

# 800V/4.5A N-Channel MOSFET

## Product Summary

|               |     |   |
|---------------|-----|---|
| BVDSS         | 800 | V |
| ID            | 4.5 | A |
| RDSON@VGS=10V | 1.4 | Ω |

## Benefits

- Excellent high-voltage capability with reduced switching losses
- RoHS compliant
- Halogen-free

## Applications

- SMPS
- LED lighting
- TV Power Supply
- Industrial Auxiliary Power

## Ordering Information:

| Product  | Package | Marking | Packing      |
|----------|---------|---------|--------------|
| M80N045L | TO-252  |         | 2500PCS/Reel |

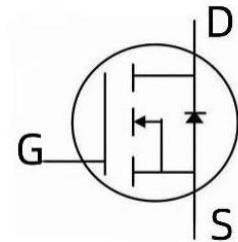
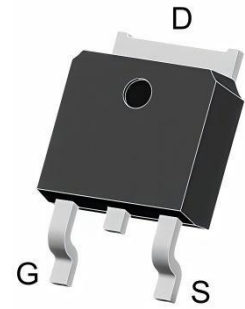
## Absolute Maximum Ratings

(T<sub>J</sub> = 25°C unless otherwise noted)

| Symbol                            | Parameter                                                              | Value         | Units |
|-----------------------------------|------------------------------------------------------------------------|---------------|-------|
| V <sub>DS</sub>                   | Drain-Source Voltage                                                   | 800           | V     |
| I <sub>D</sub>                    | Drain Current - Continuous (T <sub>C</sub> = 25°C) <sup>(Note 1)</sup> | 4.5           | A     |
|                                   | Drain Current - Continuous (T <sub>C</sub> = 100°C)                    | 3             | A     |
| I <sub>DM</sub>                   | Drain Current - Pulsed <sup>(Note 2)</sup>                             | 10            | A     |
| V <sub>GS</sub>                   | Gate-Source Voltage                                                    | ± 20          | V     |
| E <sub>AS</sub>                   | Single Pulsed Avalanche Energy <sup>(Note 3)</sup>                     | 100           | mJ    |
| P <sub>D</sub>                    | Power Dissipation (T <sub>C</sub> = 25°C)                              | 188           | W     |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range                                | - 55 to + 150 | °C    |
| R <sub>θJC</sub>                  | Thermal Resistance, Junction-to-Case, Steady-State                     | 0.66          | °C/W  |
| R <sub>θJA</sub>                  | Thermal Resistance, Junction-to-Ambient, Steady State                  | 60            | °C/W  |

## Notes:

1. The max drain current rating is junction temperature limited
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. L = 10mH, V<sub>DD</sub> = 50V, R<sub>G</sub> = 25Ω, V<sub>G</sub>=10V, Starting T<sub>J</sub> = 25°C



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**Electrical Characteristics** ( $T_J = 25^{\circ}\text{C}$  unless otherwise noted)

