

Helping Customers Innovate, Improve & Grow



The MD-175 is a Microchip GNSS disciplined module. It is a fully integrated GNSS disciplined oscillator module in a compact surface mount 40 x 50 mm footprint. The module has an embedded 72 channel receiver that is GPS, GLONASS and Galileo compatible and provides a sinewave or CMOS 10 MHz, and HCMOS 1 pps output. An onboard precision OCXO provides stabilities in the unlocked mode enabling extremely low holdover. The module operates from -40 °C to +85 °C.

Features

- Embedded GNSS Receiver - GPS, GLONASS, Galileo
- 1pps LVCMOS output signal
- 10MHz sinewave or CMOS RF output
- Other RF output frequencies available
- Serial Communications Interface
- NMEA 0183 V4.1
- Adaptive Aging correction during holdover
- Barometric pressure correction
- Evaluation kit with software

Applications

- Radar Systems
- Digital Video Broadcast
- E911 Location Systems
- General Timing and Synchronization
- Military Radio
- Basestation Communications

Block Diagram

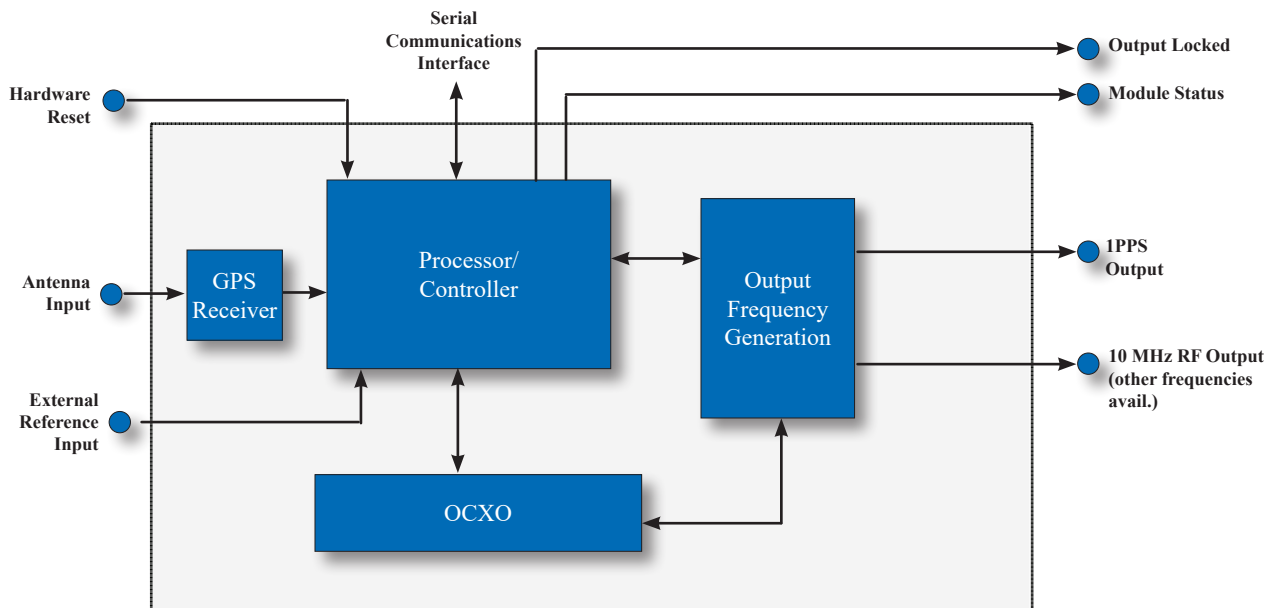


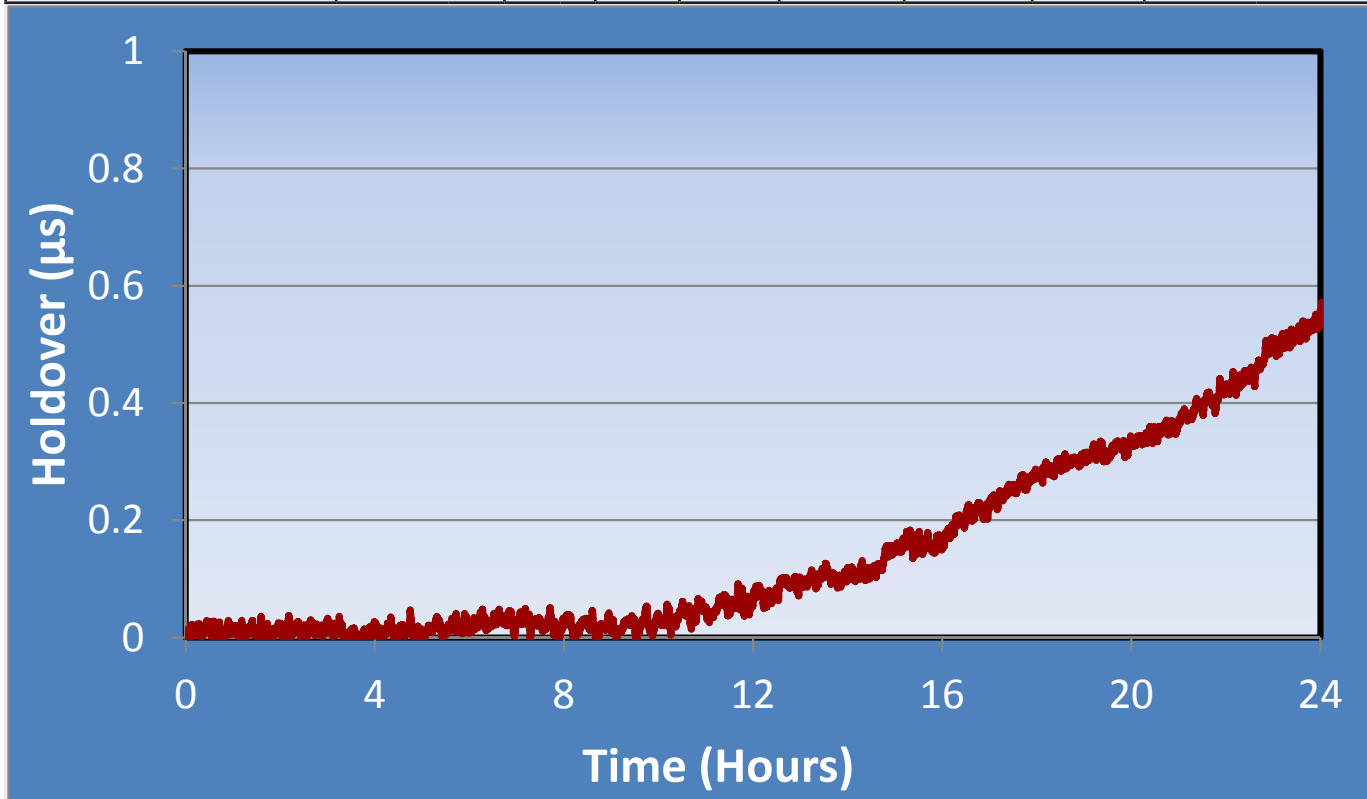
Figure 1. Functional Block Diagram

Summary Specifications

Hold Over Performance ¹				
Hold Over Time	10 min	1 hr	1 hr	24hr
Hold Over Temperature Change	$\Delta T = 2\text{ }^{\circ}\text{C}$	$\Delta T = 2\text{ }^{\circ}\text{C}$	$\Delta T = 10\text{ }^{\circ}\text{C}$	$\Delta T = 2\text{ }^{\circ}\text{C}$
Model	Maximum Accumulated Hold Over in us			
MD-175	0.05	0.24	0.4	15E7 option: 1.5 40E7 option: 4.0

