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# WISUN module (HN-WISUN-M)

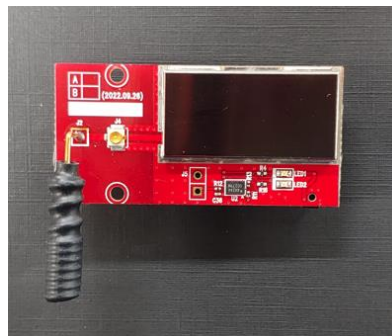
## Data Sheet

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Document No: HN-WISUN-M-20

Issue No: 1.0


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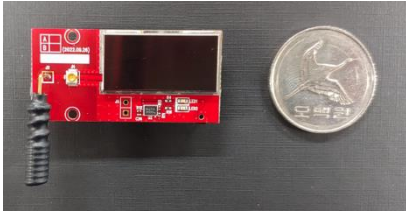
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## 1. Introduction



Smart Utility Network (SUN) (HN-WISUN-M-20) 모듈은 장거리 IOT 망구축을 위한 Sub 1GHz 대역의 통신 모듈입니다. ISM Band 인 900MHz 대역에서 사용이 가능하며 미리 정의된 AT Command 는 그림 0-1 과 같이 Star Network 을 손쉽게 구현하도록 지원합니다.

Hunature 에서 개발한 Smart scan 기능을 활용해 노드들이 beacon request 를 주기적으로 전송하고, 가장 가까운 코드네이터 로부터 response 를 수신하여 join request & response 수신하여 코드네이터의 채널과 동기화 하여 데이터 통신이 가능하다.

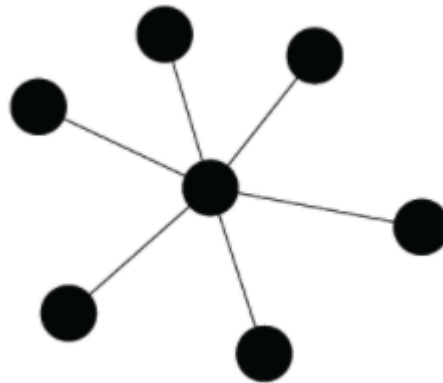



그림 0-1 Network Topology

### 1.1 관련 문서

다음 문서는 [www.Hunature.net](http://www.Hunature.net) 에서 Download 가능합니다.

- HN-DMS Application Guide (T.B.D)


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## 1.2 Main Chip Features

- Powerful 48-MHz Arm® Cortex®-M4F processor
- 352KB of in-system Programmable Flash
- 8KB of Cache SRAM (Alternatively available as general-purpose RAM)
- 80KB of ultra-low leakage SRAM. The SRAM is protected by parity to ensure high reliability of operation.
- Supports Over-the-Air upgrade (OTA)
- Excellent Receiver Sensitivity 121 dBm for SimpleLink long-range mode at 5kbps
- Output power up to +14 dBm with temperature compensation
- Digital peripherals can be routed to any GPIO
- Support I2C, UART, SPI
- Operating temperature range: -40°C to +105°C

## 1.3 Application

- 433, 470 to 510, 868, and 902 to 928 MHz ISM and SRD systems with down to 4 kHz of receive bandwidth
- Building Automation
- Building security systems
- HVAC
- Fire safety system
- Video surveillance
- Elevators, and escalators
- Grid infrastructure
- Smart meters
- Grid communications
- Other alternative energy
- Industrial Transport
- Factory automation and control
- Medical
- Electronic point of sale (EPOS)

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## 2. Module Specification

### 2.1 Module Architecture

SUN 모듈의 Main Chip CC1312R Architecture 는 다음 그림과 같습니다.

