



# 30V 6 IN 1 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.

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$
30 V	18 mΩ	23 A

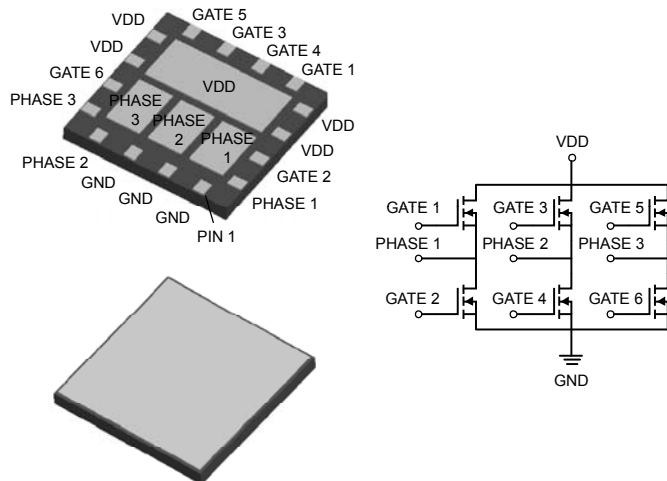
## Features

- $R_{DS(ON)} \leq 18m\Omega @ V_{GS}=10V$
- Fast switching
- Improved dv/dt capability
- Green Device Available

## Applications

- 3-PHASE Applications

DFN6X6 Pin Configuration



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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current - Continuous ( $T_C=25^\circ C$ )	23	A
	Drain Current - Continuous ( $T_C=100^\circ C$ )	14.5	A
$I_{DM}$	Drain Current - Pulsed (NOTE 1)	92	A
EAS	Single Pulse Avalanche Energy (NOTE 2)	18	mJ
IAS	Single Pulse Avalanche Current (NOTE 2)	19	A
$P_D$	Power Dissipation ( $T_C=25^\circ C$ )	15.4	W
	Power Dissipation - Derate above $25^\circ C$	0.12	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		NC018 , 3012HF6	

## 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	---	8.1	$^\circ C/W$



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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	$V_{GS}=0V, I_D=250\mu\text{A}$	30	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=30V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu\text{A}$
		$V_{DS}=24V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	10	$\mu\text{A}$
$I_{GSS}$	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 (NOTE 3)	$V_{GS}=10V, I_D=12A$	---	13.5	18	m $\Omega$
		$V_{GS}=4.5V, I_D=8A$	---	18.5	24	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu\text{A}$	1.2	1.6	2.5	V
gfs	Forward Transconductance	$V_{DS}=10V, I_D=6A$	---	8	---	S

## Dynamic and switching Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$Q_g$	Total Gate Charge	$V_{DS}=15V, V_{GS}=10V, I_D=10A$ (NOTE 3 & 4)	---	5.2	10	nC
$Q_{gs}$	Gate-Source Charge		---	0.6	1.2	
$Q_{gd}$	Gate-Drain Charge		---	2	4	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=15V, V_{GS}=10V, R_G=6\Omega,$ $I_D=1A$ (NOTE 3 & 4)	---	2.8	5	nS
$T_r$	Rise Time		---	7.2	14	
$T_{d(off)}$	Turn-Off Delay Time		---	15.8	30	
$T_f$	Fall Time		---	4.6	9	
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$	---	370	740	pF
$C_{oss}$	Output Capacitance		---	70	140	
$C_{rss}$	Reverse Transfer Capacitance		---	50	100	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$	---	2.2	4.5	$\Omega$

## 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	---	---	23	A
$I_{SM}$	Pulsed Source Current (NOTE 3)		---	---	46	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.  $V_{DD}=25V, V_{GS}=10V, L=1\text{mH}, I_{AS}=19A, R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$ .
3. The data tested by pulsed, pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .
4. Essentially independent of operating temperature.



