



# 60V N-Channel MOSFETs

## General Description

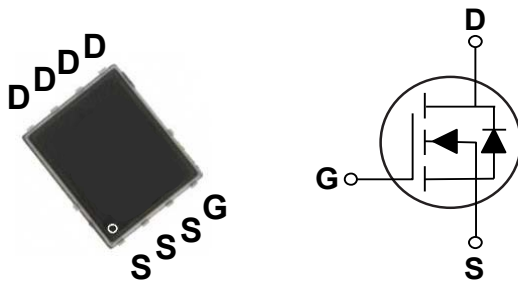
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$
60 V	4.6 mΩ	100 A

## Features

- $R_{DS(ON)} \leq 4.6m\Omega @ V_{GS}=10V$
- Fast switching
- Improved dv/dt capability
- Green Device Available

PPAK5X6 Pin Configuration



## Applications

- PowerTools
- Load Switch
- LED applications
- Motor Drive Applications

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous ( $T_C=25^\circ C$ )	100	A
	Drain Current – Continuous ( $T_C=100^\circ C$ )	63	A
$I_{DM}$	Drain Current – Pulsed (NOTE 1)	400	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	450	mJ
IAS	Single Pulse Avalanche Current (NOTE 2)	95	A
$P_D$	Power Dissipation ( $T_C=25^\circ C$ )	142	W
	Power Dissipation – Derate above $25^\circ C$	1.14	W/ $^\circ C$
$T_J$	Storage Temperature Range	-50 to 150	$^\circ C$
$T_{STG}$	Operating Junction Temperature Range	-50 to 150	$^\circ C$
Marking Code		NG4P6	

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	0.88	$^\circ C/W$



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	60	---	---	V
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =48V, 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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A	---	3.8	4.6	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A	---	4.2	5.5	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	1.6	2.5	V
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =10V, I <sub>D</sub> =3A	---	25	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =30V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A (NOTE 3、4)	---	58.2	116	nC
Q <sub>gs</sub>	Gate-Source Charge		---	16.2	32	
Q <sub>gd</sub>	Gate-Drain Charge		---	23.4	46	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =30V, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω, I <sub>D</sub> =1A (NOTE 3、4)	---	19.2	40	nS
T <sub>r</sub>	Rise Time		---	56.3	120	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	90.8	200	
T <sub>f</sub>	Fall Time		---	21.6	40	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, F=1MHz	---	6805	10000	pF
C <sub>oss</sub>	Output Capacitance		---	445	680	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	195	280	
R <sub>g</sub>	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	1.3	2.6	Ω

Drain-Source Diode Characteristics and 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	---	---	100	A
I <sub>SM</sub>	Pulsed Source Current		---	---	200	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

NOTES :

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>=95A, 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.



