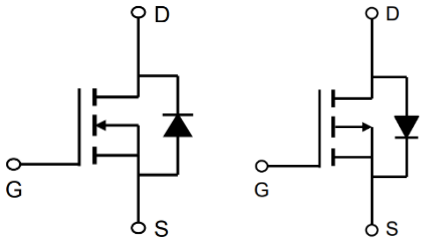
APM
A Power Microelectronics

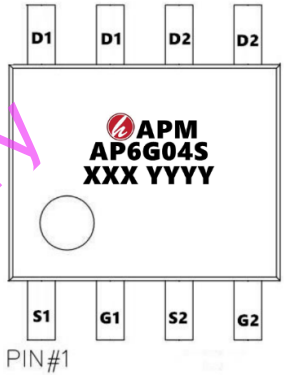
AP6G04S

40V N+P-Channel Enhancement Mode MOSFET

Description

The AP6G04S 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} = 40V I_D =6.3A

$R_{DS(ON)}$ < 37mΩ @ V_{GS}=10V （Type：30mΩ）

V_{DS} = -40V I_D =-6.1A

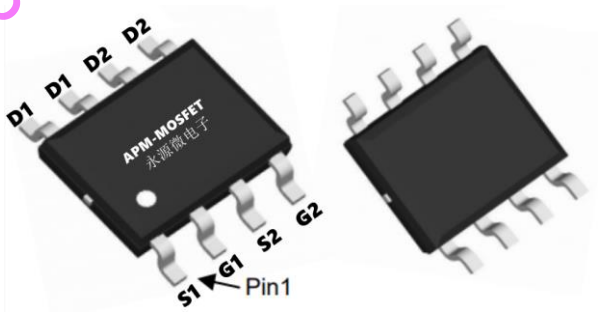
$R_{DS(ON)}$ < 75mΩ @ V_{GS}=-10V （Type：62mΩ）

Application

Wireless charging

Boost driver

Brushless motor



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP6G04S	SOP-8	AP6G04S 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	40	-40	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T_A=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	6.3	-6.1	A
I_D@T_A=70℃	Continuous Drain Current, V_{GS} @ 10V[1]	4.9	-4.8	A
I_{DM}	Pulsed Drain Current[2]	23	-22	A
EAS	Single Pulse Avalanche Energy[3]	16.2	39	mJ
I_{AS}	Avalanche Current	6.8	-6.8	A
P_D@T_A=25℃	Total Power Dissipation[4]	1.67	1.67	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	℃
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	75		℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	30		℃/W

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	40	44	---	V
△BVDSS/△TJ	BVDSS Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.032	---	V/℃
RDS(ON)	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=4A	---	30	37	mΩ
		V_{GS}=4.5V , I_D=3A	---	40	50	
VGS(th)	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.5	2.5	V
△$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-4.5	---	mV/℃
IDSS	Drain-Source Leakage Current	V_{DS}=32V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=32V , V_{GS}=0V , T_J=55℃	---	---	5	
IGSS	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=5V , I_D=4A	---	8	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	2.4	4.8	Ω
Q_g	Total Gate Charge (4.5V)	V_{DS}=15V , V_{GS}=4.5V , I_D=3A	---	5	---	nC
Qgs	Gate-Source Charge		---	1.54	---	
Qgd	Gate-Drain Charge		---	1.84	---	
Td(on)	Turn-On Delay Time	V_{DD}=15V , V_{GS}=10V , R_G=3.3Ω , I_D=1A	---	7.8	---	ns
T_r	Rise Time		---	2.1	---	
Td(off)	Turn-Off Delay Time		---	29	---	
T_f	Fall Time		---	2.1	---	
Ciss	Input Capacitance	V_{DS}=15V , V_{GS}=0V , f=1MHz	---	452	---	pF
Coss	Output Capacitance		---	51	---	
Crss	Reverse Transfer Capacitance		---	38	---	
IS	Continuous Source Current[1,4]	V_G=V_D=0V , Force Current	---	---	4.5	A
ISM	Pulsed Source Current[2,4]		---	---	14	A
VSD	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 inch² FR-4 board with 2OZ copper.

