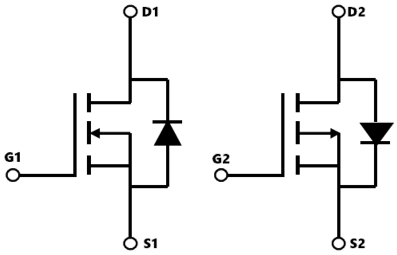
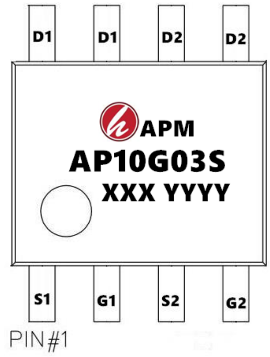
30V N+P-Channel Enhancement Mode MOSFET



Description

The AP10G03S uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.



General Features

V_{DS} = 30V I_D =12 A

$R_{DS(ON)}$ < 12mΩ @ V_{GS}=10V

V_{DS} = -30V I_D =-9.8 A

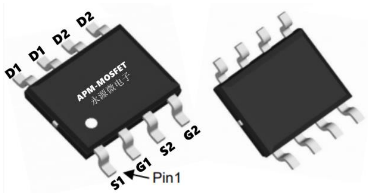
$R_{DS(ON)}$ < -25mΩ @ V_{GS}=10V

Application

Battery protection

Load switch

Uninterruptible power supply



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP10G03S	SOP-8	AP6G03S XXX YYYY	3000

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Ch	P-Ch	
V_{DS}	Drain-Source Voltage	30	-30	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T_A=25˚C	Continuous Drain Current, V_{GS} @ 10V[1]	12	-9.8	A
I_D@T_A=70˚C	Continuous Drain Current, V_{GS} @ 10V[1]	8.5	-7.2	A
I_{DM}	Pulsed Drain Current[2]	36	-32	A
EAS	Single Pulse Avalanche Energy[3]	24	72	mJ
I_{AS}	Avalanche Current	22	-38	A
P_D@T_A=25˚C	Total Power Dissipation[4]	1.5	1.5	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	˚C
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	˚C
$R_{θJA}$	Thermal Resistance Junction-Ambient [1]	---	85	˚C/W
$R_{θJC}$	Thermal Resistance Junction-Case[1]	---	25	˚C/W

30V N+P-Channel Enhancement Mode MOSFET

N-Channel Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	30	---	---	V
$ΔBV_{DSS}/ΔT_J$	BVDSS Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.023	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=8A	---	---	12	mΩ
		V_{GS}=4.5V , I_D=6A	---	---	18	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.2	---	2.5	V
$ΔV_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.08	---	mV/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=24V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=24V , V_{GS}=0V , T_J=55℃	---	---	5	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=5V , I_D=8A	---	24	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	1.8	---	Ω
Q_g	Total Gate Charge (4.5V)	V_{DS}=15V , V_{GS}=4.5V , I_D=8A	---	9.63	---	nC
Q_{gs}	Gate-Source Charge		---	3.88	---	
Q_{gd}	Gate-Drain Charge		---	3.44	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=15V , V_{GS}=10V , R_G=1.5 I_D=8A	---	4.2	---	ns
T_r	Rise Time		---	8.2	---	
$T_{d(off)}$	Turn-Off Delay Time		---	31	---	
T_f	Fall Time		---	4	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , f=1MHz	---	940	---	pF
C_{oss}	Output Capacitance		---	131	---	
C_{rss}	Reverse Transfer Capacitance		---	109	---	
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	9	A
I_{SM}	Pulsed Source Current[2,5]		---	---	36	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1	V
t_{rr}	Reverse Recovery Time	I_F=8A , dI/dt=100A/µs , T_J=25℃	---	8	---	nS
Q_{rr}	Reverse Recovery Charge		---	2.9	---	nC

Note :

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data shows Max. rating . The test condition is V_{DD}=25V,V_{GS}=10V,L=0.1mH,I_{AS}=21A

