

## General Description

The AGM412MA 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

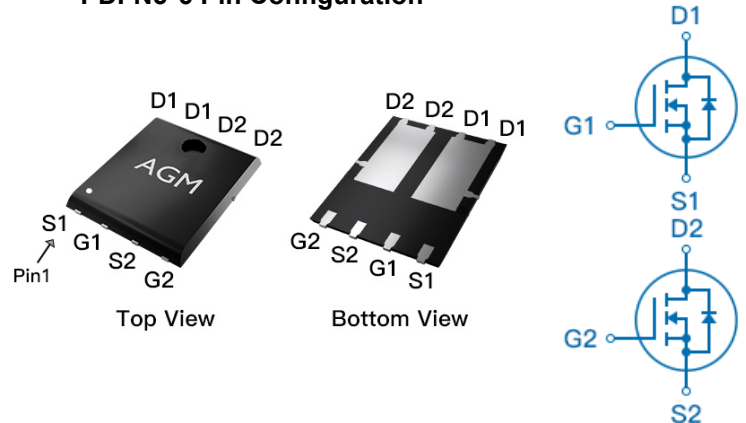
## Application

- Electronic Ballast
- Electronic Transformer
- Switch Mode Power Supply

## Product Summary

| BVDSS | $R_{DS(ON)}$ | ID  |
|-------|--------------|-----|
| 40V   | 10mΩ         | 30A |

## PDFN5\*6 Pin Configuration



## Package Marking and Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| AGM412MA       | AGM412MA | PDFN5*6        | 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(Tc=25°C) <b>(Note 1)</b> | 30         | A    |
|             | Drain Current-Continuous(Tc=100°C)                | 23         | A    |
| IDM (pluse) | Drain Current-Pulsed <b>(Note 2)</b>              | 120        | A    |
| PD          | Maximum Power Dissipation(Tc=25°C)                | 57         | w    |
|             | Maximum Power Dissipation(Tc=100°C)               | 23         | w    |
| EAS         | Avalanche energy <b>(Note 3)</b>                  | 56         | 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> | --- | 20  | °C/W |
| RθJC   | Thermal Resistance Junction-Case <sup>1</sup>                   | --- | 2.2 | °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                             | --  | --   | 1.0  | μA   |
| IGSS                               | Gate-Body Leakage Current        | VGS=±20V,VDS=0V                            | --  | --   | ±100 | nA   |
| VGS(th)                            | Gate Threshold Voltage           | VDS=VGS,ID=250μA                           | 1.2 | 1.7  | 2.2  | V    |
| gFS                                | Forward Transconductance         | VDS=5V,ID=10A                              | --  | 5.0  | --   | S    |
| RDS(on)                            | Drain-Source On-State Resistance | VGS=10V, ID=15A                            | --  | 10   | 16   | mΩ   |
|                                    |                                  | VGS=4.5V, ID=10A                           | --  | 18   | 25   | mΩ   |
| Dynamic Characteristics            |                                  |                                            |     |      |      |      |
| Ciss                               | Input Capacitance                | VDS=20V,VGS=0V<br>,F=1MHZ                  | --  | 475  | --   | pF   |
| Coss                               | Output Capacitance               |                                            | --  | 75   | --   | pF   |
| Crss                               | Reverse Transfer Capacitance     |                                            | --  | 45   | --   | pF   |
| Rg                                 | Gate resistance                  | VGS=0V,<br>VDS=0V,f=1.0MHz                 | --  | --   | --   | Ω    |
| Switching Times                    |                                  |                                            |     |      |      |      |
| td(on)                             | Turn-on Delay Time               | VDD=15V,<br>ID=10A,<br>RG=6.8Ω,<br>VGS=10V | --  | 6    | --   | nS   |
| tr                                 | Turn-on Rise Time                |                                            | --  | 12   | --   | nS   |
| td(off)                            | Turn-Off Delay Time              |                                            | --  | 18   | --   | nS   |
| tf                                 | Turn-Off Fall Time               |                                            | --  | 7    | --   | nS   |
| Qg                                 | Total Gate Charge                | VGS=10V,<br>VDS=15V,<br>ID=10A             | --  | 13   | --   | nC   |
| Qgs                                | Gate-Source Charge               |                                            | --  | 3.5  | --   | nC   |
| Qgd                                | Gate-Drain Charge                |                                            | --  | 2.5  | --   | nC   |
| Source-Drain Diode Characteristics |                                  |                                            |     |      |      |      |
| ISD                                | Source-Drain Current(Body Diode) |                                            | --  | --   | 30   | A    |
| VSD                                | Forward on Voltage               | VGS=0V,ISD=15A                             | --  | 0.86 | 1.2  | V    |
| trr                                | Reverse Recovery Time            | ISD=15A,VGS=0V                             | --  | 19   | --   | ns   |
| Qrr                                | Reverse Recovery Charge          | dI/dt=100A/μs , TJ=25℃                     | --  | 26   | --   | 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,ID=15A,L=0.5mH,R<sub>G</sub>=25ohm

