

NCE N-Channel Super Trench Power MOSFET

Description

The NCEP6090AGU 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

- $V_{DS} = 60V, I_D = 90A$
- $R_{DS(ON)} = 2.8m\Omega$ (typical) @ $V_{GS} = 10V$
- $R_{DS(ON)} = 3.5m\Omega$ (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% ΔV_{ds} TESTED!

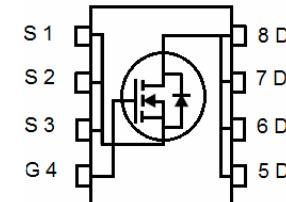
DFN 5X6



Top View



Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P6090AGU	NCEP6090AGU	DFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous (Silicon Limited)	I_D	90	A
Drain Current-Continuous($T_c=100^\circ C$)	$I_D (100^\circ C)$	63.6	A
Pulsed Drain Current	I_{DM}	360	A
Maximum Power Dissipation	P_D	100	W
Derating factor		0.8	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	500	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	1.25	$^\circ C/W$
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Electrical Characteristics ($T_c=25^\circ\text{C}$ unless otherwise noted)

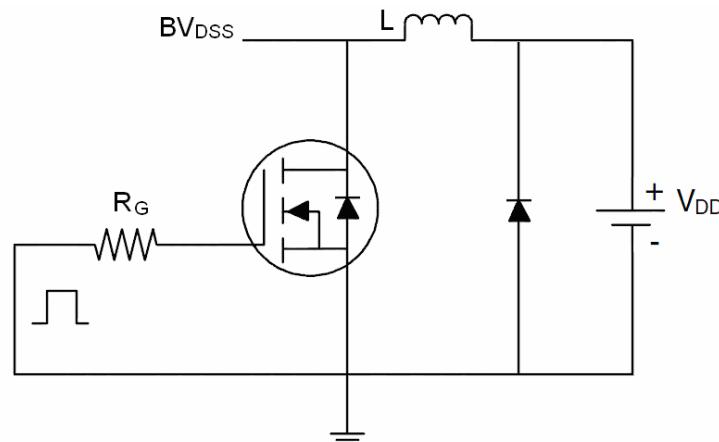
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_D=250\mu\text{A}$	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$\text{V}_{\text{DS}}=60\text{V}, \text{V}_{\text{GS}}=0\text{V}$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$\text{V}_{\text{GS}}=\pm20\text{V}, \text{V}_{\text{DS}}=0\text{V}$	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$\text{V}_{\text{GS(th)}}$	$\text{V}_{\text{DS}}=\text{V}_{\text{GS}}, \text{I}_D=250\mu\text{A}$	1.0	1.7	2.2	V
Drain-Source On-State Resistance	$\text{R}_{\text{DS(ON)}}$	$\text{V}_{\text{GS}}=10\text{V}, \text{I}_D=45\text{A}$	-	2.8	3.5	$\text{m}\Omega$
		$\text{V}_{\text{GS}}=4.5\text{V}, \text{I}_D=45\text{A}$	-	3.5	4.5	$\text{m}\Omega$
Forward Transconductance	g_{FS}	$\text{V}_{\text{DS}}=10\text{V}, \text{I}_D=45\text{A}$	40	-	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C_{iss}	$\text{V}_{\text{DS}}=30\text{V}, \text{V}_{\text{GS}}=0\text{V}, \text{F}=1.0\text{MHz}$	-	4000	-	PF
Output Capacitance	C_{oss}		-	680	-	PF
Reverse Transfer Capacitance	C_{rss}		-	23	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{\text{d(on)}}$	$\text{V}_{\text{DD}}=30\text{V}, \text{I}_D=45\text{A}$ $\text{V}_{\text{GS}}=10\text{V}, \text{R}_G=4.7\Omega$	-	11	-	nS
Turn-on Rise Time	t_r		-	5	-	nS
Turn-Off Delay Time	$t_{\text{d(off)}}$		-	56	-	nS
Turn-Off Fall Time	t_f		-	12	-	nS
Total Gate Charge	Q_g	$\text{V}_{\text{DS}}=30\text{V}, \text{I}_D=45\text{A}, \text{V}_{\text{GS}}=10\text{V}$	-	67	-	nC
Gate-Source Charge	Q_{gs}		-	12	-	nC
Gate-Drain Charge	Q_{gd}		-	8.5	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_s=45\text{A}$	-		1.2	V
Diode Forward Current (Note 2)	I_s		-	-	90	A
Reverse Recovery Time	t_{rr}	$\text{T}_J = 25^\circ\text{C}, \text{I}_F = \text{I}_s$ $d\text{I}/dt = 100\text{A}/\mu\text{s}$ (Note 3)	-	48	-	nS
Reverse Recovery Charge	Q_{rr}		-	60	-	nC

