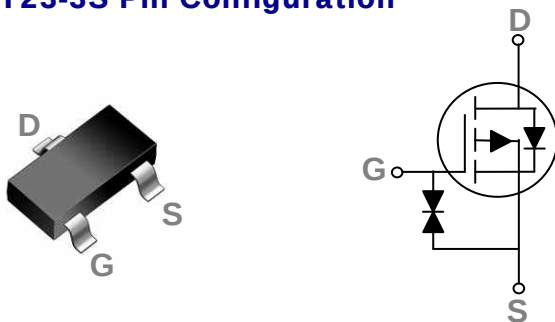


## General Description

These P-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  | 33mΩ    | -5.8A |

## Features

- -20V, -5.8A,  $R_{DS(ON)} = 33m\Omega @ V_{GS} = -4.5V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available
- Suit for -1.8V 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                                    | $\pm 10$   | V                   |
| $I_D$     | Drain Current – Continuous ( $T_c=25^\circ\text{C}$ )  | -5.8       | A                   |
|           | Drain Current – Continuous ( $T_c=100^\circ\text{C}$ ) | -3.7       | A                   |
| $I_{DM}$  | Drain Current – Pulsed <sup>1</sup>                    | -23.2      | A                   |
| $P_D$     | Power Dissipation ( $T_c=25^\circ\text{C}$ )           | 1.56       | W                   |
|           | Power Dissipation – Derate above $25^\circ\text{C}$    | 0.012      | W/ $^\circ\text{C}$ |
| $T_{STG}$ | 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 | ---  | 80   | $^\circ\text{C/W}$ |

## 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                           | ---  | -0.02 | ---  | 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> =±10V, V <sub>DS</sub> =0V                        | ---  | ---   | ±10  | uA   |

### On Characteristics

|                      |                                             |                                                           |      |      |     |       |
|----------------------|---------------------------------------------|-----------------------------------------------------------|------|------|-----|-------|
| R <sub>DS(ON)</sub>  | Static Drain-Source On-Resistance           | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A               | ---  | 28   | 33  | mΩ    |
|                      |                                             | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3A               | ---  | 37   | 45  |       |
|                      |                                             | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A               | ---  | 49   | 65  |       |
| 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  | V     |
| ΔV <sub>GS(th)</sub> | V <sub>GS(th)</sub> Temperature Coefficient |                                                           | ---  | 2    | --- | mV/°C |
| gfs                  | Forward Transconductance                    | V <sub>DS</sub> =-10V, I <sub>S</sub> =-3A                | ---  | 8.4  | --- | S     |

