

To our customers,

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

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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SWITCHING

N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3431 is N-channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES

- Super low on-state resistance:
 $R_{DS(on)1} = 5.6 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 42 \text{ A)}$
 $R_{DS(on)2} = 8.9 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4 \text{ V, } I_D = 42 \text{ A)}$
- Low C_{iss} : $C_{iss} = 6100 \text{ pF TYP.}$
- Built-in gate protection diode

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	40	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 83	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 332	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_T	100	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	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}	65	A
Single Avalanche Energy ^{Note2}	E_{AS}	423	mJ

Notes 1. $PW \leq 10 \mu\text{s}$, Duty cycle $\leq 1\%$

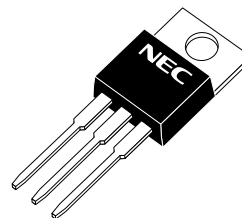
2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 20 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = 20 \rightarrow 0 \text{ V}$

ORDERING INFORMATION

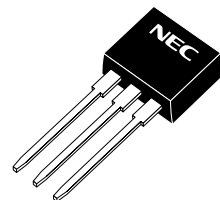
PART NUMBER	PACKAGE
2SK3431	TO-220AB
2SK3431-S	TO-262
2SK3431-ZJ	TO-263
2SK3431-Z	TO-220SMD ^{Note}

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

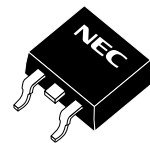
(TO-220AB)



(TO-262)



(TO-263, TO-220SMD)

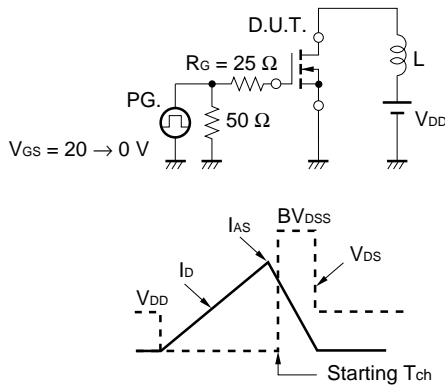


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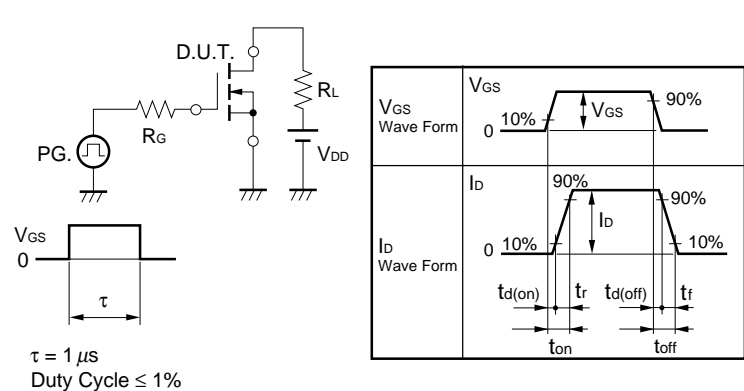
ELECTRICAL CHARACTERISTICS (TA = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$			10	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.5	2.0	2.5	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 42\text{ A}$	30	60		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 42\text{ A}$		4.5	5.6	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4\text{ V}, I_D = 42\text{ A}$		6.2	8.9	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}$		6100		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$		1400		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1\text{ MHz}$		700		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, I_D = 42\text{ A}$		120		ns
Rise Time	t_r	$V_{GS} = 10\text{ V}$		1800		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10\ \Omega$		350		ns
Fall Time	t_f			440		ns
Total Gate Charge	Q_G	$V_{DD} = 32\text{ V}$		110		nC
Gate to Source Charge	Q_{GS}	$V_{GS} = 10\text{ V}$		18		nC
Gate to Drain Charge	Q_{GD}	$I_D = 83\text{ A}$		31		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 83\text{ A}, V_{GS} = 0\text{ V}$		1.0		V
Reverse Recovery Time	t_{rr}	$I_F = 83\text{ A}, V_{GS} = 0\text{ V}$		65		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 100\text{ A}/\mu\text{s}$		110		nC

