

NCE N-Channel Super Trench II Power MOSFET

Description

The NCEP035N60AG uses **Super Trench II** 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

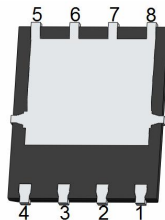
- $V_{DS} = 60V, I_D = 90A$
 $R_{DS(ON)} = 2.8m\Omega$ (typical) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 3.5m\Omega$ (typical) @ $V_{GS} = 4.5V$
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating

100% UIS TESTED!
100% ΔV_{ds} TESTED!

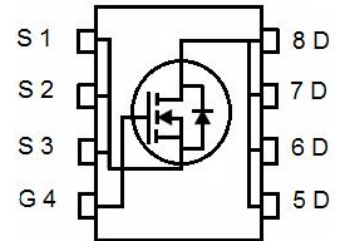
DFN 5X6



Top View



Bottom View



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
P035N60AG	NCEP035N60AG	DFN5X6-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	90	A
Drain Current-Continuous($T_c = 100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	63.6	A
Pulsed Drain Current	I_{DM}	360	A
Maximum Power Dissipation	P_D	85	W
Derating factor		0.68	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 1)	E_{AS}	520	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.47	$^\circ\text{C/W}$
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Electrical Characteristics (T_c=25°C unless otherwise noted)

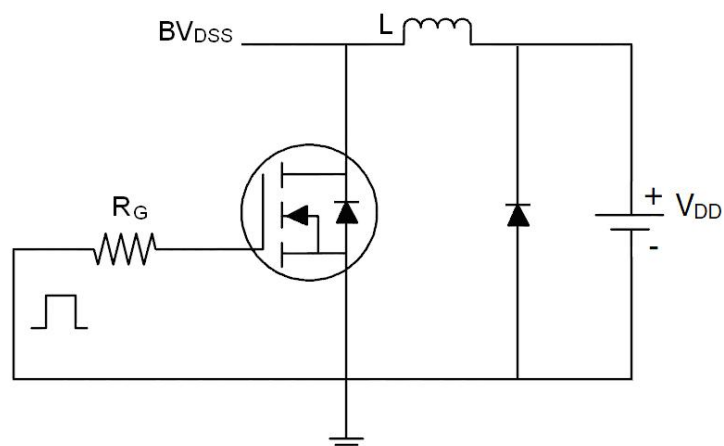
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	60		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1.0	1.7	2.4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =45A	-	2.8	3.5	mΩ
		V _{GS} =4.5V, I _D =45A	-	3.5	4.5	mΩ
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =45A	40	-	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, F=1.0MHz	-	4000	-	PF
Output Capacitance	C _{oss}		-	605	-	PF
Reverse Transfer Capacitance	C _{rss}		-	44	-	PF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =45A V _{GS} =10V, R _G =4.7Ω	-	11	-	nS
Turn-on Rise Time	t _r		-	5	-	nS
Turn-Off Delay Time	t _{d(off)}		-	49	-	nS
Turn-Off Fall Time	t _f		-	10	-	nS
Total Gate Charge	Q _g	V _{DS} =30V, I _D =45A, V _{GS} =10V	-	73		nC
Gate-Source Charge	Q _{gs}		-	12.5		nC
Gate-Drain Charge	Q _{gd}		-	11		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =45A	-		1.2	V
Diode Forward Current	I _S		-	-	90	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = I _S di/dt = 100A/μs	-	48		nS
Reverse Recovery Charge	Q _{rr}		-	60		nC

Notes:

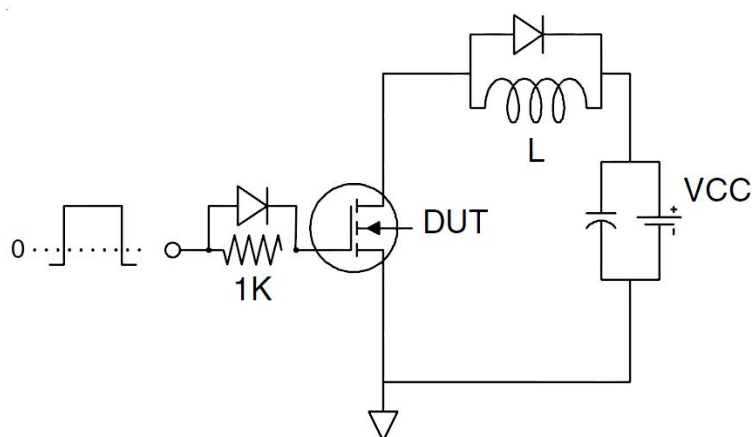
1. EAS condition : T_J=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150° C. The SOA curve provides a single pulse rating.