4 .The power dissipation is limited by 150℃ junction temperature

5.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

P-Channel Electrical Characteristics (T_J=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BVDSS Temperature Coefficient	Reference to 25℃ , I_D=-1mA	---	-0.022	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=-10V , I_D=-6A	---	---	25	mΩ
		V_{GS}=-4.5V , I_D=-4A	---	---	42	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =-250uA	-1.0	---	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.6	---	mV/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-24V , V_{GS}=0V , T_J=25℃	---	---	-1	uA
		V_{DS}=-24V , V_{GS}=0V , T_J=55℃	---	---	-5	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=-5V , I_D=-6A	---	17	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	13	---	
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-15V , V_{GS}=-4.5V , I_D=-6A	---	12.6	---	nC
Q_{gs}	Gate-Source Charge		---	4.8	---	
Q_{gd}	Gate-Drain Charge		---	4.8	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=-15V , V_{GS}=-10V , R_G=3.3 , I_D=-6A	---	4.6	---	ns
T_r	Rise Time		---	14.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	41	---	
T_f	Fall Time		---	19.6	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , f=1MHz	---	1345	---	pF
C_{oss}	Output Capacitance		---	194	---	
C_{rss}	Reverse Transfer Capacitance		---	158	---	
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	-6.5	A
I_{SM}	Pulsed Source Current[2,5]		---	---	-26	A
V_{SD}	Diode Forward Voltage[2]	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1.2	V

Note :

1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZcopper.

2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3.The EAS data sh.The power dissipation is limited by ows Max. rating

