

KT1276 is a LoRa Technology Transceiver Module, which developed by KingTing Tech Corporation.

KT1276 provides an easy to use, low-power solution for long range wireless data transmission.

LoRa™ is a registered trademark of Semtech Corporation.

General Features

- ASCII command interface over UART
- Compact form factor: 20.3 x 38.8 x 3.2 mm
- Castellated SMT pads for easy and reliable PCB mounting
- Environmentally friendly, RoHS compliant
- Compliance: Modular Certified for the United States (FCC)
- Device Firmware Upgrade (DFU) over UART

Operational

- Single operating voltage: 2.1V to 3.6V (3.3V typical)
- Temperature range: -40°C to +85°C
- Low-power consumption
- LoRa™ Technology modulation
- Integrated MCU, Crystal, EUI-64 Node Identity
- 3PINs for control and status
- Low-Power Long Range Transceiver operating in the 918 MHz frequency band
- High Receiver Sensitivity: down to -138.8dBm
- FSK, GFSK, and LoRa Technology modulation

Applications

- Automated Meter Reading
- Home and Building Automation
- Wireless Alarm and Security Systems
- Industrial Monitoring and Control
- Internet of Things (IoT)

1.0 Device Overview

The KT1276 transceiver module features LoRa Technology RF modulation, which provides long range spread spectrum communication with high interference immunity.

Figure 1-1, Figure 1-2, and Figure 1-3 show the module's top view, the pinout, and the block diagram.

FIGURE 1-1: KT1276 TOP VIEW

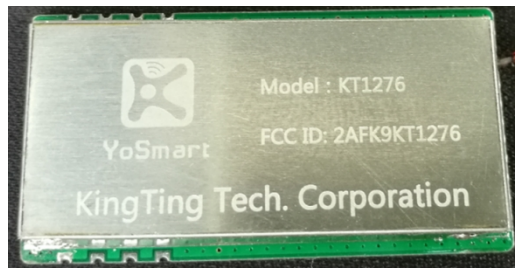


FIGURE 1-2: KT1276 PIN DIAGRAM

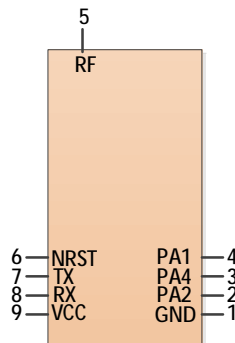
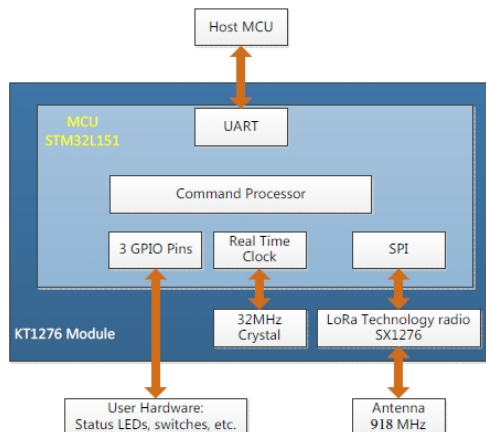


Table 1-1: describes the module's pins.

Pin	Name	Type	Description
1	GND	Power	Ground supply terminal
2	PA2	Input/Output	General purpose I/O pin
3	PA4	Input/Output	General purpose I/O pin
4	PA1	Input/Output	General purpose I/O pin
5	RF	RF analog	RF signal pin
6	NRST	Input	Active-low device Reset input
7	UART_TX	Output	Communication UART Transmit (TX)
8	UART_RX	Input	Communication UART Receive (RX)
9	VCC	Power	Positive supply terminal

FIGURE 1-3: KT1276 BLOCK DIAGRAM



2.0 GENERAL SPECIFICATIONS

Table 2-1 provides the general specifications for the module. Table 2-2 and Table 2-3 provide the module's electrical characteristics and current consumption. Table 2-4 and Table 2-5 show the module's dimensions and the RF output power calibration data.