Test Circuit

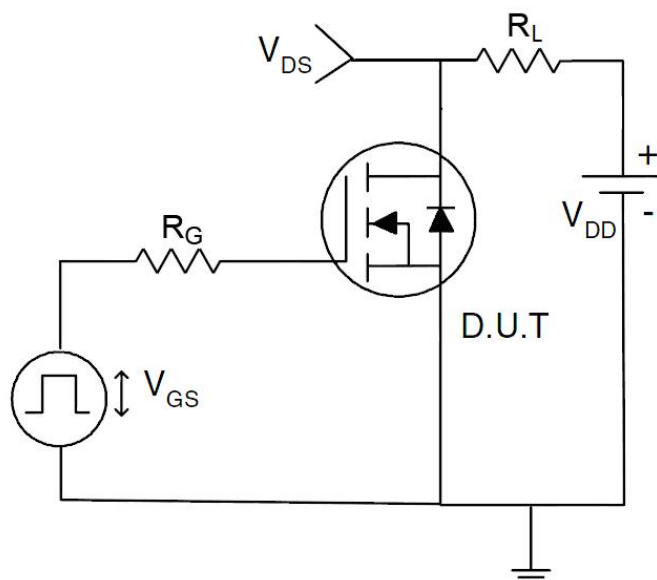
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

