

### General Description

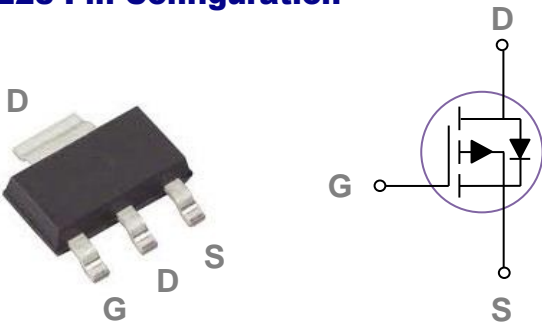
These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BVDSS	RDSON	ID
-60V	105mΩ	-3.2A

### Features

- -60V,-3.2A,  $R_{DS(ON)} = 105m\Omega @ V_{GS} = -10V$
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green Device Available

### SOT223 Pin Configuration



### 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 ( $T_A=25^\circ\text{C}$ )	-3.2	A
	Drain Current – Continuous ( $T_C=25^\circ\text{C}$ )	-5	A
$I_{DM}$	Drain Current – Pulsed <sup>1</sup> ( $T_A=25^\circ\text{C}$ )	-12.8	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 ( $T_C=25^\circ\text{C}$ )	5.4	W
$T_{STG}$	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	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	23	$^\circ\text{C/W}$

**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	$V_{GS}=0V, I_D=-250\mu A$	-60	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=-1\text{mA}$	---	-0.05	---	$V/^\circ\text{C}$
$I_{DSS}$	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	$V_{GS}=-10V, I_D=-3A$	---	87	105	$m\Omega$
		$V_{GS}=-4.5V, I_D=-2A$	---	107	140	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.6	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3	---	$mV/^\circ\text{C}$
$g_{fs}$	Forward Transconductance	$V_{DS}=-10V, I_D=-3A$	---	5.5	---	S

**Dynamic and switching Characteristics**

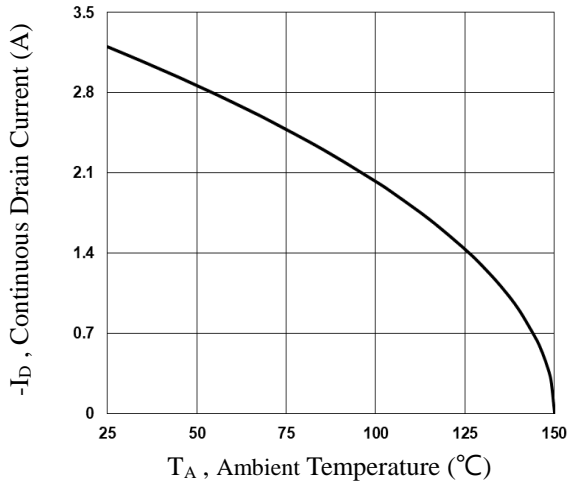
$Q_g$	Total Gate Charge <sup>3, 4</sup>	$V_{DS}=-30V, V_{GS}=-10V, I_D=-2A$	---	10	15	nC
$Q_{gs}$	Gate-Source Charge <sup>3, 4</sup>		---	1.6	3.2	
$Q_{gd}$	Gate-Drain Charge <sup>3, 4</sup>		---	3	6	
$T_{d(on)}$	Turn-On Delay Time <sup>3, 4</sup>	$V_{DD}=-30V, V_{GS}=-10V, R_G=6\Omega$ $I_D=-1A$	---	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	$V_{DS}=-30V, V_{GS}=0V, F=1\text{MHz}$	---	785	1300	pF
$C_{oss}$	Output Capacitance		---	175	300	
$C_{rss}$	Reverse Transfer Capacitance		---	112	220	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	36	---	$\Omega$

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

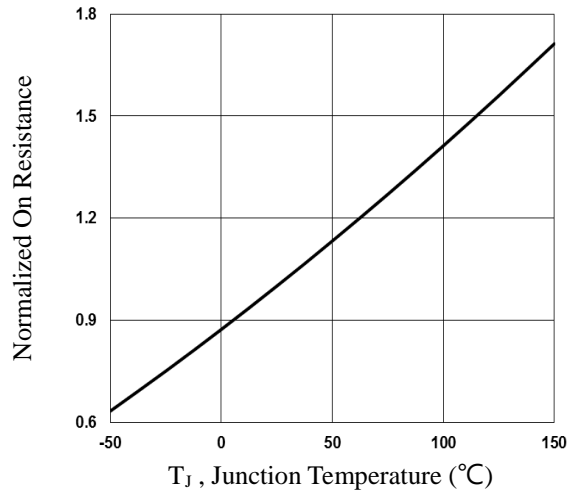
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V$ , Force Current	---	---	-3.2	A
$I_{SM}$	Pulsed Source Current		---	---	-6.4	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1	V

Note :

