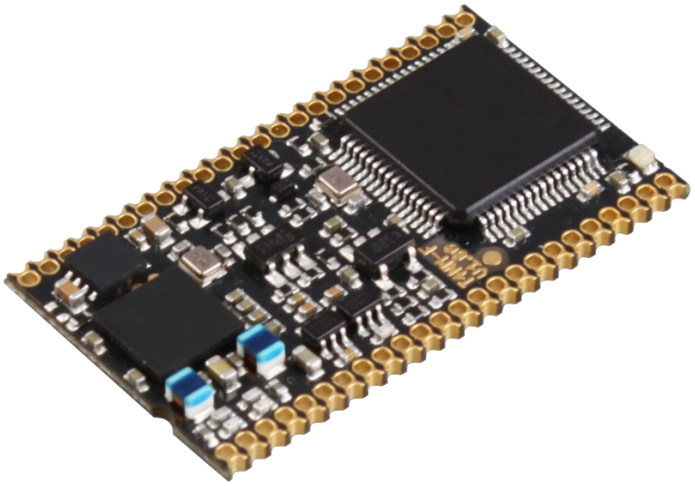
TWN4

MultiTech Nano

DocRev3, July 7, 2017



Elatec GmbH

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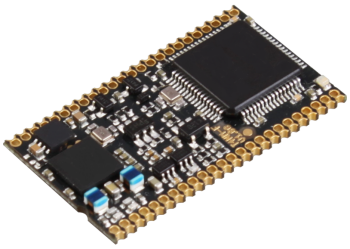
1 Introduction

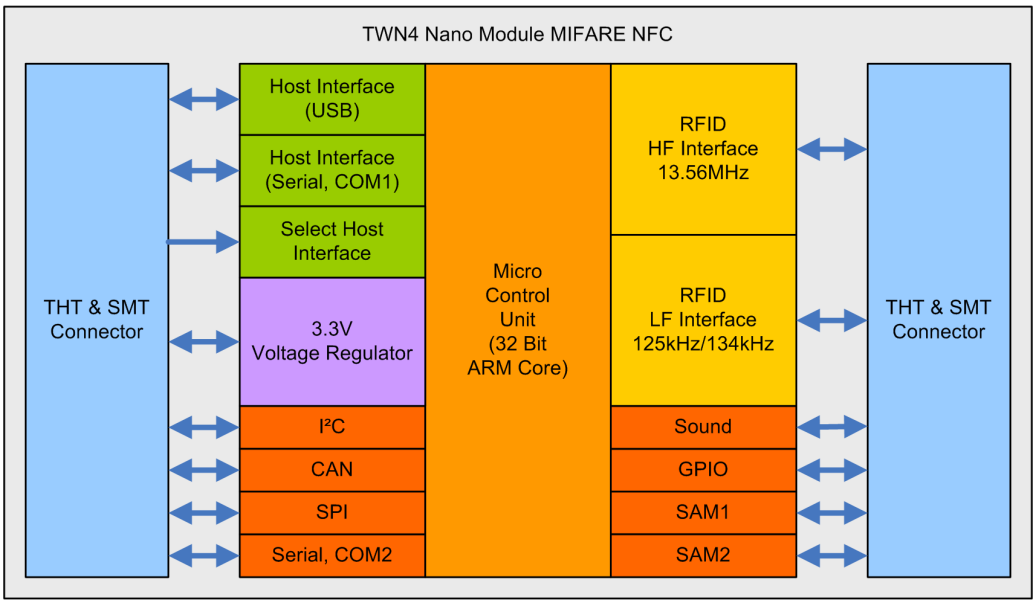
Here is a picture of the TWN4 MultiTech Nano:



Currently, there is one model of TWN4 Nano Module available:

- TWN4 MultiTech Nano

The TWN4 Nano Module contains voltage regulator, control unit, RFID front ends and communication interfaces.



2 Connector and Pin-Out

The TWN4 Nano Module has two rows of pins (24 pins each), which can be used either for THT or SMT mounting on the carrier board. The contact pitch is 1.27mm (50mil).

