

AP050N03Q

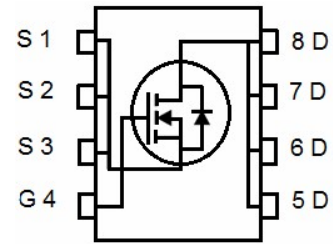
N-Channel Power MOSFET

Description

The AP050N03Q 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.

Application

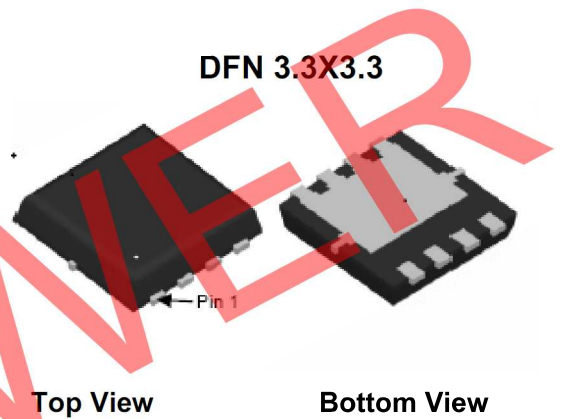
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification



Schematic Diagram

General Features

- $V_{DS} = 30V, I_D = 65$
 $R_{DS(ON)} = 4.5m\Omega$ (typical) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 6.5m\Omega$ (typical) @ $V_{GS} = 4.5V$
- High density cell design for ultra low R_{dson}
- Very low on-resistance $R_{DS(on)}$
- Good stability and uniformity with high E_{AS}
- 150 °C operating temperature
- Pb-free lead plating



Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
AP050N03Q	050N03Q	DFN 3.3X3.3-8L	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	65	A
Drain Current-Continuous($T_C = 100^\circ C$)	$I_D(100^\circ C)$	46	A
Pulsed Drain Current	I_{DM}	260	A
Maximum Power Dissipation	P_D	45	W
Derating factor		0.36	W/ $^\circ C$
Single pulse avalanche energy ^(Note 5)	E_{AS}	150	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)	$R_{\theta JC}$	2.8	$^\circ C/W$
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Electrical Characteristics (TC=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	30	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=30V, V_{GS}=0V$	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	± 100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	1.5	2.2	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=20A$	-	4.5	6.0	m Ω
		$V_{GS}=4.5V, I_D=20A$	-	6.5	8.5	
Forward Transconductance	g_{FS}	$V_{DS}=5V, I_D=20A$	30	-	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{iss}	$V_{DS}=15V, V_{GS}=0V,$ $F=1.0MHz$	-	1784	-	PF
Output Capacitance	C_{oss}		-	266	-	PF
Reverse Transfer Capacitance	C_{rss}		-	212	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=5V, I_D=20A$ $V_{GS}=10V, R_{GEN}=6\Omega$	-	7	-	nS
Turn-on Rise Time	t_r		-	6	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	30	-	nS
Turn-Off Fall Time	t_f		-	8	-	nS
Total Gate Charge	Q_g		$V_{DS}=15V, I_D=20A,$ $V_{GS}=10V$	-	38.4	-
Gate-Source Charge	Q_{gs}	-		5.8	-	nC
Gate-Drain Charge	Q_{gd}	-		7.9	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	$V_{GS}=0V, I_S=20A$	-	0.85	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	65	A
Reverse Recovery Time	t_{rr}	$T_J = 25^\circ C, I_F = 20A$	-	-	47	nS
Reverse Recovery Charge	Q_{rr}	$di/dt = 100A/\mu s$ (Note3)	-	-	25	nC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

