

## NCE N-Channel Super Trench Power MOSFET

### Description

The NCEP30T22GU uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $Q_g$ . This device is ideal for high-frequency switching and synchronous rectification.

### Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

### General Features

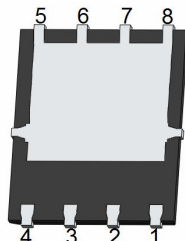
- $V_{DS} = 30V, I_D = 220A$ 
  - $R_{DS(ON)} = 0.62m\Omega$  (typical) @  $V_{GS} = 10V$
  - $R_{DS(ON)} = 0.80m\Omega$  (typical) @  $V_{GS} = 4.5V$
- Excellent gate charge x  $R_{DS(on)}$  product(FOM)
- Very low on-resistance  $R_{DS(on)}$
- 150°C operating temperature
- Pb-free lead plating

**100% UIS TESTED!**  
**100%  $\Delta V_{ds}$  TESTED!**

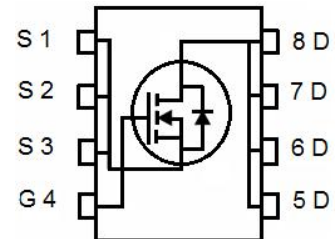
### PDFN 5X6-8L



Top View



Bottom View



Schematic Diagram

### Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P30T22GU	NCEP30T22GU	PDFN5X6-8L	Ø330mm	12mm	5000units

### Absolute Maximum Ratings ( $T_c = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	220	A
Drain Current-Continuous( $T_c = 100^\circ\text{C}$ )	$I_D(100^\circ\text{C})$	170	A
Pulsed Drain Current	$I_{DM}$	880	A
Maximum Power Dissipation	$P_D$	200	W
Derating factor		1.60	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 1)	$E_{AS}$	1880	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ\text{C}$

### Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.63	$^\circ\text{C/W}$
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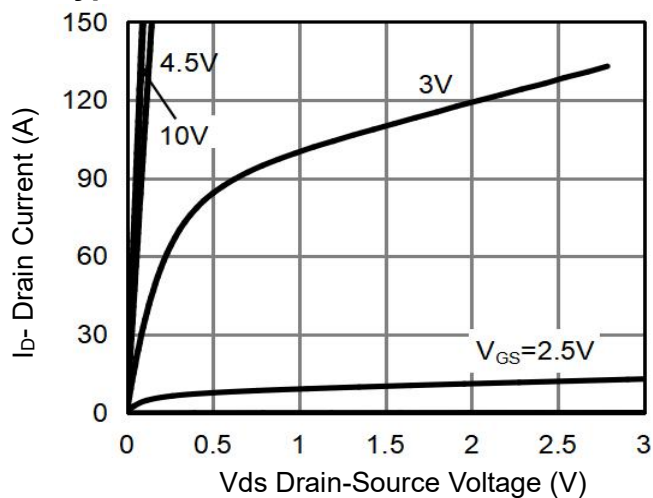
## Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

Parameter	Symbol		Condition	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>		V <sub>GS</sub> =0V I <sub>D</sub> =250μA	30		-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	T <sub>J</sub> =25°C	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	-	-	1	μA
		T <sub>J</sub> =60°C		-	-	2	μA
		T <sub>J</sub> =125°C		-	-	10	μA
Gate-Body Leakage Current	I <sub>GSS</sub>		V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics							
Gate Threshold Voltage	V <sub>GS(th)</sub>		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.7	2.5	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>		V <sub>GS</sub> =10V, I <sub>D</sub> =100A	-	0.62	0.8	mΩ
			V <sub>GS</sub> =4.5V, I <sub>D</sub> =100A	-	0.80	1.08	mΩ
Forward Transconductance	g <sub>FS</sub>		V <sub>DS</sub> =5V, I <sub>D</sub> =100A		100	-	S
Dynamic Characteristics							
Input Capacitance	C <sub>iss</sub>		V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, F=1.0MHz	-	6950	-	PF
Output Capacitance	C <sub>oss</sub>			-	2670	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>			-	130	-	PF
Switching Characteristics <sup>(Note 2)</sup>							
Turn-on Delay Time	t <sub>d(on)</sub>		V <sub>DD</sub> =15V, I <sub>D</sub> =100A V <sub>GS</sub> =10V, R <sub>G</sub> =1.6Ω	-	12	-	nS
Turn-on Rise Time	t <sub>r</sub>			-	8	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>			-	50	-	nS
Turn-Off Fall Time	t <sub>f</sub>			-	9	-	nS
Total Gate Charge	Q <sub>g</sub>		V <sub>DS</sub> =15V, I <sub>D</sub> =100A, V <sub>GS</sub> =10V	-	106	-	nC
Gate-Source Charge	Q <sub>gs</sub>			-	15		nC
Gate-Drain Charge	Q <sub>gd</sub>			-	17		nC
Drain-Source Diode Characteristics							
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>		V <sub>GS</sub> =0V, I <sub>S</sub> =100A	-		1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>			-	-	220	A
Reverse Recovery Time	t <sub>rr</sub>		T <sub>J</sub> = 25°C, I <sub>F</sub> =I <sub>S</sub> di/dt = 100A/μs	-	32	-	nS
Reverse Recovery Charge	Q <sub>rr</sub>			-	110	-	nC

