

## General Description

The AGM412S 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

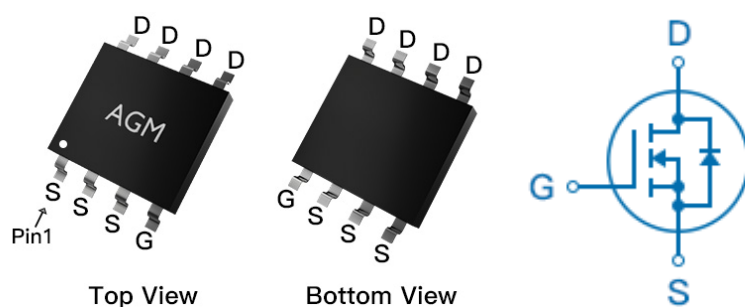
## Application

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

## Product Summary

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 40V   | 11mΩ  | 13A |

## SOP-8 Pin Configuration



## Package Marking and Ordering Information

| Device Marking | Device  | Device Package | Reel Size | Tape width | Quantity |
|----------------|---------|----------------|-----------|------------|----------|
| AGM412S        | AGM412S | SOP8           | 330mm     | 12mm       | 3000     |

**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(TA=25°C) (Note 1)       | 13         | A    |
|             | Drain Current-Continuous(TA=100°C)               | 8.5        | A    |
| IDM (pulse) | Drain Current-Pulsed (Note 2)                    | 52         | A    |
| PD          | Maximum Power Dissipation(TA=25°C)               | 2.5        | w    |
|             | Maximum Power Dissipation(TA=100°C)              | 1.0        | w    |
| EAS         | Avalanche energy (Note 3)                        | 90         | 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 |

**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 | 1.4  | 2.2  | V    |
| gFS                                | Forward Transconductance         | VDS=5V,ID=5A                            | --  | 10   | --   | S    |
| RDS(on)                            | Drain-Source On-State Resistance | VGS=10V, ID=8A                          | --  | 11   | 14   | mΩ   |
|                                    |                                  | VGS=4.5V, ID=5A                         | --  | 13.5 | 22   | mΩ   |
| Dynamic Characteristics            |                                  |                                         |     |      |      |      |
| Ciss                               | Input Capacitance                | VGS=0V,<br>VDS=20V,F=1MHZ               | --  | 1125 | --   | pF   |
| Coss                               | Output Capacitance               |                                         | --  | 103  | --   | pF   |
| Crss                               | Reverse Transfer Capacitance     |                                         | --  | 77   | --   | pF   |
| Rg                                 | Gate resistance                  | VGS=0V,<br>VDS=0V,f=1.0MHz              | --  | --   | --   | Ω    |
| Switching Times                    |                                  |                                         |     |      |      |      |
| td(on)                             | Turn-on Delay Time               | VGS=10V,VDS=20V,<br>ID=8A,RL=1Ω,RGEN=3Ω | --  | 9    | --   | nS   |
| tr                                 | Turn-on Rise Time                |                                         | --  | 8    | --   | nS   |
| td(off)                            | Turn-Off Delay Time              |                                         | --  | 29   | --   | nS   |
| tf                                 | Turn-Off Fall Time               |                                         | --  | 14   | --   | nS   |
| Qg                                 | Total Gate Charge                | VGS=10V, VDS=20V,<br>ID=8A              | --  | 18   | --   | nC   |
| Qgs                                | Gate-Source Charge               |                                         | --  | 3.2  | --   | nC   |
| Qgd                                | Gate-Drain Charge                |                                         | --  | 3.8  | --   | nC   |
| Source-Drain Diode Characteristics |                                  |                                         |     |      |      |      |
| ISD                                | Source-Drain Current(Body Diode) |                                         | --  | --   | 13   | A    |
| VSD                                | Forward on Voltage               | VGS=0V,IS=8A                            | --  | --   | 1.2  | V    |
| trr                                | Reverse Recovery Time            | IF=8A , dI/dt=100A/μs ,<br>TJ=25℃       | --  | 20   | --   | ns   |
| Qrr                                | Reverse Recovery Charge          |                                         | --  | 10   | --   | nc   |

