

NCE N-Channel **Super Trench** Power MOSFET

Description

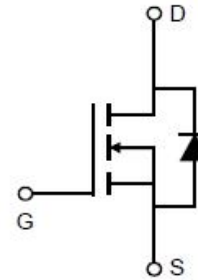
The NCEP40T20GU uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(on)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

General Features

- $V_{DS} = 40V, I_D = 200A$
 $R_{DS(on)} = 0.9m\Omega$ (typical) @ $V_{GS} = 10V$
 $R_{DS(on)} = 1.15m\Omega$ (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

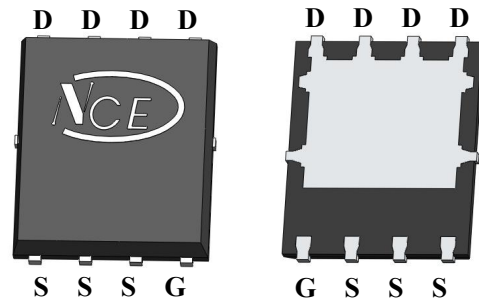
Application

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



Schematic Diagram

PDFN5X6-8L



Top View

Bottom View

100% UIS TESTED!
100% ΔV_{ds} TESTED!

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P40T20GU	NCEP40T20GU	PDFN5X6-8L	Ø330mm	12mm	5000units

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous (Silicon Limited)	I_D	200	A
Drain Current-Continuous($T_c = 100^\circ C$)	$I_D(100^\circ C)$	150	A
Pulsed Drain Current	I_{DM}	800	A
Maximum Power Dissipation	P_D	180	W
Derating factor		1.44	W/ $^\circ C$
Single pulse avalanche energy ^(Note 1)	E_{AS}	1800	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.67	$^{\circ}\text{C/W}$
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Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V,V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	1.0	1.5	2.2	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =100A	-	0.9	1.1	mΩ
		V _{GS} =4.5V, I _D =100A	-	1.15	1.5	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V,I _D =100A		90	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V,V _{GS} =0V, F=1.0MHz	-	8085	-	pF
Output Capacitance	C _{oss}		-	2123	-	pF
Reverse Transfer Capacitance	C _{rss}		-	121	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V,I _D =100A V _{GS} =10V,R _G =1.6Ω	-	13	-	nS
Turn-on Rise Time	t _r		-	8	-	nS
Turn-Off Delay Time	t _{d(off)}		-	55	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =20V,I _D =100A, V _{GS} =10V	-	137	-	nC
Gate-Source Charge	Q _{gs}		-	19	-	nC
Gate-Drain Charge	Q _{gd}		-	14	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V,I _S =100A	-	-	1.2	V
Diode Forward Current	I _S		-	-	200	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 100A	-	35	-	nS
Reverse Recovery Charge	Q _{rr}	di/dt = 100A/μs	-	120	-	nC

Notes:

1. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, L=0.5\text{mH}, R_G=25\Omega$
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 $T_J(\text{MAX})=150^{\circ}\text{C}$. The SOA curve provides a single pulse rating.

