

# MOS FIELD EFFECT TRANSISTOR

## 2SK3294

### SWITCHING

### N-CHANNEL POWER MOS FET

#### DESCRIPTION

The 2SK3294 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.

#### FEATURES

- Gate voltage rating  $\pm 30$  V
- Low on-state resistance  
 $R_{DS(on)} = 160 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 10 \text{ A)}$
- Low input capacitance  
 $C_{iss} = 1500 \text{ pF TYP. (} V_{DS} = 10 \text{ V, } V_{GS} = 0 \text{ V)}$
- Avalanche capability rated
- Built-in gate protection diode
- Surface mount device available

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

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	250	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 30$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 20$	A
Drain Current (Pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 60$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	100	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T2}$	1.5	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>	$I_{AS}$	20	A
Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	150	mJ

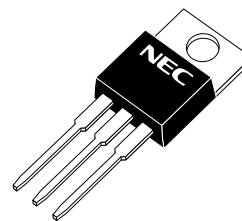
**Notes** 1.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

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

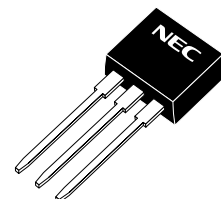
#### ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3294	TO-220AB
2SK3294-S	TO-262
2SK3294-ZJ	TO-263(MP-25ZJ)

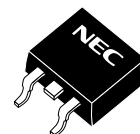
(TO-220AB)



(TO-262)



(TO-263)

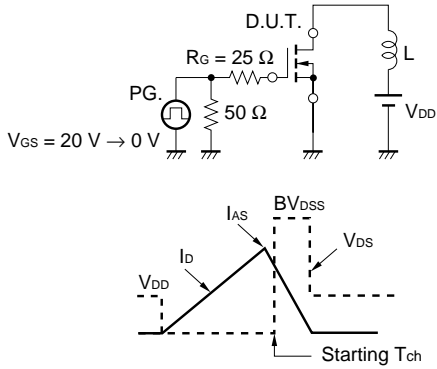


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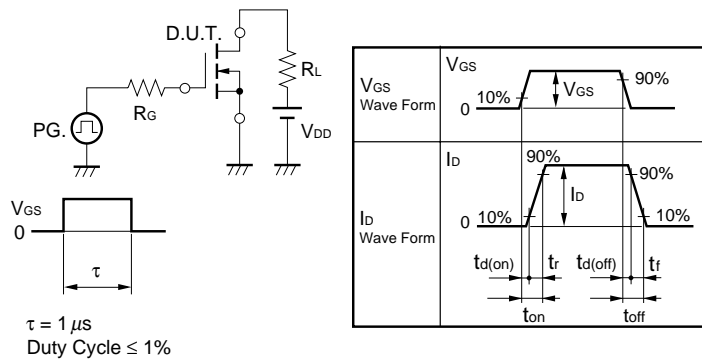
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 250 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		4.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 A	6.0			S
Drain to Source On-state Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A		120	160	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		1500		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		360		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		220		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 125 V, I <sub>D</sub> = 10 A		24		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		78		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		110		ns
Fall Time	t <sub>f</sub>			60		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 200 V		57		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		8		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 20 A		36		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V		1.0		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 20 A, V <sub>GS</sub> = 0 V		340		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 50 A/μs		2.1		μC

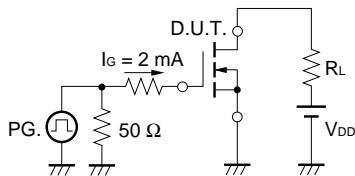
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

