

N-Channel Enhancement Mode Power MOSFET

Description

The HM40N04Q uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

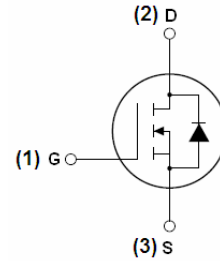
- $V_{DS} = 40V, I_D = 40A$
 $R_{DS(ON)} = 5.5m\Omega @ (Typ) V_{GS} = 10V$
- High density cell design for ultra low $R_{DS(ON)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

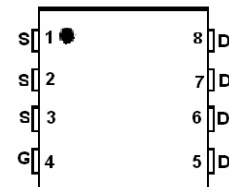
- Load switching
- Hard switched and high frequency circuits
- Uninterruptible power supply

100% UIS TESTED!

100% ΔV_{DS} TESTED!



Schematic diagram



DFN3X3-8L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM40N04Q	HM40N04Q	DFN3X3-8L	-	-	-

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	I_D	40	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D (100^\circ C)$	28	A
Pulsed Drain Current	I_{DM}	120	A
Maximum Power Dissipation	P_D	65	W
Derating factor		0.43	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	400	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ C$

Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 2)	$R_{\theta JC}$	2.3	$^{\circ}\text{C/W}$
--	-----------------	-----	----------------------

Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise noted)

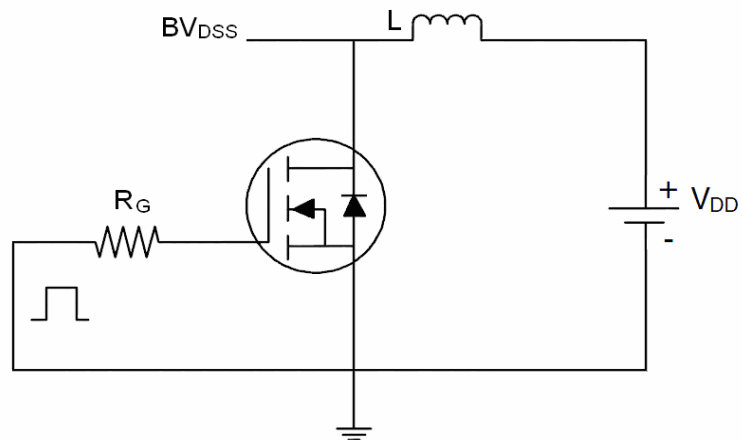
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	40	45	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =40V,V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V,V _{DS} =0V	-	-	±100	nA
On Characteristics ^(Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250μA	1.0	1.7	2.5	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	5.5	7	mΩ
Forward Transconductance	g _{FS}	V _{DS} =10V,I _D =20A	15	-	-	S
Dynamic Characteristics ^(Note4)						
Input Capacitance	C _{iss}	V _{DS} =20V,V _{GS} =0V, F=1.0MHz	-	1800	-	PF
Output Capacitance	C _{oss}		-	280	-	PF
Reverse Transfer Capacitance	C _{rss}		-	190	-	PF
Switching Characteristics ^(Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V,I _D =2A,R _L =1Ω V _{GS} =10V,R _G =3Ω	-	6.4	-	nS
Turn-on Rise Time	t _r		-	17.2	-	nS
Turn-Off Delay Time	t _{d(off)}		-	29.6	-	nS
Turn-Off Fall Time	t _f		-	16.8	-	nS
Total Gate Charge	Q _g	V _{DS} =20V,I _D =20A, V _{GS} =10V	-	29		nC
Gate-Source Charge	Q _{gs}		-	4.5		nC
Gate-Drain Charge	Q _{gd}		-	6.4		nC
Drain-Source Diode Characteristics						
Diode Forward Voltage ^(Note 3)	V _{SD}	V _{GS} =0V,I _S =10A	-		1.2	V
Diode Forward Current ^(Note 2)	I _S		-	-	40	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 20A di/dt = 100A/μs ^(Note3)	-	29	-	nS
Reverse Recovery Charge	Q _{rr}		-	26	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

