

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

- Super Low On-State Resistance
 $R_{DS(on)1} = 17 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 28 \text{ A)}$
 $R_{DS(on)2} = 27 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 28 \text{ A)}$
- Low C_{iss} : $C_{iss} = 2100 \text{ pF (TYP.)}$
- Built-in Gate Protection Diode

ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|-------------|----------|
| 2SK3058 | TO-220AB |
| 2SK3058-S | TO-262 |
| 2SK3058-ZJ | TO-263 |

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

| | | | |
|--|----------------|--------------|------------------|
| Drain to Source Voltage ($V_{GS} = 0$) | V_{DSS} | 60 | V |
| Gate to Source Voltage ($V_{DS} = 0$) | $V_{GSS(AC)}$ | ± 20 | V |
| Gate to Source Voltage ($V_{DS} = 0$) | $V_{GSS(DC)}$ | +20, -10 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ± 55 | A |
| Drain Current (Pulse) ^{Note1} | $I_{D(pulse)}$ | ± 165 | A |
| Total Power Dissipation ($T_C = 25^\circ\text{C}$) | P_T | 58 | W |
| Total Power Dissipation ($T_A = 25^\circ\text{C}$) | P_T | 1.5 | 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} | 27.5 | A |
| Single Avalanche Energy ^{Note2} | E_{AS} | 75.6 | mJ |

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

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

THERMAL RESISTANCE

| | | | |
|--------------------|----------------|------|--------------------|
| Channel to Case | $R_{th(ch-C)}$ | 2.16 | $^\circ\text{C/W}$ |
| Channel to Ambient | $R_{th(ch-A)}$ | 83.3 | $^\circ\text{C/W}$ |

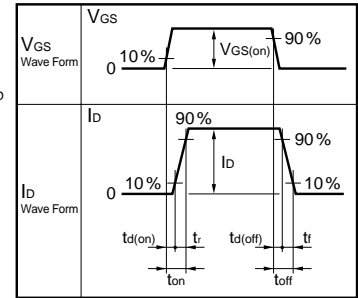
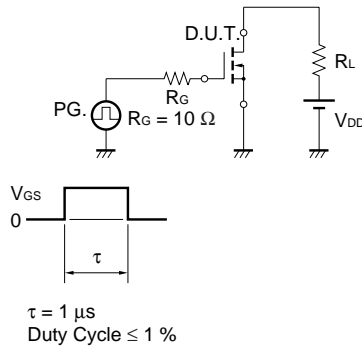
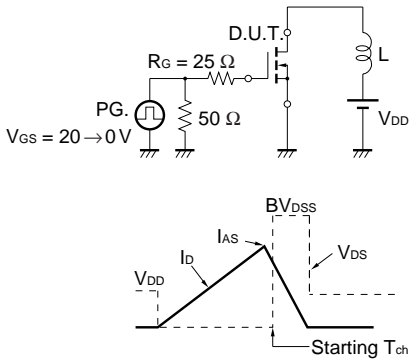
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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

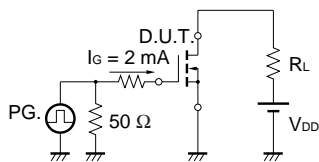
| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|----------------------|--|------|------|------|------|
| Drain to Source On-state Resistance | R _{DS(on)1} | V _{GS} = 10 V, I _D = 28 A | | 12 | 17 | mΩ |
| | R _{DS(on)2} | V _{GS} = 4.0 V, I _D = 28 A | | 19 | 27 | mΩ |
| Gate to Source 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 = 28 A | 13 | 42 | | S |
| Drain Leakage Current | I _{DSS} | V _{DS} = 60 V, V _{GS} = 0 V | | | 10 | μA |
| Gate to Source Leakage Current | I _{GSS} | V _{GS} = ±20 V, V _{DS} = 0 V | | | ±10 | μA |
| Input Capacitance | C _{iss} | V _{DS} = 10 V | | 2100 | | pF |
| Output Capacitance | C _{oss} | V _{GS} = 0 V | | 550 | | pF |
| Reverse Transfer Capacitance | C _{rss} | F = 1 MHz | | 220 | | pF |
| Turn-on Delay Time | t _{d(on)} | I _D = 28 A | | 36 | | ns |
| Rise Time | t _r | V _{GS(on)} = 10 V | | 410 | | ns |
| Turn-off Delay Time | t _{d(off)} | V _{DD} = 30 V | | 130 | | ns |
| Fall Time | t _f | R _G = 10 Ω | | 260 | | ns |
| Total Gate Charge | Q _G | I _D = 55 A | | 45 | | nC |
| Gate to Source Charge | Q _{GS} | V _{DD} = 48 V | | 7 | | nC |
| Gate to Drain Charge | Q _{GD} | V _{GS} = 10 V | | 13 | | nC |
| Body Diode Forward Voltage | V _{F(S-D)} | I _F = 55 A, V _{GS} = 0 V | | 1.0 | | V |
| Reverse Recovery Time | t _{rr} | I _F = 55 A, V _{GS} = 0 V | | 60 | | ns |
| Reverse Recovery Charge | Q _{rr} | di/dt = 100A/μs | | 100 | | nC |

