ME310G1

HW Design Guide

Telit Technical Documentation

APPLICABILITY TABLE

PRODUCTS
ME310G1-W1
ME310G1-WW
ME310G1-WWV
ME310G1-W2

CONTENTS

1. INTRODUCTION

1.1. Scope

This document introduces the ME310G1 module and presents possible and recommended hardware solutions for the development of a product based on this module. All the features and the solutions described in this document are applicable to all the variants listed in the applicability table.

This document cannot include every hardware solution or every product that can be designed. Where the suggested hardware configurations are not to be considered mandatory, the information provided should be used as a guide and starting point for the proper development of the product with the Telit module.

1.2. Audience

This document is intended for Telit customers, in particular system integrators, who are going to implement their applications using our ME310G1 modules.

1.3 Contact Information, Support

For general contact, technical support services, technical questions and report of documentation errors contact Telit Technical Support at:

- *TS-EMEA@telit.com*
- *TS-AMERICAS@telit.com*
- *TS-APAC@telit.com*

Alternatively, use:

http://www.telit.com/support

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

http://www.telit.com

Our aim is to make this guide as helpful as possible. Keep us informed with your comments and suggestions for improvements.

Telit appreciates the user feedback on our information.

1.4. Symbol Conventions

⚠️	**Danger:** This information MUST be followed or catastrophic equipment failure or personal injury may occur.
✋	**Warning:** Alerts the user on important steps about the module integration.
📌	**Note/Tip:** Provides advice and suggestions that may be useful when integrating the module.
🔺	**Electro-static Discharge:** Notifies the user to take proper grounding precautions before handling the product.

Table 1: Symbol Conventions

All dates are in ISO 8601 format, that is YYYY-MM-DD.

1.5. Related documents

80617ST10991A ME310G1/ME910G1/ML865G1 AT Commands Reference Guide

2. GENERAL PRODUCT DESCRIPTION

2.1. Overview

The ME310G1 module is a CATM / NBIoT communication product that allows integrators to plan availability for even the longest lifecycle applications, highly recommended for new designs specified for worldwide coverage.

The ME310G1-WWV product is fully voice capable, the digital audio interface make it suitable for applications such as voice enabled alarm panels, mHealth patient monitors and specialty phones such as those for the elderly or sensory-impaired.

The ME310G1 operates with 1.8 V GPIOs, minimizing power consumption and making it even more ideal for application with battery-powered and wearable devices.

2.2. Product Variants and Frequency Bands

Product	2G Band (MHz)	LTE CATM1	NBIoT	CS Voice VoLTE	Region
ME310G1-W1	-	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B28, B66, B71, B85, B86*	N	Worldwide
ME310G1-WW	850, 900, 1800, 1900	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B28, B66, B71, B85	N	Worldwide
ME310G1-WWV	850, 900, 1800, 1900	B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85	-	Y	Worldwide
ME310G1-W2	-	B1, B3, B8, B20, B28, B31, B72	B1, B3, B8, B20, B28, B31, B72	N	Worldwide

*Table 2: Product Variants and their Frequency Bands   * See note below*

Refer to "RF Section" for details information about frequencies.

Note: Cellular technologies and frequency bands may vary based on firmware version and firmware configuration used.

Note: "B86" is not a 3GPP band, it means the following:

UL range: 787-788 MHz, DL range: 757-758 MHz

that is available only in module where AT#BNDOPTIONS command contains the string B86. i.e.

AT#BNDOPTIONS?

#BNDOPTIONS: 1,2,3,4,5,8,12,13,18,19,20,25,26,27,28,66,71,85,86

7.3.   Target Market

ME310G1 can be used for telematics applications where tamper-resistance, confidentiality, integrity, and authenticity of end-user information are required, for example:

- Telematics services
- Road pricing
- Pay-as-you-drive insurance
- Stolen vehicles tracking
- Internet connectivity

7.4.   Main features

Function	Features
Modem	- CATM and NBIoT technologies - SMS support (text and PDU) - Alarm management - Real Time Clock
Interfaces	- USB 2.0 HS (AT command* and FW upgrade) - USIF0 Main UART (AT command* and FW upgrade) - USIF1 Secondary UART (Not currently supported) - AUX UART (AT Command*, AppZone Diagnostic) - SPI 6 GPIOs - Antenna port

Table 3: Functional Features

Functionality depending on ports configuration

2.5. TX Output Power

2.5.1. ME310G1-W1

Band	Mode	Class	RF power (dBm) Nominal*
B1, B2, B3, B4, B5, B8, B12, B13, B14, B18, B19, B20, B25, B26, B27, B28, B66, B85, B86	(LTE) CAT-M1	5	21
B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B28, B66, B71, B85	(LTE) CAT-NB1	5	21

Table 4: Transmission Output Power

2.5.2. ME310G1-WW and ME310G1-WWV

Band	Mode	Class	RF power (dBm) Nominal*
850/900MHz	GPRS	4	32.5
850/900MHz	EGPRS	E2	27
1800/1900MHz	GPRS	1	29.5
1800/1900MHz	EGPRS	E2	26
B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B85	(LTE) CAT-M1	3	23
B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B28, B66, B85	(LTE) CAT-NB2	3	23
B71	(LTE) CAT-NB2	5	20

Table 5: Transmission Output Power ME310G1WW and ME310G1 - WWW

2.5.3. ME310G1-W2

Band	Mode	Class	RF power (dBm) Nominal*
B1, B3, B8, B20, B28	(LTE) CAT-M1	5	21
B1, B3, B8, B20, B28	(LTE) CAT-NB2	5	21
B31, B72	(LTE) CAT-M1	2	26
B31, B72	(LTE) CAT-NB2	3	23

Table 6: Transmission Output Power ME310G1-W2

* Max output power tolerance range according to 3GPP TS 36.521-1 and 3GPP TS 51.010-1 or better

7.6. RX Sensitivity

2.6.1. ME310G1-W1

Band	REFsens (dBm) Typical	REFsens (dBm)* 3GPP Limit
CATM1 / Band1	-107.1	-102.7
CAT M1 / Band2	-107.5	-100.3
CAT M1 / Band3	-106.4	-99.3
CAT M1 / Band4	-107.3	-102.3
CAT M1 / Band5	-106.0	-100.8
CAT M1 / Band8	-107.3	-99.8
CAT M1 / Band12	-103.2	-99.3
CAT M1 / Band13	-104.3	-99.3
CAT M1 / Band18	-107.2	-102.3
CAT M1 / Band19	-106.5	-102.3
CAT M1 / Band20	-105.4	-99.8
CAT M1 / Band25	-107.5	-
CAT M1 / Band26	-107.1	-100.3
CAT M1 / Band27	-107.1	-100.8
CAT M1 / Band28	-105.5	-100.8
CAT M1 / Band66	-107.5	-
CAT M1 / Band85	-102.2	-
CAT NB2 / Band1	-115.5	-108.2
CAT NB2 / Band2	-115.6	-108.2
CAT NB2 / Band3	-114.0	-108.2
CAT NB2 / Band4	-115.8	-
CAT NB2 / Band5	-115.1	-108.2
CAT NB2 / Band8	-114.1	-108.2
CAT NB2 / Band12	-115.5	-108.2

Band	REFsens (dBm) Typical	REFsens (dBm)* 3GPP Limit
CAT NB2 / Band13	-115.8	-108.2
CAT NB2 / Band18	-115.1	-108.2
CAT NB2 / Band19	-115.4	-108.2
CAT NB2 / Band20	-114.0	-108.2
CAT NB2 / Band25	-115.7	-
CAT NB2 / Band26	-115.4	-108.2
CAT NB2 / Band28	-115.7	-108.2
CAT NB2 / Band66	-115.3	-108.2
CAT NB2 / Band71	-111.3	-
CAT NB2 / Band85	-115.7	-

Table 7: RX Sensitivity ME310G1-W1   * 3GPP TS 36.521-1 Release 15 Minimum performance requirement

2.6.2. ME310G1-WW

Band	REFsens (dBm) Typical	REFsens (dBm)* 3GPP Limit
CATM1 / Band1	-105.6	-102.7
CAT M1 / Band2	-106.7	-100.3
CAT M1 / Band3	-104.3	-99.3
CAT M1 / Band4	-106.2	-102.3
CAT M1 / Band5	-105.8	-100.8
CAT M1 / Band8	-106.2	-99.8
CAT M1 / Band12	-104.8	-99.3
CAT M1 / Band13	-106.7	-99.3
CAT M1 / Band18	-106.6	-102.3
CAT M1 / Band19	-105.7	-102.3
CAT M1 / Band20	-105.7	-99.8
CAT M1 / Band25	-106.7	-
CAT M1 / Band26	-106.4	-100.3
CAT M1 / Band27	-106.9	-100.8

Band	REFsens (dBm) Typical	REFsens (dBm)* 3GPP Limit
CAT M1 / Band28	-106.4	-100.8
CAT M1 / Band66	-105.8	-
CAT M1 / Band85	-104.0	-
CAT NB2 / Band1	-115.7	-108.2
CAT NB2 / Band2	-115.9	-108.2
CAT NB2 / Band3	-115.5	-108.2
CAT NB2 / Band4	-115.1	-
CAT NB2 / Band5	-115.8	-108.2
CAT NB2 / Band8	-115.3	-108.2
CAT NB2 / Band12	-115.5	-108.2
CAT NB2 / Band13	-115.5	-108.2
CAT NB2 / Band18	-115.8	-108.2
CAT NB2 / Band19	-115.6	-108.2
CAT NB2 / Band20	-114.7	-108.2
CAT NB2 / Band25	-115.9	-
CAT NB2 / Band26	-115.7	-108.2
CAT NB2 / Band28	-115.5	-108.2
CAT NB2 / Band66	-115.2	-108.2
CAT NB2 / Band71	-107.5	-
CAT NB2 / Band85	-115.5	-

*Table 8: RX Sensitivity ME310G1-WW   * 3GPP TS 36.521-1 Release 15 Minimum performance requirement*

2.6.3. ME310G1-W2

Band	REFsens (dBm) Typical	REFsens (dBm)* 3GPP Limit
CATM1 / Band1	-106.6	-102.7
CAT M1 / Band3	-107.0	-99.3
CAT M1 / Band8	-106.9	-99.8
CAT M1 / Band20	-106.8	-99.8

Band	REFsens (dBm) Typical	REFsens (dBm)* 3GPP Limit
CAT M1 / Band28	-107.4	-100.8
CAT M1 / Band31	-105.2	-96.6
CAT M1 / Band72	-105.4	-96.6

Table 9: RX Sensitivity ME310G1-W2   * 3GPP TS 36.521-1 Release 15 Minimum performance requirement

2.7. Mechanical Specifications

2.7.1. Dimensions

The overall dimensions of ME310G1-W1 are:

- Length: 14.3 mm
- Width: 13.1 mm
- Thickness: 2.6 mm

The overall dimensions of ME310G1-WW, ME310G1-WWV and ME310G1-W2 are:

- Length: 18.0 mm
- Width: 15.0 mm
- Thickness: 2.6 mm

2.7.2. Weight

The nominal weight of the ME310G1-W1 is 1gr.

The nominal weight of the ME310G1-WW, ME310G1-WWV and ME310G1-W2 is 1.5 gr.

2.8. Temperature Range

Temperature range		Note
Operating Temperature Range	−40°C to +85°C	The module is fully functional (*) and compliant according to regulatory standards.
Storage Temperature Range	−40°C to +105°C	The module is not powered and not connected to power supply

Table 10: Temperature Range

Note: (*) Functional: if applicable, the module is able to make and receive voice calls, data calls, send and receive SMS and data traffic.

3. PINS ALLOCATION

3.1 Pin-out

Pin	Signal	I/O	Function	Type	Comment
USB HS 2.0 Communication Port					
U19	USB_D+	I/O	USB differential Data (+)		
V18	USB_D-	I/O	USB differential Data (-)		
T18	USB_VBUS	AI	USB Power Sense		
Asynchronous Serial Port (USIF0) – Prog. / Data + HW Flow Control					
Y16	TXD0	I	Serial data input (TXD) from DTE	CMOS 1.8V	Internal PU (100K)
AA15	RXD0	O	Serial data output (RXD) to DTE	CMOS 1.8V	
Y18	RTS0	I	Input for Request to send signal (RTS) from DTE	CMOS 1.8V	Internal PU (100K)
AA17	CTS0	O	Output for Clear to send signal (CTS) to DTE	CMOS 1.8V	
Asynchronous Serial Port (USIF1)					
Y12	TXD1	I	Serial data input (TXD) from DTE	CMOS 1.8V	Internal PU (100K)
AA11	RXD1	O	Serial data output (RXD) to DTE	CMOS 1.8V	MUST NOT BE "HIGH" at boot
AA13	RTS1	I	Input for Request to send signal (RTS) from DTE	CMOS 1.8V	Internal PU (100K)
Y14	CTS1	O	Output for Clear to send signal (CTS) to DTE	CMOS 1.8V	
Auxiliary Serial Port					
Y10	TX_AUX	O	Auxiliary UART (TX Data to DTE)	CMOS 1.8V	
AA9	RX_AUX	I	Auxiliary UART (RX Data to DTE)	CMOS 1.8V	Internal PU (100K)
SIM card interface					

Pin	Signal	I/O	Function	Type	Comment
L1	SIM_CLK	O	External SIM signal – Clock	CMOS 1.8V	
M2	SIM_RST	O	External SIM signal – Reset	CMOS 1.8V	
N1	SIM_DAT	I/O	External SIM signal – Data I/O	CMOS 1.8V	
P2	SIM_VCC	-	Power supply for the SIM	1.8V	Only 1.8V simcard are supported
-	SIMIN	I	Presence SIM input	CMOS 1.8V	See par.5.8
SPI					
AA5	SPI_MOSI	I/O	SPI MOSI	CMOS 1.8V	
Y8	SPI_MISO	I/O	SPI MISO	CMOS 1.8V	
AA7	SPI_CLK	I/O	SPI Clock	CMOS 1.8V	
Y6	SPI_CS	I/O	SPI Chip Select	CMOS 1.8V	
DIGITAL IO					
V11	IO1	I/O	Configurable GPIO01/ DTR is alternate function	CMOS 1.8V	Internal PU (100K) if DTR
V13	IO2	I/O	Configurable GPIO02/ RING is alternate function	CMOS 1.8V	Internal PD (100K)
D7	IO3	I/O	Configurable GPIO03	CMOS 1.8V	Internal PD (100K)
D9	IO4	I/O	Configurable GPIO04	CMOS 1.8V	Internal PD (100K)
D11	IO5	I/O	Configurable GPIO05	CMOS 1.8V	Internal PD (100K)
D13	IO6	I/O	Configurable GPIO06	CMOS 1.8V	Internal PD (100K)
ADC and DAC					
B18	ADC	I	Analog To Digital converter Input	A/D	

Pin	Signal	I/O	Function	Type	Comment
R16	DAC	O	Digital To Analog converter Output	D/A	PWM signal
RF Section					
A5	CELL_MAIN ANTENNA	I/O	Main Antenna (50 ohm)	RF	
E19	GNSS ANTENNA	I	GNSS Antenna	RF	
GNSS_PPS					
H18	GNSS_LNA_EN	O	GNSS external LNA enable	CMOS 1.8V	
G16	GNSS_PPS	O	1 Pulse per Second	CMOS 1.8V	
Miscellaneous Functions					
B2	S_LED	O	Status LED	CMOS 1.8V	
N16	ON_OFF*/WAKE*	I	Input Command for Power ON/OFF and to wake from deep sleep mode	CMOS 1.8V	Active Low
R1	PWRMON	O	Power ON Monitor	CMOS 1.8V	
T2	FORCED_USB_BOOT	I	Optional pin, connect to test point	CMOS 1.8V	Active high, Internal PD (100K)
Audio Section					
C1	DVI_WA0	I/O	Digital Audio Interface (WA0)	CMOS 1.8V	
D2	DVI_RX	O	Digital Audio Interface (RX)	CMOS 1.8V	
E1	DVI_TX	I	Digital Audio Interface (TX)	CMOS 1.8V	
F2	DVI_CLK	I/O	Digital Audio Interface (CLK)	CMOS 1.8V	
Power Supply					
W1	VBATT_PA	-	Main power supply (Radio PA)	Power	
AA3	VBATT	-	Main power supply (Baseband)	Power	
N4	CTANK	-	Internal supply domain pin for external tank capacitor	1.8V	

Pin	Signal	I/O	Function	Type	Comment
A3	GND	-	RF Ground	Power	
A7	GND	-	RF Ground	Power	
A9	GND	-	RF Ground	Power	
A13	GND	-	RF Ground	Power	
A17	GND	-	RF Ground	Power	
B4	GND	-	RF Ground	Power	
B6	GND	-	RF Ground	Power	
B10	GND	-	RF Ground	Power	
B12	GND	-	RF Ground	Power	
B14	GND	-	RF Ground	Power	
B16	GND	-	RF Ground	Power	
C19	GND	-	RF Ground	Power	
D18	GND	-	RF Ground	Power	
F8	GND	-	Thermal Ground	Power	
F12	GND	-	Thermal Ground	Power	
F18	GND	-	Thermal Ground	Power	
G19	GND	-	Thermal Ground	Power	
H6	GND	-	Thermal Ground	Power	
H14	GND	-	Thermal Ground	Power	
J19	GND	-	Thermal Ground	Power	
K18	GND	-	Thermal Ground	Power	
M18	GND	-	Thermal Ground	Power	
N19	GND	-	Thermal Ground	Power	
P6	GND	-	Thermal Ground	Power	
P14	GND	-	Thermal Ground	Power	
T8	GND	-	Thermal Ground	Power	
T12	GND	-	Thermal Ground	Power	
U1	GND	-	Power Ground	Power	
V2	GND	-	Power Ground	Power	
W19	GND	-	Power Ground	Power	
Y2	GND	-	Power Ground	Power	
Y4	GND	-	Power Ground	Power	

Pin	Signal	I/O	Function	Type	Comment
RESERVED					
G1	RESERVED	-	RESERVED		
H2	RESERVED	-	RESERVED		
J1	RESERVED	-	RESERVED		
K2	RESERVED	-	RESERVED		
J4	RESERVED	-	RESERVED		
G4	RESERVED	-	RESERVED		
L19	RESERVED	-	RESERVED		
A11	RESERVED	-	RESERVED		
R4	RESERVED	-	RESERVED		
L4	RESERVED	-	RESERVED		
V7	RESERVED	-	RESERVED		
V9	RESERVED	-	RESERVED		
L16	RESERVED	-	RESERVED		
P18	RESERVED	-	RESERVED		
J16	RESERVED	-	RESERVED		
R19	RESERVED	-	RESERVED		
B8	RESERVED	-	RESERVED		
A15	RESERVED	-	RESERVED		

Table 11: Pin-out Information

Warning: Reserved pins must not be connected. All pull-up (PU) and pull-down (PD) are about 100K.

