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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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MOS FIELD EFFECT TRANSISTOR 2SK3793

SWITCHING N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK3793 is N-channel MOS Field Effect Transistor designed for high current switching applications.

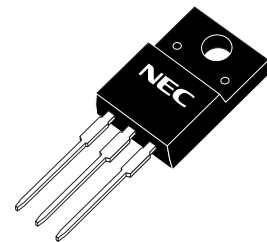
ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|-------------|-----------------|
| 2SK3793 | Isolated TO-220 |

FEATURES

- Super low on-state resistance
 $R_{DS(on)1} = 125 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 6 \text{ A)}$
 $R_{DS(on)2} = 148 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 6 \text{ A)}$
- Low C_{iss} : $C_{iss} = 900 \text{ pF TYP.}$
- Built-in gate protection diode

(Isolated TO-220)



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

| | | | |
|--|----------------|-------------|------------------|
| Drain to Source Voltage ($V_{GS} = 0 \text{ V}$) | V_{DSS} | 100 | V |
| Gate to Source Voltage ($V_{DS} = 0 \text{ V}$) | V_{GSS} | ± 20 | V |
| Drain Current (DC) ($T_C = 25^\circ\text{C}$) | $I_{D(DC)}$ | ± 12 | A |
| Drain Current (pulse) ^{Note1} | $I_{D(pulse)}$ | ± 22 | A |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) | P_{T1} | 20 | W |
| Total Power Dissipation ($T_A = 25^\circ\text{C}$) | P_{T2} | 2.0 | 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} | 10 | A |
| Single Avalanche Energy ^{Note2} | E_{AS} | 10 | mJ |

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

2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = 50 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = 20 \rightarrow 0 \text{ V}$

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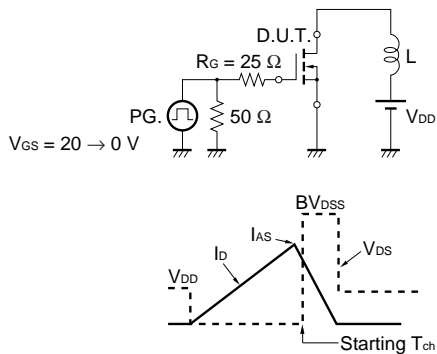
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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

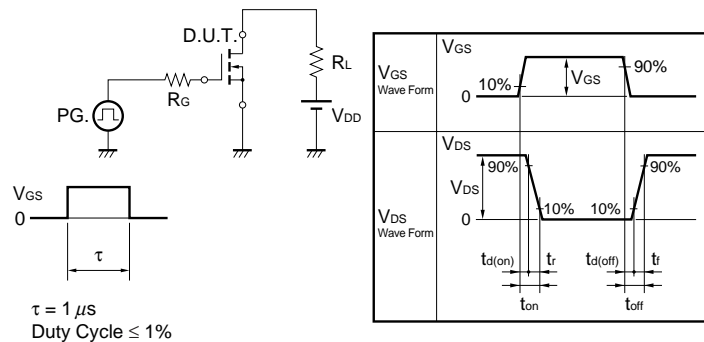
| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|----------------------|--|------|------|------|------|
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} = 100 V, V _{GS} = 0 V | | | 10 | μA |
| Gate Leakage Current | I _{GSS} | V _{GS} = ±20 V, V _{DS} = 0 V | | | ±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 ^{Note} | y _{fs} | V _{DS} = 10 V, I _D = 6 A | 5.0 | 10.3 | | S |
| Drain to Source On-state Resistance ^{Note} | R _{DS(on)1} | V _{GS} = 10 V, I _D = 6 A | | 89 | 125 | mΩ |
| | R _{DS(on)2} | V _{GS} = 4.5 V, I _D = 6 A | | 96 | 148 | mΩ |
| Input Capacitance | C _{iss} | V _{DS} = 10 V | | 900 | | pF |
| Output Capacitance | C _{oss} | V _{GS} = 0 V | | 110 | | pF |
| Reverse Transfer Capacitance | C _{rss} | f = 1 MHz | | 50 | | pF |
| Turn-on Delay Time | t _{d(on)} | V _{DD} = 50 V, I _D = 6 A | | 9 | | ns |
| Rise Time | t _r | V _{GS} = 10 V | | 5 | | ns |
| Turn-off Delay Time | t _{d(off)} | R _G = 0 Ω | | 30 | | ns |
| Fall Time | t _f | | | 4 | | ns |
| Total Gate Charge | Q _G | V _{DD} = 80 V | | 21 | | nC |
| Gate to Source Charge | Q _{GS} | V _{GS} = 10 V | | 3.0 | | nC |
| Gate to Drain Charge | Q _{GD} | I _D = 12 A | | 6.2 | | nC |
| Body Diode Forward Voltage ^{Note} | V _{F(S-D)} | I _F = 12 A, V _{GS} = 0 V | | 0.89 | 1.5 | V |
| Reverse Recovery Time | t _{rr} | I _F = 12 A, V _{GS} = 0 V | | 52 | | ns |
| Reverse Recovery Charge | Q _{rr} | di/dt = 100 A/μs | | 94 | | nC |