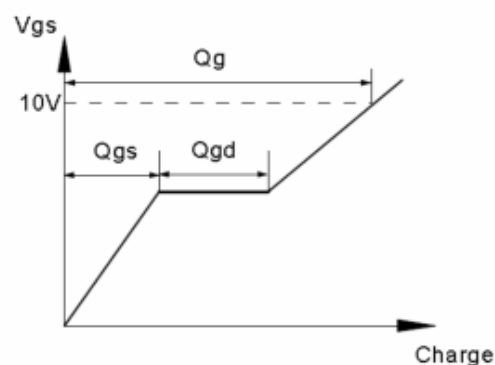
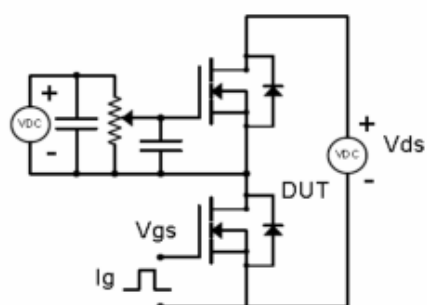
Notes 1.The maximum current rating is package limited.

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

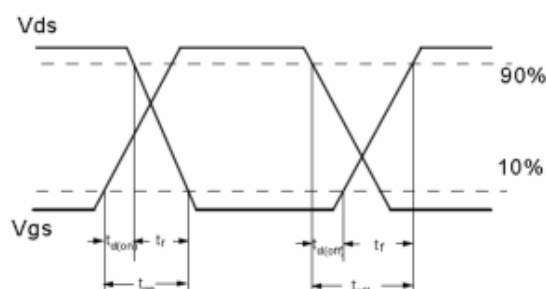
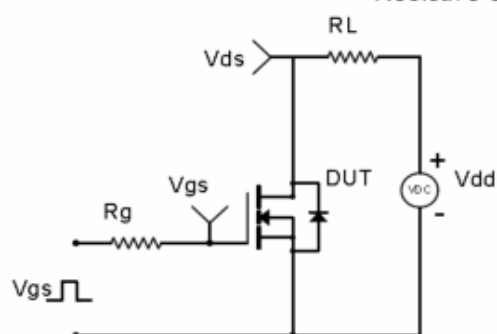
Notes 3.EAS condition: TJ=25°C, VDD=25V, Vgs=10V, ID=19A, L=0.5mH, RG=25ohm

## Test Circuit & Waveform

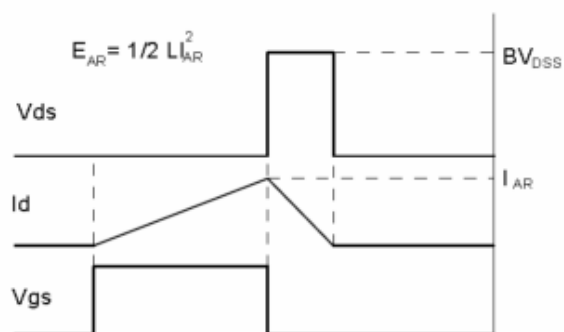
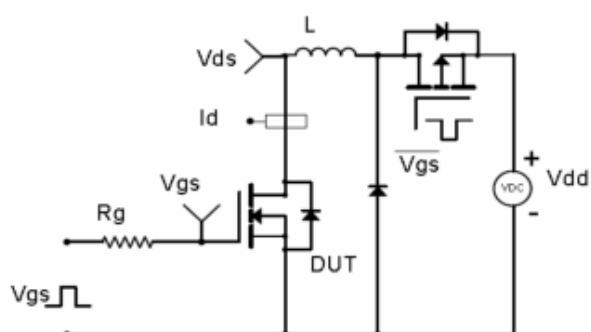
Gate Charge Test Circuit & Waveform



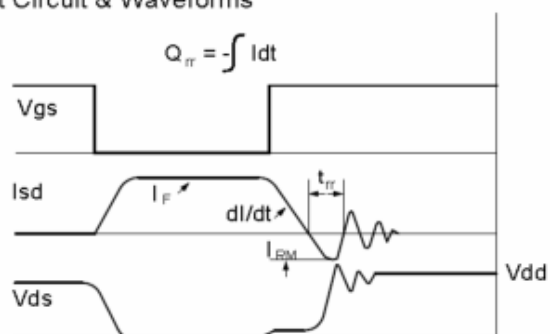
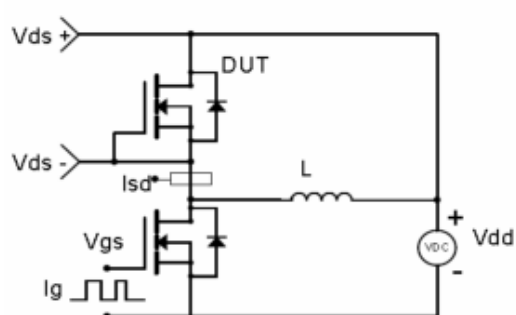
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



