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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

P-CHANNEL POWER MOS FET

DESCRIPTION

The 2SJ601 is P-channel MOS Field Effect Transistor designed for solenoid, motor and lamp driver.

FEATURES

- Low on-state resistance:
 $R_{DS(on)1} = 31 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -18 \text{ A)}$
 $R_{DS(on)2} = 46 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.0 \text{ V, } I_D = -18 \text{ A)}$
- Low input capacitance:
 $C_{iss} = 3300 \text{ pF TYP. (} V_{DS} = -10 \text{ V, } V_{GS} = 0 \text{ V)}$
- Built-in gate protection diode
- TO-251/TO-252 package

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

| | | | |
|--|----------------|-------------|------------------|
| Drain to Source Voltage ($V_{GS} = 0 \text{ V}$) | V_{DSS} | -60 | V |
| Gate to Source Voltage ($V_{DS} = 0 \text{ V}$) | V_{GSS} | ± 20 | V |
| Drain Current (DC) ($T_C = 25^\circ\text{C}$) | $I_{D(DC)}$ | ± 36 | A |
| Drain Current (pulse) ^{Note1} | $I_{D(pulse)}$ | ± 120 | A |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) | P_T | 65 | W |
| Total Power Dissipation ($T_A = 25^\circ\text{C}$) | P_T | 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} | -35 | A |
| Single Avalanche Energy ^{Note2} | E_{AS} | 123 | mJ |

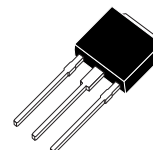
Notes 1. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = -30 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = -20 \rightarrow 0 \text{ V}$

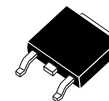
ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|-------------|----------------|
| 2SJ601 | TO-251 (MP-3) |
| 2SJ601-Z | TO-252 (MP-3Z) |

(TO-251)



(TO-252)



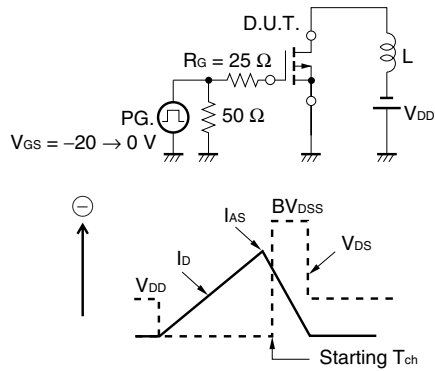
