DMX ENGINEERING

casPower

INSTALLATION + COMMISSIONING GUIDE

Casambi-controlled H-bridge with two universal dry-contact I/O terminals

Hardware reference: casPower Board Rev. C / casDouglas platform

PRODUCT ROLE casPower drives a two-wire DC load in either polarity and provides two universal dry-contact I/O terminals. A Casambi profile assigns each terminal as an input or low-side output.

At a glance	Verified installation value
Power	12-24 VDC Class 2; polarity sensitive; 2 A maximum supply
Powered output	One H-bridge: Output A / Output B, up to supply voltage
Dry I/O	Two universal terminals; each supports dry input sensing or a low-side output up to 25 mA
Environment	Indoor, open-type device; keep antenna clear of metal

DOCUMENT VERSION 1.00

1 Product overview

casPower is a Casambi Bluetooth Low Energy node for powered DC loads. Its MP6612 H-bridge can energize, reverse, pulse, or PWM-control a two-wire load. Typical loads include reversible actuators, small DC motors, latching or conventional relays, and solenoids within the product ratings.

DO NOT USE Do not connect casPower to a constant-current LED-driver output. Power it from a polarity-correct 12-24 VDC Class 2 supply. Never apply external voltage to either Dry Contact I/O terminal.

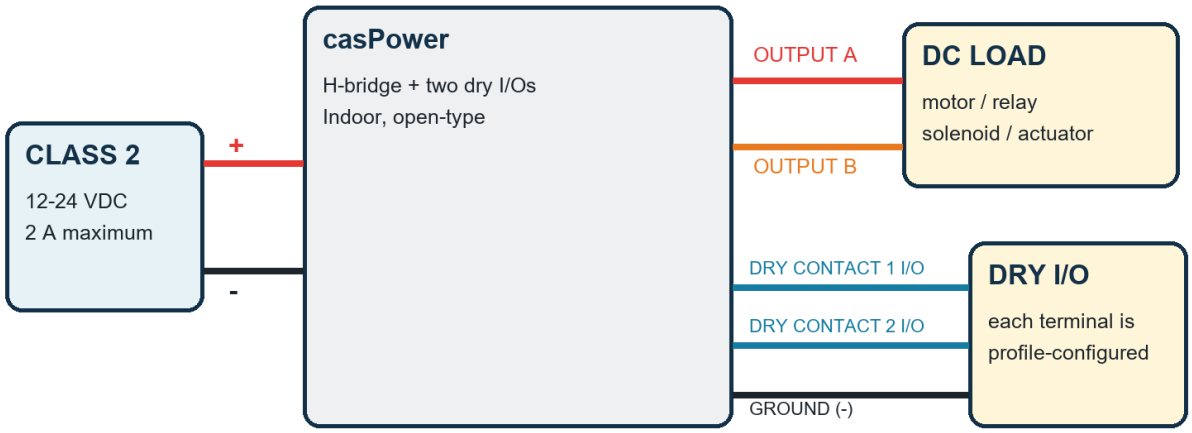
1.1 Technical data

Item	Rating / description
Supply	12-24 VDC Class 2, polarity sensitive
No-load current	30 mA typical
Supply / load current	2 A maximum application rating; select wiring and supply for load current
Powered output	Output A and Output B; reversible polarity; PWM approximately 20 kHz
Output voltage	Approximately the applied DC supply voltage, subject to driver losses and programmed PWM
Dry I/O inputs	Either I/O: dry switch to Ground (-); 100 ms static debounce; no external voltage
Dry I/O outputs	Either I/O: low-side electronic contact to Ground (-); 25 mA maximum; normal/inverted
Ambient / case	-25 to +45 C ambient; +75 C maximum case
Storage / humidity	-25 to +75 C; 0-80% RH, non-condensing
Dimensions / weight	72.6 x 30.0 x 18.0 mm including ears; 23 g
Wire / torque	14-22 AWG (0.5-1.5 mm2); strip 6-7 mm; 0.4 N-m (2.6 lb-in)
Radio	Fanstel BT840E Casambi module, 2.4 GHz BLE

1.2 Mechanical placement

Mount with terminal openings accessible and the label visible. Keep the radio/antenna end clear of metal, dense wiring, and grounded enclosures. Use a listed nonmetallic enclosure when enclosure protection is required.

