# TF050N04M

## ● General Description

The TF050N04M combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$ .This device is ideal for load switch and battery protection applications.

## ● 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

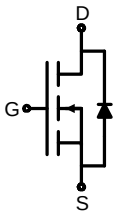
MB/VGA Vcore

SMPS 2nd Synchronous Rectifier

POL application

BLDC Motor driver

## ● Product Summary

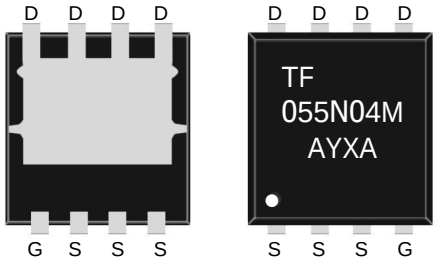



$V_{DS}$ =40V $I_D$=50A

$R_{DSON(10V\ typ)}$ =4.9mΩ

$R_{DSON(4.5V\ typ)}$ =6.0mΩ

RoHS compliant




**PDFNWB3.3x3.3-8L**

## ●Ordering Information:

| | |
|---|---|
| Part NO. | TF050N04M |
| Marking 1 | TF050N04M |
| Marking 2 | TF:tuofeng; AA:device code; Y:year code; X:Week |
| MOQ | 5000 |

## ●Absolute Maximum Ratings ($T_C$ =25℃)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $I_{D@}T_C$=25℃ | 50 | A |
| | $I_{D@}T_C$=75℃ | 40 | A |
| | $I_{D\ @}T_C$=100℃ | 35 | A |
| Pulsed Drain Current ① | $I_{DM}$ | 180 | A |
| Total Power Dissipation | $P_D@T_C$=25℃ | 60 | W |
| Total Power Dissipation | $P_D@T_A$=25℃ | 2.0 | W |
| Operating Junction Temperature | $T_J$ | -55 to 150 | ℃ |
| Storage Temperature | $T_{STG}$ | -55 to 150 | ℃ |

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

| | | | |
|---|---|---|---|
| Single Pulse Avalanche Energy | $E_{AS}$ | 180 | mJ |
| Avalanche Current | $I_{AS}$ $I_{AR}$ | 30 | A |

**●Thermal resistance**

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | 3.2 | ° C/W |
| Thermal resistance, junction - ambient | $R_{thJA}$ | - | - | 57 | ° C/W |
| Soldering temperature, wave soldering for 8s | $T_{sold}$ | - | - | 265 | ° C |

**●Electronic Characteristics**

| Parameter | Symbol | Condition | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ =0V,$I_D$ =250uA | 40 | | | V |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ =$V_{DS}$, $I_D$ =250uA | 1.0 | 1.5 | 2.5 | V |
| Drain-Source Leakage Current | $I_{DSS}$ | $V_{DS}$=40V, $V_{GS}$ =0V | | | 1.0 | uA |
| Gate- Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V ,$V_{DS}$ =0V | | | ±100 | nA |
| Static Drain-source On Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=30A | | 4.9 | 6.0 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=20A | | 6.0 | 7.5 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ =25V, $I_D$=10A | | 18 | | S |
| Source-drain voltage | $V_{SD}$ | Is=20A | | | 1.20 | V |

**●Electronic Characteristics**

| Parameter | Symbol | Condition | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | Ciss | Vds=20V,Vgs=0V f = 1MHz | - | 2174 | - | pF |
| Output capacitance | Coss | | - | 146 | - | |
| Reverse transfer capacitance | Crss | | - | 150 | - | |

**●Gate Charge characteristics**($T_a$ = 25℃)

| Parameter | Symbol | Condition | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| Gate Risistance | $R_g$ | f = 1MHz | | 1.5 | | Ω |
| Total gate charge | Qg | $V_{DD}$ = 20V | - | 43.2 | - | nC |
| Gate - Source charge | Qgs | $I_D$ = 20A | - | 23.9 | - | |
| Gate - Drain charge | Qgd | $V_{GS}$ = 10V | - | 15.2 | - | |
| Turn-ON Delay time | $t_{D(on)}$ | $V_{GS}$=10V ,$V_{DS}$=20V $R_G$ =3.0Ω, I=20A | | 8.8 | | ns |
| Turn-ON Rise time | $t_r$ | | | 111 | | ns |
| Turn-Off Delay time | $t_{D(off)}$ | | | 36.6 | | ns |
| Turn-Off Fall time | $t_f$ | | | 103 | | ns |