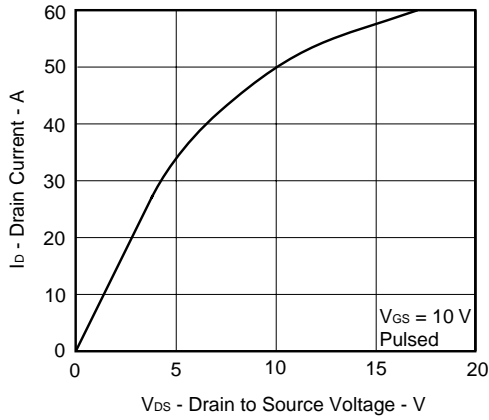


**TEST CIRCUIT 3 GATE CHARGE**

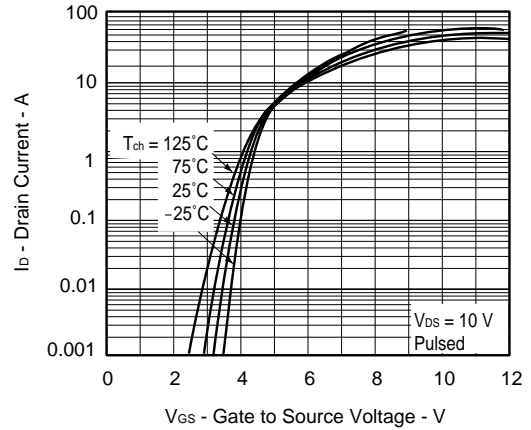


TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

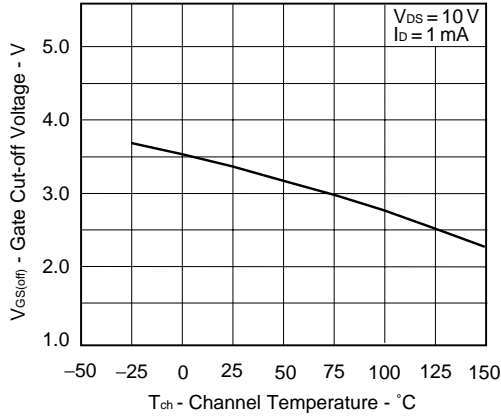
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



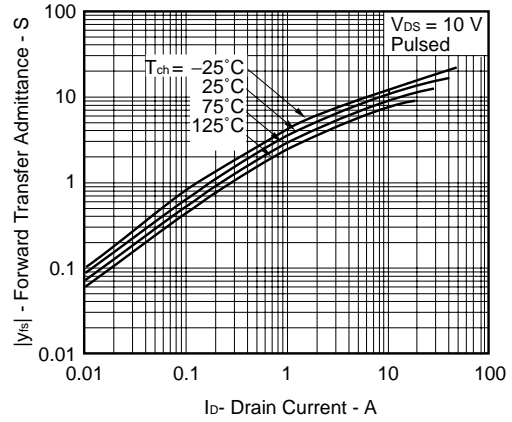
FORWARD TRANSFER CHARACTERISTICS



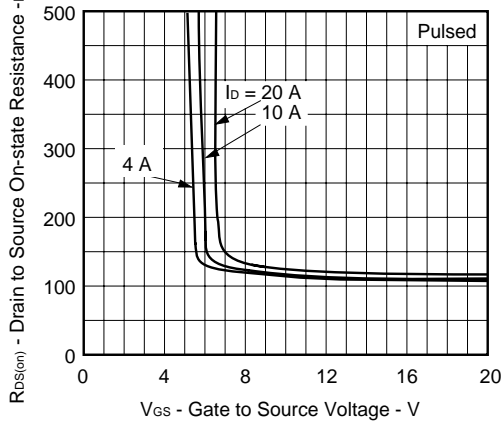
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



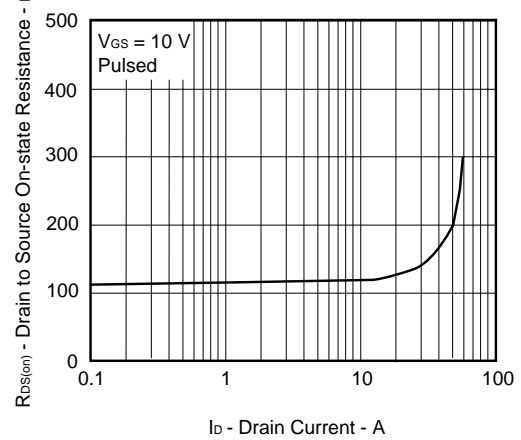
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

