

## General Description

The AGM403D1-M1 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
- 100% Avalanche tested
- 100% DVDS tested

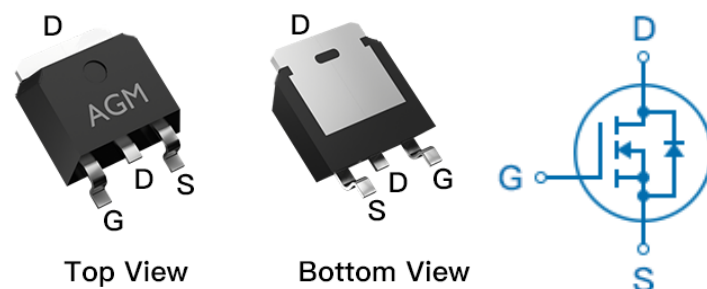
## Application

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

## Product Summary

| BVDSS | RDSON | ID   |
|-------|-------|------|
| 40V   | 2.7mΩ | 100A |

## TO-252 Pin Configuration



## Package Marking and Ordering Information

| Device Marking | Device      | Device Package | Reel Size | Tape width | Quantity |
|----------------|-------------|----------------|-----------|------------|----------|
| AGM403         | AGM403D1-M1 | TO-252         | 330mm     | 16mm       | 2500     |

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

| Symbol      | Parameter                                        | Value      | Unit |
|-------------|--------------------------------------------------|------------|------|
| VDS         | Drain-Source Voltage (VGS=0V)                    | 40         | V    |
| VGS         | Gate-Source Voltage (VDS=0V)                     | ±20        | V    |
| ID          | Drain Current-Continuous(Tc=25°C) (Note 1)       | 100        | A    |
|             | Drain Current-Continuous(Tc=100°C)               | 67         | A    |
| IDM (pluse) | Drain Current-Pulsed (Note 2)                    | 400        | A    |
| PD          | Maximum Power Dissipation(Tc=25°C)               | 62.5       | w    |
|             | Maximum Power Dissipation(Tc=100°C)              | 25         | w    |
| EAS         | Avalanche energy (Note 3)                        | 400        | 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> | --- | 50  | °C/W |
| RθJC   | Thermal Resistance Junction-Case <sup>1</sup>                   | --- | 2.0 | °C/W |

**Table 3. Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Symbol                             | Parameter                        | Conditions                         | Min | Typ  | Max  | Unit |
|------------------------------------|----------------------------------|------------------------------------|-----|------|------|------|
| On/Off States                      |                                  |                                    |     |      |      |      |
| BVDSS                              | Drain-Source Breakdown Voltage   | VGS=0V ID=250μA                    | 40  | --   | --   | V    |
| IDSS                               | Zero Gate Voltage Drain Current  | VDS=40V,VGS=0V                     | --  | --   | 1    | μA   |
| IGSS                               | Gate-Body Leakage Current        | VGS=±20V,VDS=0V                    | --  | --   | ±100 | nA   |
| VGS(th)                            | Gate Threshold Voltage           | VDS=VGS,ID=250μA                   | 1.2 | 1.6  | 2.2  | V    |
| gFS                                | Forward Transconductance         | VDS=5V,ID=10A                      | --  | 38   | --   | S    |
| RDS(on)                            | Drain-Source On-State Resistance | VGS=10V, ID=20A                    | --  | 2.7  | 4.0  | mΩ   |
|                                    |                                  | VGS=4.5V, ID=10A                   | --  | 3.7  | 6.0  | mΩ   |
| Dynamic Characteristics            |                                  |                                    |     |      |      |      |
| Ciss                               | Input Capacitance                | VDS=15V,VGS=0V,<br>F=1MHZ          | --  | 5341 | --   | pF   |
| Coss                               | Output Capacitance               |                                    | --  | 380  | --   | pF   |
| Crss                               | Reverse Transfer Capacitance     |                                    | --  | 293  | --   | pF   |
| Rg                                 | Gate resistance                  | VGS=0V,<br>VDS=0V,f=1.0MHz         | --  | 0.9  | --   | Ω    |
| Switching Times                    |                                  |                                    |     |      |      |      |
| td(on)                             | Turn-on Delay Time               | VGS=10V,VDS=20V,<br>ID=30A,RGEN=3Ω | --  | 12   | --   | nS   |
| tr                                 | Turn-on Rise Time                |                                    | --  | 16   | --   | nS   |
| td(off)                            | Turn-Off Delay Time              |                                    | --  | 39   | --   | nS   |
| tf                                 | Turn-Off Fall Time               |                                    | --  | 15   | --   | nS   |
| Qg                                 | Total Gate Charge                | VGS=10V, VDS=20V,<br>ID=30A        | --  | 65   | --   | nC   |
| Qgs                                | Gate-Source Charge               |                                    | --  | 12.5 | --   | nC   |
| Qgd                                | Gate-Drain Charge                |                                    | --  | 15   | --   | nC   |
| Source-Drain Diode Characteristics |                                  |                                    |     |      |      |      |
| ISD                                | Source-Drain Current(Body Diode) |                                    | --  | --   | 100  | A    |
| VSD                                | Forward on Voltage               | VGS=0V,IS=20A                      | --  | --   | 1.2  | V    |
| trr                                | Reverse Recovery Time            | IF=20A , dl/dt=100A/μs ,<br>TJ=25℃ | --  | 22   | --   | ns   |
| Qrr                                | Reverse Recovery Charge          |                                    | --  | 11   | --   | 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: T<sub>J</sub>=25°C , V<sub>DD</sub>=25V, V<sub>gs</sub>=10V, I<sub>D</sub>=40A, L=0.5mH, R<sub>G</sub>=25ohm

