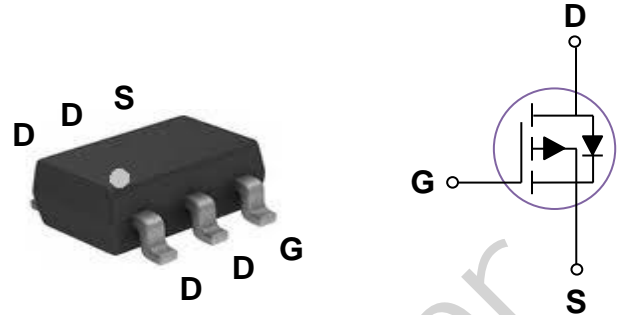


### Features

- -60V, -3.3A,  $R_{DS(ON)} = 96m\Omega @ V_{GS} = -10V$
- Improved  $dv/dt$  capability
- Fast switching
- Green Device Available



### General Description

These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

### Applications

- Motor Drive
- Power Tools
- LED Lighting

### Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous ( $T_A=25^\circ\text{C}$ )	-3.3	A
	Drain Current – Continuous ( $T_A=70^\circ\text{C}$ )	-2.6	A
$I_{DM}$	Drain Current – Pulsed <sup>1</sup>	-13.2	A
EAS	Single Pulse Avalanche Energy <sup>2</sup>	25	mJ
IAS	Single Pulse Avalanche Current <sup>2</sup>	-18	A
$P_D$	Power Dissipation ( $T_A=25^\circ\text{C}$ )	2	W
	Power Dissipation – Derate above $25^\circ\text{C}$	0.016	W/ $^\circ\text{C}$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62.5	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**
**Off Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA	-60	---	---	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-60V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-48V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	---	---	-10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA

**On Characteristics**

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-2A	---	80	96	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1A	---	100	130	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.0	-1.6	-2.5	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-1A	---	3	---	S

