

# CMP961x

## WiFi + Bluetooth + Thread/Matter Hosted Module

### Datasheet

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## TRANSCEIVER IC

The CMP961x, utilizing the NXP IW611/612 SoC, is a WiFi+Bluetooth+Thread/Matter combo device with integrated MCU core. This transceiver supports Wi-Fi connectivity at both 2.4 and 5 GHz to maximize performance in harsh environments. WLAN host interface is SDIO, the Bluetooth host interface is UART and the 802.15.4 interface for Thread/Matter is SPI.

## HOST DRIVER SUPPORT

The CMP961x modules are supported on a variety of host platforms including MPU and MCU architectures. Hardware from leading MPU/MCU vendors and operating systems such as Android, Linux as well as FreeRTOS. Please contact CEL for details on available drivers, Quick Start Guides and Driver Porting Guides.

## BLOCK DIAGRAM

TBD

## ABSOLUTE MAXIMUM RATINGS

Description	Min	Max	Unit
Storage temperature range	-40	85	°C
Power supply voltage (VDD33)	3.0	3.6	V
I/O supply voltage	0.99	3.6	V

## RECOMMENDED OPERATING CONDITIONS

Description	Min	Typ	Max	Unit
Operating temperature range (-1 and -1C)	0	-	70	°C
Operating temperature range (-2, -2C and -9)	-40	-	85	°C
Supply Voltage (VDD)	3.14	3.3	3.46	V
Supply Voltage (VIO – 1.8V I/O)	1.62	1.8	1.98	V
Supply Voltage (VIO – 3.3V I/O)	2.97	3.3	3.47	V

## POWER CONSUMPTION

(@25°C unless otherwise specified)

### WLAN TX POWER CONSUMPTION

Wi-Fi Band (GHz)	Mode	BW (MHz)	TX Power (dBm)	Max Current (VDD 3.3V)	Avg Current (VDD 3.3V)	Unit
2.4	11b @ 1 Mbps	20	17	298	296	mA
	11g @ 54 Mbps	20	16	280	278	
	11n @ MCS0	40	14	273	270	
	11n @ MCS7	40	14	251	248	
	11ax @ MCS0 NSS1	40	12	259	259	
	11ax @ MCS11 NSS1	40	12	232	231	
5	11a @ 6 Mbps	20	16	398	392	mA
	11n @ MCS0	40	16	399	395	
	11n @ MCS7	40	16	362	357	
	11ac @ MCS0 NSS1	80	14	366	360	

	11ac @ MCS9 NSS1	80	14	321	317	
	11ax @ MCS0 NSS1	80	11	314	312	
	11ax @ MCS11 NSS1	80	11	285	283	

### WLAN RX POWER CONSUMPTION

WiFi Band (GHz)	Mode	BW (MHz)	Max Current (VDD 3.3V)	Max Current (VDD 3.3V)	Units
2.4	11b @ 11 Mbps	20	60	56	mA
	11n @ MCS7	40	72	70	
	11ax @ MCS11 NSS1	40	71	68	
5	11a @ 54 Mbps	20	84	72	mA
	11n @ MCS7	40	92	82	
	11ac @ MCS9 NSS1	80	106	100	
	11ax @ MCS11 NSS1	80	104	98	

### Low Power Modes

Operation Mode	Max Current (VDD 3.3V)	Avg Current (VDD 3.3V)	Units
PDn	70	20	uA
Deep Sleep	400	300	uA

### BLUETOOTH POWER CONSUMPTION

Bluetooth Operation Mode	Max Current (VDD 3.3V)	Avg Current (VDD 3.3V)	Units
Continuous RX	59	30	mA
Continuous TX @ 2 dBm	59	35	mA

802.15.4 Operation Mode (CMP9612 only)	Max Current (VDD 3.3V)	Avg Current (VDD 3.3V)	Units
Continuous RX	TBD	TBD	mA
Continuous TX @ 20 dBm	TBD	TBD	mA

