# SHENZHEN TUOFENG SEMICONDUCTOR TECHNOLOGY CO.,LTD
## N-Channel Enhancement Mode Power MOSFET
# TF100N03M

## 30V N-Channel MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V) = 30V
$I_D$ =24A
$R_{DSON(typ)}$ < 16mΩ ($V_{GS}$ = 10V)
$R_{DSON(typ)}$ < 21mΩ ($V_{GS}$ = 4.5V)

100% UIS Tested
100% $R_g$ Tested

• Trench Power αMOS Technology
• Low $R_{DS(ON)}$
• Low Gate Charge
• High Current Capability
• RoHS and Halogen-Free Compliant

### Applications

• DC/DC Converters in Computing
• Isolated DC/DC Converters in Telecom and Industrial

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

040N03M
TFAYXA
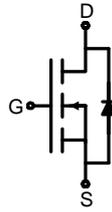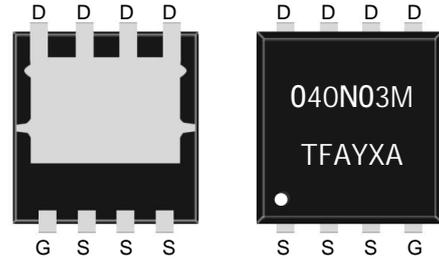
TF:tuofeng; AA:device code; Y:year code; X:Week

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| 100N03M | TF100N03M | PDFN3x3-8 | Ø330mm | 12mm | 5000 units |

| Absolute Maximum Ratings $T_A$=25℃ unless otherwise noted | | | | |
|---|---|---|---|---|
| **Parameter** | **Symbol** | **Maximum** | | **Units** |
| Drain-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current [B] | $T_C$=25℃ | $I_D$ | 24 | A |
| Pulsed Drain Current [C] | | $I_{DM}$ | 50 | |
| Continuous Drain Current [A] | $T_A$=25℃ | $I_{DSM}$ | 9.5 | |
| Avalanche Current [C] | | $I_{AS}$, $I_{AR}$ | 17 | A |
| Repetitive avalanche energy L=0.1mH [C] | | $E_{AS}$, $E_{AR}$ | 14 | mJ |
| Power Dissipation [B] | $T_C$=25℃ | $P_D$ | 20 | W |
| Power Dissipation [A] | $T_A$=25℃ | $P_{DSM}$ | 3.1 | |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 150 | ℃ |

| Thermal Characteristics | | | | | |
|---|---|---|---|---|---|
| **Parameter** | | **Symbol** | **Typ** | **Max** | **Units** |
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{θJA}$ | 30 | 40 | ℃/W |
| Maximum Junction-to-Ambient [A] | Steady-State | | 60 | 75 | ℃/W |
| Maximum Junction-to-Case [B] | Steady-State | $R_{θJC}$ | 5 | 6 | ℃/W |