### Dynamic and switching Characteristics

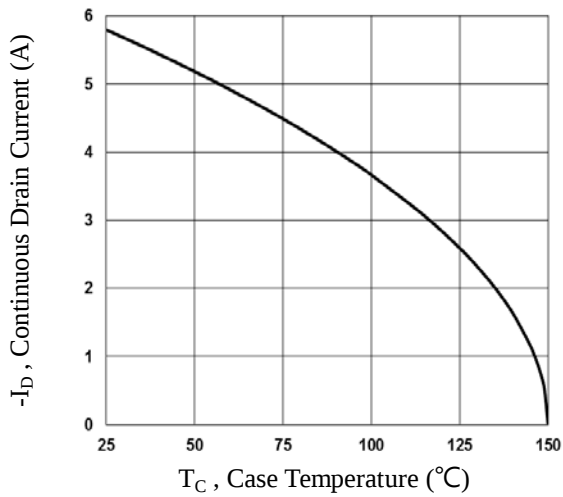
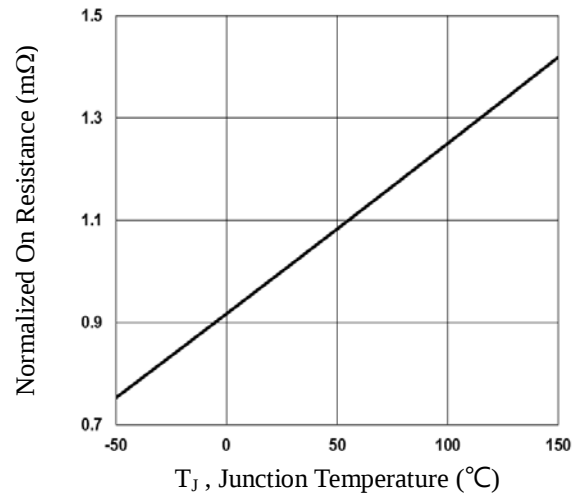
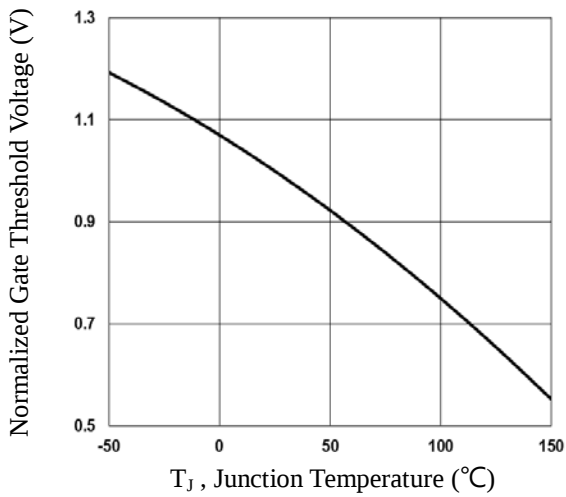
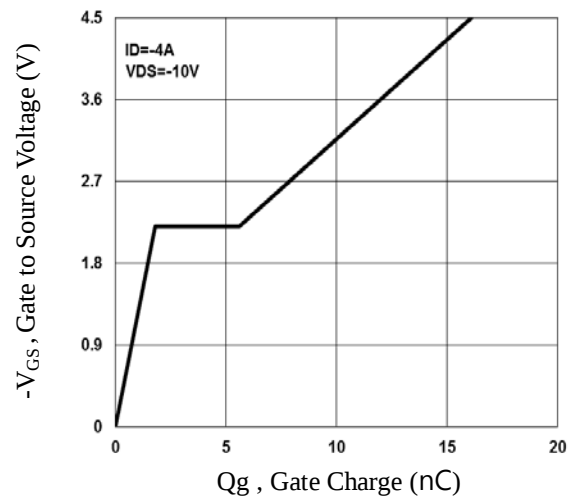
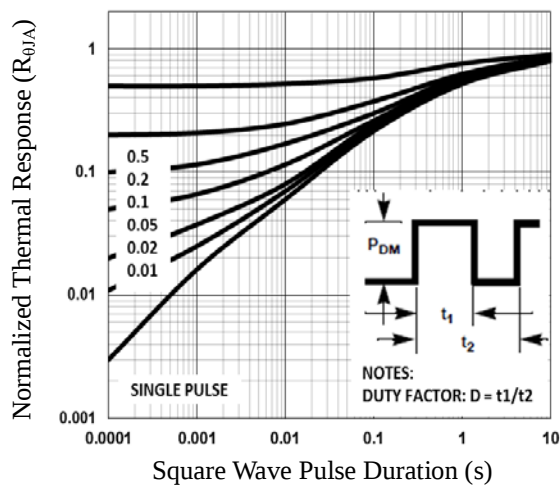
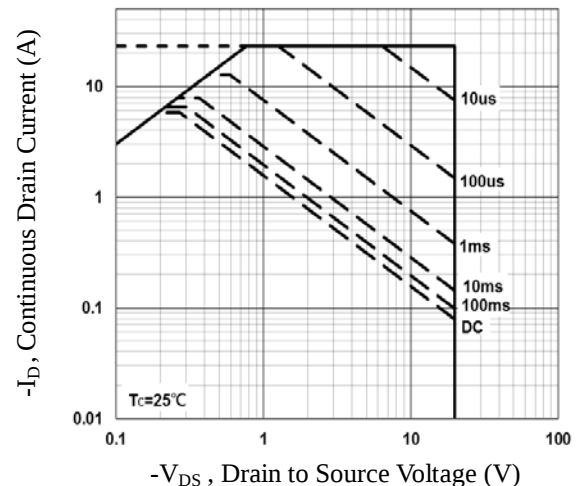
|                     |                                    |                                                                                           |     |      |      |    |
|---------------------|------------------------------------|-------------------------------------------------------------------------------------------|-----|------|------|----|
| 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> =-4A                        | --- | 16.1 | 25   | nC |
| Q <sub>gs</sub>     | Gate-Source Charge <sup>2,3</sup>  |                                                                                           | --- | 1.8  | 3    |    |
| Q <sub>gd</sub>     | Gate-Drain Charge <sup>2,3</sup>   |                                                                                           | --- | 3.8  | 7    |    |
| 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> =25Ω<br>I <sub>D</sub> =-1A | --- | 8.2  | 16   | nS |
| T <sub>r</sub>      | Rise Time <sup>2,3</sup>           |                                                                                           | --- | 30   | 57   |    |
| T <sub>d(off)</sub> | Turn-Off Delay Time <sup>2,3</sup> |                                                                                           | --- | 71.1 | 135  |    |
| T <sub>f</sub>      | Fall Time <sup>2,3</sup>           |                                                                                           | --- | 19.8 | 38   |    |
| C <sub>iss</sub>    | Input Capacitance                  | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, F=1MHz                                        | --- | 1440 | 2100 | pF |
| C <sub>oss</sub>    | Output Capacitance                 |                                                                                           | --- | 155  | 230  |    |
| C <sub>rss</sub>    | Reverse Transfer Capacitance       |                                                                                           | --- | 115  | 170  |    |

