Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
-20V	130mΩ@-4.5V	-1.0A
	180mΩ@-2.5V	

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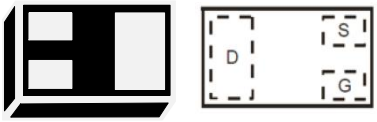
Feature

- High power and current handing capability
- Surface mount package

Application

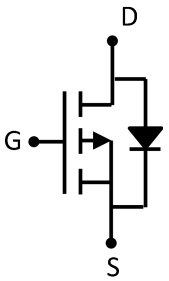
- Battery Switch
- DC/DC Converter

Package

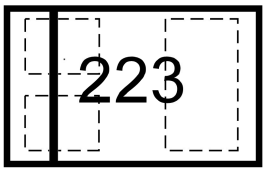


PDFN1006-3L

Circuit diagram



Marking



223 **:Device Code**

Order Information

Device	Package	Unit/Tape
SP2231NC	PDFN1006-3L	10000

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

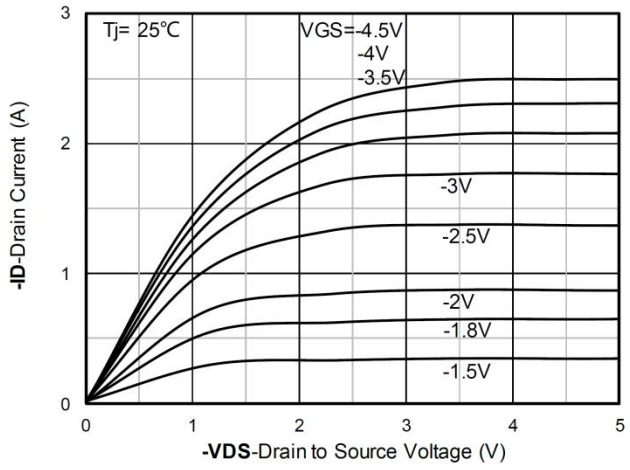
Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-20	V
Gate-Source Voltage	V_{GSS}	±12	V
Continuous Drain Current (Ta=25℃)	I_D	-1	A
Continuous Drain Current (Ta=100℃)	I_D	-0.67	A
Pulse Drain Current Tested	I_{DM}	-4	A
Power Dissipation (Ta=25℃)	P_D	150	mW
Power Dissipation (Ta=100℃)	P_D	60	mW
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	833	°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℃, unless otherwise noted)

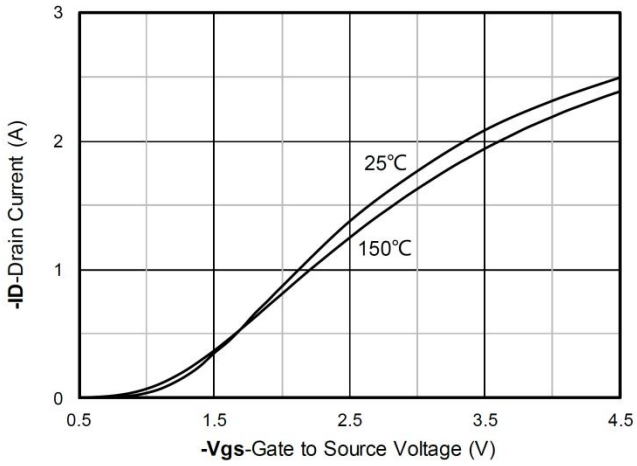
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	VGS=0V , ID=-250μA	-20	-	-	V
Drain-Source Leakage Current	I_{DSS}	VDS=-16V , VGS=0V	-	-	-1	uA
Gate-Source Leakage Current	I_{GSS}	VGS=±12V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	$V_{GS(th)}$	VDS=VGS , ID=-250μA	-0.5	-0.7	-1.0	V
Static Drain-Source On-Resistance	$R_{DS(ON)}$	VGS=-4.5V , ID=-0.5A	-	130	160	mΩ
		VGS=-2.5V , ID=-0.4A	-	180	270	
Dynamic characteristics						
Input Capacitance	C_{iss}	VDS=-10V , VGS=0V , f=1MHz	-	270	-	pF
Output Capacitance	C_{oss}		-	55	-	
Reverse Transfer Capacitance	C_{rss}		-	30	-	
Total Gate Charge	Q_g	VDS=-10V , VGS=-4.5V , ID=-2A	-	2.5	-	nC
Gate-Source Charge	Q_{gs}		-	0.46	-	
Gate-Drain Charge	Q_{gd}		-	0.1	-	
Gate Plateau Voltage	$V_{plateau}$		-	-2.1	-	V
Switching Characteristics						
Turn-On Delay Time	$t_{d(on)}$	VDD=-10V VGS=-4.5V , RG=3Ω , RL=5Ω	-	10	-	nS
Turn-On Rise Time	t_r		-	5	-	
Turn-Off Delay Time	$t_{d(off)}$		-	21	-	
Turn-Off Fall Time	t_f		-	7	-	
Source-Drain Diode characteristics						
Diode Forward Voltage	V_{SD}	VGS=0V , IS=-1A , TJ=25℃	-	-	-1.2	V

