

## General Description

The AGM405AP2 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

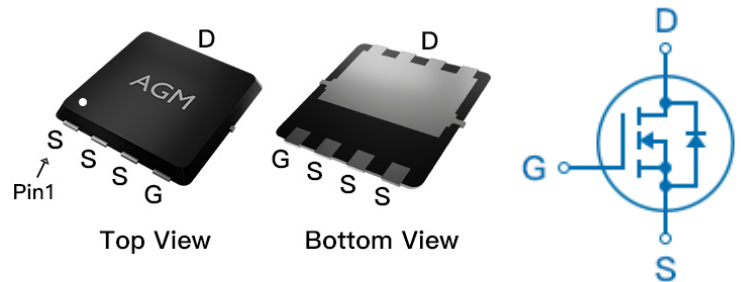
## Application

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

## Product Summary

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 40V   | 4.4mΩ | 46A |

## PDFN3.3\*3.3 Pin Configuration



## Package Marking and Ordering Information

| Device Marking | Device    | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| AGM405AP2      | AGM405AP2 | PDFN3.3*3.3    | 330mm     | 12mm       | 5000     |

**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)       | 46         | A    |
|             | Drain Current-Continuous(Tc=100°C)               | 30         | A    |
| IDM (pluse) | Drain Current-Pulsed (Note 2)                    | 184        | A    |
| PD          | Maximum Power Dissipation(Tc=25°C)               | 28         | w    |
|             | Maximum Power Dissipation(Tc=100°C)              | 11         | w    |
| EAS         | Avalanche energy (Note 3)                        | 81         | 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> | --- | 60  | °C/W |
| RθJC   | Thermal Resistance Junction-Case <sup>1</sup>                   | --- | 4.5 | °C/W |

**Table 3. Electrical Characteristics (TA=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                       | --  | 20   | --  | S    |
| RDS(on)                            | Drain-Source On-State Resistance | VGS=10V, ID=20A                     | --  | 4.4  | 5.9 | mΩ   |
|                                    |                                  | VGS=4.5V, ID=15A                    | --  | 6.6  | 8.5 | mΩ   |
| Dynamic Characteristics            |                                  |                                     |     |      |     |      |
| Ciss                               | Input Capacitance                | VDS=20V,VGS=0V,<br>F=1MHZ           | --  | 842  | --  | pF   |
| Coss                               | Output Capacitance               |                                     | --  | 321  | --  | pF   |
| Crss                               | Reverse Transfer Capacitance     |                                     | --  | 13   | --  | pF   |
| Rg                                 | Gate resistance                  | VGS=0V,<br>VDS=0V,f=1.0MHz          | --  | 3.7  | --  | Ω    |
| Switching Times                    |                                  |                                     |     |      |     |      |
| td(on)                             | Turn-on Delay Time               | VGS=10V,VDS=20V,<br>RL=1Ω,RGEN=1.6Ω | --  | 5.5  | --  | nS   |
| tr                                 | Turn-on Rise Time                |                                     | --  | 49.5 | --  | nS   |
| td(off)                            | Turn-Off Delay Time              |                                     | --  | 18.0 | --  | nS   |
| tf                                 | Turn-Off Fall Time               |                                     | --  | 5.5  | --  | nS   |
| Qg                                 | Total Gate Charge                | VGS=10V, VDS=20V,<br>ID=20A         | --  | 13.5 | --  | nC   |
| Qgs                                | Gate-Source Charge               |                                     | --  | 2.4  | --  | nC   |
| Qgd                                | Gate-Drain Charge                |                                     | --  | 2.6  | --  | nC   |
| Source-Drain Diode Characteristics |                                  |                                     |     |      |     |      |
| ISD                                | Source-Drain Current(Body Diode) |                                     | --  | --   | 46  | A    |
| VSD                                | Forward on Voltage               | VGS=0V,IS=20A                       | --  | --   | 1.2 | V    |
| trr                                | Reverse Recovery Time            | ID=20A ,VDD=20V                     | --  | 28.6 | --  | ns   |
| Qrr                                | Reverse Recovery Charge          | dl/dt=100A/μs , TJ=25℃              | --  | 15.0 | --  | 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, VDD=25V, Vgs=10V, ID=18A, L=0.5mH, RG=25ohm