## Typical Performance Characteristics

Figure 1: Output Characteristics

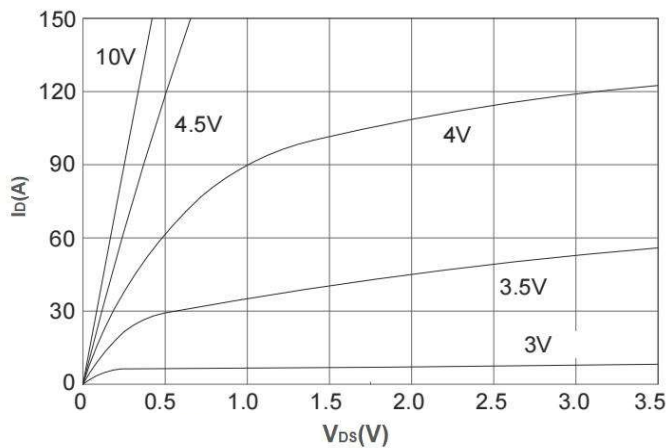


Figure 2: Typical Transfer Characteristics

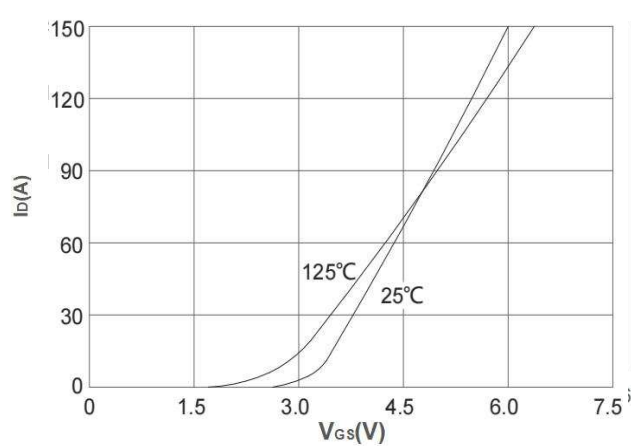


Figure 3: On-resistance vs. Drain Current

