

### General Description

The TF070P03M combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ .

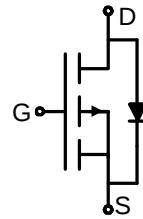
### Features

Advance high cell density Trench technology  
Low  $R_{DS(ON)}$  to minimize conductive loss  
Low Gate Charge for fast switching  
Low Thermal resistance

### Application

MB/VGA Vcore  
SMPS 2<sup>nd</sup> Synchronous Rectifier  
POL application  
BLDC Motor driver

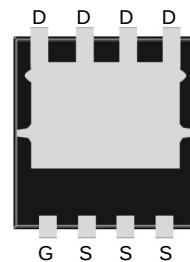
### Product Summary



$$V_{DS} = -30V \quad I_D = -60A$$

$$R_{DS(ON)}(-10V \text{ typ}) = 7.5m\Omega$$

$$R_{DS(ON)}(-4.5V \text{ typ}) = 11m\Omega$$



PDFN3333-8L

### Ordering Information:

|                           |                                                  |
|---------------------------|--------------------------------------------------|
| Part NO.                  | TF070P03M                                        |
| Marking1                  | 070P03M                                          |
| 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             | $I_{D@T_C=25^\circ C}$  | -60        | A          |
|                                      | $I_{D@T_C=75^\circ C}$  | -42        | A          |
|                                      | $I_{D@T_C=100^\circ C}$ | -36        | A          |
| Pulsed Drain Current <sup>①</sup>    | $I_{DM}$                | -180       | A          |
| Total Power Dissipation <sup>②</sup> | $P_D@T_C=25^\circ C$    | 50         | W          |
| Total Power Dissipation              | $P_D@T_A=25^\circ C$    | 2.0        | W          |
| Operating Junction Temperature       | $T_J$                   | -55 to 150 | $^\circ C$ |
| Storage Temperature                  | $T_{STG}$               | -55 to 150 | $^\circ C$ |

•Thermal resistance

| Parameter                                        | Symbol            | Min. | Typ. | Max. | Unit  |
|--------------------------------------------------|-------------------|------|------|------|-------|
| Thermal resistance, junction - case <sup>②</sup> | R <sub>thJC</sub> | -    | -    | 3.5  | ° C/W |
| Thermal resistance, junction - ambient           | R <sub>thJA</sub> | -    | -    | 50   | ° C/W |
| Soldering temperature, wavesoldering for 8s      | T <sub>sold</sub> | -    | -    | 265  | ° C   |

•Electronic Characteristics

| Parameter                         | Symbol              | Condition                                                   | Min. | Typ  | Max. | Unit |
|-----------------------------------|---------------------|-------------------------------------------------------------|------|------|------|------|
| Drain-Source Breakdown Voltage    | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250uA               | -30  |      |      | V    |
| Gate Threshold Voltage            | V <sub>GS(TH)</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250uA | -1.0 | -1.5 | -2.0 | V    |
| Drain-Source Leakage Current      | I <sub>DSS</sub>    | V <sub>DS</sub> = -28V, V <sub>GS</sub> = 0V                |      |      | -1.0 | uA   |
| Gate- Source Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V                |      |      | ±100 | nA   |
| Static Drain-source On Resistance | R <sub>DS(ON)</sub> | V <sub>GS</sub> = -10V, I <sub>D</sub> = -20A               |      | 7.5  | 9.0  | mΩ   |
|                                   |                     | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -15A              |      | 11   | 14   | mΩ   |
| Forward Transconductance          | g <sub>FS</sub>     | V <sub>DS</sub> = -10V, I <sub>D</sub> = -10A               |      | 12   |      | S    |
| Source-drain voltage              | V <sub>SD</sub>     | I <sub>S</sub> = -20A                                       |      | 0.85 | 1.00 | V    |

•Electronic Characteristics

| Parameter                    | Symbol           | Condition                                                  | Min. | Typ  | Max. | Unit |
|------------------------------|------------------|------------------------------------------------------------|------|------|------|------|
| Input capacitance            | C <sub>iss</sub> | f = 1MHz<br>V <sub>DD</sub> = -30V<br>V <sub>GS</sub> = 0V | -    | 2497 | -    | pF   |
| Output capacitance           | C <sub>oss</sub> |                                                            | -    | 240  | -    |      |
| Reverse transfer capacitance | C <sub>rss</sub> |                                                            | -    | 230  | -    |      |