Typical Electrical and Thermal Characteristics

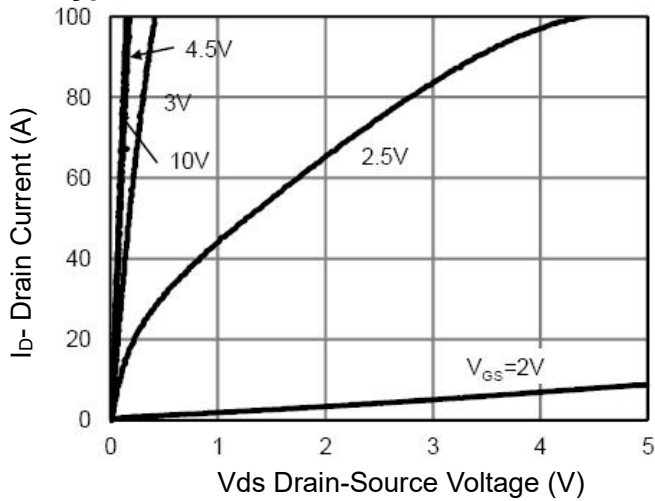


Figure 1 Output Characteristics

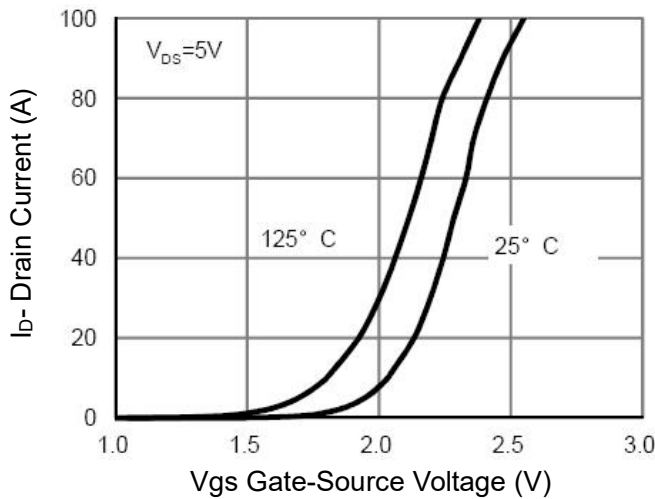


Figure 2 Transfer Characteristics

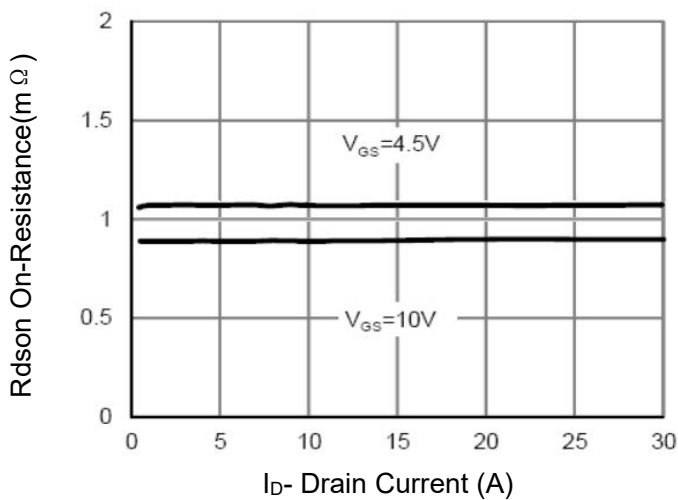


Figure 3 $R_{DS(on)}$ - Drain Current

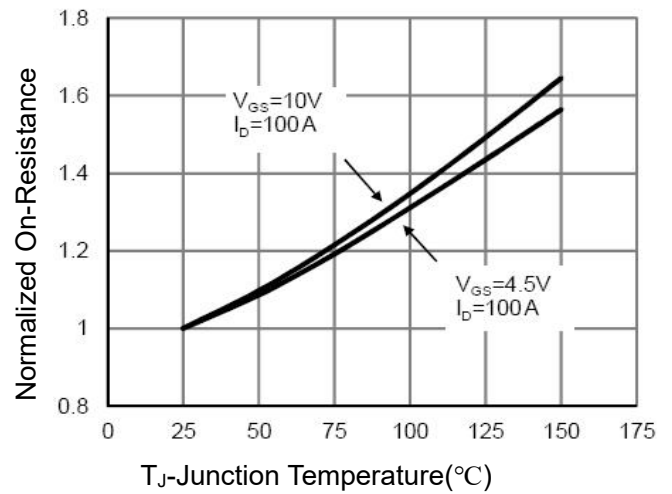


Figure 4 $R_{DS(on)}$ -Junction Temperature

