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Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

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DATA SHEET

RENESAS

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

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

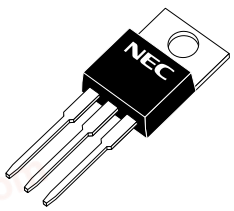
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

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

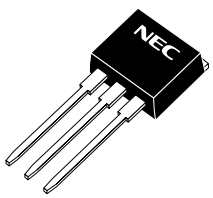
Notes 1. PW ≤ 10 μs, Duty cycle ≤ 1%

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

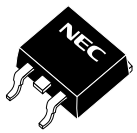
(TO-220AB)



(TO-262)



(TO-263, TO-220SMD)



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Document No. D14649EJ3V0DS00 (3rd edition)
Date Published July 2002 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

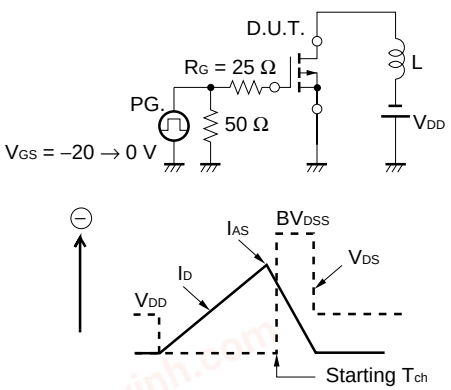
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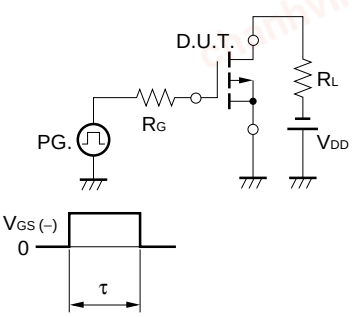
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

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	$\|y_{fs}\|$	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

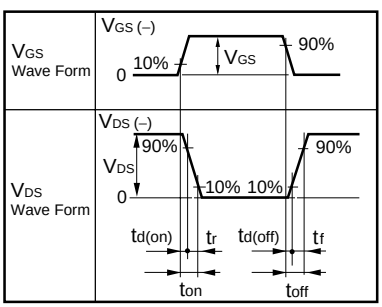
TEST CIRCUIT 1 AVALANCHE CAPABILITY



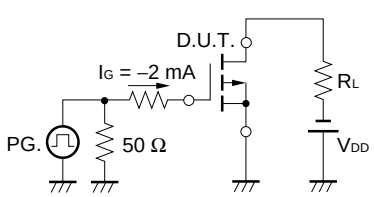
TEST CIRCUIT 2 SWITCHING TIME



τ = 1 μs
Duty Cycle ≤ 1%



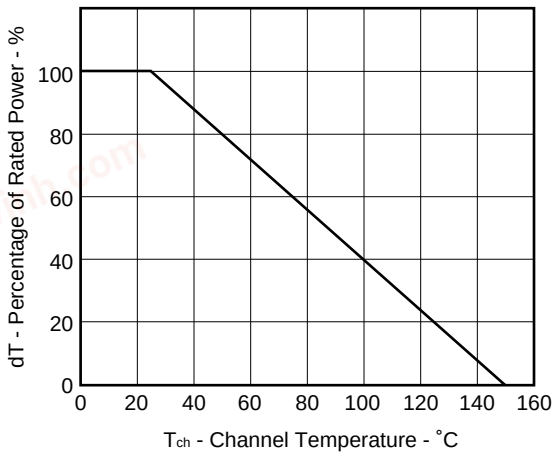
TEST CIRCUIT 3 GATE CHARGE



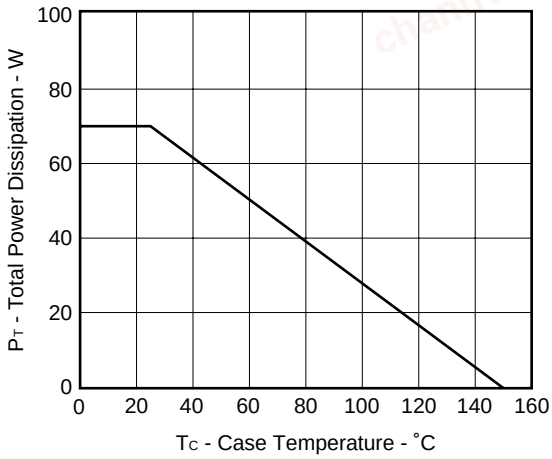
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TYPICAL CHARACTERISTICS (T_A = 25°C)

