

● General Description

The AGM312M1 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

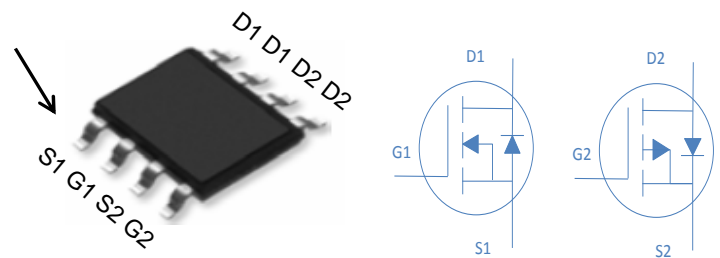
- Advance high cell density Trench technology
- Low $R_{DS(ON)}$ to minimize conductive loss
- Low Gate Charge for fast switching
- Low Thermal resistance

● Application

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

Product Summary

BVDSS	RDSON	ID
30V	18mΩ	9.0A
-30V	30mΩ	-7.2A

SOP-8 Pin Configuration

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AGM312M	AGM312M1	SOP-8	325mm	16mm	3000

Table 1. Absolute Maximum Ratings (TA=25°C)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage ($V_{GS}=0V$)	30	-30	V
V_{GS}	Gate-Source Voltage ($V_{DS}=0V$)	±20	±20	V
I_D	Drain Current-Continuous($T_c=25^\circ C$) (Note 1)	9.0	-7.2	A
	Drain Current-Continuous($T_c=100^\circ C$)	5.7	-4.7	A
IDM (pluse)	Drain Current-Continuous@ Current-Pulsed (Note 2)	24	-19	A
P_D	Total Power Dissipation($T_c=25^\circ C$)	5	5	W
	Total Power Dissipation($T_A=100^\circ C$)	0.2	0.2	W
EAS	Avalanche energy (Note 3)	25	25	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) ¹	---	62	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	24	°C/W

ELECTRICAL SPECIFICATIONS ($T_A = 25^\circ\text{C}$ unless otherwise noted)						
PARAMETER	CONDITIONS	SYMBOL	MIN	TYP	MAX	UNIT
Static ^(Note 4)						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	BV_{DSS}	30	--	--	V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(TH)}$	1.2	1.5	2.5	V
Gate Body Leakage	$V_{GS} = \pm 20V, V_{DS} = 0V$	I_{GSS}	--	--	± 100	nA
Zero Gate Voltage Drain Current	$V_{DS} = 30V, V_{GS} = 0V$	I_{DSS}	--	--	1	μA
	$V_{DS} = 24V, T_C = 125^\circ\text{C}$		--	--	10	
Drain-Source On-State Resistance	$V_{GS} = 10V, I_D = 10A$	$R_{DS(on)}$	--	18	29	m Ω
	$V_{GS} = 4.5V, I_D = 6A$		--	22	32	
Forward Transconductance	$V_{DS} = 5V, I_D = 6A$	g_{fs}	--	13	--	S
Dynamic ^(Note 5)						
Total Gate Charge	$V_{DS} = 15V, I_D = 8A,$ $V_{GS} = 4.5V$	Q_g	--	4.1	--	nC
Gate-Source Charge		Q_{gs}	--	1	--	
Gate-Drain Charge		Q_{gd}	--	2.1	--	
Input Capacitance	$V_{DS} = 25V, V_{GS} = 0V,$ $f = 1.0\text{MHz}$	C_{iss}	--	370	--	μF
Output Capacitance		C_{oss}	--	55	--	
Reverse Transfer Capacitance		C_{rss}	--	32	--	
Switching ^(Note 6)						
Turn-On Delay Time	$V_{DD} = 15V, I_D = 1A,$ $R_{GEN} = 6\Omega$	$t_{d(on)}$	--	2.8	--	ns
Turn-On Rise Time		t_r	--	7.2	--	
Turn-Off Delay Time		$t_{d(off)}$	--	15.8	--	
Turn-Off Fall Time		t_f	--	4.6	--	

Notes:

1. Current limited by package
2. Pulse width limited by the maximum junction temperature
3. $L = 0.1\text{mH}, I_{AS} = 17A, V_{DD} = 25V, R_G = 25\Omega,$ Starting $T_J = 25^\circ\text{C}$
4. Pulse test: $PW \leq 300\mu s,$ duty cycle $\leq 2\%$
5. For DESIGN AID ONLY, not subject to production testing.
6. Switching time is essentially independent of operating temperature.