Fig.1 Power Dissipation

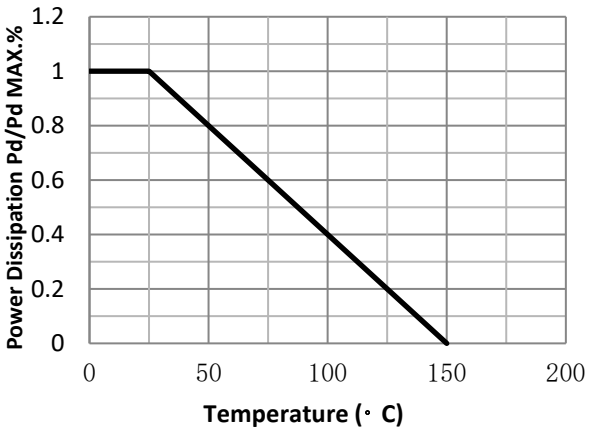



Fig.2 Typical output Characteristics

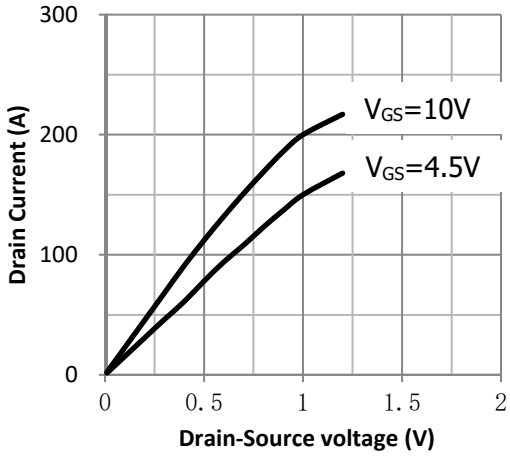



Fig.3 Threshold Voltage V.S Junction Temperature

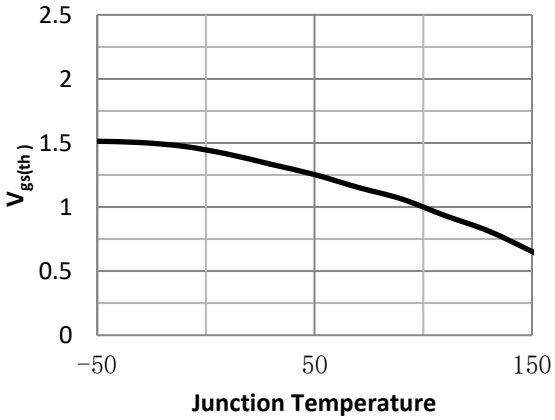



Fig.4 Resistance V.S Drain Current

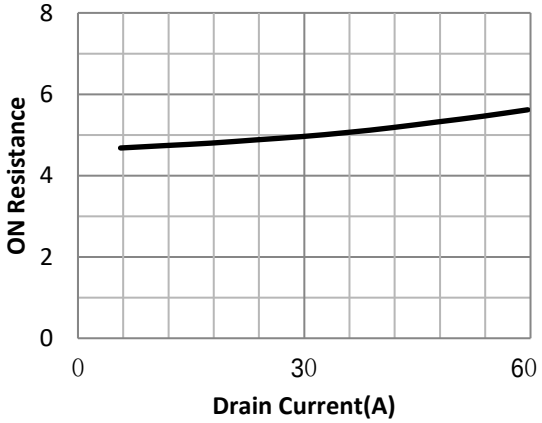



Fig.5 On-Resistance VS Gate Source Voltage

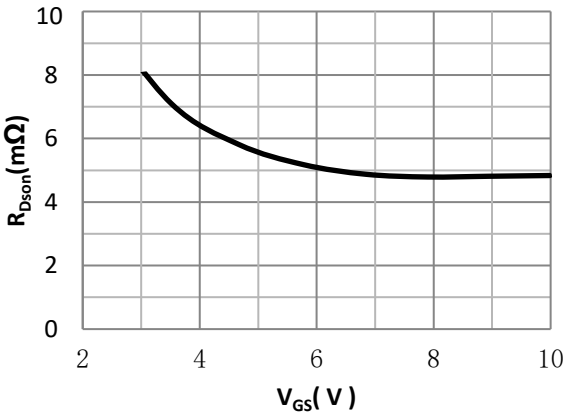



Fig.6 On-Resistance V.S Junction Temperature

