

## GENERAL FEATURES

- $V_{DS} = -30V, I_D = -50A$
- $R_{DS(ON)} = 8.0m\Omega @ V_{GS} = -10V$  typ
- $R_{DS(ON)} = 18m\Omega @ V_{GS} = -4.5V$  typ

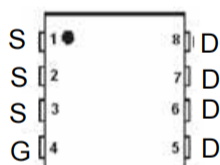
## Application

- Load/Power Switching
- Interfacing Switching
- Logic Level Shift

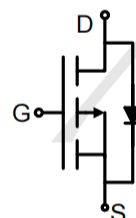
## Package and Pin Configuration



PDFN3333 top view



## Circuit diagram



## Marking

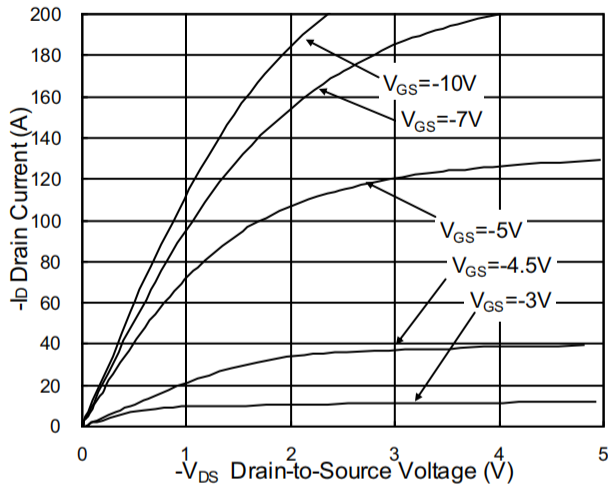


## Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

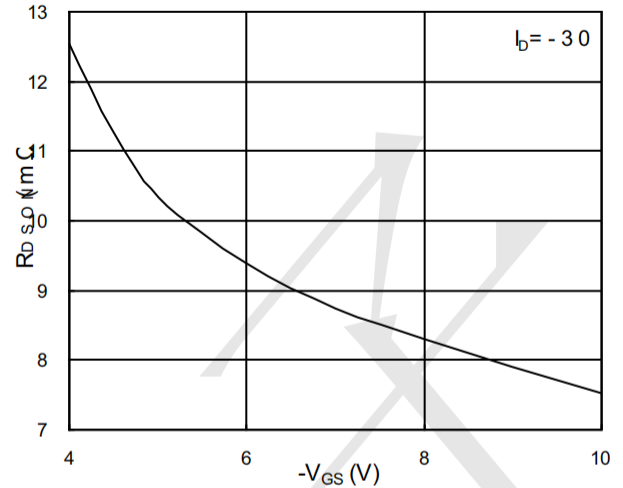
| Parameter                                        | Symbol             | Limit      | Unit       |
|--------------------------------------------------|--------------------|------------|------------|
| Drain-Source Voltage                             | $V_{DS}$           | -30        | V          |
| Gate-Source Voltage                              | $V_{GS}$           | $\pm 20$   | V          |
| Drain Current-Continuous                         | $I_D$              | -50        | A          |
| Drain Current-Continuous( $T_C = 100^\circ C$ )  | $I_D(100^\circ C)$ | -32        | A          |
| Pulsed Drain Current                             | $I_{DM}$           | -200       | A          |
| Maximum Power Dissipation                        | $P_D$              | 38         | W          |
| Single pulse avalanche energy (Note 5)           | $E_{AS}$           | 125        | mJ         |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$     | -55 To 150 | $^\circ C$ |

