DSC60XX

Ultra-Small, Ultra-Low Power MEMS Oscillator

Features

- Wide Frequency Range: 2 kHz to 80 MHz
- Ultra-Low Power Consumption: 1.3 mA/12 µA (Active/Stdby)
- Ultra-Small Footprints
  - 1.6 mm × 1.2 mm
  - 2.0 mm × 1.6 mm
  - 2.5 mm × 2.0 mm
  - 3.2 mm × 2.5 mm
- Frequency Select Input Supports 2 Predefined Frequencies
- High Stability: ±25, ±50 ppm
- Wide Temperature Range
  - Industrial: –40°C to 85°C
  - Ext. Commercial: –20° to 70°C
- Excellent Shock & Vibration Immunity
  - Qualified to MIL-STD-883
- High Reliability
  - 20x Better MTF Than Quartz Oscillators
- Supply Range of 1.71V to 3.63V
- Short Sample Lead Time: <2 weeks
- Lead Free & RoHS Compliant

Applications

- Low Power/Portable Applications - IoT, Embedded/Smart Devices
- Consumer - Home Healthcare, Fitness Devices, Home Automation
- Automotive - Rear View/Surround View Cameras, Infotainment System
- Industrial - Building/Factory Automation, Surveillance Camera

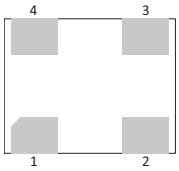
General Description

The DSC60xx family of MEMS oscillators combines industry-leading low-power consumption, ultra-small packages with exceptional frequency stability, and jitter performance over temperature. The single-output DSC60xx MEMS oscillators are excellent choices for use as clock references in small, battery-powered devices such as wearable and Internet of Things (IoT) devices in which small size, low power consumption, and long-term reliability are paramount. They also meet the stringent mechanical durability and reliability requirements within Automotive Electronics Council standard Q100 (AEC-Q100), so they are well suited for under-hood applications as well.

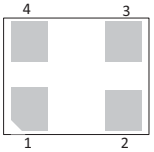
The DSC60xx family is available in ultra-small 1.6 mm x 1.2 mm and 2.0 mm x 1.6 mm packages. Other package sizes include: 2.5 mm x 2.0 mm and 3.2 mm x 2.5 mm. These packages are “drop-in” replacements for standard 4-pin CMOS quartz crystal oscillators.

Package Types

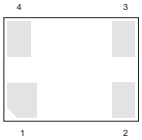
DSC60XX
3.2x2.5
DFN
Top View



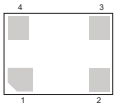
DSC60XX
2.5x2.0
LGA
Top View



DSC60XX
2.0x1.6
LGA
Top View



DSC60XX
1.6x1.2
LGA
Top View



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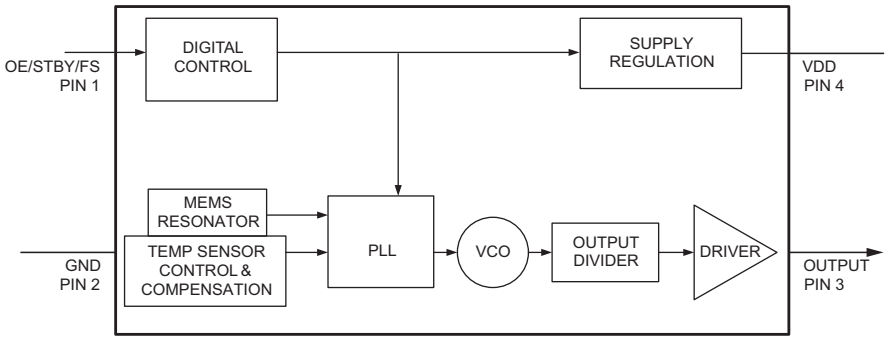
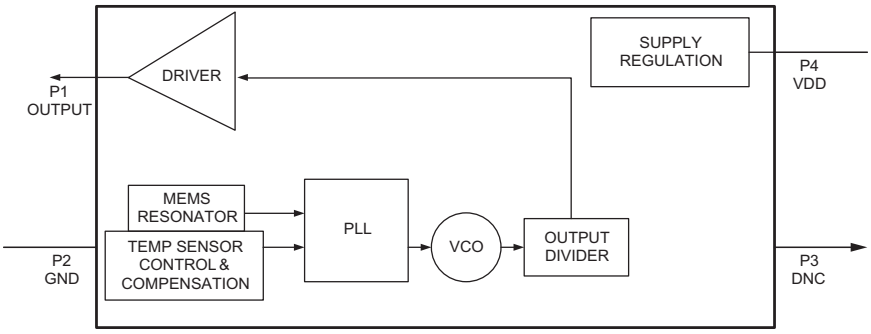
Block Diagram

