ENS2278-3823

System HW Description

Ver. 1.0

2025. 1.

EUCAST

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1 Preface

1.1 Document purpose

The main purpose of this manual is to understand the features of the ENS2000 series. (5G enterprise small cell base station)

For details on the management or operating procedures of the ENS2000 system, refer to the following reference manual.

- ENS2000 Operation manual
- ENS2000 Installation manual

1.2 Documentation Modifications and Updates

EUCAST keeps the documentation updated to ensure that the documentation is consistent with system changes. However, there may be some inconsistencies due to the system upgrade or error correction process. If there is any confusion as a result of system changes or error corrections, please contact us at the address provided in the "Contact Information" section for correct information.

1.3 Copyright

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1.4 Contact information

For more information about our products, please contact us via the contact channel below.

- Address : 13595, 4F Seongok Building, 262, Hwangsaeul-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
- Phone : 031-706-5261
- Fax : 031-706-5226
- E-mail : eucast@eu-cast.com
- Homepage : www.eu-cast.com

1.5 Caution and Other Marks

FCC Rules Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Part 15.19

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 of the device.

Part 15.21

Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate

equipment.

RF Exposure

The antenna (or antennas) must be installed to maintain at all times a distance minimum of at least 27 cm between the radiation source (antenna) and any individual. This device may not be installed or used in conjunction with any other antenna or transmitter.

2 Summary

2.1 Scope of the document

This document is the specifications of EUCAST's Indoor 5G NR gNodeB (ENS2000).

2.2 Reference

References in this document include. :

[1] 3GPP TS 138.141, 5G NR Base Station (BS) conformance testing

[2] 3GPP TS 138.104, 5G NR Base Station (BS) radio transmission and reception

3 ENS2000 Introduction

The ENS2278-3823 is 5G NR TDD 3.5GHz US CBRS base station system of ENS2000 series.
The ENS2278-3823 supports single sector 2T2R (+16dBm/ANT @ BW 20MHz, +22dBm/ ANT @ BW 100MHz) systems.
It can be configured to use IEEE1588 V2 for time and frequency synchronization between Master and Slave.

4 ENS2278-3823 System Specifications

4.1 H/W System Specifications

Table 4.1. H/W General Specification

No.	ITEM	Specification	Remark
1	Frequency Range	3550~3700MHz	
2	Maximum Transmitter Power	+16dBm/ANT @ BW 20MHz +22dBm/ANT @ BW 100MHz	
3	Antenna Config.	2x2 MIMO	
4	Backhaul	1000Base-T × 1	
5	Power	AC adaptor : AC 100~240V, 50/60Hz DC 12V	Using AC/DC adaptor
6	Power Consumption(Avg)	Typ. 50W	
7	Size(mm)	214mm(W) *214mm(H) *60mm(D)	Excluding protrusion
8	Weight	< 2 kg	
9	Volume	2.8L	
10	GPS Interface	L1 band	
11	Modulation type	QPSK, 16QAM, 64QAM, 256QAM	
12	Sub-carrier spacing	30kHz	

4.2 H/W Extension Interface and Environment

Table 4.2. H/W General Specification

No.	ITEM	Specification	Remark
1.1	RF Antenna I/F	Intenna	
1.2	Backhaul I/F	RJ45 2.5G Base-T × 1	
1.3	GPS Antenna I/F	SMA(J)	
1.4	Power I/F	DC Connection port	
1.5	LMT I/F	RJ45(Ethernet)	
2.	Environment Condition		
2.1	Temperature	Operating Temperature : 0~+40℃ Storage Temperature : -30~+70℃	
2.2	Humidity	5%~95%(RH)	
2.3	Waterproof and dustproof	IP30	

