Lead-free Green

DMN2028USS

20V N-CHANNEL ENHANCEMENT MODE MOSFET

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$ max	I_D max T_A = 25°C (Note 3)
20V	20mΩ @ V_{GS}= 4.5V	9.8A
	28mΩ @ V_{GS}= 2.5V	8.3A

Features and Benefits

- Low On-Resistance
- Low Input Capacitance
- Fast Switching Speed
- Low Output Leakage
- **ESD Protected Up to 2kV**
- **Lead Free/RoHS Compliant (Note 1)**
- **Halogen and Antimony Free. "Green" Device (Note 1)**
- **Qualified to AEC-Q101 Standards for High Reliability**

Description and Applications

This MOSFET has been designed to minimize the on-state resistance ($R_{DS(on)}$) and yet maintain superior switching performance, making it ideal for high efficiency power management applications.

- Battery charging
- Power management functions
- DC-DC converters
- Portable power adaptors

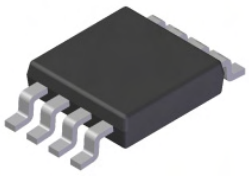
Mechanical Data

- Case: SO-8
- Case Material: Molded Plastic, “Green” Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminal Connections: See Diagram Below
- Terminals: Finish – Matte Tin annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.074 grams (approximate)

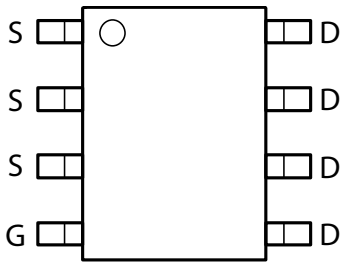


ESD PROTECTED TO 2kV

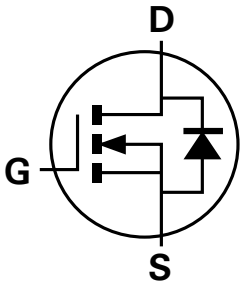
SO-8



Top View



Top View



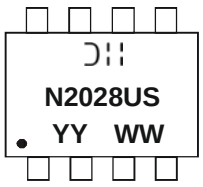
Equivalent Circuit

Ordering Information (Note 1)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN2028USS-13	N2028US	13	12	2,500

Notes: 1. No purposefully added lead. Diodes Inc.'s "Green" policy and packaging details can be found on our website at http://www.diodes.com

Marking Information



= Manufacturer’s Marking
N2028US = Product Type Marking Code
YYWW = Date Code Marking
YY = Year (ex: 10 = 2010)
WW = Week (01-53)

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Maximum Ratings @T_A = 25°C unless otherwise specified

Characteristic			Symbol	Value	Unit
Drain-Source voltage			V_{DSS}	20	V
Gate-Source voltage			V_{GS}	±12	
Continuous Drain current	V_{GS} = 4.5V	(Note 3)	I_D	9.8	A
		T_A = 70°C (Note 3)		7.9	
		(Note 2)		7.3	
Pulsed Drain current	V_{GS} = 4.5V	(Note 4)	I_{DM}	45.0	
Continuous Source current (Body diode)		(Note 3)	I_S	6.0	
Pulsed Source current (Body diode)		(Note 4)	I_{SM}	45.0	

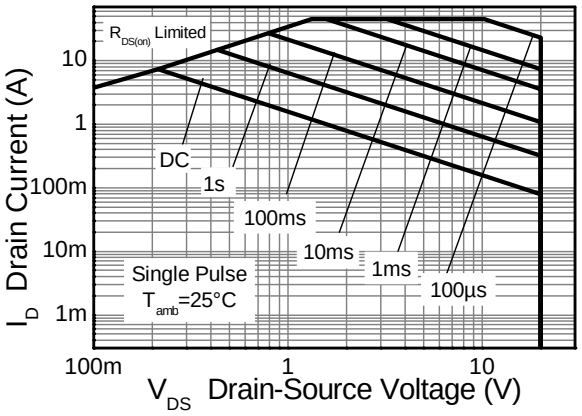
Thermal Characteristics @T_A = 25°C unless otherwise specified

