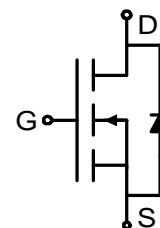


## Description

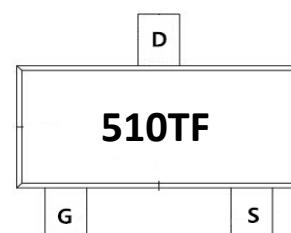
The 5N10 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



## General Features

$V_{DS} = 100V$   $I_D = 5A$

$R_{DS(ON\ typ)} = 90m\Omega @ V_{GS}=10V$

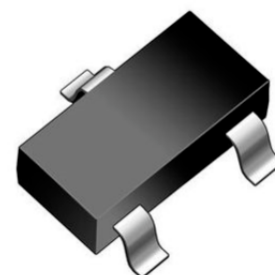


## Application

Battery protection

Load switch

Uninterruptible power supply



## Absolute Maximum Ratings ( $T_C=25^\circ C$ unless otherwise noted)

| Symbol                 | Parameter  | Rating     | Units        |
|------------------------|--|------------|--------------|
| $V_{DS}$               | Drain-Source Voltage   | 100        | V            |
| $V_{GS}$               | Gate-Source Voltage  | $\pm 20$   | V            |
| $I_D @ T_A=25^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$                     | 5          | A            |
| $I_D @ T_A=70^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$                     | 3.2        | A            |
| $I_{DM}$               | Pulsed Drain Current <sup>2</sup>                              | 15         | A            |
| $P_D @ T_A=25^\circ C$ | Total Power Dissipation <sup>3</sup>                           | 3.1        | W            |
| $T_{STG}$              | Storage Temperature Range                                      | -55 to 150 | $^\circ C$   |
| $T_J$                  | Operating Junction Temperature Range                           | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$        | Thermal Resistance Junction-ambient(steady state) <sup>1</sup> | 100        | $^\circ C/W$ |
| $R_{\theta JA}$        | Thermal Resistance Junction-ambient( $t < 10s$ ) <sup>1</sup>  | 40         | $^\circ C/W$ |

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

| Symbol              | Parameter                                      | Conditions   | Min. | Typ. | Max. | Unit |
|---------------------|--|--|------|------|------|------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA   | 100  | 108  | ---  | V    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =4A   | ---  | 90   | 125  | mΩ   |
|                     |  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A  | ---  | 115  | 145  | mΩ   |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                                 | 1.2  | 1.7  | 2.5  | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =80V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                          | ---  | ---  | 1    | uA   |
|                     |  | V <sub>DS</sub> =80V, V <sub>GS</sub> =0V, T <sub>J</sub> =85°C                          | ---  | ---  | 50   |      |
| I <sub>GSS</sub>    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   | ---  | ---  | ±100 | nA   |
| R <sub>g</sub>      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz   | ---  | 2.3  | 4.6  |      |
| Q <sub>g</sub>      | Total Gate Charge (10V)                        | V <sub>DS</sub> =30V, V <sub>GS</sub> =10V, I <sub>D</sub> =4A                           | ---  | 3.57 | ---  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                             |  | ---  | 0.76 | ---  |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                              |  | ---  | 0.71 | ---  |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                             | V <sub>DD</sub> =30V, V <sub>GS</sub> =10V,<br>R <sub>G</sub> =3.3<br>I <sub>D</sub> =1A | ---  | 11   | ---  | ns   |
| T <sub>r</sub>      | Rise Time                                      |  | ---  | 6    | ---  |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time                            |  | ---  | 30   | ---  |      |
| T <sub>f</sub>      | Fall Time                                      |  | ---  | 4    | ---  |      |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz  | ---  | 182  | ---  | pF   |
| C <sub>oss</sub>    | Output Capacitance                             |  | ---  | 30   | ---  |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   |  | ---  | 3.6  | ---  |      |
| I <sub>s</sub>      | Continuous Source Current <sup>1,4</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current  | ---  | ---  | 2    | A    |
| V <sub>SD</sub>     | Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C                            | ---  | ---  | 1.2  | V    |

