NEC

MOS FIELD EFFECT TRANSISTOR
2SK3056

SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

DESCRIPTION

The 2SK3056 is N-Channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES

- Low On-state Resistance
  $R_{DS(on)1}$ = 34 mΩ MAX. (V_{GS} = 10 V, I_D = 16 A)
  $R_{DS(on)2}$ = 50 mΩ MAX. (V_{GS} = 4.0 V, I_D = 16 A)
- Low C_{iss} : C_{iss} = 920 pF TYP.
- Built-in Gate Protection Diode

ORDERING INFORMATION

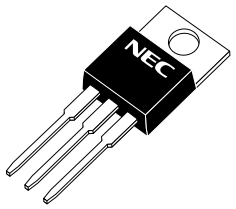
PART NUMBER	PACKAGE
2SK3056	TO-220AB
2SK3056-S	TO-262
2SK3056-ZJ	TO-263
★ 2SK3056-Z	TO-220SMD[Note]

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

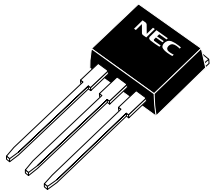
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	60	V
Gate to Source Voltage (V_{DS} = 0 V)	$V_{GSS(AC)}$	±20	V
Gate to Source Voltage (V_{DS} = 0 V)	$V_{GSS(DC)}$	+20, –10	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	±32	A
Drain Current (pulse) [Note1]	$I_{D(pulse)}$	±100	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	34	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	1.5	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current [Note2]	I_{AS}	16	A
Single Avalanche Energy [Note2]	E_{AS}	25.6	mJ

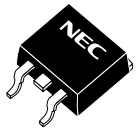
(TO-220AB)



(TO-262)



(TO-263, TO-220SMD)



Notes 1. PW ≤ 10 μs, Duty cycle ≤ 1%

★ **2.** Starting Tch = 25°C, V_{DD} = 30 V, R_G = 25 Ω, V_{GS} = 20 → 0 V

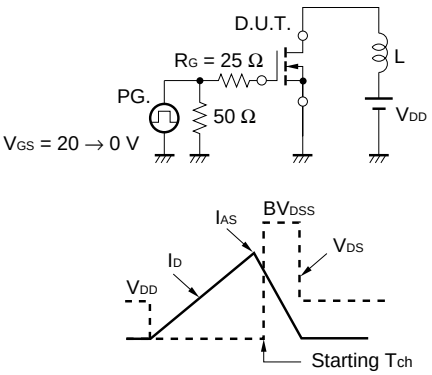
Document No. D13095EJ2V0DS00 (2nd edition)
Date Published April 2001 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

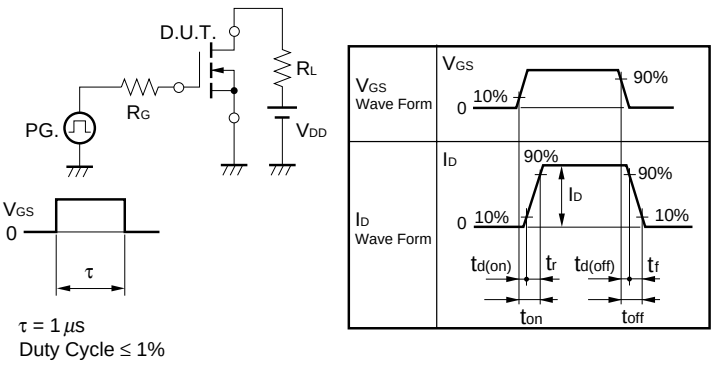
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 60 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	1.0	1.5	2.0	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 16 A	8.0	20		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 16 A		24	34	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.0 V, I_D = 16 A		35	50	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		920		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		280		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		120		pF
Turn-on Delay Time	$t_{d(on)}$	I_D = 16 A		25		ns
Rise Time	t_r	V_{GS} = 10 V		300		ns
Turn-off Delay Time	$t_{d(off)}$	V_{DD} = 30 V		70		ns
Fall Time	t_f	R_G = 10 Ω		120		ns
Total Gate Charge	Q_G	I_D = 32 A		25		nC
Gate to Source Charge	Q_{GS}	V_{DD} = 48 V		3.3		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = 10 V		7.0		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 32 A, V_{GS} = 0 V		1.0		V
Reverse Recovery Time	t_{rr}	I_F = 32A, V_{GS} = 0 V		50		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100A/μs		68		nC

