VC-829

32.768 kHz CMOS Crystal Oscillator

Features

- CMOS Output XO
- 32.768 kHz
- 3.3V, 2.5V, and 1.8V Operation
- 18 µA Maximum Current
- Output Disable Feature
- –40°C to +125°C Operating Temperature Range
- Small, Industry Standard 3.2 mm x 2.5 mm Package
- Product is Compliant to RoHS Directive and Fully Compatible with Lead-Free Assembly

Applications

- RTC IC
- Smartphones
- IoT
- Wearables

General Description

Microchip's VC-829 crystal oscillator is a quartz-stabilized, square wave generator with a CMOS output. The VC-829 uses a fundamental crystal that results in very low jitter performance and a monolithic IC that improves reliability and reduces cost.

Block Diagram

VC-829
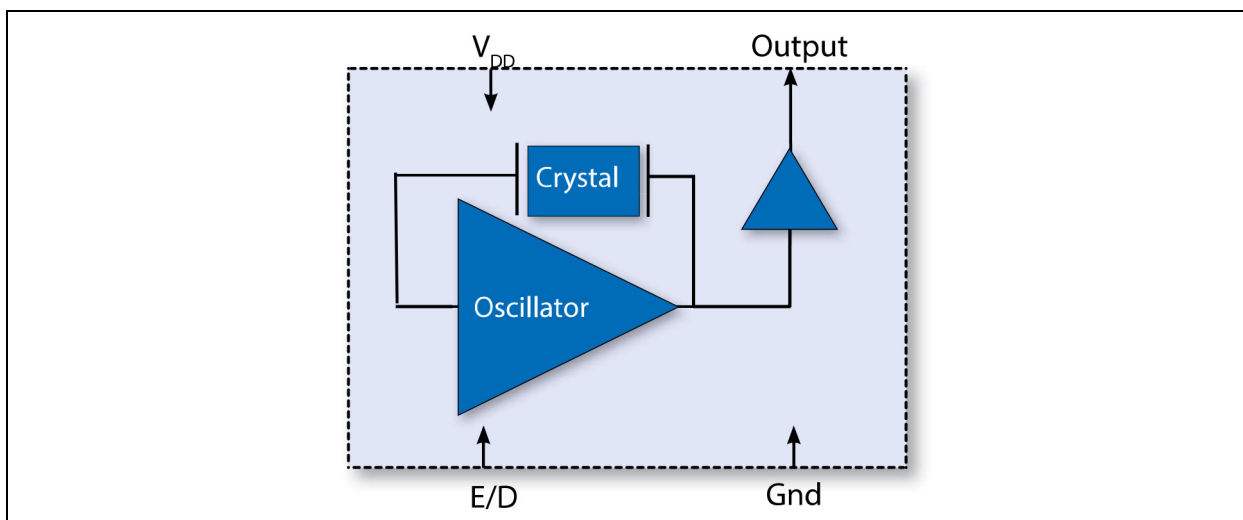
1.0   ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

ESD Rating, Human Body Model (MIL-STD-883, Method 3015, Note 1) .... 1.5 kV
ESD Rating, Charged Device Model (JESD22-C101, Note 1) .... 1 kV
Storage Temperature (T_S) .... –55°C to +125°C
Soldering Temperature (T_{LS}) .... +260°C for 30 seconds

† Notice: 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.

Note 1: Although ESD protection circuitry has been designed into the VC-829, proper precautions should be taken when handling and mounting. Microchip employs a Human Body Model (HBM) and a Charged Device Model (CDM) for ESD susceptibility testing and design protection evaluation.

