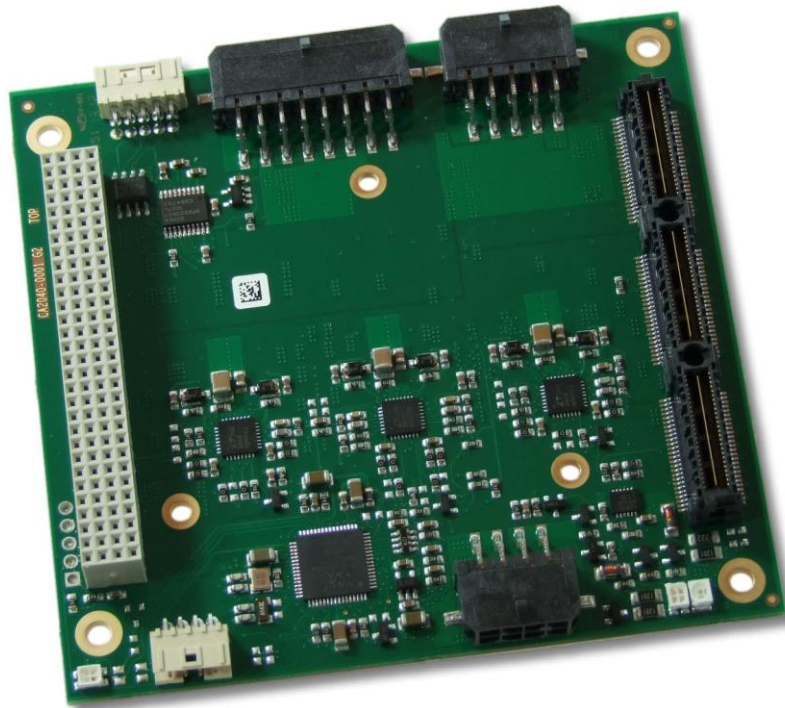


ADLPS104-150

Manual

rev. 1.0



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0 Document History

Version	Changes
0.1	First pre-release
0.2	Corrected connector P401
1.0	First released version

All company names, brand names, and product names referred to in this manual are registered or unregistered trademarks of their respective holders and are, as such, protected by national and international law.

1 Introduction

1.1 Important Notes

Please read this manual carefully before you begin installation of this hardware device. To avoid Electrostatic Discharge (ESD) or transient voltage damage to the board, adhere to the following rules at all times:

- You must discharge your body from electricity before touching this board.
- Tools you use must be discharged from electricity as well.
- Please ensure that neither the board you want to install, nor the unit on which you want to install this board, is energized before installation is completed.
- Please do not touch any devices or components on the board.

 **WARNING**

As soon as the board is connected to a working power supply, touching the board may result in electrical shock, even if the board has not been switched on yet. Please also note that the mounting holes for heat sinks are connected to ground, so when using an externally AC powered device, a substantial ground plane differential can occur if the external device's AC power supply or cable does not include an earth ground. This could also result in electrical shock when touching the device and the heat sink simultaneously.

1.2 Technical Support

Technical support for this product can be obtained in the following ways:

- By contacting our support staff at +1 858-490-0597 or +49 (0) 271 250 810 0
- By contacting our staff via e-mail at support@adl-usa.com or support@adl-europe.com
- Via our website at www.adl-usa.com/support or www.adl-europe.com/support

1.3 Warranty

This product is warranted to be free of defects in workmanship and material. ADL Embedded Solutions' sole obligation under this warranty is to provide replacement parts or repair services at no charge, except shipping cost. Such defects which appear within 12 months of original shipment of ADL Embedded Solutions will be covered, provided a written claim for service under warranty is received by ADL Embedded Solutions no less than 30 days prior to the end of the warranty period or within 30 days of discovery of the defect – whichever comes first. Warranty coverage is contingent upon proper handling and operation of the product. Improper use such as unauthorized modifications or repair, operation outside of specified ratings, or physical damage may void any service claims under warranty.

1.4 Return Authorization

All equipment returned to ADL Embedded Solutions for evaluation, repair, credit return, modification, or any other reason must be accompanied by a Return Material Authorization (RMA) number. ADL Embedded Solutions requires a completed RMA request form to be submitted in order to issue an RMA number. The form can be found under the Support section at our website: www.adl-usa.com or www.adl-europe.com. Submit the completed form to support@adl-usa.com or fax to +1 858-490-0599 for the USA office, or to rma@adl-europe.com or fax to +49 (0) 271 250 810 20 to request an RMA from the European office in Germany. Following a review of the information provided, ADL Embedded Solutions will issue an RMA number.

1.5 Description of Safety Symbols

The following safety symbols are used in this documentation. They are intended to alert the reader to the associated safety instructions.

A red rectangular box containing a white exclamation mark inside a triangle on the left, followed by the word "DANGER" in white capital letters.

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

A yellow rectangular box containing a black exclamation mark inside a triangle on the left, followed by the word "WARNING" in black capital letters.

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

A yellow rectangular box containing a black exclamation mark inside a triangle on the left, followed by the word "CAUTION" in black capital letters.

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

A blue rectangular box containing the word "NOTICE" in white capital letters.

NOTICE is used to address practices not related to physical injury.

1.6 RoHS

The PCB and all components are RoHS compliant (RoHS = Restriction of Hazardous Substances Directive). The soldering process is lead free.

1.7 FCC Approval for Canada

FCC: Canadian Notice

This equipment does not exceed the Class A limits for radiated emissions as described in the Radio Interference Regulations of the Canadian Department of Communications.