4. The test condition is V150℃ junction temperature$_{DD}$=-25 V,V_{GS}=-10V,L=0.1mH,I_{AS}=-30A

5 .The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

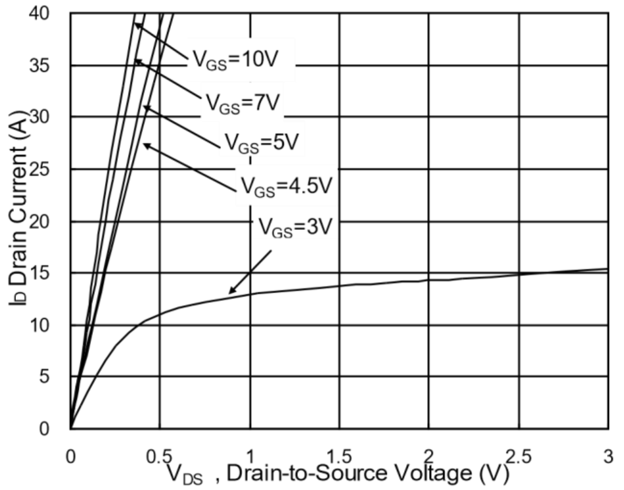


Fig.1 Typical Output Characteristics

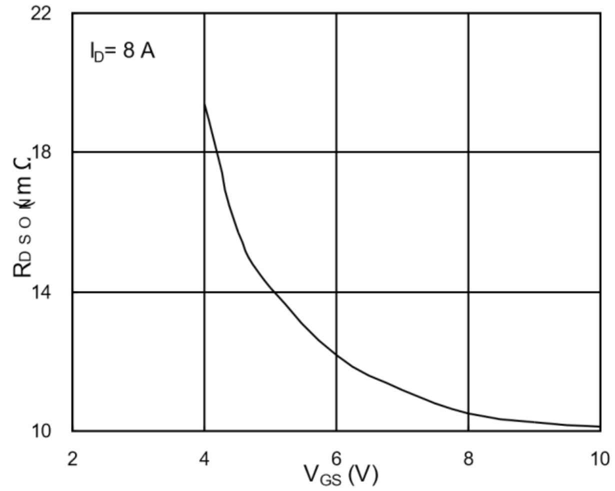


Fig.2 On-Resistance vs. G-S Voltage

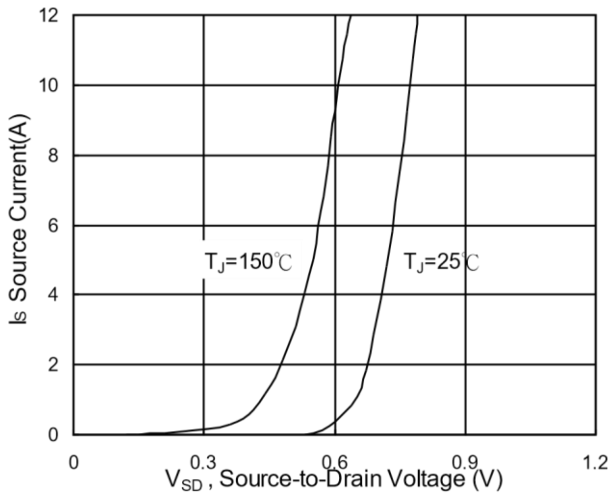


Fig.3 Forward Characteristics of Reverse

