

**WIRELESS SOLUTION**  
MADE IN SWEDEN

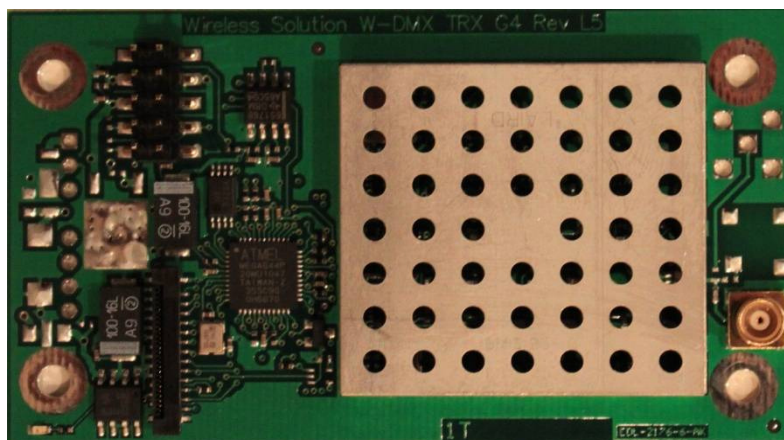


# **W-DMX OEM TRX**

## **IMPLEMENTATION GUIDE**

### **GENERATION 4**

**REV. Q1**





## W-DMX OEM TRX

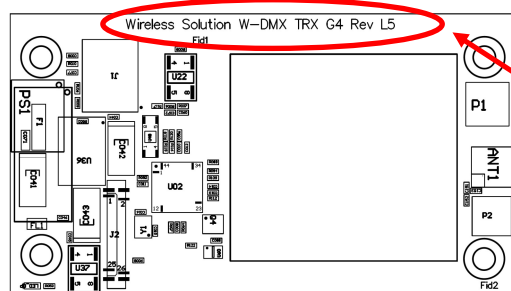
Author: Ben Darrington  
Date: 07/07/2012  
Document revision: Q1  
**Document Status: Company Confidential**

This document describes the mechanical and electrical properties, as well as the electrical interface, of the W-DMX OEM TRX G4 card; model Pro, Micro, and Pico. Refer to Appendix 1 for a complete listing of Order Codes and descriptions.

The W-DMX system is the most advanced wireless lighting control system on the market today. With over 120,000 units sold, and over 35 OEM customers worldwide, the W-DMX wireless protocol has become the world's unofficial standard for Wireless DMX and RDM control. The G4 line contains the following key features:

1. Support for Adaptive Frequency Hopping Spread Spectrum technology. This technology allows the system to dynamically avoid other users of the radio spectrum, in order to ensure that we do not cause interference with other radio users i.e. WLAN. All radiocards have this functionality as standard, with zero-configuration required.
2. Dualband support, on the 2.4GHz and 5.8GHz frequency bands for select models. The use of two bands at the same time greatly increases the amount of radio spectrum available to the user, and ensures that even in the toughest of environments, where an entire frequency band is fully utilised or jammed, the system still functions.
3. RDM support, with a full managed proxy implementation. All RDM devices, when connected through the wireless system on select models of radiocard (those supporting RDM) will be exposed through the system to an upstream controller automatically.
4. Introduction of our 'datasafe' and 'invisiwire' technologies, which collectively ensure that data is more redundant to interference, and the system responds just as a wire would respond.
5. Backward compatibility with G3 transmitters and receivers. G4 receivers will automatically detect a G3 transmitter, and G4 transmitters can be switched into G3 mode, to ensure that the G4 system functions correctly with G3 devices. Refer to the W-DMX user manual for further details.

This document is valid for hardware **L5** of the G4 TRX card. The revision mark is found along the edge of the card as indicated in Figure 1.



Wireless Solution W-DMX TRX Rev L5



**Figure 1: Location of the W-DMX OEM TRX revision mark.**

**FCC Statement**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

**CONFIDENTIALITY NOTICE**

Any disclosure, copying, distribution or use of the contents of the information herein without prior written authorization from Wireless Solution is prohibited.

Please refer to our Non-Disclosure Agreement for complete information about Wireless Solution's confidentiality and non-disclosure policies.

**Warning ! ESD sensitive device**



**The W-DMX OEM PCB is sensitive to ESD.**

**Follow proper ESD control procedures when handling the W-DMX OEM PCB.**

# Table of contents

## Contents

<b>1</b>	<b>FCC AND INDUSTRY CANADA STATEMENT</b> .....	<b>6</b>
<b>2</b>	<b>INDUSTRY CANADA COMPLIANCE STATEMENT</b> .....	<b>7</b>
<b>3</b>	<b>OEM PRODUCT COMPLIANCE</b> .....	<b>8</b>
3.1	PRODUCT MARKING .....	8
<b>4</b>	<b>MECHANICAL DIMENSIONS</b> .....	<b>10</b>
<b>5</b>	<b>ANTENNAS</b> .....	<b>11</b>
5.1	ANTENNA OPTIONS .....	12
5.2	ANTENNA, ANTENNA CABLE AND CONNECTOR .....	13
5.3	CABLES .....	14
5.3.1	A40921 W-DMX OEM RP-SMA Cable Indoor 20cm.....	14
5.3.2	A40922 W-DMX OEM RP-SMA Cable Indoor 40cm.....	14
5.3.3	A40920 W-DMX OEM N Cable Outdoor 20cm.....	14
5.3.4	A40924 W-DMX OEM RP-SMA Flange-Mount Cable Indoor 30cm.....	15
5.3.5	A40922 W-DMX 40cm OEM Cable .....	15
5.4	INDOOR ANTENNAS.....	16
5.4.1	A40501 W-DMX Indoor 2dBi Antenna 2.4Ghz.....	16
5.4.2	A40511 W-DMX Indoor 2dBi/4dBi Dualband Antenna 2.4/5.8GHz.....	16
5.4.3	A40502 W-DMX Indoor 5dBi Antenna 2.4GHz.....	17
5.4.4	A40503 W-DMX Indoor 7dBi Antenna 2.4GHz.....	17
5.4.5	A40517G4B W-DMX Indoor Mini 2dBi Antenna 2.4GHz.....	18
5.4.6	A40520 W-DMX Indoor Mini 2dBi Antenna 2.4GHz.....	18
5.4.7	A40529 W-DMX Indoor Mini 2dBi Antenna 2.4GHz.....	19
5.4.8	A40525G4 W-DMX Indoor 2dBi Heavy Duty. 360x320.....	19
5.4.9	A40527G4 W-DMX Indoor 3dBi Heavy Duty. 360x280 degrees.....	19
5.5	OUTDOOR ANTENNAS .....	20
5.5.1	A40516G4(B/W) W-DMX Outdoor Mini 2dBi Antenna 2.4GHz.....	20
5.5.2	A40512 W-DMX Outdoor 2dBi/4dBi Dualband Antenna 2.4/5.8GHz .....	20
5.5.3	A40526G4 W-DMX Outdoor 2/3 dBi. Dual Band 2/3dBi.....	21
5.5.4	A40530G4 W-DMX Outdoor Chassi 2dBi Heavy Duty 360x280 degrees.....	21
5.5.5	A40531G4 W-DMX Outdoor Chassi 2dBi Heavy Duty 360x320 degrees.....	22
5.6	OEM ANTENNAS .....	23
5.6.1	A40523 W-DMX Internal OEM Antenna 2.4GHz.....	23
5.7	ACCESSORIES.....	24
5.7.1	A40621 W-DMX N to RP-SMA Antenna Adaptor.....	24
<b>6</b>	<b>TYPICAL OPERATING CIRCUIT</b> .....	<b>25</b>
<b>7</b>	<b>POWER INDICATOR</b> .....	<b>26</b>
<b>8</b>	<b>LOSS OF DMX OR RADIO LINK</b> .....	<b>26</b>
<b>9</b>	<b>LOSS OF POWER</b> .....	<b>27</b>
<b>10</b>	<b>INTERFACE CONNECTOR J1</b> .....	<b>28</b>
<b>11</b>	<b>USER INTERFACE</b> .....	<b>29</b>
11.1	FUNCTION SWITCH.....	30
11.2	LED INDICATOR .....	31
11.2.1	LED Indication - Receiver:.....	31
11.2.2	LED Indication - Transmitter: .....	32
11.3	SPI INTERFACE .....	33



11.4	INTERFACE TO A MICROCONTROLLER .....	34
11.5	FUNCTION SWITCH.....	34
11.5.1	Function Switch Electrical Requirements.....	34
11.5.2	TRX TX Timing Requirements: Add Receivers.....	34
11.5.3	TRX TX Timing Requirements: Link Receivers .....	35
11.5.4	TRX RX Timing Requirements: Unlink from a Transmitter .....	35
11.6	LED INDICATOR .....	35
11.7	SOFTWARE UPDATES .....	35
11.7.1	Concept.....	35
11.7.2	Design considerations .....	35
<b>12</b>	<b>DMX TTL LEVELS.....</b>	<b>35</b>
<b>13</b>	<b>SPECIFICATIONS.....</b>	<b>37</b>
13.1	ELECTRICAL SPECIFICATIONS .....	37
	ENVIRONMENTAL REQUIREMENTS .....	38
<b>APPENDIX 1.</b>	<b>ORDER CODES.....</b>	<b>39</b>
	RADIOCARDS.....	39
	ANTENNA CABLES.....	40
	ANTENNAS .....	41
	ACCESSORIES .....	42
<b>APPENDIX 2.</b>	<b>REVISION HISTORY.....</b>	<b>43</b>
<b>NOTES.....</b>		<b>45</b>



# 1 FCC and Industry Canada Statement

## DECLARATION OF CONFORMITY

We,

Wireless Solution,  
Stureparksvägen 7  
451 55 Uddevalla  
Sweden,

declare under our sole responsibility that the product(s)

FCC ID: NY2-WDMXTRX  
Model: W-DMX TRX

complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or locate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## RF Exposure Warning for North America, and Australia

**Warning!** To meet FCC and other national safety guidelines for RF exposure, the antennas for this device must be installed to ensure a minimum separation distance of 20cm (7.9 in.) from persons.



## 2 Industry Canada Compliance Statement

We,

Wireless Solution,  
Stureparksvägen 7  
451 55 Uddevalla  
Sweden,

declare under our sole responsibility that the product(s)

IC: 10464A-WDMXTRX  
Model: W-DMX TRX

complies with RSS-210 of IC rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

This Class B Digital apparatus meets all the requirements of the Canadian Interference Causing Equipment Regulations ICES 003.

Cet appareil numérique de classe B respecte les exigences du règlement du Canada sur le matériel brouilleur NMB-003.

The device is certified to the requirements of RSS-210 for 2.4 GHz spread spectrum devices. The use of this device in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.



### 3 OEM Product Compliance

Wireless Solution has to the greatest extent possible made regulatory compliance for end products incorporating the W-DMX OEM TRX cards effortless for the OEM.

The W-DMX OEM TRX cards provide compliance with worldwide RF regulations with a few requirements outlined in this section:

#### 3.1 Product Marking

The following text and graphics<sup>1</sup> has to be added to the product marking for compliance in the US, Canada and Europe:

*Contains:*

FCC ID: NY2-WDMXTRX

IC: 10464A-WDMXTRX

Model: W-DMX TRX

*“This device complies with part 15 of the FCC rules and RSS-210 of IC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. See instructions if interference to radio or television reception is suspected.”*



---

<sup>1</sup> Original graphics in several file formats are available from Wireless Solution.





