

20V N+P Dual Channel MOSFETs

General Description

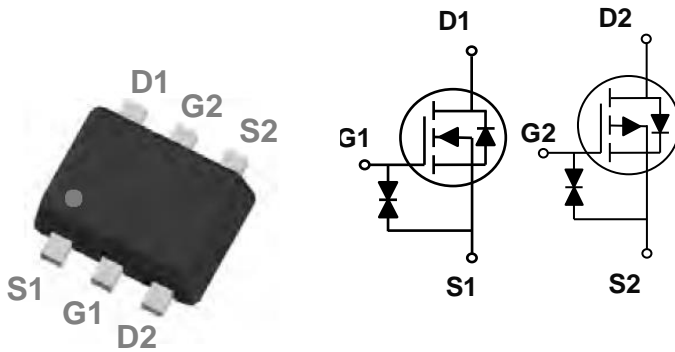
These N+P dual Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.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

BVDSS	RDSON	ID
20V	300mΩ	800mA
-20V	600mΩ	-400mA

Features

- Fast switching
- Green Device Available
- Suit for 1.5 Gate Drive Applications

SOT-563 Dual Pin Configuration



Applications

- Notebook
- Load Switch
- Networking
- Hand-held Instruments

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

Symbol	Parameter	Rating		Units
V _{DS}	Drain-Source Voltage	20	-20	V
V _{GS}	Gate-Source Voltage	±8	±8	V
I _D	Drain Current – Continuous (T _C =25°C)	800	-400	mA
	Drain Current – Continuous (T _C =100°C)	510	-250	mA
I _{DM}	Drain Current – Pulsed ¹	3.2	-1.6	A
P _D	Power Dissipation (T _C =25°C)	312	312	mW
	Power Dissipation – Derate above 25°C	2.5	2.5	mW/°C
T _{STG}	Storage Temperature Range	-55 to 150	-55 to 150	°C
T _J	Operating Junction Temperature Range	-55 to 150	-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction to ambient	---	400	°C/W



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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	-0.01	---	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=20V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=16V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 6V, V_{DS}=0V$	---	---	± 20	μA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5V, I_D=0.5A$	---	200	300	m Ω
		$V_{GS}=2.5V, I_D=0.4A$	---	235	400	
		$V_{GS}=1.8V, I_D=0.2A$	---	295	550	
		$V_{GS}=1.5V, I_D=0.1A$	---	365	800	
		$V_{GS}=1.2V, I_D=0.1A$	---	600	1500	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	0.3	0.6	1.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3	---	mV/ $^\circ\text{C}$

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=10V, V_{GS}=4.5V, I_D=0.5A$	---	1	2	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	0.26	0.5	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	0.2	0.4	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=10V, V_{GS}=4.5V, R_G=10\Omega$ $I_D=0.5A$	---	5	10	ns
T_r	Rise Time ^{2,3}		---	3.5	7	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	14	28	
T_f	Fall Time ^{2,3}		---	6	12	
C_{iss}	Input Capacitance	$V_{DS}=10V, V_{GS}=0V, F=1\text{MHz}$	---	38.2	75	pF
C_{oss}	Output Capacitance		---	14.4	28	
C_{rss}	Reverse Transfer Capacitance		---	6	12	

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	---	---	0.8	A
I_{SM}	Pulsed Source Current		---	---	1.6	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=0.2A, T_J=25^\circ\text{C}$	---	---	1	V



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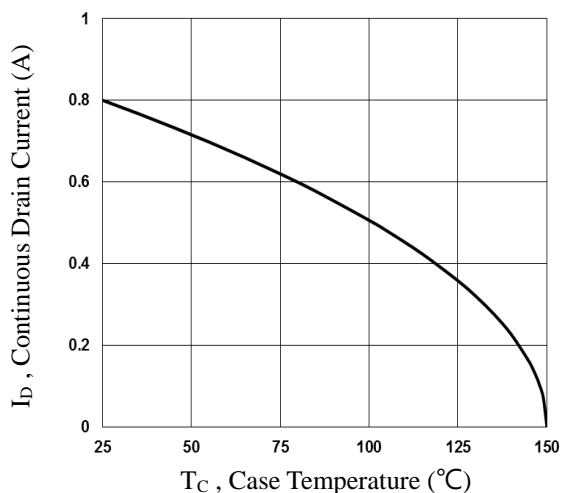


