



# 40V Dual N-Channel MOSFETs

## General Description

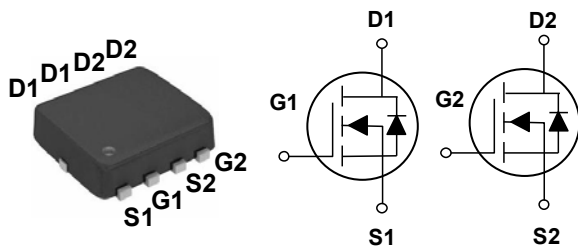
These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These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

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$
40 V	21 m $\Omega$	8 A

## Features

- $R_{DS(ON)}=21m\Omega@V_{GS}=10V$
- 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	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_A=25^\circ C$ )	8	A
	Drain Current - Continuous ( $T_A=70^\circ C$ )	6.4	A
$I_{DM}$	Drain Current - Pulsed (NOTE 1)	32	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	4.9	mJ
IAS	Single Pulse Avalanche Current (NOTE 2)	9.9	A
$P_D$	Power Dissipation ( $T_A=25^\circ C$ )	2	W
	Power Dissipation - Derate above $25^\circ C$	0.016	W/ $^\circ C$
$T_J$	Operating Junction Temperature Range	-50 to 150	$^\circ C$
$T_{STG}$	Storage Temperature Range	-50 to 150	$^\circ C$
Marking Code		ND021	

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	---	62.5	$^\circ C/W$



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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	$V_{GS}=0V, I_D=250\mu A$	40	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=40V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=32V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	10	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA

## On Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=8A$	---	17	21	m $\Omega$
		$V_{GS}=4.5V, I_D=4A$	---	23	29	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	---	2.5	V
gfs	Forward Transconductance	$V_{DS}=10V, I_D=1A$	---	5	---	S

## Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$Q_g$	Total Gate Charge	$V_{DS}=32V, V_{GS}=10V, I_D=3A$ (NOTE 3 & 4)	---	10.8	---	nC
$Q_{gs}$	Gate-Source Charge		---	1.6	---	
$Q_{gd}$	Gate-Drain Charge		---	3.3	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=3.3\Omega,$ $I_D=1A$ (NOTE 3 & 4)	---	3.8	---	nS
$T_r$	Rise Time		---	10.5	---	
$T_{d(off)}$	Turn-Off Delay Time		---	22.2	---	
$T_f$	Fall Time		---	6.6	---	
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, F=1\text{MHz}$	---	724	---	pF
$C_{oss}$	Output Capacitance		---	70	---	
$C_{riss}$	Reverse Transfer Capacitance		---	109	---	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, F=1\text{MHz}$	---	2.6	---	$\Omega$

## Drain-Source Diode Characteristics and Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current	$V_G=V_D=0V, \text{Force Current}$	---	---	8	A
$I_{SM}$	Pulsed Source Current		---	---	16	A
$V_{SD}$	Diode Forward Voltage	$V_{GS}=0V, I_S=1A, T_J=25^\circ\text{C}$	---	---	1	V

## NOTES :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=25V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=9.9A, R_G=25\Omega$ , 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

