

### ● 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

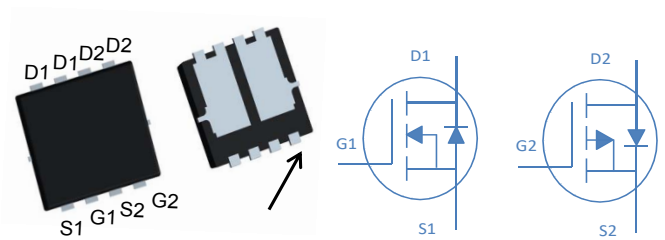
### ● Application

- MB/VGA Vcore
- SMPS 2<sup>nd</sup> 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	--mm	--mm	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)	40	-45	A
	Drain Current-Continuous( $T_c=100^\circ C$ )	35	-37	A
IDM (pluse)	Drain Current-Continuous@ Current-Pulsed (Note 2)	70	-84	A
$P_D$	Total Power Dissipation( $T_c=25^\circ C$ )	25	25	W
	Total Power Dissipation( $T_A=100^\circ C$ )	10	10	W
EAS	Avalanche energy (Note 3)	98	125	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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>On/Off States</b>						
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	--	2.5	V
gFS	Forward Transconductance	VDS=25V,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
<b>Dynamic Characteristics</b>						
Ciss	Input Capacitance	VGS=0V, F=1MHZ	--	1580	--	pF
Coss	Output Capacitance		--	270	--	pF
Crss	Reverse Transfer Capacitance		--	140	--	pF
Rg	Gate resistance	VGS=0V, VDS=0V,f=1.0MHz	--	--	--	Ω
<b>Switching Times</b>						
td(on)	Turn-on Delay Time	VGS=10V,VDS=25V, RL=0.75Ω,RGEN=6Ω	--	--	--	nS
tr	Turn-on Rise Time		--	--	--	nS
td(off)	Turn-Off Delay Time		--	--	--	nS
tf	Turn-Off Fall Time		--	--	--	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
<b>Source-Drain Diode Characteristics</b>						
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 , dI/dt=100A/μs ,	--	--	--	ns
Qrr	Reverse Recovery Charge	TJ=25°C	--	--	--	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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>On/Off States</b>						
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	--	-2.5	V
gFS	Forward Transconductance	VDS=-10V, 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
<b>Dynamic Characteristics</b>						
Ciss	Input Capacitance	VDS=-15V, VGS=0V, F=1MHZ	--	2650	--	pF
Coss	Output Capacitance		--	185	--	pF
Crss	Reverse Transfer Capacitance		--	135	--	pF
Rg	Gate resistance	VGS=0V, VDS=0V, f=1.0MHz	--	--	--	Ω
<b>Switching Times</b>						
td(on)	Turn-on Delay Time	VGS=-10V, VDS=-15V, ID=-15A, RGEN=3.3Ω	--	--	--	nS
tr	Turn-on Rise Time		--	--	--	nS
td(off)	Turn-Off Delay Time		--	--	--	nS
tf	Turn-Off Fall Time		--	--	--	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
<b>Source-Drain Diode Characteristics</b>						
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°C	--	--	--	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

