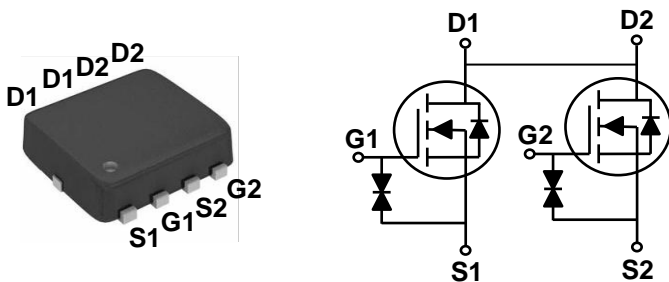


### General Description

These N-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.

### PPAK3x3 Dual NEP Pin Configuration



BVDSS	RDSON	ID
20V	14mΩ	8.6A

### Features

- 20V,8.6A,  $R_{DS(ON)} = 14m\Omega$  @  $V_{GS} = 4.5V$
- Improved  $dv/dt$  capability
- ESD Protection Diode Embedded
- 100% EAS Guaranteed
- Green Device Available

### Applications

- POL Applications
- SMPS 2<sup>nd</sup> SR
- Li-Battery Protection



### Absolute Maximum Ratings $T_c=25^\circ C$ unless otherwise noted

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	20	V
$V_{GS}$	Gate-Source Voltage	$\pm 10$	V
$I_D$	Drain Current – Continuous ( $T_A=25^\circ C$ )	8.6	A
	Drain Current – Continuous ( $T_A=70^\circ C$ )	6.8	A
$I_{DM}$	Drain Current – Pulsed <sup>1</sup>	34.4	A
$P_D$	Power Dissipation ( $T_c=25^\circ C$ )	1.67	W
	Power Dissipation – Derate above $25^\circ C$	0.014	W/ $^\circ C$
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	75	$^\circ C/W$

**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> =250uA	20	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.02	---	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C	---	---	10	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V	---	---	±10	uA

**On Characteristics**

R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A	8.5	11	14	mΩ
		V <sub>GS</sub> =4.2V, I <sub>D</sub> =5A	8.5	11.2	14.2	mΩ
		V <sub>GS</sub> =3.7V, I <sub>D</sub> =4A	8.5	11.5	14.5	mΩ
		V <sub>GS</sub> =3.0V, I <sub>D</sub> =4A	9	12	15.2	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A	9.5	12.5	16	mΩ
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A	11	15.5	20	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	0.3	0.6	1	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	2	---	mV/°C
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>S</sub> =5A	---	13	---	S

**Dynamic and switching Characteristics**

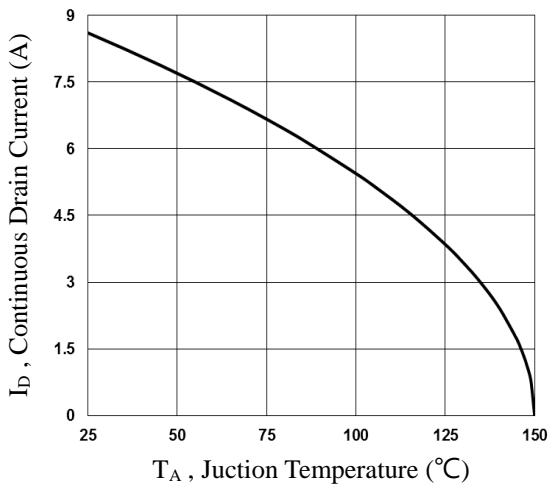
Q <sub>g</sub>	Total Gate Charge <sup>2,3</sup>	V <sub>DS</sub> =10V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A	---	16.9	26	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>2,3</sup>		---	1.1	3	
Q <sub>gd</sub>	Gate-Drain Charge <sup>2,3</sup>		---	4	7	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>2,3</sup>	V <sub>DD</sub> =10V, V <sub>GS</sub> =4.5V, R <sub>G</sub> =25Ω I <sub>D</sub> =1A	---	6.8	13	ns
T <sub>r</sub>	Rise Time <sup>2,3</sup>		---	20	38	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>2,3</sup>		---	41.8	79	
T <sub>f</sub>	Fall Time <sup>2,3</sup>		---	13.2	25	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, F=1MHz	---	1020	1480	pF
C <sub>oss</sub>	Output Capacitance		---	160	240	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	110	160	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	2	4	Ω

