




### Description

Vectron's VMK series 32.768 kHz tuning fork is used as a building block for 32.768 kHz oscillator clocks, and associated divide-by to generate a 1 Hz / 1 second clock signal. The VMK3 is a 3.2x1.5 ceramic hermetically sealed package and VMK4 is 2.0x1.2.

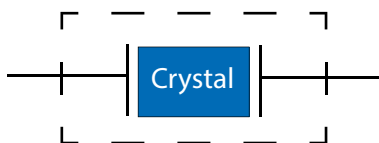
### Features

- $\pm 20$  ppm Initial Accuracy
- -20/70°C or -40/85°C operating temperature
- Small Industry Standard Packages
- Product is compliant to RoHS directive  and fully compatible with lead free assembly

### Applications

- Real Time CLOCKS
- Microprocessors
- Wearables
- IoT
- Bluetooth Low Energy
- Medical, Hearing Aids, Meters and Monitors
- Security

### Block Diagram



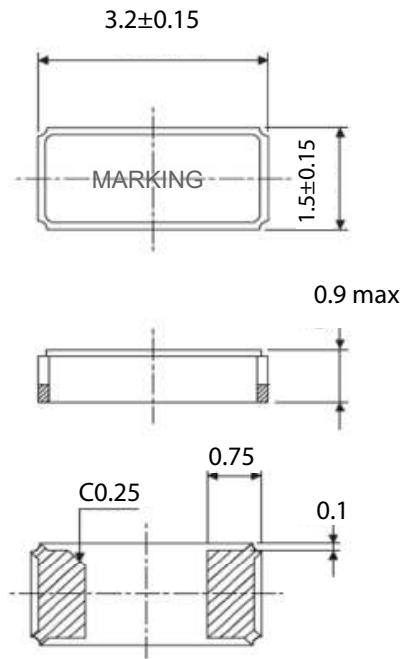
**Table 1. VMK3 Electrical Performance**

Parameter	Symbol	Min.	Typ	Max	Units
Nominal Frequency	F <sub>NOM</sub>		32.768		kHz
Crystal Mode		Tuning Fork			
Operating Temperature Range, <i>ordering option</i>	T <sub>OP</sub>	-20 to 70, -40 to 85			°C
Frequency Stability					
Stability Over T <sub>OP</sub>	F <sub>STAB</sub>			-0.040	ppm/ °C²
Turnover Temperature		20	25	30	°C
Frequency Tolerance, referenced to 25 °C	F <sub>TOL</sub>			±20	ppm
Load Capacitance, <i>ordering option</i>	C <sub>L</sub>	6, 7, 9 or 12.5			pF
Equivalent Series Resistance	ESR			70	KOhms
Shunt Capacitance	C <sub>o</sub>		1.2	3.0	pF
Motional Capacitance	C <sub>1</sub>		3.5		fF
Drive Level				1.0	uW
Aging / 1st year	F <sub>AGE</sub>			±3	ppm
Storage Temperature	T <sub>STO</sub>	-55		125	°C
Package		3.2 x 1.5			mm
Weight			13		mg

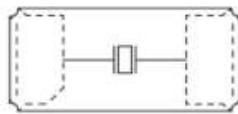
Product is compliant to RoHS directive and fully compatible with lead free assembly.



