

## Description

The HM5N15Q 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

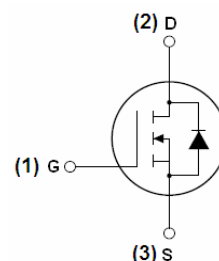
- $V_{DS} = 150V, I_D = 5A$   
 $R_{DS(ON)} < 300m\Omega @ V_{GS} = 10V$  (Typ: 70m $\Omega$ )
- High density cell design for ultra low  $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

## Application

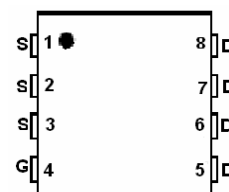
- Boost converters
- LED backlighting
- Uninterruptible power supply

**100% UIS TESTED!**

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



Schematic diagram



Marking and pin assignment

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
HM5N15Q	HM5N15Q	DFN3X3-8L	-	-	-

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

Symbol	Parameter	Limit	Unit
$V_{DS}$	Drain-Source Voltage	150	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current-Continuous	5	A
$I_D (100^\circ\text{C})$	Drain Current-Continuous( $T_C = 100^\circ\text{C}$ )	3.5	A
$I_{DM}$	Pulsed Drain Current	15	A
$P_D$	Maximum Power Dissipation	75	W
	Derating factor	0.5	W/ $^\circ\text{C}$
$E_{AS}$	Single pulse avalanche energy <sup>(Note 5)</sup>	200	mJ
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 To 175	$^\circ\text{C}$

## Thermal Characteristic

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	2.0	$^\circ\text{C/W}$
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## Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise noted)

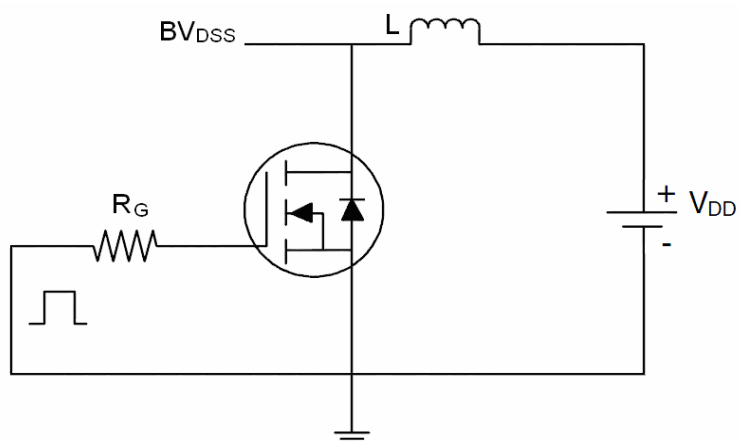
Symbol		Parameter	Condition	Min	Typ	Max	Unit
Off Characteristics							
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage		V <sub>GS</sub> =0V I <sub>D</sub> =250μA	150	165	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current		V <sub>DS</sub> =150V,V <sub>GS</sub> =0V	-	-	1	μA
I <sub>GSS</sub>	Gate-Body Leakage Current		V <sub>GS</sub> =±20V,V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>							
V <sub>GS(th)</sub>	Gate Threshold Voltage		V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA	1.5	2	2.5	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance		V <sub>GS</sub> =10V, I <sub>D</sub> =10A	-	260	300	mΩ
g <sub>FS</sub>	Forward Transconductance		V <sub>DS</sub> =5V,I <sub>D</sub> =10A	-	20	-	S
Dynamic Characteristics <sup>(Note4)</sup>							
C <sub>ISS</sub>	Input Capacitance		V <sub>DS</sub> =25V,V <sub>GS</sub> =0V, F=1.0MHz	-	2000	-	PF
C <sub>OSS</sub>	Output Capacitance			-	290	-	PF
C <sub>rss</sub>	Reverse Transfer Capacitance			-	180	-	PF
Switching Characteristics <sup>(Note 4)</sup>							
t <sub>d(on)</sub>	Turn-on Delay Time		V <sub>DD</sub> =75V,R <sub>L</sub> =5Ω V <sub>GS</sub> =10V,R <sub>GEN</sub> =3Ω	-	10.5	-	nS
t <sub>r</sub>	Turn-on Rise Time			-	5.5	-	nS
t <sub>d(off)</sub>	Turn-Off Delay Time			-	14.5	-	nS
t <sub>f</sub>	Turn-Off Fall Time			-	3	-	nS
Q <sub>g</sub>	Total Gate Charge		V <sub>DS</sub> =75V,I <sub>D</sub> =10A, V <sub>GS</sub> =10V	-	17	-	nC
Q <sub>gs</sub>	Gate-Source Charge			-	4	-	nC
Q <sub>gd</sub>	Gate-Drain Charge			-	4.4	-	nC
Drain-Source Diode Characteristics							
V <sub>SD</sub>	Diode Forward Voltage <sup>(Note 3)</sup>		V <sub>GS</sub> =0V,I <sub>S</sub> =8A	-	-	1.2	V
I <sub>S</sub>	Diode Forward Current <sup>(Note 2)</sup>		-	-	-	5	A
t <sub>rr</sub>	Reverse Recovery Time		TJ = 25°C, IF = 10A	-	32	-	nS
Q <sub>rr</sub>	Reverse Recovery Charge		di/dt = 100A/μs <sup>(Note3)</sup>	-	53	-	nC
t <sub>on</sub>	Forward Turn-On Time		Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