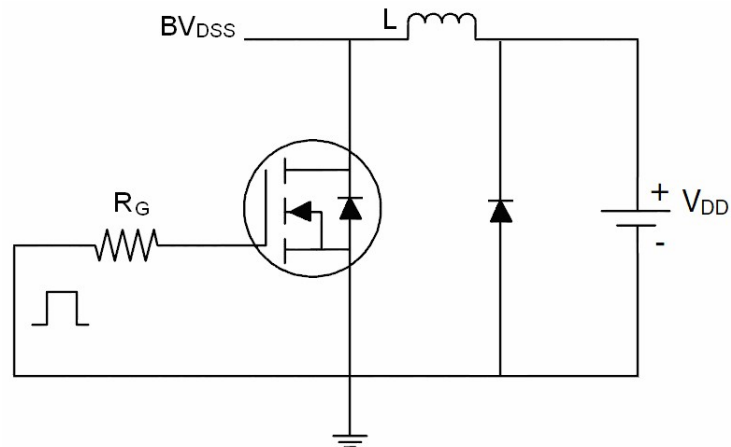
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^\circ C, V_{DD}=15V, V_G=10V, L=0.5mH, R_g=25\Omega$

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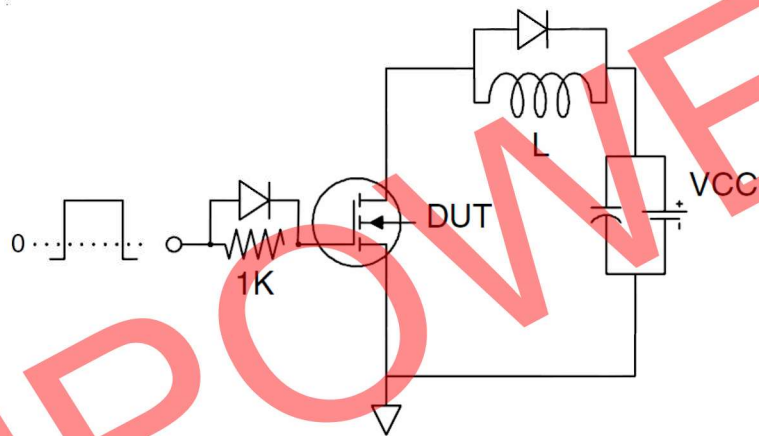
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Test Circuit

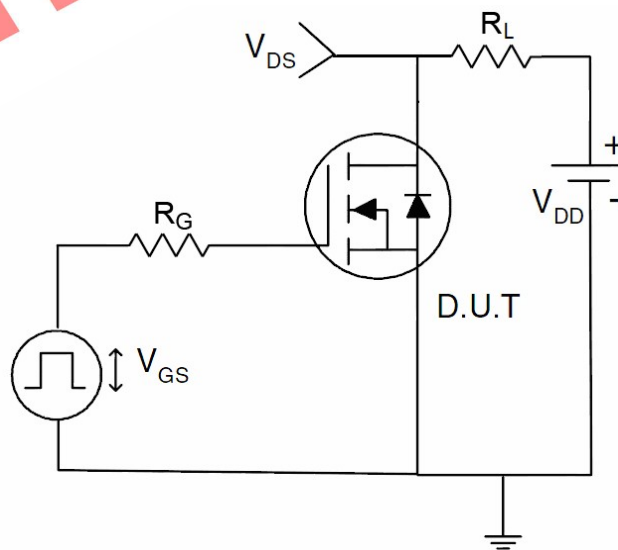
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



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Typical Electrical and Thermal Characteristics (Curves)