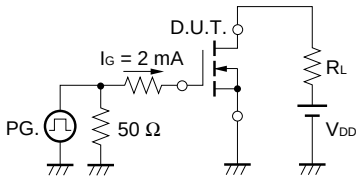
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

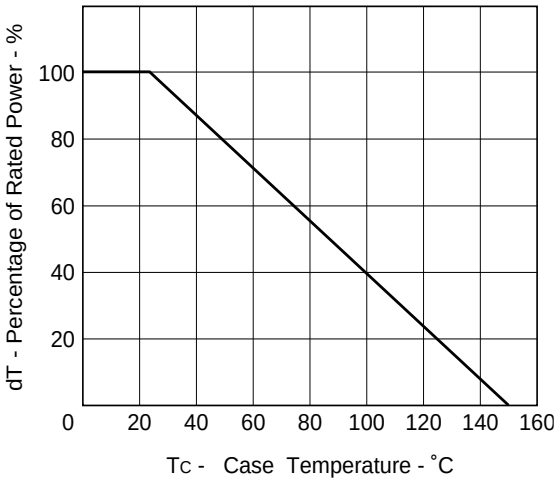


TEST CIRCUIT 3 GATE CHARGE

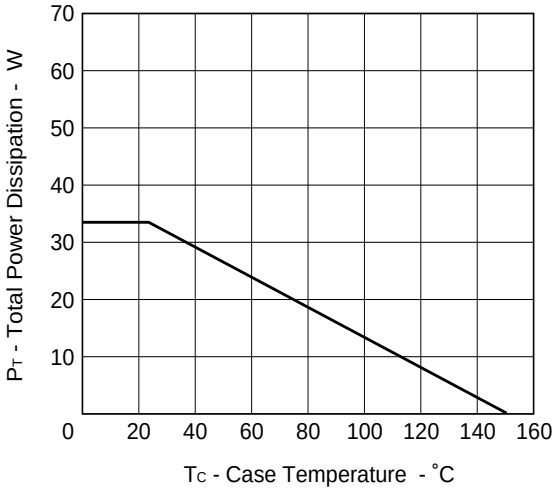


TYPICAL CHARACTERISTICS (T_A = 25°C)

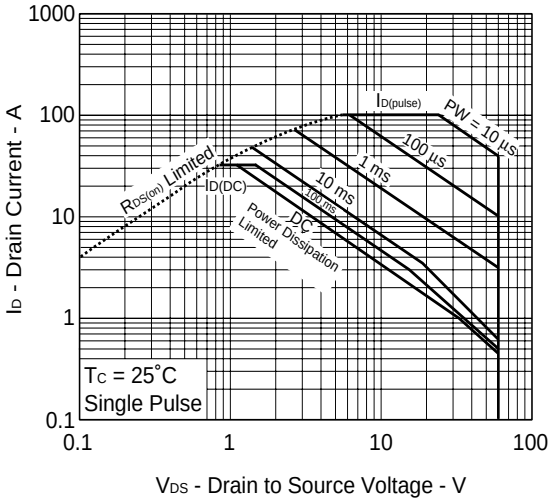
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