1.8 FCC Approvals for the United States of America

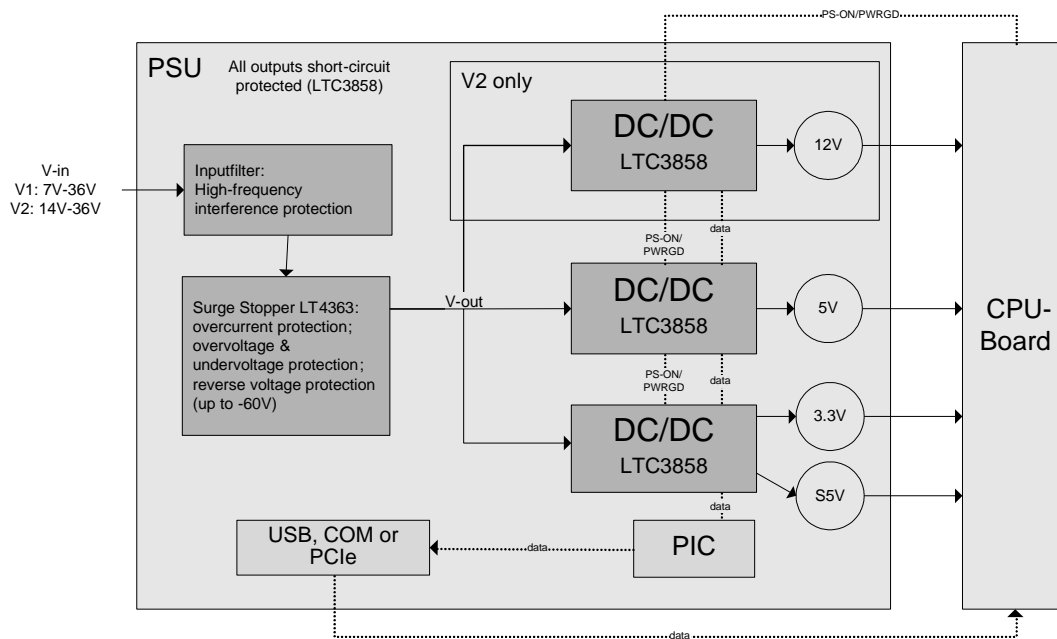
FCC: Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2 Overview

2.1 Features

The ADLPS104-150 is a 150W PSU card, e.g. for use with industrial motherboards. Based on Linear Technology®'s LTC3858 2-Phase Synchronous Step-Down Controller, it is available in two product variants, V1 allowing an input voltage ranging from 7V to 36V, and V2 allowing 14V to 36V. Both variants offer S5V/2A, 5V/20A and 3.3V/5A outputs with V2 offering an additional 12V/10A output. All other features are the same between both variants such as the max. input current of 15A and several protections on the input and on the output side (see list below). ATX compliant signals provide effective communication with the motherboard. Using a special PSU software several interfaces allow configurations and monitoring of technically relevant functions, such as temperature, voltage level etc. Please refer to your distributor for information on available software support. The standard temperature range is 0-60° C. Extended temperature range is available with derating starting at 70° C. Regarding EM radiation, the module complies with the EN61000-6-2 and EN61000-6-4 industrial codes.



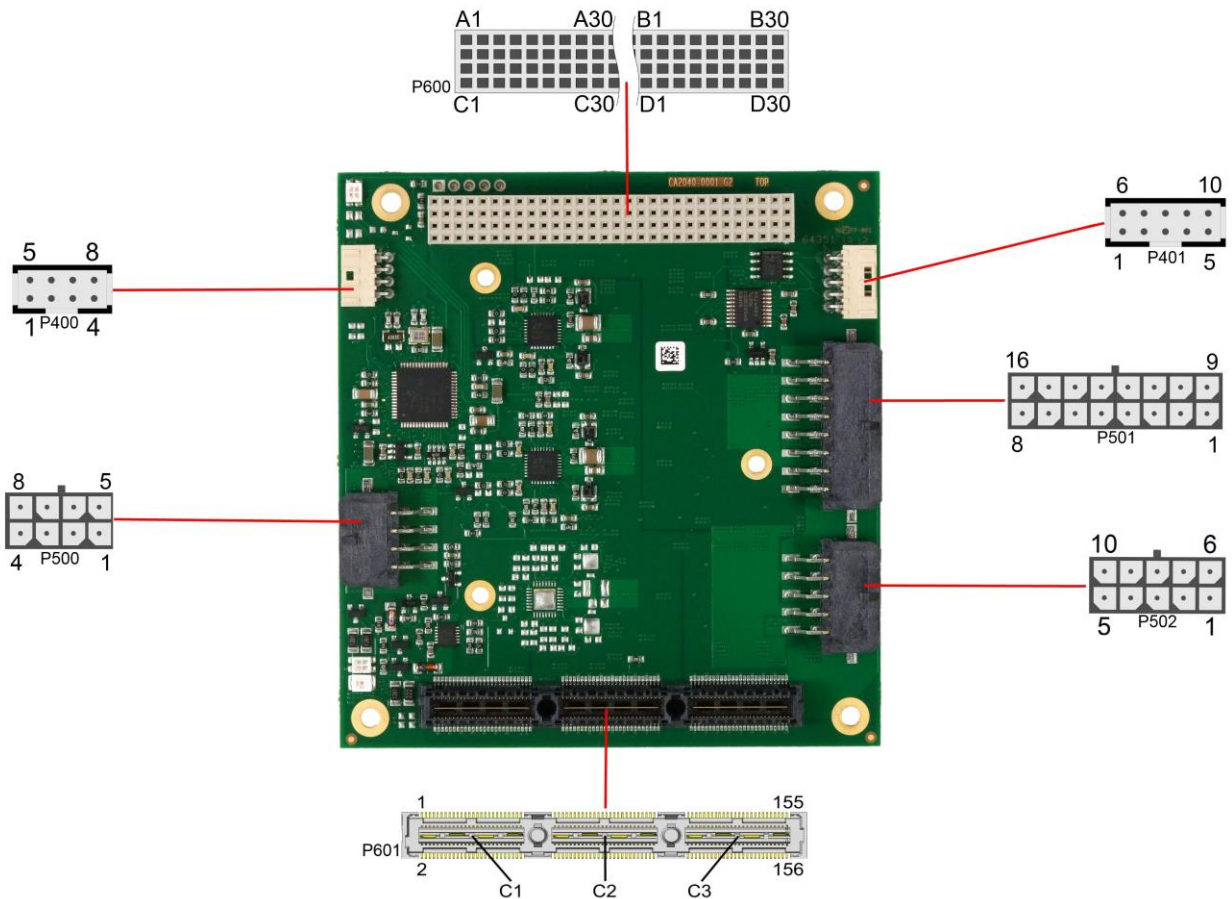
2.2 Featurelist

ADLPS104-150	Power Supply Unit
Operating voltage	Input voltage range V1: 7V-36V
	Input voltage range V2: 14V-36V
	Outputs: 5V/2A, 5V/20A, 3.3V/5A Additional output of 12V/10A (V2 only)
	Power consumption 150W
Signaling	RGB LED for status display
	Red LED for reverse voltage
Protections	Input side: reverse voltage protection up to 60V
	In-/Output side: overvoltage protection
	Deep discharge protection of accumulator
	Overcurrent protection
	In-/Output side: undervoltage protection
	Input side: burst protection up to 80V
	Output side: Protection against abnormal voltages (monitored via PWRGD)
Output side: short-circuit protection	
UPS	No on-board UPS capability
Signals	ATX compliant signals (PWRGD, PS-ON etc.)
	Except for 5V, all output voltages are switchable via PS-ON signal
Monitoring	Temperature monitoring
	Voltage monitoring
Temperature Range	0-55°C (Extended temperature on request, please note the derating)
Format	90.2mm x 95.5mm
Standards	DIN EN61000-6-2
	DIN EN61000-6-4

3 Connectors

3.1 Connector Map

Please use the connector map below for quick reference. Only connectors on the component side are shown. For more information on each connector refer to the table below.



