

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

DESCRIPTION

The 2SK3111 is N channel MOS FET device that features a low on-state resistance and excellent switching characteristics, and designed for high voltage applications such as DC/DC converter, actuator driver.

ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3111	TO-220AB
2SK3111-S	TO-262
2SK3111-ZJ	TO-263

FEATURES

- Gate voltage rating ± 30 V
- Low on-state resistance
 $R_{DS(on)} = 180 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 10 \text{ A)}$
- Low input capacitance
 $C_{iss} = 1000 \text{ pF TYP. (} V_{DS} = 10 \text{ V, } V_{GS} = 0 \text{ V)}$
- Avalanche capability rated
- Built-in gate protection diode
- Surface mount device available

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Drain to source voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	200	V
Gate to source voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 30	V
Drain current (DC) ($T_C = 25 \text{ }^\circ\text{C}$)	$I_{D(DC)}$	± 20	A
Drain current (pulse) ^{Note1}	$I_{D(pulse)}$	± 60	A
Total power dissipation ($T_A = 25 \text{ }^\circ\text{C}$)	P_{T1}	1.5	W
Total power dissipation ($T_C = 25 \text{ }^\circ\text{C}$)	P_{T2}	65	W
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$
Single avalanche current ^{Note2}	I_{AS}	20	A
Single avalanche energy ^{Note2}	E_{AS}	100	mJ

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

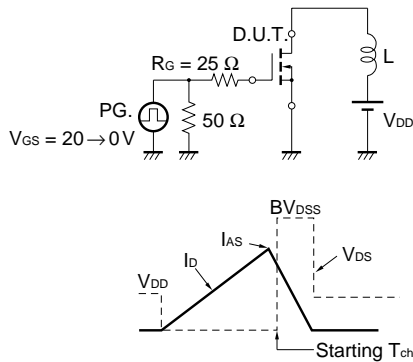
2. Starting $T_{ch} = 25 \text{ }^\circ\text{C}$, $V_{DD} = 100 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

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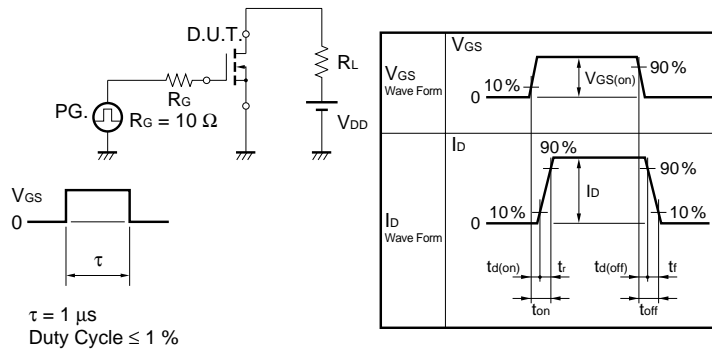
ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain Leakage Current	I _{DSS}	V _{DS} = 200 V, V _{GS} = 0 V			100	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±30 V, V _{DS} = 0 V			±10	μA
Gate to Source Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	2.5		4.5	V
Forward Transfer Admittance	y _{fs}	V _{DS} = 10 V, I _D = 10 A	3.0			S
Drain to Source On-state Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 10 A		120	180	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V		1000		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		300		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		150		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 100 V		25		ns
Rise Time	t _r	I _D = 10 A		90		ns
Turn-off Delay Time	t _{d(off)}	V _{GS(on)} = 10 V		80		ns
Fall Time	t _f	R _G = 10 Ω		40		ns
Total Gate Charge	Q _G	V _{DD} = 160 V		40		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 10 V		7		nC
Gate to Drain Charge	Q _{GD}	I _D = 20 A		25		nC
Diode Forward Voltage	V _{F(S-D)}	I _F = 20 A, V _{GS} = 0 V		1.0		V
Reverse Recovery Time	t _{rr}	I _F = 20 A, V _{GS} = 0 V		300		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 50 A/μs		1.7		μC