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

3、The power dissipation is limited by 150℃ junction temperature

4、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
BVDSS	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-40	-44	---	V
△BVDSS/△TJ	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=-1mA	---	-0.018	---	V/℃
RDS(ON)	Static Drain-Source On-Resistance[2]	V_{GS}=-10V , I_D=-3A	---	62	75	mΩ
		V_{GS}=-4.5V , I_D=-2A	---	81	100	
VGS(th)	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =-250uA	-1.0	-1.5	-2.5	V
△$V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	2.5	---	mV/℃
IDSS	Drain-Source Leakage Current	V_{DS}=-40V , V_{GS}=0V , T_J=25℃	---	---	-1	uA
		V_{DS}=-40V , V_{GS}=0V , T_J=55℃	---	---	-5	
IGSS	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
gfs	Forward Transconductance	V_{DS}=-5V , I_D=-3A	---	5.8	---	S
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-32V , V_{GS}=-4.5V , I_D=-3A	---	6.4	---	nC
Qgs	Gate-Source Charge		---	2.1	---	
Qgd	Gate-Drain Charge		---	2.5	---	
Td(on)	Turn-On Delay Time	V_{DD}=-20V , V_{GS}=-4.5V , R_G=3.3Ω, I_D=-3A	---	4.2	---	ns
T_r	Rise Time		---	23	---	
Td(off)	Turn-Off Delay Time		---	26.8	---	
T_f	Fall Time		---	20.6	---	
Ciss	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , f=1MHz	---	620	---	pF
Coss	Output Capacitance		---	65	---	
Crss	Reverse Transfer Capacitance		---	53	---	
IS	Continuous Source Current[1,4]	V_G=V_D=0V , Force Current	---	---	-3.2	A
ISM	Pulsed Source Current[2,4]		---	---	-16.1	A
VSD	Diode Forward Voltage[2]	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1	V

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 power dissipation is limited by 150℃ junction temperature
4、The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