**Electrical Characteristics (T$_J$=25℃ unless otherwise noted)**

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------|-----|-----|-----|-------|
| **STATIC PARAMETERS** | | | | | | |
| BV$_{DSS}$ | Drain-Source Breakdown Voltage | I$_D$=250µA, V$_{GS}$=0V | 30 | | | V |
| I$_{DSS}$ | Zero Gate Voltage Drain Current | V$_{DS}$=30V, V$_{GS}$=0V | | | 1 | µA |
| I$_{GSS}$ | Gate-Body leakage current | V$_{DS}$=0V, V$_{GS}$= ±20V | | | ±100 | nA |
| V$_{GS(th)}$ | Gate Threshold Voltage | V$_{DS}$=V$_{GS}$ I$_D$=250µA | 1.4 | 1.8 | 2.5 | V |
| I$_{D(ON)}$ | On state drain current | V$_{GS}$=10V, V$_{DS}$=5V | 50 | | | A |
| R$_{DS(ON)}$ | Static Drain-Source On-Resistance | V$_{GS}$=10V, I$_D$=8A | | 16 | 20 | mΩ |
| | | V$_{GS}$=4.5V, I$_D$=7A | | 21 | 26 | |
| g$_{FS}$ | Forward Transconductance | V$_{DS}$=5V, I$_D$=8A | | 30 | | S |
| V$_{SD}$ | Diode Forward Voltage | I$_S$=1A,V$_{GS}$=0V | | 0.75 | 1 | V |
| I$_S$ | Maximum Body-Diode Continuous Current | | | | 20 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| C$_{iss}$ | Input Capacitance | | 440 | 550 | 660 | pF |
| C$_{oss}$ | Output Capacitance | V$_{GS}$=0V, V$_{DS}$=15V, f=1MHz | 77 | 110 | 143 | pF |
| C$_{rss}$ | Reverse Transfer Capacitance | | 33 | 55 | 77 | pF |
| R$_g$ | Gate resistance | V$_{GS}$=0V, V$_{DS}$=0V, f=1MHz | 3 | 4 | 4.9 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| Q$_g$ (10V) | Total Gate Charge | | 7.8 | 9.8 | 12 | nC |
| Q$_g$ (4.5V) | Total Gate Charge | V$_{GS}$=10V, V$_{DS}$=15V, I$_D$=8A | 3.6 | 4.6 | 5.5 | nC |
| Q$_{gs}$ | Gate Source Charge | | 1.4 | 1.8 | 2.2 | nC |
| Q$_{gd}$ | Gate Drain Charge | | 1.3 | 2.2 | 3 | nC |
| t$_{D(on)}$ | Turn-On DelayTime | | | 5 | | ns |
| t$_r$ | Turn-On Rise Time | V$_{GS}$=10V, V$_{DS}$=15V, R$_L$=2Ω, | | 3.2 | | ns |
| t$_{D(off)}$ | Turn-Off DelayTime | R$_{GEN}$=3Ω | | 24 | | ns |
| t$_f$ | Turn-Off Fall Time | | | 6 | | ns |
| t$_{rr}$ | Body Diode Reverse Recovery Time | I$_F$=8A, dI/dt=500A/µs | 7 | 9 | 11 | ns |
| Q$_{rr}$ | Body Diode Reverse Recovery Charge | I$_F$=8A, dI/dt=500A/µs | 12 | 15 | 18 | nC |

A: The value of R$_{θJA}$ is measured with the device mounted on 1in$^2$ FR-4 board with 2oz. Copper, in a still air environment with T$_A$=25°C. The Power dissipation P$_{DSM}$ is based on R$_{θJA}$ t ≤10s value and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°C may be used if the PCB allows it.

B. The power dissipation P$_D$ is based on T$_{J(MAX)}$=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C: Repetitive rating, pulse width limited by junction temperature T$_{J(MAX)}$=150°C.

D. The R$_{θJA}$ is the sum of the thermal impedence from junction to case R$_{θJC}$ and case to ambient.

E. The static characteristics in Figures 1 to 6 are obtained using <300ms pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T$_{J(MAX)}$=150°C.