Note Pulsed

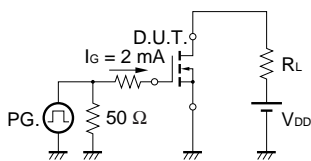
TEST CIRCUIT 1 AVALANCHE CAPABILITY



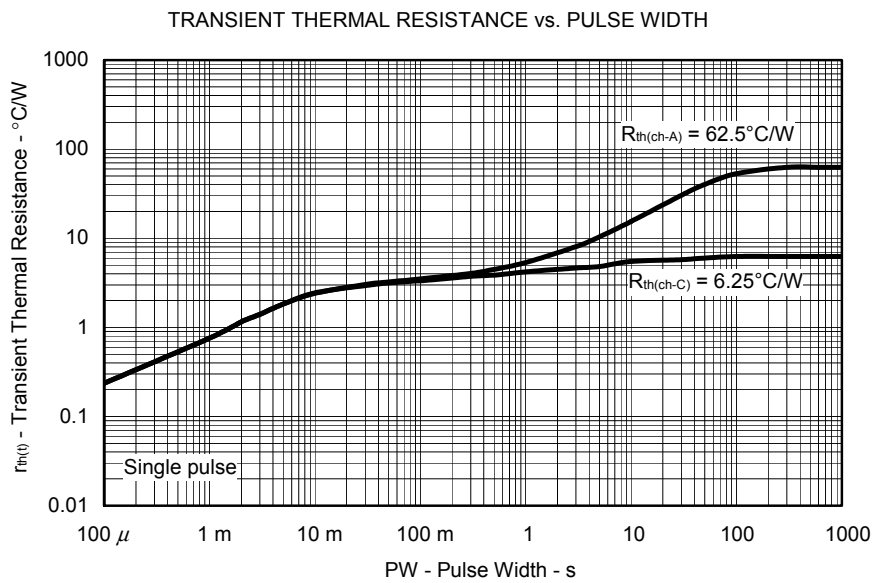
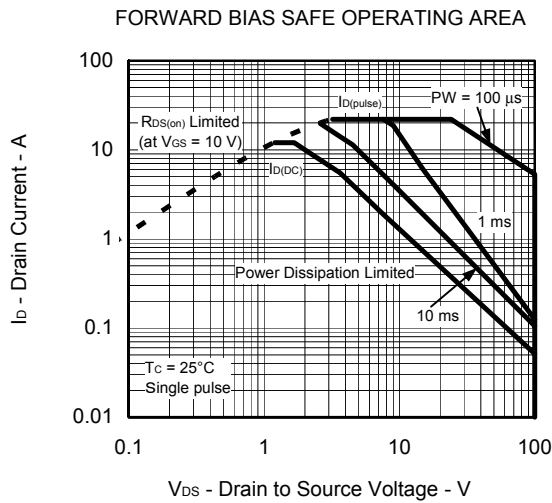
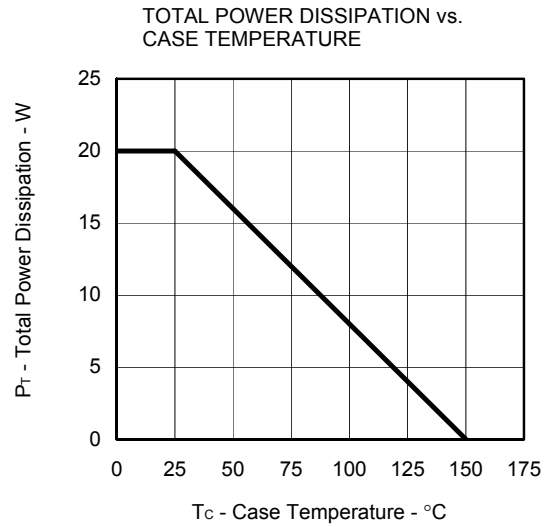
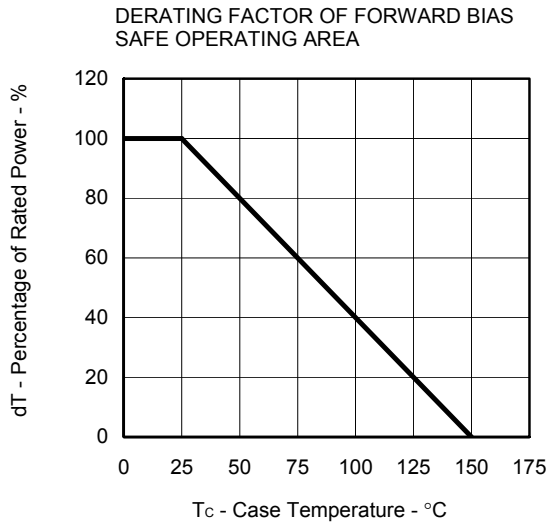
TEST CIRCUIT 2 SWITCHING TIME



