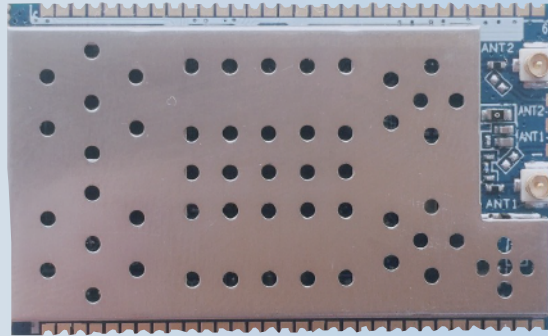


Linux, WiFi, IoT Embedded Module

DUO



OVERVIEW:

Dragino DUO is a minimal Open Source Linux system with 580Mhz CPU speed. It supports 300M 2T2R 2.4G WiFi and compatible with 802.11b/g/n. DUO has rich interface such as Ethernet, USB, UART, PCI-E, eMMC, I2C, I2S, PCM and quantity of GPIOs. DUO is of small outline package and can be used for various IoT solutions.

DUO runs a customized Open Source OpenWrt system. There are lots of examples and documents on how to design the software /hardware around DUO IoT module. With DUO, developers can release their IoT, WiFi or Linux products very fast and stable.

Features:

- Open source Linux (OpenWrt) inside
- Low power consumption
- Compatible with Arduino IDE 1.5.4 or later, user can program, debug or upload sketch to Arduino board via Arduino IDE.
- Managed by Web GUI, SSH via LAN or WiFi
- Software upgradable via network
- Built-in web server
- Support internet connection via LAN port, WiFi.
- Failsafe design provides robustly system

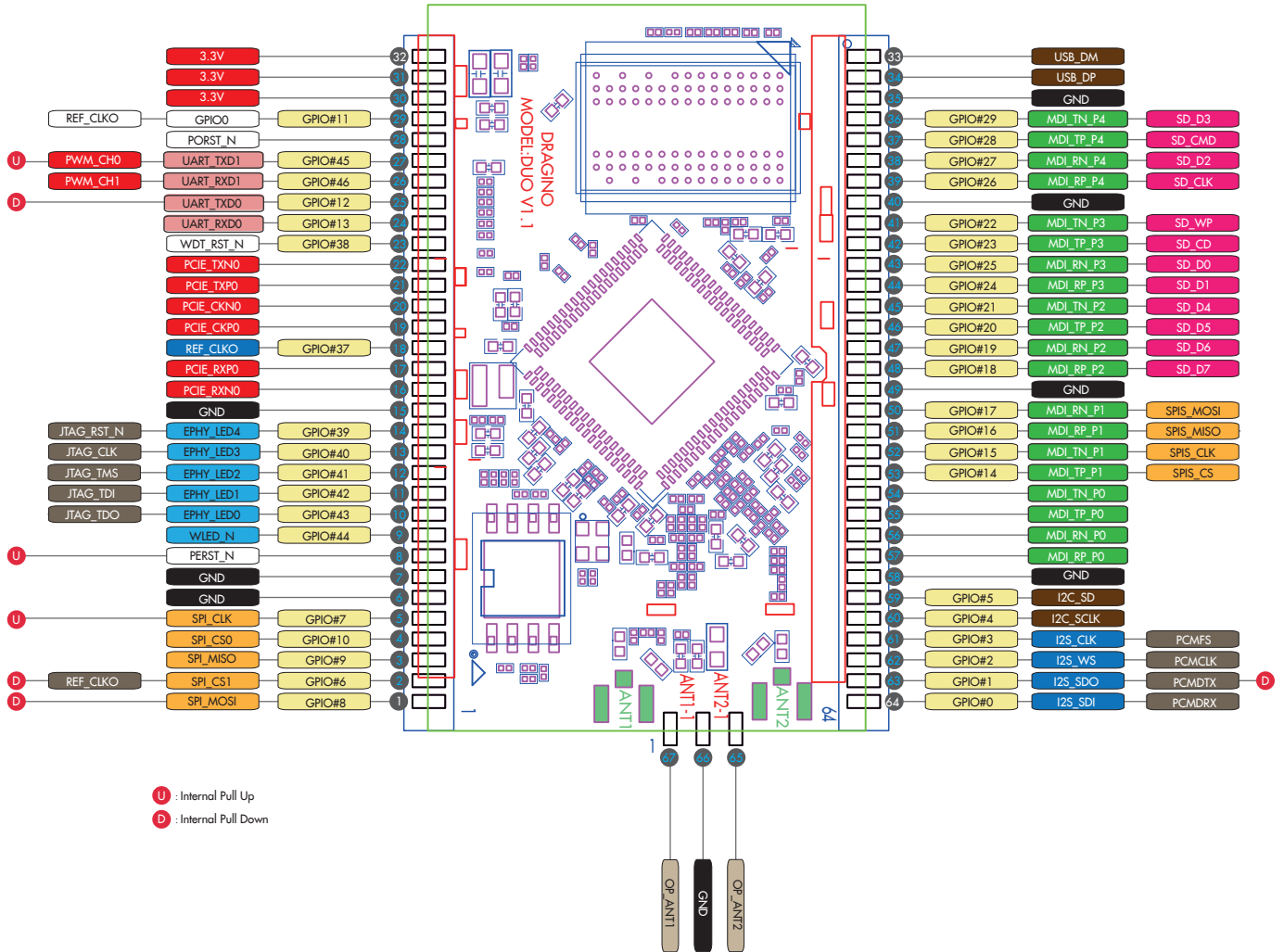
Applications:

- Internet of Things
- Industrial Control
- WiFi Router

Specification:

- Processor: MT7628AN, 580MHz, 24K MIPS
- Flash: 16/32 MBytes
- RAM: 64/128/256 MBytes
- Power Input: 3.3v
- 5 x 10M/100M RJ45 interfaces
- 1 x USB 2.0 host connector
- 46 multiplex GPIOs
- 1 x PCI-E root complex interface
- 2 x UART, I2C, I2S
- SPI/SD-XC/eMMC
- 300Mbps 2T2R WiFi 802.11 b/g/n
- I-Pex connectors or optional antenna pins
- Frequency range: 2.4~2.4835GHz
- Typical Distance: Indoor: 60m (max);
Outdoor 150m (max) (with 2 dBi antenna)

DUO Module Pin Out



Order Info: DUO-XX-YY-ZZ

- XX:**
- * 2G -- 2Gb = 256MB DDR
 - * 1G -- 1Gb = 128MB DDR
 - * 5M -- 512Mb = 64MB DDR
- YY:**
- * 32 -- 32MB Flash
 - * 16 -- 16MB Flash
- ZZ:**
- * 00 -- WiFi Radio uses ANT1(i-pex) and ANT2(i-pex)
 - * 01 -- WiFi Radio uses ANT1(i-pex) and OP_ANT2(smd)
 - * 10 -- WiFi Radio uses OP_ANT1(smd) and ANT2(i-pex)
 - * 11 -- WiFi Radio uses OP_ANT1(smd) and OP_ANT2(smd)

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

1. List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.

Explanation: This module meets the requirements of FCC part 15C

(15.247).itSpecifically identified AC Power Line Conducted Emission,Radiated Spurious emissions,Band edge and RF Conducted Spurious Emissions,Conducted Peak Output Power,Bandwidth,Power Spectral Density,Antenna Requirement.

Summarize the specific operational useconditions,

2.5. Trace antenna designs

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to- point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: EUT has two FPCB antennas, the antenna cannot be replaced by other authorized antennas, and the gain of each replacement antenna does not exceed 2.08dBi

2.4 Limited module procedures

If a modular transmitter is approved as a “limited module,” then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is a single module.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information:

(1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person’s body); and (2) additional text needed for the host product manufacturer to provide to end users in their end- product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: ZHZDUO-1G-32.

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product.

The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: EUT has two FPCB antennas, the antenna cannot be replaced by other authorized antennas, and the gain of each replacement antenna does not exceed 2.08dBi

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: ZHZDUO-1G-32.

2.9 Information on test modes and additional testing requirements⁵

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: Dragino Technology Co., Limited

can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuitry, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.

OEM integration instructions:

This device is intended only for OEM integrators under the following conditions:

The transmitter module may not be co-located with any other transmitter or antenna. The

module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End product labeling:

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module [FCC ID: ZHZDUO-1G-32](#)".

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

FCC WARNING

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 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 ZHZDUO-1G-32”

The module can be used for WIFI Module with 2.08dBi dual antennas1&2. The host manufacturer installing this module into their product must ensure that the final compost product complies with the FCC requirements by a technical assessment or evaluation to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.