

General Description

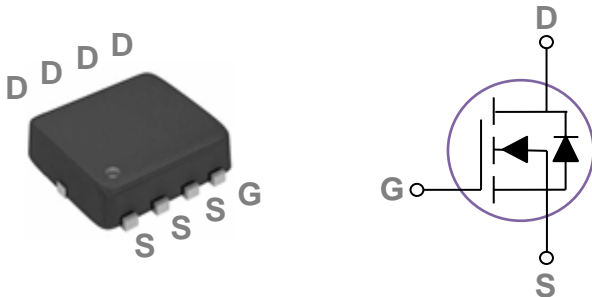
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

| | | |
|-------|-------|-----|
| BVDSS | RDSON | ID |
| 30V | 6mΩ | 60A |

Features

- 30V,60A, $R_{DS(ON)} = 6m\Omega @ V_{GS} = 10V$
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

PPAK3X3 Pin Configuration



Applications

- MB / VGA / Vcore
- POL Applications
- SMPS 2nd SR

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

| Symbol | Parameter | Rating | Units |
|-----------|--|------------|---------------------|
| V_{DS} | Drain-Source Voltage | 30 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| I_D | Drain Current – Continuous ($T_c=25^\circ\text{C}$) | 60 | A |
| | Drain Current – Continuous ($T_c=100^\circ\text{C}$) | 38 | A |
| I_{DM} | Drain Current – Pulsed ¹ | 240 | A |
| EAS | Single Pulse Avalanche Energy ² | 88 | mJ |
| IAS | Single Pulse Avalanche Current ² | 42 | A |
| P_D | Power Dissipation ($T_c=25^\circ\text{C}$) | 45 | 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 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 2.8 | $^\circ\text{C/W}$ |

Electrical Characteristics ($T_J=25\text{ }^\circ\text{C}$, unless otherwise noted)
Static State Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------------------|--|--|------|------|-----------|---------------------|
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$ | 30 | --- | --- | V |
| $\Delta BV_{DSS}/\Delta T_J$ | BV_{DSS} Temperature Coefficient | Reference to 25°C , $I_D=1\text{mA}$ | --- | 0.04 | --- | $V/^\circ\text{C}$ |
| I_{DSS} | Drain-Source Leakage Current | $V_{DS}=30V, V_{GS}=0V, T_J=25^\circ\text{C}$ | --- | --- | 1 | μA |
| | | $V_{DS}=24V, V_{GS}=0V, T_J=125^\circ\text{C}$ | --- | --- | 10 | μA |
| I_{GSS} | Gate-Source Leakage Current | $V_{GS}=\pm 20V, V_{DS}=0V$ | --- | --- | ± 100 | nA |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance ³ | $V_{GS}=10V, I_D=20A$ | --- | 4.8 | 6 | $m\Omega$ |
| | | $V_{GS}=4.5V, I_D=10A$ | --- | 6.7 | 9 | $m\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}, I_D=250\mu A$ | 1.2 | 1.6 | 2.5 | V |
| $\Delta V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -4 | --- | $mV/^\circ\text{C}$ |
| g_{fs} | Forward Transconductance | $V_{DS}=10V, I_D=10A$ | --- | 23 | --- | S |

Dynamic Characteristics

| | | | | | | |
|--------------|-------------------------------------|--|-----|------|------|----------|
| Q_g | Total Gate Charge ^{3, 4} | $V_{DS}=15V, V_{GS}=4.5V, I_D=20A$ | --- | 11.1 | 18 | nC |
| Q_{gs} | Gate-Source Charge ^{3, 4} | | --- | 1.85 | 3.8 | |
| Q_{gd} | Gate-Drain Charge ^{3, 4} | | --- | 6.8 | 12 | |
| $T_{d(on)}$ | Turn-On Delay Time ^{3, 4} | $V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega$ $I_D=15A$ | --- | 7.5 | 14 | ns |
| T_r | Rise Time ^{3, 4} | | --- | 14.5 | 28 | |
| $T_{d(off)}$ | Turn-Off Delay Time ^{3, 4} | | --- | 35.2 | 67 | |
| T_f | Fall Time ^{3, 4} | | --- | 9.6 | 18 | |
| C_{iss} | Input Capacitance | $V_{DS}=25V, V_{GS}=0V, F=1\text{MHz}$ | --- | 1210 | 1800 | pF |
| C_{oss} | Output Capacitance | | --- | 190 | 280 | |
| C_{rss} | Reverse Transfer Capacitance | | --- | 100 | 150 | |
| R_g | Gate resistance | $V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$ | --- | 2.5 | 5 | Ω |

