

## 60V P-Channel MOSFETs

### General Description

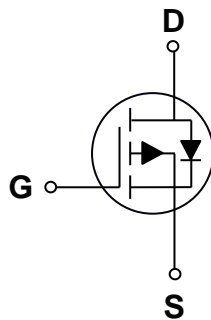
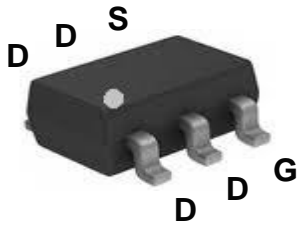
These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BVDSS	RDSON	ID
-60V	96mΩ	-3.3A

### Features

- -60V,-3.3A, RDS(ON) =96mΩ@VGS = -10V
- Improved dv/dt capability
- Fast switching
- Green Device Available

### SOT-23-6Pin Configuration



### Applications

- Motor Drive
- Power Tools
- LED Lighting

### Absolute Maximum Ratings (Tc=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	-60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Drain Current – Continuous (T <sub>A</sub> =25°C)	-3.3	A
	Drain Current – Continuous (T <sub>A</sub> =70°C)	-2.6	A
I <sub>DM</sub>	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 <sub>D</sub>	Power Dissipation (T <sub>A</sub> =25°C)	2	W
	Power Dissipation – Derate above 25°C	0.016	W/°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction to ambient	---	62.5	°C/W



# FTK6909L

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Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)

### Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-60	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-60V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	$\mu A$
		$V_{DS}=-48V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	-10	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA

### On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-2A$	---	80	96	m $\Omega$
		$V_{GS}=-4.5V, I_D=-1A$	---	100	130	m $\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.6	-2.5	V
$g_{fs}$	Forward Transconductance	$V_{DS}=-10V, I_D=-1A$	---	3	---	S

### Dynamic and switching Characteristics

$Q_g$	Total Gate Charge <sup>3, 4</sup>	$V_{DS}=-30V, V_{GS}=-10V, I_D=-1A$	---	10	15	nC
$Q_{gs}$	Gate-Source Charge <sup>3, 4</sup>		---	1.6	3.2	
$Q_{gd}$	Gate-Drain Charge <sup>3, 4</sup>		---	3	6	
$T_{d(on)}$	Turn-On Delay Time <sup>3, 4</sup>	$V_{DD}=-30V, V_{GS}=-10V, R_G=6\Omega$ $I_D=-1A$	---	8	16	ns
$T_r$	Rise Time <sup>3, 4</sup>		---	15.4	30	
$T_{d(off)}$	Turn-Off Delay Time <sup>3, 4</sup>		---	42.8	80	
$T_f$	Fall Time <sup>3, 4</sup>		---	8.4	16	
$C_{iss}$	Input Capacitance	$V_{DS}=-30V, V_{GS}=0V, F=1\text{MHz}$	---	720	1080	pF
$C_{oss}$	Output Capacitance		---	42	63	
$C_{rss}$	Reverse Transfer Capacitance		---	32	48	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	22	---	$\Omega$

### Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	-3.3	A
$I_{SM}$	Pulsed Source Current		---	---	-6.6	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1	V
$t_{rr}$	Reverse Recovery Time	$V_R=-50V, I_S=-1A$	---	30	---	ns
$Q_{rr}$	Reverse Recovery Charge	$di/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	15	---	nC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=-25V, V_{GS}=-10V, L=0.1\text{mH}, I_{AS}=-18A, R_G=25\Omega, \text{Starting } T_J=25^\circ\text{C}$ .
3. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
4. Essentially independent of operating temperature.

