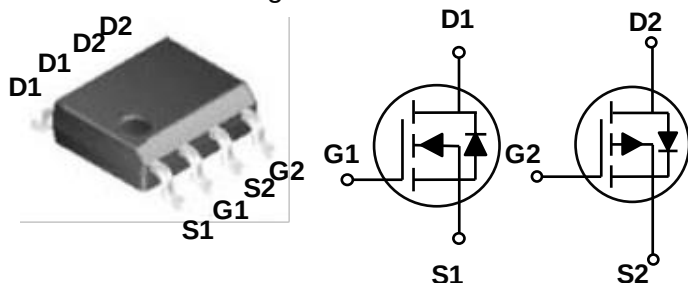


40V N+P Dual Channel MOSFETs

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.

SOP-8L Pin Configuration



BVDSS	RDSON	ID
40V	32mΩ	6.7A
-40V	40mΩ	-7.2A

Features

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications

Applications

- DC Fan
- Motor Drive Applications
- Networking
- Half / Full Bridge Topology

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

Symbol	Parameter	Rating		Units
V_{DS}	Drain-Source Voltage	40	-40	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
I_D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	6.7	7.2	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	4.3	4.5	A
I_{DM}	Drain Current – Pulsed ¹	26.8	28.8	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	2.5		W
	Power Dissipation – Derate above 25°C	0.02		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
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	50	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	62	$^\circ\text{C/W}$



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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	$V_{GS}=0V$, $I_D=250\mu A$	40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1mA$	---	0.04	---	V/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=40V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=32V$, $V_{GS}=0V$, $T_J=125^\circ\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V$, $I_D=5A$	---	24	32	m Ω
		$V_{GS}=4.5V$, $I_D=3A$	---	32	45	m Ω
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.0	1.8	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	-3	---	mV/ $^\circ\text{C}$
gfs	Forward Transconductance	$V_{DS}=10V$, $I_D=3A$	---	3.6	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=20V$, $V_{GS}=4.5V$, $I_D=3A$	---	2.8	5.6	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	0.5	1	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	1.5	3	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=20V$, $V_{GS}=4.5V$, $R_G=25\Omega$ $I_D=1A$	---	3.2	6	ns
T_r	Rise Time ^{2,3}		---	8.6	16	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	18	36	
T_f	Fall Time ^{2,3}		---	6	12	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $F=1MHz$	---	420	800	pF
C_{oss}	Output Capacitance		---	65	120	
C_{rss}	Reverse Transfer Capacitance		---	40	80	

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	---	---	6.7	A
I_{SM}	Pulsed Source Current		---	---	13.4	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. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
3. Essentially independent of operating temperature.

