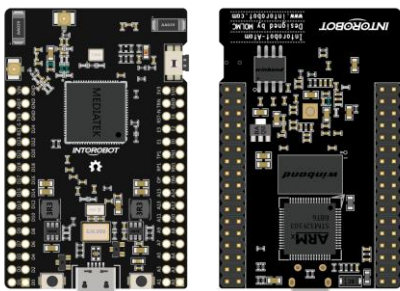


IntoRobot **Atom Datasheet**



Dexterous-Beautiful · Respect Innovation
Smart-Fast · Enjoy Passion

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1 Overview

IntoRobot-Atom is a WiFi core board for Makers. It is of small size, dual-CPU design, and code compatible with Arduino. It includes rich interfaces, such as 46 IOs, USARTs, SPI, I2C, PWM, CAN, USB, Ethernet port, etc., as well as running with OpenWrt system.

IntoRobot-Atom is comprised of an STM32 ARM MCU and a WiFi Router CPU; the Linux system OpenWrt is running on the Router. It is an open-ware system that is fully compatible with Arduino. It grants easily Internet connections for conventional devices such as coffee-machine, flowerpot and aquarium. Besides, it can push any detected changes to Facebook, WeChat and Twitter easily. There are much more to be discovered by yourself. Meanwhile, for advanced applications, you can quickly implement computer vision algorithms with embedded OpenCV, which may advance the intelligence of your surveillance vessel, UAV, robotic arms, etc.

2 Hardware Specification

2.1 Hardware Architecture

Chart 1: Hardware architecture.

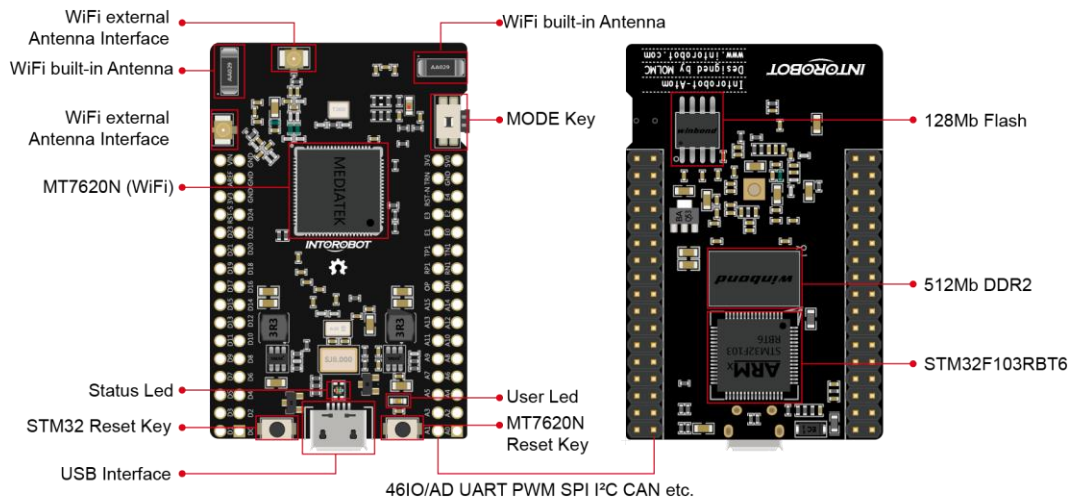


Chart 2: Specification

Product Name	IntoRobot-Atom
Cloud Service	IntoRobot-Cloud (www.intorobot.com)
CPU	<ol style="list-style-type: none"> STM32F103RBT6 Cortex-M3, 72MHz Flash: 128KB SRAM: 20KB MT7620N MIPS24KEc (580MHz) 64KBI-Cache and 32K BD-Cache 802.11b/g/n
Linux System	OpenWrt 14.07 or later
DC Payload	3.3V/800mA
GPIO	46
I2C	2
SPI	2
USART	3
PWM	12
A/D	16 (12 bit)
External interrupt	41
USB2.0	1
Ethernet Port	1
WiFi Router	Dual antenna, 300M Bandwidth

Note: ImLink is a technology for fast WiFi configuration provided by IntoRobot.

