

## General Description

The AGMS5N50D combines advanced trench MOSFET technology with a low resistance package to provide extremely low  $R_{DS(ON)}$ .

This device is ideal for load switch and battery protection applications.

## Features

- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

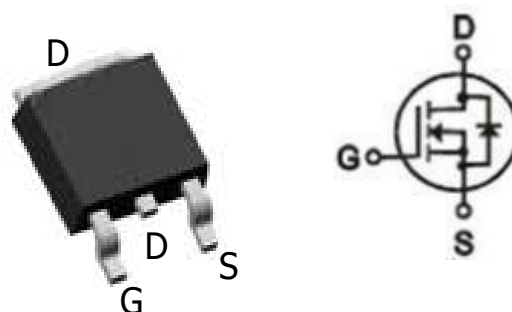
## Application

- MB/VGA Vcore
- SMPS 2<sup>nd</sup> Synchronous Rectifier
- POL application
- BLDC Motor driver

## Product Summary

| BVDSS | RDSON | ID |
|-------|-------|----|
| 500V  | 1.4Ω  | 5A |

## TO-252 Pin Configuration



## Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| AGMS5N50D      | AGMS5N50D | TO-252         | 330mm     | 16mm       | 2500     |

**Table 1. Absolute Maximum Ratings (Tc=25°C)**

| Symbol      | Parameter                                         | Value      | Unit |
|-------------|---------------------------------------------------|------------|------|
| VDS         | Drain-Source Voltage (VGS=0V)                     | 500        | V    |
| VGSS        | Gate-Source Voltage (VDS=0V)                      | ±30        | V    |
| ID          | Drain Current-Continuous(Tc=25°C) (Note 1)        | 5          | A    |
|             | Drain Current-Continuous(Tc=100°C)                | 2.6        | A    |
| IDM (pluse) | Drain Current-Continuous@ Current-Pulsed (Note 2) | 20         | A    |
| PD          | Maximum Power Dissipation(Tc=25°C)                | 24.5       | w    |
|             | Maximum Power Dissipation(Tc=100°C)               | 12         | w    |
| EAS         | Avalanche energy (Note 3)                         | 167        | mJ   |
| TJ,TSTG     | Operating Junction and Storage Temperature Range  | -55 To 150 | °C   |

**Table 2. Thermal Characteristic**

| Symbol | Parameter                                                       | Typ | Max  | Unit |
|--------|-----------------------------------------------------------------|-----|------|------|
| RθJA   | Thermal Resistance Junction-ambient (Steady State) <sup>1</sup> | --- | 48.2 | °C/W |
| RθJC   | Thermal Resistance Junction-Case <sup>1</sup>                   | --- | 4.2  | °C/W |

