

## P-Channel Enhancement Mode MOSFET

### 1. Product Information

#### 1.1 Features

- ☒ Surface-mounted package
- ☒ Low Thermal Resistance

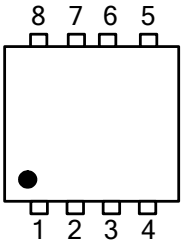
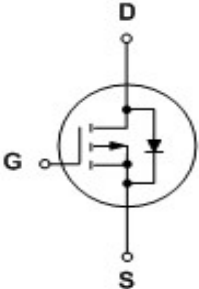
#### 1.2 Applications

- ☒ Motor drivers
- ☒ DC - DC Converter

#### 1.3 Quick reference

- ☒  $BV \geq -60\text{ V}$
- ☒  $P_{tot} \leq 9.6\text{ W}$
- ☒  $I_D \leq -13\text{ A}$
- ☒  $R_{DS(ON)} \leq 95\text{ m}\Omega @ V_{GS} = -10\text{ V}$
- ☒  $R_{DS(ON)} \leq 120\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$

### Pin Description

| Pin     | Description | Simplified Outline                                                                                                     | Symbol                                                                                |
|---------|-------------|------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1,2,3   | Source      |  <p>Top View<br/>PDFN3.3*3.3-8L</p> |  |
| 4       | Gate        |                                                                                                                        |                                                                                       |
| 5,6,7,8 | Drain       |                                                                                                                        |                                                                                       |

## 2. Limiting Values

| Symbol               | Parameter                               | Conditions                                        | Min  | Max    | Unit   |
|----------------------|-----------------------------------------|---------------------------------------------------|------|--------|--------|
| V <sub>DS</sub>      | Drain-Source Voltage                    | T <sub>C</sub> = 25 °C                            |      | - 60   | V      |
| V <sub>GS</sub>      | Gate-Source Voltage                     | T <sub>C</sub> = 25 °C                            | -    | ± 20   | V      |
| I <sub>D</sub> *     | Drain Current                           | T <sub>C</sub> = 25 °C, V <sub>GS</sub> = - 10 V  | -    | - 13   | A      |
|                      |                                         | T <sub>C</sub> = 100 °C, V <sub>GS</sub> = - 10 V |      | - 7.4  | A      |
| I <sub>DM</sub> *,** | Pulsed Source Current                   | T <sub>C</sub> = 25 °C, V <sub>GS</sub> = - 10 V  | -    | - 28.4 | A      |
| P <sub>tot</sub> *   | Total Power Dissipation                 | T <sub>C</sub> = 25 °C                            | -    | 9.6    | W      |
| T <sub>stg</sub>     | Storage Temperature                     |                                                   | - 55 | 150    | °C     |
| T <sub>J</sub>       | Junction Temperature                    |                                                   | -    | 150    | °C     |
| I <sub>S</sub>       | Diode Forward Current                   | T <sub>C</sub> = 25 °C                            | -    | - 13   | A      |
| E <sub>AS</sub> *    | Single Pulsed Avalanche Energy          | V <sub>DD</sub> = - 50 V, L = 1 mH                | -    | 52     | mJ     |
| R <sub>θJA</sub> *   | Thermal Resistance- Junction to Ambient |                                                   | -    | 70     | °C / W |
| R <sub>θJC</sub> *   | Thermal Resistance- Junction to Case    |                                                   | -    | 13     |        |

Notes :

- \* Surface Mounted on 1 in<sup>2</sup> pad area, t ≤ 10 sec
- \*\* Pulse width ≤ 300 μs, duty cycle ≤ 2 %
- \*\*\* limited by bonding wire

## 4. Marking Information

| Product Name | Marking                                                         |
|--------------|-----------------------------------------------------------------|
| N13P06Q      | <div>13P06</div> <div>YWWXXX</div> <div>YWWXXX: Date Code</div> |

## 5. Ordering Code

| Product Name | Package        | Reel Size | Tape width | Quantity | Note |
|--------------|----------------|-----------|------------|----------|------|
| N13P06Q      | PDFN3.3*3.3-8L |           |            | 5000     |      |