Fig.1 Power Dissipation

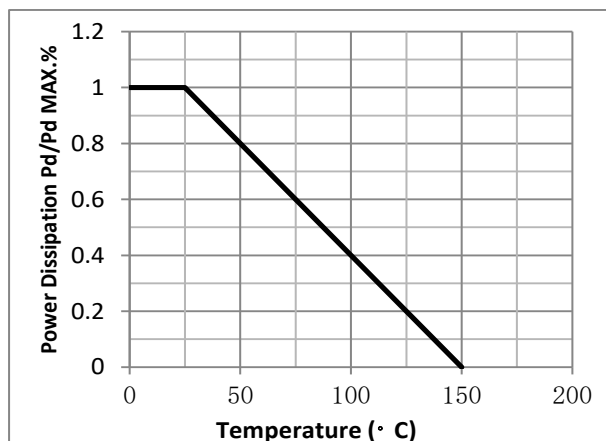


Fig.2 Typical output Characteristics

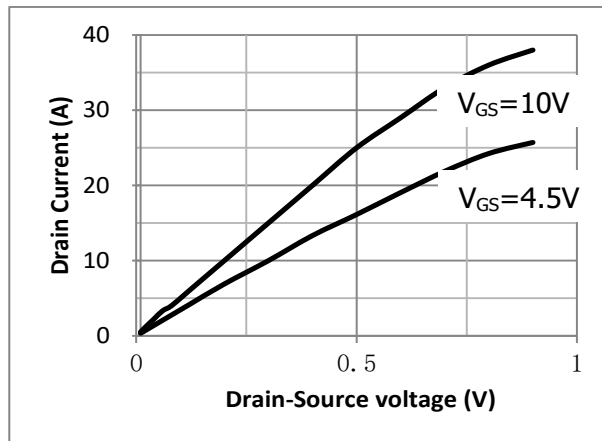


Fig.3 Threshold Voltage V.S Junction Temperature

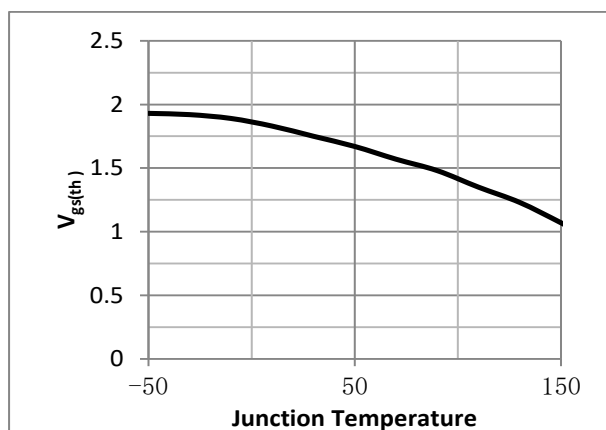


Fig.4 Resistance V.S Drain Current

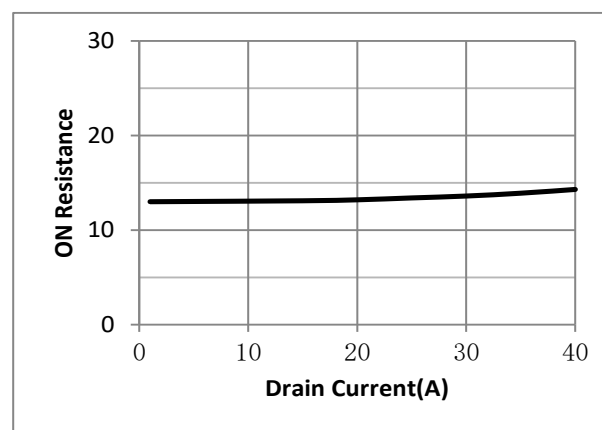