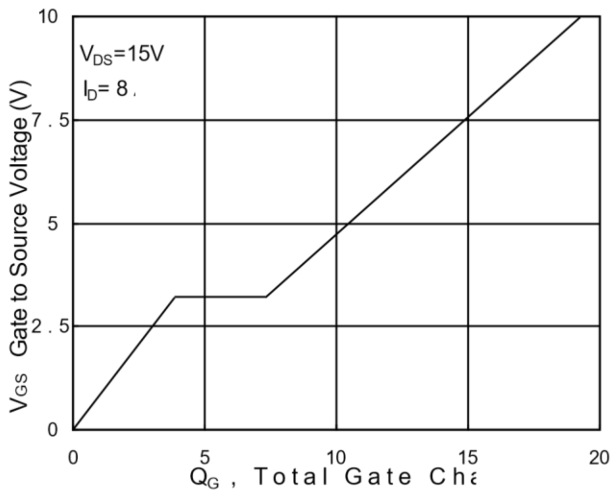


Fig.4 Gate-Charge Characteristics

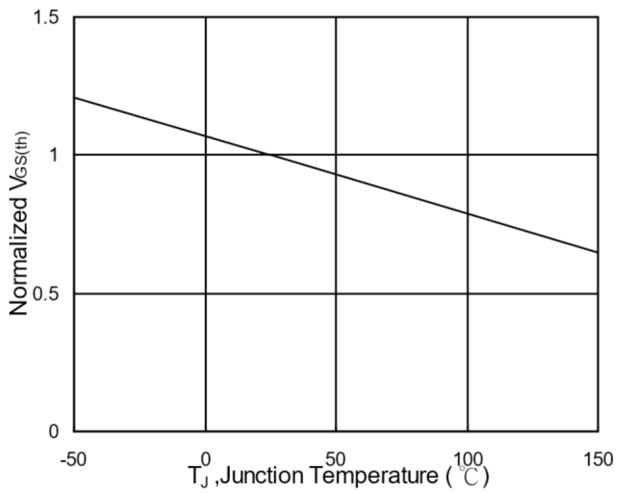


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

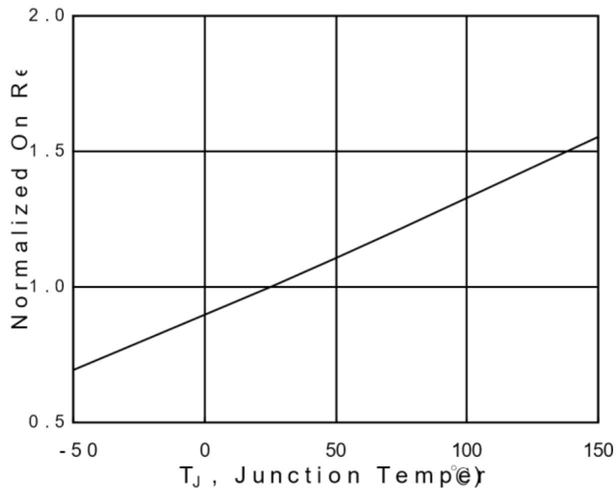


Fig.6 Normalized R_{DSON} vs. T_J

30V N+P-Channel Enhancement Mode MOSFET

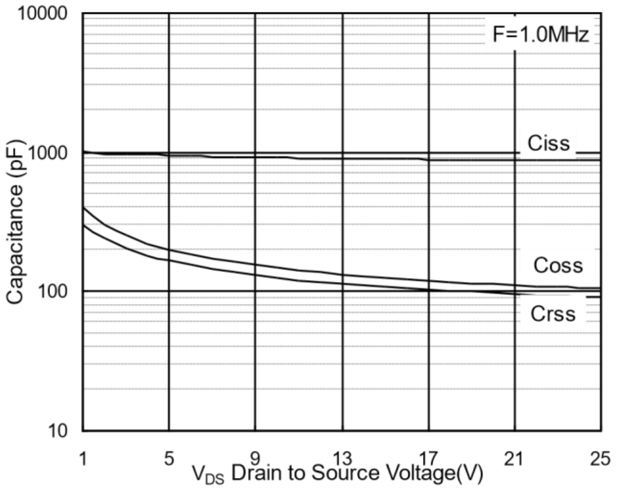


Fig.7 Capacitance

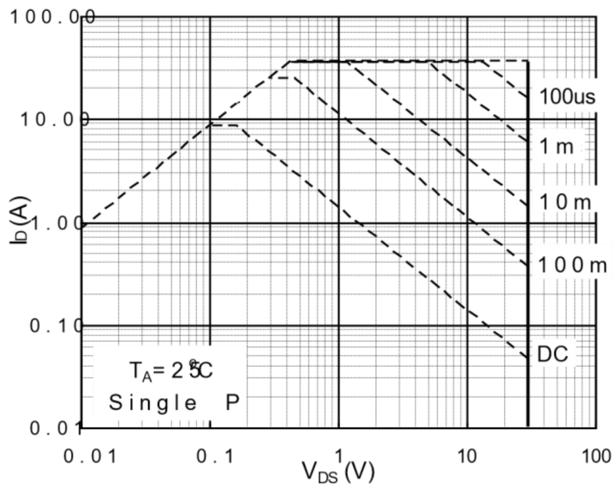