## 6. Electrical Characteristics (T<sub>A</sub> = 25 °C Unless Otherwise Noted)

| Symbol                                   | Parameter                        | Conditions                                                                                                                      | Min  | Typ | Max   | Unit |
|------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------|------|-----|-------|------|
| Static Characteristics                   |                                  |                                                                                                                                 |      |     |       |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> = 0 V, I <sub>D</sub> = - 250 μA                                                                                | - 60 | -   | -     | V    |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = - 250 μA                                                                  | - 1  | -   | - 2.5 | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Source Current | V <sub>DS</sub> = - 48 V, V <sub>GS</sub> = 0 V                                                                                 | -    | -   | 1     | μA   |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> = ± 20 V, V <sub>DS</sub> = 0 V                                                                                 | -    | -   | ± 100 | nA   |
| R <sub>DS(ON)</sub> <sup>a</sup>         | Drain-Source On-State Resistance | V <sub>GS</sub> = - 10 V, I <sub>D</sub> = - 5 A                                                                                | -    | 83  | 95    | m Ω  |
|                                          |                                  | V <sub>GS</sub> = - 4.5 V, I <sub>D</sub> = - 3 A                                                                               | -    | 105 | 120   |      |
| Diode Characteristics                    |                                  |                                                                                                                                 |      |     |       |      |
| V <sub>SD</sub> <sup>a</sup>             | Diode Forward Voltage            | I <sub>SD</sub> = - 5 A, V <sub>GS</sub> = 0 V                                                                                  | -    | -   | - 1.3 | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> = - 5 A, dI <sub>SD</sub> /dt = 100 A/μs                                                                        | -    | 15  | -     | nS   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                                                                 | -    | 13  | -     | nC   |
| Dynamic Characteristics <sup>b</sup>     |                                  |                                                                                                                                 |      |     |       |      |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = - 30 V<br>Frequency = 1 MHz                                                            | -    | 911 | -     | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                                 | -    | 44  | -     |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                                 | -    | 40  | -     |      |
| t <sub>d(on)</sub>                       | Turn-on Delay Time               | V <sub>DS</sub> = - 30 V, V <sub>GEN</sub> = - 10 V,<br>R <sub>G</sub> = 3.9 Ω, R <sub>L</sub> = 6 Ω,<br>I <sub>D</sub> = - 5 A | -    | 5.5 | -     | nS   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                                 | -    | 8.3 | -     |      |
| t <sub>d(off)</sub>                      | Turn-off Delay Time              |                                                                                                                                 | -    | 21  | -     |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                                 | -    | 10  | -     |      |
| Gate Charge Characteristics <sup>b</sup> |                                  |                                                                                                                                 |      |     |       |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>GS</sub> = - 10 V, V <sub>DS</sub> = - 30 V,<br>I <sub>DS</sub> = - 5 A                                                  | -    | 16  | -     | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                                 | -    | 4.3 | -     |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                                 | -    | 2.2 | -     |      |

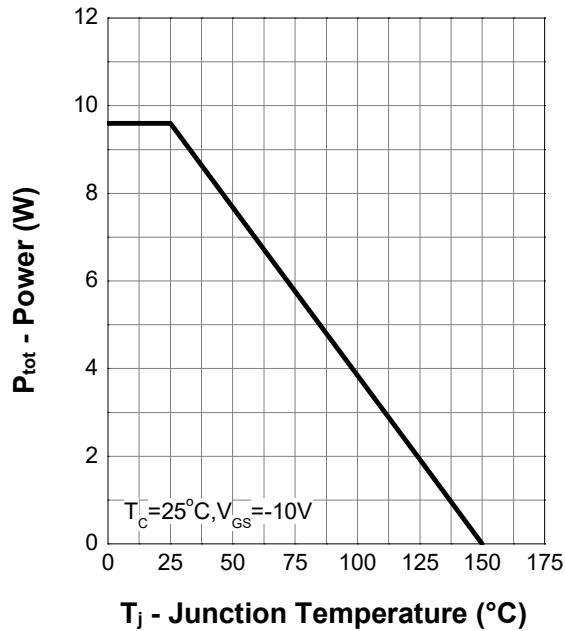
Notes :

