

## SWITCHING

### N-CHANNEL POWER MOS FET

#### DESCRIPTION

The 2SK3575 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  
 $R_{DS(on)1} = 4.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 42 \text{ A)}$
- Low gate charge  
 $Q_G = 70 \text{ nC TYP. (} V_{DD} = 24 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 83 \text{ A)}$
- 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) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 83$	A
Drain Current (pulse) <b>Note1</b>	$I_{D(pulse)}$	$\pm 332$	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T1}$	1.5	W
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T2}$	105	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>	$I_{AS}$	57	A
Single Avalanche Energy <b>Note2</b>	$E_{AS}$	325	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
2SK3575	TO-220AB
2SK3575-S	TO-262
2SK3575-ZK	TO-263
2SK3575-Z	TO-220SMD <sup>Note</sup>

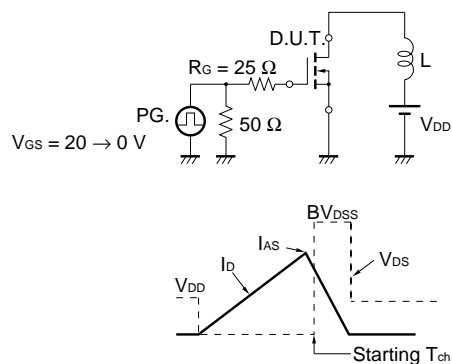
**Note** TO-220SMD package is produced only in Japan.

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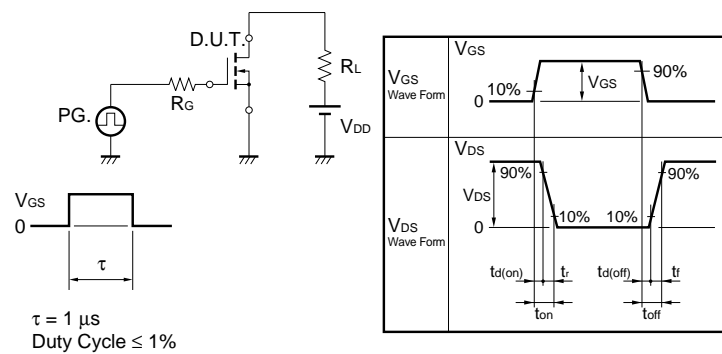
**ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

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	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			$\pm 100$	nA
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} $	$V_{DS} = 10\text{ V}, I_D = 42\text{ A}$	27			S
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 42\text{ A}$		3.3	4.5	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.5\text{ V}, I_D = 42\text{ A}$		4.3	6.4	$\text{m}\Omega$
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$		3700		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		1430		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1\text{ MHz}$		500		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, I_D = 42\text{ A}$		26		ns
Rise Time	$t_r$	$V_{GS} = 10\text{ V}$		27		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10\ \Omega$		110		ns
Fall Time	$t_f$			40		ns
Total Gate Charge	$Q_G$	$V_{DD} = 24\text{ V}$		70		nC
Gate to Source Charge	$Q_{GS}$	$V_{GS} = 10\text{ V}$		12		nC
Gate to Drain Charge	$Q_{GD}$	$I_D = 83\text{ A}$		20		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 83\text{ A}, V_{GS} = 0\text{ V}$		1.0		V
Reverse Recovery Time	$t_{rr}$	$I_F = 83\text{ A}, V_{GS} = 0\text{ V}$		61		ns
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100\text{ A}/\mu\text{s}$		94		nC

