



60V/13A N -Channel Enhancement Mode Power MOSFET

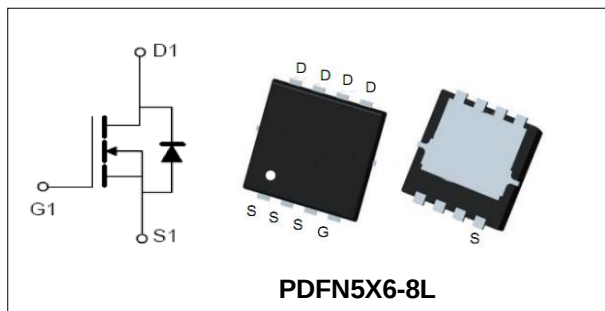
Features

- Improved dv/dt Capability, High Ruggedness
- Maximum Junction Temperature Range (150°C)

Applications

- DC Fan
- Brushless motor
- Optimized for Power Management Applications for Portable Products, such as H-bridge, Inverters Car Charger and Others

BVDSS	60	V
ID	13	A
RDSON@VGS=10V	25	mΩ
RDSON@VGS=4.5V	32	mΩ



Order Information

Product	Package	Marking	Reel Size	Reel	Carton
PTN6013	PDFN5X6-8L	PTN6013	13inch	5000PCS	50000PCS

Absolute Maximum Ratings

Symbol	Parameter			Unit
Common Ratings (TC=25°C Unless Otherwise Noted)				
V _{(BR)DSS}	Drain-Source Breakdown Voltage		60	V
V _{GS}	Gate-Source Voltage		±20	V
T _J	Maximum Junction Temperature		150	°C
T _{STG}	Storage Temperature Range		-50 to 150	°C
I _S	Diode Continuous Forward Current	TC =25°C	13	A
Mounted on Large Heat Sink				
E _{AS}	Single Pulse Avalanche Energy (Note1)		17	mJ
I _{DM}	Pulse Drain Current Tested (Silicon Limit) (Note2)	TC =25°C	52	A
I _D	Continuous Drain current	TC =25°C	13	A
P _D	Maximum Power Dissipation	TC =25°C	21	W
R _{θJC}	Thermal Resistance Junction-to-Case (Note3)		5.95	°C/W



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N-Channel Electrical Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ T _J = 25°C (unless otherwise stated)						
V _{(BR)DSS}	Drain- Source Breakdown Voltage	VGS=0V ID=250μA	60	--	--	V
I _{DSS}	Zero Gate Voltage Drain current	VDS=60V,VGS=0V	--	--	1	μA
I _{GSS}	Gate-Body Leakage Current	VGS=±20V,VDS=0V	--	--	±100	nA
V _{GS(TH)}	Gate Threshold Voltage	VDS=VGS,ID=250μA	1	1.6	2.5	V
R _{DS(ON)}	Drain-Source On-State Resistance (Note4)	VGS=10V, ID=12A	--	25	37	mΩ
		VGS=4.5V, ID=8A	--	32	48	mΩ
Dynamic Electrical Characteristics @ T _J = 25°C (unless otherwise stated) (Note5)						
C _{iss}	Input Capacitance	VDS= 30V, VGS=0V, F=1MHz	--	867	--	pF
C _{oss}	Output Capacitance		--	50	--	pF
C _{rss}	Reverse Transfer Capacitance		--	43.9	--	pF
Q _g	Total Gate Charge	VDS= 30V, ID= 7.5A, VGS= 10V	--	28	--	nC
Q _{gs}	Gate-Source Charge		--	3	--	nC
Q _{gd}	Gate-Drain Charge		--	6	--	nC
Switching Characteristics (Note5)						
t _{d(on)}	Turn-on Delay Time	VDD=30V, RG=3Ω, VGS=10V, RG=3Ω	--	5	--	nS
t _r	Turn-on Rise Time		--	18	--	nS
t _{d(off)}	Turn-off Delay Time		--	15	--	nS
t _f	Turn-off Fall Time		--	26	--	nS
Source- Drain Diode Characteristics@ T _J = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	IS=7.5A,VGS=0V	--	--	1.2	V