Fig.5 On-Resistance VS Gate Source Voltage

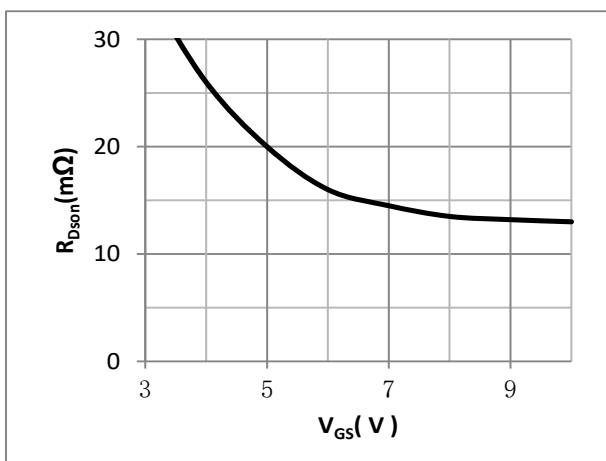


Fig.6 On-Resistance V.S Junction Temperature

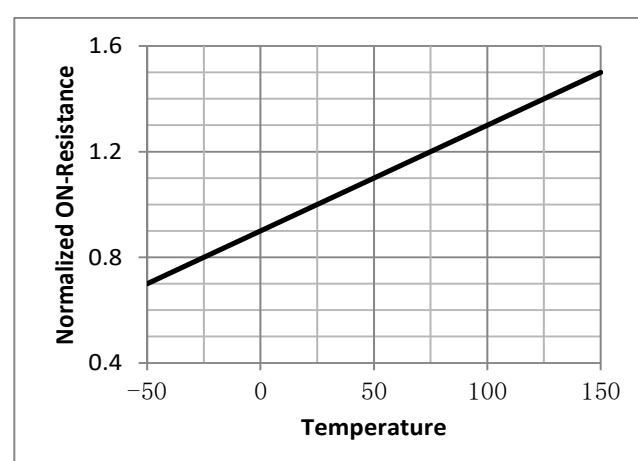


Fig.7 Switching Time Measurement Circuit

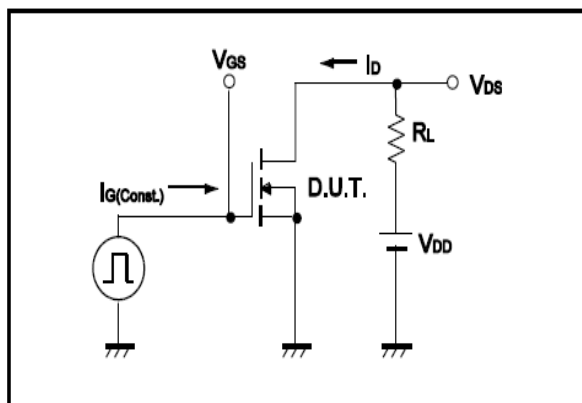


Fig.8 Gate Charge Waveform

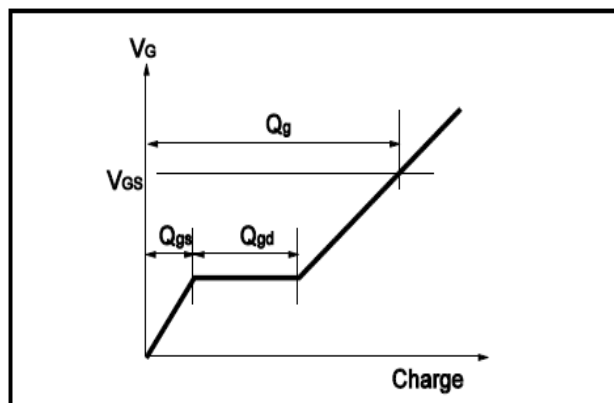


Fig.9 Switching Time Measurement Circuit