DSC6001/03/11/13/21/23/41/43/51/53/61/63



DSC6083 (kHz Output)



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1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings

Supply Voltage ..... –0.3V to +4.0V
Input Voltage, V_{IN} ..... –0.3V to V_{DD}+0.3V
ESD Protection ..... 4000V HBM, 400V MM, 2000V CDM

ELECTRICAL CHARACTERISTICS

Electrical Characteristics: Unless otherwise indicated, V_{DD}= 1.8V –5% to 3.3V +10%, T_A= –40°C to 85°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Supply Voltage Note 1	V_{DD}	1.71	—	3.63	V	—
Active Supply Current	I_{DD}	—	1.3	—	mA	F_{OUT} = 24 MHz, V_{DD} = 1.8V, No Load
Standby Supply Current Note 2	I_{STBY}	—	12	—	µA	V_{DD} = 1.8/2.5V
		—	80	—		V_{DD} = 3.3V
Frequency Stability Note 3	Δf	—	—	±25 ±50	ppm	All temp ranges
Aging	Δf	—	—	±5	ppm	1st year @25°C
		—	—	±1		Per year after first year
Startup Time	t_{SU}	—	—	1.3	ms	From 90% V_{DD} to valid clock output, T = 25°C
Input Logic Levels Note 4 Input Logic High	V_{IH}	0.7xV_{DD}	—	—	V	—
Input Logic Low	V_{IL}	—	—	0.3xV_{DD}	V	
Output Disable Time Note 5	t_{DA}	—	—	200+Period	µs	—
Output Enable Time Note 6	t_{EN}	—	—	1	µs	—
Enable Pull-up Resistor Note 7	—	—	300	—	kΩ	If configured
Output Logic Levels Output Logic High	V_{OH}	0.8xV_{DD}	—	—	V	I = 1mA
Output Logic Low	V_{OL}	—	—	0.2xV_{DD}	V	I = –1mA

Note 1: Pin 4 V_{DD} should be filtered with 0.1 uf capacitor.
2: Not including current through pull-up resistor on EN pin (if configured). Higher standby current seen at >3.3V V_{DD}.
3: Includes frequency variations due to initial tolerance, temp. and power supply voltage.
4: Input waveform must be monotonic with rise/fall time < 10 ms
5: Output Disable time takes up to 1 Period of the output waveform + 200 ns.
6: For parts configured with OE, not Standby.
7: Output is enabled if pad is floated or not connected.
8: Output Duty Cycle will be 40% to 60% when output frequency is between 40 MHz to 60 MHz.

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ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: Unless otherwise indicated, V_{DD}= 1.8V –5% to 3.3V +10%, T_A= –40°C to 85°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions	
Output Transition Time Rise Time/Fall Time	t_{RX}/t_{FX}	—	2.5	3.5	ns	DSC60x3 Low Drive, 20% to 80% C_L=5 pF	V_{DD} = 1.8V
		—	1.5	2.2			V_{DD} = 2.5V/3.3V
	t_{RY}/t_{FY}	—	1.2	2.0	ns	DSC60x1 Std. Drive, 20% to 80% C_L=10 pF	V_{DD} = 1.8V
		—	0.6	1.2			V_{DD} = 2.5V/3.3V
Frequency	f_0	0.002	—	80	MHz	Output on Pin 1 for < 1 MHz	
Output Duty Cycle, Note 8	SYM	45	—	55	%	—	
Period Jitter, RMS	J_{PER}	—	32	40	ps_{RMS}	DSC60x3 Low Drive, F_{OUT} = 27 MHz	V_{DD} = 1.8V
		—	25	32			V_{DD} = 2.5V/3.3V
		—	23	30		DSC60x1 Std. Drive, F_{OUT} = 27 MHz	V_{DD} = 1.8V
		—	20	28			V_{DD} = 2.5V/3.3V
Cycle-to-Cycle Jitter (peak)	$J_{Cy–Cy}$	—	180	240	ps	DSC60x3 Low Drive, F_{OUT} = 27 MHz	V_{DD} = 1.8V
		—	120	170			
		—	115	190		DSC60x1, Std. Drive, F_{OUT} = 27 MHz	V_{DD} = 2.5V/3.3V
		—	90	150			

Note 1: Pin 4 V_{DD} should be filtered with 0.1 uf capacitor.

2: Not including current through pull-up resistor on EN pin (if configured). Higher standby current seen at >3.3V V_{DD}.

3: Includes frequency variations due to initial tolerance, temp. and power supply voltage.

4: Input waveform must be monotonic with rise/fall time < 10 ms

5: Output Disable time takes up to 1 Period of the output waveform + 200 ns.

6: For parts configured with OE, not Standby.

