

1.2V CMOS Crystal Oscillator

Features

- CMOS Output
- Output Frequencies from 5 MHz to 100 MHz
- 1.2V Operation
- Output Disable Feature
- Operating Temperature from -40°C to $+125^{\circ}\text{C}$
- Product is Compliant to RoHS Directive and Fully Compatible with Lead Free Assembly (excluding solder dipped, _SNPB, option)

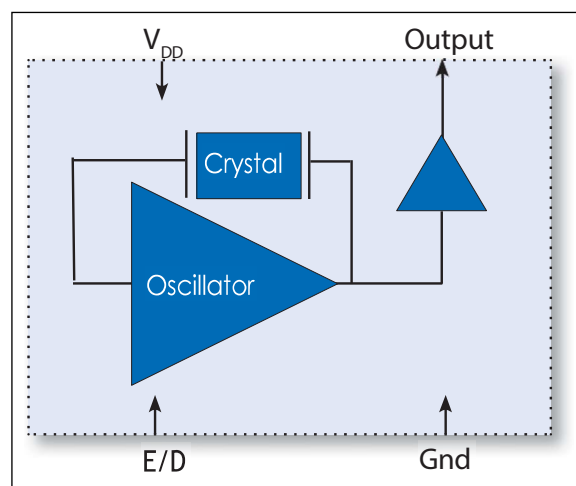
Applications

- SONET/SDH/DWDM
- Ethernet, GE, SynchE
- Storage Area Networking
- Fibre Channel
- Digital Video
- Broadband Access
- Base Stations, Picocells

General Description

Microchip's VC-9B Crystal Oscillator (XO) is a quartz stabilized square wave generator with a CMOS output. The VC-9B uses a fundamental or a 3rd overtone crystal, oscillating in a fundamental tone, resulting in very low jitter performance, and a monolithic IC that improves reliability and reduces cost.

Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

ELECTRICAL PERFORMANCE

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Supply Voltage						
Voltage	V _{DD}	1.08	1.2	1.32	V	Note 1
Maximum Supply Voltage	V _{DD(MAX)}	−0.5	—	3.5	V	—
Current	I _{DD}	—	—	5	mA	Note 2, ≤54 MHz
		—	—	12	mA	Note 2, >54 MHz
Current, Output Disabled	I _{DD}	—	—	5	μA	—
Frequency						
Nominal Frequency	f _{NOM}	5.000	—	100.000	MHz	Note 3, Ordering Option
Stability	f _{STAB}	—	—	±25	ppm	Note 4, Note 7 Ordering Option
		—	—	±30		
		—	—	±35		
		—	—	±50		
		—	—	±100		
Outputs						
Output Logic Level High	V _{OH}	0.9*V _{DD}	—	—	V	Note 2
Output Logic Level Low	V _{OL}	—	—	0.1*V _{DD}	V	
Output Logic High Drive	I _{OH}	1	—	—	mA	
Output Logic Low Drive	I _{OL}	1	—	—	mA	
Load	C _L	—	—	15	pF	—
Output Rise/Fall Time	t _r /t _f	—	—	6	ns	Note 2
Duty Cycle	DC	45	50	55	%	Note 2, Note 5
Phase Noise, 54 MHz	—	—	−70	—	dBc/Hz	10 Hz
		—	−112	—		100 Hz
		—	−135	—		1 kHz
		—	−143	—		10 kHz
		—	−148	—		100 kHz
		—	−152	—		1 MHz
		—	−155	—		10 MHz
		—	−158	—		20 MHz
RMS Jitter	Φ _J	—	370	—	fs	12 kHz to 20 MHz

- Note 1:** The power supply should have bypass capacitors as close to the supply pin to ground as possible (for example, 10 μF, 0.1 μF, and 0.01 μF).
- 2:** Parameters are tested with the test circuit shown in Figure 1-1.
- 3:** See Standard Frequencies and the [Product Identification System](#) sections for more specific information.
- 4:** Includes initial accuracy, operating temperature, supply voltage, and aging.
- 5:** Duty Cycle is measured as On-Time/Period. See Figure 1-2.
- 6:** The output is enabled if the Enable/Disable pin is left open.
- 7:** Only ±50 ppm and ±100 ppm stability options are available for −40°C to +105°C and −40°C to +125°C temperature ranges.