G. The maximum current rating is limited by bond-wires.

H. These tests are performed with the device mounted on 1 in$^2$ FR-4 board with 2oz. Copper, in a still air environment with T$_A$=25°C. The SOA curve provides a single pulse rating.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
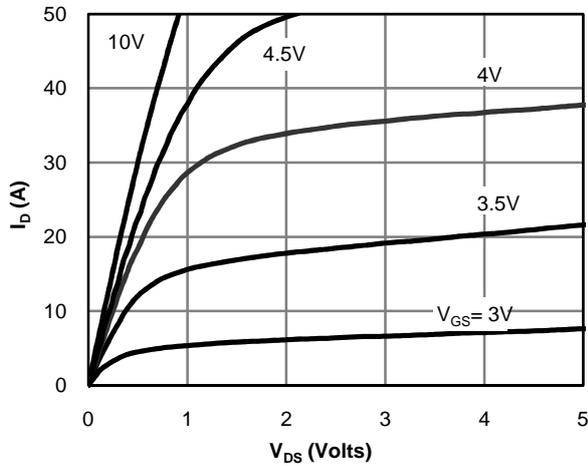
**Figure 1: On-Region Characteristics**
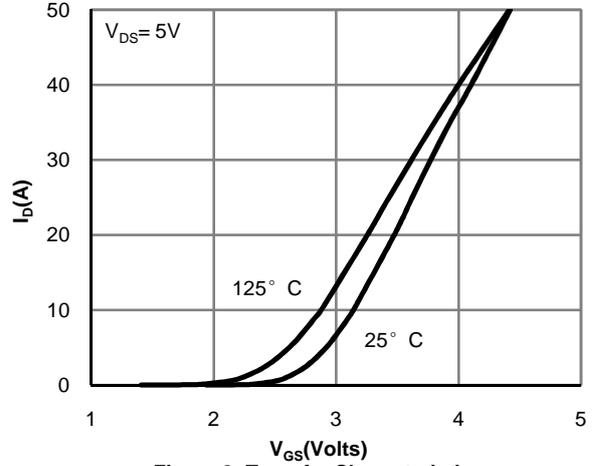
**Figure 2: Transfer Characteristics**
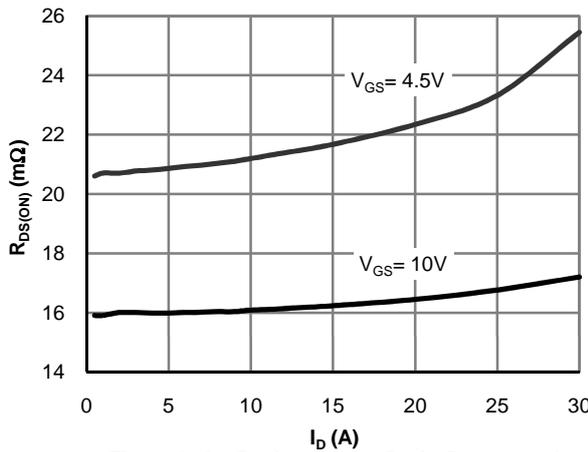
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage**
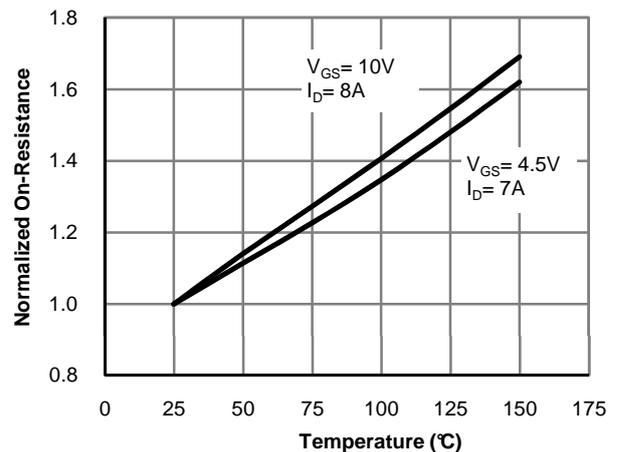
**Figure 4: On-Resistance vs. Junction Temperature**
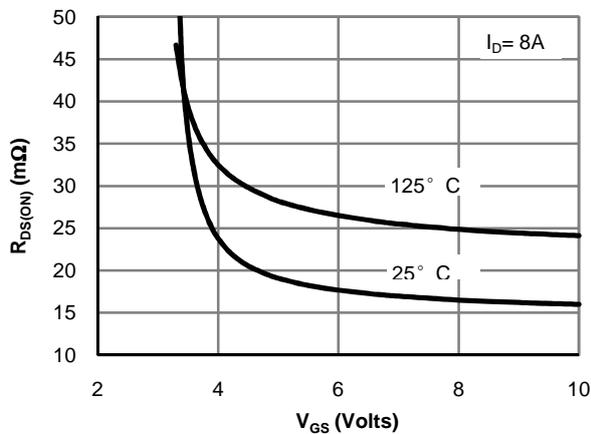
**Figure 5: On-Resistance vs. Gate-Source Voltage**
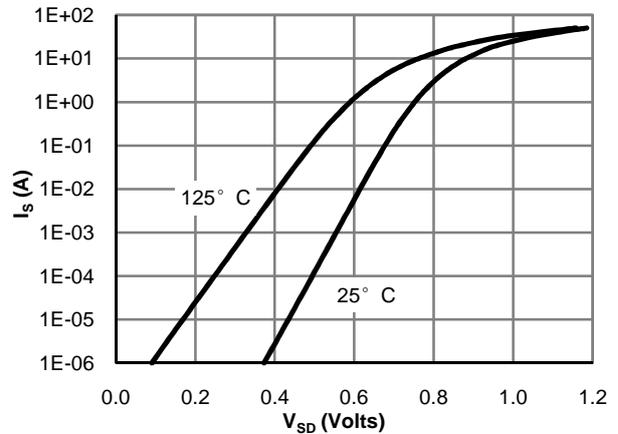
**Figure 6: Body-Diode Characteristics**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

