

### SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

#### DESCRIPTION

The 2SK3354 is N-channel MOS Field Effect Transistor designed for high current switching applications.

#### FEATURES

- Super low on-state resistance:  
 $R_{DS(on)1} = 8.0 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 42 \text{ A)}$   
 $R_{DS(on)2} = 12 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4 \text{ V, } I_D = 42 \text{ A)}$
- Low  $C_{iss}$ :  $C_{iss} = 6300 \text{ pF TYP.}$
- Built-in gate protection diode

#### 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 ( $V_{DS} = 0 \text{ V}$ )    | $V_{GSS(AC)}$  | $\pm 20$    | V                |
| Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )      | $I_{D(DC)}$    | $\pm 83$    | A                |
| Drain Current (pulse) <sup>Note1</sup>               | $I_{D(pulse)}$ | $\pm 332$   | A                |
| Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) | $P_{T1}$       | 100         | W                |
| Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) | $P_{T2}$       | 1.5         | W                |
| Channel Temperature                                  | $T_{ch}$       | 150         | $^\circ\text{C}$ |
| Storage Temperature                                  | $T_{stg}$      | -55 to +150 | $^\circ\text{C}$ |
| Single Avalanche Current <sup>Note2</sup>            | $I_{AS}$       | 55          | A                |
| Single Avalanche Energy <sup>Note2</sup>             | $E_{AS}$       | 302         | mJ               |

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

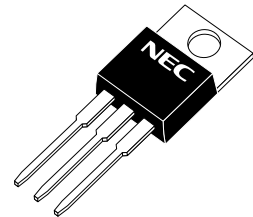
**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

#### ★ ORDERING INFORMATION

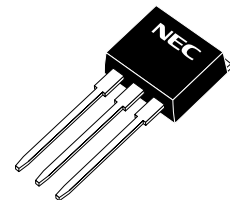
| PART NUMBER | PACKAGE                   |
|-------------|---------------------------|
| 2SK3354     | TO-220AB                  |
| 2SK3354-S   | TO-262                    |
| 2SK3354-ZJ  | TO-263                    |
| 2SK3354-Z   | TO-220SMD <sup>Note</sup> |

**Note** TO-220SMD package is produced only in Japan.

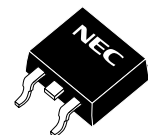
(TO-220AB)



(TO-262)



(TO-263, TO-220SMD)

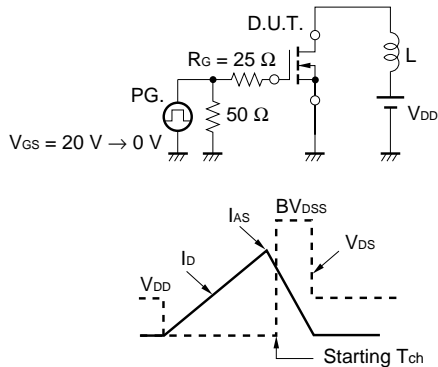


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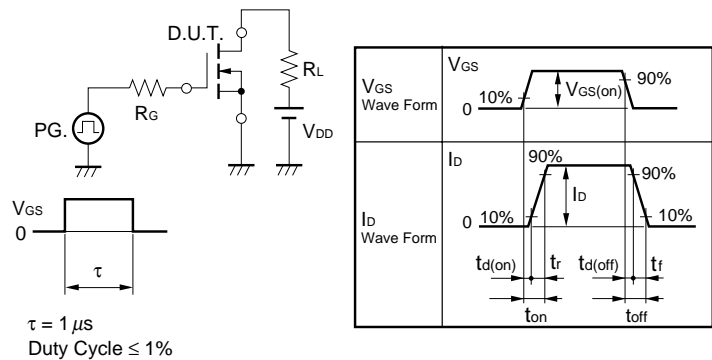
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

