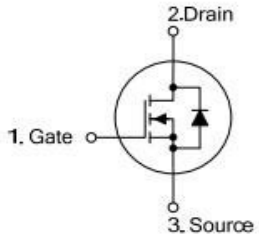
迈诺斯科技

# D90N25-MNS

## Silicon N-Channel Power MOSFET

## Description

D90N25-MNS, the silicon N-channel Enhanced MOSFETs, is obtained by advanced MOSFET technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor is suitable device for SMPS, high speed switching and general purpose applications.




**Schematic diagram**

**TO-247**

## General Features

① $V_{DS}$=250V, $R_{dson}$<35mΩ @$V_{GS}$=10V, $I_D$=90A (Typ:26mΩ)
② Fast Switching
③ Low Crss
④ 100% avalanche tested
⑤ Improved dv/dt capability
⑥ RoHS product

## Application

① High frequency switching mode power supply

## Package Marking And Ordering Information：

| Ordering Codes | Package | Product Code | Packing |
|---|---|---|---|
| D90N25-MNS | TO-247 | D90N25 | Tube |

## ABSOLUTE RATINGS

at TC = 25°C, unless otherwise specified

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain-to-Source Voltage | 250 | V |
| $I_D$ | Continuous Drain Current | 90 | A |
| | Continuous Drain Current $T_C$ = 100°C | 73 | A |
| $I_{DM}$ | Pulsed Drain Current(Note1) | 360 | A |
| $V_{GS}$ | Gate-to-Source Voltage | ±30 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy(Note2) | 4200 | mJ |
| $d_{v/dt}$ | Peak Diode Recovery dv/dt(Note3) | 5.0 | V/ns |
| $P_D$ | Power Dissipation | 830 | W |
| | Derating Factor above 25°C | 6.7 | W/℃ |
| $T_J$， $T_{stg}$ | Operating Junction and Storage Temperature Range | 150，–55 to 150 | ℃ |
| $T_L$ | Maximum Temperature for Soldering | 300 | ℃ |

## Thermal characteristics

| Symbol | Parameter | RATINGS | Units |
|---|---|---|---|
| RθJC | Junction-to-Case | 0.15 | ℃/W |
| RθJA | Junction-to-Ambient | 62.5 | ℃/W |

## Electrical Characteristics

at $T_C$ = 25°C, unless otherwise specified

| OFF Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Values | | | Units |
| | | | Min. | Typ. | Max. | |
| $V_{DSS}$ | Drain to Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 250 | -- | -- | V |
| $\Delta B_{VDSS}/\Delta T_J$ | Bvdss Temperature Coefficient | $I_D$=250uA, Reference25℃ | -- | 0.2 | -- | V/℃ |
| $I_{DSS}$ | Drain to Source Leakage Current | $V_{DS}$ =250V, $V_{GS}$= 0V, $T_j$= 25℃ | -- | -- | 10 | μA |
| | | $V_{DS}$ =200V, $V_{GS}$= 0V, $T_j$= 125℃ | -- | -- | 100 | μA |
| $I_{GSS(F)}$ | Gate to Source Forward Leakage | $V_{GS}$ =+30V | -- | -- | 100 | nA |
| $I_{GSS(R)}$ | Gate to Source Reverse Leakage | $V_{GS}$ =-30V | -- | -- | -100 | nA |

| ON Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Values | | | Units |
| | | | Min. | Typ. | Max. | |
| $R_{DS(ON)}$ | Drain-to-Source On- Resistance | $V_{GS}$=10V, $I_D$=45A(Note4) | -- | 26 | 35 | mΩ |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS}$ = VGS, $I_D$= 250μA(Note4) | 2.0 | -- | 4.0 | V |

| Dynamic Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Values | | | Units |
| | | | Min. | Typ. | Max. | |
| $R_g$ | Gate resistance | f = 1.0MHz | -- | 1.1 | -- | Ω |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V $V_{DS}$ = 25V f = 1.0MHz | -- | 9650 | -- | PF |
| $C_{oss}$ | Output Capacitance | | -- | 930 | -- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 42 | -- | |