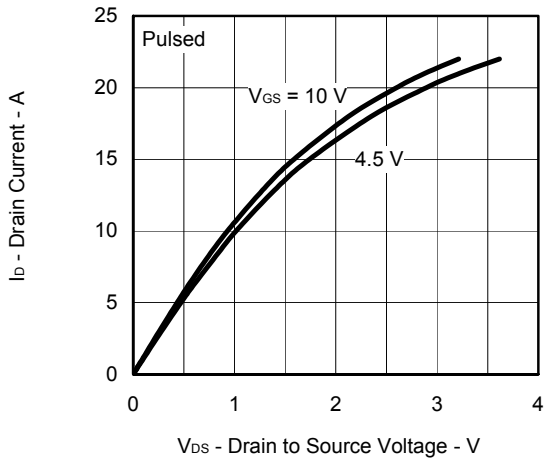
TEST CIRCUIT 3 GATE CHARGE



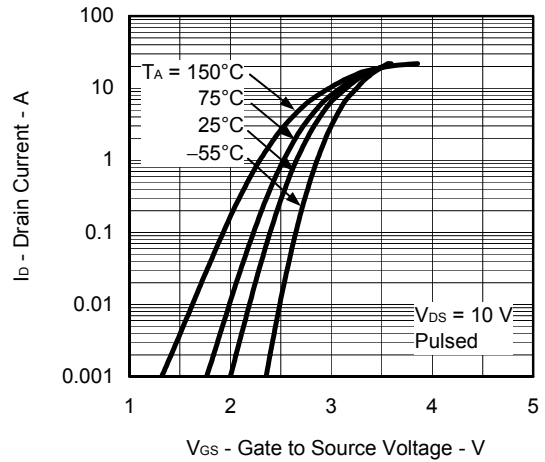
TYPICAL CHARACTERISTICS (T_A = 25°C)



