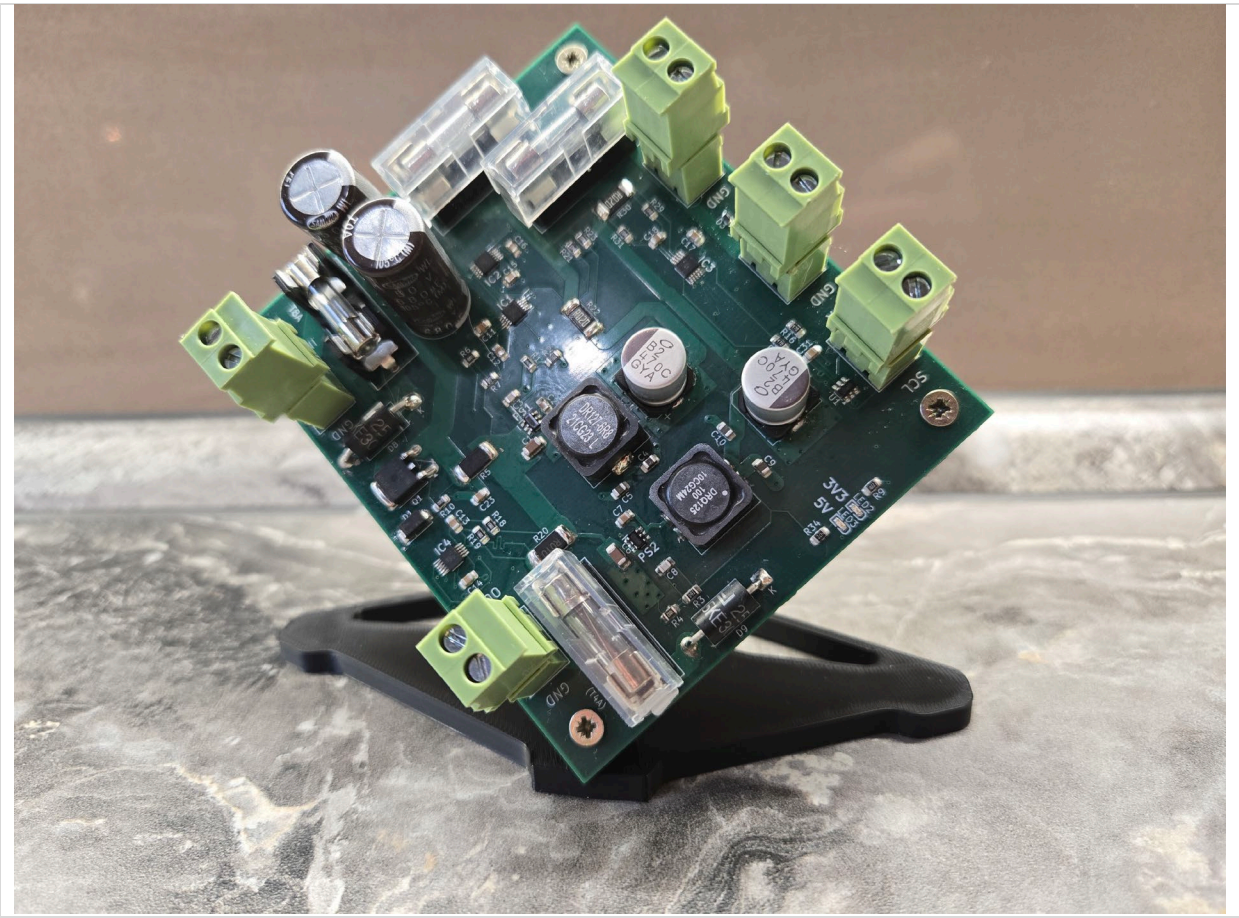
RZC CORE

POWER SENSE

Datasheet



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1. Product Overview

RZC CORE Power Sense is a power distribution, voltage conversion and monitoring module designed for embedded automation and control systems. The module accepts a **7–24 V DC input** and provides regulated **5 V and 3.3 V power rail** together with dedicated **high-current load output.**

Four independent power-monitoring channels allow measurement of voltage, current and power on the main input, load output and both regulated power rails.

