

Features

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

Application

- Battery protection
- Load switch
- Uninterruptible power supply

Product Summary

● N-Channel



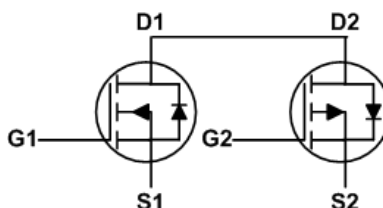
V_{DS}	60	V
$R_{DS(on), Typ} V_{GS}=10V$	22	mΩ
$R_{DS(on), Typ} V_{GS}=4.5V$	27	mΩ
I_D	23	A

● P-Channel

V_{DS}	-60	V
$R_{DS(on), Typ} V_{GS}=-10V$	61	mΩ
$R_{DS(on), Typ} V_{GS}=-4.5V$	80	mΩ
I_D	-18	A



TO252-4



N-Channel&P-Channel

Absolute Maximum Ratings ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D@T_C=25^{\circ}\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	23	-18	A
$I_D@T_C=100^{\circ}\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	15	-11	A
$I_D@T_A=25^{\circ}\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	5.6	-4.3	A
$I_D@T_A=70^{\circ}\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	4.5	-3.5	A
I_{DM}	Pulsed Drain Current ²	92	-72	A
EAS	Single Pulse Avalanche Energy ³	25.5	35.3	mJ
I_{AS}	Avalanche Current	22.6	-26.6	A
$P_D@T_C=25^{\circ}\text{C}$	Total Power Dissipation ⁴	34.7	34.7	W
$P_D@T_A=25^{\circ}\text{C}$	Total Power Dissipation ⁴	2	2	W
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^{\circ}\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^{\circ}\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	62	62	$^{\circ}\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	3.6	3.6	$^{\circ}\text{C/W}$

N-Channel Electrical Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	60	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.063	---	V/°C
R _{DS(on)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =15A	---	22	29	mΩ
		V _{GS} =4.5V, I _D =10A	---	27	35	
V _{GS(th)}	Gate Threshold Voltage		1.0	---	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient	V _{GS} =V _{DS} , I _D =250uA	---	-5.24	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =48V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =48V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =15A	---	17	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	3.2	---	
Q _g	Total Gate Charge (4.5V)	V _{DS} =48V, V _{GS} =4.5V, I _D =12A	---	12.56	---	nC
Q _{gs}	Gate-Source Charge		---	3.24	---	
Q _{gd}	Gate-Drain Charge		---	6.31	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =30V, V _{GS} =10V, R _G =3.3Ω, I _D =10A	---	8	---	ns
T _r	Rise Time		---	14.2	---	
T _{d(off)}	Turn-Off Delay Time		---	24.4	---	
T _f	Fall Time		---	4.6	---	
C _{iss}	Input Capacitance	V _{DS} =15V, V _{GS} =0V, f=1MHz	---	1039	---	pF
C _{oss}	Output Capacitance		---	65	---	
C _{rss}	Reverse Transfer Capacitance		---	48	---	
I _S	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	23	A
I _{SM}	Pulsed Source Current ^{2,5}		---	---	92	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	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 EAS data shows Max. rating. The test condition is V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=22.6A
- 4.The power dissipation is limited by 150°C 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 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-60	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.03	---	V/°C
R _{DS(ON)}	Static Drain_Source On_Resistance ²	V _{GS} =-10V, I _D =-12A	---	61	79	mΩ
		V _{GS} =-4.5V, I _D =-8A	---	80	104	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.0	---	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.56	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-48V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =-48V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-12A	---	15	---	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} =-48V, V _{GS} =-4.5V, I _D =-12A	---	9.86	---	nC
Q _{gs}	Gate-Source Charge		---	3.08	---	
Q _{gd}	Gate-Drain Charge		---	2.95	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-15V, V _{GS} =-10V, R _G =3.3Ω, I _D =-1A	---	28.8	---	ns
T _r	Rise Time		---	19.8	---	
T _{d(off)}	Turn-Off Delay Time		---	60.8	---	
T _f	Fall Time		---	7.2	---	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	---	944	---	pF
C _{oss}	Output Capacitance		---	63	---	
C _{rss}	Reverse Transfer Capacitance		---	46	---	
I _S	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	-18	A
I _{SM}	Pulsed Source Current ^{2,5}		---	---	-72	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.2	V