Fig.8 Safe Operating Area

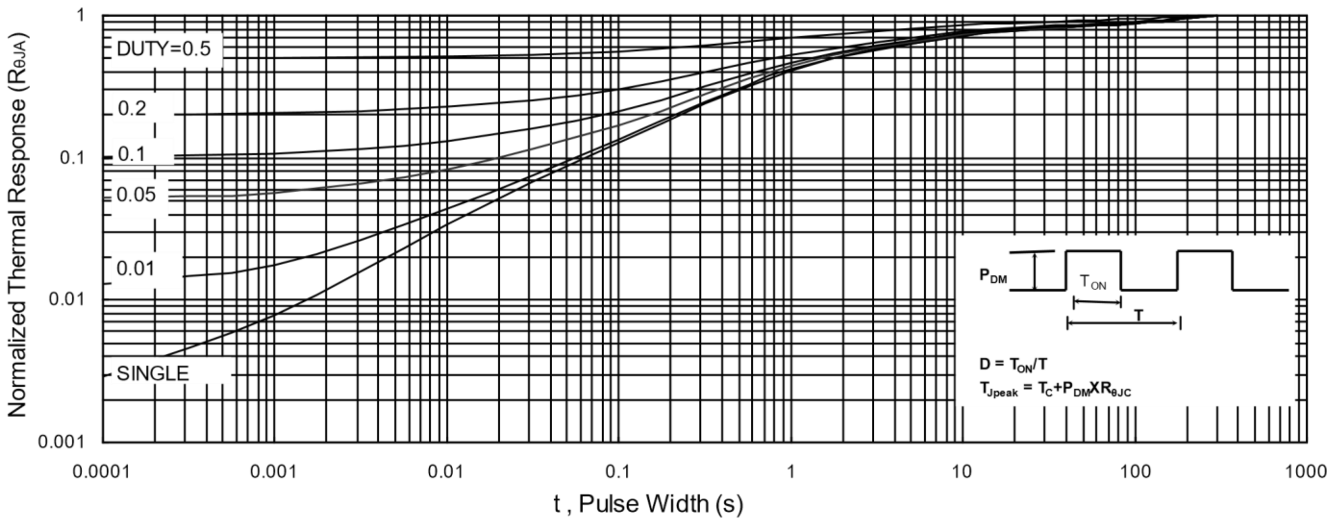


Fig.9 Normalized Maximum Transient Thermal Impedance

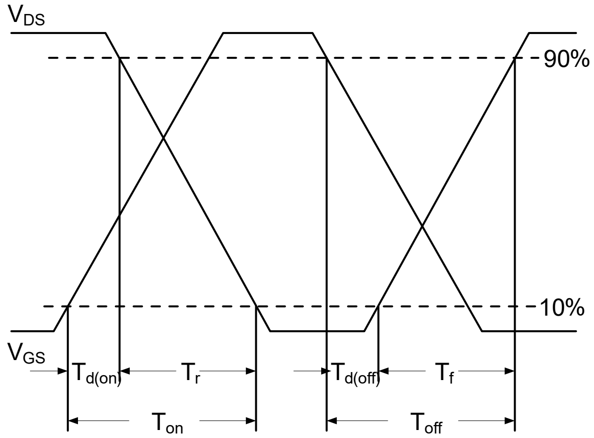


Fig.10 Switching Time Waveform

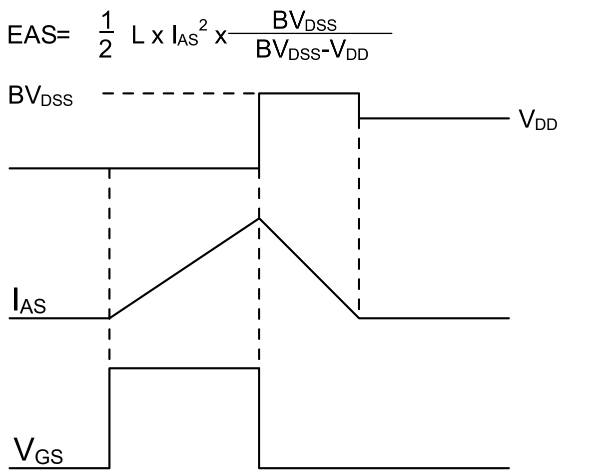


Fig.11 Unclamped Inductive Switching Waveform

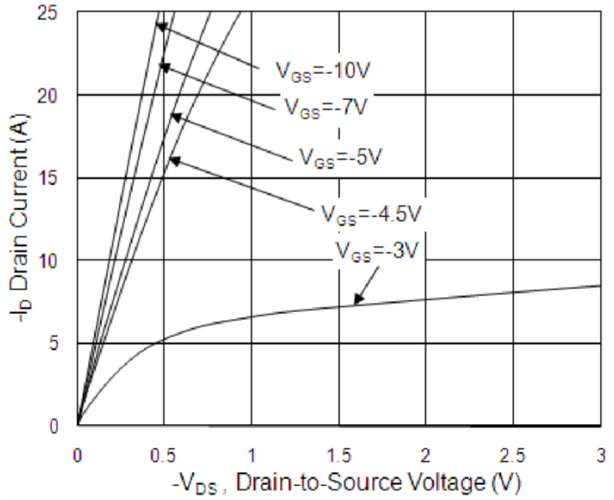


Fig.1 Typical Output Characteristics

