

## SWITCHING

## N-CHANNEL POWER MOS FET

### DESCRIPTION

The 2SK3322 is N-Channel DMOS FET device that features a low gate charge and excellent switching characteristics, and designed for high voltage applications such as switching power supply, AC adapter.

### ORDERING INFORMATION

| PART NUMBER  | PACKAGE          |
|--------------|------------------|
| 2SK3322      | TO-220AB (MP-25) |
| 2SK3322-S    | TO-262           |
| 2SK3322-ZJ   | TO-263(MP-25ZJ)  |
| ★ 2SK3322-ZK | TO-263(MP-25ZK)  |

### FEATURES

- ★ • Low gate charge :  
 $Q_G = 15 \text{ nC TYP. (} V_{DD} = 450 \text{ V, } V_{GS} = 10 \text{ V, } I_D = 5.5 \text{ A)}$
- Gate voltage rating :  $\pm 30 \text{ V}$
- Low on-state resistance :  
 $R_{DS(on)} = 2.2 \Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 2.8 \text{ A)}$
- Avalanche capability ratings
- Surface mount package available

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

|                                                      |                |             |                  |
|------------------------------------------------------|----------------|-------------|------------------|
| Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )   | $V_{DSS}$      | 600         | V                |
| Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )    | $V_{GSS}$      | $\pm 30$    | V                |
| Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )      | $I_{D(DC)}$    | $\pm 5.5$   | A                |
| Drain Current (pulse) <sup>Note1</sup>               | $I_{D(pulse)}$ | $\pm 20$    | A                |
| Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) | $P_{T1}$       | 1.5         | W                |
| Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) | $P_{T2}$       | 65          | 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>            | $I_{AS}$       | 4.0         | A                |
| Single Avalanche Energy <sup>Note2</sup>             | $E_{AS}$       | 10.7        | mJ               |

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

**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = 150 \text{ V}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$

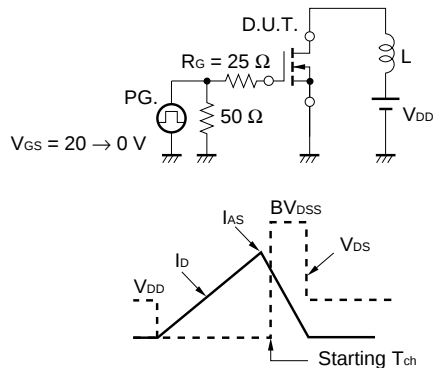
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★ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