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

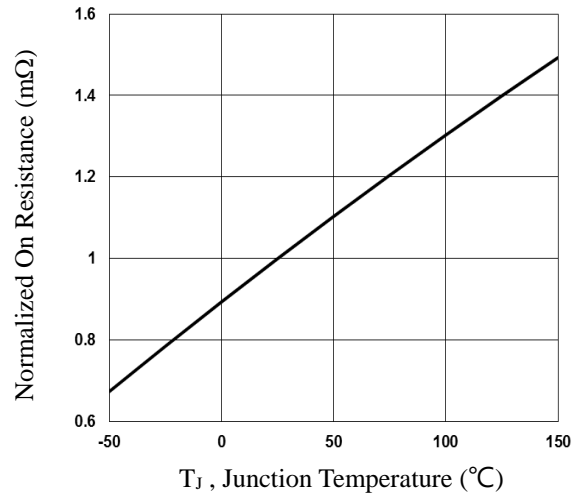
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	8.6	A
I <sub>SM</sub>	Pulsed Source Current		---	---	17.2	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1	V

Note :

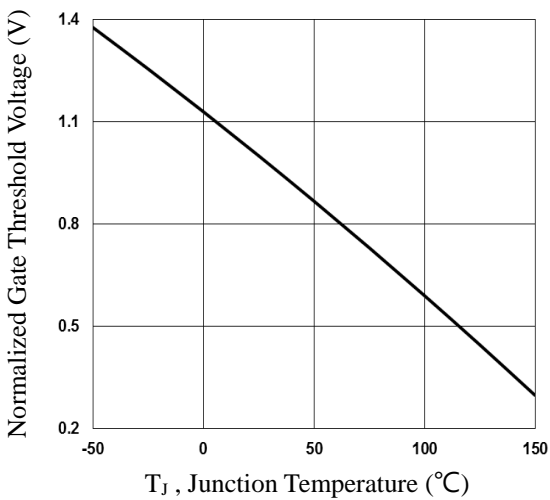
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
3. Essentially independent of operating temperature.



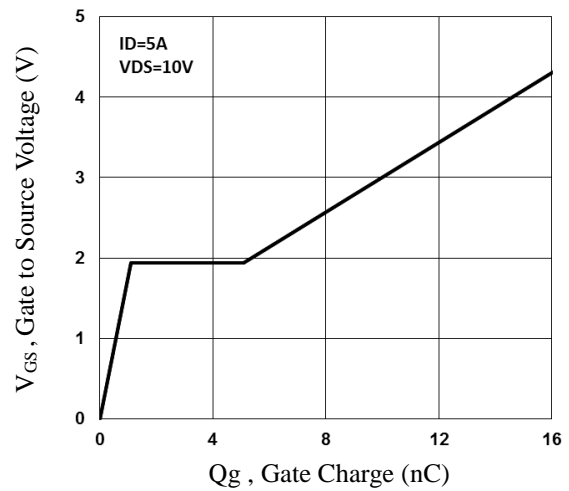
**Fig.1 Continuous Drain Current vs.  $T_c$**



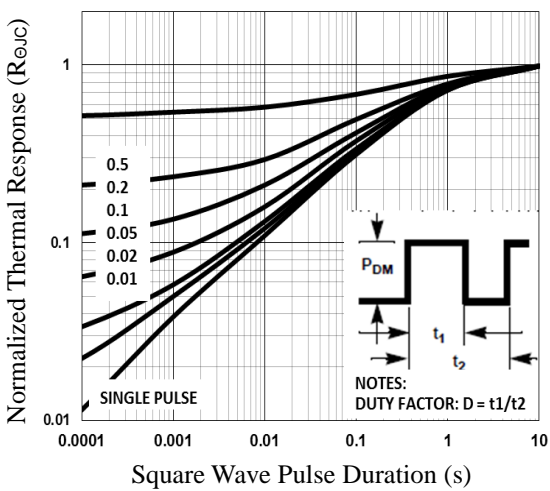
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



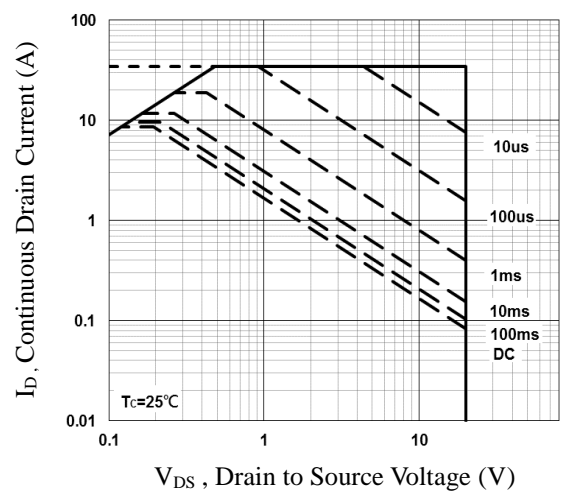
**Fig.3 Normalized  $V_{th}$  vs.  $T_j$**