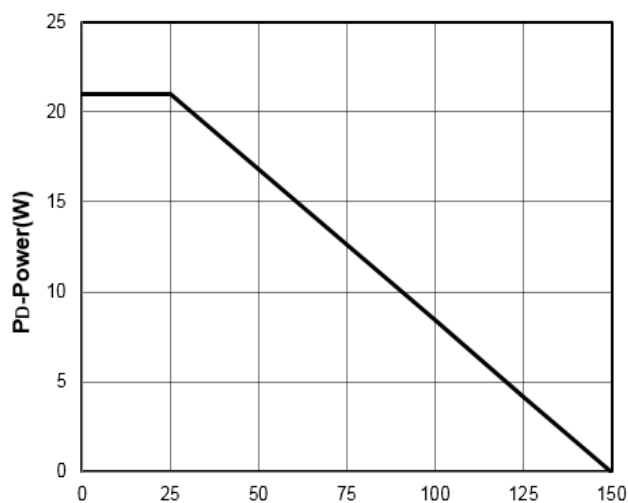
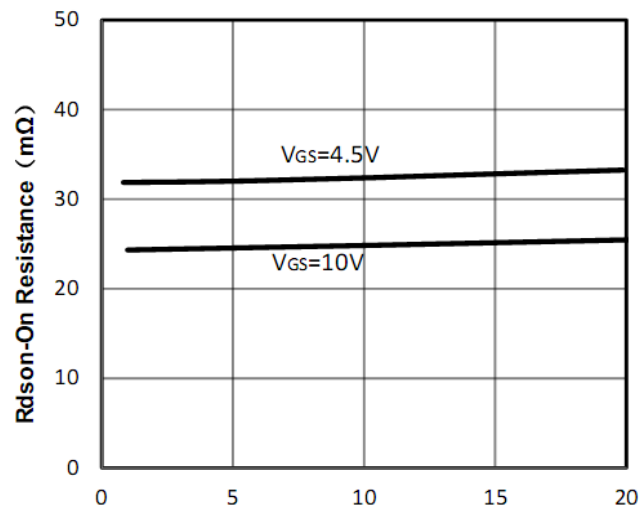
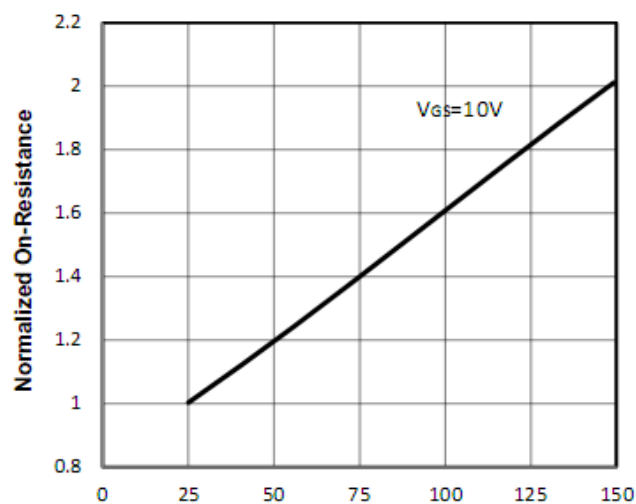
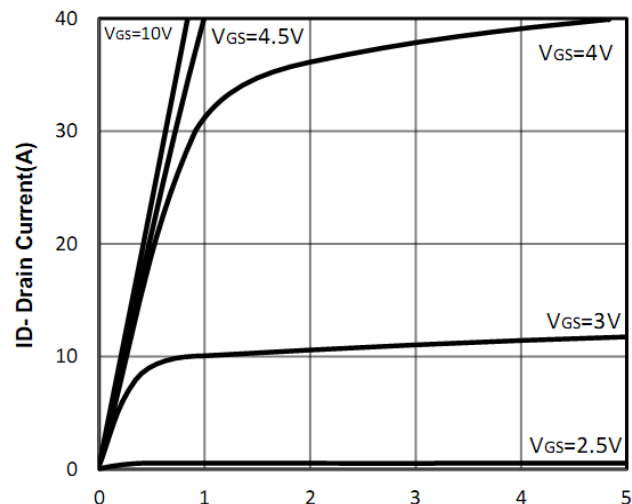
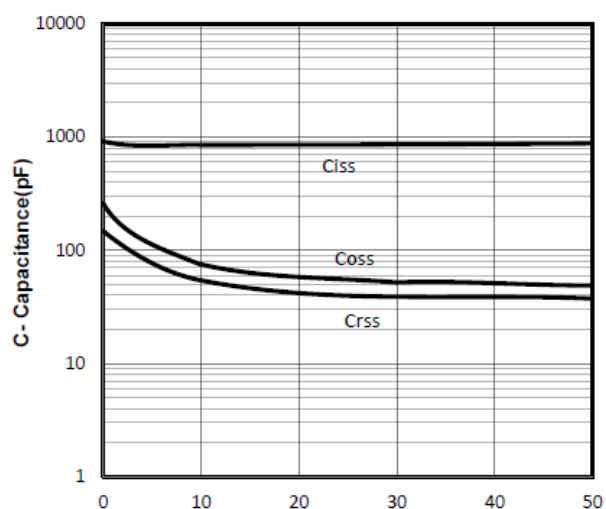
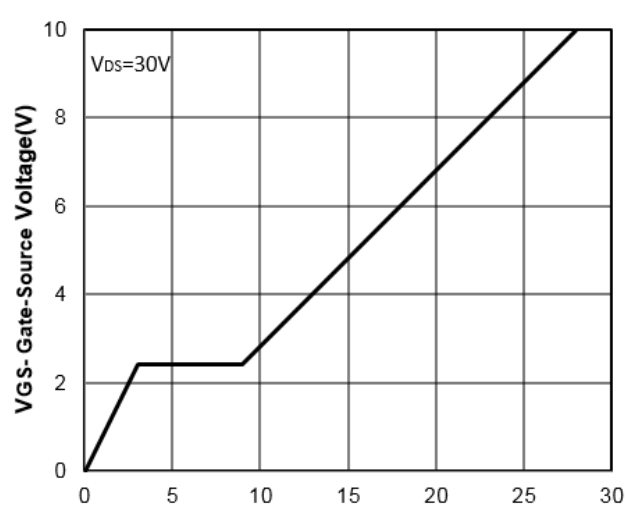
Note:

- Limited by TJmax, starting TJ = 25° C, RG = 4.5Ω, VD =20V, VGS =10V. Part not recommended for use above this value.
- Repetitive Rating: Pulse width limited by maximum junction temperature.
- Surface Mounted on FR4 Board, t ≤ 10 sec.
- Pulse Test: pulse width ≤ 300 us, duty cycle ≤ 2%.
- Guaranteed by design, not subject to production testing.



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Typical Characteristics

Figure1: T_J - Junction Temperature ($^{\circ}C$)Figure2: I_D - Drain Current (A)Figure3: T_J - Junction Temperature ($^{\circ}C$)Figure4: V_{DS} - Drain-Source Voltage (V)Figure5: V_{DS} - Drain-Source Voltage (V)Figure6: Q_g - Gate Charge (nC)



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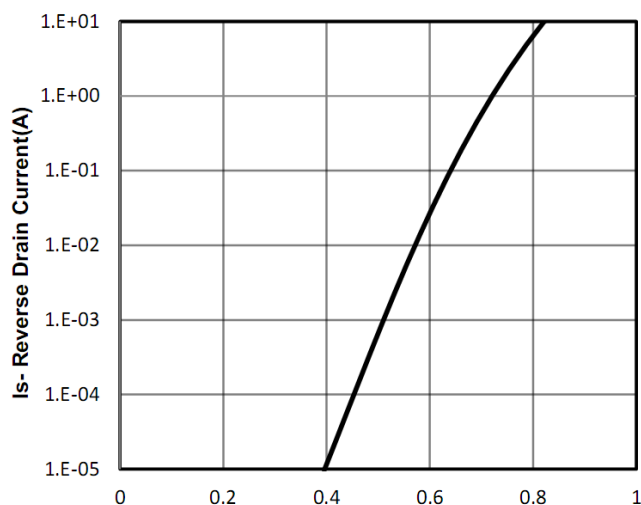


