6 What Makes Your Satellite Transmitter Tick? The Hardware of the *LinkStar-STX3-ME*

The basic elements of a design utilizing the *LinkStar-STX3-ME* simplex transmitter are shown in Figure 6 below.

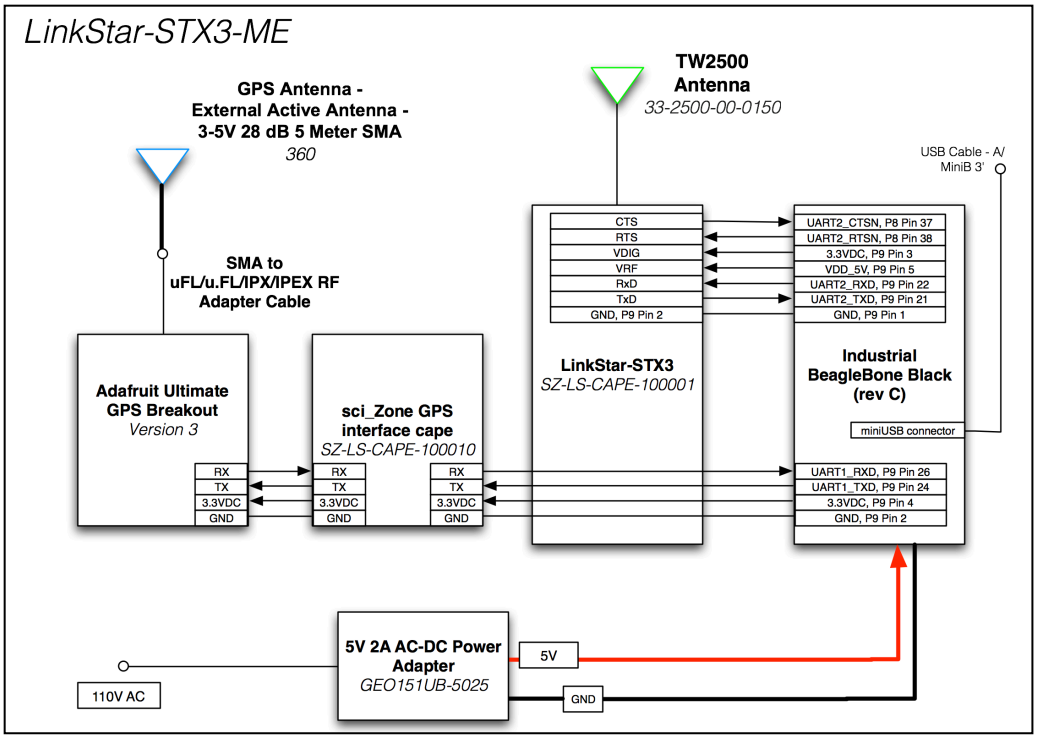

Figure 6. The LinkStar-STX3-ME

The main components of the *LinkStar-STX3-ME* are:

- The *Industrial BeagleBone Black (rev C)*
- The *LinkStar-STX3* satellite radio module
- TW2500 Antenna (for the *LinkStar-STX3* satellite radio module)
- The *sci_Zone GPS Interface cape*
- The *Adafruit Ultimate GPS Breakout*
- GPS External Active Antenna with SMA to uFL/u.FL/IPX/IPEX RF adapter cable
- 5V 2A AC-DC Power Adapter

6.1 Mechanical

Both the *LinkStar-STX3* satellite radio module and the *sci_Zone GPS Interface cape* are **capes** that stack on the *Industrial BeagleBone Black* headers. The dimensions and mounting hole location of the *Industrial BeagleBone Black* are shown in Figure 7. The entire system is mounted inside a "BUD Box"; Figure 8 shows the dimensions of the case.

The antenna used for the *LinkStar-STX3-ME* is the Tallysman™ *TW2500* magnetic mount antenna with 50 cm cable with SMA male connector. Figure 9 shows the dimensions of the *TW2500* satellite radio antenna. For applications above 50,000 feet the user is recommended to use the Tallysman™ *TW1500* antenna which can be ordered from *sci_Zone.*

The *Adafruit Ultimate GPS Breakout* dimensions can be found in Figure 10. This GPS can be used for high altitude balloon applications to over 100,000 feet. For advanced aviation and space applications of the *LinkStar-STX3* the user is required to upgrade to the NovAtel™ *OEM 719* GPS which is sold by *sci_Zone.* Special certifications are required to use the *OEM 719 GPS* in space and will require the permission of the U.S. government.