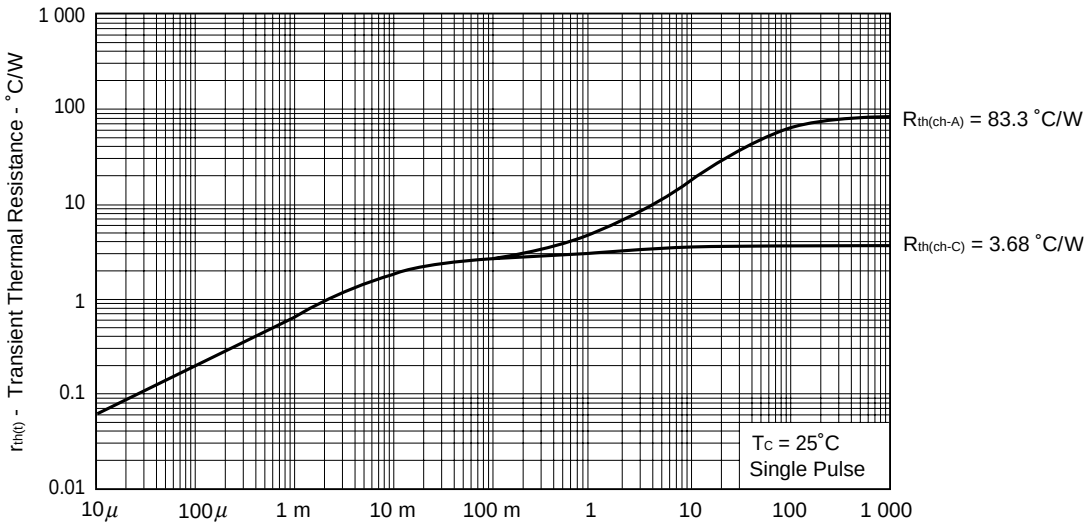
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



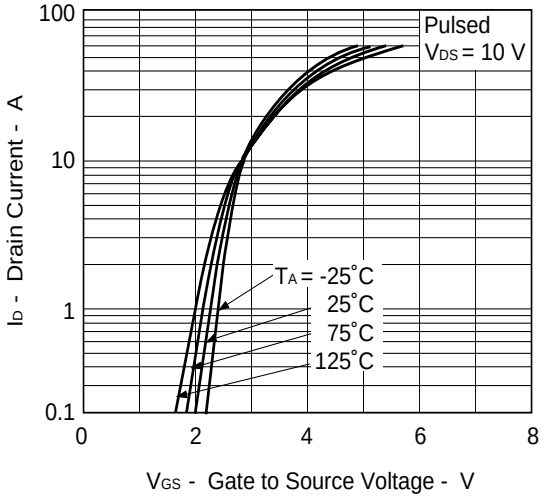
★ FORWARD BIAS SAFE OPERATING AREA



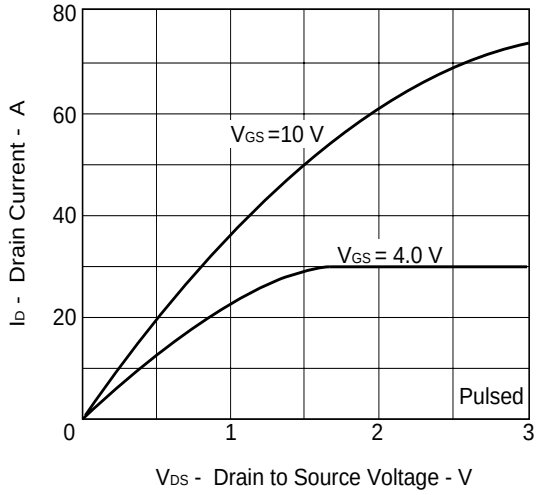
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