# Electrical Characteristics Diagrams

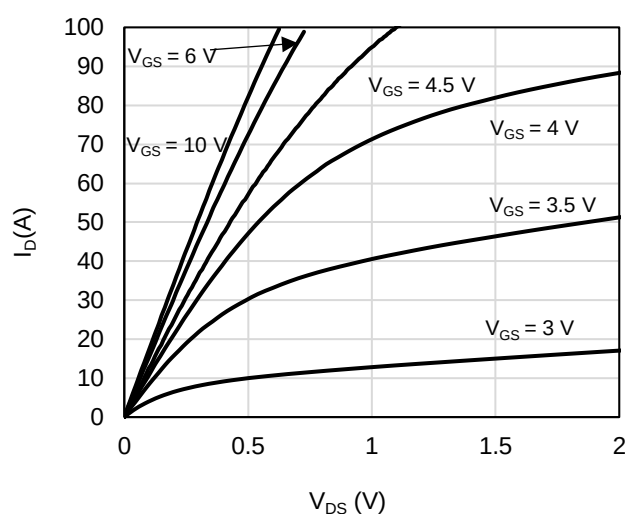


Figure 1: On-Region Characteristics

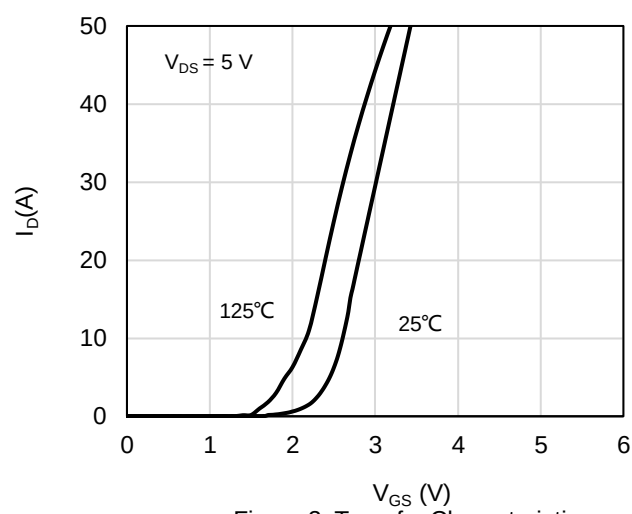


Figure 2: Transfer Characteristics

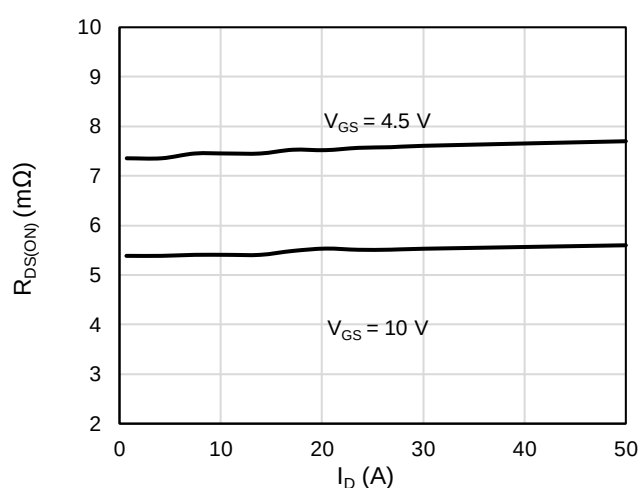


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

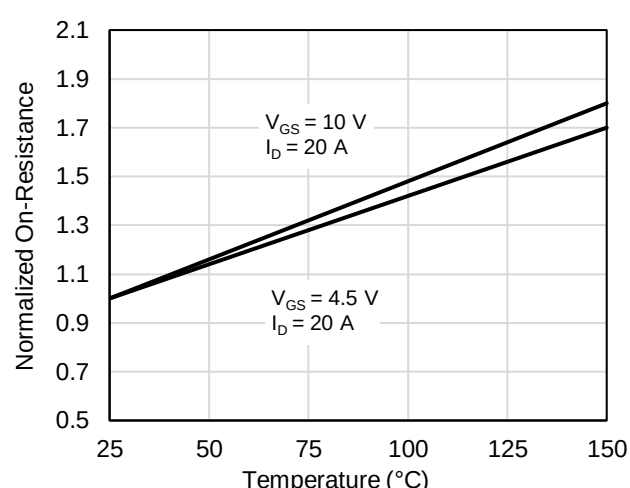


