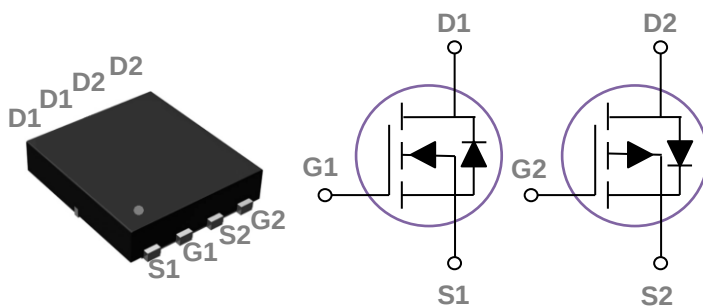


General Description

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
30V	6.7mΩ	60A
-30V	16mΩ	-40A

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	30	-30	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
I_D	Drain Current – Continuous ($T_c=25^\circ\text{C}$)	60	-40	A
	Drain Current – Continuous ($T_c=100^\circ\text{C}$)	38	-25	A
I_{DM}	Drain Current – Pulsed ^{1, 5}	240	-160	A
EAS	Single Pulse Avalanche Energy ^{2, 6}	88	88	mJ
IAS	Single Pulse Avalanched Current ^{2, 6}	42	-42	A
P_D	Power Dissipation ($T_c=25^\circ\text{C}$)	48		W
	Power Dissipation – Derate above 25°C	0.38		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	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	2.6	$^\circ\text{C/W}$

N-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	$V_{GS}=0V$, $I_D=250\mu A$	30	---	---	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=30V$, $V_{GS}=0V$, $T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=24V$, $V_{GS}=0V$, $T_J=125^\circ\text{C}$	---	---	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	$V_{GS}=10V$, $I_D=20A$	---	5.6	6.7	$m\Omega$
		$V_{GS}=4.5V$, $I_D=10A$	---	7.5	10	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1.2	1.6	2.5	V
g_{fs}	Forward Transconductance	$V_{DS}=10V$, $I_D=3A$	---	13	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge ^{3, 4}	$V_{DS}=15V$, $V_{GS}=10V$, $I_D=30A$	---	20	30	nC
Q_{gs}	Gate-Source Charge ^{3, 4}		---	2.6	5	
Q_{gd}	Gate-Drain Charge ^{3, 4}		---	4.5	7	
$T_{d(on)}$	Turn-On Delay Time ^{3, 4}	$V_{DD}=15V$, $V_{GS}=10V$, $R_G=6\Omega$ $I_D=30A$	---	4	6	ns
T_r	Rise Time ^{3, 4}		---	8	10	
$T_{d(off)}$	Turn-Off Delay Time ^{3, 4}		---	10	15	
T_f	Fall Time ^{3, 4}		---	6	10	
C_{iss}	Input Capacitance	$V_{DS}=15V$, $V_{GS}=0V$, $F=1\text{MHz}$	---	1270	1900	pF
C_{oss}	Output Capacitance		---	210	320	
C_{rss}	Reverse Transfer Capacitance		---	140	210	
R_g	Gate resistance	$V_{GS}=0V$, $V_{DS}=0V$, $F=1\text{MHz}$	---	2.5	---	Ω

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	---	---	60	A
I_{SM}	Pulsed Source Current		---	---	120	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. $V_{DD}=25V$, $V_{GS}=10V$, $L=0.1mH$, $I_{AS}=42A$, $R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$.
3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
4. Essentially independent of operating temperature.