ELECTRICAL PERFORMANCE (CONTINUED)

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Enable/Disable						
Output Enable	V_{IH}	$0.8 \cdot V_{DD}$	—	—	V	Note 6
Output Disable	V_{IL}	—	—	$0.2 \cdot V_{DD}$	V	
Disable Time	t_{DIS}	—	—	0.1	μs	—
Start-Up Time	t_{SU}	—	—	5	ms	—
Maximum E/D Voltage	—	−0.5	—	$V_{DD} + 0.5$	V	—
Operating Temperature	T_{OP}	−10	—	+70	$^{\circ}C$	Ordering Option
		−40	—	+85		
		−40	—	+105		
		−40	—	+125		

- Note 1:** The power supply should have bypass capacitors as close to the supply pin to ground as possible (for example, 10 μF , 0.1 μF , and 0.01 μF).
- 2:** Parameters are tested with the test circuit shown in Figure 1-1.
- 3:** See Standard Frequencies and the [Product Identification System](#) sections for more specific information.
- 4:** Includes initial accuracy, operating temperature, supply voltage, and aging.
- 5:** Duty Cycle is measured as On-Time/Period. See Figure 1-2.
- 6:** The output is enabled if the Enable/Disable pin is left open.
- 7:** Only ± 50 ppm and ± 100 ppm stability options are available for $-40^{\circ}C$ to $+105^{\circ}C$ and $-40^{\circ}C$ to $+125^{\circ}C$ temperature ranges.

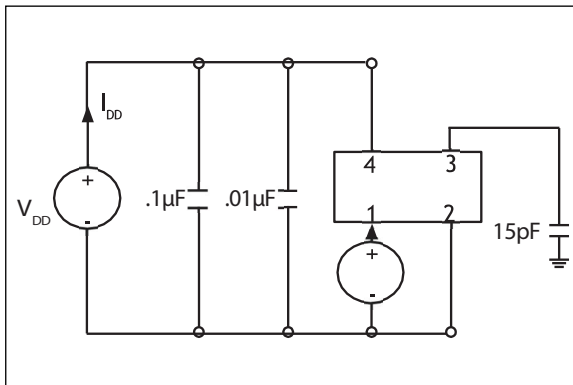


FIGURE 1-1: Test Circuit.

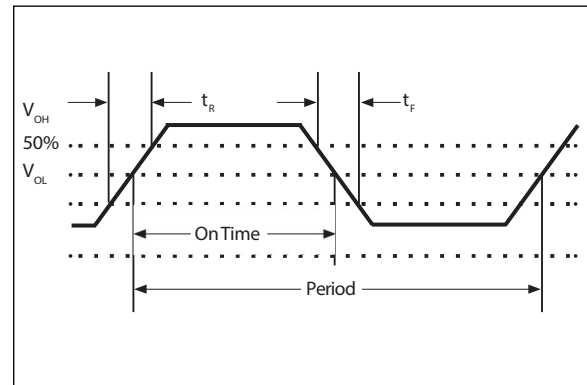


FIGURE 1-2: Waveform.

VC-9B

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this data sheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability. Permanent damage is also possible if E/D is applied before V_{DD} .

Parameter	Symbol	Value
Storage Temperature	T_S	-55°C to +125°C
Soldering Temperature	T_{LS}	+260°C
Soldering Time	t_S	30 sec.

Handling Precautions

Although ESD protection circuitry has been designed into the VC-9B, proper precautions should be taken when handling and mounting. Microchip employs a Human Body Model (HBM), a Charged Device Model (CDM), and a Machine Model (MM) for ESD susceptibility testing and design protection evaluation.

TABLE 1-1: ESD RATINGS

Model	Minimum	Conditions
Human Body Model	±2000V	JDEC JES22-A1141
Charged Device Model	±1000V	JESD22-C101
Machine Model	±200V	JDEC JESD22-A114

2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 2-1](#) and the optional Enable/Disable function is detailed in [Table 2-2](#).

