DATA SHEET

MOS FIELD EFFECT TRANSISTOR

2SJ604

SWITCHING
P-CHANNEL POWER MOS FET

DESCRIPTION

The 2SJ604 is P-channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

FEATURES

- Super low on-state resistance:
  $R_{DS(on)1}$ = 30 mΩ MAX. (V_{GS} = –10 V, I_D = –23 A)
  $R_{DS(on)2}$ = 43 mΩ MAX. (V_{GS} = –4.0 V, I_D = –23 A)
- Low input capacitance:
  C_{iss} = 3300 pF TYP. (V_{DS} = –10 V, V_{GS} = 0 V)
- Built-in gate protection diode

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}	∓20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	∓45	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	∓120	A
Total Power Dissipation (T_C = 25°C)	P_T	70	W
Total Power Dissipation (T_A = 25°C)	P_T	1.5	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current Note2	I_{AS}	–35	A
Single Avalanche Energy Note2	E_{AS}	123	mJ

Notes 1. PW ≤ 10 μs, Duty cycle ≤ 1%

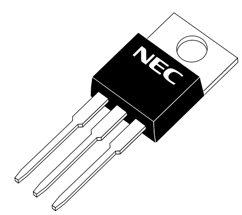
2. Starting T_{ch} = 25°C, V_{DD} = –30 V, R_G = 25 Ω, V_{GS} = –20 → 0 V

ORDERING INFORMATION

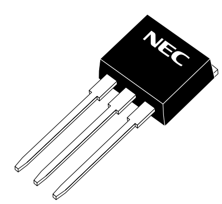
PART NUMBER	PACKAGE
2SJ604	TO-220AB
2SJ604-S	TO-262
2SJ604-ZJ	TO-263
2SJ604-Z	TO-220SMD Note

Note TO-220SMD package is produced only in Japan

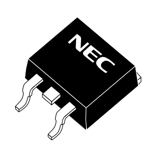
(TO-220AB)



(TO-262)



(TO-263, TO-220SMD)



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The mark ★ shows major revised points.

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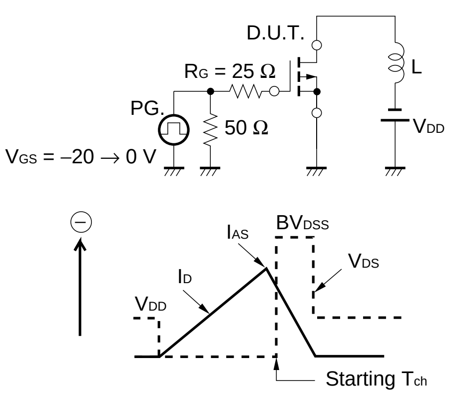
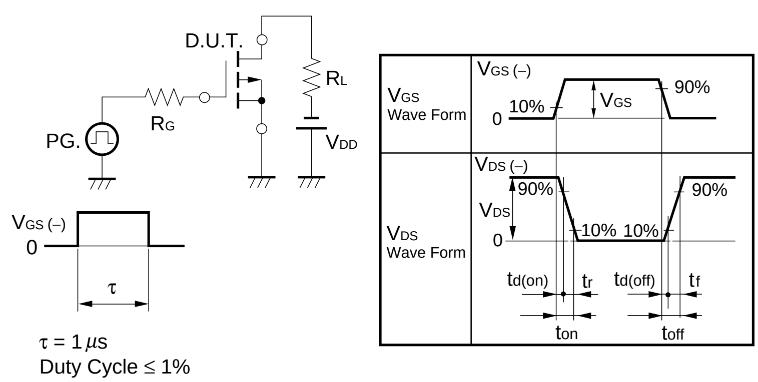
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