**Note :**

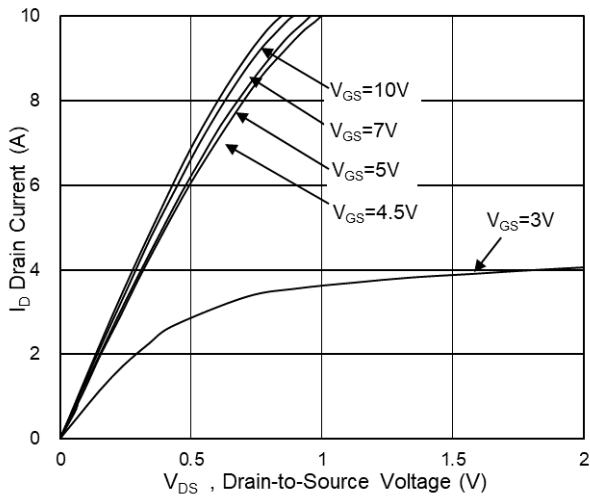
1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

2.The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%

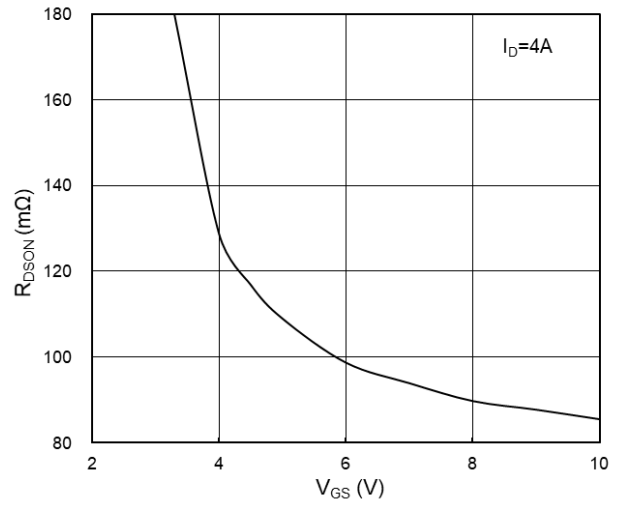
3.The power dissipation is limited by 150°C junction temperature