| Switching Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | **Parameter** | **Test Conditions** | **Values** | | | **Units** |
| | | | **Min.** | **Typ.** | **Max.** | |
| $t_{d(ON)}$ | Turn-on Delay Time | $I_D$ =45A<br>$V_{DD}$ = 125V<br>$V_{GS}$ = 10V<br>$R_G$ =1Ω | -- | 51 | -- | ns |
| $t_r$ | Rise Time | | -- | 174 | -- | |
| $t_{d(OFF)}$ | Turn-Off Delay Time | | -- | 40 | -- | |
| $t_f$ | Fall Time | | -- | 162 | -- | |
| $Q_g$ | Total Gate Charge | $I_D$ =90A<br>$V_{DD}$ =200V<br>$V_{GS}$ = 10V | -- | 148 | -- | nC |
| $Q_{gs}$ | Gate to Source Charge | | -- | 36 | -- | |
| $Q_{gd}$ | Gate to Drain (“Miller”)Charge | | -- | 55 | -- | |

| Source-Drain Diode Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Symbol** | **Parameter** | **Test Conditions** | **Values** | | | **Units** |
| | | | **Min.** | **Typ.** | **Max.** | |
| $I_S$ | Continuous Source Current (Body Diode) | $T_C$=25 °C | -- | -- | 90 | A |
| $I_{SM}$ | Maximum Pulsed Current (Body Diode) | | -- | -- | 360 | A |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=90A, $V_{GS}$=0V(Note4) | -- | -- | 1.2 | V |
| $T_{rr}$ | Reverse Recovery Time | $I_S$=45A,<br>$T_j$ = 25°C<br>dIF/dt=100A/us, $V_{GS}$=0V | -- | 260 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 2950 | -- | nC |

Note1: Pulse width limited by maximum junction temperature
Note2: L=10mH, $V_{Ds}$=50V, Start $T_J$=25℃
Note3: ISD =90A,di/dt ≤100A/us,VDD≤BVDS, Start TJ=25℃
Note4: Pulse width tp≤300μs, δ≤2%

