

CTD456-BB-06B5 Evaluation Board User Guide

DESCRIPTION

The Allegro CTD456 evaluation board demonstrates the advantages of the CT456 high dV/dt optimized XtremeSense™ TMR coreless current sensor in enabling high-accuracy current measurements for many consumer, enterprise, and industrial applications. The device supports a ± 6 mT magnetic field range where the CT456 senses and translates the magnetic field into a linear analog output voltage. The device achieves a total error output of less than 1.0% over voltage and temperature. The device provides effective common-mode rejection of more than -50 dB, enabling the CT456 to have greater than 90% immunity to stray magnetic fields, thus having almost no impact on the accuracy of the current measurement. The device has less than 300 ns output response time, while the current consumption is approximately 6.0 mA. The CT456 is housed in a very low-profile, industry-standard 8-lead TSSOP package that is both green and RoHS compliant.

FEATURES

- Preset magnetic field range: ± 6 mT
- Low-noise performance
- Optimized for high dV/dt applications
- Linear analog output voltage
- Response time: <300 ns
- Supply voltage: 5.0 V
- Operating temperature: -40°C to 125°C



Figure 1: CTD456-BB-06B5 Evaluation Board

Table of Contents

Description	1
Features	1
Using the Evaluation Board	2
Schematic	3
Layout	3
Bill of Materials	4
Related Links	5
Revision History	6

Table 1: CTD456-BB-06B5 Evaluation Board Configurations

Configuration Name	Part Number	Magnetic Field Range	Coupling Coefficient	Bandwidth
CTD456-BB-06B5	CT456-A06B5-TS08	± 6 mT	12 $\mu\text{T/A}$	1 MHz
CTD456-PT-06B5				

Table 2: General Specifications

Specification	Min.	Nom.	Max.	Units
Input Operating Temperature	-40	-	125	$^{\circ}\text{C}$
Input Operating Voltage	4.75	5.0	5.50	V

USING THE EVALUATION BOARD

This section provides an overview of the connections and configuration options of the CTD456-BB-06B5 evaluation board. Figure 2 highlights the proper configuration. The CT456 datasheet contains detailed information on the use and functionality of each pin, detailed specifications about the sensor, and should be consulted for more information than is contained in this user guide.

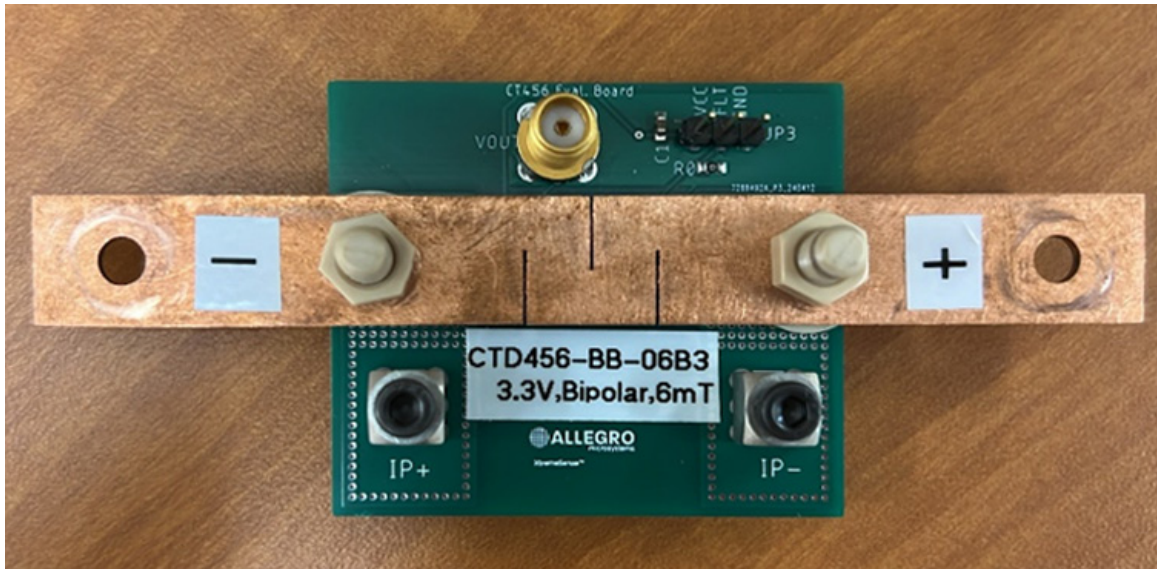


Figure 2: CTD456-BB-06B5 Evaluation Board with Busbar

Power Input and Board Configuration

When current is flowing through a busbar above or below the CT456, the XtremeSense TMR sensor inside the chip senses the field which in turn generates a differential voltage signal that then goes through the Analog Front-End (AFE) to output a current measurement as low as $\pm 1.0\%$ 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 as the bandwidth for the CT456 is 1.0 MHz. Even with a high bandwidth, the chip consumes a minimal amount of power.

For high-current applications, use the busbar. For other applications, remove the busbar and connect power to the terminal heads. To ensure safety, do not let the busbar come into direct contact with the sensor.

Power-On Time

Power-On Time of 100 μ s is the amount of time required by CT456 to start up, fully power the chip, and becoming 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 (within 10% of steady-state voltage under an applied magnetic field) after the power supply has reached the minimum V_{CC} .

Response Time

Response Time of 300 ns for the CT456 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.

SCHEMATIC

Figure 3 below shows the schematic of the CTD456-BB-06B5 evaluation board.