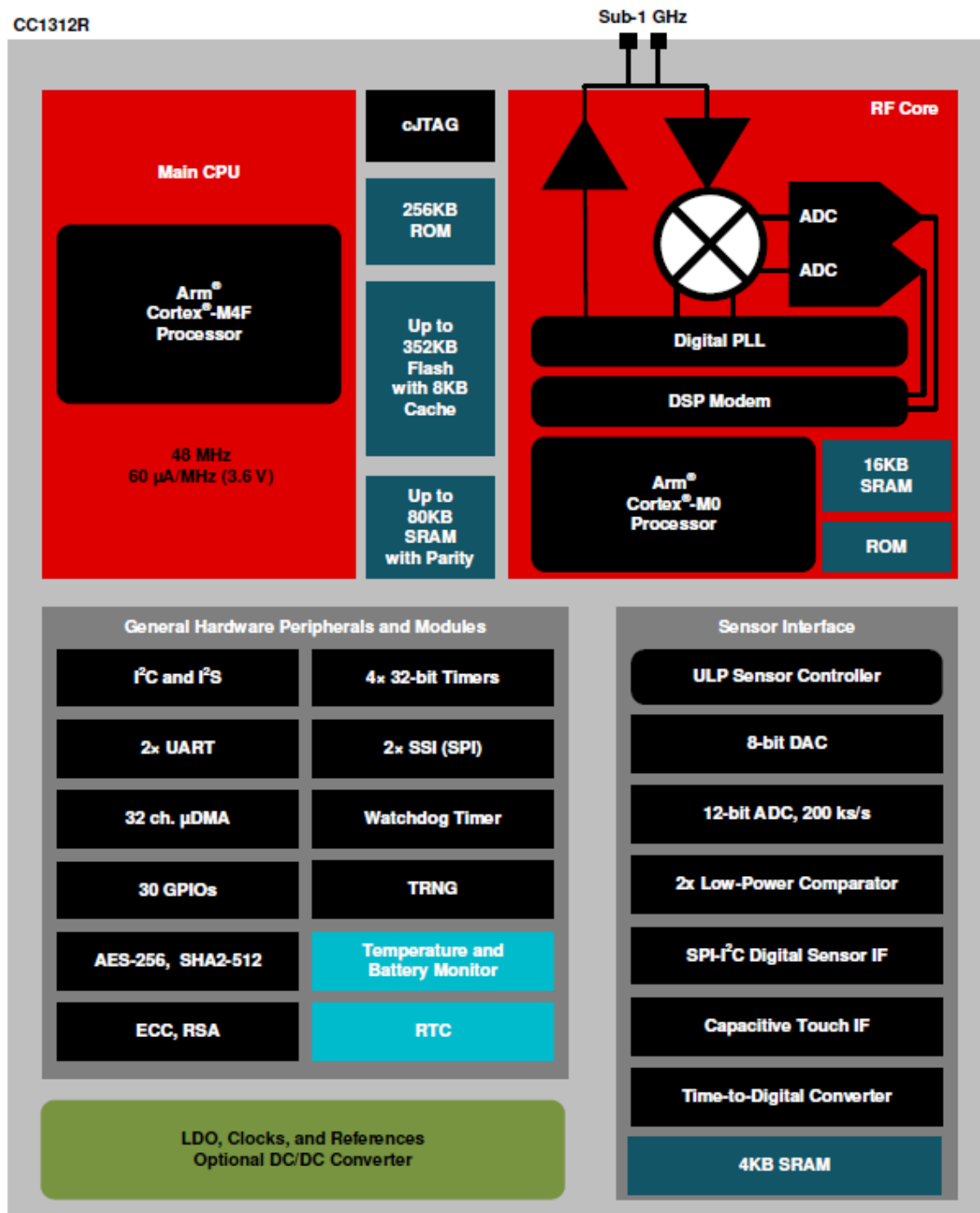



그림 2-1 Module Architecture

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## 2.2 Electrical Specification

### 2.2.1 Key Specification

SUN 모듈의 핵심 사양은 다음 표 2.2-1 과 같습니다.

표 2.2-1 Key Specification

Item	Description	비고
Main Chipset	Arm® Cortex®-M4F system	
	352KB Flash	
Memory	SPI Serial Flash 4Mbit(256KB)	
RF	-121dBm sensitivity (Long Range Mode)	
	Integrated channel filters	
Clock	External 48MHz, Internal 32KHz RTC	
Operating Mode	Active, IDLE, Standby, Shutdown	
I/F	SPI, I2C, UART, GPIO(Analog, Digital)	
Download I/F	SPI Programming (SWDIO, SWDCLK), UART	
Network	P2P, Repeater, Star, Mesh	

### 2.2.2 Absolute Maximum Rating

다음 표 2.2-2 와 같은 동작 특성을 갖습니다

표 2.2-2 Absolute Maximum Rating


Operating Conditions	Min	Typ	Max	Unit
Storage temperature	-40	-	150	°C
Power Supply Voltage	-0.3	-	4.1	V

### 2.2.3 Recommended Operating Conditions

다음 표 2.2-3 와 같은 동작 특성을 갖습니다.

