

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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EOL announced Product

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SWITCHING

N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3712 is N-channel MOS FET device that features a low on-state resistance and excellent switching characteristics, and designed for high voltage applications such as DC/DC converter.

FEATURES

- High voltage: $V_{DSS} = 250$ V
- Gate voltage rating: ± 30 V
- Low on-state resistance
 $R_{DS(on)} = 0.58 \Omega$ MAX. ($V_{GS} = 10$ V, $I_D = 4.5$ A)
- Low C_{iss} : $C_{iss} = 450$ pF TYP. ($V_{DS} = 10$ V, $I_D = 0$ A)
- Built-in gate protection diode
- TO-251/TO-252 package

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

| | | | |
|--|----------------|-------------|------------------|
| Drain to Source Voltage ($V_{GS} = 0$ V) | V_{DSS} | 250 | V |
| Gate to Source Voltage ($V_{DS} = 0$ V) | V_{GSS} | ± 30 | V |
| Drain Current (DC) ($T_C = 25^\circ\text{C}$) | $I_{D(DC)}$ | ± 9.0 | A |
| Drain Current (pulse) ^{Note1} | $I_{D(pulse)}$ | ± 27 | A |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) | P_{T1} | 40 | W |
| Total Power Dissipation ($T_A = 25^\circ\text{C}$) | P_{T2} | 1.0 | W |
| Channel Temperature | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Single Avalanche Current ^{Note2} | I_{AS} | 9 | A |
| Single Avalanche Energy ^{Note2} | E_{AS} | 8.1 | mJ |
| Repetitive Avalanche Current ^{Note3} | I_{AR} | 9 | A |
| Repetitive Pulse Avalanche Energy ^{Note3} | E_{AR} | 8.1 | mJ |

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

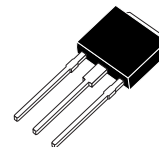
2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 125$ V, $R_G = 25 \Omega$, $V_{GS} = 20 \rightarrow 0$ V, $L = 100 \mu\text{H}$

3. $T_{ch(peak)} \leq 150^\circ\text{C}$, $L = 100 \mu\text{H}$

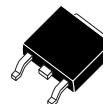
ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|-------------|----------------|
| 2SK3712 | TO-251 (MP-3) |
| 2SK3712-Z | TO-252 (MP-3Z) |

(TO-251)



(TO-252)



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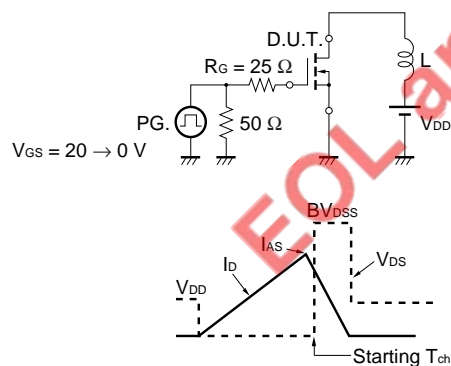
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ELECTRICAL CHARACTERISTICS (TA = 25°C)

