Wuxi Unigroup Microelectronics CO.,LTD.

# 30V N-Channel Trench MOSFET(Preliminary)

## General Description

- Trench Power technology
- Low Capacitance
- Ultra low Gate Charge
- Optimized for fast-switching applications

## Applications

- Synchronous Rectification in DC/DC and AC/DC Converters
- Isolated DC/DC Converters in Telecom and Industrial

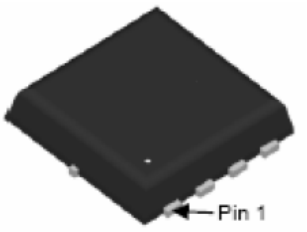
## Product Summary

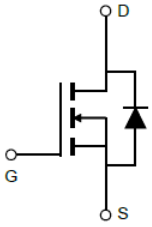
| | |
|---|---|
| $V_{DS}$ | 30V |
| $I_D$ (at $V_{GS}$=10V) | 60A |
| $R_{DS(ON)}$ (at $V_{GS}$=10V) | < 5.8mΩ |
| $R_{DS(ON)}$ (at $V_{GS}$=4.5V) | < 8.8mΩ |

100% UIS Tested
100% DVDS Tested

RoHS

DFN3.3x3.3




| Part Number | Package Type | Form | Marking |
|---|---|---|---|
| TTG60N03QTC | DFN3.3x3.3 | Tape & Reel | 60N03QTC |

## Absolute Maximum Ratings ($T_A$ =25ºC 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] | $T_C$ =25ºC | $I_D$ | 17 | A |
| | $T_C$ =100ºC | | 17 | |
| Pulsed Drain Current [A] | | $I_{DM}$ | 180 | A |
| Avalanche Current [A] | | $I_{AS}$ | 18 | A |
| Single Pulse Avalanche Energy L =0.3mH [A] | | $E_{AS}$ | 48.6 | mJ |
| Power Dissipation [C] | $T_C$ =25ºC | $P_D$ | 46.8 | W |
| | $T_C$ =100ºC | | 23.4 | W |
| Junction and Storage Temperature Range | | $T_J$, $T_{STG}$ | -55 to 175 | ºC |

**Thermal Characteristics**

| Parameter | | Symbol | Maximum | Units |
|---|---|---|---|---|
| Maximum Junction-to-Case | Steady-State | $R_{\theta JC}$ | 3.2 | ºC/W |
| Maximum Junction-to-Ambient | Steady-State | $R_{\theta JA}$ | 100 | |

## Electrical Characteristics($T_J$ =25ºC unless otherwise noted)

| Symbol | Parameter | Conditions | | Value | | | Units |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| **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 | $T_J$ =25ºC | | | 1 | μA |
| | | | $T_J$ =125ºC | | | 100 | |
| $I_{GSS}$ | 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 | 1.6 | 2 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$ =10V, $I_D$ =30A | | | 4.8 | 5.8 | mΩ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$ =4.5V, $I_D$ =30A | | | 7.5 | 8.8 | mΩ |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ =5V, $I_D$ =20A | | | 29 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$ =30A, $V_{GS}$ =0V | | | | 1 | V |
| $I_S$ | Maximum Body-Diode Continuous Current [B] | | | | | 17 | A |
| **DYNAMIC PARAMETERS** | | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ =0V, $V_{DS}$ =15V, f =1$MH_Z$ | | | 855 | | pF |
| $C_{oss}$ | Output Capacitance | | | | 230 | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | | | 124 | | |
| $R_g$ | Gate Resistance | f =1$MH_Z$ | | | 7 | | Ω |
| **SWITCHING PARAMETERS** | | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$ =10V,$V_{DS}$ =15V, $I_D$ =20A | | | 17.5 | | nC |
| $Q_g$(4.5V) | Total Gate Charge | | | | 9.2 | | |
| $Q_{gs}$ | Gate Source Charge | | | | 2.3 | | |
| $Q_{gd}$ | Gate Drain Charge | | | | 4.5 | | |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS}$ =10V,$V_{DS}$ =15V, $I_D$ =20A, $R_G$ =1.6Ω | | | 32 | | ns |
| $t_r$ | Turn-On Rise Time | | | | 3.6 | | |
| $T_{D(off)}$ | Turn-Off Delay Time | | | | 53 | | |
| $t_f$ | Turn-Off Fall Time | | | | 7.3 | | |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$ =20A, di/dt =100A/μs | | | 43.3 | | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | | | | 23.7 | | nC |