Pin	Pin Name	Function
1	HF_ANT1	TWN4 MultiTech Nano: Together with pin HF_ANT2, this pin is doing load modulation on antenna 13.56MHz TWN4 MultiTech Nano LEGIC 42: Not connected
2	HF_RXP	TWN4 MultiTech Nano: Together with pin HF_RXN, this pin builds the input from the direct matched antenna 13.56MHz TWN4 MultiTech Nano LEGIC 42: Not connected
3	HF_TX1	TWN4 MultiTech Nano: Together with pin HF_TX2, this pin builds the output to the direct matched antenna 13.56MHz TWN4 MultiTech Nano LEGIC 42: Output for antenna (50 Ohm)
4	GND	Ground
5	HF_TX2	TWN4 MultiTech Nano: Together with pin HF_TX1, this pin builds the output to the direct matched antenna 13.56MHz TWN4 MultiTech Nano LEGIC 42: Not connected
6	HF_RXN	TWN4 MultiTech Nano: Together with pin HF_RXP, this pin builds the input from the direct matched antenna 13.56MHz TWN4 MultiTech Nano LEGIC 42: Not connected
7	HF_ANT2	TWN4 MultiTech Nano: Together with pin HF_ANT1, this pin is doing load modulation on antenna 13.56MHz TWN4 MultiTech Nano LEGIC 42: Not connected
8	LF_ANT1	Output 1 for connecting external 125 kHz / 134.2 kHz antennas
9	LF_ANT2	Output 2 for connecting external 125 kHz / 134.2 kHz antennas
continued on next page. . .		

10	GPIO0	GPIO0, I/O pin for general purposes.
11	GPIO1	GPIO1, I/O pin for general purposes.
12	GPIO2	GPIO2, I/O pin for general purposes.
13	GPIO3	GPIO3, I/O pin for general purposes.
14	GPIO4	GPIO4, I/O pin for general purposes.
15	GPIO5	GPIO5, I/O pin for general purposes.
16	GPIO6	GPIO6, I/O pin for general purposes.
17	GPIO7	GPIO7, I/O pin for general purposes.
18	SAM1_CLK	Clock output for SAM1
19	SAM1_IO	I/O line for SAM1
20	SAM1_RST	Reset output for SAM1
21	GND	Ground
22	SAM2_CLK	Clock output for SAM2
23	SAM2_IO	I/O line for SAM2
24	SAM2_RST	Reset output for SAM2
25	BOOT	Shortcut against ground during reset will guide firmware directly into boot loader
26	SPK+	Digitally modulated output for a speaker. Second connection for the speaker is ground. The impedance of the speaker should be greater than 24 ohm.
27	COM2_TX-	Low active output (logic level, push/pull) of asynchronous TXD from COM2.
28	COM2_RX-	Low active input (logic level) with internal pull-up resistor of asynchronous RXD to COM2.
29	SPI_SS-	Pin SS- of SPI interface
30	SPI_MISO	Pin MISO of SPI interface
31	SPI_MOSI	Pin MOSI of SPI interface
32	SPI_SCK	Pin SCK of SPI interface
33	GND	Ground
34	CAN_TX	TTL TX pin of CAN interface. A external interface circuit is required.
35	CAN_RX	TTL RX pin of CAN interface. A external interface circuit is required.

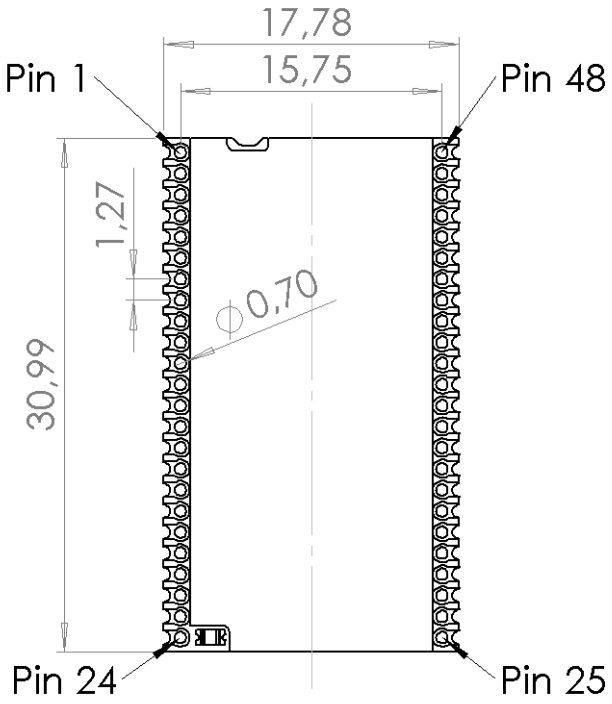
continued on next page. . .