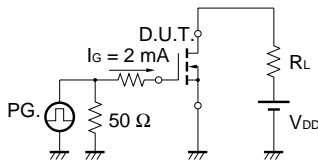
TEST CIRCUIT 1 AVALANCHE CAPABILITY



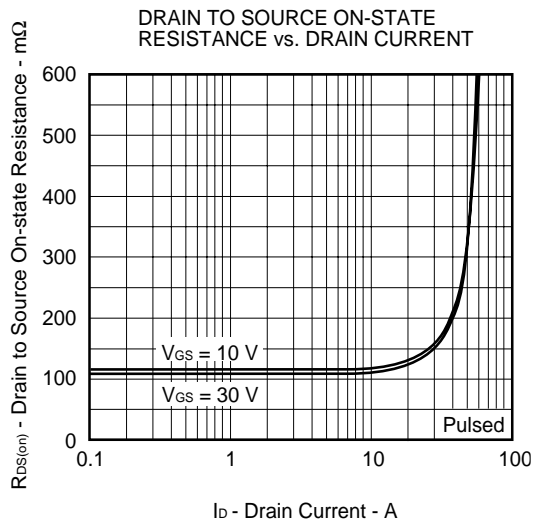
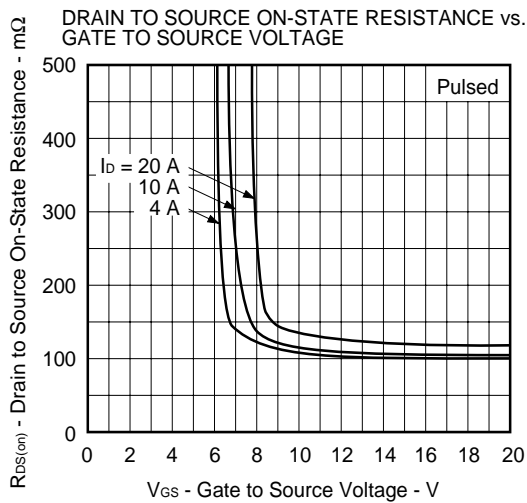
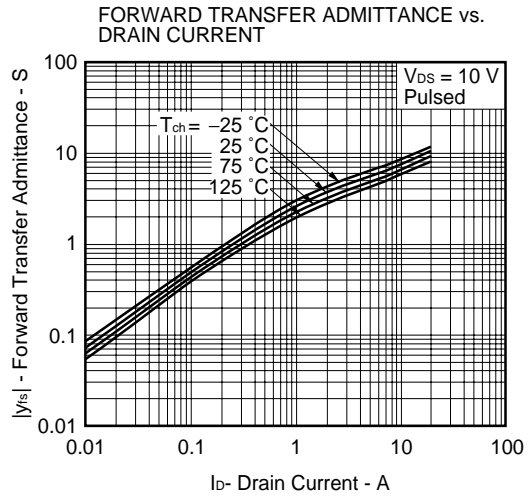
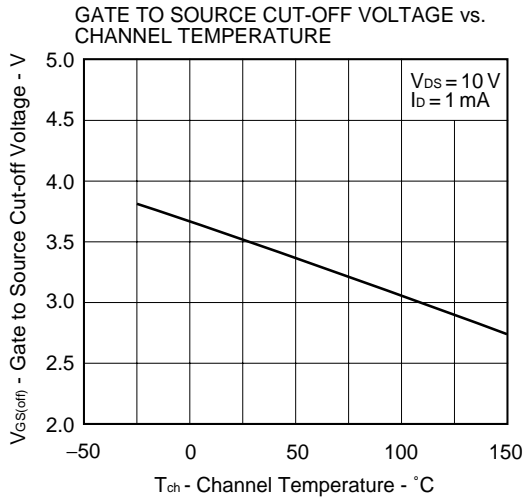
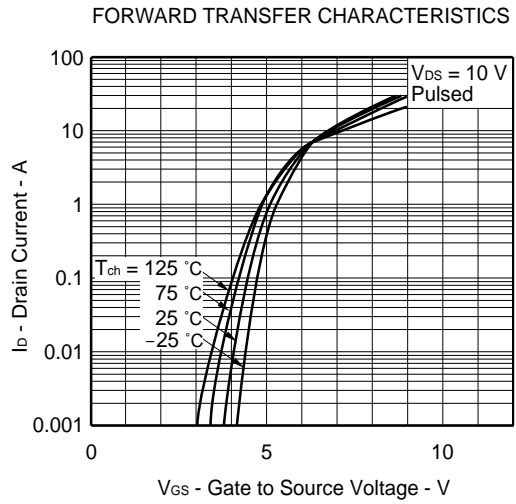
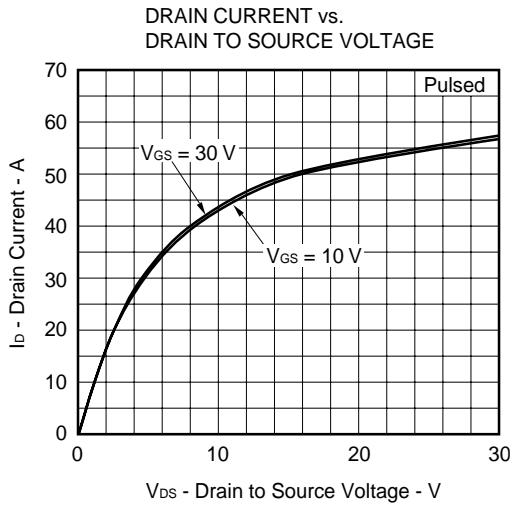
TEST CIRCUIT 2 SWITCHING TIME