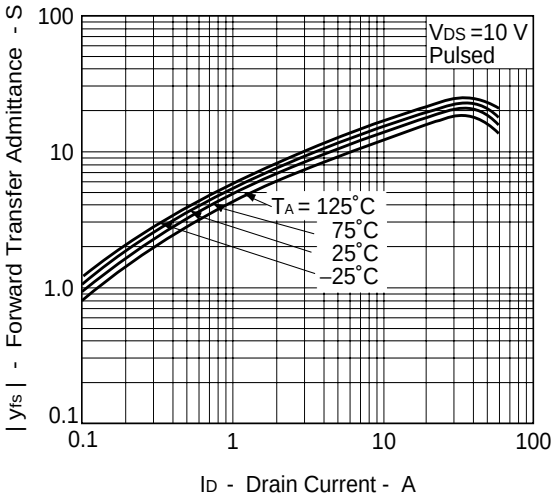
FORWARD TRANSFER CHARACTERISTICS



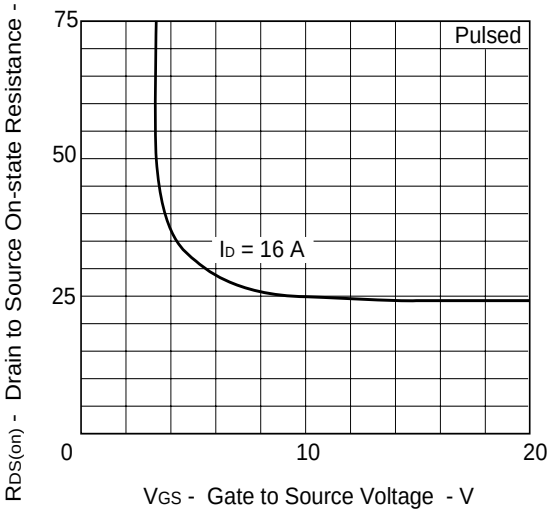
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



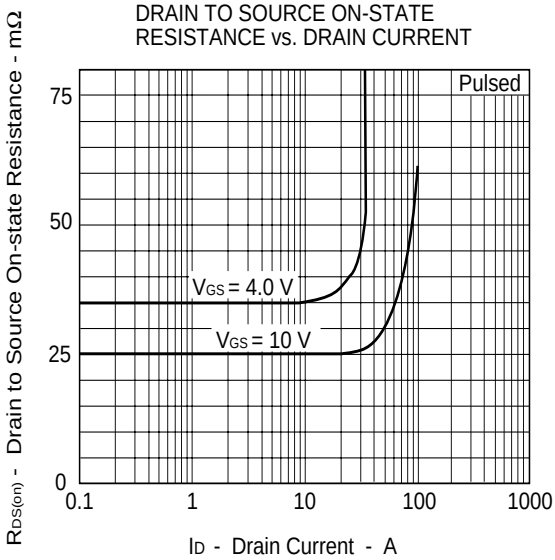
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



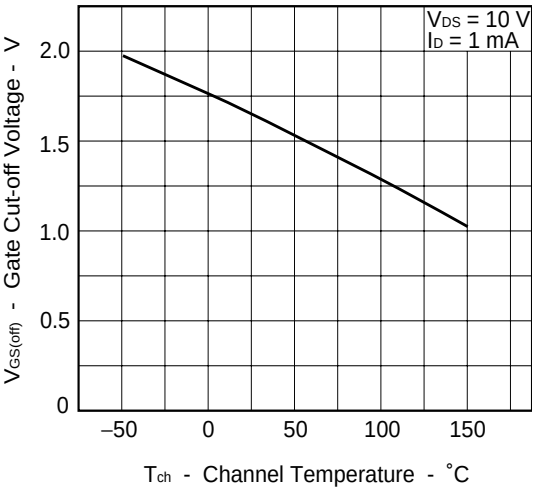
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



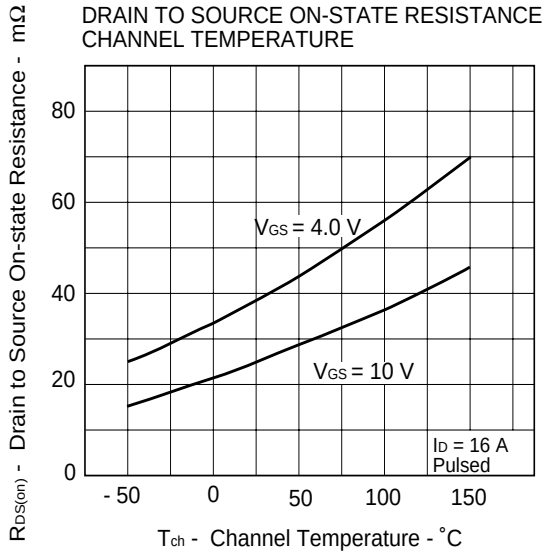
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



