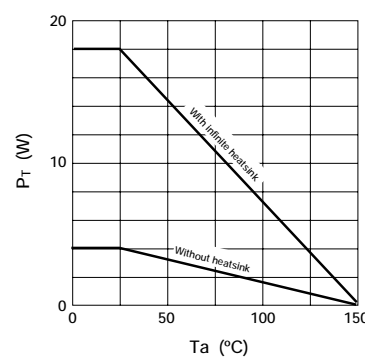
■ θ_{J-a} — t Characteristics



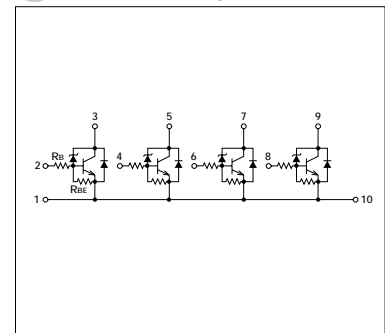
■ Safe Operating Area (single pulse)



■ P_T — T_a Derating



Equivalent Circuit Diagram



Power Transistor Array STA461C

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	65±5	V
V _{CEO}	65±5	V
V _{EB0}	6	V
I _C	±6 (pulse ±10)	A
I _B	1	A
P _T	3.2 (Ta = 25°C)	W
	18 (Tc = 25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

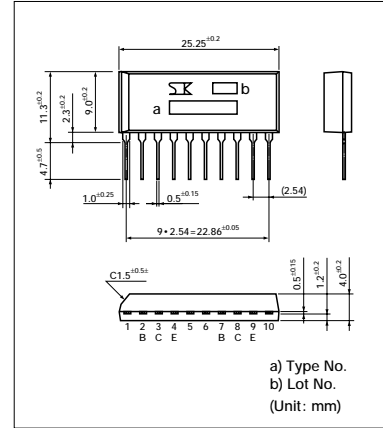
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 60V	10max	μA
I _{EB0}	V _{EB} = 6V	10max	μA
V _{CEO}	I _C = 50mA	60 to 70	V
h _{FE}	V _{CE} = 1V, I _C = 1A	400 to 1500	
V _{CE(sat)}	I _C = 1.5A, I _B = 15mA	0.15max	V
V _{FEC}	I _{FEC} = 6A	1.5max	V
Es/b	L = 10mH, single pulse	80min	mJ

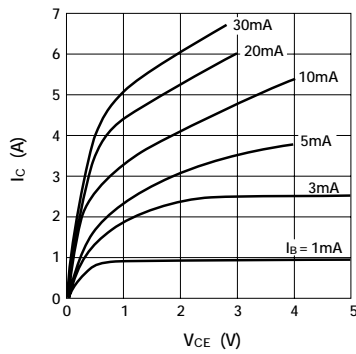
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _r (μs)
12	12	1	10	-5	30	-30	0.2	3.9	0.2

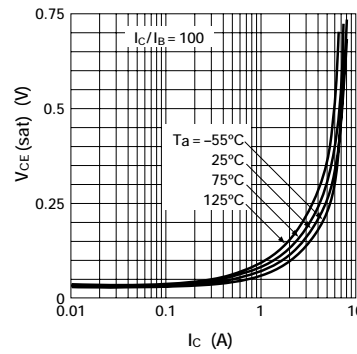
External Dimensions STA4 (LF400B)



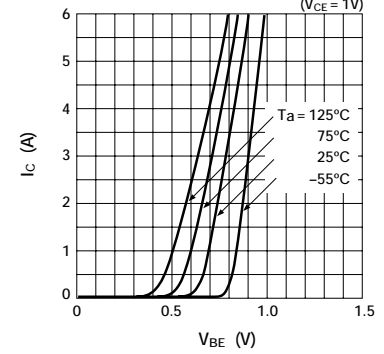
I_C — V_{CE} Characteristics (typ.)



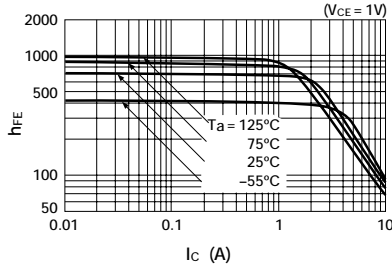
V_{CE(sat)} — I_C Temperature Characteristics (typ.)



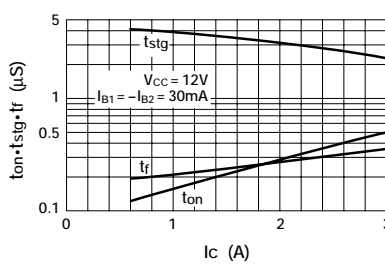
I_C — V_{BE} Temperature Characteristics (typ.)



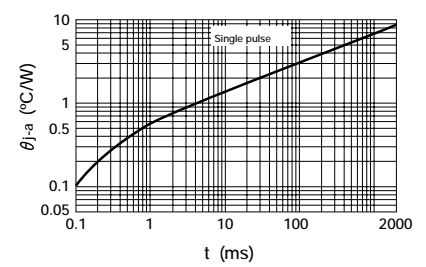
h_{FE} — I_C Temperature Characteristics (typ.)



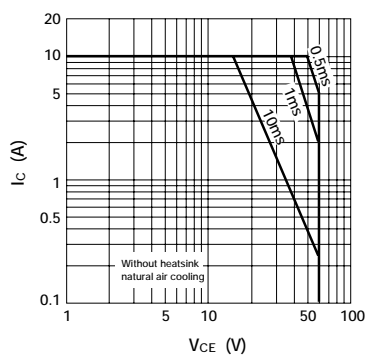
t_{on} · t_{stg} · t_r — I_C Characteristics



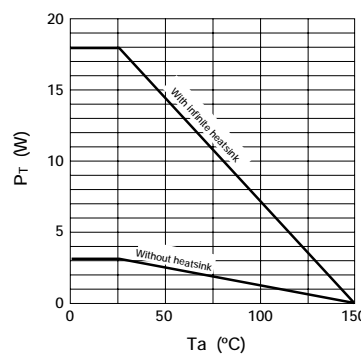
θ_{J-a} — t Characteristics



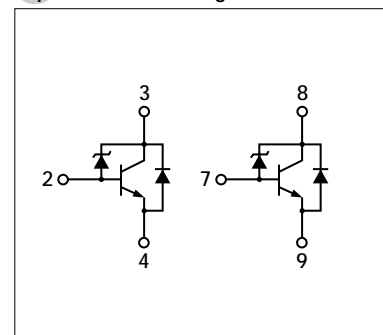
Safe Operating Area (single pulse)



P_T — Ta Derating



Equivalent Circuit Diagram



Power Transistor Array STA463C

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	115±10	V
V _{CE0}	115±10	V
V _{EBO}	6	V
I _C	±6 (pulse ±10)	A
I _B	1	A
P _T	3.2 (Ta=250°C)	W
	18 (Tc=25°C)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

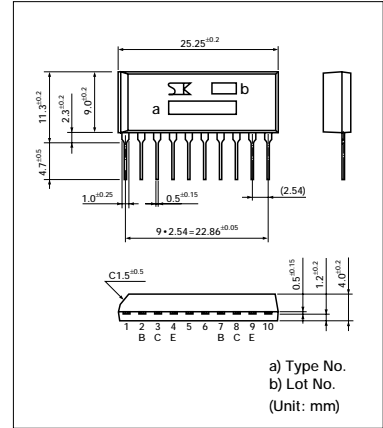
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = 105V	10max	μA
I _{EBO}	V _{EB} = 6V	10max	μA
V _{CE0}	I _C = 50mA	105 to 125	V
h _{FE}	V _{CE} = 1V, I _C = 1A	400 to 1500	
V _{CE(sat)}	I _C = 1.2A, I _B = 12mA	0.12max	V
V _{FEC}	I _{FEC} = 6A	1.5max	V
Es/b	L = 10mH, single pulse	45min	mJ

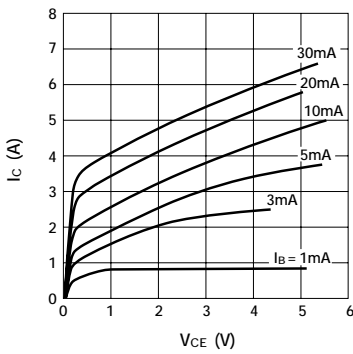
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _f (μs)
12	12	1	10	-5	30	-30	0.2	5.7	0.4

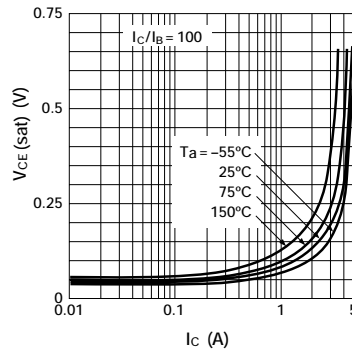
External Dimensions STA4 (LF400B)



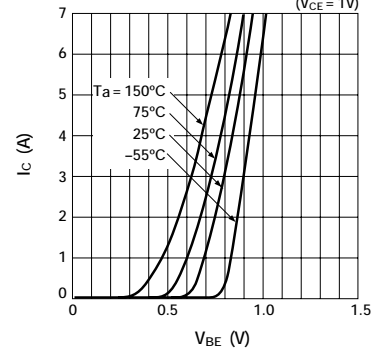
I_C — V_{CE} Characteristics (typ.)



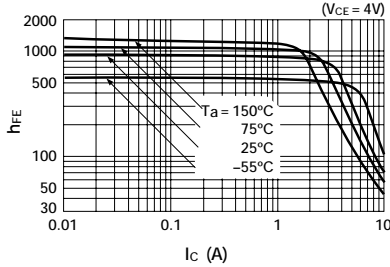
V_{CE(sat)} — I_C Temperature Characteristics (typ.)



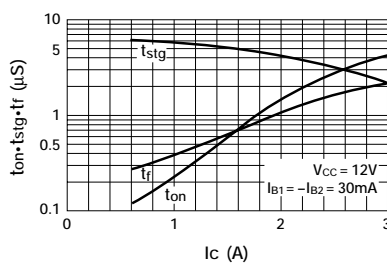
I_C — V_{BE} Temperature Characteristics (typ.)



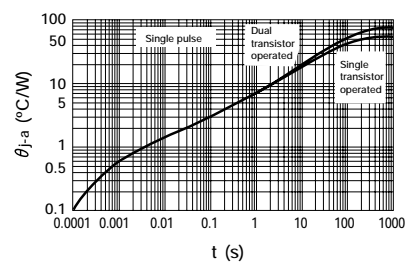
h_{FE} — I_C Temperature Characteristics (typ.)



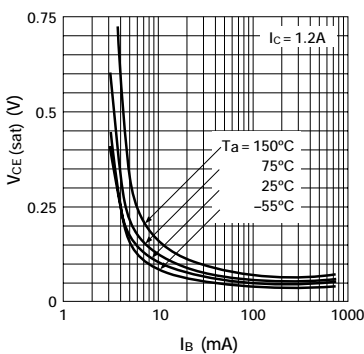
t_{on} · t_{stg} · t_f — I_C Characteristics



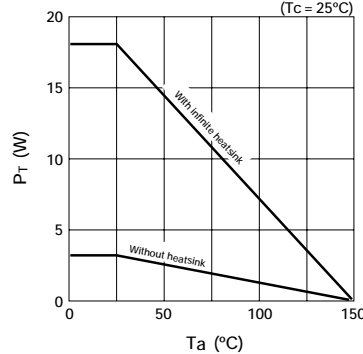
θ_{J-a} — t Characteristics



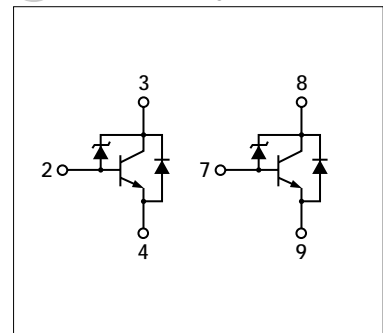
V_{CE(sat)} — I_B Temperature Characteristics (typ.)



P_T — Ta Derating



Equivalent Circuit Diagram



Power Transistor Array SLA8004

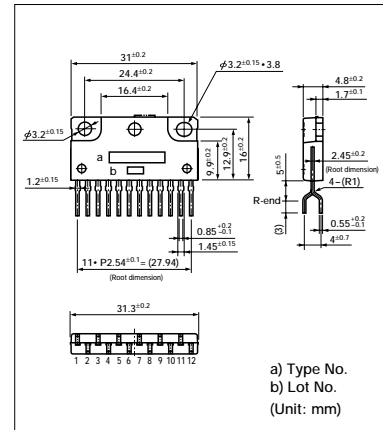
Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings		Unit
	NPN	PNP	
VcBo	60	-55	V
VcEO	60	-55	V
VEBO	6	-6	V
Ic	12	-12	A
Ib	3	-3	A
P _T	5 (T _C =25°C, No Fin)		W
	40 (T _C =25°C)		W
T _J	150		°C
T _{stg}	-55 to +150		°C

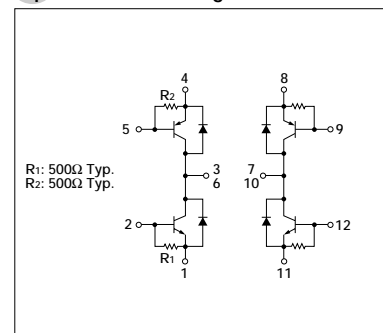
Electrical Characteristics (Ta=25°C)

Symbol	NPN		PNP		Unit
	Test Conditions	Ratings	Test Conditions	Ratings	
IcBo	V _{CB} = 60V	100max	V _{CB} = -55V	-100max	μA
IeBo	V _{EB} = 6V	60max	V _{EB} = -6V	-60max	mA
VcEO	I _C = 25mA	60min	I _C = -25mA	-55min	V
h _{FE}	V _{CE} = 1V, I _C = 3A	150min	V _{CE} = -1V, I _C = -3A	80min	
V _{CE} (sat)	I _C = 6A, I _B = 0.3A	0.35max	I _C = -6A, I _B = -0.3A	-0.35max	V
V _{FEC}	I _{FEC} = 10A	2.5max	I _{FEC} = 10A	2.5max	V

External Dimensions SLA (LF817)



Equivalent Circuit Diagram



Surface-mount Power Transistor Array SDA03

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	-60	V
V _{CE0}	-60	V
V _{EB0}	-6	V
I _C	-6 (pulse -12)	A
I _B	-1	A
P _T	3 (No Fin)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

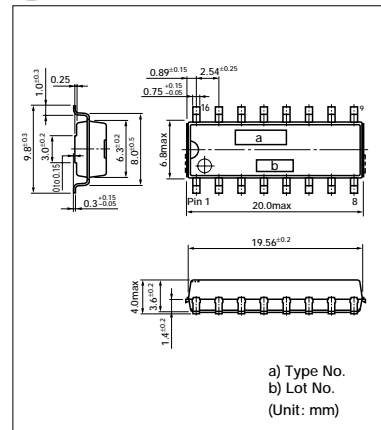
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = -60V	-10max	μA
I _{EB0}	V _{EB} = -6V	-10max	μA
V _{CE0}	I _C = -25mA	-60min	V
h _{FE}	V _{CE} = -4V, I _C = -2A	100min	
V _{CE(sat)}	I _C = -2A, I _B = -0.1A	-0.4max	V

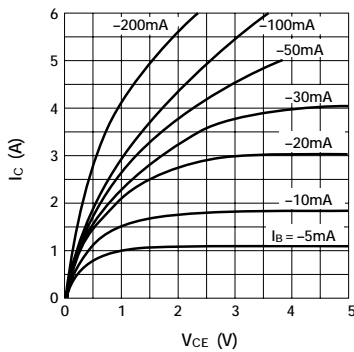
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _f (μs)
12	12	1	10	-5	-50	50	0.4	1.75	0.22

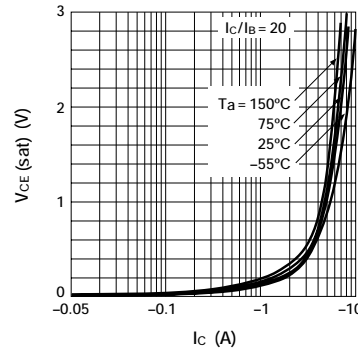
External Dimensions SMD-16A



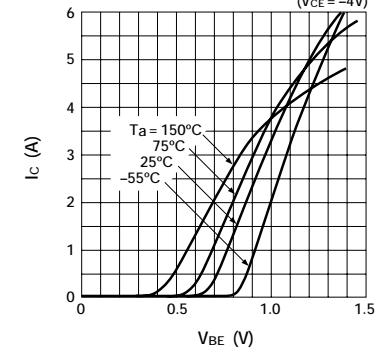
I_C — V_{CE} Characteristics



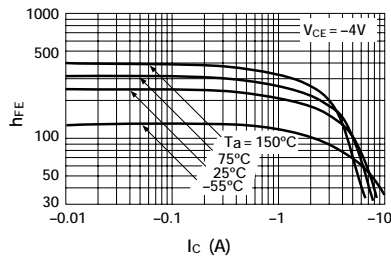
V_{CE(sat)} — I_C Temperature Characteristics (typ.)



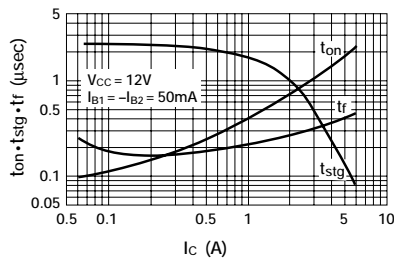
I_C — V_{BE} Temperature Characteristics (typ.)