Note :

- 1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z 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}=-26.6A
- 4.The power dissipation is limited by 150°C 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

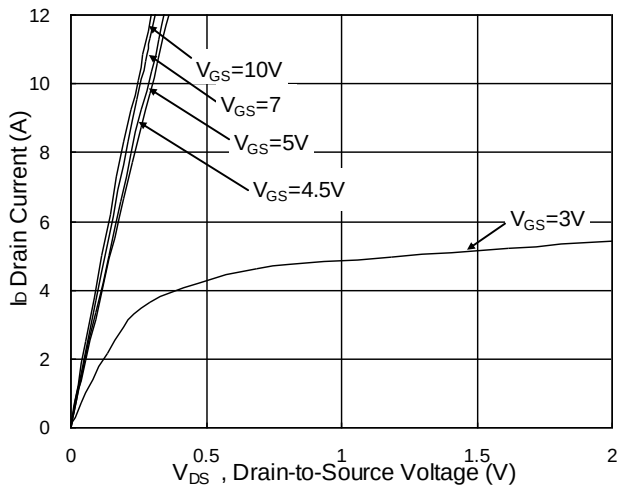


Fig.1 Typical Output Characteristics

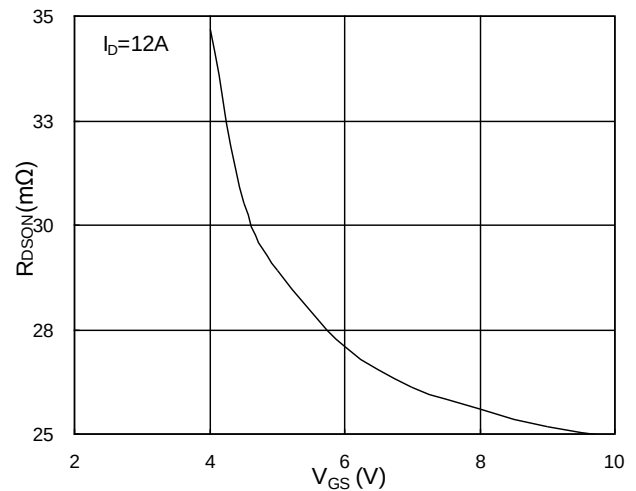


Fig.2 On-Resistance v.s Gate-Source

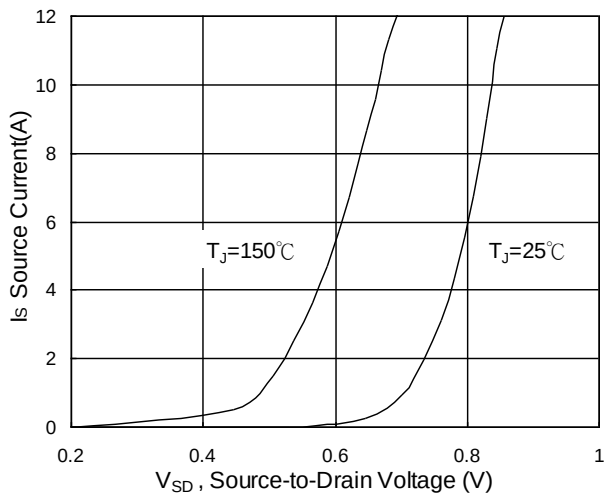


Fig.3 Forward Characteristics of Reverse

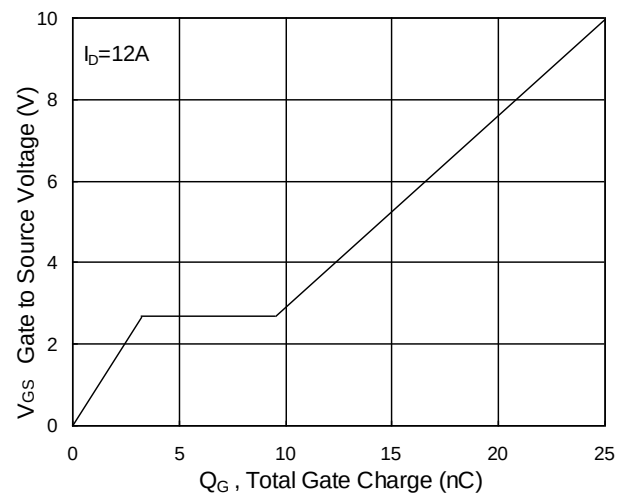


Fig.4 Gate-Charge Characteristics

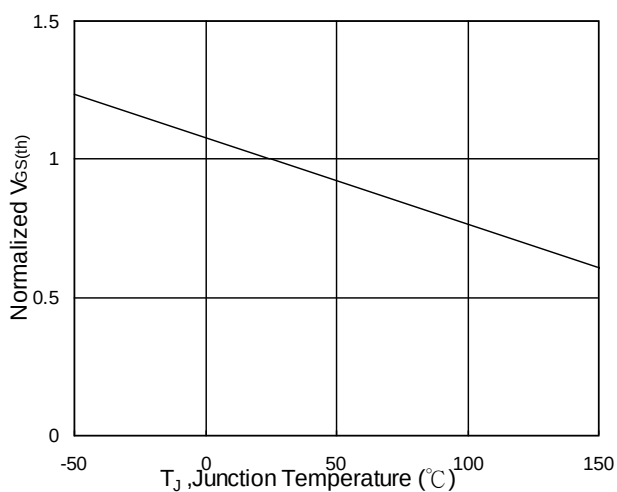