TEST CIRCUIT 1 AVALANCHE CAPABILITY

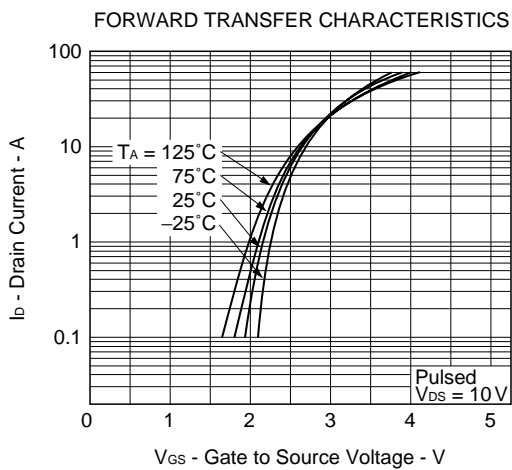
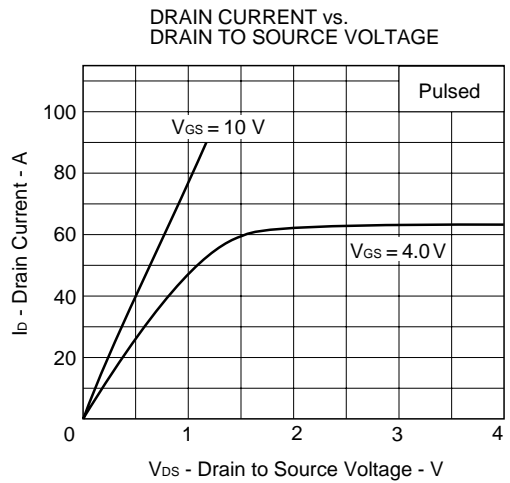
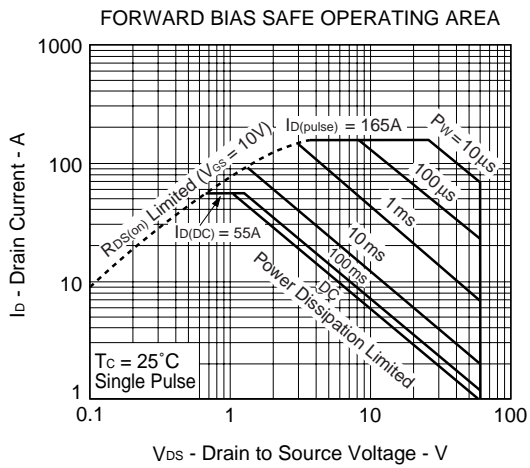
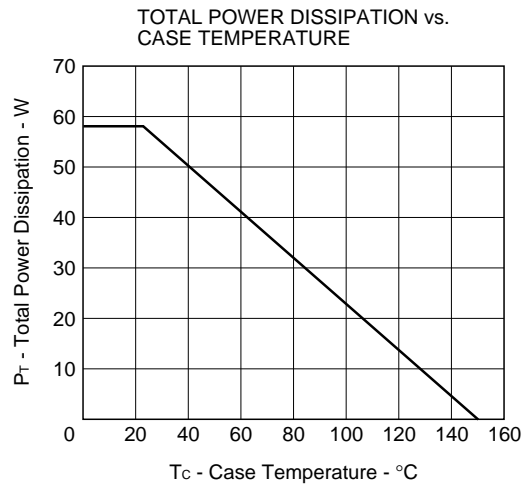
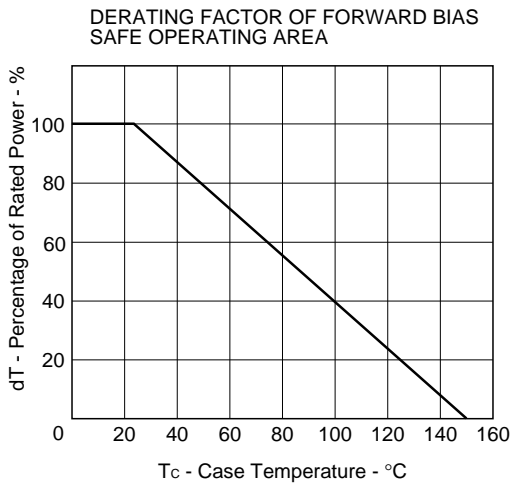
TEST CIRCUIT 2 SWITCHING TIME



