

## SWITCHING N-CHANNEL POWER MOS FET

### DESCRIPTION

The 2SK3113 is N-channel DMOS FET device that features a low gate charge and excellent switching characteristic, and designed for high voltage applications such as switching power supply, AC adapter.

### FEATURES

- Low on-state resistance  
 $R_{DS(on)} = 4.4 \Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 1.0 \text{ A)}$
- Low gate charge  
 $Q_G = 9 \text{ nC TYP. (} V_{DD} = 450 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 2.0 \text{ A)}$
- Gate voltage rating  $\pm 30 \text{ V}$
- Avalanche capability ratings

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	600	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 30$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 2.0$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 8.0$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	20	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>Note2</sup>	$P_{T2}$	1.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	$-55 \text{ to } +150$	$^\circ\text{C}$
Single Avalanche Current <sup>Note3</sup>	$I_{AS}$	2.0	A
Single Avalanche Energy <sup>Note3</sup>	$E_{AS}$	2.7	mJ

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

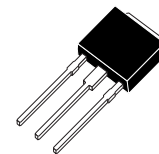
2. Mounted on glass epoxy board of 40 mm x 40 mm x 1.6 mm

3. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 150 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$

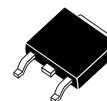
### ★ ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3113	TO-251 (MP-3)
2SK3113-Z	TO-252 (MP-3Z)

(TO-251)



(TO-252)

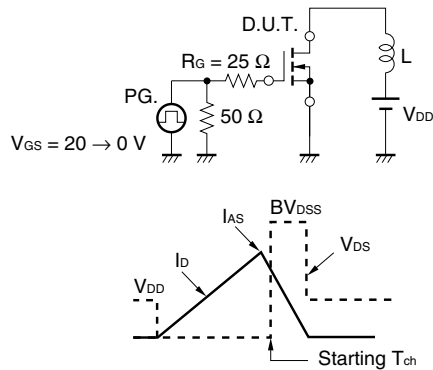


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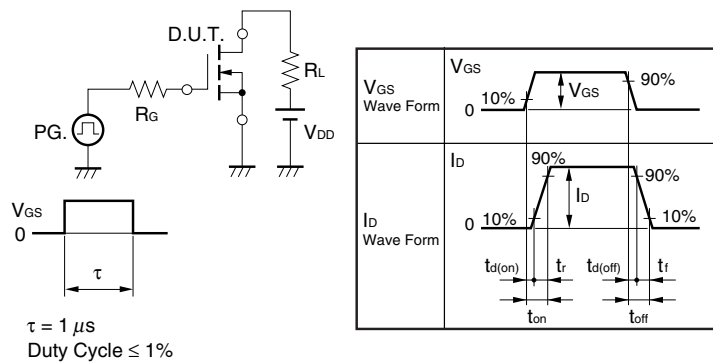
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V			100	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V			±10	μA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.5		3.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.0 A	0.5			S
Drain to Source On-state Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 1.0 A		3.3	4.4	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		290		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		60		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		5		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 150 V, I <sub>D</sub> = 1.0 A		7		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		2		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω, R <sub>L</sub> = 10 Ω		22		ns
Fall Time	t <sub>f</sub>			9		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 450 V		9		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		2.4		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 2.0 A		2		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 2.0 A, V <sub>GS</sub> = 0 V		0.9		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 2.0 A, V <sub>GS</sub> = 0 V		0.9		μs
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 50 A/μs		2.0		μC

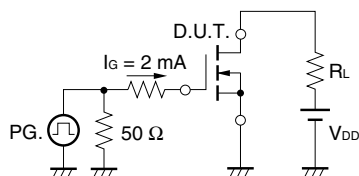
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