Figure7: Vsd- Source-Drain Voltage (V)

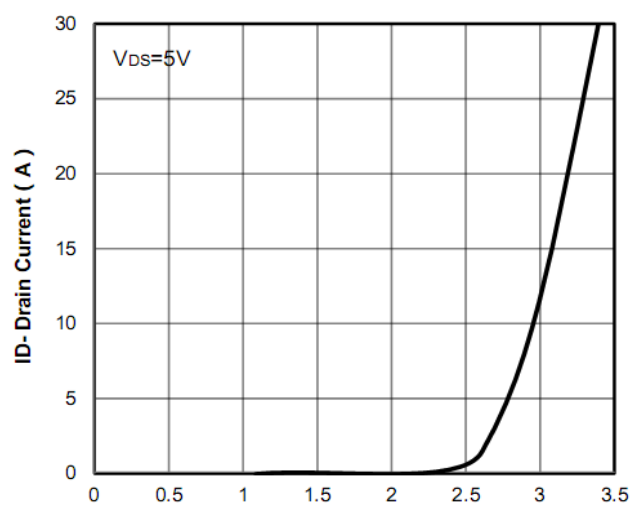


Figure8: Vgs- Gate-Source Voltage (V)

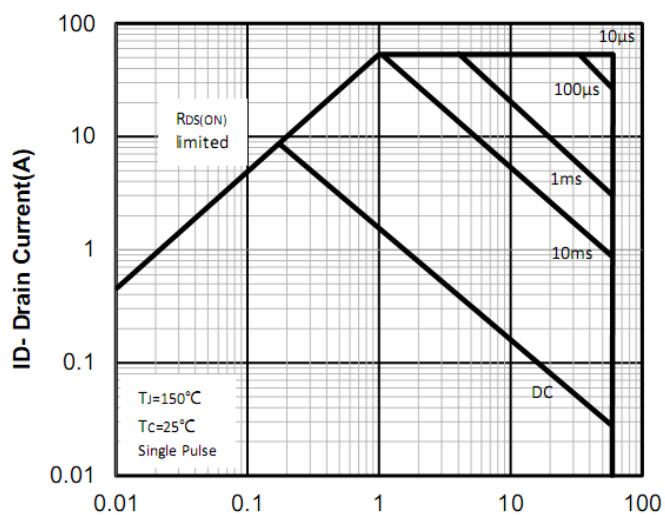


Figure9: VDS- Drain -Source Voltage (V)