Figure 4: On-Resistance vs. Junction Temperature

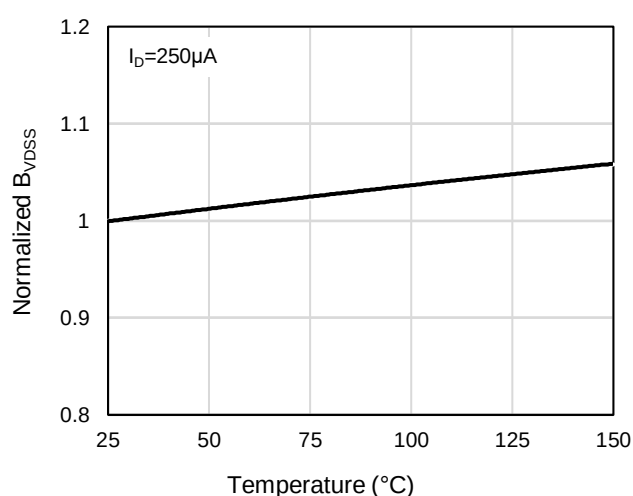


Figure 5: Breakdown Voltage vs. Junction Temperature

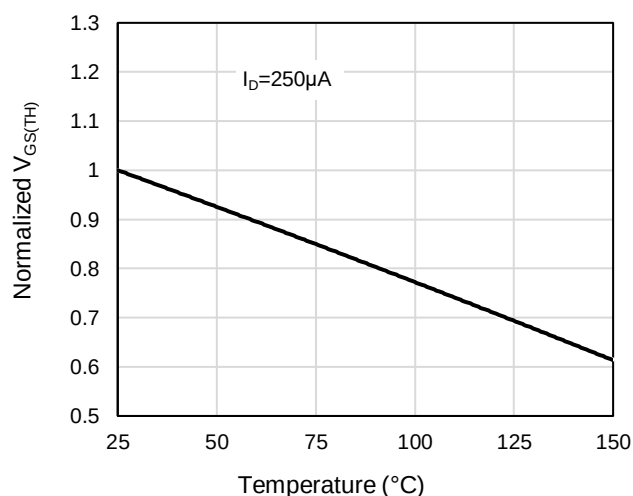


Figure 6: Threshold Voltage vs. Junction Temperature

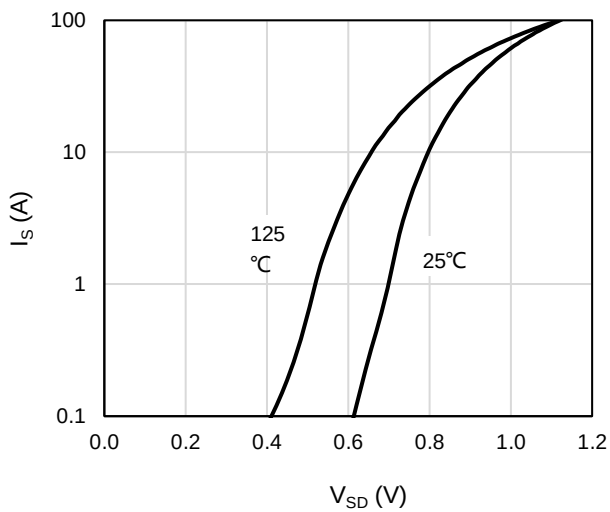


Figure 7: Body-Diode Characteristics

