

Product Summary

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



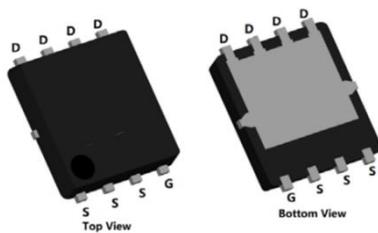
Feature

- Fast Switching
- Low Gate Charge and R_{ds(on)}
- AEC-Q101 qualified
- Advanced Split Gate Trench Technology
- 100% Single Pulse avalanche energy Test

Applications

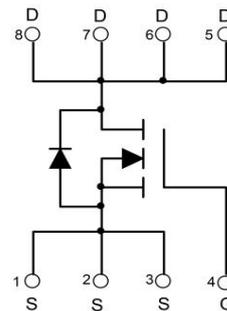
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

Package

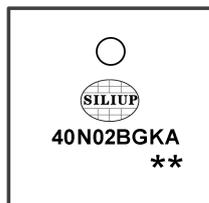


PDFN5X6-8L

Circuit diagram



Marking



40N02BGKA =Device Code
** =Week Code

Order Information

Device	Package	Unit/Tape
SP40N02BGNKA	PDFN5X6-8L	5000

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

Parameter	Symbol	Rating	Units	
Drain-Source Voltage	V _{DS}	40	V	
Gate-Source Voltage	V _{GS}	±20	V	
Continuous Drain Current (T _c =25°C)	Package Limit	I _D	120	A
Continuous Drain Current (T _c =25°C)				
Continuous Drain Current (T _c =100°C)	I _D	91	A	
Pulse Drain Current Tested	I _{DM}	480	A	
Single pulsed avalanche energy ¹	E _{AS}	162	mJ	
Power Dissipation (T _c =25°C)	P _D	85	W	
Power Dissipation (T _c =100°C)	P _D	42.5	W	
Thermal Resistance Junction-to-Case	R _{θJC}	1.76	°C/W	
Thermal Resistance Junction-to-Ambient	R _{θJA}	58	°C/W	
Storage Temperature Range	T _{STG}	-55 to 175	°C	
Operating Junction Temperature Range	T _J	-55 to 175	°C	

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

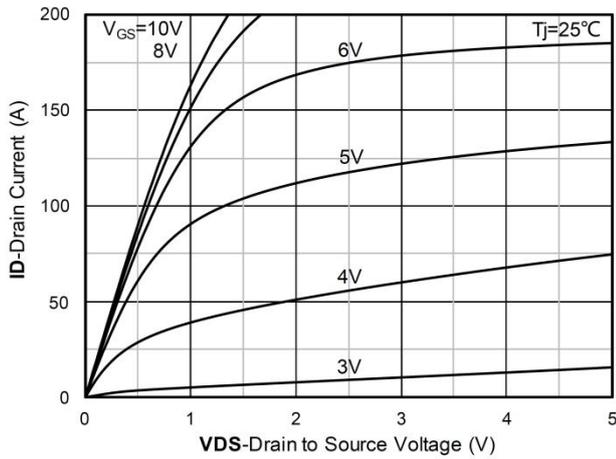
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250uA	40	45	-	V
Drain-Source Leakage Current	I _{DSS}	V _{DS} =40V, V _{GS} =0V, T _J =25°C	-	-	1	uA
Gate-Source Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{GS} =V _{DS} , I _D =250uA	1.2	1.7	2.2	V
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =50A	-	2.3	2.8	mΩ
Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =4.5V, I _D =50A	-	3.3	4.0	mΩ
Gate Resistance	R _G	V _{DS} =20V, V _{GS} =0V, f=1MHz	-	2.0	-	Ω
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, f=1MHz	-	2856	-	pF
Output Capacitance	C _{oss}		-	798	-	
Reverse Transfer Capacitance	C _{rss}		-	87	-	
Total Gate Charge	Q _g	V _{DS} =20V, V _{GS} =10V, I _D =50A	-	40	-	nC
Gate-Source Charge	Q _{gs}		-	10	-	
Gate-Drain Charge	Q _{gd}		-	12	-	
Gate Plateau Voltage	V _{plateau}		-	4.3	-	
Switching Characteristics						
Turn-On Delay Time	T _{d(on)}	V _{DD} =20V, V _{GS} =10V, R _G =1.9Ω, I _D =50A	-	14	-	nS
Rise Time	T _r		-	16	-	
Turn-Off Delay Time	T _{d(off)}		-	25	-	
Fall Time	T _f		-	13	-	
Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =1A, T _J =25°C	-	-	1.2	V
Diode Continuous Current	I _S	I _S =50A, di/dt=100A/us, T _J =25°C	-	-	120	A
Reverse recover time	T _{rr}		-	42	-	nS
Reverse recovery charge	Q _{rr}		-	38	-	nC