Warning: C104/RXD1 cannot have any PU or HIGH state during BOOTING UP phase.

3.2 LGA Pads Layout

TOP VIEW

Figure 1: LGA Pads Layout

SUPPLY AND CONTROL	
SIM CARD	
ANALOG FUNCTIONALITY	
GROUND	
DIGITAL FUNCTIONALITY	
DIGITAL COMMUNICATION	
RF SIGNALS	
RESERVED/NOT ASSIGNED/ RESERVED FOR FUTURE USE	
GNSS	

4. POWER SUPPLY

The power supply circuitry and the board layout are a very important part in the full product design and they strongly reflect on the overall performance of the product so the requirements and the guidelines that will follow should be read carefully for a proper design.

4.1. Power Supply Requirements

The external power supply must be connected to VBATT & VBATT_PA signals and must fulfil the following requirements:

Power Supply	Value
Nominal Supply Voltage	3.8V
Operating Voltage Range	3.2 V - 4.2 V
Extended Voltange Range	2.6 V - 4.5 V
VBATT$_{min}$	2.7V

Table 12: Power Supply Requirements

Warning: The range 2.6V - 3.2V can be used only if both USB and 2G are disabled.

Warning: The supply voltage of the modem must never exceed the Extended Operating Voltage Range.

Wrong implementation of power supply guidelines described in this document may result in module fault.

Note: For PTCRB approval on the final products the power supply is required to be within the "Normal Operating Voltage Range".

Note: The application's power supply section must be designed with care to avoid an excessive voltage drop during transmission peak current absorptions. If the voltage drops beyond the limits of the Extended Operating Voltage range, an unintentional module power off can occur.

Note: When turning on the modem, the voltage must be at least VBATTmin.

Note: HW User Guide specifications shall be fully acknowledged and correctly implemented in order to use the module in its "Extended Operating Voltage Range".

4.2. Power Consumption

4.2.1. Idle mode

Mode	Measure (Typical)			Mode Description
IDLE mode	CATM (mA)	NBIoT (mA)	2G (mA)	
AT+CFUN=1	8.1	8.0	8.0	Normal mode: full functionality of the module
AT+CFUN=4		7.5		Disabled TX and RX; module is not registered on the network
AT+CFUN=5	1.20	0.95	-	Paging cycle #256 frames (2.56s DRx cycle)
	0.60	0.60	-	81.92s eDRx cycle length (PTW=2.56s, DRX=1.28s)
	0.18[1]	0.18[1]	-	327.68s eDRx cycle length (PTW=2.56s, DRX=1.28s)
	0.10[1]	0.10[1]	-	655.36s eDRx cycle length (PTW=2.56s, DRX=1.28s)
	0.05[1]	0.05[1]	-	1310.72s eDRx cycle length (PTW=2.56s, DRX=1.28s)
	0.03[1]	0.03[1]	-	2621.44s eDRx cycle length (PTW=2.56s, DRX=1.28s)
	-	-	0.90	Paging Multiframe 9
PSM mode	Typical (mA)			
AT+CPSMS=1	3uA			No current source or sink by any connected pin

Table 13: Idle and PSM mode   [1]PSM in between eDRX

Mode		Measure* (Typical)	Mode Description
GPS		(mA)	
Active State (GNSS ON, CFUN=4)	Acquisition	69.3	GPS+GLO, DPO off
	Navigation	22	GPS+GLO, DPO on DWELL=280ms
		55.9	GPS+GLO, DPO off
Active State (GNSS ON, CFUN=5 eDRX)	Acquisition	68.5	GPS+GLO, DPO off
	Navigation	15.7	GPS+GLO, DPO on DWELL=280ms
		54	GPS+GLO, DPO off

Table 14: GPS Mode   *reference signal @-130 dbm with static scenario

Note: The reported LTE CAT M1 and LTE CAT NB1 idle mode values are an average among all the product variants and bands for each network wireless technology.

The support for a specific network wireless technology depends on the product variant configuration.

4.2.2. ME310G1-W1 Connected Mode

Mode	Measure (Typical)		Mode Description
Connected mode	Average (mA)	Peak (mA)	
CATM	180	400	1 RB, RMC, TBS=5, QPSK, 21dBm, all bands
NBIoT	245	340	3.75KHz subcarrier spacing, 1 SC, RU 32ms, TBS=0, BPSK, 21dBm, all bands
	65	290	15KHz subcarrier spacing, 12 SC, RU 1ms, TBS=5, QPSK, 21dBm, all bands

Table 15: ME310G1-W1 connected mode

4.2.3. ME310G1-WW and ME310G1-WWV Connected Mode

	Measure (Typical)		Mode Description
Connected mode	Average (mA)	Peak (mA)	
CATM	380	1100	1 RB, RMC, TBS=5, QPSK, 23dBm, Band 85, 28, 12
	320	900	1 RB, RMC, TBS=5, QPSK,23dBm, Band 13, 26, 5, 18, 19, 20, 8
	305	800	1 RB, RMC, TBS=5, QPSK, 23dBm, Band 3, 2, 25, 4, 1, 66
NBIoT	240	335	3.75KHz subcarrier spacing, 1 SC, RU 32ms, TBS=0, BPSK, 20dBm, Band 71
	600	1000	3.75KHz subcarrier spacing, 1 SC, RU 32ms, TBS=0, BPSK, 23dBm, Band 85, 28, 12
	500	850	3.75KHz subcarrier spacing, 1 SC, RU 32ms, TBS=0, BPSK, 23dBm, Band 13, 26, 5, 18, 19, 20, 8
	430	750	3.75KHz subcarrier spacing, 1 SC, RU 32ms, TBS=0, BPSK, 23dBm, Band 3, 2, 25, 4, 1, 66
	68	300	15KHz subcarrier spacing, 12 SC, RU 1ms, TBS=5, QPSK, 21dBm, Band 71
	88	950	15KHz subcarrier spacing, 12 SC, RU 1ms, TBS=5, QPSK, 23dBm, Band 85, 28, 12
	78	800	15KHz subcarrier spacing, 12 SC, RU 1ms, TBS=5, QPSK, 23dBm, Band 13, 26, 5, 18, 19, 20, 8
	77	730	15KHz subcarrier spacing, 12 SC, RU 1ms, TBS=5, QPSK, 23dBm, Band 3, 2, 25, 4, 1, 66
GPRS	300	2000	1TX + 1RX, CS1, GMSK, Band 850, 900
	170	1000	1TX + 1RX, CS1, GMSK, Band 1800, 1900

Table 16: ME310G1-WW and ME310G1-WWV Connected Mode

4.2.4. ME310G1-W2 Connected Mode

Mode	Measure (Typical)		Mode Description
Connected mode	Average (mA)	Peak (mA)	
CATM	180	400	1 RB, RMC, TBS=5, QPSK, 21dBm, B1, B3, B8, B20, B28
	300	680	1 RB, RMC, TBS=5, QPSK 26dBm, B31, B72
NBIoT	245	340	3.75KHz subcarrier spacing, 1 SC, RU 32ms, TBS=0, BPSK, 21dBm, B1, B3, B8, B20, B28
	430	750	3.75KHz subcarrier spacing, 1 SC, RU 32ms, TBS=0, BPSK, 23dBm, B31, B72
	65	290	15KHz subcarrier spacing, 12 SC, RU 1ms, TBS=5, QPSK, 21dBm, B1, B3, B8, B20, B28
	73	730	15KHz subcarrier spacing, 12 SC, RU 1ms, TBS=5, QPSK, 23dBm, B31, B72

4.3 General Design Rules

The main guidelines for the Power Supply Design include three different design steps:

- the electrical design
- the thermal design
- the PCB layout

4.3.1. Electrical Design Guidelines

The electrical design of the power supply strongly depends on the power source where this power is drained. We will distinguish them into three categories:

- +5V input (typically PC internal regulator output)
- +12V input (typically automotive)
- Battery

4.3.1.1. +5V Source Power Supply Design Guidelines

- The desired output for the power supply is 3.8V, so there's not a big difference between the input source and the desired output and a linear regulator can be

used. A switching power supply will not be suited due to the low drop out requirements.

- When using a linear regulator, a proper heat sink shall be provided in order to dissipate the power generated.

- A Bypass low ESR capacitor of adequate capacity must be provided in order to cut the current absorption peaks close to the Module, a 100μF capacitor is usually suitable.

- Make sure the low ESR capacitor on the power supply output is rated at least 10V.

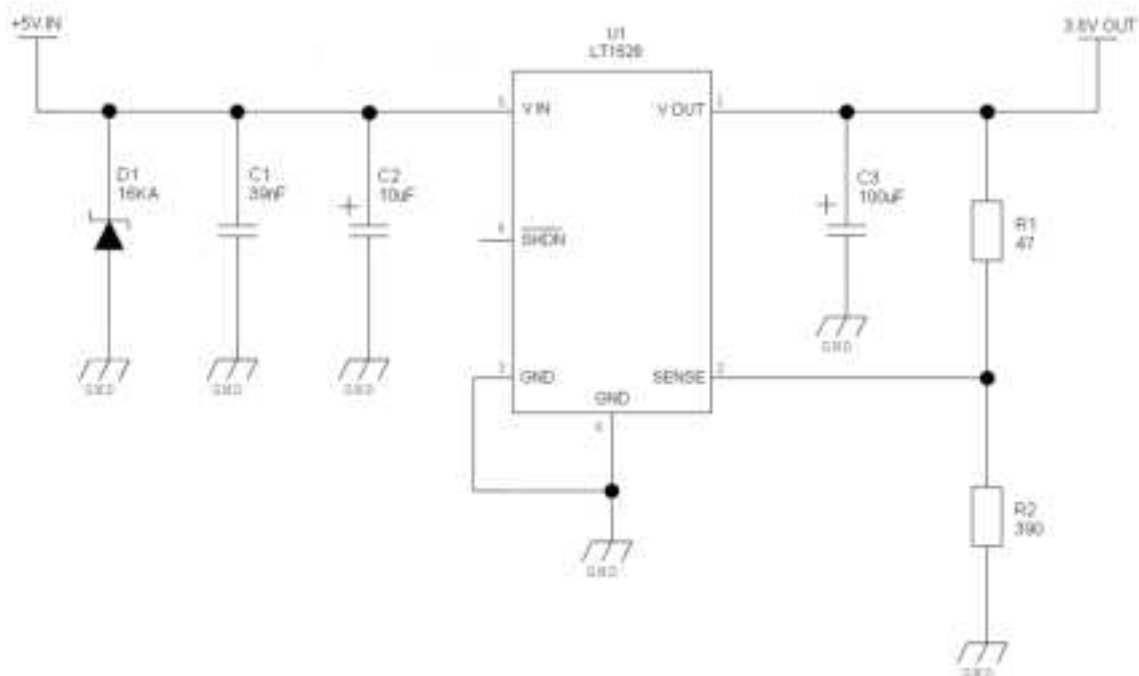An example of linear regulator with 5V input is:

Figure 2: example of linear regulator with 5V input

4.3.1.2. +12V Source Power Supply Design Guidelines

- The desired output for the power supply is 3.8V, so due to the big difference between the input source and the desired output, a linear regulator is not suited and shall not be used. A switching power supply will be preferable because of its better efficiency.

- When using a switching regulator, a 500kHz or higher switching frequency regulator is preferable due to its smaller inductor size and its faster transient response. This allows the regulator to respond quickly to the current peaks absorption.

- In any case the frequency and Switching design selection is related to the application to be developed since the switching frequency could also generate EMC interferences.

- For car PB battery the input voltage can rise up to 15,8V and this should be kept in mind when choosing components: all components in the power supply must withstand this voltage.

- A Bypass low ESR capacitor of adequate capacity must be provided in order to cut the current absorption peaks, a 100μF capacitor is usually suitable.

- Make sure the low ESR capacitor on the power supply output has a nominal voltage of at least 10V.

- For Car applications a spike protection diode should be inserted close to the power input, in order to clean the power supply from the spikes.

An example of switching regulator with 12V input is in the below schematic:
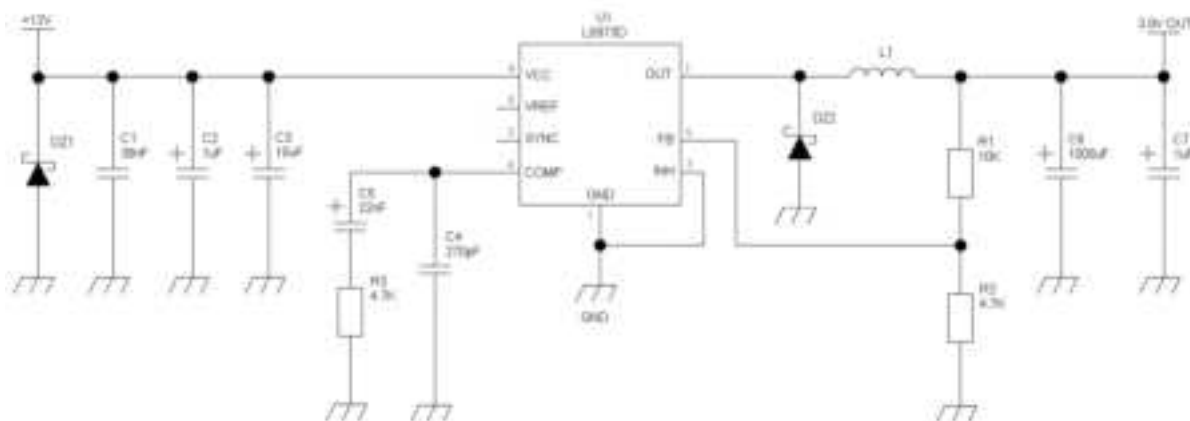
Figure 3: Recommended Circuit

4.3.1.3. Battery Source Power Supply Design Guidelines

The desired nominal output for the power supply is 3.8V and the maximum voltage allowed is 4.2V, hence a single 3.7V Li-Ion cell battery type is suited for supplying the power to the Telit ME310G1 module.

- A Bypass low ESR capacitor of adequate capacity must be provided in order to cut the current absorption peaks, a 100μF tantalum capacitor is usually suited.

- Make sure the low ESR capacitor (usually a tantalum one) is rated of at least 10V.

- A protection diode should be inserted close to the power input, in order to save the ME310G1 from power polarity inversion. Otherwise the battery connector should be done in a way to avoid polarity inversions when connecting the battery.

- The battery must be rated to supply current peaks up to 2A.

Note: DO NOT USE any type of Ni-Cd, Ni-MH, and Pb battery directly connected to ME310G1. Their use can lead to overvoltage on the ME310G1 and damage it. USE ONLY Li-Ion battery types.

4.3.2. Thermal Design Guidelines

Worst case as reference values for thermal design of ME310G1 are:

- Average current consumption: 700 mA (LTE CAT M1 and NB1 modes)
- Average current consumption: 700 mA (GPRS and EDGE modes)
- Supply voltage: 4.50V

Note: Make PCB design in order to have the best connection of GND pads to large surfaces of copper.

Note: The ME310G1 includes a function to prevent overheating.