The *GPS External Active Antenna* is a magnetic mount active antenna with 5m cable. The dimensions can be found in Figure 11.

Size (circuit boards):	3.5" x 2.15" (86.36mm x 53.34mm)
Maximum Height (circuit boards):	
Size (case):	6.632" x 4.764" x 3.158" (168.5mm x 121.0mm x 80.21mm)
Mass (with antennas):	

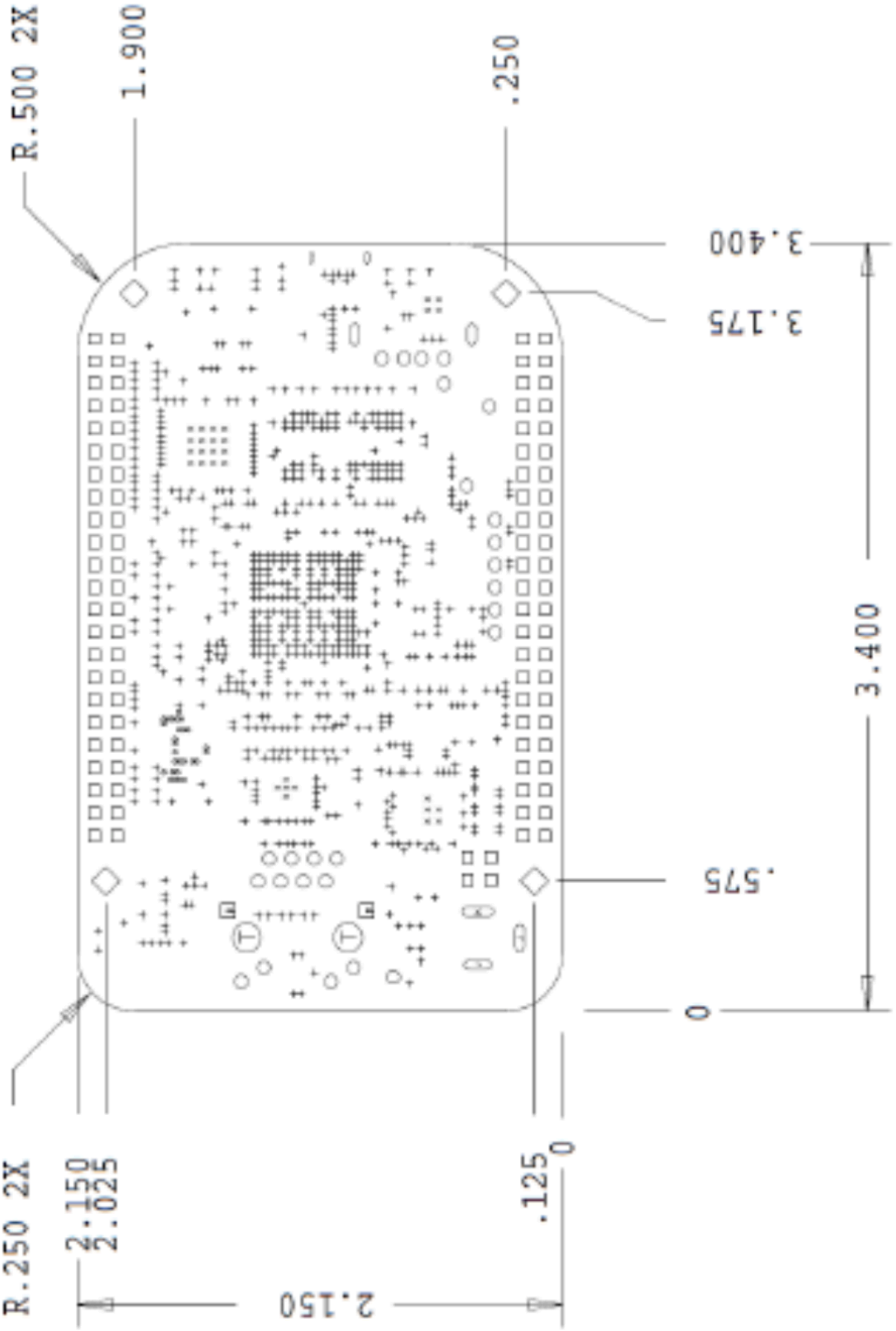

Figure 7. *Industrial BeagleBone Black* board dimensions.