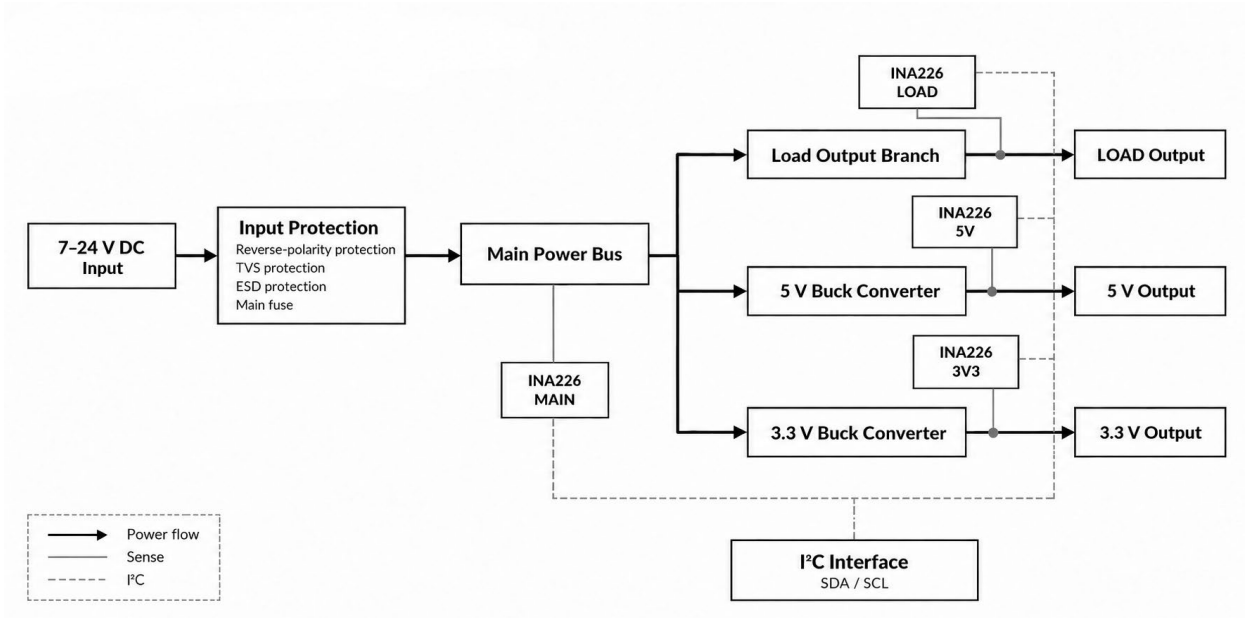
Integrated protection features include reverse-polarity protection, input transient suppression, branch fusing and protection for inductive loads.

Power Sense is designed as part of the **RZC CORE modular platform** and can be used together with RZC CORE control modules or integrated into other low-voltage embedded systems.

2. Features

- 7–24 V DC input voltage range
- Provides regulated 5 V and 3.3 V power rails together with a dedicated high-current load output.
- Four independent INA226 power-monitoring channels
- Voltage, current and power monitoring
- standalone embedded aplications
- I^2C monitoring interface
- Reverse-polarity protection
- Input transient suppression
- Individual branch overcurrent protection
- Inductive load protection
- 4-layer PCB design
- Pluggable terminal blocks for convenient installation and servicing
- Designed for RZC CORE control modules and standalone embedded aplications

3. Block Diagram



4. Absolute Maximum Ratings

Stresses beyond the absolute maximum rating may cause permanent damage to the device. Operation at these limits is not recommended

Input voltages above 24 V are outside the recommended operating range.

Note: The input TVS diode has a reverse stand-off voltage of 25.6 V. Operation near or above this voltage may result in increased TVS leakage current and is outside the recommended operating range.