Fig.1 Power Dissipation

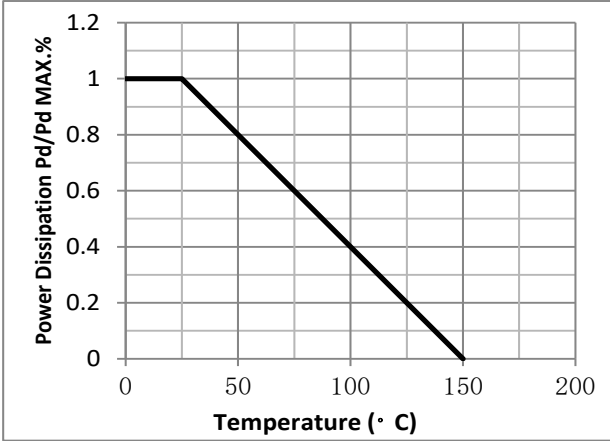


Fig.2 Typical output Characteristics

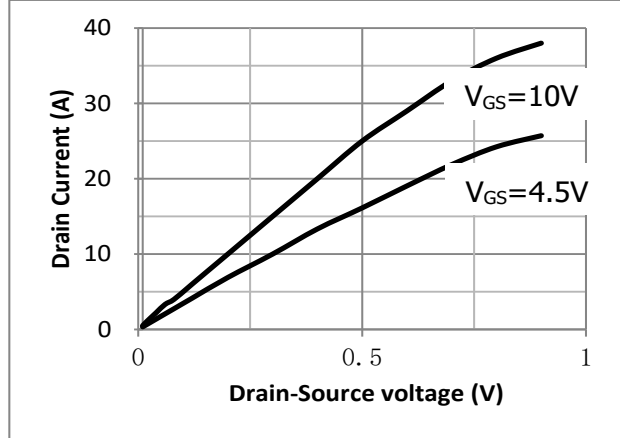


Fig.3 Threshold Voltage V.S Junction Temperature

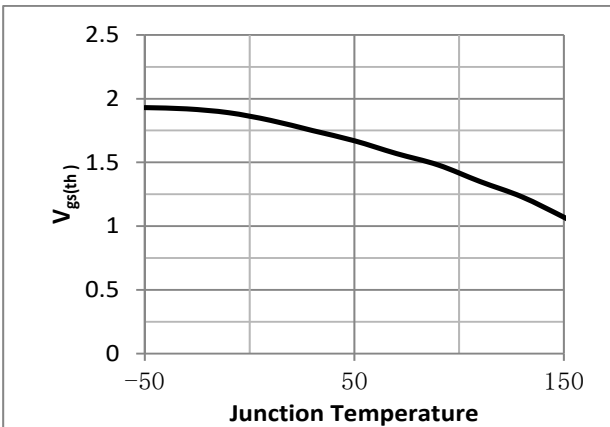


Fig.4 Resistance V.S Drain Current

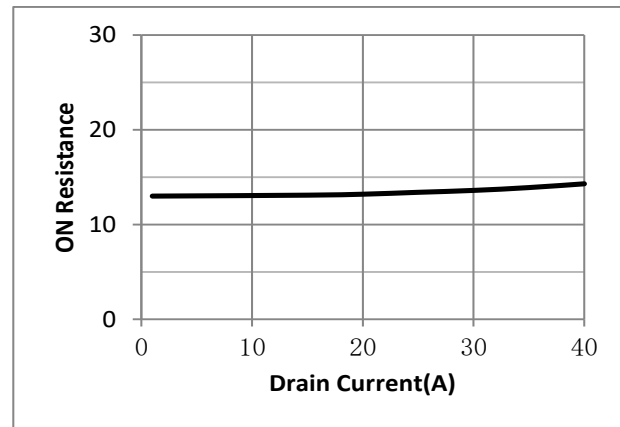


Fig.5 On-Resistance VS Gate Source Voltage

