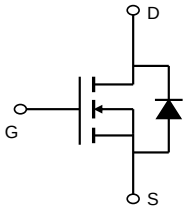
## General Description

- Trench Power MOSFET technology
- Low $R_{DS(ON)}$ at 10 $V_{GS}$
- Low Gate Charge

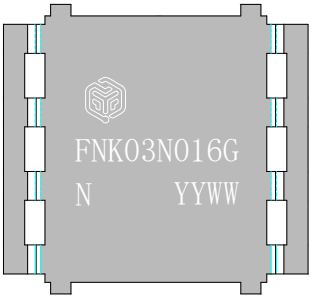



Schematic diagram

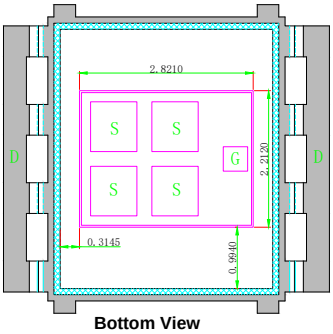
## Product Summary

| | |
|---|---|
| $V_{DS}$ | 30V |
| $I_D$ (at $V_{GS}$=10V) | 130A |
| $R_{DS(ON)}$ (at $V_{GS}$=10V) | < 1.6mΩ |

Side View




Top View




Bottom View

TDHD4*5

## Applications

- Load switch, battery switch
- Automotive applications
- Uninterruptible power supply

| Orderable Part Number | Package Type | Form | Minimum Order Quantity |
|---|---|---|---|
| FNK03N016G | TDHD 4*5 | Tape & Reel | |

**Absolute Maximum Ratings $T_A$=25°C unless otherwise noted**

| Parameter | Symbol | Maximum | Units |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | $V_{GS}$ | ± 20 | V |
| Continuous Drain Current G | $I_D$ | 130 | A |
| Pulsed Drain Current C | $I_{DM}$ | 520 | |
| Avalanche energy L=0.5mH C | $E_{AS}$ | 270 | mJ |
| Power Dissipation B | $P_D$ | 96 | W |
| Junction and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 150 | °C |

**Thermal Characteristics**

| Parameter | | Symbol | Typ | Max | Units |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient A | t ≤ 10s | $R_{\theta JA}$ | 25 | 30 | °C/W |
| Maximum Junction-to-Ambient A D | Steady-State | | 40 | 50 | °C/W |
| Maximum Junction-to-Case | Steady-State | $R_{\theta JC}$ | 1.3 | 1.8 | °C/W |

**Electrical Characteristics ($T_J$=25°C 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, $V_{GS}$=±10V | | | ±100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS,}$ $I_D$=250μA | 1.0 | 1.5 | 2.5 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=25A | | 1.3 | 1.6 | mΩ |
| | | $V_{GS}$=4.5V, $I_D$=20A | | 2.1 | 2.5 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$=5V, $I_D$=20A | | 150 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A, $V_{GS}$=0V | | | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 50 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 5100 | | pF |
| $C_{oss}$ | Output Capacitance | | | 1550 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 220 | | pF |
| $R_g$ | Gate resistance | f=1MHz | | | 3.5 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=15V, $I_D$=20A | | 80 | 100 | nC |
| $Q_g$(4.5V) | Total Gate Charge | | | 34 | 54 | nC |
| $Q_{gs}$ | Gate Source Charge | | | 11 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 12 | | nC |
| $t_{D(on)}$ | Turn-On DelayTime | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=0.75Ω, $R_{GEN}$=3Ω | | 8 | | ns |
| $t_r$ | Turn-On Rise Time | | | 7 | | ns |
| $t_{D(off)}$ | Turn-Off DelayTime | | | 90 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 20 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=20A, di/dt=500A/μs | | 24 | | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=20A, di/dt=500A/μs | | 65 | | nC |

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25° C. The Power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ t≤ 10s and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.
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. Single pulse width limited by junction temperature $T_{J(MAX)}$=150° C.
D. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
E. The static characteristics in Figures 1 to 6 are obtained using <300 μs 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. The SOA curve provides a single pulse rating.
G. The maximum current rating is package limited.
H. These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with $T_A$=25° C.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

