

## General Description

The AGM409D 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

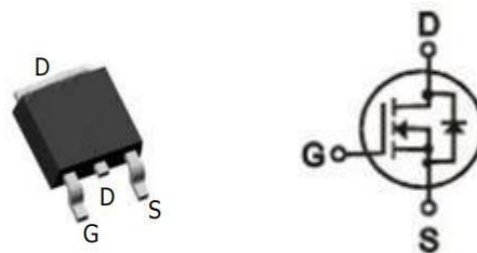
## Application

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

## Product Summary

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 40V   | 6.5mΩ | 63A |

## TO-252 Pin Configuration



## Package Marking and Ordering Information

| Device Marking | Device  | Device Package | Reel Size | Tape width | Quantity |
|----------------|---------|----------------|-----------|------------|----------|
| AGM409D        | AGM409D | TO-252         | ----      | ----       | 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)        | 63         | A    |
|             | Drain Current-Continuous(Tc=100°C)                | 41         | A    |
| IDM (pluse) | Drain Current-Continuous@ Current-Pulsed (Note 2) | 190        | A    |
| PD          | Maximum Power Dissipation(Tc=25°C)                | 54         | w    |
|             | Maximum Power Dissipation(Tc=100°C)               | 21         | w    |
| EAS         | Avalanche energy (Note 3)                         | 141        | 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> | --- | 40  | °C/W |
| RθJC   | Thermal Resistance Junction-Case <sup>1</sup>                   | --- | 2.3 | °C/W |

**Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)**

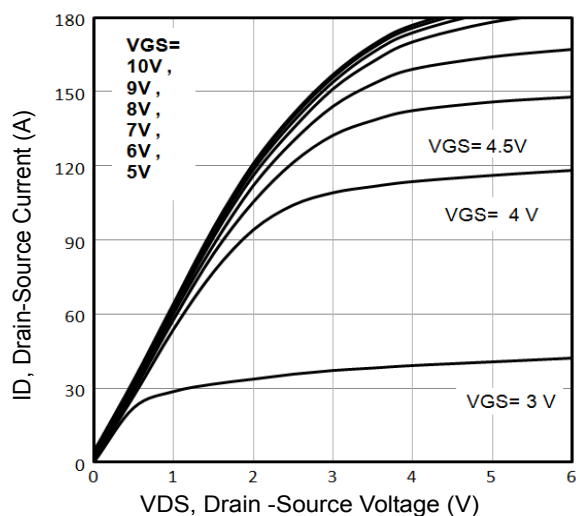
| Symbol                             | Parameter                        | Conditions                           | Min | Typ  | Max  | Unit |
|------------------------------------|----------------------------------|--------------------------------------|-----|------|------|------|
| On/Off States                      |                                  |                                      |     |      |      |      |
| 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                     | 1.0 | 1.5  | 2.5  | V    |
| gFS                                | Forward Transconductance         | VDS=5V,ID=12A                        | --  | --   | --   | S    |
| RDS(on)                            | Drain-Source On-State Resistance | VGS=10V, ID=25A                      | --  | 6.5  | 8.9  | mΩ   |
|                                    |                                  | VGS=4.5V, ID=15A                     | --  | 8.5  | 12   | mΩ   |
| Dynamic Characteristics            |                                  |                                      |     |      |      |      |
| Ciss                               | Input Capacitance                | VDS=30V,VGS=0V,<br>F=1MHZ            | --  | 1490 | --   | pF   |
| Coss                               | Output Capacitance               |                                      | --  | 170  | --   | pF   |
| Crss                               | Reverse Transfer Capacitance     |                                      | --  | 125  | --   | pF   |
| Rg                                 | Gate resistance                  | VGS=0V,<br>VDS=0V,f=1.0MHz           | --  | 2.3  | --   | Ω    |
| Switching Times                    |                                  |                                      |     |      |      |      |
| td(on)                             | Turn-on Delay Time               | VGS=10V,VDS=20V,<br>ID=10A,RGEN=3.5Ω | --  | 8    | --   | nS   |
| tr                                 | Turn-on Rise Time                |                                      | --  | 21   | --   | nS   |
| td(off)                            | Turn-Off Delay Time              |                                      | --  | 34   | --   | nS   |
| tf                                 | Turn-Off Fall Time               |                                      | --  | 19   | --   | nS   |
| Qg                                 | Total Gate Charge                | VGS=10V, VDS=20V,<br>ID=20A          | --  | 28.5 | --   | nC   |
| Qgs                                | Gate-Source Charge               |                                      | --  | 5.8  | --   | nC   |
| Qgd                                | Gate-Drain Charge                |                                      | --  | 7.3  | --   | nC   |
| Source-Drain Diode Characteristics |                                  |                                      |     |      |      |      |
| ISD                                | Source-Drain Current(Body Diode) |                                      | --  | --   | 63   | A    |
| VSD                                | Forward on Voltage               | VGS=0V,IS=25A                        | --  | 0.86 | 1.2  | V    |
| trr                                | Reverse Recovery Time            | IF=20A , dI/dt=100A/μs ,<br>TJ=25℃   | --  | 38   | --   | ns   |
| Qrr                                | Reverse Recovery Charge          |                                      | --  | 26   | --   | nc   |

Notes 1.The maximum current rating is package limited.

