

**• General Description**

The AGM420MA 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**

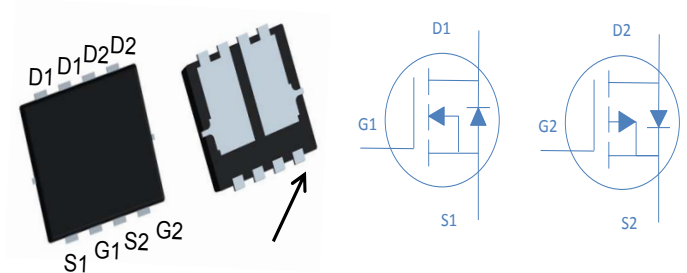
- Advance high cell density Trench technology
- Low  $R_{DS(ON)}$  to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

**• Application**

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

**Product Summary**

BVDSS	RDSON	ID
40V	18mΩ	20A
-40V	26mΩ	-18A

**PDFN5\*6 Pin Configuration**

**Package Marking and Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AGM420MA	AGM420MA	DFN5*6	325mm	16mm	3000

**Table 1. Absolute Maximum Ratings (TA=25°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( $T_c=25^\circ C$ ) (Note 1)	18	-20	A
	Drain Current-Continuous( $T_c=100^\circ C$ )	15	-16	A
IDM (pluse)	Drain Current-Continuous@ Current-Pulsed (Note 2)	50	-40	A
$P_D$	Total Power Dissipation( $T_c=25^\circ C$ )	25	31	W
	Total Power Dissipation( $T_A=100^\circ C$ )	4	5	W
EAS	Avalanche energy (Note 3)	31	58	mJ
TJ,TSTG	Operating Junction and Storage Temperature Range	-55 To 150	-55 To 150	°C

**Table 2. Thermal Characteristic**

Symbol	Parameter	Typ	Max	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient (Steady State) <sup>1</sup>	---	62	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	5	°C/W

**Electrical 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	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current(T <sub>j</sub> =25°C)	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	1.2	1.7	2.5	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ④	V <sub>GS</sub> =10V, I <sub>D</sub> =25A	--	18	23	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ④	V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A	--	25	36	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	970	1130	1230	pF
C <sub>oss</sub>	Output Capacitance		95	100	120	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		80	90	105	pF
R <sub>g</sub>	Gate Resistance	f=1MHz	--	2.2	--	Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V	--	20.5	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	4.9	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	4.1	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =20V, I <sub>D</sub> =20A, R <sub>G</sub> =3Ω, V <sub>GS</sub> =10V				
t <sub>r</sub>	Turn-on Rise Time		--	44.5	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	19	--	ns
t <sub>f</sub>	Turn-Off Fall Time		--	9.2	--	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> =25A, V <sub>GS</sub> =0V	--	0.9	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C, I <sub>SD</sub> =20A, V <sub>GS</sub> =0V di/dt=100A/μs	--	6.8	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	1.6	--	nC

NOTE:

- ① Repetitive rating; pulse width limited by max junction temperature.
- ② Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 6A, V<sub>GS</sub> = 10V. Part not recommended for use above this value
- ③ The power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

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	--	--	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 ②	V <sub>GS</sub> =-10V, I <sub>D</sub> =-15A	--	26	34	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ②	V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A	--	34	46	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> =-30V, V <sub>GS</sub> =0V, f=1MHz	--	1112	--	pF
C <sub>OSS</sub>	Output Capacitance		--	135	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	95	--	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =-20V, I <sub>D</sub> =-10A, V <sub>GS</sub> =-10V	--	27	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	7.3	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	5.6	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =-20V, I <sub>D</sub> =-10A, R <sub>G</sub> =6.8Ω, V <sub>GS</sub> =-10V	--	13	--	nS
t <sub>r</sub>	Turn-on Rise Time		--	18	--	nS
t <sub>d(off)</sub>	Turn-Off Delay Time		--	36	--	nS
t <sub>f</sub>	Turn-Off Fall Time		--	25	--	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> =-15A, V <sub>GS</sub> =0V	--	-0.89	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C, I <sub>sd</sub> =-10A, V <sub>GS</sub> =0V	--	34	--	nS
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=-100A/μs		30		nC

NOTE:

① Repetitive rating; pulse width limited by max. junction temperature.

② Pulse width ≤ 300μs; duty cycle ≤ 2%.

③ Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = -34A, V<sub>GS</sub> = -10V. Part not recommended for use above this value

P-Channel Typical Characteristics

Typical Characteristics

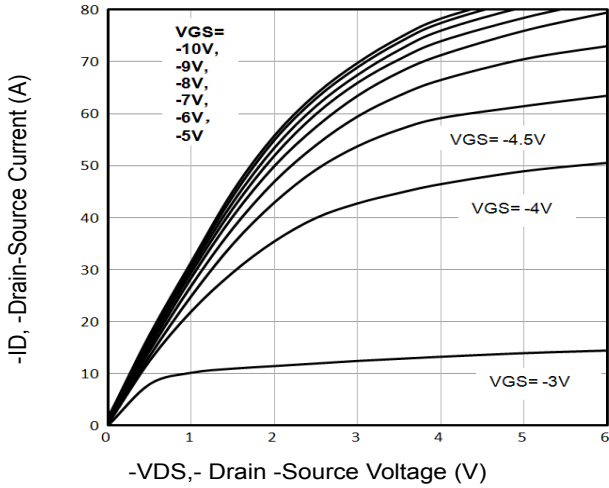


Fig1. Typical Output Characteristics

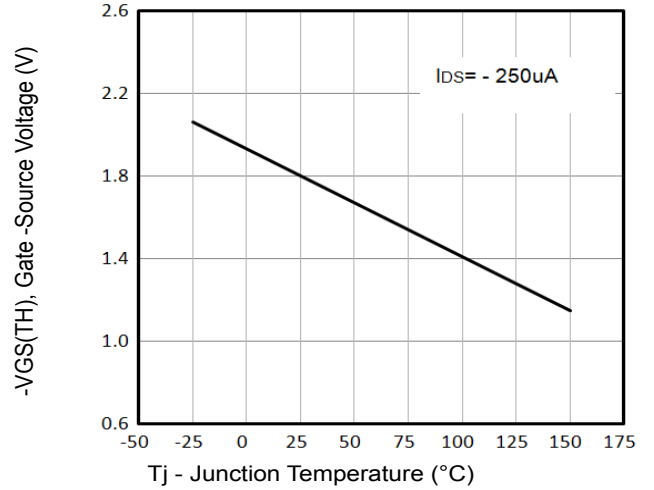


