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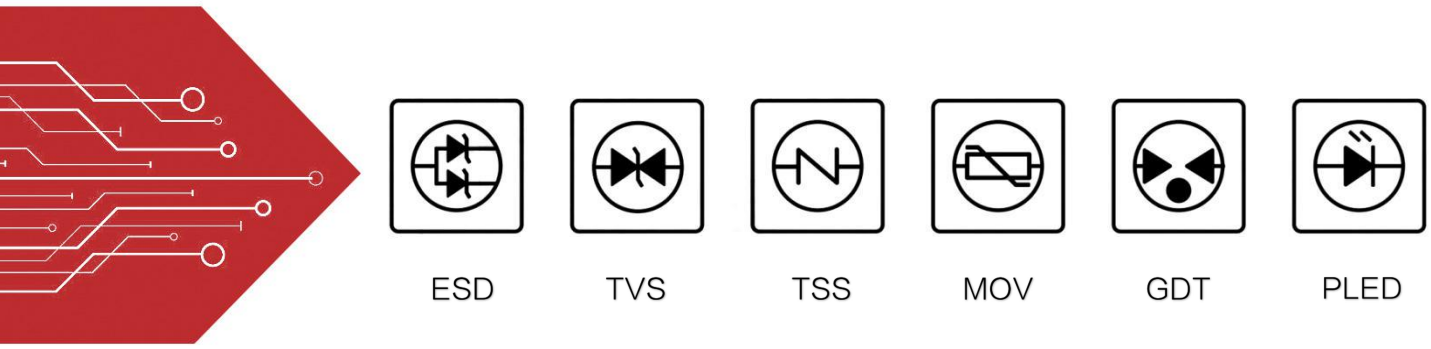
SEMICONDUCTOR



Product data sheet

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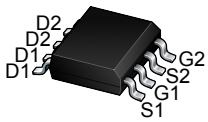
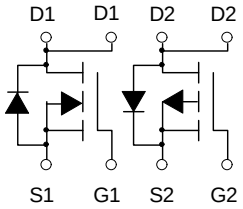


SOP-8



N-Channel and P-Channel

Description

The AO4612-MS is the high performance complementary N-ch and P-ch MOSFETs with high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The AO4612-MS meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

BVDSS	RDSON	ID
60V	60mΩ	5.0A
-60V	100mΩ	-4.0A

- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D@T_A=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	5.0	-4.0	A
I_D@T_A=70℃	Continuous Drain Current, V_{GS} @ 10V[1]	3.8	-3	A
I_{DM}	Pulsed Drain Current[2]	9.6	-7.5	A
EAS	Single Pulse Avalanche Energy[3]	25.5	35.3	mJ
I_{AS}	Avalanche Current	22.6	-26.6	A
P_D@T_A=25℃	Total Power Dissipation[4]	1.5	1.5	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	---	85	℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	36	℃/W

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	60	---	---	V
$\triangle BV_{DSS}/\triangle T_J$	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=1mA	---	0.063	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=10V , I_D=4A	---	60	80	mΩ
		V_{GS}=4.5V , I_D=2A	---	80	100	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.2	---	2.5	V
$\triangle V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-5.24	---	mV/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=48V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=48V , 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=4A	---	21	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	3.2	---	Ω
Q_g	Total Gate Charge (4.5V)	V_{DS}=12V , V_{GS}=10V , I_D=4A	---	5.5	---	nC
Q_{gs}	Gate-Source Charge		---	1.8	---	
Q_{gd}	Gate-Drain Charge		---	2.4	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=12V , V_{GS}=10V , R_G=3.3Ω, I_D=4A	---	6	---	ns
T_r	Rise Time		---	10	---	
$T_{d(off)}$	Turn-Off Delay Time		---	15	---	
T_f	Fall Time		---	7	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , f=1MHz	---	695	---	pF
C_{oss}	Output Capacitance		---	148	---	
C_{rss}	Reverse Transfer Capacitance		---	7	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	5.0	A
I_{SM}	Pulsed Source Current[2,5]		---	---	9.6	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 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}=5A
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	-60	---	---	V
$\triangle BV_{DSS}/\triangle T_J$	BV_{DSS} Temperature Coefficient	Reference to 25℃ , I_D=-1mA	---	-0.049	---	V/℃
$R_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V_{GS}=-10V , I_D=-3A	---	100	115	mΩ
		V_{GS}=-4.5V , I_D=-2A	---	115	130	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =-250uA	-1.2	---	-2.5	V
$\triangle V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.56	---	mV/℃
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-48V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=-48V , 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=-3A	---	5.8	---	S
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1MHz	---	13.5	---	Ω
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-20V , V_{GS}=-4.5V , I_D=-3A	---	5.9	---	nC
Q_{gs}	Gate-Source Charge		---	2.9	---	
Q_{gd}	Gate-Drain Charge		---	1.8	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=-12V , V_{GS}=-10V , R_G=3.3Ω, I_D=-3A	---	10	---	ns
T_r	Rise Time		---	17	---	
$T_{d(off)}$	Turn-Off Delay Time		---	22	---	
T_f	Fall Time		---	21	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , f=1MHz	---	715	---	pF
C_{oss}	Output Capacitance		---	51	---	
C_{rss}	Reverse Transfer Capacitance		---	34	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current[1,5]	V_G=V_D=0V , Force Current	---	---	-4.0	A
I_{SM}	Pulsed Source Current[2,5]		---	---	-7.5	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 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}=-20.0A
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.