Summary Performance Characteristics								
Model	Warm Up Time (min-utes)	Aging / day (ppb) ¹	Temperature Stability (ppb)	Accuracy to UTC (+/-1 σ) (ns) ²	Frequency Accuracy ³	Warm up Power @ 25 $^{\circ}\text{C}$ (W)	Steady State Power @ 25 $^{\circ}\text{C}$ (W)	Voltage (V)
MD-175	7	0.06	0.4	10	<1E-12	4.5	2.0	5.0V analog/ 3.3V digital

Phase Noise/ ADEV								
Model	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	ADEV $\tau=1\text{s}$	ADEV $\tau=10\text{s}$	Condition
MD-175	-125	-140	-145	-145	-145	5e-12	1E-11	at 10 MHz



Specifications

Internal Receiver Characteristics					
Parameter					Condition
Type	Timing				Mobile, Self-Survey, or Fixed Position
Number of channels	72				
Frequency bands	GPS L1C/A				
	GLONASS L1OF				
	Galileo E1B/C				
	QZSS L1C/A				
	SBAS L1C/A				Disabled by default
Tracking capability	36 SVs				
Sensitivity	-167 dBm				Tracking (GPS & GLONASS)
	-148 dBm				Cold Acquisition (GPS & GLONASS)
	-160 dBm				Reacquisition (GPS & GLONASS)
Position Accuracy	2.5 meters CEP				GPS & GLONASS, static, -130 dBm, > 6 SVs
TTF	25 seconds				Cold Start (GPS & GLONASS)
GPS Antenna					
Parameter	Min	Typical	Max	Units	Condition
Antenna Input Voltage ⁴	2.6	5.0	5.5	V _{DC}	
Antenna Current		20	100	mA	
RF Output Waveform Characteristics					
Waveform	Sinewave				
Load		50		Ω	
Output Power	+3		+7	dBm	
Harmonics			-30	dBc	
Spurious			-80	dBc	
Waveform	LVCMOS				
Load		15		pF	
High-level output voltage (V _{OH})	2.4		3.4	VDC	15 pF 10k Ohm
Low-level output voltage (V _{OL})		0.0	0.4	VDC	15 pF 10k Ohm
Duty Cycle	45		55	%	15 pF 10k Ohm
1pps Output Characteristics					
Parameter	Min	Typical	Max	Units	Condition
Waveform	LVCMOS				
High-level output voltage (V _{OH})	3.0		3.4	V _{DC}	> 100 Ohms
Low-level output voltage (V _{OL})		0.0	0.4	V _{DC}	> 100 Ohms
Pulse Width	10ns to 99.999ms				user programmable
External 1pps Reference Input Characteristics					
Parameter	Min	Typical	Max	Units	Condition
Waveform	LVCMOS, TTL				
High-level input voltage (V _{IH})	2.4		3.5	VDC	15 pF 10kOhm
Low-level input voltage (V _{IL})		0.0	0.4	VDC	15 pF 10kOhm
Pulse Width	10			us	

