

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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MOS FIELD EFFECT TRANSISTOR  
**2SK3225**

SWITCHING  
N-CHANNEL POWER MOS FET

**DESCRIPTION**

The 2SK3225 is N-Channel MOS Field Effect Transistors designed for high current switching applications.

**FEATURES**

- Low on-state resistance  
 $R_{DS(on)1} = 18 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 17 \text{ A)}$   
 $R_{DS(on)2} = 27 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 17 \text{ A)}$
- Low input capacitance  
 $C_{iss} = 2100 \text{ pF TYP.}$
- Built-in gate protection diode
- TO-251/TO-252 package

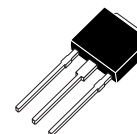
**ORDERING INFORMATION**

PART NUMBER	PACKAGE
2SK3225	TO-251 (MP-3)
2SK3225-Z	TO-252 (MP-3Z)

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)**

Drain to Source Voltage	V <sub>DSS</sub>	60	V
Gate to Source Voltage	V <sub>GSS(AC)</sub>	±20	V
Gate to Source Voltage	V <sub>GSS(DC)</sub>	+20, -10	V
Drain Current (DC)	I <sub>D(DC)</sub>	±34	A
Drain Current (Pulse) <sup>Note1</sup>	I <sub>D(pulse)</sub>	±136	A
Total Power Dissipation (T <sub>C</sub> = 25°C)	P <sub>T1</sub>	40	W
Total Power Dissipation (T <sub>A</sub> = 25°C)	P <sub>T2</sub>	1.0	W
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C
Single Avalanche Current <sup>Note2</sup>	I <sub>AS</sub>	15	A
Single Avalanche Energy <sup>Note2</sup>	E <sub>AS</sub>	22	mJ

(TO-251)



(TO-252)



**Note1.** PW ≤ 10 μs, Duty cycle ≤ 1%

**2.** Starting T<sub>ch</sub> = 25°C, V<sub>DD</sub> = 30 V, R<sub>G</sub> = 25 Ω, V<sub>GS</sub> = 20 → 0 V

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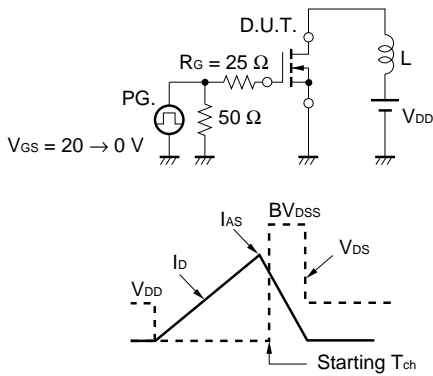
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**ELECTRICAL CHARACTERISTICS (TA = 25°C)**

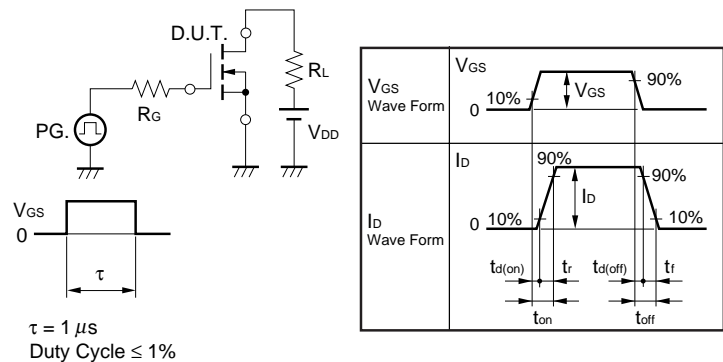
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Leakage Current	$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			$\pm 10$	$\mu\text{A}$
Gate to Source Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.0	1.5	2.0	V
Forward Transfer Admittance <sup>Note</sup>	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 17\text{ A}$	13	27		S
Drain to Source On-state Resistance <sup>Note</sup>	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 17\text{ A}$		13	18	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.0\text{ V}, I_D = 17\text{ A}$		18	27	$\text{m}\Omega$
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$		2100		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		550		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1\text{ MHz}$		220		pF
Turn-on Delay Time	$t_{d(on)}$	$I_D = 17\text{ A}$		32		ns
Rise Time	$t_r$	$V_{GS} = 10\text{ V}$		300		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{DD} = 30\text{ V}$		110		ns
Fall Time	$t_f$	$R_G = 10\ \Omega$		140		ns
Total Gate Charge	$Q_G$	$I_D = 34\text{ A}$		45		nC
Gate to Source Charge	$Q_{GS}$	$V_{DD} = 48\text{ V}$		7		nC
Gate to Drain Charge	$Q_{GD}$	$V_{GS} = 10\text{ V}$		13		nC
Body Diode Forward Voltage <sup>Note</sup>	$V_{F(S-D)}$	$I_F = 34\text{ A}, V_{GS} = 0\text{ V}$		0.94		V
Reverse Recovery Time	$t_{rr}$	$I_f = 34\text{ A}, V_{GS} = 0\text{ V}$		60		ns
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100\text{ A}/\mu\text{s}$		95		nC

