

• General Description

The AGM304MA 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

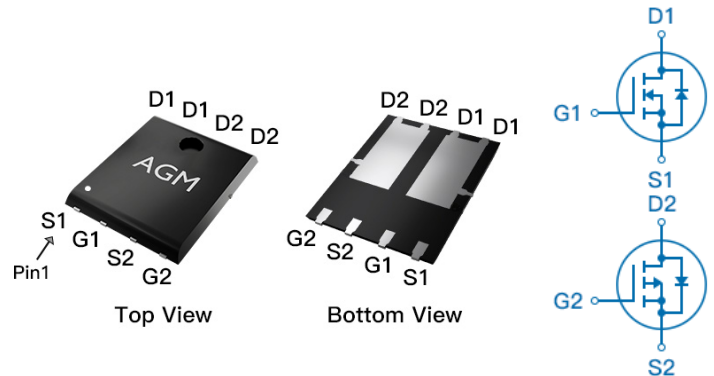
• Application

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

Product Summary

BVDSS	RDSON	ID
30V	4.5mΩ	60A
-30V	7.6mΩ	-60A

PDFN5*6 Pin Configuration



Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AGM304MA	AGM304MA	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 ($V_{GS}=0V$)	30	-30	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)	60	-60	A
	Drain Current-Continuous($T_C=100^\circ\text{C}$)	40	-40	A
IDM (pluse)	Drain Current-Pulsed (Note 2)	240	-240	A
P_D	Total Power Dissipation($T_C=25^\circ\text{C}$)	23	31	W
	Total Power Dissipation($T_C=100^\circ\text{C}$)	9.5	15	W
EAS	Avalanche energy (Note 3)	148	240	mJ
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	-55 To 175	$^\circ\text{C}$

Table 2. Thermal Characteristic

Symbol	Parameter	Typ	N-Ch Max	P-Ch Max	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient (Steady State) ¹	---	75	50	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	5.4	4.8	$^\circ\text{C}/\text{W}$

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	30	--	--	V
IDSS	Zero Gate Voltage Drain Current	VDS=30V,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	1.5	2.1	V
gFS	Forward Transconductance	VDS=5V,ID=15A	--	18	--	S
RDS(on)	Drain-Source On-State Resistance	VGS=10V, ID=20A	--	4.5	6.0	mΩ
		VGS=4.5V, ID=15A	--	6.3	8.5	mΩ
Dynamic Characteristics						
Ciss	Input Capacitance	VDS=15V,VGS=0V, F=1MHZ	--	1600	--	pF
Coss	Output Capacitance		--	235	--	pF
Crss	Reverse Transfer Capacitance		--	211	--	pF
Rg	Gate resistance	VGS=0V, VDS=0V,f=1.0MHz	--	1.6	--	Ω
Switching Times						
td(on)	Turn-on Delay Time	VGS=10V,VDS=15V, RL=0.75Ω,RGEN=3Ω	--	8.9	--	nS
tr	Turn-on Rise Time		--	74	--	nS
td(off)	Turn-Off Delay Time		--	17.5	--	nS
tf	Turn-Off Fall Time		--	81	--	nS
Qg	Total Gate Charge	VGS=10V, VDS=15V, ID=20A	--	17	--	nC
Qgs	Gate-Source Charge		--	3.8	--	nC
Qgd	Gate-Drain Charge		--	3.2	--	nC
Source-Drain Diode Characteristics						
ISD	Source-Drain Current(Body Diode)		--	--	60	A
VSD	Forward on Voltage	VGS=0V,IS=20A	--	--	1.2	V
trr	Reverse Recovery Time	IF=20A , dI/dt=100A/μs ,	--	14	--	ns
Qrr	Reverse Recovery Charge	TJ=25°C	--	3.0	--	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,VDD=15V,Vgs=10V,ID=31.5A, L=0.3mH,RG=25ohm

Table 3. P-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	-30	--	--	V
IDSS	Zero Gate Voltage Drain Current	VDS=-30V,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	-1.6	-2.2	V
gFS	Forward Transconductance	VDS=-5V,ID=-15A	--	18	--	S
RDS(on)	Drain-Source On-State Resistance	VGS=-10V, ID=-20A	--	7.6	9.5	mΩ
		VGS=-4.5V, ID=-15A	--	11.5	14	mΩ
Dynamic Characteristics						
Ciss	Input Capacitance	VDS=-15V,VGS=0V, F=1MHZ	--	2980	--	pF
Coss	Output Capacitance		--	382	--	pF
Crss	Reverse Transfer Capacitance		--	350	--	pF
Rg	Gate resistance	VGS=0V, VDS=0V,f=1.0MHz	--	4.8	--	Ω
Switching Times						
td(on)	Turn-on Delay Time	VGS=-10V,VDS=-15V, RL=0.75Ω,RGEN=3Ω	--	21	--	nS
tr	Turn-on Rise Time		--	18	--	nS
td(off)	Turn-Off Delay Time		--	26	--	nS
tf	Turn-Off Fall Time		--	8.0	--	nS
Qg	Total Gate Charge	VGS=-10V, VDS=-15V, ID=-20A	--	61	--	nC
Qgs	Gate-Source Charge		--	75	--	nC
Qgd	Gate-Drain Charge		--	15.5	--	nC
Source-Drain Diode Characteristics						
ISD	Source-Drain Current(Body Diode)		--	--	-60	A
VSD	Forward on Voltage	VGS=0V,IS=-20A	--	--	-1.2	V
trr	Reverse Recovery Time	IF=-20A , di/dt=100A/μs , TJ=25°C	--	15	--	ns
Qrr	Reverse Recovery Charge		--	20	--	nc

