Shelly module X3_ELEGRP datasheet

Datasheet version 2

Hardware version v011

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Features

CPU and On-Chip Memory

- ESP32-C3 embedded, 32-bit RISC-V single-core processor, up to 160 MHz
- 384 KB ROM
- 400 KB SRAM (16 KB for cache)
- 8 KB SRAM in RTC
- 8 MB flash in chip package

*The flash is integrated into the chip's package. Flash supports more than **100,000 program/erase cycles** and more than **20 years** data retention time.*

Wi-Fi

- IEEE **802.11 b/g/n**-compliant
- Center frequency range of operating channel: **2412 ~ 2484** MHz
- Supports 20 MHz, 40 MHz bandwidth in 2.4 GHz band
- 1T1R mode with data rate up to **150 Mbps**
- Simultaneous support for Infrastructure BSS in Station mode, SoftAP mode, Station + SoftAP mode, and promiscuous mode

Note that when the chip scans in Station mode, the SoftAP channel will change along with the Station channel

Bluetooth®

- Bluetooth LE
- Internal co-existence mechanism between Wi-Fi and Bluetooth to share the same antenna
- Speed: 125 Kbps, 500 Kbps, 1 Mbps, 2 Mbps
- Advertising extensions
- Multiple advertisement sets
- Channel selection algorithm #2

Peripherals

- Up to **6 digital inputs or outputs**, usable by the firmware platform
- Support for UART communication via JS interface, more protocols will be supported in the future
- Temperature & humidity sensor support - DS18B20 & DHT22

Integrated Components on Module

- **40 MHz** crystal oscillator

Antenna

- On-board PCB antenna

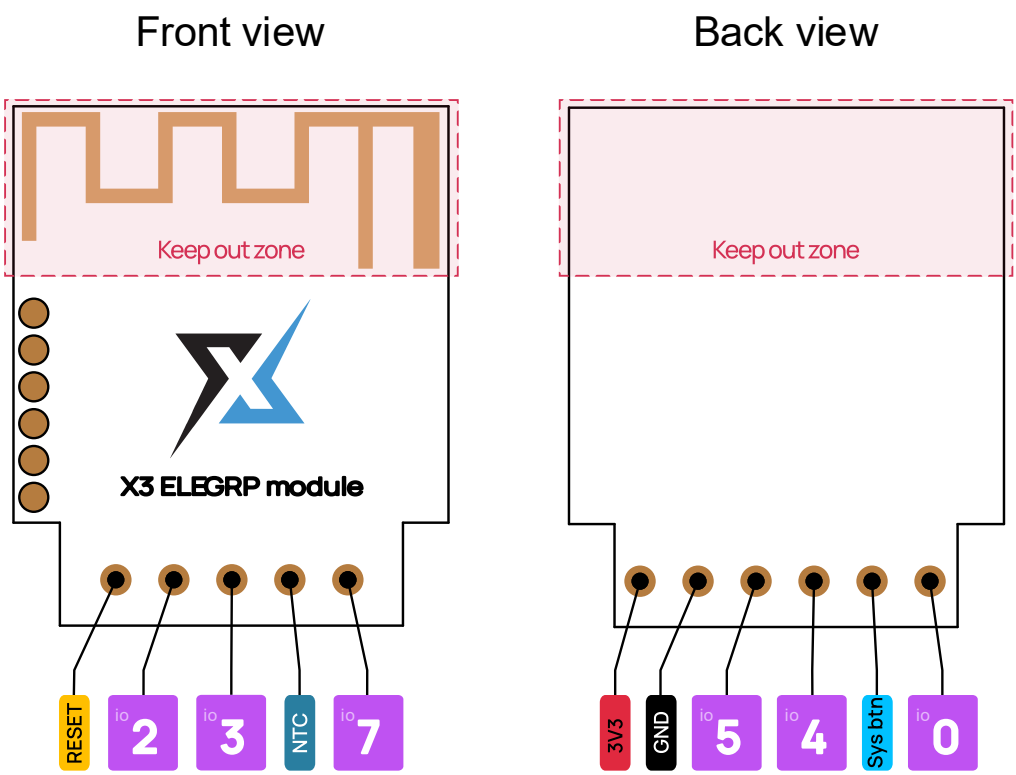
Operating conditions

- Operating voltage: Power supply: **3.0~ 3.6 VDC**
- Operating ambient temperature: **−40°C ~ 105 °C**

