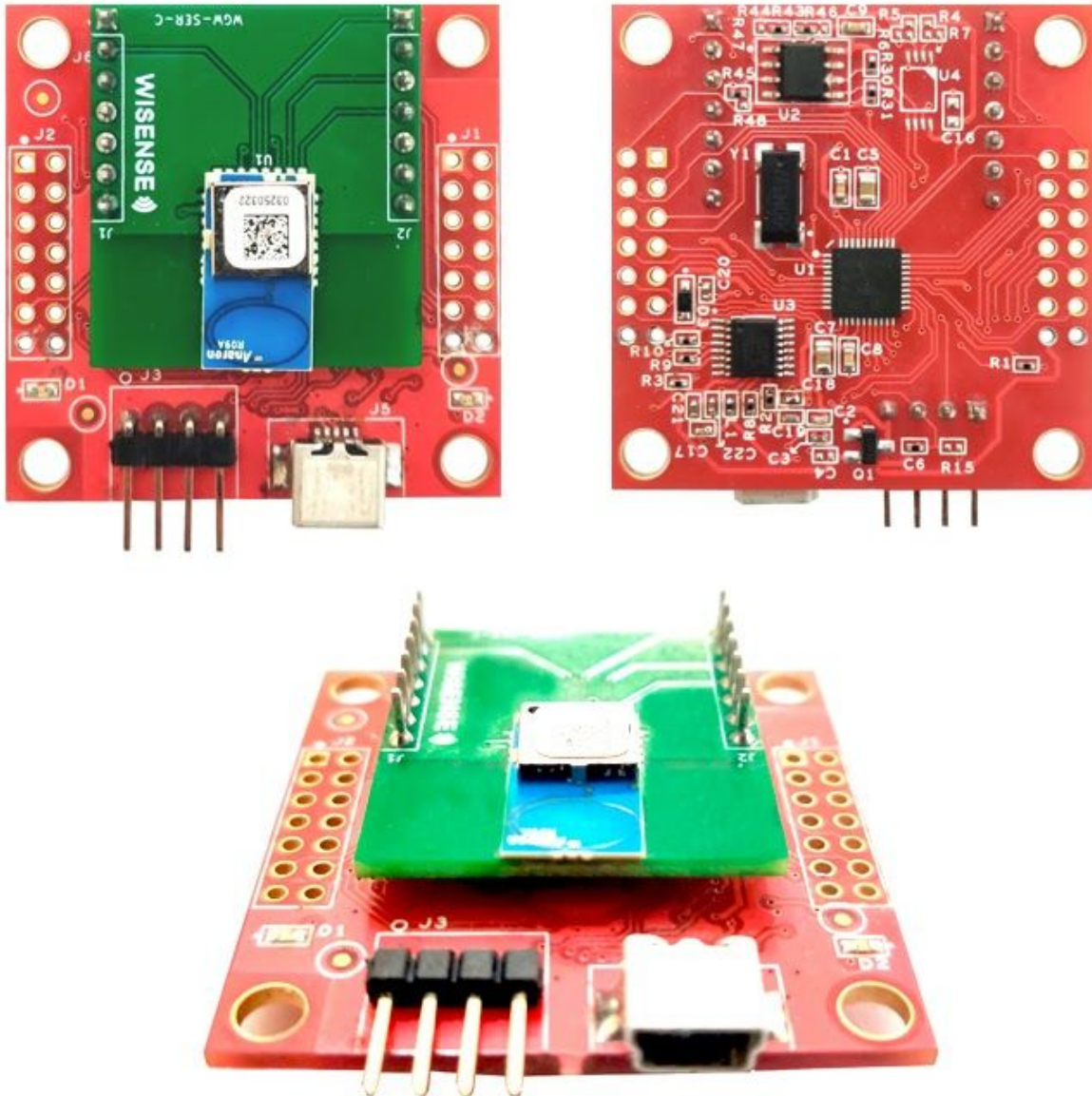


## WiSense WSN1101ACL Datasheet (WiSense Network Coordinator)



The WSN1101ACL is WiSense Sub 1-GHz wireless mesh coordinator node. It includes the CC1101 high-performance sub-GHz radio (from TI) and the MSP430G2955 microcontroller (from TI).

