

## 650V N-Channel Enhancement Mode MOSFET

### Description

The NP4N65G uses advanced trench technology to provide excellent  $R_{DS(ON)}$ . This device is suitable for use as a load switch or in PWM applications.

### General Features

- ◆  $V_{DS} = 650V$ ,  $I_D = 4A$   
 $R_{DS(ON)}(Typ.) = 2.49\Omega$  @  $V_{GS} = 10V$
- ◆ High power and current handling capability
- ◆ Lead free product is acquired
- ◆ Surface mount package
- ◆ 150 °C operating temperature
- ◆ 100% UIS tested

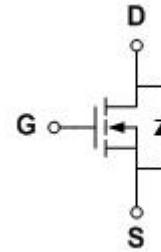
### Application

- ◆ PWM applications
- ◆ Load switch
- ◆ Uninterruptible power supply

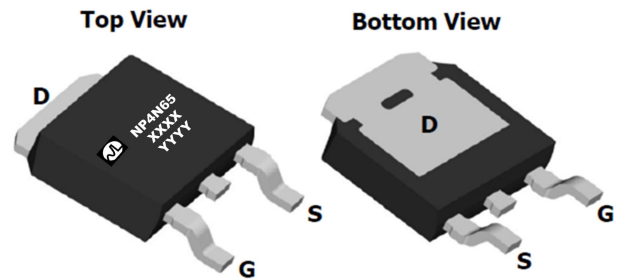
### Package

- ◆ TO-252-2L

### Schematic diagram



### Marking and pin assignment



XXXXX—Wafer Information  
 YYYYY—Quality Code

### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP4N65G-G	-55°C to +150°C	TO-252-2L	2500

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

parameter	symbol	limit	unit	
Drain-source voltage	$V_{DS}$	650	V	
Gate-source voltage	$V_{GS}$	±30	V	
Continuous Drain Current	$I_D$	TC=25°C	4	A
		TC=70°C	3	
Pulsed Drain Current	$I_{DP}$	16	A	
Avalanche energy ( $T_j = 25^\circ C$ , $V_{DD} = 100V$ , $V_G = 10V$ , $L = 0.5mH$ , $R_g = 50\Omega$ )	$E_{AS}$	40	mJ	
Power Dissipation	$P_D$	41	W	
Operating junction Temperature range	$T_j$	-55—150	°C	

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	650	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=650V, V_{GS}=0V$	-	-	1	$\mu A$
		$T_J=85^\circ C$	-	-	10	
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 30V$	-	-	$\pm 100$	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	2.9	4.0	V
Drain-source on-state resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=2A$	-	2.49	3.5	$\Omega$
On Status Drain Current	$I_{D(ON)}$	$V_{DS}=20V, V_{GS}=10V$	4	-	-	A
<b>Diode Characteristics</b>						
Diode Forward Voltage	$V_{SD}$	$I_{SD}=4A, V_{GS}=0V$	-	0.86	1.2	V
Diode Continuous Forward Current	$I_S$		-	-	4	A
Reverse Recovery Time	$t_{rr}$	$I_F=2A,$	-	200	-	ns
Reverse Recovery Charge	$Q_{rr}$	$dI/dt=100A/\mu s$	-	6	-	nC
<b>Dynamic Characteristics</b>						
Gate Resistance	$R_G$	$V_{GS}=0V, V_{DS}=0V, f=1MHz$	-	2.3	-	$\Omega$
Input capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=100V$ $f=1.0MHz$	-	532	-	pF
Output capacitance	$C_{OSS}$		-	21	-	
Reverse transfer capacitance	$C_{RSS}$		-	1.72	-	
Turn-on delay time	$t_{D(ON)}$	$V_{GS}=10V, V_{DS}=380V,$ $R_L=3\Omega, I_D=2A, R_G=2.5\Omega$	-	8	-	ns
Turn-on Rise time	$t_r$		-	4	-	
Turn-off delay time	$t_{D(OFF)}$		-	53	-	
Turn-off Fall time	$t_f$		-	9	-	
Total gate charge	$Q_g$	$V_{GS}=480V, I_D=2A$ $V_{DS}=10V$	-	9.5	-	nC
Gate-source charge	$Q_{gs}$		-	3.2	-	
Gate-drain charge	$Q_{gd}$		-	1.5	-	