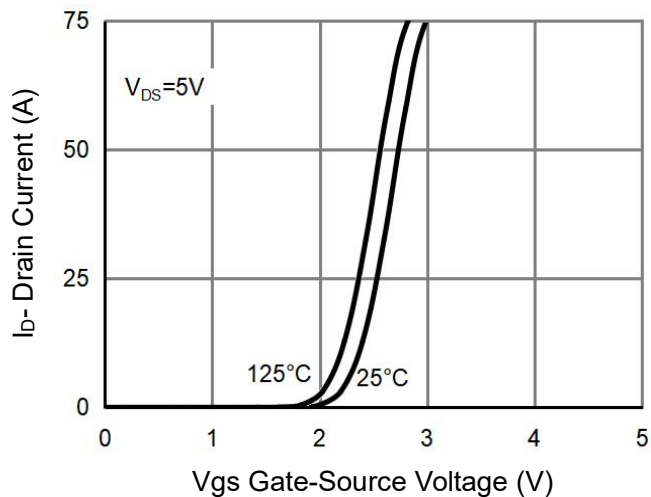
### Notes:

1. EAS condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=15V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=150°C. The SOA curve provides a single pulse rating.

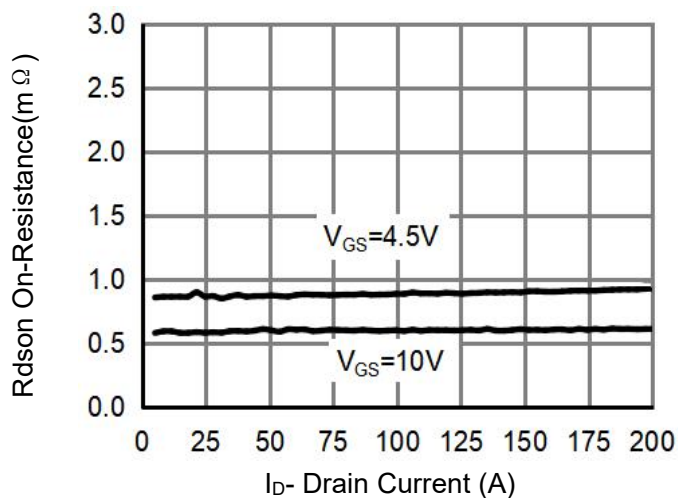
## Typical Electrical and Thermal Characteristics