Fig2.  $-V_{GS(TH)}$  Gate -Source Voltage Vs.  $T_j$

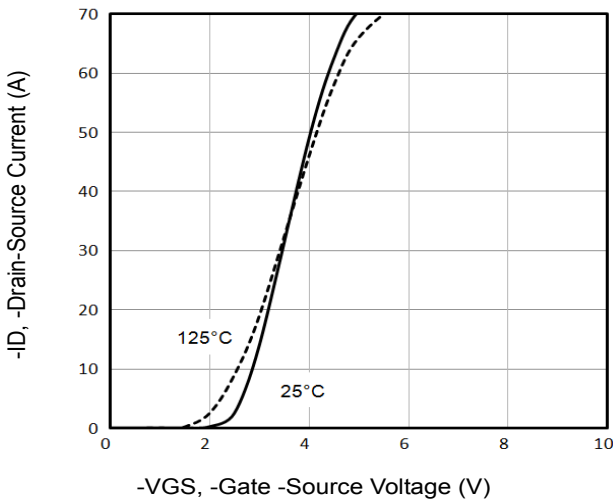


Fig3. Typical Transfer Characteristics

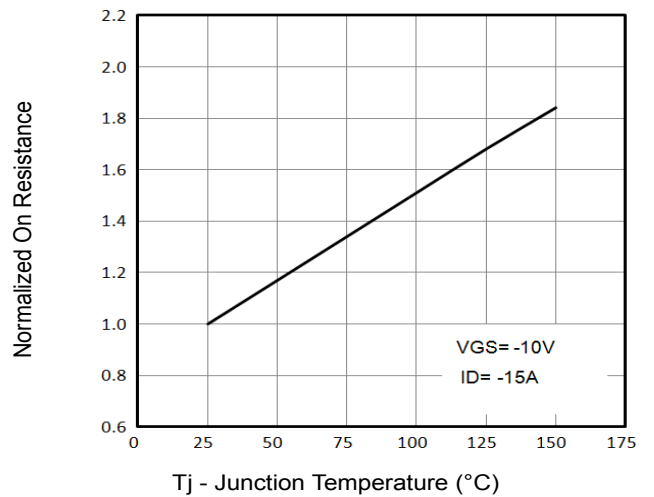


Fig4. Normalized On-Resistance Vs.  $T_j$

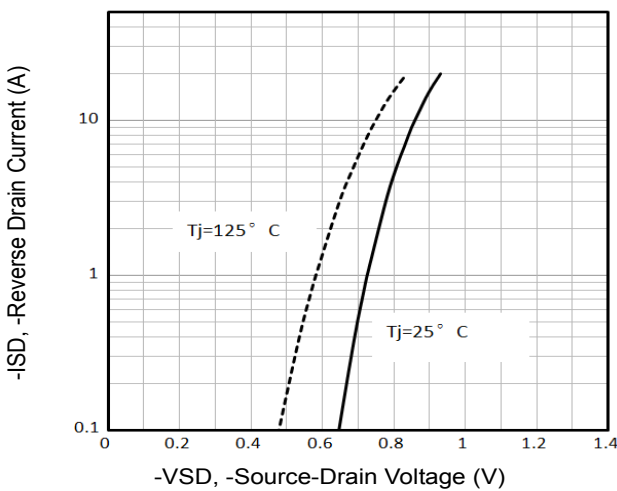


Fig5. Typical Source-Drain Diode Forward Voltage

