40V N-Channel Enhancement Mode MOSFET

Description

The NP60S04D6-Sn uses SGT 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} =40V，I_D =60A
  $R_{DS(ON)}$(Typ.)= 5.9mΩ @V_{GS}=10V
  $R_{DS(ON)}$(Typ.)= 8.9mΩ @V_{GS}=4.5V
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- 100% UIS tested

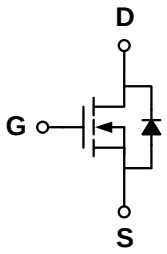
Application

- Synchronus Rectification in DC/DC Converters
- Industrial and Motor Drive applications

Package

- PDFN5*6-8L-A

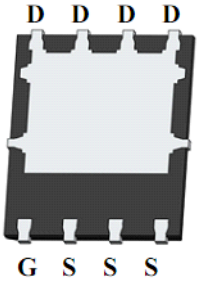
Schematic diagram



Marking and pin assignment

PDFN5*6-8L-A

Top View



Bottom View

XXXX—Wafer Information

YYYY—Quality Code

Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP60S04D6-Sn-G	-55°C to +150°C	PDFN5*6-8L-A	5000

Absolute Maximum Ratings (TA=25℃ unless otherwise noted)

parameter		symbol	limit	unit
Drain-source voltage		V_{DS}	40	V
Gate-source voltage		V_{GS}	±20	V
Continuous Drain Current	TC=25°C	I_D	60	A
	TC=100°C		38	
Pulsed Drain Current		I_{DM}	240	A
Avalanche energy(T_j=25℃ ,V_{DD}=30V,V_G=10V,L=0.5mH,Rg=25Ω)		E_{AS}	60	mJ
Power Dissipation	TC=25°C	P_D	35	W
	TC=100°C		14	
Operating junction Temperature range		Tj	-55—150	℃

Electrical Characteristics (TA=25℃ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0V, I_D=250μA	40	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS}=40V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	5	
Gate Leakage Current	I_{GSS}	V_{DS}=0V, V_{GS}=±20V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250μA	1	1.6	2.5	V
Drain-source on-state resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=20A	-	5.9	8.5	mΩ
		V_{GS}=4.5V, I_D=20A	-	8.9	15	
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=20A	-	70	-	S
Diode Characteristics						
Diode Forward Voltage	V_{SD}	I_{SD}=1A,V_{GS}=0V	-	0.7	1.2	V
Diode Continuous Forward Current	I_S		-	-	60	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = I_S di/dt = 100A/μs	-	11	-	ns
Reverse Recovery Charge	Q_{rr}		-	21	-	nC
Dynamic Characteristics						
Gate Resistance	R_G	V_{GS}=0V, V_{DS}=0V,f=1MHz	-	1.35	-	Ω
Input capacitance	C_{ISS}	V_{GS}=0V ,V_{DS}=20V f=1.0MHz	-	740	-	pF
Output capacitance	C_{OSS}		-	230	-	
Reverse transfer capacitance	C_{RSS}		-	36	-	
Turn-on delay time	$t_{D(ON)}$	V_{GS}=10V, V_{DS}=20V, R_L=1.5Ω, R_G=3Ω	-	7.5	-	ns
Turn-on Rise time	tr		-	2	-	
Turn-off delay time	$t_{D(OFF)}$		-	23	-	
Turn-off Fall time	t_f		-	3	-	
Total gate charge	Q_g	V_{GS}=10V, V_{DS}=20V， I_D=20A	-	17	-	nC
Gate-source charge	Q_{gs}		-	2.6	-	
Gate-drain charge	Q_{gd}		-	3.8	-	

Thermal Characteristics

Parameter		Symbol	Typ	Max	Unit
Maximum Junction-to-Lead	Steady-State	$R_{\theta JC}$	3	3.5	℃/W

The value of R qJA is measured with the device mounted on 1in 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.

The R qJA is the sum of the thermal impedence from junction to lead R qJL and lead to ambient.

