

General Description

The AGM412MPA 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

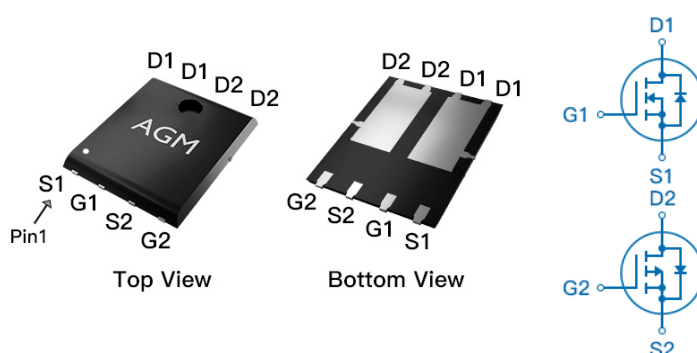
Application

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

Product Summary

| BVDSS | RDSON | ID |
|-------|-------|------|
| 40V | 10mΩ | 40A |
| -40V | 12mΩ | -45A |

PDFN5*6 Pin Configuration



Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| AGM412MPA | AGM412MPA | PDFN5*6 | 330mm | 12mm | 3000 |

Table 1. Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$)

| Symbol | Parameter | Rating | | Units |
|----------------|---|------------|------------|--------------------|
| | | N-Ch | P-Ch | |
| V_{DS} | Drain-Source Voltage ($V_{GS}=0V$) | 40 | -40 | V |
| V_{GS} | Gate-Source Voltage ($V_{DS}=0V$) | ± 20 | ± 20 | V |
| I_D | Drain Current-Continuous($T_C=25^{\circ}\text{C}$) (Note 1) | 40 | -45 | A |
| | Drain Current-Continuous($T_C=100^{\circ}\text{C}$) | 35 | -37 | A |
| IDM (pluse) | Drain Current-Pulsed (Note 2) | 160 | -180 | A |
| P_D | Total Power Dissipation($T_C=25^{\circ}\text{C}$) | 25 | 25 | W |
| | Total Power Dissipation($T_C=100^{\circ}\text{C}$) | 10 | 10 | W |
| EAS | Avalanche energy (Note 3) | 72 | 196 | mJ |
| T_J, T_{STG} | Operating Junction and Storage Temperature Range | -55 To 150 | -55 To 150 | $^{\circ}\text{C}$ |

Table 2. Thermal Characteristic

| Symbol | Parameter | Typ | Max | Unit |
|-----------------|---|-----|-----|----------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State) ¹ | --- | 20 | $^{\circ}\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | --- | 5.0 | $^{\circ}\text{C/W}$ |

Table 3. N- Channel Electrical Characteristics (T_J=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 | -- | 2.2 | V |
| gFS | Forward Transconductance | VDS=5V,ID=10A | -- | 9 | -- | S |
| RDS(on) | Drain-Source On-State Resistance | VGS=10V, ID=20A | -- | 10 | 14 | mΩ |
| | | VGS=4.5V, ID=10A | -- | 13 | 18 | mΩ |
| Dynamic Characteristics | | | | | | |
| Ciss | Input Capacitance | VDS=20V, VGS=0V, F=1MHZ | -- | 1152 | -- | pF |
| Coss | Output Capacitance | | -- | 85 | -- | pF |
| Crss | Reverse Transfer Capacitance | | -- | 73 | -- | pF |
| Rg | Gate resistance | VGS=0V, VDS=0V,f=1.0MHz | -- | 2.7 | -- | Ω |
| Switching Times | | | | | | |
| td(on) | Turn-on Delay Time | VGS=10V,VDS=25V, RL=0.75Ω,RGEN=6Ω | -- | 6.0 | -- | 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, VDS=25V, ID=5A | -- | 17 | -- | nC |
| Qgs | Gate-Source Charge | | -- | 8 | -- | nC |
| Qgd | Gate-Drain Charge | | -- | 10 | -- | nC |
| Source-Drain Diode Characteristics | | | | | | |
| ISD | Source-Drain Current(Body Diode) | | -- | -- | 40 | A |
| VSD | Forward on Voltage | VGS=0V,IS=5A | -- | -- | 1.2 | V |
| trr | Reverse Recovery Time | IF=5A , dl/dt=100A/μs , TJ=25℃ | -- | -- | -- | ns |
| Qrr | Reverse Recovery Charge | | -- | -- | -- | 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_J=25°C, V_{DD}=25V, V_{gs}=10V, I_D=17A, L=0.5mH, R_G=25ohm