N-Channel Typical Characteristics

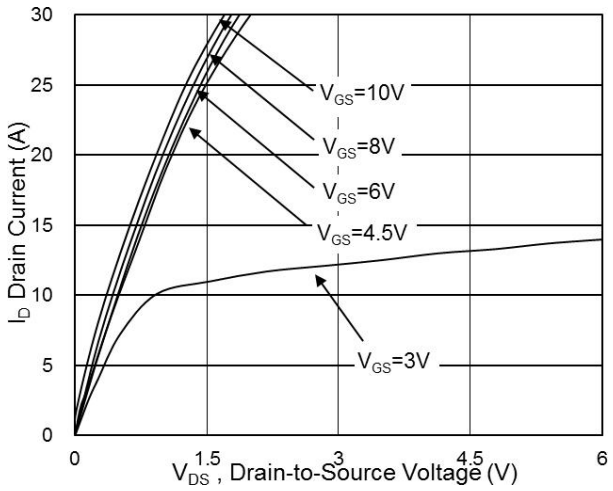


Fig.1 Typical Output Characteristics

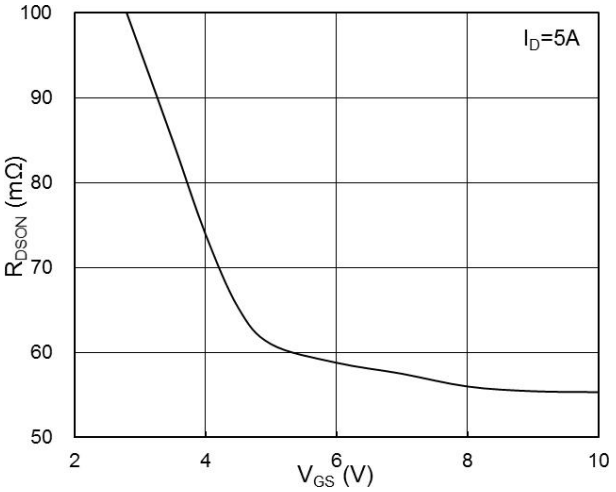


Fig.2 On-Resistance v.s Gate-Source

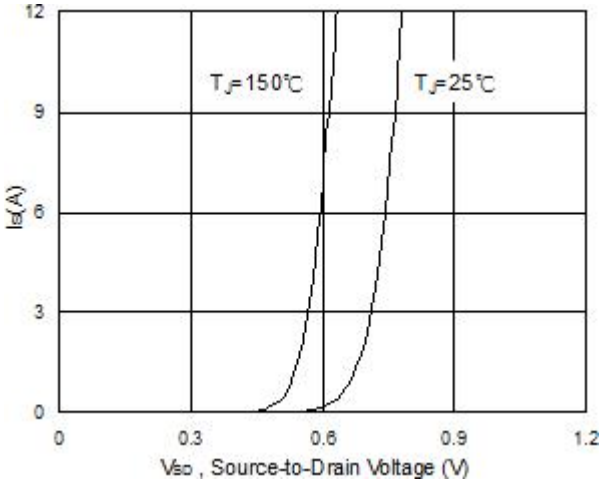


Fig.3 Forward Characteristics of Reverse

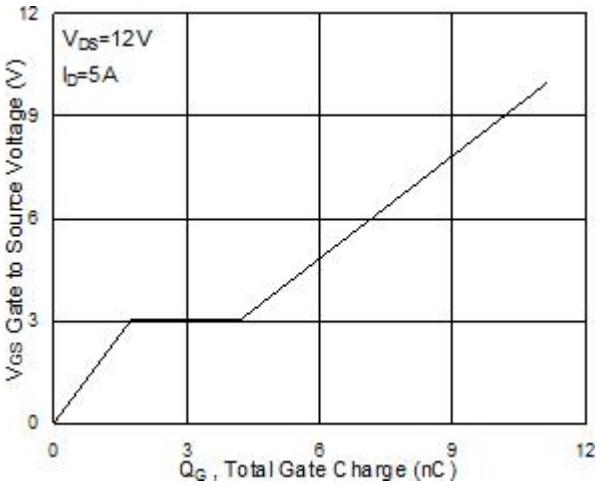


