2SH12
Silicon N-Channel IGBT

HITACHI

1st. Edition
Feb. 1995

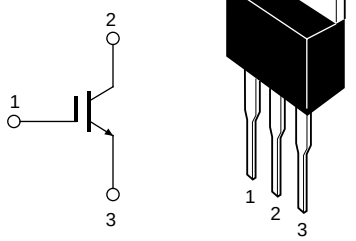
Application

High speed power switching

Features

- High speed switching
- Low on saturation voltage

TO–220AB



1. Gate
2. Collector
3. Emitter

Table 1 Absolute Maximum Ratings (Ta = 25°C)

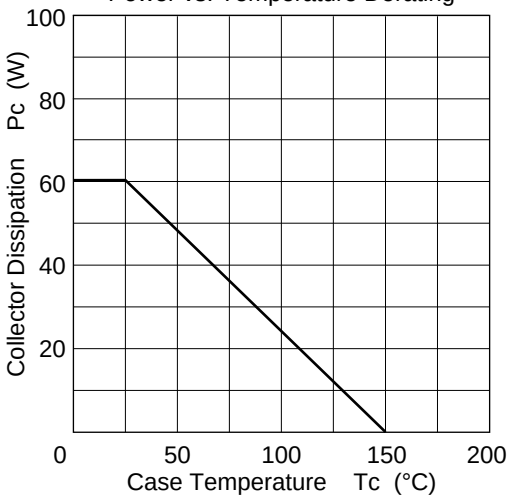
Item	Symbol	Ratings	Unit
Collector to emitter voltage	V_{CES}	600	V
Gate to emitter voltage	V_{GES}	±20	V
Collector current	I_C	15	A
Collector peak current	ic(peak)	30	A
Collector dissipation	P_C*	60	W
Channel temperature	T_j	150	°C
Storage temperature	Tstg	–55 to +150	°C

* Value at Tc = 25°C

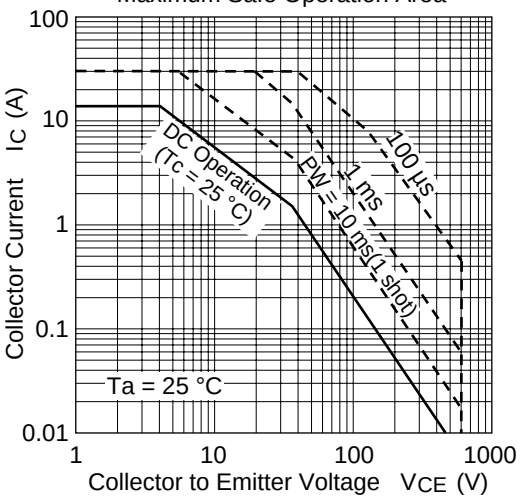
Table 2 Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector to emitter breakdown voltage	$V_{(BR)CES}$	600	—	—	V	I_C = 100 µA, V_{GE} = 0
Zero gate voltage collector current	I_{CES}	—	—	0.5	mA	V_{CE} = 600 V, V_{GE} = 0
Gate to emitter leak current	I_{GES}	—	—	±1	µA	V_{GE} = ±20 V, V_{CE} = 0
Gate to emitter cutoff current	$V_{GE(off)}$	3.0	—	5.0	V	I_C = 1 mA, V_{CE} = 10 V
Collector to emitter saturation voltage	$V_{CE(sat)}$[1]	—	2.0	—	V	I_C = 7.5 A, V_{GE} = 15 V
Collector to emitter saturation voltage	$V_{CE(sat)}$[2]	—	2.6	3.3	V	I_C = 15 A, V_{GE} = 15 V
Input capacitance	Cies	—	1400	—	pF	V_{CE} = 10 V, V_{GE} = 0, f = 1 MHz
Switching time	t_r	—	120	—	ns	I_C = 15 A,
	t_{on}	—	200	—		R_L = 20 Ω,
	t_f	—	300	600		V_{GE} = ±15 V
	t_{off}	—	500	1000		Rg = 50 Ω