N- Channel Typical Electrical and Thermal Characteristics (Curves)
•Thermal resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction - case	R_{thJC}	-	-	34	$^{\circ}C/W$
Thermal resistance, junction - ambient	R_{thJA}	-	-	180	$^{\circ}C/W$
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	$^{\circ}C$

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=-250\mu A$	-30			V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.2		-2.5	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=-30V, V_{GS}=0V$			-1.0	μA
Gate- Source Leakage Current	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$			± 100	nA
Static Drain-source On Resistance	$R_{DS(ON)}$	$V_{GS}=-10V, I_D=-20A$		31	42	$m\Omega$
		$V_{GS}=-4.5V, I_D=-10A$		39	56	$m\Omega$
Forward Transconductance	g_{FS}	$V_{DS}=-10V, I_D=-5A$		6		S
Source-drain voltage	V_{SD}	$I_S=-20A$			1.28	V

•Electronic Characteristics

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Input capacitance	C_{iss}	$f = 1MHz$	-	850	-	μF
Output capacitance	C_{oss}		-	140	-	
Reverse transfer capacitance	C_{rss}		-	103	-	

•Gate Charge characteristics($T_a = 25^{\circ}C$)

Parameter	Symbol	Condition	Min.	Typ	Max.	Unit
Total gate charge	Q_g	$V_{DD}=25V$	-	13	-	nC
Gate - Source charge	Q_{gs}	$I_D=2A$	-	7	-	
Gate - Drain charge	Q_{gd}	$V_{GS}=10V$	-	2	-	

N-CH Electrical Characteristics (T_J=25 °C, unless otherwise)

