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A Product Line of  
 Diodes Incorporated



DMN4036LK3

40V N-CHANNEL ENHANCEMENT MODE MOSFET

## Product Summary

$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$ $T_A = 25^\circ C$
40V	36m $\Omega$ @ $V_{GS} = 10V$	12.2A
	61m $\Omega$ @ $V_{GS} = 4.5V$	9.4A

## 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.

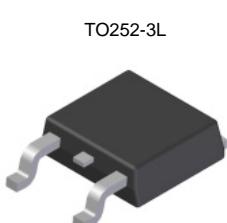
- Backlighting
- DC-DC Converters
- Power management functions

## Features and Benefits

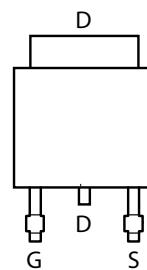
- Low on-resistance
- Fast switching speed
- "Green" component and RoHS compliant (Note 1)
- Qualified to AEC-Q101 Standards for High Reliability

## Mechanical Data

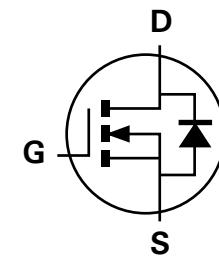
- Case: TO252-3L
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94V-0 (Note 1)
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals Connections: See Diagram
- Terminals: Matte Tin Finish annealed over Copper leadframe. Solderable per MIL-STD-202, Method 208
- Weight: 0.33 grams (approximate)



TOP VIEW



PIN OUT -TOP VIEW



Equivalent Circuit

## Ordering Information (Note 1)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
DMN4036LK3-13	N4036L	13	16	2,500

Note: 1. Diodes, Inc. defines "Green" products as those which are RoHS compliant and contain no halogens or antimony compounds; further information about Diodes Inc.'s "Green" Policy can be found on our website. For packaging details, go to our website.

## Marking Information



DI = Manufacturer's Marking  
 N4036L = Product Type Marking Code  
 YYWW = Date Code Marking  
 YY = Year (ex: 09 = 2009)  
 WW = Week (01 - 53)

**Maximum Ratings** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic		Symbol	Value	Unit
Drain-Source voltage		$V_{DSS}$	40	V
Gate-Source voltage	(Note 2)	$V_{GS}$	$\pm 20$	V
Continuous Drain current	$V_{GS} = 10\text{V}$	$I_D$	12.2	A
			9.7	
			8.5	
Pulsed Drain current	$V_{GS} = 10\text{V}$	$I_{DM}$	31.7	A
Continuous Source current (Body diode)	(Note 4)	$I_S$	10.4	A
Pulsed Source current (Body diode)	(Note 5)	$I_{SM}$	31.7	A

