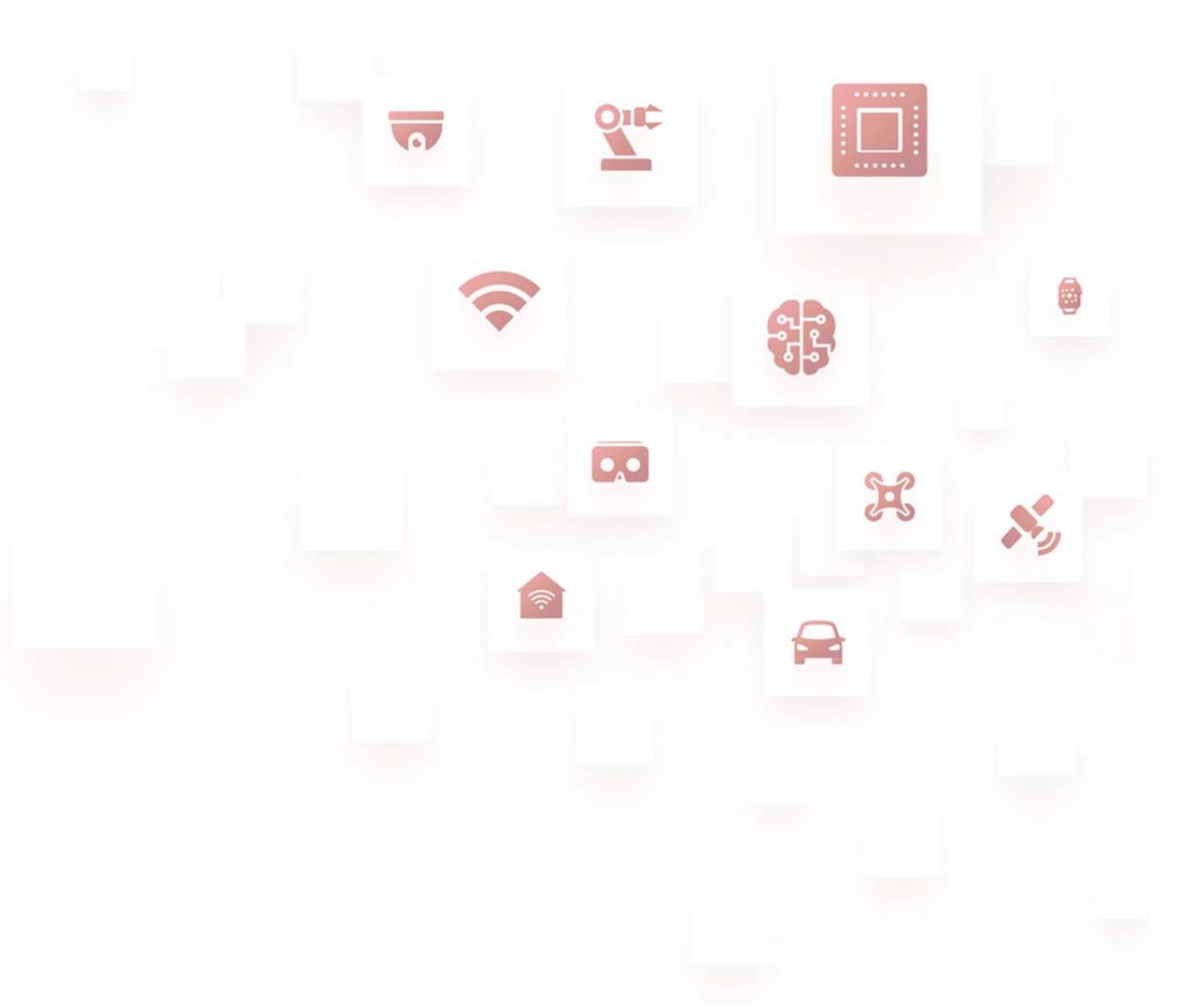


Thundercomm

Empowering Every IoT Device with Our Technology



Thundercomm TurboX C4290/CM4290 Development Kit

Hardware User Manual

Rev. V1.0
JUN 7, 2022

DN: tc-j-22110

Revision History

Revision	Date	Description
1.0	JUN 7, 2022	Initial release.

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About This Document

- Illustrations in this documentation might look different from your product.
- Depending on the model, some optional accessories, features, and software programs might not be available on your device.
- Depending on the version of operating systems and programs, some user interface instructions might not be applicable to your device.
- Documentation content is subject to change without notice. Thundercomm makes constant improvements on the documentation of your computer, including this guidebook.
- Button, tool, and key names appear in bold font, for example, click **Save** or press **Enter**.
- Folders and files are formatted in italic, for example, *turbox_flash_flat.sh*.

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Chapter 1. Introduction

This document introduces the features of TurboX C4290/CM4290 DK (Development Kit), aiming to guide the developer on product design and verification based on Thundercomm TurboX C4290/CM4290 SOM (System-on-module).

☞ “TurboX” referred to herein is the English text of our registered trademark:
TURBOX

- **Version identification:**

You can find the following information on your DK, for example: **CM4290 INTERPOSER BOARD Ver.03**, which means the hardware version number of your board is 03.

- **Safety precautions:**

Required output of the power adaptor is 12V, with the current greater than or equal to 2A. It is recommended to use the power adaptor provided by Thundercomm.

As PCB (Printed circuit board) and hardware components are totally exposed to open environment, it is required to take proper electrostatic protection during daily use:

- Use ESD (Electronic Static Discharge) table mat
- Wear anti-static wrist strap or heel grounder

☞ **NOTE:** All interfaces and buttons are protected with anti-static measures that meet standard electromagnetic compatibility standard *IEC61000-4-2*.

Chapter 2. Product Overview

TurboX C4290/CM4290 DK (Development Kit) is one of the most powerful boards with high-performance Thundercomm C4290/CM4290 SOM, rich peripherals and flexible interfaces. With integrated Android OS (Operating System), it is designed for evaluating, optimizing, testing, and releasing intelligent hardware products for developers, OEMs (Original Equipment Manufacturers), consumer businesses, and producers of hardware modules, including smart speaker, smart assistant, mesh router, and soundbar producers, etc.