Number	Function	Page
P400	"USB"	p. 15
P401	"COM"	p. 14
P500	"Power Input"	p. 11
P501	"Power Output Peripherals"	p. 12
P502	"Power Output CPU"	p. 13
P600	"PC/104Plus Bus"	p. 16
P601	"PC/104 PCIe"	p. 18

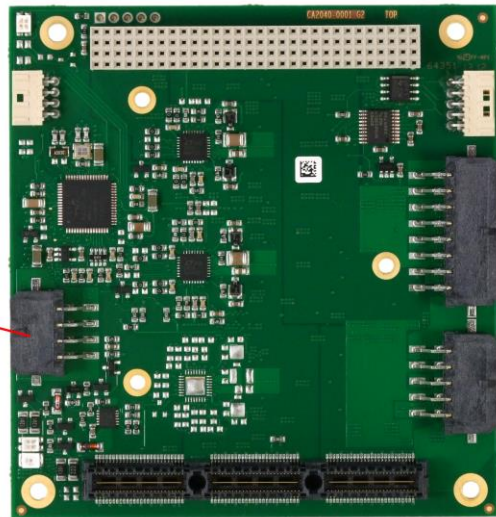
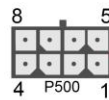
3.2 Power Input

The power supply of the ADLPS104-150 is realized via a 2x4-pin connector.

Manufacturer	Description	Mating Connector
Molex	43045-0809	WM1786-ND

NOTICE

Since this is a 90 degree connector, the symbol in the drawing below represents the connector face as seen from the side (PCB on bottom) rather than from above.



Description	Name	Pin	Name	Description
power supply	V_in	1	5	V_in
power supply	V_in	2	6	V_in
ground	GND	3	7	GND
ground	GND	4	8	GND

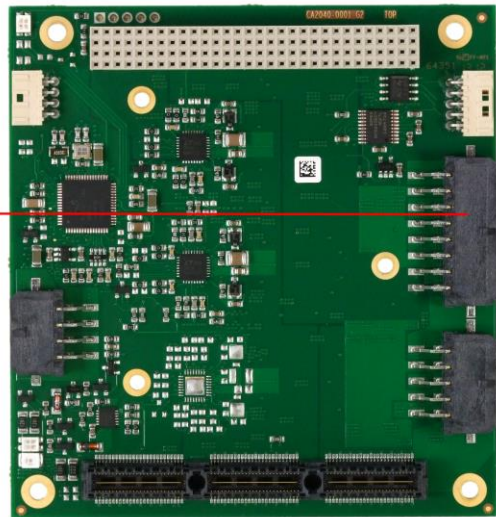
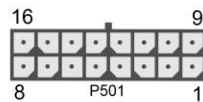
3.3 Power Output Peripherals

The output power for peripheral devices is provided via a 2x8-pin connector.

Manufacturer	Description	Mating Connector
Molex	PS43045-16xx	PS43025-16xx

NOTICE

Since this is a 90 degree connector, the symbol in the drawing below represents the connector face as seen from the side (PCB on bottom) rather than from above.



Description	Name	Pin	Name	Description
12V / 10A	12V	1	9	12V
ground	GND	2	10	GND
5V / 20A	VCC	3	11	VCC
ground	GND	4	12	GND
3.3V / 5A	3.3V	5	13	3.3V
ground	GND	6	14	GND
S5V / 5A	SVCC	7	15	PWR_PWRGO OD
PS-ON#	PWR_PSON#	8	16	PWRBTN#
				powergood
				powerbutton

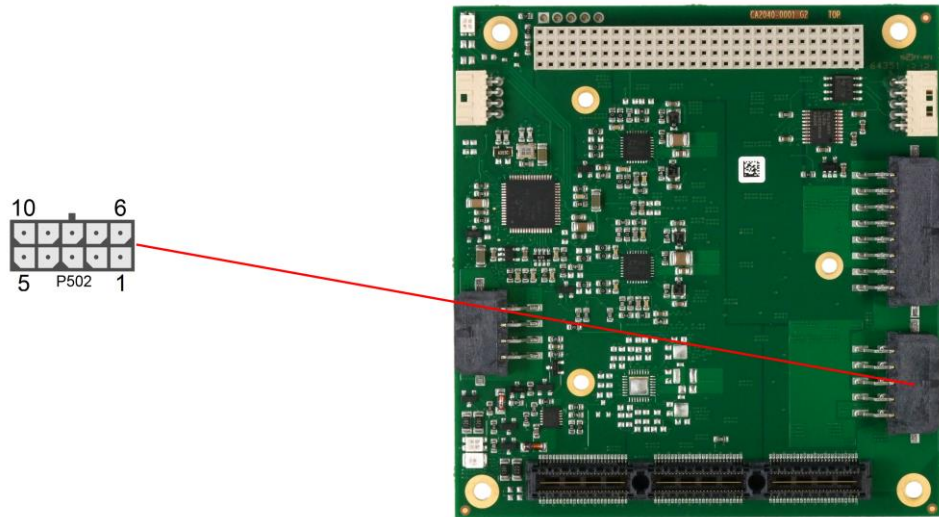
3.4 Power Output CPU

The output power for the CPU is provided via a 2x5-pin connector.

Manufacturer	Description	Mating Connector
Molex	43045-1009	Molex 43025-1000

NOTICE

Since this is a 90 degree connector, the symbol in the drawing below represents the connector face as seen from the side (PCB on bottom) rather than from above.



Description	Name	Pin	Name	Description
12V / 10A	12V	1	6	12V
ground	GND	2	7	GND
ground	GND	3	8	SVCC
ground	GND	4	9	GND
5V / 20A	VCC	5	10	VCC

NOTICE

Product variants allowing an input voltage range from 7V to 36V will not have 12V output available. Pins 1 and 6 are "Reserved" on those variants.