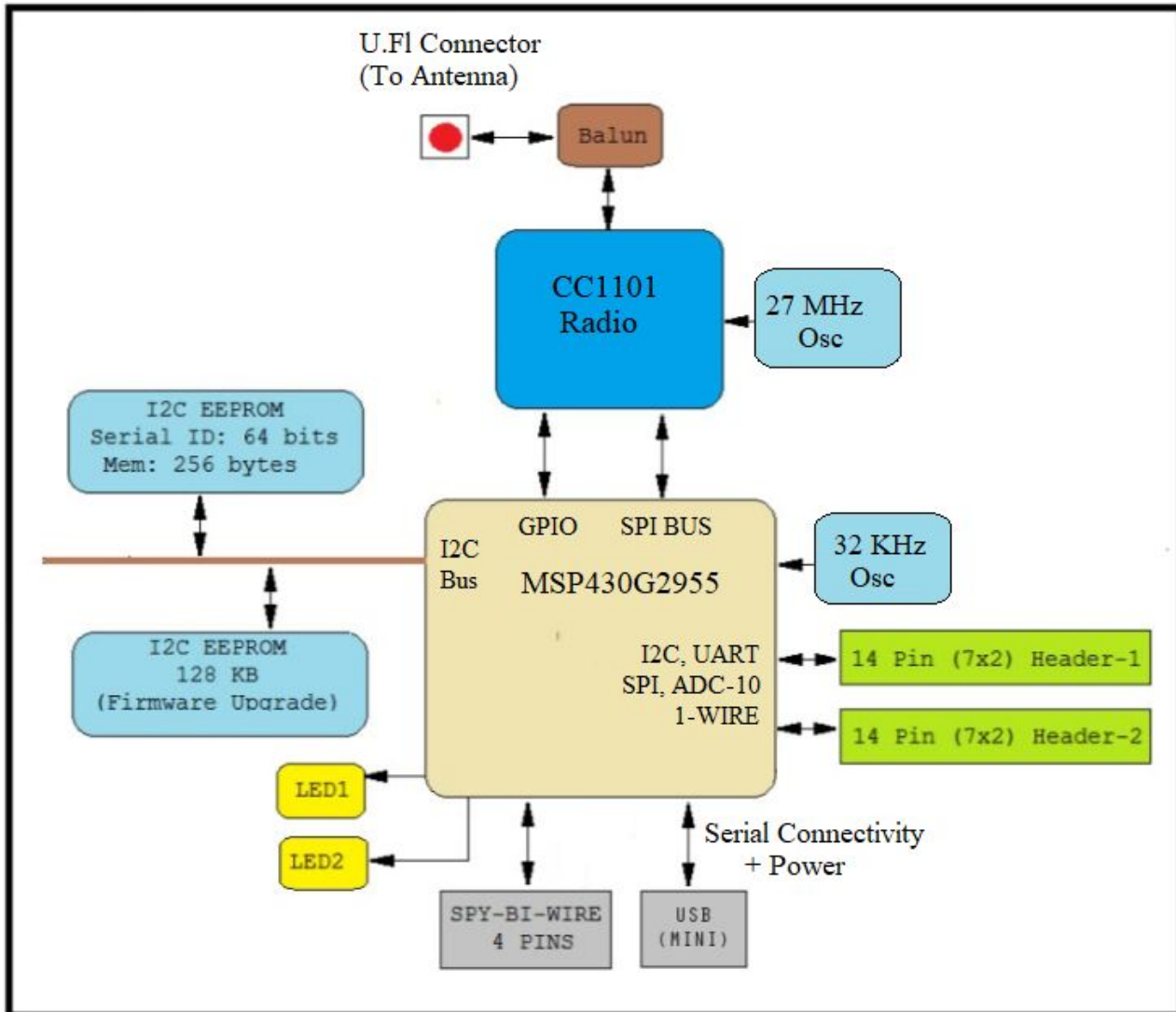
The module consists of two separate PCBs.

