

## Dual N-Channel Enhancement Mode MOSFET

### 1. Product Information

#### 1.1 Features

- ☒ Surface-mounted package
- ☒ Low threshold voltage
- ☒ Source Down
- ☒ ESD protected

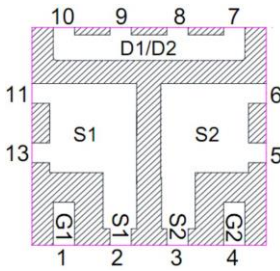
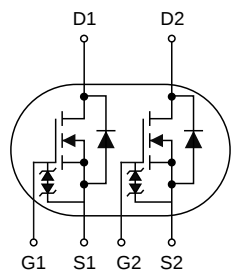
#### 1.2 Applications

- ☒ Motor drivers
- ☒ DC/DC Converter

#### 1.3 Quick reference

- ☒  $BV \geq 16\text{ V}$
- ☒  $R_{DS(ON)} \leq 2.0\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$
- ☒  $P_{tot} \leq 58\text{ W}$
- ☒  $R_{DS(ON)} \leq 2.2\text{ m}\Omega @ V_{GS} = 2.5\text{ V}$
- ☒  $I_D \leq 100\text{ A}$
- ☒  $R_{DS(ON)} \leq 2.5\text{ m}\Omega @ V_{GS} = 1.8\text{ V}$

### 2. Pin Description

| Pin      | Description      | Simplified Outline                                                                   | Symbol                                                                                |
|----------|------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1        | Gate 1           |  |  |
| 2,11,12  | Source 1         |                                                                                      |                                                                                       |
| 3,5,6    | Source 2         |                                                                                      |                                                                                       |
| 4        | Gate 2           |                                                                                      |                                                                                       |
| 7,8,9,10 | Drain 1/ Drain 2 |                                                                                      |                                                                                       |

TTFN13-3.3x3.3-13L

## 3. Limiting Values

| Symbol              | Parameter                              | Conditions                                    | Min | Max      | Unit                 |
|---------------------|----------------------------------------|-----------------------------------------------|-----|----------|----------------------|
| $V_{DS}$            | Drain-Source Voltage                   | $T_C=25^{\circ}\text{C}$                      | -   | 16       | V                    |
| $V_{GS}$            | Gate-Source Voltage                    | $T_C=25^{\circ}\text{C}$                      | -   | $\pm 10$ | V                    |
| $I_D^*$             | Drain Current (DC)                     | $T_C=25^{\circ}\text{C}, V_{GS}=10\text{ V}$  | -   | 100      | A                    |
|                     |                                        | $T_C=100^{\circ}\text{C}, V_{GS}=10\text{ V}$ | -   | 58       | A                    |
| $I_{DM}^{*,**,***}$ | Drain Current (Pulsed)                 | $T_C=25^{\circ}\text{C}, V_{GS}=10\text{ V}$  | -   | 144      | A                    |
| $P_{tot}^*$         | Total Power Dissipation                | $T_C=25^{\circ}\text{C}$                      | -   | 58       | W                    |
| $T_{stg}$           | Storage Temperature                    |                                               | -55 | 150      | $^{\circ}\text{C}$   |
| $T_J$               | Junction Temperature                   |                                               | -   | 150      | $^{\circ}\text{C}$   |
| $I_S$               | Diode Forward Current                  | $T_C=25^{\circ}\text{C}$                      | -   | 100      | A                    |
| $E_{AS}^*$          | Single Pulsed Avalanche Energy         | $V_{DD}=20\text{ V}, L=1.0\text{ mH}$         | -   | 388      | mJ                   |
| $R_{\theta JA}^*$   | Thermal Resistance-Junction to Ambient |                                               | -   | 60       | $^{\circ}\text{C/W}$ |
| $R_{\theta JC}^*$   | Thermal Resistance-Junction to Case    |                                               | -   | 6.8      | $^{\circ}\text{C/W}$ |

Notes:

- \* Surface Mounted on 1 in<sup>2</sup> pad area,  $t \leq 10\text{ sec}$
- \*\* Pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$
- \*\*\* Limited by bonding wire