## Typical Performance Characteristics

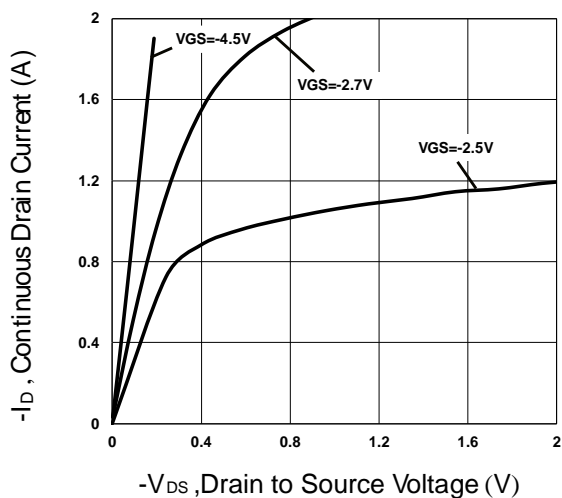


Fig.1 Typical Output Characteristics

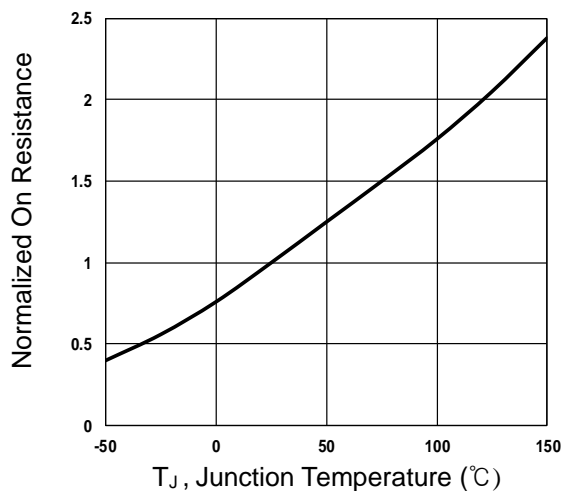


Fig.2 Normalized RDSON vs. TJ

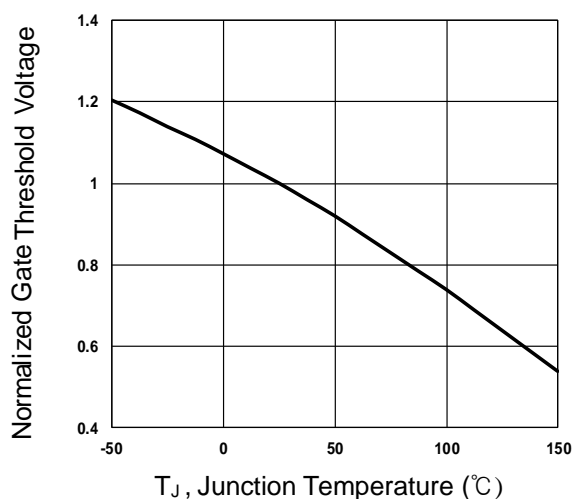


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

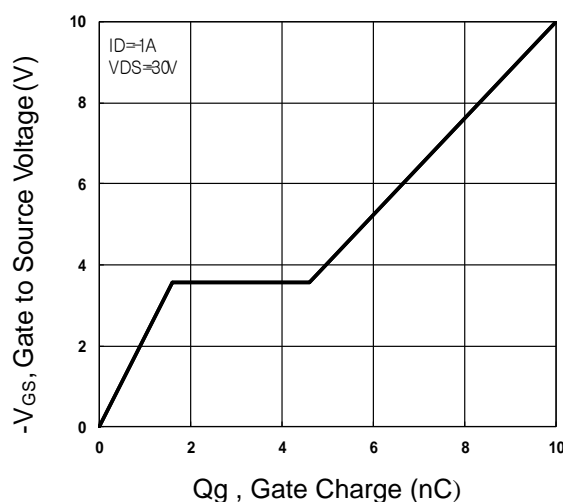