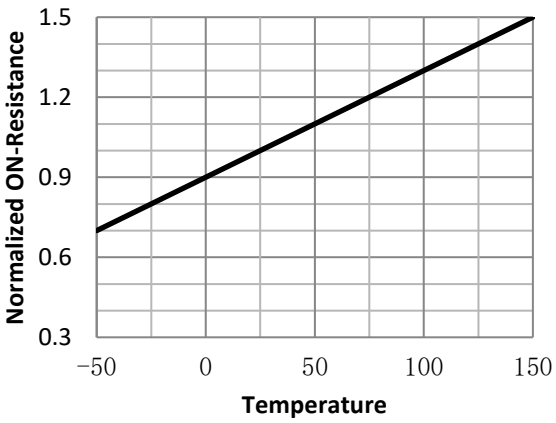


Fig.7 Switching Time Measurement Circuit

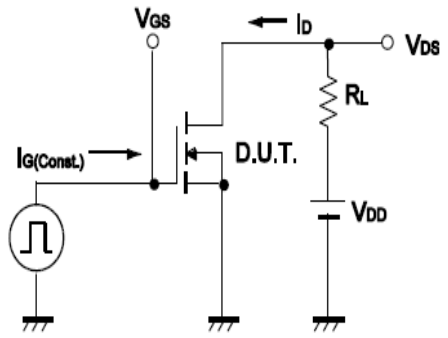



Fig.8 Gate Charge Waveform

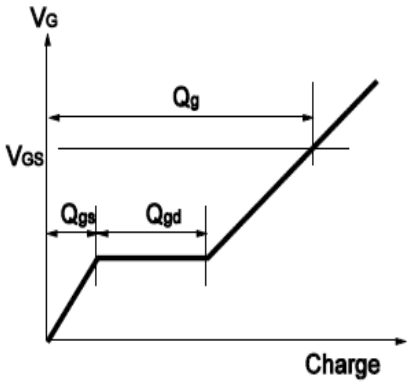



Fig.9 Switching Time Measurement Circuit

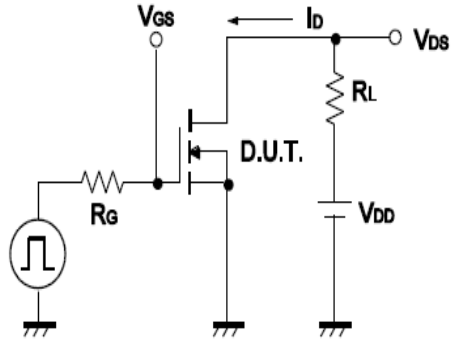



Fig.10 Gate Charge Waveform

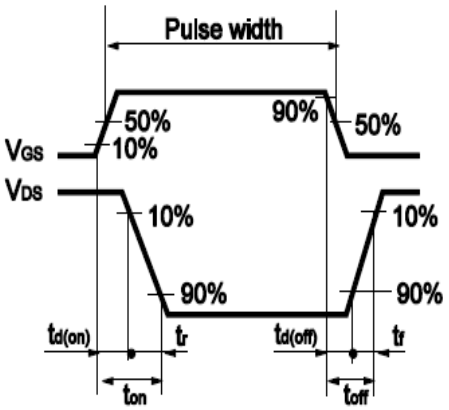



Fig.11 Avalanche Measurement Circuit

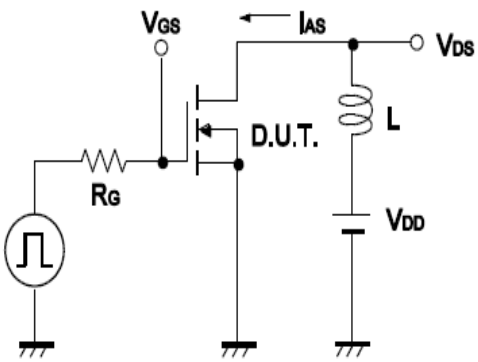