2 Terminals and typical wiring



Never apply external voltage to either Dry Contact I/O terminal.

2.1 Terminal mapping

Position	Signal	Field connection
Power +	+12 to +24 VDC	Class 2 supply positive
Power -	Ground / 0 V	Class 2 supply negative and dry-I/O common
1	Output A	First H-bridge load lead
2	Output B	Second H-bridge load lead
3	Dry Contact 1 I/O	Profile-configured dry input or low-side output; source channel 0
4	Dry Contact 2 I/O	Profile-configured dry input or low-side output; source channel 1
5	Ground (-)	Common reference for both dry-contact I/O terminals

OUTPUT POLARITY Forward is Output A positive with respect to Output B. Reverse is Output B positive with respect to Output A. Confirm the desired mechanical direction before final commissioning.

2.2 Load compatibility

- Use loads designed for the applied 12-24 VDC supply.
- For inductive loads, keep the wiring short and follow the load manufacturer's suppression requirements. Do not place a single flyback diode directly across a load that must reverse polarity.
- Use Max Duty and Hold PWM only after confirming the load can operate safely at the selected duty cycle.
- The firmware monitors the H-bridge nFAULT input and releases the output on a hard fault; it automatically retries the last command after the fault clears.

3 H-bridge control modes

Mode	Network level behavior	Powered-output result
Maintained	0 = off; nonzero = on	Holds the selected base polarity. Optional full-duty pull-in then reduced Hold PWM.
Momentary	Nonzero command triggers	Full-duty one-shot pulse for Pulse Duration, then output coasts.
Reversing	0-127 reverse; 128 off; 129-255 forward	Bipolar maintained control; distance from 128 sets PWM duty.
PWM Dim	0 off; 1-255 increasing output	Unipolar PWM in the selected base polarity; capped by Max Duty.

3.1 Direction and electrical state

Commanded state	Output A	Output B	Driver action
Forward	+ / PWM	-	A positive, B negative
Reverse	-	+ / PWM	B positive, A negative
Off	High impedance	High impedance	nSLEEP low; output coasts
Brake	Low	Low	Driver awake with enable low; firmware-internal state

3.2 Output parameters

Parameter	Range / options	Default	Use
Output Mode	Maintained / Momentary / Reversing / PWM Dim	Maintained	Selects the command-to-output transfer function
Polarity	Forward / Reverse	Forward	Base direction for maintained, momentary, and PWM Dim
Pulse Duration	16-bit milliseconds	500 ms	Momentary on-time
Pull-In Time	16-bit milliseconds; 0 disables	0 ms	Full-duty solenoid pull-in period
Hold PWM	0-100%; 0 or 100 = full	Full	Reduced steady drive after pull-in
Max Duty	1-100%	100%	Caps PWM Dim and Reversing duty
Default State	Off / On / Last	Off	Power-up or restore behavior
Invert Network	Normal / inverted	Normal	Inverts on/off semantics in maintained/momentary modes

LOAD SAFETY Start with Max Duty = 100%, Pull-In Time = 0, and Hold PWM = full unless the connected load's datasheet explicitly supports reduced-duty holding. Verify current and temperature under worst-case supply voltage.

4 Installation procedure

Step 1 **De-energize the circuit.** Verify the Class 2 source is off and the load cannot move unexpectedly.

Step 2 **Mount the controller.** Use the mounting ears or a listed nonmetallic enclosure. Keep the radio end clear of metal.

Step 3 **Connect the load.** Land its two leads on Output A and Output B. Do not bond either output lead to Ground (-).

Step 4 **Connect each dry I/O for its selected profile role.** Inputs use a dry contact to Ground (-). Outputs connect only to a compatible contact-sense input and are limited to 25 mA. Never inject voltage into either terminal.

Step 5 **Connect Class 2 power.** Observe polarity and use a supply rated for the connected load without exceeding the 2 A application limit.

Step 6 **Inspect before power-up.** Check conductor strands, torque, polarity, load freedom of movement, and antenna clearance.

Step 7 **Power and test at low risk.** Begin with the load uncoupled or mechanically safe, then verify forward, reverse, off, and fault recovery as applicable.

