

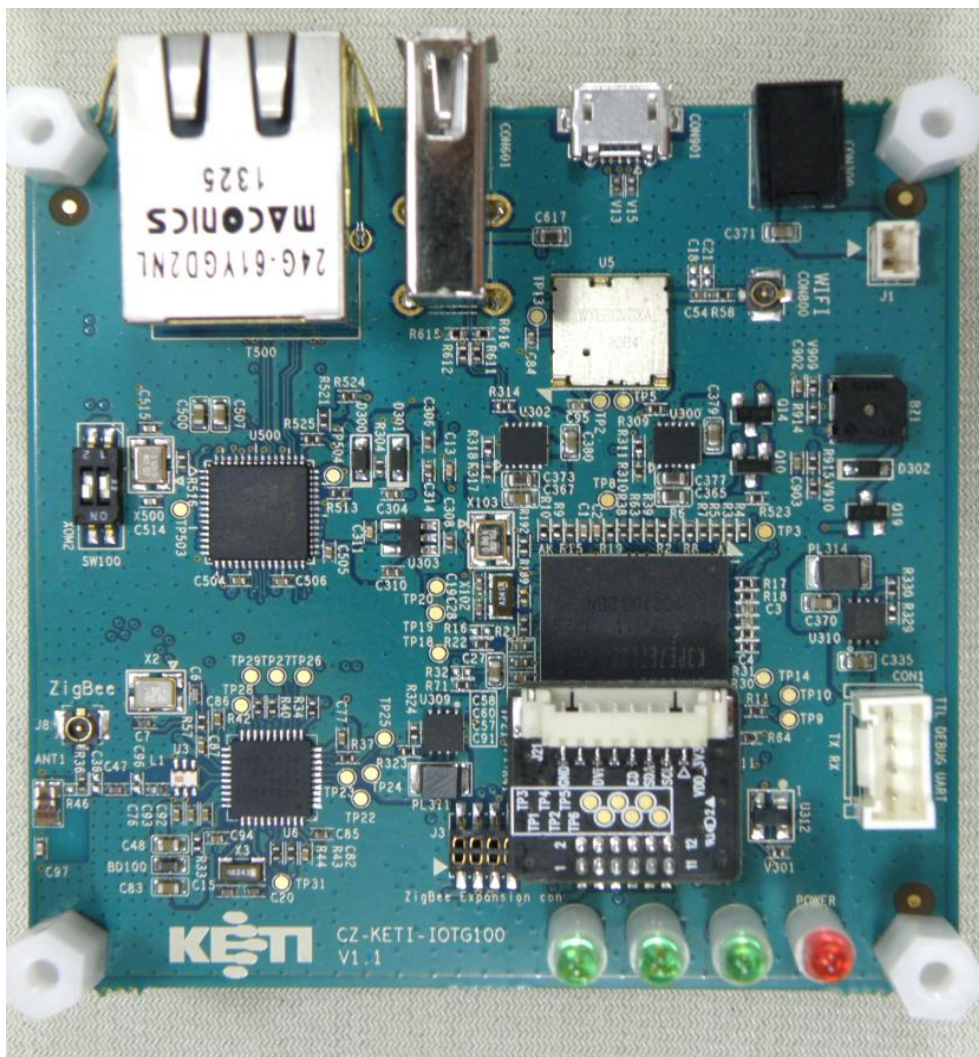
Gateway Main Board-IOTG100 소개

CR-IOT은 사물인터넷 (Internet of Things)이라는 개념을 기반으로 센서를 통한 다양한 정보를 유무선 통신을 이용하여 수집된 정보를 이용하여 특정 기능을 수행할 수 있도록 개발된 보드입니다.