N-Typical Characteristics

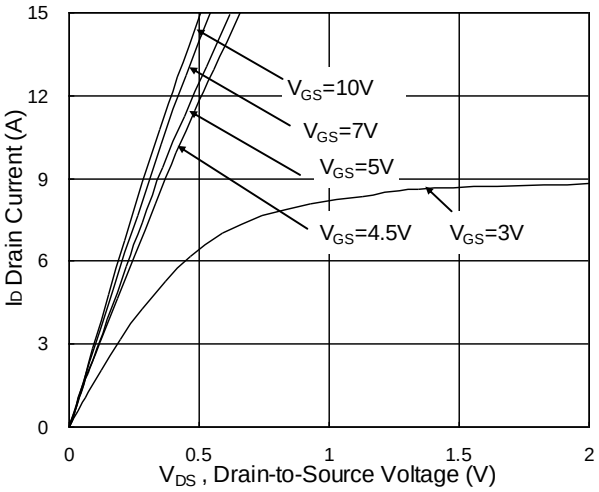


Fig.1 Typical Output Characteristics

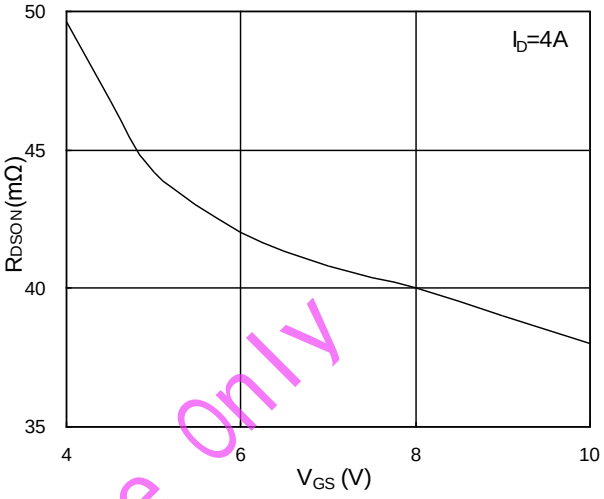


Fig.2 On-Resistance vs. Gate-Source

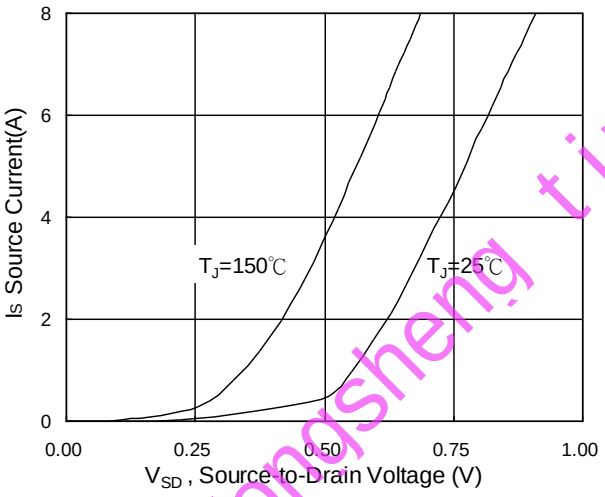


Fig.3 Forward Characteristics Of Reverse

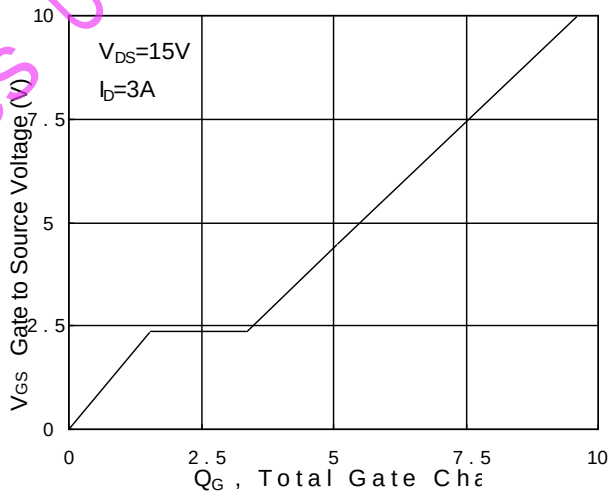


Fig.4 Gate-Charge Characteristics