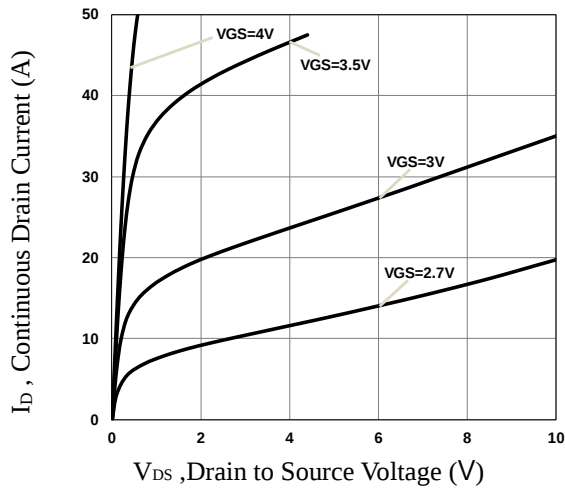


Fig.1 Typical Output Characteristics

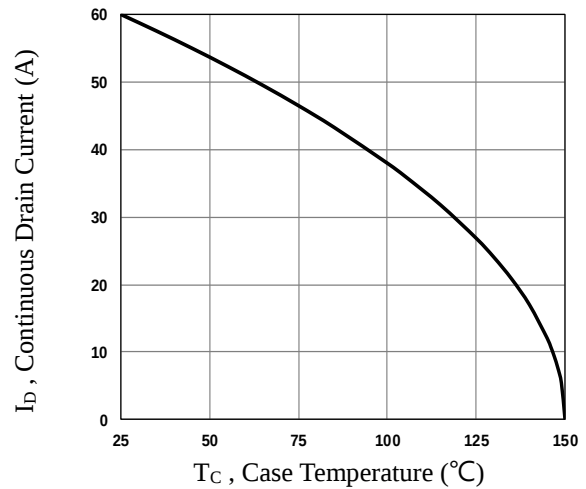


Fig.2 Continuous Drain Current vs. T_C

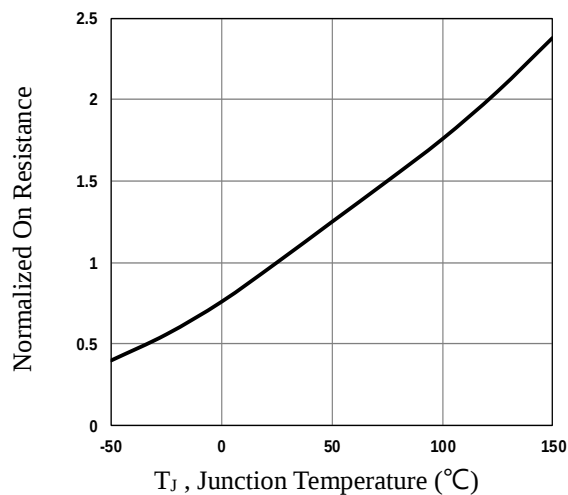


Fig.3 Normalized R_{DS(on)} vs. T_J

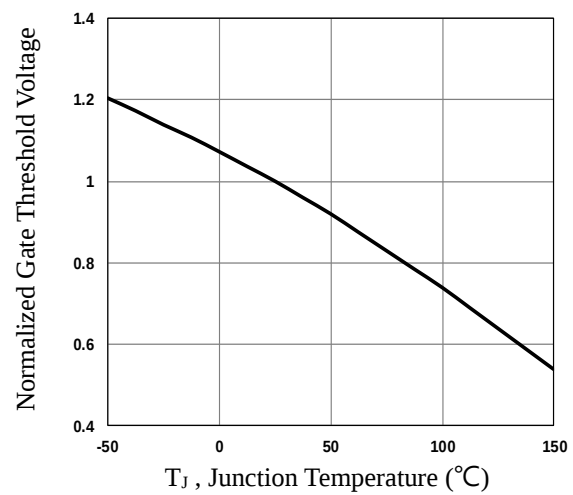


Fig.4 Normalized V_{th} vs. T_J

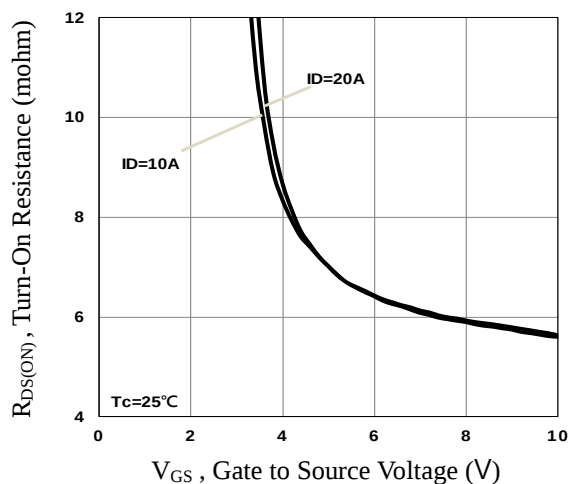