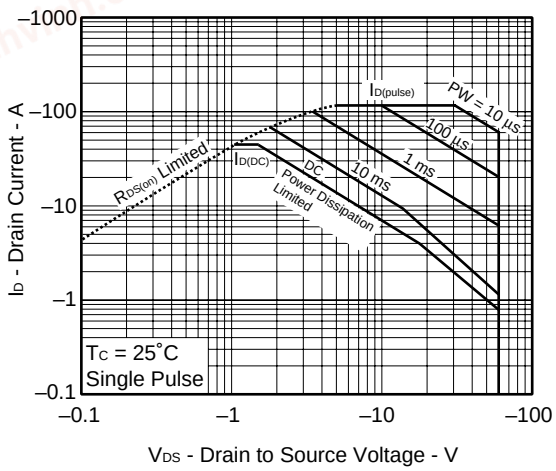
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



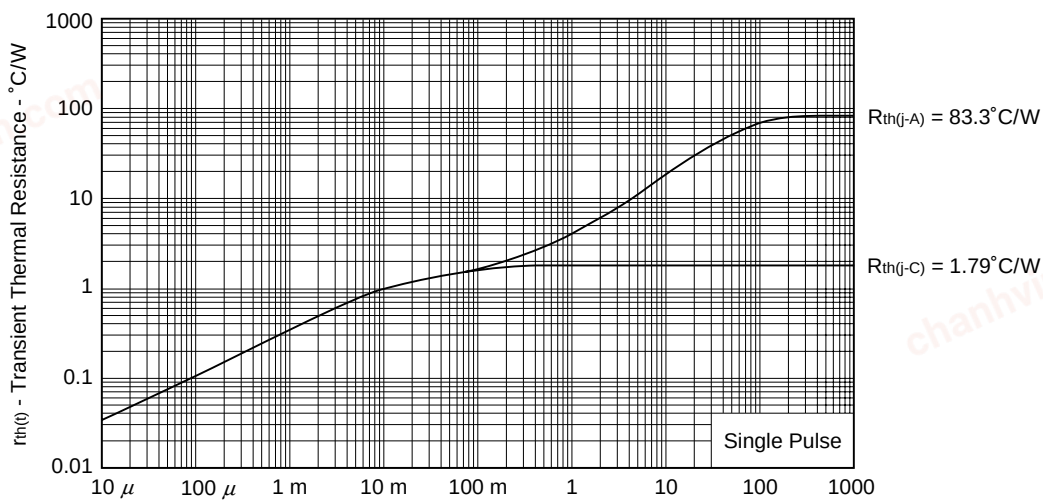
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