### 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              | ---  | ---  | -5.8  | A    |
| I <sub>SM</sub> | Pulsed Source Current     |                                                                | ---  | ---  | -23.2 | A    |
| V <sub>SD</sub> | Diode Forward Voltage     | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, 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 Impedance**

**Fig.6 Maximum Safe Operation Area**

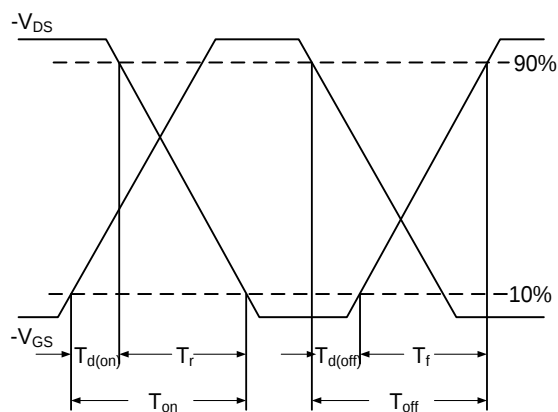


Fig.7 Switching Time Waveform

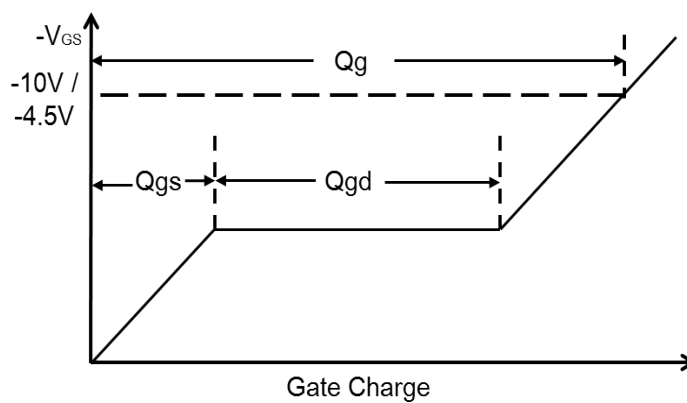
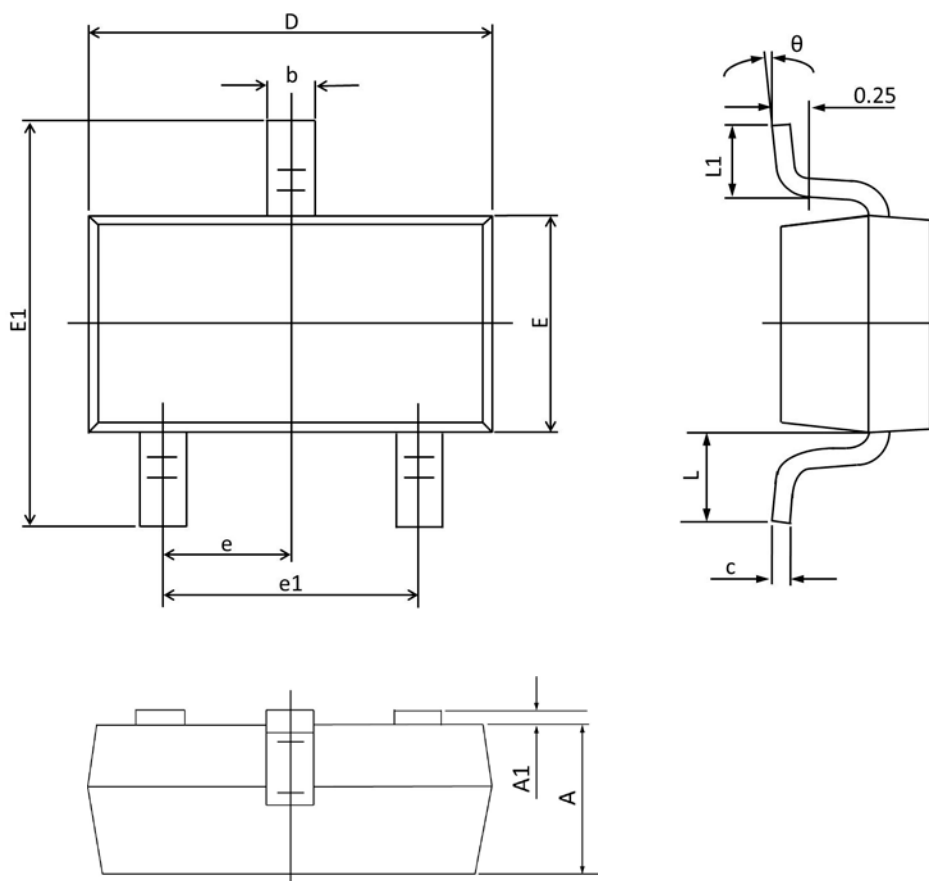


Fig.8 Gate Charge Waveform

## SOT23-3S PACKAGE INFORMATION



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min                       | Max   | Min                  | Max   |
| A        | 0.900                     | 1.000 | 0.035                | 0.039 |
| A1       | 0.000                     | 0.100 | 0.000                | 0.004 |
| b        | 0.300                     | 0.500 | 0.012                | 0.020 |
| c        | 0.090                     | 0.110 | 0.003                | 0.004 |
| D        | 2.800                     | 3.000 | 0.110                | 0.118 |
| E        | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1       | 2.250                     | 2.550 | 0.089                | 0.100 |
| e        | 0.950 TYP.                |       | 0.037 TYP.           |       |
| e1       | 1.800                     | 2.000 | 0.071                | 0.079 |
| L        | 0.550 REF.                |       | 0.022 REF.           |       |
| L1       | 0.300                     | 0.500 | 0.012                | 0.020 |
| $\theta$ | 1°                        | 7°    | 1°                   | 7°    |