

### Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent  $CdV/dt$  effect decline
- 100% EAS Guaranteed
- Green Device Available

### Applications

- Power management in half bridge and inverters
- DC-DC Converter
- Load Switch

### General Description

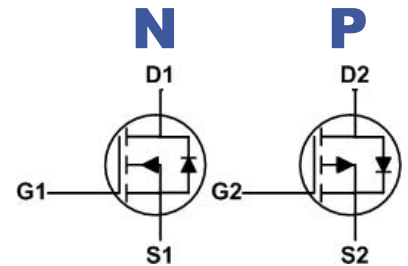
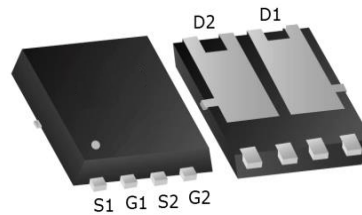
The UD30G15D is the highest performance trenchN-ch and P-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The UD30G15D meet the RoHS and Green Product requirement , 100% EAS guaranteedwith full function reliability approved.

### Product Summary

| BVDSS | RDSON | ID   |
|-------|-------|------|
| 30V   | 16mΩ  | 15A  |
| -30V  | 33mΩ  | -12A |

### PDFN3333-8L Pin Configuration



### Absolute Maximum Ratings

| Symbol                | Parameter                                  | Rating     |            | Units      |
|-----------------------|--------------------------------------------|------------|------------|------------|
|                       |                                            | N-Channel  | P-Channel  |            |
| $V_{DS}$              | Drain-Source Voltage                       | 30         | -30        | V          |
| $V_{GS}$              | Gate-Source Voltage                        | $\pm 20$   | $\pm 20$   | V          |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 15         | -12        | A          |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 12         | -8         | A          |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>          | 42         | -24        | A          |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup> | 72         | 59         | mJ         |
| $I_{AS}$              | Avalanche Current                          | 21         | -19        | A          |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>       | 2.5        | 2.08       | W          |
| $T_{STG}$             | Storage Temperature Range                  | -55 to 150 | -55 to 150 | $^\circ C$ |
| $T_J$                 | Operating Junction Temperature Range       | -55 to 150 | -55 to 150 | $^\circ C$ |

### Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit         |
|-----------------|--------------------------------------------------|------|------|--------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | 85   | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 50   | $^\circ C/W$ |

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

| Symbol                       | Parameter                                      | Conditions                                       | Min. | Typ.  | Max.      | Unit                 |
|------------------------------|------------------------------------------------|--------------------------------------------------|------|-------|-----------|----------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V, I_D=250\mu A$                        | 30   | ---   | ---       | V                    |
| $\Delta BV_{DSS}/\Delta T_J$ | BVDSS Temperature Coefficient                  | Reference to $25^\circ\text{C}$ , $I_D=1mA$      | ---  | 0.034 | ---       | V/ $^\circ\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V, I_D=13A$                            | ---  | 16    | 23        | m $\Omega$           |
|                              |                                                | $V_{GS}=4.5V, I_D=10A$                           | ---  | 23    | 32        |                      |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}, I_D=250\mu A$                    | 1.0  | 1.5   | 2.5       | V                    |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                  | ---  | -5.8  | ---       | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=30V, V_{GS}=0V, T_J=25^\circ\text{C}$    | ---  | ---   | 1         | $\mu A$              |
|                              |                                                | $V_{DS}=30V, V_{GS}=0V, T_J=55^\circ\text{C}$    | ---  | ---   | 5         |                      |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V, V_{DS}=0V$                      | ---  | ---   | $\pm 100$ | nA                   |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=15V, I_D=10A$                            | ---  | 10    | ---       | S                    |
| $R_g$                        | Gate Resistance                                | $V_{DS}=24V, V_{GS}=0V, f=1MHz$                  | ---  | 2.5   | ---       | $\Omega$             |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=20V, V_{GS}=4.5V, I_D=13A$               | ---  | 7.2   | ---       | nC                   |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                  | ---  | 1.4   | ---       |                      |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                  | ---  | 2.2   | ---       |                      |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=12V, V_{GS}=10V, R_G=3.3\Omega, I_D=10A$ | ---  | 3.9   | ---       | ns                   |
| $T_r$                        | Rise Time                                      |                                                  | ---  | 9.2   | ---       |                      |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                  | ---  | 14.5  | ---       |                      |
| $T_f$                        | Fall Time                                      |                                                  | ---  | 6.0   | ---       |                      |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=25V, V_{GS}=0V, f=1MHz$                  | ---  | 370   | ---       | pF                   |
| $C_{oss}$                    | Output Capacitance                             |                                                  | ---  | 54    | ---       |                      |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                  | ---  | 40    | ---       |                      |

