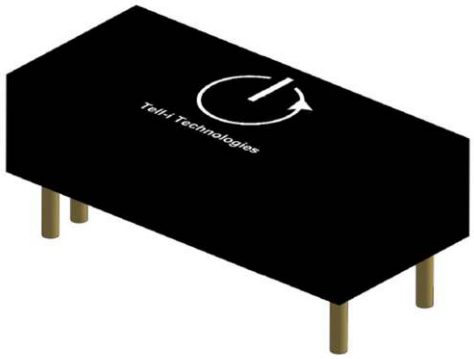
Ultrafast, Contactless Current Sensor DS 10. 2

Tell-i Technologies



Tell-i Technologies' ultrafast current sensor offers very high frequency current sensing through contactless, lossless magnetic point-field detection using magnetoresistor technology. The sensor is optimized for power electronics applications on printed circuit boards where the sensor is placed above the trace carrying the current to be measured. Through patented circuitry[1,2], the Tell-i sensor responds to current at frequencies up to 10 MHz with 15 ns response time and 85 ns rise time, while its contactless design gives circuit designers flexibility. The contactless design allows for measurement without altering the current trace which can introduce inductance and other parasitic effects harming circuit performance at high switching frequencies.

Mounted directly above the current trace to be measured, the sensor is linear up to ±10A, with ±20A full range with some nonlinearity. The sensor experiences very little hysteresis (0.8%) and low temperature drift (-0.3 %/°C) when compared with Hall sensors, and it includes offset and reset pins for calibration and resetting due to oversaturation. The sensor accepts up to 5V supply and outputs a differential voltage proportional to the measured magnetic field with offset 2.5V.

Features

- DC – 10 MHz Bandwidth
- Contactless
- Low Hysteresis
- Linear ±10A, Full ±20A
- High Sensitivity
- Low Temperature Drift
- Compact (1.5x0.8x0.25) (in)

Applications

- Wide-Bandgap Enabled Converters
- Power Supplies
- Control and Prognostics
- Automotive
- Datacenters
- Renewables
- Protection Equipment

Contactless current sensor is placed on top of current carrying trace on printed circuit board

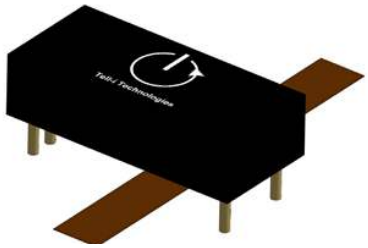


Figure 1 - Placement of contactless sensor above current trace

1. US Provisional Patent, number 62432327, filed Dec. 9,2016.
2. Patent Application: PCT/US17/32415, May 12, 2017.

Specifications

Characteristic	Condition	Typical	Unit
Bandwidth	-3dB	10	MHz
Rise Time	Step response from 0 to 90% for 10A current	85	ns
Response Time	Sensor response delay	15	ns
Linear Current Range	Sensor mounted directly above current trace	±10	A
Full Current Range	Sensor mounted directly above current trace	±20	A
V_{dd} – Supply Voltage		5	V
Output Offset Voltage	Output with no current	V_{dd} / 2	V
Sensitivity (mV/A)	Sensor mounted directly above current trace	63.7	mV/A
Output Sensitivity (mV/V/mT)	Independent of mounting	10	mV/V/mT
Hysteresis Error	Percent of full scale	0.08	% FS
Operating Temperature		-40-125	°C
Temperature Drift		-0.3	%/°C