## RF PERFORMANCE

### Wi-Fi 2.4/5 GHz Band RF Receiver Specifications

(@25°C unless otherwise specified)

Parameter	Description	Min	Typ	Max	Unit
2.4 GHz Frequency Range	Center Channel Frequency	2400	-	2490	MHz
5 GHz Frequency Range	Center Channel Frequency	5180		5825	MHz
RX Sensitivity 2.4 GHz	11b (11 Mbps)		-85	-82	dBm
	11g (54 Mbps)		-71	-68	
	11n (HT20 MCS7)		-66	-63	
	11n (HT40 MCS7)		-67	-64	
	11ax (HE20 MCS11)		-57	-54	
	11ax (HE40 MCS11)		-57	-54	
RX Sensitivity 5 GHz	11a (54 Mbps)		-68	-65	dBm
	11n (HT20 MCS7)		-66	-63	
	11n (HT40 MCS7)		-63	-60	
	11ac (VHT20 MCS8)		-62	-59	
	11ac (VHT40 MCS9)		-58	-55	
	11ac (VHT80 MCS9)		-56	-53	
	11ax (HE20 MCS11)		-56	-53	
	11ax (HE40 MCS11)		-54	-51	
	11ax (HE80 MCS11)		-53	-50	

## Wi-Fi 2.4/5 GHz Band RF Transmitter Specifications

(@25°C unless otherwise specified)

Parameter	Description	Min	Typ	Max	Unit
2.4 GHz Frequency Range	Center Channel Frequency	2412	-	2500	MHz
5 GHz Frequency Range	Center Channel Frequency	5180		5825	
TX Power 2.4 GHz	11b (11 Mbps) @	15	17	19	dBm
	11g (54 Mbps)	14.5	16	17.5	
	11n (HT20 MCS7)	12.5	14	15.5	
	11n (HT40 MCS7)	12.5	14	15.5	
	11ax (HE20 MCS11)	10.5	12	13.5	
	11ax (HE40 MCS11)	10.5	12	13.5	
TX Power 5 GHz	11a (54 Mbps)	14	16	18	dBm
	11n (HT20 MCS7)	14	16	18	
	11n (HT40 MCS7)	14	16	18	
	11ac (VHT20 MCS8)	12	14	16	
	11ac (VHT40 MCS9)	12	14	16	
	11ac (VHT80 MCS9)	12	14	16	
	11ax (HE20 MCS11)	9	11	13	
	11ax (HE40 MCS11)	9	11	13	
	11ax (HE80 MCS11)	9	11	13	

## Bluetooth 2.4 GHz Band RF Tx/Rx Specifications

(@25°C unless otherwise specified)

Parameter	Min	Typ	Max	Unit
Frequency Range	2400	-	2500	MHz
TX Power – LE (1Mbps; 2Mbps; S=2; S=8)	-	TBD	-	dBm
TX Power – BDR		TBD		dBm
TX Power – EDR		TBD		dBm
RX Sensitivity LE 1Mbps	-	TBD	-	dBm
RX Sensitivity LE 2Mbps		TBD		dBm
RX Sensitivity LE 500 kbps (S=2)		TBD		dBm
RX Sensitivity LE 125 kbps (S=8)		TBD		dBm
RX Sensitivity DH5		TBD		dBm
RX Sensitivity 2DH5		TBD		dBm
RX Sensitivity 3DH5		TBD		dBm

## 802.15.4 2.4 GHz Band RF Tx/Rx Specifications

(@25°C unless otherwise specified)

Parameter	Min	Typ	Max	Unit
Frequency Range	2400	-	2500	MHz
TX Power		TBD		dBm
RX Sensitivity	-	-101	-	dBm

