

60V N-Channel Enhancement Mode MOSFET

Description

The NP2N7002VR uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 1.8V. This device is suitable for use as a load switch or in PWM applications.

General Features

- ◆ $V_{DS} = 60V$, $I_D = 340mA$
 $R_{DS(ON)}(Typ.) = 1.15\Omega @ V_{GS} = 10V$
 $R_{DS(ON)}(Typ.) = 1.25\Omega @ V_{GS} = 4.5V$
- ◆ High power and current handing capability
- ◆ Lead free product is acquired
- ◆ Surface mount package
- ◆ ESD Rating: 2000V HBM

Application

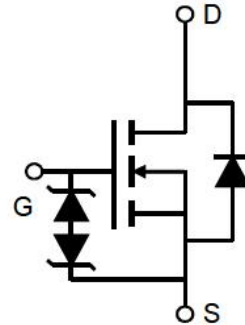
- ◆ PWM applications
- ◆ Load switch

Package

- ◆ SOT-23-3L

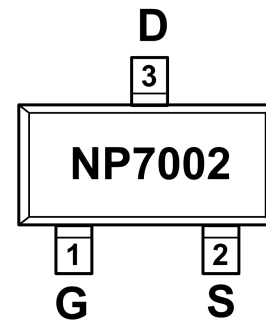


Schematic diagram



Marking and pin assignment

SOT-23-3L
(TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP2N7002VR-G	-55°C to +150°C	SOT-23-3L	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
Drain current-continuous ^a @Tj=125°C -pulse ^b	I_D	0.34	A
	I_{DM}	0.3	A
Maximum power dissipation	P_D	0.15	W
Operating junction Temperature range	T_j	-55—150	°C

Notes:

- a. surface mounted on FR4 board, $t \leq 10\text{sec}$
- b. pulse test: pulse width $\leq 300\mu\text{s}$, duty $\leq 2\%$

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
OFF Characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	60	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=48V, V_{GS}=0V$	-	-	1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 10	μA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.4	2.5	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=200mA$	-	1.15	2.5	Ω
		$V_{GS}=4.5V, I_D=200mA$	-	1.25	3.5	
Recovered charge	Q_r	$V_{GS}=0V, I_S=300mA$ $V_R=25V$ $dI_S/dt=-100A/\mu S$	-	30	-	nC
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=30V, V_{GS}=0V$ $f=1.0MHz$	-	14.8	-	pF
Output capacitance	C_{OSS}		-	3.6	-	
Reverse transfer capacitance	C_{RSS}		-	2.1	-	
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=5V$ $V_{GS}=10V$ $R_L=250\Omega$ $R_{GEN}=50\Omega$	-	-	10	ns
Rise time	t_r		-	30	-	
Turn-off delay time	$t_{D(OFF)}$		-	-	15	
Total gate charge	Q_g	$V_{DS}=30V, I_D=200mA$ $V_{GS}=10V$	-	1.3	-	nC
Gate-source charge	Q_{gs}		-	0.4	-	
Gate-drain charge	Q_{gd}		-	0.1	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V_{SD}	$V_{GS}=0V, I_S=300mA$	-	-	1.5	V

Thermal Characteristics

Parameter	Symbol	Typ	max	Unit
Thermal Resistance-Junction to Case	$R_{\theta jc}$	1.7	-	$^{\circ}C/W$
Thermal Resistance junction-to ambient	$R_{\theta Ja}$	62.5	-	