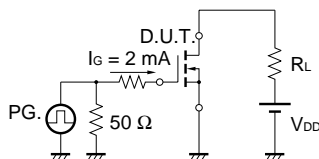
★ TEST CIRCUIT 1 AVALANCHE CAPABILITY



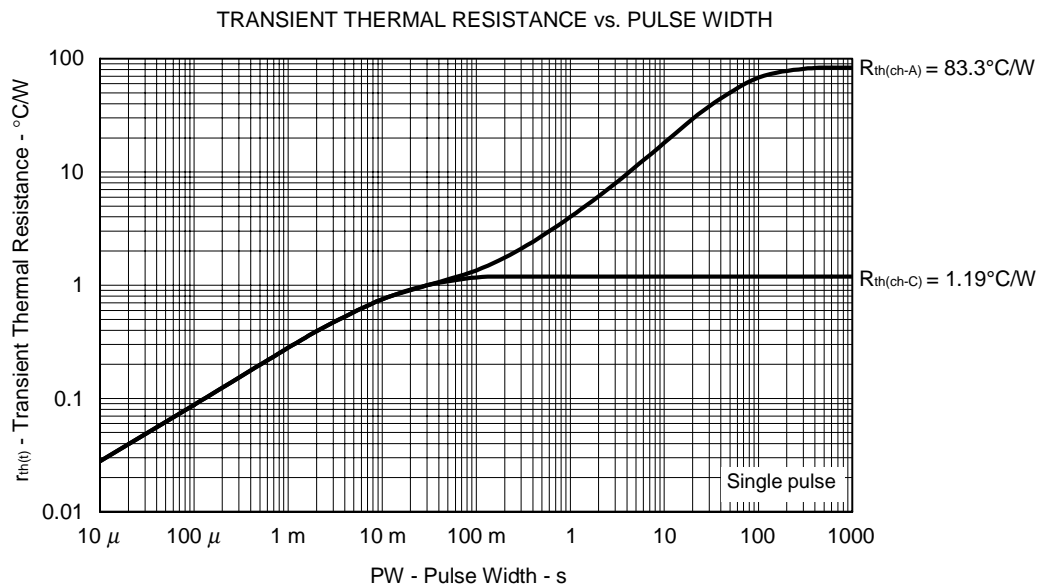
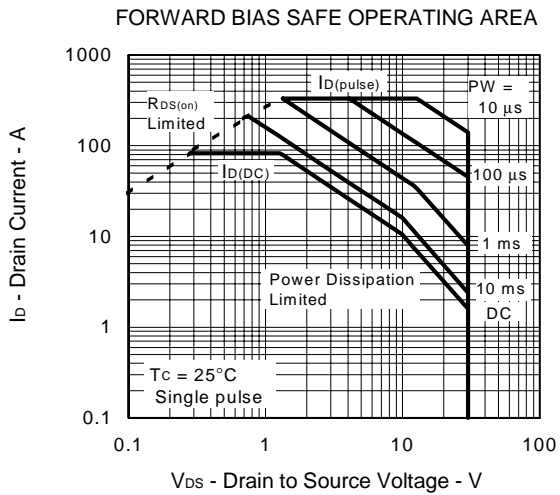
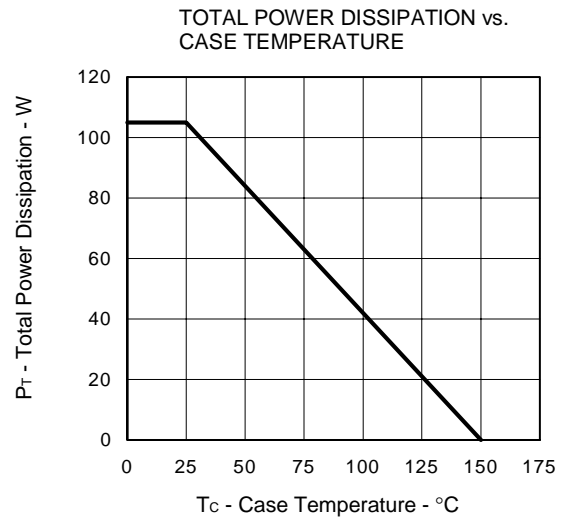
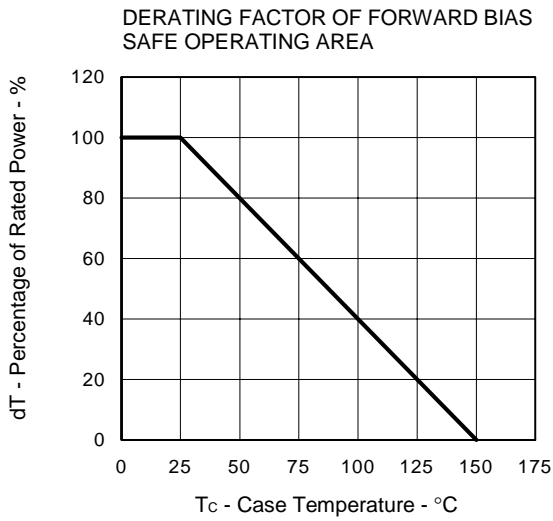
TEST CIRCUIT 2 SWITCHING TIME



