DSA63XX

Ultra-Small, Ultra-Low Power MEMS Oscillator for Automotive with Spread Spectrum for Automotive

Features

- Automotive AEC-Q100 Qualified
- Output Frequency: 1 MHz to 100 MHz LVCMOS
- Spread Spectrum Options:
  - Center-Spread: ±0.25%, ±0.5%, ±1.0%, ±1.5%, ±2.0%, ±2.5%
  - Down-Spread: –0.25%, –0.5%, –1.0%, –1.5%, –2.0%, –3.0%
- Ultra-Low Power Consumption: 3 mA (Active), 1µA (Standby)
- Ultra-Small Package Sizes:
  - 1.6 mm x 1.2 mm VFLGA
  - 2.0 mm x 1.6 mm VFLGA
  - 2.5 mm x 2.0 mm VLGA
  - 3.2 mm x 2.5 mm VDFN
  - 5.0 mm x 3.2 mm VDFN
  - 7.0 mm x 5.0 mm VDFN
- Excellent Shock and Vibration Immunity
  - Qualified to MIL-STD-883
- High Reliability
  - 20x Better MTF Than Quartz Oscillators
- Lead Free and RoHS Compliant

Applications

- Automotive Infotainment
- Automotive ADAS
- Automotive Camera Module

Benefits

- Replace High-Temperature Crystals and Quartz Oscillators

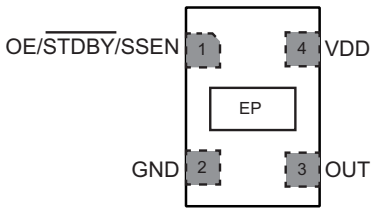
General Description

The DSA63xx series of clock generators uses a proven silicon MEMS technology to provide excellent frequency stability over a wide range of temperatures as well as small size. Available in three different package sizes with operating current as low as 3 mA, the smallest 4-pin package is a mere 1.6 mm x 1.2 mm in size. The devices support up to ±2.5% or –3% spread spectrum that can achieve up to 15 dB electromagnetic interference (EMI) reduction. Because of industry standard package and pin options, customers can solve last minute EMI problems simply by placing the new DSA63xx on their current board layout with no redesign required.

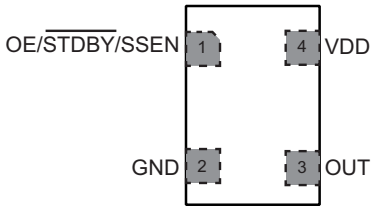
The DSA63xx family is available in 1.6 mm x 1.2 mm & 2.0 mm x 1.6 mm VFLGA, 7.0 mm x 5.0 mm, 5.0 mm x 3.2 mm & 3.2 mm x 2.5 mm VDFN, and 2.5 mm x 2.0 mm VLGA packages. These packages are “drop-in” replacements for standard 4-pin CMOS quartz crystal oscillators.

Package Types

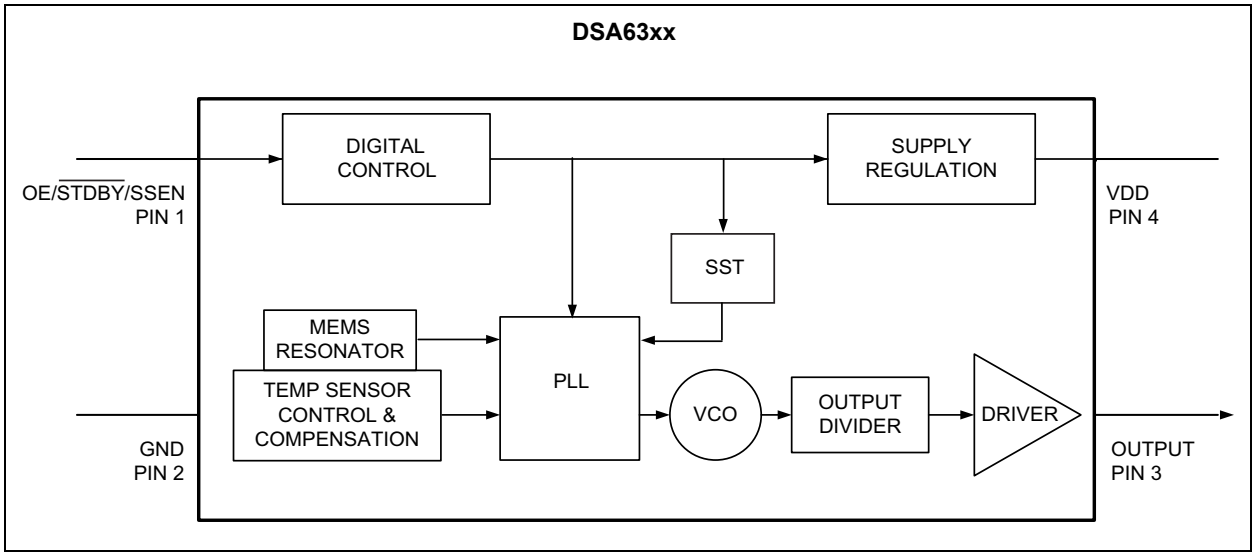
DSA63xx
7.0 mm x 5.0 mm VDFN
(Top View)



DSA63xx
5.0 mm x 3.2 mm VDFN
3.2 mm x 2.5 mm VDFN
2.5 mm x 2.0 mm VLGA
2.0 mm x 1.6 mm VFLGA
1.6 mm x 1.2 mm VFLGA
(Top View)



Block Diagram



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 ..... 4 kV HBM, 400V MM, 2 kV CDM

ELECTRICAL CHARACTERISTICS

Electrical Characteristics: Unless otherwise indicated, V_{DD} = 1.8V –5% to 3.3V +10%, T_A = –40°C to +125°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	V_{DD}	1.71	—	3.63	V	Note 1
Power Supply Ramp	t_{PU}	0.1	—	100	ms	—
Active Supply Current	I_{DD}	—	3.0	—	mA	f_{OUT} = 27 MHz, V_{DD} = 1.8V, No Load
Standby Supply Current	I_{STBY}	—	1	—	µA	V_{DD} = 1.8/2.5V Note 2
		—	1.5	—		V_{DD} = 3.3V Note 2
Output Duty Cycle	SYM	45	—	55	%	—
Frequency	f_0	1	—	100	MHz	—
Frequency Stability	Δf	—	—	±20 ±25 ±50	ppm	All temp ranges, Note 3, Spread Spectrum is off.
Aging	Δf	—	—	±5	ppm	1st year @25°C
		—	—	±1		Per year after first year
Startup Time	t_{SU}	—	—	1.5	ms	From 90% V_{DD} to valid clock output, T = 25°C
Input Logic Levels	V_{IH}	0.7 x V_{DD}	—	—	V	Input Logic High, Note 4
	V_{IL}	—	—	0.3 x V_{DD}	V	Input Logic Low, Note 4
Output Disable Time	t_{DA}	—	—	200 + 2 Periods	ns	Note 5
Output Enable Time	t_{EN}	—	—	1	µs	Note 6
OE/$\overline{\text{STDBY}}$/SSEN Pull-Up Resistor	—	—	300	—	kΩ	If configured, Note 7

Note 1: Pin 4 V_{DD} should be filtered with 0.1 µF capacitor.
2: Not including current through pull-up resistor on EN pin (if configured).
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 two periods 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: Time to reach 90% of target V_{DD}. Power ramp rise must be monotonic.

ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: Unless otherwise indicated, V_{DD} = 1.8V –5% to 3.3V +10%, T_A = –40°C to +125°C.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions	
Output Logic Levels	V_{OH}	0.8 x V_{DD}	—	—	V	Output Logic High, I = 3 mA, Std. Drive	
						Output Logic High, I = 6 mA, High Drive	
	V_{OL}	—	—	0.2 x V_{DD}	V	Output Logic Low, I = –3 mA, Std. Drive	
						Output Logic Low, I = –6 mA, High Drive	
Output Transition Time Rise Time/Fall Time	t_{RX}/t_{FX}	—	1	1.5	ns	DSA63x2 High Drive, 20% to 80% C_L = 15 pF	V_{DD} = 1.8V
		—	0.5	1.0			V_{DD} = 2.5V/3.3V
	t_{RY}/t_{FY}	—	1.2	2.0	ns	DSA63x1 Std. Drive, 20% to 80% C_L = 10 pF	V_{DD} = 1.8V
		—	0.6	1.2			V_{DD} = 2.5V/3.3V
Period Jitter, RMS	J_{PER}	—	8.5	—	ps_{RMS}	f_{OUT} = 27 MHz Spread Off	V_{DD} = 1.8V
		—	7	—			V_{DD} = 2.5V/3.3V
Cycle-to-Cycle Jitter, Peak	$J_{Cy–Cy}$	—	50	70	ps	f_{OUT} = 27 MHz Spread Off	V_{DD} = 1.8V
		—	35	60			V_{DD} = 2.5V/3.3V
Period Jitter, Peak-to-Peak	J_{PP}	—	70	—	ps	f_{OUT} = 27 MHz Spread Off	V_{DD} = 1.8V
		—	60	—			V_{DD} = 2.5V/3.3V
Spread Spectrum Modulation Frequency	f_{SS}	—	33	—	kHz	—	

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

2: Not including current through pull-up resistor on EN pin (if configured).

