

DS50.2/DS50.2m

Ultrafast DC-7MHz, 50A, Contactless, Galvanically Isolated, Bidirectional Current Sensor



1. Description

Tell-i Technologies' ultrafast current sensor offers exceptionally high-frequency current sensing through contactless, lossless magnetic point-field detection using magnetoresistive 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, the Tell-i sensor responds to ac and dc currents while its contactless design gives circuit designers flexibility for isolation, thermal, and optimal layout design. In addition, 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.

The sensor is mounted directly above the current trace or the busbar to be measured. The results are linear up to $\pm 50A$. Compared with Hall-effect sensors, Tell-i sensor experiences minimal hysteresis (0.8%) and low temperature drift ($-0.3\%/^{\circ}C$). Unlike other magnetoresistor or inductive based current sensors, DS50 series do not need a reset mechanism. The sensor accepts up to 5V supply and outputs a differential voltage proportional to the measured magnetic field with an offset of 2.5V. DS50 series is offered in through-hole and surface mount packages.

DS50 series is specifically developed to address the need for ultrafast current sensing in high frequency power electronics circuits using wide bandgap semiconductor power devices such as GaN and SiC power devices. The high accuracy measurement with minimal propagation delays of 15nsec allows for high frequency ($>1MHz$) peak current-mode and average-current mode closed-loop control implementations.



2. Features

- DC-7MHz Bandwidth
- Linear $\pm 50A$
- Contactless
- Non-invasive
- No set or reset requirements
- Isolated Output
- Low Hysteresis
- Low Temperature Drift

3. Applications

- Wide-Bandgap Power Electronics
- Non-intrusive measurements
- Aerospace
- Automotive
- Datacenters
- Solar PV Inverters
- Plasma Power Supplies
- Medical Power Supplies



Order

Online

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4. Main Characteristics

Stresses above these ratings may cause permanent damage. In addition, exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation at these or other conditions beyond those specified is not implied.

Parameters	Conditions	Symbol	Value	Units
Supply Voltage		V_{dd}	5	V
Sensor Quiescent Current		I_{qc}	20	mA
Rise Time		t_{rise}	<48	ns
Bandwidth (-3dB)	Calculated		>7	MHz
Propagation Delay		t_{pd}	15	ns
Linear Current Range	mounted on the current trace		± 50	A
Linearity Error	$\pm 50A$		1	%
Output Offset Voltage	Output with no current		$V_{dd}/2$	V
Sensitivity	mounted on the current trace		42	mV/A
Hysteresis Error (Percent of full scale)			0.08	%Fs
Operating Temperature			-40-125	°C
Temperature Drift			-0.3	%/°C

