SEMICONDUCTOR

# D019N04G

## 130A 40V N-Channel Enhancement Mode Power MOSFET

## Features

- High Reliability Capability
- Extremely low on-resistance RDS(on)
- Excellent gate charge x RDS(on) product(FOM)

| Product Summary | | | |
|---|---|---|---|
| $V_{DS}$ | $R_{DS(on)}$ (mΩ) Typ | $I_D$ (A) | Qg (Typ) |
| 40V | 1. 6 @ 10V 30A | 130 | 168nc |

## Mechanical Data

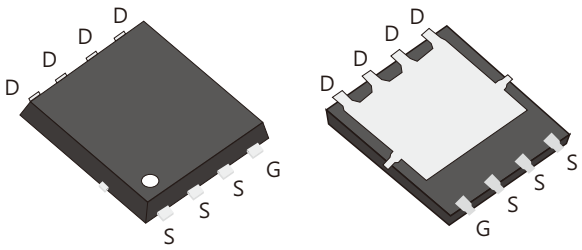
- Case:DFN5×6 Package

DFN5×6

D019N04G

## Application

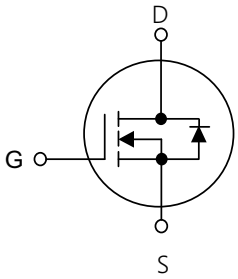
- Switching Application
- SR (Synchronous rectification)
- DC/DC converter
- General purpose applications




## Ordering Information

| Part No. | Package Type | Package | Quality(box) |
|---|---|---|---|
| D019N04G | DFN5×6 | Tape & Reel | 5000 |

## Block Diagram




## Table1 Absolute Maximum Ratings ($T_C$=25°C, unless otherwise specified)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_C$=25°C | $I_D$ | 130 | A |
| | $T_C$=100°C | | 85 | |
| Pulsed Drain Current (Note 1) | | $I_{DM}$ | 520 | A |
| Single Pulse Avalanche Energy(Note 2) | | $E_{AS}$ | 900 | mJ |
| Power Dissipation | $T_C$=25°C | $P_D$ | 78 | W |
| Operating Junction and Storage Temperature | | $T_J$/$T_{STG}$ | -55~+150 | °C |

Table 2.Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal resistance Junction to Ambient | $R_{\theta JA}$ | 40 | °C/W |
| Thermal resistance Junction to Case | $R_{\theta JC}$ | 1.6 | °C/W |

Table 3. Electrical Characteristics ($T_J$=25°C, unless otherwise specified)

| Parameter | | Symbol | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Off Characteristics | | | | | | | |
| Drain-Source Breakdown Voltage | | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=250μA | 40 | - | - | V |
| Drain-Source Leakage Current | | $I_{DSS}$ | $V_{DS}$=40V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate- Source Leakage Current | Forward | $I_{GSS}$ | $V_{GS}$=20V,$V_{DS}$=0V | - | - | 100 | nA |
| | Reverse | | $V_{GS}$=-20V,$V_{DS}$=0V | - | - | -100 | nA |
| On Characteristics(Note 3) | | | | | | | |
| Gate Threshold Voltage | | $V_{GS(TH)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 1.0 | 1.7 | 2.4 | V |
| Static Drain-Source On-State Resistance | | $R_{DS(ON)}$ | $V_{GS}$=10V,$I_D$=30A | - | 1.6 | 1.9 | mΩ |
| Dynamic Characteristics(Note 4) | | | | | | | |
| Input Capacitance | | $C_{ISS}$ | $V_{DS}$=20V,$V_{GS}$=0V,f=1MHz | - | 9386 | - | pF |
| Output Capacitance | | $C_{OSS}$ | | - | 655 | - | pF |
| Reverse Transfer Capacitance | | $C_{RSS}$ | | - | 562 | - | pF |
| Gate Resisitance | | $R_G$ | $V_{DD}$=0V,$V_{GS}$=0V,f=1MHz | - | 1.2 | - | Ω |
| Switching Characteristics (Note 4) | | | | | | | |
| Turn-On Delay Time | | td(on) | $V_{DS}$=20V, $V_{GS}$=10V,$R_L$=3.5Ω, | - | 11 | - | ns |
| Turn-On Rise Time | | $t_R$ | | - | 4.6 | - | ns |
| Turn-Off Delay Time | | td(off) | | - | 32 | - | ns |
| Turn-Off Fall Time | | tf | | - | 6 | - | ns |
| Total Gate Charge | | $Q_G$ | $V_{DS}$=20V,$I_D$=30A, $V_{GS}$=10V | - | 168 | - | nC |
| Gate-Source Charge | | $Q_{GS}$ | | - | 26 | - | nC |
| Gate-Drain Charge | | $Q_{GD}$ | | - | 33 | - | nC |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | | |
| Drain-Source Diode Forward Voltage | | $V_{SD}$ | $V_{GS}$=0V, $I_S$=50A | - | - | 1.2 | V |
| Maximum Continuous Drain-Source Diode Forward Current | | $I_S$ | | - | - | 130 | A |
| Reverse Recovery Time | | trr | $V_{GS}$=0V, $I_F$=20A dI$_F$/dt=500A/μs | - | 44 | - | ns |
| Reverse Recovery Charge | | $Q_{RR}$ | | - | 47 | - | nC |