표 2.2-3 Recommended Operating Conditions

Operating Conditions	Min	Typ	Max	Unit
Operating temperature	-40	-	105	°C
Power Supply Voltage	1.8	3.3	3.8	V


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## 2.2.4 Current Consumption

다음 표 2.2-4 와 같이 전류량을 소모합니다.

표 2.2-4 Current Consumption

Mode	Description	Total Typical Current at 3.6V, 25°C
Shutdown	Shutdown. No clocks running, no retention	150nA
Standby Without cache retention	RTC running, CPU, 80KB RAM and (partial) register retention. XOSC_LF	0.99uA
Standby With cache retention	RTC running, CPU, 80KB RAM and (partial) register retention. XOSC_LF	2.92uA
RX active	Radio receive current, 868 MHz	5.8mA
TX active	Radio transmit current, 868 MHz 0 dBm output power setting	8.0mA
	Radio transmit current, 868 MHz +10 dBm output power setting	14.3mA
	Radio transmit current, 868 MHz, Boost mode +14 dBm output power setting	24.9mA

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## 2.3 Module information

### 2.3.1 Block Diagram

SUN Module 의 Block Diagram 은 다음 그림 2-2 과 같습니다.

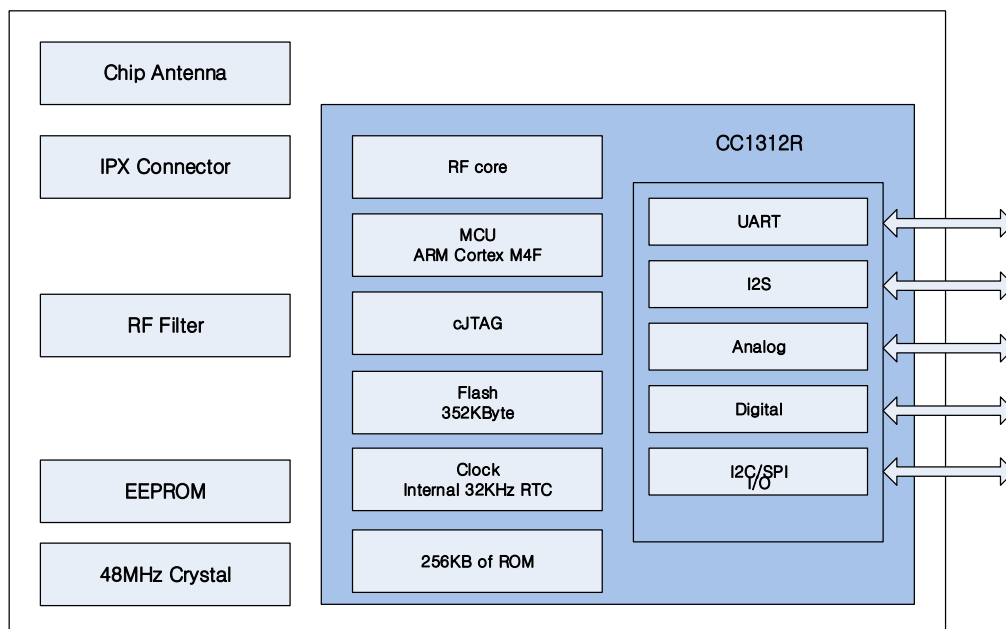


그림 2-2 Block Diagram

### 2.3.2 Pin Out

SUN Module 의 핀 구성은 다음 그림 2-3 과 같습니다.