4.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

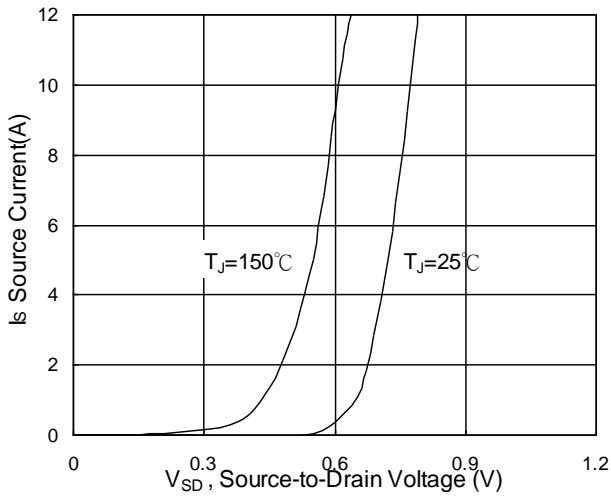
**Typical Characteristics**



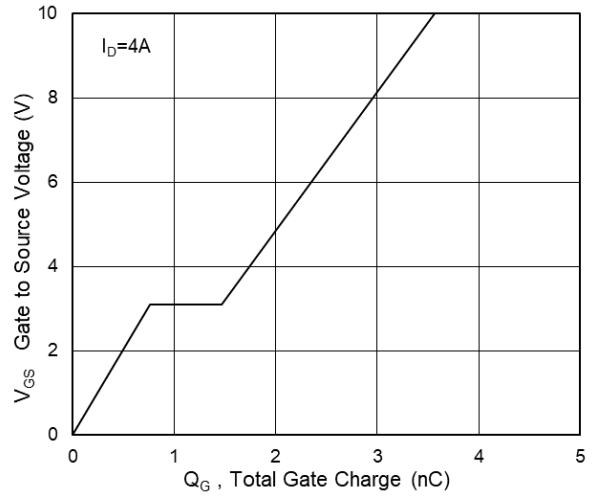
**Fig.1 Typical Output Characteristics**



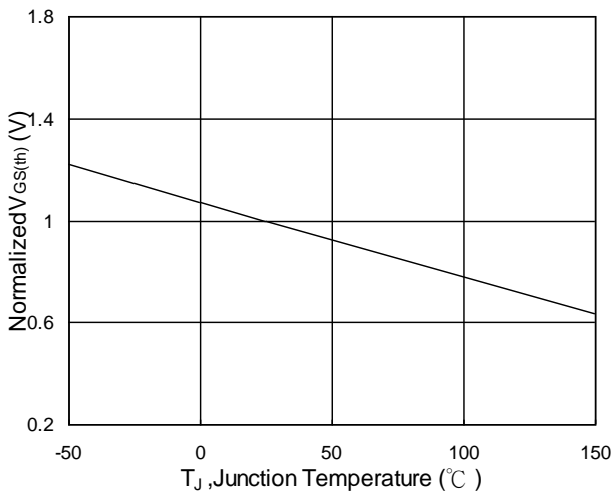
**Fig.2 On-Resistance vs G-S Voltage**



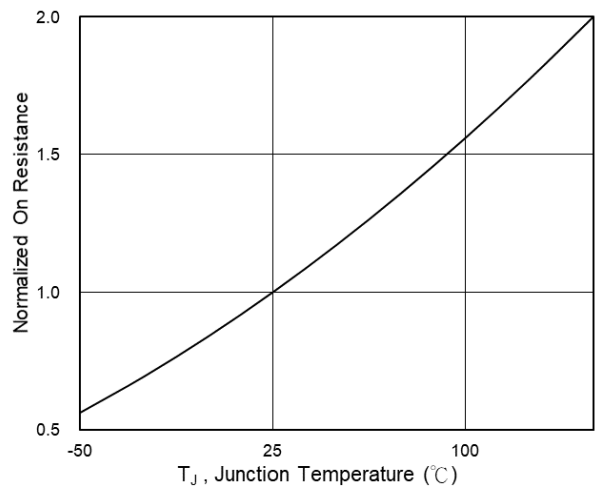
**Fig.3 Source Drain Forward Characteristics**



