## Description

The CAM622 Multi Comms Board is built around CambridgeIC's CAM622 resonant inductive processor IC, whose purpose is to measure the position of a contactless moving target relative to a sensor that it is connected to.

The CAM622 Multi Comms Board connects to a Type B sensor, which measures the position of an adjacent Type B target. The sensor and target are both built from conventional PCBs.

The CAM622 energises the sensor, detects signals induced in sensor coils by the target, and processes them to determine position every 30µs.

The board includes an SPI interface connector used for programming and to communicate with host SPI devices. SPI signaling and power are 3.3V.

The board also includes a Multi Comms connector including three 5V differential IOs. These support multiple communication interface options:

- An ABN interface allows the board to emulate an incremental optical encoder with quadrature (AB) and index (N) outputs. Configuration is fully programmable over SPI including the number of cycles per revolution and index pulse position.
- A point to point BiSS-C interface allows a host device to read absolute position values at high speed. Diagnostic data is also transmitted at a lower rate. The BiSS-C protocol is implemented with an iC-Haus iC-MCB IC.
- A simple SSI interface, also implemented with the iC-MCB IC.
- SENT, typically used for automotive applications.

The board includes an efficient 5V to 3.3V regulator. 5V power supply is applied by the host through the Multi Comms connector. The 5V power also supplies differential line driver/receiver ICs.

Please refer to the CAM622 datasheet for features and specifications of the CAM622, and to the appropriate sensor datasheet for sensor details and performance.

A Multi Comms Adapter is also available that connects to the CAM622 ABN Board over either SPI or BiSS-C, and to a PC over USB. CAM622 Configuration Tool and Read Position PC software is available for configuring the CAM622 and viewing measurement results.

## Performance

- 4.5V to 5.5V supply
- 90mA supply current from 5V generating ABN
- Board operating temperature -40°C to +125°C
- Up to 16 bits of AB edge resolution

| **Product identification** | |
|---|---|
| **Part no.** | **Description** |
| 013-5043 | CAM622 Multi Comms Board |
| 013-6019 | 6-way dual PicoBlade Sensor Cable |
| 013-6020 | PicoBlade SPI Cable |
| 013-6024 | Dual PicoBlade SPI Cable |
| 013-6023 | PicoBlade Multi Comms Cable |
| 013-5044 | Multi Comms Adapter |

## Features

- CAM622 Resonant Inductive Encoder IC
- Efficient 5V to 3.3V regulator
- Fully programmable configuration, non-volatile
- Status indication with LED
- SPI interface for configuration or host comms
- RS422 style differential line driver / receivers.

## Applications

- Prototyping CAM622 based applications
- Optical encoder replacement
- Magnetic encoder replacement
- CAM622 processor board with SPI interface
- Reference design for CAM622 circuitry

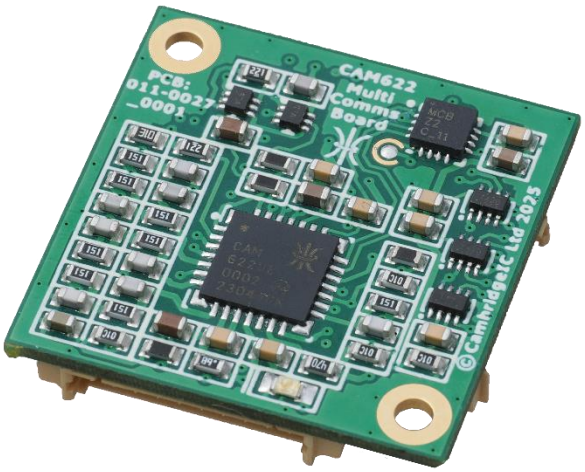


**Figure 1 CAM622 Multi Comms Board, Top**

# 1 Mechanical Design

Figure 2 shows the mechanical design of the CAM622 Multi Comms Board.

