



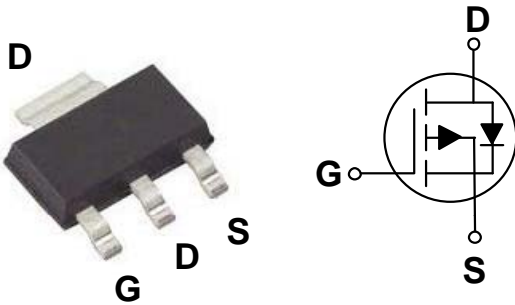
60V P-Channel MOSFETs

**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.

<b>BV<sub>DSS</sub></b>	<b>R<sub>DS(ON)</sub></b>	<b>I<sub>D</sub></b>
-60 V	105 mΩ	-3.2 A

SOT-223 Pin Configuration



**Features**

- -60V, -3.2A, R<sub>DS(ON)</sub>=105mΩ @V<sub>GS</sub>= -10V
- Improved dv/dt capability
- Fast switching
- Green Device Available

**Applications**

- Motor Drive
- Power Tools
- LED Lighting

**Absolute Maximum Ratings T<sub>c</sub>=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)	-3.2	A
	Drain Current - Continuous (T <sub>A</sub> =70°C)	-2.56	A
I <sub>DM</sub>	Drain Current - Pulsed (NOTE 1)	-12.8	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	25	mJ
IAS	Single Pulse Avalanche Current (NOTE 2)	-18	A
P <sub>D</sub>	Power Dissipation (T <sub>A</sub> =25°C)	2.02	W
	Power Dissipation – Derate above 25°C	0.02	W/°C
T <sub>J</sub>	Operating Junction Temperature Range	-50 to 150	°C
T <sub>STG</sub>	Storage Temperature Range	-50 to 150	°C

**Thermal Characteristics**

Symbol	Parameter	Typ.	Max	Unit
R <sub>θJA</sub>	Thermal Resistance Junction to Ambient	---	62	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction to Case	---	23	°C/W

**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	$V_{GS}=0V, I_D=-250\mu\text{A}$	-60	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-60V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	$\mu\text{A}$
		$V_{DS}=-48V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	-10	$\mu\text{A}$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA

**On Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-10V, I_D=-3A$	---	87	105	m $\Omega$
		$V_{GS}=-4.5V, I_D=-2A$	---	120	145	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu\text{A}$	-1.0	-1.6	-2.5	V
gfs	Forward Transconductance	$V_{DS}=-10V, I_D=-3A$	---	5.5	---	S

**Dynamic and switching Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$Q_g$	Total Gate Charge (NOTE 3、4)	$V_{DS}=-30V, V_{GS}=-10V, I_D=-2A$	---	10	15	nC
$Q_{gs}$	Gate-Source Charge (NOTE 3、4)		---	1.6	3.2	
$Q_{gd}$	Gate-Drain Charge (NOTE 3、4)		---	3	6	
$T_{d(on)}$	Turn-On Delay Time (NOTE 3、4)	$V_{DD}=-30V, V_{GS}=-10V, R_G=6\Omega, I_D=-1A$	---	8	16	nS
$T_r$	Rise Time (NOTE 3、4)		---	15.4	30	
$T_{d(off)}$	Turn-Off Delay Time (NOTE 3、4)		---	42.8	80	
$T_f$	Fall Time (NOTE 3、4)		---	8.4	16	
$C_{iss}$	Input Capacitance	$V_{DS}=-30V, V_{GS}=0V, F=1\text{MHz}$	---	785	1300	pF
$C_{oss}$	Output Capacitance		---	175	300	
$C_{riss}$	Reverse Transfer Capacitance		---	112	220	
Rg	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	36	---	$\Omega$

**Drain-Source Diode Characteristics and Ratings**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	-3.2	A
$I_{SM}$	Pulsed Source Current		---	---	-6.4	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1	V