5. Performance

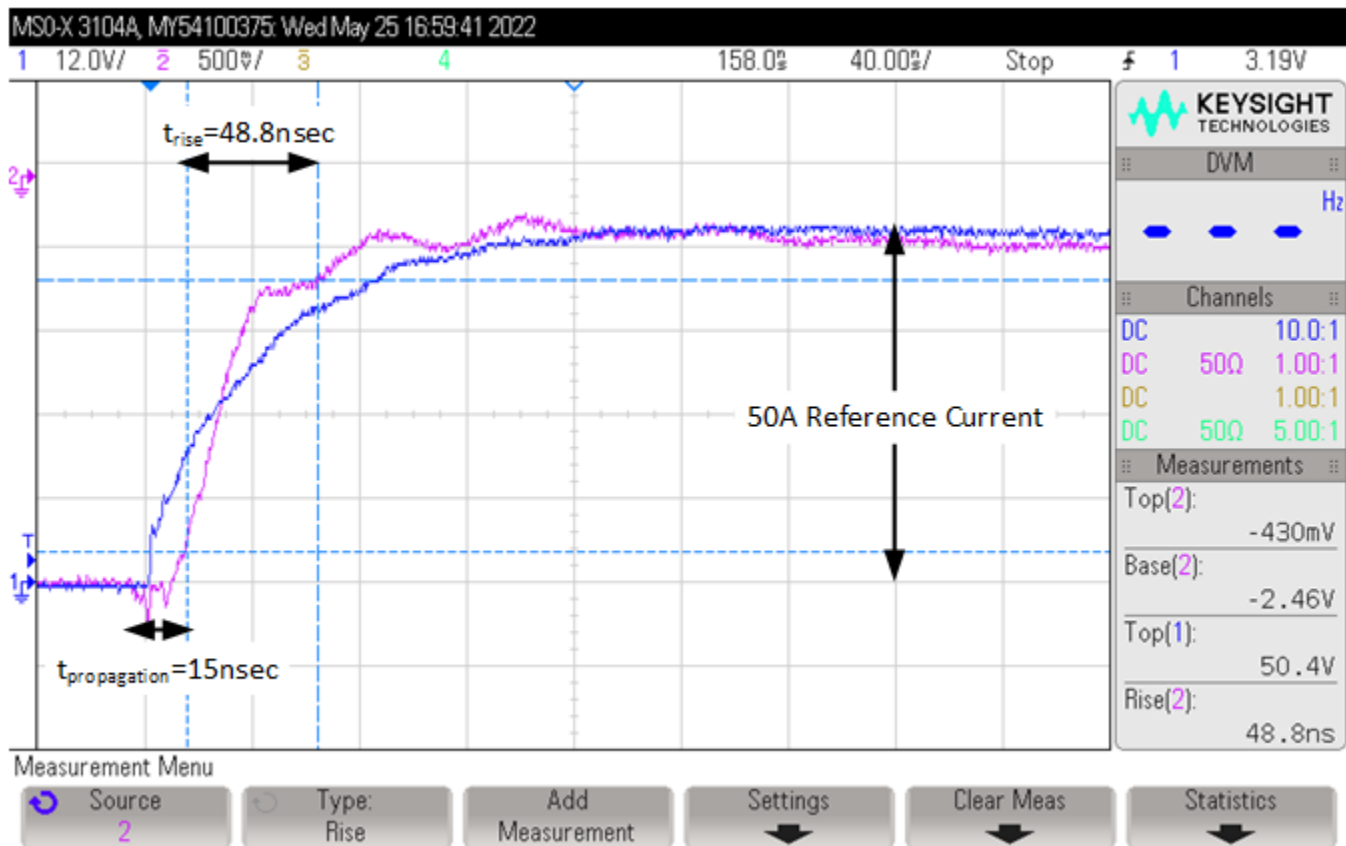


Figure 1. Step Response.

6. Examples of Performance

Tell-i DS50.2 ultrafast contactless sensor was evaluated and tested in several high frequency converters. Figure 2 presents an example of the sensor performance in a 3MHz GaN DC-DC switching converter. As can be seen, the current is captured with a very high resolution and accuracy that enables seamless closed-loop control implementation.

