

SWITCHING  
N-CHANNEL POWER MOS FET

## DESCRIPTION

The 2SK3574 is N-channel MOS FET device that features a low on-state resistance and excellent switching characteristics, designed for low voltage high current applications such as DC/DC converter with synchronous rectifier.

## FEATURES

- 4.5V drive available
- Low on-state resistance  
 $R_{DS(on)1} = 13.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 24 \text{ A)}$
- Low gate charge  
 $Q_G = 22 \text{ nC TYP. (} V_{DD} = 24 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 48 \text{ A)}$
- Built-in gate protection diode
- Avalanche capability ratings
- Surface mount device available

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

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 48$	A
Drain Current (pulse) <b>Note1</b>	$I_{D(pulse)}$	$\pm 140$	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T1}$	1.5	W
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T2}$	29	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <b>Note2</b>	$I_{AS}$	19	A
Single Avalanche Energy <b>Note2</b>	$E_{AS}$	36	mJ

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

**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 15 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$

## ★ ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3574	TO-220AB
2SK3574-S	TO-262
2SK3574-ZK	TO-263
2SK3574-Z	TO-220SMD <sup>Note</sup>

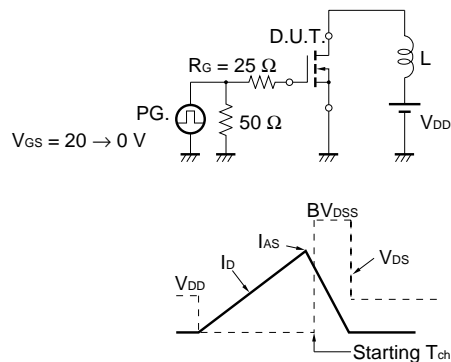
**Note** TO-220SMD package is produced only in Japan.

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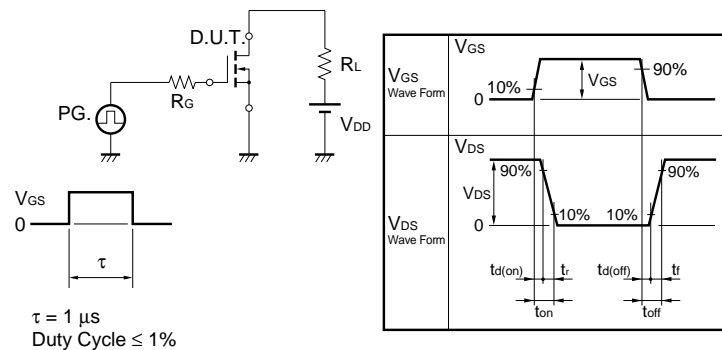
**ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			$\pm 10$	$\mu\text{A}$
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.5		2.5	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 24\text{ A}$	7.0			S
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 24\text{ A}$		10.1	13.5	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}$		15	24	$\text{m}\Omega$
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$		940		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		245		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1\text{ MHz}$		170		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, I_D = 24\text{ A}$		12		ns
Rise Time	$t_r$	$V_{GS} = 10\text{ V}$		18		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10\ \Omega$		39		ns
Fall Time	$t_f$			12		ns
Total Gate Charge	$Q_G$	$V_{DD} = 24\text{ V}$		22		nC
Gate to Source Charge	$Q_{GS}$	$V_{GS} = 10\text{ V}$		3.8		nC
Gate to Drain Charge	$Q_{GD}$	$I_D = 48\text{ A}$		7		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 48\text{ A}, V_{GS} = 0\text{ V}$		1.1		V
Reverse Recovery Time	$t_{rr}$	$I_F = 48\text{ A}, V_{GS} = 0\text{ V}$		29		ns
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100\text{ A}/\mu\text{s}$		24.8		nC