**Guaranteed Avalanche Characteristics**

| Symbol | Parameter                                  | Conditions                        | Min. | Typ. | Max. | Unit |
|--------|--------------------------------------------|-----------------------------------|------|------|------|------|
| EAS    | Single Pulse Avalanche Energy <sup>5</sup> | $V_{DD}=25V, L=0.1mH, I_{AS}=21A$ | 16   | ---  | ---  | mJ   |

**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                 | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|--------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,6</sup> | $V_G=V_D=0V$ , Force Current               | ---  | ---  | 15   | A    |
| $I_{SM}$ | Pulsed Source Current <sup>2,6</sup>     |                                            | ---  | ---  | 40   | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V, I_S=10A, T_J=25^\circ\text{C}$ | ---  | ---  | 1.2  | V    |

Note :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper,  $t < 10\text{sec}$ .
2. The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
3. The EAS data shows Max. rating. The test condition is  $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=21A$
4. The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
5. The Min. value is 100% EAS tested guarantee.
6. The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

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

| Parameter                                     | Symbol               | Conditions                                                                                      | Min. | Typ. | Max. | Unit |
|-----------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics                        |                      |                                                                                                 |      |      |      |      |
| Drain-Source Breakdown Voltage                | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                                                   | -30  | -    | -    | V    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>     | V <sub>DS</sub> = -30V, V <sub>GS</sub> = 0V                                                    | -    | -    | -1   | μA   |
| Gate-Source Leakage                           | I <sub>GSS</sub>     | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V                                                    | -    | -    | ±100 | nA   |
| Gate-Source Threshold voltage                 | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250μA                                     | -1   | -1.5 | -2.5 | V    |
| Drain-Source on-State Resistance <sup>3</sup> | R <sub>DS(on)</sub>  | V <sub>GS</sub> = -10V,I <sub>D</sub> = -8.2A                                                   | -    | 33   | 44   | mΩ   |
|                                               |                      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -6A                                                   | -    | 46   | 64   |      |
| Dynamic Characteristics <sup>4</sup>          |                      |                                                                                                 |      |      |      |      |
| Input Capacitance                             | C <sub>iss</sub>     | V <sub>GS</sub> = 0V , V <sub>DS</sub> = -15V,<br>f = 1.0MHz                                    | -    | 530  | -    | pF   |
| Output Capacitance                            | C <sub>oss</sub>     |                                                                                                 | -    | 70   | -    |      |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>     |                                                                                                 | -    | 56   | -    |      |
| Switching Characteristics <sup>4</sup>        |                      |                                                                                                 |      |      |      |      |
| Total Gate Charge                             | Q <sub>g</sub>       | V <sub>GS</sub> = -10V,V <sub>DS</sub> = -15V,<br>I <sub>D</sub> = -8.2A                        | -    | 6.8  | -    | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>      |                                                                                                 | -    | 1.0  | -    |      |
| Gate-Drain Charge                             | Q <sub>gd</sub>      |                                                                                                 | -    | 1.4  | -    |      |
| Turn-on Delay Time                            | t <sub>d(on)</sub>   | V <sub>GS</sub> =-10V, V <sub>DS</sub> = -15V ,<br>R <sub>L</sub> = 15Ω,R <sub>GEN</sub> = 2.5Ω | -    | 14   | -    | ns   |
| Rise Time                                     | t <sub>r</sub>       |                                                                                                 | -    | 61   | -    |      |
| Turn-off Delay time                           | t <sub>d(off)</sub>  |                                                                                                 | -    | 19   | -    |      |
| Fall Time                                     | t <sub>f</sub>       |                                                                                                 | -    | 10   | -    |      |
| Source-Drain Body Diode Characteristics       |                      |                                                                                                 |      |      |      |      |
| Diode Forward Voltage <sup>3</sup>            | V <sub>SD</sub>      | I <sub>S</sub> = -2A, V <sub>GS</sub> = 0V                                                      | -    | -    | -1.2 | V    |
| Continuous Source Current                     | I <sub>S</sub>       |                                                                                                 | -    | -    | -12  | A    |

**Notes:**

1. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C.
2. The data tested by surface mounted on a 1 inch2 FR-4 board with 20Z copper, The value in any given application depends on the user's specific board design.
3. Pulse Test: Pulse width≤300μs, duty cycle≤2%.
4. This value is guaranteed by design hence it is not included in the production test.