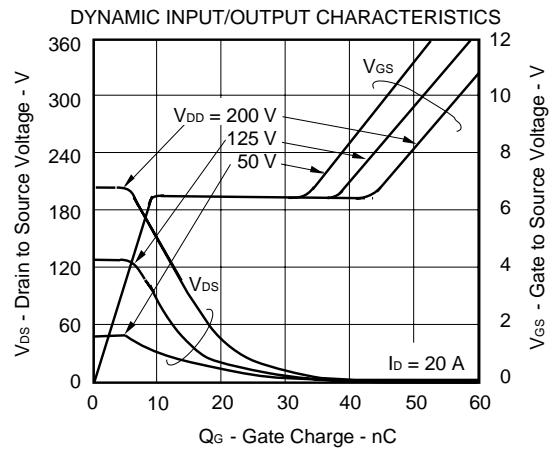
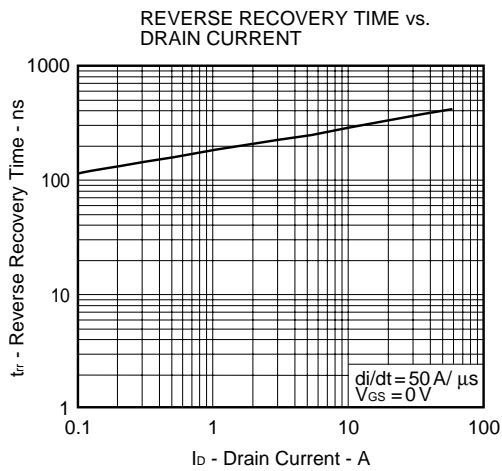
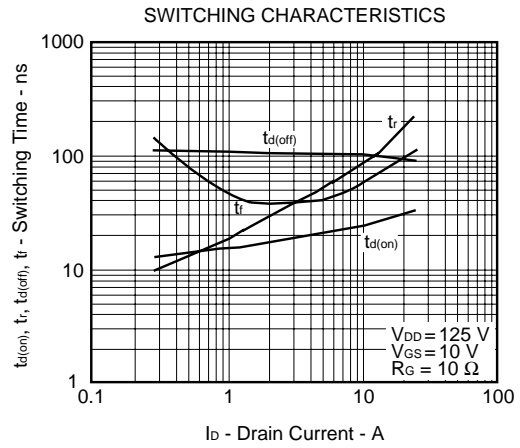
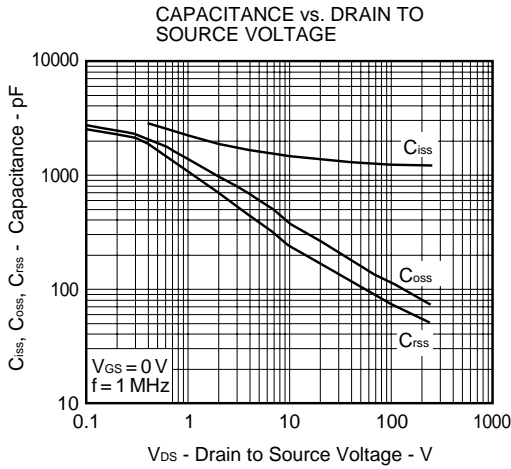
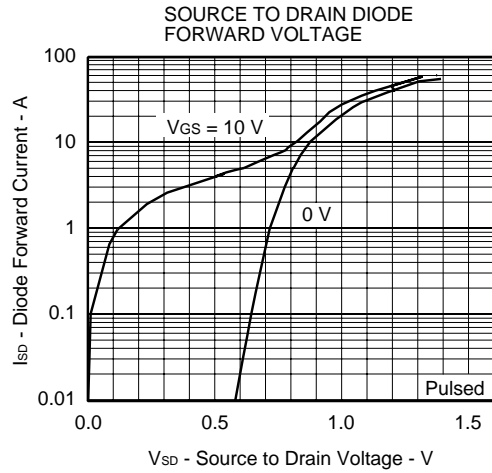
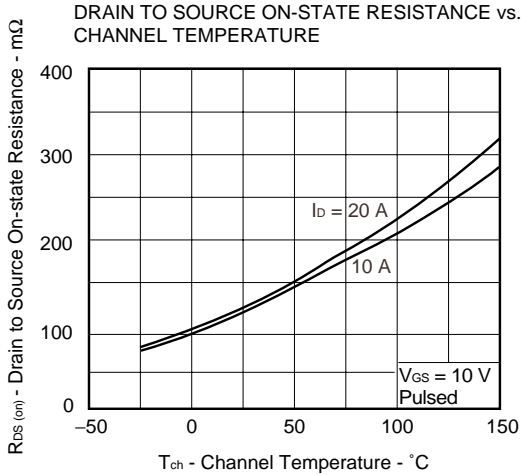


DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

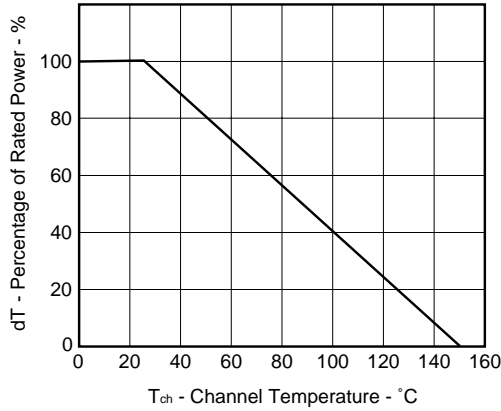


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

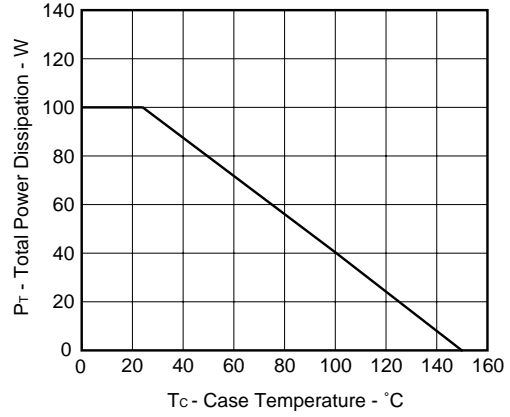




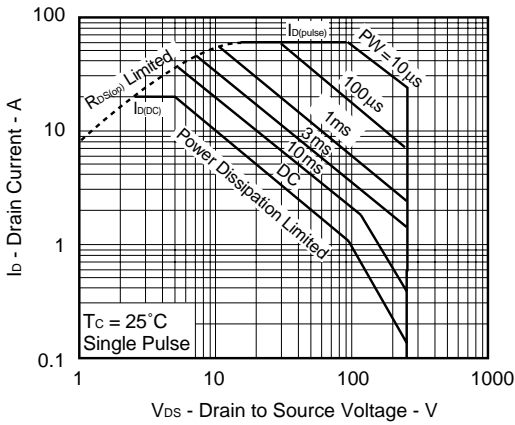
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



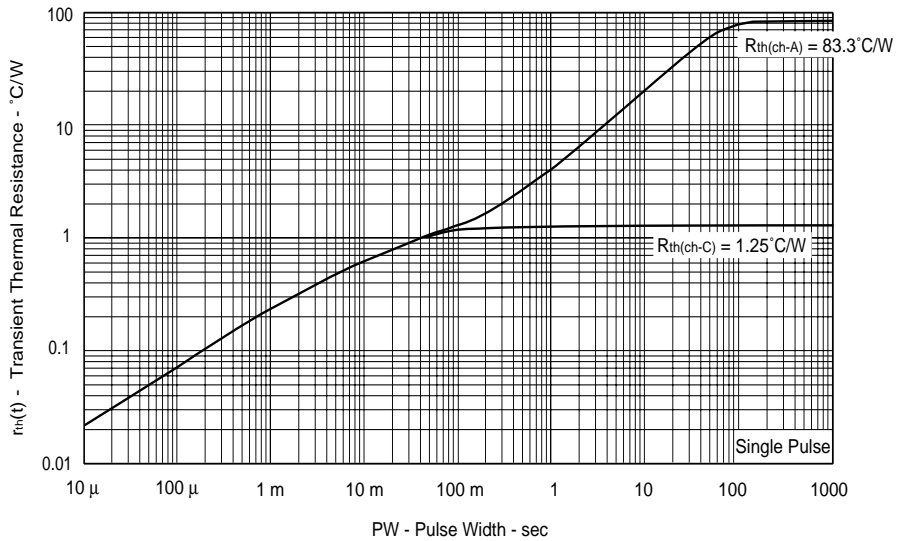
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

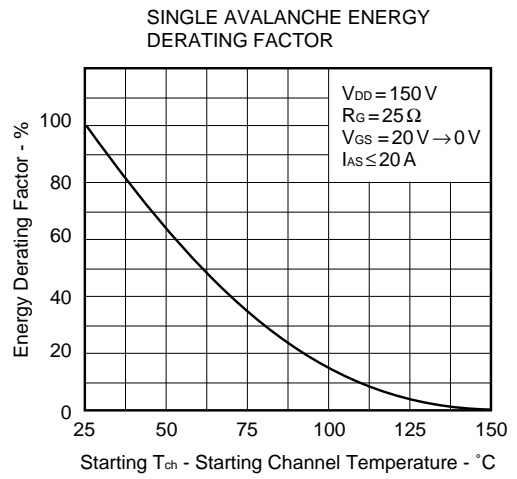
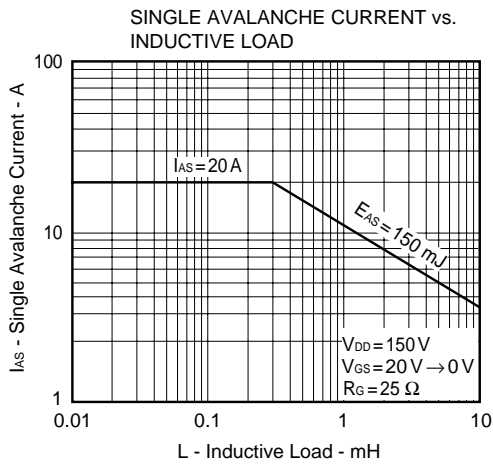