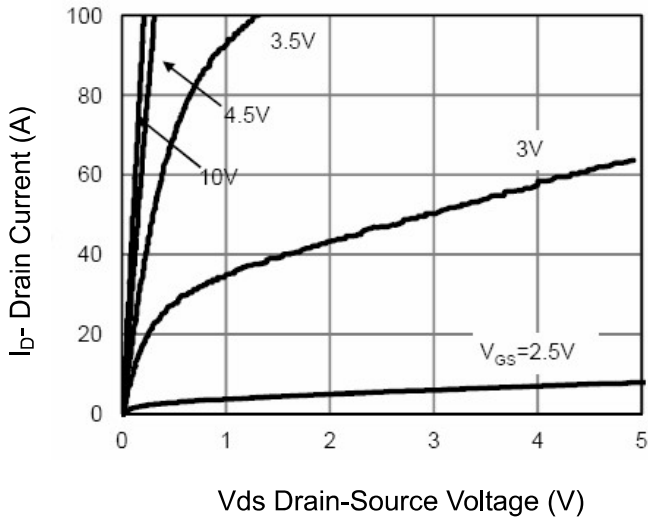


Figure 1 Output Characteristics

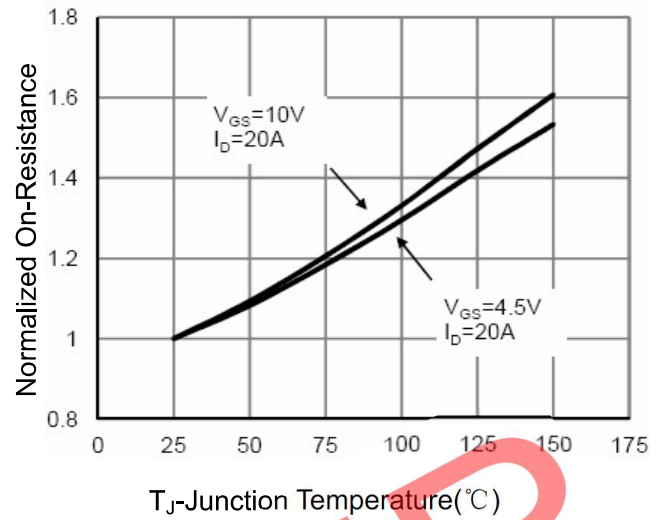


Figure 4 Rdson-Junction Temperature

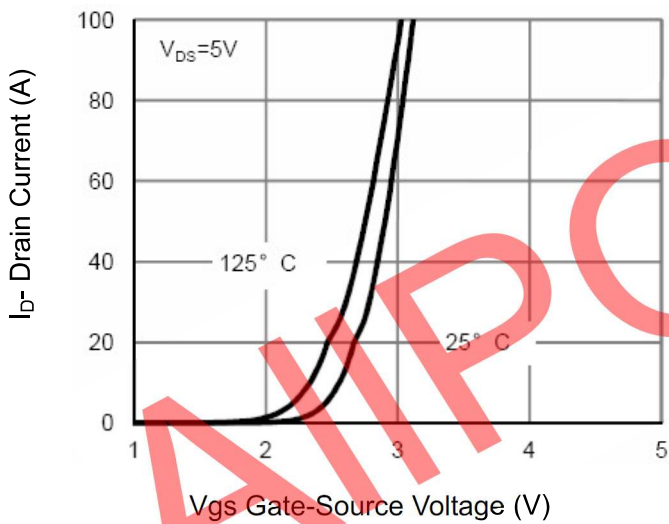


Figure 2 Transfer Characteristics