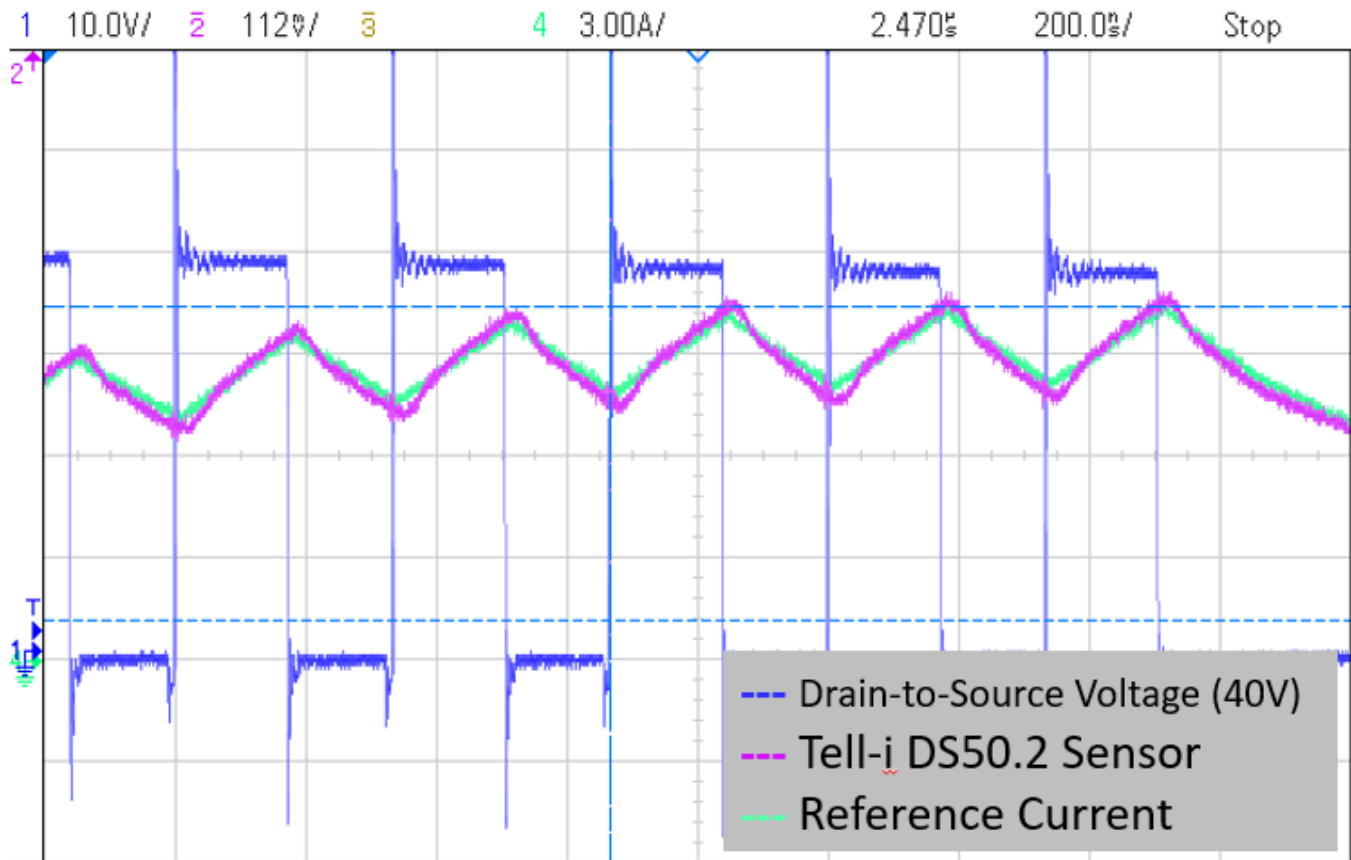


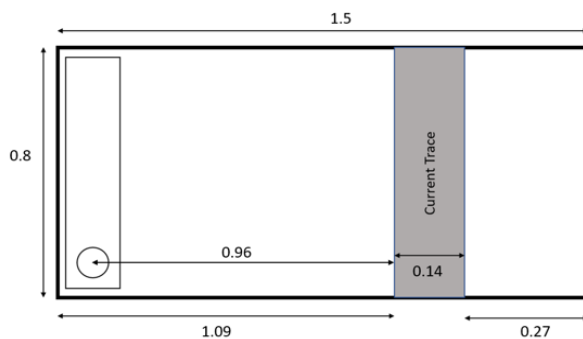
Figure 2. Performance of Tell-i DS50.2m current sensor in a 3MHz DC/DC switching converter.