| Symbol                                                 | Parameter                              | Test Conditions                                                                                 | Min | Typ   | Max   | Units |
|--------------------------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------|-----|-------|-------|-------|
| Static Characteristics                                 |                                        |                                                                                                 |     |       |       |       |
| BV <sub>DSS</sub>                                      | Drain-Source Breakdown Voltage         | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                  | 800 | -     | -     | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current        | V <sub>DS</sub> = 800 V, V <sub>GS</sub> = 0 V                                                  | -   | -     | 1.0   | μA    |
| I <sub>GSS</sub>                                       | Gate Leakage Current                   | V <sub>GS</sub> = ± 20 V, V <sub>DS</sub> = 0 V                                                 | -   | -     | ± 100 | nA    |
| V <sub>GS(TH)</sub>                                    | Gate Threshold voltage                 | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                     | 3.5 | 4.0   | 4.5   | V     |
| R <sub>DS(ON)</sub>                                    | Drain-Source on-state resistance       | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.5A                                                   | -   | 1.2   | 1.4   | Ω     |
| Dynamic Characteristics                                |                                        |                                                                                                 |     |       |       |       |
| C <sub>ISS</sub>                                       | Input Capacitance                      | V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0 V<br>F = 1 MHz                                      | -   | 379   | -     | pF    |
| C <sub>OSS</sub>                                       | Output Capacitance                     |                                                                                                 | -   | 65    | -     | pF    |
| C <sub>RSS</sub>                                       | Reverse Transfer Capacitance           |                                                                                                 | -   | 4.5   | -     | pF    |
| R <sub>G</sub>                                         | Gate Resistance                        | F = 1 MHz                                                                                       | -   | 15    | -     | Ω     |
| Switching Characteristics                              |                                        |                                                                                                 |     |       |       |       |
| T <sub>D(ON)</sub>                                     | Turn On Delay Time                     | V <sub>DD</sub> = 400 V , I <sub>D</sub> = 4 A<br>V <sub>GS</sub> = 10 V, R <sub>G</sub> = 10 Ω | -   | 57    | -     | nS    |
| T <sub>R</sub>                                         | Rise Time                              |                                                                                                 | -   | 13    | -     | nS    |
| T <sub>D(OFF)</sub>                                    | Turn Off Delay Time                    |                                                                                                 | -   | 171.4 | -     | nS    |
| T <sub>F</sub>                                         | Fall Time                              |                                                                                                 | -   | 19.5  | -     | nS    |
| Q <sub>G</sub>                                         | Total Gate Charge                      | V <sub>DD</sub> = 400 V , I <sub>D</sub> = 4 A<br>V <sub>GS</sub> = 0 to 10 V                   | -   | 3.77  | -     | nC    |
| Q <sub>GS</sub>                                        | Gate-Source Charge                     |                                                                                                 | -   | 1.16  | -     | nC    |
| Q <sub>GD</sub>                                        | Gate-Drain Charge                      |                                                                                                 | -   | 1.31  | -     | nC    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                        |                                                                                                 |     |       |       |       |
| I <sub>S</sub>                                         | Continuous Source Current (Body Diode) |                                                                                                 | -   | -     | 4.5   | A     |
| I <sub>SM</sub>                                        | Pulsed Source Current (Body Diode)     |                                                                                                 | -   | -     | 10    | A     |
| V <sub>SD</sub>                                        | Diode Forward Voltage                  | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 4 A                                                     | -   | 0.8   | 1.2   | V     |
| T <sub>RR</sub>                                        | Reverse recovery time                  | V <sub>DD</sub> = 400 V, I <sub>S</sub> = 4 A<br>di/dt=100A/μS                                  | -   | 254.6 | -     | nS    |
| Q <sub>RR</sub>                                        | Reverse recovery charge                |                                                                                                 | -   | 1.45  | -     | μC    |
| I <sub>rrm</sub>                                       | Peak reverse recovery current          |                                                                                                 | -   | 13    | -     | A     |

### Electrical Characteristics Diagrams

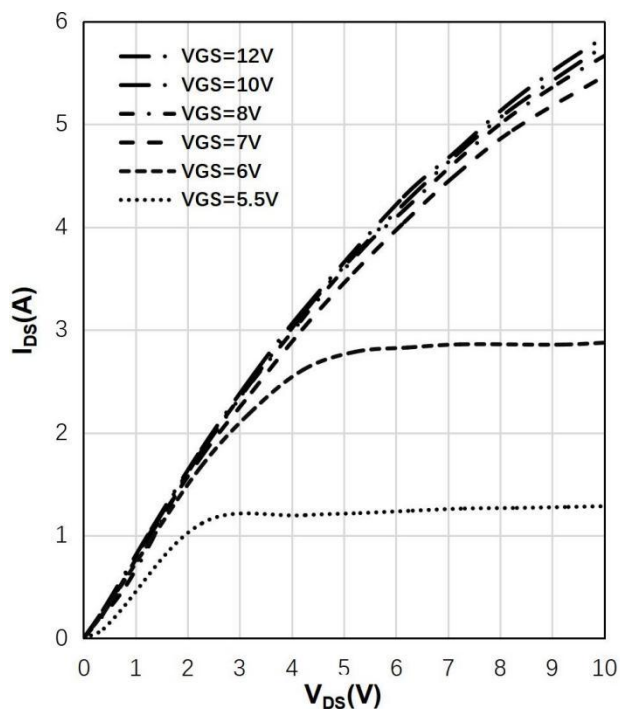


Fig.1 Typical Output Characteristics ( $25^{\circ}\text{C}$ )