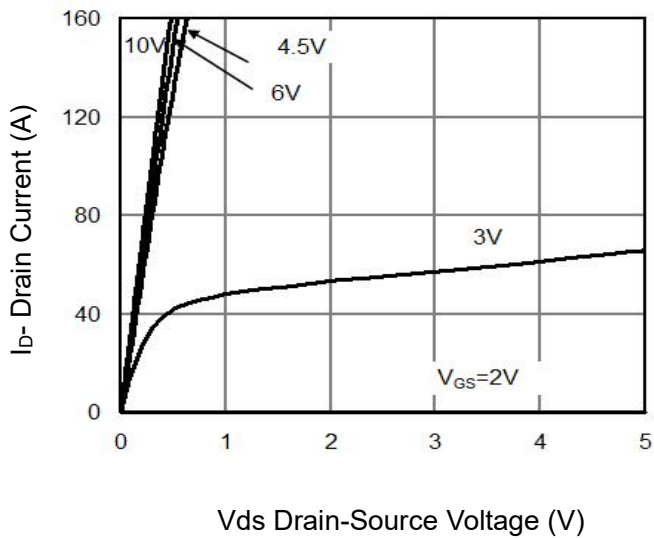


Figure 1 Output Characteristics

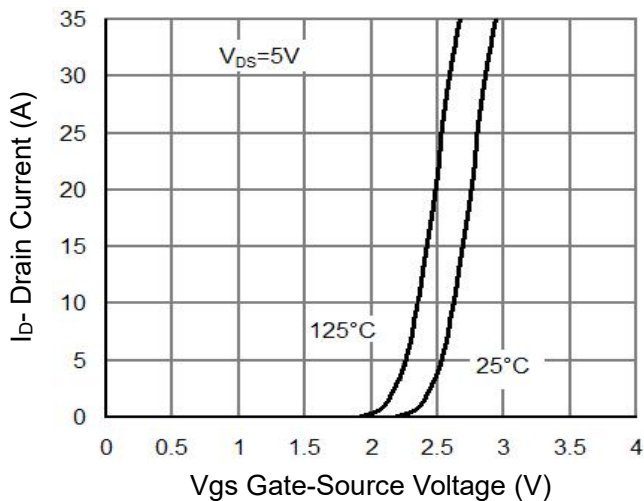


Figure 2 Transfer Characteristics

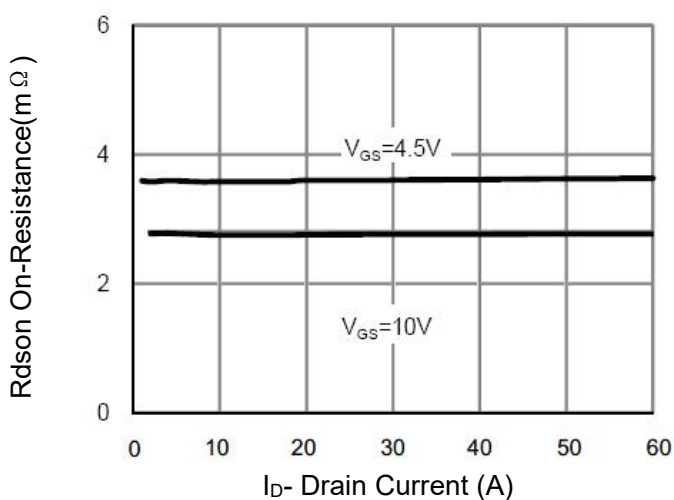


Figure 3 $R_{DS(on)}$ - Drain Current

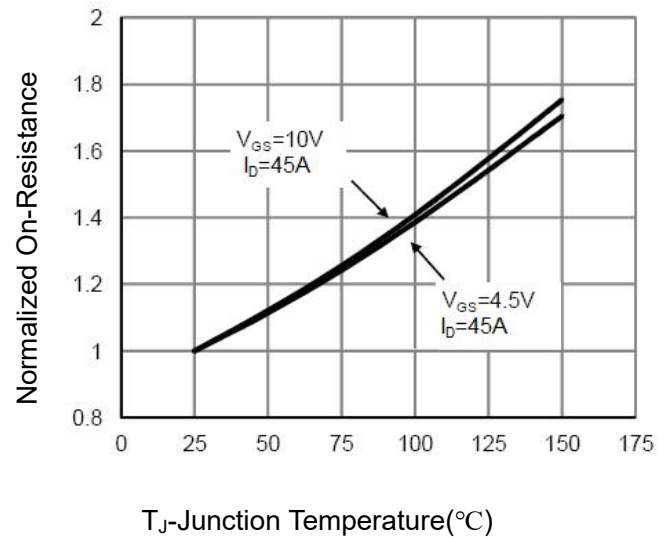