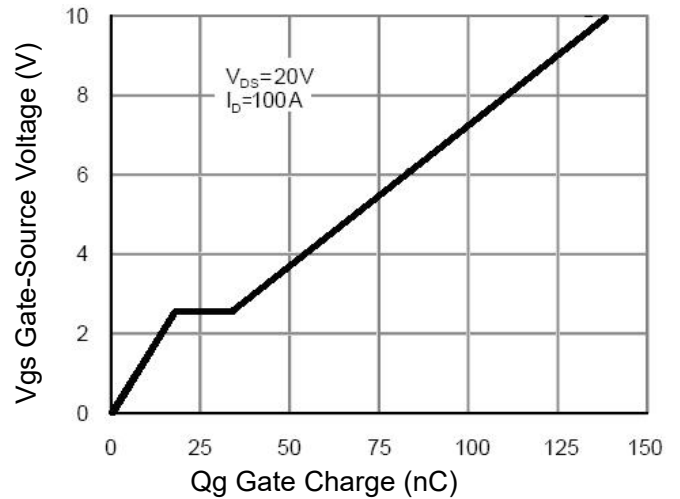


Figure 5 Gate Charge

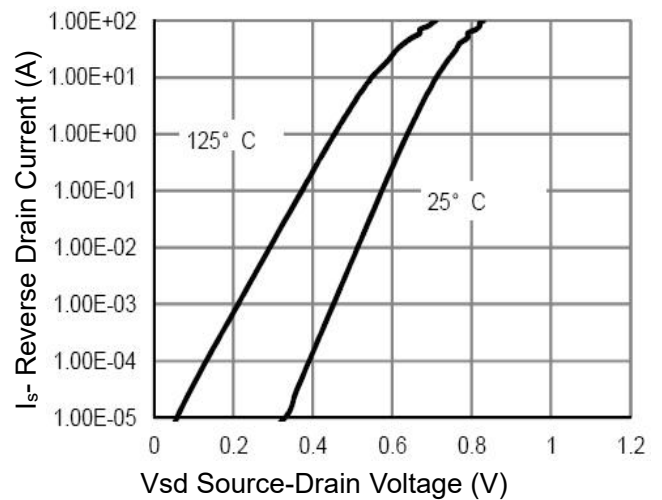


Figure 6 Source- Drain Diode Forward

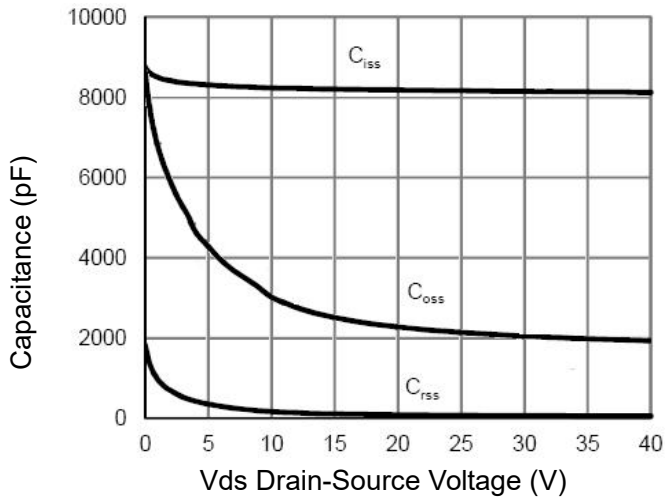


Figure 7 Capacitance vs Vds

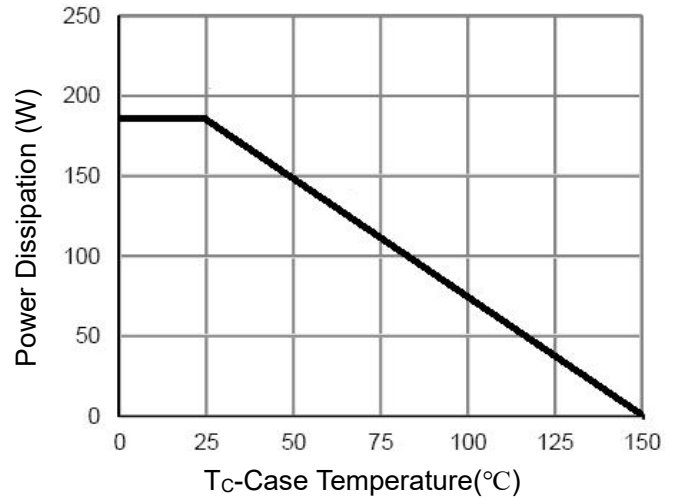


Figure 9 Power De-rating

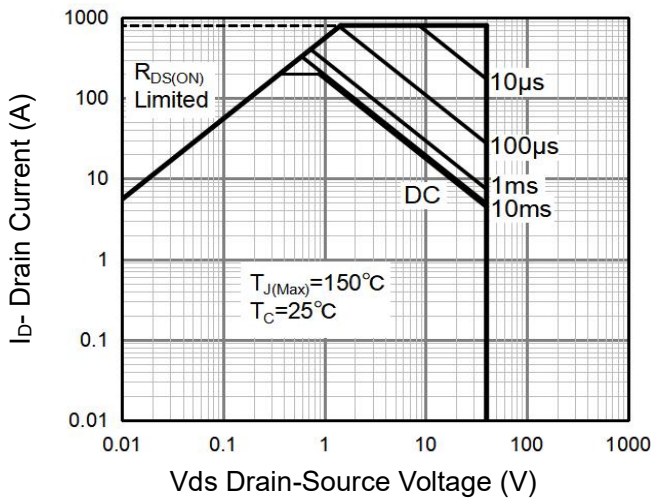


Figure 8 Safe Operation Area (Note3)