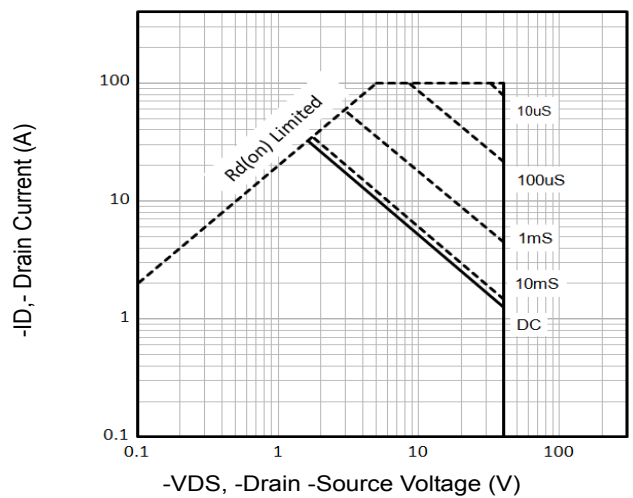


Fig6. Maximum Safe Operating Area

Typical Characteristics

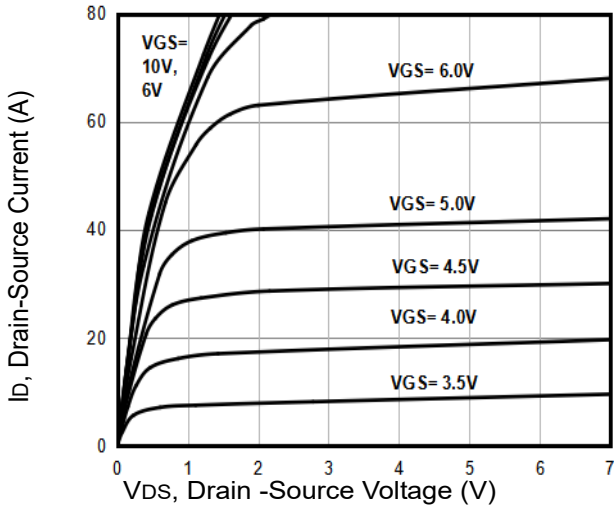


Fig1. Typical Output Characteristics

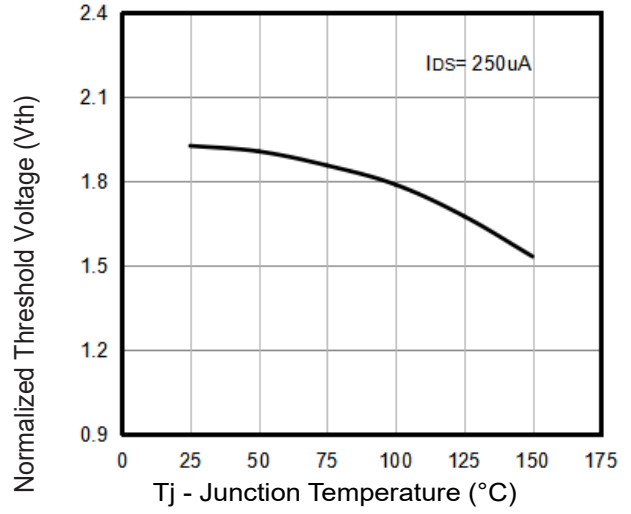


Fig2. Normalized Threshold Voltage Vs. Temperature

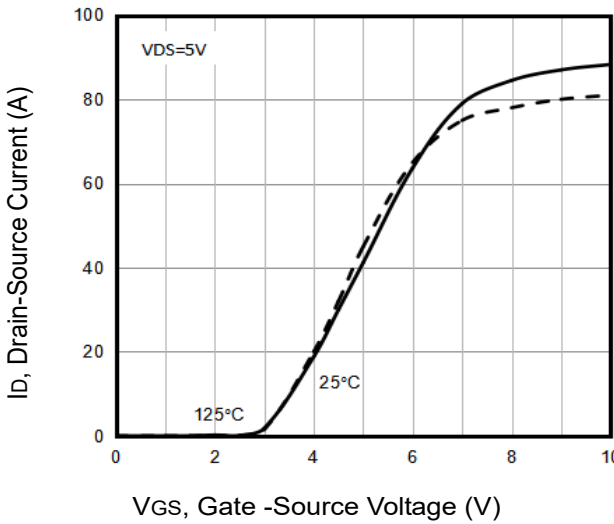


