

60V P-Channel Enhancement Mode MOSFET

Description

The NP4P06MR-M uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in load switch and battery protection applications.

General Features

- ◆ $V_{DS} = -60V$, $I_D = -4A$
 $R_{DS(ON)}(Typ.) = 91m\Omega$ @ $V_{GS} = -10V$
 $R_{DS(ON)}(Typ.) = 101m\Omega$ @ $V_{GS} = -4.5V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package

Application

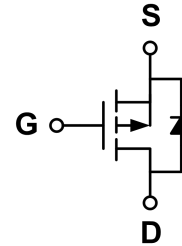
- ◆ Battery protection
- ◆ Load switch

Package

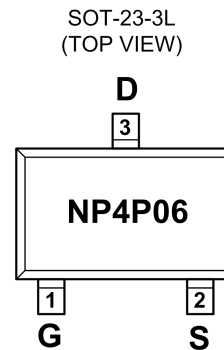
- ◆ SOT-23-3L



Schematic diagram



Marking and pin assignment



XXXX—Wafer Information
 YYYY—Quality Code

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP4P06MR-M-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	$T_A = 25^\circ C$	-4	A
		$T_A = 70^\circ C$	-3	A
Pulsed Drain Current ^C	I_{DM}	-16	A	
Maximum power dissipation ^B	P_D	$T_A = 25^\circ C$	1.4	W
		$T_A = 70^\circ C$	0.9	
Operating junction Temperature range	T_j	-55—150	°C	

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}	$V_{DS}=-60V, V_{GS}=0V$	-	-	-1	μA
Gate-body leakage	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
ON Characteristics						
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.0	-1.65	-2.5	V
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=-4A$	-	91	110	m Ω
		$V_{GS}=4.5V, I_D=-4A$	-	101	130	
Forward transconductance	g_{fs}	$V_{DS}=-5V, I_D=-4A$	-	10	-	S
Dynamic Characteristics						
Input capacitance	C_{ISS}	$V_{DS}=-20V, V_{GS}=0V$ $f=1.0MHz$	-	901	-	pF
Output capacitance	C_{OSS}		-	50	-	
Reverse transfer capacitance	C_{RSS}		-	26	-	
Switching Characteristics						
Turn-on delay time	$t_{D(ON)}$	$V_{DS}=-30V$ $R_L=7.5\Omega$ $V_{GS}=-10V$ $R_{GEN}=3\Omega$	-	8	-	ns
Rise time	t_r		-	4	-	
Turn-off delay time	$t_{D(OFF)}$		-	32	-	
Fall time	t_f		-	7	-	
Total gate charge	$Q_g(10V)$	$V_{DS}=-30V, I_D=-4A$ $V_{GS}=-10V$	-	16	-	nC
Total gate charge	$Q_g(4.5V)$		-	14	-	
Gate-source charge	Q_{gs}		-	2.7	-	
Gate-drain charge	Q_{gd}		-	2.3	-	
DRAIN-SOURCE DIODE CHARACTERISTICS						
Diode forward voltage	V_{SD}	$V_{GS}=0V, I_s=-1.0A$	-	-0.8	-1.5	V

Thermal Characteristics

Parameter		Symbol	Typ.	Max.	Unit
Maximum Junction-to-Ambient ^A	$t \leq 10s$	$R_{\theta JA}$	70	90	$^{\circ}C/W$
Maximum Junction-to-Ambient ^A	Steady-State		100	125	
Maximum Junction-to-Lead	Steady-State	$R_{\theta JL}$	62	80	

A. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^{\circ}C$. The value in any given application depends on the user's specific board design.

B. The power dissipation PD is based on $T_{J(MAX)}=150^{\circ}C$, using $\leq 10s$ junction-to-ambient thermal resistance.

C. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^{\circ}C$. Ratings are based on low frequency and duty