Notes:

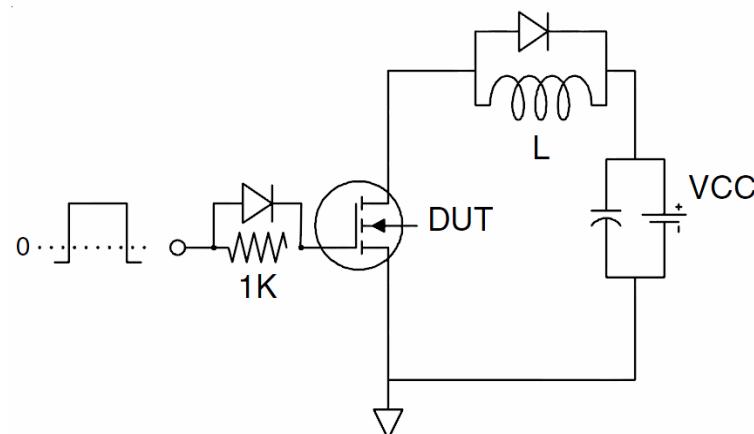
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition : $\text{T}_J=25^\circ\text{C}, \text{V}_{\text{DD}}=30\text{V}, \text{V}_{\text{G}}=10\text{V}, \text{L}=0.5\text{mH}, \text{R}_G=25\Omega$

Test Circuit

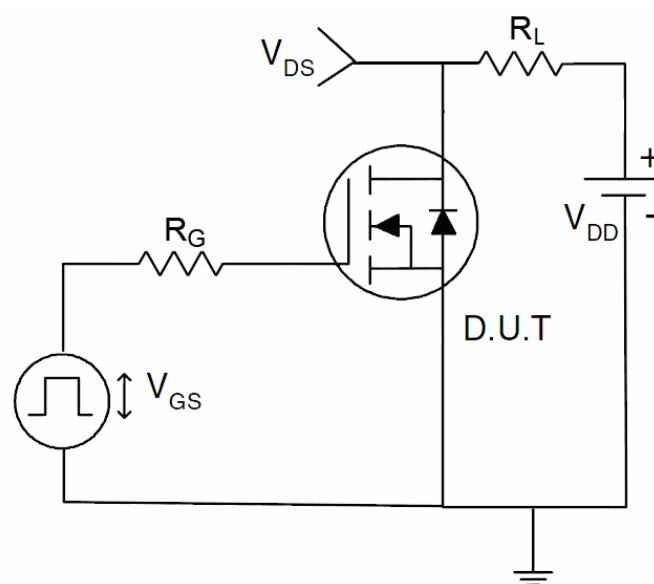
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