## Characteristics Curves

**Figure 1 Safe Operating Area**

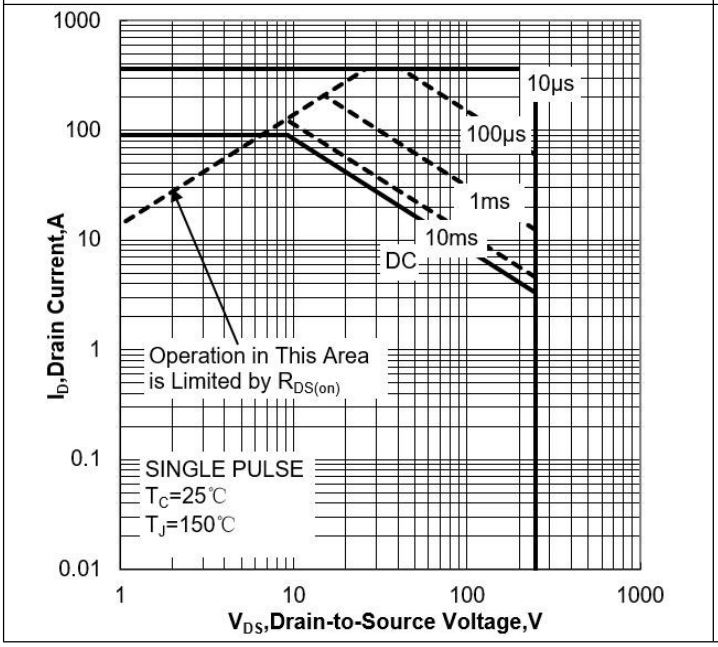



**Figure 2 Power Dissipation**

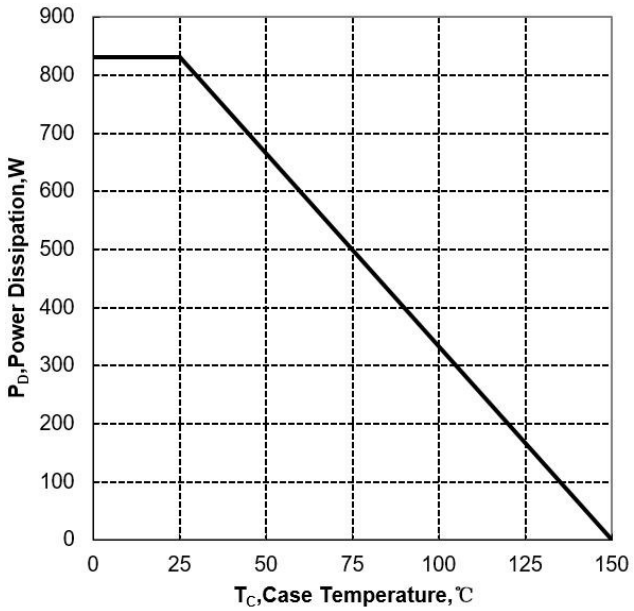



**Figure 3a Max Thermal Impendance**

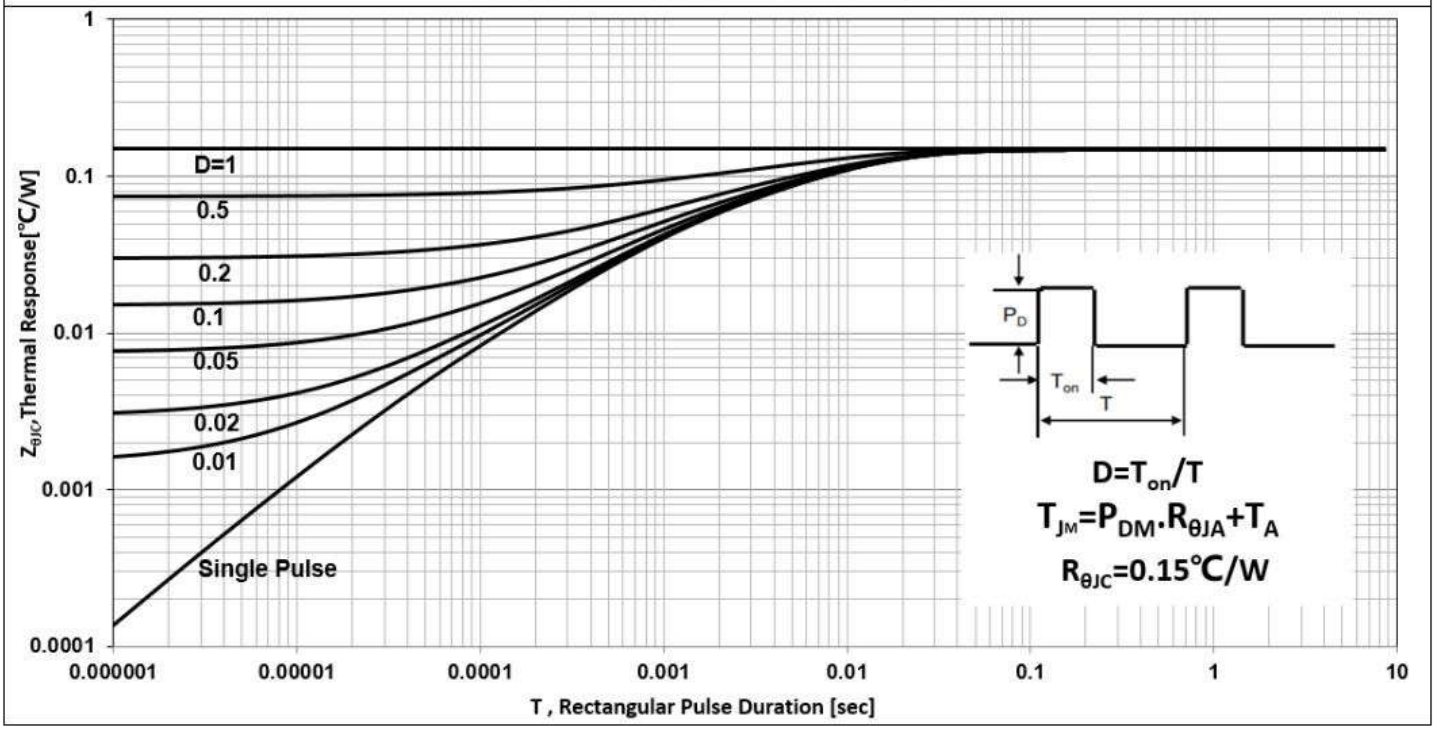