**Table 3. Electrical Characteristics (TC=25°C unless otherwise noted)**

| Symbol                             | Parameter                        | Conditions                          | Min | Typ | Max  | Unit |
|------------------------------------|----------------------------------|-------------------------------------|-----|-----|------|------|
| On/Off States                      |                                  |                                     |     |     |      |      |
| BVDSS                              | Drain-Source Breakdown Voltage   | VGS=0V ID=250μA                     | 500 | --  | --   | V    |
| IDSS                               | Zero Gate Voltage Drain Current  | VDS=500V,VGS=0V                     | --  | --  | 1    | μA   |
| IGSSF                              | Gate-Body Leakage Current        | VGS=±30V,VDS=0V                     | --  | --  | ±100 | nA   |
| VGS(th)                            | Gate Threshold Voltage           | VDS=VGS,ID=250μA                    | 2.4 | --  | 4.0  | V    |
| gFS                                | Forward Transconductance         | VDS=40V,ID=2.5A                     | --  | 2.9 | --   | S    |
| RDS(on)                            | Drain-Source On-State Resistance | VGS=10V, ID=2.5A                    | --  | 1.4 | 1.6  | Ω    |
|                                    |                                  | VGS=4.5V, ID=2.5A                   | --  | --  | --   | Ω    |
| Dynamic Characteristics            |                                  |                                     |     |     |      |      |
| Ciss                               | Input Capacitance                | VDS=25V,VGS=0V,<br>F=1MHZ           | --  | 415 | --   | pF   |
| Coss                               | Output Capacitance               |                                     | --  | 58  | --   | pF   |
| Crss                               | Reverse Transfer Capacitance     |                                     | --  | 1.4 | --   | pF   |
| Rg                                 | Gate resistance                  | VGS=0V,<br>VDS=0V,f=1.0MHz          | --  | --  | --   | Ω    |
| Switching Times                    |                                  |                                     |     |     |      |      |
| td(on)                             | Turn-on Delay Time               | VGS=10V,VDS=250V,<br>ID=5A,RGEN=25Ω | --  | 7   | --   | nS   |
| tr                                 | Turn-on Rise Time                |                                     | --  | 22  | --   | nS   |
| td(off)                            | Turn-Off Delay Time              |                                     | --  | 15  | --   | nS   |
| tf                                 | Turn-Off Fall Time               |                                     | --  | 23  | --   | nS   |
| Qg                                 | Total Gate Charge                | VGS=10V,<br>VDS=400V, ID=5A         | --  | 13  | --   | nC   |
| Qgs                                | Gate-Source Charge               |                                     | --  | 4.9 | --   | nC   |
| Qgd                                | Gate-Drain Charge                |                                     | --  | 2.3 | --   | nC   |
| Source-Drain Diode Characteristics |                                  |                                     |     |     |      |      |
| ISD                                | Source-Drain Current(Body Diode) |                                     | --  | --  | 5    | A    |
| VSD                                | Forward on Voltage               | VGS=0V,IS=5A                        | --  | --  | 1.2  | V    |
| trr                                | Reverse Recovery Time            | IS=5A , dI/dt=100A/μs ,<br>TJ=25℃   | --  | 289 | --   | ns   |
| Qrr                                | Reverse Recovery Charge          |                                     | --  | 1.2 | --   | nc   |

Notes 1.The maximum current rating is package limited.