Note :

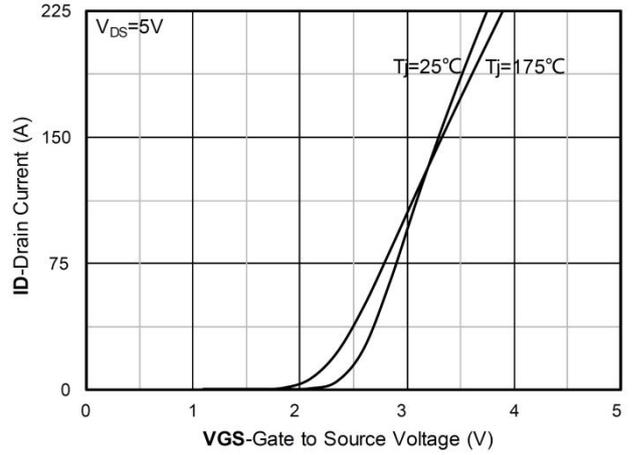
1. The test condition is V_{DD}=15V, V_{GS}=10V, L=0.5mH, R_G=25Ω



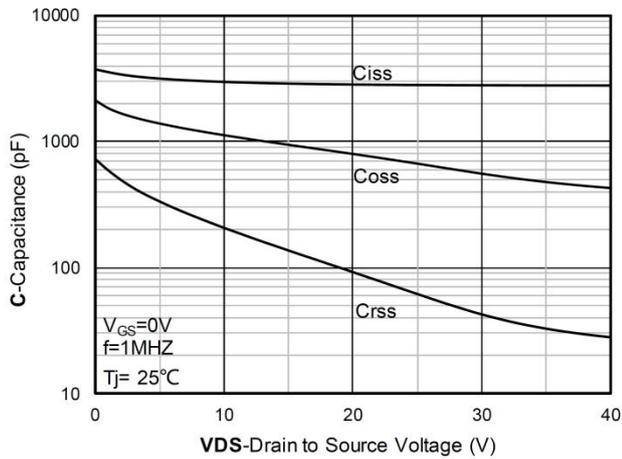
Typical Characteristics



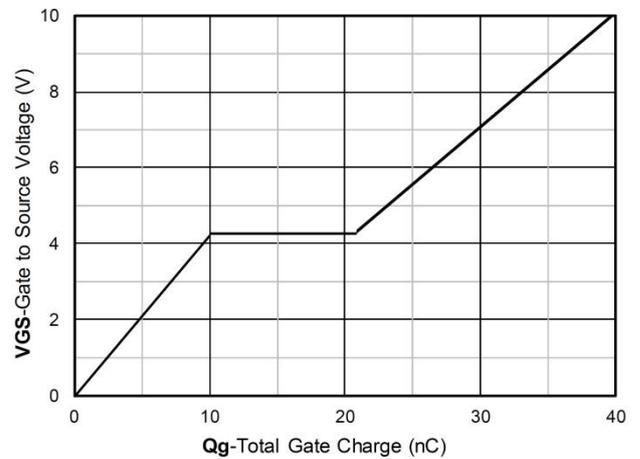
Output Characteristics



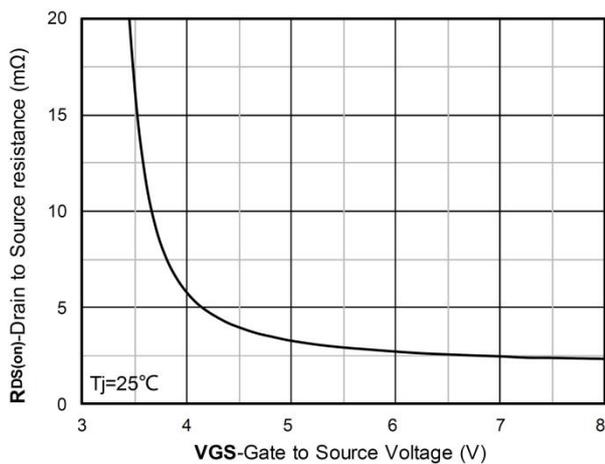
Transfer Characteristics



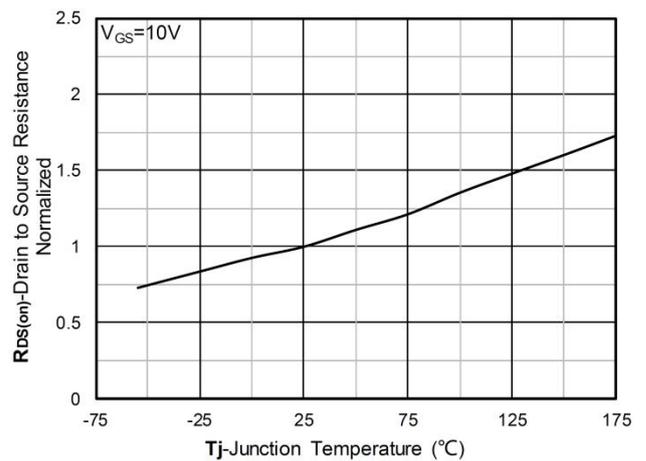