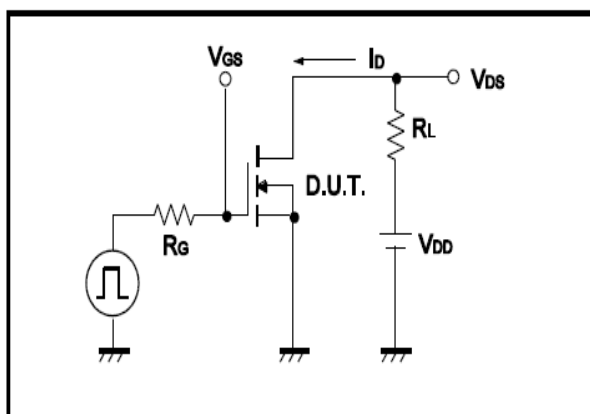


Fig.10 Gate Charge Waveform

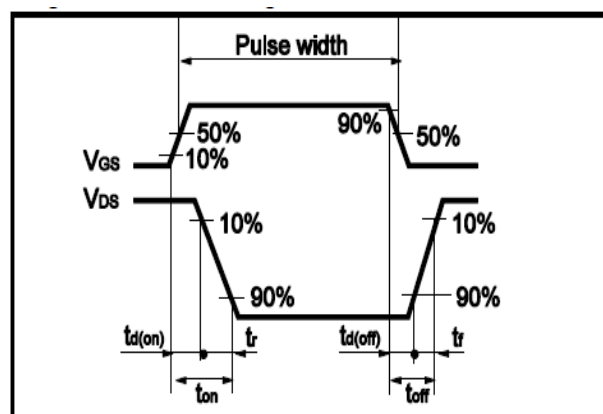


Fig.11 Avalanche Measurement Circuit

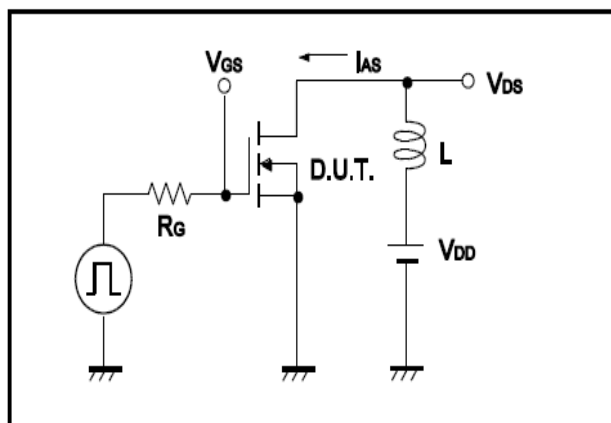
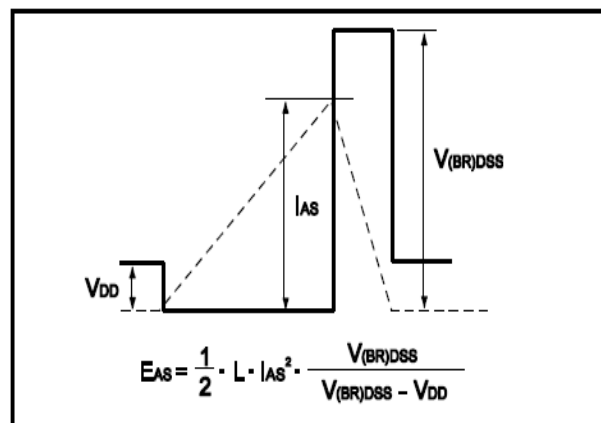
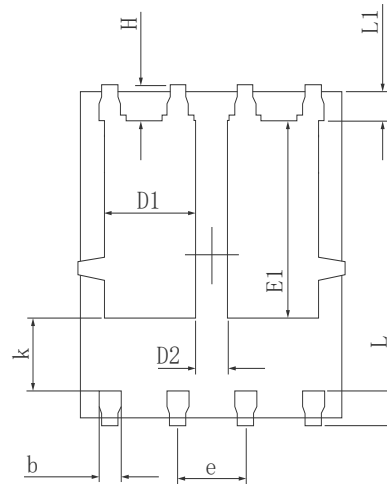
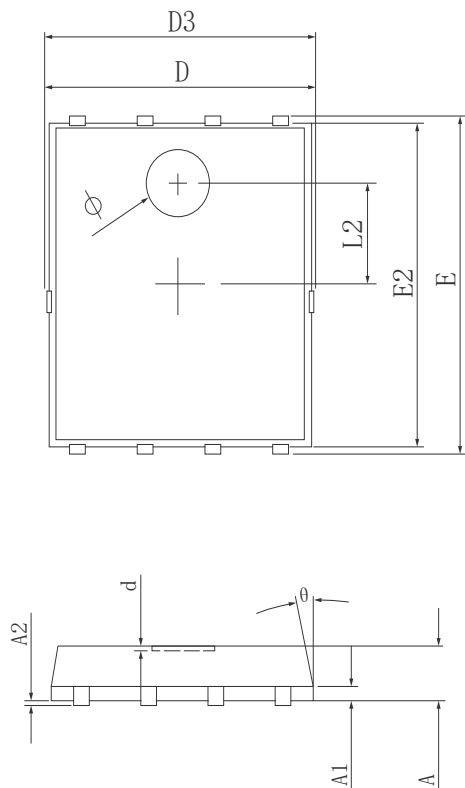