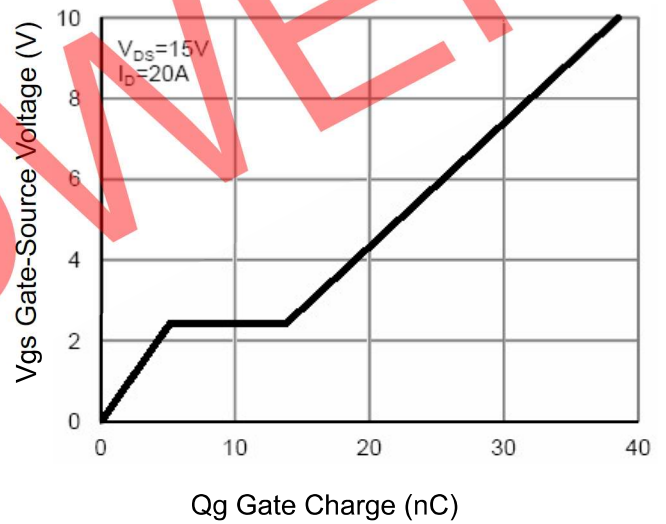


Figure 5 Gate Charge

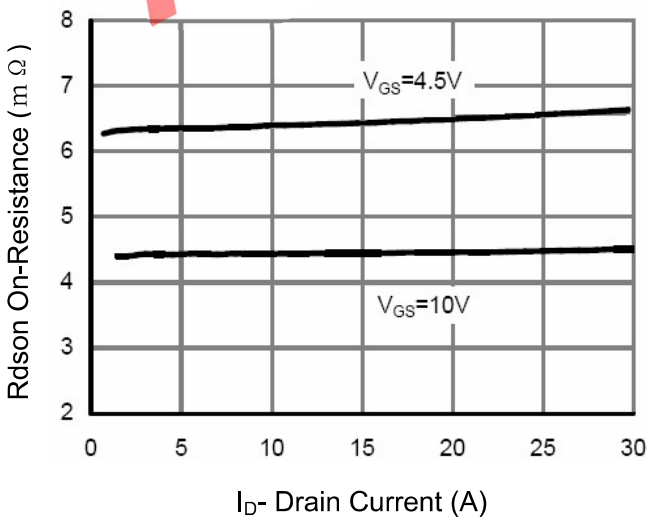


Figure 3 Rdson- Drain Current

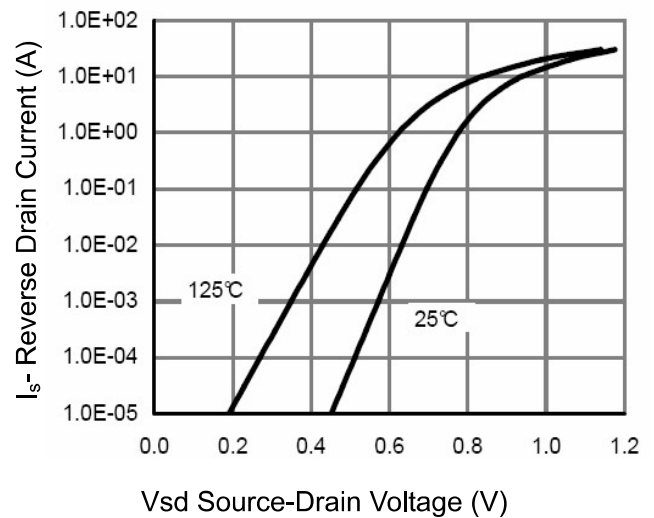
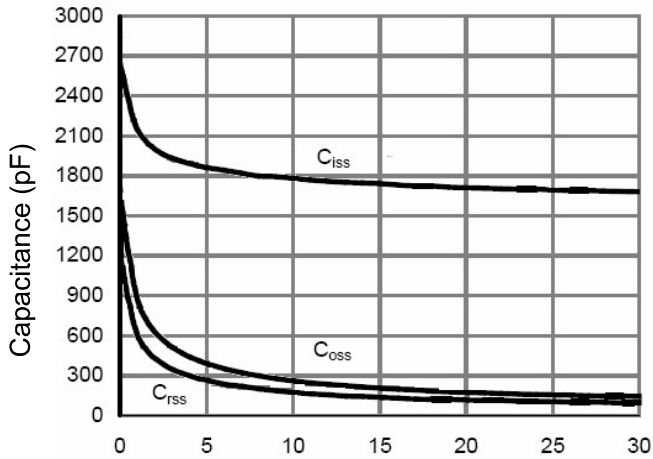
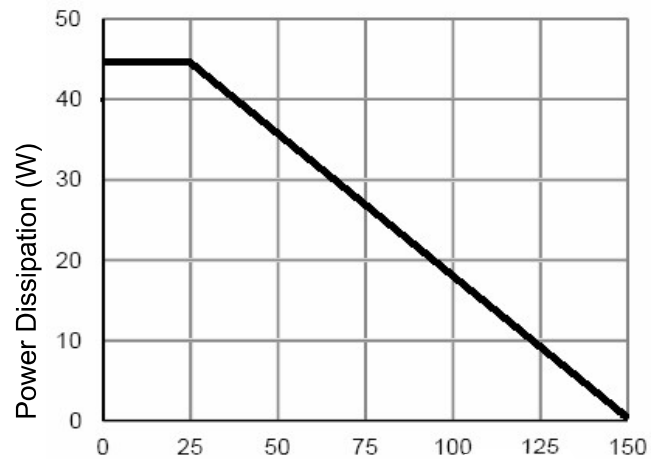