## I/O PIN ASSIGNMENTS

### CMP961x-1(C) and CMP961x-2(C)

Pin No	CMP961x Function (or IW61x pin)
1	GPIO[29]
2	VSS (Ground)
3	n/a
4	PDn#
5	GPIO[1]
6	SD_DAT[3]
7	SD_DAT[2]
8	SD_DAT[1]
9	SD_DAT[0]
10	SD_CMD
11	SD_CLK
12	GND
13	GPIO[15] / SPI_TXD (9612 only)
14	GPIO[14] / SPI_RXD (9612 only)
15	GPIO[13] / SPI_FRM (9612 only)
16	GPIO[12] / SPI_CLK (9612 only)
17	GND
18	VDDIO
19	n/a
20	GPIO[5]
21	GPIO[4]
22	GPIO[7]
23	GPIO[6]
24	GPIO[31]
25	GPIO[30]
26	GND
27	GPIO[28]
28	GPIO[20] / SPI_INT (9612 only)
29	GPIO[24]
30	GPIO[22]
31	GPIO[15]
32	GPIO[14]
33	WCI-2 TX
34	WCI-2 RX
35	GPIO[13]
36	UART_CTS
37	UART_RTS#
38	UART_SIN
39	UART_SOUT
40	GPIO[12]
41	GPIO[0]
42	GND

**CMP961x-9**

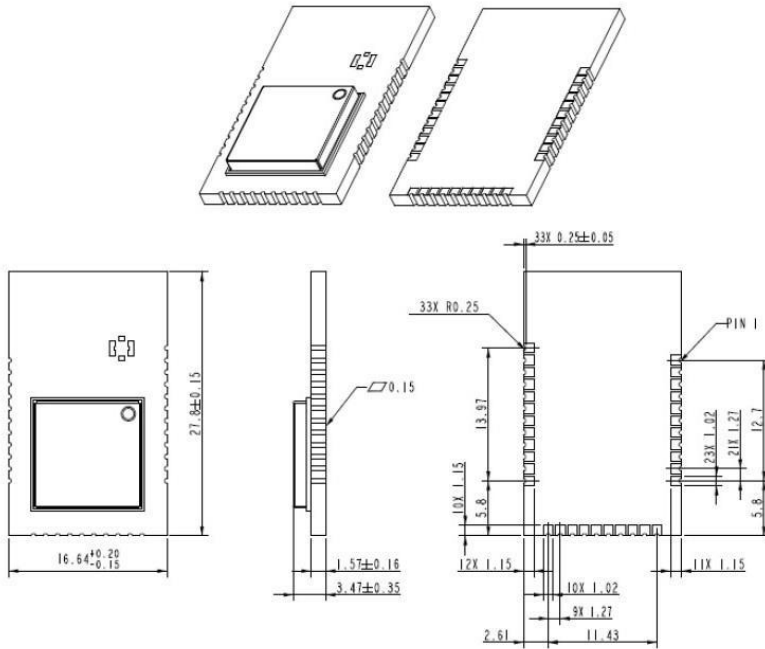
Pin No	Module Function (or IW416 pin)
1	GND
2	RF Output
3	GND
4	GPIO[15]
5	GPIO[14]
6	GPIO[18]
7	GPIO[19]
8	GPIO[13]
9	VDD33
10	GPIO[29]
11	GPIO[12]
12	PDn#
13	GPIO[17]
14	SD_DAT[2]
15	SD_DAT[3]
16	SD_CMD
17	SD_CLK
18	SD_DAT[0]
19	SD_DAT[1]
20	GND
21	1.8V_OUT
22	VDDIO
23	1.8V_IN
24	N/C
25	GPIO[5]
26	GPIO[4]
27	GPIO[6]
28	GPIO[7]
29	GPIO[31]
30	GPIO[30]
31	GND
32	N/C
33	GND
34	GPIO[2]
35	GPIO[28]
36	GND
37	GPIO[1]
38	WCI-2 TX
39	WCI-2 RX
40	GPIO[16]
41	UART_RTS#
42	UART_SOUT
43	UART_SIN
44	UART_CTS#
45	GND
46	GPIO[24]
47	GPIO[22]
48	GPIO[20]



