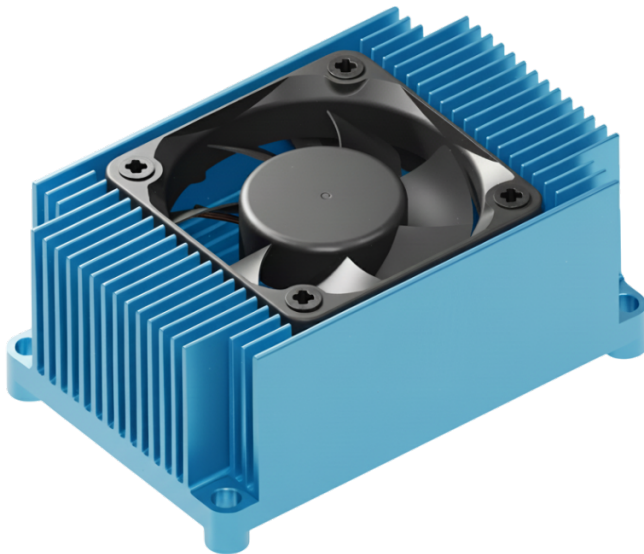


Aquila Heatsink Active

Datasheet

Preliminary – Subject to Change



Revision History

Document Revisions

Date	Doc. Revision	Product Version	Changes
10-Oct-2025	Rev. 0.1	V1.1	Initial documentation

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1 Abbreviations

Table 1: Abbreviations

Abbreviation	Explanation
ADC	Analog to Digital Converter
BTB	Board To Board
CAN	Controller Area Network, a bus that is mainly used in the automotive and industrial environment
CAN FD	Controller Area Network Flexible Data-Rate, an extension to the original CAN bus protocol which allows higher data rates and larger message sizes.
CEC	Consumer Electronic Control, HDMI feature that allows controlling CEC compatible devices
CPU	Central Processor Unit
CSI	Camera Serial Interface
DAC	Digital to Analog Converter
DDC	Display Data Channel, interface for reading out the capability of a monitor. In this document DDC2B (based on I2C) is always meant.
DFP	Downstream Facing Port, USB Type-C port that acts as a host
DRP	Dual-Role Port, USB Type-C port that can operate as power sink and source
DSI	Display Serial Interface
DVI	Digital Visual Interface, digital signals are electrically compatible with HDMI
EDID	Extended Display Identification Data, timing setting information provided by the display in a PROM
EMI	Electromagnetic Interference, high-frequency disturbances
ESD	Electrostatic Discharge, high voltage spike or spark that can damage electrostatic-sensitive devices
FPD-Link	Flat Panel Display Link, high-speed serial interface for liquid crystal displays. In this document is also called the LVDS interface.
GBE	Gigabit Ethernet, Ethernet interface with a maximum data rate of 1000Mbit/s
GND	Ground
GND_CHASSIS	Chassis Ground
GPIO	General Purpose Input/Output, pin that can be configured as an input or output
GSM	Global System for Mobile Communications
HDA	High-Definition Audio (HD Audio), the digital audio interface between CPU and audio codec
I2C	Inter-Integrated Circuit, the two-wire interface for connecting low-speed peripherals
I2S	Integrated Interchip Sound, serial bus for connecting PCM audio data between two devices
I/O	Input-Output
JTAG	Joint Test Action Group, widely used debug interface
LCD	Liquid Crystal Display
LSB	Least Significant Bit
LVDS	Low-Voltage Differential Signaling, electrical interface standard that can transport high-speed signals over twisted-pair cables. Many interfaces like PCIe or SATA use this interface. Since the first successful application was the Flat Panel Display Link, LVDS became a synonymous for this interface. In this document, the term LVDS is used for the FPD-Link interface.
MAC	Medium Access Control is part of the second layer (data link layer) in the Ethernet stack
MIPI	Mobile Industry Processor Interface Alliance
MDI	Medium Dependent Interface, the physical interface between Ethernet PHY and cable connector
MDIO	Management Data Input/Output, an interface that is used for controlling the Ethernet PHY. The bus consists of the MDC clock and the MDIO bidirectional data signal.