## FCC Declaration of Conformity

Products intended for the US and Canadian market has to carry the following text in the user manual or in an enclosure to the product documentation available in the product packaging. Replace ***Company Name*** and ***Company Address*** in the text below with the OEMs name and address.

We,

***Company Name***  
***Company Address***

declare under our sole responsibility that the product which contains

FCC ID: NY2-WDMXTRX  
IC: 10464A-WDMXTRX  
Model: W-DMX TRX

complies with Part 15 of the FCC rules and RSS-210 of IC rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or locate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## **RF Exposure Warning for North America, and Australia**

**Warning!** To meet FCC/IC and other national safety guidelines for RF exposure, the antennas for this device must be installed to ensure a minimum separation distance of 20cm (7.9 in.) from persons.

## 4 Mechanical Dimensions

All W-DMX OEM TRX cards; model Pro, Micro, and Pico of Revision L5 have the same dimensions, as well as form and fit properties.

The total height of the card depends on the mating connector used for J1. Refer to Figure 9 on page 29 for dimensions of J1 itself.

The card features a dedicated 3,2mm diameter mounting hole in every corner. The screw holes are located according to Table 1. Note that the locations of the mounting holes are asymmetrical.

Micro and PRO cards are equipped with a metal shield cage over the RF circuitry to meet regulatory requirements. The shield is outlined by the dashed line in Figure 2. Receiver cards are not equipped with this shield, and expose the underlying components. This is normal.

An AutoCad.dxf file with all relevant dimensions is available on request from Wireless Solution.

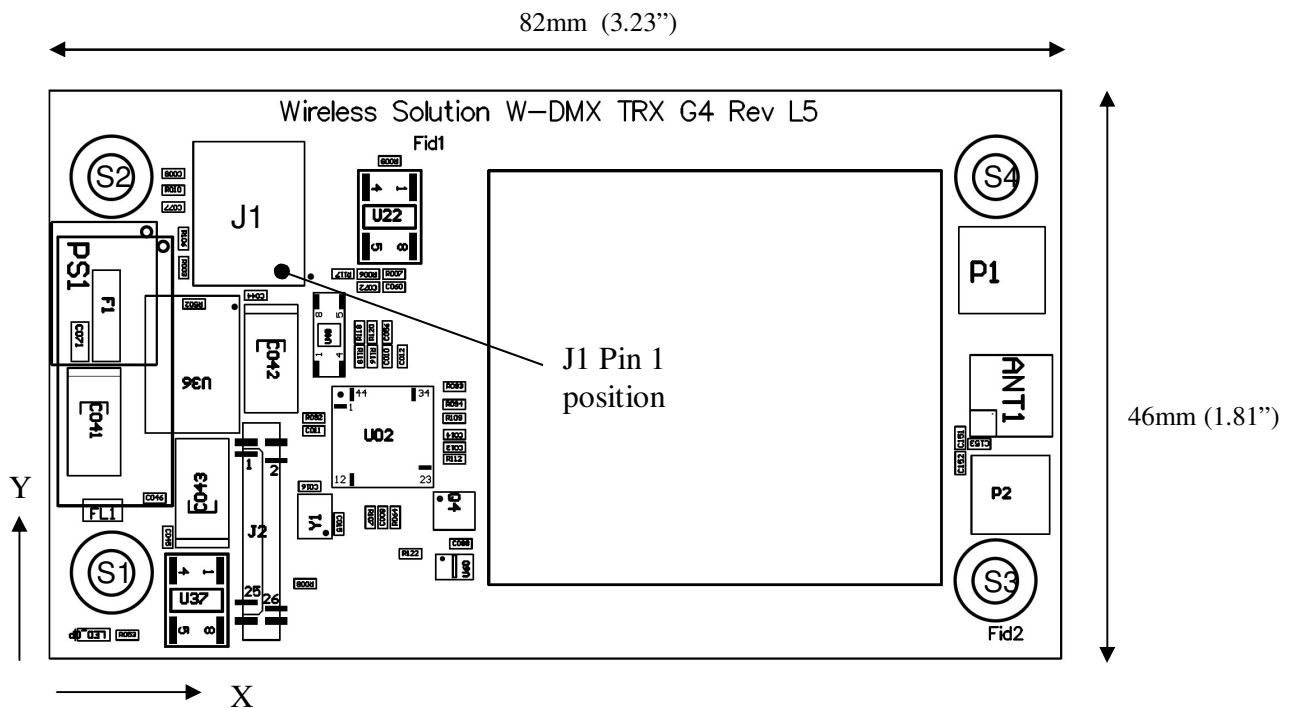


Figure 2: TRX Board Dimensions & Layout, Metric (Inches in Brackets).

Screw #	X (mm)	Y (mm)
S1	5.0	7.0
S2	5.0	39.0
S3	76.6	39.1
S4	76.7	6.3

Table 1: Mounting Hole Locations, Metric .



## 5 Antennas

Note that several aspects, including physical placement, should to be considered with both external antennas and the integral on-board antenna. While antenna placement is relatively flexible with the standard antennas recommended for OEM use, it is recommended to consult with Wireless Solution prior to making the final antenna placement decision to ensure optimal performance.

It is common for most indoor products to use any of our RP-SMA cables, and ship standard with an indoor 2dBi antenna. For products that have the potential to be used outdoors, and are IP-65 or similarly rated, an N-type antenna cable is recommended as this provides a waterproof seal between the connector and the casing. For products that are not exposed directly to the elements, an N to RP-SMA adaptor along with a standard 2dBi RP-SMA antenna is recommended, as customers can change later to an IP-65 rated antenna if they require this. For products with direct, continuous exposure to the elements, the solution described above, but with a 2dBi IP-65 antenna instead of the indoor antenna and adaptor is recommended.

Further information on the range of Antenna that Wireless Solution offer can be found on page 14.

## 5.1 Antenna Options

Most models of the W-DMX OEM TRX card are available with a connector for an external antenna or with an on-board antenna. Refer to the order list at the back of this document for a complete list of Order Codes and descriptions.

The connector and antenna locations are outlined in Figure 3. The options are designated as follow:

P2 is a MCX female antenna connector (for use with MCX antenna cables).

ANT1 is an integral on-board chip antenna (on-board antenna option, refer to order codes).

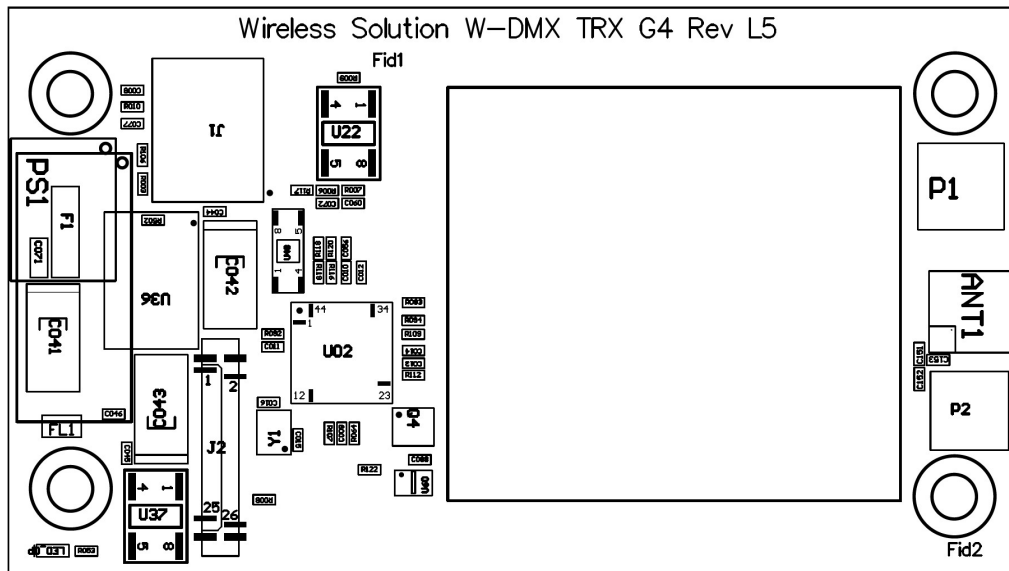


Figure 3: Antenna Connector (X2) and On-Board Antenna (A1) Locations.



## 5.2 Antenna, Antenna cable and connector

A wide range of antennas and standard, as well as custom, antenna cables with connectors and adaptors are available from Wireless Solution for applications that utilize external antennas.

The W-DMX OEM TRX card features a high frequency MCX connector, X2 in Figure 3, to which the internal antenna cable is plugged in. One end of the internal antenna cable is furnished with a MCX connector and the other end is furnished with a RP-SMA or N chassis connector for attachment of the antenna, antenna with adaptor, or external antenna cable.

The RP-SMA connector is only suitable for indoor use and is typically used in relatively light duty applications. Temporary outdoor use is possible if the unit is shielded from exposure to rain, water splashes, and other environmental factors.

The N connector is mandatory for permanent outdoor applications and also best suited for heavy duty applications where mechanical damage of the connector during e.g. transportation might be an issue. As an example, the W-DMX line of stand-alone transmitters and receivers use the N connector for its durability and water resistance.

Note that, if the customer chooses to use an N-type cable, they will require an external N to RP-SMA adaptor to utilize our standard indoor antennas.

Indoor antennas are rated up to IP43, and can be used outdoors in covered conditions, provided provision has been made at the antenna connection to IP rate the fixture to the appropriate rating.

You will find dimensional drawing for our standard cables later in this section.

Custom solutions are available on request from Wireless Solution if the standard cables fail to satisfy the requirements for a particular application.

The W-DMX 2dBi 2.4GHz antenna has an operating range of 360 x 360 degrees. The W-DMX Indoor and Outdoor Dualband antennas have gains of 2dBi and 4dBi at 2.4GHz and 5.8GHz respectively, and have an operating range of 360 x 360 degrees in the 2.4GHz band, and 240 x 360 degrees in the 5.8GHz band.

Note that all units are metric.

## 5.3 Cables

### 5.3.1 A40921 W-DMX OEM RP-SMA Cable Indoor 20cm

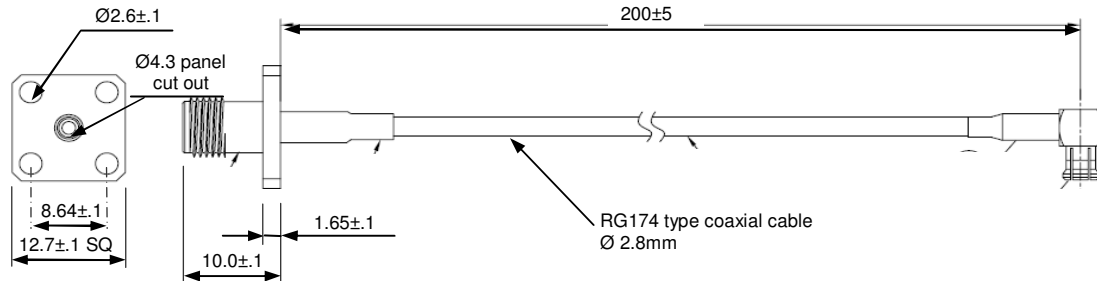


Figure 4: A40921 Mechanical Dimensions, Metric.