4.3.3. Power Supply PCB layout Guidelines

As seen in the guidelines for electrical design, the power supply shall have a low ESR capacitor on the output to cut the current peaks on the input to protect the supply from spikes. The placement of this component is crucial for the correct working of the circuitry. A misplaced component can be useless or can even decrease the power supply performance.

- The Bypass low ESR capacitor must be placed close to the Telit ME310G1 power input pads or, if the power supply is a switching type, it can be placed close to the inductor to cut the ripple, provided the PCB trace from the capacitor to the ME310G1 is wide enough to ensure a dropless connection even during an 2A current peak.

- The protection diode must be placed close to the input connector where the power source is drained.

- The PCB's traces to the ME310G1 and the Bypass capacitor must be wide enough to ensure that no significant voltage drops occur. This is for the same reason as previous point. Try to keep this trace as short as possible.

- To reduce the EMI due to switching, it is important to keep the mesh involved very small; therefore the input capacitor, the output diode (if not incorporated in the IC) and the regulator shall form a very small loop.This is done in order to reduce the radiated field (noise) to the switching frequency (100-500 kHz usually).

- A dedicated ground for the Switching regulator separated by the common ground plane is suggested.

- The placement of the power supply on the board should be done in such a way to guarantee that the high current return paths in the ground plane are not overlapped to any noise sensitive circuitry as the microphone amplifier/buffer or earphone amplifier.

- The power supply input cables should be kept separate from noise sensitive lines such as microphone/earphone cables.

- The insertion of the EMI filter on the VBATT pins is suggested in those designs where the antenna is placed close to battery or power supply lines. A ferrite bead like Murata BLM18EG101TN1 or Taiyo Yuden P/N FBMH1608HM101 can be used for this purpose.

The below figure shows the recommended circuit:
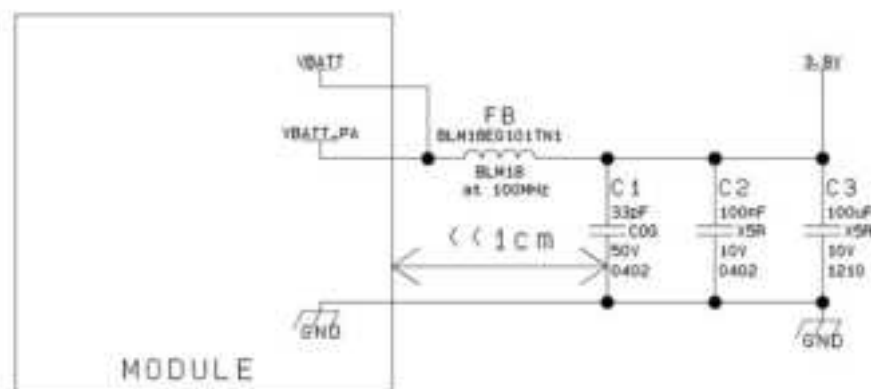
Figure 4: recommended circuit

4.4. RTC Supply

RTC is functional when ME310G1 is in PSM or OFF state and VBATT pin is supplied.

RTC settings are lost when VBATT supply is removed.

4.5. PWRMON Power-on monitor

PWRMON is always active (output high) when the module is powered ON (module powered ON indication) and cannot be set to LOW level by any AT command.

This signal is present on pin R1.The operating range characteristics of PWRMON signal are:

Item	Min	Typical	Max
Output voltage	1.35V	1.8V	1.8V
Output current	-	1mA	3mA

Table 17: Operating range characteristics of PWRMON signal

Note: PWRMON during PSM period is LOW (PSM has to be previously enabled by AT+CPSMS command)

Note: The Output Current MUST never be exceeded; care must be taken when designing the application section to avoid an excessive current consumption. If the Current exceeds the limits it may cause a module shutdown.

Warning:This signal is NOT provided in order to supply small devices from the module.

PWRMON is only a module power-on indicator.

5. DIGITAL SECTION

ME310G1 has four main operation states:

- **OFF state:** Vbatt is applied and only RTC is running. The Baseband is switched OFF and the only possible change is the ON state.
- **ON state:** the baseband is fully switched on and ME310G1 is ready to accept AT commands. ME310G1 can be idle or connected.
- **Sleep mode state:** the main baseband processor is intermittently switched ON and AT commands can be processed with some latency. ME310G1 is idle with low current consumption.
- **Deep sleep mode state:** PSM defined in 3GPP Release 12. Baseband is switched OFF most of the time.

5.1. Logic Levels

Parameter	Min	Max
ABSOLUTE MAXIMUM RATINGS – NOT FUNCTIONAL		
Input level on any digital pin (CMOS 1.8) with respect to ground	-0.3V	2.1V
Operating Range - Interface levels (1.8V CMOS)		
Input high level	1.5V	1.9V
Input low level	0V	0.35V
Output high level	1.6V	1.9V
Output low level	0V	0.2V

Table 18: Logic levels Minimum and maximum

Parameter	Max
Current characteristics:	
Output Current	1mA
Input Current	1uA

Table 19: Logic levels average

5.2. Power On

The following flow chart shows the proper "Modem Turn ON" procedure.
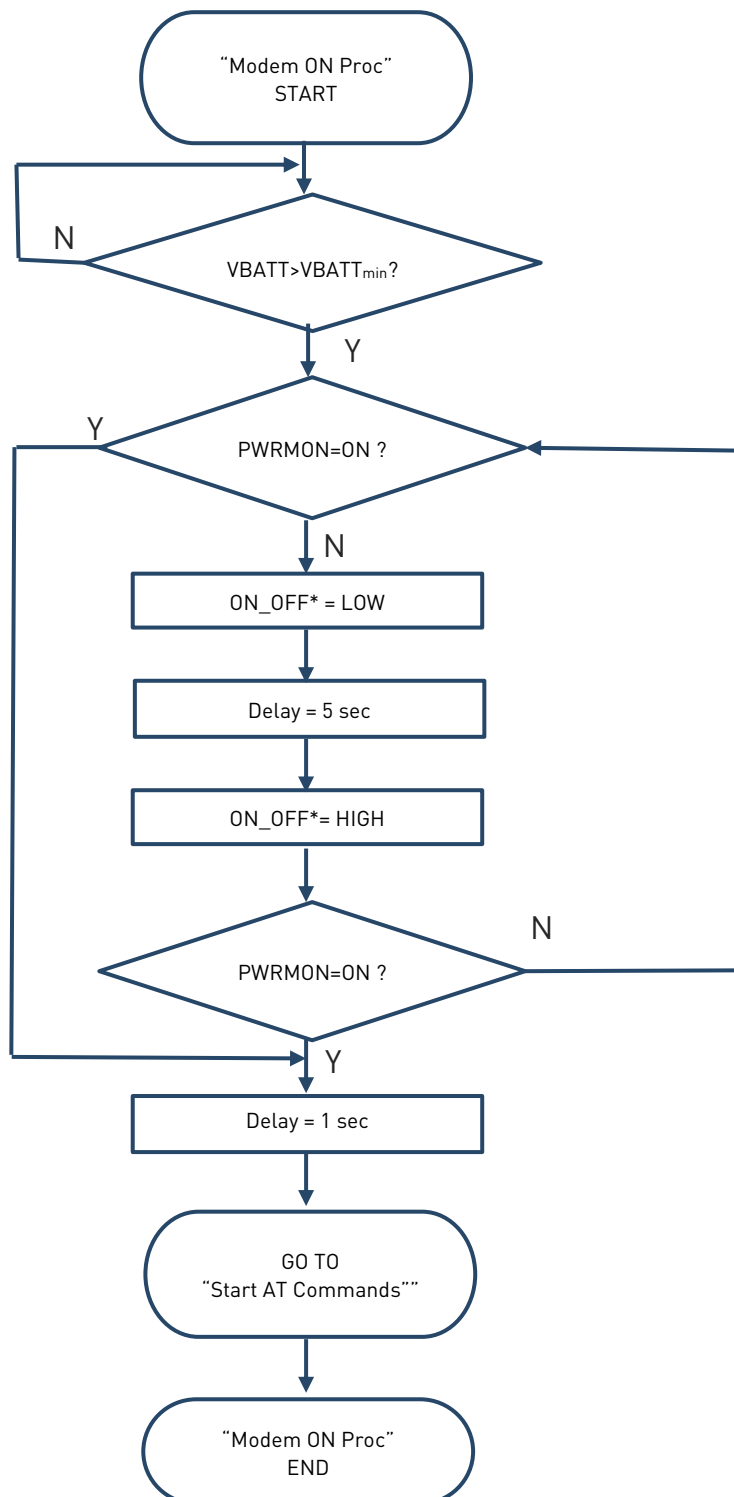
Figure 5: Modem On Proc flow chart

In some use cases ON_OFF* can be tied fix LOW taking in account two limitations:

1. PSM wake-up asynchronous capability will be lost.
2. To perform an unconditional shutdown it is necessary to send AT#SYSHALT command and then cut Vbatt.

5.3. Power Off

The proper procedure to power-off the module is to use the AT#SHDN command.

An alternative procedure is to use ON_OFF* pin as described in the following procedure:
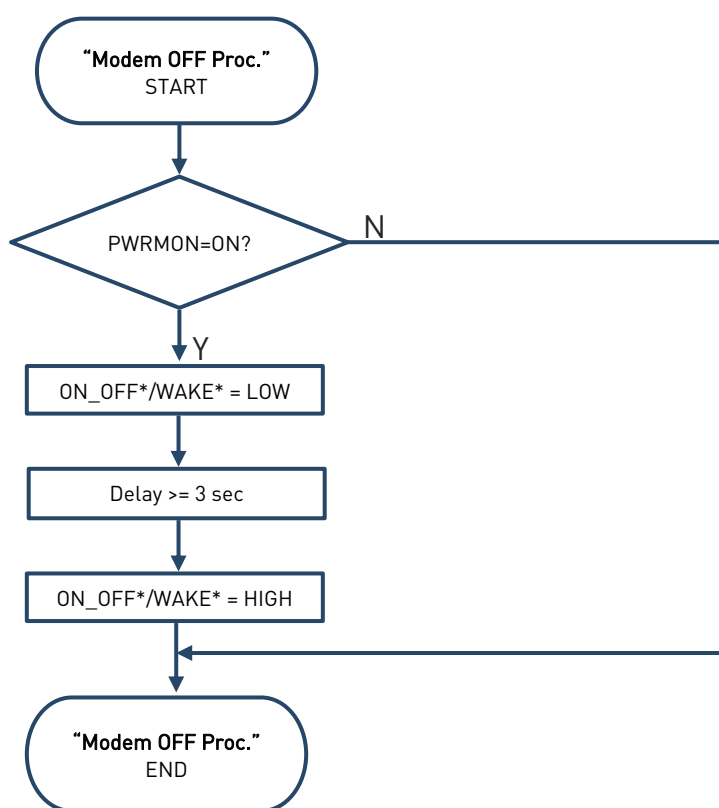
Figure 6: Modem OFF Proc flow chart

5.4. Unconditional shutdown

The following flow chart shows the proper procedure for unconditional shutdown of ME310G1 except in PSM mode. When the procedure is completed the ME310G1 is reset and it stops any operation. After the release of the line, the ME310G1 is unconditionally shut down, without performing any detach operation from the network in which it is registered.
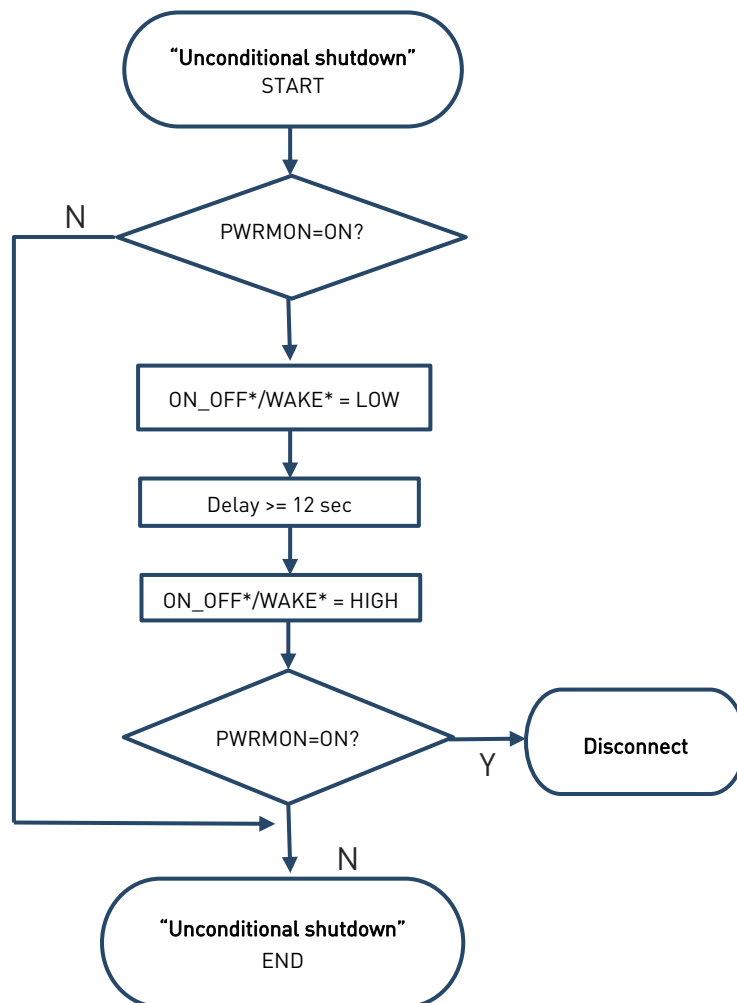

Figure 7: Unconditional shutdown of ME310G1

Warning: Unconditional Hardware SHUTDOWN by toggling VBATT Power, must not be used during the normal shutdown operation of the device since it does not detach the device from the network and can damage the memory content. It shall be kept as an emergency exit procedure.

INCORRECT SHUTDOWN Procedure can void the warranty.

5.5. Wake up from deep sleep mode

ME310G1 supports the Power Saving Mode (PSM) functionality defined in 3GPP Release 12. When the Periodic Update Timer expires, ME310G1 shuts down until the next scheduled wake-up time. Asynchronous event controlled by host can wake up from deep sleep mode by asserting ON_OFF*/WAKE* pin LOW for at least 5 seconds. Host can detect deep sleep mode by polling PWRMON pin if PSM has been previously configured.

5.6. Fast shut down

The procedure to power off ME310G1 described in Section 5.3 normally takes more than 1 second to detach from network and make ME310G1 internal filesystem properly closed.

In case of unwanted supply voltage loss the system can be switched off without any risk of filesystem data corruption by implementing Fast Shut Down feature.

Fast Shut Down feature permits to reduce the current consumption and the time-to-poweroff to minimum values.

Note: Refer to ME310G1/ME910G1/ML865G1 AT Commands Reference Guide (Fast shut down - #FASTSHDN) in order to set up detailed AT command.

5.6.1. Fast shut down by hardware

The Fast Power Down can be triggered by configuration of any GPIO. HI level to LOW level transition of GPIO triggers fast power down procedure.

Example circuit:
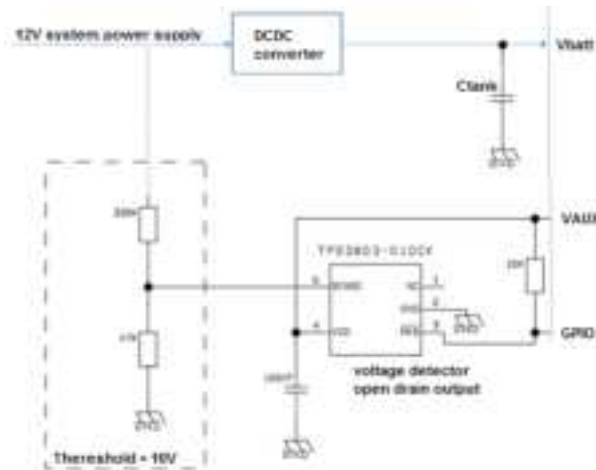
Note: Consider voltage drop under max current conditions when defining the voltage detector thereshold in order to avoid unwanted shutdown.

5.6.2. Fast shut down by software

The Fast Shut Down can be triggered by AT command.

5.7.   Communication ports

5.7.1. USB 2.0 HS

The ME310G1 includes one integrated universal serial bus (USB 2.0 HS) transceiver. The following table lists the available signals:

PAD	Signal	I/O	Function	NOTE
U19	USB_D+	I/O	USB differential Data (+)	
V18	USB_D-	I/O	USB differential Data (-)	
T18	VUSB	AI	Power sense for the internal USB transceiver.	

Table 20: USB 2.0HS available signals

USB_VBUS input voltage range and input current are:

Parameter	Min	Max
ABSOLUTE MAXIMUM RATINGS – NOT FUNCTIONAL		
USB_VBUS Input level	-0.3V	6.0V
Operating Range		
USB_VBUS Input high level	1.0V	5.25V
USB_VBUS Input low level	0V	0.4V

Table 21: Voltage range

Parameter	TYP
Current characteristics:	
USB_VBUS Input Current	6uA

Table 22: Input current

5.7.2. SPI

The ME310G1 Module is provided by a standard 3-wire SPI master or slave interface with chip select control.