Characteristic		Symbol	Value	Unit
Power dissipation Linear derating factor	(Note 2)	P_D	1.56 12.5	W mW/°C
	(Note 3)		2.81 22.5	
Thermal Resistance, Junction to Ambient	(Note 2)	$R_{\theta JA}$	80.0	°C/W
	(Note 3)		44.5	
Thermal Resistance, Junction to Lead	(Note 5)	$R_{\theta JL}$	37.0	
Operating and storage temperature range		T_J, T_{STG}	-55 to 150	°C

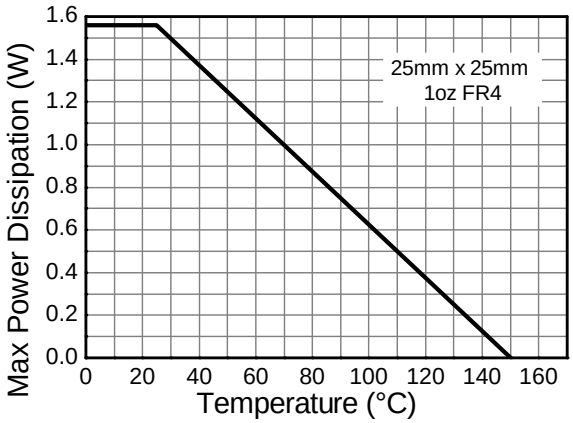
Notes:
2. For a device surface mounted on 25mm x 25mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
3. Same as note (2), except the device is measured at t ≤ 10 sec.
4. Same as note (2), except the device is pulsed with D = 0.02 and pulse width 300µs.
5. Thermal resistance from junction to solder-point (at the end of the drain lead).

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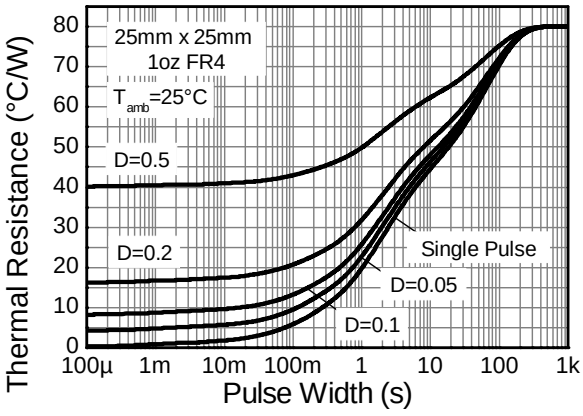
Thermal Characteristics



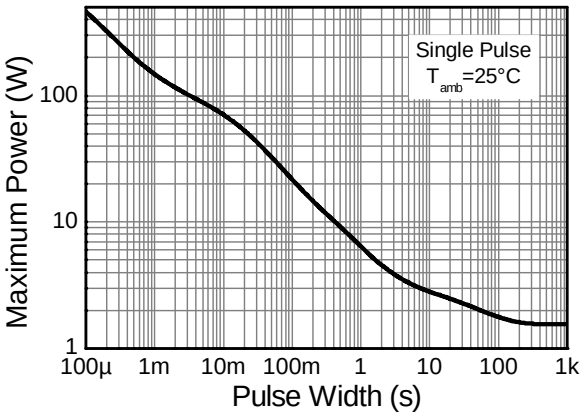
Safe Operating Area



Derating Curve



Transient Thermal Impedance



Pulse Power Dissipation

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Electrical Characteristics @T_A = 25°C unless otherwise specified