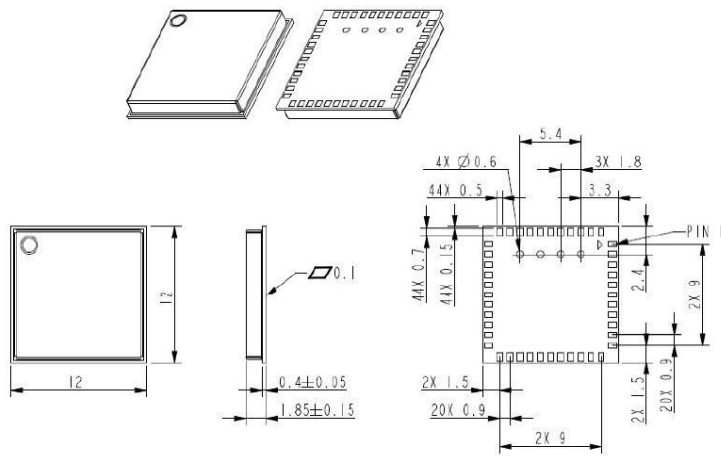
## MODULE DIMENSIONS

All dimensions in mm.

### CMP961x-1x and CMP961x-2x



### CMP961x-9

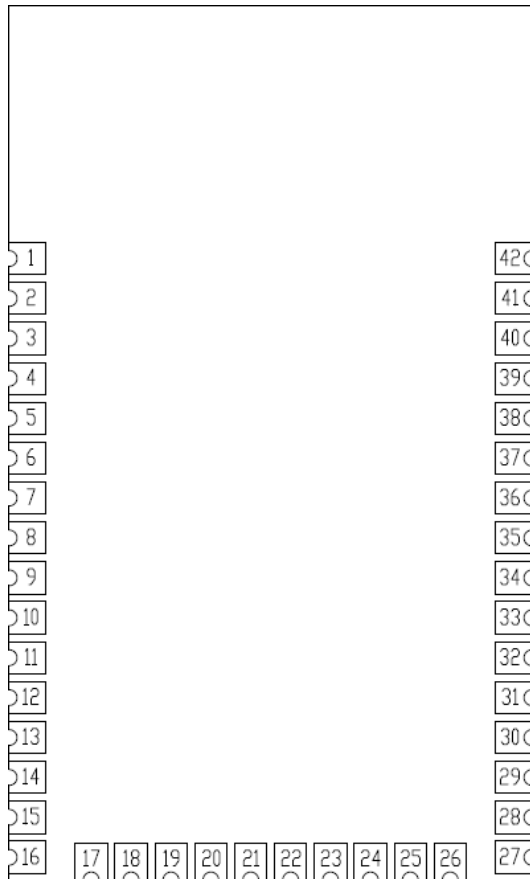


TOLERANCE UNLESS OTHERWISE SPECIFIED: ±0.1mm

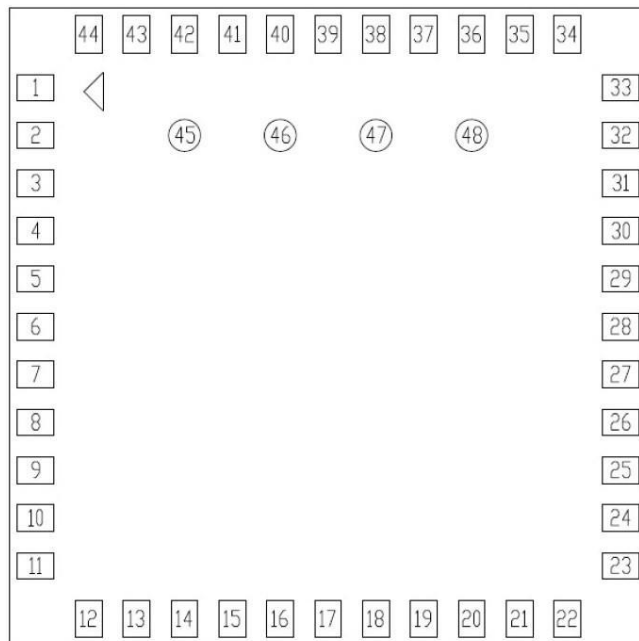
## PIN MAP

All dimensions in mm.

