

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	5.0mΩ@10V	55A
	8.0mΩ@4.5V	



合肥矽普半导体

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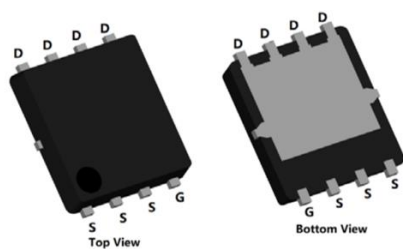
Feature

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

Applications

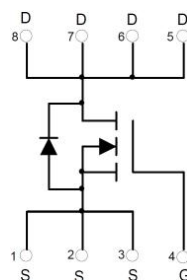
- DC-DC Converters
- Motor Control
- Portable equipment application

Package



PDFN5X6-8L

Circuit diagram



Marking



SP40N05GNK
**

:Device Code
:Week Code

Order Information

Device	Package	Unit/Tape
SP40N05GNK	PDFN5X6-8L	5000

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

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	V_{DSS}	40	V
Gate-Source Voltage	V_{GSS}	± 20	V
Continuous Drain Current (Tc=25°C)	I_D	55	A
Continuous Drain Current (Tc=100°C)	I_D	37	A
Pulse Drain Current Tested	I_{DM}	220	A
Single pulsed avalanche energy ¹	E_{AS}	81	mJ
Power Dissipation (Tc=25°C)	P_D	45	W
Power Dissipation(Tc=100°C)	P_D	18	W
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	2.77	°C/W
Storage Temperature Range	T_{STG}	-55 to 150	°C
Operating Junction Temperature Range	T_J	-55 to 150	°C

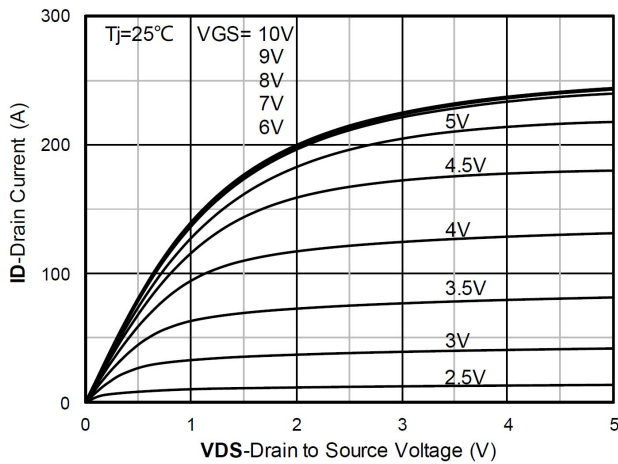
Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V, ID=250mA	40	-	-	V
Drain-Source Leakage Current	Idss	VDS=32V, VGS=0V	-	-	1	uA
Gate-Source Leakage Current	Igss	VGS=±20V, VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VDS=VGS, ID=250uA	1.1	1.5	2.1	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V, ID=20A	-	5.0	6.3	mΩ
		VGS=4.5V, ID=10A	-	8.0	14	
Gate Resistance	RG	VDS=20V , VGS=0V , f=1MHz	-	1.8	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=20V , VGS=0V , f=1MHz	-	1048	-	pF
Output Capacitance	Coss		-	187	-	
Reverse Transfer Capacitance	Crss		-	11	-	
Total Gate Charge	Qg	VDS=20V , VGS=10V , ID=30A	-	20	-	nC
Gate-Source Charge	Qgs		-	4	-	
Gate-Drain Charge	Qgd		-	6	-	
Gate Plateau Voltage	Vplateau		-	3.1	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=20 VGS=10V , RG=3Ω, ID=30A	-	6	-	nS
Rise Time	Tr		-	2.5	-	
Turn-Off Delay Time	Td(off)		-	22	-	
Fall Time	Tf		-	3.5	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Diode Continuous Current	Is		-	-	55	A
Reverse recover time	Trr	IS=20A , di/dt=100A/us , TJ=25℃	-	12	-	nS
Reverse recovery charge	Qrr		-	14	-	nC