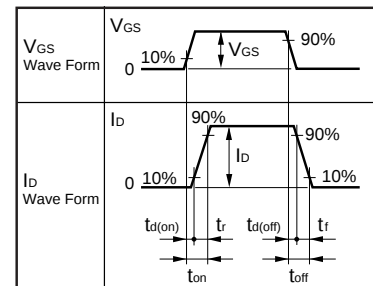
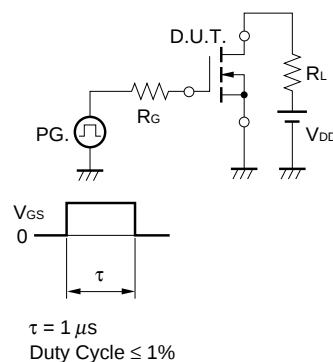
| CHARACTERISTICS                                 | SYMBOL               | TEST CONDITIONS                                  | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------------------|----------------------|--------------------------------------------------|------|------|------|------|
| Zero Gate Voltage Drain Current                 | I <sub>DSS</sub>     | V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V   |      |      | 100  | μA   |
| Gate Leakage Current                            | I <sub>GSS</sub>     | V <sub>GS</sub> = ±30 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    | 2.5  |      | 3.5  | V    |
| Forward Transfer Admittance <b>Note</b>         | y <sub>fs</sub>      | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 2.8 A   | 1.0  |      |      | S    |
| Drain to Source On-state Resistance <b>Note</b> | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 2.8 A   |      | 1.7  | 2.2  | Ω    |
| Input Capacitance                               | C <sub>iss</sub>     | V <sub>DS</sub> = 10 V,                          |      | 550  |      | pF   |
| Output Capacitance                              | C <sub>oss</sub>     | V <sub>GS</sub> = 0 V,                           |      | 115  |      | pF   |
| Reverse Transfer Capacitance                    | C <sub>rss</sub>     | f = 1 MHz                                        |      | 13   |      | pF   |
| Turn-on Delay Time                              | t <sub>d(on)</sub>   | V <sub>DD</sub> = 150 V, I <sub>D</sub> = 2.8 A, |      | 12   |      | ns   |
| Rise Time                                       | t <sub>r</sub>       | V <sub>GS</sub> = 10 V,                          |      | 10   |      | ns   |
| Turn-off Delay Time                             | t <sub>d(off)</sub>  | R <sub>G</sub> = 10 Ω                            |      | 35   |      | ns   |
| Fall Time                                       | t <sub>f</sub>       |                                                  |      | 12   |      | ns   |
| Total Gate Charge                               | Q <sub>G</sub>       | V <sub>DD</sub> = 450 V,                         |      | 15   |      | nC   |
| Gate to Source Charge                           | Q <sub>GS</sub>      | V <sub>GS</sub> = 10 V,                          |      | 4    |      | nC   |
| Gate to Drain Charge                            | Q <sub>GD</sub>      | I <sub>D</sub> = 5.5 A                           |      | 4.4  |      | nC   |
| Body Diode Forward Voltage <b>Note</b>          | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 5.5 A, V <sub>GS</sub> = 0 V    |      | 1.0  |      | V    |
| Reverse Recovery Time                           | t <sub>rr</sub>      | I <sub>F</sub> = 5.5 A, V <sub>GS</sub> = 0 V,   |      | 1.6  |      | μs   |
| Reverse Recovery Charge                         | Q <sub>rr</sub>      | di/dt = 50 A/μs                                  |      | 5.3  |      | μC   |