Notes 2.Repetitive Rating: Pulse width limited by maximum junction temperature

Notes 3.EAS condition: TJ=25°C

## Typical Characteristics

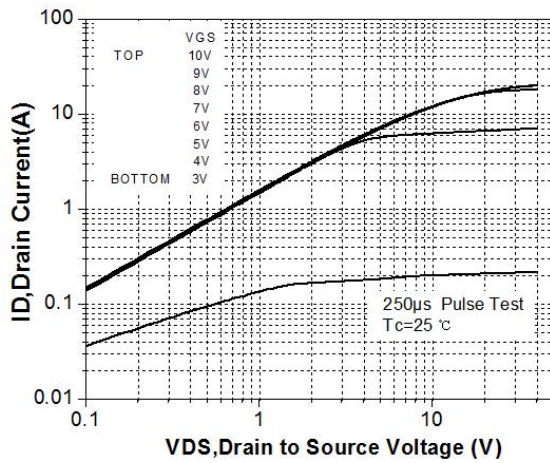


Figure 1. On-Region Characteristics

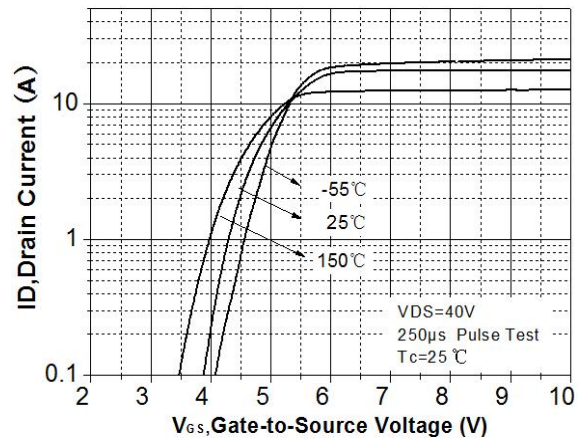


Figure 2. Transfer Characteristics

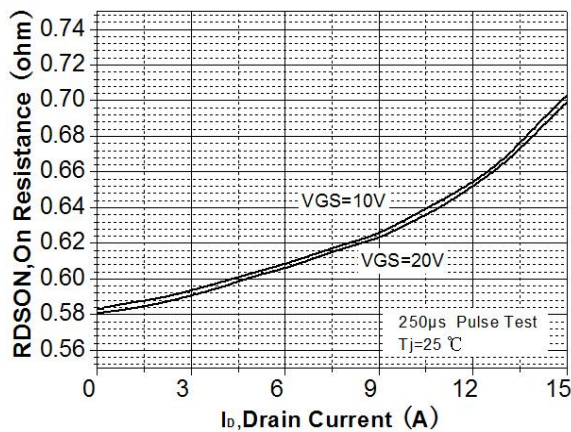


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