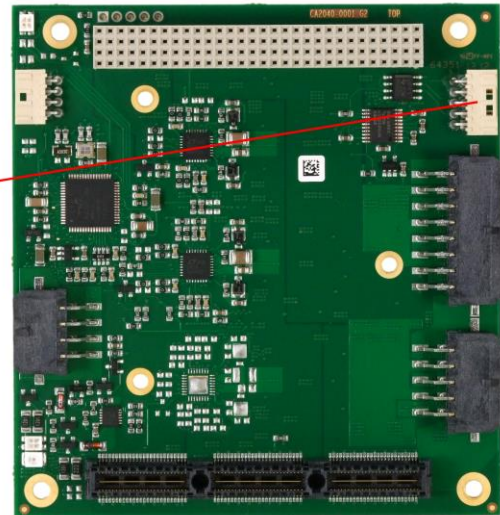
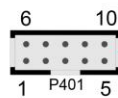
3.5 COM

A serial interface is provided via a 2x5-pin connector (male, FCI 98417-G61-10LF). It is possible to read out several technically relevant informations, such as temperature, voltage level etc. and to configure several settings. Alternatively those dates can be transmitted by USB (page 15) oder PCIe (page 18).

The default signal level is RS485. Using a special software the signal level can be switched to RS232. Please refer to your distributor for information on available software support.

NOTICE

Since this is a 90 degree connector, the symbol in the drawing below represents the connector face as seen from the side (PCB on bottom) rather than from above.



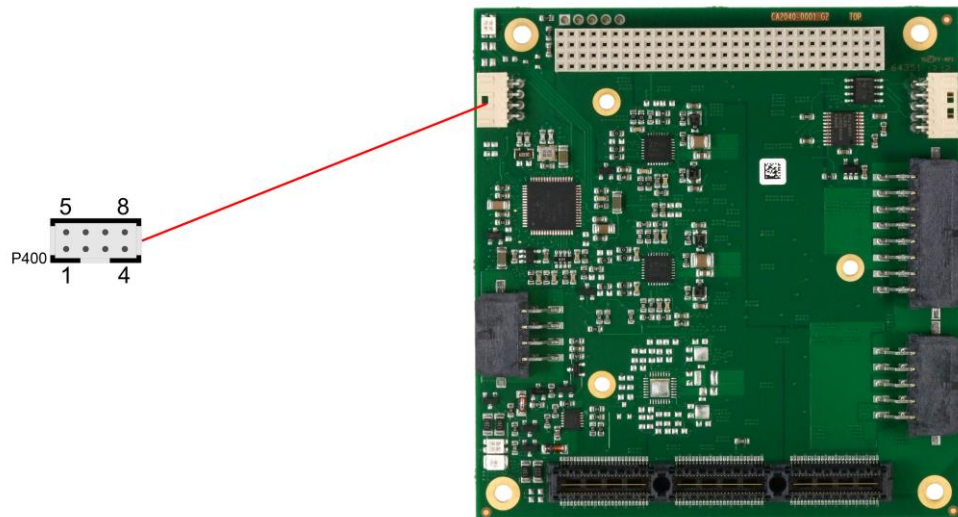
Description	Name	Pin		Name	Description
termination resistor		1	6	N/C	reserved
receiver	RX	2	7	RX	receiver
transmitter	TX	3	8	TX	transmitter
termination resistor		4	9	COMMODE	Com mode
ground	GND	5	10	SVCC	standby supply

3.6 USB

Via a 2x4-pin connector (FCI 98417-G61-08LF) the ADLPS104-150 is available as USB2.0 device. It is possible to read out technically relevant informations, such as temperature, voltage level etc. and to configure several settings. Please refer to your distributor for information on available software support.

Alternatively it is possible to transmit those dates via the serial interface (page 14) or PCIe (page 18).

NOTICE Since this is a 90 degree connector, the symbol in the drawing below represents the connector face as seen from the side (PCB on bottom) rather than from above.

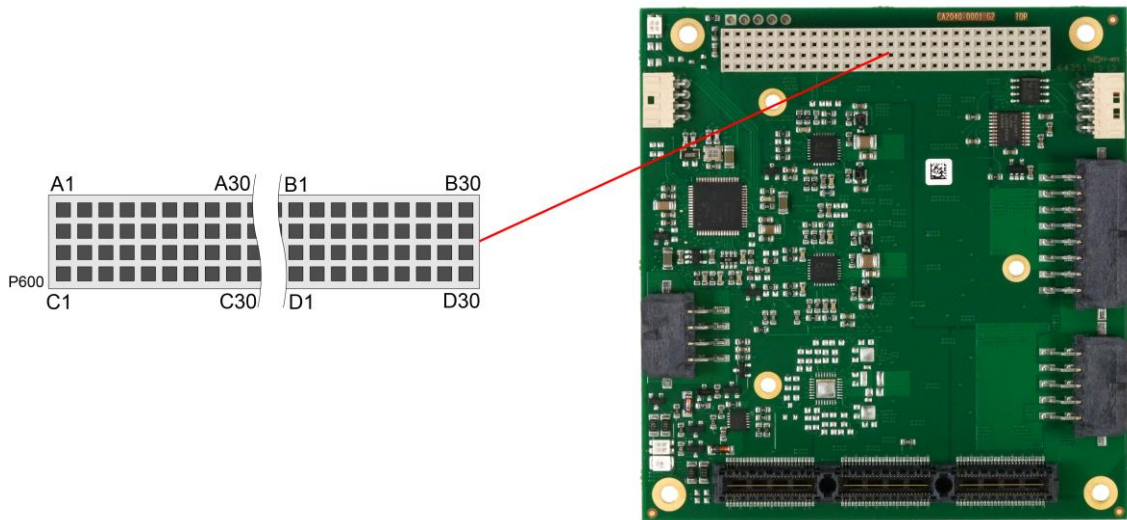


Description	Name	Pin	Name	Description
power supply	VUSB	1	5	N/C reserved
minus channel USB	USB-	2	6	N/C reserved
plus channel USB	USB+	3	7	N/C reserved
ground	GND	4	8	N/C reserved

3.7 PC/104Plus Bus

On the ADLPS104-150 installed PC/104Plus bus is by default no possibility to connect expansion cards. The connector block protects the board from mechanical damages.

If the PSU gets connected to a CPU board via the PC/104Plus bus the bus provides power supply.