a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

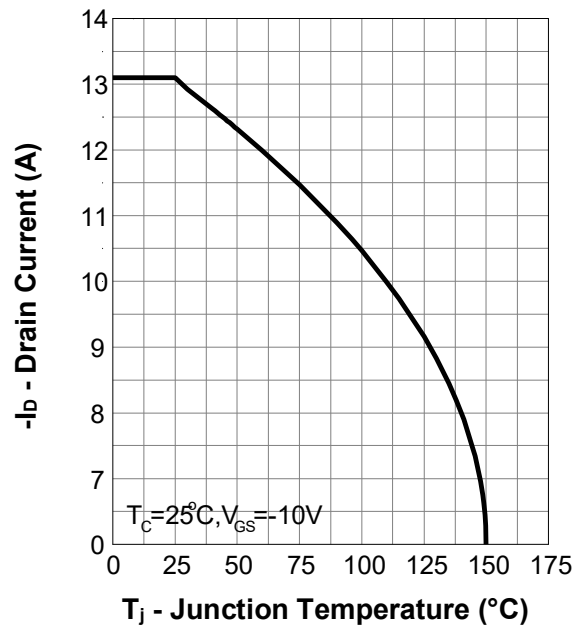
b : Guaranteed by design, not subject to production testing

## 7. Typical Characteristics (Cont.)

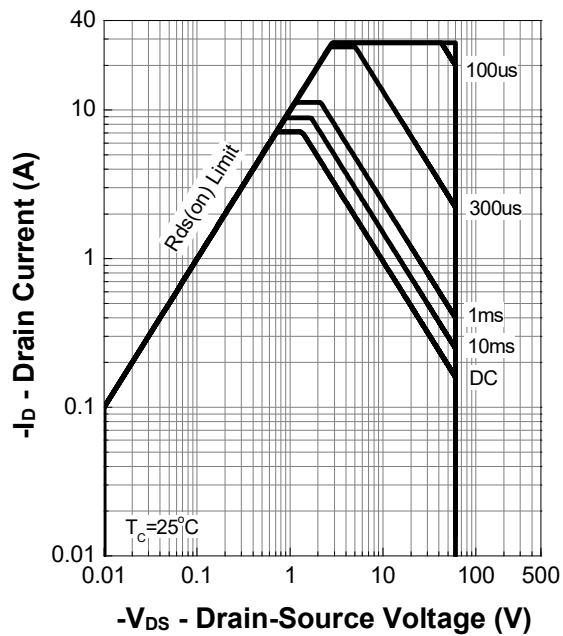
**Power Capability**



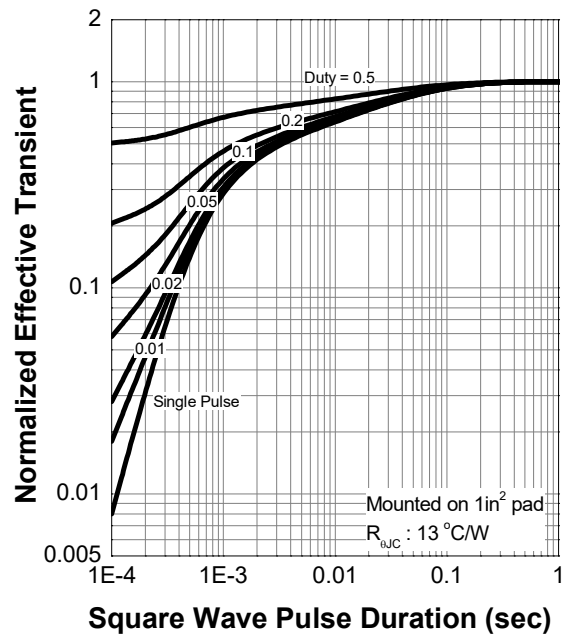