2.1. Board introduction

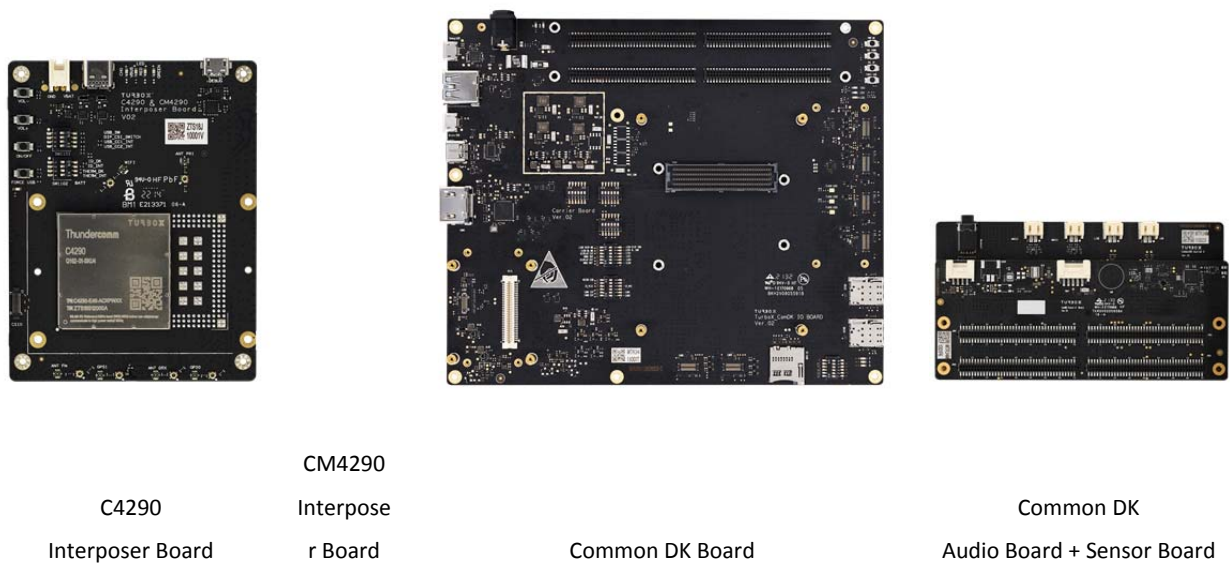


Figure 2-1. Board Introduction

2.2. Overview

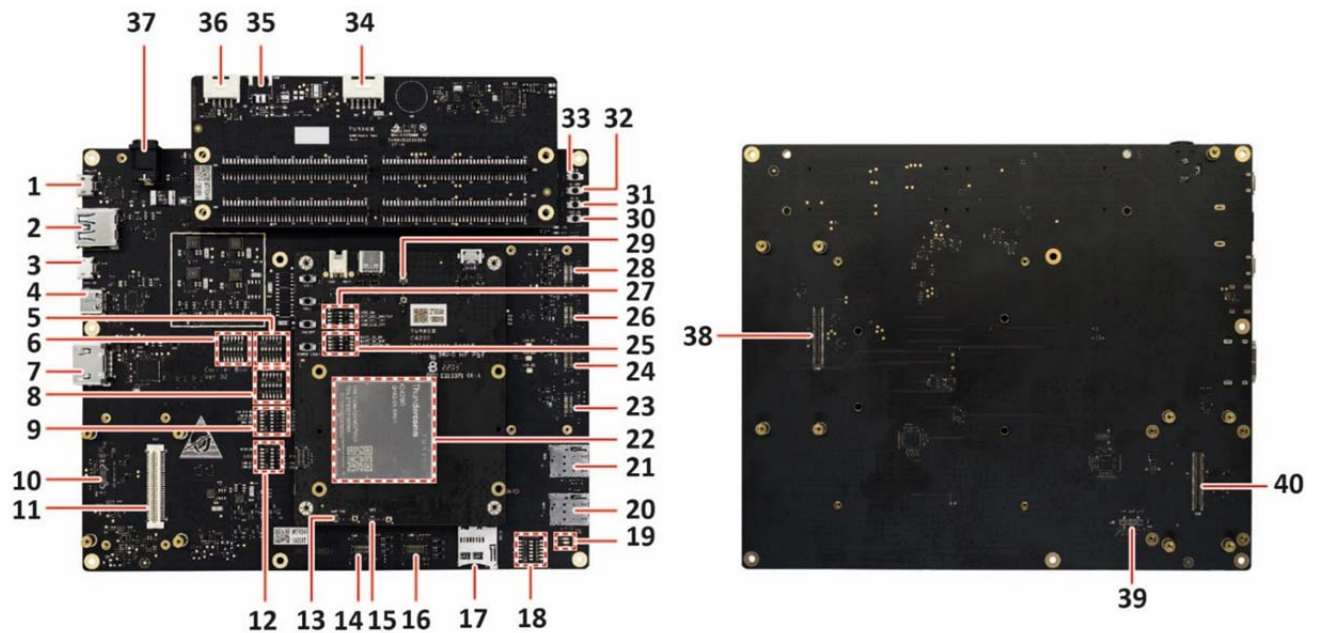


Figure 2-2. Board Layout

Table 2-1. Board layout description

1. UART debug connector	11. PCIE connector *	21. SIM card slot 1 **	31. Volume up button
2. USB 3.1 Type-A connector	12. SW 1300	22. SOM plate	32. Volume down button
3. Micro USB connector	13. FM antenna connector	23. Camera connector 2	33. Power on button
4. USB 3.1 Type-C connector	14. Camera connector 5 *	24. Camera connector 3 *	34. Battery connector
5. SW 2100	15. GPS antenna connector	25. SW 1102	35. CAN connector *
6. SW 2200	16. Camera connector 4 *	26. Camera connector 0	36. Fan connector
7. HDMI out connector	17. SD card slot	27. SW 1101	37. 12V DC in jack
8. SW 2101	18. Switch *	28. Camera connector 1	38. CSI signal connector
9. SW 1301	19. RGB LED	29. Wi-Fi antenna slot	39. LCD connector
10. LCD connector 1 *	20. SIM card slot 2 **	30. Force USB boot button	40. External display connector
41. Headset connector	42. Line out connector	43. Ear out Connector	44. Amic1 connector
44. Amic3 connector	45. speaker1 connector	46. speaker2 connector	47. Hdmi in connector

2.3. Features

Table 2-2. Feature description

Item	Specification
Processor	CPU: A customized 64-bit Arm v-8.0 compliant applications processor (Qualcomm® Kryo™ 260 CPU) • Kryo Gold: quad high-performance cores 2.0 GHz • Kryo Silver: quad low-power cores 1.8 GHz • DSP: Qualcomm® Hexagon™ Vector eXtensions (dual HVX at 1.0 GHz)
Memory	• LPDDR4x 4GB + eMMC 64GB
Display	• 1 x MIPI DSI: support one 4-lane MIPI DSI D-PHY port • HDMI out: Support 1080P
USB	• 1 x USB Type-C host or 1 x micro USB • 1 x Micro USB 2.0 connector (for UART debug)
SDIO	• 1 x TF card
UIM	• 2 x UIM (Only for CM4290)
Camera	• 3 x MIPI CSI: support 4-lane MIPI CSI D-PHY port • 1 x HDMI IN
Power supply	• DC-Jack: 1 x 12V DC in
Audio	• 1 x 3.5 mm HP jack • 1 x 3.5 mm LINE_OUT jack • 1 x 3.5 mm LINE_IN jack • 2 x Analog microphone • 2 x Class-D Smart Speaker (up to 8Ω@2W)
Button	• 1 x Button for power on • 1 x Button for force USB • 2 x Button for volume tuning
Switch	• 5 X Dip switch • 1 X Boot config switch
LED	• 2 x Power indicator • 2 x Status indicator • 2 x User LED • 2 x Flash LED
Operating temperature	-20°C to + 70°C

