

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	1.2mΩ@10V	120A



合肥矽普半导体

Siliup Semiconductor Technology Co., Ltd

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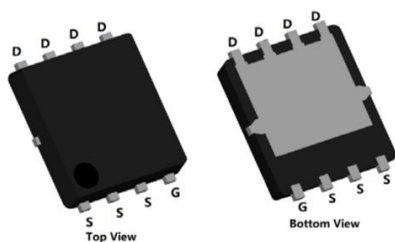
Feature

- Fast Switching
- Low Gate Charge and Rdson
- Advanced Split Gate Trench Technology
- **100% UIS TESTED**
- **100% ΔVds TESTED**

Applications

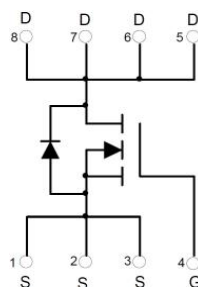
- Power switching application
- PWM Application
- DC-DC Converter

Package



PDFN5X6-8L

Circuit diagram



Marking



SP40N01GHNK
**

:Device Code
:Week Code

Order Information

Device	Package	Unit/Tape
SP40N01GHNK	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)	Silicon Limit	I_D	230	A
Continuous Drain Current (Tc=25°C)	Package Limit	I_D	120	A
Continuous Drain Current (Tc=100°C)		I_D	80	A
Pulse Drain Current Tested		I_{DM}	480	A
Single pulsed avalanche energy ¹		E_{AS}	1089	mJ
Power Dissipation (Tc=25°C)		P_D	120	W
Power Dissipation (Tc=100°C)		P_D	48	W
Thermal Resistance Junction-to-Case		$R_{\theta JC}$	1.04	°C/W
Storage Temperature Range		T_{STG}	-55 to 150	°C
Operating Junction Temperature Range		T_J	-55 to 150	°C

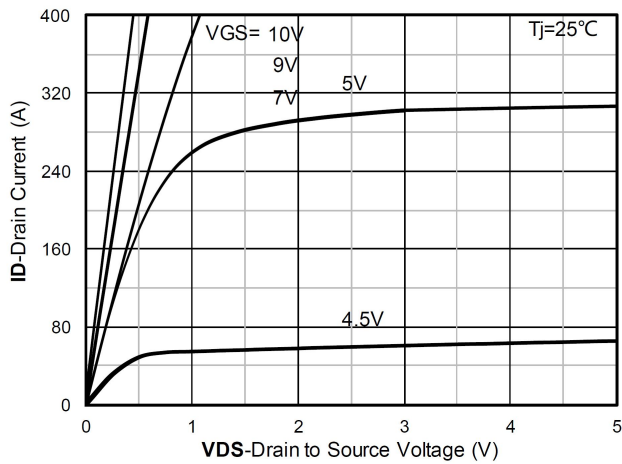
Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	40	-	-	V
Drain-Source Leakage Current	IDSS	VDS=32V , VGS=0V , TJ=25℃	-	-	1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID =250uA	2.4	2.8	3.4	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V , ID=50A	-	1.2	1.5	mΩ
Gate Resistance	RG	f=1MHz	-	3.54	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=20V , VGS=0V , f=1MHz	-	5750	-	pF
Output Capacitance	Coss		-	1950	-	
Reverse Transfer Capacitance	Crss		-	119	-	
Total Gate Charge	Qg	VDS=20V , VGS=10V , ID=100A	-	86	-	nC
Gate-Source Charge	Qgs		-	32	-	
Gate-Drain Charge	Qgd		-	18	-	
Gate Plateau Voltage	Vplateau		-	5.4	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=20V , VGS=10V , RG=2.7Ω , ID=100A	-	22	-	nS
Rise Time	Tr		-	28	-	
Turn-Off Delay Time	Td(off)		-	92	-	
Fall Time	Tf		-	28	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	IS		-	-	120	A
Reverse Recovery Time	Trr	IS=50A , di/dt=200A/us , TJ=25℃	-	52	-	nS
Reverse Recovery Charge	Qrr		-	45	-	nC

