# PDEC2210V

## 20V N-Channel MOSFETs

| BVDSS | RDSON | ID |
|-------|-------|-----|
| 20V | 12mΩ | 30A |

## 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.*

## Features

- *20V,30A, RDS(ON) =12mΩ @VGS = 10V*
- *Improved dv/dt capability*
- *ESD Protection Diode Embedded*
- *100% EAS Guaranteed*
- *Green Device Available*

## Applications

- *MB / VGA / Vcore*
- *POL Applications*
- *SMPS 2$^{nd}$ SR*
- *Li-Battery Protection*

## PPAK3x3 Dual Pin Configuration



## Absolute Maximum Ratings Tc=25℃ 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℃) | 30 | A |
| | Drain Current – Continuous ($T_C$=100℃) | 19 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] | 120 | A |
| $P_D$ | Power Dissipation ($T_C$=25℃) | 26 | W |
| | Power Dissipation – Derate above 25℃ | 0.21 | W/℃ |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|--------|-----------|------|------|------|
| $R_{θJA}$ | Thermal Resistance Junction to ambient | --- | 62 | ℃/W |
| $R_{θJC}$ | Thermal Resistance Junction to Case | --- | 4.8 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, 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 |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | --- | 0.02 | --- | V/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=20V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=16V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | 10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=$\pm$10V , $V_{DS}$=0V | --- | --- | $\pm$100 | nA |

### On Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=4.5V , $I_D$=10A | 8 | 10 | 12 | m$\Omega$ |
| | | $V_{GS}$=4.2V , $I_D$=10A | 8 | 10.1 | 12.2 | m$\Omega$ |
| | | $V_{GS}$=3.7V , $I_D$=9A | 8 | 10.3 | 12.5 | m$\Omega$ |
| | | $V_{GS}$=3.0V , $I_D$=9A | 8.5 | 10.7 | 13.2 | m$\Omega$ |
| | | $V_{GS}$=2.5V , $I_D$=8A | 9 | 11.4 | 14.5 | m$\Omega$ |
| | | $V_{GS}$=1.8V , $I_D$=8A | 10 | 15 | 20 | m$\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 0.3 | 0.6 | 1 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 2 | --- | mV/℃ |
| gfs | Forward Transconductance | $V_{DS}$=10V , $I_S$=5A | --- | 12 | --- | S |

### Dynamic and switching Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge[2,3] | $V_{DS}$=10V , $V_{GS}$=4.5V , $I_D$=5A | --- | 16.9 | 26 | nC |
| $Q_{gs}$ | Gate-Source Charge[2,3] | | --- | 1.1 | 3 | |
| $Q_{gd}$ | Gate-Drain Charge[2,3] | | --- | 4 | 7 | |
| $T_{d(on)}$ | Turn-On Delay Time[2,3] | $V_{DD}$=10V , $V_{GS}$=4.5V , $R_G$=25$\Omega$ $I_D$=1A | --- | 6.8 | 13 | ns |
| $T_r$ | Rise Time[2,3] | | --- | 20 | 38 | |
| $T_{d(off)}$ | Turn-Off Delay Time[2,3] | | --- | 41.8 | 79 | |
| $T_f$ | Fall Time[2,3] | | --- | 13.2 | 25 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=10V , $V_{GS}$=0V , F=1MHz | --- | 1020 | 1480 | pF |
| $C_{oss}$ | Output Capacitance | | --- | 160 | 240 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 110 | 160 | |
| Rg | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, F=1MHz | --- | 2 | 4 | $\Omega$ |

### 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 | --- | --- | 30 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | 60 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1 | V |

Note :
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width $\leqq$ 300us , duty cycle $\leqq$ 2%.
3. Essentially independent of operating temperature.
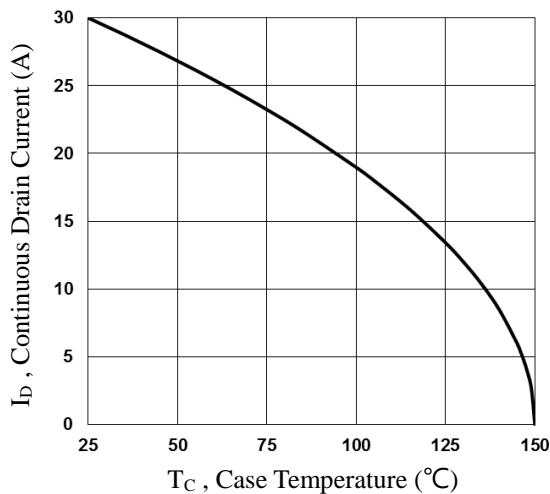
**Fig.1    Continuous Drain Current vs. $T_C$**
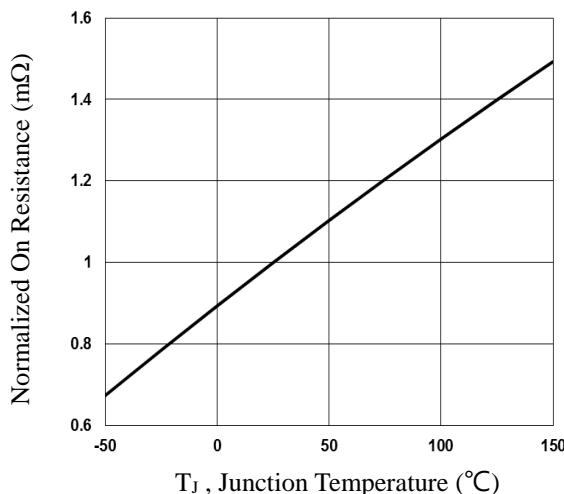