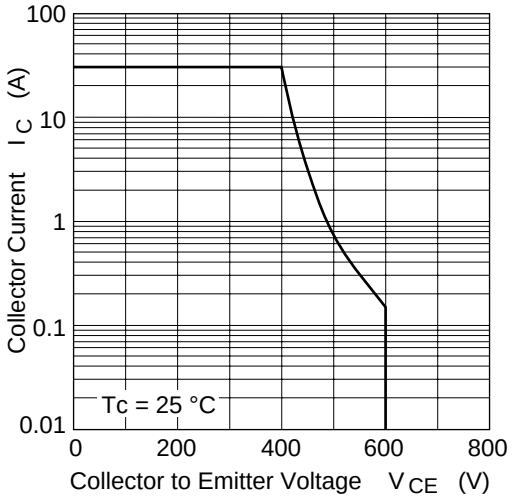
Power vs. Temperature Derating



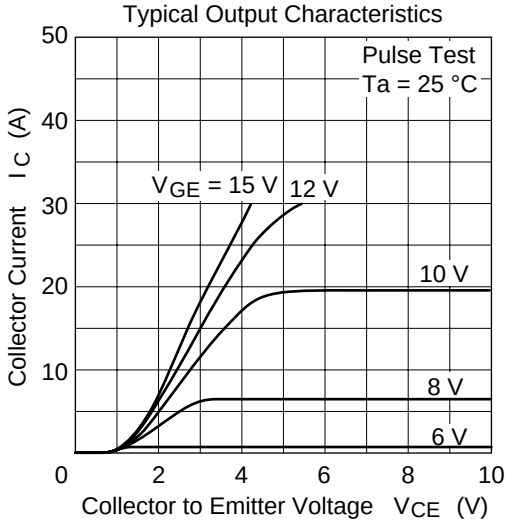
Maximum Safe Operation Area



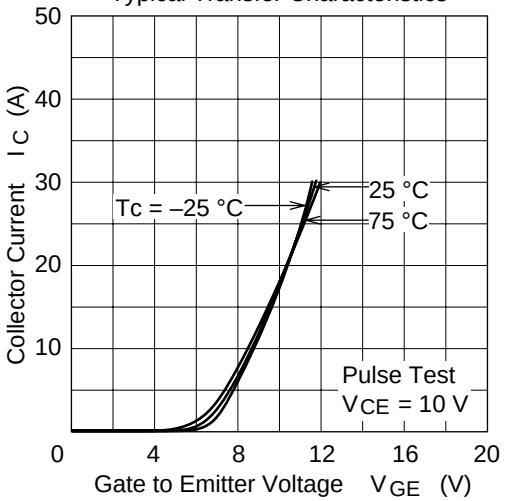
Reverse Bias SOA



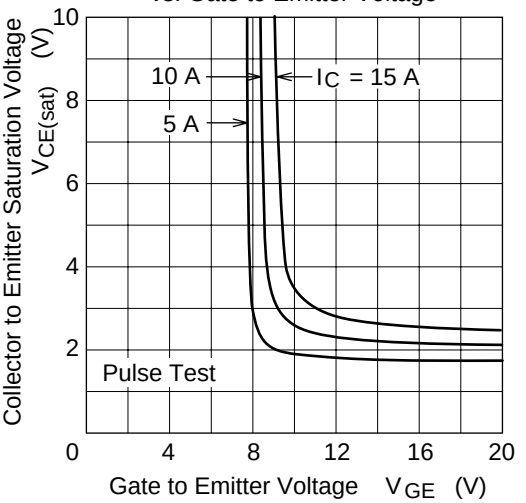
Typical Output Characteristics