$V_{DS}$= 15V
$I_D$= 8A
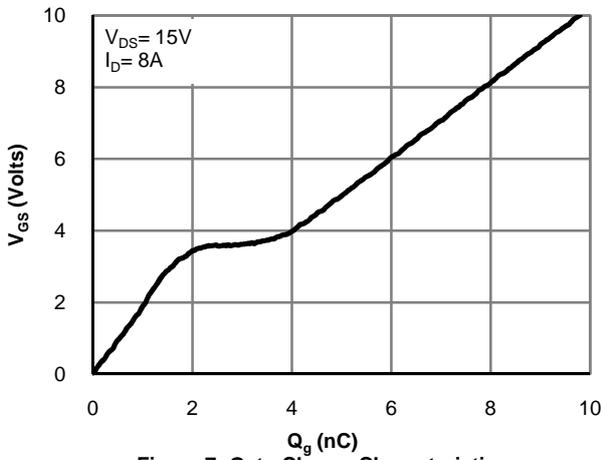
Figure 7: Gate-Charge Characteristics

$C_{iss}$
$C_{oss}$
$C_{rss}$
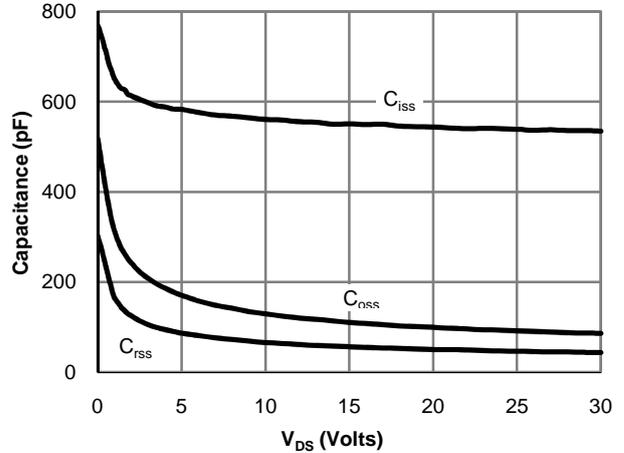
Figure 8: Capacitance Characteristics

10μs
100μs
1ms
DC
$R_{DS(ON)}$ limited
$T_{J(Max)}$=150°C
$T_A$=25°C
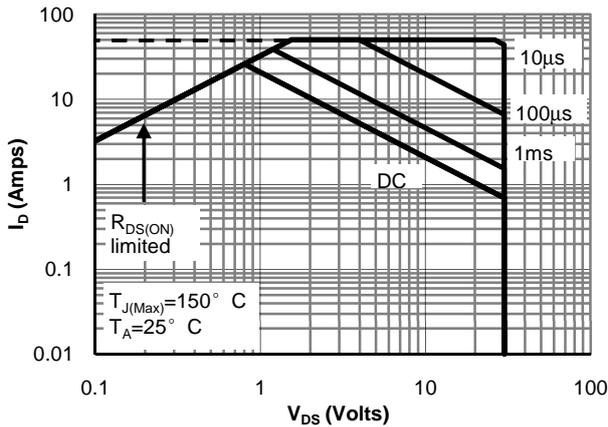
Figure 9: Maximum Forward Biased Safe
Operating Area (Note H)