40V N+P Dual Channel MOSFETs

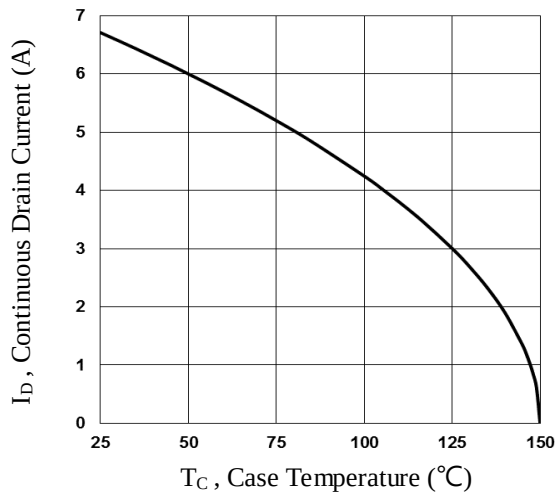


Fig.1 Continuous Drain Current vs. T_C

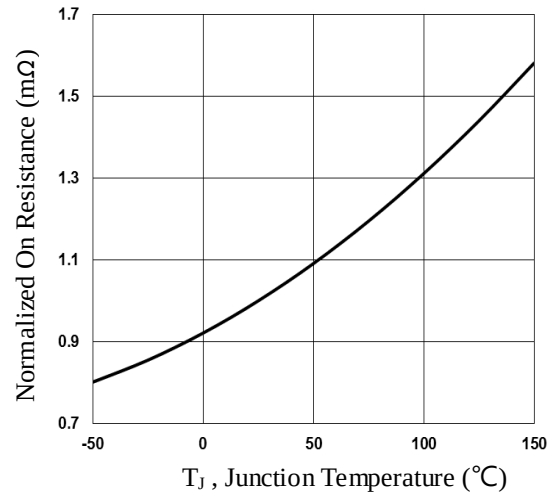


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

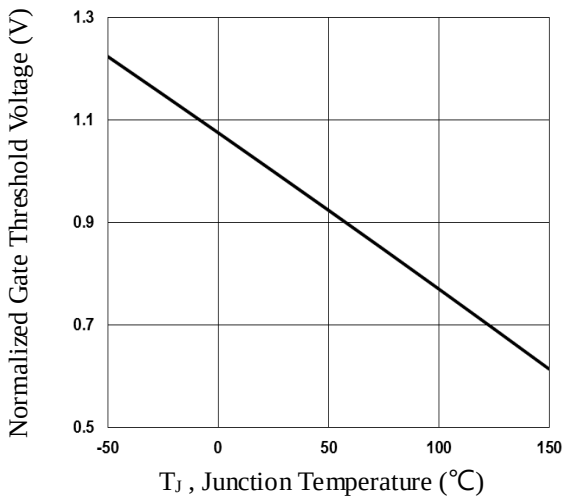


Fig.3 Normalized V_{th} vs. T_J

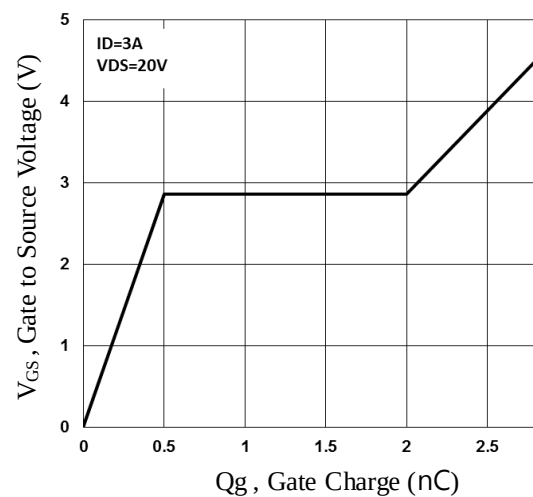


Fig.4 Gate Charge Waveform

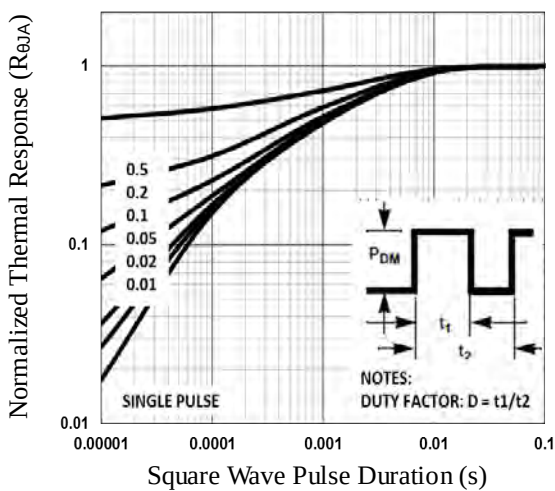


Fig.5 Normalized Transient Impedance

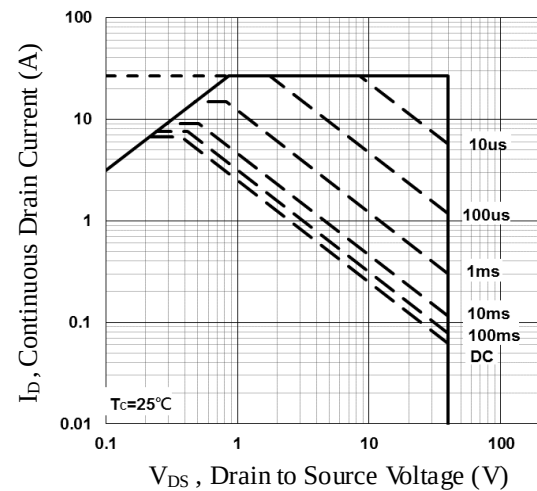


Fig.6 Maximum Safe Operation Area



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40V N+P Dual Channel MOSFETs

P-CH 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	$V_{GS}=0V$, $I_D=-250\mu A$	-40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1mA$	---	-0.04	---	$V/^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-40V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-32V$, $V_{GS}=0V$, $T_J=125^\circ\text{C}$	---	---	-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	$V_{GS}=-10V$, $I_D=-4A$	---	32	40	m Ω
