

## P-Ch 20V Fast Switching MOSFETs

- ★ Super Low Gate Charge
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

### Product Summary



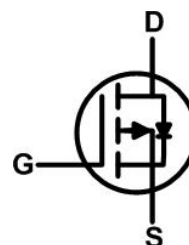
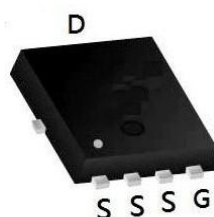
| BVDSS | RDSON | ID   |
|-------|-------|------|
| -20V  | 15mΩ  | -20A |

### Description

The UD20P02D is the high cell density trenched P-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The UD20P02D meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

### PDFN3333-8L Pin Configuration



### Absolute Maximum Ratings (T<sub>A</sub>=25°C unless otherwise specified)

| Symbol                            | Parameter                               |                        | Max.        | Units |
|-----------------------------------|-----------------------------------------|------------------------|-------------|-------|
| V <sub>DSS</sub>                  | Drain-Source Voltage                    |                        | -20         | V     |
| V <sub>GSS</sub>                  | Gate-Source Voltage                     |                        | ±12         | V     |
| I <sub>D</sub>                    | Continuous Drain Current                | T <sub>A</sub> = 25°C  | -20         | A     |
|                                   |                                         | T <sub>A</sub> = 100°C | -12         | A     |
| I <sub>DM</sub>                   | Pulsed Drain Current <sup>note1</sup>   |                        | -28         | A     |
| P <sub>D</sub>                    | Power Dissipation                       | T <sub>A</sub> = 25°C  | 5           | W     |
| R <sub>θJA</sub>                  | Thermal Resistance, Junction to Ambient |                        | 62.5        | °C/W  |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range |                        | -55 to +150 | °C    |

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

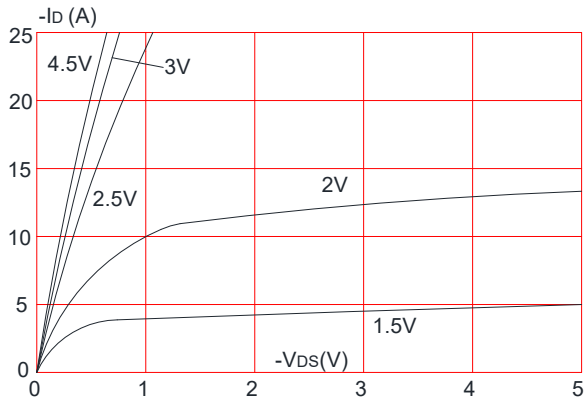
| Symbol                                                 | Parameter                                                 | Test Condition                                                                                      | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                           |                                                                                                     |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA                                                        | -20  | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V,                                                        | -    | -    | -1   | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V                                                         | -    | -    | ±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                                          | -0.4 | -0.7 | -1.0 | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br><small>note2</small> | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -7A                                                       | -    | 15   | 20   | mΩ    |
|                                                        |                                                           | V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -5A                                                       | -    | 21.  | 32   |       |
| Dynamic Characteristics                                |                                                           |                                                                                                     |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                         | V <sub>DS</sub> = -10V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                            | -    | 2000 | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                        |                                                                                                     | -    | 242  | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                              |                                                                                                     | -    | 231  | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                         | V <sub>DS</sub> = -10V, I <sub>D</sub> = -3A,<br>V <sub>GS</sub> = -4.5V                            | -    | 15.3 | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                        |                                                                                                     | -    | 2.2  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                               |                                                                                                     | -    | 4.4  | -    | nC    |
| Switching Characteristics                              |                                                           |                                                                                                     |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                        | V <sub>DD</sub> = -10V, I <sub>D</sub> = -7A,<br>V <sub>GS</sub> = -4.5V,<br>R <sub>GEN</sub> =2.5Ω | -    | 10   | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                         |                                                                                                     | -    | 31   | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                       |                                                                                                     | -    | 28   | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                        |                                                                                                     | -    | 8    | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                           |                                                                                                     |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current  |                                                                                                     | -    | -    | -20  | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current      |                                                                                                     | -    | -    | -28  | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> = -7A                                                           | -    | -0.8 | -1.2 | V     |

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

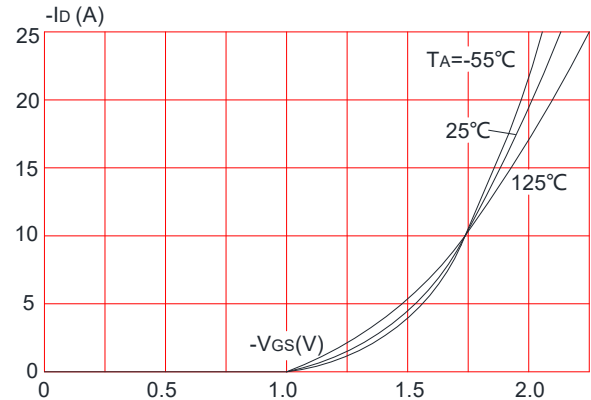
2. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$