Figure 6 Source- Drain Diode Forward

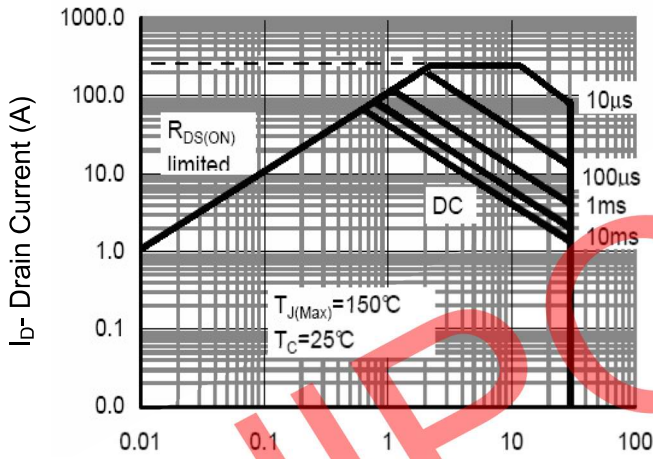
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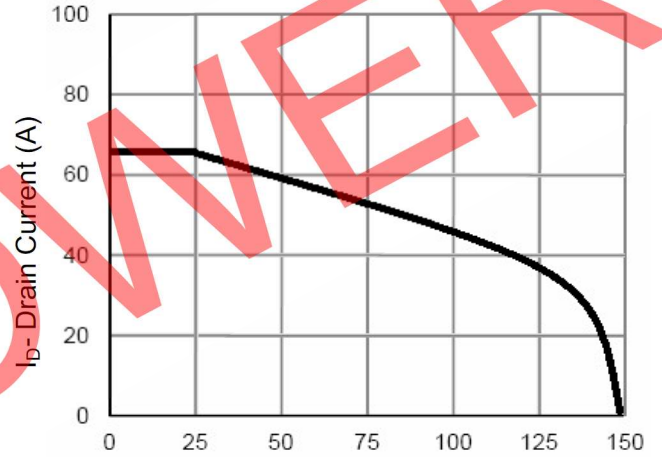
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