### Notes:

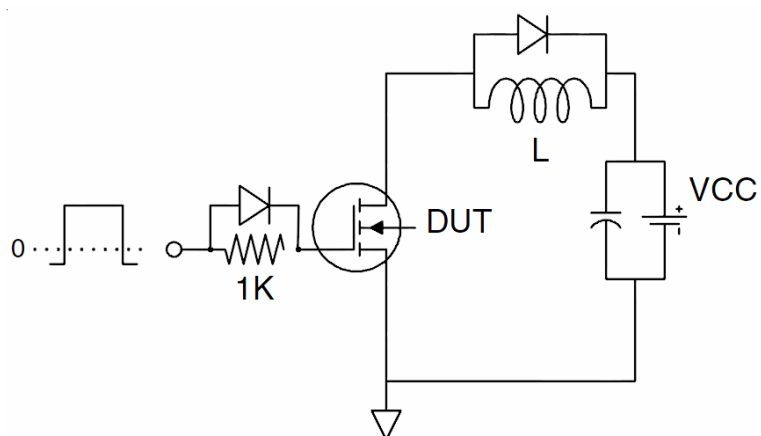
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T<sub>J</sub>=25°C, V<sub>DD</sub>=50V, V<sub>G</sub>=10V, L=0.5mH, R<sub>g</sub>=25Ω