## Typical Performance Characteristics

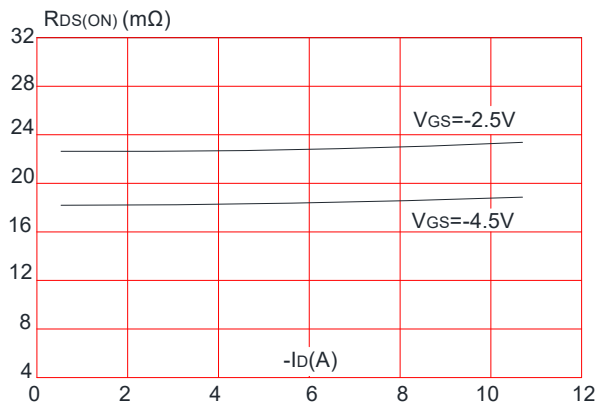
**Figure 1:** Output Characteristics



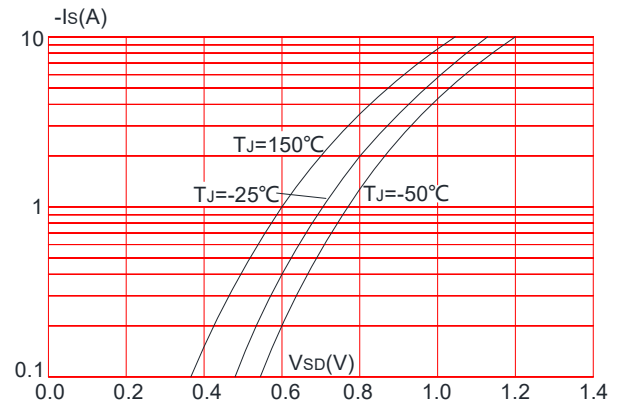
**Figure 2:** Typical Transfer Characteristics



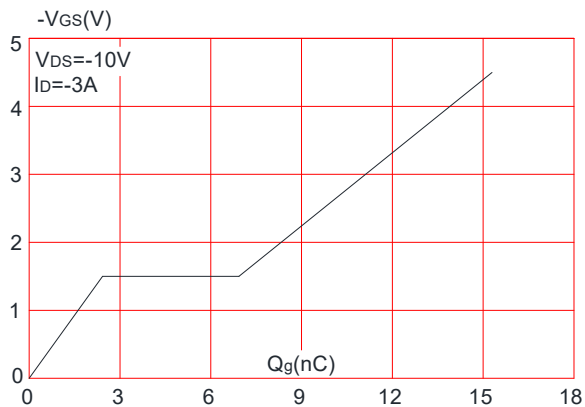
**Figure 3:** On-resistance vs. Drain Current



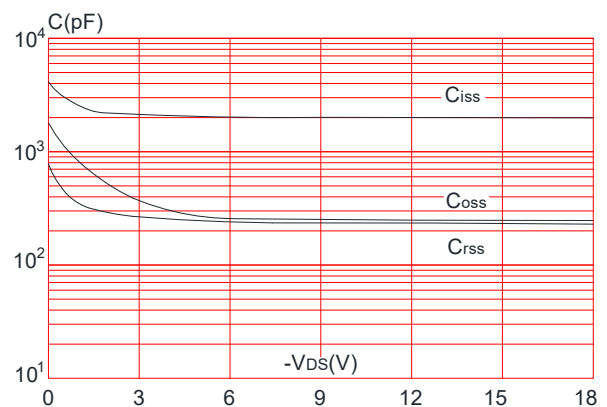
**Figure 4:** Body Diode Characteristics