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation $P_D$ is based on $T_{J(MAX)}$ =175ºC, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

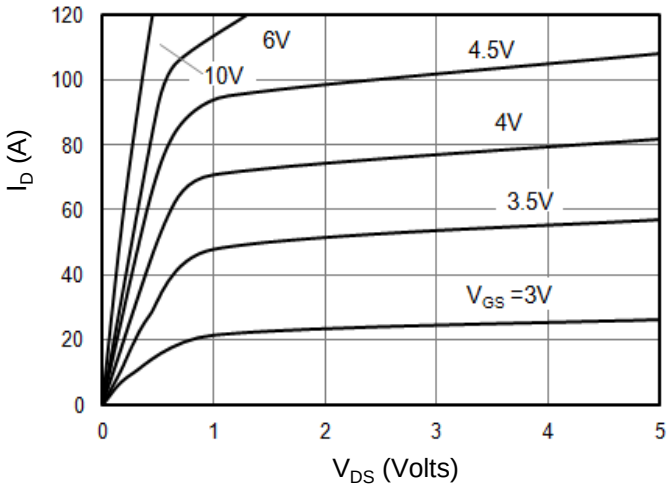



**Figure 1: On-Region Characteristics**

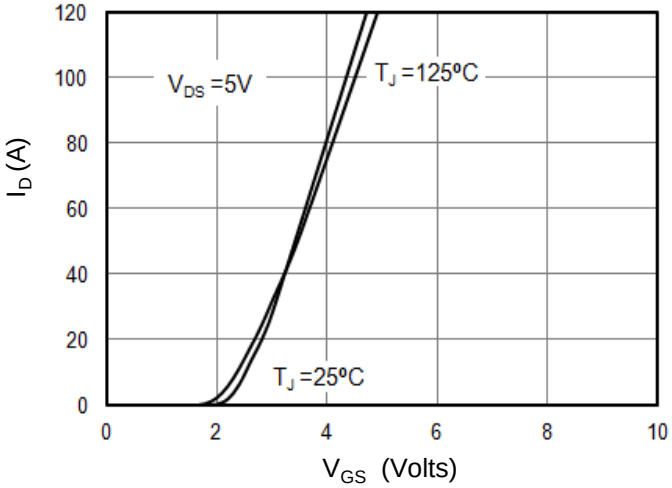



