The Allegro™ ACS722 current sensor IC is an economical and precise solution for AC or DC current sensing in industrial, commercial, and communications systems. The small package is ideal for space constrained applications while also saving costs due to reduced board area. Typical applications include motor control, load detection and management, switched-mode power supplies, and overcurrent fault protection.

The device consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic field to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which includes Allegro’s patented digital temperature compensation, resulting in extremely accurate performance over temperature. The output of the device has a positive slope when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sensing. The internal resistance of this conductive path is 0.65 mΩ typical, providing low power loss.

The terminals of the conductive path are electrically isolated from the sensor leads (pins 5 through 8). This allows the ACS722 current sensor IC to be used in high-side current sense applications without the use of high-side differential amplifiers or other costly isolation techniques.

The ACS722 is provided in a small, low profile SOIC8 package. The leadframe is plated with 100% matte tin, providing high inrush current withstand capability. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which includes Allegro’s patented digital temperature compensation, resulting in extremely accurate performance over temperature. The output of the device has a positive slope when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sensing. The internal resistance of this conductive path is 0.65 mΩ typical, providing low power loss.

The ACS722 outputs an analog signal, $V_{OUT}$, that changes, proportionally, with the bidirectional AC or DC primary sensed current, $I_P$, within the specified measurement range. The $BW\_SEL$ pin can be used to select one of the two bandwidths to optimize the noise performance. Grounding the $BW\_SEL$ pin puts the part in the high bandwidth (80 kHz) mode.
ACS722
High Accuracy, Galvanically Isolated Current Sensor IC
With Small Footprint SOIC8 Package

Features and Benefits (continued)
• Output voltage proportional to AC or DC current
• Factory-trimmed sensitivity and quiescent output voltage for improved accuracy
• Chopper stabilization results in extremely stable quiescent output voltage
• Nearly zero magnetic hysteresis
• Ratiometric output from supply voltage

Description (continued)
which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free, except for flip-chip high-temperature Pb-based solder balls, currently exempt from RoHS. The device is fully calibrated prior to shipment from the factory.

Selection Guide

<table>
<thead>
<tr>
<th>Part Number</th>
<th>$I_{PR}$ (A)</th>
<th>Sens(Typ) at $V_{CC} = 3.3$ V (mV/A)</th>
<th>$T_A$ (°C)</th>
<th>Packing¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACS722LLCTR-05AB-T²</td>
<td>±5</td>
<td>264</td>
<td>-40 to 150</td>
<td>Tape and Reel, 3000 pieces per reel</td>
</tr>
<tr>
<td>ACS722LLCTR-10AU-T²</td>
<td>10</td>
<td>132</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACS722LLCTR-10AB-T²</td>
<td>±10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACS722LLCTR-20AU-T²</td>
<td>20</td>
<td>66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACS722LLCTR-20AB-T²</td>
<td>±20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACS722LLCTR-40AU-T²</td>
<td>40</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACS722LLCTR-40AB-T²</td>
<td>±40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Contact Allegro for additional packing options.
²Variant not intended for automotive applications.
**SPECIFICATIONS**

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Notes</th>
<th>Rating</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>$V_{CC}$</td>
<td></td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>Reverse Supply Voltage</td>
<td>$V_{RCC}$</td>
<td></td>
<td>–0.1</td>
<td>V</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>$V_{OUT}$</td>
<td></td>
<td>25</td>
<td>V</td>
</tr>
<tr>
<td>Reverse Output Voltage</td>
<td>$V_{RIOUT}$</td>
<td></td>
<td>–0.1</td>
<td>V</td>
</tr>
<tr>
<td>Operating Ambient Temperature</td>
<td>$T_A$</td>
<td>Range L</td>
<td>–40 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>$T_J(max)$</td>
<td></td>
<td>165</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>$T_{stg}$</td>
<td></td>
<td>–65 to 165</td>
<td>°C</td>
</tr>
</tbody>
</table>

### Isolation Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Notes</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Strength Test Voltage</td>
<td>$V_{ISO}$</td>
<td>Agency type-tested for 60 seconds per UL 60950-1 (edition. 2). Production tested at $V_{ISO}$ for 1 second, in accordance with UL 60950-1 (edition. 2).</td>
<td>2400</td>
<td>$V_{RMS}$</td>
</tr>
<tr>
<td>Working Voltage for Basic Isolation</td>
<td>$V_{WVBI}$</td>
<td>Maximum approved working voltage for basic (single) isolation according UL 60950-1 (edition 2).</td>
<td>420</td>
<td>$V_{PK}$ or $V_{DC}$</td>
</tr>
<tr>
<td>Clearance</td>
<td>$D_{cl}$</td>
<td>Minimum distance through air from IP leads to signal leads.</td>
<td>3.9</td>
<td>mm</td>
</tr>
<tr>
<td>Creepage</td>
<td>$D_{cr}$</td>
<td>Minimum distance along package body from IP leads to signal leads.</td>
<td>3.9</td>
<td>mm</td>
</tr>
</tbody>
</table>

