

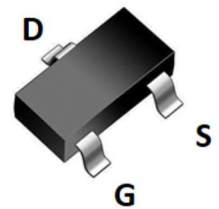
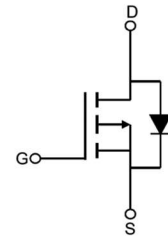
## P-channel Enhancement Mode Power MOSFET

### Features

- -20V, -7A  
 $R_{DS(ON)} < 24.5m\Omega$  @  $V_{GS} = -4.5V$   
 $R_{DS(ON)} < 32m\Omega$  @  $V_{GS} = -2.5V$
- Advanced Trench Technology
- Provide Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired

### Application

- Load Switch
- PWM Application
- Power management



**SOT-23**

### Marking : P72

### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Symbol          | Parameter                               |                           | Max.        | Units              |
|-----------------|-----------------------------------------|---------------------------|-------------|--------------------|
| $V_{DSS}$       | Drain-Source Voltage                    |                           | -20         | V                  |
| $V_{GSS}$       | Gate-Source Voltage                     |                           | $\pm 12$    | V                  |
| $I_D$           | Continuous Drain Current                | $T_A = 25^\circ\text{C}$  | -7          | A                  |
|                 |                                         | $T_A = 100^\circ\text{C}$ | -4.6        | A                  |
| $I_{DM}$        | Pulsed Drain Current <sup>note1</sup>   |                           | -28         | A                  |
| $P_D$           | Power Dissipation                       | $T_A = 25^\circ\text{C}$  | 2           | W                  |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient |                           | 62.5        | $^\circ\text{C/W}$ |
| $T_J, T_{STG}$  | Operating and Storage Temperature Range |                           | -55 to +150 | $^\circ\text{C}$   |