Specifications

Lock Status Indicator					
Parameter	Min	Typical	Max	Units	Condition
Module Locked	90		100	%V _{CC}	
Module Not Locked	0		20	%V _{CC}	
Module Hardware OK Indicator					
Module Hardware OK	90		100	%V _{CC}	
Module Hardware Failure	0		20	%V _{CC}	
Module Hardware Reset					
Reset Module	0		0.5	V _{DC}	10 kOhm internal pullup
Serial Communications Interface					
Rx high-level input voltage (V _{IH})	2.8			V _{DC}	
Rx low-level input voltage (V _{IL})	-0.5	0.0	0.5	V _{DC}	
Tx high-level output voltage (V _{OH})	3.15	3.3	3.4	V _{DC}	
Tx low-level output voltage (V _{OL})	-0.2	0.0	0.2	V _{DC}	
Update rate		1		Hz	
Communications Protocol	VSIP2/NMEA 0183 V4.1				See VSIP2 for Full Details
Supply Voltage					
Supply voltage (V _{CC})	+4.75	+5.0	+5.25	V _{DC}	
Supply voltage (Digital V _{CC})	+3.0	+3.3	+3.4	V _{DC}	
Absolute Maximum Ratings					
Supply voltage (V _{CC})			6	V _{DC}	
Supply voltage (Digital V _{CC})			3.5	V _{DC}	
Dc voltage on any I/O pin			3.9	V _{DC}	
Output load	100			Ohms	
AC ripple			50	mVpk-pk	10Hz to 1MHz
Environmental Conditions					
Parameter	Min	Typical	Max	Units	Condition
Operating temperature	-40		+85	°C	
Humidity @ 40°C			90	%	
Storage Temperature	-55		+125	°C	
Physical Characteristics					
Weight			43	g	
g-sensitivity		1		ppb/g	10 to 1000 Hz

Environmental

Environmental Compliance

Parameter	Conditions
Mechanical shock	MIL-STD-202, Method 213 condition B
Mechanical vibration	MIL-STD-202, Method 204 condition A
Resistance to solvents	MIL-STD-202, Method 215

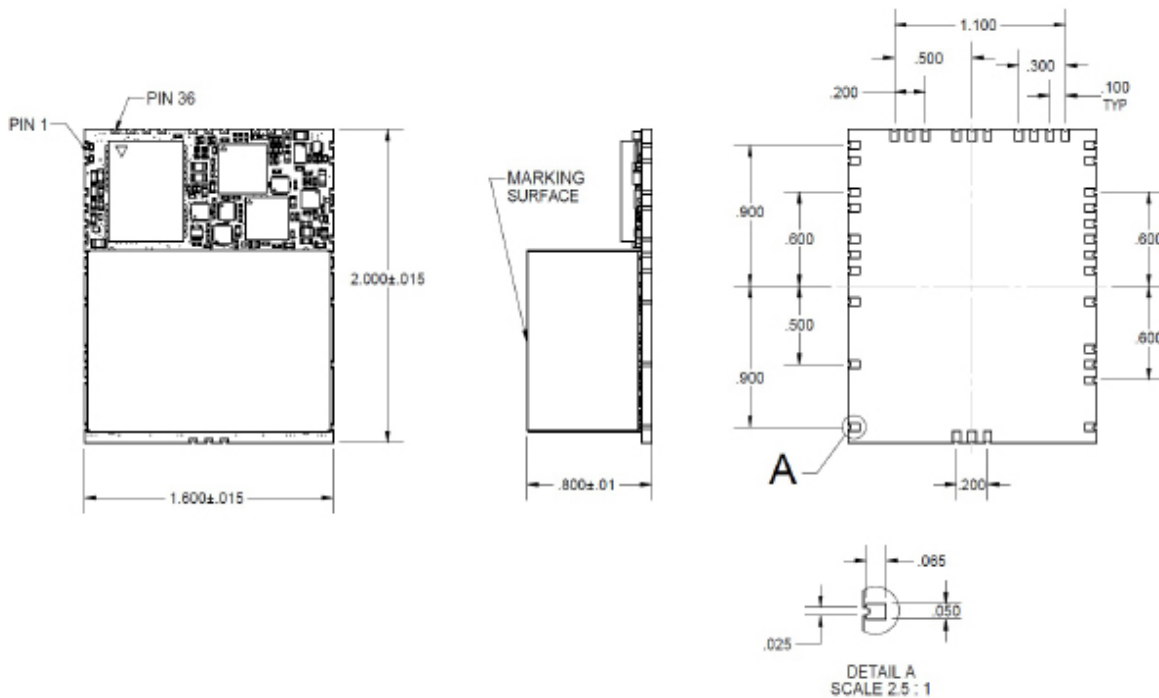
Handling Precautions

Although ESD protection circuitry has been designed into the MD-175, 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.

