NEC

MOS FIELD EFFECT TRANSISTOR
2SK3570

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 mΩ MAX. (V_{GS} = 10 V, I_D = 24 A)
- Low gate charge
  Q_G = 23 nC TYP. (V_{DD} = 16 V, V_{GS} = 10 V, I_D = 48 A)
- Built-in gate protection diode
- Surface mount device available

★ ORDERING INFORMATION

PART NUMBER	PACKAGE
2SK3570	TO-220AB
2SK3570-S	TO-262
2SK3570-ZK	TO-263
2SK3570-Z	TO-220SMD **Note**

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

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	20	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±48	A
Drain Current (pulse) **Note**	$I_{D(pulse)}$	±160	A
Total Power Dissipation (T_A = 25°C)	P_{T1}	1.5	W
Total Power Dissipation (T_C = 25°C)	P_{T2}	29	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Note PW ≤ 10 μs, Duty Cycle ≤ 1%

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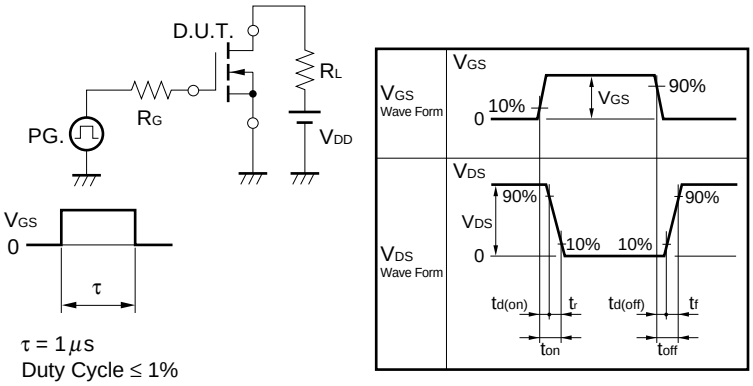
The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

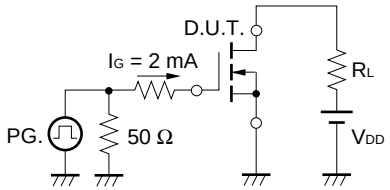
Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	1.5		2.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 24 A	8.0			S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 24 A		8.2	12	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 15 A		12.3	22	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		930		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		360		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		250		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 10 V, I_D = 24 A		13		ns
Rise Time	t_r	V_{GS} = 10 V		20		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		39		ns
Fall Time	t_f			14		ns
Total Gate Charge	Q_G	V_{DD} = 16 V		23		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		4		nC
Gate to Drain Charge	Q_{GD}	I_D = 48 A		7		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 48 A, V_{GS} = 0 V		1.1		V
Reverse Recovery Time	t_{rr}	I_F = 48 A, V_{GS} = 0 V		33		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		25		nC

