



NanoPower P60 PDU-200

Datasheet

Power Distribution Unit daughter board for the P60 system

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2 System Overview

The P60 PDU-200 (Power Distribution Unit) is a GomSpace daughterboard to be used with the P60 Dock. It contains 9 output channels with configurable voltage output.

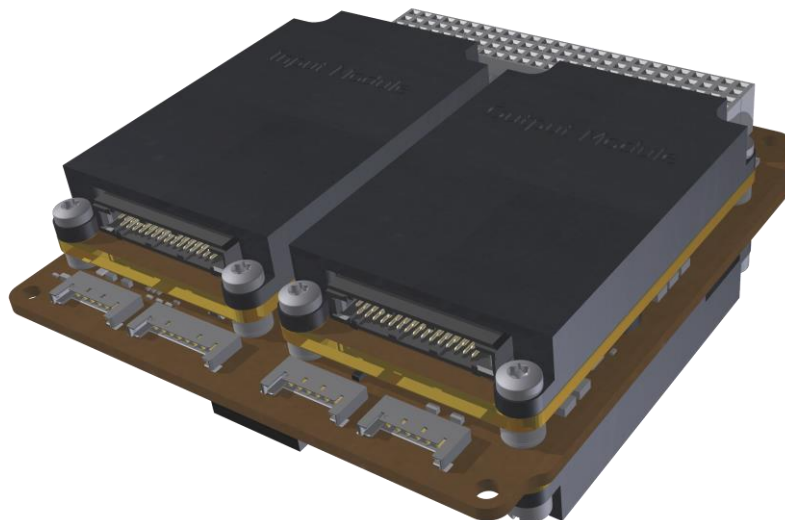


Figure 1 CAD drawing of a motherboard with four daughter boards with shields

2.1 Highlighted Features

P60 PDU-200 Module

- 9 switchable, latch-up, overcurrent protected outputs routed to the PC104 stack and a high-current rated discrete connector
- Outputs available in a high-current rated discrete connector
- Outputs are routed via P60 Dock to the PC104 stack
- 3 buck converters per module for regulated voltages below the battery voltage.
- Configurable output voltages per module of 3.3 V, 5 V or 8 V
 - 12 V, 18 V, 24 V possible for one regulator and two channels.
- Protected programmable current limit on outputs
- Current and voltage measurements on each output channel
- Detection and logging of overcurrent events
- Synchronized out-of-phase converters for low EMI operation
- Spread Spectrum Frequency Modulation
- PCB material: Glass/Polyimide IPC 6012C cl. 3/A
- IPC-A-610 Class 3 assembly

Note that the total power conversion is limited by thermal considerations. Hence installation hardware and operating voltages is indirectly a limiting factor – in general the higher voltage the higher power.

2.2 Block Diagram

The PDU module contains 3 Buck converters that can be connected to each of the 9 output channels. HW configuration during production fixes each output to a specific converter and sets the voltage of each converter. An output channel can also be configured to unregulated battery voltage. All 9 outputs are available in the motherboard stack connector, and only 6 of the channels are available in the TFM connector (together with a few communication channels).