36	I2C_SCL	Clock pin of I2C interface. No internal pull up.
37	I2C_SDA	Data pin of I2C interface. No internal pull up.
38	PWRDWN-	Low active TTL input with internal pull-up resistor for turning off the voltage regulator.
39	RESET-	Low active TTL input with internal pull-up resistor for hard reset.
40	VCC	3.3V power supply input.
41	VREG	3.3V output from on-board voltage regulator
42	HOSTSEL	Host channel selector: Low = COM1, high = USB. This pin is internally pulled high.
43	USB_DM	USB Data -
44	USB_DP	USB Data +
45	COM1_TX-	Low active output (logic level, push/pull) of asynchronous TXD from COM1.
46	COM1_RX-	Low active input (logic level) with internal pull-up resistor of asynchronous RXD to COM1.
47	VIN	Unregulated input to on-board voltage regulator.
48	GND	Ground

2.1 Assembly Information

2.1.1 Dimensions

The dimensions of TWN4 Nano Module are as follows.:



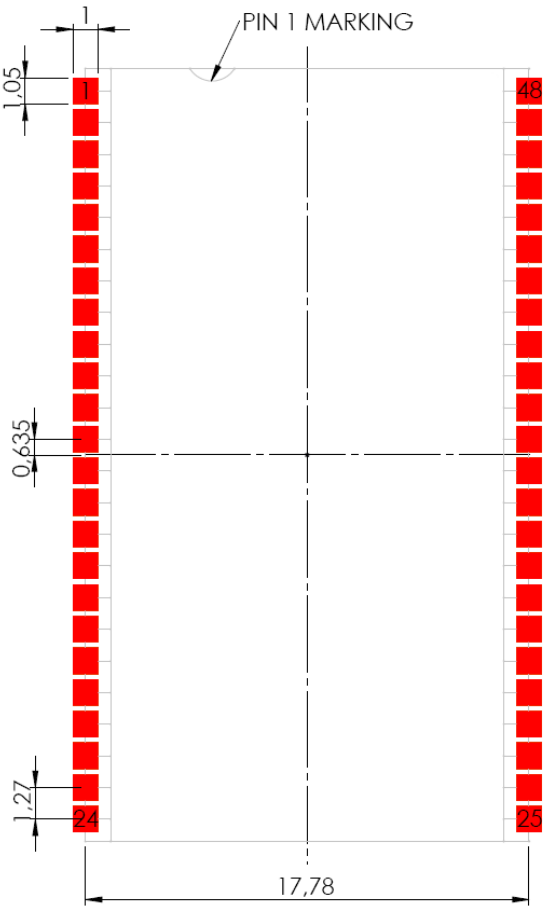
2.1.2 Through-Hole Technology (THT)

Suggested connector for THT assembly is Samtec TMS-124-02-G-S.

In case a detachable connection is required, mating part (to be mounted on carrier board) is Samtec SLM-124-01-G-S.

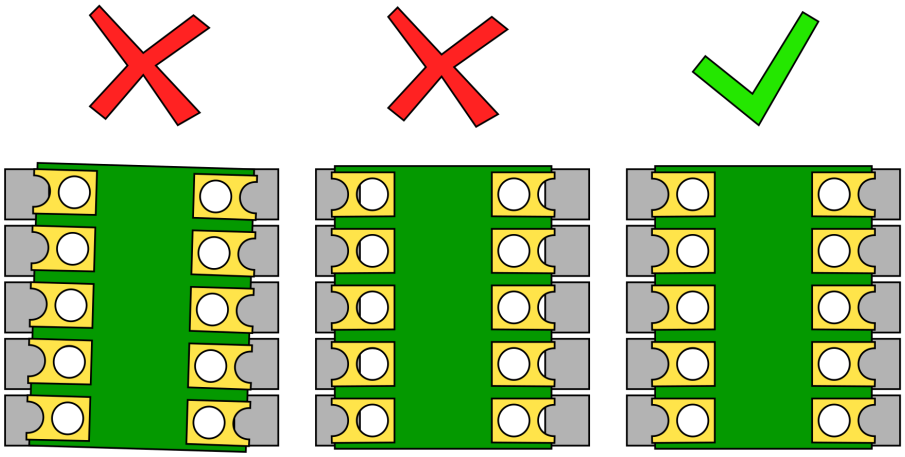
2.1.3 Surface Mount Technology (SMT)

