

**• General Description**

The AGM402D 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**

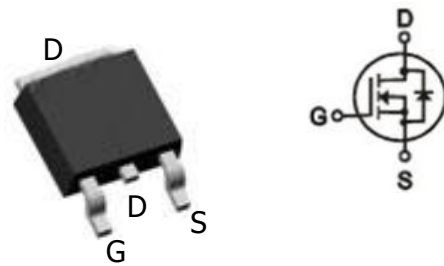
- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

**• Application**

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

**Product Summary**

BVDSS	RDSON	ID
40V	2.1mΩ	120A

**TO-252 Pin Configuration**

**Package Marking and Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AGM402D	AGM402D	TO-252	--mm	--mm	2500

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

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-Source Voltage ( $V_{GS}=0V$ )	40	V
$V_{GS}$	Gate-Source Voltage ( $V_{DS}=0V$ )	$\pm 20$	V
$I_D$	Drain Current-Continuous( $T_c=25^\circ\text{C}$ ) (Note 1)	120	A
	Drain Current-Continuous( $T_c=100^\circ\text{C}$ )	68	A
$I_{DM (pulse)}$	Drain Current-Continuous@ Current-Pulsed (Note 2)	520	A
$P_D$	Maximum Power Dissipation( $T_c=25^\circ\text{C}$ )	125	W
	Maximum Power Dissipation( $T_c=100^\circ\text{C}$ )	62	W
$E_{AS}$	Avalanche energy (Note 3)	550	mJ
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 175	$^\circ\text{C}$

**Table 2. Thermal Characteristic**

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient (Steady State) <sup>1</sup>	---	62	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	1.2	$^\circ\text{C/W}$

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

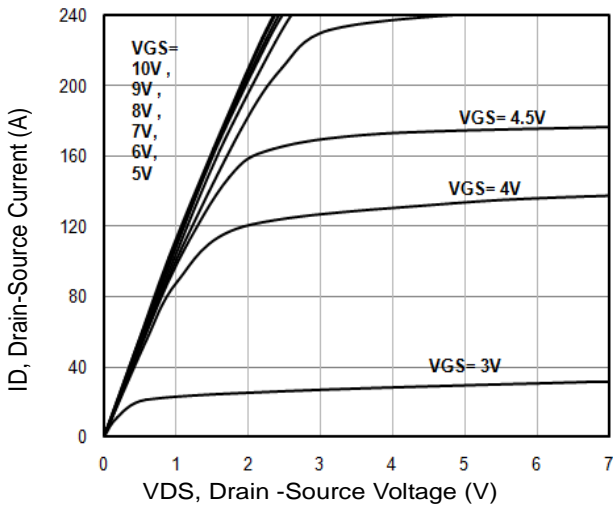
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	40	45	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	--	--	1	μA
	Zero Gate Voltage Drain Current (T <sub>j</sub> =125°C)	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V	--	--	100	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.7	2.5	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance <sup>③</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =40A	--	2.1	2.9	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance <sup>③</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	--	3.1	5	mΩ
<b>Dynamic Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz		3040		pF
C <sub>oss</sub>	Output Capacitance			395		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			320		pF
R <sub>g</sub>	Gate Resistance	f=1MHz		2		Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V, I <sub>D</sub> =40A, V <sub>GS</sub> =10V	--	73	--	nC
Q <sub>gs</sub>	Gate-Source Charge		-	15	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		-	15	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =20V, I <sub>D</sub> =40A, R <sub>G</sub> =3Ω, V <sub>GS</sub> =10V	--	12.7	--	nS
t <sub>r</sub>	Turn-on Rise Time		-	6.3	--	nS
t <sub>d(off)</sub>	Turn-Off Delay Time		-	51	--	nS
t <sub>f</sub>	Turn-Off Fall Time		-	12	--	nS
<b>Source- Drain Diode Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	I <sub>SD</sub> =40A, V <sub>GS</sub> =0V	--	0.8	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C, I <sub>SD</sub> =30A, V <sub>GS</sub> =0V	--	16	--	nS
Q <sub>rr</sub>	Reverse Recovery Charge		di/dt=500A/μs		41	

Notes 1. The maximum current rating is package limited.

