

## 40V N-Channel Enhancement Mode MOSFET

### Features

- ★ Advanced Trench MOS Technology
- ★ 100% EAS Guaranteed
- ★ Fast Switching Speed
- ★ Green Device Available

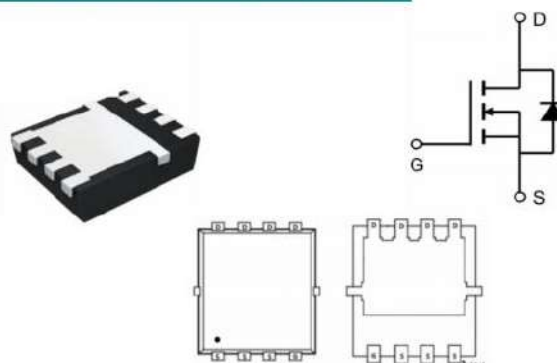
### Applications

- ★ High Frequency Switching and Synchronous Rectification.
- ★ DC/DC Converter.

### Product Summary

 $V_{DS} = 40V$   $I_D = 100A$ 
 $R_{DS(ON)} < 4.0 m\Omega @ V_{GS} = 10V$ 
 $R_{DS(ON)} < 6.0 m\Omega @ V_{GS} = 4.5V$ 

### PDFN33-8Pin Configuration



### Absolute Maximum Ratings

| Symbol                    | Parameter                                  | Rating     | Units      |
|---------------------------|--------------------------------------------|------------|------------|
| $V_{DS}$                  | Drain-Source Voltage                       | 40         | V          |
| $V_{GS}$                  | Gate-Source Voltage                        | $\pm 20$   | V          |
| $I_D @ T_C = 25^\circ C$  | Continuous Drain Current <sup>1</sup>      | 100        | A          |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current <sup>1</sup>      | 75         | A          |
| $I_{DM}$                  | Pulsed Drain Current <sup>2</sup>          | 150        | A          |
| EAS                       | Single Pulse Avalanche Energy <sup>3</sup> | 120        | mJ         |
| $I_{AS}$                  | Avalanche Current                          | 50         | A          |
| $P_D @ T_C = 25^\circ C$  | Total Power Dissipation <sup>4</sup>       | 30         | W          |
| $T_{STG}$                 | Storage Temperature Range                  | -55 to 150 | $^\circ C$ |
| $T_J$                     | Operating Junction Temperature Range       | -55 to 150 | $^\circ C$ |

### Thermal Data

| Symbol          | Parameter                                                       | Typ. | Max. | Unit         |
|-----------------|-----------------------------------------------------------------|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State) <sup>1</sup> | ---  | 60   | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>                   | ---  | 3.2  | $^\circ C/W$ |

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### Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise specified)

| Symbol              | Parameter                                      | Conditions                                                                             | Min. | Typ. | Max. | Unit |
|---------------------|------------------------------------------------|----------------------------------------------------------------------------------------|------|------|------|------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                             | 40   | ---  | ---  | V    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                              | ---  | 1.8  | 4.0  | mΩ   |
|                     |                                                | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                             | ---  | 3.2  | 6.0  |      |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                         | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                               | 1    | 1.8  | 2.5  | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current                   | V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                        | ---  | ---  | 1    | μA   |
|                     |                                                | V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                        | ---  | ---  | 5    |      |
| I <sub>GSS</sub>    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                             | ---  | ---  | ±100 | nA   |
| R <sub>g</sub>      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                       | ---  | 1.7  | ---  | Ω    |
| Q <sub>g</sub>      | Total Gate Charge (4.5V)                       | V <sub>DS</sub> =20V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =12A                       | ---  | 5.8  | ---  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                             |                                                                                        | ---  | 3    | ---  |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                              |                                                                                        | ---  | 1.2  | ---  |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                             | V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω<br>I <sub>D</sub> =1A | ---  | 14.3 | ---  | ns   |
| T <sub>r</sub>      | Rise Time                                      |                                                                                        | ---  | 5.6  | ---  |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time                            |                                                                                        | ---  | 20   | ---  |      |
| T <sub>f</sub>      | Fall Time                                      |                                                                                        | ---  | 11   | ---  |      |
| C <sub>iss</sub>    | Input Capacitance                              | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz                                      | ---  | 5320 | ---  | pF   |
| C <sub>oss</sub>    | Output Capacitance                             |                                                                                        | ---  | 1930 | ---  |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance                   |                                                                                        | ---  | 380  | ---  |      |