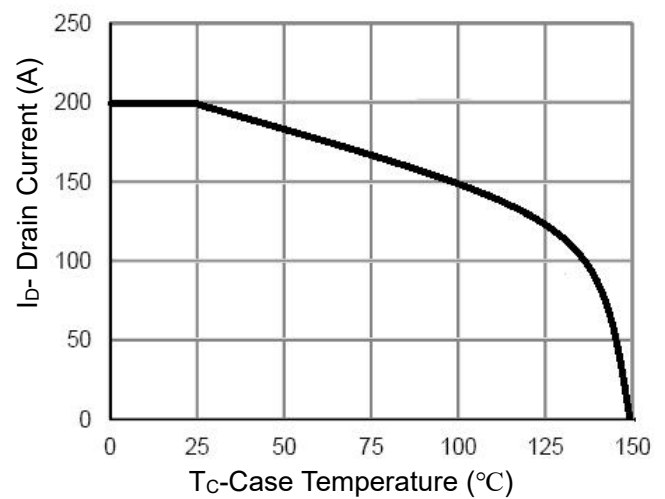


Figure 10 Current De-rating

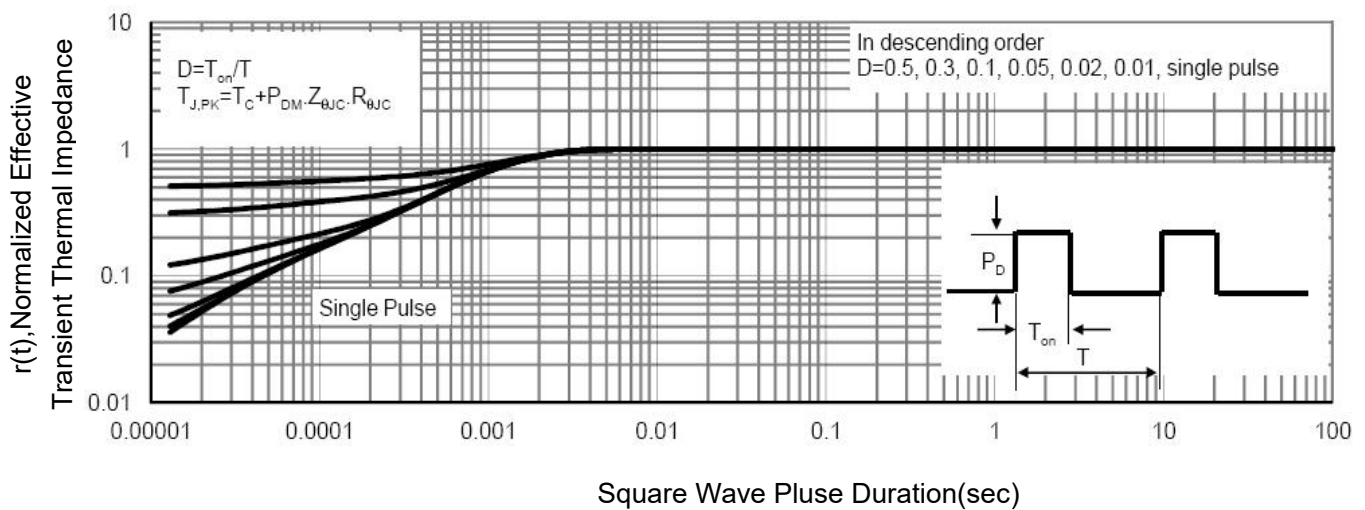