**Current Capability**



**Safe Operation Area**

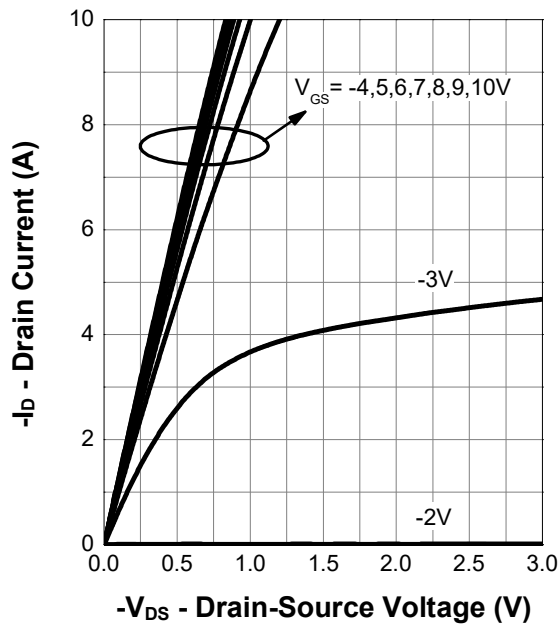


**Transient Thermal Impedance**

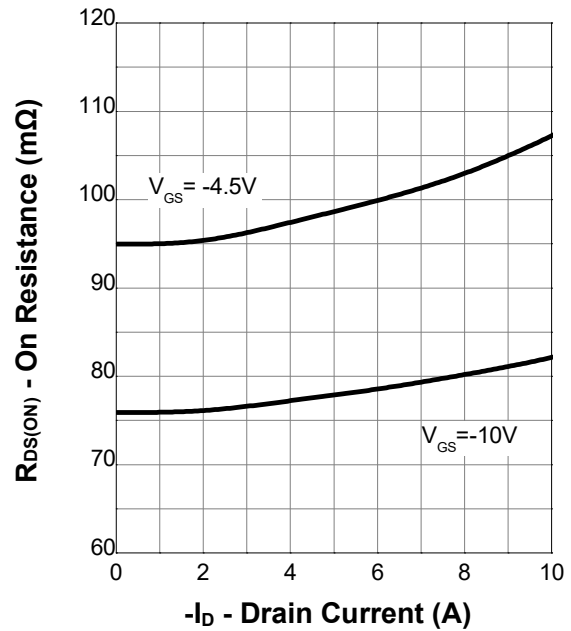


## 7. Typical Characteristics (Cont.)

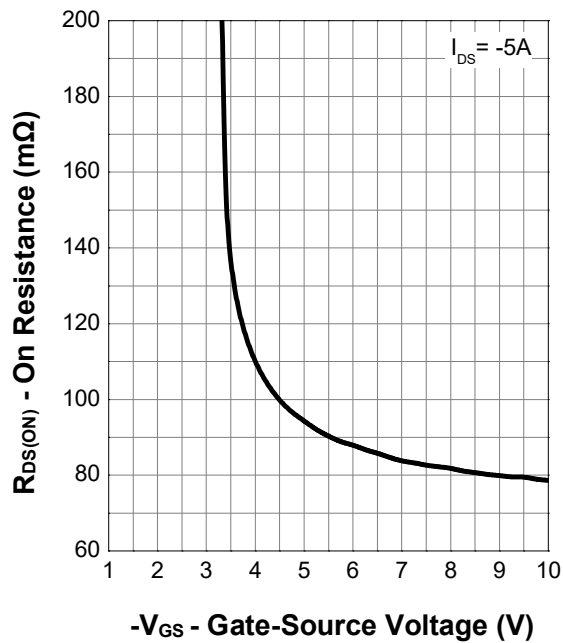
Output Characteristics



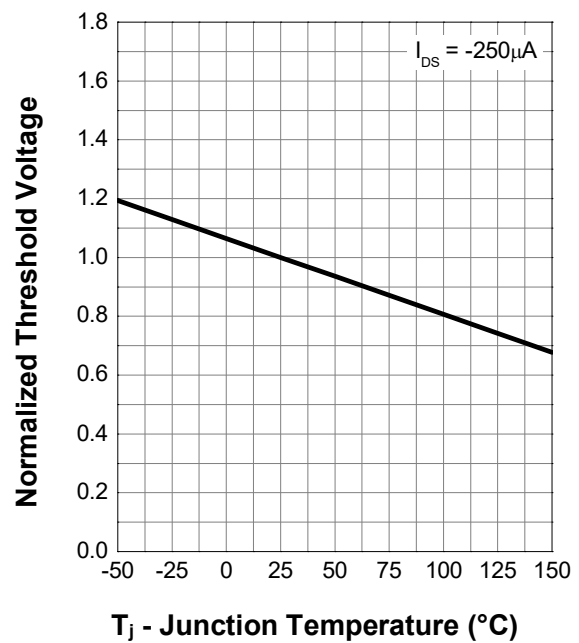
On Resistance