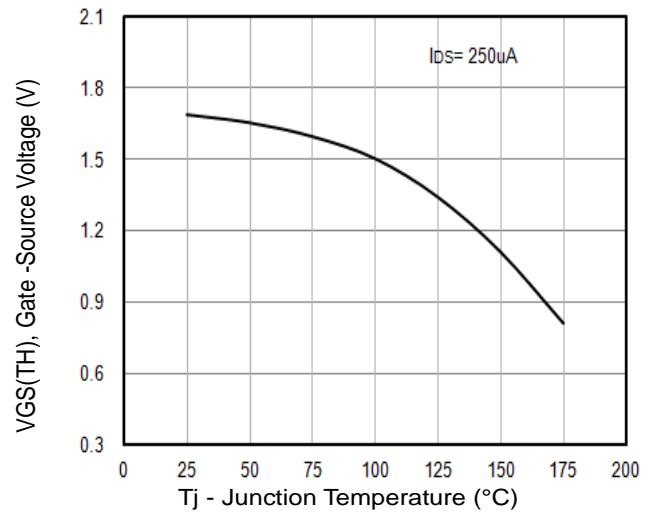
Notes 2. Repetitive Rating: Pulse width limited by maximum junction temperature

Notes 3. EAS condition: T<sub>j</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, R<sub>G</sub>=25Ω

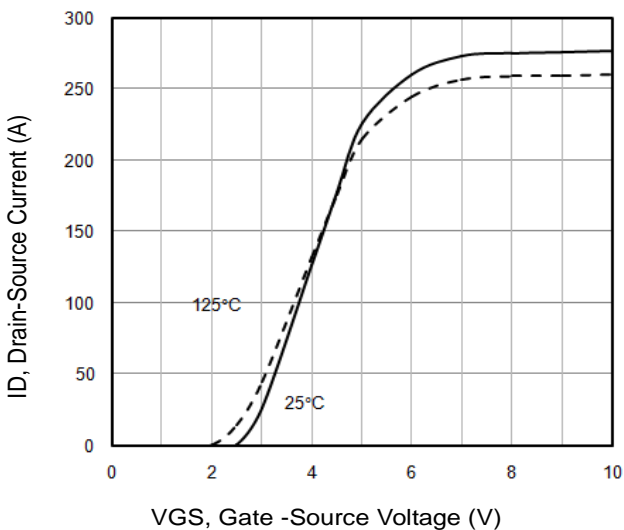
**Typical Characteristics**



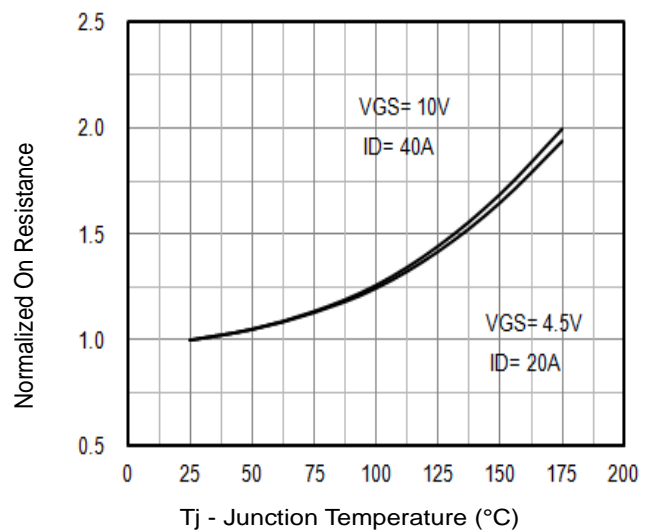
**Fig1.** Typical Output Characteristics



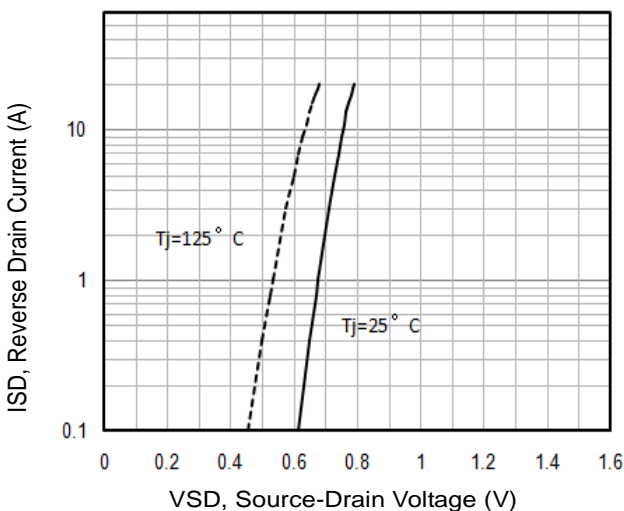
**Fig2.**  $V_{GS(TH)}$  Gate-Source Voltage Vs.  $T_j$