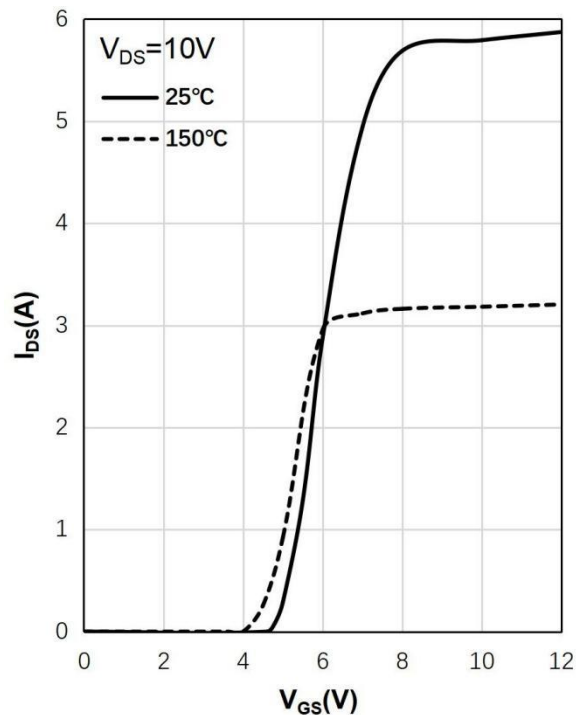


Fig.2 Typical Transfer Characteristics

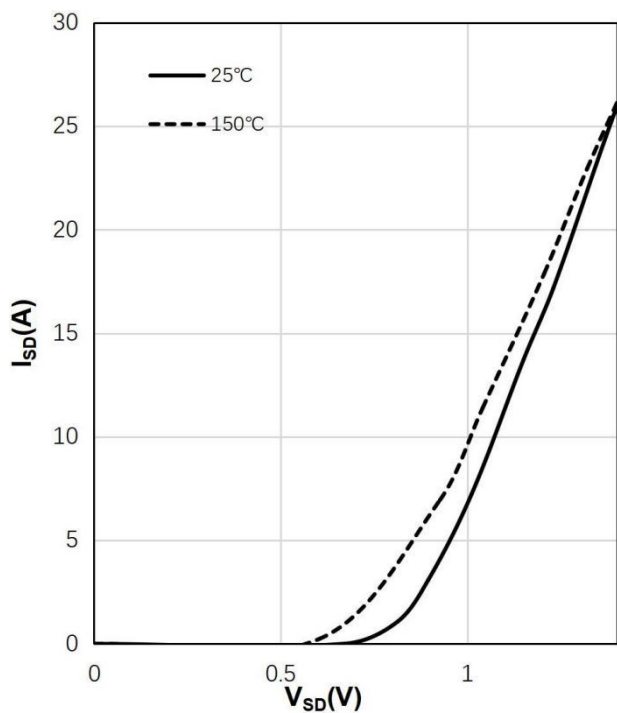


Fig.3 Typical Diode  $V_{SD}$  vs.  $I_{SD}$  Characteristic

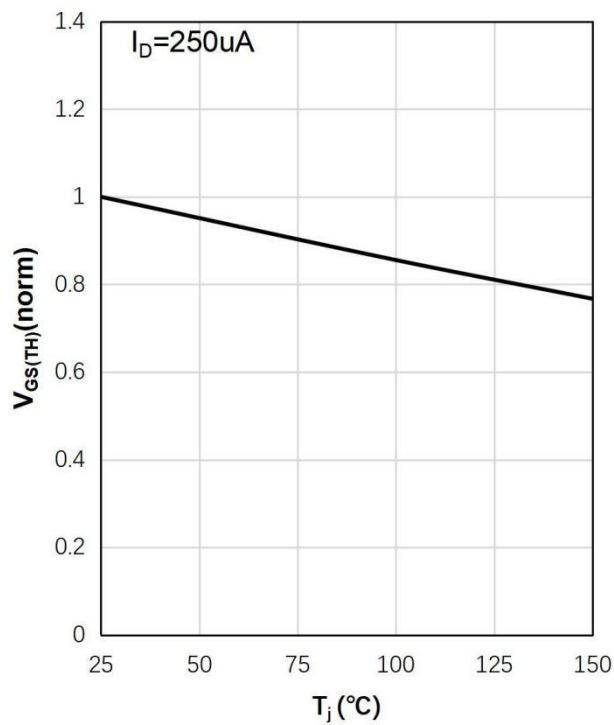


Fig.4 Threshold Voltage vs Temperature Characteristic

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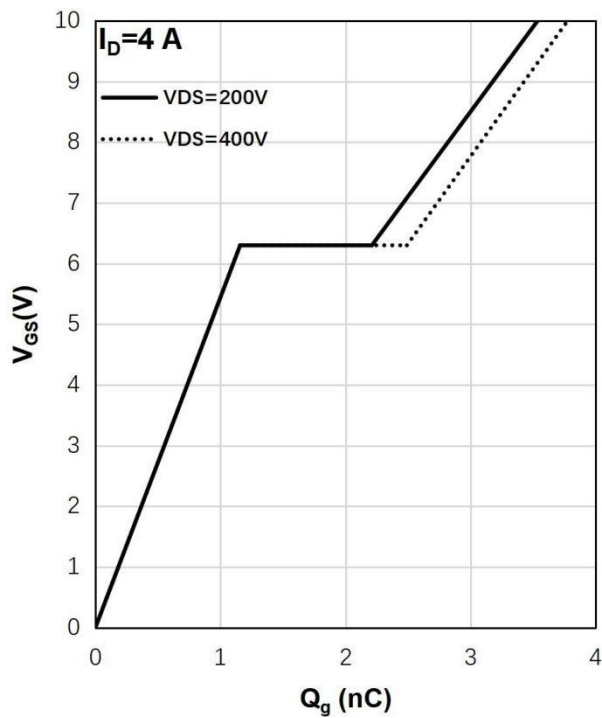


