80V N-Channel MOSFETs

# PDX8970

## 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 |
|---|---|---|
| 80V | 2.6mΩ | 250A |

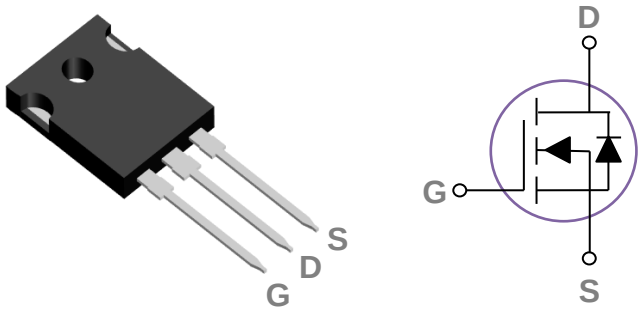
## Features

- *80V,250A, RDS(ON) =2.6mΩ@VGS = 10V*
- *Improved dv/dt capability*
- *Fast switching*
- *100% EAS Guaranteed*
- *Green Device Available*

## Applications

- *Networking*
- *Load Switch*
- *LED applications*

## TO247 Pin Configuration




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

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 80 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$ | Drain Current – Continuous ($T_C$=25℃) | 250 | A |
| | Drain Current – Continuous ($T_C$=100℃) | 155 | A |
| $I_{DM}$ | Drain Current – Pulsed[1] | 1000 | A |
| EAS | Single Pulse Avalanche Energy[2] | 1280 | mJ |
| IAS | Single Pulse Avalanche Current[2] | 160 | A |
| $P_D$ | Power Dissipation ($T_C$=25℃) | 543 | W |
| | Power Dissipation – Derate above 25℃ | 4.35 | 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 | --- | 62 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case | --- | 0.23 | ℃/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 | 80 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | --- | 0.05 | --- | V/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=80V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=64V , $V_{GS}$=0V , $T_J$=125℃ | --- | --- | 10 | uA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±25V , $V_{DS}$=0V | --- | --- | ±100 | nA |

### On Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V , $I_D$=20A | --- | 2 | 2.6 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.5 | 2.2 | 3.5 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -5 | --- | mV/℃ |
| gfs | Forward Transconductance | $V_{DS}$=10V , $I_D$=3A | --- | 18 | --- | S |

### Dynamic and switching Characteristics

| | | | | | | |
|---|---|---|---|---|---|---|
| $Q_g$ | Total Gate Charge[3,4] | $V_{DS}$=40V , $V_{GS}$=10V , $I_D$=10A | --- | 247 | 360 | nC |
| $Q_{gs}$ | Gate-Source Charge[3,4] | | --- | 63.5 | 125 | |
| $Q_{gd}$ | Gate-Drain Charge[3,4] | | --- | 56 | 110 | |
| $T_{d(on)}$ | Turn-On Delay Time[3,4] | $V_{DD}$=40V , $V_{GS}$=10V , $R_G$=10Ω $I_D$=10A | --- | 71 | 140 | ns |
| $T_r$ | Rise Time[3,4] | | --- | 103 | 200 | |
| $T_{d(off)}$ | Turn-Off Delay Time[3,4] | | --- | 291 | 580 | |
| $T_f$ | Fall Time[3,4] | | --- | 170 | 340 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=40V , $V_{GS}$=0V , F=1MHz | --- | 16800 | 33000 | pF |
| $C_{oss}$ | Output Capacitance | | --- | 930 | 1860 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 55 | 110 | |
| $R_g$ | Gate resistance | $V_{GS}$=0V, $V_{DS}$=0V, F=1MHz | --- | 1.8 | 3.6 | Ω |

### 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 | --- | --- | 250 | A |
| $I_{SM}$ | Pulsed Source Current | | --- | --- | 500 | A |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$=0V,$I_S$=20A , di/dt=100A/μs | --- | 54 | --- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | $T_J$=25℃ | --- | 78 | --- | nC |

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}$=50V,$V_{GS}$=10V,L=0.1mH,$I_{AS}$=160A., Starting $T_J$=25℃
3. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
4. Essentially independent of operating temperature.