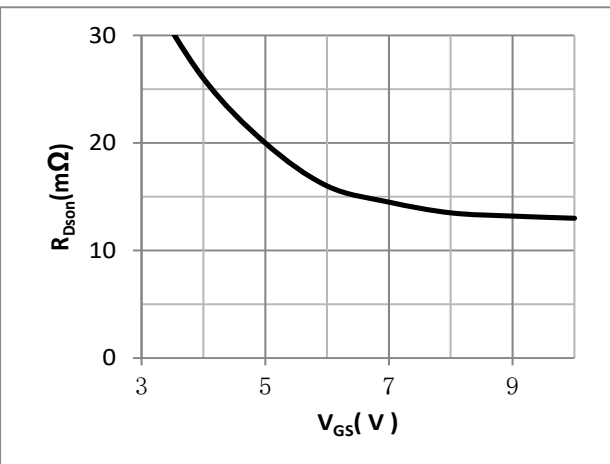


Fig.6 On-Resistance V.S Junction Temperature

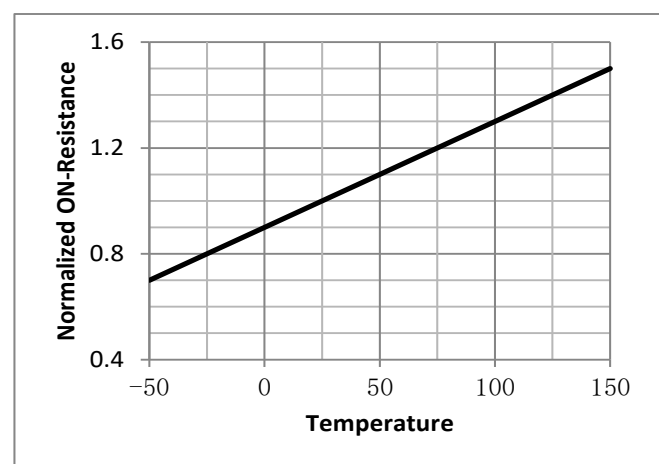


Fig.7 Switching Time Measurement Circuit

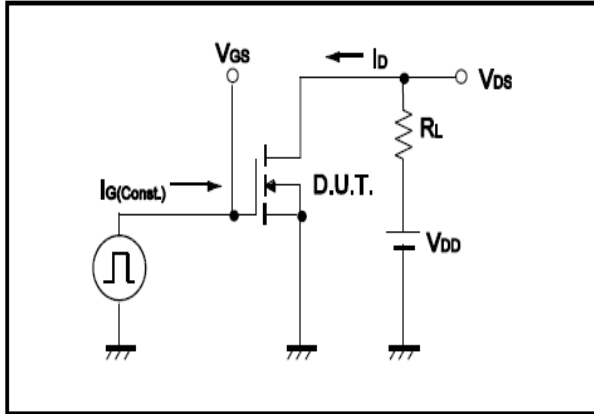


Fig.8 Gate Charge Waveform

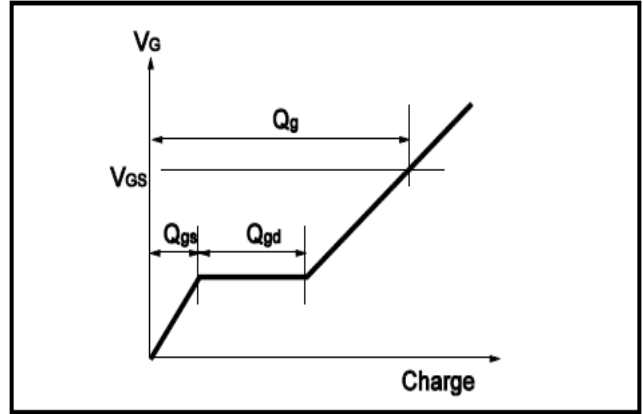


Fig.9 Switching Time Measurement Circuit

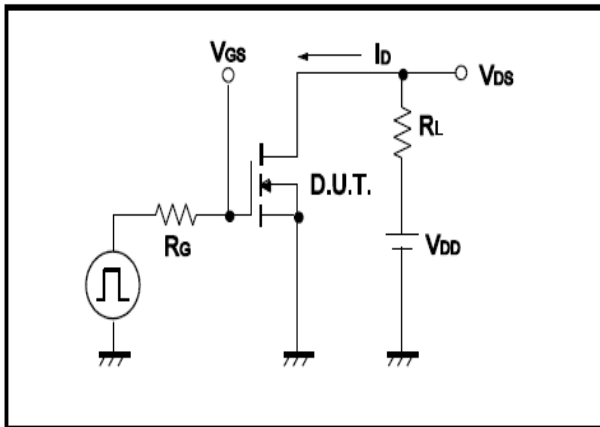