**Figure 4 Typical Output Characteristics**

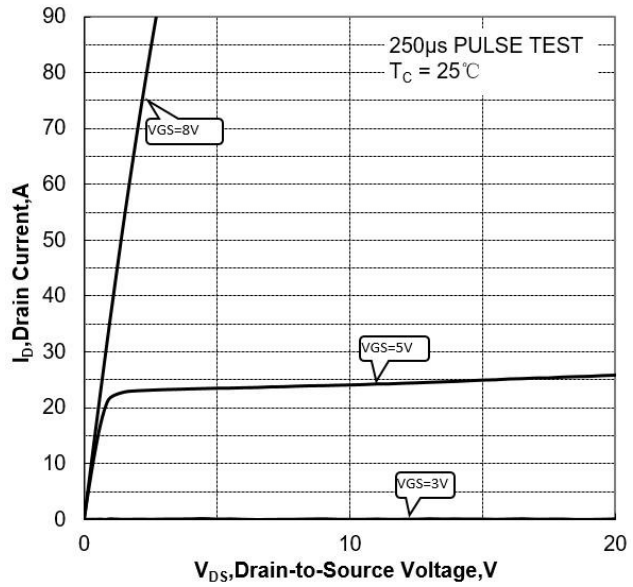



**Figure 5 Typical Transfer Characteristics**

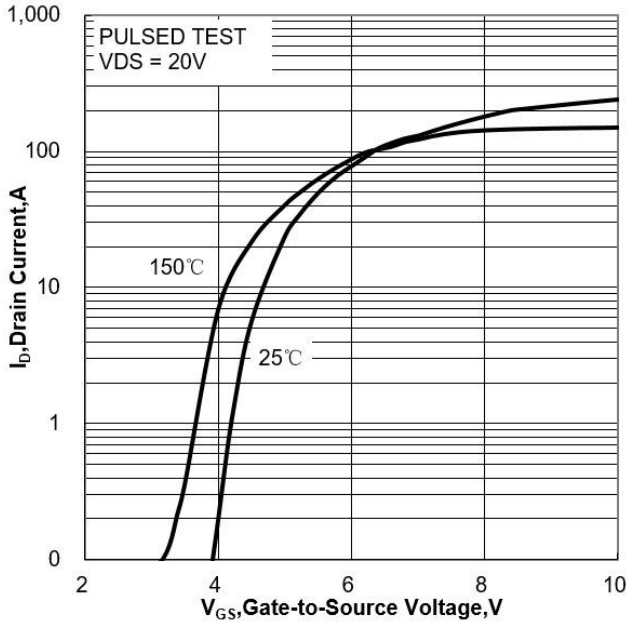



**Figure 6 Typical Drain to Source ON Resistance vs Drain Current**

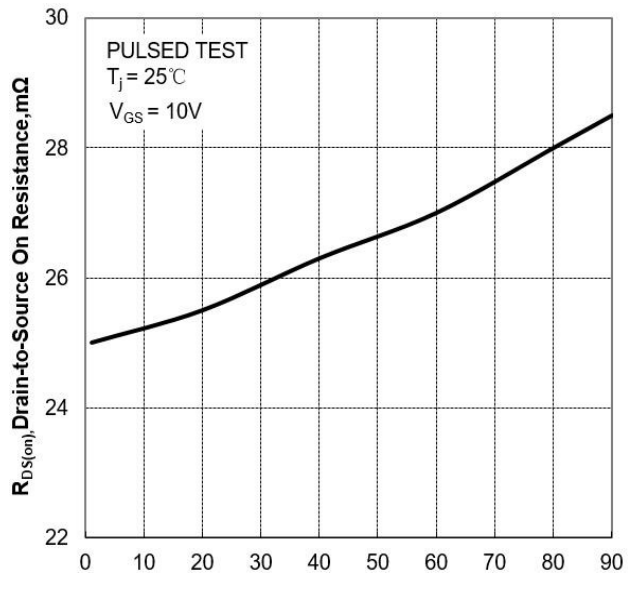



**Figure 7 Typical Drian to Source on Resistance