### 5.3.2 A40922 W-DMX OEM RP-SMA Cable Indoor 40cm

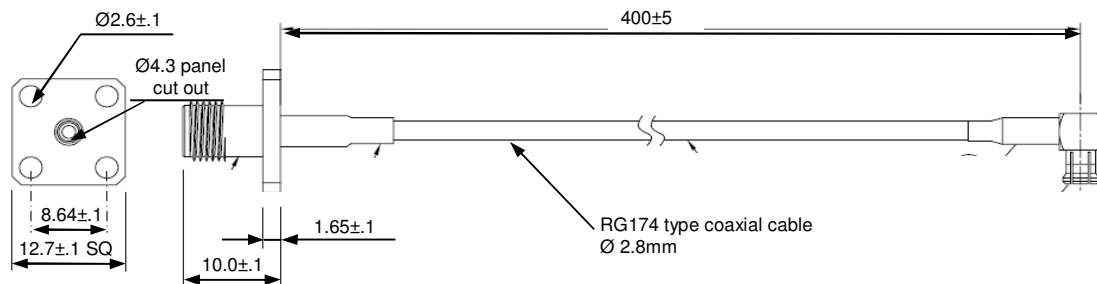


Figure 5: A40922 Mechanical Dimensions, Metric.

### 5.3.3 A40920 W-DMX OEM N Cable Outdoor 20cm

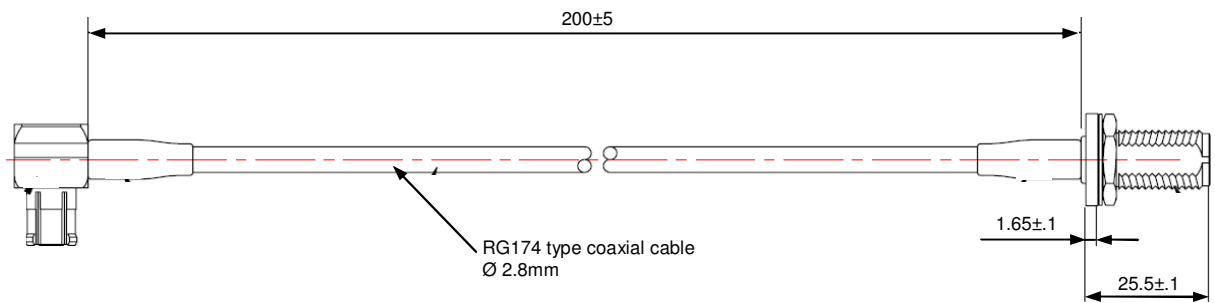


Figure 6: A40920 Mechanical Dimensions, Metric.

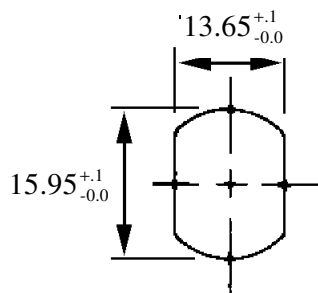


Figure 7: A40920 N Type Panel Cut Out Dimensions, Metric.

### 5.3.4 A40924 W-DMX OEM RP-SMA Flange-Mount Cable Indoor 30cm

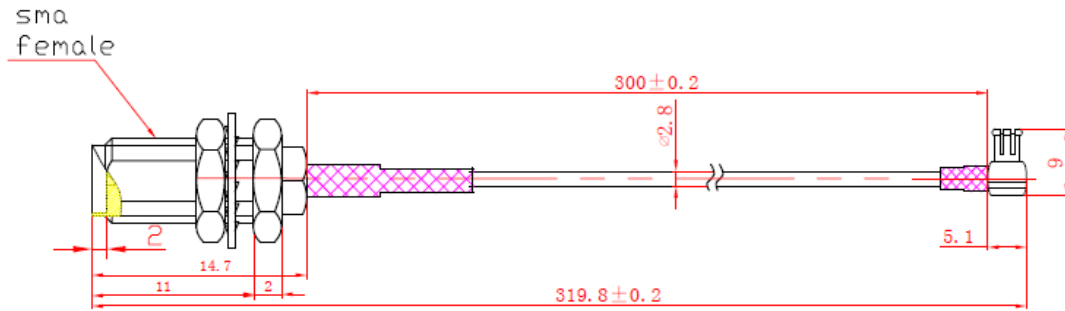


Figure 8: A40924 Mechanical Dimensions, Metric.

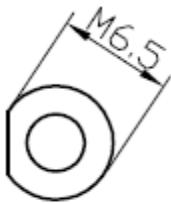


Figure 9: A40924 RP-SMA Flange-Mount Panel Cut Out Dimensions, Metric.

### 5.3.5 A40922 W-DMX 40cm OEM Cable

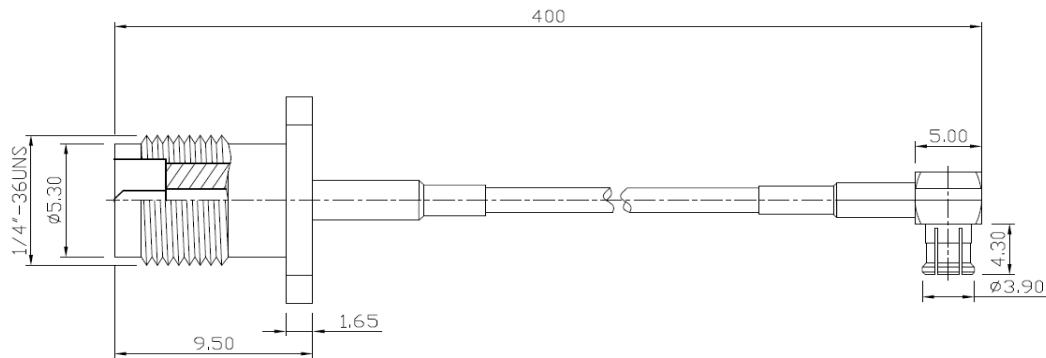
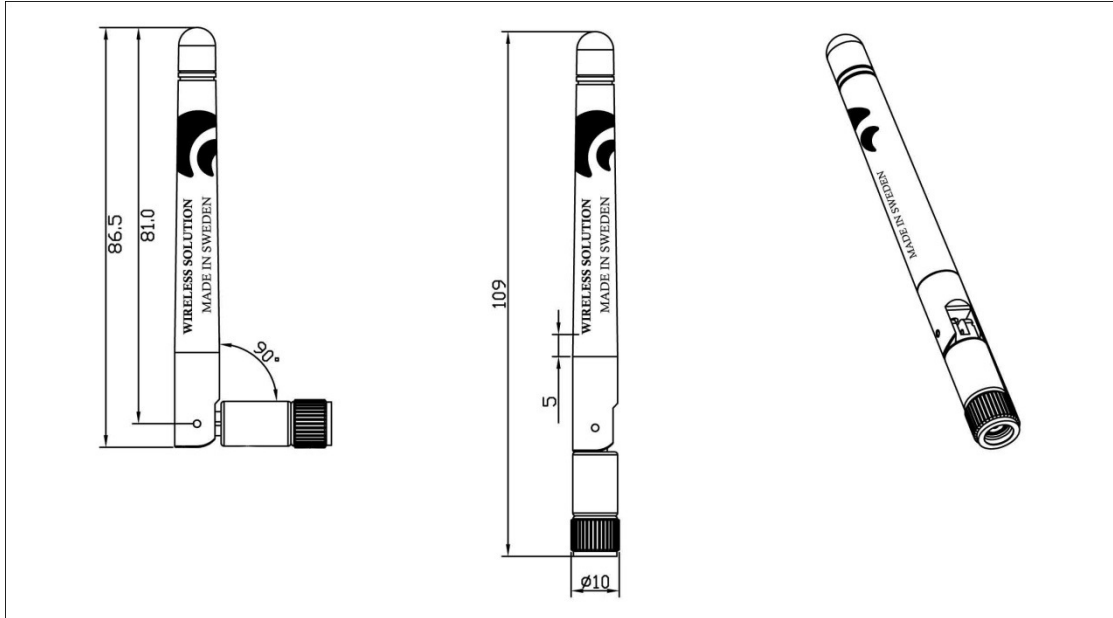


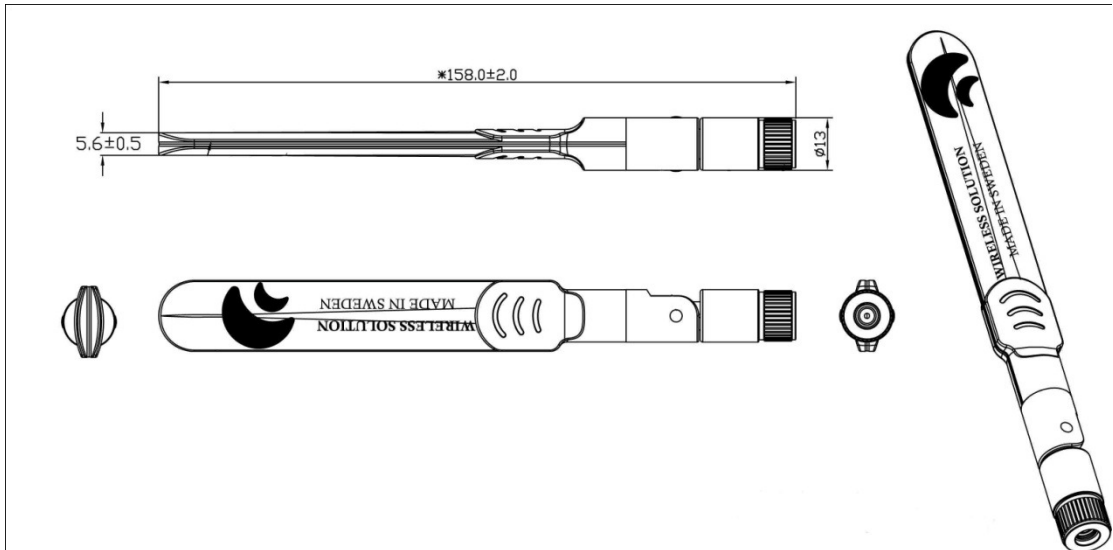
Figure 10: A40922 Mechanical Dimensions, Metric.

