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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
INDUSTRIAL USE

DESCRIPTION

This product is N-Channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES

- Low On-State Resistance
 $R_{DS(on)1} = 34 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 15 \text{ A)}$
 $R_{DS(on)2} = 50 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 15 \text{ A)}$
- Low C_{iss} : $C_{iss} = 920 \text{ pF TYP.}$
- Built-in Gate Protection Diode
- Isolated TO-220 package

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

| | | | |
|--|----------------|-------------|----|
| Drain to Source Voltage ($V_{GS} = 0 \text{ V}$) | V_{DSS} | 60 | V |
| Gate to Source Voltage ($V_{DS} = 0 \text{ V}$) | $V_{GSS(AC)}$ | ± 20 | V |
| Gate to Source Voltage ($V_{DS} = 0 \text{ V}$) | $V_{GSS(DC)}$ | +20, -10 | V |
| Drain Current (DC) ($T_C = 25^\circ\text{C}$) | $I_{D(DC)}$ | ± 30 | A |
| Drain Current (Pulse) ^{Note1} | $I_{D(pulse)}$ | ± 100 | A |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) | P_T | 25 | W |
| Total Power Dissipation ($T_A = 25^\circ\text{C}$) | P_T | 2.0 | W |
| Channel Temperature | T_{ch} | 150 | °C |
| Storage Temperature | T_{stg} | -55 to +150 | °C |
| Single Avalanche Current ^{Note2} | I_{AS} | 15 | A |
| Single Avalanche Energy ^{Note2} | E_{AS} | 22.5 | mJ |

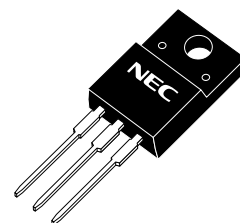
Notes 1. $PW \leq 10 \mu\text{s}$, Duty cycle $\leq 1\%$

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

ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|-------------|-----------------|
| 2SK3055 | Isolated TO-220 |

★ (Isolated TO-220)

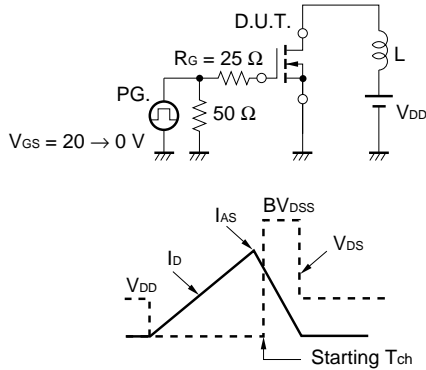


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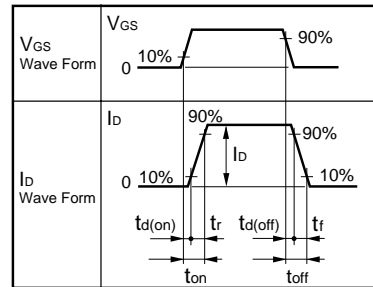
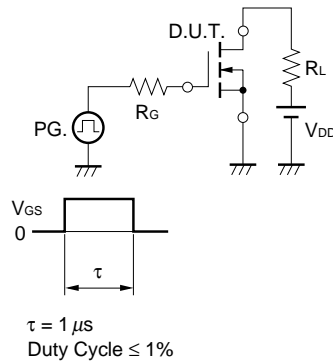
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

| 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 | 1.0 | 1.6 | 2.0 | V |
| Forward Transfer Admittance | y _{fs} | V _{DS} = 10 V, I _D = 15 A | 8.0 | 20 | | S |
| Drain to Source On-state Resistance | R _{DS(on)1} | V _{GS} = 10 V, I _D = 15 A | | 24 | 34 | mΩ |
| | R _{DS(on)2} | V _{GS} = 4.0 V, I _D = 15 A | | 35 | 50 | mΩ |
| Input Capacitance | C _{iss} | V _{DS} = 10 V | | 920 | | pF |
| Output Capacitance | C _{oss} | V _{GS} = 0 V | | 280 | | pF |
| Reverse Transfer Capacitance | C _{rss} | f = 1 MHz | | 120 | | pF |
| Turn-on Delay Time | t _{d(on)} | V _{DD} = 30 V, I _D = 15 A | | 25 | | ns |
| Rise Time | t _r | V _{GS} = 10 V | | 300 | | ns |
| Turn-off Delay Time | t _{d(off)} | R _G = 10 Ω | | 70 | | ns |
| Fall Time | t _f | | | 120 | | ns |
| Total Gate Charge | Q _G | V _{DD} = 48 V | | 25 | | nC |
| Gate to Source Charge | Q _{GS} | V _{GS} = 10 V | | 3.3 | | nC |
| Gate to Drain Charge | Q _{GD} | I _D = 30 A | | 7.0 | | nC |
| Body Diode Forward Voltage | V _{F(S-D)} | I _F = 30 A, V _{GS} = 0 V | | 1.0 | | V |
| Reverse Recovery Time | t _{rr} | I _F = 30 A, V _{GS} = 0 V | | 45 | | ns |
| Reverse Recovery Charge | Q _{rr} | di/dt = 100 A/μs | | 60 | | nC |