★ **TEST CIRCUIT 1 SWITCHING TIME**



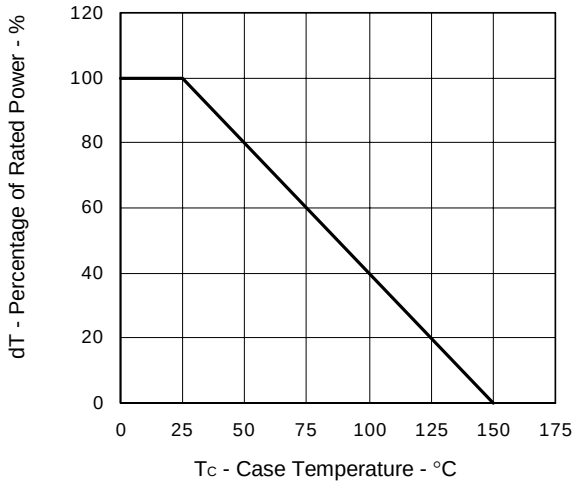
τ = 1 μs
Duty Cycle ≤ 1%

TEST CIRCUIT 2 GATE CHARGE

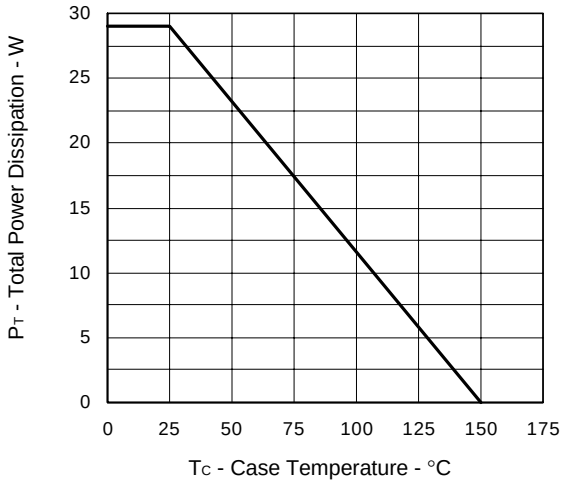


★ TYPICAL CHARACTERISTICS (T_A = 25°C)

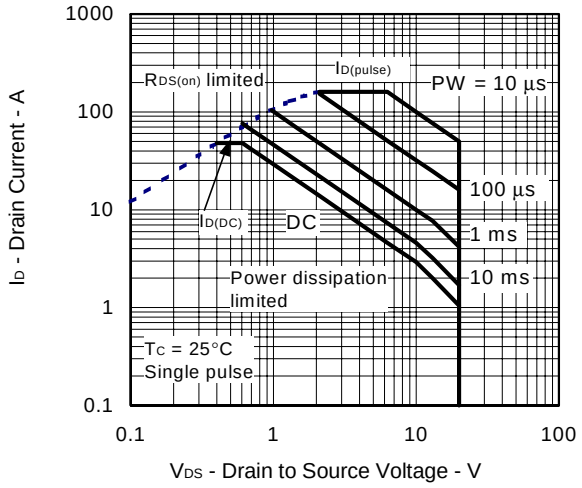
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



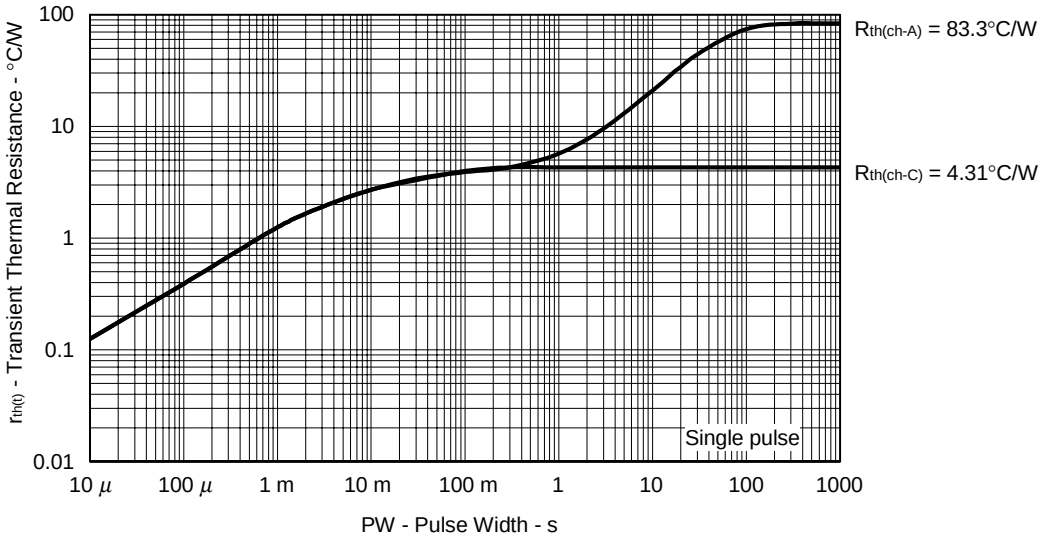
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