## Typical Performance Characteristics

Fig.1 Output Characteristics

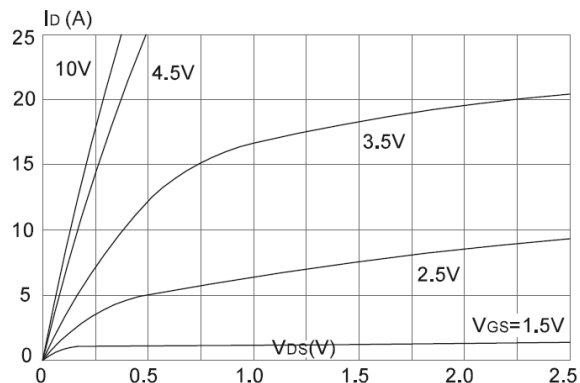


Fig.2 Typical Transfer Characteristics

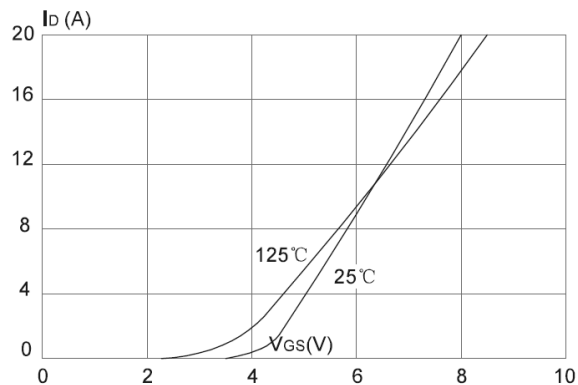


Fig.3 On-resistance VS Drain Current

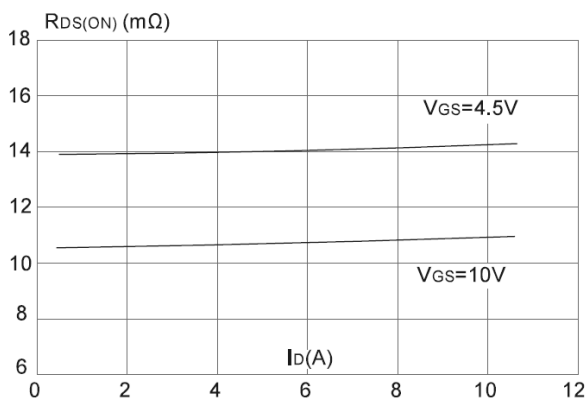


Fig. 4 Body Diode Characteristics