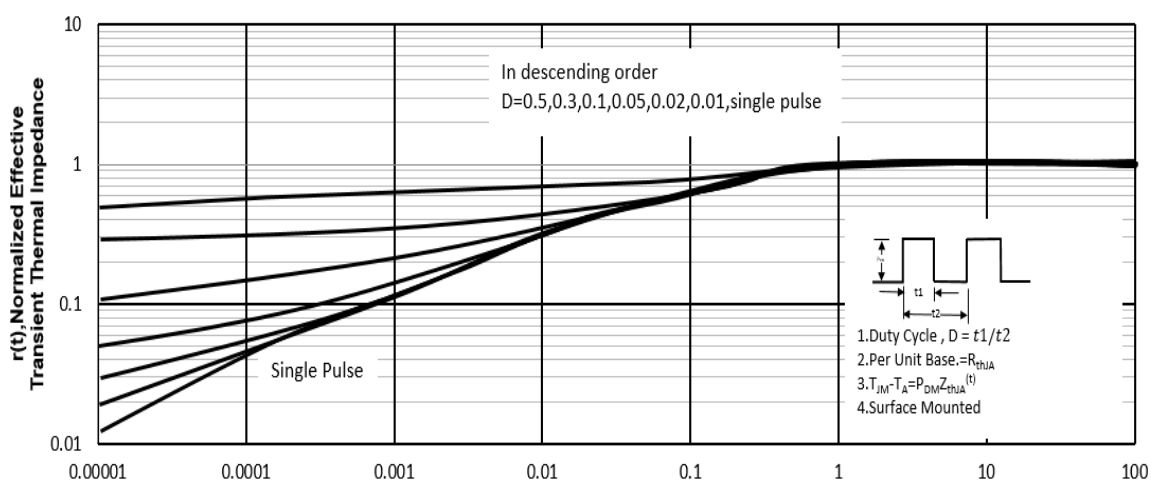


Figure10: Square Wave Pulse Duration (sec)