**Electrical Characteristics (T<sub>j</sub>=25°C unless otherwise noted)**

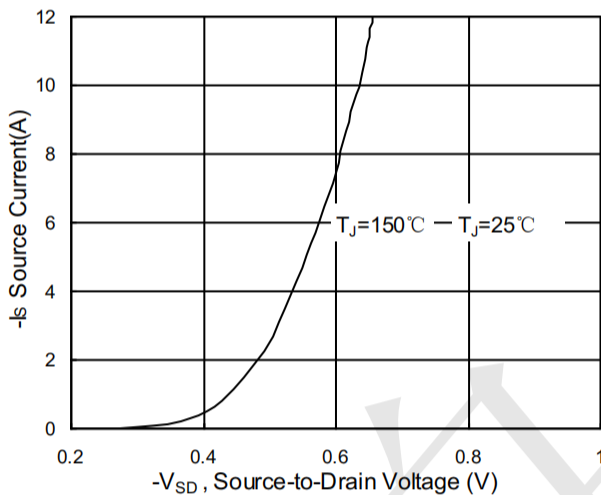
| Parameter                          | Symbol              | Condition                                                                                                      | Min  | Typ  | Max  | Unit |
|------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------|------|------|------|------|
| Off Characteristics                |                     |                                                                                                                |      |      |      |      |
| Drain-Source Breakdown Voltage     | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> = -250 μA                                                                   | -30  | -    | -    | V    |
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>    | V <sub>DS</sub> =-24V, V <sub>GS</sub> =0V                                                                     | -    | -    | 1    | μA   |
| Gate-Body Leakage Current          | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                     | -    | -    | ±100 | nA   |
| On Characteristics (Note 3)        |                     |                                                                                                                |      |      |      |      |
| Gate Threshold Voltage             | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250 μA                                                     | -1.2 | 1.5  | -2.5 | V    |
| Drain-Source On-State Resistance   | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-10V, I <sub>D</sub> =-30A                                                                    | -    | 8.0  | 15   | mΩ   |
|                                    |                     | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-15A                                                                   | -    | 18   | 24   | mΩ   |
| Forward Transconductance           | g <sub>FS</sub>     | V <sub>DS</sub> =-5V, I <sub>D</sub> =-18A                                                                     | -    | 25   | -    | S    |
| Dynamic Characteristics (Note4)    |                     |                                                                                                                |      |      |      |      |
| Input Capacitance                  | C <sub>ISS</sub>    | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                                        | -    | 3448 | -    | PF   |
| Output Capacitance                 | C <sub>OSS</sub>    |                                                                                                                | -    | 508  | -    | PF   |
| Reverse Transfer Capacitance       | C <sub>rss</sub>    |                                                                                                                | -    | 421  | -    | PF   |
| Switching Characteristics (Note 4) |                     |                                                                                                                |      |      |      |      |
| Turn-on Delay Time                 | t <sub>d(on)</sub>  | V <sub>DD</sub> =-15V, I <sub>D</sub> =-15A, R <sub>L</sub> =1Ω<br>V <sub>GS</sub> =-10V, R <sub>G</sub> =3.3Ω | -    | 9.4  | -    | nS   |
| Turn-on Rise Time                  | t <sub>r</sub>      |                                                                                                                | -    | 10.2 | -    | nS   |
| Turn-Off Delay Time                | t <sub>d(off)</sub> |                                                                                                                | -    | 117  | -    | nS   |
| Turn-Off Fall Time                 | t <sub>f</sub>      | V <sub>DS</sub> =-15V, I <sub>D</sub> =-15A,<br>V <sub>GS</sub> =-4.5V                                         | -    | 24   | -    | nS   |
| Total Gate Charge                  | Q <sub>g</sub>      |                                                                                                                | -    | 30   | -    | nC   |
| Gate-Source Charge                 | Q <sub>gs</sub>     |                                                                                                                | -    | 10   | -    | nC   |
| Gate-Drain Charge                  | Q <sub>gd</sub>     |                                                                                                                | -    | 10.4 | -    | nC   |
| Drain-Source Diode Characteristics |                     |                                                                                                                |      |      |      |      |
| Diode Forward Voltage (Note 3)     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A                                                                       | -    | -    | -1   | V    |
| Diode Forward Current (Note 2)     | I <sub>S</sub>      |                                                                                                                | -    | -    | -50  | A    |



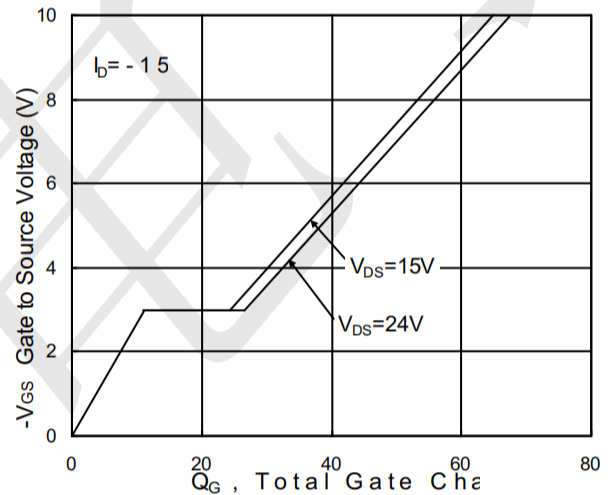
**Fig.1 Typical Output Characteristics**