## Test Circuit

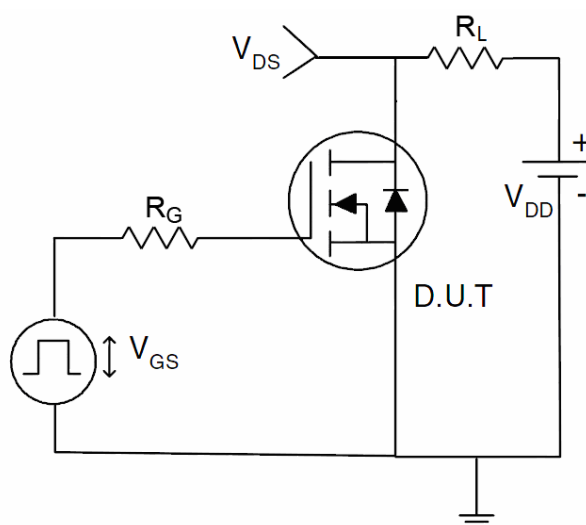
### 1) $E_{AS}$ Test Circuit



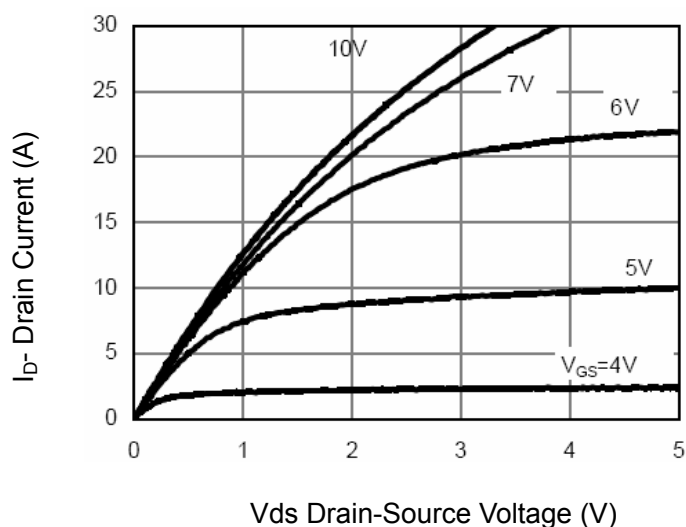
### 2) Gate Charge Test Circuit



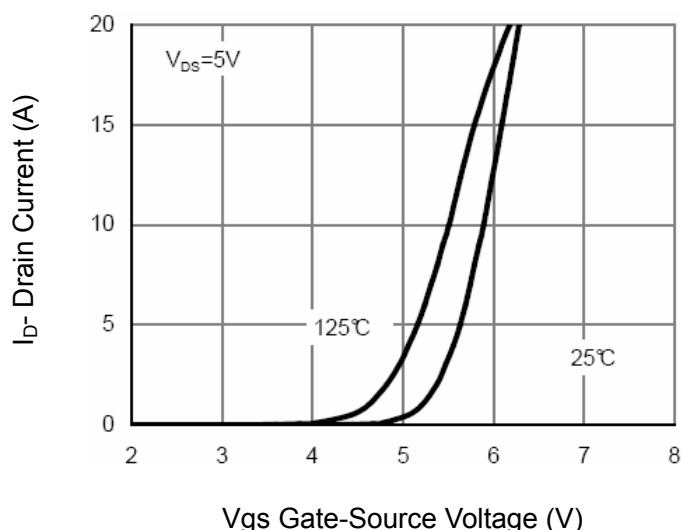
### 3) Switch Time Test Circuit



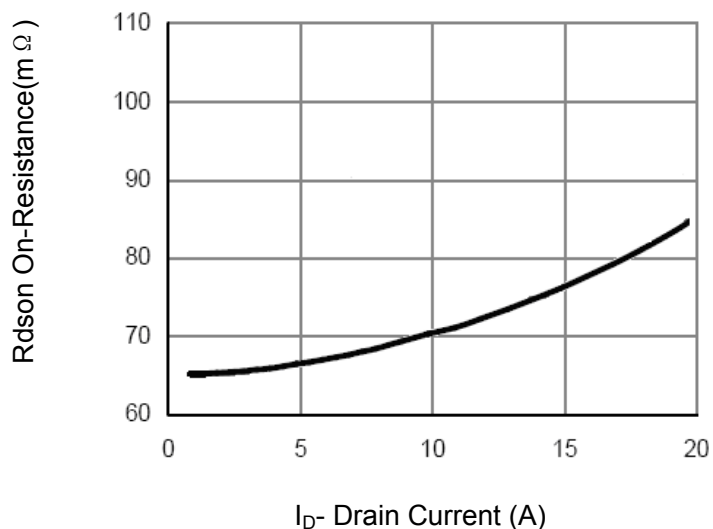
## Typical Electrical and Thermal Characteristics (Curves)



