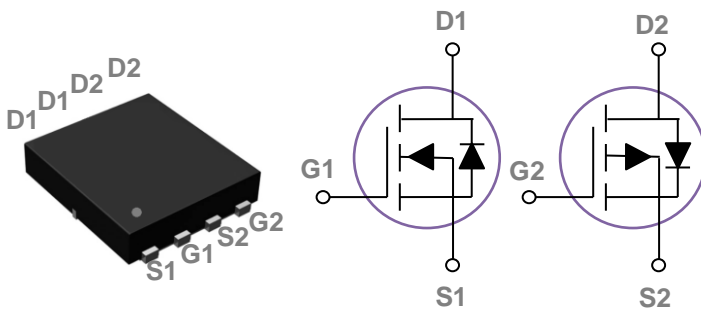


General Description

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.

PPAK5x6 Dual Pin Configuration



BVDSS	RDSON	ID
100V	168mΩ	10A
-100V	300mΩ	-8A

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	100	-100	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
I_D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	10	-8	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	6.3	-5.1	A
	Drain Current – Continuous ($T_A=25^\circ\text{C}$) ¹	5	-4.5	A
I_{DM}	Drain Current – Pulsed ($T_c=25^\circ\text{C}$) ²	40	-32	A
EAS	Single Pulse Avalanche Energy	5 ³	18 ⁷	mJ
IAS	Single Pulse Avalanched Current	10 ³	19 ⁷	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	39		W
	Power Dissipation – Derate above $T_c=25^\circ\text{C}$	0.313		W/°C
	Power Dissipation ($T_A=25^\circ\text{C}$) ¹	9		W
T_{STG}	Storage Temperature Range	-55 to 150		°C
T_J	Operating Junction Temperature Range	-55 to 150		°C

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA \text{ cont.}}$	Thermal Resistance Junction to ambient (Continuous)	---	62	°C/W
$R_{\theta JA \leq 1s}$	Thermal Resistance Junction to ambient ($P_w \leq 1s$) ¹	---	13.5	°C/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	3.2	°C/W

N-CH Electrical Characteristics (T_J=25 °C, unless otherwise noted)
Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V , I _D =250uA	40	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C , I _D =1mA	---	0.04	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =100V , V _{GS} =0V , T _J =25°C	---	---	1	uA
		V _{DS} =80V , V _{GS} =0V , T _J =125°C	---	---	10	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V , V _{DS} =0V	---	---	±100	nA

On Characteristics

R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V , I _D =4A	---	140	168	mΩ
		V _{GS} =4.5V , I _D =3A	---	145	188	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.2	1.6	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-4.9	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =10V , I _D =3A	---	6	---	S

Dynamic and switching Characteristics

Q _g	Total Gate Charge ^{4, 5}	V _{DS} =80V , V _{GS} =10V , I _D =10A	---	14.5	21.8	nC
Q _{gs}	Gate-Source Charge ^{4, 5}		---	4.8	7.2	
Q _{gd}	Gate-Drain Charge ^{4, 5}		---	2	3	
T _{d(on)}	Turn-On Delay Time ^{4, 5}	V _{DD} =80V , V _{GS} =10V , R _G =6Ω I _D =10A	---	5	---	ns
T _r	Rise Time ^{4, 5}		---	25	---	
T _{d(off)}	Turn-Off Delay Time ^{4, 5}		---	22	---	
T _f	Fall Time ^{4, 5}		---	8	---	
C _{iss}	Input Capacitance	V _{DS} =80V , V _{GS} =0V , F=1MHz	---	1026	1500	pF
C _{oss}	Output Capacitance		---	21.8	33	
C _{rss}	Reverse Transfer Capacitance		---	15.2	23	
R _g	Gate resistance		V _{GS} =0V , V _{DS} =0V , F=1MHz	---	1.7	

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	---	---	10	A
I _{SM}	Pulsed Source Current		---	---	20	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V , I _S =1A , T _J =25°C	---	---	1	V
t _{rr}	Reverse Recovery Time	V _R =100V , I _S =10A ,	---	24.5	---	ns
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs , T _J =25°C	---	65	---	nC

Note :

- P_w ≤ 1s, Limited only by maximum temperature allowed.
- Repetitive Rating : Pulsed width limited by maximum junction temperature.
- V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=10A, R_G=25Ω, Starting T_J=25°C.
- The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.
- Essentially independent of operating temperature.