### N-Channel Typical Characteristics

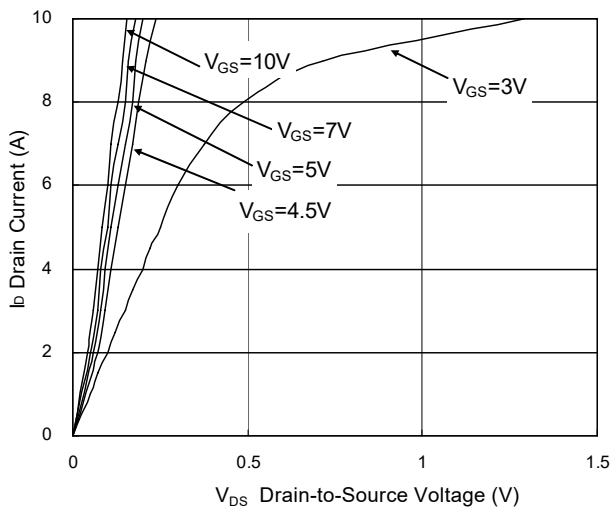


Fig.1 Typical Output Characteristics

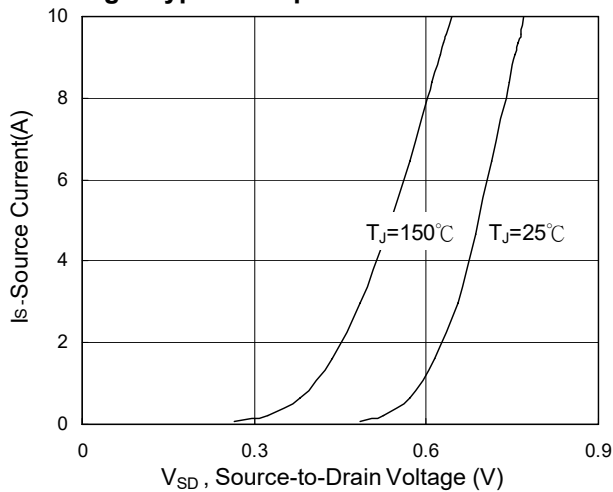
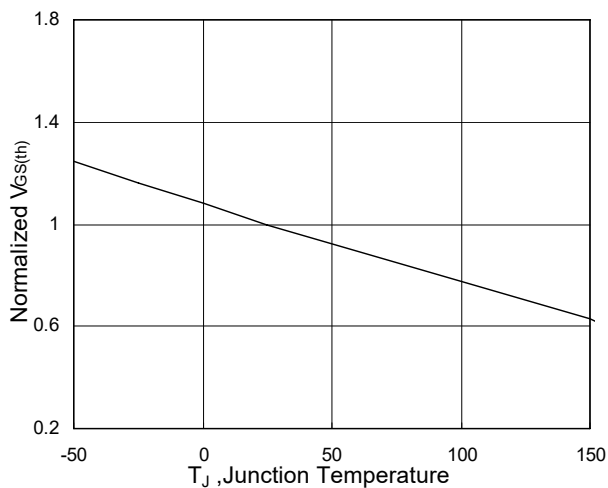