FORWARD BIAS SAFE OPERATING AREA



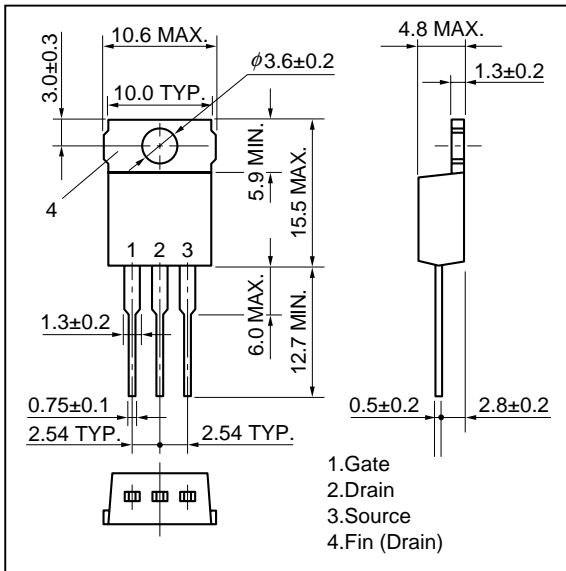
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



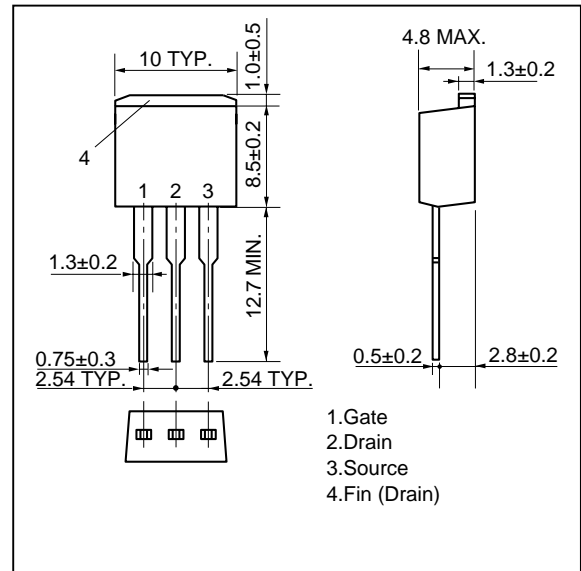


PACKAGE DRAWINGS (Unit: mm)

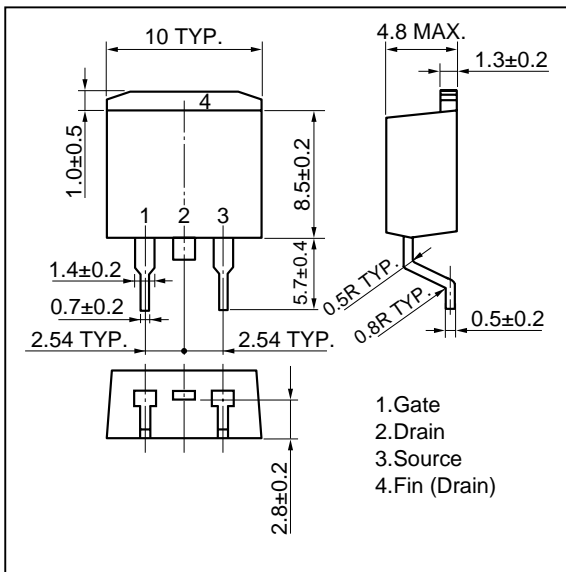
1) TO-220AB (MP-25)



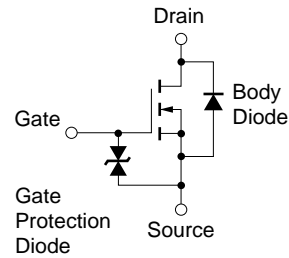
2) TO-262



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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