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Test Circuit and Waveform

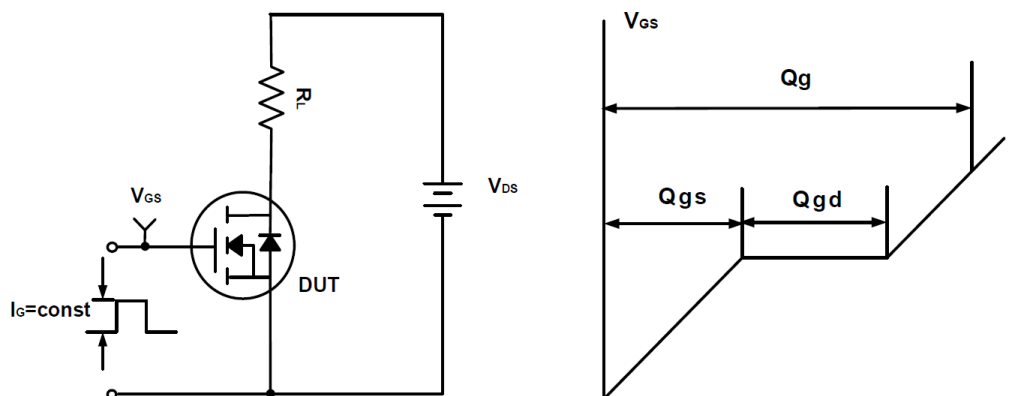


Figure A Gate Charge Test Circuit & Waveforms

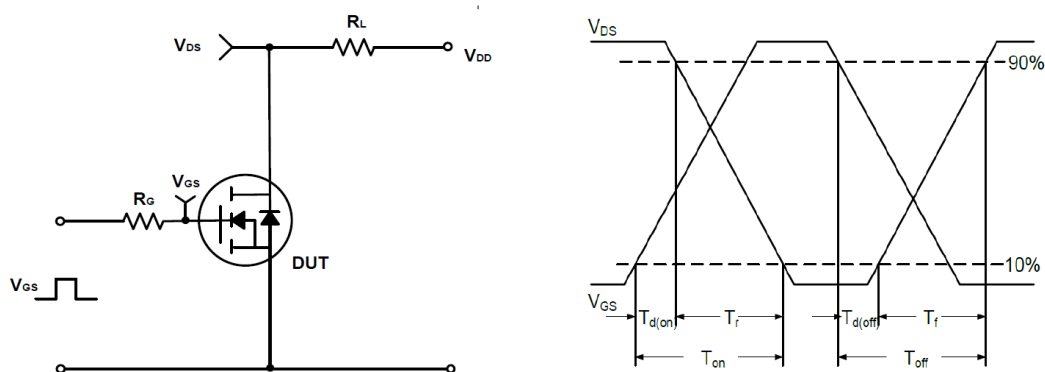


Figure B Switching Test Circuit & Waveforms

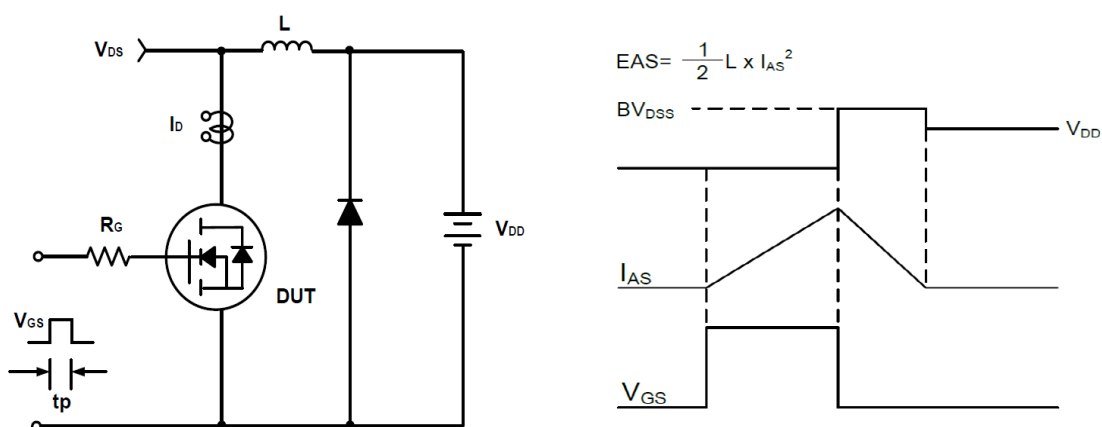
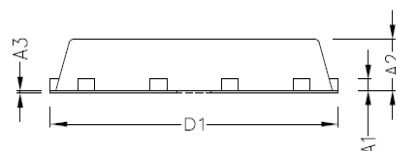
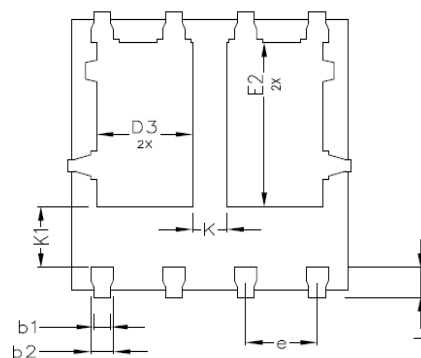
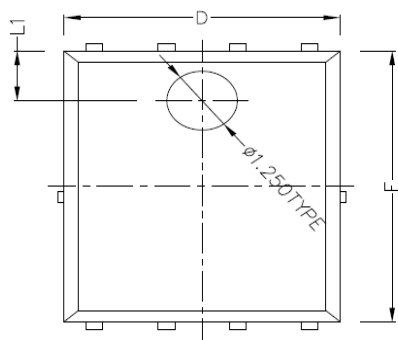


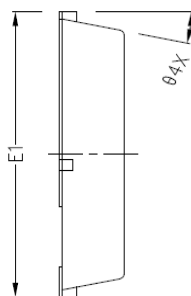
Figure C Unclamped Inductive Switching Circuit & Waveforms

**PDFN5X6-8L Package Outline Dimensions (Units: mm)**

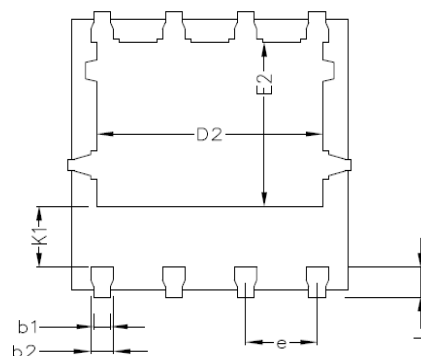
SIDE VIEW

BOTTOM VIEW
OPTION 2

TOP VIEW



SIDE VIEW

BOTTOM VIEW
OPTION 1

COMMON DIMENSIONS (UNITS OF MEASURE IS mm)			
	MIN	NORMAL	MAX
A1	0.254 BSC		
A2	1.000	1.100	1.200
A3	0.006	—	0.020
b1	0.260	0.300	0.360
b2	0.360	0.400	0.460
D	4.800	4.900	5.000
D1	5.000	5.100	5.200
D2	3.910	4.010	4.110
D3	1.605	1.705	1.805
E	5.650	5.750	5.850
E1	5.950	6.050	6.150
E2	3.375	3.475	3.575
e	1.270 TYPE		
L	0.630	0.630	0.730
L1	1.00REF		
θ	13° TYPE		
K	0.600 REF		
K1	1.235 REF		