Performance

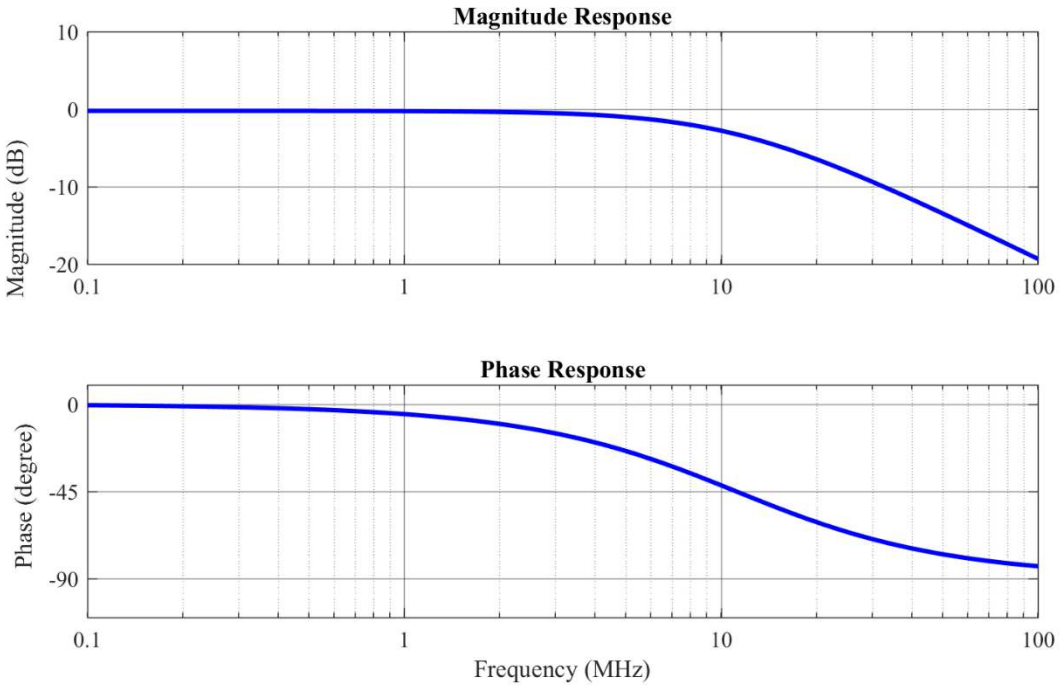


Figure 2 - Frequency response of sensor (10MHz -3dB bandwidth)

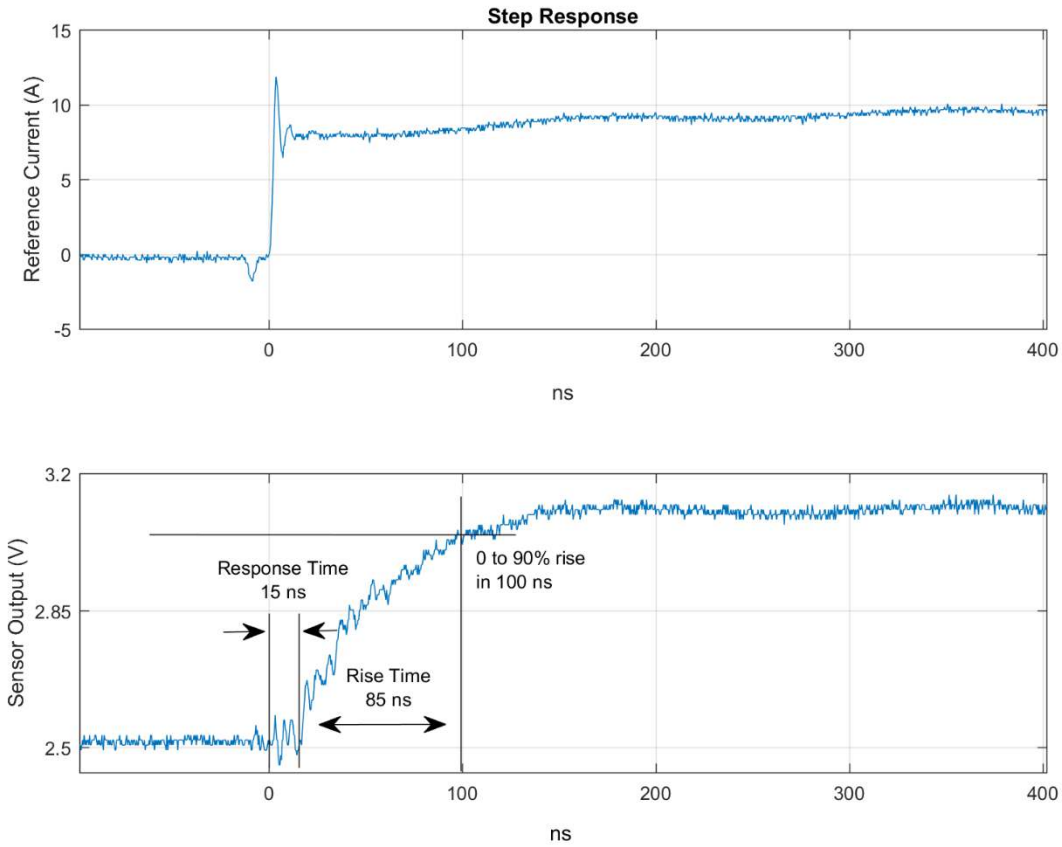


Figure 3 – Sensor response to step change in current (close view) with response and rise times shown

