User Manual

T0-RL50(RL50)

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Warning

1. Before using the product, carefully read the manual to ensure proper installation and operation.
2. If you are not ready to install any extension card, store it in an anti-static protective bag to prevent damage.
3. To discharge any static electricity, briefly touch a grounded metal object before removing the extension card from the protective bag.
4. Always wear anti-static gloves and handle the card by its edges to avoid damaging sensitive components.
5. Verify that the power supply voltage is correct before connecting the motherboard to the power supply.
6. To prevent electric shock or damage, always turn off the AC power or unplug the power cord before removing or reconfiguring the motherboard or any components.
7. Unplug the AC power cord from the outlet before relocating the motherboard or any components.
8. Ensure all power cords are unplugged before connecting or disconnecting any equipment to avoid electrical hazards.
9. Wait at least 30 seconds after powering off the system before powering it on again to prevent unnecessary wear.
10. If any issues arise during operation, consult a qualified professional for assistance.
11. This product may cause radio interference in certain environments; if necessary, users should take appropriate measures to mitigate such interference.

RL50(T0-RL50) User Manual

(English Version 1.0)

Version:		
NO.	Description	Issue Date:
V1.0	Initial Version (CN)	2024/10/13
V1.0	Initial Version (EN)	2025/08/10

Contents

Chapter 1 Product Introduction

1.1 Brief Introduction

The T0-RL50 is a 4x4 small form factor PC featuring Intel® Alder Lake-P/H or Raptor Lake-P/H series processors. Combining innovative design with optimized performance, it delivers reliable, efficient computing for smart home setups, light gaming, office productivity, and a wide range of IoT applications.

1.2 Parameters

Processor: 12th/13th Generation Intel® Core™ Processors

CPU	Cores/Threads	Max Turbo Frequency (P-core/ E-core)	Cache	TDP
Intel® Core™ i5-1240P	12C/16T	4.4GHz/3.3GHz	12 MB	28W
Intel® Core™ i5-12450H	8C/12T	4.4GHz/3.3GHz	12 MB	45W
Intel® Core™ i7-13620H	10C/16T	4.9GHz/3.6GHz	24MB	45W

TDP:

- Intel® Core™ i5-1240P: Default 28 W TDP. Sustained power limit (PL1) and boost power limit (PL2) both set to 28 W.
- Intel® Core™ i5-12450H: Default 45 W TDP. PL1 and PL2 both set to 45 W.
- Intel® Core™ i7-13620H: Default 45 W TDP. PL1 and PL2 both set to 45 W.

Memory:

- Intel® Core™ i5-1240P/ i5-12450H: 2 × SO-DIMM DDR5-4800 MHz slots, dual-channel, up to 64 GB.
- Intel® Core™ i7-13620H: 2 × SO-DIMM DDR5-5200 MHz slots, dual-channel, up to 64 GB.

GPU: Integrated Intel® graphics with the following specifications

- Intel® Core™ i5-1240P: Intel® Iris® Xe Graphics eligible, max dynamic frequency 1.30 GHz.
- Intel® Core™ i5-12450H: Intel® UHD Graphics for 12th Gen processors, max dynamic frequency 1.20 GHz.
- Intel® Core™ i7-13620H: Intel® UHD Graphics for 13th Gen processors, max dynamic frequency 1.50 GHz.

Display Outputs:

- 1 × HDMI 2.0b (HDCP 2.3)
- 1 × DisplayPort 1.4
- 1 × Thunderbolt™ 4

Storage:

- 1 × M.2 Key M slot (labeled M.2_N1), supports 2280 NVMe SSD (PCIe 4.0).
- 1 × M.2 Key M slot (labeled M.2_N/S), supports 2280 NVMe SSD (PCIe 3.0) or SATA 3.0 SSD.

Expansion: 1xM.2 Key E slot (labeled M.2_E), supports 2230 Wi-Fi and Bluetooth modules (PCIE/USB2/CNVi).

USB Ports:

- **Front:**
  - 1 × USB Type-C (USB 3.2 Gen 2, up to 10 Gbps)
  - 2 × USB 3.2 Gen 2 Type-A (up to 10 Gbps)
- **Rear**:
  - 1 × Thunderbolt™ 4 (up to 40 Gbps)
  - 1 × USB 2.0 Type-A (up to 480 Mbps)

Ethernet: 1 × RJ45 port with Intel® i226 high-speed network controller. Speed: 2.5GbE(10/100/1000/2500Mbps).

Audio: Realtek ALC897 High-Definition Audio Codec, 1xCTIA Audio Jack, supports Line-out plus Mic-in.