Capacitance Characteristics



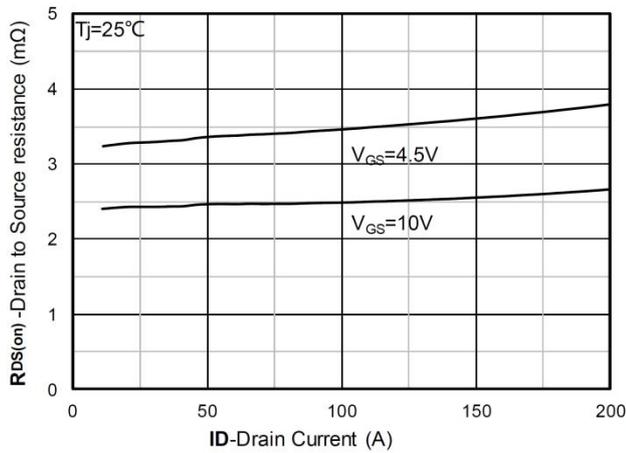
Gate Charge



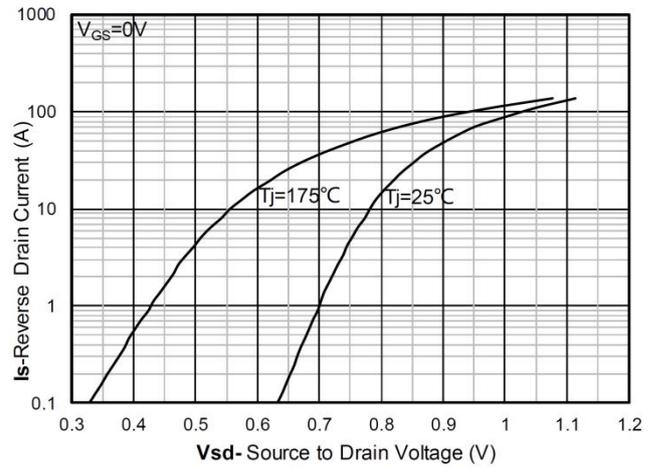
On-Resistance vs Gate to Source Voltage



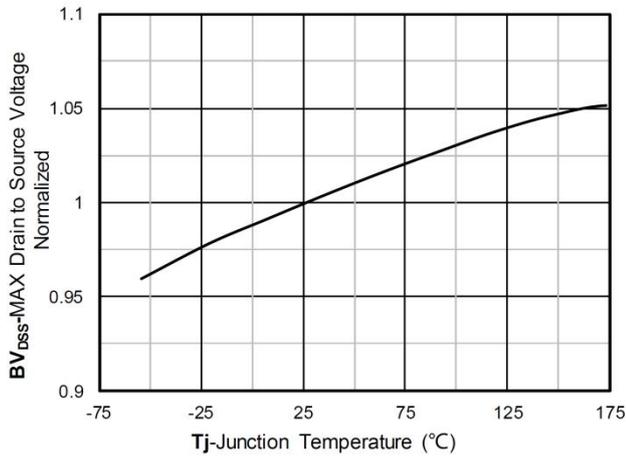
Normalized On-Resistance



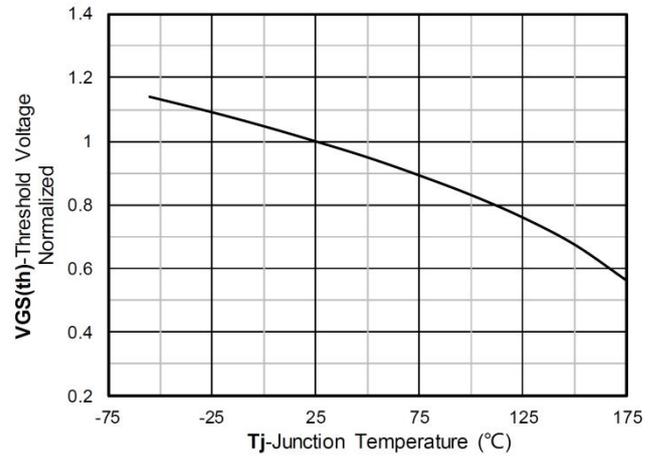
RDS(on) VS Drain Current



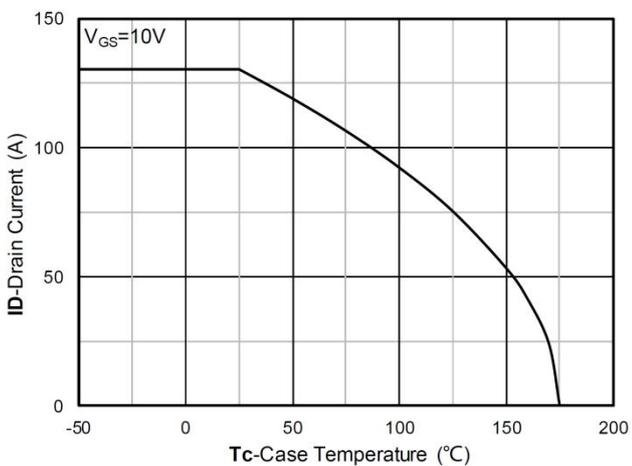
Forward characteristics of reverse diode