**Thermal Characteristics**

Parameter		Symbol	Typ	Max	Unit
Maximum Junction-to-Ambient <sup>A</sup>	Steady-State	$R_{\theta JA}$	62	75	$^\circ C/W$
Maximum Junction-to-Lead <sup>B</sup>	Steady-State	$R_{\theta JC}$	-	5.3	

A: The value of  $R_{\theta JA}$  is measured with the device mounted on 1in 2 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. The current rating is based on the  $t \leq 10s$  thermal resistance rating.

B: The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to lead  $R_{\theta JL}$  and lead to ambient.

## Typical Performance Characteristics

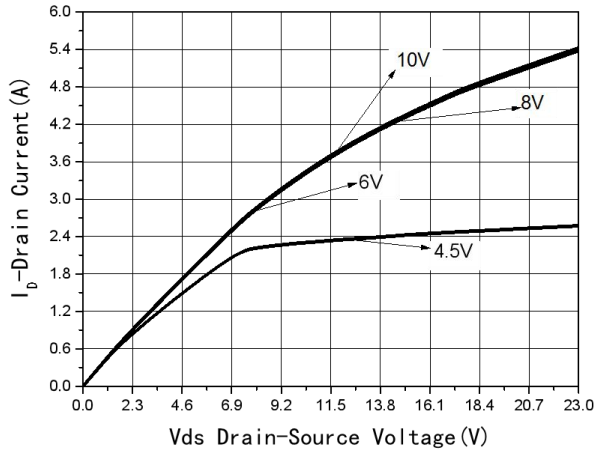


Fig1 Output Characteristics

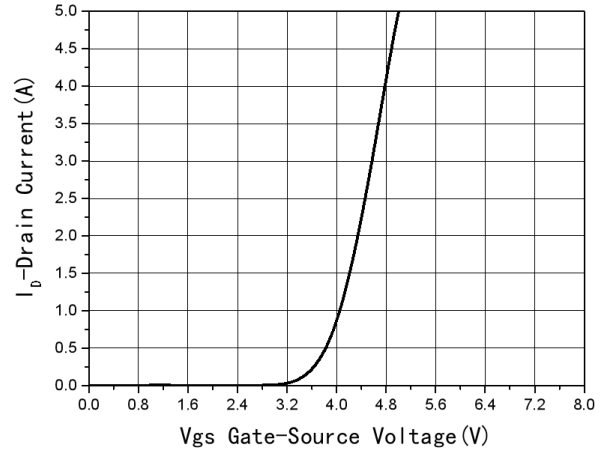


Fig2 Transfer Characteristics

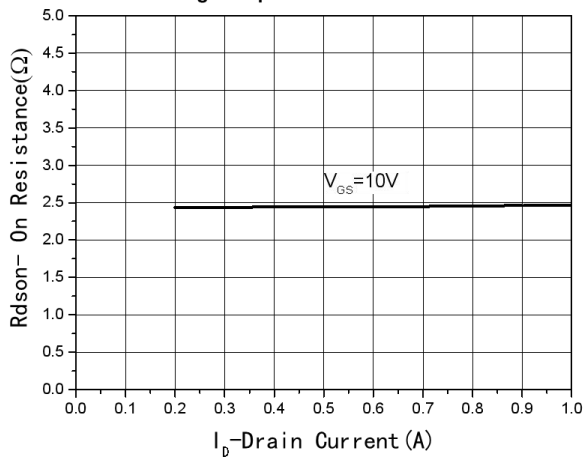


Fig3  $R_{DS(on)}$ -Drain current

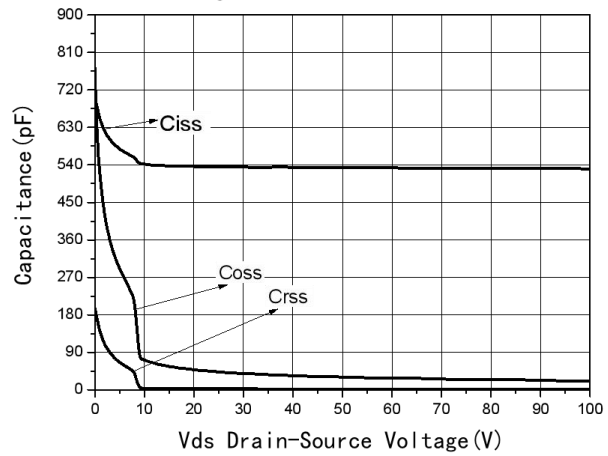


Fig4 Capacitance vs  $V_{DS}$

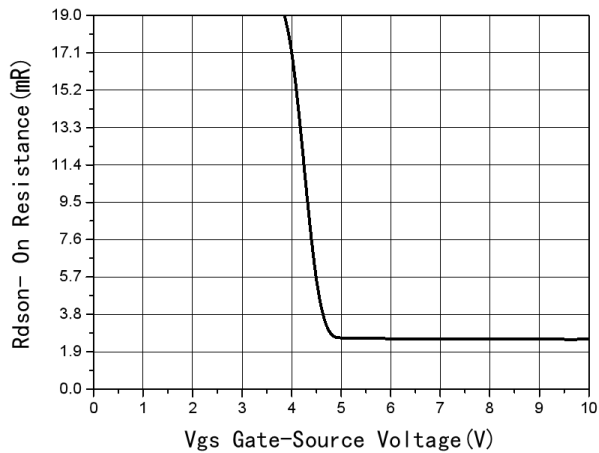