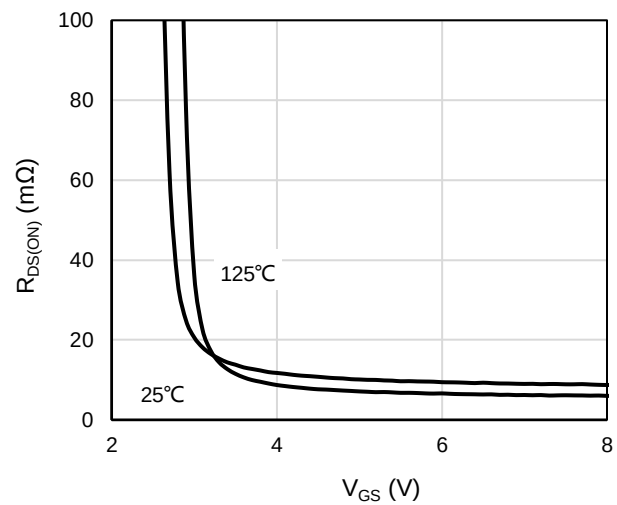


Figure 8: On-Resistance vs. Gate-Source Voltage

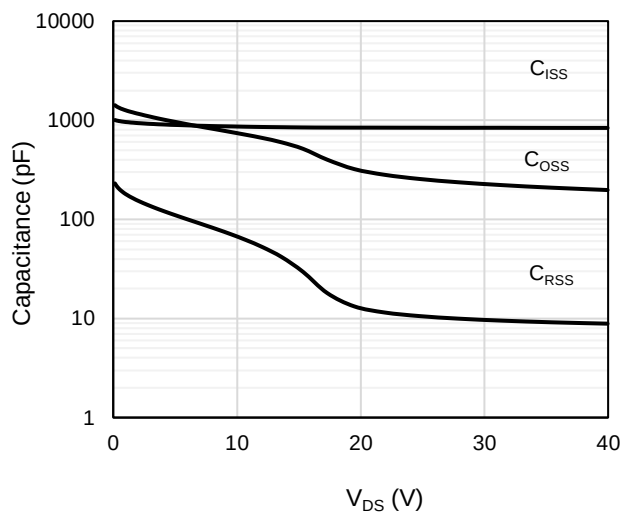


Figure 9: Capacitance Characteristics

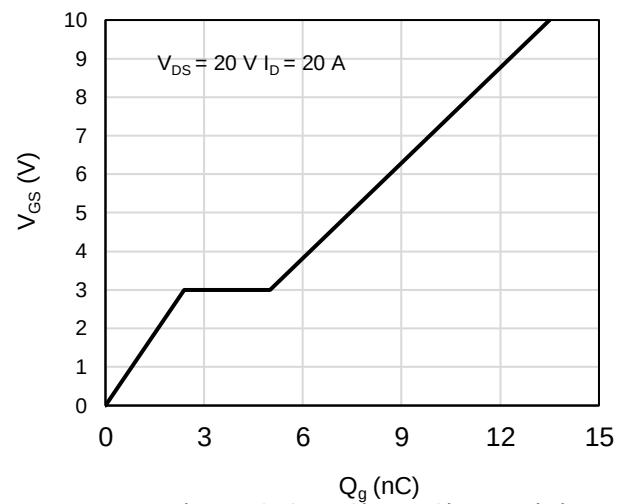


Figure 10: Gate-Charge Characteristics

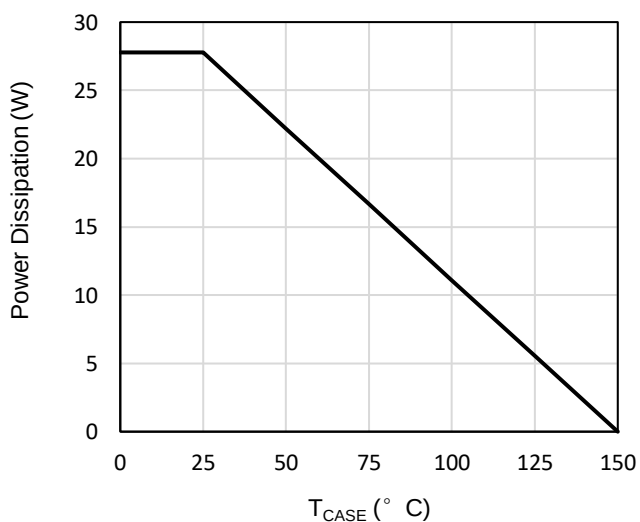