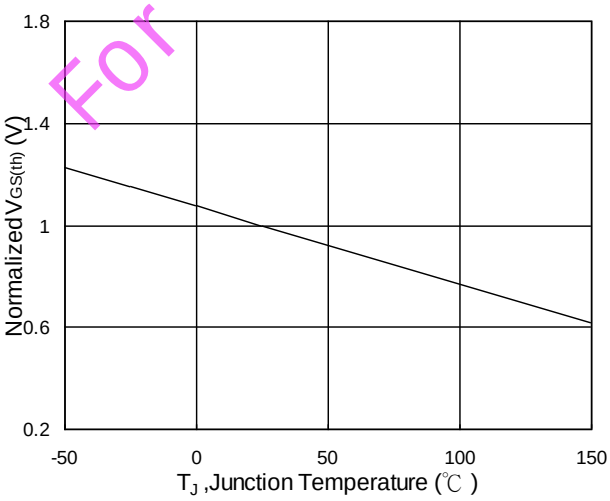


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

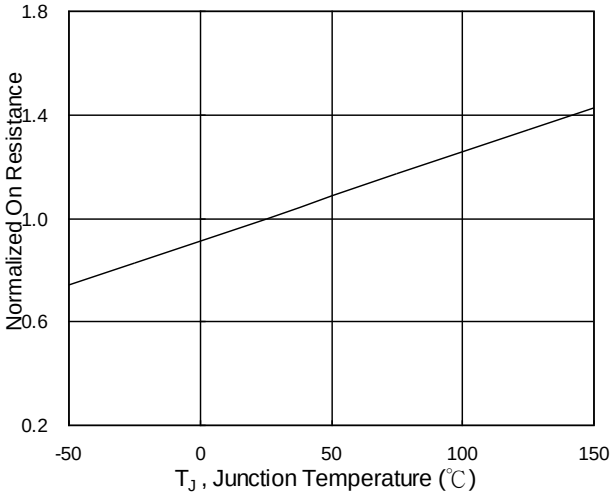


Fig.6 Normalized R_{DSON} vs. T_J

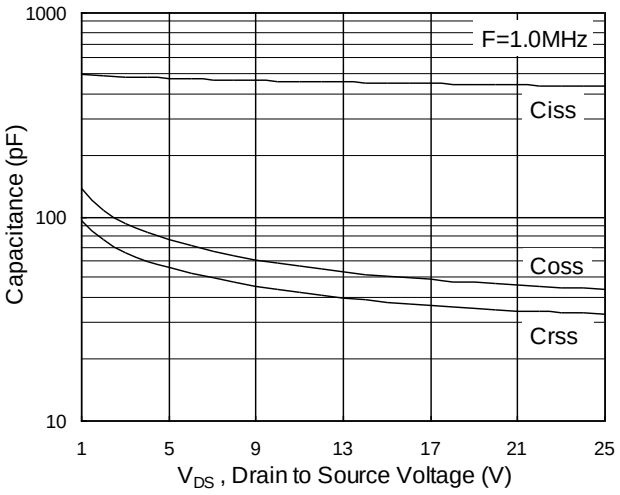


Fig.7 Capacitance

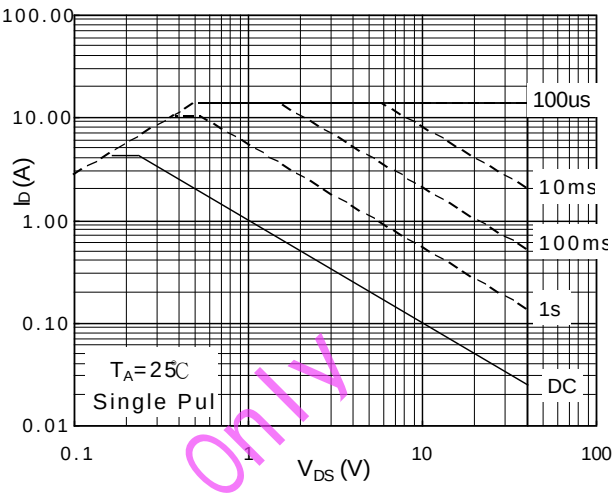


Fig.8 Safe Operating Area

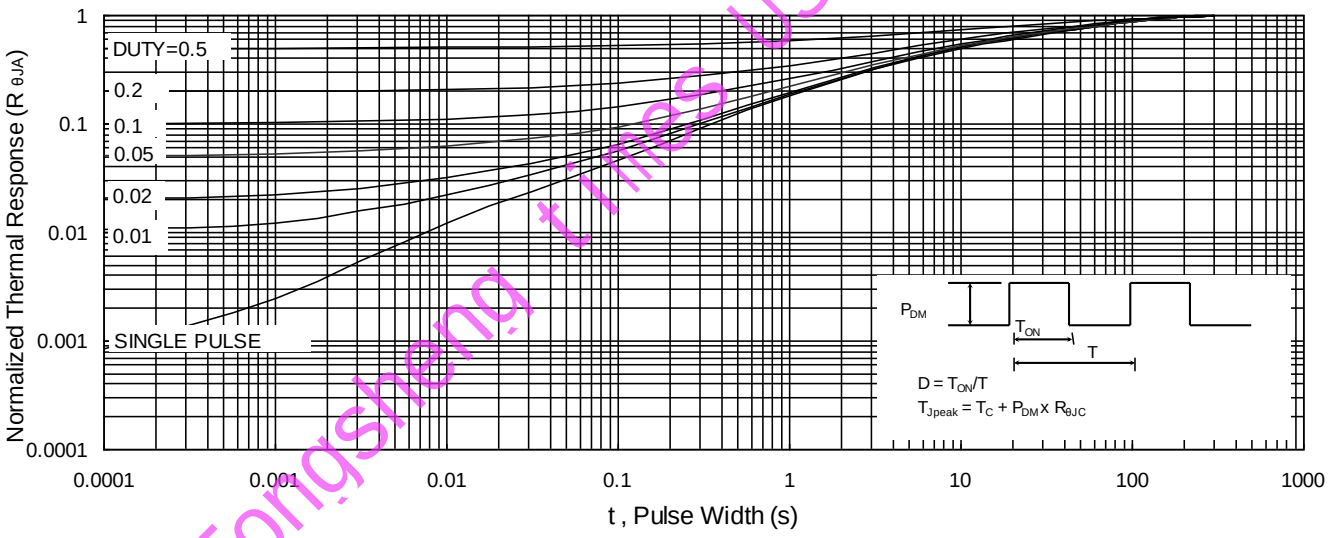