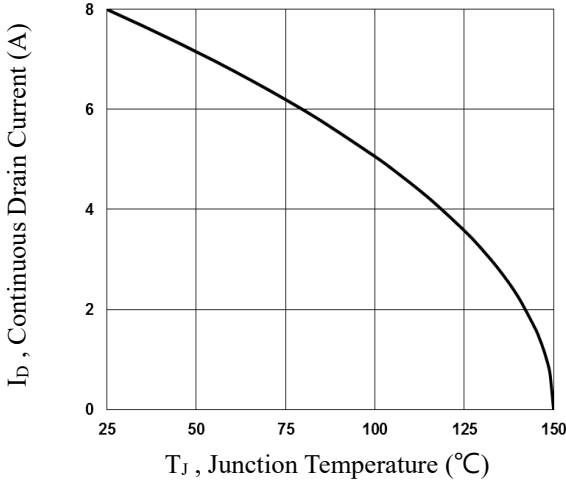


Fig.1 Continuous Drain Current vs.  $T_c$

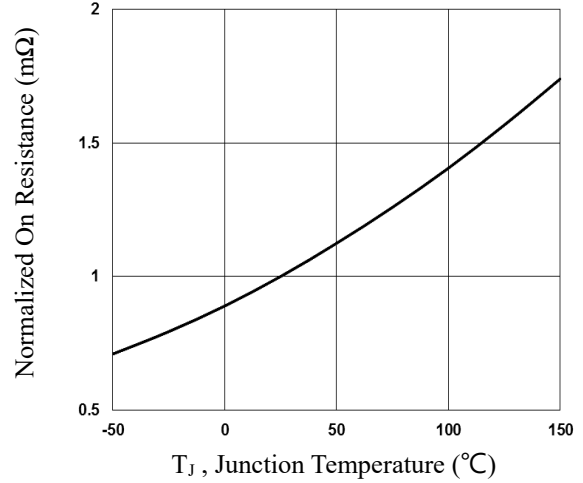


Fig.2 Normalized  $R_{DSON}$  vs.  $T_J$

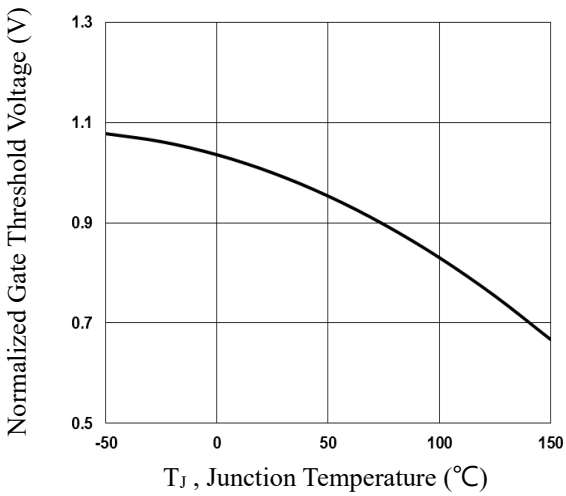


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

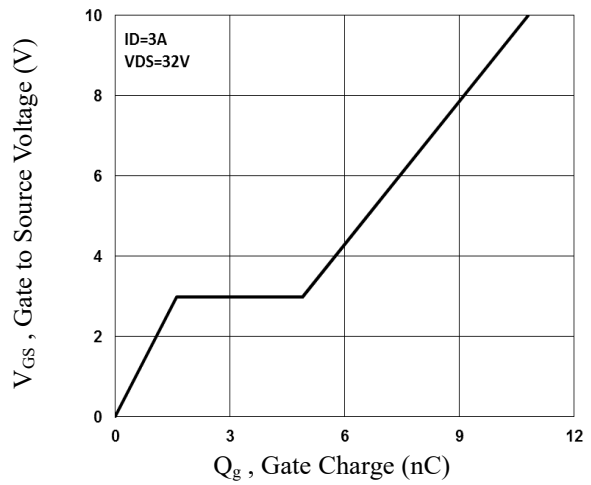


Fig.4 Gate Charge Waveform