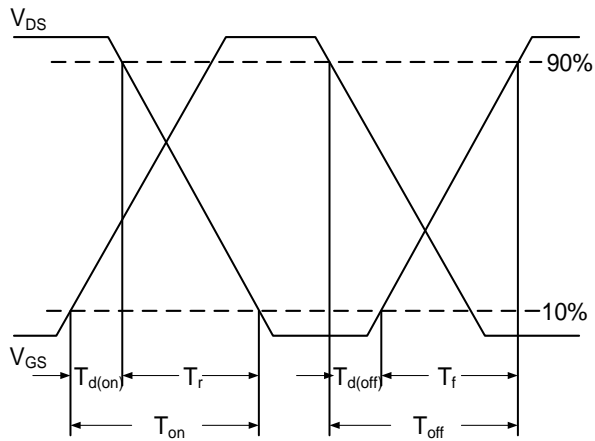
**Fig.4 Gate Charge Waveform**



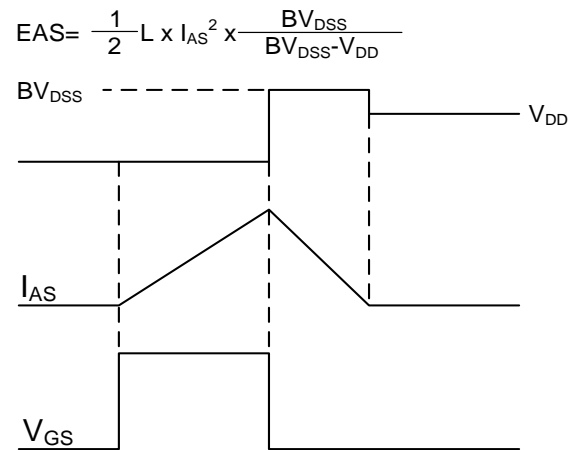
**Fig.5 Normalized Transient Response**



**Fig.6 Maximum Safe Operation Area**



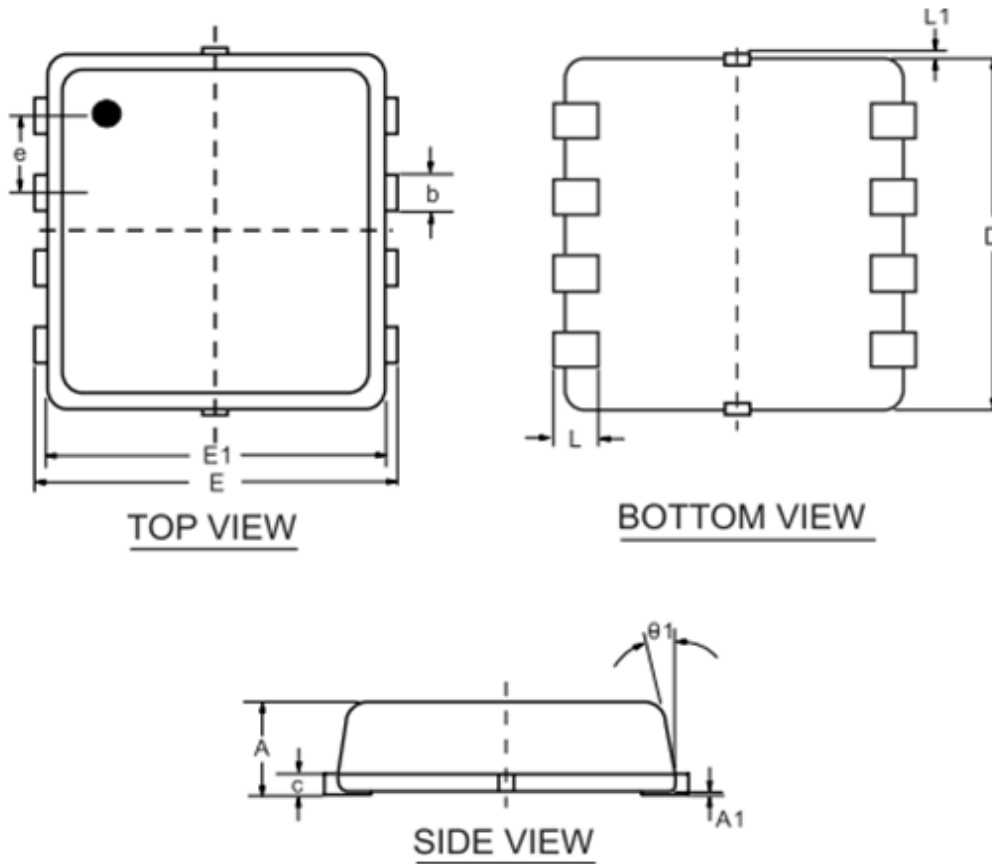
**Fig.7 Switching Time Waveform**



**Fig.8 EAS Waveform**



## PPAK3x3 Dual NEP PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	0.700	0.800	0.900
A1	0.000	---	0.050
b	0.250	0.300	0.350
c	0.080	0.152	0.250
D	2.800	2.900	3.000
E	2.700	2.800	2.900
E1	2.200	2.300	2.400
e	0.65BSC		
L	0.200	0.375	0.450
L1	0.00	---	0.10
$\theta 1$	0°	10°	12°