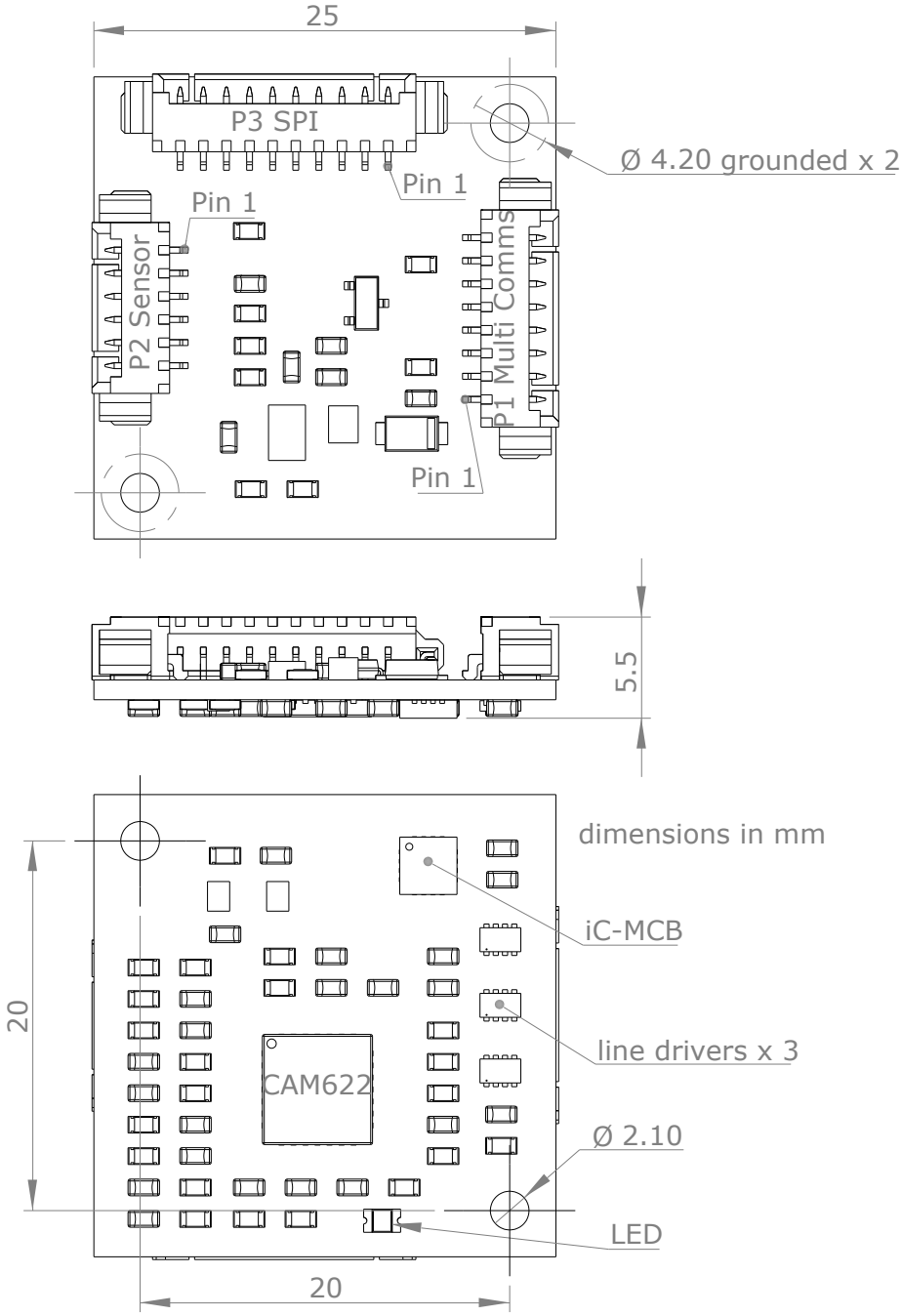


**Figure 2 CAM622 Multi Comms Board mechanical layout**

The areas immediately around the mounting holes are connected to GND both sides of the PCB. The board should not be screwed to a metal object with metal (conductive) screws unless it is acceptable for that object to become connected to 0V / ground.

# 2 Specifications

## 2.1 Electrical

**Table 1 Electrical Specifications**

| Parameter | Min | Max | Comments |
|---|---|---|---|
| Supply voltage range, 5VIN | 4.5V | 5.5V | |
| Current draw from 5VIN | | 90mA | ABN edge rate 4.5MHz, no load |

## 2.2 Thermal

The CAM622 Multi Comms Board is designed to demonstrate the CAM622 operating across its full temperature range, see Table 2.

**Table 2 Thermal Specifications**

| Parameter | Value | Comments |
|---|---|---|
| Minimum board operating temperature | -40°C | |
| Maximum board operating temperature | 125°C | Board temperature, not ambient<br>Connectors only rated to +105°C, may fail with long-term use at higher temperature<br>LED only rated to +85°C, may fail with long-term use at higher temperature |

For applications requiring continuous operation at high temperature, a customer may create their own design with alternative connectors and omit the LED, using the CAM622 Multi Comms Board as a reference.

