

# FarmiTech Device Datasheet



**IoT based Agriculture Solution**

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**First Edition**



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### Product Overview:

Farmers do put a lot of money and effort into the proper management of crops and today, with the emergence of new technologies, efforts and costs can be turned into more efficient productions. Indeed, information on the current state of conditions in the fields is essential for timely and correct decision making on further crop cultivation.



**FarmiTech** is a smart and informed agronomy system which assist with monitoring growing conditions such as weather, soil conditions, plant performance and plant stress. In this device, sensors can monitor the state of the conditions (soil and environment temperature, humidity etc.) on production areas. These data can be used to make more informed production decisions, such as fertilizer application rates and irrigation timing, to ensure conditions are optimized to maximize crop yield.

The data is stored in the designed cloud based IoT platform and shown on farmer's mobile phone or computer system and the recorded data is evaluated further and subsequently developed for future decisions.

### Product Components:

- Main Board and Microcontroller
- Soil Humidity and Temperature Sensor
- Air Humidity and Temperature Sensor
- Communication Module
- GPS
- GSM Antenna
- Battery
- Solar Panel
- Box



Table1: Device Specifications

Items	Parameters	Specification	
General Identifications	Outline Dimensions	L200*W110*H95 mm	
	Processor	ESP32 Microcontroller WROOM-32	
	Memory	4 (Internal Flash) MB	
	Weight	Device: 1.175 / Solar Panel: 490 g	
	Data Transfer Speed	85.6 kb/S	
Environmental Specifications	Operating Humidity	20 to 100 %RH	
	Operating Temperature Range	-5 to 60 C	
	Storage Temperature Range	-10 to 80 C	
Electrical Characteristics	Input Power	5 Watt	
	Input Voltage	9 V	
	Operation Current	50 to 100 mA	
	Sleep Current	12 mA	
	Charging current (max)	540 mA	
	Battery (Stand-by use)	Voltage Regulation:	6.75 to 6.90 V
		Initial Current(max):	1.2 A
	Battery (Cycle Use)	Voltage Regulation:	7.20 to 7.50 V
		Initial Current(max):	1.2 A
	Battery Capacity	5 A	
battery Output Voltage	9 V		
Interface	External Antenna Connector	SMA	
	Standard DC Power Jack 2.1mm x 5.5mm	External Power Supply, connects to solar Panels	
	Air Sensor Shield	Protects the Sensor	
Functions	Air Sensor	Air Temperature C	
		Air Humidity	
	Soil Sensor	Soil Temperature	
		Soil Humidity	
	GSM	Telecommunication	
GPS	Location Service		
LoRa	Long Range Communication Protocol		
Auxiliary	Solar Panel	Euronet Euro P5	
	Frame	Contains 3 devices namely Solar panel, Soil Sensor and Farmitech	
PCB	Copper Thickness	35 um	
	Thickness	1.6 mm	
	Board Type	FR4-TG155	
	Dimensions	124L*93W mm	