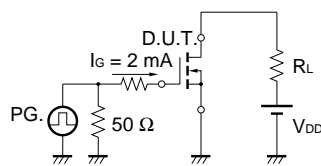
★ TEST CIRCUIT 1 AVALANCHE CAPABILITY



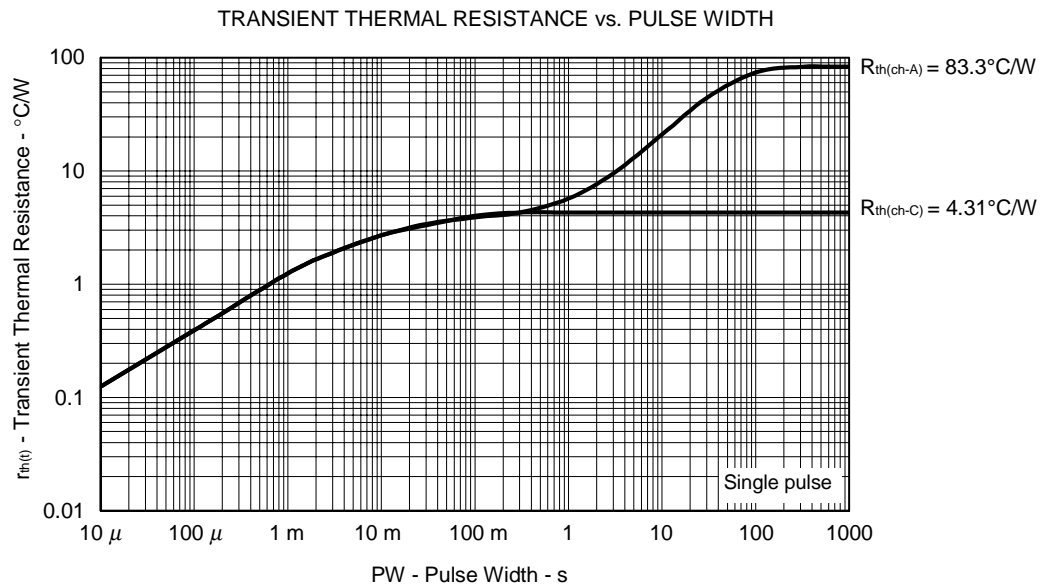
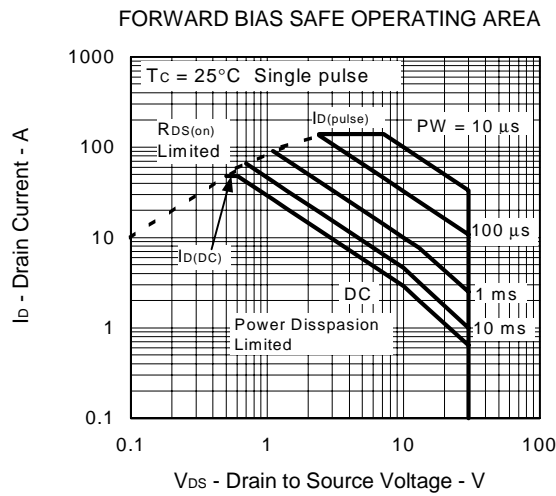
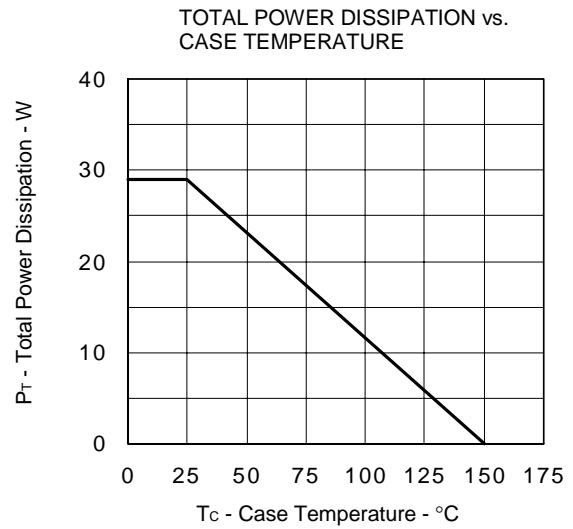
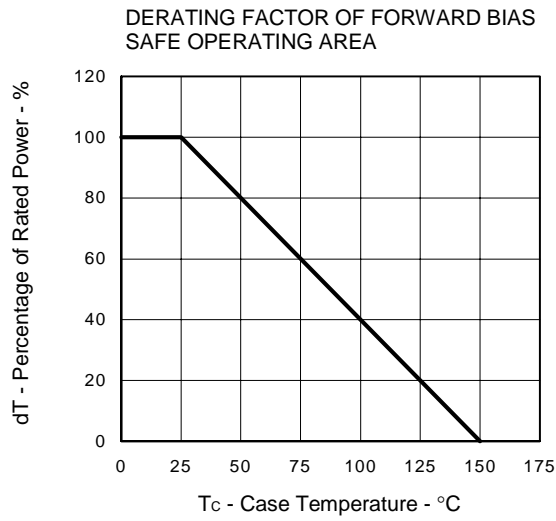
TEST CIRCUIT 2 SWITCHING TIME



