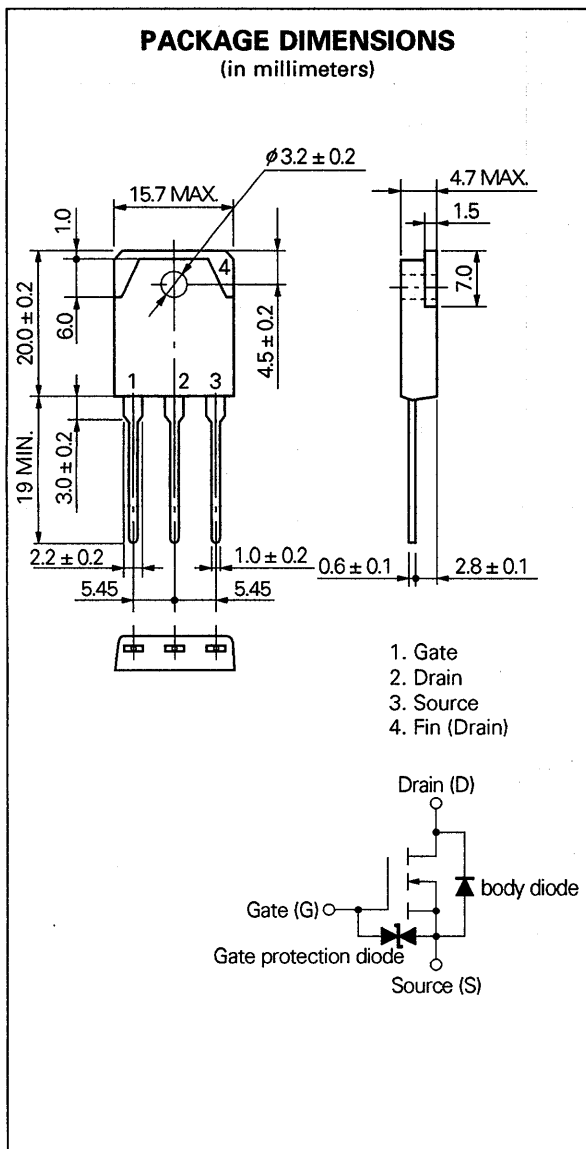


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P1 98.2

SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE



DESCRIPTION

The 2SK1123 is N-channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

FEATURES

- Low On-state Resistance
 $R_{DS(on)} \leq 27 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 20 \text{ A)}$
 $R_{DS(on)} \leq 50 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4 \text{ V, } I_D = 20 \text{ A)}$
- Low C_{iss} $C_{iss} = 3 \text{ 250 pF TYP.}$
- Built-in G-S Gate Protection Diodes

QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

ABSOLUTE MAXIMUM RATINGS

Maximum Temperatures

Storage Temperature	-55 to +150	°C
Channel Temperature	150	°C MAX.

Maximum Power Dissipation

Total Power Dissipation ($T_c = 25 \text{ }^\circ\text{C}$)	100	W
Total Power Dissipation ($T_a = 25 \text{ }^\circ\text{C}$)	3.0	W

Maximum Voltages and Currents ($T_a = 25 \text{ }^\circ\text{C}$)

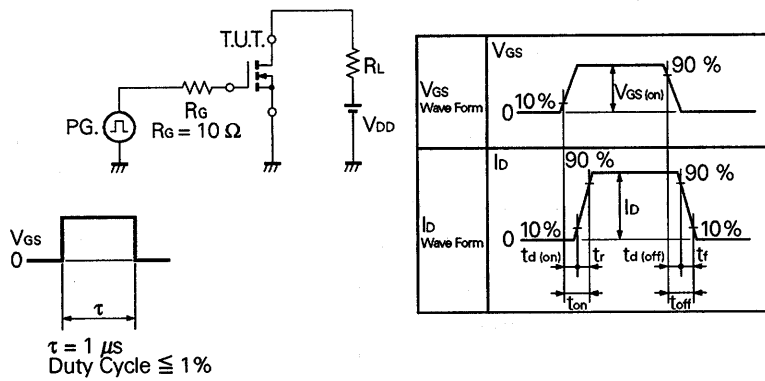
V_{DSS}	Drain to Source Voltage	60	V
$V_{GSS(AC)}$	Gate to Source Voltage	± 20	V
$I_{D(DC)}$	Drain Current (DC)	± 40	A
$I_{D(pulse)*}$	Drain Current (pulse)	± 160	A

