

## 32.768 kHz CMOS Crystal Oscillator

### Features

- CMOS Output XO
- 32.768 kHz
- 3.3V, 2.5V, and 1.8V Operation
- 18  $\mu$ A Maximum Current
- Output Disable Feature
- $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  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

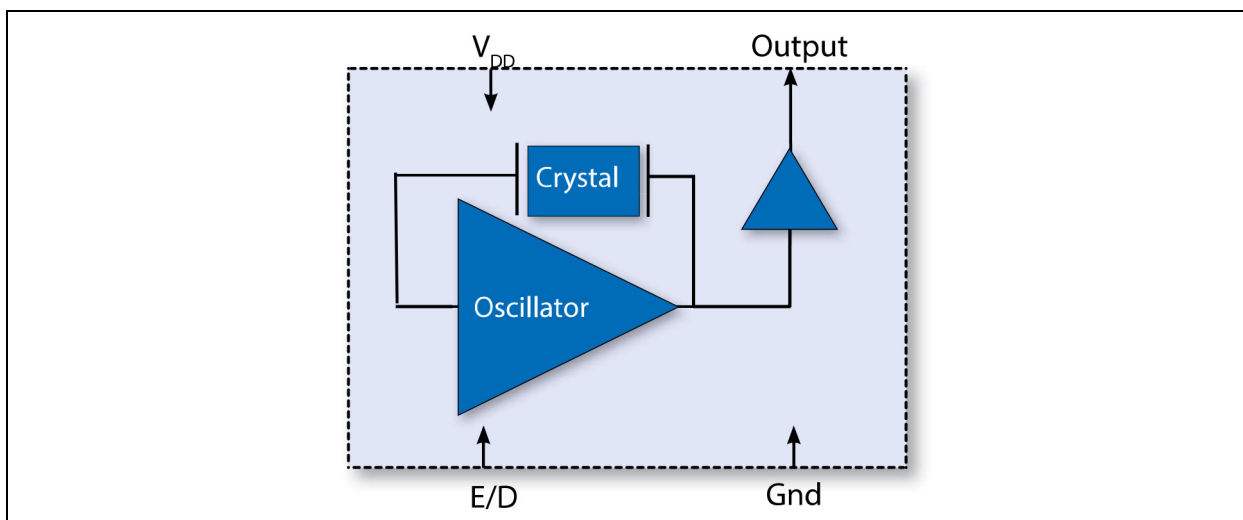
### General Description

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.

### Applications

- RTC IC
- Smartphones
- IoT
- Wearables

### Block Diagram



## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings †

ESD Rating, Human Body Model (MIL-STD-883, Method 3015, <a href="#">Note 1</a> )	1.5 kV
ESD Rating, Charged Device Model (JESD22-C101, <a href="#">Note 1</a> )	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 <sub>DD</sub>	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 <sub>DD</sub>	—	—	18	μA	—
Current, Output Disabled	—	—	—	3	μA	—
Frequency						
Nominal Frequency	f <sub>N</sub>	—	32.768	—	kHz	—
Stability (Note 3)	—	—	—	±20	ppm	Ordering Option
		—	—	±25		
		—	—	±50		
Outputs						
Output Logic Level High	V <sub>OH</sub>	0.9 * V <sub>DD</sub>	—	—	V	3.3V, 2.5V, and 1.8V operation, Note 2
Output Logic Level Low	V <sub>OL</sub>	—	—	0.1 * V <sub>DD</sub>	V	
Load	—	—	—	15	pF	—
Output Rise/Fall Time (Note 2)	t <sub>r</sub> /t <sub>f</sub>	—	—	15	ns	—
Duty Cycle (Note 2, Note 4)	—	45	50	55	%	—
Enable/Disable						
Output Enable (Note 5)	V <sub>IH</sub>	0.7 * V <sub>DD</sub>	—	—	V	—
Output Disable (Note 5)	V <sub>IL</sub>	—	—	0.3 * V <sub>DD</sub>	V	—
Disable Time	t <sub>D</sub>	—	—	150	ns	—
Start-Up Time	t <sub>SU</sub>	—	—	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.