2.2 Pin Description

Chart 3: Pin Map

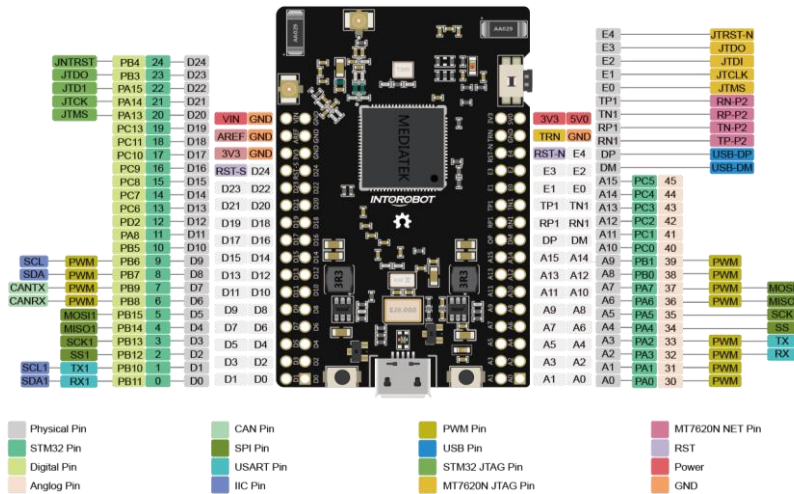
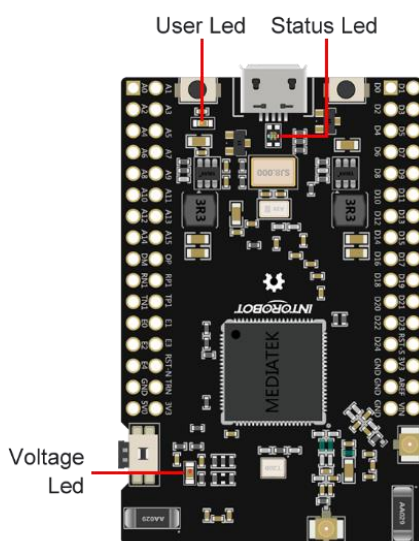


Chart 4: Pin Definition

Pins	Function Definition
D0	PB11: Digital Pin, RX1: Serial1 Receive, SDA1: I2C1(Wire1) Data Pin
D1	PB10: Digital Pin, TX1: Serial1 Transmit, SCL1: I2C1(Wire1) Clock In
D2	PB12: Digital Pin, SS1: SPI_1 Slave Select
D3	PB13: Digital Pin, SCK1: SPI_1 Clock In
D4	PB14: Digital pin, I/O, MISO1: SPI_1_MISO
D5	PB15: Digital pin, I/O, MOSI1: SPI_1_MOSI
D6	PB8: Digital pin, I/O, PWM Output, CANRX: CAN Bus Receive Pin
D7	PB9: Digital pin, I/O, PWM Output, CANTX: CAN Bus Transmit Pin
D8	PB7: Digital pin, I/O, PWM Output, SDA: I2C (Wire) Data Pin
D9	PB6: Digital pin, I/O, PWM Output, SCL: I2C (Wire) Clock In
D10	PB5: Digital pin, I/O
D11	PA8: Digital pin, I/O
D12	PD2: Digital pin, I/O
D13	PC6: Digital pin, I/O
D14	PC7: Digital pin, I/O
D15	PC8: Digital pin, I/O
D16	PC9: Digital pin, I/O
D17	PC10: Digital pin, I/O
D18	PC11: Digital pin, I/O
D19	PC13: Digital pin, I/O
D20	PA13: Digital pin, I/O, JTMS for JTAG
D21	PA14: Digital pin, I/O, JTCK for JTAG
D22	PA15: Digital pin, I/O, JTDI for JTAG
D23	PB3: Digital pin, I/O, JTDO for JTAG
D24	PB4: Digital pin, I/O, JNTRST for JTAG
A0	PA0: GPIO, AD Analog Input, PWM Output
A1	PA1: GPIO, AD Analog Input, PWM Output
A2	PA3: GPIO, AD Analog Input, PWM Output, RX: (Serial)
A3	PA2: GPIO, AD Analog Input, PWM Output, TX: (Serial)
A4	PA4: GPIO, AD Analog Input, SS: SPI Enable
A5	PA5: GPIO, AD Analog Input, SCK: SPI Clock In
A6	PA6: GPIO, AD Analog Input, PWM Output, MISO: SPI_MISO
A7	PA7: GPIO, AD Analog Input, PWM Output, MOSI: SP_MOSI
A8	PB0: GPIO, AD Analog Input, PWM Output
A9	PB1: GPIO, AD Analog Input, PWM Output
A10	PC0: GPIO, AD Analog Input
A11	PC1: GPIO, AD Analog Input
A12	PC2: GPIO, AD Analog Input
A13	PC3: GPIO, AD Analog Input
A14	PC4: GPIO, AD Analog Input
A15	PC5: GPIO, AD Analog Input
E0	MT7620N Digital pin, JTMS
E1	MT7620N Digital pin, JTCLK
E2	MT7620N Digital pin, JTDI
E3	MT7620N Digital pin, JTDO
E4	MT7620N Digital pin, NJTRST
E5	MT7620N Digital pin, JTMS
RST-S	STM32 Reset Enable
RST-N	MT7620N Reset Enable
TRN	MT7620N_JTAG Enable, Set HIGH before using JTAG
AREF	STM32_AD Reference; Default 3.3V
VIN	Atom Power in (4.75V-5.25V)
3V3	3.3V Output
5V	5V Output
GND	System GND