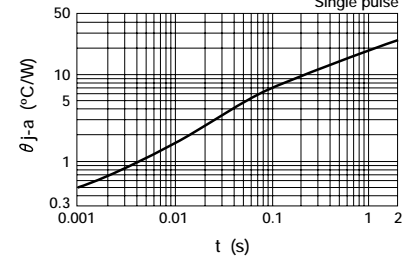
h_{FE} — I_C Temperature Characteristics



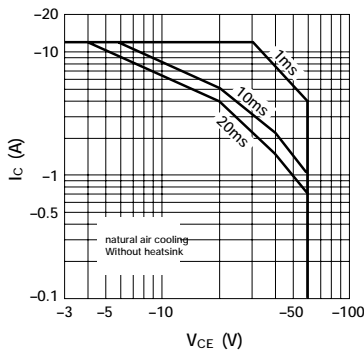
t_{on} · t_{stg} · t_f — I_C Characteristics



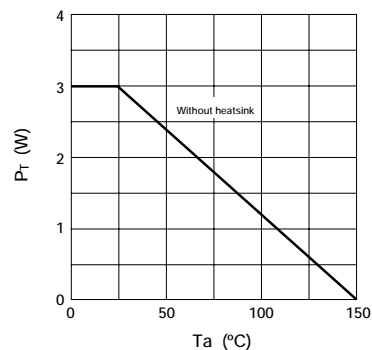
θ_{J-a} — t Characteristics



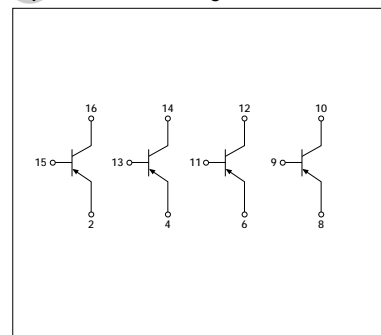
Safe Operating Area (single pulse)



P_T — Ta Derating



Equivalent Circuit Diagram



Surface-mount Power Transistor Array SDA04

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{CB0}	-60	V
V _{CE0}	-60	V
V _{EB0}	-6	V
I _C	-6 (pulse -12)	A
I _B	-1	A
P _T	2.5 (No Fin)	W
T _J	150	°C
T _{stg}	-55 to +150	°C

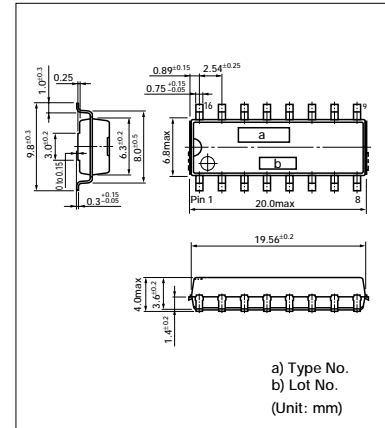
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
I _{CB0}	V _{CB} = -60V	-10max	μA
I _{EB0}	V _{EB} = -6V	-10max	μA
V _{CE0}	I _C = -25mA	-60min	V
h _{FE}	V _{CE} = -4V, I _C = -2A	100min	
V _{CE(sat)}	I _C = -2A, I _B = -0.1A	-0.4max	V

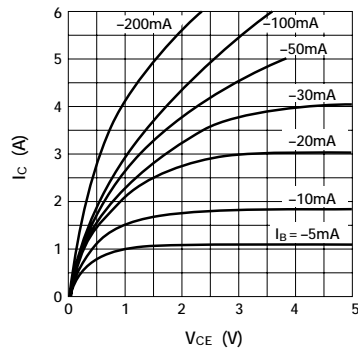
Typical Switching Characteristics

V _{CC} (V)	R _L (Ω)	I _C (A)	V _{BB1} (V)	V _{BB2} (V)	I _{B1} (mA)	I _{B2} (mA)	t _{on} (μs)	t _{stg} (μs)	t _r (μs)
12	12	1	10	-5	-50	50	0.4	1.75	0.22

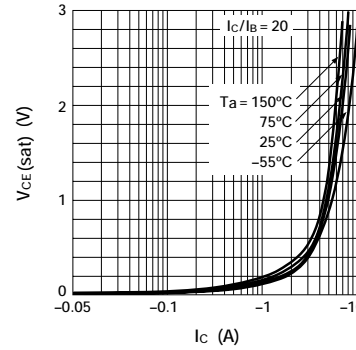
External Dimensions SMD-16A



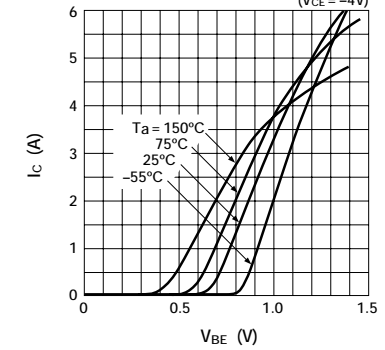
I_C — V_{CE} Characteristics



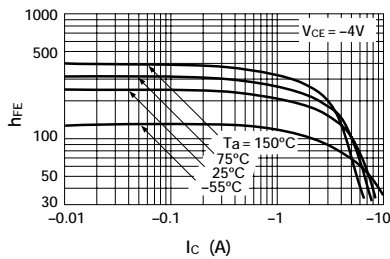
V_{CE(sat)} — I_C Temperature Characteristics (typ.)



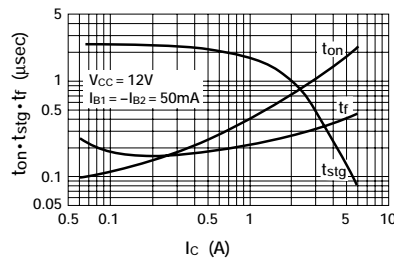
I_C — V_{BE} Temperature Characteristics (typ.)



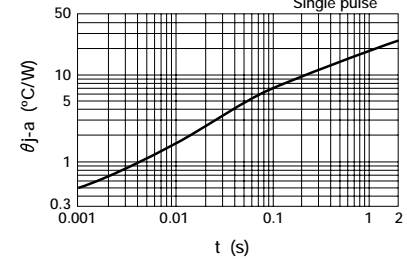
h_{FE} — I_C Temperature Characteristics



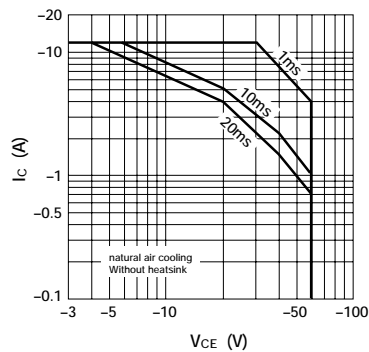
t_{on} · t_{stg} · t_r — I_C Characteristics



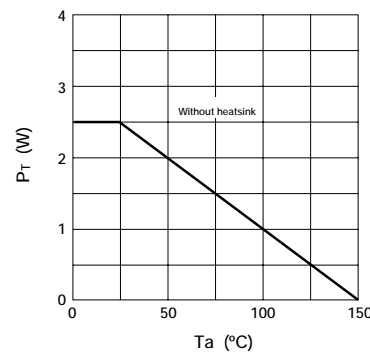
θ_{J-a} — t Characteristics



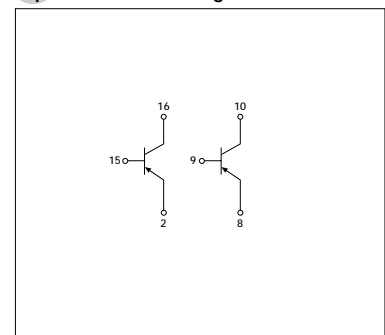
Safe Operating Area (single pulse)



P_T — Ta Derating



Equivalent Circuit Diagram



Surface-mount Power Transistor Array SDC09

Absolute Maximum Ratings (Ta=25°C)

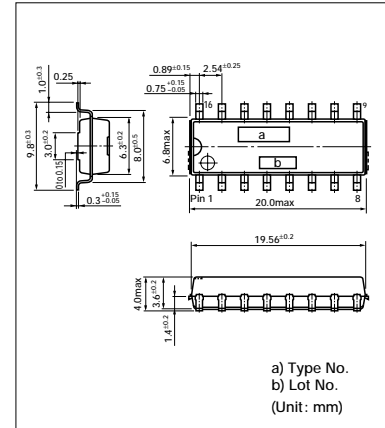
Symbol	Ratings	Unit
VcBo	65±5	V
VcEO	65±5	V
VEBO	6	V
Ic	6 (pulse 10 ⁻⁴)	A
Ib	1	A
Pr	2.8	W
Tj	150	°C
Tstg	-55 to +150	°C

* Pw ≤ 100μs, Duty ≤ 1%

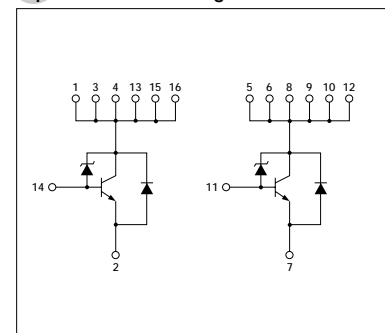
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings	Unit
IcBo	VcB = 60V	10max	μA
IeBo	VEB = 6V	10max	μA
VcEO	Ic = 50mA	60 to 70	V
hFE	VCE = 1V, Ic = 1A	400 to 1500	
VCE(sat)	Ic = 1.5A, Ib = 15mA	0.15max	V
VfEC	IfEC = 6A	1.5max	V
Es/b	L = 10mH, single pulse	80min	mJ

External Dimensions SMD-16A



Equivalent Circuit Diagram



MOS FET 2SK2701

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{DSS}	450	V
V _{GSS}	±30	V
I _D	±7	A
I _D (pulse)*1	±28	A
P _T	35 (Tc=25°C)	W
E _{AS} *2	130	mJ
I _{AS}	7	A
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

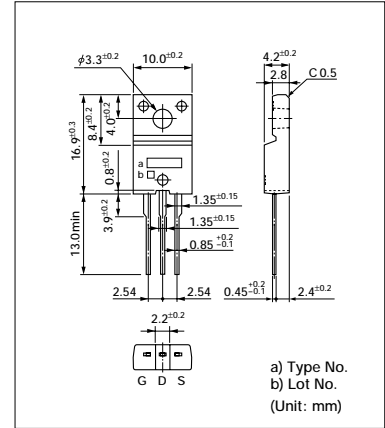
*1 P_W ≤ 100μs, duty ≤ 1%

*2 V_{DD} = 30V, L = 5mH, I_L = 7A, unclamped, R_G = 50Ω

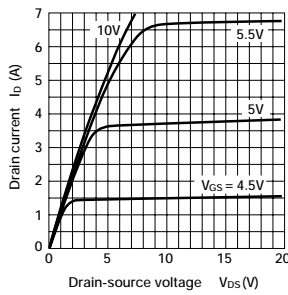
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR)DSS}	I _D = 100μA, V _{GS} = 0V	450			V
I _{GSS}	V _{GS} = ±30V		±100		nA
I _{DSS}	V _{DS} = 450V, V _{GS} = 0V		100		μA
V _{TH}	V _{DS} = 10V, I _D = 1mA	2.0	3.0	4.0	V
Re (yfs)	V _{DS} = 20V, I _D = 3.5A	3.5	5		S
R _{DS(ON)}	V _{DS} = 10V, I _D = 3.5A		0.84	1.10	Ω
C _{iss}	V _{DS} = 10V f = 1.0MHz		720		pF
C _{oss}	V _{GS} = 0V		150		pF
C _{rss}	V _{GS} = 0V		65		pF
t _{d(on)}	I _D = 3.5A		25		ns
t _r	V _{DD} = 200V R _L = 57Ω		40		ns
t _{d(off)}	V _{GS} = 10V		70		ns
t _f	V _{GS} = 10V		50		ns
V _{SD}	I _{SD} = 7A, V _{GS} = 0V		1.0	1.5	V

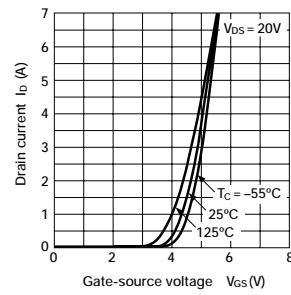
External Dimensions FM20 (full-mold)



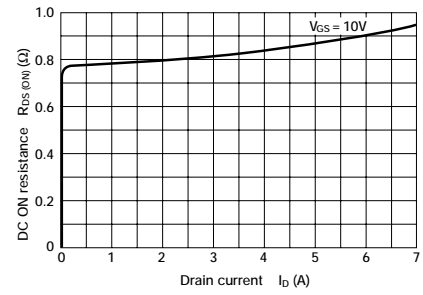
I_D — V_{DS} Characteristics



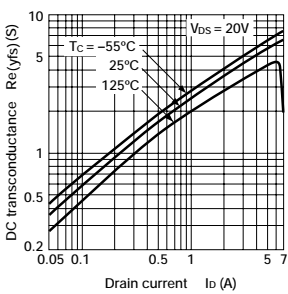
I_D — V_{GS} Characteristics



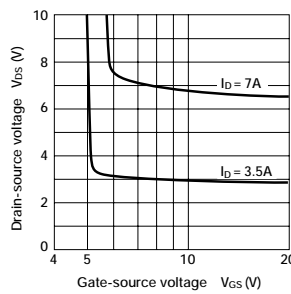
R_{DS(ON)} — I_D Characteristics



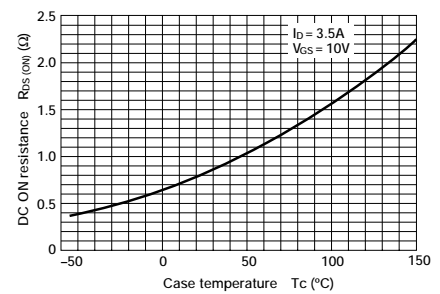
Re (yfs) — I_D Characteristics



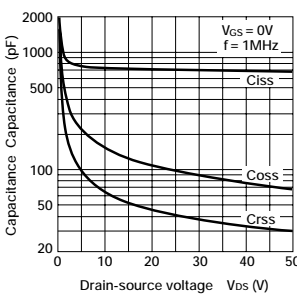
V_{DS} — V_{GS} Characteristics



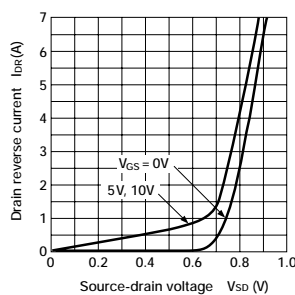
R_{DS(ON)} — T_C Characteristics



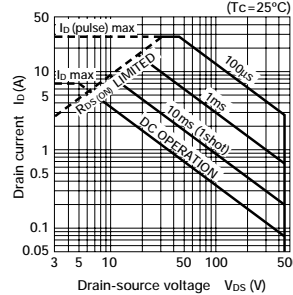
Capacitance — V_{DS} Characteristics



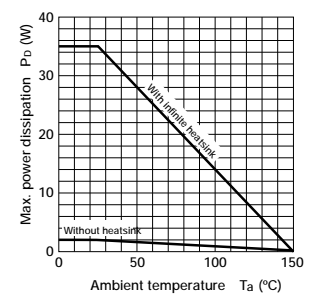
I_{DR} — V_{SD} Characteristics



Safe Operating Area (single pulse)



P_D — T_a Derating



MOS FET FKV460 (under development)

Absolute Maximum Ratings (Ta=25°C)

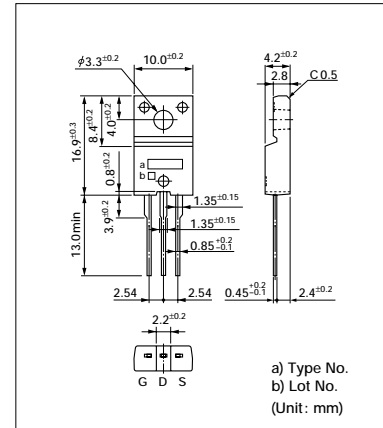
Symbol	Ratings	Unit
V _{DSS}	40	V
V _{GSS}	+20, -10	V
I _D	±60	A
I _D (pulse)*	±180	A
P _D	40 (Tc=25°C)	W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

* P_w ≅ 100μs, duty ≅ 1%

Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	40			V
I _{GSS}	V _{GS} = +20V		+10		μA
	V _{GS} = -20V		-5		
I _{DSS}	V _{DS} = 40V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.3		2.3	V
R _e (yfs)	V _{DS} = 10V, I _D = 25A	20.0			S
R _{DS (ON)}	V _{GS} = 10V, I _D = 25A		6	8	mΩ
C _{iss}	V _{DS} = 10V		2000		pF
C _{oss}	f = 1.0MHz		1200		pF
C _{rss}	V _{GS} = 0V		200		pF
t _{d (on)}	I _D = 25A				ns
t _r	V _{DD} ≅ 12V		To be defined		ns
t _{d (off)}	R _L = 0.48Ω				ns
t _f	V _{GS} = 10V				ns
V _{SD}	I _{SD} = 50A, V _{GS} = 0V		1.0	1.5	V

External Dimensions FM20 (full-mold)



MOS FET FKV460FP (under development)

Absolute Maximum Ratings (Ta=25°C)

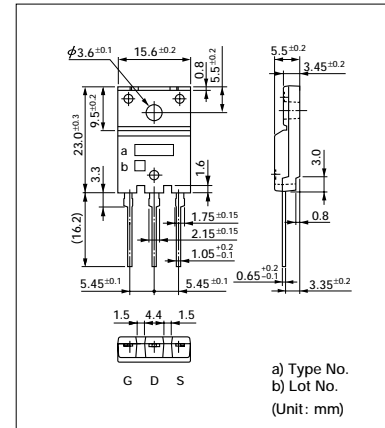
Symbol	Ratings	Unit
V _{DSS}	40	V
V _{GSS}	±20	V
I _D	±60	A
I _D (pulse)*	±180	A
P _D	70 (Tc=25°C)	W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

* P_w ≤ 100μs, duty ≤ 1%

Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	40			V
I _{GSS}	V _{GS} = +20V		+10		μA
	V _{GS} = -20V		-5		
I _{DSS}	V _{DS} = 40V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.3		2.3	V
Re (yfs)	V _{DS} = 10V, I _D = 25A	20.0			S
R _{DS (ON)}	V _{GS} = 10V, I _D = 25A		6	8	mΩ
C _{iss}	V _{DS} = 10V		2000		pF
C _{oss}	f = 1.0MHz		1200		pF
C _{rss}	V _{GS} = 0V		200		pF
t _{d (on)}	I _D = 25A				ns
t _r	V _{DD} = 12V		To be defined		ns
t _{d (off)}	R _L = 0.48Ω				ns
t _f	V _{GS} = 10V				ns
V _{SD}	I _{SD} = 50A, V _{GS} = 0V		1.0	1.5	V

External Dimensions FM100 (full-mold)



MOS FET FKV560 (under development)

Absolute Maximum Ratings (Ta=25°C)

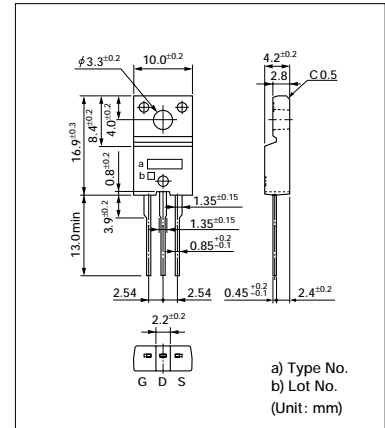
Symbol	Ratings	Unit
V _{DSS}	50	V
V _{GSS}	±20	V
I _D	±60	A
I _D (pulse)*	±180	A
P _D	40 (Tc=25°C)	W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

* P_W ≤ 100μs, duty ≤ 1%

Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	50			V
I _{GSS}	V _{GS} = +20V		+10		μA
	V _{GS} = -20V		-5		
I _{DSS}	V _{DS} = 50V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.3		2.3	V
Re (yfs)	V _{DS} = 10V, I _D = 25A	20.0			S
R _{DS (ON)}	V _{GS} = 10V, I _D = 25A		9	11	mΩ
C _{iss}	V _{DS} = 10V		2000		pF
C _{oss}	f = 1.0MHz		1000		pF
C _{rss}	V _{GS} = 0V		150		pF
t _{d (on)}	I _D = 25A				ns
t _r	V _{DD} ≈ 12V		To be defined		ns
t _{d (off)}	R _L = 0.48Ω				ns
t _f	V _{GS} = 10V				ns
V _{SD}	I _{SD} = 50A, V _{GS} = 0V		1.0	1.5	V