Fig.4 Gate-Charge Characteristics

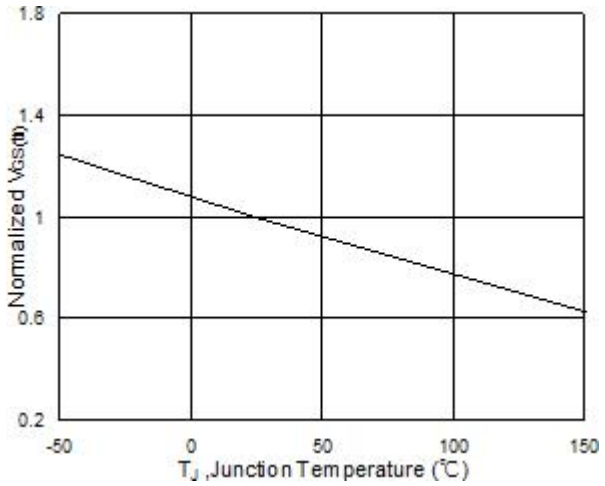


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

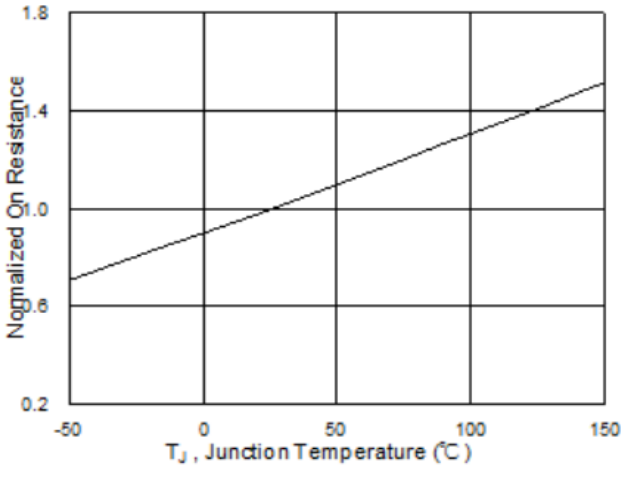


Fig.6 Normalized R_{DSON} v.s T_J

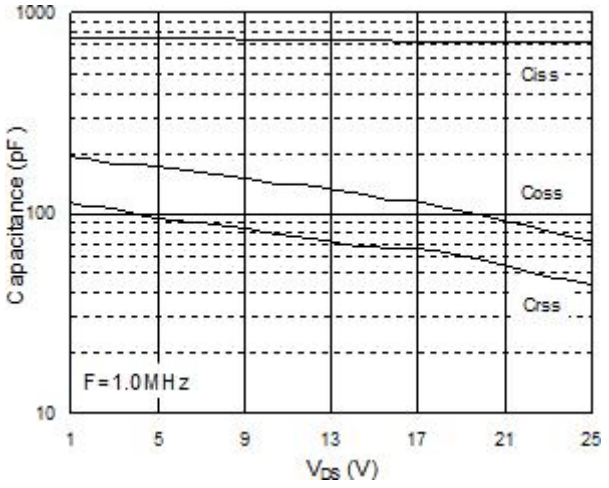


Fig.7 Capacitance

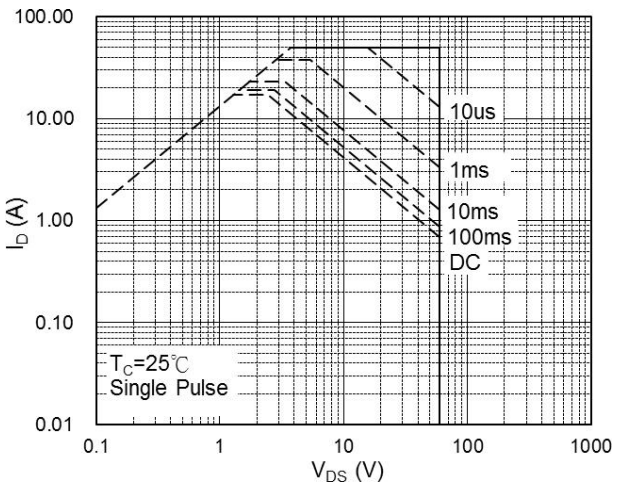


Fig.8 Safe Operating Area