Board Dimension: 120mm x 120mm
Enclosure Dimension: 135mm x 127mm x 52mm (LxWxH)
Cooling Method: Active Cooling
Operating Temp: 0°C to 50°C
Storage Temp: -20°C to 70°C
Power: 19V/20V DC-IN

Note!!! Power Supply Guidelines

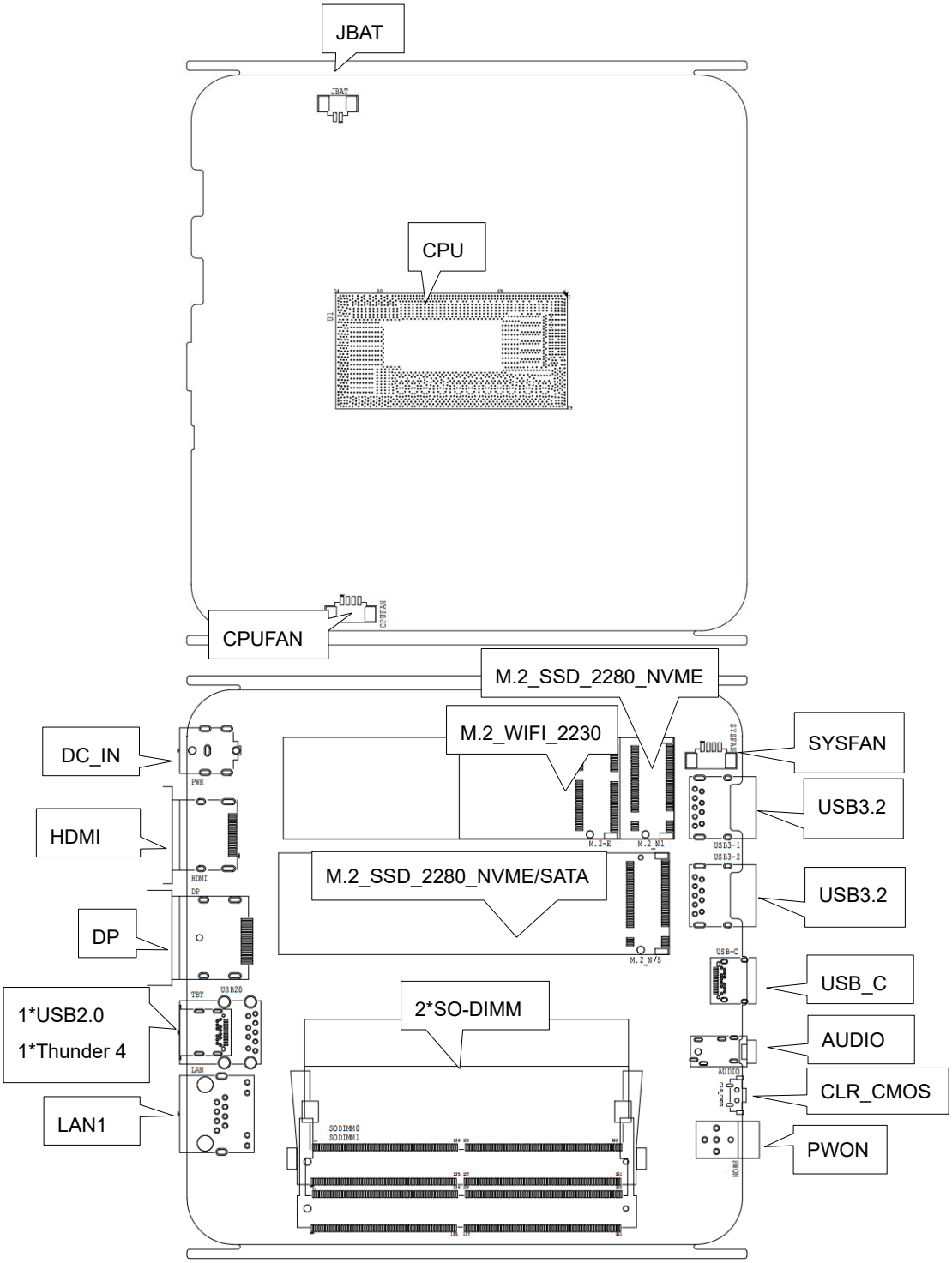
The DC power input and USB Type-C power input can be connected independently or simultaneously in any sequence. Both power sources must be rated at **90 W or higher**.

When both power inputs are active concurrently, **do not disconnect the DC power supply prior to the Type-C power supply** during shutdown or unplugging.

- Disconnecting the DC power input first will trigger the Type-C port's protective circuitry, disabling its power output.
- To re-enable power via the Type-C port, the Type-C power supply must be fully disconnected and reconnected to reset the protection mechanism.

1.3 Connector Diagram

RL50 Motherboard



1.4 I/O Interfaces

T0-RL50 Ultra-Compact Mini PC

Chapter 2 Hardware

2.1 Installations

Please refer to the following steps for installation:

1. Read the user manual carefully to make sure all the adjustments on the RL50 are correct.
2. Installing the Memory:
   - Press the ejector tab of the memory slot outwards with your fingertips.
   - Hold the memory module and align the key to the module with that on the memory slot.
   - Gently push the module into the slot until the ejector levers return completely to the closed position, holding the module in place when the module touches the bottom of the slot. To remove the module, press the ejector levers outwards to unseat the module.
3. Installing the expansion cards:
   - Locate the expansion slots and remove the screw, insert the cards into the slot at a 45-degree angle then attach the screw to the expansion cards, gently press down on it then install the screw back.
4. Connect all signal wires, cables, panel control wiring, and power supplies.
5. Start the computer and complete the setup of the BIOS program.