7: Output is enabled if pad is floated or not connected.

8: Output Duty Cycle will be 40% to 60% when output frequency is between 40 MHz to 60 MHz.

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TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Junction Operating Temperature	T_J	—	+150	—	°C	—
Storage Temperature Range	T_A	–55	—	+150	°C	—
Soldering Temperature	T_S	—	+260	—	°C	40 Sec. Max.

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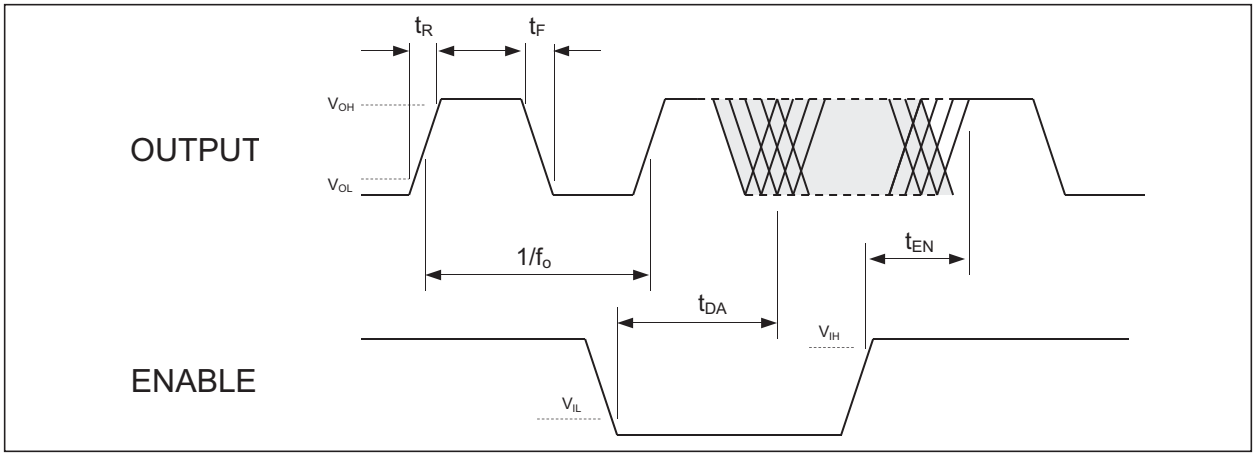
3.0 OUTPUT WAVEFORM