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 two periods 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: Time to reach 90% of target V_{DD}. Power ramp rise must be monotonic.

TEMPERATURE SPECIFICATIONS (Note 1)

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

Note 1: The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e., T_A, T_J, θ_{JA}). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum +150°C rating. Sustained junction temperatures above +150°C can impact the device reliability.

SPREAD SPECTRUM

Ordering Code	Spread Percentage	Spread Type
A	±0.25%	Center-Spread
B	±0.5%	Center-Spread
C	±1.0%	Center-Spread
D	±1.5%	Center-Spread
E	±2.0%	Center-Spread
F	±2.5%	Center-Spread
G	–0.25%	Down-Spread
H	–0.5%	Down-Spread
I	–1.0%	Down-Spread
J	–1.5%	Down-Spread
K	–2.0%	Down-Spread
L	–3.0%	Down-Spread
M	Custom	Center-Spread or Down-Spread

2.0 PIN DESCRIPTIONS

The DSA63xx is a highly configurable device and can be factory programmed in many different ways to meet the customer's needs. Microchip's ClockWorks® Configurator http://clockworks.microchip.com/Timing/ must be used to choose the necessary options, create the final part number, data sheet, and order samples. The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: DSA63XX PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1 (Note 1)	OE	Output Enable: H = Active, L = Disabled (High Impedance).
	$\overline{\text{STDBY}}$	Standby: H = Device is active, L = Device is in standby (Low Power Mode).
	SSEN	Spread Spectrum Enable: H = Enabled, L = Disabled.
2	GND	Ground.
3	OUTPUT	Oscillator clock output
4	VDD	Power Supply: 1.71V to 3.63V.

Note 1: DSA630x/1x/3x has a 300 kΩ internal pull-up resistor on Pin 1. DSA634x/5x/7x has no internal pull-up resistor on Pin 1 and needs an external pull-up or to be driven by another chip.

An explanation of the different options listed in Table 2-1 follows.

2.1 Pin 1

This is a control pin and may be configured to fulfill one of three different functions. If not actively driven, a 10 kΩ pull-up resistor is recommended.

2.1.1 OUTPUT ENABLE (OE)

Pin 1 may be configured as OE. Oscillator output may be turned on and off according to the state of this pin.

2.1.2 $\overline{\text{STDBY}}$

Pin 1 may be configured as Standby. When the pin is low, both output buffer and PLL will be off and the device will enter a low power mode.

2.1.3 SPREAD SPECTRUM ENABLE (SSEN)

This pin, when high, enables spread spectrum modulation of the clock output. Various levels of center-spread and down-spread are available. For more details, see the Spread Spectrum section and the spread spectrum ordering codes in the Product Identification System.

2.2 Pins 2 through 4

Pins 2 and 4 are the supply terminals, GND and VDD respectively. Pin 3 is the clock output, programmable to Standard and High Drive strength settings. Visit ClockWorks® Configurator to customize your device.

2.3 Output Buffer Options

The DSA63xx family is available in multiple output driver configurations.

The standard-drive (63x1) and high-drive (63x2) deliver respective output currents of greater than 3 mA and 6 mA at 20%/80% of the supply voltage. For heavy loads of 15 pF or higher, the high-drive option is recommended.

3.0 DIAGRAMS

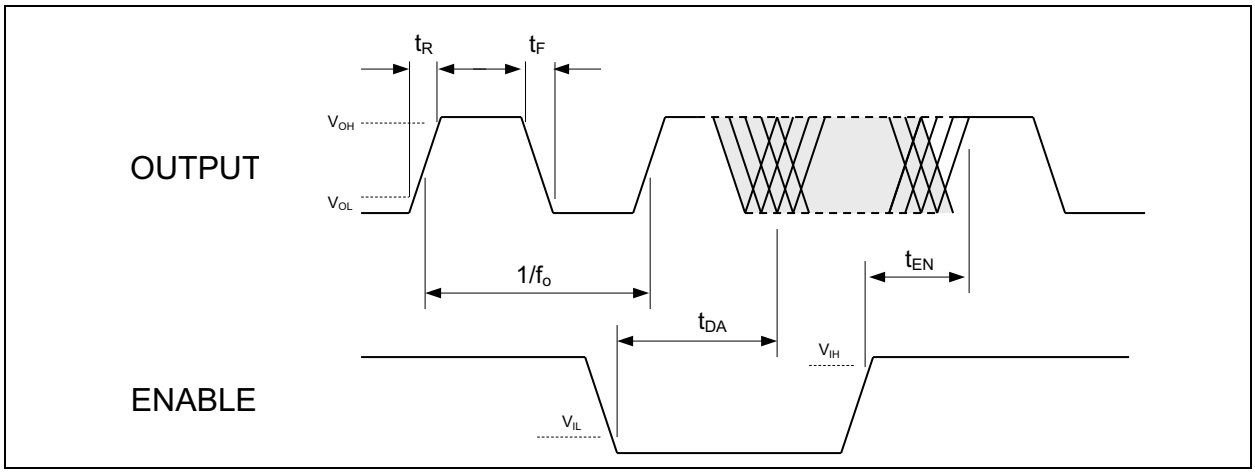


FIGURE 3-1: *Output Waveform.*

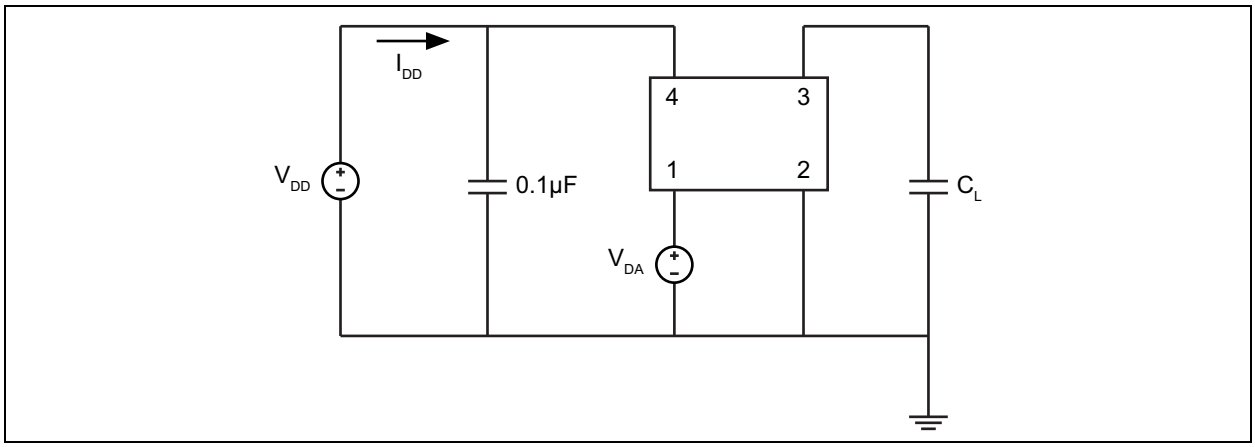


FIGURE 3-2: *Test Circuit.*

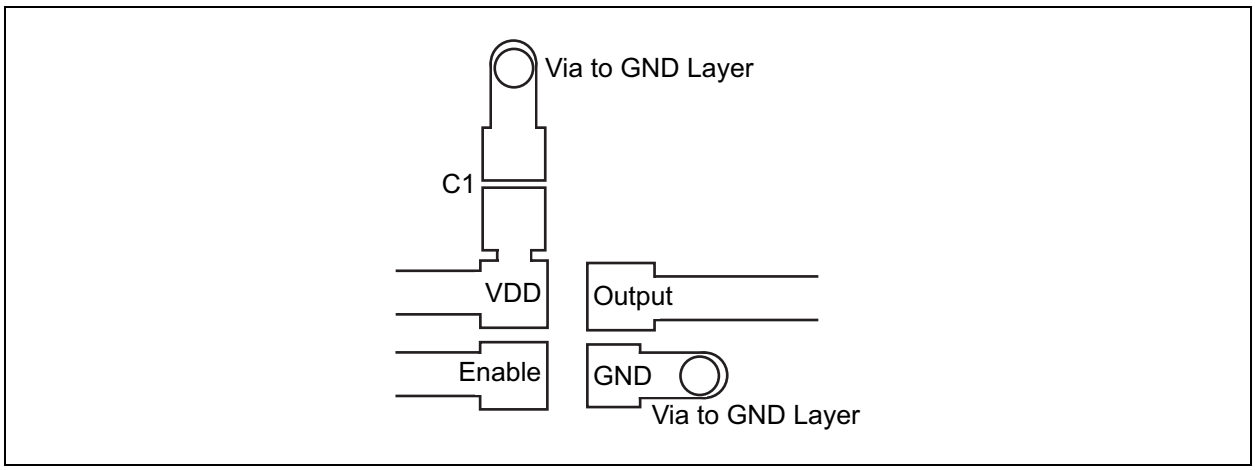


FIGURE 3-3: *Recommended Board Layout.*

4.0 SPREAD SPECTRUM

Spread spectrum is a slow modulation of the clock frequency over time. The PLL inside the MEMS oscillator is modulated with a triangular wave at 33 kHz. With such a slow modulation, the peak spectral energy of both the fundamental and all the harmonics is spread over a wider frequency range and such an energy is significantly reduced, thus providing an EMI reduction. The triangular wave is chosen because of its flat spectral density.