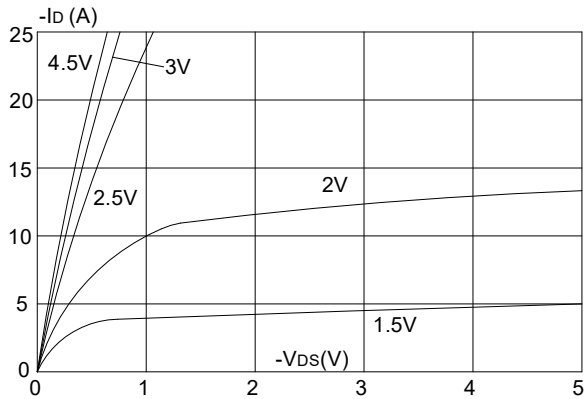
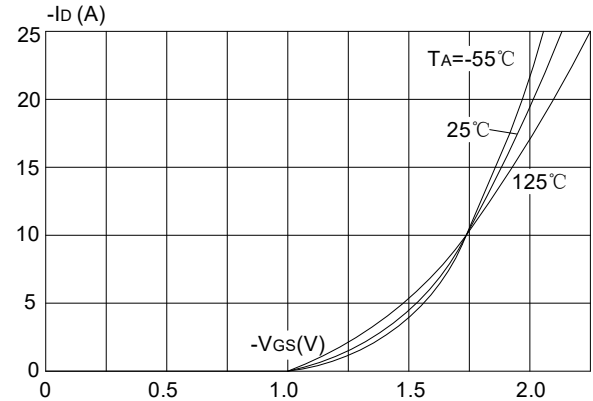
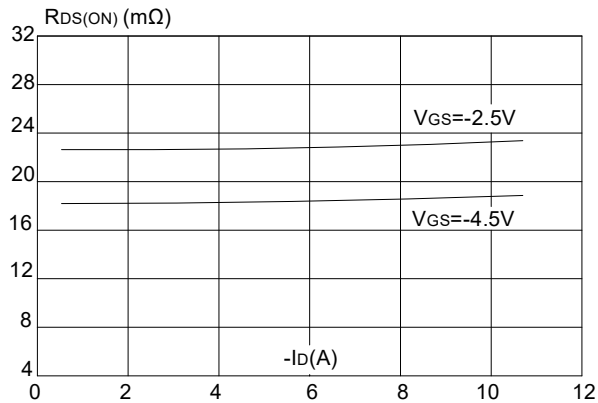
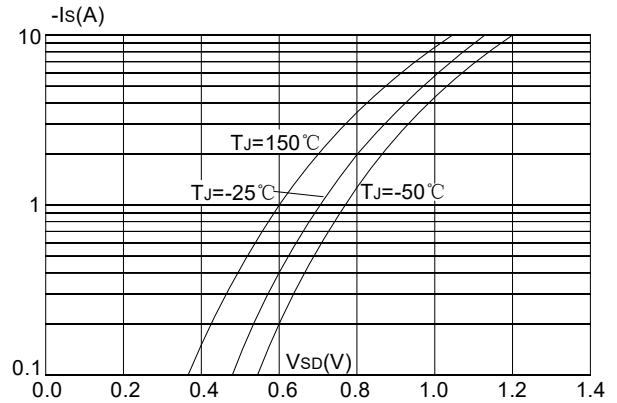
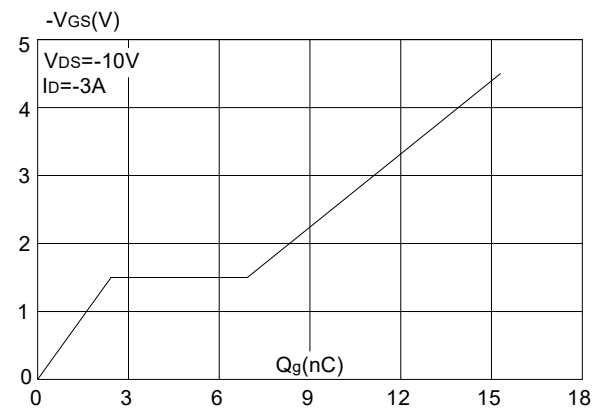
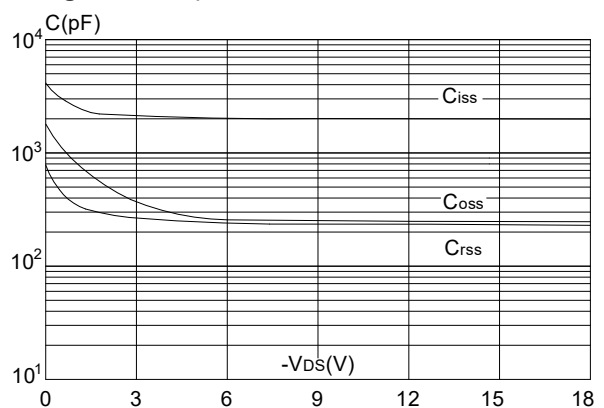
**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

| Symbol                                                 | Parameter                                                 | Test Condition                                                                                      | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                           |                                                                                                     |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA                                                        | -20  | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V,                                                        | -    | -    | -1   | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V                                                         | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                           |                                                                                                     |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA                                          | -0.4 | -0.7 | -1.0 | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br><small>note2</small> | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -7A                                                       | -    | 18.7 | 24.5 | mΩ    |
|                                                        |                                                           | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -5A                                                       | -    | 22.7 | 32   |       |
| Dynamic Characteristics                                |                                                           |                                                                                                     |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                         | V <sub>DS</sub> = -10V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                            | -    | 2000 | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                        |                                                                                                     | -    | 242  | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                              |                                                                                                     | -    | 231  | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                         | V <sub>DS</sub> = -10V, I <sub>D</sub> = -3A,<br>V <sub>GS</sub> = -4.5V                            | -    | 15.3 | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                        |                                                                                                     | -    | 2.2  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                               |                                                                                                     | -    | 4.4  | -    | nC    |
| Switching Characteristics                              |                                                           |                                                                                                     |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                        | V <sub>DD</sub> = -10V, I <sub>D</sub> = -7A,<br>V <sub>GS</sub> = -4.5V,<br>R <sub>GEN</sub> =2.5Ω | -    | 10   | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                         |                                                                                                     | -    | 31   | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                       |                                                                                                     | -    | 28   | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                        |                                                                                                     | -    | 8    | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                           |                                                                                                     |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current  |                                                                                                     | -    | -    | -7   | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current      |                                                                                                     | -    | -    | -28  | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> = -7A                                                           | -    | -0.8 | -1.2 | V     |