External Dimensions FM20 (full-mold)



MOS FET FKV560FP (under development)

Absolute Maximum Ratings (Ta=25°C)

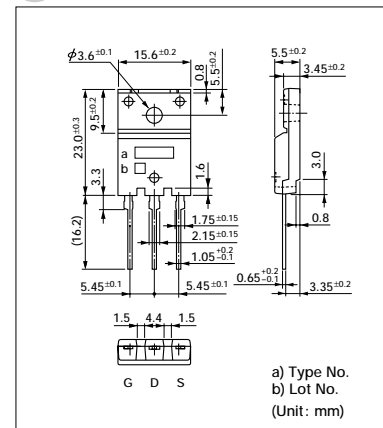
Symbol	Ratings	Unit
V _{DSS}	50	V
V _{GSS}	±20	V
I _D	±60	A
I _D (pulse) *	±180	A
P _D	70 (Tc=25°C)	W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

* P_w ≤ 100μs, duty ≤ 1%

Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _G S = 0V	50			V
I _{GSS}	V _G S = +20V		+10		μA
	V _G S = -20V		-5		
I _{DSS}	V _D S = 50V, V _G S = 0V			100	μA
V _{TH}	V _D S = 10V, I _D = 250μA	1.3		2.3	V
R _e (y/s)	V _D S = 10V, I _D = 25A	20.0			S
R _{DS (ON)}	V _G S = 10V, I _D = 25A		9	11	mΩ
C _{iss}	V _D S = 10V		2000		pF
C _{oss}	f = 1.0MHz		1000		pF
C _{rss}	V _G S = 0V		150		pF
t _{d (on)}	I _D = 25A				ns
t _r	V _{DD} = 12V		To be defined		ns
t _{d (off)}	R _L = 0.48Ω				ns
t _f	V _G S = 10V				ns
V _{SD}	I _{SD} = 50A, V _G S = 0V		1.0	1.5	V

External Dimensions FM100 (full-mold)



MOS FET FKV560S (under development)

Absolute Maximum Ratings (Ta=25°C)

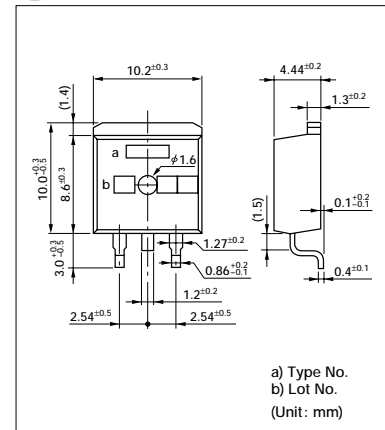
Symbol	Ratings	Unit
V _{DSS}	50	V
V _{GSS}	±20	V
I _D	±45	A
I _D (pulse)*	±135	A
P _D	60 (Tc=25°C)	W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

* P_W ≤ 100μs, duty ≤ 1%

Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	50			V
I _{GSS}	V _{GS} = +20V			+10	μA
	V _{GS} = -20V			-5	
I _{DSS}	V _{DS} = 50V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.0		2.0	V
Re (yfs)	V _{DS} = 10V, I _D = 25A	20.0			S
R _{DS(ON)}	V _{GS} = 10V, I _D = 25A		9	11	mΩ
C _{iss}	V _{DS} = 10V		2000		pF
C _{oss}	f = 1.0MHz		1000		pF
C _{rss}	V _{GS} = 0V		150		pF
t _{d(on)}	I _D = 25A				ns
t _r	V _{DD} = 12V		To be defined		ns
t _{d(off)}	R _L = 0.48Ω				ns
t _f	V _{GS} = 10V				ns
V _{SD}	I _{SD} = 50A, V _{GS} = 0V		1.0	1.5	V

External Dimensions TO220S



MOS FET FKV660 (under development)

Absolute Maximum Ratings (Ta=25°C)

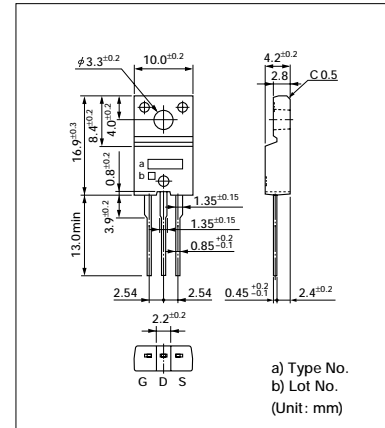
Symbol	Ratings	Unit
V _{DSS}	60	V
V _{GSS}	±20	V
I _D	±50	A
I _D (pulse)*	±150	A
P _D	40 (Tc=25°C)	W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

* P_W ≤ 100μs, duty ≤ 1%

Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	60			V
I _{GSS}	V _{GS} = +20V		+10		μA
	V _{GS} = -20V		-5		
I _{DSS}	V _{DS} = 60V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.0		2.0	V
Re (y/s)	V _{DS} = 10V, I _D = 25A	20.0			S
R _{DS (ON)}	V _{GS} = 10V, I _D = 25A		11	14	mΩ
C _{iss}	V _{DS} = 10V		2000		pF
C _{oss}	f = 1.0MHz		900		pF
C _{rss}	V _{GS} = 0V		100		pF
t _{d (on)}	I _D = 25A				ns
t _r	V _{DD} = 12V		To be defined		ns
t _{d (off)}	R _L = 0.48Ω				ns
t _f	V _{GS} = 10V				ns
V _{SD}	I _{SD} = 50A, V _{GS} = 0V		1.0	1.5	V

External Dimensions FM20 (full-mold)



MOS FET FKV660S (under development)

Absolute Maximum Ratings (Ta=25°C)

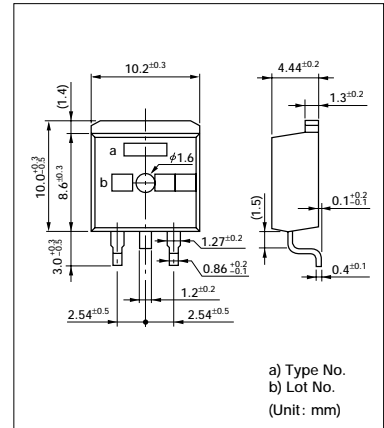
Symbol	Ratings	Unit
V _{DSS}	60	V
V _{GSS}	±20	V
I _D	±45	A
I _D (pulse) *	±135	A
P _D	60 (Tc=25°C)	W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

* P_W ≤ 100μs, duty ≤ 1%

Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	60			V
I _{GSS}	V _{GS} = ±20V		±10		μA
I _{DSS}	V _{DS} = 60V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.0		2.0	V
Re (yfs)	V _{DS} = 10V, I _D = 25A	20.0			S
R _{DS (ON)}	V _{GS} = 10V, I _D = 25A		11	14	mΩ
C _{iss}	V _{DS} = 10V		2000		pF
C _{oss}	f = 1.0MHz		900		pF
C _{rss}	V _{GS} = 0V		100		pF
t _{d (on)}	I _D = 25A				ns
t _r	V _{DD} = 12V				ns
t _{d (off)}	R _L = 0.48Ω				ns
t _f	V _{GS} = 10V				ns
V _{SD}	I _{SD} = 50A, V _{GS} = 0V		1.0	1.5	V

External Dimensions T0220S



MOS FET Array STA508A

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{DSS}	120	V
V _{GSS}	±20	V
I _D	±6	A
I _D (pulse)*1	±10	A
P _T	4 (Ta = 25°C)	W
	20 (Tc = 25°C)	W
E _{AS} *2	80	mJ
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

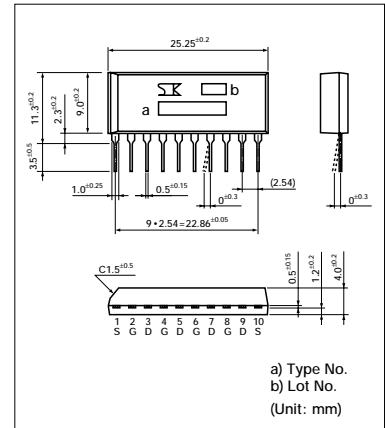
*1 P_W ≤ 100μs, duty ≤ 1%

*2 V_{DD} = 12V, L = 10mH, unclamped, R_G = 50Ω

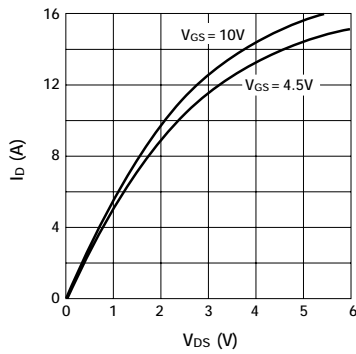
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	120			V
I _{GSS}	V _{GS} = ±20V		±5		μA
I _{DSS}	V _{DS} = 120V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.0		2.0	V
Re (yfs)	V _{DS} = 10V, I _D = 4.0A	5.0			S
R _{DS (ON)}	V _{GS} = 10V, I _D = 4.0A		0.15	0.2	Ω
	V _{GS} = 4V, I _D = 4.0A		0.2	0.25	Ω
C _{iss}	V _{DS} = 10V		400		pF
C _{oss}	f = 1.0MHz		130		pF
C _{rss}	V _{GS} = 0V		30		pF
t _{d (on)}	I _D = 4A		100		ns
t _r	V _{DD} = 12V		300		ns
t _{d (off)}	R _L = 3Ω		250		ns
t _f	V _{GS} = 5V		200		ns
V _{SD}	I _{SD} = 6A, V _{GS} = 0V	1.0	1.5		V

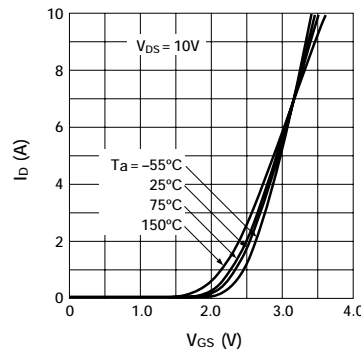
External Dimensions STA4 (LF412)



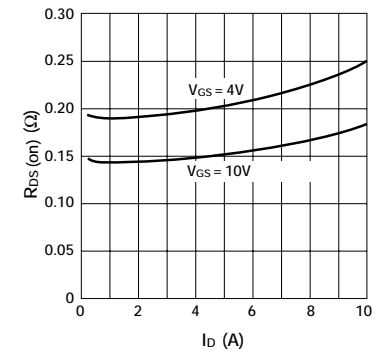
I_D — V_{DS} Characteristics



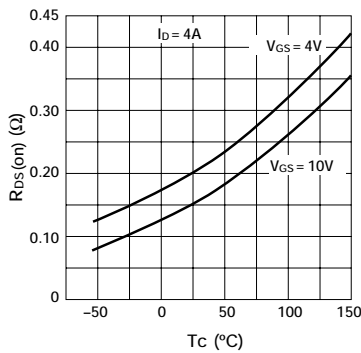
I_D — V_{GS} Characteristics



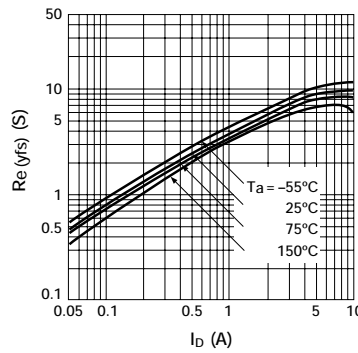
R_{DS (on)} — I_D Characteristics



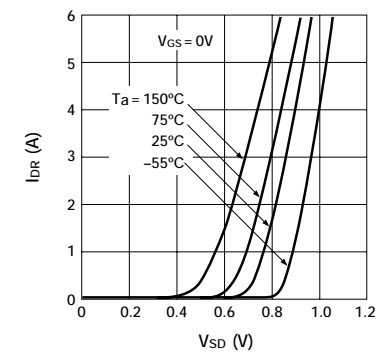
R_{DS (on)} — T_c Characteristics



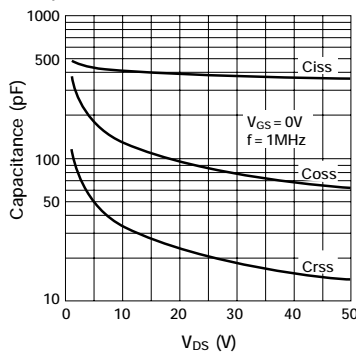
Re (yfs) — I_D Characteristics



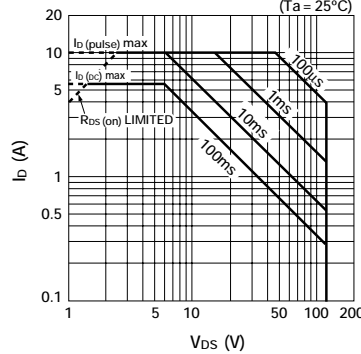
I_{DR} — V_{SD} Characteristics



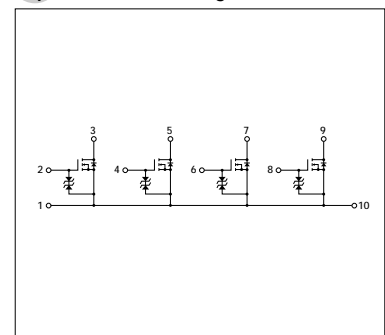
Capacitance — V_{DS} Characteristics



Safe Operating Area (single pulse) (Ta = 25°C)



Equivalent Circuit Diagram



MOS FET Array STA509A

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{DSS}	52±5	V
V _{GS}	±20	V
I _D	±3	A
I _D (pulse) ^{*1}	±6	A
P _T	4 (Ta = 25°C)	W
	20 (Tc = 25°C)	W
EAS ^{*2}	40	mJ
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

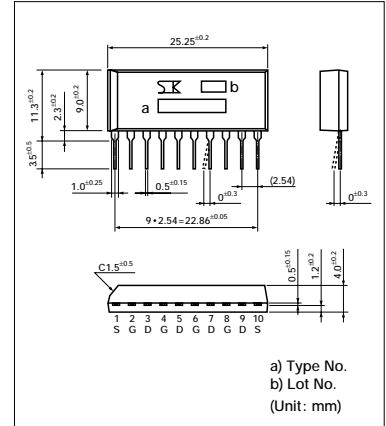
*1 P_W ≤ 100μs, duty ≤ 1%

*2 V_{DD} = 12V, L = 10mH, unclamped, R_G = 10Ω

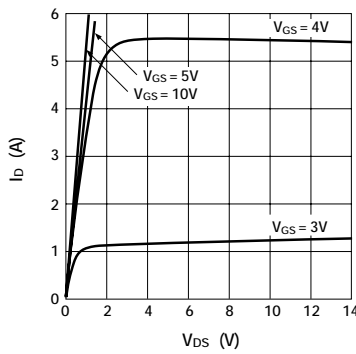
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V(BR) _{DSS}	I _D = 1mA, V _{GS} = 0V	47	52	57	V
I _{GSS}	V _{GS} = ±20V			±1.0	μA
I _{DSS}	V _{DS} = 40V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.0		2.5	V
Re (yfs)	V _{DS} = 10V, I _D = 1.0A	1.0			S
R _{DS} (ON)	V _{GS} = 10V, I _D = 1.0A		0.2	0.25	Ω
	V _{GS} = 4V, I _D = 1.0A		0.25	0.3	Ω
C _{iss}	V _{DS} = 10V		200		pF
C _{oss}	f = 1.0MHz		120		pF
C _{rss}	V _{GS} = 0V		20		pF
t _d (on)	I _D = 1A V _{DD} = 12V		2.0		μs
t _r	R _L = 12Ω		7.4		μs
t _d (off)	V _{GS} = 5V		3.3		μs
t _f	R _{G1} = 50Ω, R _{G2} = 10Ω		4.2		μs
V _{SD}	I _{SD} = 6A, V _{GS} = 0V	1.0	1.5		V

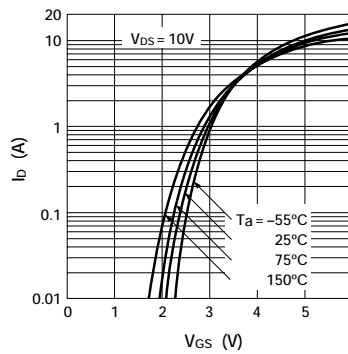
External Dimensions STA



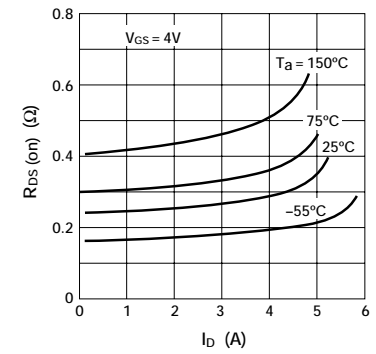
I_D — V_{DS} Characteristics



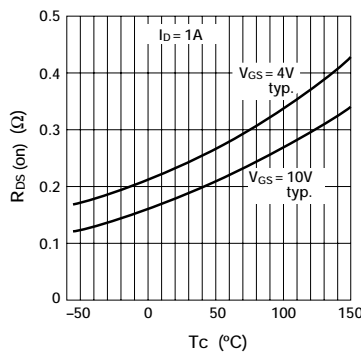
I_D — V_{GS} Characteristics



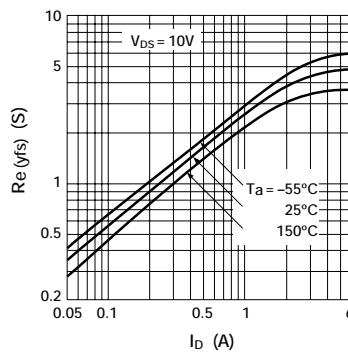
R_{DS} (on) — I_D Characteristics



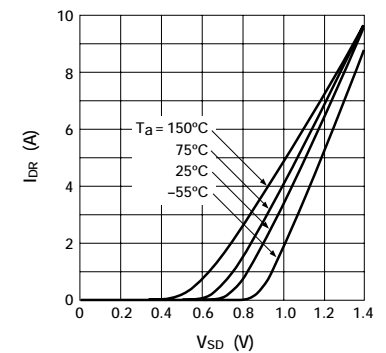
R_{DS} (on) — T_c Characteristics



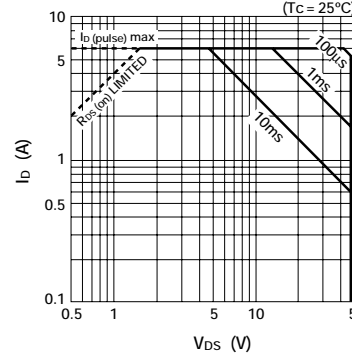
Re (yfs) — I_D Characteristics



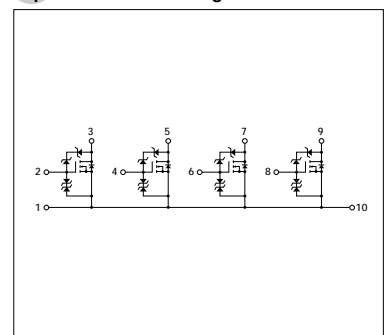
I_{DR} — V_{SD} Characteristics



Safe Operating Area (single pulse)