Notes 1.The maximum current rating is package limited.

Notes2.Repetitive Rating: Pulswidth limited by maximum junction temperature Notes

3.EAS condition: T_J=25°C,VDD=-15V,Vgs=-10V,ID=-40A, L=0.3mH,RG=25ohm

N-Channel TYPICAL ELECTRICAL AND THERMAL CHARACTERIS

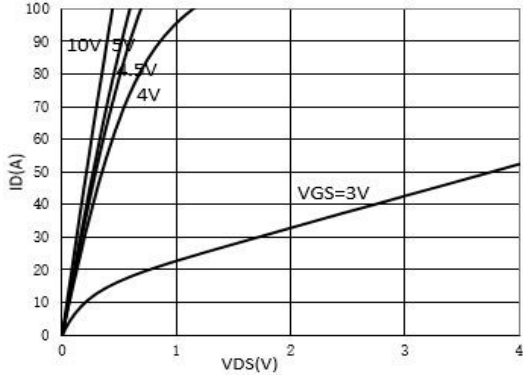


Figure 1: On-Region Characteristics (Note E)

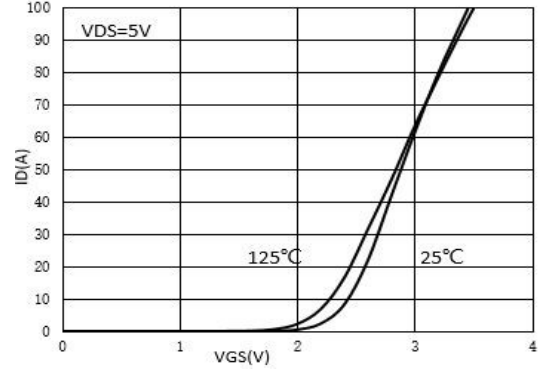


Figure 2: Transfer Characteristics (Note E)

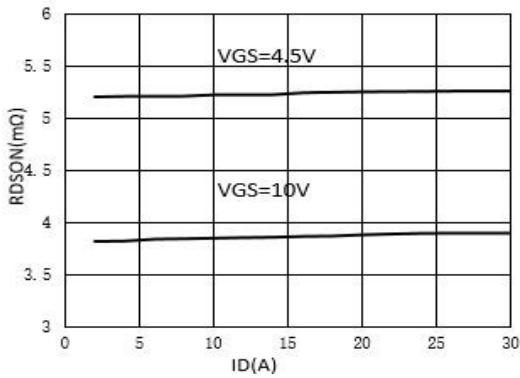


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

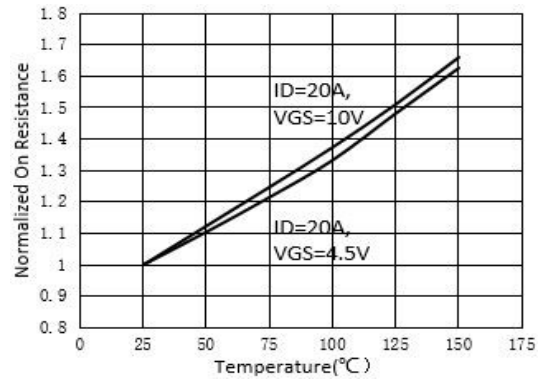


Figure 4: On-Resistance vs. Junction Temperature (Note E)