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ELECTRICAL CHARACTERISTICS (TA = 25°C)

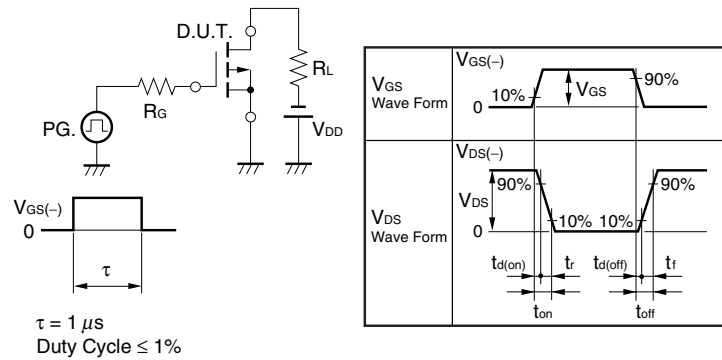
| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---------------|---|------|------|----------|------------------|
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$ | | | -10 | μA |
| Gate Leakage Current | I_{GSS} | $V_{GS} = \mp 20\text{ V}, V_{DS} = 0\text{ V}$ | | | ∓ 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 ^{Note} | $ y_{fs} $ | $V_{DS} = -10\text{ V}, I_D = -18\text{ A}$ | 15 | 30 | | S |
| Drain to Source On-state Resistance ^{Note} | $R_{DS(on)1}$ | $V_{GS} = -10\text{ V}, I_D = -18\text{ A}$ | | 25 | 31 | $\text{m}\Omega$ |
| | $R_{DS(on)2}$ | $V_{GS} = -4.0\text{ V}, I_D = -18\text{ A}$ | | 32 | 46 | $\text{m}\Omega$ |
| Input Capacitance | C_{iss} | $V_{DS} = -10\text{ V}$ | | 3300 | | pF |
| Output Capacitance | C_{oss} | $V_{GS} = 0\text{ V}$ | | 580 | | pF |
| Reverse Transfer Capacitance | C_{rss} | $f = 1\text{ MHz}$ | | 230 | | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $I_D = -18\text{ A}$ | | 11 | | ns |
| Rise Time | t_r | $V_{GS} = -10\text{ V}$ | | 12 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | $V_{DD} = -30\text{ V}$ | | 80 | | ns |
| Fall Time | t_f | $R_G = 0\ \Omega$ | | 53 | | ns |
| Total Gate Charge | Q_G | $V_{DD} = -48\text{ V}$ | | 63 | | nC |
| Gate to Source Charge | Q_{GS} | $V_{GS} = -10\text{ V}$ | | 10 | | nC |
| Gate to Drain Charge | Q_{GD} | $I_D = -36\text{ A}$ | | 16 | | nC |
| Body Diode Forward Voltage ^{Note} | $V_{F(S-D)}$ | $I_F = 36\text{ A}, V_{GS} = 0\text{ V}$ | | 1.0 | | V |
| Reverse Recovery Time | t_{rr} | $I_F = 36\text{ A}, V_{GS} = 0\text{ V}$ | | 52 | | ns |
| Reverse Recovery Charge | Q_{rr} | $di/dt = 100\text{ A}/\mu\text{s}$ | | 108 | | nC |