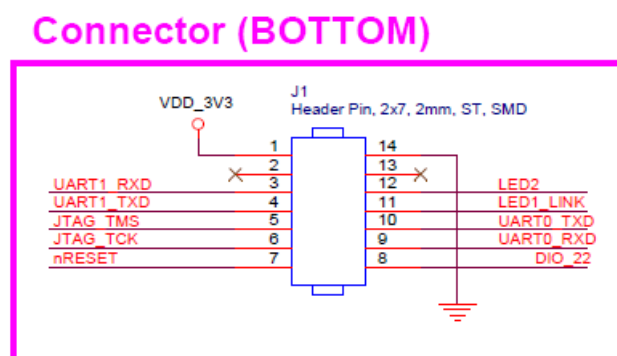



그림 2-3 Pin out Diagram




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### 2.3.3 Pin Configuration

표 2.3 Pin Configuration

No	HN-WISUN-M Name	Type	Description	CC1312R1F3RGZ Pin Assignment
J1 – 1	VDD_3V3	Power	3.3VDC Power Supply Voltage	VDD
J1 – 2	NC			
J1 – 3	UART1_RXD	I/O	Digital I/O (UART1_RXD)	DIO_14
J1 – 4	UART1_TXD	I/O	Digital I/O (UART1_TXD)	DIO_15
J1 – 5	JTAG_TMS	I/O	Digital I/O	JTAG_TMS
J1 – 6	JTAG_TCK	I/O	Digital I/O	JTAG_TCK
J1 – 7	nRESET	I	Reset, active-low	DIO_35
J1 – 8	DIO_22	I/O	Digital I/O	DIO_22
J1 – 9	UART0_RXD	I/O	Digital I/O (UART0_TX)	DIO_2
J1 – 10	UART0_TXD	I/O	Digital I/O (UART0_TX)	DIO_3
J1 – 11	LED1_LINK	I/O	Digital I/O	DIO_5
J1 – 12	LED2	I/O	Digital I/O	DIO_6
J1 – 13	NC			
J1 – 14	GND	Ground	Ground (0V)	VSS

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## 2.4 Physical Dimensions

SUN Module 의 Dimension 정보는 다음 그림과 같습니다.