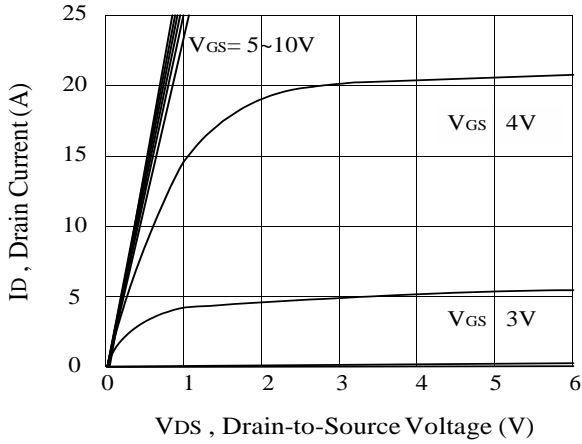


Figure 1. Output Characteristics

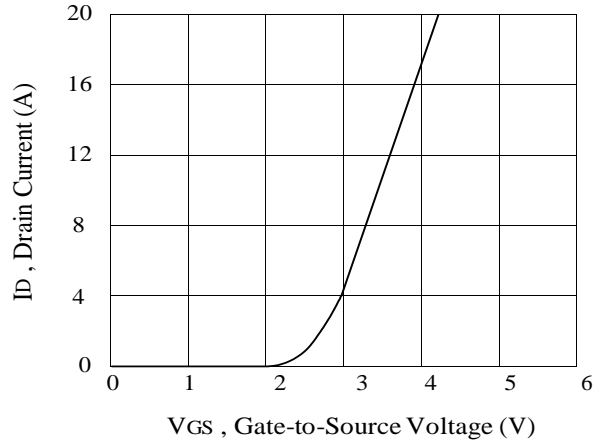


Figure 2. Transfer Characteristics

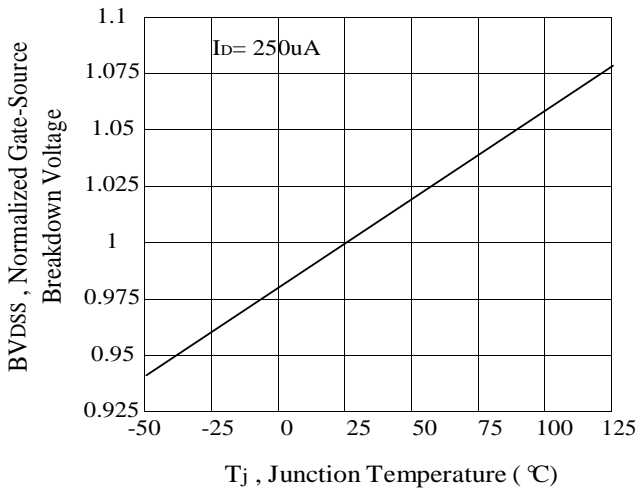


Figure 3. Breakdown Voltage Variation with Temperature

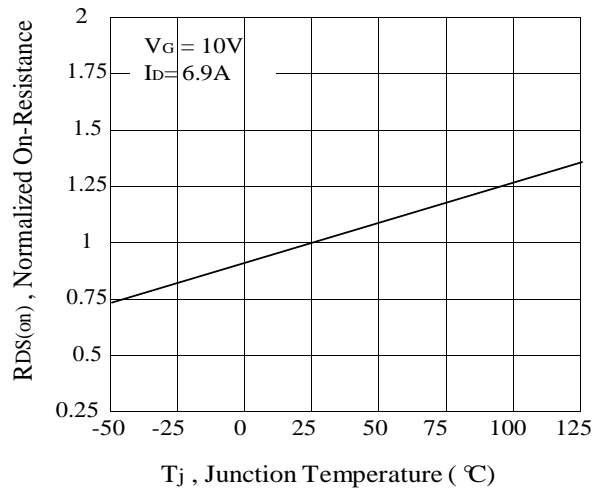


