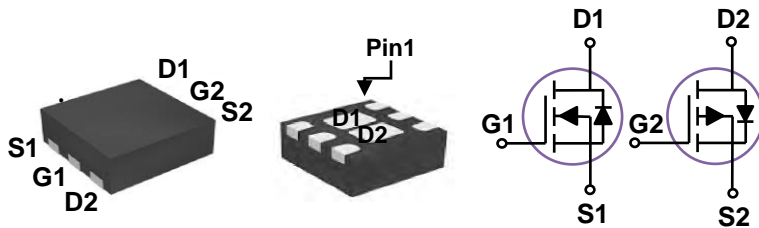


20V N+P Dual Channel MOSF ETs

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.

DFN2X2 Dual 2EP Pin Configuration



BVDSS	RDSON	ID
20V	20mΩ	5.8A
-20V	60mΩ	-3.5A

Features

- Fast switching
- Green Device Available
- Suit for 1.8V Gate Drive Applications

Applications

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

Absolute Maximum Ratings $T_c=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Rating		Units
V_{DS}	Drain-Source Voltage	20	-20	V
V_{GS}	Gate-Source Voltage	± 10	± 10	V
I_D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	5.8	-3.5	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	3.3	-1.8	A
I_{DM}	Drain Current – Pulsed ¹	15.2	-10	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	1.25	1.25	W
	Power Dissipation – Derate above 25°C	0.01	0.01	W/ $^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	100	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	15	$^\circ\text{C}/\text{W}$



20V N+ P Dual Channel MOSFETs

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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to $25\text{ }^\circ\text{C}$, $I_D=1mA$	---	0.02	---	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=20V, V_{GS}=0V, T_J=25\text{ }^\circ\text{C}$	---	---	1	μA
		$V_{DS}=16V, V_{GS}=0V, T_J=125\text{ }^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 10V, V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=4.5V, I_D=4A$	---	20	40	m Ω
		$V_{GS}=2.5V, I_D=2A$	---	32	55	m Ω
		$V_{GS}=1.8V, I_D=1.5A$	---	55	70	m Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	0.3	0.6	1	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-2	---	mV/ $^\circ\text{C}$
g_{fs}	Forward Transconductance	$V_{DS}=10V, I_D=2A$	---	4.4	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=10V, V_{GS}=4.5V, I_D=3A$	---	5.8	10	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	0.6	1.5	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	1.5	3	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=10V, V_{GS}=4.5V, R_G=25\Omega$ $I_D=1A$	---	2.9	6	ns
T_r	Rise Time ^{2,3}		---	8.4	16	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	19.2	38	
T_f	Fall Time ^{2,3}		---	5.6	12	
C_{iss}	Input Capacitance	$V_{DS}=15V, V_{GS}=0V, F=1MHz$	---	315	600	pF
C_{oss}	Output Capacitance		---	50	80	
C_{rss}	Reverse Transfer Capacitance		---	40	60	

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	---	---	3.8	A
I_{SM}	Pulsed Source Current		---	---	7.6	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25\text{ }^\circ\text{C}$	---	---	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.