Figure 4 $R_{DS(on)}$ -Junction Temperature

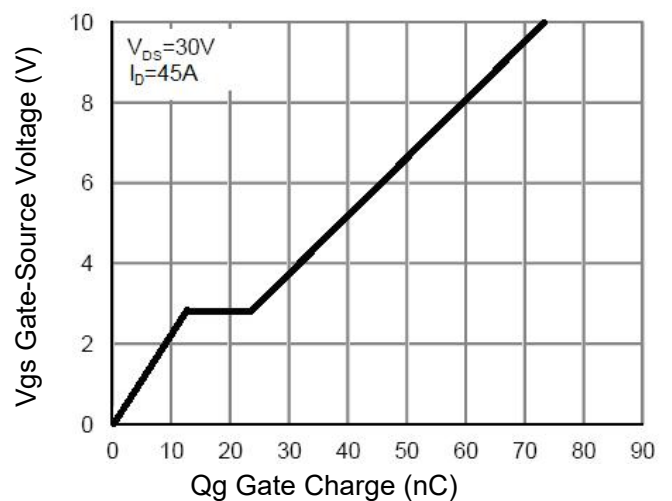


Figure 5 Gate Charge

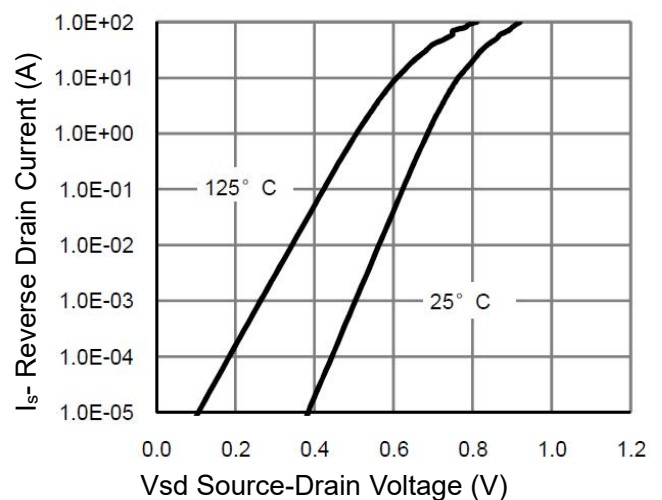


Figure 6 Source- Drain Diode Forward

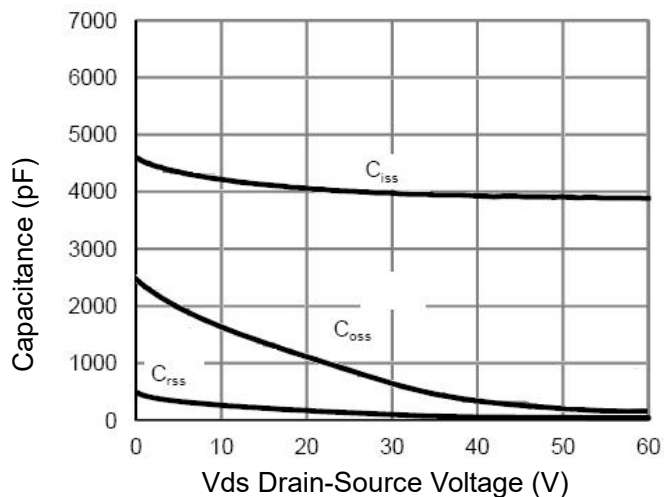


Figure 7 Capacitance vs Vds

