

Matrix-750

Linux-Ready Cortex-A7 Industrial IoT Gateway

Hardware Guide



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Artila

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FCC AND IC INFORMATION:

This Class A digital apparatus complies with Part 15 of the FCC rules and with Canadian ICES-003

Operation is subject to the following two conditions:

1. This device may not cause interference and
2. This device must accept any interference. Including interference that may cause undesired operation of the device.

Document Amendment History

Revision	Date	Remark
V 1.0	2019 Jan	Initial
V 1.01	2019 May	Add FCC information
V 1.02	2019 Nov.	Spec updated

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1. Introduction

Matrix-750 based on arm Cortex-A7, is a Linux-ready IoT gateway with highly integrated and low power consumption. Matrix-750 provides an ideal building block that easily integrates with a wide range of target markets, such as industrial control, automation, mobile gateway and other applications.

1.1 Features

- NXP iMX6ULL 800MHz Cortex-A7 Processor
- Linux kernel 4.19.x and file system
- Support Toolchain: gcc 8.2.0 + glibc 2.28
- 512MB LvDDR3 SDRAM
- Two 10/100Mbps Ethernet port
- One USB OTG port
- One RS-485 / RS-232 port
- Two Digital Input & Two Digital out
- One microSD socket
- One full size miniPCIe socket inside
- One micro-SIM socket
- Two SMA-type Antenna holes reserved
- +9 to +48VDC power input
- Ultra-low power consumption
- Wall-mounting, Optional DIN RAIL mounting adaptor

1.2 Specifications (Hardware)

CPU / Memory

- CPU: NXP iMX6ULL Cortex-A7 MPCore, up to 800MHz
- SDRAM: 512MB, LvDDR3

Network Interface

- Type: 2 x 10/100Mbps Ethernet
- Connector Type: RJ45 (with LED indicator)

USB Interface

- 1 x USB OTG Port
- MicroUSB connector

TTY (Serial) Ports

- 1 x RS-485 or RS-232 Port
- Direction Control (RS-485): Auto, by software
- Connector: Terminal block
- RS-485 Signal: Data+, Data-
- RS-232 Signal: TX, RX

TTY (Serial) Port Parameters

- Baud Rate: Up to 921.6Kbps
- Parity: None, Even, Odd, Mark, Space
- Data Bits: 5, 6, 7, 8
- Stop Bits: 1, 1.5, 2
- Flow Control: RTS / CTS, XON / XOFF, None

Console / Debug Ports

- Serial console port (inside the box)

Digital Input

- 2 x Digital Input Channels
- Isolation Protection: 2500Vrms (Photo Coupler)
- Logical High: 5~24VDC
- Logical Low: 0~1.5VDC

Relay Output

- 2 x Digital Output Channels (Solid State Relay)
- Solid State Relay: Normal Open (NO) Type
- Contact Rating: 80VDC@1.5A
- LED Indicator: YES

SD Slot

- 1 x microSD socket
- SD 2.0 compliant, supports SDHC
- Storage capacity: Support up to 128G

Expansion Slot

- 1 x Full-Size miniPCle socket
- 1 x micro-SIM card socket reserved, USB interface
- 2 x SMA-type Antenna holes reserved

Power Requirement

- Input Voltage: +9~+48VDC (terminal block)
- Typical Power Consumption: 12VDC@250mA
(mPCIe module, SD card are not included)

General

- Watchdog: Yes
- Realtime Clock: Yes, backup by super capacitor
- Dimensions (W x L x H): 89 x 112 x 30mm (3.5 x 4.4 x 1.18in)
- Net Weight: 350g (0.77lb), mPCIe module and antenna are NOT included.
- Operating Temperature: 0~70°C (32~158°F)
- Regulation: CE Class A, FCC Class A
- Installation: Wall mounting, DIN-rail mounting (with optional kit)

1.3 Specifications (Software)**Operation System**

- Linux Kernel 4.19.x
- Supports bootup from eMMC or SD card
- Support Backup/Restore from SD card or USB device
- Boot Loader: U-Boot
- File System: EXT4/EXT3/EXT2, VFAT/FAT, NFS