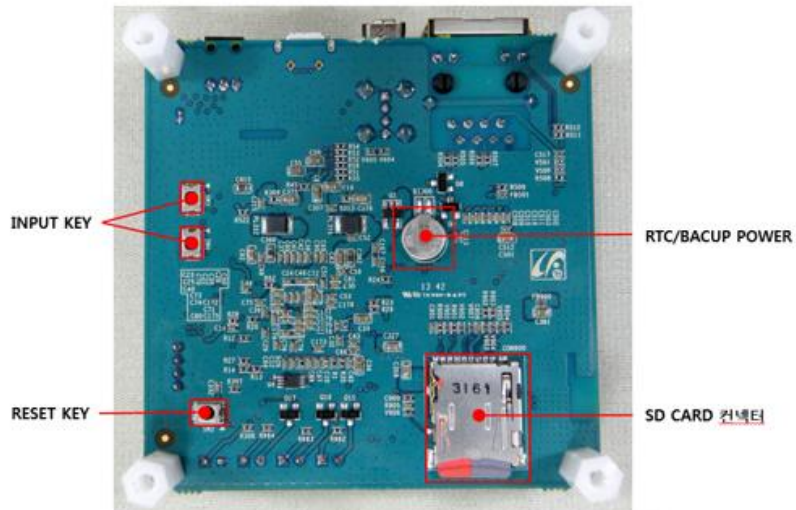
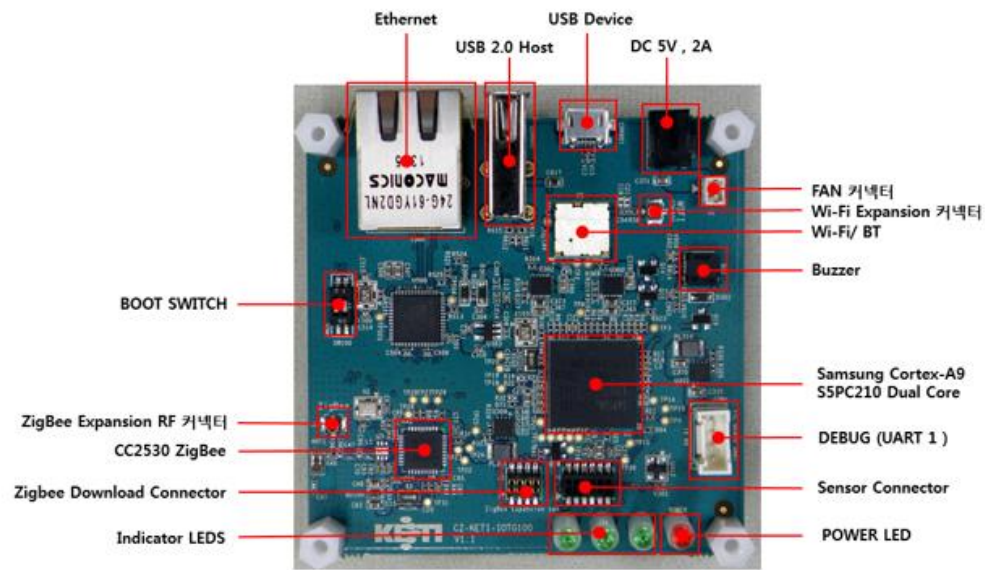
IOTG100 보드는

- Samsung Exynos4210 S5PC210 Cortex-A9 Dual Core 탑재
- RAM 512MB
- Zigbee(CC2530 칩 탑재)가 탑재
- WiFi/BT 탑재
- 각종 센서(온습도, 조도 등)를 장착할 수 있는 인터페이스 제공
- OS : Linux, Android 지원