2.1.3.1 Footprint



2.1.3.2 Placement

Please take special care about correct placement of TWN4 MultiTech Nano on the soldering pads. Wrong placement might cause holes for THT assembly to absorb tin from the SMT pads. Please follow these rules:



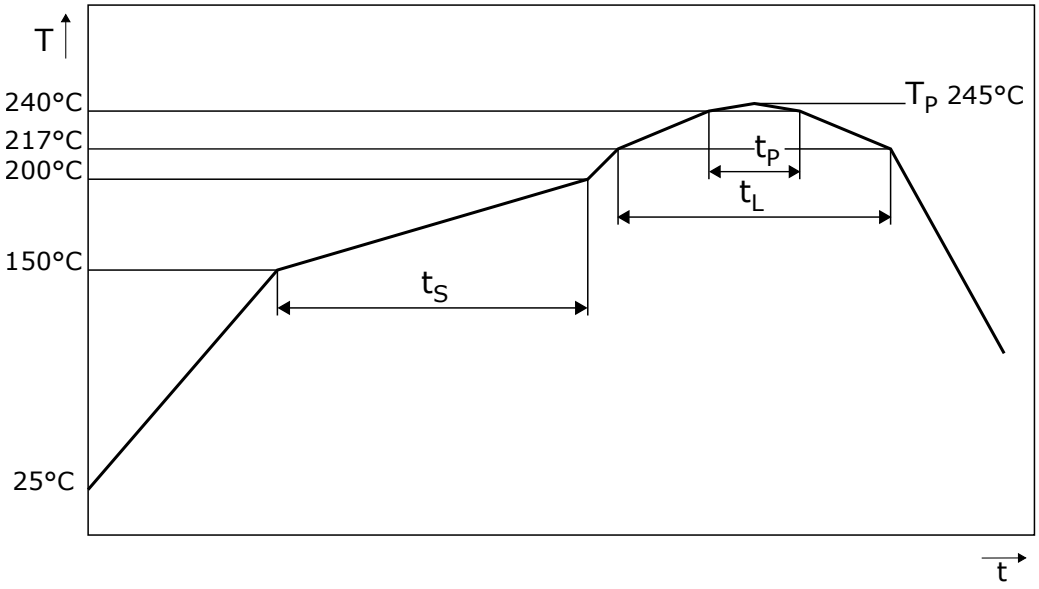
Module is not placed straight on the pads.

Module is not placed centered on the pads.

Module is placed well aligned on the pads.

2.1.3.3 Temperature Profile

For reflow soldering, following temperature profile is recommended:



Ramp-up rate	1-3 K/s
Preheat time (t_s)	60-180 seconds
Time within liquidus temperature (t_L)	60-150 seconds
Peak temperature (T_P)	245 +0/-5 °C
Time within peak (t_P)	10-30 seconds

2.1.3.4 Baking

The TWN4 MultiTech Nano has a moisture sensitivity level (MSL) of 3. This means, that the modules must be baked prior to reflow soldering, if the modules are removed from their sealed dry-bags and not soldered within their out-of-bag time, which is 168 hours.

In this case it is recommended to bake the TWN4 MultiTech Nano for 10 days at 85°C