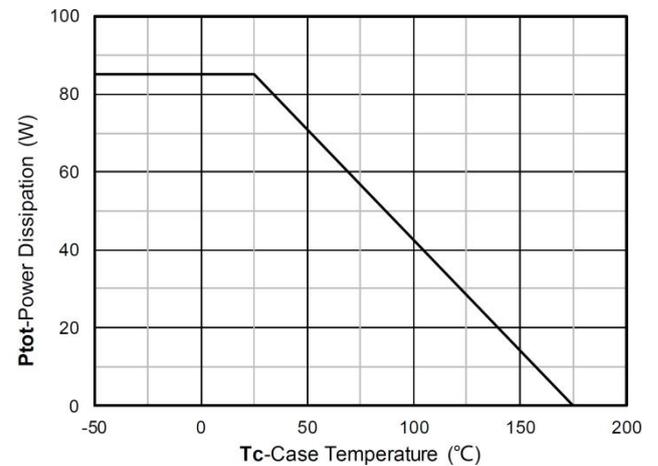
Normalized breakdown voltage



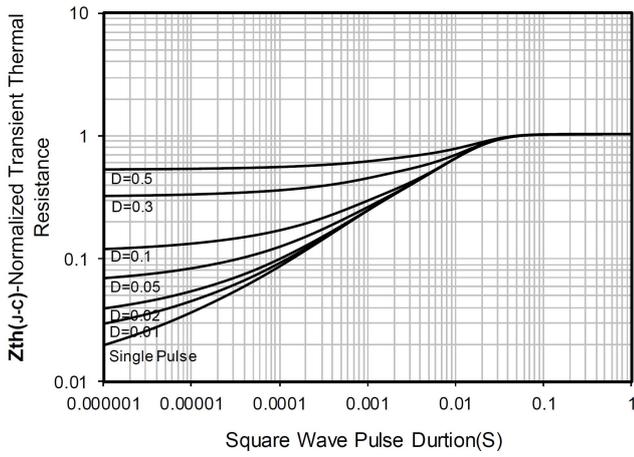
Normalized Threshold voltage