Fig.5 Turn-On Resistance vs. V_{GS}

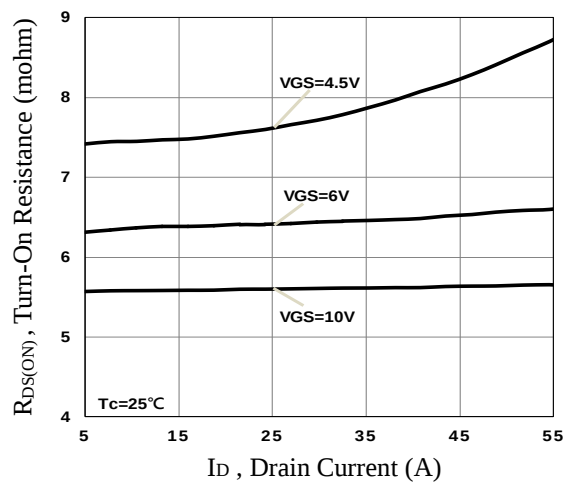
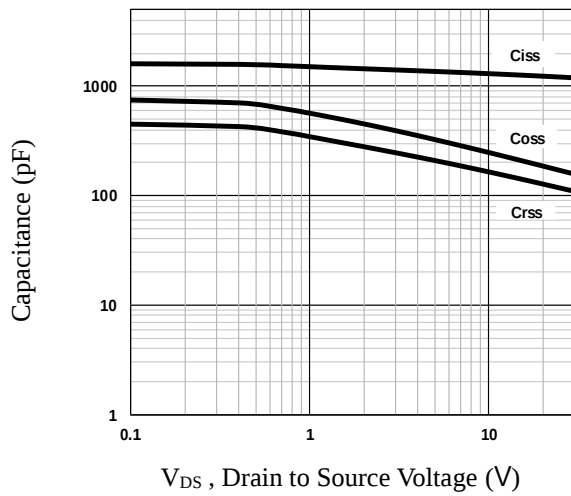
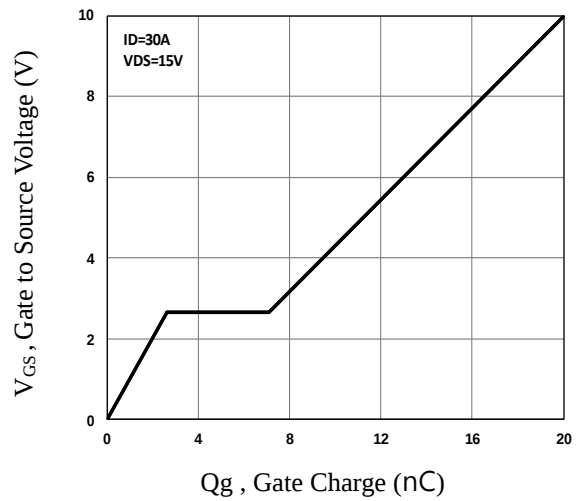
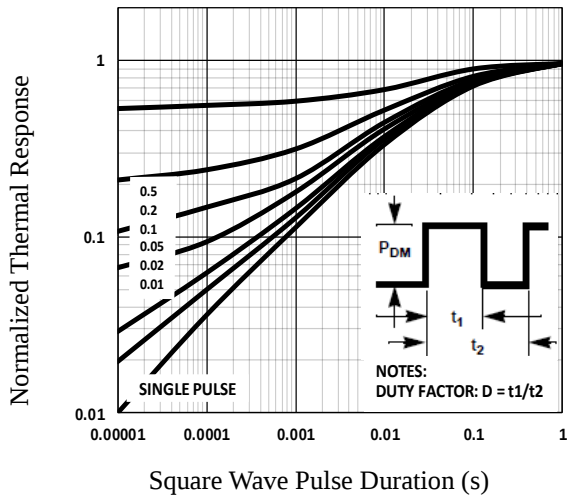
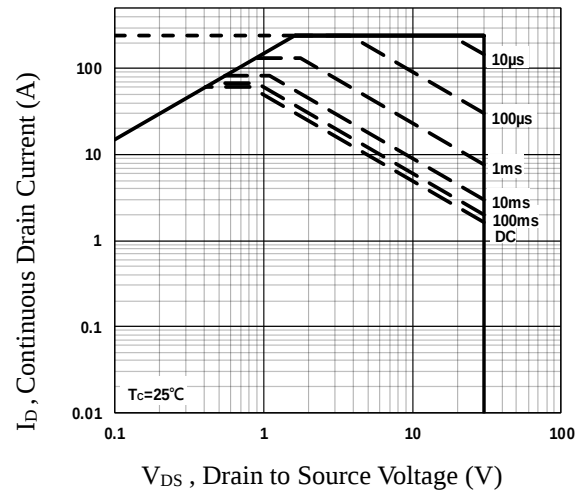
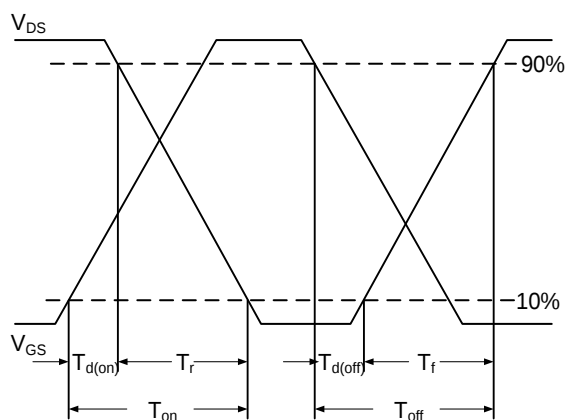
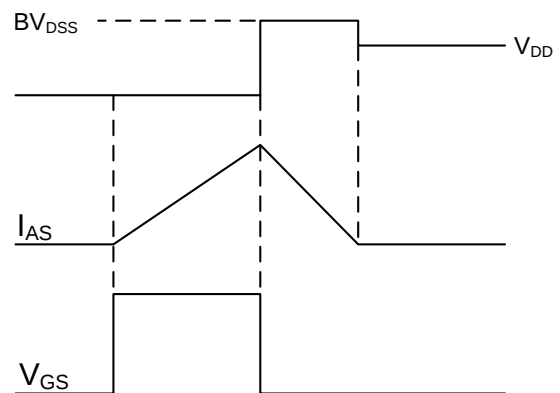