3 Antenna

3.1 LF-Antenna

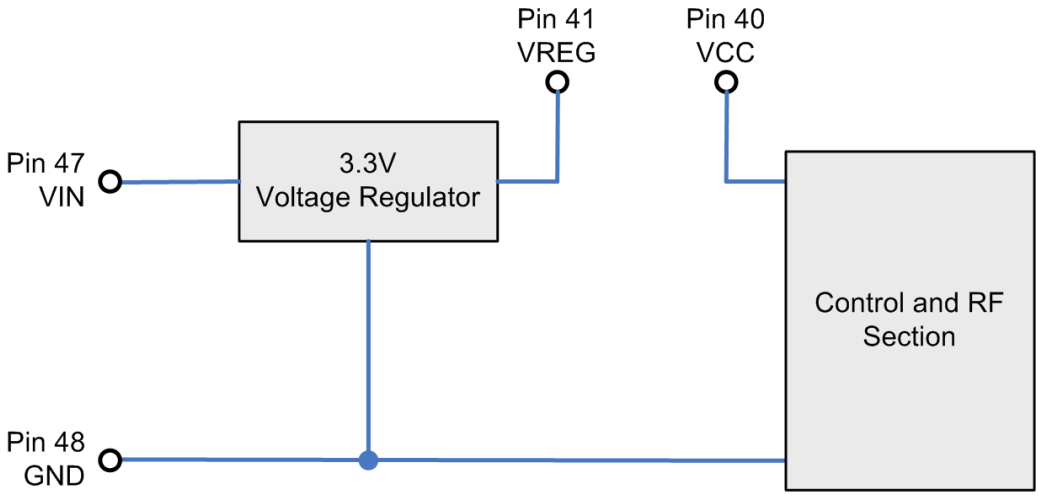
The nominal inductance for an external 125 kHz/134.2 kHz antenna is 490 µH. The series resistance of the antenna should be lower than 10 ohms.

3.2 HF-Antenna

Please see separate document TWN4 Nano Antenna Match Calc Guide DocRev1.pdf and AntennaTuner.exe. AntennaTuner allows to do an antenna design interactively.

4 Power Supply

The picture below is showing how power is routed through TWN4 Nano Module:



5 Power states and current consumption breakdown

The TWN4 Nano Module supports 3 power states that can be used to reduce the current consumption of the reader when the application calls for it.

In Normal state the reader can accommodate a request to search for a high-/low-frequency tag, perform a BLE action or interact with peripherals on short notice; the current consumption in this state is the highest.

In Sleep state the reader is not capable of any of the above, but consumes considerably less current. The reader can be woken by communication on USB/COM ports, predefined timeout, or a Low-Power-Card-Detection (LPCD) event and taken to Normal state.

In Stop state the reader consumes the least current and can be woken up via external/internal interrupt, or a Low-Power-Card-Detection (LPCD) event and taken to Normal state.

Changing the LPCD poll time will change the current consumption, which can be estimated with the following formula:

$$I_{LPCD} = 0.5mA + \frac{0.1mAs}{t_{Poll}[s]}$$

.

Table 5.1 shows the expected *typical* current draw in the 3 states described above, depending on the reader interface connected. It is assumed that a +5V DC Power Source is used. Results vary marginally when +3.3V source is used in the UART-TTL option. The UART-RS232 option was exercised using *MAX3221A* chip.

Host Connection	**USB**	**UART-TTL**
Normal Idle	65	59,4
Sleep	15,0	7,1
Sleep LPCD Option	15,4	7,5
Stop	N/A	0,45
Stop LPCD Option	N/A	0,8

Table 5.1: Typical Current Consumption in Base System States (mA)

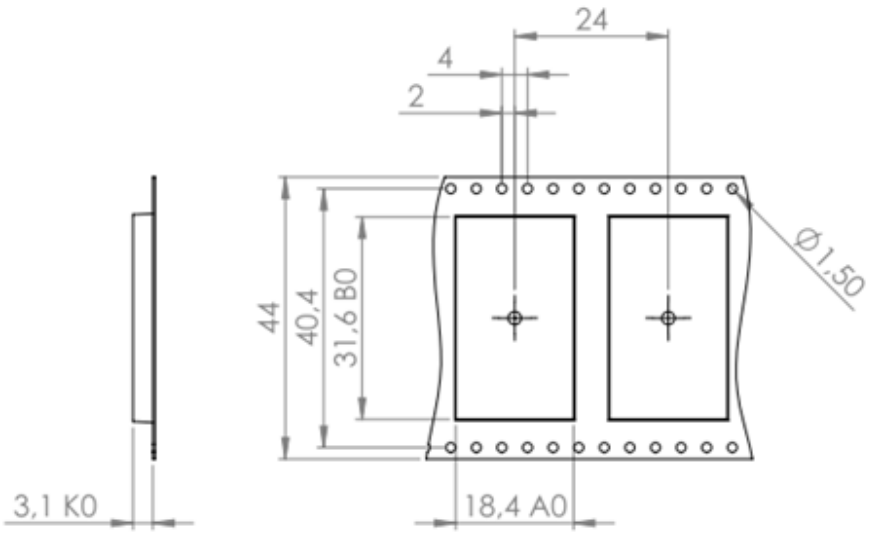
Table 5.2 shows the extra current observed when the TWN4 Nano Module is integrated into a reader (these results are to be taken as example only and are expected to change); these values are to be added to those in the "Normal Idle" base state.