		$V_{GS}=-4.5V$, $I_D=-2A$	---	45	60	m Ω
$V_{GS(th)}$	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/ $^\circ\text{C}$
gfs	Forward Transconductance	$V_{DS}=-10V$, $I_D=-3A$	---	5	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{2,3}	$V_{DS}=-20V$, $V_{GS}=-4.5V$, $I_D=-2A$	---	8	16	nC
Q_{gs}	Gate-Source Charge ^{2,3}		---	2.1	4.2	
Q_{gd}	Gate-Drain Charge ^{2,3}		---	3.6	7.2	
$T_{d(on)}$	Turn-On Delay Time ^{2,3}	$V_{DD}=-20V$, $V_{GS}=-4.5V$, $R_G=25\Omega$ $I_D=-1A$	---	20	40	ns
T_r	Rise Time ^{2,3}		---	12	24	
$T_{d(off)}$	Turn-Off Delay Time ^{2,3}		---	46	80	
T_f	Fall Time ^{2,3}	$V_{DS}=-15V$, $V_{GS}=0V$, $F=1MHz$	---	6	12	pF
C_{iss}	Input Capacitance		---	1050	1600	
C_{oss}	Output Capacitance		---	110	160	
C_{rss}	Reverse Transfer Capacitance		---	80	120	

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	---	---	-7.2	A
I_{SM}	Pulsed Source Current		---	---	-14.4	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V$, $I_S=-1A$, $T_J=25^\circ\text{C}$	---	---	-1	V

Note :

