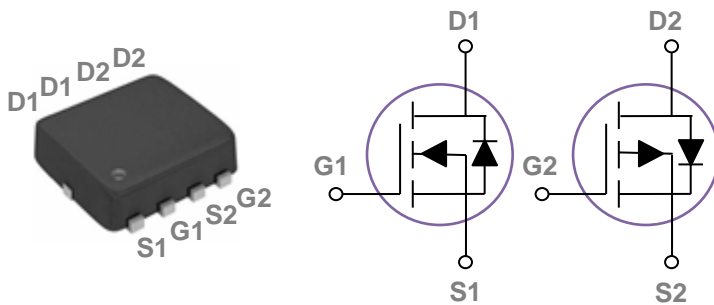


### General Description

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.

### PPAK3X3 Dual NEP Pin Configuration



BVDSS	RDSON	ID
30V	24mΩ	7A
-30V	64mΩ	-4A

### Features

- Fast switching
- Green Device Available
- Suit for 4.5V Gate Drive Applications
- 100% EAS Guaranteed

### 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	30	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	$\pm 20$	V
$I_D$	Drain Current – Continuous ( $T_A=25^\circ\text{C}$ )	7	-4	A
	Drain Current – Continuous ( $T_A=70^\circ\text{C}$ )	5.5	-3.2	A
$I_{DM}$	Drain Current – Pulsed <sup>1,5</sup>	28	-16	A
EAS	Single Pulse Avalanche Energy <sup>2,6</sup>	13	14	mJ
IAS	Single Pulse Avalanched Current <sup>2</sup>	16	17	A
$P_D$	Power Dissipation ( $T_A=25^\circ\text{C}$ )	2		W
	Power Dissipation – Derate above $25^\circ\text{C}$	0.016		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
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62.5	$^\circ\text{C}/\text{W}$

**N-CH 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	30	---	---	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =24V, 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> =±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> =4A	---	20	24	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =2A	---	27	35	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.2	1.6	2.5	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =3A	---	4	---	S

**Dynamic and switching Characteristics**

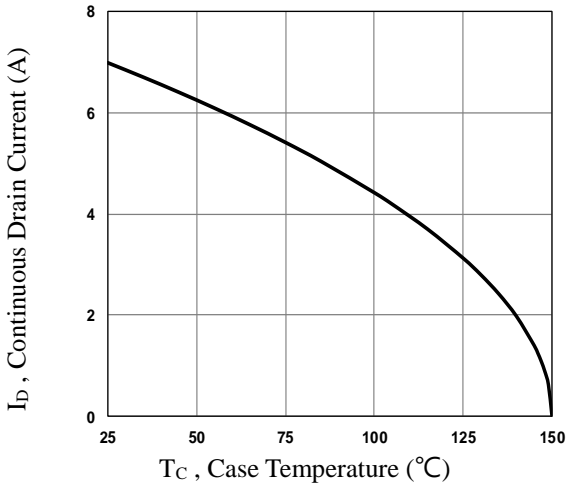
Q <sub>g</sub>	Total Gate Charge <sup>3, 4</sup>	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =4A	---	5	8	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>3, 4</sup>		---	0.4	2.5	
Q <sub>gd</sub>	Gate-Drain Charge <sup>3, 4</sup>		---	2	5	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>3, 4</sup>	V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω I <sub>D</sub> =4A	---	3	5	ns
T <sub>r</sub>	Rise Time <sup>3, 4</sup>		---	7	10	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>3, 4</sup>		---	16	25	
T <sub>f</sub>	Fall Time <sup>3, 4</sup>		---	5	8	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1MHz	---	360	540	pF
C <sub>oss</sub>	Output Capacitance		---	50	75	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	40	60	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	1.2	---	Ω

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

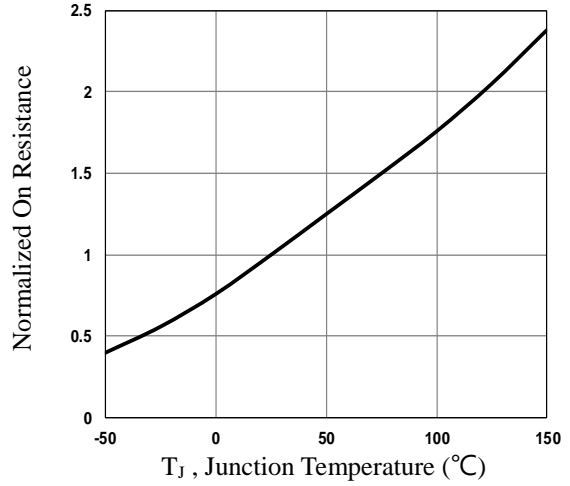
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	7	A
I <sub>SM</sub>	Pulsed Source Current		---	---	14	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>R</sub> =30V, I <sub>S</sub> =4A	---	95	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs, T <sub>J</sub> =25°C	---	115	---	nC

