

## Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$



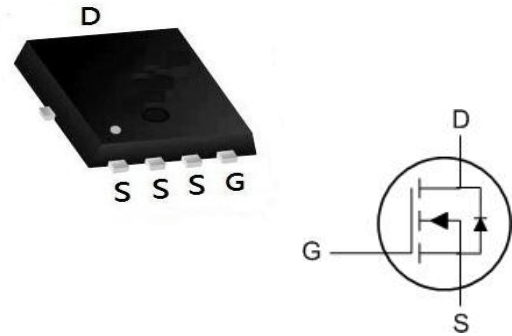
## Product Summary

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 60V   | 12mΩ  | 40A |

## Applications

- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

## PDFN3333-8L Pin Configuration



## Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ unless otherwise specified)

| Symbol          | Parameter                                       |                           | Max.        | Units              |
|-----------------|-------------------------------------------------|---------------------------|-------------|--------------------|
| $V_{DSS}$       | Drain-Source Voltage                            |                           | 60          | V                  |
| $V_{GSS}$       | Gate-Source Voltage                             |                           | $\pm 20$    | V                  |
| $I_D$           | Continuous Drain Current                        | $T_C = 25^\circ\text{C}$  | 40          | A                  |
|                 |                                                 | $T_C = 100^\circ\text{C}$ | 20          | A                  |
| $I_{DM}$        | Pulsed Drain Current <sup>note1</sup>           |                           | 150         | A                  |
| $E_{AS}$        | Single Pulsed Avalanche Energy <sup>note2</sup> |                           | 36          | mJ                 |
| $P_D$           | Power Dissipation                               | $T_C = 25^\circ\text{C}$  | 30          | W                  |
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case            |                           | 2.5         | $^\circ\text{C/W}$ |
| $T_J, T_{STG}$  | Operating and Storage Temperature Range         |                           | -55 to +175 | $^\circ\text{C}$   |

**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

| Symbol                                                 | Parameter                                                 | Test Condition                                                                           | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                           |                                                                                          |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                               | 60   | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V,                                               | -    | -    | 1.0  | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V                                              | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                           |                                                                                          |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                 | 1.0  | 1.6  | 2.5  | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br><small>note3</small> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                                | -    | 12   | 15   | mΩ    |
|                                                        |                                                           | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                               | -    | 15   | 20   |       |
| Dynamic Characteristics                                |                                                           |                                                                                          |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                         | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                   | -    | 930  | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                        |                                                                                          | -    | 230  | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                              |                                                                                          | -    | 8    | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                         | V <sub>DS</sub> =30V, I <sub>D</sub> =20A,<br>V <sub>GS</sub> =10V                       | -    | 22   | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                        |                                                                                          | -    | 4.5  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                               |                                                                                          | -    | 3.5  | -    | nC    |
| Switching Characteristics                              |                                                           |                                                                                          |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                        | V <sub>DD</sub> =30V, I <sub>D</sub> =20A,<br>R <sub>G</sub> =1.6Ω, V <sub>GS</sub> =10V | -    | 4.5  | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                         |                                                                                          | -    | 2.7  | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                       |                                                                                          | -    | 13.8 | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                        |                                                                                          | -    | 2.7  | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                           |                                                                                          |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current  |                                                                                          | -    | -    | 40   | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current      |                                                                                          | -    | -    | 150  | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> =30A                                                 | -    | -    | 1.2  | V     |
| t <sub>rr</sub>                                        | Body Diode Reverse Recovery Time                          | T <sub>J</sub> =25℃,<br>I <sub>F</sub> =20A,dl/dt=100A/μs                                | -    | 18   | -    | ns    |
| Q <sub>rr</sub>                                        | Body Diode Reverse Recovery Charge                        |                                                                                          | -    | 12   | -    | nC    |

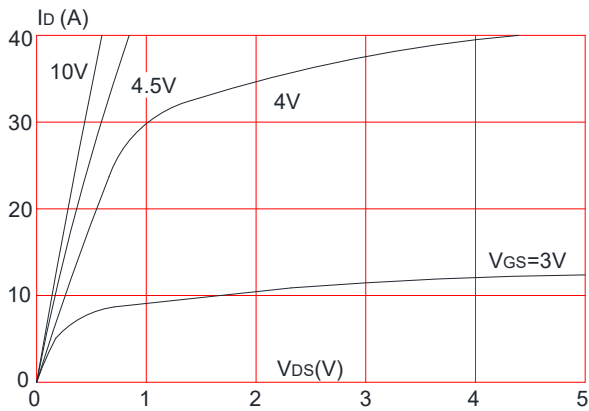
Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=30V, V_G=10V, R_G=25\Omega, L=0.5mH, I_{AS}=12A$ 