Fig.9 Normalized Maximum Transient Thermal Impedance

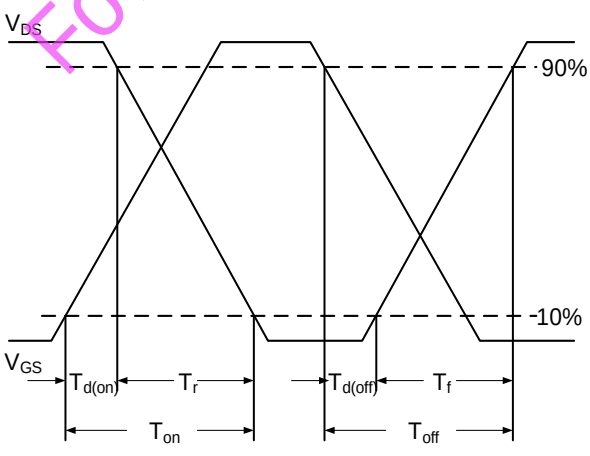


Fig.10 Switching Time Waveform

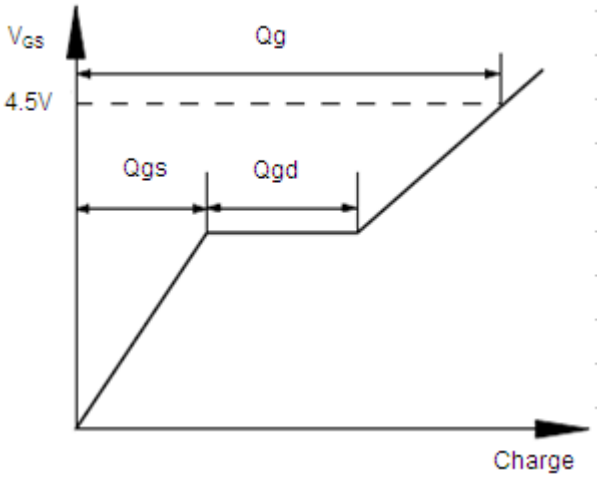


Fig.11 Gate Charge Waveform

P-Typical Characteristics

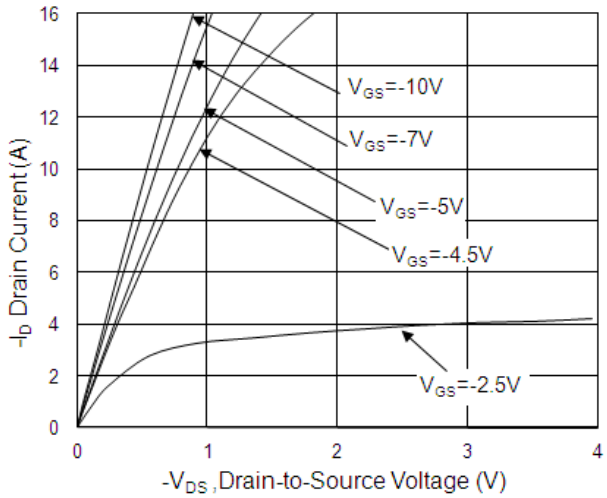


Fig.1 Typical Output Characteristics

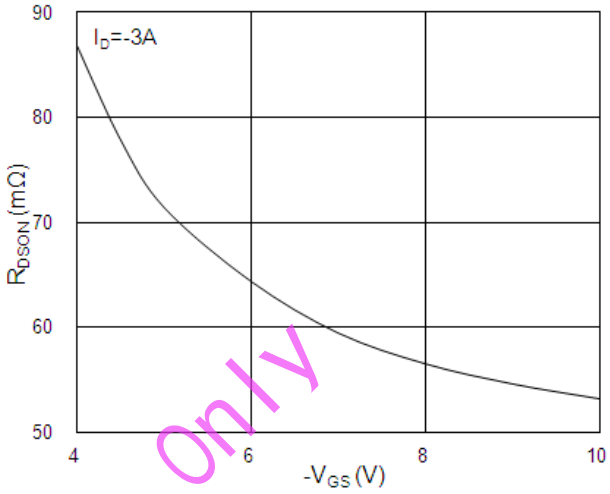


Fig.2 On-Resistance vs. G-S Voltage