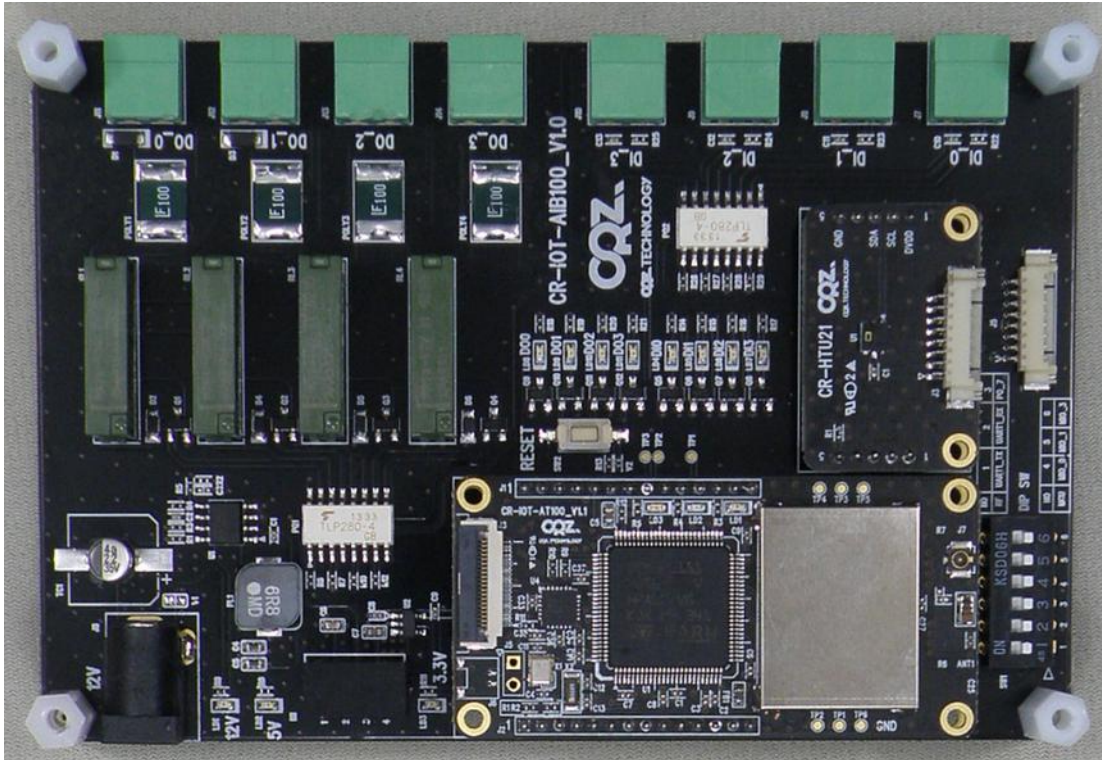
다양한 정보를 지그비,이더넷, WiFi/BT를 통하여 스마트폰이나 서버와 통신 할 수 있는 기능을 가진 보드입니다.



CPU	ARM Cortex A9 S5PC210	1GHz /1.3GHz Application Processor
Memory	LPDDR2 800Mega data rate	1Gbytes
Ethernet	SMSC LAN9220	10/100Mbps Ethernet Controller
USB	USB 2.0 Host	
	USB 2.0 OTG	
SD/MMC	SD/MMC Port 1	WiFi/BT
	SD/MMC Port 2	Boot SD Connector
UART	UART Port 0	Zigbee UART0
	UART Port 1	Debug
	UART Port 2	UART
	UART Port 3	Zigbee UART1
WiFi	SDIO ,802.11BGN 지원,	
Power	DC Power	5 Volt / 2A
	Back-up Battety	MS621 3.3V/4mAh
LED	Indicator LED x 4	
Buzzer	Buzzer BST-5533S	
Switch	Input Key	Button SW x 2
	Reset Key	Button SW x 1
	SD-Boot Mod Select	2ch-SW x 1
Connectors	Expansion Connectors	I2C, UART, SPI, GPIO etc
	ZigBee Control Connetor	



