

### General Description

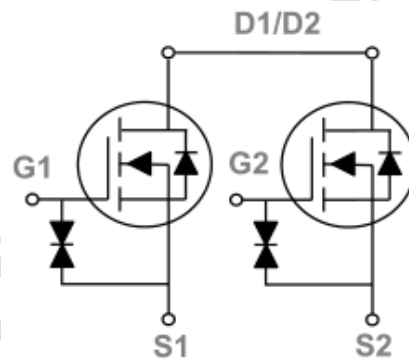
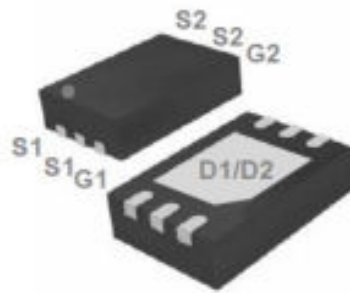
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

### Applications

- Handheld Instruments
- POL Applications
- Battery Protection Applications

### Product Summary

- $V_{DS}$  20V
- $I_D$  (at  $V_{GS}=10V$ ) 11A
- $R_{DS(ON)}$  (at  $V_{GS}=4.5V$ )  $< 8.2m\Omega$
- $R_{DS(ON)}$  (at  $V_{GS}=2.5V$ )  $< 11m\Omega$



### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Parameter                               | Symbol          | Maximum     | Units |
|-----------------------------------------|-----------------|-------------|-------|
| Drain-Source Voltage                    | $V_{DS}$        | 20          | V     |
| Gate-Source Voltage                     | $V_{GS}$        | $\pm 12$    | V     |
| Continuous Drain Current                | $I_D$           | 11          | A     |
|                                         |                 | 8.8         |       |
| Drain Current – Pulsed <sup>1</sup>     | $I_{DM}$        | 70          | A     |
| Power Dissipation                       | PD              | 1.56        | W     |
|                                         |                 | 1.1         |       |
| Storage Temperature Range               | $T_{STG}$       | -55 to +150 | °C    |
| Operating Junction Temperature Range    | $T_J$           | -55 to +150 | °C    |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 80          | °C/W  |

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

| Symbol               | Parameter                             | Conditions                                                                                | Min                               | Typ  | Max | Units |
|----------------------|---------------------------------------|-------------------------------------------------------------------------------------------|-----------------------------------|------|-----|-------|
| STATIC PARAMETERS    |                                       |                                                                                           |                                   |      |     |       |
| BV <sub>DSS</sub>    | Drain-Source Breakdown Voltage        | I <sub>D</sub> =250uA, V <sub>GS</sub> =0V                                                | 20                                |      |     | V     |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =18V, V <sub>GS</sub> =0V                                                 |                                   |      | 1   | uA    |
| I <sub>GSS</sub>     | Gate-Body leakage current             | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                                |                                   |      | ±10 | uA    |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage                | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA                                  | 0.5                               | 0.72 | 1.5 | V     |
| I <sub>D(ON)</sub>   | Onstate draincurrent                  | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V                                                 | 70                                |      |     | A     |
| R <sub>DS(ON)</sub>  | Static Drain-Source On-Resistance     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A                                                 |                                   | 6    | 8.2 | mΩ    |
|                      |                                       | V <sub>GS</sub> =2.5V, I <sub>D</sub> =2A                                                 |                                   | 8.5  | 11  | mΩ    |
| g <sub>FS</sub>      | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =5A                                                   |                                   | 20   |     | S     |
| V <sub>SD</sub>      | Diode Forward Voltage <sup>2</sup>    | I <sub>DS</sub> =1A, V <sub>GS</sub> =0V                                                  |                                   |      | 1   | V     |
| I <sub>S</sub>       | Maximum Body-Diode Continuous Current |                                                                                           |                                   |      | 8   | A     |
| DYNAMIC PARAMETERS   |                                       |                                                                                           |                                   |      |     |       |
| C <sub>iss</sub>     | Input Capacitance                     | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V<br>F=1MHz                                       |                                   | 1350 |     | pF    |
| C <sub>oss</sub>     | Output Capacitance                    |                                                                                           |                                   | 185  |     | pF    |
| C <sub>rss</sub>     | Reverse Transfer Capacitance          |                                                                                           |                                   | 160  |     | pF    |
| SWITCHING PARAMETERS |                                       |                                                                                           |                                   |      |     |       |
| Q <sub>g</sub>       | Total Gate Charge <sup>2,3</sup>      | V <sub>GS</sub> =4.5V, V <sub>DS</sub> =15V,<br>I <sub>D</sub> =11A                       |                                   | 1.5  |     | nC    |
| Q <sub>gs</sub>      | Gate Source Charge <sup>2,3</sup>     |                                                                                           |                                   | 2.8  |     | nC    |
| Q <sub>gd</sub>      | Gate Drain Charge <sup>2,3</sup>      |                                                                                           |                                   | 4.4  |     | nC    |
| t <sub>D(on)</sub>   | Turn-On Delay Time <sup>2,3</sup>     | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V,<br>I <sub>D</sub> =5.5A, R <sub>GEN</sub> =6Ω |                                   | 28   |     | ns    |
| t <sub>r</sub>       | Turn-On Rise Time <sup>2,3</sup>      |                                                                                           |                                   | 64   |     | ns    |
| t <sub>D(off)</sub>  | Turn-Off Delay Time <sup>2,3</sup>    |                                                                                           |                                   | 60   |     | ns    |
| t <sub>f</sub>       | Turn-Off Fall Time <sup>2,3</sup>     |                                                                                           |                                   | 55   |     | ns    |
| t <sub>rr</sub>      | Body Diode Reverse Recovery Time      |                                                                                           | I <sub>F</sub> =6A, dI/dt=100A/μs |      | 12  |       |
| Q <sub>rr</sub>      | Body Diode Reverse Recovery Charge    | I <sub>F</sub> =6A, dI/dt=100A/μs                                                         |                                   | 3.4  |     | nC    |