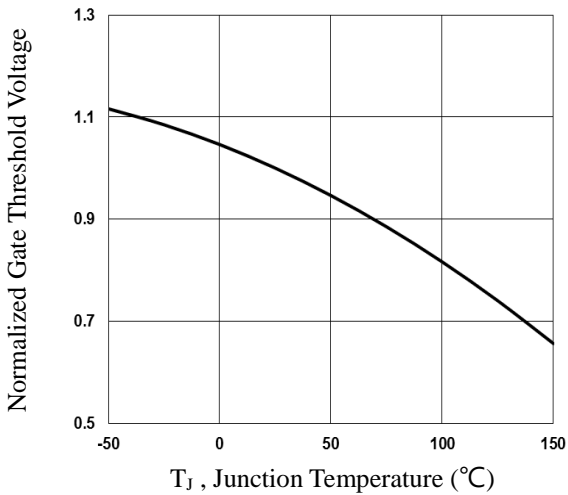
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=-25V, V_{GS}=-10V, L=0.1\text{mH}, I_{AS}=-18A., R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$ .
3. The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
4. Essentially independent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



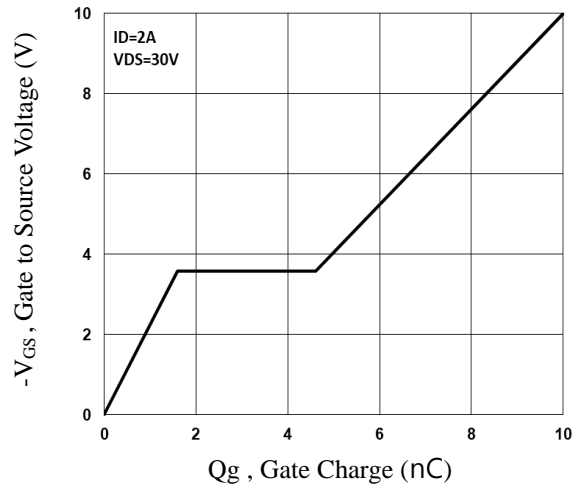
**Fig.1 Continuous Drain Current vs.  $T_A$**



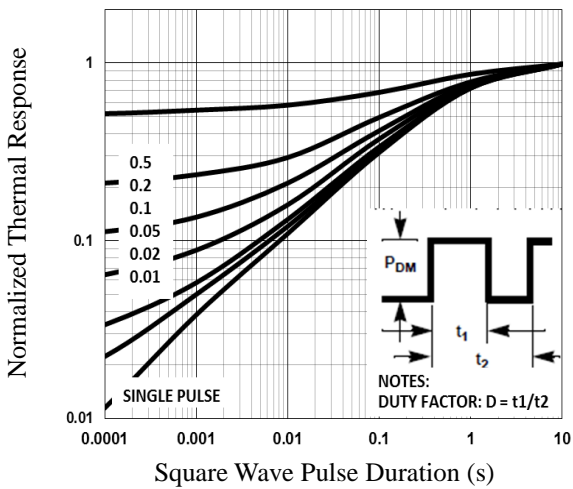
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$**



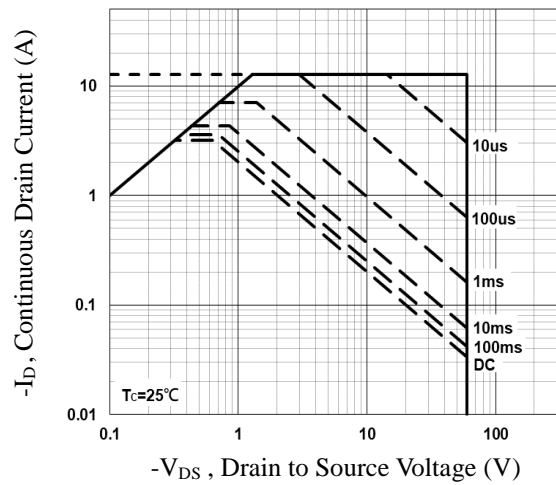
**Fig.3 Normalized  $V_{th}$  vs.  $T_J$**