Fig3. Typical Transfer Characteristics

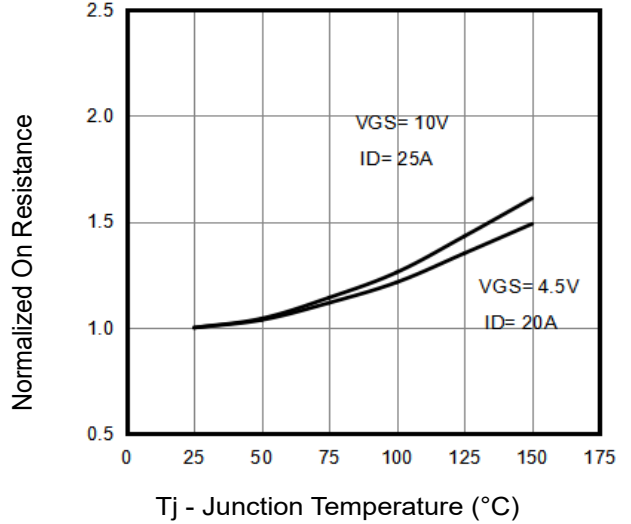


Fig4. Normalized On-Resistance Vs. Temperature

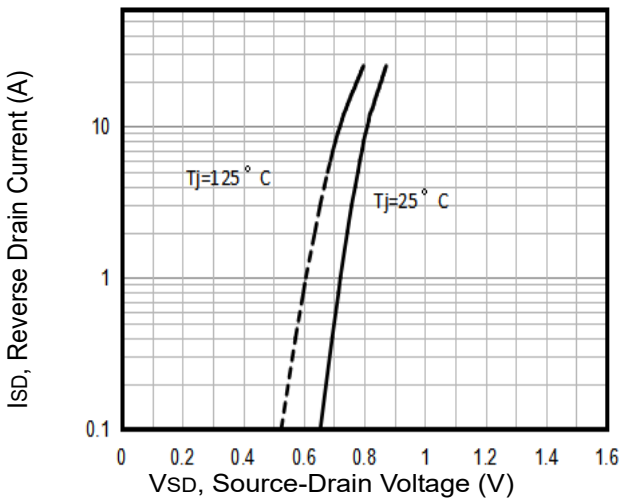


Fig5. Typical Source-Drain Diode Forward Voltage

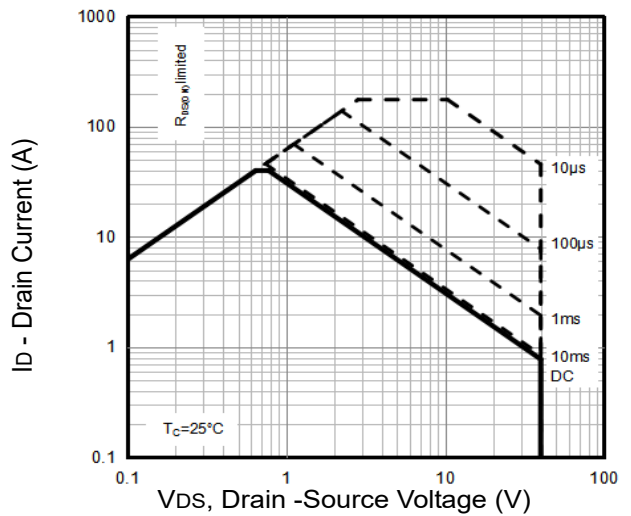
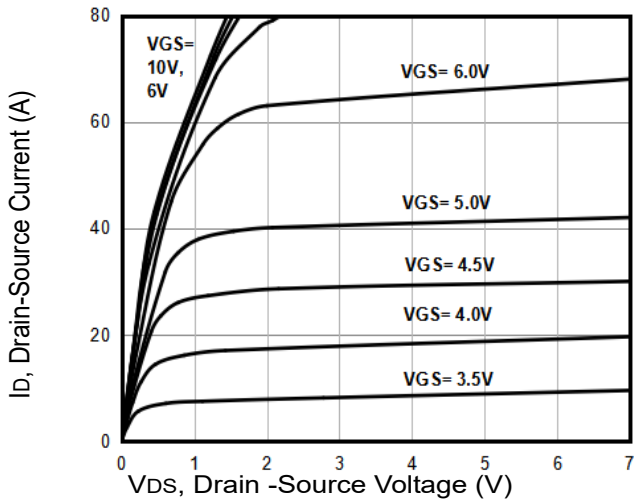