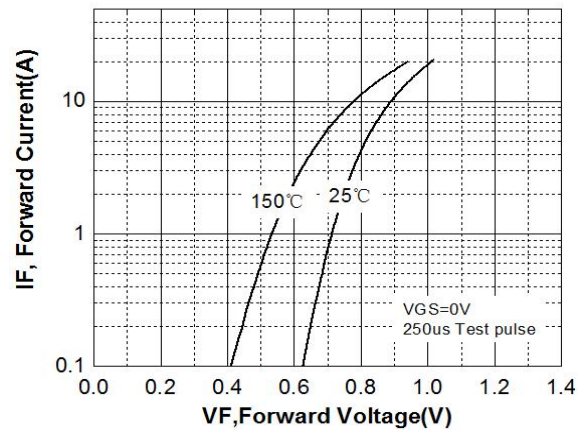


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

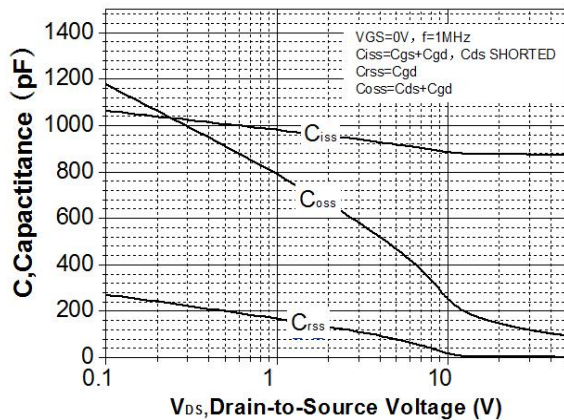


Figure 5. Capacitance Characteristics

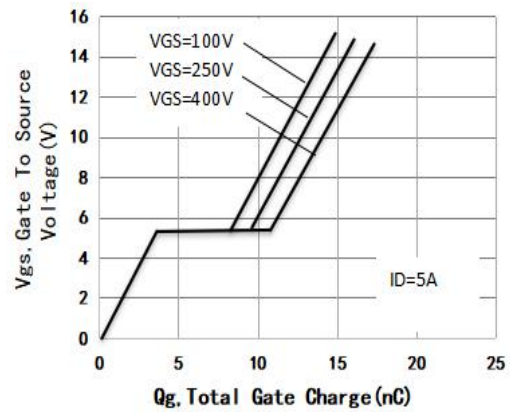


Figure 6. Gate Charge Characteristics

## Typical Characteristics (Continued)

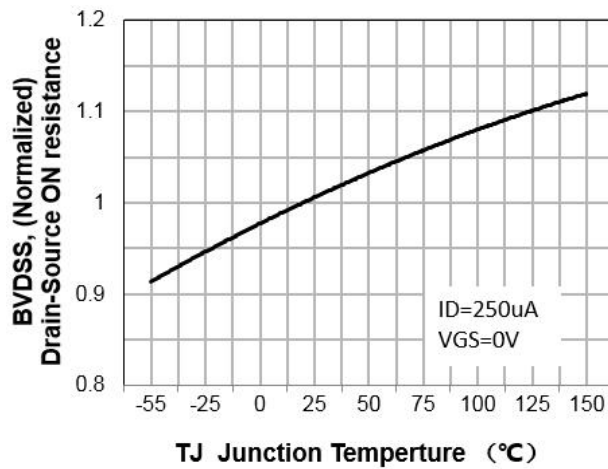


Figure 7. Breakdown Voltage Variation vs Temperature

