# GOSTONE

RoHS COMPLIANT

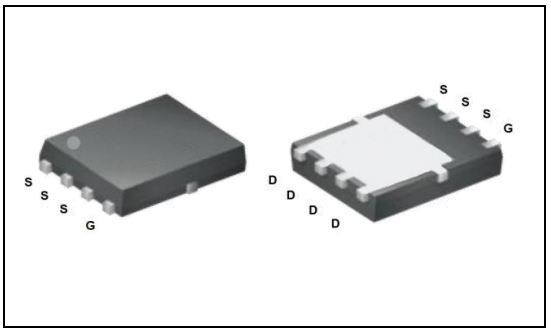
**N-Channel MOSFET 30V, 1.5mq max**

**GMS016N03E4**

## Product Summary

| $V_{DS}$ | $R_{DS(ON)}$ max | $I_D$ max |
|---|---|---|
| 30V | 1.5mÝ @ VGS = 10V | 185A |
| | 2.6mÝ @ VGS = 4.5V | |

**DFN5X6**



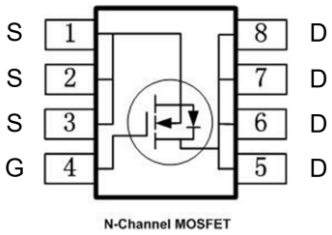

### Features

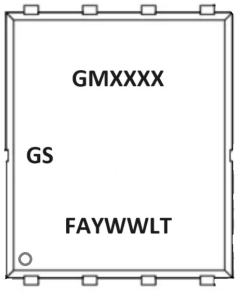
- Low $R_{DS(on)}$ trench technology
- Low thermal impedance
- Fast switching speed
- 100% avalanche tested

### Application

- DC/DC conversion
- Power switch
- Motor drives
- Li- Battery Protection

**Equivalent circuit**




**DFN5X6**

NOTE:
LOGO - GS
GMXXXXX- Part number code
F - Fab location code
A - Assembly location code
Y - Year code
WW - Week code
L&T - Assembly lot code

### Ordering Information

| Part Number | Case | Packaging |
|---|---|---|
| GMS016N03E4 | DFN5X6 | 5,000/Tape & Reel |

## Absolute Maximum Rating (Ta=25ÁC)

| Parameters | | Symbol | Max | Units |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | Ñ20 | V |
| Continuous Drain Current G | $T_C$ = +25˚C | $I_D$ | 185 | A |
| | $T_C$ = +100˚C | | 120 | A |
| Pulsed Drain Current C | | $I_{DM}$ | 500 | A |
| Avalanche Current C | | $I_{AS}$ | 70 | A |
| Avalanche Energy C | L=0.05mH | $E_{AS}$ | 122 | mJ |
| Power Dissipation B | $T_C$ = +25˚C | $P_D$ | 89 | W |
| | $T_C$ = +100˚C | | 35.7 | W |
| Operating and Storage Temperature Range | | $T_J$, $T_G$ | -55 to+150 | ˚C |

## Thermal Characteristics

| Characteristic | | Symbol | Typ | Max | Unit |
|---|---|---|---|---|---|
| Maximum Junction-to-Ambient [A] | t ≤ 10s | $R_{\theta JA}$ | 16 | 20 | °C/W |
| Maximum Junction-to-Ambient [A D] | Steady-State | | 38.5 | 55 | °C/W |
| Maximum Junction-to-Case | Steady-State | $R_{\theta JC}$ | 1.13 | 1.4 | °C/W |