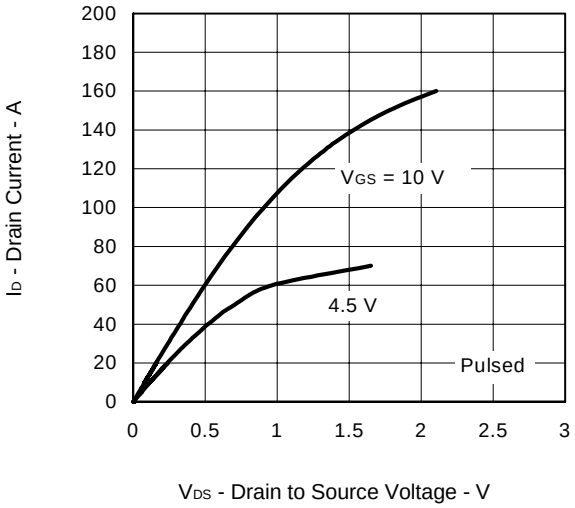
FORWARD BIAS SAFE OPERATING AREA



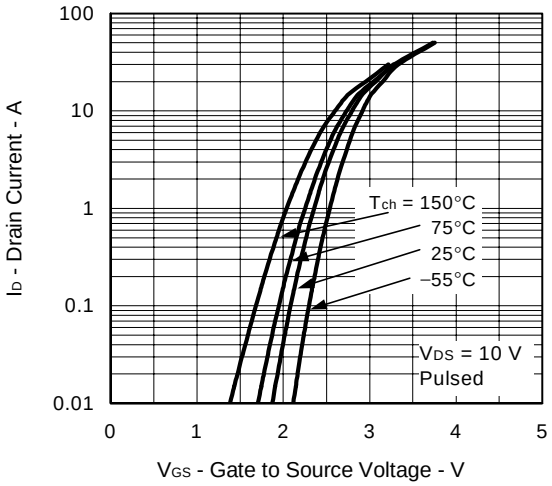
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



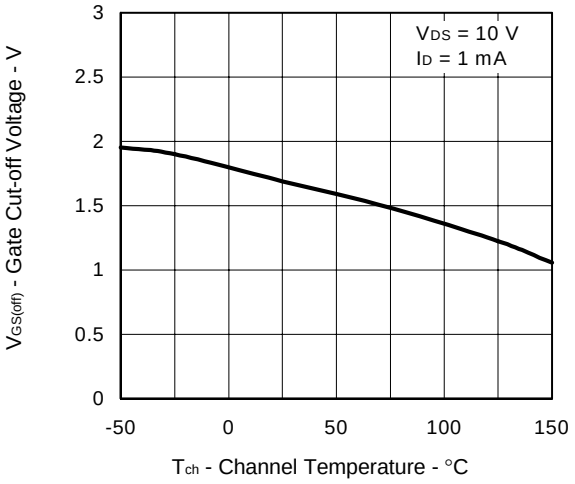
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