Typical Performance Characteristics

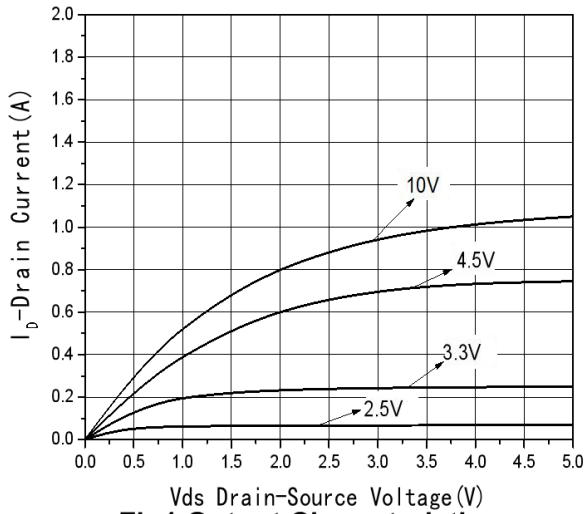


Fig1 Output Characteristics

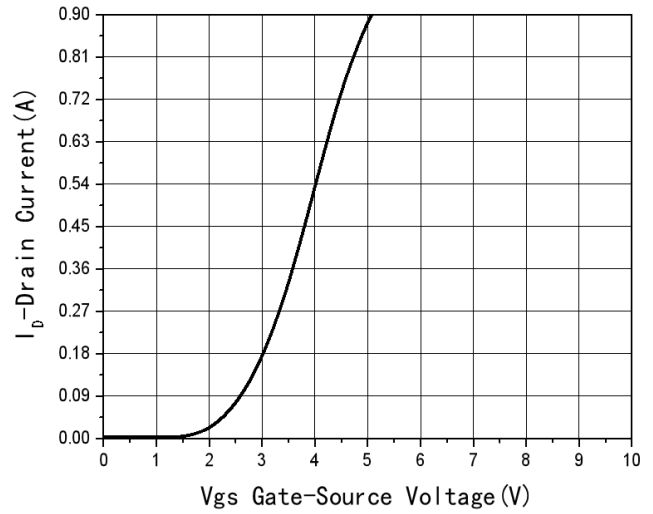


Fig2 Transfer Characteristics

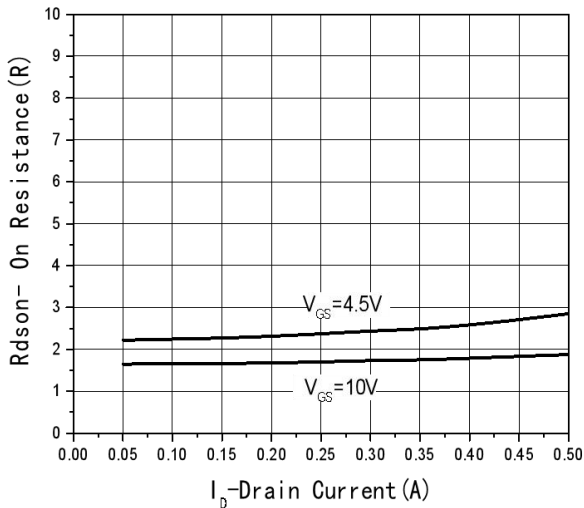


Fig3 $R_{DS(on)}$ -Drain current

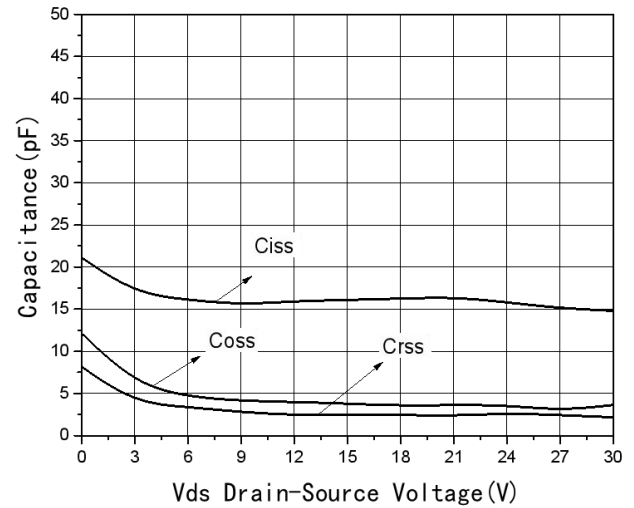


Fig4 Capacitance vs V_{DS}

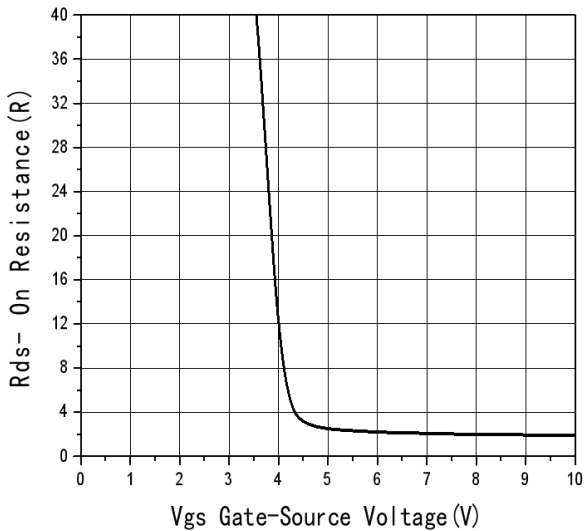


