Microsemi
a Microchip company

MD-403

I2C InterfaceOven Controlled Crystal Oscillator

The MD-403 is a Vectron module that contains a medium size ovenized crystal oscillator and an I²C interface that communicates with an onboard EEPROM and temperature sensors. The interface enables the customer to improve upon the already exceptional stability of the oscillator. Provided in a fully hermetic 13 x 20 x 10.7mm package, the device is capable of aging rates of 1ppb/day and temperature stabilities of 10 ppb from -40 to 95°C. Use of the information provided in the I²C interface provides a cost effective means of improving stability by as much as a factor of 10 depending upon environmental conditions.

Features

- Surface Mount package
- Low Profile Compact Package
- Standard frequency: 10, 20, 30.72,38.88, 40 MHz
- Temperature stability to 10 ppb
- Temperature range: -40 to 95°C
- Aging rate to 1 ppb/day
- I ²C interface with frequency coefficients, temperature sensor for additional correction

Applications

- Base stations
- Test equipment
- Synthesizers
- Military communication equipment
- Digital Switching

Performance Specifications

Frequency Stabilities[1] (10 -40 MHz)

Parameter	Min	Typical	Max	Units	Condition
vs. operating temperature range (referenced to +25°C)	-10 -10 -10		+10 +10 +10	ppb ppb ppb	-20 to +70°C -40 to +85°C -40 to +95°C
Residual error compare to fit curve	-0.6		0.6	ppb	
Improved Frequency versus temperature F(T) performance obtained using on board temperature sensor (T) and frequency vs. temperature coefficients (An)stored in EEPROM, using formula: $F(T)=A_4T^4+A_3T^3+A_2T^2+A_1T+A_0$					
Initial tolerance vs. supply voltage change vs. load change vs. aging / day vs. aging / year vs. aging / 10 year	-5 -10 -10 -1 -100 -800		5 +10 +10 +1 +100 +800	ppm ppb ppb ppb ppb ppb	at time of shipment, V_S ±5% static Load ±5% static after 30 days of operation after 30 days of operation after 30 days of operation
holdover (without compensation on customer side.)			2.5	µsec	over 30 minutes and 10°C temp jump @ T oscillator must be for miniumum 7 days on power.
holdover (with compensation on customer side.)| [6]			1		over 30 minutes and 10°C temp jump @ T oscillator must be for miniumum 7 days on power.
Warm-up time			3	minutes	to ±100ppb of final frequency (1 hour reading) @ +25°C

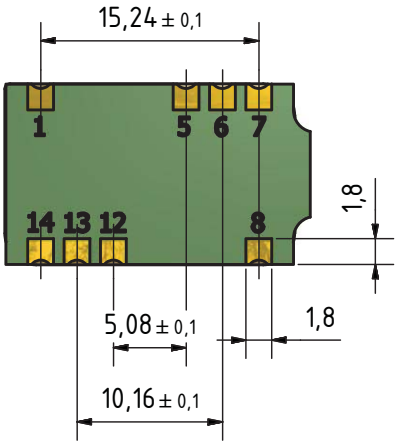
Performance Specifications

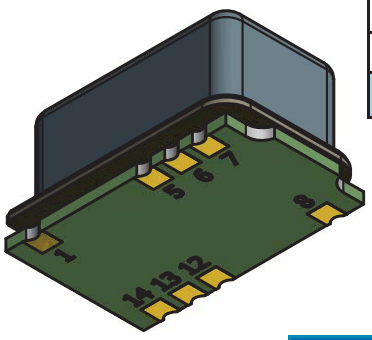
Supply Voltage (Vs)					
Parameter	Min	Typical	Max	Units	Condition
Supply voltage (standard)	3.135	3.3	3.465	VDC	
Power consumption			2.5	Watts	during warm-up
			1.0	Watts	steady state @ +25°C
RF Output					
Signal [standard]	HCMOS				
Load		15		pF	
Signal Level (Vol)			0.4	VDC	with Vs=3.3V and 15pF Load
Signal Level (Voh)	2.4			VDC	with Vs=3.3V and 15pF Load
rise time			5	ns	
fall time			5	ns	
Duty Cycle	45		55	%	@ (Voh-Vol)/2
Frequency Tuning (EFC)					
Tuning Range	Fixed OCXO; No adjust				
Additional Parameters					
Phase Noise[3]		-85 -110 -130 -143 -150 -153	-70 -95 -115 -135 -145 -150	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz	1 Hz 10 Hz 100 Hz 1 kHz 10 kHz 100khz	@ 20MHz
Phase Noise[3]		-76 -105 -130 -145 -150 -155	-60 -90 -115 -130 -145 -150	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz	1 Hz 10 Hz 100 Hz 1 kHz 10 kHz 10 kHz	@ 30.72 Mhz
Weight			10	g	
Processing & Packing	Handling & Processing Note				