Fig.6 Turn-On Resistance vs. I_D


Fig.7 Capacitance Characteristics

Fig.8 Gate Charge Characteristics

Fig.9 Normalized Transient Impedance

Fig.10 Maximum Safe Operation Area

Fig.11 Switching Time Waveform

Fig.12 EAS Waveform

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 =-250μA	-30	---	---	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-30V, V _{GS} =0V, T _J =25°C	---	---	-1	μA
		V _{DS} =-24V, V _{GS} =0V, T _J =125°C	---	---	-10	μA
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 =-15A	---	13	16	mΩ
		V _{GS} =-4.5V, I _D =-10A	---	20	26	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250μA	-1.2	-1.6	-2.5	V
g _{fs}	Forward Transconductance	V _{DS} =-10V, I _D =-3A	---	10	---	S

Dynamic and switching Characteristics

Q _g	Total Gate Charge ^{7, 8}	V _{DS} =-15V, V _{GS} =-10V, I _D =-20A	---	30	45	nC
Q _{gs}	Gate-Source Charge ^{7, 8}		---	2.8	6	
Q _{gd}	Gate-Drain Charge ^{7, 8}		---	5	8	
T _{d(on)}	Turn-On Delay Time ^{7, 8}	V _{DD} =-15V, V _{GS} =-10V, R _G =6Ω I _D =-20A	---	10	15	ns
T _r	Rise Time ^{7, 8}		---	12	20	
T _{d(off)}	Turn-Off Delay Time ^{7, 8}		---	20	30	
T _f	Fall Time ^{7, 8}		---	25	40	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, F=1MHz	---	1560	2350	pF
C _{oss}	Output Capacitance		---	235	350	
C _{rss}	Reverse Transfer Capacitance		---	175	260	

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	---	---	-40	A
I _{SM}	Pulsed Source Current		---	---	-80	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1	V

Note :

5. Repetitive Rating : Pulsed width limited by maximum junction temperature.
6. V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-42A., R_G=25Ω, Starting T_J=25°C.
7. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%.
8. Essentially independent of operating temperature.