Transfer Characteristics

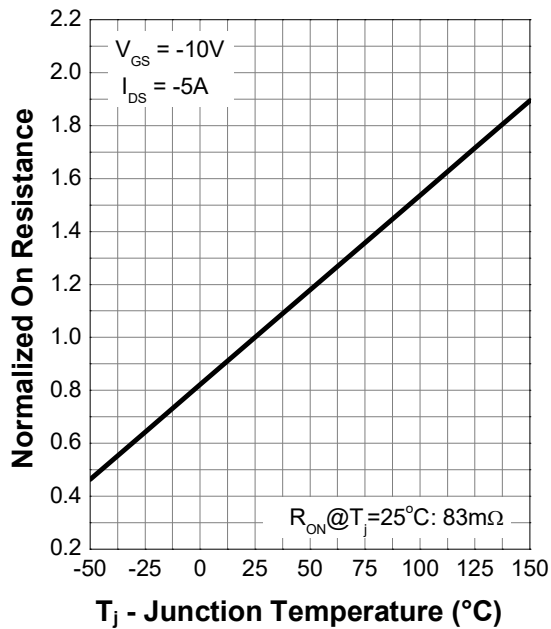


Normalized Threshold Voltage

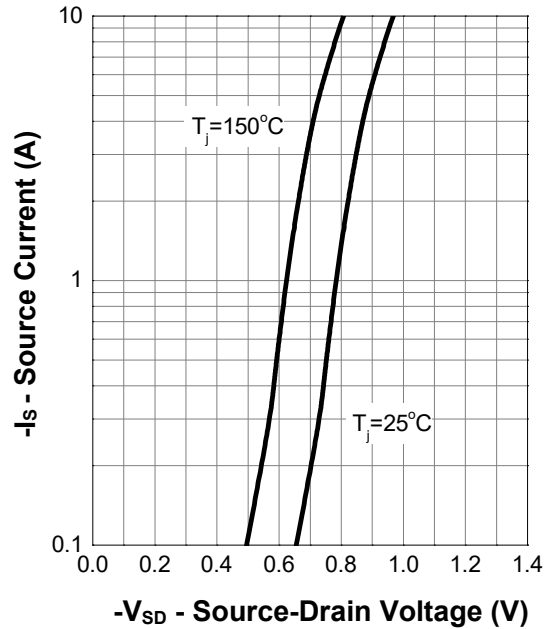


## 7. Typical Characteristics (Cont.)

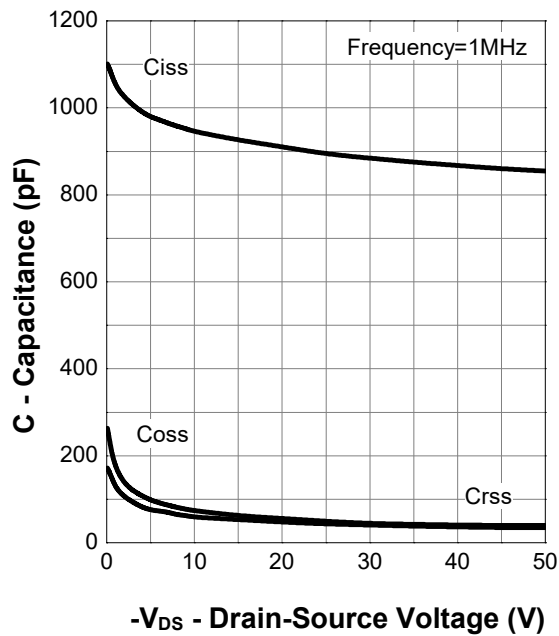
Normalized On Resistance



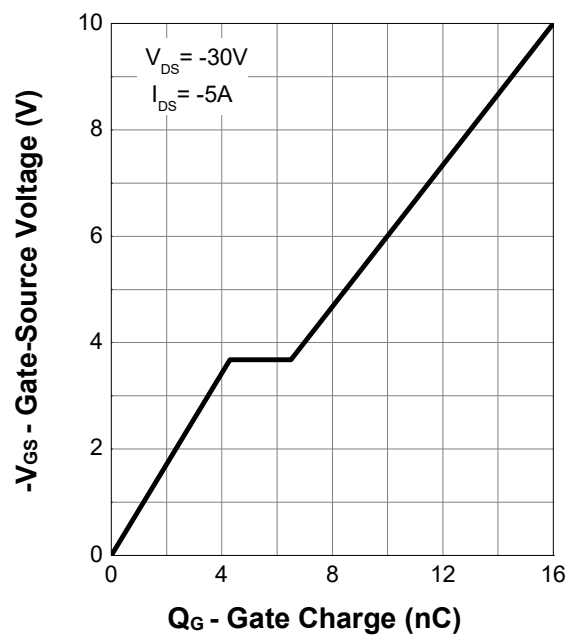
Diode Forward Current