The following table is listing the available signals:

PAD	Signal	I/O	Function	Type	NOTE
AA5	SPI_MOSI	I/O	SPI MOSI	CMOS 1.8V	
Y8	SPI_MISO	I/O	SPI MISO	CMOS 1.8V	
AA7	SPI_CLK	I/O	SPI Clock	CMOS 1.8V	

PAD	Signal	I/O	Function	Type	NOTE
Y6	SPI_CS	I/O	SPI Chip Select	CMOS 1.8V	

Table 23: Available signals

Note: The SPI interface is supported through the Telit AppZone APIs.

5.7.3. Serial Ports

The ME310G1 module is provided by 3 Asynchronous serial ports:

- Asynchronous Serial Port (USIF0)
- Asynchronous Serial Port (USIF1)*
- Auxiliary Serial Port

Several configurations can be designed for the serial port on the OEM hardware, but the most common are:

- RS232 PC com port
- microcontroller UART @ 1.8V (Universal Asynchronous Receive Transmit)
- microcontroller UART @ 5V or other voltages different from 1.8V

Depending on the type of serial port on the OEM hardware, a level translator circuit may be needed to make the system work. On the ME310G1 the ports are CMOS 1.8.

Note:*The USIF1 is currently NOT supported by ME310G1 firmware.

5.7.3.1. Asynchronous Serial Port (USIF0)

The serial port 0 on the ME310G1 is a +1.8V UART with 5 RS232 signals. It differs from the PC-RS232 in the signal polarity (RS232 is reversed) and levels.

The following table is listing the available signals:

RS232 Pin	Signal	Pad	Name	Usage
2	C104/RXD0	AA15	Transmit line	Output transmit line of ME310G1 UART
3	C103/TXD0	Y16	Receive line	Input receive of the ME310G1 UART Pull-up default during ON state

RS232 Pin	Signal	Pad	Name	Usage
4	DTR	(*)	Data Terminal Ready	Input to the ME310G1 that controls the DTE READY condition
5	GND	A3, A7, A9, A13, A17, B4, B6, B10, B12, B14, B16, C19, D18, F8, F12, F18, G19, H6, H14, J19, K18, M18, N19, P6, P14, T8, T12, U1, V2, W19, Y2, Y4	Ground	Ground
8	C106/CTS0	AA17	Clear to Send	Output from the ME310G1 that controls the Hardware flow control
7	C105/RTS0	Y18	Request to Send	Input to the ME310G1 that controls the Hardware flow control Pull-up default during ON state
9	RING	(*)	Ring Indicator	Output from the ME310G1 that indicates the incoming call condition

Table 24: Available signs   * Alternate function with GPIO, refer to par. General Purpose I/O

Note: According to V.24, some signal names are referred to the application side, therefore on the ME310G1 side these signal are in the opposite direction:

TXD on the application side will be connected to the receive line (here named C103/TXD0)

RXD on the application side will be connected to the transmit line (here named C104/RXD0)

For a reduced implementation, only the TXD, RXD lines can be connected, the other lines can be left open provided that a software flow control is implemented.

In order to avoid a back powering it is recommended to avoid having any HIGH logic level signal applied to the digital pins of the ME310G1 when the module is powered off or during an ON/OFF transition (RESET included).

5.7.3.2. Asynchronous Serial Port (USIF1)

The serial port 1 on the ME310G1 is a +1.8V UART with 5 RS232 signals. It differs from the PC-RS232 in the signal polarity (RS232 is reversed) and levels.

Warning: C104/RXD1 cannot have any PU or HIGH state during BOOTING UP phase.

The following table lists the available signals:

RS232 Pin	Signal	Pad	Name	Usage
2	C104/RXD1	AA11	Transmit line	Output transmit line of ME310G1 UART
3	C103/TXD1	Y12	Receive line	Input receive of the ME310G1 UART Pull-up default during ON state
5	GND	A3, A7, A9, A13, A17, B4, B6, B10, B12, B14, B16, C19, D18, F8, F12, F18, G19, H6, H14, J19, K18, M18, N19, P6, P14, T8, T12, U1, V2, W19, Y2, Y4	Ground	Ground
8	C106/CTS1	Y14	Clear to Send	Output from the ME310G1 that controls the Hardware flow control
7	C105/RTS1	AA13	Request to Send	Input to the ME310G1 that controls the Hardware flow control Pull-up default during ON state

Table 25: ME310G1 port signals

5.7.3.3. Auxiliary Serial Port

The auxiliary serial port on the ME310G1 is a CMOS 1.8V with only the RX and TX signals.

The signals of the ME310G1 serial port are:

PAD	Signal	I/O	Function	Type	NOTE
Y10	TX_AUX	O	Auxiliary UART (TX Data to DTE)	CMOS 1.8V	
AA9	RX_AUX	I	Auxiliary UART (RX Data from DTE)	CMOS 1.8V	

Table 26: ME310G1 serial port signals

5.8. General purpose I/O

The ME310G1 module is provided by a set of Configurable Digital Input / Output pins (CMOS 1.8V). Input pads can only be read; they report the digital value (high or low) present on the pad at the read time of. The Output pads can only be written or queried and set the value of the pad output.

An alternate function pad is internally controlled by the ME310G1 firmware and acts depending on the implemented function.

The following table shows the available GPIO on the ME310G1:

PAD	Signal	I/O	Drive Strength	Default State	NOTE
V11	GPIO_01	I/O	1 mA	INPUT - PD (100K)	Alternate function DTR INPUT - PU (100K)
V13	GPIO_02	I/O	1 mA	INPUT - PD (100K)	Alternate function RING
D7	GPIO_03	I/O	1 mA	INPUT - PD (100K)	
D9	GPIO_04	I/O	1 mA	INPUT - PD (100K)	
D11	GPIO_05	I/O	1 mA	INPUT - PD (100K)	
D13	GPIO_06	I/O	1 mA	INPUT - PD (100K)	

Table 27: ME310G1 available GPIO

5.8.1. Using a GPIO as INPUT

The GPIO pads, when used as inputs, can be connected to another device's digital output and report its status, provided that this device has interface levels compatible with the 1.8V CMOS levels of the GPIO.

Note: In order to avoid a back powering, it is recommended to avoid having any HIGH logic level signal applied to the digital pins of the ME310G1 when the module is powered off or during an ON/OFF transition.

5.8.2. Using a GPIO as OUTPUT

The GPIO pads, when used as outputs, can drive 1.8V CMOS digital devices or compatible hardware. When set as outputs, the pads have a push-pull output and therefore the pull-up resistor may be omitted.

5.9. External SIM Holder

Please refer to the related User Guide (SIM Holder Design Guides, 80000NT10001a).

Note: There is no dedicated signal (SIMIN) for "Presence SIM" in the ME310G1 pinout.

This feature can performed by connecting GPIO_01 (Pad **V11**) or of GPIO_02 (Pad **V13**) or of GPIO_03 (Pad **D7**) or of GPIO_04 (Pad **D9**) to the switch embedded in the sim-holder.

SIM detection can be configured by a specific AT Command.

Refer to the SW User Guide or the AT Commands Reference Guide for the full description of this function.
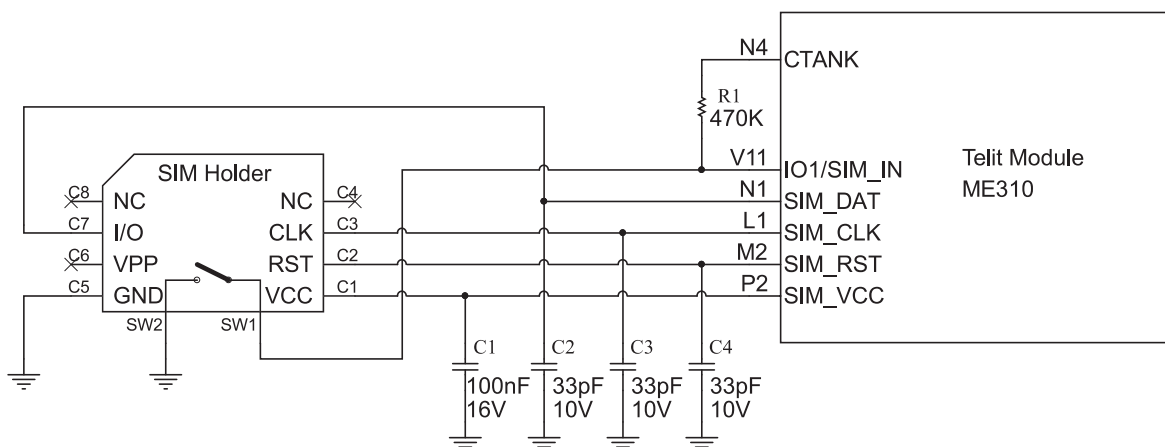

Figure 8: SIM Holder schematic

Warning:Pull-up 470K is required across CTANK (ball N4) and switch embedded in the sim-holder.

5.10. ADC Converter

The ME310G1 is provided by one AD converter. It is able to read a voltage level in the range of 0÷1.8 volts applied on the ADC pin input, store and convert it into 10 bit word.

The input lines are named as **ADC** (available on Pad **B18**).

The following table is showing the ADC characteristics:

Item	Min	Typical	Max	Unit
Input Voltage range	0	-	1.8	Volt
AD conversion	-	-	10	bits

Table 28 ADC Characteristics

5.10.1. Using ADC Converter

Available in a next document revision.

5.11. DAC Converter

The ME310G1 provides a Digital to Analog Converter. The signal (named DAC) is available on pin **R16** of the ME310G1.

5.11.1. Enabling DAC

Available in a next document revision.

5.12. CTANK

The ME310G1 provides an internal supply domain pin for additional capacitance or pullup reference to support only the specific use cases described in the ME310G1 documentation. The internal supply domain (named CTANK) is available on pin **N4** of the ME310G1.

The user's application circuit should add a place-holder capacitor of 100uF 4V connected to pin **N4** of the ME310G1 to support an enhanced power loss recovering.

5.13. Forced USB boot

In some case of firmware upgrade FORCED_USB_BOOT pin must be set to 1.8V during poweron of ME310G1.

The input current is very low, so 10K resistor to CTANK (pin N4) can be used to keep this pin in HI state.

FORCED_USB_BOOT pin must be connected only during the firmware upgrade operation and normally must be left open.

FORCED_USB_BOOT and CTANK pins must be available in the user application circuit throught the test points for easy connection of 10K resistor.

6. RF SECTION

6.1. Antenna requirements

The antenna connection and board layout design are the most important aspect in the full product design as they strongly affect the general performance of the product, so read carefully and follow the requirements and the guidelines for a proper design.

The antenna and antenna transmission line on PCB for a Telit ME310G1 device shall fulfil the following requirements:

Item	Value
Frequency range	Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s)
Bandwidth	250 MHz in LTE Band 1 140 MHz in LTE Band 2, PCS1900 170 MHz in LTE Band 3, DCS1800 445 MHz in LTE Band 4 70 MHz in LTE Band 5, GSM850 80 MHz in LTE Band 8, GSM900 47 MHz in LTE Band 12 41 MHz in LTE Band 13 60 MHz in LTE Band 18 60 MHz in LTE Band 19 71 MHz in LTE Band 20 145 MHz in LTE Band 25 80 MHz in LTE Band 26 62 MHz in LTE Band 27 100 MHz in LTE Band 28 15 MHz in LTE Band 31 490 MHz in LTE Band 66 81 MHz in LTE Band 71 15 MHz in LTE Band 72 48 MHz in LTE Band 85
Impedance	50 ohm
Input power	ME310G1-W1: > 24dBm Average power ME310G1-WW: > 33dBm Average power ME310G1-W2: > 26dBm Average power
VSWR absolute max	$\leq$ 10:1 (limit to avoid permanent damage)
VSWR recommended	$\leq$ 2:1 (limit to fulfill all regulatory requirements)

Table 29: ME310G1 Antenna and Antenna transmission line on PCB

6.1.1. PCB Design guidelines

When using the ME310G1, since there's no antenna connector on the module, the antenna must be connected to the ME310G1 antenna pad by means of a transmission line implemented on the PCB. This transmission line shall fulfil the following requirements:

Item	Value
Characteristic Impedance	50 ohm (+-10%)
Max Attenuation	0.3 dB
Coupling	Coupling with other signals shall be avoided
Ground Plane	Cold End (Ground Plane) of antenna shall be equipotential to the ME310G1 ground pins

Table 30: ME310G1 Antenna pad requirements

The transmission line should be designed according to the following guidelines:

- make sure that the transmission line's characteristic impedance is 50ohm;

- keep line on the PCB as short as possible, since the antenna line loss shall be less than about 0.3 dB;

- line geometry should have uniform characteristics, constant cross section, avoid meanders and abrupt curves;

- any kind of suitable geometry / structure (Microstrip, Stripline, Coplanar, Grounded Coplanar Waveguide...) can be used to implement the printed transmission line afferent the antenna;

- if a Ground plane is required in line geometry, that plane shall be continuous and sufficiently extended, so that the geometry can be as similar as possible to the related canonical model;

- keep, if possible, at least one layer of the PCB used only for the Ground plane; If possible, use this layer as reference Ground plane for the transmission line;

- it is advisable to surround (on both sides) the PCB transmission line with Ground, avoiding that other signal tracks face directly the antenna line track;

- avoid crossing any un-shielded transmission line footprint with other signal tracks on different layers;

- the ground surrounding the antenna line on PCB shall be strictly connected to the main Ground Plane by means of via holes (at least once per 2mm), placed close to the ground edges facing the line track;

- place the noisy EM devices as far as possible from ME310G1 antenna line;

- keep the antenna line far away from the ME310G1 power supply lines;

- if EM noisy devices (such as fast switching ICs, LCD and so on) are present on the PCB hosting the ME310G1, take care of the shielding of the antenna line by burying it in an inner layer of PCB and surrounding it with the Ground planes, or shield it with a metal frame cover;

- if the noisy EM devices are not present around the line, the use of geometries such as Microstrip or Grounded Coplanar Waveguide is preferable, since they typically ensure less attenuation than a Stripline of the same length.

7. AUDIO SECTION

The Telit digital audio interface (DVI) of the ME310G1 Module is based on the I^{2}S serial bus interface standard. The audio port can be connected to the end device through the digital interface, or through one of the several compliant codecs (in case an analog audio is needed). The audio port is available only in ME310G1-WWV that has CS Voice/VoLTE support

7.1. Electrical Characteristics

The product is providing the DVI on the following pins:

Pin	Signal	I/O	Function	Internal Pull Up	Type
C1	DVI_WA0	I/O	Digital Audio Interface (Word Alignment / LRCLK)		CMOS 1.8V
D2	DVI_RX	I	Digital Audio Interface (RX)		CMOS 1.8V
E1	DVI_TX	O	Digital Audio Interface (TX)		CMOS 1.8V
F2	DVI_CLK	I/O	Digital Audio Interface (BCLK)		CMOS 1.8V

Table 31: Electrical Characteristics

8. GNSS SECTION

The ME310G1 module includes a state-of-the-art receiver capable of simultaneously searching and tracking satellite signals from multiple satellite constellations. This multi-GNSS receiver uses the entire spectrum of GNSS systems available: GPS, GLONASS, BeiDou, Galileo, and QZSS.

8.1 GNSS Signals Pin-out

Pin	Signal	I/O	Function	Type
E19	ANT_GNSS	I	GNSS Antenna (50 ohm)	
H18	GNSS_LNA_EN	O	GNSS External LNA Enable	CMOS 1.8V
G16	GNSS_1PPS	O	1 Pulse per Second	CMOS 1.8V

Table 32: GNSS Signals Pin-out

Warning: GNSS_1PPS is not currently supported by software and it will be implemented in future SW releases.

8.2 RF Front End Design

The ME310G1 Module doesn't contain the LNA necessary to achieve maximum sensitivity. The Active antenna (antenna with a built-in low noise amplifier) must be used and must be supplied with an proper bias-tee circuit.

8.2.1. Guidelines of PCB line for GNSS Antenna

- Ensure that the antenna line impedance is 50ohm.

- Keep the antenna line on the PCB as short as possible to reduce the loss.

- The Antenna line must have uniform characteristics, constant cross section, avoid meanders and abrupt curves.

- If possible, Keep one layer of the PCB used only for the Ground plane.

- Surround (on both sides, above and below) the antenna line on the PCB with Ground, avoid having other signal tracks facing directly the antenna line.

- The ground around the antenna line on the PCB must be tightly connected to the Ground Plane by placing vias once per 2mm at least.

- Place EM noisy devices as far as possible from antenna line.

- Keep the antenna line away from power supply lines.

- Keep the antenna line away from GSM RF lines.

- If there are noisy EM devices around the PCB hosting the module, such as fast switching ICs, take care of the shielding of the antenna line by burying it inside the layers of the PCB and surrounding it with the Ground planes, or shielding it with a metal frame cover.