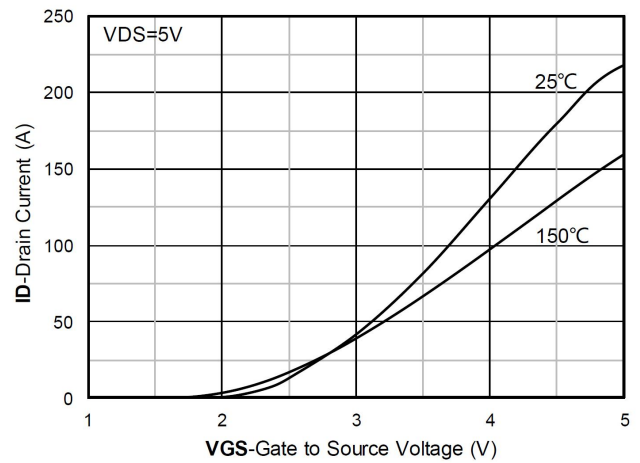
Note:

- The EAS Test condition is $V_{DD}=20V, V_{GS}=10V, L=0.5mH, R_G=25\Omega$

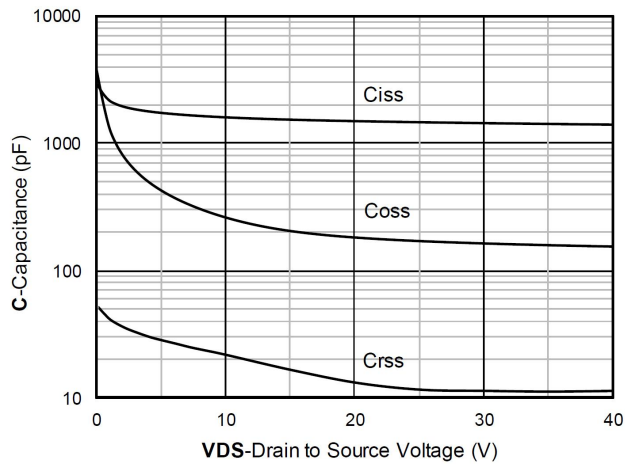
Typical Characteristics



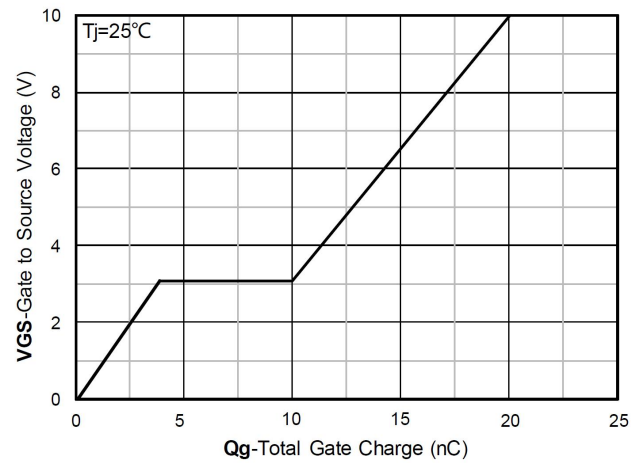
Output Characteristics



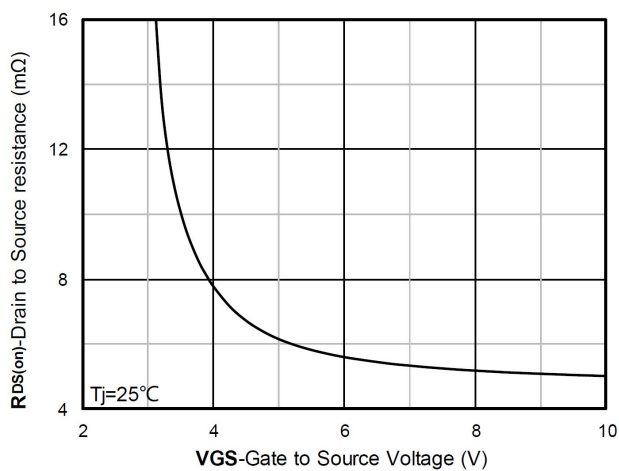
Transfer Characteristics



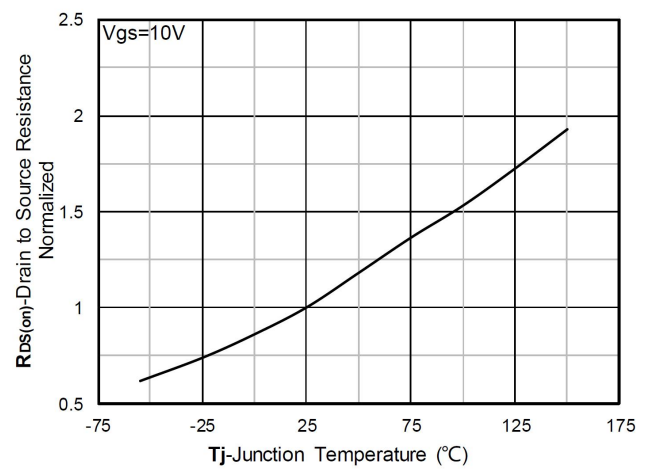