FIGURE 3-1: OUTPUT WAVEFORM

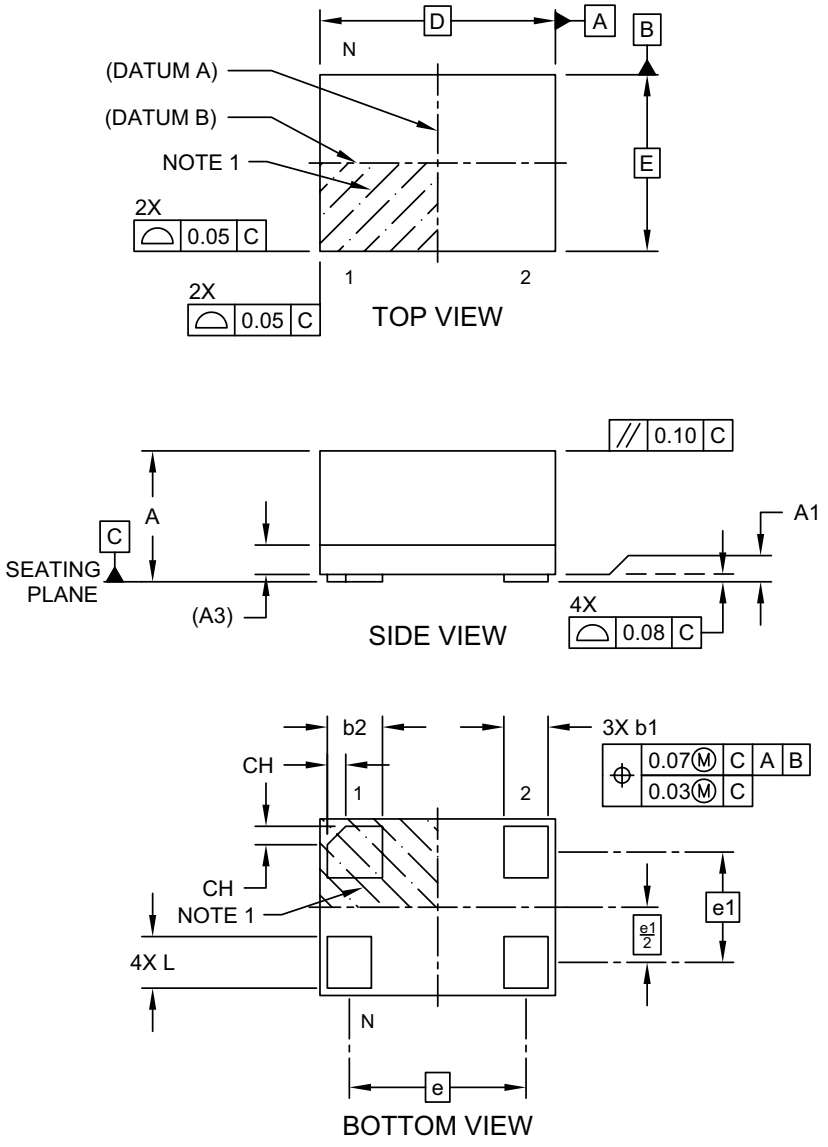


7.0 PACKAGING INFORMATION

4-Lead VFLGA 1.6 mm x 1.2 mm Package Outline

4-Lead Very Thin Fine Pitch Land Grid Array (ARA) - 1.6x1.2 mm Body [VFLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

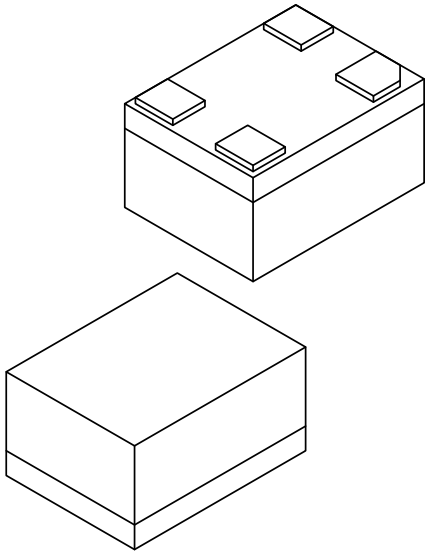


Microchip Technology Drawing C04-1199A Sheet 1 of 2

4-Lead VFLGA 1.6 mm x 1.2 mm Package Outline

4-Lead Very Thin Fine Pitch Land Grid Array (ARA) - 1.6x1.2 mm Body [VFLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		4	
Terminal Pitch	e		1.20 BSC	
Terminal Pitch	e1		0.75 BSC	
Overall Height	A	0.79	0.84	0.89
Standoff	A1	0.00	0.02	0.05
Substrate Thickness (with Terminals)	A3		0.20 REF	
Overall Length	D		1.60 BSC	
Overall Width	E		1.20 BSC	
Terminal Width	b1	0.25	0.30	0.35
Terminal Width	b2	0.325	0.375	0.425
Terminal Length	L	0.30	0.35	0.40
Terminal 1 Index Chamfer	CH	-	0.125	-

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1199A Sheet 2 of 2

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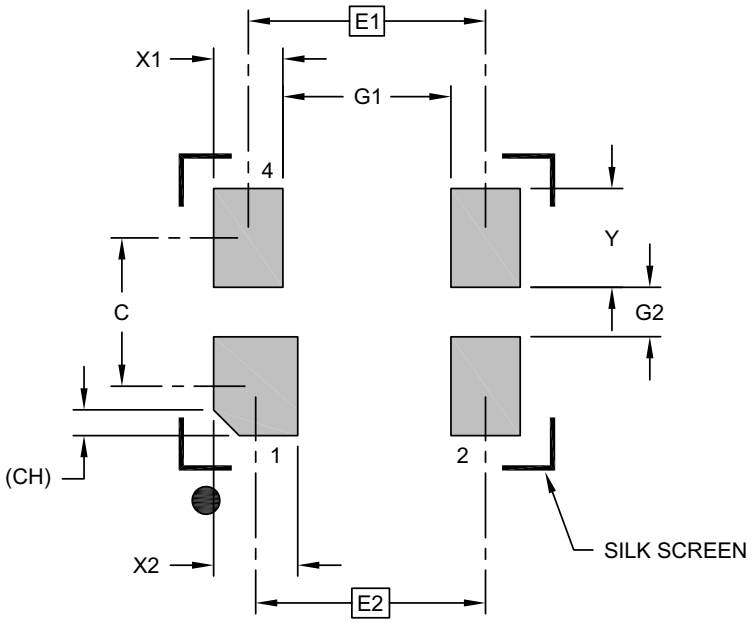
4-Lead VFLGA 1.6 mm x 1.2 mm Recommended Land Pattern

4-Lead Very Thin Fine Pitch Land Grid Array (ARA) - 1.6x1.2 mm Body [VFLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E1		1.20 BSC	
Contact Pitch	E2		1.16 BSC	
Contact Spacing	C		0.75	
Contact Width (X3)	X1			0.35
Contact Width	X2			0.43
Contact Pad Length (X6)	Y			0.50
Space Between Contacts (X4)	G1	0.85		
Space Between Contacts (X3)	G2	0.25		
Contact 1 Index Chamfer	CH		0.13 X 45° REF	