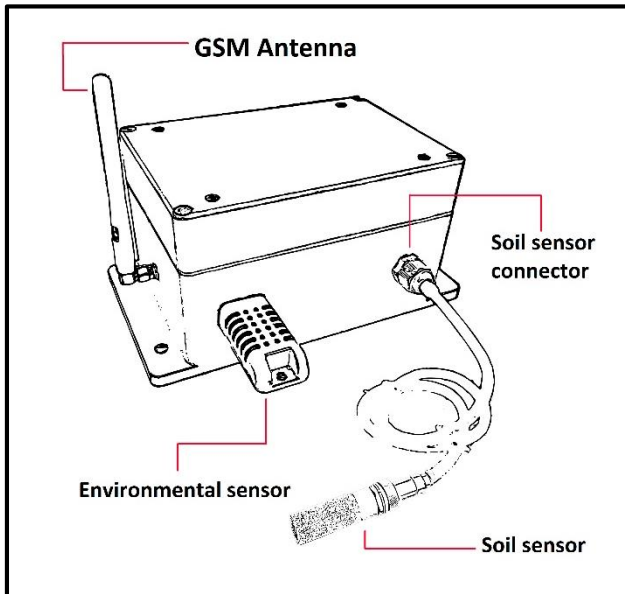


Figure 1: Device front view

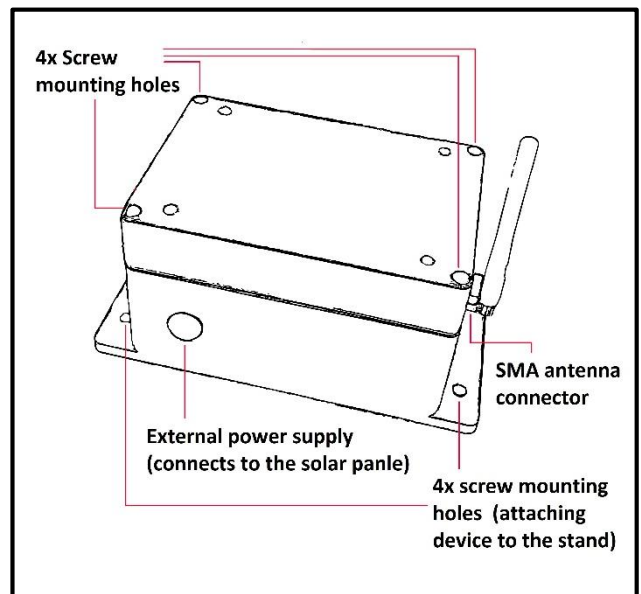


Figure 2: Device rear view

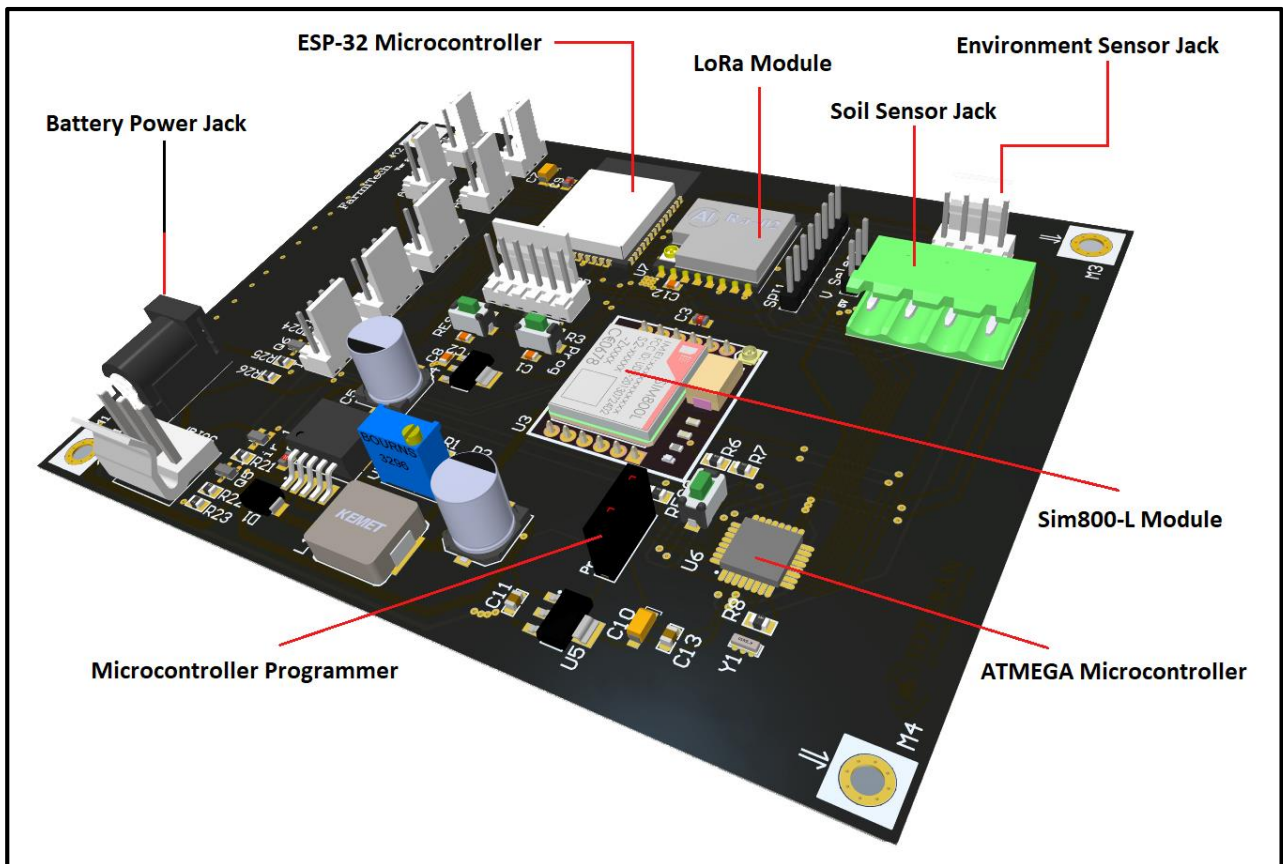


Figure 3: Arrangement of Layout-Top Layer



## Sensors Performance and Characteristics

### Soil Sensor (SHT20 by SENSIRION)

This humidity and temperature sensor is about to set new standards in terms of size and intelligence: Embedded in a reflow solder able Dual Flat No leads (DFN) package of 3 x 3mm foot print and 1.1mm height it provides calibrated, linearized signals in digital, true I2C format.



(Fully Calibrated | Digital output | I2C interface | Low power consumption | Excellent long-term stability | DFN type pack.)



SHT20 features a generation 4C CMOSens chip. Besides the capacitive relative humidity sensor and the band gap temperature sensor, the chip contains an amplifier, A/D converter, OTP memory and a digital processing unit. While the sensor itself is made of Silicon the sensors' housing consists of a plated Cu lead-frame and green epoxy-based mold compound. The device is fully RoHS and WEEE compliant, e.g., free of Pb, Cd and Hg.