Table 3. P-Channel Electrical Characteristics (TJ=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 | -- | -2.2 | V |
| gFS | Forward Transconductance | VDS=-5V,ID=-5A | -- | 18 | -- | S |
| RDS(on) | Drain-Source On-State Resistance | VGS=-10V, ID=-15A | -- | 12 | 16 | mΩ |
| | | VGS=-4.5V, ID=-10A | -- | 17 | 22 | mΩ |
| Dynamic Characteristics | | | | | | |
| Ciss | Input Capacitance | VDS=-20V,VGS=0V, F=1MHZ | -- | 2385 | -- | pF |
| Coss | Output Capacitance | | -- | 185 | -- | pF |
| Crss | Reverse Transfer Capacitance | | -- | 162 | -- | pF |
| Rg | Gate resistance | VGS=0V, VDS=0V,f=1.0MHz | -- | 5.9 | -- | Ω |
| Switching Times | | | | | | |
| td(on) | Turn-on Delay Time | VGS=-10V,VDS=-15V, ID=-15A,RGEN=3.3Ω | -- | 18 | -- | nS |
| tr | Turn-on Rise Time | | -- | 31 | -- | nS |
| td(off) | Turn-Off Delay Time | | -- | 70 | -- | nS |
| tf | Turn-Off Fall Time | | -- | 40 | -- | nS |
| Qg | Total Gate Charge | VGS=-4.5V, VDS=-15V, ID=-10A | -- | 30 | -- | nC |
| Qgs | Gate-Source Charge | | -- | 9.0 | -- | nC |
| Qgd | Gate-Drain Charge | | -- | 15 | -- | nC |
| Source-Drain Diode Characteristics | | | | | | |
| ISD | Source-Drain Current(Body Diode) | | -- | -- | -45 | A |
| VSD | Forward on Voltage | VGS=0V,IS=-15A | -- | -- | -1.28 | V |
| trr | Reverse Recovery Time | IF=-15A , dI/dt=100A/μs , TJ=25℃ | -- | -- | -- | ns |
| Qrr | Reverse Recovery Charge | | -- | -- | -- | 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=-28A, L=0.5mH, RG=25ohm