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

40V N+P Dual Channel MOSFETs

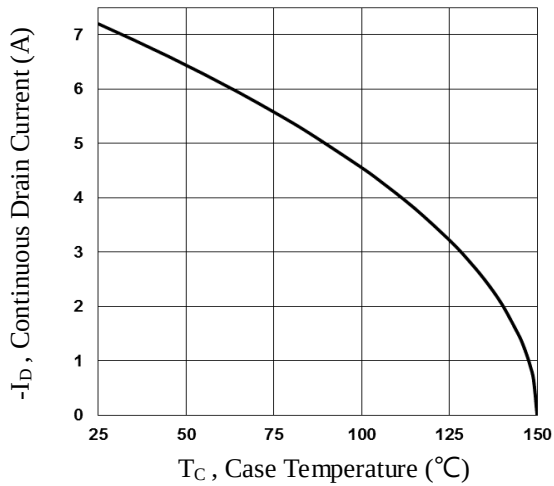


Fig.7 Continuous Drain Current vs. T_C

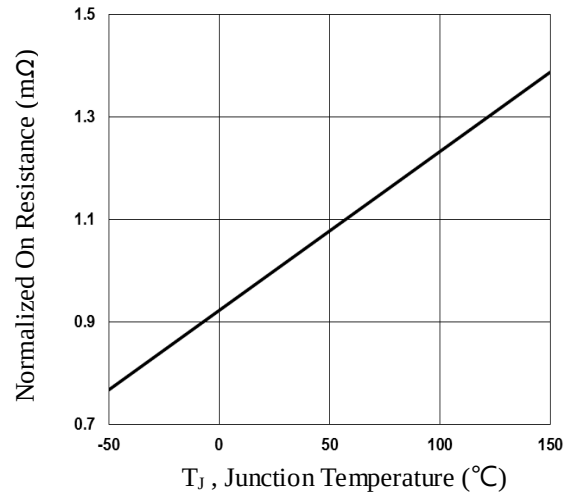


Fig.8 Normalized $R_{DS(on)}$ vs. T_J

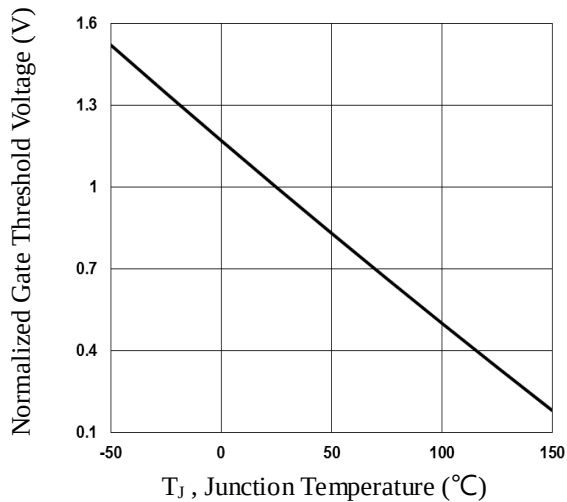


Fig.9 Normalized V_{th} vs. T_J

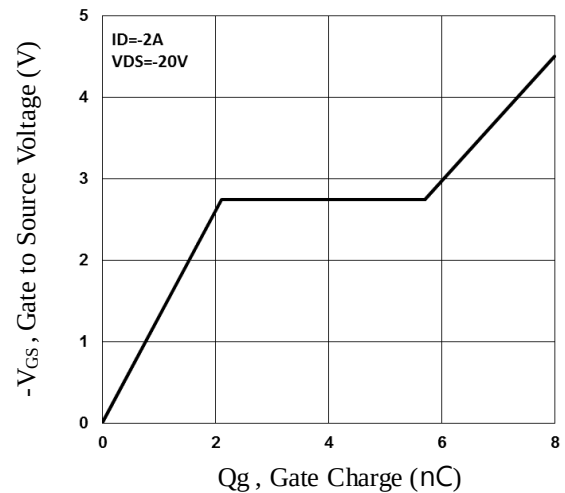


Fig.10 Gate Charge Waveform

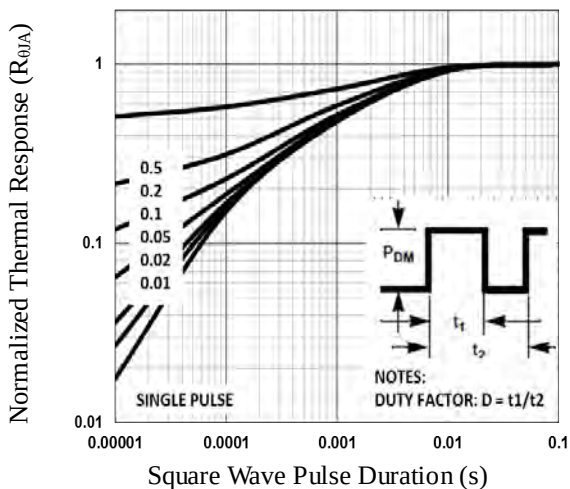


Fig.11 Normalized Transient Impedance

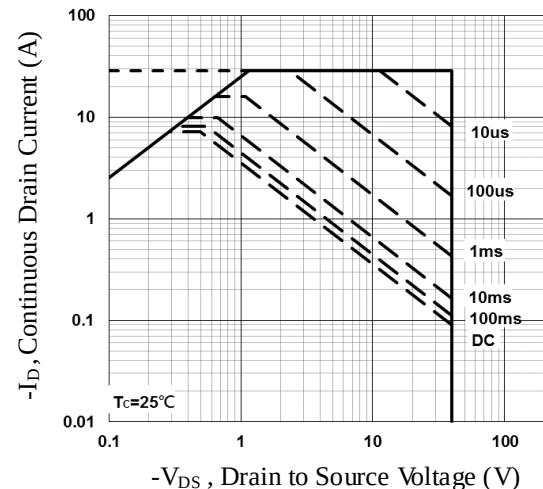