ELECTRICAL CHARACTERISTICS

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Voltage (Note 1)	V_{DD}	3.15	3.3	3.45	V	—
		2.25	2.5	2.75		
		1.62	1.8	1.98		
Maximum Voltage	—	–0.5	—	5	V	—
Current (Note 2)	I_{DD}	—	—	18	µA	—
Current, Output Disabled	—	—	—	3	µA	—
Frequency						
Nominal Frequency	f_N	—	32.768	—	kHz	—
Stability (Note 3)	—	—	—	±20	ppm	Ordering Option
		—	—	±25		
		—	—	±50		
Outputs						
Output Logic Level High	V_{OH}	0.9 * V_{DD}	—	—	V	3.3V, 2.5V, and 1.8V operation, Note 2
Output Logic Level Low	V_{OL}	—	—	0.1 * V_{DD}	V	
Load	—	—	—	15	pF	—
Output Rise/Fall Time (Note 2)	t_r/t_f	—	—	15	ns	—
Duty Cycle (Note 2, Note 4)	—	45	50	55	%	—
Enable/Disable						
Output Enable (Note 5)	V_{IH}	0.7 * V_{DD}	—	—	V	—
Output Disable (Note 5)	V_{IL}	—	—	0.3 * V_{DD}	V	—
Disable Time	t_D	—	—	150	ns	—
Start-Up Time	t_{SU}	—	—	20	ms	—

Note 1: The VC-829 power supply should have bypass capacitors as close to the supply and to ground as possible. For example, a 0.1 µF and 0.01 µF capacitor.

2: Parameters are tested with the test circuit shown in Figure 1-1.

3: Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and 1 year aging.

4: Duty Cycle is measured as On/Time Period, see Figure 1-2.

**5:** The output is enabled if the Enable/Disable pin is left open.

ELECTRICAL CHARACTERISTICS (CONTINUED)

Parameter	Sym.	Min.	Typ.	Max.	Units	Conditions
Operating Temperature	T_{OP}	−10	—	+70	°C	Ordering Option
		−40	—	+85		
		−40	—	+105		
		−40	—	+125		

Note 1: The VC-829 power supply should have bypass capacitors as close to the supply and to ground as possible. For example, a 0.1 µF and 0.01 µF capacitor.

2: Parameters are tested with the test circuit shown in Figure 1-1.

3: Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and 1 year aging.

4: Duty Cycle is measured as On/Time Period, see Figure 1-2.

5: The output is enabled if the Enable/Disable pin is left open.
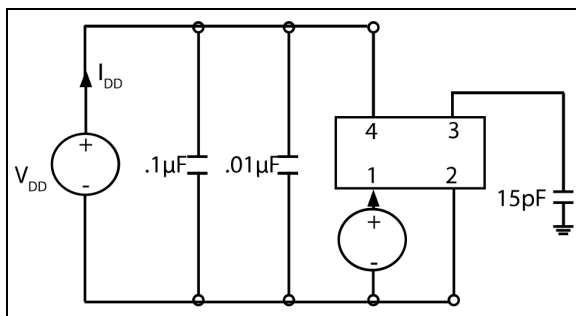
FIGURE 1-1:   Test Circuit.
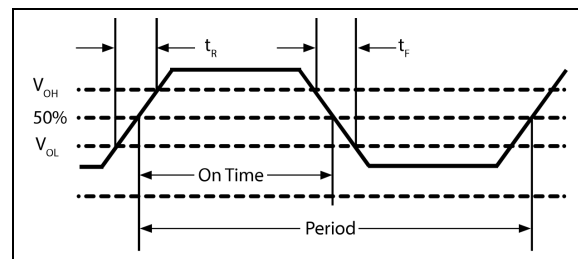
FIGURE 1-2:   Output Rise/Fall Time.

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2.0   PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

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 will include aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VC-829 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
Gross and Fine Leak	MIL-STD-883, Method 1014
Resistance to Solvents	MIL-STD-883, Method 2015
Moisture Sensitivity Level	MSL 1
Contact Pads	Gold (0.3 µm min., 1.0 µm max.) over Nickel
Weight	26 mg