.

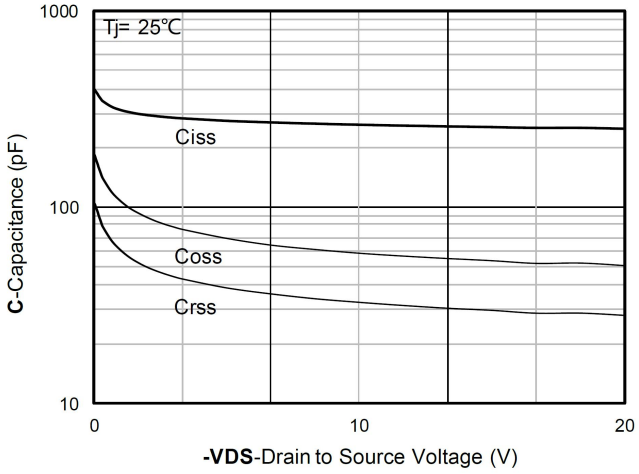
Typical Characteristics



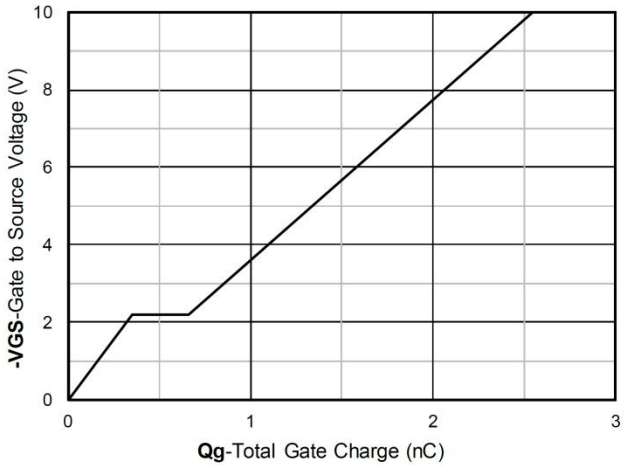
Output Characteristics



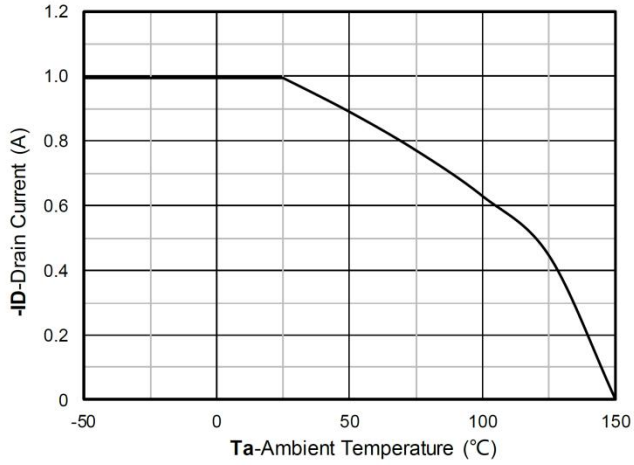
Transfer Characteristics



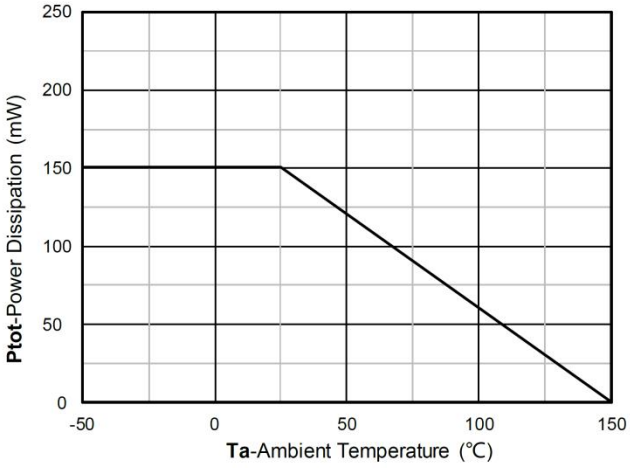
Capacitance Characteristics