**Figure 2: Transfer Characteristics**

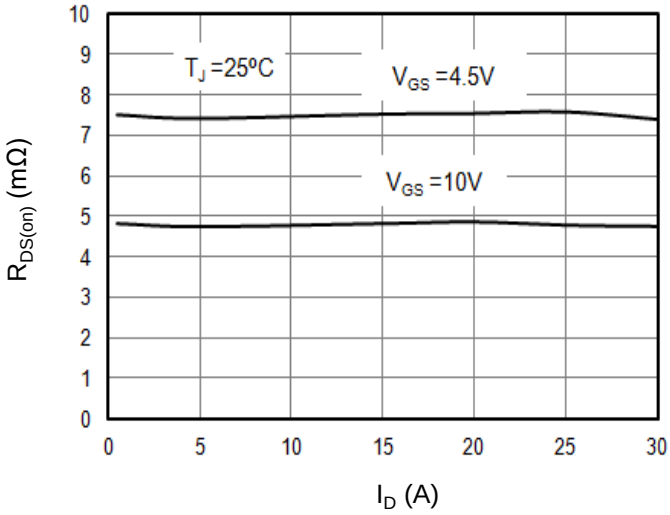



**Figure 3: On-Resistance vs. Drain Current**

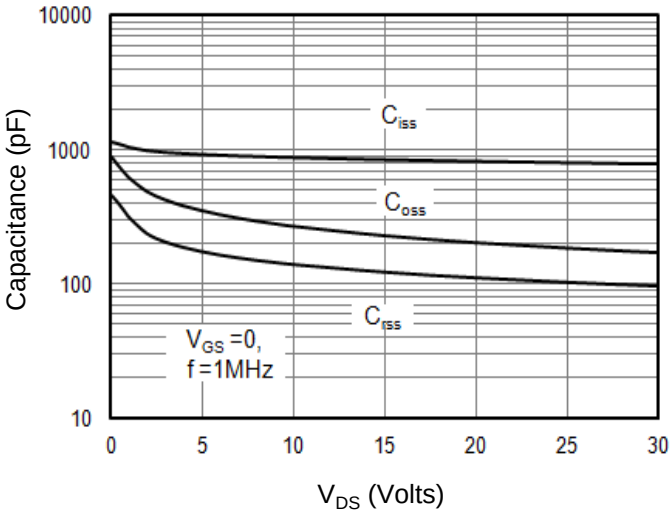



**Figure 4: Capacitance Characteristics**

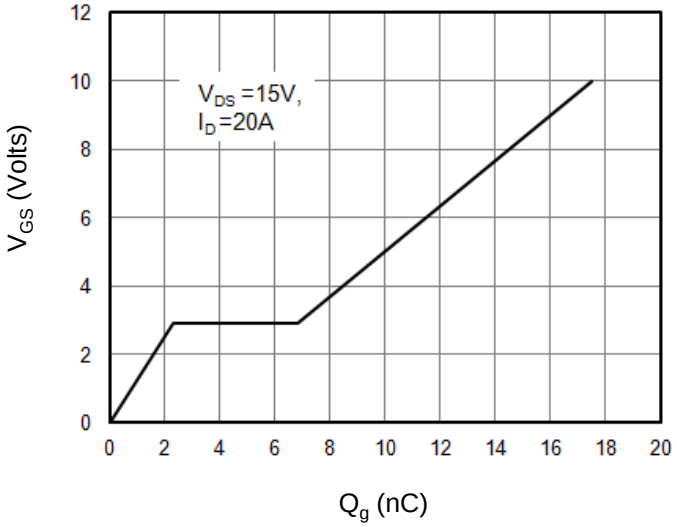



**Figure 5: Gate Charge Characteristics**

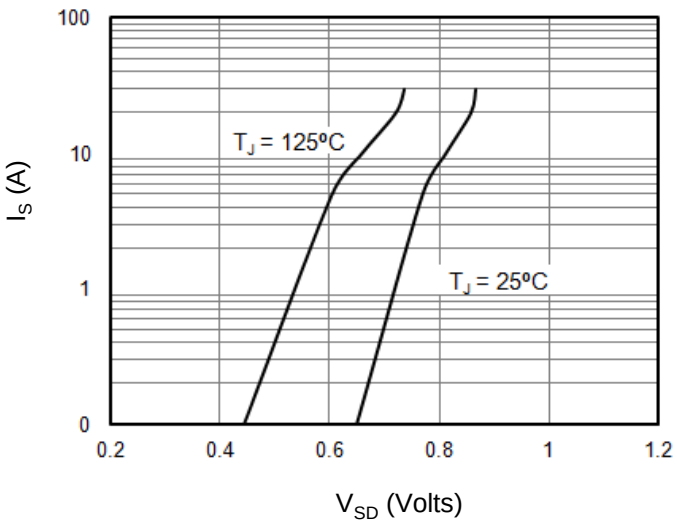



