

### SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

#### DESCRIPTION

The 2SK3225 is N-Channel MOS Field Effect Transistor 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  $C_{iss}$  :  $C_{iss} = 2100 \text{ pF TYP.}$
- Built-in Gate Protection Diode
- TO-251/TO-252 package

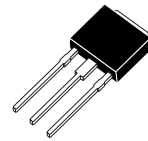
#### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3225	TO-251
2SK3225-Z	TO-252

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

Drain to Source Voltage	$V_{DSS}$	60	V
Gate to Source Voltage	$V_{GSS(AC)}$	$\pm 20$	V
Gate to Source Voltage	$V_{GSS(DC)}$	+20, -10	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 34$	A
Drain Current (Pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 136$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_T$	40	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_T$	1.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <sup>Note2</sup>	$I_{AS}$	15	A
Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	22	mJ

(TO-251)



(TO-252)



**Note1.**  $PW \leq 10 \mu\text{s}$ , Duty cycle  $\leq 1\%$

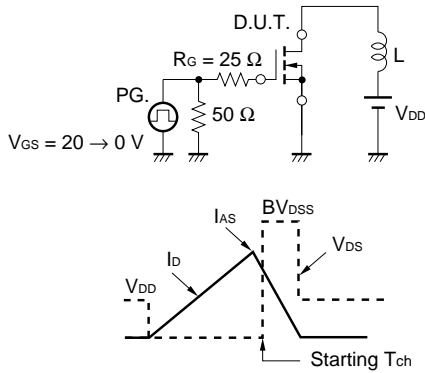
★ **2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 30 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

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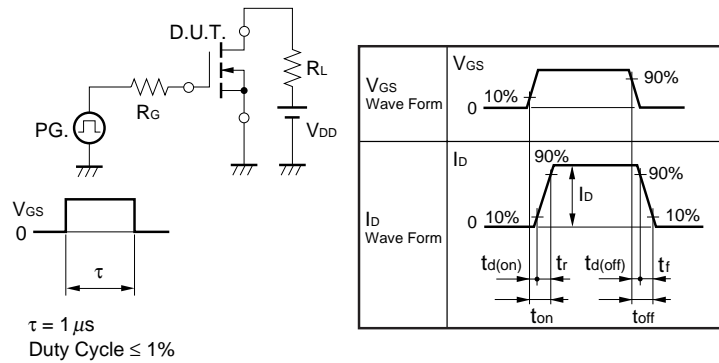
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 17 A		13	18	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 17 A		18	27	mΩ
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.0	1.5	2.0	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 17 A	13	27		S
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V			10	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		2100		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		550		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		220		pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 17 A		32		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		300		ns
Turn-off Delay Time	t <sub>d(off)</sub>	V <sub>DD</sub> = 30 V		110		ns
Fall Time	t <sub>f</sub>	R <sub>G</sub> = 10 Ω		140		ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 34 A		45		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>DD</sub> = 48 V		7		nC
Gate to Drain Charge	Q <sub>GD</sub>	V <sub>GS</sub> = 10 V		13		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 34 A, V <sub>GS</sub> = 0 V		0.94		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 34 A, V <sub>GS</sub> = 0 V		60		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		95		nC

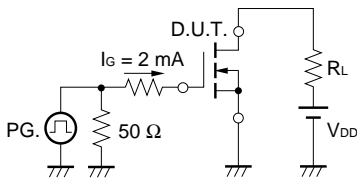
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



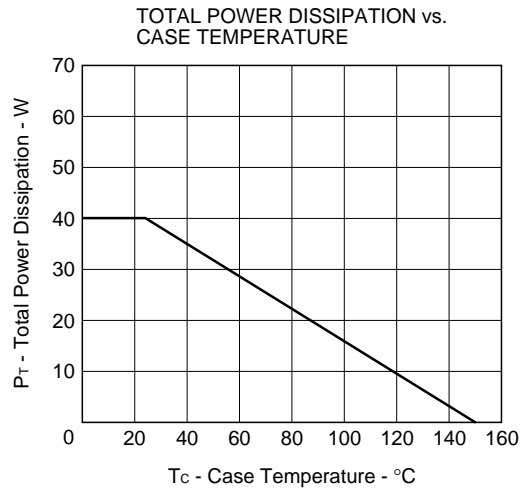
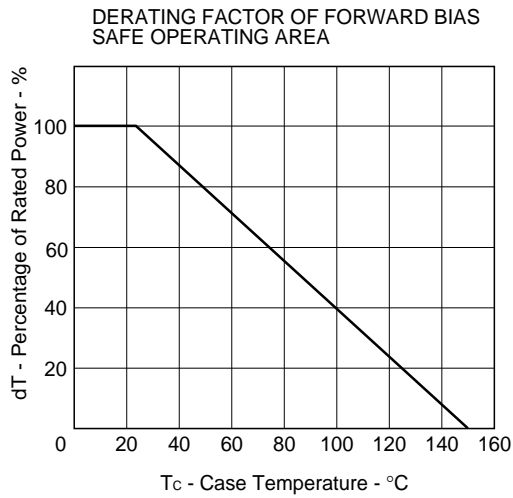
**★ TEST CIRCUIT 2 SWITCHING TIME**