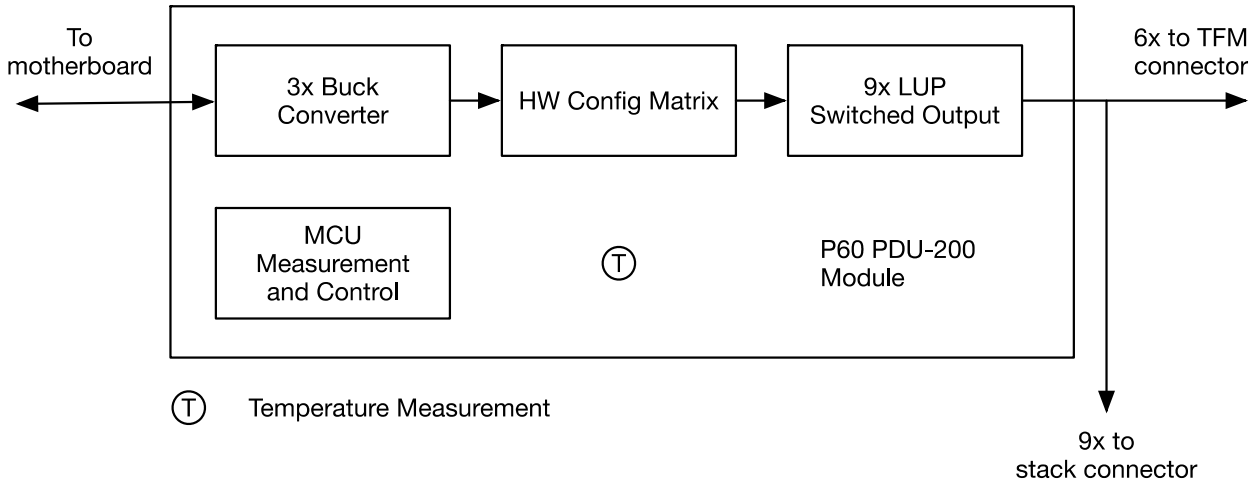
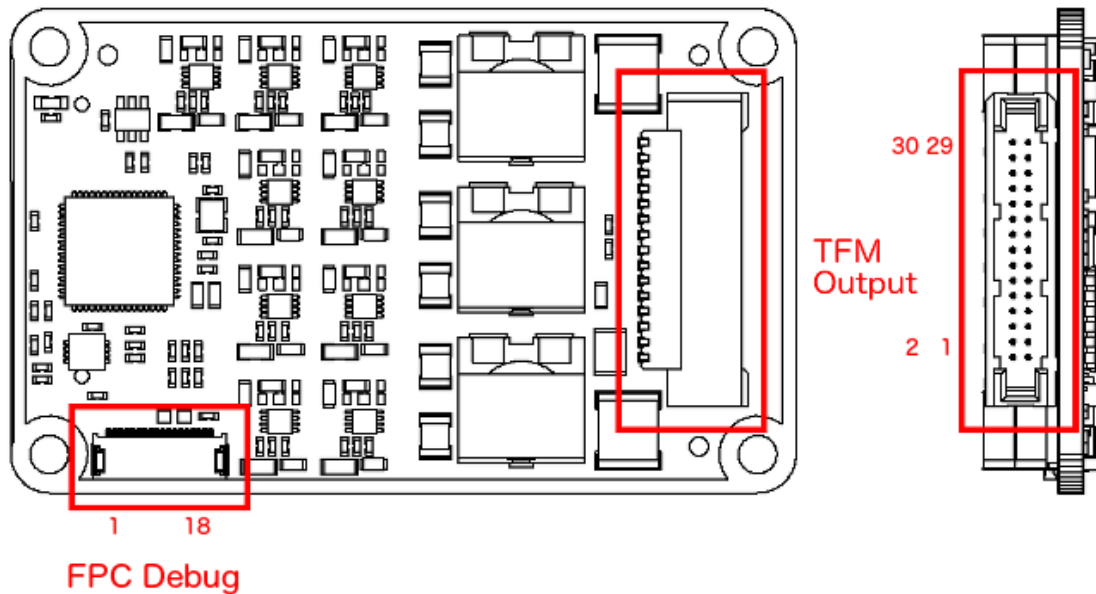


Figure 2 P60 PDU-200 block diagram

3 Connector Pinout



3.1 TFM Output

Samtec TFM-115-02-L-DH

Note that the polarization key is located next to pin 30.

Pin	Description	Pin	Description
1	Output 1	2	GND
3	Output 1	4	GND
5	SDA	6	SCL
7	Output 0	8	GND
9	Output 2	10	GND
11	SDA	12	SCL
13	Output 3	14	GND
15	VBAT	16	GND
17	VBAT	18	GND
19	Output 5	20	GND
21	VCC-internal	22	GND
23	CANH	24	CANL
25	Output 6	26	GND
27	Output 6	28	GND
29	CANH	30	CANL

3.2 FPC Debug

Molex 51281-1894

Manual programming and test connector.

Pin	Description
1	GND
2	VCC
3	RESET_NOT
4	JTAG_TDI
5	JTAG_TMS
6	JTAG_TCK
7	JTAG_TDO
8	GND
9	VCC
10	UART_RX (GOSH)
11	UART_TX (GOSH)
12	Not connected
13	Not connected
14	Not connected
15	Not connected
16	Not connected
17	Not connected
18	GND

4 Absolute Maximum Ratings

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the P60 PDU-200. Exposure to absolute maximum rating conditions for extended periods may affect the reliability.