Parameter	Symbol	Max	Unit
Input voltage	Vin	25.6	V
Load output current	Iload	4	A

5. Recommended Operating Conditions

Parameter	Symbol	Min	Typ	Max	Unit
DC input voltage	VIN	7	—	24	V
5 V output current	I5V	0	—	2	A
3.3 V output current	I3V3	0	—	2	A
Load output current	Iload	0	—	4	A
I^2C logic voltage	VI2C	—	3.3	—	V
Ambient operating temperature	TA	TBD	25	TBD	°C

Operation outside the recommended operating conditions may result in degraded performance or reduced reliability.

Maximum continuous output current may be limited by ambient temperature and thermal conditions.

6. Electrical Characteristics

Unless otherwise specified: Vin = 12 V, TA = 25 °C.

6.1 regulated Power Outputs

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
5 V output voltage	V5V	Iout = TBD mA	TBD	5.0	TBD	V
3.3 V output voltage	V3V3	Iout = TBD mA	TBD	3.3	TBD	V
5 V output ripple	Vripple_5V	Iout = TBD mA	—	TBD	—	mVpp

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
3.3V output ripple	Vripple_3.3V	Iout = TBD mA	—	TBD	—	mVpp
5 V efficiency	η5V	Vin = 12 V, Iout = TBD A	—	TBD	—	%
3.3 V efficiency	H3V3	Vin = 12 V, Iout = TBD A	—	TBD	—	%

6.2 Main / Load Path

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Load path voltage drop	Vdrop	Iload = TBD A	—	TBD	—	mV
Main path voltage drop	Vdrop	Imain = TBD A	—	TBD	—	mV
Equivalent path resistance	Rpath	—	—	TBD	—	mΩ

7. Power Monitoring

The RZC CORE Power Sense provides four independent power-monitoring channels based on the INA226 digital power monitor. Each channel measures bus voltage and shunt voltage and provides calculated current and power values through the I^2C interface.

The MAIN channel uses a 5mΩ shunt resistor, the LOAD channel uses 10 mΩ, and the 3V3 and 5V channels use 20 mΩ shunt resistors.

7.1 I^2C addresses

Channel	I^2C address	Monitored rail
MAIN	0x40	Input
LOAD	0x41	Load output
3V3	0x44	3.3 rail
5V	0x45	5 V rail

The I^2C addresses are predefined and no additional configuration is required. The addresses may be changed using the solder configuration pads on the back of the module. Refer to the Texas Instruments INA226 datasheet for supported address configurations.

7.2 accuracy

Channel	Shunt resistance	Current accuracy @ 25 °C	Equivalent current resulation	Bus voltage accuracy @ 25 °C	Bus voltage accuracy
MAIN	5 mΩ	±(1.1 % of reading + 2 mA)	0.5 mA/LSB	±(0.1 % of reading + 7.5 mV)	—
LOAD	10 mΩ	±(1.1 % of reading + 1 mA)	0.25 mA/LSB	±(0.1 % of reading + 7.5 mV)	—
3V3	20 mΩ	±(1.1 % of reading + 0.5 mA)	0.125 mA/LSB	±(0.1 % of reading + 7.5 mV)	±10.8 mV
5V	20 mΩ	±(1.1 % of reading + 0.5 mA)	0.125 mA/LSB	±(0.1 % of reading + 7.5 mV)	±12.5 mV

Current accuracy values are worst-case calculated values at 25 °C based on ±1 % shunt resistor tolerance and INA226 maximum gain and offset errors. No production calibration is applied.