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

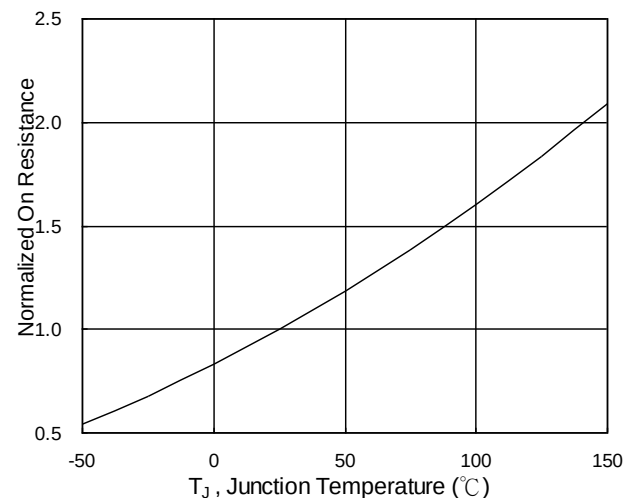
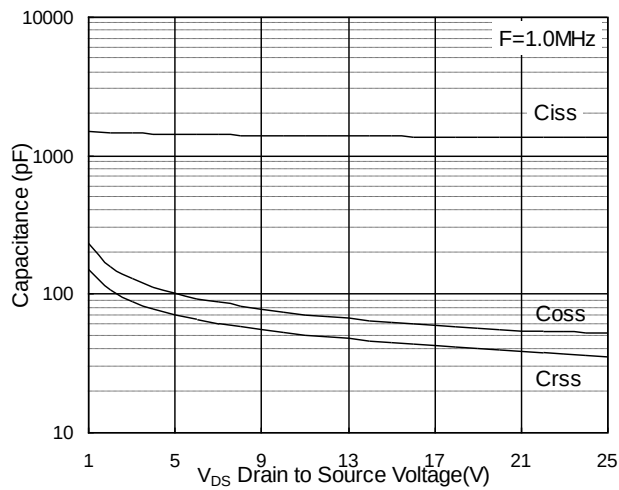
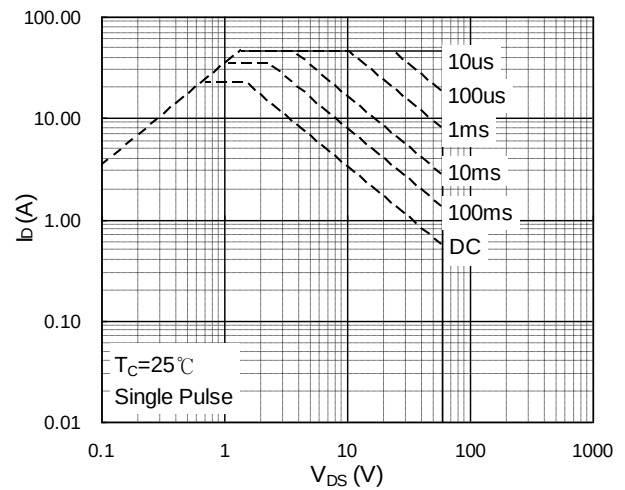
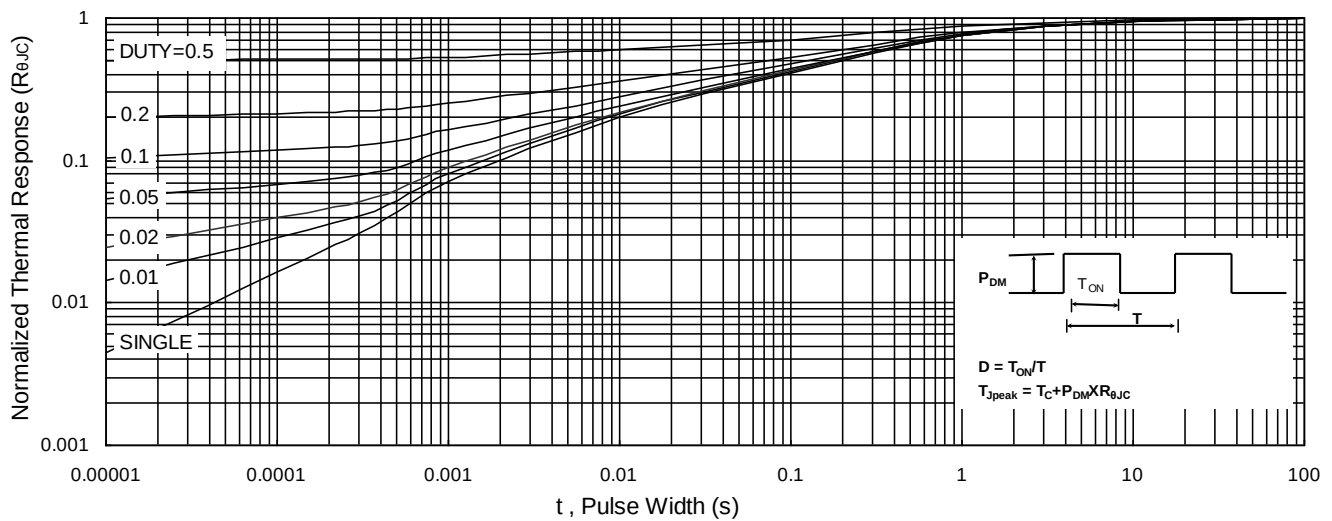
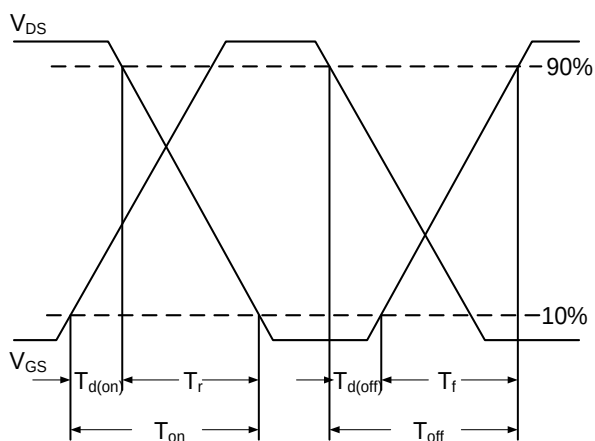
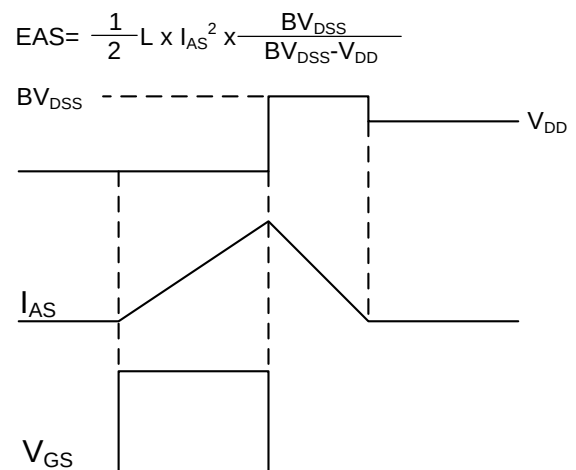