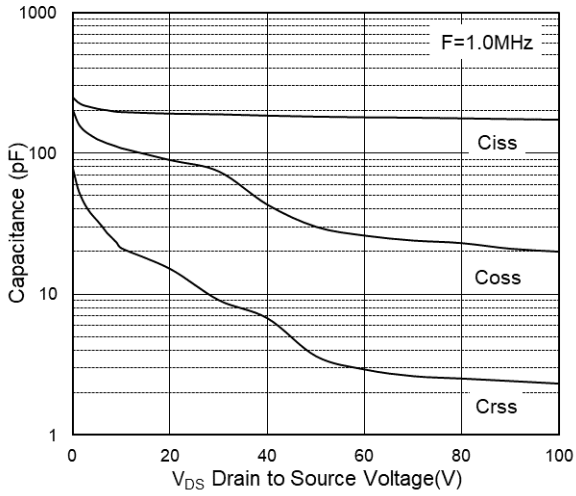
**Fig.4 Gate-Charge Characteristics**



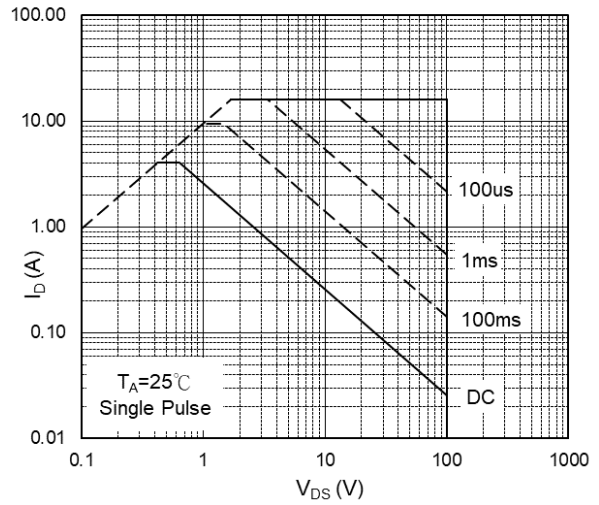
**Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$**



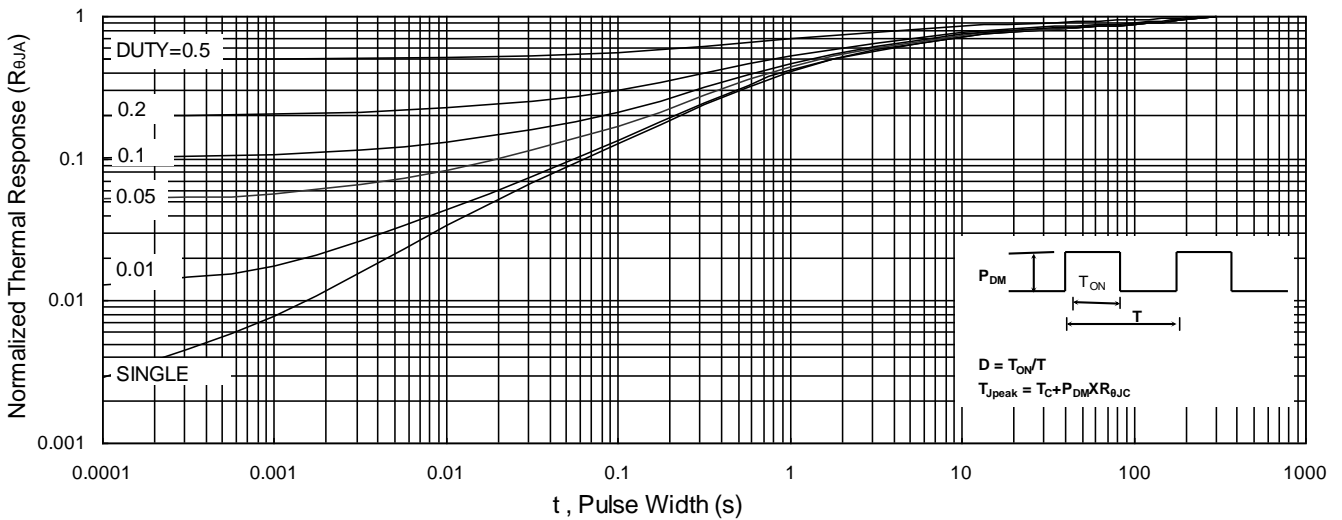
**Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$**