Equivalent Circuit Diagram



MOS FET Array SMA5113

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{DSS}	450	V
V _{GSS}	±30	V
I _D	±7	A
I _D (pulse) *1	±28	A
P _T	4 (Ta=25°C, All circuits operate, No Fin) 35 (Tc=25°C, All circuits operate, ∞ Fin)	W
EAS *2	130	mJ
I _{AS}	7	A
θ _{J-a}	31.2 (Junction - Ambientare, Ta=25°C, All circuits operate)	°C/W
θ _{J-c}	3.57 (Junction - Case, Ta=25°C, All circuits operate)	°C/W
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

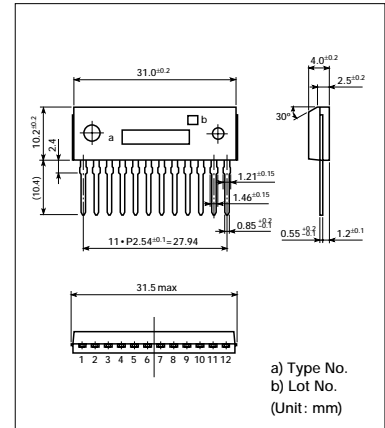
*1 P_W ≤ 100μs, duty ≤ 1%

*2 V_{DD} = 30V, L = 5mH, I_L = 7A, unclamped, R_G = 50Ω

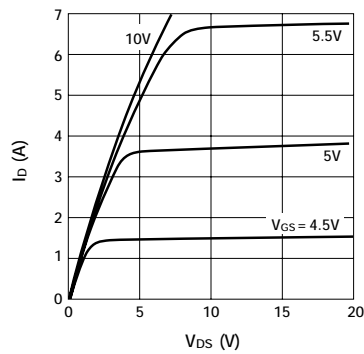
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	450			V
I _{GSS}	V _{GS} = ±30V		±100		nA
I _{DSS}	V _{DS} = 450V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 1mA	2.0		4.0	V
Re (yfs)	V _{DS} = 20V, I _D = 3.5A	3.5	5.0		S
R _{DS (ON)}	V _{GS} = 10V, I _D = 3.5A		0.84	1.1	Ω
C _{iss}	V _{DS} = 10V f = 1.0MHz		720		pF
C _{oss}	V _{GS} = 0V		150		pF
Cr _{ss}	V _{GS} = 0V		65		pF
t _{d (on)}	I _D = 3.5A V _{DD} = 200V R _L = 57Ω		25		ns
t _r	V _{GS} = 10V		40		ns
t _{d (off)}	V _{GS} = 10V		70		ns
t _r	R _G = 50Ω		50		ns
V _{SD}	I _{SD} = 7A, V _{GS} = 0V		1.0	1.5	V

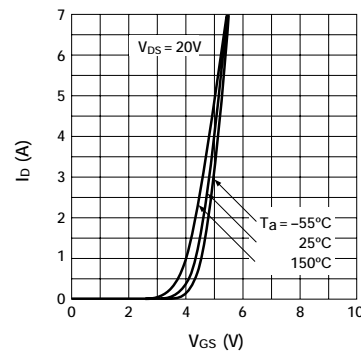
External Dimensions SMA (LF1000)



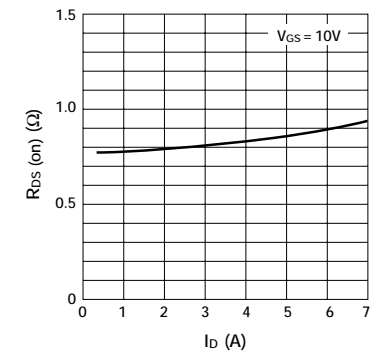
I_D — V_{DS} Characteristics



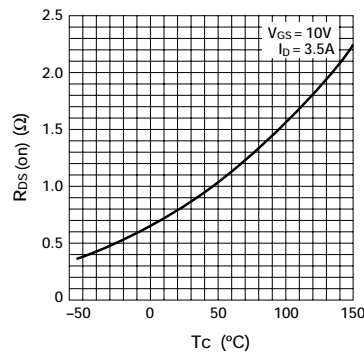
I_D — V_{GS} Characteristics



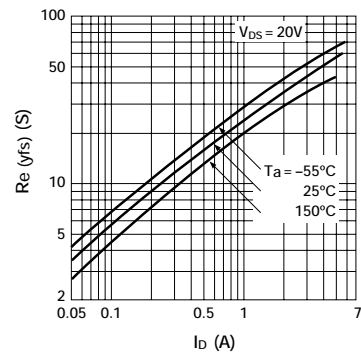
R_{DS (on)} — I_D Characteristics



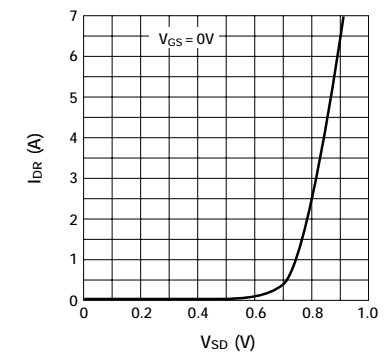
R_{DS (on)} — T_C Characteristics



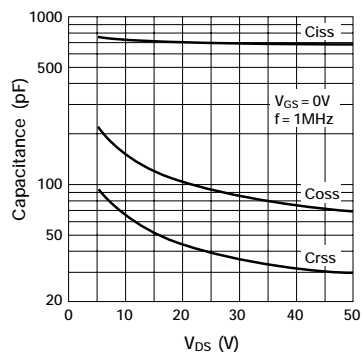
Re (yfs) — I_D Characteristics



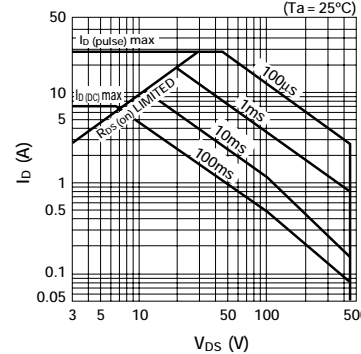
I_{DR} — V_{SD} Characteristics



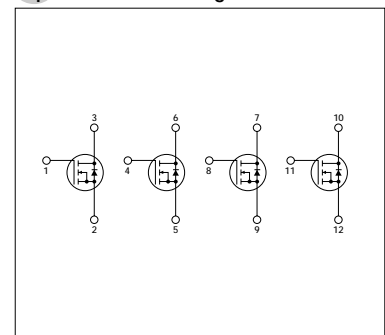
Capacitance — V_{DS} Characteristics



Safe Operating Area (single pulse)



Equivalent Circuit Diagram



MOS FET Array SLA5027

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{DSS}	60	V
V _{GSS}	±20	V
I _D	±12	A
I _D (pulse)*1	±48	A
P _T	5 (Ta=25°C, 4 circuits operate)	W
	60 (Tc=25°C, 4 circuits operate)	W
EAS*2	250	mJ
θ _{J-C}	2.08	°C/W
V _{ISO}	(Fin to lead terminal) AC1000	V _{rms}
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

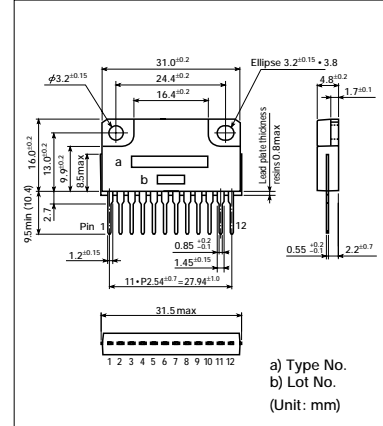
*1 P_W ≤ 250μs, duty ≤ 1%

*2 V_{DD} = 30V, L = 10mH, unclamped, R_G = 50Ω

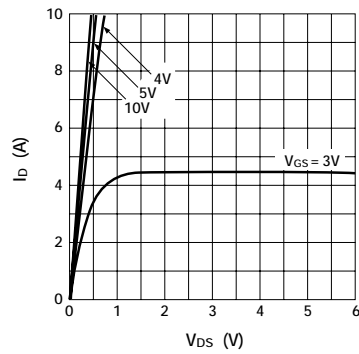
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	60			V
I _{GSS}	V _{GS} = ±20V		±100		μA
I _{DSS}	V _{DS} = 60V, V _{GS} = 0V		100		μA
V _{TH}	V _{DS} = 10V, I _D = 1mA	1.0	1.5	2.0	V
R _e (yfs)	V _{DS} = 10V, I _D = 8A	6.0	12.0		S
R _{DS (ON)}	V _{GS} = 4V, I _D = 8A		0.07	0.08	Ω
C _{ISS}	V _{DS} = 10V		1100		pF
C _{OSS}	f = 1.0MHz		500		pF
C _{RSS}	V _{GS} = 0V		170		pF
t _{d (on)}	I _D = 8A		50		ns
t _r	V _{DD} = 30V		250		ns
	R _L = 3.75Ω				
t _{d (off)}	V _{GS} = 5V		250		ns
t _r	R _G = 50Ω		180		ns
V _{SD}	I _{SD} = 10A, V _{GS} = 0V	1.0	1.5		V

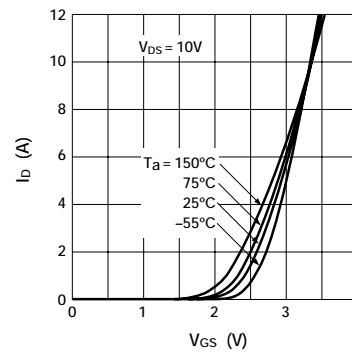
External Dimensions SLA (LF800)



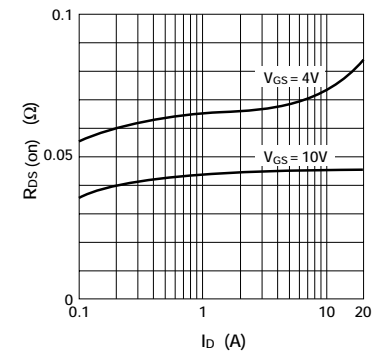
I_D - V_{DS} Characteristics



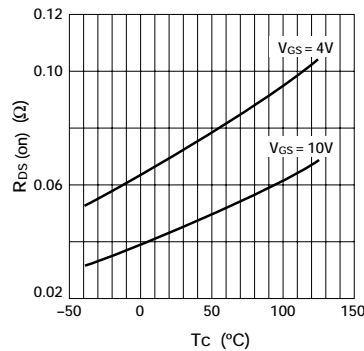
I_D - V_{GS} Characteristics



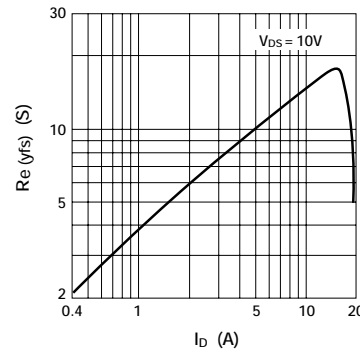
R_{DS (on)} - I_D Characteristics



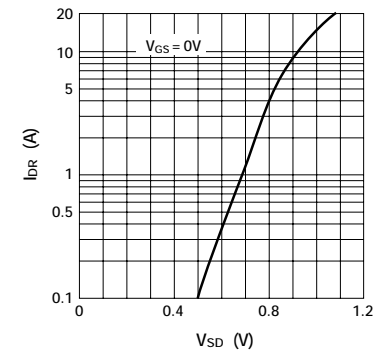
R_{DS (on)} - T_C Characteristics



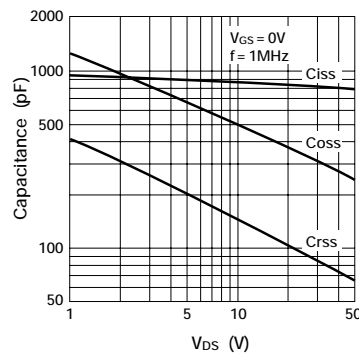
R_e (yfs) - I_D Characteristics



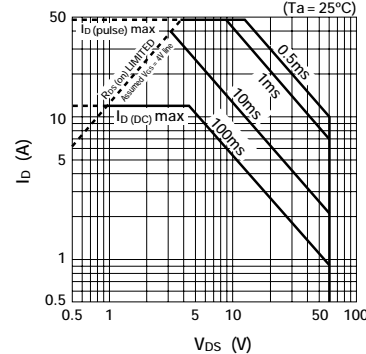
I_{DR} - V_{SD} Characteristics



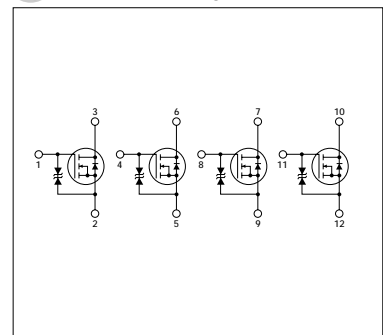
Capacitance - V_{DS} Characteristics



Safe Operating Area (single pulse)



Equivalent Circuit Diagram



Surface-mount MOS FET Array SDK06 (under development)

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{DSS}	52±5	V
V _{GSS}	±20	V
I _D	±3	A
I _D (pulse) *1	±6	A
P _T	3 (Tc=25°C, 4 circuits operate)	W
EAS *2	40	mJ
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

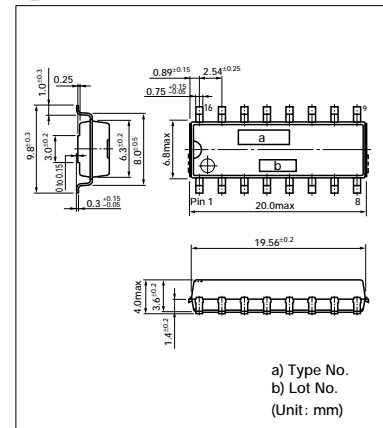
*1 P_W ≤ 100μs, duty ≤ 1%

*2 V_{DD} = 12V, L = 10mH, unclamped, R_G = 10Ω

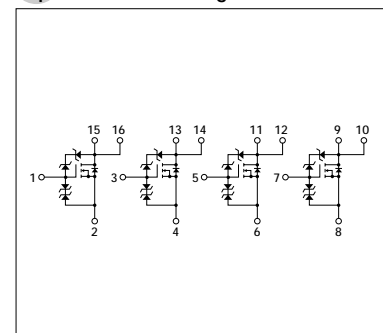
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 1mA, V _{GS} = 0V	47	52	57	V
I _{GSS}	V _{GS} = ±20V			±1.0	μA
I _{DSS}	V _{DS} = 40V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 250μA	1.0	1.8	2.5	V
Re (yfs)	V _{DS} = 10V, I _D = 1.0A	1.0			S
R _{DS (ON)}	V _{GS} = 10V, I _D = 1.0A		0.2	0.25	Ω
	V _{GS} = 4V, I _D = 1.0A		0.25	0.3	Ω
C _{iss}	V _{DS} = 10V		200		pF
C _{oss}	f = 1.0MHz		120		pF
C _{rss}	V _{GS} = 0V		20		pF
t _{d (on)}	I _D = 1A		2.0		μs
t _r	V _{DD} ≐ 12V		7.4		μs
t _{d (off)}	R _L = 12Ω		3.3		μs
	V _{GS} = 5V				
t _f	R _{G1} = 50Ω, R _{G2} = 10kΩ		4.2		μs
V _{SD}	I _{SD} = 1A, V _{GS} = 0V	1.0	1.5		V

External Dimensions SMD-16A



Equivalent Circuit Diagram



Surface-mount MOS FET Array SDK08

Absolute Maximum Ratings (Ta=25°C)

Symbol	Ratings	Unit
V _{DSS}	50	V
V _{GSS}	±20	V
I _D	±4.5	A
I _D (pulse) *1	±9	A
P _T	4 (Tc=25°C, 4 circuits operate)	W
EAS *2	80	mJ
T _{ch}	150	°C
T _{stg}	-55 to +150	°C

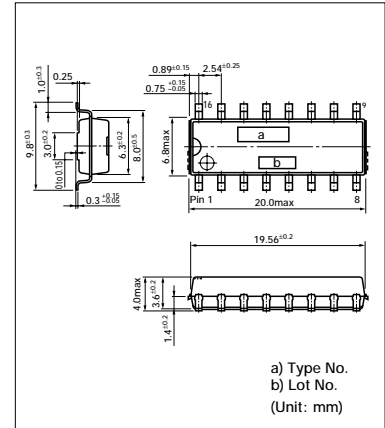
*1 P_W ≤ 100μs, duty ≤ 1%

*2 V_{DD} = 12V, L = 10mH, unclamped, R_G = 50Ω

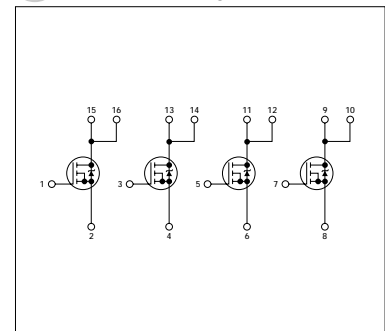
Electrical Characteristics (Ta=25°C)

Symbol	Test Conditions	Ratings			Unit
		min	typ	max	
V _{(BR) DSS}	I _D = 100μA, V _{GS} = 0V	50			V
I _{GSS}	V _{GS} = ±20V			±100	nA
I _{DSS}	V _{DS} = 50V, V _{GS} = 0V			100	μA
V _{TH}	V _{DS} = 10V, I _D = 1mA	1.3	1.8	2.3	V
Re (yfs)	V _{DS} = 10V, I _D = 4.0A	5.0	9.0	13.0	S
R _{DS (ON)}	V _{GS} = 10V, I _D = 4.0A		0.07	0.08	Ω
	V _{GS} = 4V, I _D = 4.0A		0.09	0.1	Ω
C _{iss}	V _{DS} = 10V		700		pF
C _{oss}	f = 1.0MHz		300		pF
C _{rss}	V _{GS} = 0V		90		pF
t _{d (on)}	I _D = 4A		50		ns
t _r	V _{DD} ≈ 12V		80		ns
t _{d (off)}	R _L = 3Ω		60		ns
t _f	V _{GS} = 5V		40		ns
V _{SD}	I _{SD} = 6A, V _{GS} = 0V		1.0	1.5	V

External Dimensions SMD-16A



Equivalent Circuit Diagram





Rectifier Diodes for Alternators

Type No.	Absolute maximum ratings				Electrical Characteristics					Fig. No.	Remarks
	V_{RM} (V)	I_F (AV) (A)	I_{FSM} (A)	T_{stg} (°C)	V_F (V) max	Condition I_F (A)	I_R (mA) max	V_Z (V)	Condition I_Z (mA)		
SG-9CNS	200	20	200	-40 to +150	1.10	20	0.25	—	—	1	
SG-9CNR											
SG-9LCNS	200	30	300	-40 to +150	1.10	30	0.25	—	—	2	
SG-9LCNR											
SG-10LS	200	30	350	-40 to +150	1.20	100	0.25	—	—	3	
SG-10LR											
SG-10LXS	150	35	400	-40 to +150	1.05	100	0.25	—	—	3	
SG-10LXR											
SG-10LLS	200	40	400	-40 to +150	1.05	100	0.25	—	—	4	
SG-10LLR											
SG-10LLXS	150	45	450	-40 to +150	1.00	100	0.25	—	—	4	
SG-10LLXR											
SG-10LZ23S	17	30	350	-40 to +150	1.20	100	0.05	23±3	10	3	Power Zener Type
SG-10LZ23R											
SG-10LLZ23S	17	40	400	-40 to +150	1.05	100	0.05	23±3	10	4	
SG-10LLZ23R											