#### Relative Humidity

Parameter	Condition	Value	Units
Resolution <sup>1</sup>	12 bit	0.04	%RH
	8 bit	0.7	%RH
Accuracy tolerance <sup>2</sup>	typ	±3.0	%RH
	max	see Figure 2	%RH
Repeatability		±0.1	%RH
Hysteresis		±1	%RH
Nonlinearity		<0.1	%RH
Response time <sup>3</sup>	τ 63%	8	s
Operating Range	extended <sup>4</sup>	0 to 100	%RH
Long Term Drift <sup>5</sup>	Typ.	< 0.25	%RH/yr

#### Temperature

Parameter	Condition	Value	Units
Resolution <sup>1</sup>	14 bit	0.01	°C
	12 bit	0.04	°C
Accuracy tolerance <sup>2</sup>	typ	±0.3	°C
	max	see Figure 3	°C
Repeatability		±0.1	°C
Operating Range	extended <sup>4</sup>	-40 to 125	°C
Response Time <sup>7</sup>	τ 63%	5 to 30	s
Long Term Drift <sup>8</sup>	Typ.	< 0.02	°C/yr

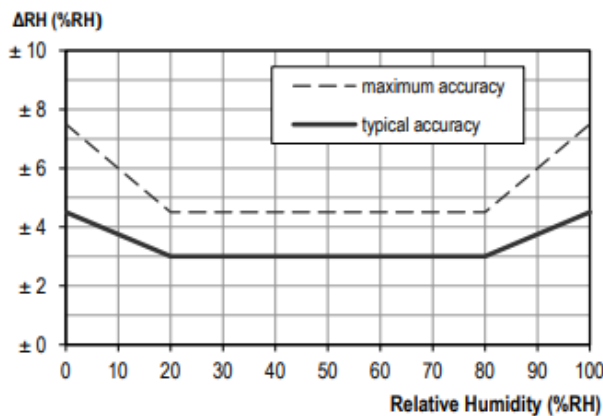


Figure 4: Typical and maximal tolerance at 25°C for relative

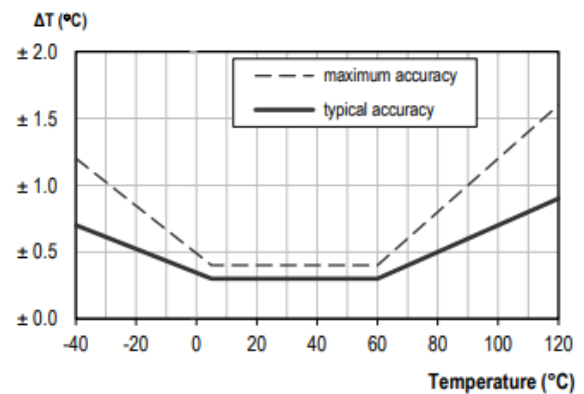


Figure 5: Maximal tolerance for temperature sensor in °C.