2.4. Block diagram

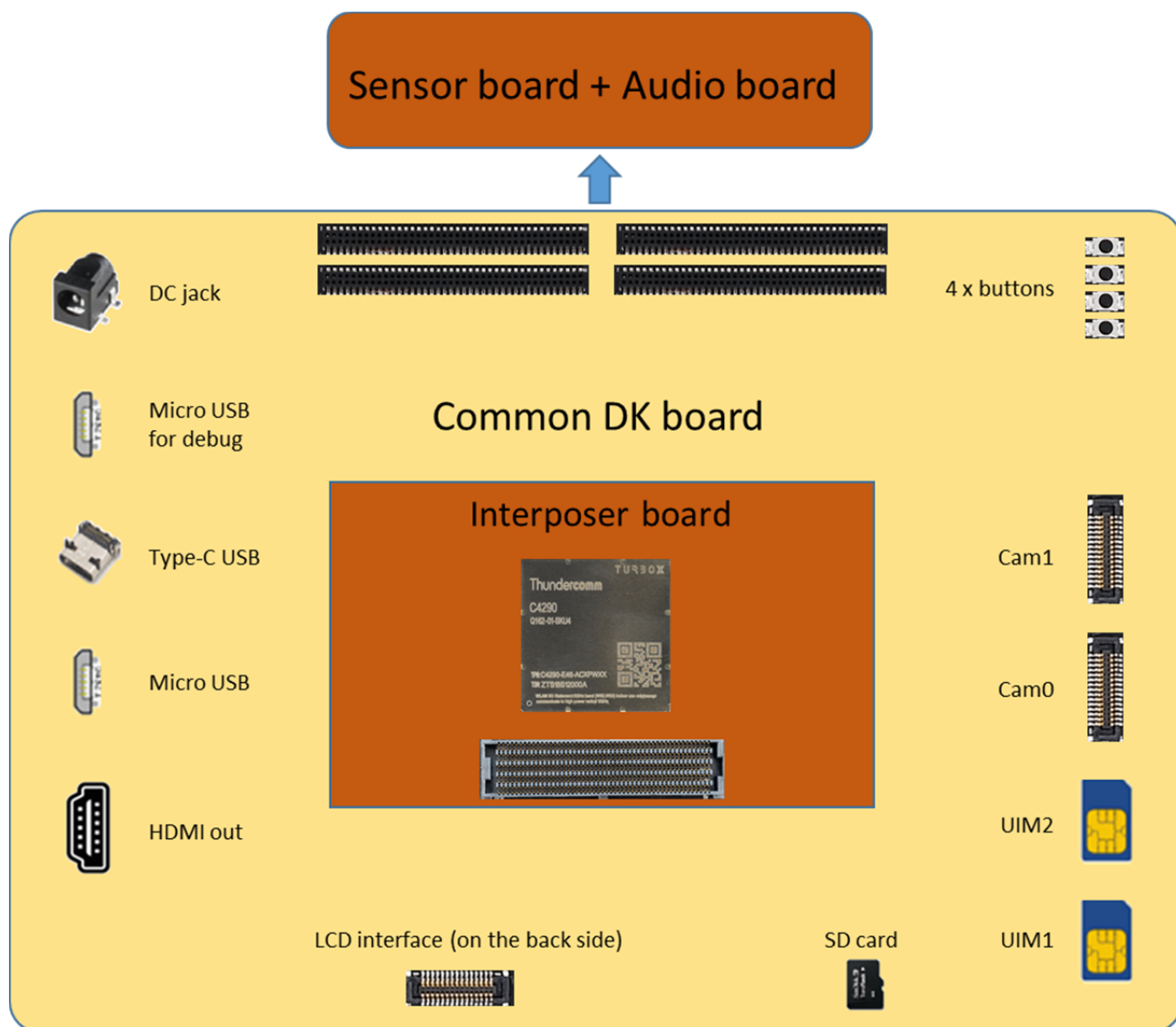


Figure 2-3. Block Diagram

2.5. Components

The Thundercomm TurboX C4290/CM4290DK includes the following hardware components:

- 1 x Common DK board
- 1 x C4290/CM4290 interposer board
- 1 x 12V/2A power supply (with a 5.5mm x 2.5mm connector)
- 1 x Wi-Fi antenna
- 1 x GPS antenna
- 2 x LTE antennas
- 1 x audio board
- 1 x sensor board
- 1 x camera module
- 1 x FPCA
- 2 x speakers

Chapter 3. Specifications for Common DK Board

3.1. Switches

3.2.1. Dip switch

Refer to [Figure 3-1](#) and [Table 3-1](#) for the details of the **dip switch** (No. 23 in [Figure 2-2](#)).

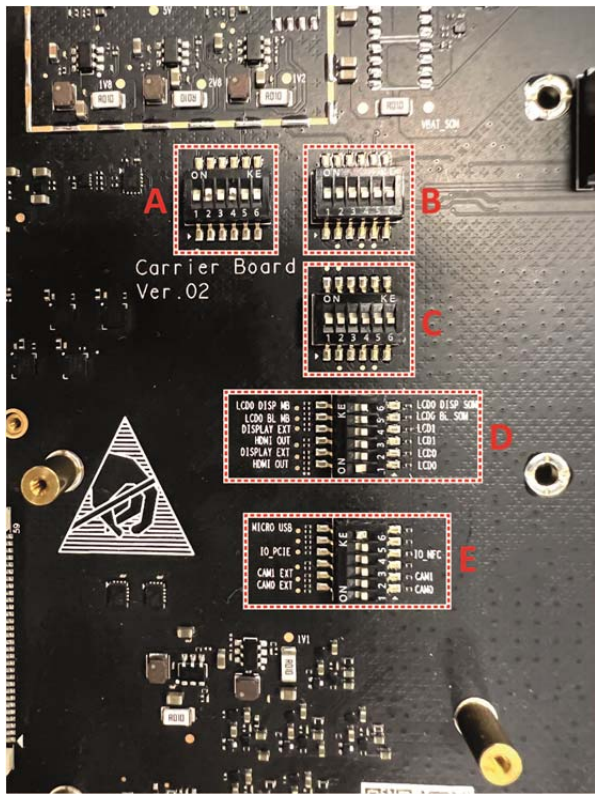


Figure 3-1. Locate Dip Switch

Table 3-1. Status and function description of dip switch

A				
No.	Status	Function	Recommendation	Comment
1	ON/OFF	ON: PM_GPIO_08_BL_PWM_OUT OUTPUT TO LS Board OFF: No use	OFF	-
2	ON/OFF	ON: PM_GPIO_08_BL_PWM_OUT OUTPUT TO LCD0; OFF: No use 1-12/2-11, only one for use.	ON	display-function
3	ON/OFF	ON: SM_GPIO_81 OUTPUT TO LS Board OFF: No use	OFF	-
4	ON/OFF	ON: SM_GPIO_81 OUTPUT TO LCD0 TE; OFF: No use 3-10/4-9, only one for use.	OFF	-
5	ON/OFF	No use	-	-
6	ON/OFF	No use	-	-
B				

No.	Status	Function	Recommendation	Comment
1	ON/OFF	No use	-	-
2	ON/OFF	No use	-	-
3	ON/OFF	ON: SM_GPIO_46 OUTPUT TO LS Board, Cam0_dovdd_1V8_EN OFF: No use	OFF	-
4	ON/OFF	ON: SM_GPIO_46 OUTPUT TO Cam0, Cam0_dovdd_1V8_EN; OFF: No use3-10/4-9, only one for use.	ON	csi0 power on
5	ON/OFF	No use	-	-
6	ON/OFF	No use	-	-

C

No.	Status	Function	Recommendation	Comment
1	ON/OFF	No use	-	-
2	ON/OFF	No use	-	-
3	ON/OFF	No use	OFF	-
4	ON/OFF	No use	OFF	-
5	ON/OFF	No use	OFF	-
6	ON/OFF	No use5	OFF	-

D

No.	Status	Function	Recommendation	Comment
1	ON/OFF	ON: DSI0 OUTPUT TO EXT DSI0 (EXT DSI0 OUTPUT TO HDMI_OUT or EXT DSI0); OFF: DSI0 OUTPUT TO LCD; TCA1 P02 No use; TCA1 and SW, only one for use.	Use SW OFF only	Use SW ON only
2	ON/OFF	ON: EXT DSI0 OUTPUT TO EXT DSI0; OFF: EXT DSI0 OUTPUT TO HDMI_OUT	OFF	OFF
3	ON/OFF	No use	-	-
4	ON/OFF	No use	-	-
5	ON/OFF	ON: LCD0_BL_LED_A enable OFF: LCD0_BL_LED_A disable	ON	-