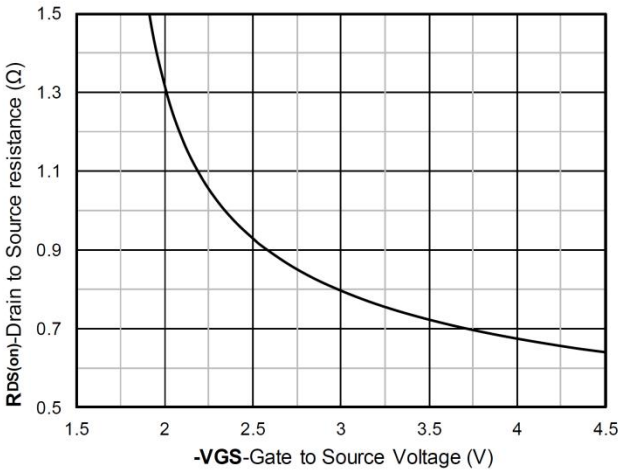
Gate Charge



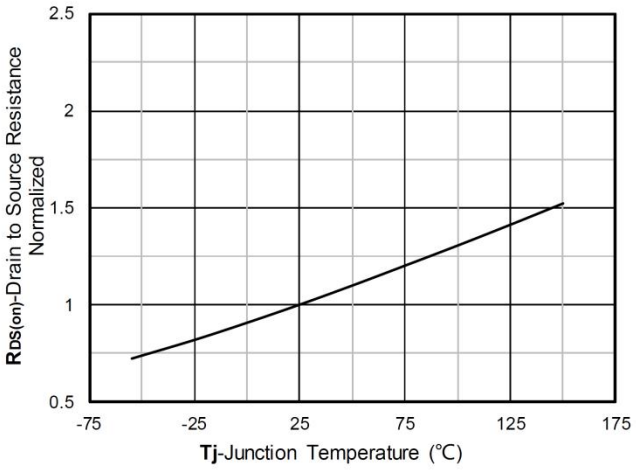
Current dissipation



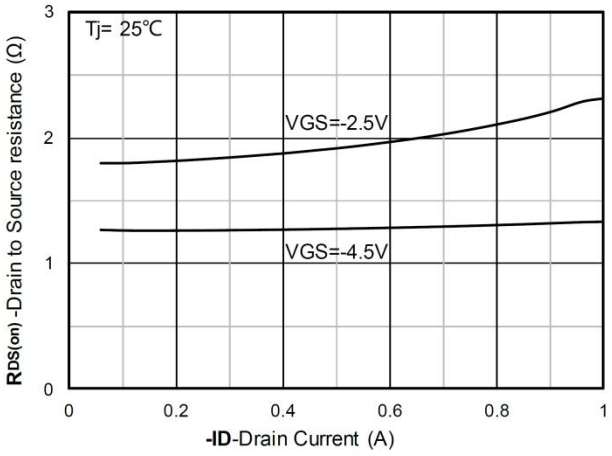
Power dissipation



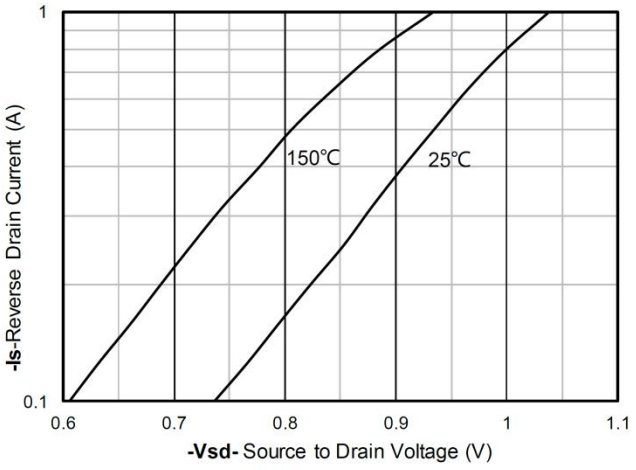
On-Resistance vs Gate to Source Voltage



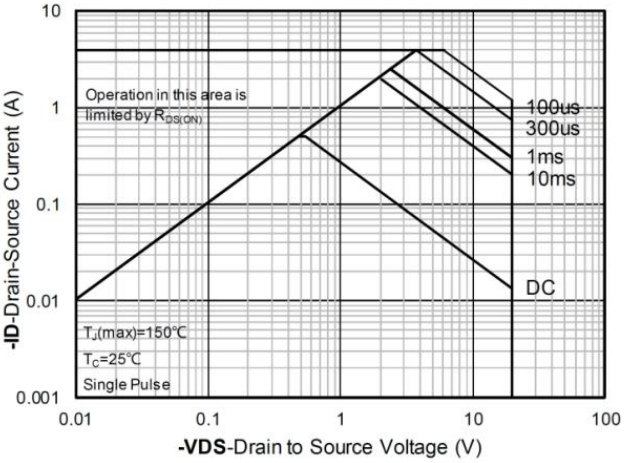