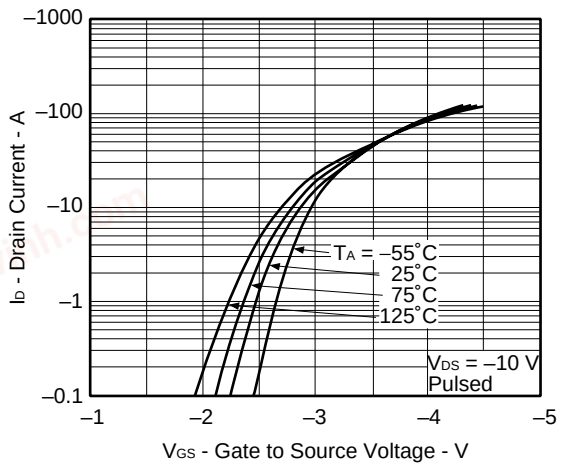


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

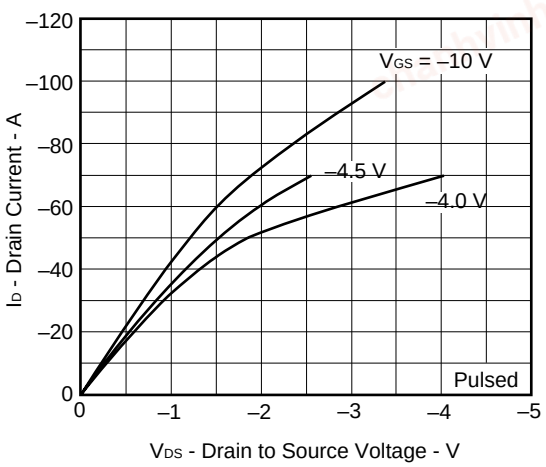


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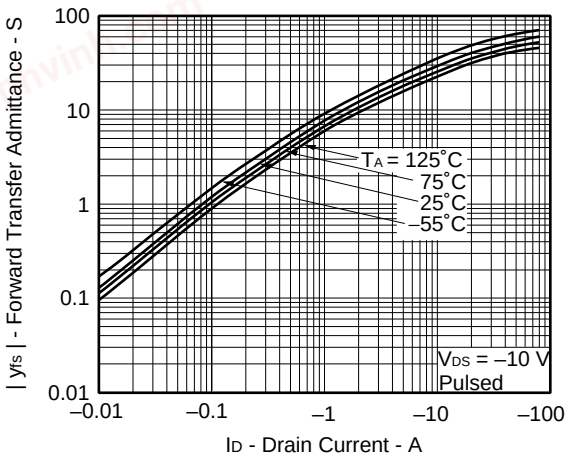
FORWARD TRANSFER CHARACTERISTICS



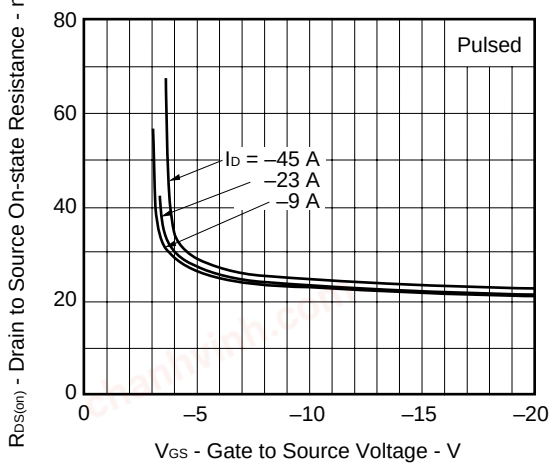
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



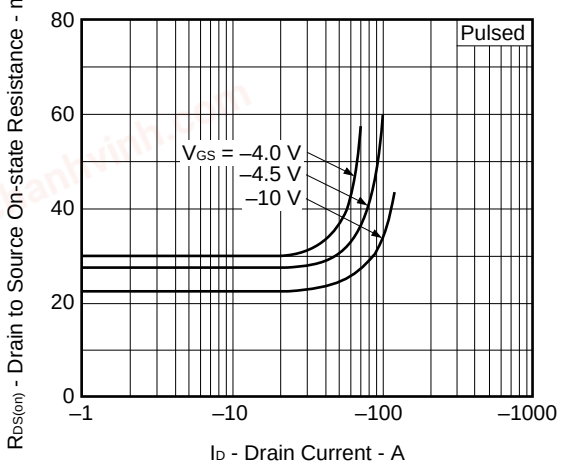
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



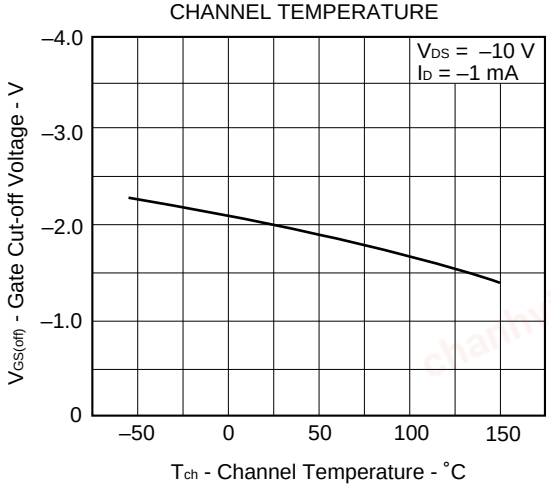
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT

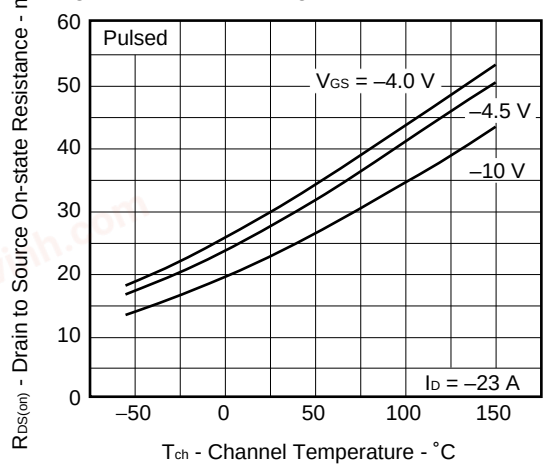


GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE

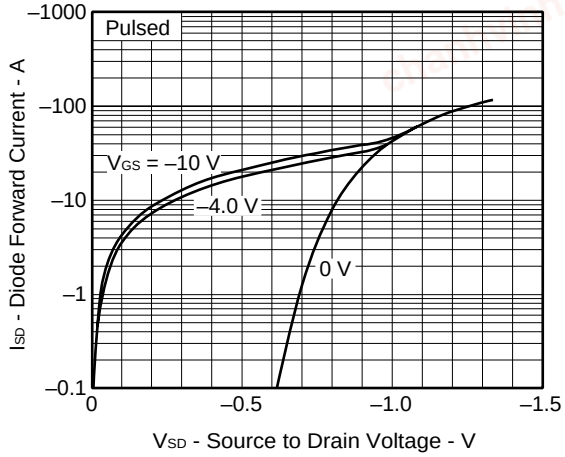


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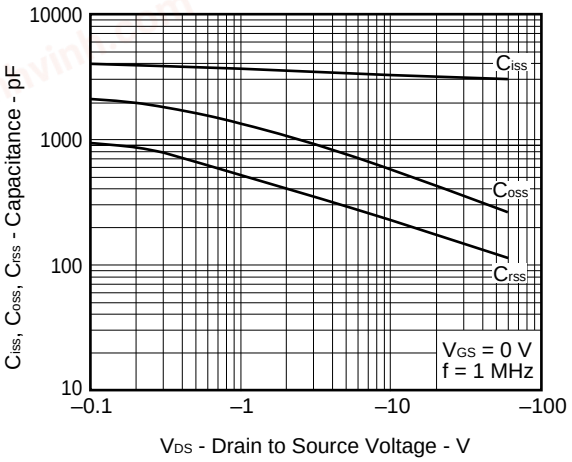
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



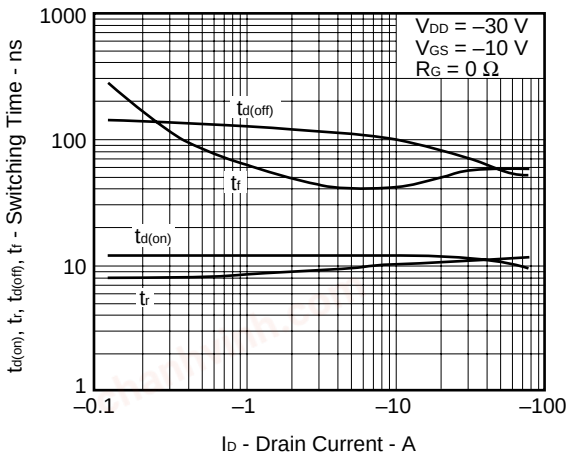
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



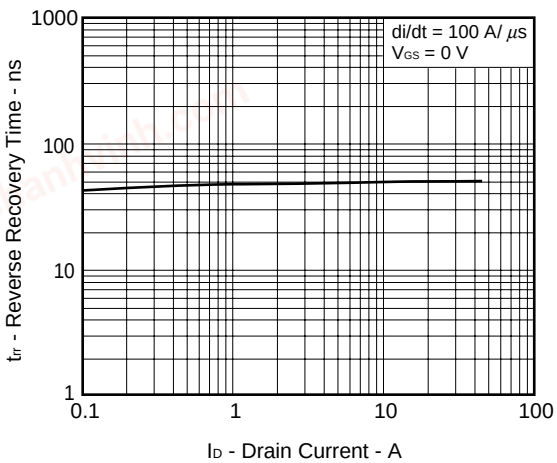
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