Notes:

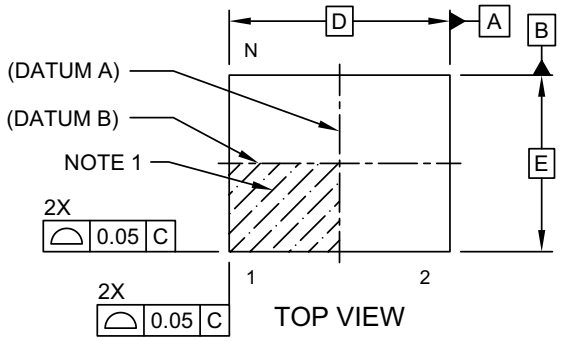
1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

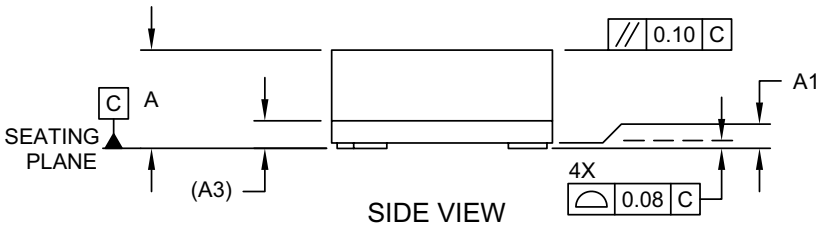
Microchip Technology Drawing C04-3199A

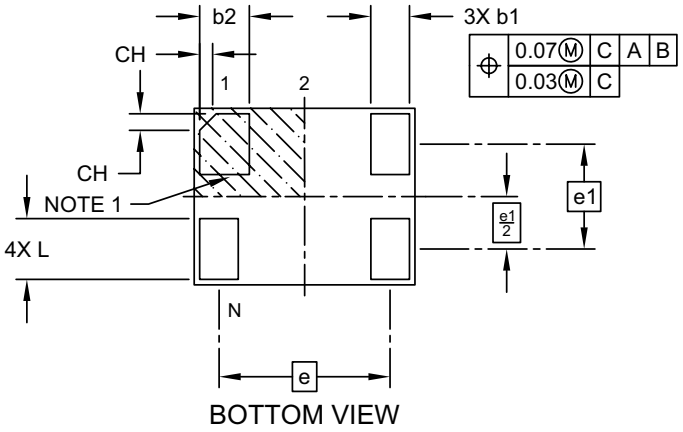
4-Lead VLGA 2.0 mm x 1.6 mm Package Outline

4-Lead Very Thin Fine Pitch Land Grid Array (ASA) - 2.0x1.6 mm Body [VFLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging







Microchip Technology Drawing C04-1200A Sheet 1 of 2

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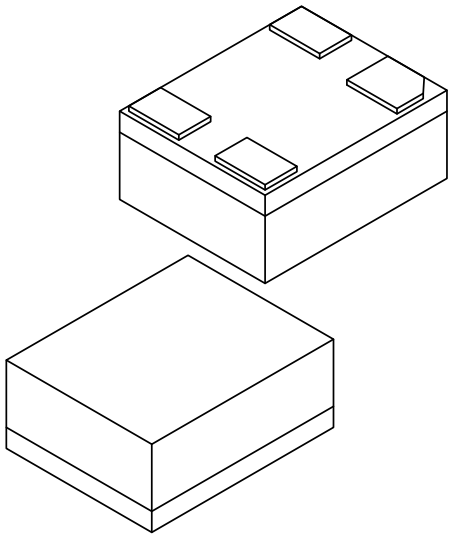
4-Lead VLGA 2.0 mm x 1.6 mm Package Outline (Continued)

4-Lead Very Thin Fine Pitch Land Grid Array (ASA) - 2.0x1.6 mm Body [VFLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		6	
Terminal Pitch	e		1.55 BSC	
Terminal Pitch	e1		0.95 BSC	
Overall Height	A	0.79	0.84	0.89
Standoff	A1	0.00	0.02	0.05
Substrate Thickness (with Terminals)	A3		0.20 REF	
Overall Length	D		2.00 BSC	
Overall Width	E		1.60 BSC	
Terminal Width	b1	0.30	0.35	0.40
Terminal Width	b2	0.40	0.45	0.50
Terminal Length	L	0.50	0.55	0.60
Terminal 1 Index Chamfer	CH	-	0.15	-