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	20	-	-	V	V_{GS} = 0V, I_D = 250µA
Zero Gate Voltage Drain Current	I_{DSS}	-	-	1.0	µA	V_{DS} = 20V, V_{GS} = 0V
Gate-Source Leakage	I_{GSS}	-	-	±10	µA	V_{GS} = ±12V, V_{DS} = 0V
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(th)}$	0.6	1.0	1.3	V	V_{DS} = V_{GS}, I_D = 250µA
Static Drain-Source On-Resistance (Note 6)	$R_{DS\ (ON)}$	-	11	20	mΩ	V_{GS} = 4.5V, I_D = 9.4A
			15	28		V_{GS} = 2.5V, I_D = 8.3A
Forward Transfer Admittance (Note 6 & 7)	$\|Y_{fs}\|$	-	16	-	S	V_{DS} = 5V, I_D = 9.4A
Diode Forward Voltage (Note 6)	V_{SD}	-	0.7	1.3	V	V_{GS} = 0V, I_S = 1.3A
DYNAMIC CHARACTERISTICS (Note 7)						
Input Capacitance	C_{iss}	-	1000	-	pF	V_{DS} = 10V, V_{GS} = 0V, f = 1.0MHz
Output Capacitance	C_{oss}	-	166	-		
Reverse Transfer Capacitance	C_{rss}	-	158	-		
Gate Resistance	R_g	-	1.51	-	Ω	V_{DS} = 0V, V_{GS} = 0V, f = 1MHz
Total Gate Charge (Note 8)	Q_g	-	7.0	-	nC	V_{GS} = 2.5V; V_{DS} = 10V, I_D = 9.4A
Total Gate Charge (Note 8)	Q_g	-	11.6	-		V_{GS} = 4.5V; V_{DS} = 10V, I_D = 9.4A
Gate-Source Charge (Note 8)	Q_{gs}	-	2.7	-		
Gate-Drain Charge (Note 8)	Q_{gd}	-	3.4	-		
Turn-On Delay Time (Note 8)	$t_{D(on)}$	-	11.67	-	ns	V_{GS} = 4.5V, V_{DS} = 10V, R_G = 6Ω , I_D = 1A
Turn-On Rise Time (Note 8)	t_r	-	12.49	-		
Turn-Off Delay Time (Note 8)	$t_{D(off)}$	-	35.89	-		
Turn-Off Fall Time (Note 8)	t_f	-	12.33	-		

Notes:
6. Measured under pulsed conditions. Pulse width ≤ 300µs; duty cycle ≤ 2%
7. For design aid only, not subject to production testing.
8. Switching characteristics are independent of operating junction temperatures.