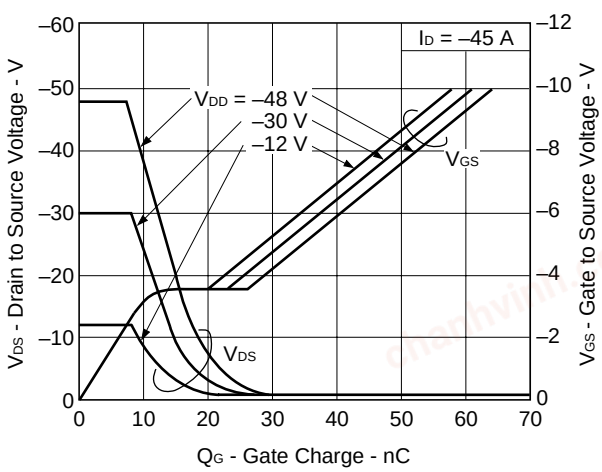
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT

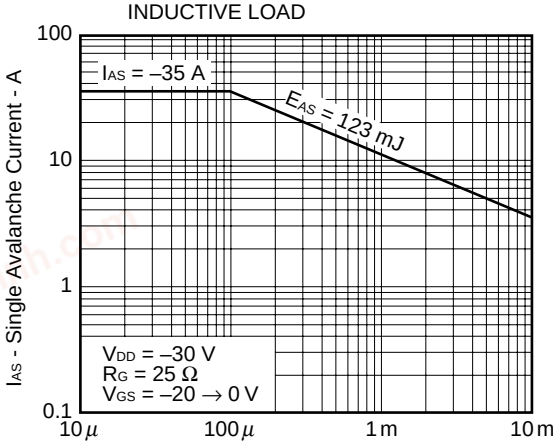


DYNAMIC INPUT/OUTPUT CHARACTERISTICS

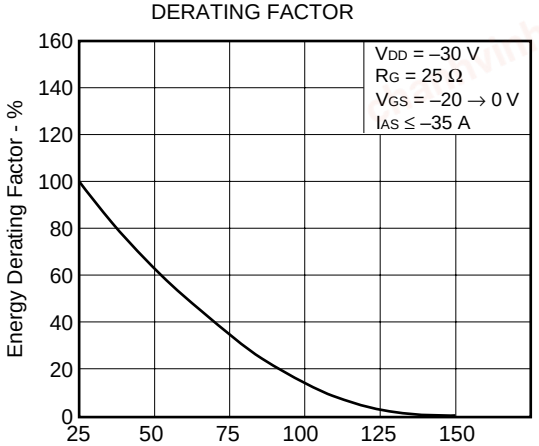


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SINGLE AVALANCHE CURRENT vs.
INDUCTIVE LOAD