## 5.4 Indoor Antennas

### 5.4.1 A40501 W-DMX Indoor 2dBi Antenna 2.4Ghz

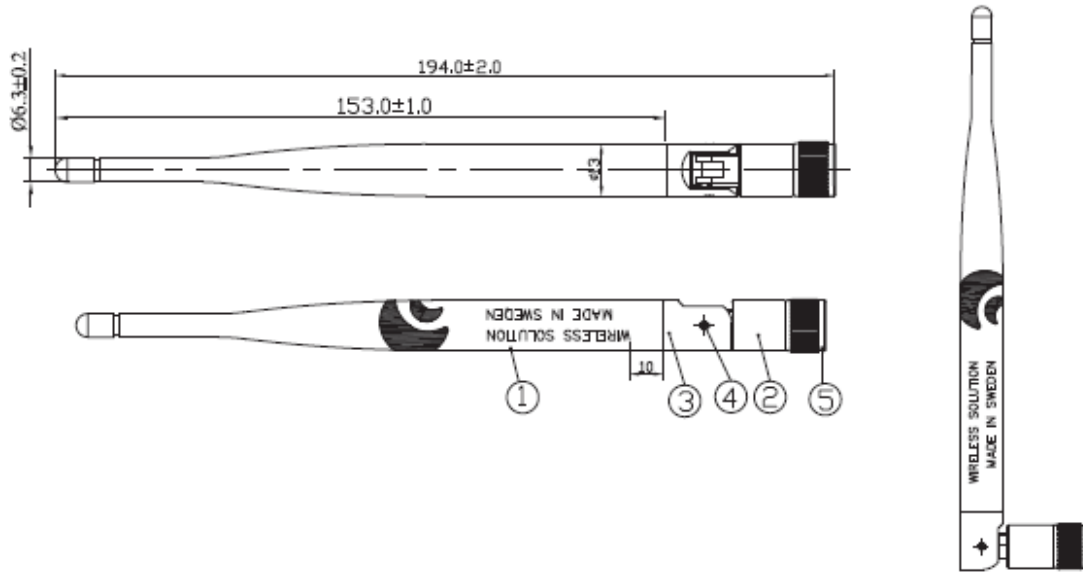


### 5.4.2 A40511 W-DMX Indoor 2dBi/4dBi Dualband Antenna 2.4/5.8GHz

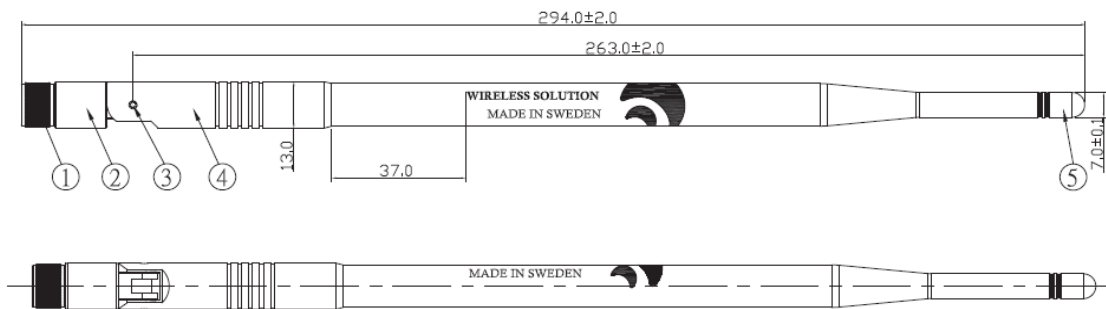




### 5.4.3 A40502 W-DMX Indoor 5dBi Antenna 2.4GHz

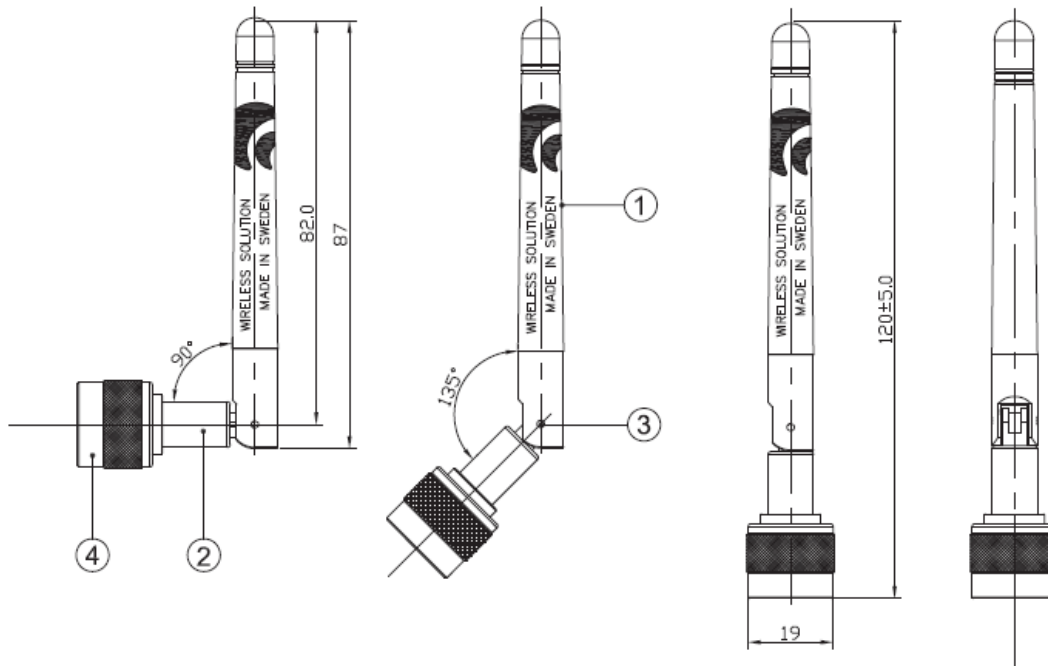


### 5.4.4 A40503 W-DMX Indoor 7dBi Antenna 2.4GHz

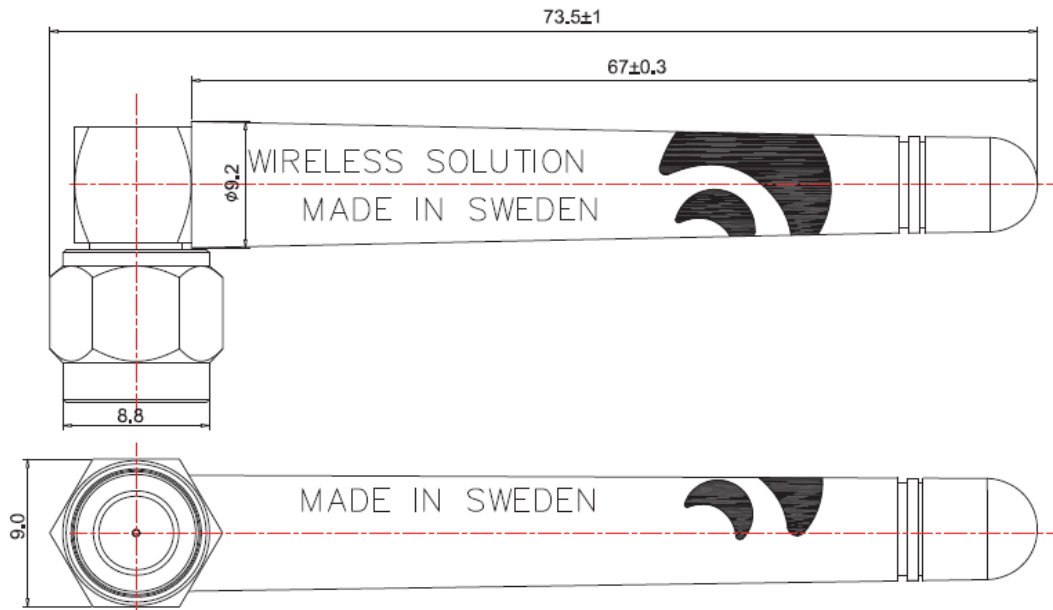




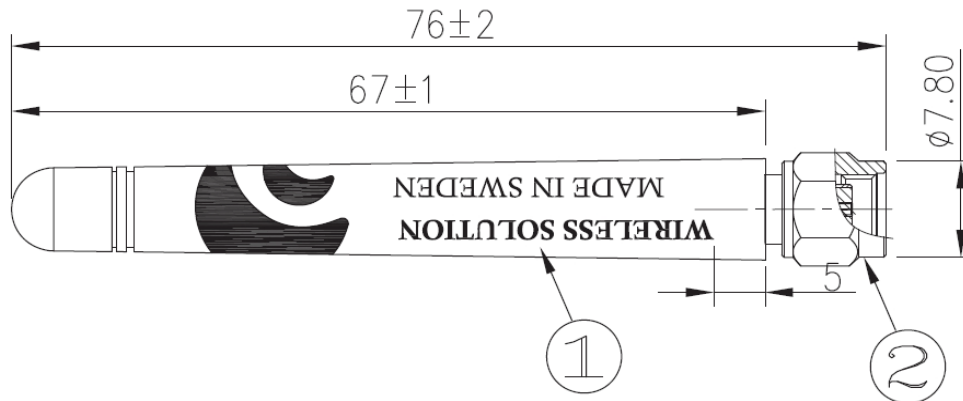
### 5.4.5 A40517G4B W-DMX Indoor Mini 2dBi Antenna 2.4GHz



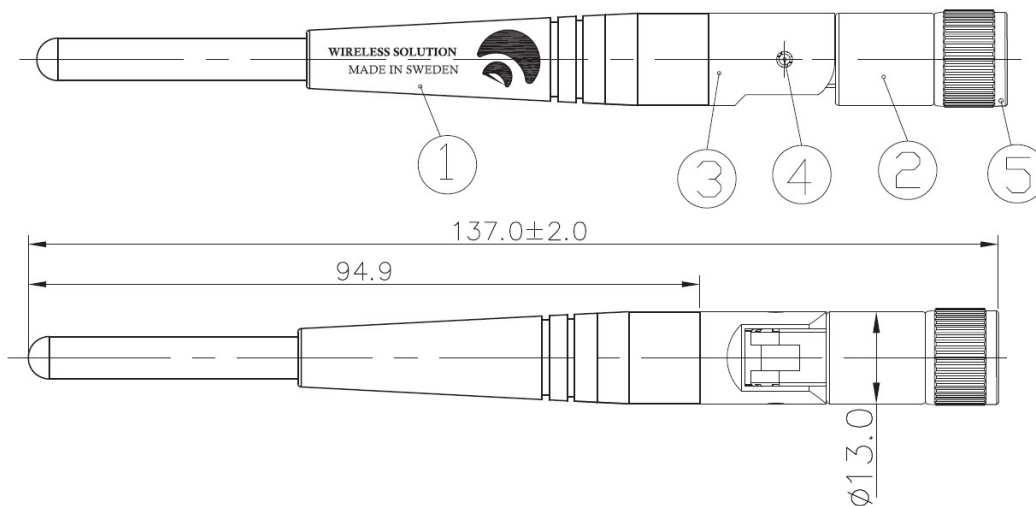
### 5.4.6 A40520 W-DMX Indoor Mini 2dBi Antenna 2.4GHz



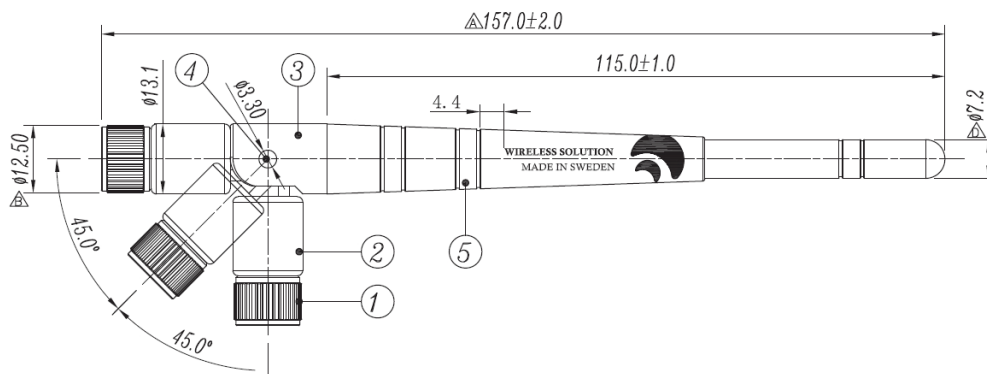
### 5.4.7 A40529 W-DMX Indoor Mini 2dBi Antenna 2.4GHz



