Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	2.3mΩ@10V	120A
	3.3mΩ@4.5V	

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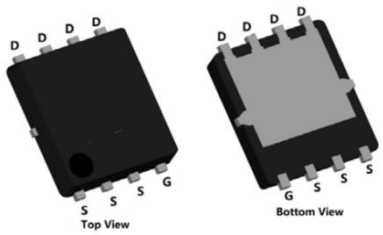
Feature

- Fast Switching
- Low Gate Charge and Rdson
- Advanced Split Gate Trench Technology
- 100% Single Pulse avalanche energy Test

Applications

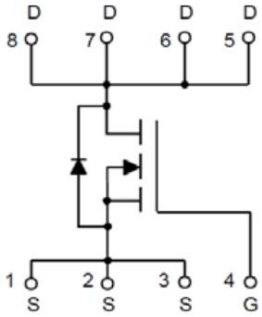
- Power switching application
- PWM Application
- DC-DC Converter

Package



PDFN5X6-8L

Circuit diagram



Marking



SP40N02BGNK : Device Code
**** : Week Code**

Order Information

Device	Package	Unit/Tape
SP40N02BGNK	PDFN5X6-8L	5000

Absolute maximum ratings (Ta=25℃, unless otherwise noted)

Parameter		Symbol	Rating	Units
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current (Tc=25℃)	Silicon Limit	I_D	135	A
Continuous Drain Current (Tc=25℃)	Package Limit	I_D	120	A
Continuous Drain Current (Tc=100℃)		I_D	80	A
Pulsed Drain Current		I_{DM}	480	A
Single Pulse Avalanche Energy[1]		E_{AS}	420	mJ
Power Dissipation (Tc=25℃)		P_D	85	W
Power Dissipation (Tc=100℃)		P_D	34	W
Thermal Resistance Junction-to-Case		$R_{\theta JC}$	1.47	℃/W
Storage Temperature Range		T_{STG}	-55 to 150	℃
Operating Junction Temperature Range		T_J	-55 to 150	℃

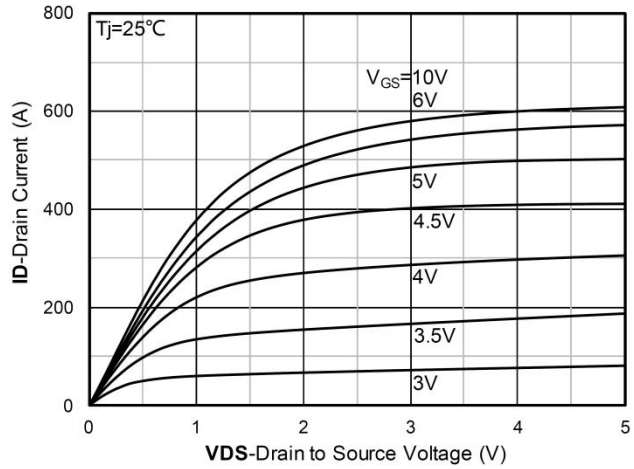
Electrical characteristics (Ta=25℃, unless otherwise noted)

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	VGS=0V , ID=250uA	40	-	-	V
Drain Cut-Off Current	I_{DSS}	VDS=32V , VGS=0V , TJ=25℃	-	-	1	uA
Gate Leakage Current	I_{GSS}	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	VGS=VDS , ID =250uA	1.3	1.7	2.3	V
Drain-Source ON Resistance	$R_{DS(ON)}$	VGS=10V , ID=20A	-	2.3	2.8	mΩ
		VGS=4.5V , ID=10A	-	3.3	4.0	
Gate Resistance	R_G	f=1MHz	-	2.9	-	Ω
Dynamic Characteristics						
Input Capacitance	C_{iss}	VDS=20V , VGS=0V , f=1MHz	-	2868	-	pF
Output Capacitance	C_{oss}		-	798	-	
Reverse Transfer Capacitance	C_{rss}		-	51	-	
Total Gate Charge	Q_g	VDS=20V , VGS=10V , ID=85A	-	42	-	nC
Gate-Source Charge	Q_{gs}		-	8.6	-	
Gate-Drain Charge	Q_{gd}		-	11	-	
Gate Plateau Voltage	$V_{plateau}$		-	3.3	-	V
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	VDD=20V , VGS=10V , RG=1.6Ω , ID=85A	-	10	-	nS
Rise Time	t_r		-	3	-	
Turn-Off Delay Time	$t_{d(off)}$		-	35	-	
Fall Time	t_f		-	4	-	
Drain-Source Body Diode Characteristics						
Source-Drain Diode Forward Voltage	V_{SD}	IS=1A , VGS=0V , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	I_S		-	-	120	A
Reverse Recovery Time	Trr	IS=50A , di/dt=100A/us , TJ=25℃	-	18	-	nS
Reverse Recovery Charge	Qrr		-	31	-	nC

