GPS RADIONOVA® RF Antenna Module

Part No. M10264

Product Specification

Applications

- **Personal Navigation Devices (PNDs)**
- **Portable Media Players (PMPs)**
- **Personal Digital Assistants (PDAs)**

- **Feature phones / Smart phones**
- **Ultra Mobile Devices (UMDs)**
- **Asset Tracking / Personal Safety**

Features

- Low cost single package GPS RF antenna module
- SiRFstarIII GPS Chipset Architecture
- Low 5mm height for thin devices
- Low current consumption
- Easy to use 'drop-in solution'
- External antenna support
- Resistant to de-tuning

Product Description

GPS RADIONOVA M10264 is a highly integrated GPS RF Antenna Module suitable for L1-band GPS and A-GPS systems. The device is based on the high performance SiRFstarIII GPS architecture combined with Antenova's high efficiency antenna technology designed to provide an optimal radiation pattern for GPS reception.

All front-end components are contained in a single package laminate base module providing a complete GPS receiver for optimum performance. M10264 operates on a single 3.6V positive bias supply with low power consumption and available low power modes for further power savings.

M10264 is supported by SiRF stand alone software and uses a UART as the host processor interface. The M10264 also incorporates an antenna switch with built-in current sensing for optional active antenna connection.
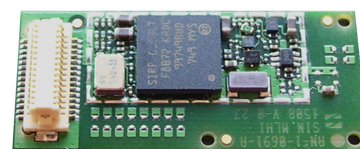
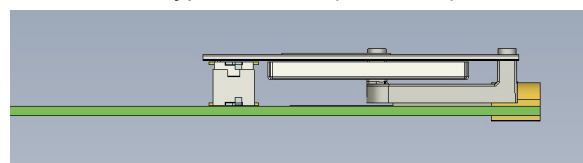## Functional Block Diagram
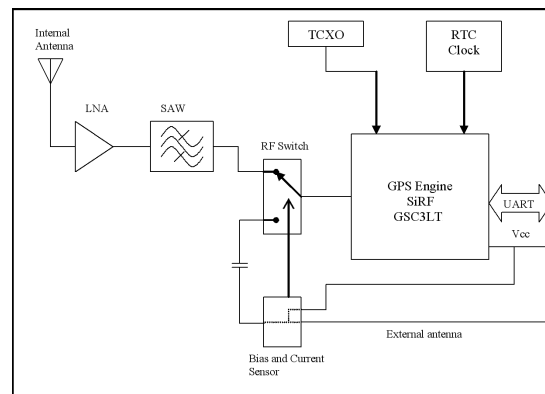
Package Style

28 x 13mm RF Antenna Module

Top View

Component side view (w/o shielding can)

Typical Mount (side view)

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Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
Vbat	Supply Voltage	-0.2	5.5	V
RFin	RF Input Power		-10	dBm
ESD	Electrostatic Discharge Immunity (HBM)	-2	+2	kV
T_{STG}	Storage Temperature	-40	+85	°C
I_{IO_REG}	I/O voltage regulator output current		10	mA
V_{IO}	I/O pin voltage (TXA, RXA, ED[0,1], GPIO [2,6,8], TM, CLK)		1.98	V
V_{ON_OFF}	ON_OFF line supply voltage		1.82	V

* Exposure to absolute ratings may adversely affect reliability and may cause permanent damage.

Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit
Ta	Ambient Temperature	-20	25	+70	°C
Vbat	Main Supply Voltage	3.3	3.6	4	V

DC Electrical Characteristics

Conditions: Vcc = 3.6V, Ta = 25 °C

Symbol	Parameter	Typ	Unit
Icc_{ACQ}	Total Supply Current (Acquisition Mode)	50	mA
Icc_{TRK}	Track Mode	30	mA
$Icc_{(HIBERNATE)}$	Sleep (Hibernate) Mode	30	µA
V_{IO_REG}	I/O voltage regulator output voltage	1.8	V

Note: Power Management modes above are automatically accessed and managed through SiRF software/Firmware.

