

### General Description

This Trench MOSFET has better characteristics, such as fast switching time, low on resistance and low gate charge. It is mainly suitable for portable equipment.

### FEATURES

- Low gate charge and operate at  $V_{GS}=-1.8V$
- $V_{DSS}=-24V$ ,  $I_D=-6A$
- Drain to Source On-state Resistance.  
 $R_{DS(ON)}=55m\Omega$  (Max.) @  $V_{GS}=-4.5V$   
 $R_{DS(ON)}=72m\Omega$  (Max.) @  $V_{GS}=-2.5V$
- ESD Protection

### MAXIMUM RATING (Ta=25°C)

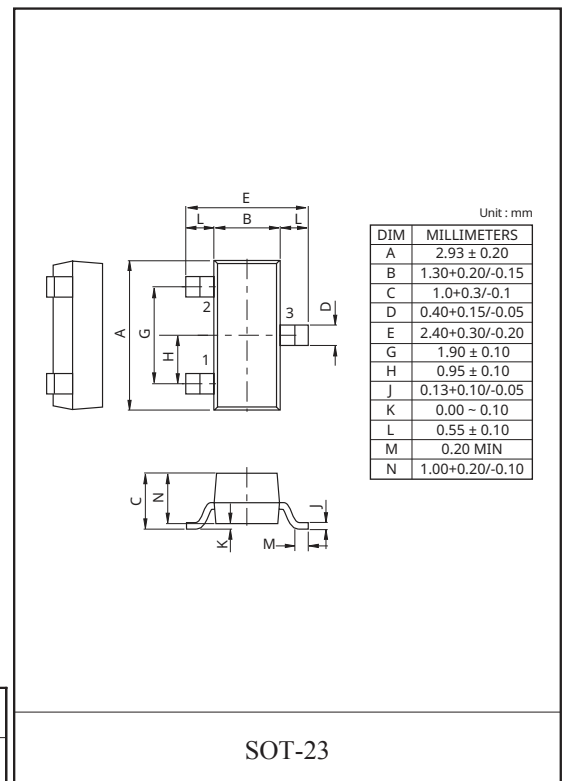
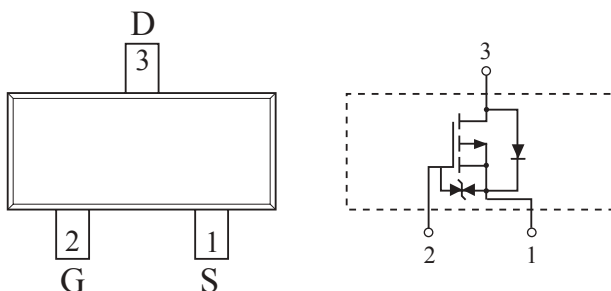
| CHARACTERISTIC                                  |                   | SYMBOL            | RATING       |      | UNIT |
|-------------------------------------------------|-------------------|-------------------|--------------|------|------|
| Drain to Source Voltage                         |                   | V <sub>DSS</sub>  | -24          |      | V    |
| Gate to Source Voltage                          |                   | V <sub>GSS</sub>  | ± 8          |      | V    |
| Drain Current                                   | DC (Note 1,2)     | I <sub>D</sub>    | -6           |      | A    |
|                                                 | Pulsed (Note 1,3) | I <sub>DP</sub>   | -24          |      |      |
| Drain Power Dissipation (Note 2)                |                   | P <sub>D</sub>    | t ≤ 0.1s     | 2    | W    |
|                                                 |                   |                   | Steady State | 0.6  |      |
| Maximum Junction Temperature                    |                   | T <sub>j</sub>    | 150          |      | ℃    |
| Storage Temperature Range                       |                   | T <sub>stg</sub>  | -55 ~ 150    |      | ℃    |
| Thermal Resistance Junction to Ambient (Note 2) |                   | R <sub>thJA</sub> | t ≤ 0.1s     | 62.5 | ℃/W  |
|                                                 |                   |                   | Steady State | 205  | ℃/W  |

Note 1) Max. current is limited by junction temperature.