Symbol	Description	Min.	Max.	Unit
T _{amb}	Operating Temperature	-35	+85	°C
V _{io}	Voltage on I ² C/USART pins	-0.1	3.4	V

5 Electrical Characteristics

Parameter	Condition	Min.	Typ.	Max.	Unit
Battery - Voltage	Battery connection				
	8 volt	6.0	7.4	8.4	V
	16 volt	12.0	14.9	16.80	V
	32 volt	24.0	29.6	33.6	V
V_{BAT} - Voltage - Current, cont.	Raw battery voltage (Depends on battery configuration) H2-45 and H2-46				
VCC power consumption			165		mW
VBAT power consumption	Per converter enabled		80		mW
DC/DC converters, 0-2 Converter 0 Converter 1 Converter 2	3.3 V, 5 V, 8 V, 12 V, 18 V, 24 V 3.3 V, 5 V or 8 V 3.3 V, 5 V or 8 V VBAT possible *			4.5	A
Output channel, 0-8				2	A
Latch-up time	Per channel		20		ms

* View option sheet for RAW VBAT options

6 Physical Characteristics

Description	Value	Unit
Mass with shield	57	g
Size	65.6 x 40.1 x 4.7	mm

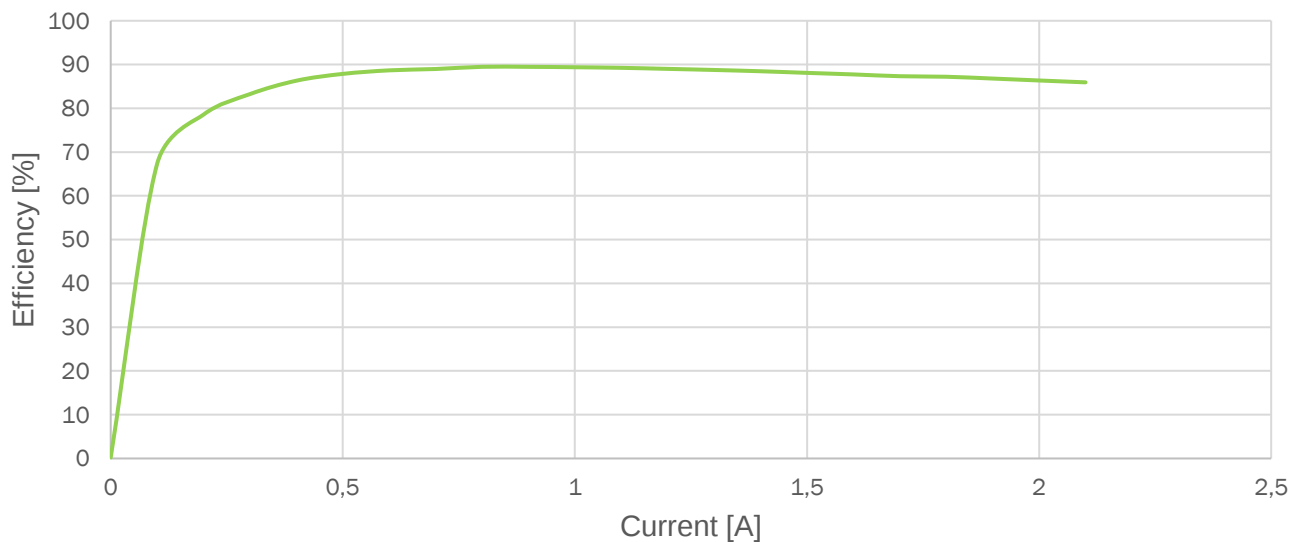
7 Output Channel Efficiency

This chapter shows the measured system efficiency, using the P60 system with an 8 V battery pack. The P60 dock has one ACU-200 and one PDU-200 module installed. The efficiencies are shown, not considering the standby power consumption (600 mW). Hence the standby power consumption should be considering on a power budget level, combined with the number of input/output channels and their expected efficiency at the expected load.

