

20V N-Channel Enhancement Mode MOSFET

Description

The NP2060D6 uses advanced trench technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(on)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

General Features

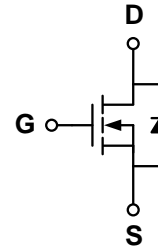
- ◆ $V_{DS} = 20V$, $I_D = 60A$
 $R_{DS(on)}(Typ.) = 4.5m\Omega$ @ $V_{GS} = 4.5V$
 $R_{DS(on)}(Typ.) = 6.2m\Omega$ @ $V_{GS} = 2.5V$
- ◆ Excellent gate charge x $R_{DS(on)}$ product(FOM)
- ◆ Very low on-resistance $R_{DS(on)}$
- ◆ 150 °C operating temperature
- ◆ 100% UIS tested



Application

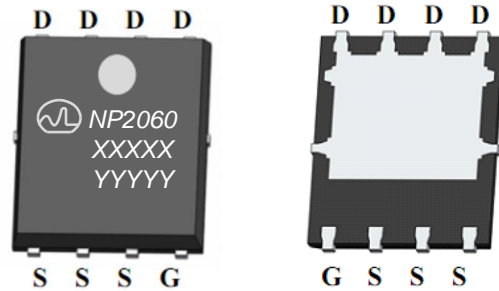
- ◆ Synchronous Rectification in DC/DC and AC/DC Converters
- ◆ Industrial and Motor Drive applications

Schematic diagram



Marking and pin assignment

PDFN5*6-8L-A



Top View

Bottom View

XXXXX—Wafer Information

YYYYY—Quality Code

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP2060D6-G	-55°C to +150°C	PDFN5*6-8L-A	5000

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

parameter	symbol	limit	unit
Drain-source voltage	V_{DS}	20	V
Gate-source voltage	V_{GS}	±12	V
Continuous Drain Current	I_D	TC=25°C	60
		TC=70°C	50
Pulsed Drain Current	I_{DP}	240	A
Avalanche energy($T_j=25^\circ C$, $V_{DD}=30V$, $V_G=10V$, $L=0.5mH$, $R_g=25\Omega$)		E_{AS}	200
Power Dissipation	P_D	TC=25°C	37.5
		TC=70°C	15
Operating junction Temperature range		T_j	-55—150
			°C

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 =250μA	20	-	-	V
Zero gate voltage drain current	I _{DSS}	V _{DS} =20V, V _{GS} =0V T _J =85°C	-	-	1	μA
			-	-	5	
Gate Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±12V	-	-	±100	nA
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	0.5	0.75	1.0	V
Drain-source on-state resistance	R _{DS(ON)}	V _{GS} =4.5V, I _D =60A V _{GS} =2.5V, I _D =40A	-	4.5	6.0	mΩ
			-	6.2	9	
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	15	-	-	S
Diode Characteristics						
Diode Forward Voltage	V _{SD}	I _{SD} =1A, V _{GS} =0V	-	0.75	1.2	V
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 20A	-	25	-	ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	24	-	nC
Dynamic Characteristics						
Gate Resistance	R _G	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	3.6	5.4	Ω
Input capacitance	C _{ISS}	V _{GS} =0V, V _{DS} =10V f=1.0MHz	-	2608	-	pF
Output capacitance	C _{OSS}		-	368	-	
Reverse transfer capacitance	C _{RSS}		-	332	-	
Turn-on delay time	t _{D(ON)}	V _{GS} =4.5V, V _{DS} =10V, R _L =1Ω, R _G =5Ω	-	6.4	-	ns
Turn-on Rise time	t _r		-	17.2	-	
Turn-off delay time	t _{D(OFF)}		-	29.6	-	
Turn-off Fall time	t _f		-	16.8	-	
Total gate charge	Q _g	V _{GS} =4.5V, V _{DS} =10V, I _D =20A	-	31	-	nC
Gate-source charge	Q _{gs}		-	4	-	
Gate-drain charge	Q _{gd}		-	10	-	

Thermal Characteristics

Parameter	Symbol	Typ	Max	Unit
Maximum Junction-to-Ambient ^A	R _{θJA}	12	20	°C/W
Maximum Junction-to-Ambient ^A		Steady-State	33	
Maximum Junction-to-Lead ^B	R _{θJC}	2.4	2.9	