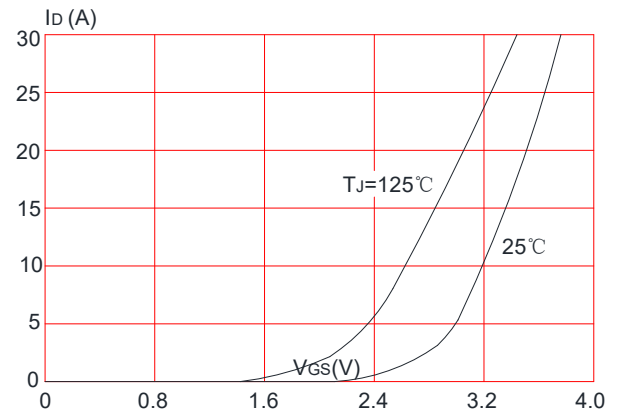
3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

## Typical Performance Characteristics

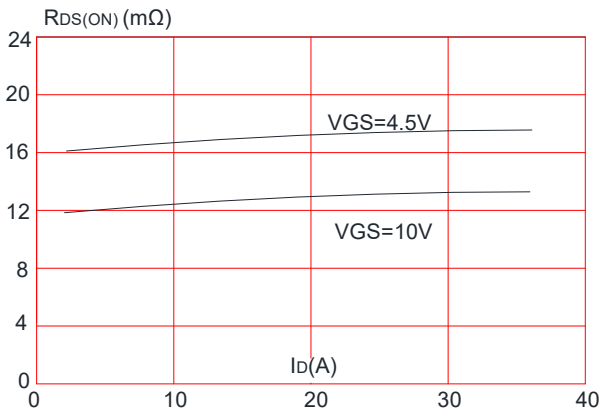
**Figure1: Output Characteristics**



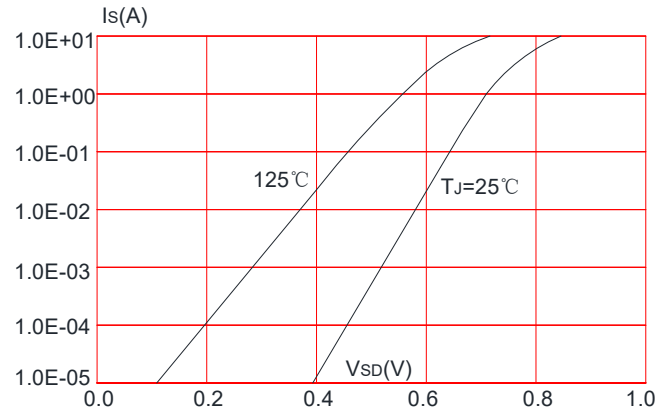
**Figure 2: Typical Transfer Characteristics**



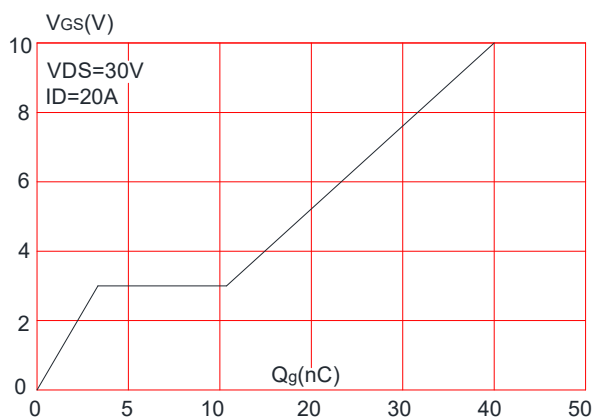
**Figure 3: On-resistance vs. Drain Current**



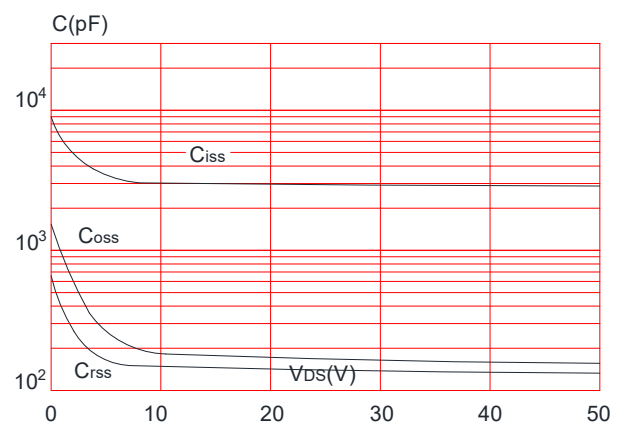
**Figure 4: Body Diode Characteristics**