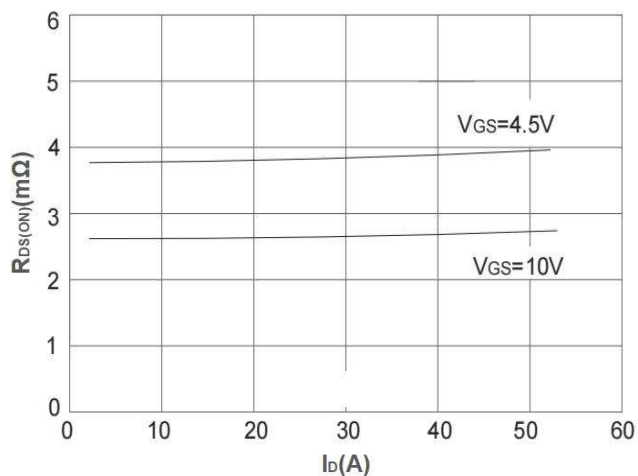


Figure 4: Body Diode Characteristics

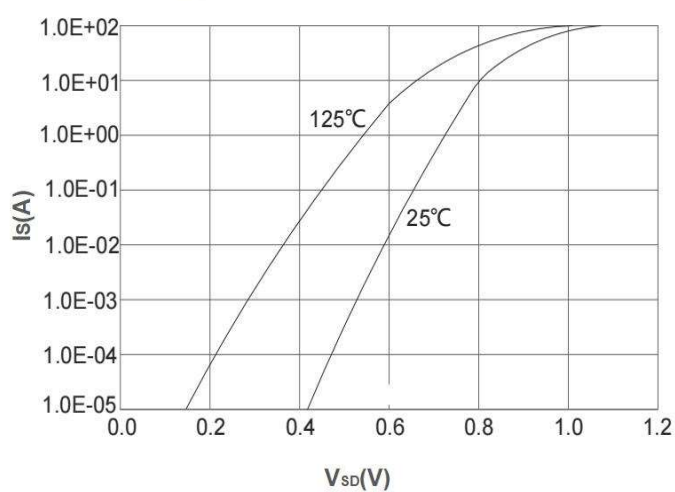


Figure 5: Gate Charge Characteristics

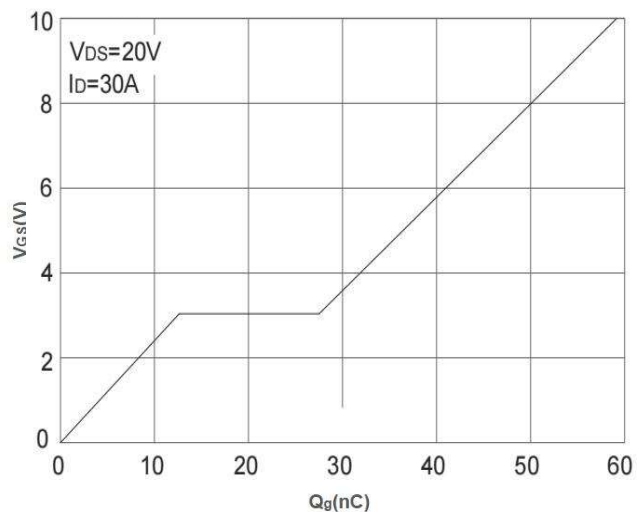
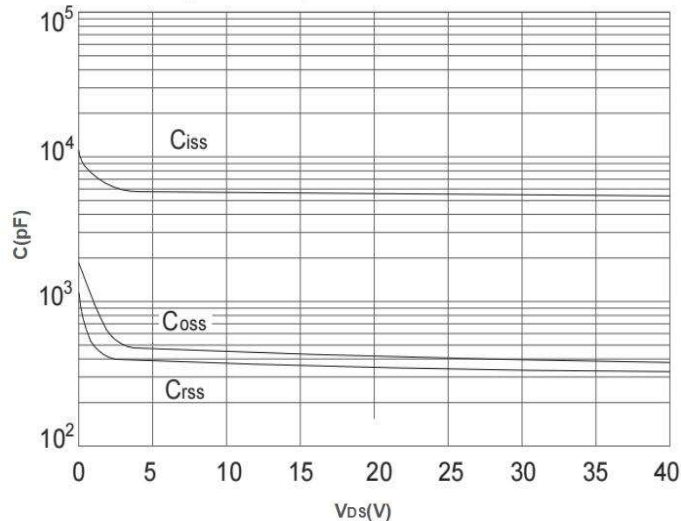