20V N+ P Dual Channel MOSFETs

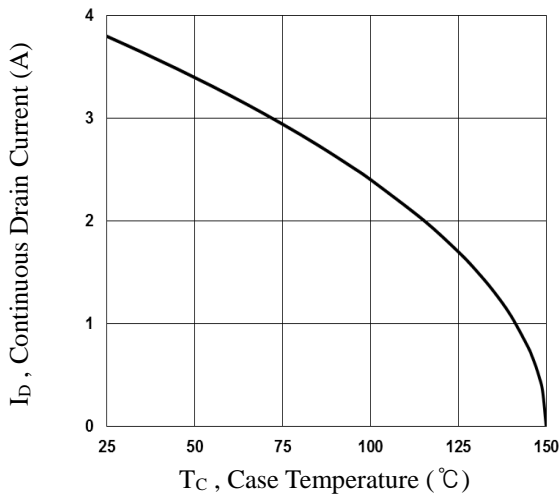


Fig.1 Continuous Drain Current vs. T_c

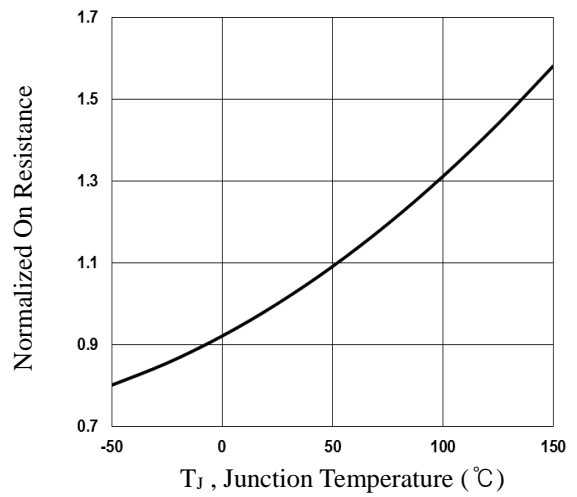


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

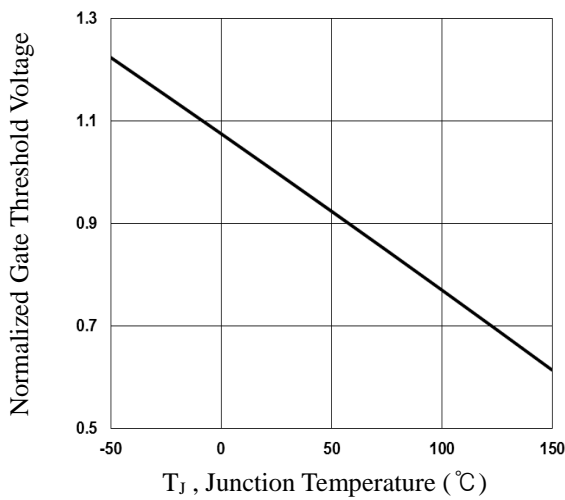


Fig.3 Normalized V_{th} vs. T_j

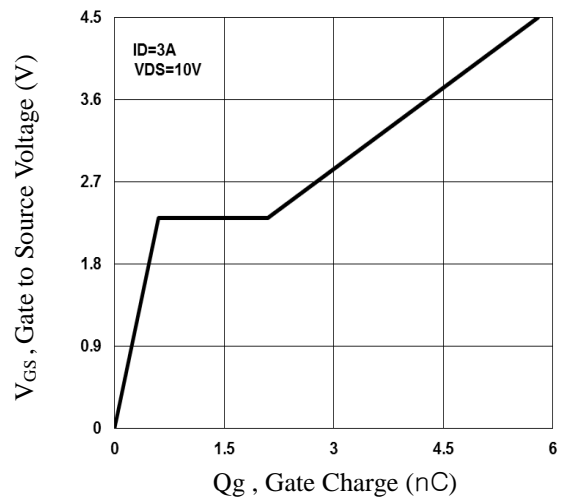


Fig.4 Gate Charge Waveform

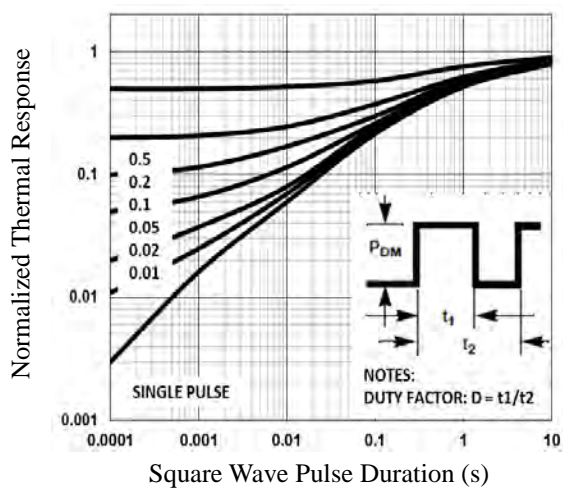


Fig.5 Normalized Transient Impedance

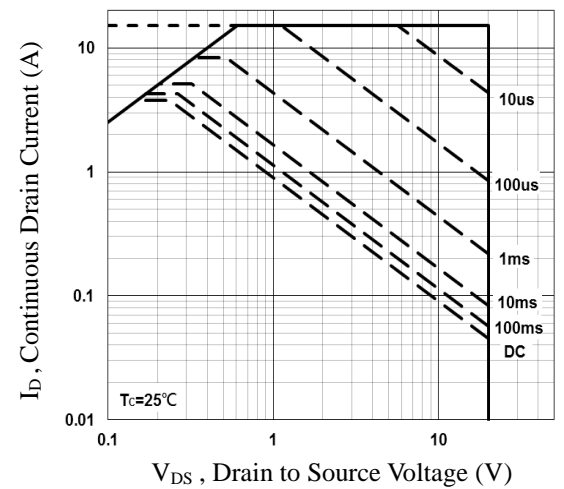


Fig.6 Maximum Safe Operation Area



20V N+ P Dual Channel MOSFETs

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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=-250\mu A$	-20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to $25\text{ }^\circ\text{C}$, $I_D=-1mA$	---	-0.01	---	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-20V$, $V_{GS}=0V$, $T_J=25\text{ }^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-16V$, $V_{GS}=0V$, $T_J=125\text{ }^\circ\text{C}$	---	---	-10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 10V$, $V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=-4.5V$, $I_D=-3A$	---	60	100	m Ω
		$V_{GS}=-2.5V$, $I_D=-2A$	---	85	120	m Ω