### Thermal Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions*</th>
<th>Rating</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Thermal Resistance (Junction to Ambient)</td>
<td>$R_{θJA}$</td>
<td>Mounted on the Allegro 85-0593 evaluation board with 400 mm² of 4 oz. copper on each side, connected to pins 1 and 2, and to pins 3 and 4, with thermal vias connecting the layers. Performance values include the power consumed by the PCB.</td>
<td>23</td>
<td>°C/W</td>
</tr>
<tr>
<td>Package Thermal Resistance (Junction to Lead)</td>
<td>$R_{θJL}$</td>
<td>Mounted on the Allegro ASEK 722 evaluation board.</td>
<td>5</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

*Additional thermal information available on the Allegro website.*
High Accuracy, Galvanically Isolated Current Sensor IC
With Small Footprint SOIC8 Package

Functional Block Diagram
Pin-out Diagram and Terminal List

Pin-out Diagram

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2</td>
<td>IP+</td>
<td>Terminals for current being sensed; fused internally</td>
</tr>
<tr>
<td>3, 4</td>
<td>IP–</td>
<td>Terminals for current being sensed; fused internally</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal ground terminal</td>
</tr>
<tr>
<td>6</td>
<td>BW_SEL</td>
<td>Terminal for selecting 20 kHz or 80 kHz bandwidth</td>
</tr>
<tr>
<td>7</td>
<td>VIOUT</td>
<td>Analog output signal</td>
</tr>
<tr>
<td>8</td>
<td>VCC</td>
<td>Device power supply terminal</td>
</tr>
</tbody>
</table>
## COMMON ELECTRICAL CHARACTERISTICS

1: valid through the full range of \( T_A = -40^\circ \text{C} \) to \( 150^\circ \text{C} \), and at \( V_{CC} = 3.3 \text{ V} \); unless otherwise specified

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>( V_{CC} )</td>
<td>( V_{CC} ) within ( V_{CC}(\text{min}) ) and ( V_{CC}(\text{max}) )</td>
<td>3</td>
<td>3.3</td>
<td>3.6</td>
<td>V</td>
</tr>
<tr>
<td>Supply Current</td>
<td>( I_{CC} )</td>
<td>( V_{OUT} ) to GND</td>
<td>–</td>
<td>9</td>
<td>12</td>
<td>mA</td>
</tr>
<tr>
<td>Output Capacitance Load</td>
<td>( C_L )</td>
<td>( V_{OUT} ) to GND</td>
<td>–</td>
<td>–</td>
<td>10</td>
<td>nF</td>
</tr>
<tr>
<td>Output Resitive Load</td>
<td>( R_L )</td>
<td>( V_{OUT} ) to GND</td>
<td>4.7</td>
<td>–</td>
<td>–</td>
<td>kΩ</td>
</tr>
<tr>
<td>Primary Conductor Resistance</td>
<td>( R_{IP} )</td>
<td>( T_A = 25^\circ \text{C} )</td>
<td>–</td>
<td>0.65</td>
<td>–</td>
<td>mΩ</td>
</tr>
<tr>
<td>Magnetic Coupling Factor</td>
<td>( C_F )</td>
<td>–</td>
<td>10</td>
<td>–</td>
<td>–</td>
<td>G/A</td>
</tr>
<tr>
<td>Rise Time</td>
<td>( t_r )</td>
<td>( I_p ) = ( I_p(\text{max}) ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to GND</td>
<td>–</td>
<td>4</td>
<td>–</td>
<td>µs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_p ) = ( I_p(\text{max}) ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to VCC</td>
<td>–</td>
<td>17.5</td>
<td>–</td>
<td>µs</td>
</tr>
<tr>
<td>Propagation Delay</td>
<td>( t_{pd} )</td>
<td>( I_p ) = ( I_p(\text{max}) ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to GND</td>
<td>–</td>
<td>1</td>
<td>–</td>
<td>µs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_p ) = ( I_p(\text{max}) ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to VCC</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>µs</td>
</tr>
<tr>
<td>Response Time</td>
<td>( t_{RESPONSE} )</td>
<td>( I_p ) = ( I_p(\text{max}) ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to GND</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>µs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_p ) = ( I_p(\text{max}) ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to VCC</td>
<td>–</td>
<td>22.5</td>
<td>–</td>
<td>µs</td>
</tr>
<tr>
<td>Internal Bandwidth</td>
<td>( BW_i )</td>
<td>Small signal ( -3 \text{ dB} ); ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to GND</td>
<td>–</td>
<td>80</td>
<td>–</td>
<td>kHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Small signal ( -3 \text{ dB} ); ( C_L = 1 \text{ nF} ), ( BW_SEL ) tied to VCC</td>
<td>–</td>
<td>20</td>
<td>–</td>
<td>kHz</td>
</tr>
<tr>
<td>Noise Density</td>
<td>( I_{ND} )</td>
<td>Input referenced noise density; ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} )</td>
<td>–</td>
<td>150</td>
<td>–</td>
<td>µA/√Hz</td>
</tr>
<tr>
<td>Noise</td>
<td>( I_N )</td>
<td>Input referenced noise; ( BW_i = 80 \text{ kHz} ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} )</td>
<td>–</td>
<td>42</td>
<td>–</td>
<td>mA/√Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input referenced noise; ( BW_i = 20 \text{ kHz} ), ( T_A = 25^\circ \text{C} ), ( C_L = 1 \text{ nF} )</td>
<td>–</td>
<td>21</td>
<td>–</td>
<td>mA/√Hz</td>
</tr>
<tr>
<td>Nonlinearity</td>
<td>( E_{LIN} )</td>
<td>Through full range of ( I_p )</td>
<td>–</td>
<td>±1</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Saturation Voltage(^2)</td>
<td>( V_{OH} )</td>
<td>( R_L = 4.7 \text{ kΩ} ), ( T_A = 25^\circ \text{C} )</td>
<td>( V_{CC} - 0.33 )</td>
<td>–</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>( V_{DL} )</td>
<td>( R_L = 4.7 \text{ kΩ} ), ( T_A = 25^\circ \text{C} )</td>
<td>–</td>
<td>–</td>
<td>0.33</td>
<td>V</td>
</tr>
<tr>
<td>Power-On Time</td>
<td>( t_{PO} )</td>
<td>Output reaches 90% of steady-state level, ( T_A = 25^\circ \text{C} ), ( I_p = I_p(\text{max}) ) applied</td>
<td>–</td>
<td>64</td>
<td>–</td>
<td>µs</td>
</tr>
</tbody>
</table>