The DSA63xx MEMS oscillator family offers several modulation options: the spreading is either center-spread or down-spread with respect to the clock frequency. Center-spread ranges from ±0.25% to ±2.5%, while down-spread ranges from –0.25% to –3%.

If the clock frequency is 100 MHz and center-spread with ±1% is chosen, the output clock will range from 99 MHz to 101 MHz. If down-spread with –2% is chosen, the output clock will range from 98 MHz to 100 MHz.

Figure 4-1 and Figure 4-2 show a spectrum example of the DSA6331 with a 33.333 MHz clock, modulated with center-spread of ±1%.

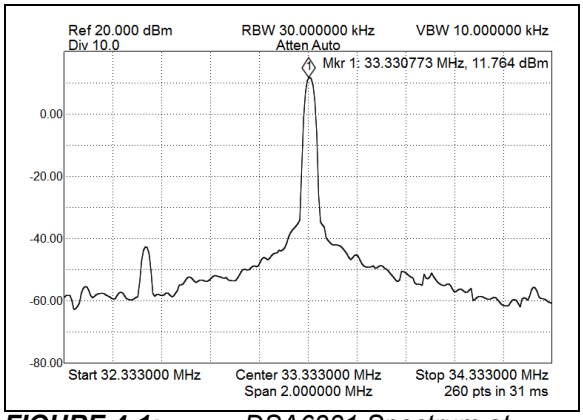


FIGURE 4-1: *DSA6331 Spectrum at 33.333 MHz with Modulation Turned Off.*

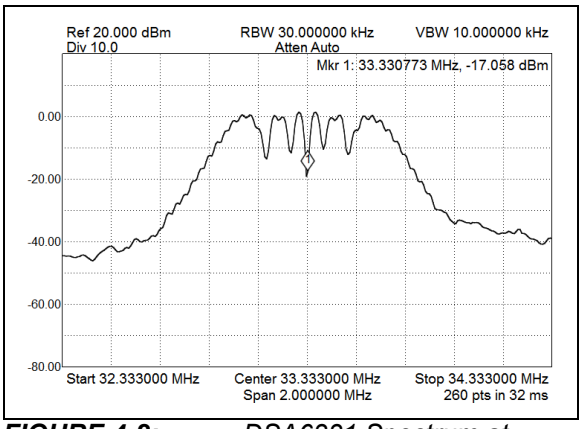


FIGURE 4-2: *DSA6331 Spectrum at 33.333 MHz with Modulation Turned On.*

It is noticeable that the spread spectrum provides a reduction of about 10 dB from the peak power. Such a reduction may also be estimated by the following equation:

EQUATION 4-1:

$$EMIReduction = 10 \times Log10(|S| \times fc \div RBW)$$

Where:
S = Peak-to-peak spread percentage (0.01 in this example).
fc = Carrier frequency (33.333 MHz in this example).
RBW = Resolution bandwidth of the spectrum analyzer (30 kHz in this example).

The theoretical calculation for this example provides 10.45 dB, which is consistent with the measurement.

Similarly to the fundamental frequency, all the harmonics are spread and attenuated in similar fashion. Figure 4-3 shows how the DSA6331 fundamental at 33.333 MHz and its odd harmonics are attenuated when various types of modulations are selected. For picture clarity, only the center-spread options are shown. However, down spread with corresponding percentage provides the same level of harmonic attenuation (e.g. center-spread of ±1% provides the same harmonics attenuation of down spread with –2%).

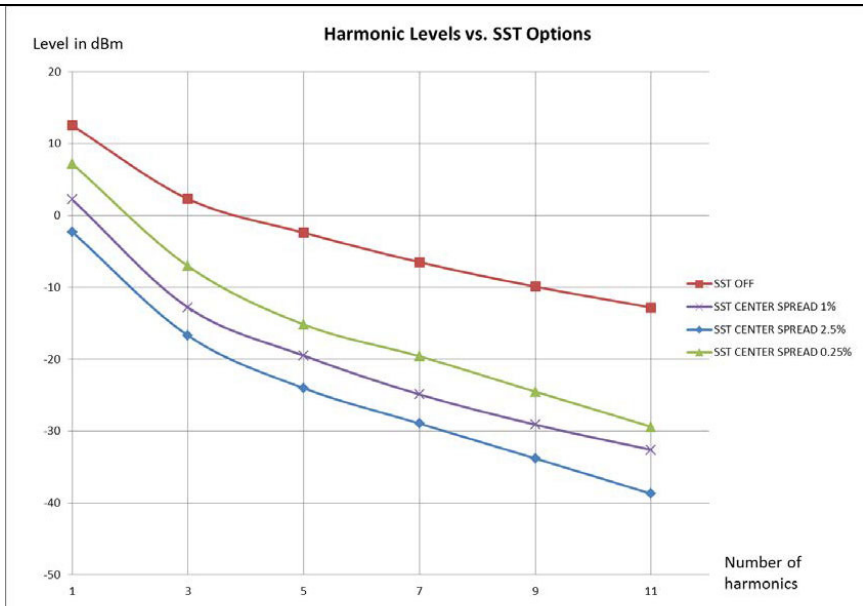


FIGURE 4-3: *DSA6331 Harmonic Levels with Various Spread Spectrum Options.*

5.0 SOLDER REFLOW PROFILE

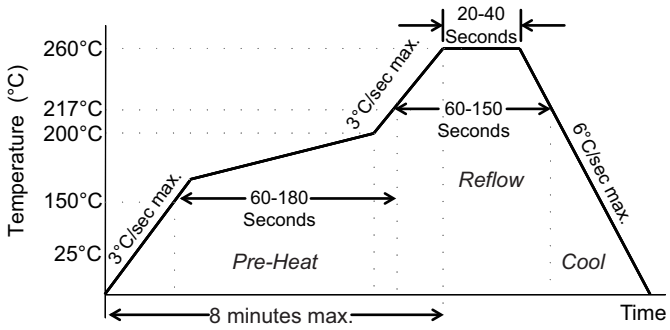


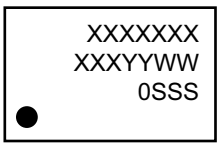
FIGURE 5-1: *Solder Reflow Profile.*

MSL 1 @ 260°C refer to JSTD-020C	
Ramp-Up Rate (200°C to Peak Temp)	3°C/sec. max.
Preheat Time 150°C to 200°C	60 to 180 sec.
Time maintained above 217°C	60 to 150 sec.
Peak Temperature	255°C to 260°C
Time within 5°C of actual Peak	20 to 40 sec.
Ramp-Down Rate	6°C/sec. max.
Time 25°C to Peak Temperature	8 minutes max.

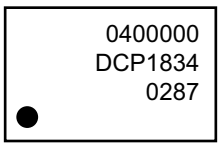
6.0 PACKAGING INFORMATION

6.1 Package Marking Information

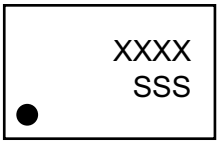
4-Lead
7.0mm x 5.0mm VDFN*
5.0mm x 3.2mm VDFN*
3.2mm x 2.5mm VDFN*
2.5mm x 2.0mm VLGA*



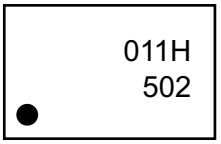
Example



4-Lead VFLGA*
2.0mm x 1.6mm
1.6mm x 1.2mm



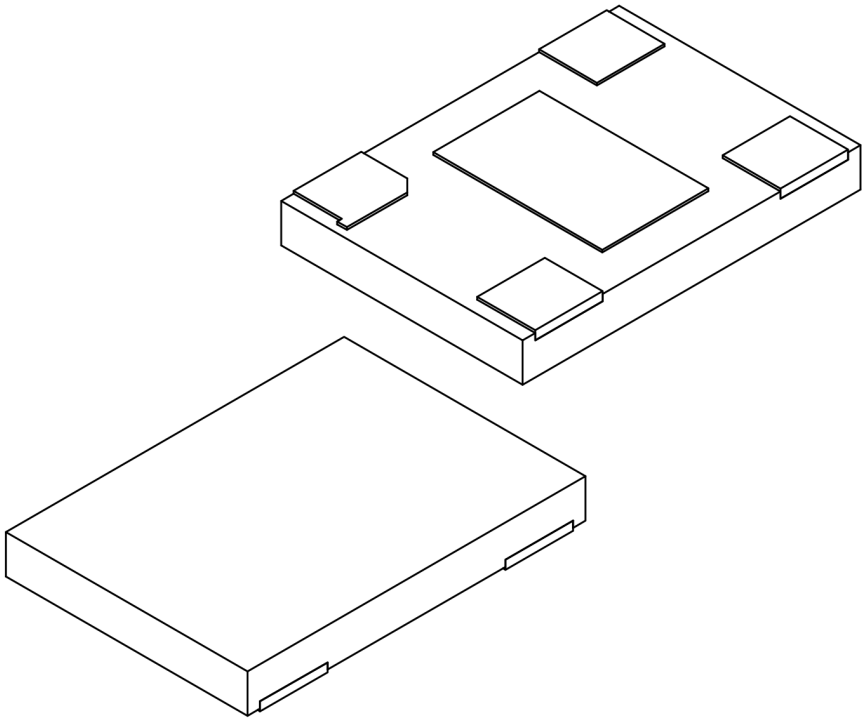
Example



Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	SSS	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	●, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).
Note:	In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.	
	Underbar (_) and/or Overbar (¯) symbol may not be to scale.	