Fig.3 Forward Characteristics of Reverse



( $^\circ\text{C}$ ) Fig.5  $V_{GS(th)}$  vs.  $T_J$

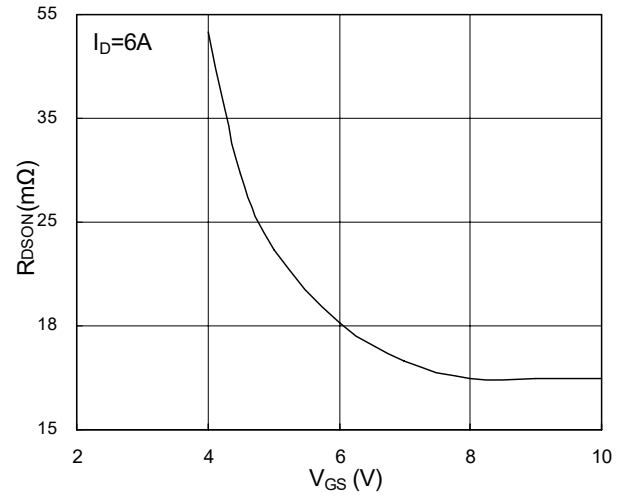


Fig.2 On-Resistance vs. G-S Voltage

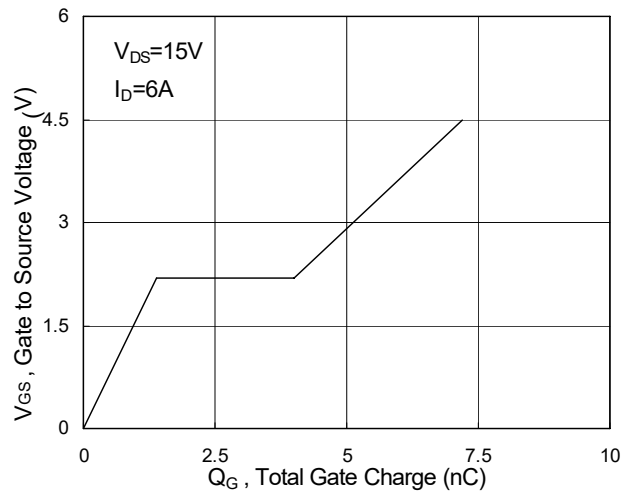


Fig.4 Gate-charge Characteristics

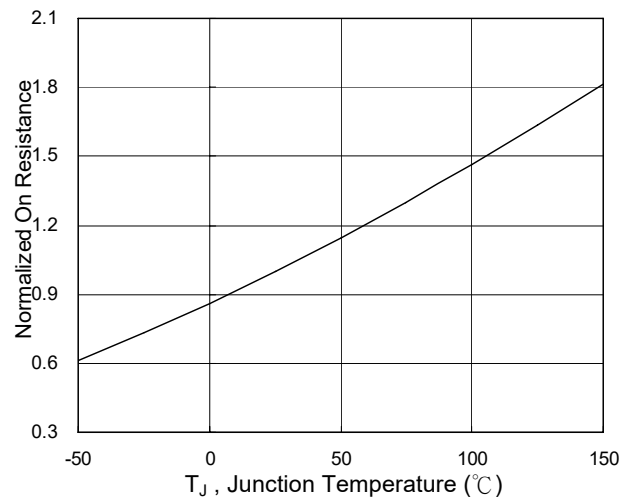
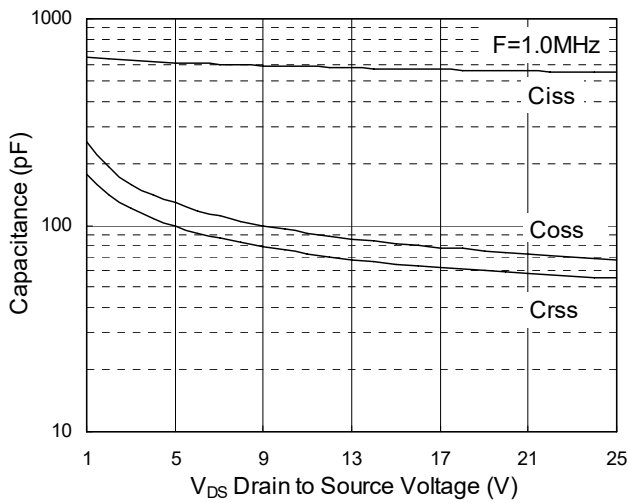
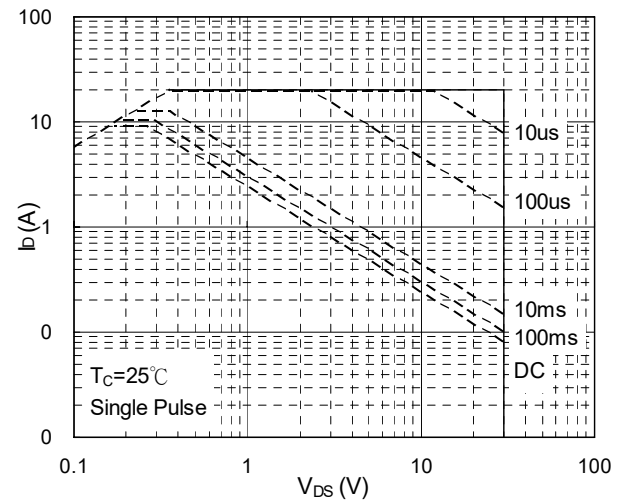


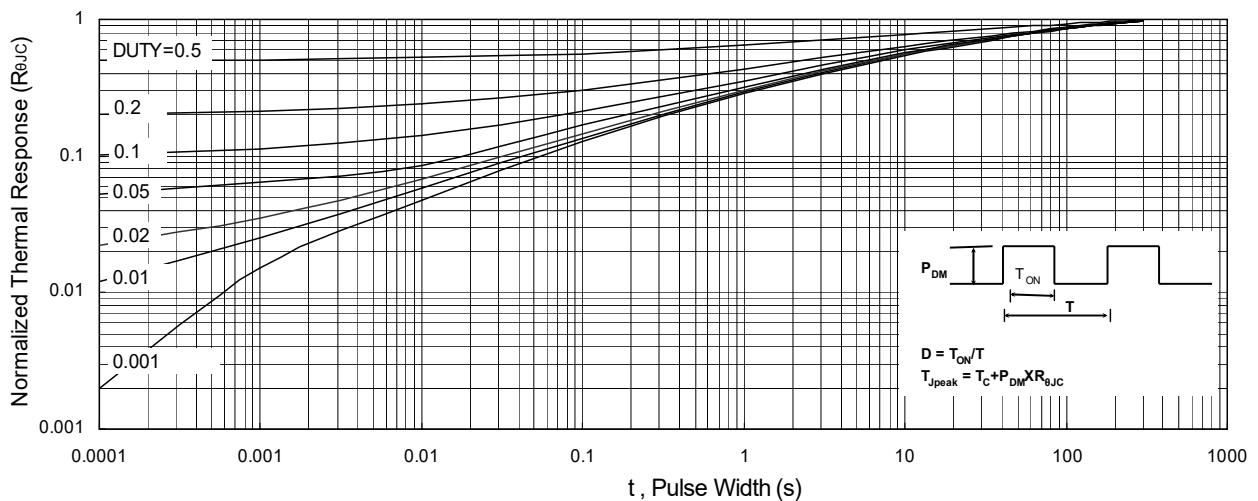
Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$