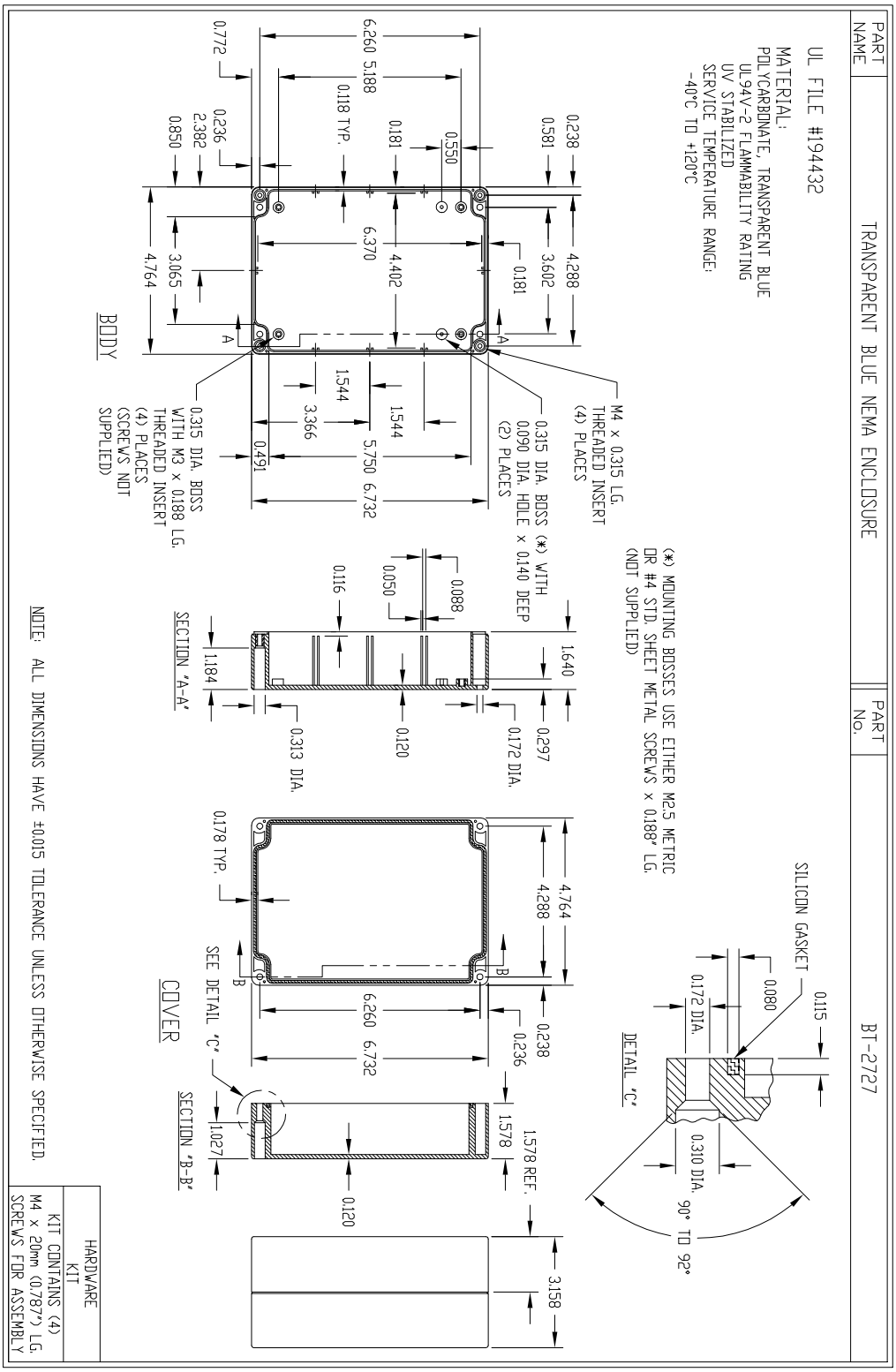

Figure 8. *LinkStar-STX3-ME* case ("BUD box") dimensions.