Normalized On-Resistance



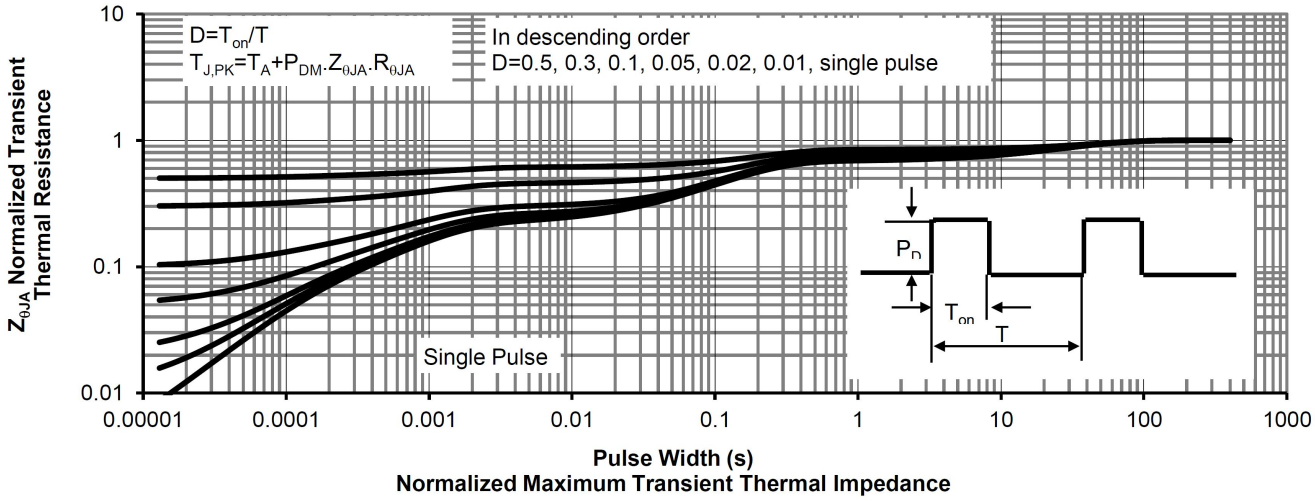
RDS(on) VS Drain Current



Forward characteristics of reverse diode



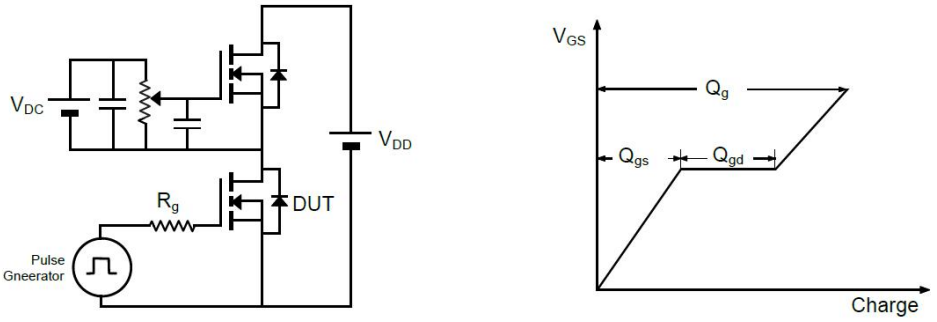
Safe Operation Area



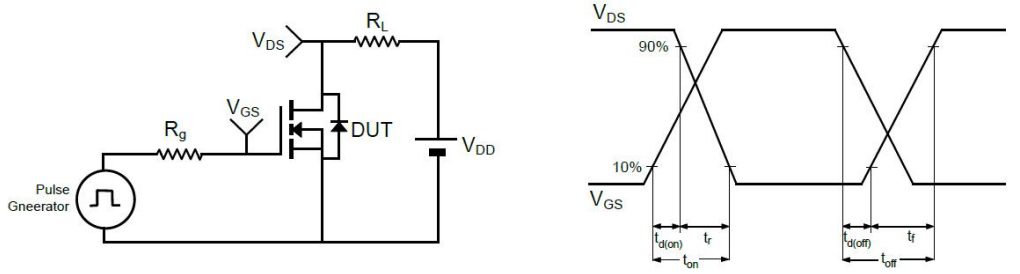
Normalized Maximum Transient Thermal Impedance