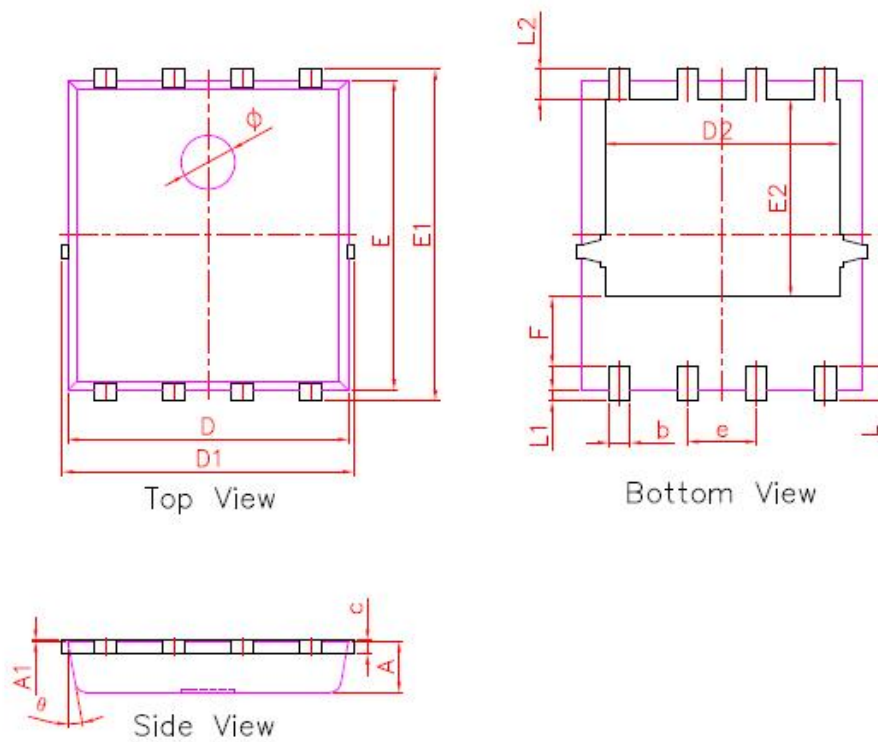


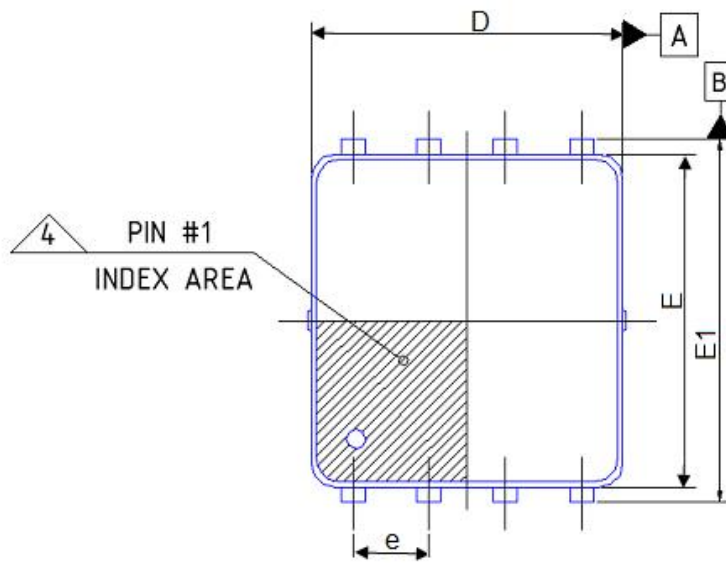
Figure 11 Normalized Maximum Transient Thermal Impedance