T_J-Junction Temperature(°C)
Figure 9 Power De-rating



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area



T_J-Junction Temperature(°C)
Figure 10 Current De-rating

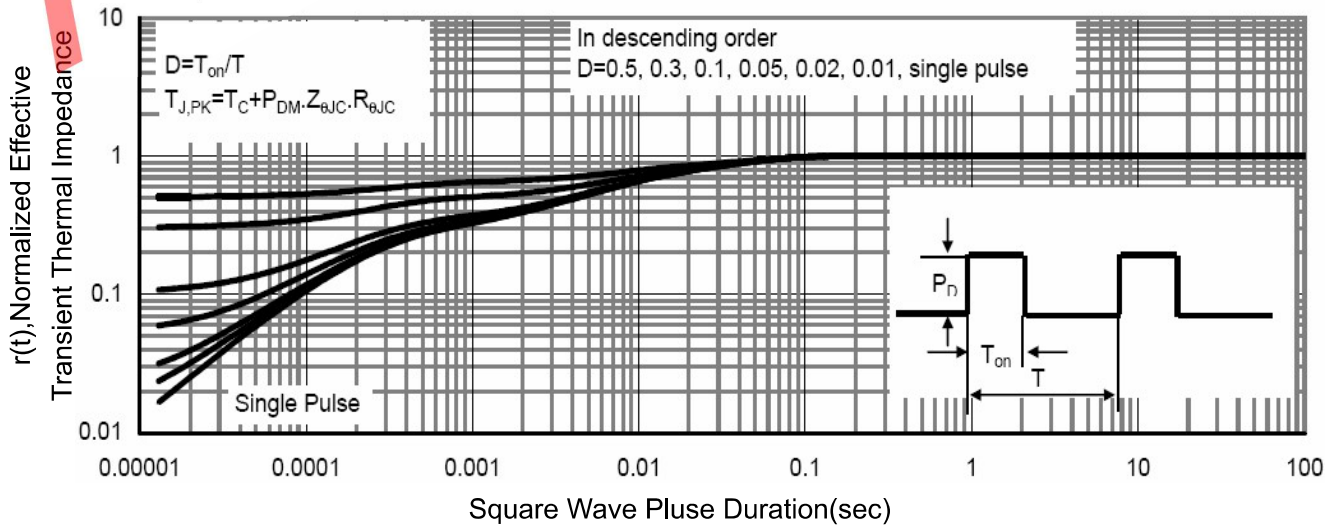
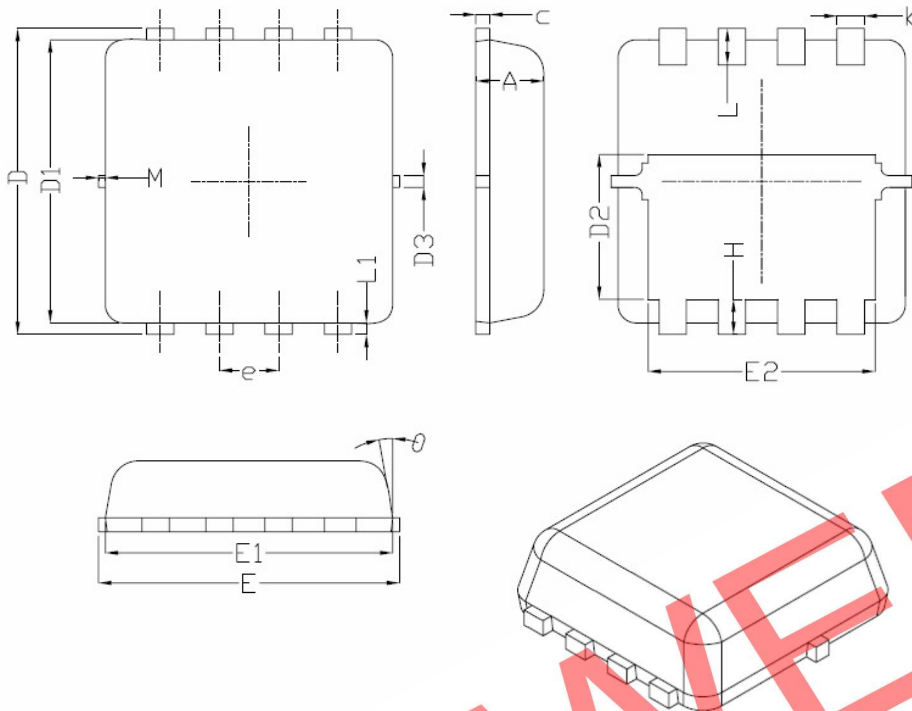


Figure 11 Normalized Maximum Transient Thermal Impedance

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DFN3.3X3.3-8L Package Information



Symbol	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.70	0.75	0.80
b	0.25	0.30	0.35
c	0.10	0.15	0.25
D	3.25	3.35	3.45
D1	3.00	3.10	3.20
D2	1.48	1.58	1.68
D3	-	0.13	-
E	3.20	3.30	3.40
E1	3.00	3.15	3.20
E2	2.39	2.49	2.59
e	0.65BSC		
H	0.30	0.39	0.50
L	0.30	0.40	0.50
L1	-	0.13	-
M	*	*	0.15
θ		10°	12°