Note that the temperature extremes specified in Table 2 relate to board temperature and not ambient. If the board is to be used in an environment above 100°C then the board must be mounted to provide a good thermal contact with the environment, to prevent board temperature from exceeding the maximum specified.

## 2.3 CAM622 Specifications

Please refer to the CAM622 datasheet for full details of the CAM622 including:

- Principle of operation
- Performance specifications
- Details of the ABN and SPI interfaces
- How to communicate with the CAM622 over SPI
- How to program the CAM622 for stand-alone operation over SPI

# 3 Connector Pin-Outs

The locations and identifiers for connectors and their pin numbering are shown in Figure 2. Table 3 lists details for these connectors to assist in specifying mating parts. Table 4, Table 5 and Table 6 list signal names and pinouts.

**Table 3 Connector details**

| Identifier | Description | Manufacturer and part number |
|---|---|---|
| P1 | 8-way PicoBlade | MOLEX 53261-0871 |
| P2 | 6-way PicoBlade | MOLEX 53261-0671 |
| P3 | 10-way PicoBlade | MOLEX 53261-1071 |

**Table 4 5VIN and ABN Connector (P1) pinout**

| Pin | Signal | ABN function | BiSS-C function | SSI | SENT function |
|---|---|---|---|---|---|
| 1 | 5VIN | Supply voltage input (5V) | | | |
| 2 | 0V | Ground, supply voltage return (0V) | | | |
| 3 | A+ | Quadrature A signal | MA+ | Clock+ | Not connected |
| 4 | A- | | MA- | Clock- | |
| 5 | B+ | Quadrature B signal | SLO+ | Data+ | SENT |
| 6 | B- | | SLO- | Data- | Not connected |
| 7 | N+ | Index pulse | Not connected | Not connected | |
| 8 | N- | | | | |

**Table 5 Sensor Connector (P2) Pinout**

| Pin | Signal | Description |
|---|---|---|
| 1 | SINA | SINA sensor coil connection |
| 2 | VREF | Common return for all coils |
| 3 | COSA | COSA sensor coil connection |
| 4 | SINB | SINB sensor coil connection |
| 5 | COSB | COSB sensor coil connection |
| 6 | EX | Excitation coil connection |

**Table 6 SPI Connector (P3) Pinout**

| Pin | Signal | Description |
|---|---|---|
| 1 | VS3V3 | Supply voltage input (3.3V) |
| 2 | | No connection |
| 3 | SI | Sample indicator output |
| 4 | EXT | Configurable digital output |
| 5 | 0V | Ground, supply voltage return (0V) |
| 6 | SDI | Serial Data In to CAM622 |
| 7 | nCS | Chip Select in to CAM622 |
| 8 | SCK | Serial Clock in to CAM622 |
| 9 | SDO | Serial Data Out from CAM622 |
| 10 | nRST | CAM622 Reset input |

The SPI Connection is only used for programming or operation over SPI. It is disconnected when the CAM622 ABN Board is generating ABN outputs from a 5V supply in normal operation.

# 4 Electronic Design

The CAM622 Multi Comms Board's schematic is shown in Figure 4. Figure 5 shows how components are arranged on the top of the PCB, and Figure 6 shows how components are arranged on the bottom of the PCB.

## 4.1 CAM622 Circuitry

The circuitry surrounding the CAM622 is as specified in its datasheet. This includes excitation circuitry for generating the EX signal for powering the sensor, and circuitry for low-pass filtering signals returned by the sensor. Please refer to the CAM622 datasheet for more details.

## 4.2 Power Supply

The 5V to 3.3V step-down power supply is built around U1, the TPS628113HQWRWYRQ1 from Texas Instruments. This device achieves high efficiency with small external components.

Due to the relatively low current draw of the CAM622 Multi Comms Board, U1 operates in its power save mode. When the VS3V3 output falls below a threshold value, it connects the SW output to VIN, raising the output voltage. It then connects SW to 0V while current in inductor L1 decays to zero. At that point SW is held open circuit until the output voltage falls below the threshold again. This mode of operation yields a variable switching frequency in the region of 250kHz.

Ripple on VS3V3 is filtered further by the combination of R3 and C11 to yield the CAM622 power supply voltage VDD. It is then filtered again by R10 and C10 to yield the analog supply voltage AVDD.

When the CAM622 MultiComms Board is powered from 3.3V applied to P3's VS3V3 (Table 6) and there is no connection to P1's 5VIN (Table 4), the regulator is inactive. The 5V net's EMF typically drops to 2.7V, and pulls the regulator's EN signal high. This high state on EN is important since it avoids a mode where the regulator is completely shut off and draws excessive current.