**Figure 6: Body Diode Forward Voltage**

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

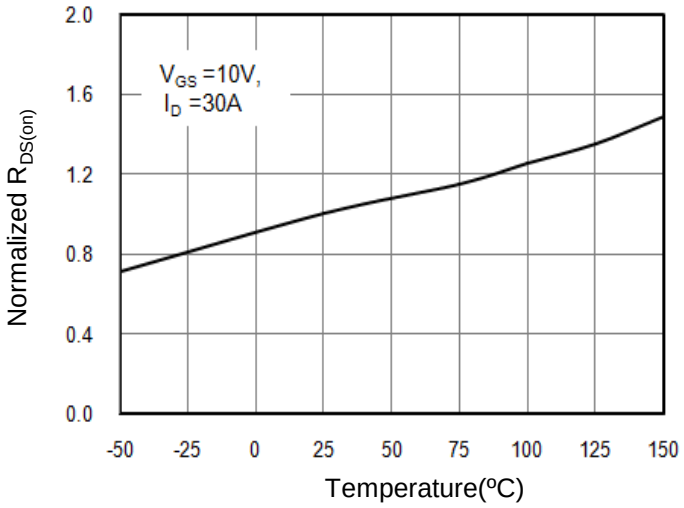



**Figure 7: On-Resistance vs. Junction Temperature**

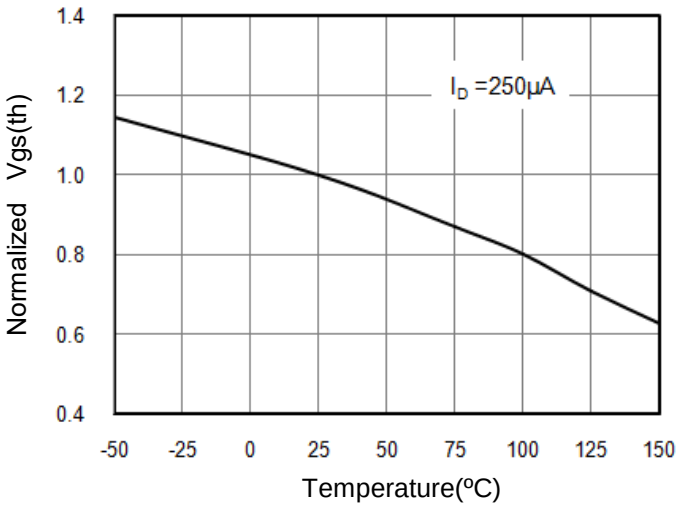



**Figure 8: Vgs(th) vs. Junction Temperature**

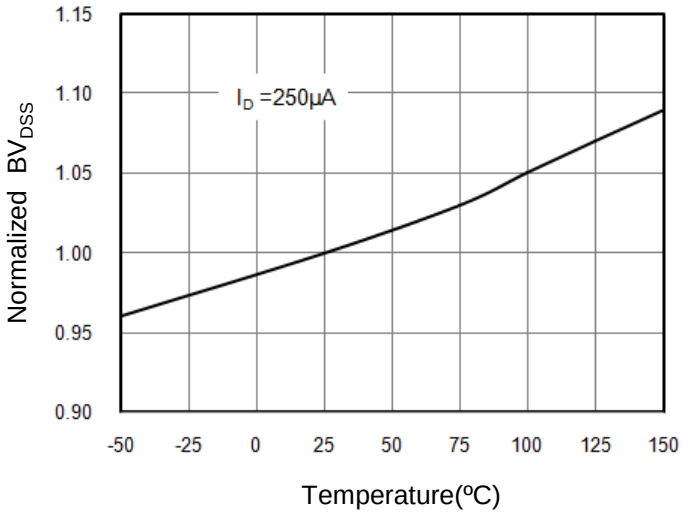