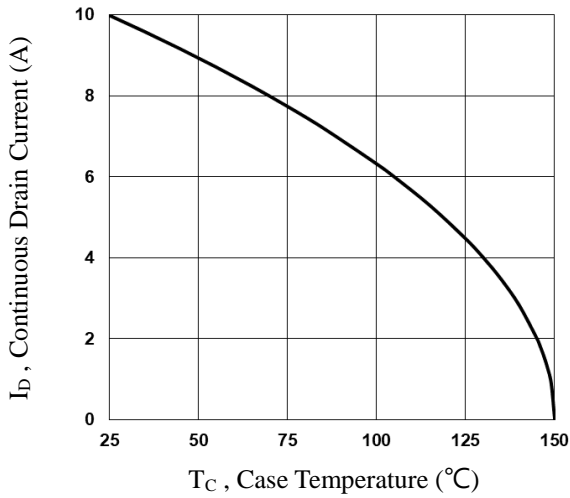


Fig.1 Continuous Drain Current vs. T_c

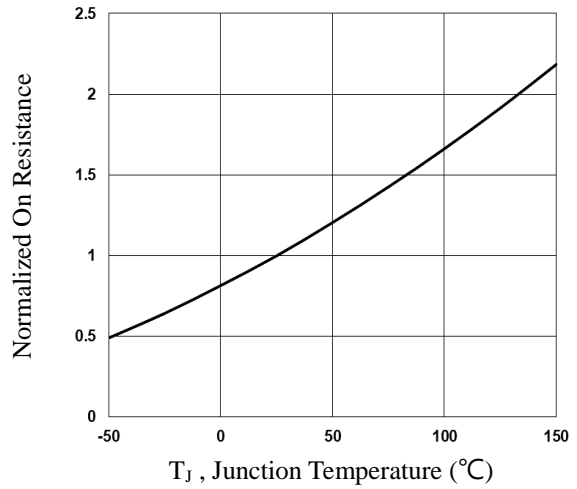


Fig.2 Normalized $R_{DS(on)}$ vs. T_j

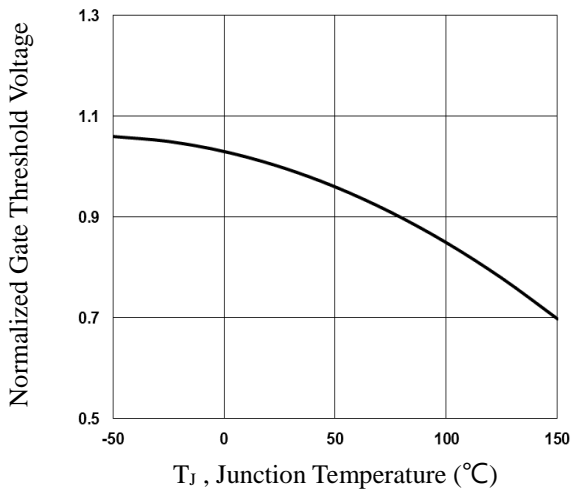


Fig.3 Normalized V_{th} vs. T_j

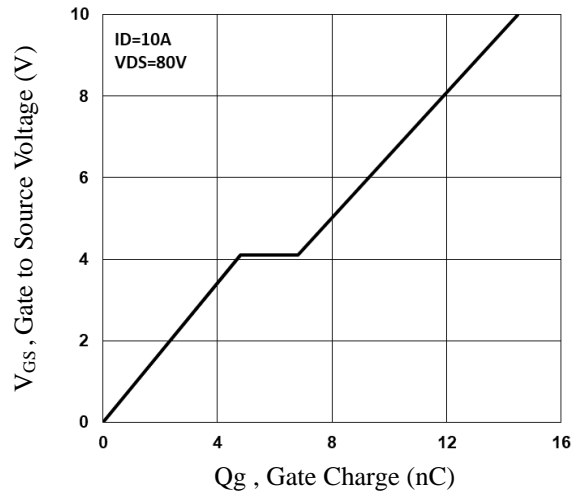


Fig.4 Gate Charge Waveform

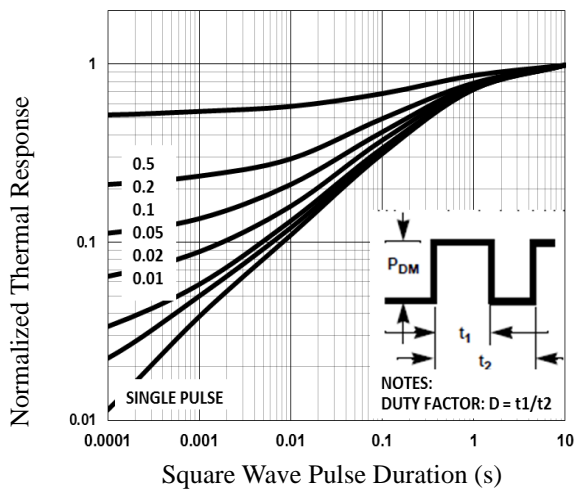


Fig.5 Normalized Transient Response

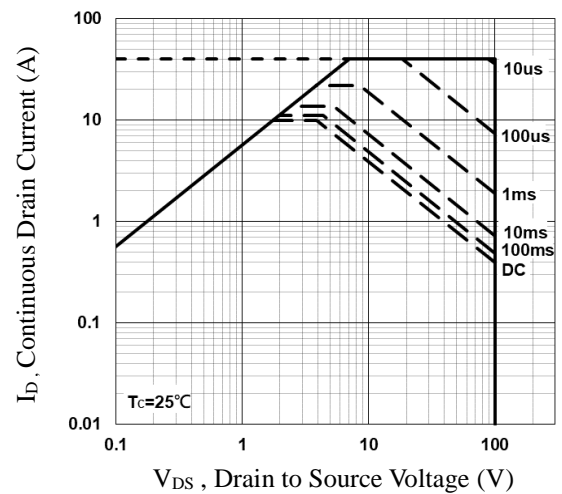


Fig.6 Maximum Safe Operation Area

P-CH Electrical Characteristics (T_J=25 °C, unless otherwise noted)
Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250uA	-40	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	0.02	---	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-100V, V _{GS} =0V, T _J =25°C	---	---	-1	uA
		V _{DS} =-80V, V _{GS} =0V, T _J =125°C	---	---	-10	uA
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA

On Characteristics

R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-3A	---	250	300	mΩ
		V _{GS} =-4.5V, I _D =-2.5A	---	270	350	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250uA	-1.2	-1.5	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-4.4	---	mV/°C
g _{fs}	Forward Transconductance	V _{DS} =-10V, I _D =-3A	---	6	---	S