**Notes:**

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.

**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**

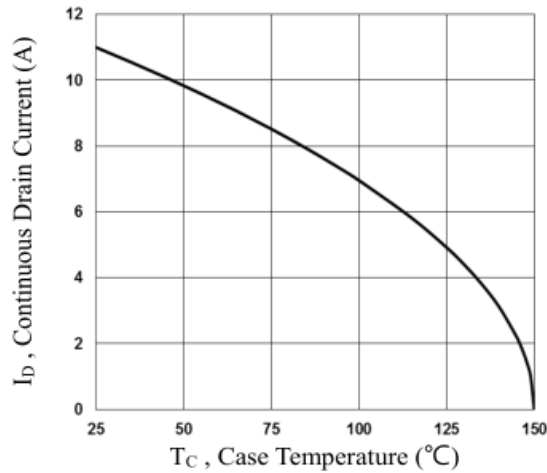


Fig 1: Continuous Drain Current vs.  $T_c$

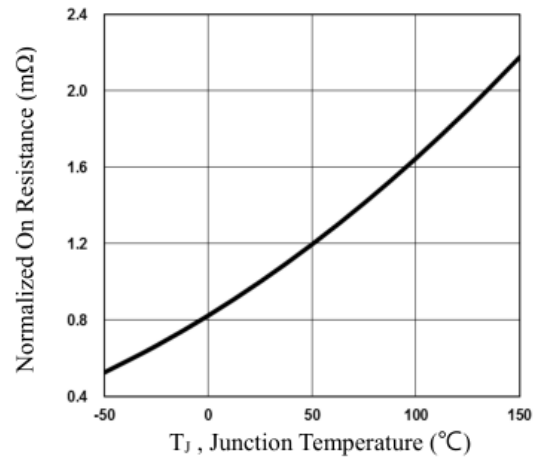


Figure 2: Normalized  $R_{DS(on)}$  vs.  $T_J$

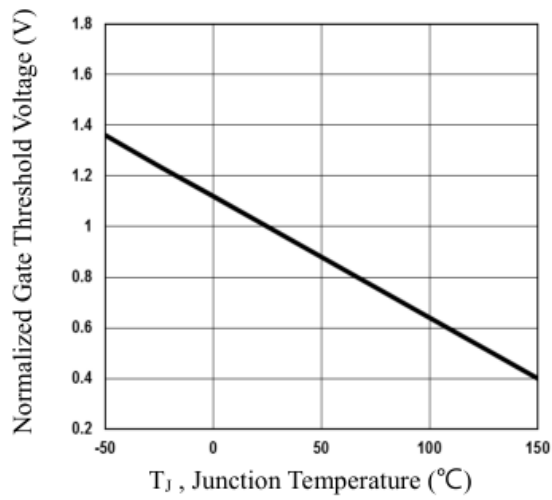


Figure 3: Normalized  $V_{th}$  vs.  $T_J$