vs Junction Temperature**

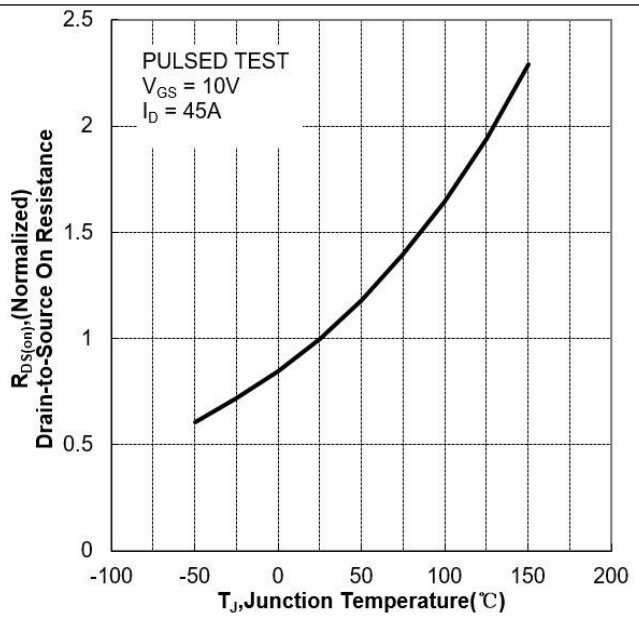


**Figure 8 Typical Theshold Voltage vs Junction Temperature**

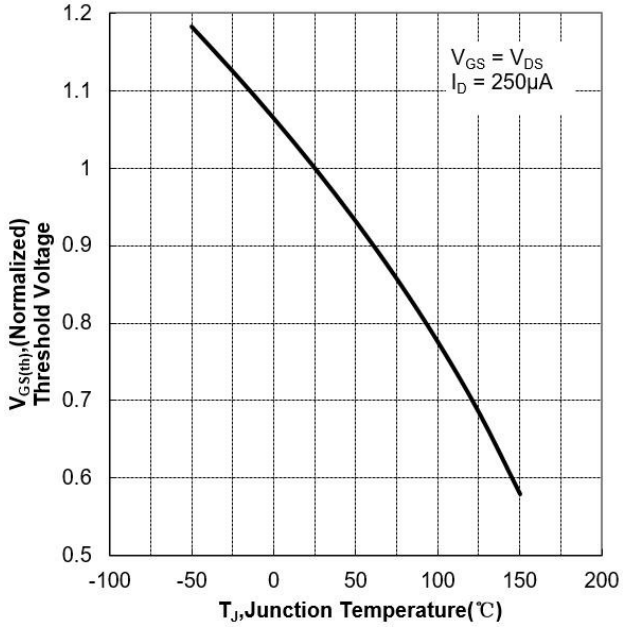



**Figure 9 Typical Breakdown Voltage vs Junction Temperature**

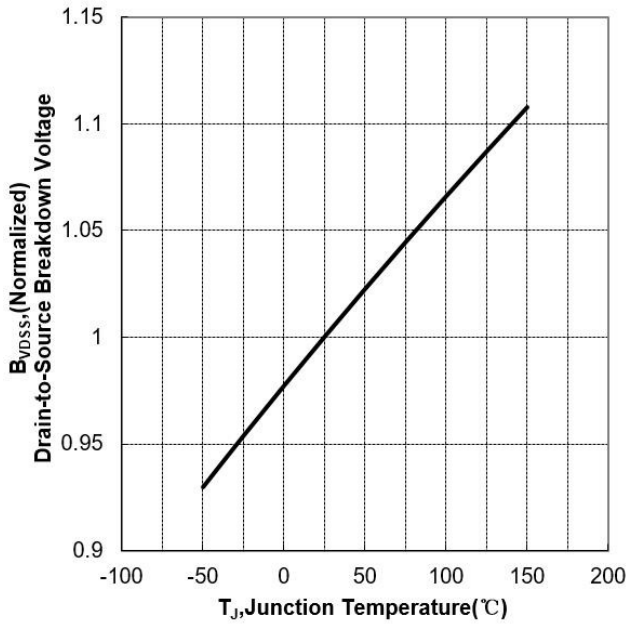