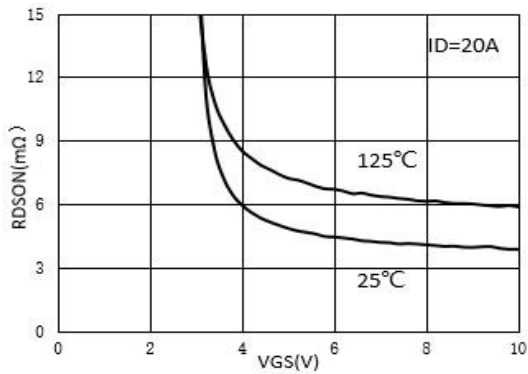


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

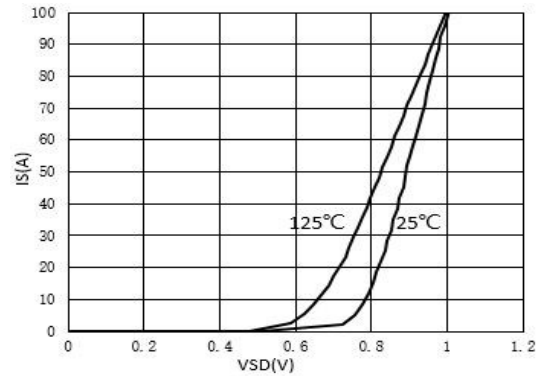


Figure 6: Body-Diode Characteristics (Note E)