### CMP961x-1(C) and CMP961x-2(C)



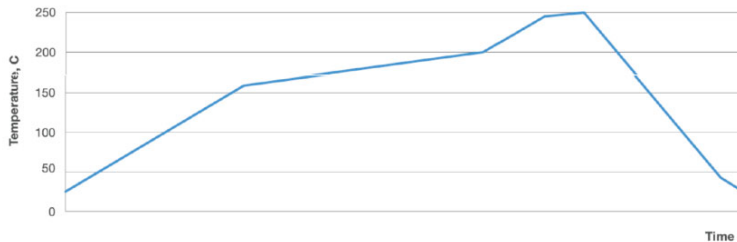
### CMP961x-9



## PROCESSING

### Recommended Reflow Profile

Parameter Values	
Ramp Up Rate	3°C/sec max
Max Time above 217°C	120 seconds
Peak Temperature	250°C
Max Time within 5°C of Peak Temperature	20 seconds
Ramp Down Rate	6°C/sec max



### Pb-Free Solder Paste

Use of “No Clean” soldering paste is strongly recommended, as it does not require cleaning after the soldering process.

**Note:** *The quality of solder joints on the castellations (“half vias”) where they contact the host board should meet the appropriate IPC Specification. See the Castellated Terminations Section in the latest IPC-A-610 Acceptability of Electronic Assemblies document.*

### Cleaning

In general, cleaning the populated module is strongly discouraged. Residuals under the module cannot be easily removed with any cleaning process.

- Cleaning with water can lead to capillary effects where water is absorbed into the gap between the host board and the module. The combination of soldering flux residuals and encapsulated water could lead to short circuits between neighboring pads. Water could also damage any stickers or labels.
- Cleaning with alcohol or a similar organic solvent will likely flood soldering flux residuals into the two housings, which is not accessible for post-washing inspection. The solvent could also damage any stickers or labels.
- Ultrasonic cleaning could damage the module permanently.

The best approach is to consider using a “No Clean” solder paste and eliminate the post-soldering cleaning step.

### Optical Inspection

After soldering the module to the host board, consider optical inspection to check the following:

- Proper alignment and centering of the module over the pads
- Proper solder joints on all pads
- Excessive solder or contacts to neighboring pads or vias

## Repeating Reflow Soldering

Only a single reflow soldering process is encouraged for host boards.

## Wave Soldering

If a wave soldering process is required on the host boards due to the presence of leaded components, only a single wave soldering process is encouraged.

## Hand Soldering

Hand soldering is possible. When using a soldering iron, follow IPC recommendations (reference document *IPC-7711*).

## Rework

The CMP9010 can be unsoldered from the host board. Use of a hot air rework tool should be programmable and the solder joint and module should not exceed the maximum peak reflow temperature of 250°C.

## Caution

If temperature ramps exceed the reflow temperature profile, module and component damage may occur due to thermal shock. Avoid overheating.

## Warning

Never attempt a rework on the module itself (i.e., replacing individual components); such actions will terminate warranty coverage.

## Additional Grounding

Attempts to improve the module or the system grounding by soldering braids, wires or cables onto the module RF shield cover is done at the customer's own risk. The ground pins at the module perimeter should be sufficient for optimum immunity to external RF interference.

## **\*\*TBD AGENCY CERTIFICATIONS - PENDING**

The following certifications are in effect for CMP961x modules.

FCC ID: TBD

IC ID: TBD

CE RED TBD

Contact CEL for certification details of CMP9010-9.

### **FCC Compliance Statement Part 15.19, Section 7.15 of RSS-GEN**

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS Standards. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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.