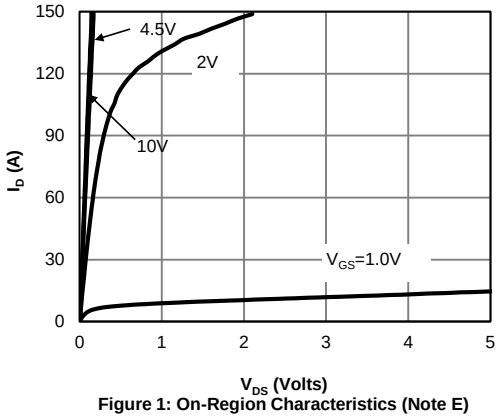



**Figure 1: On-Region Characteristics (Note E)**

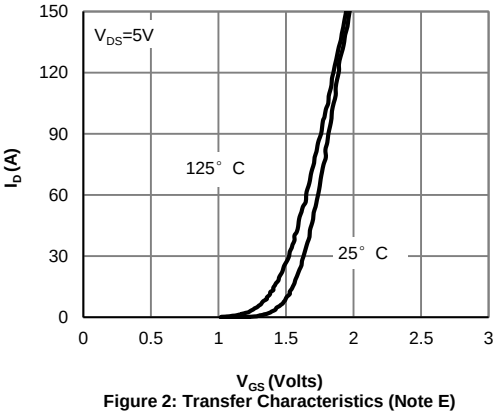



**Figure 2: Transfer Characteristics (Note E)**

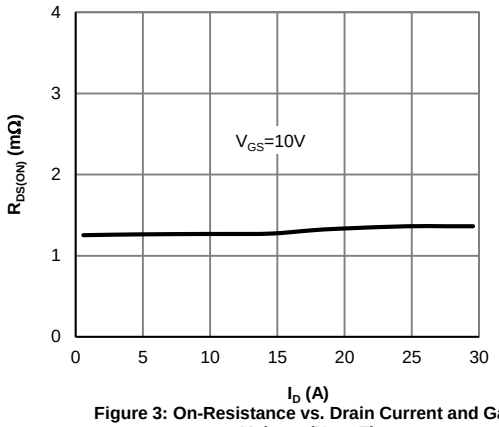



**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**

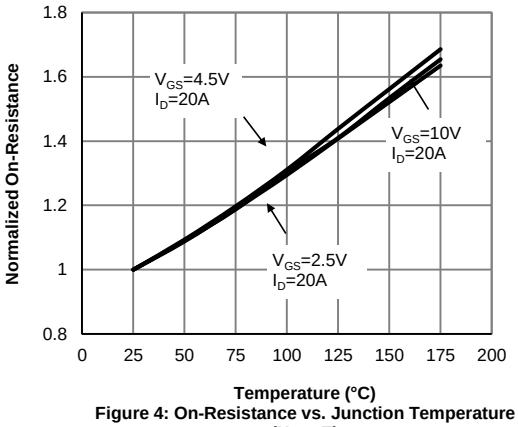



**Figure 4: On-Resistance vs. Junction Temperature (Note E)**

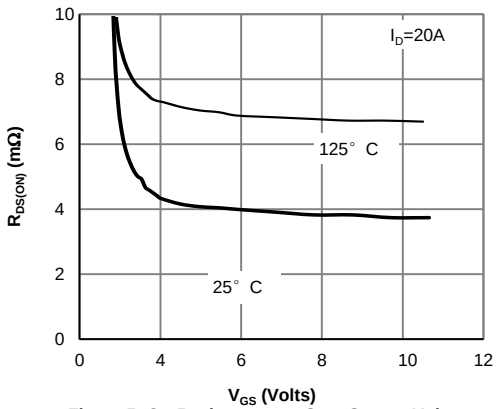



