## 20V Dual N-Channel MOSFETs

# PDEB25F4CQ

## General Description

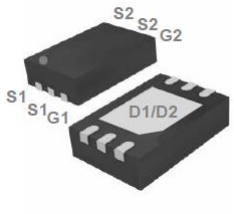
*These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

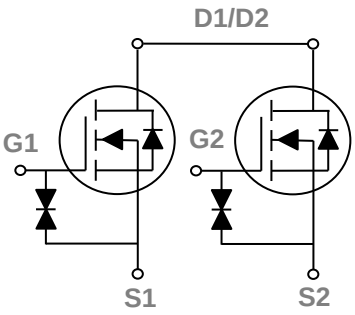
| BVDSS | RDSON | ID |
|---|---|---|
| 20V | 5.9mΩ | 30A |

## Features

- *20V,30A, RDS(ON) =5.9mΩ @VGS = 4.5V*
- *Improved dv/dt capability*
- *Fast switching*
- *G-S ESD Protection Diode Embedded*
- *Green Device Available*

## DFN2x3 Dual Pin Configuration




## Applications

- *Handheld Instruments*
- *POL Applications*
- *Battery Protection Applications*

## Absolute Maximum Ratings Tc=25℃ unless otherwise noted

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 20 | V |
| $V_{GS}$ | Gate-Source Voltage | ±12 | V |
| $I_D$ | Drain Current – Continuous ($T_A$=25℃) | 11.5 | A |
| | Drain Current – Continuous ($T_A$=70℃) | 9 | A |
| | Drain Current – Continuous ($T_C$=25℃) | 30 | A |
| | Drain Current – Continuous ($T_C$=100℃) | 19 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] ($T_C$=25℃) | 120 | A |
| $P_D$ | Power Dissipation ($T_A$=25℃) | 1.56 | W |
| | Power Dissipation – Derate above 25℃ | 0.013 | W/℃ |
| | Power Dissipation ($T_C$=25℃) | 10.2 | W |
| | Power Dissipation – Derate above 25℃ | 0.081 | 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 |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction to ambient | --- | 80 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 12.3 | ℃/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 , $I_D$=250μA | 20 | --- | --- | V |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=18V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | μA |
| | | $V_{DS}$=16V , $V_{GS}$=0V , $T_J$=70℃ | --- | --- | 10 | μA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±12V , $V_{DS}$=0V | --- | --- | ±10 | μA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=4.5V , $I_D$=5.5A | 4.0 | 5.0 | 5.9 | mΩ |
| | | $V_{GS}$=4.0V , $I_D$=5.5A | 4.1 | 5.1 | 6.3 | mΩ |
| | | $V_{GS}$=3.8V , $I_D$=5.5A | 4.2 | 5.3 | 6.6 | mΩ |
| | | $V_{GS}$=3.1V , $I_D$=5.5A | 4.3 | 5.6 | 7.1 | mΩ |
| | | $V_{GS}$=2.5V , $I_D$=5.5A | 4.9 | 6.7 | 8.7 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250μA | 0.5 | 0.75 | 1.5 | V |

### Dynamic and switching Characteristics[2]

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge | $V_{DS}$=10V , $V_{GS}$=4.5V , $I_D$=15A | --- | 19 | 30 | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 1.6 | 5 | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 4.8 | 10 | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=10V , $V_{GS}$=4.5V , $R_G$=6Ω $I_D$=15A | --- | 30 | 50 | ns |
| $T_r$ | Rise Time | | --- | 70 | 100 | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 80 | 120 | |
| $T_f$ | Fall Time | | --- | 105 | 160 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=10V , $V_{GS}$=0V , F=1MHz | --- | 440 | 660 | pF |
| $C_{oss}$ | Output Capacitance | | --- | 220 | 350 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 56 | 90 | |