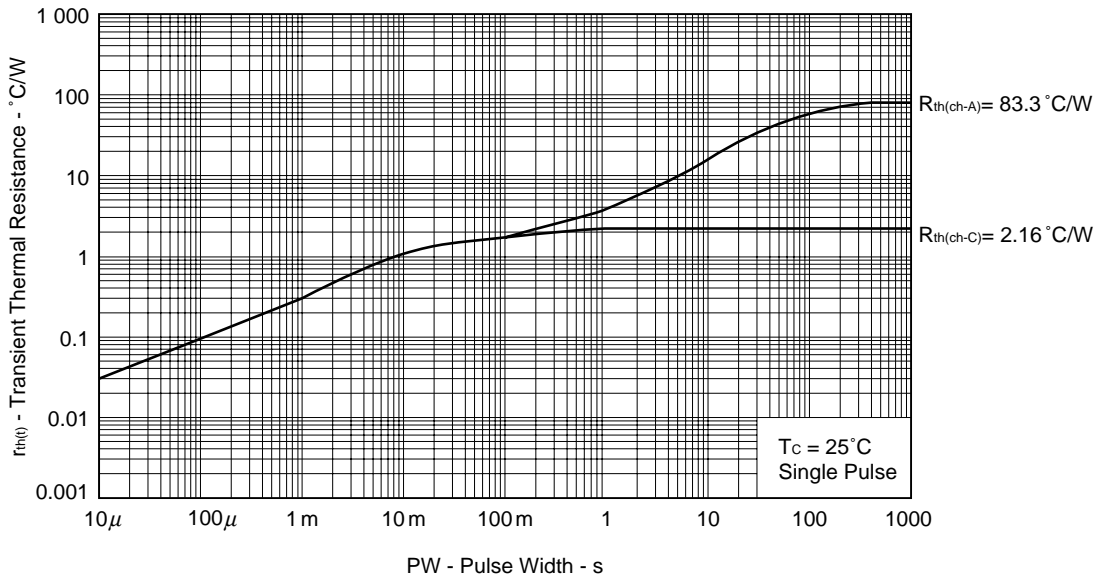
TEST CIRCUIT 3 GATE CHARGE



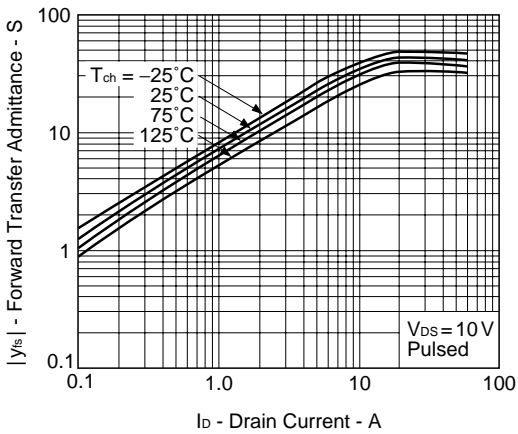
TYPICAL CHARACTERISTICS (T_A = 25 °C)