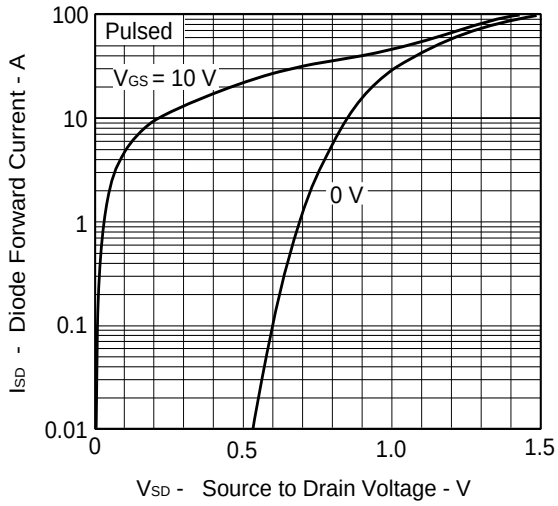
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



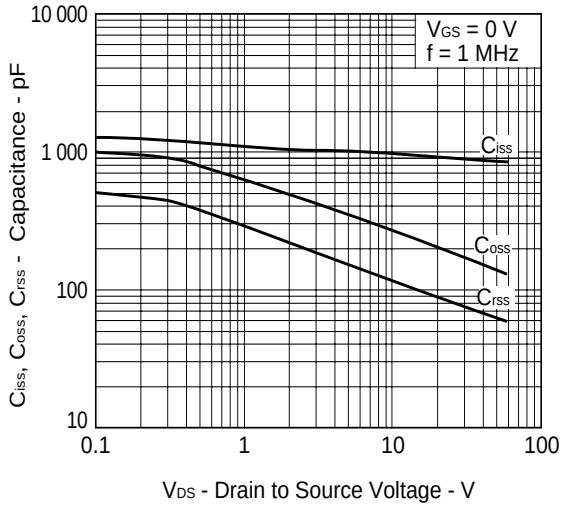
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



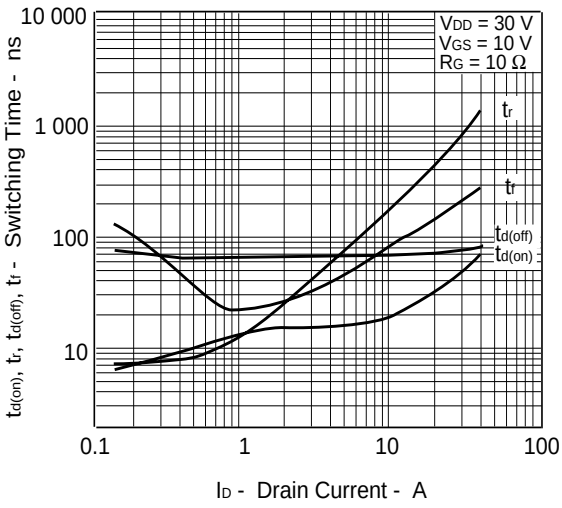
★ SOURCE TO DRAIN DIODE FORWARD VOLTAGE



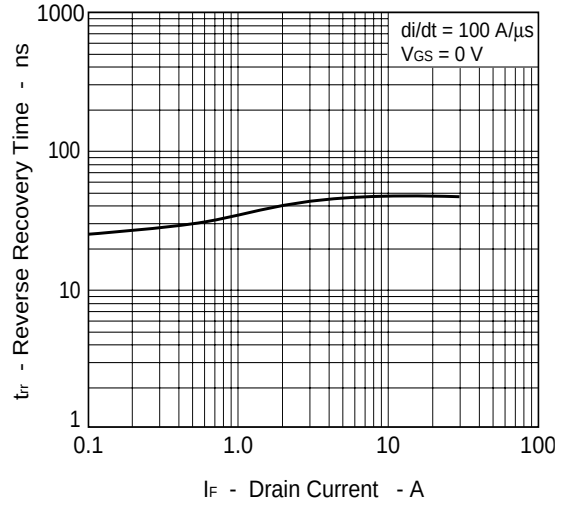
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