**Note** Pulsed

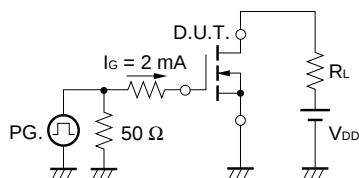
TEST CIRCUIT 1 AVALANCHE CAPABILITY



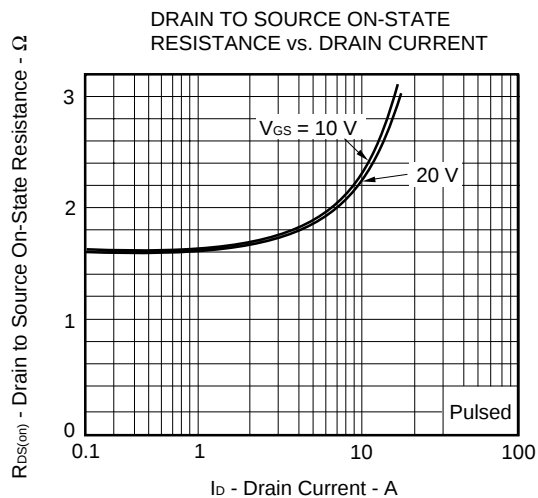
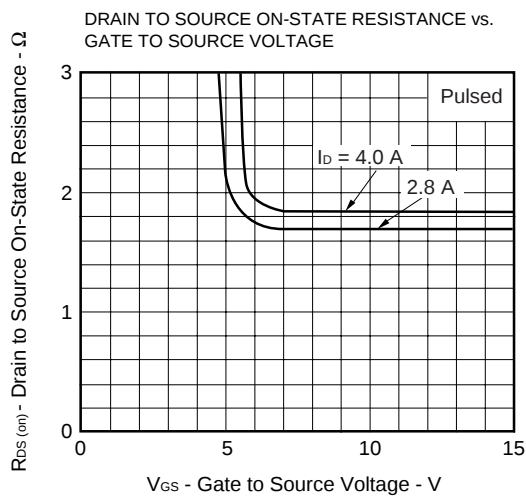
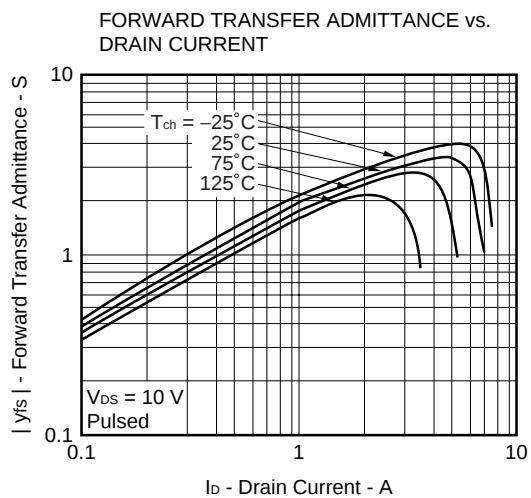
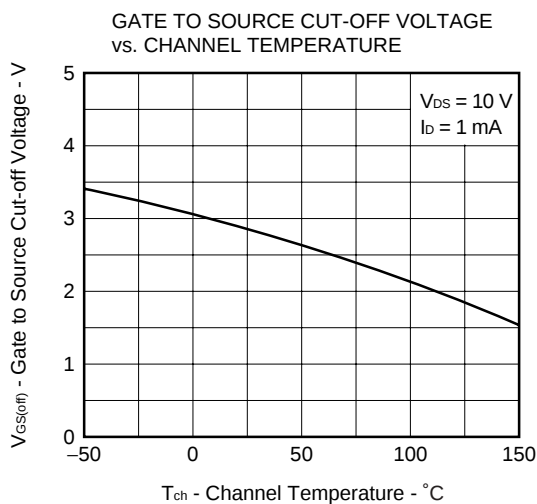
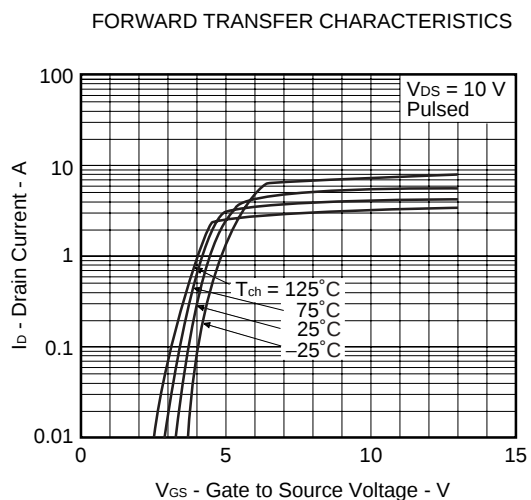
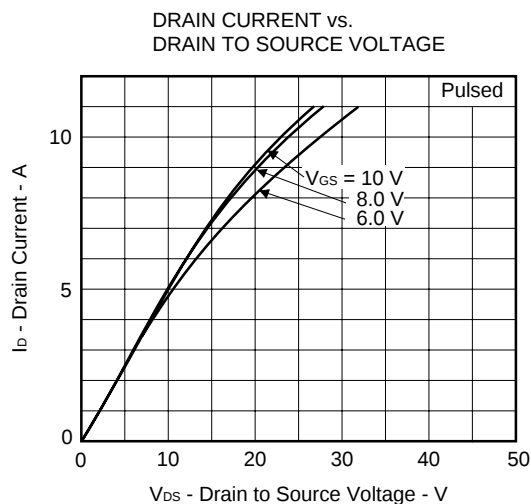
TEST CIRCUIT 2 SWITCHING TIME