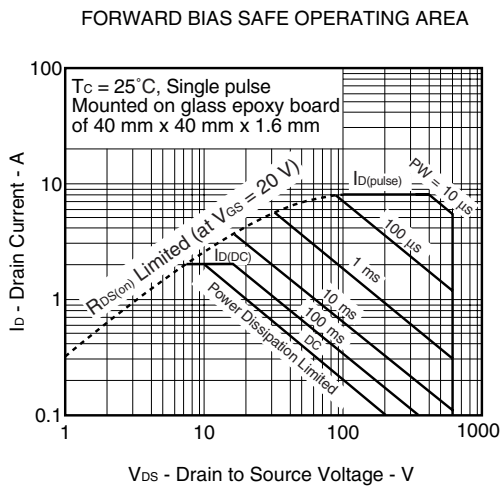
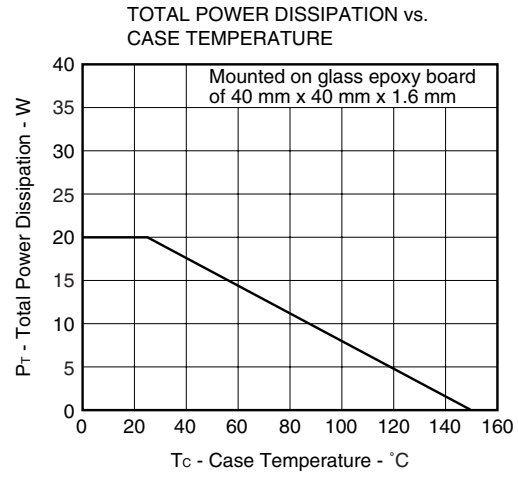
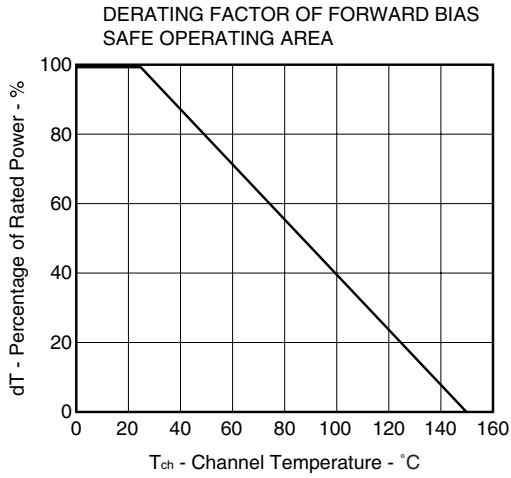
**TEST CIRCUIT 2 SWITCHING TIME**



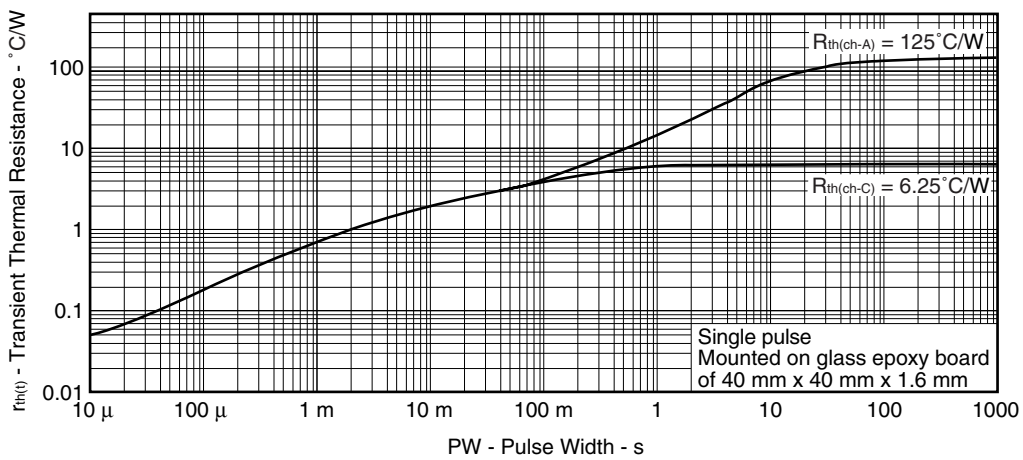
**TEST CIRCUIT 3 GATE CHARGE**



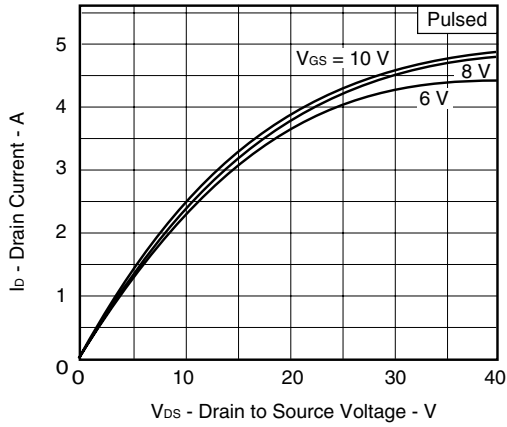
★ TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