Figure 4. On-Resistance Variation with Temperature

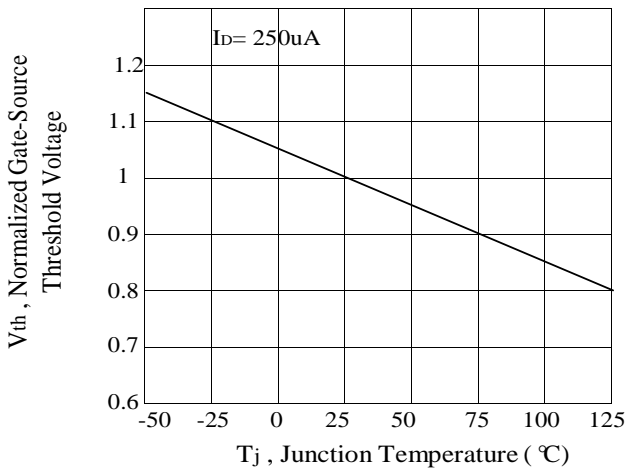


Figure 5. Gate Threshold Variation with Temperature

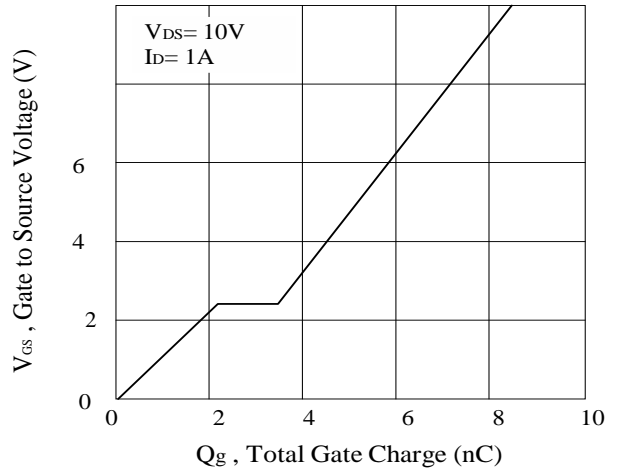
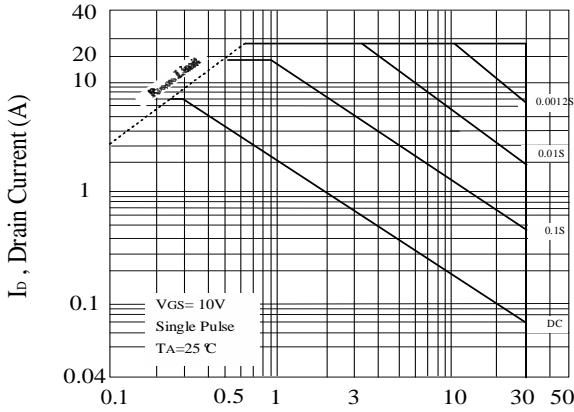
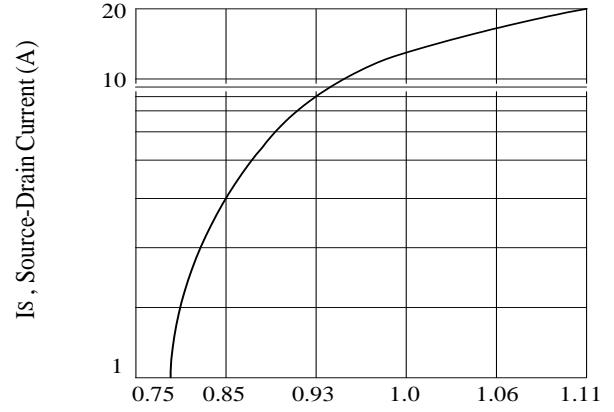