•Gate Charge characteristics(T<sub>a</sub> = 25°C)

| Parameter            | Symbol              | Condition                                                                                          | Min. | Typ  | Max. | Unit |
|----------------------|---------------------|----------------------------------------------------------------------------------------------------|------|------|------|------|
| Total gate charge    | Q <sub>g</sub>      | V <sub>DD</sub> = -15V<br>I <sub>D</sub> = -20A<br>V <sub>GS</sub> = -10V                          | -    | 32.0 | -    | nC   |
| Gate - Source charge | Q <sub>gs</sub>     |                                                                                                    | -    | 6.60 | -    |      |
| Gate - Drain charge  | Q <sub>gd</sub>     |                                                                                                    | -    | 8.00 | -    |      |
| Turn-On Delay Time   | t <sub>d(on)</sub>  | V <sub>GS</sub> = -10V<br>V <sub>DD</sub> = -15V<br>R <sub>L</sub> = 3.0Ω<br>I <sub>D</sub> = -30A | -    | 14.0 | -    | nS   |
| Turn-On Rise Time    | t <sub>r</sub>      |                                                                                                    | -    | 20.0 | -    |      |
| Turn-Off Delay Time  | t <sub>d(off)</sub> |                                                                                                    | -    | 56.0 | -    |      |
| Turn-Off Fall Time   | t <sub>f</sub>      |                                                                                                    | -    | 48.0 | -    |      |

Note:

① Pulse Test : Pulse width ≤ 300μs, Duty cycle ≤ 2% ;

Device mounted on FR-4 substrate PC board, 2oz copper, with thermal bias to bottom layer 1inch square copper plate;

