

## SWITCHING N-CHANNEL POWER MOS FET

**DESCRIPTION**

The 2SK3570 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,  
 $R_{DS(on)1} = 12 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 24 \text{ A)}$
- Low gate charge  
 $Q_G = 23 \text{ nC TYP. (} V_{DD} = 16 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 48 \text{ A)}$
- Built-in gate protection diode
- Surface mount device available

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)**

Drain to Source Voltage (V <sub>GS</sub> = 0 V)	V <sub>DSS</sub>	20	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	V <sub>GSS</sub>	±20	V
Drain Current (DC) (T <sub>c</sub> = 25°C)	I <sub>D(DC)</sub>	±48	A
Drain Current (pulse) <sup>Note</sup>	I <sub>D(pulse)</sub>	±160	A
Total Power Dissipation (T <sub>A</sub> = 25°C)	P <sub>T1</sub>	1.5	W
Total Power Dissipation (T <sub>c</sub> = 25°C)	P <sub>T2</sub>	29	W
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

**Note** PW ≤ 10 μs, Duty Cycle ≤ 1%

**★ ORDERING INFORMATION**

PART NUMBER	PACKAGE
2SK3570	TO-220AB
2SK3570-S	TO-262
2SK3570-ZK	TO-263
2SK3570-Z	TO-220SMD <sup>Note</sup>

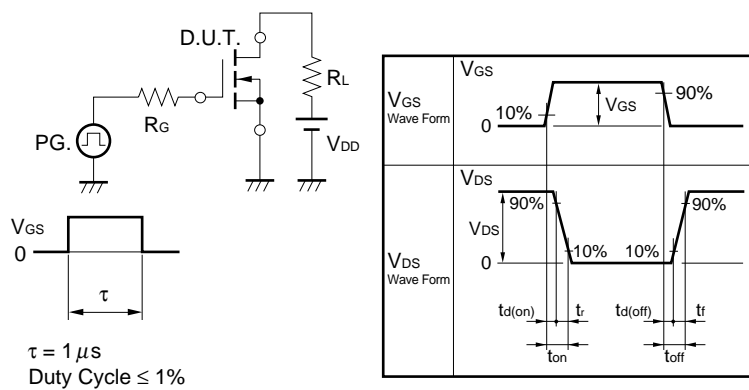
**Note** TO-220SMD package is produced only in Japan.

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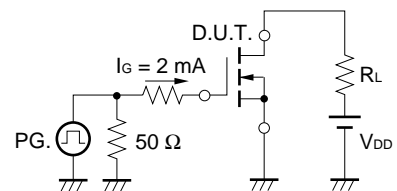
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	I <sub>bss</sub>	V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V			10	μA
Gate Leakage Current	I <sub>gss</sub>	V <sub>GS</sub> = ±20 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	1.5		2.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 24 A	8.0			S
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 24 A		8.2	12	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 15 A		12.3	22	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		930		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		250		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, I <sub>D</sub> = 24 A		13		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		20		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		39		ns
Fall Time	t <sub>f</sub>			14		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 16 V		23		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		4		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 48 A		7		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 48 A, V <sub>GS</sub> = 0 V		1.1		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 48 A, V <sub>GS</sub> = 0 V		33		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		25		nC