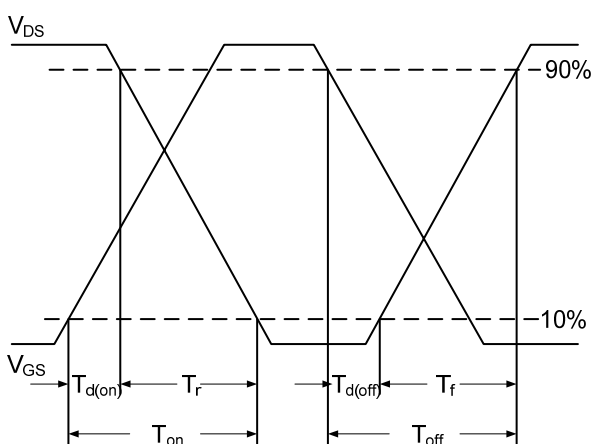
**Fig.7 Capacitance**



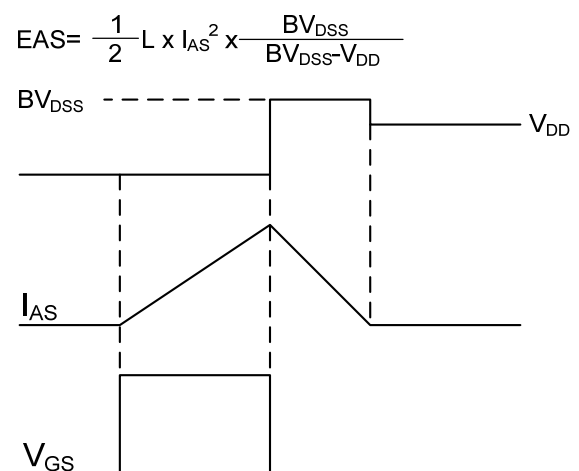
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Waveform**

$$EAS = \frac{1}{2} L \times I_{AS}^2 \times \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

