



60V N-Channel MOSFETs

General Description

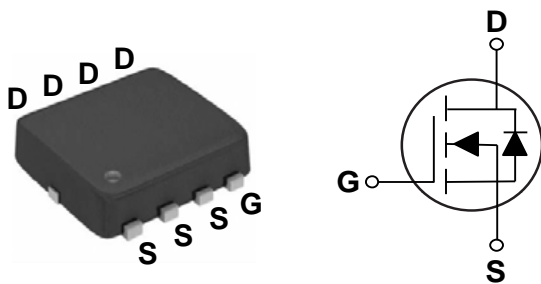
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

BV_{DSS}	$R_{DS(ON)}$	I_D
60 V	12 mΩ	42 A

Features

- $R_{DS(ON)} \leq 12m\Omega @ V_{GS}=10V$
- Improved dv/dt capability
- Fast switching
- Green Device Available

PPAK3X3 Pin Configuration



Applications

- Motor Drive
- Power Tools
- LED Lighting

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	± 20	V
I_D	Drain Current - Continuous ($T_C=25^\circ C$)	42	A
	Drain Current - Continuous ($T_C=100^\circ C$)	26	A
I_{DM}	Drain Current - Pulsed (NOTE 1)	168	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	61	mJ
IAS	Single Pulse Avalanche Current (NOTE 2)	35	A
P_D	Power Dissipation ($T_C=25^\circ C$)	52	W
	Power Dissipation - Derate above $25^\circ C$	0.42	W/ $^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
Marking Code		NG012 , DC6904	

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	---	2.4	$^\circ C/W$

**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	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=60V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	---	---	1	μA
		$V_{DS}=48V, V_{GS}=0V, T_J=125^{\circ}\text{C}$	---	---	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA

On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance (NOTE 3)	$V_{GS}=10V, I_D=10A$	---	10	12	m Ω
		$V_{GS}=4.5V, I_D=8A$	---	12	15	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.2	1.6	2.2	V
gfs	Forward Transconductance	$V_{DS}=10V, I_D=6A$	---	11.7	---	S

Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Q_g	Total Gate Charge	$V_{DS}=30V, V_{GS}=10V, I_D=10A$ (NOTE 3 & 4)	---	39.2	59	nC
Q_{gs}	Gate-Source Charge		---	5.9	9	
Q_{gd}	Gate-Drain Charge		---	8.8	14	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=6\Omega,$ $I_D=1A$ (NOTE 3 & 4)	---	9.6	18	nS
T_r	Rise Time		---	28.2	54	
$T_{d(off)}$	Turn-Off Delay Time		---	45.3	86	
T_f	Fall Time		---	10.9	21	
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, F=1\text{MHz}$	---	2100	3050	pF
C_{oss}	Output Capacitance		---	165	240	
C_{rss}	Reverse Transfer Capacitance		---	80	120	
Rg	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	1.6	3.2	Ω

Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	$V_G=V_D=0V$, Force Current	---	---	42	A
I_{SM}	Pulsed Source Current (NOTE 3)		---	---	84	A
V_{SD}	Diode Forward Voltage (NOTE 3)	$V_{GS}=0V, I_S=1A, T_J=25^{\circ}\text{C}$	---	---	1	V

NOTES :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=35A, R_G=25\Omega$, 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.