Notes : 1 Repetitive Rating:Pulse width limited by maximum junction temperature
2 L=0.5mH, $R_G$=25Ω,$V_{DS}$=48V,Starting $T_J$=25°C
3 Pulse Test: Pulse width ≤300μS, Duty cycle≤2%
4 Guaranteed by design,not subject to production

## Typical Characteristics Diagrams

Figure 1.Output Characteristics

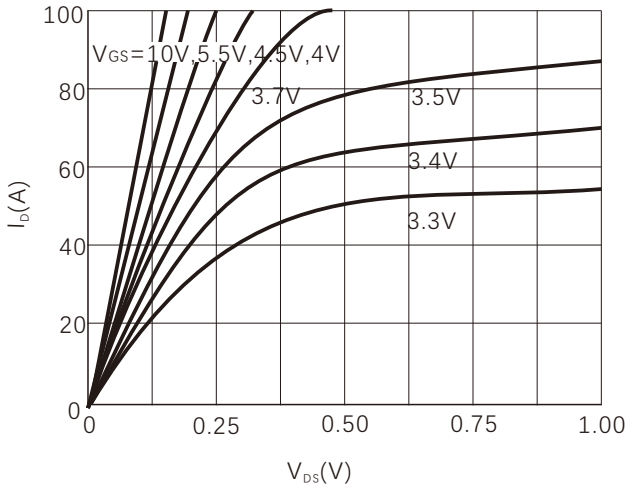