$T_{J(Max)}$=150°C
$T_C$=25°C
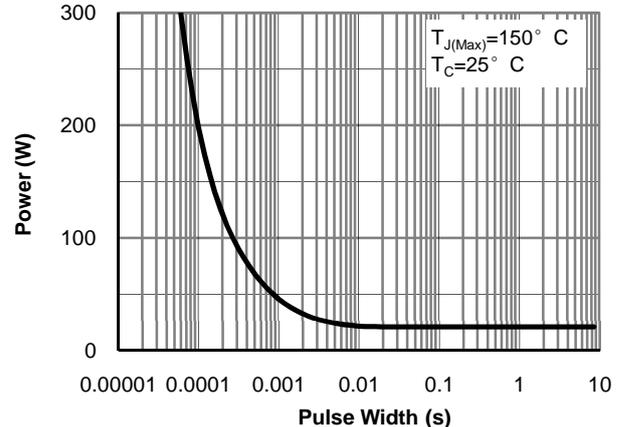
Figure 10: Single Pulse Power Rating Junction-
to-Case (Note F)

D=$T_{on}$/T
$T_{J,PK}$=$T_C$+$P_{DM}$.$Z_{\theta JC}$.$R_{\theta JC}$
$R_{\theta JC}$=6°C/W

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

$P_n$
$T_{on}$
T
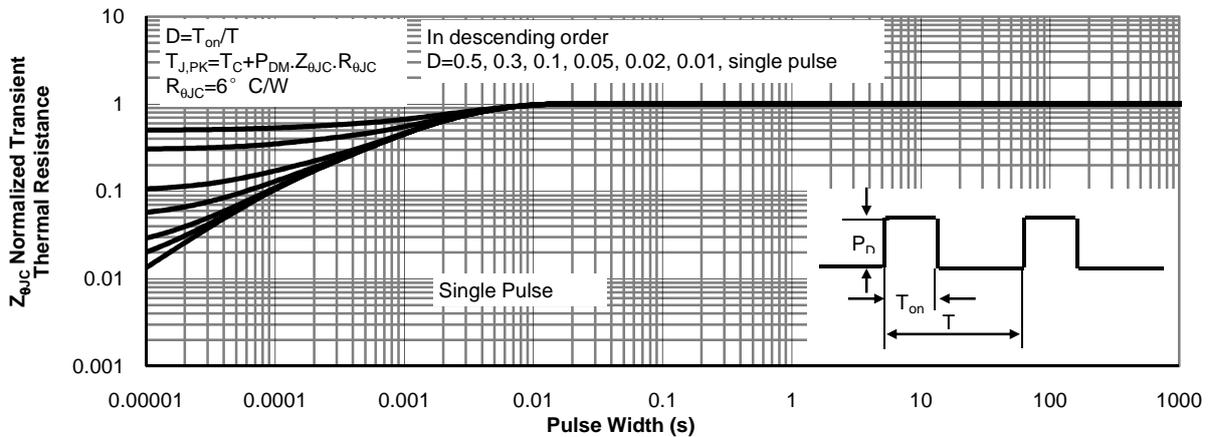
Figure 11: Normalized Maximum Transient Thermal Impedance(Note F)