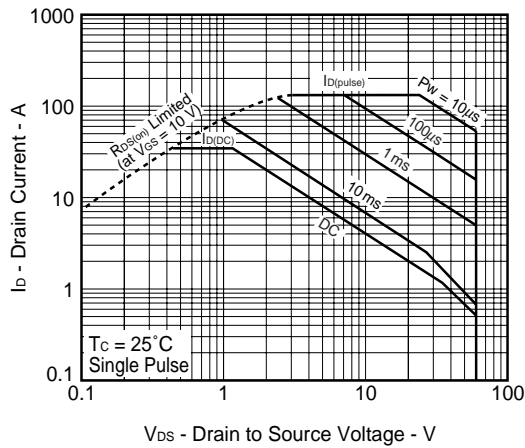
**TEST CIRCUIT 3 GATE CHARGE**



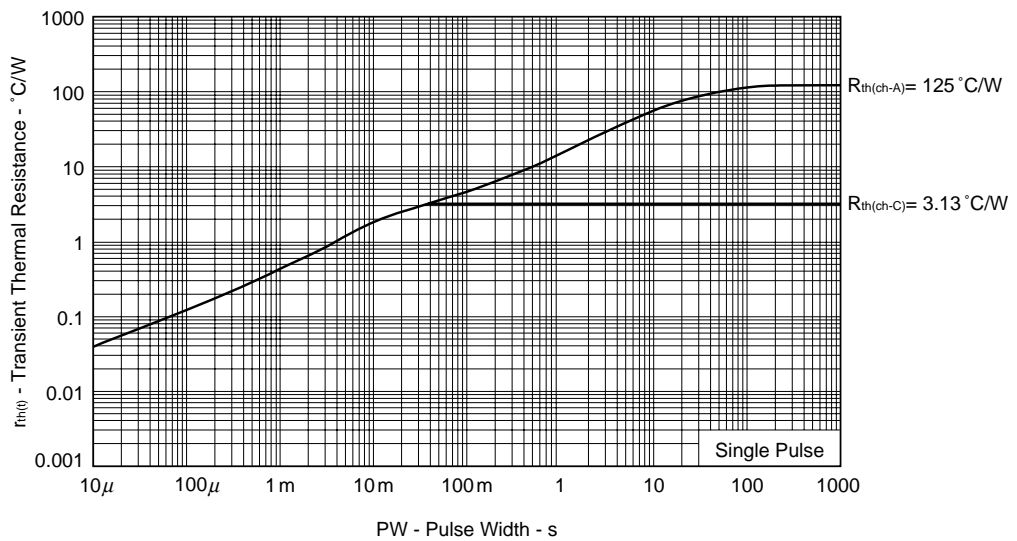
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