Note :

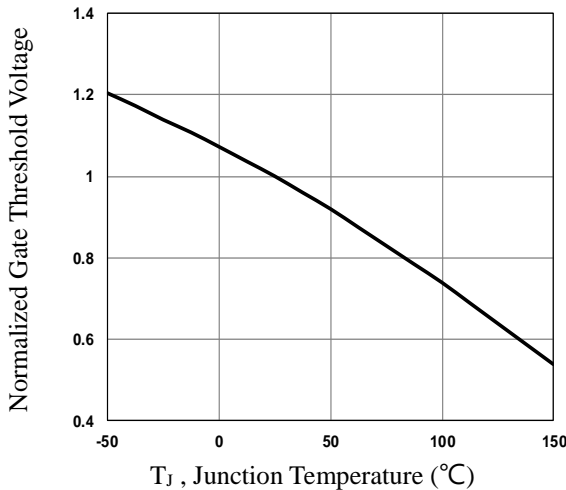
1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=16A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C.
3. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
4. Essentially independent of operating temperature.



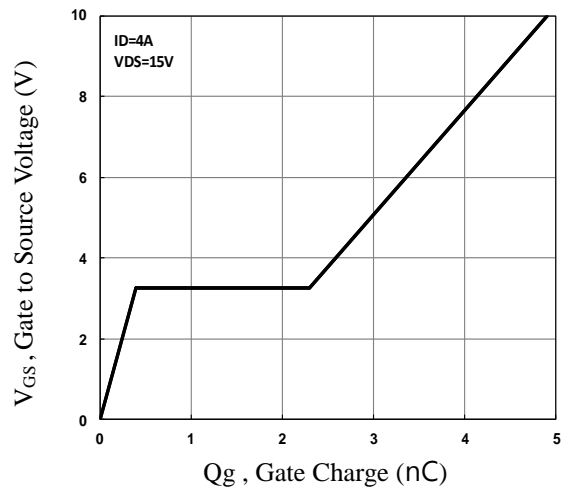
**Fig.1 Continuous Drain Current vs.  $T_c$**



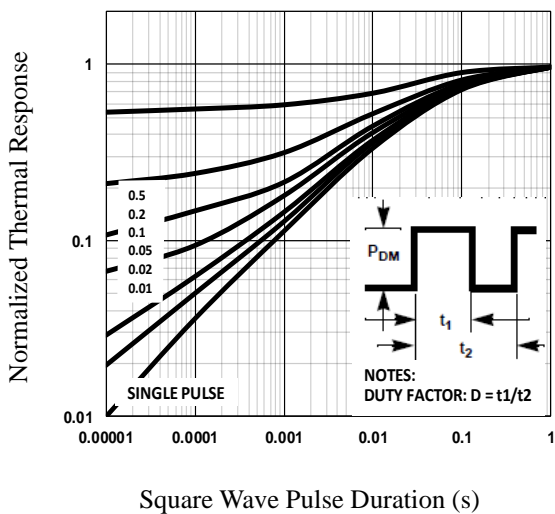
**Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_j$**



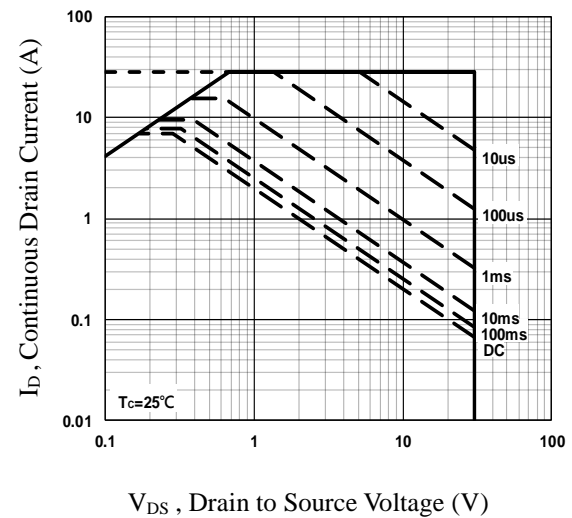
**Fig.3 Normalized  $V_{th}$  vs.  $T_j$**