Continued on next page

Table 1: Abbreviations (Continued)

Abbreviation	Explanation
mini PCIe	PCI Express Mini Card, the card form factor for internal peripherals. The interface features PCIe and USB 2.0 connectivity
MMC	MultiMediaCard, flash memory card
MSB	Most Significant Bit
NC	Not Connected
OD	Open-Drain
OTG	USB On-The-Go, a USB host interface that can also act as USB client when connected to another host interface
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect, parallel computer expansion bus for connecting peripherals
PCIe	PCI Express, a high-speed serial computer expansion bus, replaces the PCI bus
PCM	Pulse-Code Modulation, digitally representation of analog signals, standard interface for digital audio
PD	Pull-Down Resistor
PHY	The physical layer of the OSI model
PU	Pull-up Resistor
PWM	Pulse-Width Modulation
PWR	Power
QSPI	Quad SPI, SPI interface with four bidirectional data signals
RGMI	Reduced Gigabit Media-Independent Interface, the interface between Ethernet MAC and PHY for up to 1Gb/s
RJ45	Registered Jack, common name for the 8P8C modular connector that is used for Ethernet wiring
RS232	The single-ended serial port interface
RS485	Differential signaling serial port interface, half-duplex, multi-drop configuration possible
R-UIM	Removable User Identity Module, identifications card for CDMA phones and networks, an extension of the GSM SIM card
SD	Secure Digital, flash memory card
SDIO	Secure Digital Input Output, an external bus for peripherals that uses the SD interface
SIM	Subscriber Identification Module, an identification card for GSM phones
SMBus	System Management Bus (SMB), a two-wire bus based on the I ² C specifications, is used in x86 designs for system management.
SoC	System on a Chip, IC which integrates the main component of a computer on a single chip
SoM	System on a Module, PCB which integrates the main component of a computer on a single board
SPI	Serial Peripheral Interface Bus, synchronous four-wire full-duplex bus for peripherals
TIM	Thermal Interface Material, thermally conductive material between CPU and heat spreader or heat sink
TMDS	Transition-Minimized Differential Signaling, serial high-speed transmitting technology that is used by DVI and HDMI
TVS Diode	Transient-Voltage-Suppression Diode, a diode that is used to protect interfaces against voltage spikes
UFP	Upstream Facing Port, USB Type-C port that acts as a client
UART	Universal Asynchronous Receiver/Transmitter, serial interface, in combination with a transceiver an RS232, RS422, RS485, IrDA or similar interface can be achieved
USB	Universal Serial Bus, serial interface for internal and external peripherals

2 Introduction

The Aquila Heatsink Active is a complete thermal solution for Aquila SoMs. It delivers reliable active cooling temperature ranges from -40 °C to +85 °C, ensuring the SoC remains safely below its 105 °C junction temperature limit even under sustained power loads of up to 35 W.

Provided as a ready-to-assemble, vibration-resistant solution, it enables immediate deployment and also serves as a reference design for customers developing their own thermal strategies based on Aquila SoMs.

2.1 Reference Documents

For additional technical context and compatibility guidance, consult the reference documents listed below.

2.1.1 Aquila Family Specification

https://docs.toradex.com/116801-aquila_family_specification.pdf

2.1.2 Aquila Carrier Board Design Guide

https://docs.toradex.com/116803-aquila_carrier_board_design_guide.pdf

2.1.3 Toradex Developer Website - Aquila Computer Modules

<https://developer.toradex.com/hardware/aquila-som-family/modules/>

2.1.4 Toradex Developer Website - Aquila Carrier Boards

<https://developer.toradex.com/hardware/aquila-som-family/carrier-boards/>

2.1.5 Toradex Developer Website - Aquila Heatsink Active

<https://developer.toradex.com/hardware/aquila-som-family/add-ons/aquila-active-heatsink>

2.1.6 Thermal Interface Material (Tflex™ HD7.5) Datasheet

The datasheet for the Tflex™ HD7.5 Thermal Interface Material (TIM) used in this assembly can be accessed at the following link:

<https://www.laird.com/products/thermal-interface-materials/gap-fillers/tflex-hd75>

2.1.7 Fan (CFM-5015CF-160-374-22) Datasheet

The datasheet for the CFM-5015CF-160-374-22 fan used in this assembly can be accessed at the following link:

<https://www.sameskydevices.com/product/resource/cfm-50cf.pdf>

3 Technical Specifications

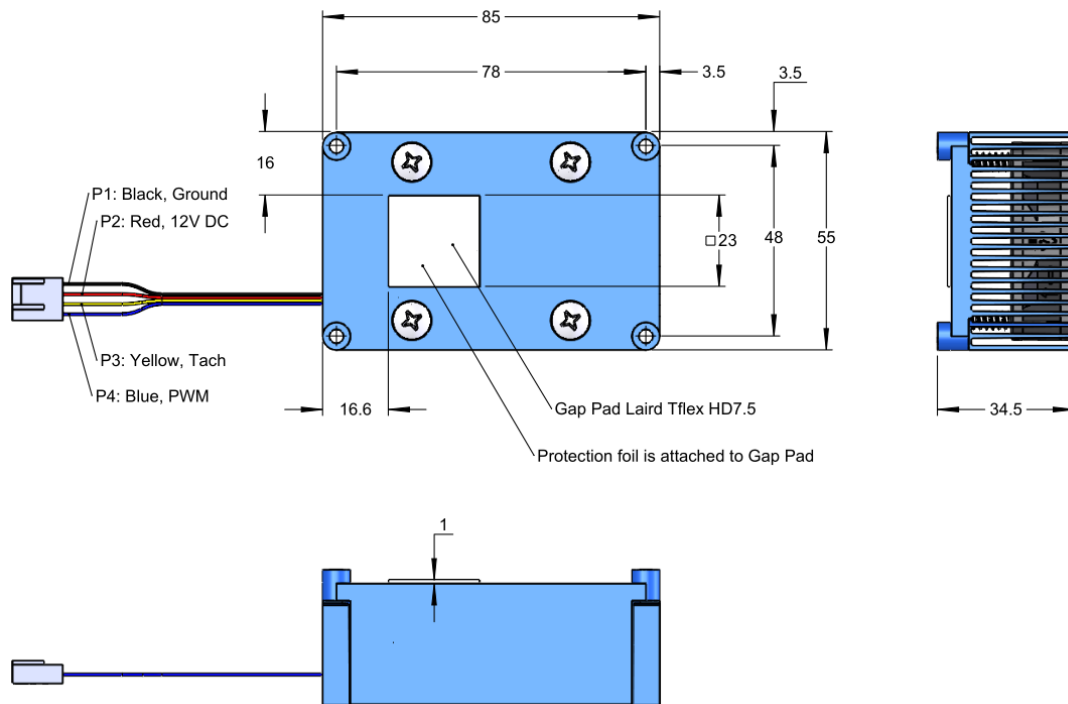
Table 2: Heatsink Technical Specifications

Material	Aluminum Alloy AL6061-T6	
Coating	Degreased, Blue anodized	
Thermal Interface Material	Tflex™ HD7.5	Refer to the Tflex™ HD7.5 Datasheet for specific information on Density, Temperature, and related specifications.
Weight	TBD	
Fan	CFM-5015CF-160-374-22	Refer to the CFM-5015CF-160-374-22 Datasheet for specific information on pinout, speed, and related specifications.
Fan Connector	Molex 470541000	
Thermal Conductivity	190–221 W/(m·K)	Valid for temperature range 40–100 °C
Thermal Resistance (Alu-Ambient with fan)	TBD	

4 Mechanical Dimensions

The following drawings illustrate the mechanical dimensions of the Aquila Heatsink Active. All measurements are in millimeters (mm).

Figure 1: Aquila Heatsink Active dimensions



4.1 General Tolerances

When not explicitly specified, the following tolerances apply to the product

- TIM Size and position : $\pm 0.5\text{mm}$ (excl. TIM Thickness)
- 0-1 PLACE DECIMALS: $\pm 0.25\text{mm}$

5 Assembly

The following procedure describes how to attach the Aquila Heatsink Active to your Aquila SoM. Follow these steps carefully to avoid mechanical or electrostatic damage, and always observe appropriate ESD safety precautions when handling electronic components.

1. Clean the top surface of the SoC package on the Aquila module using a lint-free, anti-static cloth.
2. Insert the Aquila module into the board-to-board connector on your Aquila carrier board. Ensure that the module is fully seated and parallel to the PCB to avoid connector misalignment.
3. Carefully remove the protective film from the thermal interface pad on the underside of the heatsink.
4. Align the four M3 mounting holes on the Aquila Heatsink Active with the standoffs or inserts on the carrier board. Gently lower the heatsink onto the module without sliding or shifting it laterally.
5. Secure the heatsink using four M3 screws. Tighten the screws in a cross pattern, applying even pressure. The maximum tightening torque is 0.5 N·m as specified in the mechanical drawing.
6. Connect the fan cable (4-pin Molex 470541000) to the carrier board header, ensuring correct orientation.

The system is now ready for operation.

6 Product Compliance

Up-to-date information about product compliance (such as RoHS, CE, UL 94, conflict minerals, REACH and more) can be found on our website at <https://www.toradex.com/support/product-compliance>.

7 Storage Requirements

Shelf life is the period during which a product is expected to remain within its approved specifications when stored under defined conditions.

The most significant factor limiting the Aquila Heatsink's shelf life is the protective film applied to the TIM. This film prevents contamination or premature adhesion of the TIM before installation on the System on Module.

The following table summarizes the recommended storage conditions and associated shelf life of the Aquila Heatsink:

Table 3: Storage conditions for shelf life management

Storage measures	Ambient atmosphere	Storage temperature	Storage relative humidity	Maximum storage time
Original packing	Air	20°C to 30°C	40% to 60%	12 months

Note that short-term exposure to environmental conditions outside the recommended limits is generally acceptable and is not expected to significantly reduce product lifetime.

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