Fig5 $R_{DS(on)}$ -Gate Drain voltage

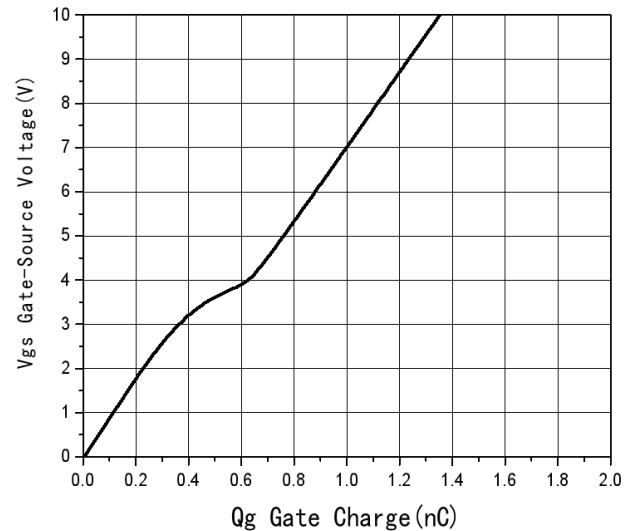


Fig6 Gate Charge

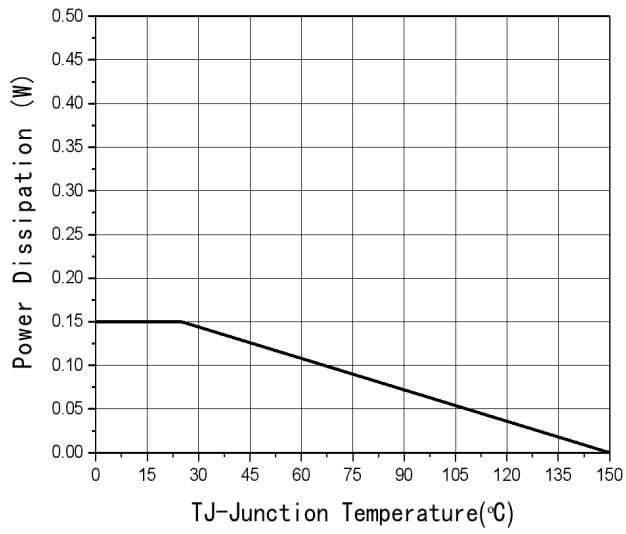


Fig7 Power De-rating

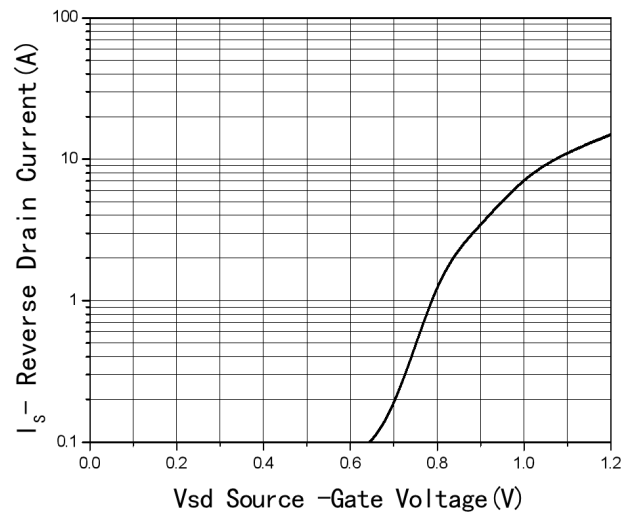
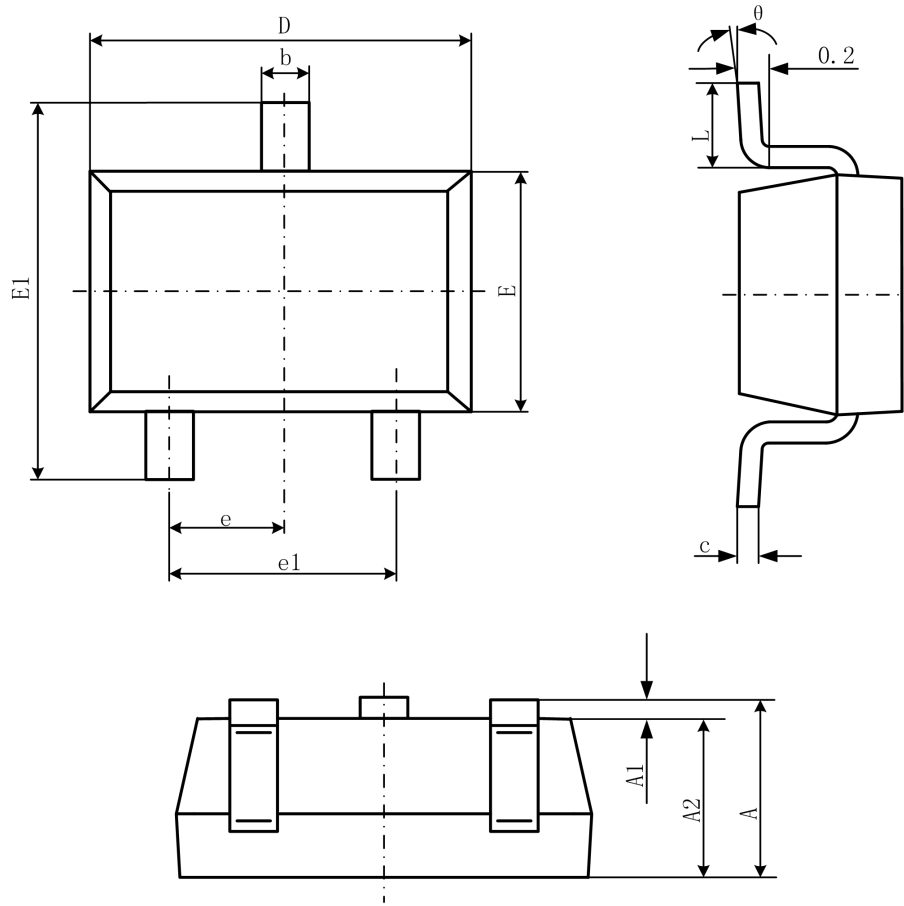


Fig8 Source-Drain Diode Forward

Package Information

- SOT-23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°