Fig.1 Power Dissipation

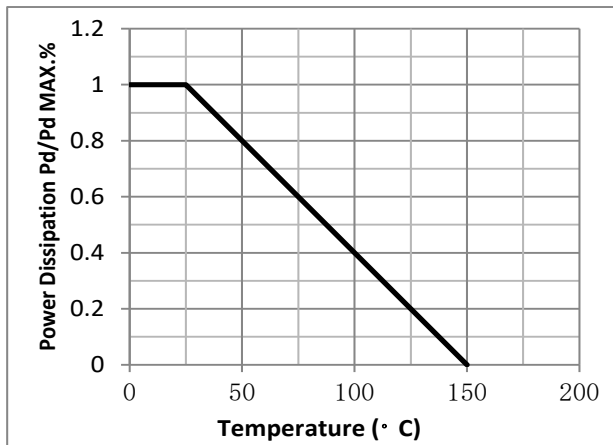


Fig.2 Typical output Characteristics

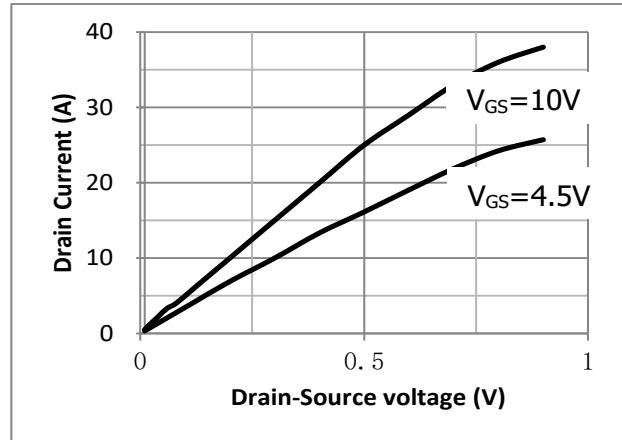


Fig.3 Threshold Voltage V.S Junction Temperature

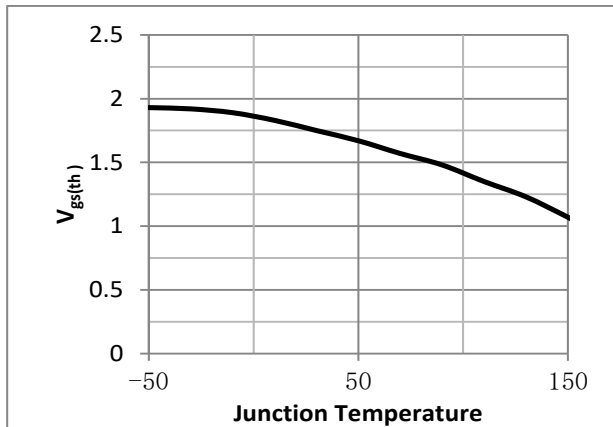


Fig.4 Resistance V.S Drain Current

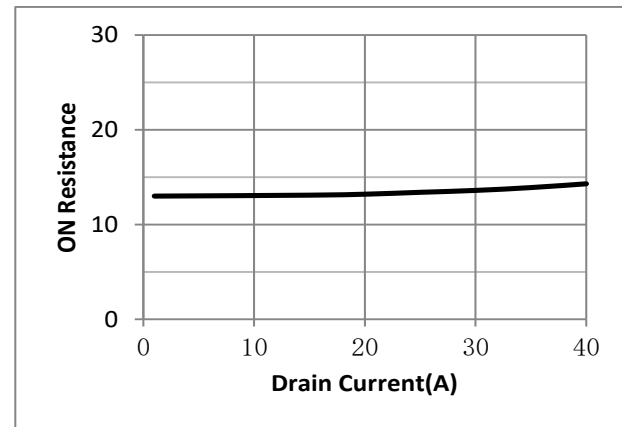


Fig.5 On-Resistance VS Gate Source Voltage

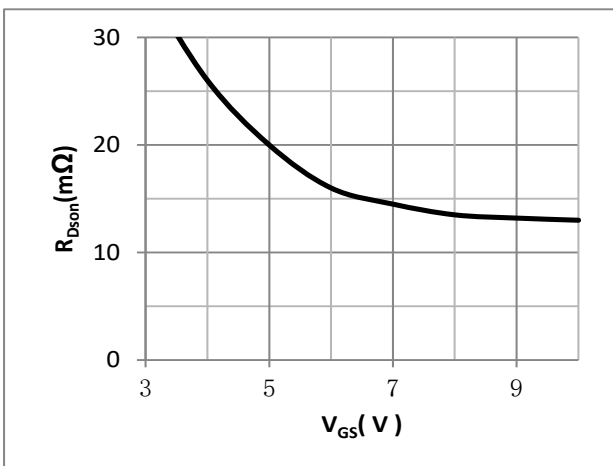