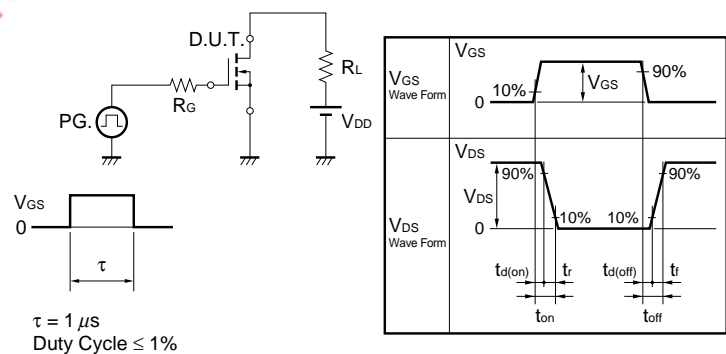
| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---------------|---|------|------|----------|---------------|
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 250\text{ V}, V_{GS} = 0\text{ V}$ | | | 10 | μA |
| Gate Leakage Current | I_{GSS} | $V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$ | | | ± 10 | μA |
| Gate Cut-off Voltage | $V_{GS(off)}$ | $V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$ | 2.5 | 3.5 | 4.5 | V |
| Forward Transfer Admittance ^{Note} | $ y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 4.5\text{ A}$ | 3 | 6 | | S |
| Drain to Source On-state Resistance ^{Note} | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 4.5\text{ A}$ | | 0.45 | 0.58 | Ω |
| Input Capacitance | C_{iss} | $V_{DS} = 10\text{ V}$ | | 450 | | pF |
| Output Capacitance | C_{oss} | $V_{GS} = 0\text{ V}$ | | 100 | | pF |
| Reverse Transfer Capacitance | C_{rss} | $f = 1\text{ MHz}$ | | 40 | | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD} = 125\text{ V}, I_D = 4.5\text{ A}$ | | 8 | | ns |
| Rise Time | t_r | $V_{GS} = 10\text{ V}$ | | 8 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | $R_G = 0\ \Omega$ | | 21 | | ns |
| Fall Time | t_f | | | 6 | | ns |
| Total Gate Charge | Q_G | $V_{DD} = 200\text{ V}$ | | 14 | | nC |
| Gate to Source Charge | Q_{GS} | $V_{GS} = 10\text{ V}$ | | 3 | | nC |
| Gate to Drain Charge | Q_{GD} | $I_D = 9.0\text{ A}$ | | 7 | | nC |
| Body Diode Forward Voltage ^{Note} | $V_{F(S-D)}$ | $I_F = 9\text{ A}, V_{GS} = 0\text{ V}$ | | 0.9 | 1.5 | V |
| Reverse Recovery Time | t_{rr} | $I_F = 9\text{ A}, V_{GS} = 0\text{ V}$ | | 150 | | ns |
| Reverse Recovery Charge | Q_{rr} | $di/dt = 100\text{ A}/\mu\text{s}$ | | 630 | | nC |

Note Pulsed

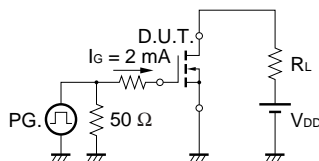
TEST CIRCUIT 1 AVALANCHE CAPABILITY



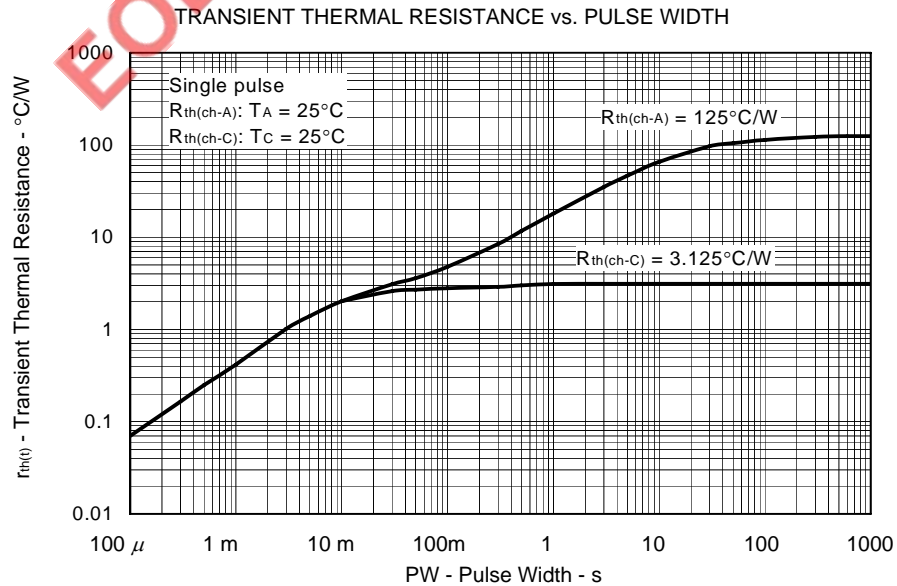
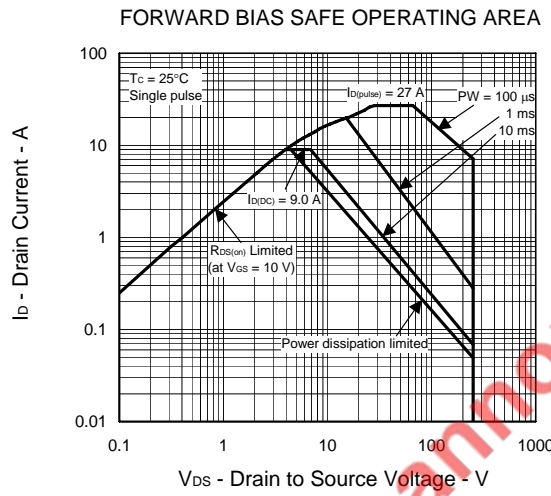
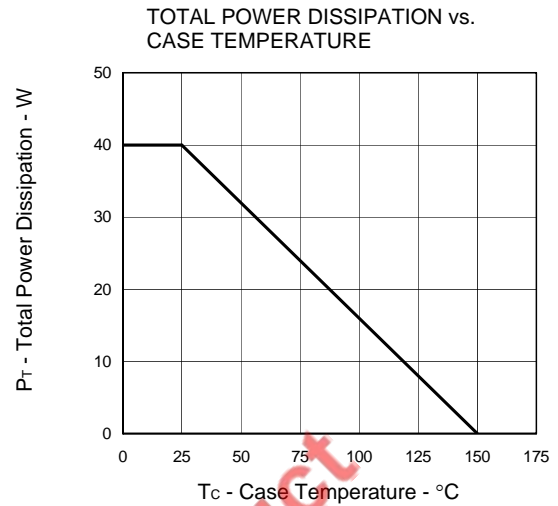
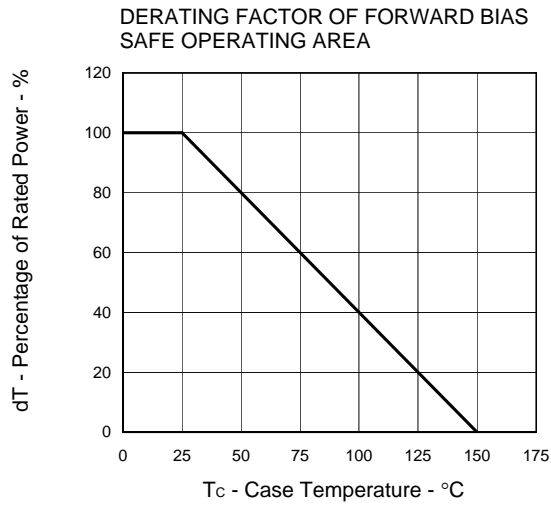
TEST CIRCUIT 2 SWITCHING TIME