Fig.5 Gate Charge Characteristics

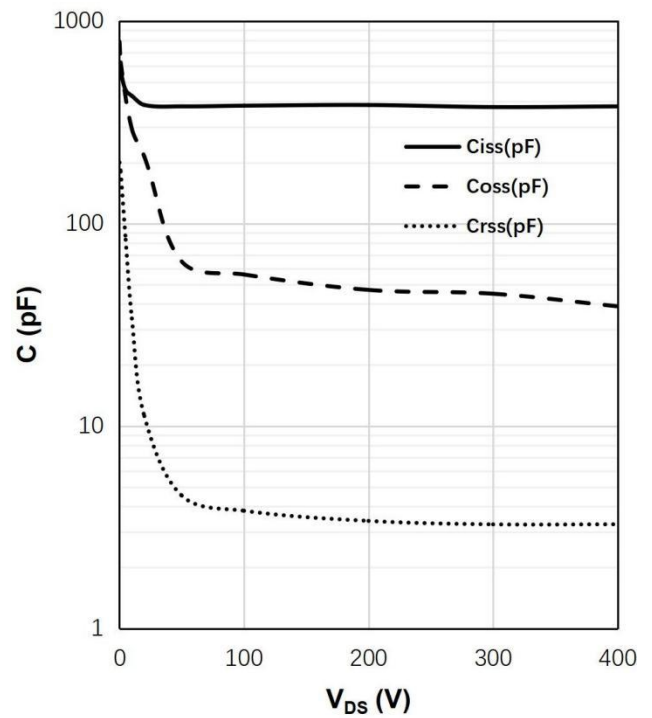


Fig.6 Typical Capacitance

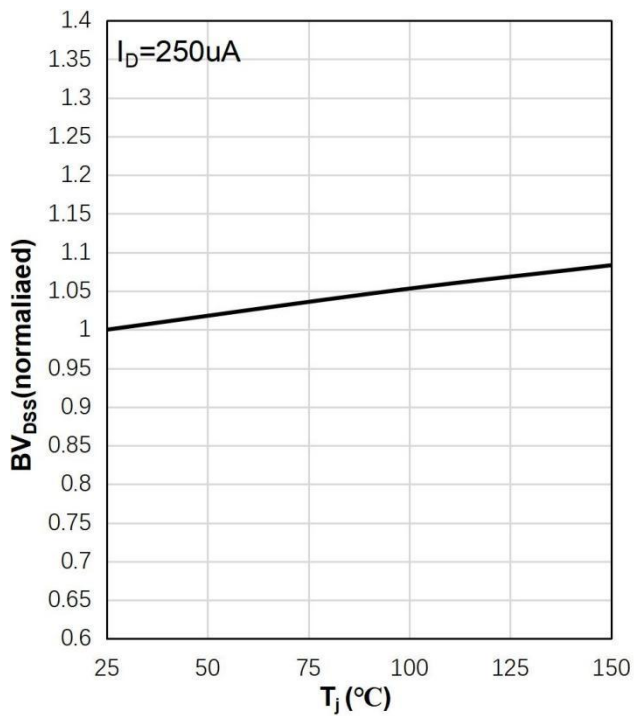


Fig.7 Breakdown Voltage vs. Temperature Characteristic