Test Circuit

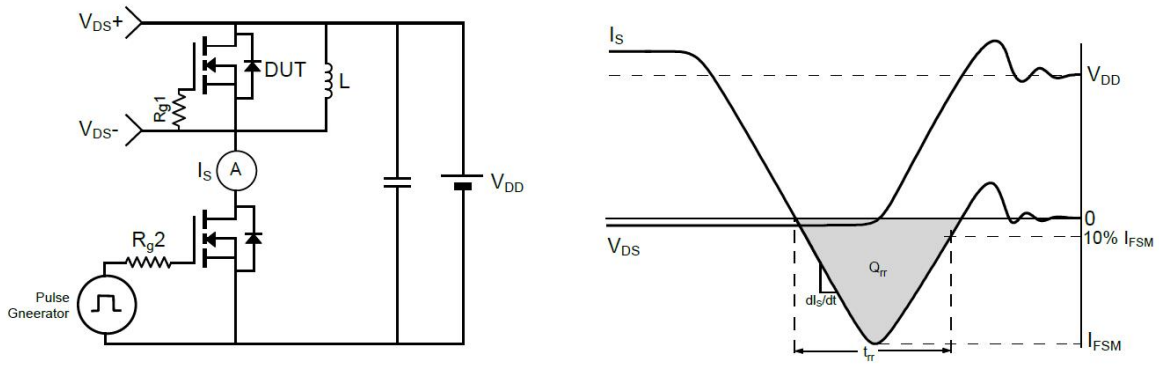
Gate Charge



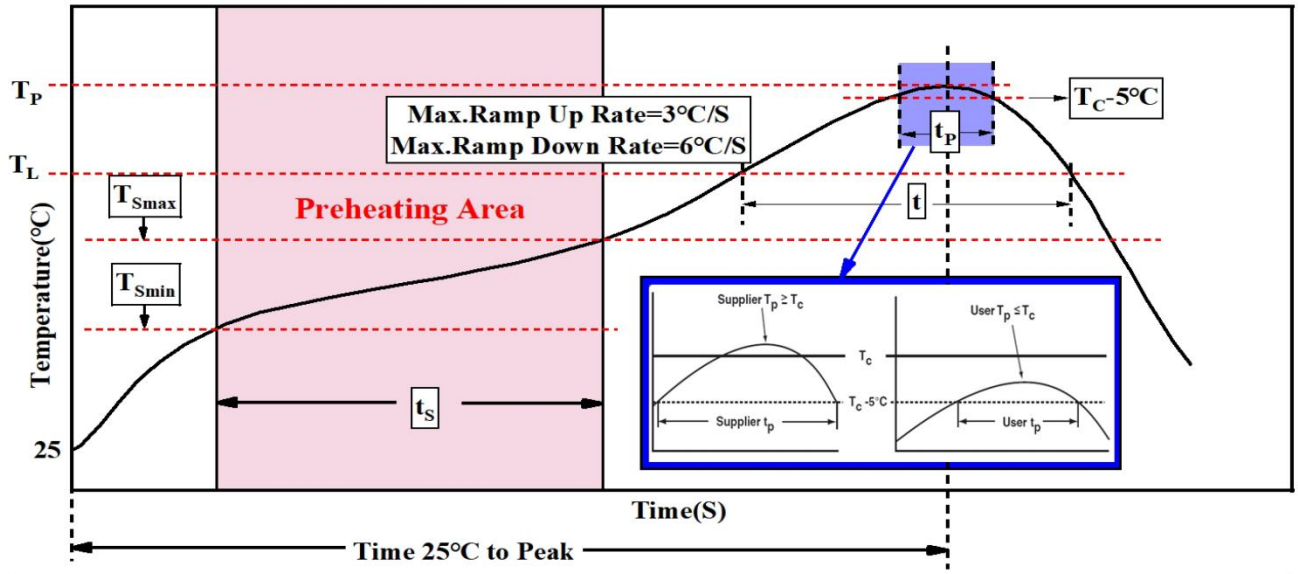
Resistive Load Switching Time