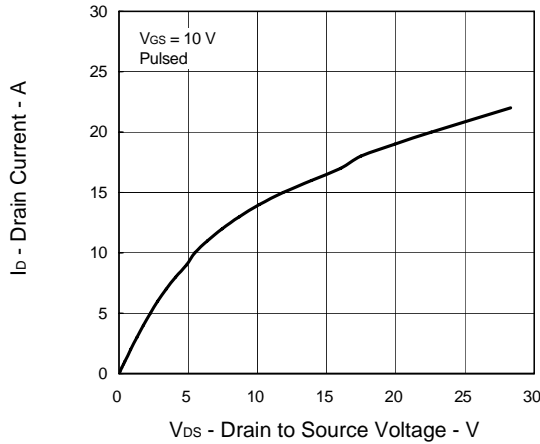
TEST CIRCUIT 3 GATE CHARGE



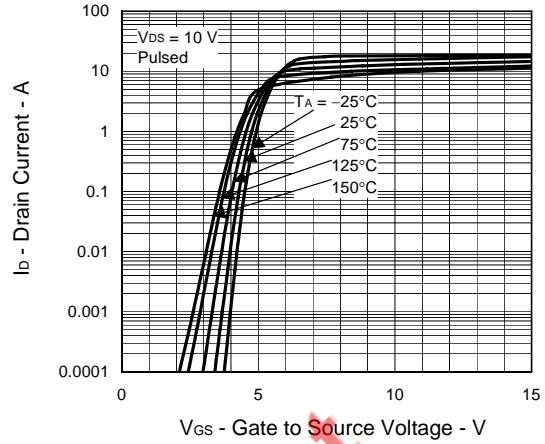
TYPICAL CHARACTERISTICS (T_A = 25°C)



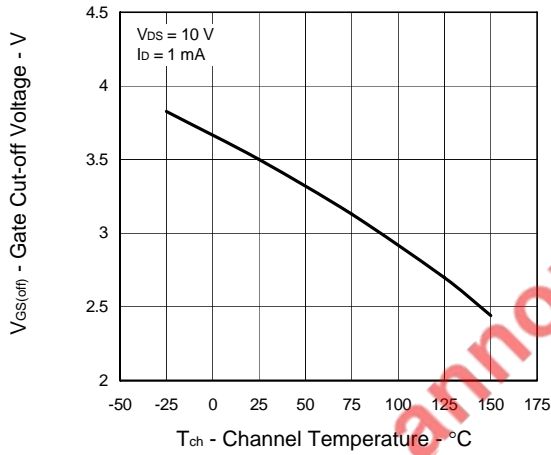
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