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External Antenna

Symbol	Parameter	Min	Typ	Max	Unit
	Insertion loss from module's connector to external antenna switch		0.7		dB
	Insersion loss of external antenna switch		0.35		dB
I_ext	External antenna bias current	2*		30	mA
V_ext	External antenna bias voltage**	Vcc-0.67		Vcc-0.044	V
	External antenna LNA gain (including cable loss)	15		27	dB
V_{Ant_Det}	Output voltage at Ant_Det pin, no external antenna detected	(Vcc-0.35) *0.72	(Vcc-0.12) *0.72		V
	Output voltage at Ant_Det pin, external antenna detected		0.8	0.25	V

*   Below this threshold the sensor might not detect the external antenna.

**   Depends on external antenna current draw.

RF Specifications

Conditions: Vbat = 3.6V, Ta = 25 °C

Symbol	Parameter	Typ	Unit
G_{LNA}	LNA Gain	18	dB
NF_{LNA}	LNA Noise Figure	1.1	dB
P_{1dB}	1dB Compression Point	-65	dBm
ANT_{RL}	Antenna Return Loss	-15	dB
ANT_{EFF}	Antenna Total Efficiency	70	%
$ANT_{EFF\ RHCP}$	Antenna RHCP Efficiency	50	%
ANT_{BW}	Antenna Bandwidth at -10dB	30	MHz

Band Rejection

Frequency	Standard	Typ	Unit
824-849	Cellular CDMA	43	dB
869-894	GSM850	43	dB
880-915	GSM900	44	dB
1710-1785	DCS	44	dB
1850-1910	PCS	48	dB
1920-1980	WCDMA	51	dB
2400-2492	WLAN, BT and WiMAX	60	dB

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System Performance

Communication	Specification	
Data Output Protocol[1]	NMEA 0183	
Host Interface	UART - CMOS 1.8V	
Baud Rate[1]	9600 bps	
GPS Engine		
Chip	SiRFstarIII GSC3LT	
Channels	Up to 20	
Position Accuracy[2]		
Autonomous	2.5m CEP	
Maximum Position Update Rate	1 Hz	
Sensitivity		
Acquisition	-142dBm	
Tracking	-159dBm	
TTFF		
Hot Start	<1s	
Warm Start	<35s	
Cold Start	<35s	

[1] Standard output protocol and baud rate - please contact Antenova for specific requirements.

[2] Circular Error Probability

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Pin out Description

Pin	Name	I/O	Pull	Description
1, 2, 3, 8, 13, 14, 15, 16, 17, 18,19, 23, 26, 27, 29, 30	GND			Ground connections
4	VIO_OUT	O		I/O voltage regulator output. Use to generate CMOS 1.8V inputs (ED[0,1], GPIO). Bypass to ground using 22pF.
5	TM	O	None	Time Mark (1.8V) 1PPS (one pulse per second). Connect to GND if not used.
6	ECLK	I	None	External clock for Frequency Aiding (1.8V) in A-GPS applications. Connect to GND if not used.
7	GPIO8	I/O	None	Time Aiding Input (CMOS 1.8V) in A-GPS applications. Connect to GND if not used.
9	ED[1]	I/O	Up	Flash: Memory Boot mode Configuration (CMOS 1.8V). See table below.
10	ED[0]	I/O	Down	Flash: Memory Boot mode Configuration (CMOS 1.8V). See table below.
11	GPIO2	I/O	None	Flash: leave unconnected or bypass to GND using 22pF.
12	GPIO6	I/O	None	Flash: leave unconnected.
20	ON_OFF	I	Down 13.9kΩ	Power RUN/SLEEP control line (1.8V). Momentary high pulse to initiate SLEEP mode in the NORMAL state and resumes operation when in SLEEP state. Pulse duration 100µs with minimum inter-pulse interval of 1s. See usage below.
21	VBAT	I		Power supply 3.6V
22	Ant_Det	O	Down	This output is high if the external antenna is detected; bypass to ground using 22pF; minimum output load 50kΩ. If not used, leave unconnected
24	RXA	I	Up	UART Receive Input (1.8V). Main message connection to host CPU. Input channel for receiving commands from SiRF software or user-written program. Do not pull-down this pin nor tie this pin high using an external pull-up. If not used, leave unconnected.
25	TXA	O	None	UART Transmit Output (CMOS 1.8V). Main message connection to host CPU. Output channel that provides navigation data.
28	Ext_Ant	I		External antenna RF connection. Provides bias current. Connect directly to a 50Ω line. If not used, leave unconnected.

