

## 40V P-Channel MOSFETs

### General Description

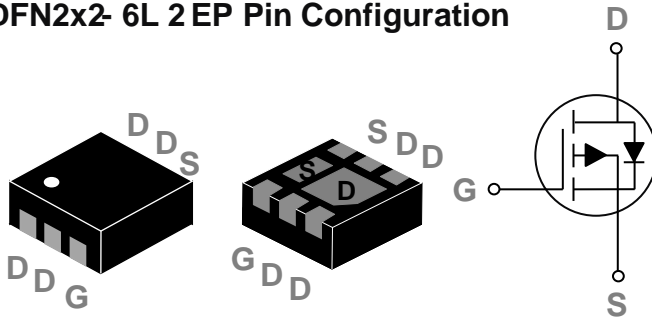
These P-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BVDSS	RDSON	ID
-40V	48mΩ	-5A

### Features

- -40V, -5A,  $R_{DS(ON)} = 48m\Omega @ V_{GS} = -10V$
- Fast switching
- Green Device Available
- Suit for -4.5V Gate Drive Applications

### DFN2x2- 6L 2 EP Pin Configuration



### Applications

- Notebook
- Load Switch
- Battery Protection
- Hand-held Instruments

### Absolute Maximum Ratings Tc=25 °C unless otherwise noted

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	-40	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub>	Drain Current – Continuous (T <sub>A</sub> =25 °C)	-5	A
	Drain Current – Continuous (T <sub>A</sub> =70 °C)	-3.2	A
I <sub>DM</sub>	Drain Current – Pulsed <sup>1</sup>	-20	A
EAS	Single Pulse Avalanche Energy <sup>2</sup>	31	mJ
IAS	Single Pulse Avalanche Current <sup>2</sup>	25	A
P <sub>D</sub>	Power Dissipation (T <sub>A</sub> =25 °C)	2	W
	Power Dissipation – Derate above 25 °C	16.1	mW/°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction to ambient	---	62	°C/W



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### Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)

#### Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA	-40	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25 °C, I <sub>D</sub> =-1mA	---	-0.03	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-40V, V <sub>GS</sub> =0V, T <sub>J</sub> =25 °C	---	---	-1	μA
		V <sub>DS</sub> =-32V, V <sub>GS</sub> =0V, T <sub>J</sub> =125 °C	---	---	-10	μA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA

#### On Characteristics

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =-10V, I <sub>D</sub> =-2A	---	40	48	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1.5A	---	60	78	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250μA	-1.2	-1.6	-2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	4	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-3A	---	5	---	S

#### Dynamic and switching Characteristics

Q <sub>g</sub>	Total Gate Charge <sup>2, 3</sup>	V <sub>DS</sub> =-20V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-2A	---	13	19	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2, 3</sup>		---	1.5	2.3	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2, 3</sup>		---	3.1	4.6	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2, 3</sup>	V <sub>DD</sub> =-20V, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω I <sub>D</sub> =-2A	---	6.3	10	ns
T <sub>r</sub>	Rise Time <sup>2, 3</sup>		---	7.2	11	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2, 3</sup>		---	46	69	
T <sub>f</sub>	Fall Time <sup>2, 3</sup>		---	14	21	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, F=1MHz	---	825	1240	pF
C <sub>oss</sub>	Output Capacitance		---	68	102	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	50	75	

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-5	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-10	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25 °C	---	---	-1	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>R</sub> =-30V, I <sub>S</sub> =-2A	---	30	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs, T <sub>J</sub> =25 °C	---	15	---	nC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=25A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25 °C.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.

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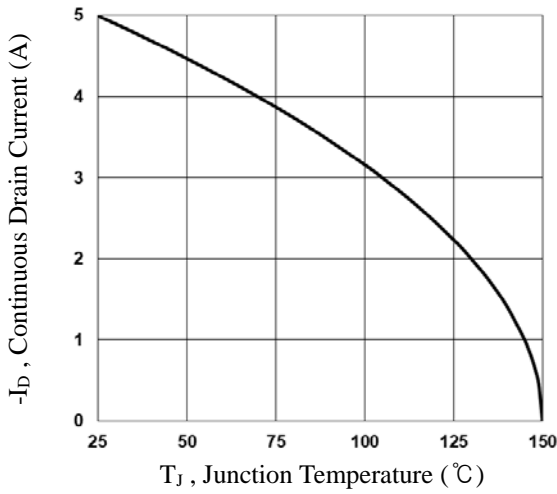