Note Pulsed

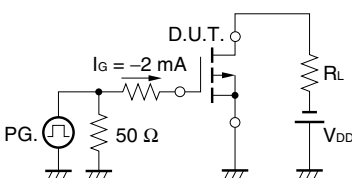
TEST CIRCUIT 1 AVALANCHE CAPABILITY



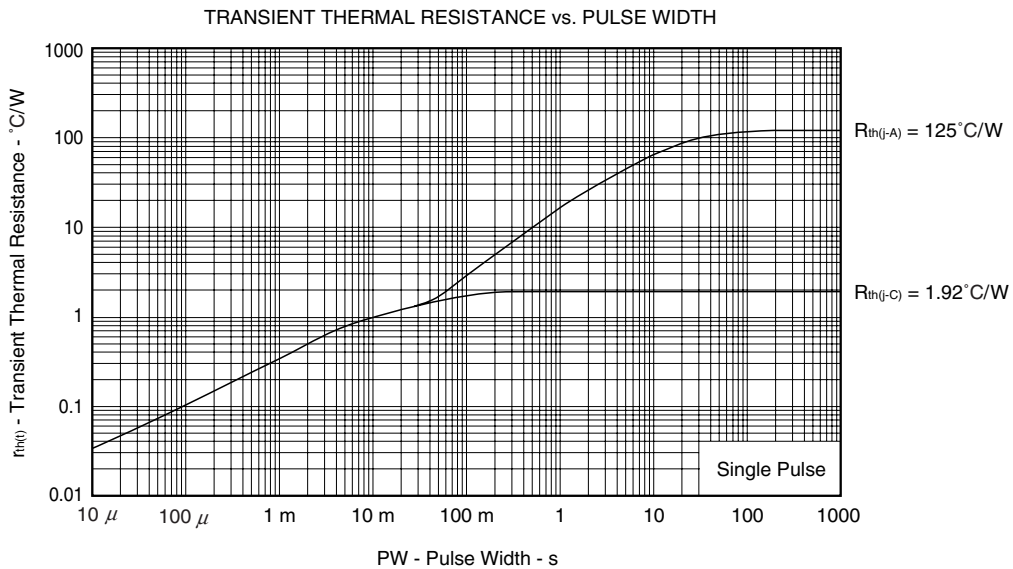
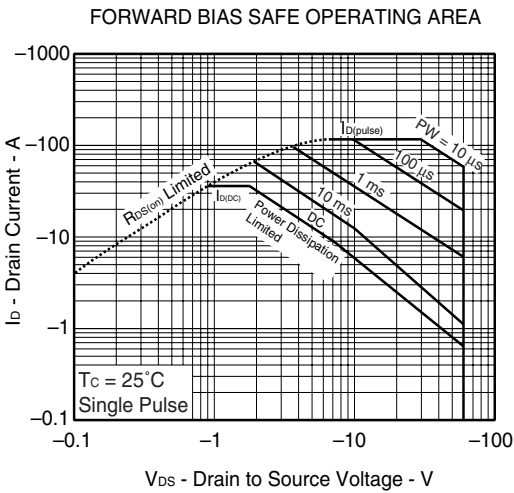
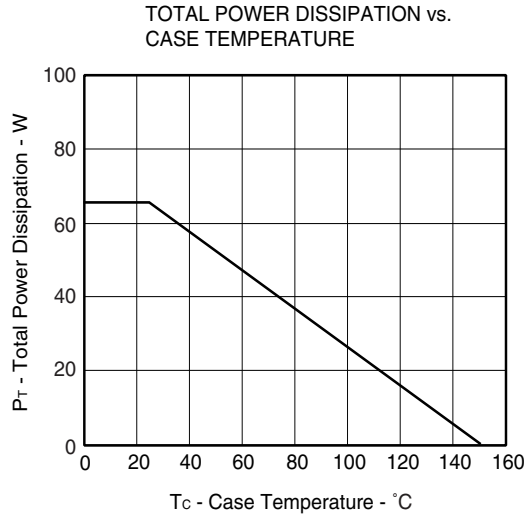
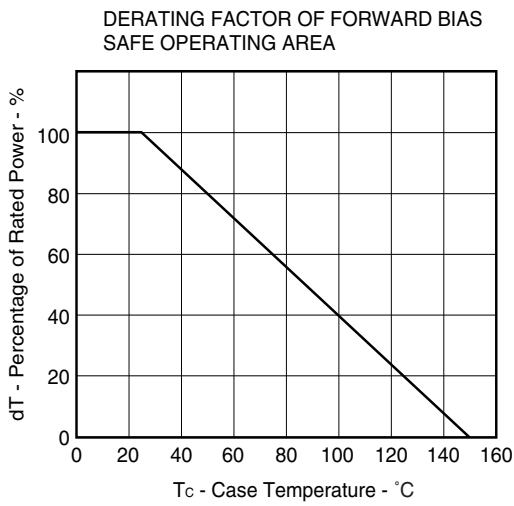
TEST CIRCUIT 2 SWITCHING TIME