Ambient temperature specifies the recommended temperature range of the environment immediately outside the Shelly module.

Module overview

IO layout



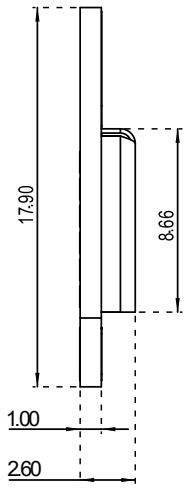
Keep out zone

The exact dimesions are marked in the Module dimesnions drawing.

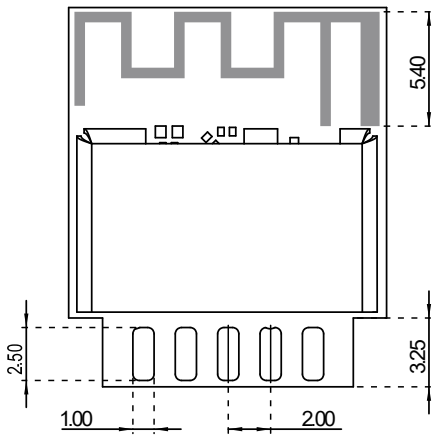
Module dimensions

Units: mm

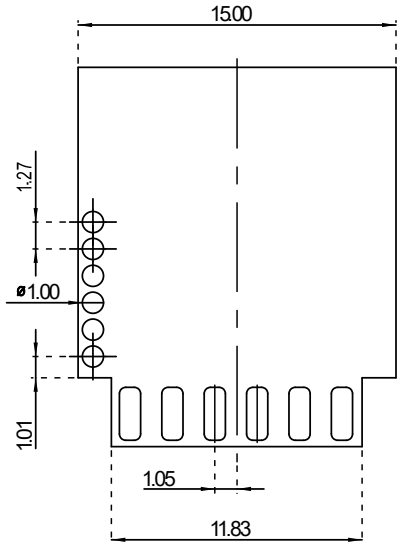
Side view



Front view



Back view



Electrical Characteristics

Absolute Maximum Ratings

Stresses above those listed in Table 1 Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under Table 2 Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Symbol	Parameter	Min	Max	Unit
VDD33	Power supply voltage	-0.3	3.6	V
TSTORE	Storage temperature	−40	105	°C

Table 1: Absolute Maximum Ratings

Recommended Operating Conditions

Symbol	Parameter	Min	Typ.	Max	Unit
VDD33	Power supply voltage	3.0	3.3	3.6	V
I_{VDD}	Current delivered by external power supply min	0.5	—	—	A
T_A	Operating ambient temperature	−40	—	105	°C

Table 2: Recommended Operating Conditions

DC Characteristics (3.3 V, 25 °C)

Symbol	Parameter	Min	Typ.	Max	Unit
C_{IN}	Pin capacitance	—	2	—	pF
V_{IH}	High-level input voltage	0.75 × VDD[1]	—	VDD[1] + 0.3	V
V_{IL}	Low-level input voltage	−0.3	—	0.25 × VDD[1]	V
I_{IH}	High-level input current	—	—	50	nA
I_{IL}	Low-level input current	—	—	50	nA
V_{OH}[2]	High-level output voltage	0.8 × VDD[1]	—	—	V
V_{OL}[2]	Low-level output voltage	—	—	0.1 × VDD[1]	V
I_{OH}	High-level source current (VDD[1] = 3.3 V, V_{OH} >= 2.64 V, PAD_DRIVER = 3)	—	40	—	mA
I_{OL}	Low-level sink current (VDD[1] = 3.3 V, V_{OL} =0.495 V, PAD_DRIVER = 3)	—	28	—	mA
R_{PU}	Pull-up resistor	—	45	—	kΩ
R_{PD}	Pull-down resistor	—	45	—	kΩ
V_{IH_nRST}	Chip reset release voltage	0.75 × VDD[1]	—	VDD[1] + 0.3	V
V_{IL_nRST}	Chip reset voltage	−0.3	—	0.25 × VDD[1]	V