2.3 Led Function

Chart 5: Leds



Note: Three leds on Atom

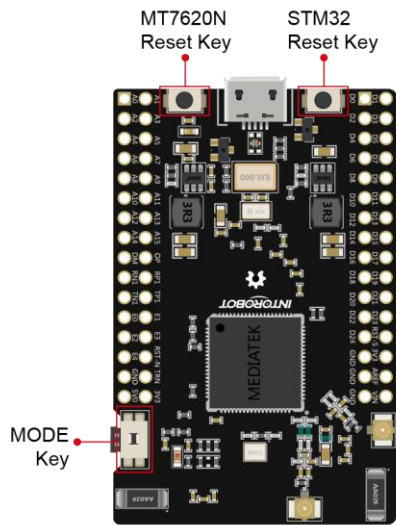
- Status Led: One RGB color LED, Showing Atom's working status
- User Led: linked to D7 Pin for debugging.
- Voltage Led: Power supply status

Chart 6: Led function

LED Color	Atom status
Red-Green-Blue-Light blue	Booting
Red blink	Configuration Mode
Yellow blink	STM32 hardware updating
Yellow blink-Yellow	OpenWrt upgrade
Green blink	Trying to link internet
Light blue blink	Working without linking internet
Blue blink	Linked to internet, but not yet to the cloud
White blink	Linked to cloud

2.4 Button Function

Chart 7: Buttons



Three buttons on Atom:

- MODE: Switching Atom's working status
- STM32 Reset key: Reboot STM32F103RBT6
- MT7620N Reset Key: Reboot OpenWrt System

Press MODE key and the LED will show different colors; correspondingly, Atom will enter into different modes:

Chart 8: Mode key's function

Pressing Time	Led color	Atom Status
3 Seconds	Red	Enter or exit configuration mode
7 Seconds	Green	Reset STM32 to Factory
10 Seconds	Blue	Serial port forwarding mode
13 Seconds	Light Blue	Restore factory defaults
20 Seconds	OFF	Restore the original state

- Configuration mode: Able to use APP or WEB serial port to connect Atom to the Cloud.
- STM32 default firmware: Atom has a default LED control program, where the onboard LED can be controlled through the APP or WEB platform.
- Serial port forwarding mode: Between OpenWrt and STM32 there is a serial connection. In this mode, the OpenWrt debugging data can be printed by using putty or other terminal tools through the USB interface on Atom.
- Restore factory defaults: Restore default firmware of OpenWrt and STM32, reserving current parameters.

