# CT455 Evaluation Board User Guide

## DESCRIPTION

The Allegro CT455 evaluation board (CTD455) demonstrates the advantages of the CT455 high dV/dt optimized XtremeSense™ tunnel-magnetoresistance (TMR) coreless current sensor in enabling high-accuracy current measurements for many consumer, enterprise, and industrial applications. The board supports devices with preset magnetic field ranges of ±6 mT or ±48 mT, where the CT455 senses and translates the magnetic field into a linear analog output voltage. The sensor is preprogrammed to compensate for gain and offset temperature drift. It also has the ability to adjust offset and gain, which relaxes mechanical tolerances during sensor mounting. The device has less than 300 ns output response time, while the current consumption is approximately 6 mA. The CT455 is housed in a very-low-profile, industry-standard eight-lead thin-shrink small-outline package (TSSOP) that is both green and RoHS compliant.

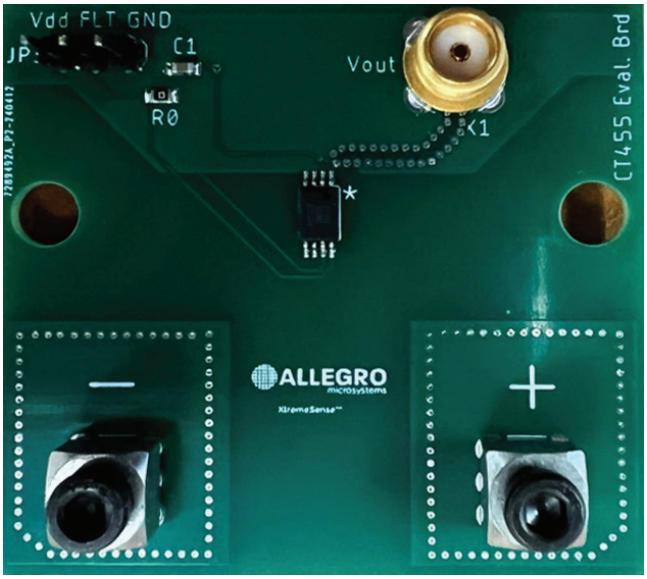


**Figure 1: CT455 Evaluation Board (CTD455)**

## FEATURES

- Preset magnetic field range: ±6 mT or ±48 mT
- Low-noise performance
- Optimized for high dV/dt applications
- Linear analog output voltage
- Response time: <300 ns
- Supply voltage: 5 V
- Operating temperature: –40°C to 125°C

## Table of Contents



**Table 1: Evaluation Board Configurations**

| Configuration Name | Part Number | Output Voltage Range | Coupling Coefficient | Bandwidth |
|---|---|---|---|---|
| CT455-BB-48B5 Evaluation Board | CTD455-A48B5-TS08 | 0.5 to 4.5 V | 42 µT/A | 1 MHz |
| CT455-PT-48B5 Evaluation Board | | | 62 µT/A | |
| CT455-BB-A06B5 Evaluation Board | CTD455-A06B5-TS08 | 0.5 to 4.5 V | 42 µT/A | 1 MHz |
| CT455-PT-A06B5 Evaluation Board | | | 62 µT/A | |

**Table 2: General Specifications**

| Specification | Min. | Nom. | Max. | Units |
|---|---|---|---|---|
| Input Operating Temperature | –40 | – | 125 | °C |
| Input Operating Voltage | 4.75 | 5 | 5.5 | V |

## USING THE EVALUATION BOARD

This section provides an overview of the connections and configuration options of all CT455 evaluation boards. The proper configuration is highlighted in Figure 2. The CT455 datasheet contains detailed information about the use and functionality of each pin, as well as detailed specifications about the sensor. For more information than is contained in this user guide, consult the datasheet.


**Figure 2: Evaluation Board with Busbar**

### Power Input and Board Configuration

When current flows through a busbar above or below the CT455, the XtremeSense™ TMR sensor inside the chip senses the field; in turn, this generates a differential voltage signal that then passes through the analog front end (AFE) to output a current measurement as low as ±1% of the full-scale total output error ($E_{OUT}$).

The chip is designed to enable a fast response time of 300 ns for the current measurement from the OUT pin: The bandwidth for the CT455 is 1 MHz. Even with a high bandwidth, the chip consumes minimal power.