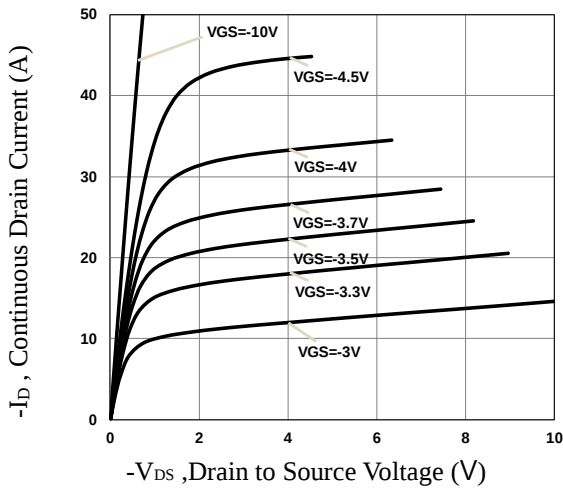


Fig.13 Typical Output Characteristics

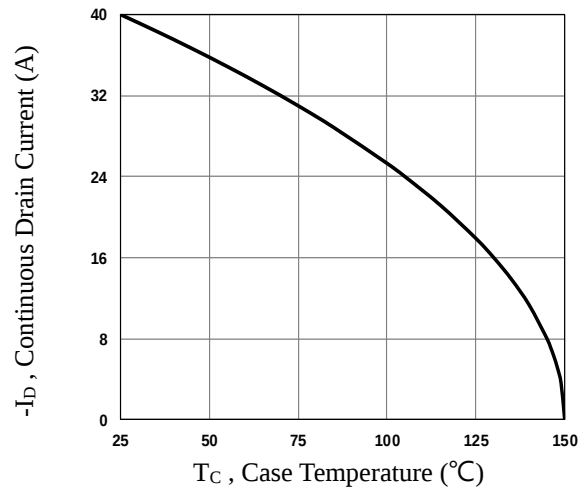


Fig.14 Continuous Drain Current vs. T_C

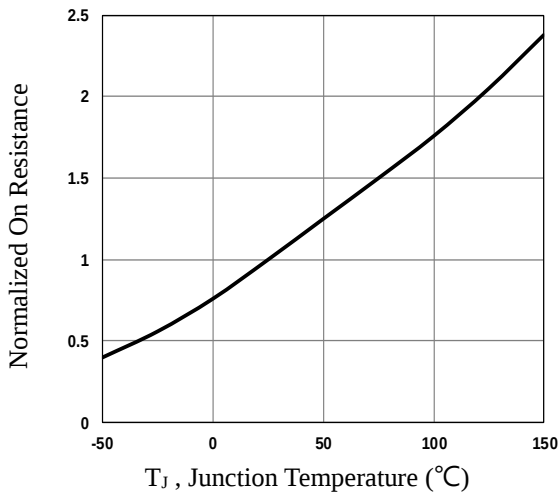


Fig.15 Normalized $R_{DS(on)}$ vs. T_J