\(^1\) Device may be operated at higher primary current levels, \( I_p \), ambient temperatures, \( T_A \), and internal leadframe temperatures, provided the Maximum Junction Temperature, \( T_J(\text{max}) \), is not exceeded.

\(^2\) The sensor IC will continue to respond to current beyond the range of \( I_p \) until the high or low saturation voltage; however, the nonlinearity in this region will be worse than through the rest of the measurement range.
### xLLCTR-5AB PERFORMANCE CHARACTERISTICS: $T_A$ Range L, valid at $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$, $V_{\text{CC}} = 3.3\text{ V}$, unless otherwise specified

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Sensing Range</td>
<td>$I_{PR}$</td>
<td></td>
<td>–5</td>
<td>–</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sens</td>
<td>$I_{PG}(\text{min}) &lt; I_P &lt; I_{PG}(\text{max})$</td>
<td>–</td>
<td>264</td>
<td>–</td>
<td>mV/A</td>
</tr>
<tr>
<td>Zero Current Output Voltage</td>
<td>$V_{IOUT(Q)}$</td>
<td>Bidirectional; $I_P = 0\text{ A}$</td>
<td>–</td>
<td>$V_{\text{CC}} \times 0.5$</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>Accuracy Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error</td>
<td>$E_{sens}$</td>
<td>$T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$; measured at $I_P = I_{PR}(\text{max})$</td>
<td>–2</td>
<td>–</td>
<td>2</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$; measured at $I_P = I_{PG}(\text{max})$</td>
<td>–</td>
<td>±2.5</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Offset Voltage¹</td>
<td>$V_{OE}$</td>
<td>$I_P = 0\text{ A}$; $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$</td>
<td>–15</td>
<td>–</td>
<td>15</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = 0\text{ A}$; $T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$</td>
<td>–</td>
<td>±20</td>
<td>–</td>
<td>mV</td>
</tr>
<tr>
<td>Total Output Error²</td>
<td>$E_{TOT}$</td>
<td>$I_P = I_{PR}(\text{max})$, $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$</td>
<td>–2.5</td>
<td>–</td>
<td>2.5</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = I_{PR}(\text{max})$, $T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$</td>
<td>–</td>
<td>±3</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Lifetime Drift Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error Lifetime Drift</td>
<td>$E_{sens_drift}$</td>
<td></td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Total Output Error Lifetime Drift</td>
<td>$E_{tot_drift}$</td>
<td></td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
</tbody>
</table>

¹ Offset Voltage does not incorporate any error due to external magnetic fields. See section: Impact of External Magnetic Fields.