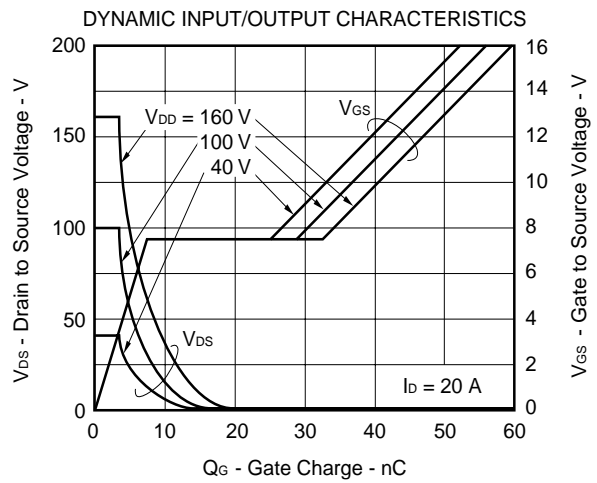
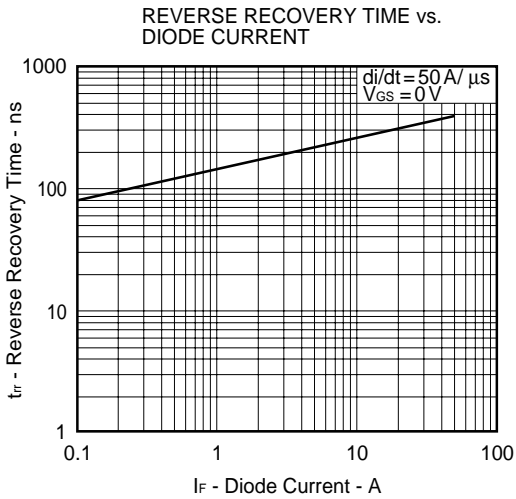
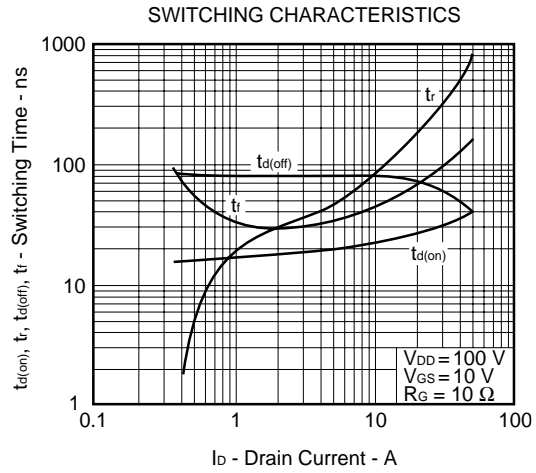
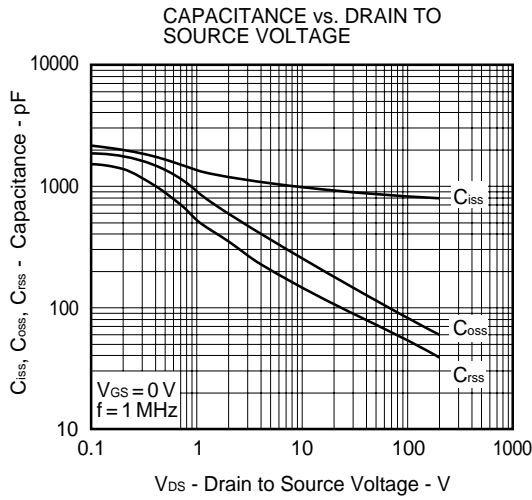
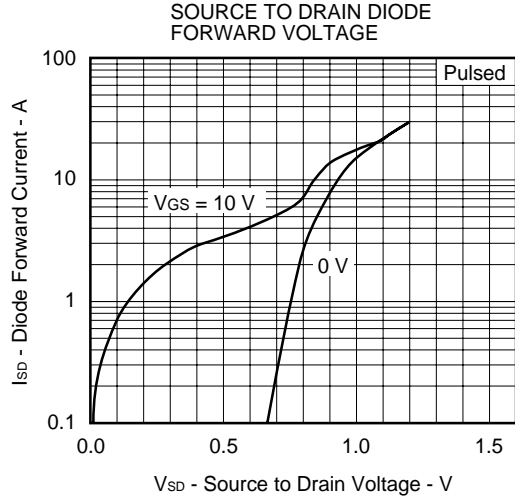
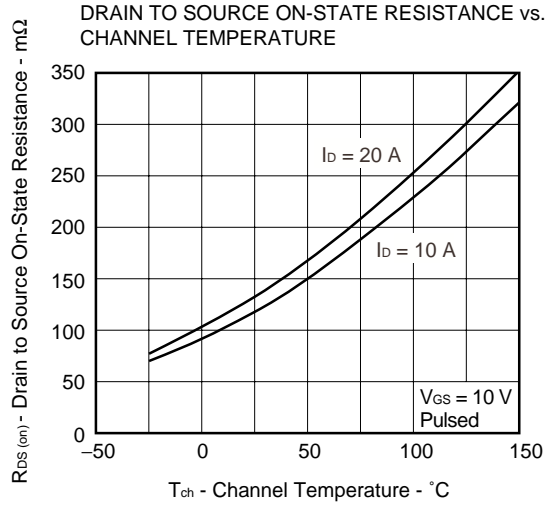