## 4. Marking Information

| Product Name | Marking                                                     |
|--------------|-------------------------------------------------------------|
| KJ3316Q      | <div>3316</div> <div>YWWXXX</div> <div>YWW: Date Code</div> |

## 5. Ordering Code

| Product Name | Package               | Reel Size | Tape width | Quantity | Note |
|--------------|-----------------------|-----------|------------|----------|------|
| KJ3316Q      | TTFN13<br>3.3x3.3-13L | -         | -          | 5000     |      |

Note: KUAJIEXIN defines "Green" as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC/JEDEC J-STD-020C)

## 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>DS</sub> =250 μA                                                                          | 16  | -    | -    | V    |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage         | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250 μA                                                             | 0.5 | -    | 1.0  | V    |
| I <sub>DSS</sub>                         | Drain Leakage Current          | V <sub>DS</sub> =16 V, V <sub>GS</sub> =0 V                                                                            | -   | -    | 1    | uA   |
| I <sub>GSS</sub>                         | Gate Leakage Current           | V <sub>GS</sub> =±10 V, V <sub>DS</sub> =0 V                                                                           | -   | -    | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>a</sup>         | On-State Resistance            | V <sub>GS</sub> =4.5 V, I <sub>DS</sub> =20 A                                                                          | -   | 1.8  | 2.0  | mΩ   |
|                                          |                                | V <sub>GS</sub> =2.5 V, I <sub>DS</sub> =15 A                                                                          | -   | 1.9  | 2.2  |      |
|                                          |                                | V <sub>GS</sub> =1.8 V, I <sub>DS</sub> =15 A                                                                          | -   | 2.2  | 2.5  |      |
| Diode Characteristics                    |                                |                                                                                                                        |     |      |      |      |
| V <sub>SD</sub> <sup>a</sup>             | Diode Forward Voltage          | I <sub>SD</sub> =10 A, V <sub>GS</sub> =0 V                                                                            | -   | -    | 1.1  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time          | I <sub>DS</sub> =10 A,<br>dI <sub>SD</sub> /dt=100 A/μs                                                                | -   | 37   | -    | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge        |                                                                                                                        | -   | 27   | -    | nC   |
| Dynamic Characteristics <sup>b</sup>     |                                |                                                                                                                        |     |      |      |      |
| C <sub>iss</sub>                         | Input Capacitance              | V <sub>GS</sub> =0 V, V <sub>DS</sub> =10 V<br>Frequency=1 MHz                                                         | -   | 3364 | -    | pF   |
| C <sub>oss</sub>                         | Output Capacitance             |                                                                                                                        | -   | 536  | -    |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance   |                                                                                                                        | -   | 42   | -    |      |
| t <sub>d(on)</sub>                       | Turn-on Delay Time             | V <sub>DS</sub> =10 V, V <sub>GEN</sub> =10 V,<br>R <sub>G</sub> =3.9 Ω, R <sub>L</sub> =1 Ω,<br>I <sub>DS</sub> =10 A | -   | 8.3  | -    | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time              |                                                                                                                        | -   | 41   | -    |      |
| t <sub>d(off)</sub>                      | Turn-off Delay Time            |                                                                                                                        | -   | 99   | -    |      |
| t <sub>f</sub>                           | Turn-off Fall Time             |                                                                                                                        | -   | 51   | -    |      |
| Gate Charge Characteristics <sup>b</sup> |                                |                                                                                                                        |     |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge              | V <sub>GS</sub> =4.5 V, V <sub>DS</sub> =10 V,<br>I <sub>DS</sub> =10 A                                                | -   | 41   | -    | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge             |                                                                                                                        | -   | 9.5  | -    |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge              |                                                                                                                        | -   | 12   | -    |      |