4.0 IR REFLOW

The VC-829 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-829 device is hermetically sealed, so an aqueous was is not an issue.
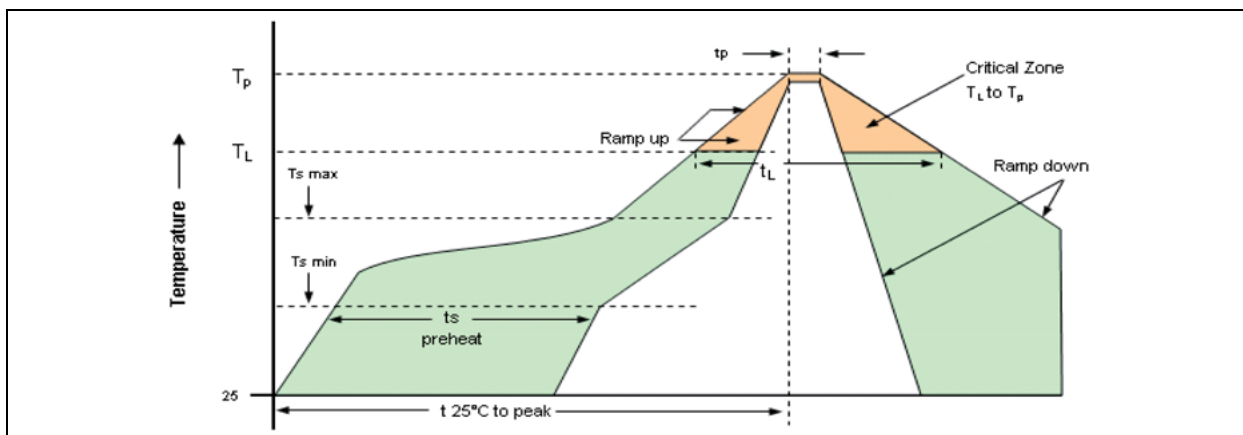
FIGURE 4-1: *Solder Profile.*

TABLE 4-1: REFLOW PROFILE

Parameter	Symbol	Value
Pre-Heat Time		60 sec. minimum, 260 sec. maximum
$T_{S(MIN)}$	t_S	150°C
$T_{S(MAX)}$		200°C
Ramp Up	R_{UP}	3°C/sec. maximum
Time above 217°C	t_L	60 sec. minimum, 150 sec. maximum
Time to Peak Temperature	T_{AMB-P}	480 seconds maximum
Time at 260°C	t_P	30 seconds maximum
Ramp Down	R_{DN}	6°C/sec. maximum

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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-829	8	3.5	1.5	4	4	178	2	13	21	60	10	14	1000
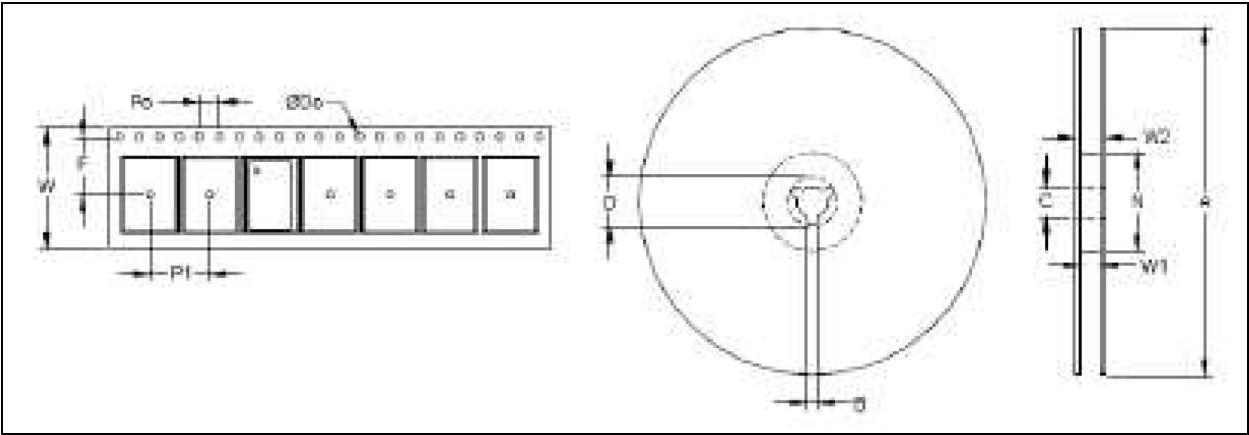
6.0   PACKAGING INFORMATION