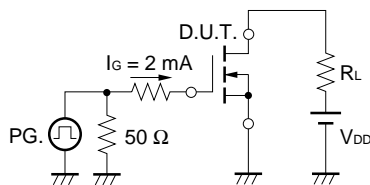
TEST CIRCUIT 1 AVALANCHE CAPABILITY



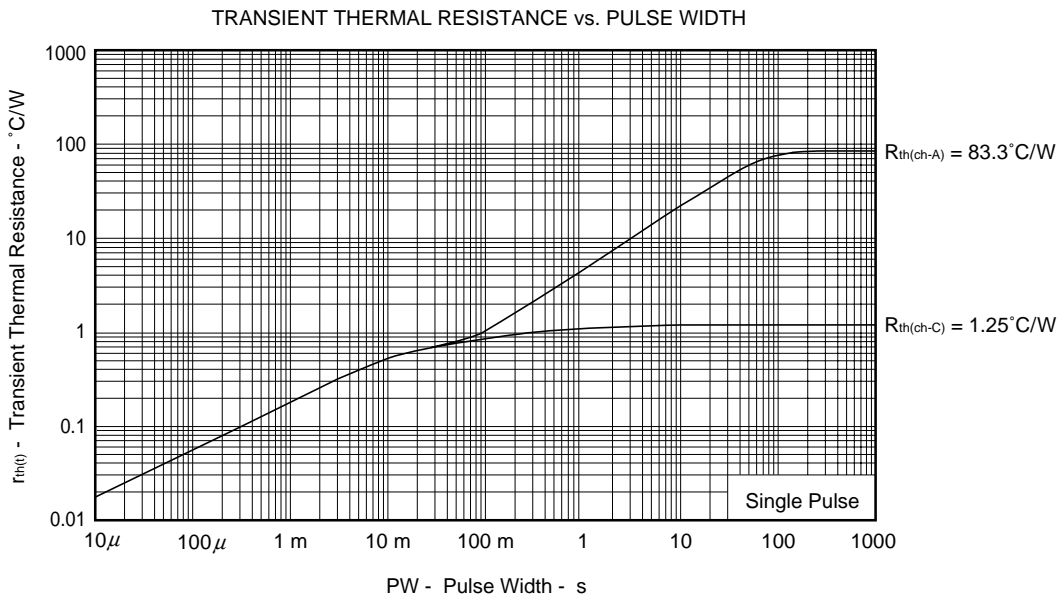
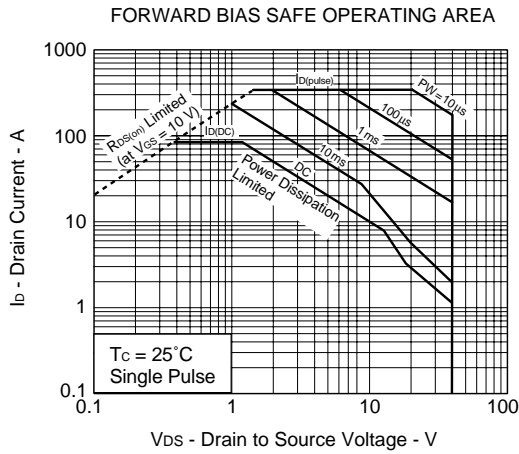
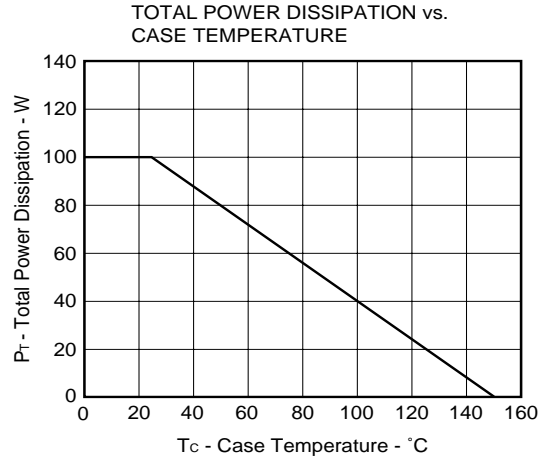
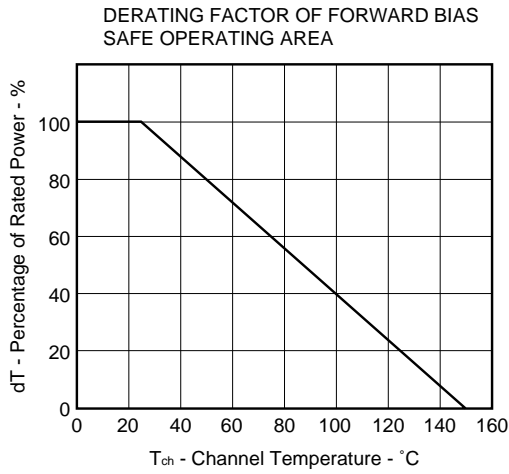
TEST CIRCUIT 2 SWITCHING TIME