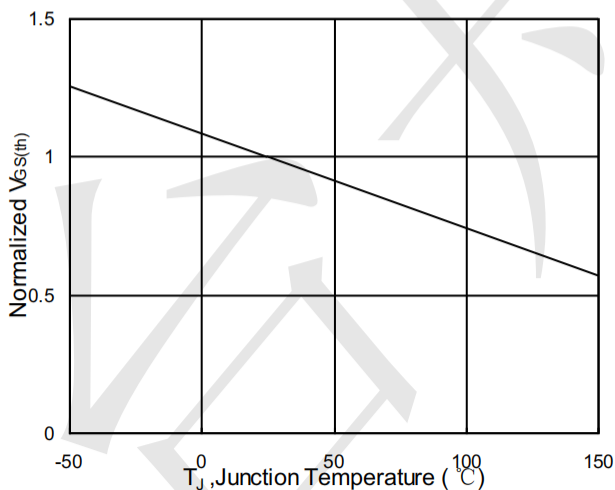
**Fig.2 On-Resistance v.s Gate-Source**



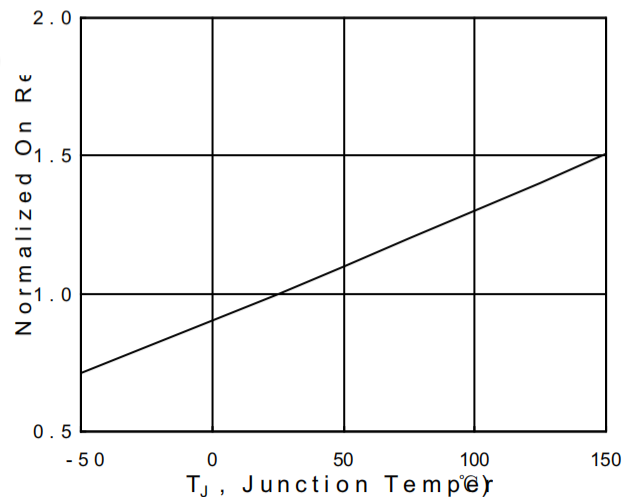
**Fig.3 Forward Characteristics Of Reverse**



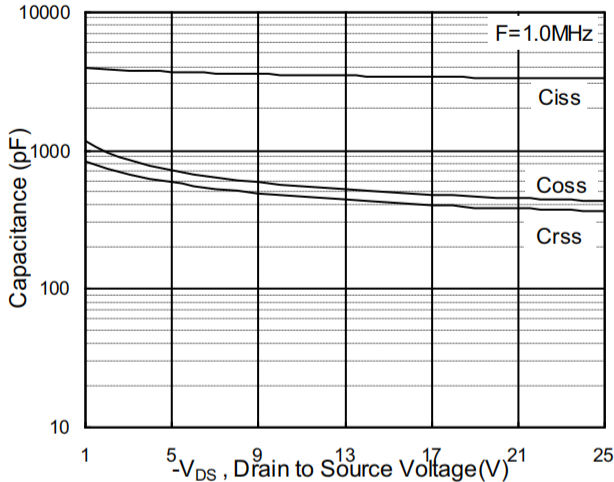
**Fig.4 Gate-Charge Characteristics**



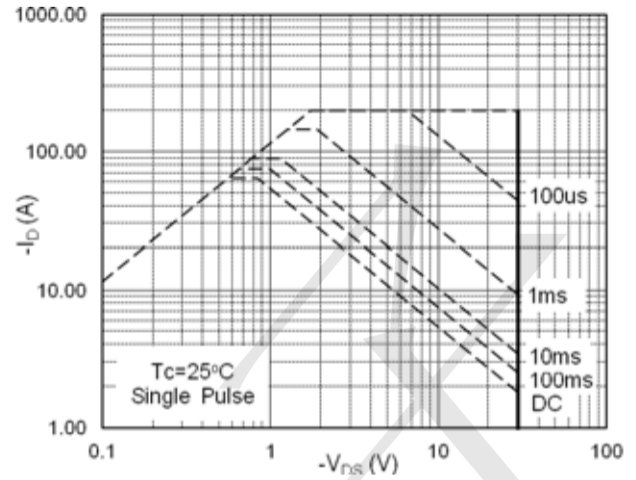
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