Fig. 1 Continuous Drain Current vs.  $T_C$

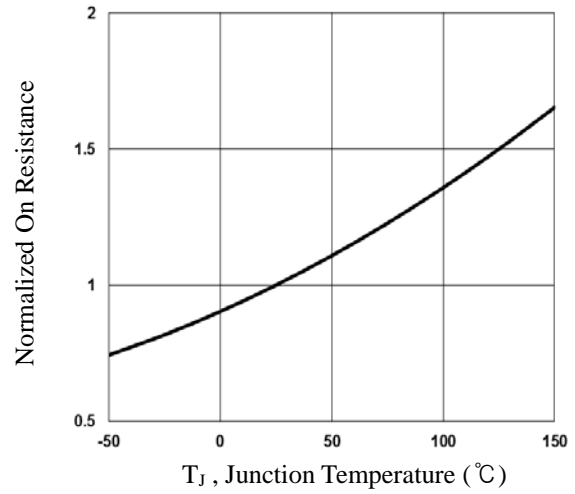


Fig. 2 Normalized RDSON vs.  $T_J$

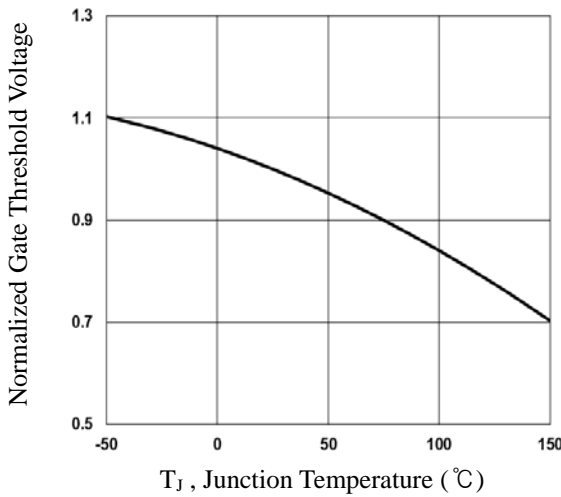


Fig. 3 Normalized  $V_{th}$  vs.  $T_J$

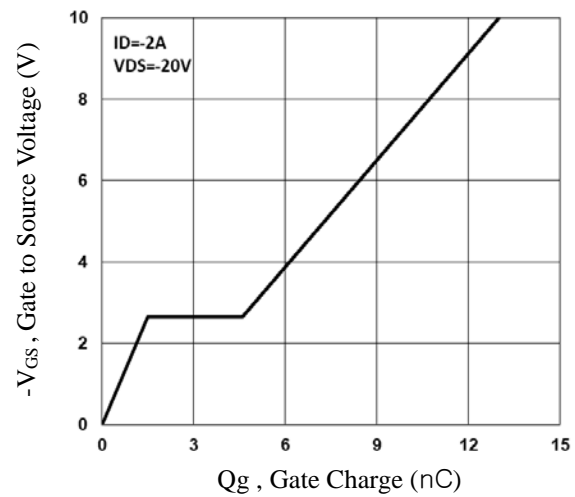


Fig. 4 Gate Charge Waveform

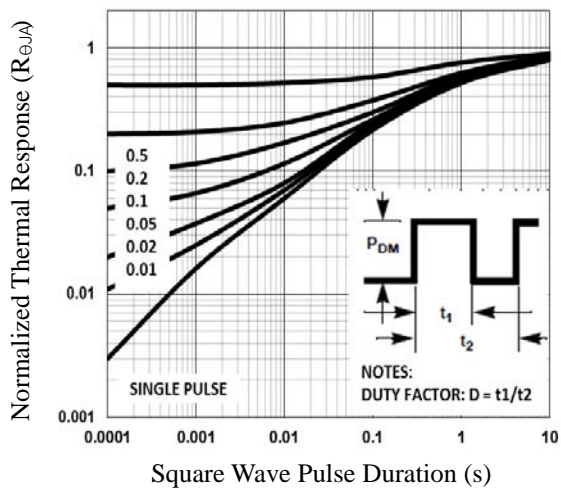


Fig. 5 Normalized Transient Impedance

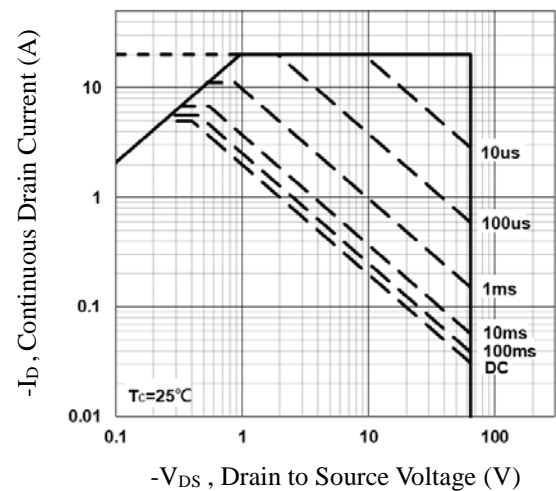


Fig.6 Maximum Safe Operation Area



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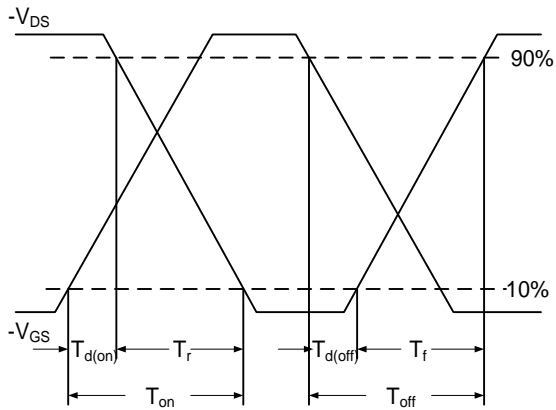