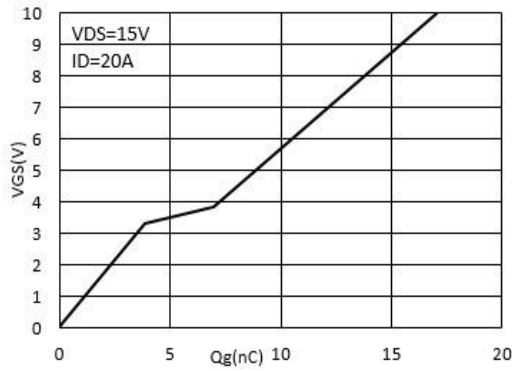


Figure 7: Gate-Charge Characteristics

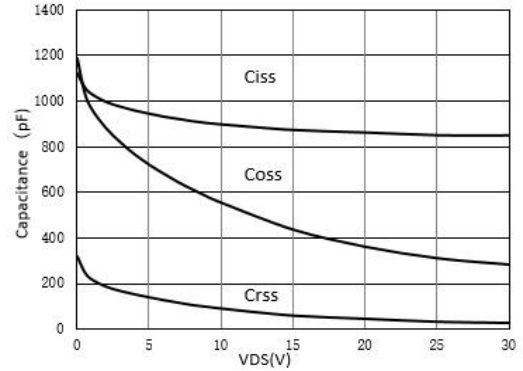


Figure 8: Capacitance Characteristics

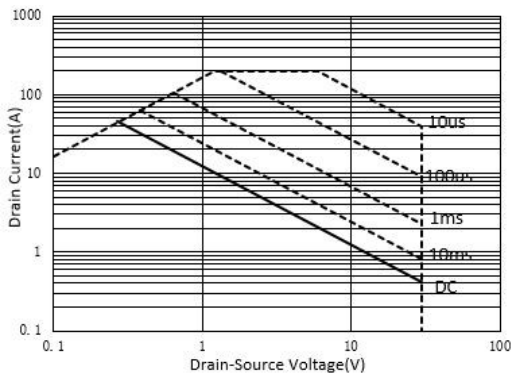


Figure 9: Maximum Forward Biased Safe Operating Area

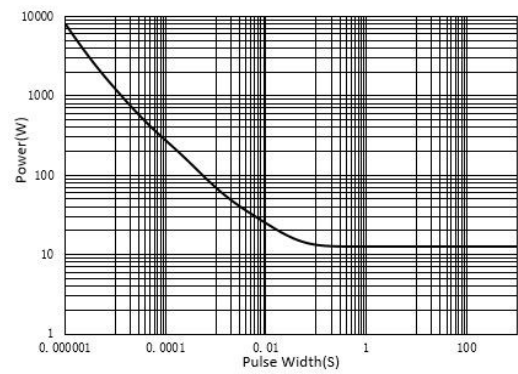


Figure 10: Single Pulse Power Rating Junction-to-Case

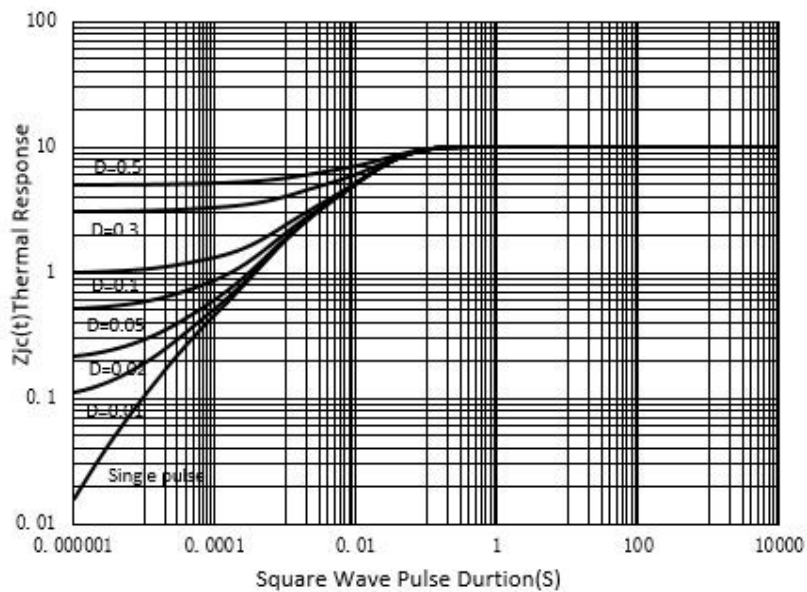
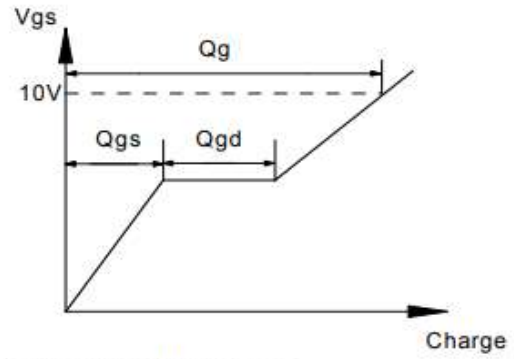
