

60V N-Channel Enhancement Mode MOSFET

Description

The NP6003VR uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

- ◆ $V_{DS} = 60V$ $I_D = 3A$
 $R_{DS(ON)} = 78m\Omega$ @ $V_{GS} = 10V$ (Typ: $76m\Omega$)
 $R_{DS(ON)} = 88m\Omega$ @ $V_{GS} = 4.5V$ (Typ: $88m\Omega$)
- ◆ High density cell design for ultra low R_{dson} .
- ◆ Fully characterized avalanche voltage and current.
- ◆ Low gate to drain charge to reduce switching losses.

Application

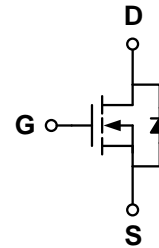
- ◆ Power switching application.
- ◆ Hard switched and high frequency circuits.
- ◆ Uninterruptible power supply.

Package

- ◆ SOT-23

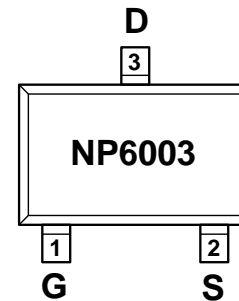


Schematic diagram



Marking and pin assignment

SOT-23
(TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP6003VR-G	-55°C to +150°C	SOT-23	3000

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

parameter	symbol	limit	unit	
Drain-source voltage	V_{DS}	60	V	
Gate-source voltage	V_{GS}	±20	V	
Continuous Drain Current (TJ = 150 °C)	$T_C = 25^\circ C$	3	A	
	$T_C = 70^\circ C$	2		
	$T_A = 25^\circ C$	1.6 ^{b,c}		
	$T_A = 70^\circ C$	1.3 ^{b,c}		
Continuous Source-Drain Diode Current	$T_C = 25^\circ C$	2.1		
	$T_A = 25^\circ C$	1 ^{b,c}		
Pulsed Drain Current (t = 300 μs)	I_{DM}	12		
Maximum power dissipation	$T_C = 25^\circ C$	P_D	2.5	W

	$T_C=70^\circ\text{C}$		1.6	
	$T_A=25^\circ\text{C}$		1.25 ^{b,c}	
	$T_A=70^\circ\text{C}$		0.8 ^{b,c}	
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55—150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	$R_{\theta JA}$	100	130	$^\circ\text{C/W}$
Maximum Junction-to-Foot (Drain)	$R_{\theta JF}$	60	75	

Notes:

- a: $T_C = 25^\circ\text{C}$. b: Surface mounted on 1" x 1" FR4 board.
 c: $t = 5\text{ s}$. d: Maximum under steady state conditions is 175°C/W .

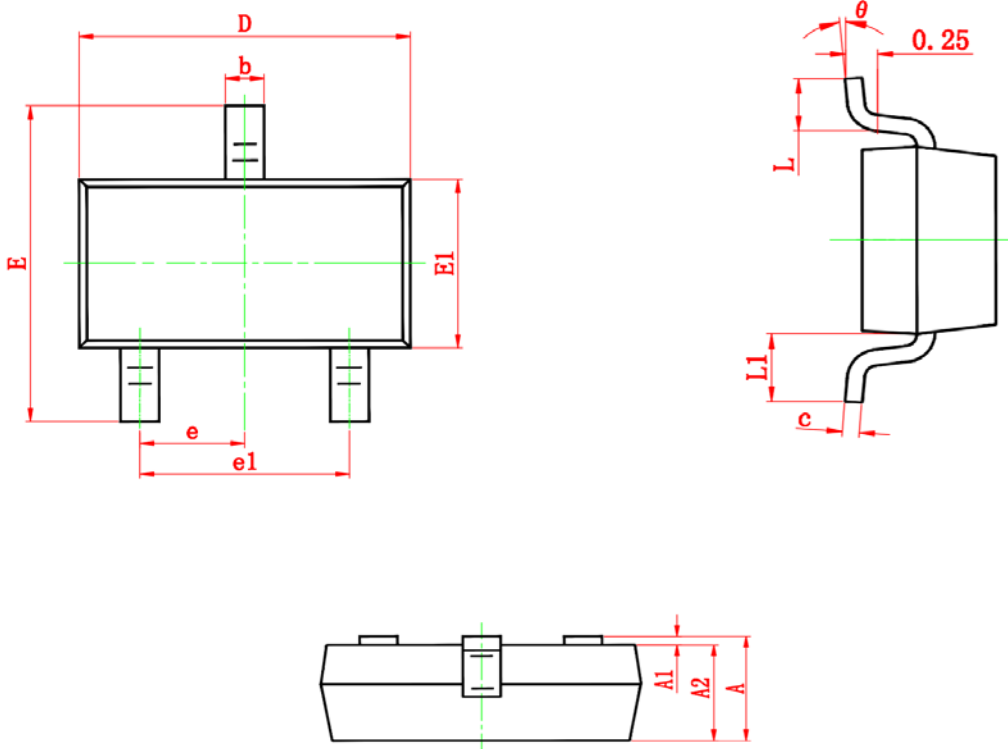
Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu\text{A}$	60	-	-	V
BVDSS Temperature Coefficient	$\Delta BV_{DSS}/\Delta T_J$	Reference to $25^\circ\text{C}, I_D=1\text{mA}$		33		$\text{mV}/^\circ\text{C}$
Zero gate voltage drain current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$	-	-	1	μA
		$T_J=85^\circ\text{C}$	-	-	30	
Gate Leakage Current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1.2	1.9	2.5	V
Drain-source on-state resistance ¹	$R_{DS(ON)}$	$V_{GS}=10V, I_D=3A$	-	78	90	$\text{m}\Omega$
		$V_{GS}=4.5V, I_D=2A$		88	100	
On Status Drain Current	$I_{D(ON)}$	$V_{DS}=10V, V_{GS}=10V$	3	-	-	A
Diode Characteristics						
Diode Forward Voltage	V_{SD}	$I_{SD}=1A, V_{GS}=0V$	-	0.75	1.1	V
Diode Continuous Forward Current	I_S		-	-	3	A
Reverse Recovery Time	t_{rr}	$I_F=1.5A,$	-	15	-	ns
Reverse Recovery Charge	Q_{rr}	$dI/dt=100A/\mu\text{s}$	-	12	-	nC
Dynamic Characteristics²						
Gate Resistance	R_G	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$	-	2.0	-	Ω
Input capacitance	C_{ISS}	$V_{GS}=0V, V_{DS}=25V$ $f=1.0\text{MHz}$	-	175	-	pF
Output capacitance	C_{OSS}		-	21	-	
Reverse transfer capacitance	C_{RSS}		-	13	-	
Turn-on delay time	$t_{D(ON)}$	$V_{GS}=10V, V_{DD}=30V,$ $R_L=4.7\Omega, I_D=1.5A,$ $R_G=3.3\Omega$	-	15	-	ns
Turn-on Rise time	t_r		-	16	-	
Turn-off delay time	$t_{D(OFF)}$		-	10	-	
Turn-off Fall time	t_f		-	10	-	

Total gate charge	Q_g	$V_{GS}=10V, I_D=2A$ $V_{DS}=30V$	-	4.1	nC
Gate-source charge	Q_{gs}			0.8	
Gate-drain charge	Q_{gd}		-	1	

Package Information

- SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	2.250	2.550	0.089	0.100
E1	1.200	1.400	0.047	0.055
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.300	0.500	0.012	0.020
L1	0.550 REF.		0.022 REF.	
θ	0°	8°	0°	8°

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