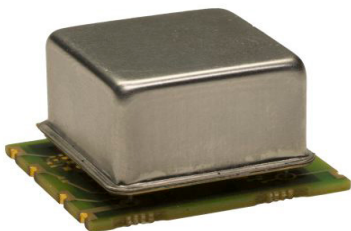


Helping Customers Innovate, Improve & Grow



MD-223

The MD-223 is a Vectron module that contains a medium size ovenized crystal oscillator and an I²C interface that communicates with an onboard EEPROM; DAC and temperature sensors. The interface enables the customer to improve upon the already good Holdover stability of the oscillator or tune the OCXO by a digital word. Provided in a fully hermetic 20 x 20 mm package mounted on a SMD spreader board. The device is capable of aging rates of 0,5 ppb/day and temperature stabilities of ± 3 ppb from -40 to 85 °C. Use of the information provided via the I2C interface, provides a cost effective method of improving the Holdover stability of the system.

Features

- Surface Mount package
- Low Profile Compact Package
- Standard frequency: 10, 20, 30.72 MHz
- Temperature stability to 3 ppb
- Aging rate to 0.5 ppb/day
- I²C interface with frequency coefficients, temperature sensor for additional correction, digital tuning

Applications

- Base stations
- Test equipment
- Synthesizers
- LTE Basestation

Performance Specifications

Frequency Stabilities ¹ (10 & 20 MHz)					
Parameter	Min	Typical	Max	Units	Condition
vs. operating temperature range (referenced to +25°C, uncompensated)	-3		+3	ppb	-40 to +85°C
By using on board temperature sensor (T) and frequency vs. temperature coefficients (An) stored in EEPROM, it is possible to identify the real Aging performance of the device during the locked mode. This information can be used during the Holdover period to improve the system Holdover performance. Attached formula describes the Frequency versus temperature $F(T)=A_4T^4+A_3T^3+A_2T^2+A_1T+A_0$					
Initial tolerance	-200		+200	ppb	at time of shipment,
vs. supply voltage change	-1		+1	ppb	$V_s \pm 5\%$ static
vs. load change	-1		+1	ppb	Load $\pm 5\%$ static
vs. aging / day	-0.5		+0.5	ppb	after 30 days of operation
vs. aging / year	-60		+60	ppb	after 30 days of operation
vs. aging / 10 year	-500		+500	ppb	after 30 days of operation
1.5 μ sec holdover	4			μ sec	1 °C temp jump @ T_0
start up time		0.25	2	sec	
Warm-up time			5	minutes	to ± 100 ppb of final frequency (1 hour reading) @ +25°C

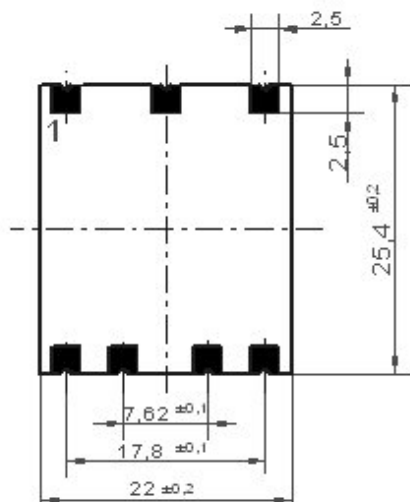
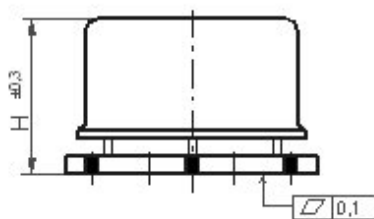
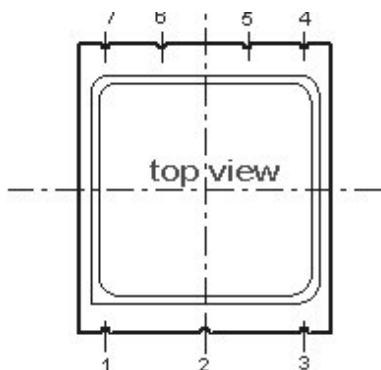
Performance Specifications