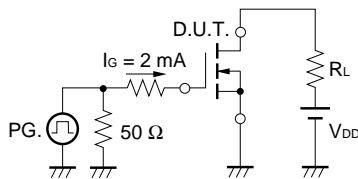
TEST CIRCUIT 1 AVALANCHE CAPABILITY



★ TEST CIRCUIT 2 SWITCHING TIME

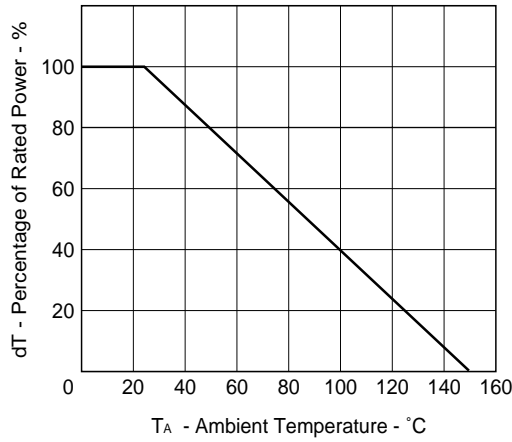


TEST CIRCUIT 3 GATE CHARGE

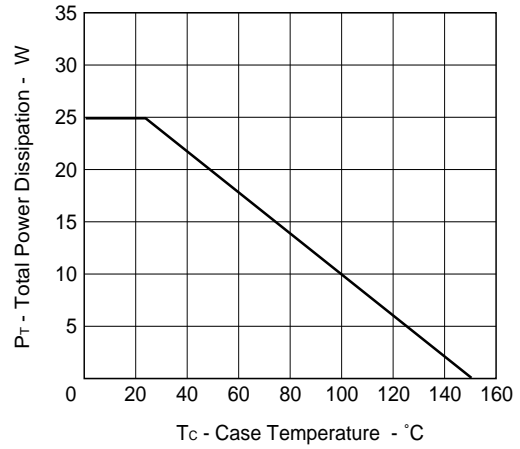


TYPICAL CHARACTERISTICS (T_A = 25°C)

DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

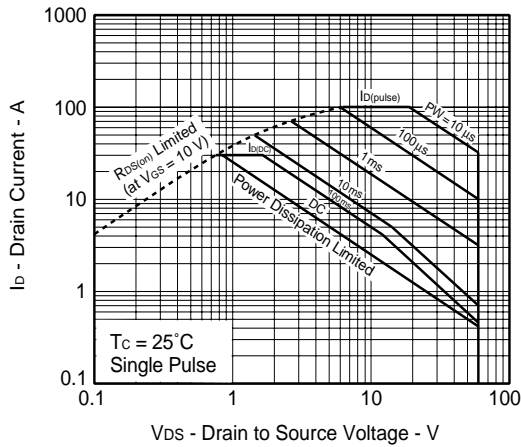


TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

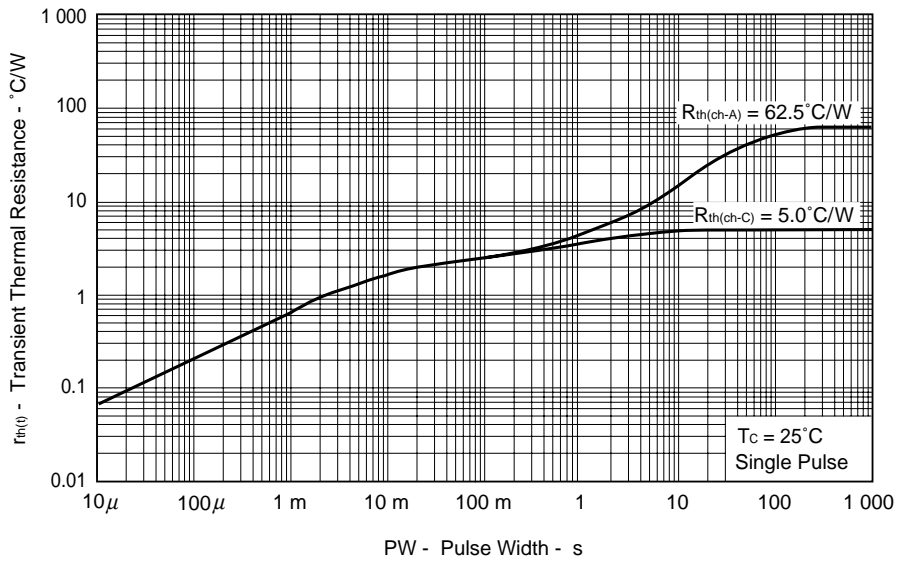


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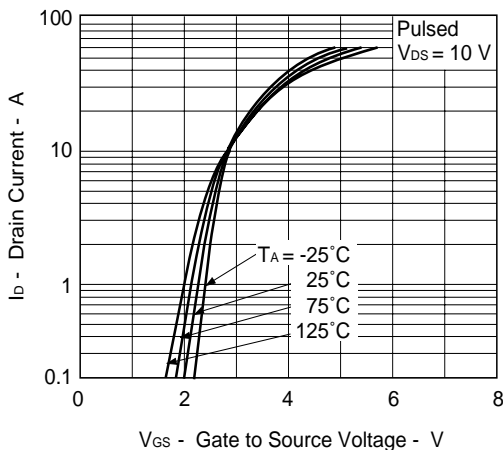
FORWARD BIAS SAFE OPERATING AREA



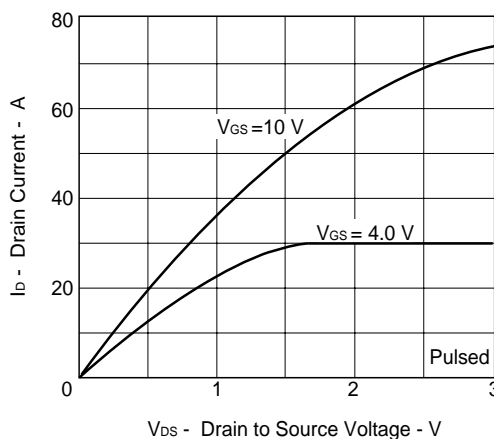
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



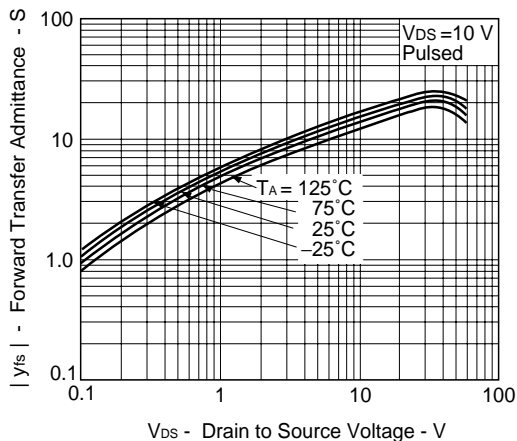
FORWARD TRANSFER CHARACTERISTICS



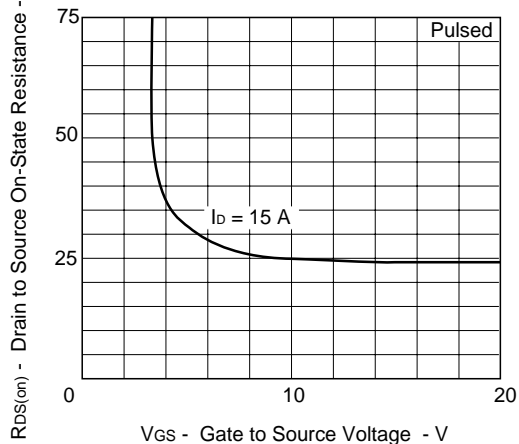
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



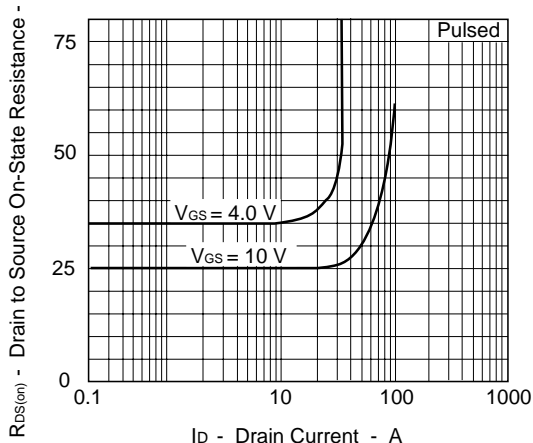
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