**Fig.2    Normalized RDSON vs. $T_J$**
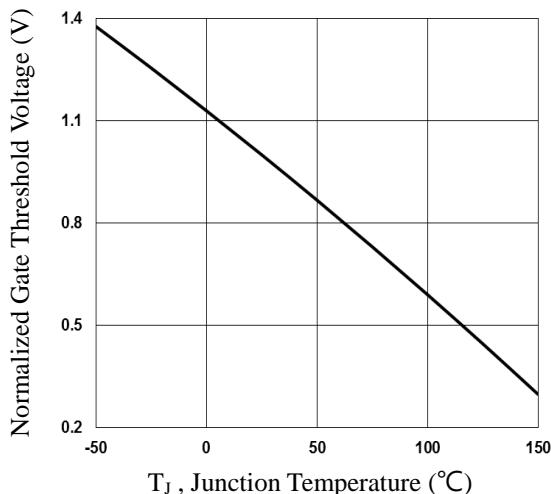


**Fig.3    Normalized $V_{th}$ vs. $T_J$**
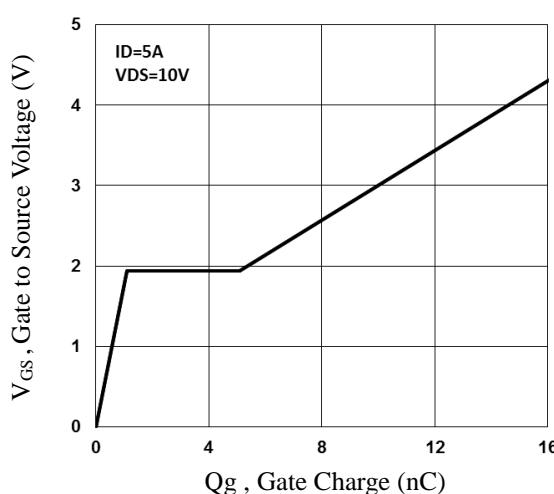


**Fig.4    Gate Charge Waveform**
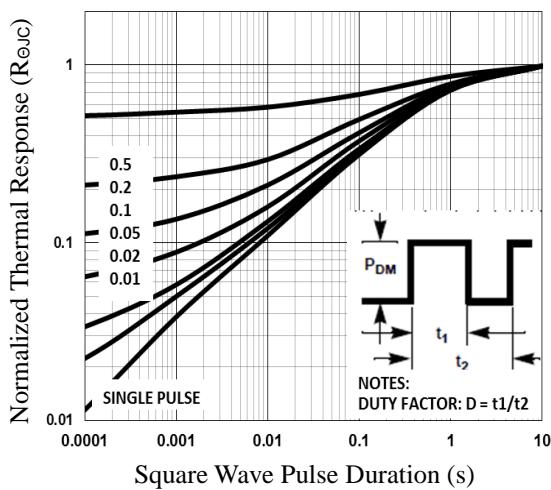


**Fig.5    Normalized Transient Response**
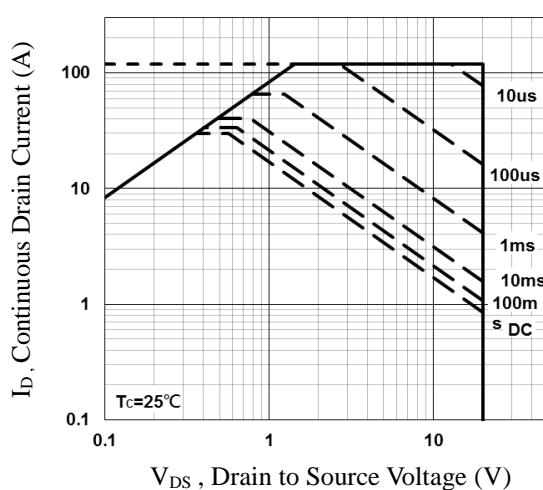


**Fig.6    Maximum Safe Operation Area**

$$EAS = \frac{1}{2}L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS}-V_{DD}}$$
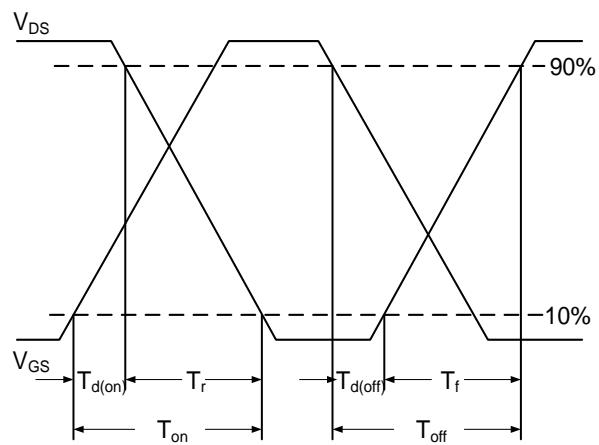
**Fig.7   Switching Time Waveform**
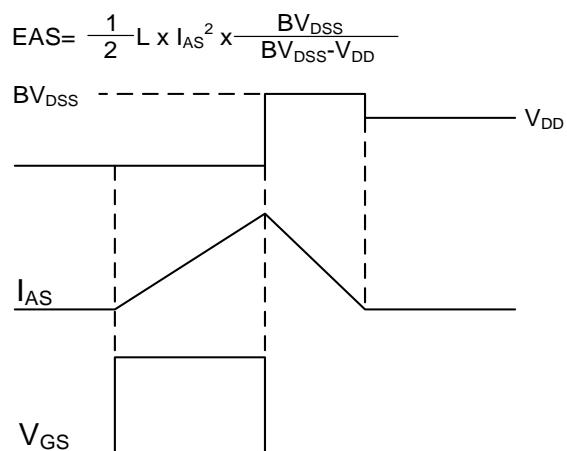
**Fig.8   EAS Waveform**

# PPAK3x3 Dual PACKAGE INFORMATION
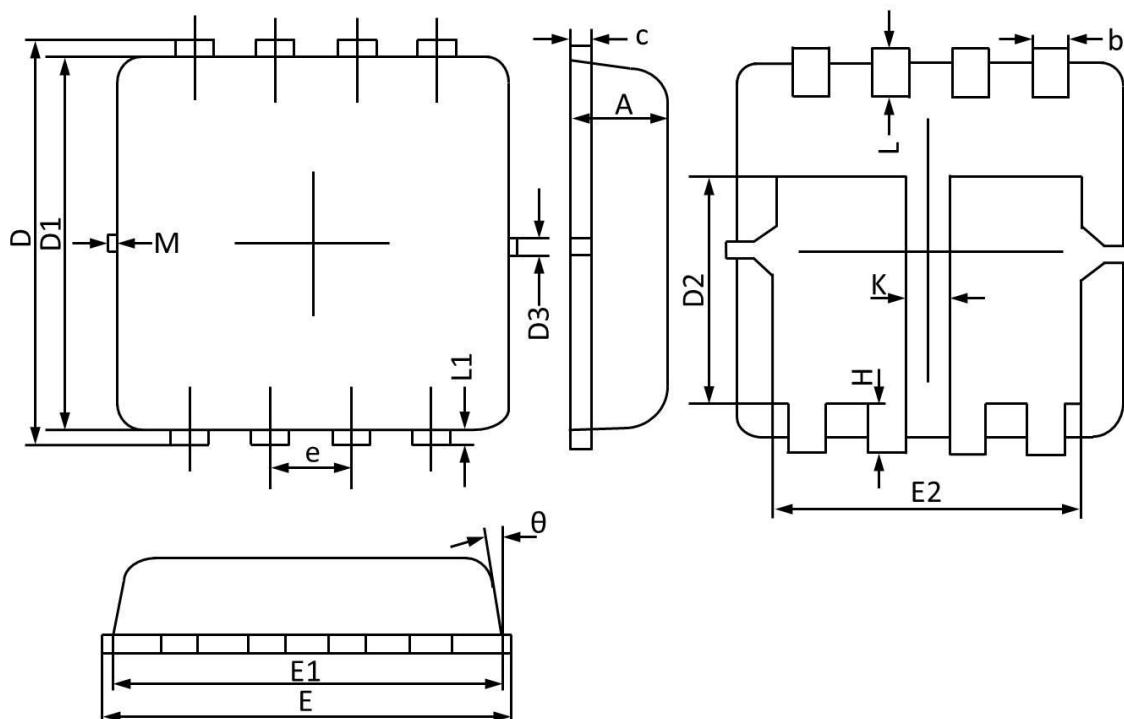


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.700 | 0.800 | 0.028 | 0.031 |
| b | 0.250 | 0.350 | 0.010 | 0.013 |
| c | 0.100 | 0.250 | 0.004 | 0.009 |
| D | 3.250 | 3.450 | 0.128 | 0.135 |
| D1 | 3.000 | 3.200 | 0.119 | 0.125 |
| D2 | 1.780 | 1.980 | 0.070 | 0.077 |
| D3 | 0.130 REF | | 0.005 REF | |
| E | 3.200 | 3.400 | 0.126 | 0.133 |
| E1 | 3.000 | 3.200 | 0.119 | 0.125 |
| E2 | 2.390 | 2.590 | 0.094 | 0.102 |
| e | 0.650 BSC | | 0.026 BSC | |
| H | 0.300 | 0.500 | 0.011 | 0.019 |
| L | 0.300 | 0.500 | 0.011 | 0.019 |
| L1 | 0.130 REF | | 0.005 REF | |
| K | 0.300 REF | | 0.012 REF | |
| θ | 0° | 12° | 0° | 12° |
| M | 0.150 REF | | 0.006 REF | |

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