Typical Performance Characteristics

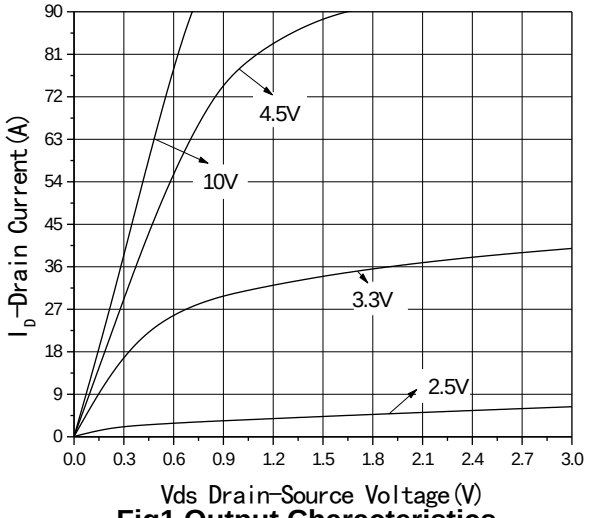


Fig1 Output Characteristics

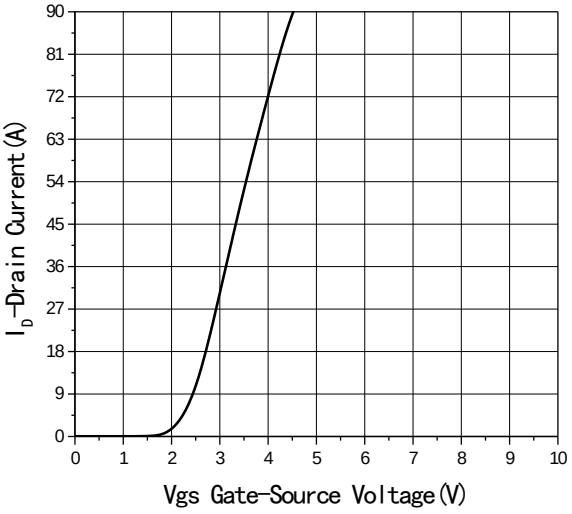


Fig2 Transfer Characteristics

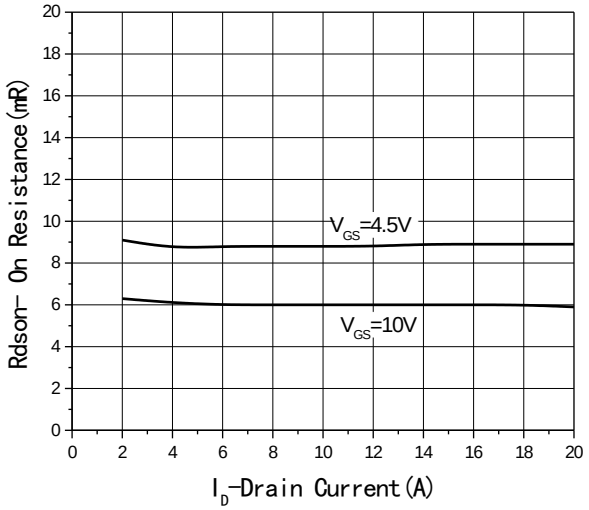


Fig3 Rdson-Drain current

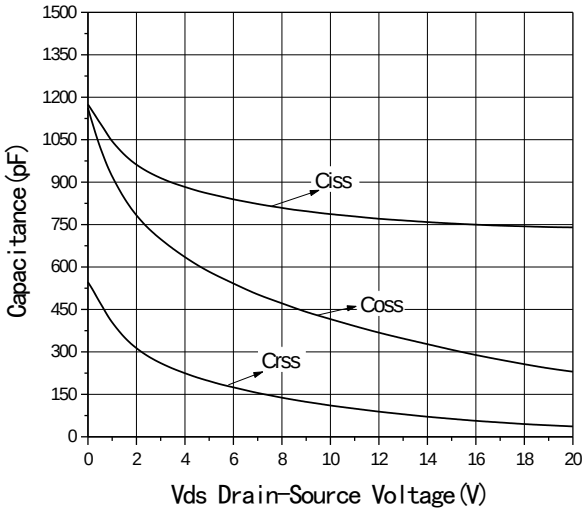


Fig4 Capacitance vs Vds