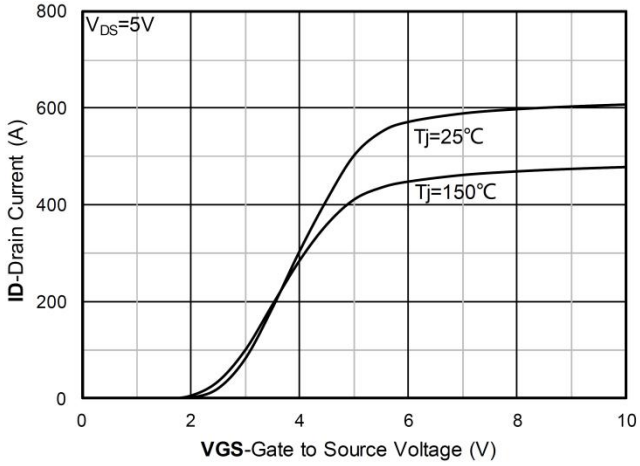
Note :

1. The test condition is VDD=20V, VGS=10V, L=0.5mH, RG=25Ω;

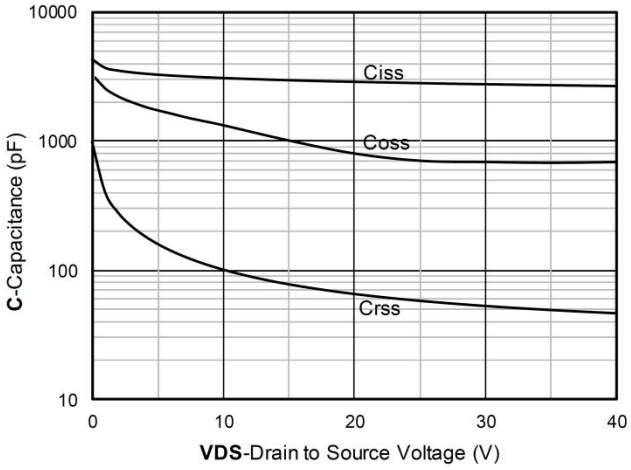
Typical Characteristics



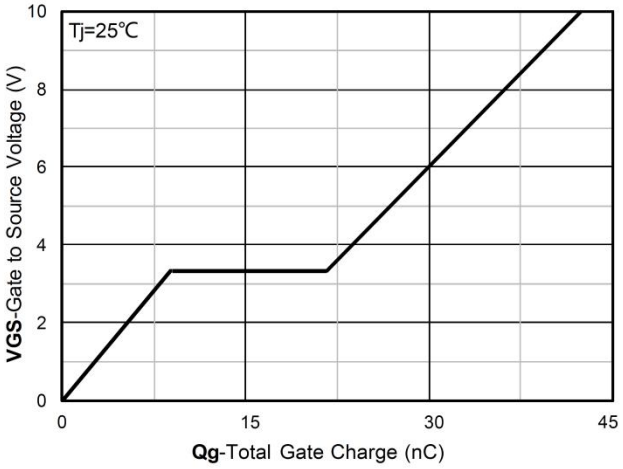
Output Characteristics