- If you do not have noisy EM devices around the PCB hosting the module, use a strip-line on the superficial copper layer for the antenna line. The line attenuation will be lower than a buried one.

8.2.2. Hardware-based solution for GNSS and LTE coexistence

When a stand-alone GNSS receiver is present in the user application, the LTE transmission may desensitize the GNSS receiver in particular if the decoupling between the LTE and GNSS antennas is low. A SAW filter can be added on LTE side, to protect GNSS receiver from LTE out-of-band emissions, as described in the diagram below.

When using the GNSS receiver embedded in the ME310G1 module, there is no condition for degradation, since the LTE part and the GNSS part are never active simultaneously, therefore the filtering on the LTE side is not necessary.
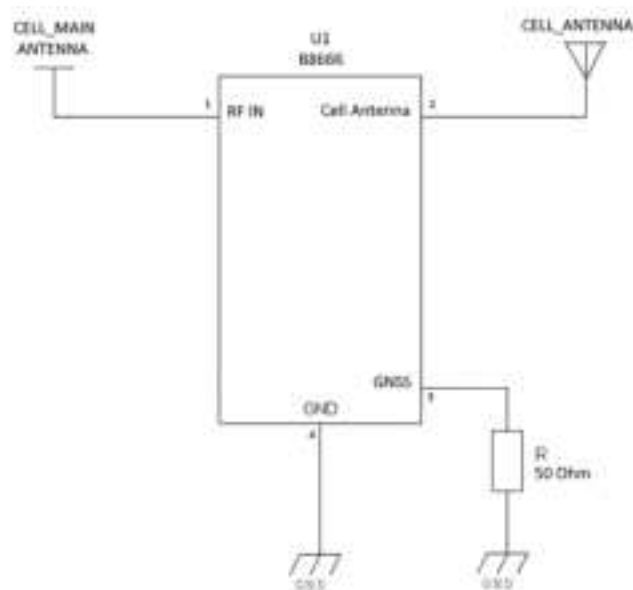

Figure 9: SAW filter on LTE side

8.3 GNSS Antenna Requirements

GNSS active antenna must be used or integrated in the application.

8.3.1. GNSS Antenna specification

Item	Value
Frequency range	1559.0 ~ 1610.0 MHz
Gain	15 ~ 30dB
Impedance	50 ohm
Noise Figure of LNA	< 1.5 (recommended)
DC supply voltage	DC 1.8 ~ 3.3V
VSWR	$\leq$ 3:1 (recommended)

Table 33: GNSS Antenna specification

Note: In case of GNSS antenna placed close to module 15dB gain is enough, in case of long cable the gain has to be increased up to 30dB.

8.3.2. GNSS Antenna – Installation Guidelines

- The antenna must be installed according to the antenna manufacturer's instructions to obtain the maximum performance of the GNSS receiver.

- The antenna location must be carefully evaluated if operating in conjunction with any other antenna or transmitter.

- The antenna must not be installed inside metal cases or near any obstacle that may degrade features such as antenna lobes and gain.

8.3.3. Powering the External LNA (active antenna)

The LNA of active antenna requires a power source because the 1.8V or 3V DC voltage required by the active antenna is not supplied by the ME310G1 module, but can be easily included in the user application circuit.

The electrical characteristics of the GPS_LNA_EN signal are:

Level	Min	Max
Output High Level	1.6V	1.9V
Output Low Level	0V	0.3V

Table 34: GPS_LNA_EN signal characteristics

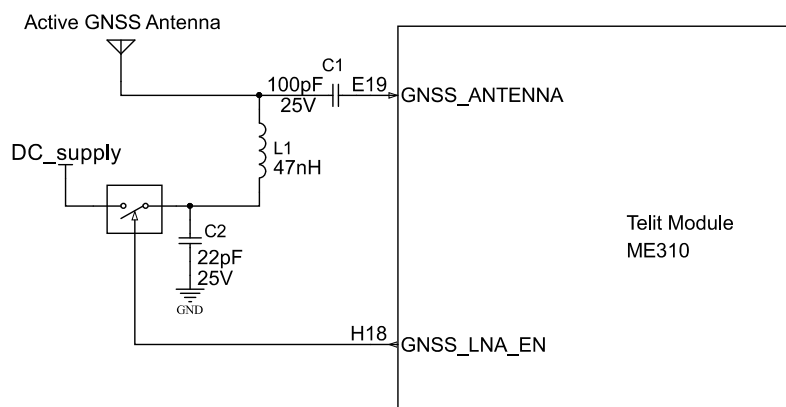Example of external antenna bias circuitry:

Figure 10: Antenna bias circuitry example

Pay attention to the maximum bias current in case of unwanted short circuit on the antenna cable since the decoupling inductor can be damaged.

8.4 GNSS Characteristics

The table below specifies the GNSS characteristics and expected performance.

Parameters		Typical Measurement	Notes
Sensitivity	Tracking Sensitivity	-159 dBm	
	Navigation	-155 dBm	
	Cold Start	-144 dBm	
TTFF	Hot	N/A	It will be available in next revision
	Warm	<30s	GNSS Simulator test @-130dBm
	Cold	<30s	GNSS Simulator test @-130dBm
Min Navigation update rate		1Hz	
CEP		<2m	

Table 35: GNSS Characteristics

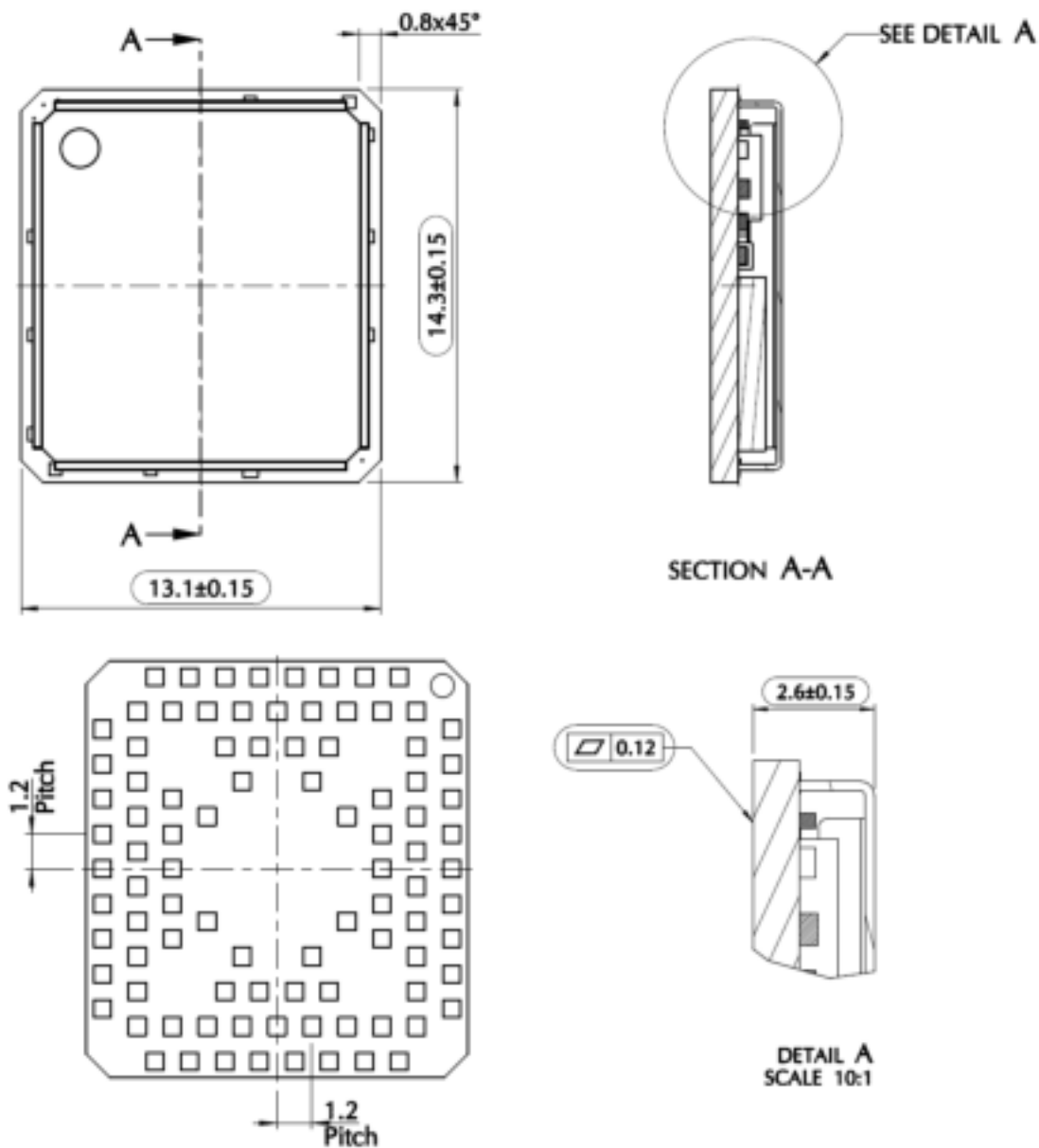# 9. MECHANICAL DESIGN

9.1. Drawing

9.1.1. ME310G1-W1

Figure 11: Mechanical Drawing ME310G1-W1

Note: Dimensions in mm. General Tolerance ±0.1, Angular Tolerance ±1°, The tolerance is not cumulative.

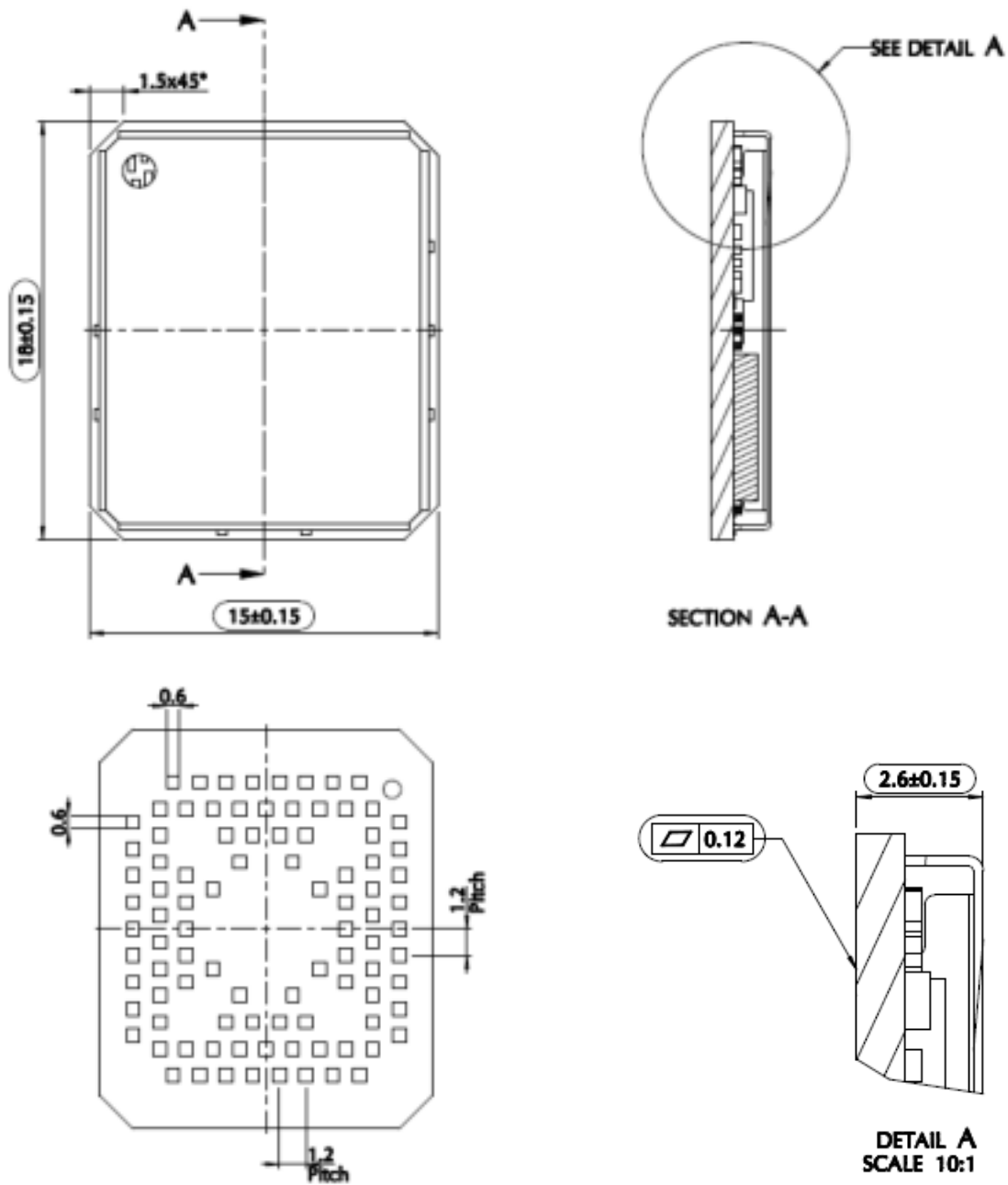### 9.1.2.   ME310G1-WW, ME310G1-WWV and ME310G1-W2

Figure 12: Mechanical Drawing ME310G1-WW, ME310G1-WWV and ME310G1-W2

10. APPLICATION PCB DESIGN

The ME310G1 modules have been designed in order to be compliant with a standard lead-free SMT process.