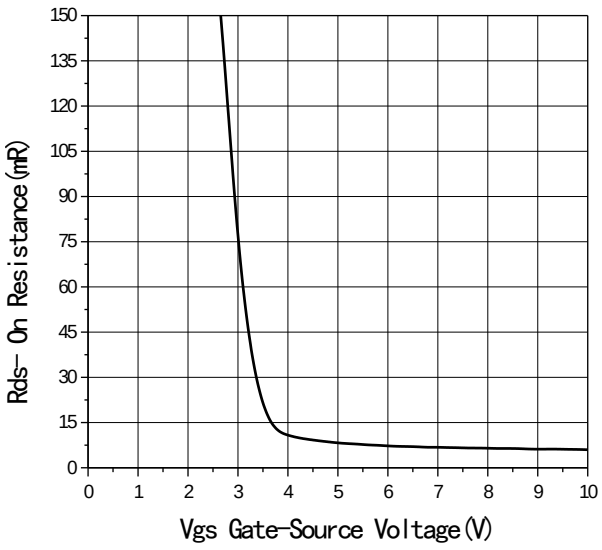


Fig5 Rdson-Gate Drain voltage

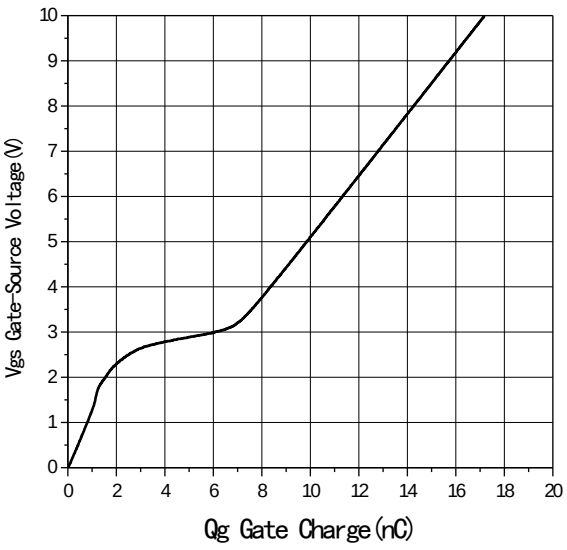


Fig6 Gate Charge

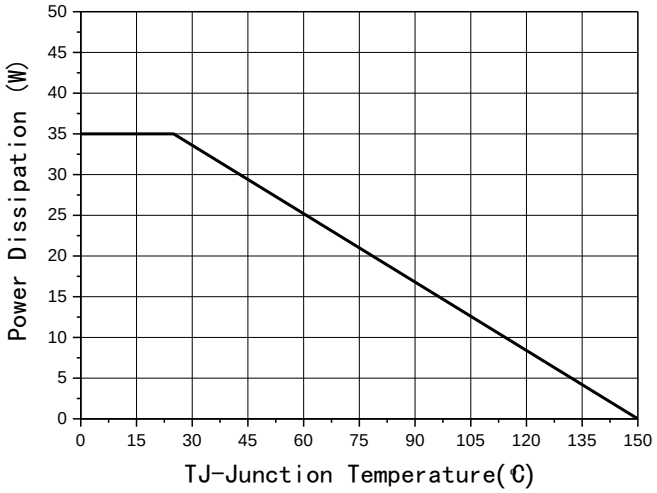


Fig7 Power De-rating

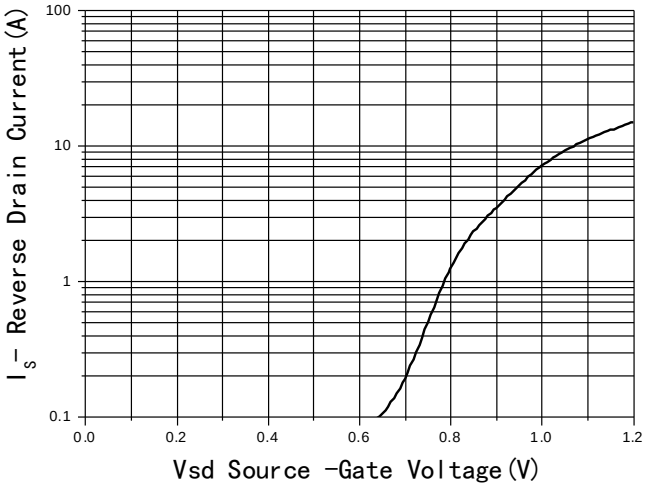


Fig8 Source-Drain Diode Forward

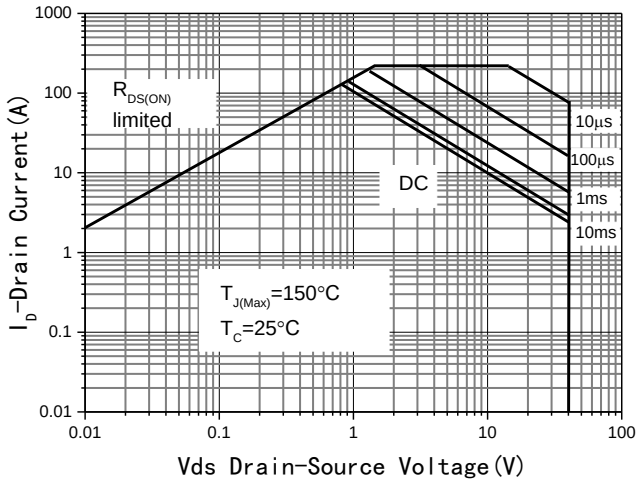
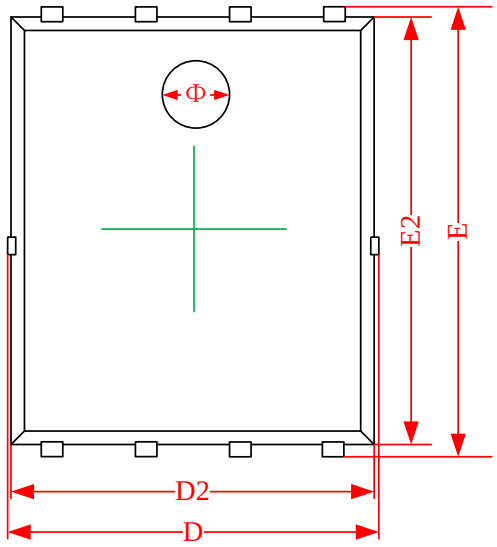