Guaranteed Avalanche Energy

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|-------------------------------|--|------|------|------|------|
| EAS | Single Pulse Avalanche Energy | $V_{DD}=25V, L=0.1\text{mH}, I_{AS}=20A$ | 20 | --- | --- | mJ |

Drain-Source Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|----------|------------------------------------|---|------|------|------|------|
| I_S | Continuous Source Current | $V_G=V_D=0V$, Force Current | --- | --- | 60 | A |
| I_{SM} | Pulsed Source Current ³ | | --- | --- | 240 | A |
| V_{SD} | Diode Forward Voltage ³ | $V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$ | --- | --- | 1 | V |
| t_{rr} | Reverse Recovery Time | $V_{GS}=0V, I_S=1A, di/dt=100A/\mu s$ | --- | --- | --- | ns |
| Q_{rr} | Reverse Recovery Charge | $T_J=25^\circ\text{C}$ | --- | --- | --- | nC |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=42A, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.
3. The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
4. Essentially independent of operating temperature.

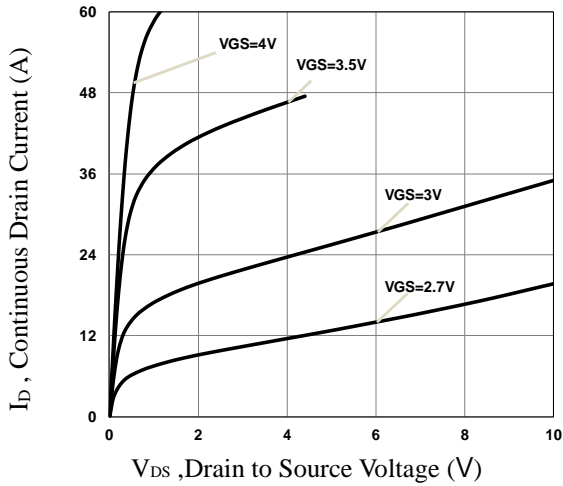


Fig.1 Typical Output Characteristics

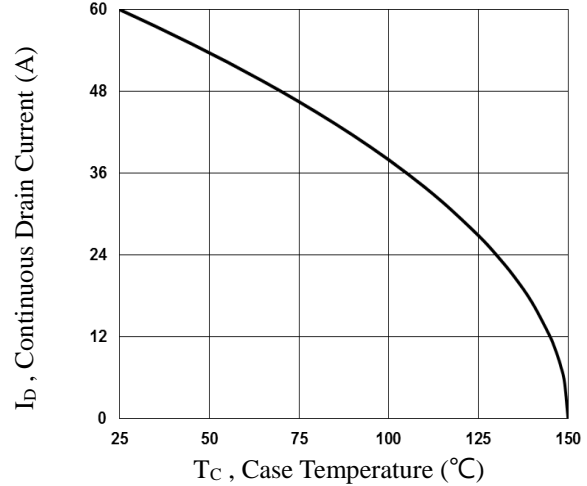


Fig.2 Continuous Drain Current vs. T_c

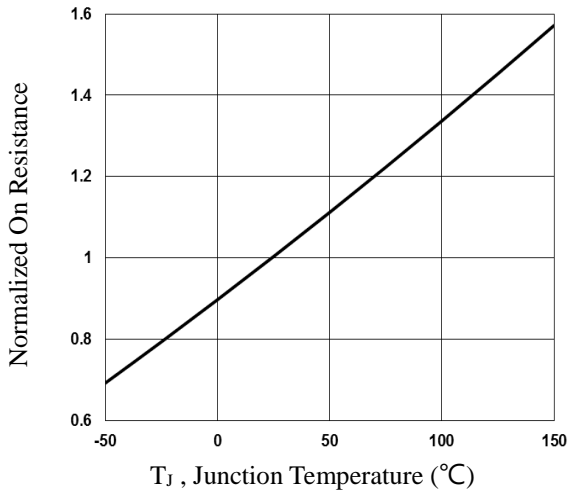