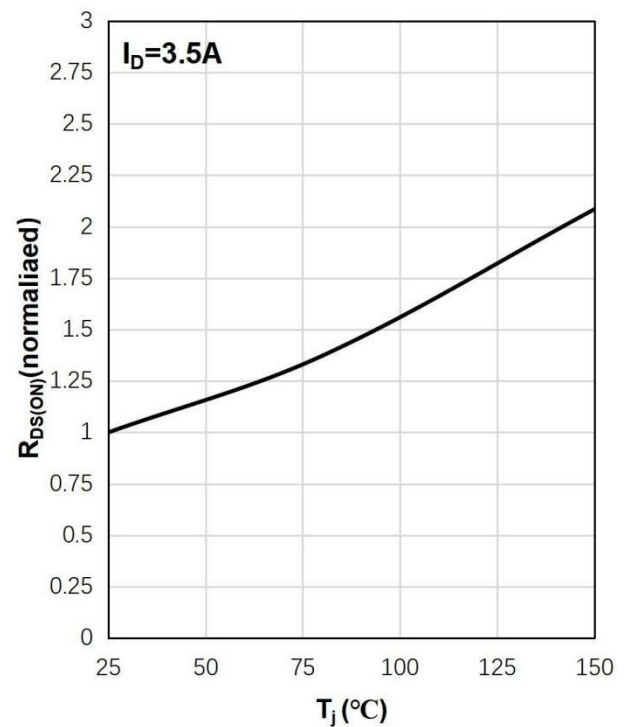


Fig.8 On Resistance vs. Temperature Characteristic

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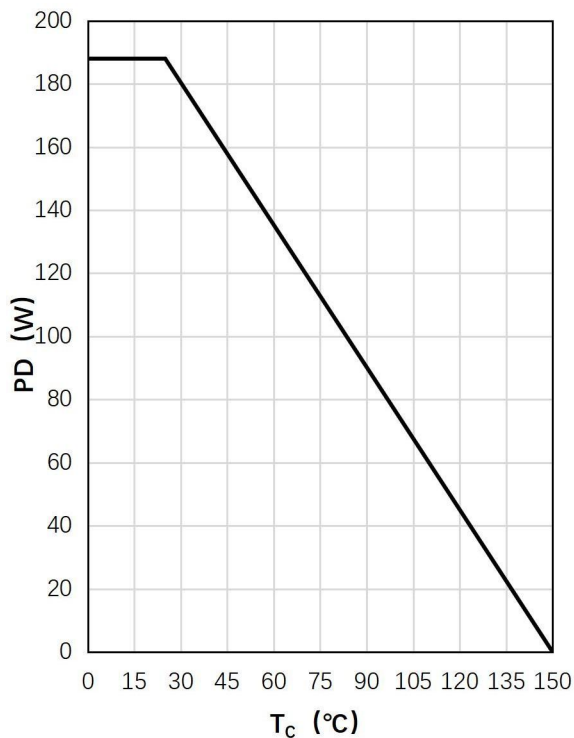