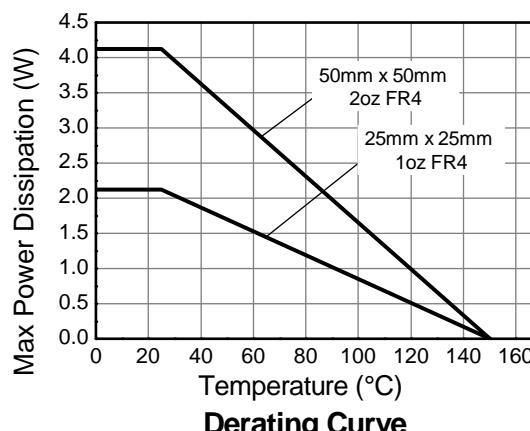
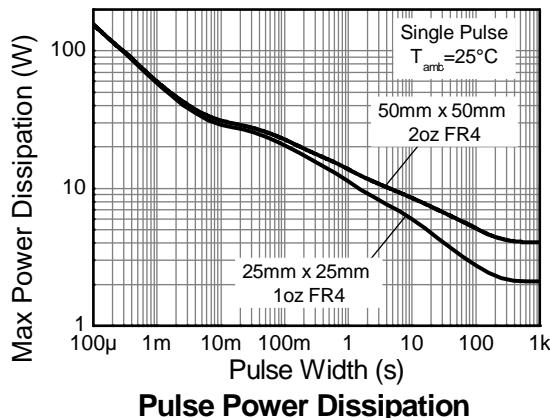
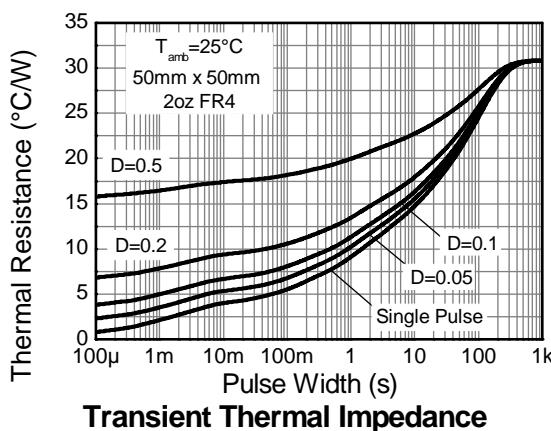
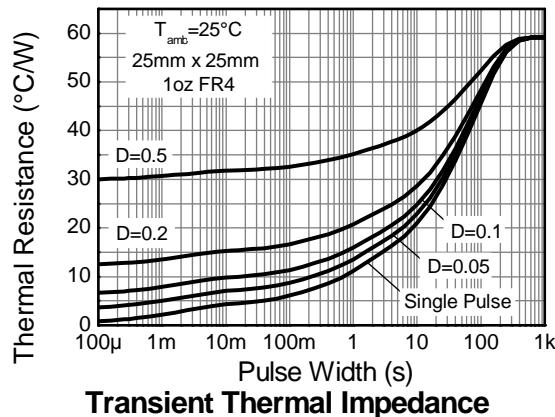
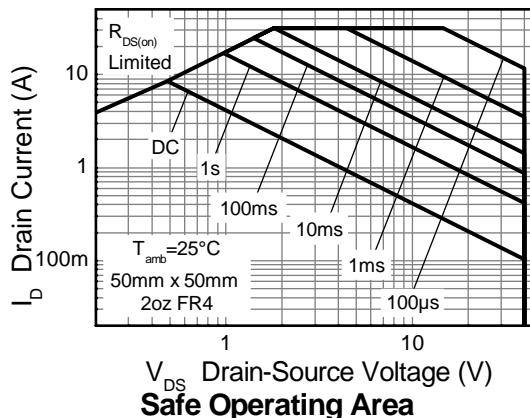
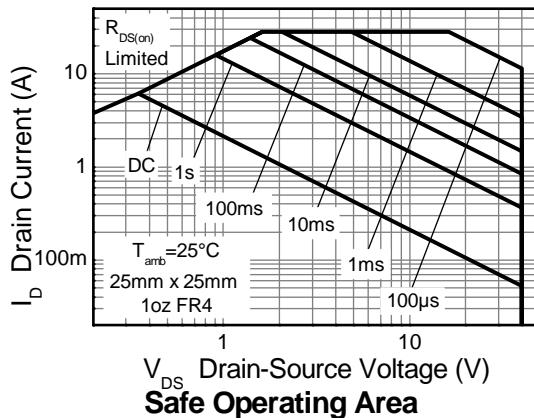
**Thermal Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

Characteristic		Symbol	Value	Unit
Power dissipation Linear derating factor	(Note 3)	$P_D$	4.12	W mW/°C
	(Note 4)		33	
	(Note 6)		8.49 67.9	
Thermal Resistance, Junction to Ambient	(Note 3)	$R_{0JA}$	2.12 16.9	°C/W
	(Note 4)		30.3	
	(Note 6)		14.7 59.0	
Thermal Resistance, Junction to Lead	(Note 7)	$R_{0JL}$	3.1	
Operating and storage temperature range		$T_J, T_{STG}$	-55 to 150	°C

Notes:

2. AEC-Q101  $V_{GS}$  maximum is  $\pm 16\text{V}$ .
3. For a device surface mounted on 50mm x 50mm x 1.6mm FR4 PCB with high coverage of single sided 2oz copper, in still air conditions; the device is measured when operating in a steady-state condition.
4. Same as note 3, except the device is measured at  $t \leq 10$  sec.
5. Same as note 3, except the device is pulsed with  $D = 0.02$  and pulse width 300  $\mu\text{s}$ . The pulse current is limited by the maximum junction temperature.
6. 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.
7. Thermal resistance from junction to solder-point (at the end of the drain lead).