## P- Channel Typical Characteristics

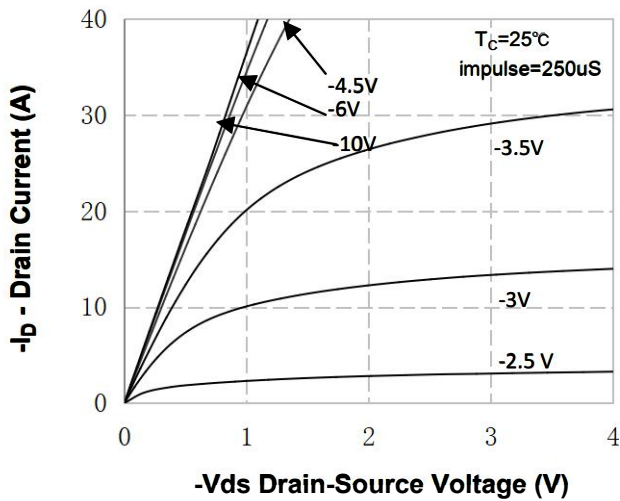


Figure 1. On-Region Characteristics

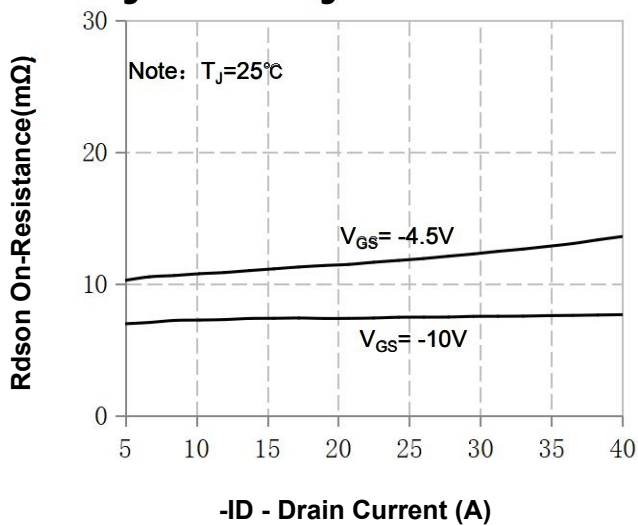


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

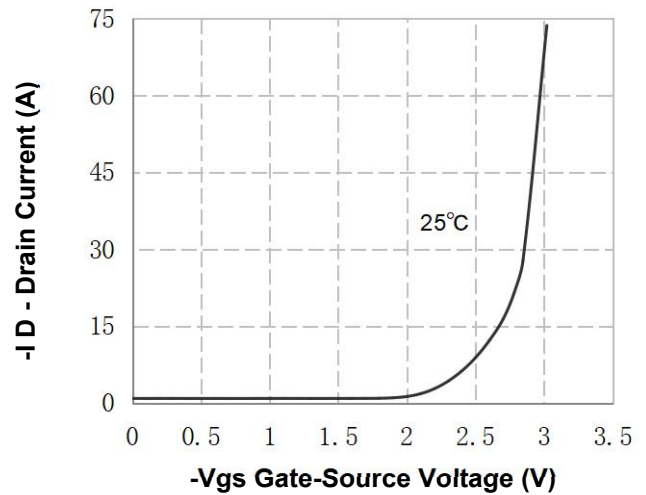


Figure 2. Transfer Characteristics

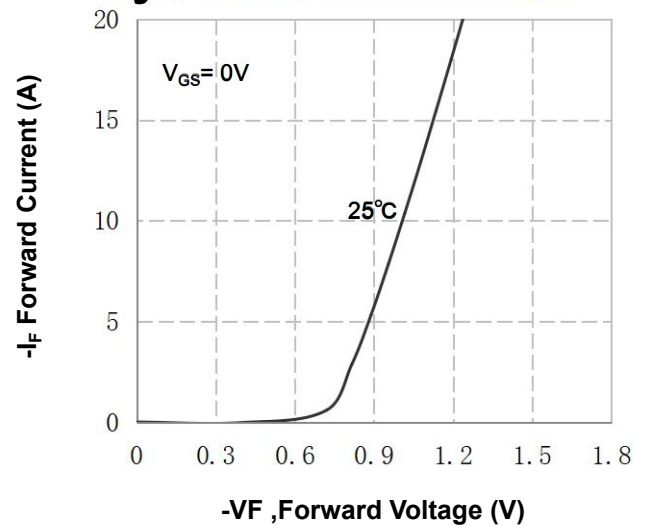


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

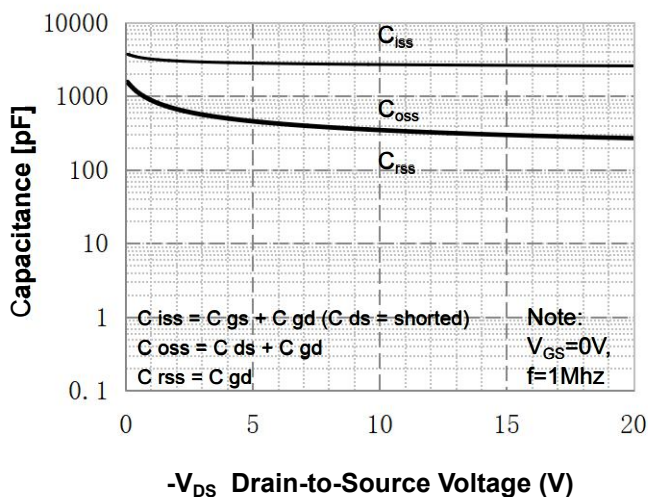


Figure 5. Capacitance Characteristics

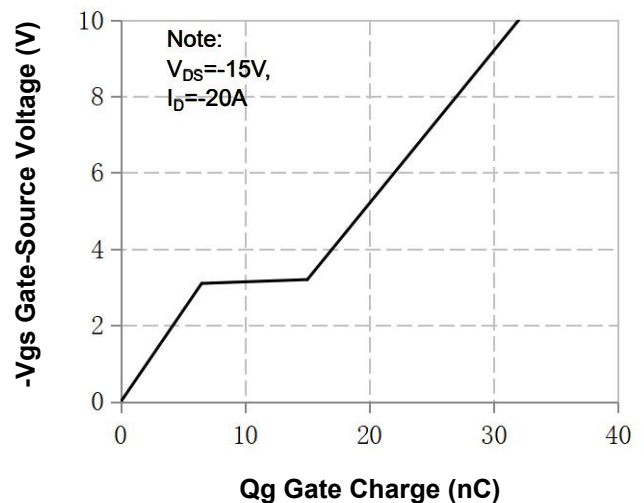


Figure 6. Gate Charge Characteristics

P- Channel Typical Characteristics (Continued)