Supply Voltage (Vs)						
Parameter	Min	Typical	Max	Units	Condition	
Supply voltage (standard)	3.13	3.3	3.46	VDC		
Power consumption			3.25	Watts	during warm-up	
			1.5	Watts	steady state @ +25°C	
RF Output						
Signal [standard]	HCMOS					
Load		15		pF		
Signal Level (Vol)			0.8	VDC	with Vs=5.0V and 15pF Load	
Signal Level (Voh)	3.4		4.6	VDC	with Vs=5.0V and 15pF Load	
rise time			5	ns		
fall time			5	ns		
Duty Cycle	45		55	%	@ (Voh-Vol)/2	
Frequency Tuning (EFC)						
Tuning Range	;No adjust				Fixed OCXO	Option
	-1 0.4		-0.4 1	ppm ppm	@tuning word x80000000 @tuning word x7FFFFFFF	
Linearity	10			%		
tuning Slope	positve					
physical resolution			16	Bit		
modulation bandwidth			0.1	Hz		
Additional Parameters						
Phase Noise ³		-104	-90	dBc/Hz	1 Hz	@ 10MHz
		-129	-120	dBc/Hz	10 Hz	
		-140	-130	dBc/Hz	100 Hz	
		-145	-140	dBc/Hz	1 kHz	
		-153	-148	dBc/Hz	10 kHz	
		-155	-150	dBc/Hz	100kHz	
Weight			12	g		
EEPROM (SCL, SDA) Pin 2; Pin 7						
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 I ² C bus timing. I ² C is a Phillips Semiconductor registered trademark.					
SCL Clock Frequency	0		100	kHz		
Communication	Product is to communicate via industry standard I2C bus timing. I ² C is a Phillips Semiconductor registered trademark.					
EEPROM	I2C Device 7-bit Address: 1010100					
For full EEPROM Map please contact factory						

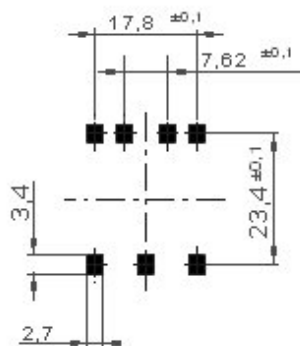
Operation condition					
Air Flow			0	m/s	At -40 to +85°C
relative Humidity			95	%	over operating temperaure range
temp rate of change			1	°C/ Minutes	

Absolute Maximum Ratings					
supply voltage (Vs)			5.5	V	with Vs= 3.3 VDC
Output Load			50	pF	
Digital Input Voltage (SDA,SCL) to GND	-0,3		3,6	V	
Operable Temperature Range	-40		+85	°C	
Storage Temperature Range	-40		+85	°C	

Outline Drawing / Enclosure



G275

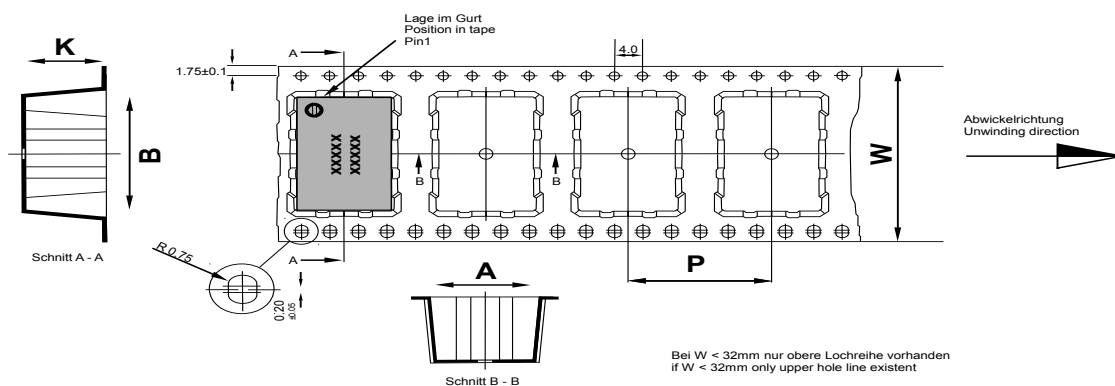


Padvorschlag
land pattern
recommendation

MD-203	
Height "H"	cover material
12.1	metal

Pin Connections	
1	I.C (Do not connect)
2	SDA (I2C)
3	Supply Voltage Input (Vs)
4	RF Output
5	Not Connected
6	SCL (I2C)
7	GND