★ **TEST CIRCUIT 1 SWITCHING TIME**

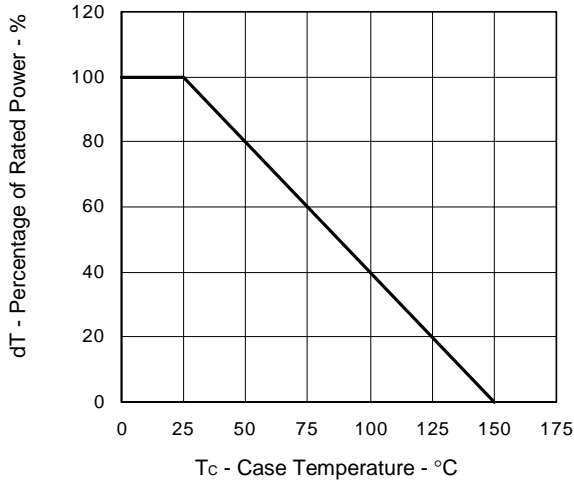


**TEST CIRCUIT 2 GATE CHARGE**

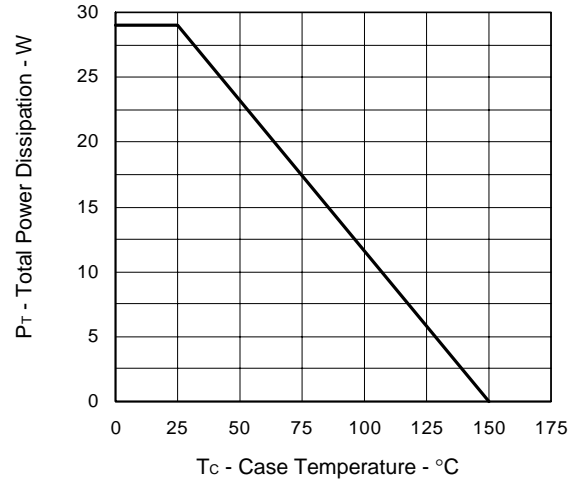


★ TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

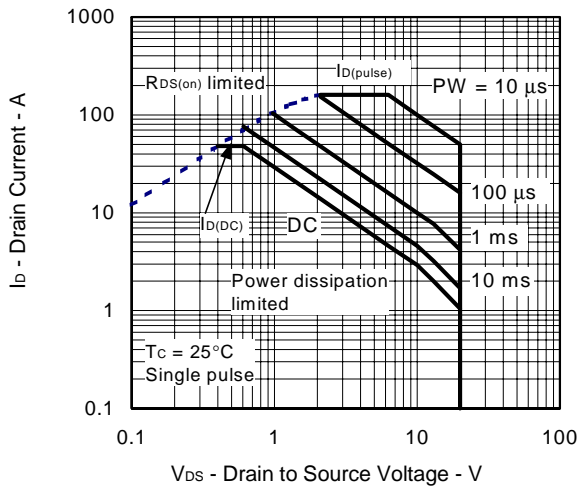
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



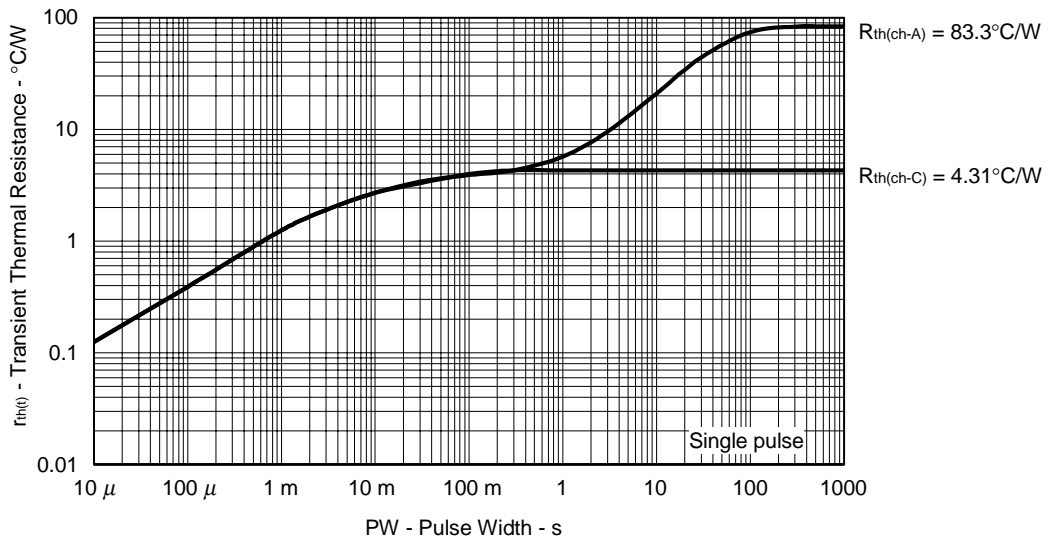
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



