

22DN20N-VB Datasheet

N-Channel 200 V (D-S) MOSFET

PRODUCT SUMMARY

V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (TYP.)
200	0.085 at V _{GS} = 10 V	14.1	9.3 nC
	0.089 at V _{GS} = 7.5 V	13.8	

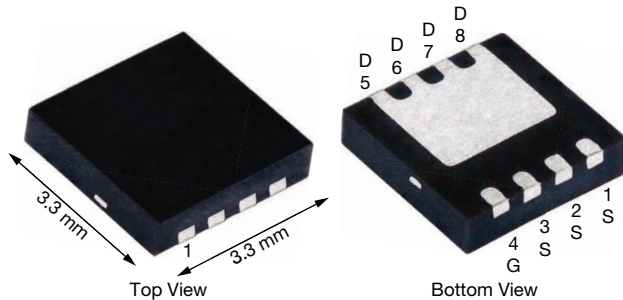
FEATURES

- ThunderFET® power MOSFET
- Optimized Q_g and Q_{oss} improve efficiency
- 100 % R_g and UIS tested



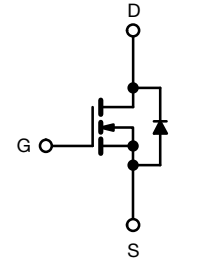
RoHS
COMPLIANT
HALOGEN
FREE

DFN 3x3 EP



APPLICATIONS

- Primary side switching
- Synchronous rectification
- DC/DC converters
- Boost converters



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-Source Voltage		V _{DS}	200	V
Gate-Source Voltage		V _{GS}	± 20	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	14.1	A
	T _C = 70 °C		11.2	
	T _A = 25 °C		4.1 ^{b, c}	
	T _A = 70 °C		3.2 ^{b, c}	
Pulsed Drain Current (t = 100 μs)		I _{DM}	30	
Continuous Source-Drain Diode Current	T _C = 25 °C	I _S	14.1	mJ
	T _A = 25 °C		4.3 ^{b, c}	
Single Pulse Avalanche Current	L = 0.1 mH	I _{AS}	10	
Single Pulse Avalanche Energy		E _{AS}	5	W
Maximum Power Dissipation	T _C = 25 °C	P _D	57	
	T _C = 70 °C		36	
	T _A = 25 °C		4.8 ^{b, c}	
	T _A = 70 °C		3 ^{b, c}	
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +150	°C
Soldering Recommendations (Peak Temperature) ^{d, e}			260	

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum Junction-to-Ambient ^{b, f}	t ≤ 10 s	R _{thJA}	21	26	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R _{thJC}	1.7	2.2	

Notes

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- The DFN3x3 package is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under steady state conditions is 70 °C/W.