Figure 6: Capacitance Characteristics



## Typical Performance Characteristics

Figure 7: Normalized Breakdown voltage vs. Junction Temperature

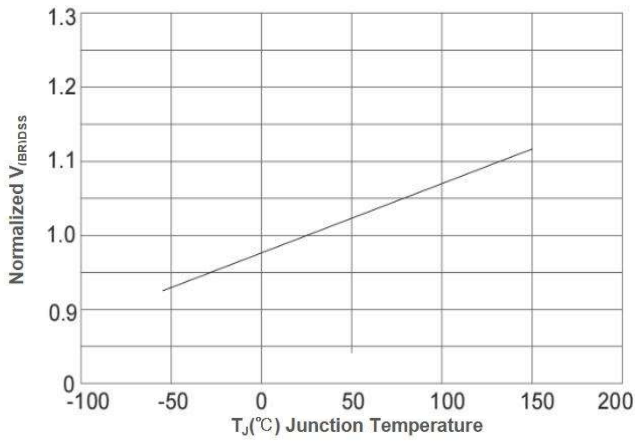


Figure 8: Normalized on Resistance vs. Junction Temperature

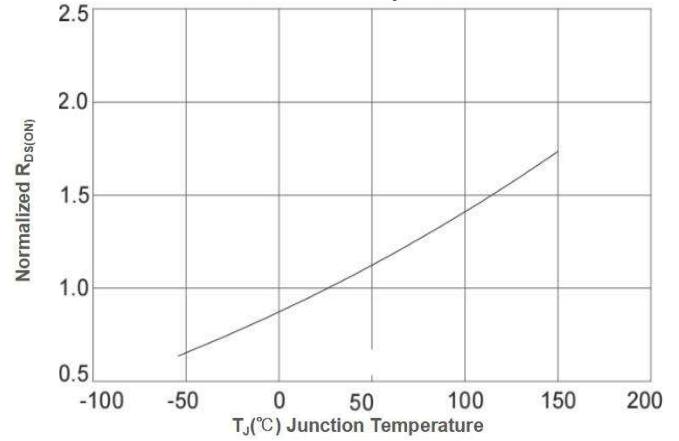


Figure 9: Maximum Safe Operating Area