| CHARACTERISTICS                     | SYMBOL               | TEST CONDITIONS   | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|----------------------|---|------|------|------|------|
| Zero Gate Voltage Drain Current     | I <sub>DSS</sub>     | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V   |      |      | 10   | μA   |
| Gate Leakage Current                | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V  |      |      | ±10  | μA   |
| Gate Cut-off Voltage                | V <sub>GS(off)</sub> | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA   | 1.5  | 2.0  | 2.5  | V    |
| Forward Transfer Admittance         | y <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 42 A   | 35   | 59   |      | S    |
| Drain to Source On-state Resistance | R <sub>DS(on)1</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 42 A   |      | 6.3  | 8.0  | mΩ   |
|                                     | R <sub>DS(on)2</sub> | V <sub>GS</sub> = 4 V, I <sub>D</sub> = 42 A  |      | 8.0  | 12   | mΩ   |
| Input Capacitance                   | C <sub>iss</sub>     | V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz  |      | 6300 |      | pF   |
| Output Capacitance                  | C <sub>oss</sub>     |   |      | 1000 |      | pF   |
| Reverse Transfer Capacitance        | C <sub>rss</sub>     |   |      | 490  |      | pF   |
| Turn-on Delay Time                  | t <sub>d(on)</sub>   | I <sub>D</sub> = 42 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 30 V,<br>R <sub>G</sub> = 10 Ω |      | 100  |      | ns   |
| Rise Time                           | t <sub>r</sub>       |   |      | 1500 |      | ns   |
| Turn-off Delay Time                 | t <sub>d(off)</sub>  |   |      | 300  |      | ns   |
| Fall Time                           | t <sub>f</sub>       |   |      | 440  |      | ns   |
| Total Gate Charge                   | Q <sub>G</sub>       | I <sub>D</sub> = 83 A, V <sub>DD</sub> = 48 V, V <sub>GS</sub> = 10 V                               |      | 106  |      | nC   |
| Gate to Source Charge               | Q <sub>GS</sub>      |   |      | 20   |      | nC   |
| Gate to Drain Charge                | Q <sub>GD</sub>      |   |      | 30   |      | nC   |
| Body Diode Forward Voltage          | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 83 A, V <sub>GS</sub> = 0 V  |      | 1.0  |      | V    |
| Reverse Recovery Time               | t <sub>rr</sub>      | I <sub>F</sub> = 83 A, V <sub>GS</sub> = 0 V,<br>di/dt = 100 A/μs                                   |      | 55   |      | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>      |   |      | 100  |      | nC   |

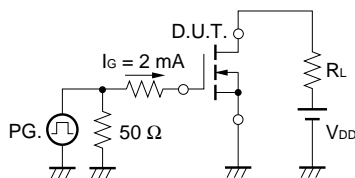
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