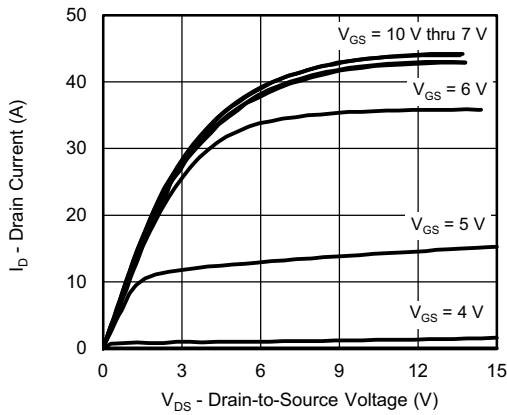
SPECIFICATIONS (T _J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	200	-	-	V
V _{DS} Temperature Coefficient	ΔV _{DS} /T _J	I _D = 250 μA	-	186	-	mV/°C
V _{GS(th)} Temperature Coefficient	ΔV _{GS(th)} /T _J		-	-6	-	
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2	-	4	V
Gate-Source Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 200 V, V _{GS} = 0 V	-	-	1	μA
		V = 200 V, V _{DS GS} = 0 V, T _J = 70 °C	-	-	10	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 10 V	15	-	-	A
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 10 V, I _D = 7 A	-	0.085	-	Ω
		V _{GS} = 7.5 V, I _D = 7 A	-	0.089	-	
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 7 A	-	16.5	-	S
Dynamic ^b						
Input Capacitance	C _{iss}	V _{DS} = 100 V, V _{GS} = 0 V, f = 1 MHz	-	608	-	pF
Output Capacitance	C _{oss}		-	57	-	
Reverse Transfer Capacitance	C _{rss}		-	7	-	
Total Gate Charge	Q _g	V = 100 V, V _{GS} = 10 V, I _D = 3 A	-	12.1	18.2	nC
		V _{DS} = 100 V, V _{GS} = 7.5 V, I _D = 3 A	-	9.3	14	
Gate-Source Charge	Q _{gs}		-	2.9	-	
Gate-Drain Charge	Q _{gd}		-	2.9	-	
Output Charge	Q _{oss}	V _{DS} = 100 V, V _{GS} = 0 V	-	19.5	-	
Gate Resistance	R _g	f = 1 MHz	0.6	1.9	3.5	Ω
Turn-On Delay Time	t _{d(on)}	V _{DD} = 100 V, R _L = 33.3 Ω I _D ≅ 3 A, V _{GEN} = 10 V, R _g = 1 Ω	-	8	16	ns
Rise Time	t _r		-	16	32	
Turn-Off Delay Time	t _{d(off)}		-	16	32	
Fall Time	t _f		-	16	32	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 100 V, R _L = 33.3 Ω I _D ≅ 3 A, V _{GEN} = 7.5 V, R _g = 1 Ω	-	10	20	
Rise Time	t _r		-	17	34	
Turn-Off Delay Time	t _{d(off)}		-	14	28	
Fall Time	t _f		-	16	32	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	-	-	14.1	A
Pulse Diode Forward Current (t = 100 μs)	I _{SM}		-	-	30	
Body Diode Voltage	V _{SD}	I _S = 5 A	-	0.82	1.1	V
Body Diode Reverse Recovery Time	t _{rr}	I _F = 5 A, dI/dt = 100 A/μs, T _J = 25 °C	-	89	178	ns
Body Diode Reverse Recovery Charge	Q _{rr}		-	258	516	nC
Reverse Recovery Fall Time	t _a		-	72	-	ns
Reverse Recovery Rise Time	t _b		-	17	-	

Notes

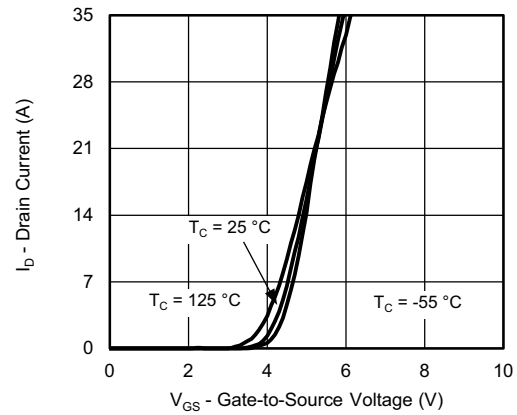
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

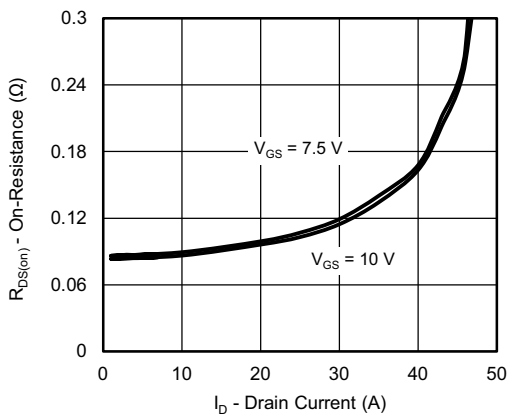
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