The sensor works stable within recommended Normal Range – see Figure 4. Long term exposure to conditions outside Normal Range, especially at humidity >80%RH, may temporarily offset the RH signal (+3%RH after 60h). After return into the Normal Range, it will slowly return towards calibration state by itself. Prolonged exposure to extreme conditions may accelerate ageing.

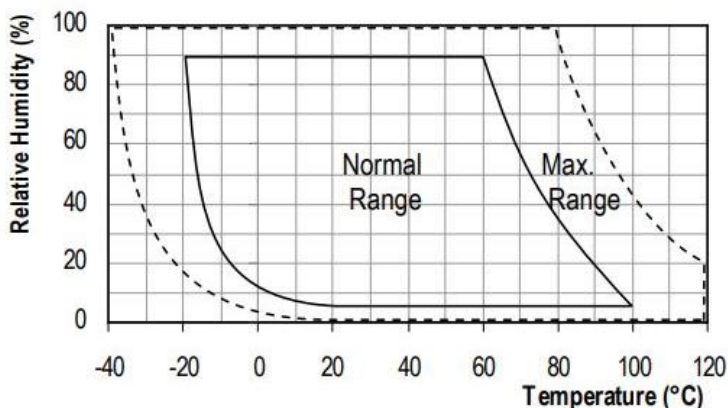


Figure 6: Operating Conditions

For more details on the SHT20, we recommend you to check the [main datasheet of the sensor](#).

### Environment Sensor (SHT30 by SENSIRION)

- Fully calibrated, linearized, and temperature compensated digital output
- Wide supply voltage range, from 2.4V to 5.5V
- I2C Interface with communication speeds up to 1 MHz and two user selectable addresses
- Typical accuracy of  $\pm 1.5\%$  RH
- Fast start-up and measurement time
- 