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	E/D	Enable/Disable
2	GND	Case and Electrical Ground
3	Output	Output
4	V_{DD}	Power Supply Voltage

TABLE 2-2: ENABLE/DISABLE FUNCTION

E/D Pin	Output
High	Clock Output
Open	Clock Output
Low	High Impedance

3.0 RELIABILITY

Microchip qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VC-9B family is capable of meeting the following qualification tests:

TABLE 3-1: ENVIRONMENTAL COMPLIANCE

Parameter	Conditions
Mechanical Shock	MIL-STD-883, Method 2002
Mechanical Vibration	MIL-STD-883, Method 2007
Solderability	MIL-STD-883, Method 2003
Fine and Gross Leak	MIL-STD-883, Method 1014
Resistance to Solvents	MIL-STD-883, Method 2015
Moisture Sensitivity Level	MSL1
Contact Pads	Gold (0.3 μm min. to 1.0 μm max.) over Nickel
Contact Pads (_SNPB Option)	Tinned using Sn63Pb37 solder alloy in accordance with J-STD-006
Weight, 7.0 mm x 5.0 mm	178 mg
Weight, 5.0 mm x 3.2 mm	62 mg
Weight, 3.2 mm x 2.5 mm	27 mg
Weight, 2.5 mm x 2.0 mm	18 mg
Weight, 2.0 mm x 1.6 mm	8 mg

4.0 IR REFLOW

The VC-9B is qualified to meet the JEDEC standard for Pb-Free assembly. The temperatures and time intervals listed are based on the Pb-Free small body requirements. The VC-9B device is hermetically sealed, so an aqueous wash is not an issue.

Note: Devices that have been solder dipped, _SNPB option, are not Pb-free.

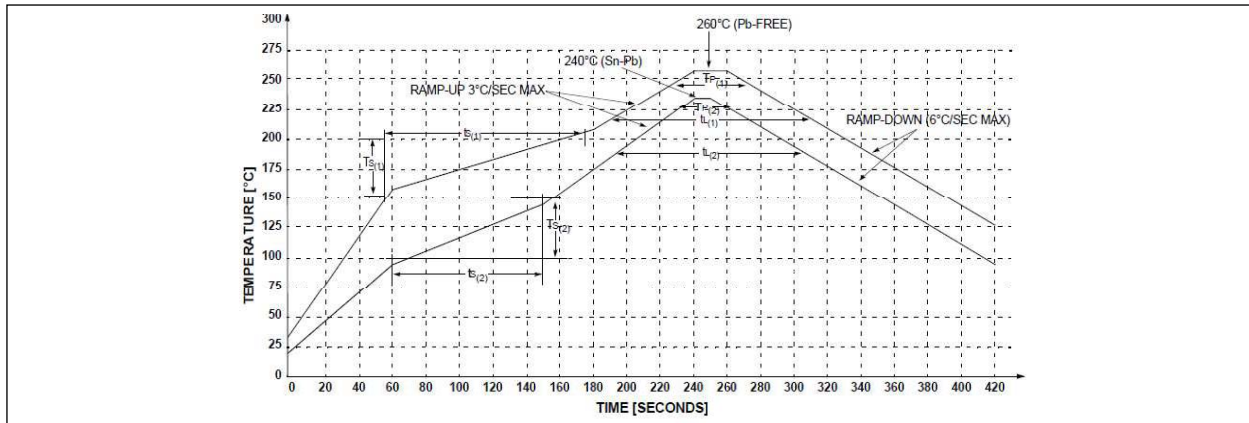


FIGURE 4-1: Solder Profile.