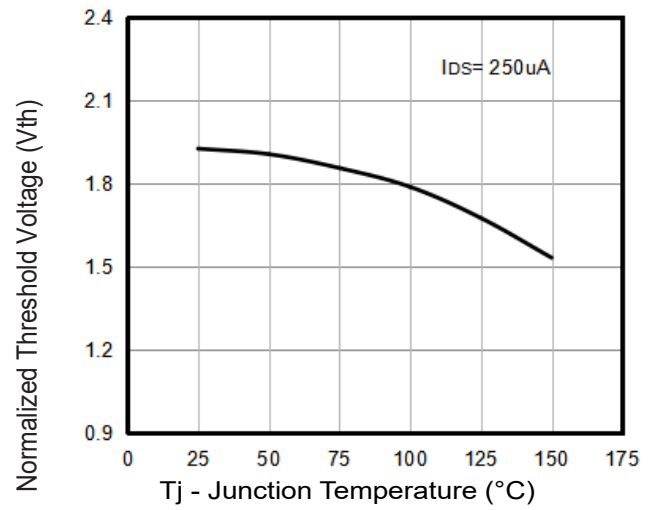
Fig6. Maximum Safe Operating Area

**N-Channel Typical Characteristics**

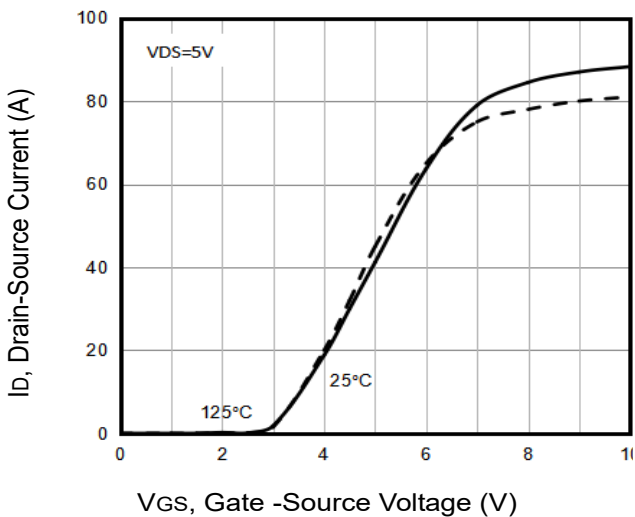
**Typical Characteristics**



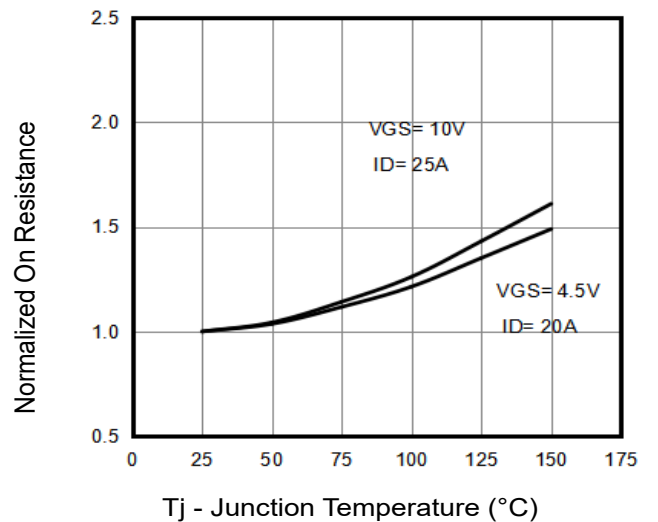
**Fig1.** Typical Output Characteristics



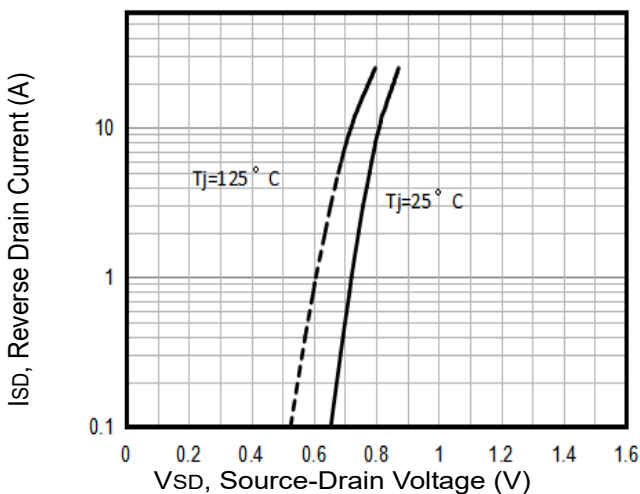
**Fig2.** Normalized Threshold Voltage Vs. Temperature



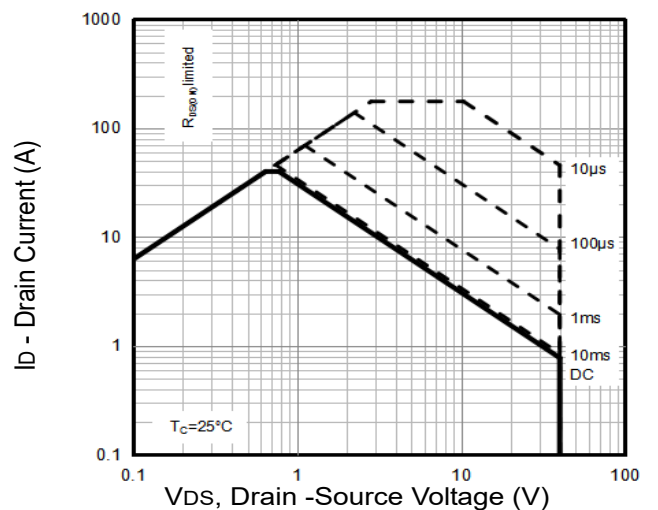
**Fig3.** Typical Transfer Characteristics



