

20V N-Channel Enhancement Mode MOSFET

Description

The NP2N7002 has been designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications

General Features

- ◆ $V_{DS} = 60V$, $I_D = 300mA$
 $R_{DS(ON)}(Typ.) = 2\Omega$ @ $V_{GS} = 10V$
 $R_{DS(ON)}(Typ.) = 2.5\Omega$ @ $V_{GS} = 4.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package
- ◆ ESD Rating: 2000V HBM

Application

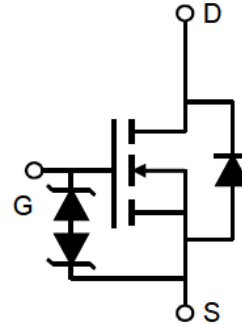
- ◆ PWM applications
- ◆ Load switch

Package

- ◆ SOT-23-3L

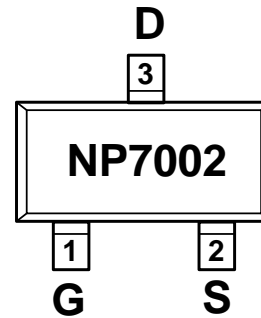


Schematic diagram



Marking and pin assignment

SOT-23-3L
(TOP VIEW)



Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP2N7002EMR-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	
Continuous Drain Current	I_D	TC=25°C	0.38	A
		TC=70°C	0.3	A
Maximum power dissipation	P_D	0.54	W	
Operating junction Temperature range	T_j	-55—150	°C	

Notes:

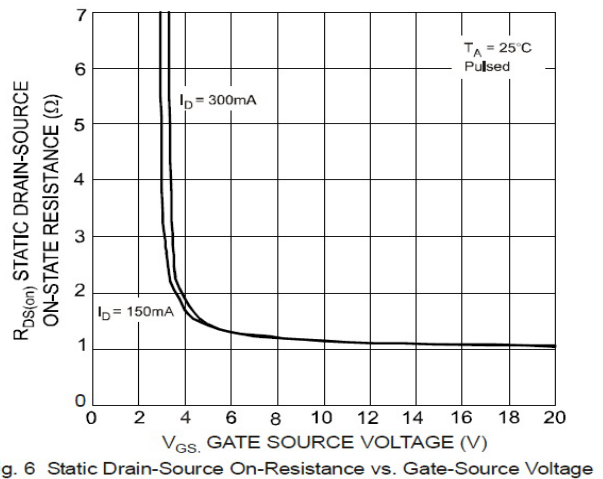
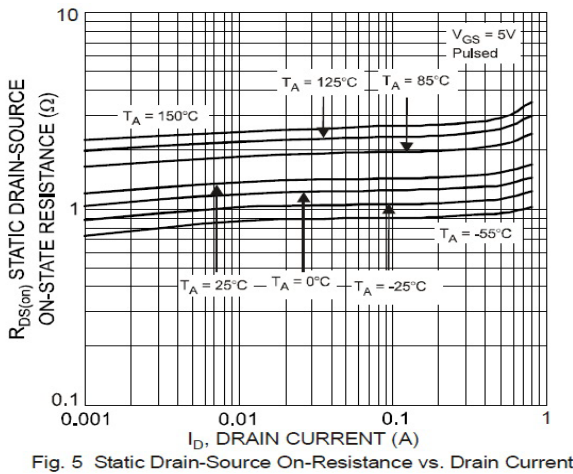
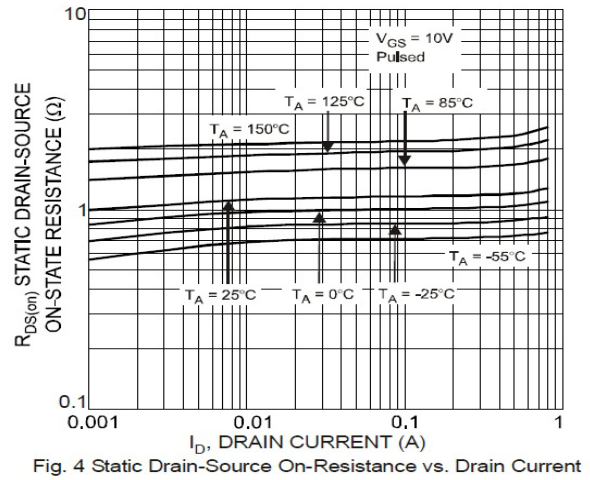
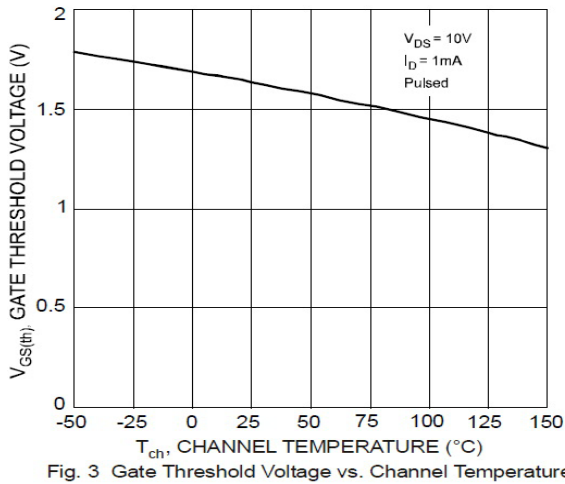
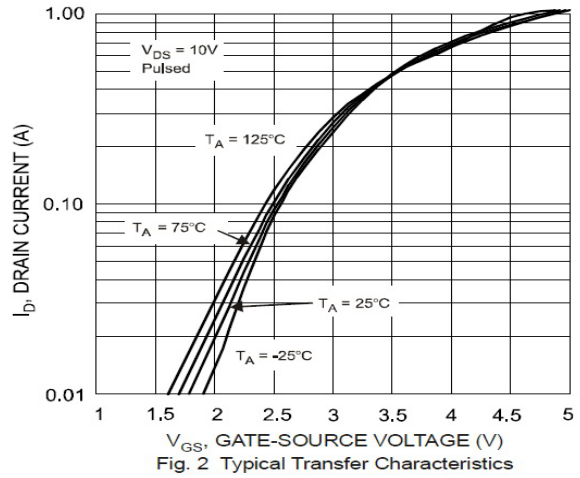
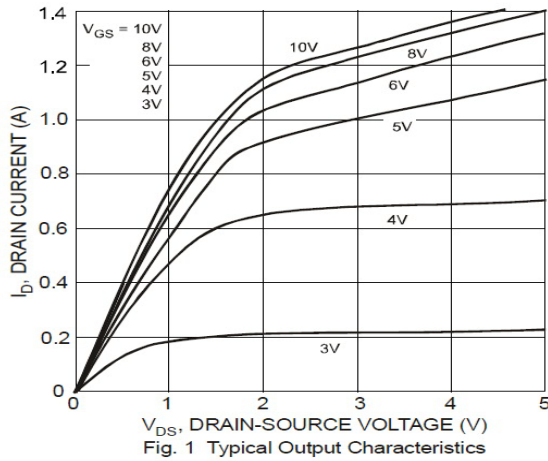
- a. surface mounted on FR4 board, $t_s \leq 10\text{sec}$
- b. pulse test: pulse width $\leq 300\mu\text{s}$, duty $\leq 2\%$

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}	$V_{DS}=0V, V_{GS}=\pm 20V$			± 1	μA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.45	2.5	V
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5V, I_D=300mA$	-	2.6	3	Ω
		$V_{GS}=10V, I_D=380mA$	-	1.7	2	
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}	$V_{DS}=10V, V_{GS}=0V$ $f=1.0MHz$	-	30	-	pF
Output capacitance	C_{OSS}		-	4.2	-	
Reverse transfer capacitance	C_{RSS}		-	2.9	-	
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DD}=5V$ $V_{GS}=10V$ $R_L=250ohm$ $R_{GEN}=50ohm$	-	3.9		ns
Rise time	t_r		-	3.4		
Turn-off delay time	$t_{D(OFF)}$		-	15.7		
Total gate charge	Q_g	$V_{DS}=10V, I_D=200mA$ $V_{GS}=10V$	-	0.3	-	nC
Gate-source charge	Q_{gs}		-	0.2	-	
Gate-drain charge	Q_{gd}		-	0.08	-	
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		