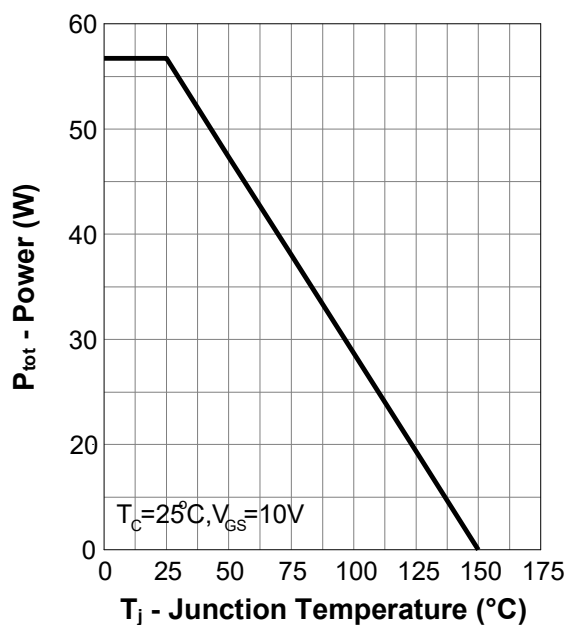
Notes:

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

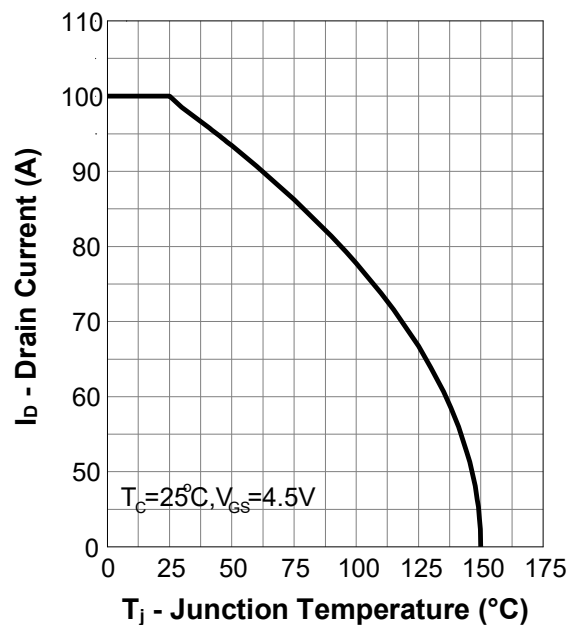
b: Guaranteed by design, not subject to production testing