Standard Shipping Method (MD-223)



Maßangaben in mm:

A, B und K Maße von Bauelement abhängig

Fertigungstoleranzen entsprechen der DIN IEC 286-3

Dimension in mm:

A, B und K are dependent upon component dimensions

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-223	44	35.7	175	28

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	JESD22-A104D Condition G -40...125C
Vibration	MIL-STD-883 Meth 2007 Cond A 20G 20-2000Hz 4x in each 3axis 4 min
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 (dipping 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.

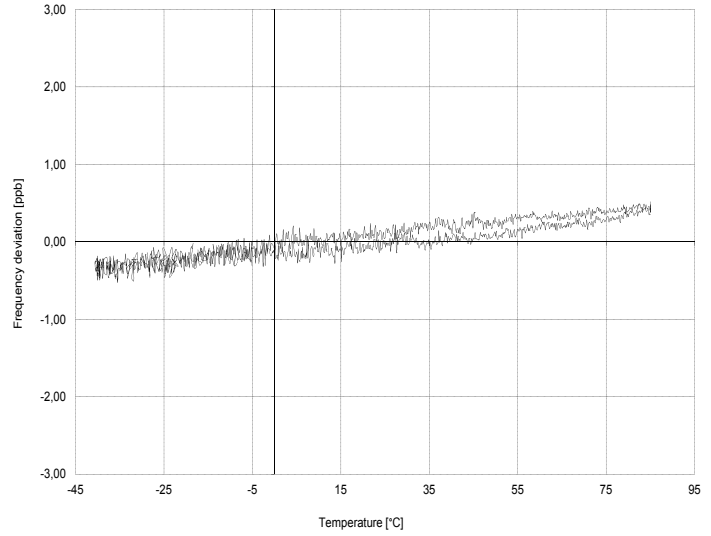
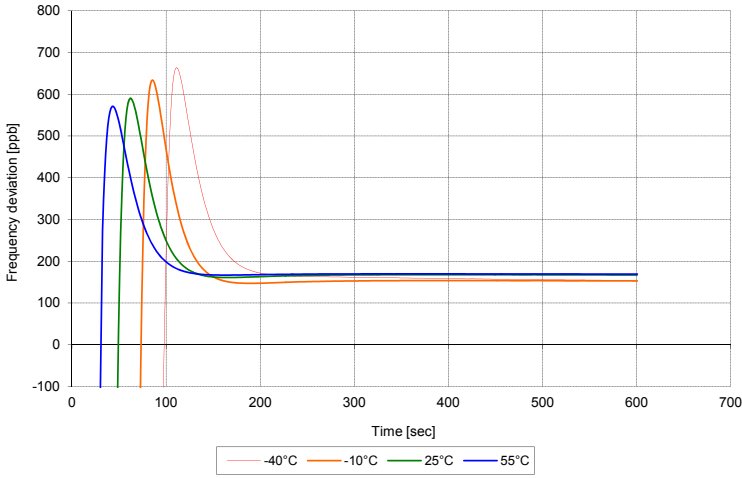
Typical Performance Data