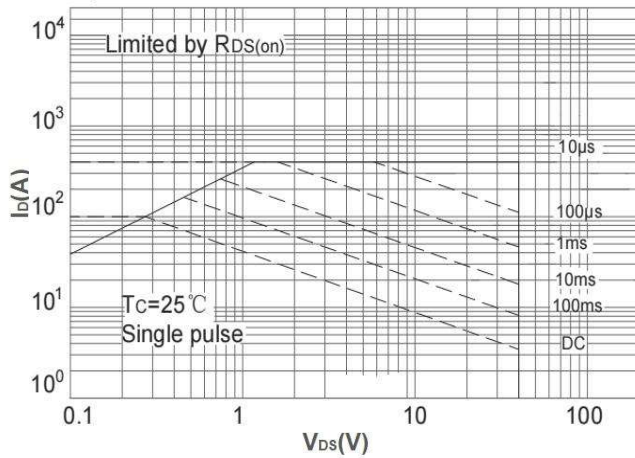


Figure 10: Maximum Continuous Drian Current vs. Case Temperature

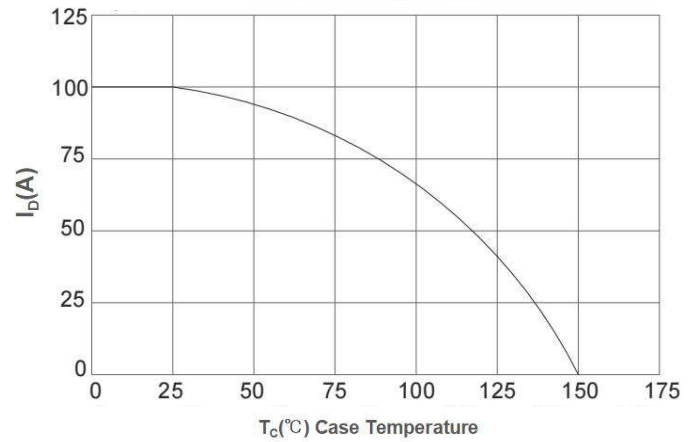


Figure 11: Normalized Maximum Transient Thermal Impedance

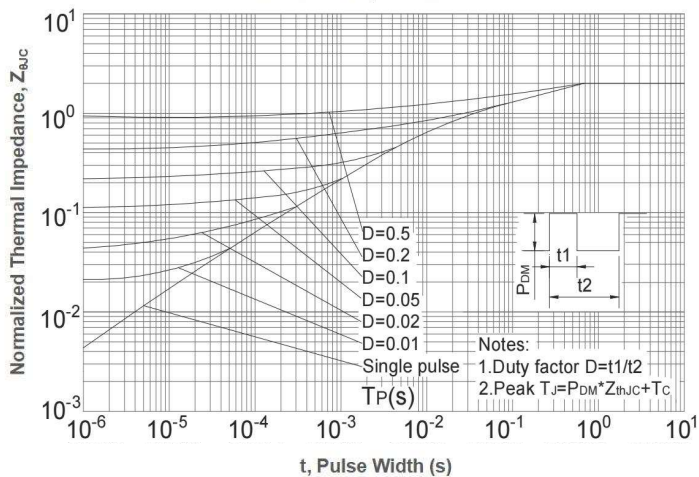
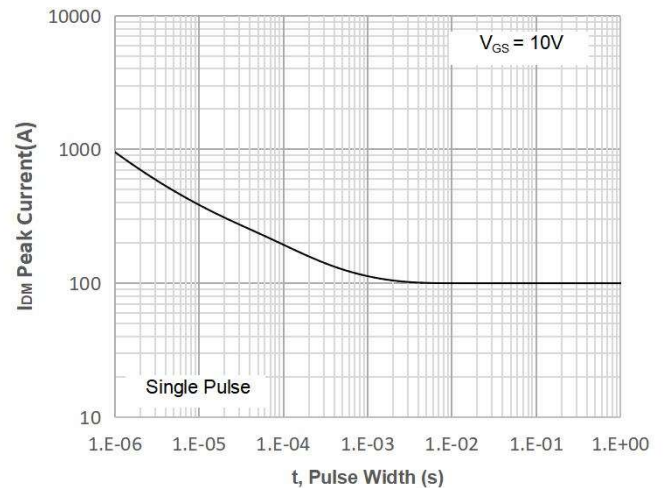