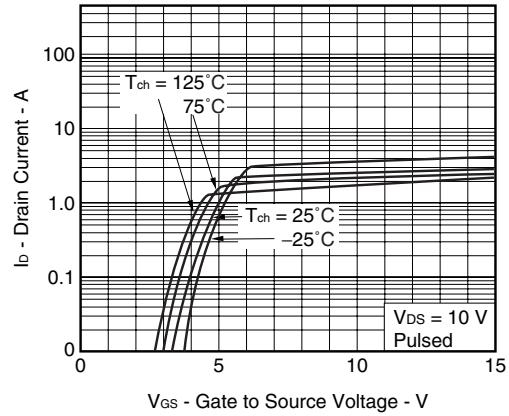
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



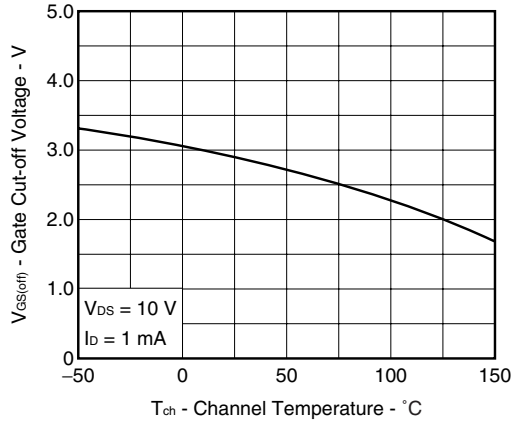
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



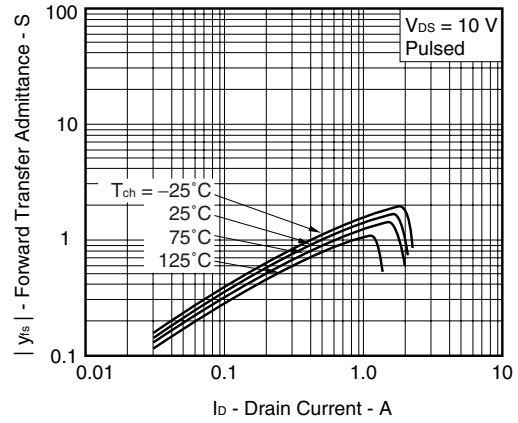
FORWARD TRANSFER CHARACTERISTICS



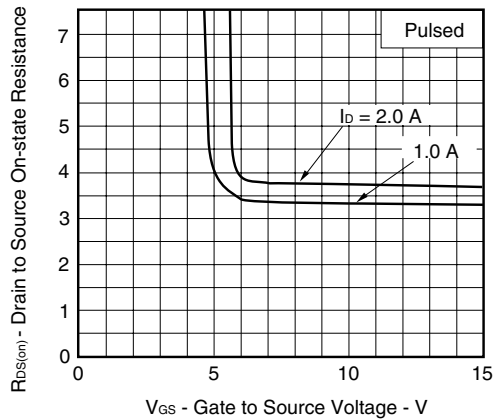
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



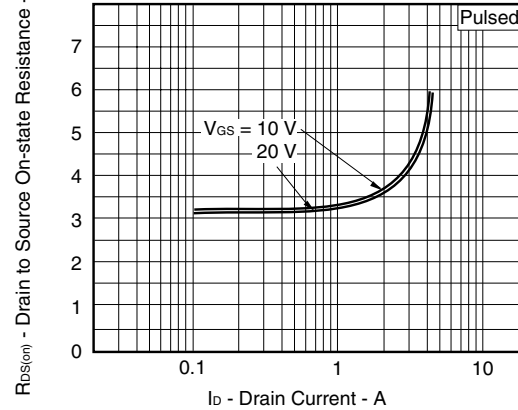
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