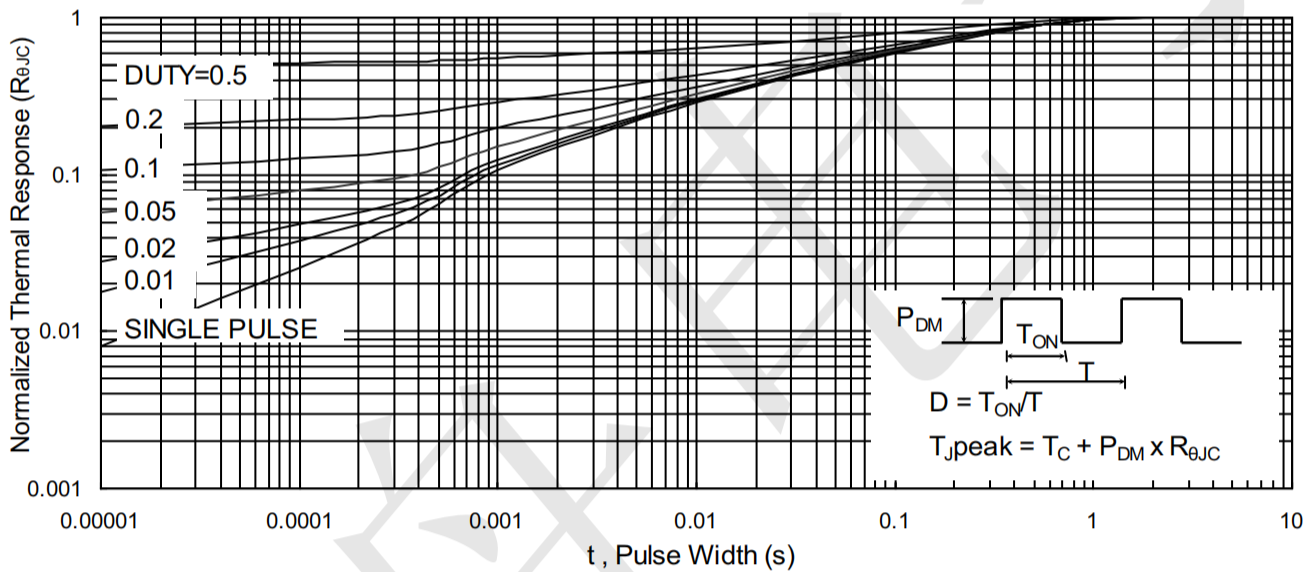
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