Table 3: DC Characteristics (3.3 V, 25 °C)

[1] VDD is the I/O voltage for pins of a particular power domain.

[2] VOH and VOL are measured using high-impedance load.

Current Consumption Characteristics

Current Consumption in Active Mode

The current consumption measurements are taken with a 3.3 V supply at 25 °C ambient temperature.

TX current consumption is rated at a 100% duty cycle.

RX current consumption is rated when the peripherals are disabled and the CPU idle.

Wi-Fi (2.4 GHz) in Active Mode

Work mode	Description		Peak (mA)
Active (RF working)	TX	802.11b, 1 Mbps	350
		802.11g, 54 Mbps	295
		802.11n, HT20, MCS7	290
		802.11n, HT40, MCS7	290
	RX	802.11b/g/n, HT20	82
		802.11n, HT40	84

Table 4: Current Consumption for Wi-Fi (2.4 GHz) in Active Mode

Bluetooth LE in Active Mode

Work Mode	RF Condition	Description	Peak (mA)
Active (RF working)	TX	Bluetooth LE	340
		Bluetooth LE	190
		Bluetooth LE	170
		Bluetooth LE	100
	RX	Bluetooth LE	86

Table 5: Current Consumption for Bluetooth LE in Active Mode

Current Consumption in Other Modes

Modem sleep mode

Mode	CPU Frequency (MHz)	Description	Typ	
			All Peripherals Clocks Disabled (mA)	All Peripherals Clocks Enabled (mA)[1]
Modem-sleep[2,3]	160	CPU is idle	16	21
		CPU is running	23	28
	80	CPU is idle	13	18
		CPU is running	17	22

Table 6: Current Consumption in Modem-sleep Mode

[1] *In practice, the current consumption might be different depending on which peripherals are enabled.*

[2] *In Modem-sleep mode, Wi-Fi is clock gated.*

[3] *In Modem-sleep mode, the consumption might be higher when accessing flash. For a flash rated at 80 Mbit/s, in SPI 2-line mode the consumption is 10 mA.*

Low power modes

Mode	Description	Typ (µA)
Light-sleep	VDD_SPI and Wi-Fi are powered down, and all GPIOs are high-impedance	130
Deep-sleep	RTC timer + RTC memory	5
Power off	CHIP_EN is set to low level, the chip is powered off	1

Table 7: Current Consumption in Low-Power Modes

RF Characteristics

The RF data is measured at the antenna port, where RF cable is connected, including the front-end loss. The external antennas used for the tests on the modules with external antenna connectors have an impedance of 50 Ω.

Devices should operate in the center frequency range allocated by regional regulatory authorities.

Unless otherwise stated, the RF tests are conducted with a 3.3 V (±5%) supply at 25 ^{0}C ambient temperature.

Wi-Fi Radio

Name	Description
Center frequency range of operating channel	2412-2462MHz
Wi-Fi wireless standard	IEEE 802.11b/g/n

Table 8: Wi-Fi RF Characteristics

Wi-Fi RF Transmitter (TX) Characteristics

TX Power with Spectral Mask and EVM Meeting 802.11 Standards

Wi-Fi RF Receiver (RX) Characteristics

For RX tests, the PER (packet error rate) limit is 8% for 802.11b, and 10% for 802.11g/n.