Fig.6 On-Resistance V.S Junction Temperature

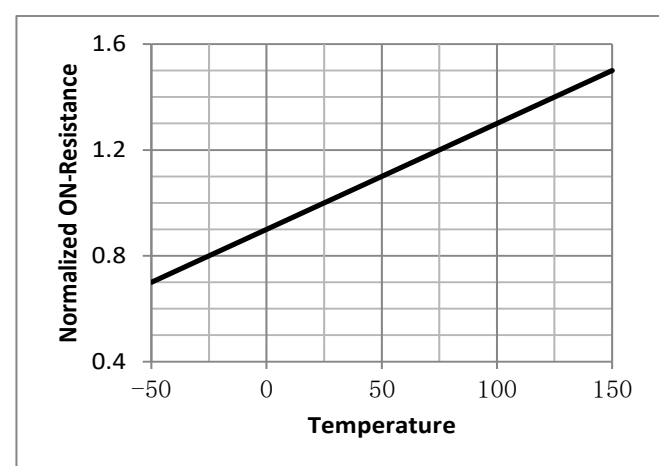


Fig.7 Switching Time Measurement Circuit

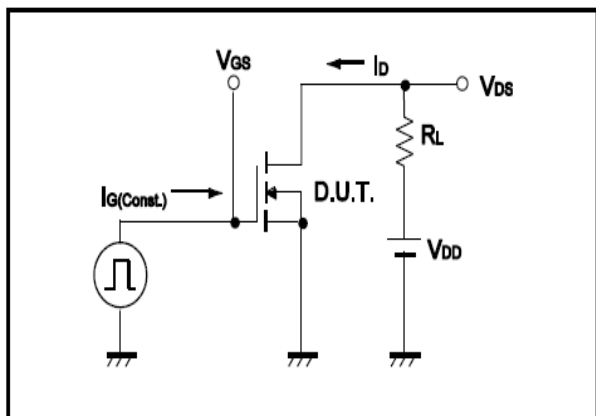


Fig.8 Gate Charge Waveform

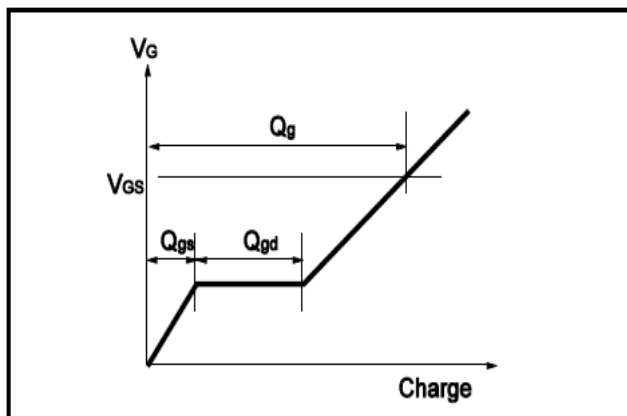


Fig.9 Switching Time Measurement Circuit

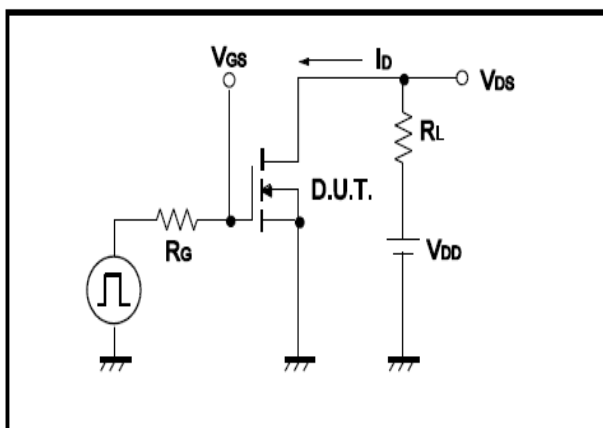


Fig.10 Gate Charge Waveform

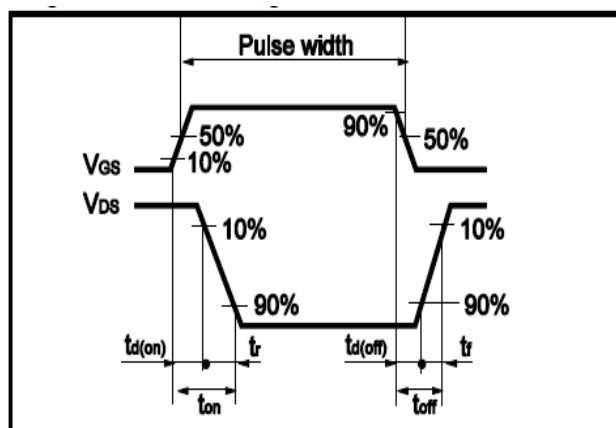