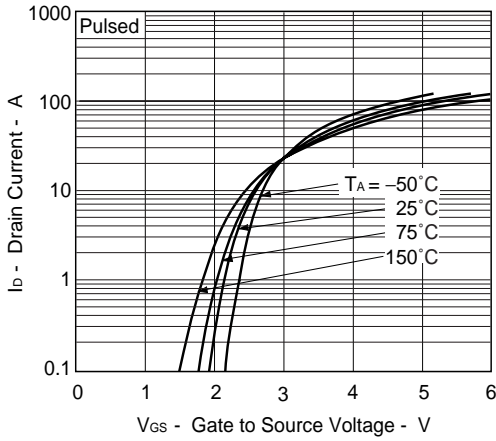
★ FORWARD BIAS SAFE OPERATING AREA



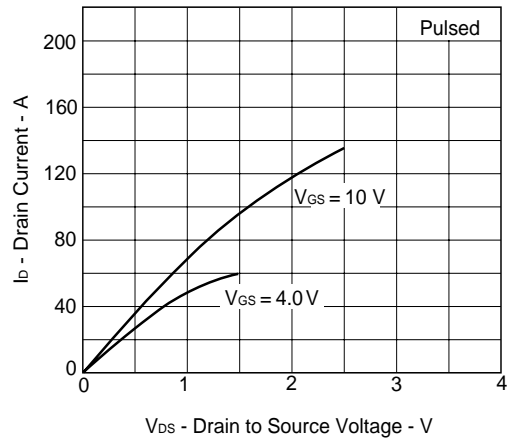
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



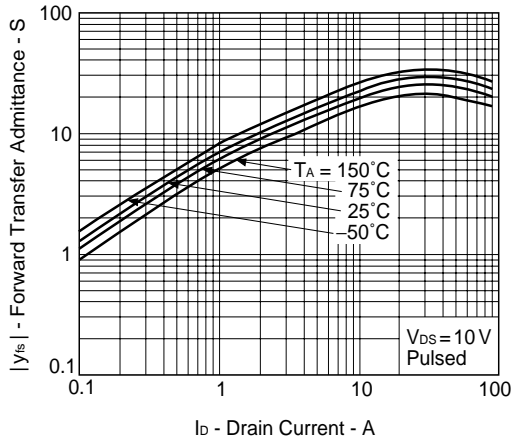
FORWARD TRANSFER CHARACTERISTICS



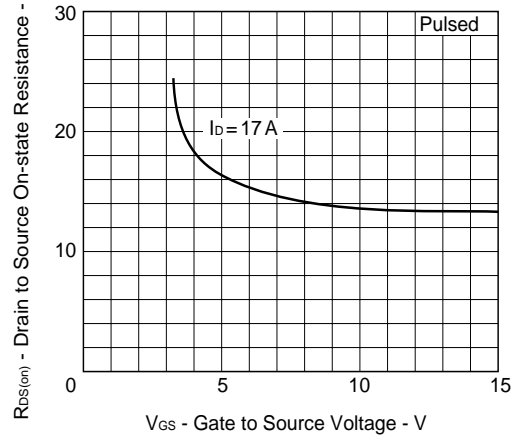
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



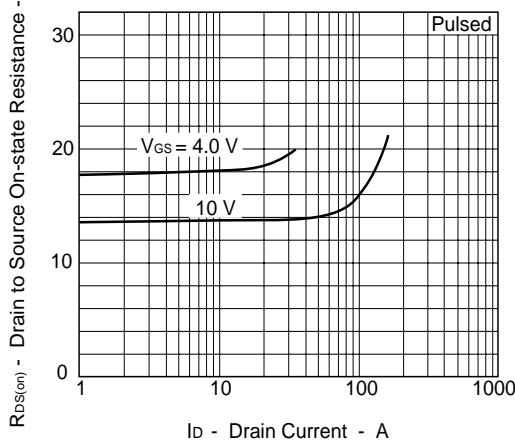
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



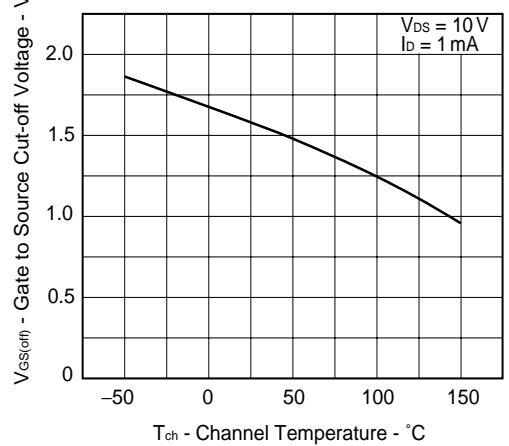
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



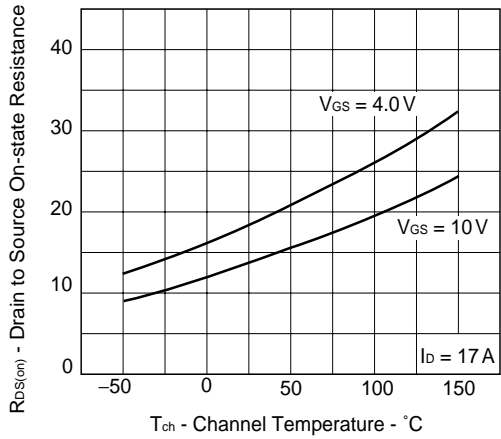
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