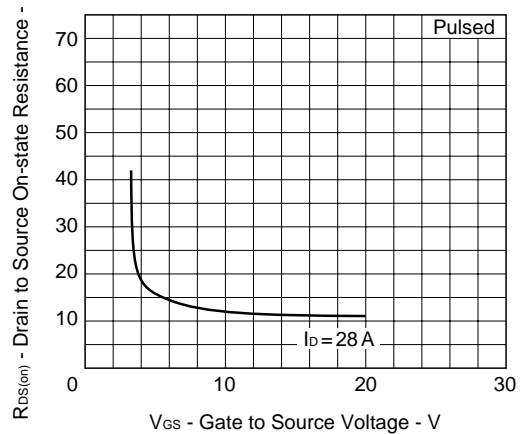
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



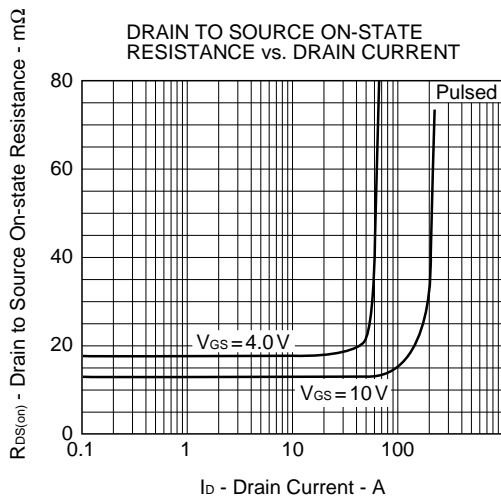
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



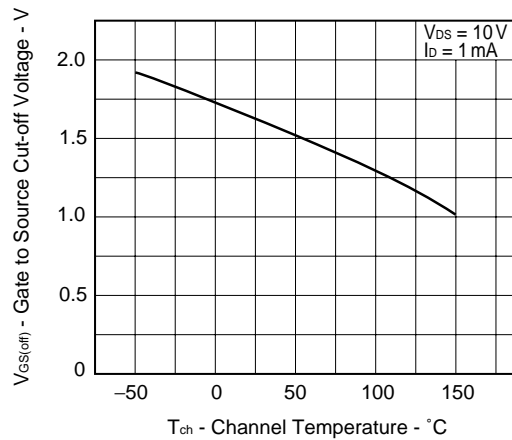
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