4-Lead Very Thin Dual Flatpack, No Lead Package (JZA) - 7x5x0.9 mm Body [VDFN] With 2.2x3.5 mm Exposed Pad

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		004	
Pitch	e		5.08 Ref	
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	-	0.05
Terminal Thickness	A3		0.203 Ref	
Overall Length	D	6.90	7.00	7.10
Exposed Pad Length	D2	2.10	2.20	2.30
Overall Width	E	4.90	5.00	5.10
Exposed Pad Width	E2	3.40	3.50	3.60
Terminal Width	b	1.35	1.40	1.45
Terminal Length	L	1.10	1.20	1.30

Notes:

1. Pin 1 visual index feature may vary, but must be located within the pin 1 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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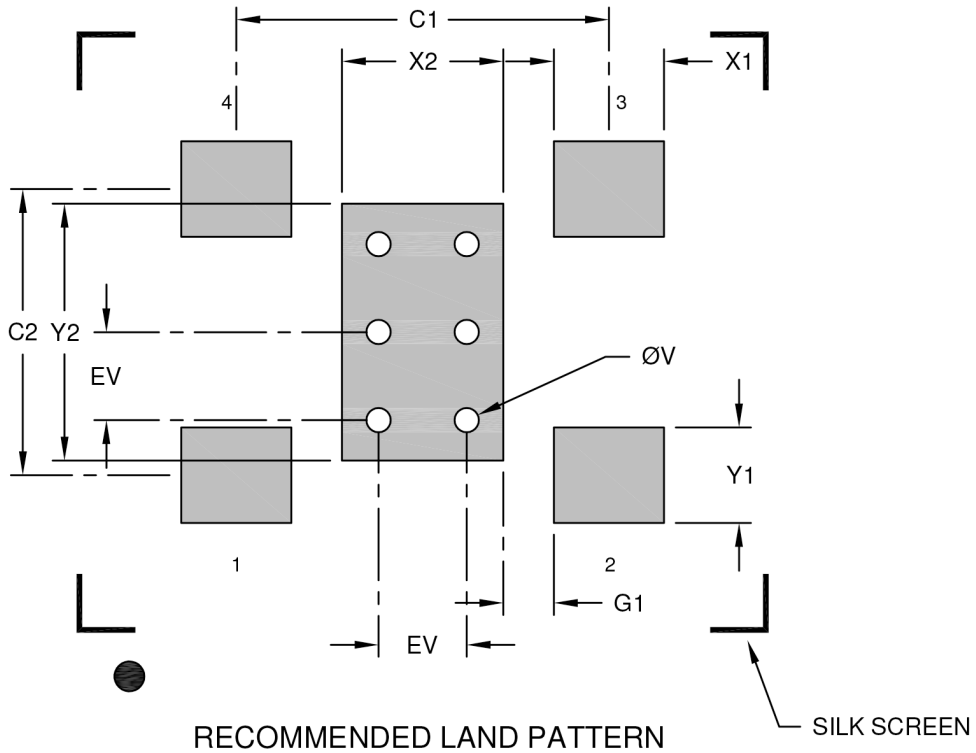
4-Lead Very Thin Dual Flatpack, No Lead Package [JZA] - 7x5x0.9 mm Body [VDFN] With 2.2x3.5 mm Exposed Pad

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
Optional Center Pad Width	X2			2.30
Optional Center Pad Length	Y2			3.60
Contact Pad Spacing	C1		5.08	
Contact Pad Spacing	C2		3.90	
Contact Pad Width (Xnn)	X1			1.50
Contact Pad Length (Xnn)	Y1			1.30
Contact Pad to Center Pad (Xnn)	G1	0.69		
Thermal Via Diameter	V		0.33	
Thermal Via Pitch	EV		1.20	

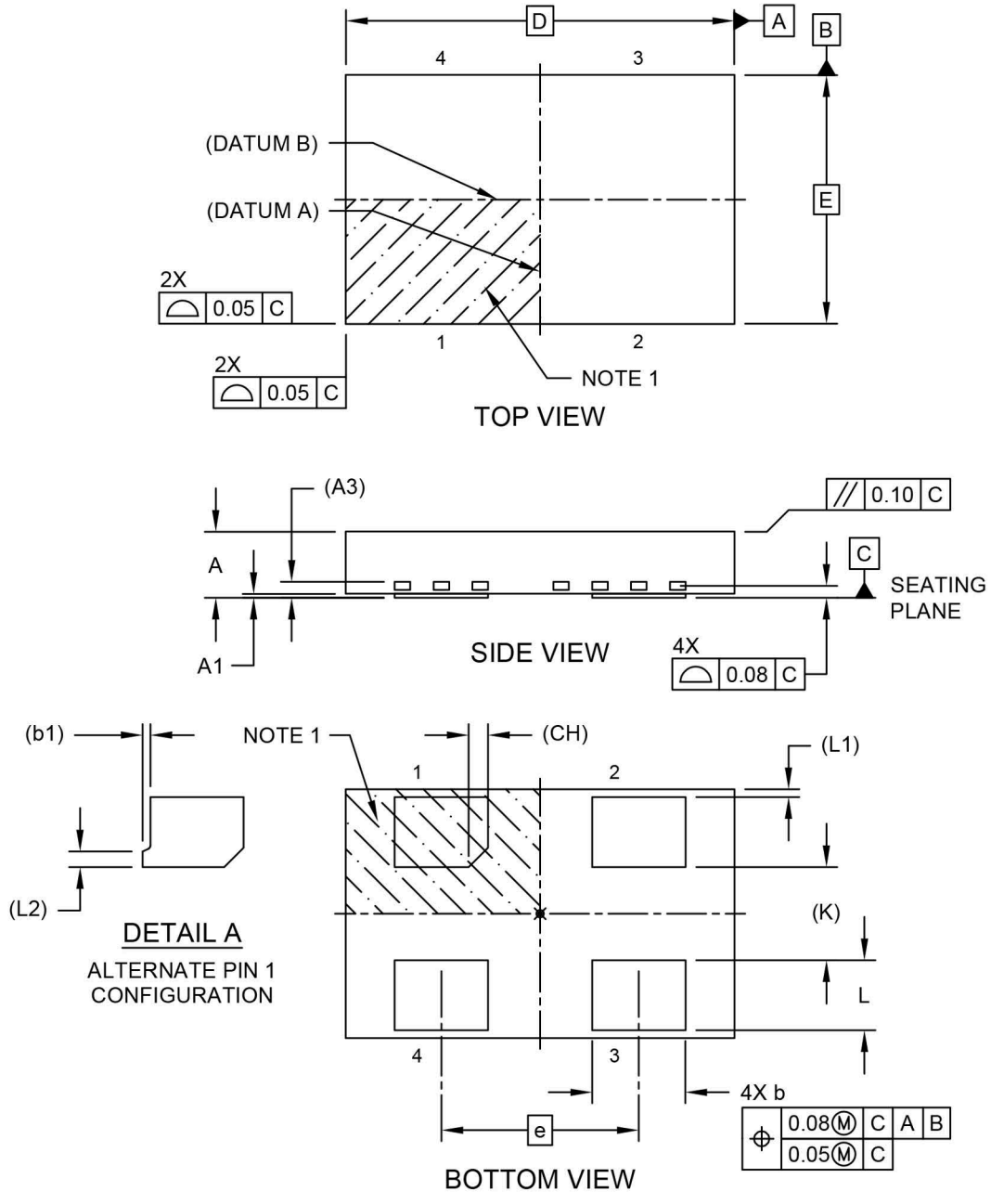
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-3025 Rev A

4-Lead Very Thin Plastic Dual Flat, No Lead Package (H6A) - 5x3.2 mm Body [VDFN]