TABLE 4-1: REFLOW PROFILE

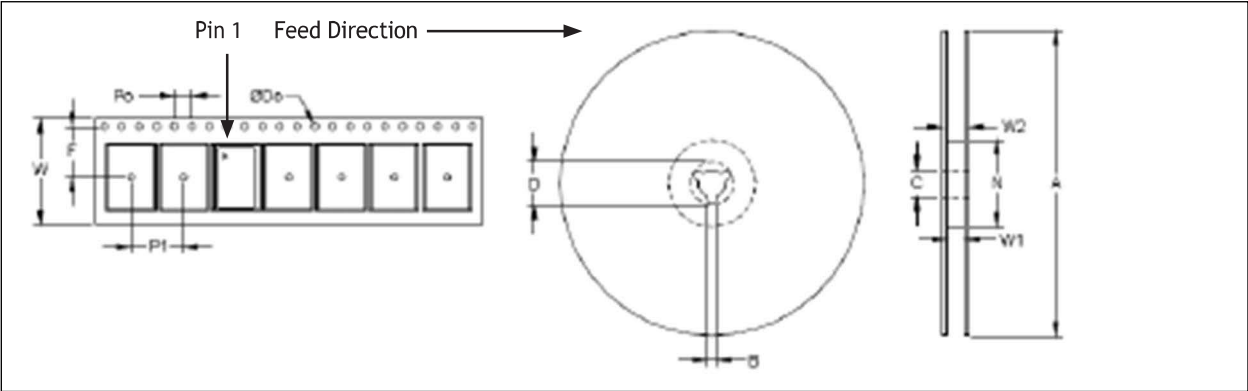
Symbol	Min.	Max.	Conditions
$T_{s(1)}$	150°C	200°C	Pb-free Option
$T_{s(2)}$	100°C	150°C	_SNPB Option
$t_{s(1)}$	60 sec.	180 sec.	Pb-free Option
$t_{s(2)}$	60 sec.	120 sec.	_SNPB Option
$t_{l(1)}$	60 sec.	150 sec.	Pb-free Option
$t_{l(2)}$	60 sec.	150 sec.	_SNPB Option
$T_{p(1)}$	245°C	260°C	Pb-free Option
$T_{p(2)}$	225°C	240°C	_SNPB Option

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5.0 TAPE AND REEL

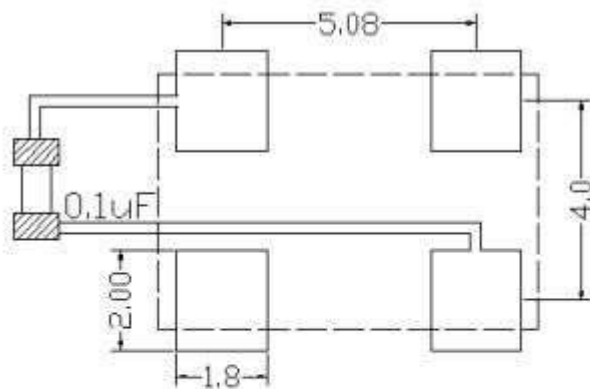
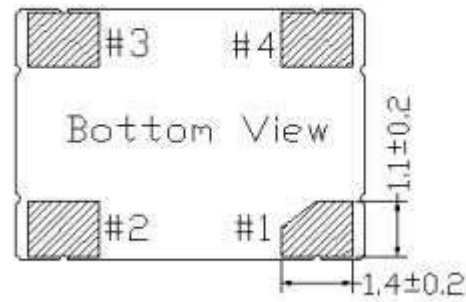
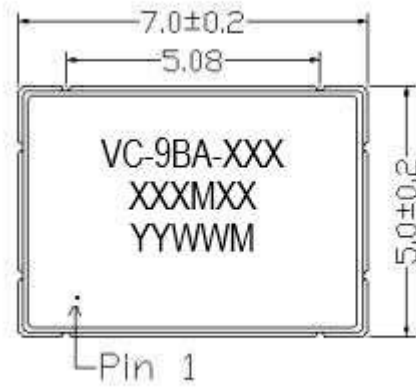
TABLE 5-1: TAPE AND REEL DIMENSIONS

Tape Dimensions (mm)						Reel Dimensions (mm)							
Dimension	W	F	Do	Po	P1	A	B	C	D	N	W1	W2	# per Reel
Tolerance	Typ.	Typ.	Typ.	Typ.	Typ.	Typ.	Min.	Typ.	Min.	Min.	Typ.	Max.	
VC-9BA	16	7.5	1.5	4	8	180	2	13	21	60	17	21	1000
VC-9BB	12	5.5	1.5	4	8	178	2	13	21	55	12	22	1000
VC-9BC	8	3.5	1.5	4	4	178	2	13	21	60	10	14	3000
VC-9BD	8	3.5	1.5	4	4	180	2	13	21	60	9	11	3000
VC-9BE	8	3.5	1.5	4	4	180	2	13	21	60	9	11	3000