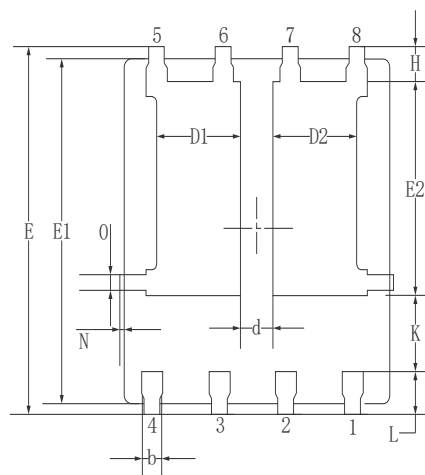
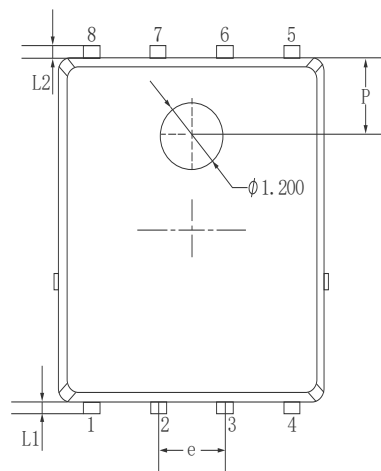
Fig.12 Avalanche Waveform



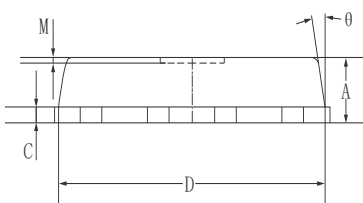
# Dimensions (PDFN5\*6)



| SYMBOL | MILLIMETER |       |       |
|--------|------------|-------|-------|
|        | MIN        | Typ.  | MAX   |
| A      | 0.900      | 1.000 | 1.100 |
| A1     | 0.254 REF. |       |       |
| A2     | 0°0.05     |       |       |
| D      | 4.824      | 4.900 | 4.976 |
| D1     | 1.605      | 1.705 | 1.805 |
| D2     | 0.500      | 0.600 | 0.700 |
| D3     | 4.924      | 5.000 | 5.076 |
| E      | 5.924      | 6.000 | 6.076 |
| E1     | 3.375      | 3.475 | 3.575 |
| E2     | 5.674      | 5.750 | 5.826 |
| b      | 0.350      | 0.400 | 0.450 |
| e      | 1.270 TYP. |       |       |
| L      | 0.534      | 0.610 | 0.686 |
| L1     | 0.424      | 0.500 | 0.576 |
| L2     | 1.800 REF. |       |       |
| k      | 1.190      | 1.290 | 1.390 |
| H      | 0.549      | 0.625 | 0.701 |
| θ      | 8°         | 10°   | 12°   |
| φ      | 1.100      | 1.200 | 1.300 |
| d      |            |       | 0.100 |