Figure2.Threshold Voltage

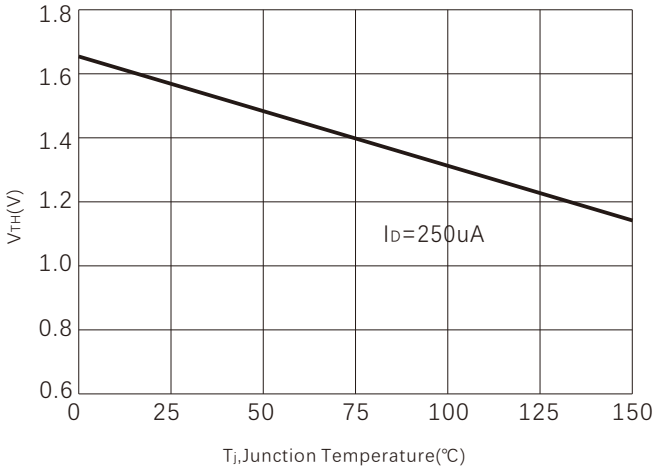



Figure 3.On-Resistance vs.Drain Current

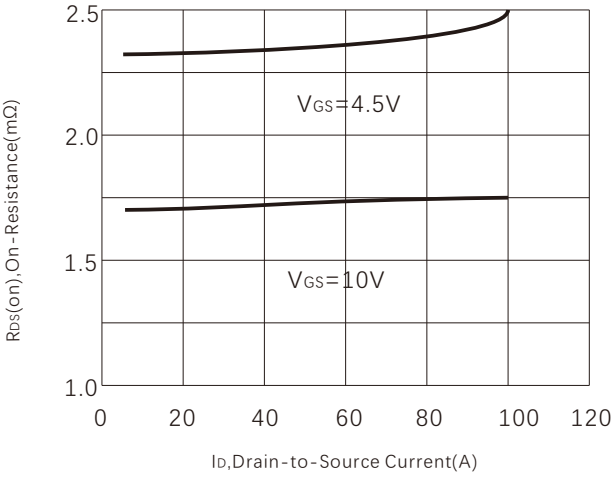



Figure 4. Capacitance

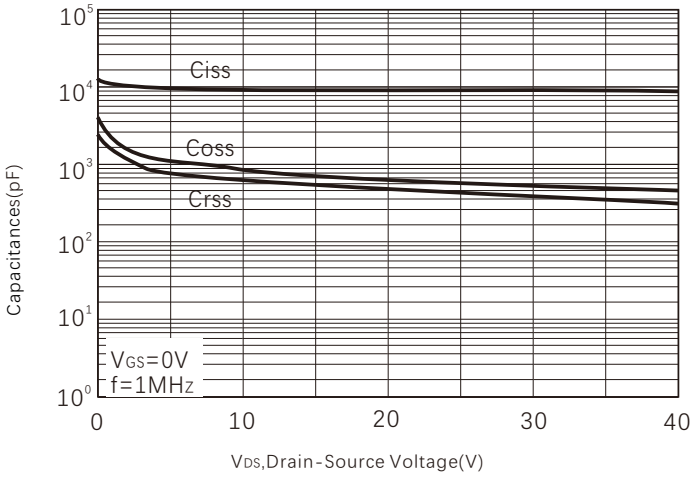



Figure 5.On-Resistance vs.Gate-Source Voltage

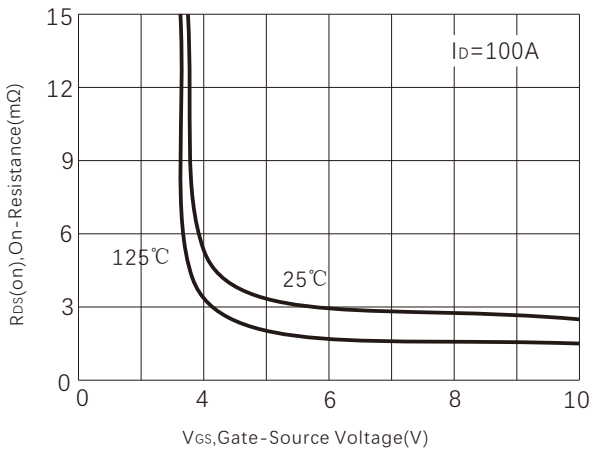



Figure 6.Source-Drain Diode Forward Voltage