Fig.11 Avalanche Measurement Circuit

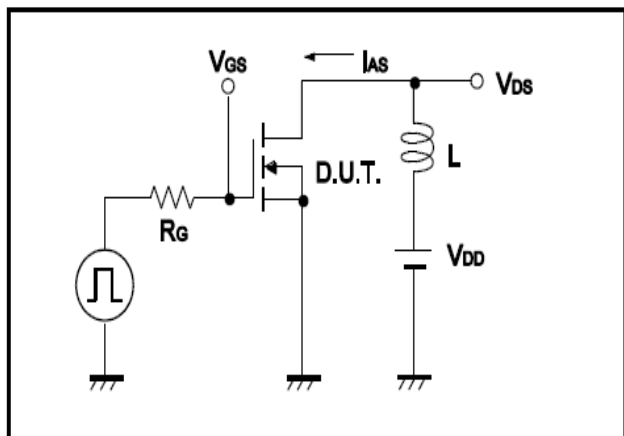


Fig.12 Avalanche Waveform

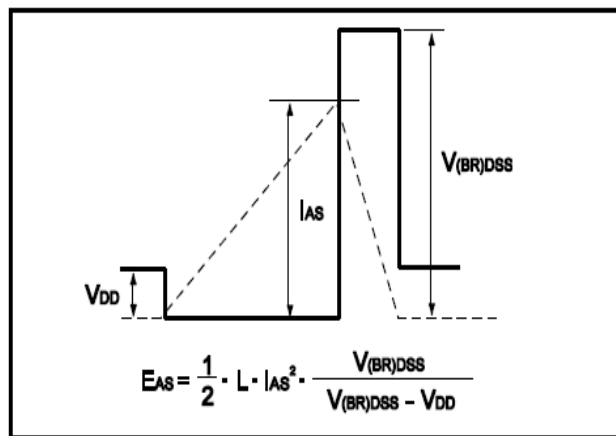


Fig.1 Gate-Charge Characteristics

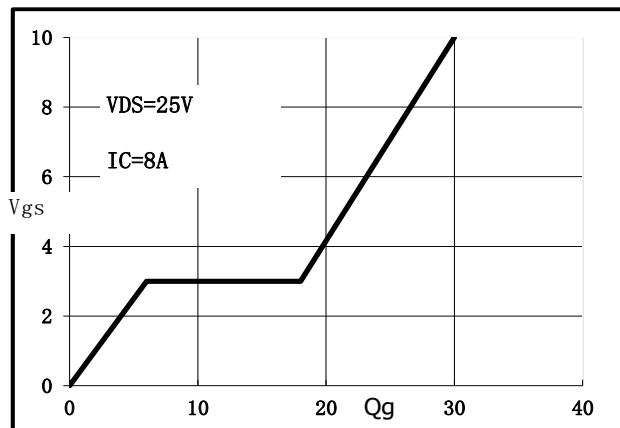


Fig.2 Capacitance Characteristics

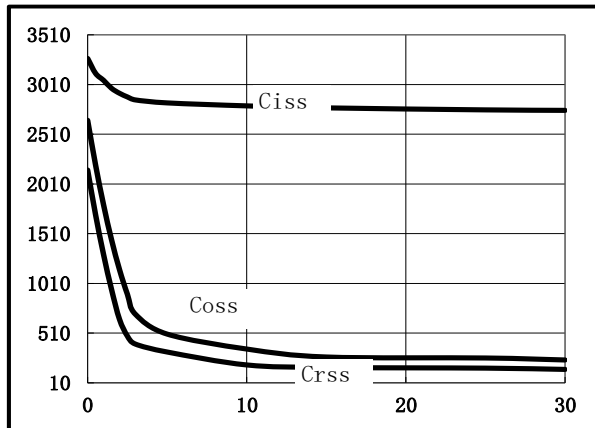


Fig.3 Power Dissipation Derating Curve

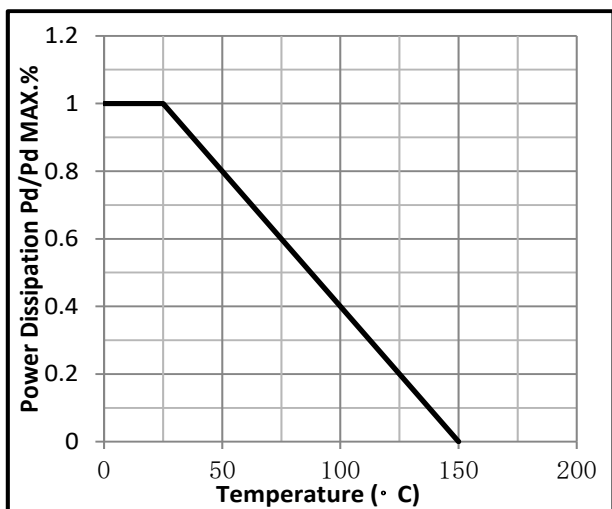