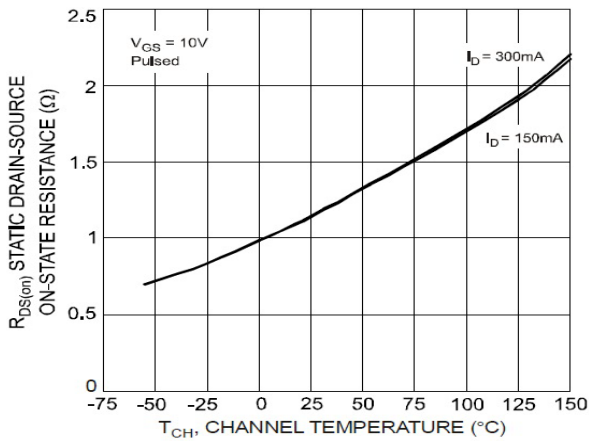


Fig. 7 Static Drain-Source On-State Resistance vs. Channel Temperature

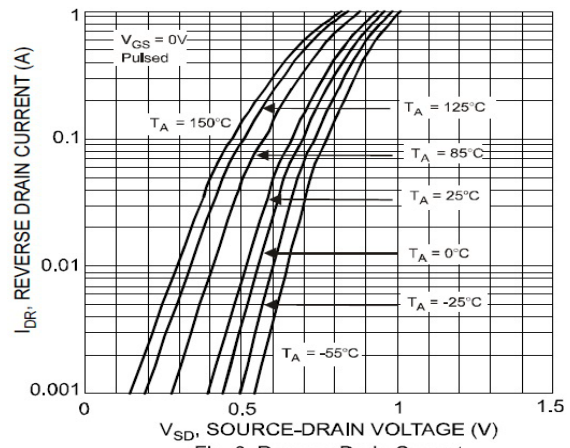


Fig. 8 Reverse Drain Current vs. Source-Drain Voltage

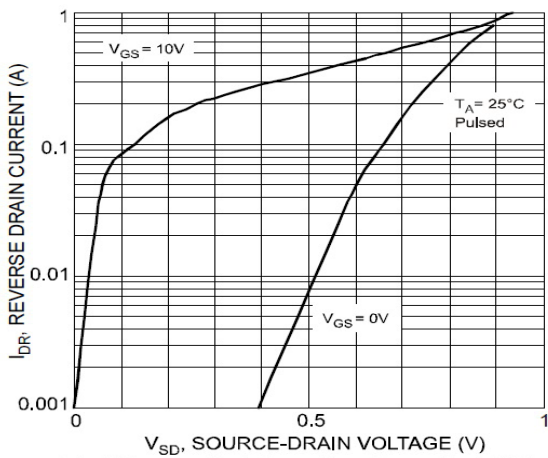


Fig. 9 Reverse Drain Current vs. Source-Drain Voltage

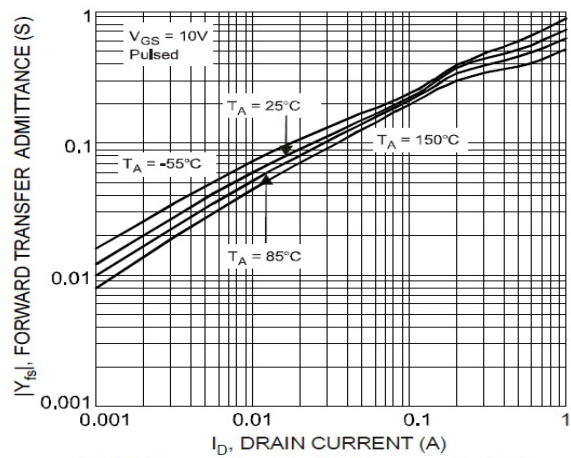