CR-IOT-AT100 보드 소개

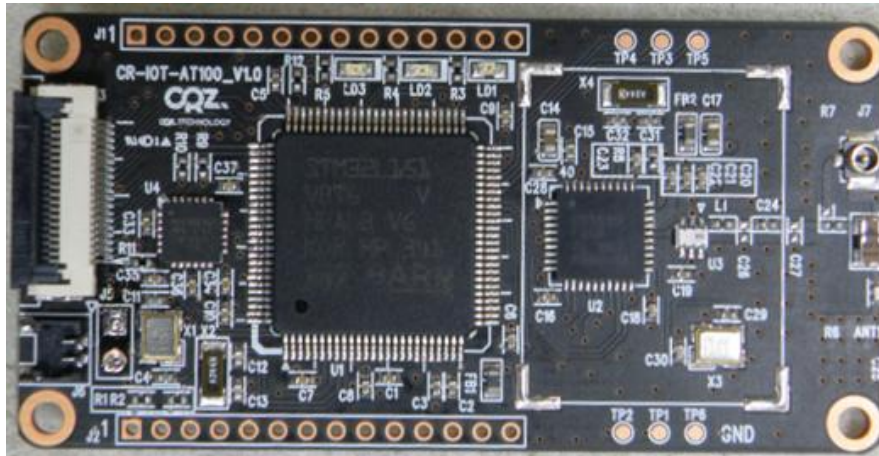


CR-IOT은 사물인터넷 (Internet of Things)이라는 개념을 기반으로 센서를 통한 다양한 정보를 유무선 통신을 이용하여 수집된 정보를 이용하여 특정 기능을 수행할 수 있도록 개발된 보드입니다.

CR-IOT-AT100보드는 STMicroelectronics 사의 저전력을 특징으로 하는 STM32L 을 장착했으며 CC2530을 이용한 ZigBee 와 RF 무선 통신이 가능합니다. 또한 9축 (자이로 + 가속도 + 지자기 컴퍼스) 센서가 탑재되어 있어 레이싱 게임, 볼링 게임, 나침반 등에 응용할 수 있으며, 이는 통해 각종 센서를 결합하여 다양한 기능을 수행하도록 제작이 가능한 보드입니다.

CR-IOT-ATDBG1보드는 CR-IOT-AT100보드의 기능을 확인하고 DEBUG가 가능하도록 제작된 보드입니다.

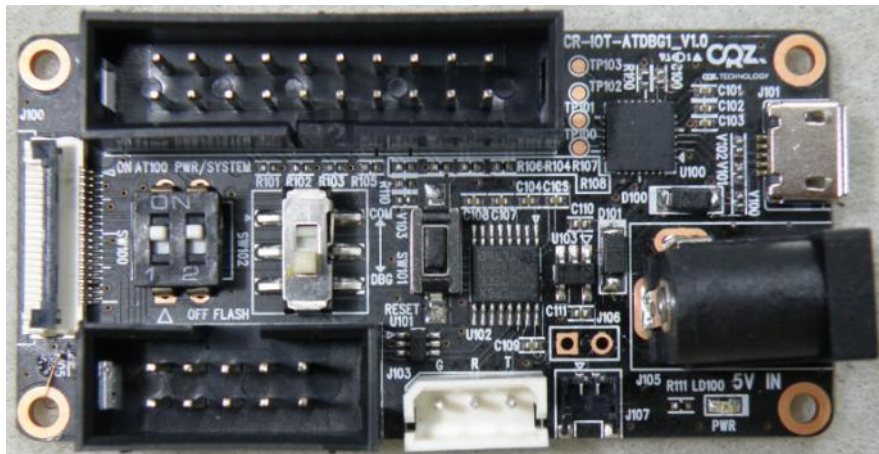
1.1. CR-IOT-AT100 Summary



[Figure 1. CR-IOT-AT100]

- Microcontroller STM32L15VBT6
- Input Voltage (recommended) 2.7~5V
- Flash Memory (STM32L15VBT6) 128Kb
- Flash Memory (CC2530) 256kb
- ZigBee Application
- 9-AXIS Sensor
- 60mm x 30mm

1.2. CR-IOT-ATDBG1 Summary



[Figure 2. CR-IOT-ATDBG1]