* $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1 \%$

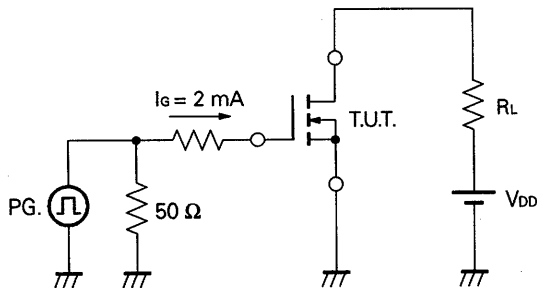
ELECTRICAL CHARACTERISTICS (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source On-state Resistance	R _{DS(on)}		22	70	mΩ	V _{GS} = 10 V, I _D = 20 A
Drain to Source On-state Resistance	R _{DS(on)}		30	95	mΩ	V _{GS} = 4.0 V, I _D = 20 A
Gate to Source Cutoff Voltage	V _{GS(off)}	1.0		2.5	V	V _{DS} = 10 V, I _D = 1 mA
Forward Transfer Admittance	y _{fs}	7.0			S	V _{DS} = 10 V, I _D = 20 A
Drain Leakage Current	I _{DSS}			10	μA	V _{DS} = 60 V, V _{GS} = 0
Gate to Source Leakage Current	I _{GSS}			±10	μA	V _{GS} = ±20 V, V _{DS} = 0
Input Capacitance	C _{iss}		3 250		pF	V _{DS} = 10 V
Output Capacitance	C _{oss}		1 200		pF	V _{GS} = 0
Reverse Transfer Capacitance	C _{rss}		380		pF	f = 1 MHz
Turn-On Delay Time	t _{d(on)}		60		ns	V _{GS(on)} = 10 V V _{DD} = 30 V I _D = 20 A, R _G = 10 Ω R _L = 1.5 Ω
Rise Time	t _r		500		ns	
Turn-Off Delay Time	t _{d(off)}		250		ns	
Fall Time	t _f		160		ns	
Total Gate Charge	Q _G		85		nC	V _{GS} = 10 V I _D = 40 A V _{DD} = 48 V
Gate to Source Charge	Q _{GS}		10		nC	
Gate to Drain Charge	Q _{GD}		35		nC	
Diode Forward Voltage	V _{SD}		1.2		V	I _{SD} = 40 A, V _{GS} = 0
Reverse Recovery Time	t _{rr}		130		ns	I _F = 40 A, V _{GS} = 0
Reverse Recovery Charge	Q _{rr}		200		nC	di/dt = 50 A/μs

Test Circuit 1: Switching Time

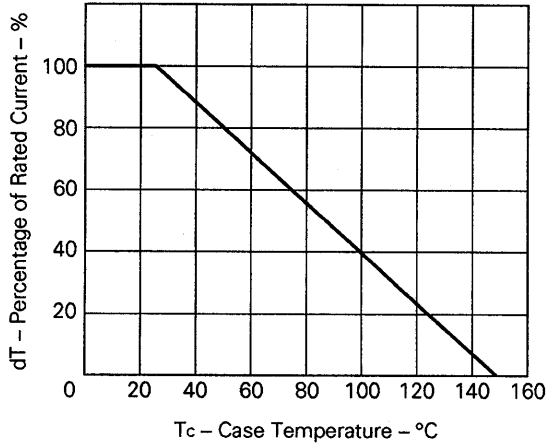


Test Circuit 2: Gate Charge

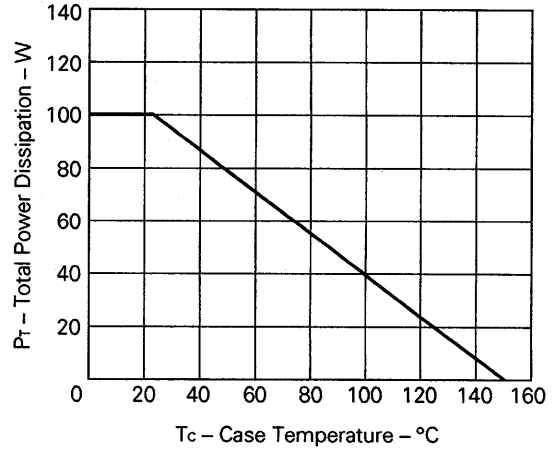


TYPICAL CHARACTERISTICS (T_a = 25 °C)