Fig. 10 Forward Transfer Admittance vs. Drain Current

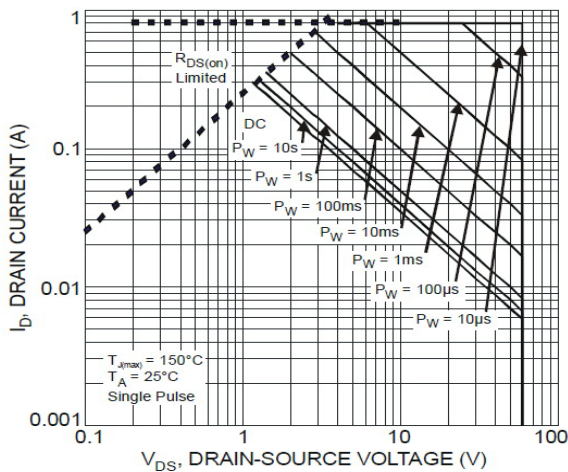


Fig. 11 Safe Operation Area

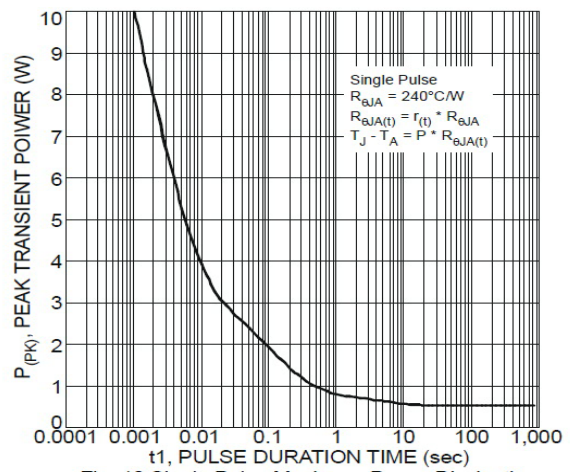
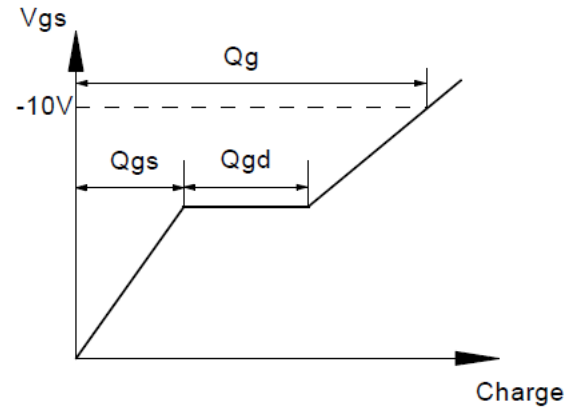
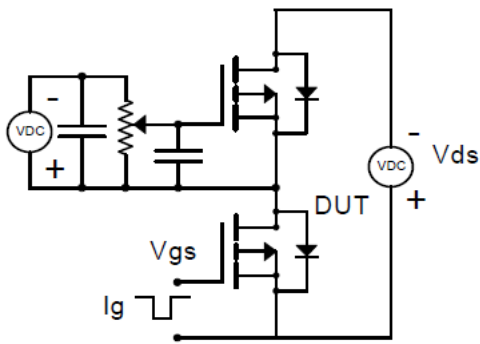
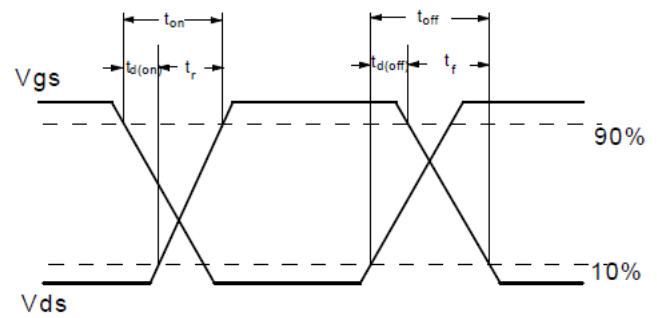
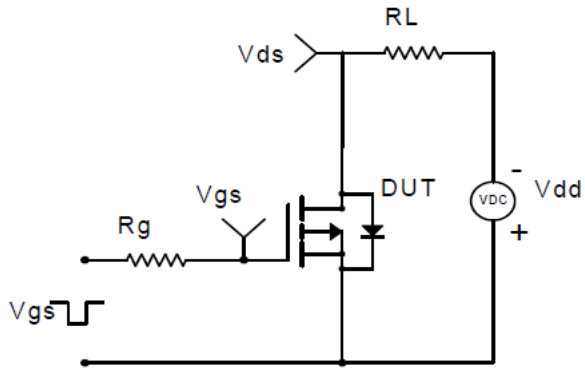