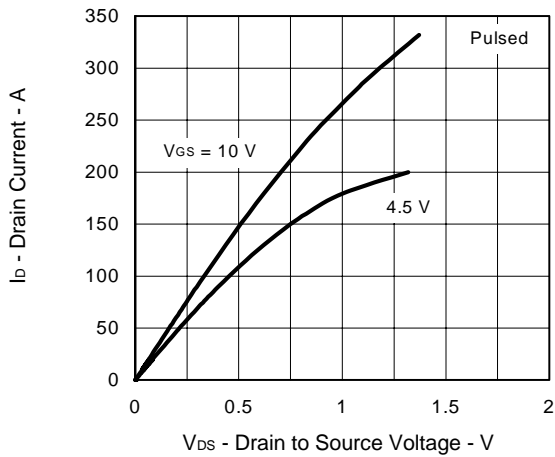
TEST CIRCUIT 3 GATE CHARGE



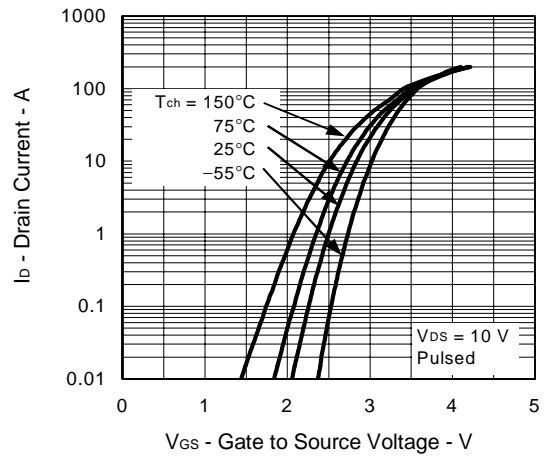
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



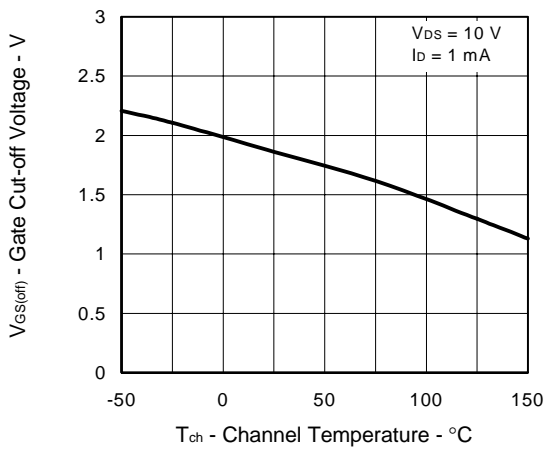
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



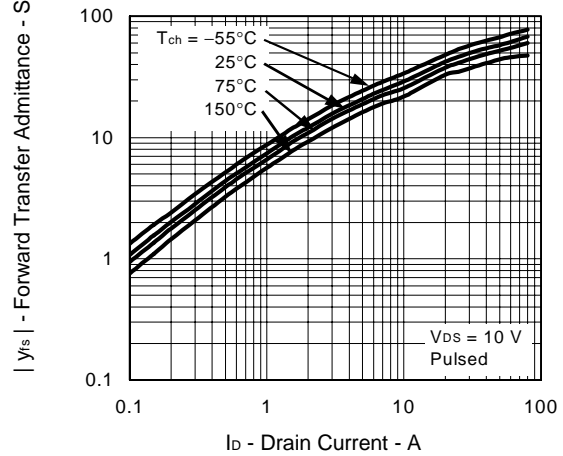
FORWARD TRANSFER CHARACTERISTICS



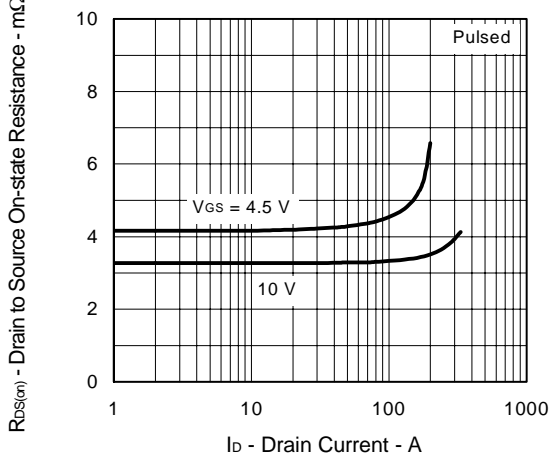
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