5 ENS2278-3823 System Function

5.1 System Diagram

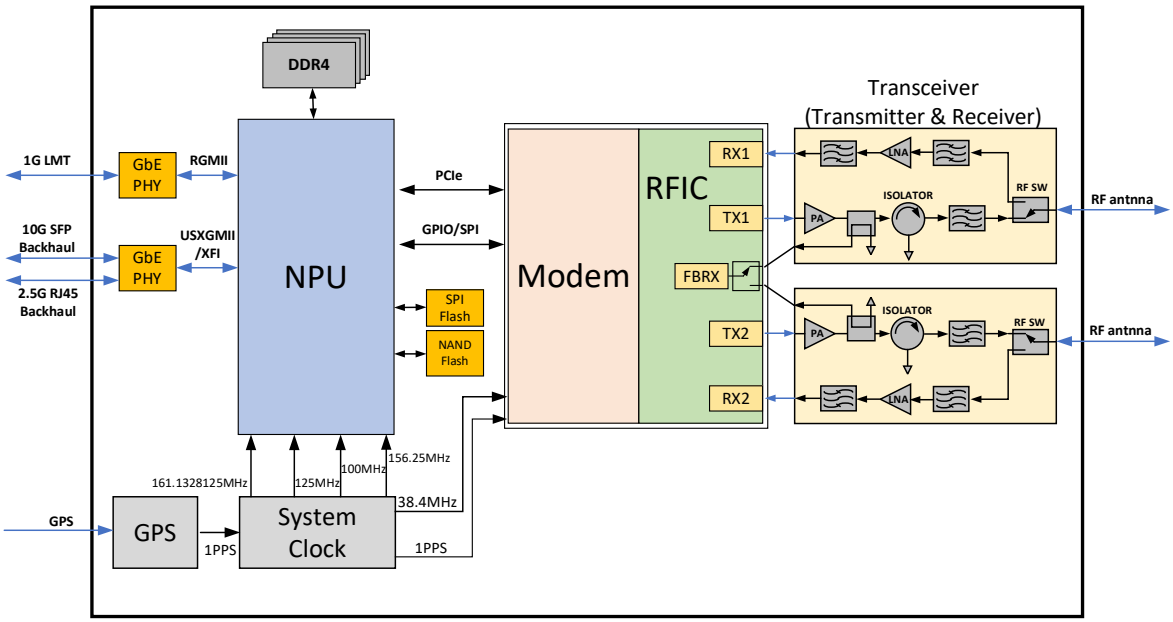

Figure 5.1-1 ENS2278-3823 block diagram

The figure is a block diagram of ENS2278-3823.

Backhaul's Ethernet port connects to the 5G core, and the power amplifier and front end wirelessly connect to the UE.

5.2 Up-link signal processing

The uplink signal processing diagram is shown in Figure 5.1-1.

The uplink 5G NR TDD signal received at each antenna port passes through the rx port on the front end (BPF). The signal is bandpass filtered to the front end (BPF) rx path and amplified by a Low Noise Amplifier (LNA).

The signal amplified by the LNA is input to the RFIC and converted into a baseband signal.

The converted baseband signal is demodulated and decoded by the Modem and delivered to the 5G core as an IP packet.

5.3 Down-link signal processing

The downlink signal processing diagram is shown in Figure 5.1-1.

IP packets received from the 5G core are encoded / modulated into baseband signals from the Modem according to the standard.

The converted baseband signal is upconverted to an RF signal by the RFIC and passed to the power amplifier.

The RF signal amplified by the power amplifier passes through the tx port on the front end (BPF) and radiates to each antenna port.

6 ENS2278-3823 System Composition

6.1 ENS2278-3823 HW block description

The ENS2278-3823 consists of Modem blocks, RFIC blocks, PAM blocks, LNA blocks, BPF blocks, RF switch blocks, PLL blocks, GPS blocks, and IEEE1588 blocks.

For system clock synchronization, the ENS2278-3823 can use GPS or IEEE1588.

The internal structure of the ENS2278-3823 is shown in Figure 6.1-1.

Figure 6.1-1 ENS2278-3823 internal figure

6.1.1 NPU Block

The NPU(Neural Processing Unit) chip is NXP's device. The NPU block is the main processor of the ENS2278-3823 that performs modem control processing and network processing.

6.1.2 Modem Block

The modem chip is Qualcomm's device. The modem block is that performs call processing.

The modem block implements the TDD LTE PHY layer functionality. It supports 1FA / 1 sector signal per unit and 2TX / 2RX MIMO diversity.

6.1.3 RFIC Block

The RFIC upconverts the received downlink baseband signal from the modem and sends it to the PAM block.