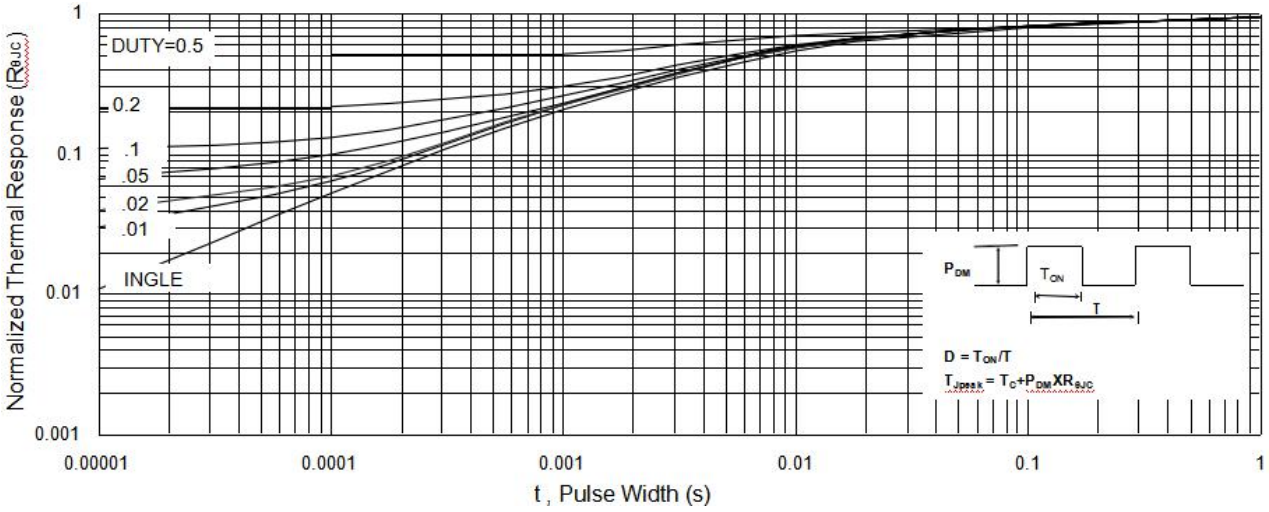


Fig.9 Normalized Maximum Transient Thermal Impedance

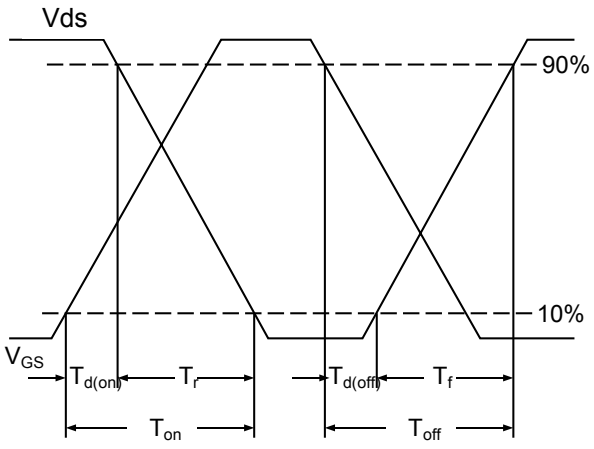


Fig.10 Switching Time Waveform

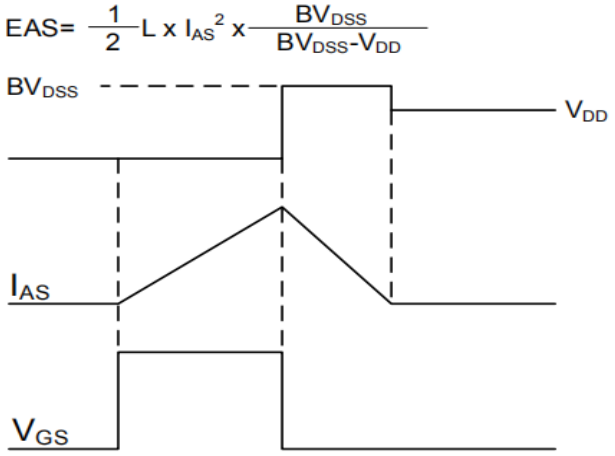


Fig.11 Unclamped Inductive Waveform

P-Channel Typical Characteristics

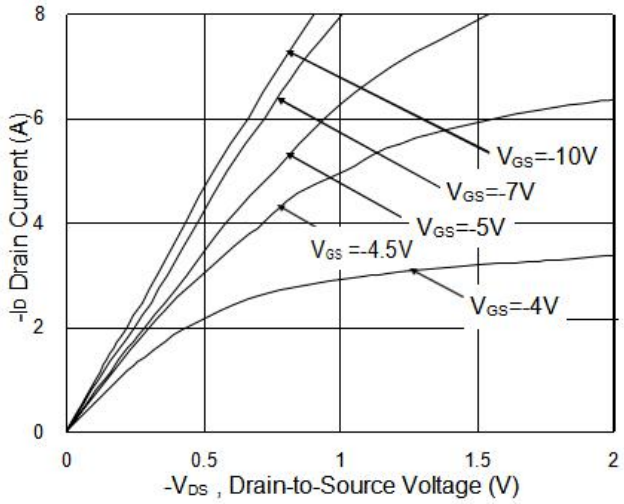