### Diode Characteristics

| Symbol          | Parameter                                | Conditions                                                    | Min. | Typ. | Max. | Unit |
|-----------------|------------------------------------------|---------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current <sup>1,5</sup> | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current             | ---  | ---  | 60   | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>2</sup>       | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C | ---  | ---  | 1    | V    |

Note :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
3. The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=31A
4. The power dissipation is limited by 150°C junction temperature
5. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

## 40V N-Channel Enhancement Mode MOSFET

### Typical Performance Characteristics

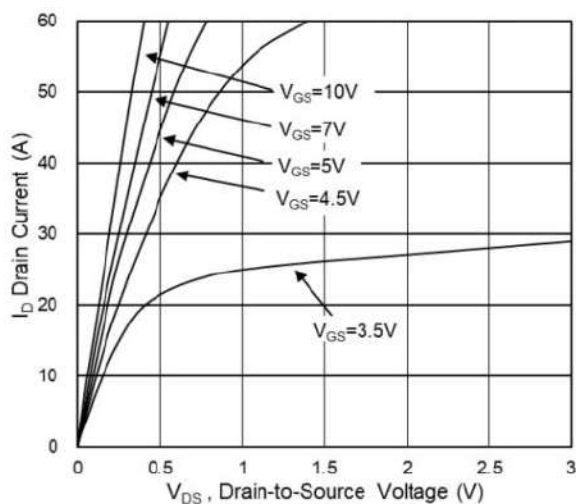


Fig.1 Typical Output Characteristics

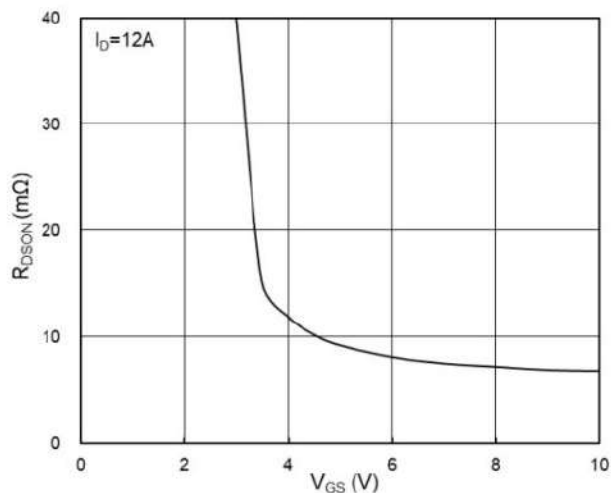


Fig.2 On-Resistance vs G-S Voltage

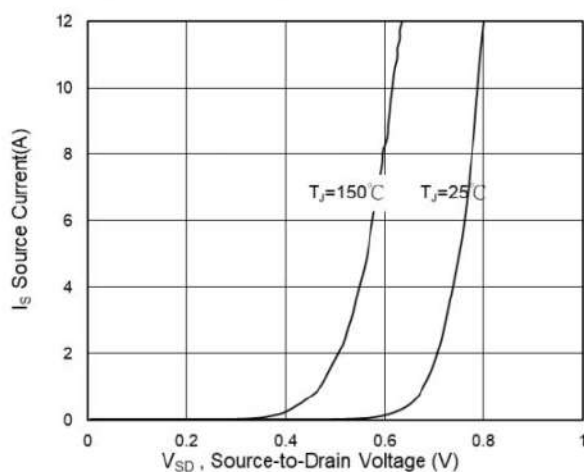


Fig.3 Source Drain Forward Characteristics

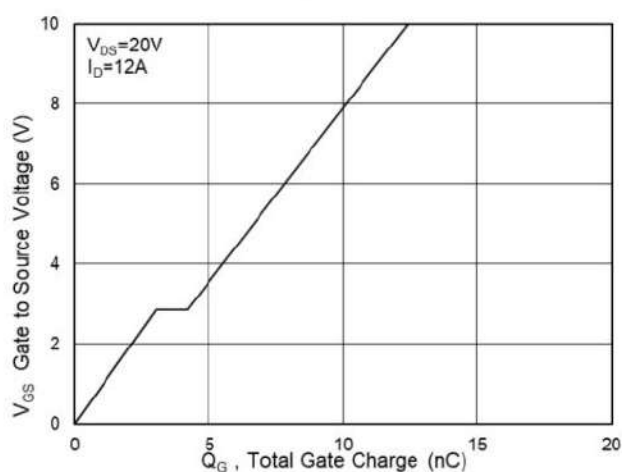


Fig.4 Gate-Charge Characteristics

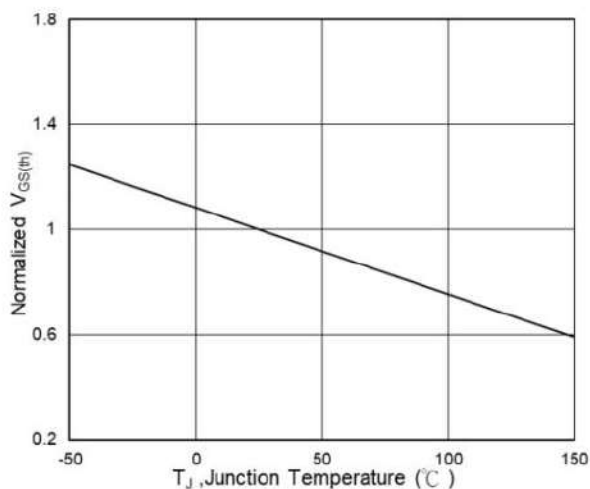


Fig.5 Normalized  $V_{GS(th)}$  vs  $T_J$