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)

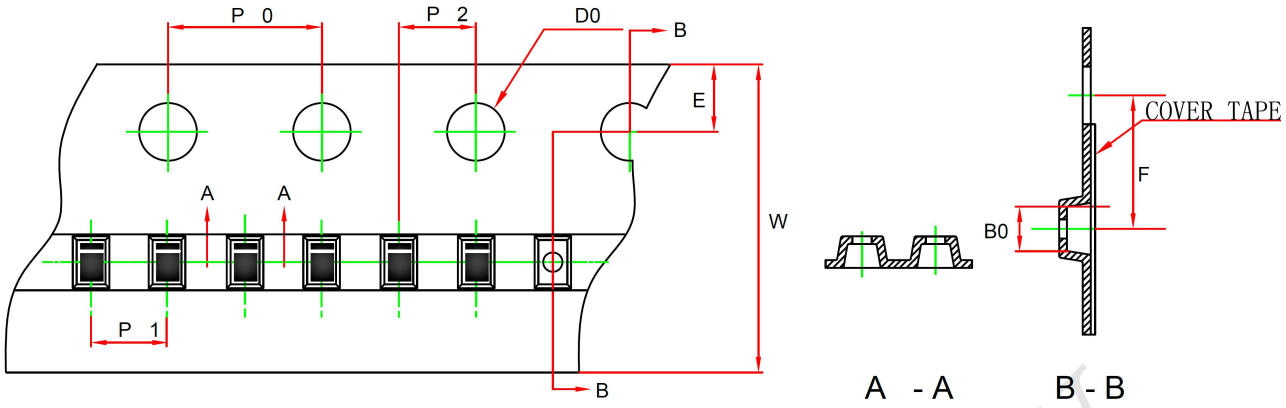
Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