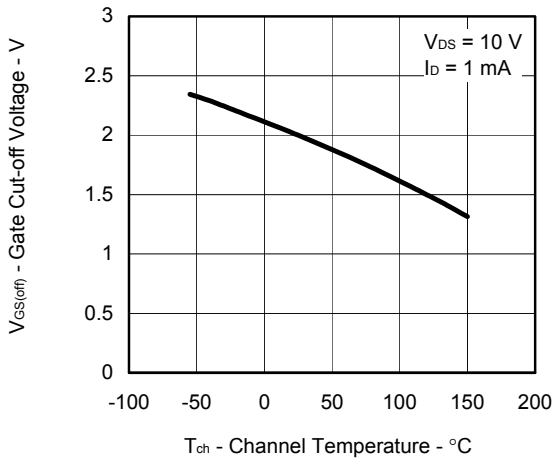
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



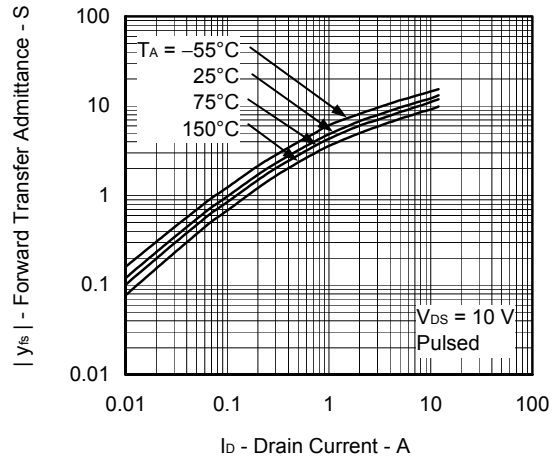
FORWARD TRANSFER CHARACTERISTICS



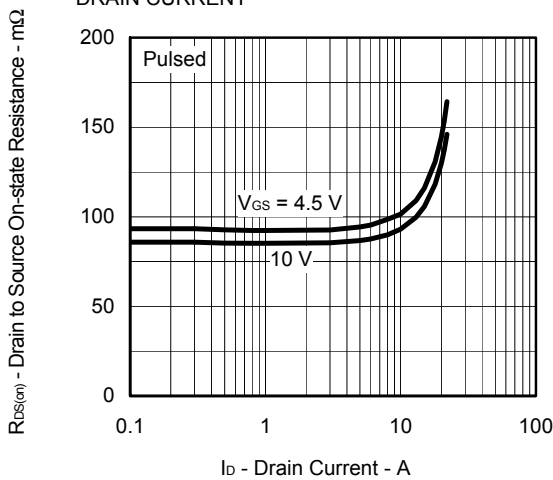
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



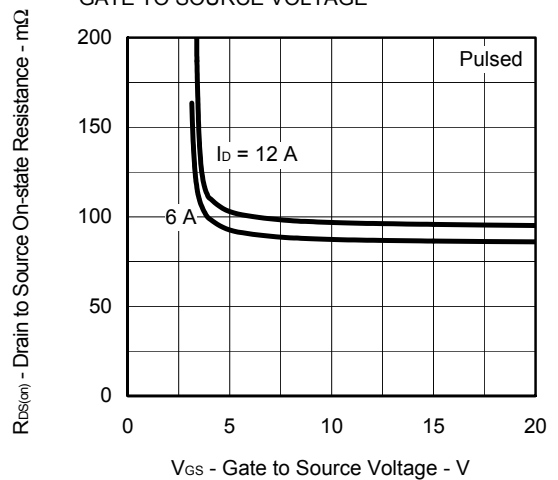
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



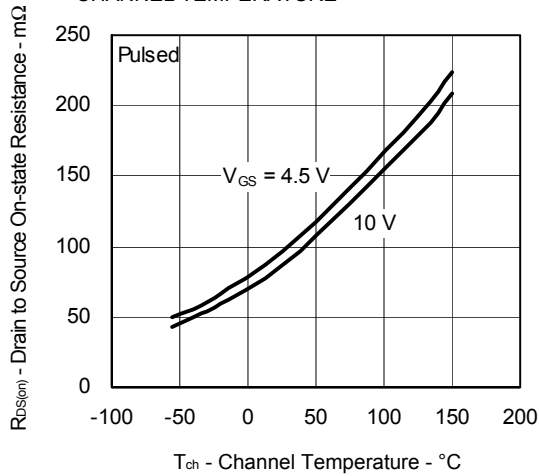
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