A customer must not connect to P1's 5VIN and P3's VS3V3 simultaneously. The only exception is when both are connected to a MultiComms Adapter, which is designed to work with both supplies connected together.

## 4.3 Line Drivers/Receivers

The CAM622 Multi Comms Board includes three THVD1420 differential line driver/receiver devices. The CAM622's A0 and A1 lines are used to control direction, which are configured depending on the interface according to Table 7:

**Table 7 Line Driver Direction Controls by interface**

| Interface | A0 (BDE) | A1 (ABEN) | Description |
|---|---|---|---|
| ABN | 1 | 1 | U5, U6, U7 THVD1420 devices act as line drivers, converting 3.3V logic level LA, LB and LN signals to 5V differential RS422 style signals on A+/A-, B+/B- and N+/N |
| BiSS-C | 1 | 0 | U5 THVD1420 device acts as a receiver for the BiSS-C MA inputs applied to A+ and A-<br>U6 THVD1420 device acts as a transmitter for the BiSS-C SLO outputs B+ and B- |
| SSI | 1 | 0 | U5 THVD1420 device acts as a receiver for the SSI clock inputs applied to A+ and A-<br>U6 THVD1420 device acts as a transmitter for the SSI data outputs B+ and B- |
| SENT | 1 | 1 | U6 THVD1420 device acts as a transmitter for SENT data output on B+ |
| SPI | 1 | 1 | U5, U6, U7 THVD1420 parts act as line drivers and output default states on A+/A-, B+/B- and N+/N |

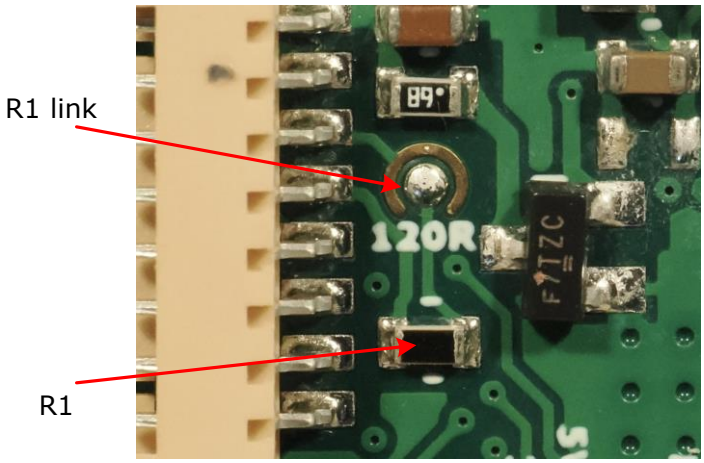


**Figure 3 Termination for A+ and A-**

The A+ and A- signals are differential inputs for BiSS-C and SSI. As supplied the CAM622 Multi Comms Board does not include any line termination.

If the CAM622 Multi Comms Board is connected to a BiSS-C or SSI host over a long cable it may be necessary to pay attention to termination for reliability of communication. The board includes a termination resistor R1 that may be connected in circuit across A+ and A- by shorting the R1 link illustrated in Figure 3, located on the bottom of the board adjacent P1.

As supplied R1 is 120Ω. R1 may be replaced in case a different termination resistor value is required. Please see Figure 3 and Figure 6 for R1's location.

## 4.4 BiSS-C Interface IC

The CAM622 Multi Comms Board uses an iC-MCB device to implement the BiSS-C protocol, U2.

The CAM622 communicates with the iC-MCB device using a second SPI interface. This connects to the CAM622's LU (BSDI), LV (BSCK), LW (BSDO), LN (BNCS) and LA (BIRQ) pins.

The iC-MCB includes line drivers and receivers. However these are not used. Instead the iC-MCB is operated from the same 3.3V supply as the CAM622, to avoid the need for level translation between the two devices. U5 is used as a line receiver for the differential BiSS-C MA inputs to A+ and A-, and U6 is used as a line driver for the differential BiSS-C SLO outputs on B+ and B-.

## 4.5 LED

The CAM622's EXT output drives an LED to provide an indication of status. To use the LED, configure EXT for LED control and active high, and set an appropriate LEDTHRESHOLD.

The CAM622 measures the amplitude of the detected signal, the measurement AmplitudeA. The LED will activate constantly for AmplitudeA values above LEDTHRESHOLD, and flash for lower values. If the target is out of range (not VALID) then the LED will be off.