### **Warning (Part 15.21)**

Changes or modifications not expressly approved by CEL could void the user's authority to operate the equipment.

### **20 cm Separation Distance**

To comply with FCC/IC RF exposure limits for general population/uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

### **OEM Responsibility to the FCC and IC Rules and Regulations**

The CMP9010 modules have been certified per FCC Part 15 Rules and to Industry Canada license-exempt RSS Standards for integration into products without further testing or certification. To fulfill the FCC and IC Certification requirements, the OEM of the CMP9010 must ensure that the information provided on the CMP9010 label is placed on the outside of the final product. The CMP9010 is labeled with its own FCC ID Number and IC ID Number. If the FCC ID and the IC ID are not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. The exterior label can use wording such as the following:

"Contains Transmitter Module FCC ID: TBD" or "Contains FCC ID: TBD"

"Contains Transmitter Module IC ID: TBD" or "Contains IC ID: TBD"

### **IC Certification — Industry Canada Statement**

The term "IC" before the certification/registration number only signifies that the Industry Canada technical specifications were met.

### **Certification IC - Déclaration d'Industrie Canada**

Le terme "IC" devant le numéro de certification/d'enregistrement signifie seulement que les spécifications techniques Industrie Canada ont été respectées.

## Section 14 of RSS-210

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population. Consult Safety Code 6, obtainable from Health Canada's website:

<http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/99ehd-dhm237/index-eng.php>

## L'article 14 du CNR-210

Le programme d'installation de cet équipement radio doit s'assurer que l'antenne est située ou orientée de telle sorte qu'il ne pas émettre de champ RF au-delà des limites de Santé Canada pour la population générale. Consulter le Code de sécurité 6,

disponible sur le site Web de Santé Canada: <http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/99ehd-dhm237/index-eng.php>

## ANTENNA INFORMATION

CEL's CMP9010 modules include options for integrated PCB trace antenna or an integrated MFH4 RF connector for use with an external antenna. The CMP9010 modules have been certified with the integrated PCB trace antenna as well as select external antennas connected via the connector.

The following are some design guidelines to help ensure antenna performance:

- Never place the ground plane or route copper traces directly underneath the antenna portion of the module
- Never place the antenna close to metallic objects
- In the overall design, ensure that wiring and other components are not placed near the antenna
- Do not place the antenna in a metallic or metalized plastic enclosure
- Keep plastic enclosures 1cm or more away from the antenna in any direction

CEL can assist with your PCB design and layout.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

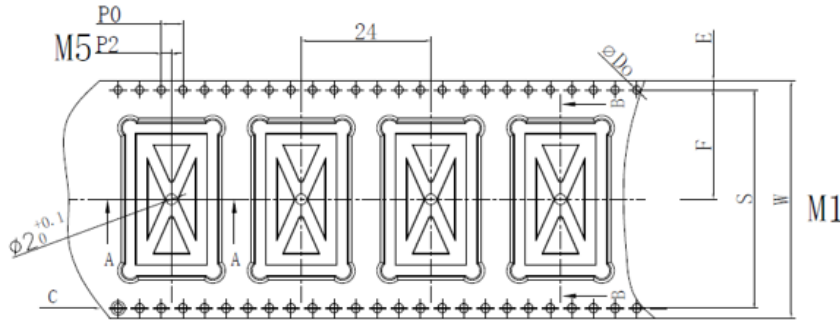
## APPROVED ANTENNAS

The OEM of the CMP961x may only use the approved antenna that has been certified with this module. The OEM of the CMP961x must test their final product configuration to comply with Unintentional Radiator Limits before declaring FCC Compliance per Part 15 of the FCC Rules.