- JTAG Connector
- CC Debugger Connector
- MINI USB Connector
- RS232 level Converter
- 5V DC Power jack
- 3.3V LDO

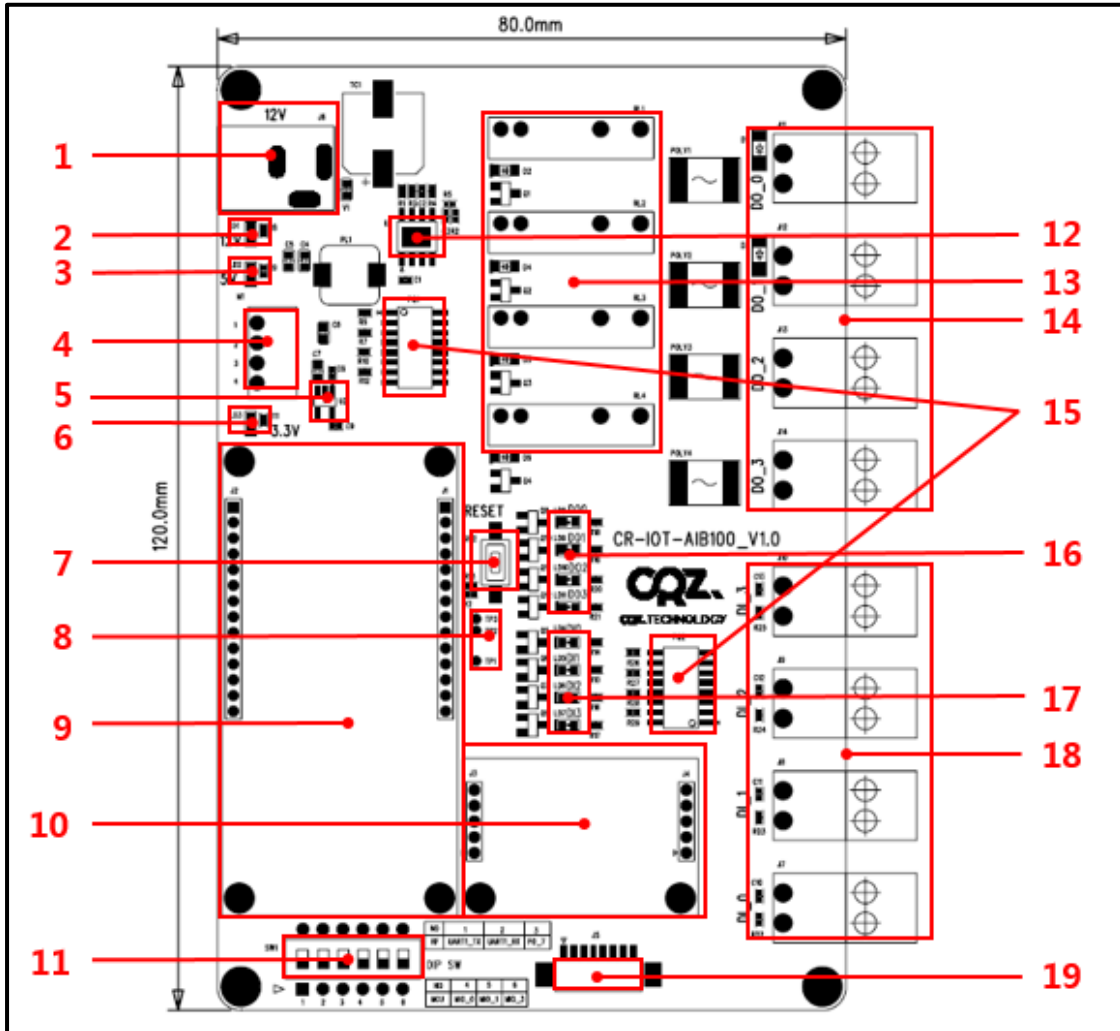
- BOOT / POWER Mode select Switch
- UART select Switch
- Reset Switch
- 60mm x 30mm