**Fig.4 Gate Charge Waveform**



**Fig.5 Normalized Transient Impedance**



**Fig.6 Maximum Safe Operation Area**

**P-CH 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	-30	---	---	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-30V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-24V, 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> =±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> =-3A	---	53	64	mΩ
		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A	---	73	95	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-1.2	-1.6	-2.5	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-10V, I <sub>D</sub> =-3A	---	4	---	S

**Dynamic and switching Characteristics**

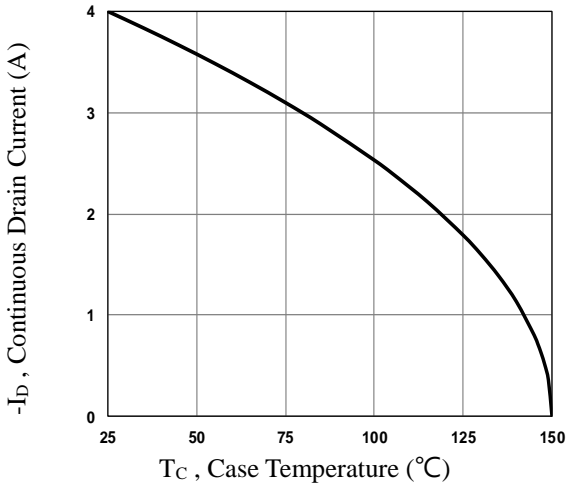
Q <sub>g</sub>	Total Gate Charge <sup>7,8</sup>	V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-2A	---	4	6	nC
Q <sub>gs</sub>	Gate-Source Charge <sup>7,8</sup>		---	0.4	2.5	
Q <sub>gd</sub>	Gate-Drain Charge <sup>7,8</sup>		---	1.2	4	
T <sub>d(on)</sub>	Turn-On Delay Time <sup>7,8</sup>	V <sub>DD</sub> =-15V, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω I <sub>D</sub> =-2A	---	3	5	ns
T <sub>r</sub>	Rise Time <sup>7,8</sup>		---	7	10	
T <sub>d(off)</sub>	Turn-Off Delay Time <sup>7,8</sup>		---	16	25	
T <sub>f</sub>	Fall Time <sup>7,8</sup>		---	5	8	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, F=1MHz	---	360	540	pF
C <sub>oss</sub>	Output Capacitance		---	50	75	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	40	60	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	8.6	---	Ω

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

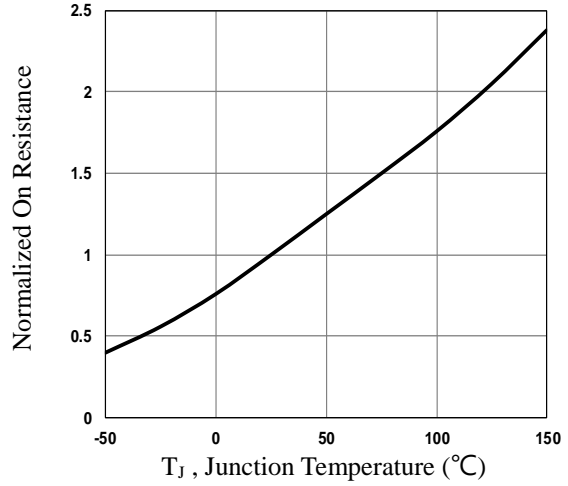
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	-4	A
I <sub>SM</sub>	Pulsed Source Current		---	---	-8	A
V <sub>SD</sub>	Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C	---	---	-1	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>R</sub> =-30V, I <sub>S</sub> =-2A	---	180	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs, T <sub>J</sub> =25°C	---	320	---	nC

Note :

