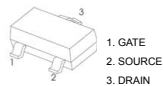


General Description

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.

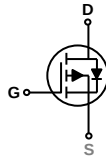
Features

- 60V, -2A, $R_{DS(ON)} = 160m\Omega @ V_{GS} = -10V$
- Improved dv/dt capability
- Fast switching
- Green Device Available

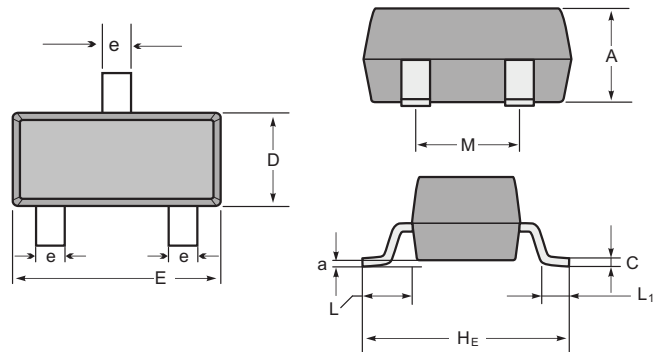


Applications

- Motor Drive
- Power Tools
- LED Lighting



BVDSS	RDSON	ID
-60V	160mΩ	-2A



SOT-23 mechanical data

UNIT		A	C	D	E	H _E	e	M	L	L ₁	a
mm	max	1.1	0.15	1.4	3.0	2.6	0.5	1.95	0.55 (ref)	0.36 (ref)	0.0
	min	0.9	0.08	1.2	2.8	2.2	0.3	1.7			0.15
mil	max	43	6	55	118	102	20	77	22 (ref)	14 (ref)	0.0
	min	35	3	47	110	87	12	67			6

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	± 20	V
I_D	Drain Current – Continuous ($T_A=25^\circ\text{C}$)	-2	A
	Drain Current – Continuous ($T_A=70^\circ\text{C}$)	-1.6	A
I_{DM}	Drain Current – Pulsed ¹	-8	A
P_D	Power Dissipation ($T_A=25^\circ\text{C}$)	1.56	W
	Power Dissipation – Derate above 25°C	0.012	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	---	80	$^\circ\text{C/W}$

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Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Off Characteristics

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	---	-0.05	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-60V , V _{GS} =0V , T _J =25°C	---	---	-1	uA
		V _{DS} =-48V , V _{GS} =0V , T _J =125°C	---	---	-10	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V , V _{DS} =0V	---	---	±100	nA

On Characteristics

R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V , I _D =-2A	---	160	200	mΩ
		V _{GS} =-4.5V , I _D =-1.5A	---	200	240	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.0	-1.9	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	5	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =-10V , I _D =-2A	---	3.5	---	S

Dynamic and switching Characteristics

Q _g	Total Gate Charge ^{2, 3}	V _{DS} =-30V , V _{GS} =-10V , I _D =-2A	---	8.2	---	nC
Q _{gs}	Gate-Source Charge ^{2, 3}		---	1.8	---	
Q _{gd}	Gate-Drain Charge ^{2, 3}		---	1.5	---	
T _{d(on)}	Turn-On Delay Time ^{2, 3}	V _{DD} =-30V , V _{GS} =-10V , R _G =6Ω I _D =-1A	---	5.2	---	ns
T _r	Rise Time ^{2, 3}		---	19	---	
T _{d(off)}	Turn-Off Delay Time ^{2, 3}		---	35	---	
T _f	Fall Time ^{2, 3}		---	10.6	---	
C _{iss}	Input Capacitance	V _{DS} =-30V , V _{GS} =0V , F=1MHz	---	425	---	pF
C _{oss}	Output Capacitance		---	35	---	
C _{rss}	Reverse Transfer Capacitance		---	20	---	

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	---	---	-2	A
I _{SM}	Pulsed Source Current		---	---	-4	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V , I _S =-1A , T _J =25°C	---	---	-1.2	V

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
3. Essentially independent of operating temperature.

RATING AND CHARACTERISTIC CURVES (SI2309)