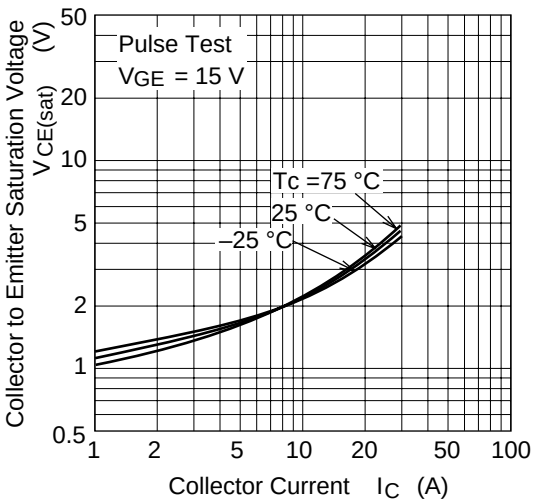
Typical Transfer Characteristics



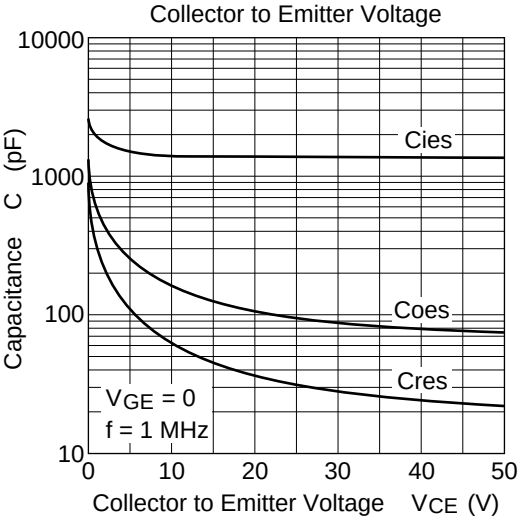
Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage

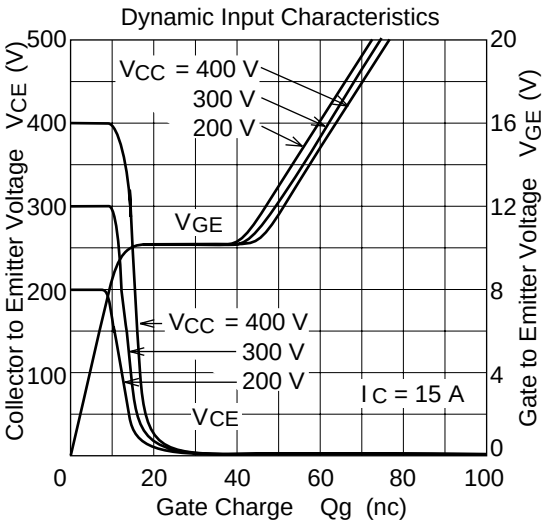


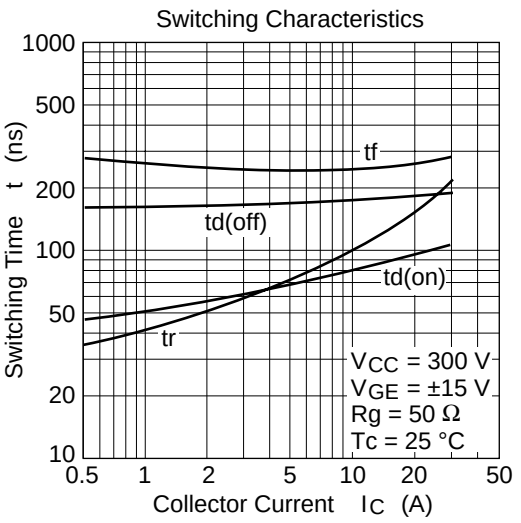
Collector to Emitter Saturation Voltage vs. Collector Current

