

#### General Description

The TF060N03M uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

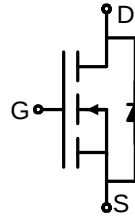
#### Features

- Advance device constructure
- Low  $R_{DS(ON)}$  to minimize conduction loss
- Low Gate Charge for fast switching
- Low Thermal resistance

#### Application

Synchronous Rectification for AC-DC/DC-DC converter  
Power Tools

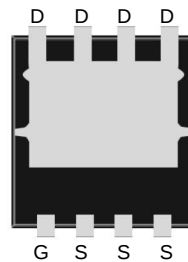
#### Product Summary



$$V_{DS}=30V \quad I_D=55A$$

$$R_{DS(ON)}(10V \text{ typ})=5.9m\Omega$$

$$R_{DS(ON)}(4.5V \text{ typ})=7.8m\Omega$$



PDFN3333-8L

#### Package Marking and Ordering Information:

|                           |                                                  |
|---------------------------|--------------------------------------------------|
| Part NO.                  | TF060N03M                                        |
| Marking1                  | TF060N03M                                        |
| Marking2                  | TF:tuofeng; Y:year code; X:Week; AA:device code; |
| Basic ordering unit (pcs) | 5000                                             |

#### Absolute Maximum Ratings ( $T_C = 25^\circ C$ )

| Parameter                      | Symbol                 | Rating     | Unit       |
|--------------------------------|------------------------|------------|------------|
| Drain-Source Voltage           | $V_{DS}$               | 30         | V          |
| Gate-Source Voltage            | $V_{GS}$               | $\pm 20$   | V          |
| Continuous Drain Current       | $I_{D@TC=25^\circ C}$  | 55         | A          |
|                                | $I_{D@TC=75^\circ C}$  | 40         | A          |
|                                | $I_{D@TC=100^\circ C}$ | 35         | A          |
| Pulsed Drain Current ①         | $I_{DM}$               | 150        | A          |
| Total Power Dissipation        | $P_D@TC=25^\circ C$    | 25         | W          |
| Total Power Dissipation        | $P_D@TA=25^\circ C$    | 2.0        | W          |
| Operating Junction Temperature | $T_J$                  | -55 to 150 | $^\circ C$ |
| Storage Temperature            | $T_{STG}$              | -55 to 150 | $^\circ C$ |
| Single Pulse Avalanche Energy  | $E_{AS}$               | 85         | mJ         |

●Thermal resistance

| Parameter                                    | Symbol     | Min. | Typ. | Max. | Unit  |
|----------------------------------------------|------------|------|------|------|-------|
| Thermal resistance, junction - case          | $R_{thJC}$ | -    | -    | 5.5  | ° C/W |
| Thermal resistance, junction - ambient       | $R_{thJA}$ | -    | -    | 60   | ° C/W |
| Soldering temperature, wavesoldering for 8 s | $T_{sold}$ | -    | -    | 265  | ° C   |

●Electronic Characteristics

| Parameter                         | Symbol       | Condition                         | Min. | Typ  | Max.      | Unit       |
|-----------------------------------|--------------|-----------------------------------|------|------|-----------|------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$     | 30   | -    | -         | V          |
| Gate Threshold Voltage            | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 250\mu A$ | 1.1  | 1.5  | 2.1       | V          |
| Drain-Source Leakage Current      | $I_{DSS}$    | $V_{DS} = 30V, V_{GS} = 0V$       | -    | -    | 1.0       | $\mu A$    |
| Gate- Source Leakage Current      | $I_{GSS}$    | $V_{GS} = \pm 20V, V_{DS} = 0V$   | -    | -    | $\pm 100$ | nA         |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS} = 10V, I_D = 20A$         | -    | 5.9  | 7.0       | m $\Omega$ |
|                                   |              | $V_{GS} = 4.5V, I_D = 20A$        | -    | 7.8  | 11        | m $\Omega$ |
| Forward Transconductance          | $g_{FS}$     | $V_{DS} = 25V, I_D = 20A$         | -    | 20   | -         | S          |
| Source-drain voltage              | $V_{SD}$     | $I_S = 20A$                       | -    | 0.84 | 1.20      | V          |