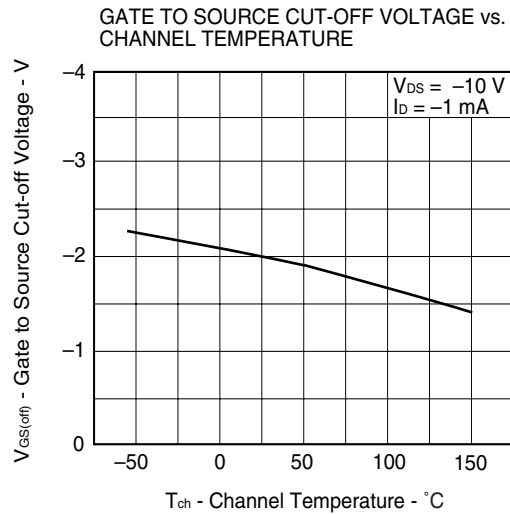
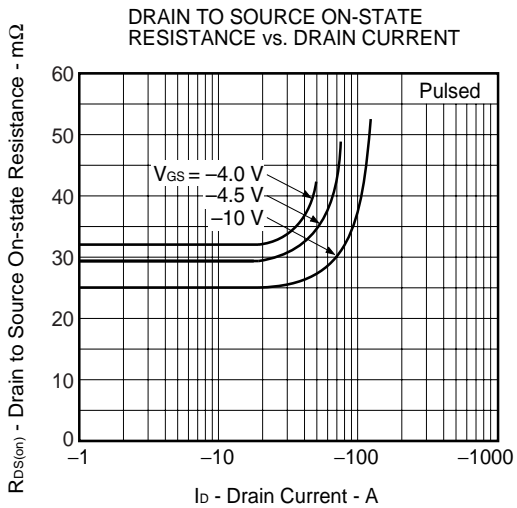
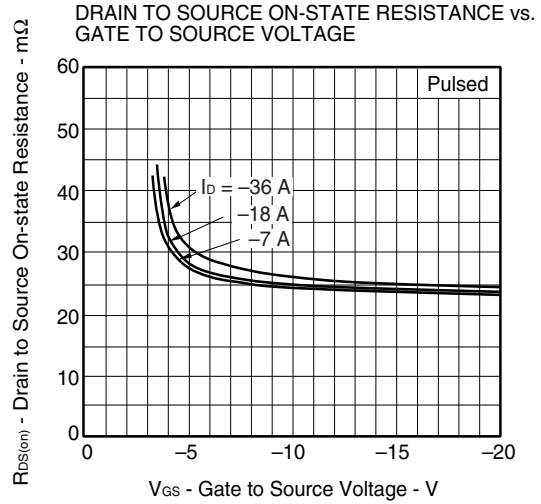
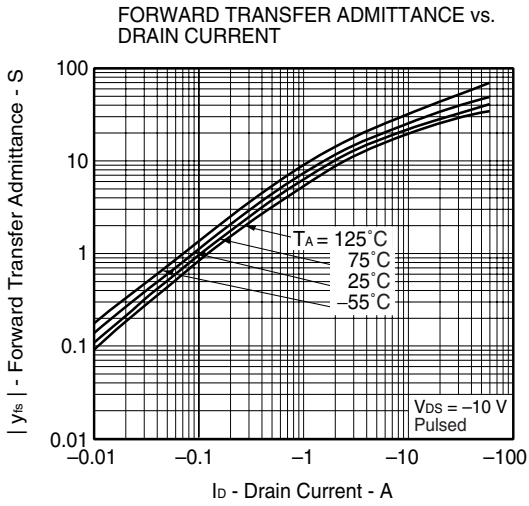
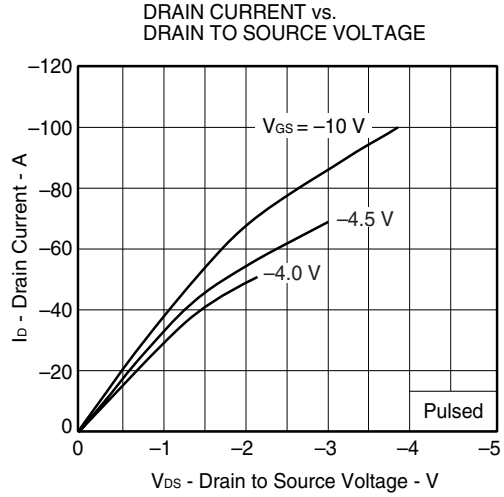
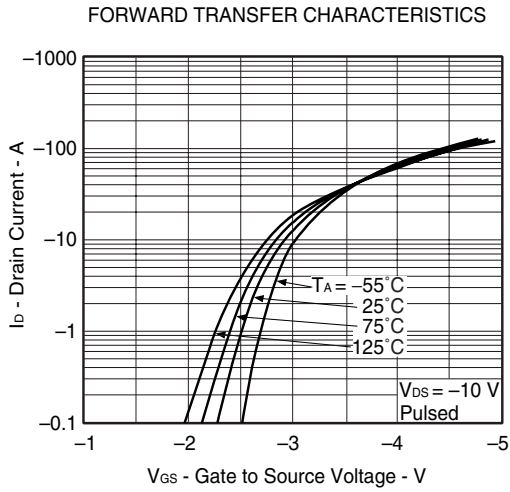