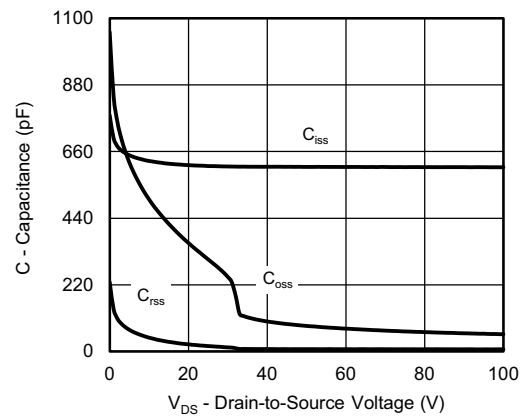
Output Characteristics



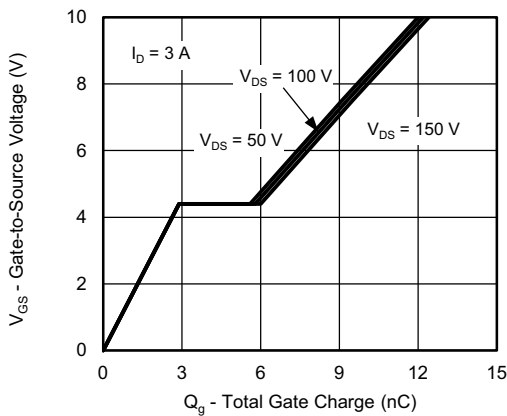
Transfer Characteristics



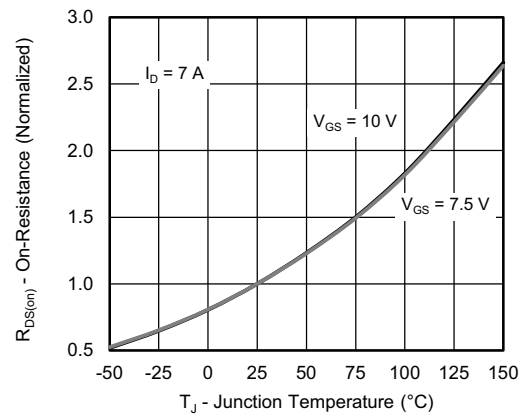
On-Resistance vs. Drain Current



Capacitance

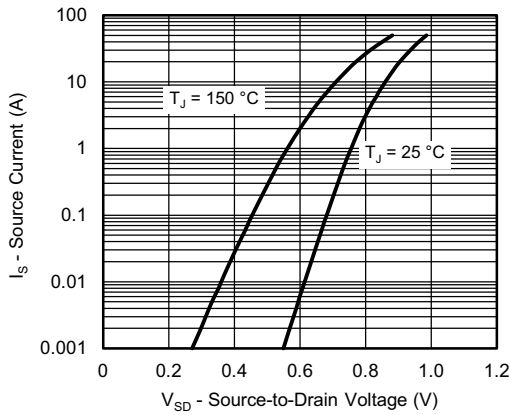


Gate Charge

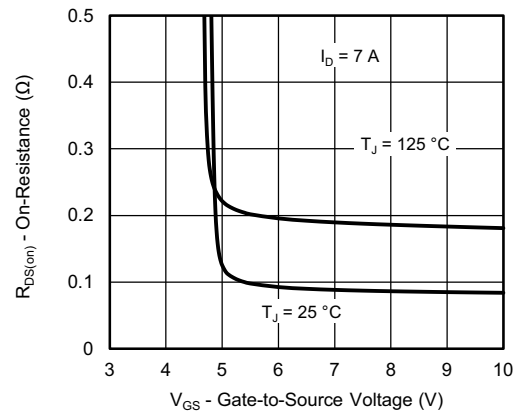


On-Resistance vs. Junction Temperature

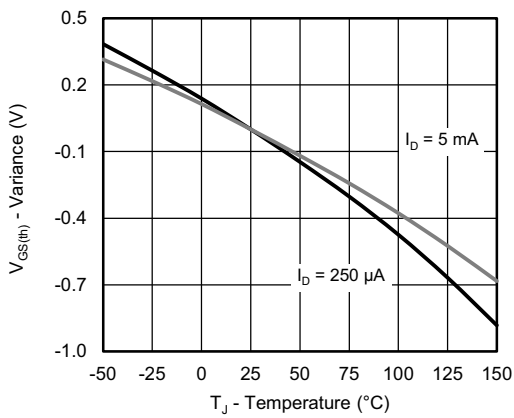
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