Typical Performance Characteristics

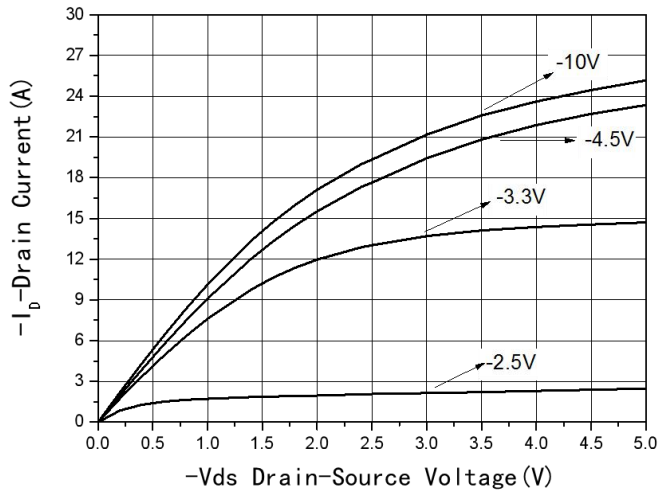


Fig1 Output Characteristics

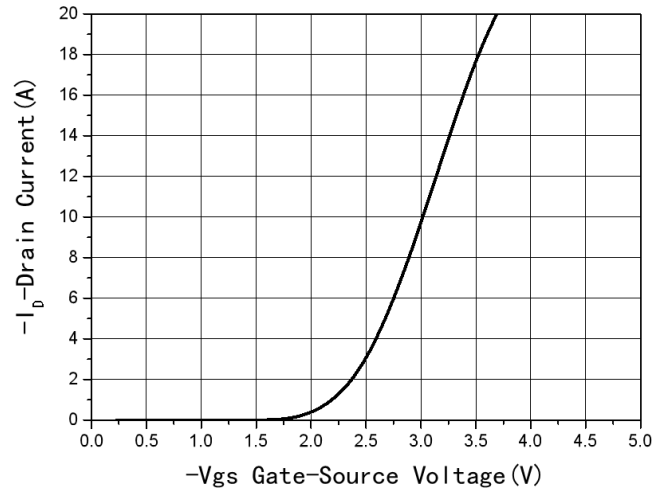


Fig2 Transfer Characteristics

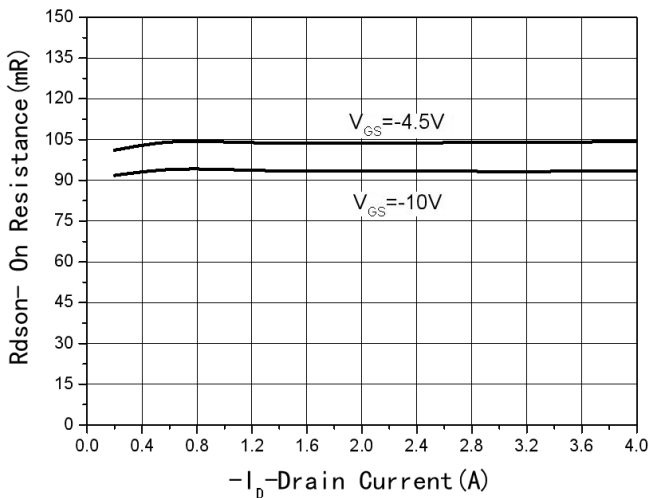


Fig3 R_{Dson} -Drain current

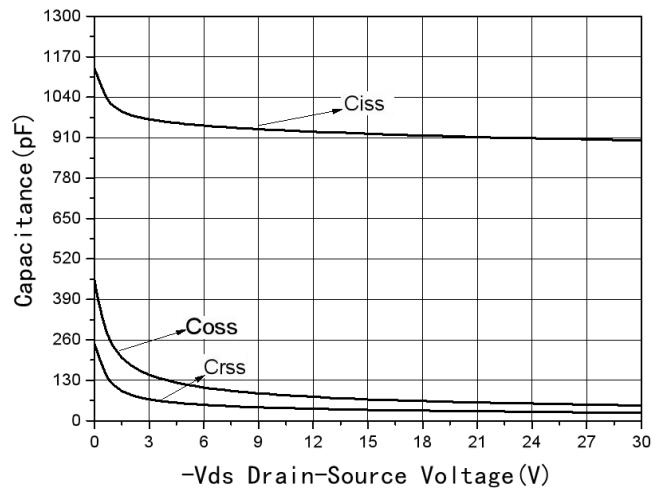


Fig4 Capacitance vs V_{DS}