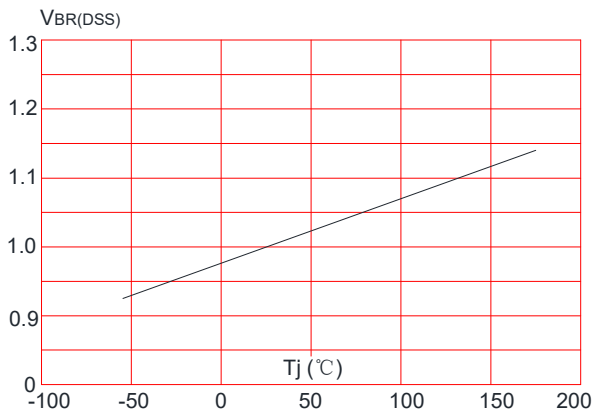
**Figure 5: Gate Charge Characteristics**



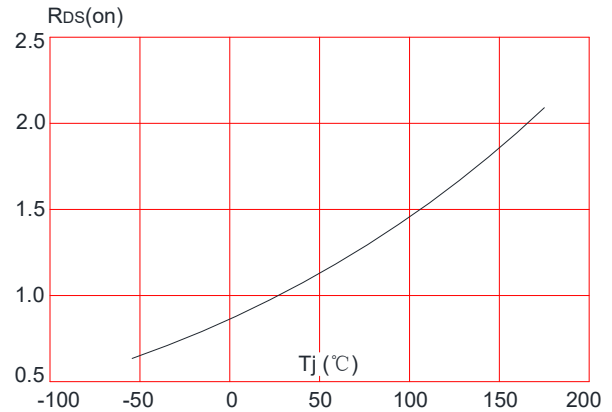
**Figure 6: Capacitance Characteristics**



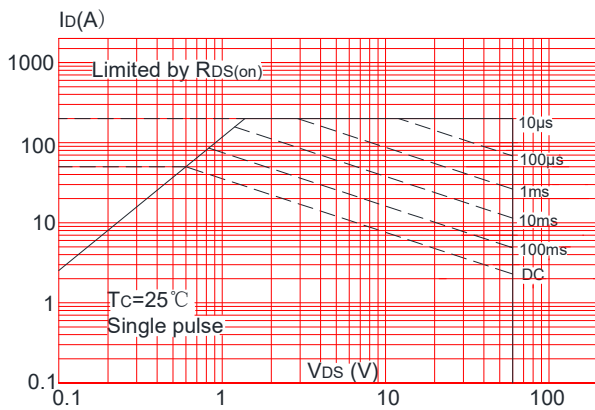
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



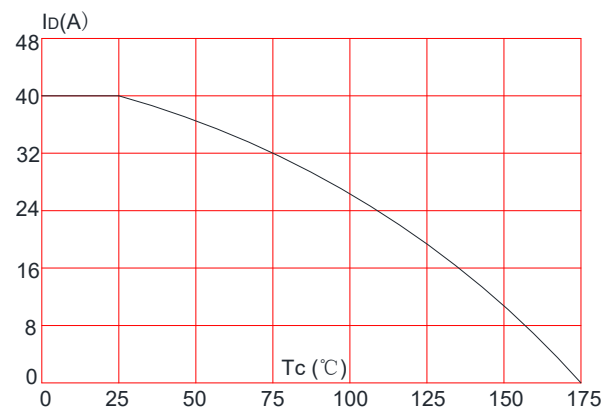
**Figure 8:** Normalized on Resistance vs. Junction Temperature



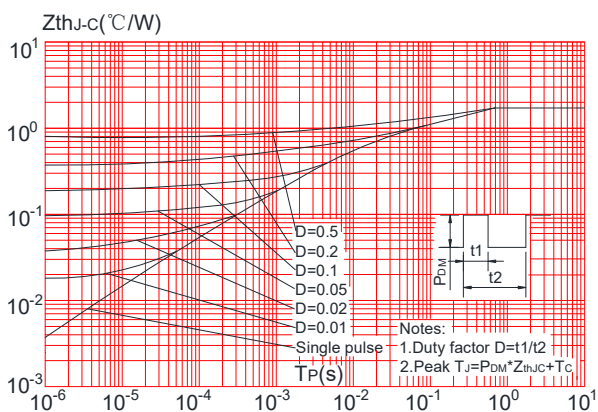
**Figure 9:** Maximum Safe Operating Area