Fig5  $R_{DS(on)}$ -Gate Drain voltage

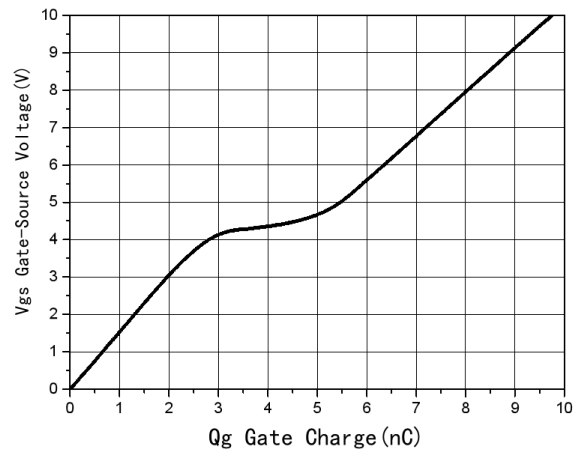


Fig6 Gate Charge

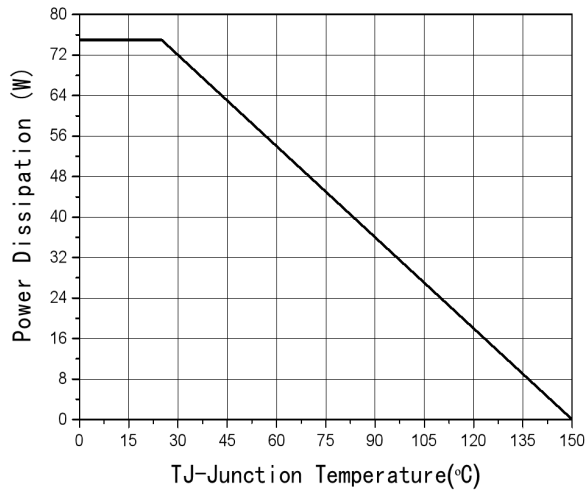


Fig7 Power De-rating

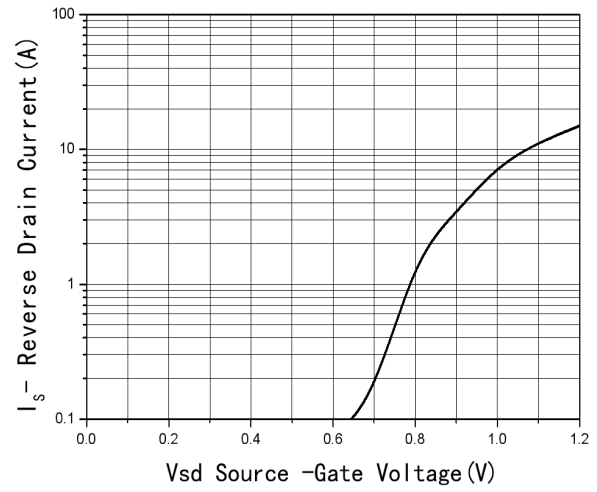
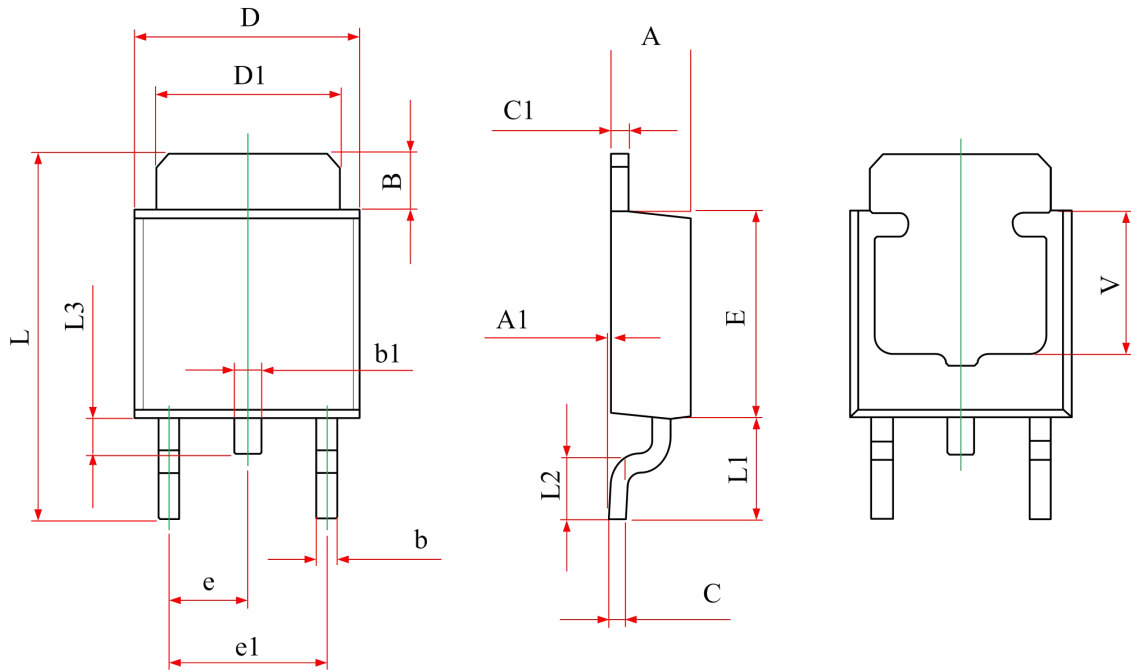


Fig8 Source-Drain Diode Forward

## Package Information

- TO-252-2L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300TYP		0.091TYP	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.600	0.900	0.024	0.035
V	3.800REF		0.150REF	