This PCB can handle 100 A of DC current for up to 10 minutes. After 10 minutes of 100 A of DC current, sensitivity changes by a maximum of 0.01% and the offset changes by a maximum of 5 mV. For applications that exceed 100 A, to prevent damage to the PCB, use the busbar. For applications that do not require a busbar, remove the busbar and connect the power to the terminal leads. To ensure safety, do not allow direct contact between the busbar and the sensor.

### Power-On Time

Power-on time of 100 µs is the amount of time required by the CT455 to start up, fully power the chip, and become fully operational from the moment the supply voltage is greater than the UVLO voltage. This time includes the ramp-up time and the settling time (the time required before the device is within 10% of the steady-state voltage under an applied magnetic field) after the power supply has reached the minimum $V_{CC}$.

### Response Time

The response time of 300 ns for the CT455 is the time interval between the following terms: when the primary current signal reaches 90% of its final value, and when the chip reaches 90% of its output corresponding to the applied current.



Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

## SCHEMATIC

The schematic of the CT455 evaluation board is shown in Figure 3.

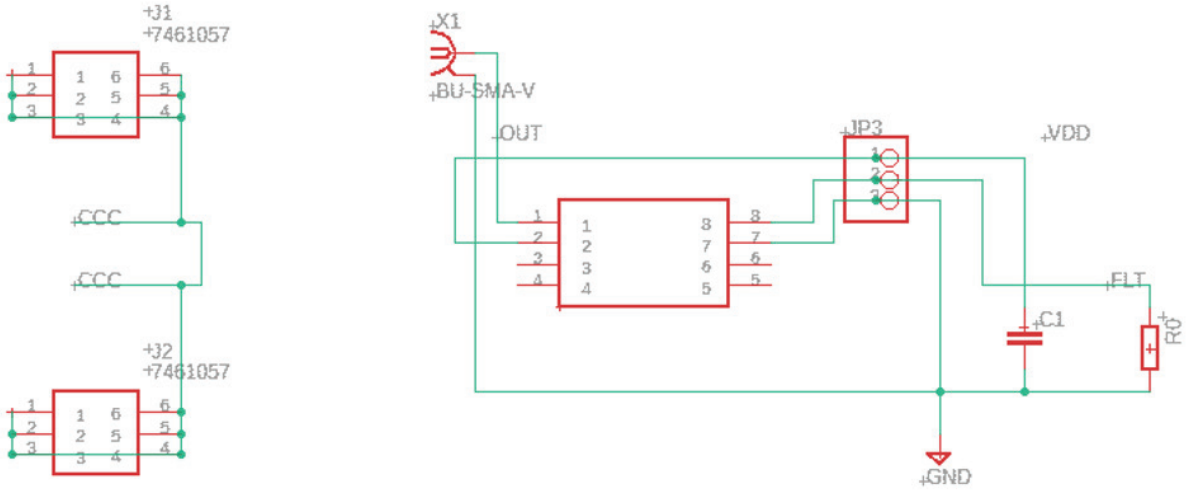


**Figure 3: Evaluation Board Schematic**

## LAYOUT

The top and bottom layers of the CT455 evaluation board are shown in Figure 4 and Figure 5.