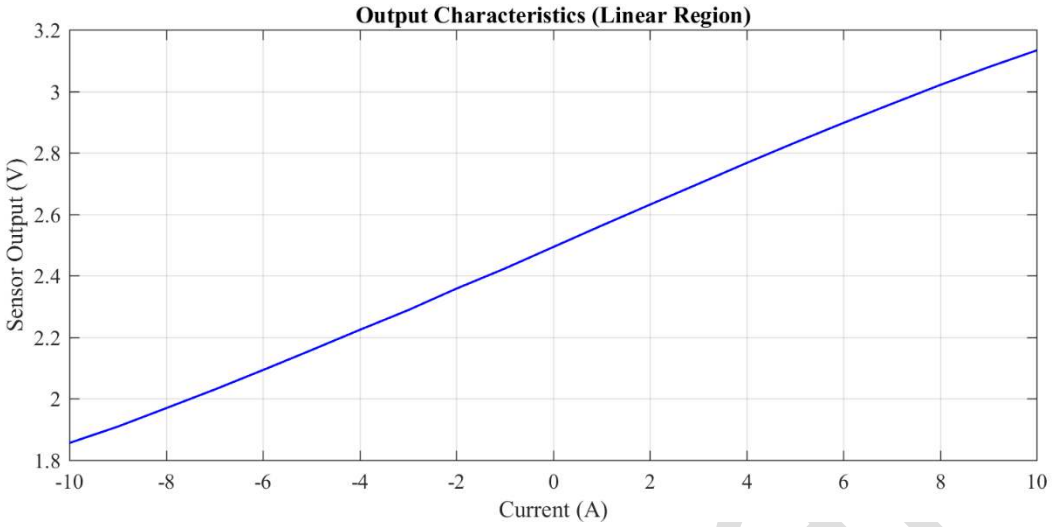


Figure 4 - Steady state (DC) sensor output through linear range of operation

Converter Operation

The Tell-I current sensor (Blue) follows the reference current (orange) closely in 1MHz converters. Limited bandwidth current sensors (current probe and 1MHz Hall) experience significant delay in capturing thecurrent dynamics. The hall sensor (green) fails to accurately measure average current due to its limited bandwidth and slew rate.