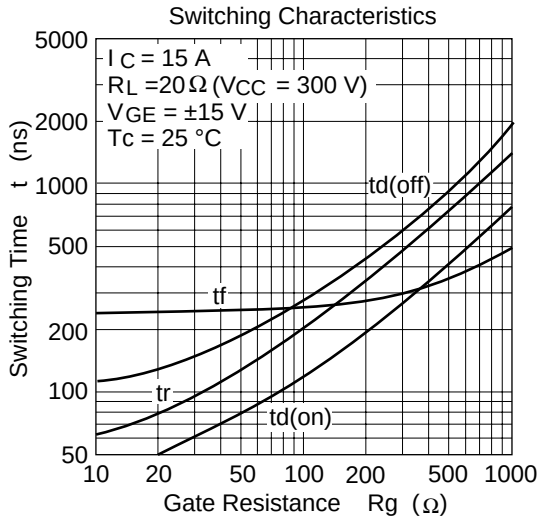


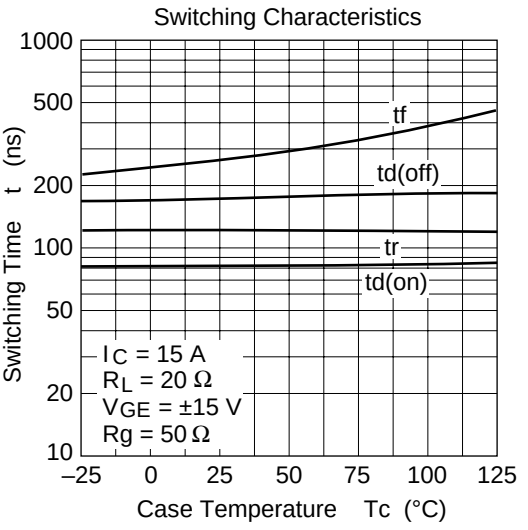
Typical Capacitance vs. Collector to Emitter Voltage



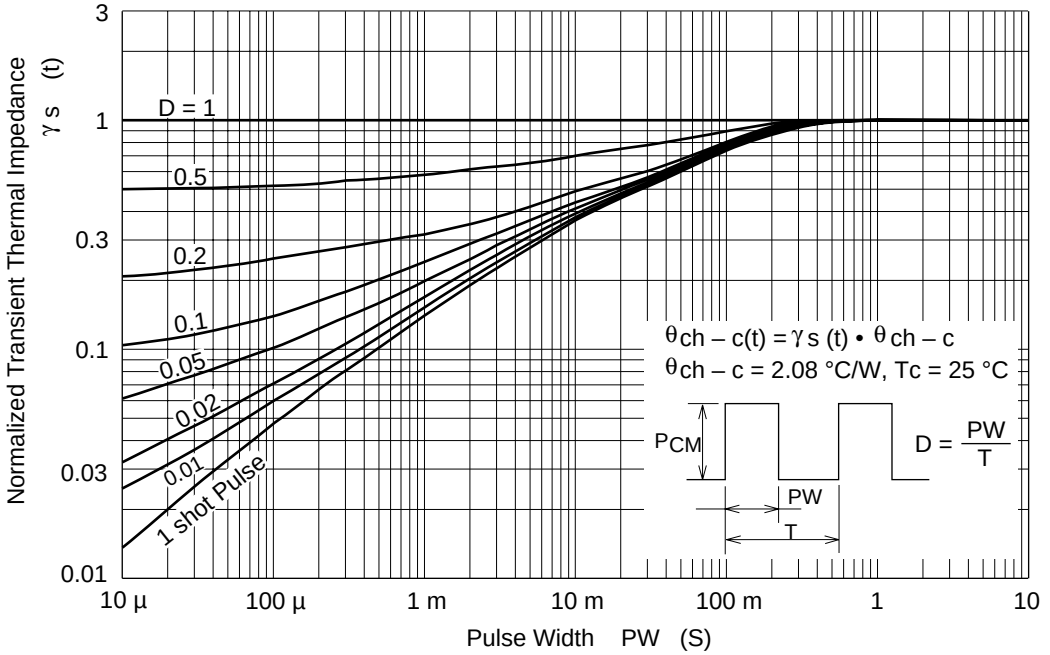

Dynamic Input Characteristics
Collector to Emitter Voltage VCE (V)
Gate to Emitter Voltage VGE (V)
Gate Charge Qg (nc)
VCC = 400 V
300 V
200 V
VGE
VCE
IC = 15 A