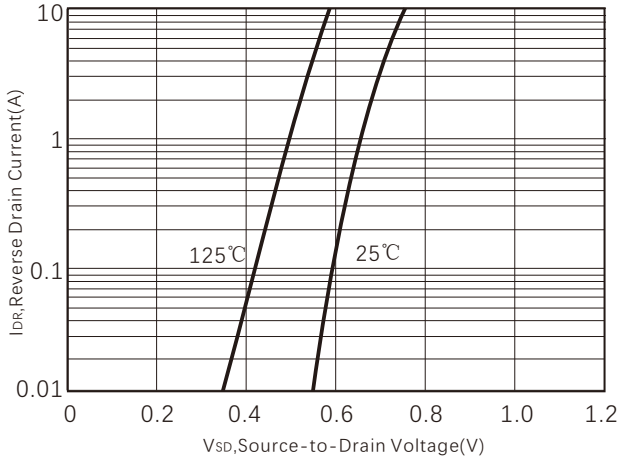


Figure7.Maximum Drain Current vs Temperature

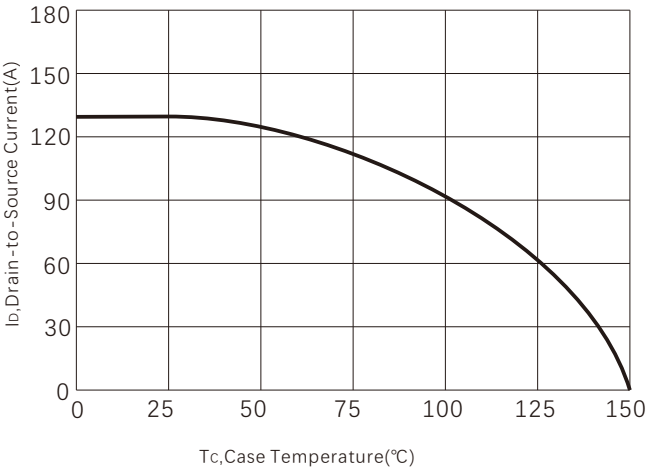



Figure 8. Transfer Characteristics

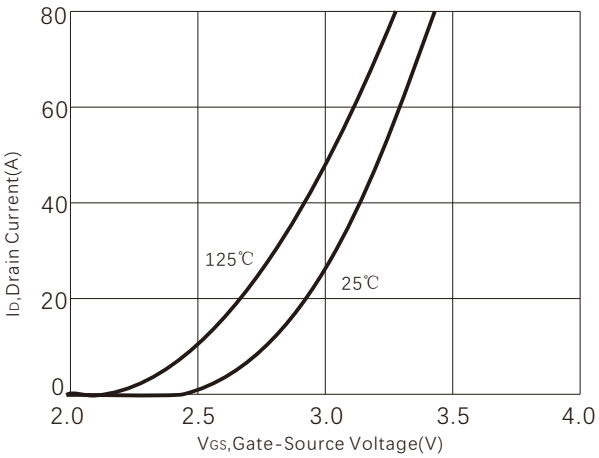



Figure 9. Safe operating area

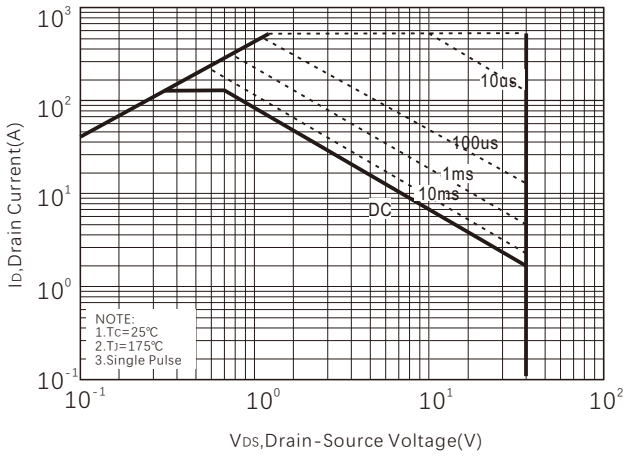
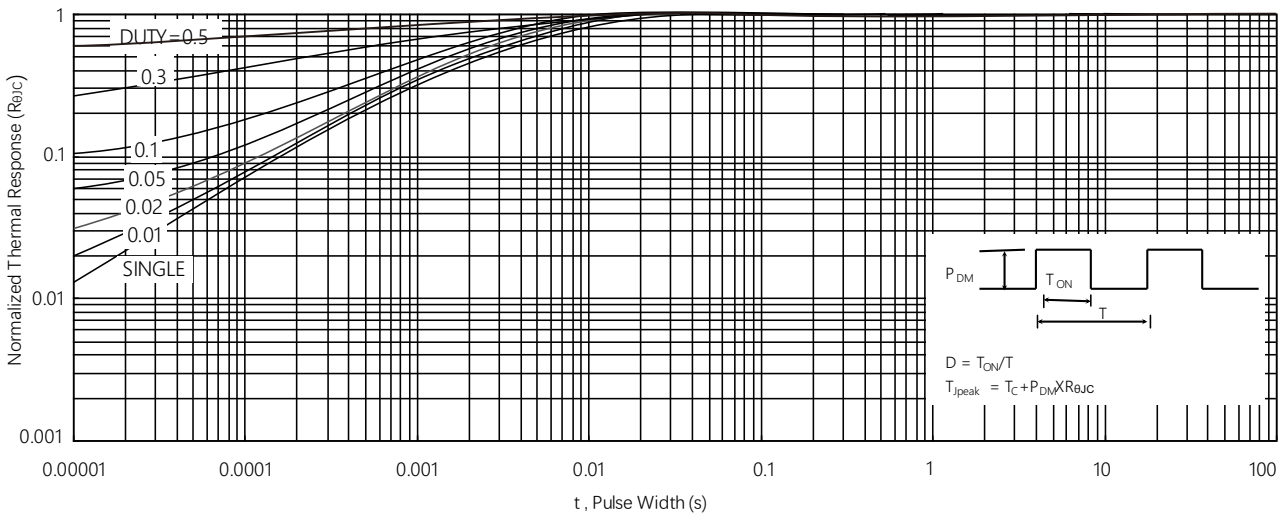
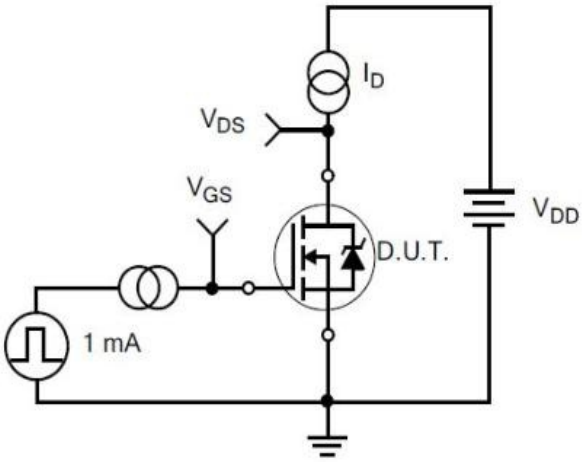