Fig.10 Gate Charge Waveform

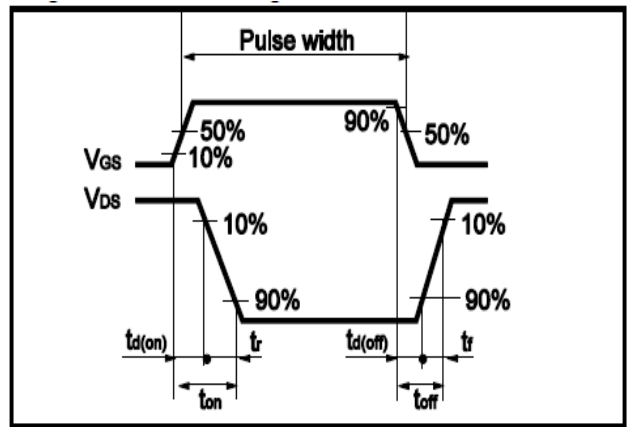


Fig.11 Avalanche Measurement Circuit

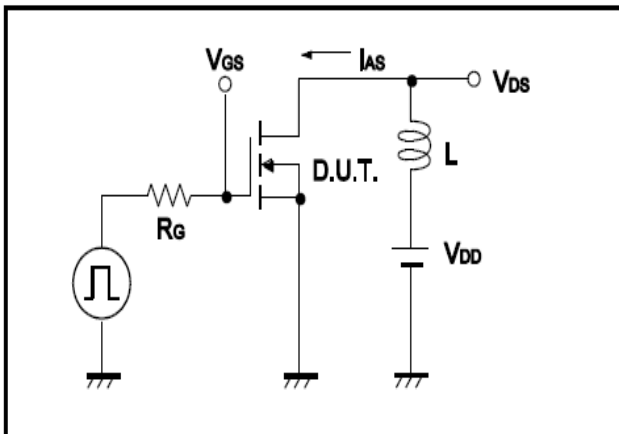


Fig.12 Avalanche Waveform

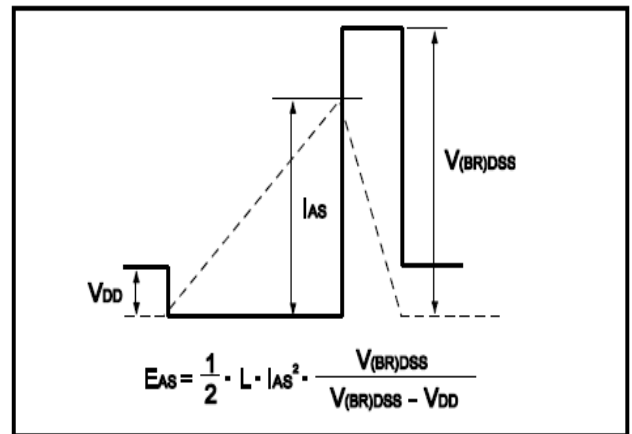


Fig.1 Gate-Charge Characteristics

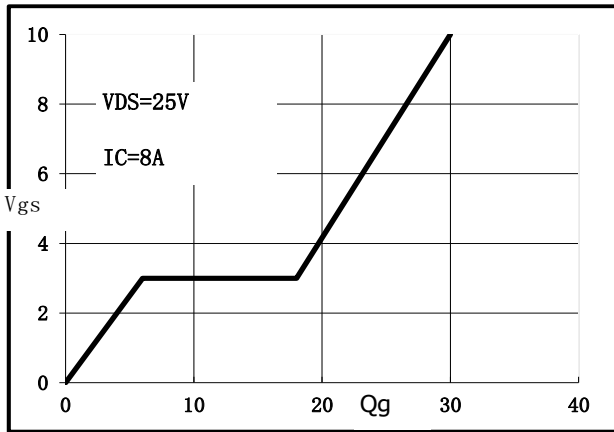


Fig.2 Capacitance Characteristics

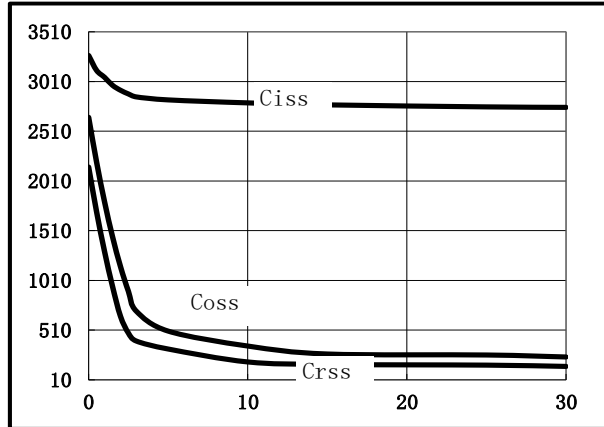