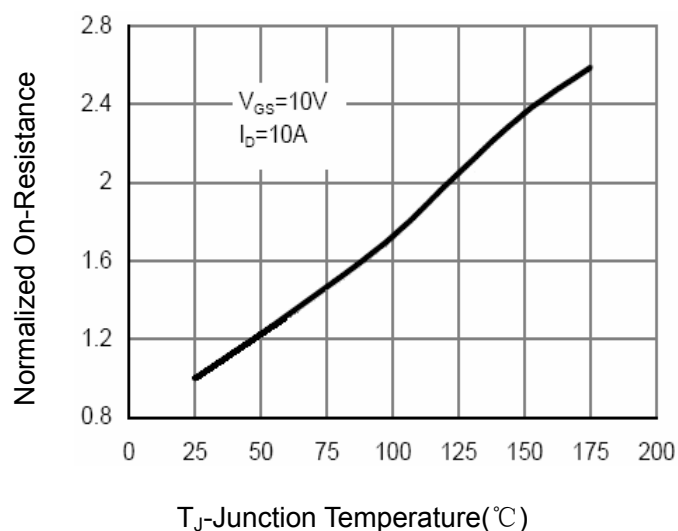
**Figure 1 Output Characteristics**



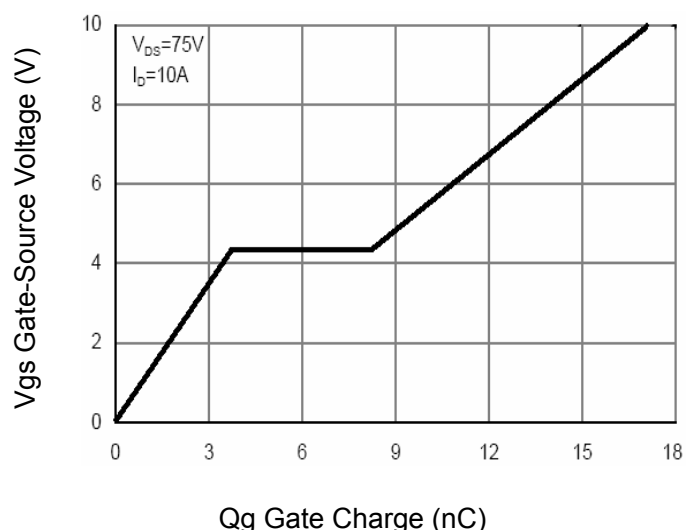
**Figure 2 Transfer Characteristics**



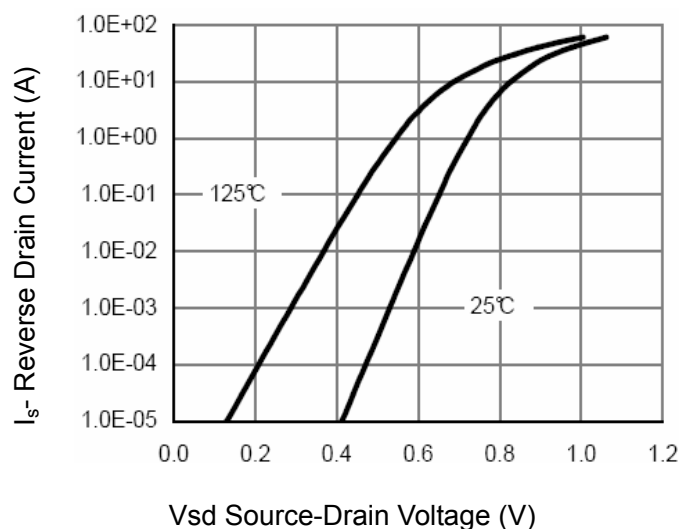
**Figure 3 Rdson- Drain Current**



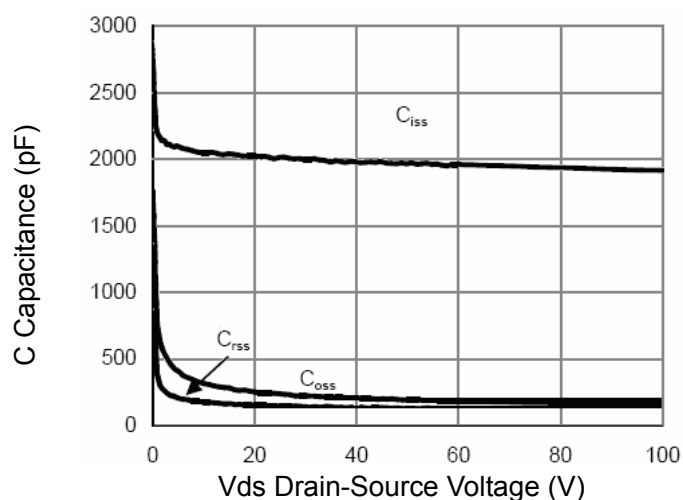
**Figure 4 Rdson-Junction Temperature**



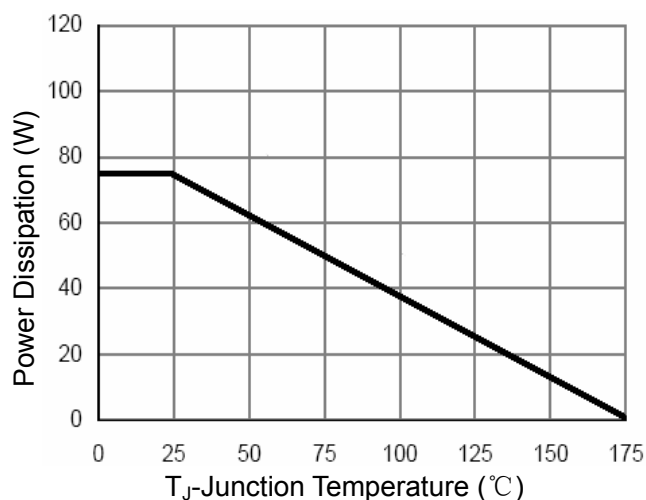
**Figure 5 Gate Charge**



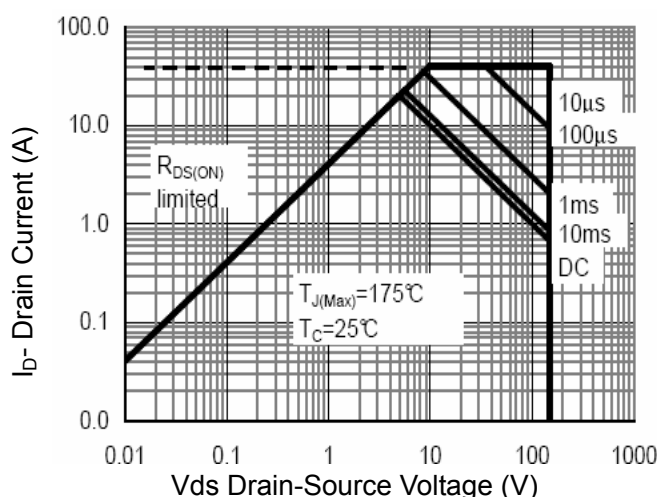
**Figure 6 Source- Drain Diode Forward**