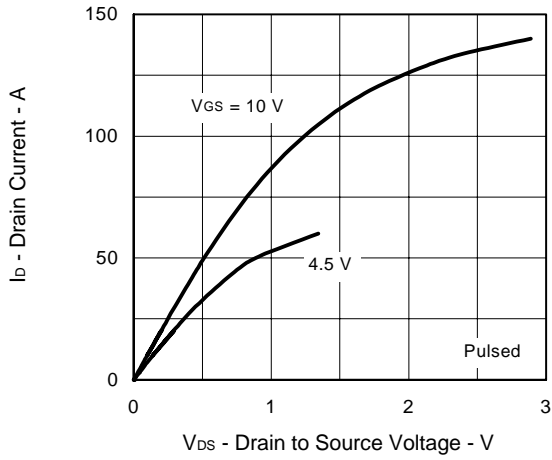
TEST CIRCUIT 3 GATE CHARGE



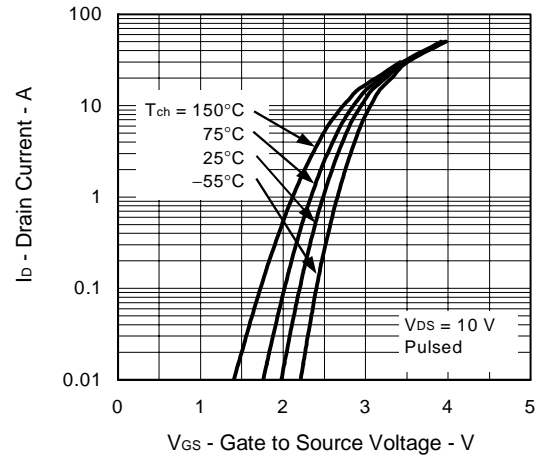
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



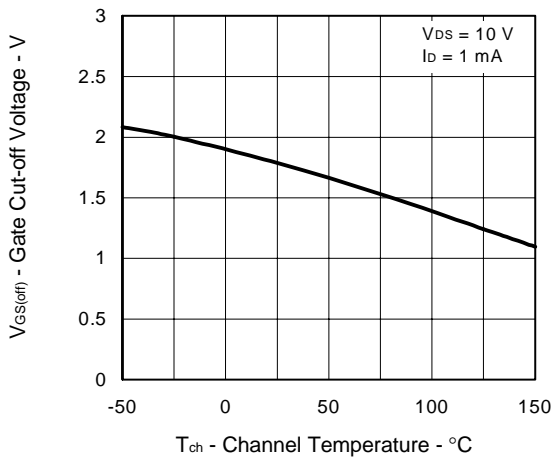
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



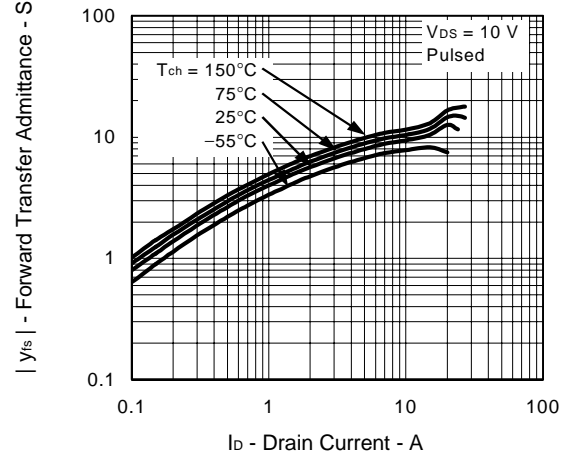
FORWARD TRANSFER CHARACTERISTICS



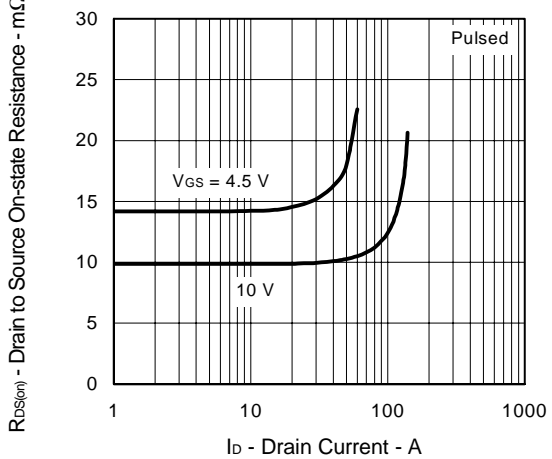
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