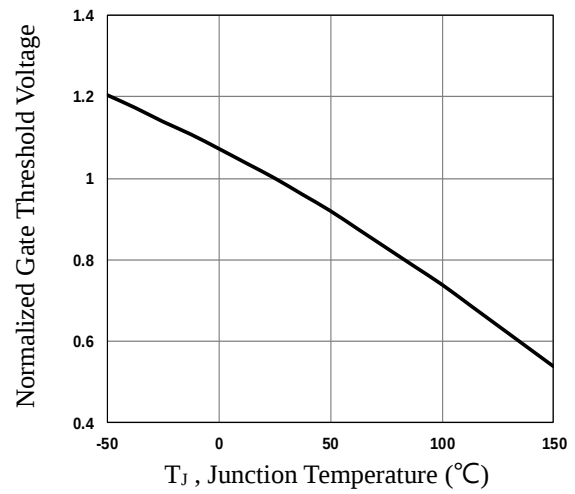


Fig.16 Normalized V_{th} vs. T_J

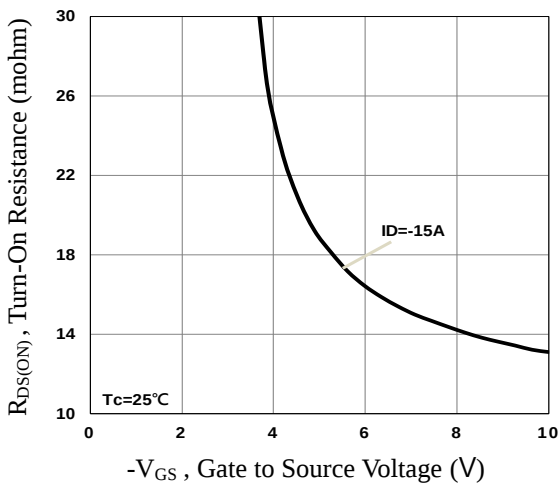


Fig.17 Turn-On Resistance vs. V_{GS}

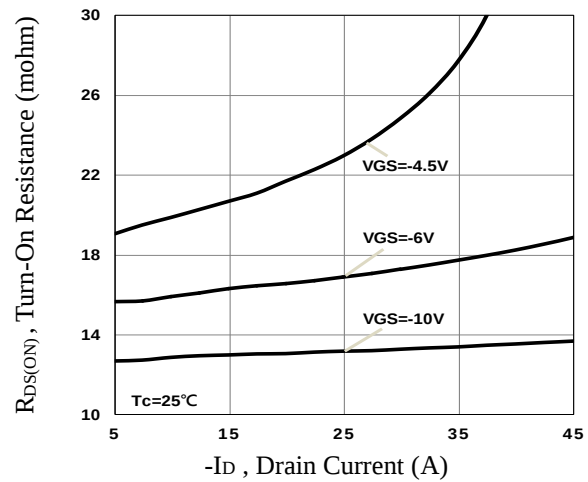


Fig.18 Turn-On Resistance vs. I_D

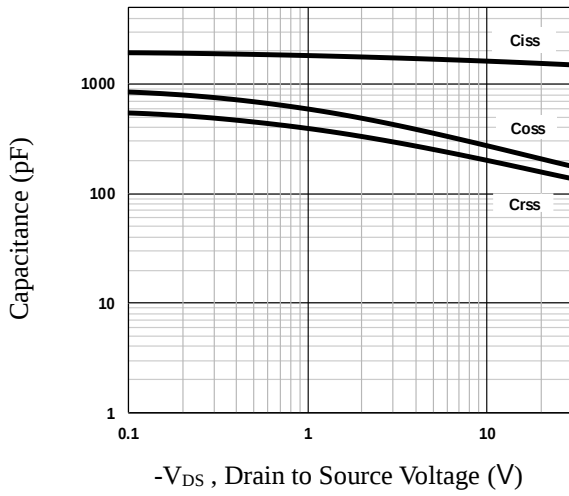