Capacitance Characteristics



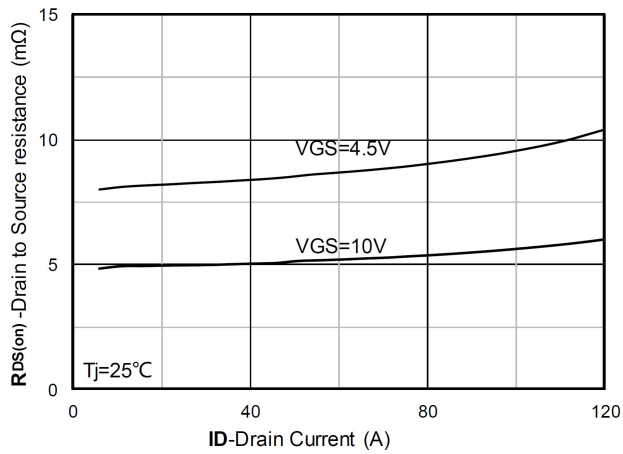
Gate Charge



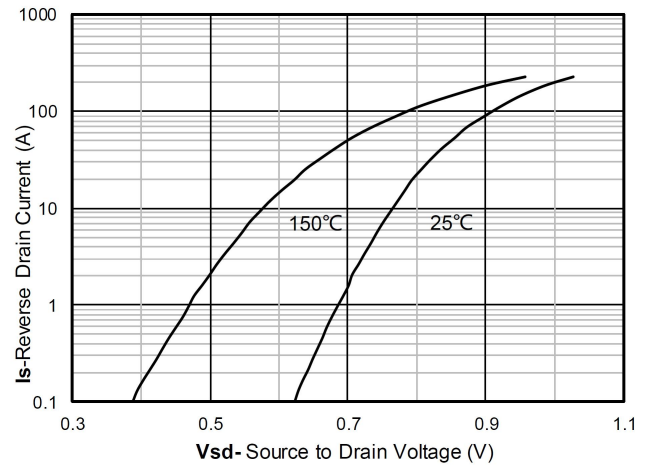
On-Resistance vs Gate to Source Voltage



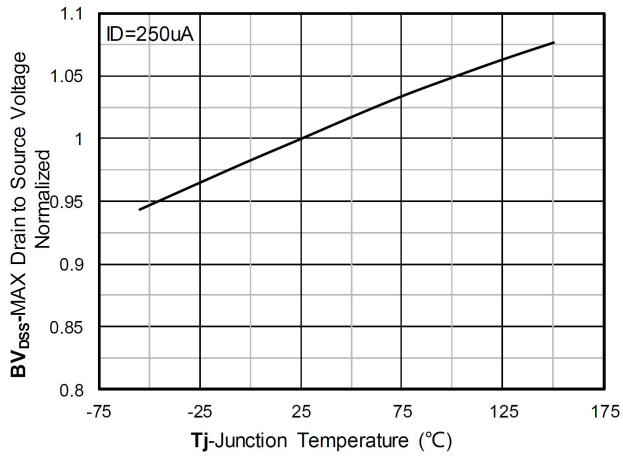
Normalized On-Resistance



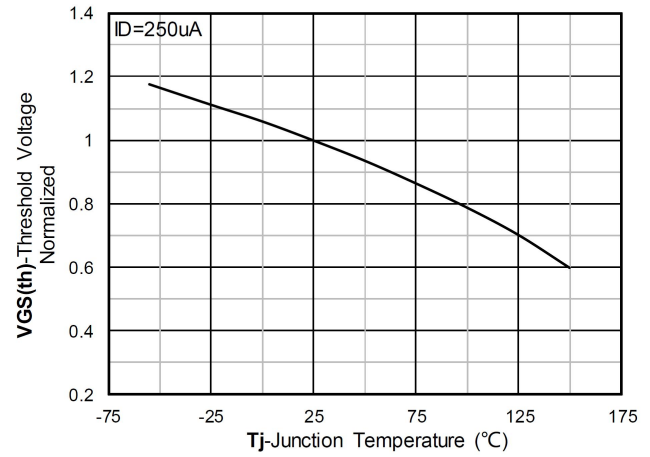
RDS(on) VS Drain Current



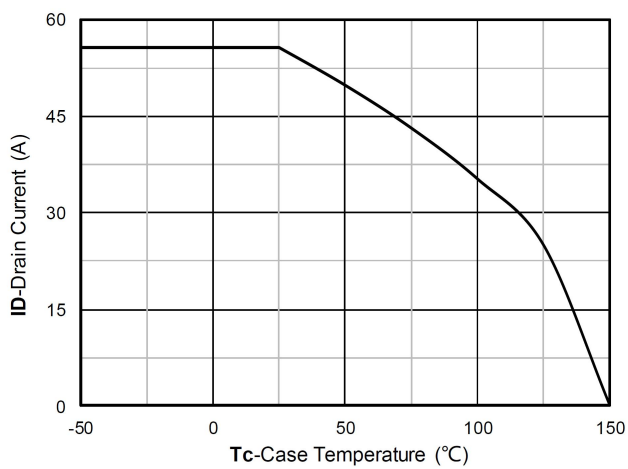
Forward characteristics of reverse diode