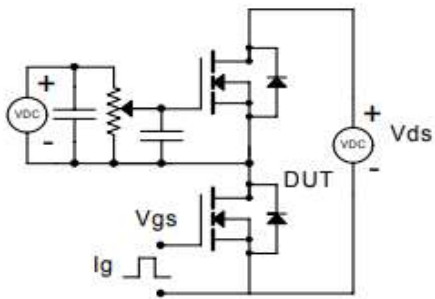
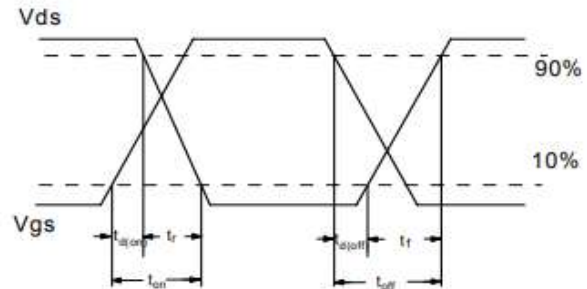
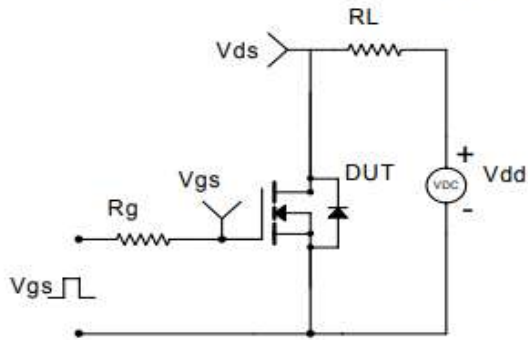
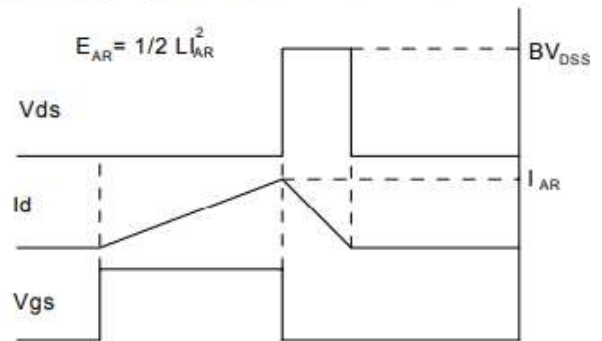
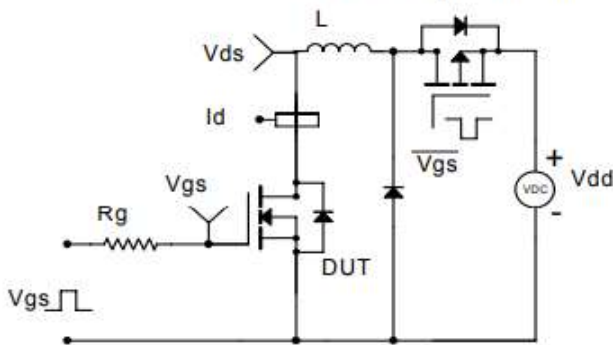
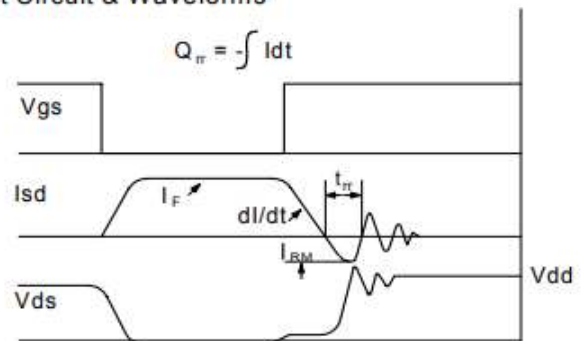
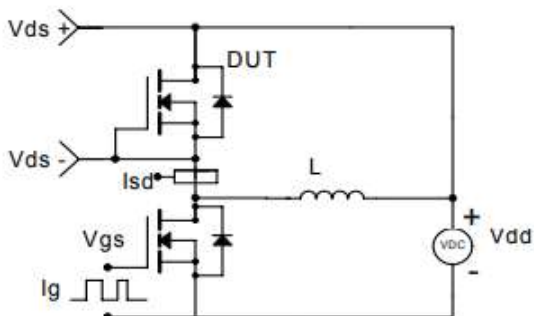
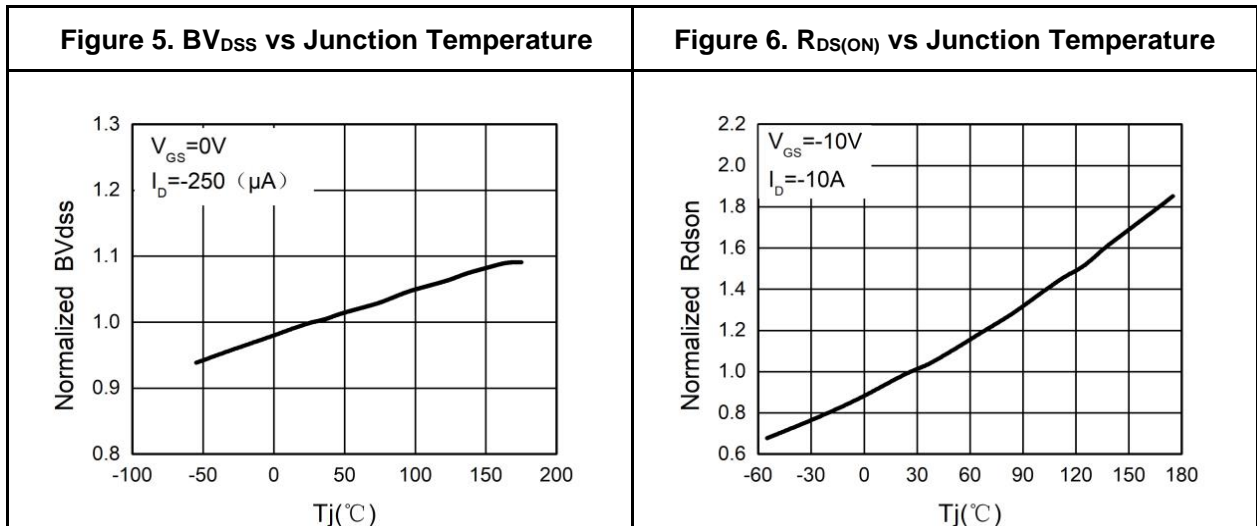
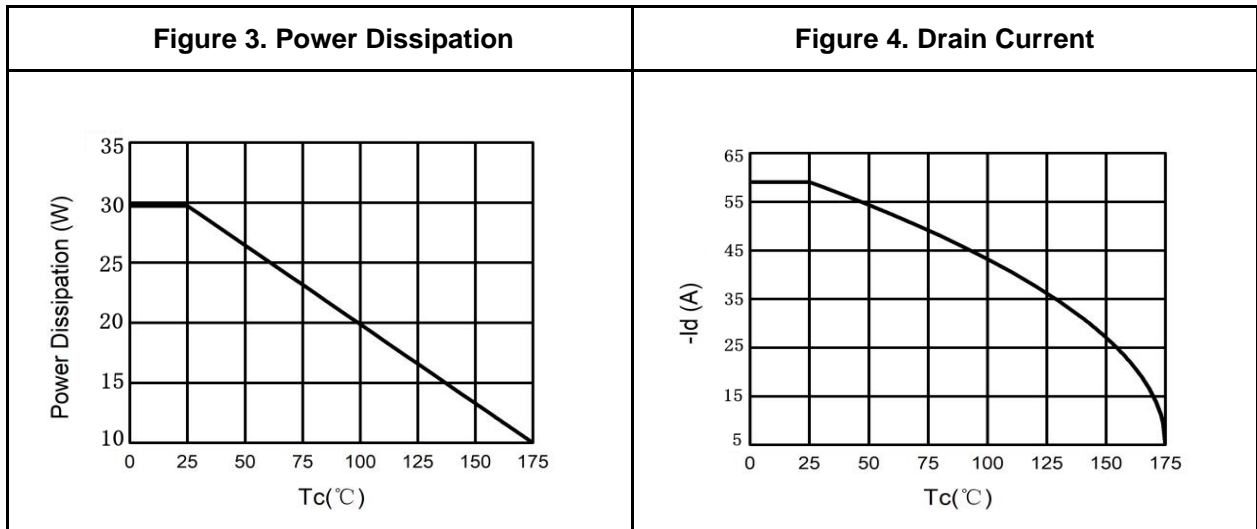
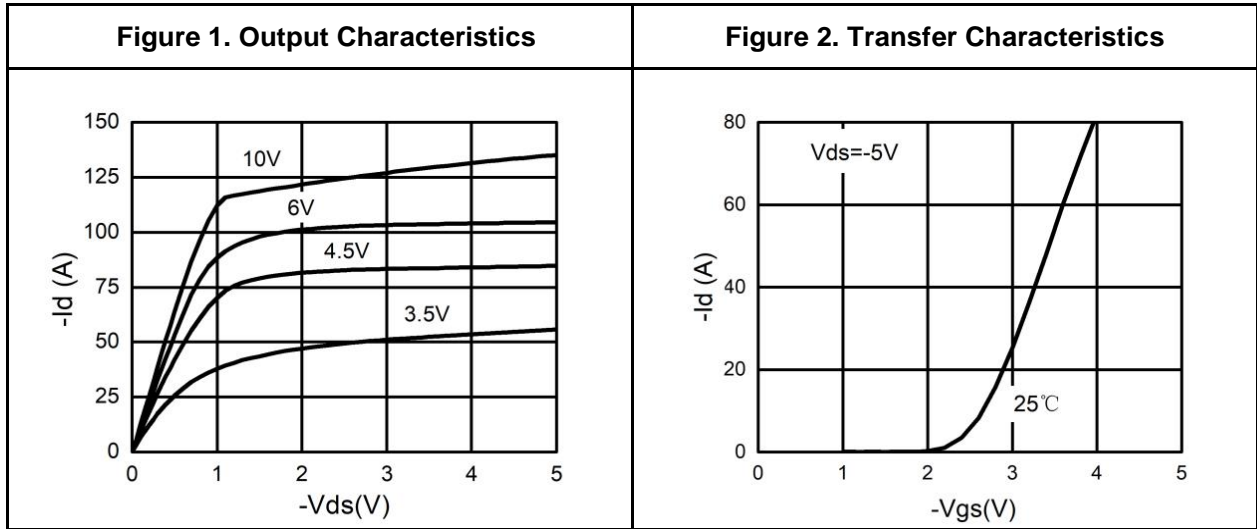