**Note** Pulsed

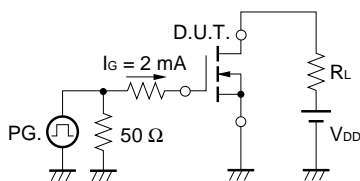
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



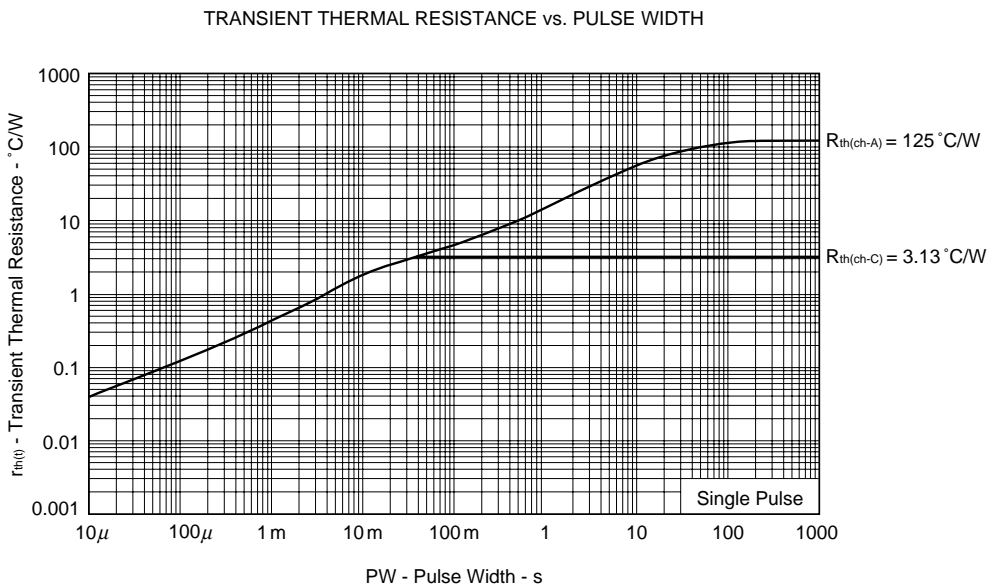
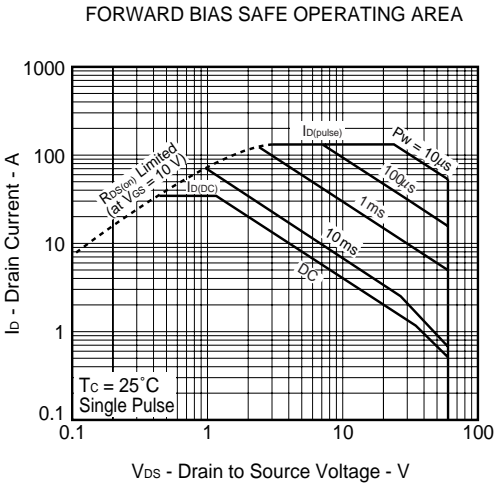
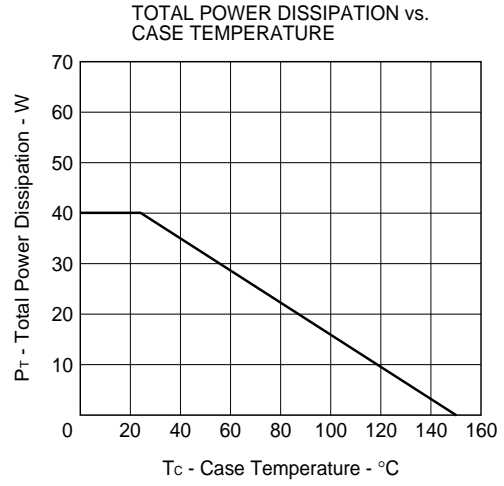
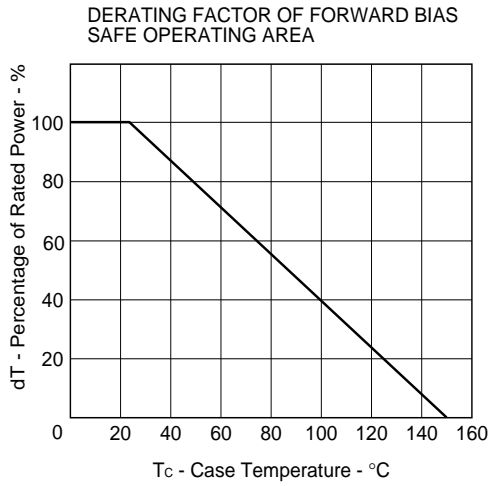
**TEST CIRCUIT 2 SWITCHING TIME**