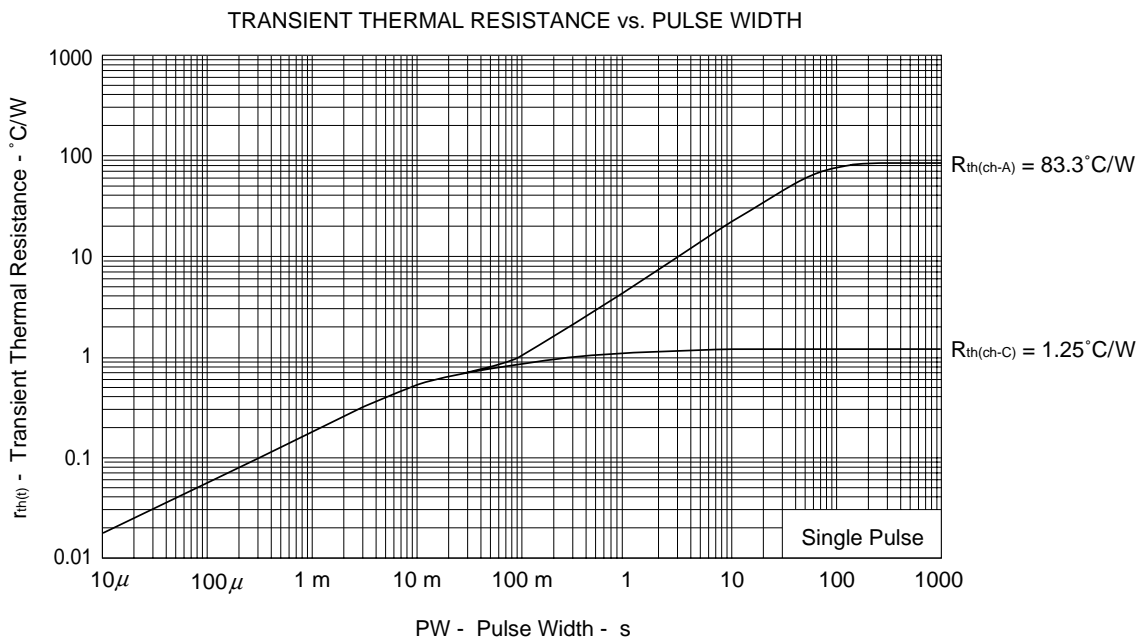
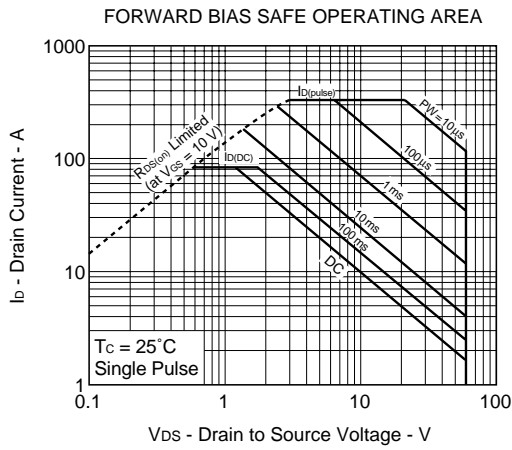
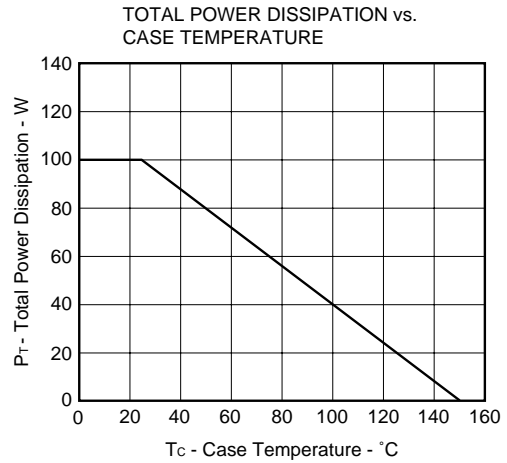
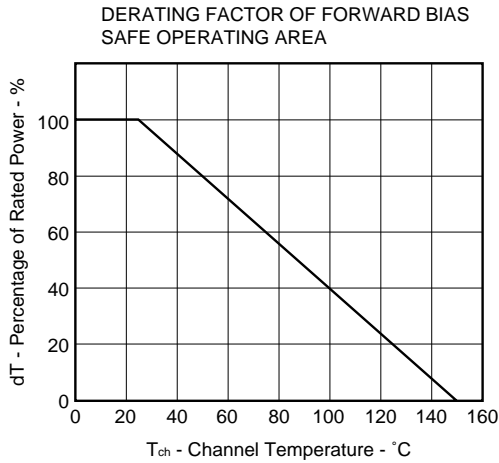
**TEST CIRCUIT 2 SWITCHING TIME**



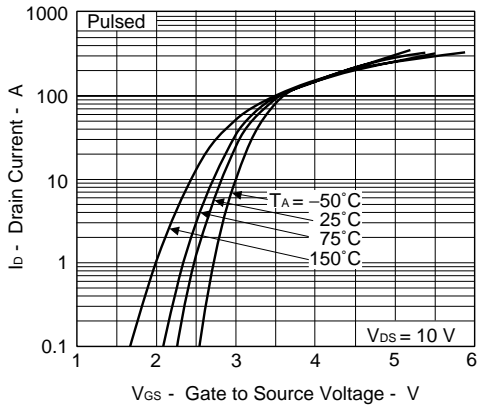
**TEST CIRCUIT 3 GATE CHARGE**



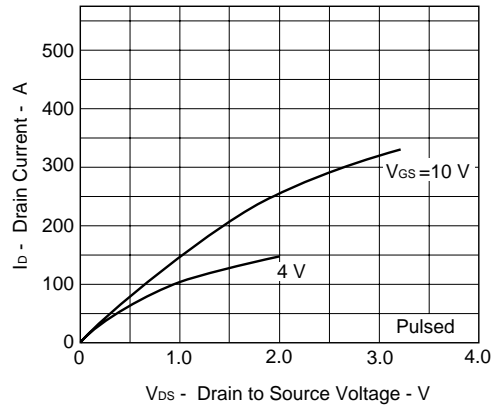
★ TYPICAL CHARACTERISTICS(T<sub>A</sub> = 25°C)



