

General Description

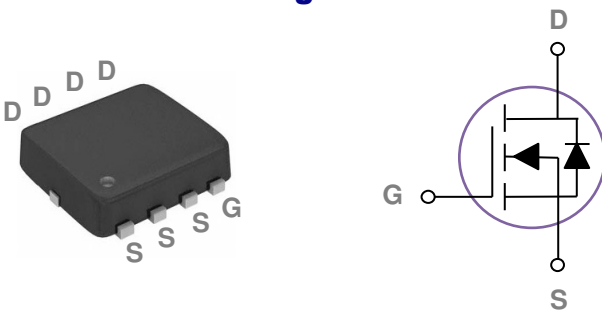
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

| | | |
|-------|-------|-----|
| BVDSS | RDSON | ID |
| 20V | 4.6mΩ | 70A |

Features

- 20V,70A, $R_{DS(ON)} = 4.6m\Omega @V_{GS} = 4.5V$
- Improved dv/dt capability
- Green Device Available
- Suit for 1.8V Gate Drive Applications

PPAK3x3 Pin Configuration



Applications

- Load Switch
- POL Applications
- SMPS 2nd SR
- Li-Battery Protection

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 | ± 10 | V |
| I_D | Drain Current – Continuous ($T_c=25^\circ\text{C}$) | 70 | A |
| | Drain Current – Continuous ($T_c=100^\circ\text{C}$) | 44 | A |
| I_{DM} | Drain Current – Pulsed ¹ | 280 | A |
| P_D | Power Dissipation ($T_c=25^\circ\text{C}$) | 44.6 | W |
| | Power Dissipation – Derate above 25°C | 0.36 | 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 | --- | 62 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 2.8 | $^\circ\text{C}/\text{W}$ |

Electrical Characteristics (T_J=25 °C, unless otherwise noted)
Off Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|---|--|------|-------|------|------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V , I _D =250uA | 20 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BV _{DSS} Temperature Coefficient | Reference to 25°C , I _D =1mA | --- | -0.01 | --- | V/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =20V , V _{GS} =0V , T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =16V , V _{GS} =0V , T _J =100°C | --- | --- | 10 | uA |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±10V , V _{DS} =0V | --- | --- | ±100 | nA |

On Characteristics

| | | | | | | |
|----------------------|---|--|-----|-----|-----|-------|
| R _{DS(ON)} | Static Drain-Source On-Resistance | V _{GS} =4.5V , I _D =20A | --- | 3.8 | 4.6 | mΩ |
| | | V _{GS} =2.5V , I _D =15A | --- | 4.7 | 5.8 | mΩ |
| | | V _{GS} =1.8V , I _D =10A | --- | 6.2 | 8 | mΩ |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 0.3 | 0.6 | 1 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | -2 | --- | mV/°C |
| g _{fs} | Forward Transconductance | V _{DS} =10V , I _S =5A | --- | 20 | --- | S |

Dynamic and switching Characteristics

| | | | | | | |
|---------------------|-------------------------------------|--|-----|------|------|----|
| Q _g | Total Gate Charge ^{2, 3} | V _{DS} =10V , V _{GS} =4.5V , I _D =6A | --- | 29.8 | 45 | nC |
| Q _{gs} | Gate-Source Charge ^{2, 3} | | --- | 2.7 | 6 | |
| Q _{gd} | Gate-Drain Charge ^{2, 3} | | --- | 9 | 14 | |
| T _{d(on)} | Turn-On Delay Time ^{2, 3} | V _{DD} =10V , V _{GS} =4.5V , R _G =25Ω I _D =1A | --- | 13.5 | 26 | ns |
| T _r | Rise Time ^{2, 3} | | --- | 29 | 55 | |
| T _{d(off)} | Turn-Off Delay Time ^{2, 3} | | --- | 66.9 | 127 | |
| T _f | Fall Time ^{2, 3} | | --- | 19.2 | 36 | |
| C _{iss} | Input Capacitance | V _{DS} =10V , V _{GS} =0V , F=1MHz | --- | 1920 | 2790 | pF |
| C _{oss} | Output Capacitance | | --- | 280 | 410 | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 180 | 270 | |

Drain-Source Diode Characteristics and Maximum Ratings

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|---|------|------|------|------|
| I _S | Continuous Source Current | V _G =V _D =0V , Force Current | --- | --- | 70 | A |
| I _{SM} | Pulsed Source Current | | --- | --- | 140 | A |
| V _{SD} | Diode Forward Voltage | V _{GS} =0V , I _S =1A , T _J =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.