●Electronic Characteristics

| Parameter                    | Symbol    | Condition                                     | Min. | Typ  | Max. | Unit |
|------------------------------|-----------|-----------------------------------------------|------|------|------|------|
| Input capacitance            | $C_{iss}$ | $f = 1MHz$<br>$V_{DS} = 15V$<br>$V_{GS} = 0V$ | -    | 1400 | -    | pF   |
| Output capacitance           | $C_{oss}$ |                                               | -    | 205  | -    |      |
| Reverse transfer capacitance | $C_{rss}$ |                                               | -    | 177  | -    |      |

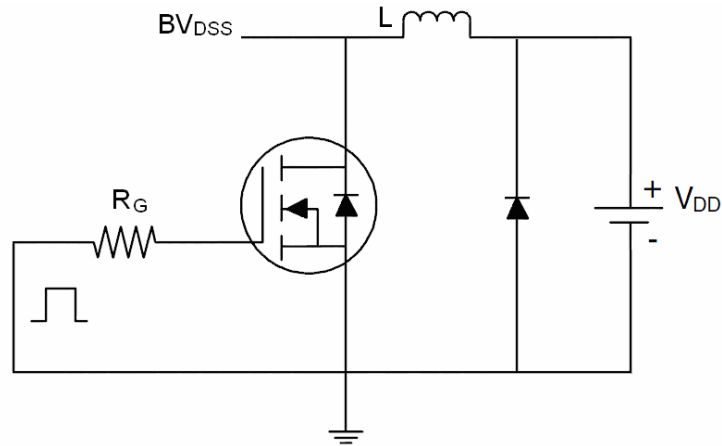
●Gate Charge characteristics( $T_a = 25^\circ C$ )

| Parameter            | Symbol   | Condition      | Min. | Typ  | Max. | Unit |
|----------------------|----------|----------------|------|------|------|------|
| Total gate charge    | $Q_g$    | $V_{DD} = 15V$ | -    | 32.3 | -    | nC   |
| Gate - Source charge | $Q_{gs}$ | $I_D = 20A$    | -    | 4.9  | -    |      |
| Gate - Drain charge  | $Q_{gd}$ | $V_{GS} = 10V$ | -    | 6.9  | -    |      |

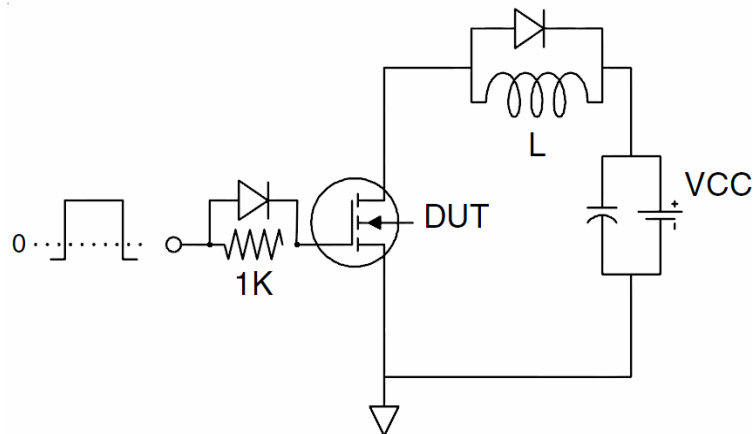
Note: ① Pulse Test : Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$  ;