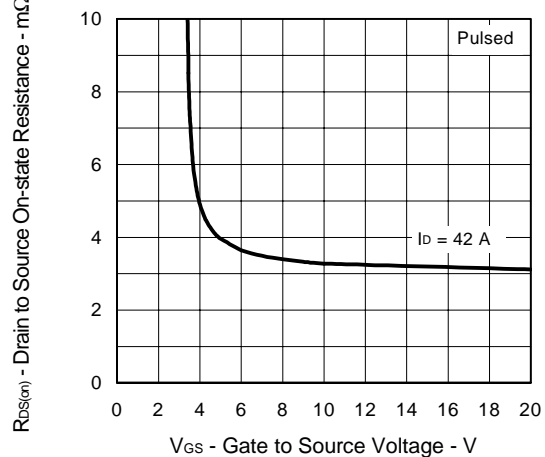
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



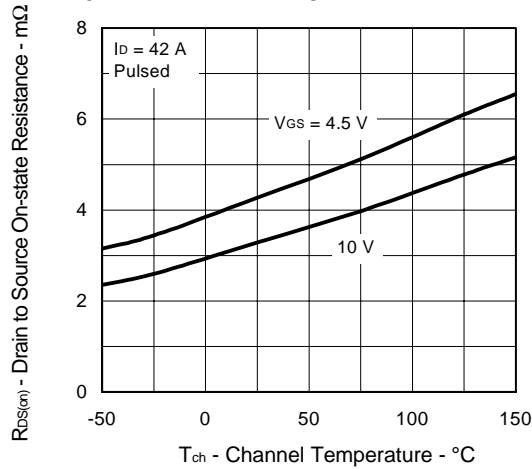
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



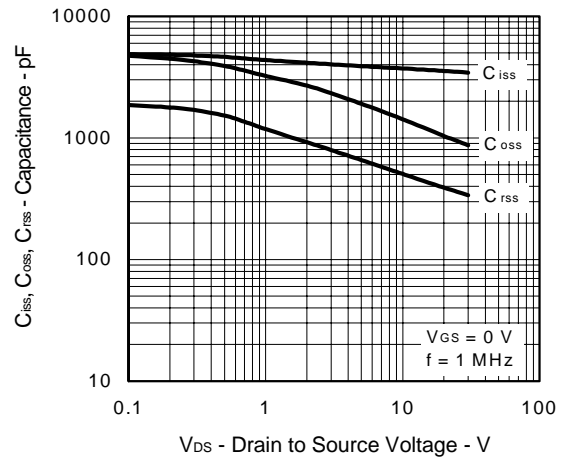
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



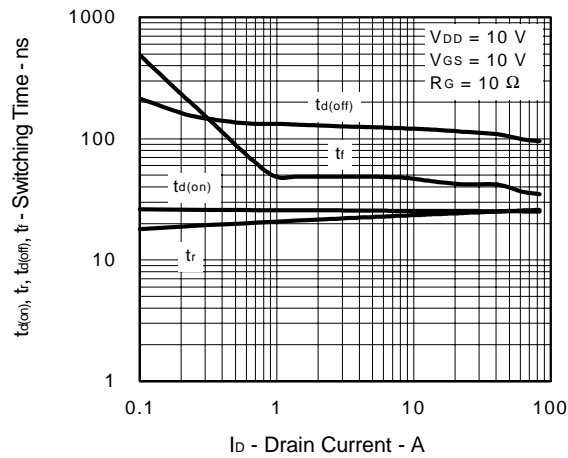
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



