30V P-Channel MOSFETs

# PDEC3907W

## 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.*

| BVDSS | RDSON | ID |
|---|---|---|
| -30V | 23mΩ | -8.5A |

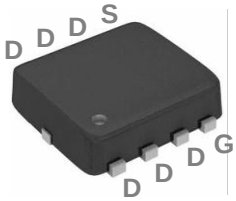
## Features

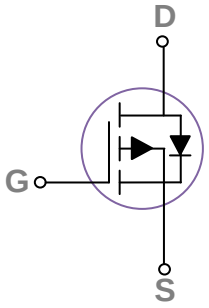
- *-30V,-8.5A, RDS(ON) =23mΩ@VGS = -10V*
- *Fast switching*
- *Green Device Available*
- *Suit for -4.5V Gate Drive Applications*

## Applications

- *MB / VGA / Vcore*
- *POL Applications*
- *Load Switch*
- *LED Application*

## PPAK2x3 Pin Configuration




## Absolute Maximum Ratings Tc=25℃ 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˚C) | -8.5 | A |
| | Drain Current – Continuous ($T_C$=100˚C) | -5.3 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] | -34 | A |
| $P_D$ | Power Dissipation ($T_C$=25˚C) | 3 | W |
| | Power Dissipation – Derate above 25˚C | 0.025 | W/˚C |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ˚C |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ˚C |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 90 | ˚C/W |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 40 | ˚C/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 | -30 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=-1mA | --- | -0.03 | --- | V/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=-30V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | -1 | uA |
| | | $V_{DS}$=-24V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | -10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±20 | uA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=-10V , $I_D$=-5A | --- | 19 | 23 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-3A | --- | 28 | 34 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -1.2 | -1.6 | -2.5 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 4 | --- | mV/℃ |
| gfs | Forward Transconductance | $V_{DS}$=-10V , $I_D$=-3A | --- | 6.8 | --- | S |

### Dynamic and switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge[2,3] | $V_{DS}$=-15V , $V_{GS}$=-4.5V , $I_D$=-5A | --- | 11 | 17 | nC |
| $Q_{gs}$ | Gate-Source Charge[2,3] | | --- | 3.4 | 6 | |
| $Q_{gd}$ | Gate-Drain Charge[2,3] | | --- | 4.2 | 8 | |
| $T_{d(on)}$ | Turn-On Delay Time[2,3] | $V_{DD}$=-15V , $V_{GS}$=-10V , $R_G$=6Ω , $I_D$=-1A | --- | 5.8 | 11 | ns |
| $T_r$ | Rise Time[2,3] | | --- | 18.8 | 36 | |
| $T_{d(off)}$ | Turn-Off Delay Time[2,3] | | --- | 46.9 | 90 | |
| $T_f$ | Fall Time[2,3] | | --- | 12.3 | 23 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-15V , $V_{GS}$=0V , F=1MHz | --- | 1250 | 2500 | pF |
| $C_{oss}$ | Output Capacitance | | --- | 160 | 320 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 90 | 180 | |

### 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 | --- | --- | -8.5 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | -17 | 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 ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