Fig. 12 Single Pulse Maximum Power Dissipation

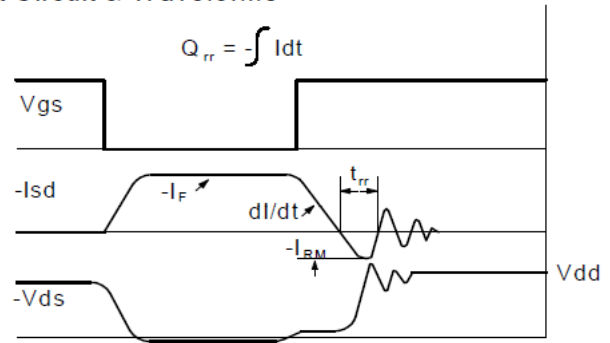
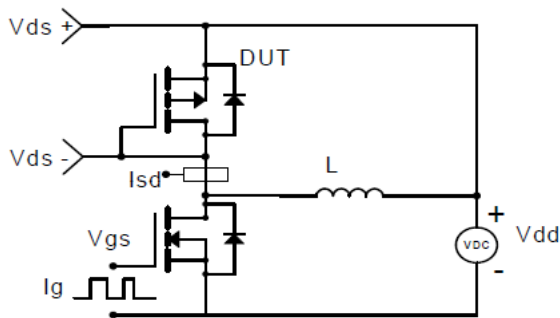
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

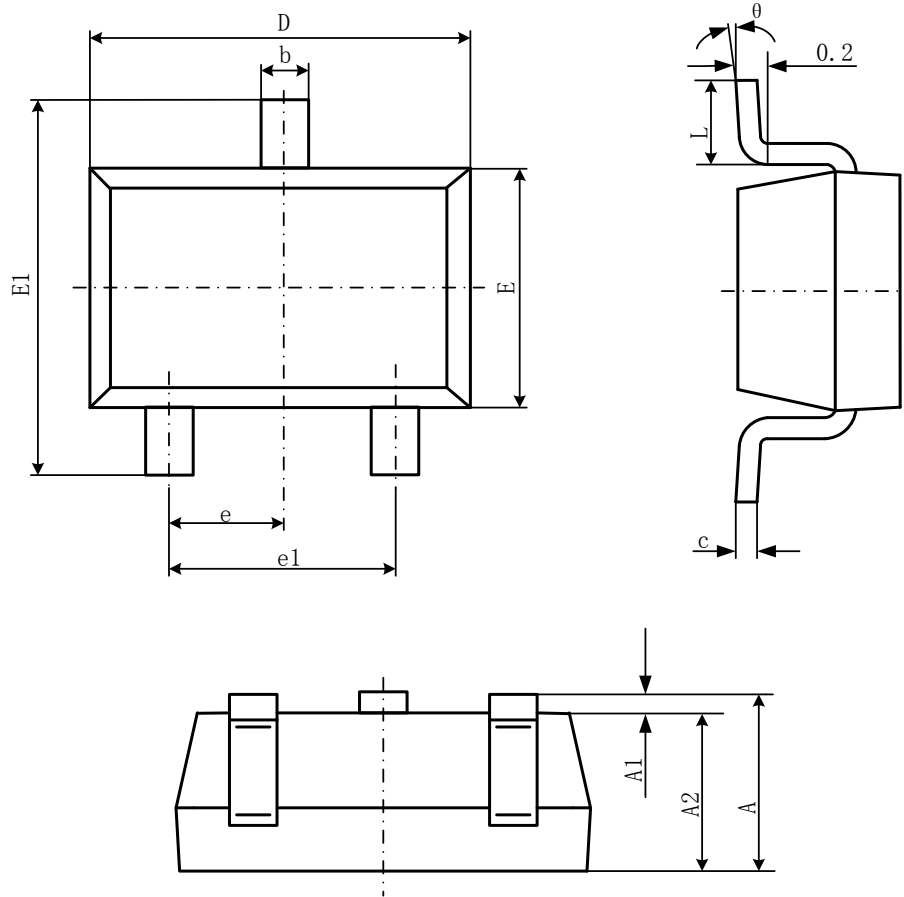


Diode Recovery Test Circuit & Waveforms



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°