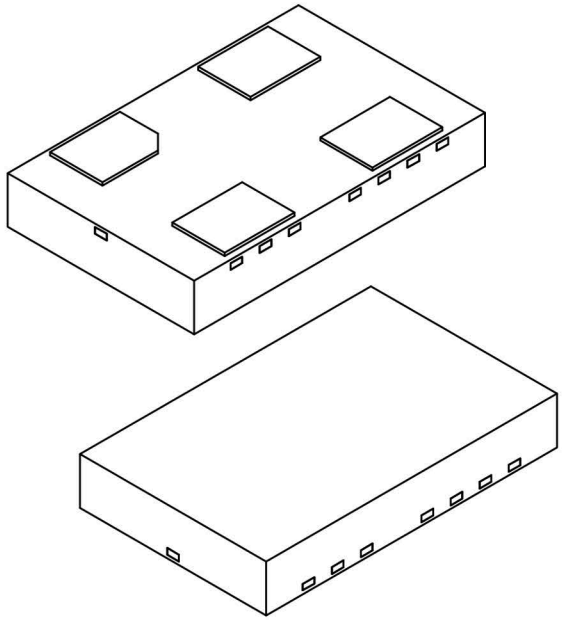
Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-1008 Rev A Sheet 1 of 2

4-Lead Very Thin Plastic Dual Flat, No Lead Package (H6A) - 5x3.2 mm Body [VDFN]

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	
Pitch	e		2.54 BSC	
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	0.02	0.05
Terminal Thickness	A3		0.20 REF	
Overall Length	D		5.00 BSC	
Overall Width	E		3.20 BSC	
Terminal Width	b	1.15	1.20	1.25
Terminal 1 Tab	b1		0.10 REF	
Terminal Length	L	0.80	0.90	1.00
Terminal Pull Back	L1		0.10 REF	
Terminal 1 Tab	L2		0.20 REF	
Terminal 1 Chamfer	CH		0.25 REF	
Terminal Spacing	K		1.20 REF	

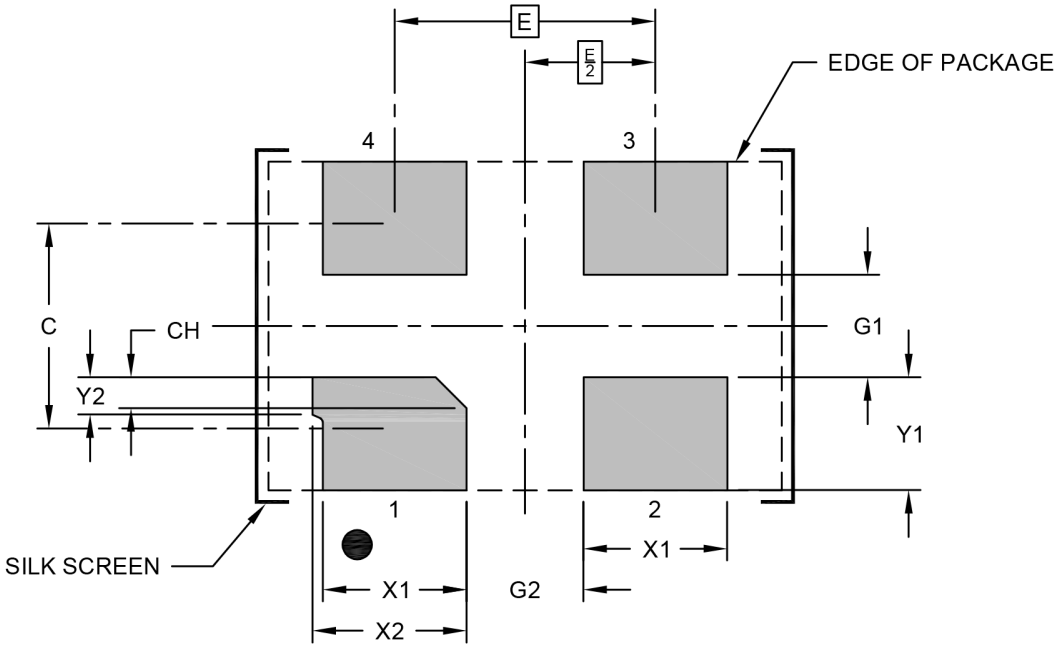
Notes:

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 C04-1008 Rev A Sheet 2 of 2

4-Lead Very Thin Plastic Dual Flat, No Lead Package (H6A) - 5x3.2 mm Body [VDFN]

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			
Contact Pad Spacing	C		2.00	
Contact Pad Width (X4)	X1			1.40
Contact Pad Width	X2			1.50
Contact Pad Length (X4)	Y1			1.10
Contact Pad Tab Length	Y2			0.36
Contact Pad to Center Pad (X2)	G1	1.00		
Contact Pad to Contact Pad (X2)	G2	1.14		
Terminal 1 Contact Pad Chamfer	CH		0.30	

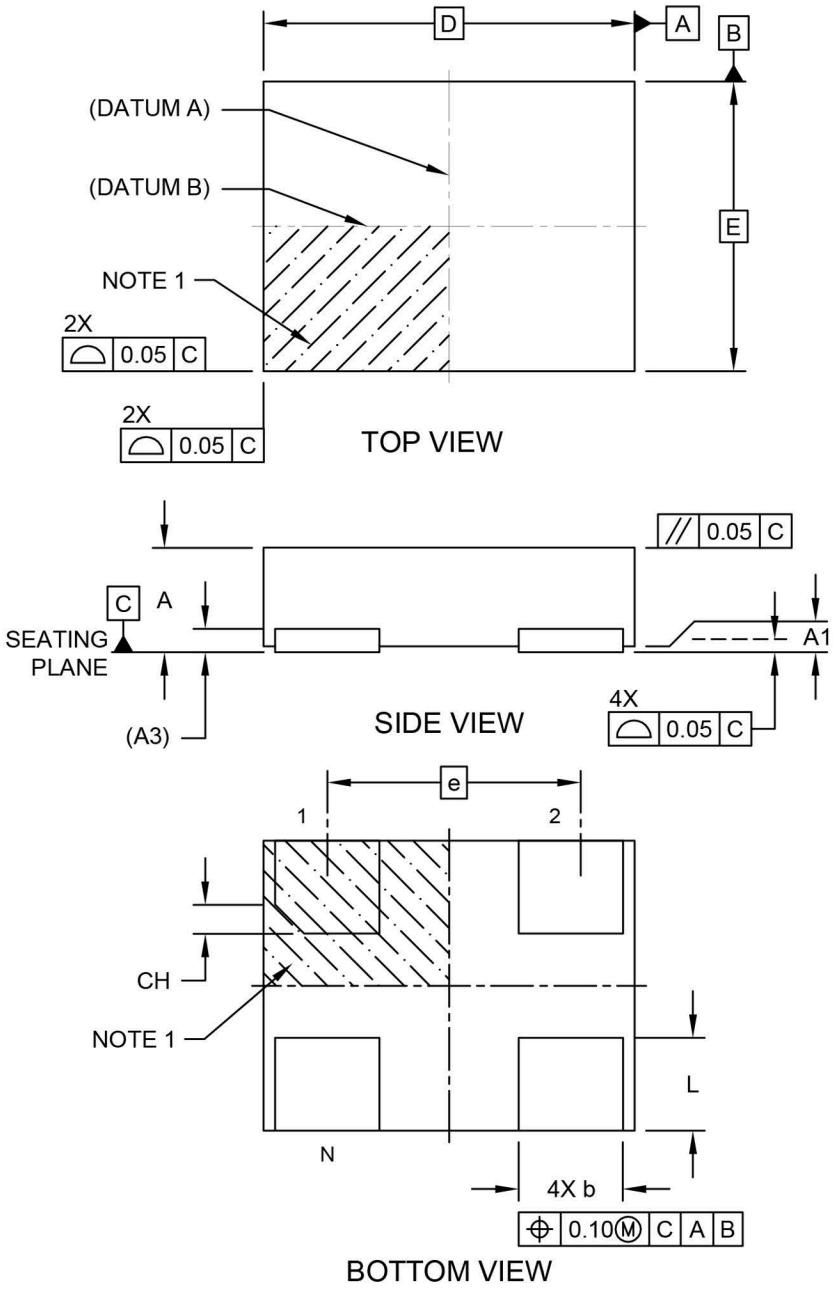
Notes:

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

Microchip Technology Drawing C04-3008 Rev A

4-Lead Very Thin Plastic Dual Flatpack No-Lead (H4A) - 3.2x2.5 mm Body [VDFN]