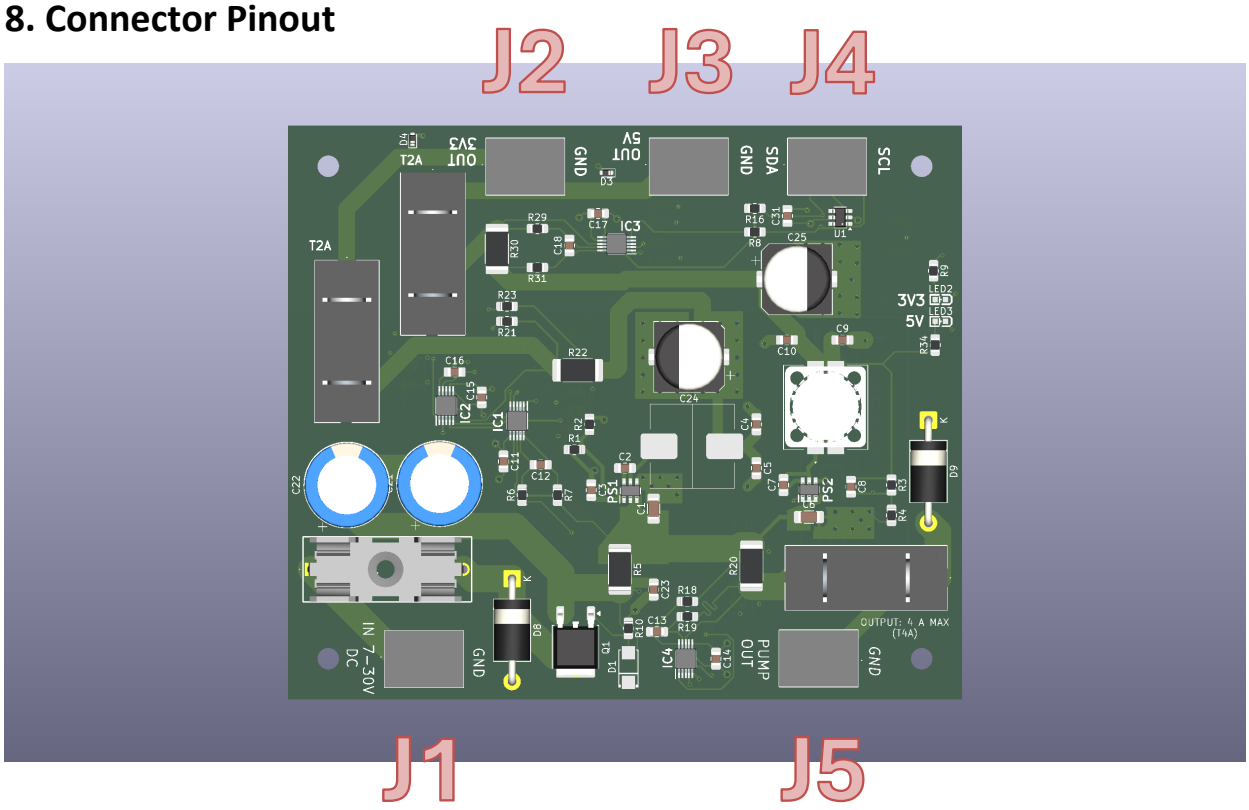
Shunt resistor TCR: 50 ppm/°C.

Resolution:

- **5 mΩ:** = 0.5 mA
- **10 mΩ:** = 0.25 mA
- **20 mΩ:** = 0.125 mA

Bus voltage measurement accuracy can be calculated as: ±(0.1 % of reading + 7.5 mV) at 25 °C.

8. Connector Pinout



Connector	signal	Description
J1	Vin + GND	DC input
J2	3V3 + GND	3.3V rail output
J3	5V + GND	5V rail output
J4	SDA + SCL	I²C interface
J5	LOAD OUT + GND	LOAD rail output

9. Protection Features

Interface / Path	Protection	Implementation
DC input	Reverse-polarity protection	P-channel MOSFET
DC input	Overcurrent protection	Main fuse

Interface / Path	Protection	Implementation
DC input	Transient suppression	1.5KE30A TVS diode, 1500 W pulse rating
Load output	Overcurrent protection	Dedicated branch fuse
Load output	Transient suppression	1.5KE30A TVS diode
Load output	Inductive load protection	Flyback / transient suppression
I²C interface	ESD protection	USBLC6-4SC6 protection array
3.3 V output	ESD protection	ESD5Z3V3
3.3 V output	Overcurrent protection	Dedicated branch fuse
5 V output	ESD protection	ESD5Z5V0
5 V output	Overcurrent protection	Dedicated branch fuse

ESD immunity target: IEC 61000-4-2 level 4, ±8 kV contact discharge and ±15 kV air discharge.