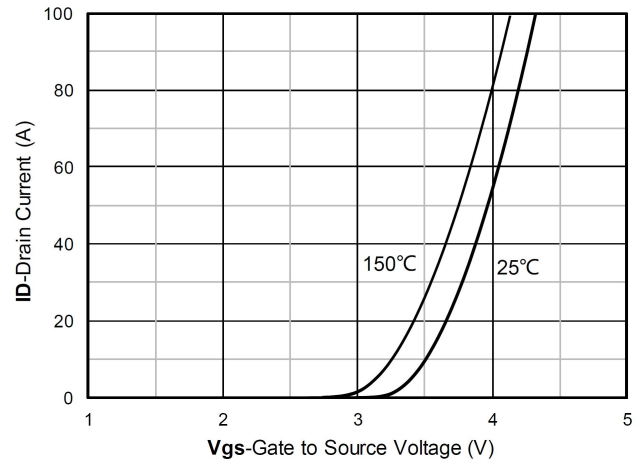
Note:

1. The test condition is $V_{DD}=20V$, $V_{GS}=10V$, $L=0.5mH$, $R_g=25\Omega$;

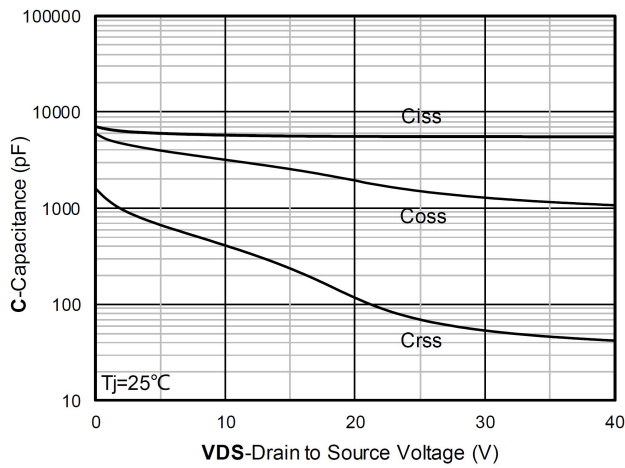
Typical Characteristics



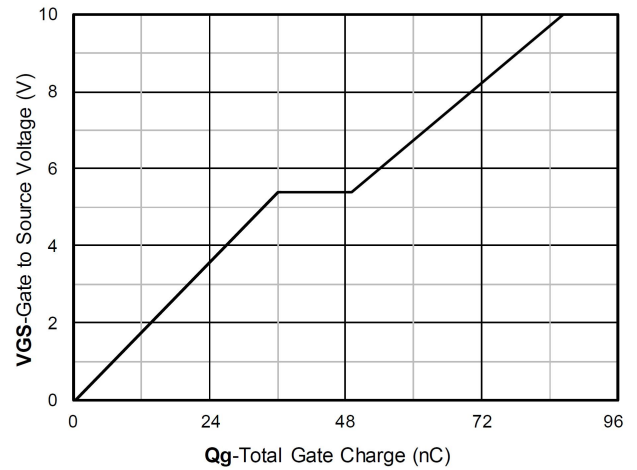
Output Characteristics



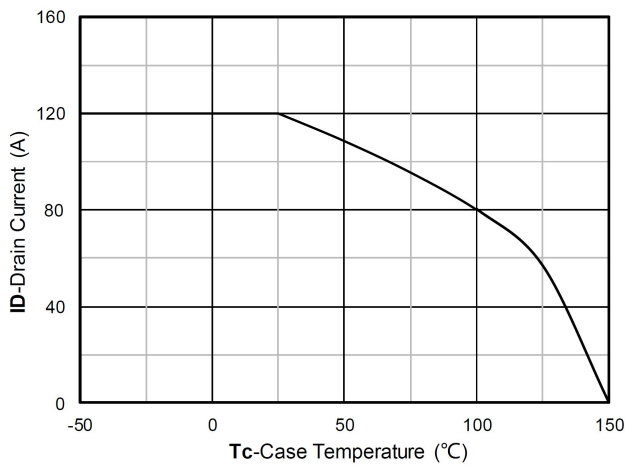
Transfer Characteristics



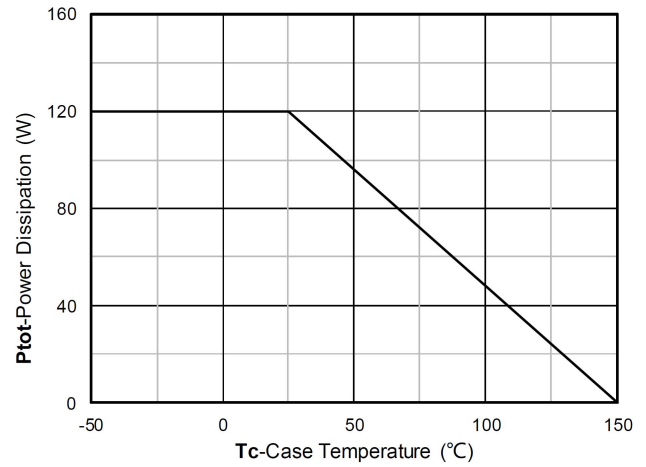