Software Development

- Toolchain: gcc 8.2.x + glibc 2.28
- Supports in-place C/C++ code compilation

Package Management

- Package repository: Artila self-maintained repository
- Command: Using standard apt-get command

Popular Packages

- Web server: Apache/Nginx/Lighttpd
- Database: MySQL/SQLite3/PostgreSQL
- Script Language: PHP/Python/Perl/NodeJS
- Text editor: vim/nano/sed
- Administration: Webmin

1.4 Packing List

- **Matrix-750:** Linux-ready Cortex-A7 800MHz Industrial IoT Gateway with 512MB SDRAM

1.5 Optional Accessory

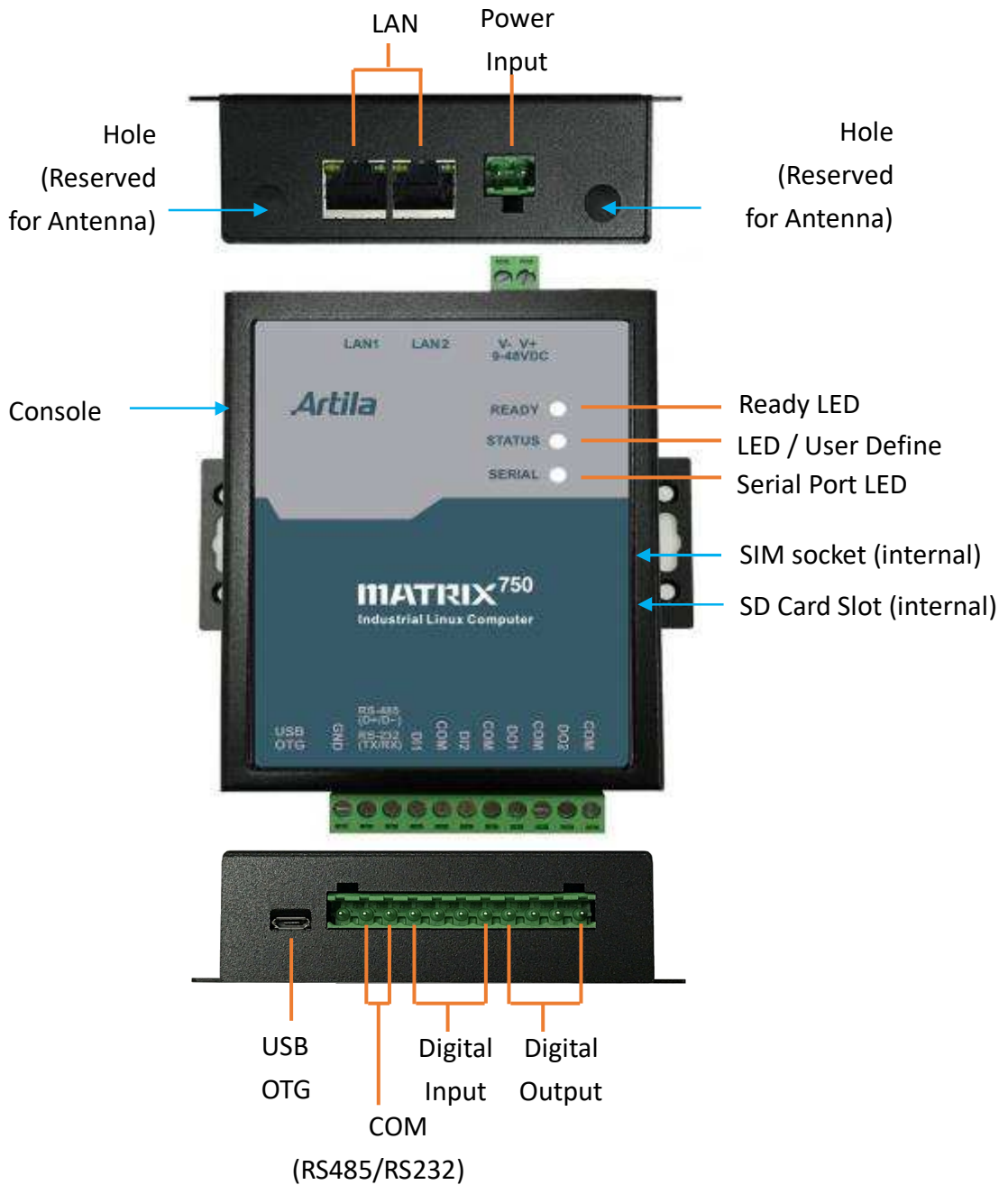
- **DK-35A** (36-DK35A-000): DIN RAIL Mounting Kit
- **PWR-12V-1A** (31-62100-000): 110~240VAC to 12VDC 1A Power Adaptor