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	–1.5	–2.0	–2.5	V
Forward Transfer Admittance	$\lvert y_{fs} \rvert$	V_{DS} = –10 V, I_D = –23 A	20	41		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = –10 V, I_D = –23 A		23	30	mΩ
	$R_{DS(on)2}$	V_{GS} = –4.0 V, I_D = –23 A		30	43	mΩ
Input Capacitance	C_{iss}	V_{DS} = –10 V		3300		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		580		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		230		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = –30 V, I_D = –23 A		12		ns
Rise Time	t_r	V_{GS} = –10 V		11		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 0 Ω		77		ns
Fall Time	t_f			52		ns
Total Gate Charge	Q_G	V_{DD}= –48 V		63		nC
Gate to Source Charge	Q_{GS}	V_{GS} = –10 V		11		nC
Gate to Drain Charge	Q_{GD}	I_D = –45 A		16		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 45 A, V_{GS} = 0 V		1.0		V
Reverse Recovery Time	t_{rr}	I_F = 45 A, V_{GS} = 0 V		51		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A / μs		105		nC

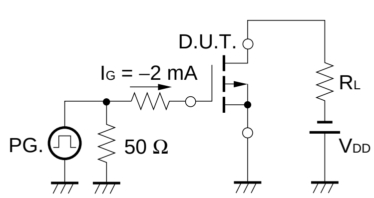
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

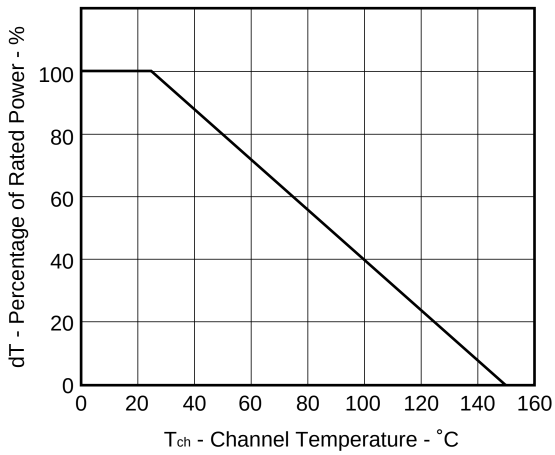


TEST CIRCUIT 3 GATE CHARGE

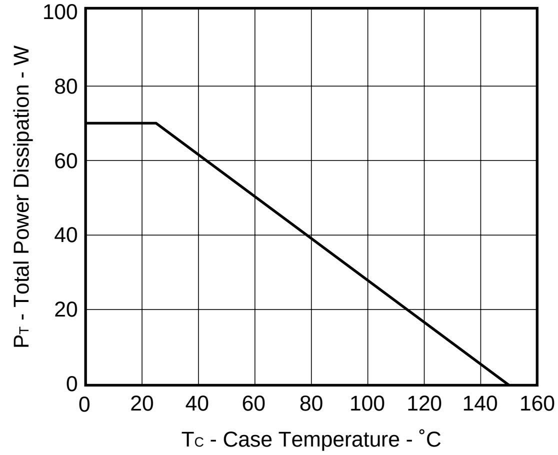


TYPICAL CHARACTERISTICS (T_A = 25°C)

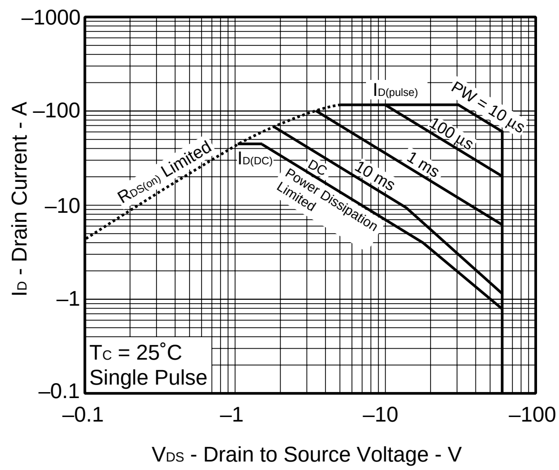
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