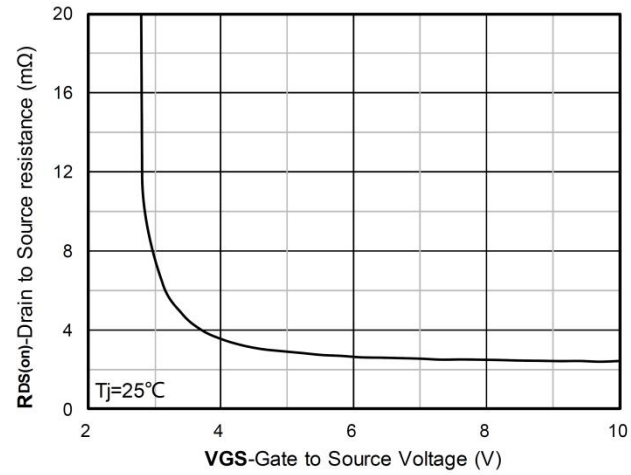
Transfer Characteristics



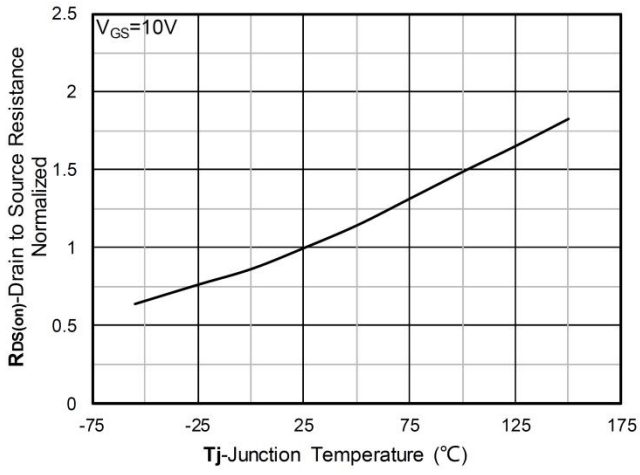
Capacitance Characteristics



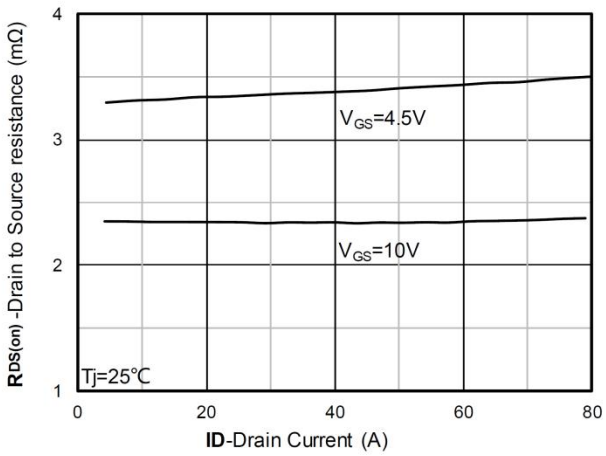
Gate Charge



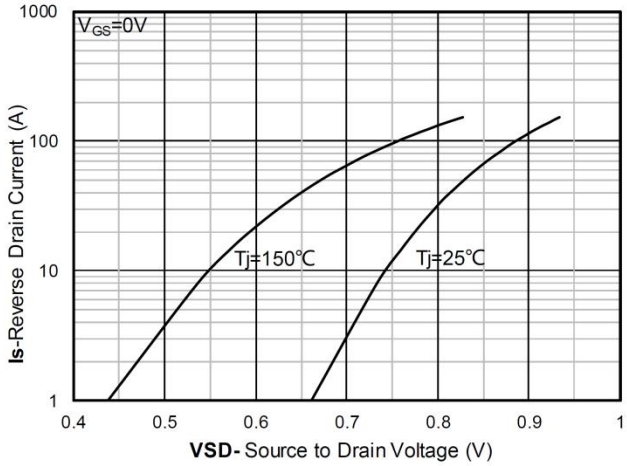
On-Resistance vs. Gate to Source Voltage