As noted in section 2.2 the LED has a relatively low maximum operating temperature, in common with most LEDs. It is not intended for long-term operation at very high temperature. If it does fail, the rest of the CAM622 ABN Board will continue to operate normally.

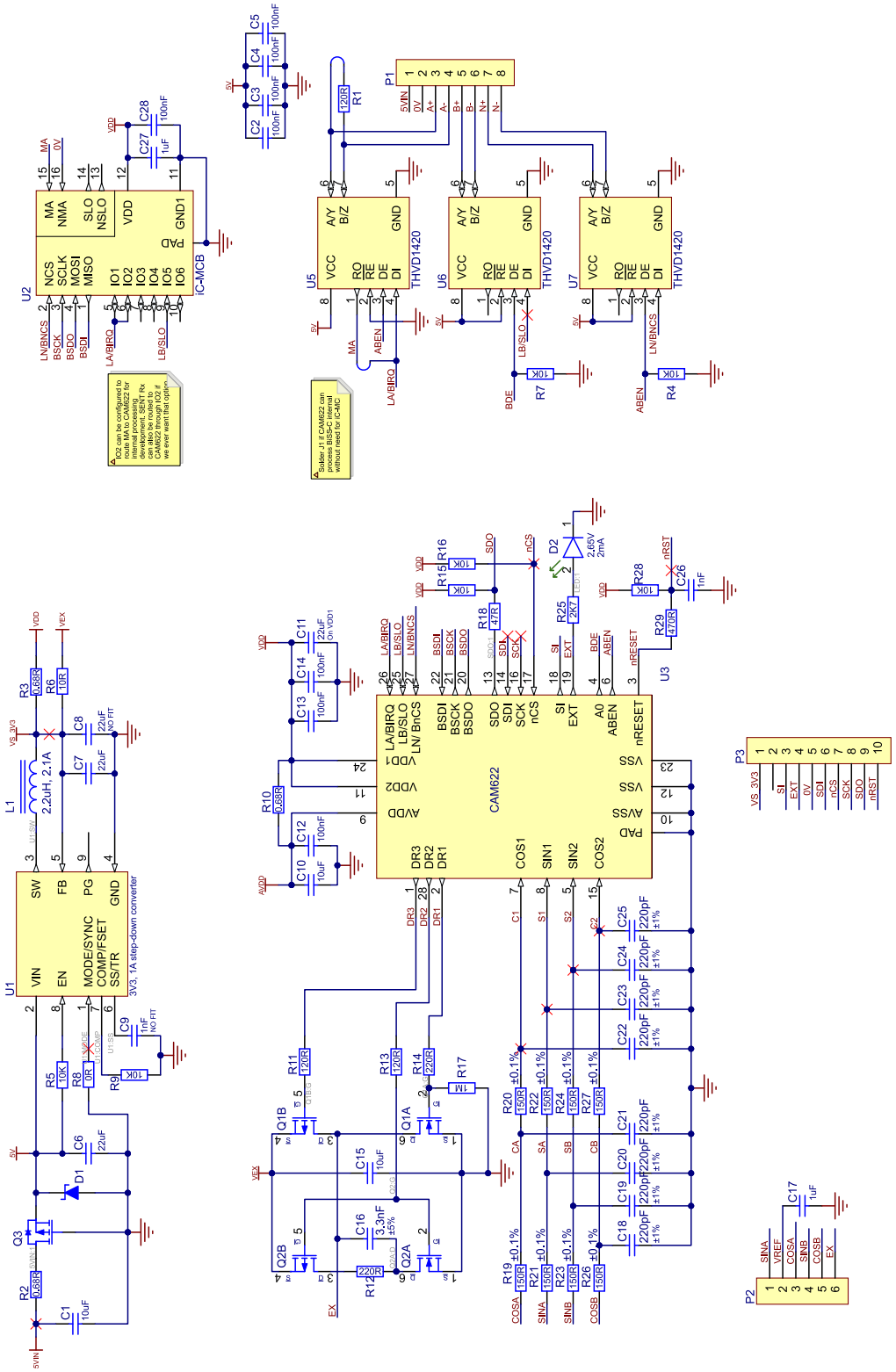

**Figure 4 CAM622 Multi Comms Board Schematic**

## 4.6 Component Placement

The top of the PCB includes the CAM622 and line driver circuitry.