1.3. CR-IOT-AIB100 Summary

- Input Voltage 12V
- 4 Input Port
- 4 Output Port
- Input / Output Isolation
- Input/ Output Indicator LED
- Power Indicator LED

2. PCB 설명

2.1 CR-IOT-AIB100 PCB 설명



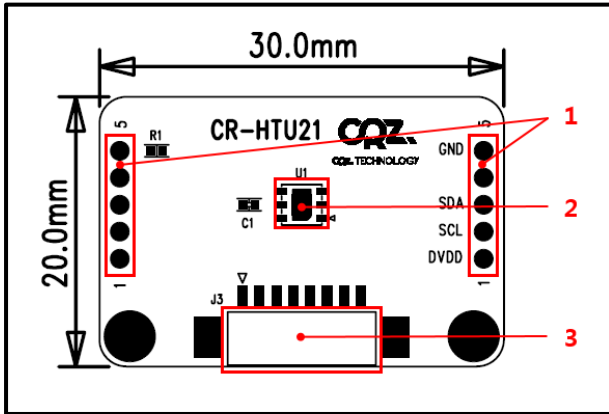
1. 12V POWER 커넥터	6. 3.3V 전원 LED	11. 6채널 스위치	16. OUTPUT LEDS
2. 12V 전원 LED	7. RESET 스위치	12. 5V LDO	17. INPUT LEDS
3. 5V 전원 LED	8. TEST 포인트	13. OUTPUT 릴레이	18. INPUT 터미널
4. DC/DC 컨버터	9. CR-IOT-AT100 커넥터	14. OUTPUT 터미널	19. 8PIN 확장 커넥터
5. 3.3V LDO	10. 센서보드 커넥터	15. 포토커플러	

2.1. CR-HTU21 Summary



- Humidity Sensor with Temperature Output
- HTU21D
- Humidity Sensor with Temperature Output
- I2C interface
- Low power consumption
- Input Voltage 1.5~3.6V

2.2 CR-HTU21 PCB 설명



1	센서 장착 커넥터
2	습도&온도 센서
3	8PIN 커넥터

2.1.1 Part # 1 - 센서 장착 커넥터

센서 장착 커넥터를 이용하여 CR-IOT-AT100 보드 또는 CR-IOT-AIB100 보드에 장착하여 센서를 동작 시켜 데이터를 수집, 활용 할 수 있습니다.

J1

1	Not Connect
2	Not Connect
3	Not Connect
4	Not Connect
5	BD_DETECT

J2

1	DVDD
2	I2C_SCL
3	I2C_SDA
4	Not Connect
5	GND

BD_DETECT1 은 센서 보드의 장착 여부를 확인하는 신호로, 보드가 장착이 되면 Low 신호를 나타냅니다.

2.1.2 Part # 2 - 습도&온도 센서

습도 & 온도 센서는 Measurement 사의 HTU12D 을 장착했습니다.

HTU12D 의 특징 및 센서의 성능은 다음과 같습니다.



- Relative Humidity and Temperature Digital Output, I²C interface
- Fully calibrated
- Low power consumption
- Fast response time

ELECTRICAL AND GENERAL ITEMS

(@T = 25°C, @Vdd = 3V)

Characteristics	Symbol	Min	Typ	Max	Unit
Voltage Supply	VDD	1.5	3.0	3.6	V
Current consumption ⁽¹⁾	Sleep mode		0.02	0.14	µA
	Measuring	300	450	500	µA
Power Dissipation	Sleep mode		0.06	0.5	µW
	Average 8bit ⁽²⁾		2.7		µW
Communication	digital 2-wire interface, I ² C protocol				
Heater	VDD=3V	5.5mW/ΔT=+0.5-1.5°C			
Storage	-40°C/125°C				