RX Sensitivity

Rate	Min (dBm)	Typ (dBm)	Max (dBm)
802.11b, 1 Mbps	—	−98.0	—
802.11b, 2 Mbps	—	−96.0	—
802.11b, 5.5 Mbps	—	−93.0	—
802.11b, 11 Mbps	—	−88.6	—
802.11g, 6 Mbps	—	−92.8	—
802.11g, 9 Mbps	—	−91.8	—
802.11g, 12 Mbps	—	−90.8	—
802.11g, 18 Mbps	—	−88.4	—
802.11g, 24 Mbps	—	−85.4	—
802.11g, 36 Mbps	—	−82.0	—
802.11g, 48 Mbps	—	−77.8	—
802.11g, 54 Mbps	—	−76.2	—
802.11n, HT20, MCS0	—	−92.6	—
802.11n, HT20, MCS1	—	−90.6	—
802.11n, HT20, MCS2	—	−88.0	—
802.11n, HT20, MCS3	—	−84.8	—
802.11n, HT20, MCS4	—	−81.6	—
802.11n, HT20, MCS5	—	−77.4	—
802.11n, HT20, MCS6	—	−75.6	—
802.11n, HT20, MCS7	—	−74.4	—
802.11n, HT40, MCS0	—	−90.0	—
802.11n, HT40, MCS1	—	−87.6	—
802.11n, HT40, MCS2	—	−84.8	—
802.11n, HT40, MCS3	—	−81.8	—
802.11n, HT40, MCS4	—	−78.4	—
802.11n, HT40, MCS5	—	−74.2	—
802.11n, HT40, MCS6	—	−72.6	—
802.11n, HT40, MCS7	—	−71.2	—

Table 11: RX Sensitivity

Maximum RX level

Rate	Min (dBm)	Typ (dBm)	Max (dBm)
802.11b, 1 Mbps	—	5	—
802.11b, 11 Mbps	—	5	—
802.11g, 6 Mbps	—	5	—
802.11g, 54 Mbps	—	0	—
802.11n, HT20, MCS0	—	5	—
802.11n, HT20, MCS7	—	0	—
802.11n, HT40, MCS0	—	5	—
802.11n, HT40, MCS7	—	0	—

Table 12: Maximum RX Level

RX Adjacent channel rejection

Rate	Min (dB)	Typ (dB)	Max (dB)
802.11b, 1 Mbps	—	35	—
802.11b, 11 Mbps	—	35	—
802.11g, 6 Mbps	—	31	—
802.11g, 54 Mbps	—	14	—
802.11n, HT20, MCS0	—	31	—
802.11n, HT20, MCS7	—	13	—
802.11n, HT40, MCS0	—	19	—
802.11n, HT40, MCS7	—	8	—

Table 13: RX Adjacent Channel Rejection

Bluetooth 5 (LE) Radio

Bluetooth LE RF Transmitter (TX) Characteristics

Bluetooth LE RF Characteristics

Name	Description
Center frequency range of operating channel	2402 ~ 2480 MHz

Table 14: Bluetooth LE RF Characteristics

Bluetooth LE - Transmitter Characteristics - 1 Mbps

Parameter	Description	Min	Typ	Max	Unit
In-band emissions	F = F0 ± 2 MHz	—	-37.62	—	dBm
	F = F0 ± 3 MHz	—	-41.95	—	dBm
	F = F0 ± > 3 MHz	—	-44.48	—	dBm
Modulation characteristics	$\Delta f1_{avg}$	—	245.00	—	kHz
	$\Delta f2_{max}$	—	208.00	—	kHz
	$\Delta f2_{avg}/\Delta f1_{avg}$	—	0.93	—	—
Carrier frequency offset	—	—	-9.00	—	kHz
Carrier frequency drift	$\lvert f_0 - f_n \rvert_{n=2,3,4,...k}$	—	1.17	—	kHz
	$\lvert f_1 - f_0 \rvert$	—	0.30	—	kHz
	$\lvert f_n - f_{n-5} \rvert_{n=6,7,8,...k}$	—	4.90	—	kHz