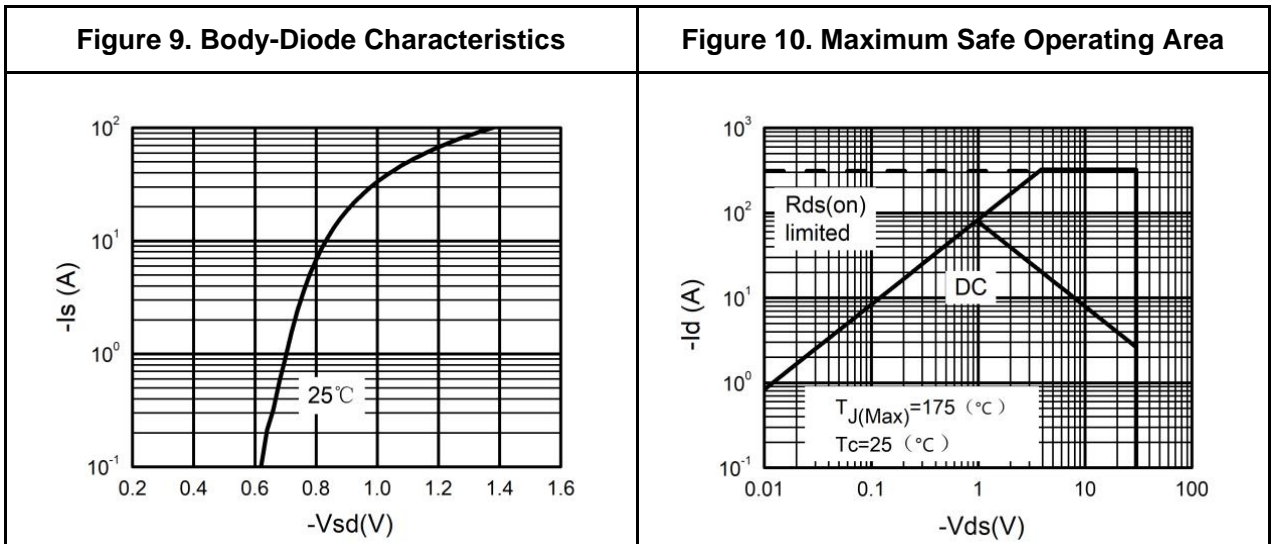
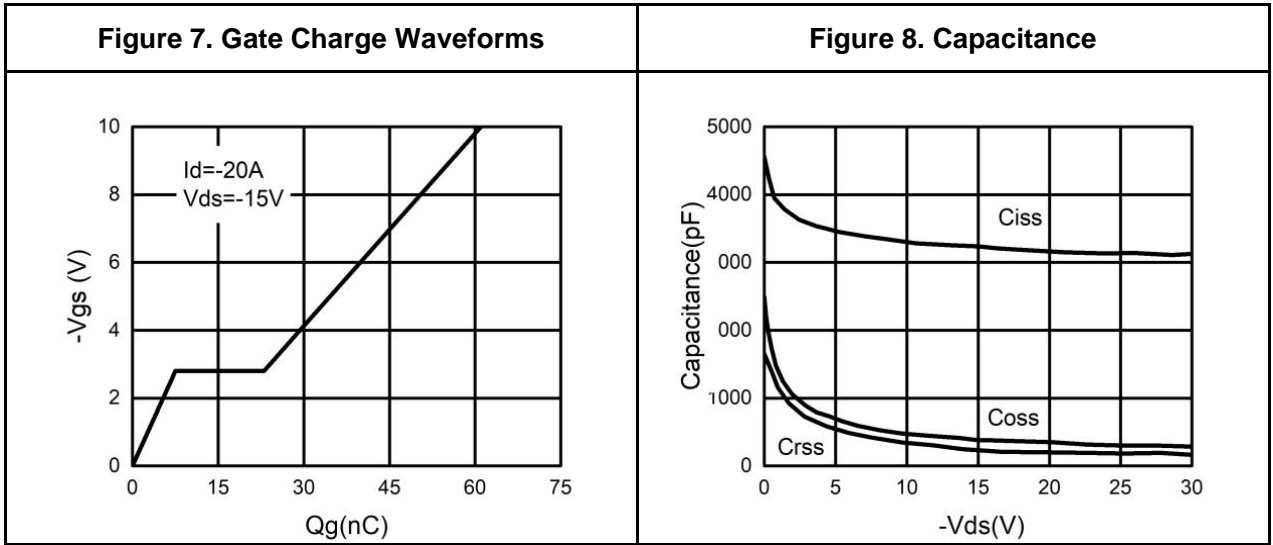
Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