Fig.1 Typical Output Characteristics

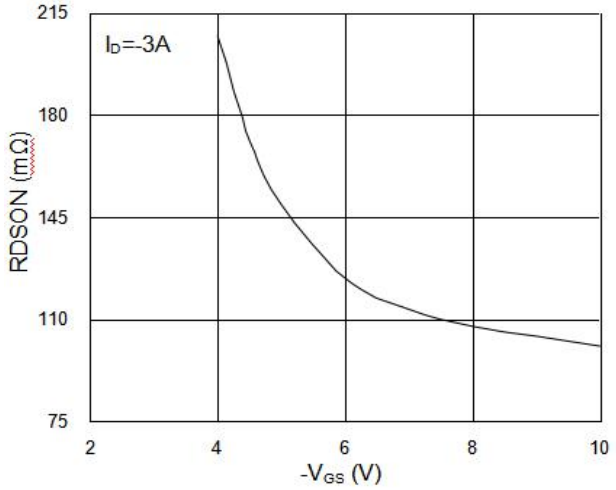


Fig.2 On-Resistance v.s Gate-Source

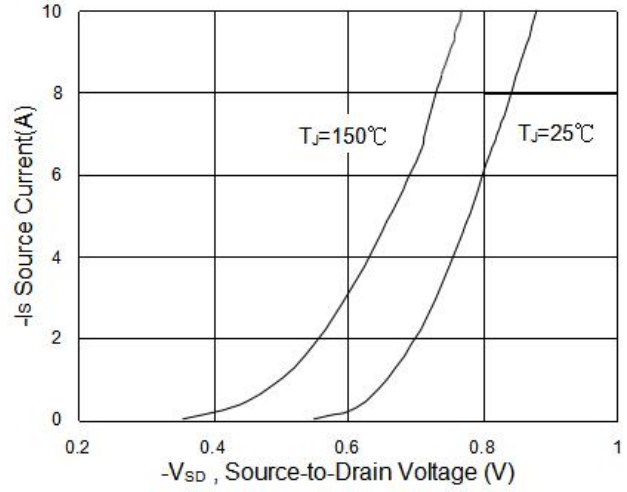


Fig.3 Forward Characteristics of Reverse

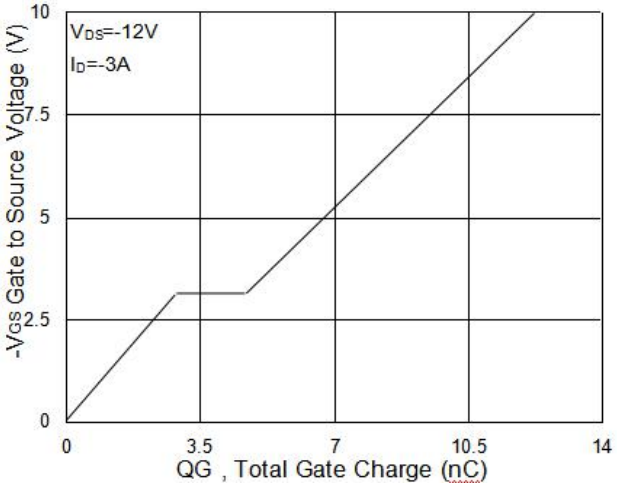


Fig.4 Gate-Charge Characteristics

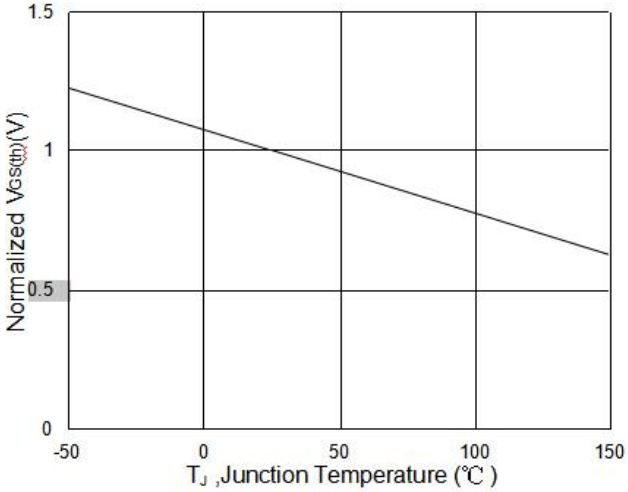