Dynamic and switching Characteristics

Q _g	Total Gate Charge ^{8,9}	V _{DS} =-80V, V _{GS} =-10V, I _D =-5A	---	11.7	17	nC
Q _{gs}	Gate-Source Charge ^{8,9}		---	1.6	2.4	
Q _{gd}	Gate-Drain Charge ^{8,9}		---	2.9	4.4	
T _{d(on)}	Turn-On Delay Time ^{8,9}	V _{DD} =-80V, V _{GS} =-10V, R _G =6Ω I _D =-3A	---	11.6	---	ns
T _r	Rise Time ^{8,9}		---	4.8	---	
T _{d(off)}	Turn-Off Delay Time ^{8,9}		---	35.8	---	
T _f	Fall Time ^{8,9}		---	18.8	---	
C _{iss}	Input Capacitance	V _{DS} =-80V, V _{GS} =0V, F=1MHz	---	755	1130	pF
C _{oss}	Output Capacitance		---	24	36	
C _{rss}	Reverse Transfer Capacitance		---	17.6	26	

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	---	---	-8	A
I _{SM}	Pulsed Source Current		---	---	-16	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1	V
t _{rr}	Reverse Recovery Time	V _R =-100V, I _S =-5A,	---	23	---	ns
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs, T _J =25°C	---	22	---	nC

Note :

6. Repetitive Rating : Pulsed width limited by maximum junction temperature.
7. V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-19A., R_G=25Ω, Starting T_J=25°C
8. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%.
9. Essentially independent of operating temperature.