Installer pre-power checklist

Verification	Done
Supply is 12-24 VDC Class 2 and polarity is correct	[ ]
Load voltage/current are within ratings	[ ]
Neither Output A nor Output B is tied to ground	[ ]
Dry Contact 1 I/O and 2 I/O have no external voltage	[ ]
Terminal torque and strand containment are verified	[ ]
Load motion is mechanically safe	[ ]
Radio end is outside metalwork or adequately clear	[ ]

5 Add casPower to the Casambi app

Use the standard Casambi App for normal commissioning. Select the intended profile before pairing whenever practical; a later profile change can alter controls, scenes, and automations.

5.1 Known output-mode profile

Profile	ID	Code	Type	Purpose
casPower - 1Out	49484	CB01	EXT/Elements	Current released profile; exposes one dry I/O as an output element

5.2 Two-I/O profile placeholders

TBD - TWO-I/O PROFILES Firmware 1.00 supports both universal terminals, but Casambi profiles that expose input roles and both simultaneous I/O channels have not yet been supplied. Add the approved profile names, database IDs, codes, element order, and screenshots here before field release. Do not assume casPower - 1Out exposes an input or I/O 2.

5.3 Pairing sequence

Step 1 **Power casPower.** Confirm it appears under More > Nearby devices while within Bluetooth range.

Step 2 **Select the profile.** Choose casPower - 1Out only for its documented single dry-output configuration. Use future approved profiles for input roles or simultaneous I/O 1/I/O 2 operation.

Step 3 **Add to the network.** Select the project network and enter authorized credentials if prompted.

Step 4 **Name the device.** Use a schedule-based identifier that includes the controlled load or location.

Step 5 **Test every element.** Exercise powered output direction/duty and the applicable dry I/O function.

Step 6 **Record the result.** Capture profile name/ID, network, output parameters, and acceptance-test results.

6 Digital input and output definitions

casPower uses the same NED digital-I/O definitions and Gang protocol as casIO4. Firmware 1.00 implements the complete control set independently for I/O 1 and I/O 2, even though the Casambi profiles needed to expose input roles and both channels have not yet been released.

DRY CONTACT INTERFACE Each Dry Contact I/O can be used as an input or a low-side electronic output according to the selected profile. Inputs accept only a contact closure to Ground (-). Outputs connect only to a compatible equipment contact-sense input, with current at or below 25 mA. Never use either terminal for line voltage.

6.1 Electrical definitions

Function	Wiring	Electrical behavior
Either I/O as input	Switch, relay contact, or open-drain collector between the selected I/O and Ground (-)	Closed contact is sensed active through the NFET buffer; no external source may be applied
Either I/O as output	Equipment contact-sense input to the selected I/O; sense common to Ground (-)	Low-side electronic closure, 25 mA maximum interface current; released state is open
Ground (-)	Common reference for Dry Contact 1 I/O and Dry Contact 2 I/O	Use only as the dry-interface common; do not use Output A or B as the reference

6.2 Exact vendor-parameter index map

Index	Suggested label	Purpose	Default
8	I/O 1 - Input Action	Standalone normal/inverted or Gang 1-10	0
9	I/O 1 - Input Mode	Follow, toggle, hold, or double-tap behavior	0
10	I/O 1 - Output Polarity	Normal or inverted electronic-contact state	0
11	I/O 2 - Input Action	Standalone normal/inverted or Gang 1-10	0
12	I/O 2 - Input Mode	Follow, toggle, hold, or double-tap behavior	0
13	I/O 2 - Output Polarity	Normal or inverted electronic-contact state	0

INDEX CONTROL I/O 1 uses indices 8-10 and I/O 2 uses 11-13. These are part of the firmware/Casambi interface and must not be reordered in future fixture definitions. Friendly labels may change; numeric values must remain exact.