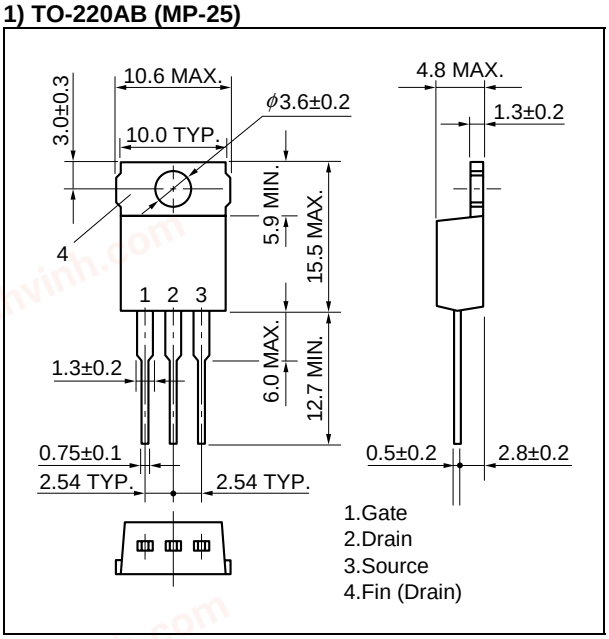
SINGLE AVALANCHE ENERGY
DERATING FACTOR



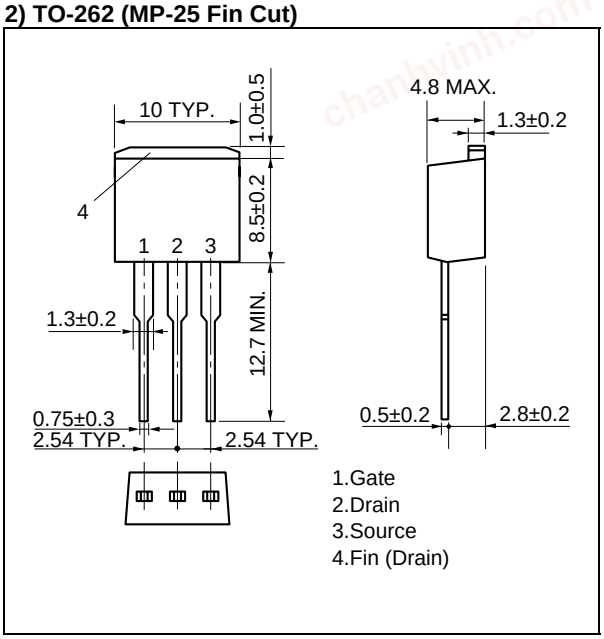
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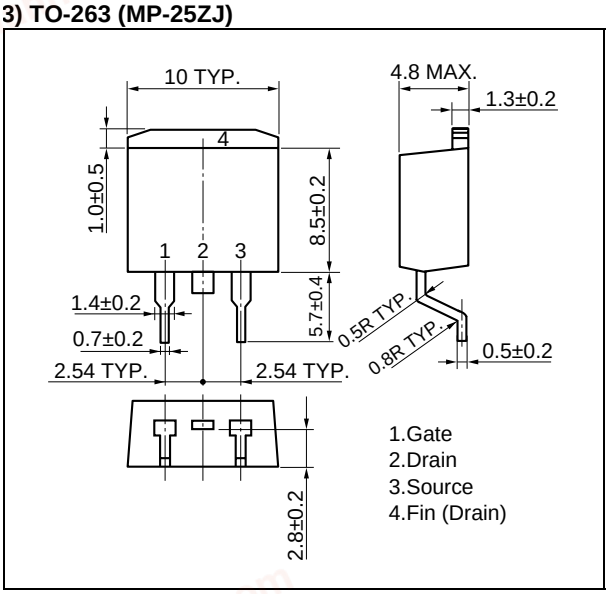
1) TO-220AB (MP-25)



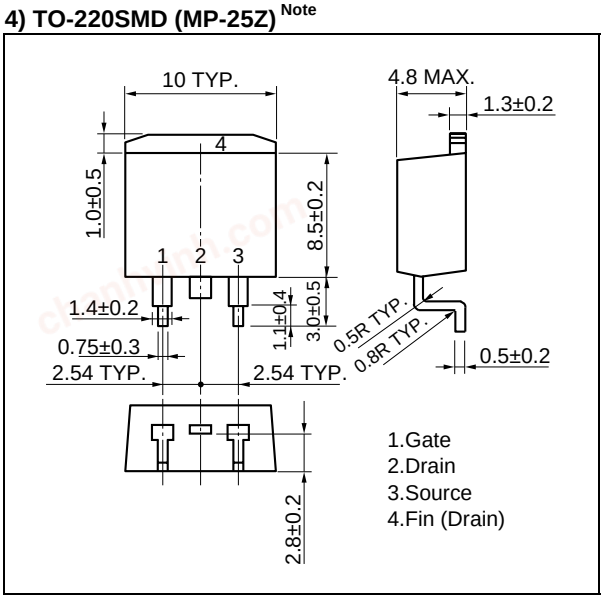
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)

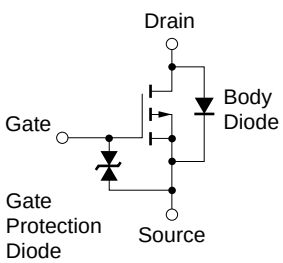


4) TO-220SMD (MP-25Z) Note



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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