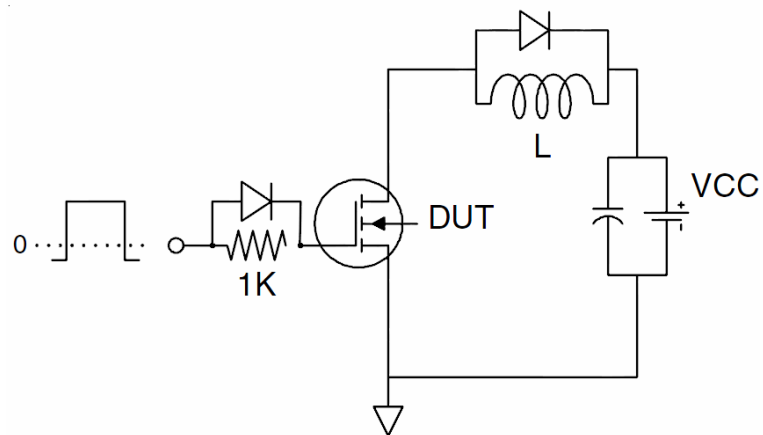
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. E_{AS} condition : $T_J=25^{\circ}\text{C}, V_{DD}=20V, V_G=10V, L=1mH, R_g=25\Omega$,

