VMK3 and VMK4

32.768 kHz Tuning Fork Data Sheet

Description

Vectron's VMK series 32.768 kHz tuning fork is used as a building block for 32.768 kHz oscillator clocks, and associatted 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

- ±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

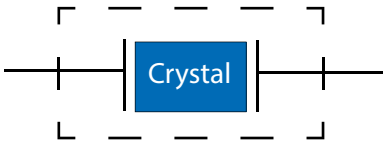
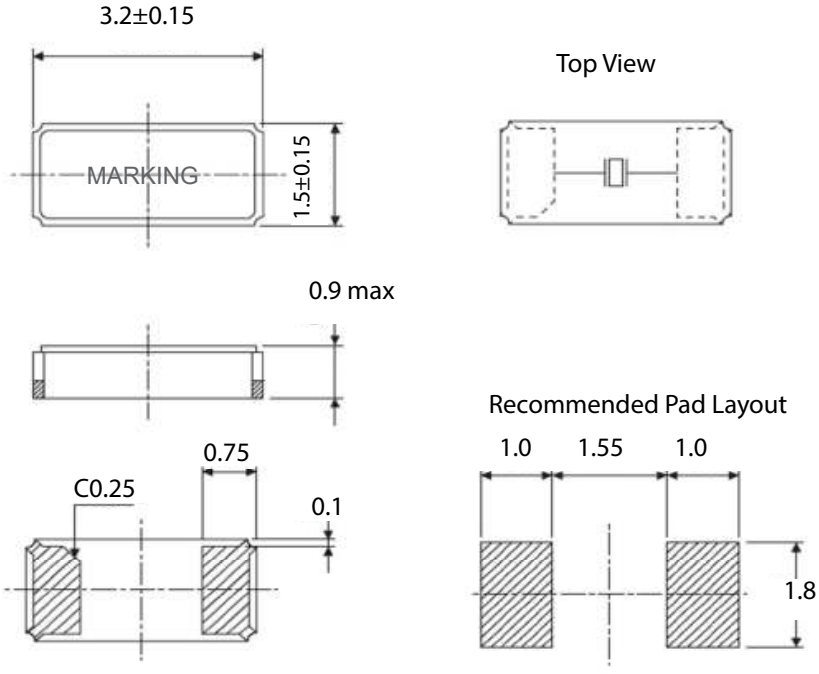


Table 1. VMK3 Electrical Performance					
Parameter	Symbol	Min.	Typ	Max	Units
Nominal Frequency	F_{NOM}		32.768		kHz
Crystal Mode			Tuning Fork		
Operating Temperature Range, *ordering option*	T_{OP}		-20 to 70, -40 to 85		°C
Frequency Stability					
Stability Over T_{OP}	F_{STAB}			-0.040	ppm/ °C²
Turnover Temperature		20	25	30	°C
Frequency Tolerance, referenced to 25 °C	F_{TOL}			±20	ppm
Load Capacitance, *ordering option*	C_L		6, 7, 9 or 12.5		pF
Equivalent Series Resistance	ESR			70	KOhms
Shunt Capacitance	C_o		1.2	3.0	pF
Motional Capacitance	C_1		3.5		fF
Drive Level				1.0	uW
Aging / 1st year	F_{AGE}			±3	ppm
Storage Temperature	T_{STO}	-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



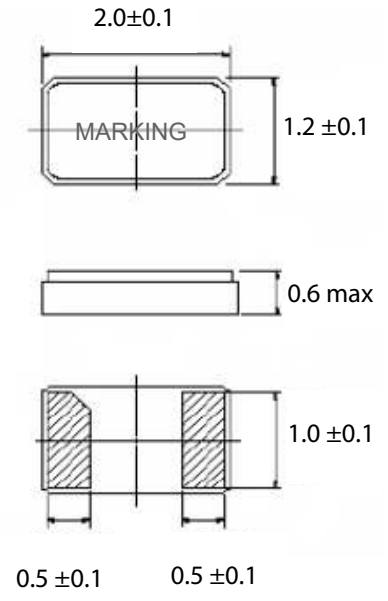
Marking Information
327YWW
where
327 = 32.768 kHz
Y= Year of Manufacturing
WW = Week of Manufacturing

All Dimensions in mm

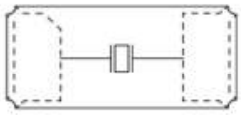
Table 2. VMK4 Electrical Performance					
Parameter	Symbol	Min.	Typ	Max	Units
Nominal Frequency	F_{NOM}		32.768		kHz
Crystal Mode			Tuning Fork		
Operating Temperature Range, *ordering option*	T_{OP}		-20 to 70, -40 to 85		°C
Frequency Stability					
Stability Over T_{OP}	F_{STAB}			-0.045	ppm/ °C²
Turnover Temperature		20	25	30	°C
Frequency Tolerance, referenced to 25 °C	F_{TOL}			±20	ppm
Load Capacitance, *ordering option*	C_L		6, 7, 9 or 12.5		pF
Equivalent Series Resistance	ESR			90	KOhms
Shunt Capacitance	C_o			1.5	pF
Motional Capacitance	C_1		4.7		fF
Drive Level				1.0	uW
Aging / 1st year	F_{AGE}			±3	ppm
Storage Temperature	T_{STO}	-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.