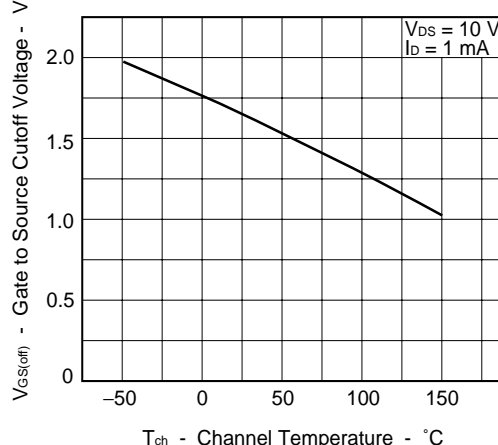
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



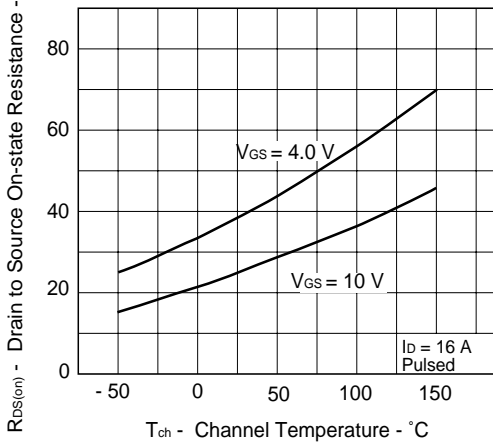
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



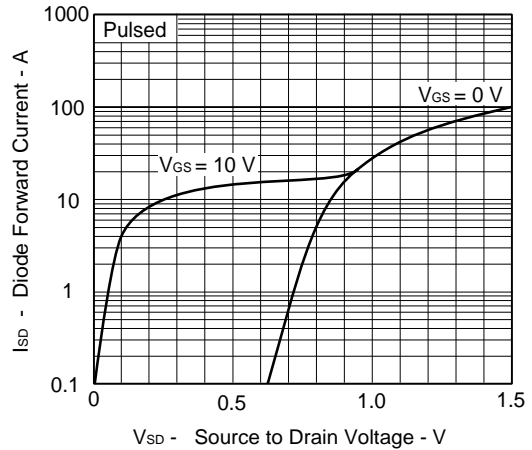
GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



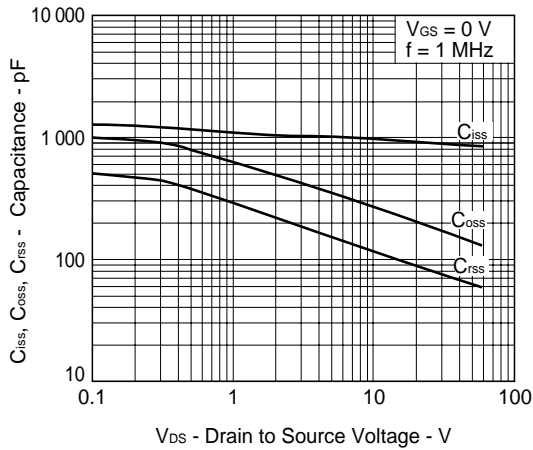
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



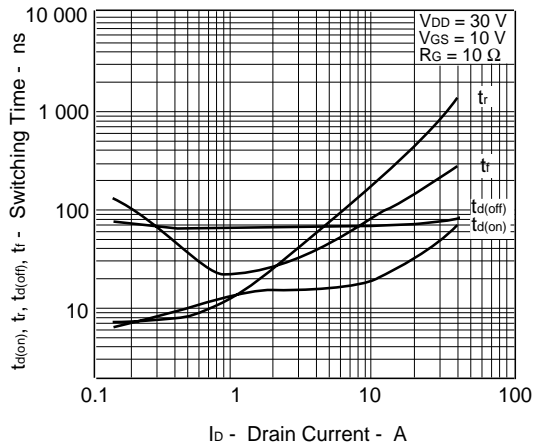
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



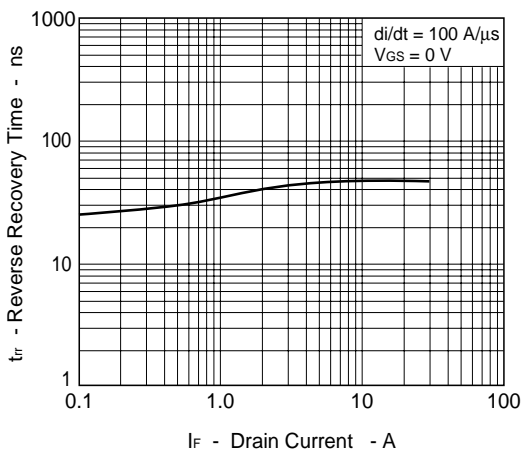
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