It also down-converts the received uplink RF signal from the LNA and sends it to the modem.

The interface with the modem is the Qlink interface(Qualcomm interface).

RFIC supports 2Tx / 2Rx.

6.1.4 PLL Block

The PLL block of the ENS2278-3823 has two clock synchronizers (Si5403).

The internally generated PLL clock is synchronized with the received reference sync signal by the GPS.

The Clock generates a 100MHz system clock for NPU processing, and generates a 125 MHz / 161.1328125 MHz / 156.25 MHz / 25MHz network clock.

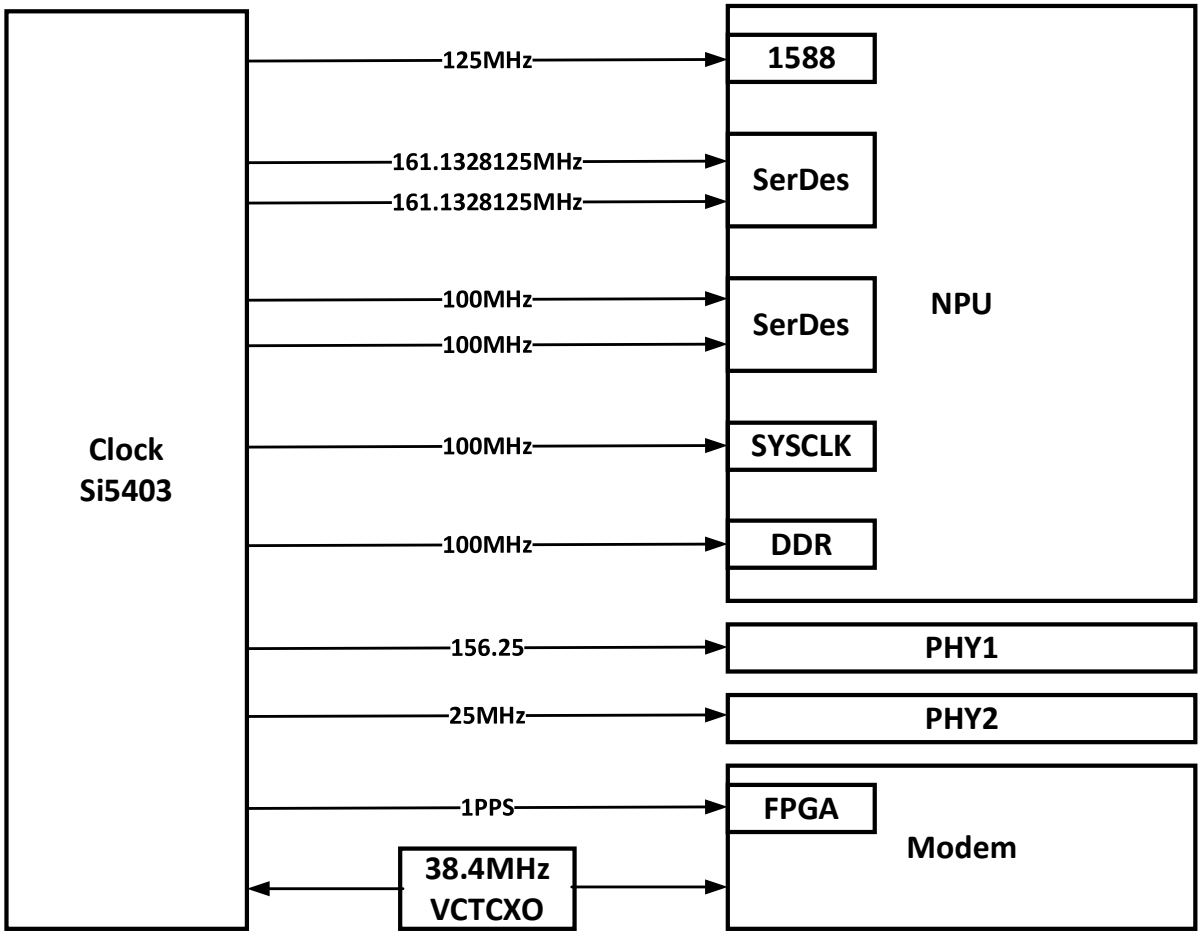

Figure 6.1-2 ENS2278-3823 clock block overview

6.1.5 Power Amplifier Block

The Power Amplifier block amplifies the output signal from the RFIC and radiates through the antenna.