Figure 6. Gate Charge



V_{DS} , Drain-Source Voltage (V)
Figure 7. Maximum Safe Operating Area



V_{SD} , Body Diode Forward Voltage (V)
Figure 8. Body Diode Forward Voltage Variation with Source Current

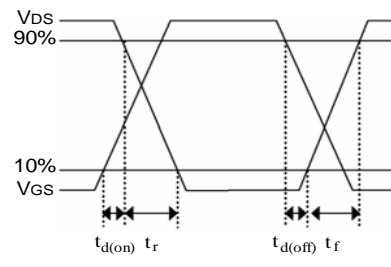
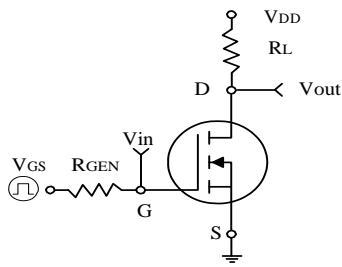


Figure 9. Switching Test Circuit and Switching Waveforms

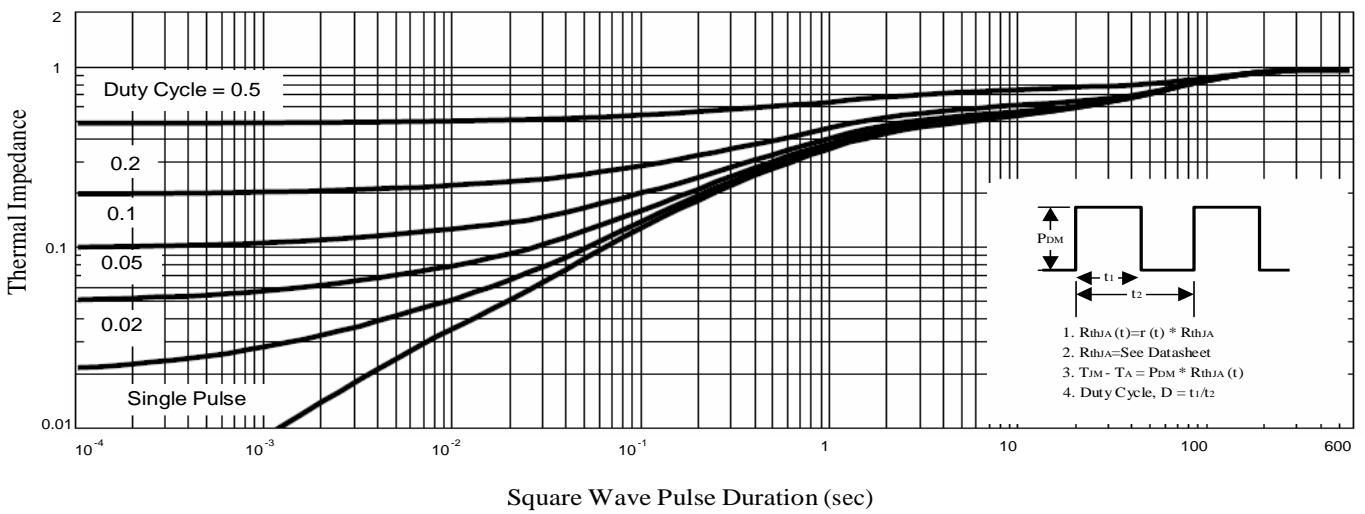


Figure 10. Normalized Thermal Transient Impedance Curve

●P Channel characteristics curve