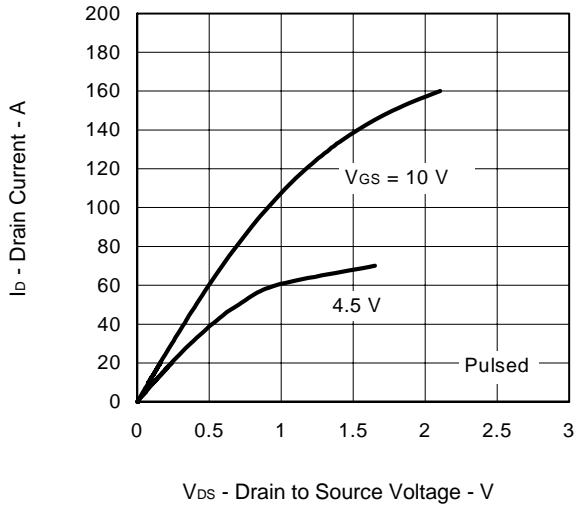
FORWARD BIAS SAFE OPERATING AREA



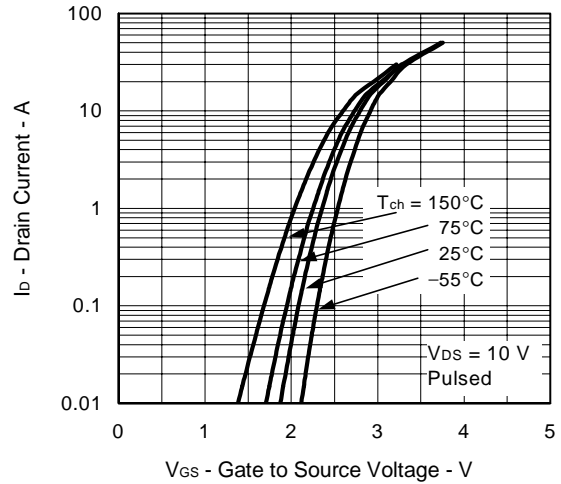
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



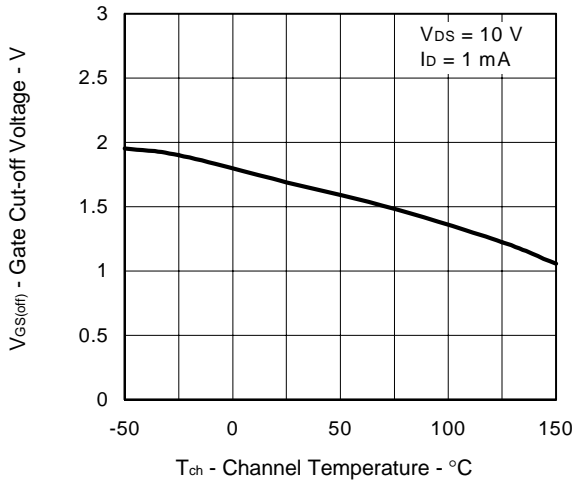
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