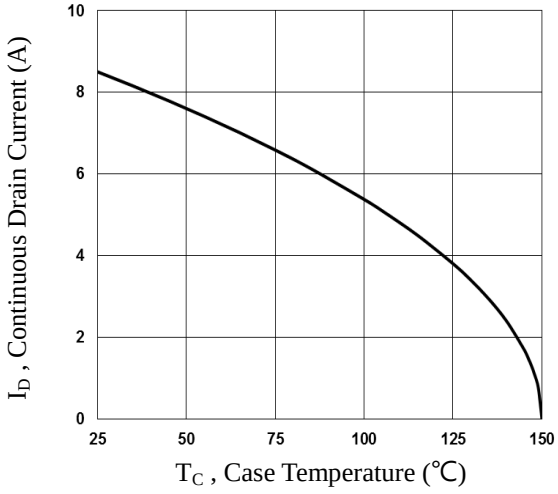



**Fig.1 Continuous Drain Current vs. $T_C$**

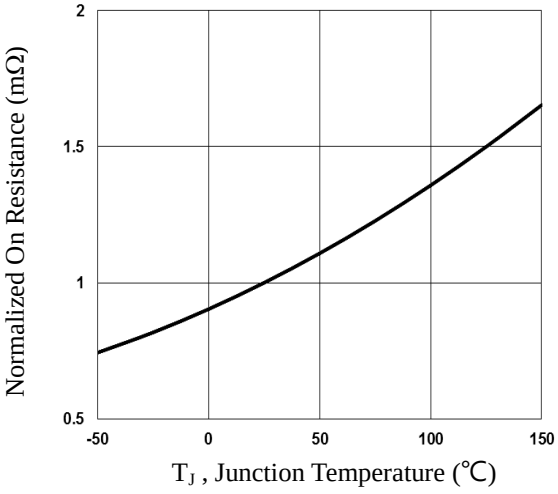



**Fig.2 Normalized RDSON vs. $T_J$**

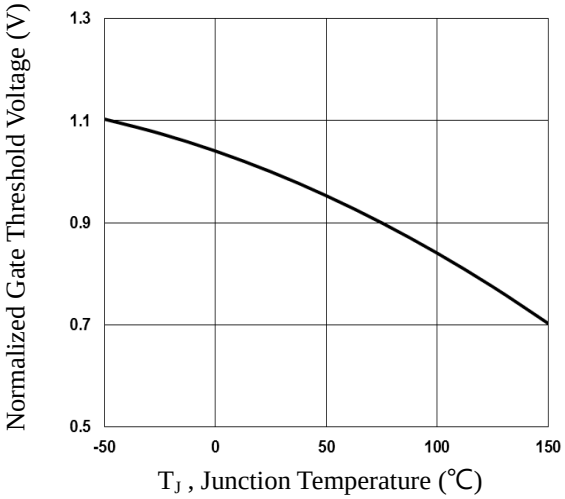



**Fig.3 Normalized $V_{th}$ vs. $T_J$**

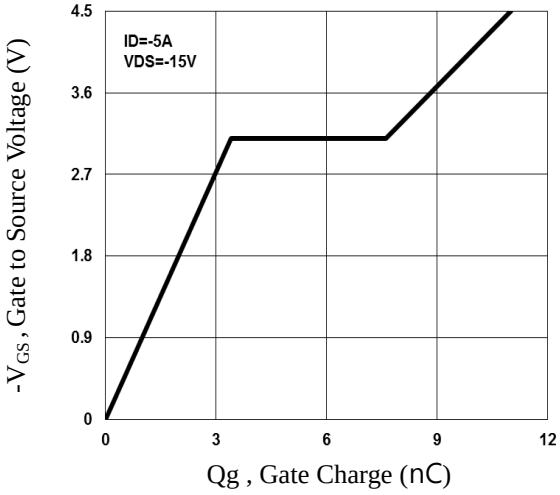



**Fig.4 Gate Charge Waveform**

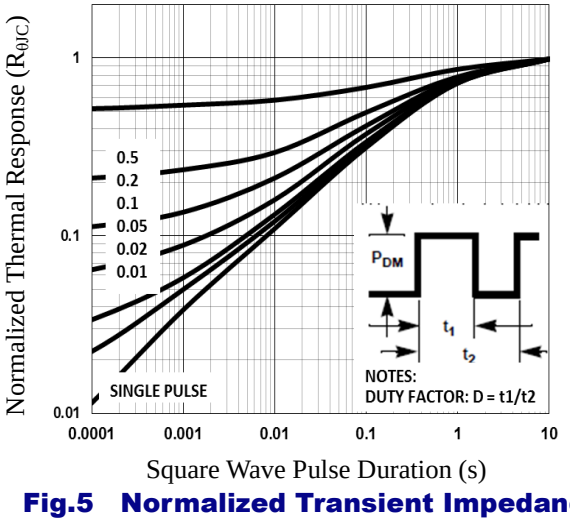



**Fig.5 Normalized Transient Impedance**

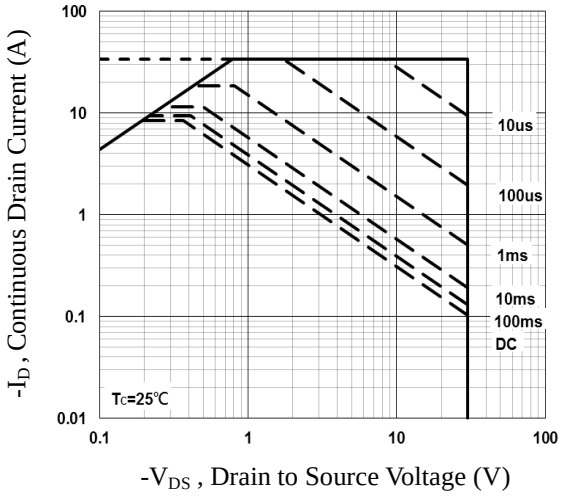



**Fig.6 Maximum Safe Operation Area**

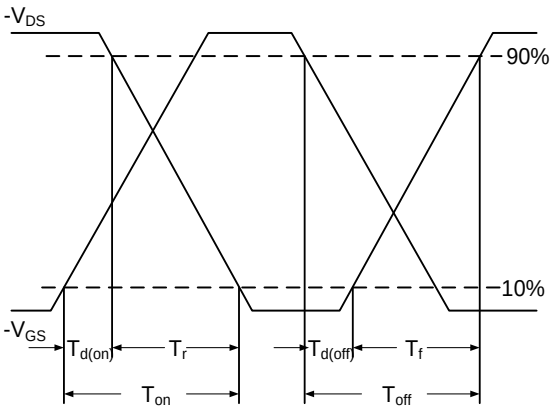