Capacitance Characteristics



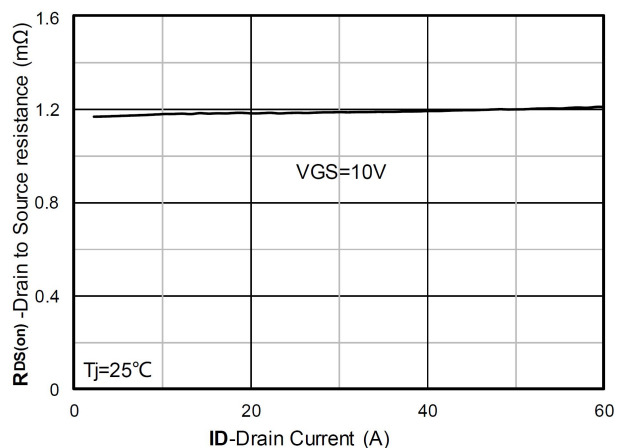
Gate Charge



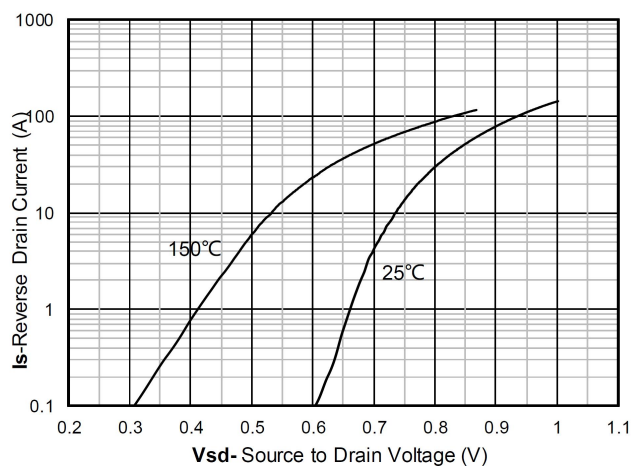
Current dissipation



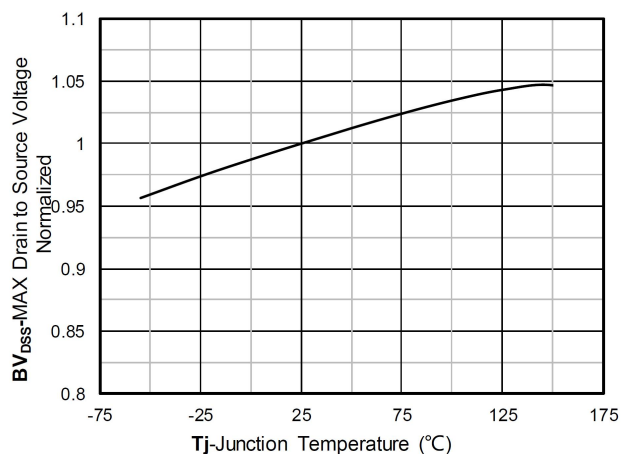
Power dissipation



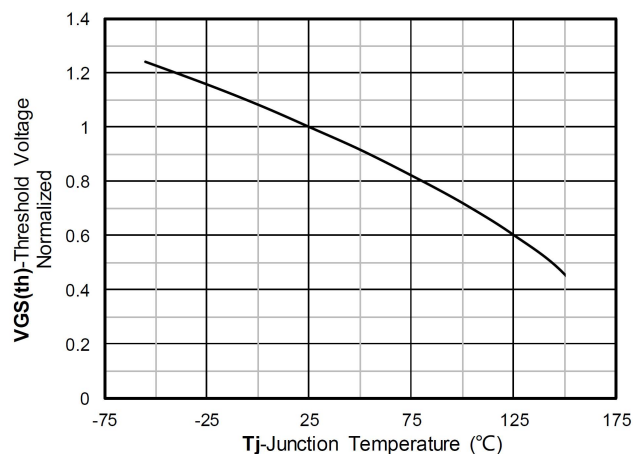
$R_{DS(on)}$ VS Drain Current



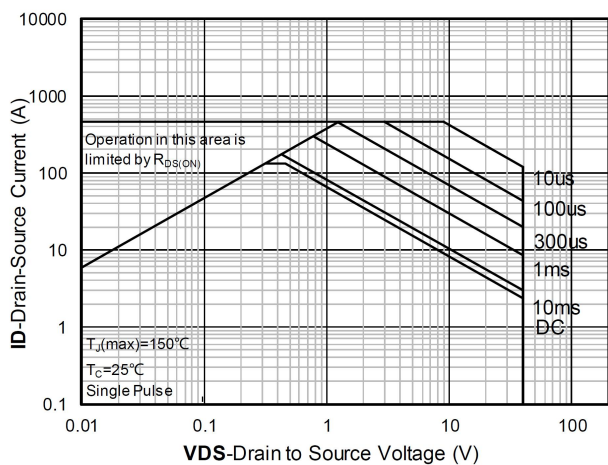
Forward characteristics of reverse diode