7. Package and Recommended Land Pattern Information

a. DS50.2 (1.5x0.8x0.25 in) - Through-Hole



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



Dimensions
are in inches

$\varnothing 0.036 \pm 0.003$

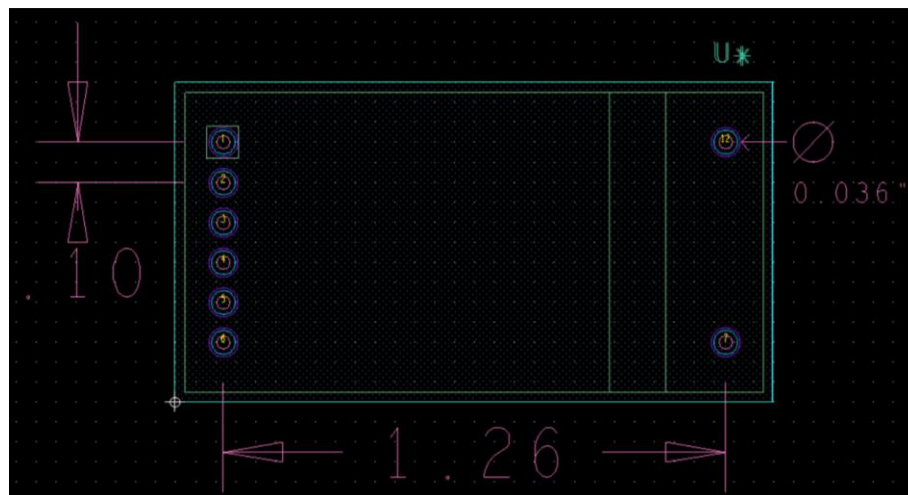
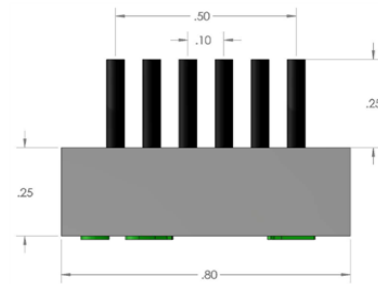
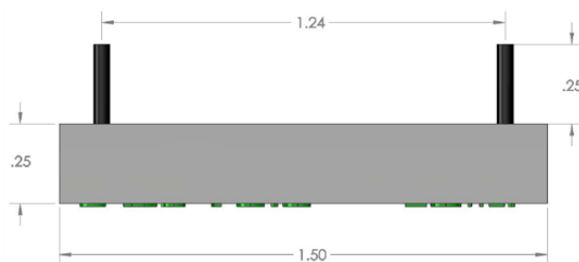
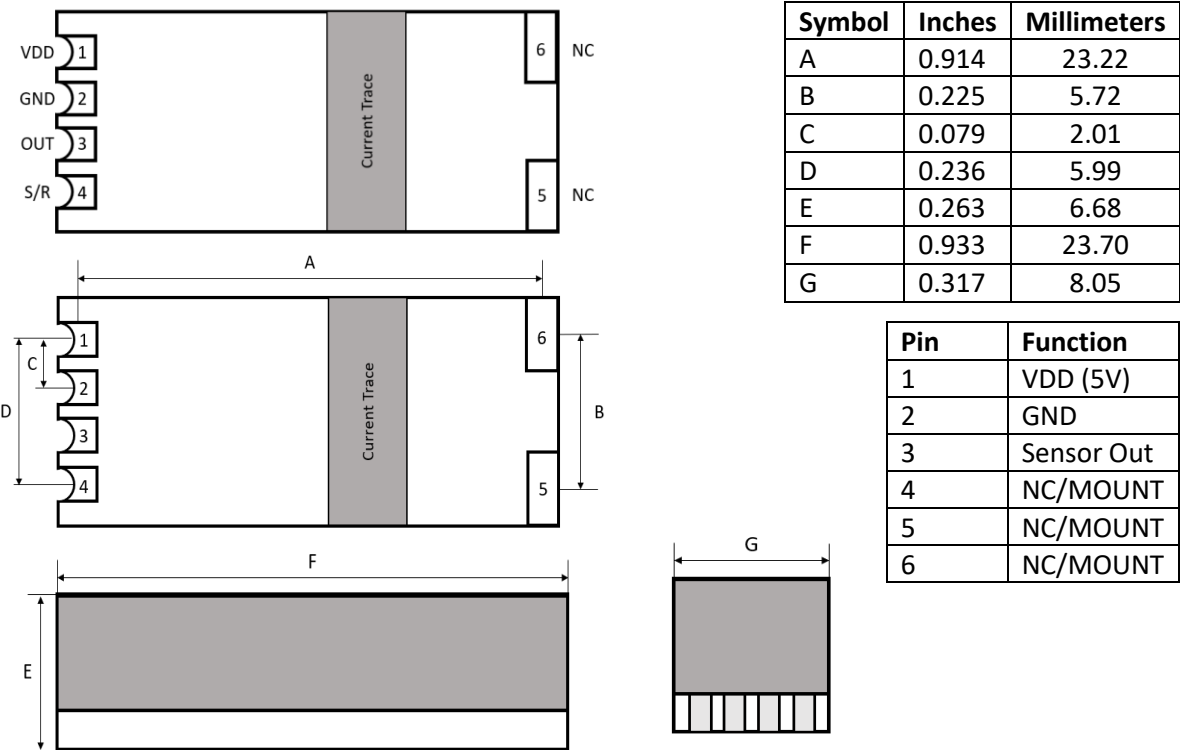