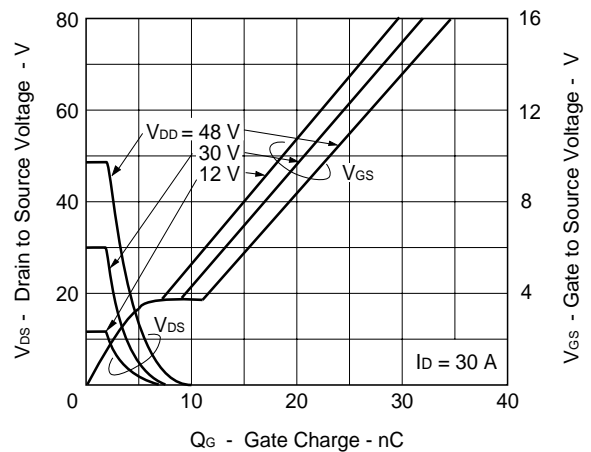
SWITCHING CHARACTERISTICS

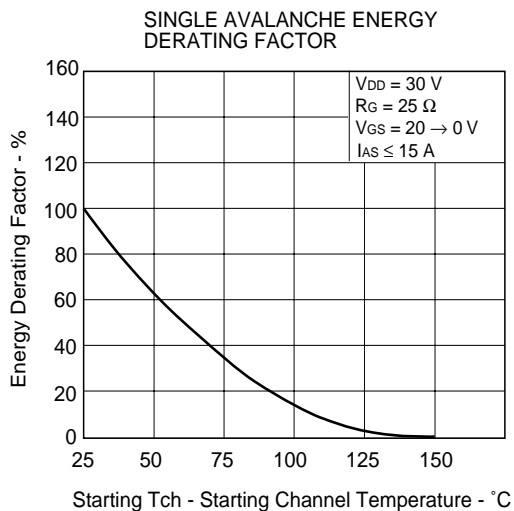
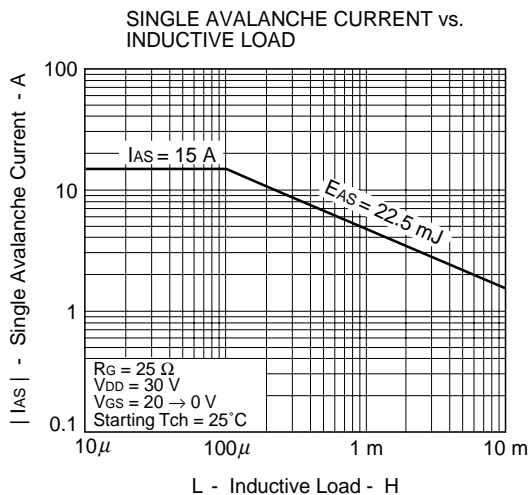


REVERSE RECOVERY TIME vs. DRAIN CURRENT



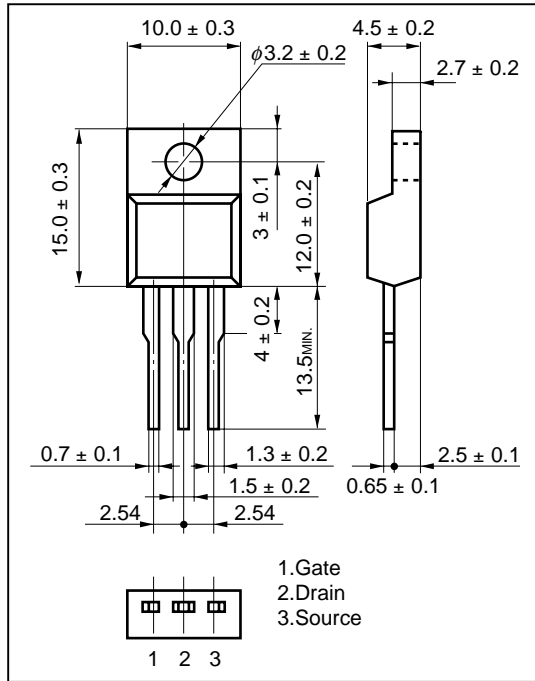
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



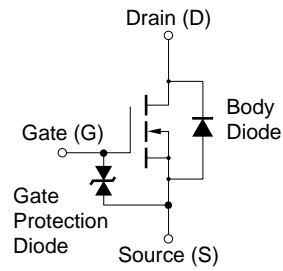


PACKAGE DRAWING (Unit: mm)

Isolated TO-220 (MP-45F)



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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