Fig.4 Gate Charge Waveform

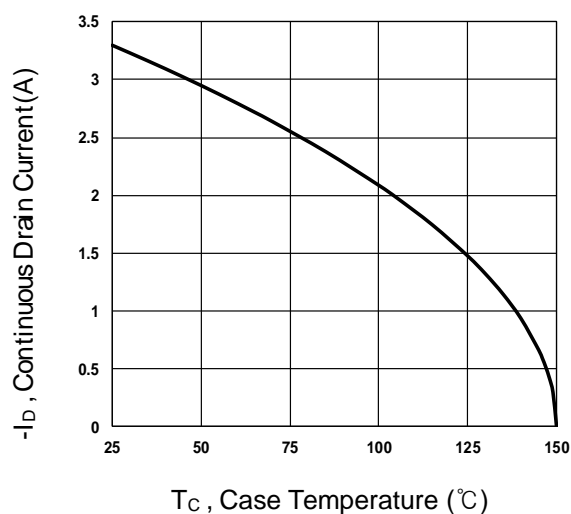


Fig.5 Continuous Drain Current vs.  $T_C$

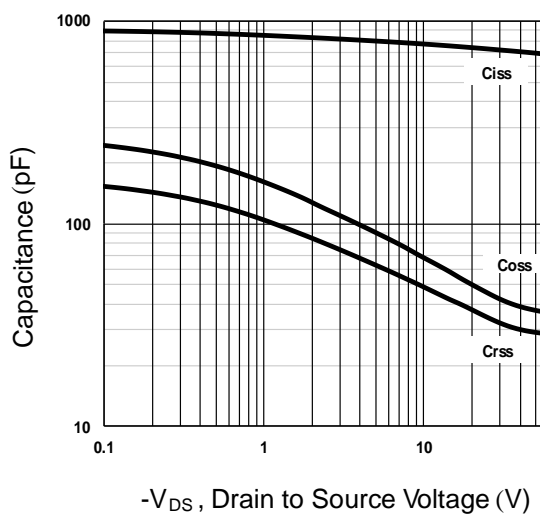


Fig.6 Capacitance Characteristics

## Typical Performance Characteristics(Con.)

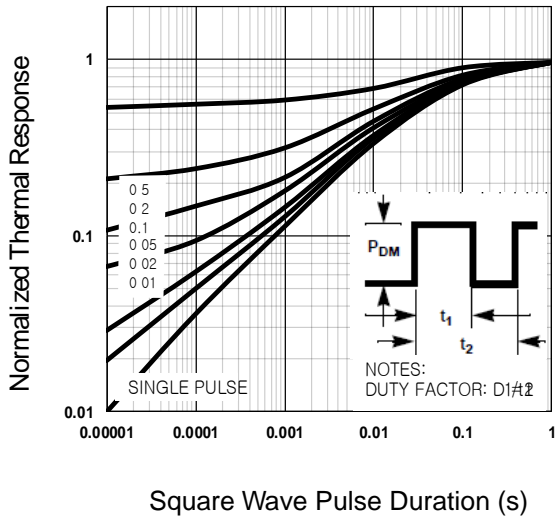


Fig.7 Normalized Transient Impedance