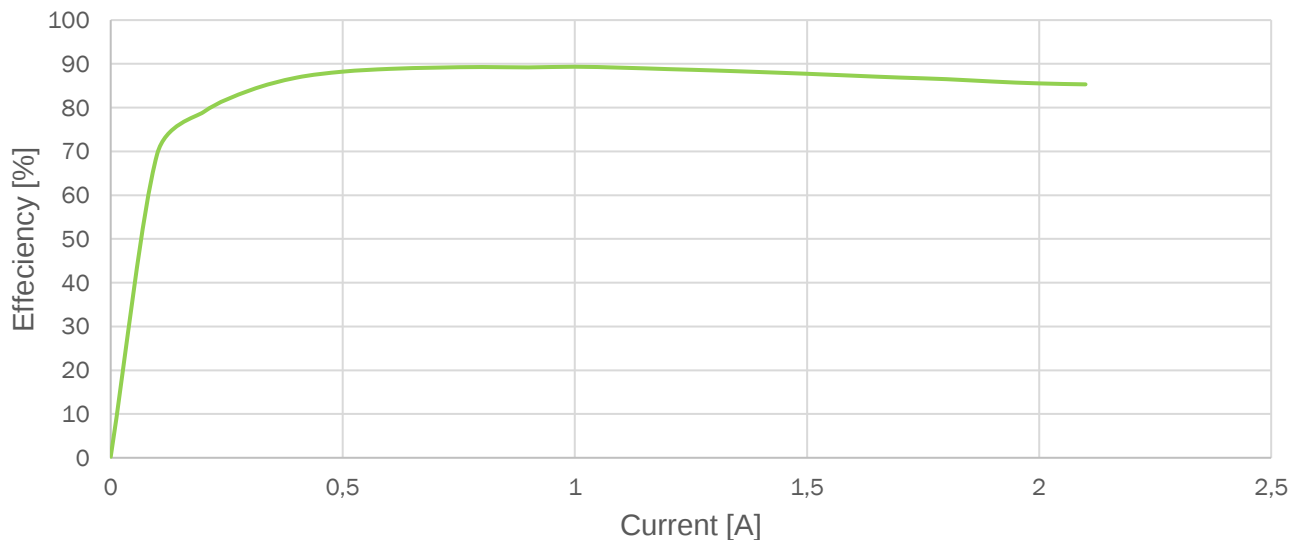
Efficiency is measured from the battery input to the stack connector output. Hence it includes all losses in the connections to/from the board and the P60 Dock power interface protection switches.

X-axis shows the output current in amps. The Y-axis shows the efficiency in percent. The configuration of the PDU-200 module is one channel to one converter. In the case of multiple channels on one converter the combined efficiency will be slightly larger.

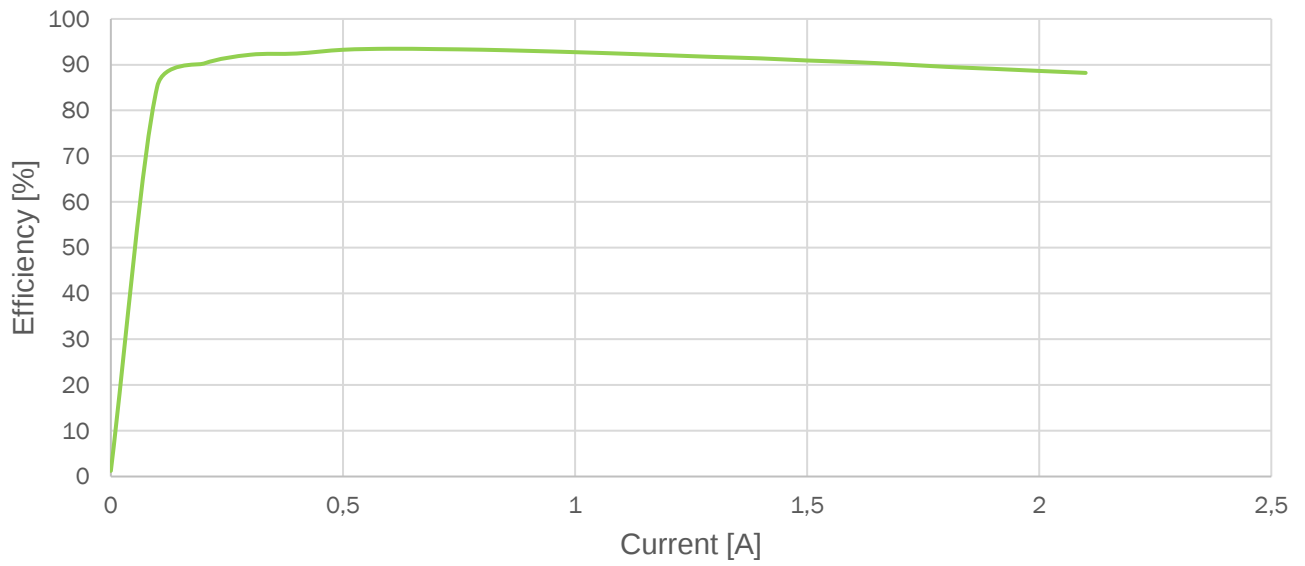
8 V battery - 3.3 V regulator - Stack output