External Dimensions (unit: mm)

Fig. 1

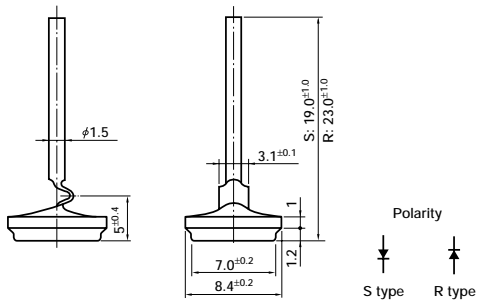


Fig. 2

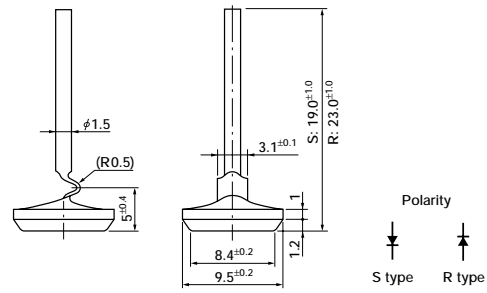


Fig. 3

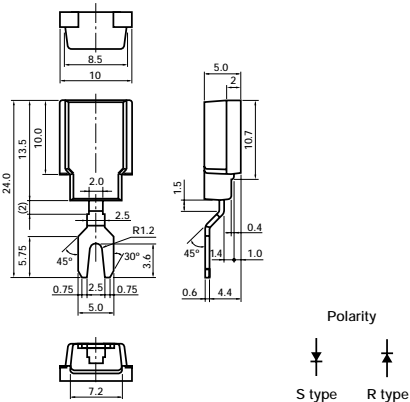
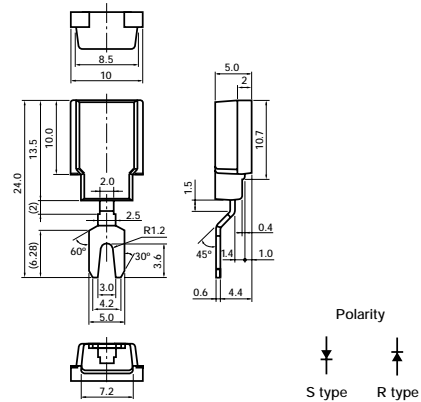


Fig. 4



High-voltage Diodes for Igniters

Type No.	Absolute Maximum Ratings				Electrical Characteristics (Ta=25°C)				Fig. No.	
	V _{RM} (kV)	I _F (AV) (mA) 50 Hz half-wave signal average	I _{RSM} (mA) Peak value of single shot triangular wave with 100μs half-power bandwidth	I _{RSM} (A) Peak value of 50 Hz half-wave signal	T _J	T _{stg}	V _F (V) max	I _R (μA) max V _R =V _{RM} Condition I _F (mA)		V _Z (kV) I _R =100μA
SHV-05J	2.5	30	30	3	-40 to +150	5	10	10	2.6 to 5.0	1
SHV-08J	4.0	30	30	3		8			4.5 to 8.0	2
SHV-30J	15.0	30	10	3		30			16.0 to 30.0	3

External Dimensions (unit: mm)

Fig. 1 (SHV-05J)

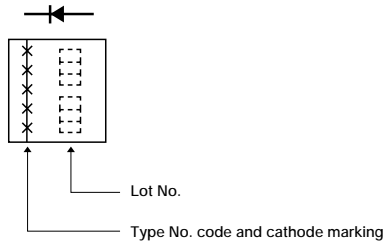
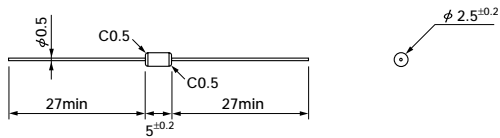


Fig. 2 (SHV-08J)

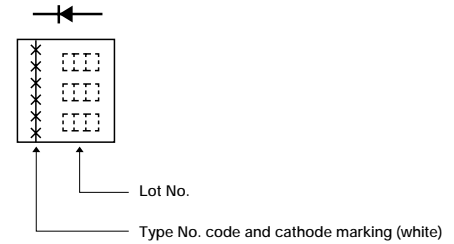
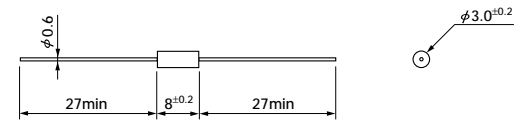
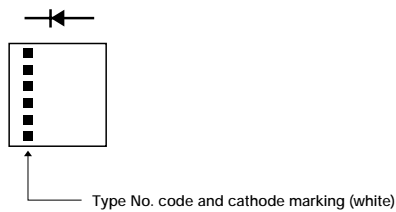
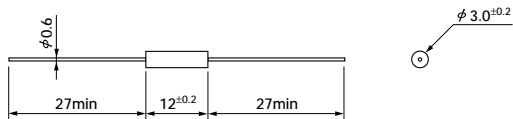


Fig. 3 (SHV-30J)



Power Zener Diode

(Ta = 25°C)

Type No.	Absolute Maximum Ratings				Electrical Characteristics			External dimensions	Remarks
	P _R (W)	V _{DC} (V)	I _{ZSM} (A) 10ms rectangular wave single shot	T _J / T _{stg} (°C)	V _Z (V) 1mA instantaneous current	I _R (μA) max	I _{R(H)} (mA) max		
SFPZ-68	50	20	2	-40 to +150	28±3.0	10	1.0	1	Surface-mount type
SPZ-G36	450	30	11		36±3.6	5	0.1	2	
PZ-628	1500	20	65		28±3.0	500	1.0	3	

External Dimensions (unit: mm)

Fig. 1

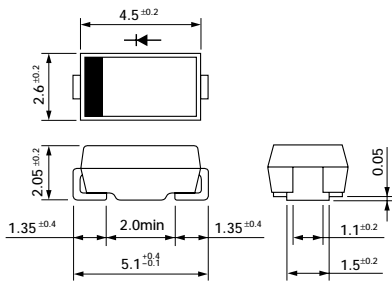


Fig. 2

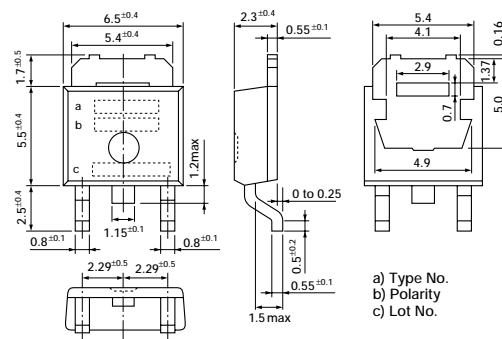
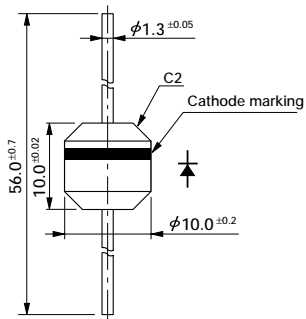


Fig. 3



a) Type No.
b) Polarity
c) Lot No.

General-purpose Diodes

Rectifier Diodes

Surface-mount Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.
	V _{RM} (V)	I _{F (AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	Condition	I _R (μA)	
				(°C)			max		
SFPM-52	200	0.9	30	-40 to +150	max	1.00	1.0	10	1
-54	400								
SFPM-62	200	1.0	45			0.98			
-64	400								

Axial Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.
	V _{RM} (V)	I _{F (AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	Condition	I _R (μA)	
				(°C)			max		
AM01Z	200	1.0	35	-40 to +150	max	0.98	1.0	10	2
01	400								
01A	600								
EM01Z	200	1.0	45	-40 to +150	max	0.97	1.0	10	3
01	400								
01A	600								
EM 1Y	100	1.0	45	-40 to +150	max	0.97	1.0	10	4
1Z	200								
1	400								
1A	600		35						
1B	800								
1C	1000								
EM 2	400	1.2	80	-40 to +150	max	0.92	1.2	10	5
2A	600								
2B	800								
RM 1Z	200	1.0	50	-40 to +150	max	0.95	1.0	10	5
1	400								
1A	600								
1B	800		0.8			40			
1C	1000								
RM 11A	600	1.2	100	-40 to +150	max	0.92	1.5	10	6
11B	800								
11C	1000								
RM 10Z	200	1.5	120	-40 to +150	max	0.91	1.5	10	7
10	400								
10A	600								
10B	800								
RM 2Z	200	1.2	100	-40 to +150	max	0.91	1.5	10	8
2	400								
2A	600								
2B	800								
2C	1000								
RO 2Z	200	1.2	80	-40 to +150	max	0.92	1.5	10	9
2	400								
2A	600								
2B	800								
2C	1000								
RM 3	400	2.5	150	-40 to +150	max	0.95	2.5	10	10
3A	600								
3B	800								
3C	1000								

(Ta=25°C)

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.
	V _{RM} (V)	I _{F (AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	Condition	I _R (μA)	
				(°C)			max		
RM 4Y	100	3.0	200	-40 to +150	max	0.95	3.0	10	8
4Z	200								
4	400								
4A	600								
4B	800								
4C	1000								
4AM	600	3.2	350	0.92	3.5				

Center-tap Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.
	V _{RM} (V)	I _{F (AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	Condition	I _R (μA)	
				(°C)			max. per chip		
FMM-22S,R	200	10.0	100	-40 to +150	max	1.1	5.0	10	9
-24S,R	400								
-26S,R	600								
FMM-31S,R	100	20.0	120	-40 to +150	max	1.1	10.0	10	10
-32S,R	200								
-34S,R	400								
-36S,R	600								

Fast Recovery Rectifier Diodes

■ Axial Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings			Electrical Characteristics				Fig. No.		
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (μA)		t _{rr1} (μs)	t _{rr2} (μs)
				(°C)		max	max		max	max
RC 2	2000	0.20	20	-40 to +150	2.00	10	4.0	1.30	5	
EH 1Z	200									
1	400	0.60	30	-40 to +150	1.35	10	4.0	1.30	4	
1A	600									
RH 1Z	200									
1	400									
1A	600	0.06	35	-40 to +150	1.30	5	4.0	1.30	5	
1B	800									
1C	1000									
AS01Z	200									
01	400	0.60	20	-40 to +150	1.50	10	1.5	0.60	2	
01A	600									
ES01Z	200									
01	400	0.70	30	-40 to +150	2.50	10	1.5	0.60	3	
01A	600									
01F	1500	0.50	20		2.00					
ES 1Z	200									
1	400	0.70	30	-40 to +150	2.50	10	1.5	0.60	4	
1A	600									
1F	1500	0.50	20		2.00					
RS 1A	600	0.70	30	-40 to +150	2.50	10	1.5	0.60	5	
1B	800									
AU01Z	200									
01	400	0.50	15	-40 to +150	1.70	10	0.4	0.18	2	
01A	600									
AU02Z	200									
02	400	0.80	25	-40 to +150	1.30	10	0.4	0.18	2	
02A	600									
RU 1	400									
1A	600	0.25	15	-40 to +150	2.50	10	0.4	0.18	5	
1B	800									
1C	1000	0.20			3.00					
EU01Z	200									
01	400	0.25	15	-40 to +150	2.50	10	0.4	0.18	3	
01A	600									
EU 1Z	200									
1	400	0.25	15	-40 to +150	2.50	10	0.4	0.18	4	
1A	600									
RF 1Z	200									
1	400									
1A	600	0.60	15	-40 to +150	2.00	10	0.4	0.18	5	
1B	800									
RU 2Z	200									
2	600	1.00	20	-40 to +150	1.50	10	0.4	0.18	5	
2B	800									
2C	1000	0.80								
EU02Z	200									
02	400	1.00	15	-40 to +150	1.40	10	0.4	0.18	3	
02A	600									
EU 2Z	200									
2	400	1.00	15	-40 to +150	1.40	10	0.4	0.18	4	
2A	600									
2YX	100	1.20	25		0.90		0.2	0.08	●	

●t_{rr1}=I_F/I_{RP}=1:1, t_{rr2}=I_F/I_{RP}=1:2

(Ta=25°C)

Type No.	Absolute Maximum Ratings			Electrical Characteristics				Fig. No.		
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (μA)		t _{rr1} (μs)	t _{rr2} (μs)
				(°C)		max	max		max	max
RU 2M	400									
2AM	600	1.10	20	-40 to +150		1.20	10	0.4	0.18	5
2YX	100	1.50	30			0.95		0.2	0.08	
RU 20A	600	1.50	50			1.10		0.4	0.18	
RU 3	400									
3A	600	1.50	20	-40 to +150		1.50	10	0.4	0.18	6
3B	800	1.10				2.00				
3C	1000	1.50				1.10				
3M	400	1.50	50			0.95		0.2	0.08	
3AM	600									
3YX	100	2.00								
RU 30Y	100	3.50	100	-40 to +150		0.89	10	0.2	0.08	3
30Z	200		80			0.97				
30	400	2.00	200			0.95		0.4	0.18	
30A	600									
RU 4Y	100									
4Z	200	3.50	70	-40 to +150		1.30	10	0.4	0.18	8
4	400					1.50				
4A	600	3.00	50			1.60	50			
4B	800									
4C	1000	2.50								
4M	400	3.50	70			1.30	10			
4AM	600									
4YX	100	4.00	100			0.85		0.2	0.08	

●t_{rr1}=I_F/I_{RP}=1:1, t_{rr2}=I_F/I_{RP}=1:2

■ Single-chip Frame Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings			Electrical Characteristics				Fig. No.		
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (μA)		t _{rr1} (μs)	t _{rr2} (μs)
				(°C)		max	max		max	max
FMU-G2YXS	100	10.0	100	-40 to +150		1.00	50	0.2	0.08	11
-G16S	600	5.0	30			1.25		0.4	0.18	
-G26S	600	10.0	40			1.35				

●t_{rr1}=I_F/I_{RP}=1:1, t_{rr2}=I_F/I_{RP}=1:2

■ Center-tap Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings			Electrical Characteristics				Fig. No.		
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (μA)		t _{rr1} (μs)	t _{rr2} (μs)
				(°C)		max. per chip	max		max	max
FMU-12S,R	200									
-14S,R	400	5.0	30	-40 to +150		1.5	50	0.4	0.18	9
-16S,R	600									
FMU-21S,R	100									
-22S,R	200	10.0	40	-40 to +150		1.5	50	0.4	0.18	9
-24S,R	400									
-26S,R	600									
FMU-32S,R	200									
-34S,R	400	20.0	80	-40 to +150		1.5	50	0.4	0.18	10
-36S,R	600									

●t_{rr1}=I_F/I_{RP}=1:1, t_{rr2}=I_F/I_{RP}=1:2

Ultra Fast Recovery Rectifier Diodes

■ Surface-mount Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings				Electrical Characteristics				Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (μA)	trr1 (ns)		trr2 (ns)
				(°C)		max	max	max		max
SFPL-52	200	0.9	25	-40 to +150	0.98	10	50	35	1	
-62		1.0	50							
SPX-G32S		3.0	80							
-62S*		6.0	80						12	

*Center-tap Type

■ Axial Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings				Electrical Characteristics				Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (μA)	trr1 (ns)		trr2 (ns)
				(°C)		max	max	max		max
AG01Y	70	1.0	25	-40 to +150	1.20	100	100	50	2	
01Z	200	0.7	15							
01	400	0.5	10							
01A	600	0.5	10							
EG01Y	70	1.0	30	-40 to +150	1.20	100	100	50	3	
01Z	200	0.7	15							
01	400	0.5	10							
01A	600	0.5	10							
01C	1000	0.5	10							
EG 1Y	70	1.1	30	-40 to +150	1.20	100	100	50	4	
1Z	200	0.8	15							
1	400	0.6	10							
1A	600	0.6	10							
RG 1C	1000	0.7	10							
RG 10Y	70	1.5	50	-40 to +150	1.10	50	100	50	5	
10	400	1.2	50							
10A	600	1.0	50							
RG 2Y	70	1.5	50	-40 to +150	1.10	50	100	50	6	
2Z	200	1.2	50							
2	400	1.0	50							
2A	600	1.0	50							
RG 4Y	70	3.5	100	-40 to +150	1.30	100	100	50	8	
4Z	200	3.0	80							
4	400	2.0	50							
4A	600	2.0	50							
4C	1000	60	3.00							
EN01Z		1.0	50	-40 to +150	0.92	100	100	50	3	
RN 1Z		1.5	60							
RN 2Z	200	2.0	70							
RN 3Z		3.0	80							
RN 4Z		3.5	120							
AP01C		0.2	5	-40 to +150	4.00	5	200	80	2	
EP01C	1000	0.1	5							
RP 1H	2000	0.1	5							
RU 1P	1000	0.4	10							
AL01Z	200	1.0	25	-40 to +150	0.98	100	50	40	2	
EL 1Z		20	25							
EL 1	400	1.5	25							
EL02Z										
RL 10Z	200	2.0	30							
RL 2Z										
2	350	40	30	-40 to +150	0.98	50	100	35	6	
2A	600	1.1	30							
RL 3Z	200	3.5	80							
3	350	50	80							
3A	600	2.0	60							
RL 4Z	200	3.5	80							
4A	600	3.0	80							
RX 3Z	200	3.0	80	-40 to +150	0.98	50	30	25	7	

■ Single-chip Frame Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings				Electrical Characteristics				Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (μA)	trr1 (ns)		trr2 (ns)
				(°C)		max	max	max		max
FMG-G26S	600	4.0	50	-40 to +150	2.50	500	100	50	11	
-G36S		8.0	80							
-G2CS		3.0	30							
-G3CS	1000	5.0	60							
FMP-G12S	200	5.0	65	-40 to +150	1.15	50	150	70	11	
FMN-G12S			100							0.92
FML-G12S	200	5.0	70	-40 to +150	0.98	250	40	35	11	
-G13S	300									
-G14S	400									
-G16S	600	50								
-G22S	200	150			0.98	500	40	30		
-G26S	600	100			1.70	100	65	40		
FMX-G12S	200	5.0	65	-40 to +150	0.98	100	30	25	11	
-G22S		10.0	150							