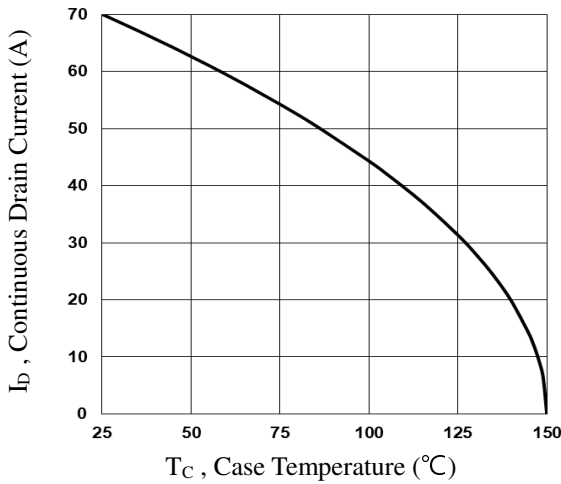


Fig.1 Continuous Drain Current vs. T_C

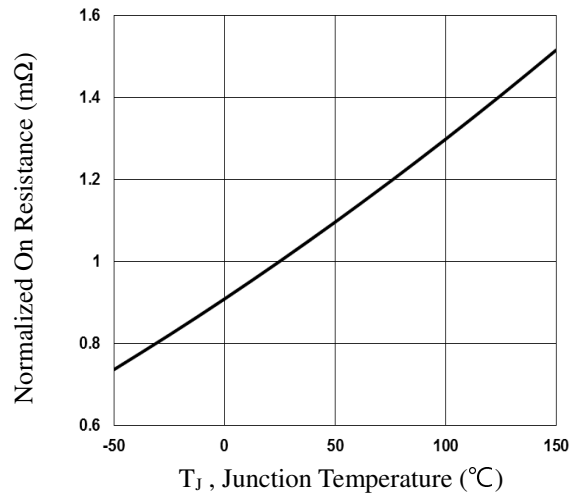


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

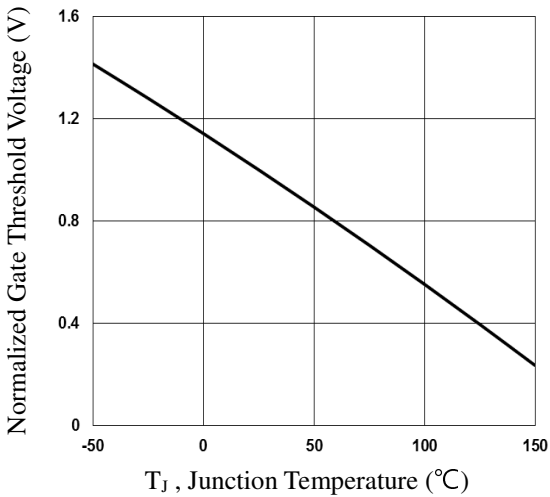


Fig.3 Normalized V_{th} vs. T_J

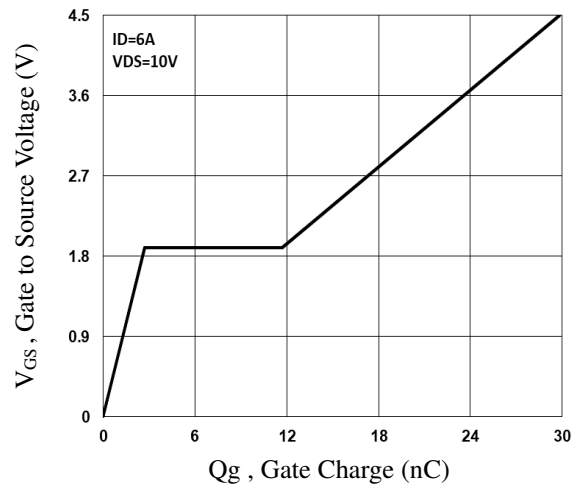


Fig.4 Gate Charge Waveform