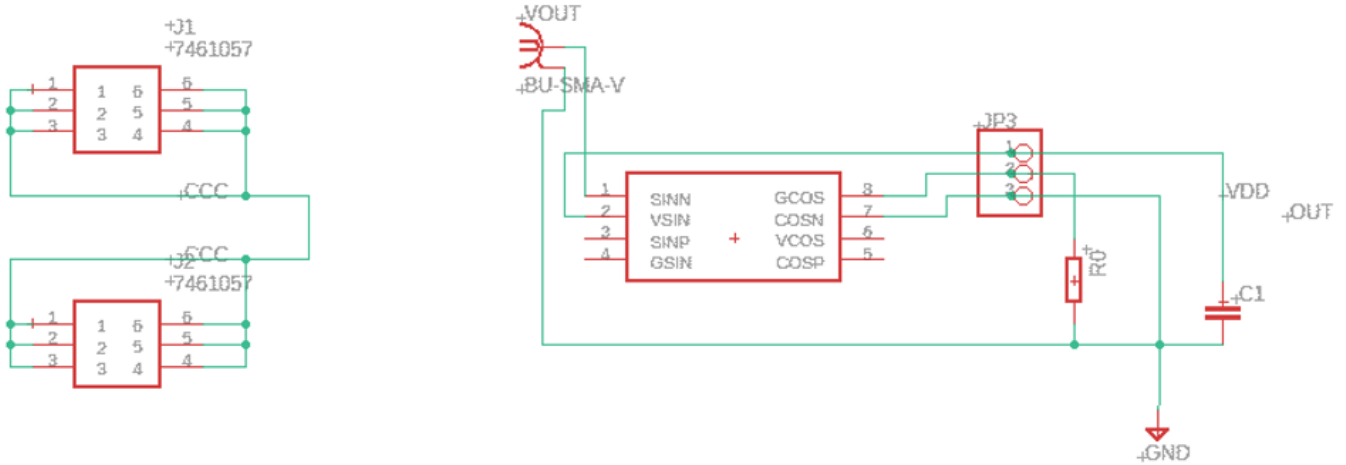


Figure 3: CTD456-BB-06B5 Schematic

LAYOUT

Figures 4 and 5 below show the top and bottom layers of the CTD456-BB-06B5 evaluation board.

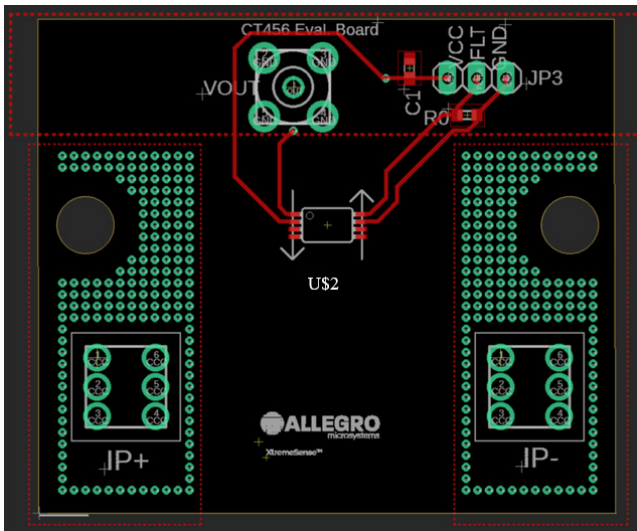


Figure 4: CTD456-BB-06B5 Top Layer

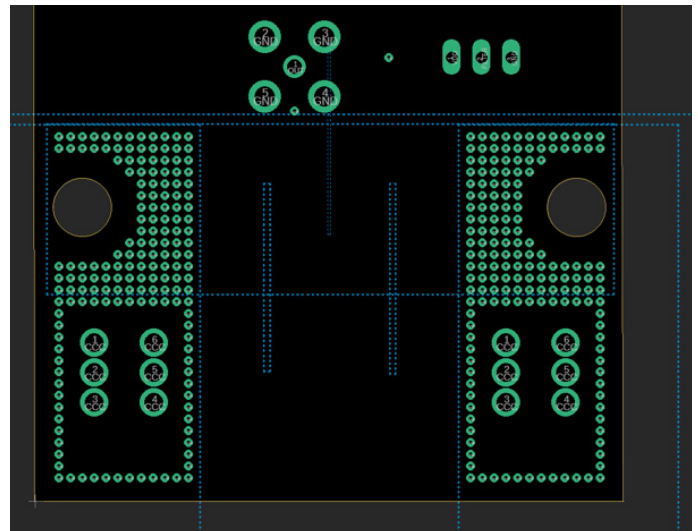


Figure 5: CTD456-BB-06B5 Bottom Layer

Bill of Materials

Table 3: CTD456-BB-06B5 Bill of Materials

Designator	Quantity	Description	Manufacturer	Manufacturer Part Number
ELECTRICAL COMPONENTS				
PCB	1	CTD455-BB-48B5 Evaluation Board	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 μ F, 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	Slit Busbar (1/2" width, 1/16" thick)	Tobar Industries	–
IP+, IP–	2	Connector Heads, 6-pin	Wurth Elektronik	732-3200-ND
IP+	1	M3 Terminal Screw, Red	Keystone	36-7701-2
IP–	1	M3 Terminal Screw, Black	Keystone	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 (1.6 mm thick)	Misumi	SPS-6-W

RELATED LINKS

CT456 Product Page:

<https://www.allegromicro.com/en/products/sense/current-sensor-ics/sip-package-zero-to-thousand-amp-sensor-ics/CT456>

Revision History

Number	Date	Description
–	May 23, 2024	Initial release
1	July 31, 2024	Updated Figure 1 and CTD456-BB-06B5 Evaluation Board Configurations Table (page 1); updated Power Input and Board Configuration section (page 2); updated Bill of Materials (page 4)

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