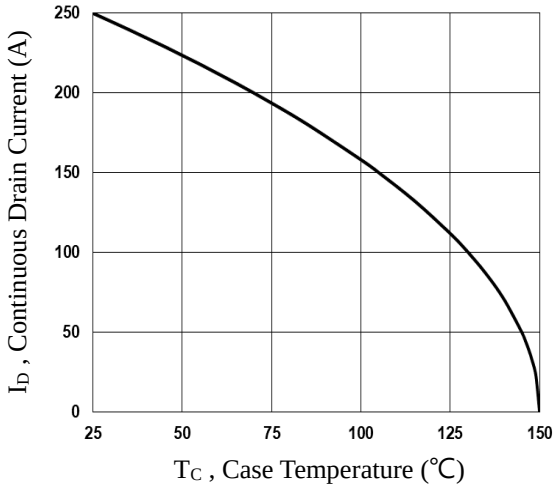



**Fig.1 Continuous Drain Current vs. $T_C$**

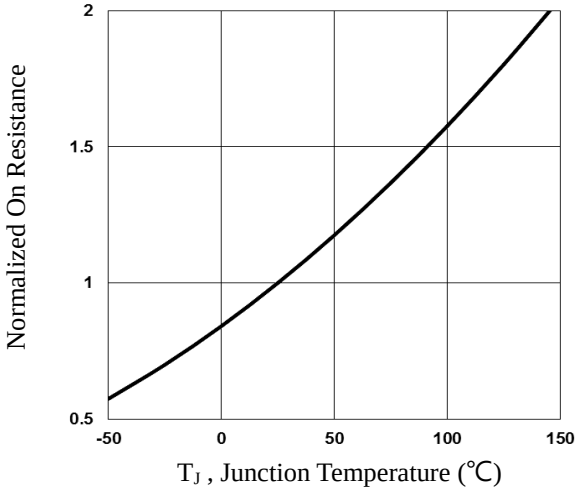



**Fig.2 Normalized RDSON vs. $T_J$**

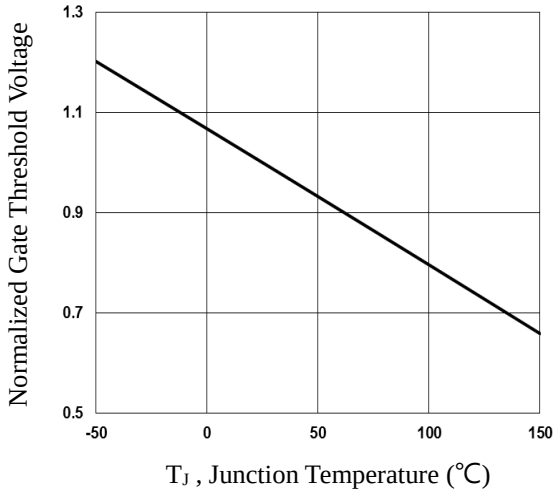



**Fig.3 Normalized Vth vs. $T_J$**

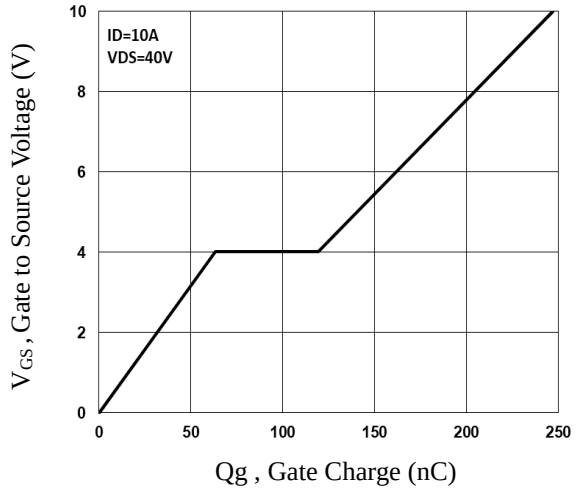



**Fig.4 Gate Charge Characteristics**

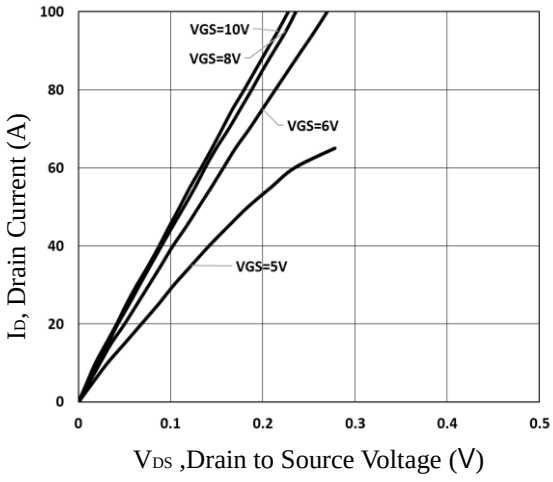



**Fig.5 Typical Output Characteristics**

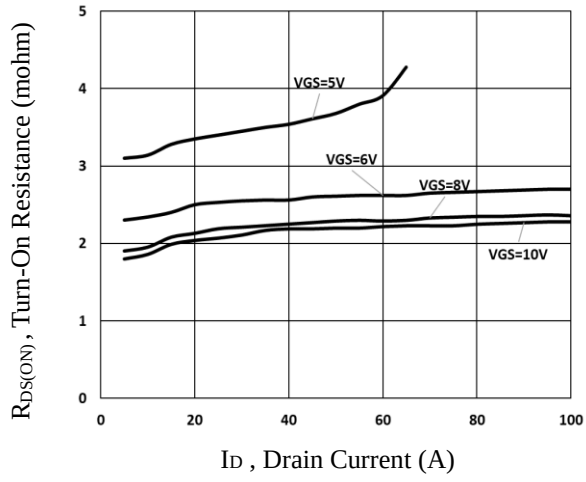