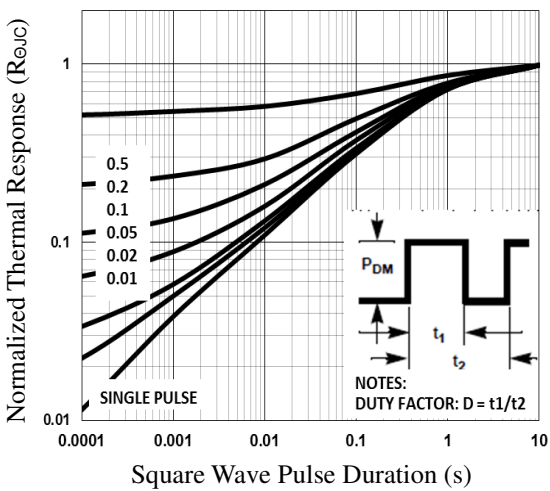


Fig.5 Normalized Transient Response

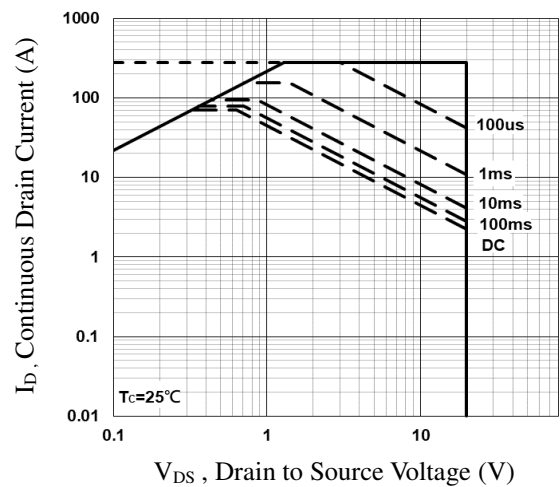


Fig.6 Maximum Safe Operation Area

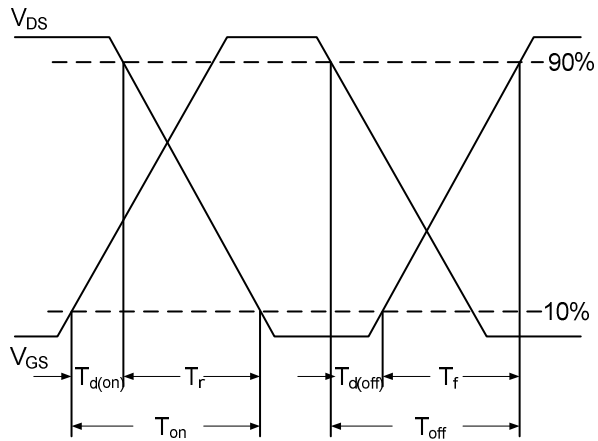


Fig.7 Switching Time Waveform

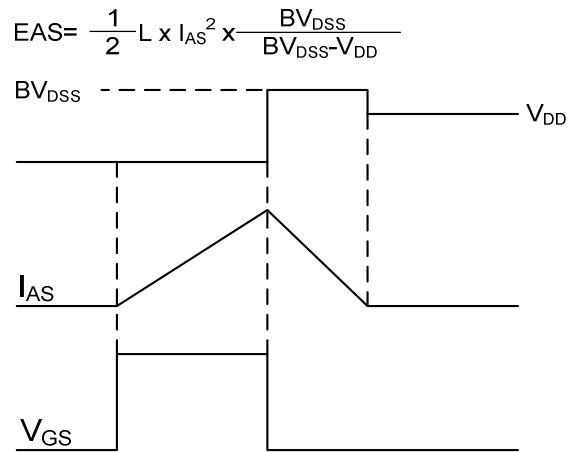
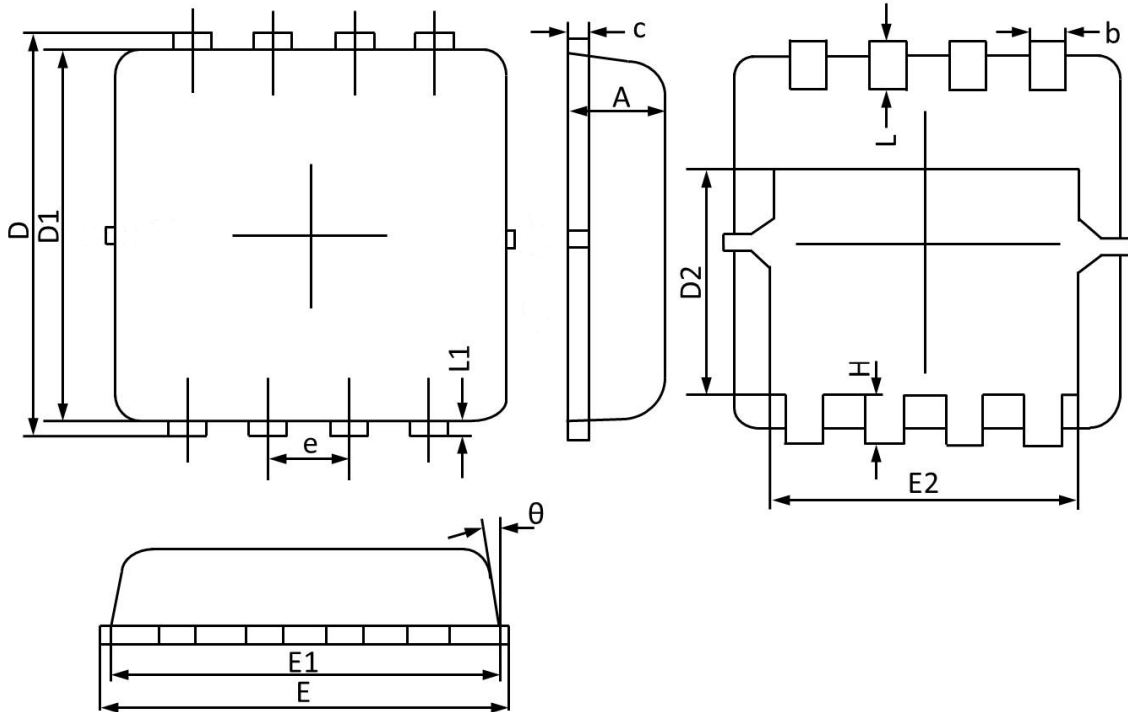