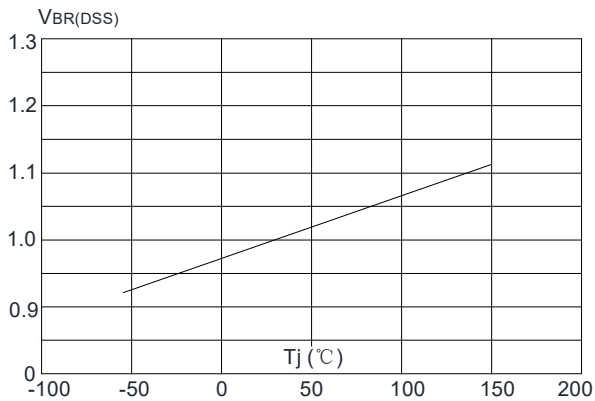
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$

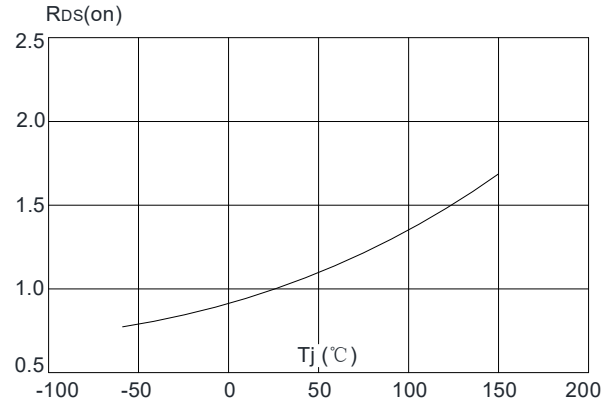
## Typical Performance Characteristics

**Figure 1: Output Characteristics**

**Figure 2: Typical Transfer Characteristics**

**Figure 3: On-resistance vs. Drain Current**

**Figure 4: Body Diode Characteristics**

**Figure 5: Gate Charge Characteristics**

**Figure 6: Capacitance Characteristics**


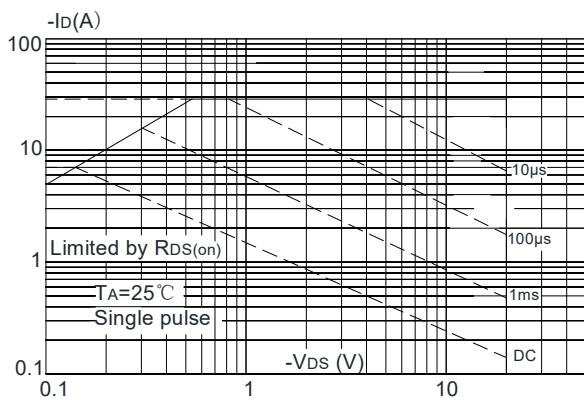
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



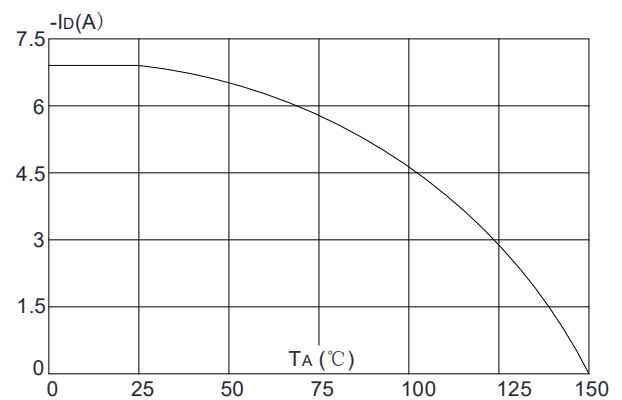
**Figure 8:** Normalized on Resistance vs. Junction Temperature