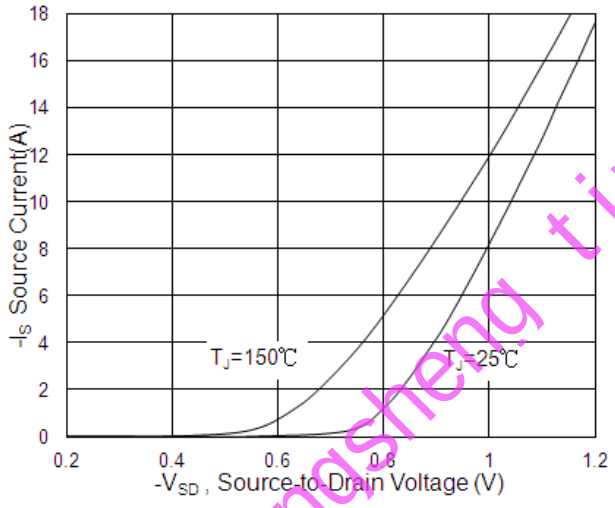


Fig.3 Forward Characteristics Of Reverse

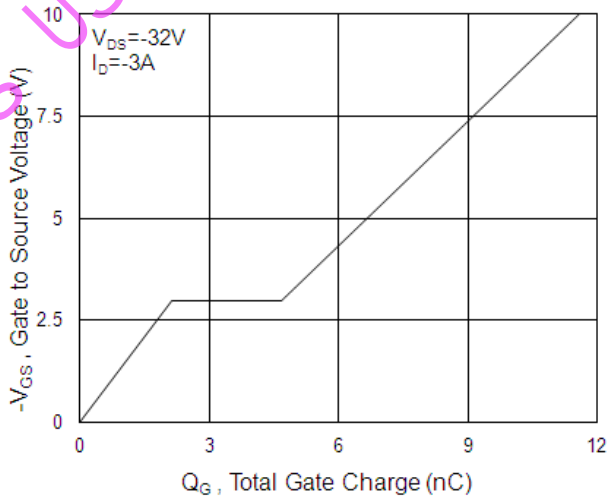


Fig.4 Gate-Charge Characteristics

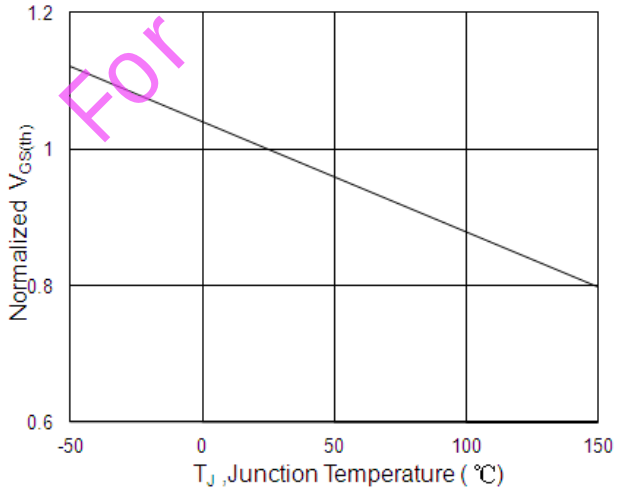


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

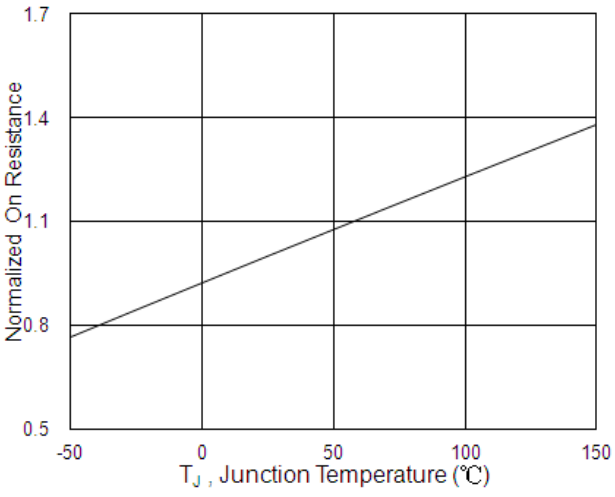


Fig.6 Normalized R_{DSON} vs. T_J