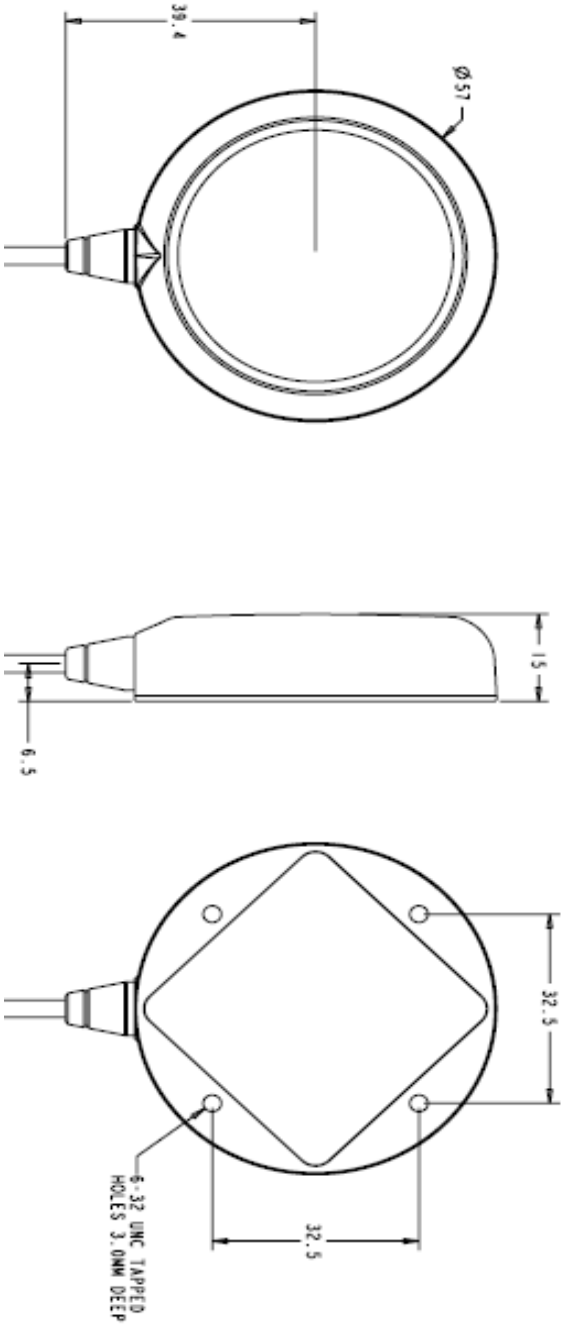

Figure 9. The *TW2500* Satellite Radio Antenna Dimensions.