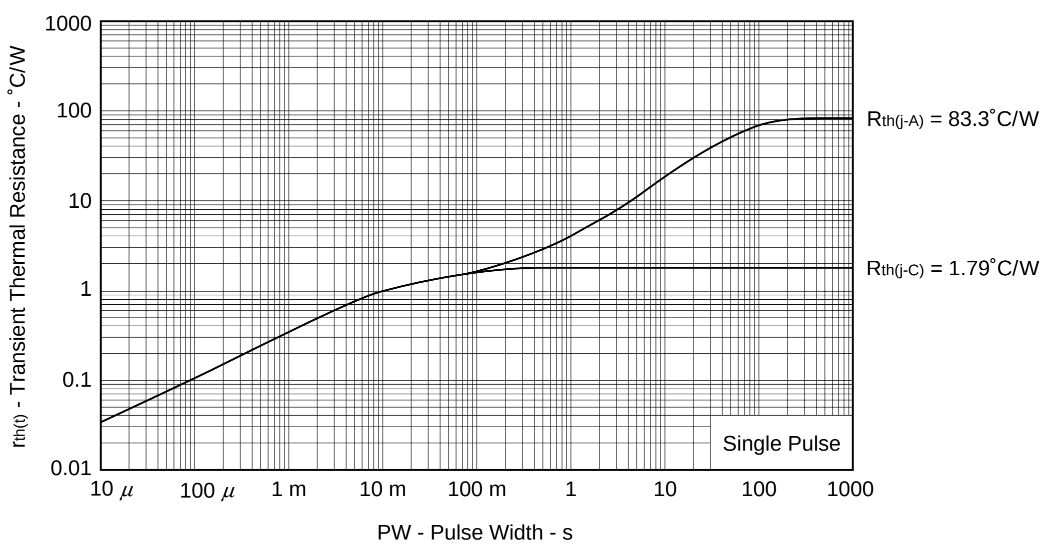
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



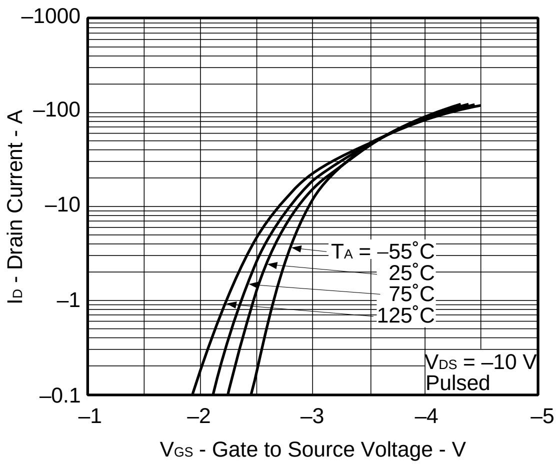
FORWARD BIAS SAFE OPERATING AREA



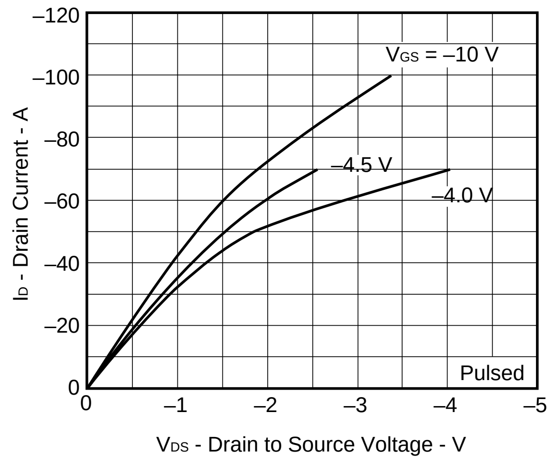
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