A: The value of R_{θJA} is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

Typical Performance Characteristics

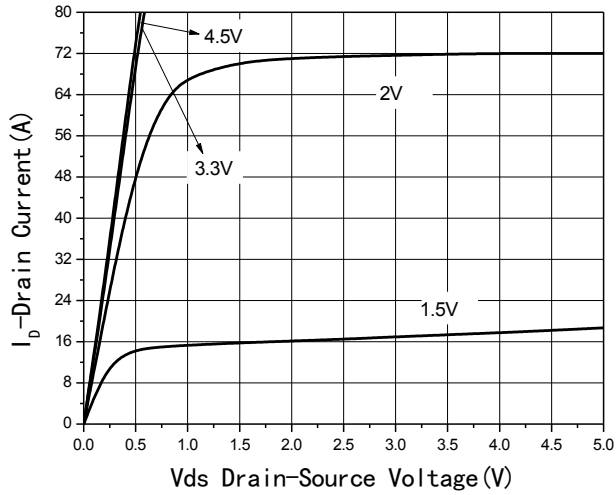


Fig1 Output Characteristics

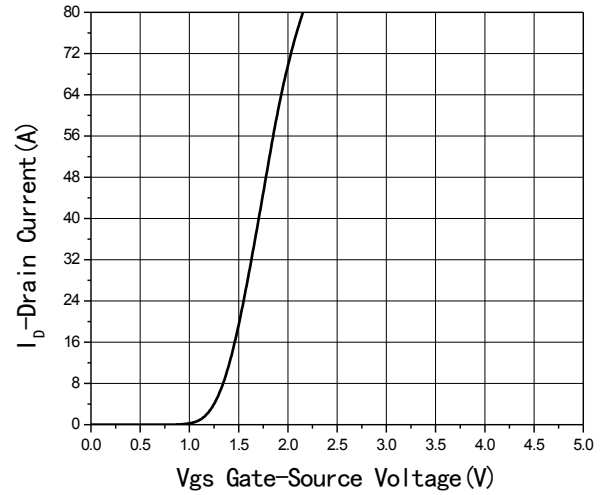


Fig2 Transfer Characteristics

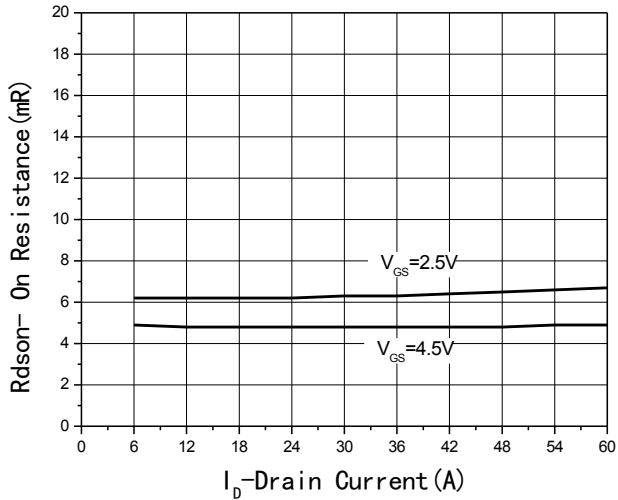


Fig3 $R_{DS(on)}$ -Drain current

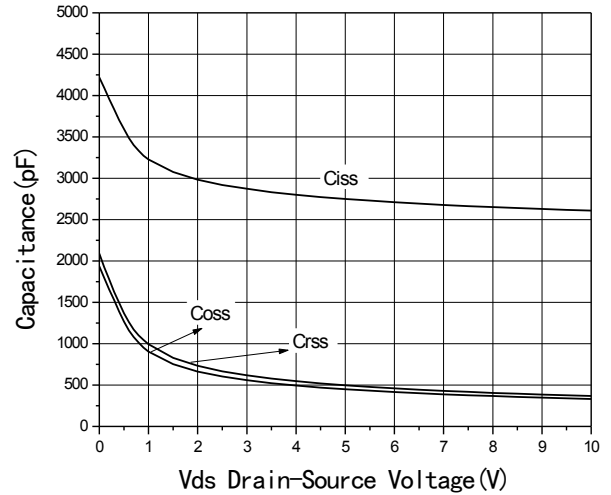


Fig4 Capacitance vs V_{DS}

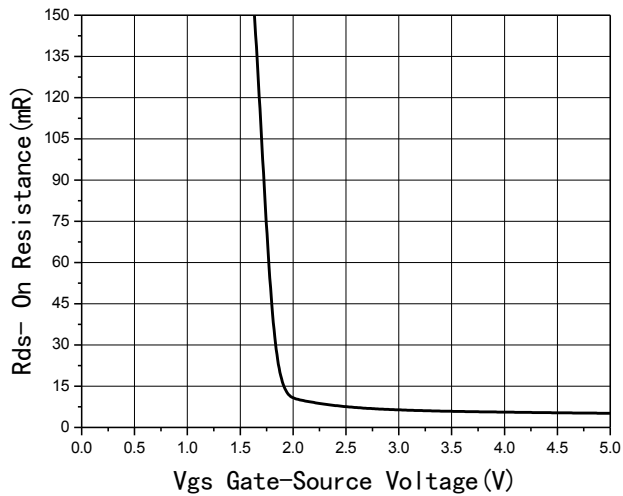