Fig.4 Typical output Characteristics

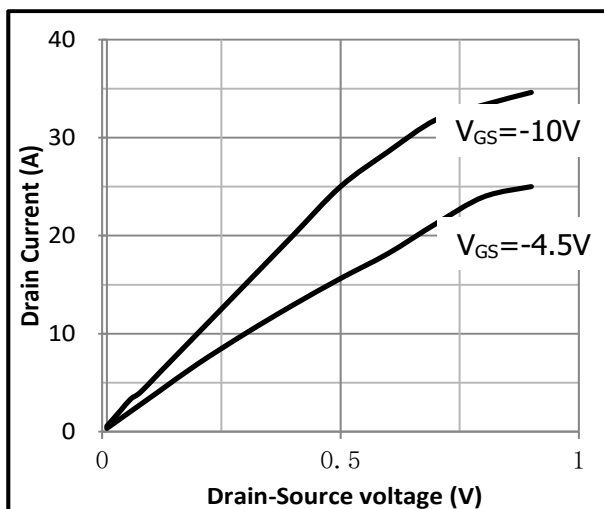


Fig.5 Threshold Voltage V.S Junction Temperature

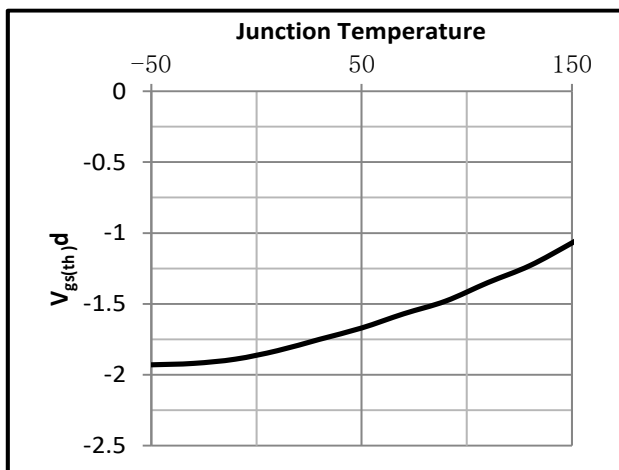


Fig.6 Resistance V.S Drain Current

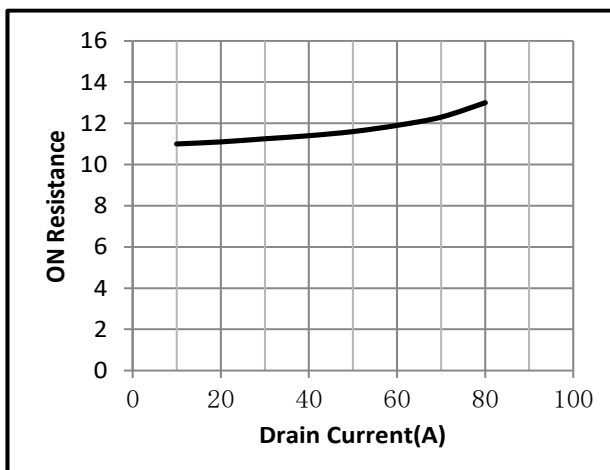


Fig.7 On-Resistance VS Gate Source Voltage

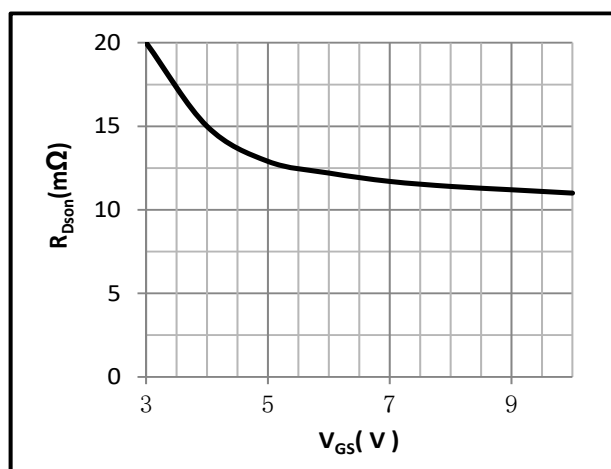


Fig.8 On-Resistance V.S Junction Temperature