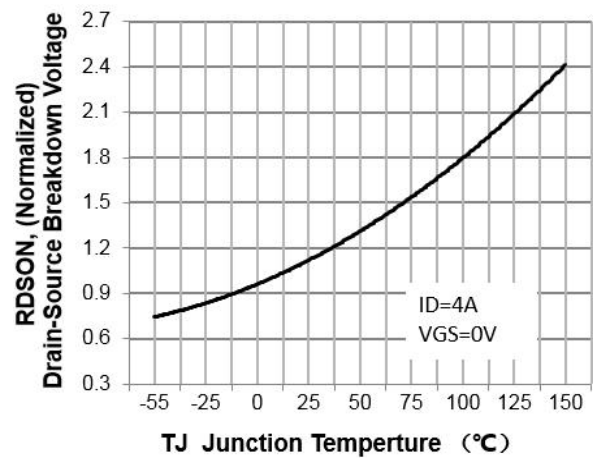


Figure 8. On-Resistance Variation vs Temperature

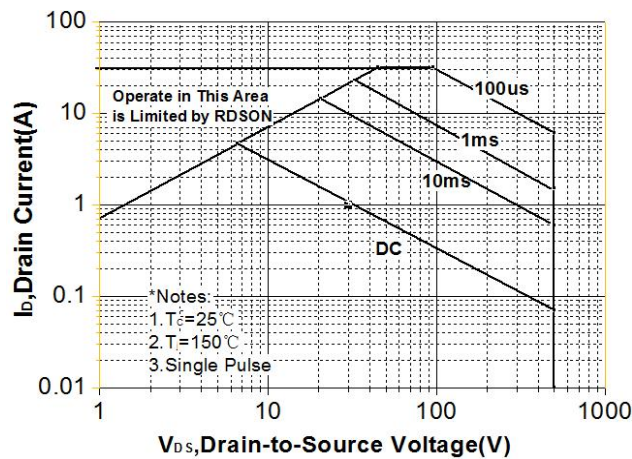


Figure 9. Maximum Safe Operating Area

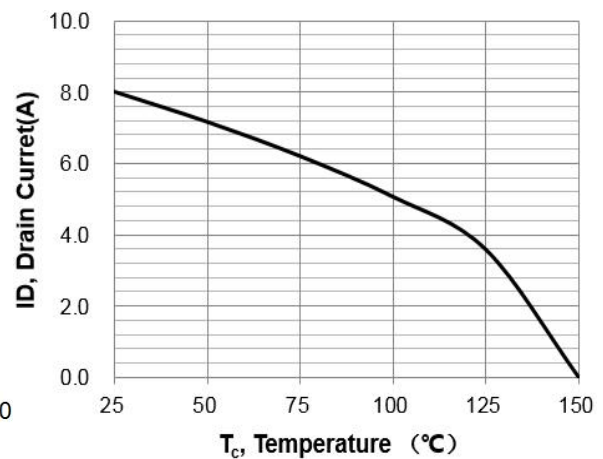


Figure 10. Maximum Drain Current vs Case Temperature

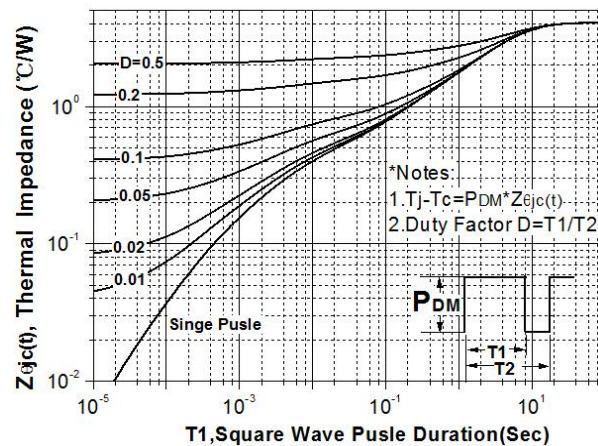
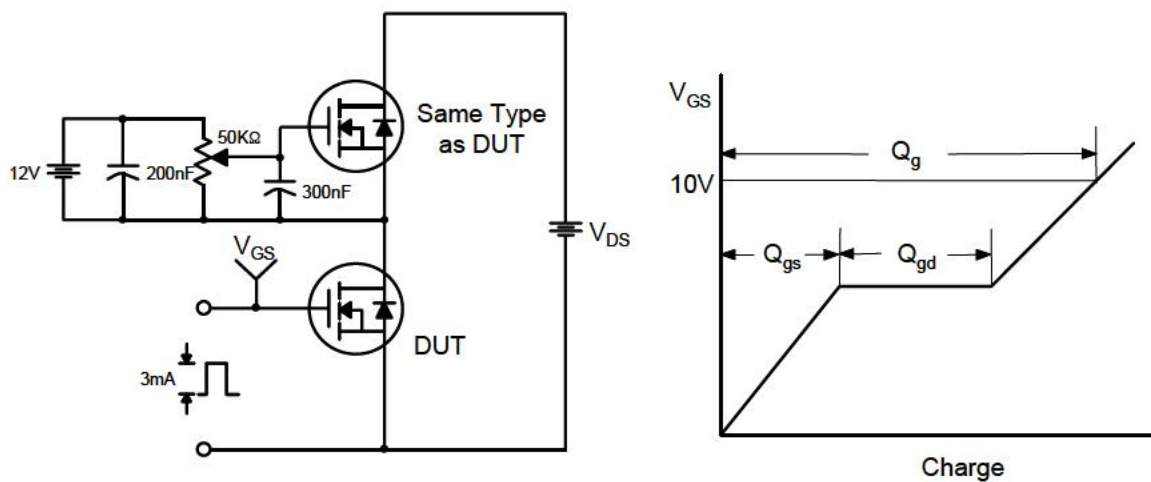
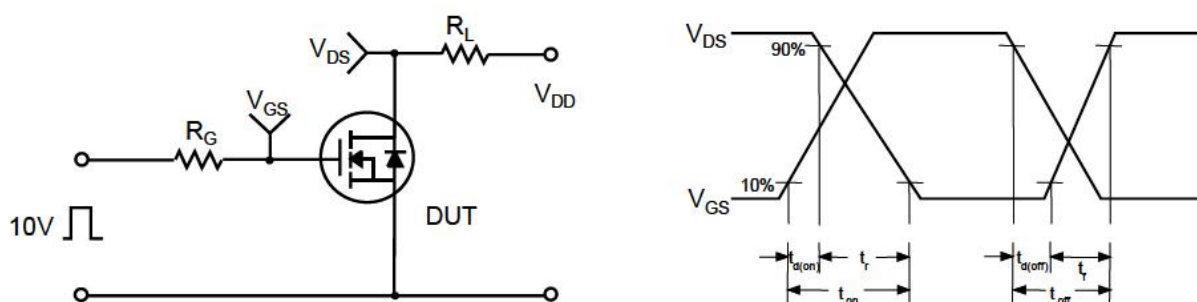