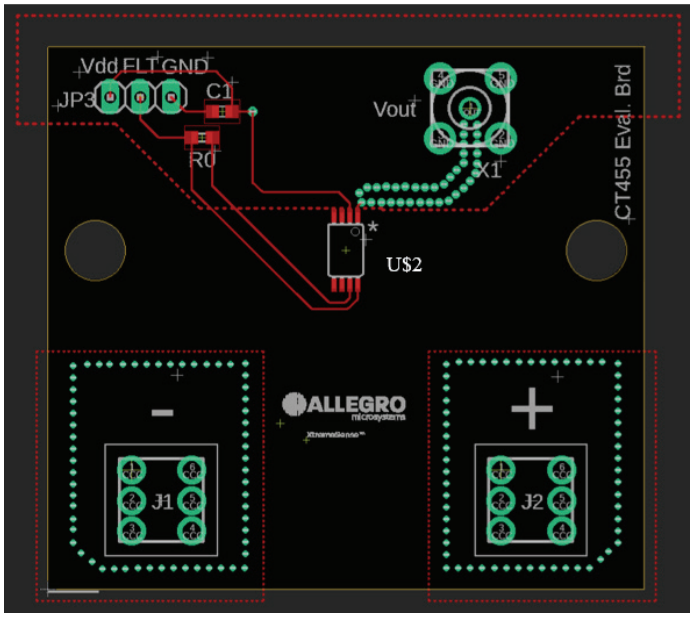


**Figure 4: Evaluation Board Top Layer**

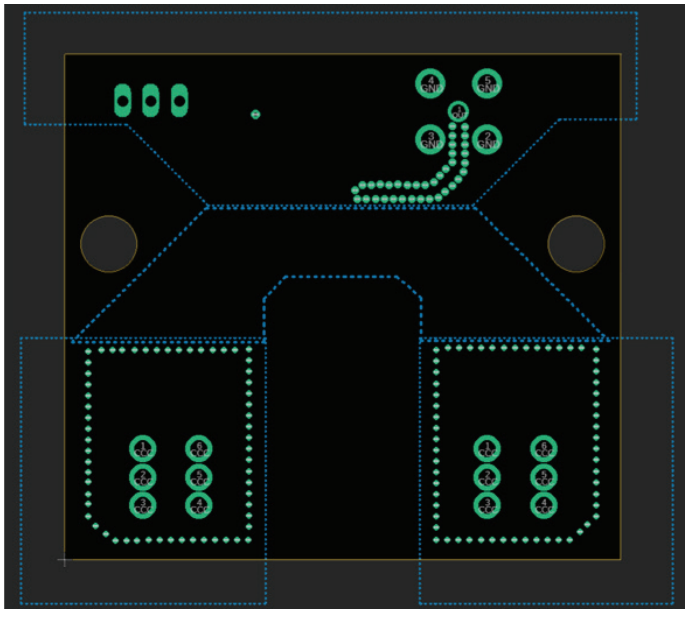

**Figure 5: Evaluation Board Bottom Layer**



Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

## Bill of Materials

**Table 3: Evaluation Board Bill of Materials**

| Designator | Quantity | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|---|
| **ELECTRICAL COMPONENTS** | | | | |
| PCB | 1 | CT455 Evaluation Board (CTD455-48B5-TS08 or CTD455-A06B5-TS08) | Allegro MicroSystems | – |
| U$2 | 1 | CT455 Sensor | Allegro MicroSystems | – |
| JP3 | 4 | Male Header Connectors, 3-pin | Samtec | TSW-103-07-F-S |
| C1 | 1 | Capacitor, Ceramic, 1.0 µF, 25 V, 10% X7R 0603 | TDK | MSAST168SB7105KTNA01 |
| VOUT | 1 | SMA Connector | Clinch Connectivity | 142-0701-201 |
| R0 | 1 | Resistor, 0 Ω | Yageo | RC1206FR-130RL |
| **OTHER COMPONENTS** | | | | |
| BB | 1 | Busbar (1/2” width, 1/16” thick) | Tobar Industries | – |
| J1, J2 | 2 | Connector Heads, 6-pin | Wurth Elektronik | 732-3200-ND |
| J2 | 1 | M3 Terminal Screw, Black | Keystone | 36-7701-2 |
| J1 | 1 | M3 Terminal Screw, Red | Ketstone | 36-7701-3 |
| S1, S2 | 2 | Plastic High Temperature Screws for Busbar | Misumi | SPS-M5X15-C |
| N1, N2 | 2 | Plastic High Temperature Nuts for Busbar | Misumi | SPS-M5-N |
| W1, W2 | 2 | Plastic High Temperature Washers for Busbar | Misumi | SPS-6-W |



Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

## RELATED LINKS

CT455 Product Page:
https://www.allegromicro.com/en/products/sense/current-sensor-ics/sip-package-zero-to-thousand-amp-sensor-ics/ct455



Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com

## Revision History

| Number | Date | Description |
|---|---|---|
| – | May 23, 2024 | Initial release |
| 1 | July 31, 2024 | Update to configuration naming convention (all pages); updated description and features (page 1); updated Table 1 (page 1); updated Power Input and Board Configuration (page 2); updated Bill of Materials (page 4) |
| 2 | December 12, 2024 | Added CTD455-A06B5-TS08 part number (throughout), updated Power Input and Board Configuration section (page 2), and made minor editorial updates (throughout) |





Allegro MicroSystems
955 Perimeter Road
Manchester, NH 03103-3353 U.S.A.
www.allegromicro.com