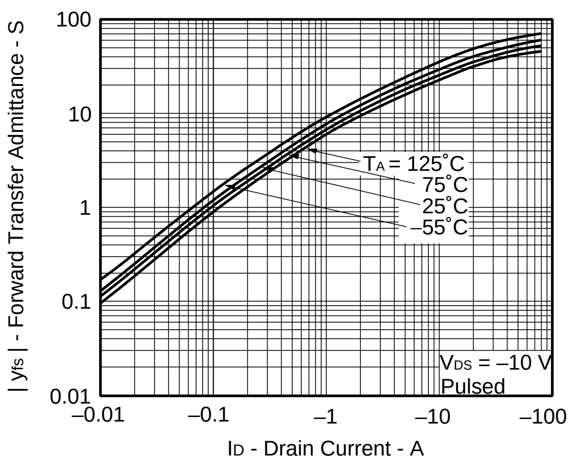
FORWARD TRANSFER CHARACTERISTICS



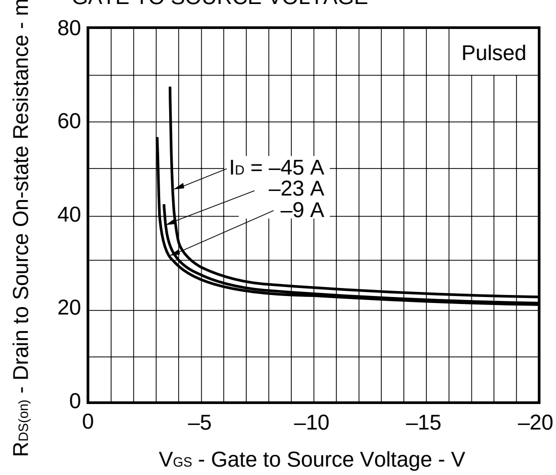
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



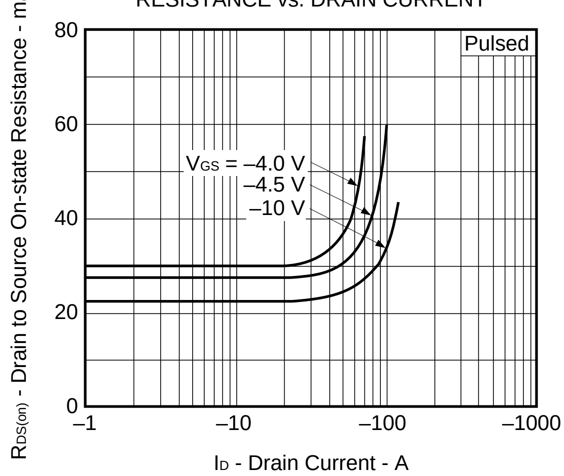
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



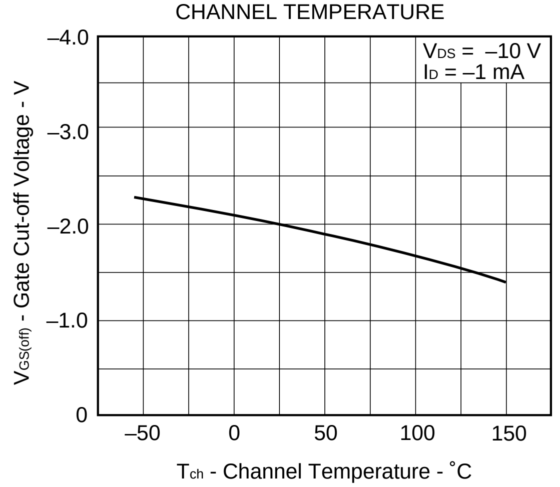
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



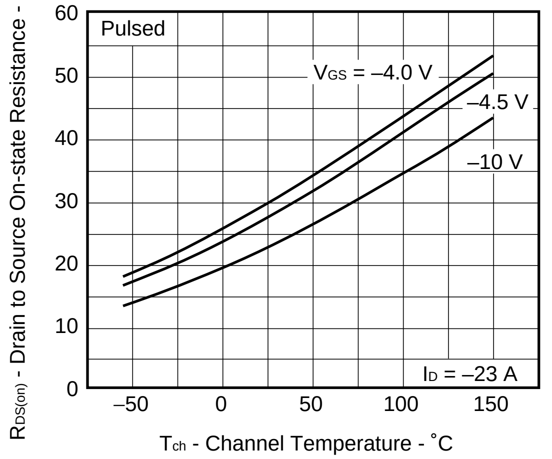
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