ESD Ratings

Model	Minimum	Conditions
Human body model	1500 V	MIL-STD-883C, Method 3015
Charged device model	1000 V	JEDEC, JESD22-C101

Package Outline

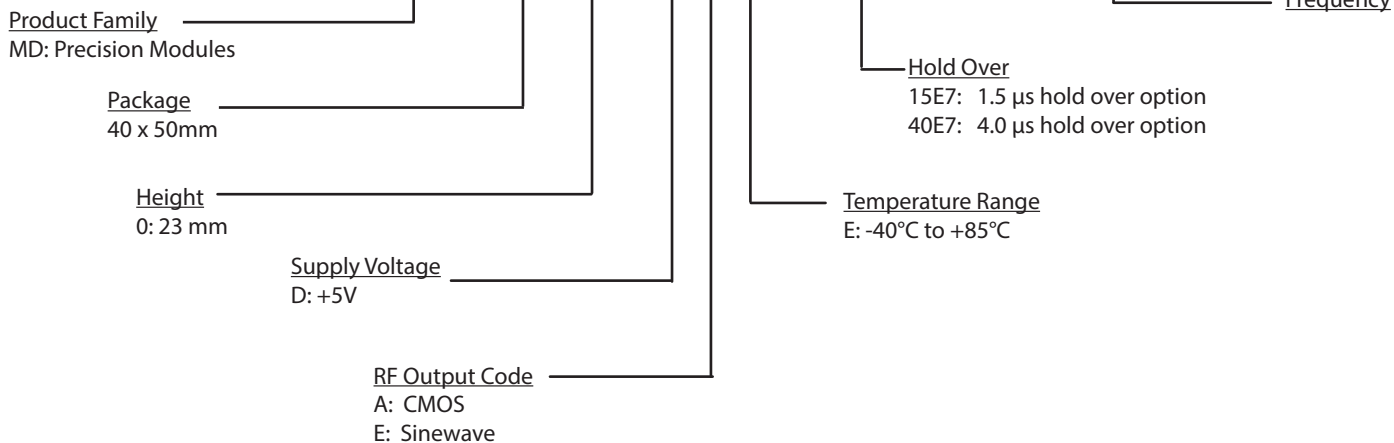


Pin Configuration

36 Pin I/O Connections		
Number	Name	Description/comment
1	PPS_OUT	1 pps output
2	REF_IN	Reference input
3,5,7,20,26,36	D_GND	Digital Ground
4	ANT_IN	Antenna
6	VCC_ANT	Antenna Supply
8,27	D_VCC	Digital 3.3V supply
9,12,13,14,16,17,18,19	A_GND	Analog Ground
10,11	A_VCC	Analog 5.0V supply
15	RF_OUT	Sinewave or CMOS (see ordering code)
21,22,29,32,33,34,35	N/C	Do not connect - leave floating
23	RX_IN	Data in - internal pull up
24	TX_OUT	data out
25		Reserved - leave floating
28	MOD_RST	Pull up - active low
30	STATUS	pull down
31	LOCK	pull down

Ordering Information

MD - 175 0 - D A E - 15E7 - 10M0000000



Available Models	
MD-1750-DAE-15E7-10M0000000	MD-1750-DAE-40E7-10M0000000
MD-1750-DEE-15E7-10M0000000	MD-1750-DEE-40E7-10M0000000

Notes

- 1) Holdover and aging performance is after 7 days of power-on time. Temperature and aging rates are when device is not locked. Performance measured in still air.
- 2) After customer applies correct offset using cable delay command while locked, after 24 hours of locked operation
- 3) ADEV at $\tau=86400s$ while locked, after 24 hours of locked operation
- 4) Antenna supply pin at pin 21 is an input voltage from customer. The DC input voltage is coupled to the RF signal of the GPS signal on the module. The customer does not need to provide any additional blocking or coupling circuitry.

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