Fig.1 Power Dissipation Derating Curve

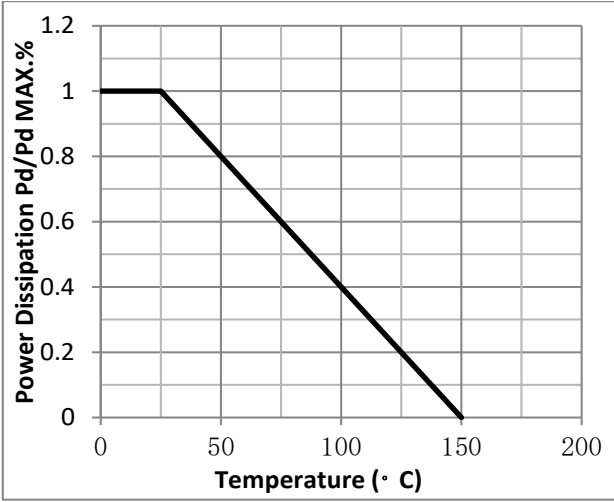


Fig.2 Typical output Characteristics

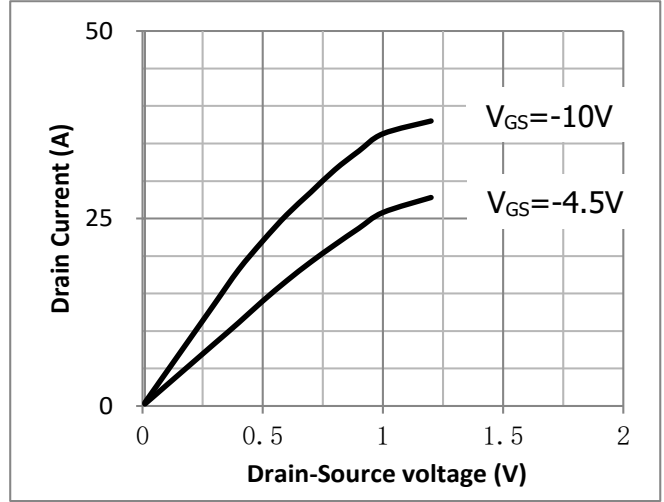


Fig.3 Threshold Voltage V.S Junction Temperature

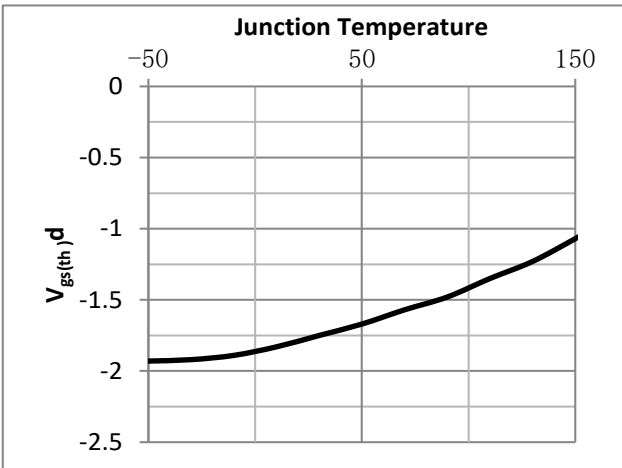


Fig.4 Resistance V.S Drain Current

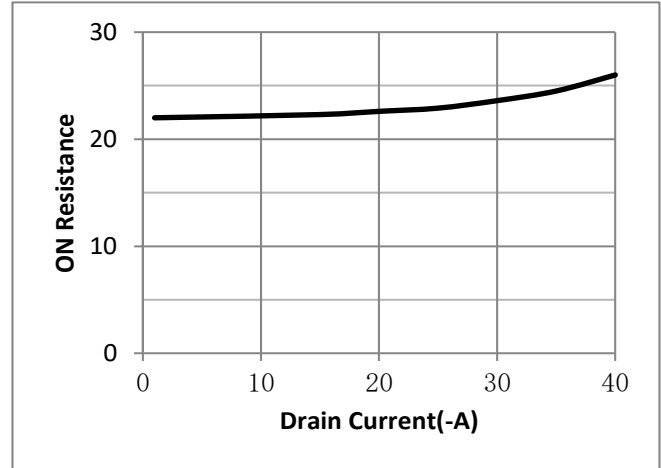


Fig.5 On-Resistance VS Gate Source Voltage

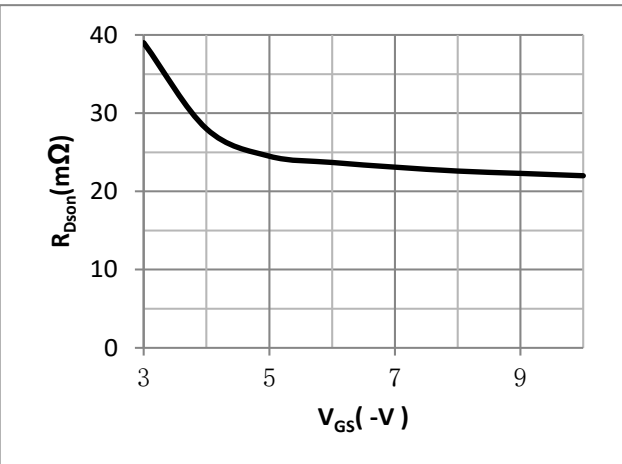
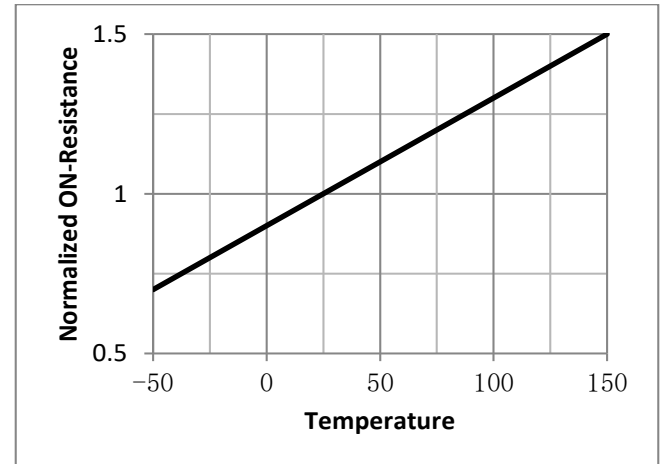