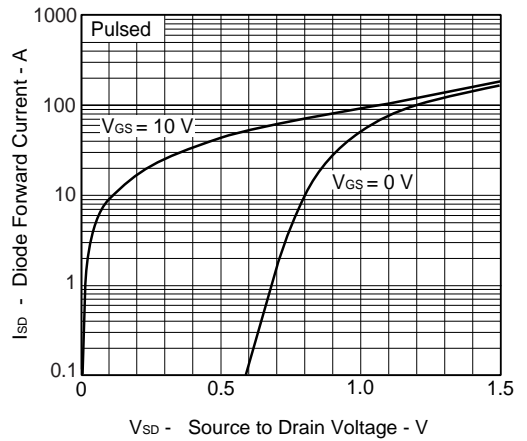
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



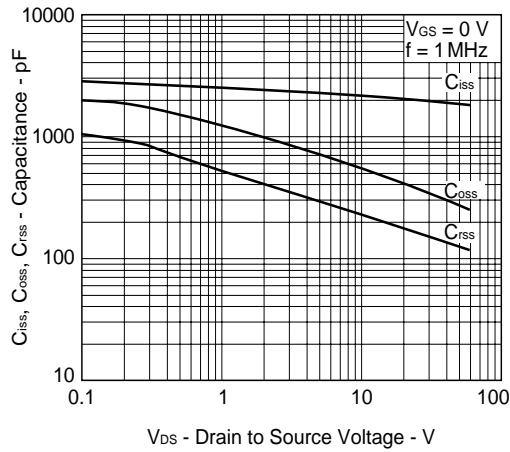
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



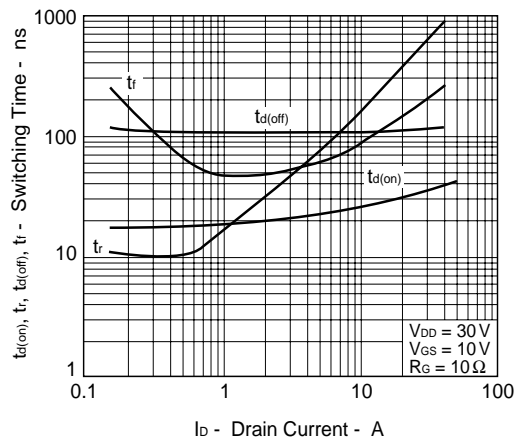
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



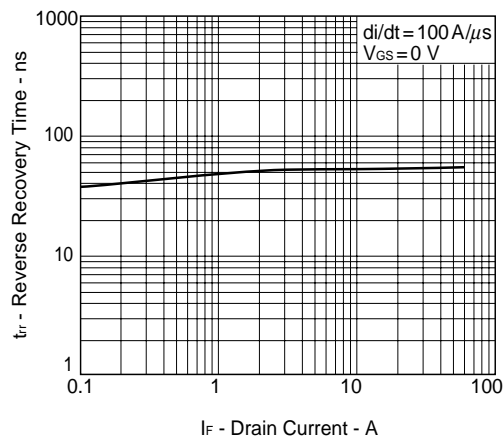
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