Fig.19 Capacitance Characteristics

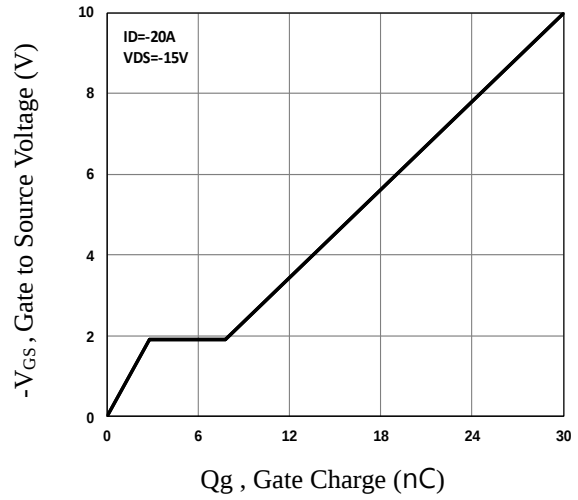


Fig.20 Gate Charge Characteristics

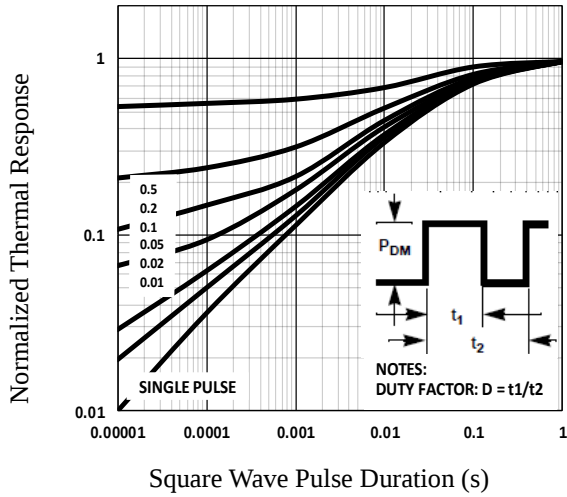


Fig.21 Normalized Transient

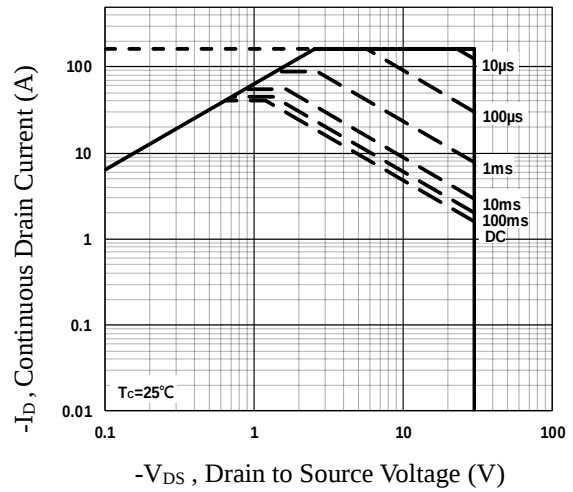
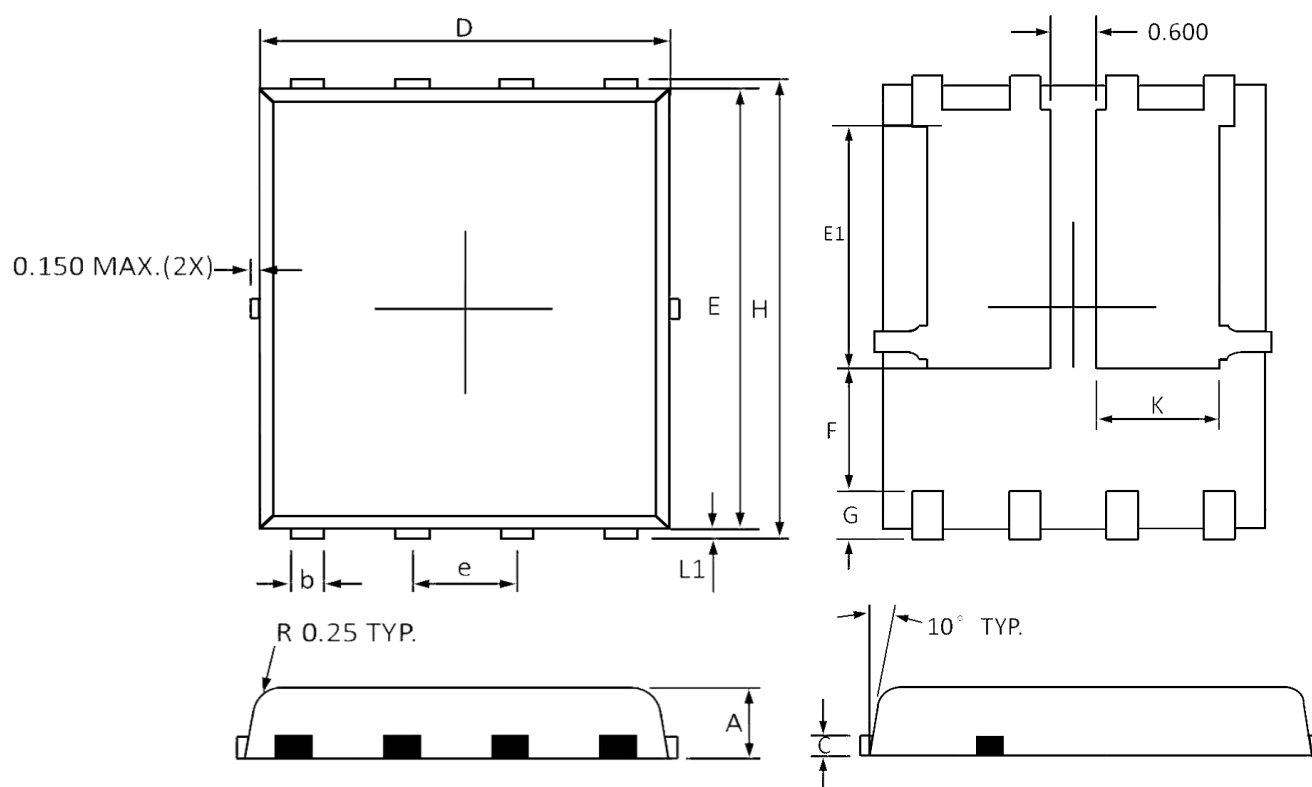