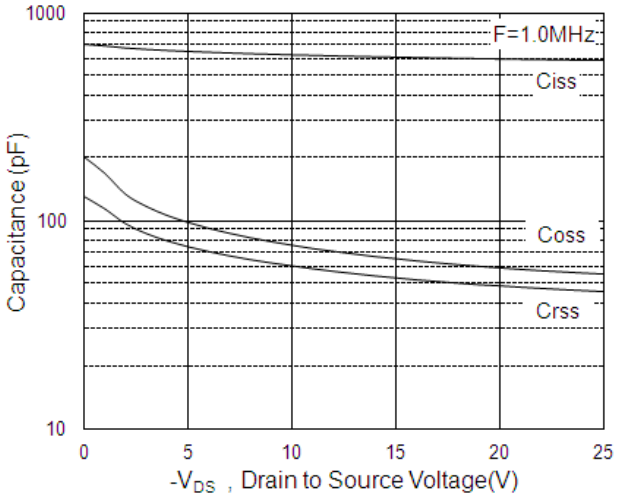


Fig.7 Capacitance

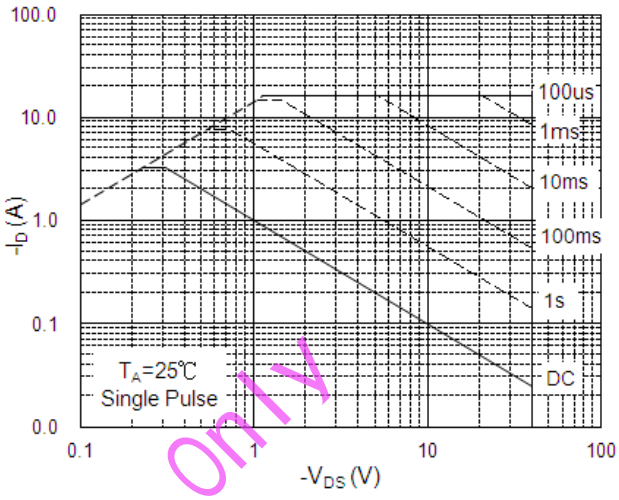


Fig.8 Safe Operating Area

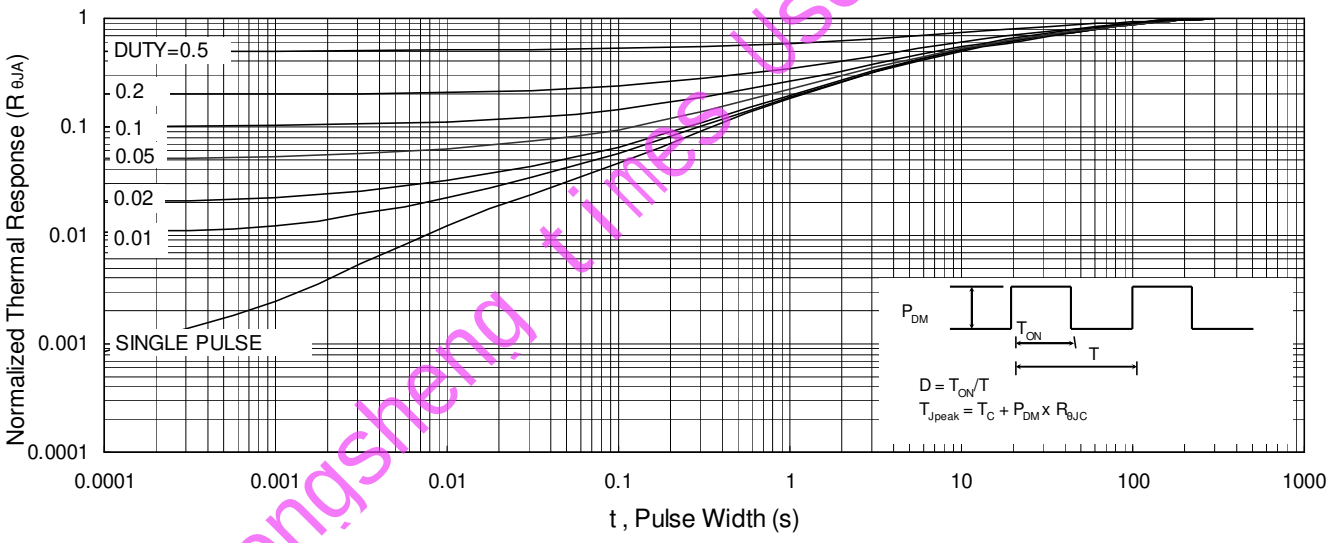


Fig.9 Normalized Maximum Transient Thermal Impedance

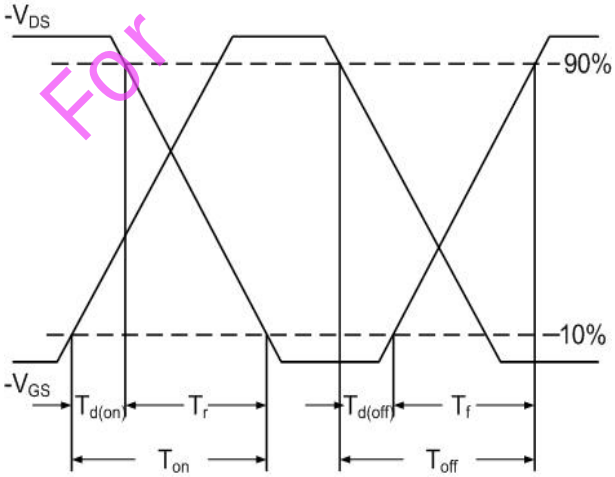


Fig.10 Switching Time Waveform

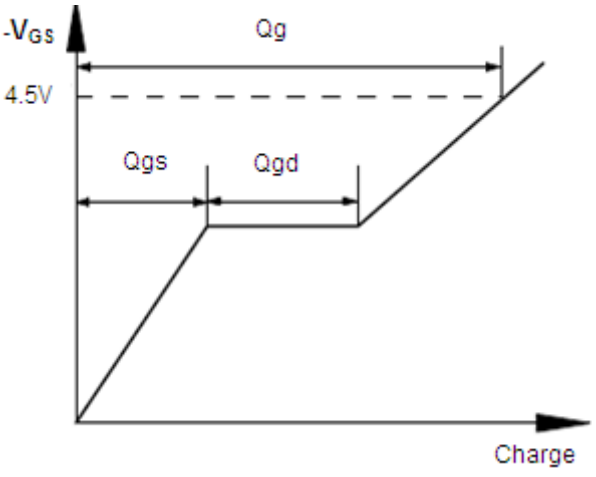
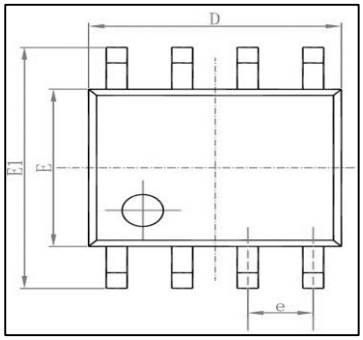