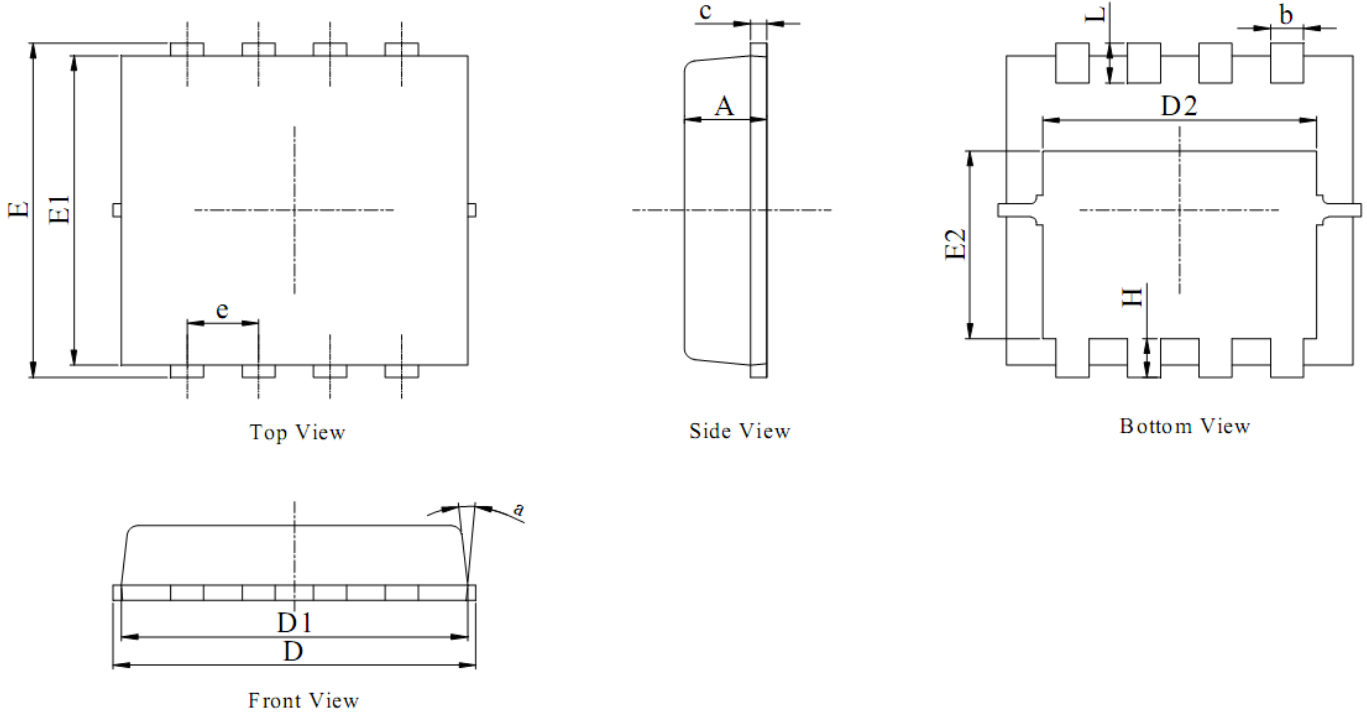
**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



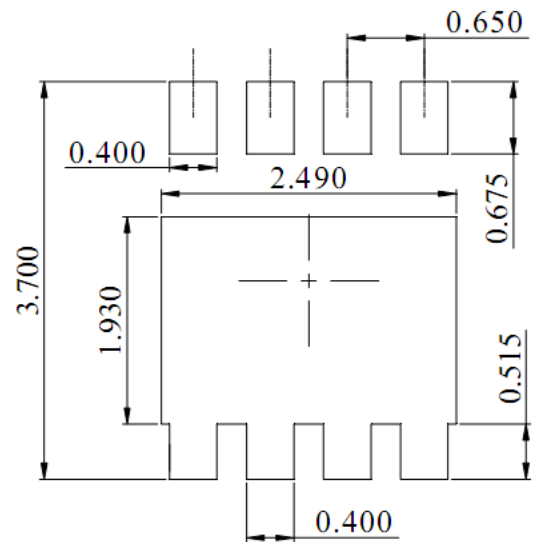
**Package Mechanical Data-PDFN3333-8L-Single**



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M,1994.
2. ALL DIMENSIONS IN MILLIMETER (ANNGLE IN DEGREE).
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| DIM. | MILLIMETER |      |      |
|------|------------|------|------|
|      | MIN.       | NOM. | MAX. |
| A    | 0.70       | 0.75 | 0.80 |
| b    | 0.25       | 0.30 | 0.35 |
| c    | 0.10       | 0.20 | 0.25 |
| D    | 3.00       | 3.15 | 3.25 |
| D1   | 2.95       | 3.05 | 3.15 |
| D2   | 2.39       | 2.49 | 2.59 |
| E    | 3.20       | 3.30 | 3.40 |
| E1   | 2.95       | 3.05 | 3.15 |
| E2   | 1.70       | 1.80 | 1.90 |
| e    | 0.65 BSC   |      |      |
| H    | 0.30       | 0.40 | 0.50 |
| L    | 0.25       | 0.40 | 0.50 |
| a    | ---        | ---  | 15°  |



DIMENSIONS:MILLIMETERS