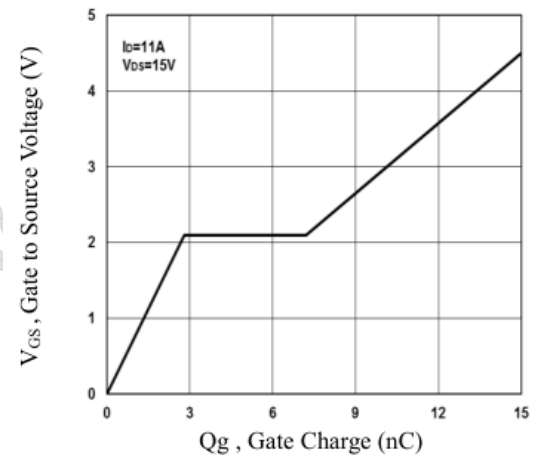


Figure 4: Gate Charge Waveform

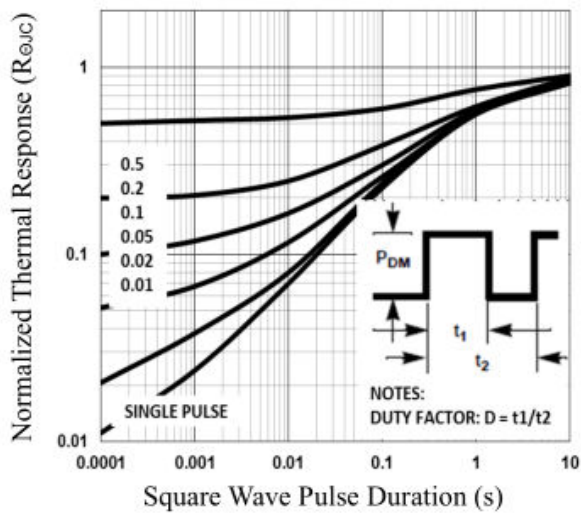


Figure 5: Normalized Transient Response

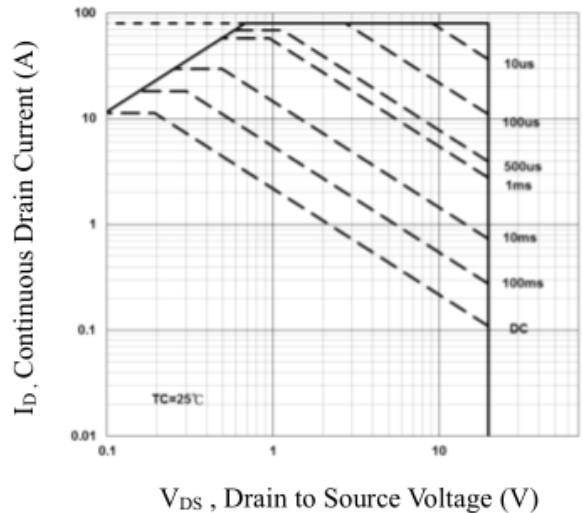


Figure 6: Maximum Safe Operation Area

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

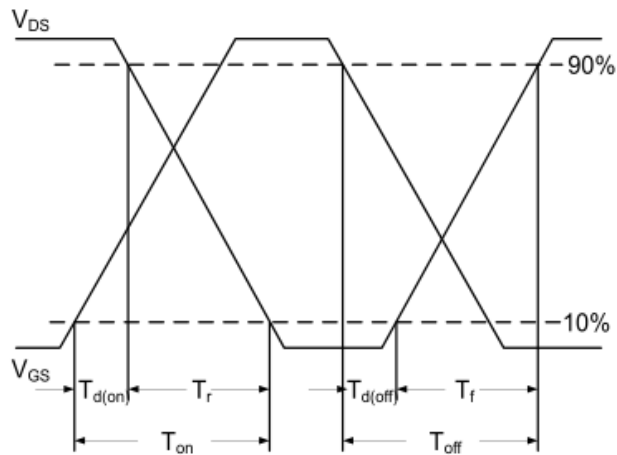


Figure 7: Switching Time Waveform