6.0 PACKAGING INFORMATION

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



Dimensions in mm

Recommended Soldering Pad Layout

MARKING

VC-9BA-xxx = Part code

XXXMXX = Frequency, eg 125M00 = 125.000MHz,

25M000 = 25.000MHz

05M000 = 5.000MHz

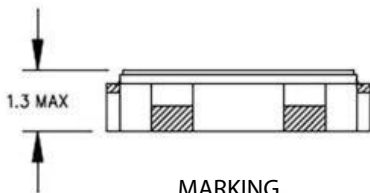
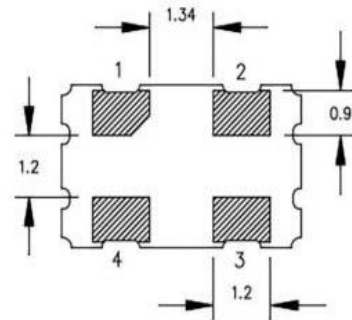
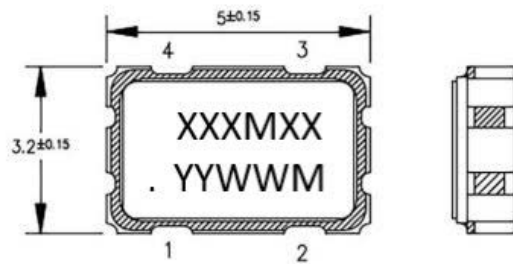
YY = Year

WW = Week

M = Manufacturing location

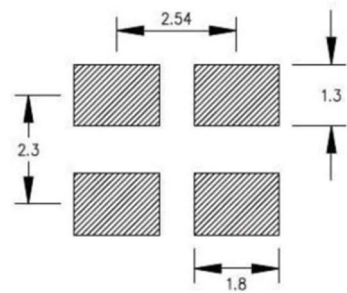
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Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

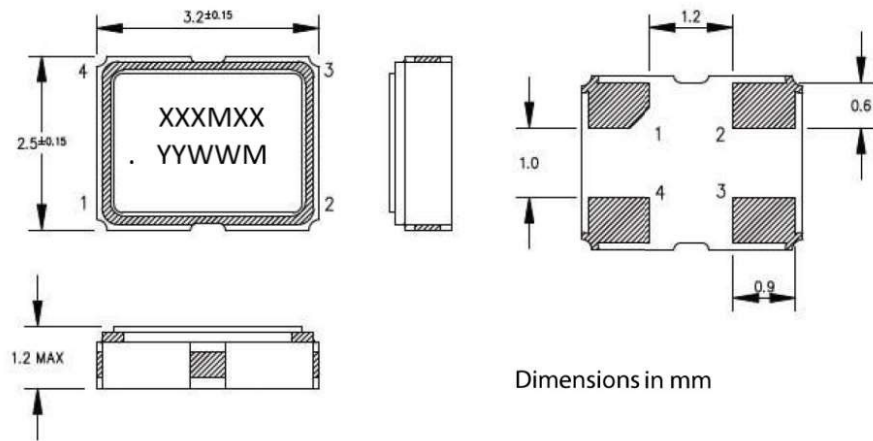


MARKING
 XXXMXX = Frequency, eg 125M00 = 125.000MHz
 25M000 = 25.000MHz
 05M000 = 5.000MHz
 YY = Year
 WW = Week
 M = Manufacturing location