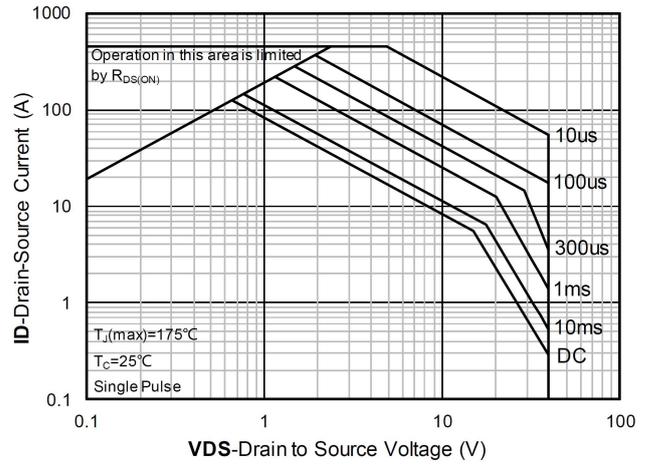
Current dissipation



Power dissipation

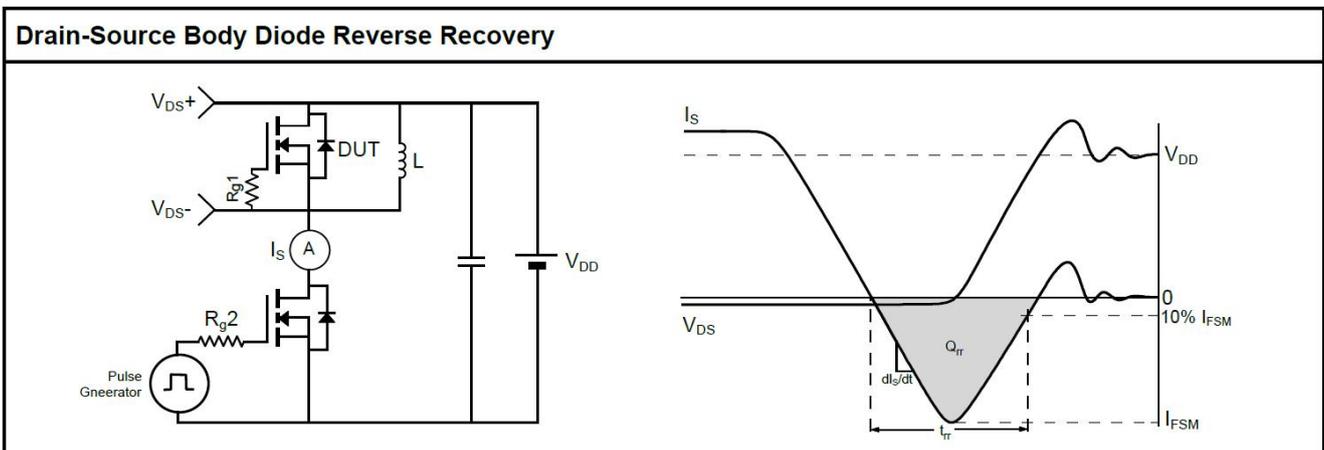