typical warm up

@ MD-2231-EAE-3090-10M00

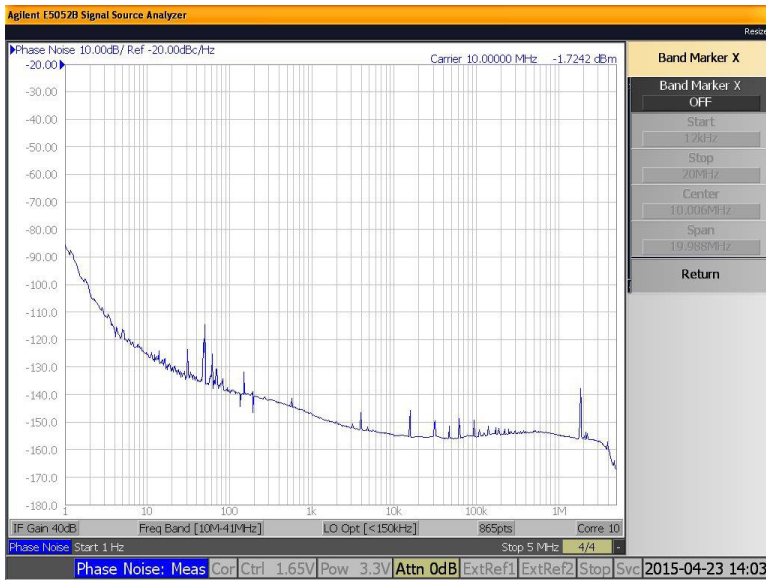
typical temperature stability

@ MD-2231-EAE-3090-10M00



typical Phase Noise

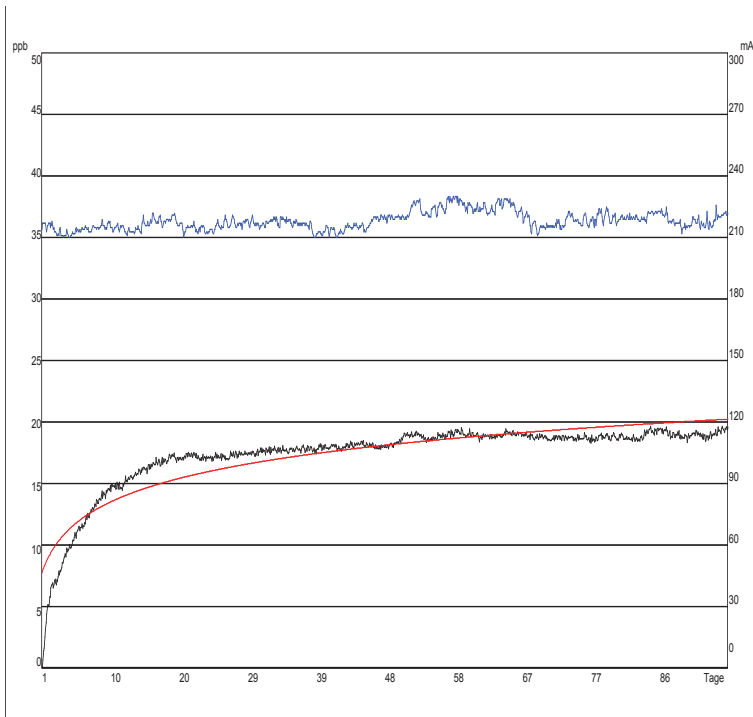
@ MD-2231-EAE-3090-10M00



Typical Performance Data

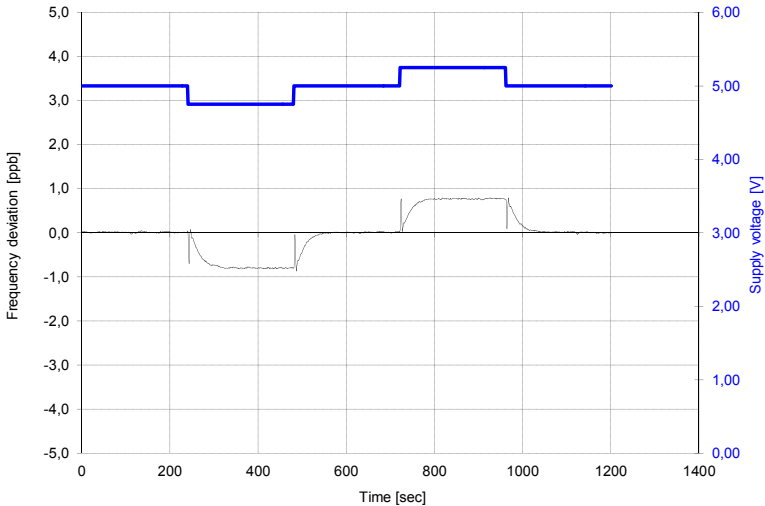
typical aging data

@ MD-2231-EAE-3090-10M00



typical frequency vs. supply voltage

@ MD-2231-EAE-3090-10M00