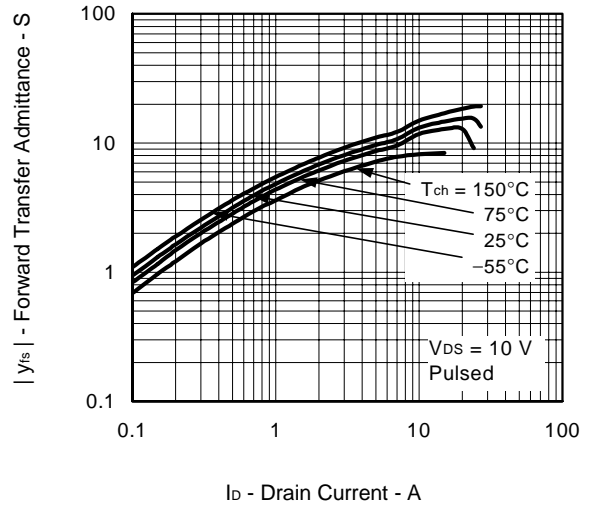
FORWARD TRANSFER CHARACTERISTICS



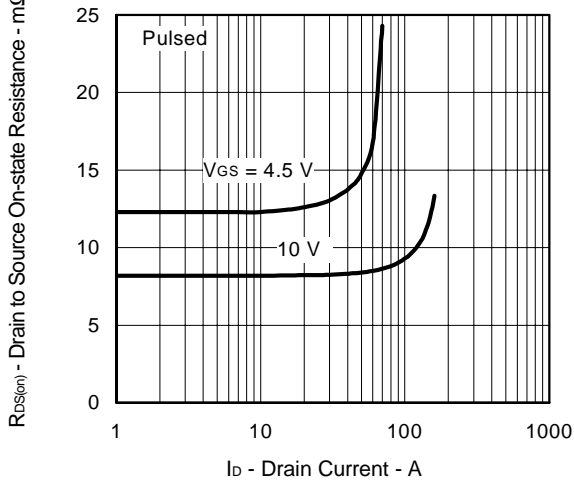
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



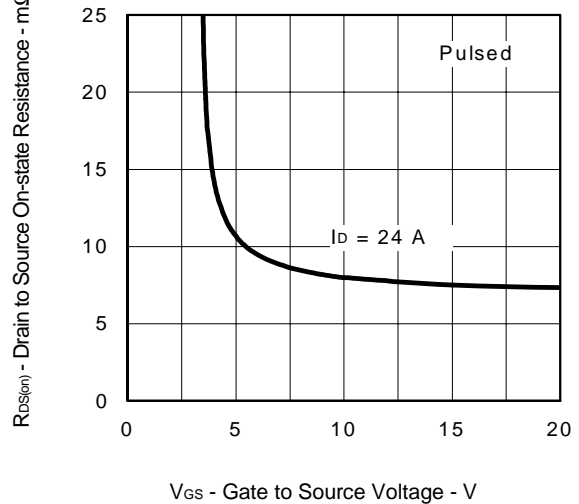
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



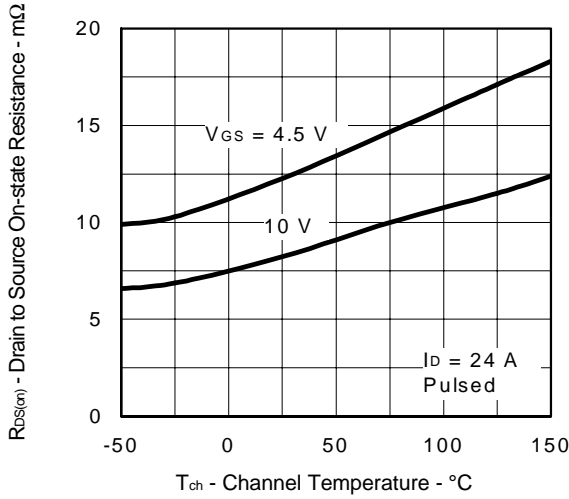
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



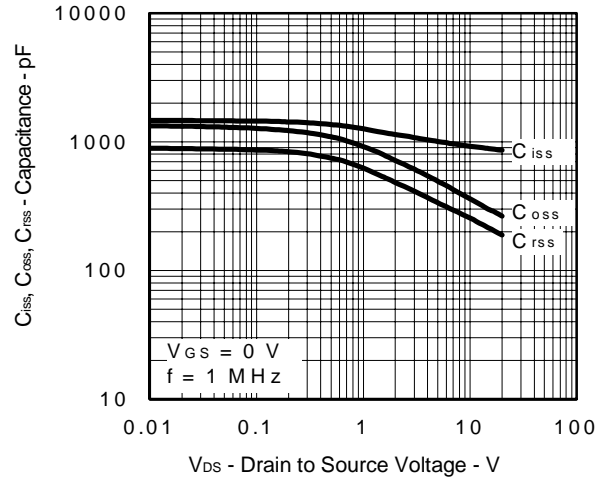
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