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS
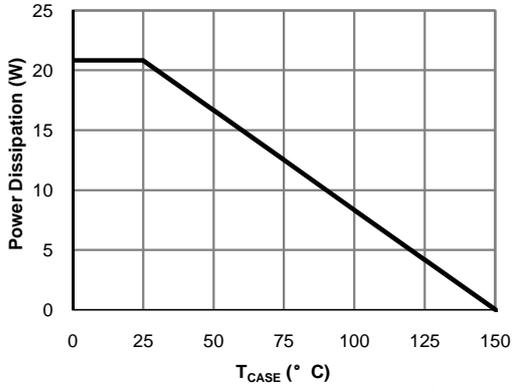
Figure 12: Power De-rating (Note F)
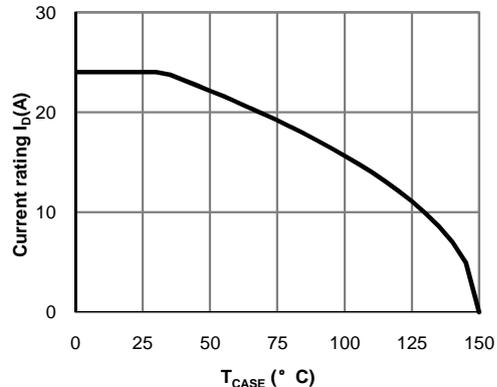
Figure 13: Current De-rating (Note F)
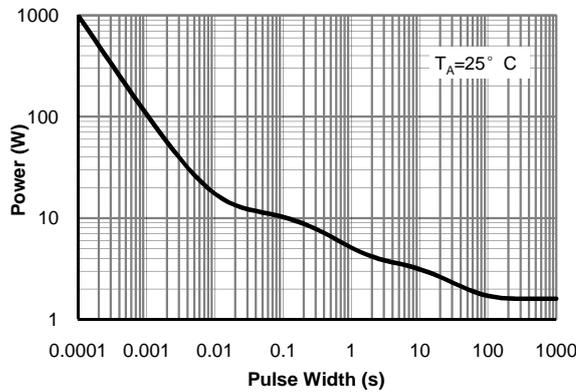
Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)
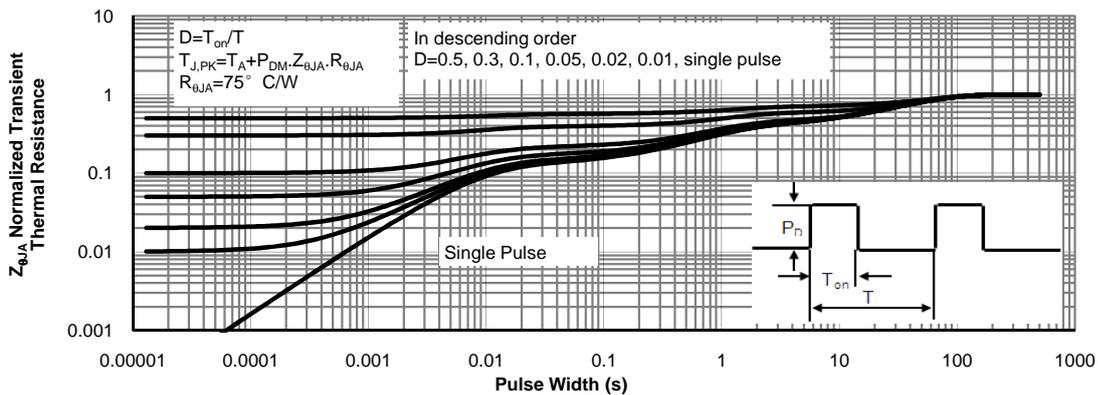
Figure 15: Normalized Maximum Transient Thermal Impedance(Note H)

$D=T_{on}/T$
$T_{J,PK}=T_A+P_{DM}\cdot Z_{\theta JA}\cdot R_{\theta JA}$
$R_{\theta JA}=75°\text{ C/W}$