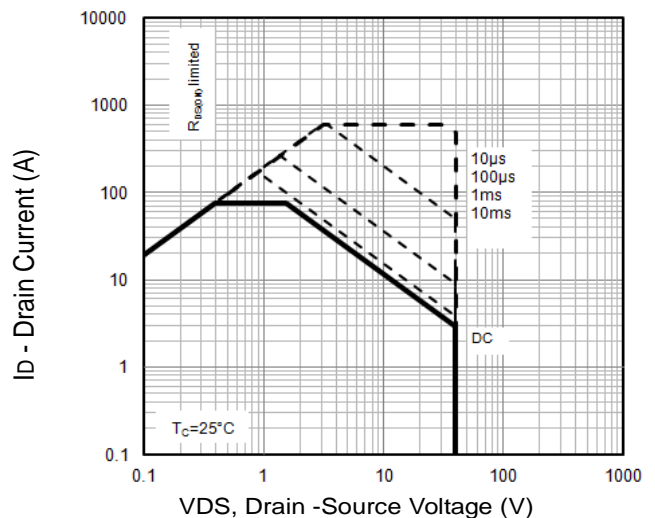
**Fig3.** Typical Transfer Characteristics



**Fig4.** Normalized On-Resistance Vs. Temperature



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



**Fig6.** Maximum Safe Operating Area

### Typical Characteristics

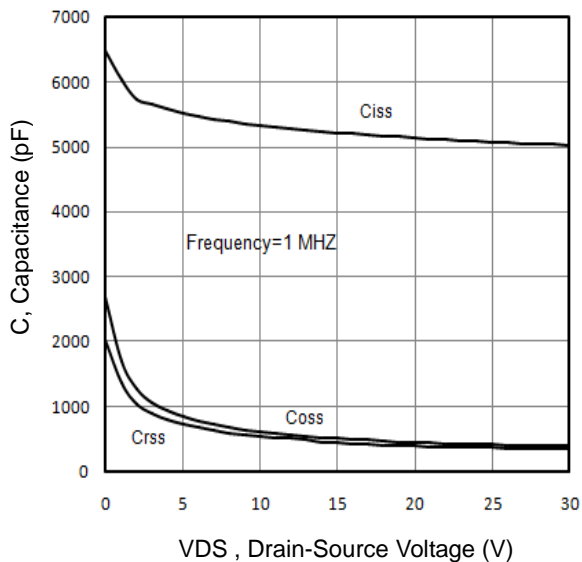


Fig7. Typical Capacitance Vs.Drain-Source Voltage

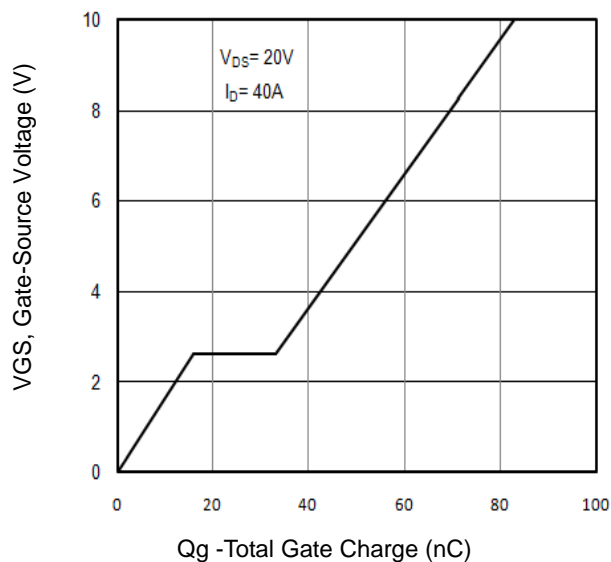


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