**Fig.7 Switching Time Waveform**

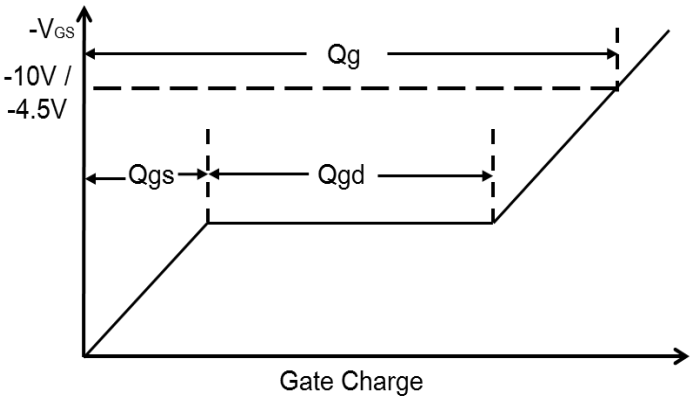
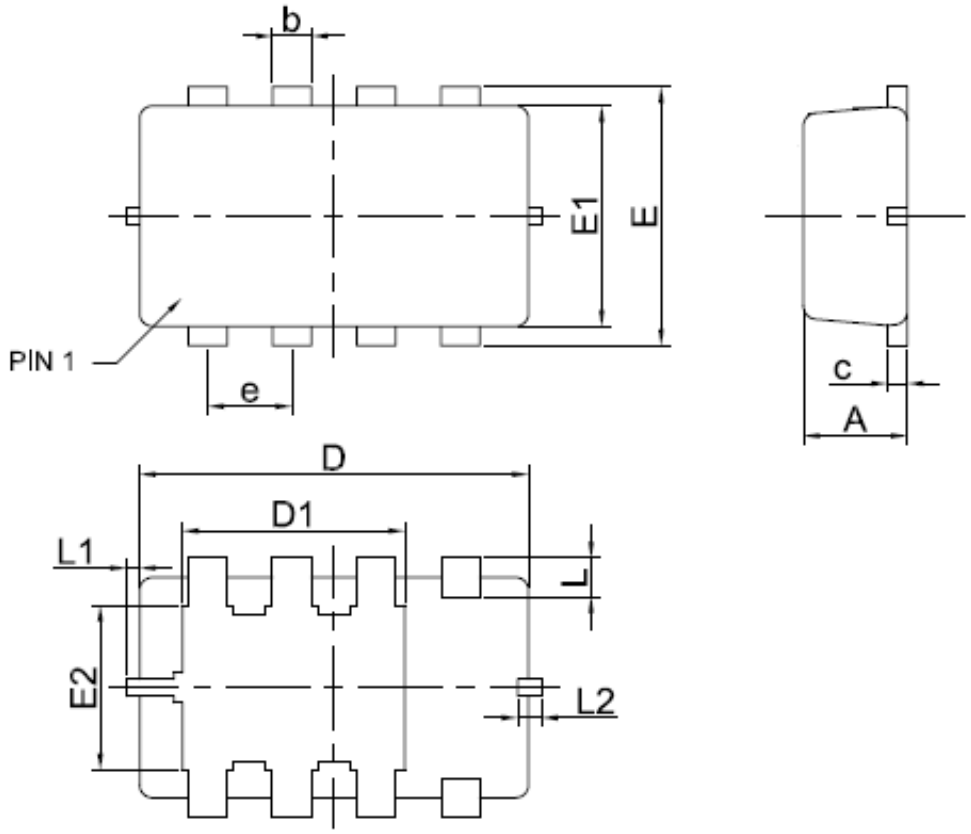



**Fig.8 Gate Charge Waveform**

# PPAK2x3 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 | 0.200 | 0.080 | 0.008 | 0.003 |
| D | 3.100 | 2.900 | 0.122 | 0.114 |
| D1 | 1.720 | 1.520 | 0.068 | 0.060 |
| E | 2.100 | 1.900 | 0.083 | 0.075 |
| E1 | 1.800 | 1.600 | 0.071 | 0.063 |
| E2 | 1.270 | 1.070 | 0.050 | 0.042 |
| e | 0.65BSC | | 0.026BSC | |
| L | 0.400 | 0.200 | 0.016 | 0.008 |
| L1 | 0.100 | 0.000 | 0.004 | 0.000 |
| L2 | 0.184 | - | 0.007 | - |