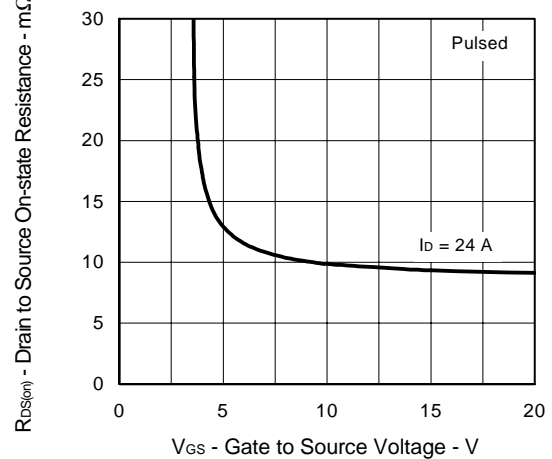
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



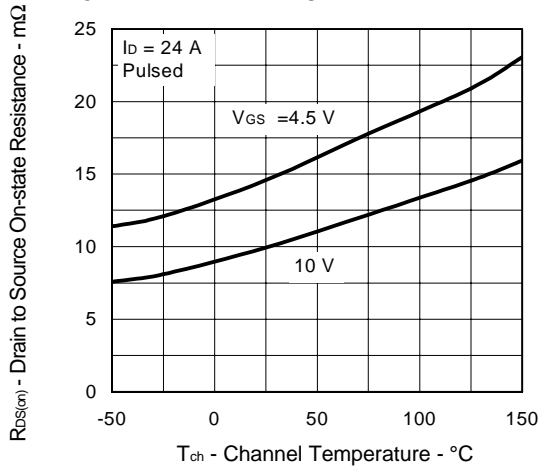
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



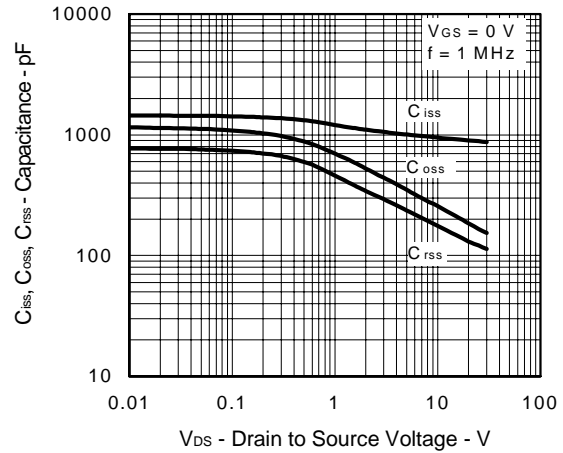
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



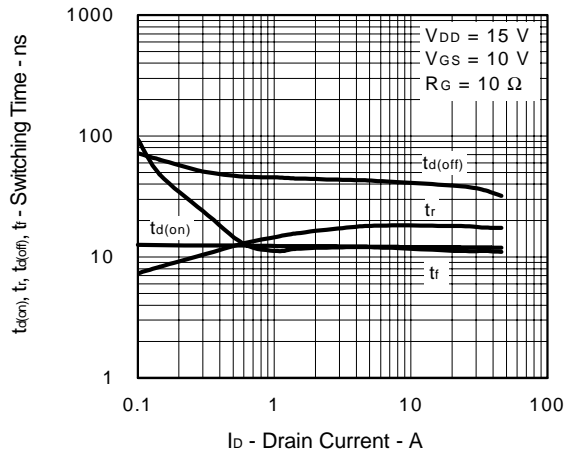
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