TEST CIRCUIT 3 GATE CHARGE

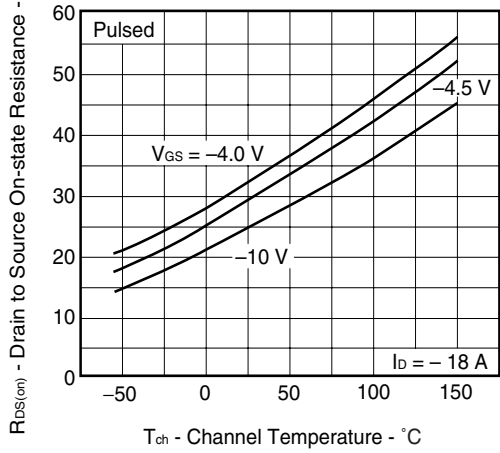


TYPICAL CHARACTERISTICS (T_A = 25°C)

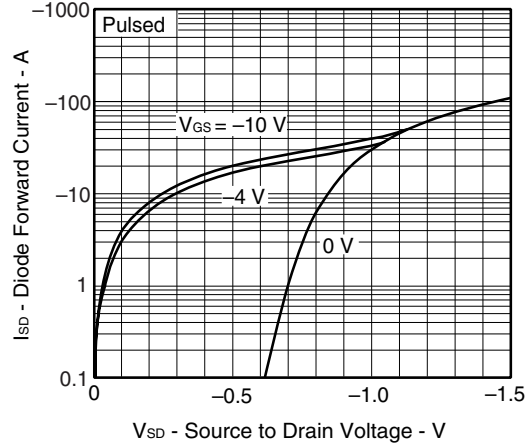




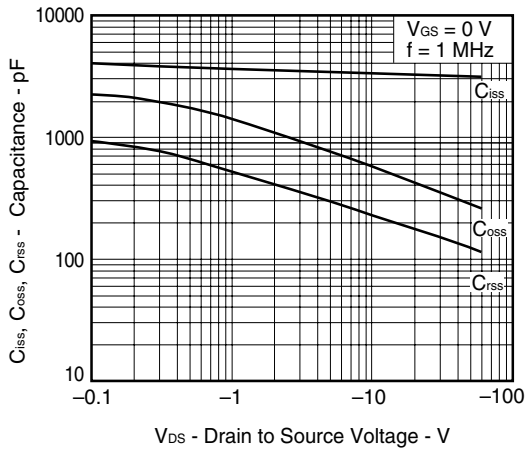
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



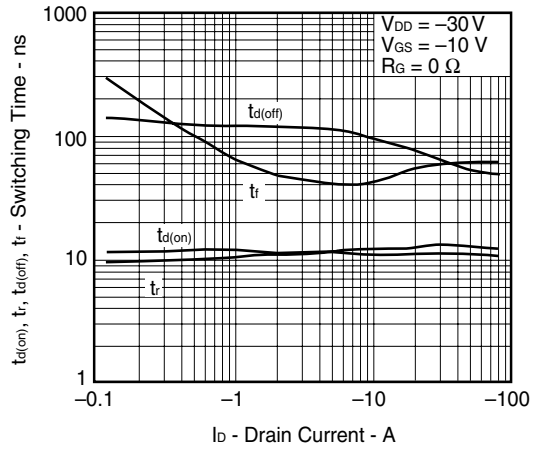
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



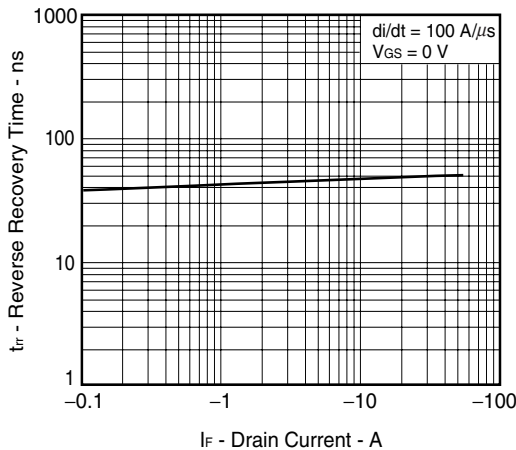
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



