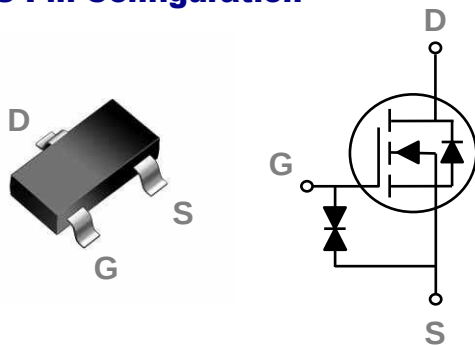


## General Description

These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

## SOT23-3S Pin Configuration



| BVDSS | RDS(ON) | ID    |
|-------|---------|-------|
| 20V   | 300mΩ   | 1.45A |

## Features

- 20V, 1.45A,  $R_{DS(ON)} = 300m\Omega @ V_{GS} = 4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available
- Suit for 1.5V Gate Drive Applications

## Applications

- Notebook
- Load Switch
- Battery Protection
- Hand-held Instruments

## Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

| Symbol    | Parameter                                             | Rating     | Units                |
|-----------|-------------------------------------------------------|------------|----------------------|
| $V_{DS}$  | Drain-Source Voltage                                  | 20         | V                    |
| $V_{GS}$  | Gate-Source Voltage                                   | $\pm 8$    | V                    |
| $I_D$     | Drain Current – Continuous ( $T_A=25^\circ\text{C}$ ) | 1.45       | A                    |
|           | Drain Current – Continuous ( $T_A=70^\circ\text{C}$ ) | 1.15       | A                    |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                   | 5.8        | A                    |
| $P_D$     | Power Dissipation ( $T_A=25^\circ\text{C}$ )          | 1          | W                    |
|           | Power Dissipation – Derate above $25^\circ\text{C}$   | 8          | mW/ $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature Range                             | -55 to 150 | $^\circ\text{C}$     |
| $T_J$     | Operating Junction Temperature Range                  | -55 to 150 | $^\circ\text{C}$     |

## Thermal Characteristics

| Symbol          | Parameter                              | Typ. | Max. | Unit               |
|-----------------|----------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | ---  | 125  | $^\circ\text{C/W}$ |

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

| 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                       | 20   | ---   | ---  | V    |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient | Reference to 25°C, I <sub>D</sub> =1mA                           | ---  | -0.01 | ---  | V/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current              | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C  | ---  | ---   | 1    | uA   |
|                                     |                                           | V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C | ---  | ---   | 10   | uA   |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current               | V <sub>GS</sub> =±6V, V <sub>DS</sub> =0V                        | ---  | ---   | ±20  | uA   |

**On Characteristics**

|                      |                                             |                                                          |     |     |      |       |
|----------------------|---------------------------------------------|----------------------------------------------------------|-----|-----|------|-------|
| R <sub>DS(ON)</sub>  | Static Drain-Source On-Resistance           | V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.5A              | --- | 200 | 300  | mΩ    |
|                      |                                             | V <sub>GS</sub> =2.5V, I <sub>D</sub> =0.4A              | --- | 235 | 400  |       |
|                      |                                             | V <sub>GS</sub> =1.8V, I <sub>D</sub> =0.2A              | --- | 295 | 550  |       |
|                      |                                             | V <sub>GS</sub> =1.5V, I <sub>D</sub> =0.1A              | --- | 365 | 800  |       |
|                      |                                             | V <sub>GS</sub> =1.2V, I <sub>D</sub> =0.1A              | --- | 600 | 1500 |       |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                      | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA | 0.3 | 0.6 | 1.0  | V     |
| ΔV <sub>GS(th)</sub> | V <sub>GS(th)</sub> Temperature Coefficient |                                                          | --- | 3   | ---  | mV/°C |