6.3 Input Action - what the contact controls

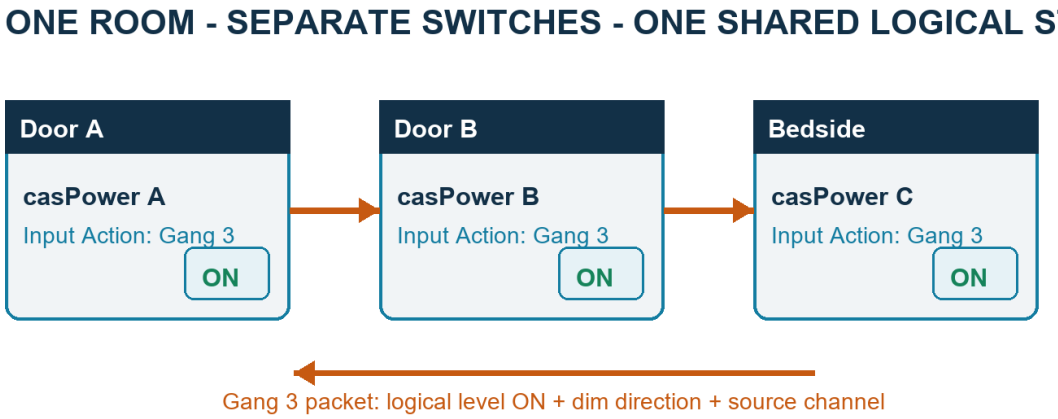
For each terminal assigned as an input, Input Action decides whether it controls its own mapped Casambi PushButton or participates in a numbered Gang shared with compatible NED Casambi devices. I/O 1 reports source channel 0; I/O 2 reports source channel 1.

Value	Suggested label	User-facing behavior
0	Standalone - Normal	Closed contact reports ON; open contact reports OFF.
1	Standalone - Inverted	Closed contact reports OFF; open contact reports ON.
2	Gang 1	Shares state with every compatible input set to Gang 1.
3	Gang 2	Shares state with every compatible input set to Gang 2.
4	Gang 3	Shares state with every compatible input set to Gang 3.
5	Gang 4	Shares state with every compatible input set to Gang 4.
6	Gang 5	Shares state with every compatible input set to Gang 5.
7	Gang 6	Shares state with every compatible input set to Gang 6.
8	Gang 7	Shares state with every compatible input set to Gang 7.
9	Gang 8	Shares state with every compatible input set to Gang 8.
10	Gang 9	Shares state with every compatible input set to Gang 9.
11	Gang 10	Shares state with every compatible input set to Gang 10.

GANG NUMBERS Gang 1 through Gang 10 are identifiers, not physical terminal or channel numbers. Use the same value on every input that must stay synchronized and a different value for each independent group.

6.4 Why MultiSwitch Gangs exist

A MultiSwitch Gang is used when two or more separated wall stations control the same room or function. No traveler wire is required between stations. Compatible NED devices exchange a vendor packet over the Casambi network so every member remembers the same logical level and dim direction.



THE PROBLEM IT SOLVES Without Gang synchronization, a remote switch may remember OFF after another station turned the room ON. Its first operation then changes only stale local memory, so the user sees no change and must operate it again. With synchronization, every member already remembers ON and the next single operation commands OFF as expected.

6.5 What happens when a Gang member is operated

Step 1 **A user operates one switch.** casPower calculates the new shared logical level and, for toggle-dim modes, the current dim direction.

Step 2 **casPower transmits a Gang packet.** The vendor message carries Gang ID, level, direction, and the operated source channel (0 for I/O 1 or 1 for I/O 2) over the Casambi network.

Step 3 **Every matching member updates its memory.** Powered compatible inputs assigned to that Gang accept the shared level; alternating-dim members also update next direction.

Step 4 **The operated input reports its PushButton level.** The mapped Element, scene, or Casambi control performs the intended action while the Gang packet aligns the other stations.

Step 5 **The next station starts from shared state.** One operation at any member produces the expected opposite command with no catch-up operation.

6.6 Gang packet fields

Gang field	Behavior
Gang ID	Input Action values 2-11 correspond to Gang 1-10. Receivers synchronize by Gang ID, not by physical channel.
Level	0-255 shared logical level. Follow/toggle edges use the endpoints; dim modes distribute intermediate levels.
Direction	Carries up/down state for alternating dimming so separated stations continue in the expected direction.
Source channel	I/O 1 transmits channel 0 and I/O 2 transmits channel 1. The sender also reports that PushButton channel's level.
Receiver action	Every powered compatible member assigned to the same Gang updates stored network level even though its local contact did not operate.