[1] Drive levels to RXA input pin must be set to open or driven to zero whenever VIO drops to zero. Do not tie this pin high using a pull-up.
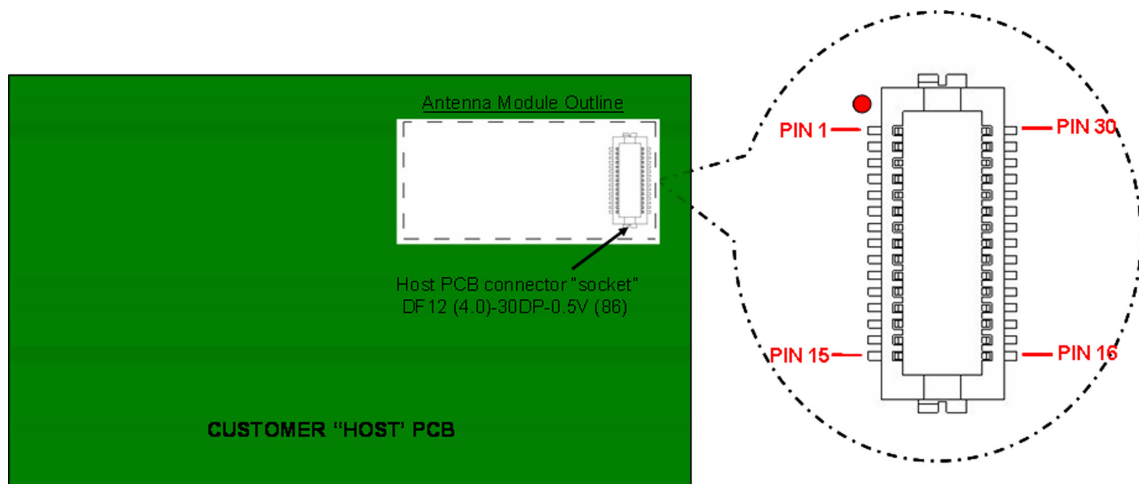
Recommended Application Schematic

The following schematic shows the recommended connection for the module for stand alone applications. Please contact Antenova for A-GPS applications.
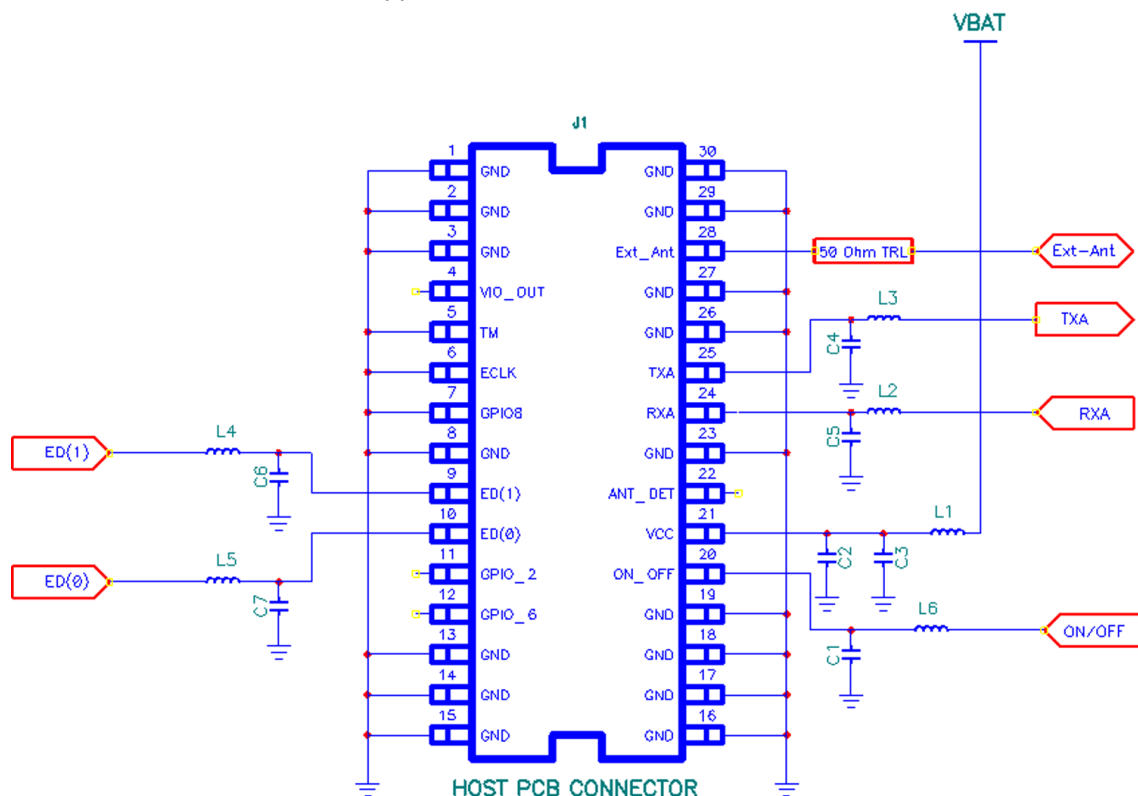