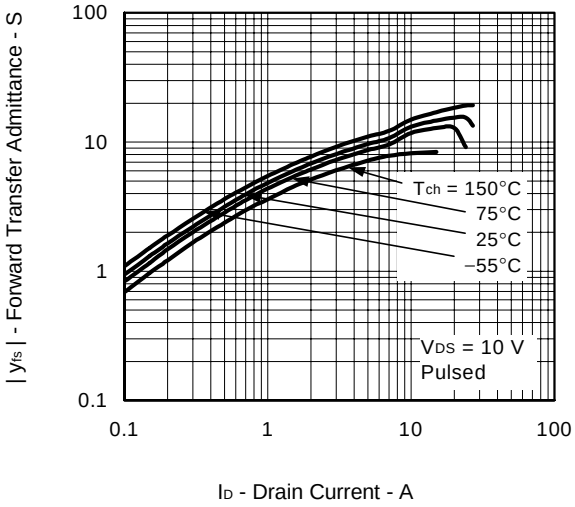
FORWARD TRANSFER CHARACTERISTICS



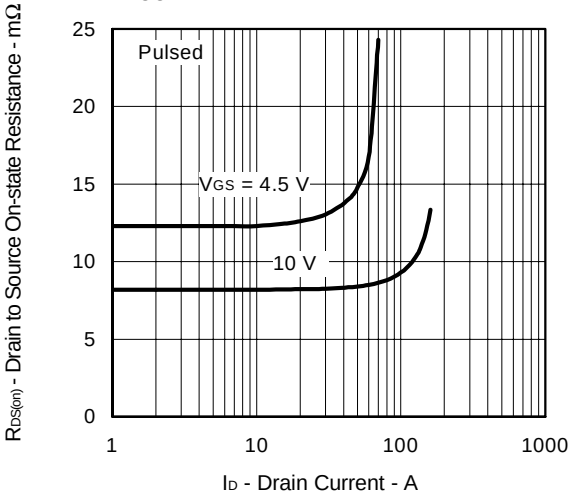
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



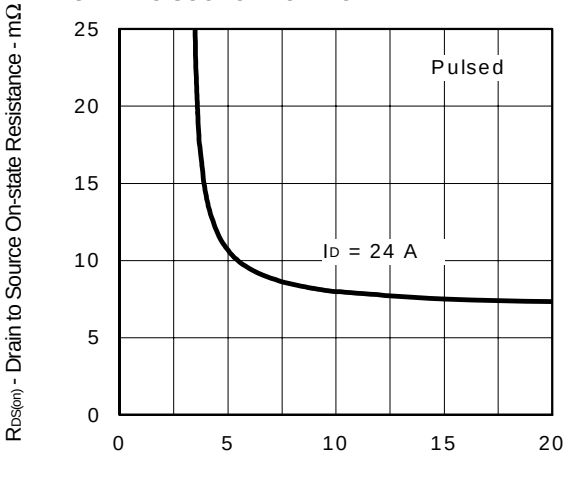
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



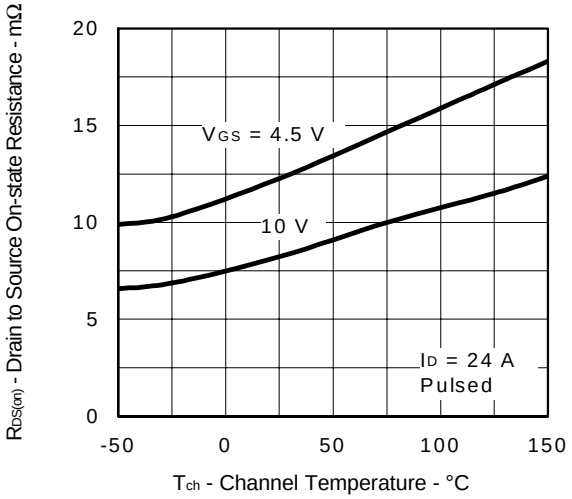
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



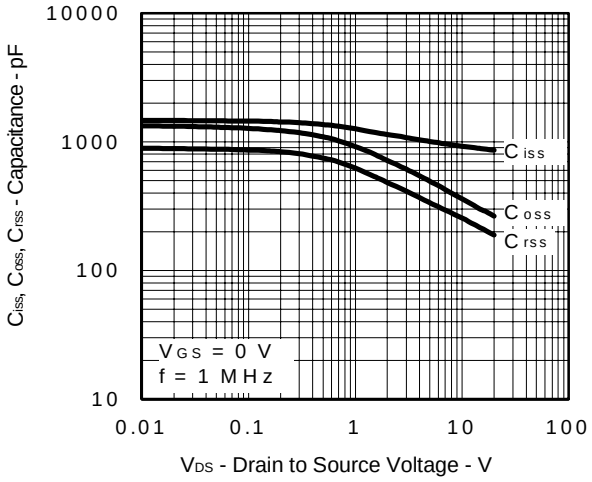
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