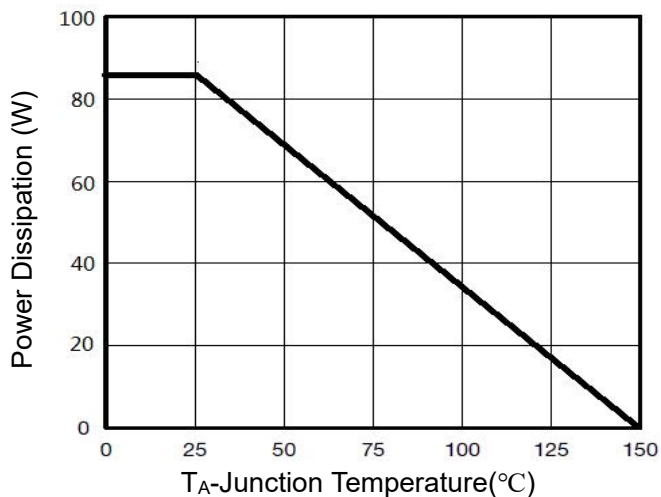


Figure 9 Power De-rating

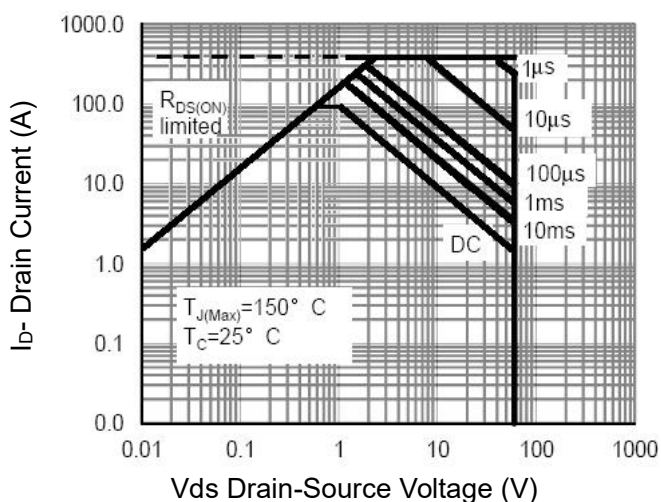


Figure 8 Safe Operation Area

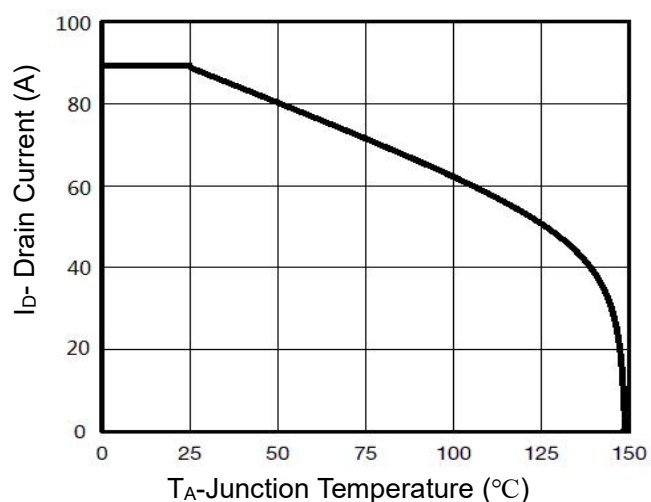


Figure 10 Current De-rating

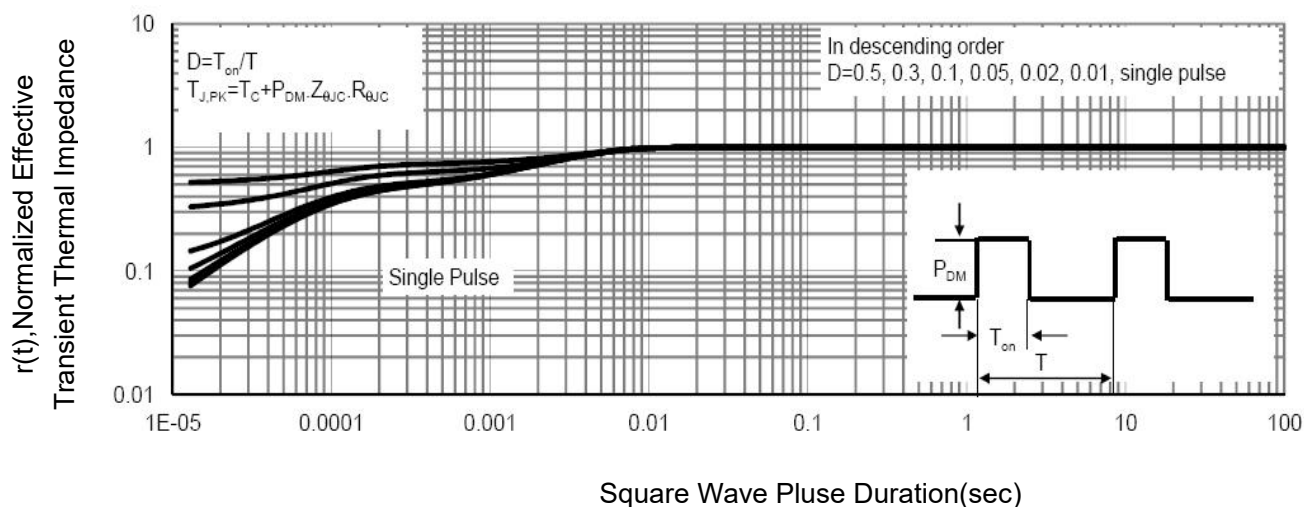
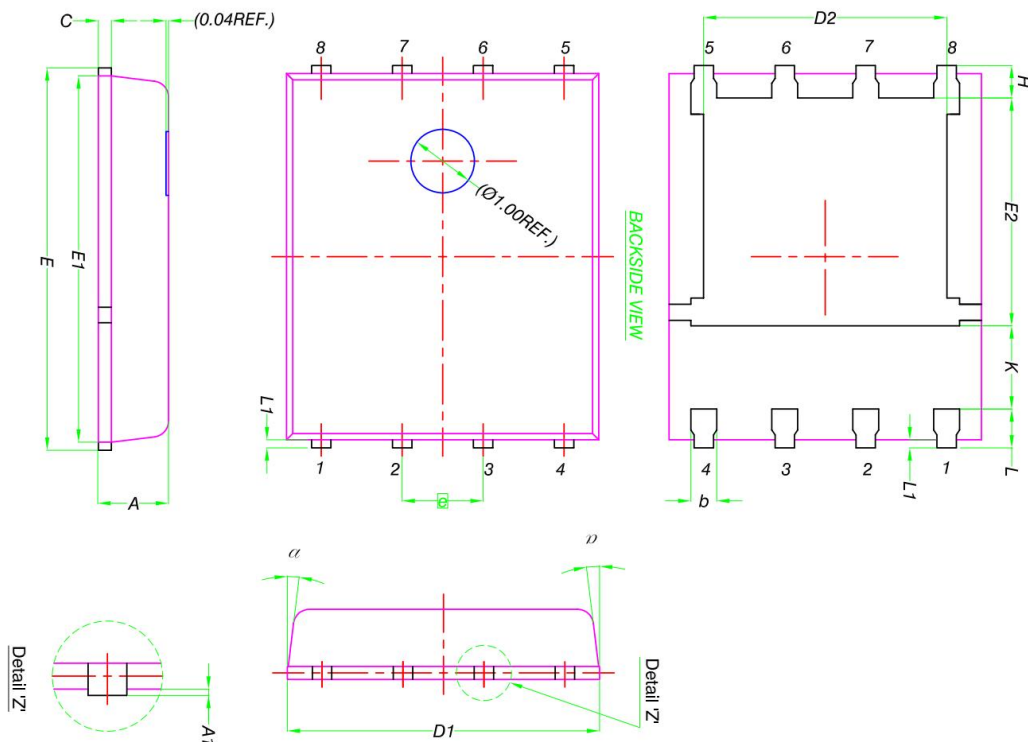