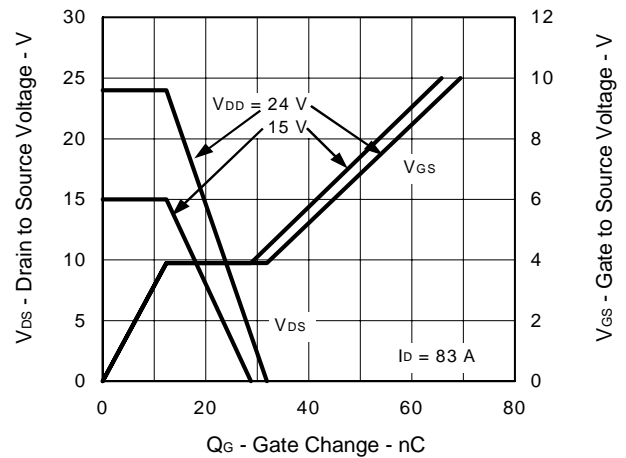
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



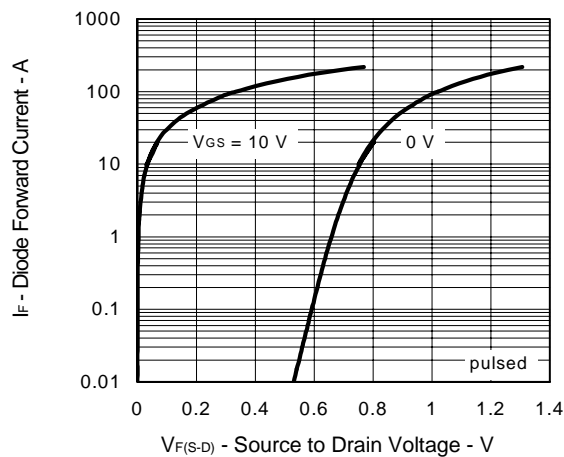
SWITCHING CHARACTERISTICS



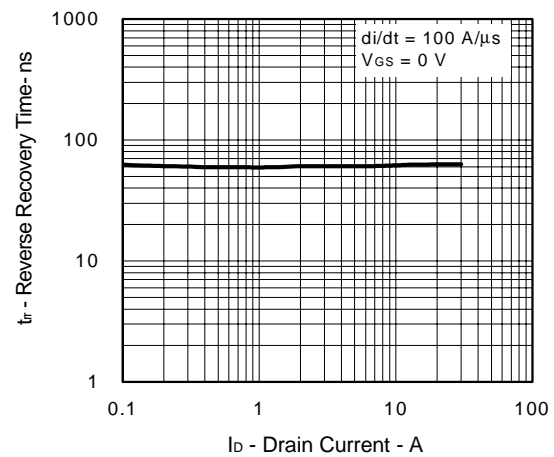
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



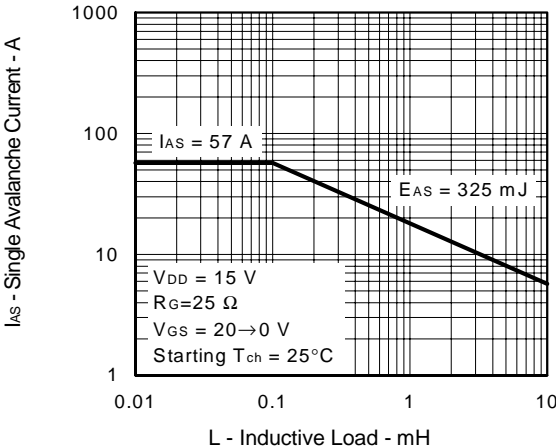
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



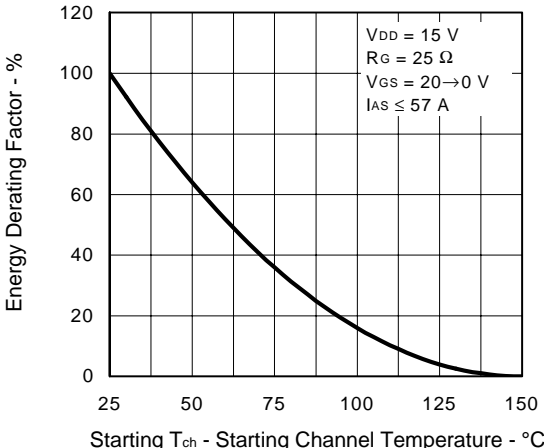
REVERSE RECOVERY TIME vs. DRAIN CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