Fig.9 Power Dissipation Characteristic



Fig.10 Drain Current vs. Temperature Characteristic

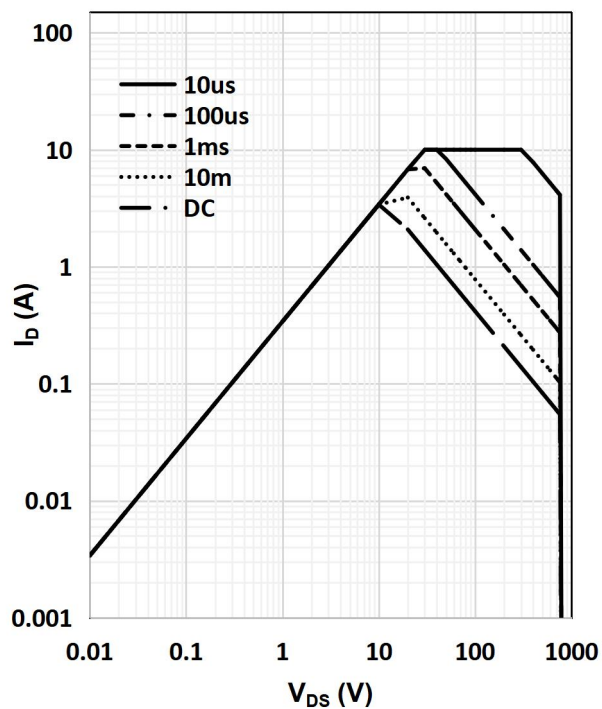


Fig.11 Safe Operating Area

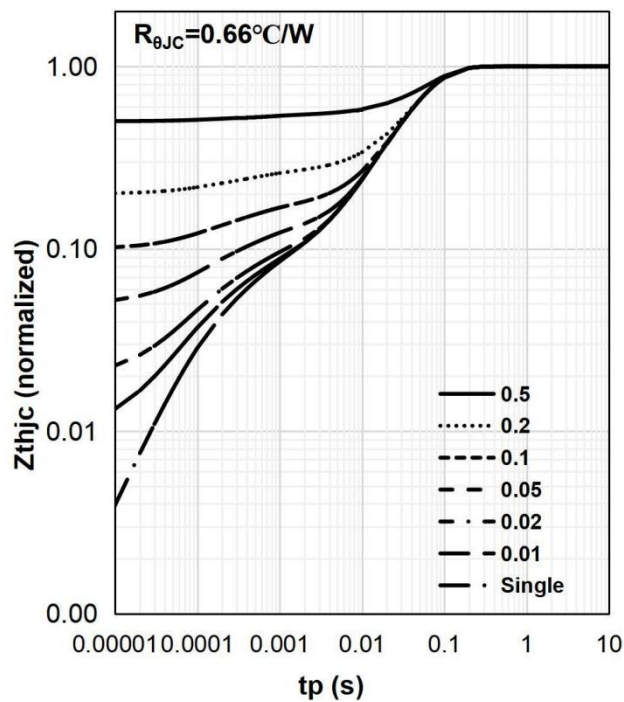
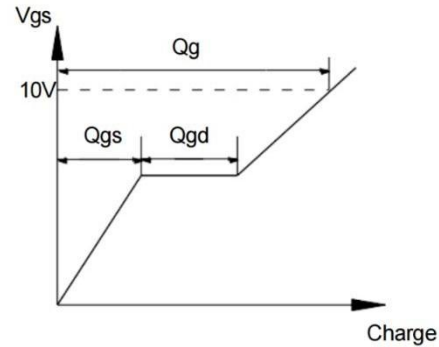
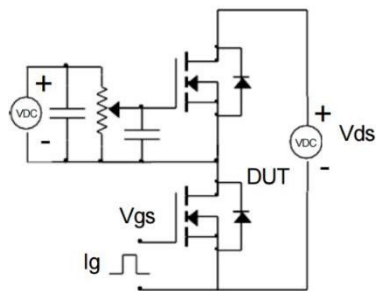