PDFN5X6-8L(E) Package Information

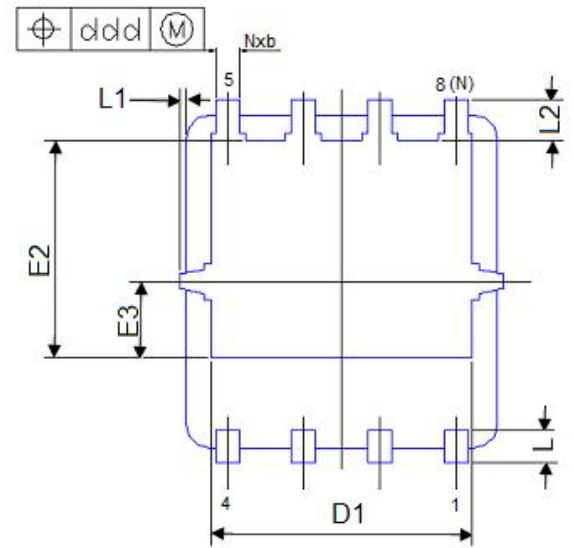


PDFN5X6-8L			
DIM.	MIN.	NOM.	MAX.
A	0.90	0.95	1.00
A1	0.00	0.02	0.05
b	0.35	0.40	0.50
c	0.20	0.25	0.30
D	5.10	5.20	5.30
D1	5.10	5.40	5.50
D2	4.25	4.35	4.45
e	1.27 BSC		
E	5.70	5.75	5.80
E1	6.00	6.15	6.30
E2	3.57	3.67	3.77
F	1.18	1.28	1.38
L	0.55	0.65	0.75
L1	0.15	0.20	0.25
L2	0.45	0.55	0.65
Ø	0.90	1.00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

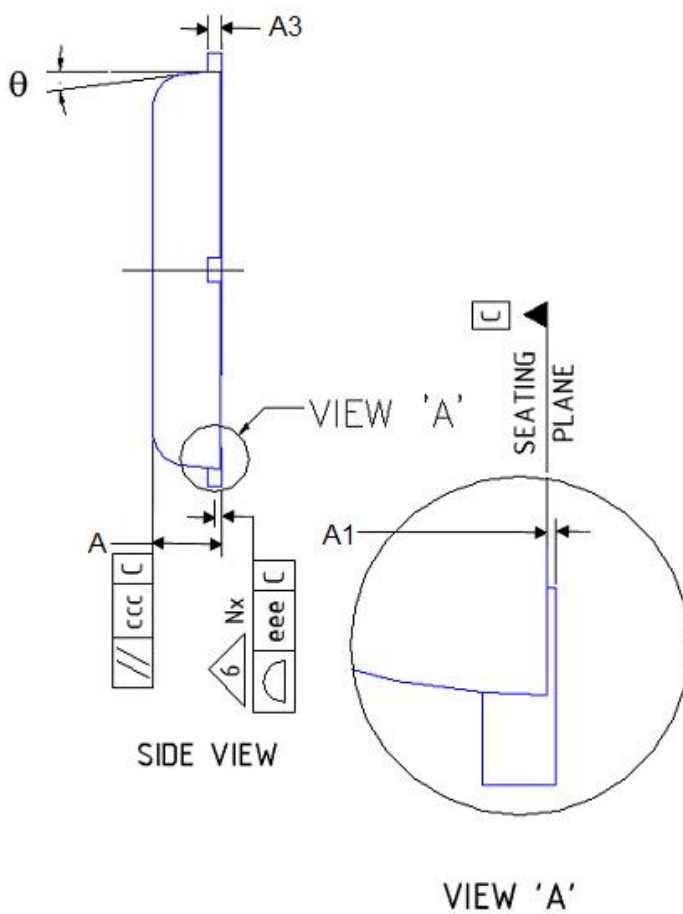
DFN5X6-8L(f) Package Information



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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