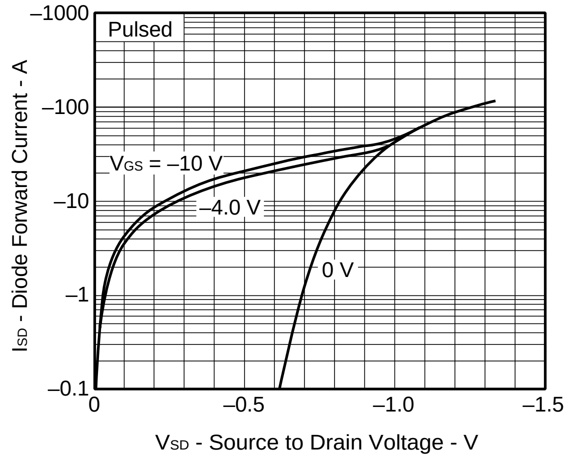
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



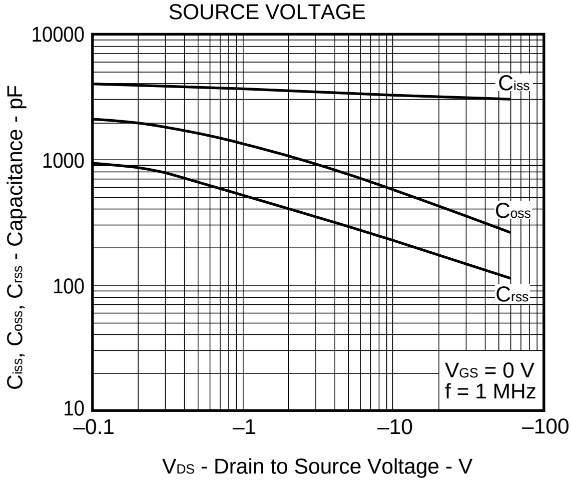
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



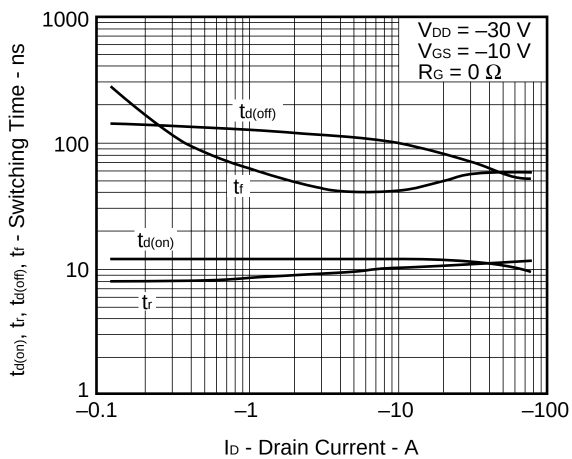
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



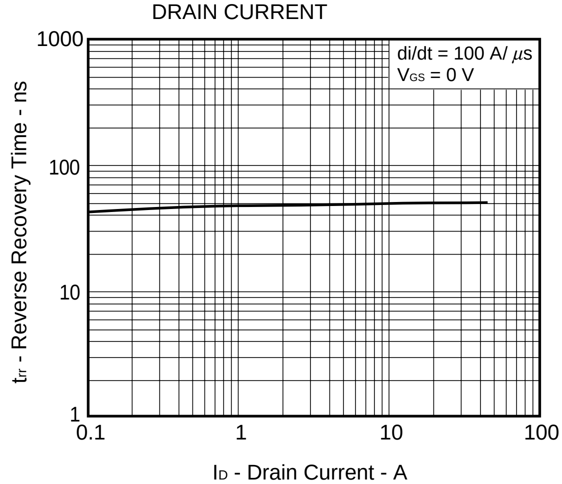
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