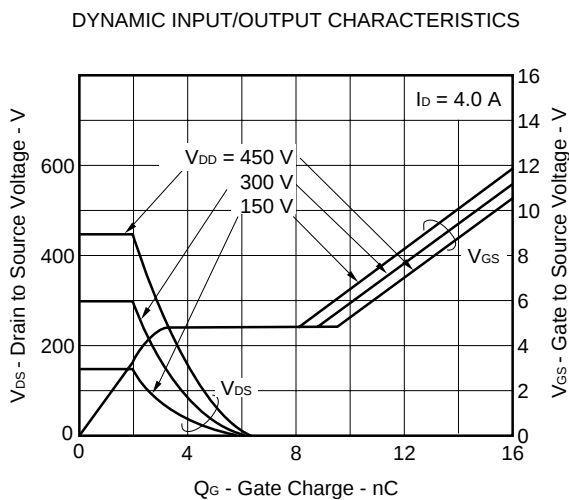
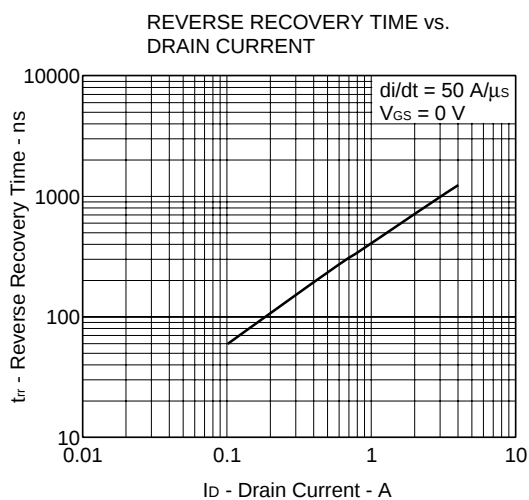
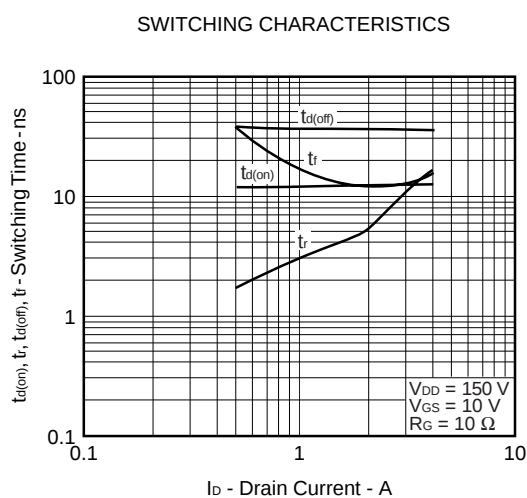
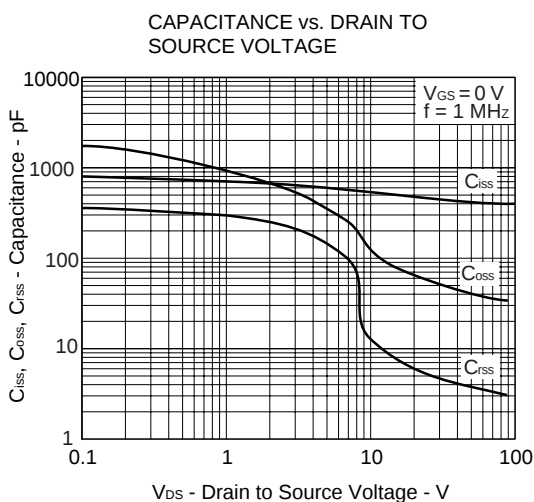
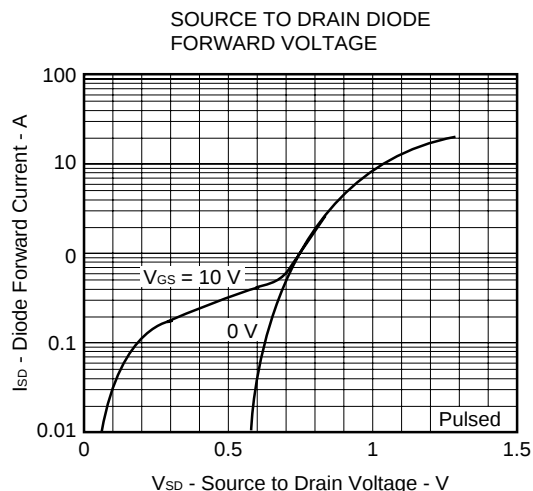
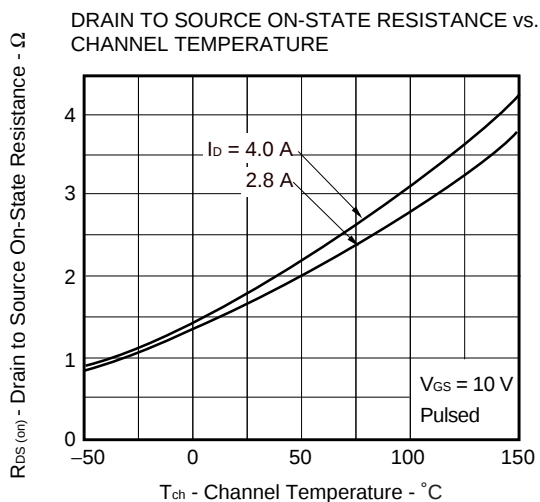