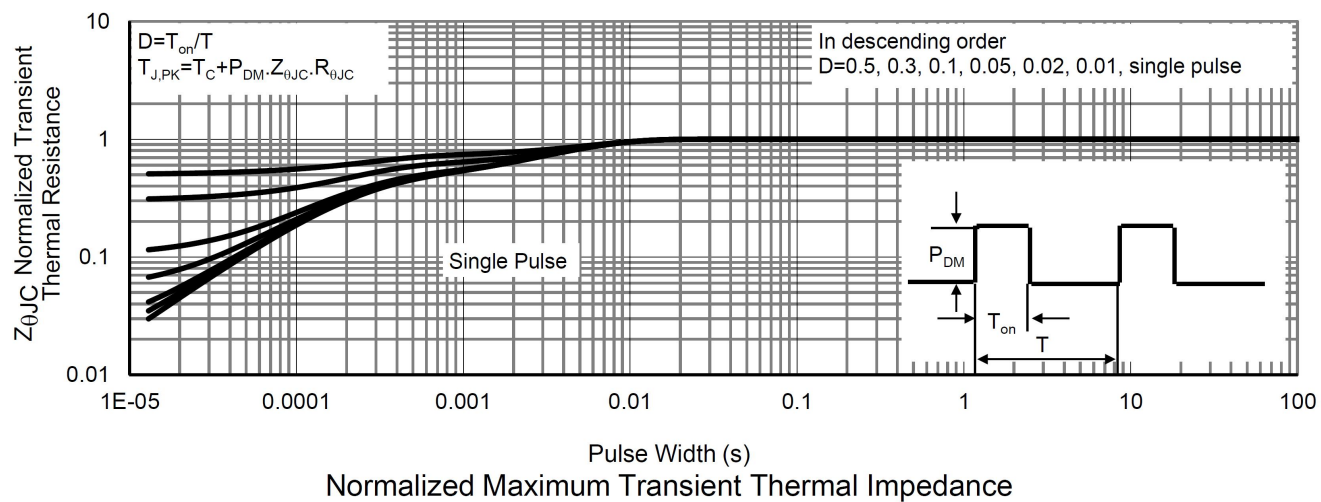
Normalized breakdown voltage



Normalized Threshold voltage

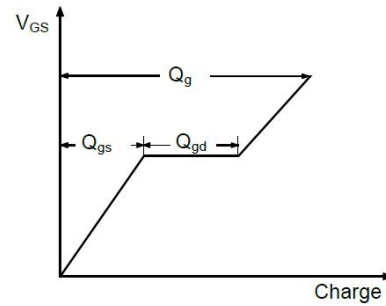
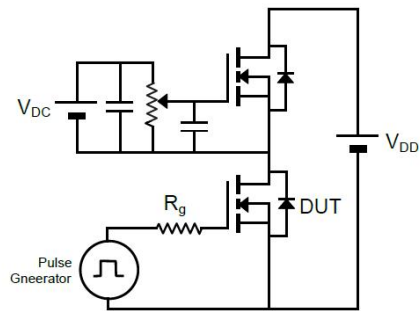


Safe Operation Area

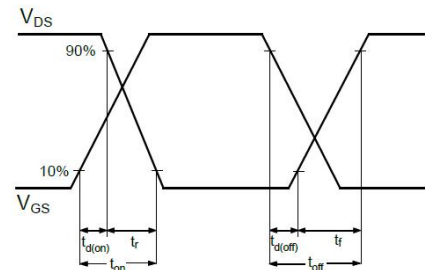