■ Center-tap Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings				Electrical Characteristics				Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (mA)	trr1 (ns)		trr2 (ns)
				(°C)		max. per chip	max. per chip	max		max
FMG-12S,R	200	5.0	35	-40 to +150	1.80	0.50	100	50	9	
-13S,R	300									
-14S,R	400									
FMG-22S,R	200	10.0	65	-40 to +150	1.80	0.50	100	50	9	
-23S,R	300									
-24S,R	400									
-26S,R	600	6.0	50		2.20					
FMG-32S,R	200	20.0	150	-40 to +150	1.80	1.00	100	50	10	
-33S,R	300									
-34S,R	400									
-36S,R	600	15.0	80		2.20					
FMC-26U	600	6.0	50	-40 to +150	2.00	0.50	70	35	9	
FML-12S	200	5.0	35	-40 to +150	0.98	0.15	40	30	9	
-13S	300									
-14S	400									
FML-22S	200	10.0	70	-40 to +150	0.98	0.25	40	30	9	
-23S	300									
-24S	400									
FML-32S	200	20.0	100	-40 to +150	0.98	0.60	40	30	10	
-33S	300									
-34S	400									
-36S	600	1.70	0.10	65	35					
FMX-12S	200	5.0	35	-40 to +150	0.98	0.05	30	25	9	
-22S		10.0	65							
-22SL		15.0	100							
-32S		20.0	150							

■ Bridge Type

(Ta=25°C)

Type No.	Absolute Maximum Ratings				Electrical Characteristics				Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (mA)	trr1 (ns)		trr2 (ns)
				(°C)		max. per chip	max. per chip	max		max
RBA-402L	200	4.0	80	-40 to +150	0.98	0.05	40	30	14	
RBV-602L	200	6.0	100							

Schottky Barrier Diodes

■ Surface-mount Type

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V) Condition = I _F	I _R (mA)	H·I _R (mA) T _a =100°C		
				(°C)						max
SFPB-52	20	1.0	30	-40 to +150	0.47	0.25	10	1		
SFPB-52		2.0	60			0.50	20			
SFPB-72		3.0				1.00				
SFPA-53	30	1.0	30	-40 to +125	0.36	1.50	70	1		
SFPA-63		2.0	40			3.00	140			
SFPA-73		3.0	50			4.50	210			
SFPE-63		2.0	40			-40 to +150	0.55		0.20	20
SFPJ-53	30	1.0	30	-40 to +150	0.45	1.00	10 (T _a =125°C)	14		
SFPJ-63		2.0	40			2.00	20 (T _a =125°C)			
SFPJ-73		3.0	50			3.00	30 (T _a =125°C)			
SPJ-63S*		6.0								
SSB-14	40	0.5	4	-40 to +150	0.58	0.10	5	16		
SFPB-54		1.0	30			0.55	1.00		50	
SFPB-64		1.5	60			0.50	5.00			
SFPB-74		2.0								
SFPE-64	40	2.0	40	-40 to +150	0.60	0.20	20	14		
SPB-G34S		3.0	50			30.00	50			
SPB-G54S		5.0	60			50.00				
SPB-64S*		6.0	50			30.00				
MPE-24H*	60	15.0	100	-40 to +150	0.60	0.75	50 (T _a =150°C)	17		
SFPB-56		0.7	10			-40 to +150	0.62		1.00	7.5
SFPB-66		1.5	25						2.00	20
SFPB-76		2.0	40						35.00	50
SPB-G56S	5.0	60	0.70	1.00	5					
SFPB-59	90	0.7	10	-40 to +150	0.81	1.00	5	1		
SFPB-69		1.5	40			2.00	10			

*Center-tap Type

■ Axial Type

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.				
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (mA)	H·I _R (mA) T _a =100°C					
				(°C)						max	max	max	
RK 42	20	3.0	100	-40 to +150	0.47	1.00	20	8					
AK 03	30	1.0	25	-40 to +150	0.55	1.00	50 (T _J =100°C)	2					
EA 03			30	-40 to +125	0.36	1.50	70	3					
EK 03		40	1.5	-40 to +150	0.55	5.00	50	4					
EK 13				40	-40 to +125	0.36	3.00	140	5				
RA 13	30	2.0	60	-40 to +150	0.55	5.00	50	6					
RK 13									2.5	50	0.45	3.00	30 (T _J =125°C)
RK 33		40	1.7						80	0.55	5.00	50	2
RJ 43													
RK 43	40	1.0	25	-40 to +150	0.55	5.00	50	4					
AK 04									1.5	40	0.55	5.00	50
EK 04		60	1.7						60	0.55	5.00	50	6
EK 14													
RK 14	60	2.0	40	-40 to +150	0.62	1.00	15	2					
RK 34									3.0	80	0.62	1.00	15
RK 44		0.7	10										
AK 06									1.5	25	0.62	1.00	15
EK 06	60	2.0	40	-40 to +150	0.62	2.00	25	6					
EK 16									3.5	70	0.62	2.00	25
RK 16		3.0	35										
RK 36									3.0	35	0.62	3.00	35

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (mA)	H·I _R (mA) T _a =100°C		
				(°C)						max. per chip
AK 09	90	0.7	10	-40 to +150	0.81	1.00	5	2		
EK 09									1.5	40
EK 19		2.0	50							
RK 19									3.5	60

■ Single-chip Frame Type

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (mA)	H·I _R (mA) T _a =100°C	
				(°C)					
FMB-G12L	20	5.0	100	-40 to +150	0.47	2.00	35	13	
FMB-G22H		10.0	200			5.00	65		
FMB-G14	40	3.0	60			5.00	100		
FMB-G14L		5.0	150			10.00	65		
FMB-G24H	60	6.0	50	0.62	5.00	50			
FMB-G16L		90	4.0	60	0.81	5.00	35		

■ Center-tap Type

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.	
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (mA)	H·I _R (mA) T _a =100°C		
				(°C)						max. per chip
FMB-22L	20	10.0	100	-40 to +150	0.47	2.00	35	9		
FMB-22H		15.0	150			3.00	50			
FMB-32		20.0	200			5.00	65			
FMB-32M		30.0	300			10.00	100			
FME-24L	40	10.0	80	-40 to +150	0.60	0.50	30	10		
FME-24H		15.0	100			0.75	50			
FMB-24		4.0	50			-40 to +150	0.55		5.00	35
FMB-24M		6.0	60						7.50	50
FMB-24L	10.0	60	5.00	35						
FMB-24H	15.0	100	10.00	65						
FMB-34S	40	12.0	75	-40 to +150	0.55	20.00	100	19		
FMB-34		15.0	150			5.00	35			
FMB-34M		30.0	300			7.50	50			
CTB-24		4.0	60			10.00	65			
CTB-24L	60	10.0	150	-40 to +150	0.62	20.00	100	20		
CTB-34		15.0	150			1.00	25			
CTB-34M		30.0	300			2.50	50			
FMB-26		90	4.0			40	-40 to +150		0.81	5.00
FMB-26L	10.0		50	10.00	150					
FMB-36	15.0		100	3.00	15					
FMB-36M	30.0		150	5.00	35					
FMB-29	90	4.0	50	-40 to +150	0.81	10.00	50	10		
FMB-29L		8.0	60			15.00	60			
FMB-39		15.0	150			15.00	60			
FMB-39M		20.0	150			15.00	60			

■ Bridge Type

Type No.	Absolute Maximum Ratings					Electrical Characteristics			Fig. No.
	V _{RM} (V)	I _{F(AV)} (A)	I _{FSM} (A)	T _J	T _{stg}	V _F (V)	I _R (mA)	H·I _R (mA) T _a =100°C	
				(°C)					
RBA-404B	40	4.0	40	-40 to +150	0.55	2.0	20	14	
-1004B		10.0	60			5.0	35 (T _J =125°C)		
406B	60	4.0	40	-40 to +150	0.62	2.0	20		

General-purpose Diodes - External Dimensions

Fig. 1

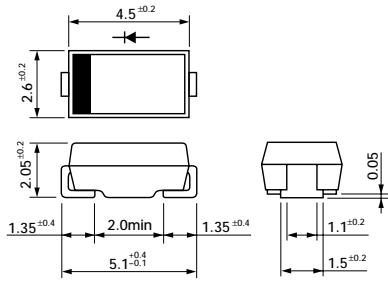


Fig. 2

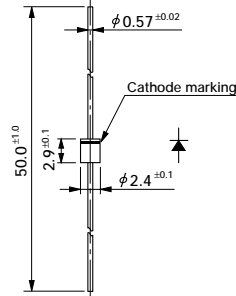


Fig. 3

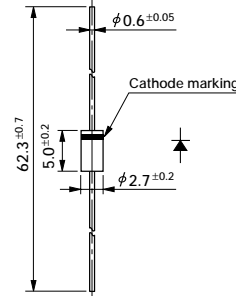


Fig. 4

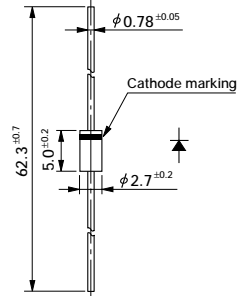


Fig. 5

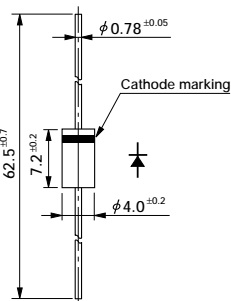


Fig. 6

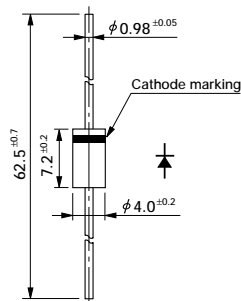


Fig. 7

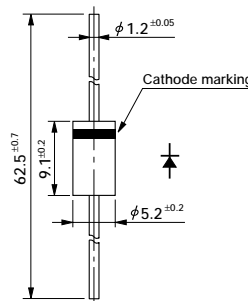


Fig. 8

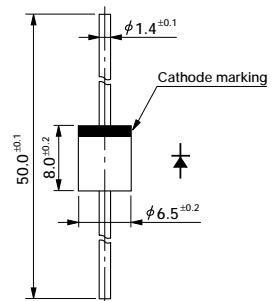


Fig. 9

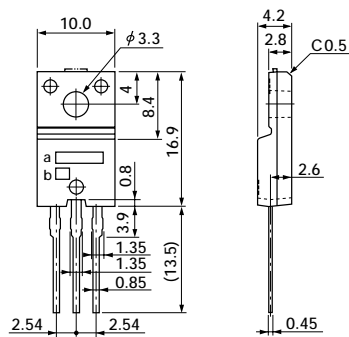
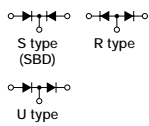
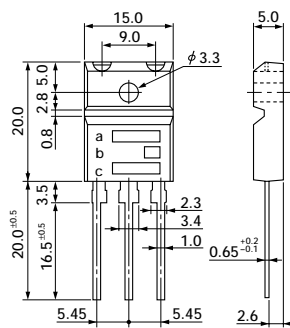
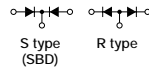


Fig. 10



a) Type No.
b) Lot No.



a) Type No.
b) Polarity
c) Lot No.

General-purpose Diodes - External Dimensions

Fig. 11 Full-mold

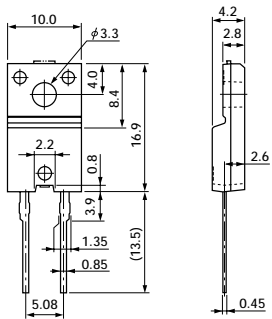


Fig. 12

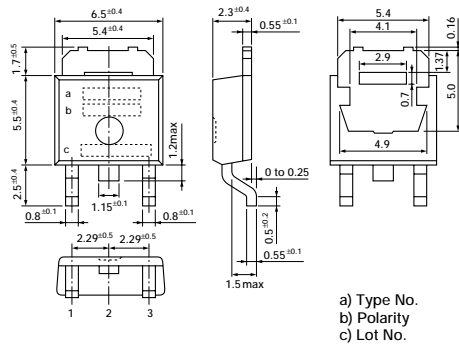


Fig. 13 Full-mold

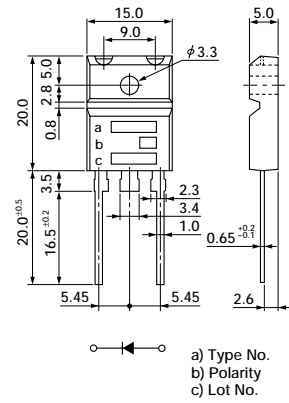


Fig. 14

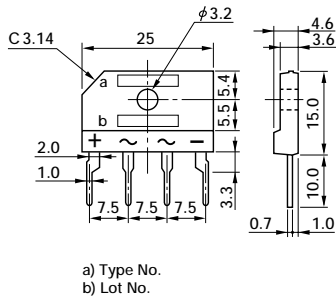


Fig. 15

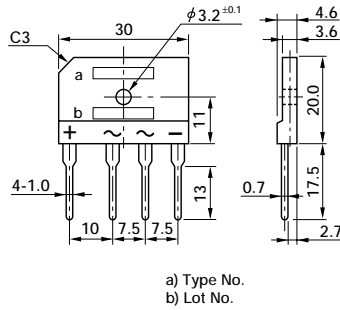


Fig. 16 SSB-14

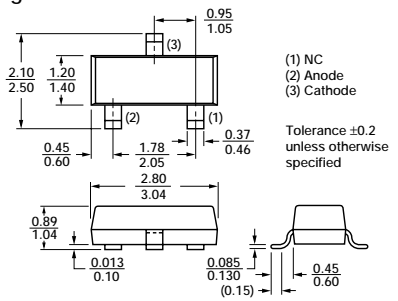


Fig. 17 MPE-24H

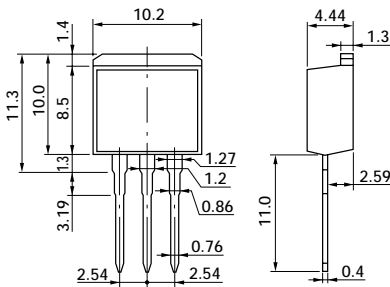


Fig. 18 MT-25 (TO-220)

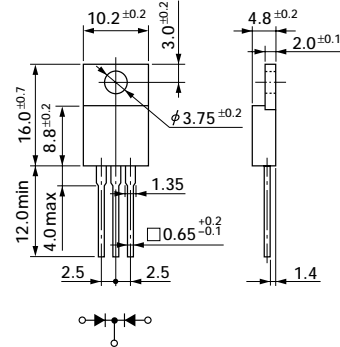
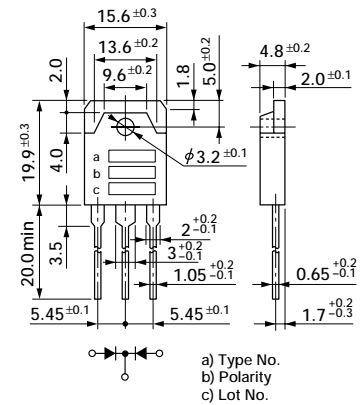


Fig. 19 MT-100 (TO-3P)



General-purpose Diodes - Taping Specifications

Taping Specifications			
Taping Name	Taping Dimensions (mm)	Packaging Dimensions (mm) and Markings	Packaging Quantity
<p>V</p> <p>A suffix "V" is added to Type No. for tape packaging.</p>	<p>Emboss taping</p> <p>(1) The cathode is on the right-hand side when viewed in the pull out direction. (2) The electrode side of the product is on the bottom when casing. (3) A leader tape of 150 to 200 mm in length is provided. (4) The leading and trailing edge of the leader tape are provided with a pitch of at least 10 mm. (5) Reversed polarity taping available on request (specify taping name "VL").</p>	<p>Reel</p> <p>Marking of Type No., Lot No., quantity, etc.</p>	<p>1,800 pcs. per reel</p>
<p>V</p> <p>A suffix "V" is added to Type No. for tape packaging.</p>	<p>Axial taping</p>	<p>Reel</p> <p>Marking of Type No., Lot No. and quantity</p>	<p>5,000 pcs. per reel (2.7φ body) 3,000 pcs. (4φ body)</p>
<p>V1</p> <p>A suffix "V1" is added to Type No. for tape packaging.</p>	<p>Axial taping</p>	<p>Ammunition (Ammo) pack</p> <p>Broken lines: perforations</p> <p>Marking of Type No., Lot No. and quantity</p>	<p>2,000 pcs. per box (2.7φ body) 3,000 pcs. (2.4φ body) 1,000 pcs. (4φ body)</p>
<p>VO</p> <p>A suffix "VO" is added to Type No. for tape packaging.</p>	<p>Axial taping</p>	<p>Ammunition (Ammo) pack</p> <p>Broken lines: perforations</p> <p>Marking of Type No., Lot No. and quantity</p>	<p>2,000 pcs. per box (2.7φ body) 3,000 pcs. (2.4φ body)</p>
<p>V3</p> <p>A suffix "V3" is added to Type No. for tape packaging.</p>	<p>Axial taping</p>	<p>Reel</p> <p>Marking of Type No., Lot No. and quantity</p>	<p>1,500 pcs. per reel (5.2φ body)</p>

General-purpose Diodes - Taping Specifications

Taping Specifications

Taping Name	Taping Dimensions (mm)	Packaging Dimensions (mm) and Markings	Packaging Quantity
<p>V4</p> <p>A suffix "V4" is added to Type No. for tape packaging.</p>	<p>Axial taping</p>	<p>Ammunition (Ammo) pack</p>	<p>1,000 pcs. per box (5.2φ body)</p>
<p>W</p> <p>A suffix "W" is added to Type No. for tape packaging.</p>	<p>Radial taping</p>	<p>Ammunition (Ammo) pack</p>	<p>4,000 pcs. per box (2.7φ body 0.6φ leads only)</p>
<p>WS</p> <p>A suffix "WS" is added to Type No. for tape packaging.</p>	<p>Radial taping (applies to A0 series)</p>	<p>Ammunition (Ammo) pack</p>	<p>2,500 pcs. per box (2.4φ body)</p>
<p>WK</p> <p>A suffix "WK" is added to Type No. for tape packaging.</p>	<p>Radial taping (applies to A0 series)</p>		<p>2,500 pcs. per box (2.4φ body)</p>

General-purpose LEDs

Standard LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Rating
IF	mA	30
IFP	mA	100
VR	V	3
Top	°C	-30 to +85
Tstg	°C	-30 to +100
VF condition: IF = 10mA		
IR condition: VR = 3V		

Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.
			VF (V)		IR (μA)	IV (mcd)	λp (nm)		
			typ	max	max	typ	Condition IF (mA)	typ	
Round, 5 φ									
SEL1110R	Diffused red	Red	2.0	2.5	50	3.0	5	700	1
SEL1110S	Tinted red								
SEL1110W	Opaline								
SEL1210R	Diffused red	Red	1.9	2.5	50	25.0	20	630	1
SEL1210S	Tinted red								
SEL1410G	Diffused green	Green	2.0	2.5	50	20.0	20	560	1
SEL1410E	Tinted green								
SEL1510C	Un-tinted	Pure green	2.0	2.5	50	30.0	20	555	1
SEL1710Y	Diffused yellow								
SEL1710K	Tinted yellow	Yellow	2.0	2.5	50	3.0	5	570	1
SEL1810D	Diffused orange								
SEL1810A	Tinted orange	Amber	1.9	2.5	50	12.0	10	610	1
SEL1910D	Diffused orange								
SEL1910A	Tinted orange	Orange	1.9	2.5	50	5.0	10	587	1
SEL1910A	Tinted orange								
Round, 4 φ									
SEL4110R	Diffused red	Red	2.0	2.5	50	2.0	5	700	2
SEL4110S	Tinted red								
SEL4110W	Opaline								
SEL4210R	Diffused red	Red	1.9	2.5	50	15.0	20	630	2
SEL4210S	Tinted red								
SEL4410G	Diffused green	Green	2.0	2.5	50	15.0	20	560	2
SEL4410E	Tinted green								
SEL4510C	Un-tinted	Pure green	2.0	2.5	50	30.0	20	555	2
SEL4710Y	Diffused yellow								
SEL4710K	Tinted yellow	Yellow	2.0	2.5	50	14.0	10	570	2
SEL4810D	Diffused orange								
SEL4810A	Tinted orange	Amber	1.9	2.5	50	10.0	10	610	2
SEL4910D	Diffused orange								
SEL4910A	Tinted orange	Orange	1.9	2.5	50	18.0	10	587	2
SEL4910A	Tinted orange								

Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.
			VF (V)		IR (μA)	IV (mcd)	λp (nm)		
			typ	max	max	typ	Condition IF (mA)	typ	
Round, 3 φ									
SEL2110R	Diffused red	Red	2.0	2.5	50	1.1	10	700	3
SEL2110S	Tinted red								
SEL2110W	Opaline								
SEL2210R	Diffused red	Red	1.9	2.5	50	10.0	20	630	3
SEL2210S	Tinted red								
SEL2210W	Opaline	Red	1.9	2.5	50	10.0	20	630	3
SEL2410G	Diffused green								
SEL2410E	Tinted green	Green	2.0	2.5	50	20.0	20	560	3
SEL2510G	Diffused green								
SEL2510C	Un-tinted	Pure green	2.0	2.5	50	3.7	20	555	3
SEL2710Y	Diffused yellow								
SEL2710K	Tinted yellow	Yellow	2.0	2.5	50	4.4	20	570	3
SEL2810D	Diffused orange								
SEL2810A	Tinted orange	Amber	1.9	2.5	50	6.0	10	610	3
SEL2910D	Diffused orange								
SEL2910A	Tinted orange	Orange	1.9	2.5	50	10.0	10	587	3
SEL2910A	Tinted orange								
Special round									
SEL2215R	Diffused red	Red	1.9	2.5	50	25.0	20	630	4
SEL2215S	Tinted red								
SEL2415G	Diffused green	Green	2.0	2.5	50	50.0	20	560	4
SEL2415E	Tinted green								
SEL2715Y	Diffused yellow	Yellow	2.0	2.5	50	70.0	20	570	4
SEL2715K	Tinted yellow								
SEL2815D	Diffused orange	Amber	1.9	2.5	50	120.0	20	610	4
SEL2815A	Tinted orange								
SEL2915D	Diffused orange	Orange	1.9	2.5	50	50.0	20	587	4
SEL2915A	Tinted orange								
Special round									
SEL1111R	Diffused red	Red	2.0	2.5	50	1.3	10	700	5
SEL1411G	Diffused green								
SEL1711Y	Diffused yellow	Yellow	2.0	2.5	50	8.0	10	570	5
SEL1811D	Diffused orange								
SEL1911D	Diffused orange	Orange	1.9	2.5	50	5.5	10	587	5
SEL2111R	Diffused red								
SEL2111W	Opaline	Red	2.0	2.5	50	1.2	10	700	6
SEL2411G	Diffused green								
SEL4117R	Diffused red	Red	2.0	2.5	50	1.0	10	700	7
SEL4417G	Diffused green								
SEL4717Y	Diffused yellow	Yellow	2.0	2.5	50	10.0	20	560	7
SEL4817D	Diffused orange								
SEL4917D	Diffused orange	Orange	1.9	2.5	50	9.5	10	610	7
SEL4917D	Tinted orange								

Standard LEDs

Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.
			V _F (V)		I _R (μA)	I _V (mcd)	λ _p (nm)	Condition I _F (mA)	
			typ	max	max	typ			
SEL1120R	Diffused red	Red	2.0	2.5	50	0.7	10	700	8
SEL1420G	Diffused green	Green				2.0	20	560	
SEL1720Y	Diffused yellow	Yellow	1.9	2.5	50	0.7	10	570	
SEL1820D	Diffused orange	Amber				2.0	10	610	
SEL1920D	Diffused orange	Orange				0.7		587	
SEL1121R	Diffused red	Red	2.0	2.5	50	0.7	10	700	9
SEL1421G	Diffused green	Green				2.0	20	560	
SEL1721Y	Diffused yellow	Yellow	1.9	2.5	50	0.7	10	570	
SEL1821D	Diffused orange	Amber				1.5	10	610	
SEL1921D	Diffused orange	Orange				0.7		587	
SEL1222R	Diffused red	Red	2.0	2.5	50	5.0	20	630	10
SEL1422G	Diffused green	Green				4.0		560	
SEL1722Y	Diffused yellow	Yellow	1.9	2.5	50	4.0	10	570	
SEL1822D	Diffused orange	Amber				2.5		610	
SEL1922D	Diffused orange	Orange				3.0		587	
SEL1124R	Diffused red	Red	2.0	2.5	50	0.7	10	700	11
SEL1424G	Diffused green	Green				2.0	20	560	
SEL1724Y	Diffused yellow	Yellow	1.9	2.5	50	0.7	10	570	
SEL1824D	Diffused orange	Amber				2.1	10	610	
SEL1924D	Diffused orange	Orange				0.7		587	
SEL4225R	Diffused red	Red	2.0	2.5	50	5.0	20	630	12
SEL4225C	Un-tinted					10.0			
SEL4425G	Diffused green	Green	1.9	2.5	50	10.0	10	610	
SEL4425E	Tinted green	Green				15.0			
SEL4725Y	Diffused yellow	Yellow	1.9	2.5	50	6.0	10	570	
SEL4725K	Tinted yellow	Yellow				10.6			610
SEL4825D	Diffused orange	Amber	1.9	2.5	50	3.0	10	587	
SEL4825A	Tinted orange	Amber				5.0			610
SEL4925D	Diffused orange	Orange				3.0		587	
SEL4925A	Tinted orange	Orange				5.0		587	
SEL4227C	Un-tinted	Red	2.0	2.5	50	10.0	20	630	13
SEL4427E	Tinted green	Green				20.0			
SEL4527C	Un-tinted	Pure green	5.0		555				
SEL4228C	Un-tinted	Red	2.0	2.5	50	18.0	20	630	14
SEL4428E	Tinted green	Green				40.0			
SEL4528C	Un-tinted	Pure green	1.9	2.5	50	15.0	10	555	
SEL4728K	Tinted yellow	Yellow				16.0			
SEL4828A	Tinted orange	Amber	1.9	2.5	50	9.0	10	610	
SEL4928A	Tinted orange	Orange				7.0			587

LEDs for Surface Illumination

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Rated
I _F	mA	30
I _{FP}	mA	100
V _R	V	3
Top	°C	-30 to +85
Tstg	°C	-30 to +100

V_F condition: I_F = 10mA
I_R condition: V_R = 3V

Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.
			V _F (V)		I _R (μA)	I _V (mcd)	λ _p (nm)	Condition I _F (mA)	
			typ	max	max	typ			
SEL1213C	Un-tinted	Red	2.0	2.5	50	3.5	20	630	15
SEL1413E	Tinted green	Green				8.0			
SEL1713K	Tinted yellow	Yellow	1.9	2.5	50	8.0	10	570	
SEL1813A	Tinted orange	Amber				5.0			
SEL1913K	Tinted light orange	Orange				5.0		587	
SEL2213C	Un-tinted	Red	2.0	2.5	50	3.0	20	630	16
SEL2413E	Tinted green	Green				7.0			
SEL2713K	Tinted yellow	Yellow	1.9	2.5	50	17.0	10	570	
SEL2813A	Tinted orange	Amber				5.7			
SEL2913K	Tinted light orange	Orange				6.6		587	

Ultra High-intensity LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Rated
I _F	mA	30
I _{FP}	mA	100
V _R	V	3
Top	°C	-30 to +85
Tstg	°C	-30 to +100

V_F condition: I_F = 10mA
I_R condition: V_R = 3V

Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.
			V _F (V)		I _R (μA)	I _V (mcd)	λ _p (nm)	Condition I _F (mA)	
			typ	max	max	typ			
SEL1610C	Un-tinted	Red	1.75	2.2	100	800	30	660	1
SEL1615C									17
SEL1650CM									18

Contact-mount (For automatic insertion) LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Rated
IF	mA	30
IFP	mA	100
VR	V	3
Top	°C	-30 to +85
Tstg	°C	-30 to +100

Vf condition: IF = 10mA
IR condition: VR = 3V

	Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.							
				VF (V)		IR (μA)	IV (mcd)	Condition IF (mA)	λp (nm)								
				typ	max	max	typ										
Round, 5φ	SEL1250SM	Tinted red	Red	1.9	2.5	50	34.0	20	630	18							
	SEL1450EKM	Tinted green	Green	2.0			95.0		560								
	SEL1550CM	Un-tinted	Pure green	2.0			36.0		555								
	SEL1950KM	Tinted yellow	Orange	1.9			64.0		587								
Round, 4φ	SEL4114R	Diffused red	Red	2.0	2.5	50	2.0	10	700	19							
	SEL4114S	Tinted red					3.0		20		630						
	SEL4214R	Diffused red					12.0										
	SEL4214S	Tinted red					25.0										
	SEL4414G	Diffused green	Green	2.0	2.5	50	24.0	10				560					
	SEL4414E	Tinted green					30.0										
	SEL4714Y	Diffused yellow					Yellow		2.0		2.5	50	13.0	10	570		
	SEL4714K	Tinted yellow											17.0				
	SEL4814D	Diffused orange	Amber	1.9	2.5	50		4.5					10		610		
	SEL4814A	Tinted orange						7.5									
	SEL4914D	Diffused orange					Orange	1.9	2.5		50	5.5		10	587		
	SEL4914A	Tinted orange										16.0					
	Round	SEL6210R	Diffused red	Red	1.9	2.5						50	12.0		20	630	20
		SEL6210S	Tinted red										25.0				
SEL6410G		Diffused green	Green	2.0	2.5	50	15.0	10	560								
SEL6410E		Tinted green					45.0										
SEL6510G		Diffused green	Pure green	2.0	2.5	50	5.0	10	555								
SEL6510C		Un-tinted					16.0										
SEL6710Y		Diffused yellow	Yellow	1.9	2.5	50	5.0	10	570								
SEL6710K		Tinted yellow					15.0										
SEL6810D		Diffused orange	Amber	1.9	2.5	50	4.0	10	610								
SEL6810A		Tinted orange					10.0										
SEL6910D	Diffused orange	Orange					1.9		2.5	50	6.5	10	587				
SEL6910A	Tinted orange										14.0						
Round	SEL6214S	Tinted red	Red	1.9	2.5	50	10.0	20	630	21							
	SEL6414E	Tinted green	Green	2.0			12.0		560								
	SEL6514C	Un-tinted	Pure green	2.0			6.0		555								
	SEL6814A	Tinted orange	Amber	1.9			5.0		610								
	SEL6914A	Tinted orange	Orange	1.9			5.0		587								

	Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.					
				VF (V)		IR (μA)	IV (mcd)	Condition IF (mA)	λp (nm)						
				typ	max	max	typ								
Round	SEL6215S	Tinted red	Red	1.9	2.5	50	30.0	20	630	22					
	SEL6415E	Tinted green	Green	2.0			50.0		560						
	SEL6515C	Un-tinted	Pure green	2.0			18.0		555						
	SEL6815A	Tinted orange	Amber	1.9			30.0		610						
	SEL6915A	Tinted orange	Orange	1.9			40.0		587						
Bow-type	SEL4229R	Diffused red	Red	1.9	2.5	50	10.0	20	630	23					
	SEL4429E	Tinted green	Green	2.5			28.0		560						
	SEL4829A	Tinted orange	Amber	1.9			8.0		610						
	SEL6427EP	Tinted green	Green	2.0			2.5		50		20.0	20	560		
Square display	SEL4226R	Diffused red	Red	1.9	2.5	50	5.0	20	630	25					
	SEL4226C	Un-tinted					10.0								
	SEL4426G	Diffused green	Green	2.0	2.5	50	10.0	10	560						
	SEL4426E	Tinted green					15.0								
	SEL4726Y	Diffused yellow					Yellow		2.0		2.5	50	6.0	10	570
	SEL4726K	Tinted yellow											10.6		
	SEL4826D	Diffused orange	Amber	1.9	2.5	50	3.0	10	610						
	SEL4826A	Tinted orange					5.0								
	SEL4926D	Diffused orange					Orange		1.9		2.5	50	3.0	10	587
	SEL4926A	Tinted orange											5.0		
5mm pitch lead	SEL5220S	Tinted red	Red	1.9	2.5	50	2.8	20	630	26					
	SEL5420E	Tinted green	Green	2.0			6.8		560						
	SEL5520C	Un-tinted	Pure green	2.0			2.4		555						
	SEL5820A	Tinted orange	Amber	1.9			6.0		610						
	SEL5920A	Tinted orange	Orange	1.9	4.4	587									
	SEL5221S	Tinted red	Red	1.9	2.5	50	14.0	20	630		27				
	SEL5421E	Tinted green	Green	2.0			36.0		560						
	SEL5521C	Un-tinted	Pure green	2.0			14.0		555						
	SEL5821A	Tinted orange	Amber	1.9			22.0		610						
	SEL5921A	Tinted orange	Orange	1.9	22.0	587									
	SEL5223S	Tinted red	Red	1.9	2.5	50	6.0	20	630		28				
	SEL5423E	Tinted green	Green	2.0			14.0		560						
	SEL5823A	Tinted orange	Amber	1.9			9.0		610						
	SEL5923A	Tinted orange	Orange	1.9			9.0		587						

Bicolor LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Ratings
P _D	mW	75
I _F	mA	30
I _{FP}	mA	100
V _R	V	4
Top	°C	-30 to +85
Tstg	°C	-30 to +100

V_F condition: I_F = 10mA

I_R condition: V_R = 4V

Type No.	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.	
		V _F (V)		I _R (μA)	I _V (mcd)	Condition I _F (mA)	λ _p (nm)		
		typ	max	max	typ				
SML1016 series	SML1216W	High-intensity red	1.9	2.5	10	40	20	630	29
		Green	2.0					560	
	SML1816W	Amber	1.9					610	
		Green	2.0					560	
	SML19416W	Orange	1.9					587	
		Green	2.0					560	
SML10060 series	SML12460C	High-intensity red	1.9	2.5	10	10	20	630	30
		Green	2.0					560	
	SML19460C	Orange	1.9					587	
		Green	2.0					560	
SML10051 series	SML12451W	High-intensity red	1.9	2.5	10	40	20	630	31
		Green	2.0					560	
	SML18451W	Amber	1.9					610	
		Green	2.0					560	
Anode Common series	SML16760CN	Ultra high-intensity red	1.7	3.0	10	20	20	660	30
		Yellow-green	2.4					570	
	SML16751WN	Ultra high-intensity red	1.7					660	
		Yellow-green	2.4					570	
Contact-mount SML70020 series	SML72420C	High-intensity red	1.9	2.5	10	10	20	630	32
		Green	2.0					560	
	SML78420C	Amber	1.9					610	
		Green	2.0					560	
	SML79420C	Orange	1.9					587	
		Green	2.0					560	
Contact-mount SML70023 series	SML72423C	High-intensity red	1.9	2.5	10	10	20	630	33
		Green	2.0					560	
	SML78423C	Amber	1.9					610	
		Green	2.0					560	
	SML79423C	Orange	1.9					587	
		Green	2.0					560	

Chip LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Ratings
I _F	mA	30
I _{FP}	mA	70
V _R	V	4
Top	°C	-30 to +85
Tstg	°C	-30 to +90

V_F condition: I_F = 10mA

I_R condition: V_R = 4V

Type No.	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.					
		V _F (V)		I _R (μA)	I _V (mcd)	Condition I _F (mA)	λ _p (nm)						
		typ	max	max	typ								
Flat type	SEC1101C	Red	2.0	2.5	100	20	1.2	700	37				
	SEC1201C	High-intensity red	1.9					7.0					
	SEC1601C	Ultra high-intensity red	1.7	2.2				60.0					
	SEC1401C	Green	2.0	2.5				15.0					
	SEC1501C	Pure green	2.0	2.5				6.5					
	SEC1801C	Amber	1.9	2.5				14.5					
	SEC1901C	Orange	1.9	2.5				10.0					
	SEC2422C	(1) Green	2.0	2.5				100		20	15.0	560	38
		(2) High-intensity red	1.9									9.0	
SEC2462C		(1) Green	2.0		15.0								
		(2) Ultra high-intensity red	1.7		2.2	14.0							
Inner Lens Type	SEC1203C	High-intensity red	1.9	2.5	100	20	18.0	630	39				
	SEC1403C	Green	2.0					20.0					
	SEC1603C	Ultra high-intensity red	1.7	2.2				120.0					
	SEC1703C	High-intensity yellow-green	2.0	2.5				30.0					
	SEC2424C	(1) Green	2.0	2.5				100		20	20.0	560	
		(2) High-intensity red	1.9									20.0	
	SEC2464C	(1) Green	2.0	2.2				100		20	20.0	560	40
		(2) Ultra high-intensity red	1.7									30.0	
		SEC2764C	(1) Ultra high-intensity yellow-green									2.0	
(2) Ultra high-intensity red	1.7		2.2	30.0									

Infrared LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Ratings
P _D	mW	150
I _F	mA	100
ΔI _F	mA/°C	-1.33 (25°C or above)
I _{FP}	mA	1000 (f=1kHz, T _w ≤ 10μs)
V _R	V	5
Top	°C	-30 to +85
Tstg	°C	-30 to +100

V_F condition: I_F = 50mA

I_R condition: V_R = 5V

I_e condition: constant voltage V_{CC} = 3V
R = 2.2Ω

Type No.	Electro-optical Characteristics (Ta=25°C)					Fig. No.
	V _F (V)		I _R (μA)	I _e (mW/sr)	λ _p (nm)	
	typ	max	max	min	typ	
SID1010CXM	1.25	1.5	10	40	940	34
SID1010CM				85		35
SID1K10CXM	1.20	1.5	10	75	940	34
SID1K10CM				140		35
SID303C	1.25	1.4	10	100	940	36
SID303BR						
SID303BS						
SID307BR				220		
SID313BP				210		
SID1003BQ				1.45		

AlGaInP Ultra High-intensity LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Ratings
I _F	mA	30
I _{FP}	mA	100
V _R	V	3
Top	°C	-30 to +85
Tstg	°C	-30 to +100

V_F condition: I_F = 10mA

I_R condition: V_R = 3V

Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.
			V _F (V)		I _R (μA)	I _v (mcd)	Condition I _F (mA)	λ _p (nm)	
			typ	max	max	typ			
SELU1250CM		Red	2.0	2.5	100	600	20	635	18
SELU1210CXM						400			34
SELU1253CM						300			35
SELU1750CM		Yellow-green	2.0	2.5	100	500	20	570	18
SELU1710CXM						300			34
SELU1753CM						200			35
SELU1850CM	Un-tinted	Amber	2.0	2.5	100	1000	20	615	18
SELU1810CXM						700			34
SELU1853CM						500			35
SELU1950CM		Orange	2.0	2.5	100	900	20	590	18
SELU1910CXM						600			34
SELU1953CM						400			35