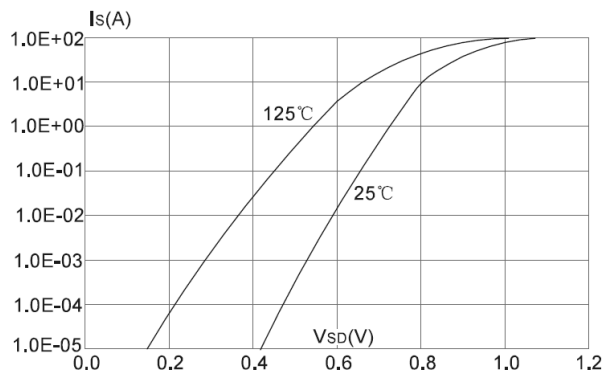


Fig.5 Gate Charge Characteristics

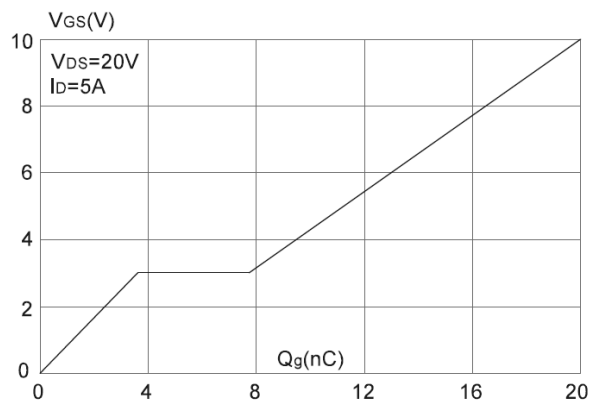


Fig. 6 Capacitance Characteristics

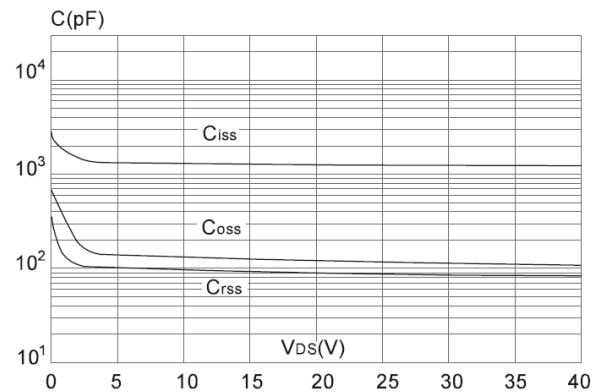


Fig.7 Normalized Breakdown Voltage  
VS Junction Temperature

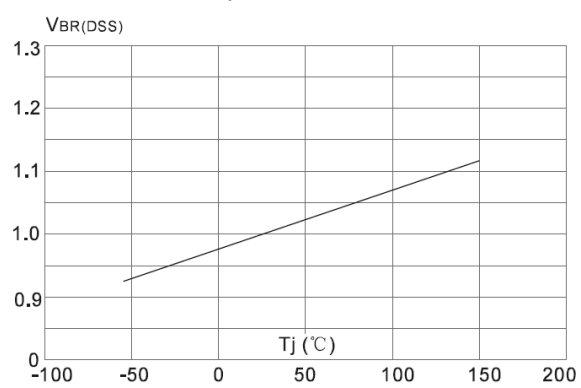


Fig. 8 Normalized On-Resistance Variation VS  