### 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. Essentially independent of operating temperature.

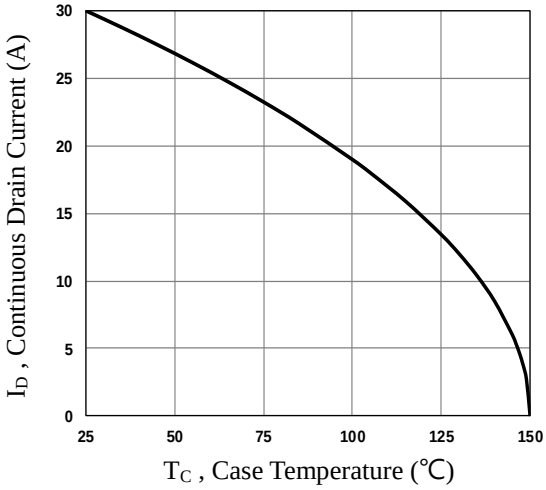



**Fig.1 Continuous Drain Current vs. $T_C$**

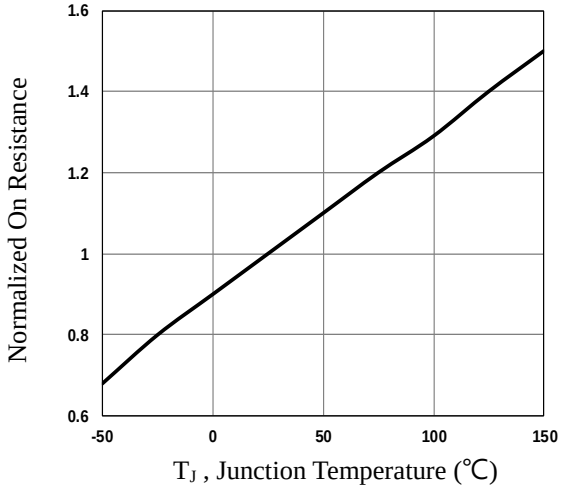



**Fig.2 Normalized RDSON vs. $T_J$**

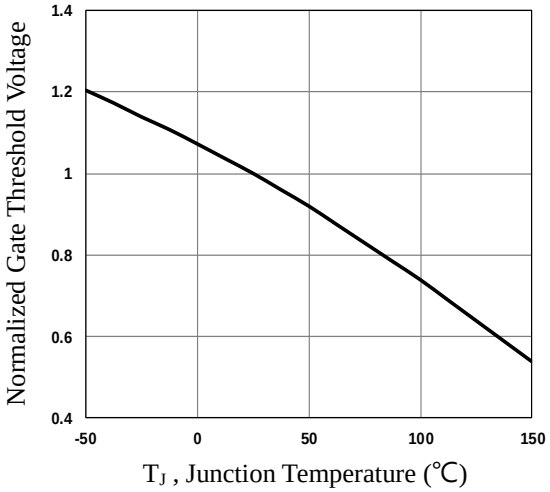