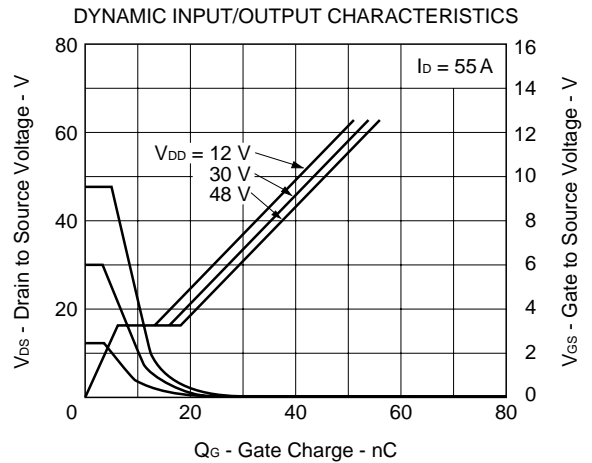
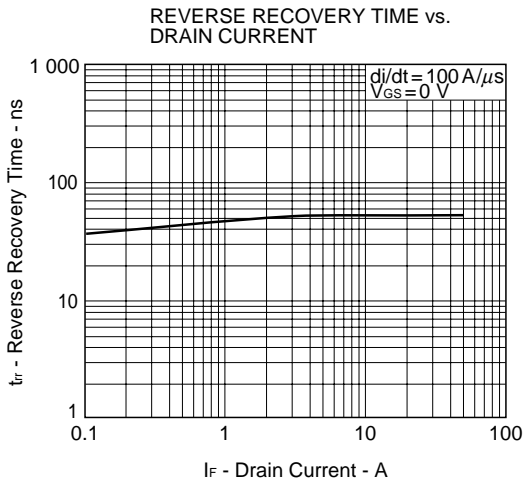
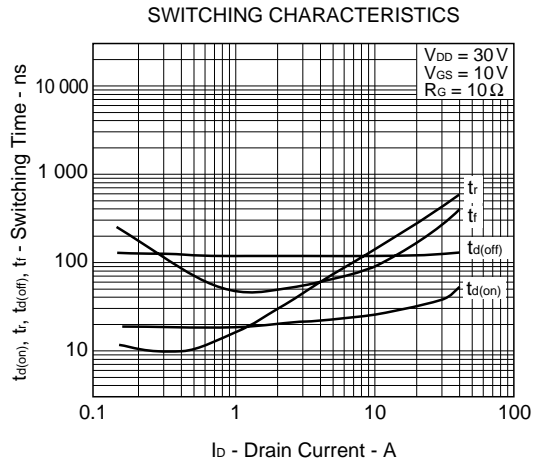
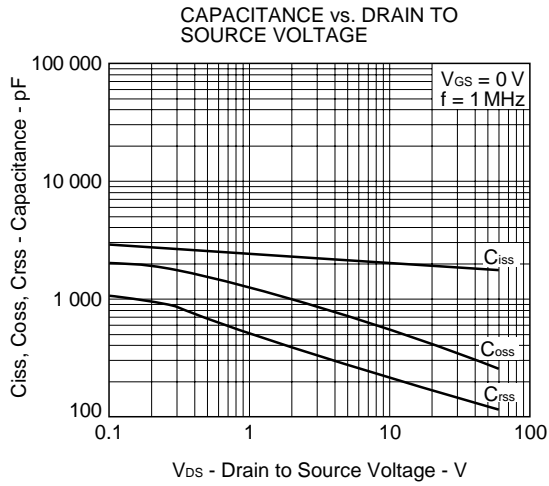
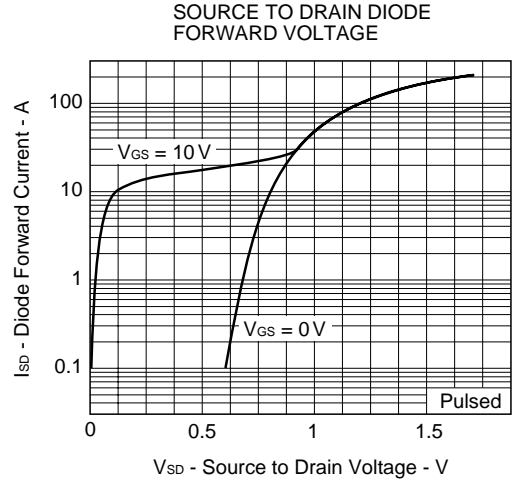
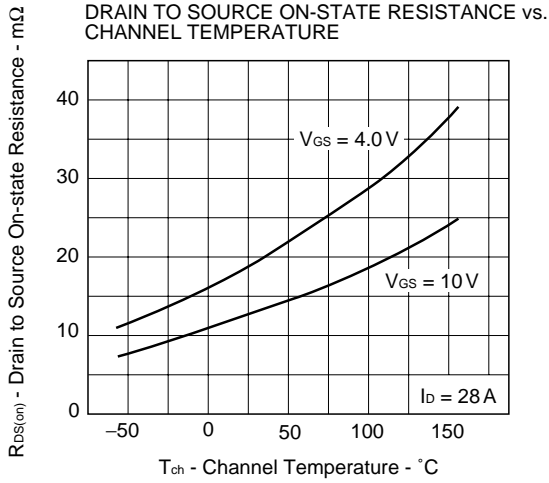


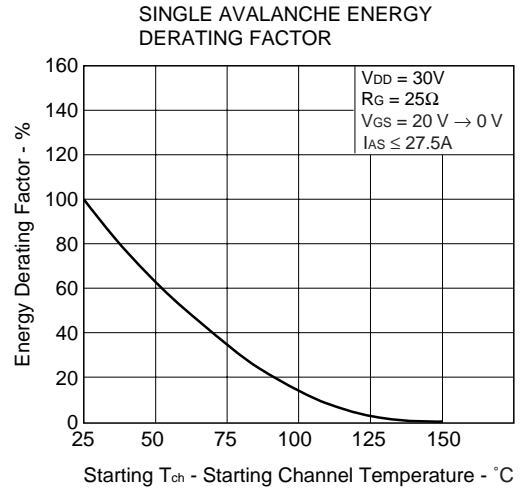
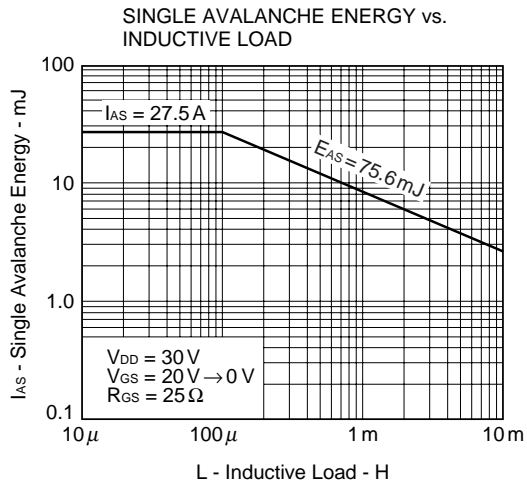
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE