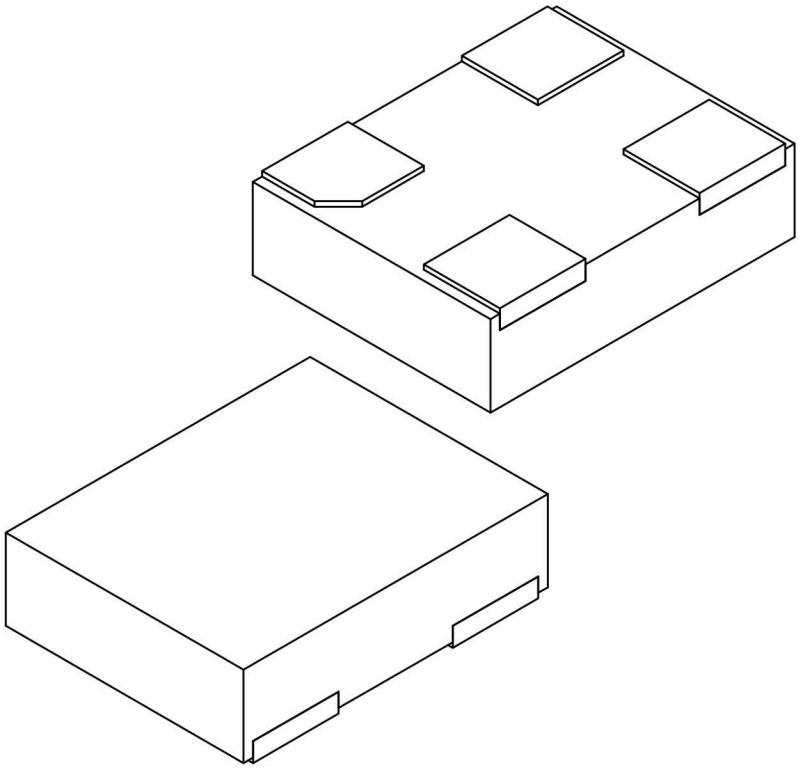
Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-1006 Rev B Sheet 1 of 2

4-Lead Very Thin Plastic Dual Flatpack No-Lead (H4A) - 3.2x2.5 mm Body [VDFN]

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	
Pitch	e		2.10 BSC	
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	0.02	0.05
Overall Length	D		3.20 BSC	
Overall Width	E		2.50 BSC	
Terminal Width	b	0.85	0.90	0.95
Terminal Length	L	0.70	0.80	0.90
Terminal 1 Index Chamfer	CH		0.25 REF	

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

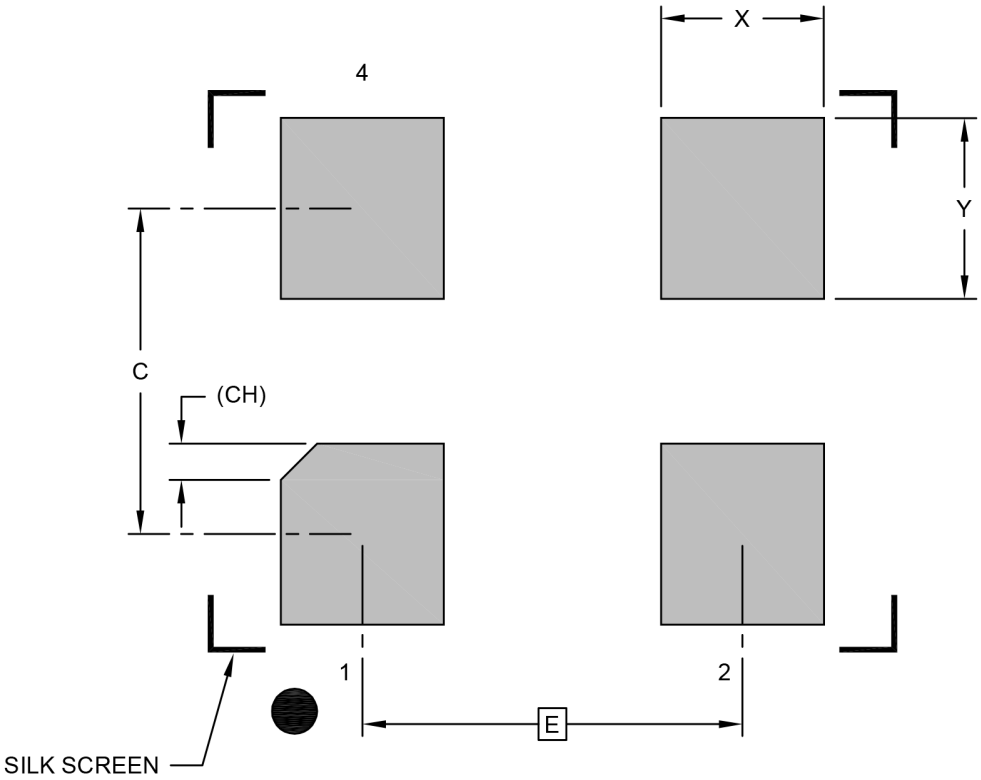
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-1006 Rev B Sheet 2 of 2

4-Lead Very Thin Plastic Dual Flatpack No-Lead (H4A) - 3.2x2.5 mm Body [VDFN]

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	2.10 BSC		
Contact Pad Spacing	C		1.80	
Contact Pad Width (Xnn)	X			0.90
Contact Pad Length (Xnn)	Y			1.00
Contact Pad Length (Xnn)	CH	0.20 REF		

Notes:

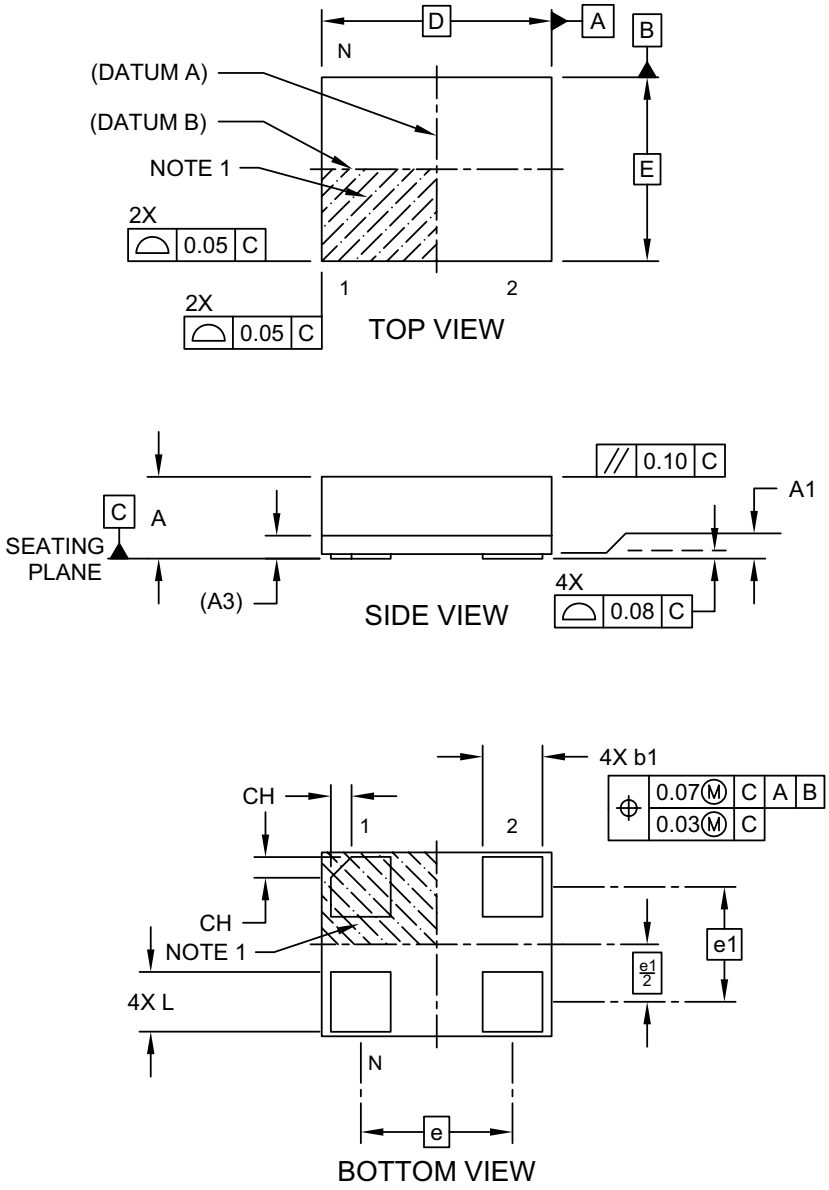
1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing C04-3006 Rev B

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

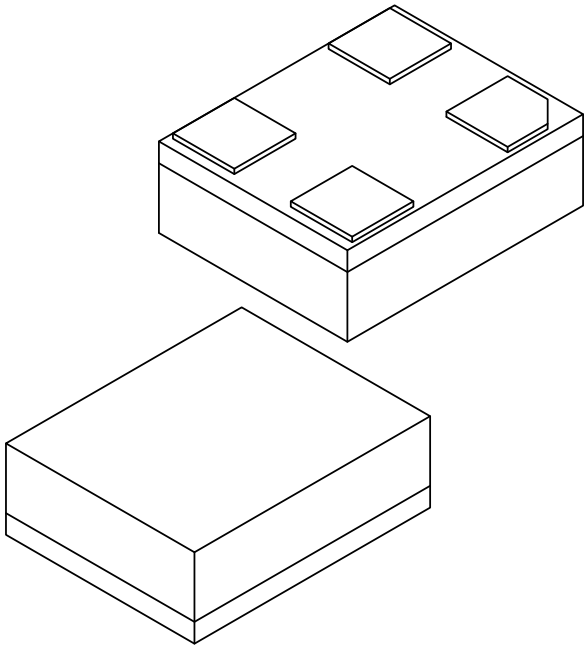
Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-1202B Sheet 1 of 2