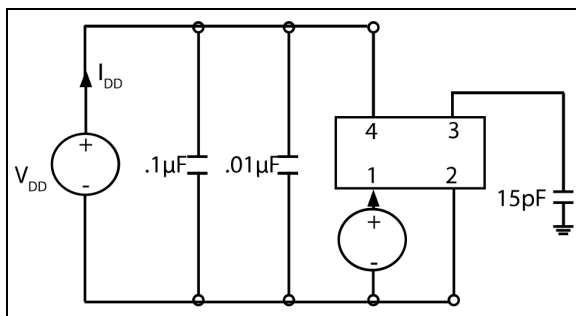
**4:** Duty Cycle is measured as On/Time Period, see [Figure 1-2](#).

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

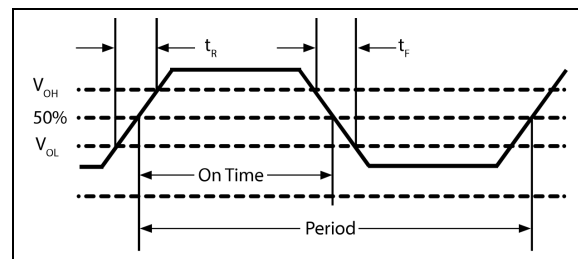
## ELECTRICAL CHARACTERISTICS (CONTINUED)

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  $\mu$ F and 0.01  $\mu$ F 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.

## 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 <sub>DD</sub>	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

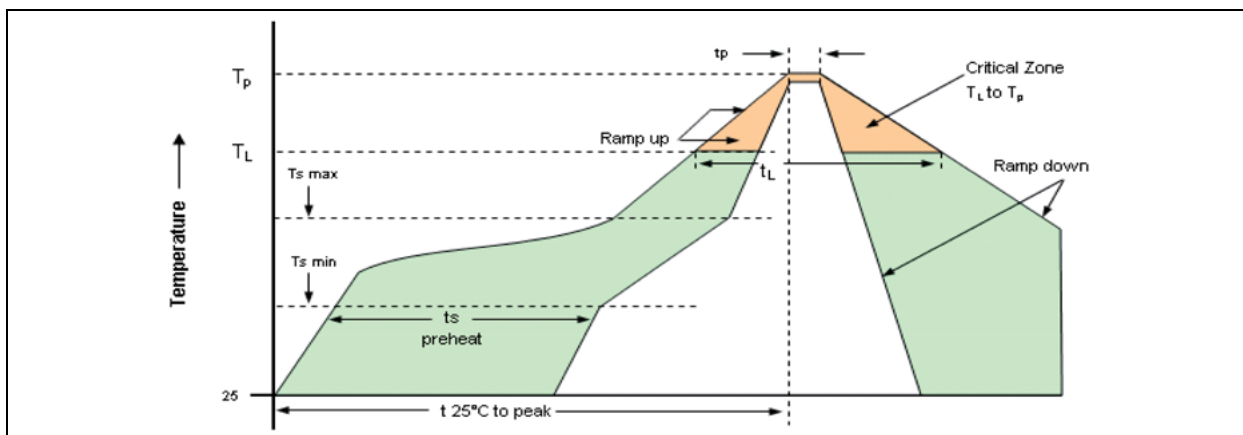
Microchip qualification will include aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VC-829 family is capable of meeting the following qualification tests.

**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 $\mu\text{m}$ min., 1.0 $\mu\text{m}$ 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.