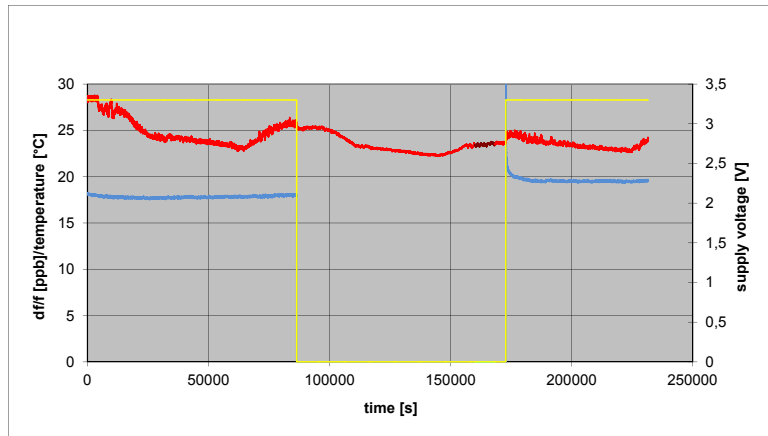
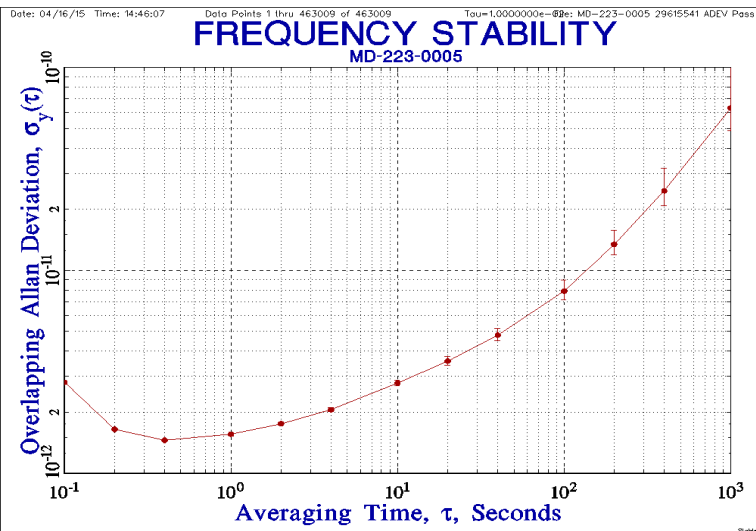
typical ADEV

@ MD-2231-EAE-3090-10M00

typical retrace

@ MD-2231-EAE-3090-10M00

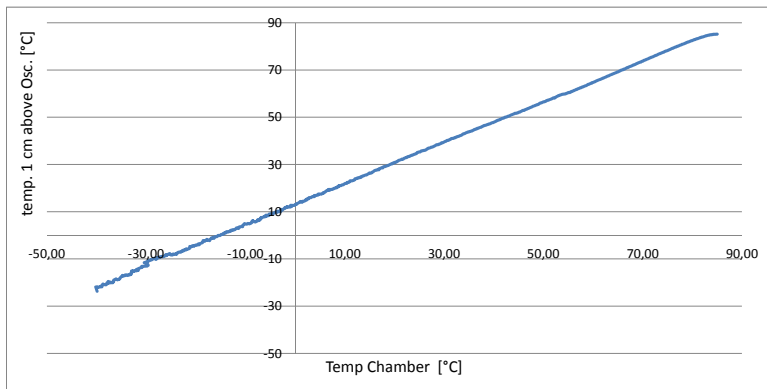
Blue: frequency; yellow: supply Voltage; Red Ambient temperature
retrace cycle: 24h power on; 24 h power off; 16 h power on



Typical Performance Data

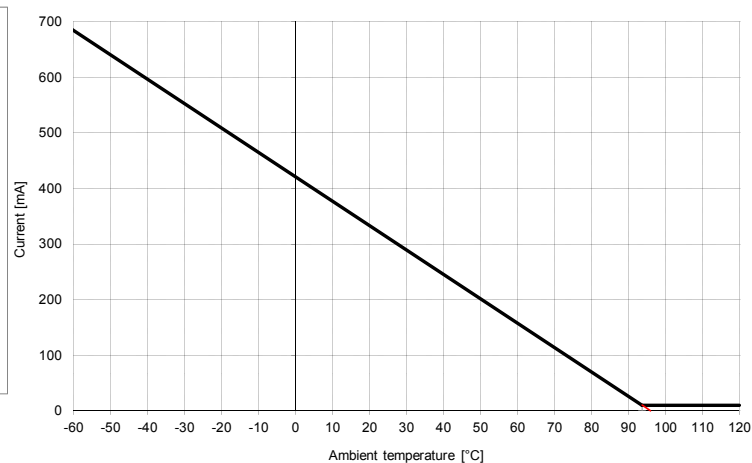
typical case temperature vs. outside temperature