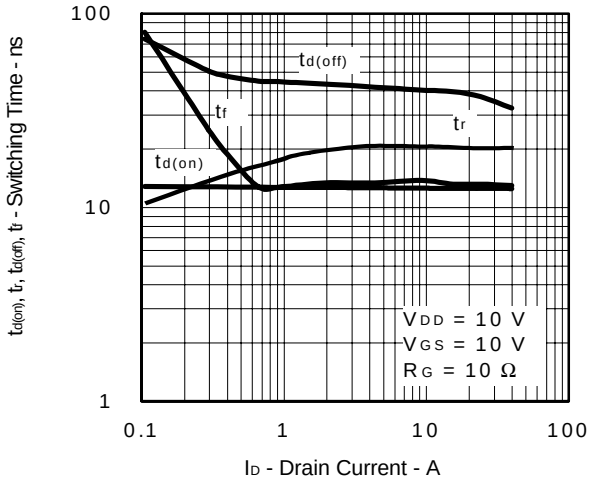
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



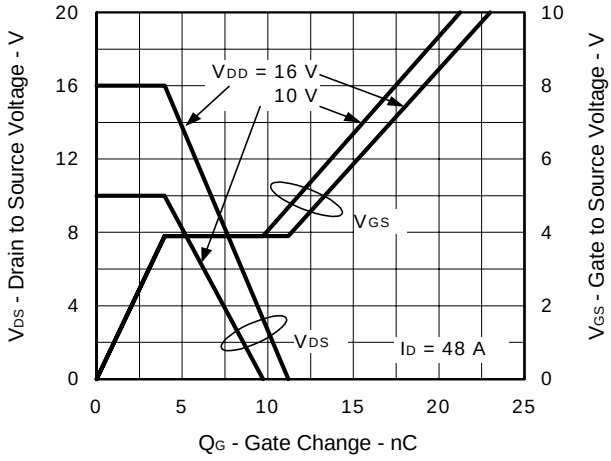
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



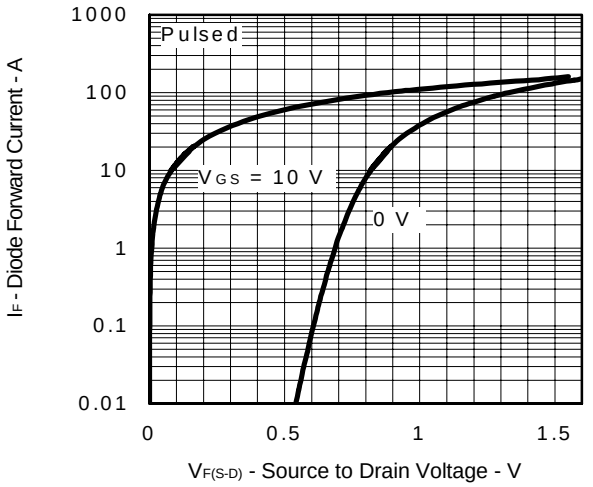
SWITCHING CHARACTERISTICS



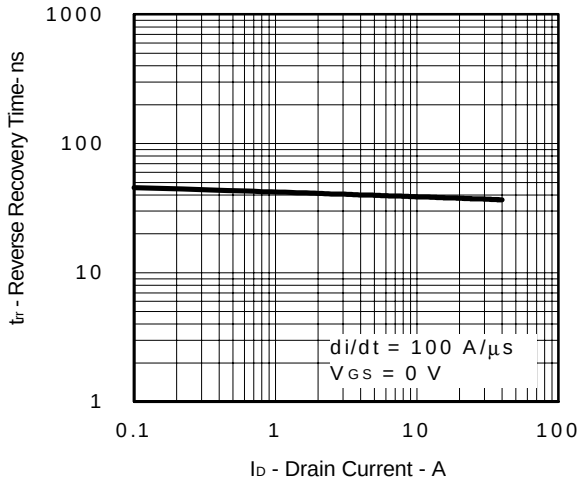
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