Note: System level ESD immunity of the complete module has not yet been independently tested or certified. Component-level ESD ratings do not guarantee equivalent system-level performance.

10. Typical Application

The RZC CORE Power Sense can be used as the central power distribution and monitoring module in low voltage embedded automation systems.

A typical installation uses a DC power source such as a battery, solar charge controller or regulated power supply connected to the main input. The module distributes power to the control electronics and external load while providing regulated 5 V and 3.3 V rails.

Integrated power monitoring channels allow the host controller to measure input, load, 5 V and 3.3 V rail voltage, current and power through the I²C interface.

Typical applications include greenhouse automation, remote monitoring systems, battery-powered controllers and low-voltage embedded equipment.

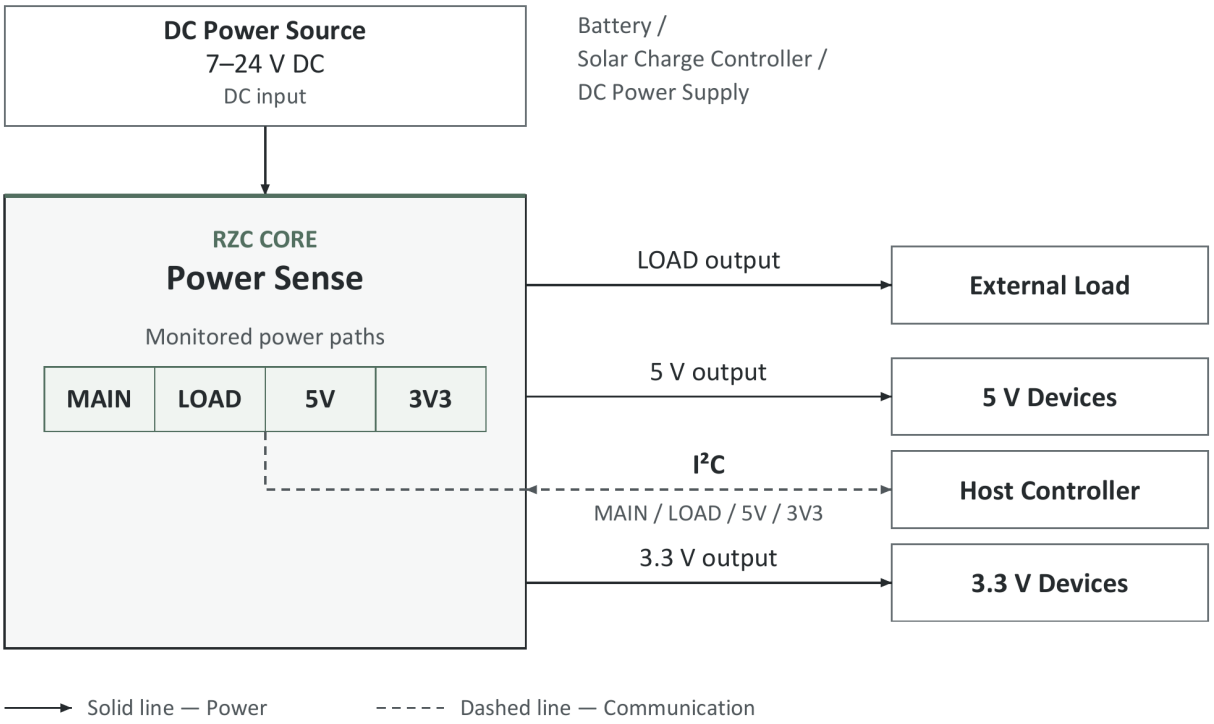


Figure 1. Typical Power Sense application in a low-voltage embedded system.