**Figure 10 Typical Theshold Voltage vs Junction Temperature**

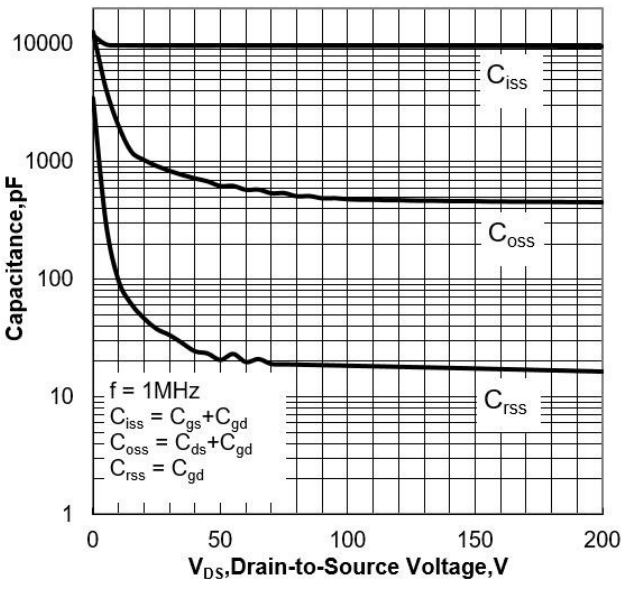
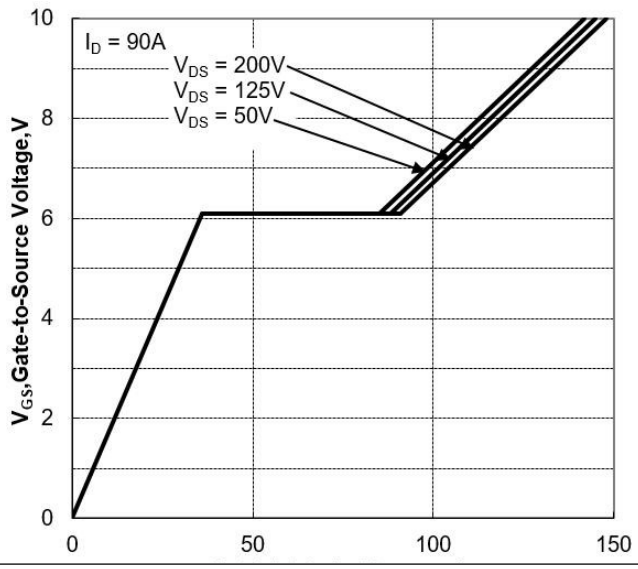
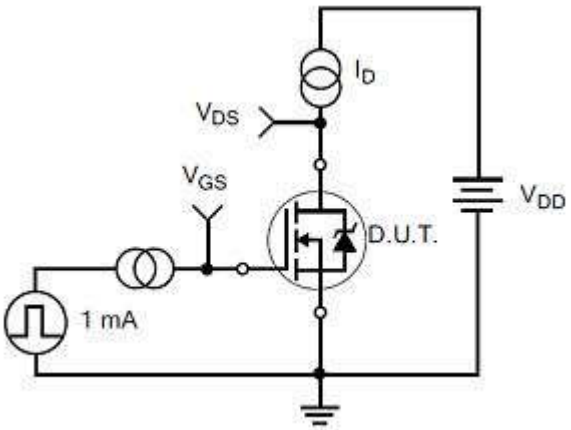
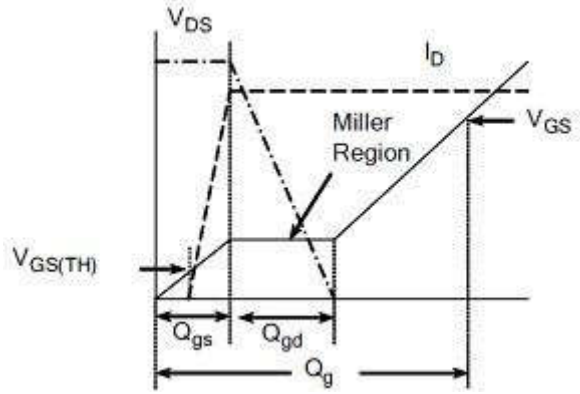
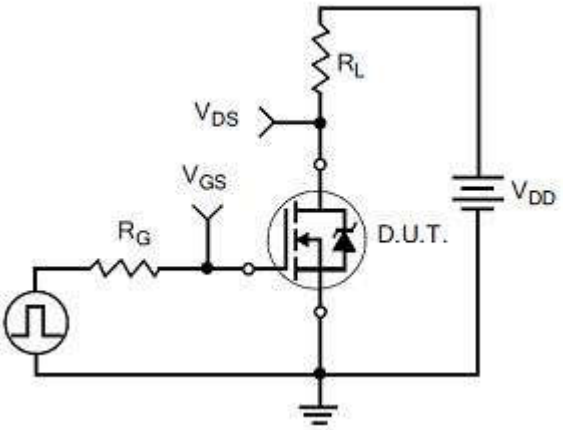
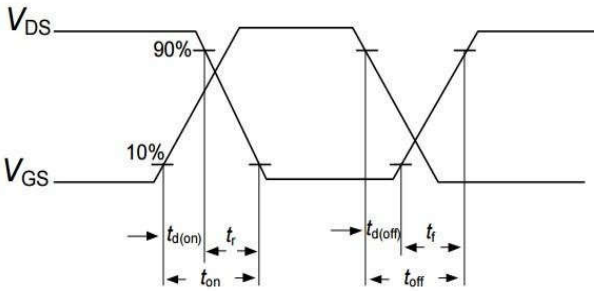