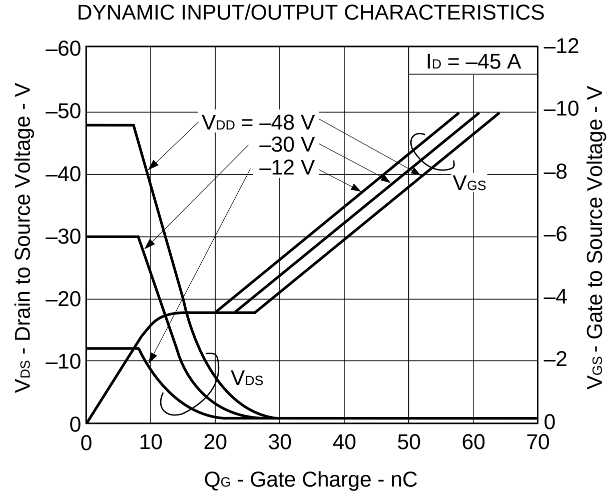
SWITCHING CHARACTERISTICS



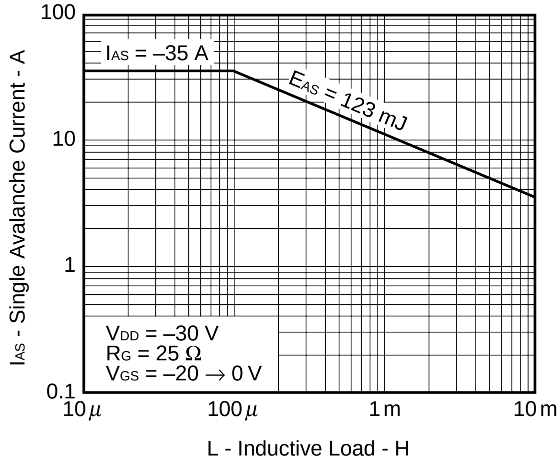
REVERSE RECOVERY TIME vs. DRAIN CURRENT



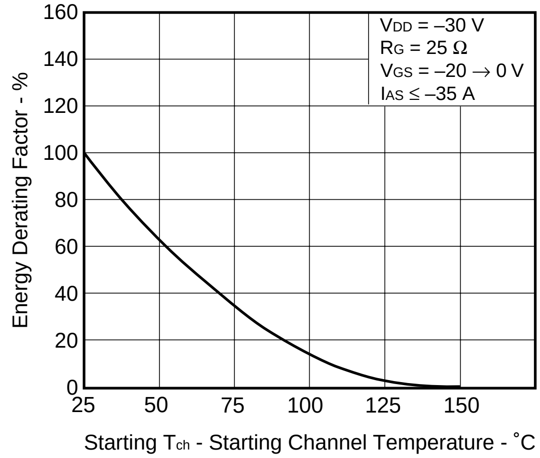
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