**Dynamic and switching Characteristics**

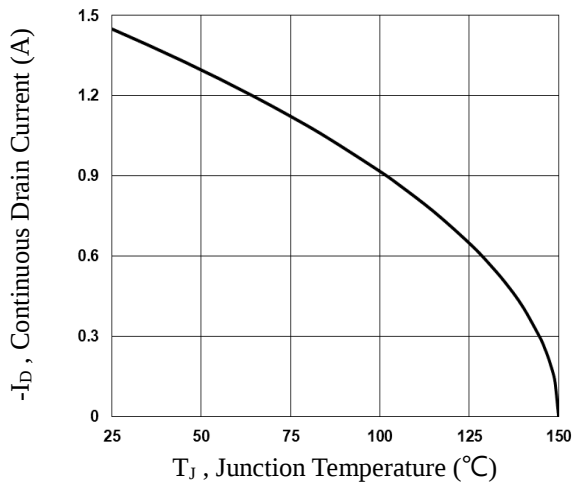
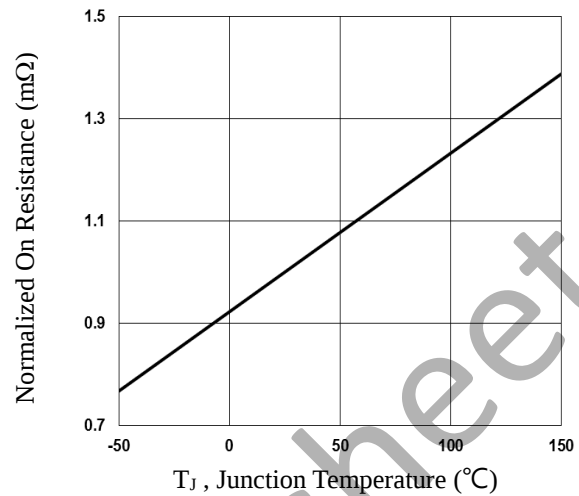
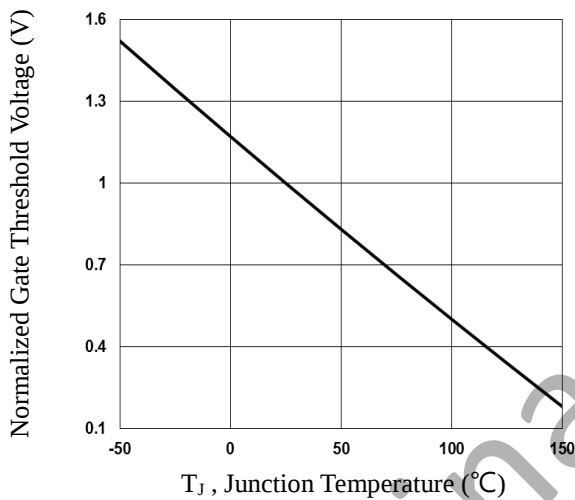
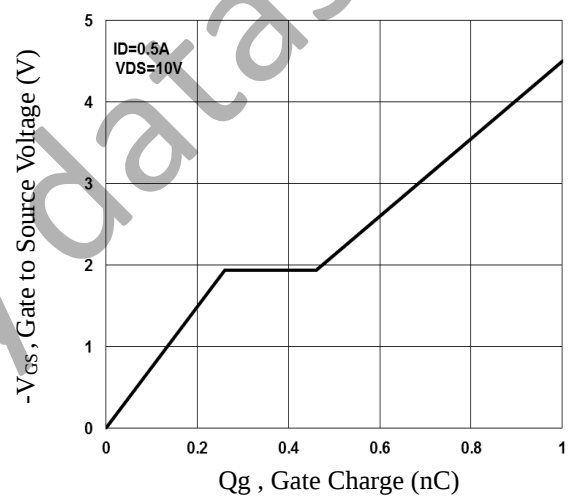
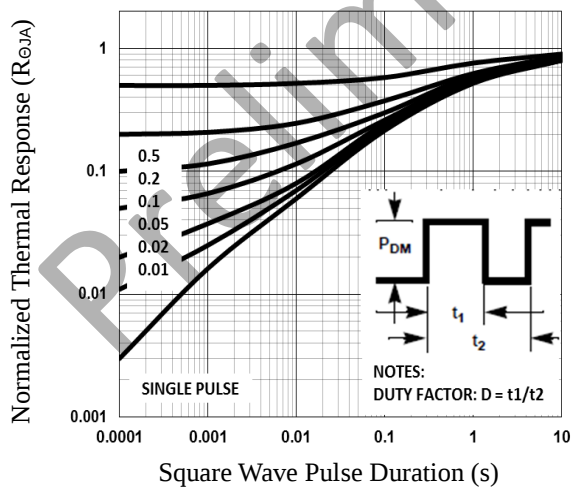
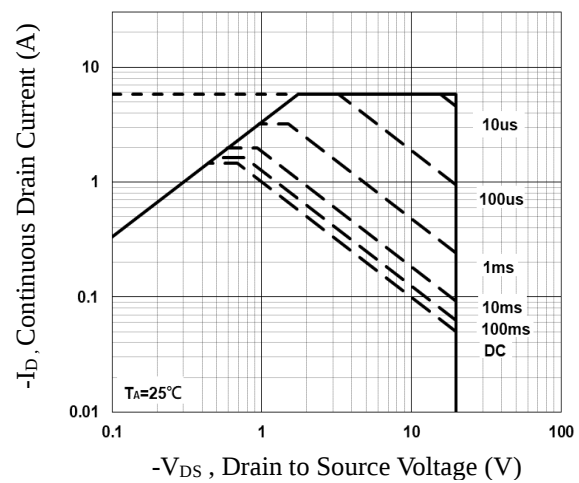
|                     |                                     |                                                                                          |     |      |     |    |
|---------------------|-------------------------------------|------------------------------------------------------------------------------------------|-----|------|-----|----|
| Q <sub>g</sub>      | Total Gate Charge <sup>2, 3</sup>   | V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.5A                        | --- | 1    | 2   | nC |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>2, 3</sup>  |                                                                                          | --- | 0.26 | 0.5 |    |
| Q <sub>gd</sub>     | Gate-Drain Charge <sup>2, 3</sup>   |                                                                                          | --- | 0.2  | 0.4 |    |
| T <sub>d(on)</sub>  | Turn-On Delay Time <sup>2, 3</sup>  | V <sub>DD</sub> =10V, V <sub>GS</sub> =4.5V, R <sub>G</sub> =10Ω<br>I <sub>D</sub> =0.5A | --- | 5    | 10  | ns |
| T <sub>r</sub>      | Rise Time <sup>2, 3</sup>           |                                                                                          | --- | 3.5  | 7   |    |
| T <sub>d(off)</sub> | Turn-Off Delay Time <sup>2, 3</sup> |                                                                                          | --- | 14   | 28  |    |
| T <sub>f</sub>      | Fall Time <sup>2, 3</sup>           |                                                                                          | --- | 6    | 12  |    |
| C <sub>iss</sub>    | Input Capacitance                   | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, F=1MHz                                        | --- | 38.2 | 75  | pF |
| C <sub>oss</sub>    | Output Capacitance                  |                                                                                          | --- | 14.4 | 28  |    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance        |                                                                                          | --- | 6    | 12  |    |