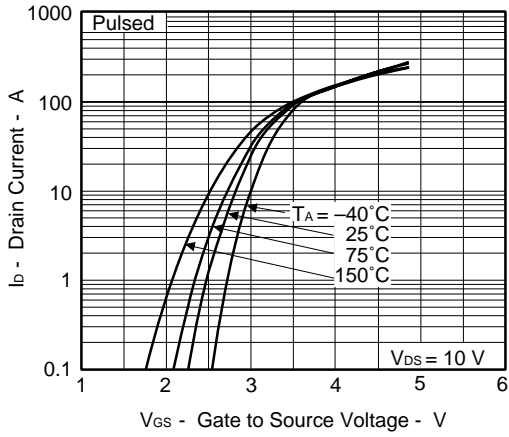
TEST CIRCUIT 3 GATE CHARGE



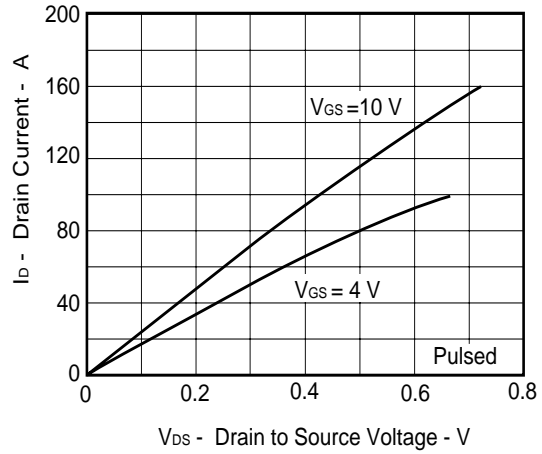
TYPICAL CHARACTERISTICS (T_A = 25°C)



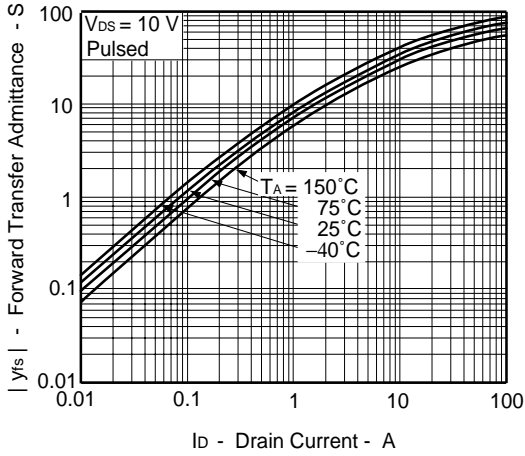
FORWARD TRANSFER CHARACTERISTICS



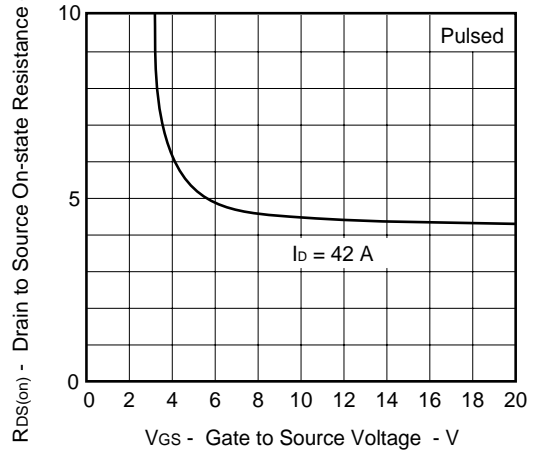
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