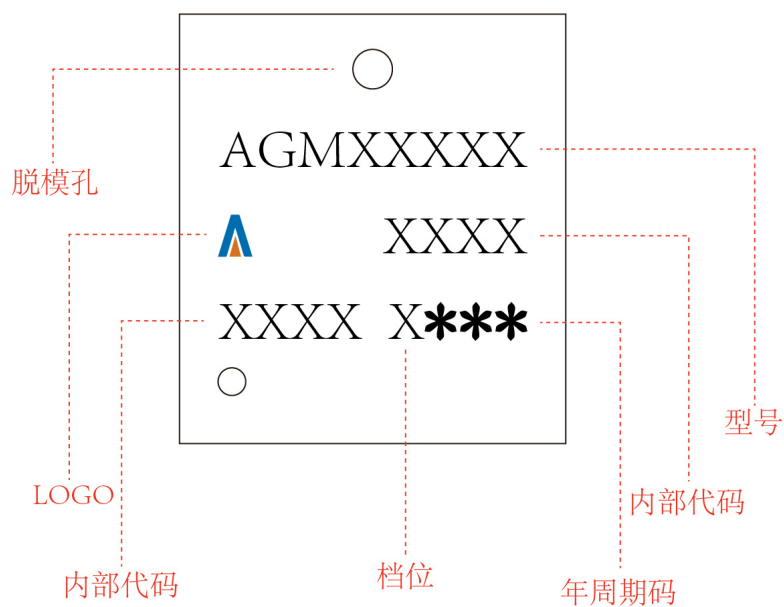
| Symbol | Millimeters |      |      |
|--------|-------------|------|------|
|        | MIN.        | NOM. | MAX. |
| A      | 0.90        | 1.05 | 1.20 |
| b      | 0.35        | 0.40 | 0.50 |
| C      | 0.20        | 0.25 | 0.35 |
| D      | 4.90        | 5.05 | 5.20 |
| D1/D2  | 1.51        | 1.61 | 1.71 |
| d      | 0.50        | 0.60 | 0.70 |
| E      | 6.00        | 6.15 | 6.30 |
| E1     | 5.60        | 5.75 | 5.90 |
| E2     | 3.47        | 3.57 | 3.67 |
| e      | 1.27 BSC.   |      |      |
| H      | 0.48        | 0.58 | 0.68 |
| K      | 1.17        | 1.27 | 1.37 |
| L      | 0.64        | 0.74 | 0.84 |
| L1/L2  | 0.20 REF.   |      |      |
| θ      | 8°          | 10°  | 12°  |
| M      | 0.08 REF.   |      |      |
| N      | 0           | -    | 0.15 |
| O      | 0.25 REF.   |      |      |
| P      | 1.28 REF.   |      |      |



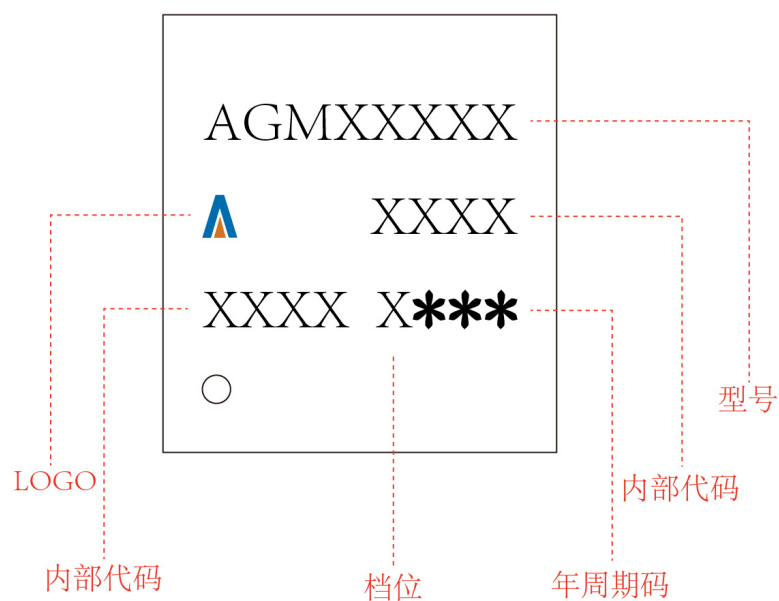
PDFN5\*6

Marking Instructions:

Model1:



Model2:



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