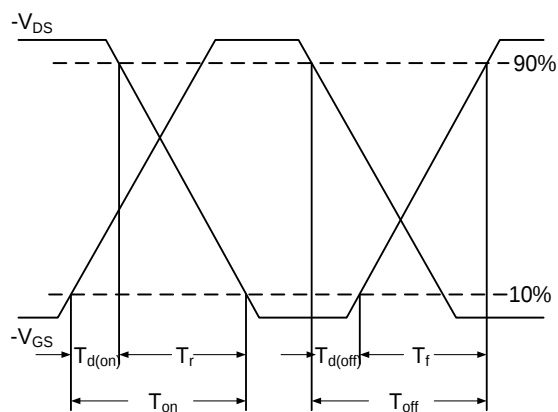
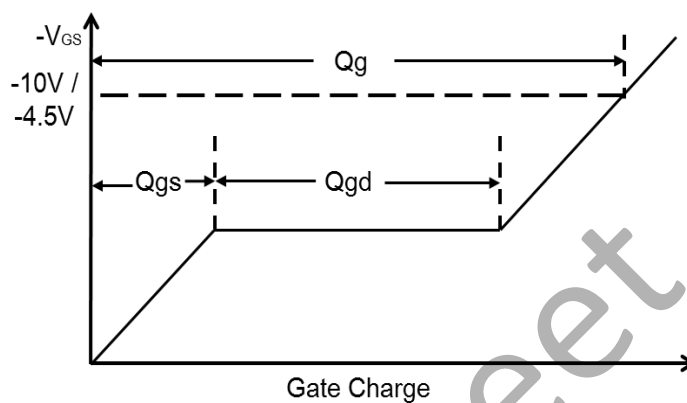
**Drain-Source Diode Characteristics and Maximum Ratings**

| Symbol          | Parameter                 | Conditions                                                      | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|-----------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current               | ---  | ---  | 1.45 | A    |
| I <sub>SM</sub> | Pulsed Source Current     |                                                                 | ---  | ---  | 2.9  | A    |
| V <sub>SD</sub> | Diode Forward Voltage     | V <sub>GS</sub> =0V, I <sub>S</sub> =0.2A, T <sub>J</sub> =25°C | ---  | ---  | 1    | V    |