**Dynamic and switching Characteristics**

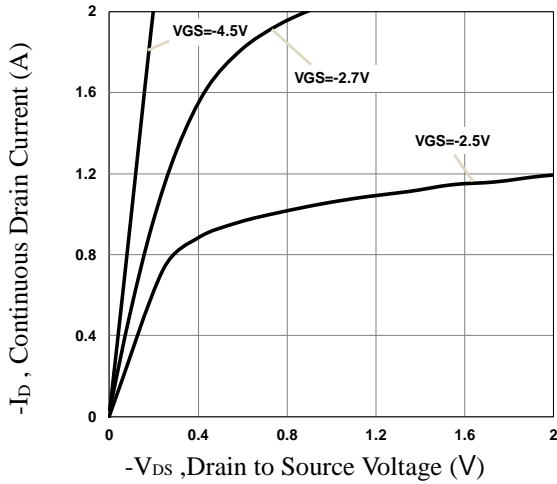
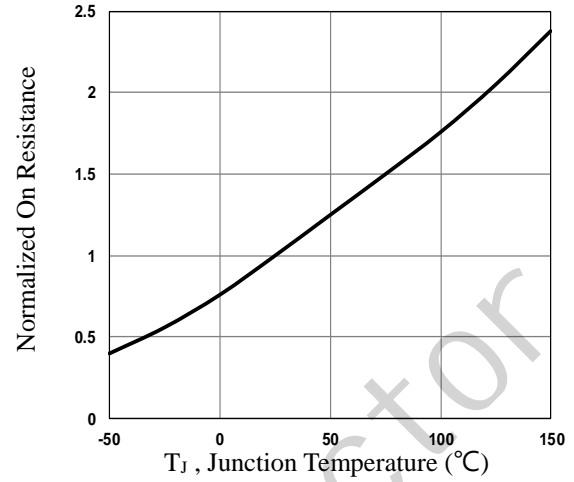
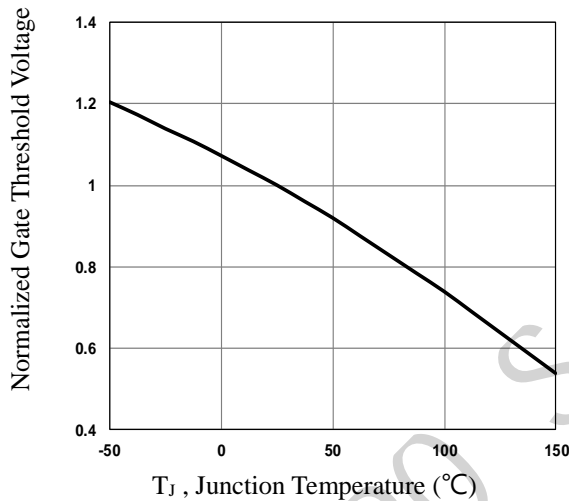
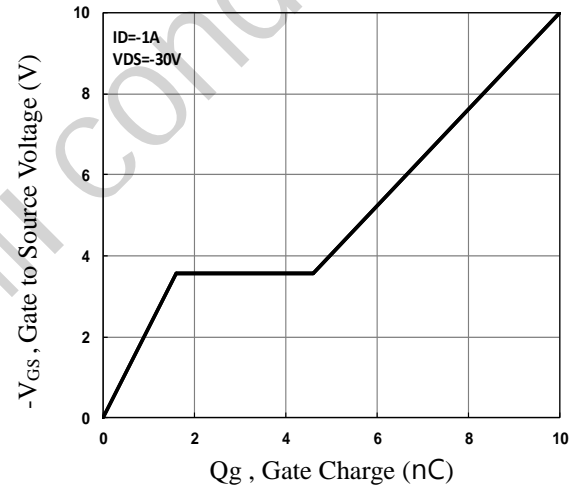
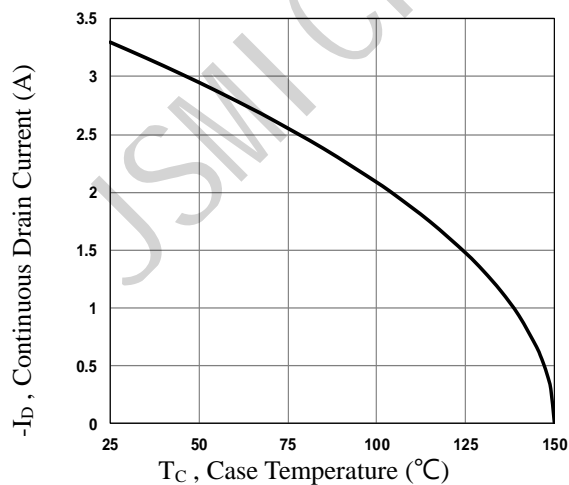
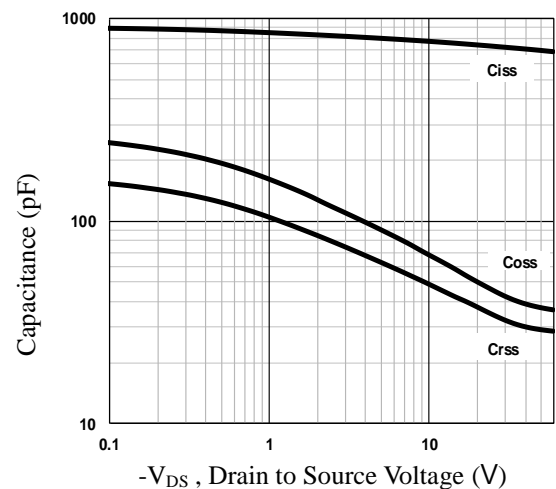
Q <sub>g</sub>	Total Gate Charge <sup>3, 4</sup>	V <sub>DS</sub> =-30V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-1A	---	10	15	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>3, 4</sup>		---	1.6	3.2	
Q <sub>gd</sub>	Gate-Drain Charge <sup>3, 4</sup>		---	3	6	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>3, 4</sup>	V <sub>DD</sub> =-30V, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω	---	8	16	ns
T <sub>r</sub>	Rise Time <sup>3, 4</sup>		---	15.4	30	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>3, 4</sup>		---	42.8	80	
T <sub>f</sub>	Fall Time <sup>3, 4</sup>		---	8.4	16	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, F=1MHz	---	720	1080	pF
C <sub>oss</sub>	Output Capacitance		---	42	63	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	32	48	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	22	---	Ω