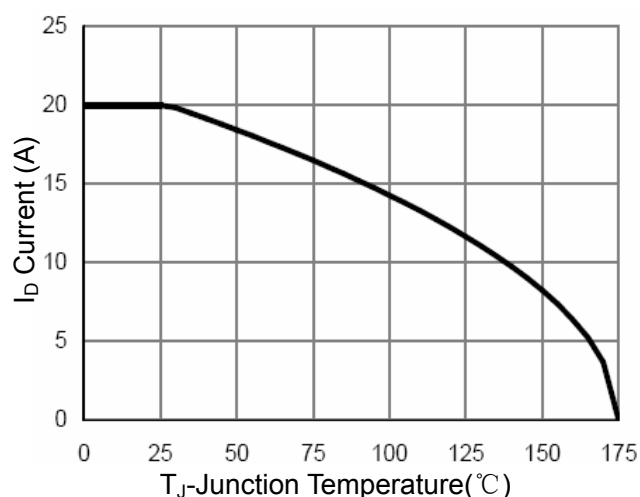
**Figure 7 Capacitance vs Vds**



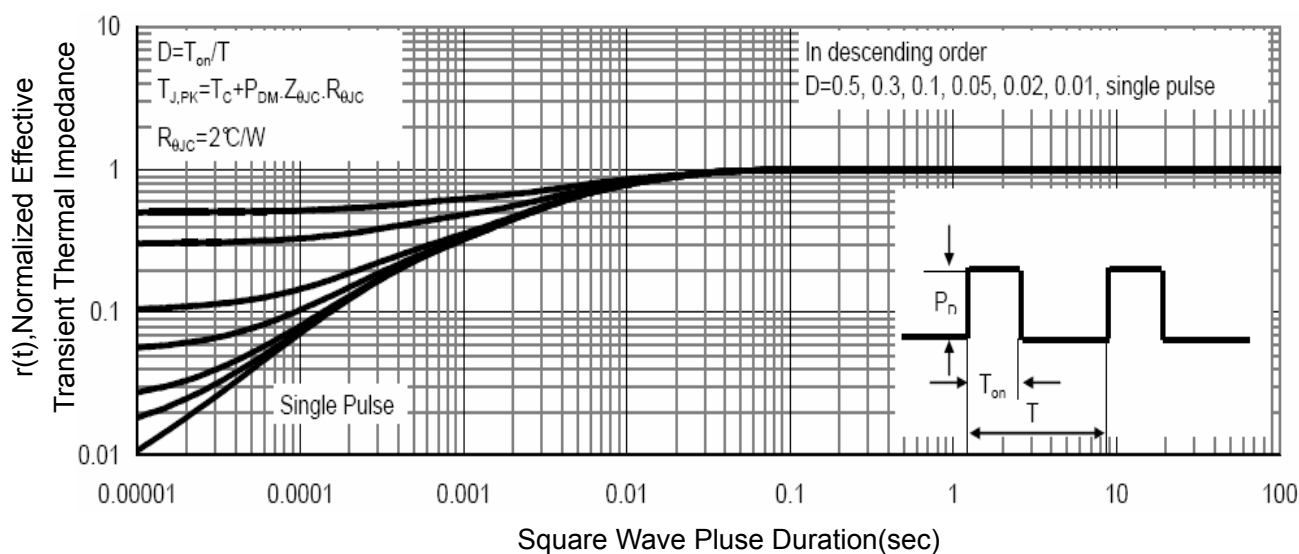
**Figure 9 Power De-rating**



**Figure 8 Safe Operation Area**