- The PCB on top hosts the CC1101 radio.
- The PCB on the bottom hosts the microcontroller.

### Standards Compliance

Region	Operating Frequency Range	Certification
USA/Canada	902-928 MHz	FCC
EU	868-870 MHz	ETSI
India	865-867 MHz	WPC (Self Certified)

**HARDWARE ARCHITECTURE**



## Microcontroller PCB

- MSP430G2955 Ultra-low-power 16 bit microcontroller from TI
  - 56 KB flash, 4KB SRAM
  - Standby current (in LPM3) as low as 1 microamp.
  - Operating voltage: 1.8 V – 3.6 V
  - Multiple On-chip 10 bit ADC channels
  - On-chip power supply voltage measurement
  - On-chip temperature sensor
- 2 pin Spy-Bi-Wire protocol for development (Programming and debugging).
- SPI/GPIO interface to the radio module
- UART/I2C/SPI/1-wire/GPIO/ADC interface to sensors
- Onboard serial (I2C) EEPROM (AT24MAC602) with hardwired and globally unique 48-bit and 64-bit addresses.
- Onboard 128 Kilo-Bytes EEPROM (M24M01) for over the air firmware upgrade. EEPROM can store two full images.
- Onboard high accuracy 32 kHz crystal
- 1 USB-Mini port for power and serial connectivity to external host such as a Raspberry PI or a Laptop/PC.
- 1 four-pin right-angled header (Spy-Bi-Wire) – Vcc, Gnd, Test, Reset
- 2 LEDs
- 2 2x7 headers which expose most of the MSP430G2955 pins.
- Dimensions: 42 mm x 42 mm
- Datasheet: <http://www.ti.com/lit/gpn/msp430g2955>
- User guide: <http://www.ti.com/lit/pdf/slau144>

## Radio PCB

- CC1101 Transceiver (TI)
  - Low-cost sub-1 GHz transceiver designed for very low-power wireless applications.
  - Receiver Sensitivity
    - -118 dBm at 1.2 kBaud, 868 MHz, 1% PER
    - -120 dBm at 1.2 kBaud, 915 MHz, 1% PER
  - Operating voltage: 1.8 V – 3.6 V
  - Modulation: 2-FSK, 4-FSK, GFSK, and MSK supported as well as OOK and flexible ASK shaping.
  - Programmable output power up to +12 dBm for all supported frequencies
  - Programmable data rate from 0.6 to 600 kbps (Default - 38.4 kbps)
  - <http://www.ti.com/lit/ds/symlink/cc1101.pdf>
- Onboard high accuracy 27 MHz crystal
- Antenna options (mutually exclusive)
  - U.FL antenna connector. Can use U.FL to SMA cable assembly to connect to the antenna outside the weatherproof enclosure.
  - PCB antenna.
- Interface
  - Two 1x7 2.54 mm pitch headers for mating with the microcontroller board.
- Dimensions
  - 37.61 mm x 37.61 mm

The WSN1101CL comes pre-programmed out of the box to operate as a WiSense mesh network coordinator node. The coordinator node is responsible for setting up and maintaining a single instance of a WiSense LPWMN. It allocates a unique 16-bit address to each registering node. It also serves as the gateway for the entire network. All communication between the nodes in the network and the outside world happens through the coordinator node.