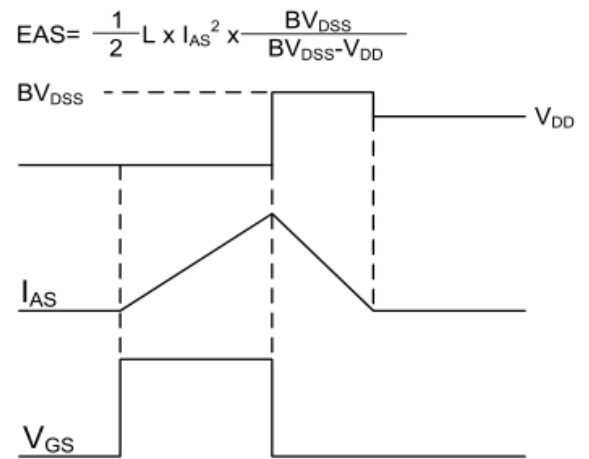
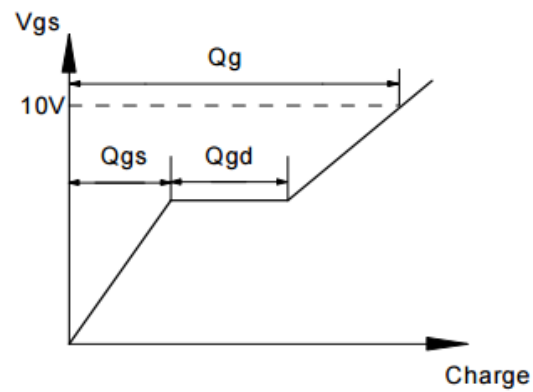
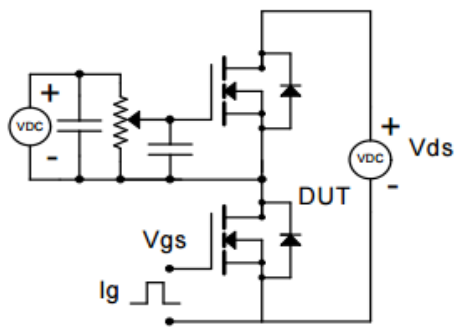
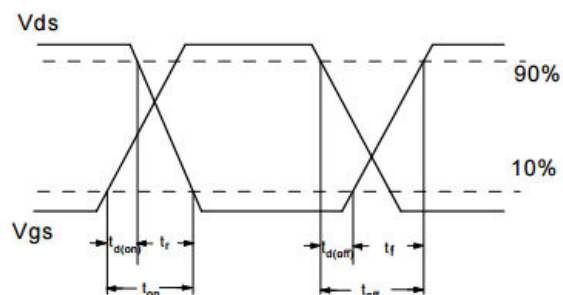
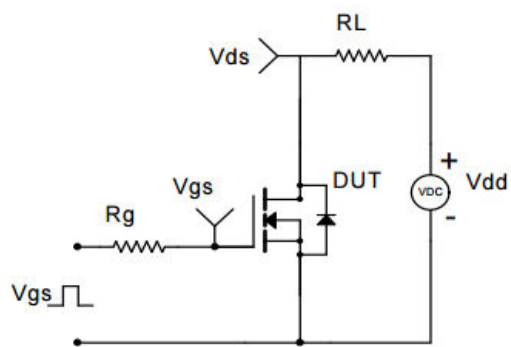
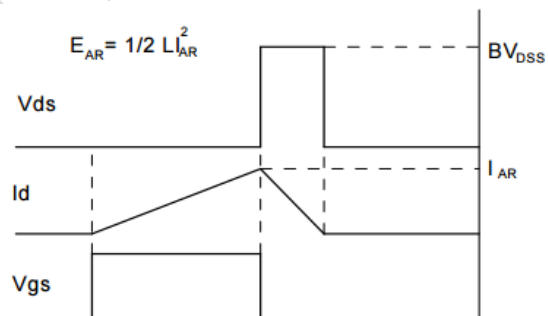
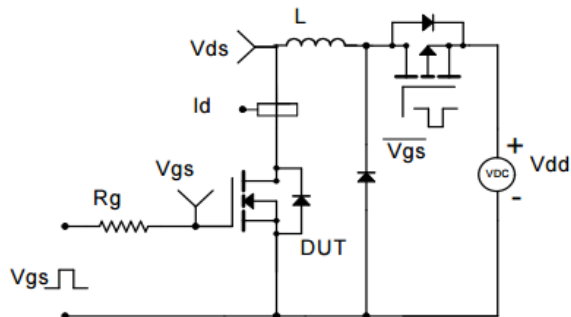
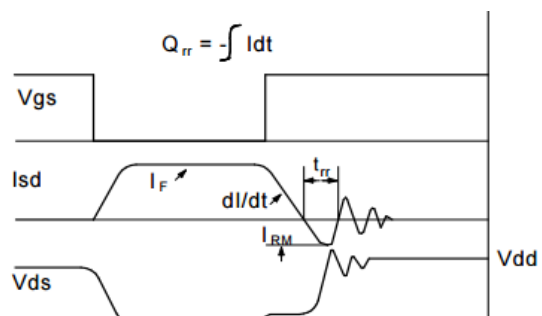
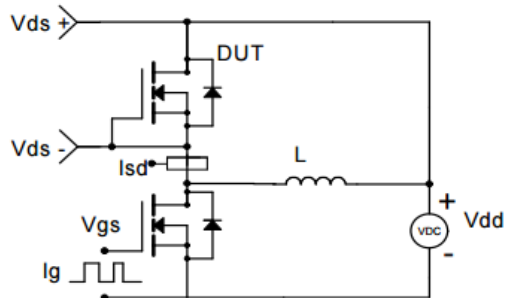
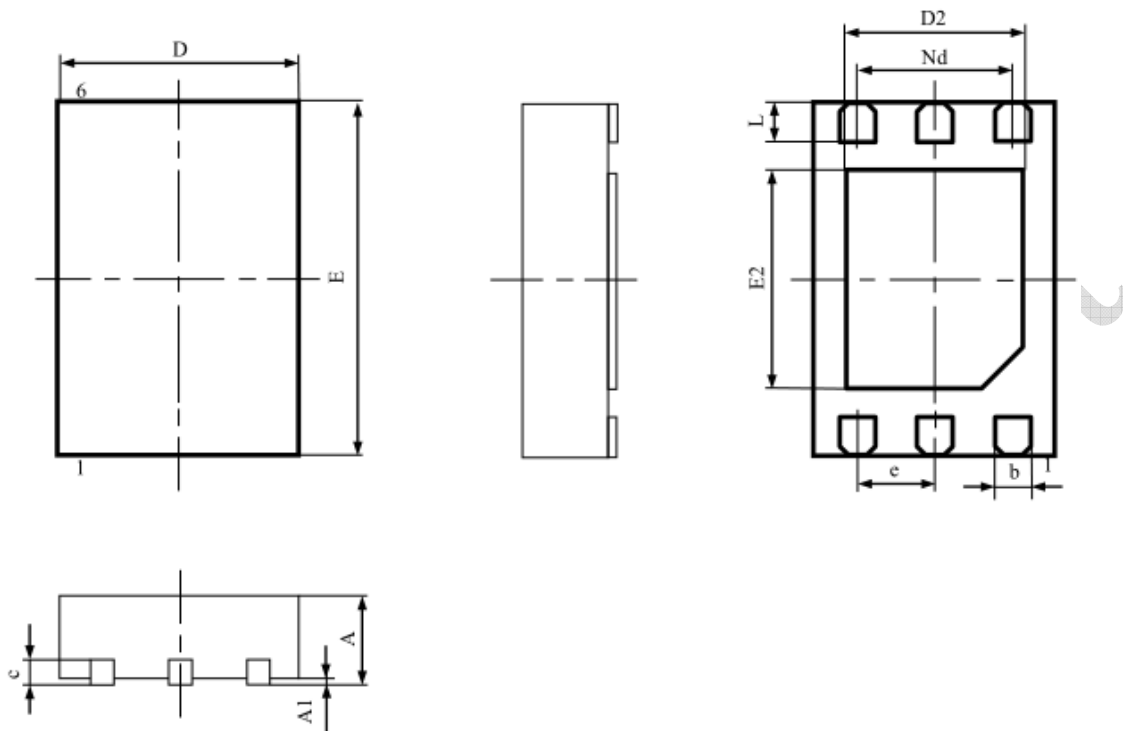