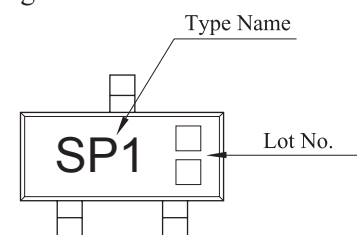
Note 2) Surface mounted on 1 in<sup>2</sup> FR-4 board with 2oz.

Note 3) Pulse test. (pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ )

### PIN CONNECTION (TOP VIEW)



### Marking



# KU390P02SZ

## ELECTRICAL CHARACTERISTICS (T<sub>j</sub>=25°C)

| CHARACTERISTIC                      | SYMBOL              | TEST CONDITION                                                                                     | MIN. | TYP.  | MAX. | UNIT |
|-------------------------------------|---------------------|----------------------------------------------------------------------------------------------------|------|-------|------|------|
| Static                              |                     |                                                                                                    |      |       |      |      |
| Drain to Source Breakdown Voltage   | BV <sub>DSS</sub>   | I <sub>DS</sub> =-250 μA, V <sub>GS</sub> =0V                                                      | -24  | -     | -    | V    |
| Drain Cut-off Current               | I <sub>DSS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =-16V                                                         | -    | -     | -1   | μA   |
| Gate to Source Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V                                                          | -    | -     | ±10  | μA   |
| Gate to Source Threshold Voltage    | V <sub>th</sub>     | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250 μA                                         | -0.3 | -     | -0.9 | V    |
| Drain to SourceSource On Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A (Note 3)                                               | -    | 42    | 55   | mΩ   |
|                                     |                     | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-4A (Note 3)                                               | -    | 52    | 72   |      |
|                                     |                     | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A (Note 3)                                               | -    | 70    | 144  |      |
| Forward Transconductance            | g <sub>fs</sub>     | V <sub>DS</sub> =-5V, I <sub>D</sub> =-4A (Note 3)                                                 | -    | 11    | -    | S    |
| Dynamic                             |                     |                                                                                                    |      |       |      |      |
| Input Capacitance                   | C <sub>iss</sub>    | V <sub>DS</sub> =10V, V <sub>GS</sub> = 0V, f=1MHz                                                 | -    | 1090  | -    | pF   |
| Output Capacitance                  | C <sub>oss</sub>    |                                                                                                    | -    | 81    | -    |      |
| Reverse Transfer Capacitance        | C <sub>rss</sub>    |                                                                                                    | -    | 65    | -    |      |
| Total Gate Charge                   | Q <sub>g</sub>      | V <sub>DS</sub> =-10V, V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-4A                                 | -    | 6.8   | -    | nC   |
|                                     |                     | V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A (Note 3)                        | -    | 12.4  | -    | nC   |
| Gate to Source Charge               | Q <sub>gs</sub>     |                                                                                                    | -    | 1.5   | -    |      |
| Gate to Drain Charge                | Q <sub>gd</sub>     |                                                                                                    | -    | 2.5   | -    |      |
| Turn-on Delay Time                  | t <sub>d(on)</sub>  | V <sub>DD</sub> =-10V, V <sub>GS</sub> =-4.5V<br>I <sub>D</sub> =-4A, R <sub>G</sub> =3 Ω (Note 3) | -    | 7     | -    | ns   |
| Turn-on Rise Time                   | t <sub>r</sub>      |                                                                                                    | -    | 4     | -    |      |
| Turn-off Delay Time                 | t <sub>d(off)</sub> |                                                                                                    | -    | 114   | -    |      |
| Turn-off Fall Time                  | t <sub>f</sub>      |                                                                                                    | -    | 50    | -    |      |
| Source-Drain Diode Ratings          |                     |                                                                                                    |      |       |      |      |
| Diode Forward Voltage               | V <sub>SD</sub>     | I <sub>S</sub> =-4A, V <sub>GS</sub> =0V (Note 3)                                                  | -    | -0.85 | -1.1 | V    |
| Reverse Recovery Time               | t <sub>rr</sub>     | I <sub>S</sub> =-4A, V <sub>GS</sub> =0V,<br>dIF/dt=100A/μs                                        | -    | 37    | -    | ns   |
| Reverse Recovery Charge             | Q <sub>rr</sub>     |                                                                                                    | -    | 9.2   | -    | nC   |