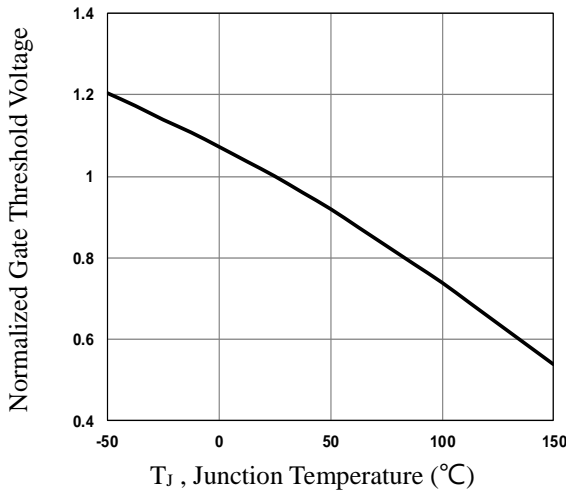
5. Repetitive Rating : Pulsed width limited by maximum junction temperature.
6. V<sub>DD</sub>=-25V, V<sub>GS</sub>=-10V, L=0.1mH, I<sub>AS</sub>=-17A., R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C
7. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
8. Essentially independent of operating temperature.



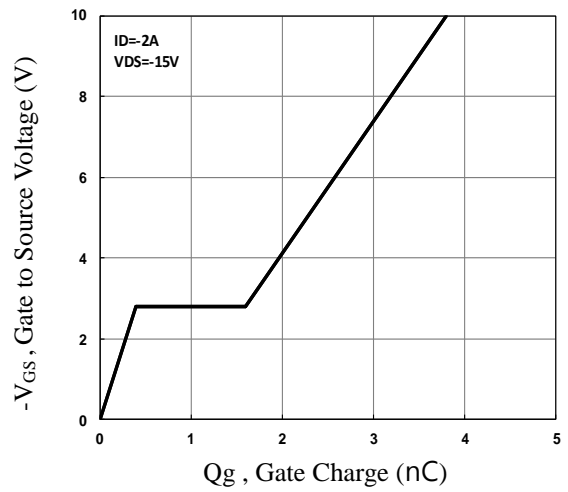
**Fig.7 Continuous Drain Current vs.  $T_c$**



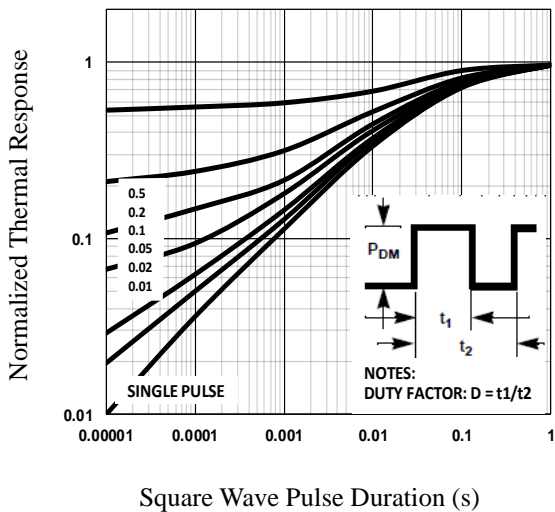
**Fig.8 Normalized  $R_{DS(on)}$  vs.  $T_j$**



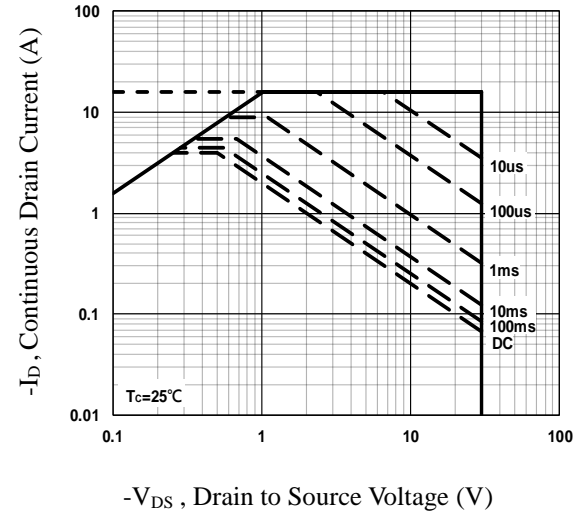
**Fig.9 Normalized  $V_{th}$  vs.  $T_j$**