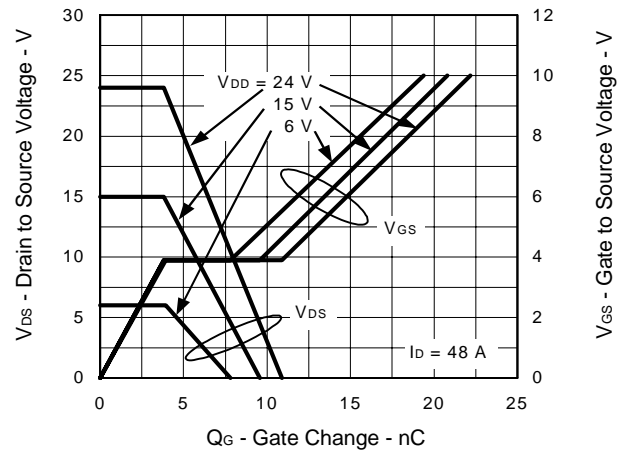
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



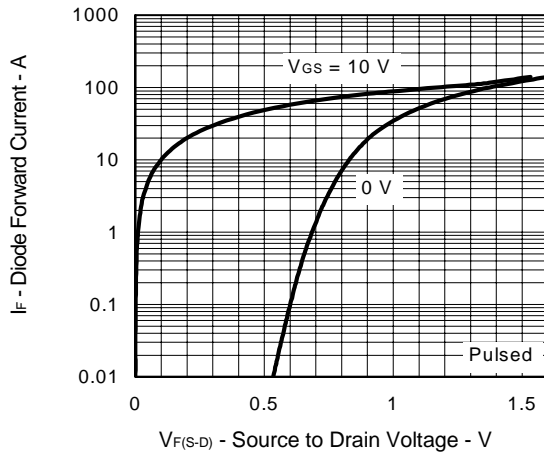
SWITCHING CHARACTERISTICS



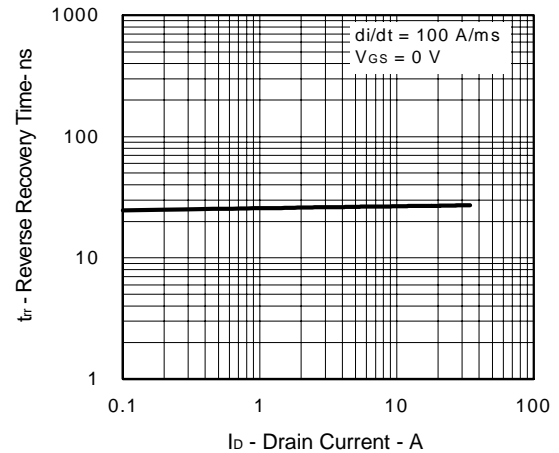
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



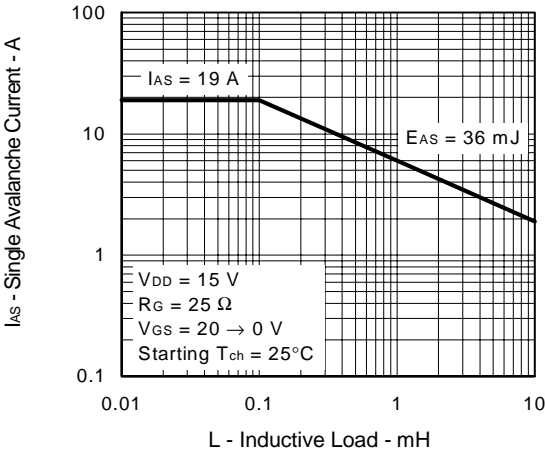
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



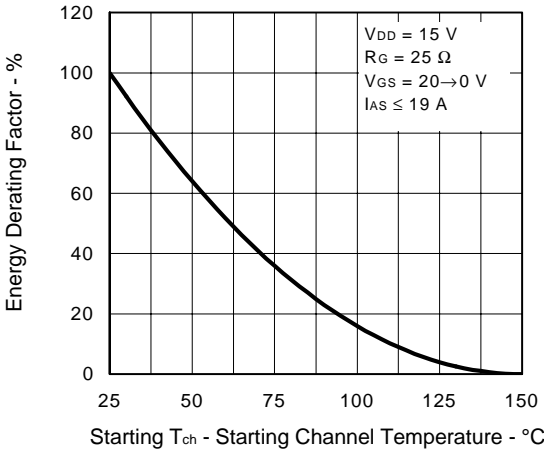
REVERSE RECOVERY TIME vs. DRAIN CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