WiSense provides a Linux/Cygwin based CLI to configure and query the WSN1101ACL and associated LPWMN (Low Power Wireless Mesh Network).

```
$ ./gw.exe /dev/ttyS27 mon
Serial port </dev/ttyS27> configuration done ...
Waiting for events / data traffic from the LPWMN ...

Received Event <6>
-----
Timestamp (Wed Dec 25 19:41:22 2019)
Event - Beacon Request received (# 1)
RSSI <-45> / LQI <17>
From <0xfc:0xc2:0x3d:0xff:0xfe:0x0d:0x93:0xa4>
-----

Received Event <20>
-----
Timestamp (Wed Dec 25 19:41:22 2019)
Event - Beacon Tx Done(# 1)
-----

Received Event <1>
-----
Timestamp <Wed Dec 25 19:41:27 2019>
Event <Node Registered>
Short Addr <1139> / Ext Addr <fc:c2:3d:ff:fe:0d:93:a4>
-----

Timestamp (Wed Dec 25 19:41:32 2019)
[1] Received msg from node <01139 / fc:c2:3d:ff:fe:0d:93:a4>
RSSI -45 dBm / LQI 21
+[Node_Voltage] <2.805000 Volts>
+[Temp_TMP75C] <28.500000 Deg C>
-----
```

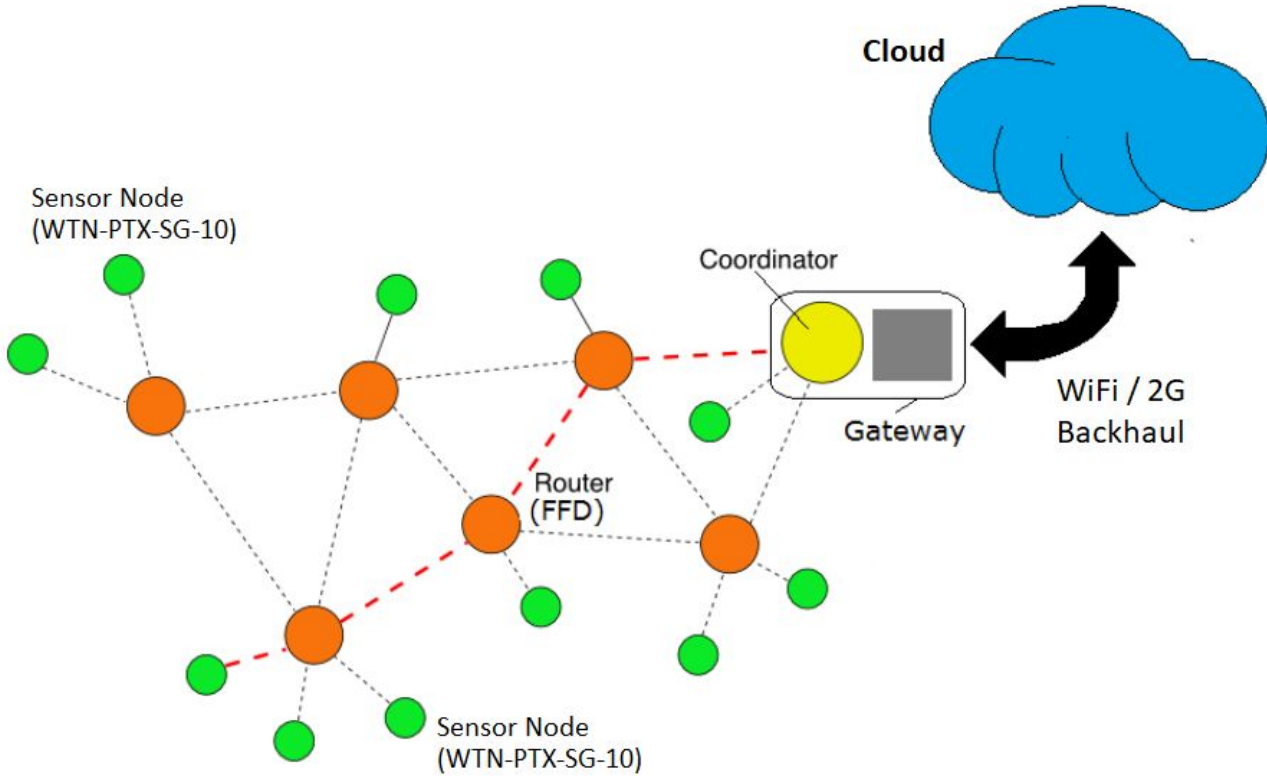


The Linux/Cygwin based CLI can be used (for example) to:

- Set the RF channel (channel 1 to channel 9) on which the LPWMN will operate.
- Set the 16-bit LPWMN identifier (LPWMN Id).
- Configure the baud rate.
- Add node to white-list / remove nodes from white-list / display white-list
- Add node to black-list / removed node from black-list / display black-list
- List all the nodes in the network.
- Get routing information
- Get/Set attributes on the Coordinator and other nodes in the network.
- Request the coordinator to reboot itself.
- Request any node in the network to reboot.
- Upgrade the firmware running on the Coordinator.
- Upgrade the firmware on any node in the network (over the air upgrade).
- Get information on the version of firmware running on the coordinator or any other node in the LPWMN.
- Monitor sensor data messages received from any node in the network
- Command any node in the network (coordinator or not) to generate an unmodulated or modulated continuous wave (CW) signal for the test, debug and certification purposes.

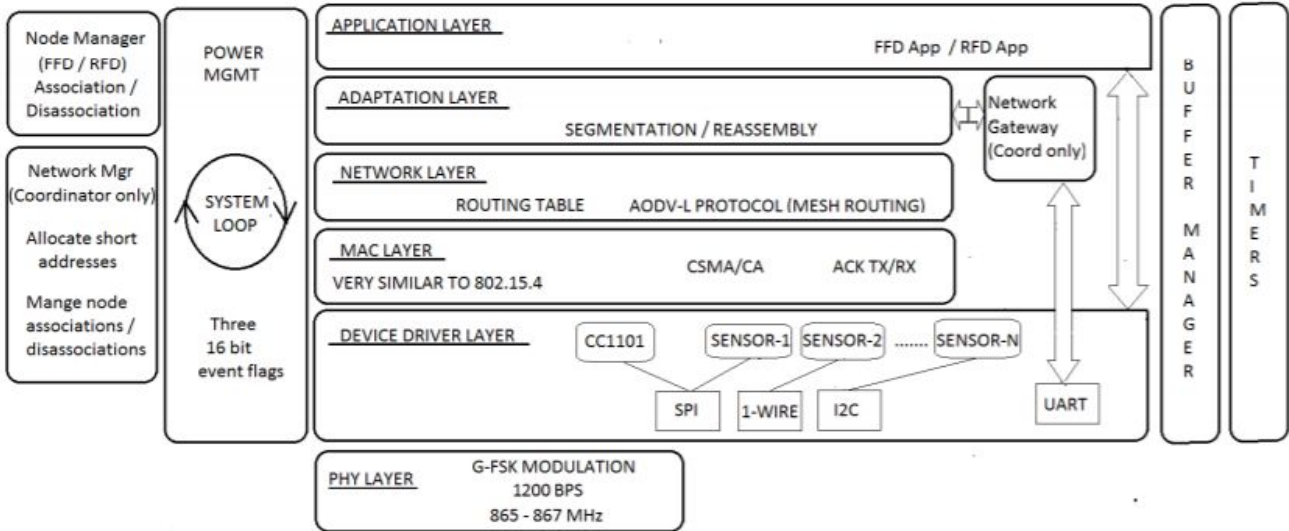
Configurable parameters are signal frequency (channel index), signal transmit power (in dBm) and transmit duration (in seconds). At the end of the specified duration, the node will reboot and resume operation as configured (Coordinator, FFD or RFD).

**WiSense Wireless Mesh / Star Network Architecture**





**WiSense Network Stack Layers**



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