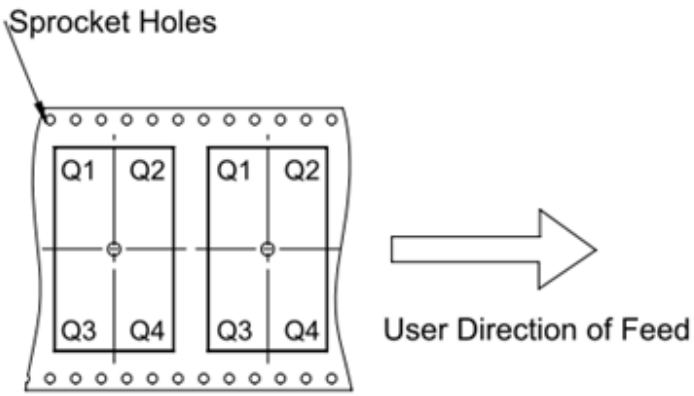
Function	Current Consumption
SearchTag-HF	+130
SearchTag-LF	+25
RS232	+4
BLE Active Packet Reception	+9
BLE Active Transmission (0 dBm output power)	+9
BLE Active Transmission (8 dBm output power)	+24
Speaker Constant Tone	+80

Table 5.2: Extra Current Consumption per Function added to "Normal Idle" base state (mA)

6 Packaging

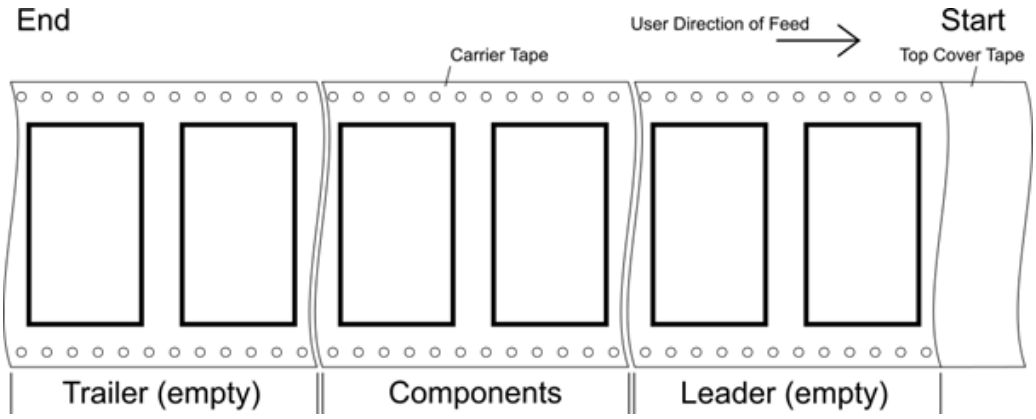
6.1 Carrier Tape





TWN4NanoModule Pin1 Marking: Quadrant Q1

6.2 Dimensions of Tape Leader & Trailer



- Start: Top Cover Tape 1x circumference plus 100mm (minimum 300mm)
- Leader: 10 pitch (minimum 100mm)
- Components: area with packed modules
- Trailer: 1 x circumference (minimum 160mm)

6.3 Package

A moisture barrier bag (MBB) is used to pack the reel (size of MBB according to reel dimension)

The MBB contains:

- The reel with TWN4 MultiTech Nano
- Desiccant packs
- Humidity indicator card

The packed MBB is de-aerated and sealed.

6.4 Label

Manufacturer Logo	 ESD MSL 3
Part number T4NM-FDC0	Version B/B1.08/NCF3.04/PRS1.04
Date code 17050101	Quantity 100

- Part number: Part number (P/N) of contained product as text and barcode (Code 128)
- Version: Hardware version/firmware version
- Date code: Date code and charge number as [YYWWNNPP], where:
  YY = Year, e.g. 17
  WW = Calendar week, e.g. 05
  NN = Production lot in decimal (incremented for each lot), e.g. 01
  PP = Production site, e.g. 01 (internal use only)
- Quantity: Number of modules on reel

6.5 Position of Label

There are two identical labels, one on MBB, one on contained reel. Following positions:

Label on MBB:

Label on reel:

7 Disclaimer

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