Figure 11. Transient Thermal Response Curve

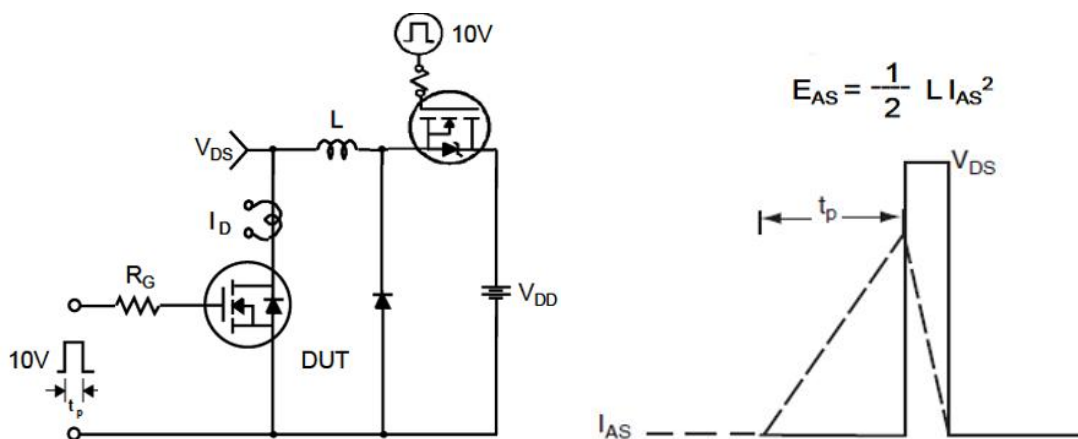
Gate Charge Test Circuit &amp; Waveform



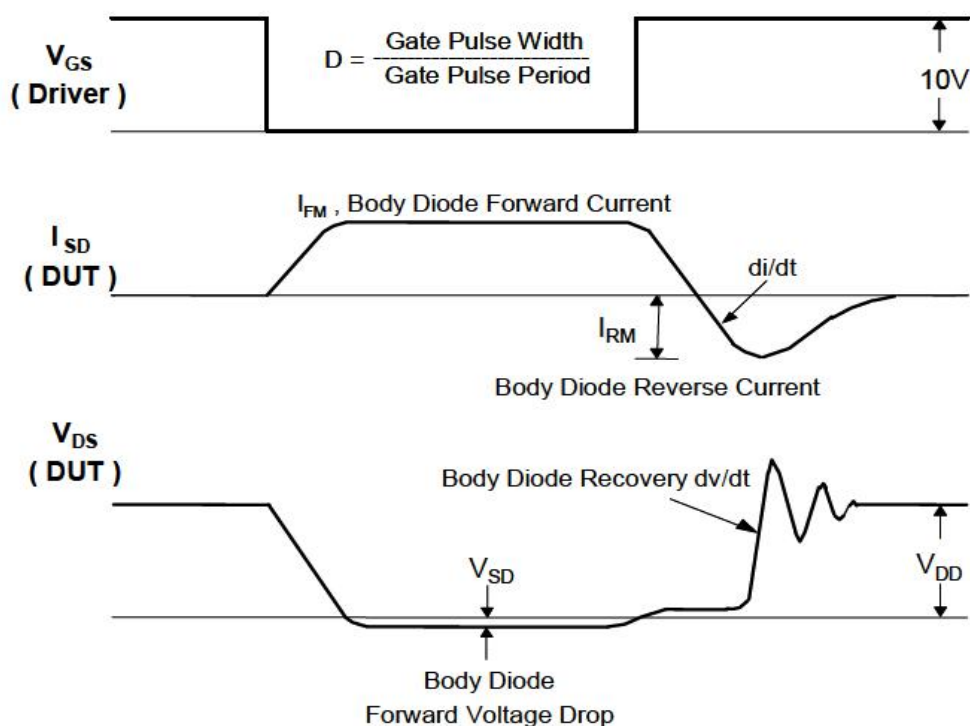
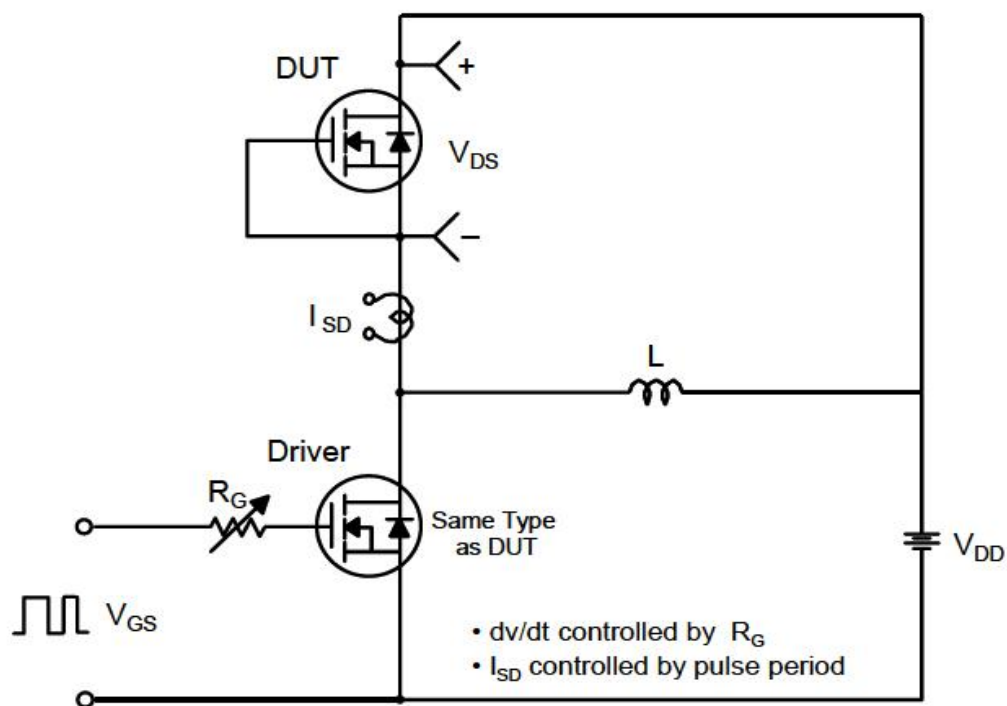
Resistive Switching Test Circuit &amp; Waveforms