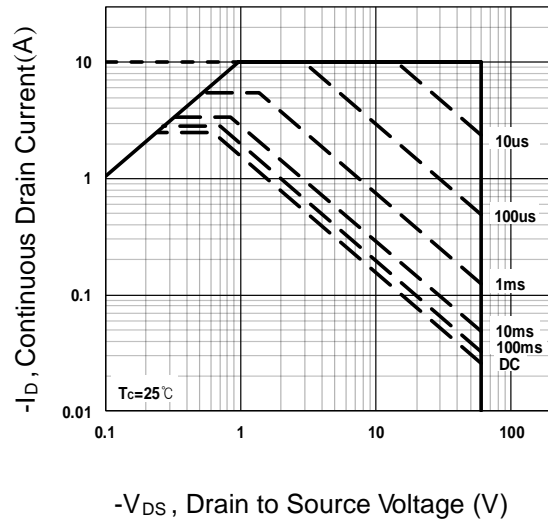


Fig.8 Maximum Safe Operation Area

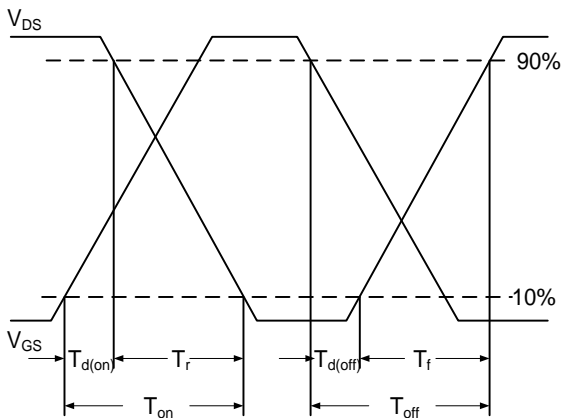


Fig.9 Switching Time Waveform

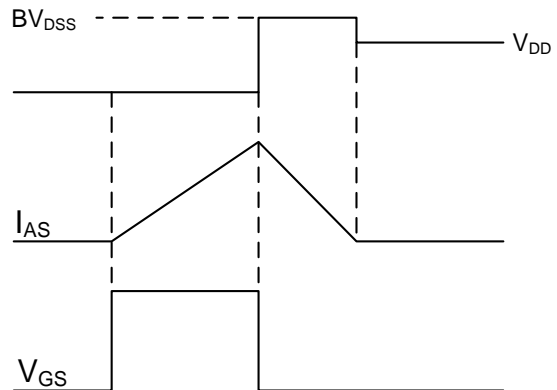
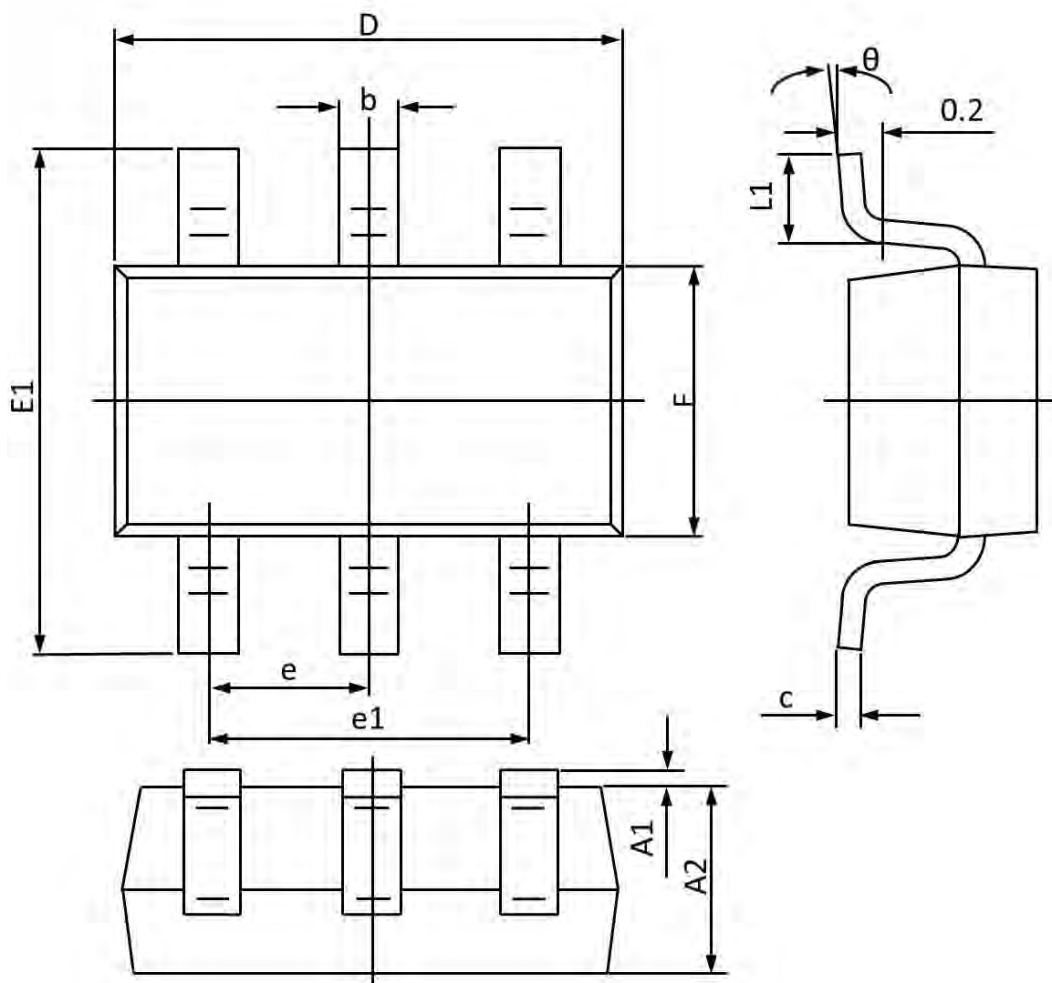


Fig.10 EAS Waveform

## SOT-23-6 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°