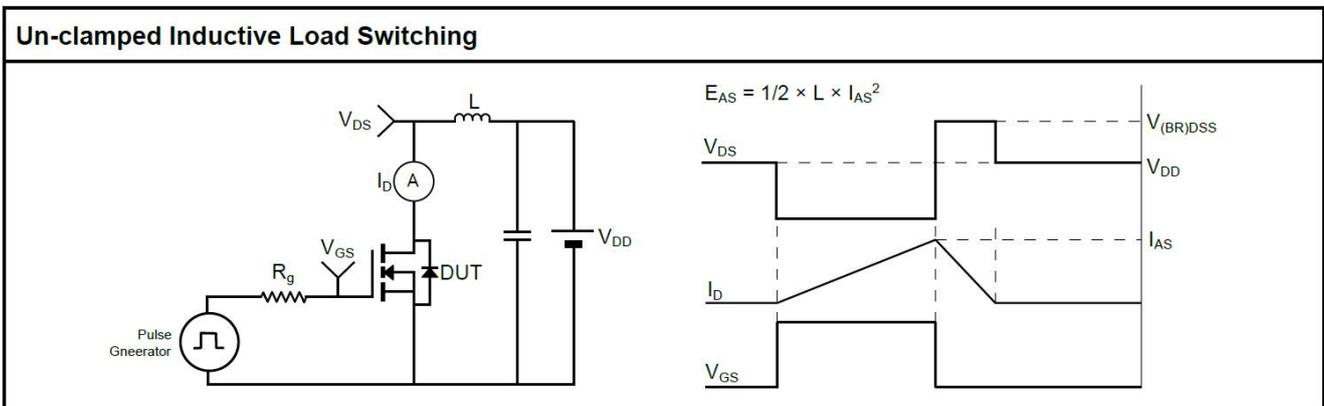
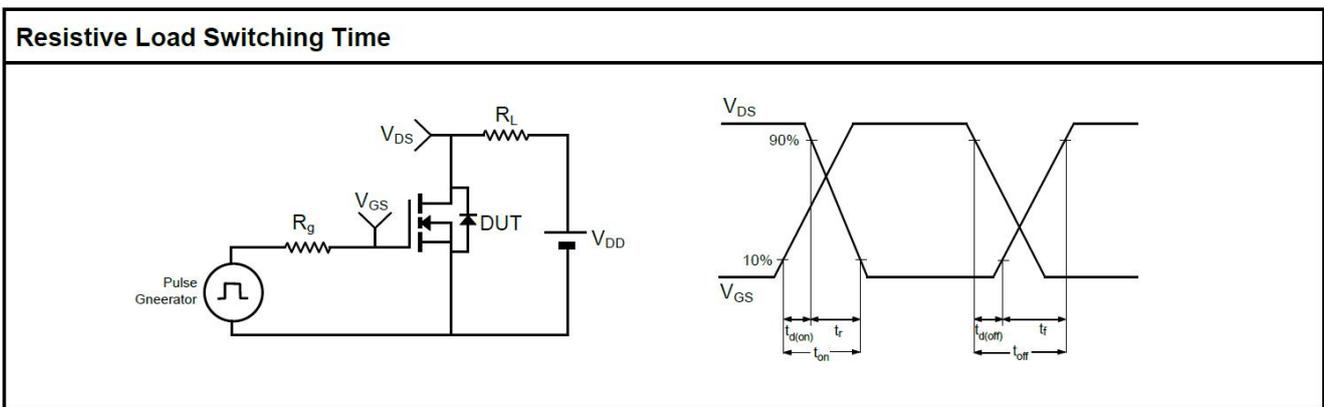
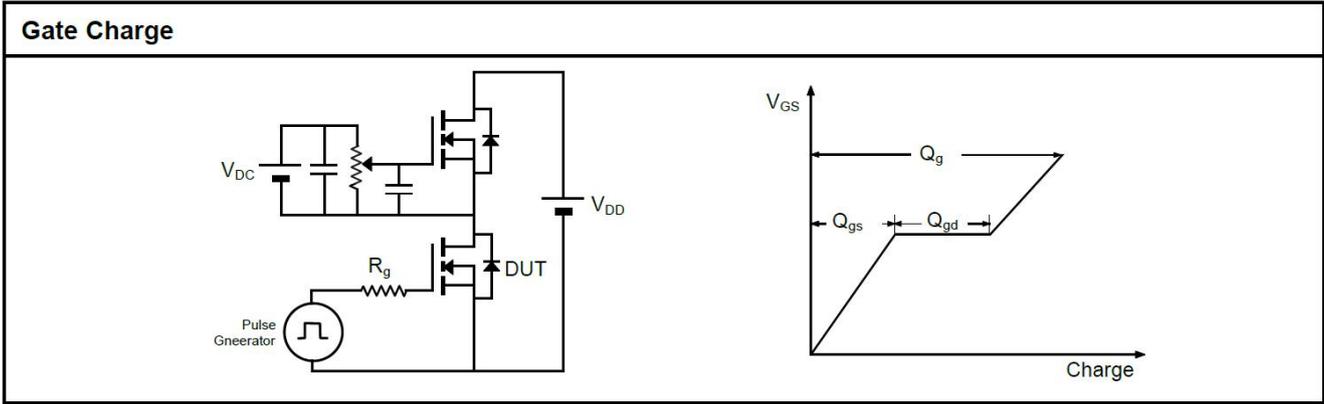