3 Electrical Characteristics

3.1 Rating values

Chart 9: Rating values

Item	Conditions	Min/Max	Unit
Storage temperature	-	-65 to 125	°C
Supply Voltage	IPC/JEDECJ-STD-020	+3 to +3.6	V

3.2 General Operating Conditions

Chart 10: Operating conditions

Conditions	Symbol	Min	Typ	Max	Unit
Temperature	-	-40	20	85	°C
Voltage	VDD	3.0	3.3	3.6	V

3.3 I/O Port Characteristics

Chart 11: I/O port characteristics

Parameter	Symbol	Typ	Min	Max	Unit
Input Low Voltage	V _{IL}	-	-	0.3VDD	V
Input High Voltage	V _{IH}	-	0.7VDD	-	V
Output Low Voltage	V _{OL}	-	-	0.4	V
Output High Voltage	V _{OH}	-	VDD-0.4	-	V

4 WiFi Characteristics

4.1 IEEE802.11b Conduction Indicators Test Table

Chart 12: IEEE802.11b conduction indicators test table

Index	Item	Unit	Conditions	Reference	Test Results					
					1#			2#		
					CH1	CH7t	CH13	CH1	CH7	CH13
1	Transmit Power	dBm	1	14~18	14.90	14.60	16.00	15.30	15.90	15.60
			2	14~18	14.00	16.30	16.00	15.30	15.90	15.60
			5.5	14~18	16.00	16.30	16.00	15.30	15.90	15.60
			11	14~18	14.00	16.30	16.00	15.30	15.90	15.60
2	Error Vector Magnitude(EVM)	dB	1	≤-10	-34.00	-28.00	-27.00	-28.00	-28.00	-27.00
			2	≤-10	-34.00	-28.00	-27.00	-28.00	-28.00	-27.00
			5.5	≤-10	-34.00	-28.00	-27.00	-28.00	-28.00	-27.00
			11	≤-10	-34.00	-28.00	-27.00	-28.00	-28.00	-27.00
3	Center Frequency Error	KHz	11	±25	17.60	15.10	14.90	13.13	13.50	13.70
4	Symbol Clock Error	ppm	11	±10	7.40	6.21	6.11	5.60	5.70	5.70
5	Minimum receiving Signal level	dBm	1, Packet Loss Rate 8%	≤-86	-89.00	-89.00	-89.00	-80.00	-87.00	-86.00
			2, Packet Loss Rate 8%	≤-84	-85.00	-85.00	-87.00	-89.00	-86.00	-86.00
			5.5, Packet Loss Rate 8%	≤-82	-85.00	-85.00	-85.00	-87.50	-86.00	-86.00
			11, Packet Loss Rate 8%	≤-80	-85.00	-85.00	-82.00	-86.00	-86.00	-86.00
6	Maximum receiving Signal level	dBm	11, Packet Loss Rate 8%	≥-8	-10	-10	-10	-10	-10	-10