Fig.1 Continuous Drain Current vs. T_C

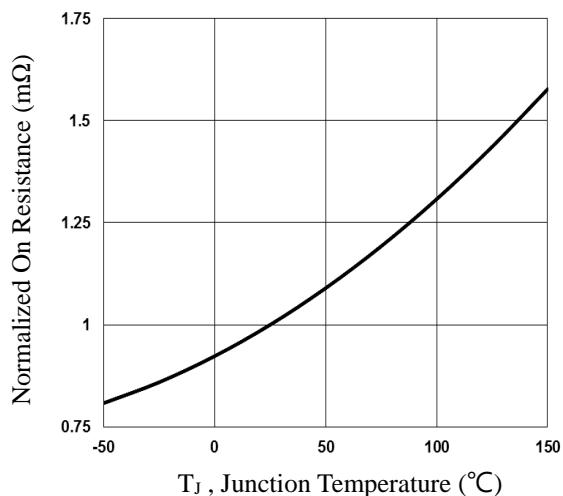


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

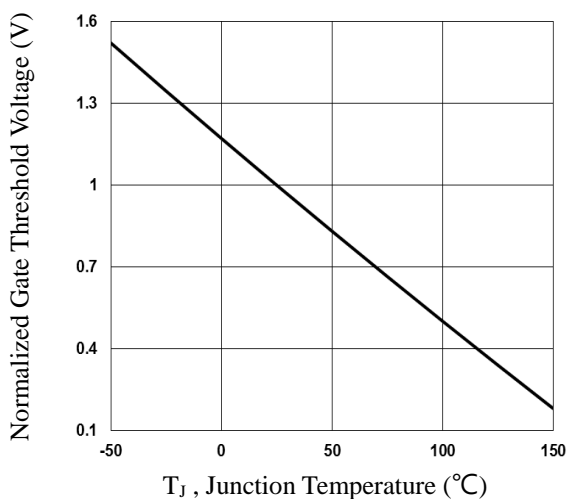


Fig.3 Normalized V_{th} vs. T_J

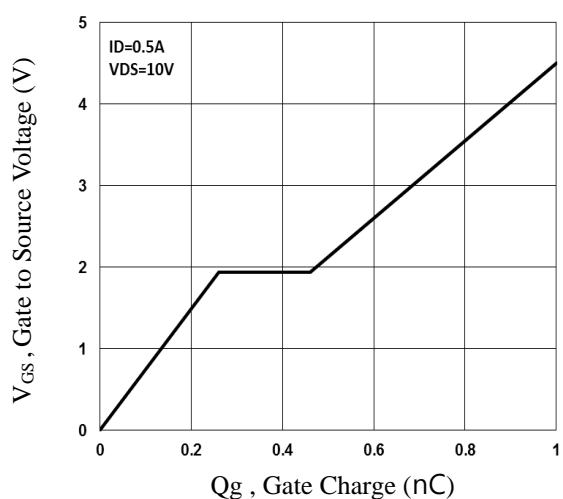


Fig.4 Gate Charge Waveform

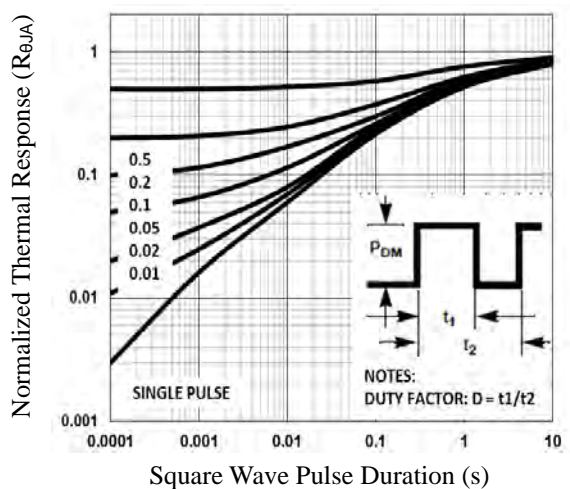


Fig.5 Normalized Transient Impedance

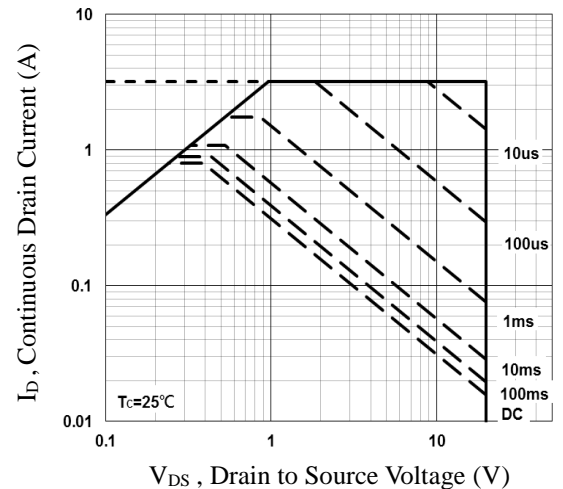


Fig.6 Maximum Safe Operation Area



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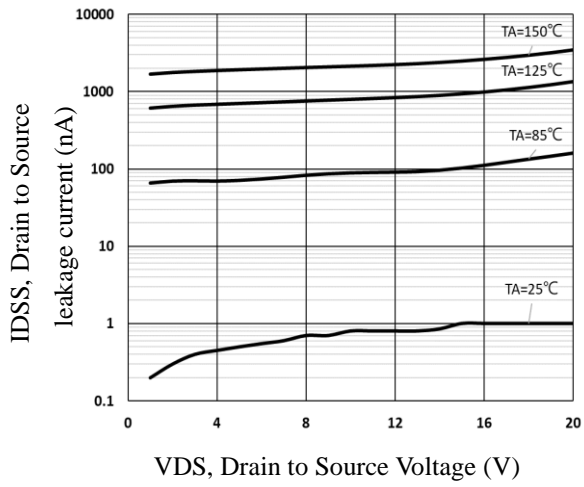


Fig.7 Leakage Current vs. VDS



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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.01	---	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-20V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-16V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	-10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 8V, V_{DS}=0V$	---	---	± 20	μA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5V, I_D=-0.3A$	---	440	600	m Ω
		$V_{GS}=-2.5V, I_D=-0.2A$	---	610	850	
		$V_{GS}=-1.8V, I_D=-0.1A$	---	810	1200	
		$V_{GS}=-1.5V, I_D=-0.1A$	---	1020	1600	