**Fig.10 Gate Charge Waveform**

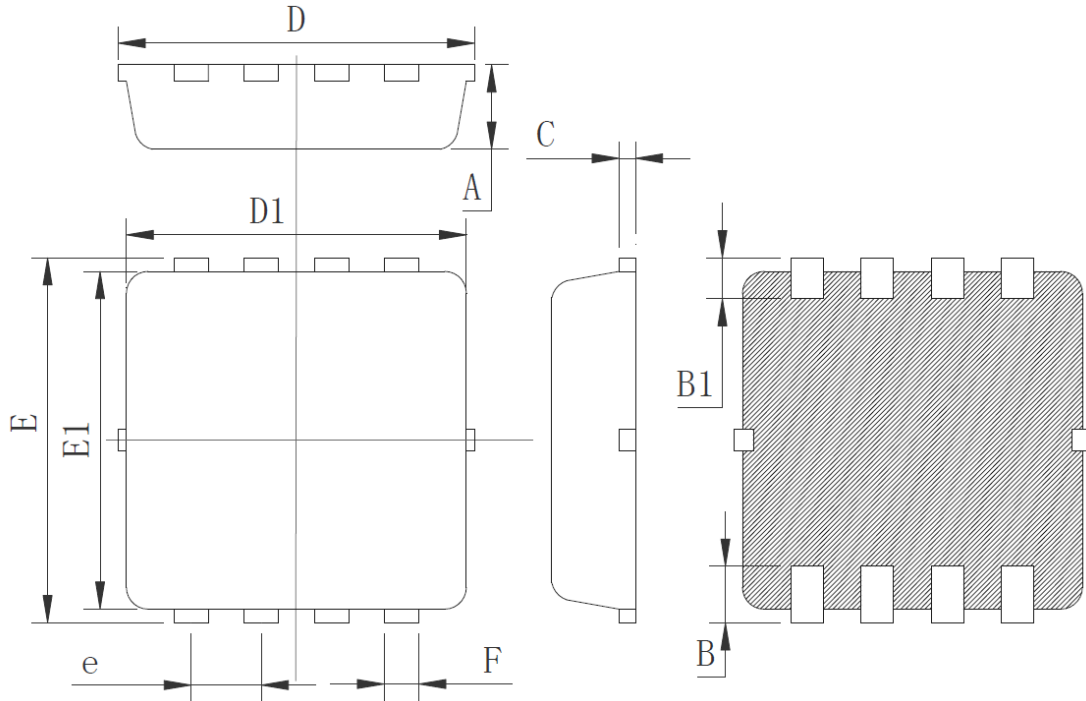


**Fig.11 Normalized Transient Impedance**



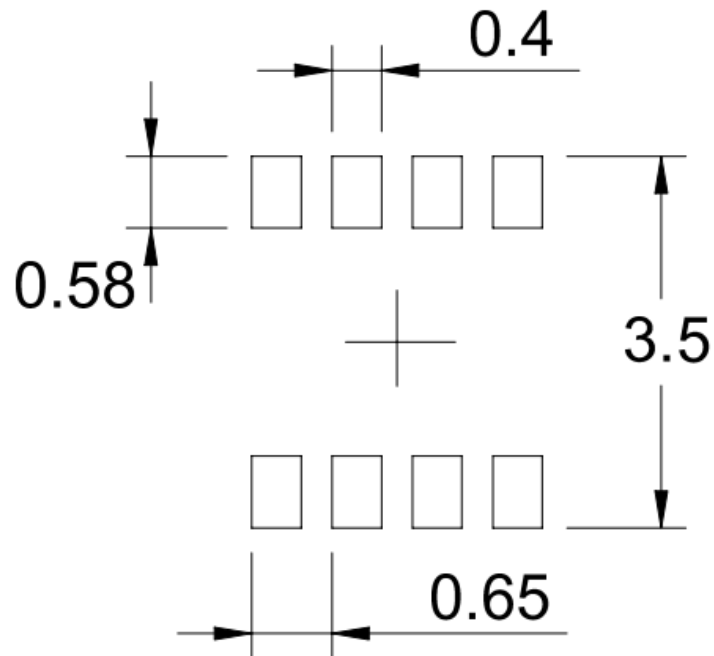
**Fig.12 Maximum Safe Operation Area**

**PPAK3x3 Dual NEP PACKAGE INFORMATION**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.725	0.825	0.029	0.032
B	0.280	0.480	0.011	0.019
B1	0.200	0.400	0.008	0.016
C	0.130	0.200	0.005	0.008
D	3.200	3.350	0.126	0.132
D1	3.050	3.250	0.120	0.128
E	3.250	3.450	0.128	0.136
E1	3.000	3.200	0.118	0.126
e	0.650 BSC		0.026 BSC	
F	0.270	0.370	0.106	0.015

PPAK3X3 Dual NEP RECOMMENDED LAND PATTERN



unit : mm