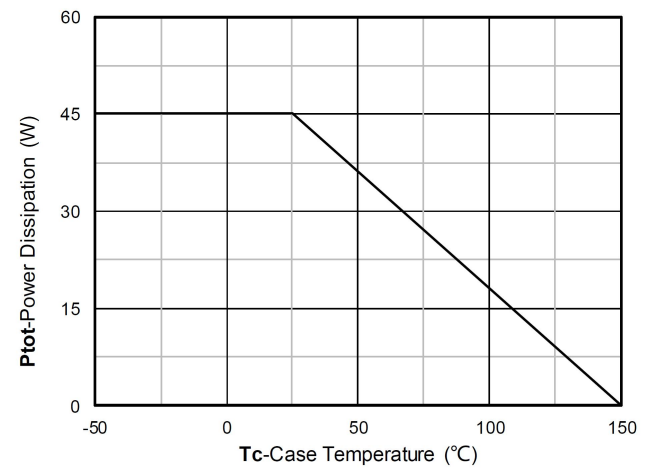
Normalized breakdown voltage



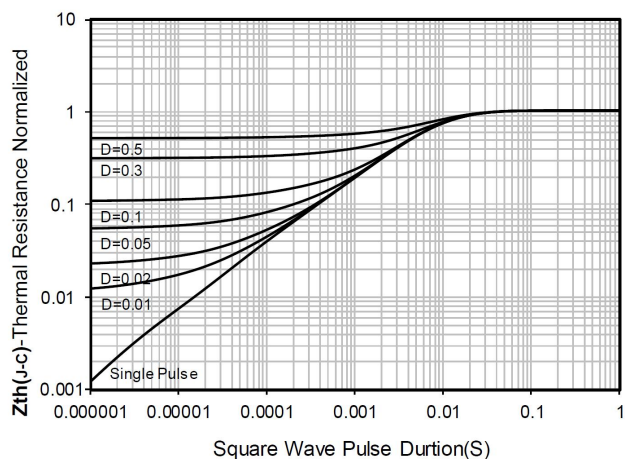
Normalized Threshold voltage



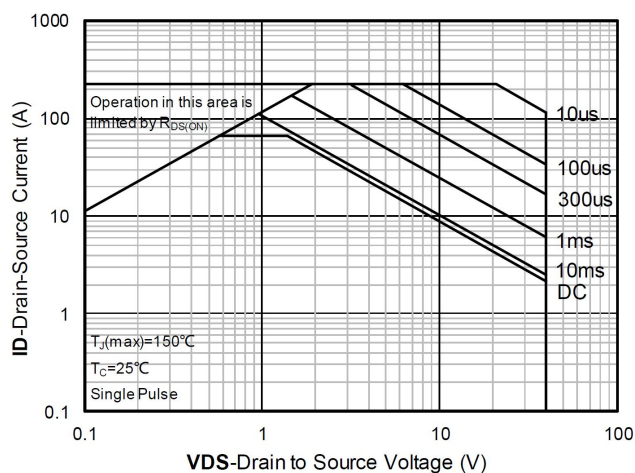
Current dissipation



Power dissipation



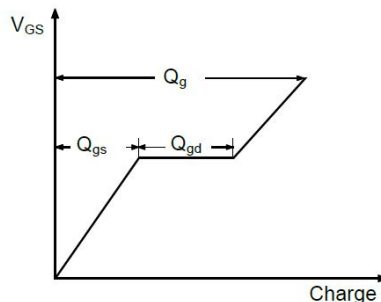
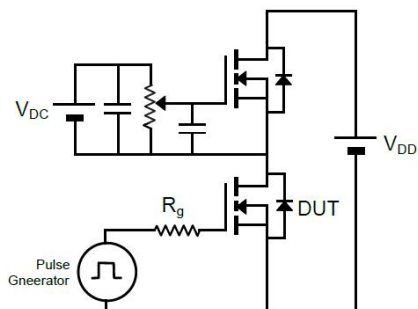
Normalized Maximum Transient Thermal Impedance