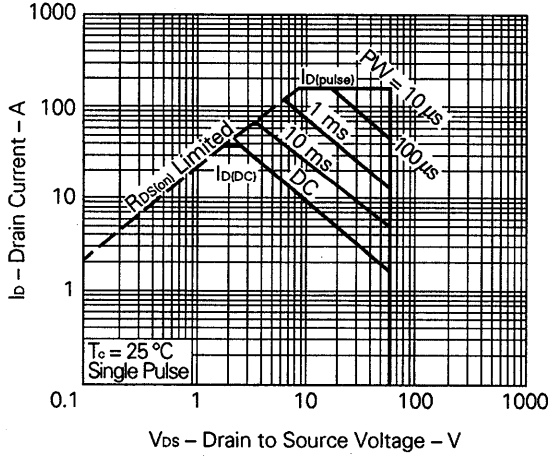
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



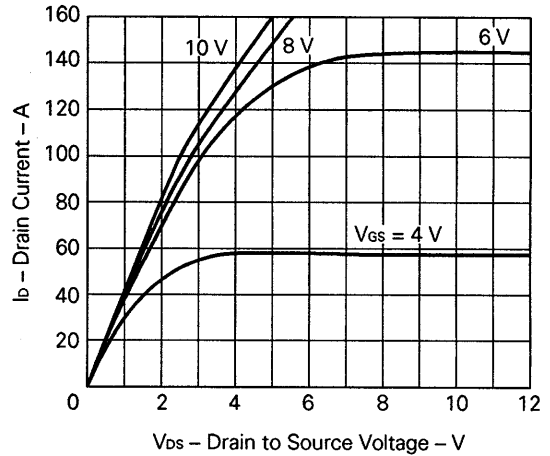
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