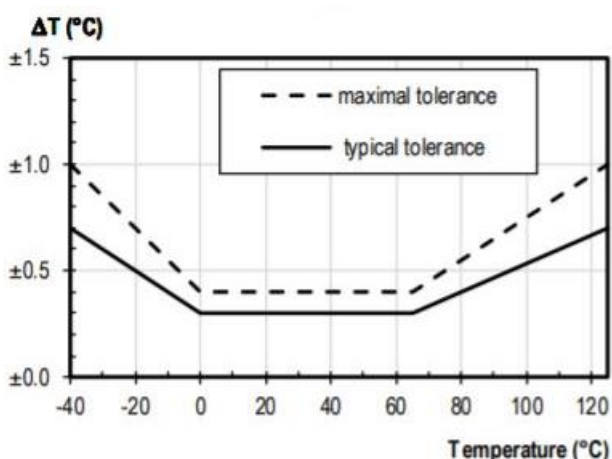


Figure 7: Tolerance of RH at 25°C

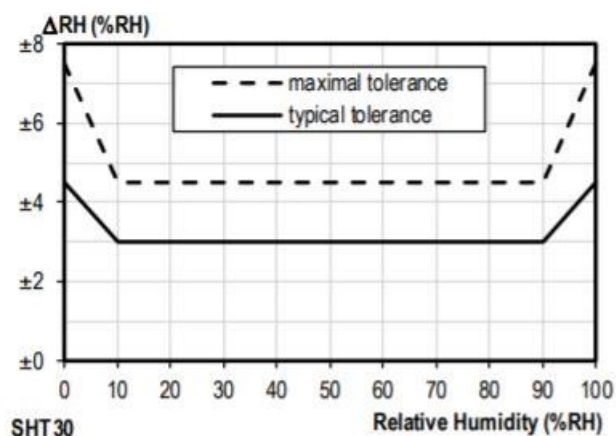


Figure 8: Typical tolerance of RH over T



### SIM800-L (GSM, GPRS)

Table2: GSM/GPRS Specifications

Feature	Implementation
Power saving	Typical power consumption in sleep mode is 0.7mA
Frequency bands	Quad-band: GSM 850, EGSM 900, DCS 1800, PCS 1900. SIM800-L can also search the 4 frequency bands automatically.
	Compliant to GSM Phase 2/2+
Transmitting power	Class 4 (2W) at GSM 850 and EGSM 900
	Class 1 (1W) at DCS 1800 and PCS 1900
GPRS connectivity	GPRS multi-slot class 12 (default)
	GPRS multi-slot class 1 to 12 (option)
Temperature range	Normal operation: -40°C to +84°C
Data GPRS	GPRS data downlink transfer: max 85.6kbps
	GPRS data uplink transfer: max 85.6kbps
	Coding scheme: CS-1, CS-2, CS-3 and CS-4
	PAP protocol for PPP connect
	Integrate the TCP/IP protocol
	Support Packet Broadcast Control Channel(PBCCH)
CSD	CSD transmission rate: 2.4, 4.8, 9.6, 14.4kbps
CSD	Support CSD transmission
USSD	Unstructured Supplementary Service Data(USSD) support
SMS	MT, MO, CB, Text and PDU mode
	SMS storage: SIM card
Real time clock	Support RTC
Timing functions	Use AT command set

Table3: Various operating modes of the module GSM/GPRS

Mode	Functions	Explanation
Normal Operation	GSM/GPRS SLEEP	Module will automatically go into sleep mode if the conditions of sleep mode are enabling and there is no on air and no hardware interrupt (such as GPIO interrupt or data on serial port). In this case, the current consumption of module will reduce to the minimal level. In sleep mode, the module can still receive paging message and SMS.
	GSM IDLE	Software is active. Module is registered to the GSM network, and the module is ready to communicate.
	GSM TALK	Connection between two subscribers is in progress. In this case, the power consumption depends on network settings such as DTX off/on, FR/EFR/HR, hopping sequences, antenna.
	GPRS STANDBY	Module is ready for GPRS data transfer, but no data is currently sent or received. In this case. Power consumption depends on network settings and GPRS configuration.



Mode	Functions	Explanation
	GPRS DATA	There is GPRS data transfer (PPP or TCP or UDP) in progress. In this case, power consumption is related with network settings (e.g. power control level); uplink/downlink data rates and GPRS configuration (e.g. used multi-slot settings)
Power down		Normal power down by using PWRKEY. The power management unit shuts down the power supply for the baseband part of the module, and only the power supply for the RTC is remained. Software is not active and the serial port is not accessible. Power supply (connected to VBAT) remains applied.
Minimum functionality mode		In this mode, the RF part of the module will not work or the SIM card will

### NEO-6M GPS Module

The NEO-6 module series is a family of stand-alone GPS receivers featuring the high-performance u-blox 6 positioning engine. The 50-channel u-blox 6 positioning engine boasts a Time-To-First-Fix (TTFF) of under 1 second. The dedicated acquisition engine, with 2 million correlators, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving NEO-6 GPS receivers excellent navigation performance even in the most challenging environments.

Table4: GPS Module Specifications

GPS performance parameter	Specification
Receiver type	50 Channels
	GPS L1 frequency, C/A code
	SBAS: WAAS, EGNOS, MSAS
Time-To-First-Fix	Cold start: 27s
	Warm start: 27s
	hot start: 1s
	Aided starts: <3s
Sensitivity	Reacquisition: -160 dBm
	Coldstart(without aiding): -147 dBm
	Hot start: -156 dBm
Maximum navigation update	1 Hz
Horizontal position accuracy	2.5m
Configurable timepulse frequency range	0.25Hz to 1Khz
Accuracy for timepulse signal	RMS: 30ns
	99%: <60ns
	Granularity: 21ns
	Compensated: 15ns
Velocity accuracy	0.1m/s
Heading accuracy	0.5 degrees



### EURONET Euro P5 Solar Panel

1. The panel should be perpendicular to the sun ray by 90 degrees.
2. Best time for charging: 11am to 15pm in sunny days.
  - 9 Voltage 5 Watts
  - Wire length: 110cm
  - Water proof
  - Max. current: 540mA



Table5: Solar Panel Specifications

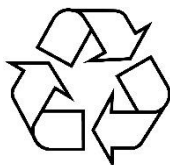
Parameter	Specification
Solar cell	Polycrystalline silicon
Dimension	259x192x17mm
Application range	Charge 7.4V/6V batteries
VMP (Optimum operating voltage)	9.2V
IMP (Optimum operating current)	540mA
VOC (Open circuit voltage)	10.2V
ISC (Short circuit voltage)	650mA
STC	Irradiance 1000W/m <sup>2</sup> Module temperature 25 Solar spectrum AM = 1.5

### Mechanical Structure and Assembly

For information regarding the device assembly and insertion, please check the FarmiTech user manual.



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