Maximum Transient Thermal Impedance

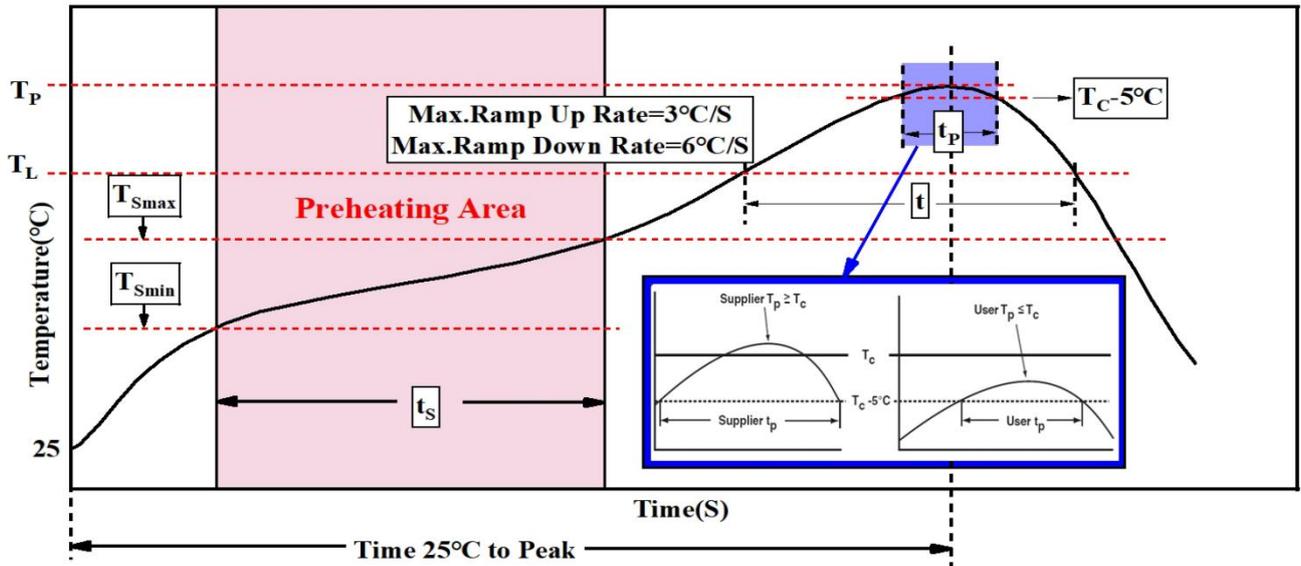


Safe Operation Area

Test Circuit



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)

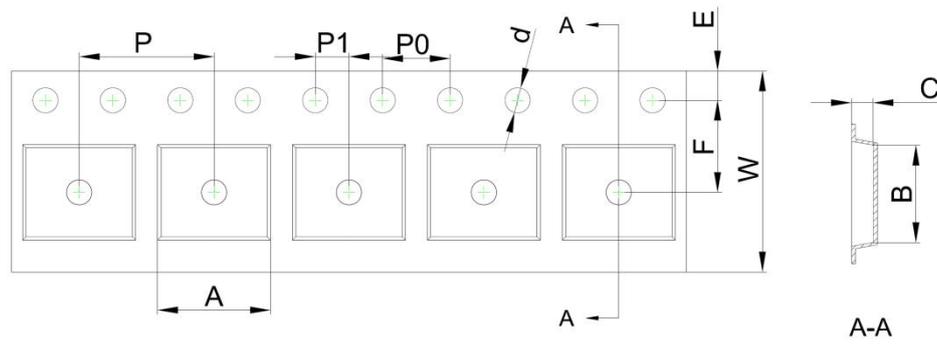
Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