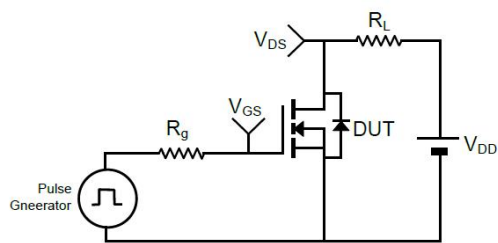


Test Circuit

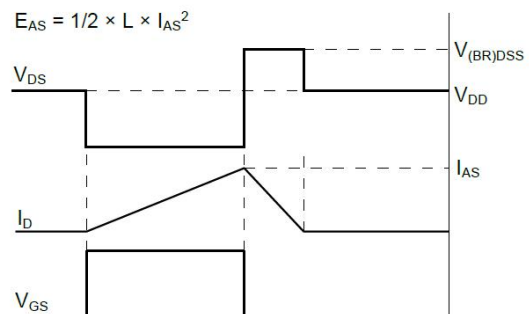
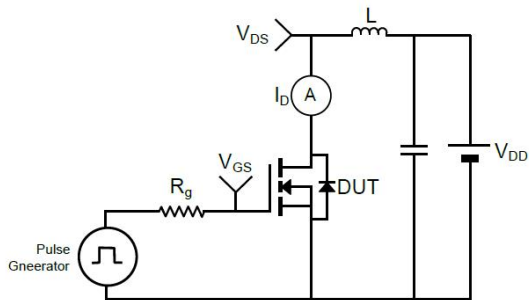
Gate Charge



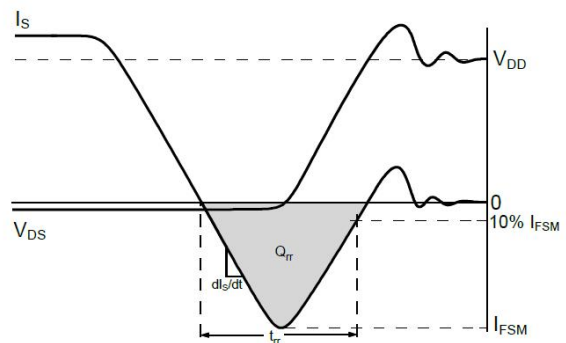
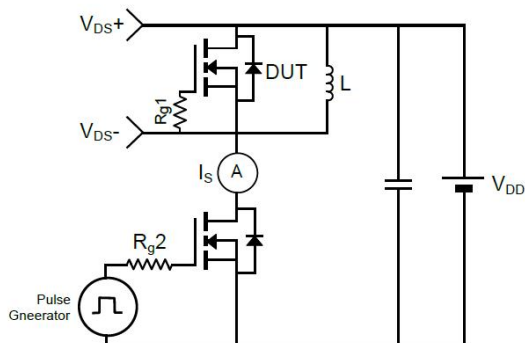
Resistive Load Switching Time