Fig.3 Power Dissipation Derating Curve

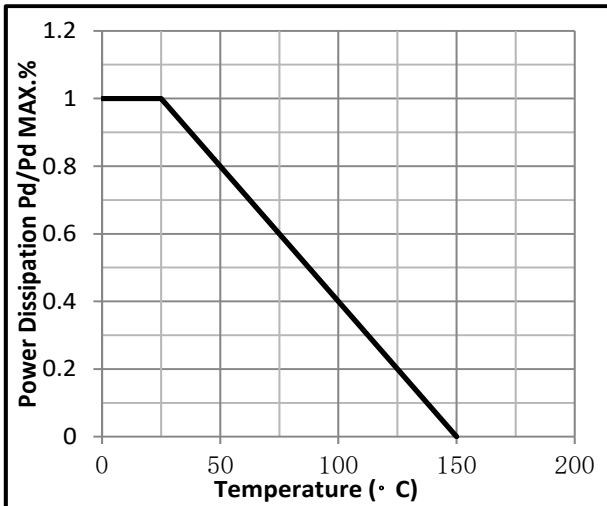


Fig.4 Typical output Characteristics

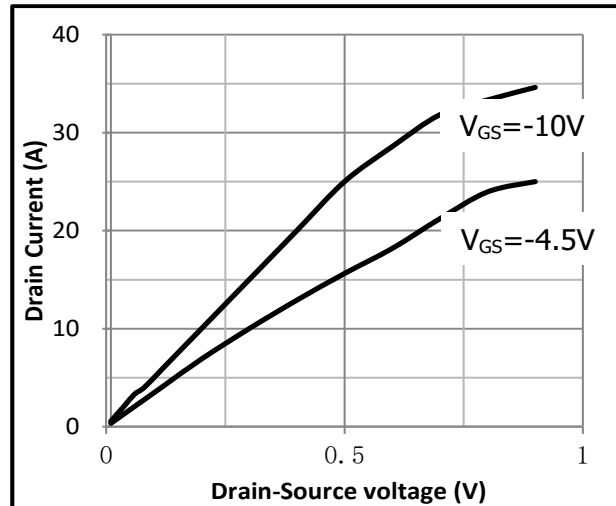


Fig.5 Threshold Voltage V.S Junction Temperature

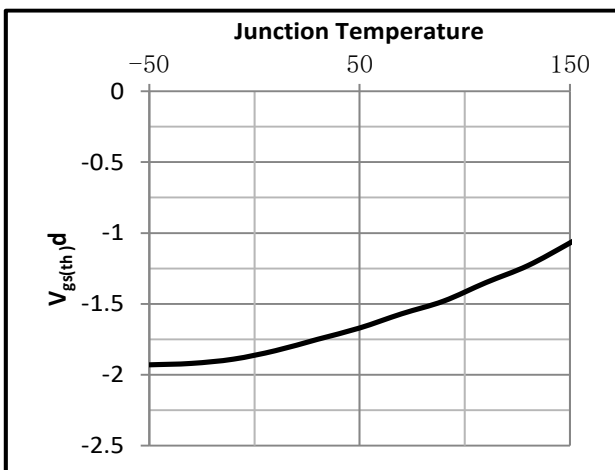


Fig.6 Resistance V.S Drain Current

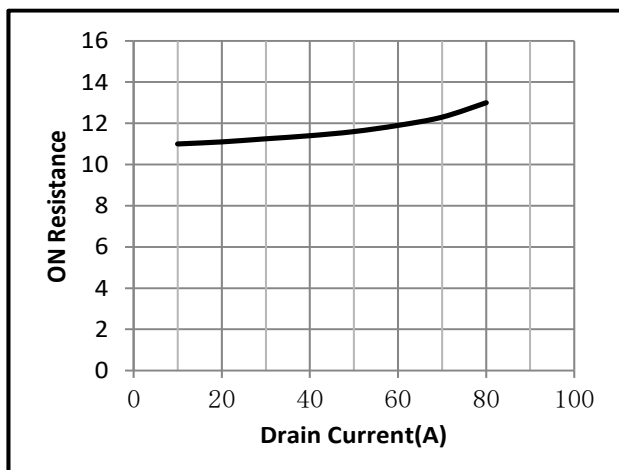


Fig.7 On-Resistance VS Gate Source Voltage