Figure 8: EAS Waveform

**Gate Charge Test Circuit & Waveform**

**Resistive Switching Test Circuit & Waveforms**

**Unclamped Inductive Switching (UIS) Test Circuit & Waveforms**

**Diode Recovery Test Circuit & Waveforms**


**Package Information**

DFN2\*3-6



| Symbol | Dimensions In Millimeters |          | Dimensions In Inches |           |
|--------|---------------------------|----------|----------------------|-----------|
|        | MAX                       | MIN      | MAX                  | MIN       |
| A      | 0.800                     | 0.700    | 0.031                | 0.028     |
| A1     | 0.050                     | 0.02typ. | 0.002                | 0.001typ. |
| b      | 0.350                     | 0.200    | 0.014                | 0.008     |
| c      | 0.250                     | 0.180    | 0.010                | 0.007     |
| D      | 2.100                     | 1.900    | 0.083                | 0.075     |
| D2     | 1.600                     | 1.400    | 0.063                | 0.055     |
| e      | 0.5BSC                    |          | 0.02BSC              |           |
| Nd     | 1.0BSC                    |          | 0.04BSC              |           |
| E      | 3.100                     | 2.900    | 0.122                | 0.114     |
| E2     | 1.750                     | 1.650    | 0.069                | 0.065     |
| L      | 0.400                     | 0.300    | 0.016                | 0.012     |