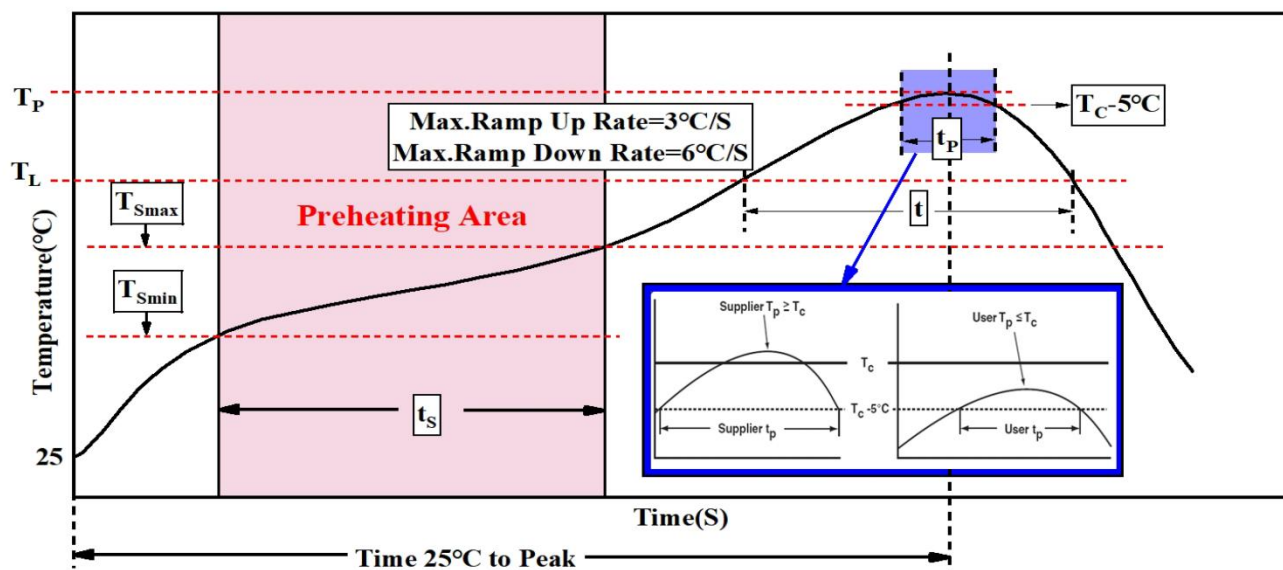
Un-clamped Inductive Load Switching



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		

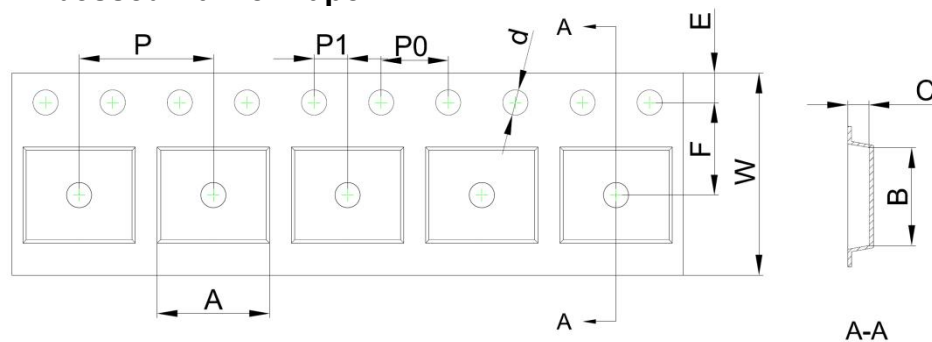
Table 1. SnPb Eutectic Process – Classification Temperatures (T_C)