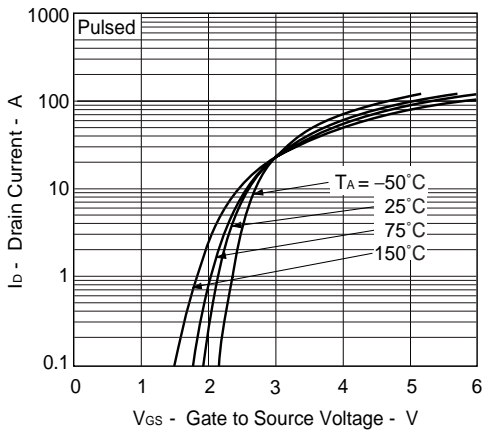
**TEST CIRCUIT 3 GATE CHARGE**



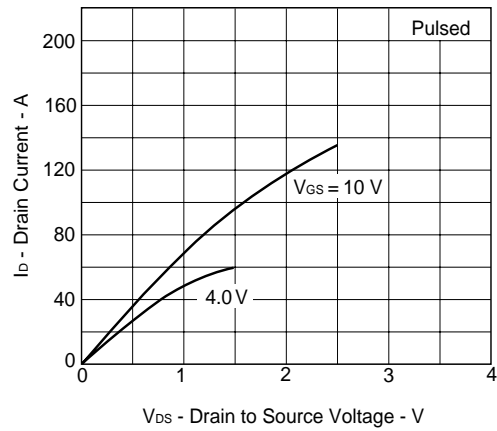
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



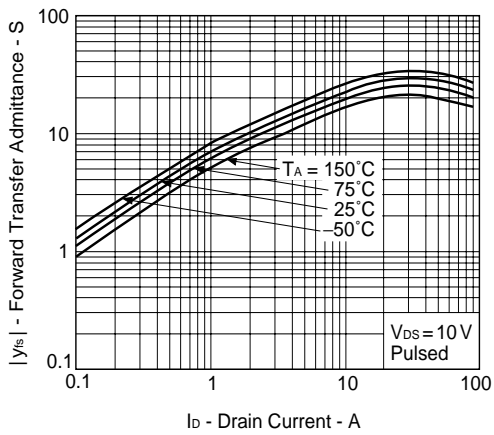
FORWARD TRANSFER CHARACTERISTICS



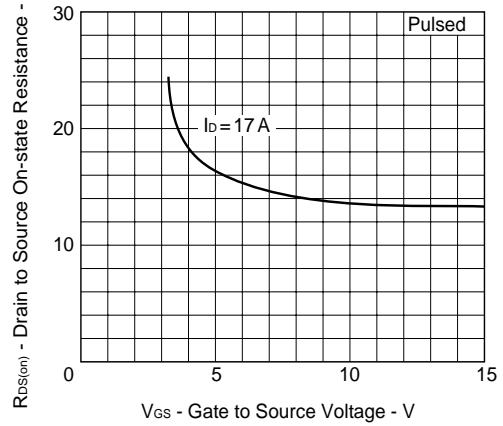
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



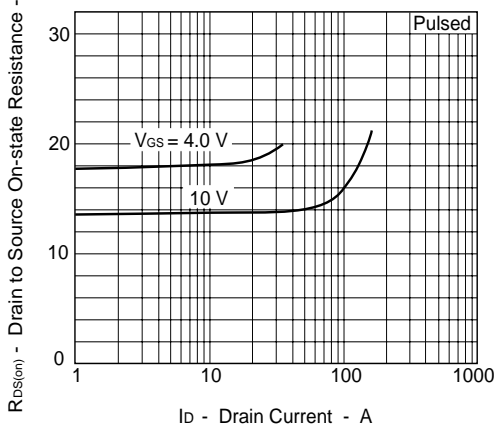
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