		$V_{GS}=-1.2V, I_D=-0.1A$	---	1800	3000	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-0.3	-0.6	-1.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	3	---	mV/ $^\circ\text{C}$

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=-10V, V_{GS}=-4.5V, I_D=-0.2A$	---	1	2	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	0.28	0.5	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	0.18	0.4	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=-10V, V_{GS}=-4.5V, R_G=10\Omega$ $I_D=-0.2A$	---	8	16	ns
T_r	Rise Time ^{2,3}		---	5.2	10	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	30	60	
T_f	Fall Time ^{2,3}		---	18	36	
C_{iss}	Input Capacitance	$V_{DS}=-10V, V_{GS}=0V, F=1\text{MHz}$	---	40	78	pF
C_{oss}	Output Capacitance		---	15	30	
C_{rss}	Reverse Transfer Capacitance		---	6.5	13	

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	---	---	-0.4	A
I_{SM}	Pulsed Source Current		---	---	-0.8	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=-0.2A, T_J=25^\circ\text{C}$	---	---	-1	V

Note :

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



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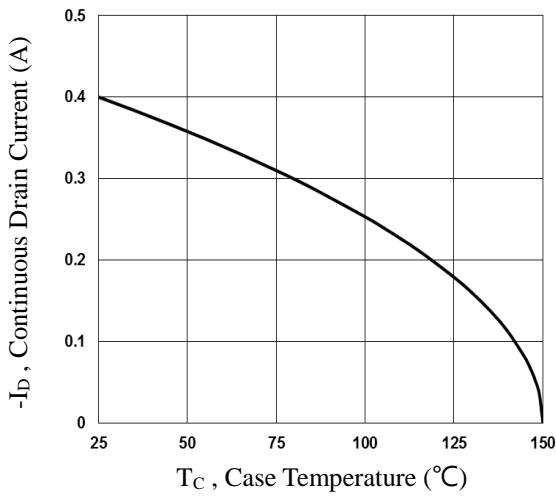