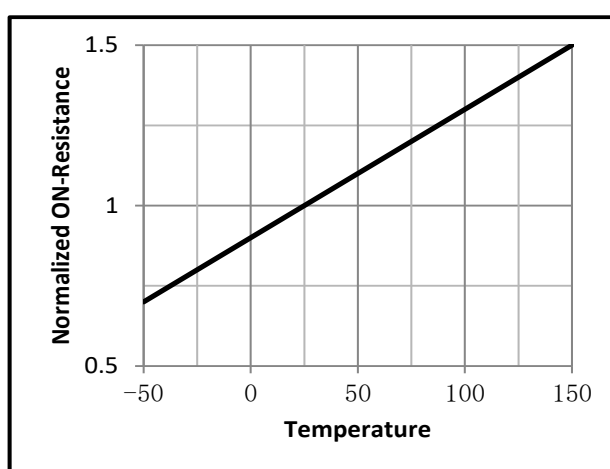


Fig.9 Switching Time Measurement Circuit

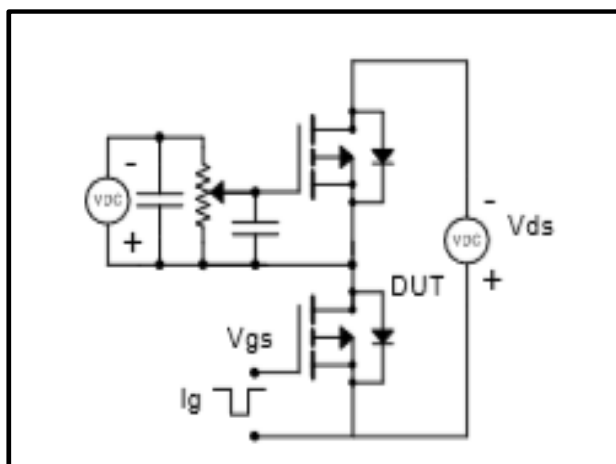


Fig.10 Gate Charge Waveform

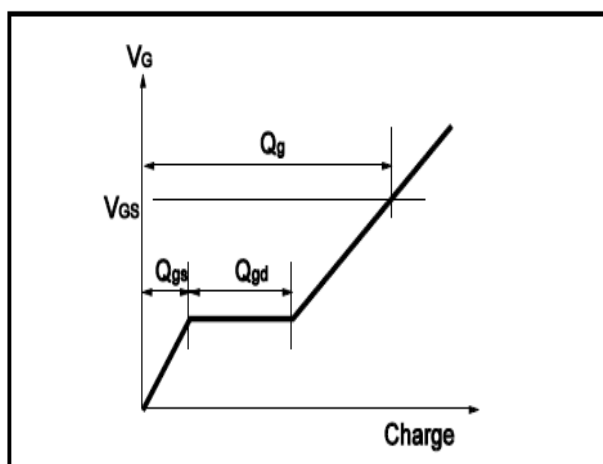


Fig.11 Switching Time Measurement Circuit

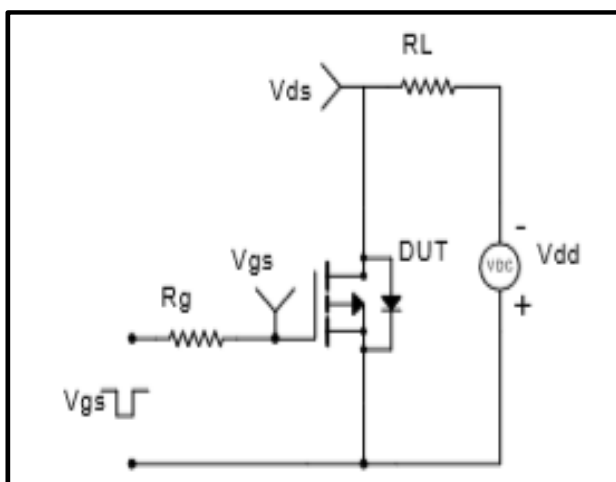
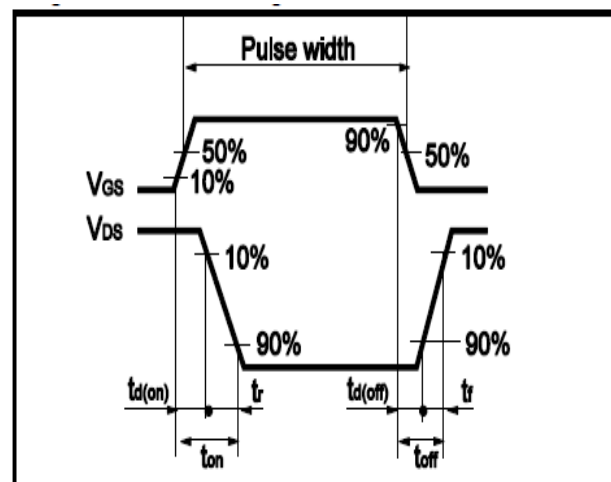
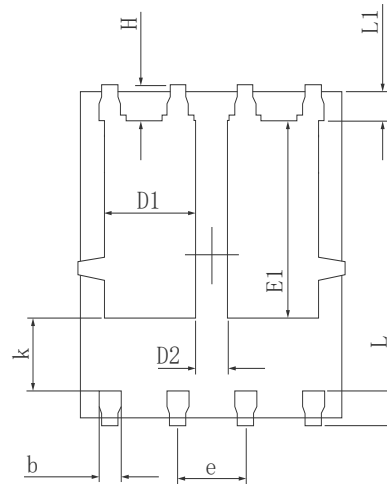
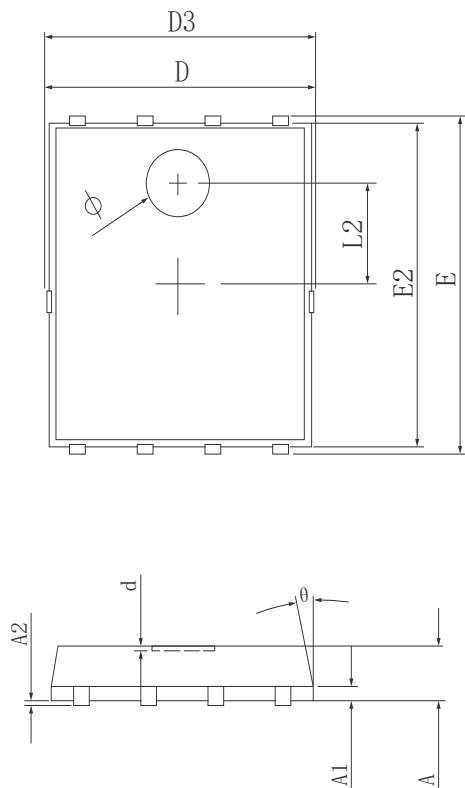