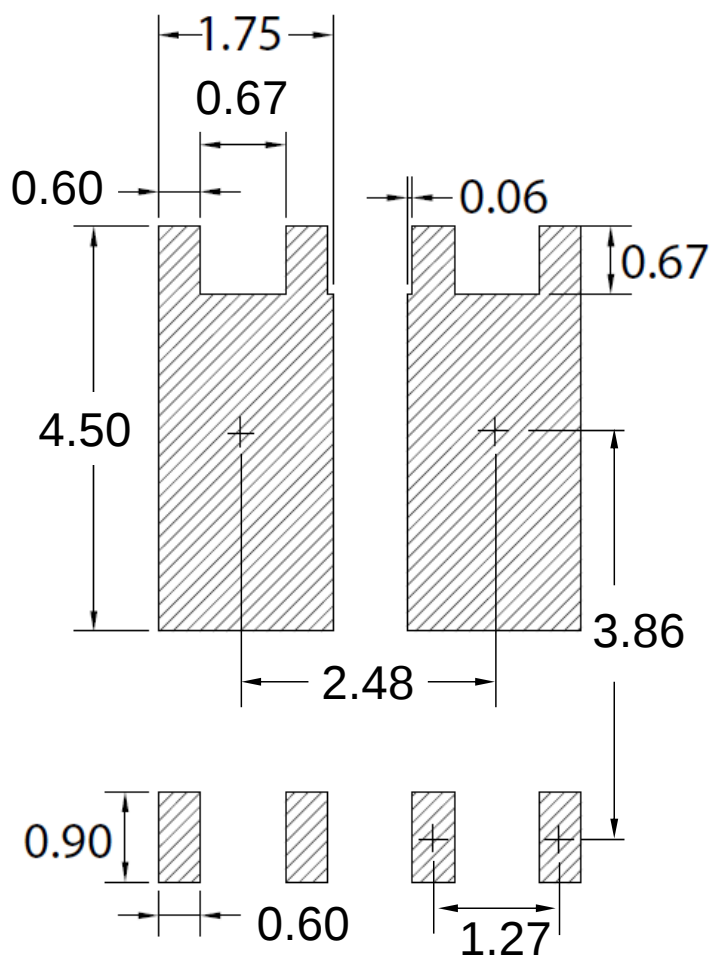
Fig.22 Maximum Safe Operation Area

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

PPAK5X6 Dual RECOMMENDED LAND PATTERN



unit : mm