Fig.8 EAS Waveform

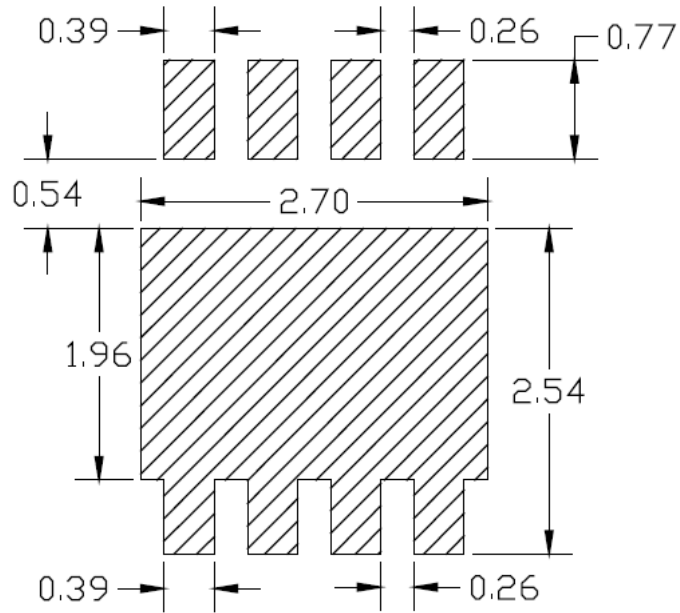
$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

PPAK3x3 PACKAGE INFORMATION



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | MAX | MIN | MAX | MIN |
| A | 0.900 | 0.700 | 0.035 | 0.028 |
| b | 0.350 | 0.240 | 0.014 | 0.009 |
| c | 0.250 | 0.100 | 0.010 | 0.004 |
| D | 3.450 | 3.050 | 0.136 | 0.120 |
| D1 | 3.200 | 2.900 | 0.126 | 0.114 |
| D2 | 1.850 | 1.350 | 0.073 | 0.053 |
| E | 3.400 | 3.000 | 0.134 | 0.118 |
| E1 | 3.250 | 2.900 | 0.128 | 0.114 |
| E2 | 2.600 | 2.350 | 0.102 | 0.093 |
| e | 0.65BSC | | 0.026BSC | |
| H | 0.500 | 0.300 | 0.020 | 0.012 |
| L | 0.500 | 0.300 | 0.020 | 0.012 |
| L1 | 0.200 | 0.070 | 0.008 | 0.003 |
| θ | 12° | 0° | 12° | 0° |

PPAK3X3 RECOMMENDED LAND PATTERN



unit : mm