Characteristics Curves

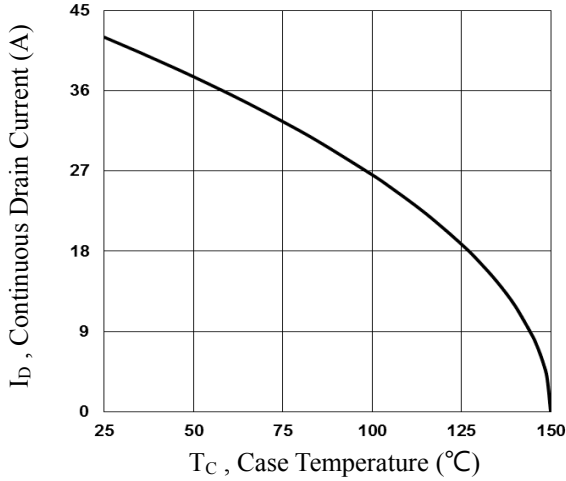


Fig.1 Continuous Drain Current vs. T_C

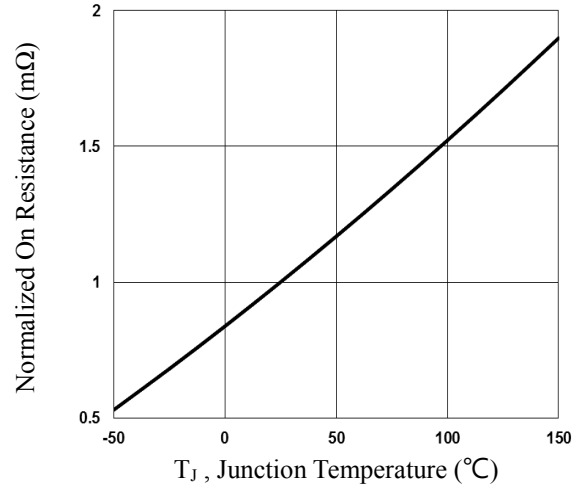


Fig.2 Normalized $R_{DS(on)}$ vs. T_J

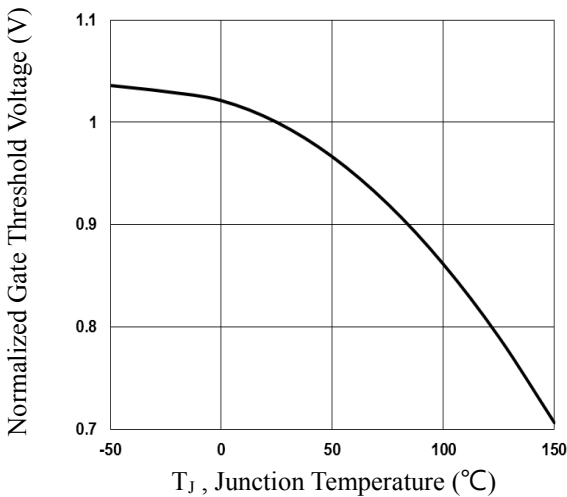


Fig.3 Normalized V_{th} vs. T_J

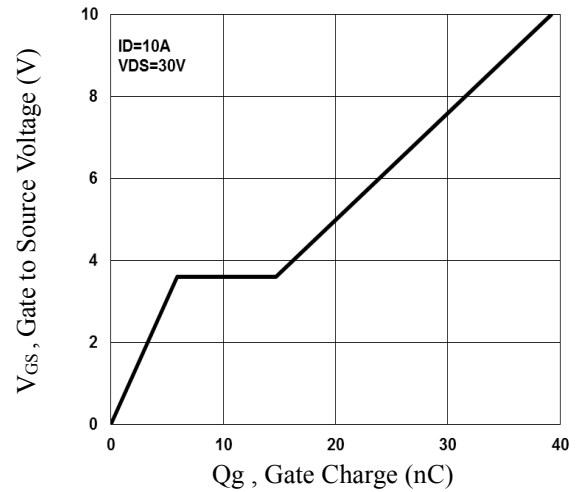


Fig.4 Gate Charge Waveform

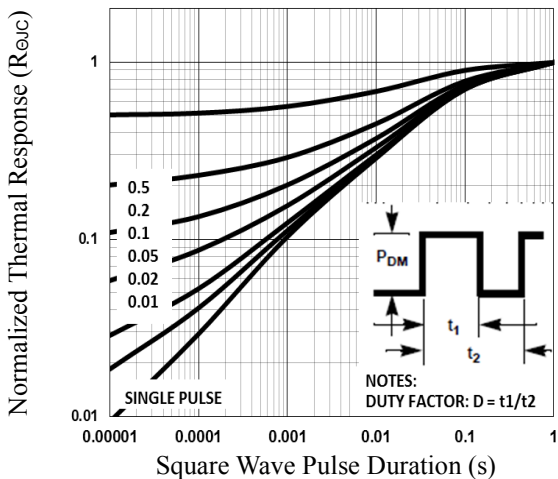


Fig.5 Normalized Transient Response

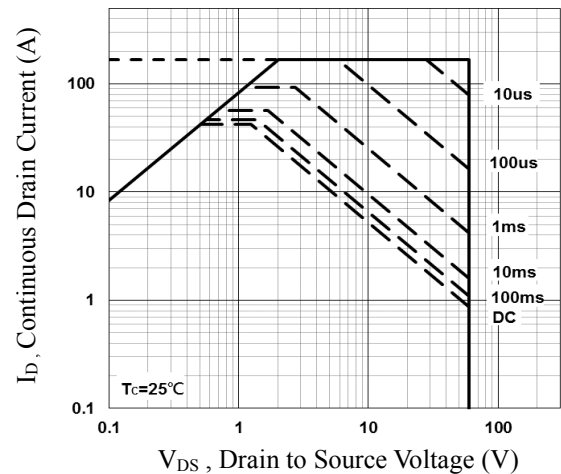