6	ON/OFF	ON: LCD0_ VSP/N enable OFF: LCD0_ VSP/N disable	ON	-
E				
No.	Status	Function	Recommendation	Comment
1	ON/OFF	ON: CSI0 OUTPUT TO EXT CSI0 OFF: CSI0 OUTPUT TO Cam0; TCA1 P00 No use TCA1 and SW, only one for use.	Use SW OFF only	CSI0; OFF
2	ON/OFF	ON: CSI1 OUTPUT TO EXT CSI1 OFF: CSI1 OUTPUT TO Cam1; TCA1 P01 No use; TCA1 and SW, only one for use.	Use SW OFF only	-
3	ON/OFF	No use	-	-
4	ON/OFF	ON: NFC control signal disable; OFF: NFC control signal enable	OFF	-
5	ON/OFF	No use	-	-
6	ON/OFF	ON: USB2.0 disable; OFF: USB2.0 enable	OFF	-

Table 3-2. TurboX C4290/CM4290 configuration

SOC	SKUx		Thundercomm Product No. (TPN)	Model
QCM4290	SKU4	4+64GB	C4290-E46-ACXPWXX	TurboX C4290
	SKU3	3+32GB	C4290-E33-ACXPWXX	TurboX C4290
	SKU6	3+32GB	CM4290-EA-E33-ACXPWXX	TurboX CM4290
	SKU7	4+64GB	CM4290-EA-E46-ACXPWXX	TurboX CM4290

3.2.2. Boot config switch

Refer to Figure 3-2 to locate the **boot config switch** (No. 15 in Figure 2-2).

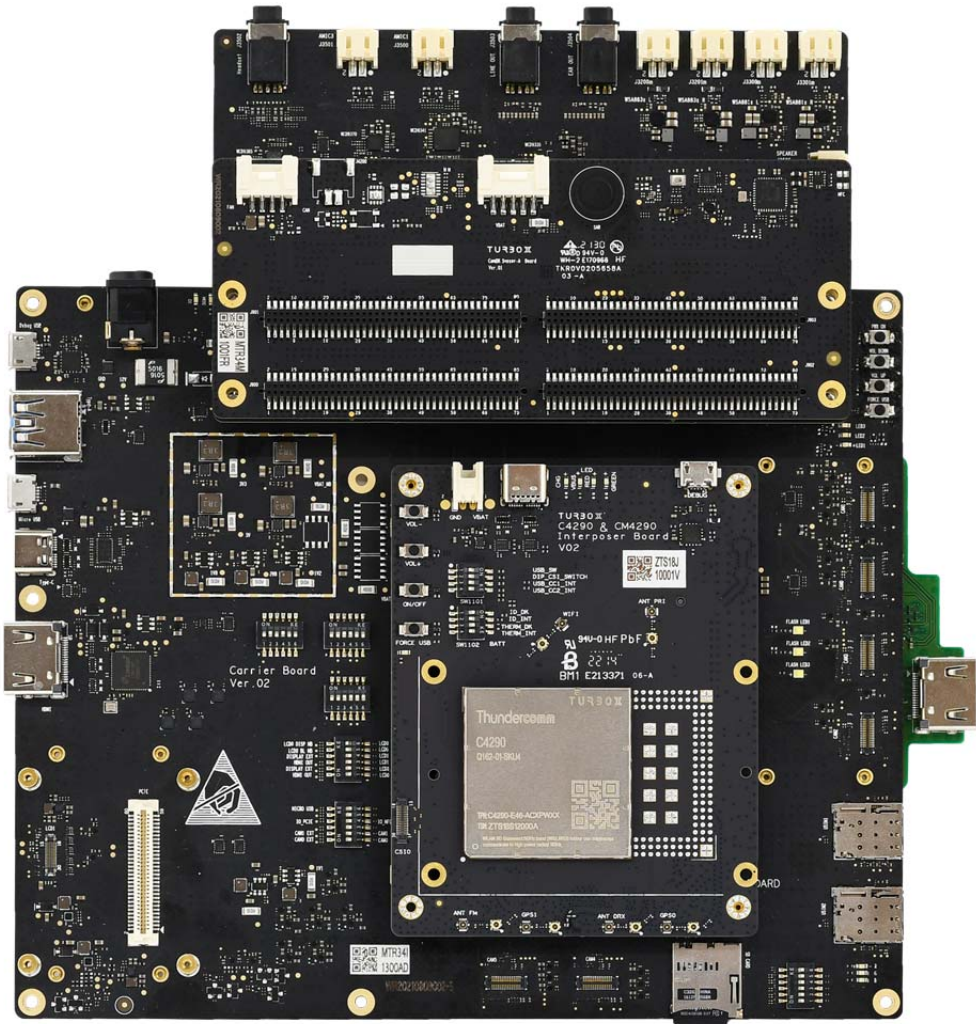


Figure 3-2. Locate Boot Config Switch

Table 3-3. Boot config switch parameters

Pin#	Signal	Description	On	Off
1	BOOT_CFG0	WDOG	High	Low
2	BOOT_CFG1	Fast_BOOT bit 0	1	0
3	BOOT_CFG2	Fast_BOOT bit 1	1	0
4	BOOT_CFG3	Fast_BOOT bit 2	1	0
5	BOOT_CFG4	Fast_BOOT bit 3	1	0
6	CBL_PWR_N		High	low

3.2. Connectors

3.2.1. Micro USB connector

C/CM4290 not support Micro USB connector

3.2.2. Type-C USB connector

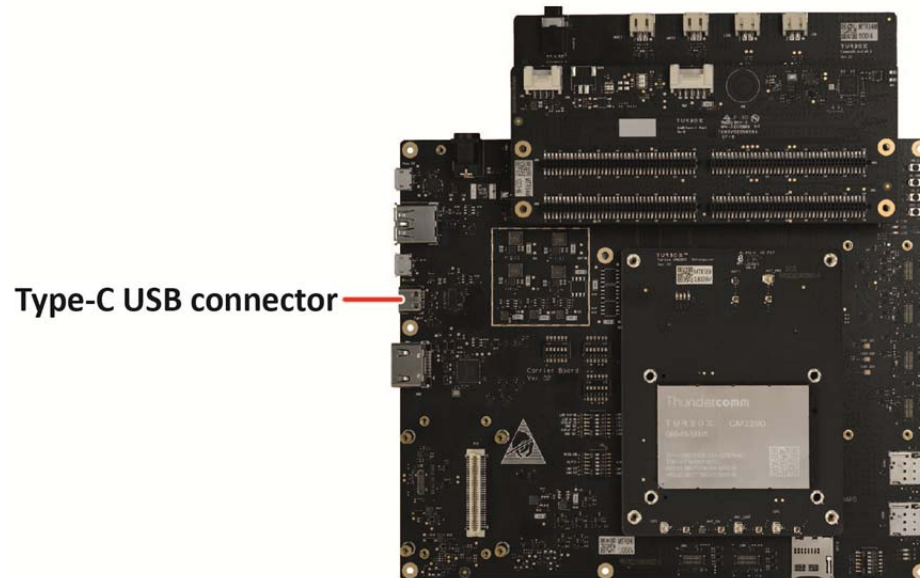


Figure 3-3. Locate Type-C USB Connector

Major functions:

- Compatible with both USB 3.0 connector and USB 2.0 connector.