Figure 3. Recommended PCB Footprint, Grid Size: 0.05" x 0.05" – DS50.2

b. DS50.2m (0.91x0.31x0.26 in) – Surface Mount Module



PCB Footprint

Tell-I DS50.2m uses castellated holes to become an SMD component. The position of the Tell-i sensor on the current trace is very important. The castellated holes are small and need specific PCB footprint for soldering. Recommendation of hand soldering and oven/reflow soldering is shown below.

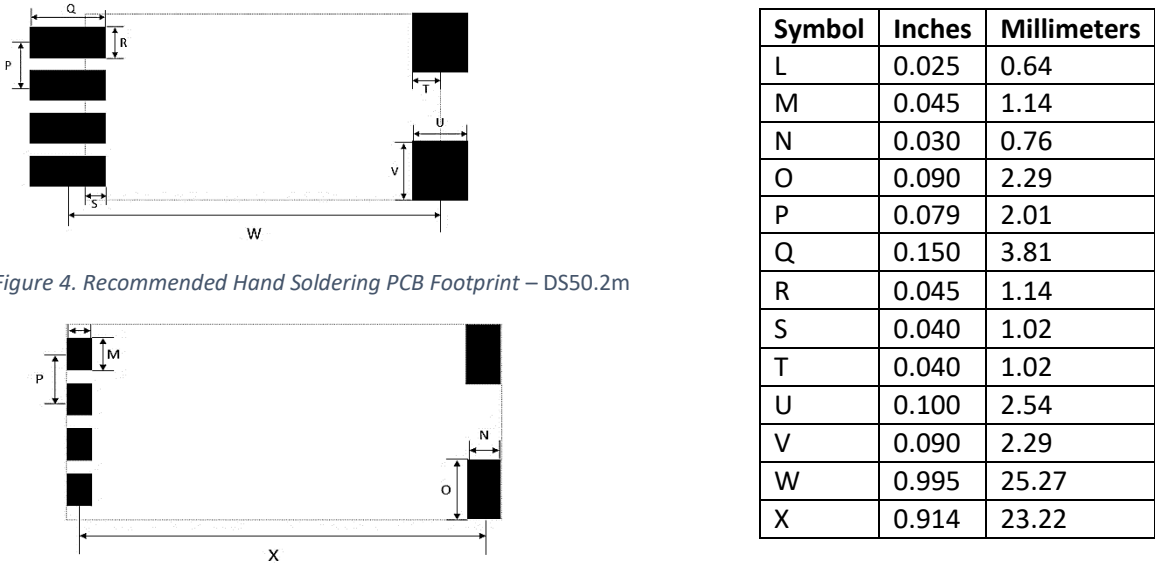


Figure 4. Recommended Hand Soldering PCB Footprint – DS50.2m

Figure 5. Recommended Oven/Reflow Soldering PCB Footprint – DS50.2m