Fig.6 Normalized $R_{DS(on)}$ v.s T_J


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

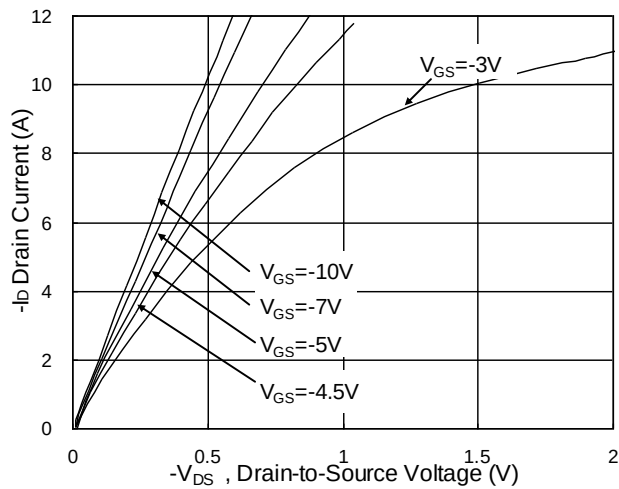


Fig.1 Typical Output Characteristics

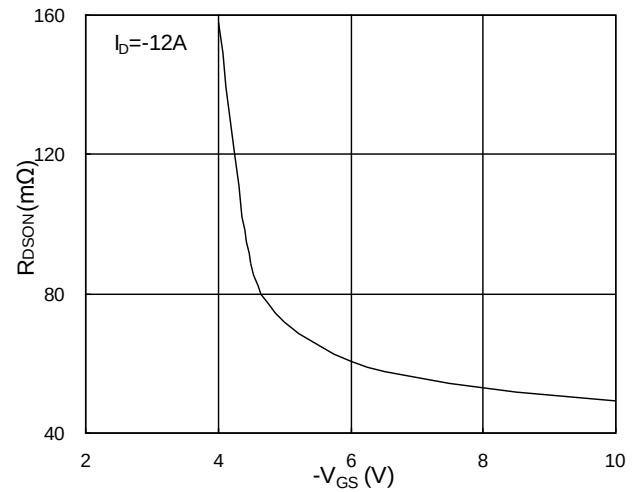


Fig.2 On-Resistance v.s Gate-Source

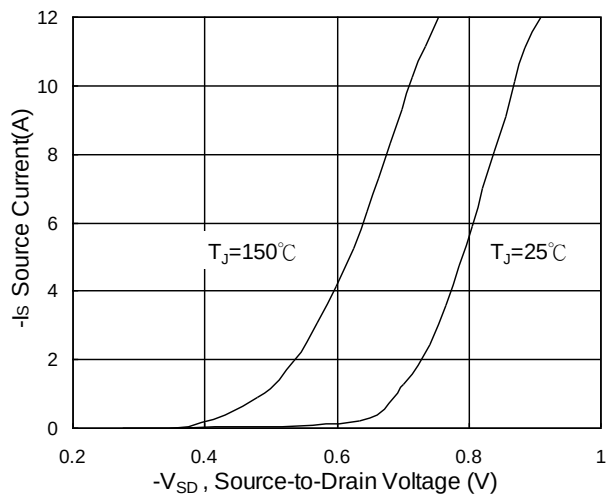


Fig.3 Forward Characteristics of Reverse

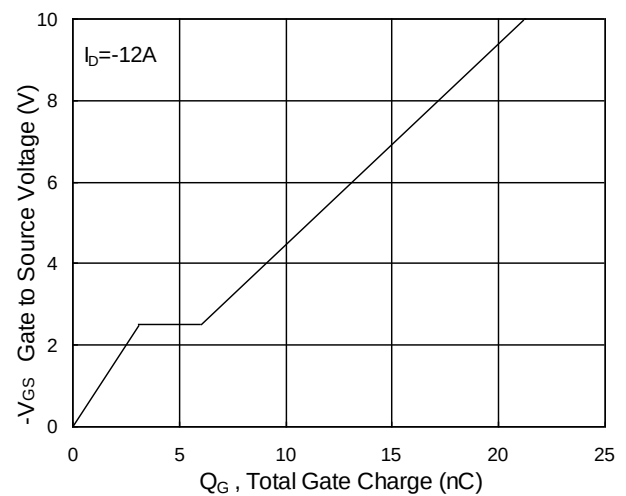


Fig.4 Gate-Charge Characteristics

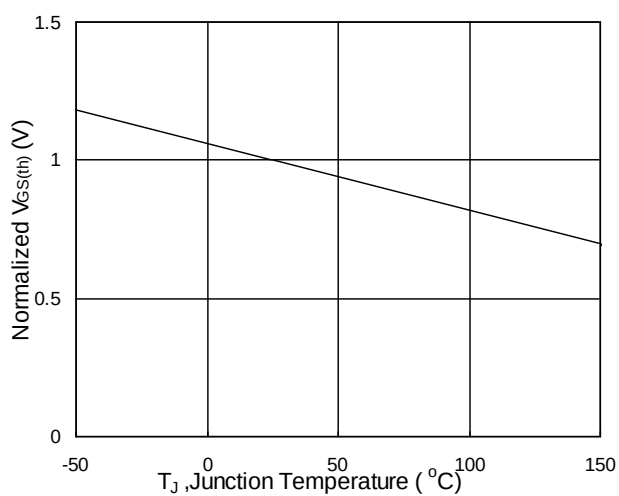