3.2.3. Micro USB connector (for UART debug)

The DK board is connected to PC with a USB cable via the **micro USB connector (for UART debug)** (No. 28 in [Figure 2-2](#)). This connector is a log USB port for SOM. On the SOM side, SOM prints log message on the DK board via this connector. The UART signal is converted to USB signal by specific circuit.

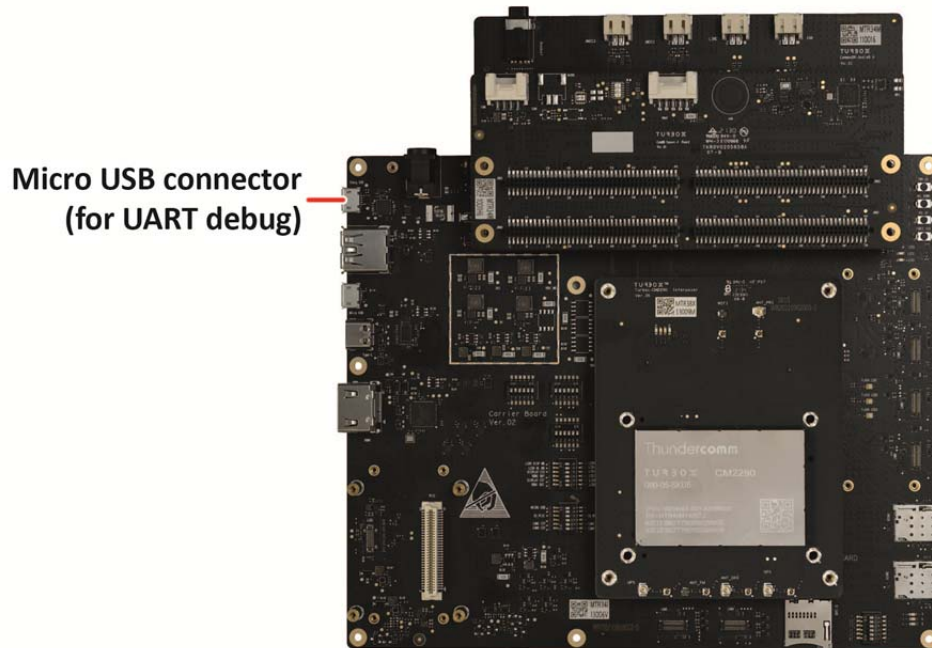


Figure 3-4. Locate Micro USB Connector (for UART Debug)

3.2.4. 12V DC in jack

This connector plugs into a 12V power supply of no less than 2A. The physical size of the connector is 5.5mm-2.5mm.

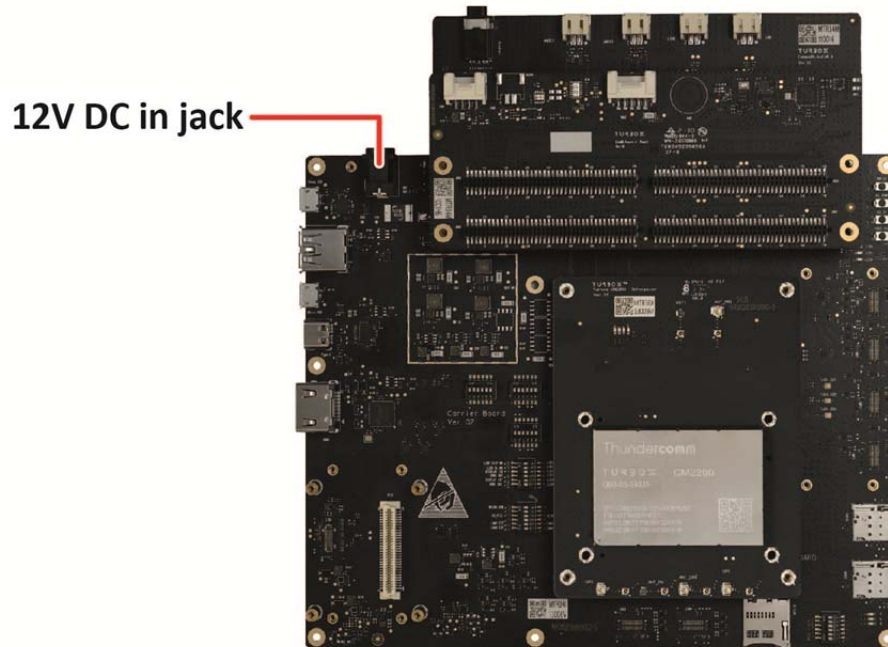


Figure 3-5. Locate 12V DC in Jack

3.2.5. HDMI out connector

C4290/CM4290 complies with D-PHY1.1 and DSI 1.02, and supports HDMI 1.4 standard. HDMI Type-A connector supports up to 1080P@30FPS output.