⁽¹⁾ Conditions: V_{dd} = 3V, SCK= 400kHz at 25°C

⁽²⁾ Conditions: V_{dd} = 3V, SCK= 400kHz, Temp<60°C, duty cycle <10%

SENSOR PERFORMANCE

RELATIVE HUMIDITY

(@T = 25°C, @Vdd = 3V)

Characteristics	Symbol	Min	Typ	Max	Unit
Resolution	12 bits		0.04		%RH
	8 bits		0.7		%RH
Humidity Operating Range	RH	0		100	%RH
Relative Humidity Accuracy @25°C (20%RH to 80%RH)	typ		±2		%RH
	max		See graph 1		%RH
Replacement	fully interchangeable				
Temperature coefficient (from 0°C to 80°C)	T _{cc}			-0.15	%RH/°C
Humidity Hysteresis			±1		%RH
Measuring Time ⁽¹⁾	12 bits		14	16	ms
	11 bits		7	8	ms
	10 bits		4	5	ms
	8 bits		2	3	ms
PSRR				±10	LSB
Recovery time after 150 hours of condensation	t		10		s
Long term drift			0.5		%RH/yr
Response Time (at 63% of signal) from 33 to 75%RH ⁽²⁾	T _{RH}		5	10	s

⁽¹⁾ Typical values are recommended for calculating energy consumption while maximum values shall be applied for calculating waiting times in communication.

⁽²⁾ At 1m/s air flow

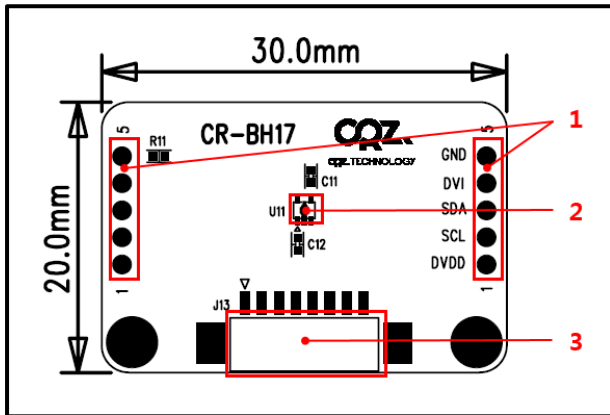
2.2. CR-BH17 Summary



- Ambient Light Sensor IC
- BH1721FVC
- I2C interface
- Wide range and High resolution.
- Input Voltage 2.4~3.6V

3. PCB 설명

2.1 CR-BH17 PCB 설명



1	센서 장착 커넥터
2	조도 센서
3	8PIN 커넥터

2.1.1 Part # 1 - 센서 장착 커넥터

센서 장착 커넥터를 이용하여 CR-IOT-AT100 보드 또는 CR-IOT-AIB100 보드에 장착하여 센서를 동작 시켜 데이터를 수집, 활용 할 수 있습니다.

J1

1	Not Connect
2	Not Connect
3	Not Connect
4	Not Connect
5	BD_DETECT

J2

1	DVDD
2	I2C_SCL
3	I2C_SDA
4	DVI
5	GND

2.1.2 Part # 2 - 조도 센서

조도 센서 ROHM 사의 BH1721FVC 을 장착했습니다.
BH1721FVC의 특징 및 센서 성능은 다음과 같습니다.



- Relative Ambient Light Digital Output, I²C interface
- Spectral responsibility is approximately human eye response
- Wide range and High resolution. (1 – 65528 lx)
- 50Hz / 60Hz Light noise reject-function
- Light source dependency is little
- Small measurement variation (+/- 15%)

● **Electrical Characteristics (VCC = 3.0V, DVI = 3.0V, Ta = 25°C, unless otherwise noted)**