Figure 11: Power De-rating

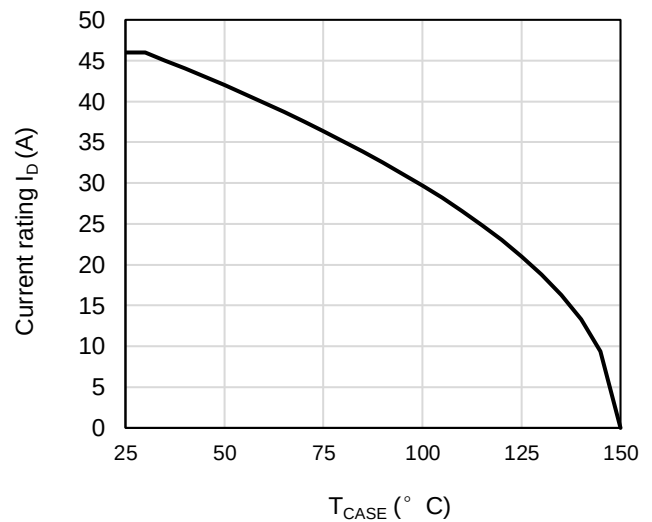


Figure 12: Current De-rating

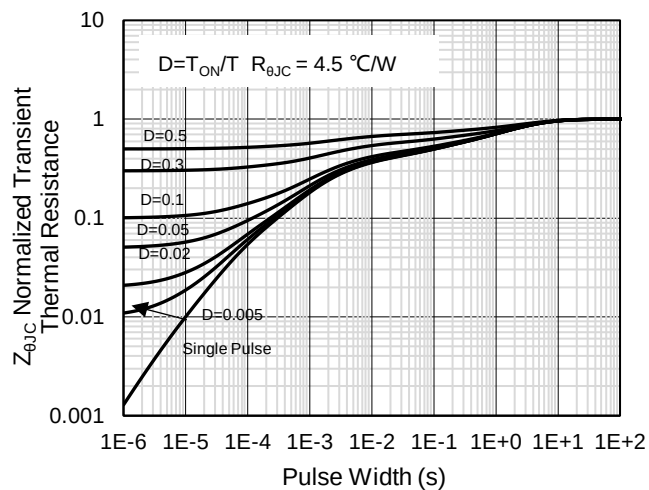


Figure 13: Normalized Maximum Transient Thermal Impedance

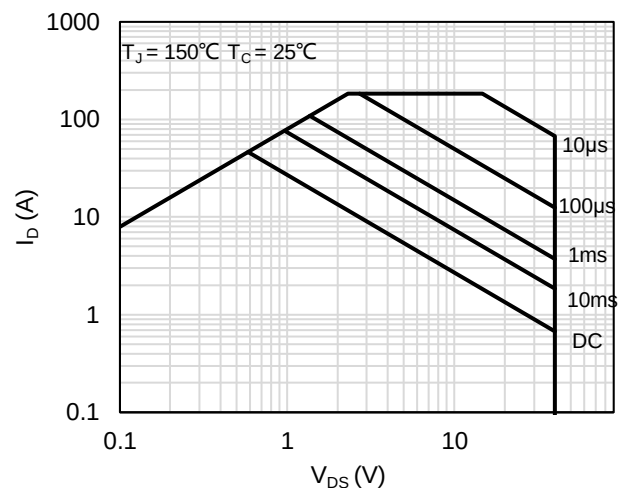
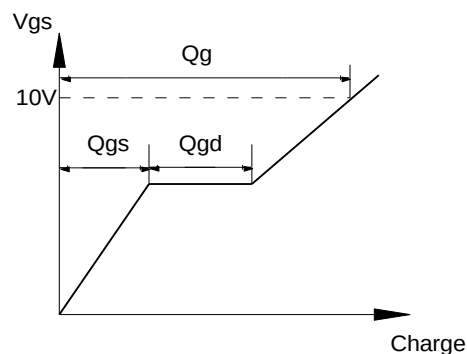
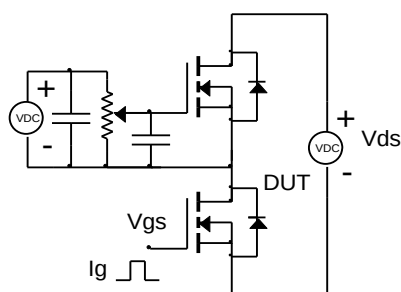