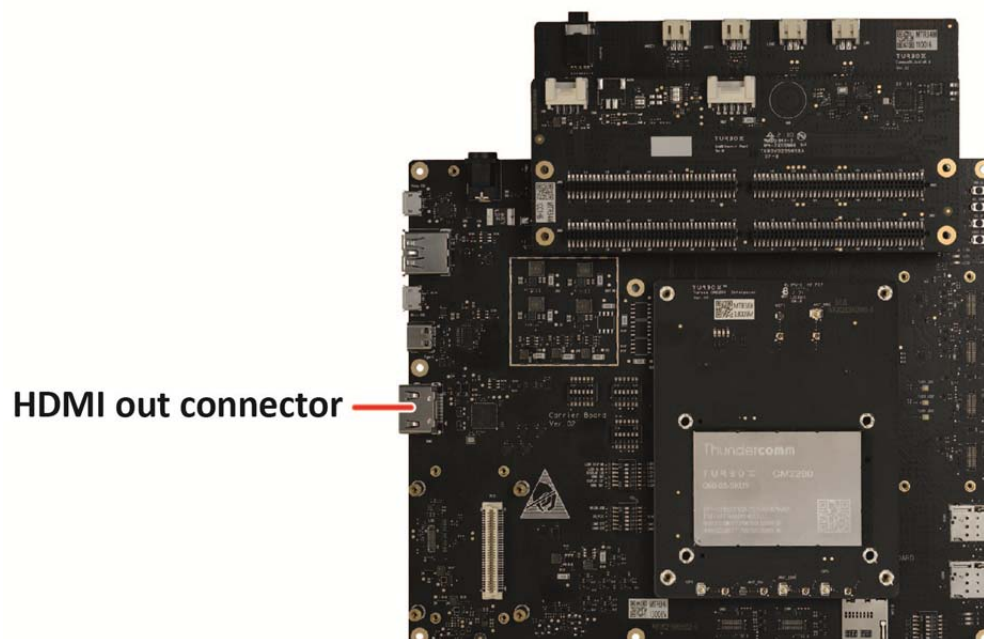


Figure 3-6. Locate HDMI Out Connector

3.2.6. Speaker connectors

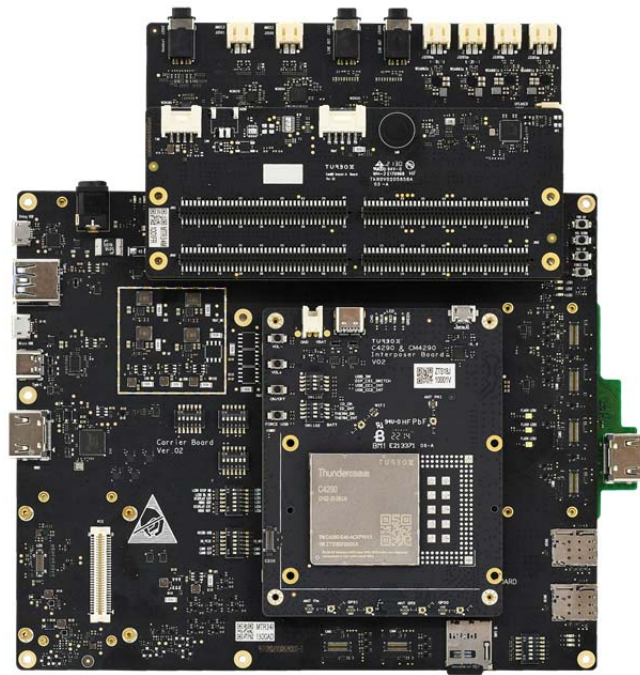


Figure 3-7. Locate Speaker Connectors

- Speaker power: 2W
- Speaker resistance: 8Ω
- Connector parameter: 2.00mm pitch/2 pins

3.2.7. Antenna connectors

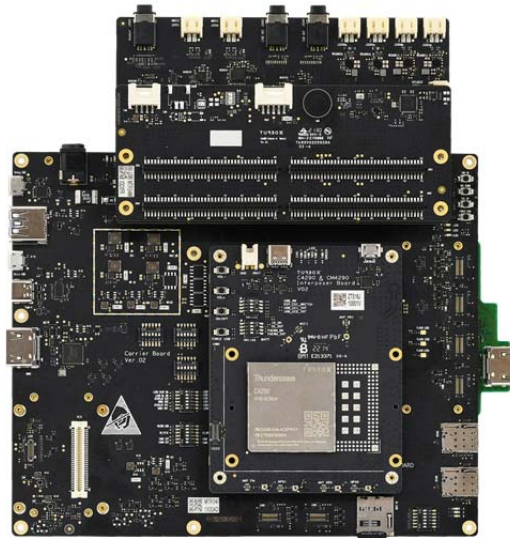


Figure 3-8. Locate Antenna Connectors

- **Wi-Fi/BT antenna connector** is used for connecting antenna for 2.4G/5G Wi-Fi network.
The 1x1 (WCN3988) MIMO (Multiple Input Multiple Output) with two spatial streams IEEE802.11 a/b/g/n/ac WLAN standards are supported.
- **Primary antenna connector** is used to connect the primary antenna.

3.2.8. SD card slot

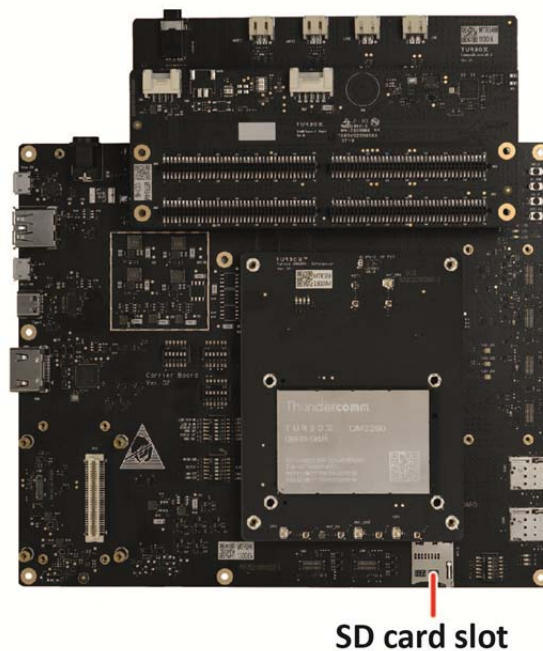


Figure 3-9. Locate SD Card Slot

- Maximum storage capacity: 128GB
- Power supply voltage: 1.8V/2.95V

3.2.9. Camera module connectors

3.2.10. C/CM4290 only support for Camera0/1/2

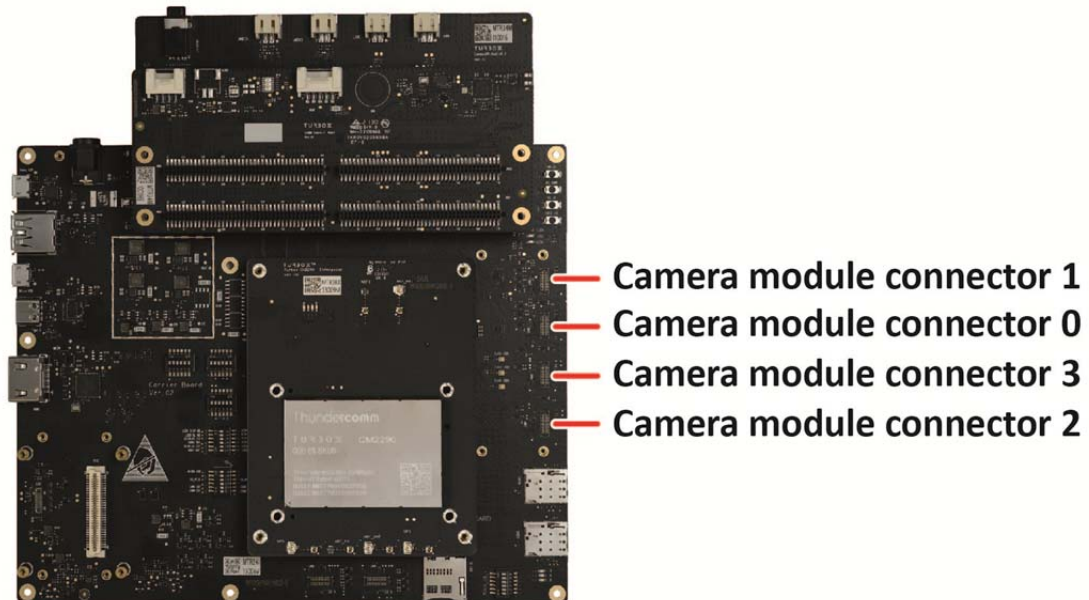


Figure 3-10. Locate Camera Module Connectors

3.2.11. Display panel connector

Refer to Figure 3-12 to connect the display panel to the board.

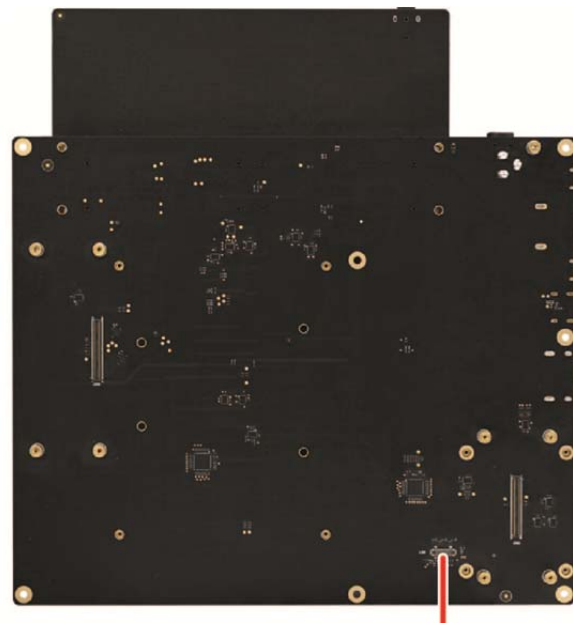


Figure 3-11. Locate Display Panel Connector

3.2.12. Headset connector

Refer to Figure 3-13 to locate the headset connector (No. 31 in [Figure 2-2](#)).