Description	Name	Pin	Name	Description
ground	GND	A1 C1	VCC	power supply
reserved	N/C	A2 C2	N/C	reserved
reserved	N/C	A3 C3	N/C	reserved
reserved	N/C	A4 C4	GND	ground
ground	GND	A5 C5	N/C	reserved
reserved	N/C	A6 C6	N/C	reserved
reserved	N/C	A7 C7	GND	ground
3.3V power supply	PCI_3.3V	A8 C8	N/C	reserved
reserved	N/C	A9 C9	PSON#	PS_ON
ground	GND	A10 C10	3.3V	3.3V power supply
reserved	N/C	A11 C11	N/C	reserved
3.3V power supply	PCI_3.3V	A12 C12	GND	ground
reserved	N/C	A13 C13	N/C	reserved
ground	GND	A14 C14	PCI_3.3V	3.3V power supply
reserved	N/C	A15 C15	N/C	reserved
reserved	N/C	A16 C16	GND	ground
3.3V power supply	PCI_3.3V	A17 C17	N/C	reserved
reserved	N/C	A18 C18	N/C	reserved
reserved	N/C	A19 C19	N/C	reserved
ground	GND	A20 C20	N/C	reserved
reserved	N/C	A21 C21	N/C	reserved
5V power supply	VCC	A22 C22	GND	ground
reserved	N/C	A23 C23	N/C	reserved
ground	GND	A24 C24	VCC	5V power supply
reserved	N/C	A25 C25	N/C	reserved
5V power supply	PCI_VCC 5V	A26 C26	GND	ground
reserved	N/C	A27 C27	N/C	reserved
ground	GND	A28 C28	VCC	5V power supply
reserved	N/C	A29 C29	N/C	reserved

Description	Name	Pin		Name	Description
reserved	N/C	A30	C30	N/C	reserved
standby power supply 5V	SVCC	B1	D1	N/C	reserved
reserved	N/C	B2	D2	VCC	5V power supply
ground	GND	B3	D3	N/C	reserved
reserved	N/C	B4	D4	N/C	reserved
reserved	N/C	B5	D5	GND	ground
reserved	N/C	B6	D6	N/C	reserved
reserved	N/C	B7	D7	N/C	reserved
reserved	N/C	B8	D8	PCI_3.3V	3.3V power supply
ground	GND	B9	D9	N/C	reserved
reserved	N/C	B10	D10	N/C	reserved
3.3V power supply	PCI_3.3V	B11	D11	GND	ground
reserved	N/C	B12	D12	N/C	reserved
ground	GND	B13	D13	PCI_3.3V	3.3V power supply
reserved	N/C	B14	D14	N/C	reserved
3.3V power supply	PCI_3.3V	B15	D15	GND	ground
reserved	N/C	B16	D16	N/C	reserved
reserved	N/C	B17	D17	PCI_3.3V	3.3V power supply
ground	GND	B18	D18	N/C	reserved
reserved	N/C	B19	D19	N/C	reserved
reserved	N/C	B20	D20	GND	ground
5V power supply	VCC	B21	D21	N/C	reserved
reserved	N/C	B22	D22	N/C	reserved
ground	GND	B23	D23	N/C	reserved
reserved	N/C	B24	D24	N/C	reserved
reserved	N/C	B25	D25	GND	ground
reserved	N/C	B26	D26	N/C	reserved
5V power supply	VCC	B27	D27	GND	ground
reserved	N/C	B28	D28	PCI_RST#	reset
reserved	N/C	B29	D29	N/C	reserved
reserved	N/C	B30	D30	GND	ground

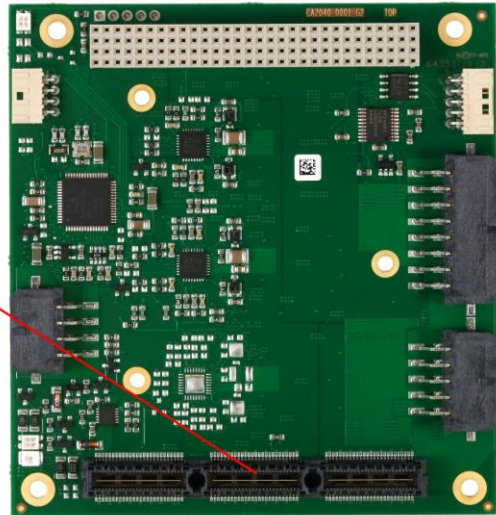
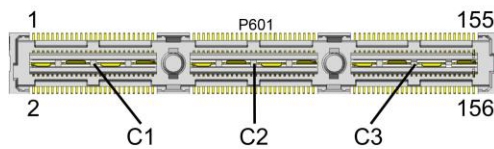
NOTICE

There is a mounting option, which offers the by default not connected 3.3V lanes.

3.8 PC/104 PCIe

The ADLPS104-150 offers a PCIe slot (type 1/type 2), on which by default pin 5 and 8 are not connected. As a mounting option those pins can be connected and the slot may be used to provide the PSU as USB device. It is possible to read out technically relevant informations, such as temperature, power consumption etc. or to configure several settings. Please refer to your distributor for information on available software support.

Alternatively those dates can be transmitted by USB (page 15) or COM (page 14).



Description	Name	Pin	Pin	Name	Description
reserved	N/C	1	2	PERST#	PCI Reset
3.3V power supply	PCIe_3.3V	3	4	PCIe_3.3V	3.3V power supply
USB data channel +	C_USB1	5	6	USB	USB0
USB data channel -	C_USB1#	7	8	USB#	USB0#
ground	GND	9	10	GND	ground
reserved	N/C	11	12	N/C	reserved
reserved	N/C	13	14	N/C	reserved
ground	GND	15	16	GND	ground
reserved	N/C	17	18	N/C	reserved
reserved	N/C	19	20	N/C	reserved
ground	GND	21	22	GND	ground
reserved	N/C	23	24	N/C	reserved
reserved	N/C	25	26	N/C	reserved
ground	GND	27	28	GND	ground
reserved	N/C	29	30	N/C	reserved
reserved	N/C	31	32	N/C	reserved
ground	GND	33	34	GND	ground
reserved	N/C	35	36	N/C	reserved
reserved	N/C	37	38	N/C	reserved
standby power supply	SVCC	39	40	SVCC	standby supply
reserved	N/C	41	42	N/C	reserved
reserved	N/C	43	44	N/C	reserved
reserved	N/C	45	46	PCIe_PWRG OOD	powergood
SMB data	SMBDAT	47	48	N/C	reserved