Dimensions in mm

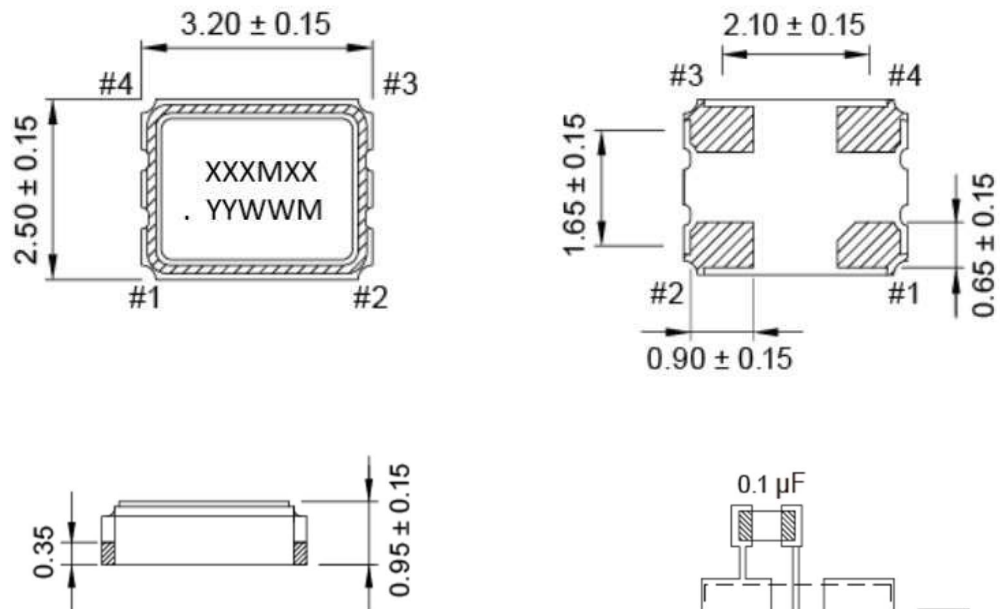


Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimensions in mm

Alternate Package



MARKING

XXXMXX = Frequency, eg 125M00 = 125.000MHz

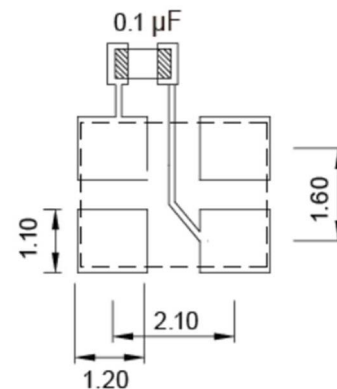
25M000 = 25.000MHz

05M000 = 5.00MHz

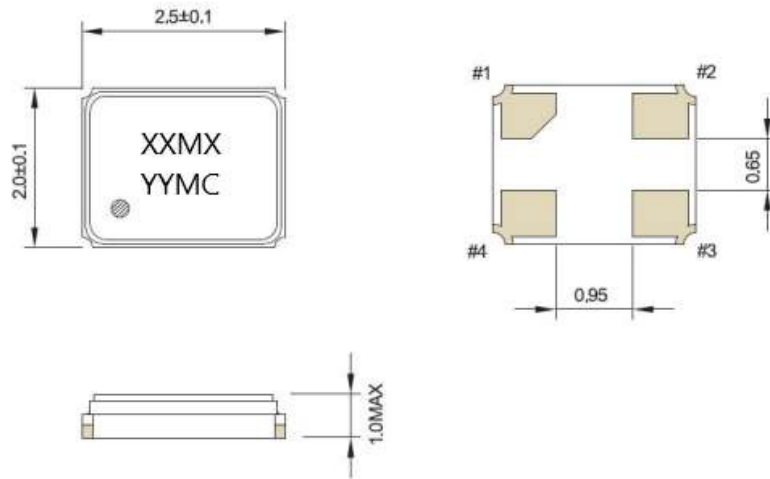
YY = Year

WW = Week

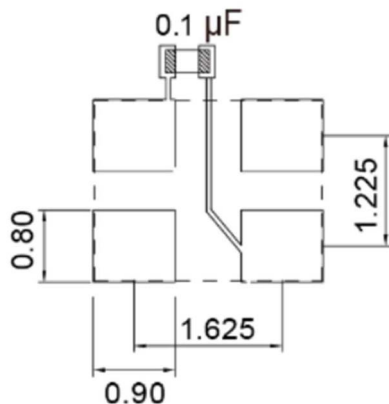
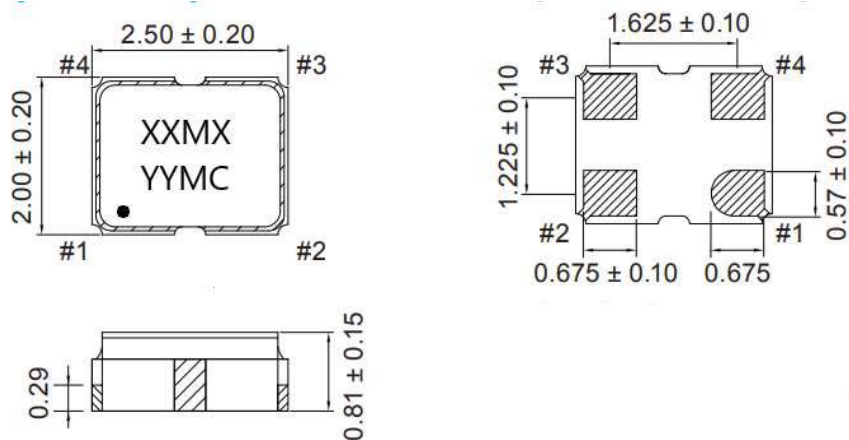
M = Manufacturing location