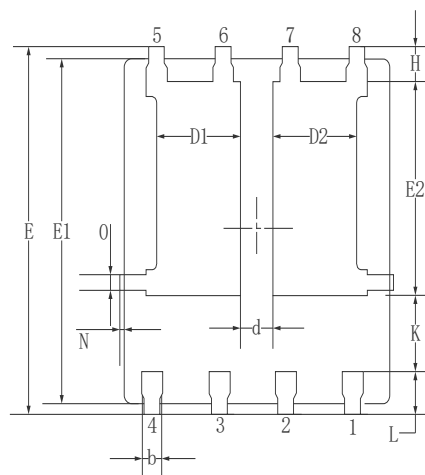
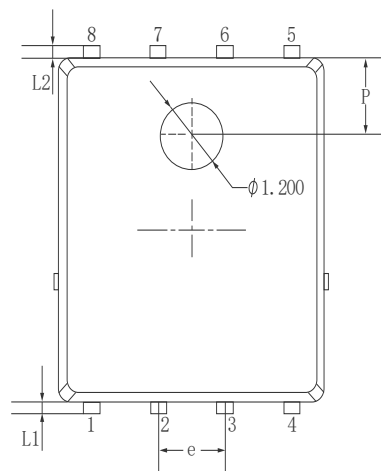
Fig.12 Gate Charge Waveform



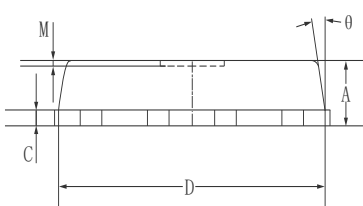
Dimensions (PDFN5*6)



| 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 |



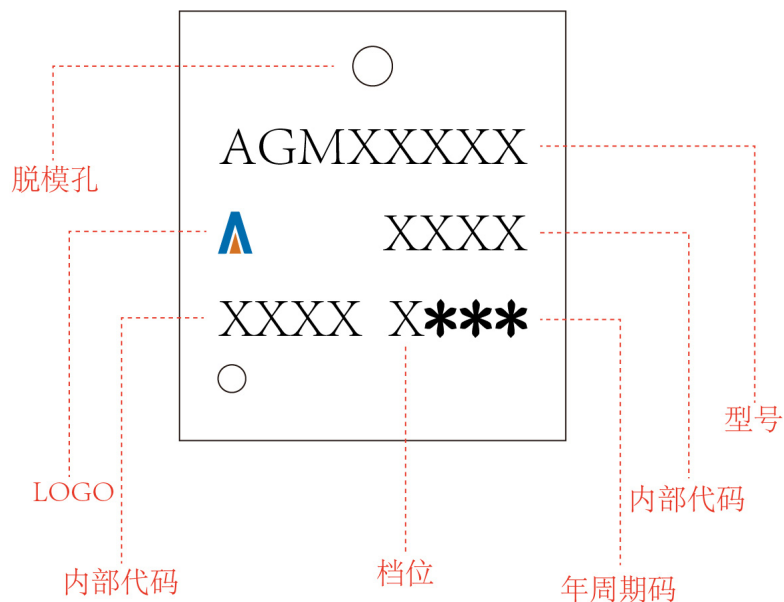
| Symbol | Millimeters | | |
|--------|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 0.90 | 1.05 | 1.20 |
| b | 0.35 | 0.40 | 0.50 |
| C | 0.20 | 0.25 | 0.35 |
| D | 4.90 | 5.05 | 5.20 |
| D1/D2 | 1.51 | 1.61 | 1.71 |
| d | 0.50 | 0.60 | 0.70 |
| E | 6.00 | 6.15 | 6.30 |
| E1 | 5.60 | 5.75 | 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. | | |



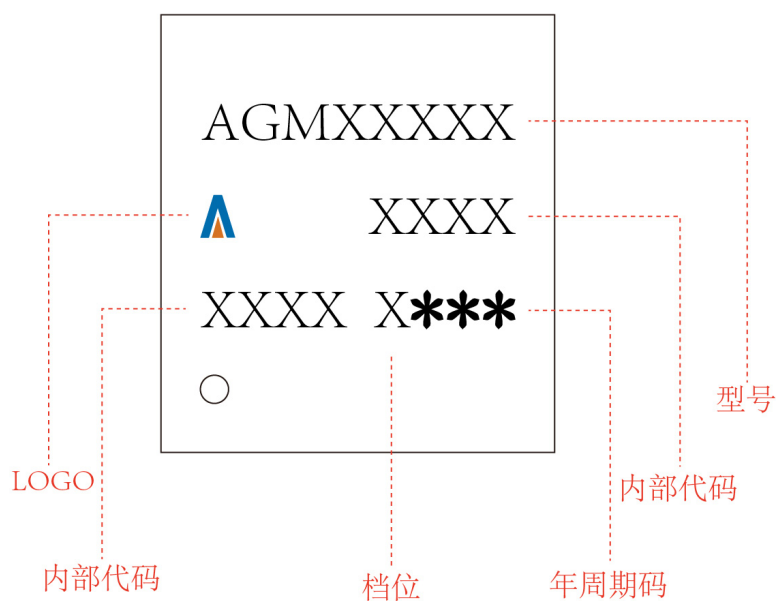
PDFN5*6

Marking Instructions:

Model1:



Model2:




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