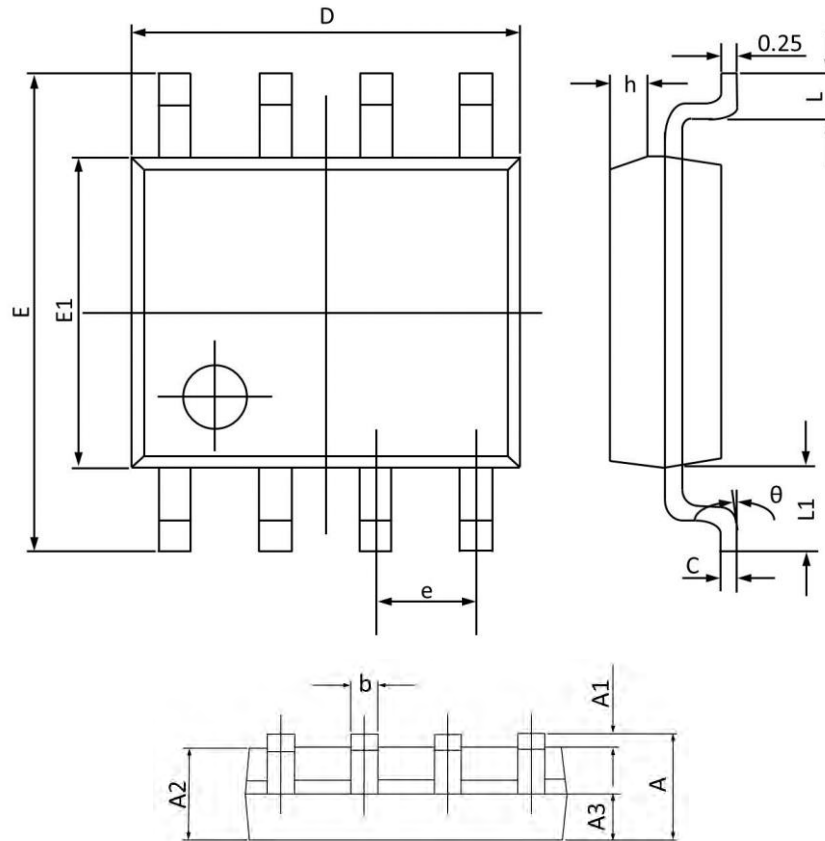


Fig.12 Maximum Safe Operation Area

40V N+P Dual Channel MOSFETs

SOP8 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.068
A1	0.100	0.250	0.004	0.009
A2	1.300	1.500	0.052	0.059
A3	0.600	0.700	0.024	0.027
b	0.390	0.480	0.016	0.018
c	0.210	0.260	0.009	0.010
D	4.700	5.100	0.186	0.200
E	5.800	6.200	0.229	0.244
E1	3.700	4.100	0.146	0.161
e	1.270(BSC)		0.050(BSC)	
h	0.250	0.500	0.010	0.019
L	0.500	0.800	0.019	0.031
L1	1.050(BSC)		0.041(BSC)	
θ	0°	8°	0°	8°