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



Alternative Package



MARKING

XXMX = Frequency, eg 100.= 100.000MHz

10.0 = 10.000MHz

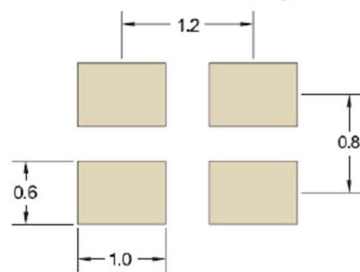
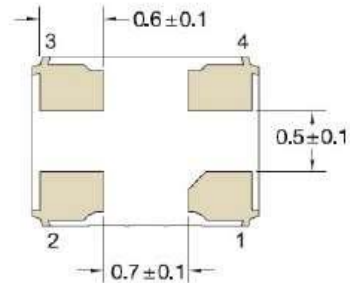
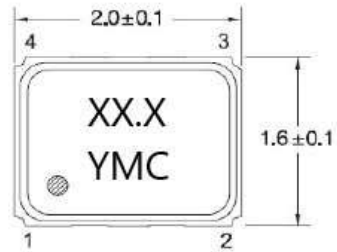
05.0 = 5.000MHz

YY = Year

M = Month, eg A = Jan

C = Manufacturing location

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



MARKING

XX.X = Frequency, eg 100. = 100.000MHz

10.0 = 10.000MHz

05.0 = 5.000MHz

Y = Year

M = Month, eg A = Jan

C = Manufacturing location

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NOTES:

APPENDIX A: REVISION HISTORY

Revision B (July 2026)

- Added ± 30 ppm stability option to the [Product Identification System](#) and [Electrical Performance](#) sections.

Revision A (July 2025)

- Initial release of the VC-9B data sheet as Microchip document DS20007023A.

VC-9B

NOTES:

PRODUCT IDENTIFICATION SYSTEM

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

Device	X	-X	X	X	-X	X	X	X	-XXXXXXXXXX	XX
Part No.	Package	Power Supply	Output	Temp. Range	Stability	Enable/Disable	Load	Custom Option	Frequency (in MHz)	Packaging
Device: VC-9B: 1.2V CMOS Crystal Oscillator Package: A = 7.0 mm x 5.0 mm Ceramic B = 5.0 mm x 3.2 mm Ceramic C = 3.2 mm x 2.5 mm Ceramic D = 2.5 mm x 2.0 mm Ceramic E = 2.0 mm x 1.6 mm Ceramic Power Supply: K = 1.2VDC Output: A = CMOS Temperature Range: W = -10°C to +70°C E = -40°C to +85°C F = -40°C to +105°C (±30 ppm, ±50 ppm, & ±100 ppm only ¹) 7 = -40°C to +125°C (±30 ppm, ±50 ppm, & ±100 ppm only ¹) Stability: F = ±25 ppm G = ±30 ppm H = ±35 ppm K = ±50 ppm S = ±100 ppm Enable/Disable: A = Enable/Disable, Enable High Load: A = 15 pF Custom Option: N = Standard Option Frequency: xxxMxxxxxx=Frequency in MHz or K for kHz (10 digits) Packaging: TR = Tape & Reel <blank>= Cut Tape/ non-TR quantities _SNPB= Tin Lead Solder Dipped Examples: a) VC-9BA-KAF-GAAN-54M0000000TR: VC-9B, 7.0 mm x 5.0 mm Package, 1.2VDC, CMOS Output, -40°C to +105°C Temp. Range, ±30 ppm Stability, Enable High, 15 pF Load, Standard Option, 54 MHz, Tape & Reel b) VC-9BD-KAW-HAAN-25M5000000: VC-9B, 2.5 mm x 2.0 mm Package, 1.2VDC, CMOS Output, -10°C to +70°C Temp. Range, ±35 ppm Stability, Enable High, 15 pF Load, Standard Option, 25.500 MHz, Cut Tape c) VC-9BC-KA7-KAAN-69M0000000_SNPB: VC-9B, 3.2 mm x 2.5 mm Package, 1.2VDC, CMOS Output, -40°C to +125°C Temp. Range, ±50 ppm Stability, Enable High, 15 pF Load, Standard Option, 69 MHz, Cut Tape, Tin Lead Solder Dipped 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: Contact Microchip for ±35ppm options with this temperature range.

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NOTES:

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