4-Lead 3.2 mm x 2.5 mm Ceramic 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
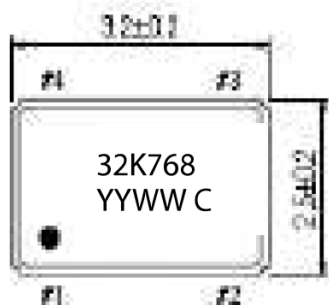
MARKING
32K768 = Frequency
YY = Year
WW Week
C = Manufacturing Location

32K768
YYWW C

1.2max
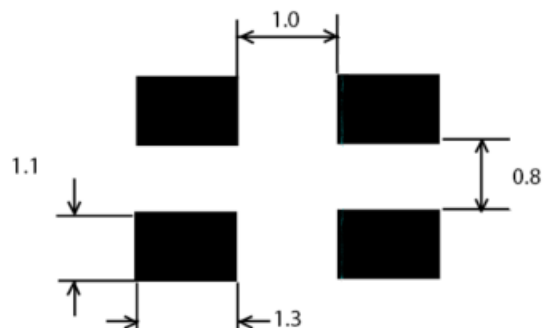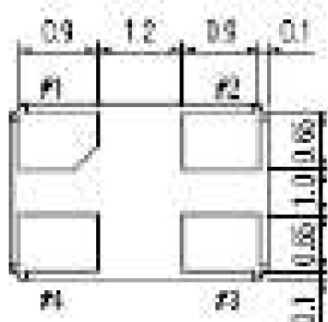
Dimensions in mm

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NOTES:

APPENDIX A: REVISION HISTORY

Revision A (April 2021)

- Converted Vectron document VC-829 to Microchip data sheet template DS20006515A.
- Minor grammatical text changes throughout.

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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	-XXXXXXXXXX	XX
Part No.	Power Supply	Output	Temp. Range	Stability	Enable/ Disable	Load	Custom Options	Frequency	Packaging

Device: VC-829:   32.768 kHz CMOS Crystal Oscillator in 4-Lead 3.2 mm x 2.5 mm Package

Power Supply:
E	=	3.3VDC
H	=	2.5VDC
J	=	1.8VDC
P	=	1.61VDC to 3.63VDC (±50 ppm option only)

Output:
A	=	CMOS

Temperature Range:
E	=	–40°C to +85°C
F	=	–40°C to +105°C (±50 ppm option only)
7	=	–40°C to +125°C (±50 ppm option only)
W	=	–10°C to +70°C

Stability:
E	=	±20 ppm
F	=	±25 ppm
K	=	±50 ppm

Enable/Disable:
A	=	Enable/Disable, Enable High

Load:
A	=	15 pF

Custom Options:
N	=	Standard option

Frequency: 32K768000=32.768 kHz

Packaging:
TR	=	1,000/Reel
<blank>	=	Cut Tape/ non-TR quantities
_SNPB	=	Tin lead solder dipped

Examples:

a) VC-829-EAE-KAAN-32K768000TR:
   VC-829, 3.3VDC, CMOS Output, –40°C to +85°C Temp Range, ±50 ppm Stability, Enable High, 15 pF Load, Standard Option, 32.768 kHz, 1000/Reel

b) VC-829-HAW-EAAN-32K768000TR:
   VC-829, 2.5VDC, CMOS Output, –10°C to +70°C Temp Range, ±20 ppm Stability, Enable High, 15 pF Load, Standard Option, 32.768 kHz, 1000/Reel

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.

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NOTES:

Note the following details of the code protection feature on Microchip devices:

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

- Microchip believes that its family of products is secure when used in the intended manner and under normal conditions.

- There are dishonest and possibly illegal methods being used in attempts to breach the code protection features of the Microchip devices. We believe that these methods require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Attempts to breach these code protection features, most likely, cannot be accomplished without violating Microchip's intellectual property rights.

- Microchip is willing to work with any customer who is concerned about the integrity of its code.

- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is "unbreakable." Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

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