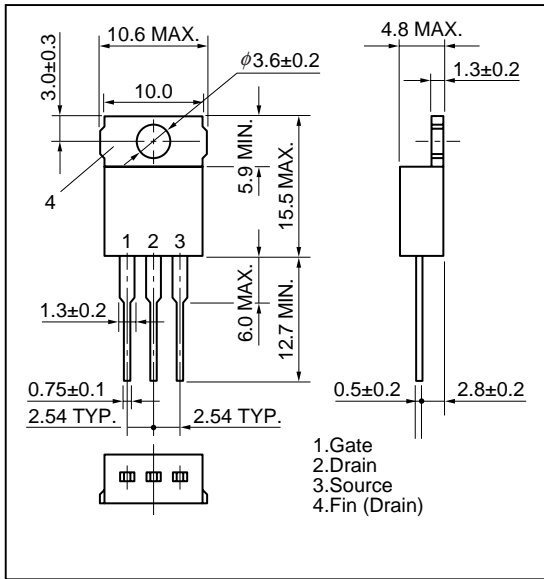




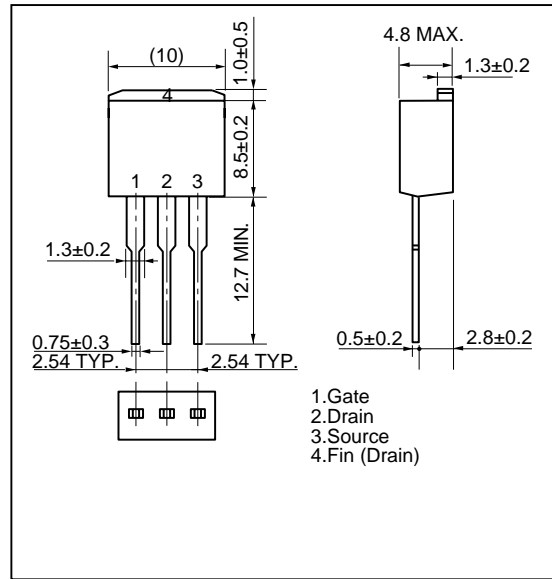


PACKAGE DRAWINGS (Unit : mm)

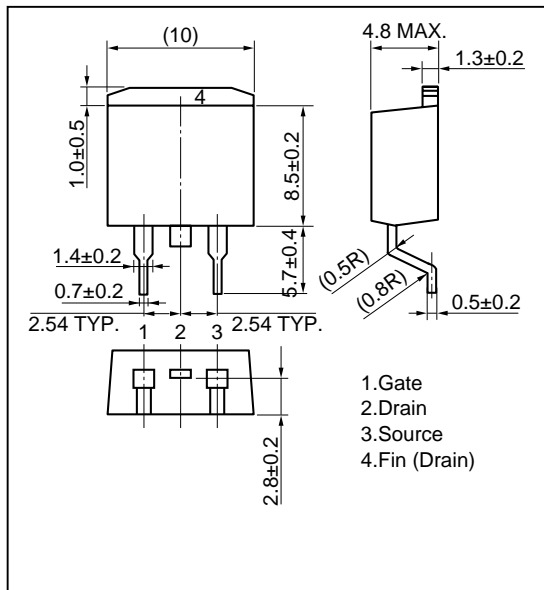
1)TO-220AB (MP-25)



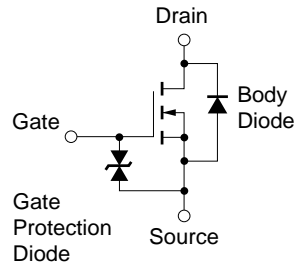
2)TO-262 (MP-25 Fin Cut)



3)TO-263 (MP-25ZJ)



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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