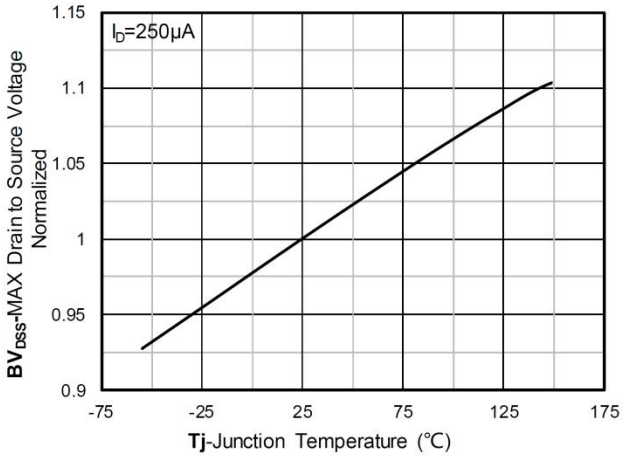
Normalized On-Resistance



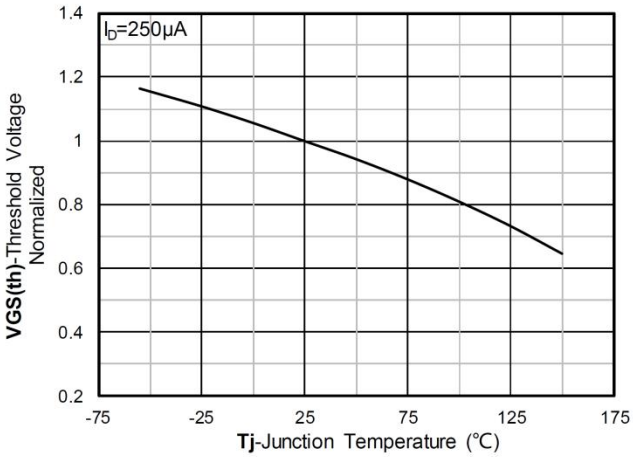
RDS(on) vs. Drain Current



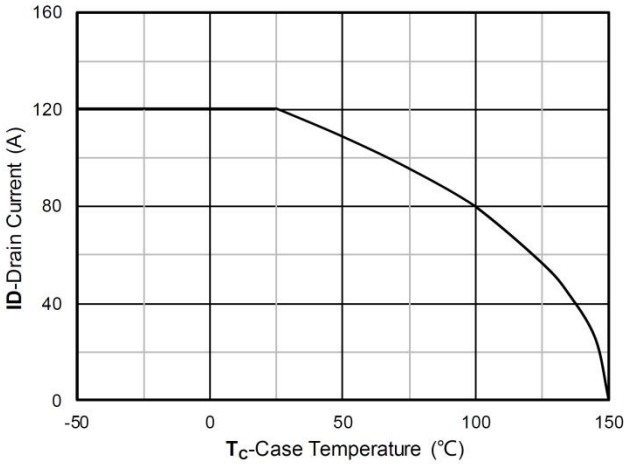
Forward characteristics of reverse diode