Description	Name	Pin		Name	Description
SMB clock	SMBCLK	49	50	N/C	reserved
SMB alert	SMBALERT#	51	52	PCIe_PSON#	PS ON - #
reserved	N/C	53	54	N/C	reserved
ground	GND	55	56	GND	ground
reserved	N/C	57	58	N/C	reserved
reserved	N/C	59	60	N/C	reserved
ground	GND	61	62	GND	ground
reserved	N/C	63	64	N/C	reserved
reserved	N/C	65	66	N/C	reserved
ground	GND	67	68	GND	ground
reserved	N/C	69	70	N/C	reserved
reserved	N/C	71	72	N/C	reserved
ground	GND	73	74	GND	ground
reserved	N/C	75	76	N/C	reserved
reserved	N/C	77	78	N/C	reserved
ground	GND	79	80	GND	ground
reserved	N/C	81	82	N/C	reserved
reserved	N/C	83	84	N/C	reserved
ground	GND	85	86	GND	ground
reserved	N/C	87	88	N/C	reserved
reserved	N/C	89	90	N/C	reserved
ground	GND	91	92	GND	ground
reserved	N/C	93	94	N/C	reserved
reserved	N/C	95	96	N/C	reserved
ground	GND	97	98	GND	ground
reserved	N/C	99	100	N/C	reserved
reserved	N/C	101	102	N/C	reserved
ground	GND	103	104	GND	ground
reserved	N/C	105	106	N/C	reserved
ground	GND	107	108	GND	ground
reserved	N/C	109	110	N/C	reserved
reserved	N/C	111	112	N/C	reserved
ground	GND	113	114	GND	ground
reserved	N/C	115	116	N/C	reserved
reserved	N/C	117	118	N/C	reserved
ground	GND	119	120	GND	ground
reserved	N/C	121	122	N/C	reserved
reserved	N/C	123	124	N/C	reserved
ground	GND	125	126	GND	ground
reserved	N/C	127	128	N/C	reserved
reserved	N/C	129	130	N/C	reserved
ground	GND	131	132	GND	ground
reserved	N/C	133	134	N/C	reserved
reserved	N/C	135	136	N/C	reserved
ground	GND	137	138	GND	ground
reserved	N/C	139	140	N/C	reserved
reserved	N/C	141	142	N/C	reserved
ground	GND	143	144	GND	ground
reserved	N/C	145	146	N/C	reserved
reserved	N/C	147	148	N/C	reserved
ground	GND	149	150	GND	ground
reserved	N/C	151	152	N/C	reserved
reserved	N/C	153	154	N/C	reserved
ground	GND	155	156	GND	ground

Description	Name	Pin	Name	Description
5V power supply	VCC	C1		
5V power supply	VCC	C2		
12V power supply	12V	C3		

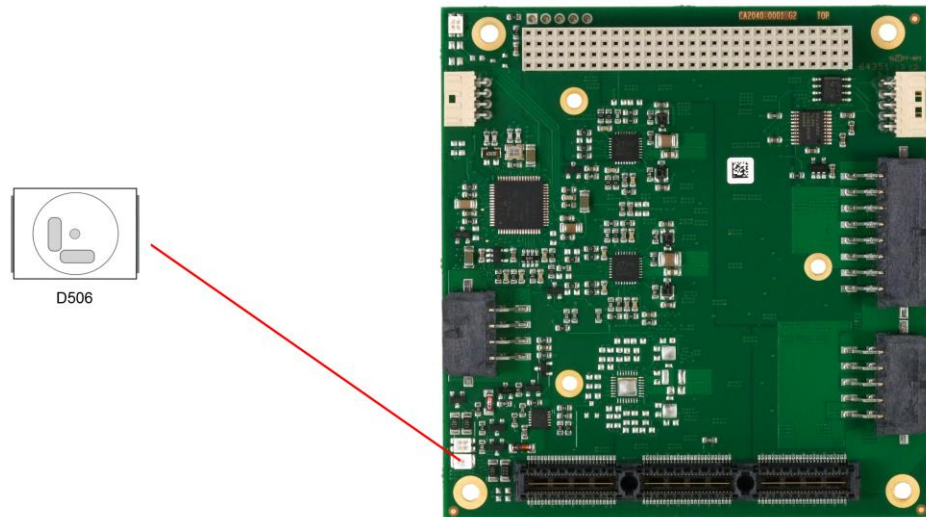
NOTICE

Mounting options which provide a power input range from 7V to 36V do not offer a 12V output. On those boards pin C3 is "Reserved".

4 State LEDs

4.1 LED: Reverse Voltage

A reverse voltage on the input side is signalled by a dedicated LED (solid red).

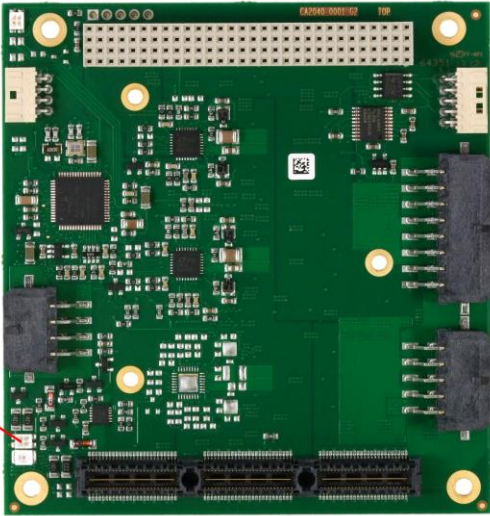


Status Codes LED:

Color	Interval	Meaning
None	permanent	Input voltage: polarity OK (or Power Off)
Red	permanent	Input voltage: polarity inverted

4.2 LED: Input Voltage

A two-colored LED indicates the status of the input voltage.

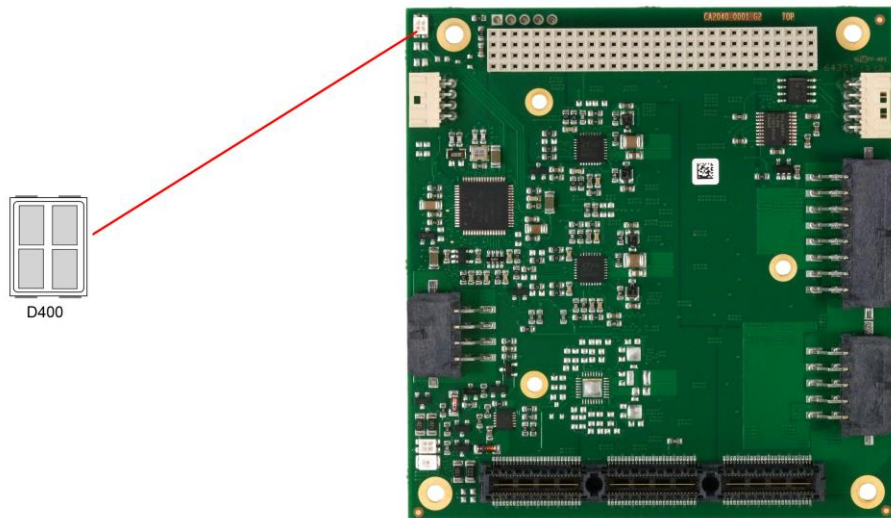


Status Codes LED:

Color	Interval		Meaning
none	solid		Power Off
Green	solid		Input voltage OK
Red	solid		Input voltage too low / too high / overcurrent

4.3 LED: Output Voltage

Status information regarding the output voltage is provided by a two-colored LED.