## Thermal Characteristics



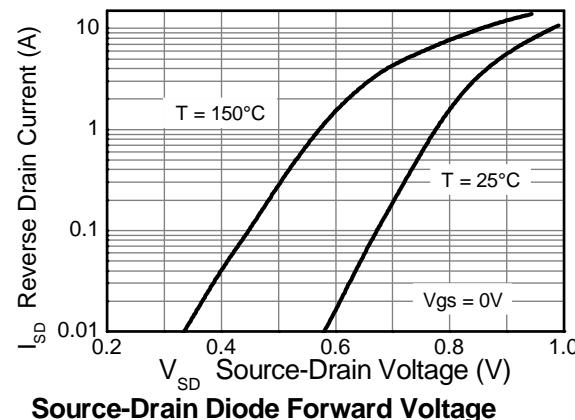
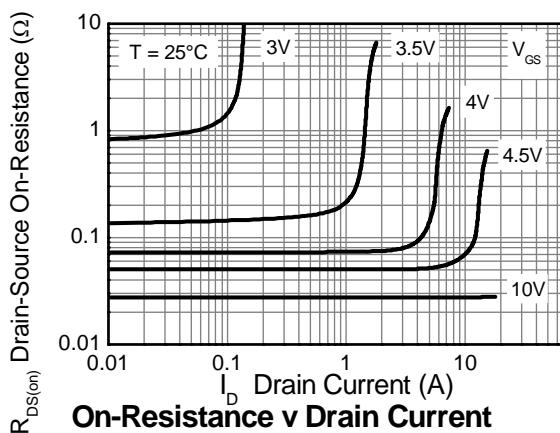
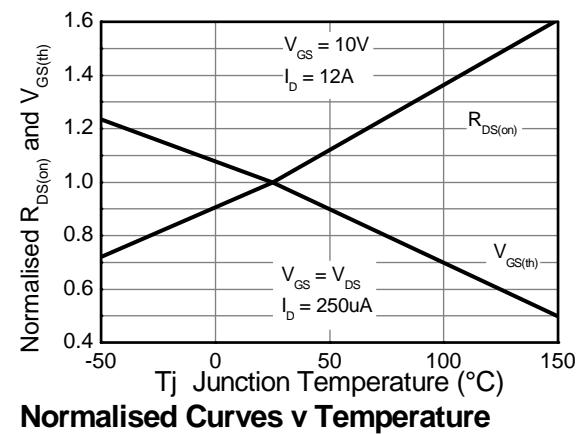
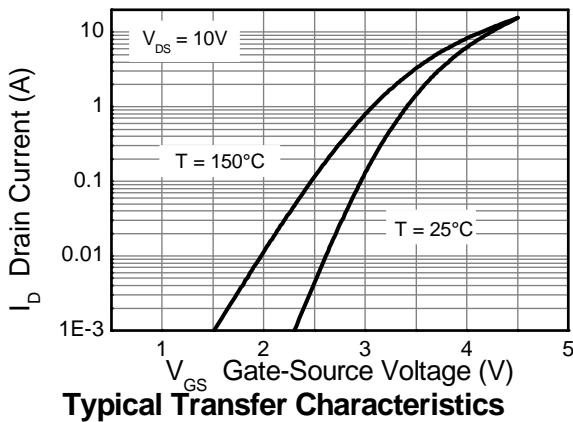
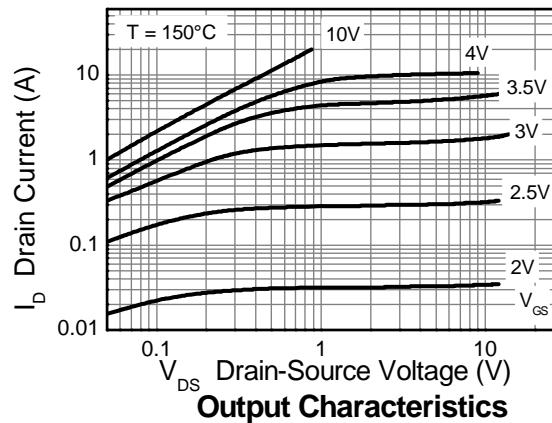
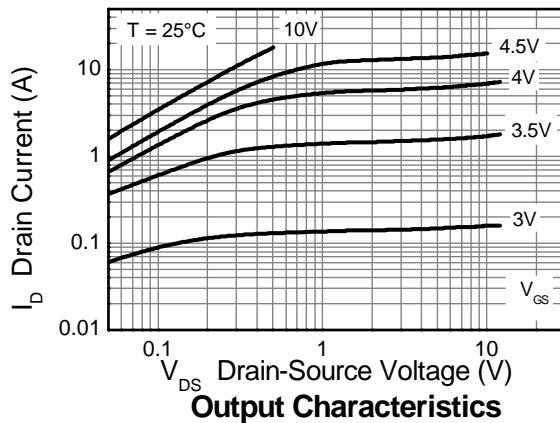