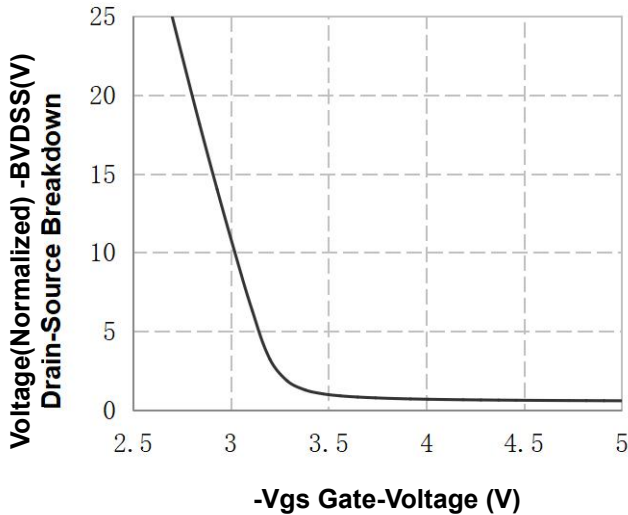


Figure 7. Breakdown Voltage Variation vs Gate-Voltage

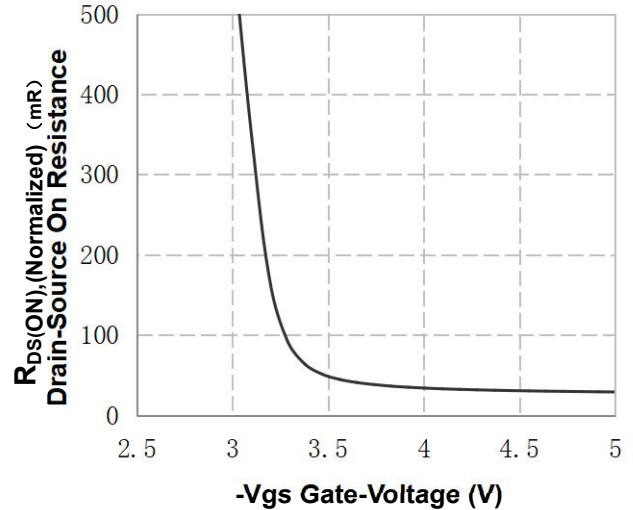


Figure 8. On-Resistance Variation vs Gate Voltage

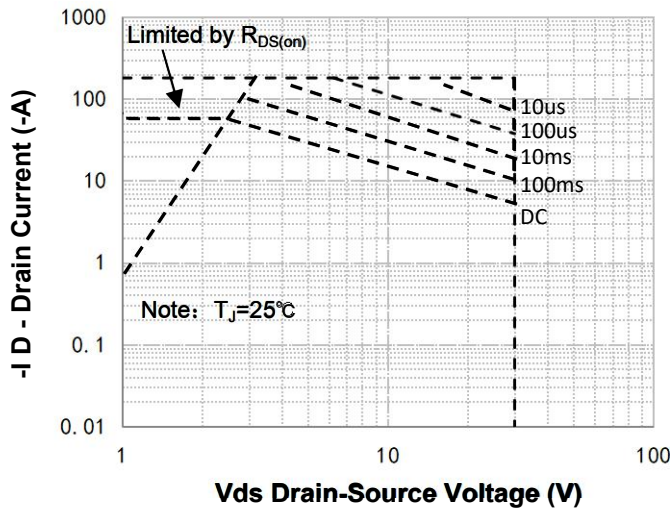


Figure 9. Maximum Safe Operating Area