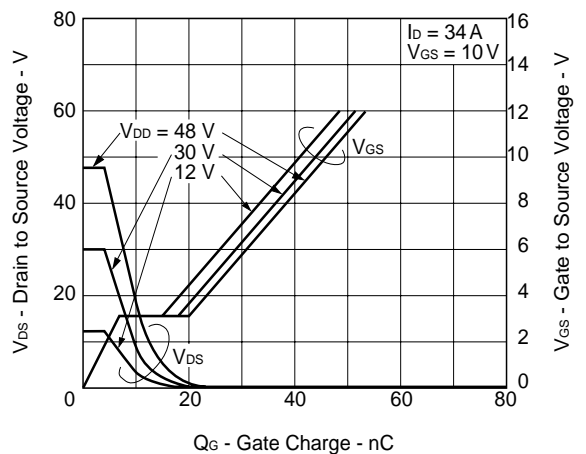
SWITCHING CHARACTERISTICS

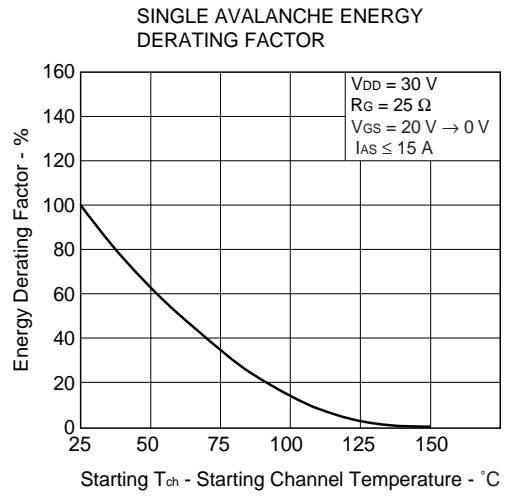
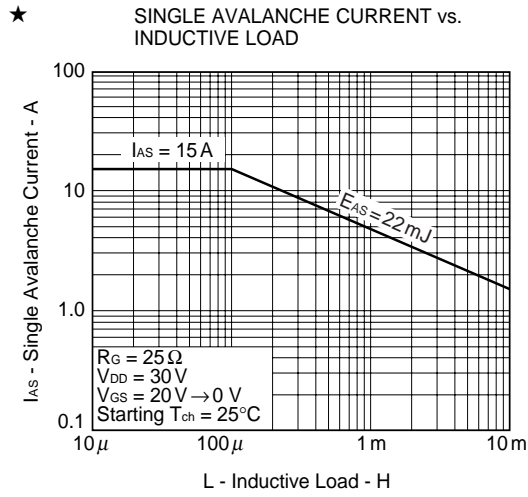


REVERSE RECOVERY TIME vs. DRAIN CURRENT



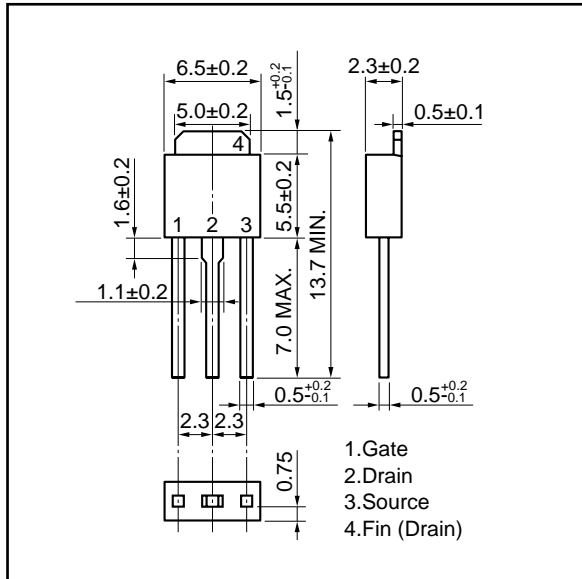
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



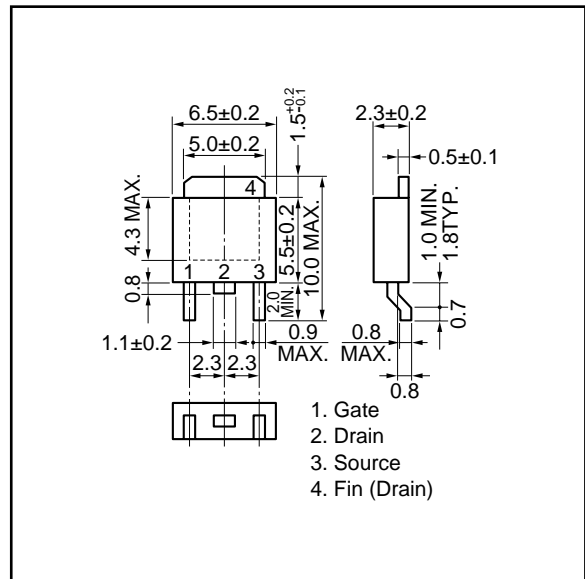


PACKAGE DRAWINGS (Unit : mm)

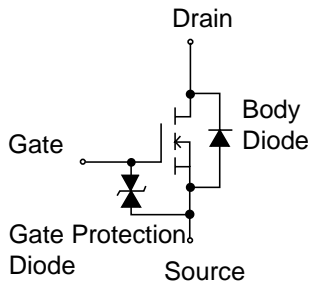
1)TO-251 (MP-3)



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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