Fig.3 Normalized R_{DS(on)} vs. T_j

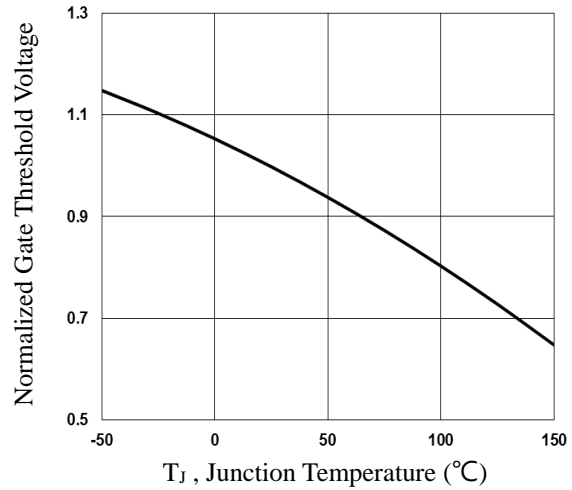


Fig.4 Normalized V_{th} vs. T_j

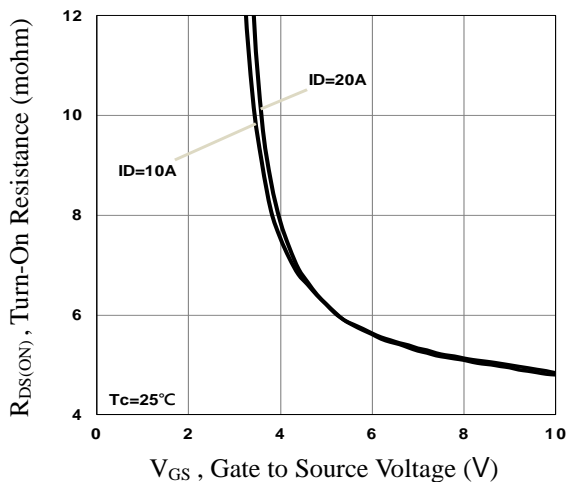


Fig.5 Turn-On Resistance vs. V_{GS}

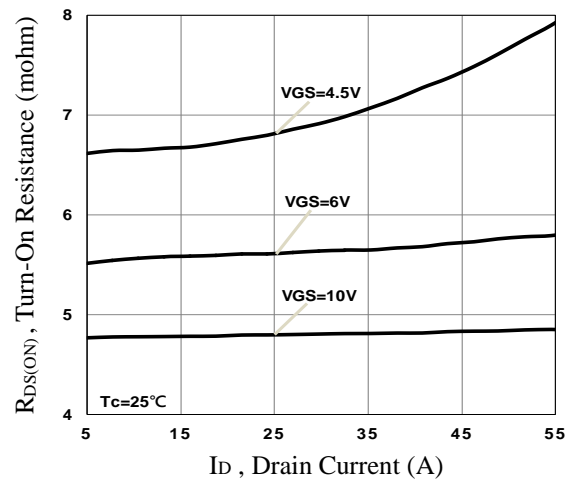


Fig.6 Turn-On Resistance vs. I_D

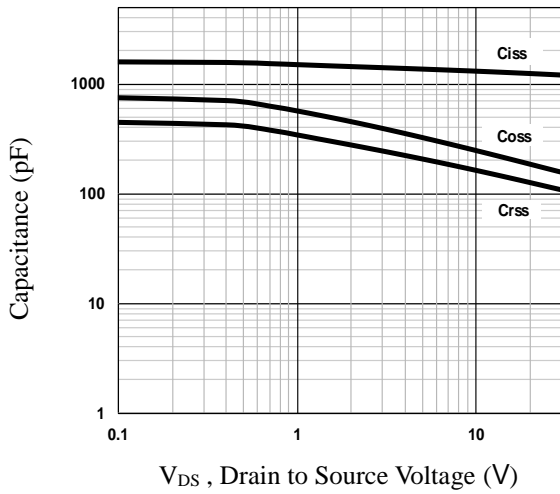


Fig.7 Capacitance Characteristics

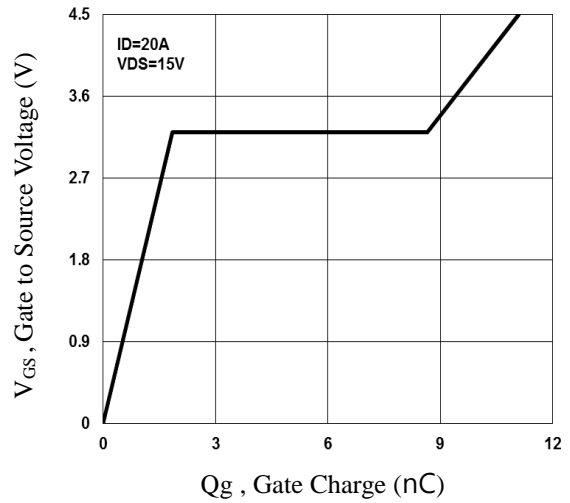


Fig.8 Gate Charge Characteristics

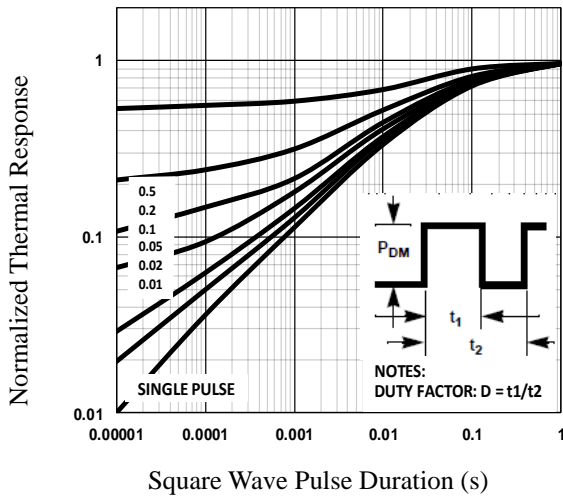


Fig.9 Normalized Transient Impedance

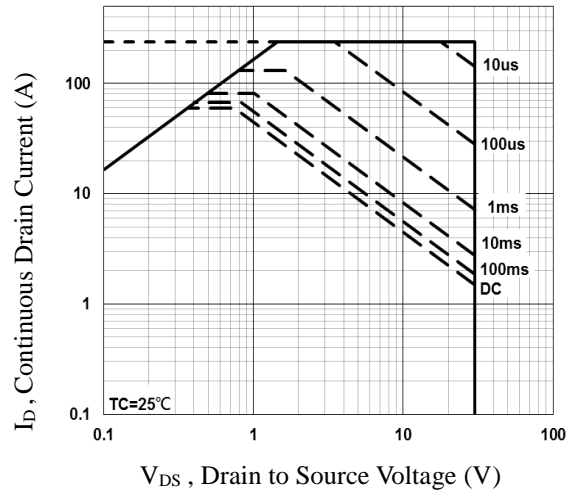


Fig.10 Maximum Safe Operation Area

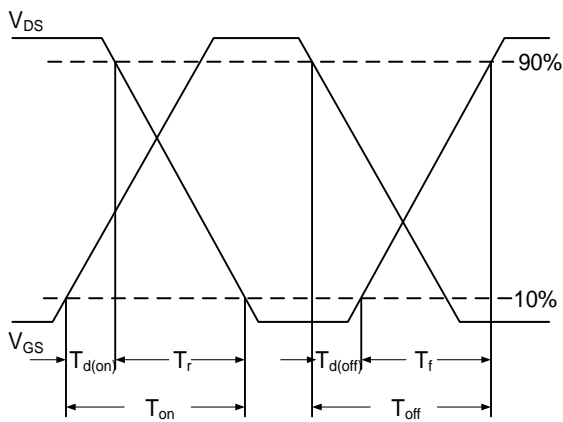


Fig.11 Switching Time Waveform