Table 15: Bluetooth LE - Transmitter Characteristics - 1 Mbps

Bluetooth LE - Transmitter Characteristics - 2 Mbps

Parameter	Description	Min	Typ	Max	Unit
In-band emissions	F = F0 ± 4 MHz	—	-43.55	—	dBm
	F = F0 ± 5 MHz	—	-45.26	—	dBm
	F = F0 ± > 5 MHz	—	-47.00	—	dBm
Modulation characteristics	$\Delta f1_{avg}$	—	497.00	—	kHz
	$\Delta f2_{max}$	—	398.00	—	kHz
	$\Delta f2_{avg}/\Delta f1_{avg}$	—	0.95	—	—
Carrier frequency offset	—	—	-9.00	—	kHz

Carrier frequency drift	$\lvert f_0 - f_n \rvert_{n=2,3,4,\ldots k}$	—	0.46	—	kHz
	$\lvert f_1 - f_0 \rvert$	—	0.70	—	kHz
	$\lvert f_n - f_{n-5} \rvert_{n=6,7,8,\ldots k}$	—	6.80	—	kHz

Table 16: Bluetooth LE - Transmitter Characteristics - 2 Mbps

Bluetooth LE - Transmitter Characteristics - 125 Kbps

Parameter	Description	Min	Typ	Max	Unit
In-band emissions	F = F0 ± 2 MHz	—	−37.90	—	dBm
	F = F0 ± 3 MHz	—	−41.00	—	dBm
	F = F0 ± > 3 MHz	—	−42.50	—	dBm
Modulation characteristics	$\Delta f1_{avg}$	—	252.00	—	kHz
	$\Delta f1_{max}$	—	200.00	—	kHz
Carrier frequency offset	—	—	−13.70	—	kHz
Carrier frequency drift	$\lvert f_0 - f_n \rvert_{n=1,2,3,\ldots k}$	—	1.52	—	kHz
	$\lvert f_0 - f_3 \rvert$	—	0.65	—	kHz
	$\lvert f_n - f_{n-3} \rvert_{n=7,8,9,\ldots k}$	—	0.70	—	kHz

Table 17: Bluetooth LE - Transmitter Characteristics - 125 Kbps

Bluetooth LE - Transmitter Characteristics - 500 Kbps

Parameter	Description	Min	Typ	Max	Unit
In-band emissions	F = F0 ± 2 MHz	—	−37.90	—	dBm
	F = F0 ± 3 MHz	—	−41.30	—	dBm
	F = F0 ± > 3 MHz	—	−42.80	—	dBm
Modulation characteristics	$\Delta f2_{avg}$	—	220.00	—	kHz
	$\Delta f2_{max}$	—	205.00	—	kHz
Carrier frequency offset	—	—	−11.90	—	kHz
Carrier frequency drift	$\lvert f_0 - f_n \rvert_{n=1,2,3,\ldots k}$	—	1.37	—	kHz
	$\lvert f_0 - f_3 \rvert$	—	1.09	—	kHz
	$\lvert f_n - f_{n-3} \rvert_{n=7,8,9,\ldots k}$	—	0.51	—	kHz