1.6 Optional Communication Module

- 4G/LTE miniPCIe Module with Antenna
- Wifi mPCIe Module with Antenna

2. Layout

2.1 Connector & LED Indicator



2.2 Dimension

Unit: mm



3. Pin Assignment and Definitions

3.1 LED Indicators

The LED provides the Matrix-750 operation information. The LED status is described as follow:



- **“Ready”** (Ready LED indicator): Ready LED keeps ON when system is ready for operating.
- **“STATUS”** (User define LED indicator): Function / activity is assigned by user.
- **“SERIAL”** (Serial Port LED indicator): Dual color LEDs indicate the data traffic at the serial ports. When RXD line is high then Green light is ON and when TXD line is high, Yellow light is ON.

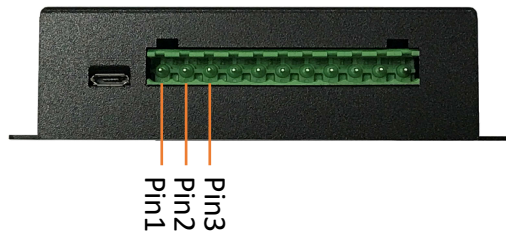
3.2 Serial Port

The Matrix-750 has one RS-485/RS-232 ports, Default setting is RS-485.

RS-485 is designed without isolation that automatically direction controlled via software

The pin assignment is shown as following table.

Port No.	Pin1	Pin2	Pin3
RS-485 Signal	GND	D+	D-
RS-232 Signal	GND	TX	RX



Enable/Disable Termination resistor for RS-485 (JP1)

The Matrix-750 provides on-board 120Ohm termination resistor for each RS-485 port.

To enable the termination resistor, please remove the upper cover of the Matrix-750, and the adjust the associated jumper to short as below:

Termination Resistor Disabled (default)	<p>• ● ● 1 2 3</p>
Termination Resistor Enabled	<p>● ● ● 1 2 3</p>

Set Serial Port to RS232 port (JP3)

The Serial Port on Matrix-750, default is RS-485 at JP3 (setting Pin 3 and Pin4)

To Enable RS-232 port, setting JP3 at Pin 1 and Pin 2



3.3 Power Connector

Connecting +9 ~ +48VDC power line to the Power in terminal block.

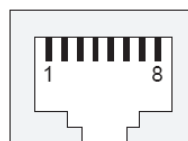


3.4 Ethernet LAN Port (LAN1 & LAN2)



The Ethernet Port use RJ45 connector. Pin-Assignment as below:

PIN	Signal
1	ETx +
2	ETx -
3	ERx +
6	ERx -

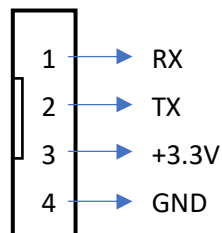


3.5 Serial Console Port (JP2)

There is a 4-pin wafer box header (JP2) inside the Matrix-750 features as serial console port that used for locally accessing Matrix-750 system via console port.



Pin assignment is: RX, TX, +3.3V, GND.



Therefore, you need to open the upper metal case and prepare or purchase a serial console cable to use the serial console port.

Or, it can be purchased “Console Cable” from Artila, P/N is [CB-PHDF9-050](#).

3.6 USB OTG Port

One USB OTG port by micro-USB connector is equipped for operation.



3.7 Digital Input

Two channel Digital Input are equipped with 5000Vrms photocoupler isolation which share the same common ground.