## NOTES :

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



Characteristics Curves

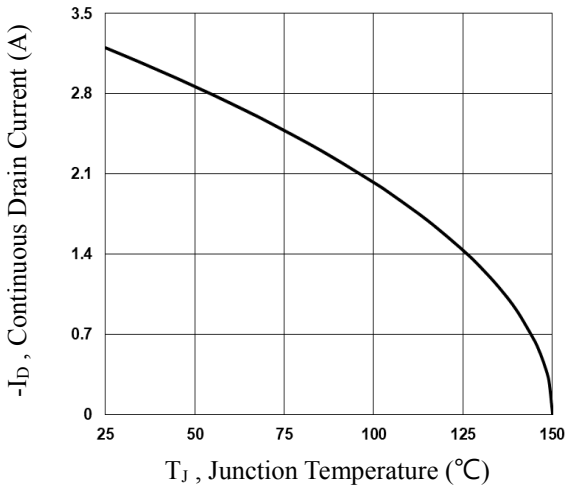


Fig.1 Continuous Drain Current vs.  $T_J$

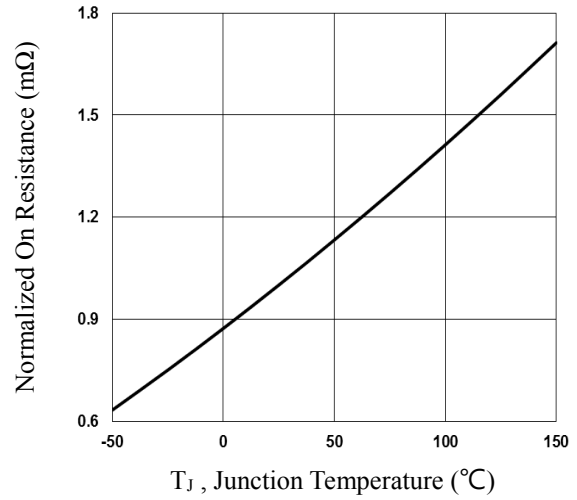


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$

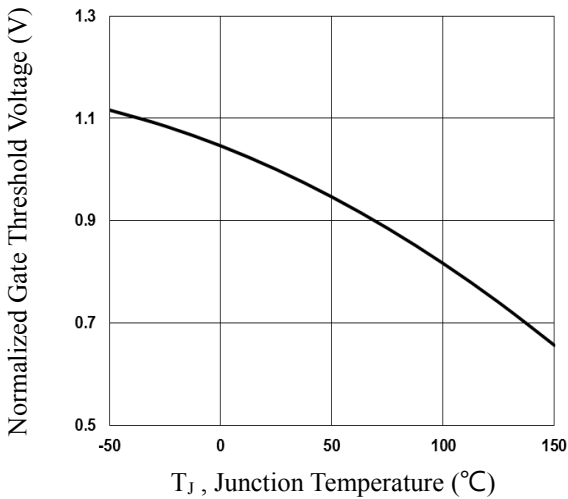


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

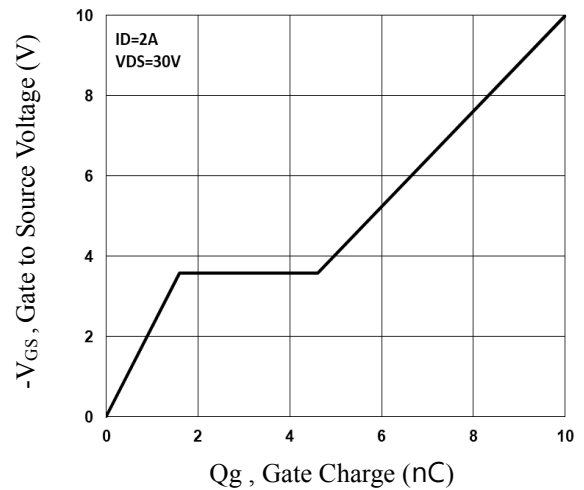


Fig.4 Gate Charge Waveform

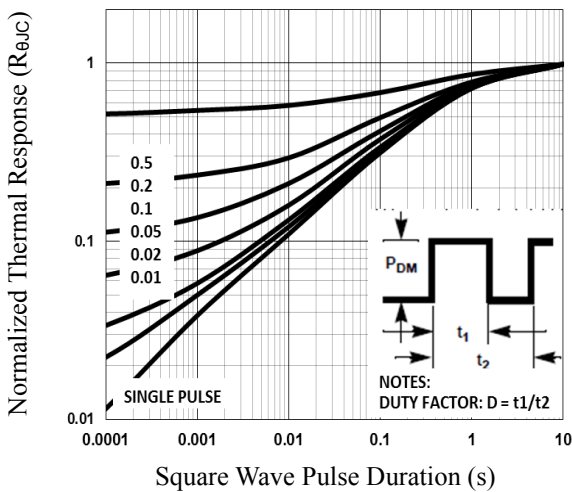


Fig.5 Normalized Transient Impedance

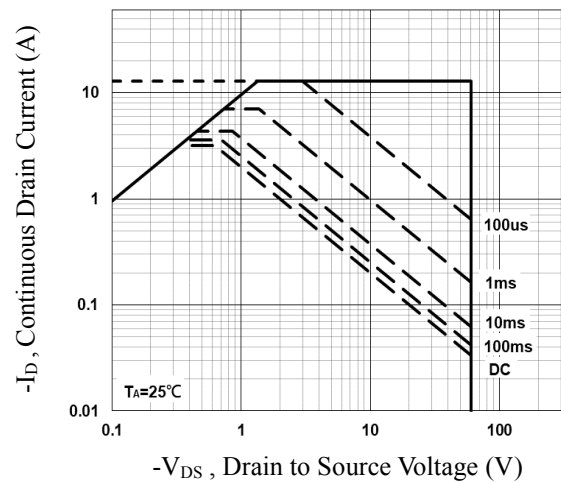


Fig.6 Maximum Safe Operation Area



Characteristics Curves