## Electrical Characteristics (@TJ = +25°C unless otherwise specified.)

| 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 |
| | | $T_J$=55℃ | | | 5 | |
| $I_{GSS}$ | 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 | 1.2 | 1.5 | 2.4 | V |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=20A | | 1.2 | 1.5 | mΩ |
| | | $T_J$=125℃ | | 1.9 | 2.4 | |
| | | $V_{GS}$=4.5V, $I_D$=20A | | 1.6 | 2.6 | mΩ |
| $g_{FS}$ | Forward Trans conductance | $V_{DS}$=5V, $I_D$=20A | | 129 | | S |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=1A,$V_{GS}$=0V | | 0.67 | 1 | V |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=85A,$V_{GS}$=0V | | 0.87 | 1.3 | V |
| $I_S$ | Maximum Body-Diode Continuous Current | | | | 132 | A |
| **DYNAMIC PARAMETERS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=15V, f=1MHz | | 3509 | | pF |
| $C_{oss}$ | Output Capacitance | | | 1847 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 86 | | pF |
| $R_g$ | Gate resistance | f=1MHz | 0.7 | 1.5 | 2.3 | Ω |
| **SWITCHING PARAMETERS** | | | | | | |
| $Q_g$(10V) | Total Gate Charge | $V_{GS}$=10V, $V_{DS}$=15V, $I_D$=20A | | 49 | | nC |
| $Q_{gs}$ | Gate Source Charge | | | 11.8 | | nC |
| $Q_{gd}$ | Gate Drain Charge | | | 6.8 | | nC |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS}$=10V, $V_{DS}$=15V, $R_L$=0.75Ω, $R_{GEN}$=3Ω | | 13 | | ns |
| $t_r$ | Turn-On Rise Time | | | 63.6 | | ns |
| $t_{D(off)}$ | Turn-Off Delay Time | | | 38 | | ns |
| $t_f$ | Turn-Off Fall Time | | | 56 | | ns |
| $t_{rr}$ | Body Diode Reverse Recovery Time | $I_F$=20A, dI/dt=100A/μs | | 51.4 | | ns |
| $Q_{rr}$ | Body Diode Reverse Recovery Charge | $I_F$=20A, dI/dt=100A/μs | | 52 | | nC |

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in$^2$ FR-4 board with 1oz. Copper, in a still air environment with $T_A$ =25°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. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and duty cycles to keep initial $T_J$=25°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 <300μs 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 larger heatsink, assuming a maximum junction temperature of Tj(max)=150℃.The SOA curve provides a single pulse rating

G. The maximum current rating is package limited

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

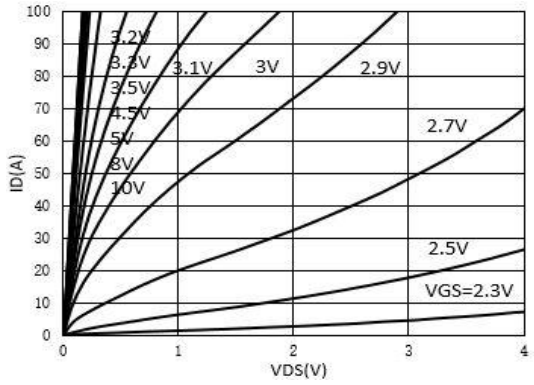



Figure1: On-Region Characteristics(Note E)

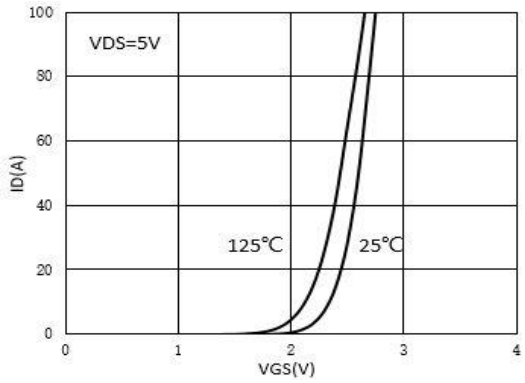
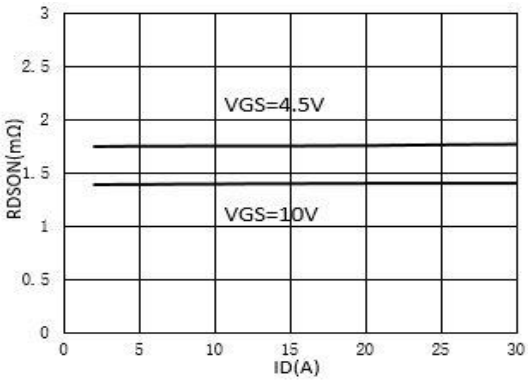