Characteristics Curves

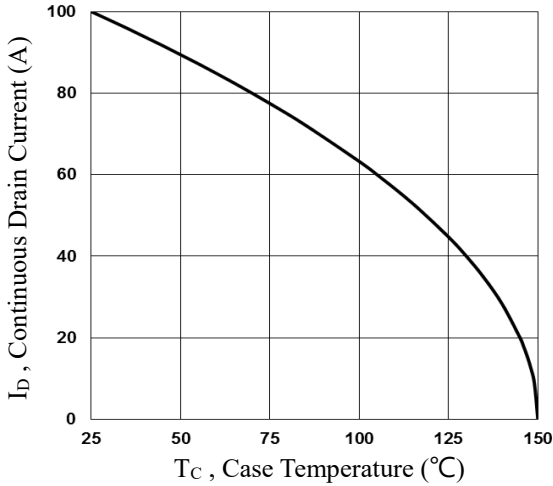


Fig.1 Continuous Drain Current vs. T<sub>C</sub>

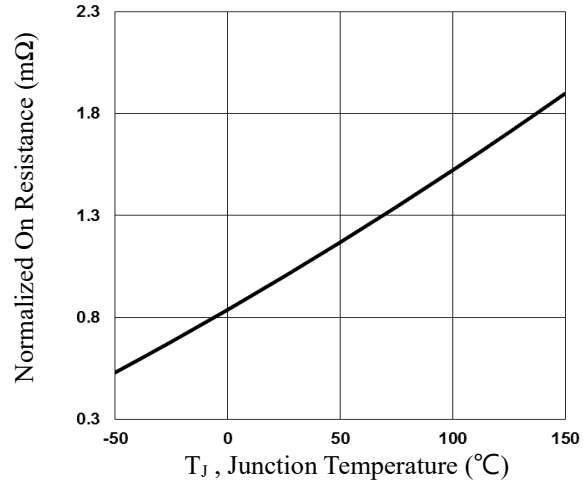


Fig.2 Normalized R<sub>DS(on)</sub> vs. T<sub>J</sub>

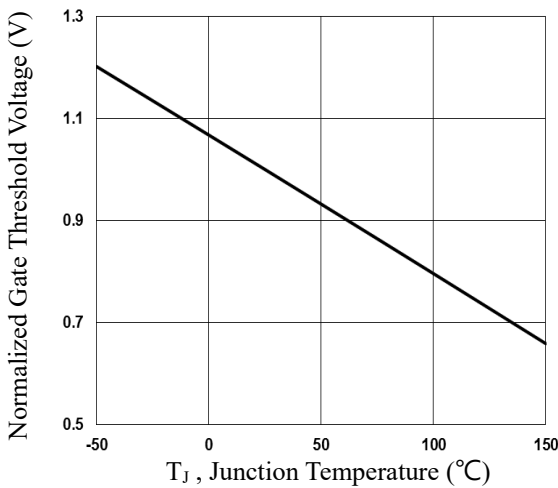


Fig.3 Normalized V<sub>th</sub> vs. T<sub>J</sub>

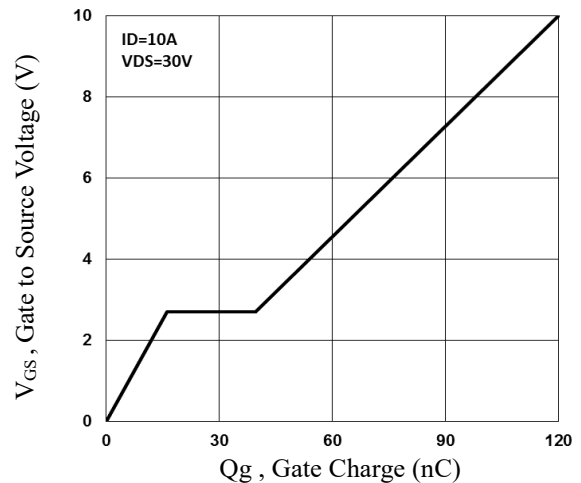


Fig.4 Gate Charge Characteristics

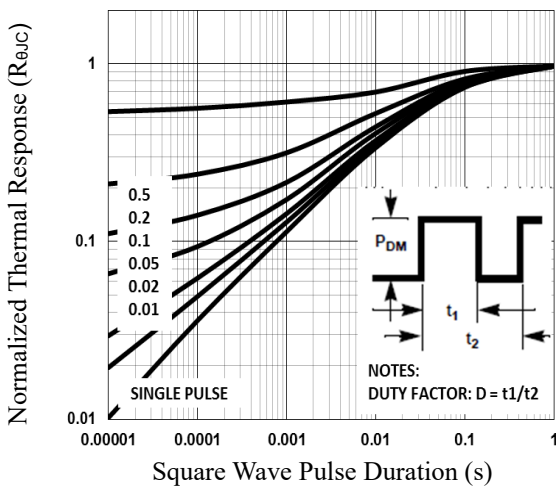