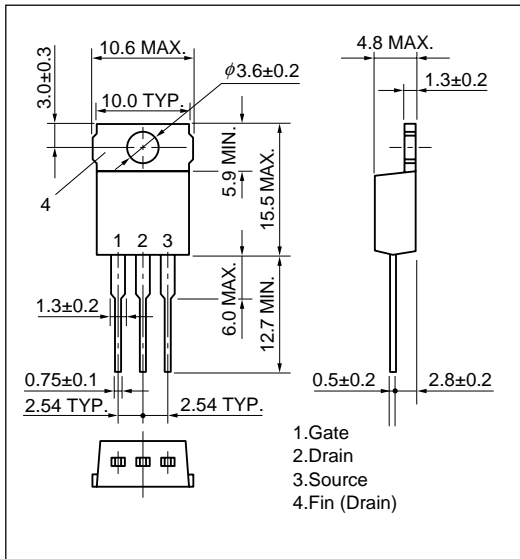


SINGLE AVALANCHE ENERGY DERATING FACTOR

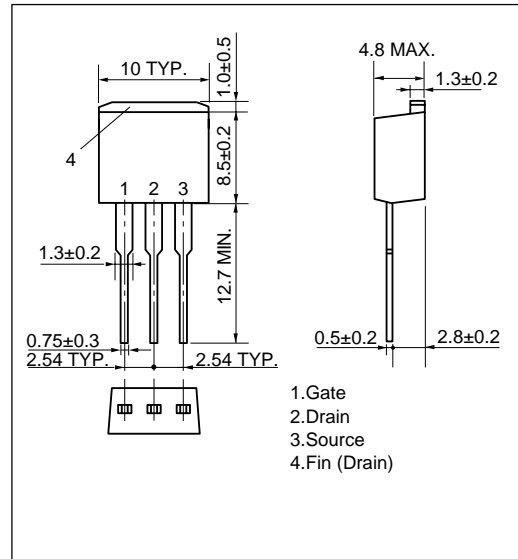


★ PACKAGE DRAWINGS (Unit: mm)

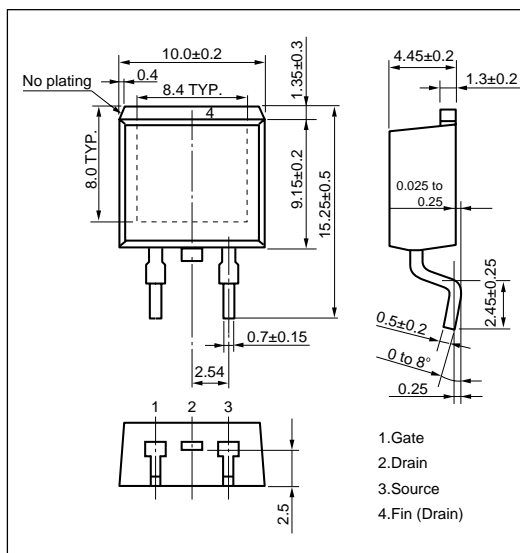
1) TO-220AB(MP-25)



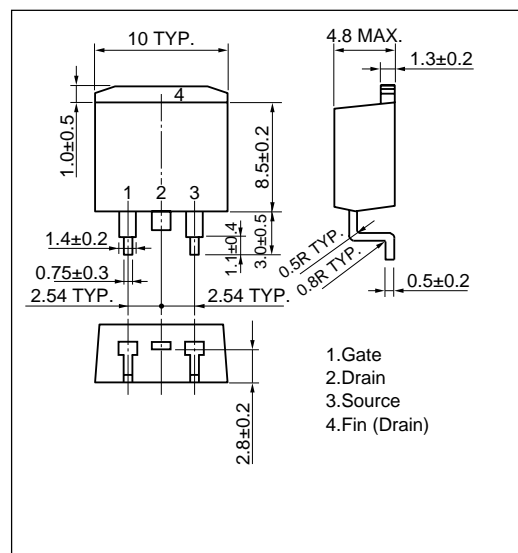
2) TO-262(MP-25 Fin Cut)



3) TO-263(MP-25ZK)

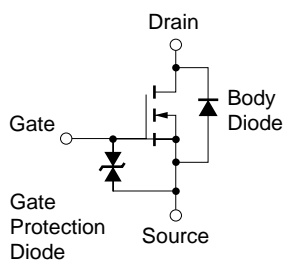


4) TO-220SMD(MP-25Z)<sup>Note</sup>



**Note** This package is produced only in Japan.

**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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