Note 1) Max. current is limited by junction temperature.  
Note 2) Surface mounted on 1 in<sup>2</sup> FR-4 board with 1oz.  
Note 3) Pulse test. (pulse width  $\leq$  300 $\mu$ s, duty cycle  $\leq$  2%)

Fig 1.  $I_D - V_{DS}$

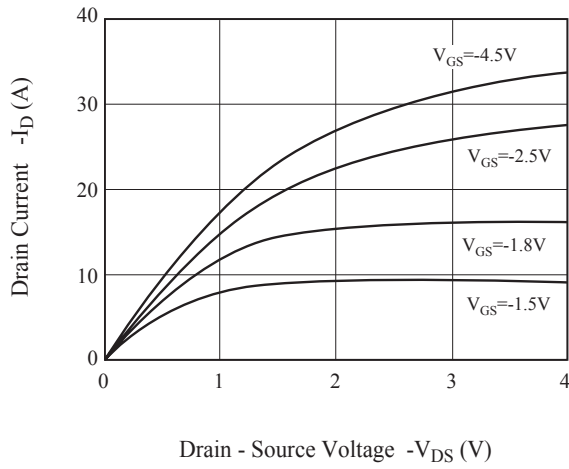


Fig 2.  $R_{DS(on)} - I_D$

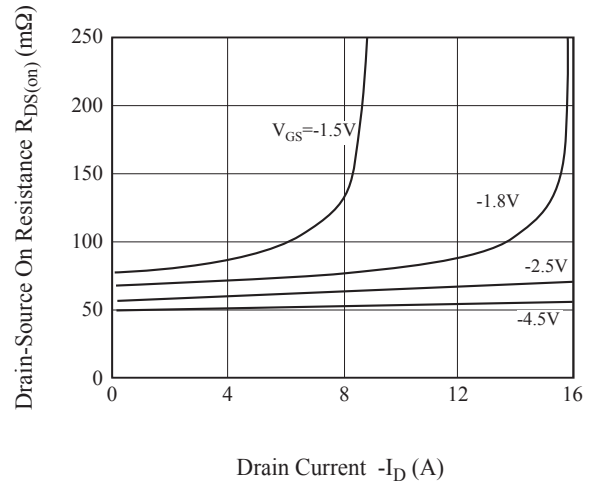


Fig 3.  $I_D - V_{GS}$

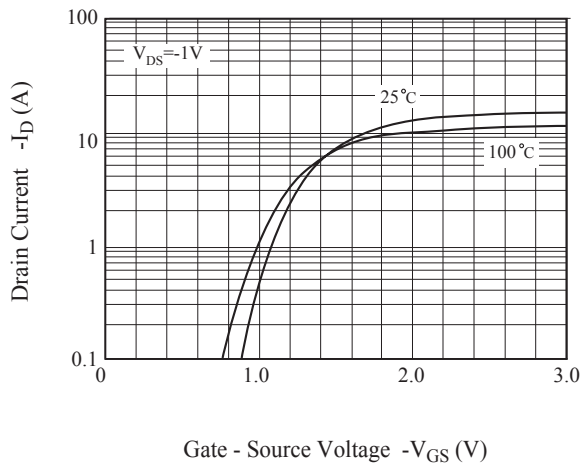


Fig 4.  $R_{DS(on)} - T_j$

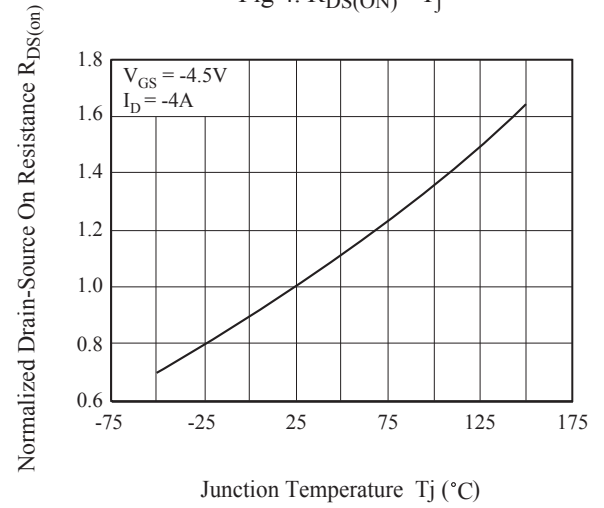


Fig 5.  $V_{th} - T_j$

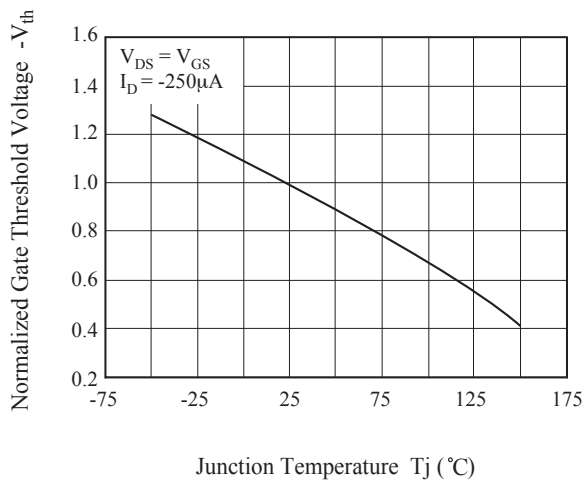


Fig 6.  $I_S - V_{SD}$