In descending order
D=0.5, 0.3, 0.1, 0.05, 0.02, 0.01, single pulse

Single Pulse

$T_A=25°\text{ C}$

Gate Charge Test Circuit & Waveform

$Q_g$

10V

$Q_{gs}$ $Q_{gd}$

Vgs

Charge

VDC

Vds

DUT

Vgs

Ig
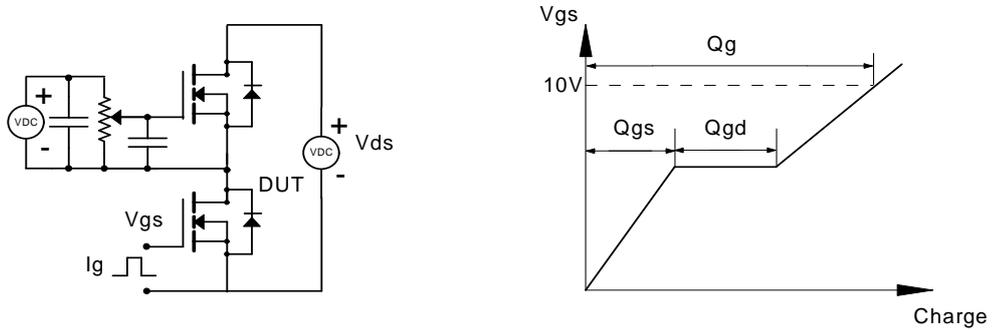
Resistive Switching Test Circuit & Waveforms

RL

Vds

Vgs

Rg

DUT

Vdd

Vgs

Vds

90%

10%

Vgs

$t_{d(on)}$ $t_r$ $t_{d(off)}$ $t_f$

$t_{on}$ $t_{off}$
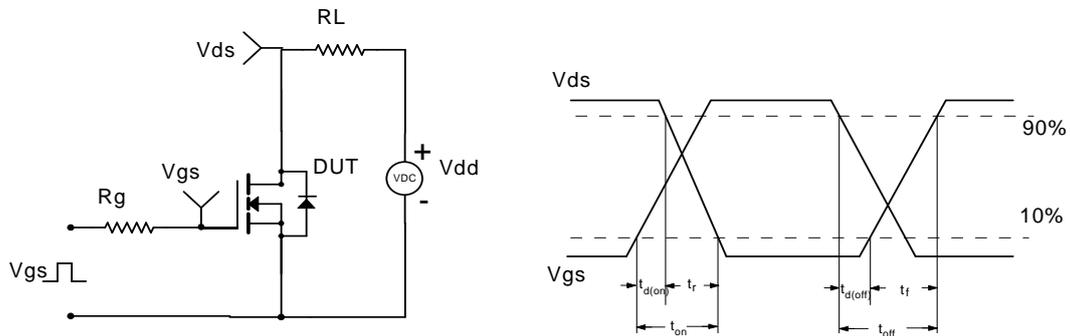
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

L

Vds

Id

$\overline{Vgs}$

Vgs

Rg

DUT

Vdd

$E_{AR} = 1/2\ LI_{AR}^2$

$BV_{DSS}$

Vds

Id

$I_{AR}$

Vgs

Vgs
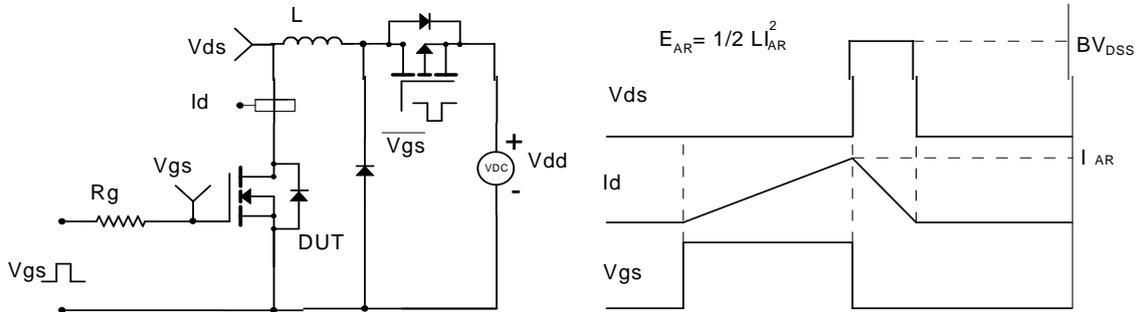
Diode Recovery Test Circuit & Waveforms