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

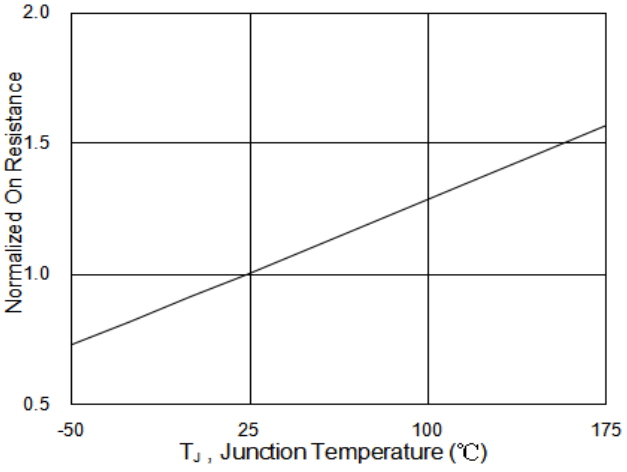


Fig.6 Normalized R_{DSON} v.s T_J

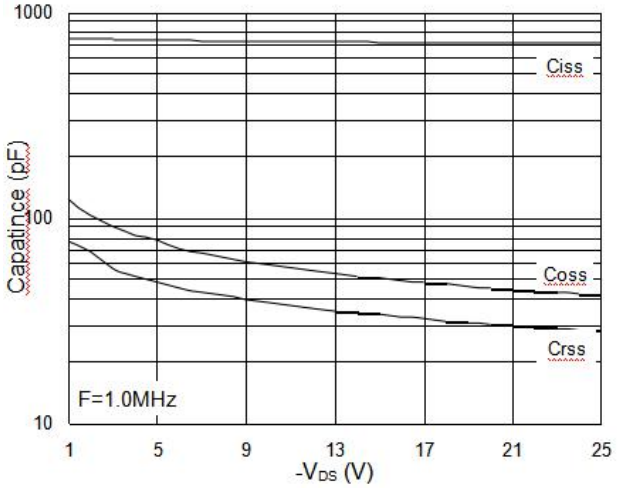


Fig.7 Capacitance

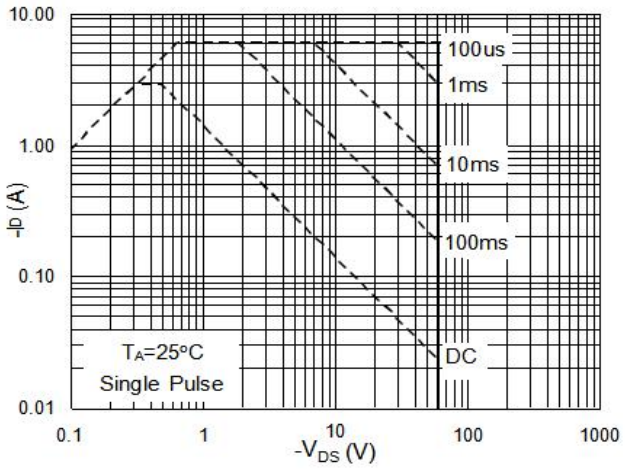


Fig.8 Safe Operating Area

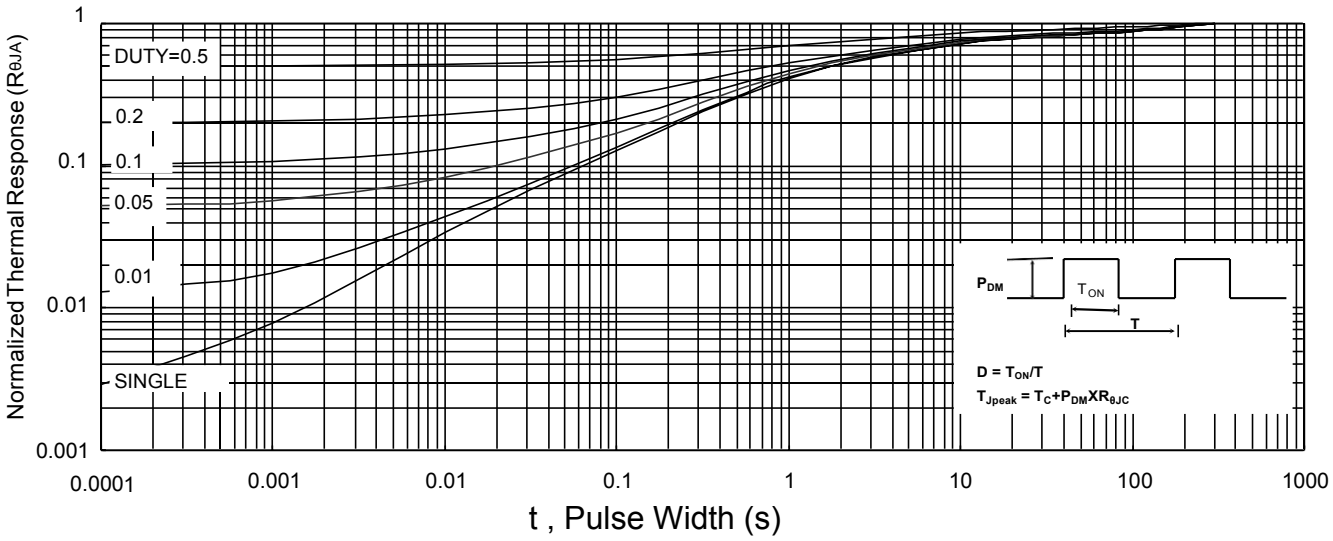