Fig.8 Continuous Drain Current vs. T_c

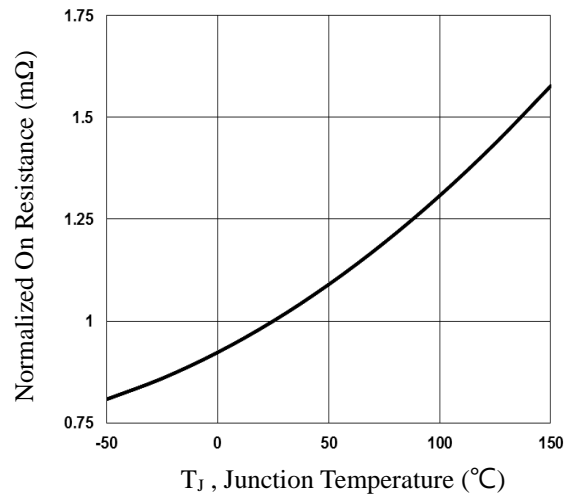


Fig.9 Normalized $R_{DS(on)}$ vs. T_j

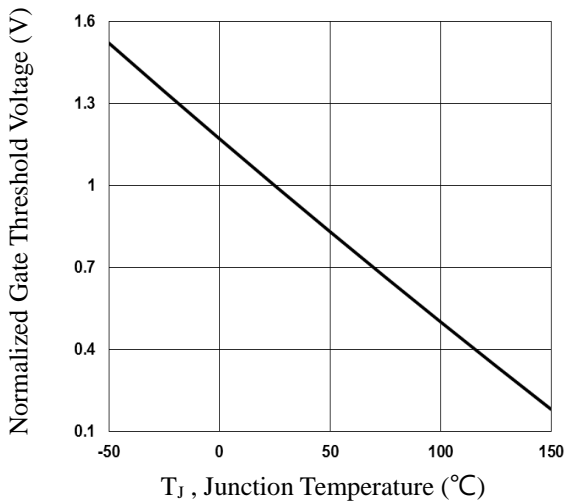


Fig.10 Normalized V_{th} vs. T_j

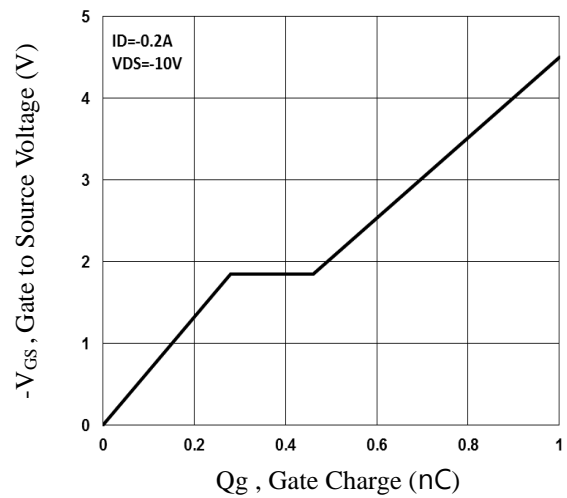


Fig.11 Gate Charge Waveform

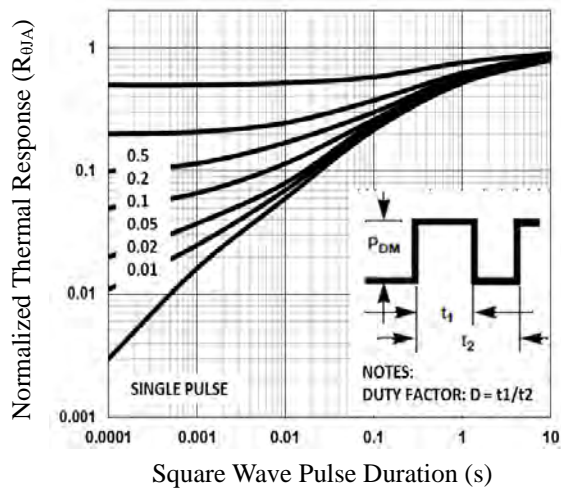


Fig.12 Normalized Transient Impedance

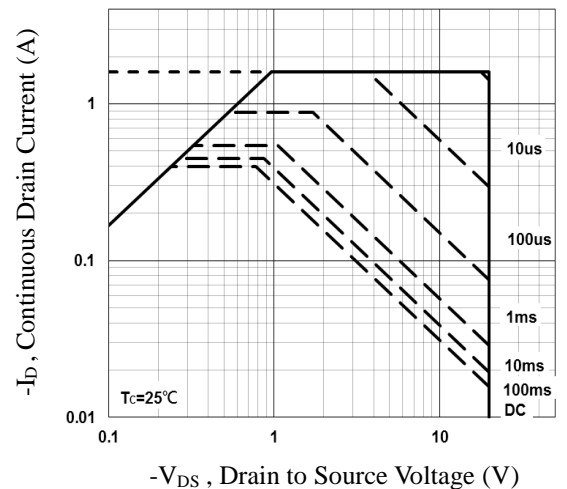


Fig.13 Maximum Safe Operation Area