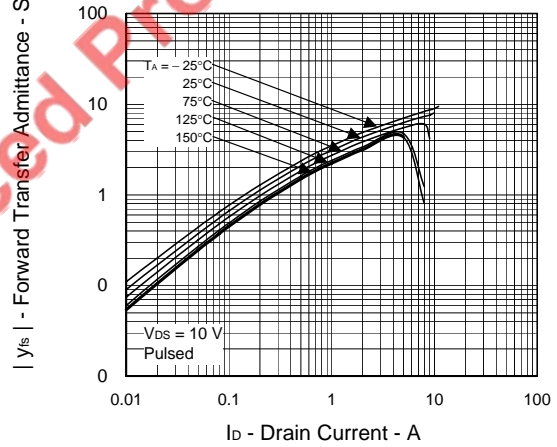
FORWARD TRANSFER CHARACTERISTICS



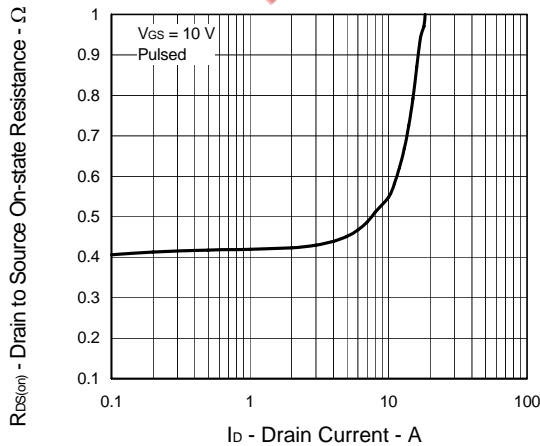
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



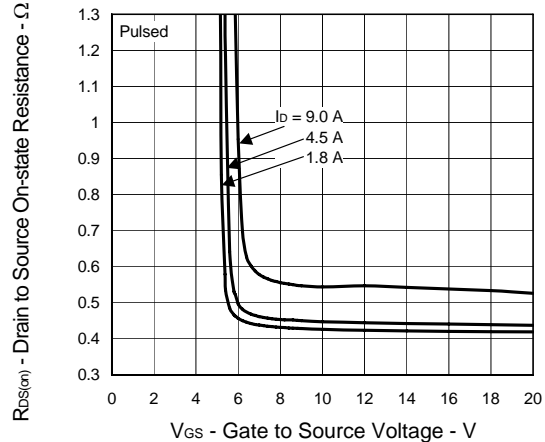
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



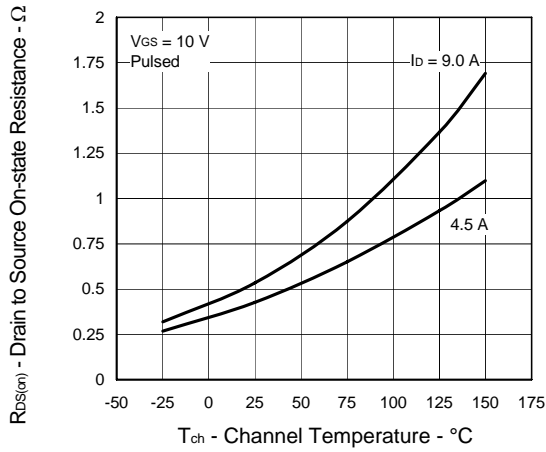
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



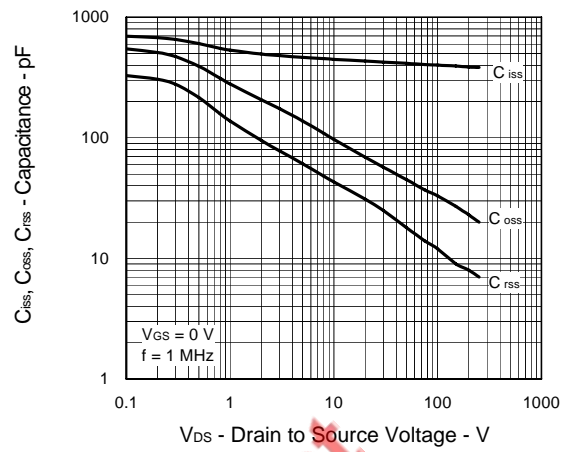
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