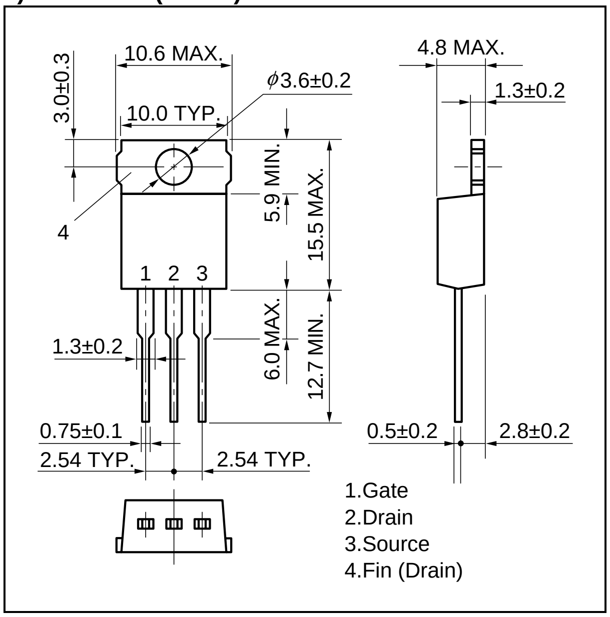


SINGLE AVALANCHE ENERGY DERATING FACTOR

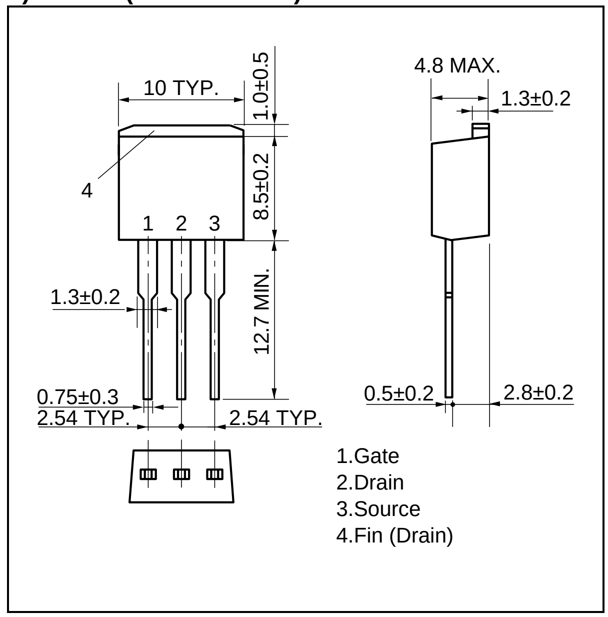


★ PACKAGE DRAWINGS (Unit: mm)

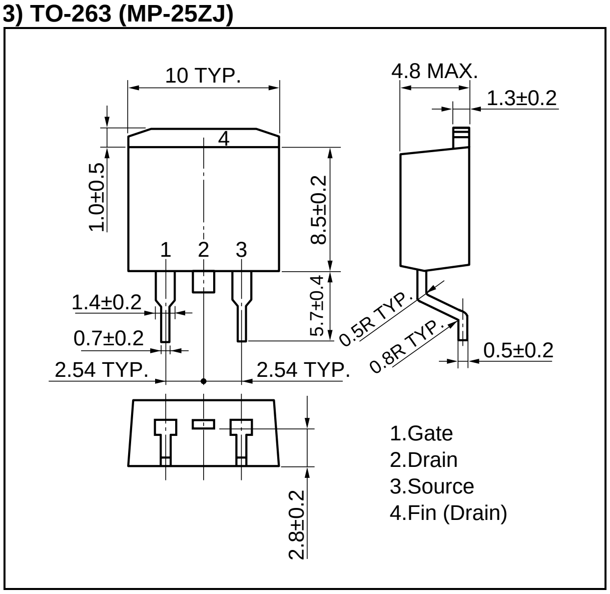
1) TO-220AB (MP-25)



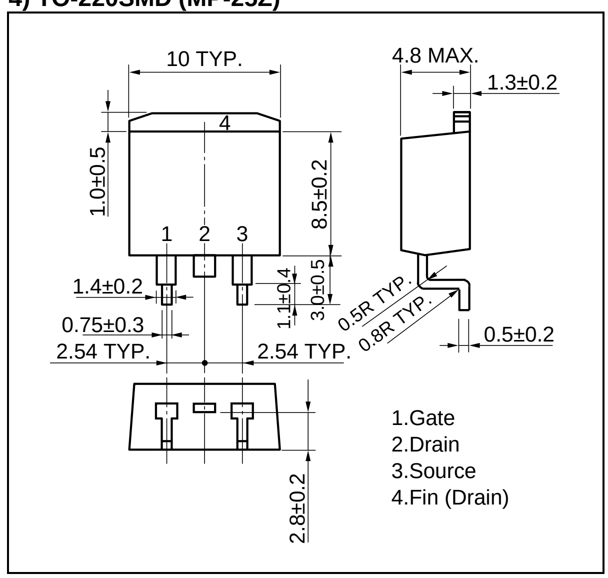
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)

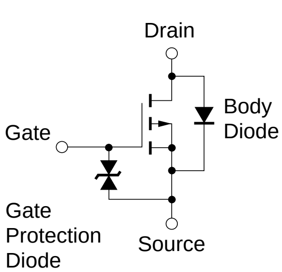


4) TO-220SMD (MP-25Z) Note



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.

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