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



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



**Fig6.** Maximum Safe Operating Area

Typical Characteristics

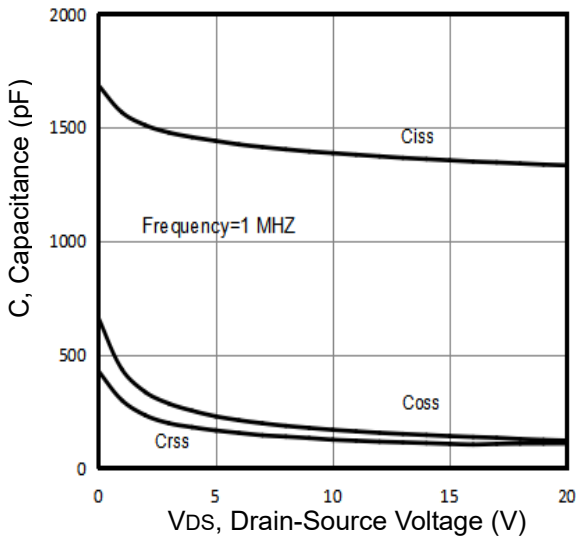


Fig7. Typical Capacitance Vs. Drain-Source Voltage

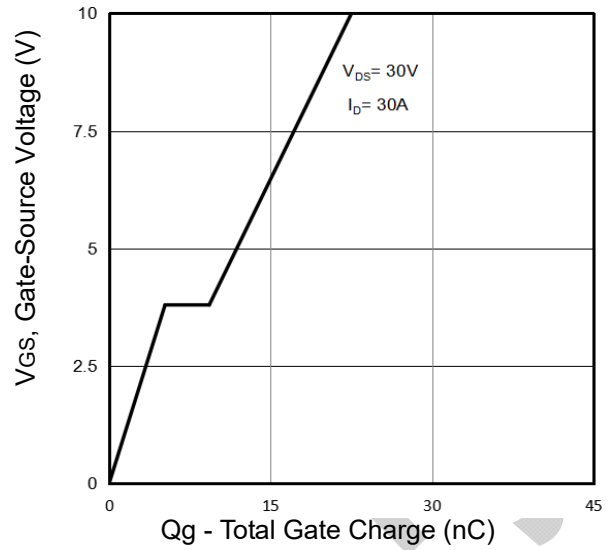


Fig8. Typical Gate Charge Vs. Gate-Source

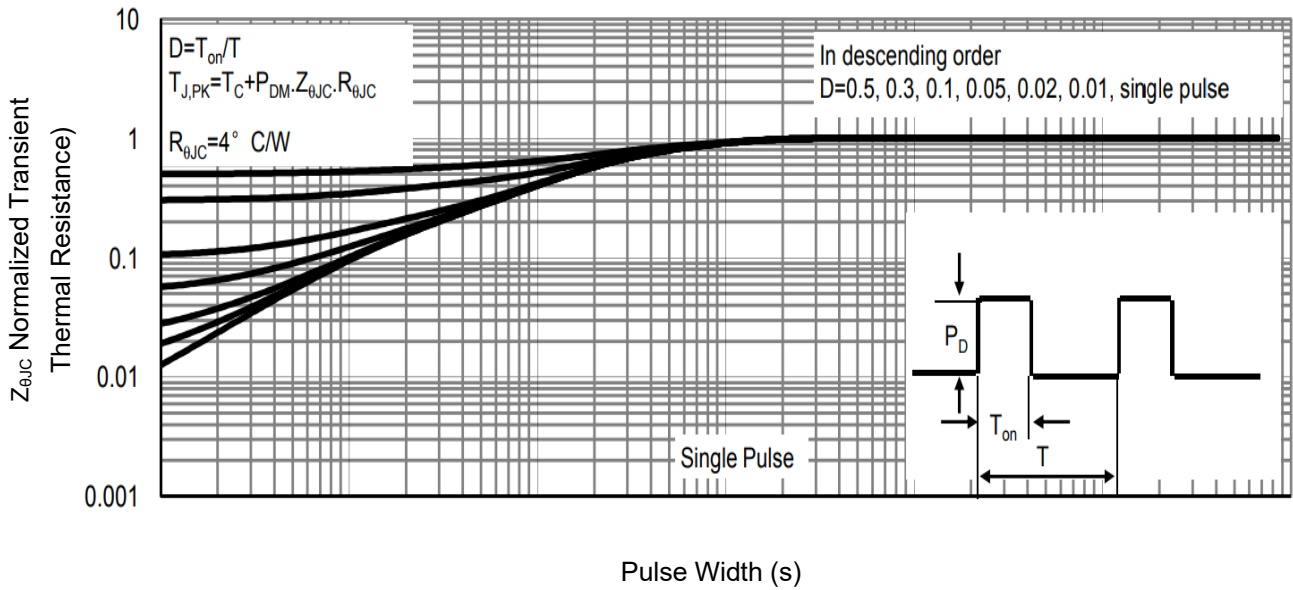


Fig9. Normalized Maximum Transient Thermal Impedance

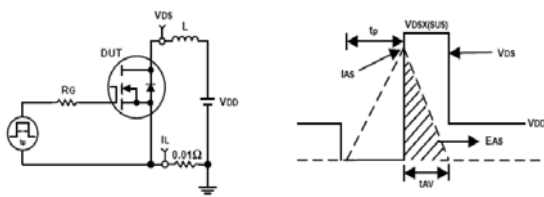


Fig10. Unclamped Inductive Test Circuit and waveforms

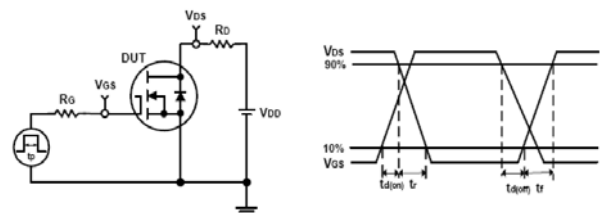