		$V_{GS}=-1.8V$, $I_D=-1A$	---	137	190	m Ω
$V_{GS(th)}$	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/ $^\circ\text{C}$
gfs	Forward Transconductance	$V_{DS}=-10V$, $I_D=-1A$	---	2.2	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{4, 5}	$V_{DS}=-10V$, $V_{GS}=-4.5V$, $I_D=-2A$	---	4.8	10	nC
Q_{gs}	Gate-Source Charge ^{4, 5}		---	0.5	1	
Q_{gd}	Gate-Drain Charge ^{4, 5}		---	1.9	4	
$T_{d(on)}$	Turn-On Delay Time ^{4, 5}	$V_{DD}=-10V$, $V_{GS}=-4.5V$, $R_G=25\Omega$ $I_D=-1A$	---	3.5	7	ns
T_r	Rise Time ^{4, 5}		---	12.6	24	
$T_{d(off)}$	Turn-Off Delay Time ^{4, 5}		---	32.6	62	
T_f	Fall Time ^{4, 5}		---	8.4	16	
C_{iss}	Input Capacitance	$V_{DS}=-15V$, $V_{GS}=0V$, $F=1MHz$	---	350	510	pF
C_{oss}	Output Capacitance		---	65	95	
C_{rss}	Reverse Transfer Capacitance		---	50	75	

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	---	---	-2.5	A
I_{SM}	Pulsed Source Current		---	---	-5	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V$, $I_S=-1A$, $T_J=25\text{ }^\circ\text{C}$	---	---	-1	V

Note :

- The data tested by pulsed, pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
- Essentially independent of operating temperature.