### 5.4.8 A40525G4 W-DMX Indoor 2dBi Heavy Duty. 360x320

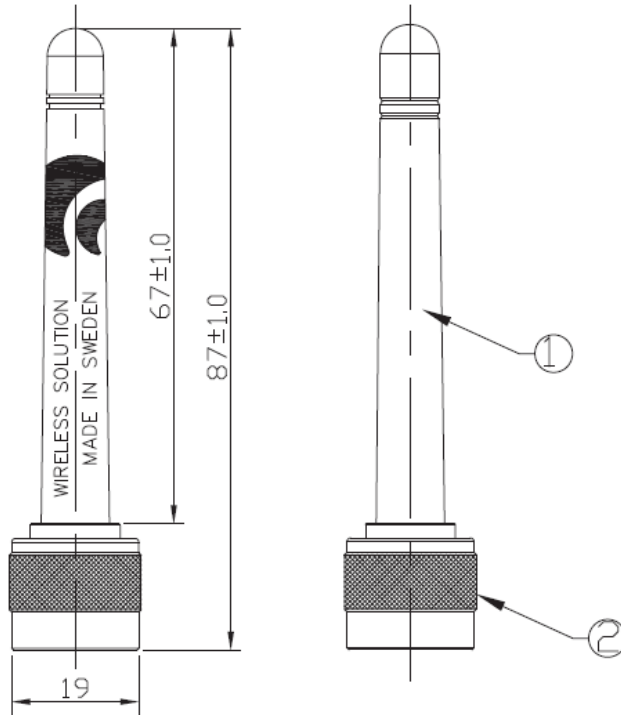


### 5.4.9 A40527G4 W-DMX Indoor 3dBi Heavy Duty. 360x280 degrees.



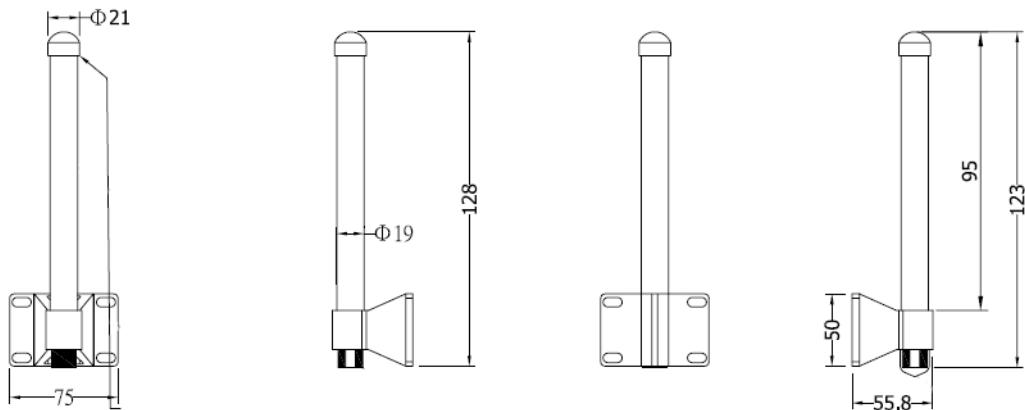
## 5.5 Outdoor Antennas

### 5.5.1 A40516G4(B/W) W-DMX Outdoor Mini 2dBi Antenna 2.4GHz

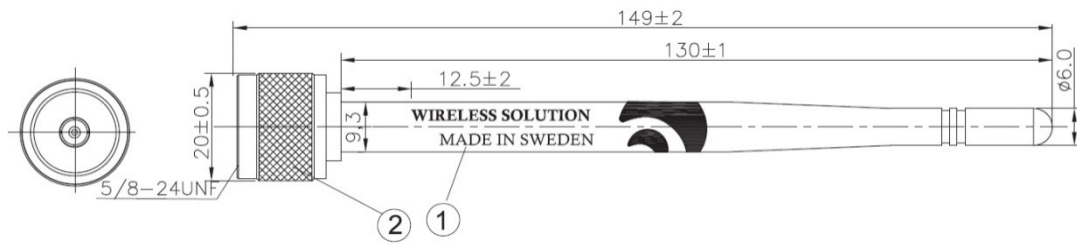


Note that this antenna is available in Black (A40516G4B) and White (A40516G4W)

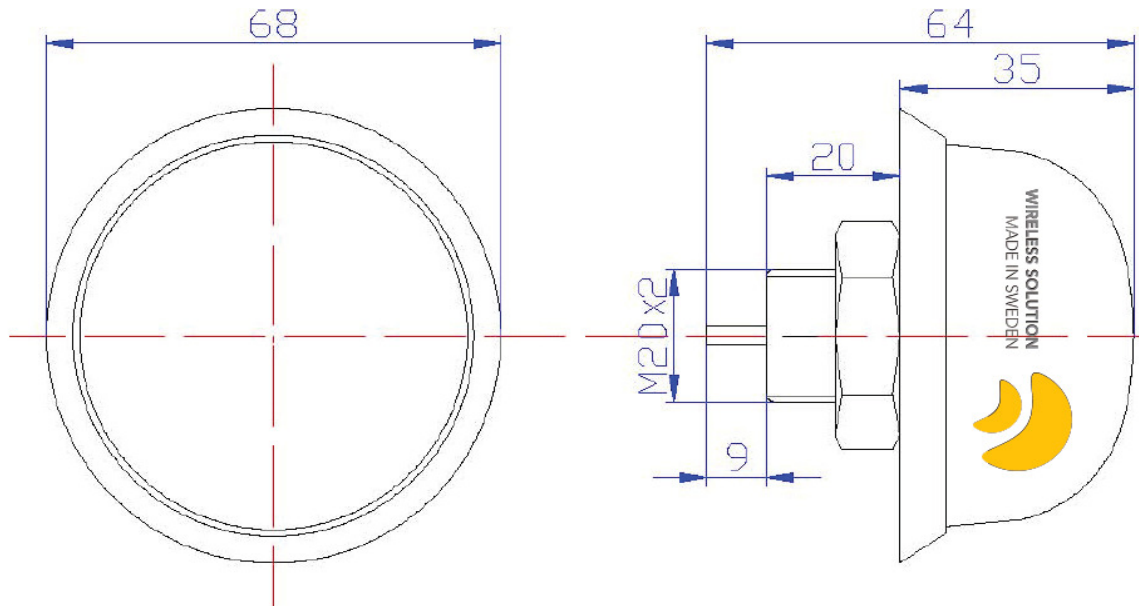
### 5.5.2 A40512 W-DMX Outdoor 2dBi/4dBi Dualband Antenna 2.4/5.8GHz