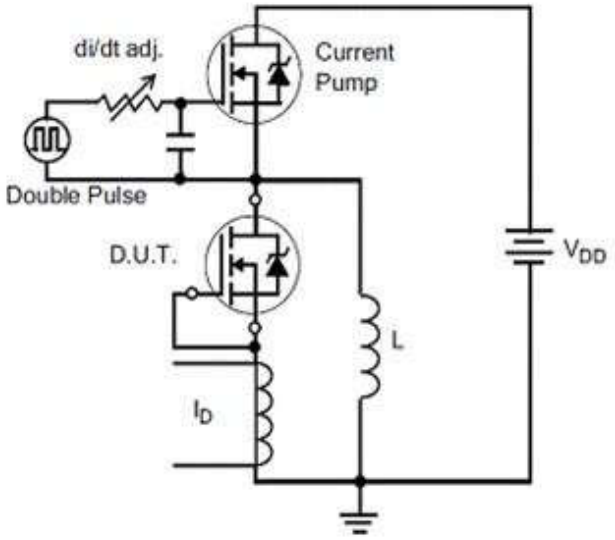
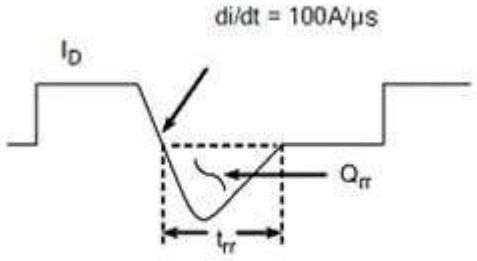