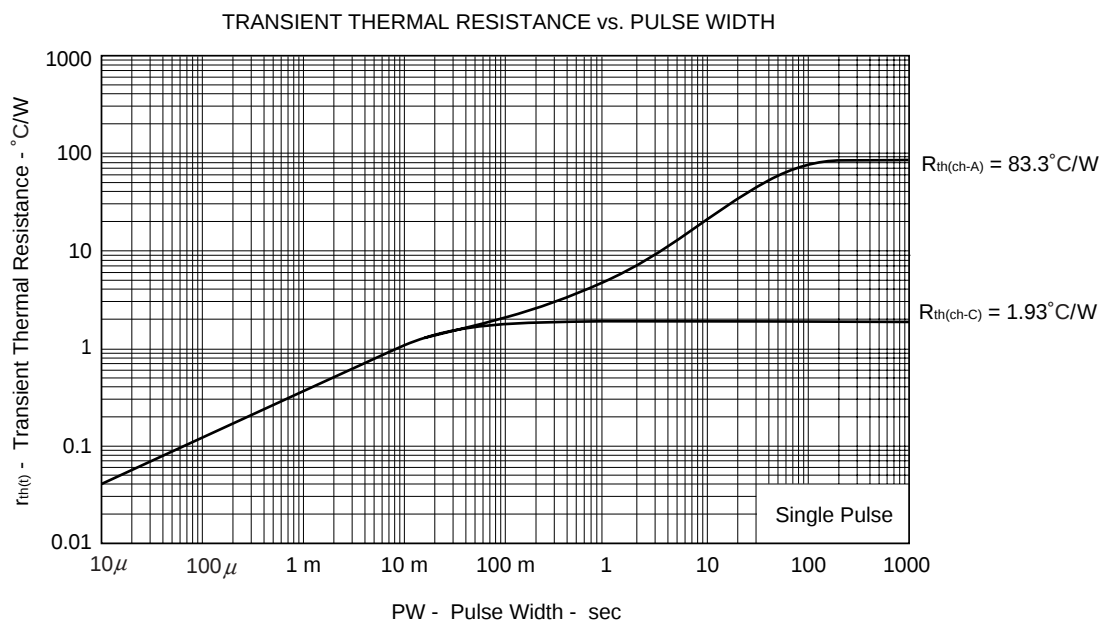
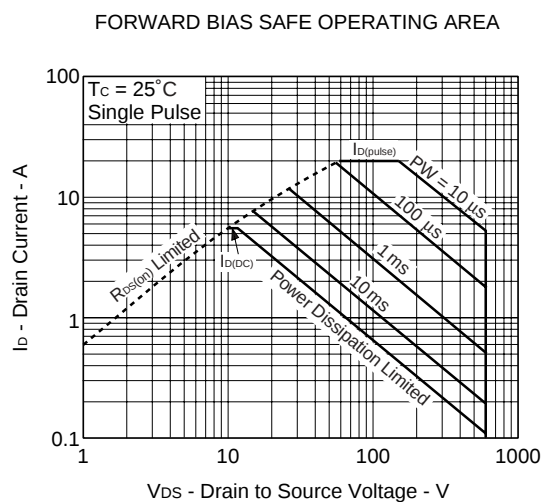
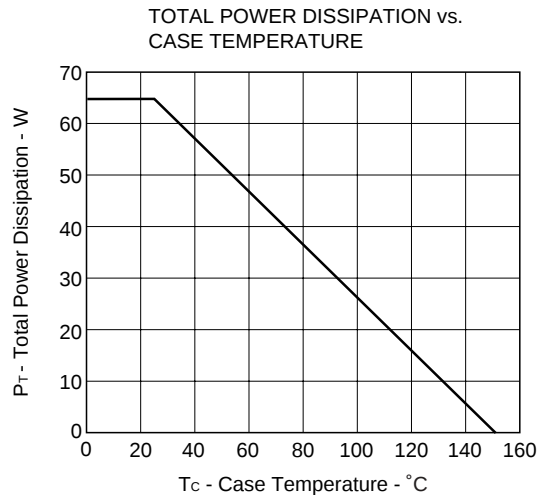
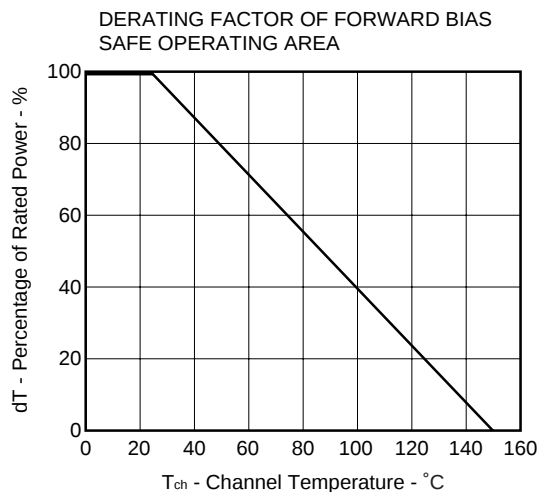
TEST CIRCUIT 3 GATE CHARGE