**5.5.3 A40526G4 W-DMX Outdoor 2/3 dBi. Dual Band 2/3dBi.**



**5.5.4 A40530G4 W-DMX Outdoor Chassi 2dBi Heavy Duty 360x280 degrees.**

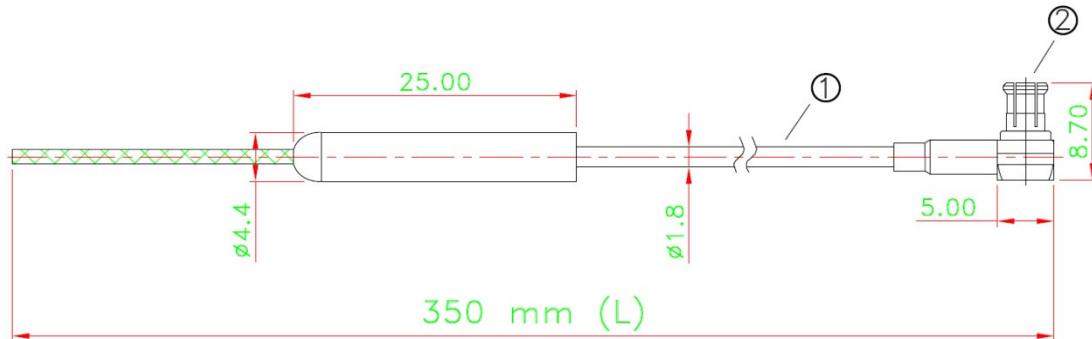






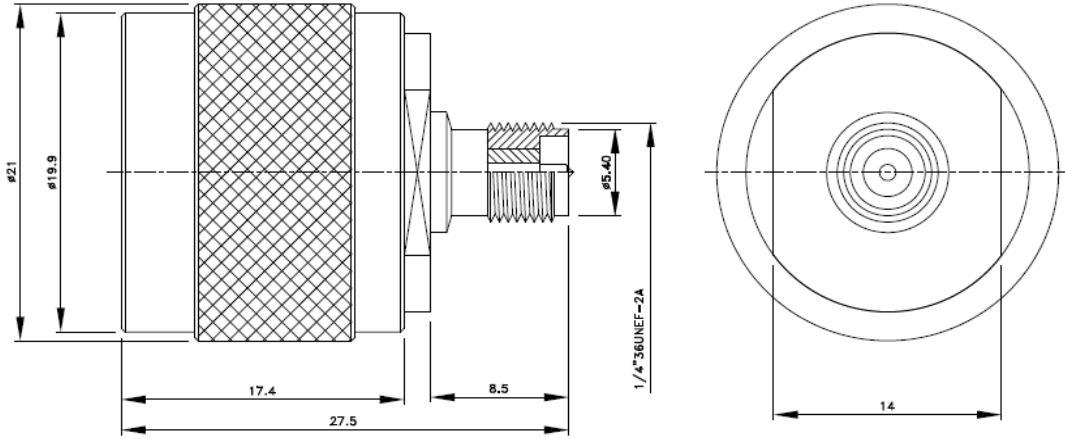
## 5.6 OEM Antennas

### 5.6.1 A40523 W-DMX Internal OEM Antenna 2.4GHz



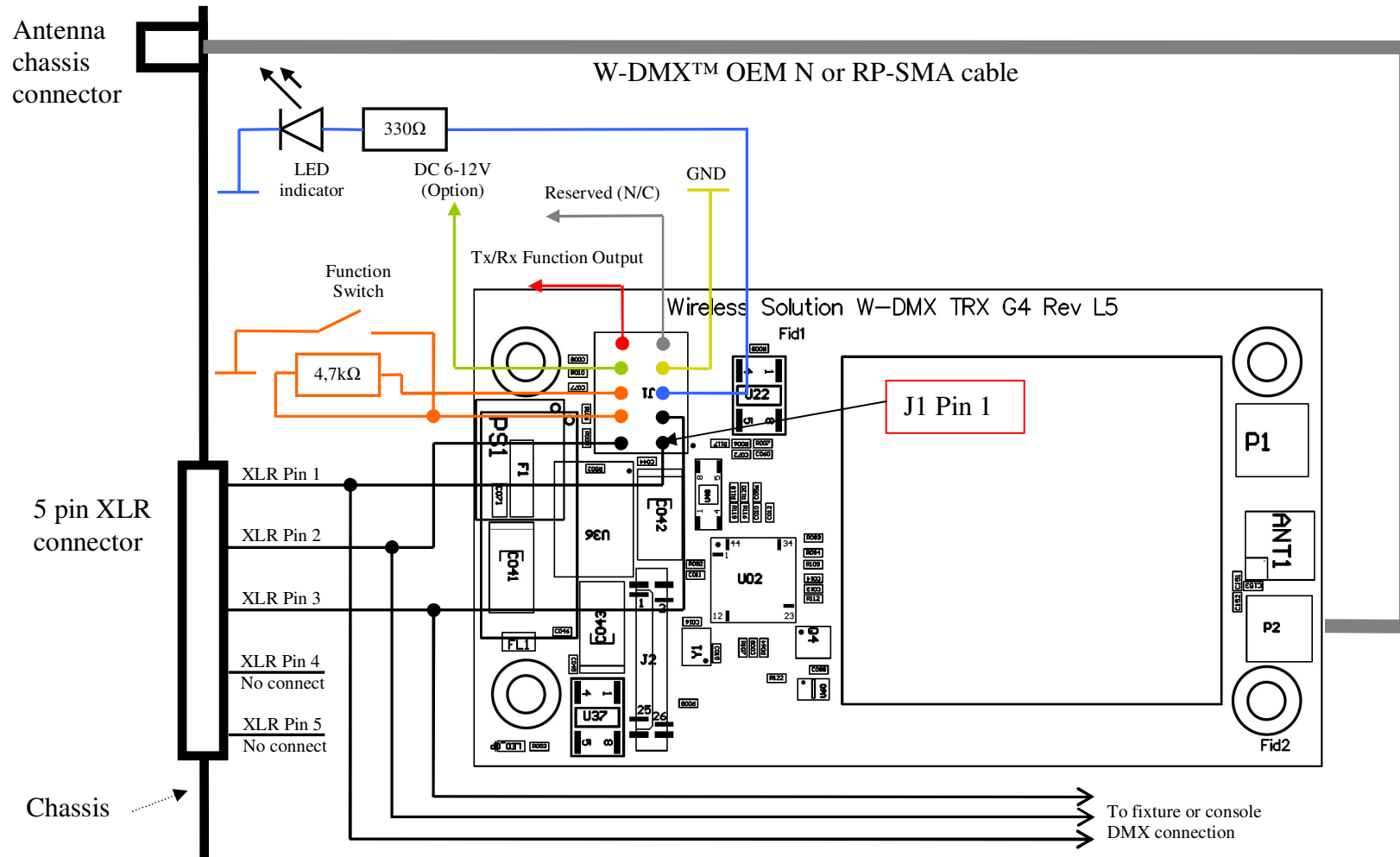
## 5.7 Accessories

### 5.7.1 A40621 W-DMX N to RP-SMA Antenna Adaptor





## 6 Typical Operating Circuit



## 7 Power indicator

The W-DMX OEM card is equipped with an on-board Power Indicator LED designated LED 1 in Figure 8. The LED is lit to indicate power is supplied correct to the card.

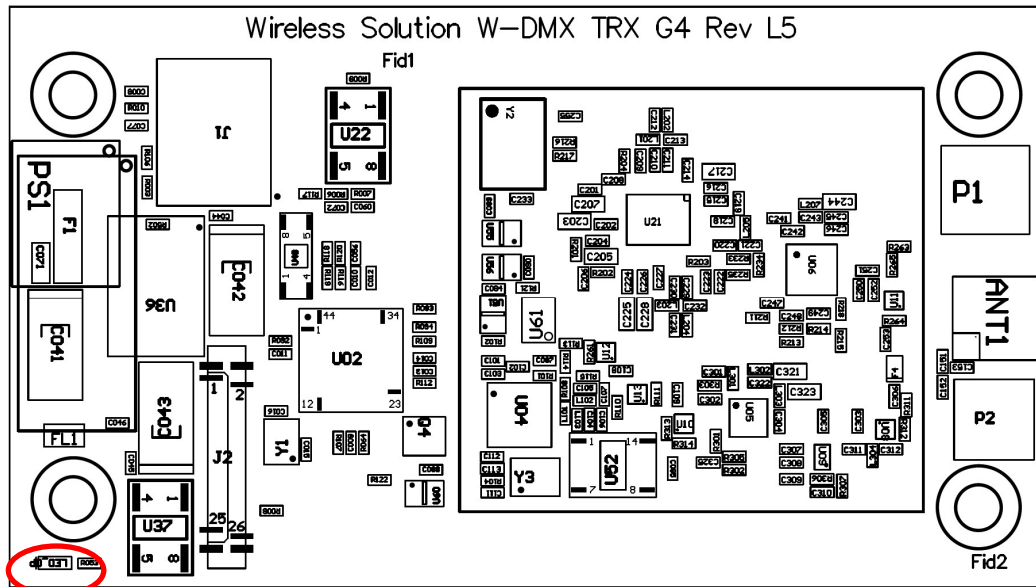


Figure 8: Power Indicator LED Location

## 8 Loss of DMX or Radio Link

Recovery of DMX at the receiving end after loss and resumption of DMX signal at the transmitter is within 5 ms.

Recovery after complete loss of the radio link is less than 50ms. Recovery of the radio link after partial loss (i.e. the loss of a single radio packet due to spurious interference) is less than 1 ms.

A W-DMX TRX OEM receiver card will turn its DMX/RDM output into a DMX/RDM input upon loss of DMX at the transmitter, or loss of radio link at the receiver.

The W-DMX G4 radio protocol duplicates packets sent over the air, and distributes them on different frequencies, thereby greatly improving reliability and data fidelity, and greatly reducing the chance of data loss caused by spurious interference when compared to other Wireless DMX products. If all redundant packets are lost, and a packet of DMX data (consisting of approximately 20 DMX slots) is not received at the receiver (a highly unlikely scenario), DMX data buffered from the previous DMX frame is output in its place to ensure continuity of data. In W-DMX literature, we refer to this data redundancy system as ‘datasafe’ technology. Note, however, that as DMX is a streaming protocol, our QoS is at the same level as DMX, and as such, if the DMX link is used for command or control data, the client should implement a data integrity mechanism at a layer above the W-DMX transport layer.



## 9 Loss of Power

All configuration information is stored in non-volatile memory and will not be lost upon loss of power to the card. Configuration information includes system setup and unit settings for power level and hopping pattern, as well as connection information for the previous transmitter the unit was connected to. The non-volatile memory will retain its information for a minimum of 10 years without power.

Upon loss of power to the card the DMX output of the receiver and the DMX input of the transmitter will go into a high impedance state.

Resumption of wireless transmission and reception of data takes place approximately 500 ms after power is reapplied to the card.



## 10 Interface Connector J1

DC power supply, the DMX signal, the user interface and optional extended functionality is connected via a standard 2 x 5 position 2.54mm (10 position dual row 0.1”) pin header designated as J1 on the card and located as depicted in Section 6, Typical Operating Circuit. The functions of the individual J1 pins are listed in Table 2 and the physical layout of the J1 connector is depicted in Figure 9.

Pin 1, 2, and 3 of J1 will function as a DMX/RDM input on a Transmitter card and as a DMX/RDM output on a Receiver card.

No provisions are made on the W-DMX OEM TRX card for the secondary DMX data connections or any other form of data that is optionally carried by Pin 4 & 5 on 5 pin DMX XLR connectors, and as such these two extra pins should never be connected to any pin the radiocard.

Pin 9 should be left disconnected, as its previous functionality (signal strength measurement) is not recommended for use in the G4 series of radiocard (this is replaced with the SPI interface as detailed later in this document).

In the standard series of cards, pin 10 functions as an output, indicating whether the unit is in the Rx or Tx mode (applicable for the micro and pro series of radiocard). If pin 10 is low (0V), the radiocard is in Tx mode. If the pin is high (5V), the radiocard is in Rx mode. To toggle between modes, push and hold the function button (this could be done with a microprocessor as described later) and cycle the supplied power. It should be noted that when this is done, pin 10 will indicate the new mode.

It is also possible to order the card with pin 10 as an input, for the Flex series of cards. If this model of card is ordered, pulling pin 10 low and cycling power to the card will put the card in Tx mode. Similarly, pulling pin 10 high and cycling power will put the card into Rx mode. The card takes the setting selected 500ms after power is re-applied to the card. Changing the level of pin 10 while power is still supplied to the card will not change the operating mode of the card.

Note that the radiocard Rx/Tx mode setup time is 500ms; i.e. the radiocard will take its setting up to 500ms from supplying power to the radiocard.

**WARNING! If the optional 6-12V power supply is fitted, do not supply voltages to Pin 6 and Pin 8 simultaneously. These two DC voltage supply pins are mutually exclusive and connecting both of them at the same time will cause catastrophic failure and permanently damage the card. If the 6-12V DC power supply is not fitted, pin 8 is connected to the 5VDC power supply. Under no circumstances should you connect this pin to any voltage higher than 5VDC unless you have specifically ordered the non-standard 6-12VDC version of the card.**

Note that pin 8 (6 – 12V power supply) is not standard on the radiocard. This is available as an option for customers who do not wish to use the 5V supply, and must be ordered specially with the additional voltage option.

Pin no	Pin function	Notes
1	DMX Link Common (DMX GND)	XLR Pin 1
2	DMX Data1 – (DMX Primary Complement)	XLR Pin 2
3	DMX Data1 + (DMX Primary True)	XLR Pin 3
4	Function Switch	Input
5	Signal LED pin	Output
6	DC input 5 ±0,1V Regulated	WARNING!
7	GND	Power Supply
8	DC Input 6 - 12V Unregulated (Option on all models) <b>OR</b> DC Input 5 ±0,1V Regulated (Micro and Pro)	WARNING!
9	Signal Strength Measurement (Rx Only) - Deprecated	Output
10	Tx/Rx Indicator (Pro/Micro Only)	Output

Table 2: Connector J1 Pin Functions

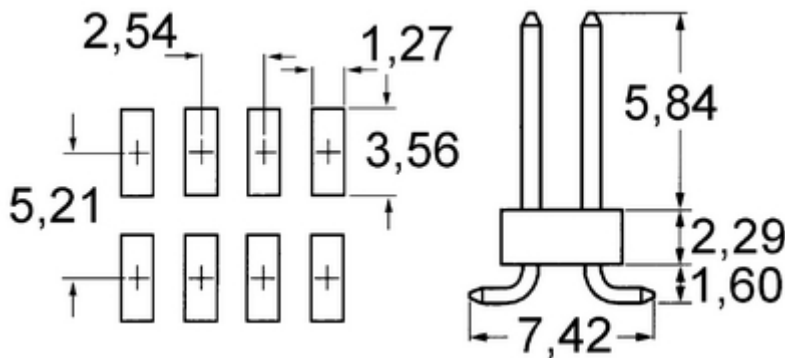


Figure 9: Connector J1 Dimensions and Pad Layout, Metric.

## 11 User Interface

The basic, minimum W-DMX OEM TRX user interface consists of a normally open momentary switch closure, typically referred to as the Function Switch for user input and an LED Indicator output for operational status indication. For products with a very minimal user interface, or for cost-sensitive products, it is recommended that this interface is chosen.