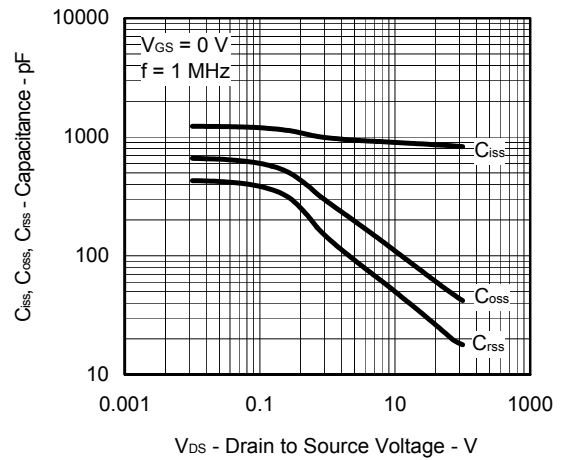
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



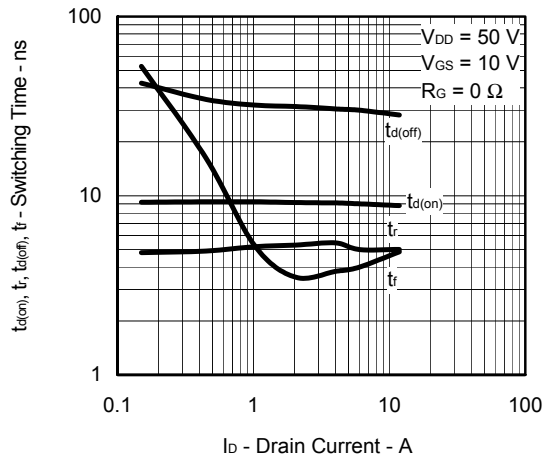
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



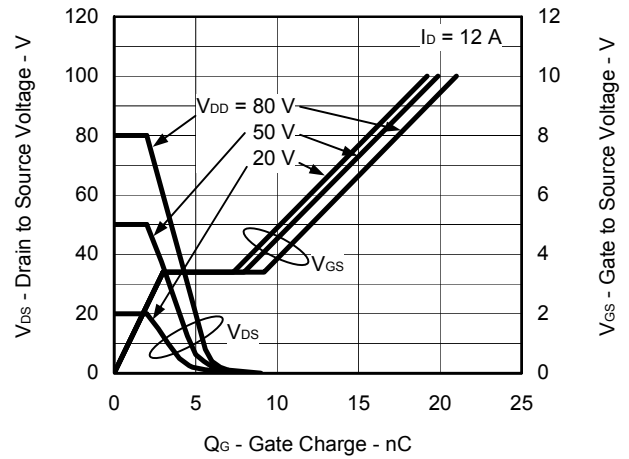
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



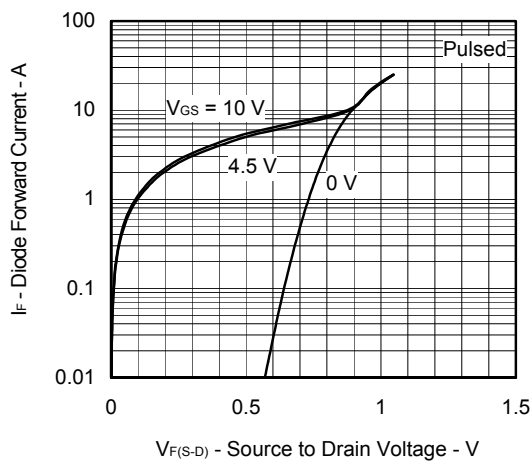
SWITCHING CHARACTERISTICS



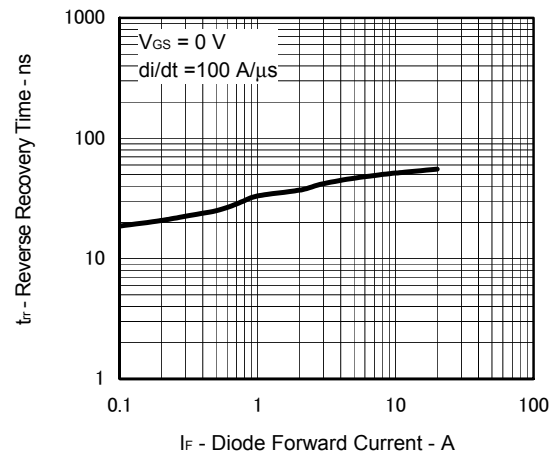
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