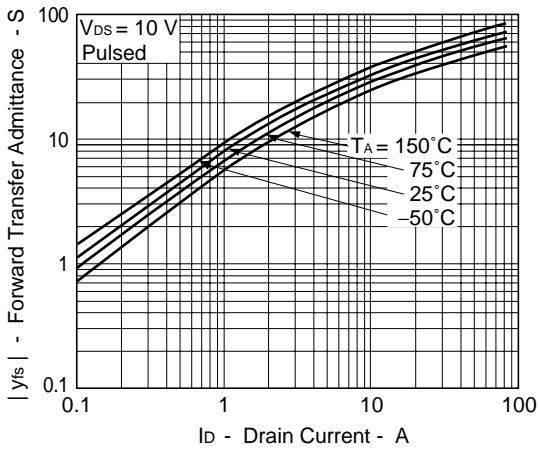
FORWARD TRANSFER CHARACTERISTICS



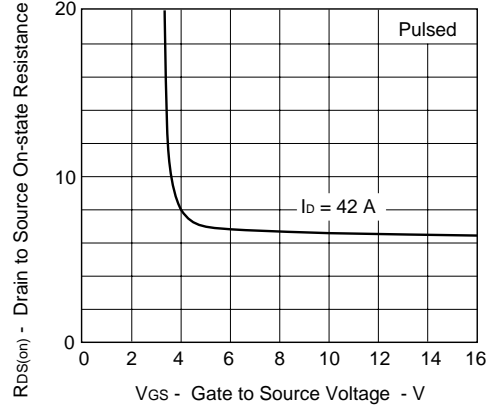
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



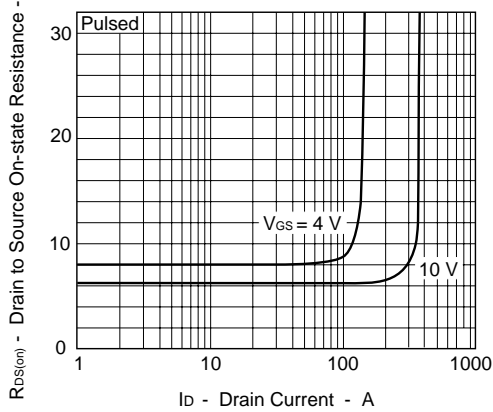
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



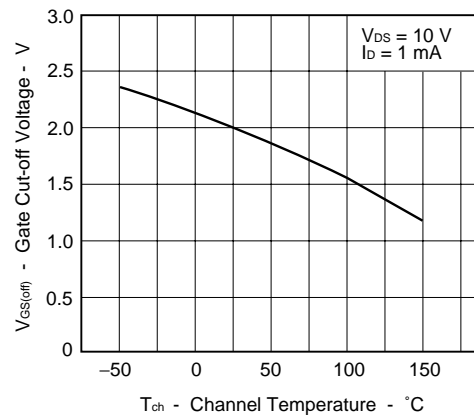
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



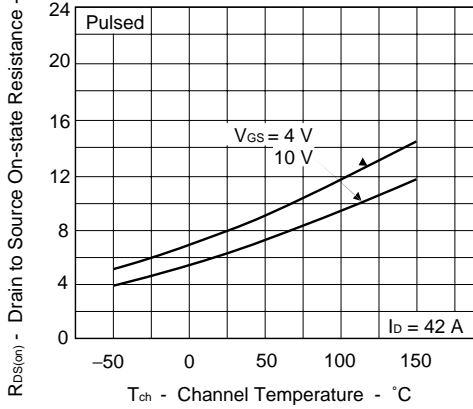
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



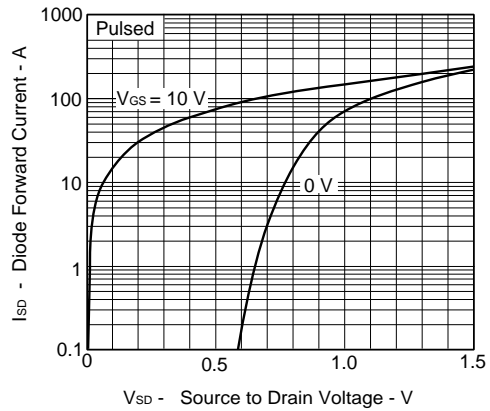
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