GaN Ultra High-intensity Blue/Pure Green LEDs

Absolute Maximum Ratings (Ta=25°C)

Parameter	Unit	Ratings
I _F	mA	30
ΔI _F	mA/°C	-0.45 (25°C or above)
I _{FP}	mA	100 (f=1kHz, T _w ≤ 100μs)
V _R	V	5
Top	°C	-25 to +80
Tstg	°C	-30 to +100

V_F condition: I_F = 20mA

I_R condition: V_R = 5V

Type No.	Type of Lens	Emitting Color	Electro-optical Characteristics (Ta=25°C)						Fig. No.
			V _F (V)		I _R (μA)	I _v (mcd)	Condition I _F (mA)	λ _p (nm)	
			typ	max	max	typ		typ	
SELU1E50CM	Un-tinted	Blue	3.6	4.0	10	1700	20	470	18
SELU1E10CXM	Un-tinted					800			34
SELU2E10C						350			3
SECU1E01C						40			37
SELU1D50CM	Un-tinted	Pure green	3.6	4.0	10	3800	20	525	18
SEL1D10CXM	Un-tinted					1800			34
SELU2D10C						900			3
SECU1D01C						100			37

General-purpose LEDs - External Dimensions

Fig. 1

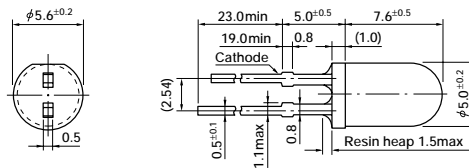


Fig. 2

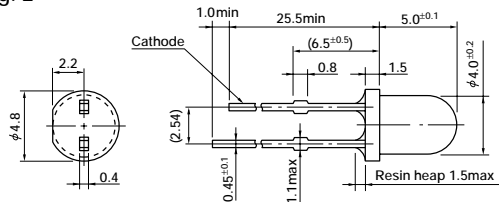


Fig. 3

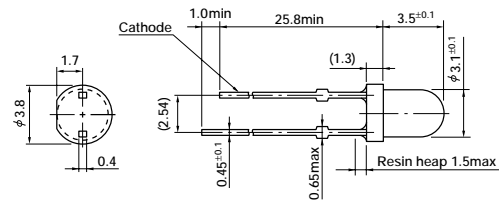


Fig. 4

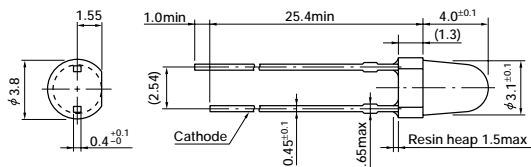


Fig. 5

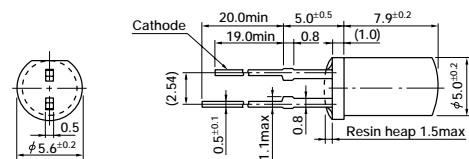


Fig. 6

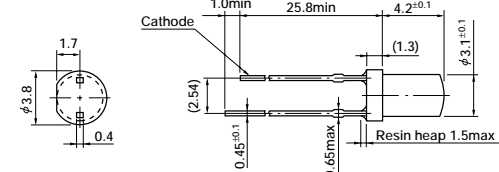


Fig. 7

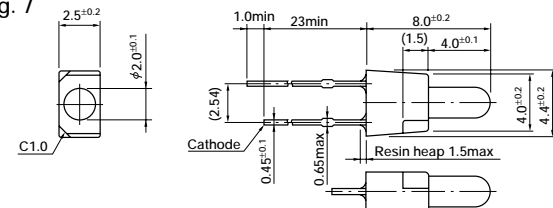


Fig. 8

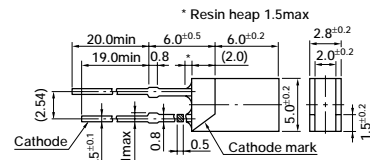


Fig. 9

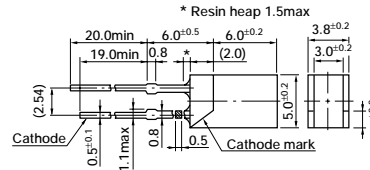


Fig. 10

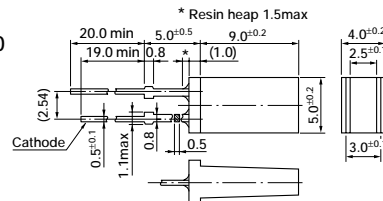


Fig. 11

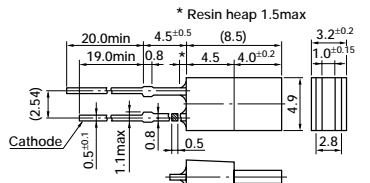


Fig. 12

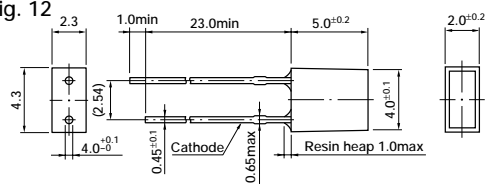


Fig. 13

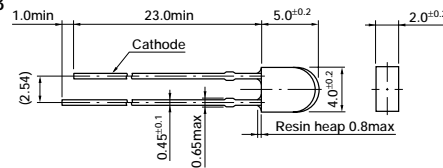


Fig. 14

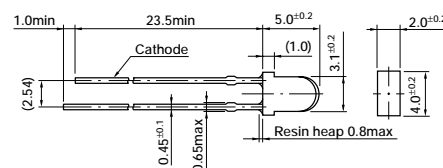


Fig. 15

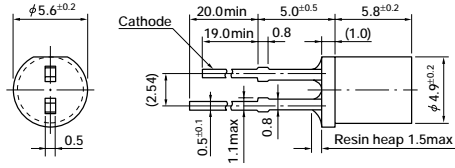


Fig. 16

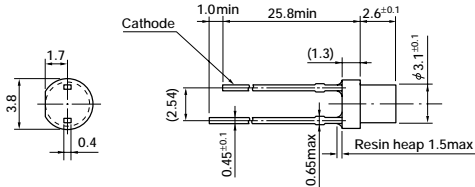


Fig. 17

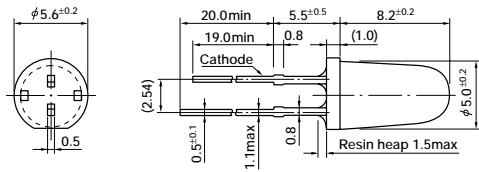


Fig. 18

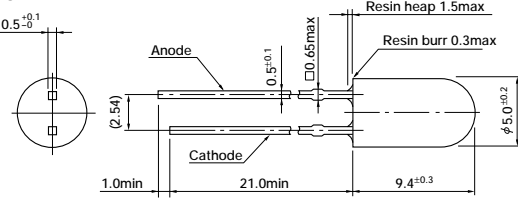


Fig. 19

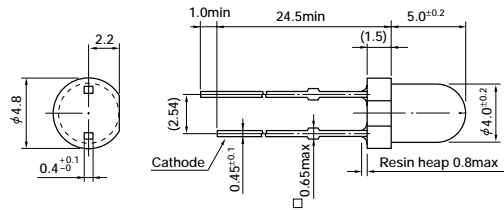


Fig. 20

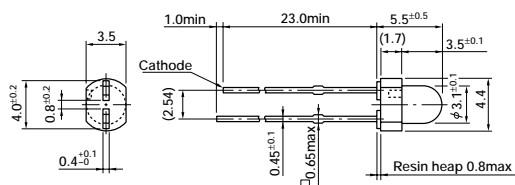


Fig. 21

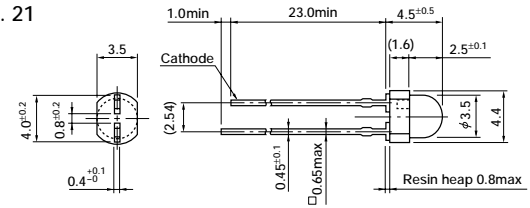


Fig. 22

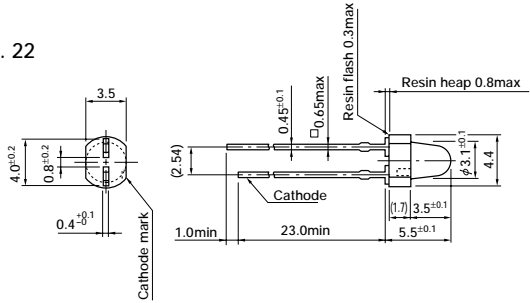


Fig. 23

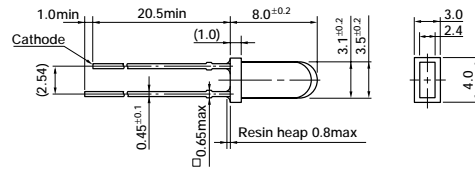


Fig. 24

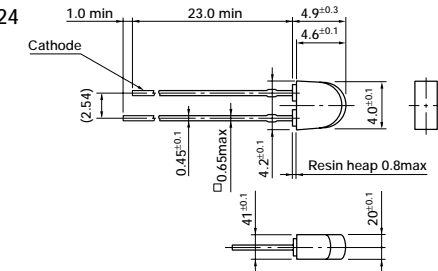


Fig. 25

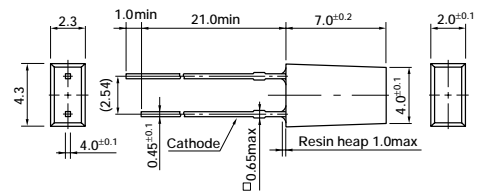
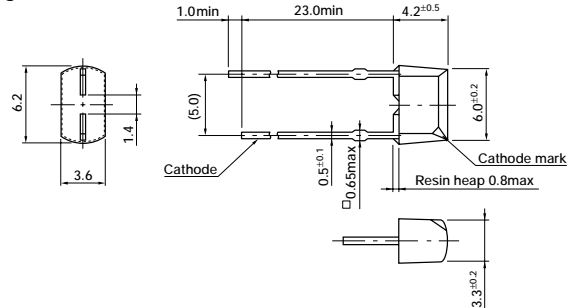


Fig. 26



General-purpose LEDs - External Dimensions

Fig. 27

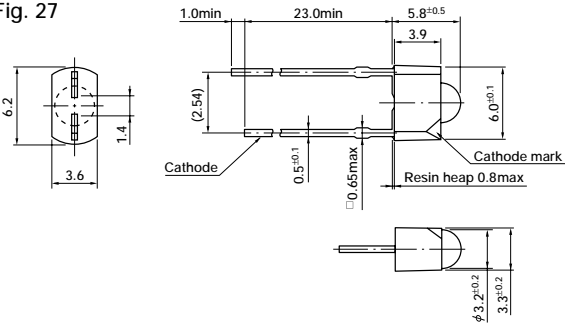


Fig. 32

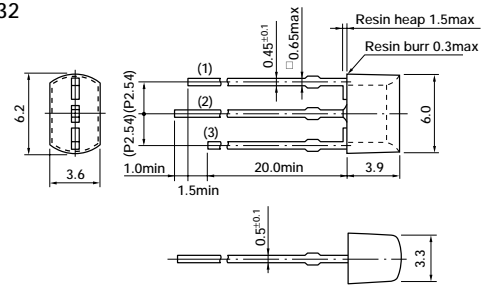


Fig. 28

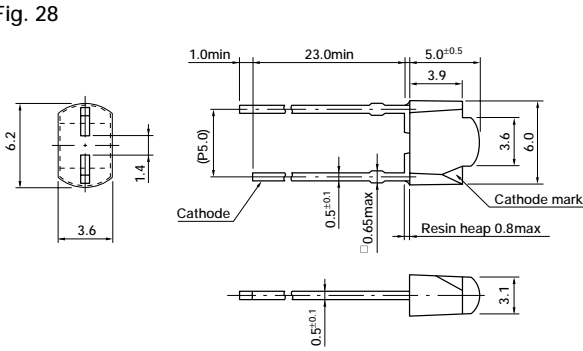


Fig. 33

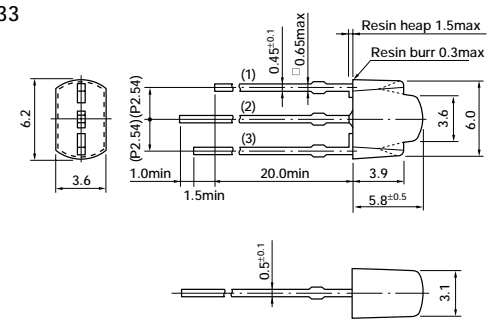


Fig. 29

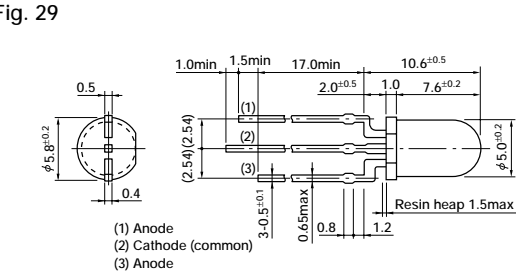


Fig. 34

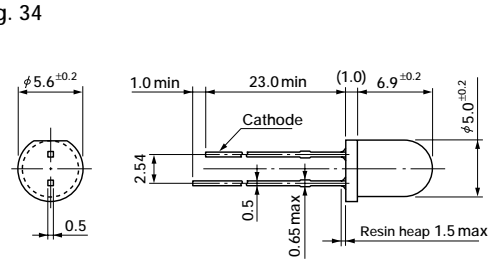


Fig. 30

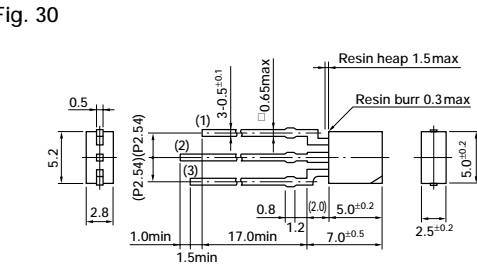


Fig. 35

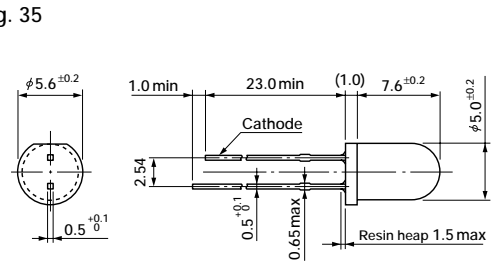


Fig. 31

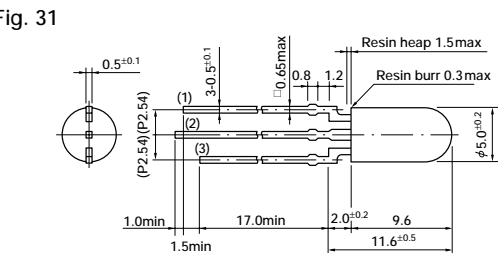


Fig. 36

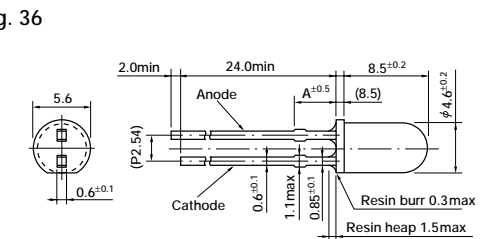


Fig. 37

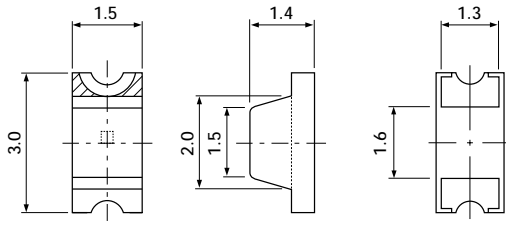


Fig. 40

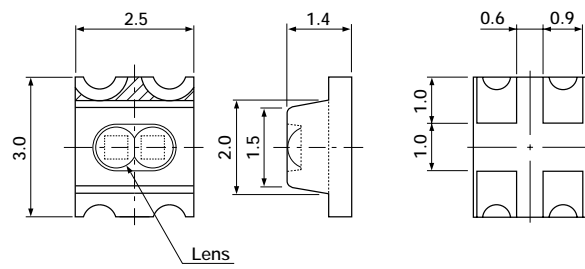


Fig. 38

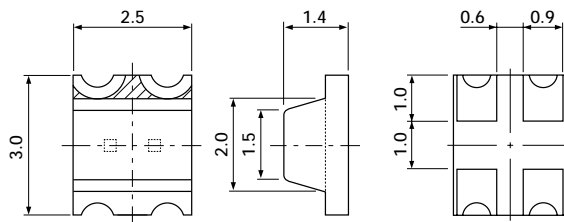


Fig. 41

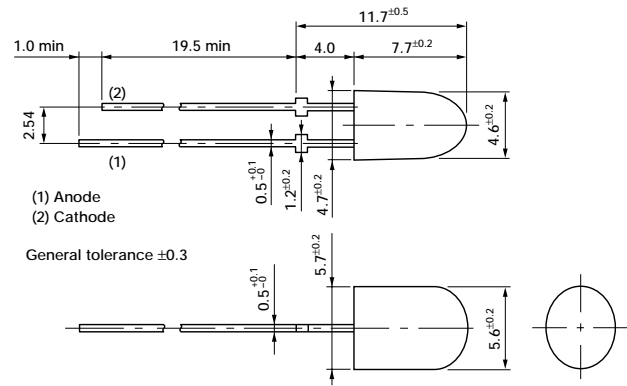
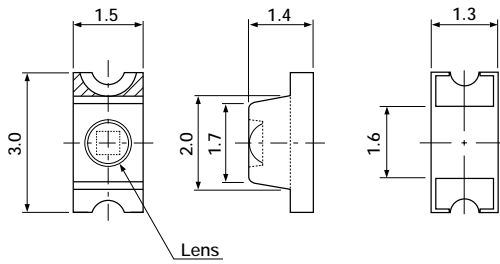


Fig. 39



Index by Type No.

Type No.	Classification	Page
2SA1488	Power transistor	50
2SA1488A	Power transistor	50
2SA1567	Power transistor	51
2SA1568	Power transistor	52
2SC3851	Power transistor	53
2SC3852	Power transistor	54
2SC4024	Power transistor	55
2SC4065	Power transistor	56
2SC4153	Power transistor	57
2SD2141	Power transistor	58
2SD2382	Power transistor	59
2SK2701	MOS FET	71
A3121**	Hall-Effect IC (unipolar switch)	44
A3122**	Hall-Effect IC (unipolar switch)	44
A3123**	Hall-Effect IC (unipolar switch)	44
A3134**	Hall-Effect IC (bipolar switch)	44
A3141**	Hall-Effect IC (unipolar switch)	44
A3142**	Hall-Effect IC (unipolar switch)	44
A3143**	Hall-Effect IC (unipolar switch)	44
A3144**	Hall-Effect IC (unipolar switch)	44
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