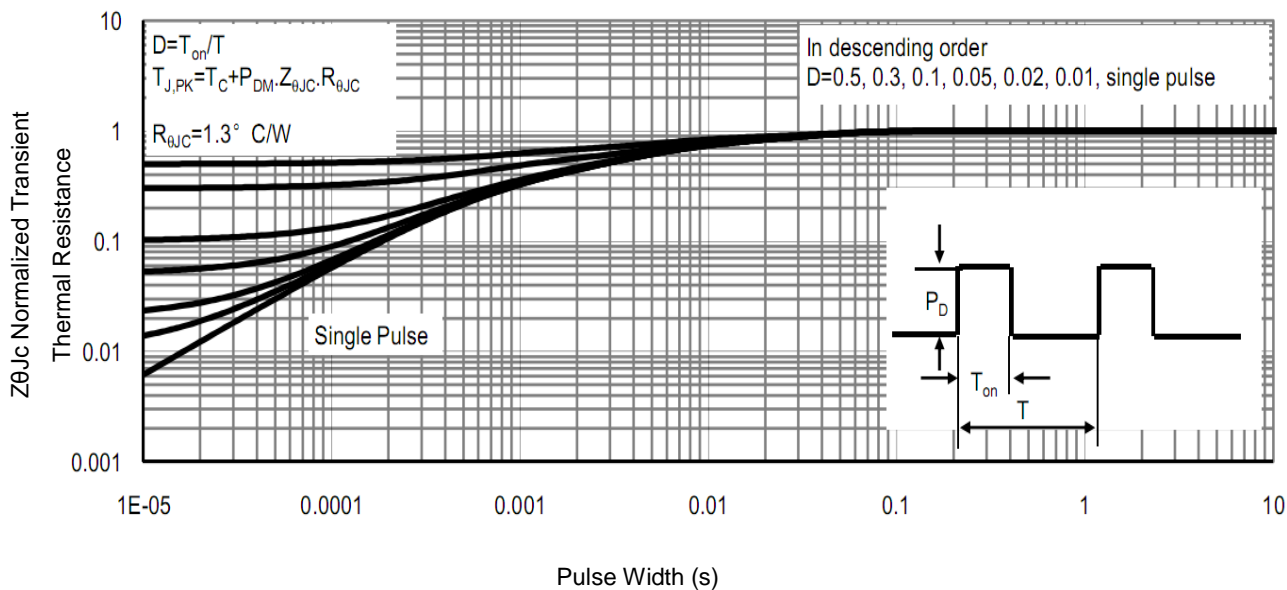


Fig9 . Normalized Maximum Transient Thermal Impedance

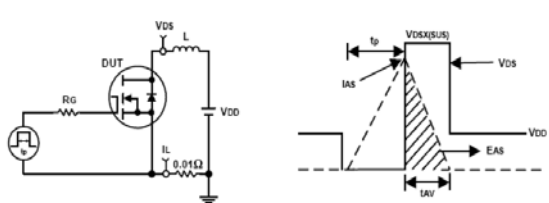


Fig10. Unclamped Inductive Test Circuit and waveforms

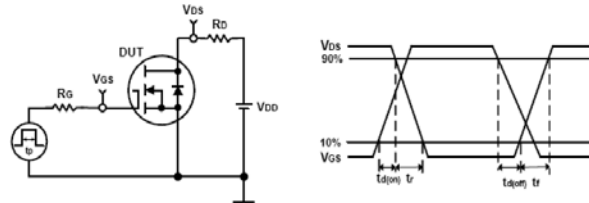
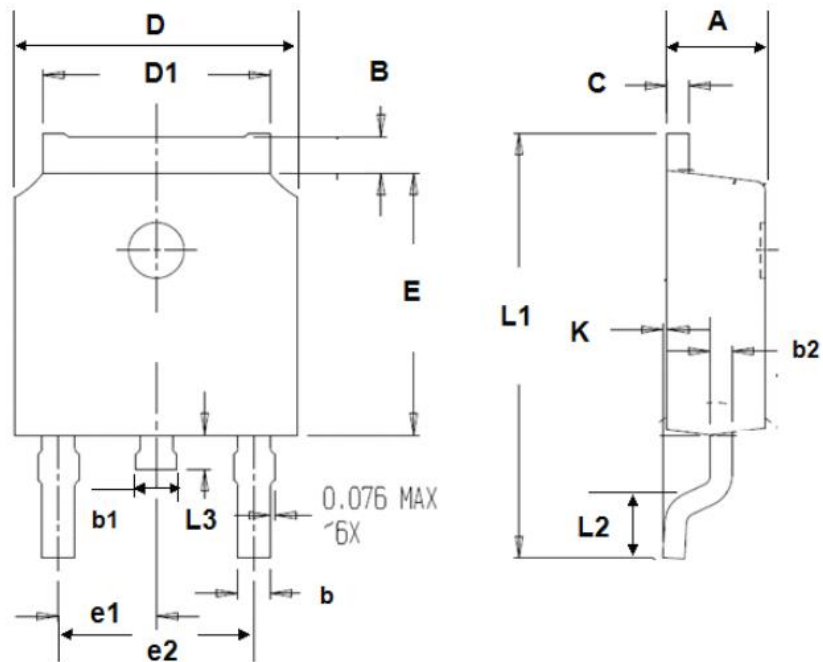


Fig11. Switching Time Test Circuit and waveforms

**•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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