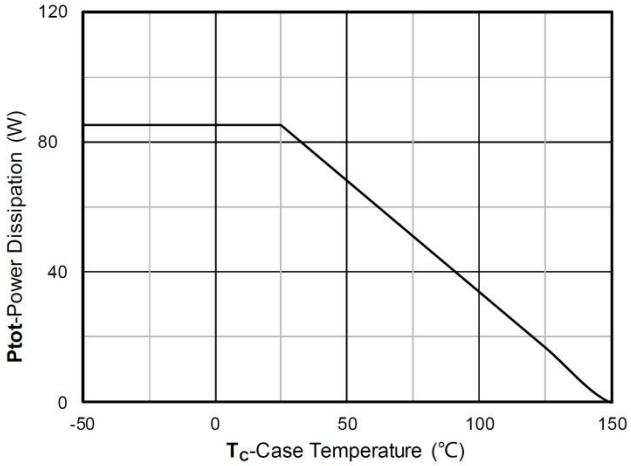
Normalized breakdown voltage



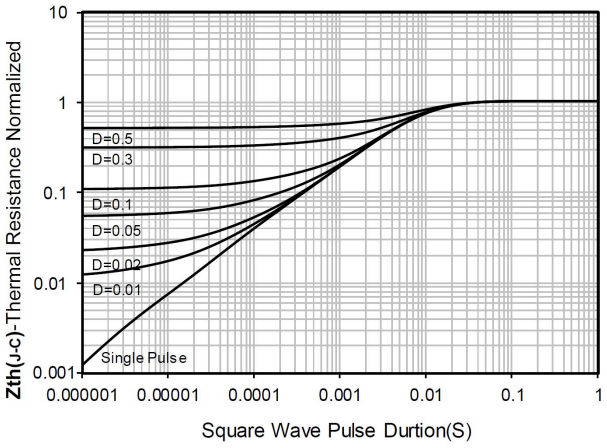
Normalized Threshold voltage



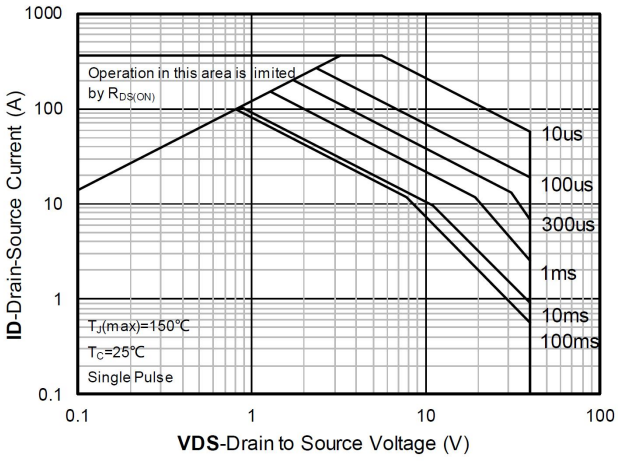
Current dissipation



Power dissipation



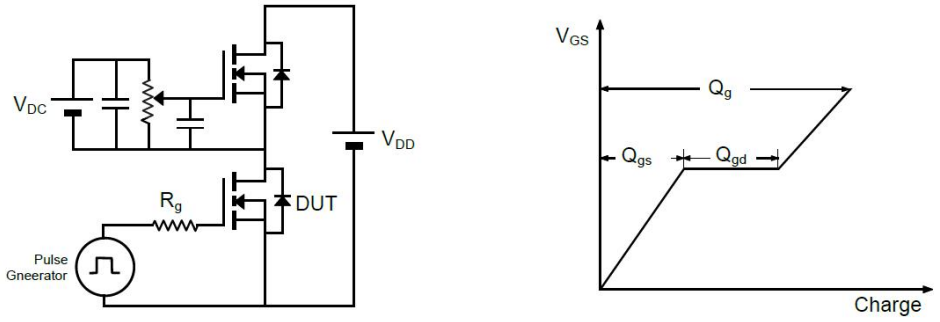
Normalized Maximum Transient Thermal Impedance