Junction Temperature

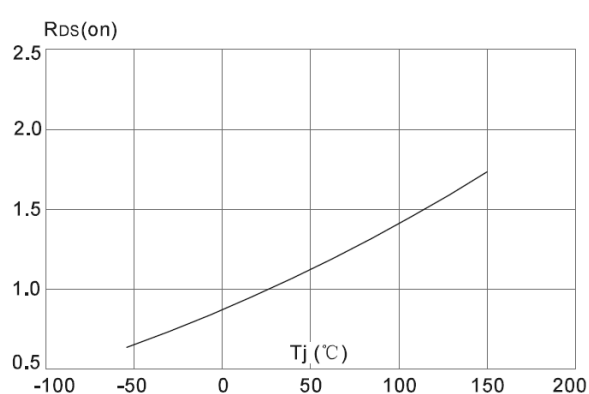


Fig.9 Maximum Continuous Drain Current VS.  
Ambient Temperature

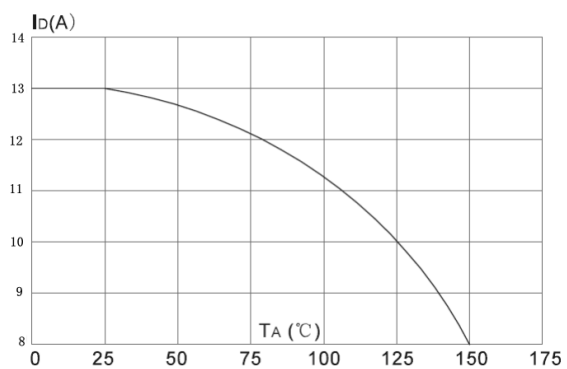


Fig.10 Safe Operating Area

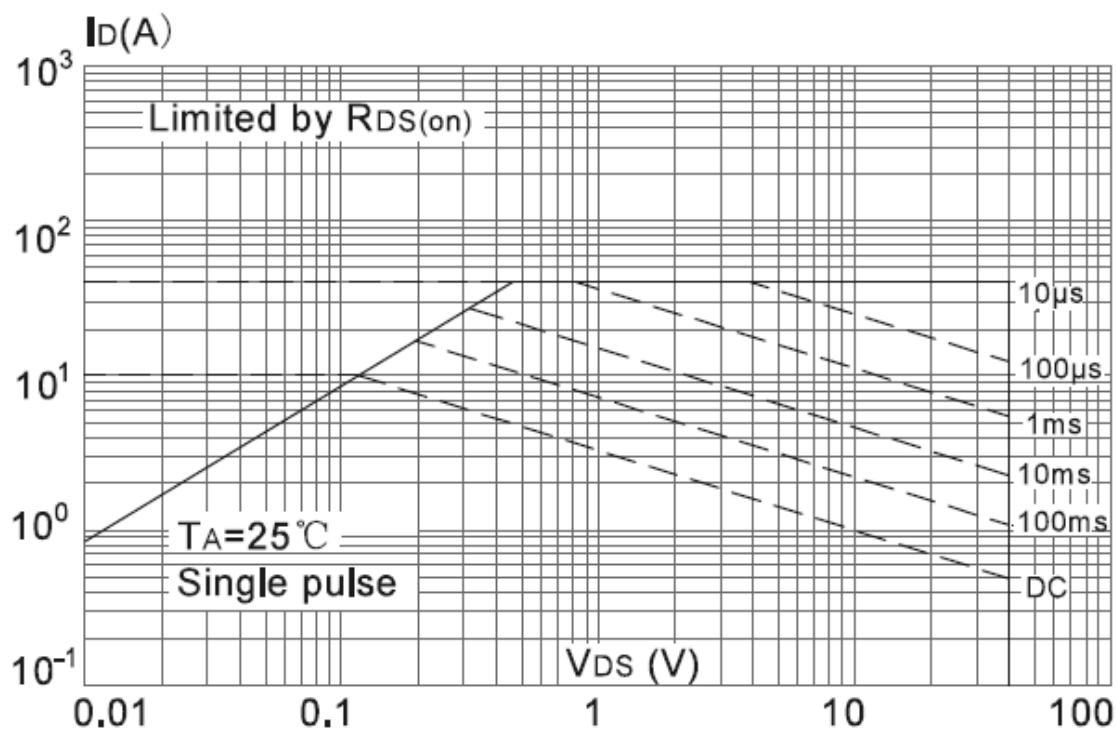
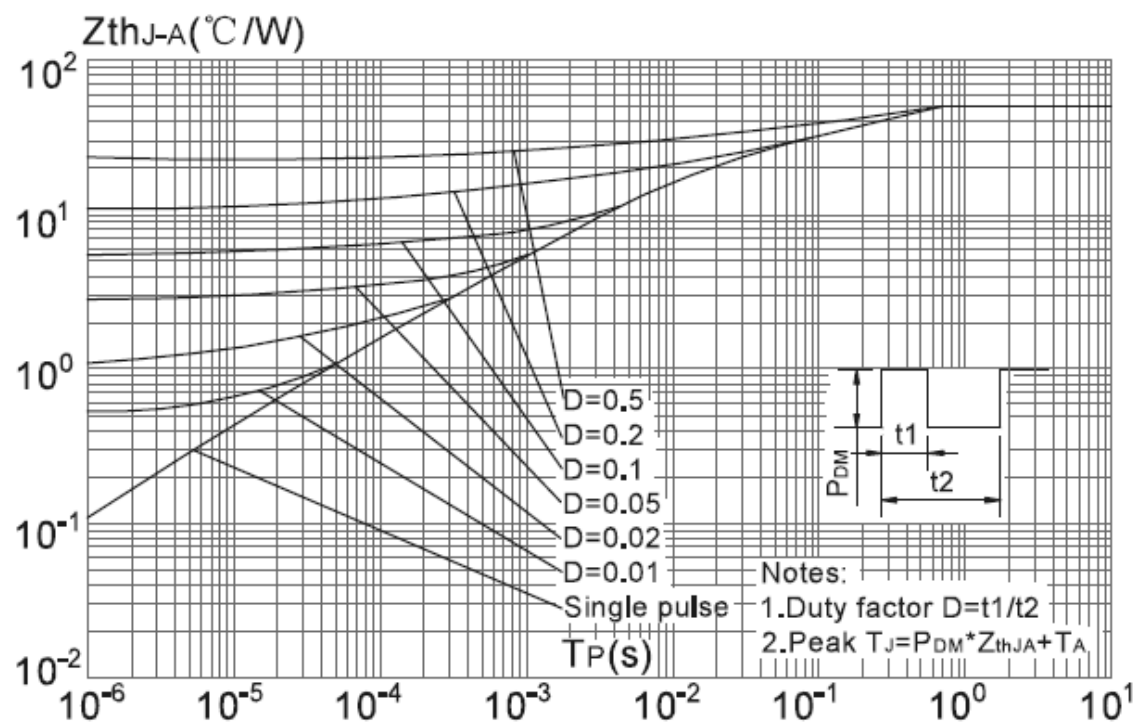
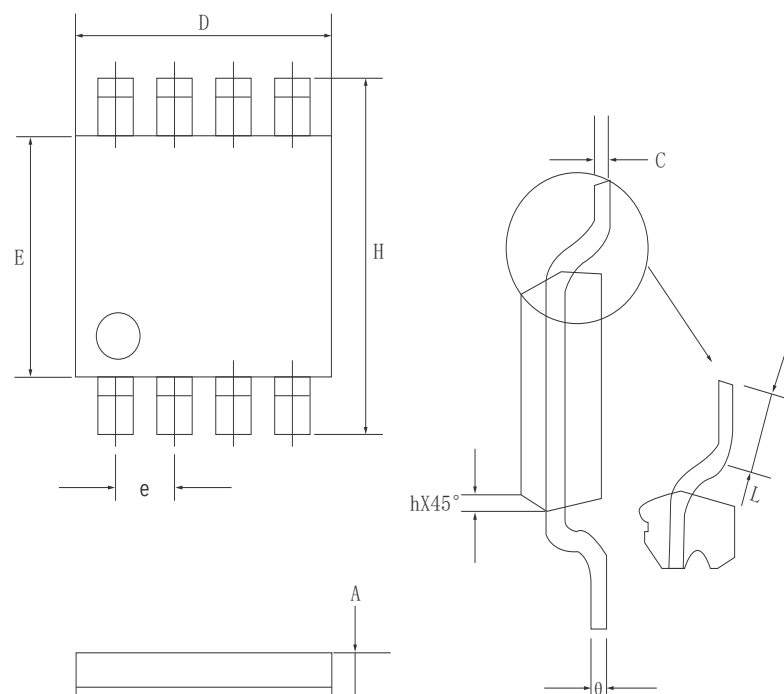