**Electrical Characteristics** @ $T_A = 25^\circ\text{C}$  unless otherwise specified

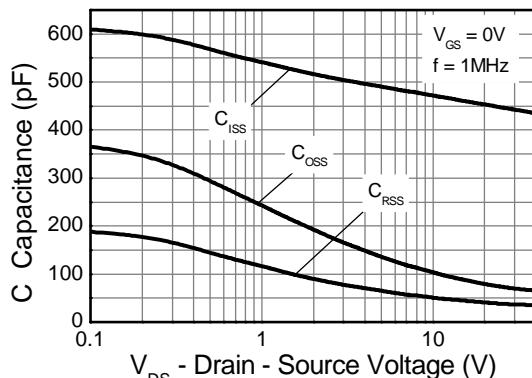
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Drain-Source Breakdown Voltage	$\text{BV}_{\text{DSS}}$	40	—	—	V	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$
Zero Gate Voltage Drain Current	$I_{\text{DSS}}$	—	—	0.5	$\mu\text{A}$	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$
Gate-Source Leakage	$I_{GS}$	—	—	$\pm 100$	nA	$V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(\text{th})}$	1.0	—	3.0	V	$I_D = 250\mu\text{A}$ , $V_{DS} = V_{GS}$
Static Drain-Source On-Resistance (Note 8)	$R_{DS(\text{ON})}$	—	0.026 0.049	0.036 0.061	$\Omega$	$V_{GS} = 10\text{V}$ , $I_D = 12\text{A}$ $V_{GS} = 4.5\text{V}$ , $I_D = 6\text{A}$
Forward Transconductance (Notes 8 & 9)	$g_{fs}$	—	19.6	—	S	$V_{DS} = 15\text{V}$ , $I_D = 12\text{A}$
Diode Forward Voltage (Note 8)	$V_{SD}$	—	0.96	1.1	V	$I_S = 12\text{A}$ , $V_{GS} = 0\text{V}$
Reverse recovery time (Note 9)	$t_{rr}$	—	112	—	ns	$I_S = 12\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$
Reverse recovery charge (Note 9)	$Q_{rr}$	—	926	—	nc	
<b>DYNAMIC CHARACTERISTICS (Note 9)</b>						
Input Capacitance	$C_{iss}$	—	453	—	pF	$V_{DS} = 20\text{V}$ , $V_{GS} = 0\text{V}$ $f = 1\text{MHz}$
Output Capacitance	$C_{oss}$	—	79.1	—	pF	
Reverse Transfer Capacitance	$C_{rss}$	—	40.5	—	pF	
Total Gate Charge (Note 10)	$Q_g$	—	4.9	—	nc	$V_{GS} = 4.5\text{V}$ $V_{GS} = 10\text{V}$
Total Gate Charge (Note 10)	$Q_g$	—	9.2	—	nc	
Gate-Source Charge (Note 10)	$Q_{gs}$	—	1.7	—	nc	
Gate-Drain Charge (Note 10)	$Q_{gd}$	—	2.7	—	nc	
Turn-On Delay Time (Note 10)	$t_{D(on)}$	—	3.2	—	ns	$V_{DD} = 20\text{V}$ , $V_{GS} = 10\text{V}$ $I_D = 12\text{A}$ , $R_G \geq 6.0\Omega$
Turn-On Rise Time (Note 10)	$t_r$	—	11.7	—	ns	
Turn-Off Delay Time (Note 10)	$t_{D(off)}$	—	11.6	—	ns	
Turn-Off Fall Time (Note 10)	$t_f$	—	9.5	—	ns	