TEST CIRCUIT 3 GATE CHARGE

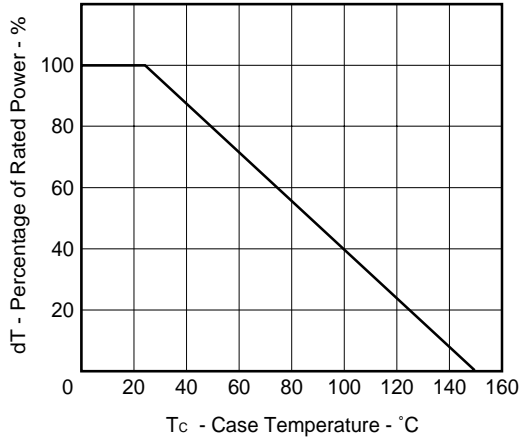


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

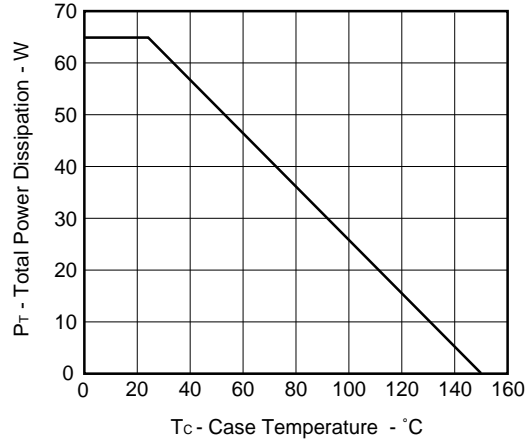




DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

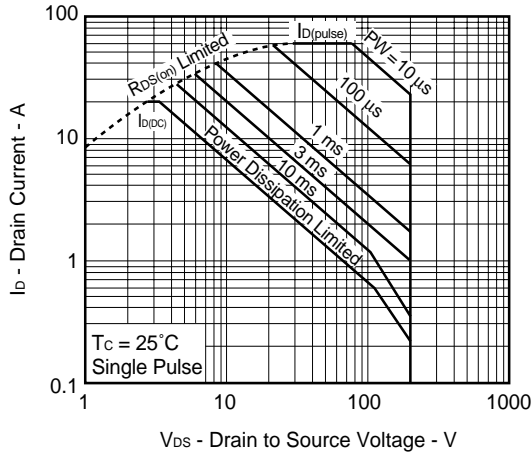


TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

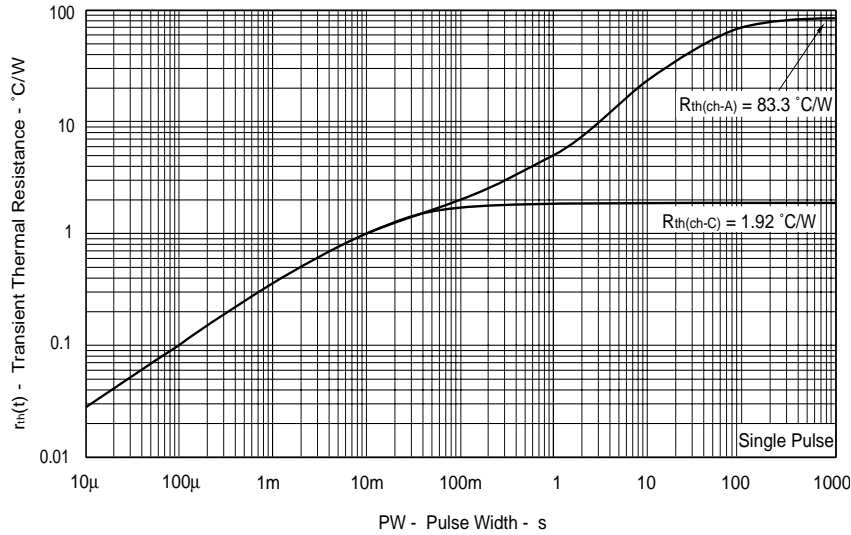


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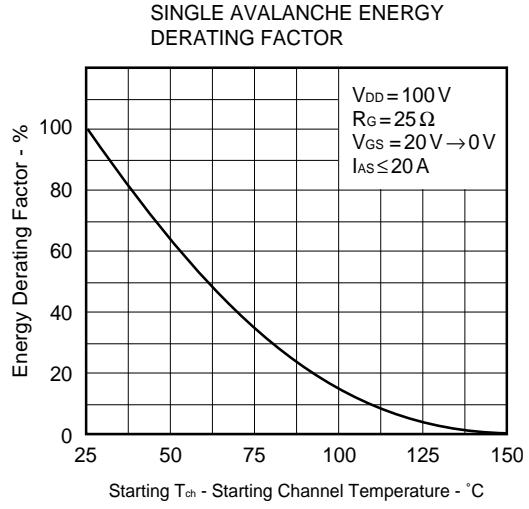
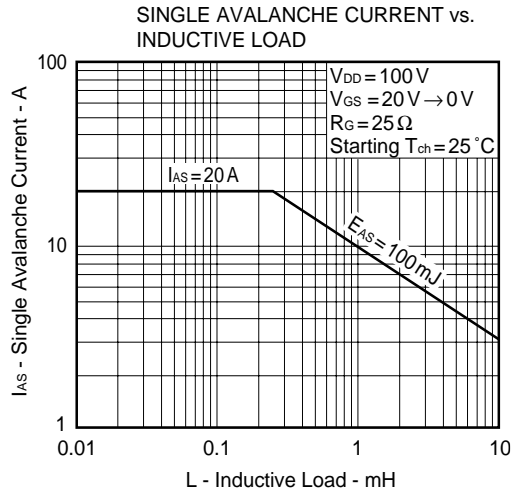
FORWARD BIAS SAFE OPERATING AREA



TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

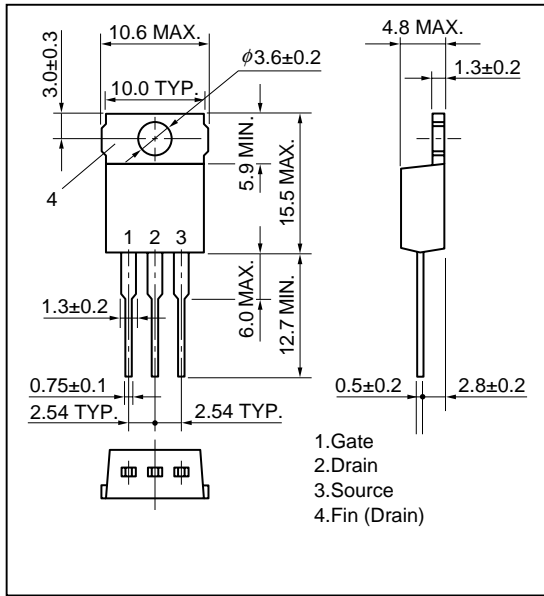


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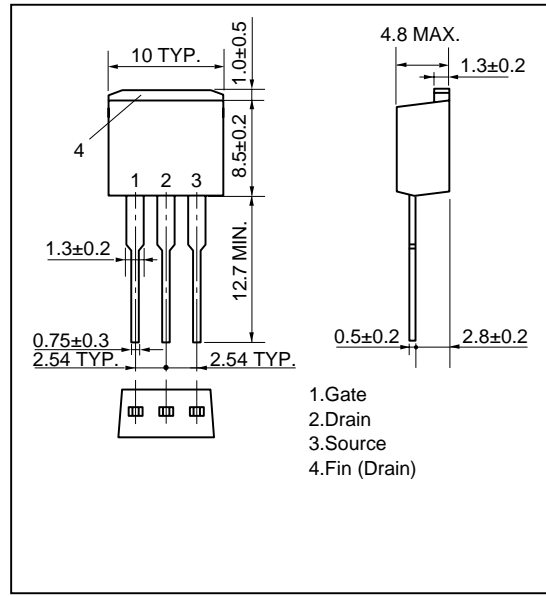


★ PACKAGE DRAWINGS (Unit : mm)

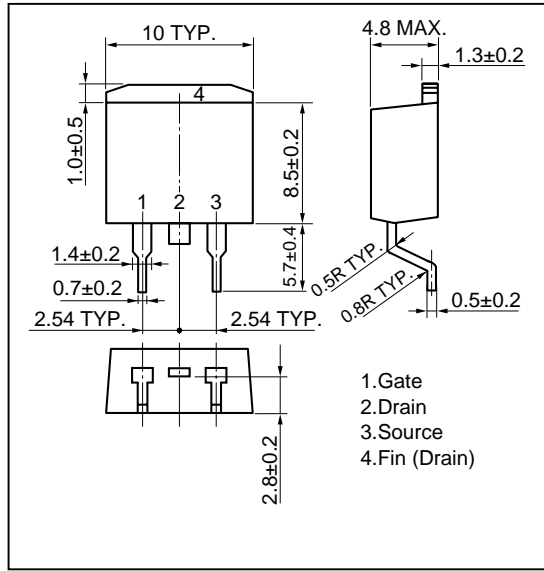
1) TO-220AB (MP-25)



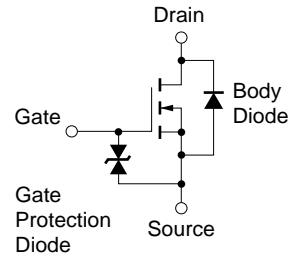
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)



EQUIVALENT CIRCUIT



Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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