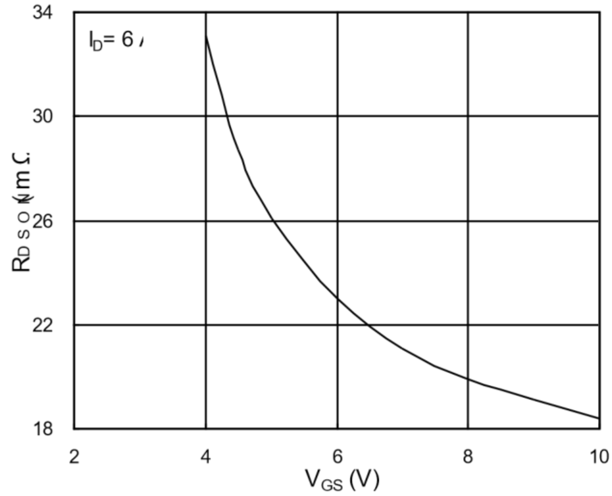


Fig.2 On-Resistance v.s Gate-Source

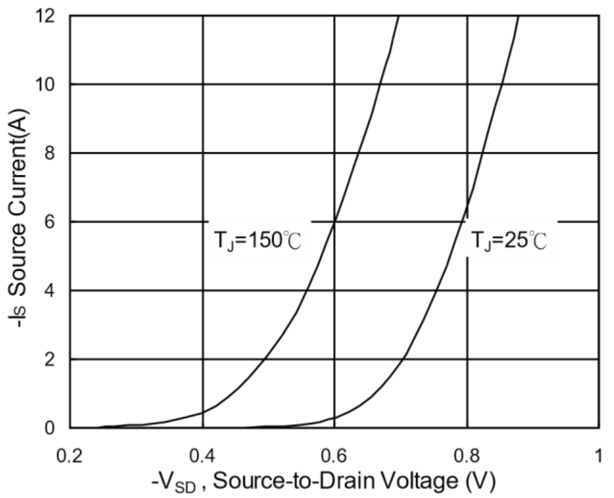


Fig.3 Forward Characteristics of Reverse

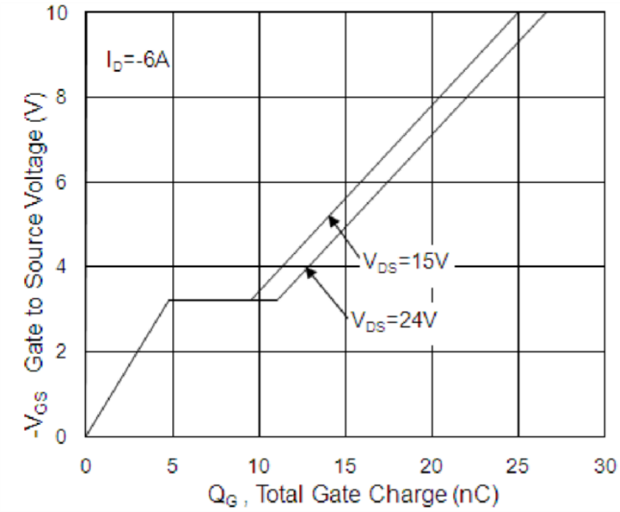


Fig.4 Gate-Charge Characteristics

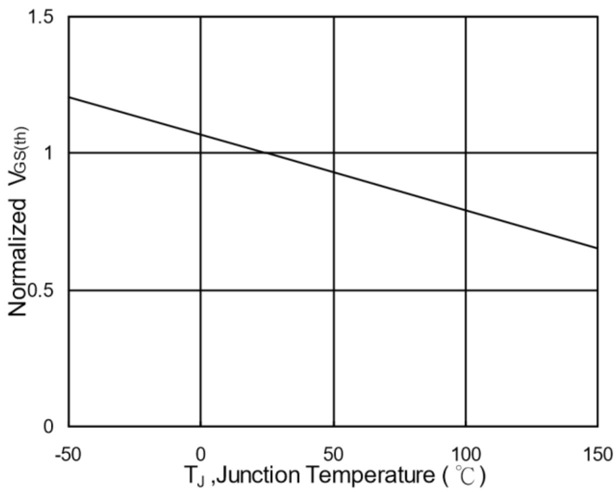


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

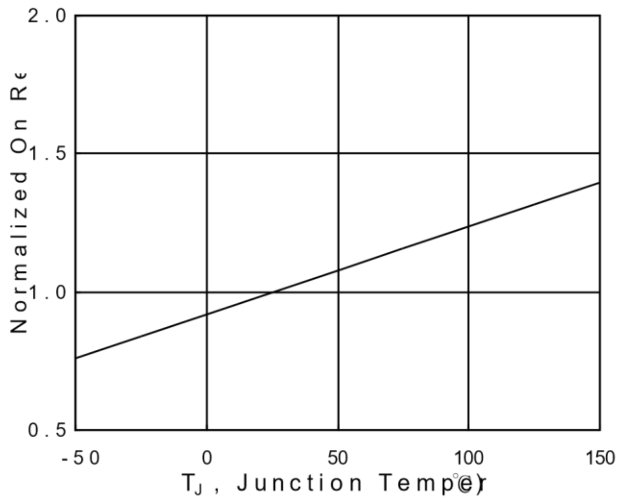


Fig.6 Normalized R_{DSON} v.s T_J