20V N+ P Dual Channel MOSFETs

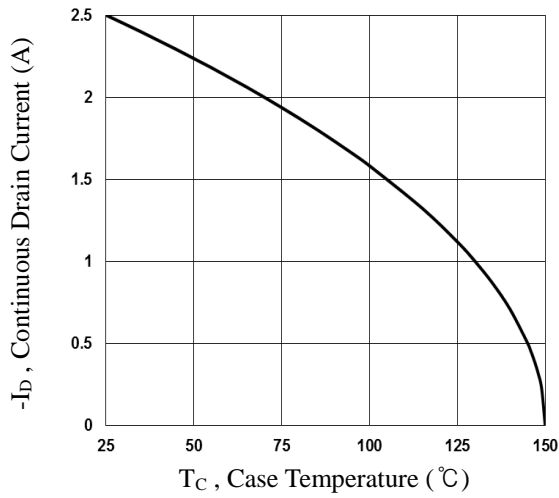


Fig.7 Continuous Drain Current vs. T_C

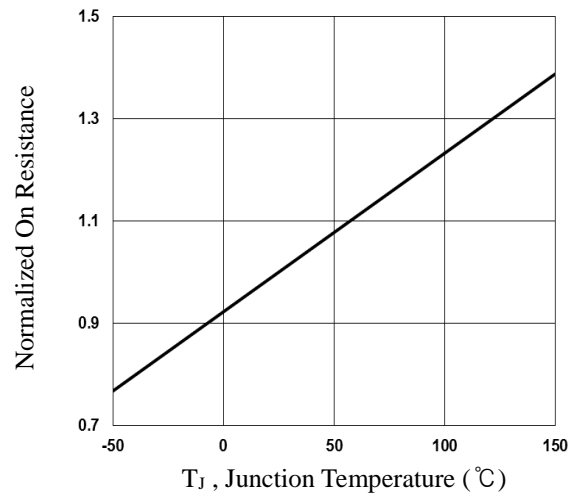


Fig.8 Normalized R_{DS(on)} vs. T_J

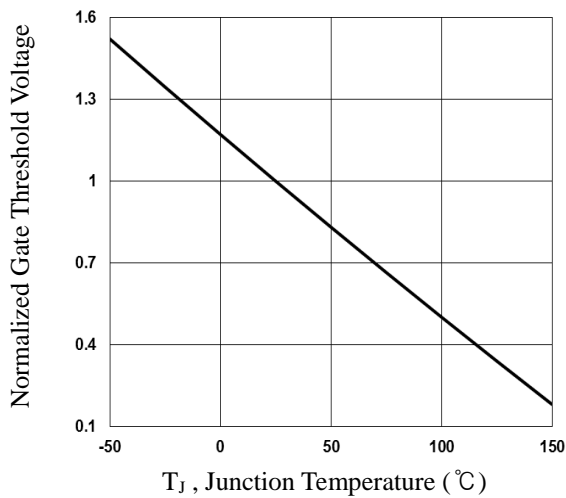


Fig.9 Normalized V_{th} vs. T_J

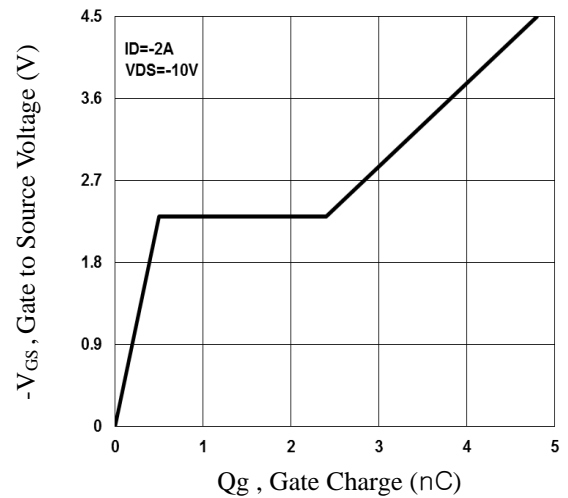


Fig.10 Gate Charge Waveform

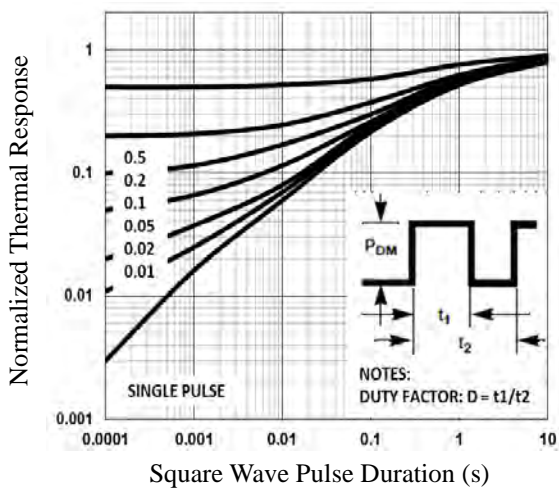


Fig.11 Normalized Transient Impedance

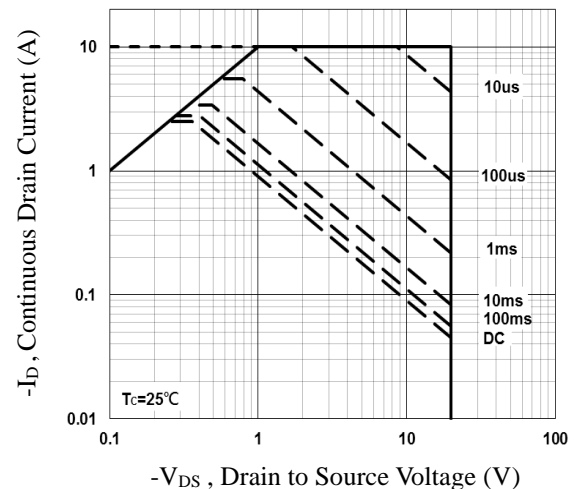
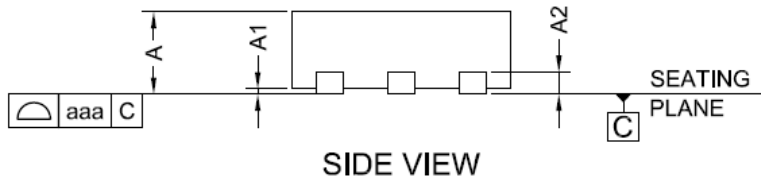