An alternative to an electro mechanical switch for the Function Switch input and the LED Indicator output is to connect these to a microprocessor on the host device and utilize its user interface to facilitate these functions. A description of such an interface arrangement is described in the Section 11.4 Interface to a Microcontroller on page 34. Note that, on transceiver cards, to change the mode of the card, power to the gate should be controllable from the host microprocessor.

A better alternative, if the user wishes to control the explicitly features of the radiocard without the long timing loops associated with the method of interfacing with a microprocessor above, and if the user wants to access features above the basic log-in and log-out of the function switch, is to use the RDM interface (Tx models/modes only) or the SPI interface provided (all models). The commands available on the SPI and RDM interface are listed in the SPI and RDM section of this document.

**NOTE! Presence of Function Switch and the LED Indicator is the minimum mandatory requirement for basic OEM implementations.**

## 11.1 Function Switch

The Function Switch is connected between J1 pin 4, the Function Switch Input, and pin 7, GND. For proper operation a pull-up resistor between pin 4 and pin 6, +5V, must also be included. The recommended value for this resistor is 4,7kΩ. An open switch will pull pin 4 up to +5V (logic High) and a switch closure will pull Pin 4 down to GND (logic Low).

On the ‘Flex’ cards, to change between transmit and receive modes on transceivers cards, disconnect power to the card (either electrically or manually), push and hold the function button on the card, then re-connect power to the card. Wait for 1-3 seconds, then release the function button. The mode will change between transmit and receive, and the J1 Pin 10 Tx/Rx indicator will indicate the mode the card has toggled to. This functionality is not available on the cards with the option where Pin 10 is the mode change input.

Transceiver cards, when in Transmit mode, are able to change between G3 ‘backward compatible’ modes, and G4 mode for transmitted signals, and are also able to select G4 5.8GHz operation (dualband model only). To change mode, effectively push and hold the button for more than 10 seconds, until such a time that the status LED output enters a blinking pattern with a long pause, followed by one two three successive blinks. A single blink in this pattern indicates the card is in G3 mode, two blinks indicate G4 2.45GHz mode, and three blinks indicate G4 5.8GHz mode. To change between modes, push quickly on the function button, which will allow you to cycle through all available modes. When ready to save the mode, disconnect power, and re-connect. The card will then have the mode saved.

Note it is also possible to change the mode through RDM, which can be a better user experience in some cases. Please read the documentation further in this document on RDM functionality, or consult Wireless Solution if you are interested in the RDM capability of the card.

The functionality provided by the “Function Switch” input and its timing parameters are described in Table 3.

Please refer to the User Manual for our standard W-DMX Black Box products for a more detailed description of the operational functionality. Note that, for the transmitter version of the card, this has changed slightly from previous models.

Transceiver Function	Push	Switch Operation	Pin 4
Idle / Normal Operation	No	Open	High
Add Receivers	Momentary	Closure for >100ms – <3s	Low
Disconnect all Receivers	Long	Closure for <10s	Low
Toggle Transmitter Mode and Receiver Mode	Long	Card powered off, then closure, then card powered on, released 1-3s after card is powered on	Low
Enter change-mode functionality (to change between G3 and G4 modes)	Long	Closure for > 10s	Low

and frequency bands)			
Change between modes (once entered into change-mode functionality)	Short	Closure for >100ms - <3s	Low
Save Mode	-	Disconnect power, re-connect power to the card	-

Receiver Function	Push	Switch Operation	Pin 4
Idle / Normal Operation	No	Open	High
Unlink from a Transmitter	Long	Closure for >3s	Low



**Table 3: Function Switch.**

## 11.2 LED Indicator

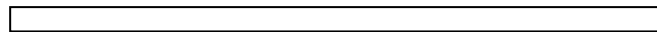
The LED indicator is connected between J1 pin 5, LED output, and pin 7, GND, via a series resistor.

The recommended series resistor value is 330Ω. This value will provide 10mA of drive current for the LED. A maximum of 20mA at 5V is available on this output.

You will find the indications provided by the LED illustrated below.

 / “Off” denotes a dark LED and  / “On” denotes a lit LED.

### 11.2.1 LED Indication - Receiver:



Continuously Off = not assigned to a transmitter



On 900ms / Off 100ms = assigned to a transmitter, but no DMX present



Continuously On = assigned to a transmitter and DMX present



On 100ms / Off 100ms = link to transmitter lost or linking to transmitter



### 11.2.2 LED Indication - Transmitter:



On 900ms / Off 100ms = no DMX present



Continuously On = DMX present



On 100ms / Off 100ms = linking receivers



On 500ms / Off 500ms = linking all receivers (Generation 3  
Compatibility Mode)





## 11.3 SPI Interface

W-DMX has an SPI interface available on an optional secondary connector (J2) that allows a microprocessor to communicate directly with the radiocard. This is the FFC connector adjacent to the J1 2x5 pin header.

It is expected that SPI is used on receiver PCBs integrated into lighting fixtures to allow OEM manufacturers to deeply integrate W-DMX functionality into the product, without having the timing loops associated with the 'push button' method of control. This will allow advanced control and status checking of the W-DMX system straight from the menu system of any product.

The maximum speed the SPI interface can be run at is 8Mbps full duplex mode. The radiocard is run in SPI master mode, i.e. SPI\_IRQ pin must be pulled low to initiate communication with the radiocard. The pin-out is as follows:

Pin Number	Function
4 – OUTPUT	~SS (Slave Select)
6 – OUTPUT	MOSI (Master Output Slave Input)
8 – INPUT	MISO (Master Input Slave Output)
10 – OUTPUT	SCK (Serial Clock)
24 – INPUT	~SPI_IRQ (Communication Request Pin)

During normal operation, pin 24 should be pulled high. Further details of the SPI interface will be given in later revisions of this document or on request, however individuals who wish to use the SPI functionality should prepare for this by connecting the ~SS and ~SPI\_IRQ pins to interrupt enabled pins on their host microprocessor, and the MOSI, MISO and SCK pins to the respective SPI controller pins on their MCU.

The SPI commands available will be identical to those available over the RDM interface.

Further information on the J2 connector can be obtained from Wireless Solution on request.

## 11.4 Interface to a Microcontroller

**NOTE! Function Switch and the LED Indicator functionality is mandatory for OEM implementations.**

An often desired approach to integration of the W-DMX OEM TRX card into a host device is to interface the Function Switch input and LED Indicator output to the host system's microcontroller and utilize its existing user interface facilities and display.

## 11.5 Function Switch

A mechanical Function Switch may be replaced by an externally controlled connection to the Function Switch input interfaced directly or via a buffer circuit to a microcontroller or similar device.

See the Section 11.1 Function Switch on page 30 in this document and the User Manual for our standard W-DMX Black Box products for a more detailed description of the operational functionality of this input.

### 11.5.1 Function Switch Electrical Requirements

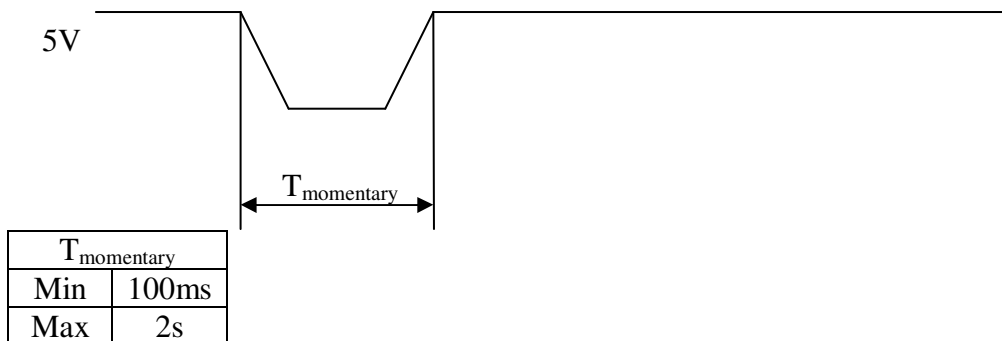
The J1 pin 4 Function Switch input accepts standard TTL voltage levels per Table 4.

J1 pin 4 Logic Voltage Levels		
	Min	Max
High	3.0V	5.0V
Low	0.0V	1.5V

Table 4: J1 pin 4 Logic Voltage Levels.

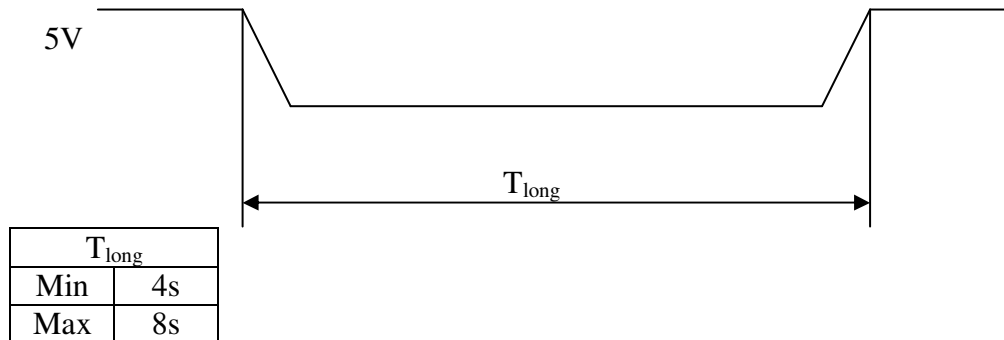
### 11.5.2 TRX TX Timing Requirements: Add Receivers

Apply the following timing to activate the "Add Receivers" function:



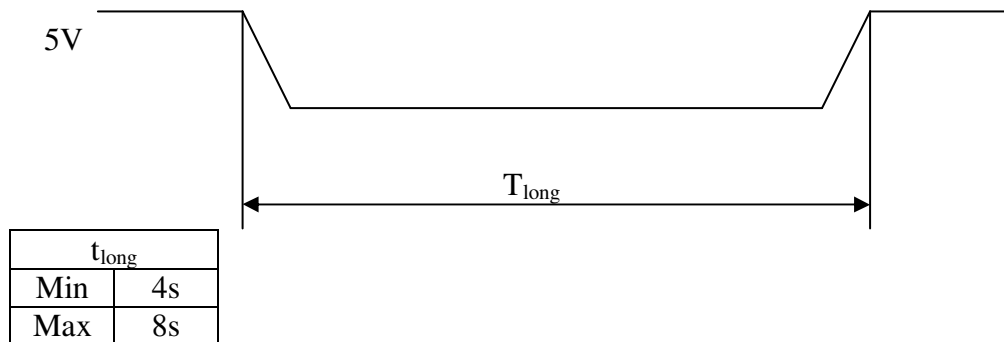
### 11.5.3 TRX TX Timing Requirements: Link Receivers

Apply the following timing to activate the “Link Receivers” function:



### 11.5.4 TRX RX Timing Requirements: Unlink from a Transmitter

Apply the following timing to activate the “Unlink from a Transmitter” function:



## 11.6 LED Indicator

The LED output on connector J1 Pin 5 is a standard TTL level output signal.

A description of the indicator behaviour can be found in Section 11.2 LED Indicator.

## 11.7 Software updates

### 11.7.1 Concept

The W-DMX device is equipped with a so called boot loader which allows upgrade to the firmware.