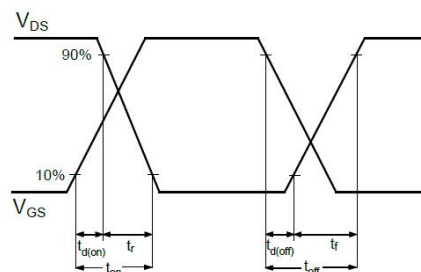
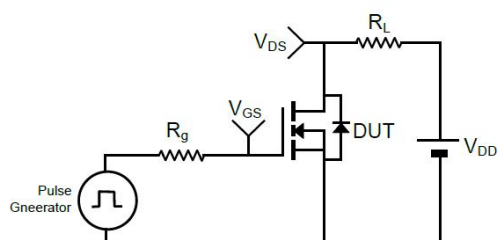
Safe Operation Area

Test Circuit

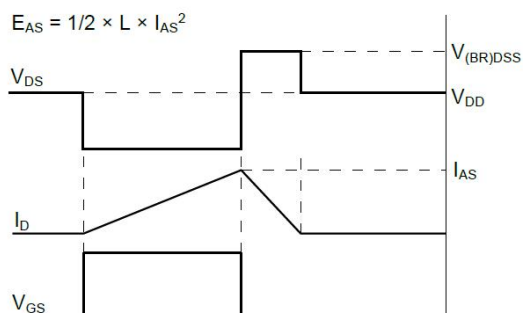
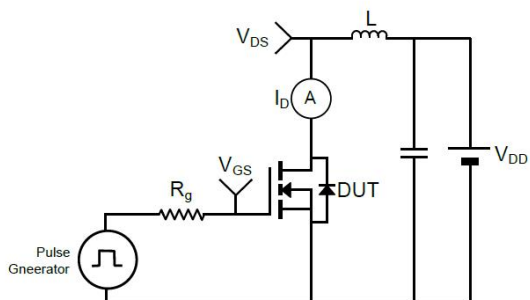
Gate Charge



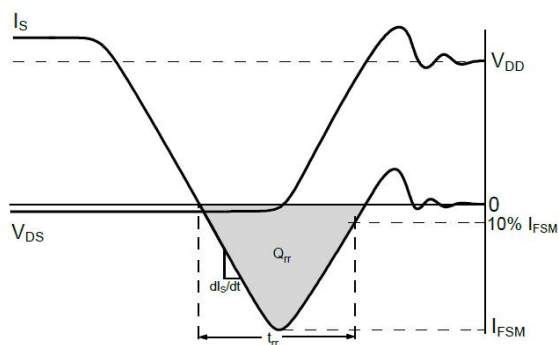
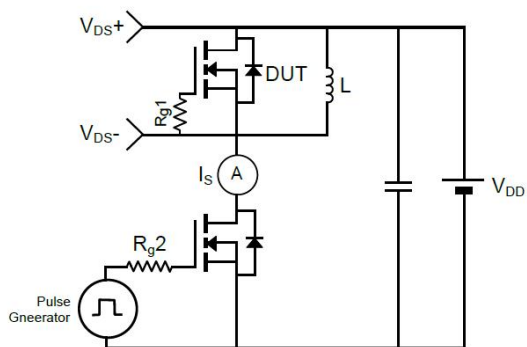
Resistive Load Switching Time