**Figure 9: $BV_{DSS}$ vs. Junction Temperature**

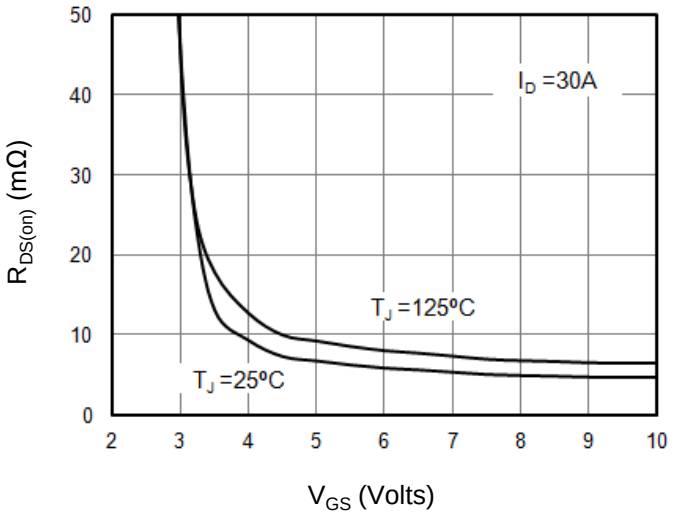



**Figure 10: On-Resistance vs. Gate-Source Voltage**

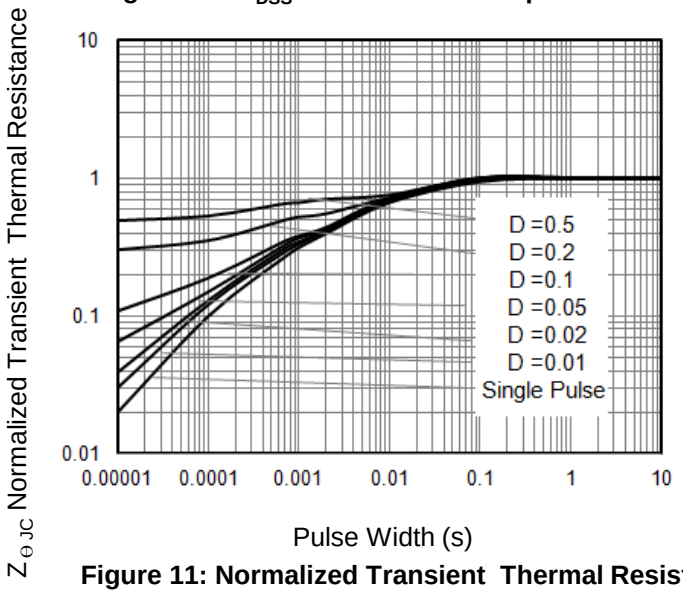



**Figure 11: Normalized Transient Thermal Resistance**

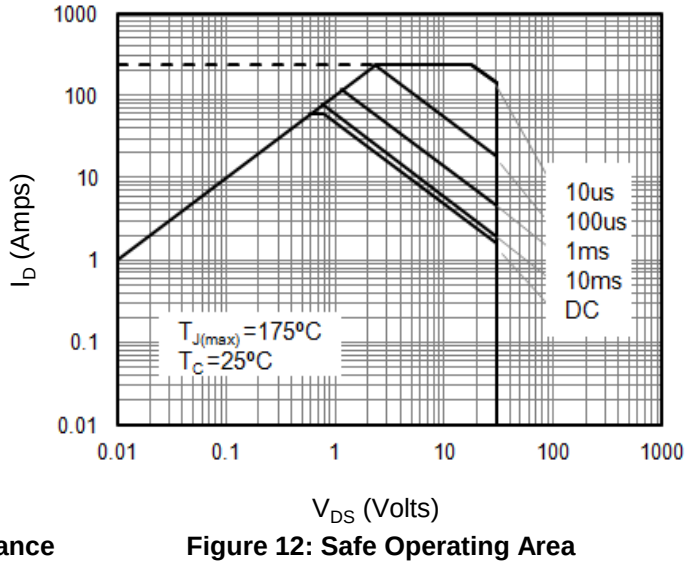