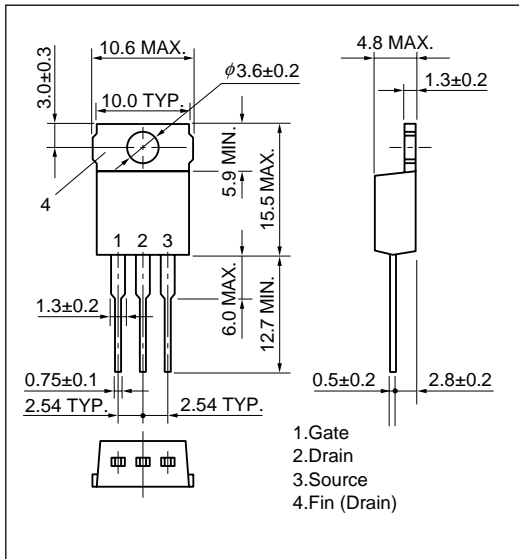


SINGLE AVALANCHE ENERGY DERATING FACTOR

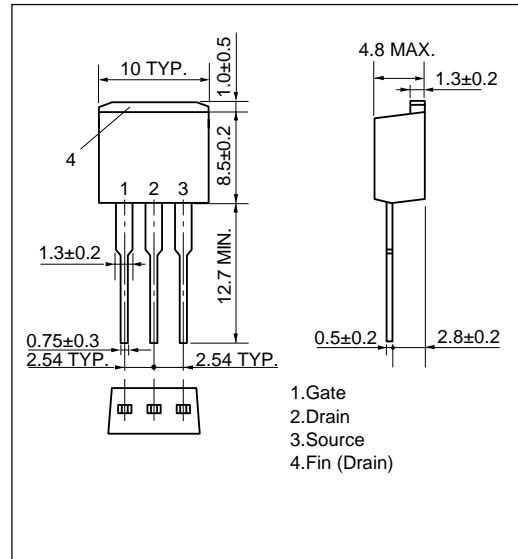


★ PACKAGE DRAWINGS (Unit: mm)

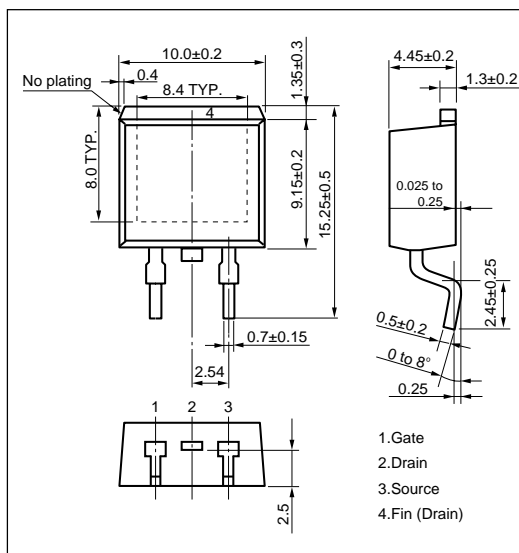
1) TO-220AB(MP-25)



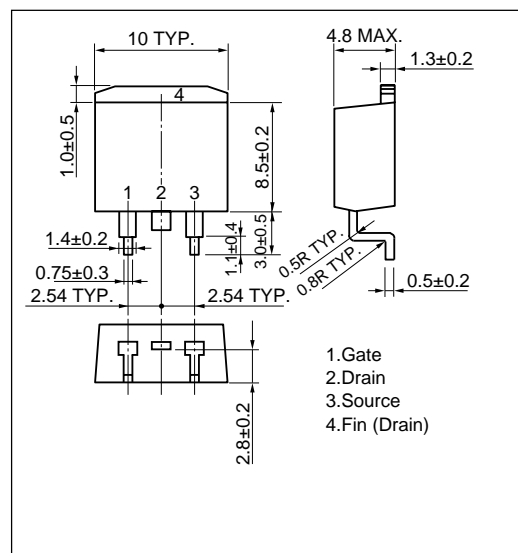
2) TO-262(MP-25 Fin Cut)



3) TO-263(MP-25ZK)

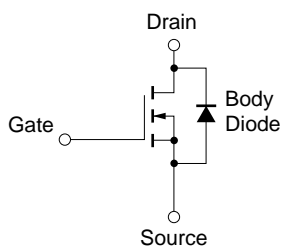


4) TO-220SMD(MP-25Z)<sup>Note</sup>



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

EQUIVALENT CIRCUIT



**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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