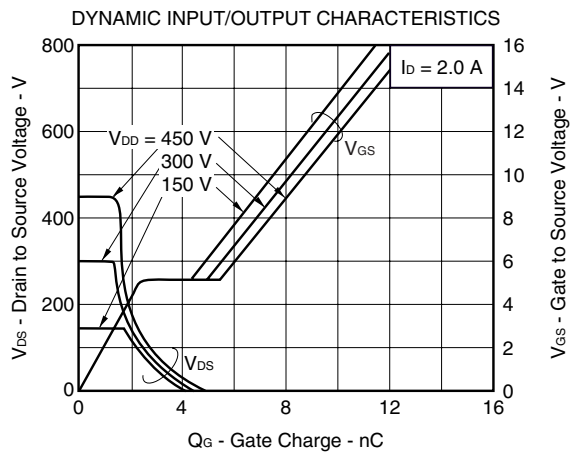
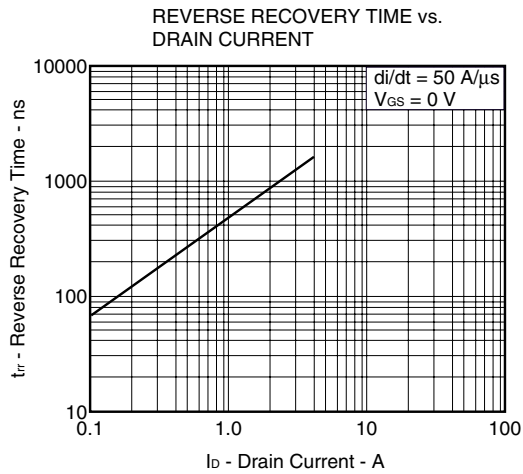
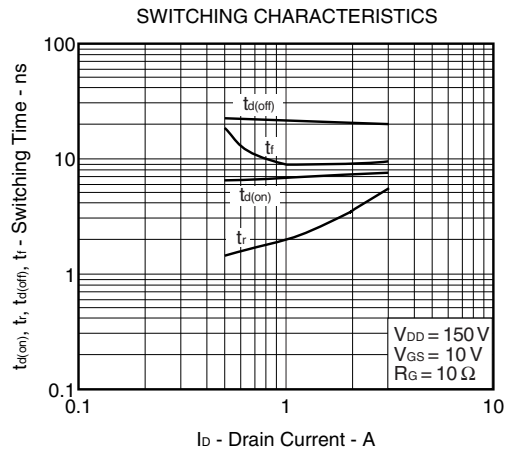
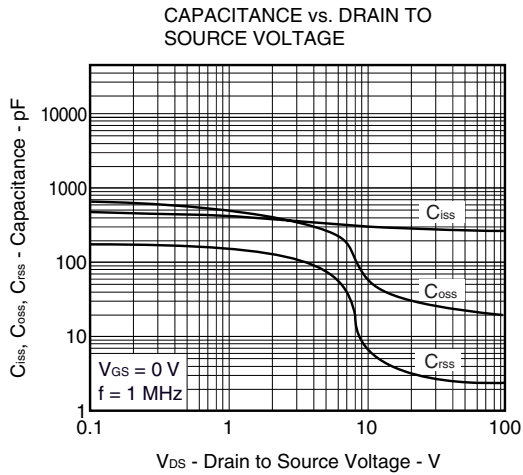
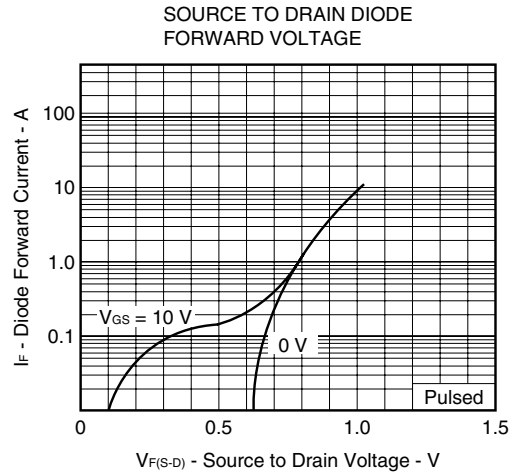
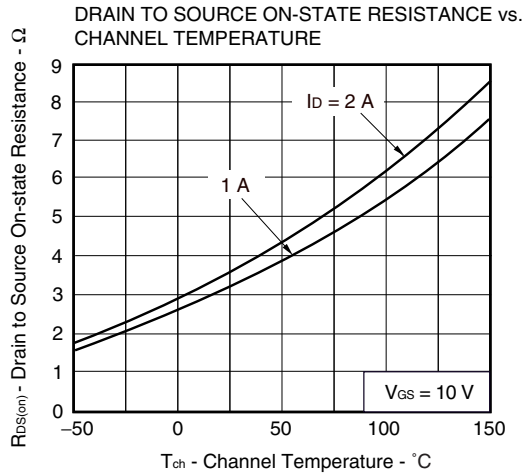