Table 18: Bluetooth LE - Transmitter Characteristics - 500 Kbps

Bluetooth LE RF Receiver (RX) Characteristics

Bluetooth LE - Receiver Characteristics - 1 Mbps

Parameter	Description	Min	Typ	Max	Unit
Sensitivity @30.8% PER	—	—	−96	—	dBm
Maximum received signal @30.8% PER	—	—	10	—	dBm
Co-channel C/I	—	—	8	—	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	—	−4	—	dB
	F = F0 − 1 MHz	—	−3	—	dB
	F = F0 + 2 MHz	—	−32	—	dB
	F = F0 − 2 MHz	—	−36	—	dB
	F ≥F0 + 3 MHz[1]	—	—	—	dB
	F ≤F0 − 3 MHz	—	−39	—	dB
Image frequency	—	—	−29	—	dB
Adjacent channel to image frequency	F = F_{image} + 1 MHz	—	−38	—	dB
	F = F_{image} − 1 MHz	—	−34	—	dB
Out-of-band blocking performance	30 MHz ~ 2000 MHz	—	−9	—	dBm
	2003 MHz ~ 2399 MHz	—	−18	—	dBm
	2484 MHz ~ 2997 MHz	—	−16	—	dBm
	3000 MHz ~ 12.75 GHz	—	−6	—	dBm
Intermodulation	—	—	−44	—	dBm

Table 19: Bluetooth LE - Receiver Characteristics - 1 Mbps

[1] *Refer to the value of Adjacent channel to image frequency when F = F_{image} − 1 MHz.*

Bluetooth LE - Receiver Characteristics - 2 Mbps

Parameter	Description	Min	Typ	Max	Unit
Sensitivity @30.8% PER	—	—	−93	—	dBm
Maximum received signal @30.8% PER	—	—	0	—	dBm
Co-channel C/I	—	—	10	—	dB
Adjacent channel selectivity C/I	F = F0 + 2 MHz	—	−7	—	dB
	F = F0 − 2 MHz	—	−7	—	dB
	F = F0 + 4 MHz[1]	—	—	—	dB
	F = F0 − 4 MHz	—	−34	—	dB
	F ≥F0 + 6 MHz	—	−39	—	dB

	F ≤F0 – 6 MHz	—	–39	—	dB
Image frequency	—	—	–27	—	dB
Adjacent channel to image frequency	F = F_{image} + 2 MHz	—	–39	—	dB
	F = F_{image} – 2 MHz[2]	—	—	—	dB
Out-of-band blocking performance	30 MHz ~ 2000 MHz	—	–17	—	dBm
	2003 MHz ~ 2399 MHz	—	–19	—	dBm
	2484 MHz ~ 2997 MHz	—	–16	—	dBm
	3000 MHz ~ 12.75 GHz	—	–22	—	dBm
Intermodulation	—	—	–40	—	dBm

Table 20: Bluetooth LE - Receiver Characteristics - 2 Mbps

[1] *Refer to the value of Image frequency.*

[2] *Refer to the value of Adjacent channel selectivity C/I when F = F0 + 2 MHz.*

Bluetooth LE - Receiver Characteristics - 125 Kbps

Parameter	Description	Min	Typ	Max	Unit
Sensitivity @30.8% PER	—	—	–104	—	dBm
Maximum received signal @30.8% PER	—	—	10	—	dBm
Co-channel C/I	—	—	2	—	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	—	–6	—	dB
	F = F0 – 1 MHz	—	–5	—	dB
	F = F0 + 2 MHz	—	–40	—	dB
	F = F0 – 2 MHz	—	–42	—	dB
	F ≥F0 + 3 MHz[1]	—	—	—	dB
	F ≤F0 – 3 MHz	—	–46	—	dB
Image frequency	—	—	–34	—	dB
Adjacent channel to image frequency	F = F_{image} + 1 MHz	—	–44	—	dB
	F = F_{image} – 1 MHz	—	–37	—	dB

Table 21: Bluetooth LE - Receiver Characteristics - 125 Kbps

[1] *Refer to the value of Adjacent channel to image frequency when F = F_{image} – 1 MHz.*

