



MOS FIELD EFFECT TRANSISTOR

2SK3356

SWITCHING  
N-CHANNEL POWER MOS FET  
INDUSTRIAL USE

DESCRIPTION

The 2SK3356 is N-channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|-------------|---------|
| 2SK3356     | TO-3P   |

FEATURES

- Super low on-state resistance:
- ★  $R_{DS(on)1} = 8.0 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 38 \text{ A)}$
- ★  $R_{DS(on)2} = 12 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4 \text{ V, } I_D = 38 \text{ A)}$
- ★ • 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                                | $V_{DSS}$      | 60          | V                |
| Gate to Source Voltage                                 | $V_{GSS(AC)}$  | $\pm 20$    | V                |
| Drain Current (DC)                                     | $I_{D(DC)}$    | $\pm 75$    | A                |
| Drain Current (pulse) <sup>Note1</sup>                 | $I_{D(pulse)}$ | $\pm 300$   | A                |
| ★ Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) | $P_T$          | 130         | W                |
| Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )   | $P_T$          | 3.0         | 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  $T_{ch} = 25 \text{ }^\circ\text{C}$ ,  $R_G = 25 \text{ }\Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

THERMAL RESISTANCE

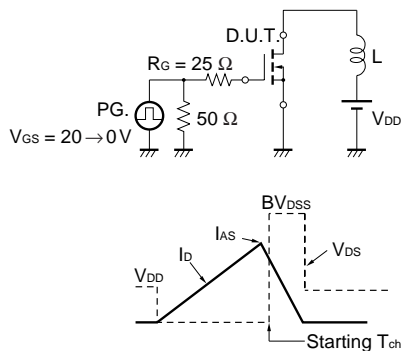
|                    |                |      |                    |
|--------------------|----------------|------|--------------------|
| Channel to Case    | $R_{th(ch-C)}$ | 0.93 | $^\circ\text{C/W}$ |
| Channel to Ambient | $R_{th(ch-A)}$ | 41.7 | $^\circ\text{C/W}$ |

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Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

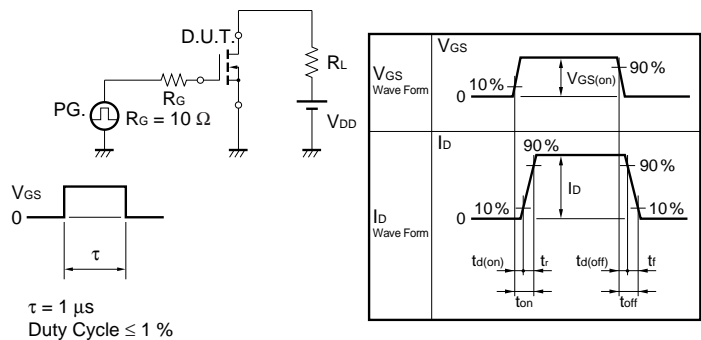
★ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

| CHARACTERISTICS                     | SYMBOL               | TEST CONDITIONS   | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|----------------------|---|------|------|------|------|
| Drain to Source On-state Resistance | R <sub>DS(on)1</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 38 A   |      | 6.3  | 8.0  | mΩ   |
|                                     | R <sub>DS(on)2</sub> | V <sub>GS</sub> = 4 V, I <sub>D</sub> = 38 A  |      | 8.0  | 12   | mΩ   |
| Gate to Source 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> = 38 A   | 35   | 57   |      | S    |
| Drain Leakage Current               | I <sub>DSS</sub>     | V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V   |      |      | 10   | μA   |
| Gate to Source Leakage Current      | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V  |      |      | ±10  | μA   |
| 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> = 38 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 30 V,<br>R <sub>G</sub> = 10 Ω |      | 90   |      | ns   |
| Rise Time                           | t <sub>r</sub>       |   |      | 1100 |      | ns   |
| Turn-off Delay Time                 | t <sub>d(off)</sub>  |   |      | 300  |      | ns   |
| Fall Time                           | t <sub>f</sub>       |   |      | 400  |      | ns   |
| Total Gate Charge                   | Q <sub>G</sub>       | I <sub>D</sub> = 75 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> = 75 A, V <sub>GS</sub> = 0 V  |      | 1.0  |      | V    |
| Reverse Recovery Time               | t <sub>rr</sub>      | I <sub>F</sub> = 75 A, V <sub>GS</sub> = 0 V,<br>di/dt = 100 A/μs                                   |      | 55   |      | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>      |   |      | 100  |      | nC   |

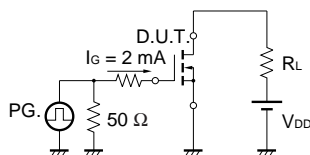
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

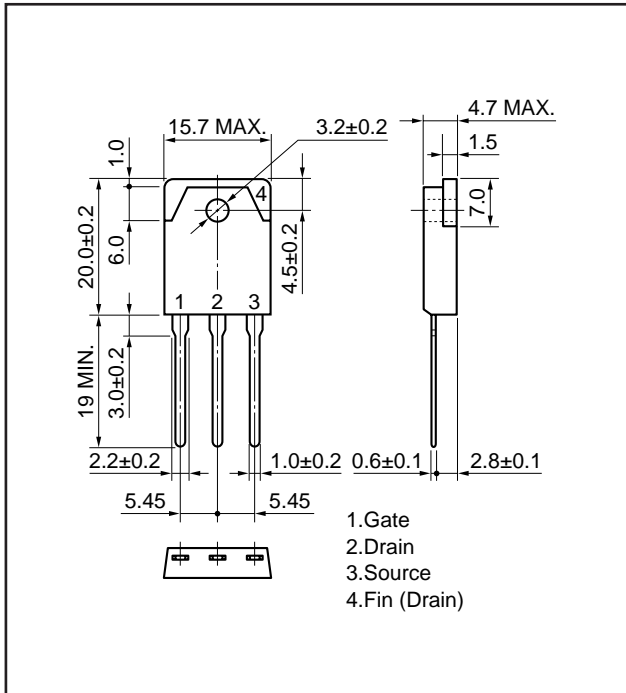


TEST CIRCUIT 3 GATE CHARGE

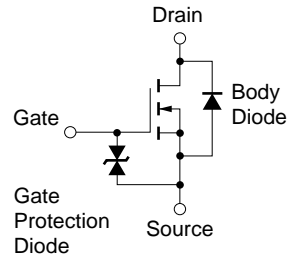


PACKAGE DRAWING (Unit: mm)

TO-3P (MP-88)



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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