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

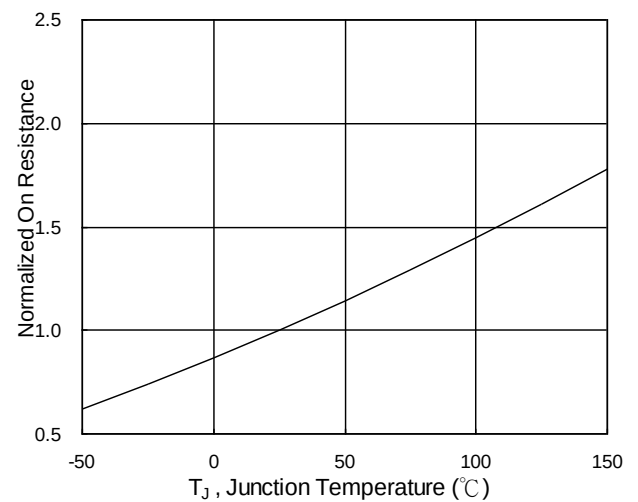


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

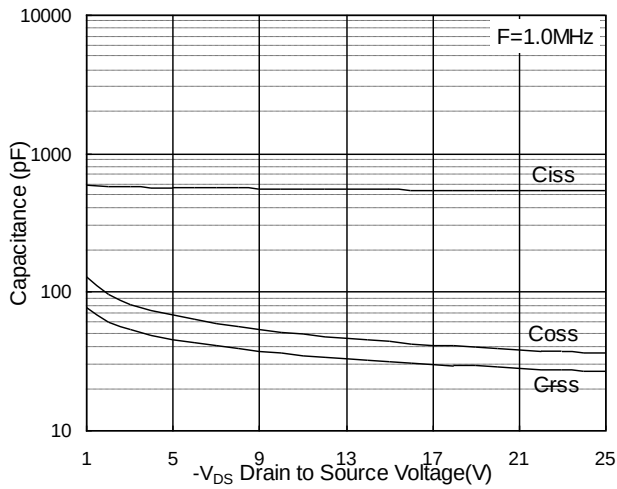


Fig.7 Capacitance

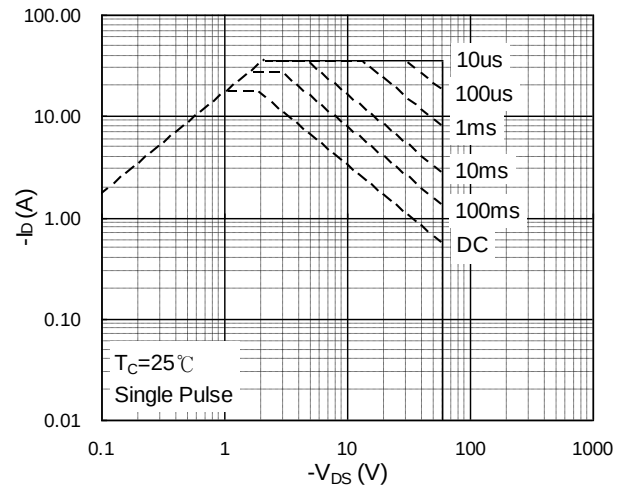


Fig.8 Safe Operating Area

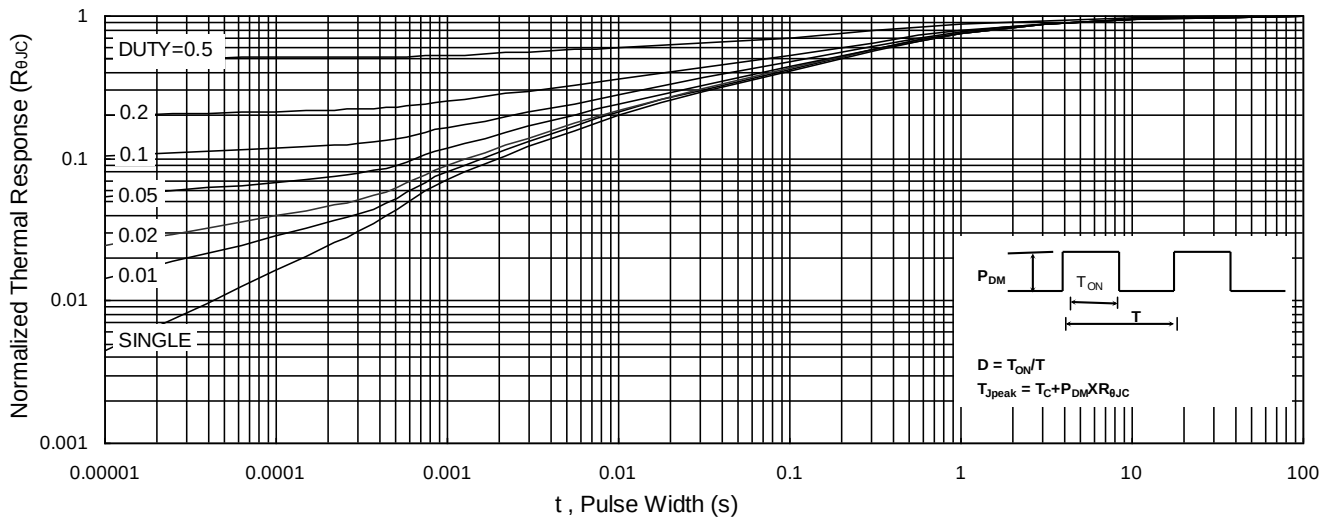


Fig.9 Normalized Maximum Transient Thermal Impedance

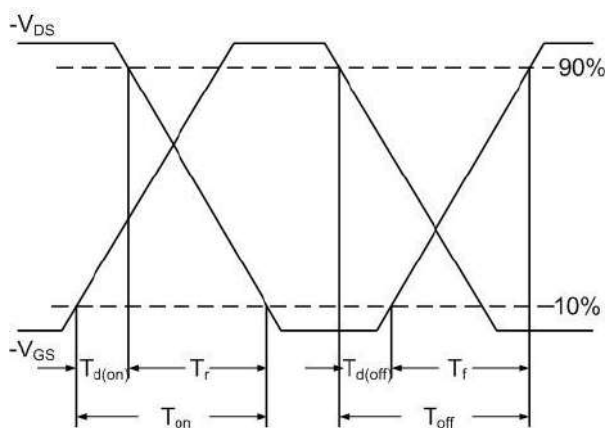


Fig.10 Switching Time Waveform