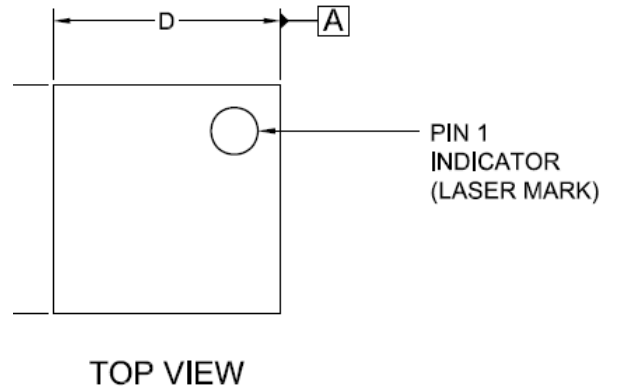
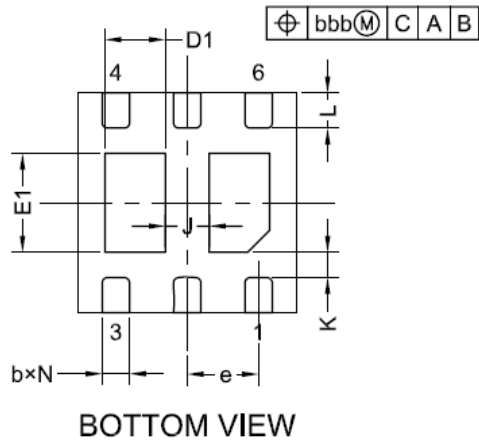


Fig.12 Maximum Safe Operation Area

20V N+ P Dual Channel MOSFETs

PPAK2X2 Dual 2EP PACKAGE INFORMATION



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	TYP	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.203		
b	0.20	0.25	0.30
D	1.95	2.00	2.05
D1	0.50	0.55	0.60
E	1.95	2.00	2.05
E1	0.85	0.90	0.95
e	0.65BSC		
L	0.27	0.32	0.37
J	0.40BSC		
K	0.20MIN		
N	6		
aaa	0.08		
bbb	0.10		