Fig. 7 Switching Time Waveform

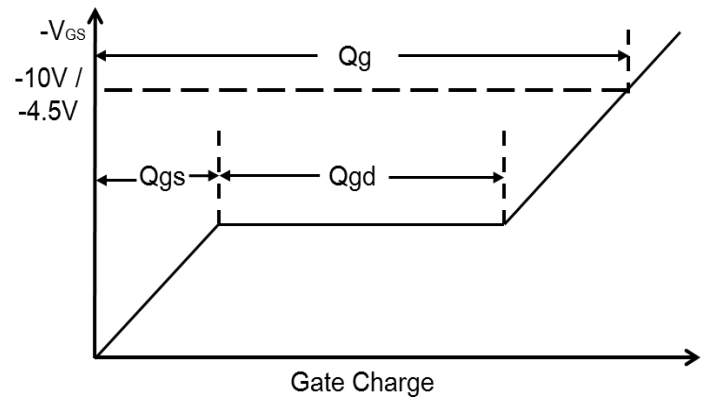
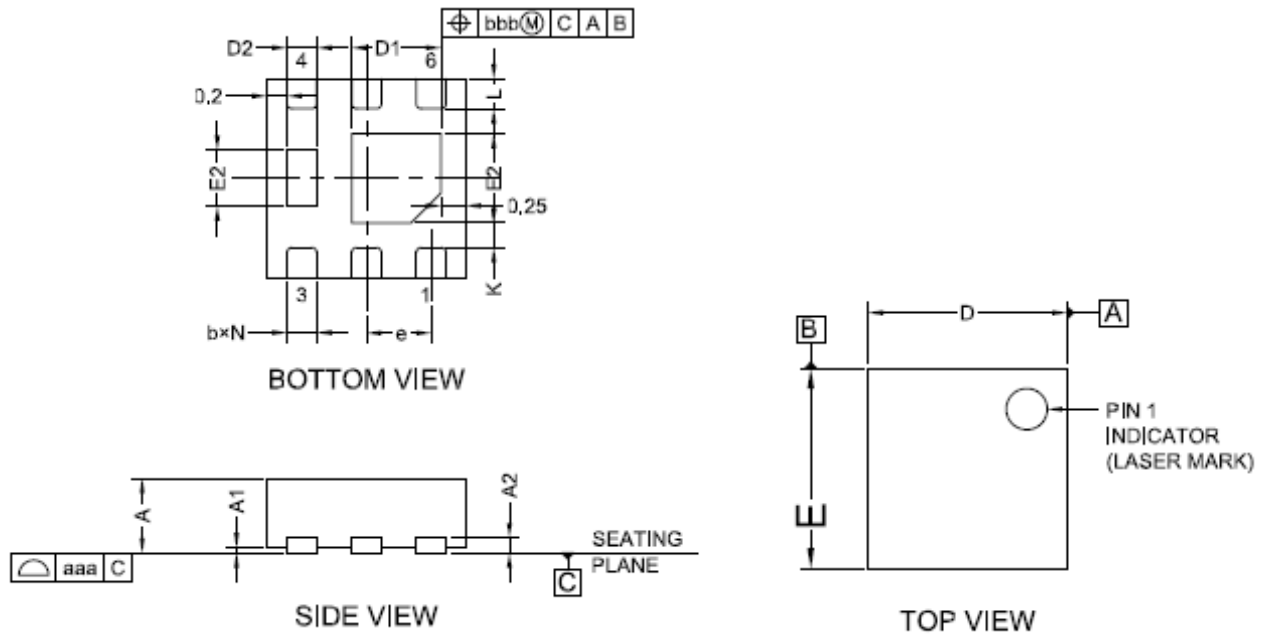


Fig. 8 Gate Charge Waveform

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### DFN2X2-6L 2EP PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
A2	0.152REF		
b	0.25	0.30	0.35
D	1.95	2.00	2.05
D1	0.80	0.90	1.00
D2	0.25	0.30	0.35
E	1.95	2.00	2.05
E1	0.80	0.90	1.00
E2	0.46	0.56	0.66
e	0.65BSC		
L	0.25	0.30	0.35
J	0.40BSC		
K	0.20MIN		
N	6.00		
aaa	0.08		
bbb	0.10		