Figure 2:Transfer Characteristics(Note E)




Firgure3:On-Resistance vs. Drain Current and Gate Voltage(Note E)

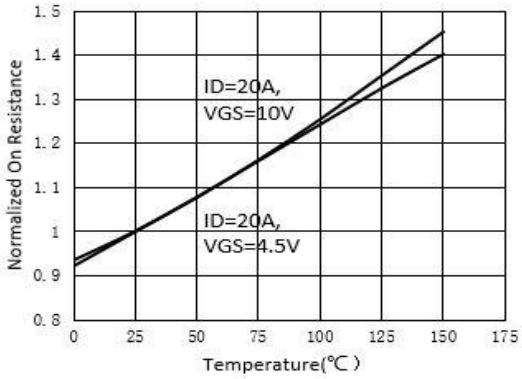
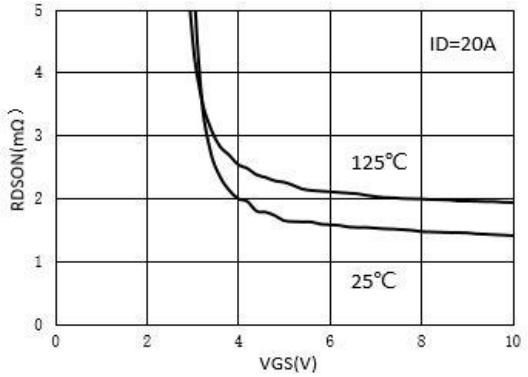



Figure 4:On-Resistance vs. Junction Temperature(Note E)




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

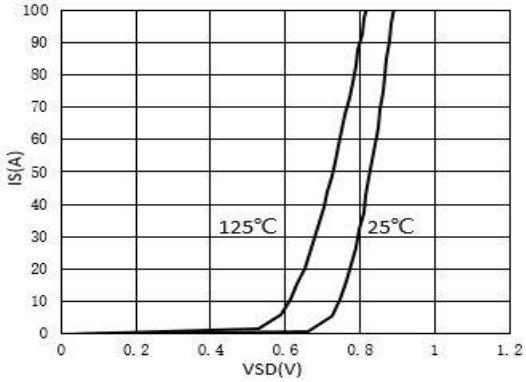



Figure 6: Body-Diode Characteristics (Note E)

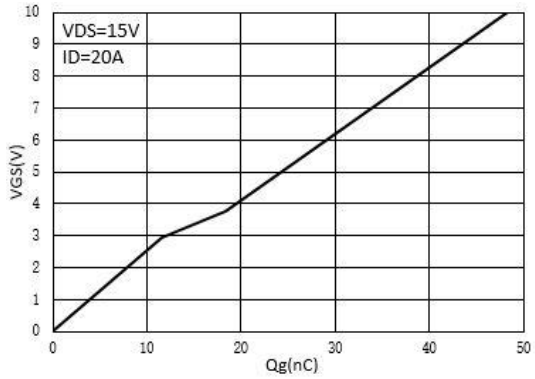



Figure 7:Gate-Charge Characteristics

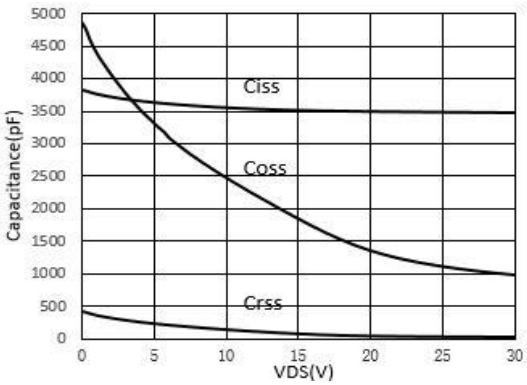



Figure 8:Capacitance Characteristics

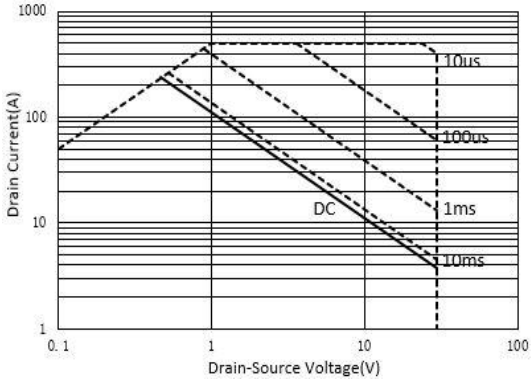



Figure 9:Maximum Forward Biased Safe Operating Area (Note F)