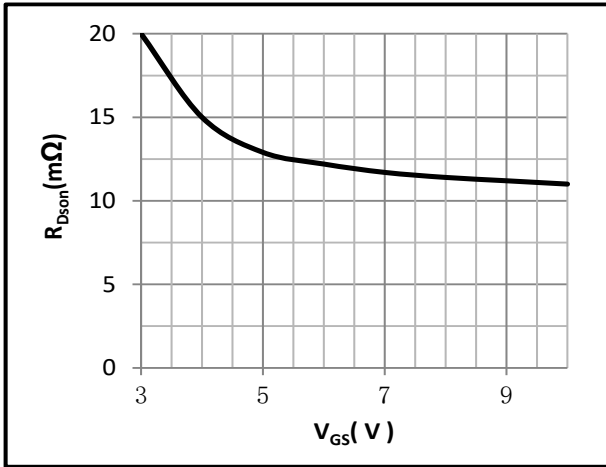


Fig.8 On-Resistance V.S Junction Temperature

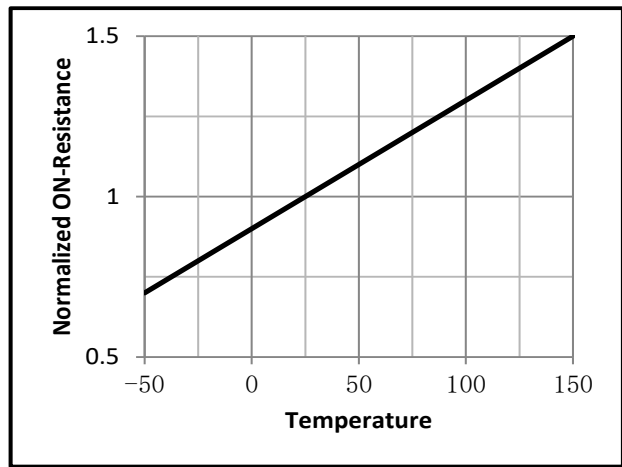


Fig.9 Switching Time Measurement Circuit

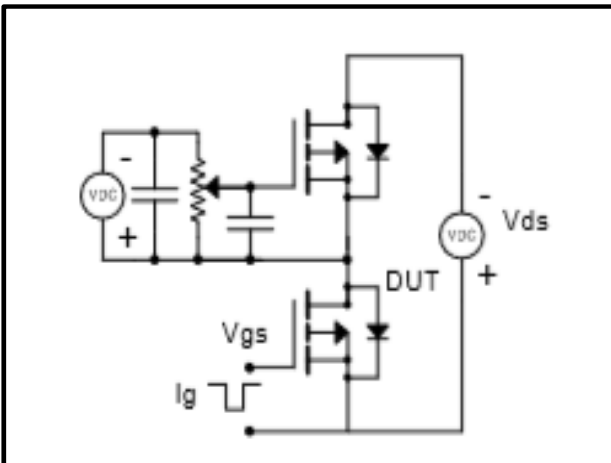


Fig.10 Gate Charge Waveform

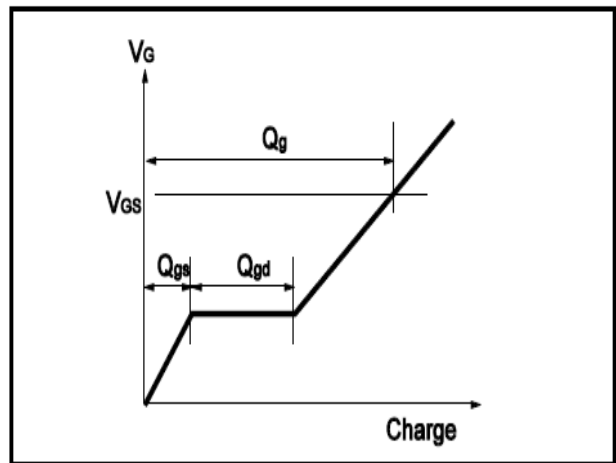


Fig.11 Switching Time Measurement Circuit

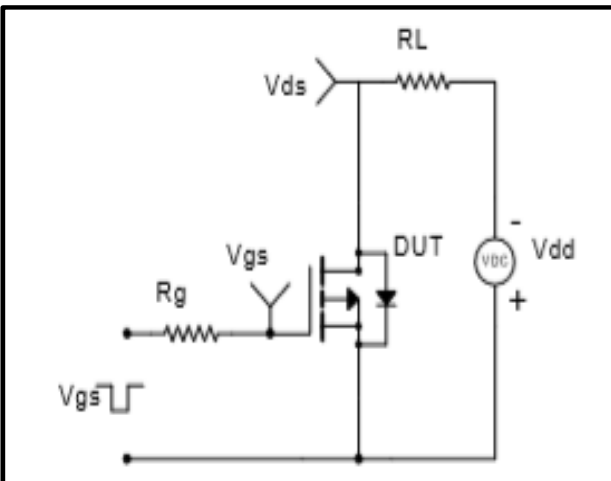