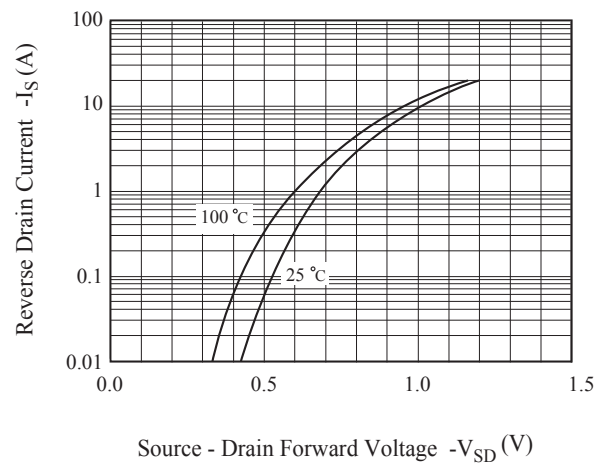


Fig7.  $Q_g - V_{GS}$

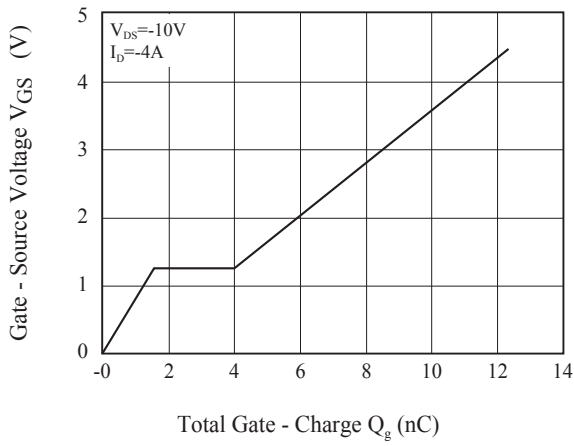


Fig8.  $C - V_{DS}$

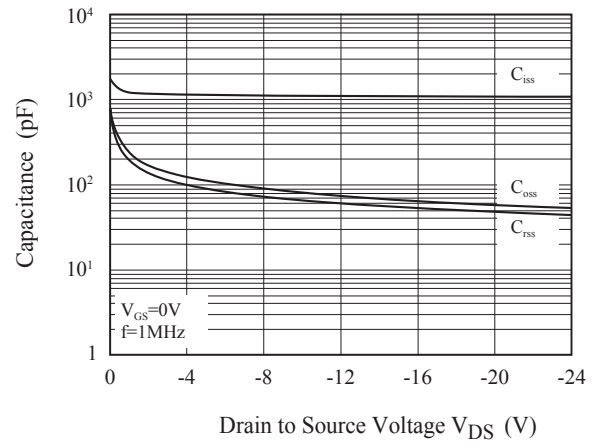


Fig9.  $BV_{DSS} - T_j$

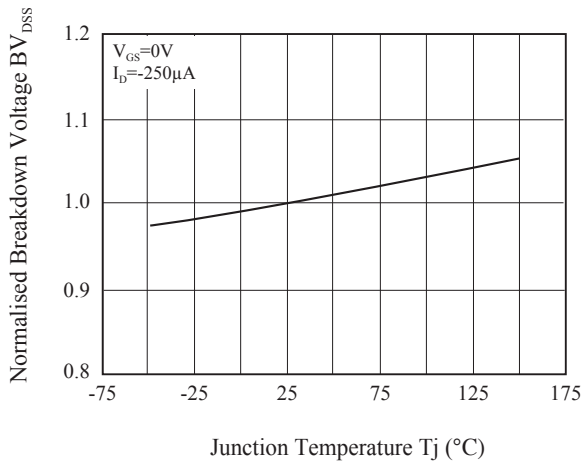


Fig10.  $R_{DS(ON)} - V_{GS}$

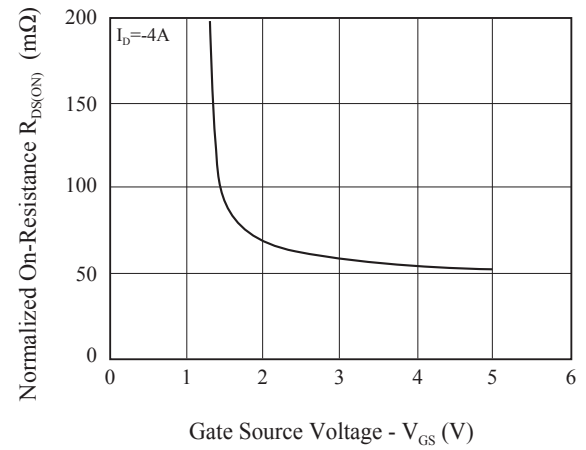