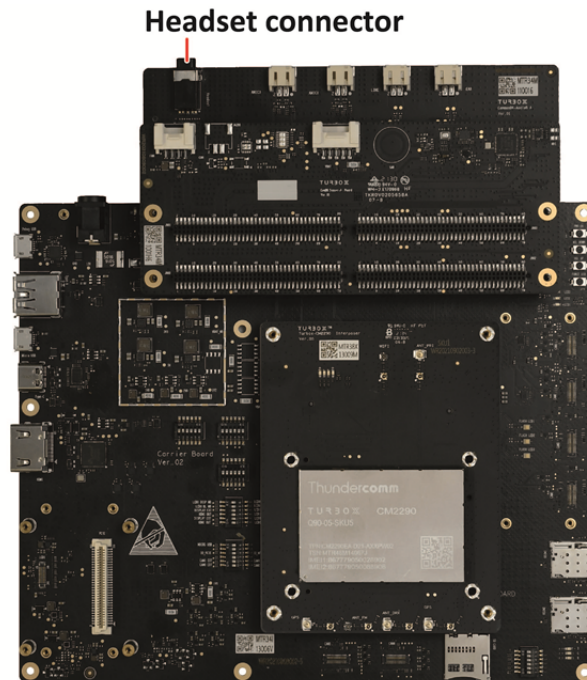


Figure 3-12. Locate Headset Connector

3.2.13. Main battery

Refer to Figure 3-14 to connect main battery to the DK.

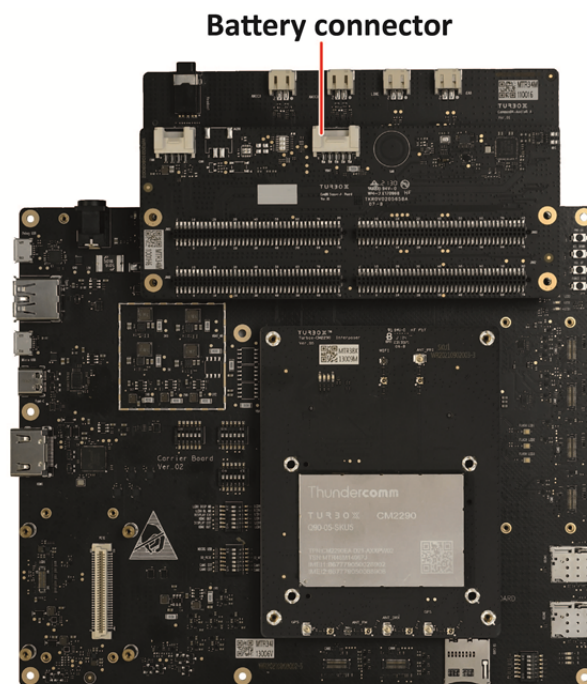


Figure 3-13. Locate Battery Connector

3.3. Buttons

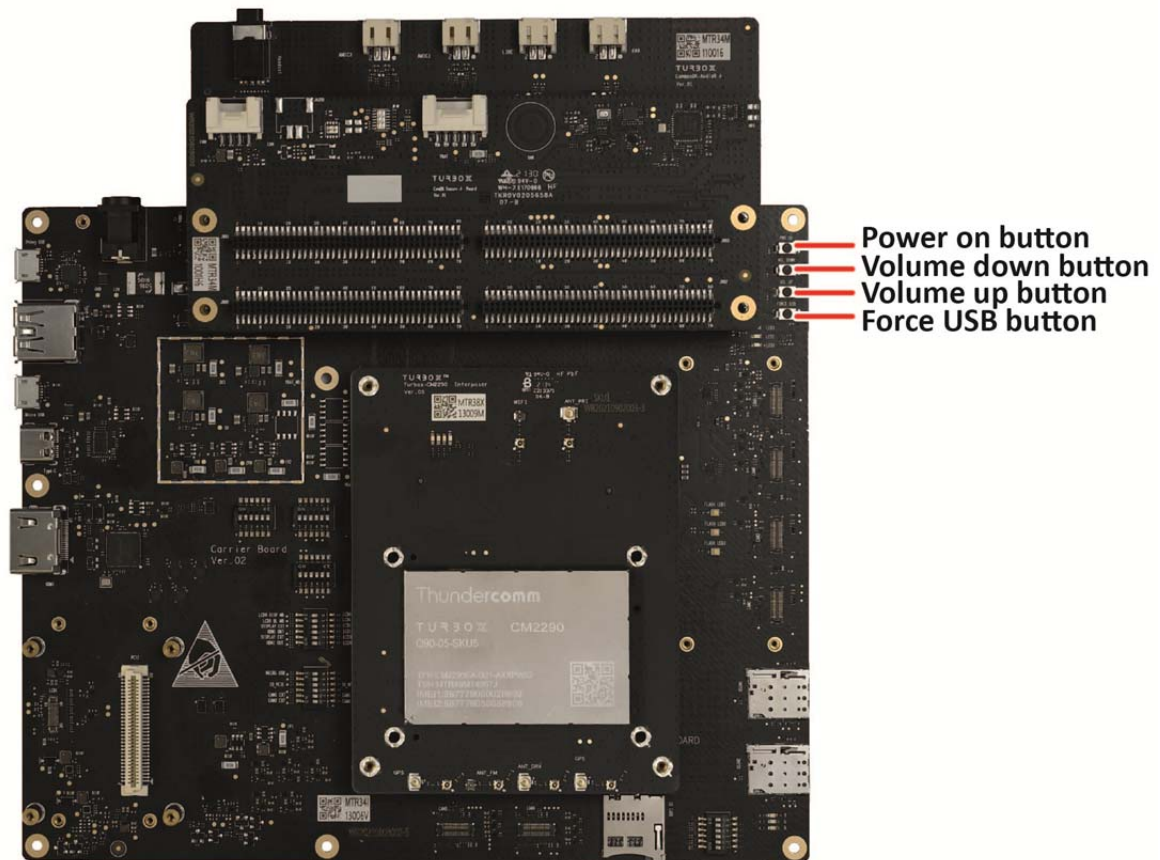


Figure 3-14. Locate Buttons

- **Power on button:** Used to boot up the device, when the board is running, pressing this button will set the device into sleep mode.
- **Volume down button:** Used to turn down the volume.
- **Volume up button:** Used to turn up the volume.
- **Force USB button:** When this button is pressed, the board will be forced to enter the download mode and boot from the **USB_HS** port during development or factory production.

3.4. LED indicators

Refer to Figure 3-16 and Table 3-4 for the LED indicators on the board.