Attention!!!

The Motherboard's components are integrated circuits and can easily be damaged by Electrostatic Discharge or ESD; therefore, please follow the instructions:

- Hold the board's edge when handing, and do not touch onboard pins, components, or plug sockets.
- When touching integrated circuit components (such as CPU, RAM, etc.), please wear an anti-static wrist strap/glove to avoid electrostatic discharge damage to the board or other sensitive components.
- Before installing the integrated circuits/sensitive components, place the sensitive components in anti-static bags to keep them safe from ESD.
- Please make sure the power switch is OFF before plugging the power plug.

2.2 Jumper Setting

Please configure the jumpers according to your requirements before installing the hardware.

How to identify the first header of jumpers and pins: Observe the mark beside the jumper or pins and find the header marked by “1” or bold line or triangular symbol. Or observe the rear panel and the header with a square solder pad is the first header.

2.3 Memory Slots

The board provides two SO-DIMM DDR5 slots and supports dual-channel memory with a maximum capacity of up to 64 GB.

Note: When installing memory modules, carefully hold the module by its edges and align the notch (key) on the module with the key in the slot. Ensure that the selected memory module matches the board’s specifications to ensure optimal performance and compatibility.

2.4 Display Interfaces

The board provides multiple display interfaces, including one HDMI 2.0b port with HDCP 2.3 support,

one DisplayPort 1.4 output, and one Thunderbolt™ 4 port for high-speed video transmission.

2.5 Storage Interfaces

The board features 2xM.2 Key M slots for storage expansion. The first slot (labeled M.2_N1) supports 2280 NVMe SSDs with PCIe 4.0 interface, while the second slot (labeled M.2_N/S) supports 2280 NVMe SSDs via PCIe 3.0 or SATA 3.0 SSDs.

2.6 Expansion Slots

The board features 1x M.2 Key E slot (labeled M.2_E) for 2230 Wi-Fi and Bluetooth Modules (supports PCIe/USB2.0/CNVi).

2.7 USB Interfaces

The board provides multiple USB ports on both front and rear panels. On the front, there are two USB 3.2 Gen 2 Type-A ports (up to 10 Gbps) and one USB Type-C port supporting USB 3.2 Gen 2 speeds (up to 10 Gbps). The rear panel includes one USB 2.0 Type-A port (up to 480 Mbps) and one Thunderbolt™ 4 port, which supports data transfer up to 40 Gbps, display output, up to 15 W PD output, and up to 120 W PD input power.

2.8 LAN

The board features one RJ45 LAN interface powered by an Intel® i226 high-speed network controller, with a maximum data rate of 2.5 GbE. The LAN supports Wake-on-LAN (Magic Packet Wake-Up) and UEFI PXE network boot. To enable UEFI PXE boot, enter the BIOS setup and set IPv4 PXE Support to Enabled.

LED Status Indicators:

LI_LED Status (Green)	Function	ACT_LED Status (Orange)	Function
Always on	Network Connected	Flashing	Data transmission

2.9 Audio Interface

The system features the Realtek ALC897 HD Audio Codec, delivering high-fidelity audio through a 3.5mm CTIA-compliant combo jack (Line-out/Mic-in).

Two-in-one (CTIA) Audio Jack:

2.10 Board Power Supply (PWR)

The board supports power input via a 19V or 20V DC adapter, using a standard barrel connector with dimensions of 5.5mm outer diameter and 2.5mm inner diameter. The power adapter must deliver stable DC voltage within this range to ensure reliable system operation and protect against potential damage. Proper polarity and connector specifications must be observed to maintain safe and optimal performance.

2.11 Power Button (PWON)

The board is equipped with a dedicated power switch button featuring an integrated blue LED indicator. The LED illuminates when the system is powered on.

2.12 CPU Fan Socket/System Fan Socket (CPUFAN/SYSFAN)

The board provides a 5V CPU fan socket (labeled CPUFAN) and an optional 5V system fan socket (labeled SYSFAN). Both sockets share the same pin configuration as detailed below:

CPU Fan Socket (Screen Printing: CPUFAN)

Pin	Signal
1	GND
2	VCC
3	TAC
4	CTL

SYSTEM Fan Socket (Screen Printing: SYSFAN)

Pin	Signal
1	GND
2	VCC
3	TAC
4	CTL

2.16 CMOS Clearance/Retention (CLR_CMOS)

CMOS is powered by onboard button batteries. Clearing CMOS will permanently remove the previous system settings and restore the board system to original settings (factory settings).

Step 1: Turn off the PC and disconnect the power.

Step 2: Press CLR_CMOS for 15 seconds then disconnect.

Step 3: Restart the device, press the <DEL> button to enter the BIOS, load the optimal default value, save, and exit the settings.

COMS (Screen Printing: CLR_CMOS)

Setting	Function
Close	Clear COMS

⚠ **Attention!!!** Do not clear the CMOS while the computer is powered on, as this may damage the motherboard.