Notes:
1. GPIO2, and GPIO6 are left unconnected.
2. If the external antenna is not used on M10264-C2F, leave the corresponding pin unconnected.
3. If there is no plan for updating the firmware code of the module after installed in the final product, then ED[0] and ED[1] (Pin 9 and 10 of the host connector) can be connected directly to ground and the corresponding components (C6, C7, L4, L5) of the LC filters removed.
4. Notice that the Hirose connector is not polarized: care must be taken in preventing insertion of the module in the wrong direction

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Bill of Material

| Ref. Designator	Values	QTY.	Description/Comments
L1, L2, L3, L4, L5, L6	47nH	6	Murata LQG15HN47NJ02 or equivalent with Self Resonant Frequency (SRF) of 1600MHz. Do not use wire wound inductors.
C1, C2, C4, C5, C6, C7	22pF	6	Place as close as possible to the connector
C3	2.2uF	1	
J1	Connector 30 ways	1	Hirose DF12 (4.0) - 30DP-0.5V (86)

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Typical Chamber Performance
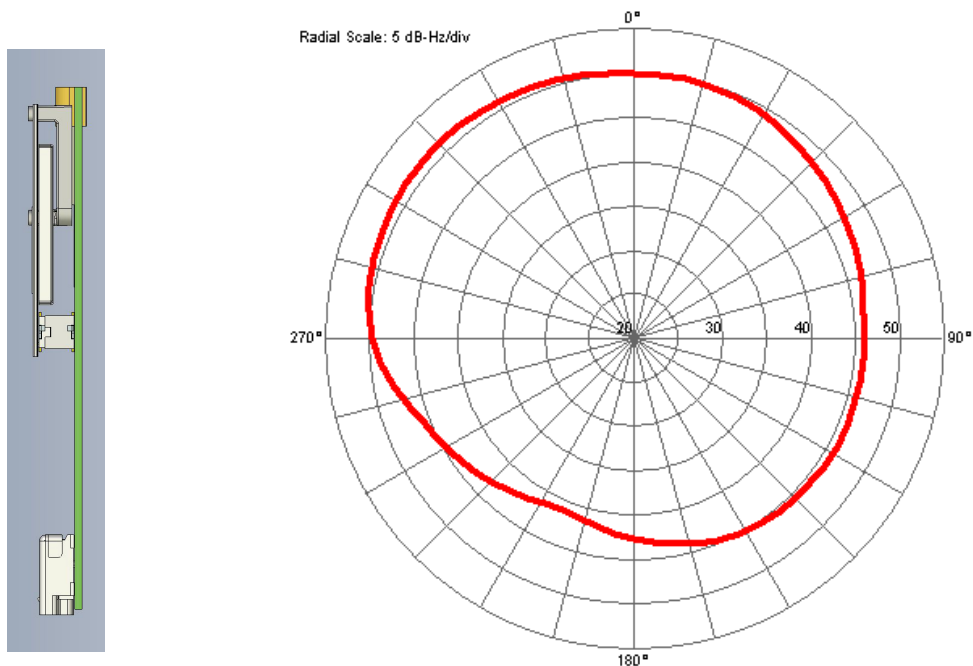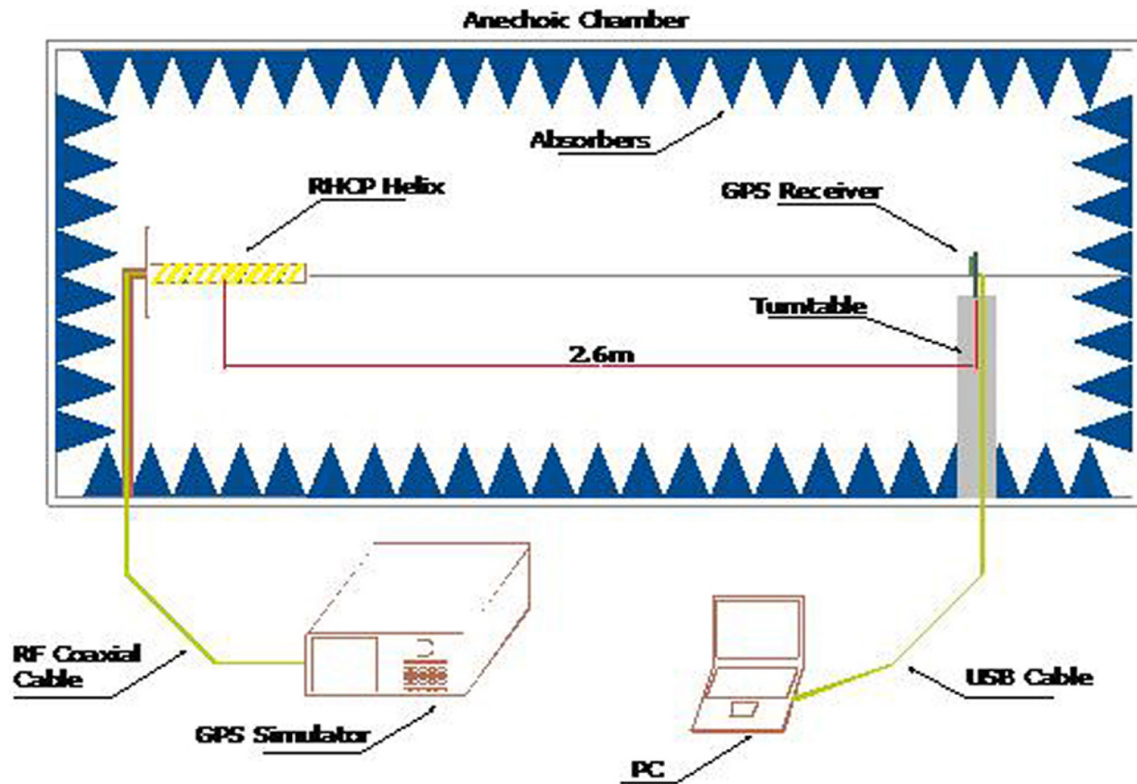
Note: Radiation pattern measured on Antenova's standard test board. Tuning may be needed in product integration to adjust radiation pattern.