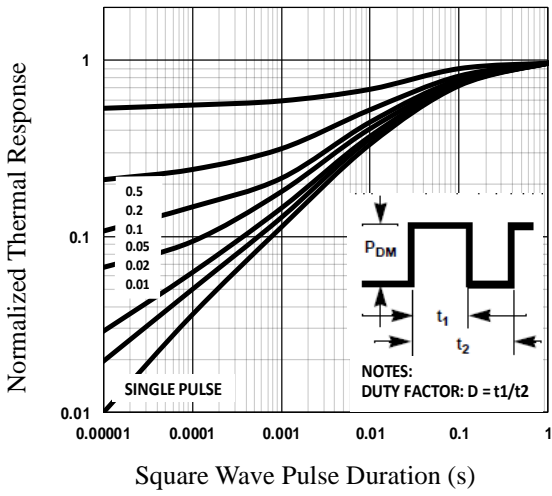
**Drain-Source Diode Characteristics and Maximum Ratings**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-3.3	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-6.6	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>R</sub> =-50V, I <sub>S</sub> =-1A	---	30	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs, T <sub>J</sub> =25°C	---	15	---	nC

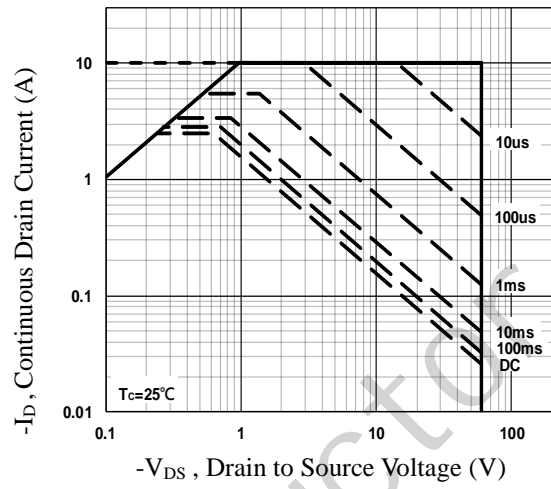
Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=-25V, V<sub>GS</sub>=-10V, L=0.1mH, I<sub>AS</sub>=-18A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.
3. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
4. Essentially independent of operating temperature.