Fig.6 On-Resistance V.S Junction Temperature



•Test Circuit

Fig.1 Switching Time Measurement Circuit

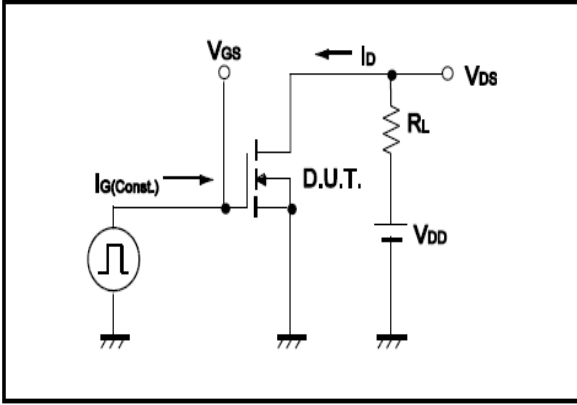


Fig.2 Gate Charge Waveform

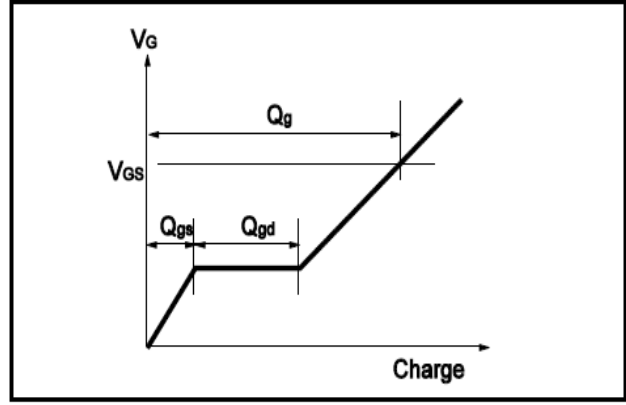


Fig.3 Switching Time Measurement Circuit

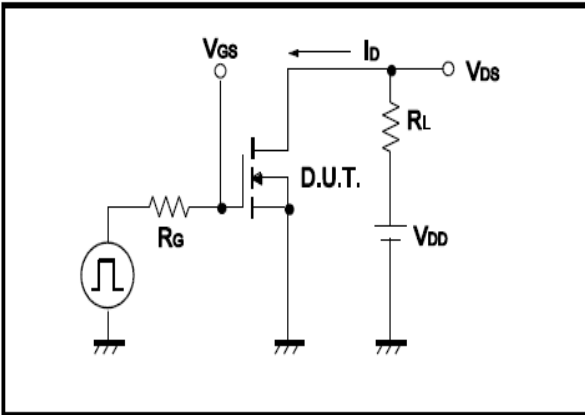


Fig.4 Gate Charge Waveform

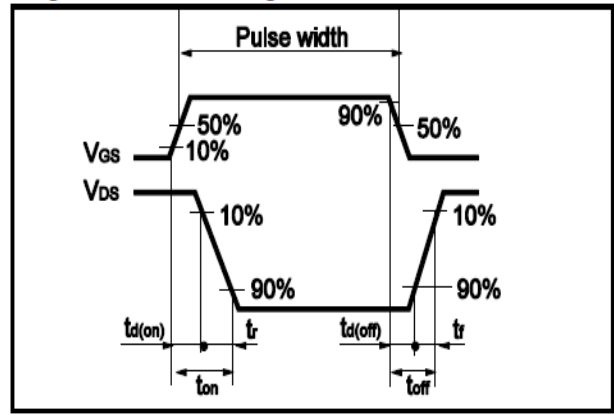


Fig.5 Avalanche Measurement Circuit

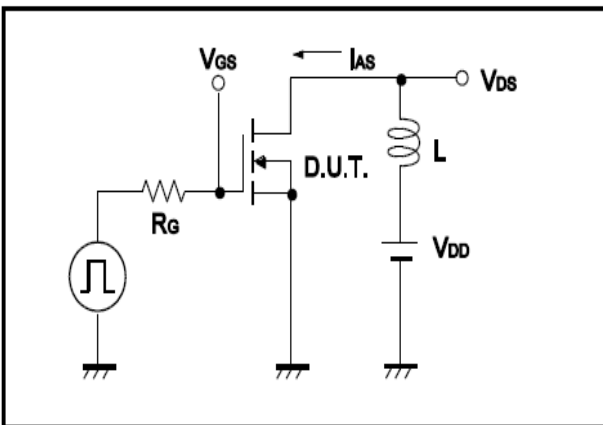
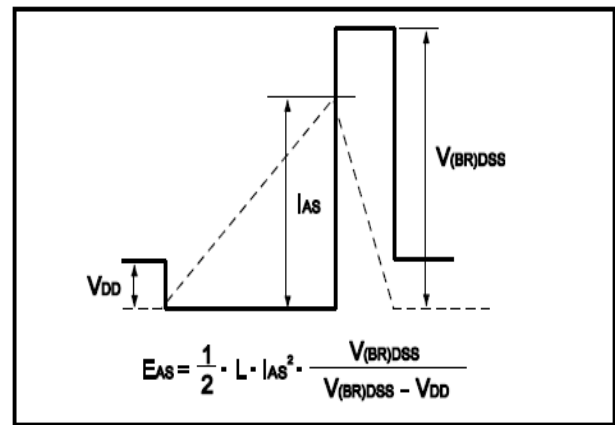
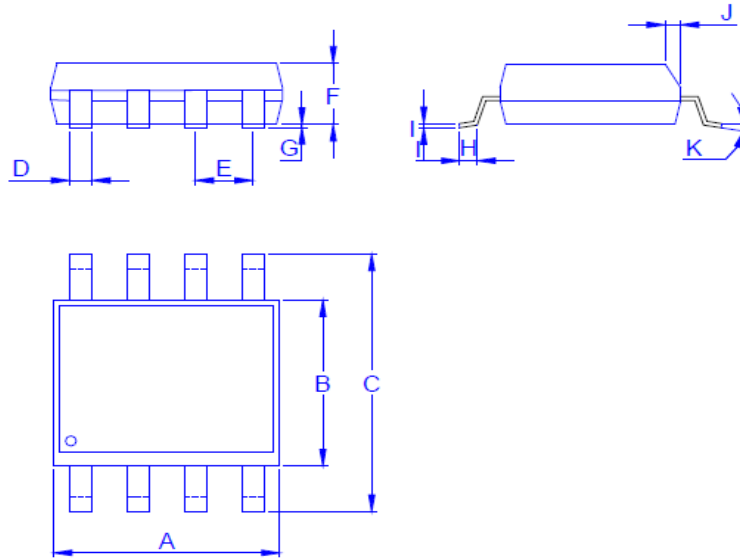


Fig.6 Avalanche Waveform



Package Outline

SOIC-8, 8leads



Dimension in mm

Dimension	A	B	C	D	E	F	G	H	I	J	K
Min.	4.70	3.70	5.80	0.33		1.20	0.08	0.40	0.19	0.25	0°
Typ.					1.27						
Max.	5.10	4.10	6.20	0.51		1.62	0.28	0.83	0.26	0.50	8°


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