**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**

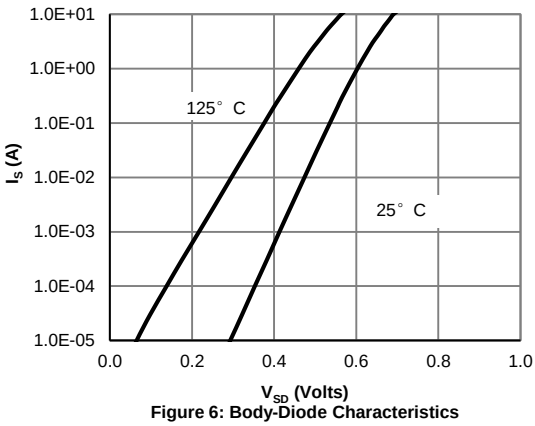



**Figure 6: Body-Diode Characteristics (Note E)**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

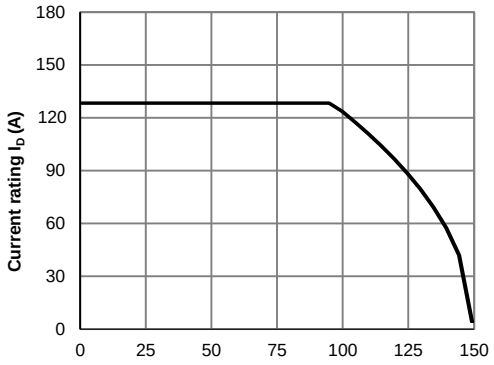



**Figure 7: Current De -rating (Note F)**

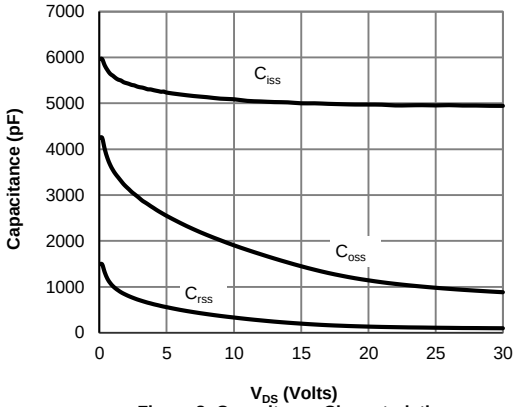



**Figure 8: Capacitance Characteristics**

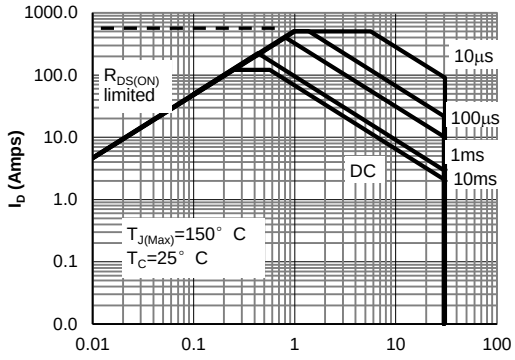