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

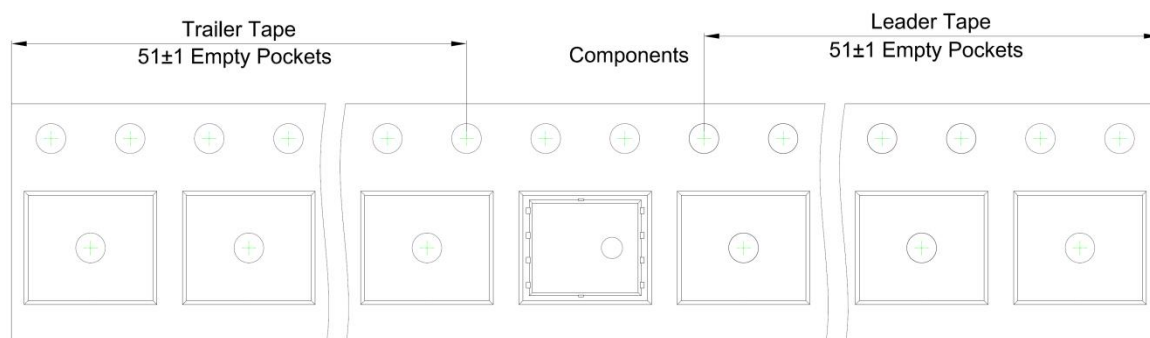
PDFN5X6-8L Embossed Carrier Tape



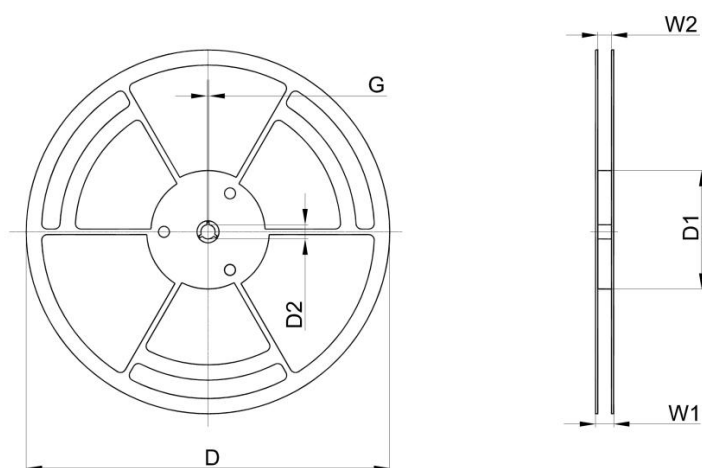
Dimensions are in millimeter

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

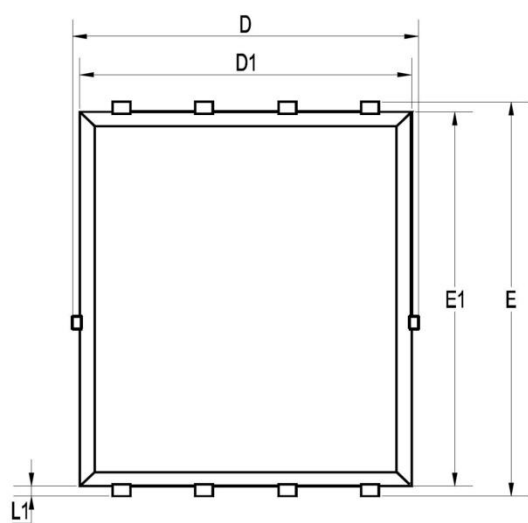


Dimensions are in millimeter

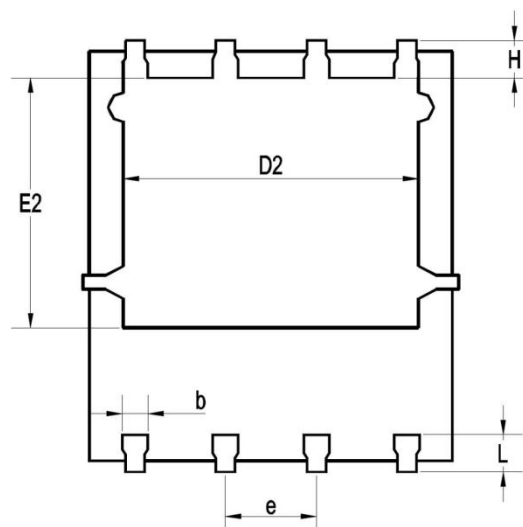
Reel Option	D	D1	D2	G	W1	W2
13" Dia	Ø330.00	100.00	13.00	1.90	17.60	12.40

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

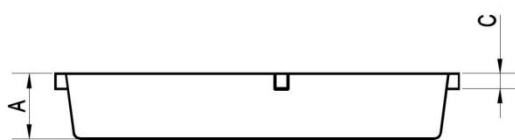
PDFN5X6-8L Package Information



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	1.200	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