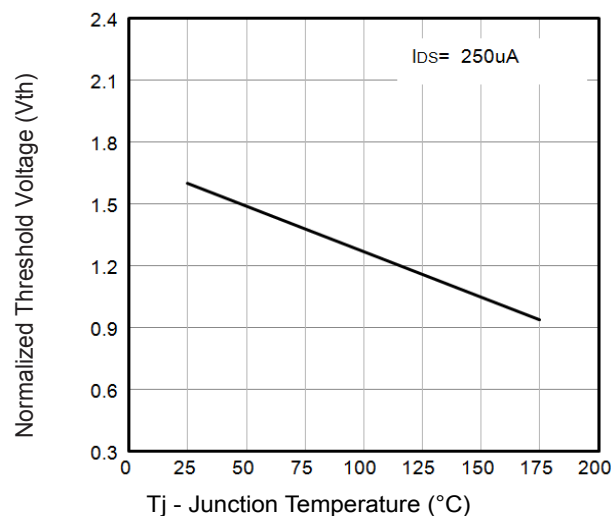
Notes 2.Repetitive Rating: Pulse width limited by maximum junction temperature

Notes 3.EAS condition: TJ=25°C

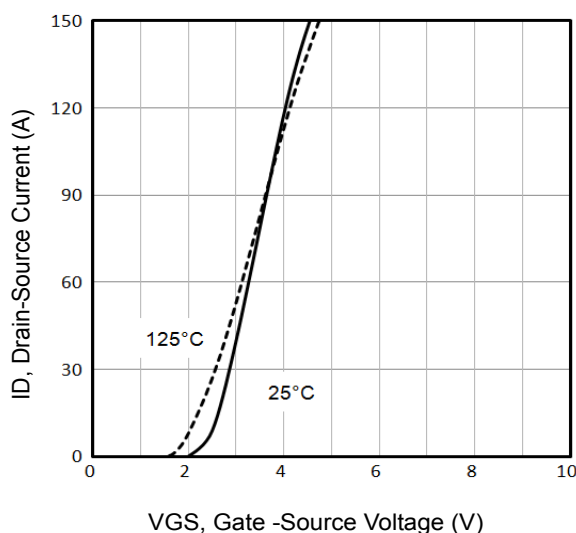
## Typical Characteristics



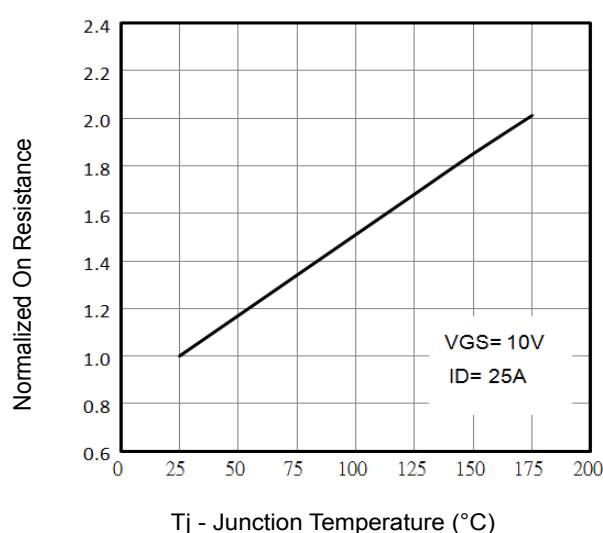
**Fig1.** Typical Output Characteristics



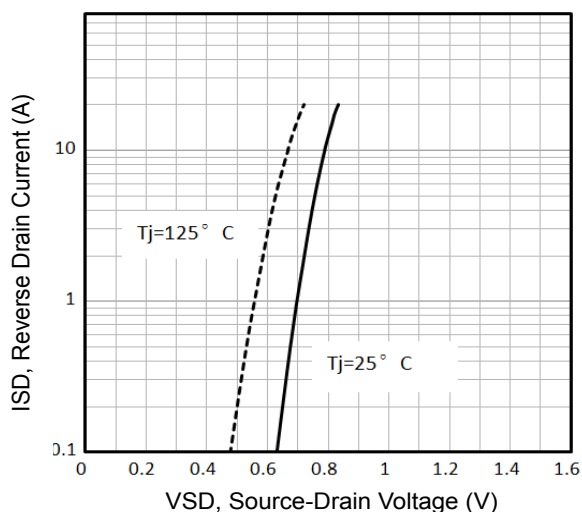
**Fig2.**  $V_{GS(TH)}$  Gate-Source Voltage Vs.  $T_j$