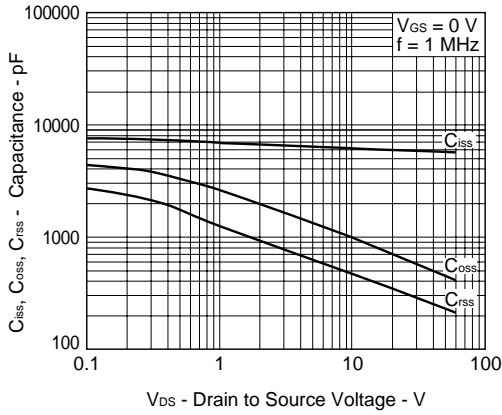
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



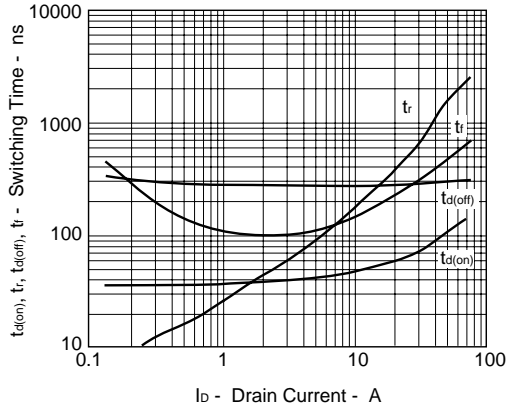
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



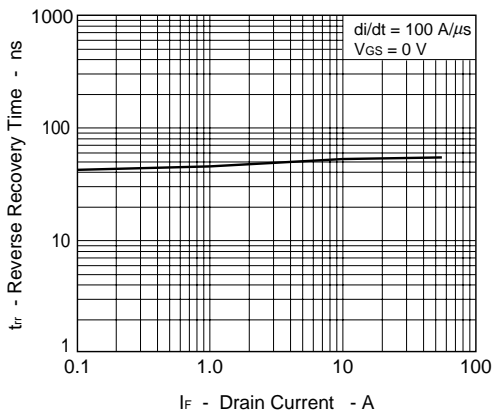
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



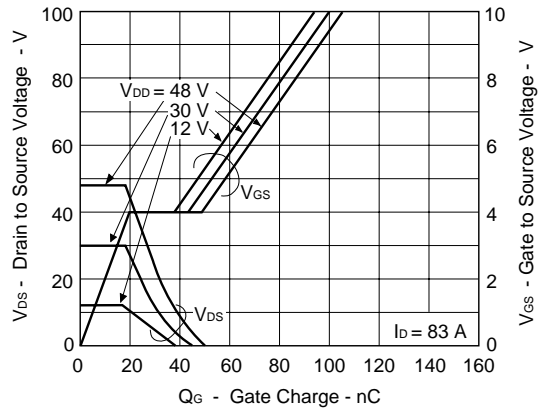
SWITCHING CHARACTERISTICS

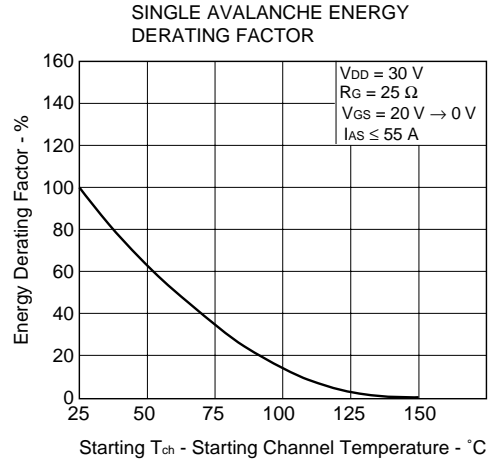
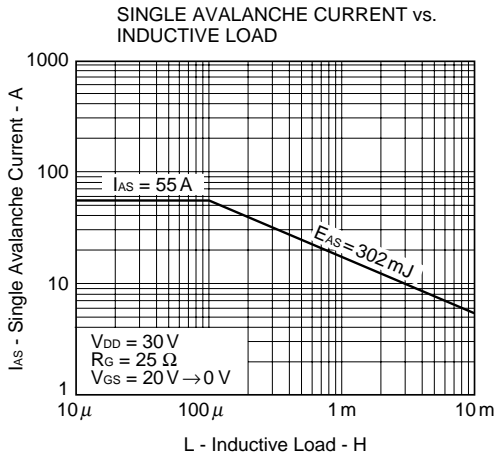