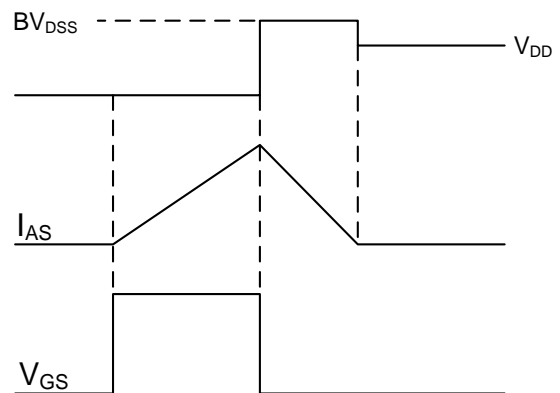
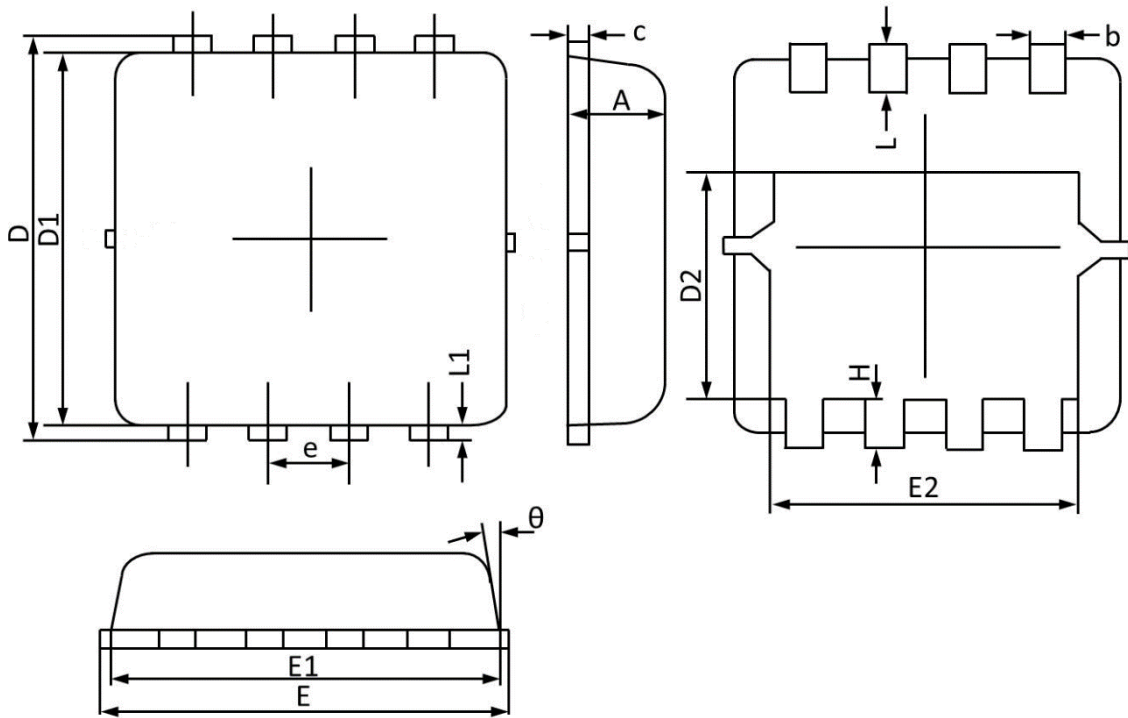


Fig.12 EAS Waveform

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 | 0.250 | 0.014 | 0.010 |
| c | 0.250 | 0.100 | 0.010 | 0.004 |
| D | 3.500 | 3.050 | 0.138 | 0.120 |
| D1 | 3.200 | 2.900 | 0.126 | 0.114 |
| D2 | 1.950 | 1.350 | 0.077 | 0.053 |
| E | 3.400 | 3.000 | 0.134 | 0.118 |
| E1 | 3.300 | 2.900 | 0.130 | 0.114 |
| E2 | 2.600 | 2.350 | 0.102 | 0.093 |
| e | 0.65BSC | | 0.026BSC | |
| H | 0.750 | 0.300 | 0.030 | 0.012 |
| L | 0.600 | 0.300 | 0.024 | 0.012 |
| L1 | 0.200 | 0.060 | 0.008 | 0.002 |
| θ | 14° | 6° | 14° | 6° |