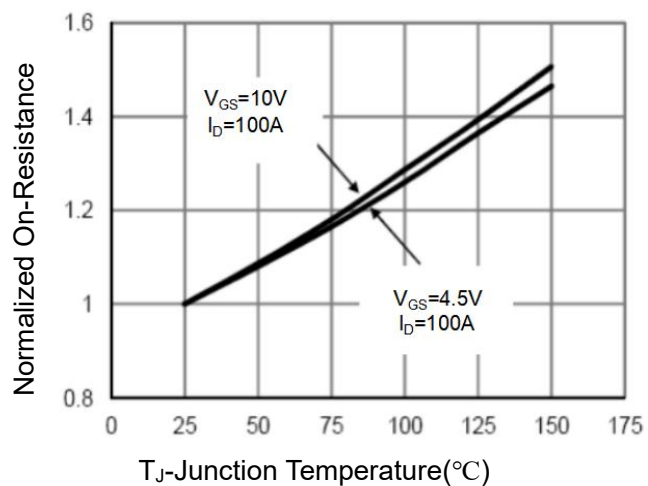
**Figure 1 Output Characteristics**



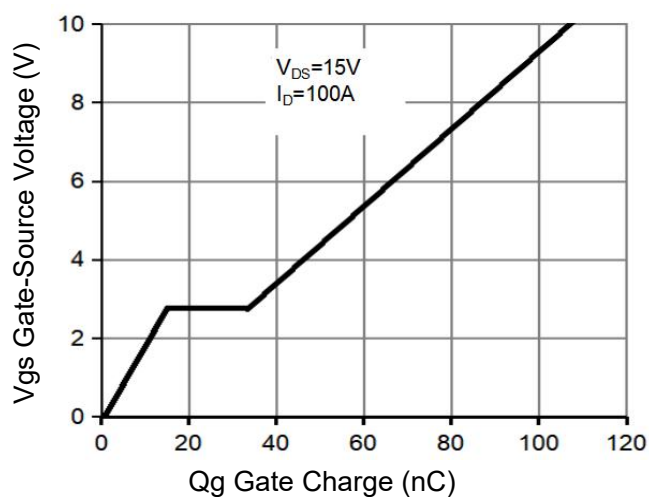
**Figure 2 Transfer Characteristics**



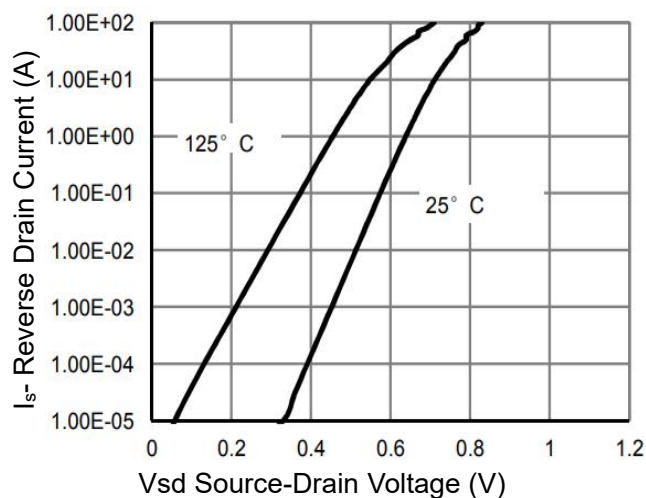
**Figure 3  $R_{DS(on)}$ - Drain Current**



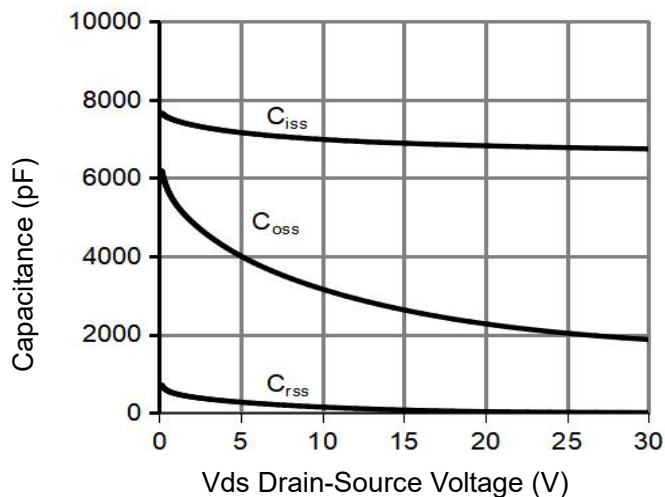
**Figure 4  $R_{DS(on)}$ -Junction Temperature**