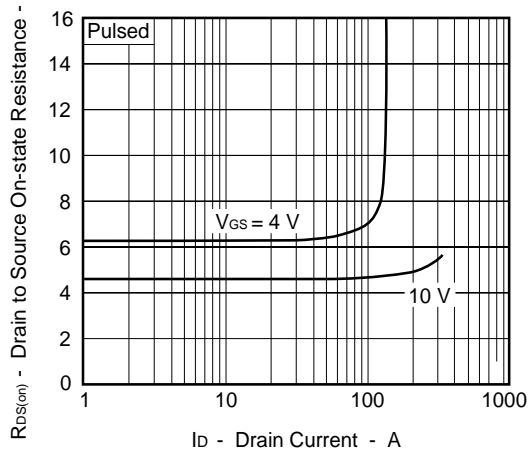
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



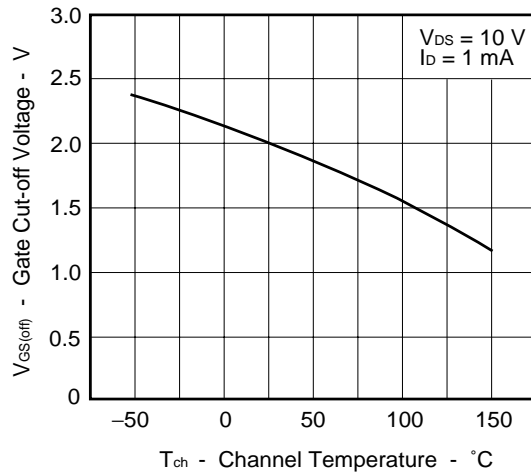
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



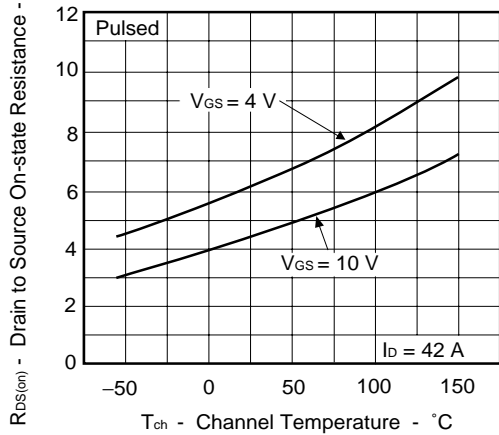
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



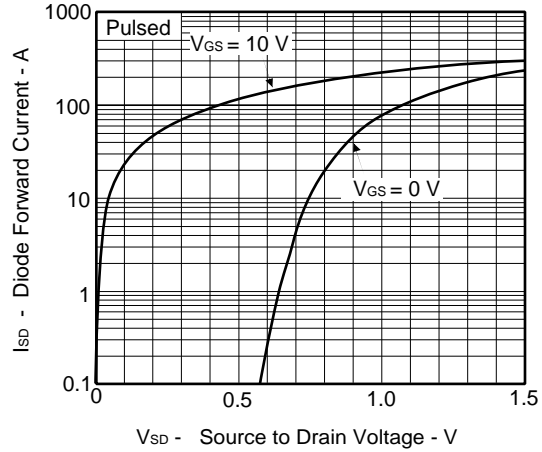
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



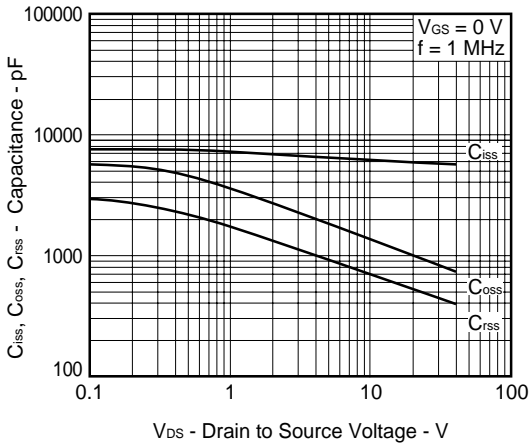
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