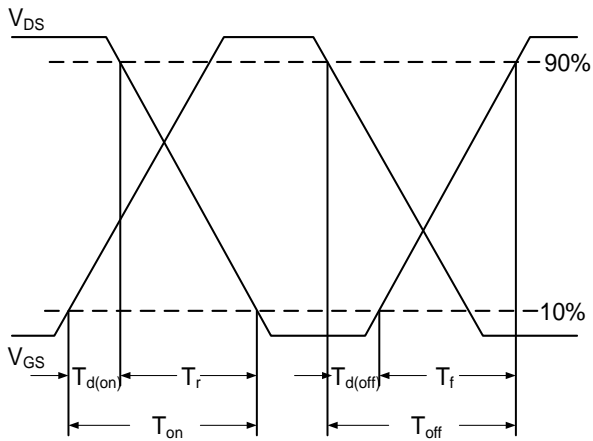
**Fig.4 Gate Charge Waveform**



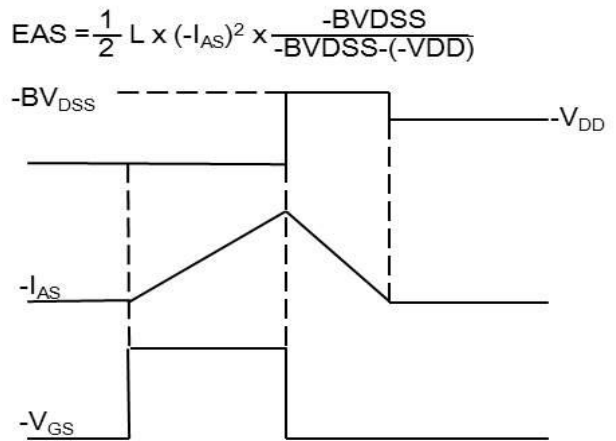
**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**

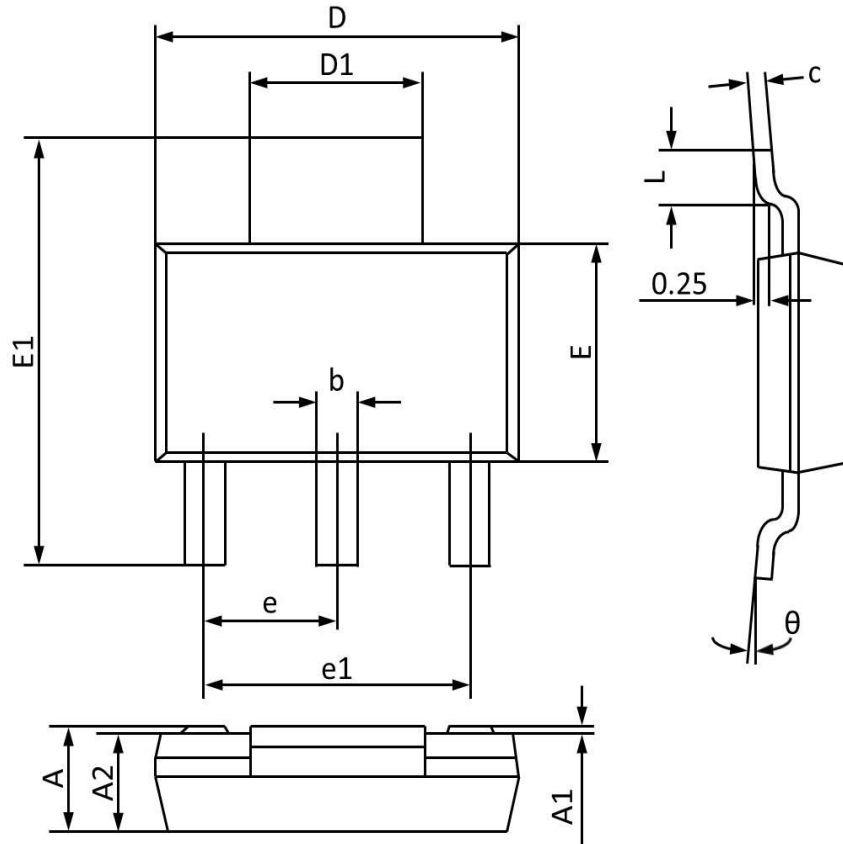


**Fig.7 Switching Time Waveform**



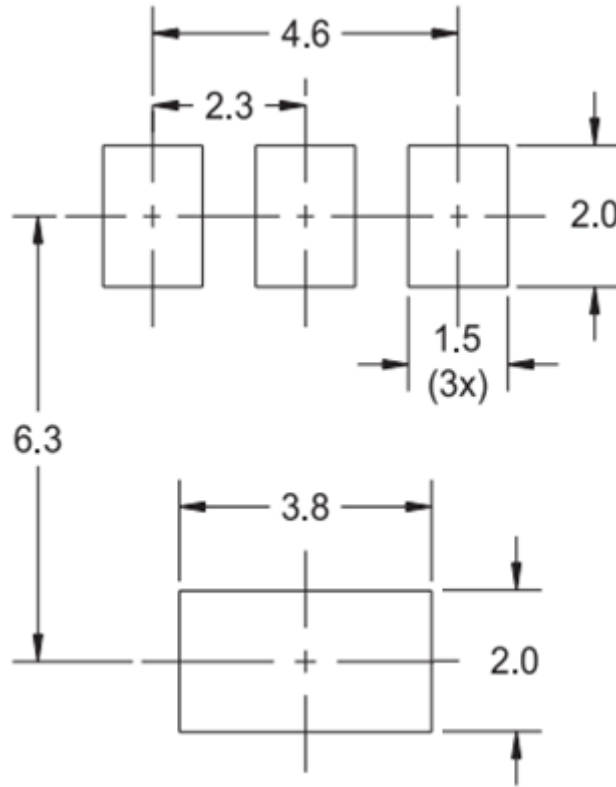
**Fig.8 EAS Waveform**

## SOT223 PACKAGE INFORMATION



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°

### SOT223 RECOMMENDED LAND PATTERN



unit : mm