**Figure 9: Maximum Forward Biased Safe Operating Area (Note F)**

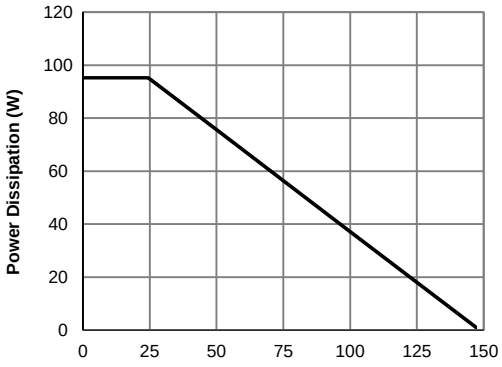



**Figure 10: Power De-rating (Note F)**

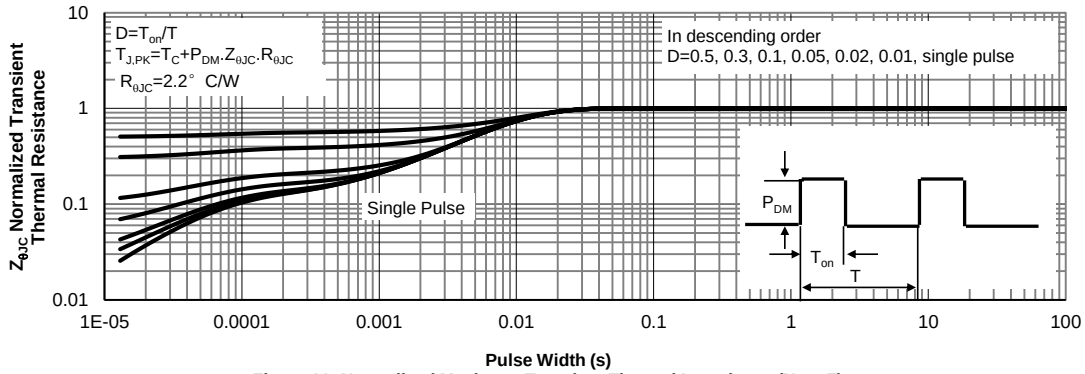



**Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)**

Figure A: Gate Charge Test Circuit & Waveforms

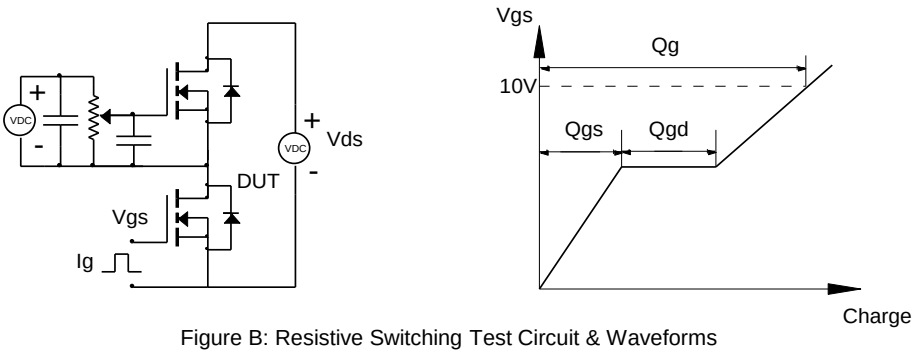



Figure B: Resistive Switching Test Circuit & Waveforms