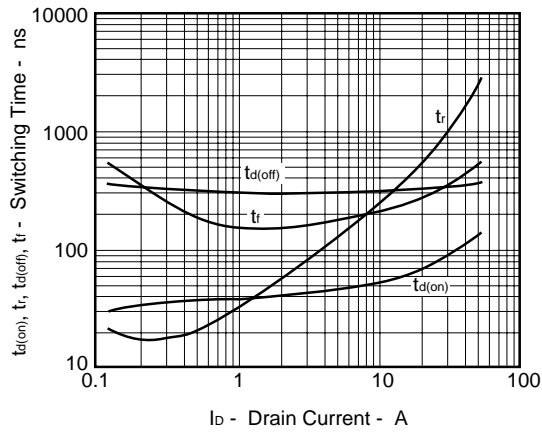
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



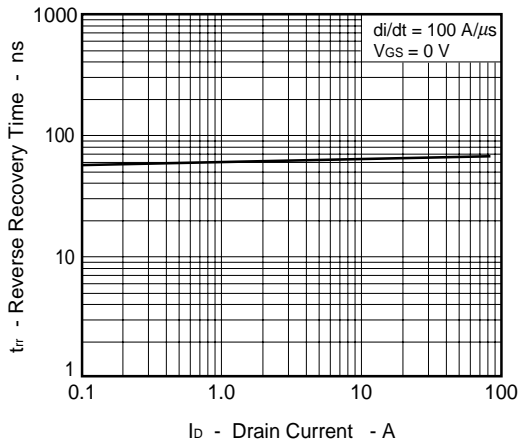
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



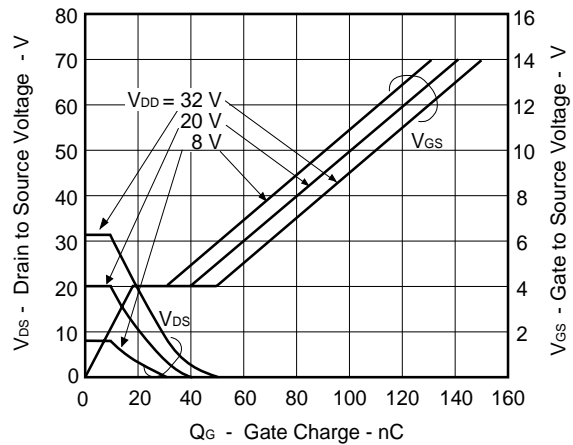
SWITCHING CHARACTERISTICS

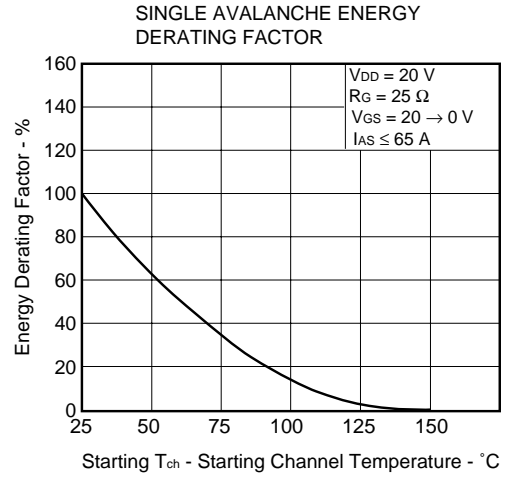
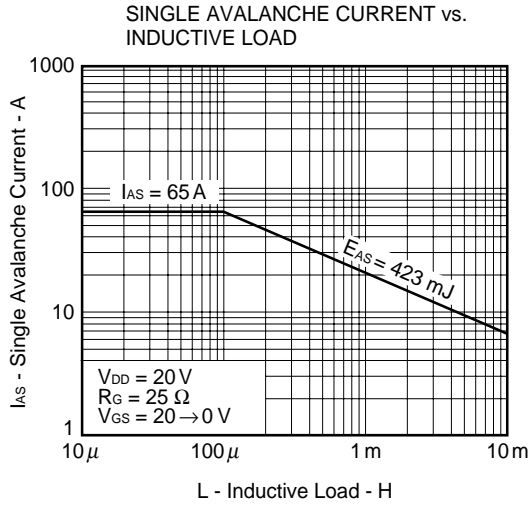