Fig.9 Normalized Maximum Transient Thermal Impedance

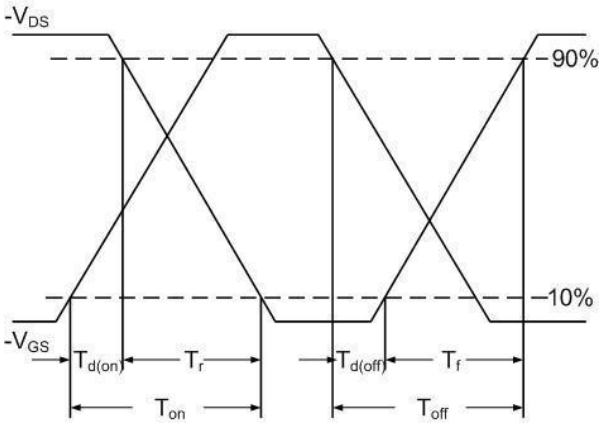


Fig.10 Switching Time Waveform

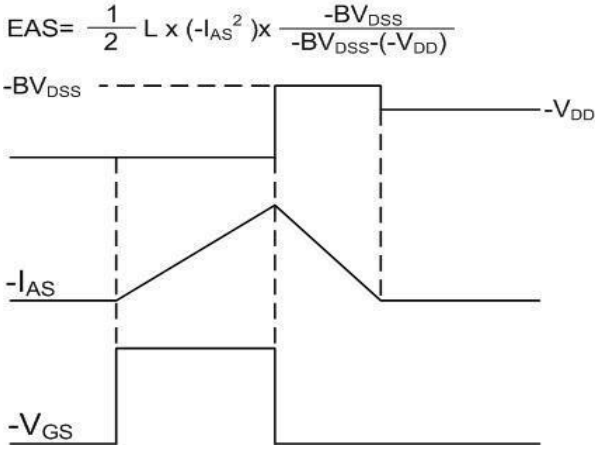
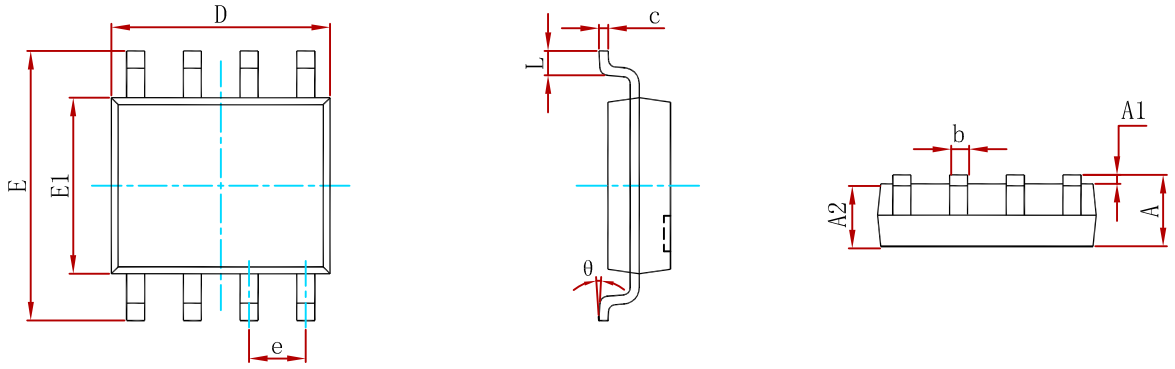


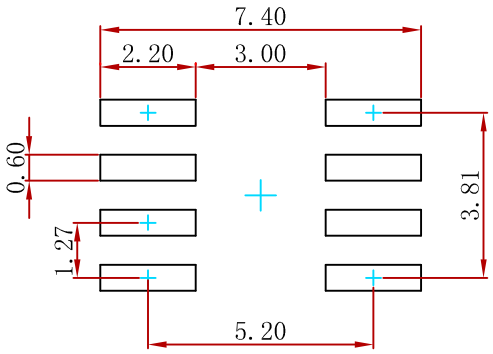
Fig.11 Unclamped Inductive Waveform

PACKAGE MECHANICAL DATA



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	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

Suggested Pad Layout



Note:
1.Controlling dimension:in millimeters.
2.General tolerance:± 0.05mm.
3.The pad layout is for reference purposes only.

REEL SPECIFICATION

P/N	PKG	QTY
AO4612-MS	SOP-8	3000

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