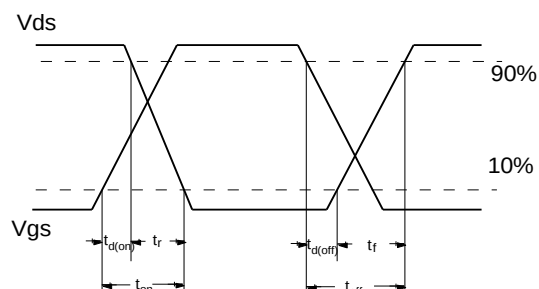
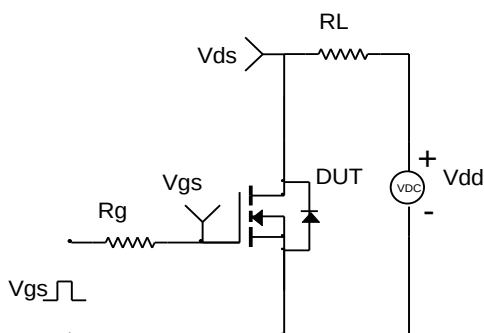
Figure 14: Maximum Forward Biased Safe Operating Area

# Test Circuit and Waveform

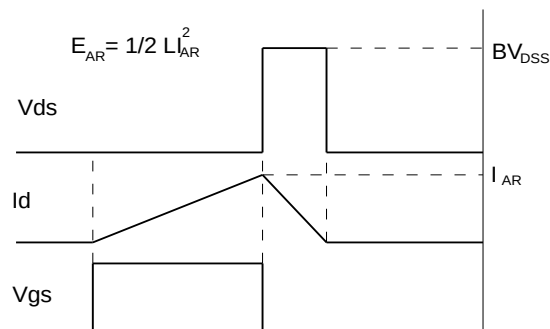
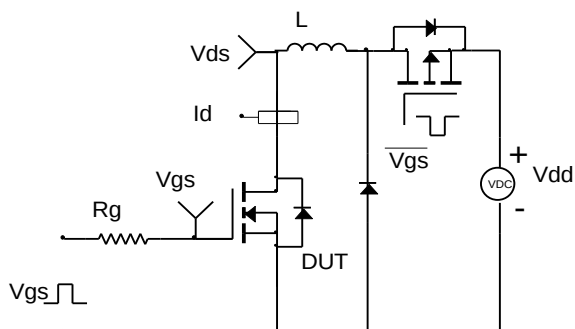
Gate Charge Test Circuit &amp; Waveform



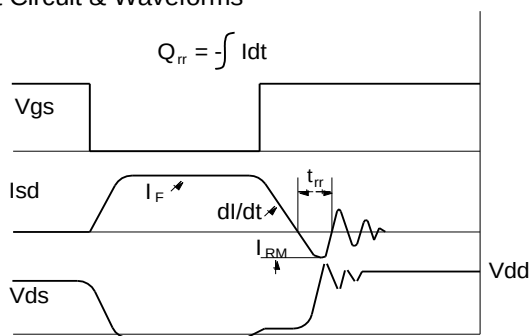
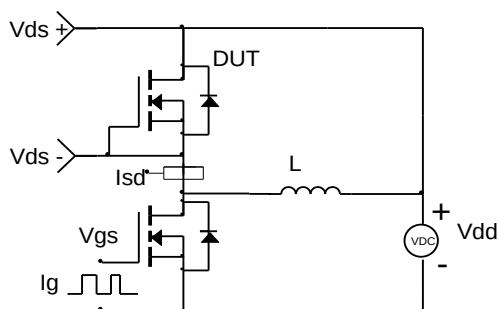
Resistive Switching Test Circuit &amp; Waveforms