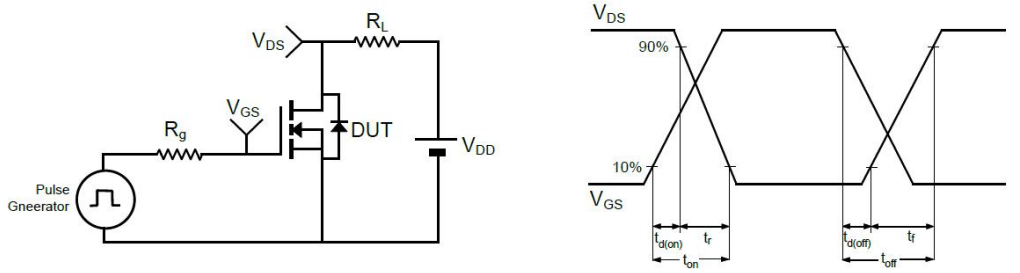
Safe Operation Area

Test Circuit

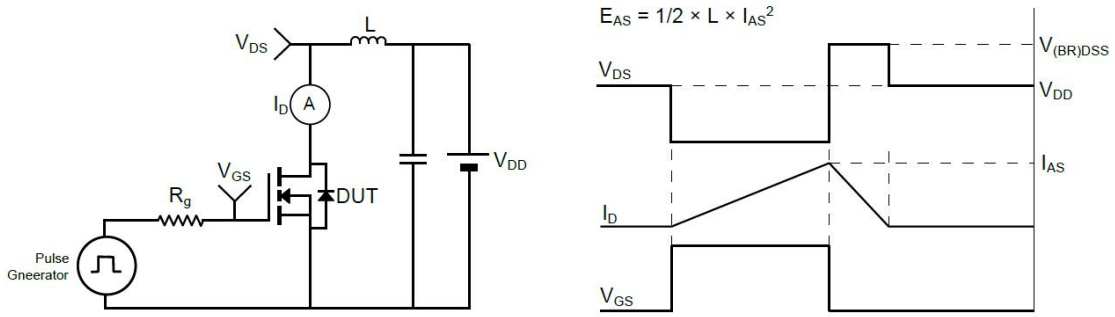
Gate Charge



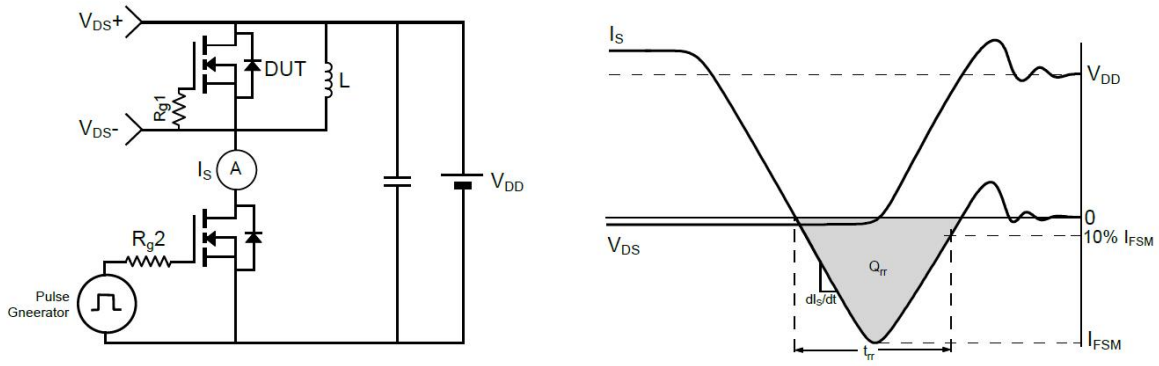
Resistive Load Switching Time



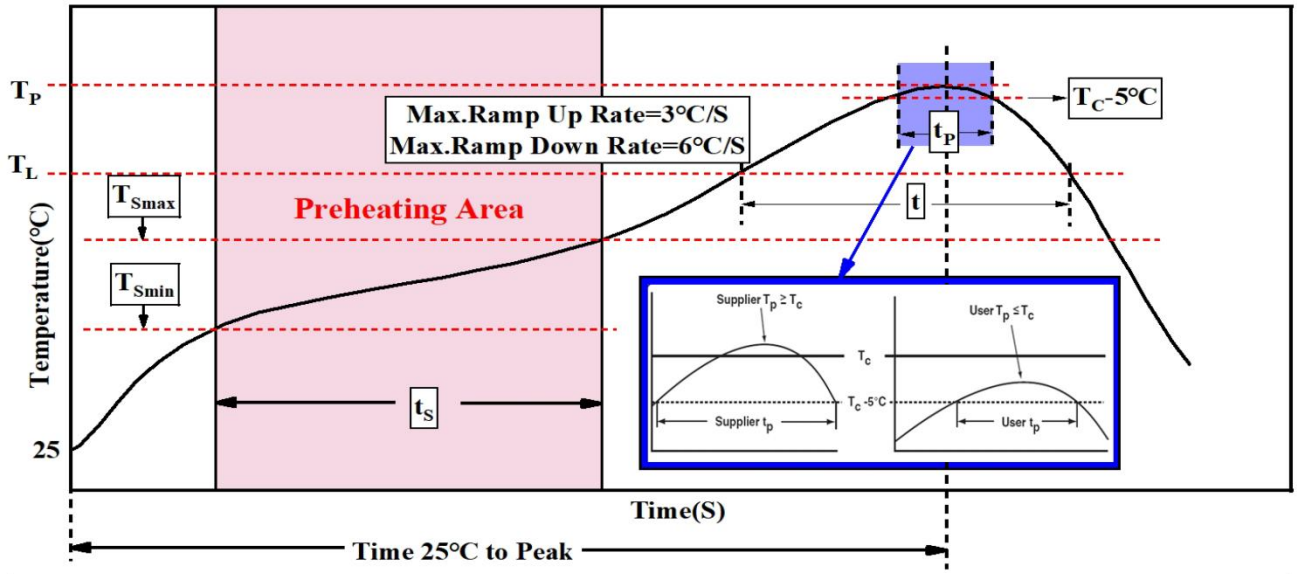
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (Tsmin) Temperature max (Tsmax) Time (Tsmin to Tsmax) (ts)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-120 seconds
Average ramp-up rate (Tsmax to Tp)	3 °C/second max.	3°C/second max.
Liquidous temperature (TL) Time at liquidous (tL)	183 °C 60-150 seconds	217°C 60-150 seconds
Peak package body Temperature e (Tp)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (tp)** within 5°C of the specified classification temperature (Tc)	20** seconds	30** seconds
Average ramp-down rate (Tp to Tsmax)	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (Tp) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (tp) is defined as a supplier minimum and a user maximum		