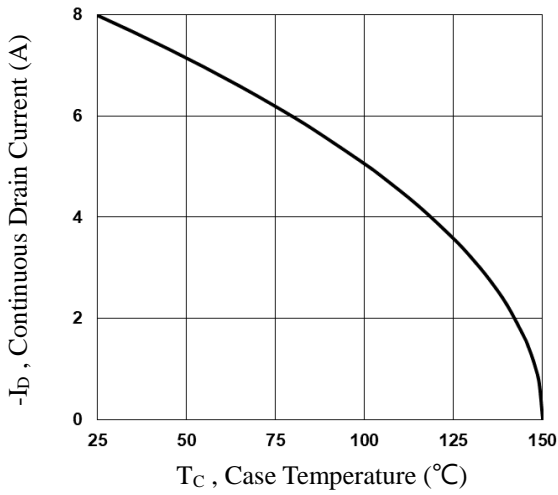


Fig.7 Continuous Drain Current vs. T_c

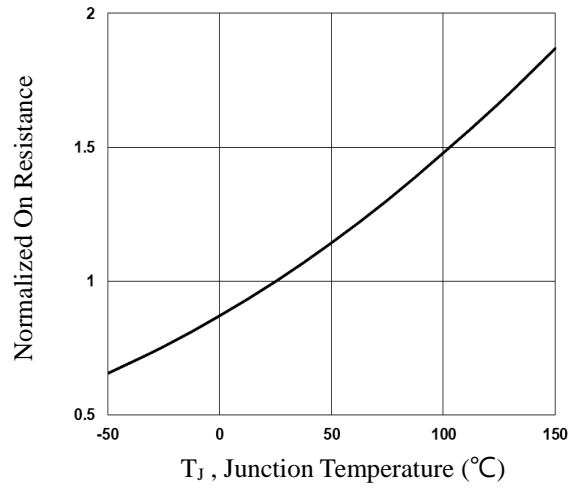


Fig.8 Normalized $R_{DS(on)}$ vs. T_j

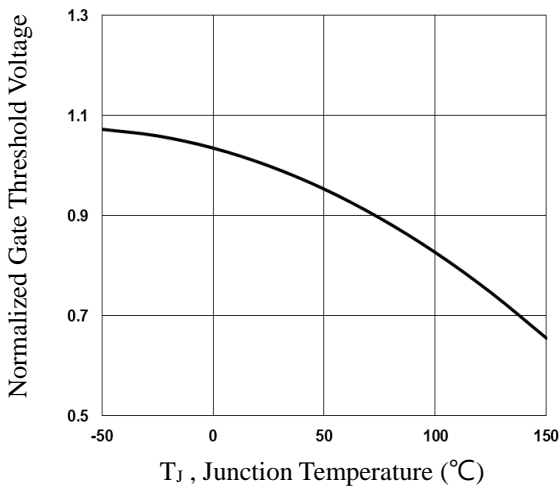


Fig.9 Normalized V_{th} vs. T_j

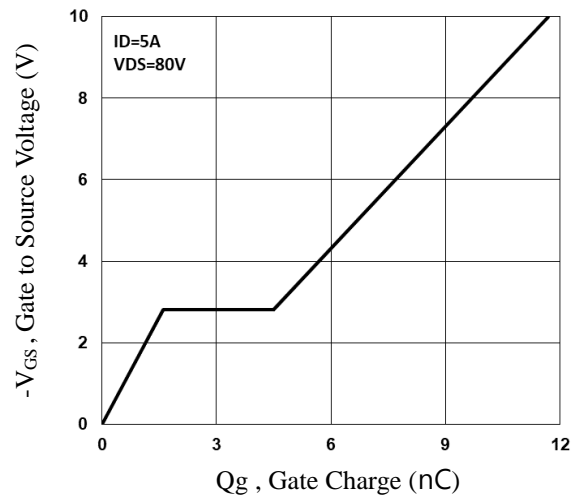


Fig.10 Gate Charge Waveform

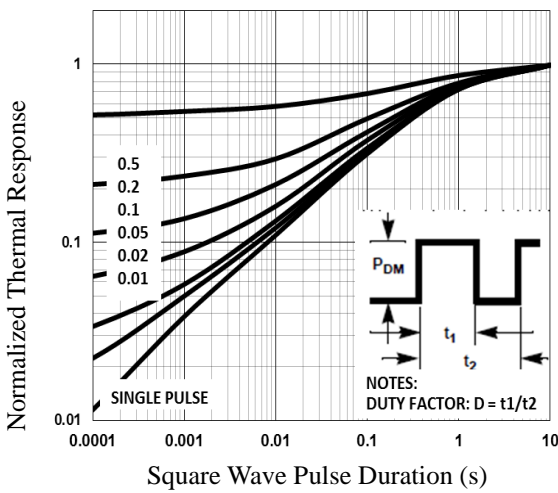


Fig.11 Normalized Transient Impedance

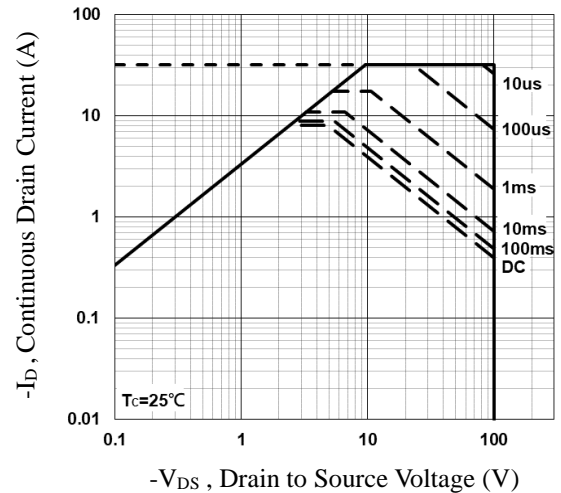