## 7. Typical Characteristics

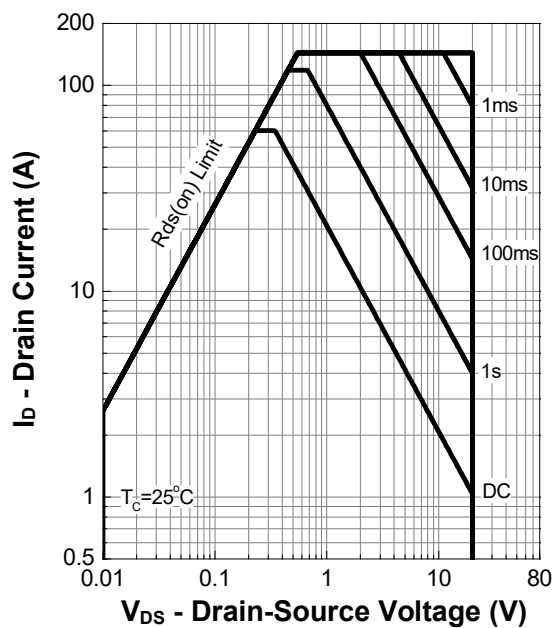
**Power Capability**



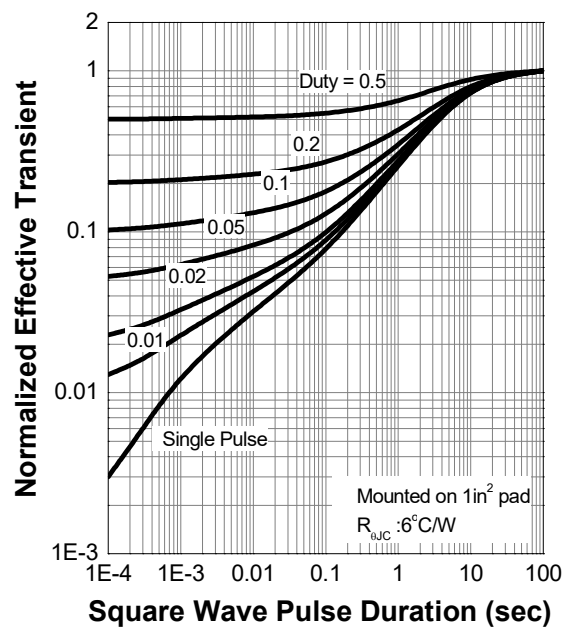
**Current Capability**



**Safe Operation Area**

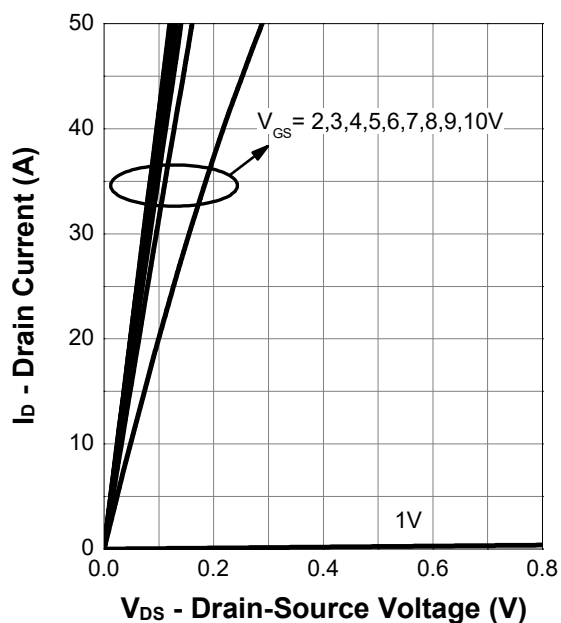


**Transient Thermal Impedance**

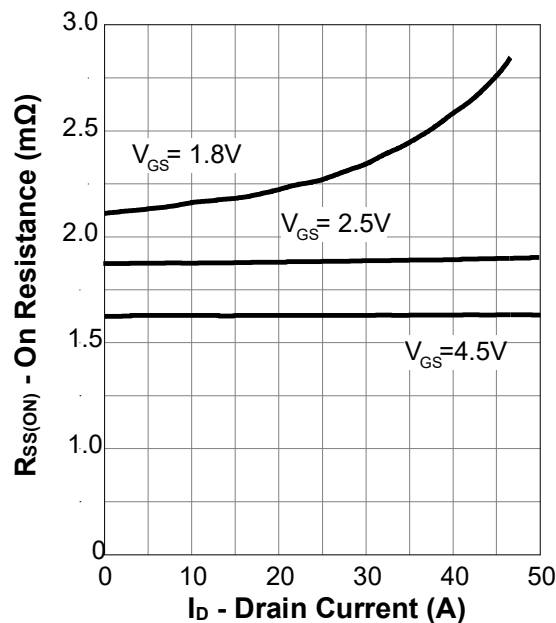


## 7. Typical Characteristics (cont.)

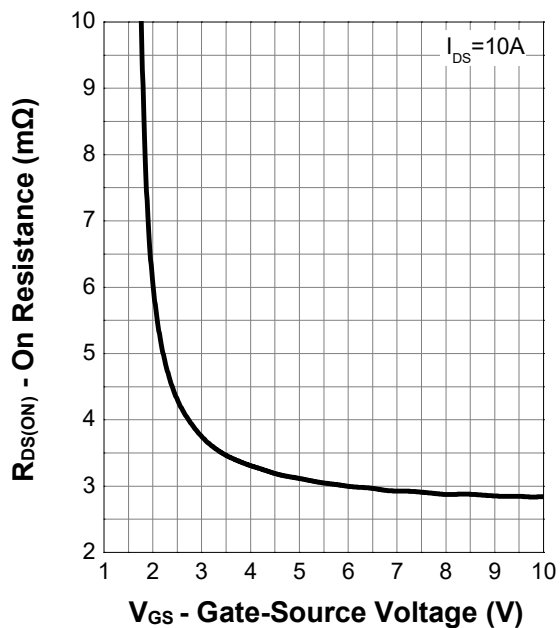
Output Characteristics



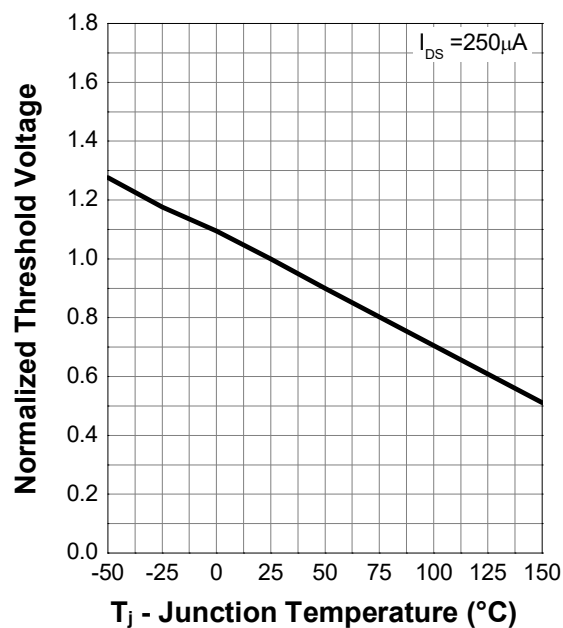
On Resistance



Transfer Characteristics

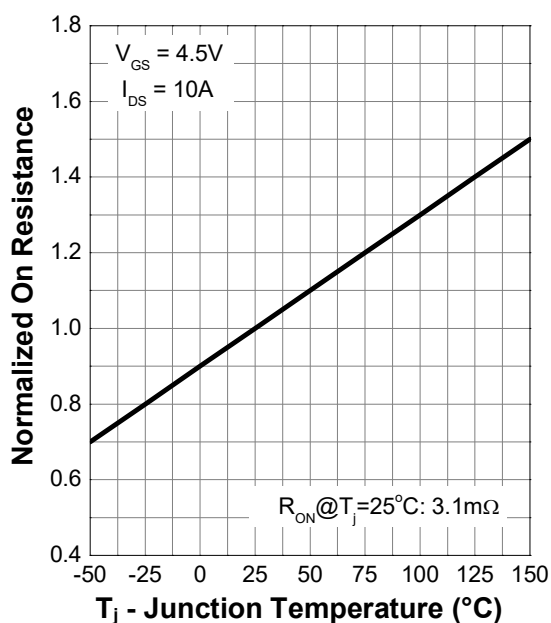


Normalized Threshold Voltage

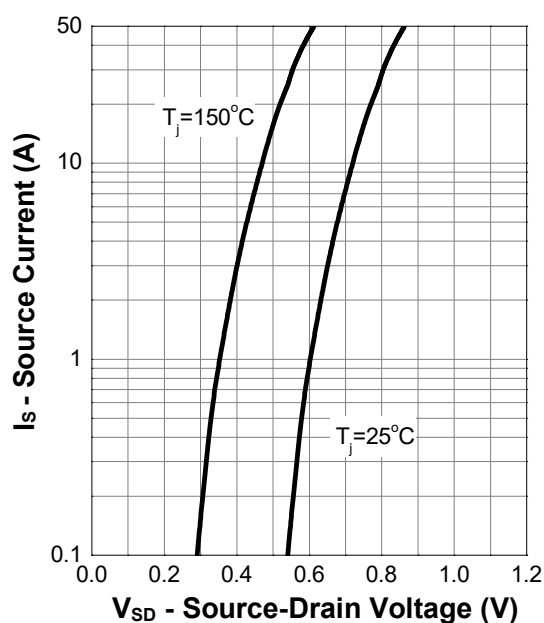