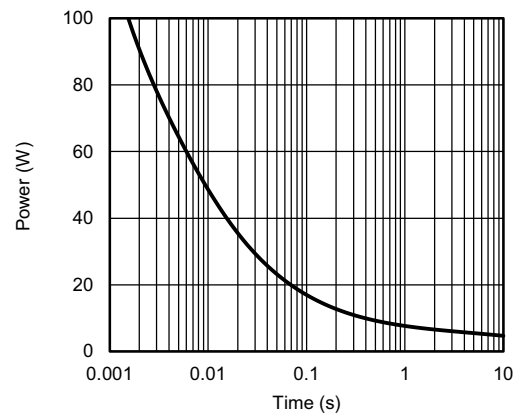
Source-Drain Diode Forward Voltage



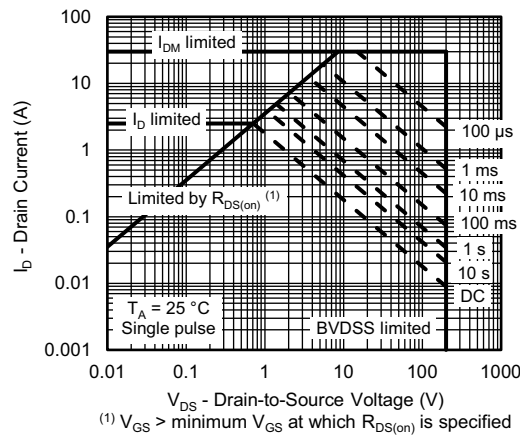
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

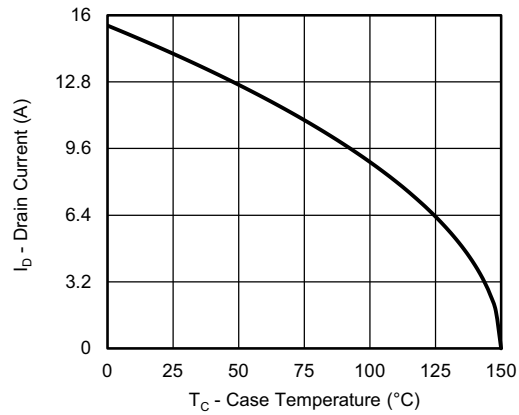
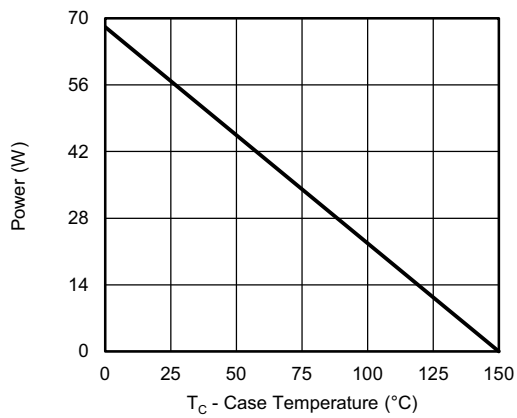
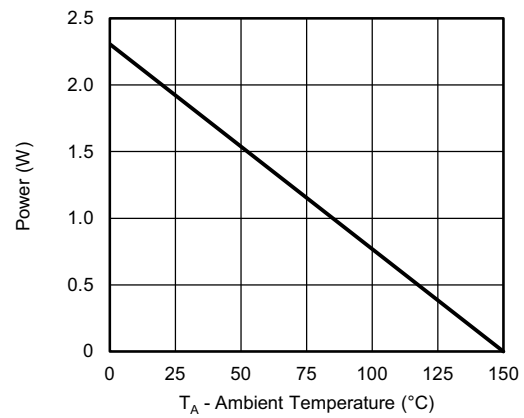