Fig5 $R_{DS(on)}$ -Gate Drain voltage

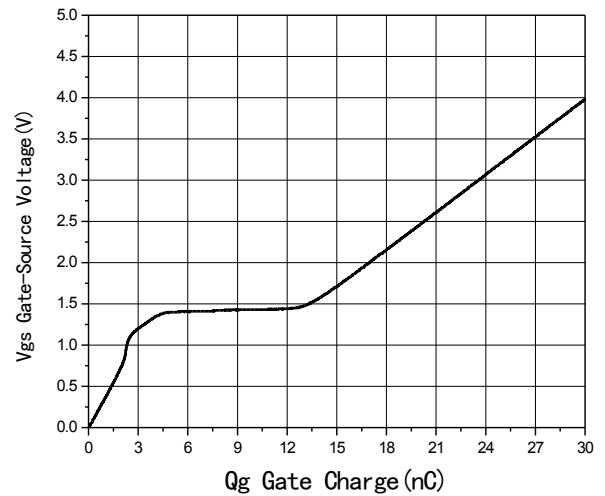


Fig6 Gate Charge

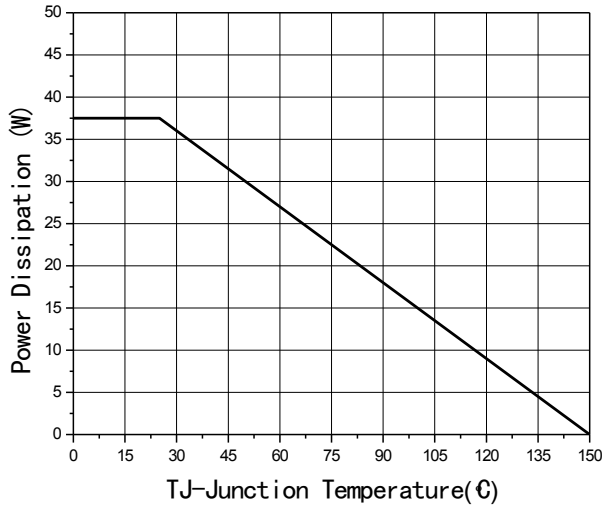


Fig7 Power De-rating

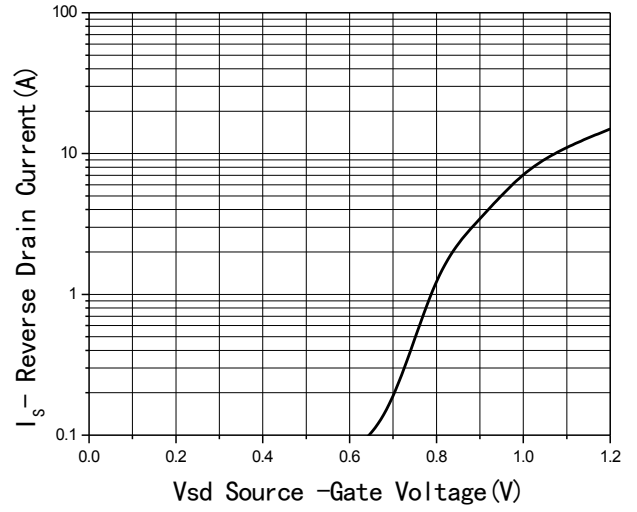
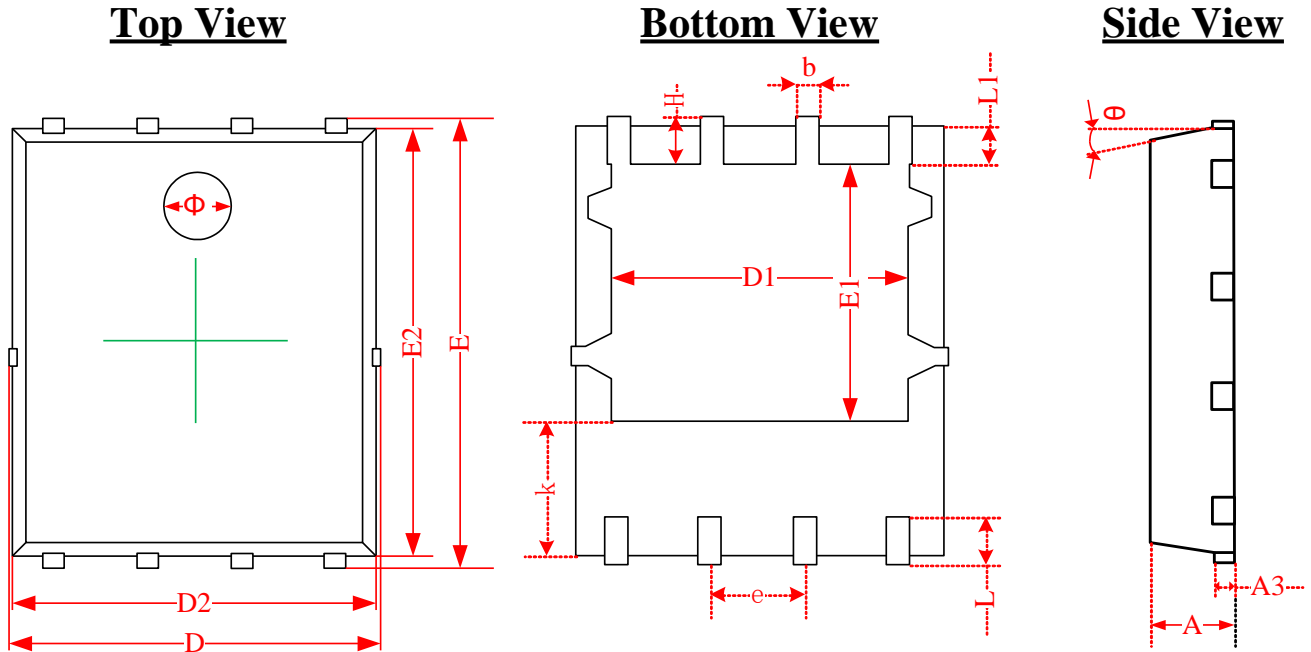


Fig8 Source-Drain Diode Forward

Package Information

- PDFN5*6-8L-A



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.870	0.900	0.930	0.034	0.035	0.036
A3	0.152REF.			0.006REF.		
D	4.944	5.020	5.096	0.195	0.198	0.201
E	5.974	6.050	6.126	0.235	0.238	0.241
D1	3.910	4.010	4.110	0.154	0.158	0.162
E1	3.375	3.475	3.575	0.133	0.137	0.141
D2	4.870	4.900	4.930	0.192	0.193	0.194
E2	5.720	5.750	5.780	0.226	0.227	0.228
k	1.190	1.290	1.390	0.047	0.051	0.055
b	0.350	0.380	0.410	0.014	0.015	0.016
e	1.270TYP.			0.050TYP.		
L	0.559	0.635	0.711	0.022	0.025	0.028
L1	0.424	0.500	0.576	0.017	0.020	0.023
H	0.574	0.650	0.726	0.023	0.026	0.029
θ	10°	11°	12°	10°	11°	12°
Φ	1.150	1.200	1.250	0.045	0.047	0.049