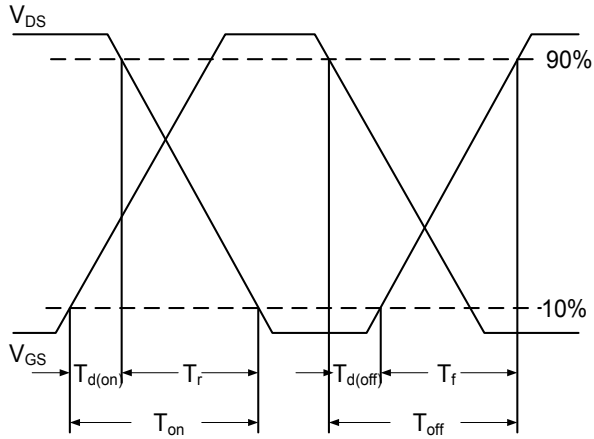


Fig.7 Switching Time Waveform

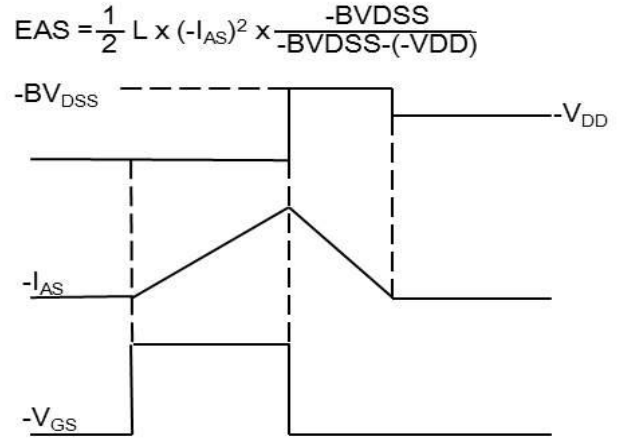
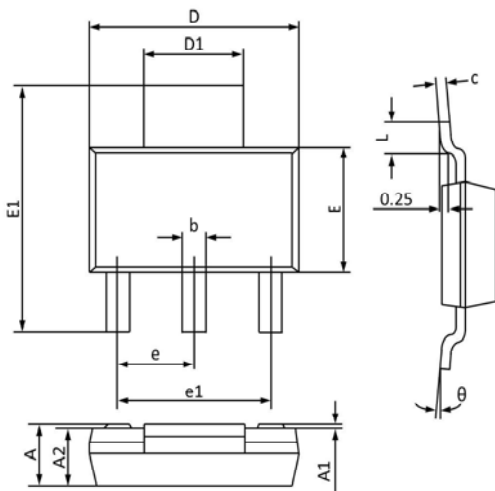


Fig.8 EAS Waveform

Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	1.800	1.520	0.071	0.060
A1	0.100	0.000	0.004	0.000
A2	1.700	1.500	0.067	0.059
b	0.820	0.660	0.032	0.026
c	0.350	0.250	0.014	0.010
D	6.400	6.200	0.252	0.244
D1	3.100	2.900	0.122	0.114
E	3.700	3.300	0.146	0.130
E1	7.070	6.830	0.278	0.269
e	2.30(BSC)		0.091(BSC)	
e1	4.700	4.500	0.185	0.177
L	1.150	0.900	0.045	0.035
θ	10°	0°	10°	0°

SOT-223



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