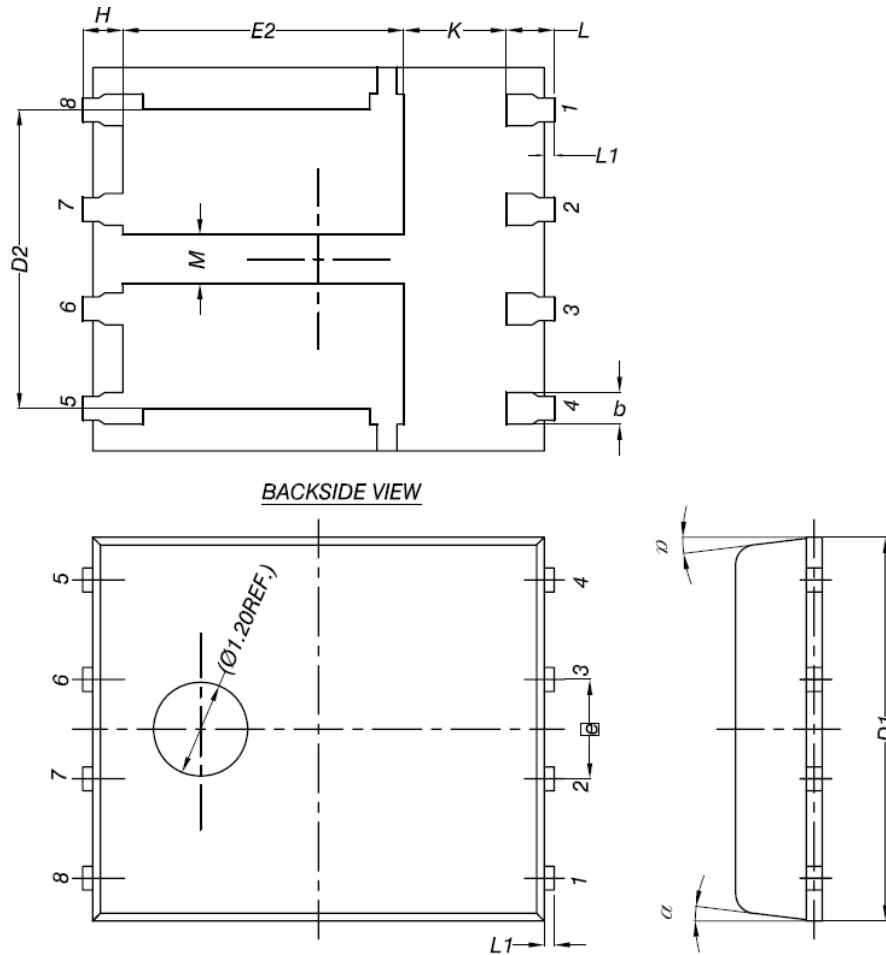


Fig11. Switching Time Test Circuit and waveforms

**PDFN5x6 Package Outline Data**

**DIMENSIONS** ( unit : mm )

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
<b>A</b>	0.90	1.00	1.10	<b>e</b>	1.27 BSC		
<b>b</b>	0.33	0.41	0.51	<b>H</b>	0.41	0.51	0.61
<b>C</b>	0.20	0.25	0.30	<b>K</b>	1.10	--	--
<b>D1</b>	4.80	4.90	5.00	<b>L</b>	0.51	0.61	0.71
<b>D2</b>	3.61	3.81	3.96	<b>L1</b>	0.06	0.13	0.20
<b>E</b>	5.90	6.00	6.10	<b>M</b>	0.50	--	--
<b>E1</b>	5.70	5.75	5.80	<b>α</b>	0°	--	12°
<b>E2</b>	3.38	3.58	3.78				




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