Capacitance

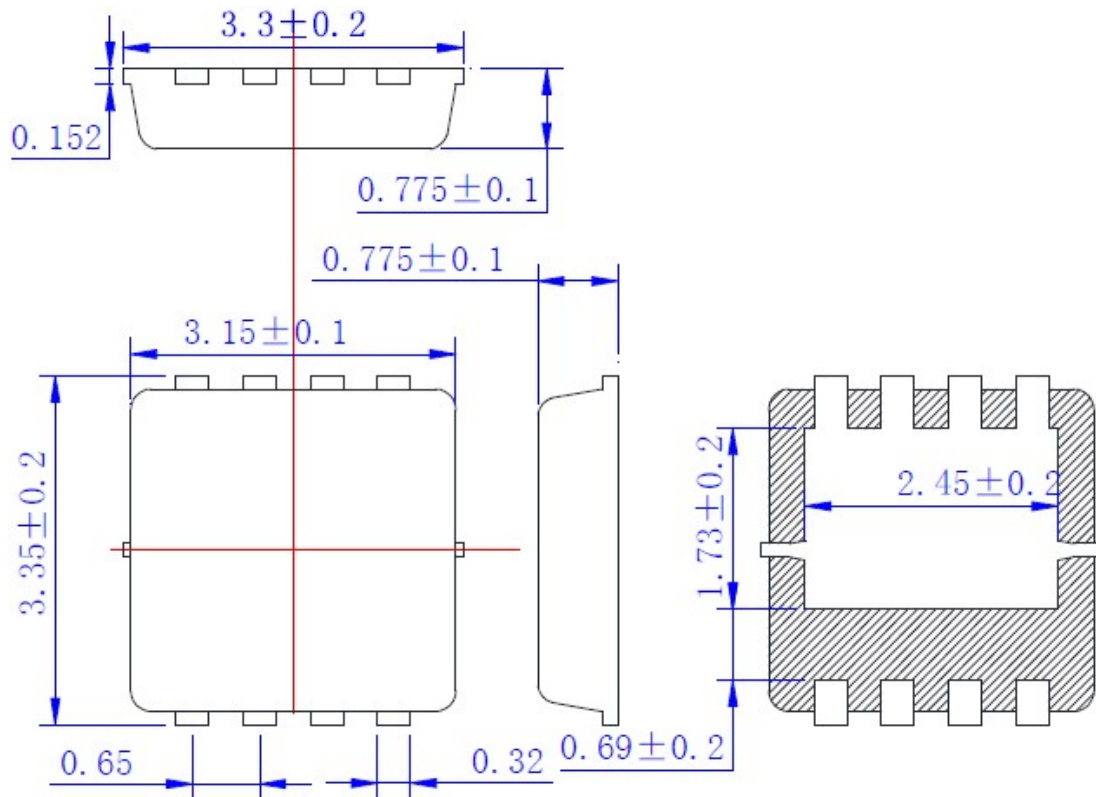


Gate Charge



## 8. Package Dimensions

PDFN3.3\*3.3 -8L



### NOTICE

JSMD reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to any product herein. JSMD does not assume any liability arising out of the application or use of any product described herein.