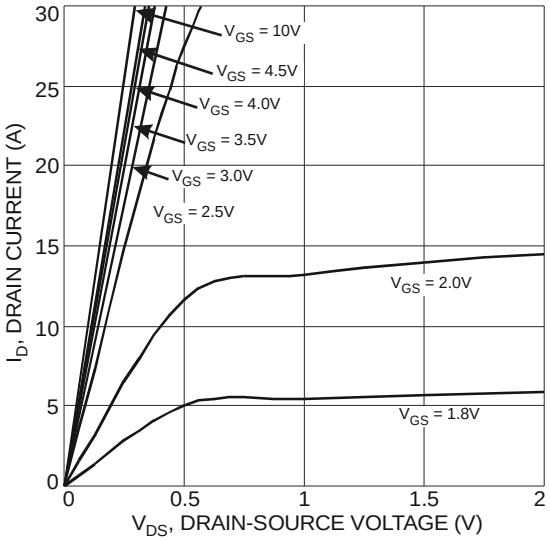


Fig. 1 Typical Output Characteristic

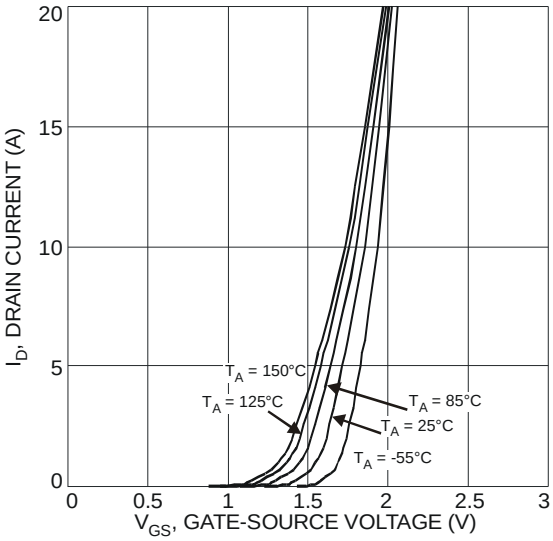


Fig. 2 Typical Transfer Characteristic

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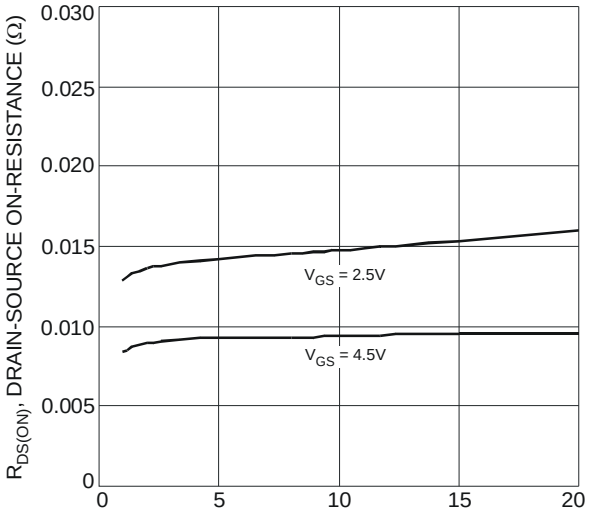