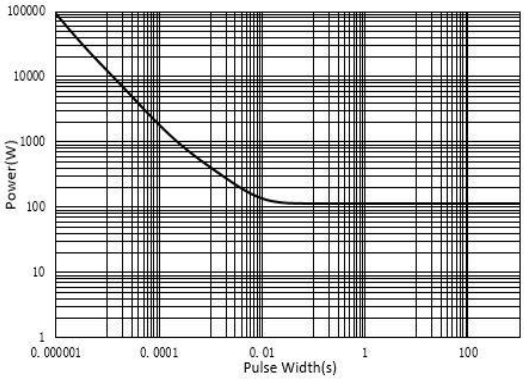



Figure 10:Single pulse Power Rating Junction-to-Case(Note F)

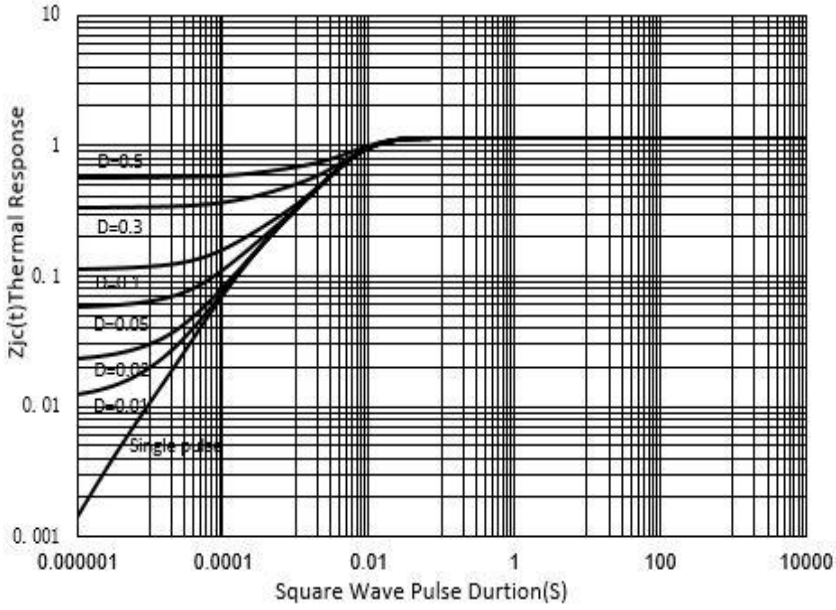
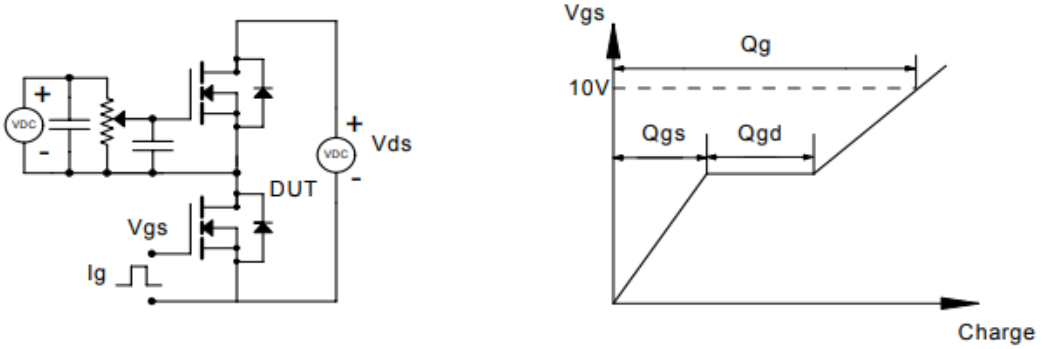