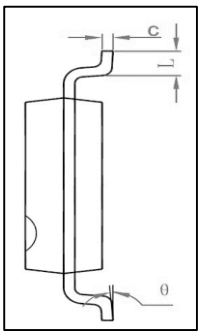
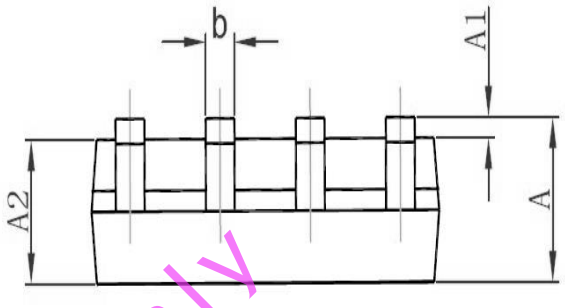


Fig.11 Gate Charge Waveform

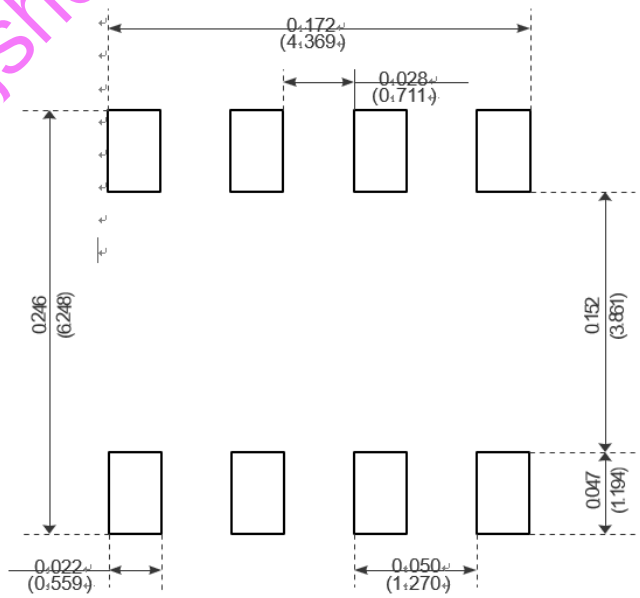
Package Mechanical Data-SOP-8L







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

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Edition	Date	Change
RVE1.0	2018/01/31	Initial release