Notes: 8. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$   
 9. For design aid only, not subject to production testing.  
 10. Switching characteristics are independent of operating junction temperatures.

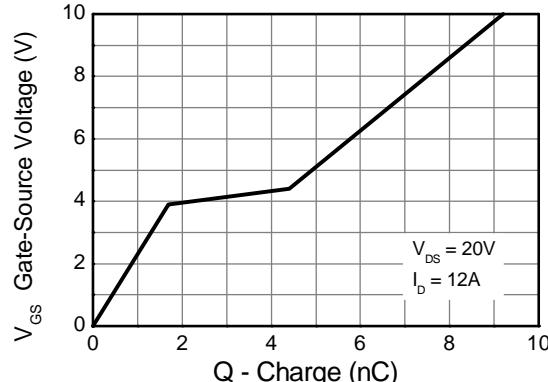
## Typical Characteristics



## Typical Characteristics - continued

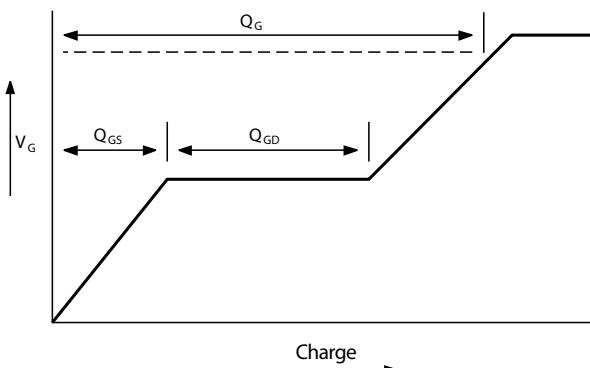


Capacitance v Drain-Source Voltage

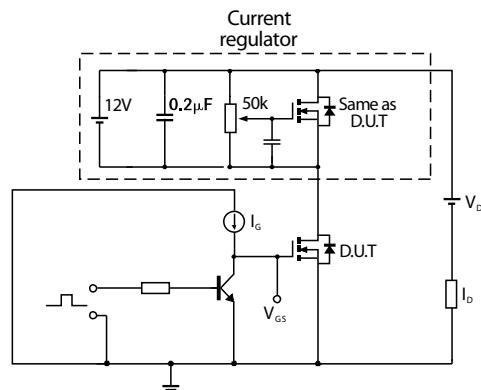


Gate-Source Voltage v Gate Charge

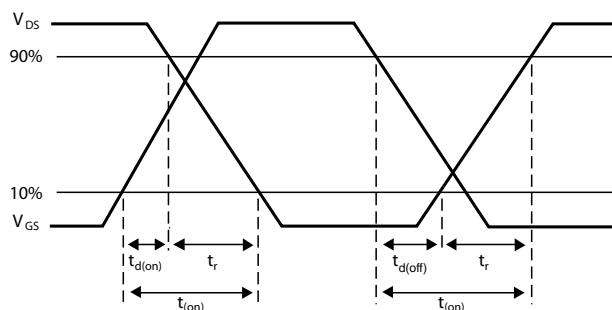
## Test Circuits



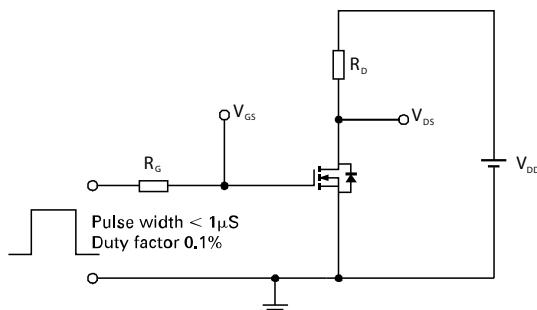
Basic gate charge waveform



Gate charge test circuit

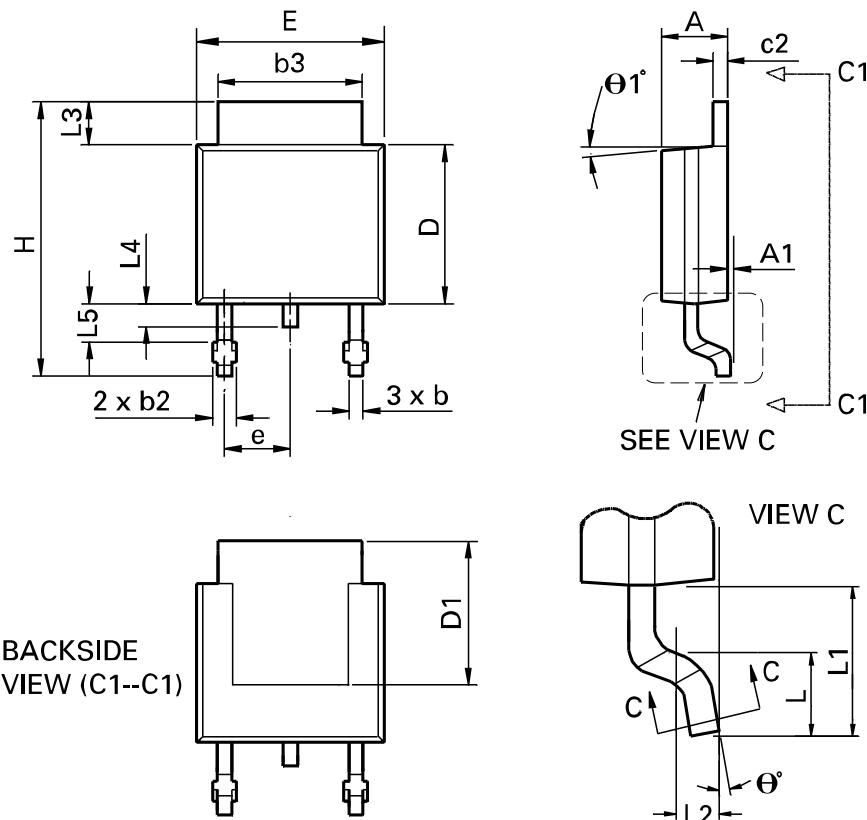


Switching time waveforms