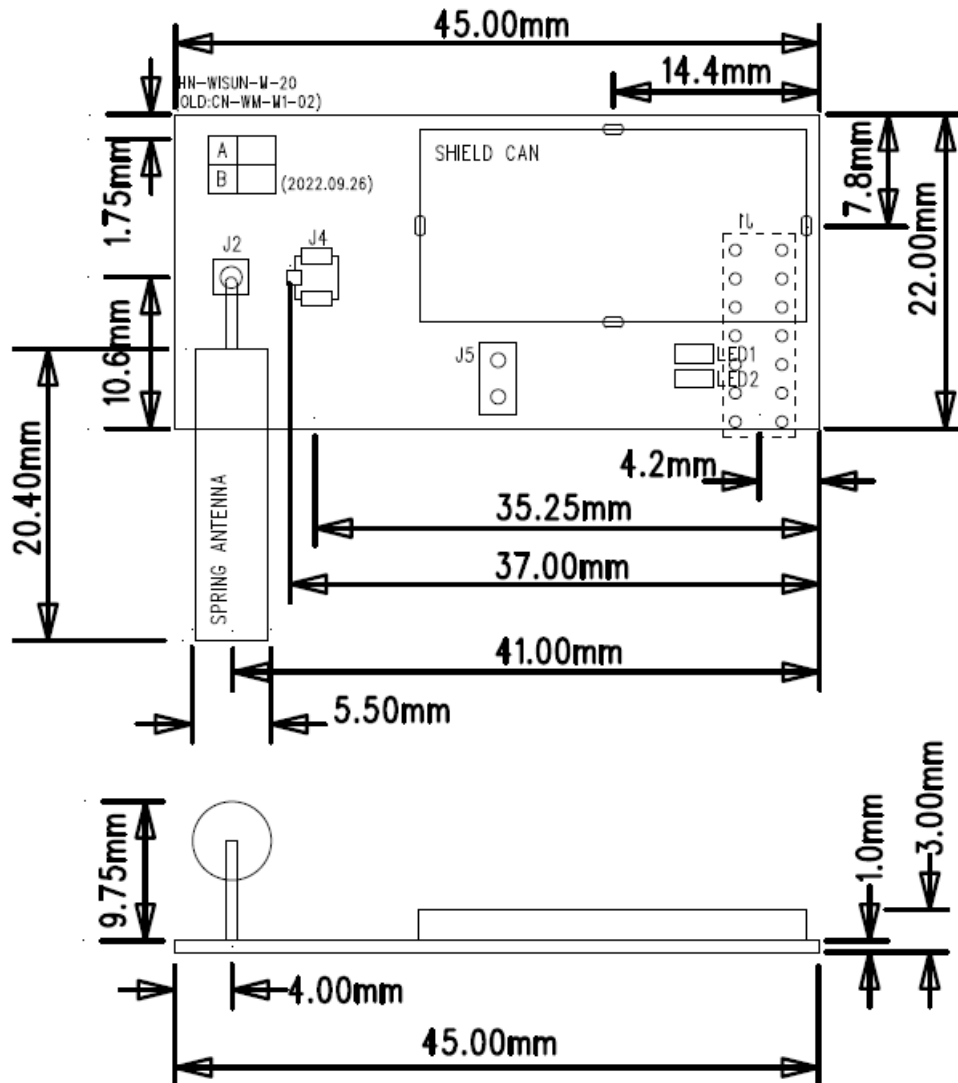



그림 2-4 Dimension

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### 3. Antenna Radiation Report

Antenna radiation pattern 과 Test result 는 아래와 같습니다.

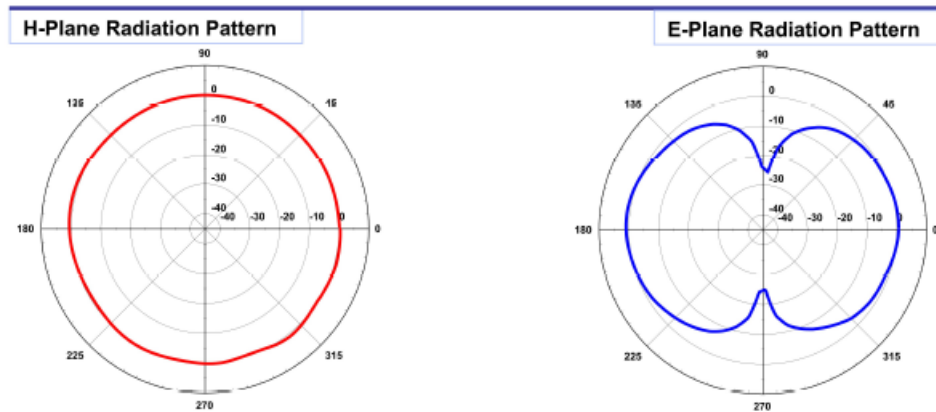



그림 3-1 Measurement Report

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## 4. Packet Frame

### 4.1 Node → Gateway

Frame Header						Payload	Frame Tail	
Flag (0x7e)	Frameformat	Dst	Src	Control	HCS	DLMS/COSEM	FCS	Flag (0x7e)
1	2	2	1	1	2	n	2	1

Flag : 0x7E

FrameFormat : A0, LEN(Flag 2 bytes 를 제외한 길이)

Dst, Control, HCS : 미사용

Payload : 사용자 데이터

FCS : 미사용

Flag : 0x7E

### 4.2 Gateway -> Node


LMN Frame			HDLC Frame								
LMN Header			HDLC Header						Payload	HDLC Tail	
STX (0x51f8)	Packet Length	MAC Addr	Flag (0x7E)	Framef ormat	Dst	Src	Control	HCS	DLMS/COSEM	FCS	Flag (0x7e)
2	2	8	1	2	2	1	1	2	n	2	1

STX : 51, 8F

Packet Length : HDLC Frame 길이 (Big Endian)

MAC Addr : 목적지 MAC 주소

HDLC Frame : 위 Node 의 Frame 과 동일

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### 4.3 Packet 예

[Node -> Gateway]

Node TX : 7e a0 0d 00 00 00 00 00 00 61 62 63 00 00 7e

Gateway RX : 51 F8 00 0F 00 12 4B 00 24 AC 19 A0 7E A0 0D 00 00 00 00 00 00 61 62 63 00 00 7E

[Gateway → Node]

Gateway TX : 51 F8 00 0F 00 12 4B 00 24 AC 19 A0 7E A0 0D 00 00 00 00 00 00 61 62 63 00 00 7E

Node RX : 7e a0 0d 00 00 00 00 00 00 61 62 63 00 00 7e

## 5. AT Command

T.B.D