Bluetooth LE - Receiver Characteristics - 500 Kbps

Parameter	Description	Min	Typ	Max	Unit
Sensitivity @30.8% PER	—	—	−99	—	dBm
Maximum received signal @30.8% PER	—	—	10	—	dBm
Co-channel C/I	—	—	3	—	dB
Adjacent channel selectivity C/I	F = F0 + 1 MHz	—	−5	—	dB
	F = F0 − 1 MHz	—	−7	—	dB
	F = F0 + 2 MHz	—	−39	—	dB
	F = F0 − 2 MHz	—	−40	—	dB
	F ≥ F0 + 3 MHz[1]	—	—	—	dB
	F ≤ F0 − 3 MHz	—	−40	—	dB
Image frequency	—	—	−34	—	dB
Adjacent channel to image frequency	F = F_{image} + 1 MHz	—	−43	—	dB
	F = F_{image} − 1 MHz	—	−38	—	dB

Table 22: Bluetooth LE - Receiver Characteristics - 500 Kbps

[1] *Refer to the value of Adjacent channel to image frequency when F = F_{image} − 1 MHz.*

Revision history

Date	Version	Release notes
11-21-2025	V1	1. First version created.
04-15-2026	V2	1. Dimension drawings updated to show the shield added to the module.

FCC WARNING

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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more 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.

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

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

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

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:

“Contains Transmitter Module FCC ID:2BDC6-SWITCHX3”

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3

Explanation: This module meets the requirements of FCC part 15C(15.247).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain.

Explanation: The EUT only have one PCB antenna, Yes, the module contains a permanently attached antenna, The antenna gain is 2.4G:4.26dBi. The use condition of the prototype is mobile.

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer isresponsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited

module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.
Explanation: The module is a single module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);

b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);

c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;

d) Appropriate parts by manufacturer and specifications;

e) Test procedures for design verification; and

f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: No, The module has no tracking antenna design, is PCB antenna.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person’s body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This

module is designed to comply with the FCC statement,
FCC ID: 2BDC6-SWITCHX3

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT only have one PCB antenna, Yes, the module contains a permanently attached antenna, The antenna gain is 4.26dBi.

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This

includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2BDC6-SWITCHX3

2.9 Information on test modes and additional testing requirements5

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.

Explanation: WiFiRanger, A CHINA DRAGON TECHNOLOGY LIMITED can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15

Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The host shoule be evaluated by the FCC Subpart B.

This product uses PCB antenna with a maximum antenna gain 4.26dBi,

2.11 Note EMI Considerations

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode7; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

Explanation: The customer is an independent module and has been implemented in accordance with D04.

2.12 How to make changes

Since . only Grantees are permitted to make permissive changes, it is recommended that module manufactures provide contact information and some guidance to host providers in the integration instructions if they expect their module will be used differently than granted.

Explanation: Contact Information: We have provided our technical support contact (email: svetozar.iliev@shelly.com) for host manufacturers to reach us regarding any proposed changes to the module's operational conditions or integration method.

IC Statement

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference;

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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;

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet équipement est conforme aux limites d' exposition aux rayonnements de la IC établies pour unenvironnement non contrôé. Cet équipement doit être installé et fonctionner à au moins 20cm de distance d'un radiateur ou de votre corps. Cet émetteur ne doit pas être co-localisé ni fonctionner en conjonction avec une autre antenne ou un autre émetteur.

Cet émetteur radio IC:33486-SWITCHX3 a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous, avec le gain maximal admissible indiqué. Les types d'antenne non inclus dans cette liste qui ont un gain supérieur au gain maximum indiqué pour tout type répertorié sont strictement interdits pour une utilisation avec cet appareil.

The radio transmitter IC: 33486-SWITCHX3 has been approved by The Ministry of Innovation, Science and Economic Development of Canada to use the following antenna types with the specified maximum allowed gain. Antenna types not included in this list, whose gain is higher than the maximum gain of any type listed, are strictly prohibited from use with this device.

The final end product must be labelled in a visible area with the following:
contains IC:33486-SWITCHX3

Type of antenna:	PCB antenna
Antenna Gain:	2.4G :2400-2500(4.26dBi)
Impedance:	50hm
Manufacture:	Shelly Europe Ltd.
Model:	Shelly X3 ELEGRP Module