REVERSE RECOVERY TIME vs. DRAIN CURRENT



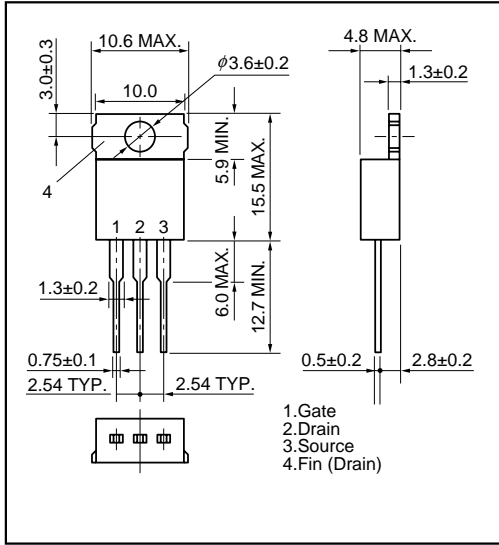
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



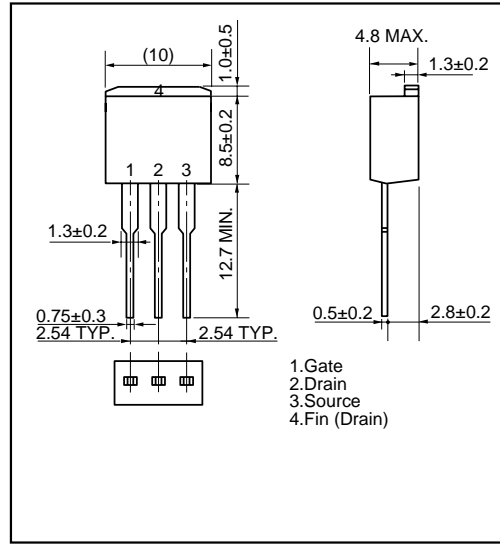


★ PACKAGE DRAWINGS (Unit: mm)

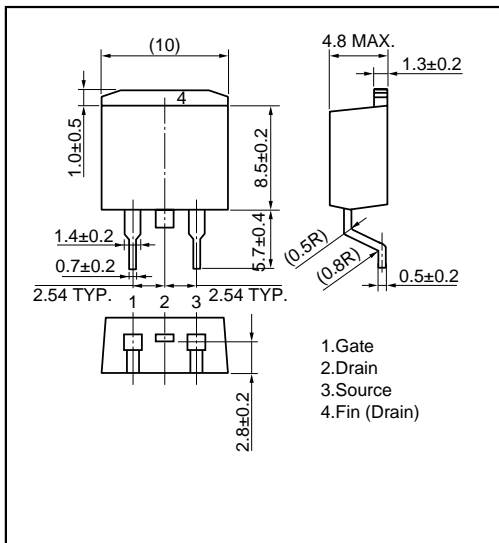
1) TO-220AB(MP-25)



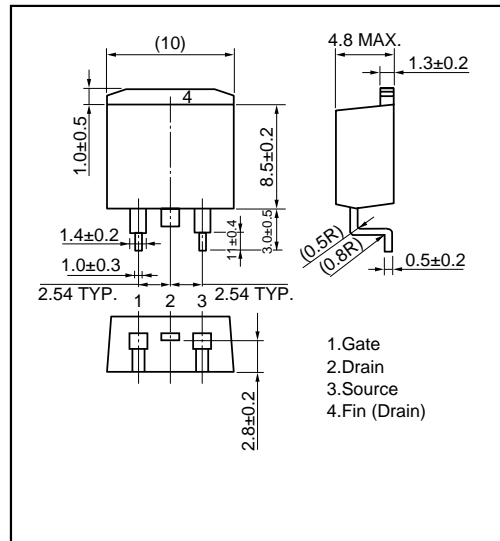
2) TO-262(MP-25 Fin Cut)



3) TO-263 (MP-25ZJ)

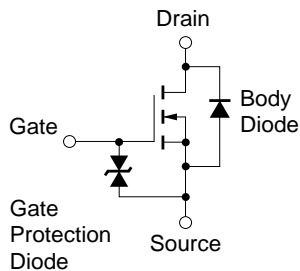


4) TO-220SMD(MP-25Z)<sup>Note</sup>



**Note** This Package is produced only in Japan.

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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