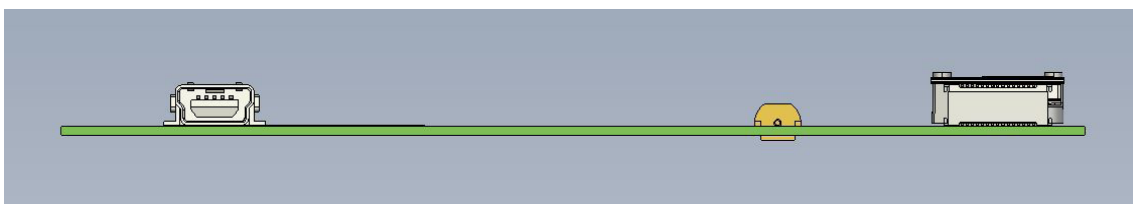## Integrated Antenna and RF Solutions

Typical RF Antenna Module Placement

Note: Module placement locations and orientations are critical for achieving optimal system performance. It is strongly recommended to contact Antenova for design recommendations.
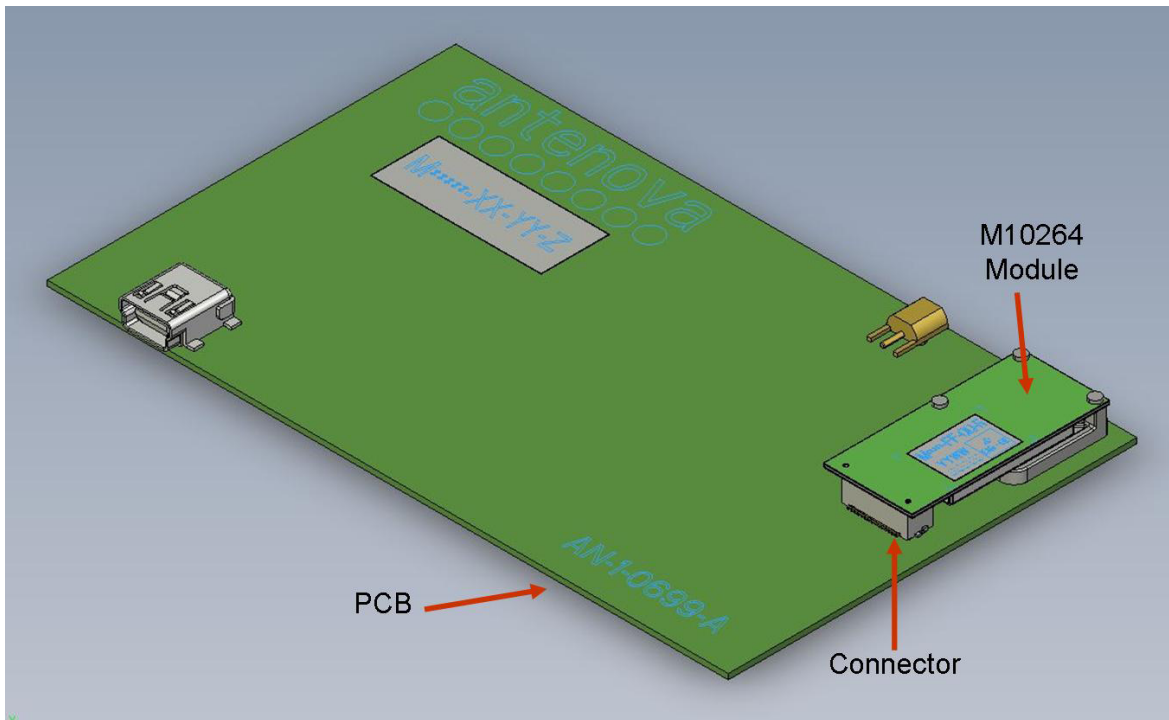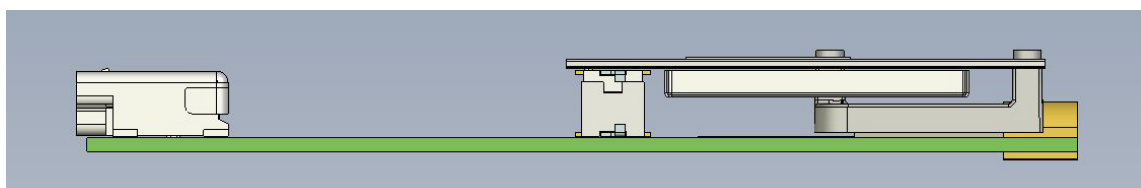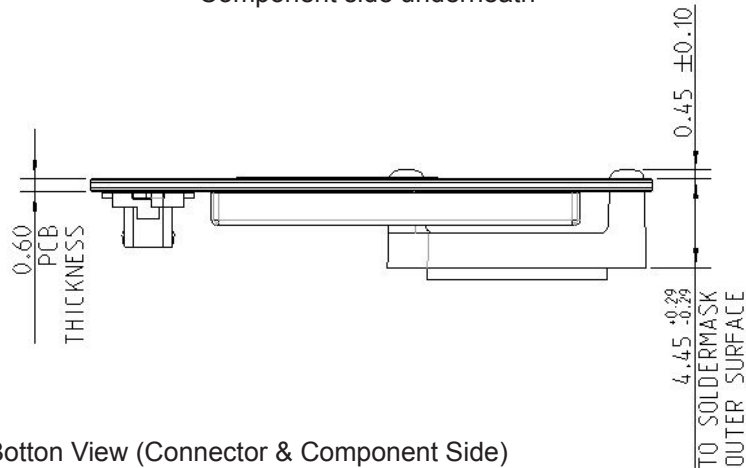