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

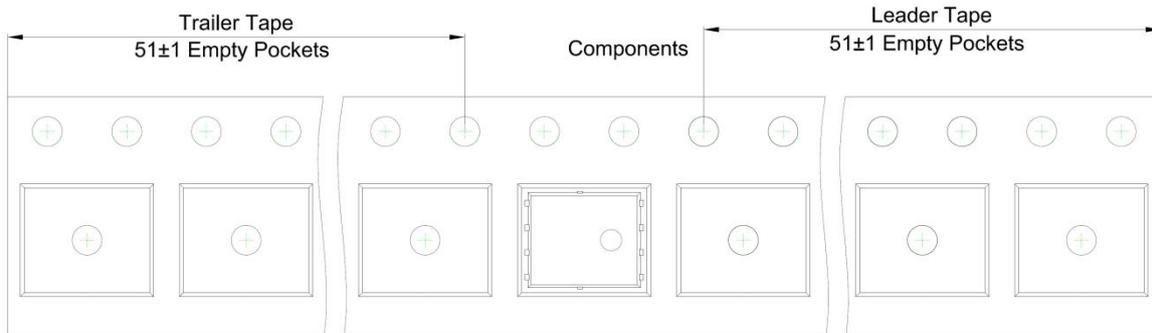


PDFN5X6-8L Embossed Carrier Tape

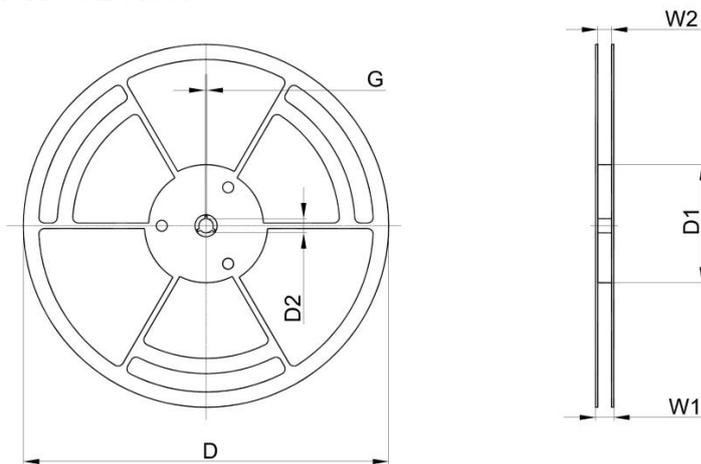


Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
PDFN5X6-8L	6.30	5.30	1.10	Φ1.50	1.75	5.50	4.00	8.00	2.00	12.00

PDFN5X6-8L Tape Leader and Trailer



PDFN5X6-8L Reel

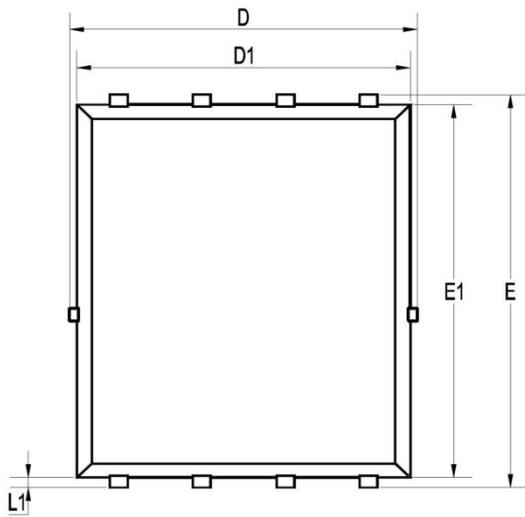


Dimensions are in millimeter						
Reel Option	D	D1	D2	G	W1	W2
13" Dia	Ø330.00	100.00	13.00	1.90	17.60	12.40

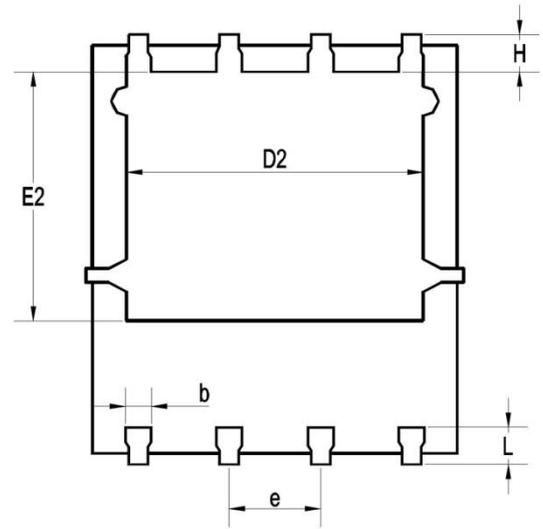
REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)
5,000 pcs	13 inch	5,000 pcs	340×336×29	50,000 pcs	353×346×365



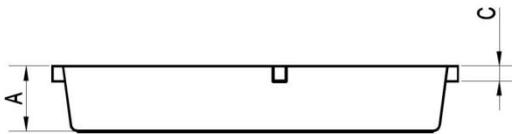
PDFN5X6-8L Package Information



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