The ENS2278-3823 has two power amplifiers, one for each transmission path.

The power amplifier block has the following specifications: :

Table 6.1-1. Power Amplifier block specification

No.	PARAMETER	VALUE	UNIT	REMARK
1	Frequency	3.3~4.2	GHz	

2	Gain	33(typ.)	dB	
3	Output Level	+30(typ.)	dBm	100MHz LTE, 8.5dB PAR signal
4	Power Supply	+5, +12	V	Dual Power Supply

6.1.6 LNA Block

The Low Noise Amplifier (LNA) block amplifies the signal received from the antenna and sends it to the RFIC.

LNA is used for each receive path. LNA block specifications are as follows. :

Table 6.1-2. LNA block specification

No.	PARAMETER	VALUE	UNIT	REMARK
1	Frequency	3300~4200	MHz	
2	Gain	18.4(typ.)	dB	
3	NF	2.7(typ.)	dB	

6.1.7 Front-End Block (BPF, Band Pass Filter)

The front-end block has eliminates each spurious noise on the transmit and receive paths.

6.1.8 Circulator Block

The Circulator block has separation separates the transmission path from the reception path.

6.1.9 GPS block

The GPS block provides a synchronization reference signal for the ENS2278-3823 and

provides a hold over function.

In the additional alarm function, the GPS block provides monitoring for the external antenna (GPS antenna open, GPS antenna short).

The GPS module of the ENS2278-3823 supports reference sync signal generation and hold over by default.

The GPS block diagram is shown below.

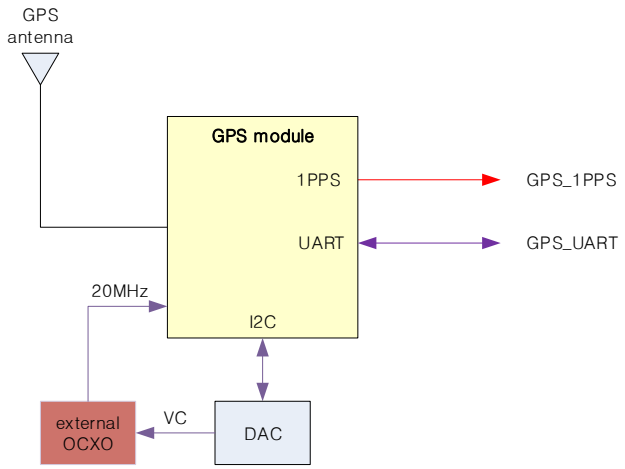

Figure 6.1-3 GPS block diagram

6.1.10 IEEE1588 Block

In addition to the GPS system synchronization method, the system synchronization method using IEEE1588 is supported.

IEEE1588 system synchronization method is configured using clock block and NPU.