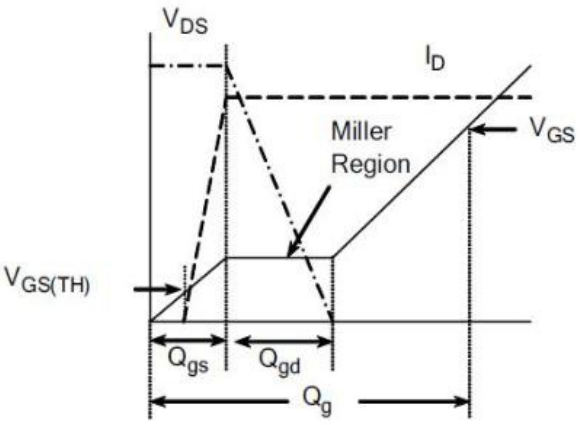

Figure 10.Normalized Maximum Transient Thermal Impedance



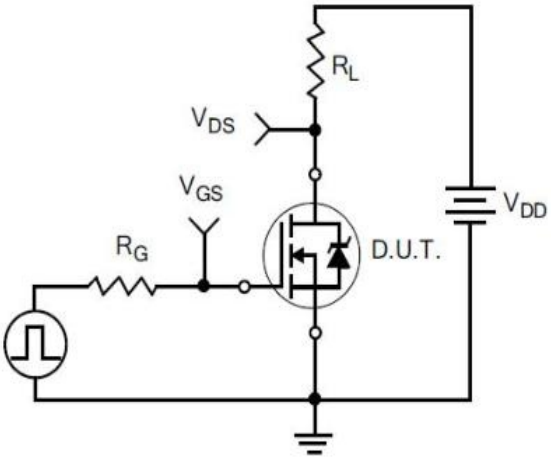
Typical Test Circuit



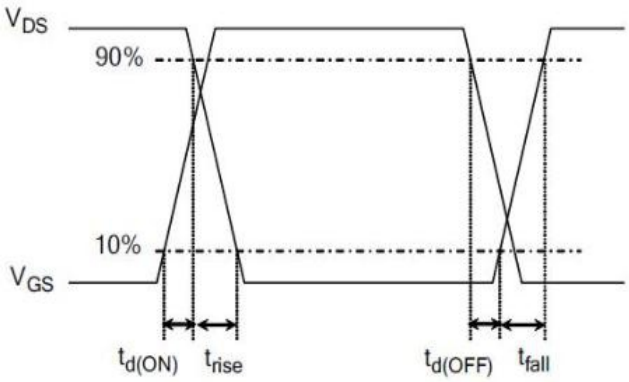

1) Gate Charge Test Circuit



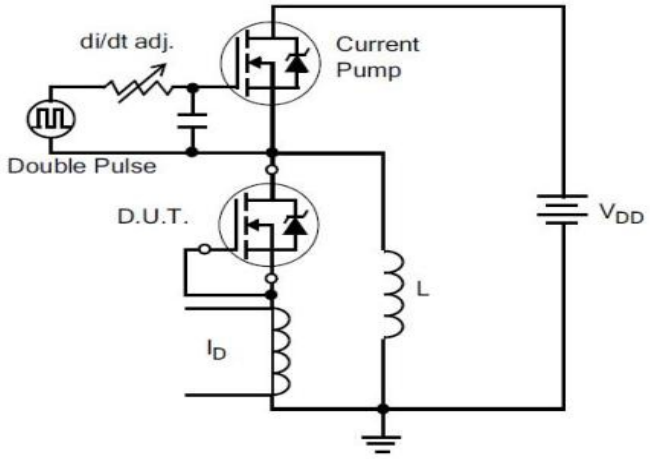

2) . Gate Charge Waveform



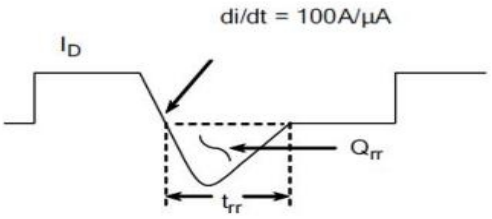

3) Resistive Switching Test Circuit