EEPROM (SCL, SDA) Pin 12; Pin 13					
Parameter	Min	Typical	Max	Units	Condition
I2C Bus Voltage		2,8		VDC	
DC Electrical Characteristics					
High Level Input Voltage (Vih)	0.7* VI2C		VI2C +0.3	Vdc	SDA (internally pulled-up to V_{I2C} with a 22kohm resistor) and SCL
Low Level Input Voltage (Vil)	-0.3		0.3 VI2C	Vdc	SDA (internally pulled-up to V_{I2C} with a 22kohm resistor) and SCL
Electrical Characteristic					Product is to communicate via industry standard I²C bus timing. I²C is a Phillips Semiconductor registered trademark.
SCL Clock Frequency	0		100	kHz	
Communication					Product is to communicate via industry standard I²C bus timing. I²C is a Phillips Semiconductor registered trademark.
EEPROM	I2C Device 7-bit Address: 1010100				
Internal Temperature Sensor	I2C Device 7-bit Address: 1001000				model LM73
For full EEPROM Map please contact factory					

Absolute Maximum Ratings					
supply voltage (Vs)			5.5	V	with Vs=3.3 & 5.0 VDC
Output Load			50	pF	
Operable Temperature Range	-40		+95	°C	
Storage Temperature Range	-40		+125	°C	

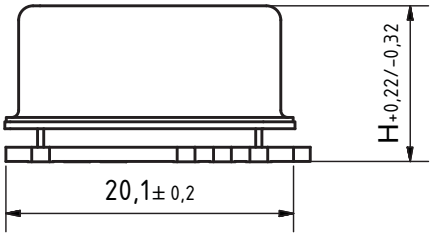
Outline Drawing / Enclosure

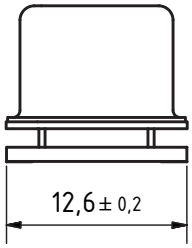


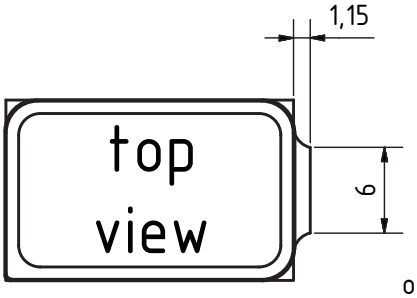


MD-403	
Height "H"	cover material
10,7 mm	metal

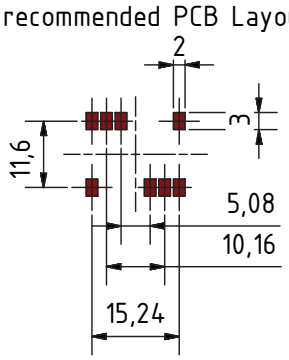
Pin Connections	
1	I.C (int. connected, do not connect)
5	WP (Write protect; I2C)
6	I.C (int. connected, do not connect)
7	Ground (Case)
8	RF Output
12	SDA (I2C)
13	SCL (I2C)
14	Supply Voltage Input (Vs)





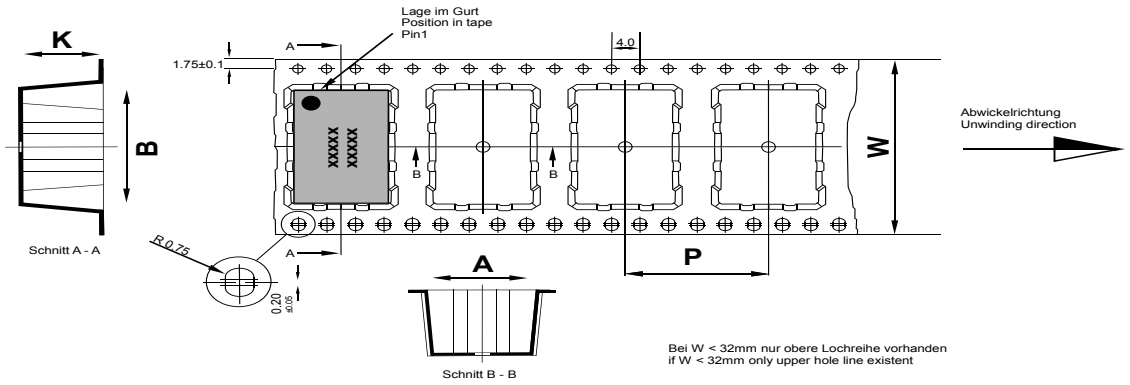


original size



Dimensions in mm

Standard Shipping Method (MD-403)