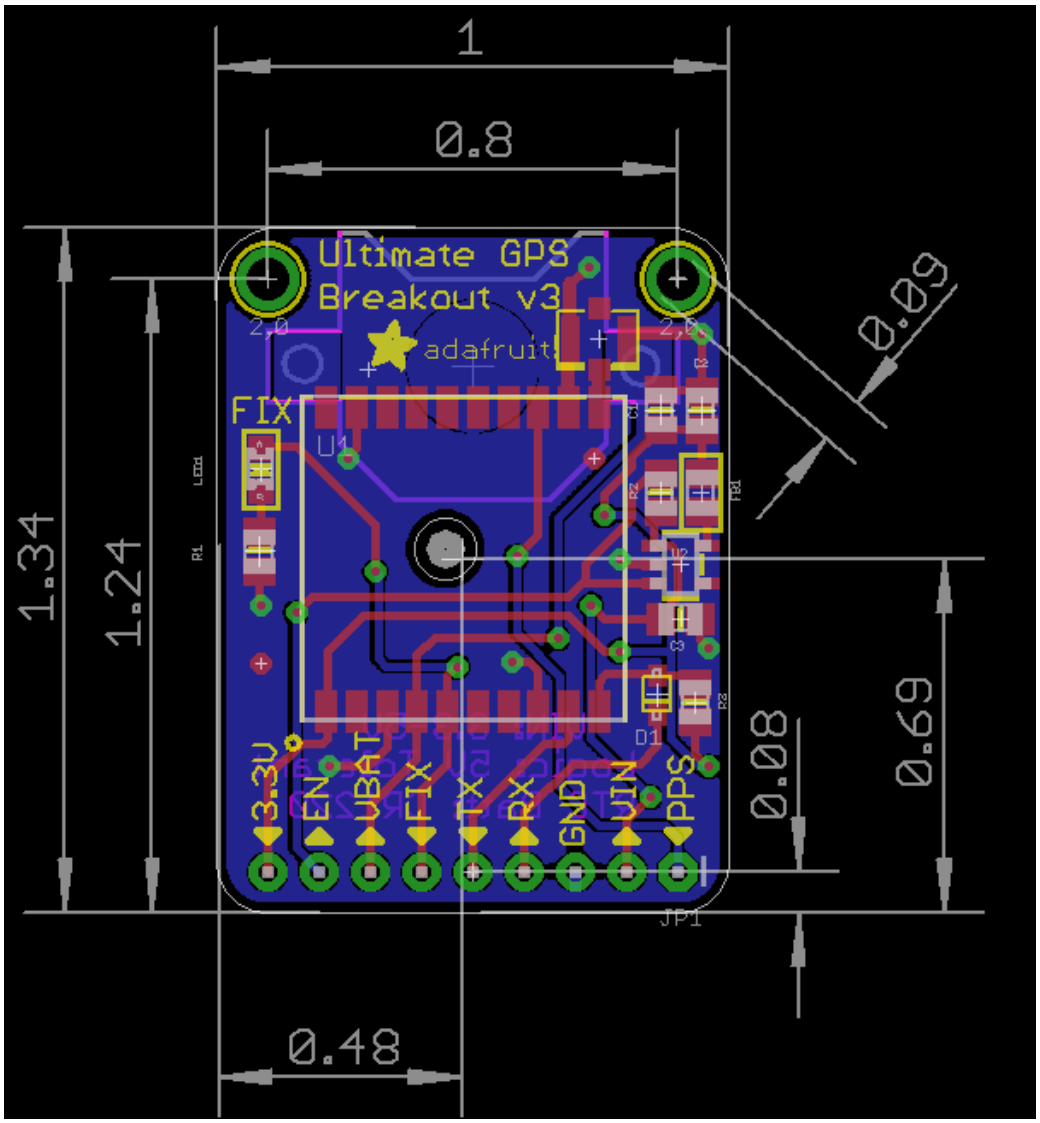

Figure 10. The *Adafruit™ Ultimate GPS Breakout* Dimensions.