**Fig.6 Turn-On Resistance vs. $I_D$**

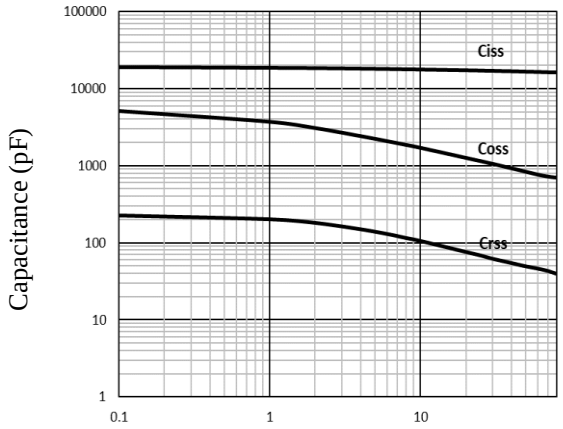



**Fig.7 Capacitance Characteristics**

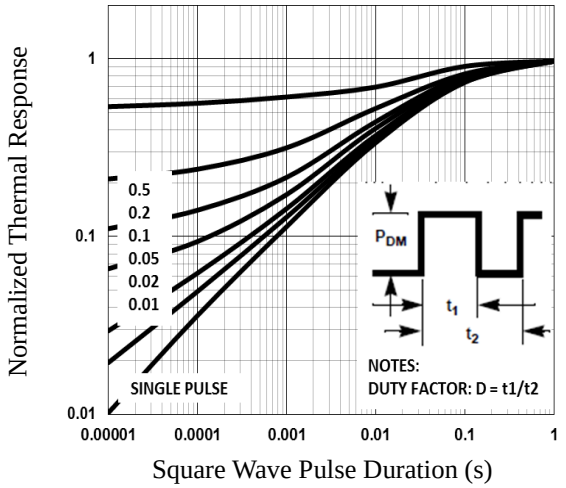



**Fig.8 Normalized Transient Impedance**

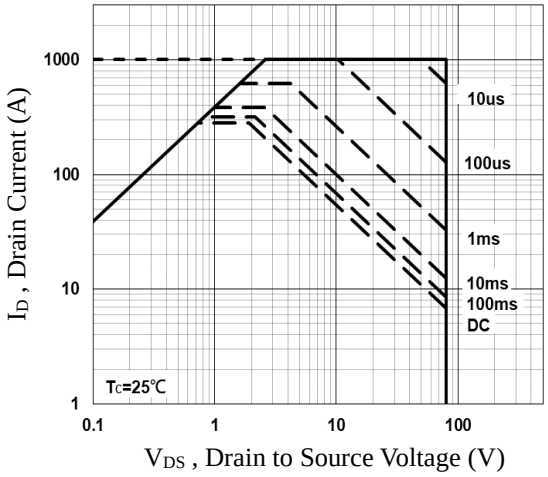



**Fig.9 Maximum Safe Operation Area**

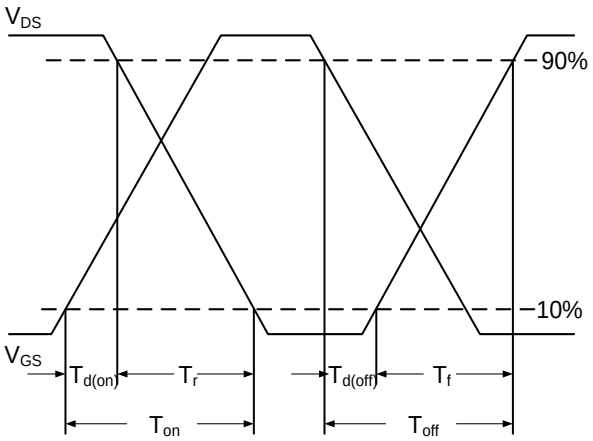



**Fig.10 Switching Time Waveform**

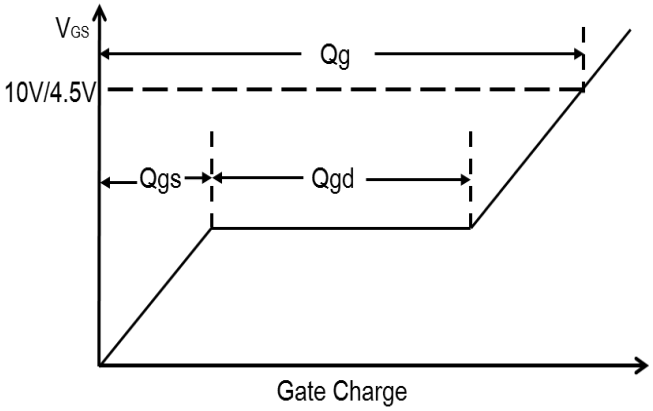
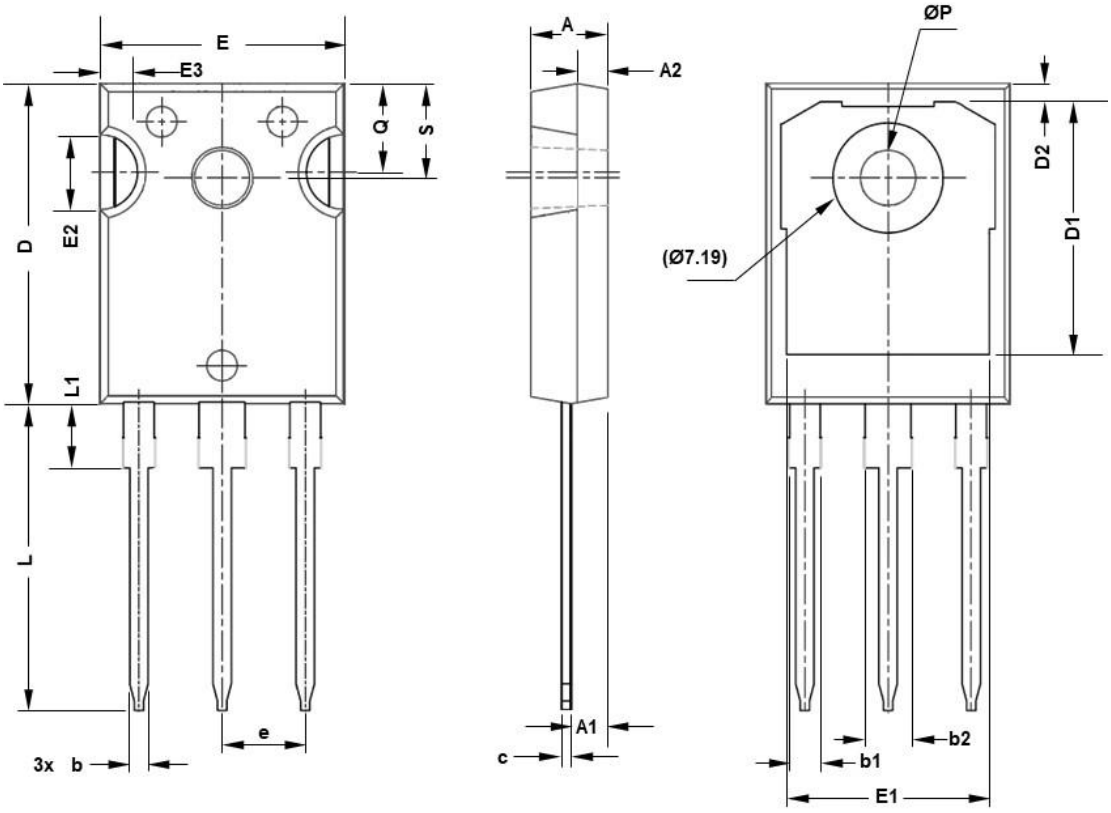



**Fig.11 Gate Charge Waveform**

# TO247 PACKAGE INFORMATION




| SYMBOL | mm | | SYMBOL | mm | |
|---|---|---|---|---|---|
| | MIN | MAX | | MIN | MAX |
| A | 4.83 | 5.21 | E2 | 4.32 | 5.49 |
| A1 | 2.29 | 2.55 | E3 | 2.15 | 2.80 |
| A2 | 1.50 | 2.49 | e | 5.44BSC | |
| b | 1.12 | 1.33 | L | 19.81 | 20.32 |
| b1 | 1.91 | 2.39 | L1 | 4.10 | 4.40 |
| b2 | 2.87 | 3.22 | ΦP | 3.56 | 3.65 |
| C | 0.55 | 0.69 | Q | 5.39 | 6.20 |
| D | 20.80 | 21.10 | S | 6.04 | 6.30 |
| D1 | 16.25 | 17.65 | | | |
| D2 | 0.51 | 1.35 | | | |
| E | 15.75 | 16.13 | | | |
| E1 | 13.46 | 14.16 | | | |