### P-Channel Typical Characteristics

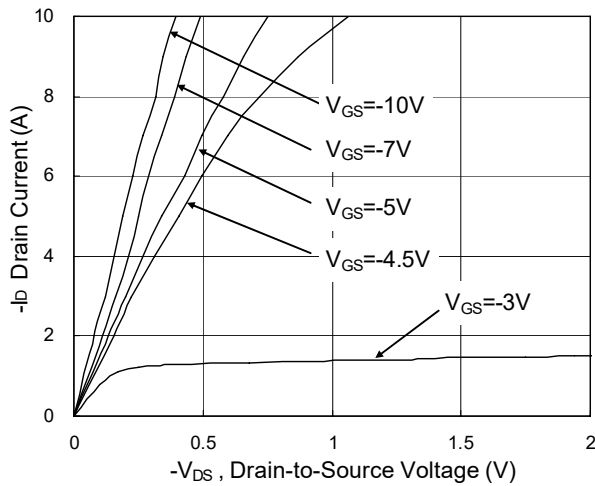


Fig.1 Typical Output Characteristics

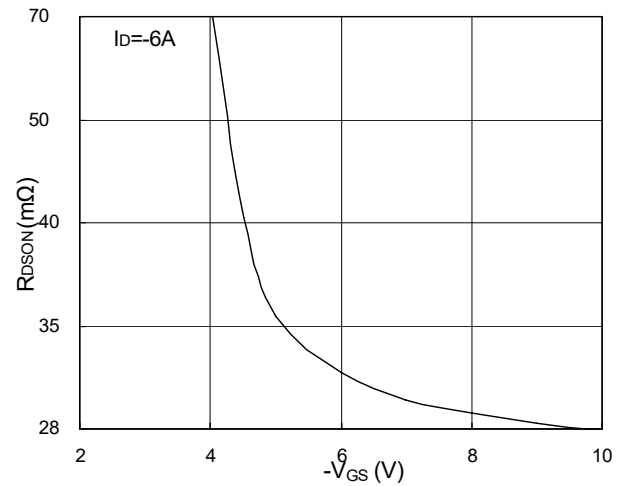


Fig.2 On-Resistance vs. Gate-Source

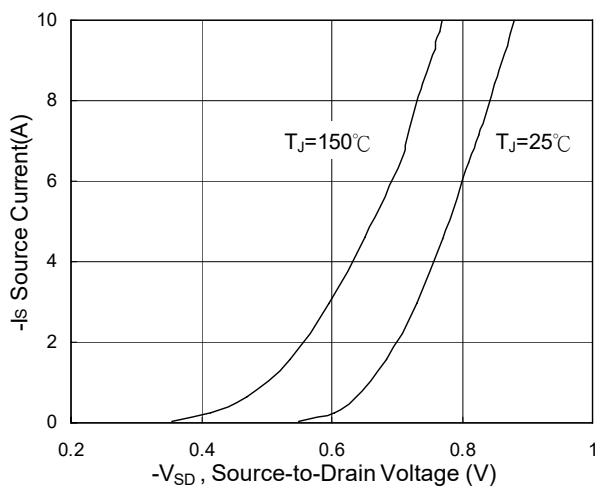


Fig.3 Forward Characteristics of Reverse

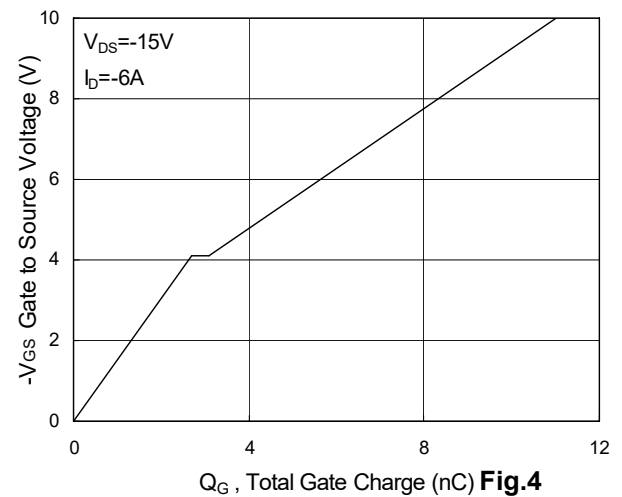


Fig.4

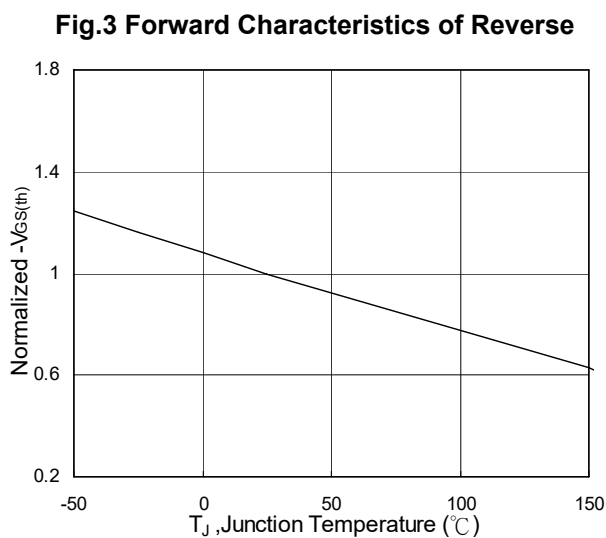


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

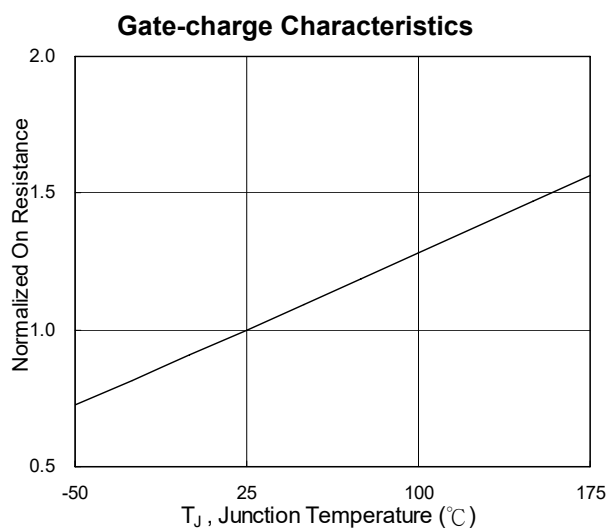


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

N-Ch and P-Ch Fast Switching MOSFETs

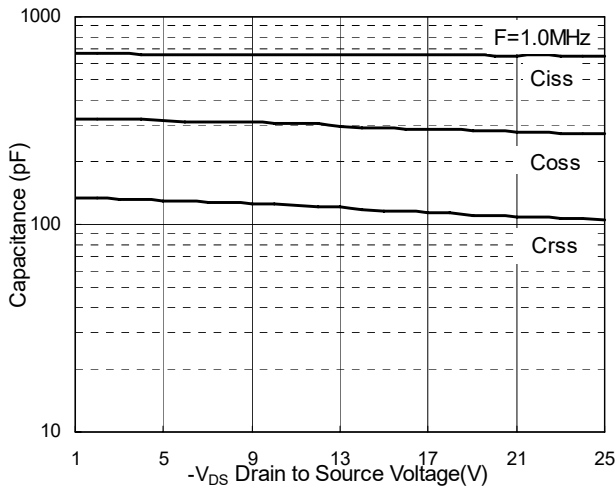


Fig.7 Capacitance

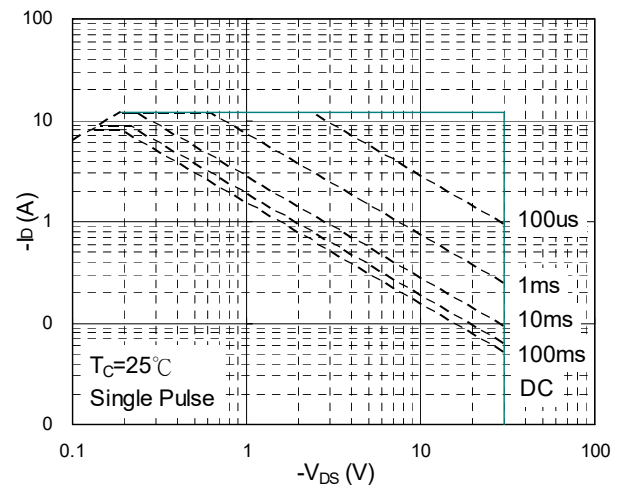


Fig.8 Safe Operating Area

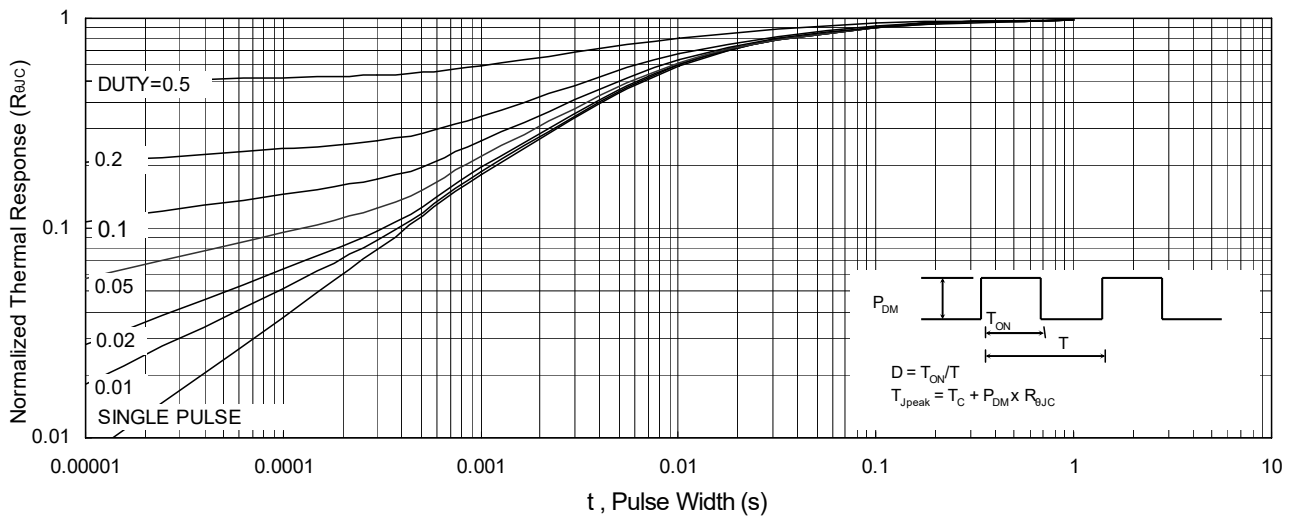


Fig.9 Normalized Maximum Transient Thermal Impedance