4.2 IEEE802.11g Conduction Indicators Test Table

Chart 13: IEEE802.11g conduction indicators test table

Index	Item	Unit	Conditions	Reference	Test Results					
					1#			2#		
					CH1	CH7	CH13	CH1	CH7	CH13
1	Transmit Power	dBm	6	14~18	19.43	18.00	18.70	18.70	19.00	18.50
			9	14~18	19.43	17.80	18.70	18.70	19.00	18.50
			12	14~18	19.43	18.00	18.70	18.70	19.00	18.50
			18	14~18	19.43	17.00	19.00	18.70	19.00	18.50
			24	14~18	15.20	18.00	17.20	16.20	16.60	16.00
			36	14~18	15.20	18.00	17.20	16.10	16.50	16.00
			48	14~18	15.40	16.80	14.20	14.20	14.60	14.00
			54	14~18	15.10	16.80	14.00	14.20	14.60	14.00
2	Error Vector Magnitude (EVM)	dB	6	≤-5	-31.00	-28.00	-28.00	-27.00	-25.00	-26.00
			9	≤-8	-32.00	-32.00	-29.00	-27.00	-26.00	-26.00
			12	≤-10	-32.00	-31.00	-28.00	-27.00	-25.00	-26.00
			18	≤-13	-32.00	-30.00	-34.00	-27.00	-34.00	-35.00
			24	≤-16	-32.00	-31.00	-34.00	-34.00	-34.00	-36.00
			36	≤-19	-32.00	-31.00	-34.00	-36.00	-34.00	-36.00
			48	≤-22	-32.00	-31.00	-34.00	-35.00	-34.00	-36.00
			54	≤-25	-32.00	-31.00	-34.00	-35.00	-34.00	-36.00
3	Center Frequency Error	KHz	54	±25	13.20	13.50	14.30	13.30	14.30	14.30
4	Symbol Clock Error	ppm	54	±10	5.51	5.80	5.80	6.20	6.10	5.58
5	Minimum receiving Signal level	dBm	6, Packet Loss Rate 10%	≤-82	-86.00	-82.00	-83.00	-85.00	-84.00	-84.00
			9, Packet Loss Rate 10%	≤-81	-86.00	-81.00	-82.00	-85.00	-84.00	-84.00
			12, Packet Loss Rate 10%	≤-79	-86.00	-79.00	-79.00	-79.00	-79.00	-84.00
			18, Packet Loss Rate 10%	≤-77	-86.00	-79.00	-78.00	-79.00	-79.00	-84.00
			24, Packet Loss Rate 10%	≤-74	-80.00	-75.00	-75.00	-79.00	-79.00	-80.00
			36, Packet Loss Rate 10%	≤-70	-80.00	-72.00	-75.00	-79.00	-79.00	-79.00
			48, Packet Loss Rate 10%	≤-66	-74.00	-72.00	-70.00	-69.00	-69.00	-72.00
			54, Packet Loss Rate 10%	≤-65	-74.00	-70.00	-70.00	-69.00	-69.00	-72.00
6	Maximum receiving Signal level	dBm	54, Packet Loss Rate 10%	≥-20	-10	-10	-10	-10	-10	-10