Table 2-1: General Specifications

Specification	Description
Frequency Band	902.000 MHz to 928.000 MHz
Modulation Method	LoRa™ Technology modulation
Maximum Over-the-Air Data Rate	12500 bps with LoRa Technology modulation
RF connection	Board edge connection
Interface	UART
Operation Range	>5 km coverage at urban area
Sensitivity at 0.1% BER	-138.8dBm
Temperature (operating)	-40°C to +85°C
Temperature (storage)	-40°C to +115°C
Humidity	10% ~ 90% non-condensing

Table 2-2: Electrical characteristics

Parameter	Min.	Max.	Units
Supply Voltage	2.1	3.6	V
Voltage on any pin with respect to VSS (except VDD)	-0.3	VDD + 0.3	V
Voltage on VDD with respect to VSS	-0.3	3.9	V
Input Clamp Current (I _{IK}) (V _I < 0 or V _I > VDD)	—	+/-20	mA
Output Clamp Current (I _{OK}) (V _O < 0 or V _O > VDD)	—	+/-20	mA
GPIO sink/source current each	—	25/25	mA
Total GPIO sink/source current	—	200/185	mA
RAM Data Retention Voltage (in Sleep mode or Reset state)	1.5	—	V
VDD Start Voltage to ensure internal Power-on Reset signal	—	0.7	V
VDD Rise Rate to ensure internal Power-on Reset signal	0.05	—	V/ms
Brown-out Reset Voltage	1.75	2.05	V
Logic Input Low Voltage	—	0.15 x VDD	V
Logic Input High Voltage	0.8 x VDD	—	V
Input Leakage at <25°C (VSS < V _{PIN} < VDD, Pin at high-impedance)	—	50	nA
Input Leakage at +60°C (VSS < V _{PIN} < VDD, Pin at high-impedance)	—	100	nA
Input Leakage at +85°C (VSS < V _{PIN} < VDD, Pin at high-impedance)	—	200	nA
RF Input Level	—	+10	dBm

TABLE 2-3: CURRENT CONSUMPTION

Mode	Typical Current at 3V (mA)
Idle	9.8
RX	21.4

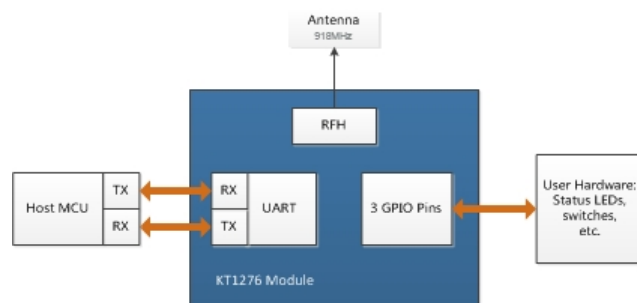
TABLE 2-4:MODULE DIMENSIONS

Parameter	Value
Dimensions	20.3 x 38.8 x 3.2 mm
Weight	4.8g

3.0 Typical Hardware Connections

Figure below shows the typical hardware connections.

FIGURE 3-1:HARDWARE CONNECTIONS



- INTERFACE TO HOST MCU

The KT1276 module has a dedicated UART interface to communicate with a host controller.

Table below shows the default settings for the UART communication.

TABLE 3-1: DEFAULT UART SETTINGS

Specification	Description
Baud Rate	57600 bps
Packet Length	8 bit
Parity Bit	No
Stop Bits	1 bit
Hardware Flow Control	No

- GPIO PINS

The module has 3 GPIO pins. These lines can be connected to switches, LEDs, and relay outputs. The pins are either logic inputs or outputs that can be accessed via the module firmware. These pins have limited sink and source capabilities.

- RF CONNECTION

When routing RF path, use proper strip lines with an impedance of 50 Ohm.

- RESET PIN

The module's reset pin is an active-low logic input.

- POWER PINS

It is recommended to connect power pins (Pin 1 and 9) to a stable supply voltage with sufficient

source current.

Additional filtering capacitors are not required but can be used to ensure stable supply voltage in noisy environment.

4.0 PHYSICAL DIMENSIONS

Figure 4-1 and Figure 4-2 illustrate the physical dimensions and the recommended PCB layout for the KT1276 module.