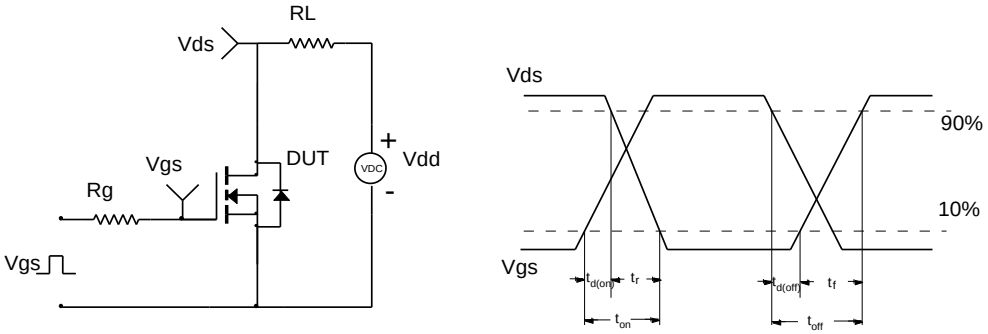



Figure C: Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

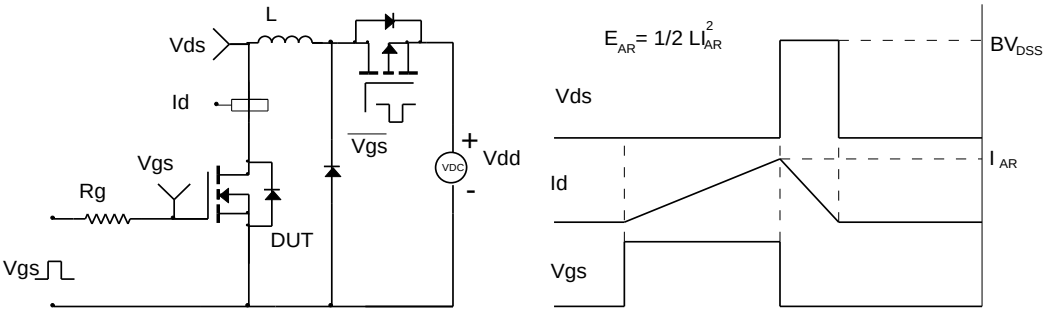
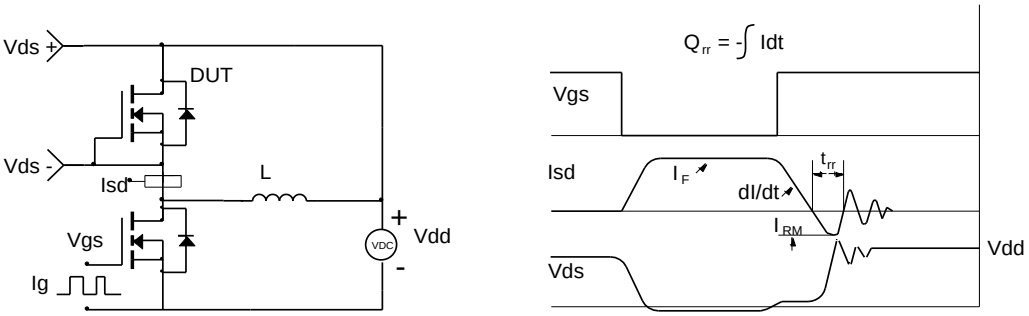
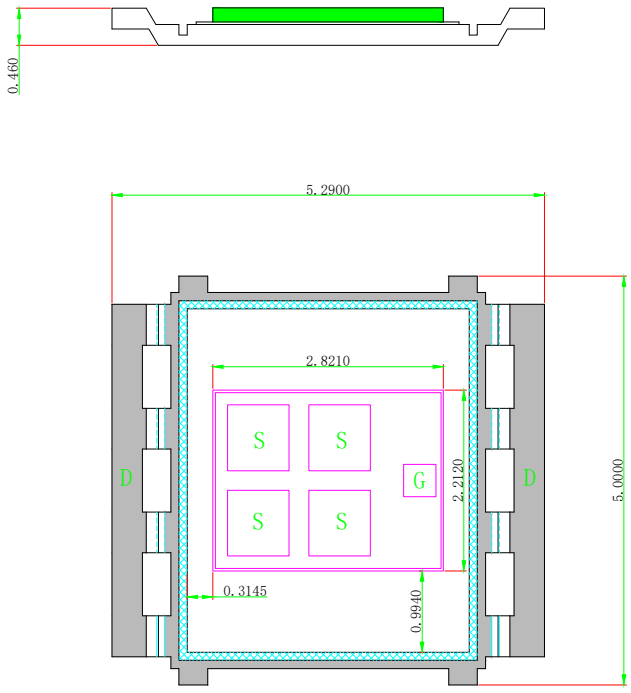



Figure D: Diode Recovery Test Circuit & Waveforms

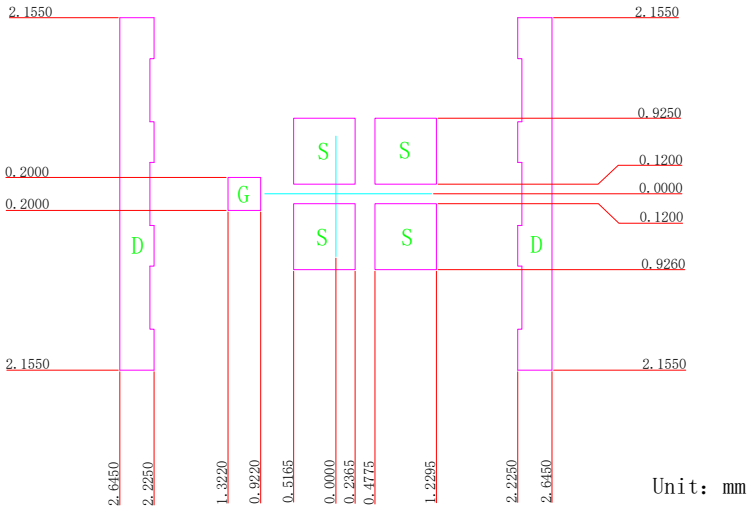


## TDHD5*6 Package Information

Unit: mm




Back




Front

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