Test circuit

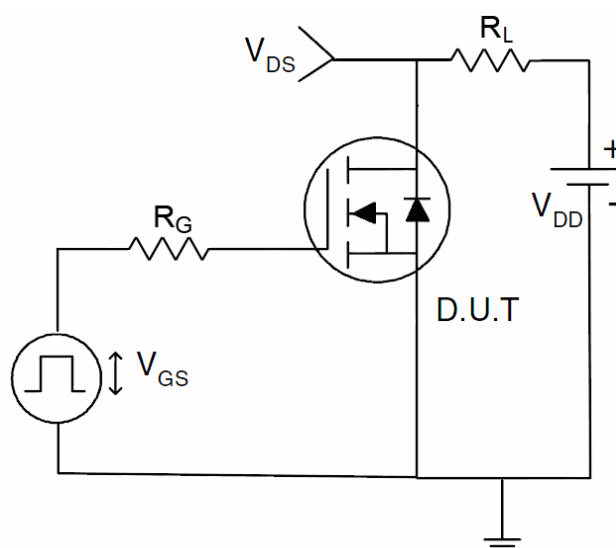
1) E_{AS} Test Circuit



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

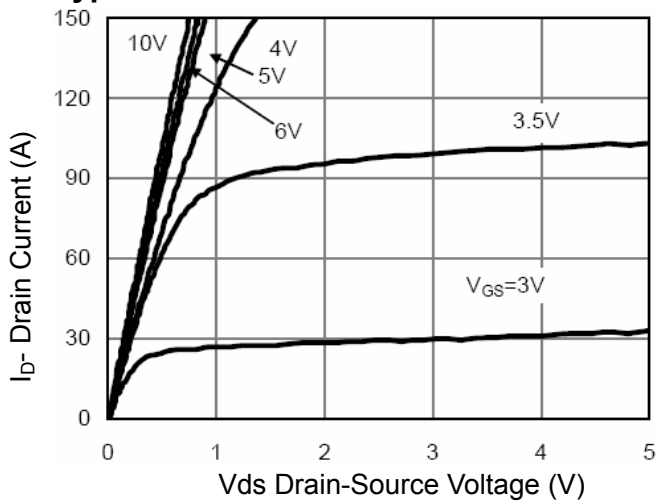


Figure 1 Output Characteristics

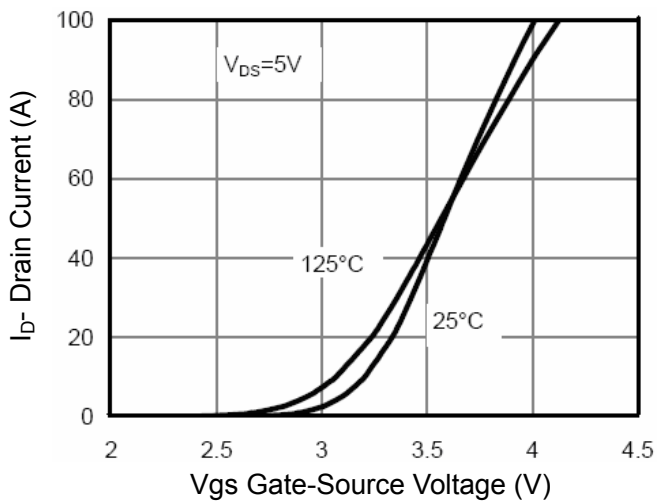


Figure 2 Transfer Characteristics

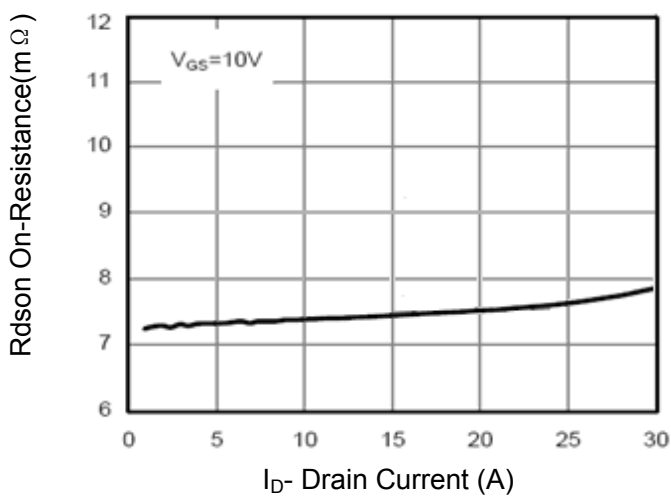


Figure 3 Rdson- Drain Current

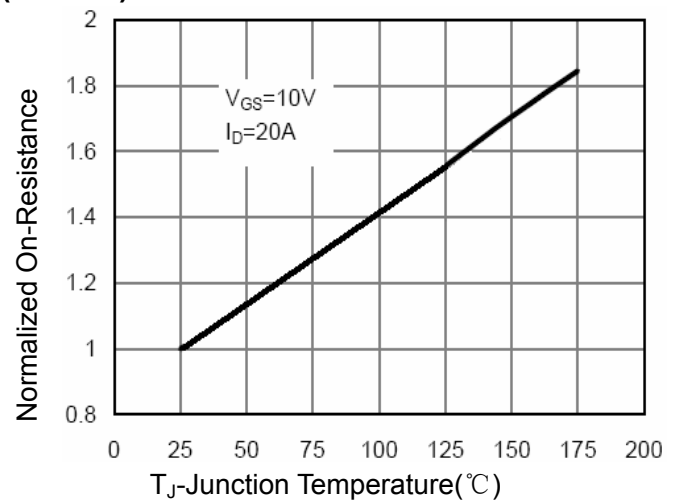