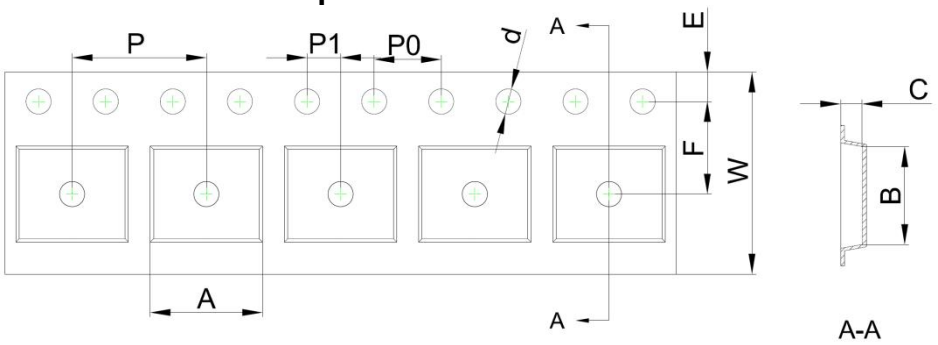
Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (Tc)

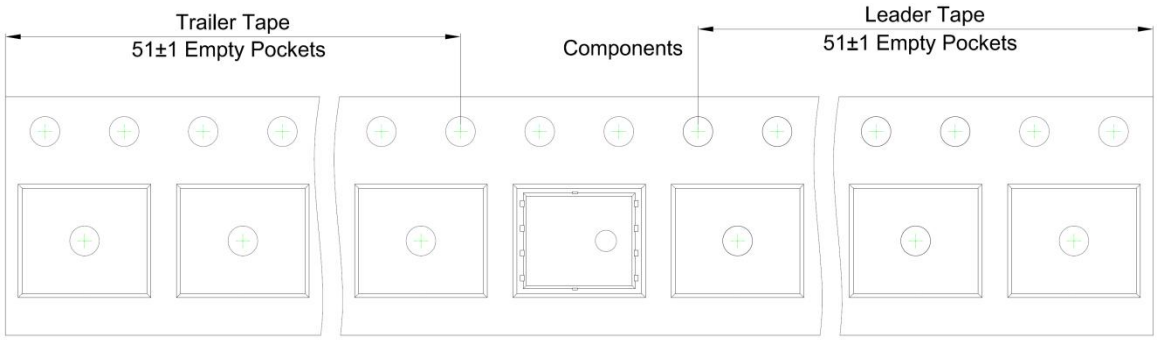
Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