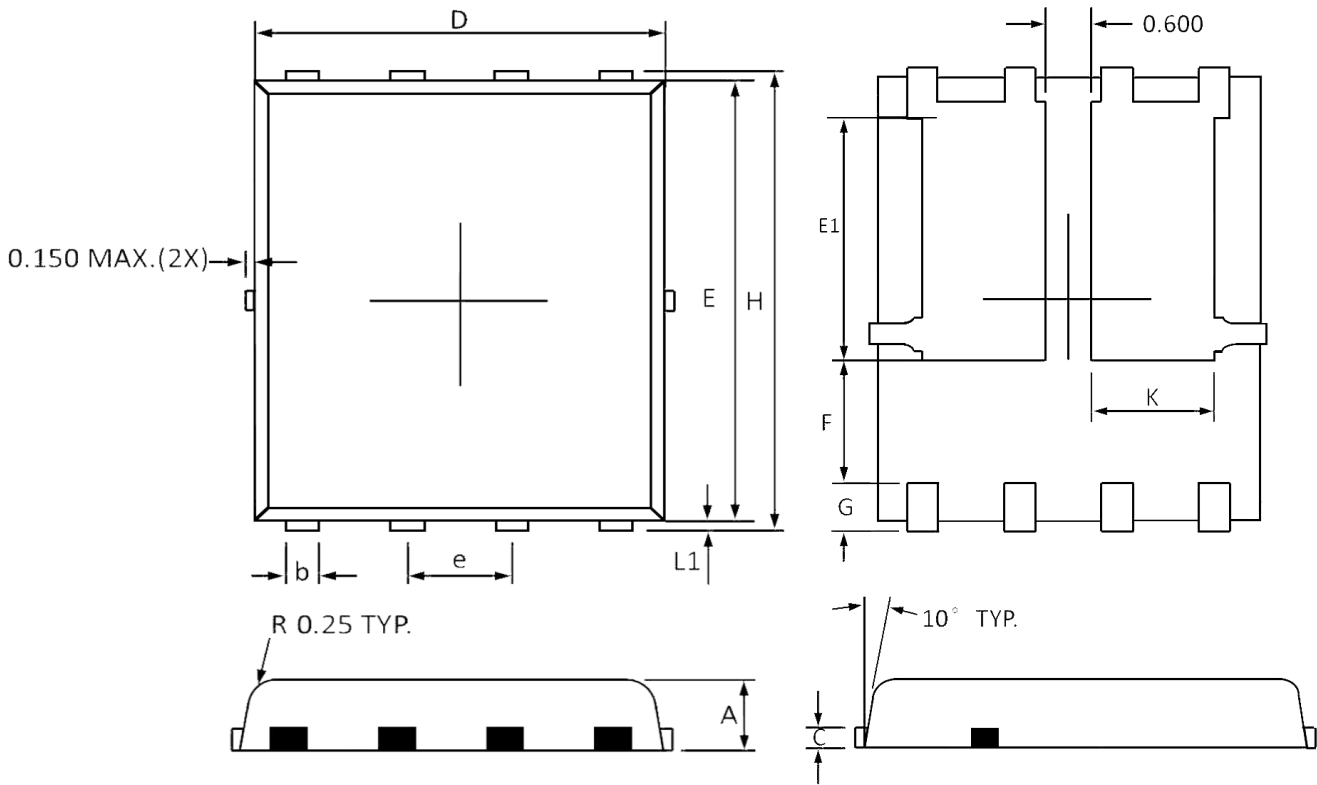


Fig.12 Maximum Safe Operation Area

PPAK5x6 Dual PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
b	0.300	0.510	0.012	0.020
C	0.250 Ref		0.010 Ref	
D	4.800	5.400	0.189	0.213
E	5.450	5.960	0.215	0.235
E1	3.200	3.800	0.126	0.150
e	1.27 BSC		0.050 BSC	
F	1.000	1.900	0.039	0.075
G	0.380	0.800	0.015	0.031
H	5.850	6.300	0.230	0.248
L1	0.050	0.250	0.002	0.010
K	1.500	1.900	0.059	0.074