Status Codes LED:

Color	Interval		Meaning
none	N/A		Power Off or S5V OK while PWRGD de-asserted
Green	solid		All Output voltages OK
Red	solid		S5V is Off

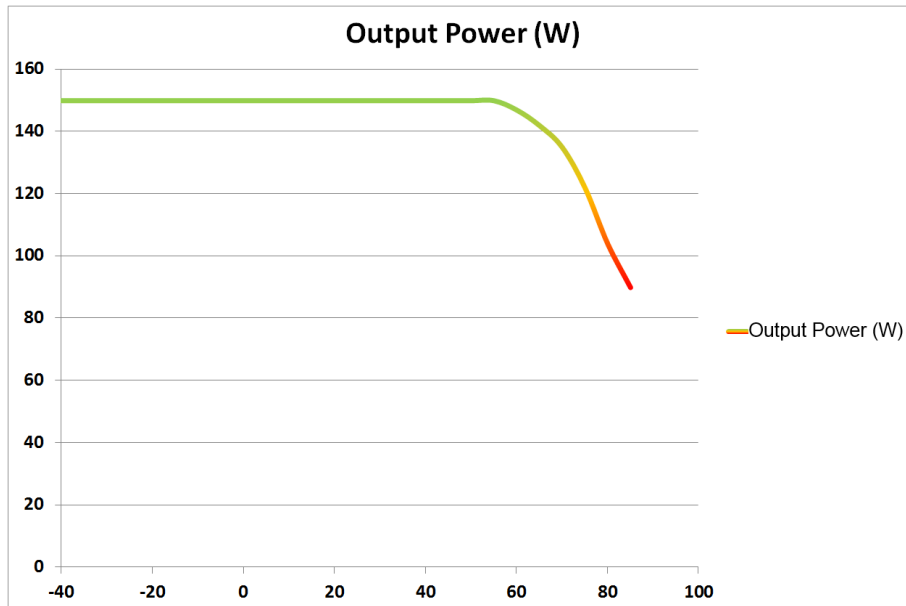
5 Electrical Characteristics

NOTICE

These figures will deteriorate drastically if an insufficient thermal solution is used for the power transistors.

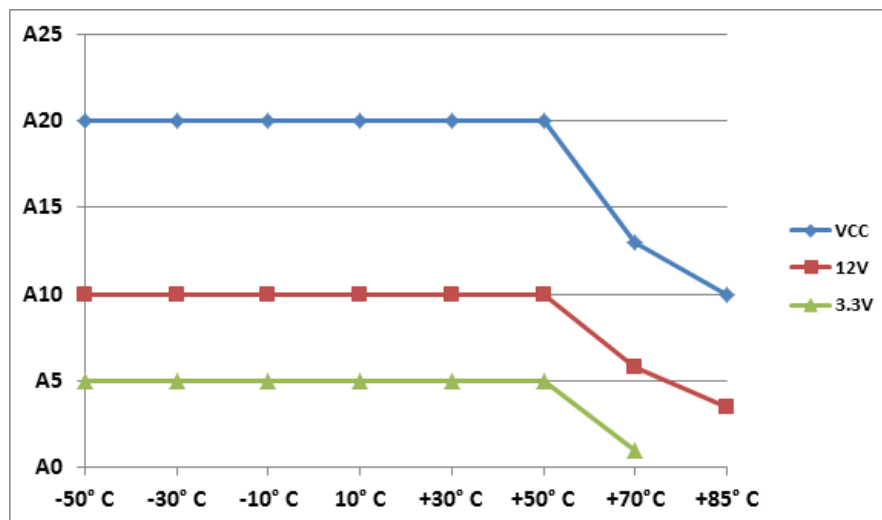
5.1 Temperature Derating - Overall

The following picture shows the output power in relation to temperature:



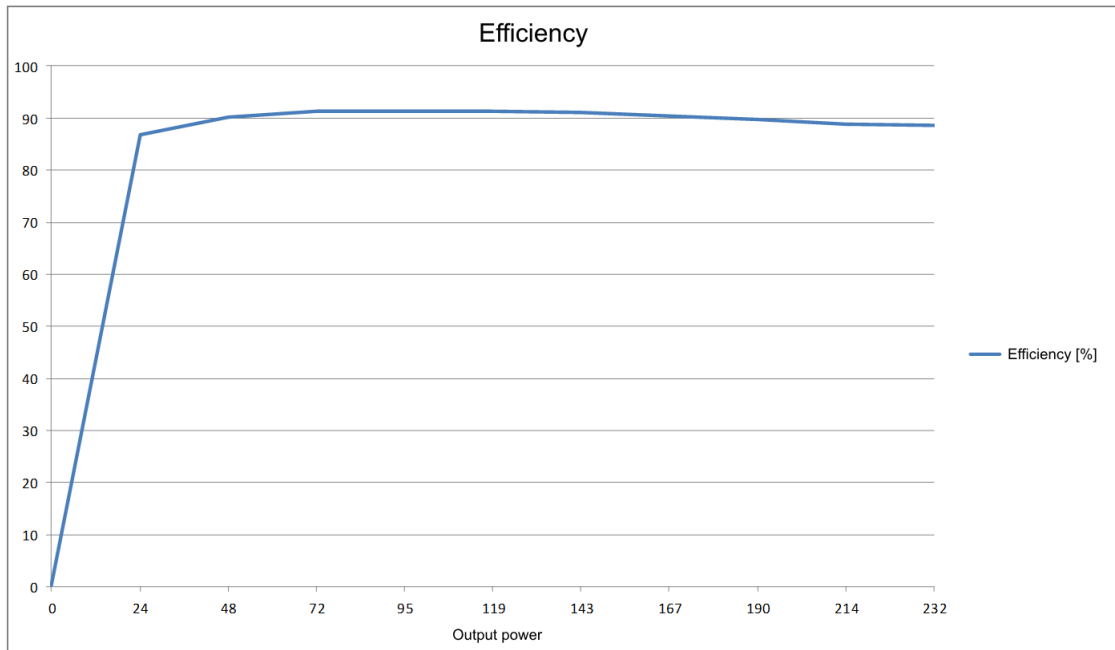
5.2 Temperature Derating for each Controller

The ADLPS104-150 can be ordered for operation in an extended ambient temperature range of -40° C to 85° C. In this case, derating applies for the temperatures above 70° C as follows:



5.3 Efficiency

The picture below shows the efficiency data for various output voltages. The data has been measured at room temperature with 24V input voltage.