Fig9 Safe Operating Area

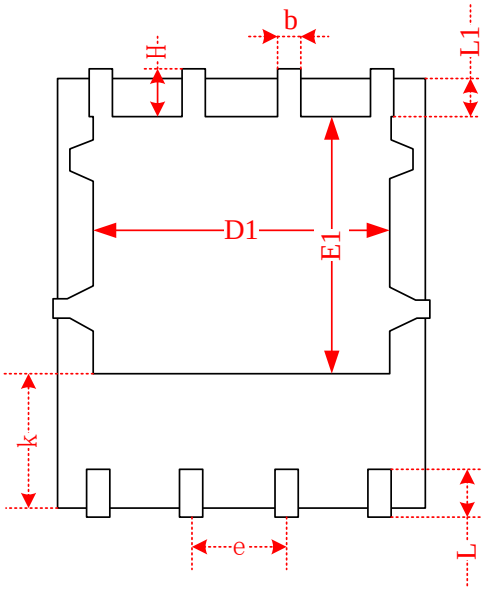
Package Information

- **PDFN5*6-8L-A**

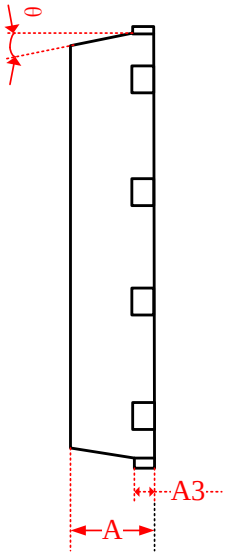
Top View



Bottom View



Side View



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		0.203REF.			0.008REF.	
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