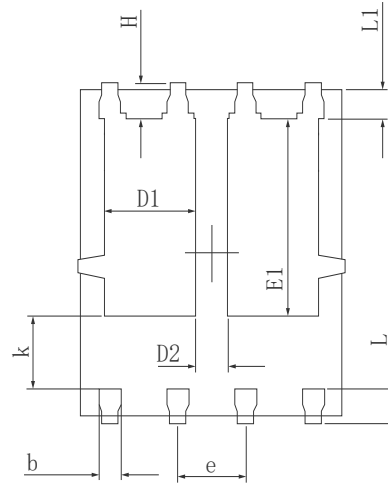
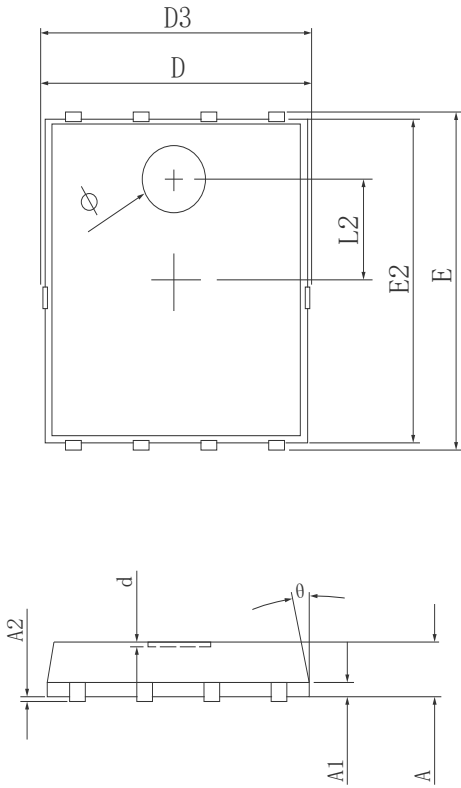
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

Diode Recovery Test Circuit & Waveforms


P-Channel Typical Electrical And Thermal Characteristics (Curves)

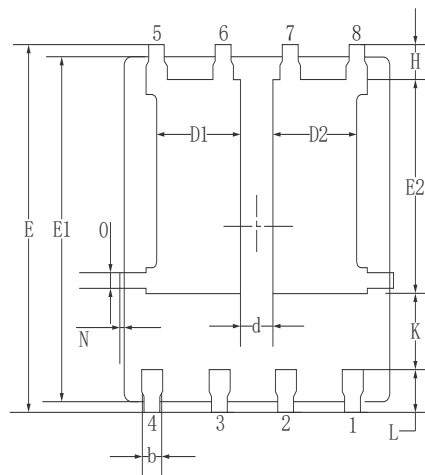
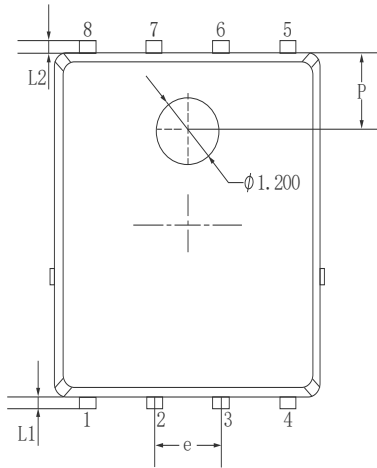