Figure 4 Rdson-Junction Temperature

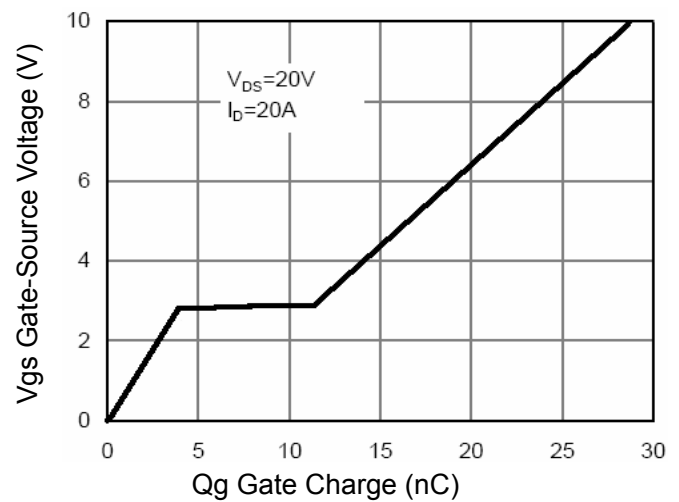


Figure 5 Gate Charge

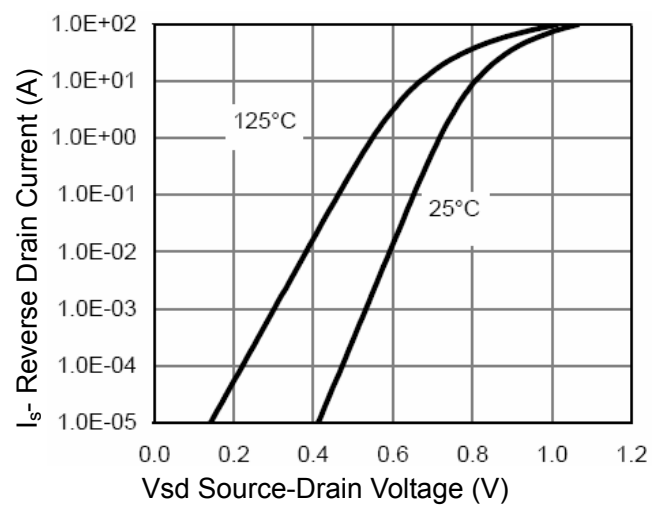


Figure 6 Source- Drain Diode Forward

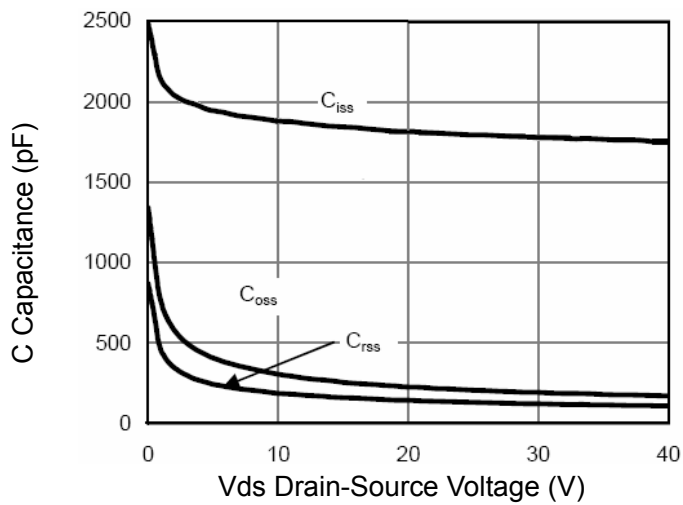


Figure 7 Capacitance vs Vds

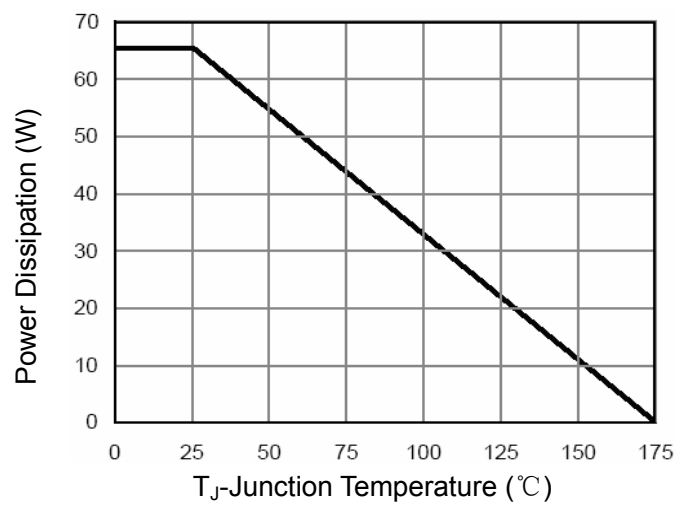


Figure 9 Power De-rating

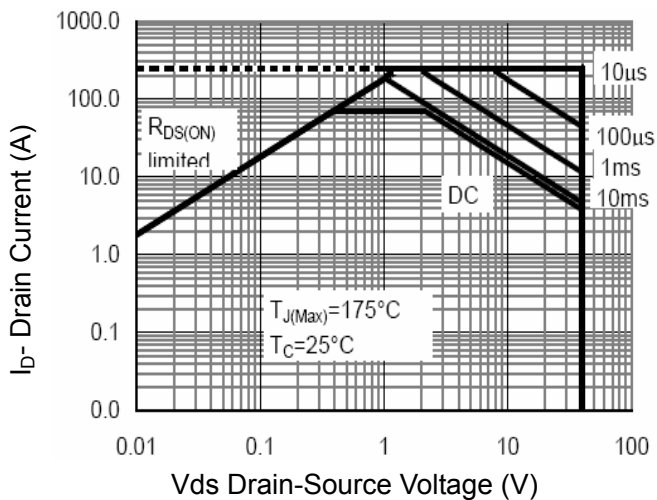


Figure 8 Safe Operation Area