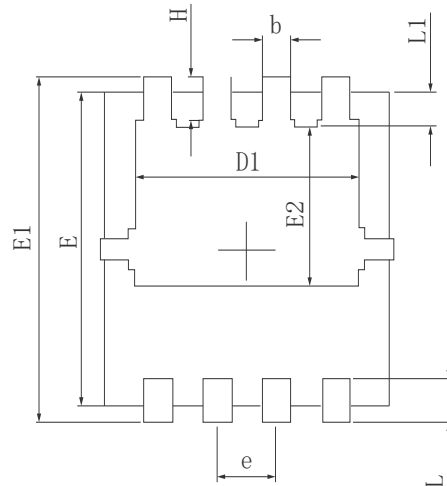
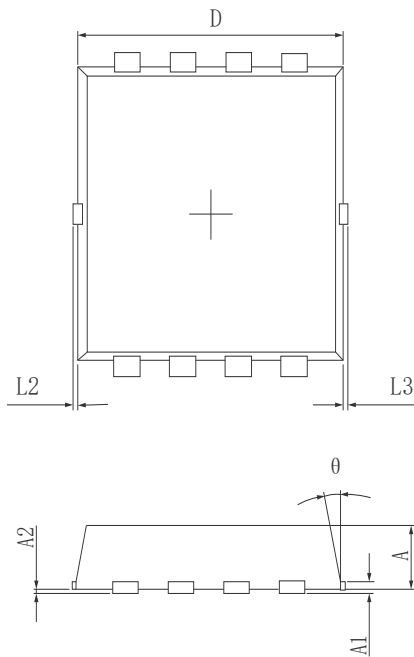
Unclamped Inductive Switching (UIS) Test Circuit &amp; Waveforms



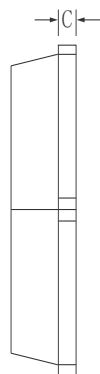
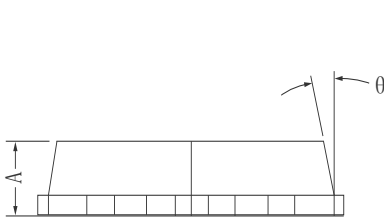
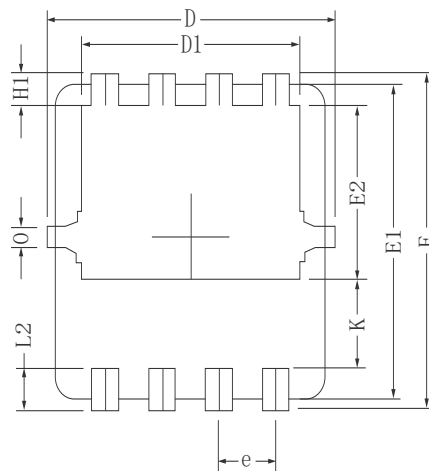
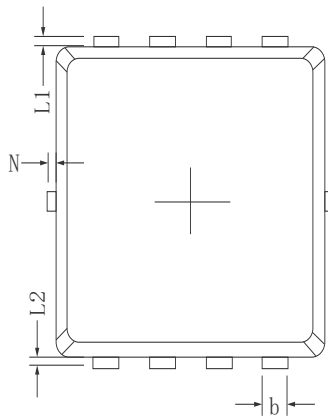
Diode Recovery Test Circuit &amp; Waveforms