FIGURE 4-1: KT1276 PHYSICAL DIMENSIONS

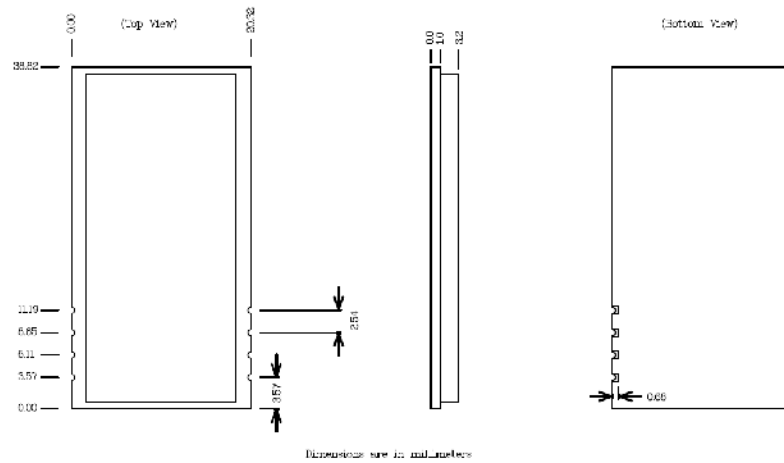
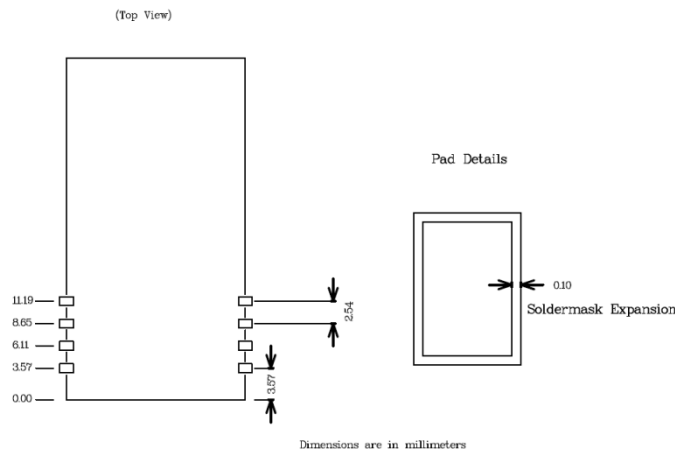


FIGURE 4-2: RECOMMENDED PCB FOOTPRINT



5.0 APPLICATION INFORMATION

- RF pins and strip line

The RF signals must be routed with properly terminated 50 Ohm strip lines. Use curves instead of sharp corners. Keep the routing path as short as possible.

- Approved Antennas

Modular certification of the KT1276 module was performed with wire antenna, the length is 82mm.

Refer to "Regulatory Approval" for specific regulatory requirements by country.

6.0 Regulatory Approval

The KT1276 module has received Federal Communications Commission (FCC) CFR 47 Telecommunications, Part 15 Subpart C "Intentional Radiators" modular approval in accordance with Part 15.212 Modular Transmitter approval.

Modular approval allows the end user to integrate the KT1276 module into a finished product without obtaining subsequent and separate FCC approvals for intentional radiation, provided

no changes or modifications are made

to the module circuitry.

Changes or modifications could void the user's authority to operate the equipment. The end user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

The finished product is required to comply with all applicable FCC equipment authorization regulations, requirements and equipment functions not associated with the transmitter module portion. For example, compliance must be demonstrated to regulations for other transmitter components within the host product; to requirements for unintentional radiators (Part 15 Subpart B "Unintentional Radiators"), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Verification, or Declaration of Conformity) (e.g., transmitter modules may also contain digital logic functions) as appropriate.

- LABELING AND USER INFORMATION REQUIREMENTS

The KT1276 module has been labeled with its own FCC ID number, and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording as follows:

Contains Transmitter Module FCC ID: 2AFK9KT1276

or

Contains FCC ID: 2AFK9KT1276

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

A user's manual for the finished product should include the following statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that

interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Additional information on labeling and user information requirements for Part 15 devices can be found in KDB Publication 784748 available at the FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB)

<https://apps.fcc.gov/oetcf/kdb/index.cfm>

- RF EXPOSURE

All transmitters regulated by FCC must comply with RF exposure requirements. KDB 447498 General RF Exposure Guidance provides guidance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to Radio Frequency (RF) fields adopted by the Federal Communications Commission (FCC).

From the KT1276 FCC Grant: Output power listed is conducted. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators. This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification and must not be co-located or operating in conjunction with any other antenna or transmitters within a host device, except in accordance with FCC multi-transmitter product procedures.

- APPROVED EXTERNAL ANTENNA TYPES

To maintain modular approval in the United States, only the antenna types that have been tested shall be used.

It is permissible to use different antenna manufacturer provided the same antenna type and antenna gain (equal to or less than) is used.

Testing of the KT1276 module was performed with the wire antenna, the length is 82mm.

- HELPFUL WEB SITES

Federal Communications Commission (FCC): <http://www.fcc.gov>

FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB): <https://apps.fcc.gov/oetcf/kdb/index.cfm>.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The module should not be installed and operated simultaneously with other radios except additional RF exposure was evaluated for simultaneous transmission.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:

“Contains Transmitter Module **2AFK9KT1276**”