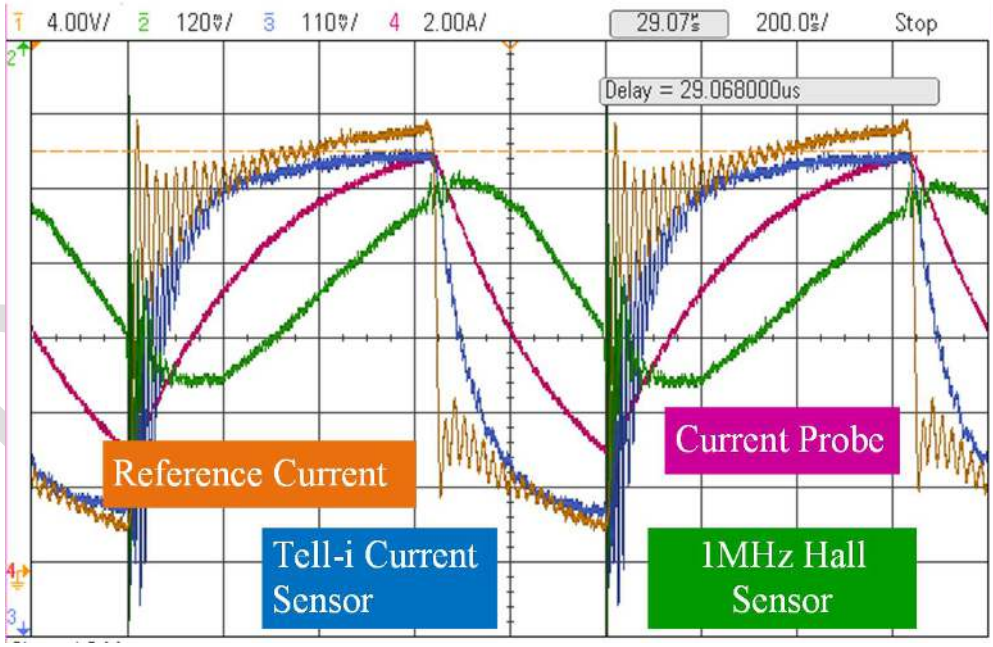


Figure 5 - Sensor operation in 1MHz switching converter compared with other sensing technology

Pinout and Package

Figure 6 - Pinout diagram (bottom view)

Pin		Pin	
1	Offset +	5	Vout
2	Offset -	6	Set/Reset
3	Vdd (5V)	7	NC (mount)
4	GND	8	NC (mount)

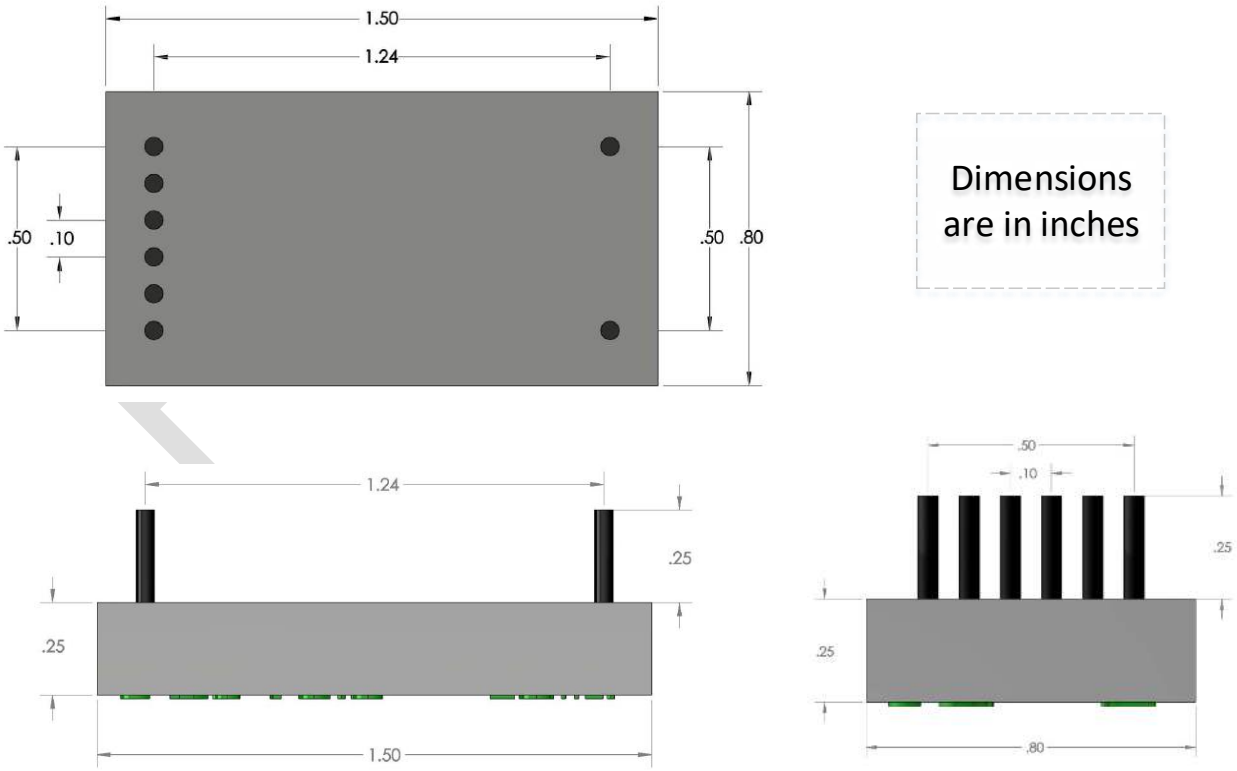


Figure 7 – Sensor package dimensions