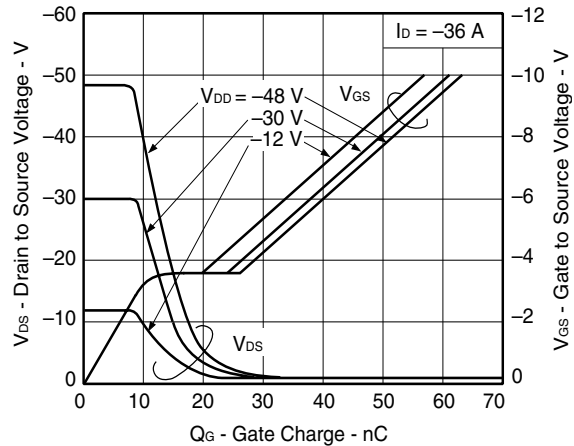
SWITCHING CHARACTERISTICS

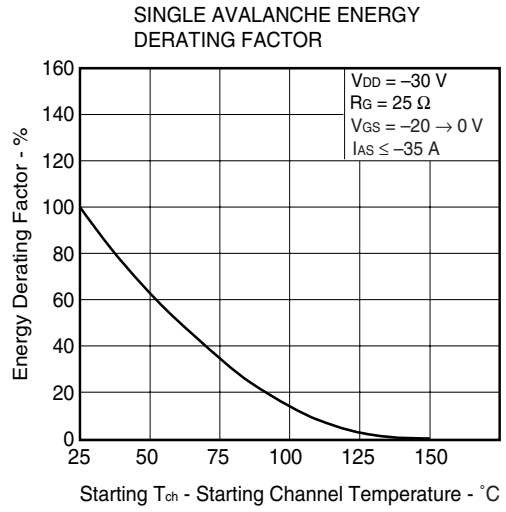
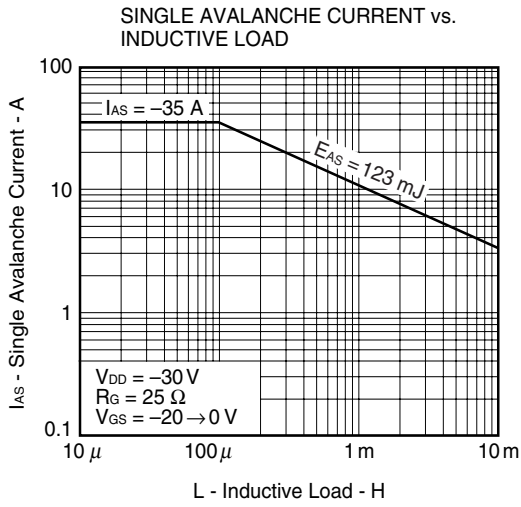


REVERSE RECOVERY TIME vs. DRAIN CURRENT



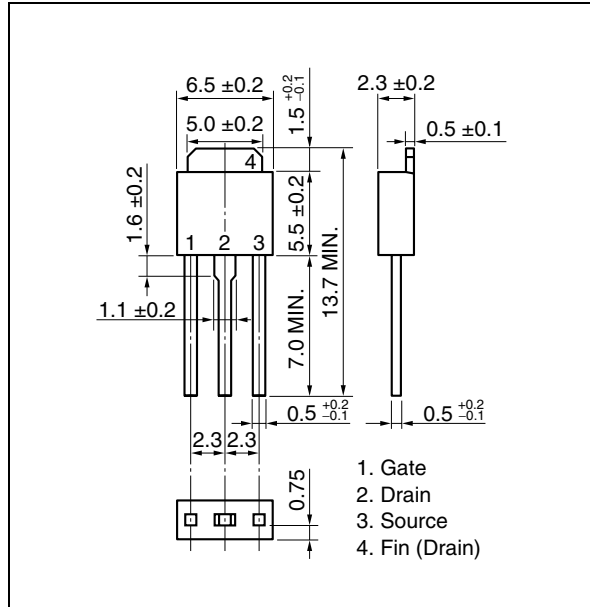
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



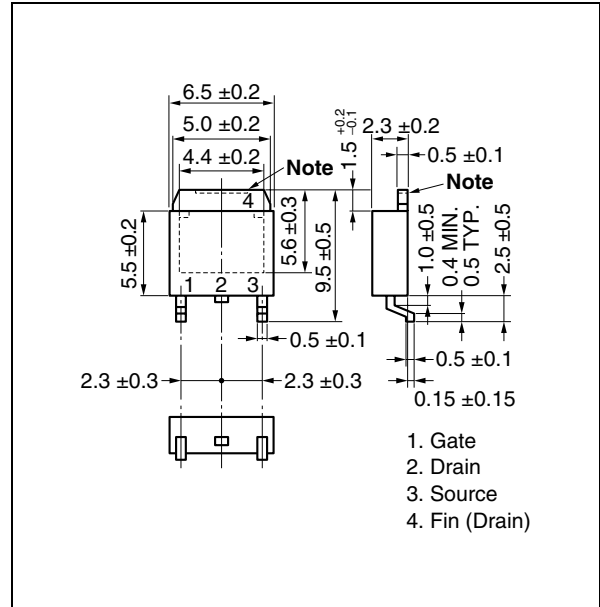


PACKAGE DRAWINGS (Unit: mm)

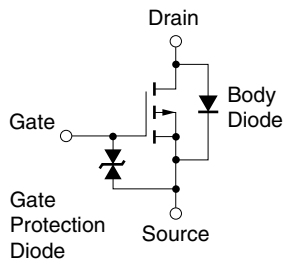
1) TO-251 (MP-3)



<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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