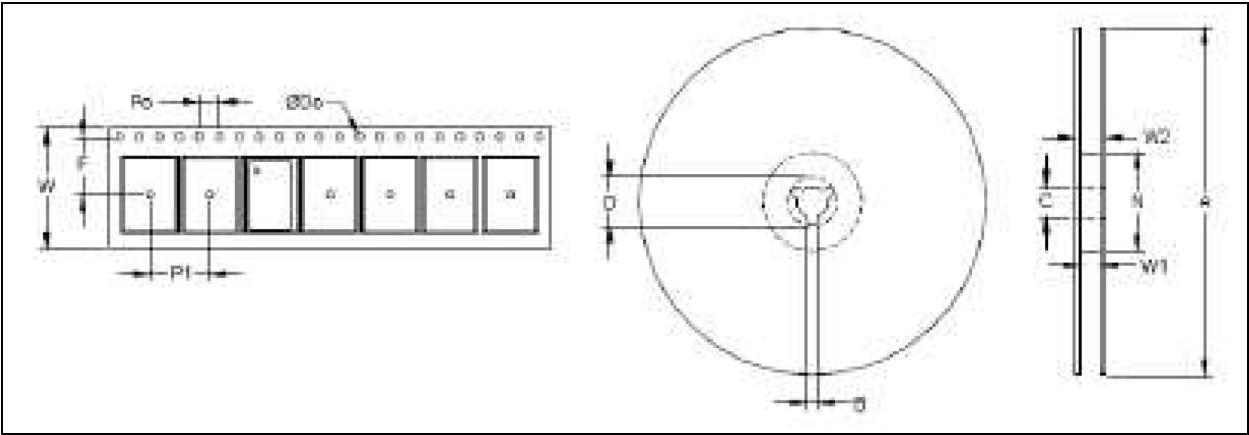
**TABLE 4-1: REFLOW PROFILE**

Parameter	Symbol	Value
Pre-Heat Time	$t_s$	60 sec. minimum, 260 sec. maximum
$T_{S(MIN)}$		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

5.0 TAPE AND REEL

TABLE 5-1: TAPE AND REEL DIMENSIONS

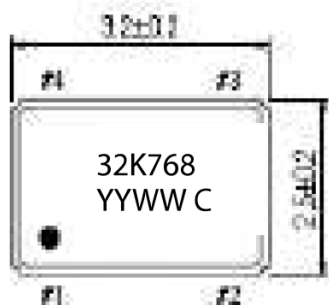
Tape Dimensions (mm)						Reel Dimensions (mm)							
Dimension	W	F	Do	Po	P1	A	B	C	D	N	W1	W2	# per Reel
Tolerance	Typ	Typ	Typ	Typ	Typ	Typ	Min	Typ	Min	Min	Typ	Max	
VC-829	8	3.5	1.5	4	4	178	2	13	21	60	10	14	1000



## 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>



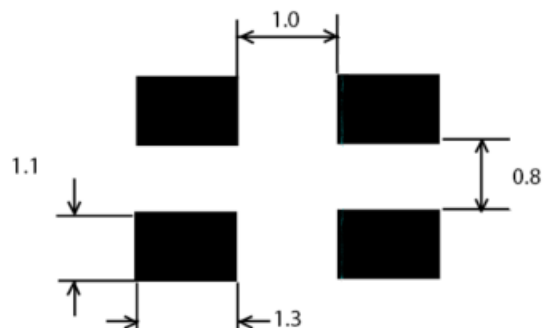
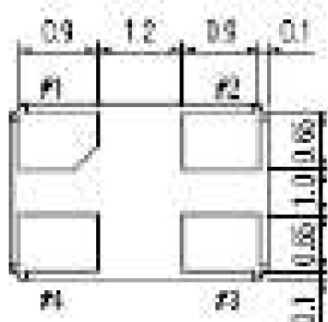
#### MARKING

32K768 = Frequency

YY = Year

WW = Week

C = Manufacturing Location



Dimensions in mm

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.

NOTES:

## PRODUCT IDENTIFICATION SYSTEM

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

<u>Device</u>	<u>-X</u>	<u>X</u>	<u>X</u>	<u>-X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>-XXXXXXXXXX</u>	<u>XX</u>
Part No.	Power Supply	Output	Temp. Range	Stability	Enable/Disable	Load	Custom Options	Frequency	Packaging
<div> <div> <b>Device:</b> VC-829: 32.768 kHz CMOS Crystal Oscillator in 4-Lead 3.2 mm x 2.5 mm Package </div> <div> <b>Power Supply:</b> <div> E = 3.3VDC H = 2.5VDC J = 1.8VDC P = 1.61VDC to 3.63VDC (±50 ppm option only) </div> </div> <div> <b>Output:</b> <div> A = CMOS </div> </div> <div> <b>Temperature Range:</b> <div> 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 </div> </div> <div> <b>Stability:</b> <div> E = ±20 ppm F = ±25 ppm K = ±50 ppm </div> </div> <div> <b>Enable/Disable:</b> <div> A = Enable/Disable, Enable High </div> </div> <div> <b>Load:</b> <div> A = 15 pF </div> </div> <div> <b>Custom Options:</b> <div> N = Standard option </div> </div> <div> <b>Frequency:</b> 32K768000=32.768 kHz </div> <div> <b>Packaging:</b> <div> TR = 1,000/Reel &lt;blank&gt;= Cut Tape/ non-TR quantities _SNPB= Tin lead solder dipped </div> </div> </div> <div> <b>Examples:</b> <div> 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 </div> <div> 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 </div> <div> <b>Note 1:</b> 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. </div> </div>									

NOTES:

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ISBN: 978-1-5224-8122-5

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