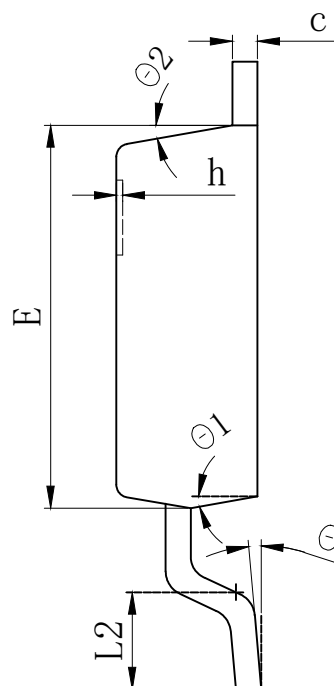
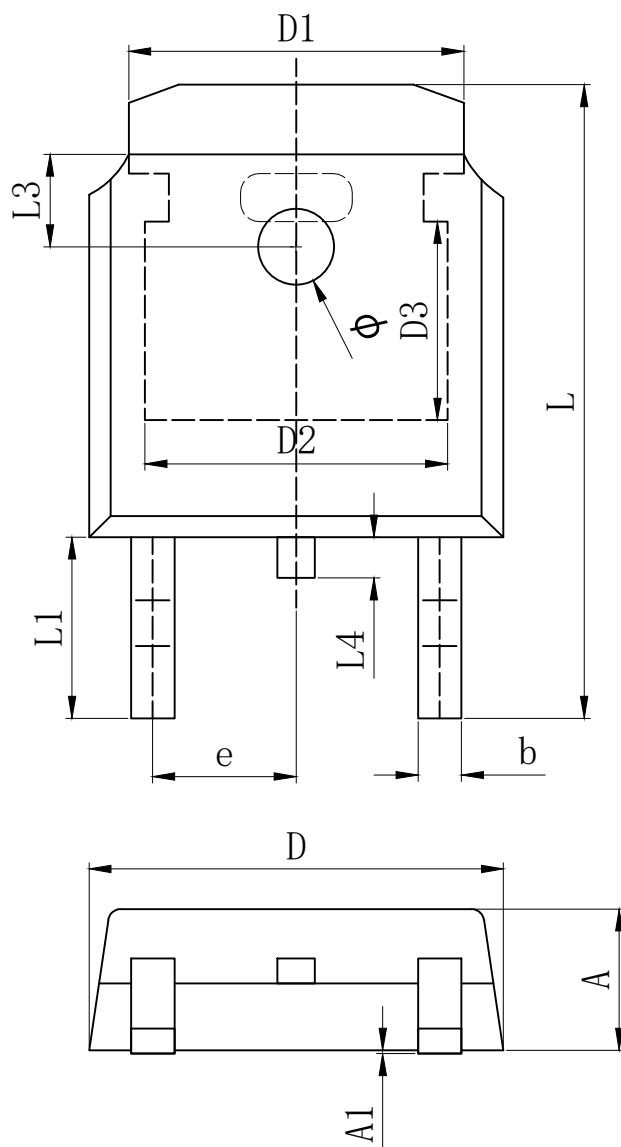
Unclamped Inductive Switching Test Circuit &amp; Waveforms



# Peak Diode Recovery dv/dt Test Circuit & Waveforms



# TO-252 Package Outline Data



| SYMBOL     | MILLIMETER |        |        |
|------------|------------|--------|--------|
|            | MIN        | Typ.   | MAX    |
| A          | 2.200      | 2.300  | 2.400  |
| A1         | 0.000      |        | 0.127  |
| b          | 0.640      | 0.690  | 0.740  |
| c (电镀后)    | 0.460      | 0.520  | 0.580  |
| D          | 6.500      | 6.600  | 6.700  |
| D1         | 5.334 REF  |        |        |
| D2         | 4.826 REF  |        |        |
| D3         | 3.166 REF  |        |        |
| E          | 6.000      | 6.100  | 6.200  |
| e          | 2.286 TYP  |        |        |
| h          | 0.000      | 0.100  | 0.200  |
| L          | 9.900      | 10.100 | 10.300 |
| L1         | 2.888 REF  |        |        |
| L2         | 1.400      | 1.550  | 1.700  |
| L3         | 1.600 REF  |        |        |
| L4         | 0.600      | 0.800  | 1.000  |
| $\Phi$     | 1.100      | 1.200  | 1.300  |
| $\theta$   | 0°         |        | 8°     |
| $\theta 1$ | 9° TYP     |        |        |
| $\theta 2$ | 9° TYP     |        |        |

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## Revision History

| Revision | Date     | Major changes                |
|----------|----------|------------------------------|
| Ver1.1   | 2023/4/3 | Chang RDSON 10V(max) to 1.6Ω |
|          |          |                              |
|          |          |                              |