## VMK3 Package Drawing and Pad Layout



Top View



### Marking Information

327YWW

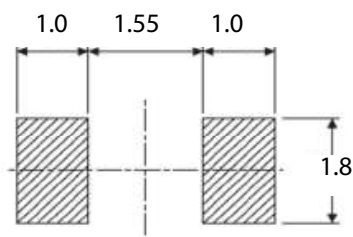
where

327 = 32.768 kHz

Y= Year of Manufacturing

WW = Week of Manufacturing


Recommended Pad Layout



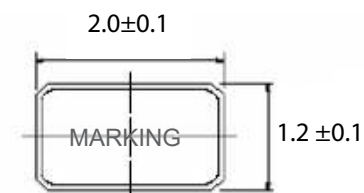
All Dimensions in mm

**Table 2. VMK4 Electrical Performance**

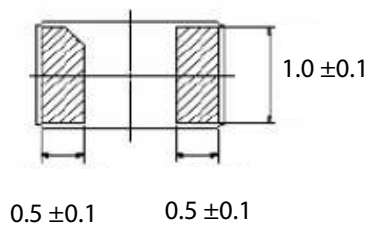
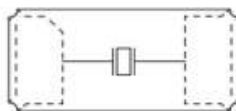
Parameter	Symbol	Min.	Typ	Max	Units
Nominal Frequency	F <sub>NOM</sub>		32.768		kHz
Crystal Mode		Tuning Fork			
Operating Temperature Range, <i>ordering option</i>	T <sub>OP</sub>	-20 to 70, -40 to 85			°C
Frequency Stability					
Stability Over T <sub>OP</sub>	F <sub>STAB</sub>			-0.045	ppm/ °C <sup>2</sup>
Turnover Temperature		20	25	30	°C
Frequency Tolerance, referenced to 25 °C	F <sub>TOL</sub>			±20	ppm
Load Capacitance, <i>ordering option</i>	C <sub>L</sub>	6, 7, 9 or 12.5			pF
Equivalent Series Resistance	ESR			90	KOhms
Shunt Capacitance	C <sub>o</sub>			1.5	pF
Motional Capacitance	C <sub>1</sub>		4.7		fF
Drive Level				1.0	uW
Aging / 1st year	F <sub>AGE</sub>			±3	ppm
Storage Temperature	T <sub>STO</sub>	-55		125	°C
Package		2.0 x 1.2			mm
Weight		6			mg

Product is compliant to RoHS directive and fully compatible with lead free assembly. 

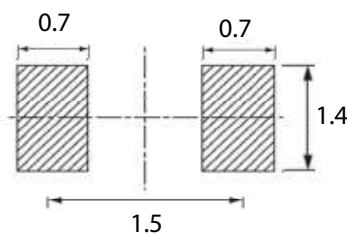
## VMK4 Package Drawing and Pad Layout



Top View



Recommended Pad Layout



### Marking Information

327YWW

where

327 = 32.768 kHz

Y= Year of Manufacturing

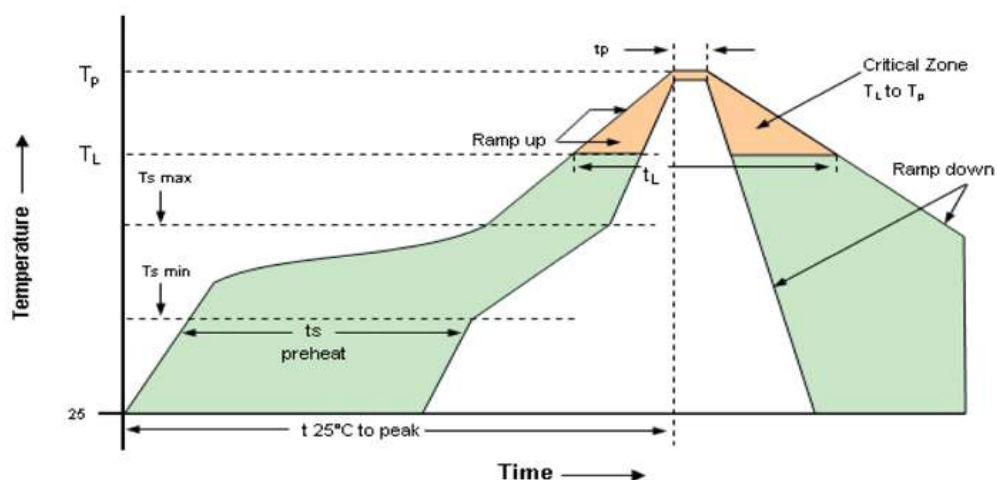
WW = Week of Manufacturing

All Dimensions in mm

### Table 3. Environmental Compliance

Parameter	Conditions
Mechanical Shock	MIL-STD-883, Method 2002, Condition A
Mechanical Vibration	MIL-STD-883, Method 2007, Condition A
Temperature Cycle	MIL-STD-883, Method 1010, Condition B
Solderability	MIL-STD-202-210, Condition B
Gross and Fine Leak	MIL-STD-883, Method 1014
Altitude	MIL-STD-883, Method 1001, Condition B
Moisture Sensitivity Level	MSL 1