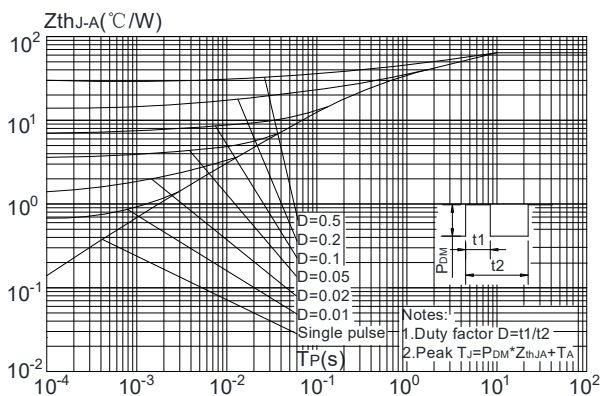
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature

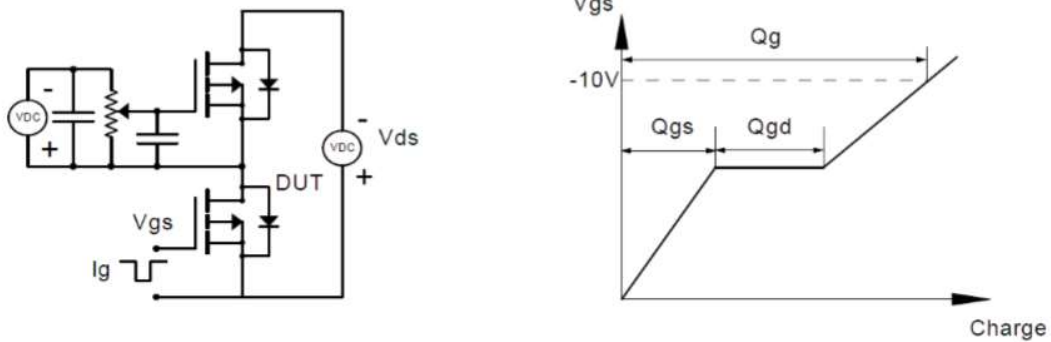


**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

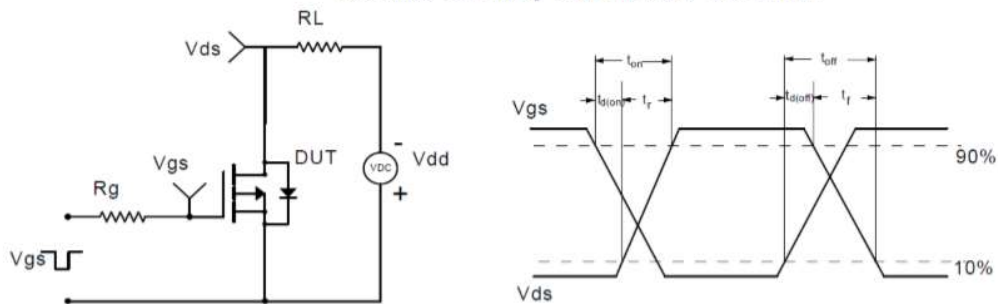


## Test Circuit

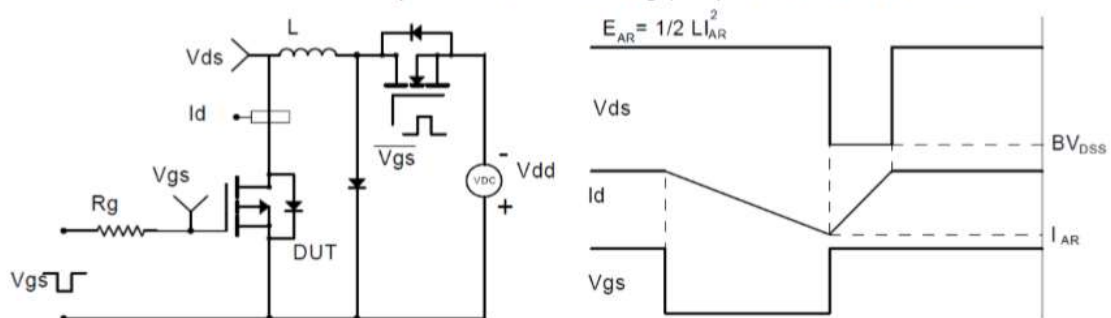
Gate Charge Test Circuit & Waveform



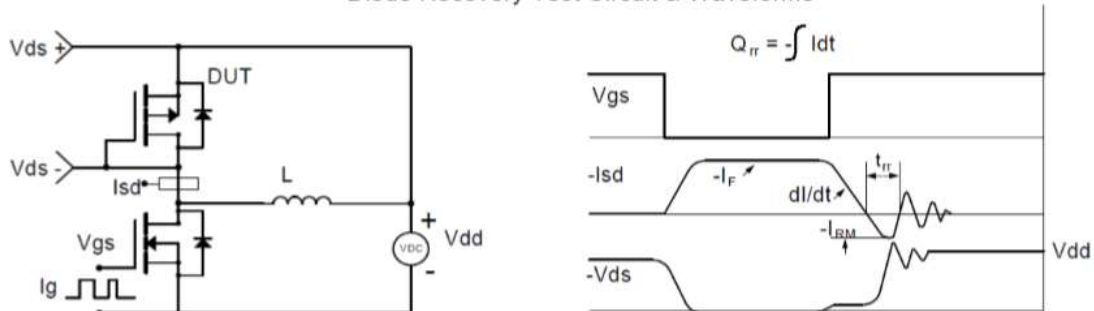
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



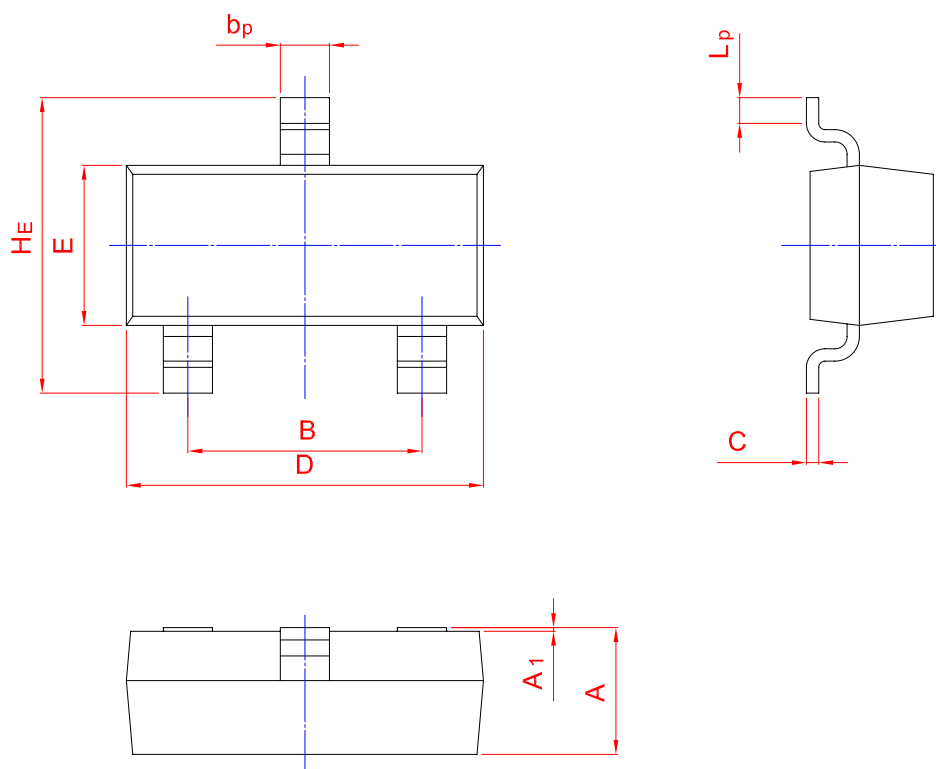
Diode Recovery Test Circuit & Waveforms



**PACKAGE OUTLINE**

Plastic surface mounted package; 3 leads

SOT-23



| UNIT | A            | B            | b <sub>p</sub> | C            | D            | E            | H <sub>E</sub> | A <sub>1</sub> | L <sub>p</sub> |
|------|--------------|--------------|----------------|--------------|--------------|--------------|----------------|----------------|----------------|
| mm   | 1.40<br>0.95 | 2.04<br>1.78 | 0.50<br>0.35   | 0.19<br>0.08 | 3.10<br>2.70 | 1.65<br>1.20 | 3.00<br>2.20   | 0.100<br>0.013 | 0.50<br>0.20   |