**Figure 5:** Gate Charge Characteristics

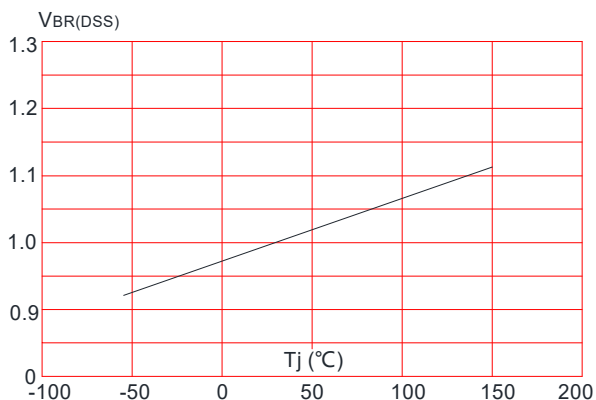


**Figure 6:** Capacitance Characteristics

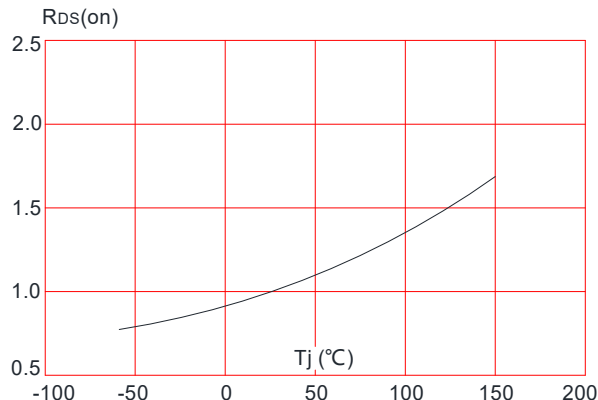


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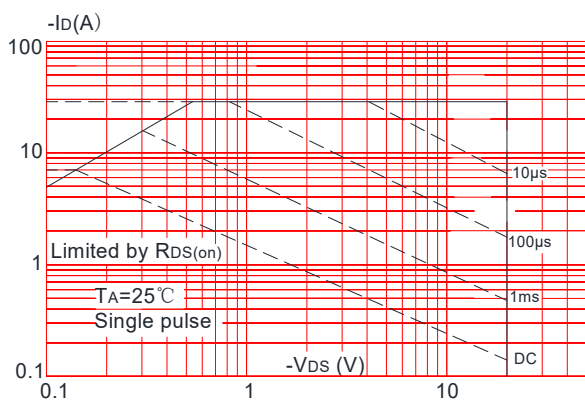
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



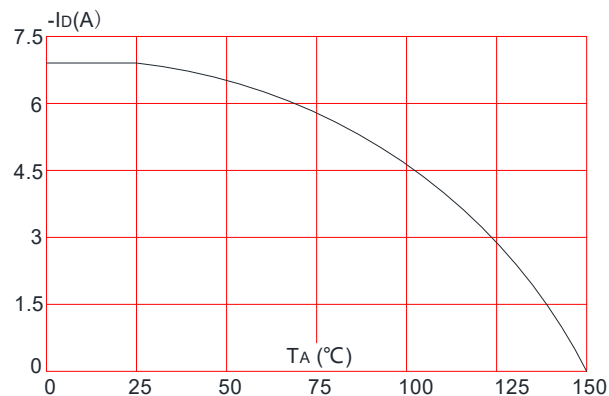
**Figure 8:** Normalized on Resistance vs. Junction Temperature



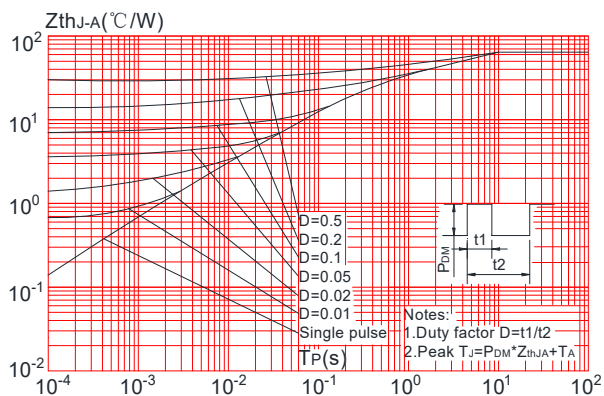
**Figure 9:** Maximum Safe Operating Area



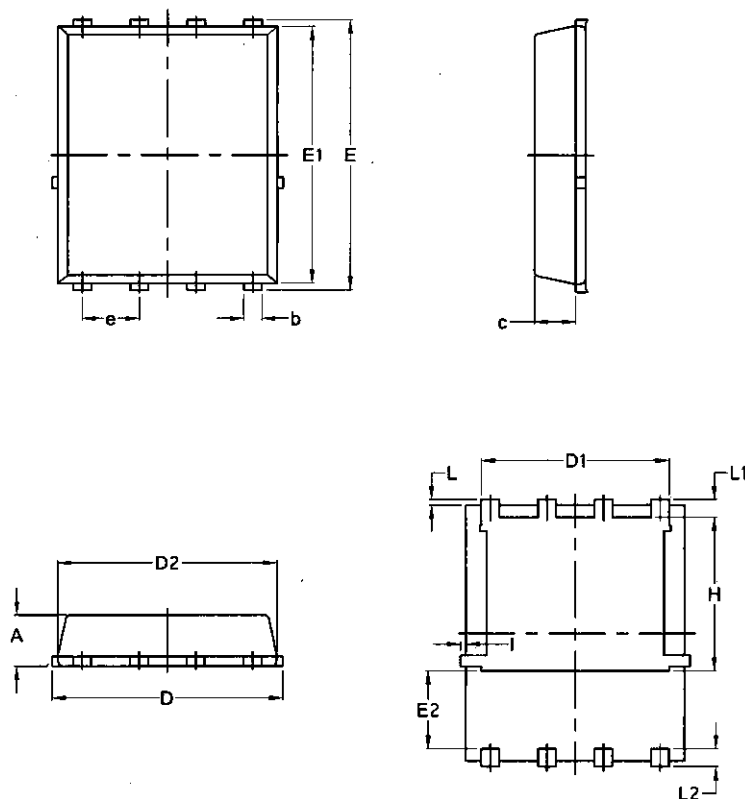
**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature



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



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



### 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. |      |      |