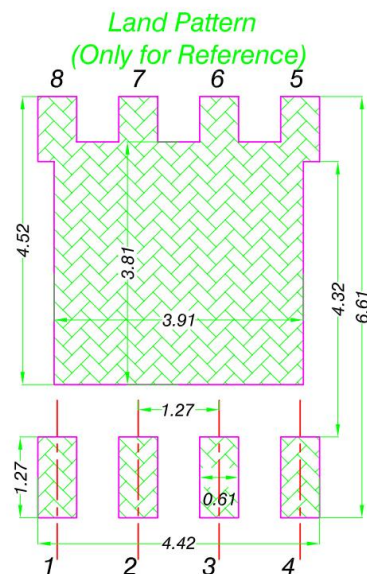


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN5X6-8L(G) Package Information



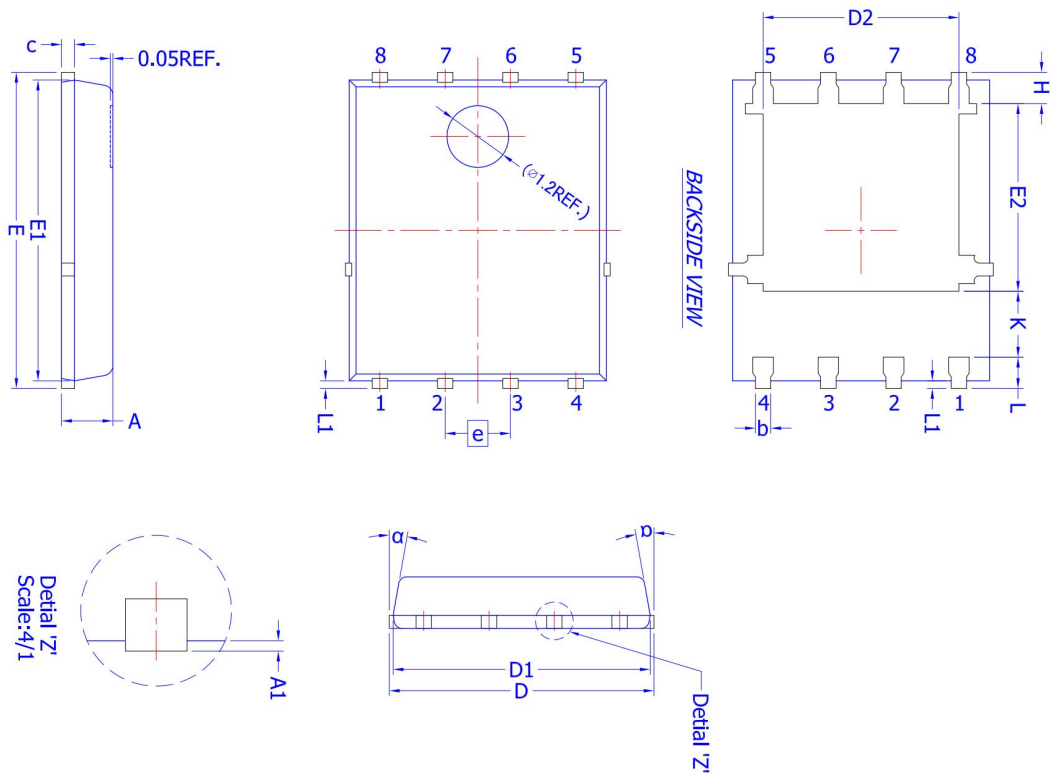
DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.33	0.41	0.51
C	0.20	0.25	0.30
D1	4.80	4.90	5.00
D2	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
α	0°	-	12°