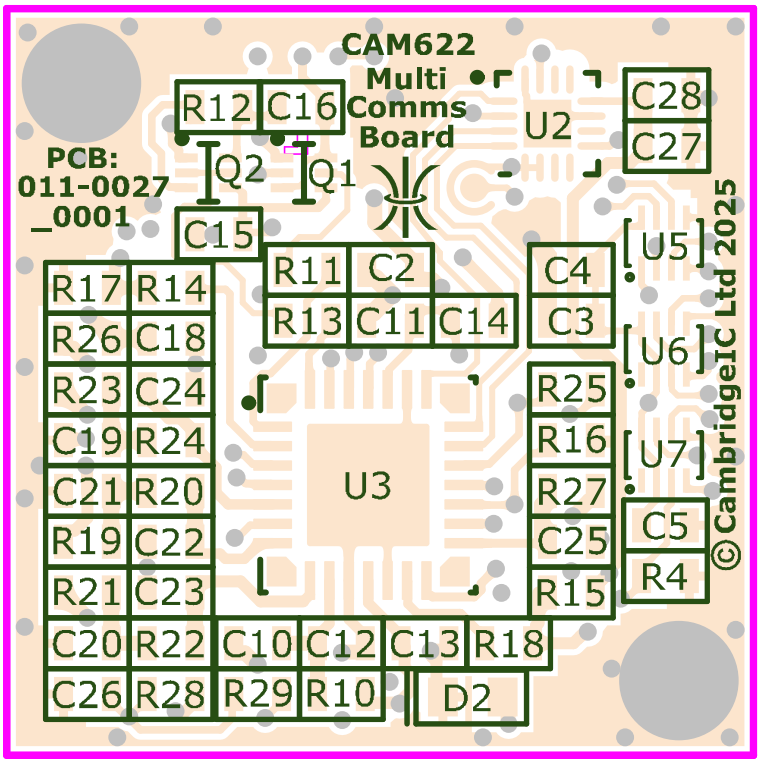


**Figure 5 CAM622 Multi Comms Board Component Placement, Top**

The bottom of the PCB includes the 3 connectors, power supply circuitry and C17 from the CAM622 circuitry.

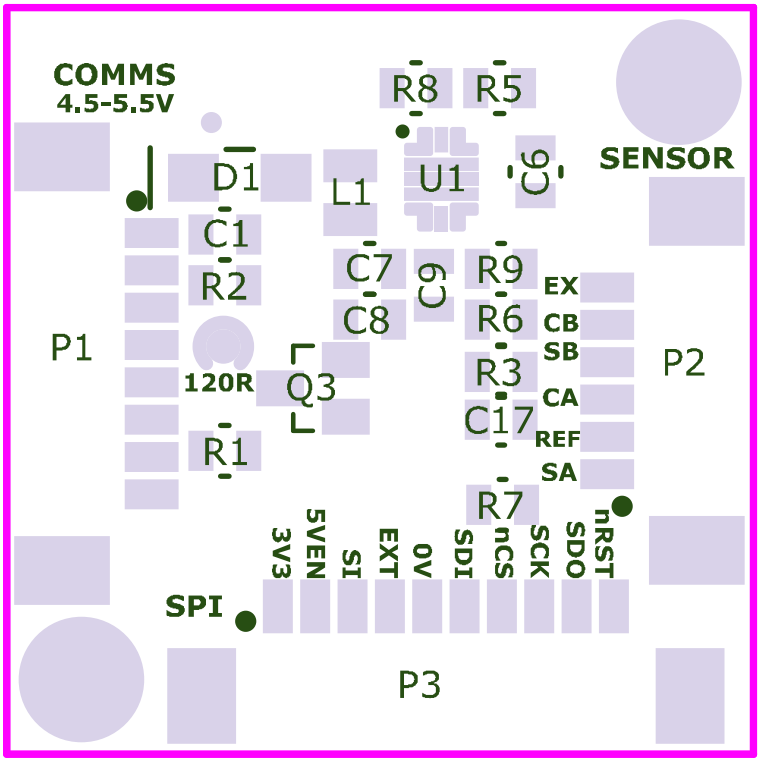


**Figure 6 CAM622 Multi Comms Board Component Placement, Bottom**

# 5 Document History

| Revision | Date | Reason |
|---|---|---|
| 0001 | 27 June 2025 | First draft for BiSS-C testing purposes only |
| 0002 | 4 February 2026 | Added "A customer must not connect to P1's 5VIN and P3's VS3V3 simultaneously…"<br>The following applies to revision 013-5043_0003 onwards:<br>Removed 5VEN connection to P3 to fix excessive current draw when pulled low |

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