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

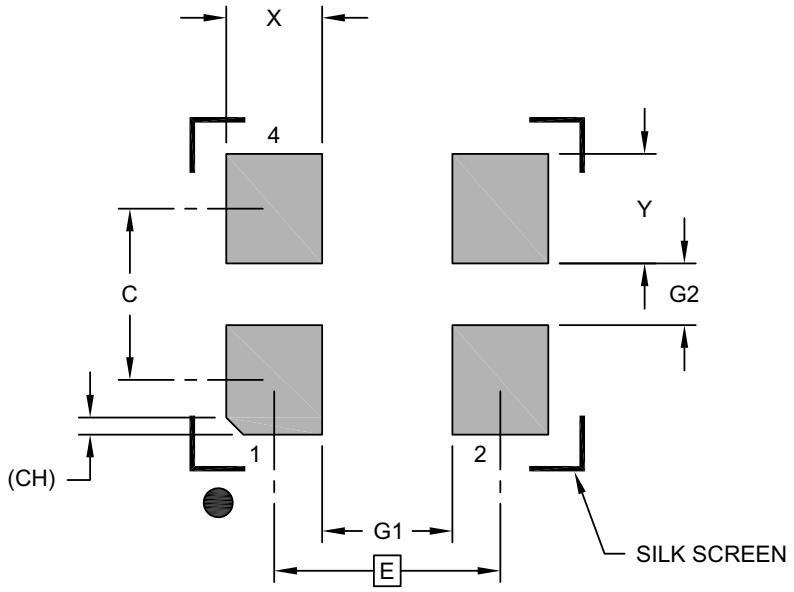
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-1202B Sheet 2 of 2

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 (X4)	Y			0.80
Space Between Contacts (X2)	G1	0.95		
Space Between Contacts (X2)	G2	0.45		
Contact 1 Index Chamfer	CH	0.13 X 45° REF		

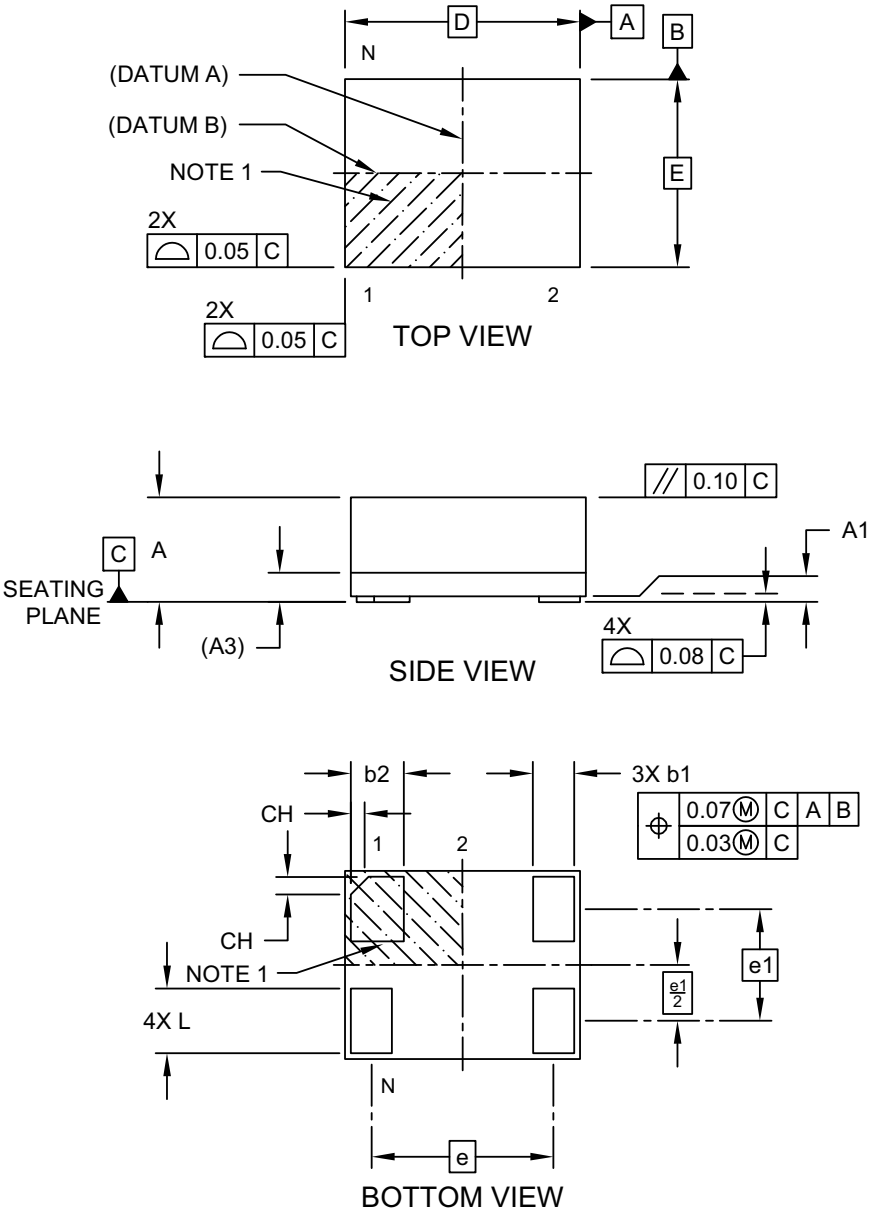
Notes:

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

Microchip Technology Drawing C04-3202B

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

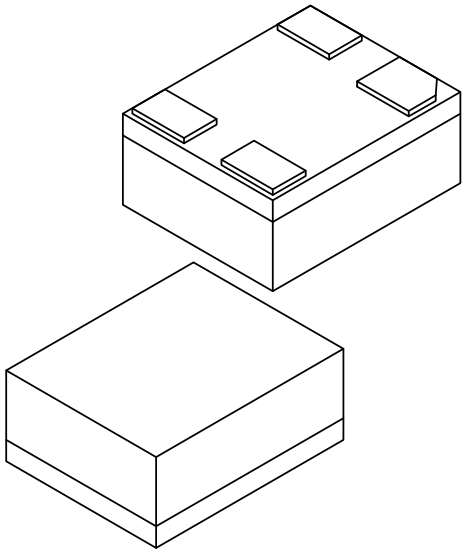
Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-1200 Rev D Sheet 1 of 2

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		4	
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

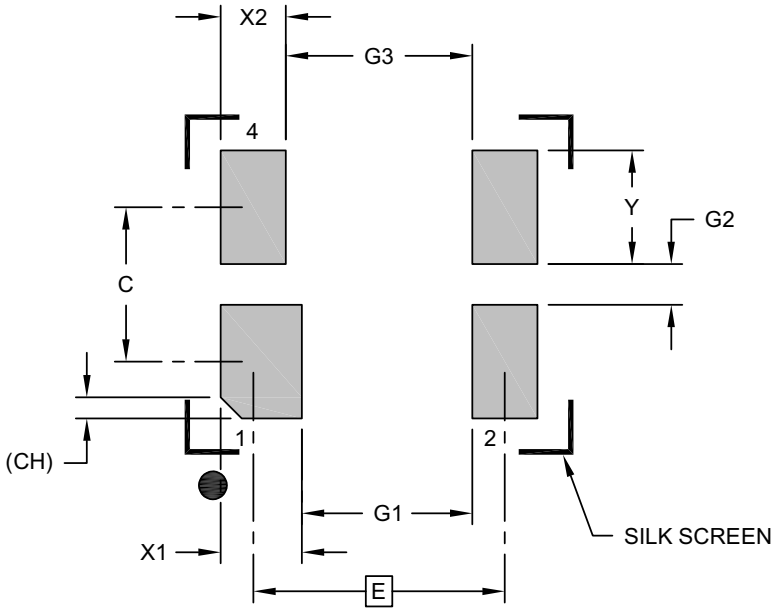
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-1200 Rev D Sheet 2 of 2

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	X1			0.50
Contact Width (X3)	X2			0.40
Contact Pad Length (X4)	Y			0.70
Space Between Contacts	G1	1.05		
Space Between Contacts (X2)	G2	0.25		
Space Between Contacts	G3	1.15		
Contact 1 Index Chamfer	CH	0.13 X 45° REF		