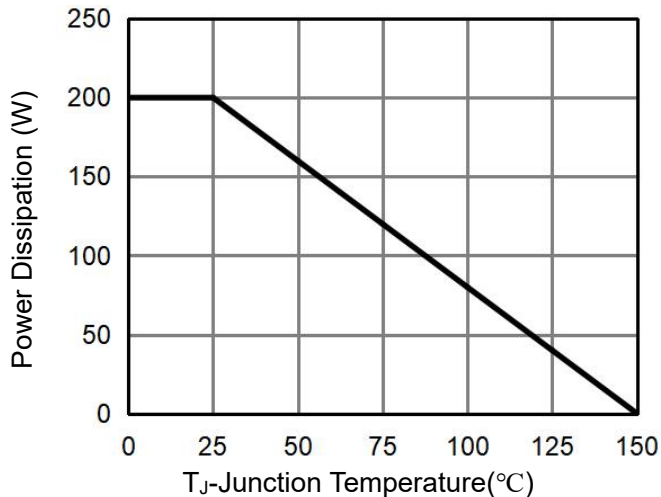
**Figure 5 Gate Charge**



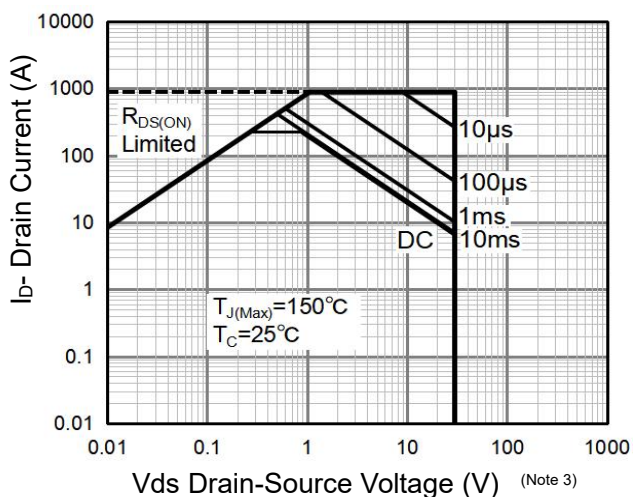
**Figure 6 Source- Drain Diode Forward**



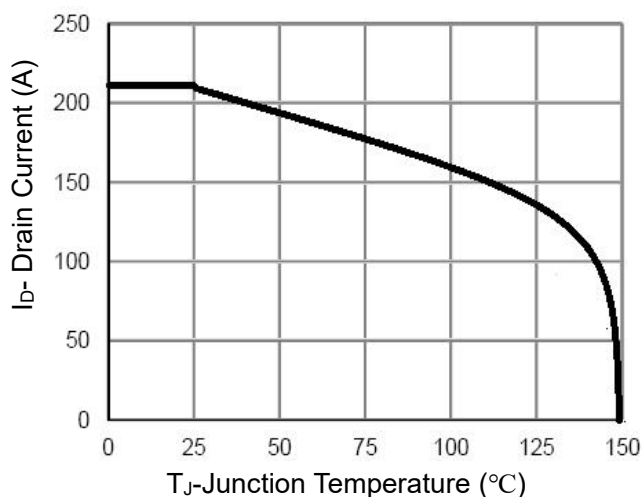
**Figure 7 Capacitance vs Vds**



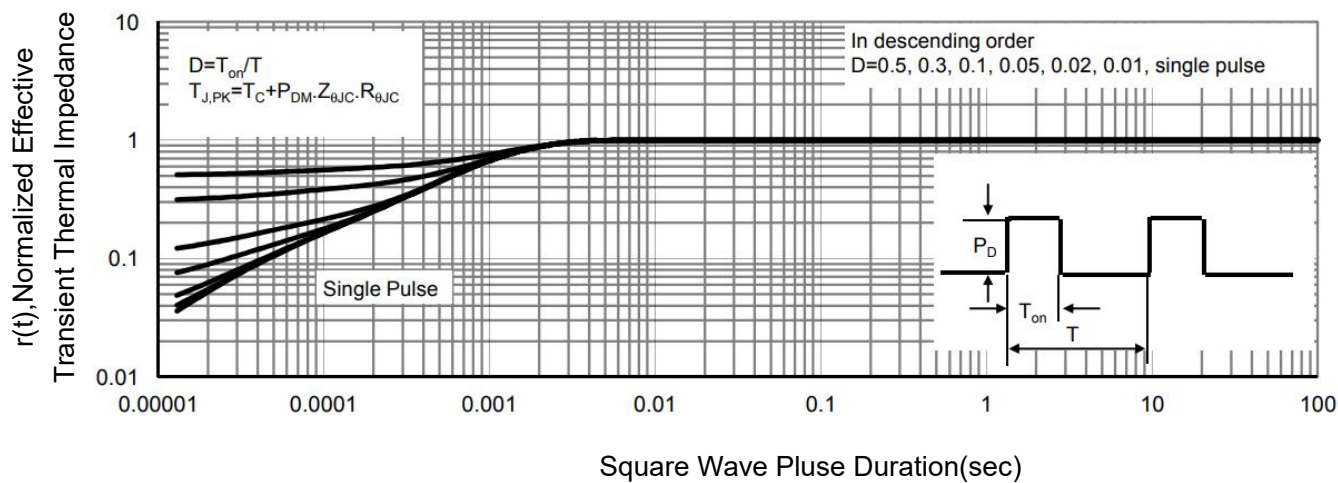
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**