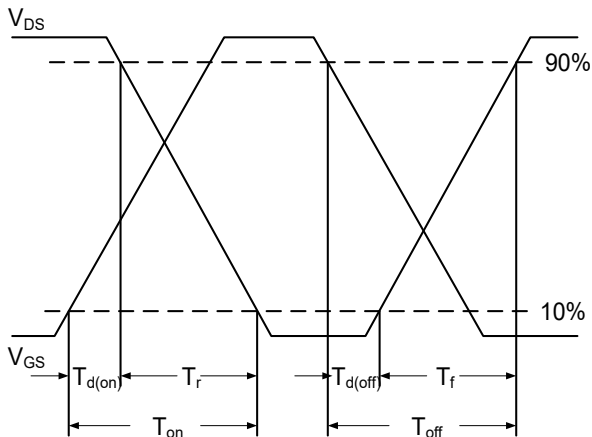


Fig.5 Switching Time Waveform

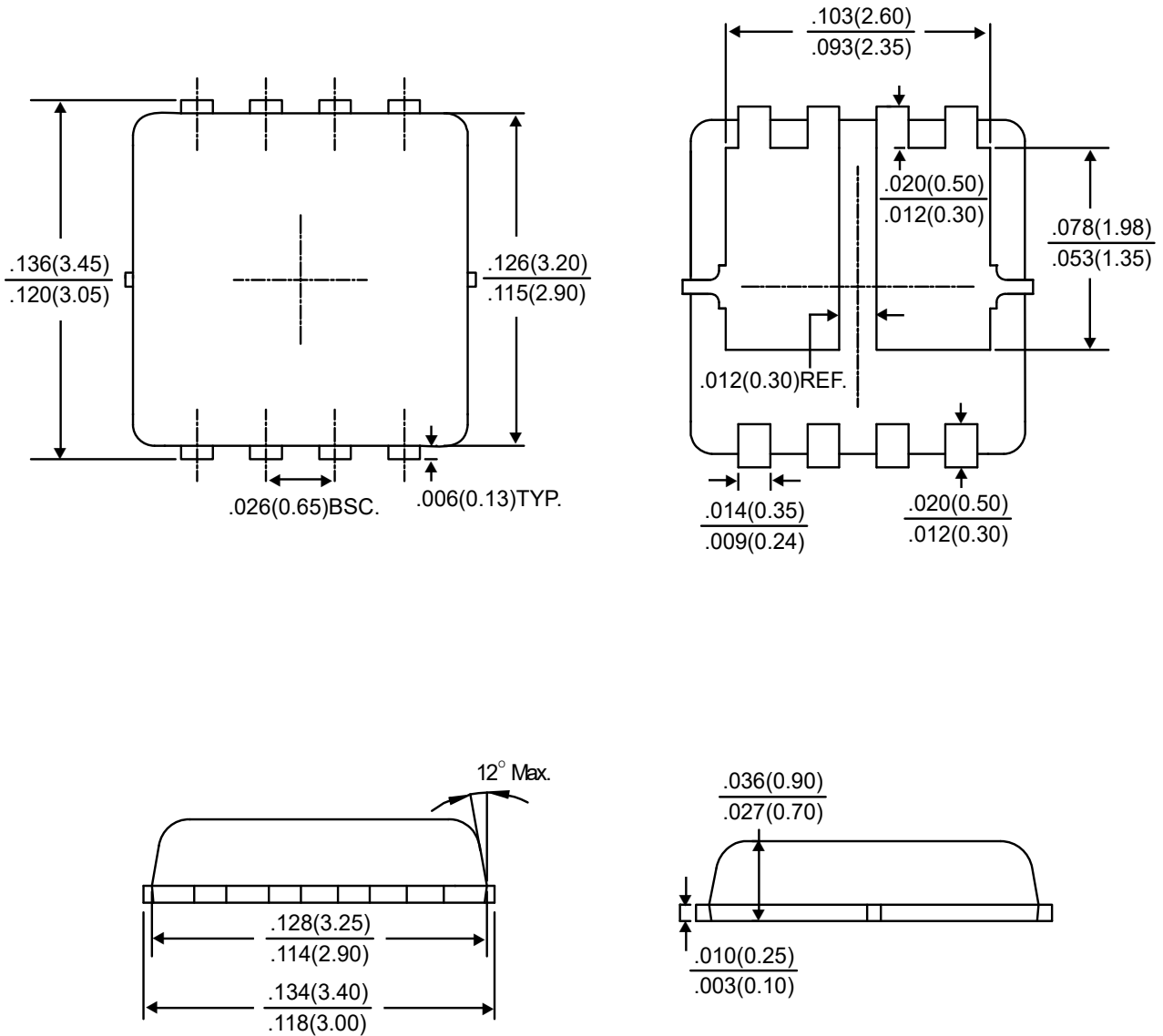


**P3MND021**



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## Package Outline Dimensions



### PPAK3X3

Dimensions in inches and (millimeters)



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