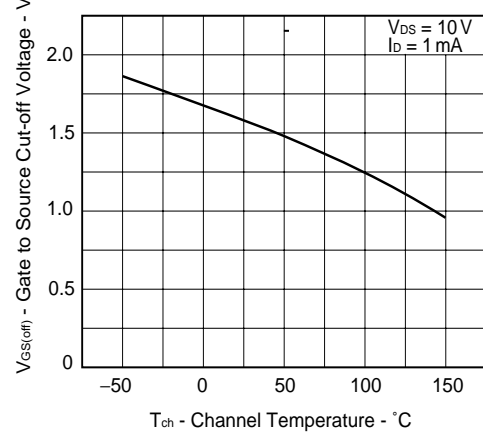
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



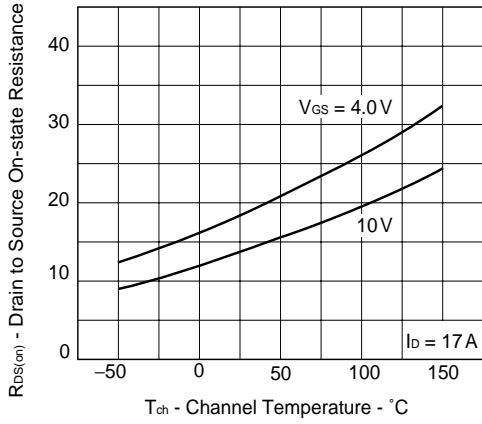
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



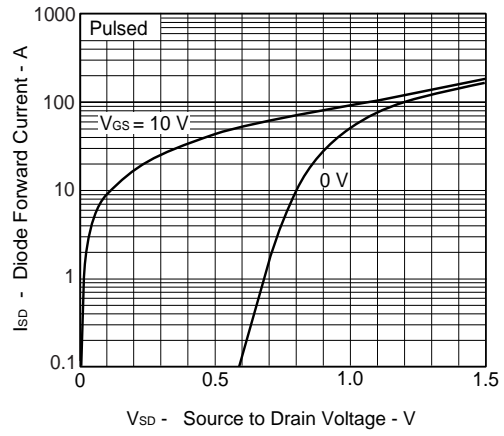
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



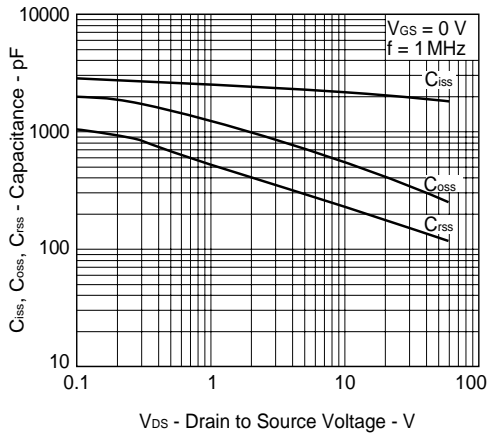
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



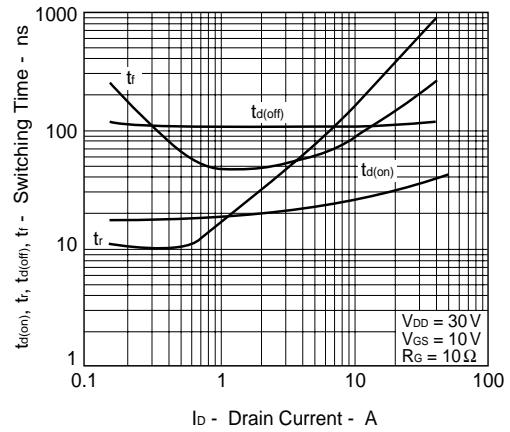
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



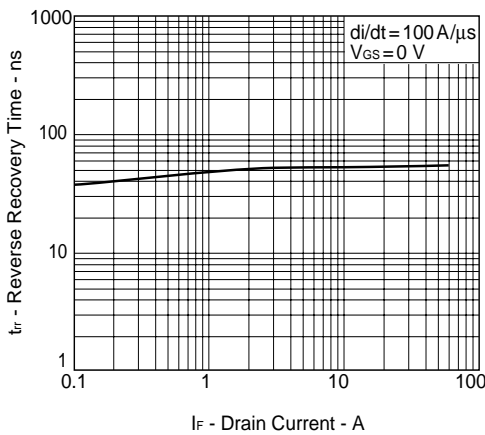
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