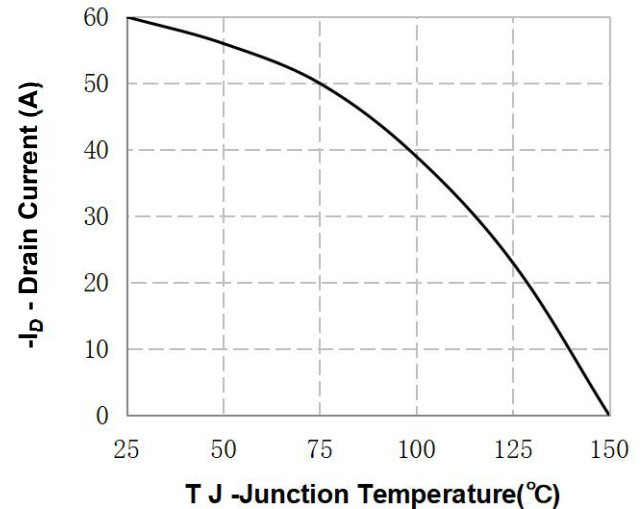


Figure 10. Maximum Continuous Drain Current vs Case Temperature

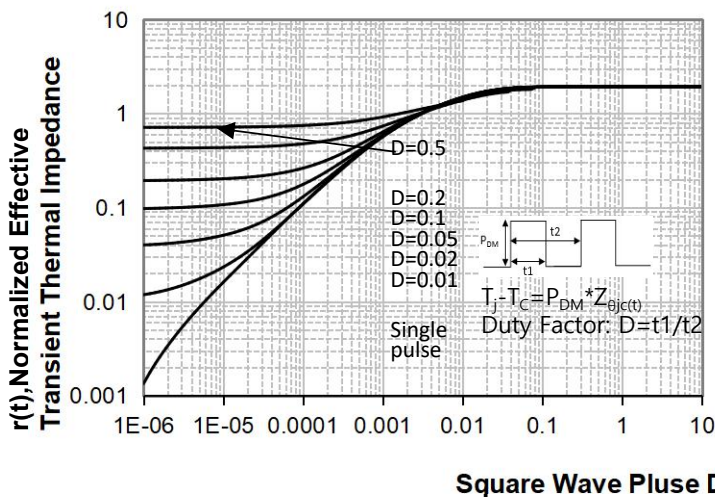
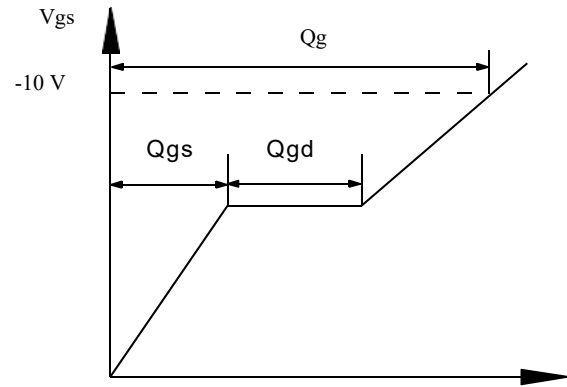
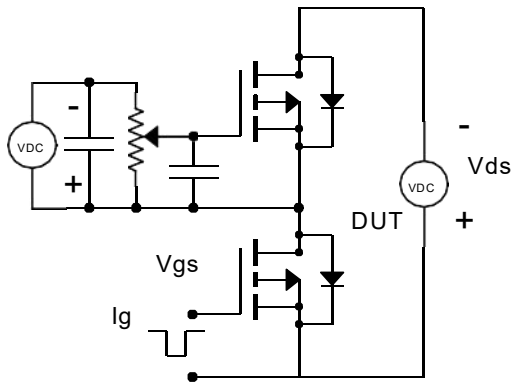
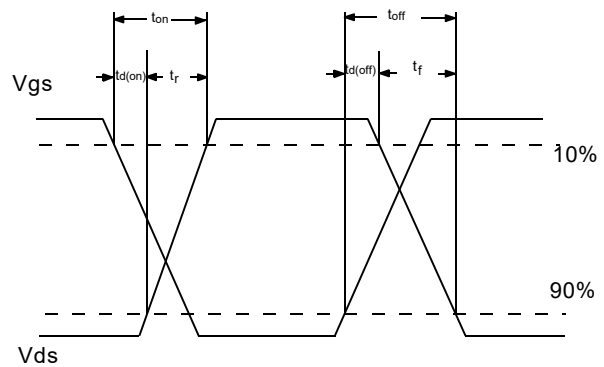
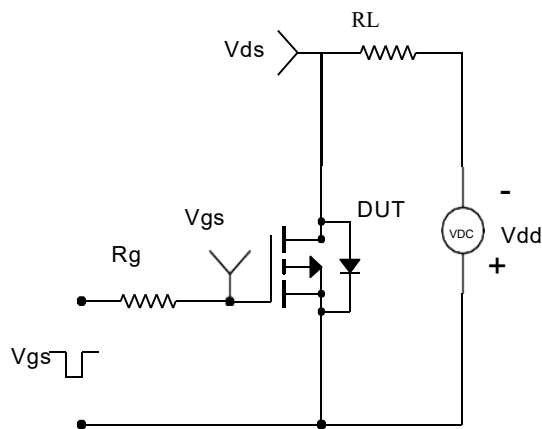