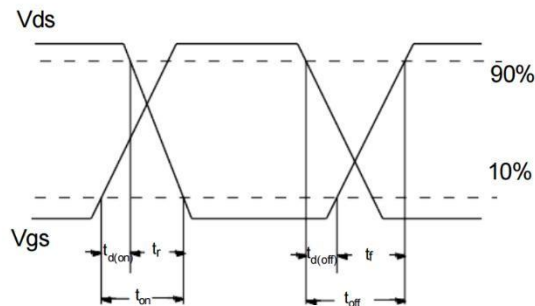
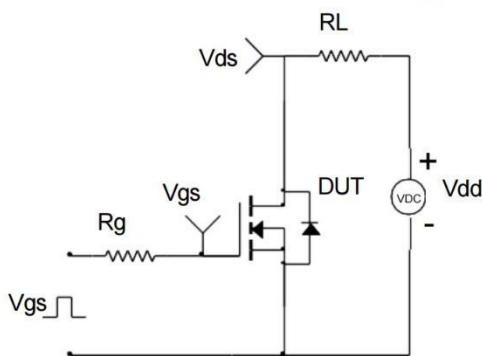
Fig.12 Transient Thermal Impedance

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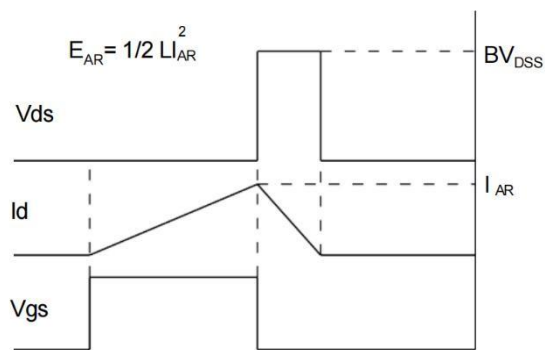
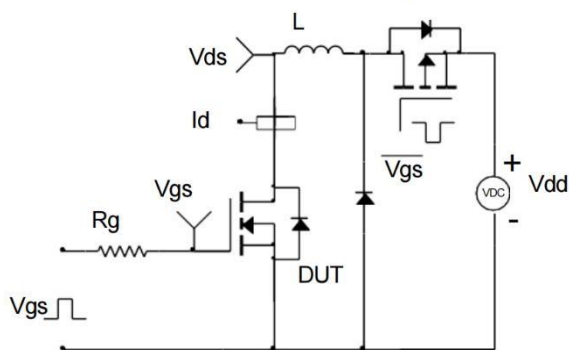
Gate Charge Test Circuit & Waveform



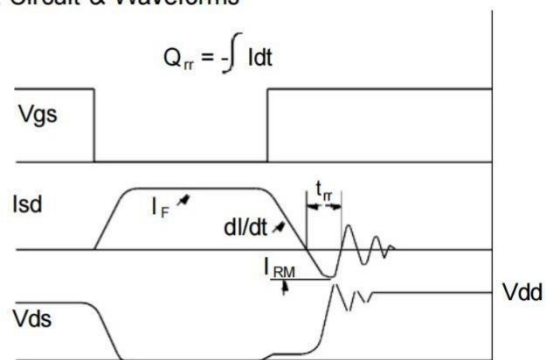
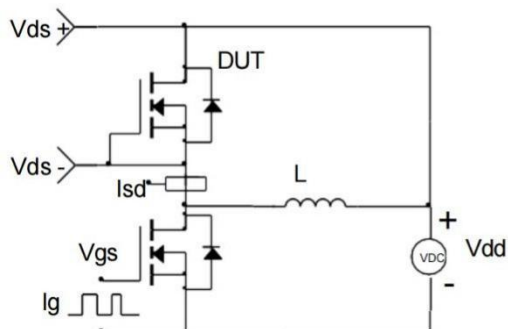
Resistive Switching Test Circuit & Waveforms