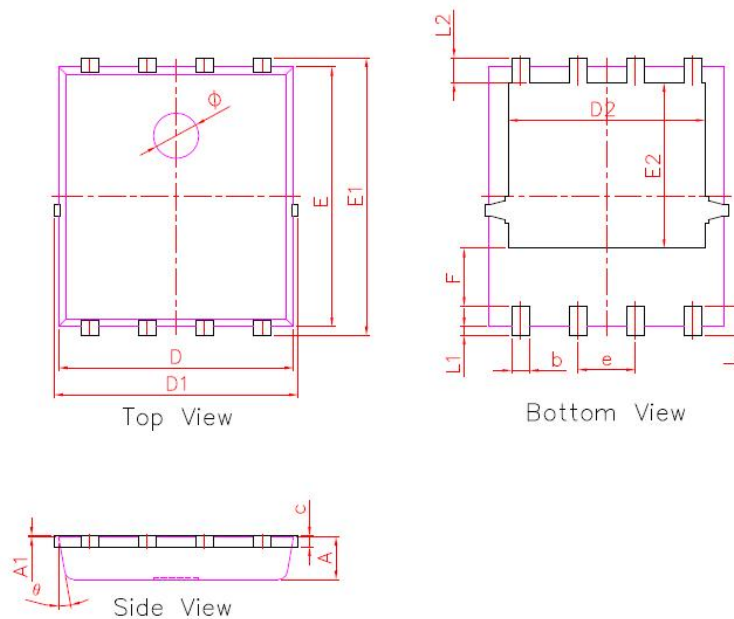


**Figure 10 Current De-rating**



**Figure 11 Normalized Maximum Transient Thermal Impedance**

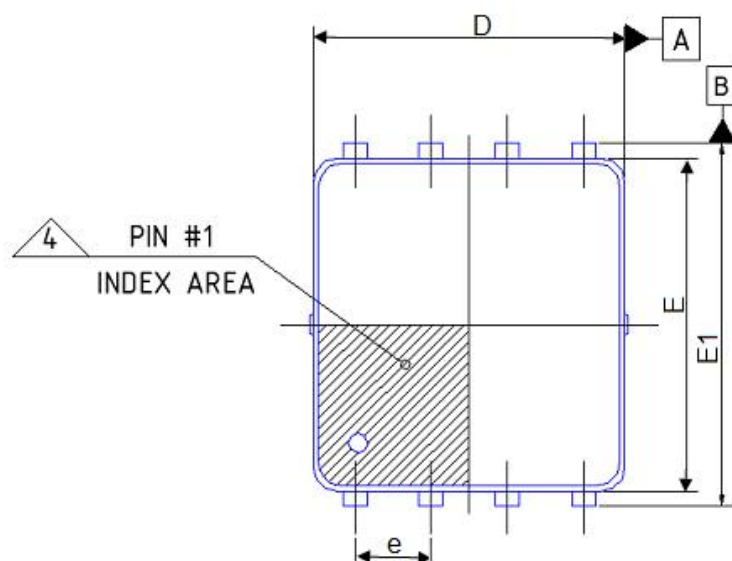
## PDFN5X6-8L(E) Package Information



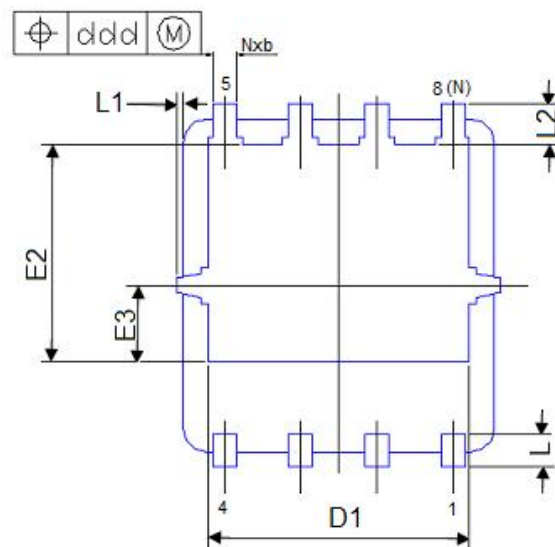
PDFN5X6-8L			
DIM.	MIN.	NOM.	MAX.
A	0.90	0.95	1.00
A1	0.00	0.02	0.05
b	0.35	0.40	0.50
c	0.20	0.25	0.30
D	5.10	5.20	5.30
D1	5.10	5.40	5.50
D2	4.25	4.35	4.45
e	1.27 BSC		
E	5.70	5.75	5.80
E1	6.00	6.15	6.30
E2	3.57	3.67	3.77
F	1.18	1.28	1.38
L	0.55	0.65	0.75
L1	0.15	0.20	0.25
L2	0.45	0.55	0.65
Φ	0.90	1.00	1.10
Θ	8°	10°	12°
All dimensions in millimeters			