Typical Electrical And Thermal Characteristics (Curves)

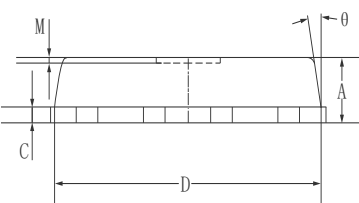


•Dimensions (PDFN5*6)


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



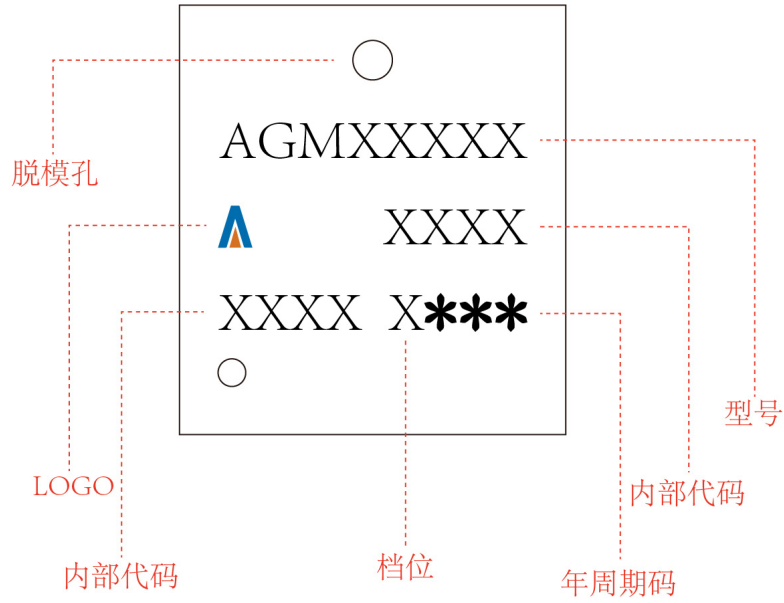
Symbol	Millimeters		
	MIN.	NOM.	MAX.
A	0.90	1.05	1.20
b	0.35	0.40	0.50
C	0.20	0.25	0.35
D	4.90	5.05	5.20
D1/D2	1.51	1.61	1.71
d	0.50	0.60	0.70
E	6.00	6.15	6.30
E1	5.60	5.75	5.90
E2	3.47	3.57	3.67
e	1.27 BSC.		
H	0.48	0.58	0.68
K	1.17	1.27	1.37
L	0.64	0.74	0.84
L1/L2	0.20 REF.		
θ	8°	10°	12°
M	0.08 REF.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



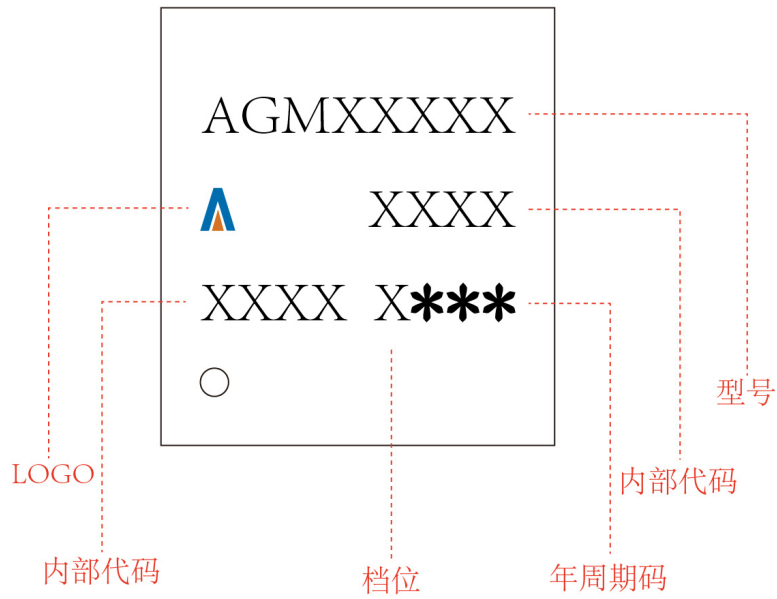
PDFN5*6

Marking Instructions:

Model1:



Model2:




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