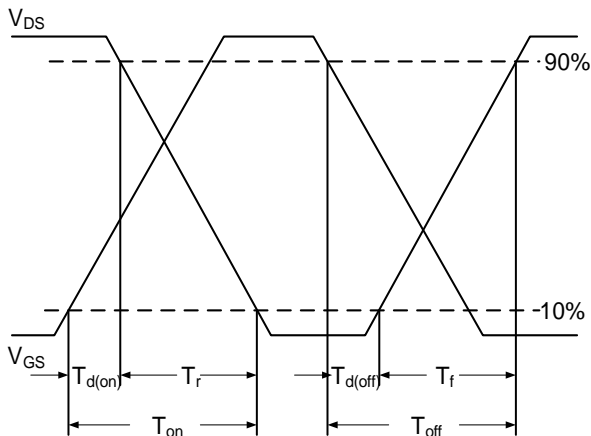
**Fig.7 Capacitance**



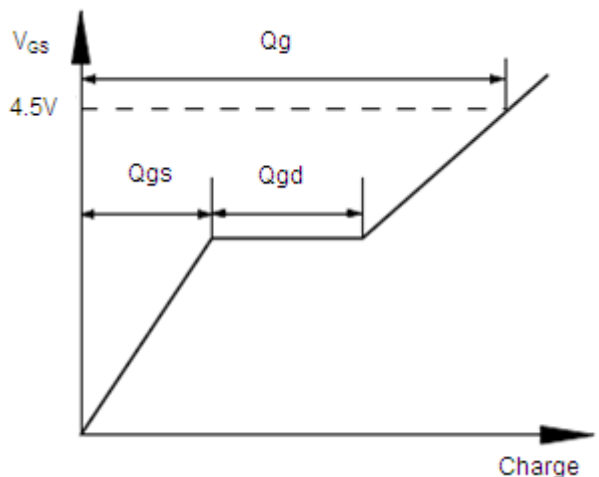
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

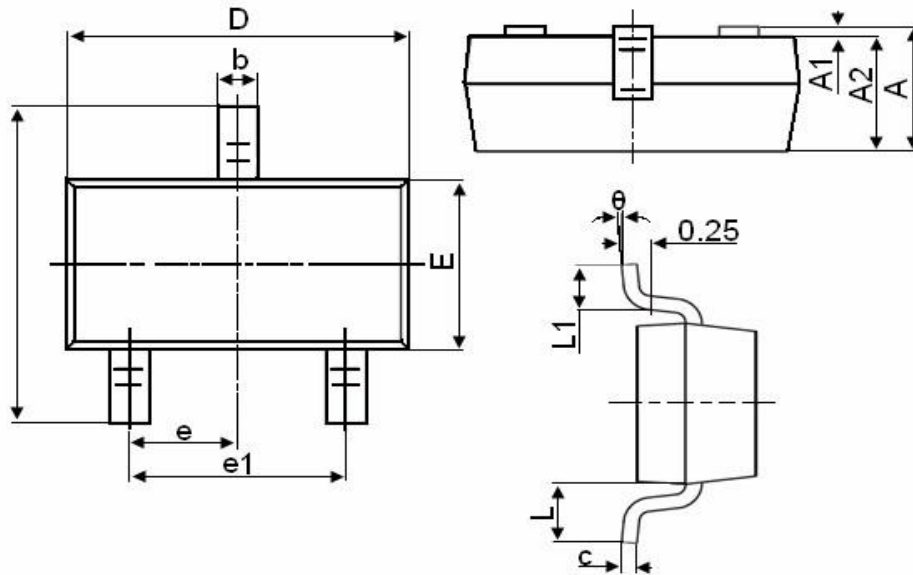


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

Package Mechanical Data-SOT-23



| Symbol | Dimensions in Millimeters |       |
|--------|---------------------------|-------|
|        | MIN.                      | MAX.  |
| A      | 0.900                     | 1.150 |
| A1     | 0.000                     | 0.100 |
| A2     | 0.900                     | 1.050 |
| b      | 0.300                     | 0.500 |
| c      | 0.080                     | 0.150 |
| D      | 2.800                     | 3.000 |
| E      | 1.200                     | 1.400 |
| E1     | 2.250                     | 2.550 |
| e      | 0.950TYP                  |       |
| e1     | 1.800                     | 2.000 |
| L      | 0.550REF                  |       |
| L1     | 0.300                     | 0.500 |
| θ      | 0°                        | 8°    |