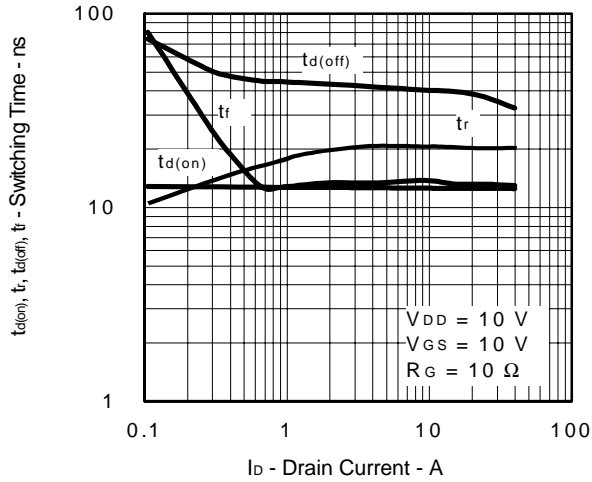
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



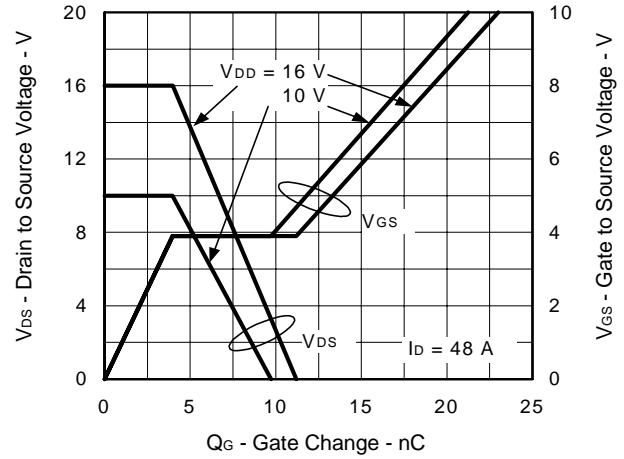
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



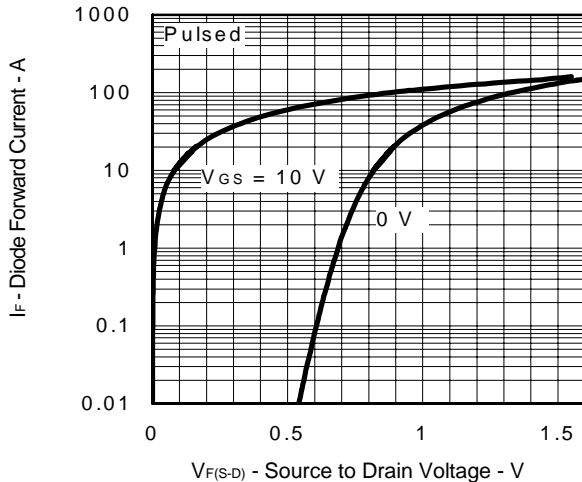
SWITCHING CHARACTERISTICS



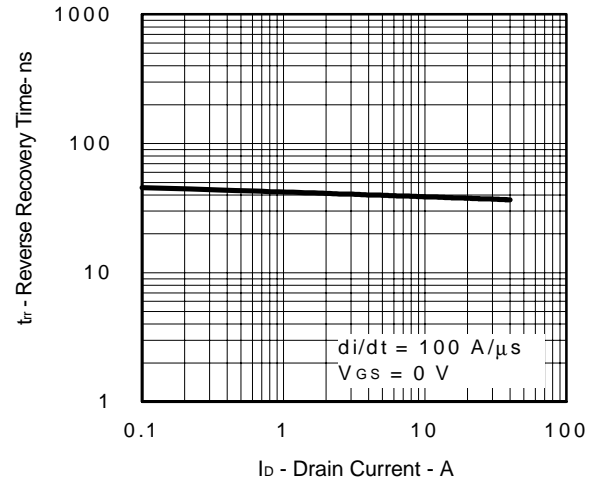
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