6.1.11 Network Block

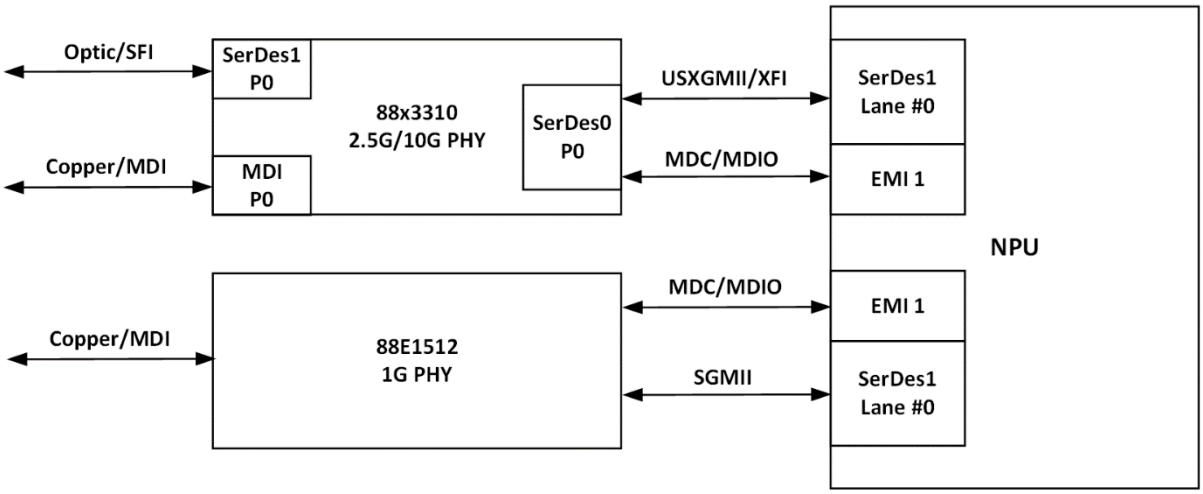

Figure 6.1-4 Network block diagram

The ENS2278-3823 has three Ethernet ports:

Backhaul 2 ports, and local management port. The Ethernet port interface names are shown in the following table.

One of the 2 backhaul ports is 2.5G copper port, other port is 10G optic port. 2 ports can optionally use only 1 port.

The Local Management Tool (LMT) port is a debug port.

6.2 ENS2278-3823 Extended Interface Description

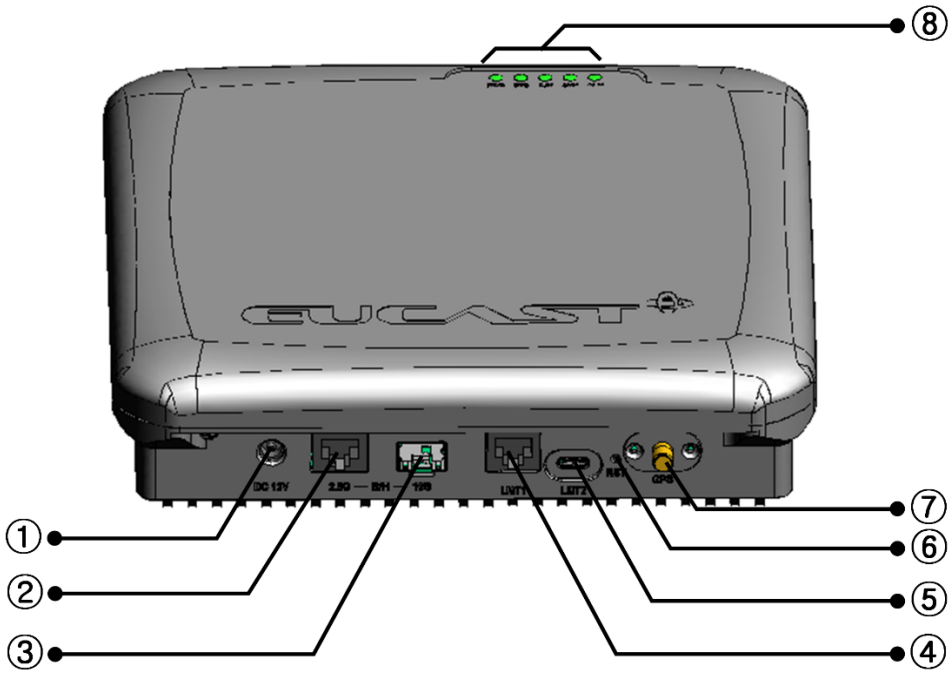

Figure 6.2-1. ENS2278-3823 extended I/O interface

1) DC Power Input Port: + 12VDC power input (AC / DC adapter output)

2) Backhaul Port: RJ45, Main network port (supports 2.5G base-T)

3) Backhaul Port: SFP, Main network port (supports 10G base-X)

4) Local Management Tool (LMT1): RJ45, debugging port (supports 1G base-T)

5) Local Management Tool (LMT2): USB-C, debugging port (Serial Port)

6) Reset Button: HW Reset Button, Toggle Switch Button

7) GPS Antenna Port: GPS receiver port, GPS antenna cable connection, L1 band support

8) LED: PWR / STS / B/H / SYN / ALM alarm monitoring, ENS000 status and alarm indication