**Solderprofile:**



### Table 4. Reflow Profile

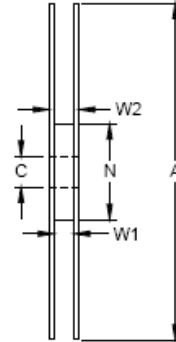
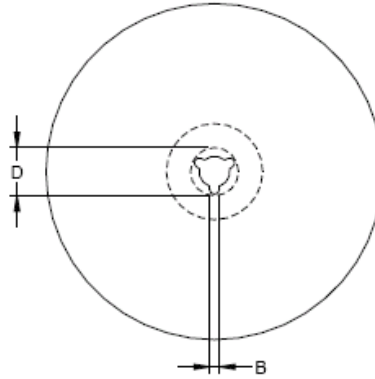
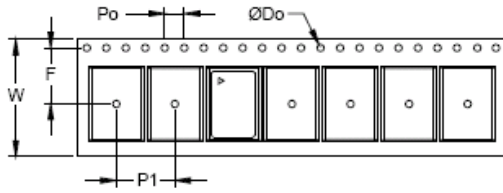
Parameter	Symbol	Value
PreHeat Time Ts-min Ts-max	$t_s$	60 sec Min, 260 sec Max 150°C 200°C
Ramp Up	$R_{UP}$	3 °C/sec Max
Time Above 217 °C	$t_L$	60 sec Min, 150 sec Max
Time To Peak Temperature	$T_{AMB-P}$	480 sec Max
Time at 260 °C	$t_P$	10 sec Max
Ramp Down	$R_{DN}$	6 °C/sec Max

Tuning fork products oscillate at frequency bands that are close to ultrasonic cleaning process's, this may cause electrical resonance deterioration and even damaging the overall structure of devices. Using ultrasonic cleaning machine to clean tuning fork devices should be avoided. If the use of this method to clean tuning fork devices is required, it's recommended to qualify the process and functionality of devices before and after the cleaning process.

# Tape & Reel

**Table 5 . 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
VMK3	12	5.5	1.5	4.0	4.0	180	2	13	21	60	13.0	15.4	3000
VMK4	8	3.5	1.5	4.0	4.0	178	2.5	13	21	60	9	11.4	3000



## Ordering Information

### VMKx - 1Ex- xx- 32K7680000xx

**Product** \_\_\_\_\_  
**VMK** (32.768kHz tuning fork)

**Size** \_\_\_\_\_  
**3** = 3.2 x 1.5 mm  
**4** = 2.0 x 1.2 mm

**Mode** \_\_\_\_\_  
**1**: Fundamental Tuning Fork

**Frequency Tolerance** \_\_\_\_\_  
**E**: ±20ppm

**Packaging**  
**TR**: Tape and Reel  
**blank**: Cut Tape / non TR quantities

**Frequency** in kHz

**Load Capacitance**  
 Load capacitance in pF  
 06, 07, 09, 12 (12 = 12.5)

**Operating Temperature**  
**E**: -40 to 85 °C  
**J**: -20 to 70 °C

#### Example:

**VMK3-1EE-32K7680000TR**  
**VMK3-1EE-32K7680000**  
**VMK3-1EE-32K7680000\_SNPB**

**Tape and Reel**  
**Cut Tape**  
**Tin lead solder dipped**

## Revision History

Revision Date	Approved	Description
July 17, 2020	FB	Initial release

## Contact Information

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