Fig.6 Maximum Safe Operation Area



Characteristics Curves

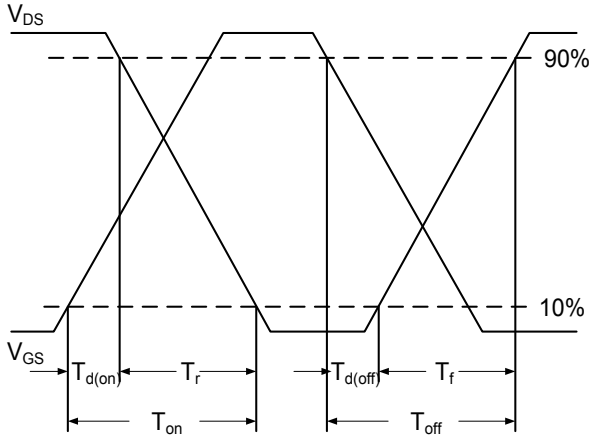


Fig.7 Switching Time Waveform

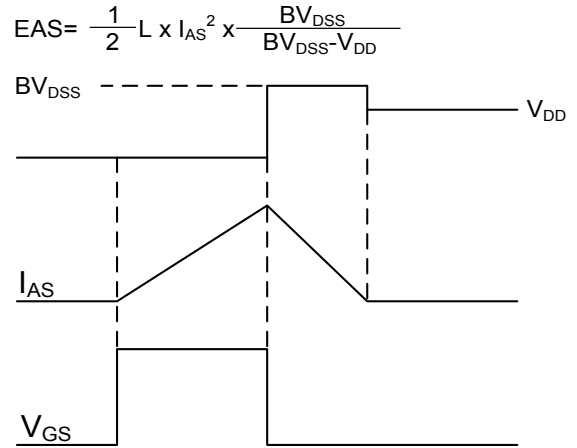
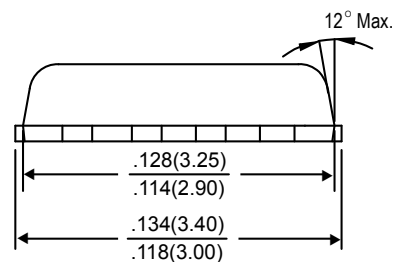
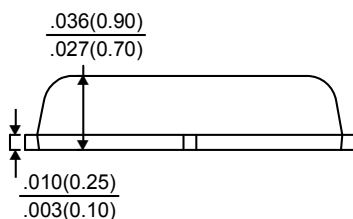
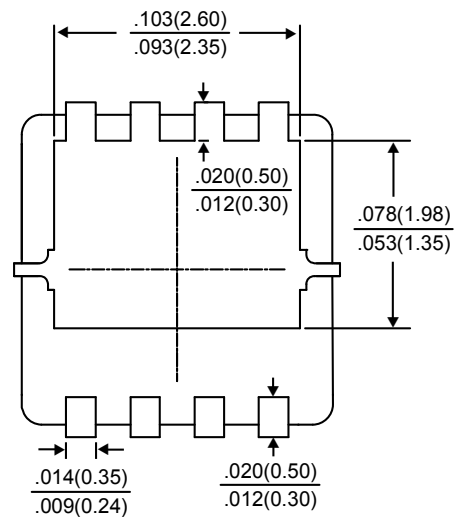
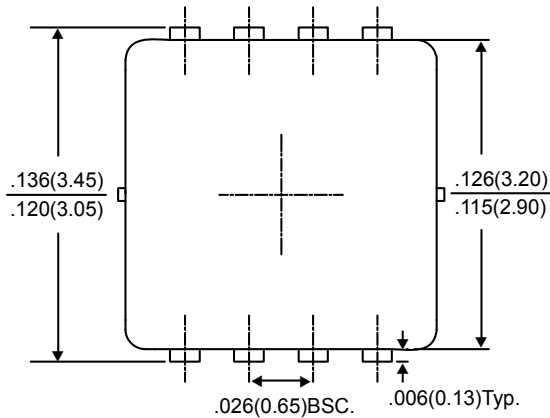


Fig.8 EAS Waveform

Package Outline Dimensions



PPAK3X3

Dimensions in inches and (millimeters)



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