Figure 12: Peak Current Capacity



## Test Circuit

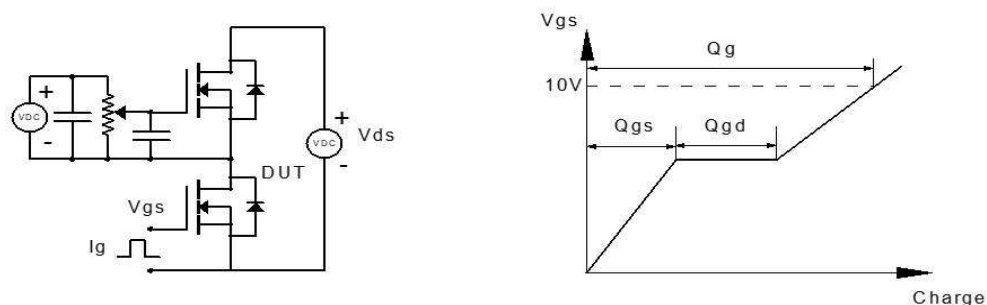


Figure 1: Gate Charge Test Circuit & Waveform

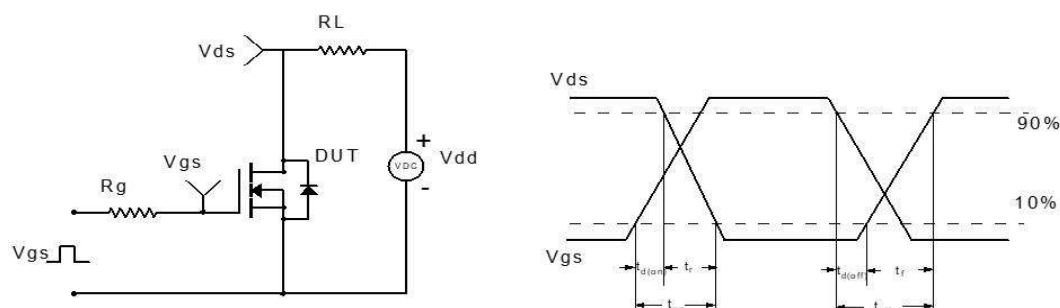


Figure 2: Resistive Switching Test Circuit & Waveform