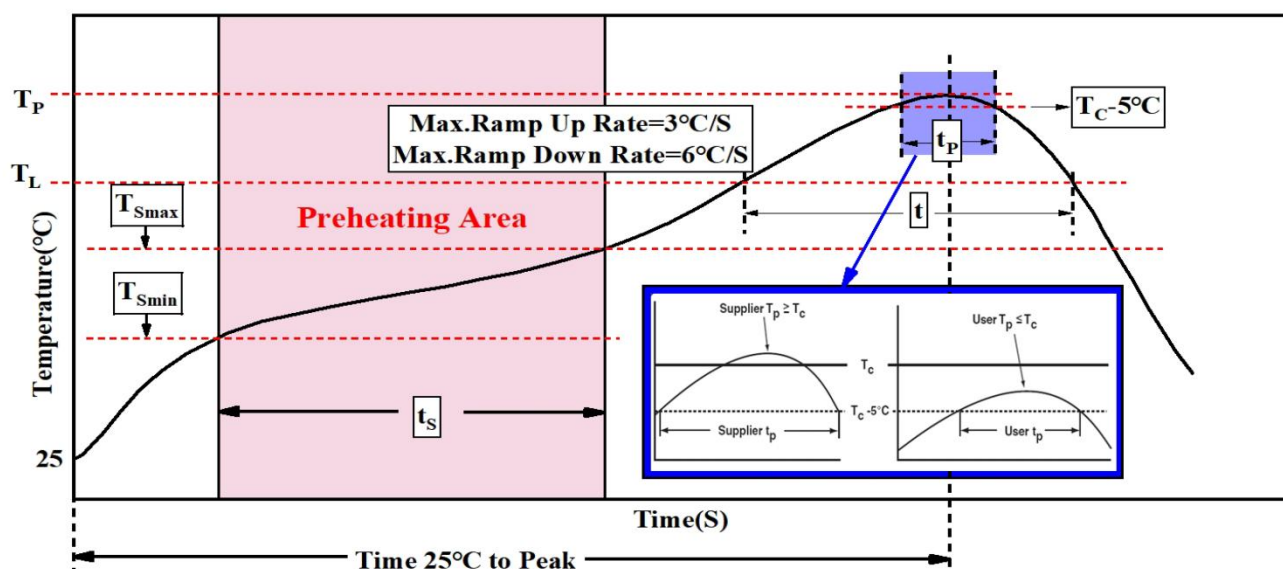
Un-clamped Inductive Load Switching



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 (T_{Smin})	100°C	150°C
Temperature max (T_{Smax})	150°C	200°C
Time (T_{Smin} to T_{Smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{Smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217°C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature e (T_P)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_C)	20** seconds	30** seconds
Average ramp-down rate (T_P to T_{Smax})	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 (T_P) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_P) is defined as a supplier minimum and a user maximum		

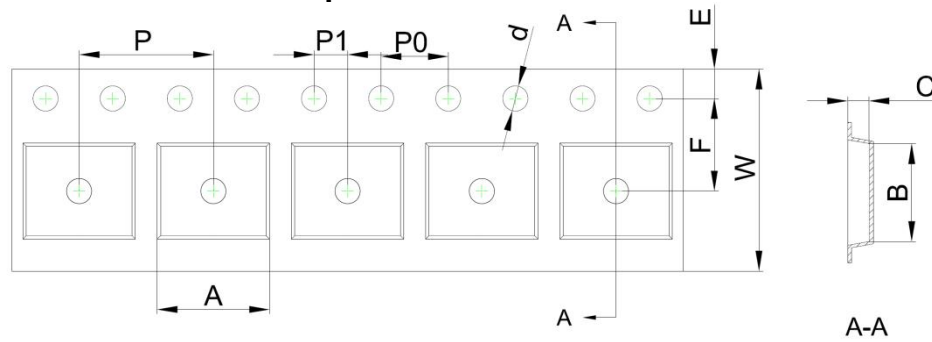
Table 1. SnPb Eutectic Process – Classification Temperatures (T_C)

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 (T_C)