**Fig.1 Typical Output Characteristics**

**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$** 

**Fig.3 Normalized  $V_{th}$  vs.  $T_J$** 

**Fig.4 Gate Charge Waveform**

**Fig.5 Continuous Drain Current vs.  $T_c$** 

**Fig.6 Capacitance Characteristics**

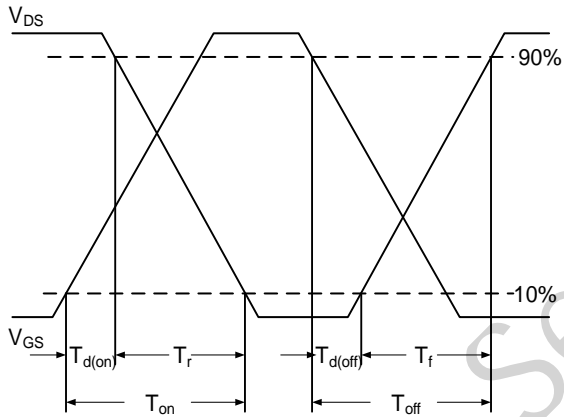


**Fig.7 Normalized Transient Impedance**

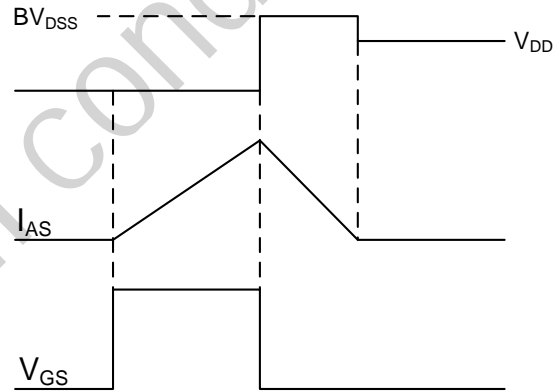


**Fig.8 Maximum Safe Operation Area**

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

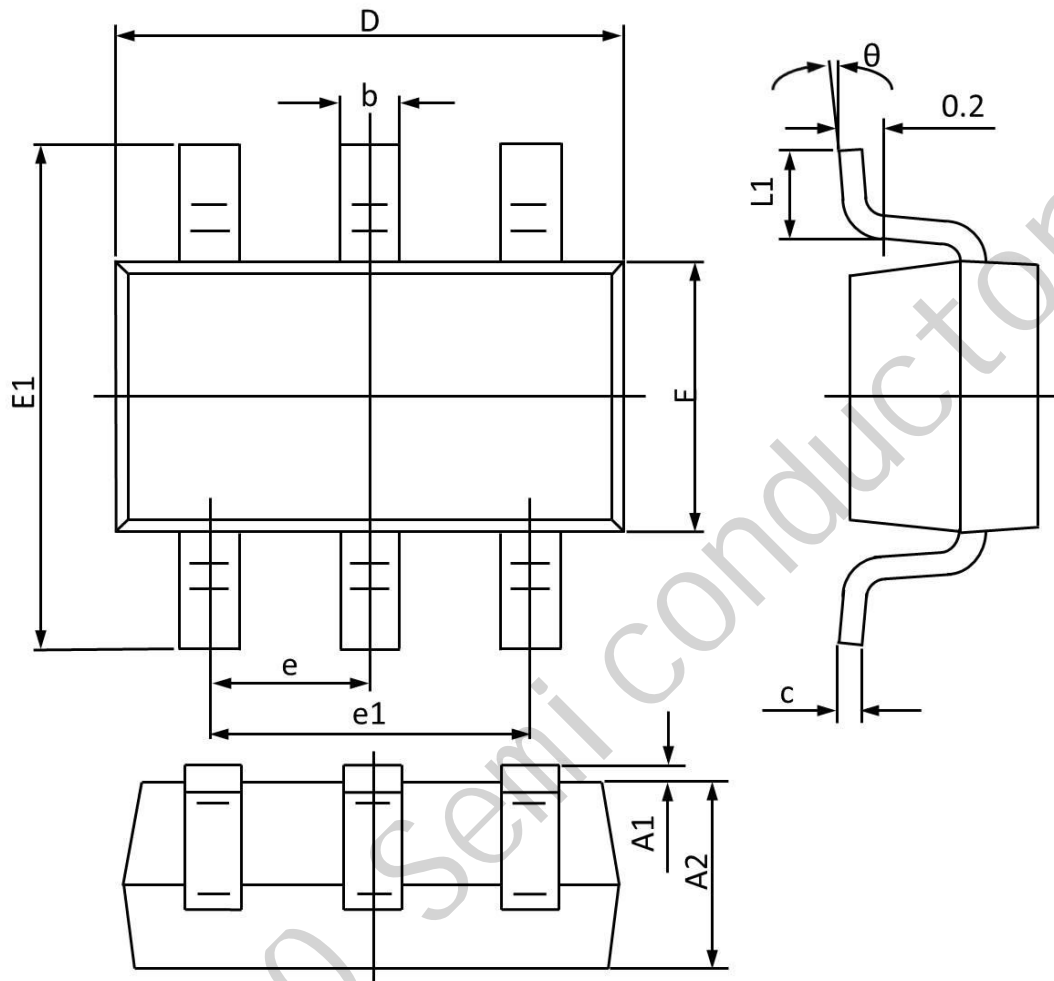


**Fig.9 Switching Time Waveform**



**Fig.10 EAS Waveform**

## SOT23-6 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A1	---	0.150	---	0.006
A2	0.900	1.300	0.035	0.051
b	0.300	0.500	0.012	0.019
c	0.100	0.200	0.004	0.008
D	2.800	3.050	0.110	0.120
E1	2.600	3.000	0.103	0.118
F	1.500	1.800	0.059	0.071
e	0.950 TYP		0.037 TYP	
e1	1.900 TYP		0.075 TYP	
L1	0.250	0.600	0.010	0.024
$\theta$	0°	8°	0°	8°