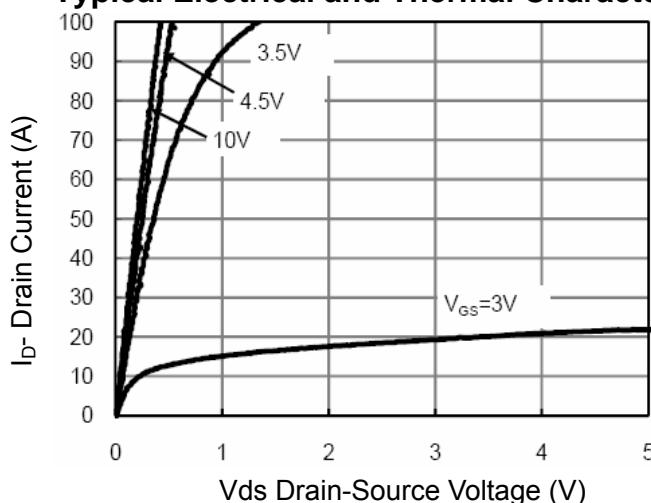


Figure 1 Output Characteristics

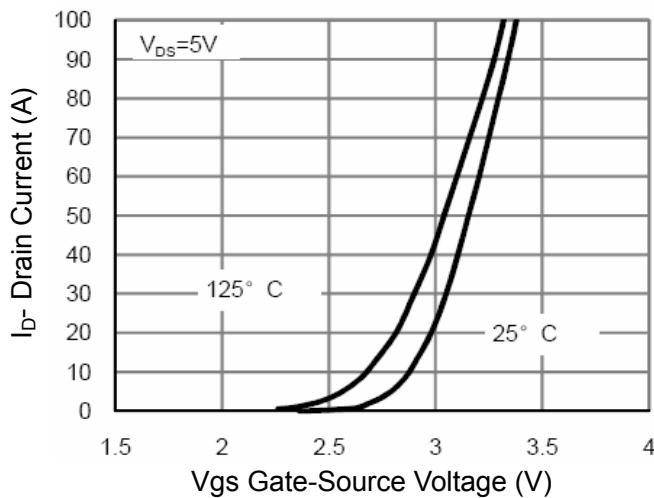


Figure 2 Transfer Characteristics

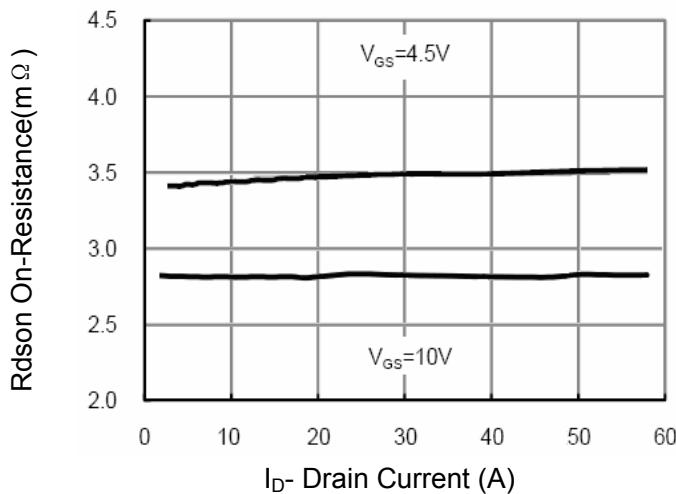


Figure 3 Rdson- Drain Current

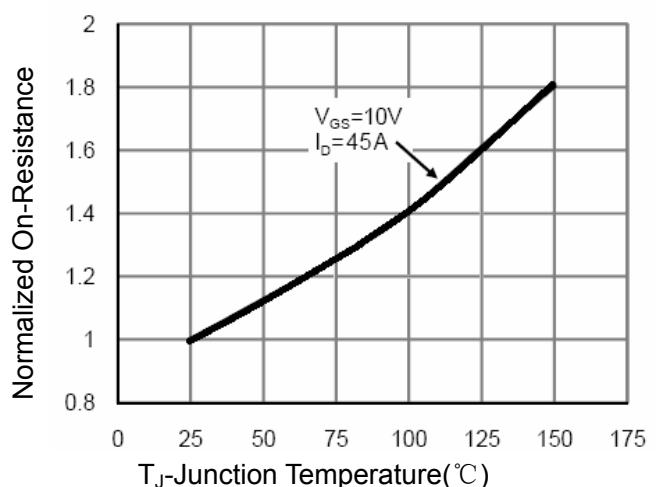


Figure 4 Rdson-JunctionTemperature