@ MD-2231-EAE-3090-10M00



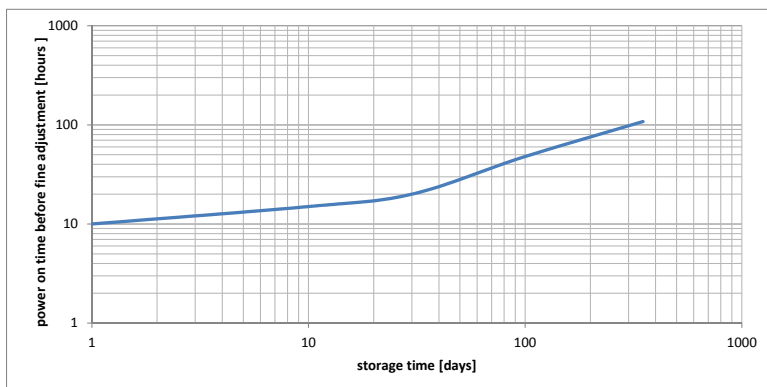
typical power consumption vs. operating temperature

@ MD-2231-EAE-3090-10M00

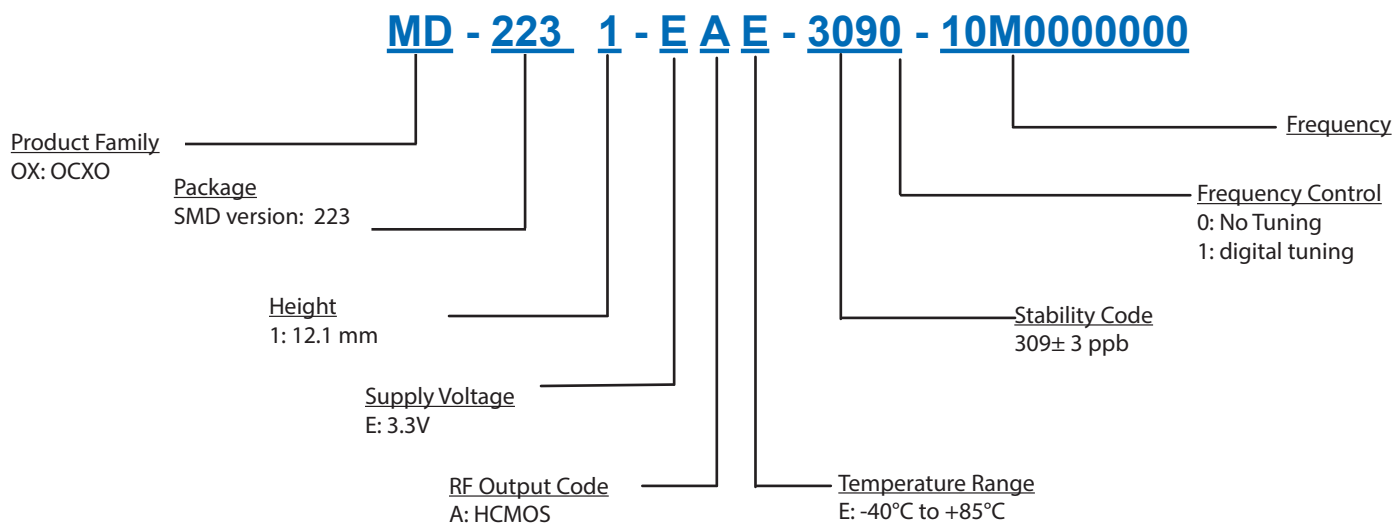


recommended power on time after x days of power off

@ MD-2231-EAE-3090-10M00



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.

For Additional Information, Please Contact

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