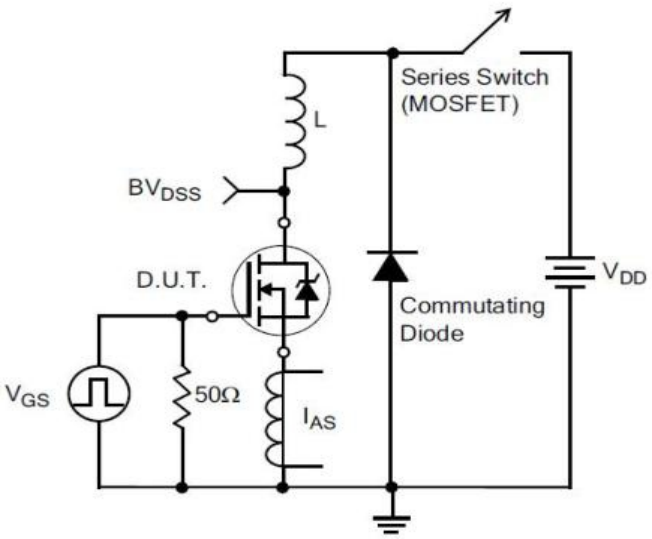

4) Resistive Switching Waveforms



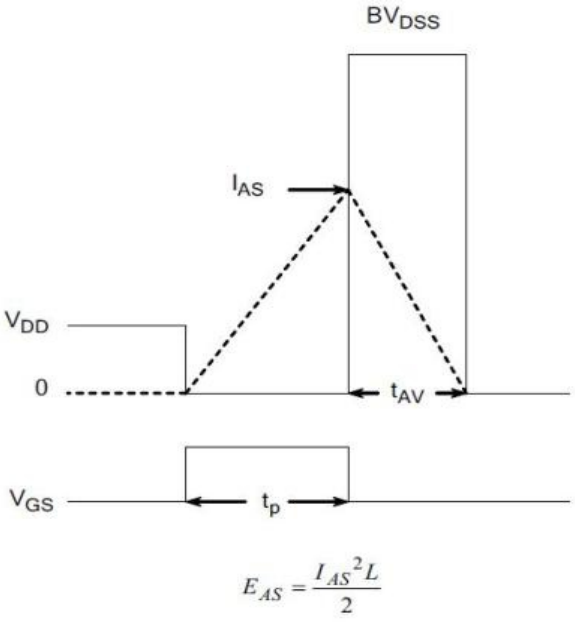

5) Diode Reverse Recovery Test Circuit




6) Diode Reverse Recovery Waveform



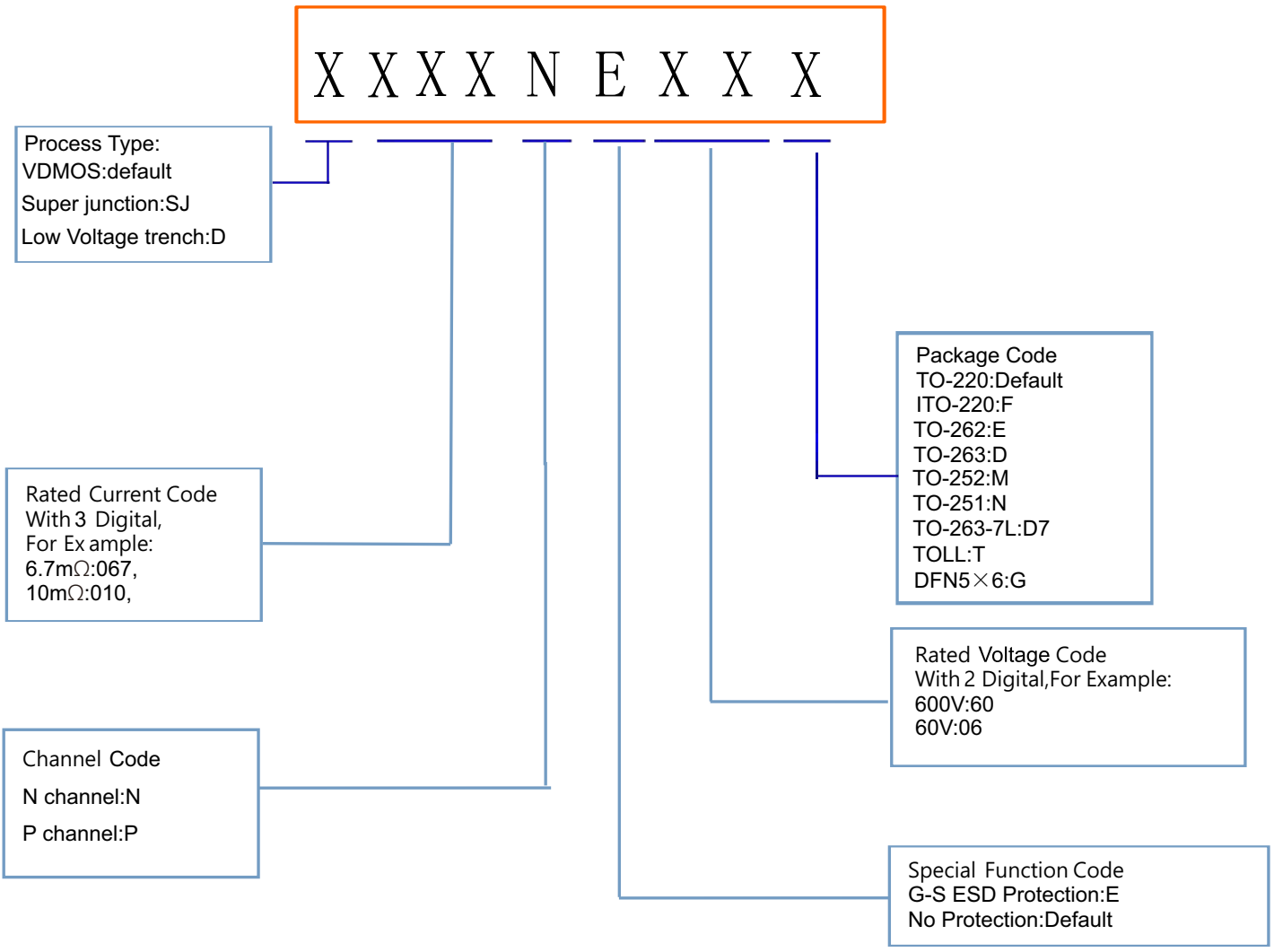

7) . Unclamped Inductive Switching Test Circuit




$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

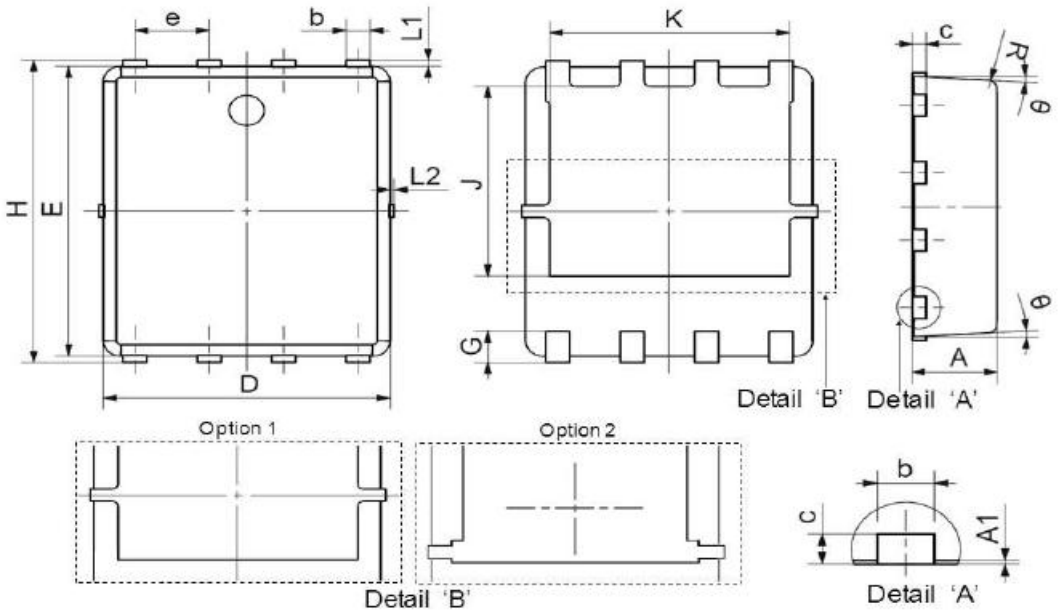
8) Unclamped Inductive Switching Waveforms

## Product Names Rules



Dimensions

## DFN5×6 PACKAGE OUTLINE DIMENSIONS




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.80 | 1.20 | 0.031 | 0.047 |
| A1 | 0.00 | 0.05 | 0.000 | 0.002 |
| b | 0.30 | 0.51 | 0.012 | 0.020 |
| c | 0.15 | 0.35 | 0.006 | 0.014 |
| D | 4.80 | 5.40 | 0.189 | 0.213 |
| e | 1.27 BSC | | 0.050 BSC | |
| E | 5.66 | 6.06 | 0.223 | 0.239 |
| G | 0.30 | 0.71 | 0.012 | 0.028 |
| H | 5.90 | 6.35 | 0.232 | 0.250 |
| J | 3.32 | 3.92 | 0.131 | 0.154 |
| K | 3.61 | 4.25 | 0.142 | 0.167 |
| L1 | 0.05 | 0.25 | 0.002 | 0.010 |
| L2 | 0.00 | 0.15 | 0.000 | 0.006 |
| R | 0.25 REF | | 0.010 REF | |
| θ | 0° | 12° | 0° | 12° |

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