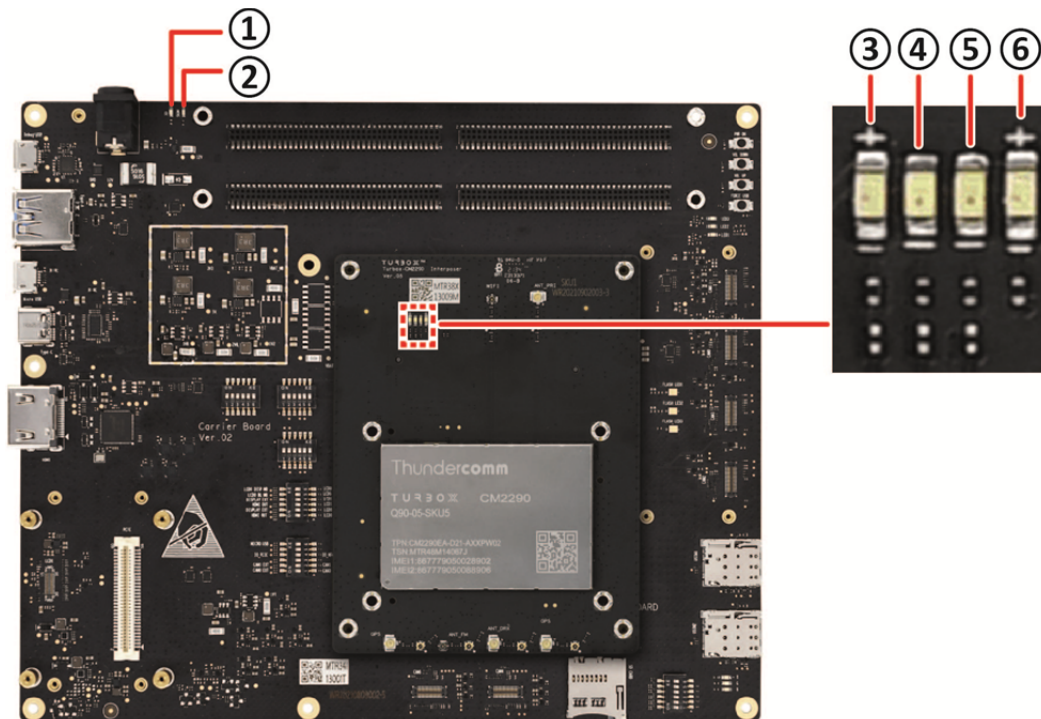


Figure 3-15. Locate LEDs

Table 3-4. Function description of LED indicators

LED indicator	Function
① DC power indicator	Indicates the DK power status
② SOM power indicator	Indicates the SOM power status
③ Green LED	Green LED controlled by the user
④ Red LED	Red LED controlled by the user
⑤ Charging indicator	Indicates the board charging status
⑥ USB indicator	Indicates USB device connection status

3.5. Sensors

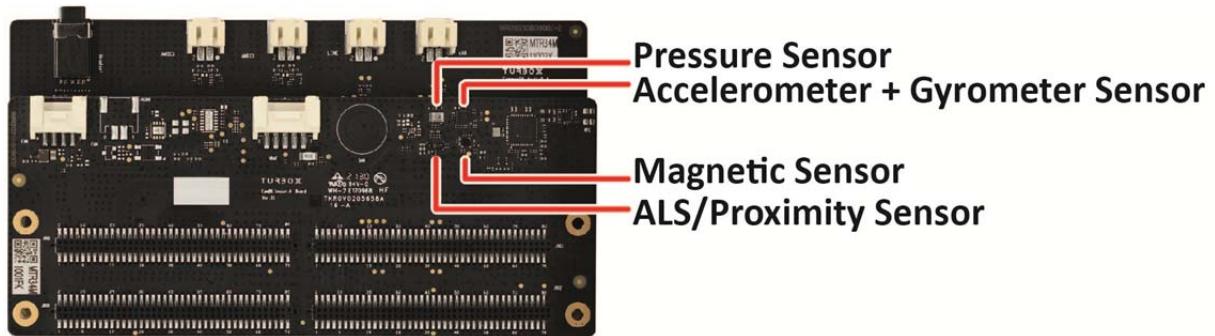


Figure 3-16. Locate Sensors

- Pressure sensor, using a BMP280, delivers high performance with an IIC interface in all applications that require precise pressure measurement. Its accuracy is ± 0.12 hPa, equivalent to ± 1 m difference in altitude.
- Accelerometer + gyrometer sensor, using a LSM6DS3TR-C, has a full-scale acceleration range of $\pm 2/\pm 4/\pm 8/\pm 16$ g and an angular rate range of $\pm 125/\pm 250/\pm 500/\pm 1000/\pm 2000$ dps.
- Magnetic sensor, using a AK09915, is a 3-axis magnetometer device suitable for compass application.
- ALS/proximity sensor, using a TMD2755, features proximity detection and digital ambient light sensing (ALS).

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Hereby, Thundercomm Technology Co., Ltd declares that the radio equipment type TurboX C4290 is in compliance with Directive 2014/53/EU as well as UK Radio Equipment Regulations SI 2017 No.1206. The full text of the EU/UK declaration of conformity is available at the following internet address: <https://www.thundercomm.com> for CE and UK.

CE&UK Statement

Frequency band: 5150 - 5250 MHz:

Indoor use: installations and use inside buildings, road vehicles, trains and aircraft. Limited outdoor use: If used outdoors, equipment shall not be attached to a fixed installation or to the external body of road vehicles, a fixed infrastructure or a fixed outdoor antenna. Use by unmanned aircraft systems (UAS) is limited to within the 5170 - 5250 MHz band.

Frequency band: 5250 - 5350 MHz:

Indoor use: Inside buildings only. Installations and use in road vehicles, trains and aircraft are not permitted. Outdoor use is not permitted.

Frequency band: 5470 - 5725 MHz:

Installations and use in road vehicles, trains and aircraft and use for unmanned aircraft systems (UAS) are not permitted.

2402 MHz-2480 MHz(BT):7.33 dBm

2402 MHz-2480 MHz(BLE): 9.92 dBm

2412 MHz-2472 MHz: 20 dBm

5150 MHz ~ 5250 MHz: 20 dBm

5250 MHz ~ 5350 MHz: 20 dBm

5470 MHz ~ 5725 MHz: 20 dBm

5725 MHz ~ 5850 MHz: 14 dBm

Federal Communication Commission Interference Statement

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 one of the following measures:

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

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

FCC Declaration of Conformity

We Thundercomm Technology Co., Ltd declare under our sole responsibility that

TurboX C4290 SOM/ TurboX C4290 comply with Part 15 of FCC Rules.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or

transmitter.

This device is intended only for OEM integrators under the following conditions:

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- (2) The transmitter module may not be co-located with any other transmitter or antenna,

IMPORTANT NOTE:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labelled in a visible area with the following: "Contains FCC ID: 2AOHHTURBOXC4290".

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

Industry Canada Statement

This device complies with license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS standard(s).

Operation is subject to the following two conditions:

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

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Le dispositif rencontre l'exemption des limites courantes d'évaluation dans la section 2.5 de RSS 102 et la conformité à l'exposition de RSS-102 rf, utilisateurs peut obtenir l'information canadienne sur l'exposition et la conformité de rf.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

This radio transmitter (IC: 23465-TURBOXC4290) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 23465-TURBOXC4290) a été approuvé par Industrie Canada 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.

Antenna Information

Model	Type	Connector	Peak gain (dBi)
1461531100	FPC	N/A	3
1461531100	FPC	N/A	4

Radiation Exposure Statement

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following condition:

- The transmitter module may not be co - located with any other transmitter or antenna.

As long as the condition above is met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end - product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes:

- Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 1 condition ci - dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co - location with another transmitter), then the Canada authorization is no longer considered valid and the ISED ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re - evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

Note Importante:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considérée comme valide et l'ID ISED ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

The final end product must be labeled in a visible area with the following:
Contains IC: 23465-TURBOXC4290

Plaque signalétique du produit final

Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante:
Contient des IC: 23465-TURBOXC4290

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems

les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;