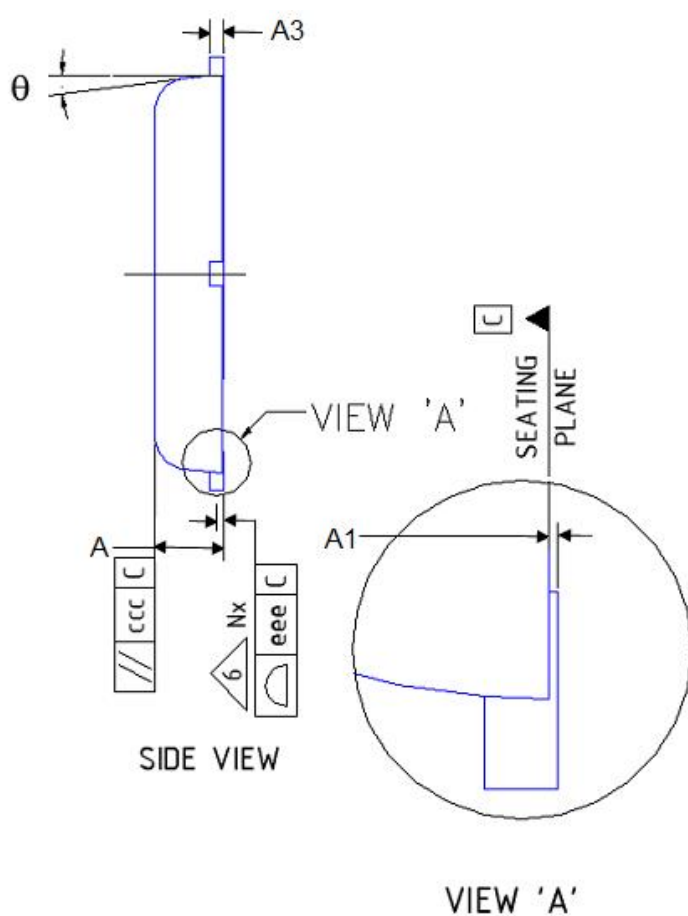
## PDFN5X6-8L(f) Package Information



TOP VIEW



BOTTOM VIEW



Dimension Table				
Thickness Symbol	V			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	0.85	0.95	1.00	
A1	0.00	---	0.05	
A3	---	0.2 Ref	---	
b	0.30	0.40	0.50	
D	5.10	5.20	5.30	
E	5.45	5.55	5.65	
e	1.27 BSC			
D1	4.25	4.35	4.45	
E1	5.95	6.05	6.15	
E2	3.525	3.625	3.725	
E3	1.175	1.275	1.375	
L	0.45	0.55	0.65	
L1	0	---	0.15	
L2	0.68 REF			
θ	0°	---	10°	
aaa	0.05			
bbb	0.10			
ccc	0.10			
ddd	0.05			
eee	0.08			
N	8			
ND	4			
NOTES	1,2			

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