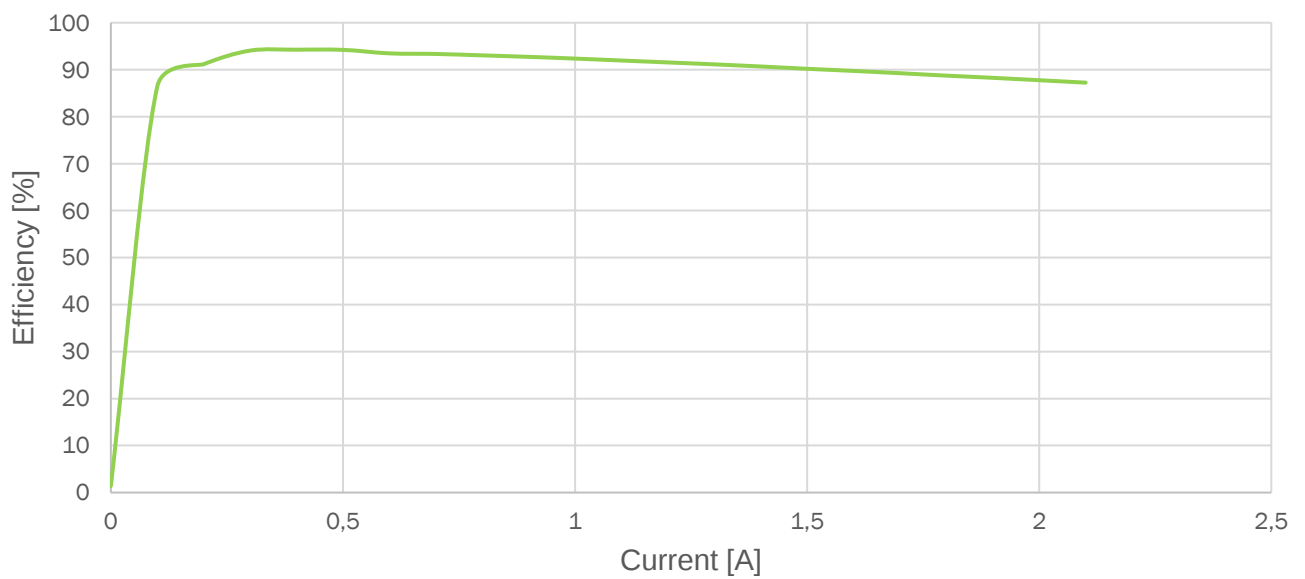
7 V battery - 3.3 V regulator - Stack output



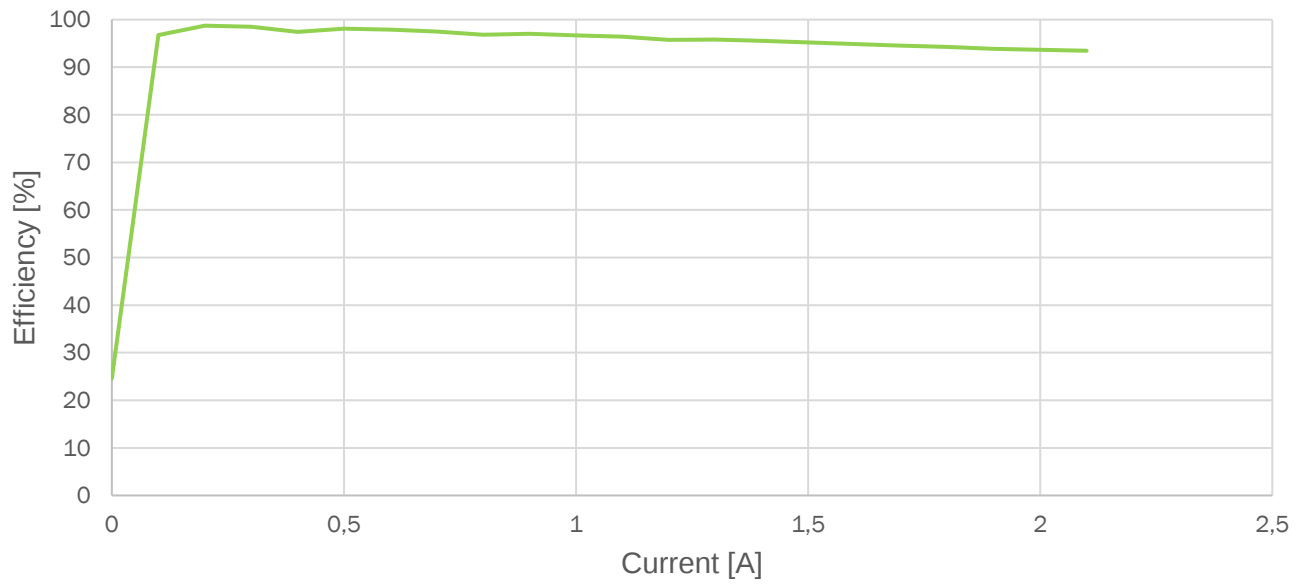
8 V battery - 5.0 V regulator - Stack output