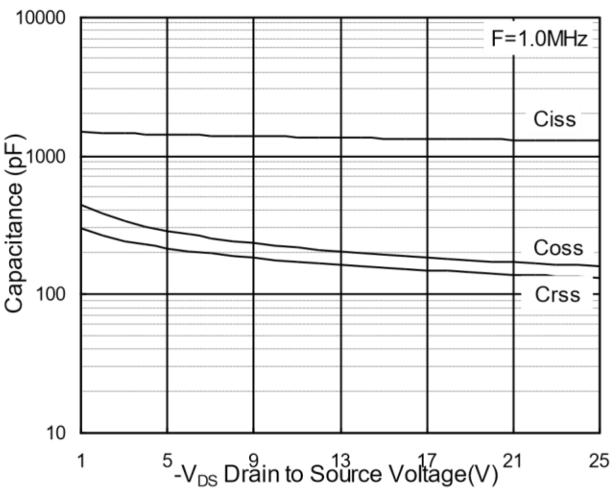


Fig.7 Capacitance

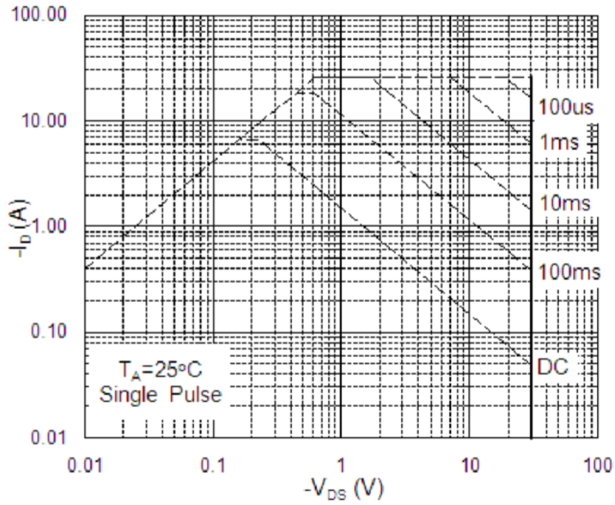


Fig.8 Safe Operating Area

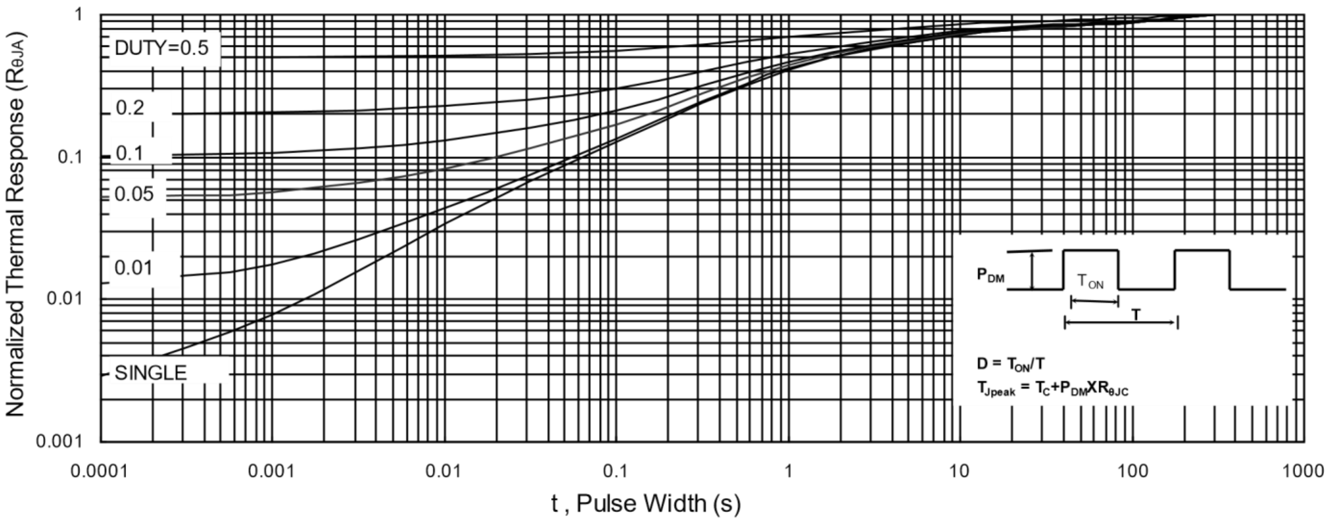


Fig.9 Normalized Maximum Transient Thermal Impedance

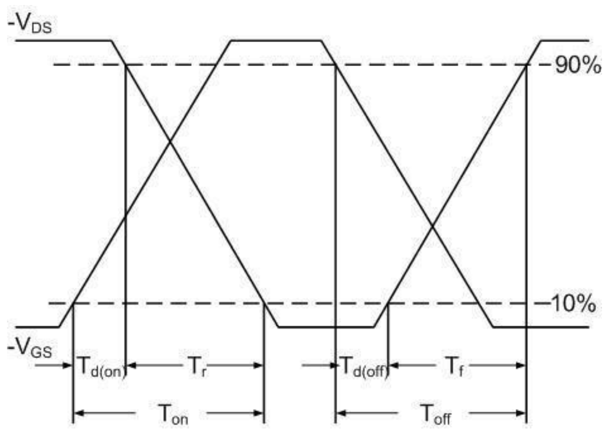


Fig.10 Switching Time Waveform

$$EAS = \frac{1}{2} L \times (-I_{AS}^2) \times \frac{-BV_{DSS}}{-BV_{DSS}-(-V_{DD})}$$