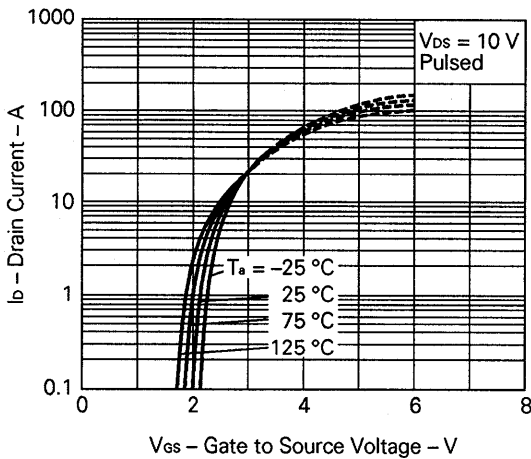
FORWARD BIAS SAFE OPERATING AREA

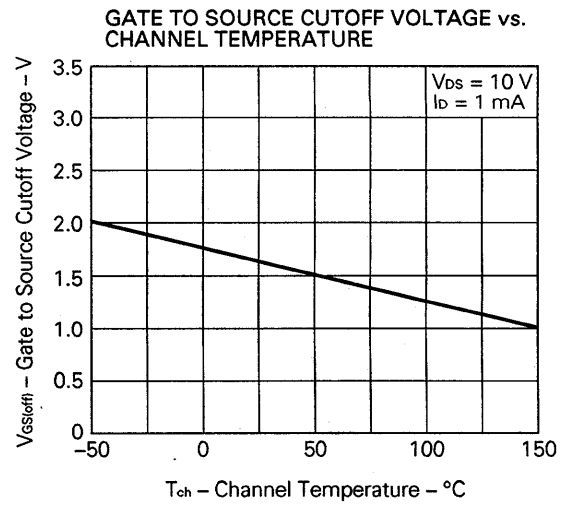
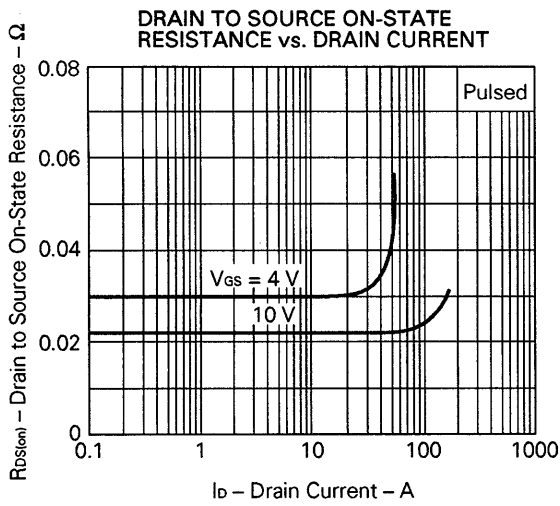
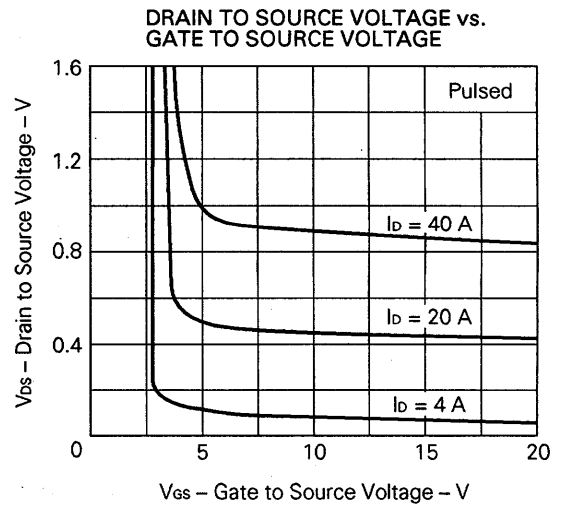
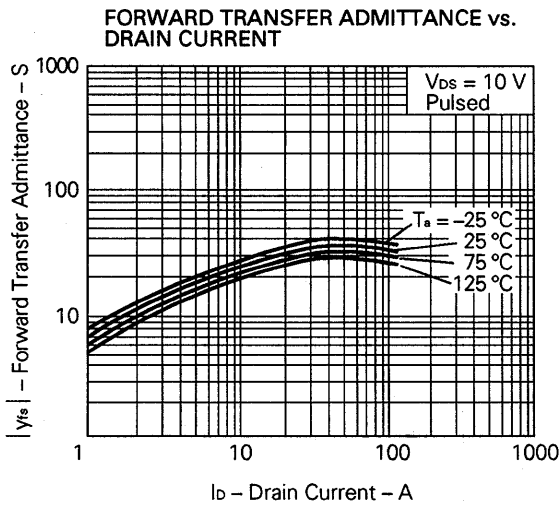
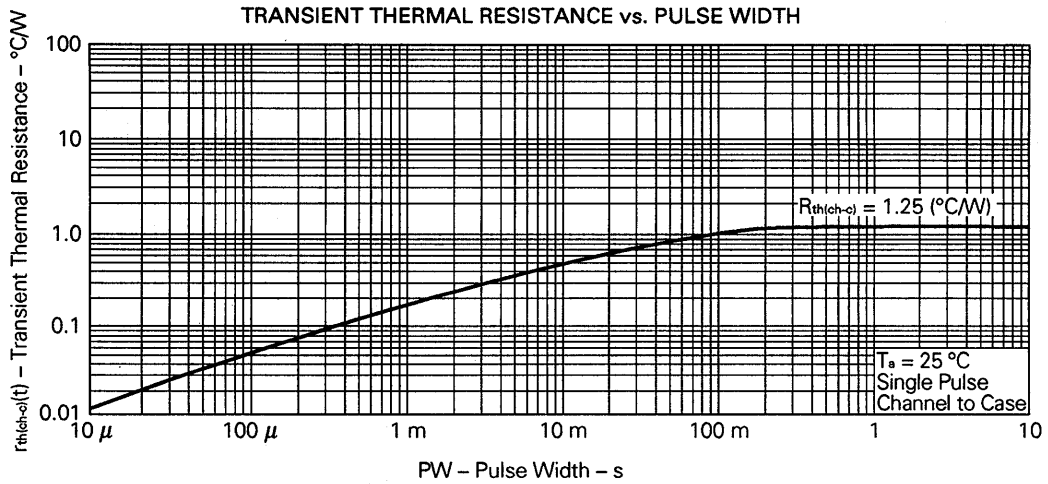


DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE

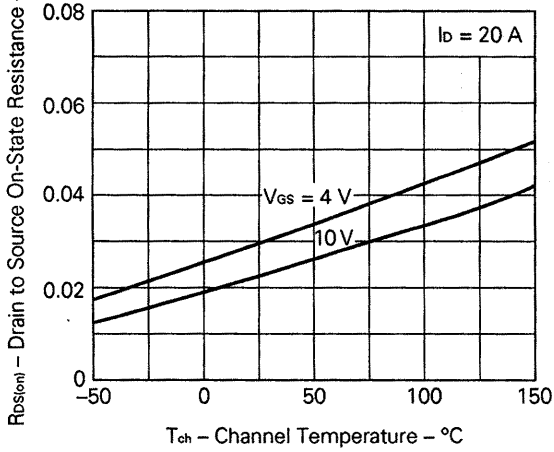


TRANSFER CHARACTERISTICS

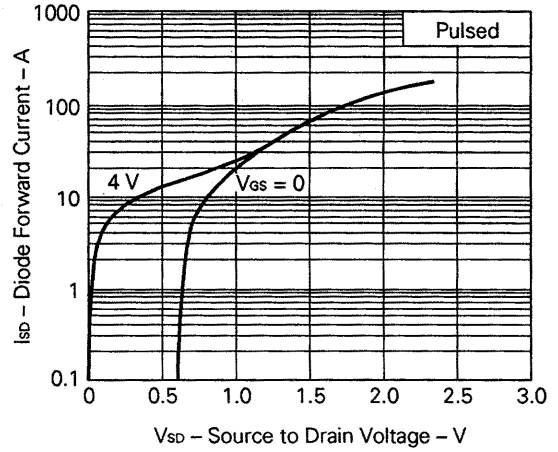




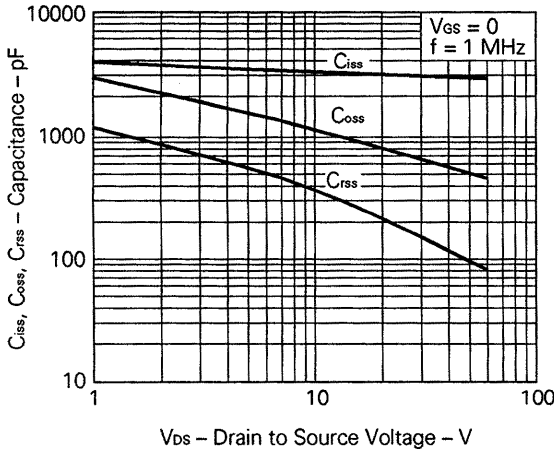
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



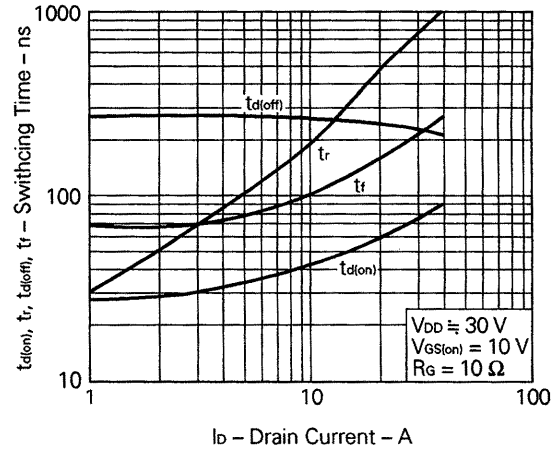
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



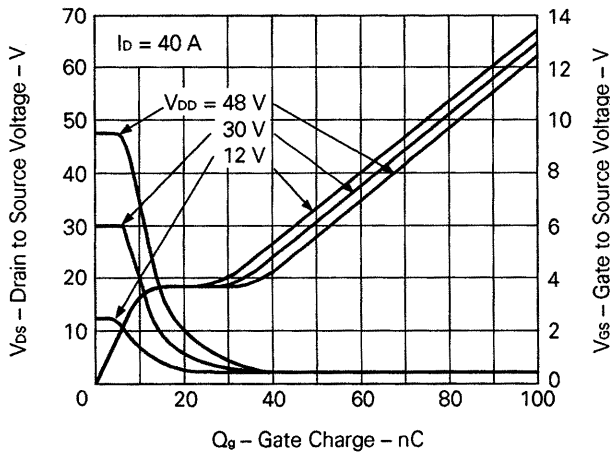
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



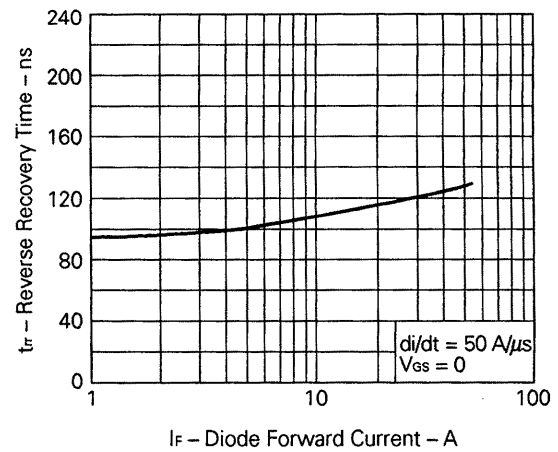
SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



Reference

Application note name	No.
Safe operating area of Power MOS FET.	TEA-1034
Application circuit using Power MOS FET.	TEA-1035
Quality control of NEC semiconductors devices.	TEI-1202
Quality control guide of semiconductors devices.	MEI-1202
Assembly manual of semiconductors devices.	IEI-1207

[MEMO]

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