### 11.7.2 Design considerations

Keep balanced signals close together.

## 12 DMX TTL Levels

DMX TTL levels are available on the optional J2 FFC cable connector, should a user wish to bypass the RS485 interface for DMX/RDM input and output. This can result in cost savings for a finished product integrating W-DMX OEM cards, as the manufacturer does not need an RS485 line driver to interface with the product. The associated pins on the J2 connector are as follows:



<b>Pin No</b>	<b>Function</b>
J2:20	DMX TTL Input
J2:21, J2:22	DMX TTL Output
J2:23	DMX TTL Input Enable (bring this pin high if you are using the DMX TTL input (disables the RS485 line driver on the card)
J2:12	DMX Data Direction (High is active output, low is active input) – used to control the direction pins on an external RS485 driver



## 13 Specifications

**WARNING! Do not exceed the values in this specification. Values outside this specification might cause catastrophic failure and permanently damage the card.**

### 13.1 Electrical Specifications

**WARNING! Do not connect 5V DC (pin 6) and DC input (pin 8) simultaneously, if you are using a board fitted with the option 6-32V power supply.**

Parameter	Min.	Typ.	Max.	Unit
<b>DC Supply</b>				
DC input voltage <sup>1</sup> (Optional)	6		12	V
5V DC input <sup>2</sup>	4.9	5.0	5.1	V
LED Pin output source current			20	mA
<b>DMX interface</b>				
Maximum number of units on the DMX bus	As DMX Standard			
Maximum data rate <sup>3</sup>		250		kbps
ESD protection, human body model		±15		kV
<b>RF characteristics (2.4GHz)</b>				
Maximum Output Power	20		26.0 <sup>4</sup>	dBm
	100		400 <sup>4</sup>	mW
Frequency Range of operation	2402		2479	MHz
Channel bandwidth		1		MHz
Sensitivity at 0.1% BER		-96		dBm
Range with standard 2dBi antenna (measured) <sup>6</sup>		500		m
<b>RF characteristics (5.8GHz)</b>				
Maximum Output Power	-		27.0	dBm
	-		500	mW
Frequency Range of operation	5742		5825	MHz
Channel bandwidth		1		MHz
Sensitivity at 0.1% BER		-96		dBm
Range with standard 4dBi antenna (measured) <sup>8</sup>		400		m

<sup>1</sup> Do not connect Pin 6 when voltage is applied to the DC input on Pin 8.

<sup>2</sup> Do not connect Pin 8 when voltage is applied to the 5V DC input on Pin 6.

<sup>3</sup> Slew rate limited for minimum of EMI in un-terminated networks.

<sup>4</sup> Note that national and/or local regulations might mandate the RF output power to be lower than the stated maximum in this specification.

<sup>6</sup> Measured in a typical urban environment.

<sup>8</sup> Measured in a typical urban environment.



## Environmental requirements

Parameter	Min.	Typ.	Max.	Unit
Operating Temperature	-20		80 <sup>1</sup>	°C
Humidity <sup>2</sup>	20		80	%

---

<sup>1</sup> Consult with Wireless Solution for temperatures exceeding 80°C.

<sup>2</sup> Non-condensing.

<sup>5</sup> For 5.8GHz Operation only. For 2.4GHz operation, refer to the current consumption on A40902



## Appendix 1. Order Codes

### Radiocards

Order Code	Name	Notes
A40900G4	Pico G4 Receiver, Internal Antenna, 2.45GHz	Standard 2.4GHz radiocard with internal antenna - note limited in distance.
A40901G4	Pico G4 Receiver, MCX Connector, 2.45GHz	Standard 2.4GHz radiocard with external antenna.
A40902G4	Micro G4, Transceiver, MCX Antenna. DMX/RDM. 2,45GHz	2.45GHz card that be changeable between transmit and receive. Supports full RDM.
A40903G4	Micro G4, Transceiver, Internal Antenna. DMX/RDM. 2,45GHz	2.45GHz card that be changeable between transmit and receive. Supports full RDM.
A40904G4	PRO G4, Transceiver, MCX Connector. DMX/RDM. 2,45GHz + 5,8GHz	Dualband, changeable between transmit and receive. Supports full RDM.
A40905G4	Pico G4 Receiver, MCX Connector. 2,45GHz + 5,8GHz.	Receive only card, on dual bands.

Note: All cards have 5V input only. For an additional 6-32V input, please contact Wireless Solution.



## Antenna Cables

Order Code	Name	Notes
A40920	W-DMX 20cm Antenna Cable MCX - Chassi N Female Connector.	Mandatory for IP-65 products
A40921	W-DMX 20cm Antenna Cable MCX - RP-SMA Chassi Connector	Indoor use only
A40922	W-DMX 40cm Antenna Cable MCX - RP-SMA Chassi Connector	Indoor use only
A40924	W-DMX 30cm Antenna Cable MCX - RP-SMA Female Flange.	Indoor use only
A40925	W-DMX 2x5 Pin flat Cable for radio card pin header	
A40926	W-DMX 26 Pin flat Cable for SPI Interface	

Note: If the standard cables above do not meet your requirements, custom cables can be provided. Contact Wireless Solution for more information.





## Antennas

Order Code	Name	Notes
A40501	Indoor 2dBi Omni Antenna. 2.45GHz	Standard, recommended antenna for 2.4GHz radiocards
A40502	Indoor 5dBi Omni Antenna. 2,45GHz	Higher gain antenna in 2.4GHz for greater range, indoor use and light/rental outdoor use only
A40504	Outdoor 2dBi Omni Antenna. 2,45GHz	Standard for IP-65 equipment for 2.4GHz radiocards
A40511	Indoor Omni Antenna. 2dBi 2,45GHz, 4dBi 5,8GHz	Standard, recommended antenna for 2.4GHz and 5.8GHz dualband radiocards
A40512	Outdoor 2dBi Omni 2,45 GHz Antenna, 4dBi 5,8GHz	Standard for IP-65 equipment for 2.4GHz and 5.8GHz dualband radiocards
A40511G4	Indoor 2/4dBi Omni Dualband, 2,45/5.8GHz 360/240 opening angle	Standard, recommended antenna for 2.45/5.8GHz dualband radiocards. Antenna used as standard in all W-DMX products.
A40520	Indoor 2dBi Omni 2,45 GHz Antenna, Mini	Mini antenna, fixed base (right-angled)
A40516G4B	Outdoor 2dBi Omni 2,45 GHz Antenna, Mini, N-Male Connector	Mini antenna, IP-65 for outdoor products, 2.45GHz only, fixed base
A40517G4B	Outdoor 2dBi Omni 2,45 GHz Antenna, Mini, N-Male Connector	Mini antenna, IP-65 for outdoor products, 2.45GHz only, adjustable base
A40529	A40529 W-DMX Indoor Mini 2dBi Antenna 2.4GHz	Mini antenna, IP-65 for indoor products, 2.45GHz only, fixed base
A40523	W-DMX Internal OEM Antenna 2.4GHz	Cable antenna, internal only, 2.45GHz only
A40525G4	W-DMX Indoor 2dBi Heavy Duty. 360x320	RP-SMA connector, internal only, 2.45GHz only
A40526G4	W-DMX Outdoor 2/3 dBi. Dual Band 2/3dBi	N-Type connector, outdoor antenna, dualband
A40527G4	W-DMX Indoor 3dBi Heavy Duty. 360x280 degrees.	RP-SMA Connector, indoor antenna
A40530G4	W-DMX Outdoor Chassi 2dBi Heavy Duty 360x280 degrees.	MCX Connector, outdoor antenna
A40531G4	W-DMX Outdoor Chassi 2dBi Heavy Duty 360x320 degrees.	MCX Connector, outdoor antenna



## Accessories

Order Code	Name	Notes
A40621	Adapter N Male to RP-SMA Female	Required if customers wishes to use an antenna with an RP-SMA connector (i.e. 2dBi indoor), and are using an N type antenna cable
A40502	Adapter RP-SMA Male to N Female	Required if customers are using an RP-SMA cable, and wish to attach an outdoor antenna to the unit
A40504	Adapter for Extension Cable. N-Female to N-Female	Used to join two N-type antenna cables together.
A40511	Lighting Arrestor N-Male to N-Female	Recommended for outdoor installations, when antenna is highest item in the vicinity.



## Appendix 2. Revision History

### K1

Revision K1 is hardware compatible with revision F of the TRX. Revision K1 is based on revision K of this document.

- Introduction added
- Revision history added
- Table of contents added
- Minor changes in the text on page 4.

### K2

Revision K2 is hardware compatible with revision F of the TRX. Revision K2 is based on revision K1 of this document.

- FCC statement added
- Industry Canada Compliance Statement added

### K3

Revision K3 is hardware compatible with revision F of the TRX. Revision K3 is based on revision K2 of this document.

- Example of antenna adaptors added
- ESD precaution statement added

### K4

Revision K4 is hardware compatible with revision F of the TRX. Revision K4 is based on revision K3 of this document.

- Hole dimensions on page 4 updated

### L1

Revision L1 is hardware compatible with revision F of the TRX. Revision L1 is based on revision K4 of this document, but includes major additions and editorial changes to the document.

- Mechanical dimensions for available W-DMX antenna coaxial cables added.
- DC current consumption specified for all available OEM TRX PCB:s added.
- LED function table added.
- Order codes added.
- Environmental requirements added.

### L3

Revision L3 is hardware compatible with revision F of the TRX. Revision L3 is based on revision L1 of this document.

- Additional information on J1 connections, section 6 added.

### M1

Revision M1 is hardware compatible with revision A of the preliminary G4 design. Revision M1 is based on revision L3 of this document.

- Amended to add information on the functions of pins 9 and 10 on the J1 connector of the radiocard.
- Amended to add RDM commands available on Tx and through Tx to Rx.
- Amended to add basic SPI functionality.

### M2

Revision M2 is hardware compatible with revision A of the preliminary G4 design. Revision M2 is based on revision M1 of this document.

- Corrected ~SPI\_IRQ pin to be pin 24 instead of pin 26.

### M3

Revision M3 is hardware compatible with revision A of the preliminary G4 design. Revision M3 is based on revision M2 of this document.

- Added information on Pin 10 Tx/Rx select.
- Corrected error in minimum frequency range to 2.402 GHz.
- Corrected information in section 21 regarding current consumption of units.

### N1

Revision N1 is hardware compatible with revision A of the preliminary G4 design. Revision N1 is based on revision M3 of this document.



- Revised to add more information on G4 radiocards.

### **P1**

Revision P1 is hardware compatible with revision A of the preliminary G4 design. Revision P1 is based on revision N1 of this document.

- Amended RDM command table.
- Amended SPI interface information.
- Added order codes for W-DMX cards, antennas, cables and accessories.
- General amendments to the document.

### **P2**

Revision P2 is hardware compatible with revision A of the preliminary G4 design. Revision P2 is based on revision P1 of this document.

- Added information on DMX TTL Levels.

### **P3**

Revision P3 is hardware compatible with revision A of the preliminary G4 design. Revision P3 is based on revision P2 of this document.

- Added additional RDM commands.

### **Q3**

Revision P3 is hardware compatible with revision A of the G4 design. Revision Q1 is based on revision P3 of this document.

- Numerous changes and updates