NOT A CASAMBI LUMINAIRE GROUP A MultiSwitch Gang synchronizes internal switch memory. It is separate from a normal Casambi luminaire group, scene, or Element mapping. The Gang keeps stations in step; the mapped Casambi function determines what is controlled.

6.7 Match the physical switch type

Switch type	Recommended Input Mode	Gang behavior
Maintained wall switch	On / Off (follow contact)	Either physical transition toggles shared state; lever positions at separated stations do not need to match
Momentary pushbutton	Toggle (each press)	Debounced closure toggles once; release does not create a second toggle
Hold-to-dim button	Hold brighten / dim / alternating	Level changes while held; alternating mode coordinates the next ramp direction
Standalone input	Input Action 0 or 1	No Gang packet; input controls only its mapped Casambi function

6.8 Input Mode - how the contact is interpreted

Value	Suggested label	Best with	Behavior
0	On / Off	Maintained switch	Standalone follows contact; in a Gang, each transition toggles shared state
1	Toggle	Momentary button	Each debounced closure toggles; release does not toggle
2	Hold to brighten	Momentary button	Level rises while held; release stops ramp
3	Hold to dim	Momentary button	Level falls while held; release stops ramp
4	Hold alternating	Momentary button	Each new press reverses ramp direction
5	Double-tap to full	Momentary button	Hold brightens; double-tap ramps to maximum
6	Double-tap to off	Momentary button	Hold dims; double-tap ramps to off
7	Double-tap to ends	Momentary button	Hold alternates; double-tap ramps to selected endpoint

SWITCH MATCHING Start maintained switches with On / Off and momentary pushbuttons with Toggle. Use hold or double-tap only when intentional and when the future input profile exposes a compatible PushButton element.

6.9 Output Polarity - what ON means

Value	Suggested label	Electrical result
0	Normal (closed when on)	Casambi ON closes the selected I/O to Ground (-); OFF releases it
1	Inverted (open when on)	Casambi ON releases the selected I/O; OFF closes it to Ground (-)

6.10 Common digital-I/O configurations

Use case	Input Action	Input Mode	Output Polarity	Expected result
Maintained local switch	Standalone - Normal	On / Off	Normal	Closed = on; open = off
Momentary local button	Standalone - Normal	Toggle	Normal	Each press toggles
Maintained multi-location	Same Gang n on all	On / Off	As required	Every switch transition toggles Gang
Momentary multi-location	Same Gang n on all	Toggle	As required	Each button closure toggles Gang
Press-and-hold dimmer	Standalone or same Gang n	Hold alternating	As required	Hold ramps; next press reverses
Equipment contact input	Input settings unused	Input settings unused	Normal	Casambi ON closes to Ground (-)

PROFILE DEPENDENCY These definitions are complete for both terminals at the firmware level. Input operation and simultaneous I/O 1/I/O 2 control remain engineering-only until approved Casambi profiles expose the required PushButton and output elements. casPower - 1Out remains the documented single-output choice.

6.11 Commission the entire Gang

- Turn the controlled function ON at station A, then operate station B once; it must turn OFF on that first operation.
- Repeat among every pair of stations and prove that only the intended Gang members respond.
- For dim modes, prove level direction, release behavior, double-tap endpoints, and alternating-direction memory.
- Repeat after network recovery, power cycling, device replacement, and any profile or parameter change.

7 Startup and acceptance testing

Check	Acceptance requirement
Power	12-24 VDC is present and casPower remains visible in the app
Network	Device is paired to the correct network with a project-standard name
Profile	Profile name/ID matches the intended dry-I/O role
Off	Output A/B coast and the load is de-energized
Forward	Load moves/energizes in the recorded forward direction
Reverse	Reversing mode produces the opposite direction without mechanical binding
PWM / hold	Duty-limited operation is stable; load current and temperature are acceptable
I/O 1 input/output	Approved profile reports input behavior or changes the target contact-sense input as assigned
I/O 2 input/output	Approved two-I/O profile reports input behavior or changes the target contact-sense input as assigned
Fault	A simulated safe fault/overload releases output and normal operation recovers only as expected
Mesh	Control succeeds from representative occupied locations