Parameter	Symbol	Ratings			Units	Conditions
		Min.	Typ.	Max.		
VCC Voltage	Vcc	2.4	3.0	3.6	V	
I ² C Reference Voltage	Vdvi	1.65	-	Vcc	V	
Supply Current	Icc1	-	140	199	μA	Ev = 100 lx ※ ¹
Powerdown Current	Icc2	-	0.01	1.0	μA	No input Light
Peak Wave Length	λp	-	560	-	nm	
Measurement Accuracy	S/A	1.02	1.2	1.38	times	Sensor out / Actual lx EV = 1000 lx ※ ¹ , ※ ²
Dark (0 lx) Sensor out	S0	0	0	2	count	H-Resolution Mode ※ ³
H-Resolution Mode Resolution	rHR	-	1	-	lx	
L-Resolution Mode Resolution	rLR	-	8	-	lx	
H-Resolution Mode Measurement Time	tHR	-	120	180	ms	
L-Resolution Mode Measurement Time	tLR	-	16	24	ms	
Incandescent / Fluorescent Sensor out ratio	rIF	-	1	-	times	EV = 1000 lx
DVI Input 'L' Voltage	VDVL	-	-	0.4	V	

※¹ White LED is used as optical source.

※² Measurement Accuracy typical value is possible to change '1' by "Measurement result adjustment function".

※³ Use H-Resolution Mode if dark data (less than 20 lx) is need.

● **Reference Data**

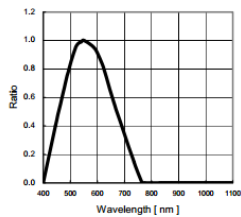


Fig.1 Spectral Response

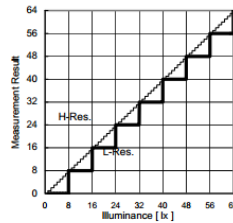


Fig.2 Illuminance - Measurement Result 1

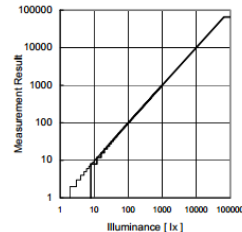


Fig.3 Illuminance - Measurement Result 2

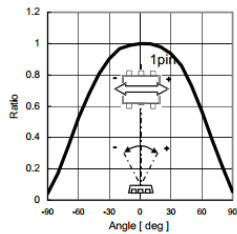


Fig.4 Directional Characteristics 1

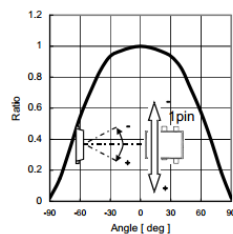


Fig.5 Directional Characteristics 2

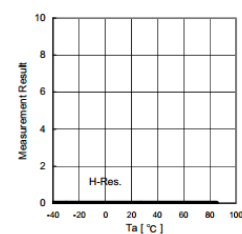


Fig.6 Dark Response

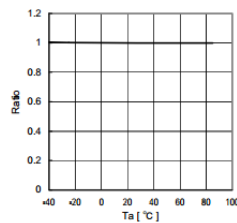


Fig.7 Measurement Result Temperature Dependency

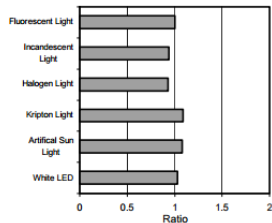


Fig.8 Light Source Dependency (Fluorescent Light is set to '1')

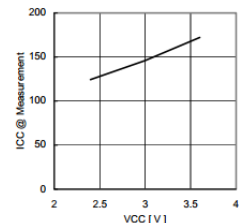


Fig.9 VCC - ICC (During measurement)

2.1.3 Part # 3 - 8PIN 커넥터

8PIN 확장 커넥터를 통해서 CR-IOT-AT100 이외에 유저가 사용하고자 하는 보드에 센서를 연결시켜 활용이 가능합니다.

1	DVDD	5	Not Connect
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2	I2C_SCL	6	DVI
3	I2C_SDA	7	Not Connect
4	BD_DETECT	8	GND