7 V battery - 5.0 V regulator - Stack output



8 V battery - CH2 unregulated - Stack output



8

Physical Layout

The PDU PCB top under the shield has two connectors at the right edge and at the bottom left corner. Middle left is a MCU and a FRAM. Top left is a LED. Middle right are three buck converters.

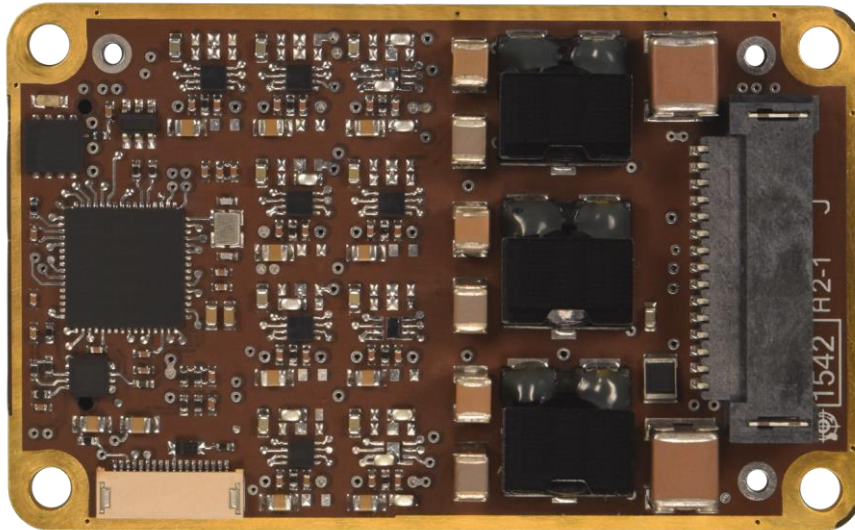


Figure 3 PDU module top

The bottom side has two FSI connectors to the left, Buck converters middle. Two ADC right side middle and bottom left.

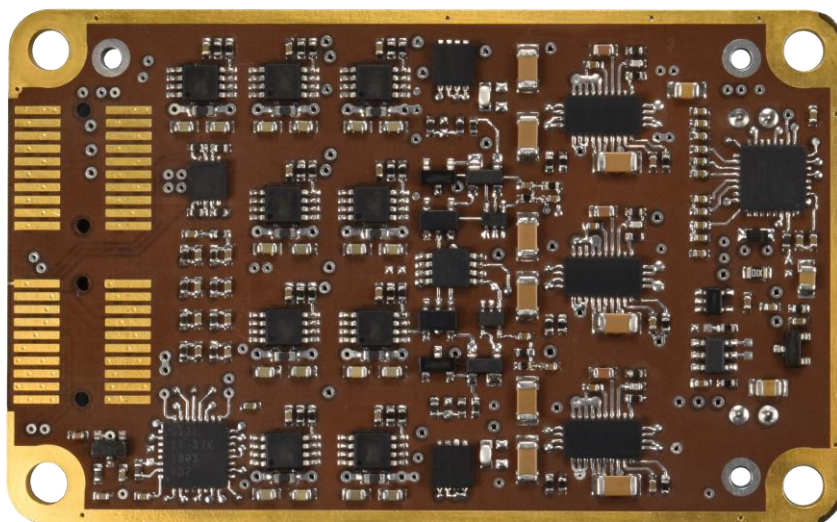


Figure 4 PDU module bottom

9 Disclaimer

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