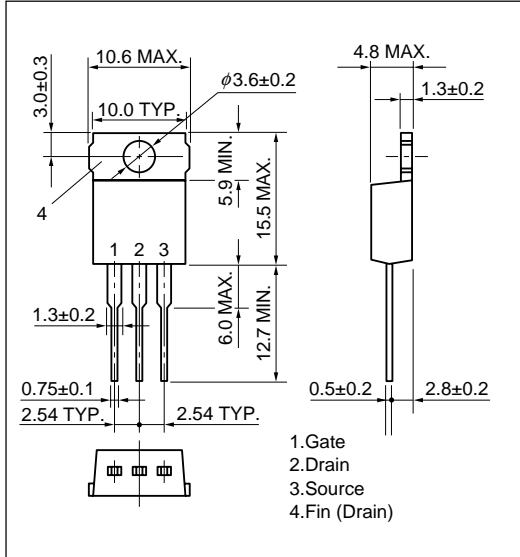


REVERSE RECOVERY TIME vs. DRAIN CURRENT

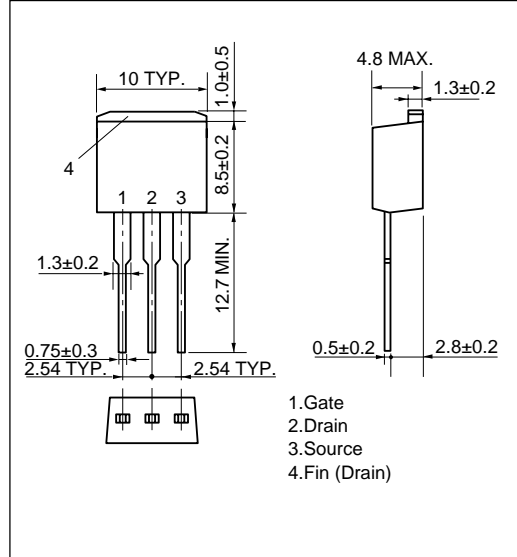


★ PACKAGE DRAWINGS (Unit: mm)

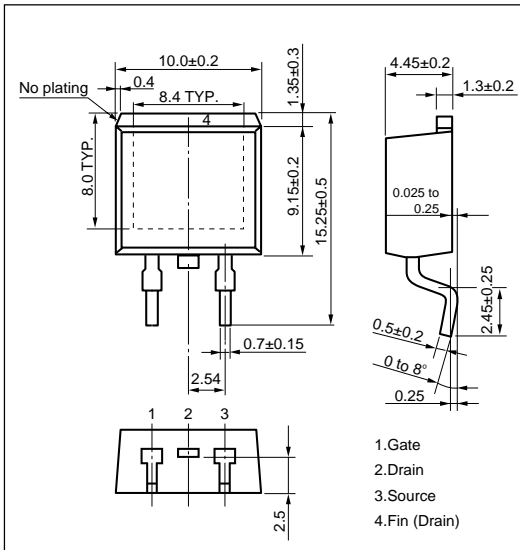
1) TO-220AB (MP-25)



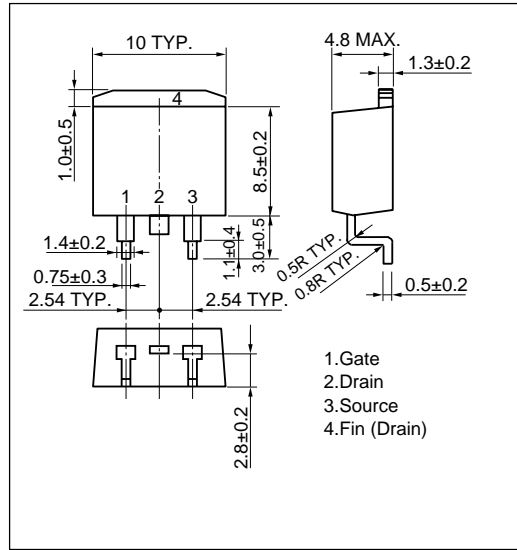
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZK)

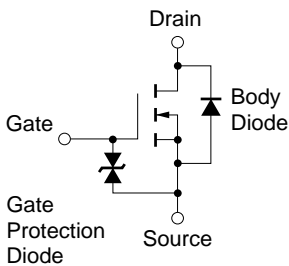


4) TO-220SMD (MP-25Z) **Note**



**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.

[MEMO]

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