Note:

1. All Dimension Are In mm.
2. Package Body Sizes Exclude Mold Flash, Protrusion Or Gate Burrs.
Mold Flash, Protrusion Or Gate Burrs Shall Not Exceed 0.10 mm Per Side.
3. Package Body Sizes Determined At The Outermost Extremes Of The Plastic Body Exclusive Of Mold Flash, Tie Bar, Tie Bar Burrs, Gate Burrs And Interlead Flash, But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.
4. The Package Top May Be Smaller Than The Package Bottom.

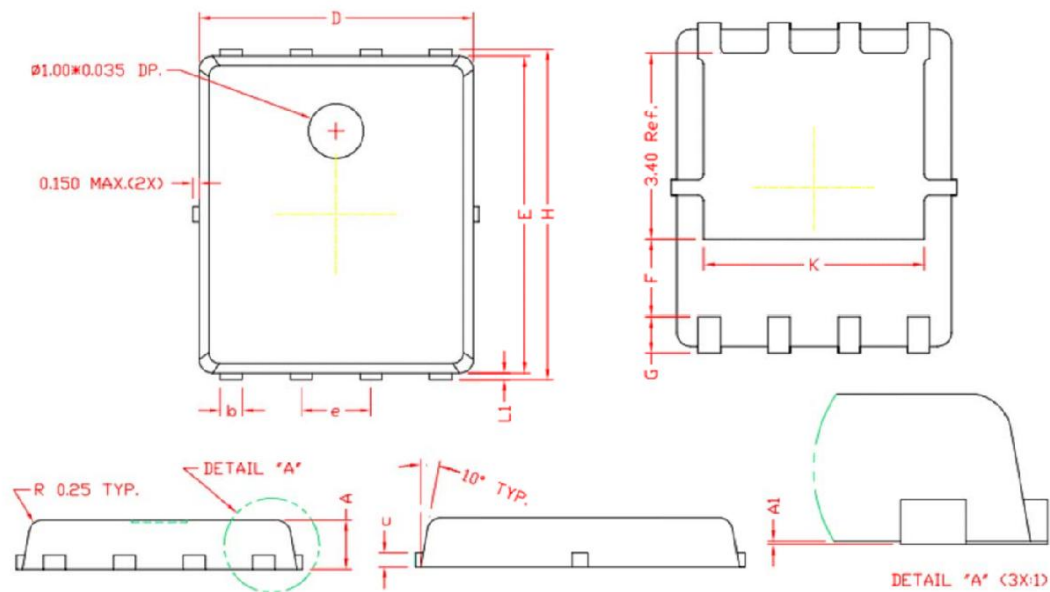
DFN5X6-8L(P) Package Information



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0	-	0.05
b	0.30	0.40	0.50
c	0.20	0.25	0.30
D	5.15 BSC		
D1	5.00 BSC		
D2	3.76	3.81	3.86
E	6.15 BSC		
E1	5.80	5.85	5.90
E2	3.45	3.65	3.85
e	1.27 BSC		
H	0.51	0.61	0.71
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.08	0.15	0.23
α	10°	11°	12°

- Note:
1. All Dimension Are In mm;
 2. Package Body Sizes Exclude Mold Flash,Protrusion Or Gate Burrs.
Mold Flash,Protrusion Or Gate Burrs Shall Not Exceed 0.10mm Per Side.
 3. Package Body Sizes Determined At The Outermost Extremes Of The Plastic.
Body Exclusive Of Mold Flash,Tie Bar, Tie Bar Burrs Gate Burrs And Interlead Flash,
But Including Any Mismatch Between The Top And Bottom Of The Plastic Body.
 4. The Package Top May Be Smaller Than The Package Bottom.

DFN5X6-8L(X) Package Information



COMMON DIMENSIONS

(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0.00	0.03	0.05
b	0.35	0.42	0.49
c	0.254 REF.		
D	4.90	5.00	5.10
F	1.40 REF.		
E	5.70	5.80	5.90
e	1.27 BSC.		
H	5.95	6.08	6.20
L1	0.10	0.14	0.18
G	0.60 REF.		
K	4.00 REF.		

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