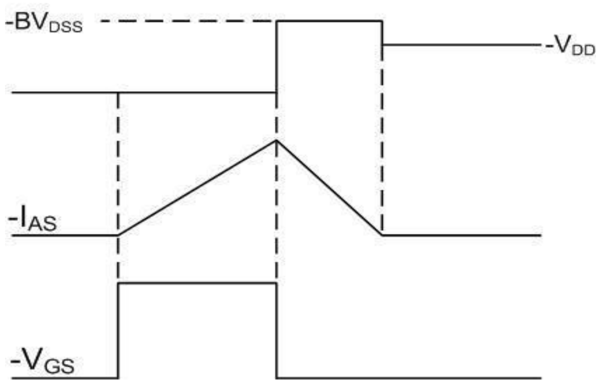
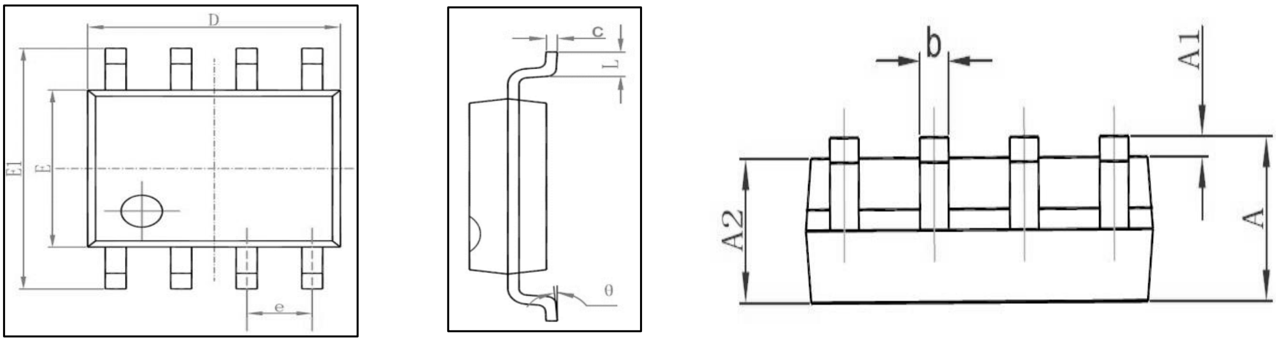
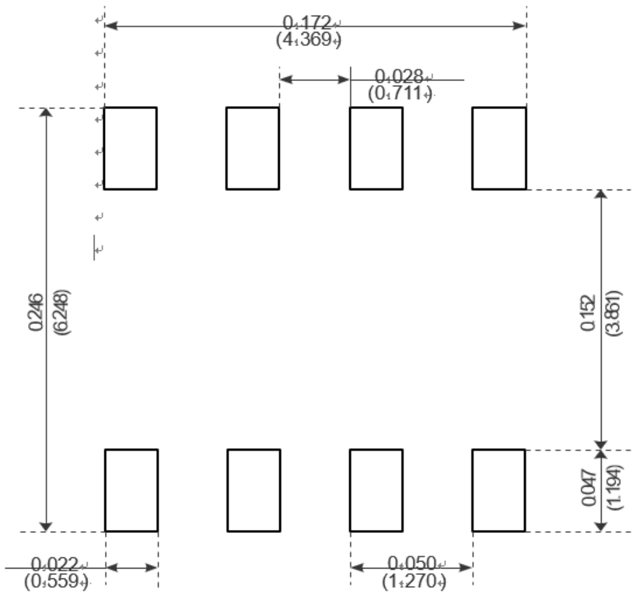


Fig.11 Unclamped Inductive Switching Waveform

Package Mechanical Data-SOP-8/ESOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



Recommended Minimum Pads

Attention

1,Any and all APM Microelectronics products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your APM Microelectronics representative nearest you before using any APM Microelectronics products described or contained herein in such applications.

2,APM Microelectronics assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all APM Microelectronics products described or contained herein.

3, Specifications of any and all APM Microelectronics products described or contained here instipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer’s products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer’s products or equipment.

4, APM Microelectronics Semiconductor CO., LTD. strives to supply high quality high reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design,and structural design.

5,In the event that any or all APM Microelectronics products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

6, No part of this publication may be reproduced or transmitted in any form or by any means,electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of APM Microelectronics Semiconductor CO., LTD.

7, Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. APM Microelectronics believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

8, Any and all information described or contained herein are subject to change without notice due to product/technology improvement,etc. When designing equipment, refer to the "Delivery Specification" for the APM Microelectronics product that you Intend to use.