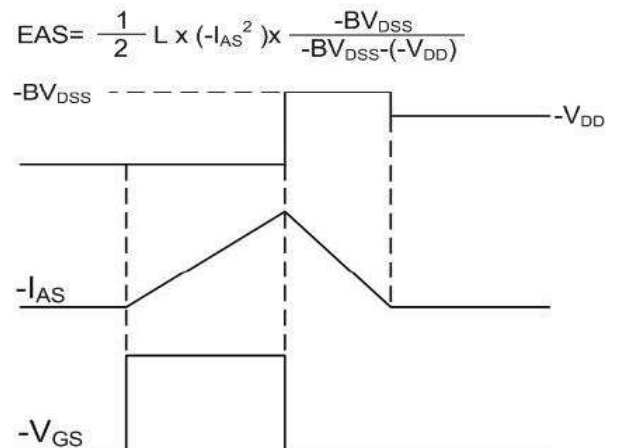
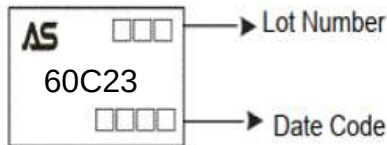
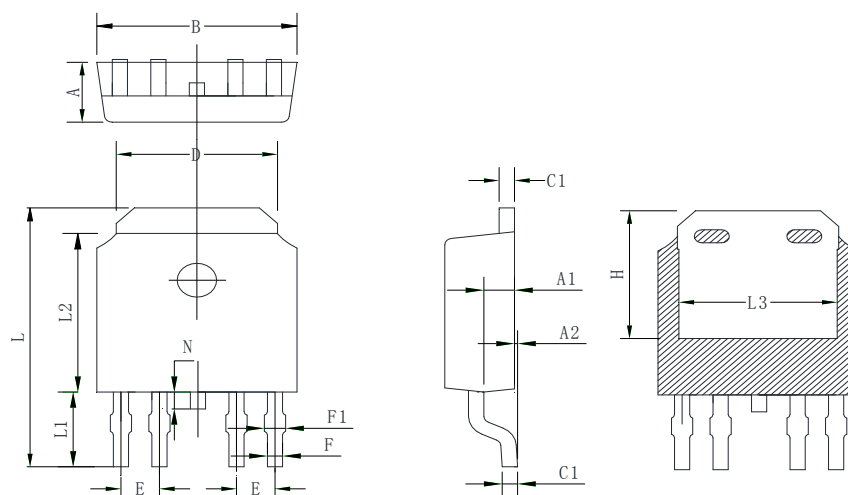


Fig.11 Unclamped Inductive Waveform

Ordering and Marking Information

Ordering Device No.	Marking	Package	Packing	Quantity
ASDM60C23JQ-R	60C23	TO-252-4	Tape&Reel	2500/Reel

PACKAGE	MARKING
TO-252-4	 The diagram shows a TO-252-4 package with the following markings: - AS (ASDsemi logo) 60C23 (Device type) - Lot Number (indicated by two empty boxes) - Date Code (indicated by two empty boxes)

TO-252-4 PACKAGE OUTLINE DRAWING


Symbol	Min	Typ	Max
A	2.20	2.30	2.40
A1	0.91	1.01	1.11
A2	0.05	0.15	0.25
B	6.45	6.60	6.75
C	0.45	0.50	0.58
C1	0.45	0.50	0.58
D	5.12	5.32	5.52
E	1.27 TYP		
F1	0.45	0.60	0.75
F	0.40	0.50	0.60
H	4.70	4.90	5.10
L	9.70	10.00	10.20
L1	2.6	2.8	3.0
L2	5.95	6.10	6.25
L3	5.00	5.20	5.40`
N	0.45	0.65	0.85

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