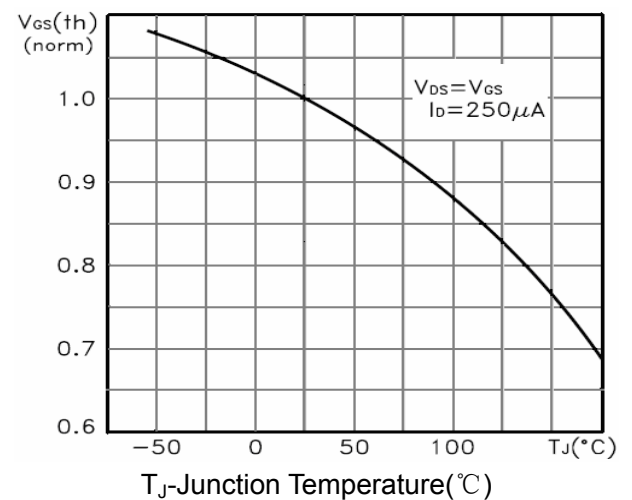


Figure 10 $V_{GS(th)}$ vs Junction Temperature

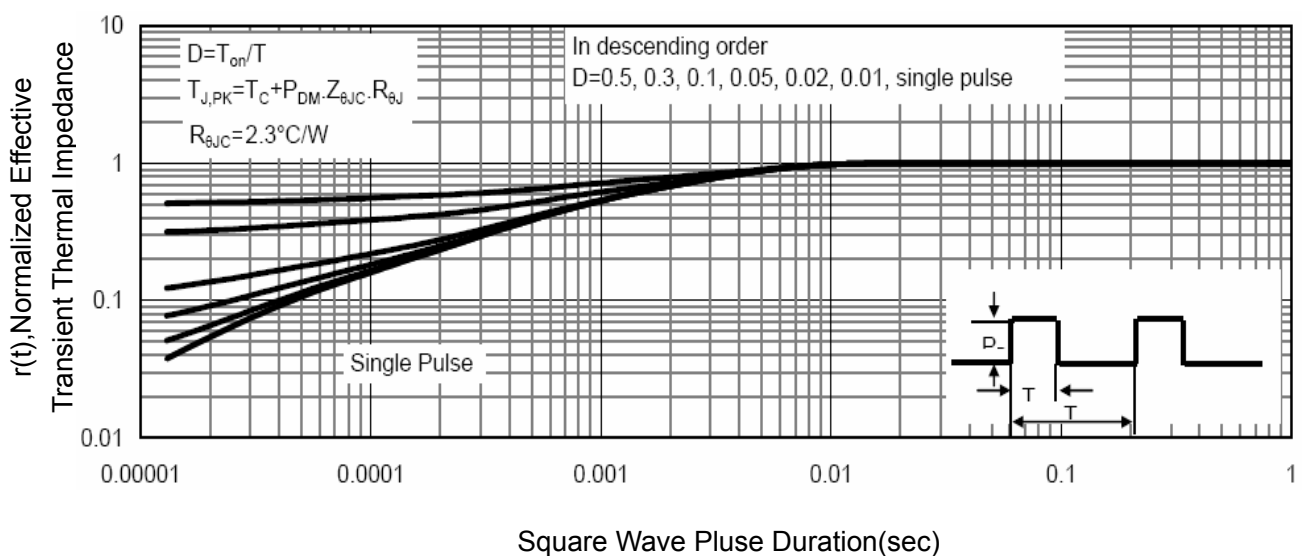
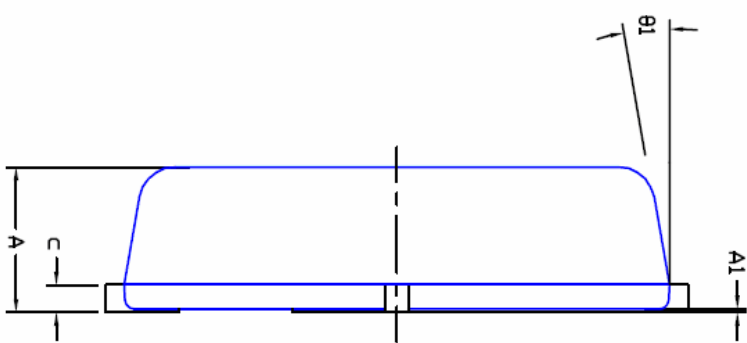
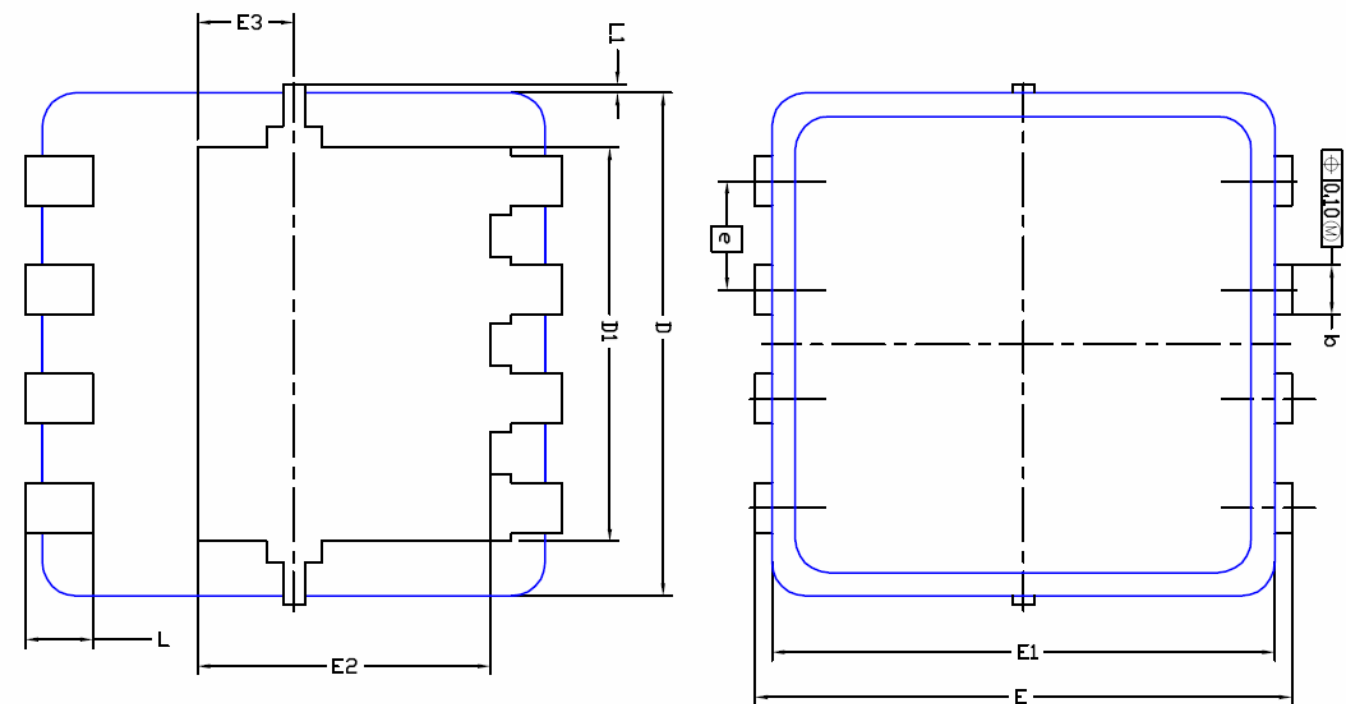


Figure 11 Normalized Maximum Transient Thermal Impedance

DFN3X3 EP Package Information



DIM.	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0,700	0,80	0,900	0,0276	0,0315	0,0354
A1	0,00	---	0,05	0,000	---	0,002
b	0,24	0,30	0,35	0,009	0,012	0,014
c	0,10	0,152	0,25	0,004	0,006	0,010
D	3,00 BSC			0,118 BSC		
D1	2,35 BSC			0,093 BSC		
E	3,20 BSC			0,126 BSC		
E1	3,00 BSC			0,118 BSC		
E2	1,75 BSC			0,069 BSC		
E3	0,575 BSC			0,023 BSC		
e	0,65 BSC			0,026 BSC		
L	0,30	0,40	0,50	0,0118	0,0157	0,0197
L1	0	---	0,100	0	---	0,004
θ1	0°	10°	12°	0°	10°	12°