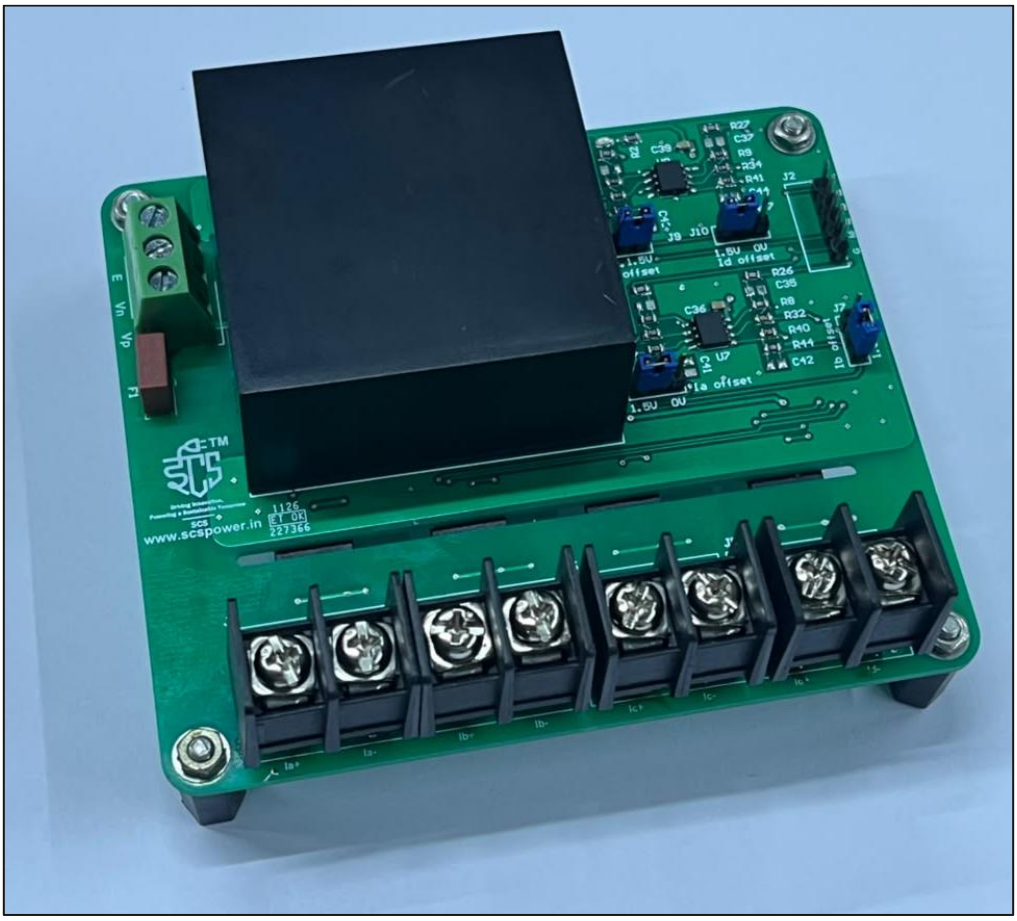
User Manual

SCS04HFCSXXX

(High Frequency Current Sensors Board)



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Overview:

- AC/DC universal current sensors board.
- On board auxiliary power supplies.
- Excellent accuracy and linearity.
- Thermal and noise optimized PCB design.
- Up to four onboard current sensors.
- Current sensing bandwidth >250 kHz.
- Current sensing range maximum up to 50 A.
- Selectable offset 0V and 1.5V.
- Current sensing accuracy better than ±1%
- Board can be power up with single phase 85-300Vac power supply.
- LED indication for power on.

Board Protection:

- Over Current
- Over Voltage
- Short Circuit
- As per IEC 61000-4 Standard

Applications:

This board is universal and can be used for any application whether AC or DC current sensing and have frequency bandwidth of 250kHZ, some of the targeted applications are,

- Power Converters
- Electrical Drives
- General purpose industry applications
- Laboratory R&D purposes
- Testing purposes

Table 1 Pinout

Number	Name	Description
1.	V_p	Positive terminal for AC voltage supply
2.	V_n	Negative terminal for AC voltage supply
3.	E	Earth terminal
4.	$I_{a+}, I_{b+}, I_{c+}, I_{d+}, I_{a-}, I_{b-}, I_{c-}, I_{d-}$	terminals for the sensing current input
5.	I_a, I_b, I_c, I_d	Sensor output
6.	G	Ground terminal

Offset setting

Each 3-pin header (J15, J16, J17, J18) in the sensing circuit is provided for selecting the required Offset:

- 0V: Install the jumper between the 0V pins.
- 1.5V: Install the jumper between the 1.5V pins.