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

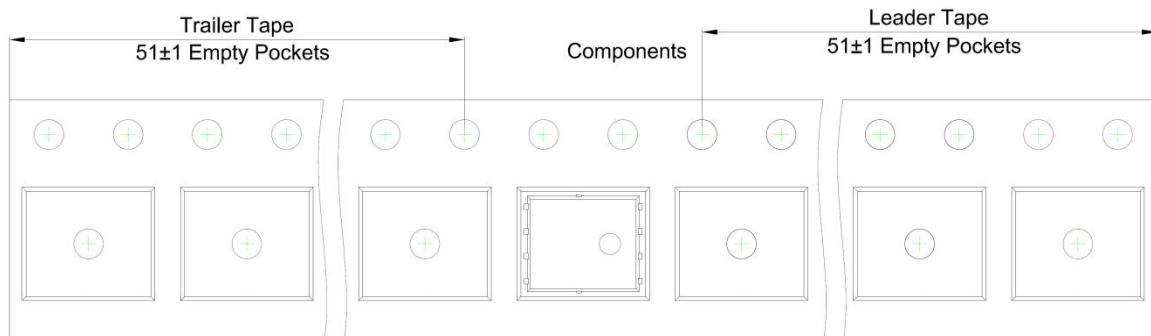
PDFN5X6-8L Embossed Carrier Tape



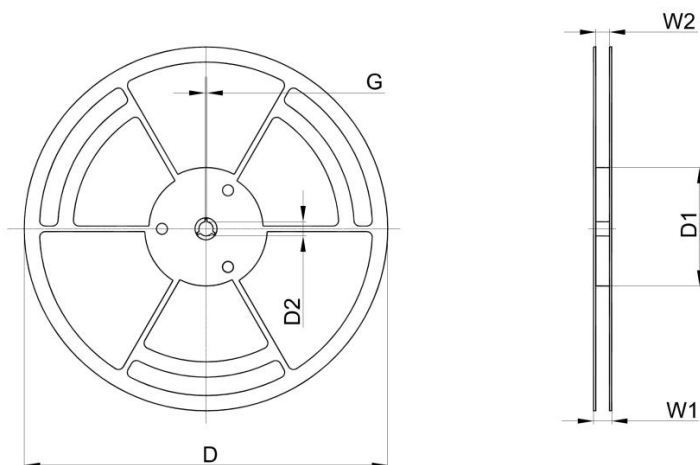
Dimensions are in millimeter

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

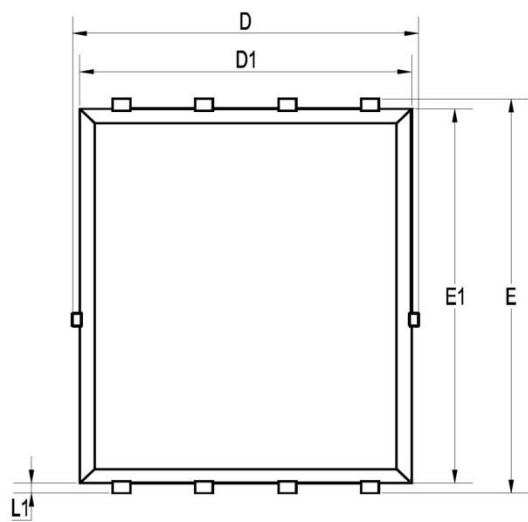


Dimensions are in millimeter

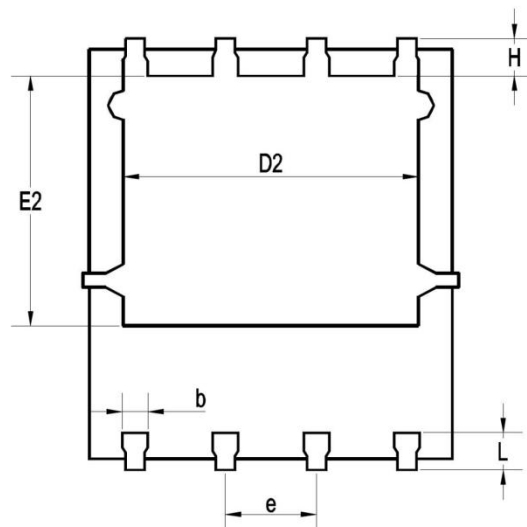
Reel Option	D	D1	D2	G	W1	W2
13"Dia	Ø330.00	100.00	13.00	1.90	17.60	12.40

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

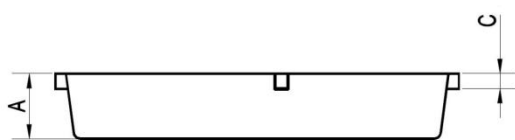
PDFN5X6-8L Package Information



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	1.120	0.035	0.044
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	0.710	0.014	0.028
L1	0.060	0.200	0.002	0.008
H	0.350	0.710	0.014	0.028