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M

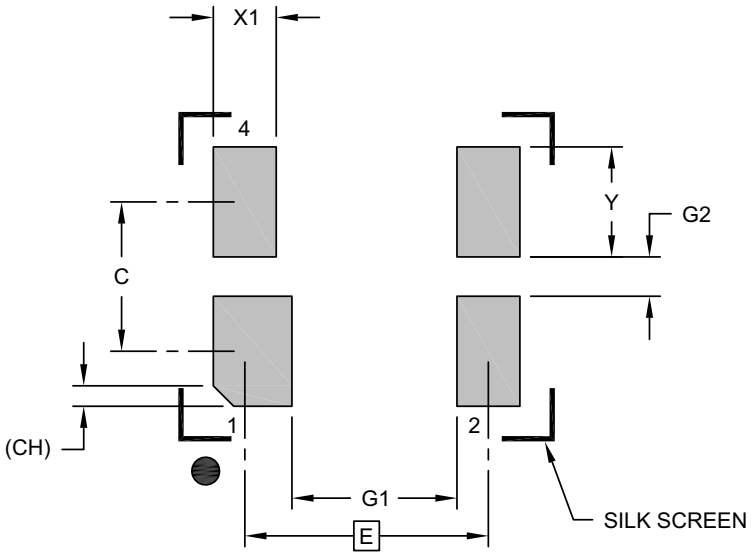
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1200A Sheet 2 of 2

4-Lead VFLGA 2.0 mm x 1.6 mm Package Outline

4-Lead Very Thin Fine Pitch Land Grid Array (ASA) - 2.0x1.6 mm Body [VFLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	1.55 BSC		
Contact Spacing	C		0.95	
Contact Width (X4)	X1			0.50
Contact Width (X2)	X2			0.40
Contact Pad Length (X6)	Y			0.70
Space Between Contacts (X4)	G1	1.05		
Space Between Contacts (X3)	G2	0.25		
Contact 1 Index Chamfer	CH	0.13 X 45° REF		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-3200A

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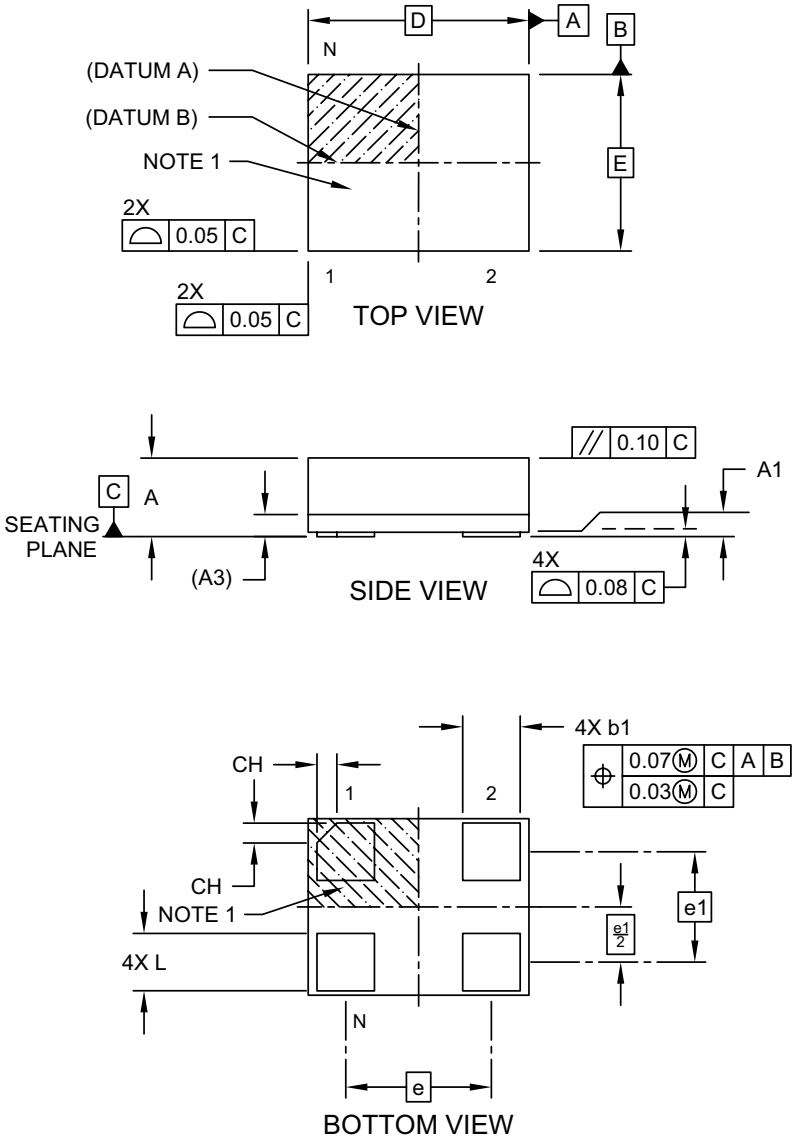
4-Lead VLGA 2.5 mm x 2.0 mm Package Outline