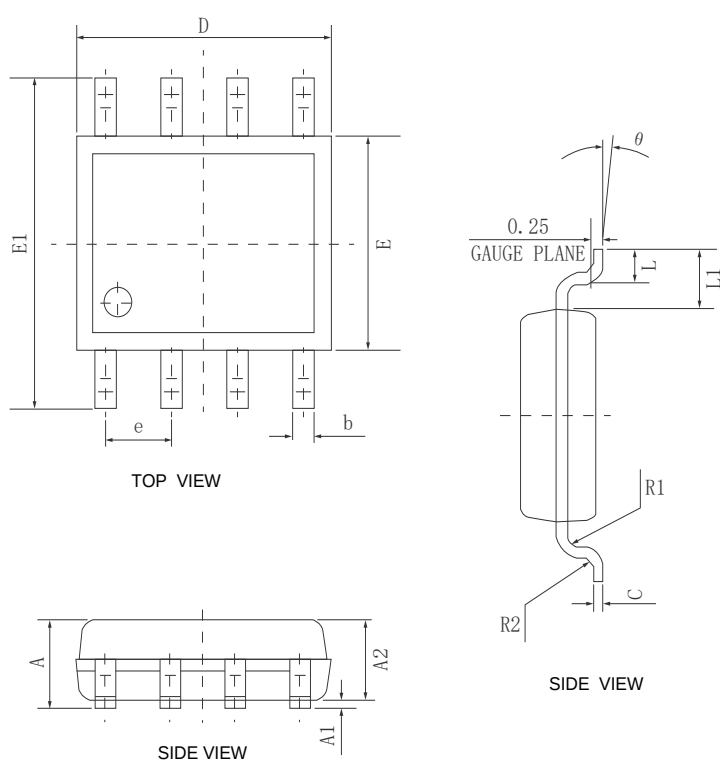
Fig. 11 Transient Thermal Response Curve