7.1 Troubleshooting

Symptom	Likely cause	Corrective action
Not visible	No/incorrect power; already paired; poor radio path	Measure input voltage, move phone closer, and check network status
Pairs but no load response	Wrong profile/mode; output disabled; wiring error	Verify profile, Output Mode, Output A/B wiring, and network level
Direction reversed	Load leads or Polarity setting reversed	Swap A/B leads with power off, or change Polarity and re-test
Pulse too short/long	Pulse Duration mismatch	Set the approved millisecond value and repeat full-load test
Load drops out / overheats	Hold PWM or Max Duty unsuitable; supply sag	Restore defaults, measure voltage/current, and verify load datasheet
Dry input inactive	Output-only profile selected; wrong I/O element; no ground closure	Use an approved input profile when released; verify closure to Ground (-) and channel mapping
Dry output inactive	Profile does not expose that I/O; wrong element/polarity; incompatible circuit	Verify profile element order and polarity; test only with a <=25 mA contact-sense input
Repeated faults	Overload, short, stall, wiring fault	De-energize immediately; isolate load and correct the cause before retry

8 Engineering reference and closeout

8.1 PSoC 4 pin mapping

PIN MAP VERIFIED The supplied PSoC pin-assignment view confirms IN_P at P1[2] and IN_N at P2[2]. Rev. C schematic nets and the successful PSoC Creator firmware build confirm both universal dry-I/O mappings below.

Function	PSoC pin	Board / firmware role
IN_P / PWM enable	P1[2]	MP6612 enable/PWM input; verified in PSoC pin assignment
IN_N / direction	P2[2]	MP6612 direction input; verified in PSoC pin assignment
SLEEP	P0[2]	MP6612 nSLEEP output
FAULT	P0[3]	MP6612 nFAULT input, active low
VISEN	P0[6]	H-bridge current-sense ADC input
VSENSE	P2[6]	Supply/load voltage-sense ADC input
DRY_IN_1	P0[1]	I/O 1 buffered contact sense
DRY_OUT_1	P0[0]	I/O 1 low-side output MOSFET gate
DRY_IN_2	P4[3]	I/O 2 buffered contact sense; explicitly initialized in firmware
DRY_OUT_2	P4[2]	I/O 2 low-side output MOSFET gate; explicitly initialized in firmware
DRYOUT_RELAY	P3[0]	Casambi module relay-output sense
UART RX / TX	P4[0] / P4[1]	BT840E Casambi serial interface

8.2 Closeout record

Field	Project record
Project / area	
casPower name in app	
Casambi network	
Profile name / ID	
Controlled load	
Output mode / polarity	
Pulse / pull-in / hold / max duty	
I/O 1 role / input mode-action / output polarity	
I/O 2 role / input mode-action / output polarity	
Commissioned by / date	

8.3 Regulatory and installation notes

- Indoor use only. Install as an open-type Class 2 device in accordance with the National Electrical Code and applicable local requirements.
- Operation is subject to the two FCC Part 15 conditions: the device may not cause harmful interference and must accept interference received, including interference that may cause undesired operation.
- Changes or modifications not expressly approved by DMX Engineering may void the user's authority to operate the equipment.
- Maintain at least 20 cm separation between the radio antenna and users or bystanders where required by the approved installation configuration.
- Use the current product label for applicable certification marks and radio identifiers. The Rev. C design uses the Fanstel BT840E radio module.

8.4 Technical support

DMX Engineering LLC
1908 N. 101st Place
Mesa, Arizona 85207
480-993-7972
sales@dmx.engineering
https://dmx.engineering

8.5 Product identification and certification label

casPower uses the controlled Fanstel bottom-label treatment shared with casIO4 and casTen. It carries the ETL/CSA, CE, IP20, WEEE, indoor-use, ambient, nRF52840/BT840 radio, and UL/CSA conformity markings shown below.

LABEL CONTROL Use this image as the controlled bottom-label artwork reference. Confirm that the internal- or external-antenna Fanstel variant installed in shipped casPower hardware matches the applicable FCC identifier before print release; do not redraw certification marks.

TWO-I/O PROFILE STATUS Casambi input-mode and simultaneous two-I/O profile names, IDs, codes, element order, and selection screenshots remain placeholders. The documented casPower - 1Out profile supports one output element; firmware 1.00 already supports both physical I/O channels.