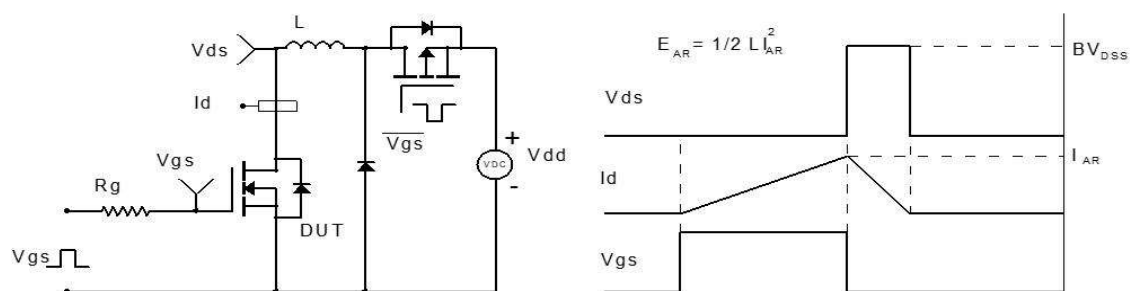


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

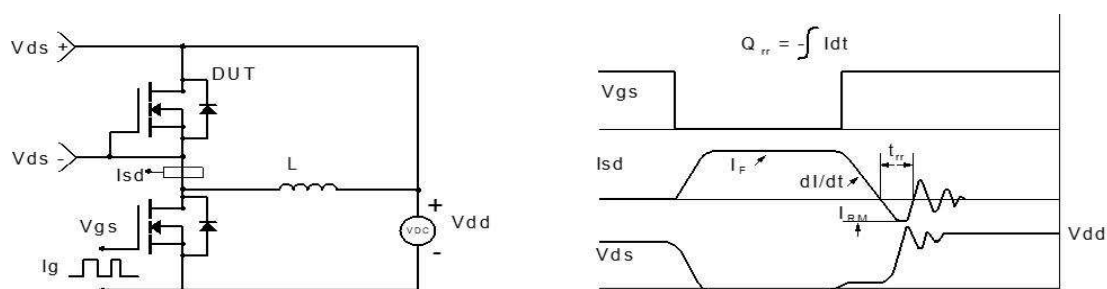
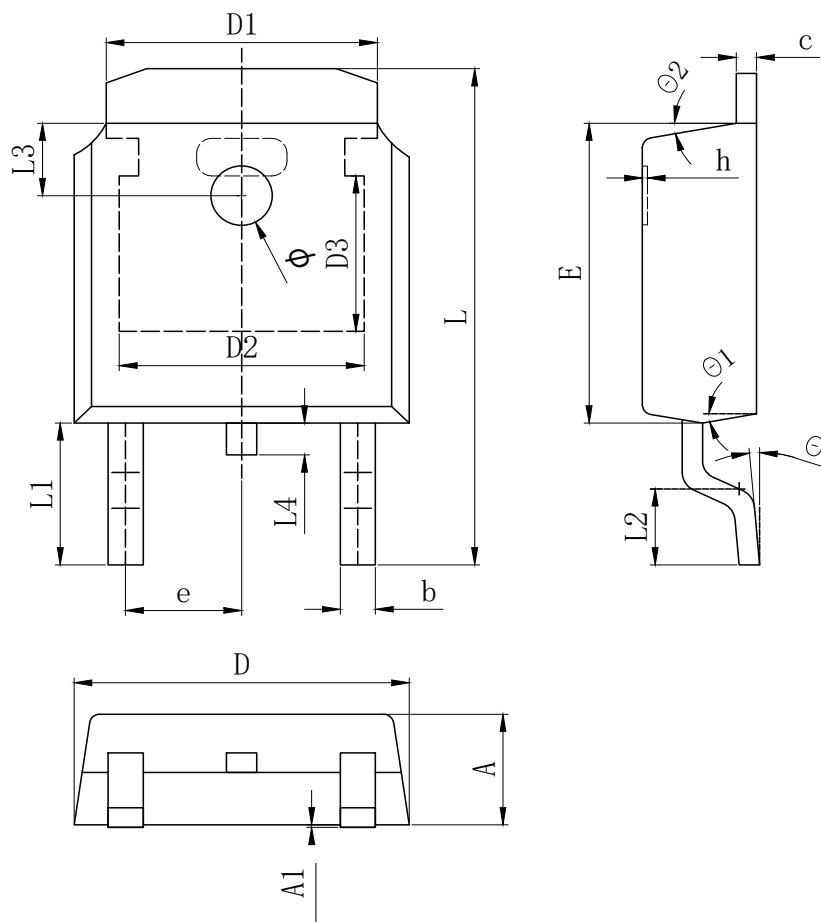
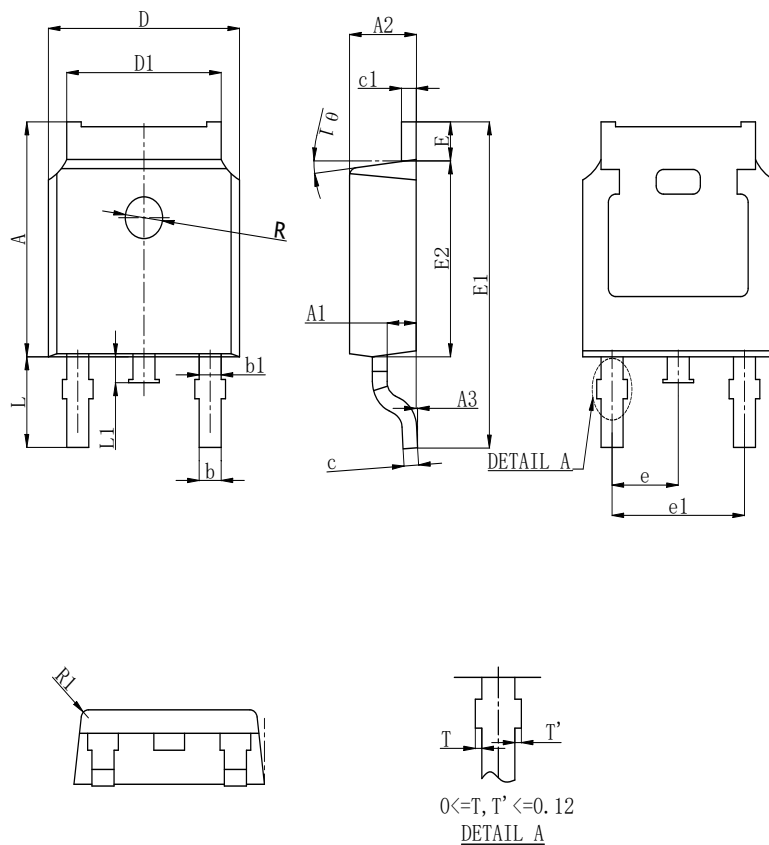