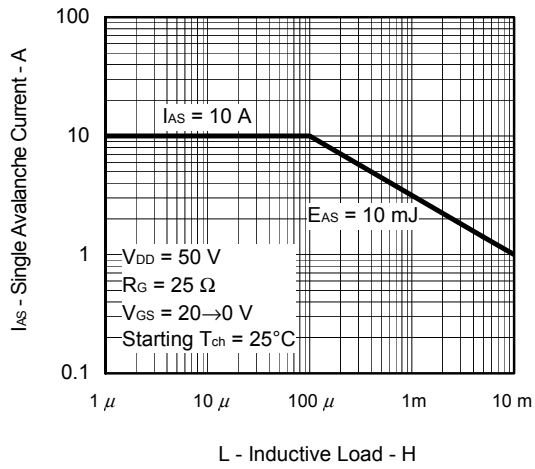
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



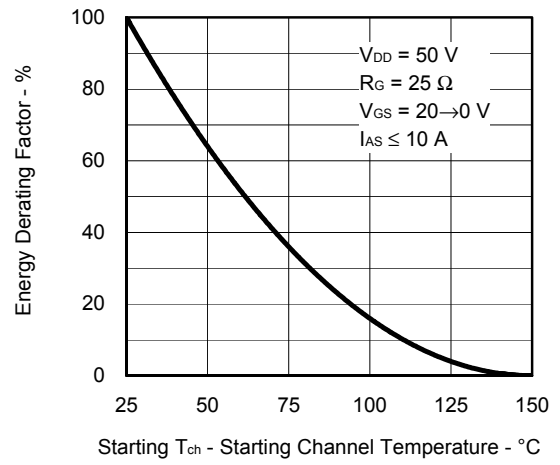
REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



SINGLE AVALANCHE CURRENT vs. INDUCTIVE LOAD

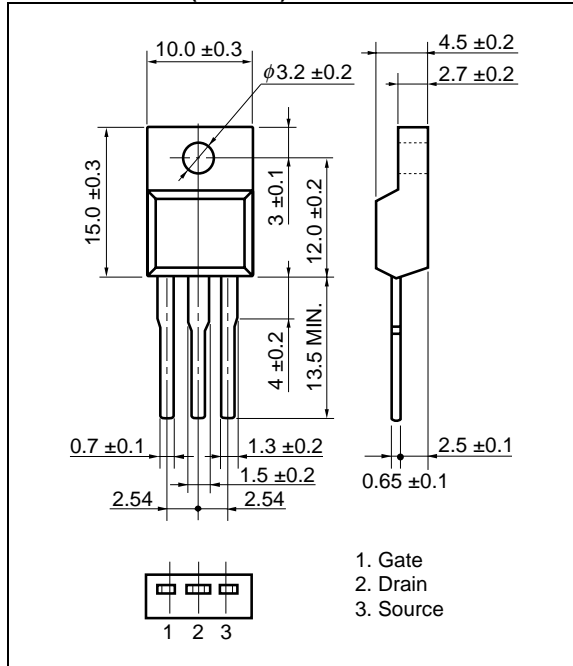


SINGLE AVALANCHE ENERGY DERATING FACTOR

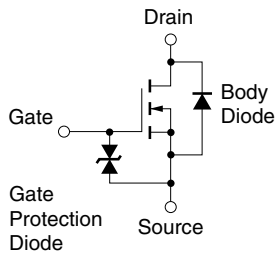


PACKAGE DRAWING (Unit: mm)

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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