## Test Circuit

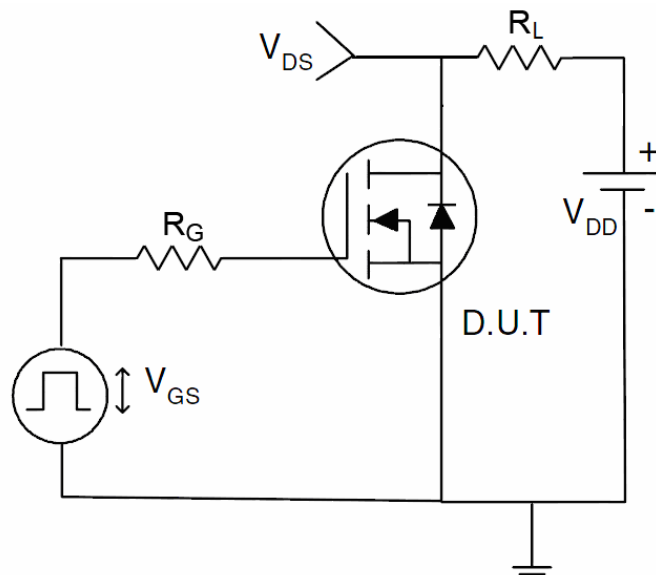
### 1) $E_{AS}$ test Circuit



### 2) Gate charge test Circuit



### 3) Switch Time Test Circuit



### Typical Electrical and Thermal Characteristics

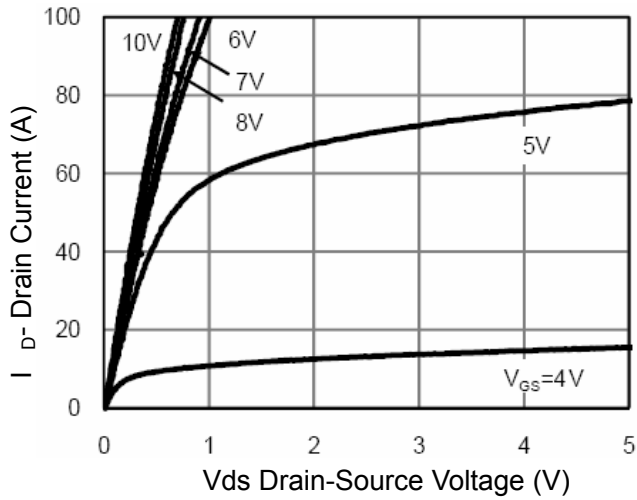


Figure 1 Output Characteristics

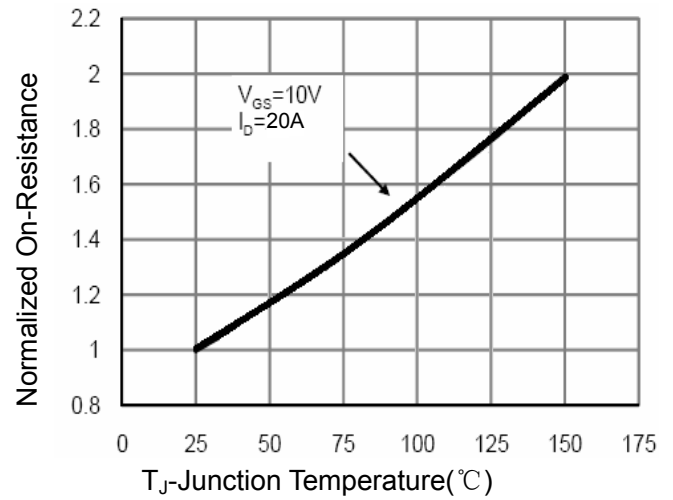


Figure 4  $R_{DS(on)}$ -Junction Temperature

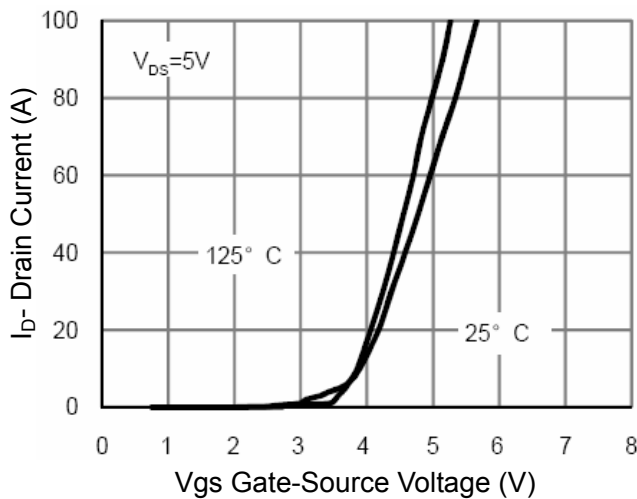


Figure 2 Transfer Characteristics

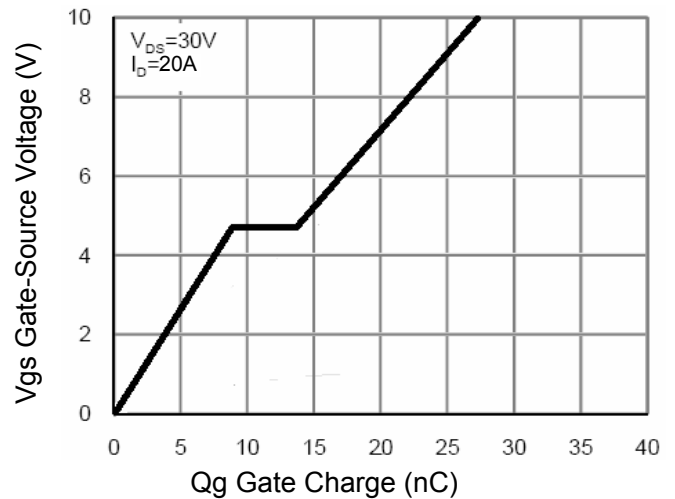


Figure 5 Gate Charge

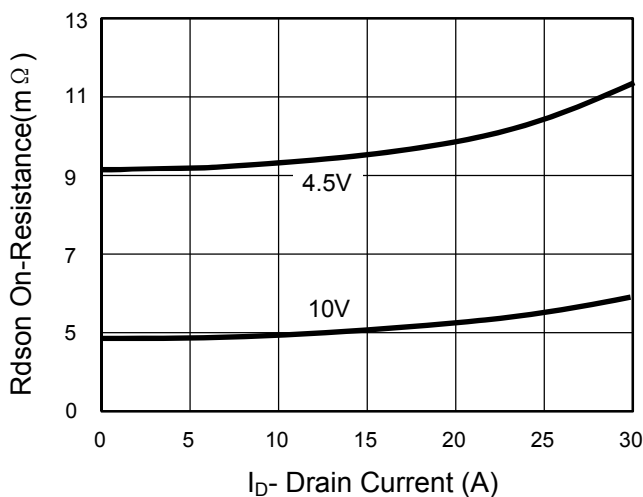


Figure 3  $R_{DS(on)}$ - Drain Current

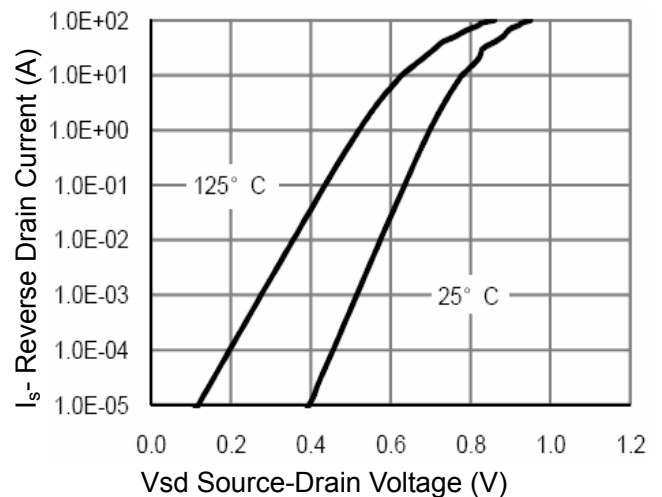