**Fig.3 Normalized $V_{th}$ vs. $T_J$**

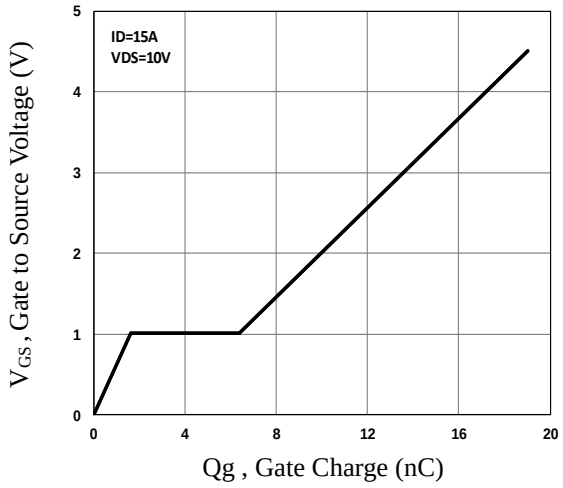



**Fig.4 Gate Charge Waveform**

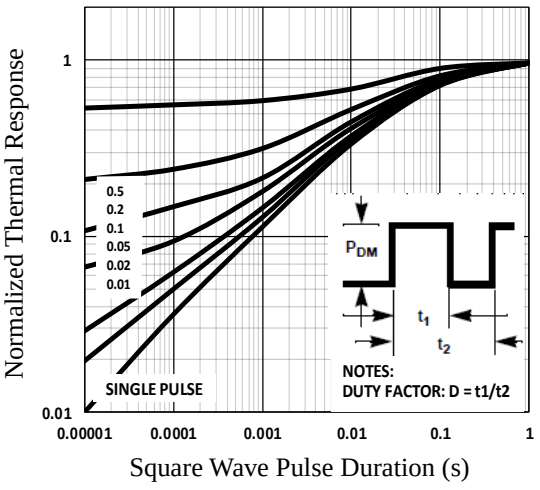



**Fig.5 Normalized Transient Response**

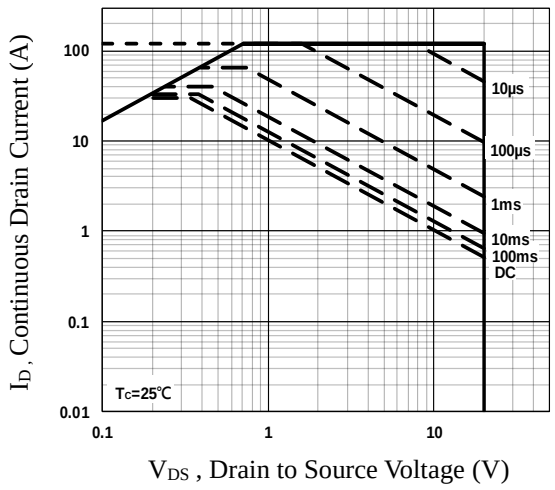



**Fig.6 Maximum Safe Operation Area**

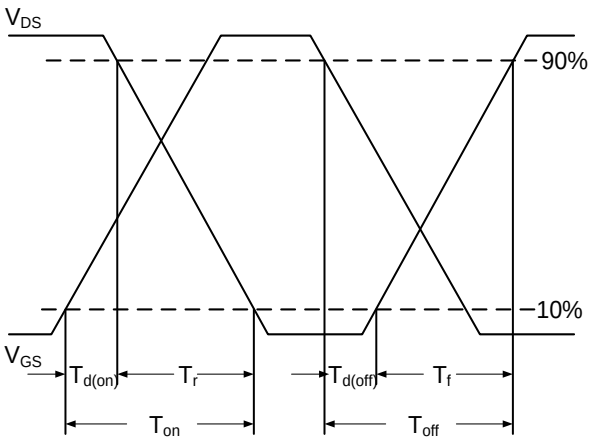