Fig. 3 Typical On-Resistance
vs. Drain Current and Gate Voltage

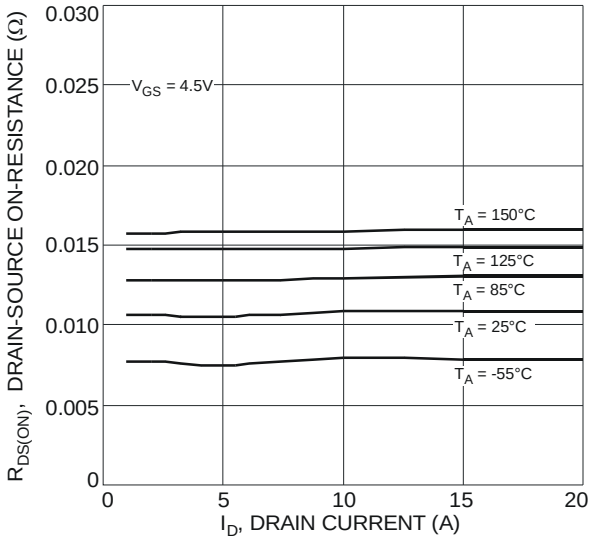


Fig. 4 Typical On-Resistance
vs. Drain Current and Temperature

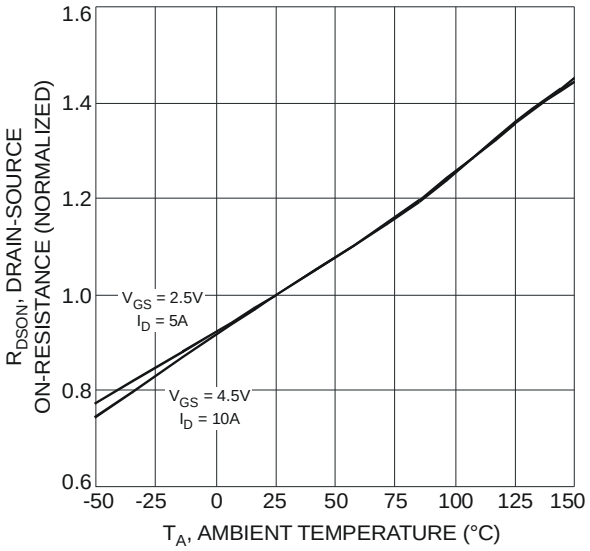


Fig. 5 On-Resistance Variation with Temperature

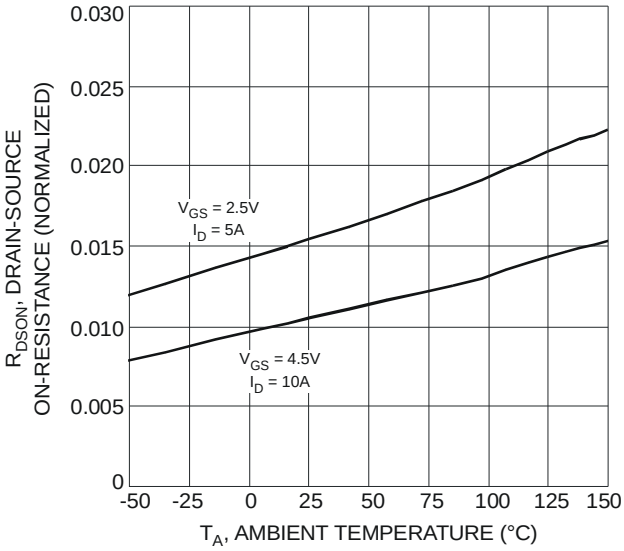


Fig. 6 On-Resistance Variation with Temperature

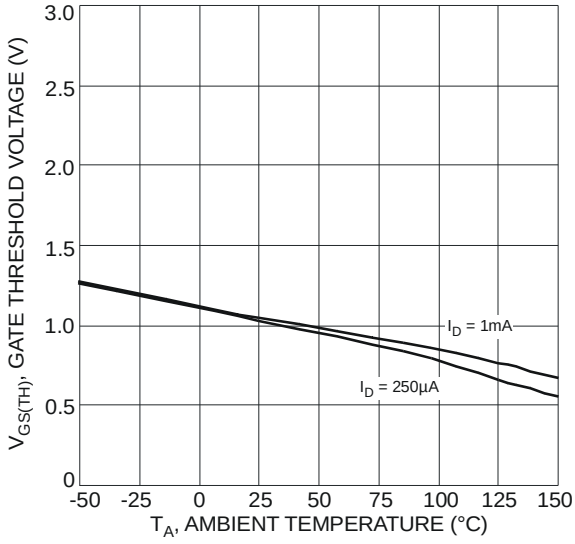


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

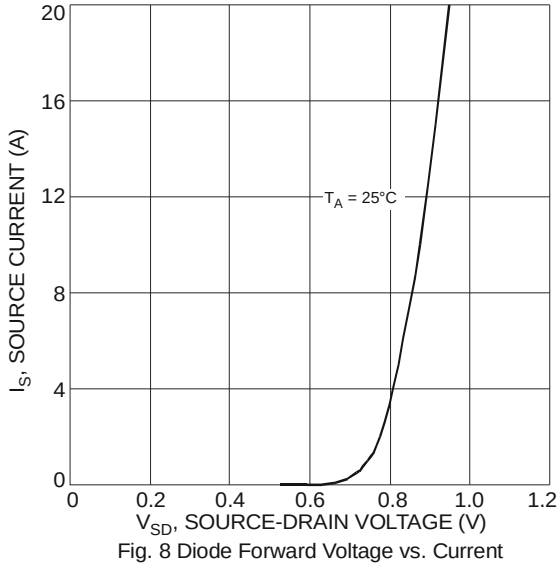


Fig. 8 Diode Forward Voltage vs. Current

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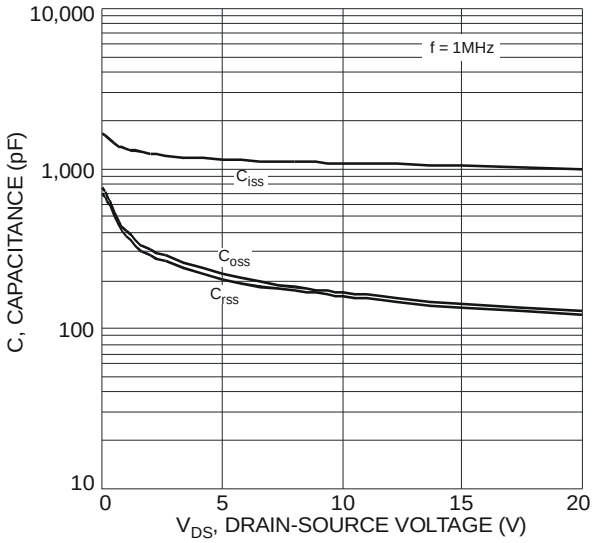