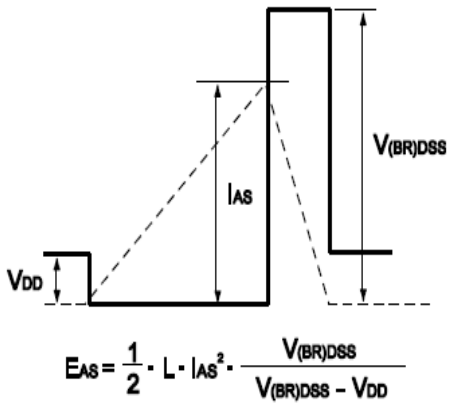
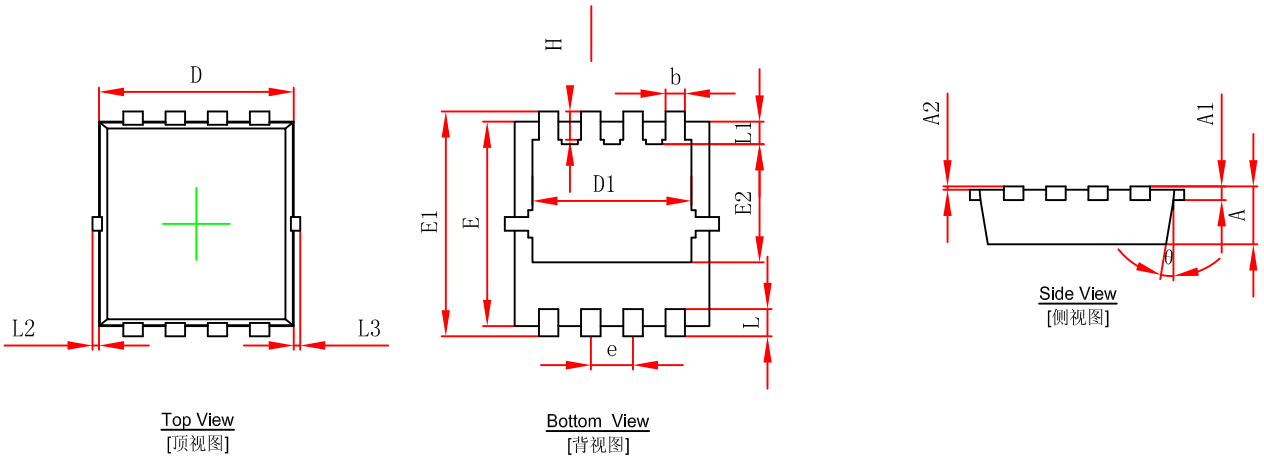



Fig.12 Avalanche Waveform



## PDFNWB3.3x3.3-8L Package Outline Dimensions

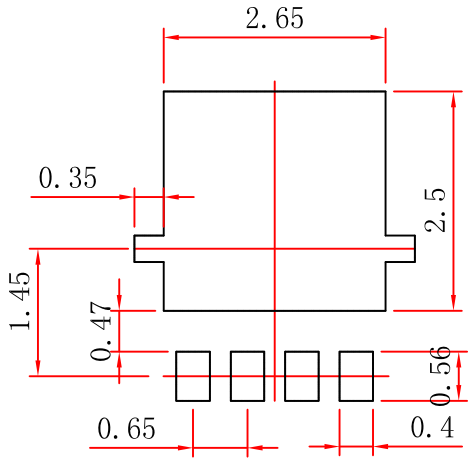



Top View
[顶视图]

Bottom View
[背视图]

| 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° |

## PDFNWB3.3x3.3-8L Suggested Pad Layout




Note:
1.Controlling dimension:in millimeters.
2.General tolerance:±0.05mm.
3.The pad layout is for reference purposes only.