Characteristics Curves

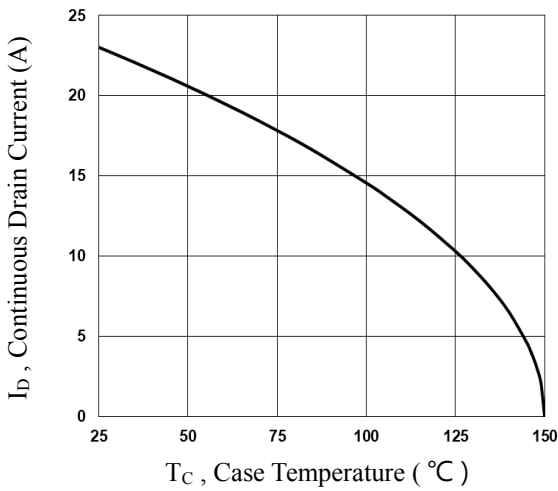


Fig.1 Continuous Drain Current vs.  $T_c$

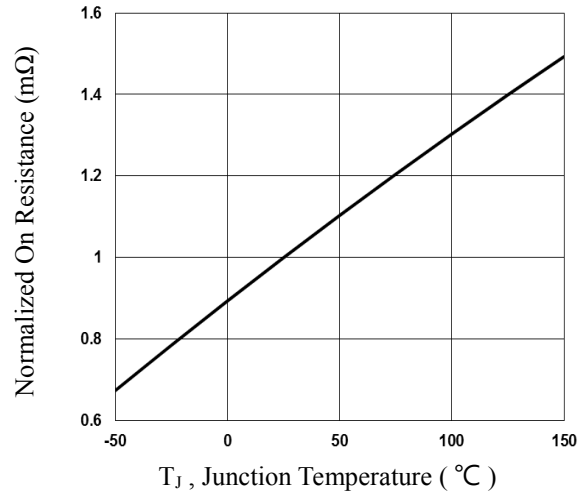


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_j$

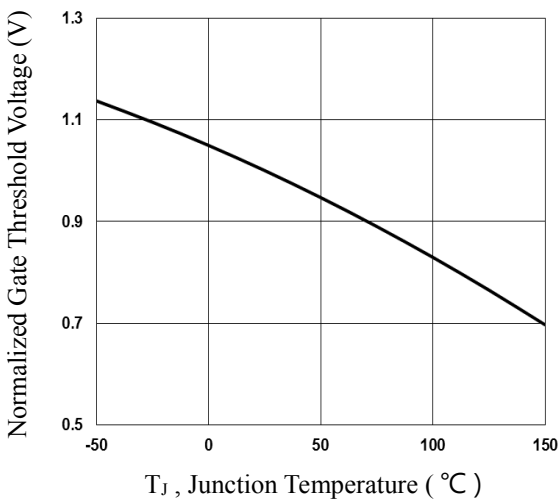


Fig.3 Normalized  $V_{th}$  vs.  $T_j$

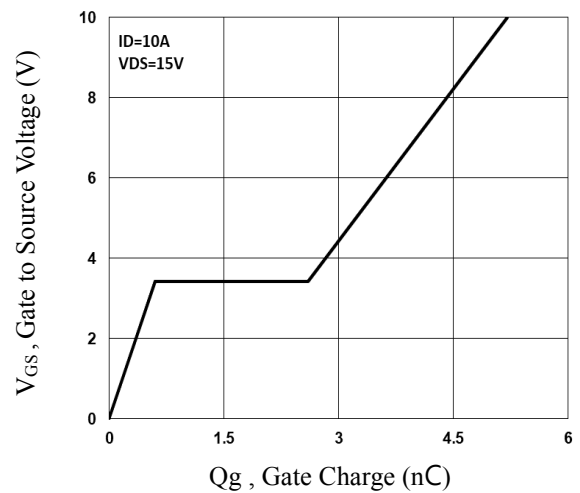


Fig.4 Gate Charge Waveform

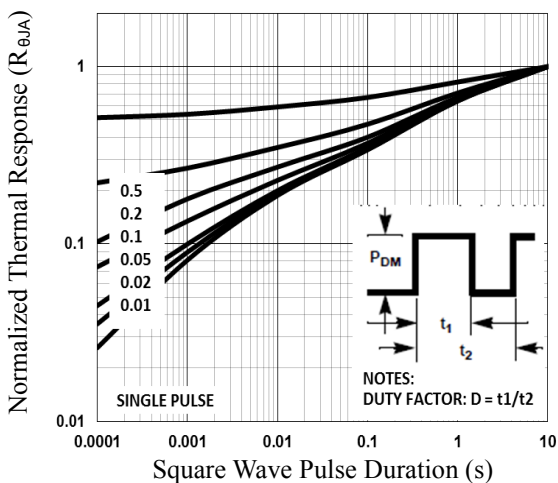


Fig.5 Normalized Transient Response

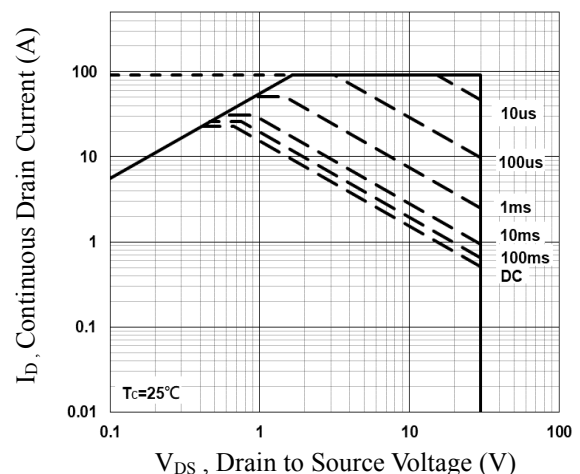


Fig.6 Maximum Safe Operation Area



Characteristics Curves

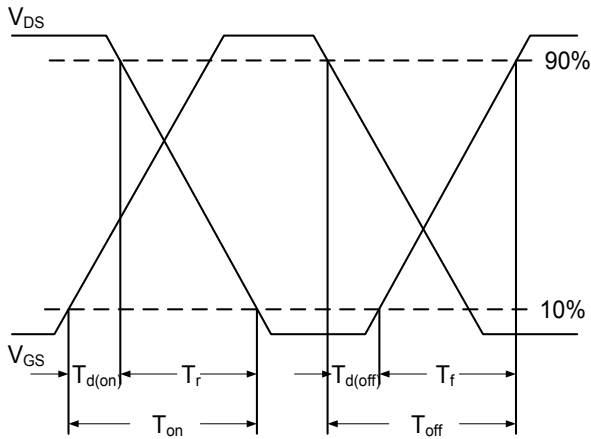


Fig.7 Switching Time Waveform

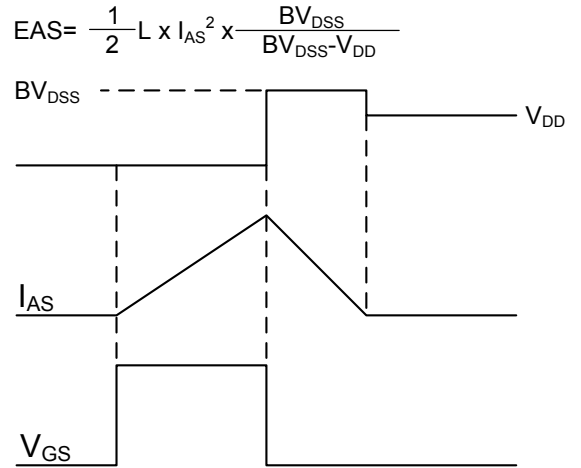
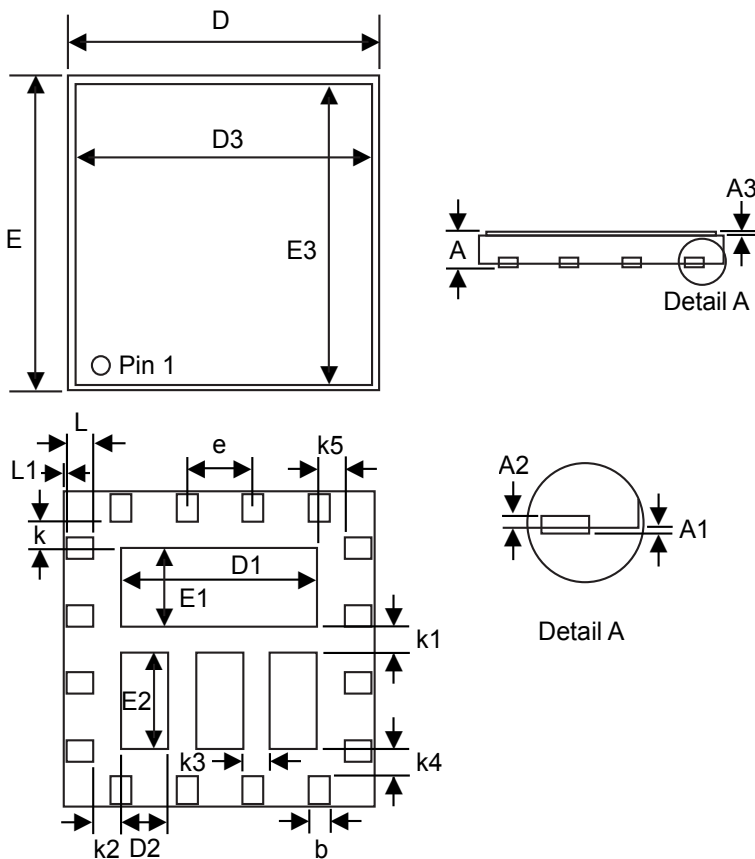


Fig.8 EAS Waveform

Package Outline Dimensions



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.53	0.60	0.02	0.024
A1	-	0.01	-	0.001
A2	0.03	0.10	0.001	0.004
A3	0.05	0.10	0.001	0.004
D	5.90	6.10	0.232	0.241
E	5.90	6.10	0.232	0.241
D1	3.70	3.90	0.145	0.154
E1	1.32	1.53	0.051	0.061
D2	0.80	1.00	0.031	0.04
E2	1.72	1.93	0.067	0.076
b	0.35	0.45	0.013	0.018
L	0.45	0.55	0.017	0.022
L1	0.01	0.09	0.001	0.004
k	0.55 Ref		0.022 Ref	
k1	0.55 Ref		0.022 Ref	
k2	0.55 Ref		0.022 Ref	
k3	0.55 Ref		0.022 Ref	
k4	0.55 Ref		0.022 Ref	
k5	0.55 Ref		0.022 Ref	
e	1.27 BSC		0.05 BSC	
D3	5.80 Ref		0.229 Ref	
E3	5.80 Ref		0.229 Ref	

DFN6X6



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