**Figure 12: Safe Operating Area**

**Figure A：Gate Charge Test Circuit and Waveforms**

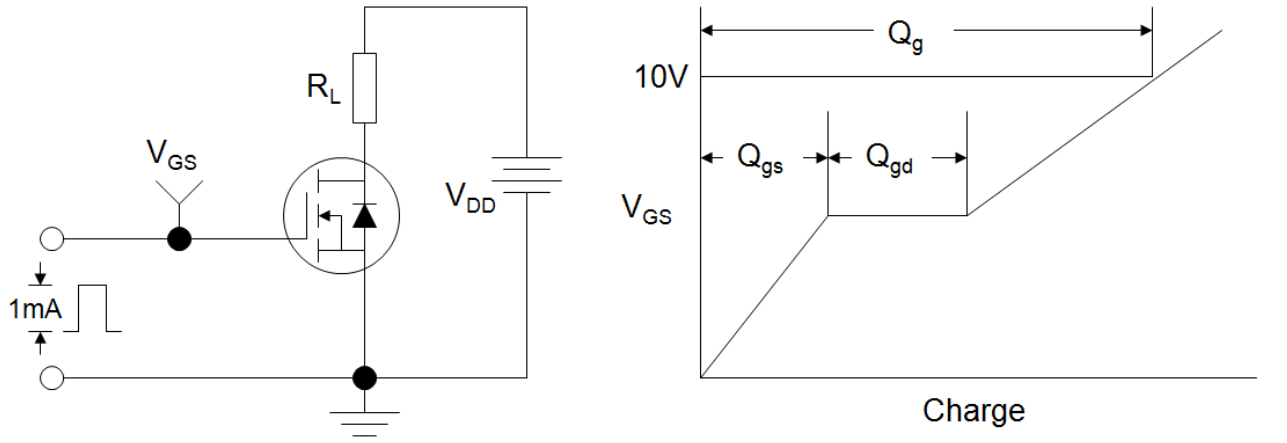



**Figure B：Resistive Switching Test Circuit and Waveforms**

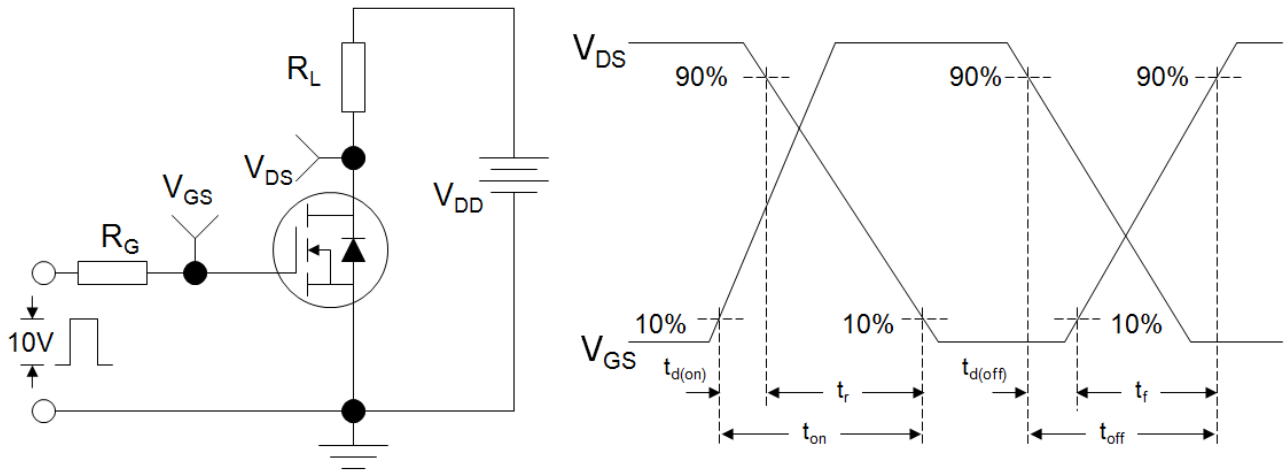
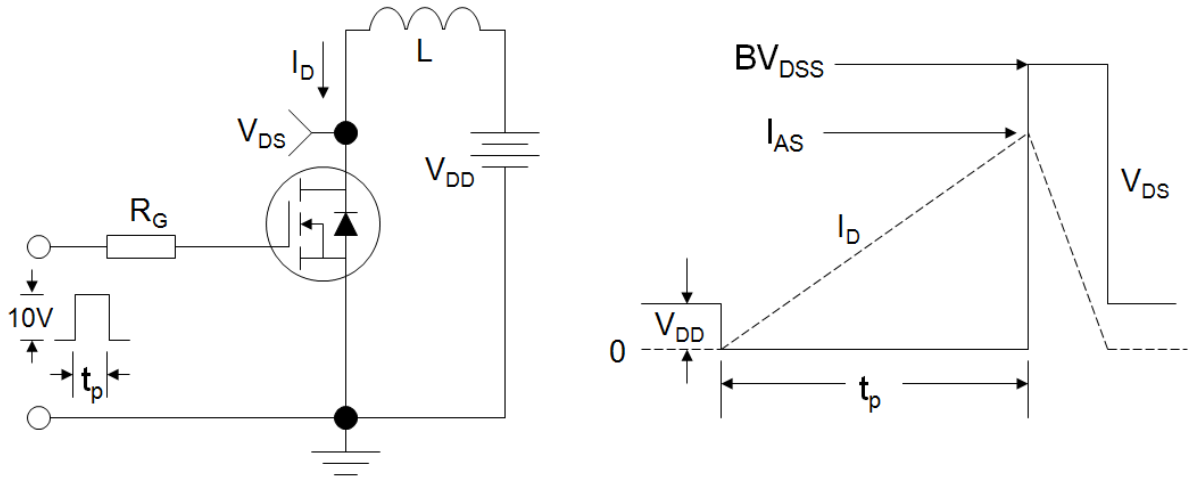
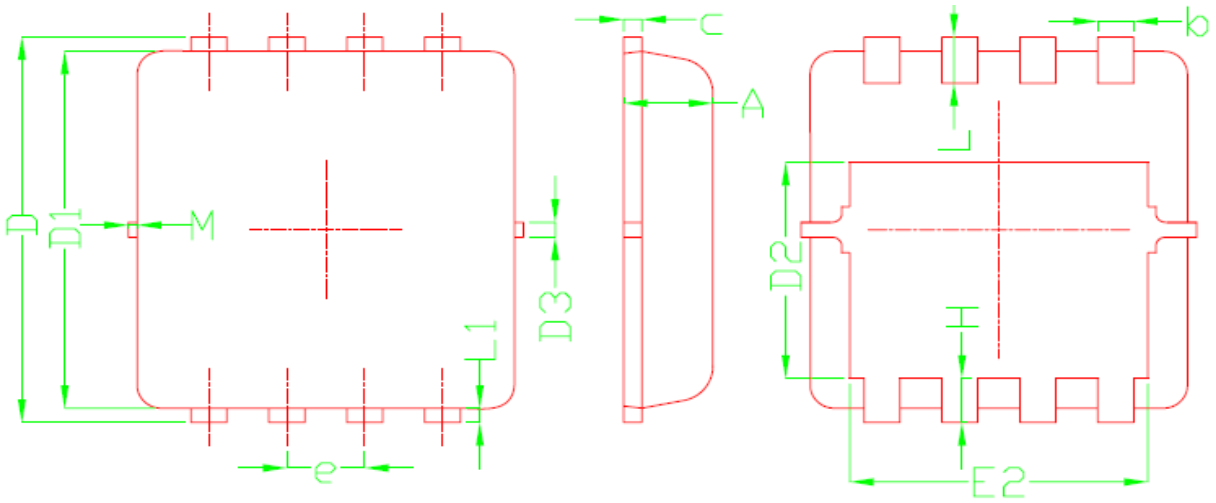
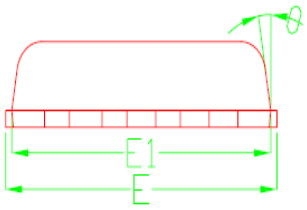