## 7. Typical Characteristics (cont.)

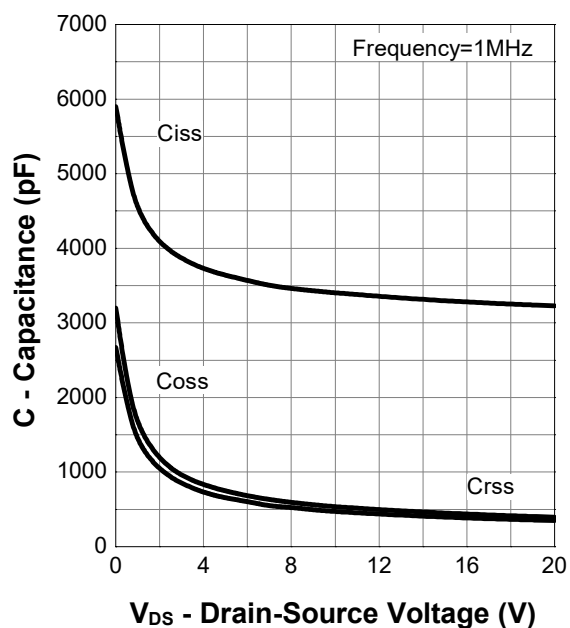
Normalized On Resistance



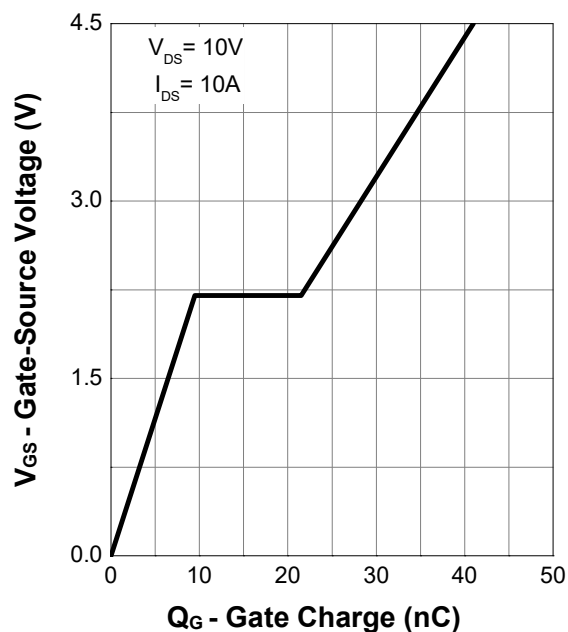
Diode Forward Current



Capacitance

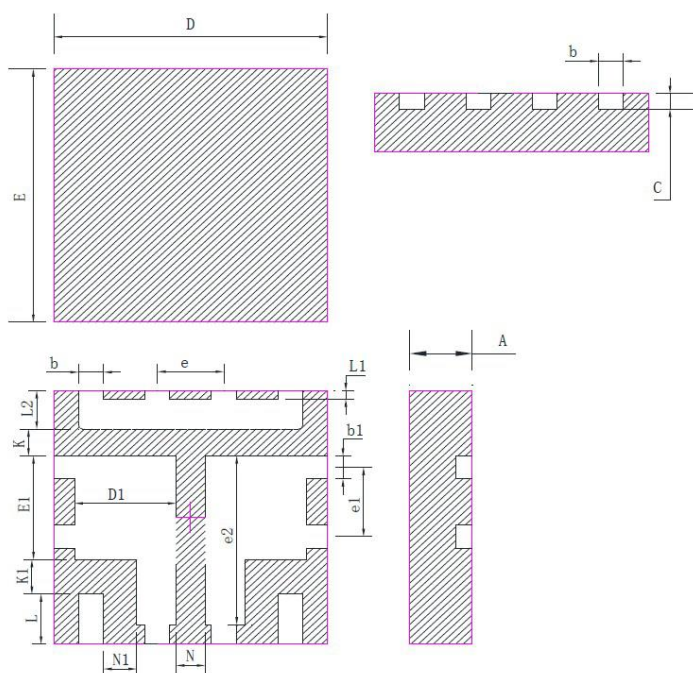


Gate Charge



## 8. Package Dimensions

TTFN13-3.3x3.3-13L



| Symbol | Dimensions in Millimeters |      |
|--------|---------------------------|------|
|        | MIN.                      | MAX. |
| A      | 0.70                      | 0.80 |
| b      | 0.20                      | 0.40 |
| b1     | 0.20                      | 0.40 |
| c      | 0.18                      | 0.25 |
| D      | 3.20                      | 3.40 |
| D1     | 1.12                      | 1.32 |
| E      | 3.20                      | 3.40 |
| E1     | 1.25                      | 1.45 |
| E2     | 2.10                      | 2.30 |
| e      | 0.70                      | 0.90 |
| e1     | 0.80                      | 1.00 |
| K      | 0.25                      | 0.45 |
| K1     | 0.35                      | 0.55 |
| L      | 0.55                      | 0.75 |
| L1     | 0.10                      | 0.30 |
| L2     | 0.40                      | 0.60 |
| N      | 0.25                      | 0.45 |
| N1     | 0.30                      | 0.50 |