Vds +

DUT

Vds -

Isd

L

Vgs

Ig

Vdd

$Q_{rr} = -\int Idt$

Vgs

Isd

$I_F$

dI/dt

$t_{rr}$

$I_{RM}$

Vds

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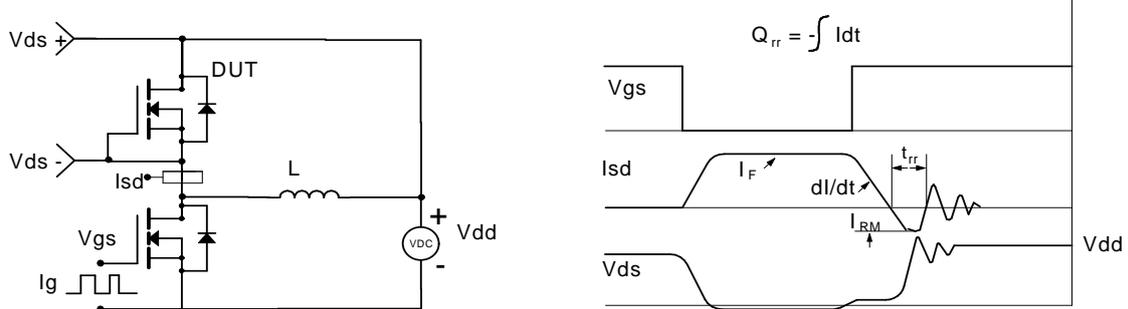
## PDFNWB3.3x3.3-8L Package Outline Dimensions

Top View
[顶视图]

Bottom View
[背视图]

Side View
[侧视图]
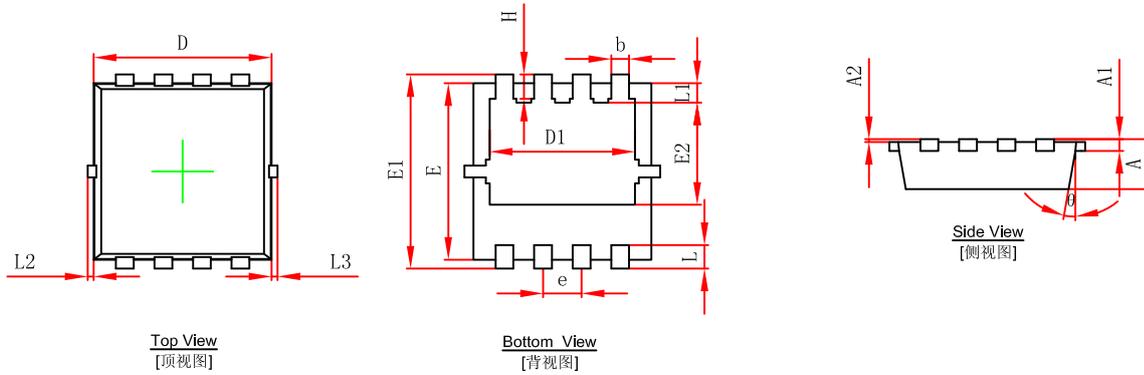
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.650 | 0.850 | 0.026 | 0.033 |
| A1 | 0.152 REF. | | 0.006 REF. | |
| A2 | 0~0.05 | | 0~0.002 | |
| D | 2.900 | 3.100 | 0.114 | 0.122 |
| D1 | 2.300 | 2.600 | 0.091 | 0.102 |
| 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

2.65
2.5
0.35
1.45
0.47
0.56
0.65
0.4
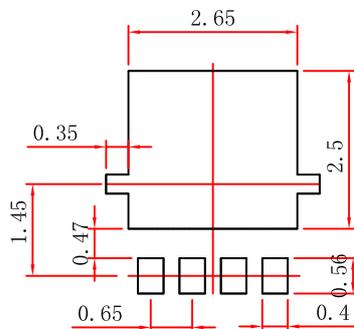
Note:
1.Controlling dimension:in millimeters.
2.General tolerance:±0.05mm.
3.The pad layout is for reference purposes only.

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