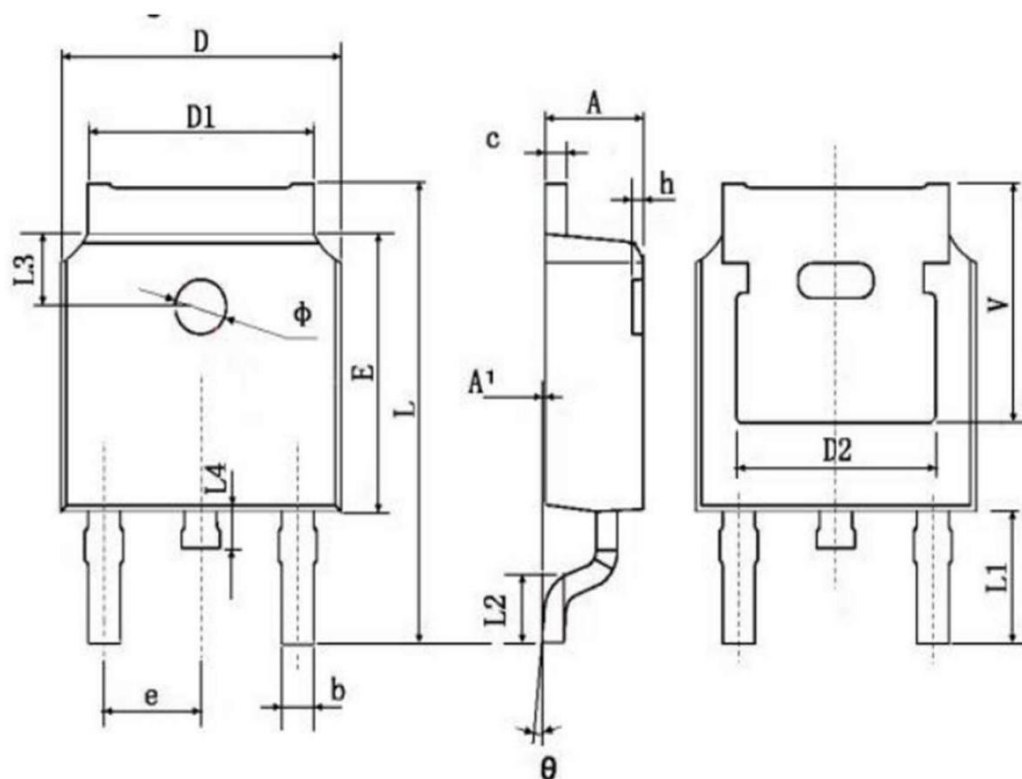
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



### Package Outline



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.250                     | 2.350  | 0.089                | 0.093 |
| A1     | 0.050                     | 0.150  | 0.002                | 0.006 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.458                     | 0.558  | 0.018                | 0.022 |
| D      | 6.550                     | 6.650  | 0.259                | 0.263 |
| D1     | 5.234                     | 5.434  | 0.207                | 0.215 |
| D2     | 4.826 TYP.                |        | 0.191 TYP.           |       |
| E      | 6.050                     | 6.150  | 0.239                | 0.243 |
| e      | 2.236                     | 2.336  | 0.088                | 0.092 |
| L      | 9.820                     | 10.220 | 0.388                | 0.404 |
| L1     | 3.000 TYP.                |        | 0.119 TYP.           |       |
| L2     | 1.400                     | 1.600  | 0.055                | 0.063 |
| L3     | 1.800 TYP.                |        | 0.071 TYP.           |       |
| L4     | 0.700                     | 0.900  | 0.028                | 0.036 |
| Φ      | 1.150                     | 1.250  | 0.045                | 0.049 |
| θ      | 0°                        | 3°     | 0°                   | 3°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.399 TYP                 |        | 0.213 TYP            |       |