REVERSE RECOVERY TIME vs. DRAIN CURRENT



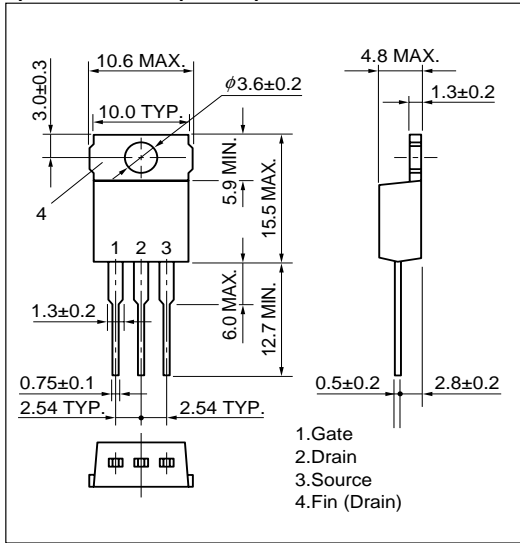
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



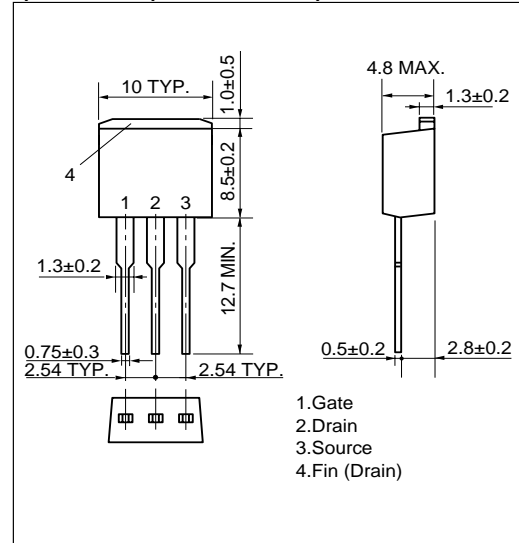


★ PACKAGE DRAWINGS (Unit: mm)

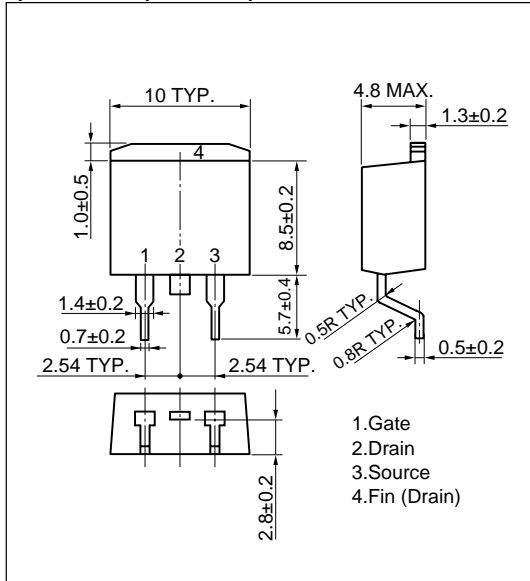
1) TO-220AB (MP-25)



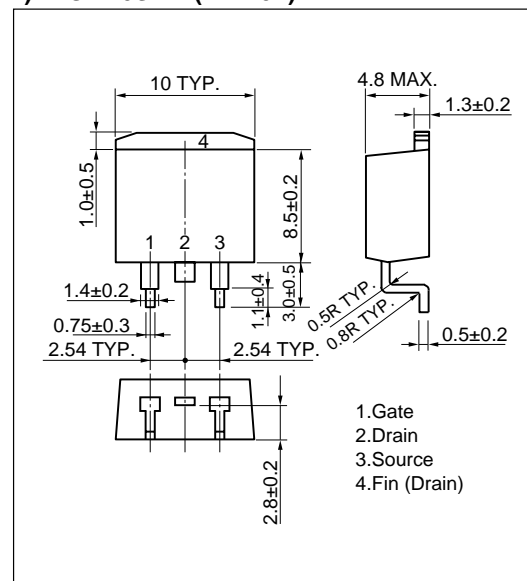
2) TO-262 (MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)

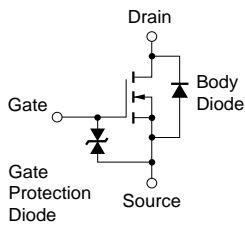


4) TO-220SMD (MP-25Z) ^{Note}



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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