10.1. Footprint

10.1.1. ME310G1-W1
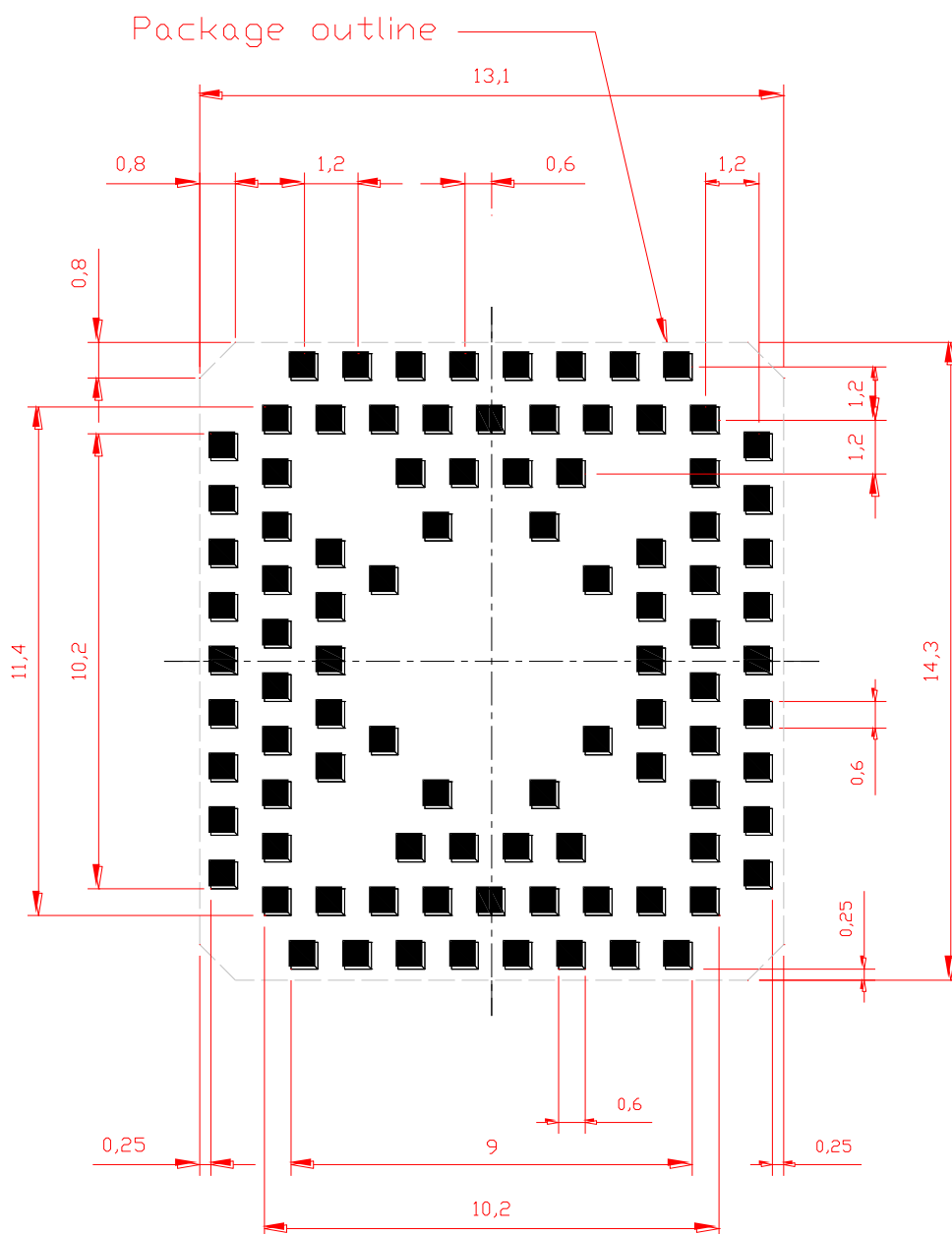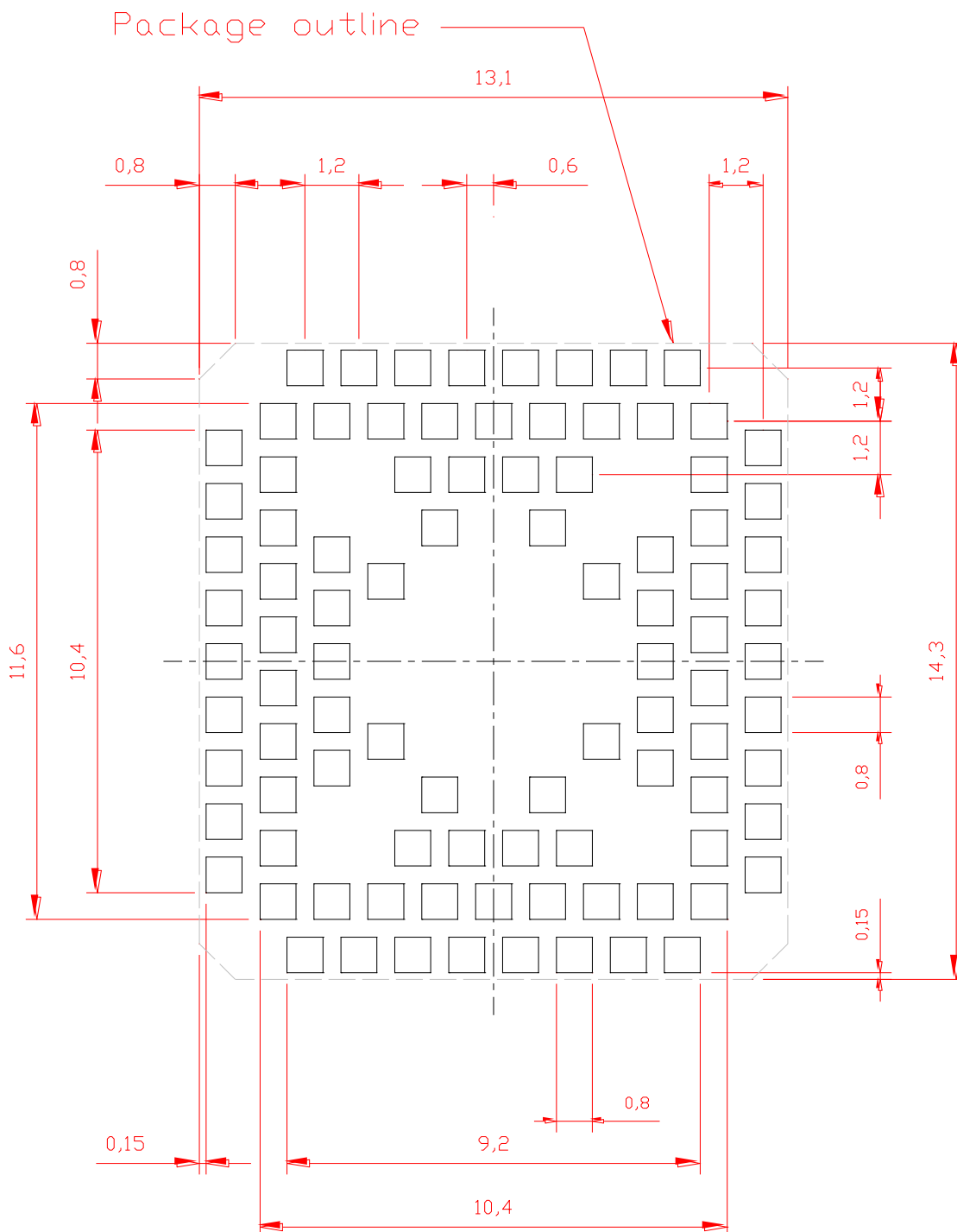
COPPER PATTERN (top view)

Figure 13: Copper Pattern (top view)

SOLDER RESIST PATTERN (top view)

Figure 14: Solder resist pattern (top view)

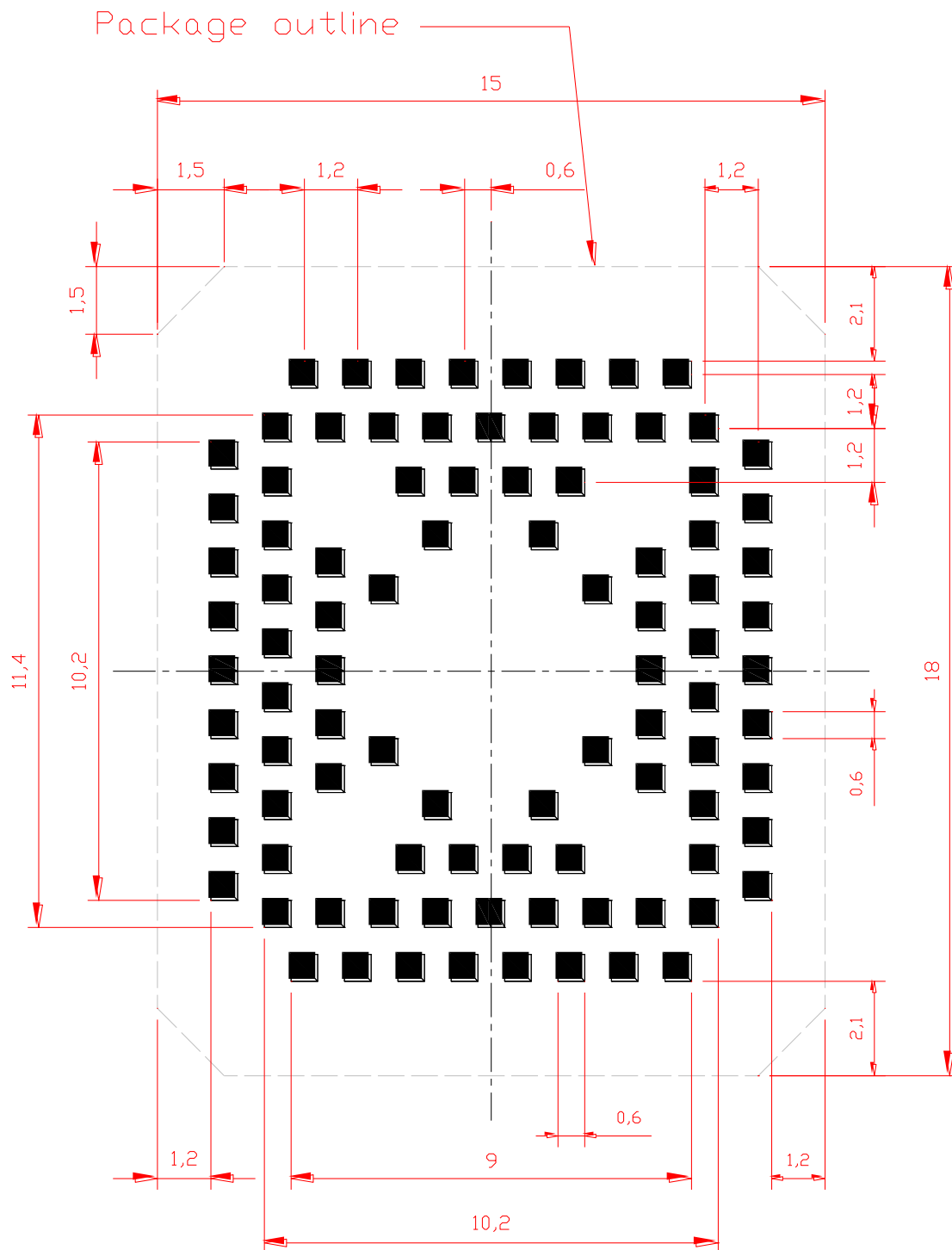## 10.1.2. ME310G1-WW, ME310G1-WWV and ME310G1-W2

COPPER PATTERN (top view)

Figure 15: Example Figure

SOLDER RESIST PATTERN (top view)
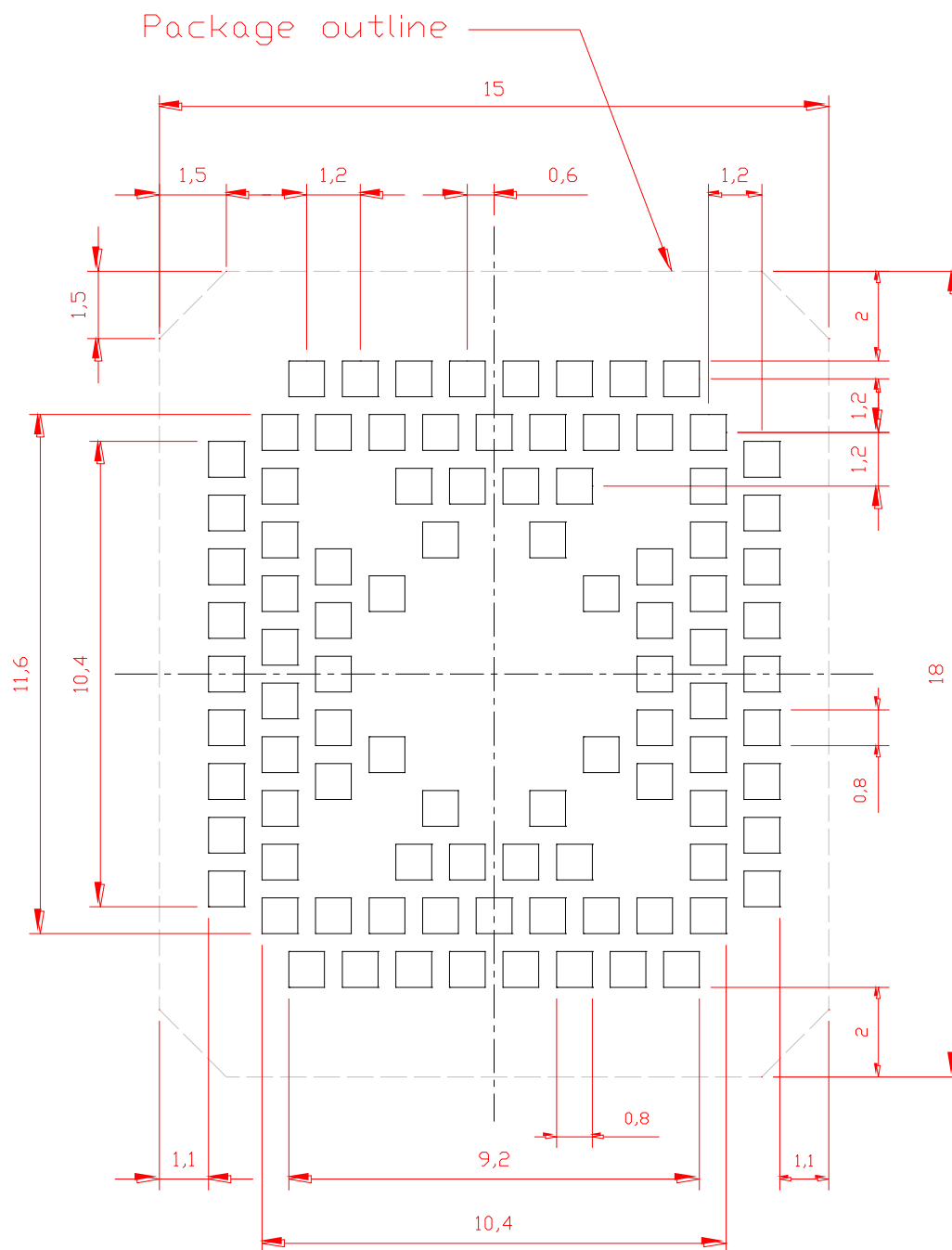
Figure 16: Example Figure

10.1.3. Recommendations for ME310G1-W1

In order to easily rework the ME310G1-W1, it is recommended to consider on the application a 2 mm placement inhibit area around the module.

It is also suggested, as a common rule for an SMT component, to avoid having a mechanical part of the application in direct contact with the module.

Figure 17: ME310G1-W1 Recommendations

> **Note**: In the customer application, the region under WIRING INHIBIT (see the figure above) must be clear from signal or ground paths.

10.1.4. Recommendations for ME310G1-WW, ME310G1-WWV and ME310G1-W2

In order to easily rework the ME310G1-WW, ME310G1-WWV and ME310G1-W2 it is recommended to consider the application placement inhibit area around the module, as specified in the below figure.
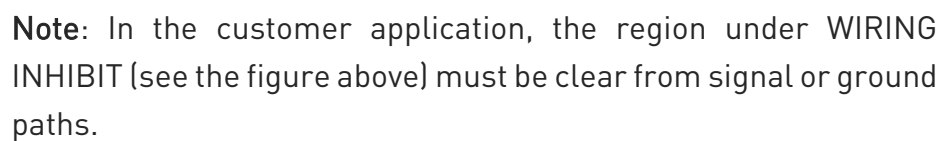
It is also suggested, as common rule for an SMT component, to avoid having a mechanical part of the application in direct contact with the module.

Figure 18: ME310G1-WW, ME310G1-WWV and ME310G1-W2 Recommendations

Note: In the customer application, the region under WIRING INHIBIT (see the figure above) must be clear from signal or ground paths.
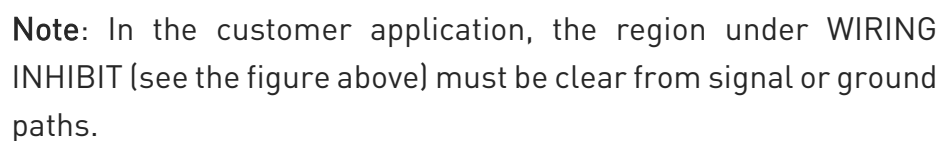
10.2. PCB pad design

Non solder mask defined (NSMD) type is recommended for the solder pads on the PCB.
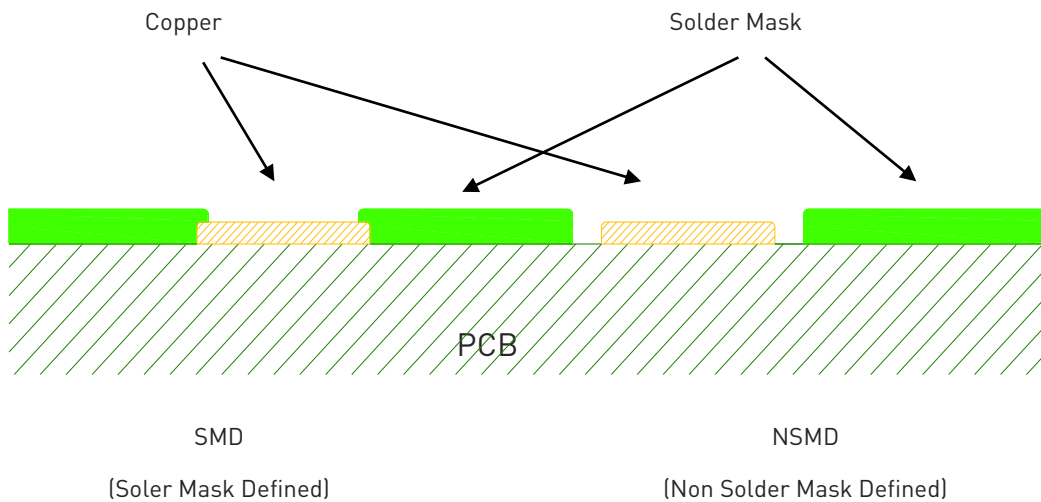

Figure 19: PCB solder pad recommendations

The recommendation for the PCB pads dimensions are 1:1 with module pads.

It is not recommended to place via or micro-via not covered by solder resist in an area of 0.3 mm around the pads unless it carries the same signal of the pad itself

Holes in pad are allowed only for blind holes and not for through holes.

Recommendations for PCB pad surfaces:

Finish	Layer Thickness (um)	Properties
Electro-less Ni / Immersion Au	3 –7 / 0.03 – 0.15	good solder ability protection, high shear force values

Table 36 Recommendations for PCB pad surfaces

The PCB must be able to resist the higher temperatures that occur during the lead-free process. This issue should be discussed with the PCB-supplier. In general, the wettability of tin-lead solder paste on the described surface plating is better than the lead-free solder paste.

It is not necessary to panel the application's PCB, however in that case it is recommended to use milled contours and pre-drilled board breakouts; scoring or v-cut solutions are not recommended.

10.3.   Stencil

The layout of the stencil apertures can be the same as the recommended footprint (1:1), we suggest a thickness of stencil foil ≥ 120 µm.

10.4.   Solder paste

Item	Lead Free
Solder Paste	Sn/Ag/Cu

Table 37: Solder paste

We recommend using only "no clean" solder paste to avoid the cleaning of the modules after assembly.