4.3 IEEE802.11n Conduction Indicators Test Table

Chart 14: IEEE802.11n conduction indicators test table

Index	Item	Unit	Conditions	Reference	Test Results						
					1#			2#			
					CH1	CH7	CH13	CH1	CH7	CH13	
1	Transmit Power	HT20	dBm	6.5	14~18	18.10	18.10	18.10	18.50	18.20	18.10
				13	14~18	18.10	18.10	18.10	18.50	18.10	18.10
				19.5	14~18	18.30	18.30	18.40	18.60	18.60	18.30
				26	14~18	18.00	16.30	18.50	18.20	18.70	18.30
				39	14~18	16.20	16.20	16.30	16.00	16.50	16.20
				52	14~18	16.10	16.20	16.30	16.10	16.50	16.20
				58.5	14~18	14.20	14.20	14.30	14.00	14.60	14.20
		65	14~18	14.20	14.20	14.30	14.00	14.60	14.20		
		HT40	dBm	13.5	14~18	18.50	18.10	18.10	18.30	18.40	18.50
				27	14~18	18.50	18.10	18.10	18.30	18.50	18.50
				40.5	14~18	18.20	18.40	18.50	18.30	18.60	18.30
				54	14~18	18.20	18.40	18.10	18.30	18.50	18.30
				81	14~18	16.10	16.40	16.20	16.20	16.40	16.20
				108	14~18	16.10	16.40	16.30	16.20	16.40	16.40
121.5	14~18			14.10	14.40	14.30	14.10	14.20	14.20		
135	14~18	14.10	14.40	14.30	14.10	14.10	14.30				
2	Error Vector Magnitude (EVM)	HT20	dB	6.5	≤-5	-29.00	-29.00	-29.00	-29.00	-28.00	-27.00
				13	≤-10	-28.00	-28.00	-28.00	-28.00	-28.00	-27.00
				19.5	≤-13	-30.00	-30.00	-30.00	-29.00	-28.00	-29.00
				26	≤-16	-30.00	-30.00	-30.00	-29.00	-29.00	-29.00
				39	≤-19	-32.00	-33.00	-35.00	-35.00	-36.00	-36.00
				52	≤-22	-32.00	-33.00	-34.00	-34.00	-36.00	-36.00
				58.5	≤-25	-32.00	-33.00	-35.00	-35.00	-36.00	-36.00
		65	≤-28	-32.00	-33.00	-35.00	-35.00	-36.00	-35.00		
		HT40	dB	13.5	≤-5	-30.00	-29.00	-30.00	-29.00	-29.00	-30.00
				27	≤-10	-31.00	-30.00	-30.00	-30.00	-29.00	-31.00
				40.5	≤-13	-30.00	-29.00	-30.00	-29.00	-29.00	-30.00
				54	≤-16	-29.00	-29.00	-29.00	-29.00	-29.00	-30.00
				81	≤-19	-31.00	-31.00	-32.00	-35.00	-33.00	-35.00
				108	≤-22	-30.00	-31.00	-32.00	-35.00	-34.00	-35.00
121.5	≤-25			-32.00	-32.00	-32.00	-35.00	-34.00	-35.00		
135	≤-28	-32.00	-32.00	-32.00	-35.00	-34.00	-35.00				
3	Center Frequency Error	KHz	65	±25	14.30	14.10	14.00	12.70	12.90	12.70	
4	Symbol Clock Error	ppm	65	±10	8.20	8.20	8.20	5.40	5.30	5.20	
5	Minimum receiving Signal level	HT20	dBm	6.5, Packet Loss Rate 10%	≤-82	-84.0	-83.0	-83.0	-82.0	-82.0	-83.0
				1, Packet Loss Rate 10%	≤-79	-84.0	-81.0	-83.0	-82.0	-82.0	-83.0
				19.5, Packet Loss Rate 10%	≤-77	-84.0	-81.0	-83.0	-82.0	-80.0	-83.0
				26, Packet Loss Rate 10%	≤-74	-82.0	-80.0	-83.0	-82.0	-76.0	-83.0
				39, Packet Loss Rate 10%	≤-70	-76.0	-76.0	-77.0	-78.0	-75.0	-78.0
				52, Packet Loss Rate 10%	≤-66	-76.0	-74.0	-76.0	-75.0	-71.0	-78.0

		HT40	dBm	58.5, Packet Loss Rate 10%	≤ -65	-76.0	-70.0	-73.0	-75.0	-71.0	-74.0
				65, Packet Loss Rate 10%	≤ -64	-70.0	-70.0	-72.0	-70.0	-79.0	-73.0
				13.5, Packet Loss Rate 10%	≤ -79	-82.0	-83.0	-83.0	-83.0	-83.0	-82.0
				27, Packet Loss Rate 10%	≤ -76	-82.0	-83.0	-83.0	-83.0	-83.0	-82.0
				40.5, Packet Loss Rate 10%	≤ -74	-79.0	-80.0	-83.0	-80.0	-80.0	-82.0
				54, Packet Loss Rate 10%	≤ -71	-79.0	-80.0	-80.0	-80.0	-78.0	-79.0
				81, Packet Loss Rate 10%	≤ -67	-72.0	-73.0	-74.0	-73.0	-73.0	-73.0
				108, Packet Loss Rate 10%	≤ -63	-70.0	-73.0	-73.0	-72.0	-70.0	-70.0
				121.5, Packet Loss Rate 10%	≤ -62	-70.0	-70.0	-70.0	-70.0	-70.0	-70.0
				135, Packet Loss Rate 10%	≤ -61	-70.0	-69.0	-70.0	-70.0	-79.0	-78.0
6	Maximum receiving Signal level		dBm	65, Packet Loss Rate 10%	≥ -20	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0

5 Atom Dimensions

5.1 Board Dimensions

Chart 15: Board dimensions

Unit: mm