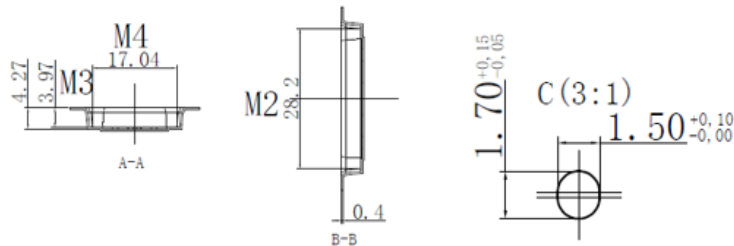
## SHIPMENT, HANDLING AND STORAGE

### Tape and Reel

The CMP961x modules are delivered in tape and reel. The CMP961x-1x and CMP961x-2x reels contains 600 modules.



E	1.75 ± 0.10
F	20.20 ± 0.15
S	40.40 ± 0.10
P2	2.00 ± 0.15
∅D0	1.50 ± $\begin{smallmatrix} 0.10 \\ 0.00 \end{smallmatrix}$
∅D1	2.00 ± $\begin{smallmatrix} 0.10 \\ 0.00 \end{smallmatrix}$
P0	4.00 ± 0.10
10P0	40.00 ± 0.20
W	44.00 ± 0.30
P	24.00 ± 0.10
A0	17.04 ± 0.10
B0	28.20 ± 0.10
K0	4.27 ± 0.10
T	0.40 ± 0.05



The CMP961x-9 reels contain 1500 modules.

### Handling

The CMP961x modules are designed and packaged to be processed in an automated assembly line.

### Warning

The CMP961x modules contain highly sensitive electronic circuitry. Handling without proper ESD protection may destroy or damage the module permanently.

### Warning

The CMP961x modules are moisture-sensitive devices. Appropriate handling instructions and precautions are summarized in J-STD-033. Read carefully to prevent permanent damage due to moisture intake.

### Moisture Sensitivity Level (MSL)

MSL 3, per J-STD-033

### Storage

Storage/shelf life in sealed bags is 12 months at <40°C and <90% relative humidity.

## ORDERABLE PART NUMBERS

Orderable Part Number	Description	Min/Mult
CMP9611-1-R	IW611, Wi-Fi + BT combo, PCB antenna, Commercial Temp	600
CMP9611-1C-R	IW611, Wi-Fi + BT combo, MFH4 connector, Commercial Temp	600
CMP9611-2-R	IW611, Wi-Fi + BT combo, PCB antenna, Industrial Temp	600
CMP9611-2C-R	IW611, Wi-Fi + BT combo, MFH4 connector, Industrial Temp	600
CMP9611-2-EVB	Evaluation Board, CMP9611-2	1
CMP9611-2C-EVB	Evaluation Board, CMP9611-2C	1
CMP9612-1-R	IW612, Wi-Fi + BT + 15.4 combo, PCB antenna, Commercial Temp	600
CMP9612-1C-R	IW612, Wi-Fi + BT + 15.4 combo, MFH4 connector, Commercial	600
CMP9612-2-R	IW612, Wi-Fi + BT + 15.4 combo, PCB antenna, Industrial Temp	600
CMP9612-2C-R	IW612, Wi-Fi + BT + 15.4 combo, MFH4 connector, Industrial Temp	600
CMP9612-2-EVB	Evaluation Board, CMP9612-2	1
CMP9612-2C-EVB	Evaluation Board, CMP9612-2C	1
CMP9611-9-R	IW611, Wi-Fi + BT combo, LGA, Industrial Temp	1500
CMP9612-9-R	IW612, Wi-Fi + BT + 15.4 combo, LGA, Industrial Temp	1500

## REFERENCES

Reference Documents	Download
Health Canada Safety Code 6	<a href="#">Link</a>

## REVISION HISTORY

Revision	Changes to Current Version	Page(s)
0032-00-07-01-000 (Issue 1) Aug 2022	Initial Preliminary Data Sheet	N/A
0032-00-07-01-000 (Issue 2) Nov 2022	Add radio Tx/Rx specifications; update power consumption; update mechanical dimensions and pinout list	
0032-00-07-01-000 (Issue 3) June 2023	Clarify operating conditions for module variants; add WiFi power consumption data.	