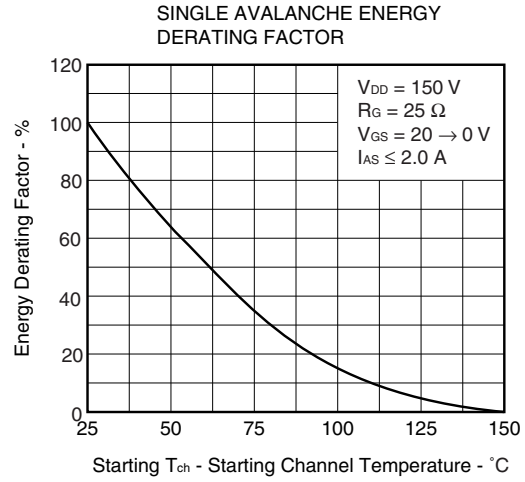
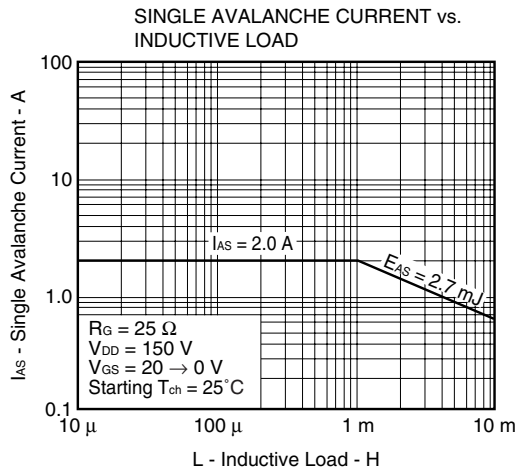
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

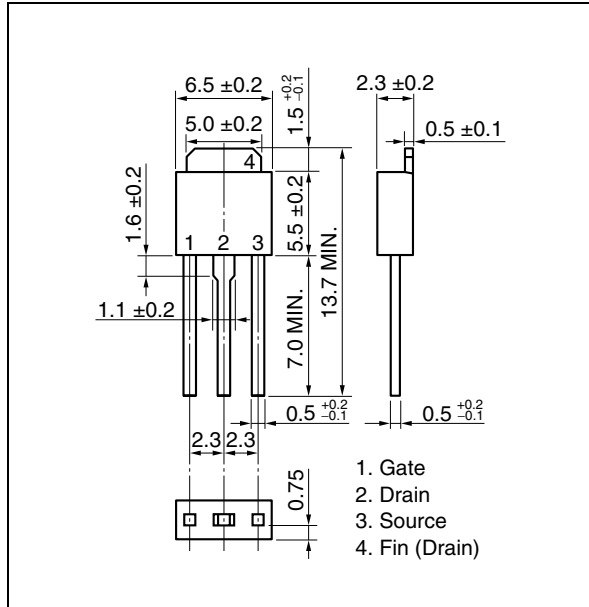




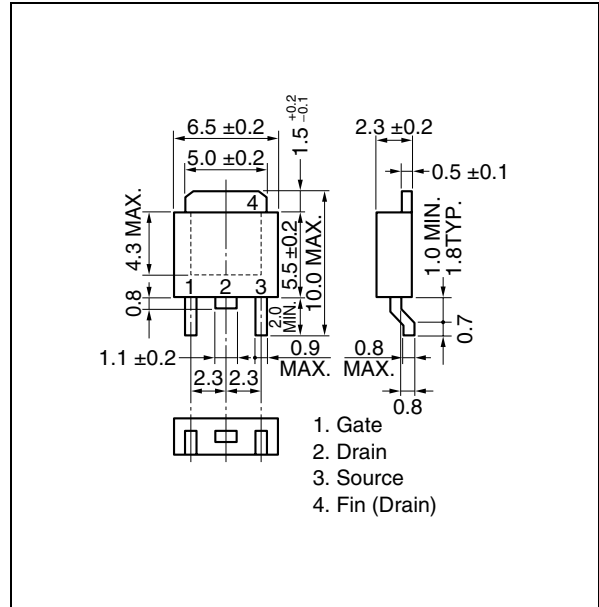


★ PACKAGE DRAWINGS (Unit: mm)

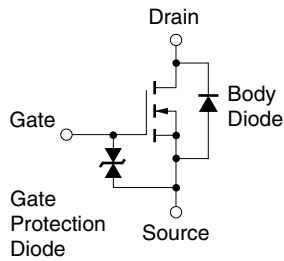
1) TO-251 (MP-3)



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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