Figure 11. Transient Thermal Response Curve

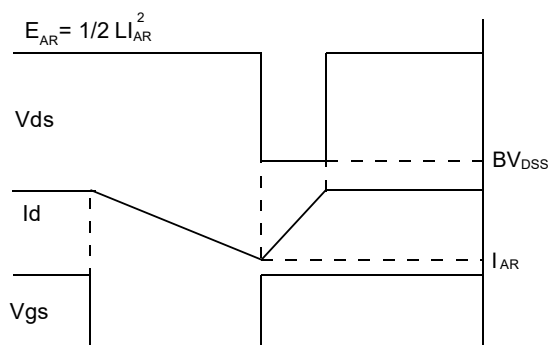
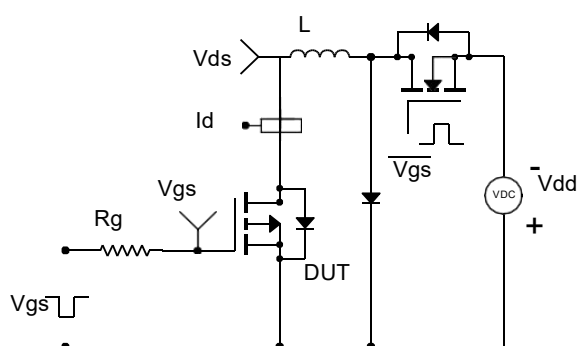
### Gate Charge Test Circuit & Waveform



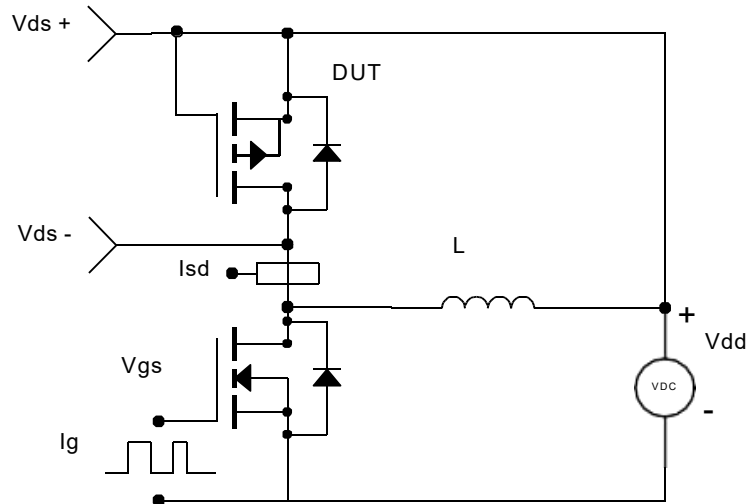
### Resistive Switching Test Circuit & Waveforms