Table 2 Sensor Offset Jumper pin Identification

Sr. No.	Indicator	Description
1	J15	For A Current sensor
2	J16	For C Current sensor
3	J17	For B Current sensor
4	J18	For D Current sensor

2 Sensor Gain Calculation

2.1 Conversion Formulas

$$\text{Gain} = \frac{I_{IN}}{V_{OUT}}$$

Take three different readings and then average for better accuracy. For better calculation of gain use sensor near to its rated Current values.

Use accurate multi-meter for calibrate sensors, use AC range for AC measurements.

To obtain original wave shape in microcontroller/DSP/FPGA/DSPACE:

The current outputs are available in voltage form on pins I_a, I_b, I_c, I_d , all referenced to GND. Each output pin has a fixed gain. In the microcontroller, simply multiply the ADC value by the gain in non-offset mode, and in offset mode, subtract 1.5 V from the ADC value first and then apply the gain.

Table 3 Sample AC Current Gain Calculation At I_a

Input rms current(A)	Output rms voltage(V)	Gain
4.82	0.489	9.856
3.87	0.392	9.872
2.94	0.295	9.966
2.07	0.205	10.09
1.20	0.115	10.43
	Average Gain	10.04

2.2 Gain Calculation Examples

Example 1

Given:

- Input rms Current (I_{in}): 3.87 A
- Measured Output rms Voltage (V_{out}): 0.392 V

Gain:

$$\text{Gain} = \frac{I_{IN}}{V_{OUT}}$$

$$\text{Gain} = \frac{3.87}{0.392} = 9.872$$

3. Experimental Validation

3.1 Setup

A SIGLENT SDS824 oscilloscope and FLUKE 15B+ Digital multimeter was used to monitor the output voltage and input current. The overall experimental setup is shown below.