**Fig.7 Switching Time Waveform**

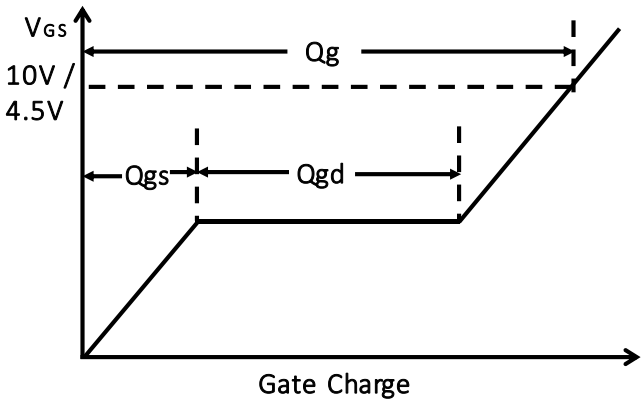
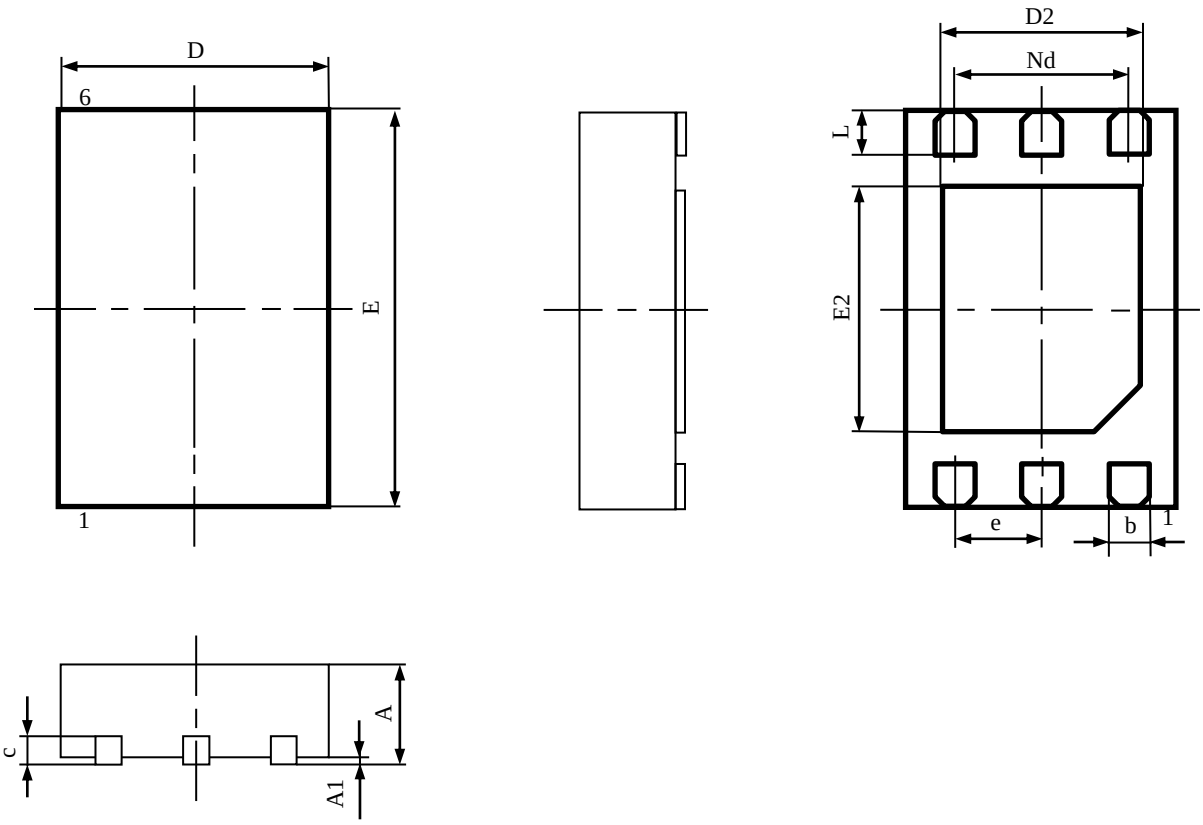


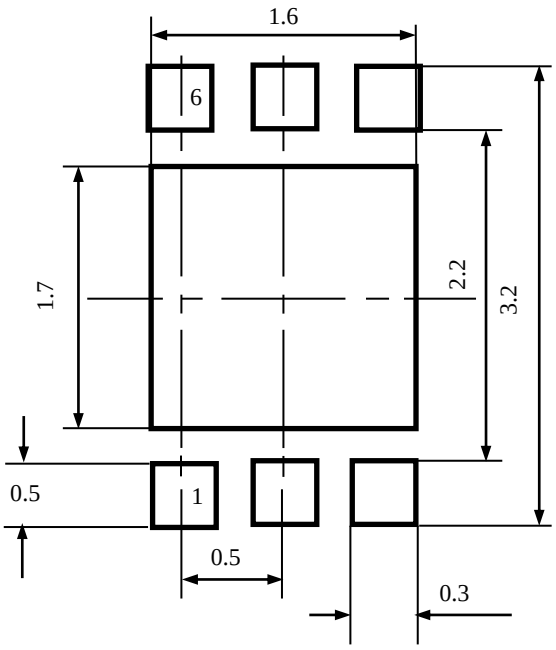

**Fig.8 Gate Charge Waveform**

# DFN2X3 PACKAGE INFORMATION




| 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 |

# DFN2X3 RECOMMENDED LAND PATTERN




unit : mm