**Figure 11 Typical Breakdown Voltage vs Junction Temperature**



## Test Circuit and Waveform

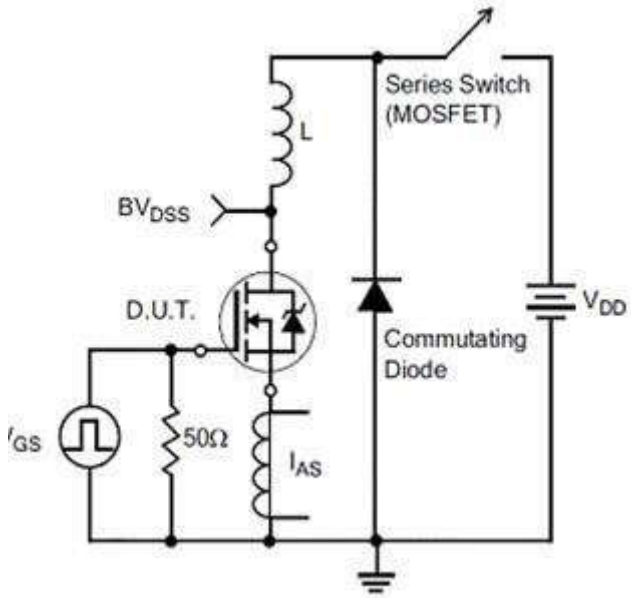
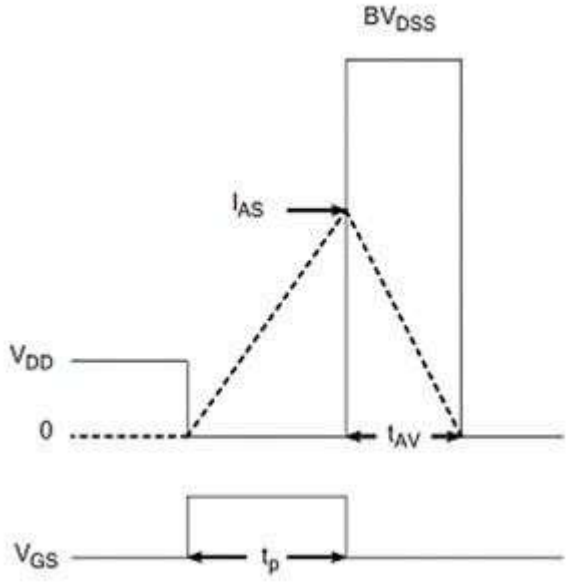
| Figure 12 Gate Charge Test Circuit | Figure 13 Gate Charge Waveforms |
|---|---|
|  |  |

| Figure 14 Resistive Switching Test Circuit | Figure 15 Resistive Switching Waveforms |
|---|---|
|  |  |

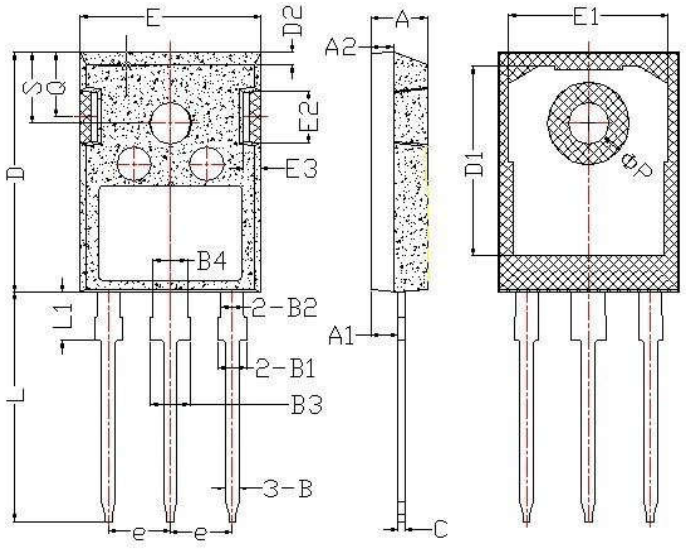
| Figure 16 Diode Reverse Recovery Test Circuit | Figure 17 Diode Reverse Recovery Waveform |
|---|---|
|  |  |





| Figure 18 Unclamped Inductive Switching Test | Figure 19 Unclamped Inductive Switching |
|---|---|
|  |  |

## Package Description




| Items | Values(mm) | |
|---|---|---|
| | MIN | MAX |
| A | 4.6 | 5.2 |
| A1 | 2,2 | 2.6 |
| B | 0.9 | 1.4 |
| B1 | 1.75 | 2.35 |
| B2 | 1.75 | 2.15 |
| B3 | 2.8 | 3.35 |
| B4 | 2.8 | 3.15 |
| C | 0.5 | 0.7 |
| D | 20.60 | 21.30 |
| D1 | 16 | 18 |
| E | 15.5 | 16.10 |
| E1 | 13 | 14.7 |
| E2 | 3.80 | 5.3 |
| E3 | 0.8 | 2.60 |
| e | 5.2 | 5.7 |
| L | 19 | 20.5 |
| L1 | 3.9 | 4.6 |
| ΦP | 2.5 | 3.70 |
| Q | 5.2 | 6.00 |
| S | 5.8 | 6.6 |

**TO-247 Package**

**NOTE:**

1. Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
2. When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
3. MOSFETs is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
4. Shenzhen Minos reserves the right to make changes in this specification sheet and is subject to change withoutprior notice.

**CONTACT:**

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