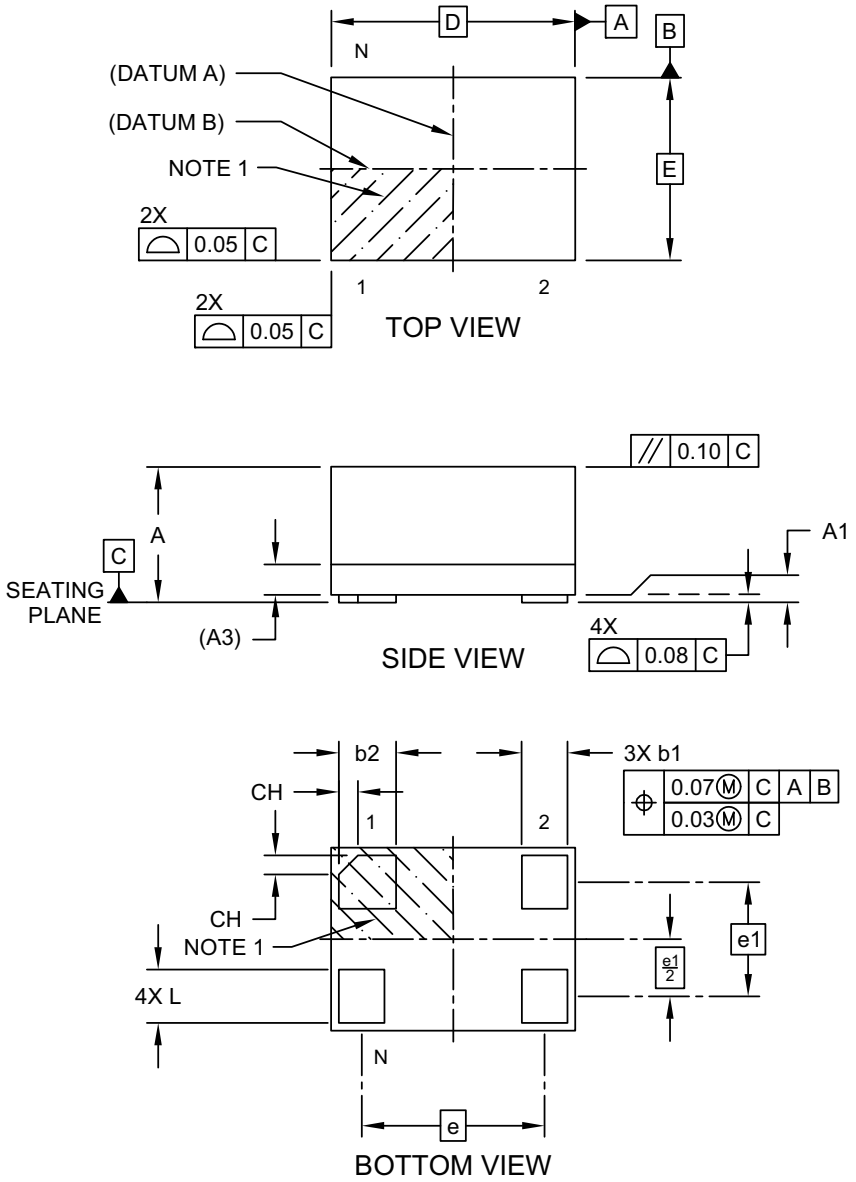
Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. The value in parenthesis, next to the item description is a unit multiplier.

Microchip Technology Drawing C04-3200 Rev D

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

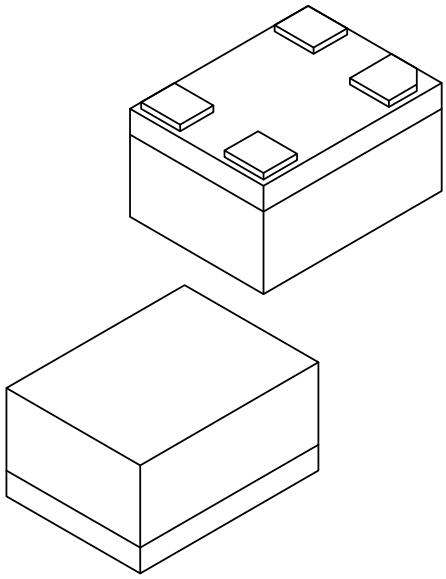
Note:	For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging



Microchip Technology Drawing C04-1199B Sheet 1 of 2

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

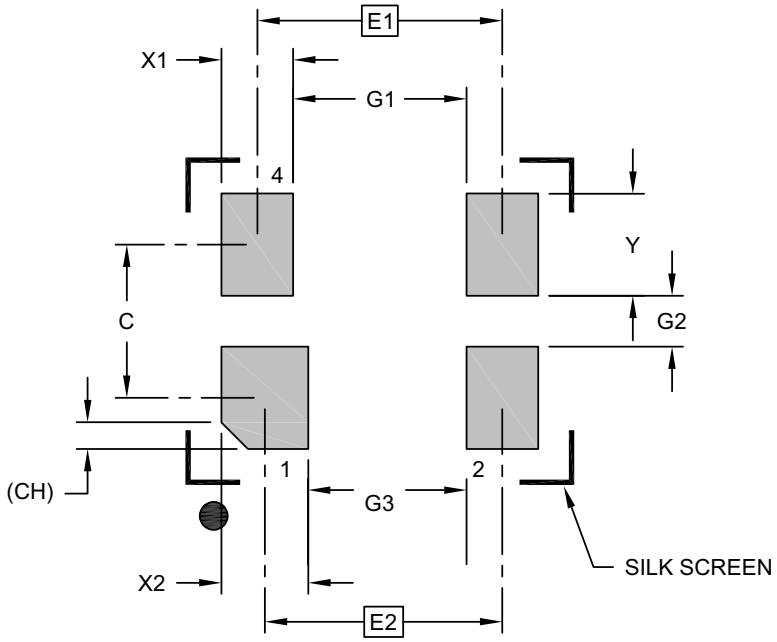
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

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

Microchip Technology Drawing C04-1199B Sheet 2 of 2

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 (X4)	Y			0.50
Space Between Contacts	G1	0.85		
Space Between Contacts (X2)	G2	0.25		
Space Between Contacts	G3	0.77		
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.
2. The value in parenthesis, next to the item description is a unit multiplier.

Microchip Technology Drawing C04-3199B

APPENDIX A: REVISION HISTORY

Revision A (April 2019)

- Initial creation of DSA63xx Microchip data sheet DS20006189A.

Revision B (May 2019)

- Ensured part number of DSA63xx is correctly reflected across entire document.
- Clarified Conditions for Frequency Stability in Electrical Characteristics table.
- Revised the Product Identification System section to better reflect the current naming convention.

Revision C (November 2022)

- Added the 7.0 mm x 5.0 mm VDFN, 5.0 mm x 3.2 mm VDFN and 3.2 mm x 2.5 mm VDFN package options throughout the document.

NOTES:

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	XXX
Device	Pin 1 Definition	Output Drive Strength	Package	Temperature Range	Frequency Stability	Revision	Frequency	Media Type	Automotive Suffix

Device: DSA60: Ultra-Small, Low Power MEMS Oscillator

Pin 1 Definition:

Selection	Pin 1	Internal Pull-Up Register
0	OE	Pull-up
1	$\overline{\text{STDBY}}$	Pull-up
2	FS	Pull-up
4	OE	None
5	$\overline{\text{STDBY}}$	None
6	FS	None

Output Drive Strength: 1 = Standard; 3 = Low

Package:
A = 4-Lead 7.0 mm x 5.0 mm VDFN
B = 4-Lead 5.0 mm x 3.2 mm VDFN
C = 4-Lead 3.2 mm x 2.5 mm VDFN
J = 4-Lead 2.5 mm x 2.0 mm VLGA
M = 4-Lead 2.0 mm x 1.6 mm VFLGA
H = 4-Lead 1.6 mm x 1.2 mm VFLGA

Temperature Range:
A = –40°C to +125°C (Automotive Grade 1)
L = –40°C to +105°C (Automotive Grade 2)
I = –40°C to +85°C (Automotive Grade 3)

Frequency Stability:
1 = ± 50 ppm
2 = ± 25 ppm
3 = ± 20 ppm

Revision: B = Revision B

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.

Media Type:
<blank>= 50/Tube, 100 pce. min. (A Package Option)
<blank>= 72/Tube, 144 pce. min. (B Package Option)
<blank>= 110/Tube (C Package Option)
<blank>= 140/Tube (J Package Option)
<blank>= 100/Bag (M & H Package Options)
T = 1,000/Reel
B = 3,000/Reel

Automotive Suffix: Vxx = The “xx” is assigned by Microchip.

Examples:

a) DSA6013JI3B-080.0000VAO:
Ultra-Small, Low Power MEMS Oscillator, Pin1 = $\overline{\text{STDBY}}$ with Internal Pull-Up, Low Drive Strength, 4-Lead 2.5 mm x 2.0 mm VLGA, Automotive Grade 3 Temperature, ±20 ppm Stability, Revision B, 80 MHz Frequency, 140/Tube

b) DSA6001HL1B-016.0000TVAO:
Ultra-Small, Low Power MEMS Oscillator, Pin1 = OE with Internal Pull–Up, Standard Drive Strength, 4-Lead 1.6 mm x 1.2 mm VFLGA, Automotive Grade 2 Temperature, ±50 ppm Stability, Revision B, 16 MHz Frequency, 1,000/Reel

c) DSA6021MA2B-0157VAO:
Ultra-Small, Low Power MEMS Oscillator, Pin1 = Freq. Select with Internal Pull-Up, Standard Drive Strength, 4-Lead 2.0 mm x 1.6 mm VFLGA, Automotive Grade 1 Temperature, ±25 ppm Stability, Revision B, Two Frequencies Configured through ClockWorks, 100/Bag

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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- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
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