Figure 6 Source- Drain Diode Forward

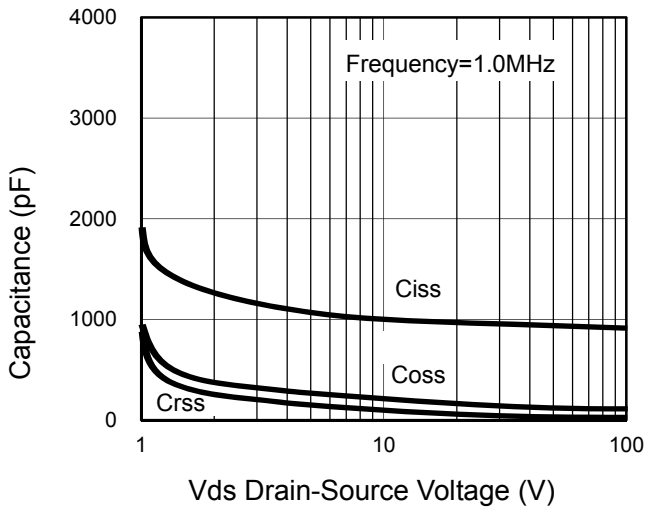


Figure 7 Capacitance vs Vds

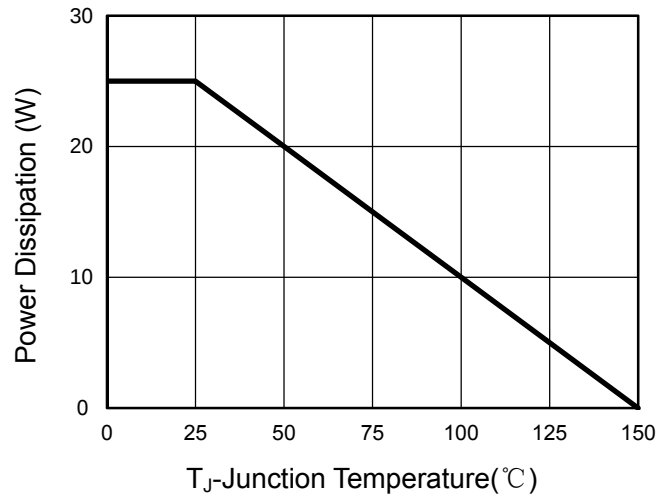


Figure 9 Power De-rating

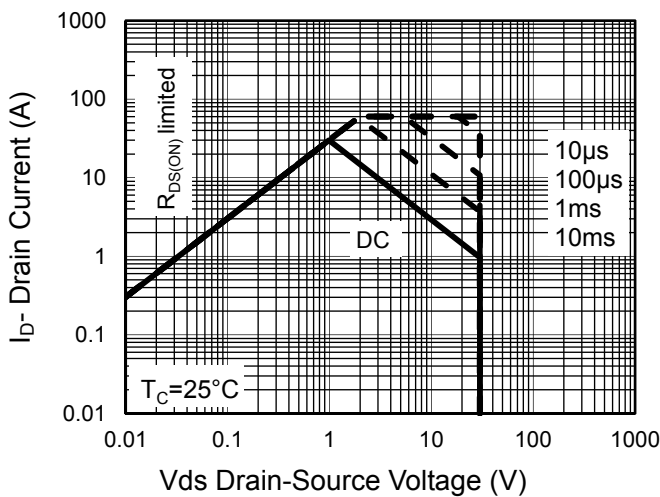


Figure 8 Safe Operation Area

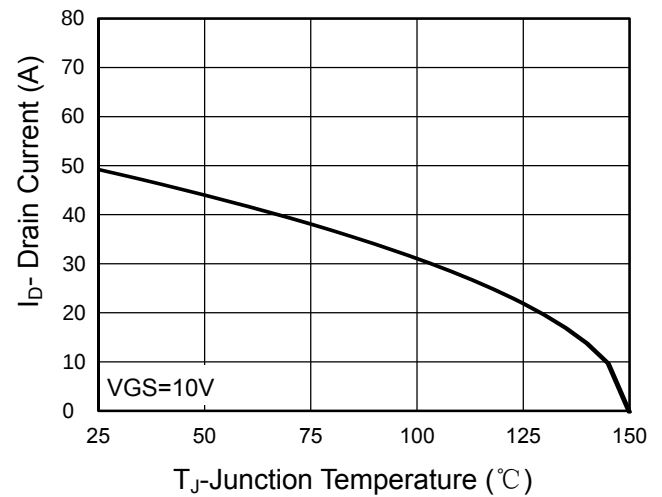


Figure 10 Current De-rating

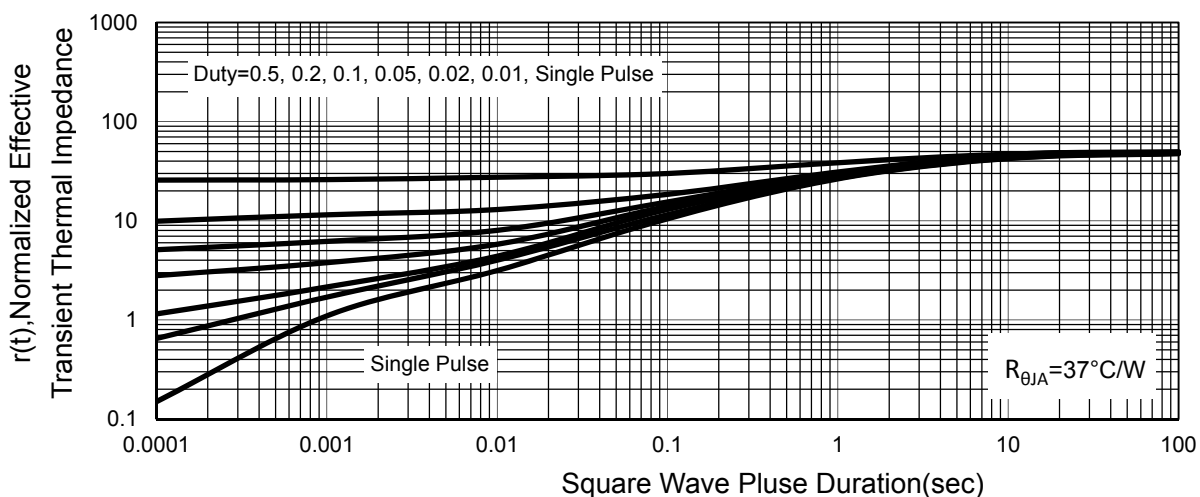
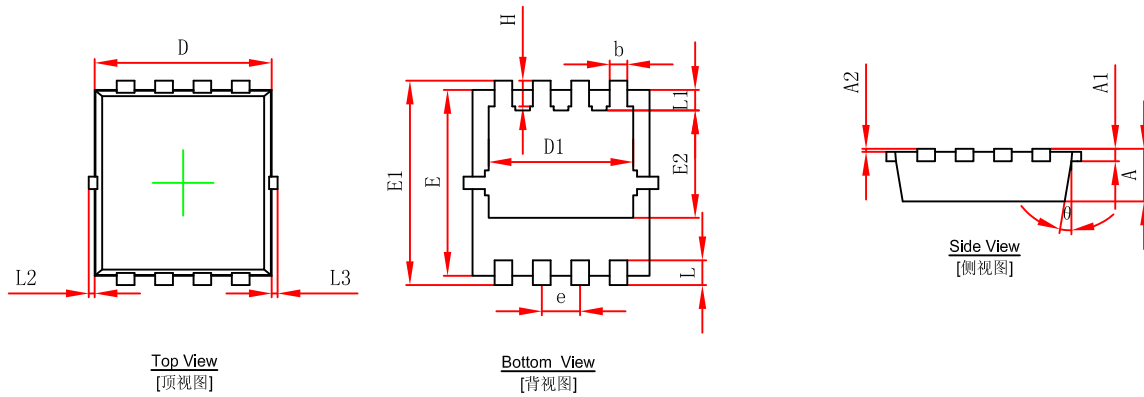


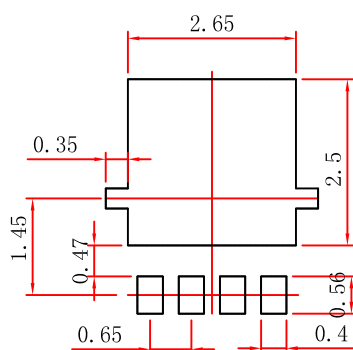
Figure 11 Normalized Maximum Transient Thermal Impedance

## PDFN3333-8L Package Outline Dimensions



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 0.650                     | 0.850 | 0.026                | 0.033 |
| A1     | 0.152 REF.                |       | 0.006 REF.           |       |
| A2     | 0~0.05                    |       | 0~0.002              |       |
| D      | 2.900                     | 3.100 | 0.114                | 0.122 |
| D1     | 2.300                     | 2.600 | 0.091                | 0.102 |
| E      | 2.900                     | 3.100 | 0.114                | 0.122 |
| E1     | 3.150                     | 3.450 | 0.124                | 0.136 |
| E2     | 1.535                     | 1.935 | 0.060                | 0.076 |
| b      | 0.200                     | 0.400 | 0.008                | 0.016 |
| e      | 0.550                     | 0.750 | 0.022                | 0.030 |
| L      | 0.300                     | 0.500 | 0.012                | 0.020 |
| L1     | 0.180                     | 0.480 | 0.007                | 0.019 |
| L2     | 0~0.100                   |       | 0~0.004              |       |
| L3     | 0~0.100                   |       | 0~0.004              |       |
| H      | 0.315                     | 0.515 | 0.012                | 0.020 |
| θ      | 9°                        | 13°   | 9°                   | 13°   |

## PDFN3333-8L Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.