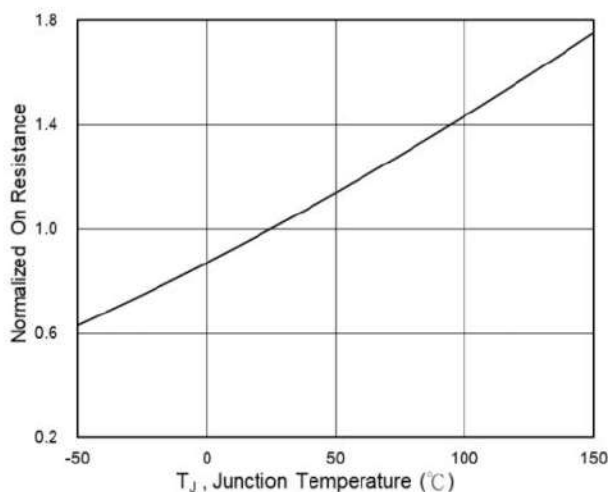


Fig.6 Normalized  $R_{DS(on)}$  vs  $T_J$

## 40V N-Channel Enhancement Mode MOSFET

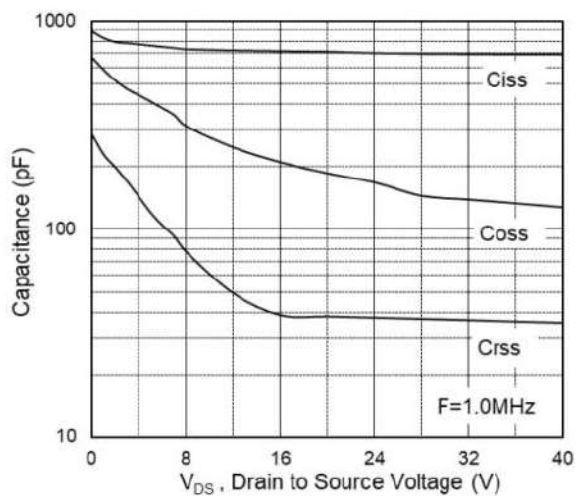


Fig.7 Capacitance

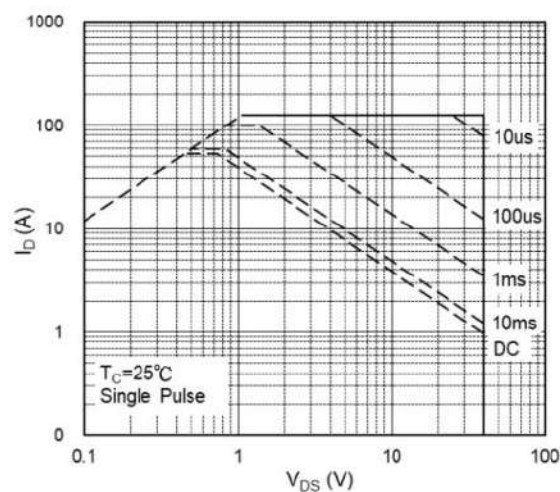


Fig.8 Safe Operating Area

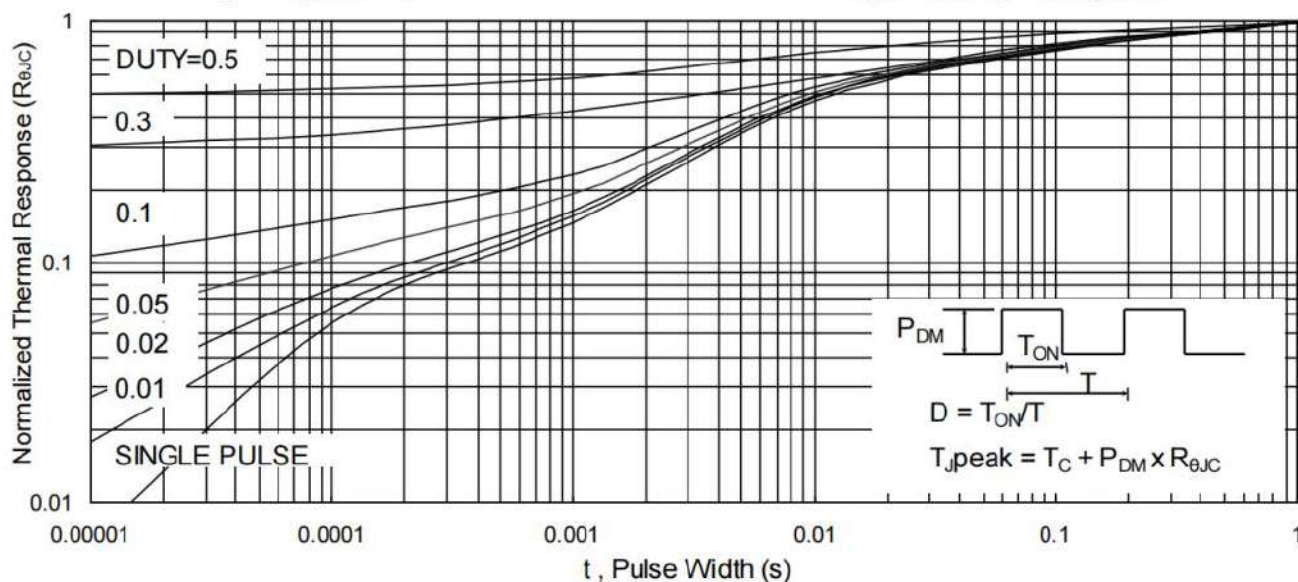


Fig.9 Normalized Maximum Transient Thermal Impedance

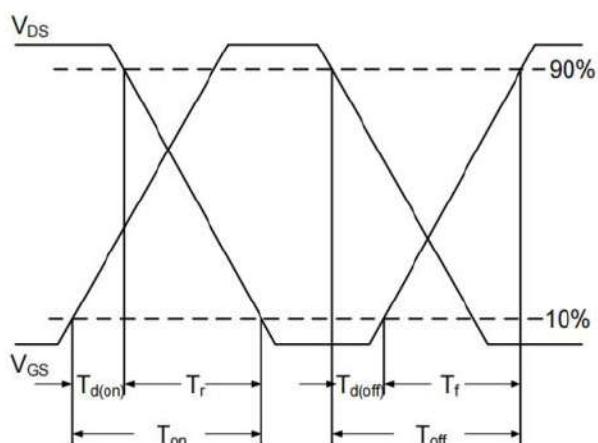


Fig.10 Switching Time Waveform

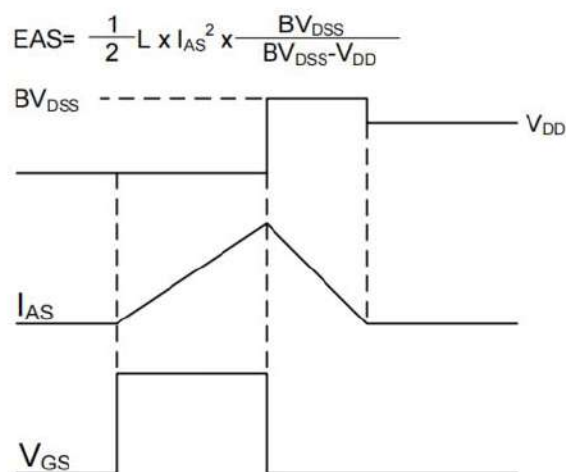
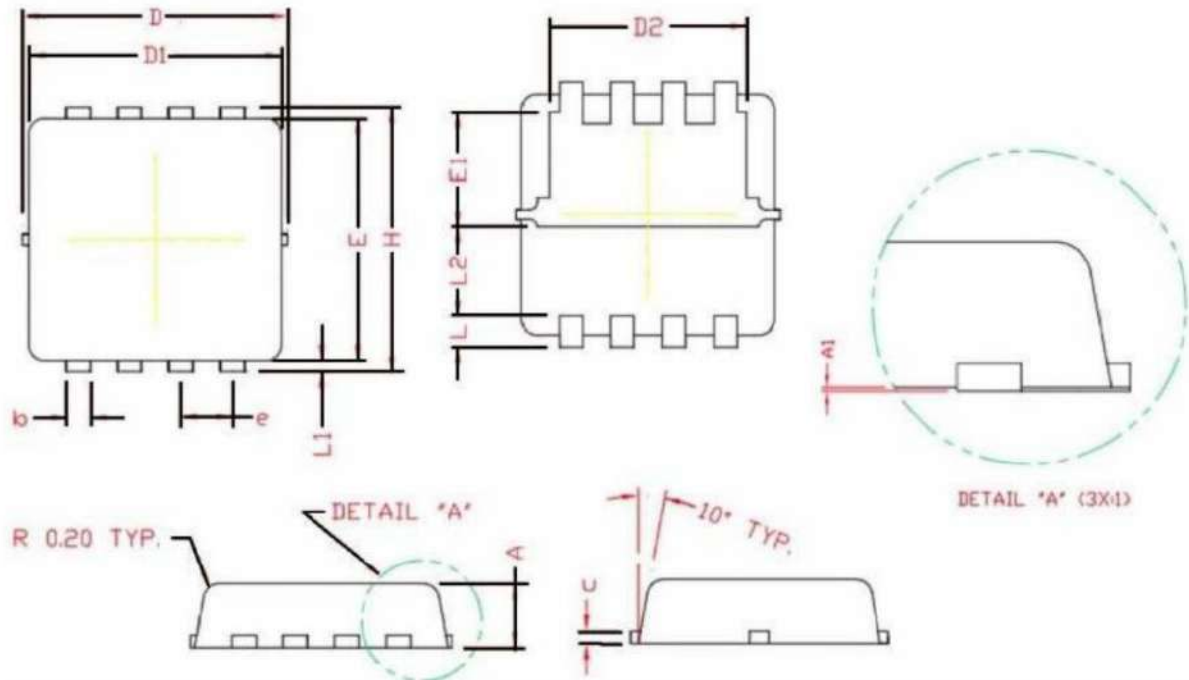


Fig.11 Unclamped Inductive Waveform

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## PDFN3333-8L Package Information



## COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN       | NOM  | MAX  |
|--------|-----------|------|------|
| A      | 0.70      | 0.80 | 0.90 |
| A1     | 0.00      | 0.03 | 0.05 |
| b      | 0.24      | 0.30 | 0.35 |
| c      | 0.10      | 0.15 | 0.20 |
| D      | 3.25      | 3.32 | 3.40 |
| D1     | 3.05      | 3.15 | 3.25 |
| D2     | 2.40      | 2.50 | 2.60 |
| E      | 3.00      | 3.10 | 3.20 |
| E1     | 1.35      | 1.45 | 1.55 |
| e      | 0.65 BSC. |      |      |
| H      | 3.20      | 3.30 | 3.40 |
| L      | 0.30      | 0.40 | 0.50 |
| L1     | 0.10      | 0.15 | 0.20 |
| L2     | 1.13 REF. |      |      |