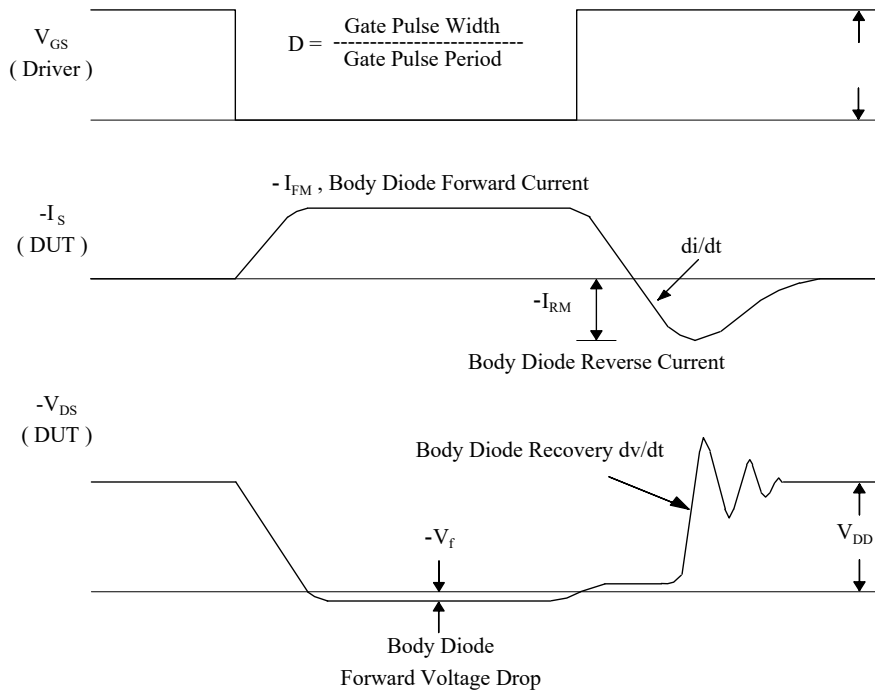
### Unclamped Inductive Switching Test Circuit & Waveforms



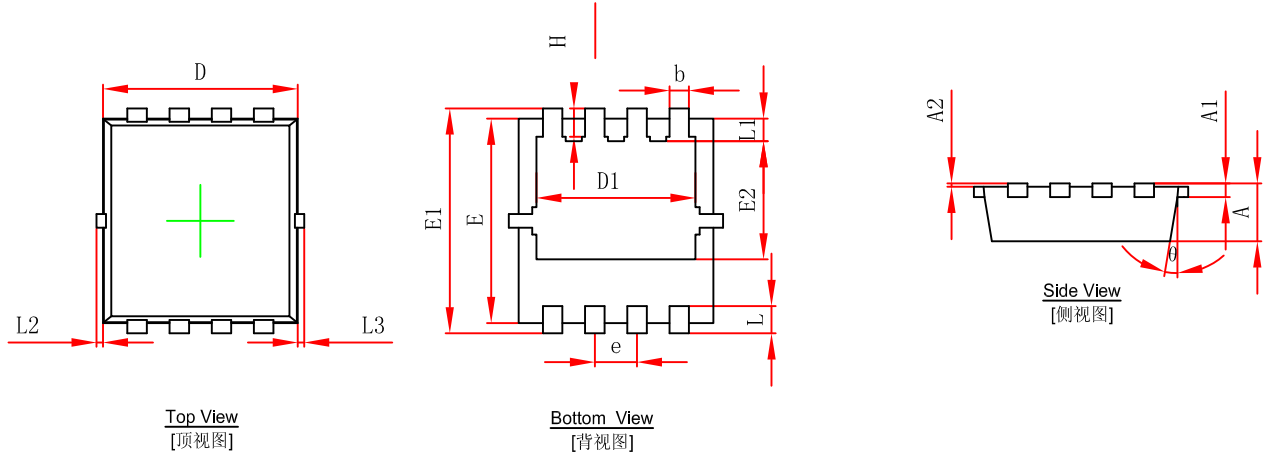
## Peak Diode Recovery dv/dt Test Circuit & Waveforms



- $dv/dt$  controlled by  $R_G$
- $I_{SD}$  controlled by pulse period

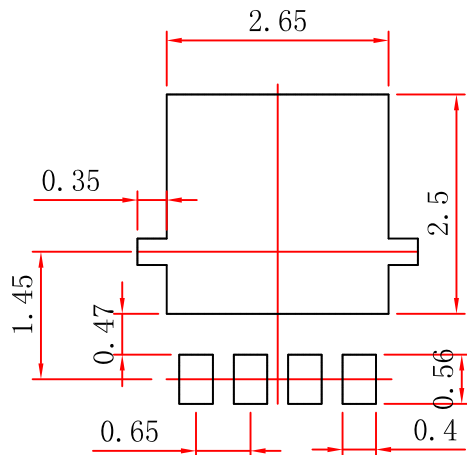


## PDFN3333-8L Package Outline Dimensions



| 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.