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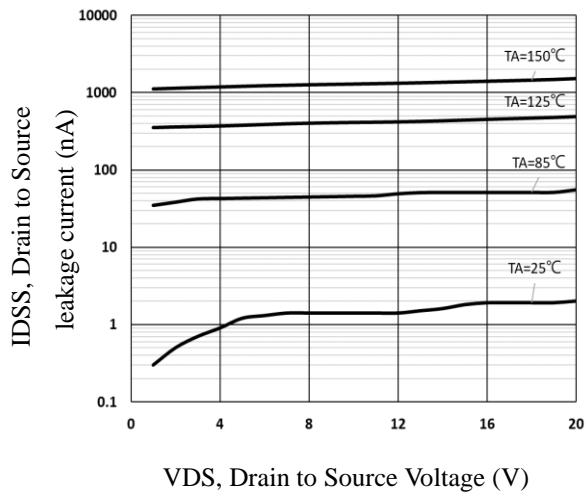
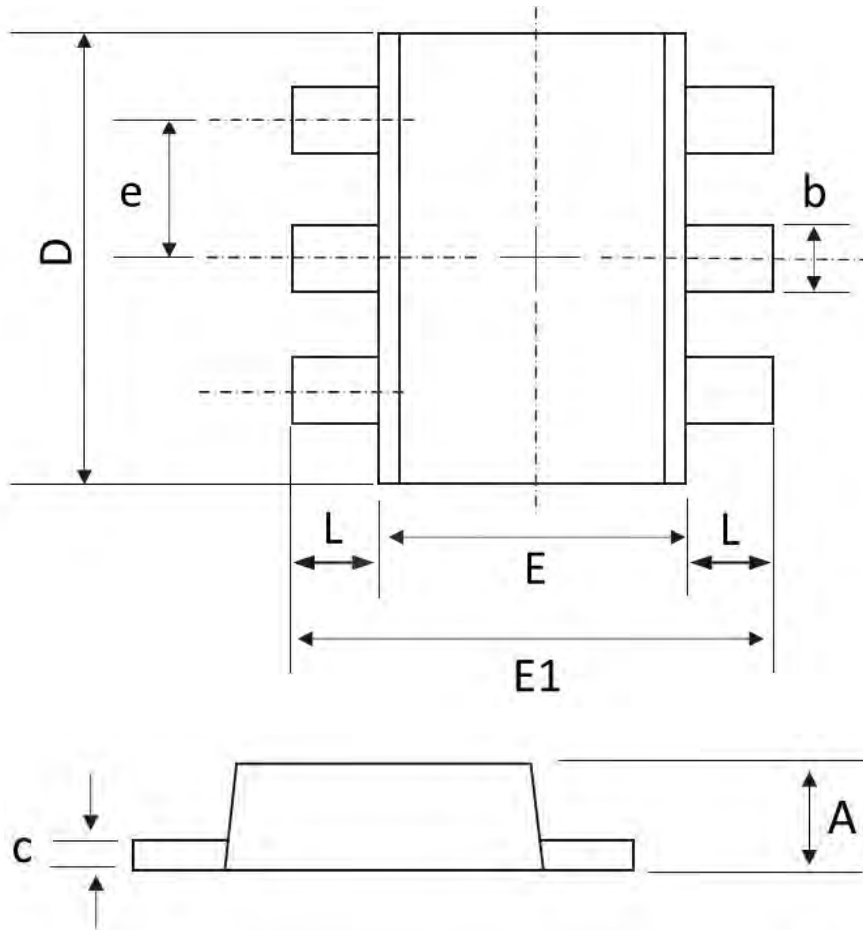


Fig.14 Leakage Current vs. V_{DS}

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SOT-563 Dual PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MAX	MIN	MAX	MIN
A	0.600	0.500	0.024	0.020
b	0.300	0.150	0.012	0.006
c	0.180	0.100	0.007	0.004
D	1.700	1.500	0.067	0.059
E	1.250	1.100	0.049	0.043
E1	1.700	1.550	0.067	0.061
e	0.5BSC		0.02BSC	
L	0.300	0.100	0.012	0.004