10.5.   Solder Reflow

Recommended solder reflow profile:

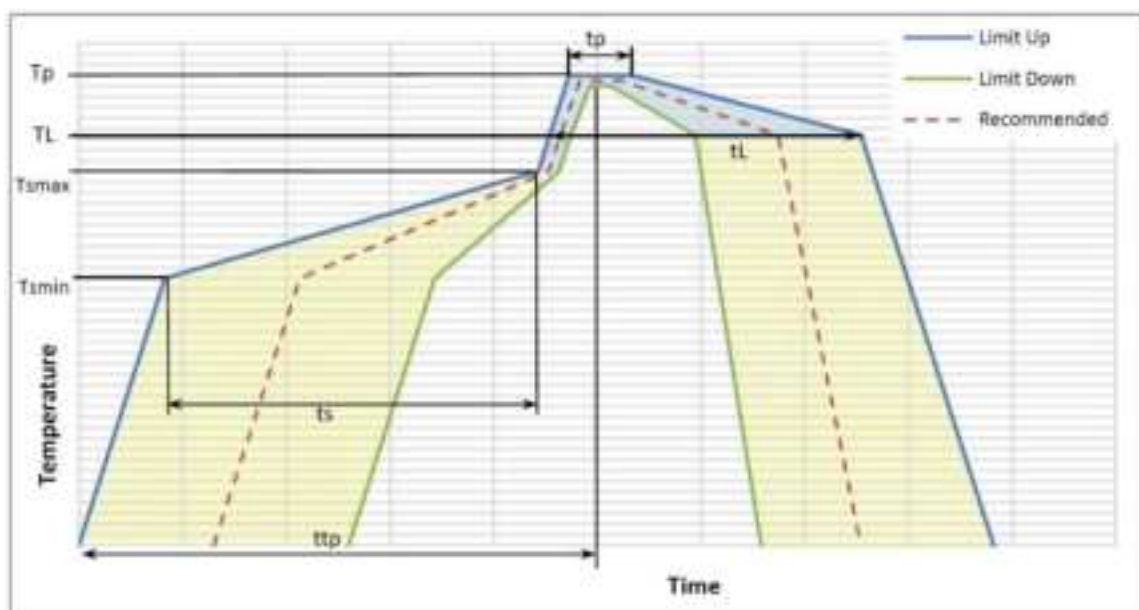*Figure 20: Recommended Solder reflow profile*

Warning: The aforementioned solder reflow profile represents the typical SAC reflow limits and does not guarantee the adequate adherence of the module to the customer application throughout the temperature range. The customer must optimize the reflow profile based on the overall system taking into account factors such as thermal mass and warpage.

Profile Feature	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	3°C/second max
Preheat – Temperature Min (Tsmin) – Temperature Max (Tsmax) – Time (min to max) (ts)	150°C 200°C 60-180 seconds
Tsmax to TL – Ramp-up Rate	3°C/second max
Time maintained above: – Temperature (TL) – Time (tL)	217°C 60-150 seconds
Peak Temperature (Tp)	245 +0/-5°C
Time within 5°C of actual Peak Temperature (tp)	10-30 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.

Table 38 Profile feature recommendations

Note: All temperatures refer to topside of the package, measured on the package body surface

Warning: THE ME310G1 MODULES WITHSTANDS ONE REFLOW PROCESS ONLY.

Warning: The aforementioned solder reflow profile represents the typical SAC reflow limits and does not guarantee the adequate adherence of the module to the customer application throughout the temperature range. The customer must optimize the reflow profile depending on the overall system, taking into account factors such as thermal mass and warpage.

11. PACKAGING

11.1. Tray

11.1.1. ME310G1-W1
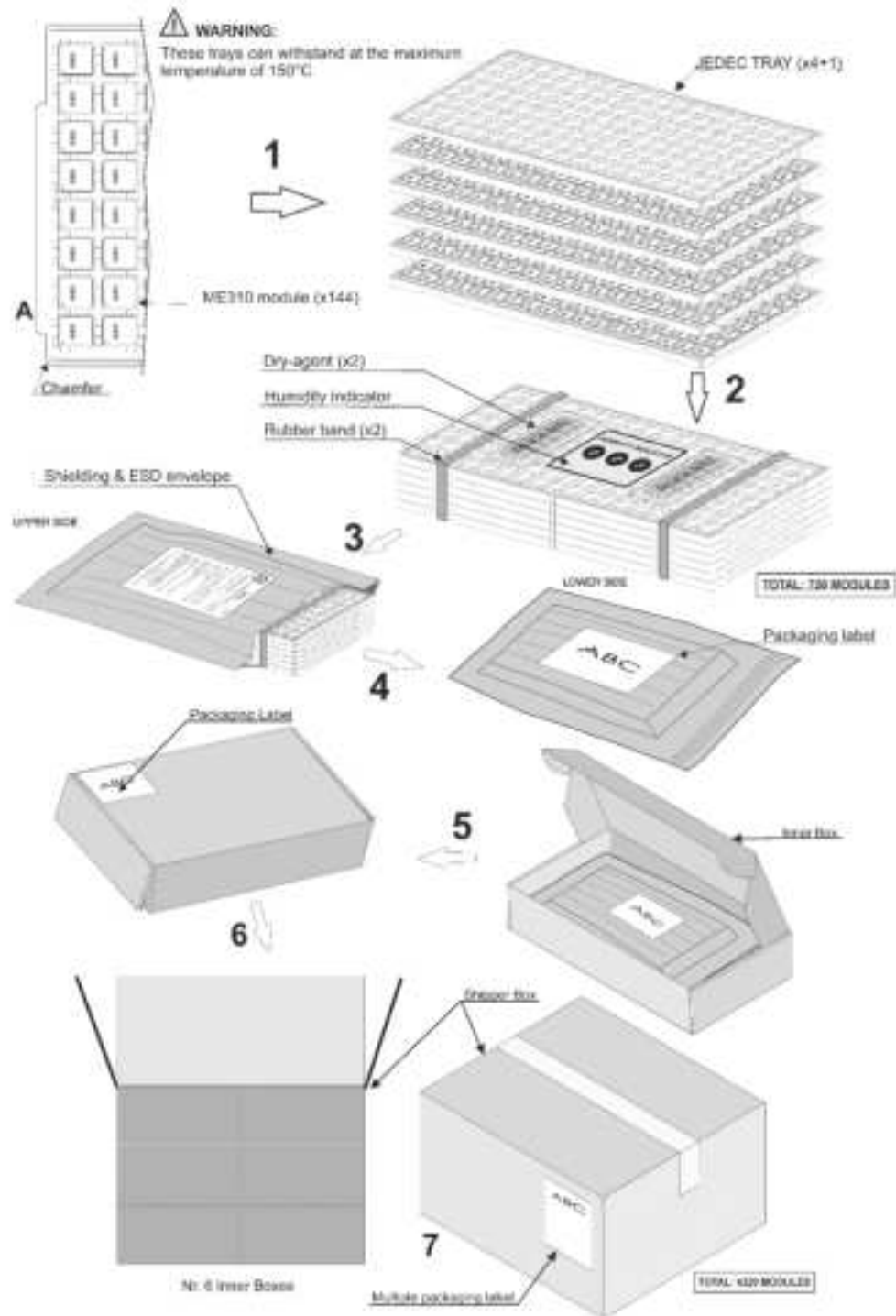

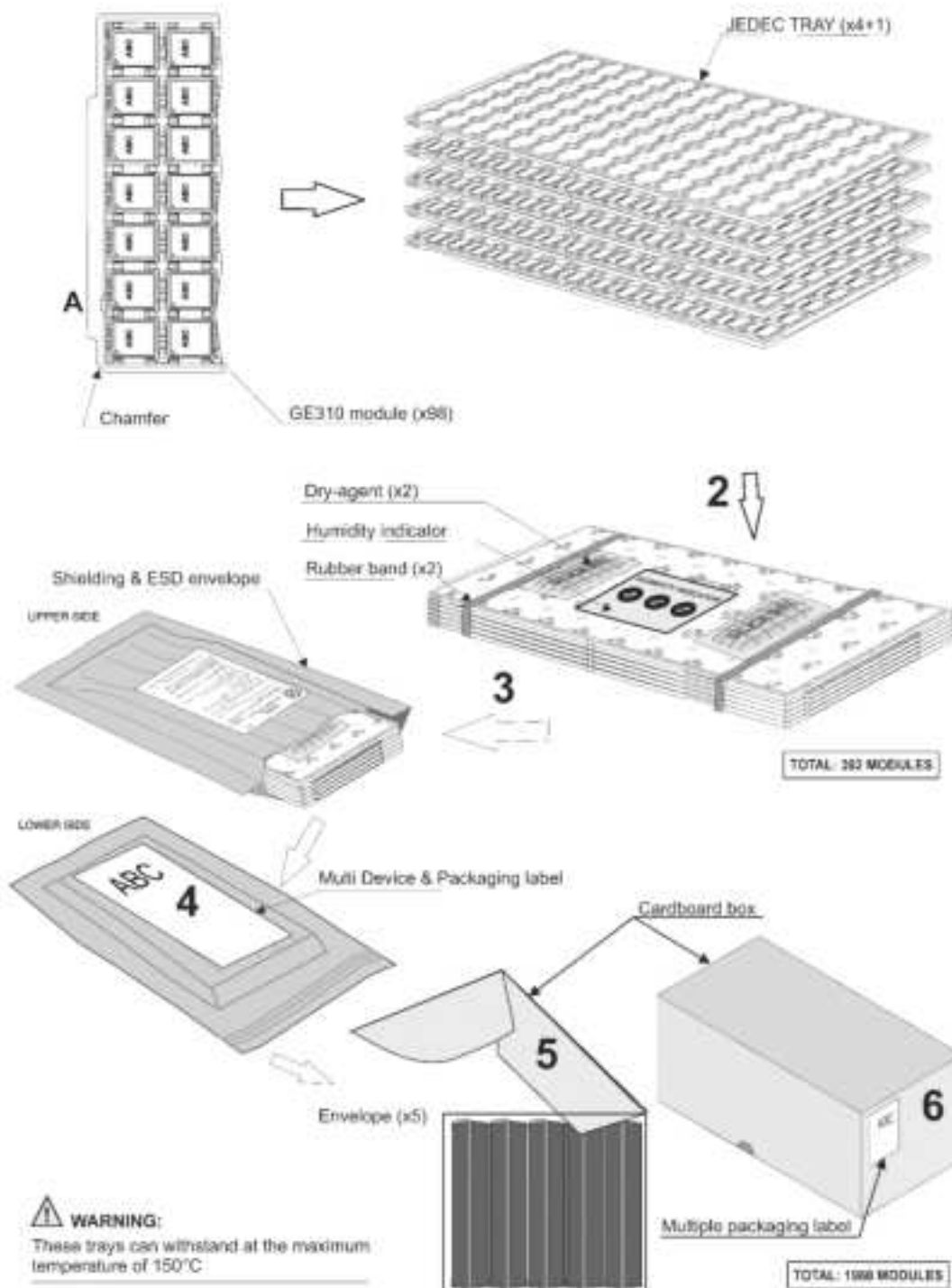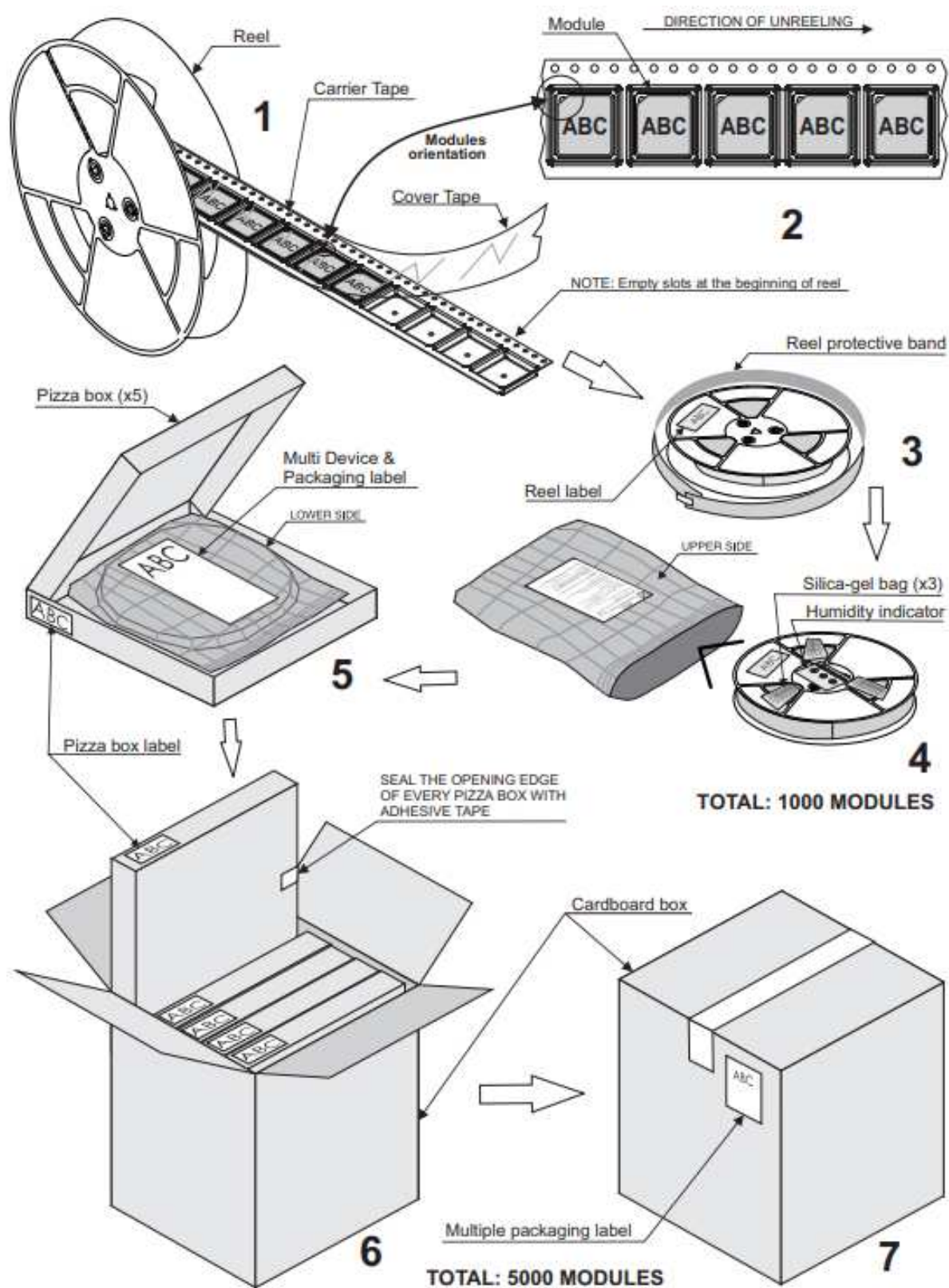*Figure 21: ME310G1-W1 tray packaging*