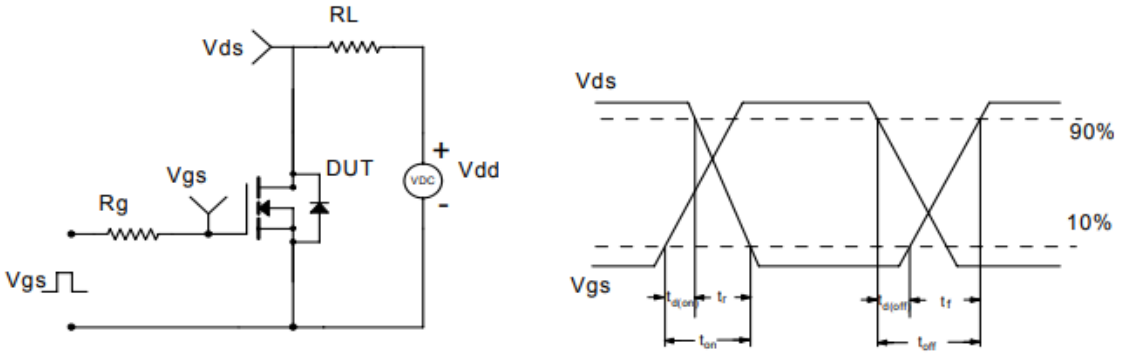

Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

## Test Circuit

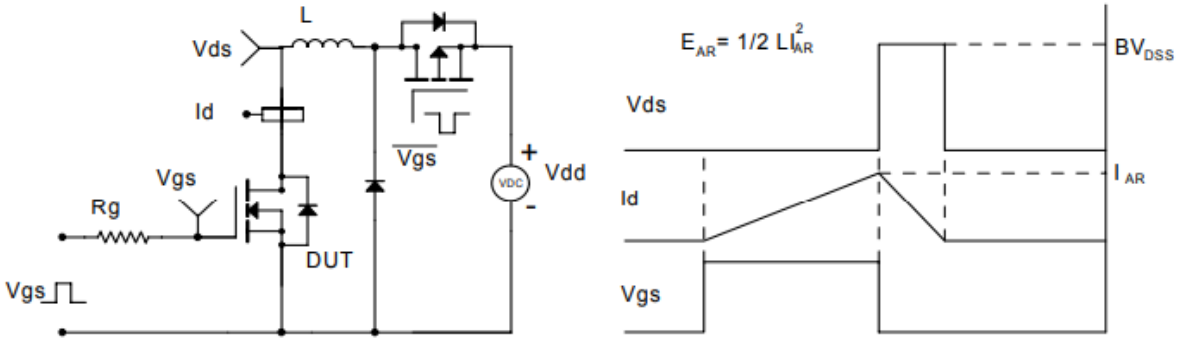
Gate Charge Test Circuit & Waveform



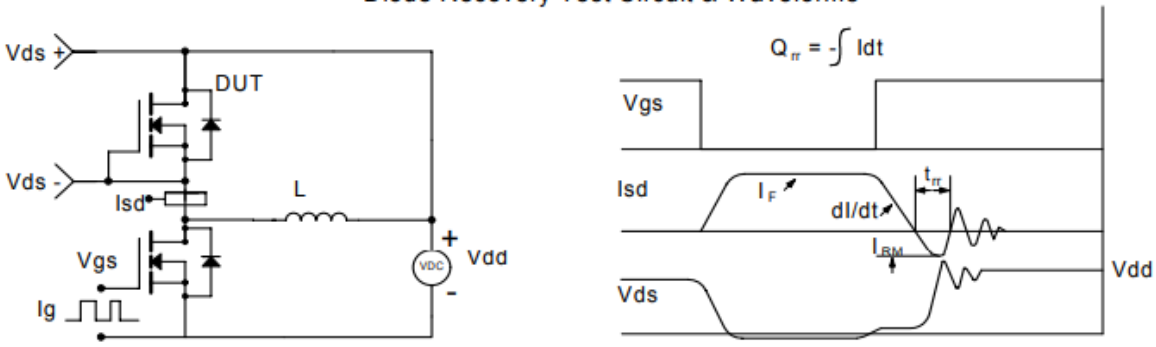

Resistive Switching Test Circuit & Waveforms



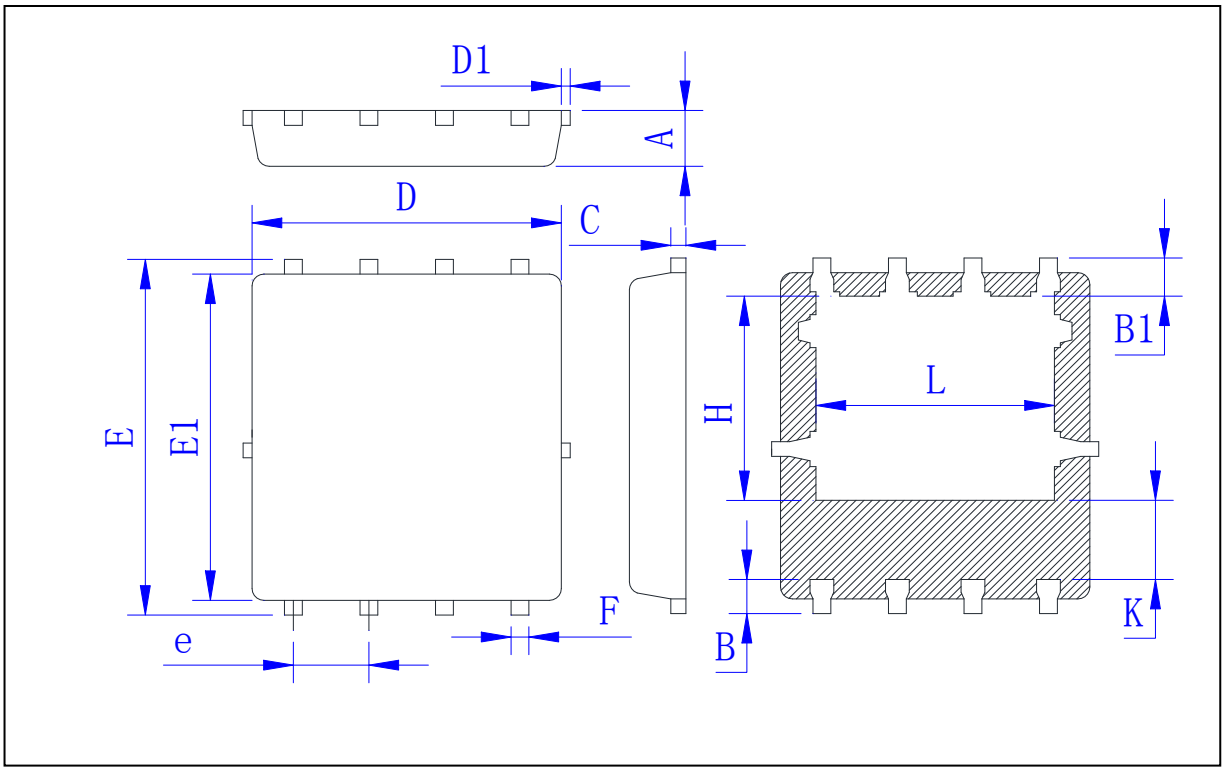

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms



## Package outline:DFN5x6




| Symbol | Min | Typ | Max |
|---|---|---|---|
| A | 0.90 | 0.95 | 1.00 |
| B | 0.48 | 0.58 | 0.68 |
| B1 | 0.55 | 0.65 | 0.75 |
| C | 0.20 | 0.254 | 0.30 |
| D | 5.10 | 5.20 | 5.30 |
| D1 | | | 0.15 |
| E | 5.90 | 6.05 | 6.20 |
| E1 | 5.40 | 5.55 | 5.70 |
| e | 1.22 | 1.27 | 1.32 |
| F | 0.25 | 0.30 | 0.35 |
| H | 3.27 | 3.47 | 3.67 |
| L | 3.80 | 4.00 | 4.20 |
| K | 1.20 | | |

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