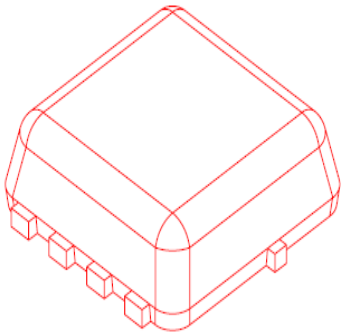

**Figure C：Unclamped Inductive Switching (UIS) Test Circuit and Waveforms**

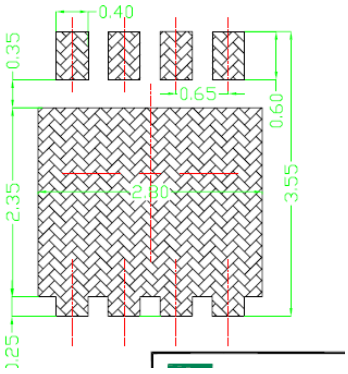


# DFN 3.3x3.3






| SYMBOL | DIMENSIONAL REQMTS | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 |
| b | 0.25 | 0.30 | 0.35 |
| c | 0.10 | 0.15 | 0.25 |
| D | 3.25 | 3.35 | 3.45 |
| D1 | 3.00 | 3.10 | 3.20 |
| D2 | 1.78 | 1.88 | 1.98 |
| D3 | --- | 0.13 | --- |
| E | 3.20 | 3.30 | 3.40 |
| E1 | 3.00 | 3.15 | 3.20 |
| E2 | 2.39 | 2.49 | 2.59 |
| e | 0.65BSC | | |
| H | 0.30 | 0.39 | 0.50 |
| L | 0.30 | 0.40 | 0.50 |
| L1 | --- | 0.13 | --- |
| θ | --- | 10° | 12° |
| M | * | * | 0.15 |
| * Not specified | | | |

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