Fig.5 Normalized Transient Impedance

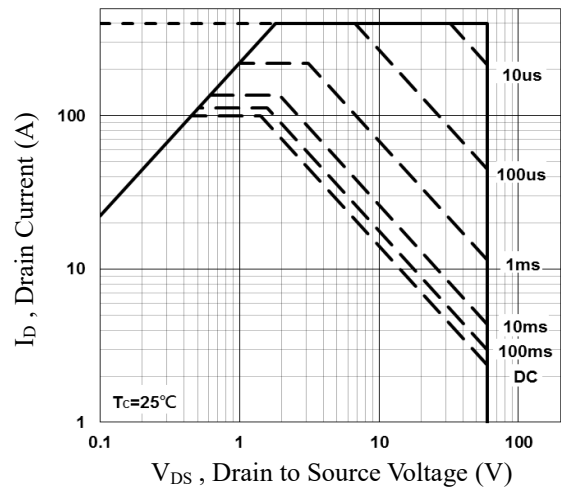


Fig.6 Maximum Safe Operation Area



Characteristics Curves

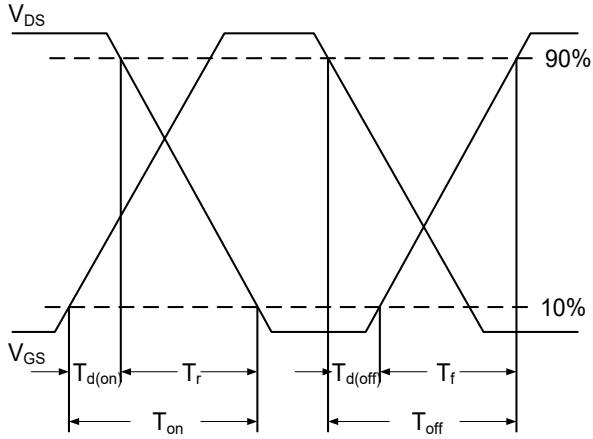


Fig.7 Switching Time Waveform

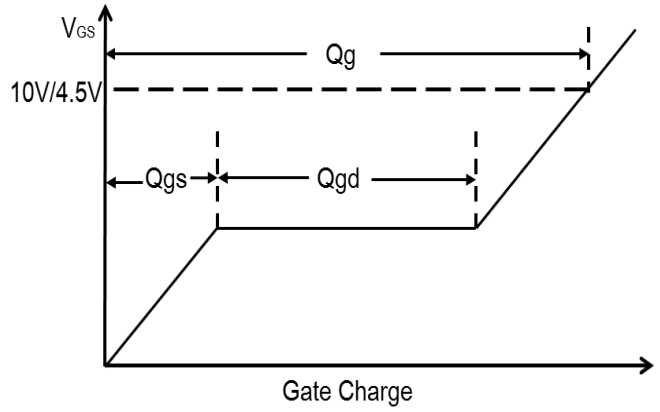
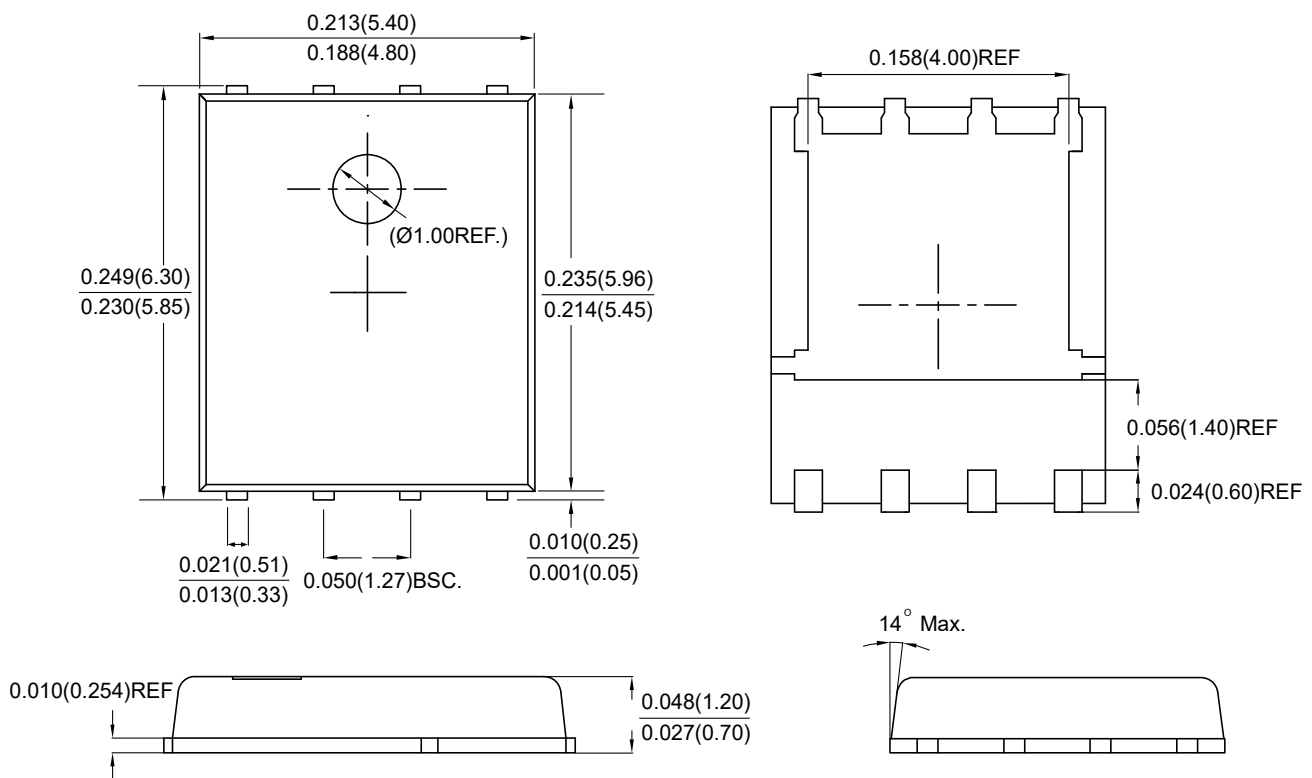


Fig.8 Gate Charge Waveform

Package Outline Dimensions



PPAK5X6

Dimensions in inches and (millimeters)



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