Maßangaben in mm:	Dimension in mm:
A, B und K Maße von Bauelement abhängig	A, B und K are dependent uppon component dimensions
Fertigungstoleranzen entsprechen der DIN IEC 286-3	production tolerance complying DIN IEC 286-3

All dimensions in millimeters unless otherwise stated

Enclosure Type	Tape Width W (mm)	Quantity per meter	Quantity per reel	Dimension P
MD-403	44	50	230	20

Recommended Reflow Profile

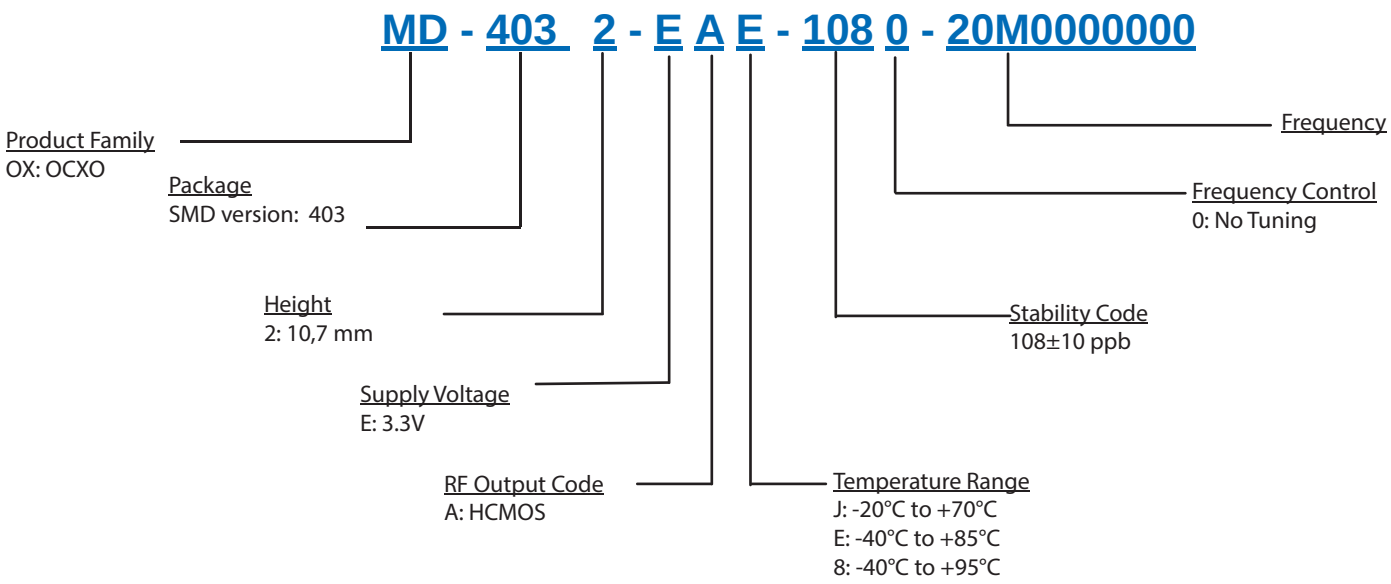
IPC/JEDEC J-STD-020 (latest revision)
Additional Information:
This SMD oscillator has been designed for pick and place reflow soldering.
SMD oscillators must be on the top side of the PCB during the reflow process.

Additional Environmental Conditions

Parameter	Description
Rapid temperature changes	MIL-883-1010 Cond B 1000 cycles -55/125C
Vibration	MIL-STD-883 Meth 2007 Cond A 20G 20-2000Hz 4x in each 3axis 4 min
Shock	Mech.Shock MIL-STD-202 Meth 213 Cond.C 100G 6ms 6 shocks in each direction
Solderability	J_STD_002C Cond A, Through hole device/ Cond. B, SMD 255C (diving time 50,5sec.) Dip+Look with 8h damp pre-treatment: solder wetting >95%
Solvent resistance	MIL-STD-883 Meth 2015 Solv. 1,3,4
ESD	HBM JESD22-A114-F Class 1C 10* 1000V
Moisture Sensit.	Level 1 JESD22-A113-B
RoHS compliance	100% RoHS 6 compliant
Washable	washable device

Note: All temperatures refer to topside of the package, measured on the package body surface.

Ordering Information



Notes:

1. Contact factory for improved stabilities or additional product options. Not all options and codes are available at all frequencies.
2. Unless other stated all values are valid after warm-up time and refer to typical conditions for supply voltage, frequency control voltage, load, temperature (25°C).
3. Phase noise degrades with increasing output frequency.
4. Subject to technical modification.
5. Contact factory for availability.
6. final results depend on the compensation algorithm, position on the board, shielding against airflow and other

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