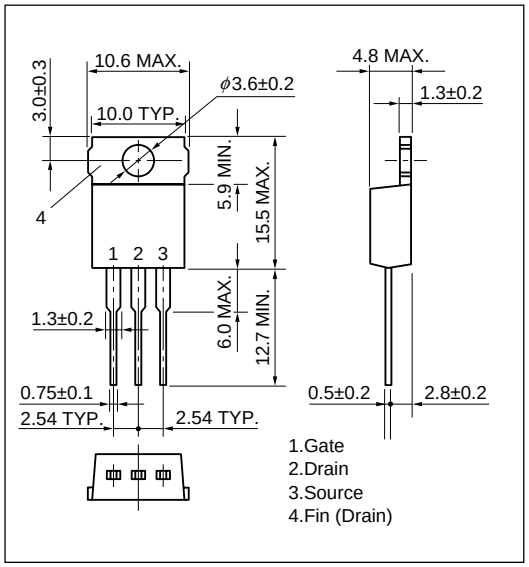


REVERSE RECOVERY TIME vs. DRAIN CURRENT

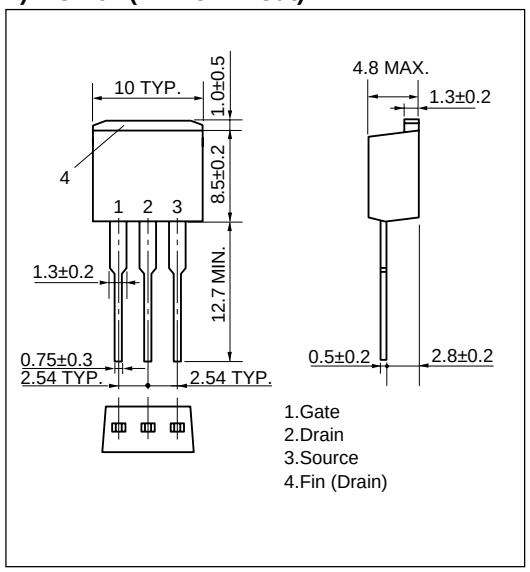


★ PACKAGE DRAWINGS (Unit: mm)

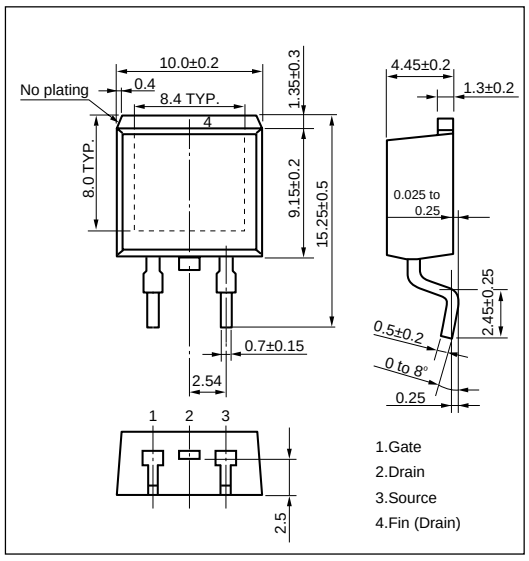
1) TO-220AB (MP-25)



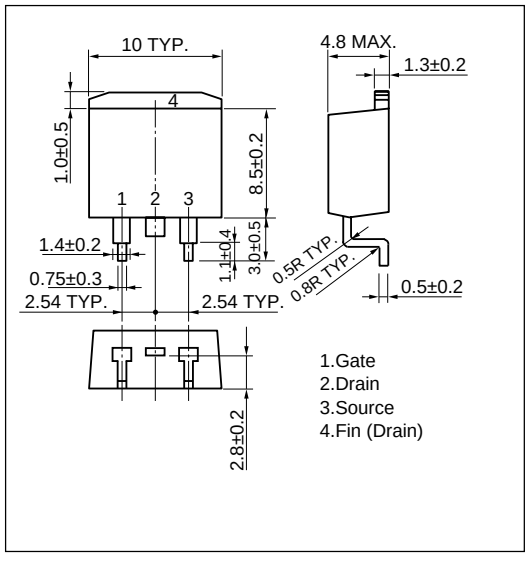
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZK)



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



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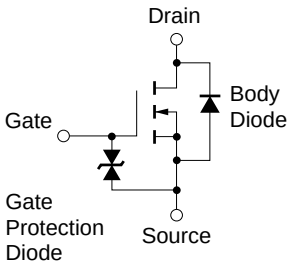
EQUIVALENT CIRCUIT



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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