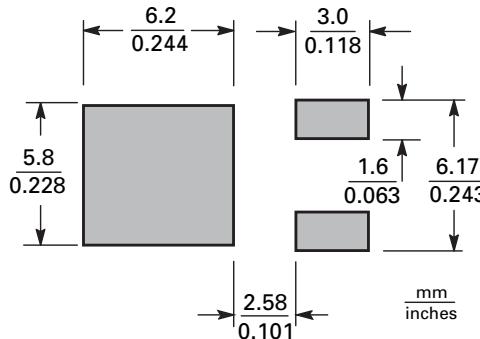
Switching time test circuit

## Package Outline Dimensions



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	0.086	0.094	2.18	2.39	e	0.090 BSC		2.29 BSC	
A1	-	0.005	-	0.127	H	0.370	0.410	9.40	10.41
b	0.020	0.035	0.508	0.89	L	0.055	0.070	1.40	1.78
b2	0.030	0.045	0.762	1.14	L1	0.108 REF		2.74 REF	
b3	0.205	0.215	5.21	5.46	L2	0.020 BSC		0.508 BSC	
c	0.018	0.024	0.457	0.61	L3	0.035	0.065	0.89	1.65
c2	0.018	0.023	0.457	0.584	L4	0.025	0.040	0.635	1.016
D	0.213	0.245	5.41	6.22	L5	0.045	0.060	1.14	1.52
D1	0.205	-	5.21	-	Θ1°	0°	10°	0°	10°
E	0.250	0.265	6.35	6.73	Θ°	0°	15°	0°	15°
E1	0.170	-	4.32	-	-	-	-	-	-

## Suggested Pad Layout



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