# Dimensions (PDFN3.3\*3.3)



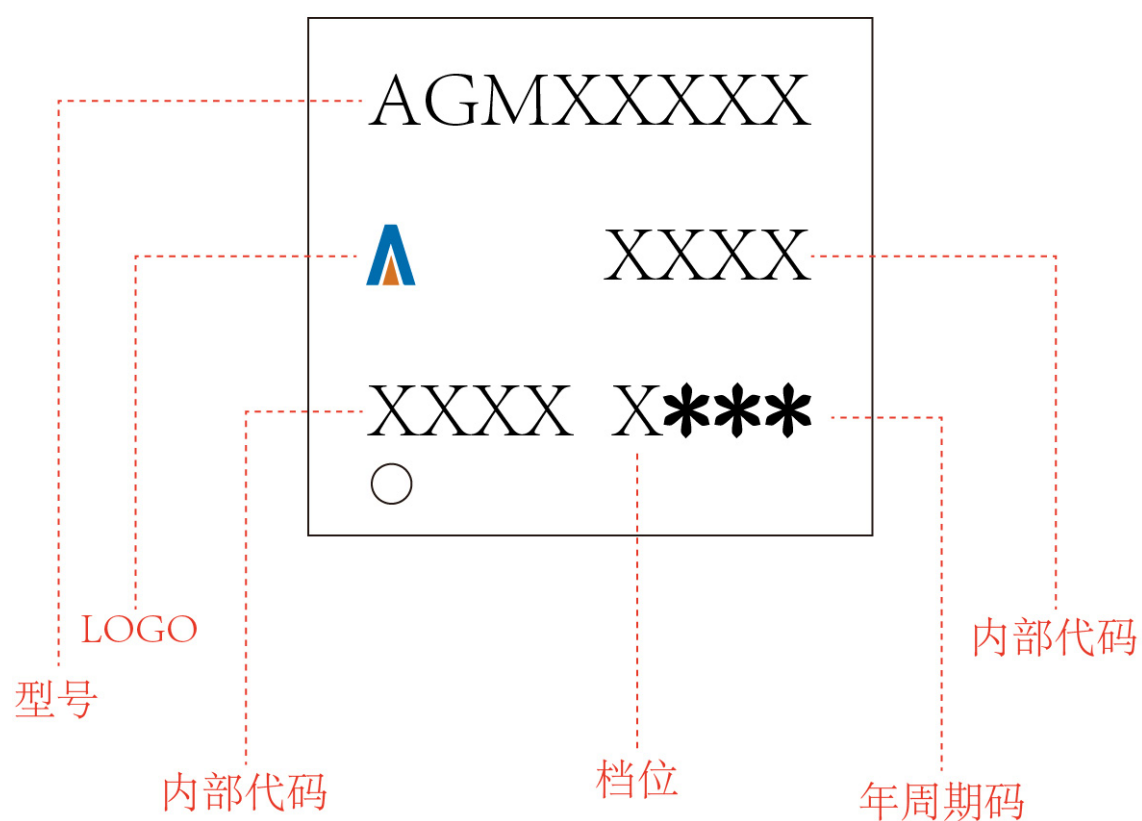
| SYMBOL | MILLIMETER |       |       |
|--------|------------|-------|-------|
|        | MIN        | Typ.  | MAX   |
| A      | 0.700      | 0.800 | 0.900 |
| A1     | 0.152REF.  |       |       |
| A2     | 0~0.05     |       |       |
| D      | 3.000      | 3.100 | 3.200 |
| D1     | 2.300      | 2.450 | 2.600 |
| E      | 2.900      | 3.000 | 3.100 |
| E1     | 3.150      | 3.300 | 3.450 |
| E2     | 1.320      | 1.520 | 1.720 |
| b      | 0.200      | 0.300 | 0.400 |
| e      | 0.550      | 0.650 | 0.750 |
| L      | 0.300      | 0.400 | 0.500 |
| L1     | 0.180      | 0.330 | 0.480 |
| L2     | 0~0.100    |       |       |
| L3     | 0~0.100    |       |       |
| H      | 0.315      | 0.415 | 0.515 |
| θ      | 8°         | 10°   | 12°   |



| Symbols | Millimeters |      |      |
|---------|-------------|------|------|
|         | MIN.        | NOM. | MAX. |
| A       | 0.65        | 0.75 | 0.85 |
| b       | 0.25        | 0.30 | 0.35 |
| C       | 0.15        | 0.20 | 0.25 |
| D       | 3.00        | 3.10 | 3.20 |
| D1      | 2.40        | 2.50 | 2.60 |
| E       | 3.20        | 3.30 | 3.40 |
| E1      | 3.00        | 3.10 | 3.20 |
| E2      | 1.60        | 1.70 | 1.80 |
| e       | 0.65 BSC.   |      |      |
| H1      | 0.21        | 0.31 | 0.41 |
| H2      | 0.30        | 0.40 | 0.50 |
| K       | 0.78        | 0.88 | 0.98 |
| L1/L2   | 0.10 REF.   |      |      |
| θ       | 11°         | 12°  | 13°  |
| N       | 0           | -    | 0.15 |
| 0       | 0.2 REF.    |      |      |

### PDFN3.3\*3.3

#### Marking Instructions:





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