Front View

Back View

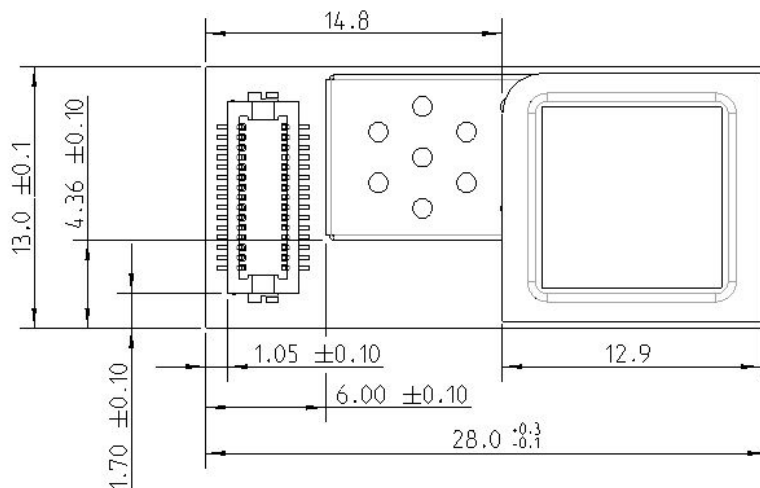

Side View

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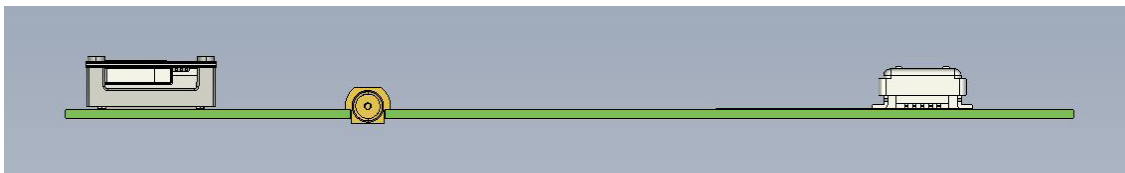
Mechanical Drawing

Side View with Antenna Side on top and Connector &
Component side underneath

0.45 ±0.10

0.60 PCB THICKNESS

4.45 +0.29 -0.29 TO SOLDERMASK OUTER SURFACE

Botton View (Connector & Component Side)

Side View

14.8

13.0 ±0.1

4.36 ±0.10

1.05 ±0.10

6.00 ±0.10

12.9

1.70 ±0.10

28.0 +0.3 -0.1

M*****-PP-QQ-R
YYWW
SSSSS
2D BARCODE

4.68 +0.31 -0.21 TO SOLDERMASK OUTER SURFACE

4.0 +0.2 0 CONNECTOR MATED HEIGHT

Side View (Mated with Male Connector)
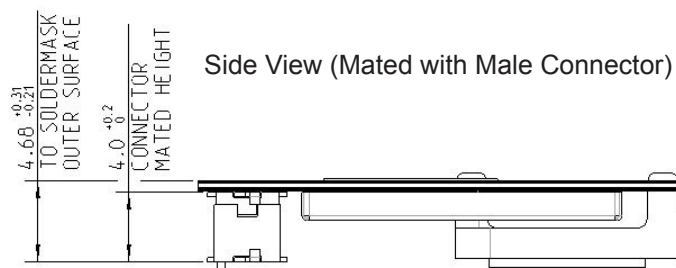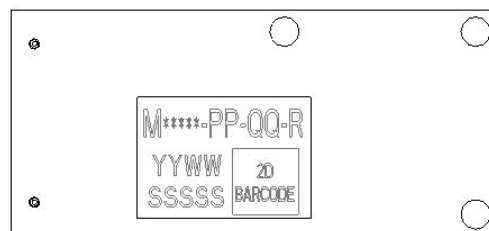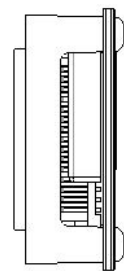
Notes: Units = mm

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