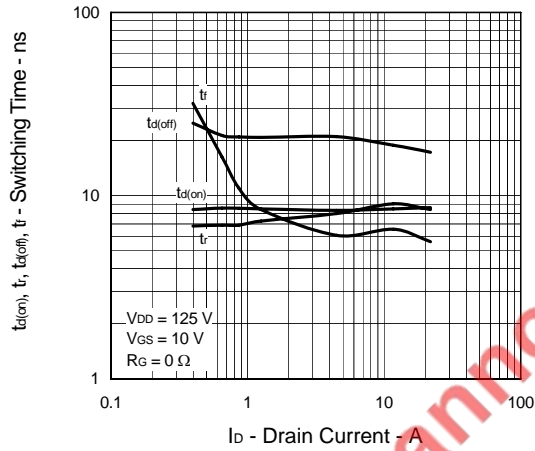
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



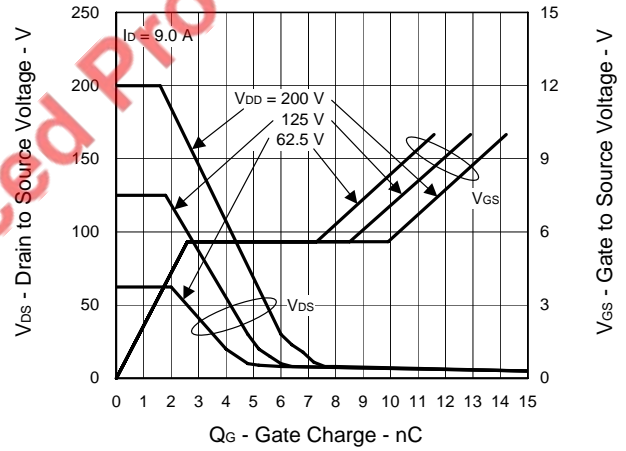
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