Figure 22: ME310G1-W1 tray

11.1.2. ME310G1-WW

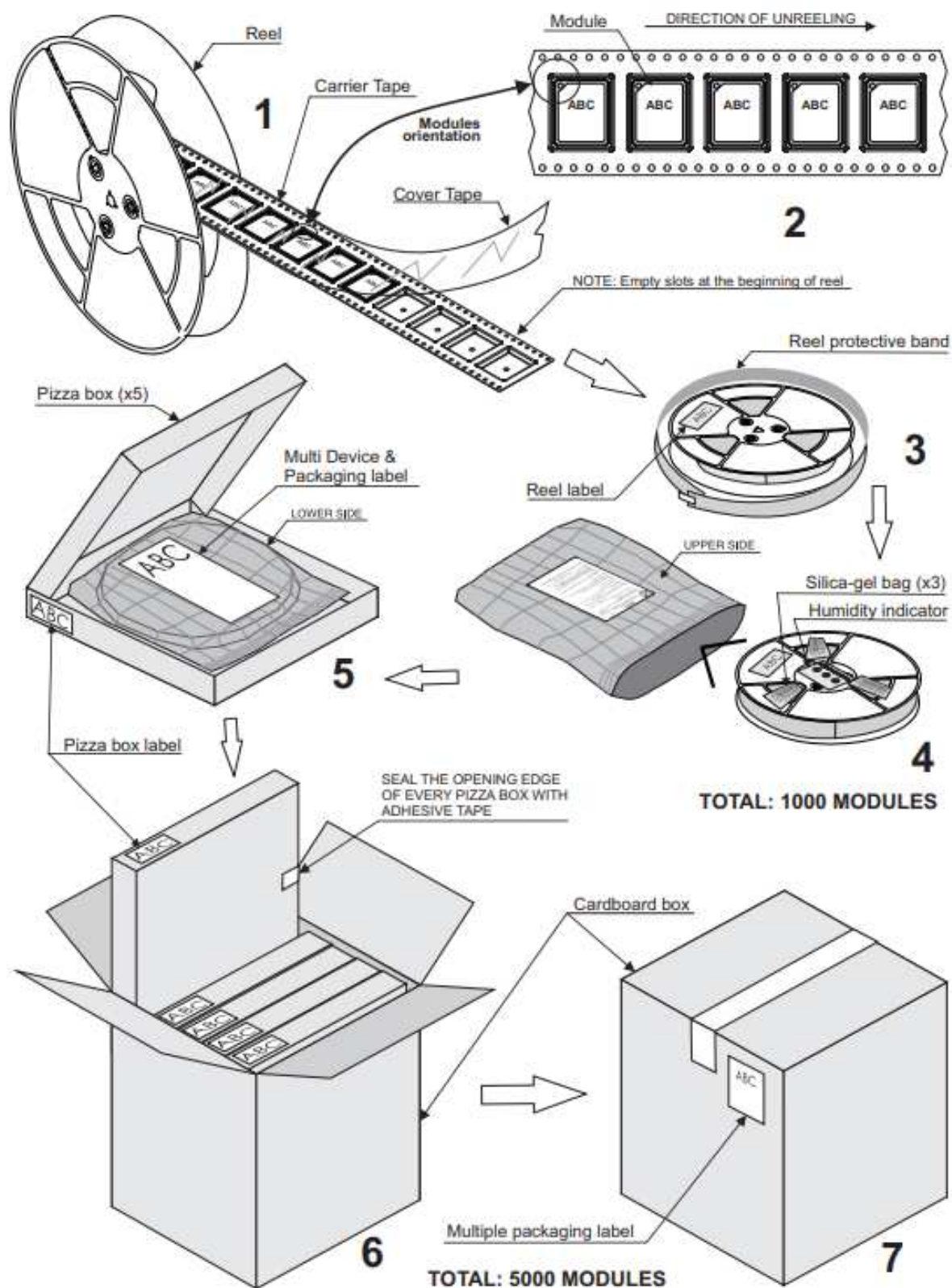*Figure 23: ME310G1-WW tray packaging*

Figure 24: ME310G1-WW tray

11.2. Reel

11.2.1. ME310G1-W1

11.2.2. ME310G1-WW and ME310G1-W2

12. CONFORMITY ASSESSMENT ISSUES

12.1. Approvals summary

Type Approval	ME310G1-W1	ME310G1-WW	ME310G1-WWV	ME310G1-W2
EU RED	Yes	Yes	Yes	Yes
US FCC	Yes	Yes	Yes	-
CA ISED	Yes	Yes	Yes	-
BRAZIL ANATEL	-	Yes	-	-
JAPAN JRF & JTBL	-	Yes	-	-
CHINA CCC	-	Yes	-	-
Singapore INDA	In planning	Yes	-	-
NCC Taiwan	-	Yes	-	-

Table 39: Type approvals summary

12.2. RED approval

12.2.1. RED Declaration of Conformity

Hereby, Telit Communications S.p.A declares that the ME310G1-W1, ME310G1-WW, ME310G1-WWV and ME310G1-W2 Modules are in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address: http://www.telit.com/red Text of 2014/53/EU Directive (RED) can be found here:

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0053

12.2.2. RED Antennas

This radio transmitter has been approved under RED to operate with the antenna types listed below with the maximum permissible gain indicated. The usage of a different antenna in the final hosting device may need a new assessment of host conformity to RED.

Model	Antenna Type
ME310G1-W1	Omnidirectional Antenna Gain 2.14 dBi
ME310G1-WW	
ME310G1-WWV	
ME310G1-W2	

Table 40: RED Antenna Type

Max Gain for RED (dBi)				
Band	ME310G1-W1	ME310G1-WW	ME310G1-WWV	ME310G1-W2
GSM 900	---	---	8.48	---
DCS 1800	---	---	14.36	---
GPRS/EGPRS 900	---	5.97	5.97	---
GPRS/EGPRS 1800	---	10.34	9.34	---
FDD 1	14.84	11.84	11.84	14.3
FDD 3	14.33	11.33	11.33	13.8
FDD 8	11.45	8.45	8.45	10.7
FDD 20	11.20	8.20	8.20	11.2
FDD 28	10.47	7.47	7.47	10.7
FDD 31	---	---	---	2.5
FDD 72	---	---	---	2.5

Table 41: Max Gain for RED

12.3. FCC and ISED approval / *FCC et ISDE approbation*

12.3.1. FCC certificates

The FCC Certificate is available here:

https://www.fcc.gov/oet/ea/fccid

12.3.2. ISED Certificate / *ISDE certificates*

The ISED Certificate is available here / *Le certificat ISDE est disponible ici*:

https://sms-sgs.ic.gc.ca/equipmentSearch/searchRadioEquipments?execution=e1s1&lang=en

12.3.3. Applicable FCC and ISED rules / *Liste des règles FCC et ISDE applicables*

Model Modèle	Applicable FCC Rules	Applicable ISED Rules Règles ISDE applicables
ME310G1-W1	47 CFR Part 2, 22, 24, 27, 90	RSS: 132 Issue3, 133 Issue 6, 130 Issue 2, 139 Issue 3; RSS-Gen Issue 5
ME310G1-WW		
ME310G1-WWV		

Table 42 Applicable FCC and ISED rules

12.3.4. FCC and ISED Regulatory notices / Avis réglementaires de FCC et ISDE

Modification statement / *Déclaration de modification*

Telit does not approve any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Telit n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Interference statement / *Déclaration d'interférence*

This device complies with Part 15 of the FCC Rules and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Wireless notice / *Wireless avis*

This device complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the ISED radio frequency (RF) Exposure rules. This transmitter must not be co-located or operate in conjunction with any other antenna or transmitter. The antenna should be installed and operated with minimum distance of 20 cm between the radiator and your body.

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS-102 de la fréquence radio (RF) ISED règles d'exposition. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur. L'antenne doit être installée de façon à garder une distance minimale de 20 centimètres entre la source de rayonnements et votre corps.

FCC Class B digital device notice (FCC only)

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 to correct the interference by taking one or more of the following measures:

Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the 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.

CAN ICES-3 (B) / NMB-3 (B) (ISED only) / *(ISDE seulement)*

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

12.3.5. FCC/ISED Antennas / *FCC/ISDE Antennes*

FCC

This radio transmitter has been approved by FCC and ISED to operate with the antenna types listed below with the maximum allowable gain indicated. Antenna types not included in this list, with a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Model	Antenna Type

ME310G1-W1	Omnidirectional Antenna Gain 2.14 dBi
ME310G1-WW	
ME310G1-WWV	

Table 43 FCC Antenna Type

Max Gain for FCC (dBi)			
Band	ME310G1-W1	ME310G1-WW	ME310G1-WWV
GSM 850	---	---	6.6
GSM 1900	---	---	2.0
GPRS/EGPRS 850	---	6.9	6.9
GPRS/EGPRS 1900	---	2.5	2.5
FDD 2	11.0	8.0	8.0
FDD 4	8.0	5.0	5.0
FDD 5	12.4	9.4	9.4
FDD 12	11.6	8.7	8.7
FDD 13	12.1	9.1	9.1
FDD 25	11.0	8.0	8.0
FDD 26	12.3	9.3	9.3
FDD 66	8.0	5.0	5.0
FDD 71	11.4	11.4	11.4
FDD 85	11.6	8.6	8.6
FDD 86	12.1	---	---

Table 44: Max Gain for FCC (dBi)

ISED / *ISDE*

This radio transmitter has been approved by ISED to operate with the antenna types listed below with the maximum allowable gain indicated. Antenna types not included in this list, with a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio a été approuvé par ISDE pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Model Modèle	Antenna Type Type d'Antenne
ME310G1-W1	Omnidirectional

ME310G1-WW	Antenna Gain 2.14 dBi Omnidirectionelle
ME310G1-WWV	Gain de l'antenne 2.14 dBi

Table 45: ISED Antenna Type

Gain maximum for ISED (dBi) / *Gain maximum pour ISDE (dBi)*			
Bande	ME310G1-W1	ME310G1-WW	ME310G1-WWV
GSM 850	---	---	6.1
GSM 1900	---	---	2.0
GPRS/EGPRS 850	---	3.6	3.6
GPRS/EGPRS 1900	---	2.5	2.5
FDD 2	11.0	8.0	8.0
FDD 4	8.0	5.0	5.0
FDD 5	9.1	6.1	6.1
FDD 12	8.6	5.6	5.6
FDD 13	8.9	5.9	5.9
FDD 25	11.0	8.0	8.0
FDD 26	9.0	6.0	6.0
FDD 66	8.0	5.0	5.0
FDD 71	8.4	8.4	8.4
FDD 85	8.6	5.6	5.6

Table 46: Gain maximum for ISED (dBi)

12.3.6. FCC label and compliance information

The product has a FCC ID label on the device itself. In addition, the OEM host end product manufacturer will be informed to display a label referring to the enclosed module The external label will read as follows: "Contains Transmitter Module FCC ID: RI7ME310G1W1" or "Contains FCC ID: RI7ME310G1W1" for ME310G1-W1 and : "Contains Transmitter Module FCC ID: RI7ME310G1WW" or "Contains FCC ID: RI7ME310G1WW" for ME310G1-WW and ME310G1-WWV

Below list of all the models and related FCC ID:

Model	FCC ID
ME310G1-W1	RI7ME310G1W1
ME310G1-WW	RI7ME310G1WW
ME310G1-WWV	

Table 47: FCC ID

12.3.7. ISED label and compliance information/*Étiquette et informations de conformité ISDE*

The host product shall be properly labelled to identify the modules within the host product.

The ISED certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labelled to display the ISED certification number for the module, preceded by the word "contains" or similar wording expressing the same meaning, as follows:

Contains IC: XXXXXX-YYYYYYYYYY

In this case, XXXXXX-YYYYYYYYYY is the module's certification number.

Le produit hôte devra être correctement étiqueté, de façon à permettre l'identification des modules qui s'y trouvent.

L'étiquette d'homologation d'un module d'ISDE devra être apposée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'ISDE, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit:

Contient IC : XXXXXX-YYYYYYYYYY

Dans ce cas, XXXXXX-YYYYYYYYYY est le numéro d'homologation du module.

Model Modèle	ISED Certification Number Num. de certification ISDE
ME310G1-W1	5131A-ME310G1W1
ME310G1-WW	5131A-ME310G1WW
ME310G1-WWV	

Table 48: ISED Certification Number

12.3.8. Information on test modes and additional testing requirements / Informations sur les modes de test et les exigences de test supplémentaires

The module has been evaluated in mobile stand-alone conditions. For different operational conditions other than a stand-alone modular transmitter in a host (multiple,

simultaneously transmitting modules or other transmitters in a host), additional testing may be required (collocation, retesting...)

If this module is intended for use in a portable device, the user is responsible for separate approval to meet the SAR requirements of FCC Part 2.1093 and IC RSS-102.

Le module a été évalué dans des conditions autonomes mobiles. Pour différentes conditions de fonctionnement d'un émetteur modulaire autonome dans un hôte (plusieurs modules émettant simultanément ou d'autres émetteurs dans un hôte), des tests supplémentaires peuvent être nécessaires (colocalisation, retesting...)

Si ce module est destiné à être utilisé dans un appareil portable, vous êtes responsable de l'approbation séparée pour satisfaire aux exigences SAR de la FCC Partie 2.1093 et IC RSS-102.

12.3.9. FCC Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the license, and that the host product manufacturer is responsible for compliance with any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the beneficiary markets his product as compliant with Part 15 Subpart B (when it also contains unintentional-radiator digital circuity), then the beneficiary must communicate that the final host product still requires compliance tests of Part 15 Subpart B with the modular transmitter installed. The end product with an embedded module may also need to pass the FCC Part 15 unintentional emission testing requirements and be properly authorized in accordance with FCC Part 15.

12.4. ANATEL Regulatory Notices

"Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados"

"This equipment is not entitled to protection against harmful interference and must not cause interference in duly authorized systems"

ME910G1-WW, ME310G1-WW, ML865G1-WW Homologation #: 08566-20-02618

12.5. NCC Regulatory Notices

According to NCC Taiwan requirements, the module and the packaging shall be identified as described in the following lines. Shall be added also the specified safety warning statement.

Brand name: Telit

Model name: ME310G1-WW

Equipment name: WWAN module

NCC logo:

NCC ID: CCAF21Y00040

NCC safety warning statement: "減少電磁波影響，請妥適使用"

NCC Note: 注意：行動電話業務(2G)於106年6月停止提供服務後，本設備2G功能在國內將無法使用。

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13.3. Safety Recommendations

Make sure the use of this product is allowed in your country and in the environment required. The use of this product may be dangerous and has to be avoided in areas where:

- it can interfere with other electronic devices, particularly in environments such as hospitals, airports, aircrafts, etc.

- there is a risk of explosion such as gasoline stations, oil refineries, etc. It is the responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity. We recommend following the instructions of the hardware user guides for correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conformed to the security and fire prevention regulations. The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible for the functioning of the final product. Therefore, the external components of the module, as well as any project or installation issue, have to be handled with care. Any interference may cause the risk of disturbing the GSM network or external devices or having an impact on the security system. Should there be any doubt, please refer to the technical documentation and the regulations in force. Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed carefully in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (20 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The equipment is intended to be installed in a restricted area location.

The equipment must be supplied by an external specific limited power source in compliance with the standard EN 62368-1:2014.

The European Community provides some Directives for the electronic equipment introduced on the market. All of the relevant information is available on the European Community website:

https://ec.europa.eu/growth/sectors/electrical-engineering_en

14. GLOSSARY

ADC	Analog – Digital Converter
BPSK	Modulation used for in OFDM symbols
CLK	Clock
CMOS	Complementary Metal – Oxide Semiconductor
CS	Chip Select
DAC	Digital – Analog Converter
DTE	Data Terminal Equipment
DVI	Digital Voice Interface
EM	Electromagnetic
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ESR	Equivalent Series Resistance
FDD	Frequency Division Duplexing
GPIO	General Purpose Input Output
HS	High Speed
HSDPA	High Speed Downlink Packet Access
HSIC	High Speed Inter Chip
HSUPA	High Speed Uplink Packet Access
I/O	Input Output
LTE	Long Term Evolution
MISO	Master Input – Slave Output
MOSI	Master Output – Slave Input
MRDY	Master Ready
NAS	Non-Access Stratum
PCB	Printed Circuit Board
PSM	Power Saving Mode according to 3GPP Rel.12
QPSK	Modulation used for in OFDM symbols

RB	Resource Block; the smallest unit of resources that can be allocated to a user
RF	Radio Frequency
RMC	Reference Measurement Channel; it refers to a 3GPP standardized setting for the channel. For more details, refer to 3GPP TS 36.521-1
RTC	Real Time Clock
RU	Resource Unit (NB IoT Only); the time reported is the length for the specific configuration SC - SC Spacing
SC	Sub Carriers: indicates the number of Sub-Carriers used
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
SRDY	Slave Ready
TBS	Transport Block Size
UART	Universal Asynchronous Receiver Transmitter
UMTS	Universal Mobile Telecommunication System
USB	Universal Serial Bus
VNA	Vector Network Analyzer
VSWR	Voltage Standing Wave Radio
WCDMA	Wideband Code Division Multiple Access

15. DOCUMENT HISTORY

Revision	Date	Changes
11	2021-03-16	Section12.5, added NCC Regulatory Notices
		Section 8.4, measurements update
		Section 2.2 and 2.5 added B86
		Section 12.3 added B86 FCC antenna info
10	2021-01-12	Reviewed template design and styles
		Section 12.2 updated with ME310G1-W2 information
		Section 11.2 updated with Reel information
		Section 7.2 removed
		Chapter 4 update
8	2020-09-14	Added ME310G1-W2 variant
		Section 2.5, TX Power update
		Section 2.8, Temperature ranges update
		Section 5.2, Power-on timing change back to 5sec
7	2020-07-22	Conformity assessment update with ANATEL
6	2020-05-19	Power consumption update (GPS)
		Conformity assessment update
		Added ME310G1-WWV variant
5	2020-04-29	Power consumption figures update
		FORCED_USB_BOOT renamed ROM_BOOT
		Added USB signals in PIN ALLOCATION
		Added "WARNING" RXD1 in PIN ALLOCATION and in section 5.6.3.2
		Footprint update in section 10.1
		Added Packaging Tray information
		Added GNSS and LTE coexistence suggestion
		VBATmin update in section 4.1
4	2020-01-31	Power consumption figures update
		RX Sensitivity figures update
		HW Shutdown update
		Conformity assessment update
3	2019-10-02	Power consumption figures update
		Added DTR and RING
		Removed B14
		Update ME310G1-WW inhibit area reccomandation
		Extended Voltange Range lower limit change

Revision	Date	Changes
2	2019-08-13	Added ME310G1-WW
		Update of Temperature range table
		N16 pin update (ON_OFF*/WAKE*)
		ON/OFF procedure updated
1	2019-06-13	Band list update, pinout update
		Added SIMIN, USB_VBUS, CTANK, PWRMON, ROM_BOOT pins description
		Added power on procedure
0	2019-03-11	First issue

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