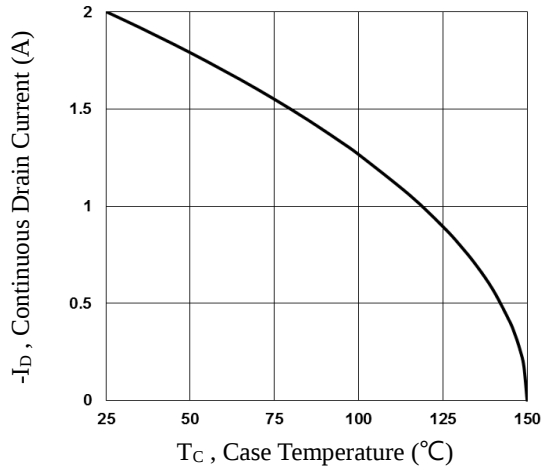


Fig.1 Continuous Drain Current vs. T_C

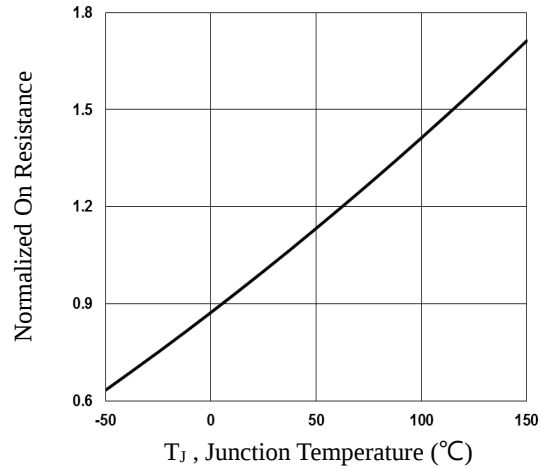


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

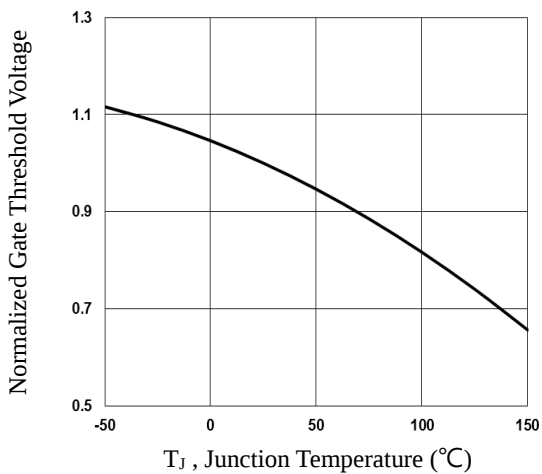


Fig.3 Normalized V_{th} vs. T_J

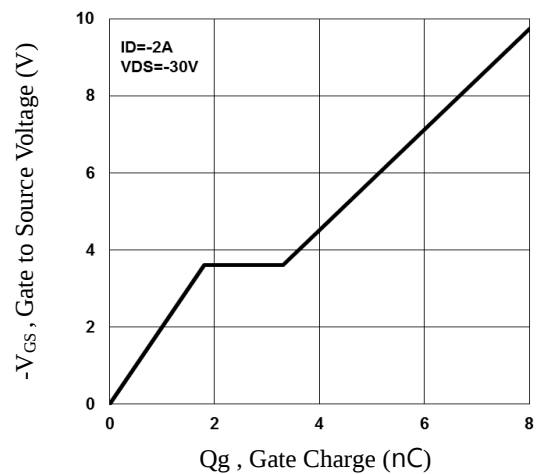


Fig.4 Gate Charge Waveform

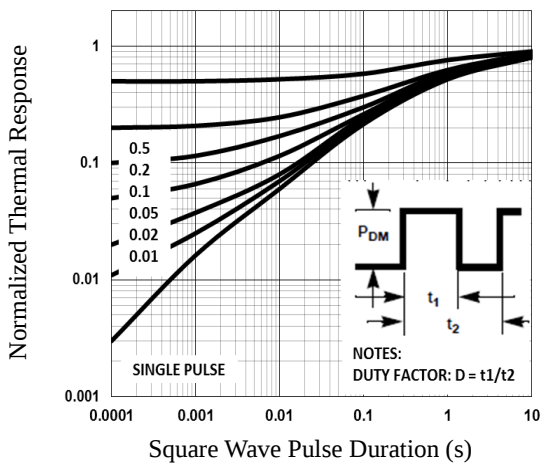


Fig.5 Normalized Transient Impedance

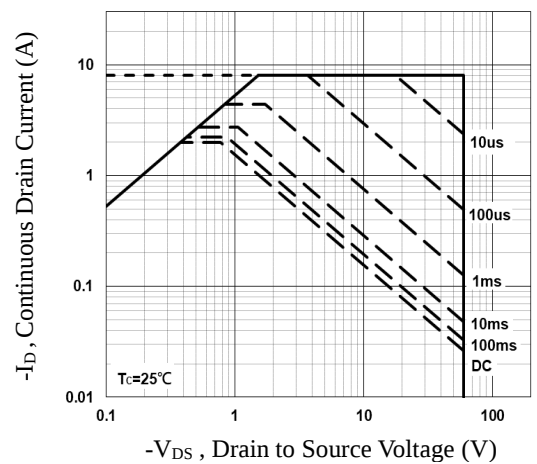


Fig.6 Maximum Safe Operation Area