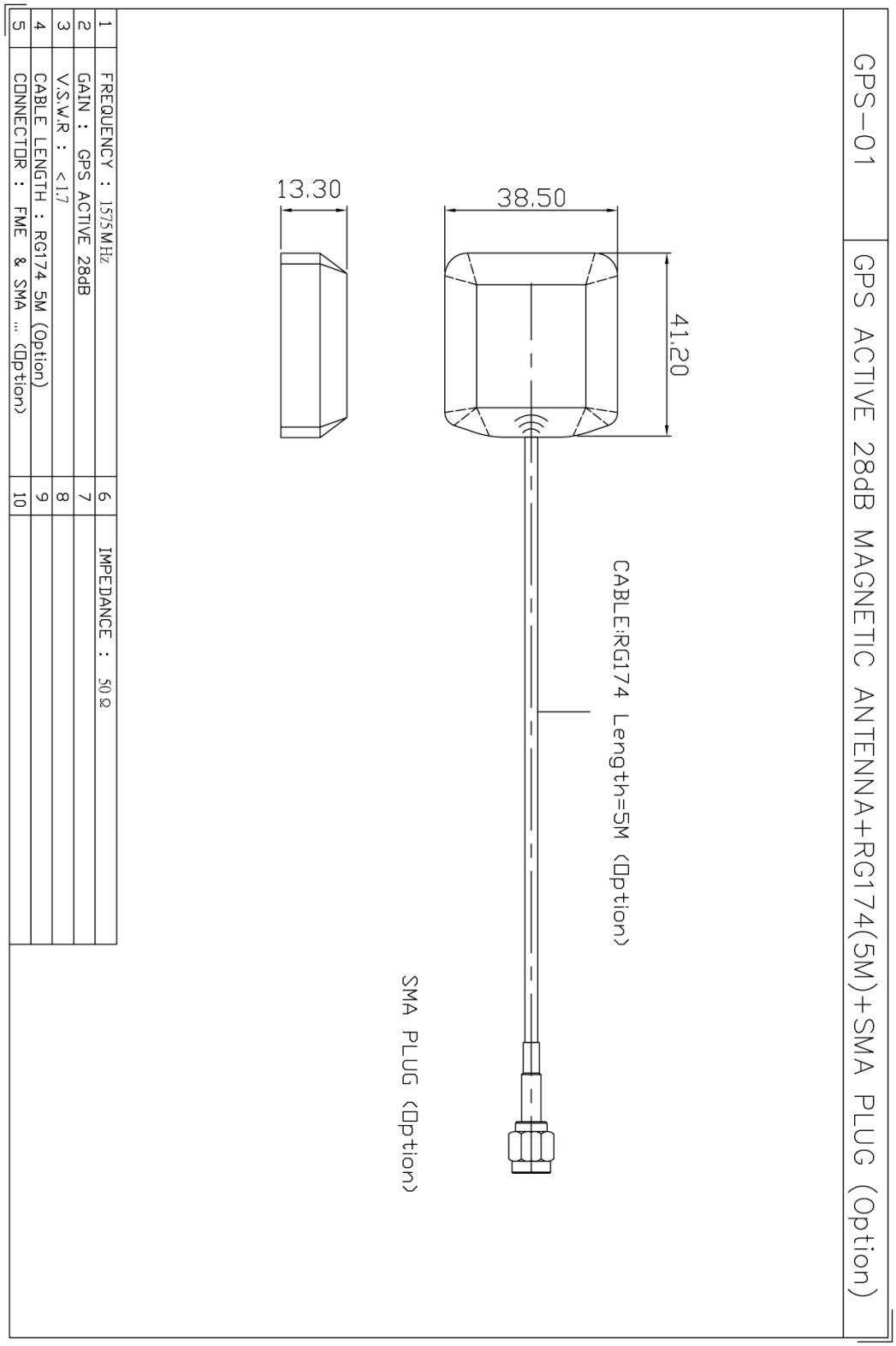

Figure 11. GPS External Active Antenna Dimensions.

6.2 Electrical

Power to the *LinkStar-STX3-ME* is provided through the **5V 2A AC-DC** power adapter connected to the 2.1mm female/male barrel jack connector cable which is connected to the *Industrial BeagleBone Black*.

The *Industrial BeagleBone Black* provides power to the *LinkStar-STX3* cape, the *Adafruit Ultimate GPS Breakout* and the *GPS External Active Antenna*.

DO NOT PLUG IN THE USB CORD FIRST!

IF the USB cord is plugged in first to your computer it will provide power through it to the *Industrial BeagleBone Black* and it will be the default power source for the *LinkStar-STX3-ME.* The power provided through the USB cord is insufficient to drive either the *LinkStar-STX3* satellite radio module or the *Adafruit Ultimate GPS Breakout*. YOUR RADIO WILL BE UNABLE TO BROADCAST DATA PACKETS TO THE GLOBALSTAR NETWORK!

Other sources of power CAN be provided to the *LinkStar-STX3-ME* including Lithium-Ion batteries and solar panels as long as the power requirements for the *Industrial BeagleBone Black* are met AND at least 5V@1 amp are provided to the system. Refer to the *BeagleBone Black System Reference Manual (Rev C)* for details on power options for the *BeagleBone Black*.

If the *Adafruit Ultimate GPS Breakout* is disabled, disconnected from the *sci_Zone GPS Interface Cape*, or power is removed the *LinkStar-STX3-ME* will not transmit packets to the Globalstar network. Transmission only occurs when *Adafruit GPS* is connected via the *sci_Zone GPS Interface Cape* and is powered on AND has verified a signal from the GPS satellites in orbit AND has verified the location and altitude of the *LinkStar-STX3-ME*. This allows the *LinkStar-STX3-ME* to set the appropriate channel based on location and altitude, or block message transmission if the *LinkStar-STX3-ME* is in a restricted area. If there is no GPS signal and if the location and altitude cannot be verified, the *LinkStar-STX3-ME* shall not transmit a message. **If the *Adafruit GPS* is disconnected, inoperable, or damaged the *LinkStar-STX3-ME* will be unable to transmit any messages.**

6.3 Environmental

Operating Temperature Range: -40 to +85 ºC
Vibration, TW2500 Antenna: 3 axis, sweep=15 min, 10 to 200Hz sweep: 3G
Shock, TW2500 Antenna: Vertical axis: 50 G, other axes: 30 G

6.4 Pins Used On The *Industrial BeagleBone Black*

The following pins are used by the *LinkStar-STX3-ME* and NOT AVAILABLE FOR USE BY ANY DEVICE:

HEADER P8
P7: TIMER4
P8: TIMER7
P9: TIMER5
P10: TIMER6
P11: GPIO1_13
P12: GPIO1_12
P14: GPIO0_26
P31: UART5_CTSN
P32: UART5_RTSN
P37: UART2_CTSN
P38: UART2_RTSN

HEADER P9
P3: DC_3.3V
P4: DC_3.3V
P5: VDD_5V
P21: UART2-TXD
P22: UART2-RXD
P24: UART1_TXD
P26: UART1_RXD