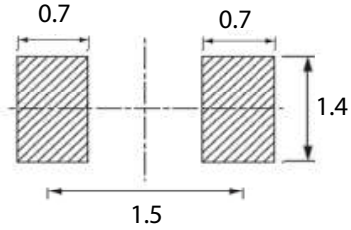
VMK4 Package Drawing and Pad Layout



Top View



Recommended Pad Layout



All Dimensions in mm

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Reliability & IR Compliance

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:

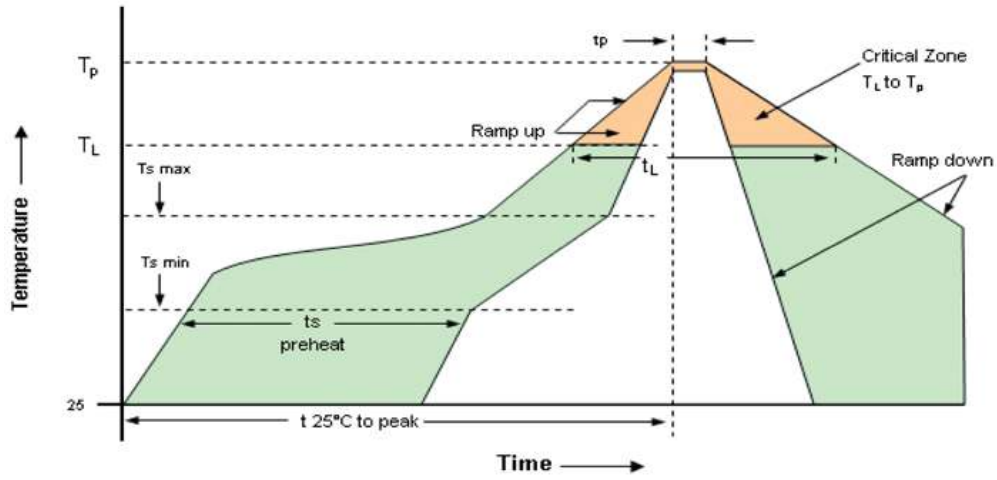
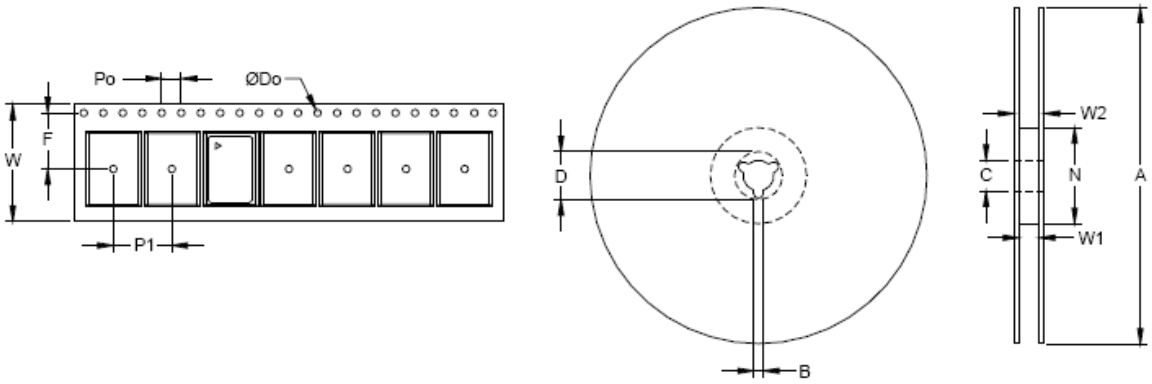


Table 4. Reflow Profile		
Parameter	**Symbol**	**Value**
PreHeat Time Ts-min Ts-max	t_S	60 sec Min, 260 sec Max 150°C 200°C
Ramp Up	R_{UP}	3 °C/sec Max
Time Above 217 °C	t_L	60 sec Min, 150 sec Max
Time To Peak Temperature	T_{AMB-P}	480 sec Max
Time at 260 °C	t_P	10 sec Max
Ramp Down	R_{DN}	6 °C/sec 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	**Tape and Reel**
VMK3-1EE-32K7680000	**Cut Tape**
VMK3-1EE-32K7680000_SNPB	**Tin lead solder dipped**

Revision History

Revision Date	Approved	Description
July 17, 2020	FB	Initial release

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VMK3-9001-32K7680000