4-Lead Very Thin Land Grid Array (AUA) - 2.5x2.0 mm Body [VLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

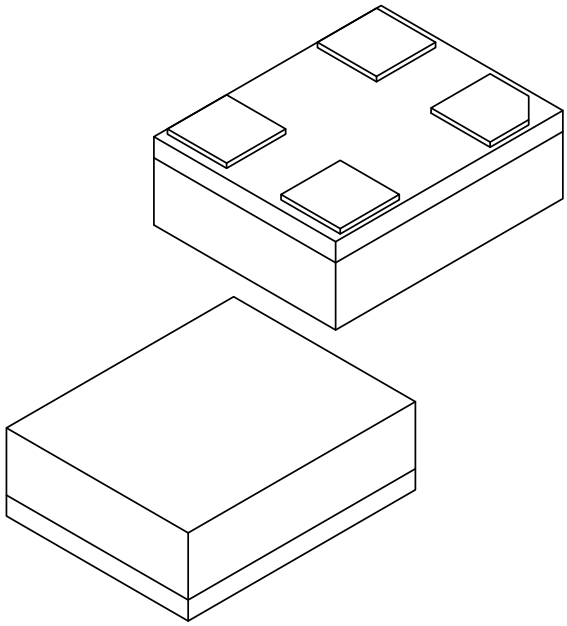


Microchip Technology Drawing C04-1202A Sheet 1 of 2

4-Lead VLGA 2.5 mm x 2.0 mm Package Outline (Continued)

4-Lead Very Thin Land Grid Array (AUA) - 2.5x2.0 mm Body [VLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N		4	
Terminal Pitch	e		1.65 BSC	
Terminal Pitch	e1		1.25 BSC	
Overall Height	A	0.79	0.84	0.89
Standoff	A1	0.00	0.02	0.05
Substrate Thickness (with Terminals)	A3		0.20 REF	
Overall Length	D		2.50 BSC	
Overall Width	E		2.00 BSC	
Terminal Width	b1	0.60	0.65	0.70
Terminal Length	L	0.60	0.65	0.70
Terminal 1 Index Chamfer	CH	-	0.225	-

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.

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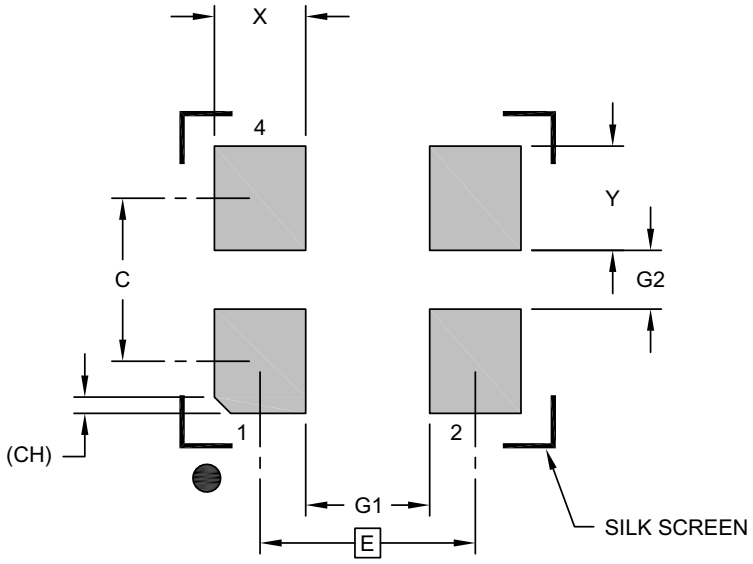
4-Lead VLGA 2.5 mm x 2.0 mm Recommended Land Pattern

4-Lead Very Thin Land Grid Array (AUA) - 2.5x2.0 mm Body [VLGA]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E	1.65 BSC		
Contact Spacing	C		1.25	
Contact Width (X4)	X			0.70
Contact Pad Length (X6)	Y			0.80
Space Between Contacts (X4)	G1	0.95		
Space Between Contacts (X3)	G2	0.45		
Contact 1 Index Chamfer	CH	0.13 X 45° REF		