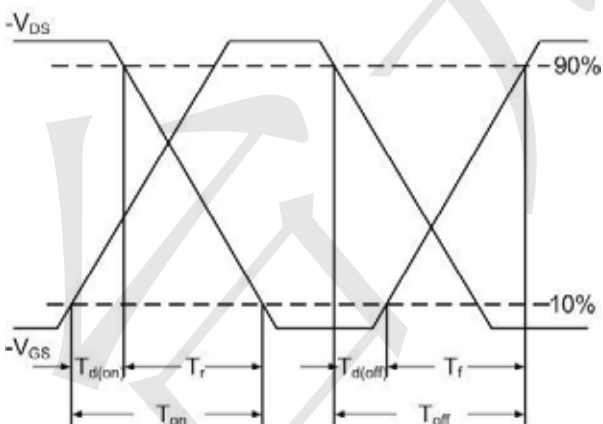
**Fig.7 Capacitance**



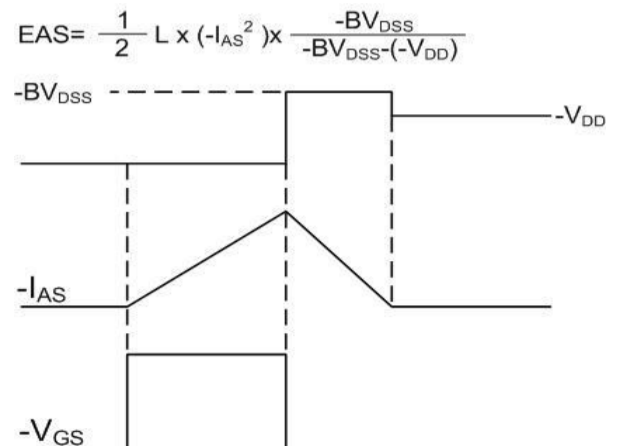
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

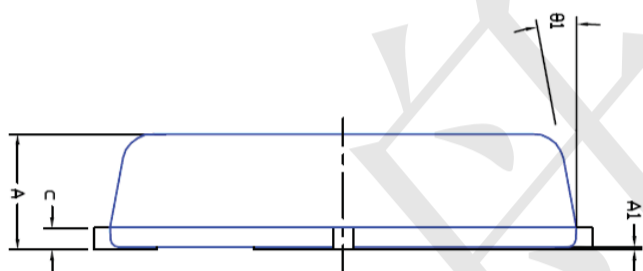
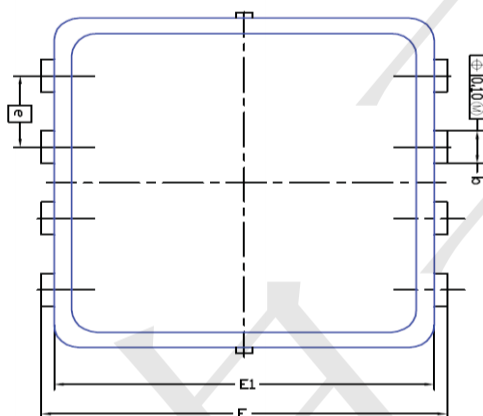
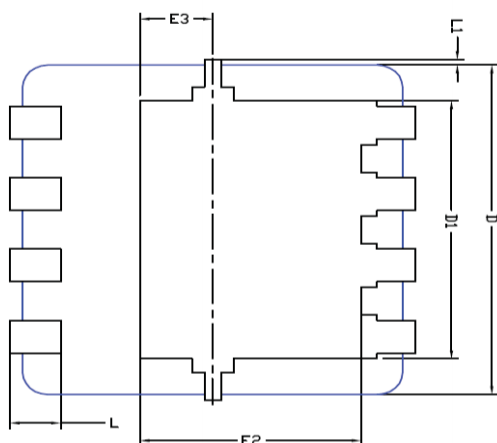


**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

**PDFN3333 Package Information**



| DIM. | MILLIMETERS |       |       | INCHES    |        |        |
|------|-------------|-------|-------|-----------|--------|--------|
|      | MIN         | NOM   | MAX   | MIN       | NOM    | MAX    |
| A    | 0.700       | 0.80  | 0.900 | 0.0276    | 0.0315 | 0.0354 |
| A1   | 0.00        | ---   | 0.05  | 0.000     | ---    | 0.002  |
| b    | 0.24        | 0.30  | 0.35  | 0.009     | 0.012  | 0.014  |
| c    | 0.10        | 0.152 | 0.25  | 0.004     | 0.006  | 0.010  |
| D    | 3.00 BSC    |       |       | 0.118 BSC |        |        |
| D1   | 2.35 BSC    |       |       | 0.093 BSC |        |        |
| E    | 3.20 BSC    |       |       | 0.126 BSC |        |        |
| E1   | 3.00 BSC    |       |       | 0.118 BSC |        |        |
| E2   | 1.75 BSC    |       |       | 0.069 BSC |        |        |
| E3   | 0.575 BSC   |       |       | 0.023 BSC |        |        |
| e    | 0.65 BSC    |       |       | 0.026 BSC |        |        |
| L    | 0.30        | 0.40  | 0.50  | 0.0118    | 0.0157 | 0.0197 |
| L1   | 0           | ---   | 0.100 | 0         | ---    | 0.004  |
| θ1   | 0°          | 10°   | 12°   | 0°        | 10°    | 12°    |

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