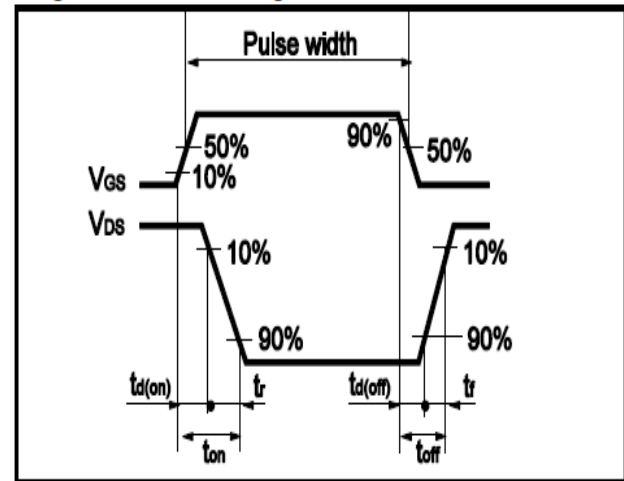
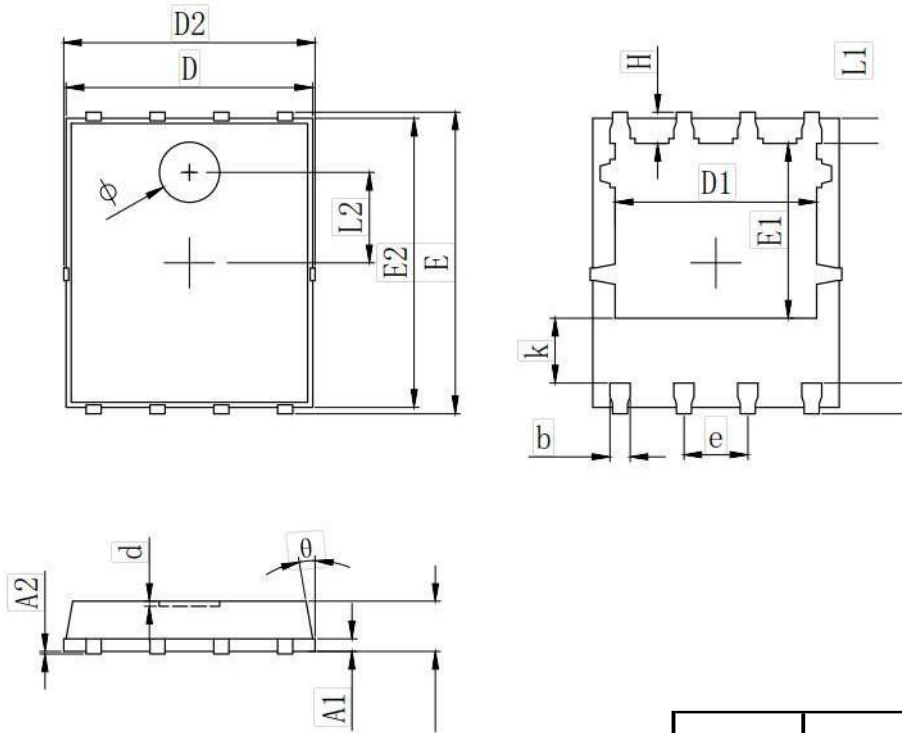


Fig.12 Gate Charge Waveform



**•Dimensions (DFN5×6)**


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	3.910	4.010	4.110
D2	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
$\theta$	8°	10°	12°
$\phi$	1.100	1.200	1.300
d			0.100




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