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

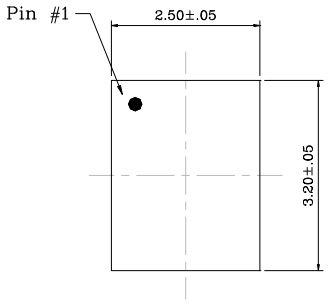
Microchip Technology Drawing C04-3202A

4-Lead CDFN 3.2 mm x 2.5 mm Package Outline and Recommended Land Pattern

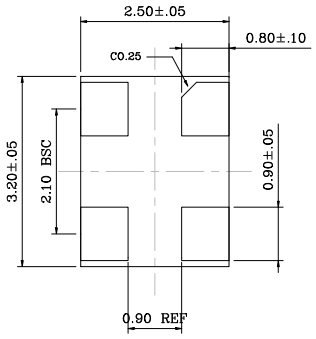
Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

TITLE
4 LEAD CDFN 3.2x2.5mm COL PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

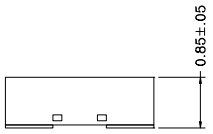
DRAWING #	CDFN3225-4LD-PL-1	**UNIT**	MM



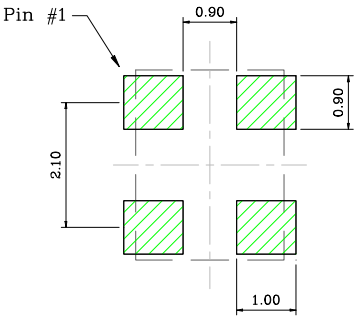
Top View



Bottom View



Side View



Recommended Land Pattern

NOTE:
1. Green shaded rectangles in Recommended Land Pattern are solder stencil opening.

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APPENDIX A: REVISION HISTORY

Revision A (September 2016)

- Initial creation of DSC60XX Microchip data sheet DS20005625A.

NOTES:

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PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

PART NO.	X	X	X	X	X	X –	XXX.XXXX	X
Device	Pin 1 Definition	Output Drive Strength	Package	Temperature Range	Frequency Stability	Revision	Frequency	Tape and Reel

Device:	DSC60XX:	Ultra-Low Power MEMS Oscillator	
Pin Definition:	Selection	Pin 1	Internal Pull Register
	0	OE	Pull-up
	1	STDBY	Pull-up
	2	FS	Pull-up
	4	OE	None
	5	STDBY	None
	6	FS	None
	8	KHz Output	None
Output Drive Strength:	1	Standard	
	3	Low	
Packages:	C =	4-Lead 3.2 mm x 2.5 mm DFN	
	J =	4-Lead 2.5 mm x 2.0 mm VFLGA	
	M =	4-Lead 2.0 mm x 1.6 mm VFLGA	
	H =	4-Lead 1.6 mm x 1.2 mm VFLGA	
Temperature Range:	E =	-20°C to +70°C (Extended Commercial)	
	I =	-40°C to +85°C (Industrial)	
Frequency Stability:	1 =	± 50 ppm	
	2 =	± 25 ppm	
Revision:	A =	Revision A	
Frequency:	xxx.xxxx =	User-Defined Frequency between 001.0000 MHz and 80.0000 MHz	
	xxxkxxx =	User-Defined Frequency between 002.000 kHz and 999.999 kHz	
	xxxx =	Frequency configuration code when pin 1 = FS. Configure the part online through ClockWorks configurator.	
Tape and Reel:	Blank =	Bulk	
	T =	Tape and Reel	

Examples:

a) DSC6013JI2A-024.0000: Ultra–Low Power MEMS Oscillator, Pin1= Standby with internal Pull–Up, Low Output Drive Strength, 4-Lead 2.5 mm x2.0 mm VFLGA, Industrial Temperature (–40°C to 85°C), ±25 ppm, Revision A, 24 MHz Frequency, Bulk

b) DSC6001HE1A-016.0000T: Ultra–Low Power MEMS Oscillator, Pin1= OE with internal Pull–Up, Standard Output Drive Strength, 4-Lead 1.6 mm x1.2 mm VFLGA, Extended Commercial Temperature (–20°C to 70°C), ±50 ppm, Revision A, 16 MHz Frequency, Tape and Reel

c) DSC6083ME1A-032k768: Ultra–Low Power MEMS Oscillator, Pin1= 32.768KHz Clock Output , Low Output Drive Strength, 4-Lead 2.0 mm x1.6 mm VFLGA, Extended Commercial Temperature (–20°C to 70°C), ±50 ppm, Revision A, Bulk

d) DSC6023CI2A-001B: Ultra–Low Power MEMS Oscillator, Pin1= FS with internal Pull-up, Low Output Drive Strength, 4-Lead 3.2 mm x2.5 mm CDFN, Industrial Temperature (–40°C to 85°C), ±25 ppm, Revision A, Frequency code = 001B (configured through ClockWorks), Bulk

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

Note 1: Please visit Microchip ClockWorks® Configurator Website to configure the part number for customized frequency. http://clockworks.microchip.com/timing/.

NOTES:

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