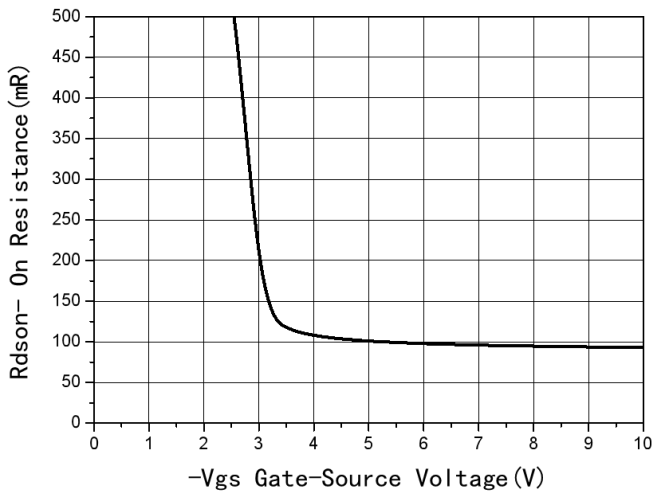
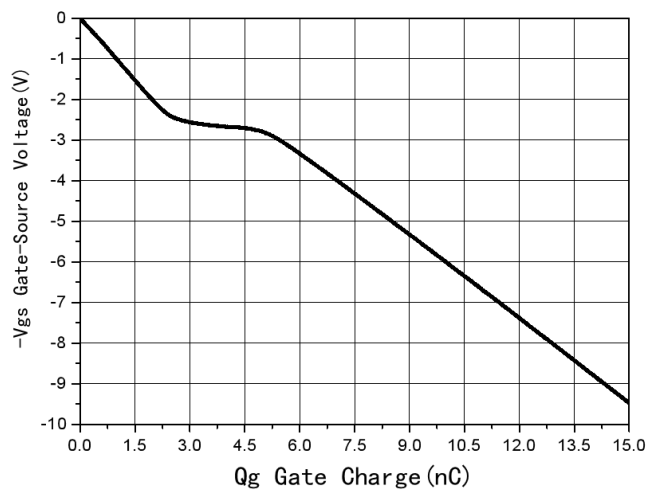
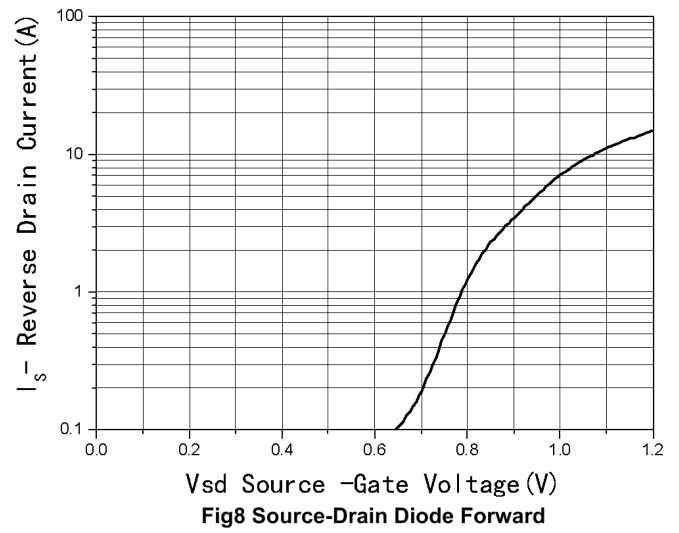
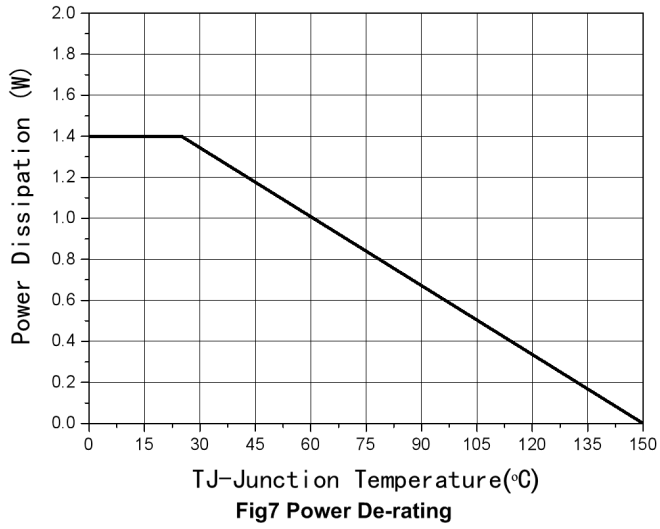


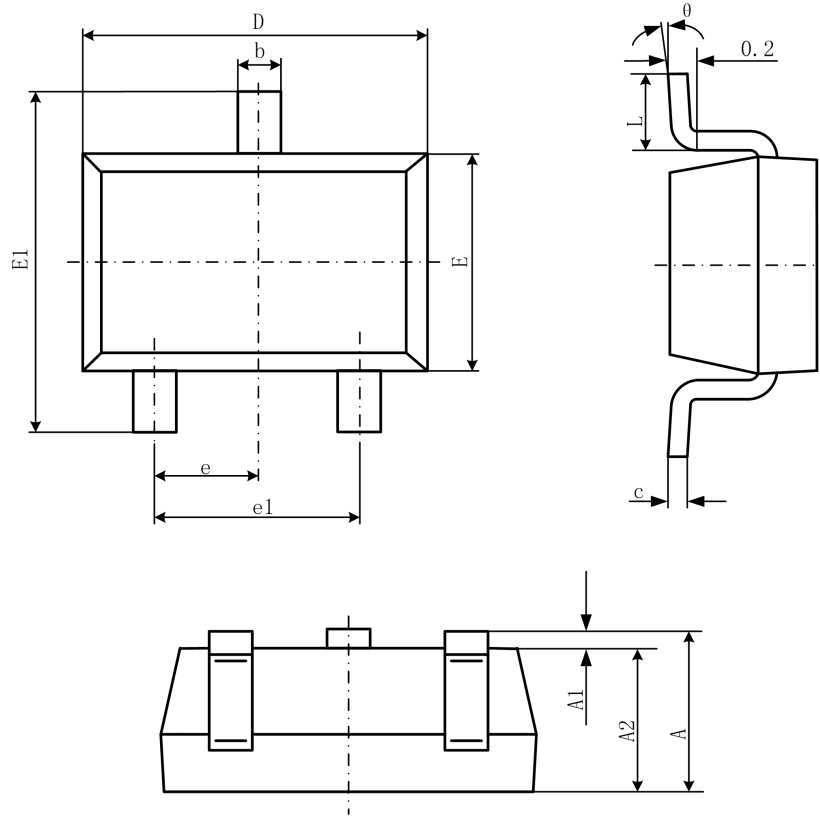
Fig5 R_{Dson} -Gate Drain voltage





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°