The specification of the isolated input channels is:

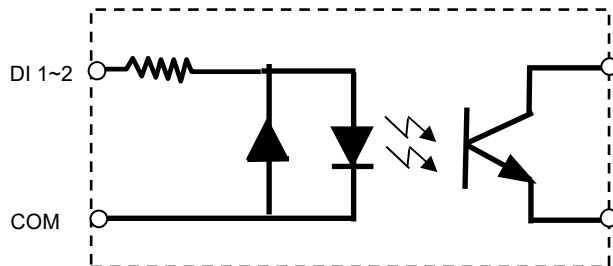
Logical High: 5~24Vdc

Logical Low: 0~1.5Vdc

Input resistance: 1.8KOhms@0.32W

Response time: 20 μ s

Isolation: 5000Vrms

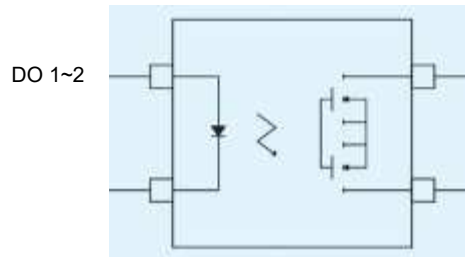


DIx: Isolated digital input channels.

COM: Common ground.

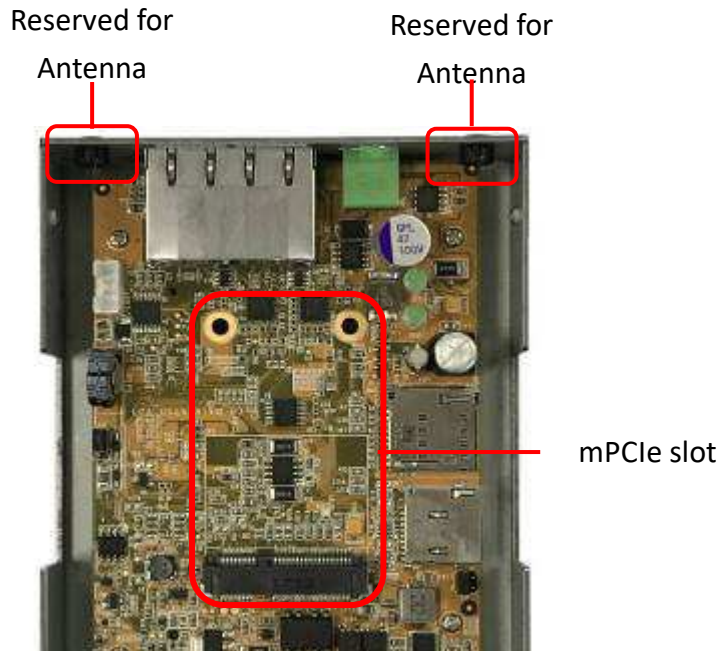
3.8 Digital Out

Two channel Digital Output by solid state relay.



3.9 miniPCle Slot

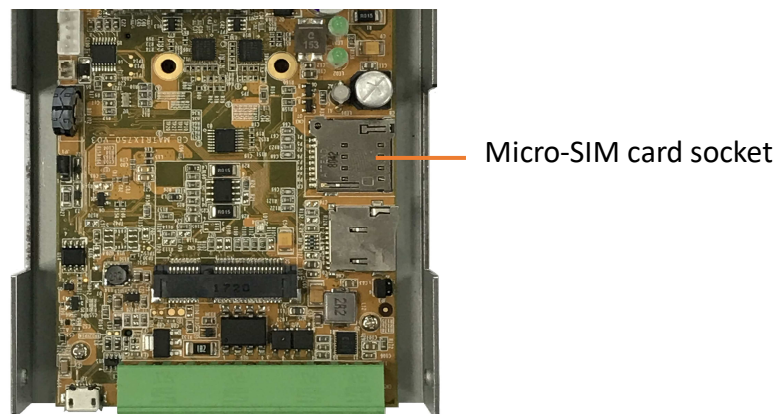
The Matrix-750 comes with a miniPCle (mPCle) slot and dual holes for antenna reserved for communication/networking functionality.



3.10 SIM card Socket

There is a micro-SIM card socket inside.

After removed top cover, it can be inserted a micro-SIM card accompanying LTE/4G module.



3.11 SD card Socket

There is a micro-SD card socket inside as data storage.
After removed top cover, it can be accessed the SD card.