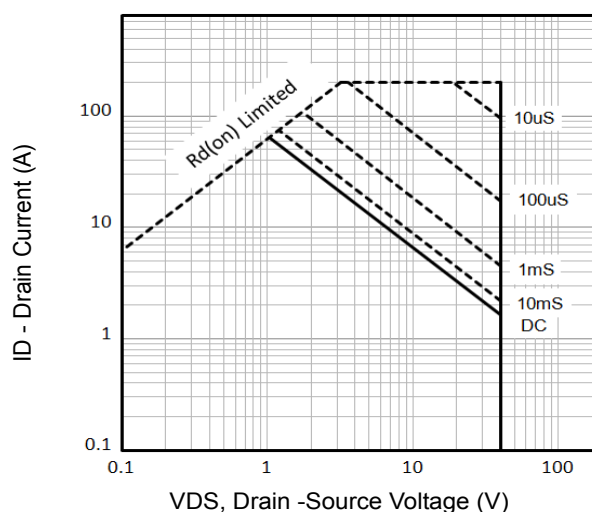
**Fig3.** Typical Transfer Characteristics



**Fig4.** Normalized On-Resistance Vs.  $T_j$

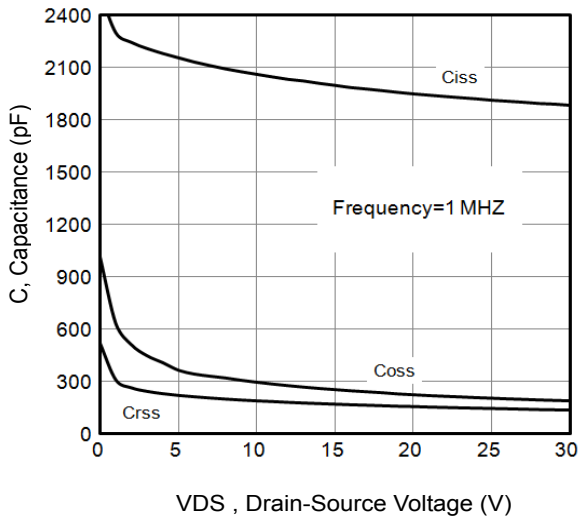


**Fig5.** Typical Source-Drain Diode Forward Voltage

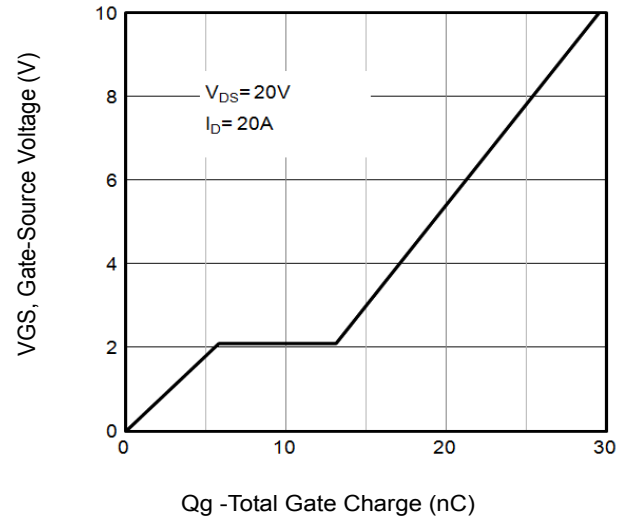


**Fig6.** Maximum Safe Operating Area

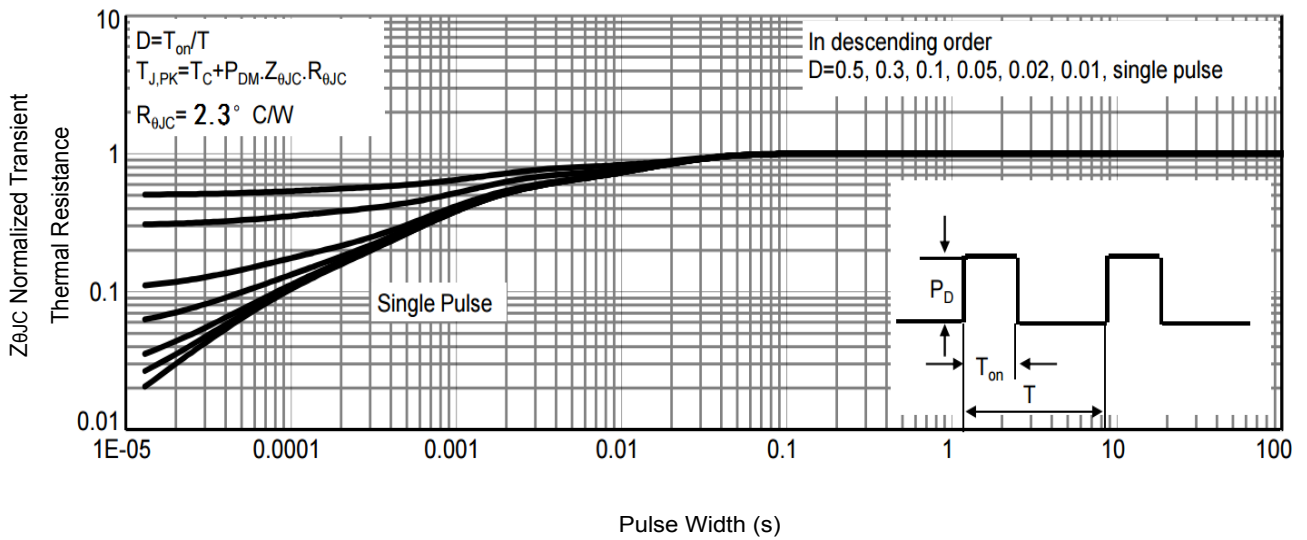
## Typical Characteristics



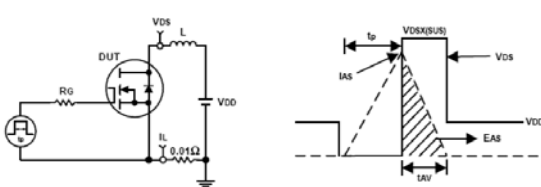
**Fig7.** Typical Capacitance Vs. Drain-Source Voltage



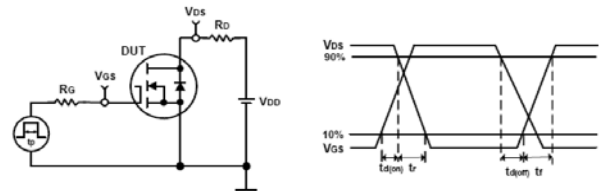
**Fig8.** Typical Gate Charge Vs. Gate-Source Voltage



**Fig9 .** Normalized Maximum Transient Thermal Impedance



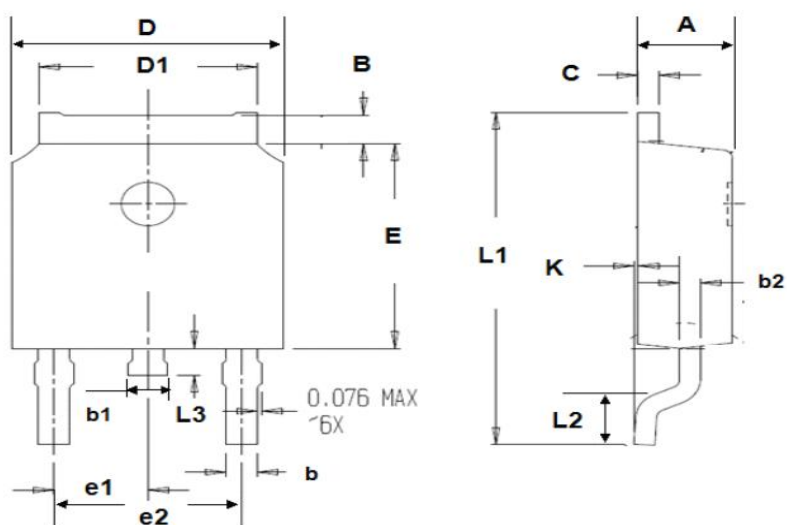
**Fig10.** Unclamped Inductive Test Circuit and waveforms



**Fig11.** Switching Time Test Circuit and waveforms

## • Dimensions

| SYMBOL | min  | max   | SYMBOL | min  | max  |
|--------|------|-------|--------|------|------|
| A      | 2.10 | 2.50  | B      | 0.85 | 1.25 |
| b      | 0.50 | 0.80  | b1     | 0.50 | 0.90 |
| b2     | 0.45 | 0.70  | C      | 0.45 | 0.70 |
| D      | 6.30 | 6.75  | D1     | 5.10 | 5.50 |
| E      | 5.30 | 6.30  | e1     | 2.25 | 2.35 |
| L1     | 9.20 | 10.60 | e2     | 4.45 | 4.75 |
| L2     | 0.90 | 1.75  | L3     | 0.60 | 1.10 |
| K      | 0.00 | 0.23  |        |      |      |



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