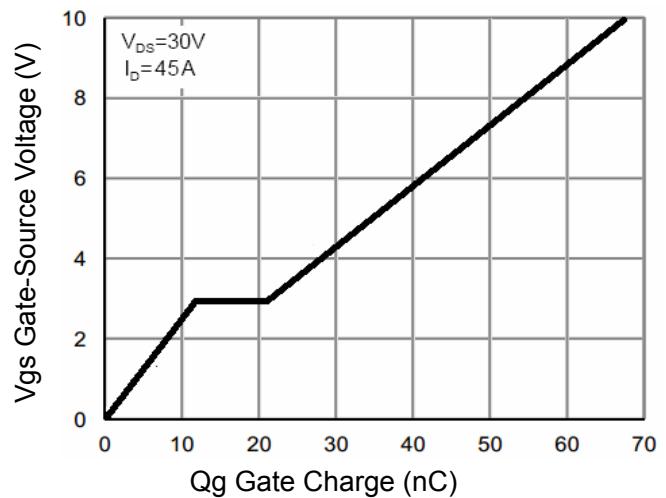


Figure 5 Gate Charge

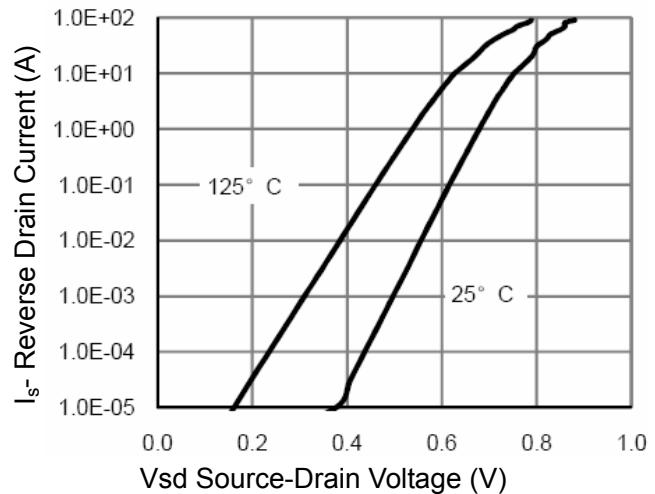


Figure 6 Source- Drain Diode Forward

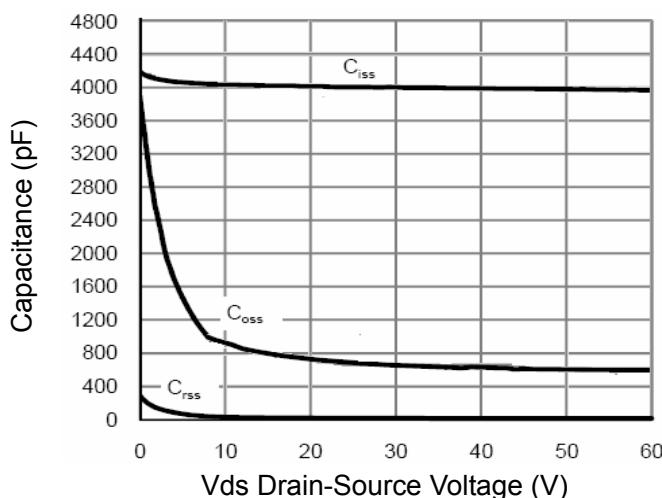


Figure 7 Capacitance vs Vds

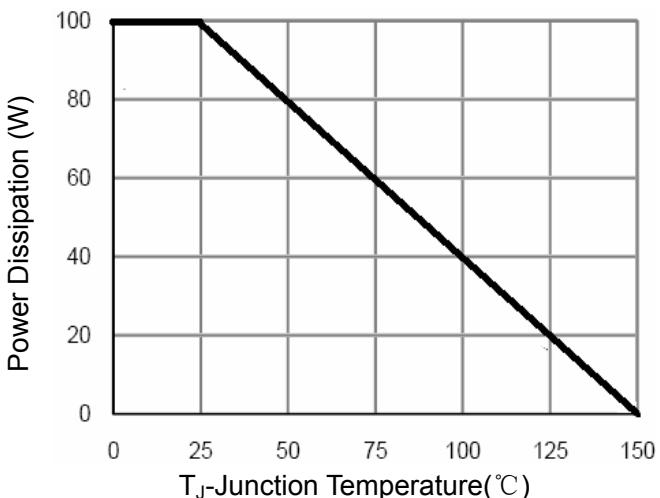


Figure 9 Power De-rating