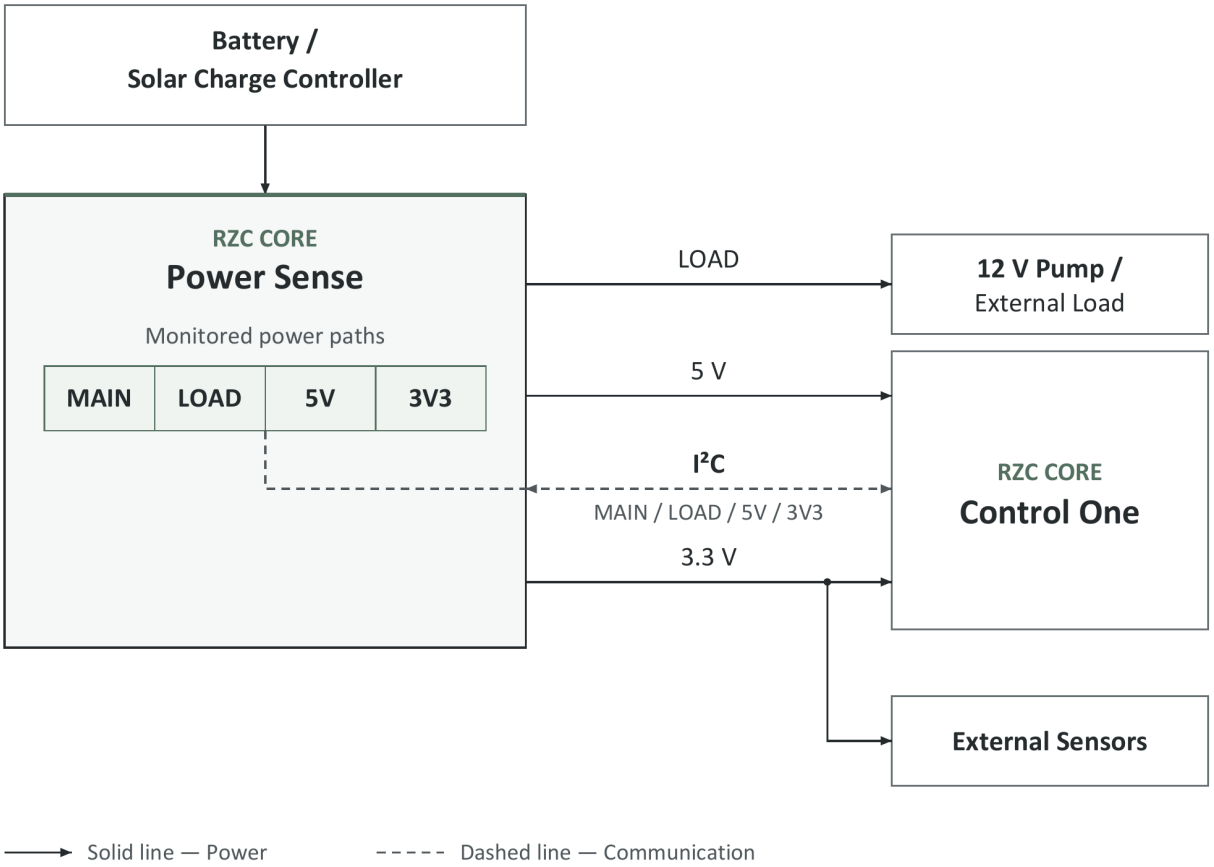
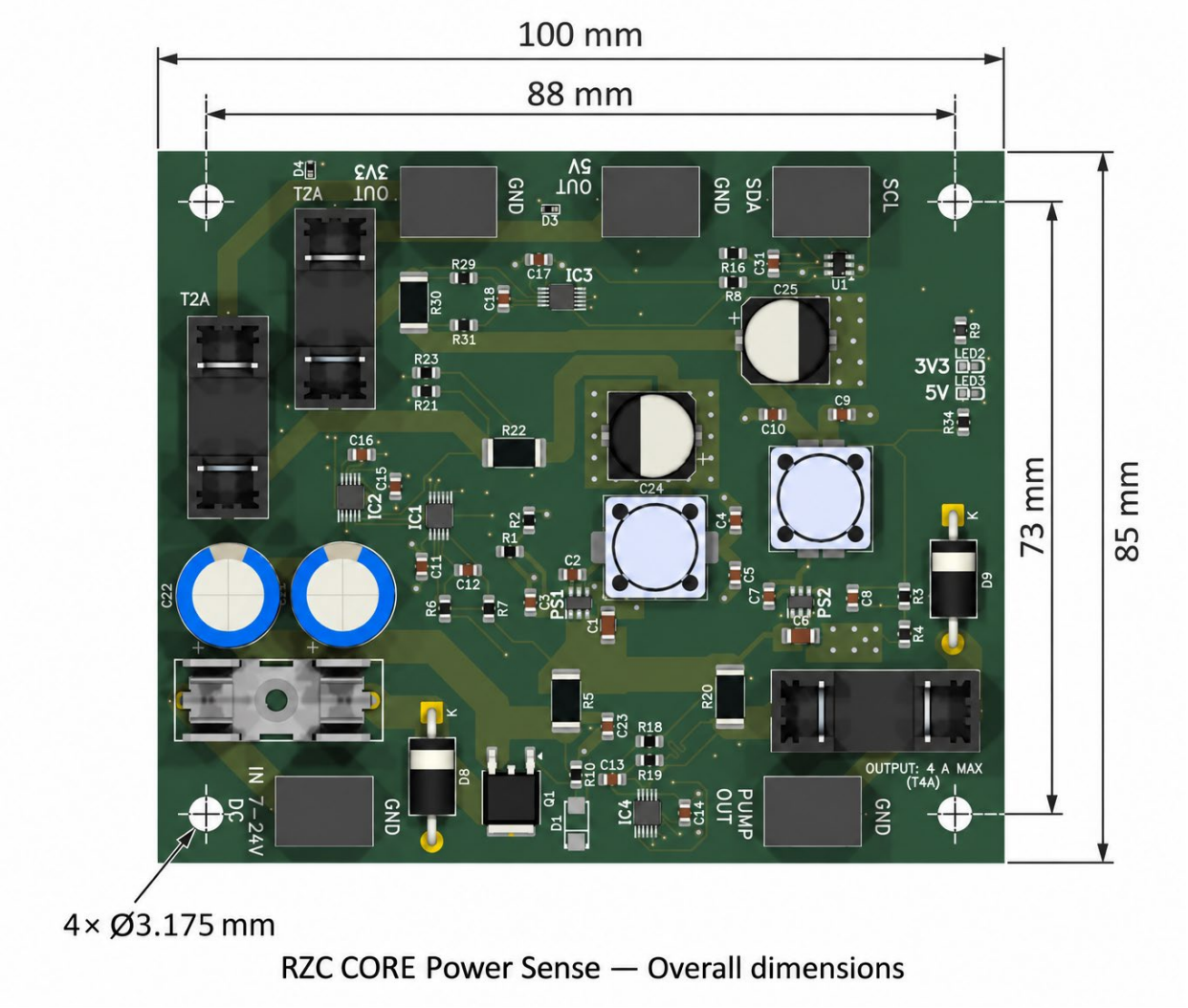


Figure 2. Example integration of Power Sense in an RZC CORE control system.

11. Mechanical Information



RZC CORE Power Sense — Overall dimensions

12. Ordering Information

Order code	Product name	Variant	notes
RZCPS-B	RZC CORE Power Sense	Standard	Fully assembled module

13. Revision History

Revision	Date	Description
0.1	October 2026	Preliminary