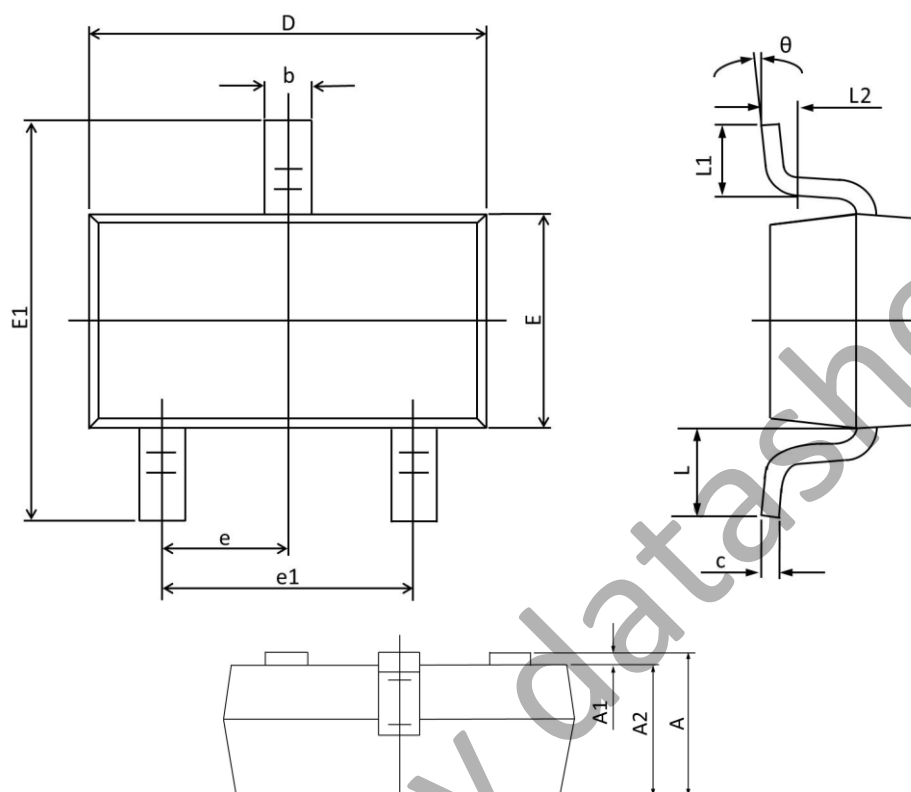
Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. Essentially independent of operating temperature.


**Fig.1 Continuous Drain Current vs.  $T_c$** 

**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$** 

**Fig.3 Normalized  $V_{th}$  vs.  $T_J$** 

**Fig.4 Gate Charge Waveform**

**Fig.5 Normalized Transient Response**

**Fig.6 Maximum Safe Operation Area**


**Fig.7 Switching Time Waveform**

**Fig.8 Gate Charge Waveform**

## SOT23-3S PACKAGE INFORMATION



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Max                       | Min   | Max                  | Min   |
| A        | 1.150                     | 0.900 | 0.045                | 0.035 |
| A1       | 0.100                     | 0.000 | 0.004                | 0.000 |
| A2       | 1.050                     | 0.900 | 0.041                | 0.035 |
| b        | 0.500                     | 0.300 | 0.020                | 0.012 |
| c        | 0.150                     | 0.080 | 0.006                | 0.003 |
| D        | 3.000                     | 2.800 | 0.118                | 0.110 |
| E        | 1.400                     | 1.200 | 0.055                | 0.047 |
| E1       | 2.550                     | 2.250 | 0.100                | 0.089 |
| e        | 0.95 TYP.                 |       | 0.037 TYP.           |       |
| e1       | 2.000                     | 1.800 | 0.079                | 0.071 |
| L        | 0.55 REF.                 |       | 0.022 REF.           |       |
| L1       | 0.500                     | 0.300 | 0.020                | 0.012 |
| L2       | 0.25 TYP.                 |       | 0.01 TYP.            |       |
| $\theta$ | 8°                        | 0°    | 8°                   | 0°    |