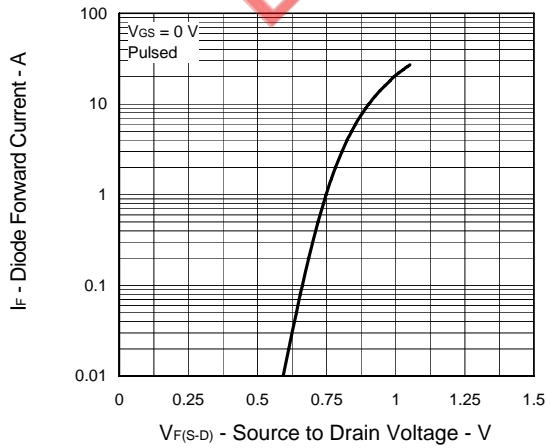
SWITCHING CHARACTERISTICS



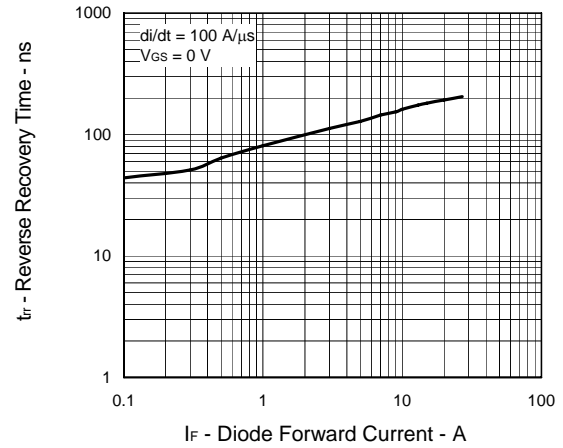
DYNAMIC INPUT/OUTPUT CHARACTERISTICS

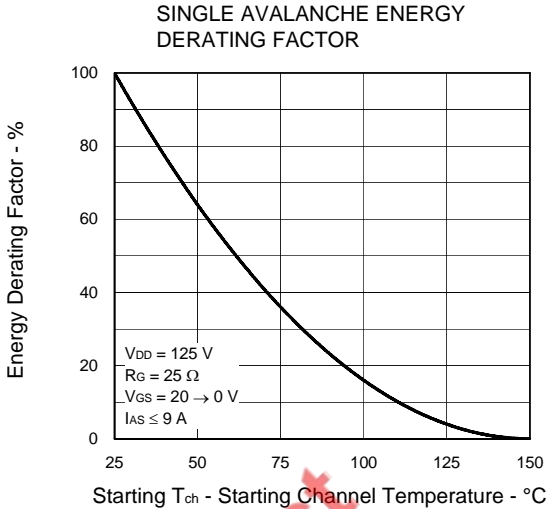
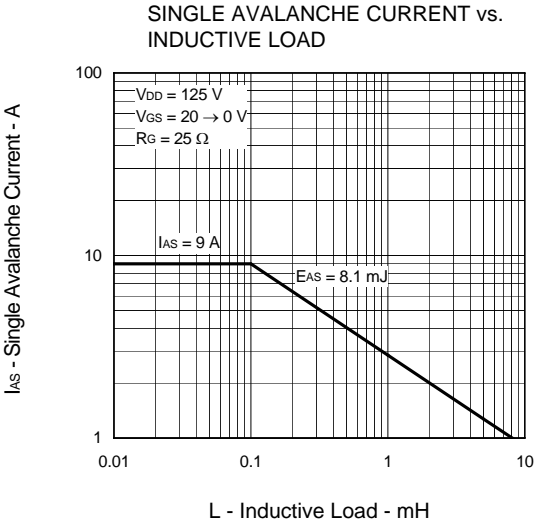


SOURCE TO DRAIN DIODE FORWARD VOLTAGE



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

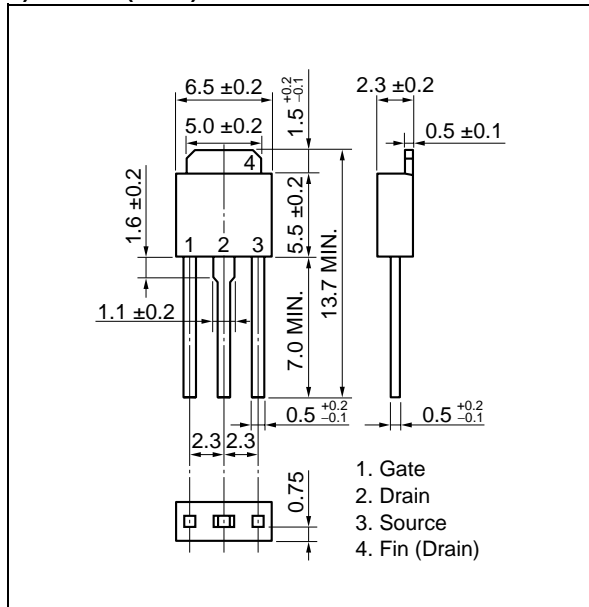




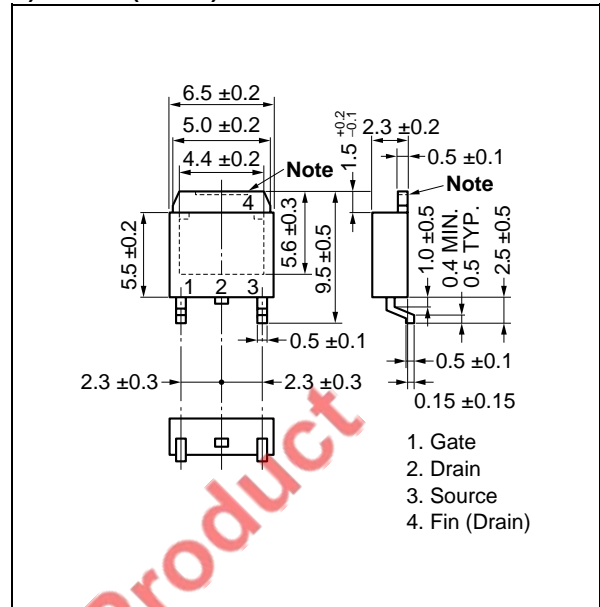
EOL announced Product

PACKAGE DRAWINGS (Unit: mm)

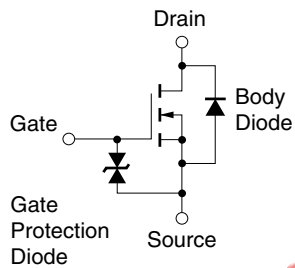
1) TO-251 (MP-3)



<R> 2) TO-252 (MP-3Z)



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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