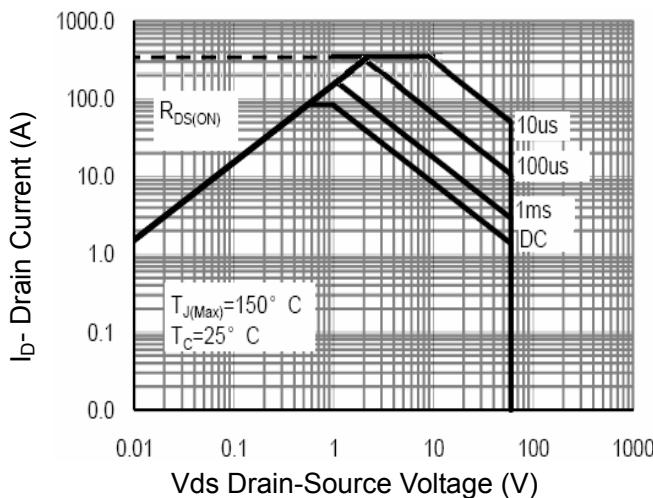


Figure 8 Safe Operation Area

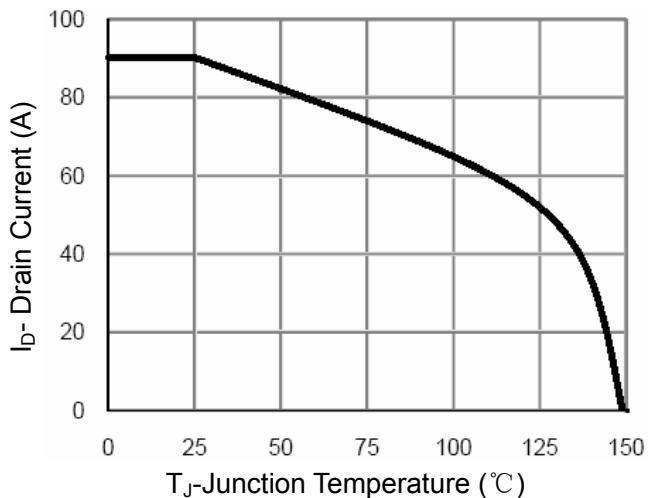


Figure 10 Current De-rating

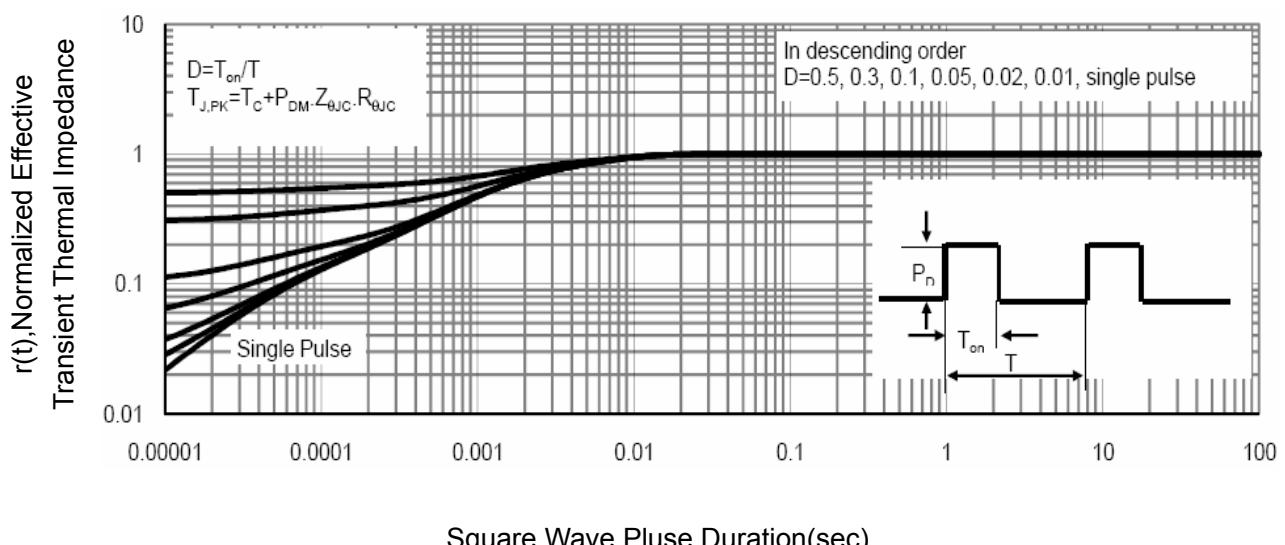
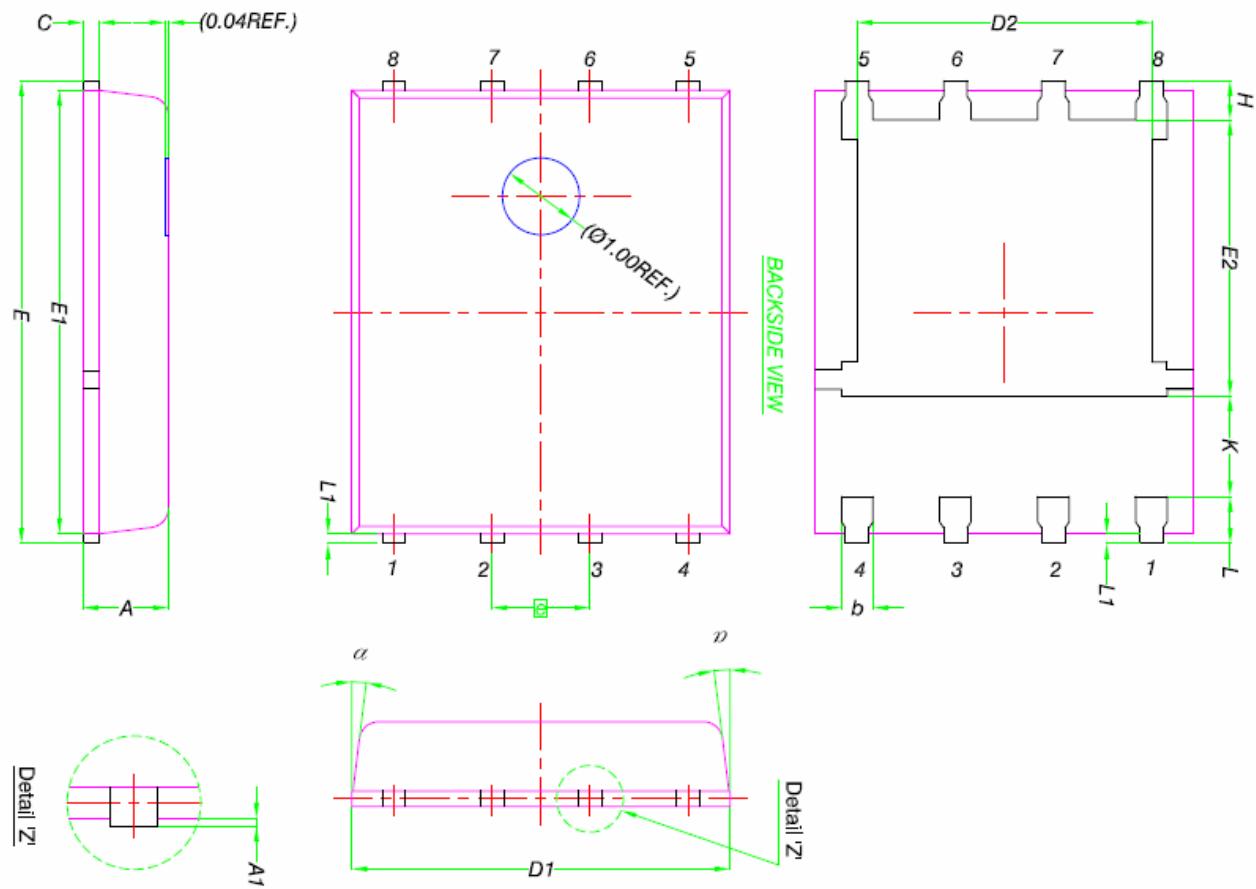
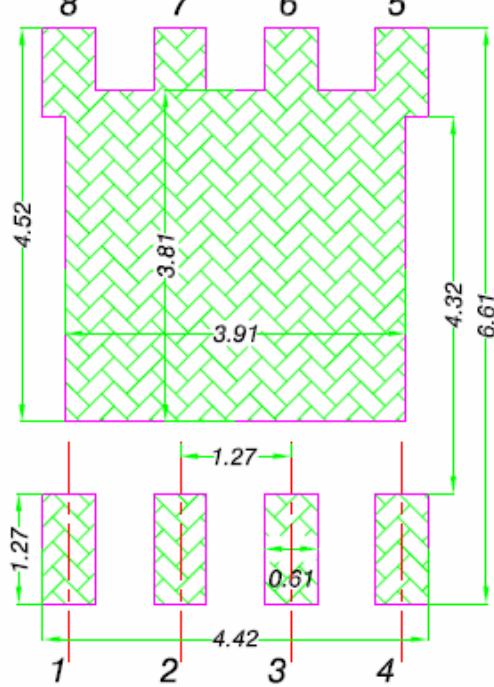


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN5X6-8L Package Information


DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e 1.27 BSC			
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°

*Land Pattern
(Only for Reference)*





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