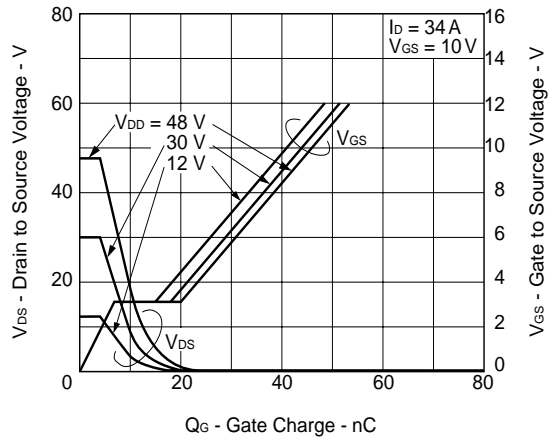
SWITCHING CHARACTERISTICS

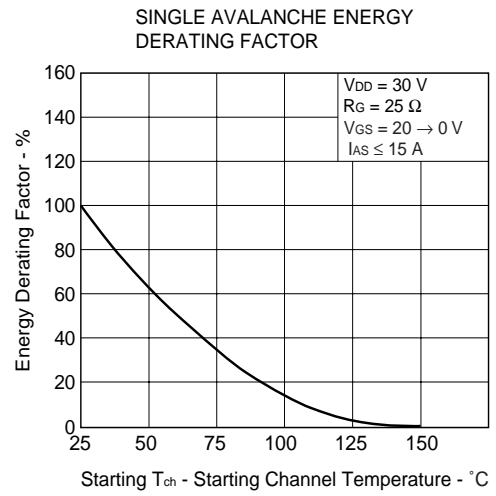
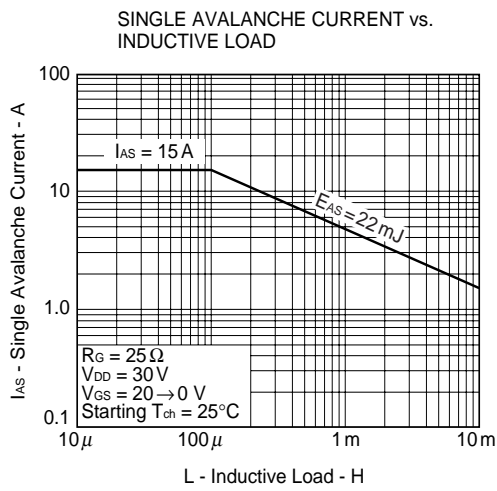


REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS

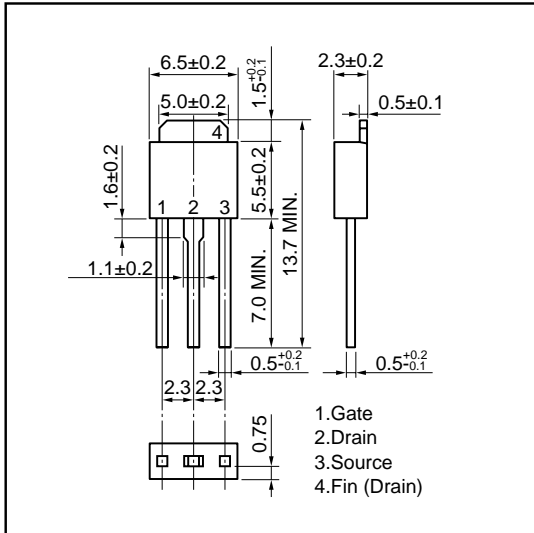




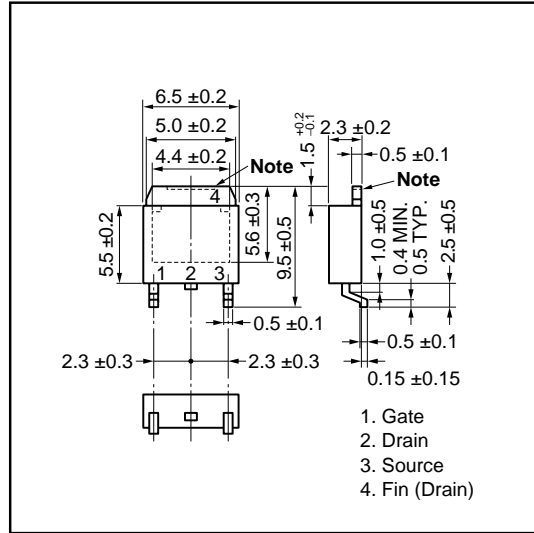


PACKAGE DRAWINGS (Unit : mm)

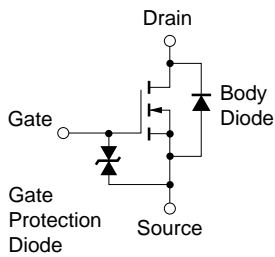
1)TO-251 (MP-3)



<R> 2)TO-252 (MP-3Z)



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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