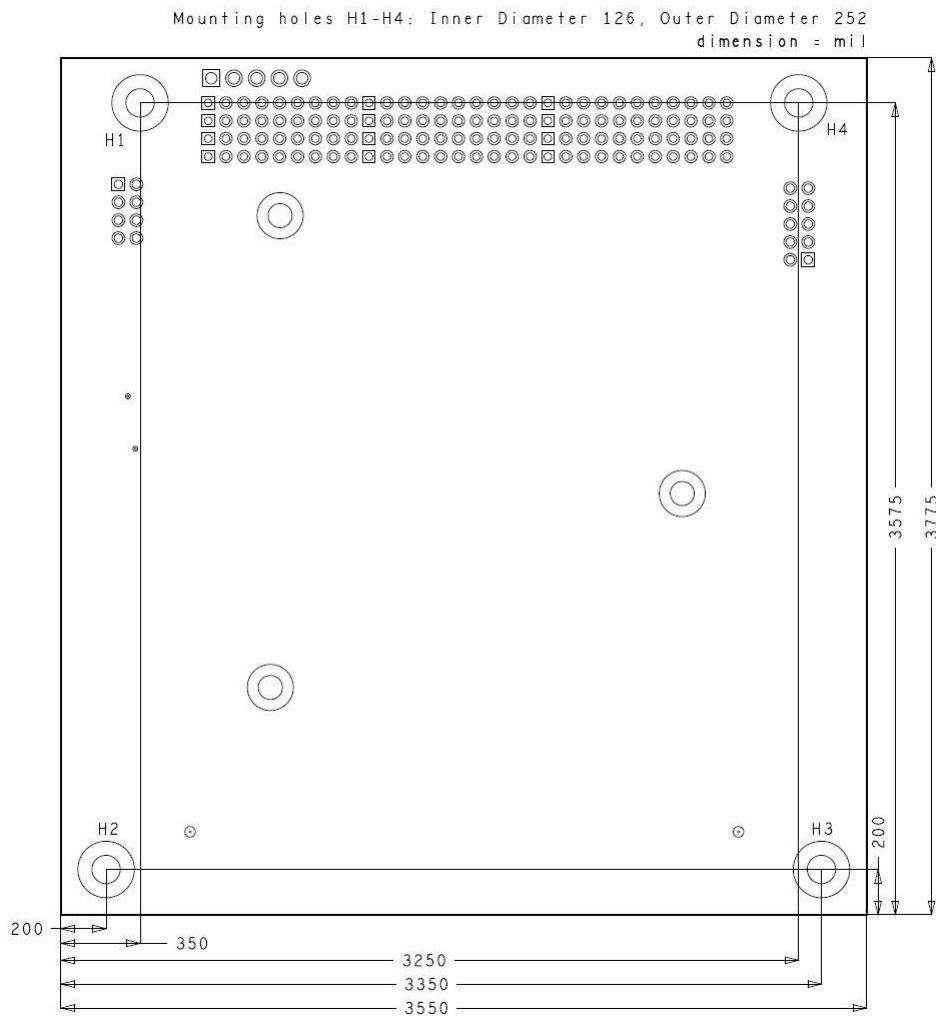


6 Mechanical Drawings

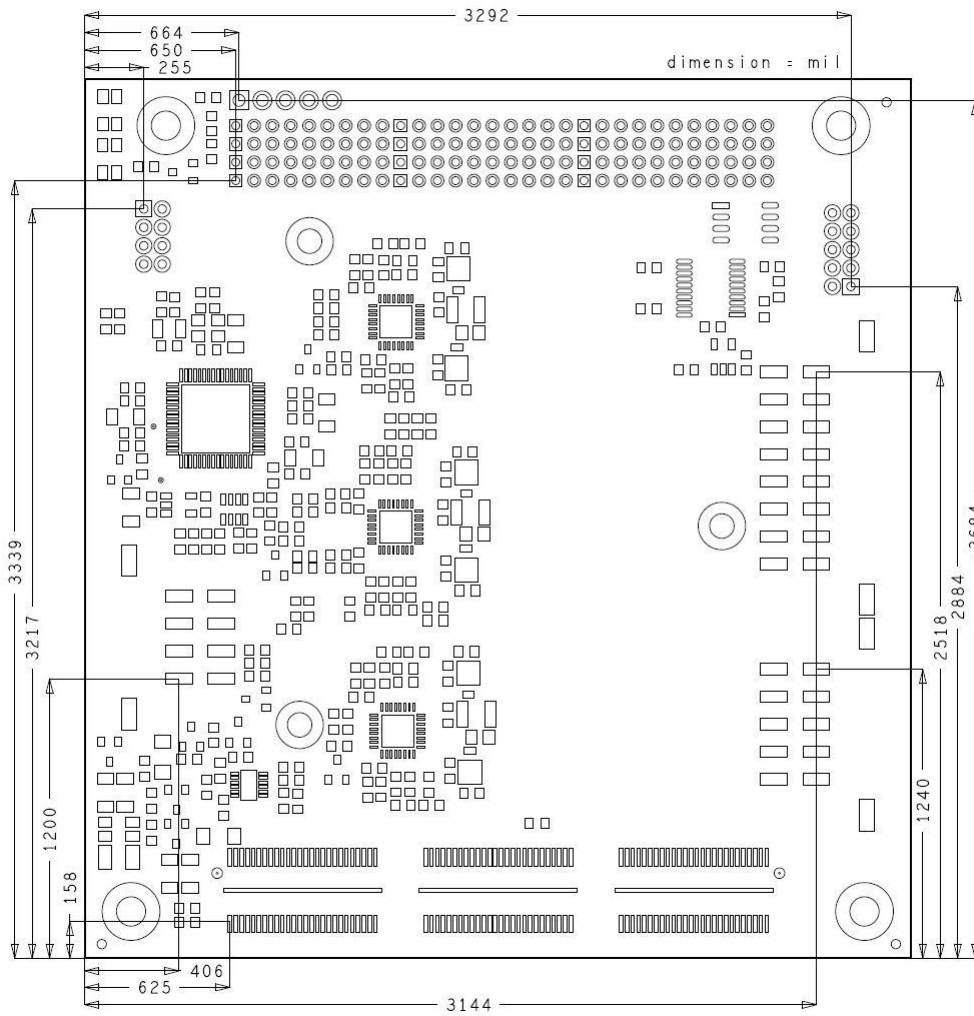
NOTICE

Use a sufficient thermal solution!
In order to achieve an optimal efficiency, we advise against using the ADLPS104-150 without a sufficient thermal solution.

6.1 PCB: Mounting Holes



6.2 PCB: Pin-1 Dimensions



6.3 PCB: Cooling

The ADLPS104-150 needs an appropriate cooling solution. The components which need attention are colored in the drawings below.

NOTICE

Most of these components carry a current on the outside of their metal housing. Therefore, only isolating materials can be used for the direct contact between cooling solution and component. The drawing below is in TOP view. BOTTOM view would be mirror-inverted.