Fig11. Transient Thermal Response Curve

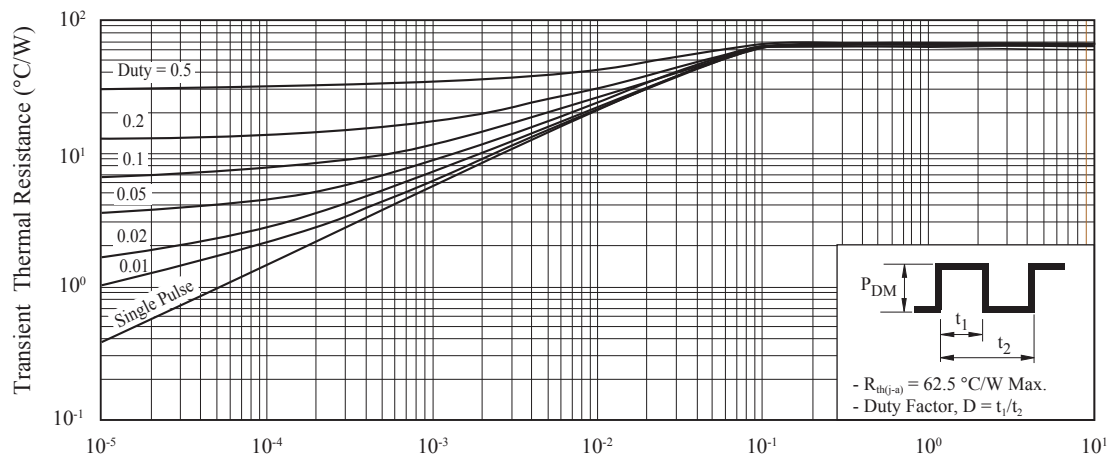


Fig12. Gate Charge

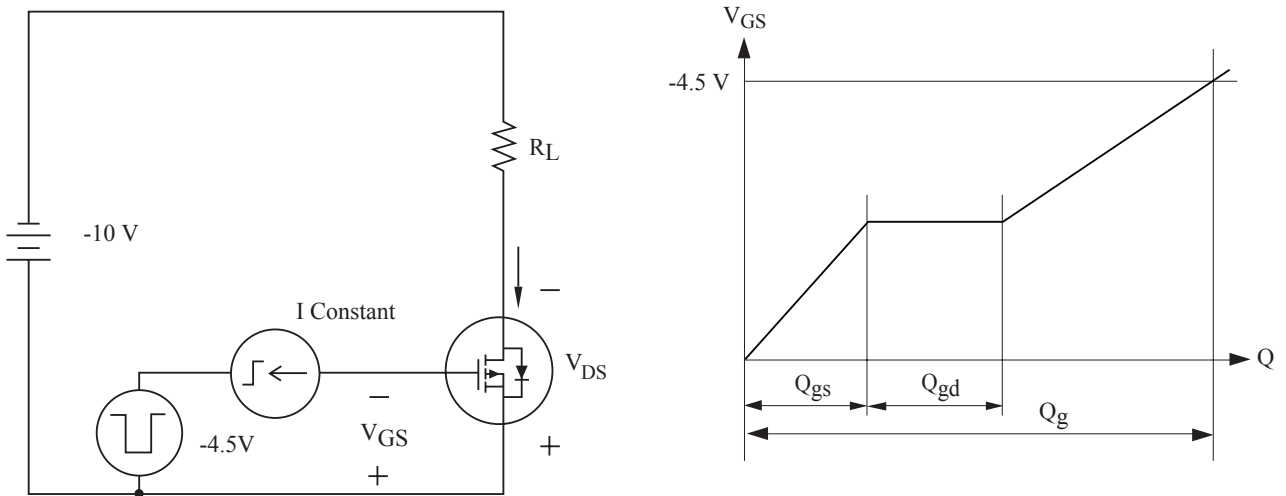


Fig13. Resistive Load Switching

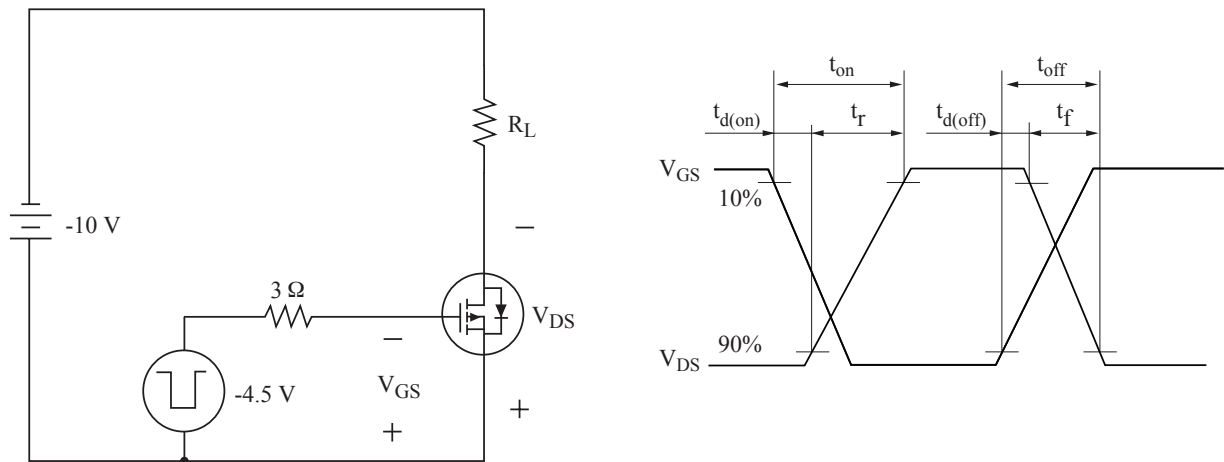


Fig14. Source - Drain Diode Reverse Recovery