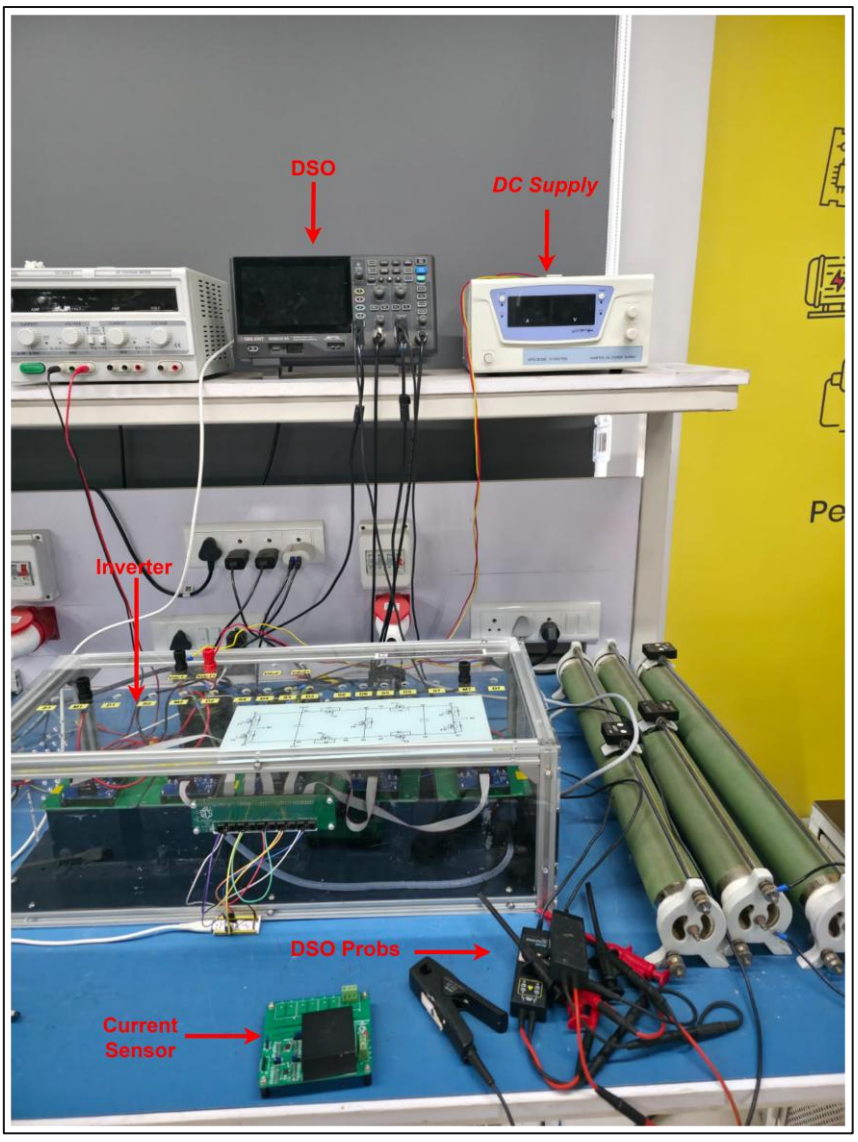

Figure 1 : Experimental setup

3.2 Experimental Results

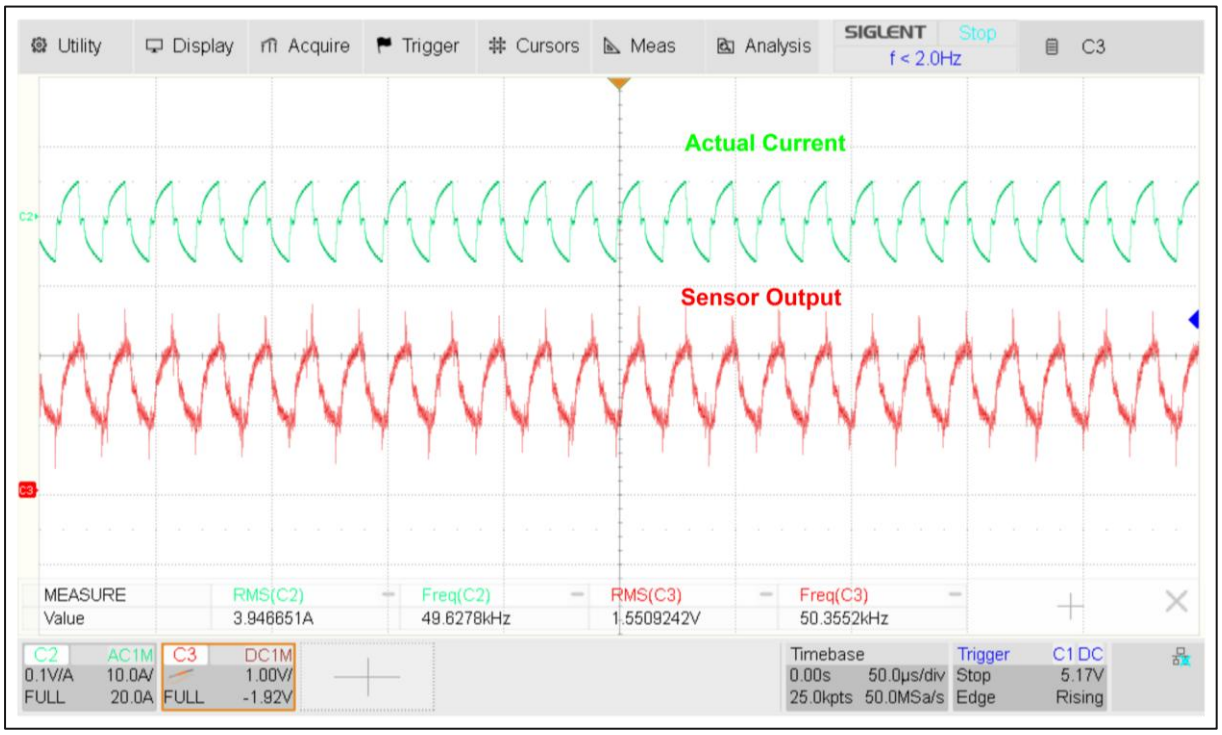

Figure 2 : Results with 50kHz current