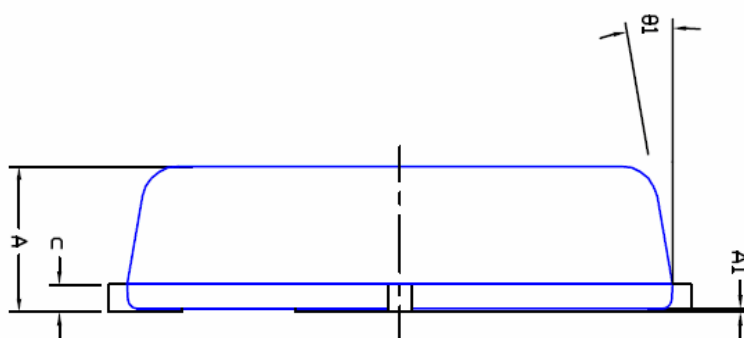
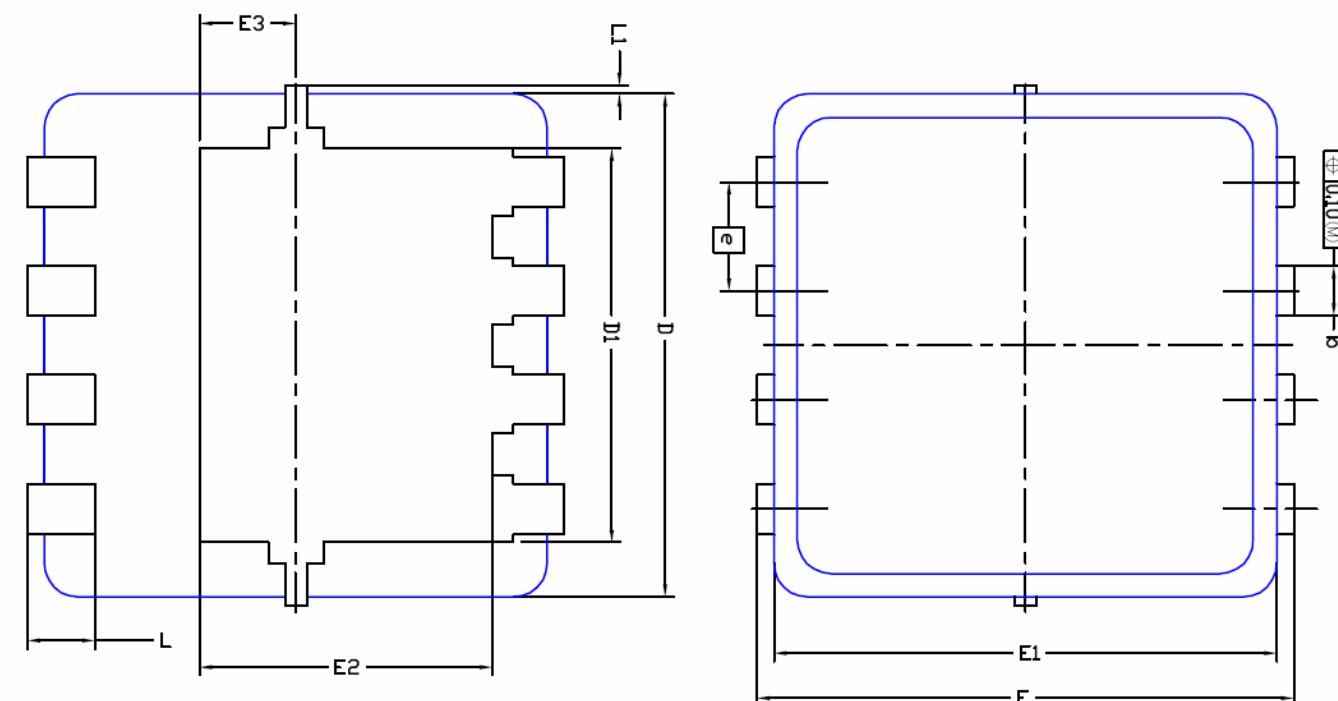


**Figure 10 ID Current- Junction Temperature**



**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°