PDFN5X6-8L Embossed Carrier Tape

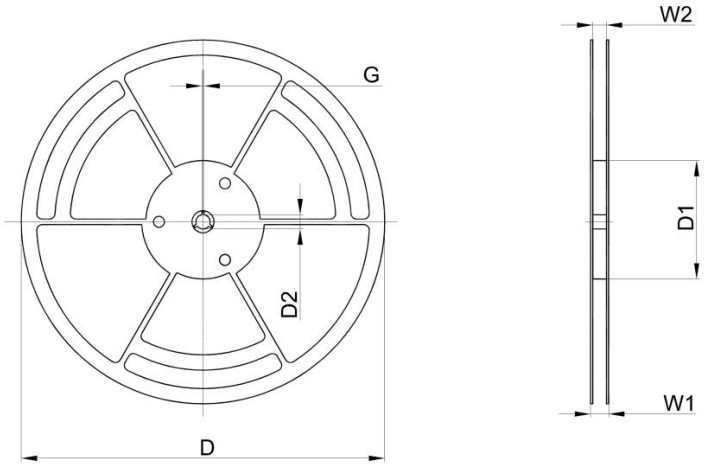


Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
PDFN5X6-8L	6.30	5.30	1.10	Φ1.50	1.75	5.50	4.00	8.00	2.00	12.00

PDFN5X6-8L Tape Leader and Trailer



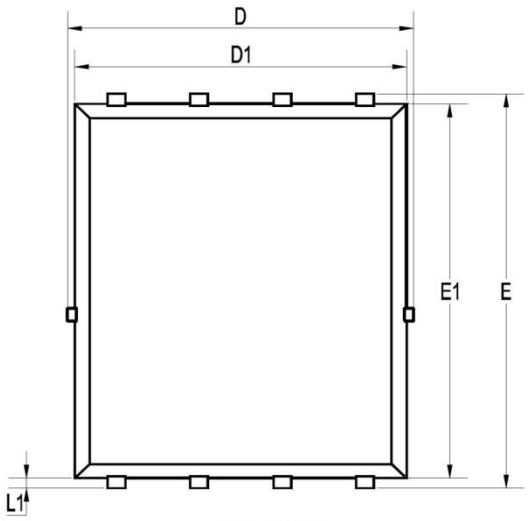
PDFN5X6-8L Reel



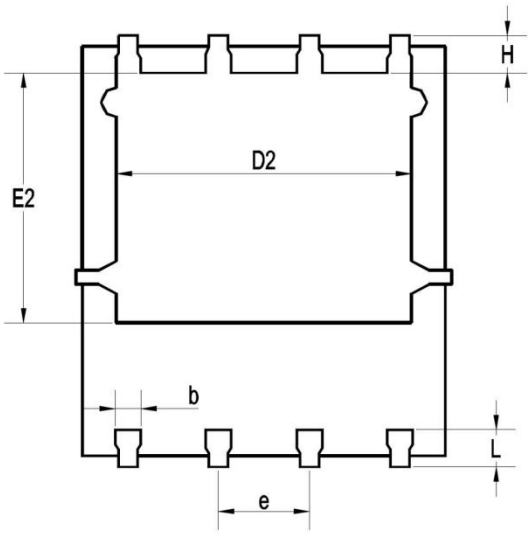
Dimensions are in millimeter						
Reel Option	D	D1	D2	G	W1	W2
13"Dia	Ø330.00	100.00	13.00	1.90	17.60	12.40

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)
5,000 pcs	13 inch	5,000 pcs	340×336×29	50,000 pcs	353×346×365

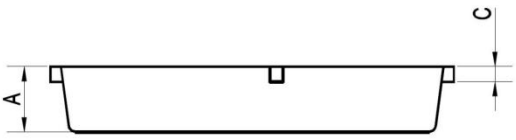
PDFN5X6-8L Package Information



Top View
[顶视图]



Bottom View
[背视图]



Side View
[侧视图]

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.200	0.035	0.047
b	0.330	0.510	0.013	0.020
C	0.110	0.340	0.004	0.013
D	4.700	5.260	0.185	0.207
D1	4.700	5.100	0.185	0.201
D2	3.560	4.500	0.140	0.177
E	5.750	6.250	0.226	0.246
E1	5.600	6.000	0.220	0.236
E2	3.180	3.660	0.125	0.144
e	1.170	1.370	0.046	0.054
L	0.350	0.750	0.014	0.030
L1	0.000	0.200	0.000	0.008
H	0.350	0.710	0.014	0.028