# Dimensions (SOP8)



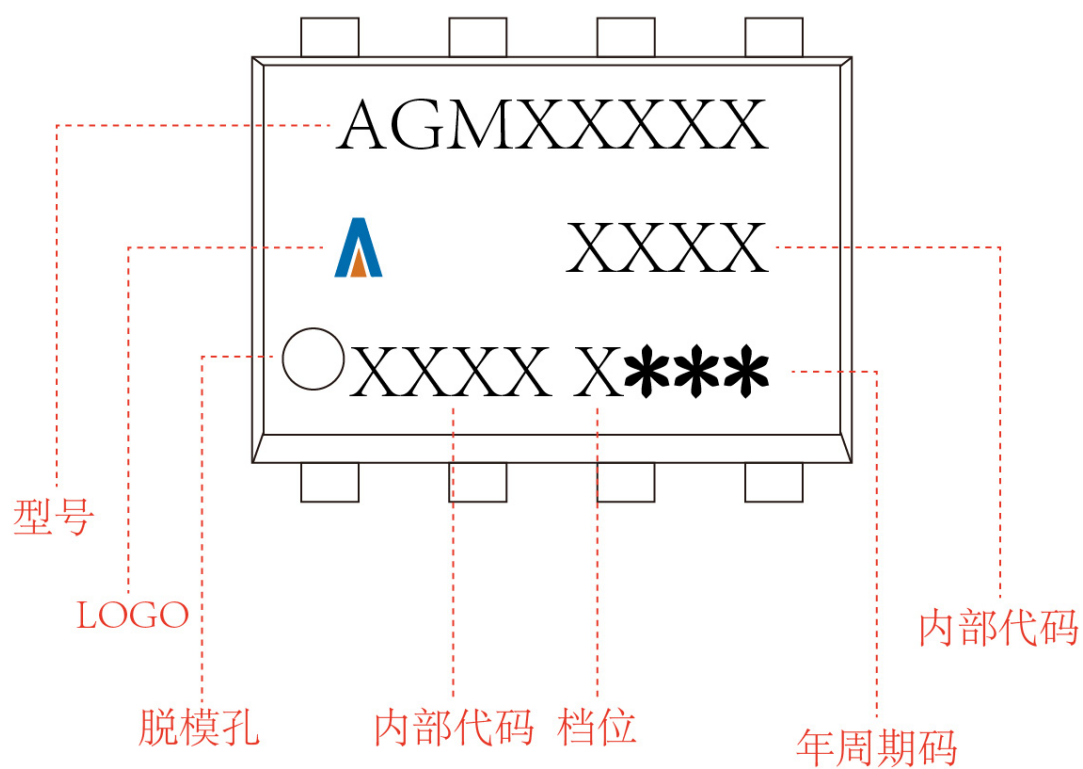
| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 1.35        | 1.75 |
| A1  | 0.02        | 0.15 |
| B   | 0.33        | 0.5  |
| C   | 0.1         | 0.25 |
| D   | 4.8         | 5    |
| E   | 3.8         | 4    |
| e   | 1.27 (BSC)  |      |
| H   | 5.8         | 6.2  |
| h   | 0.25        | 0.5  |
| I   | 0.4         | 1.25 |
| θ   | 0°          | 7°   |



| SYMBOL | MIN      | NOM   | MAX   |
|--------|----------|-------|-------|
| A      | 1.40     | 1.60  | 1.80  |
| A1     | 0.05     | 0.15  | 0.25  |
| A2     | 1.35     | 1.45  | 1.55  |
| b      | 0.30     | 0.40  | 0.50  |
| c      | 0.153    | 0.203 | 0.253 |
| D      | 4.80     | 4.90  | 5.00  |
| E      | 3.80     | 3.90  | 4.00  |
| E1     | 5.80     | 6.00  | 6.20  |
| L      | 0.45     | 0.70  | 1.00  |
| θ      | 2°       | 4°    | 6°    |
| L1     | 1.04 REF |       |       |
| e      | 1.27 BSC |       |       |
| R1     | 0.07 TYP |       |       |
| R2     | 0.07 TYP |       |       |

## SOP8

### Marking Instructions:



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