Single Pulse Power, Junction-to-Ambient



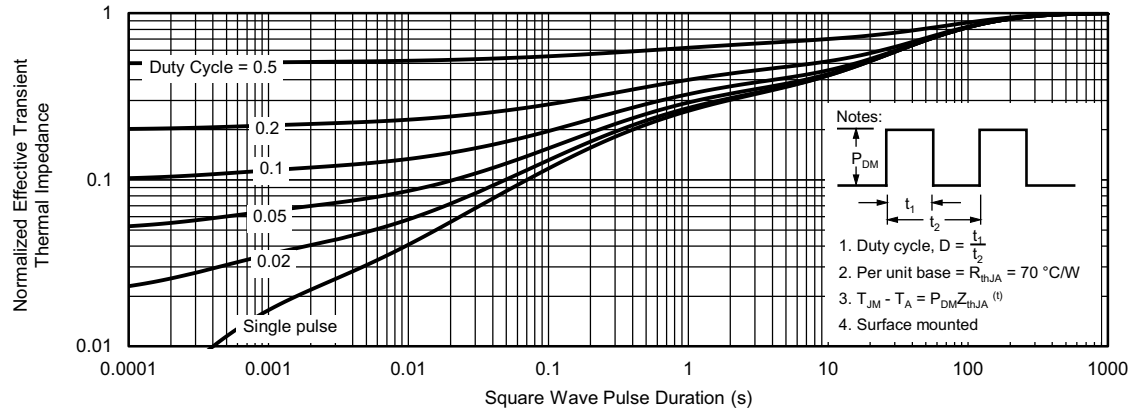
Safe Operating Area

⁽¹⁾ $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

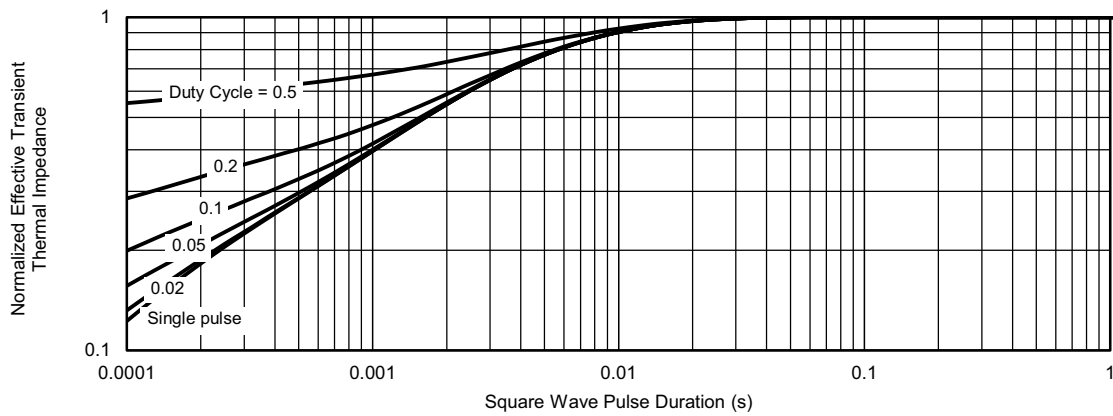
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Current Derating ^a

Power, Junction-to-Case

Power, Junction-to-Ambient
Note

- a. The power dissipation P_D is based on T_J (max.) = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