Figure 4: Diode Recovery Test Circuit & Waveform

# TO-252 Package Outline Data



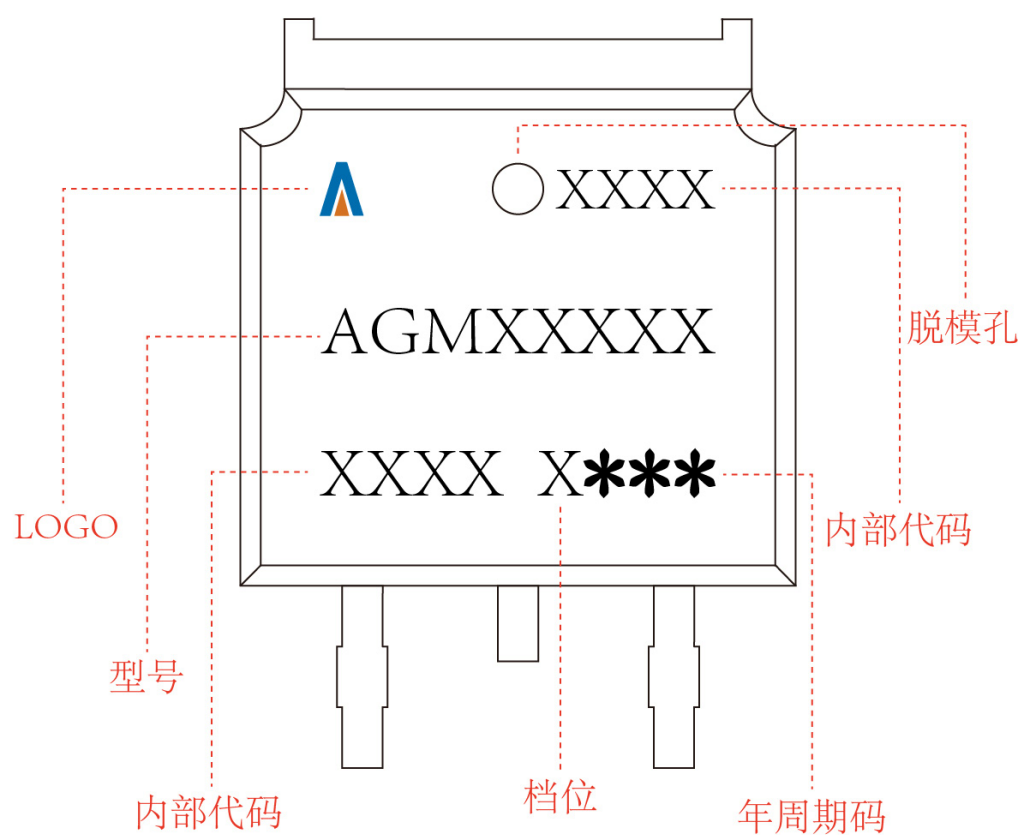
| SYMBOL     | MILLIMETER |        |        |
|------------|------------|--------|--------|
|            | MIN        | Typ.   | MAX    |
| A          | 2.200      | 2.300  | 2.400  |
| A1         | 0.000      |        | 0.127  |
| b          | 0.640      | 0.690  | 0.740  |
| c (电镀后)    | 0.460      | 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     |        |        |



| SYMBOL     | MILLIMETER |       |        |
|------------|------------|-------|--------|
|            | MIN        | NOM   | MAX    |
| A          | 7.050      | 7.100 | 7.150  |
| A1         | 0.960      | 1.010 | 1.060  |
| A2         | 2.250      | 2.300 | 2.350  |
| A3         | 0.000      | 0.050 | 0.100  |
| b          | 0.760REF.  |       |        |
| b1         | 1.000REF.  |       |        |
| c          | 0.508REF.  |       |        |
| c1         | 0.508REF.  |       |        |
| D          | 6.550      | 6.600 | 6.650  |
| D1         | 5.220      | 5.320 | 5.420  |
| E          | 0.950      | 1.000 | 1.050  |
| E1         | 9.700      | 9.900 | 10.100 |
| E2         | 6.050      | 6.100 | 6.150  |
| e          | 2.286BSC   |       |        |
| e1         | 4.572REF.  |       |        |
| L          | 2.650      | 2.800 | 2.950  |
| L1         | 0.700      | 0.800 | 0.900  |
| $\theta 1$ | 7° REF.    |       |        |
| R          | 1.300REF.  |       |        |
| R1         | 0.250REF.  |       |        |

TO-252

Marking Instructions:



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