



Current Sense and Monitor

Modern society relies heavily on electricity to power our daily lives. With the growth in electric consumption comes the need to accurately monitor and measure the flow of electric current. Current sensing has become one of the most important elements of the power supply chain.

Current sensors come in a variety of designs separated by cost, accuracy, reliability and technology. The most common semiconductor sensor is based on the Hall effect, such as the LEM HLSR module. Crocus Technology sensors use the more advanced Tunneling Magneto Resistance (TMR) technology.

Crocus has made available a reference design PCB incorporating the latest CT430 TMR sensor IC to help customers easily replace the LEM HLSR module. The Crocus micro-module is a functional equivalent solution with the same pinout as the HLSR device but with enhanced performance as listed in Table 1 and smaller size.

The Crocus micro-module design kit makes it easy for engineers to verify performance on the actual board. Simply remove the HLSR device and replace it with the micro-module. Crocus offers the design files so design engineers can make their own micro-module or incorporate the design into their application.

Availability

Contact Crocus representative for your free design kit. info@crocus-technology.com



HLSR



**Crocus
HLSR Module**



Table 1. Performance Comparison

Parameter	Unit	HLSR Micro-Module			HLSR 20-P		
		Min.	Typ.	Max.	Min.	Typ.	Max.
Current Range	A	-50		+50	-50		+50
Supply Voltage	V	4.75	5.00	5.50	4.5	5.0	5.5
Current Consumption	mA		6.0	9.0		19.0	25.0
Current Carrying Conductor	mΩ		0.5			0.29	
Bandwidth	kHz		1,000			400	
Response Time	ns		300				2,500
Output Voltage Range	V	0.50		4.50	0.50		4.50
Total Error	% FS		±0.50	±1.00		±1.00	±3.40*
Non-linearity Error	% FS		±0.10			±0.50	
TCS	% FS		±0.50				±2.90**
CMFRR	dB		54				N/A
VOUT – VREF Error	mV		±5.0				±77.8
Output Noise @ 100 kHz	mA _{RMS}		14.0			16.1	
Temperature Range	°C	-40	+25	+125	-40	+25	+105
Package Mass	g		0.6				5.5

Crocus Technology. Sensing a Smarter World.

Crocus created XtremeSense® TMR providing the highest sensitivity, the lowest power consumption and smallest size by comparison to other dated magnetic technologies such as Hall, AMR and GMR.

CT430 - 1 MHz Bandwidth, High Accuracy Isolated Current Sensor with Overcurrent Fault Detection

The CT430 ($V_{CC} = 5.0\text{ V}$) is a high bandwidth and ultra-low noise integrated contact current sensor that uses Crocus Technology's patented XtremeSense® TMR technology to enable high accuracy current measurements for consumer, enterprise, and industrial applications. It supports eight (8) current ranges where the integrated current carrying conductor (CCC) will handle up to 65 A of current and generates a current measurement as a linear analog output voltage. It achieves a total output error of less than $\pm 1.0\%$ full-scale (FS) over the full temperature range.

Fast response with a 1 MHz bandwidth and 300ns response time. High signal-to-noise (SNR) with ultra-low noise of 9.0 mA_{RMS} . Integrated common mode field rejection of -54 dB to ensure stray fields do not impact measurements in the working application. The CT430 has an integrated over-current detection (OCD) circuitry to identify out of range currents which is output on the fault pin (FLT#). The FLT# is an open drain, active LOW digital signal.

The CT430 is offered in an industry standard 16-lead SOIC-Wide package that is "green" and RoHS compliant.

Also available in 3.3 V version as CT431.

FEATURES

- Total Error Output: $\pm 0.5\%$ FS (typ.)
- 300 ns Response Time, 1 MHz Bandwidth
- Noise as Low as 9.0 mA_{RMS}
- Integrated $0.5\text{ m}\Omega$ Conductor
- $V_{CC} = 5.0\text{ V}$
- Immunity to Common Mode Field: -54 dB
- Rated Isolation Voltage: $>5\text{ kV}_{RMS}$
- UL/IEC 62387 and UL1577 Certified
- IEC 61000-4-5 Certified
- AC or DC Current Range:
 - +20.0 ADC / $\pm 20.0\text{ APK}$
 - +30.0 ADC / $\pm 30.0\text{ APK}$
 - +50.0 ADC / $\pm 50.0\text{ APK}$
 - +65.0 ADC / $\pm 65.0\text{ APK}$
- 16-lead SOIC-Wide package (10.20 x 10.31 x 2.54 mm)



Table 2. Cross Reference LEM to Crocus

Operating Current	Device	Parameters		
		Sensitivity (mV/A)	Peak Measure Range (A)	Comment
10A	HLSR 10-P	80	± 25	
	CT430-HSWF20MR	100	± 20	Review peak measurement range requirement
16A	HLSR 16-P	50	± 40	
	CT430-HSWF30MR	66.7	± 30	Review peak measurement range requirement
20A*	HLSR 20-P	40	± 50	
	CT430-HSWF50MR	40	± 50	Match
32A**	HLSR 32-P	25	± 80	
	CT430-HSWF50MR	40	± 50	Review peak measurement range requirement
40A	HLSR 40-P	20	± 100	
	CT430-HSWF65MR	31	± 65	Require enhanced thermal PCB
50A	HLSR 50-P	16	± 125	
	CT430-HSWF65MR	31	± 65	Require enhanced thermal PCB



* Available design kit
EVB430CL-20B

** Available design kit
EVB430CL-20B

Table 3. Family of CT43x TMR Current Sensors

Part Order Number	Current Range	Sensitivity (mV/V/mT)	V_{CC} (V)	Polarity	Typ. Total Error	Max. Total Error	CMFRR (dB)	Operating Temperature Range	Package
CT430-HSWF20DR	0 A to +20 A	200.0	5.0	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT430-HSWF20MR	-20 A to +20 A	100.0	5.0	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT430-HSWF30DR	0 A to +30 A	133.3	5.0	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT430-HSWF30MR	-30 A to +30 A	66.7	5.0	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT430-HSWF50DR	0 A to +50 A	80.0	5.0	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.5\%$ FS	-54	-40°C to +125°C	SOICW-16
CT430-HSWF50MR	-50 A to +50 A	40.0	5.0	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT430-HSWF65DR	0 A to +65 A	61.5	5.0	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.5\%$ FS	-54	-40°C to +125°C	SOICW-16
CT430-HSWF65MR	-65 A to +65 A	30.8	5.0	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF20DR	0 A to +20 A	100.0	3.3	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF20MR	-20 A to +20 A	50.0	3.3	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF30DR	0 A to +30 A	66.7	3.3	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF30MR	-30 A to +30 A	33.3	3.3	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF50DR	0 A to +50 A	40.0	3.3	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.5\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF50MR	-50 A to +50 A	20.0	3.3	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF65DR	0 A to +65 A	30.8	3.3	Unipolar	$\pm 0.7\%$ FS	$< \pm 1.5\%$ FS	-54	-40°C to +125°C	SOICW-16
CT431-HSWF65MR	-65 A to +65 A	15.4	3.3	Bipolar	$\pm 0.5\%$ FS	$< \pm 1.0\%$ FS	-54	-40°C to +125°C	SOICW-16