Fig. 9 Typical Total Capacitance

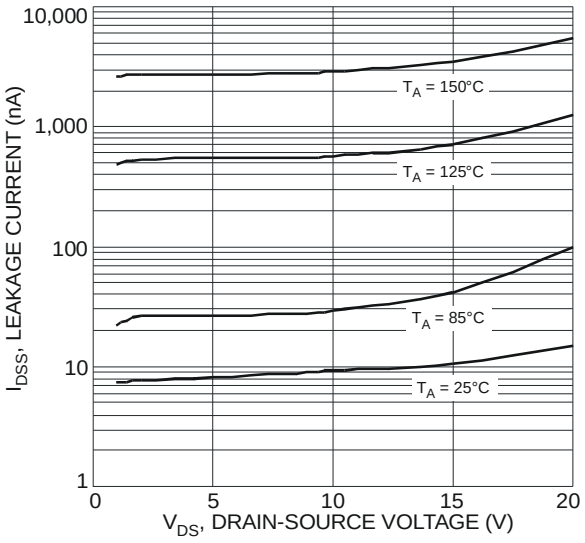


Fig. 10 Typical Leakage Current
vs. Drain-Source Voltage

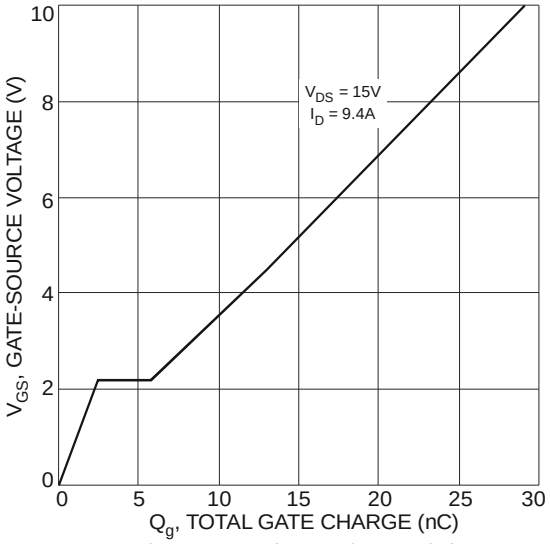
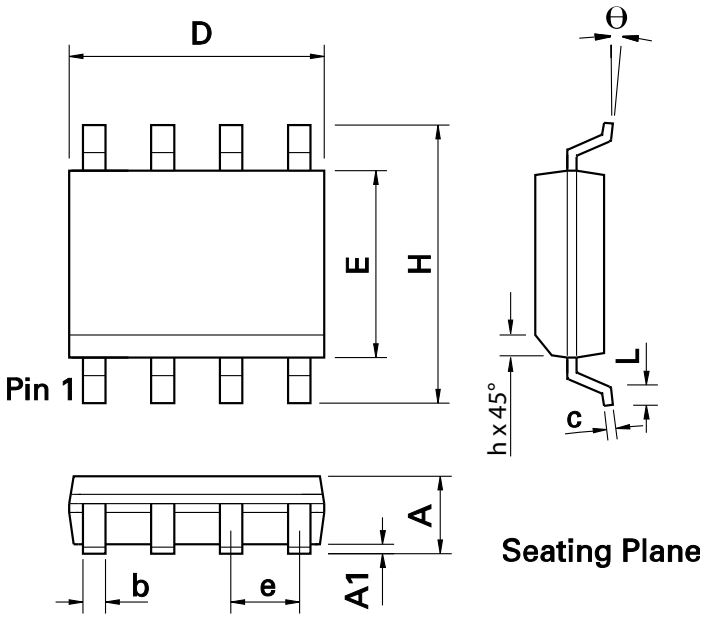


Fig. 11 Gate-Charge Characteristics

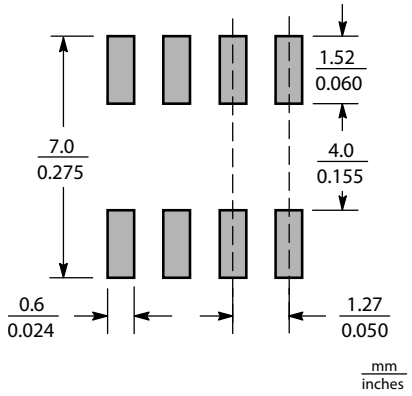
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Package Outline Dimensions



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.053	0.069	1.35	1.75	e	0.050 BSC		1.27 BSC	
A1	0.004	0.010	0.10	0.25	b	0.013	0.020	0.33	0.51
D	0.189	0.197	4.80	5.00	c	0.008	0.010	0.19	0.25
H	0.228	0.244	5.80	6.20	θ	0°	8°	0°	8°
E	0.150	0.157	3.80	4.00	h	0.010	0.020	0.25	0.50
L	0.016	0.050	0.40	1.27	-	-	-	-	-

Suggested Pad Layout



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