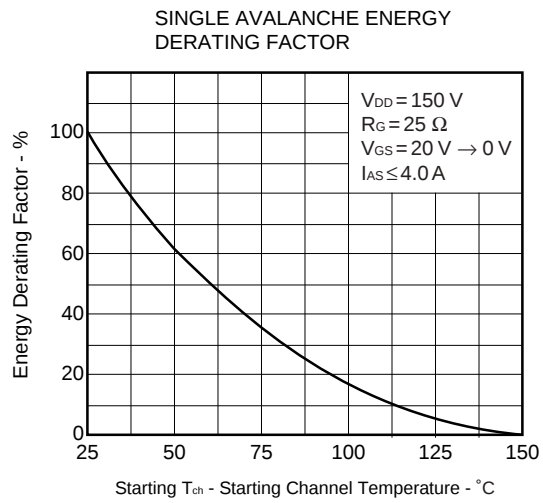
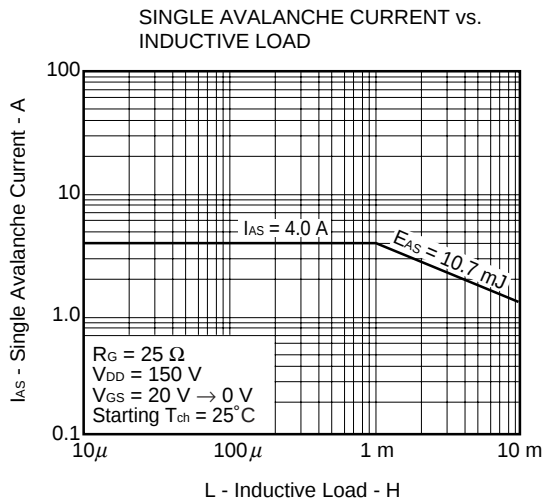


TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



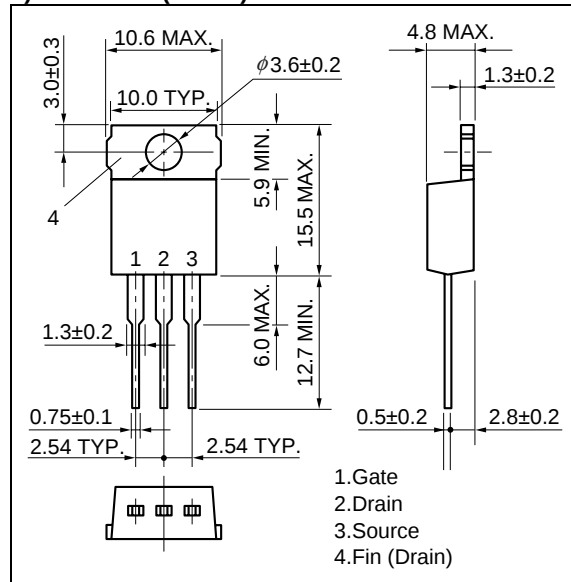




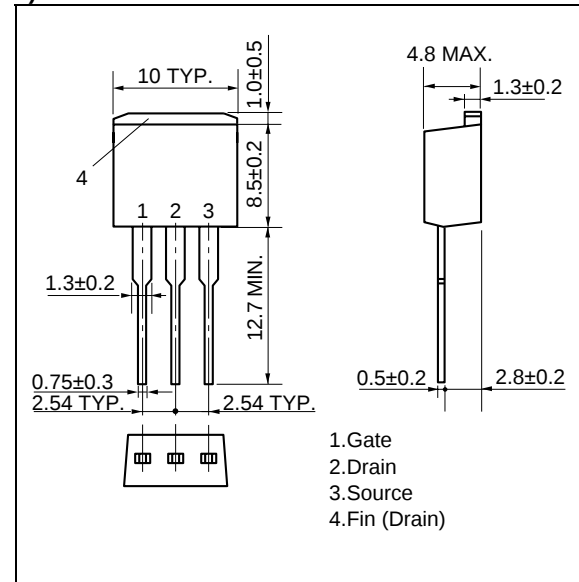


★ PACKAGE DRAWINGS (Unit: mm)

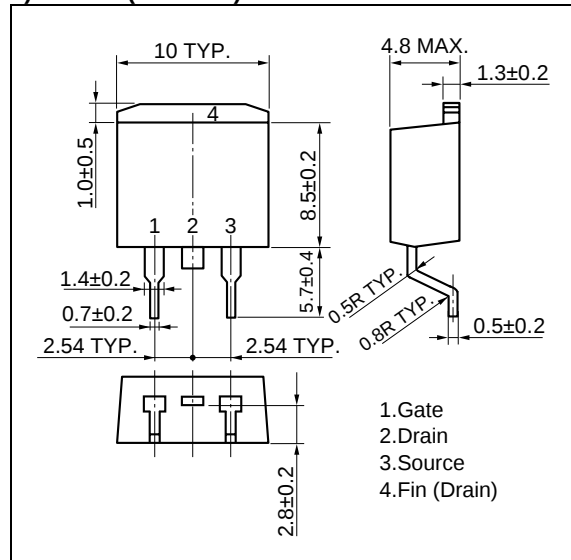
1) TO-220AB (MP-25)



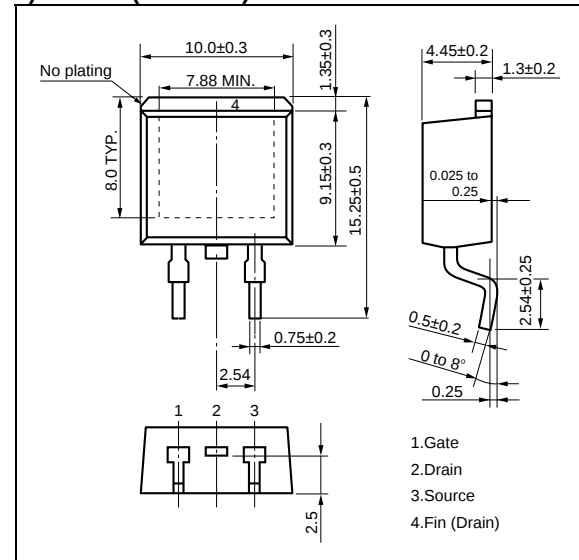
2) TO-262



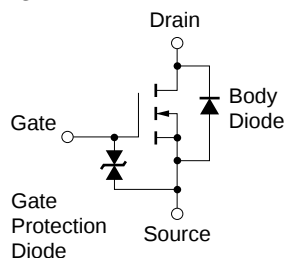
3) TO-263 (MP-25ZJ)



4) TO-263 (MP-25ZK)



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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