Switching Characteristics
Switching Time t (ns)
Collector Current IC (A)
tf
td(off)
td(on)
tr
VCC = 300 V
VGE = ±15 V
Rg = 50 Ω
Tc = 25 °C

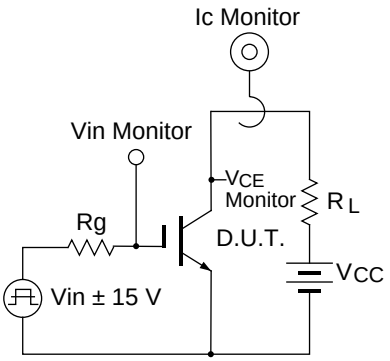

Switching Characteristics
IC = 15 A
RL =20Ω (VCC = 300 V)
VGE = ±15 V
Tc = 25 °C
Switching Time t (ns)
Gate Resistance Rg (Ω)
td(off)
tf
tr
td(on)


Switching Characteristics
Switching Time t (ns)
Case Temperature Tc (°C)
tf
td(off)
tr
td(on)
IC = 15 A
RL = 20 Ω
VGE = ±15 V
Rg = 50 Ω

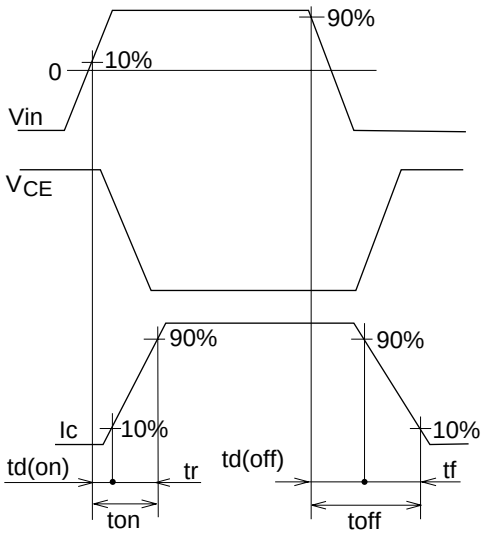
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



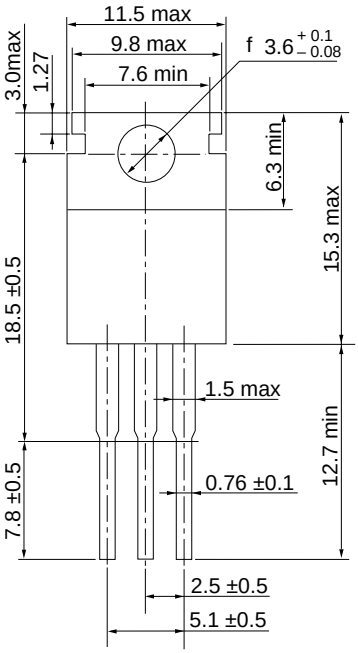
Waveforms

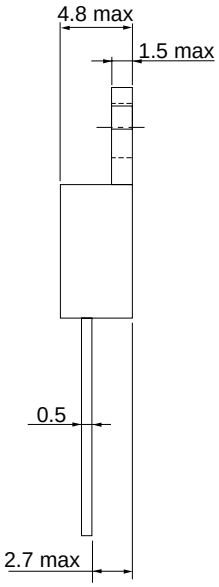


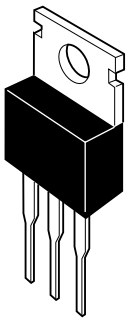
Package Dimensions

Unit : mm

• TO–220AB







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