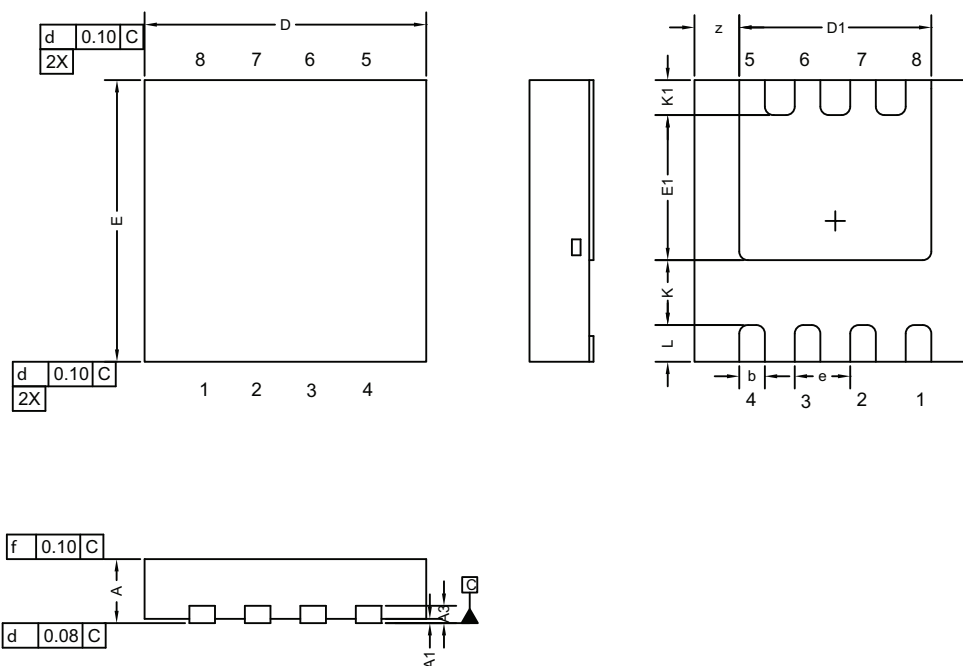


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

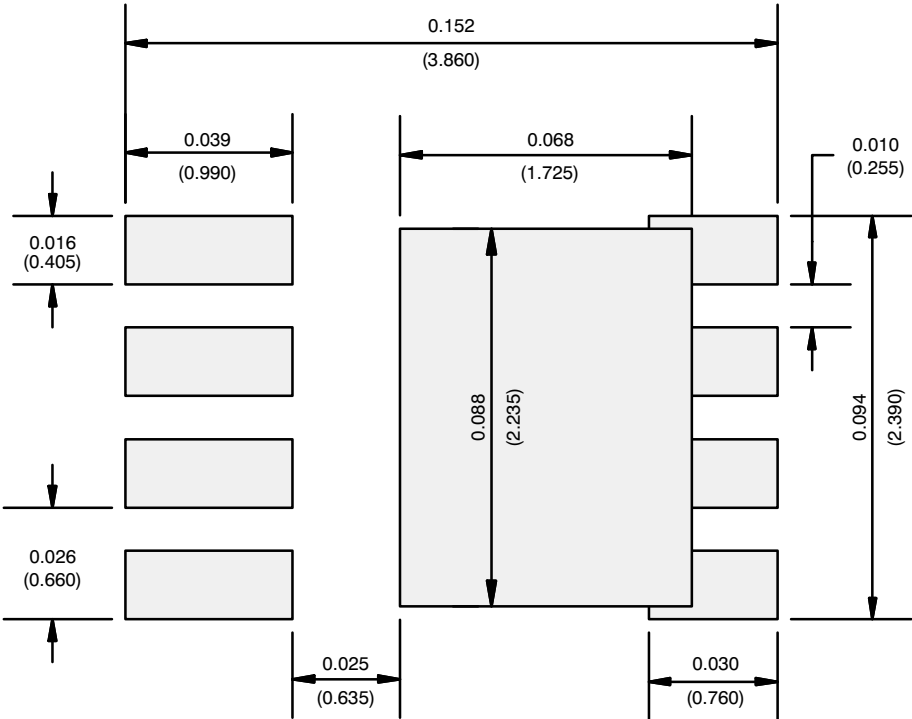
Case Outline for DFN3X3



DIM.	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.67	0.75	0.83	0.027	0.030	0.033
A1	0	-	0.05	0	-	0.002
A3	0.20 REF			0.008 REF		
b	0.30 BSC			0.012 BSC		
D	3.30 BSC			0.130 BSC		
D1	2.15	2.25	2.35	0.084	0.088	0.092
E	3.30 BSC			0.130 BSC		
E1	1.60	1.70	1.80	0.063	0.067	0.071
e	0.65 BSC			0.026 BSC		
K	0.76 TYP			0.030 TYP		
K1	0.41 TYP			0.016 TYP		
L	0.43 BSC			0.017 BSC		
z	0.525 TYP			0.021 TYP		
ECN: C12-0200-Rev. A, 12-Mar-12 DWG: 6008						

Note

- Millimeters will govern.



Recommended Minimum Pads
Dimensions in Inches/(mm)

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