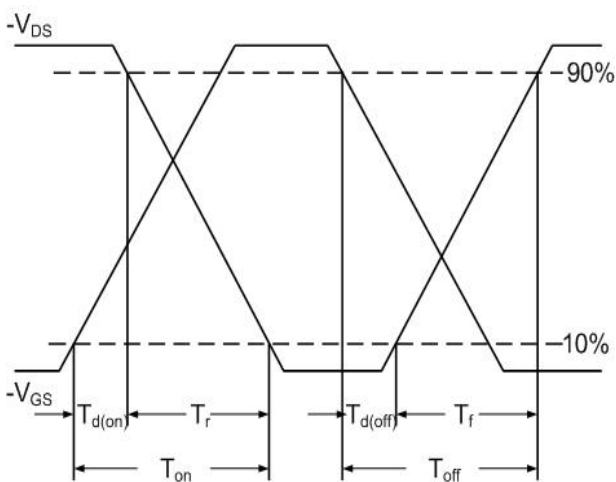


Fig.10 Switching Time Waveform

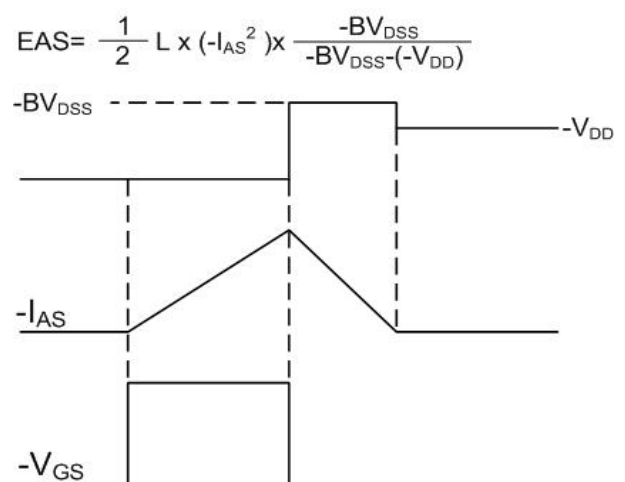
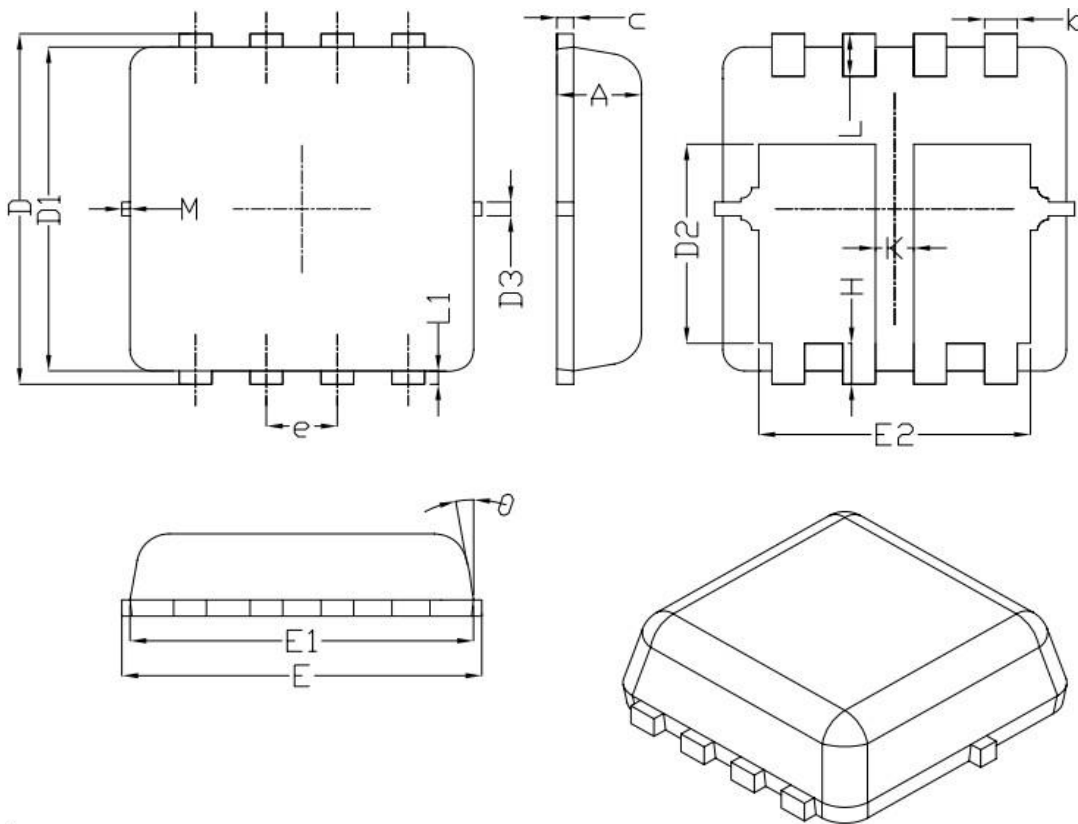


Fig.11 Unclamped Inductive Waveform

### Dual PDFN3333-8L Package Outline Data



| Symbol          | Dimensions (unit: mm) |      |      |
|-----------------|-----------------------|------|------|
|                 | Min                   | Typ  | Max  |
| A               | 0.70                  | 0.75 | 0.80 |
| b               | 0.25                  | 0.30 | 0.35 |
| c               | 0.10                  | 0.15 | 0.25 |
| D               | 3.25                  | 3.35 | 3.45 |
| D1              | 3.00                  | 3.10 | 3.20 |
| D2              | 1.78                  | 1.88 | 1.98 |
| D3              | --                    | 0.13 | --   |
| E               | 3.20                  | 3.30 | 3.40 |
| E1              | 3.00                  | 3.15 | 3.20 |
| E2              | 2.39                  | 2.49 | 2.59 |
| e               | 0.65 BSC              |      |      |
| H               | 0.30                  | 0.39 | 0.50 |
| L               | 0.30                  | 0.40 | 0.50 |
| L1              | --                    | 0.13 | --   |
| K               | 0.30                  | --   | --   |
| θ               | --                    | 10°  | 12°  |
| M               | *                     | *    | 0.15 |
| * Not Specified |                       |      |      |

Notes:

1. Refer to JEDEC MO-240 variation CA.
2. Dimensions "D1" and "E1" do NOT include mold flash protrusions or gate burrs.
3. Dimensions "D1" and "E1" include interterminal flash or protrusion.