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

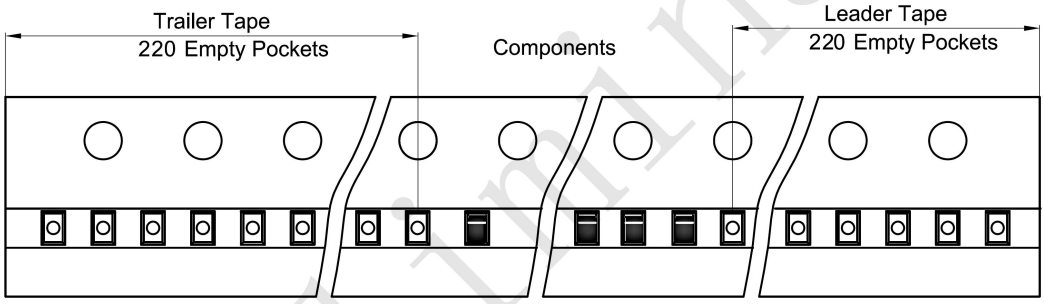
PDFN1006-3L Tape and Reel

PDFN1006-3L Embossed Carrier Tape

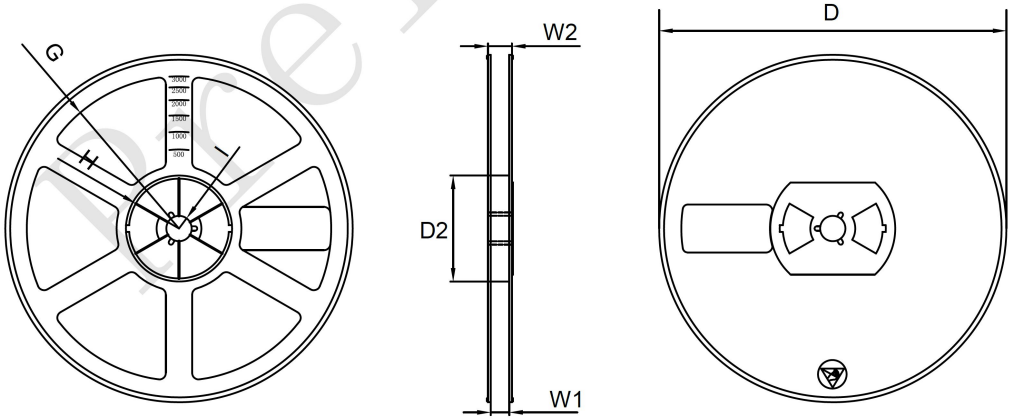


Dimensions In Millimeters (mm)								
Pkg type	B0	P0	P1	P2	E	F	W	D0
DFN1006-3L	1.11	4.00	2.00	2.00	1.75	3.50	8.00	1.55
Tolerance	+/-0.06	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.1	+/-0.3	+/-0.1

PDFN1006-3L Tape Leader and Trailer



PDFN1006-3L Reel

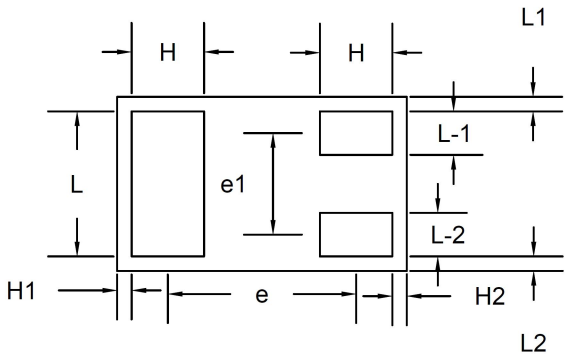


Symbol	Dimensions In Millimeters (mm)						
	D	D2	G	H	I	W1	W2
7" Dia	Φ178.00	54.50	R78.00	R25.6	R6.5	9.50	12.30
Tolerance	+/-2	+/-1	+/-1	+/-1	+/-1	+/-2	+/-1.5

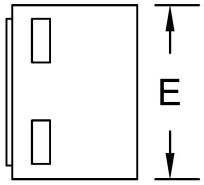
REEL	Reel Size	Box	Box size(mm)	Carton	Carton Size(mm)
10000 pcs	7 inch	150000 pcs	220×220×210	600000 pcs	450×450×240

Preliminary

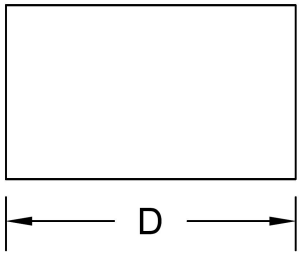
PDFN1006-3L Package Information



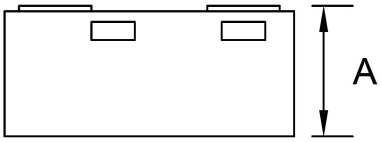
TOP VIEW
［顶视图］



SIDE VIEW
［侧视图］



BOTTOM VIEW
［底视图］



SIDE VIEW
［侧视图］

Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.44	0.51
L	0.45	0.55
L-1/L-2	0.10	0.20
H	0.20	0.30
D	0.95	1.05
E	0.55	0.65
L1/L2	0.05REF	
H1/H2	0.05REF	
e	0.65BSC	
e1	0.35BSC	