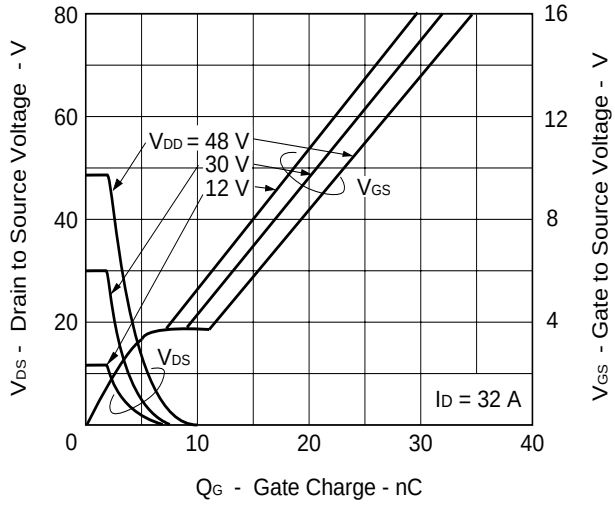
SWITCHING CHARACTERISTICS



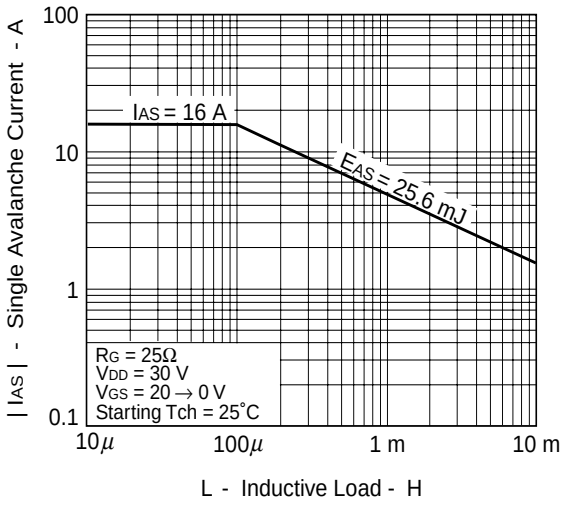
REVERSE RECOVERY TIME vs. DRAIN CURRENT



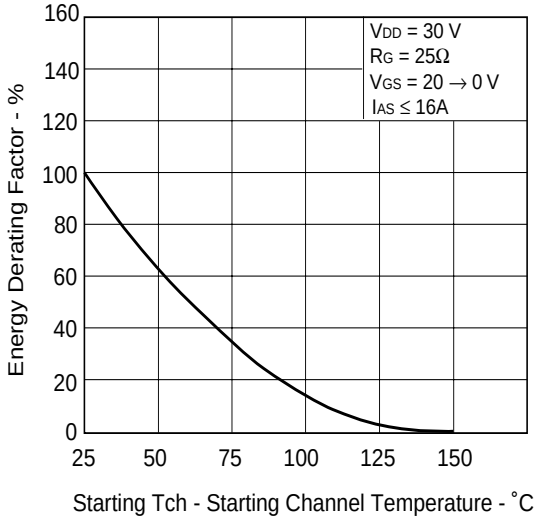
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOAD

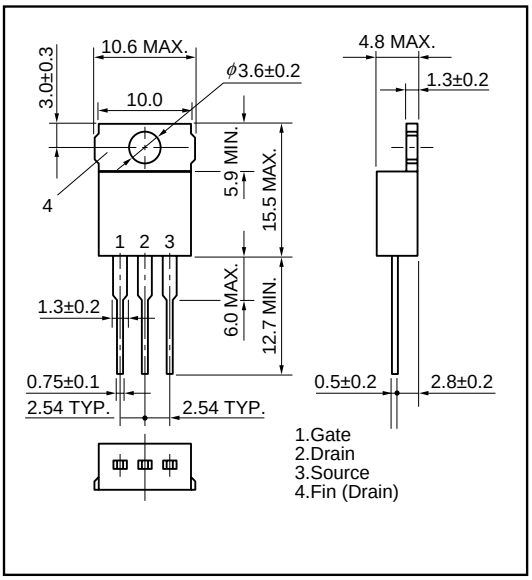


SINGLE AVALANCHE ENERGY
DERATING FACTOR

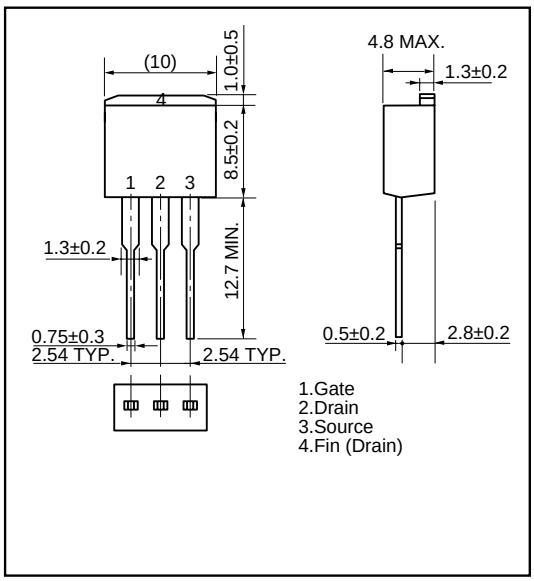


★ PACKAGE DRAWINGS (Unit: mm)

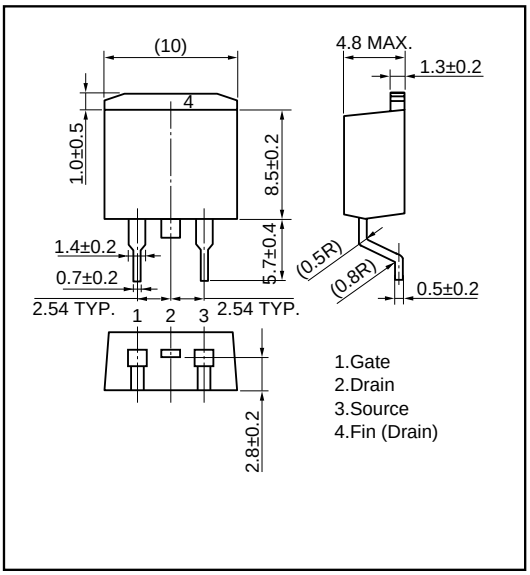
1) TO-220AB(MP-25)



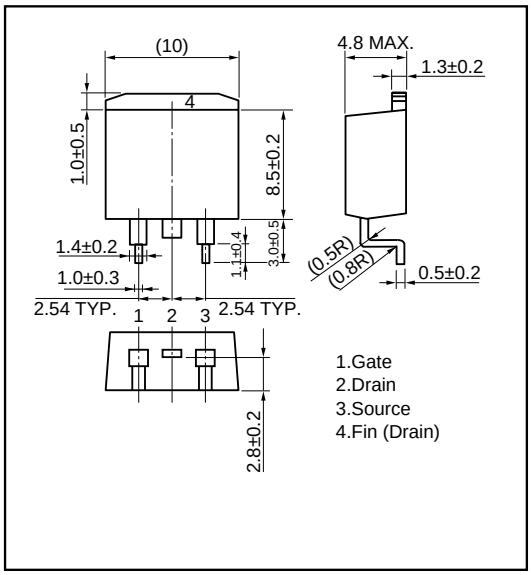
2) TO-262(MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)

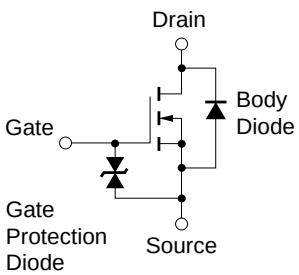


4) TO-220SMD(MP-25Z)[Note]



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.