² Percentage of $I_P$, with $I_P = I_{PR}(\text{max})$
## xLLCTR-10AU PERFORMANCE CHARACTERISTICS: $T_A$ Range L, valid at $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$, $V_{CC} = 3.3$ V, unless otherwise specified

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Sensing Range</td>
<td>$I_{PR}$</td>
<td>$I_{PG}(\text{min}) &lt; I_P &lt; I_{PG}(\text{max})$</td>
<td>0</td>
<td>264</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sens</td>
<td>$I_{PG}(\text{max})$</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>mV/A</td>
</tr>
<tr>
<td>Zero Current Output</td>
<td>$V_{IOUT(Q)}$</td>
<td>Unidirectional; $I_P = 0$ A</td>
<td>–</td>
<td>$V_{CC} \times 0.1$</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>Accuracy Performance</td>
<td>$E_{sens}$</td>
<td>$T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$; measured at $I_P = I_{PR}(\text{max})$</td>
<td>$-2$</td>
<td>–</td>
<td>2</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$; measured at $I_P = I_{PG}(\text{max})$</td>
<td>–</td>
<td>$\pm 2.5$</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Offset Voltage¹</td>
<td>$V_{OE}$</td>
<td>$I_P = 0$ A; $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$</td>
<td>$-15$</td>
<td>–</td>
<td>15</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = 0$ A; $T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$</td>
<td>–</td>
<td>$\pm 20$</td>
<td>–</td>
<td>mV</td>
</tr>
<tr>
<td>Total Output Error²</td>
<td>$E_{TOT}$</td>
<td>$I_P = I_{PR}(\text{max})$, $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$</td>
<td>$-2.5$</td>
<td>–</td>
<td>2.5</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = I_{PR}(\text{max})$, $T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$</td>
<td>–</td>
<td>$\pm 3$</td>
<td>–</td>
<td>%</td>
</tr>
</tbody>
</table>

### Lifetime Drift Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity Error Lifetime Drift</td>
<td>$E_{sens_drift}$</td>
<td>–</td>
<td>–</td>
<td>$\pm 2$</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Total Output Error Lifetime Drift</td>
<td>$E_{TOT_drift}$</td>
<td>–</td>
<td>–</td>
<td>$\pm 2$</td>
<td>–</td>
<td>%</td>
</tr>
</tbody>
</table>

¹ Offset Voltage does not incorporate any error due to external magnetic fields. See section: Impact of External Magnetic Fields.

² Percentage of $I_P$, with $I_P = I_{PR}(\text{max})$

## xLLCTR-10AB PERFORMANCE CHARACTERISTICS: $T_A$ Range L, valid at $T_A = -40^\circ\text{C}$ to $150^\circ\text{C}$, $V_{CC} = 3.3$ V, unless otherwise specified

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Sensing Range</td>
<td>$I_{PR}$</td>
<td>$I_{PG}(\text{min}) &lt; I_P &lt; I_{PG}(\text{max})$</td>
<td>$-10$</td>
<td>–</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sens</td>
<td>$I_{PG}(\text{max})$</td>
<td>–</td>
<td>132</td>
<td>–</td>
<td>mV/A</td>
</tr>
<tr>
<td>Zero Current Output</td>
<td>$V_{IOUT(Q)}$</td>
<td>Bidirectional; $I_P = 0$ A</td>
<td>–</td>
<td>$V_{CC} \times 0.5$</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>Accuracy Performance</td>
<td>$E_{sens}$</td>
<td>$T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$; measured at $I_P = I_{PR}(\text{max})$</td>
<td>$-1.5$</td>
<td>–</td>
<td>1.5</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$; measured at $I_P = I_{PG}(\text{max})$</td>
<td>–</td>
<td>$\pm 2$</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Offset Voltage¹</td>
<td>$V_{OE}$</td>
<td>$I_P = 0$ A; $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$</td>
<td>$-10$</td>
<td>–</td>
<td>10</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = 0$ A; $T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$</td>
<td>–</td>
<td>$\pm 15$</td>
<td>–</td>
<td>mV</td>
</tr>
<tr>
<td>Total Output Error²</td>
<td>$E_{TOT}$</td>
<td>$I_P = I_{PR}(\text{max})$, $T_A = 25^\circ\text{C}$ to $150^\circ\text{C}$</td>
<td>–</td>
<td>$\pm 3$</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = I_{PR}(\text{max})$, $T_A = -40^\circ\text{C}$ to $25^\circ\text{C}$</td>
<td>–</td>
<td>$\pm 3$</td>
<td>–</td>
<td>%</td>
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</table>

### Lifetime Drift Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity Error Lifetime Drift</td>
<td>$E_{sens_drift}$</td>
<td>–</td>
<td>–</td>
<td>$\pm 2$</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Total Output Error Lifetime Drift</td>
<td>$E_{TOT_drift}$</td>
<td>–</td>
<td>–</td>
<td>$\pm 2$</td>
<td>–</td>
<td>%</td>
</tr>
</tbody>
</table>

¹ Offset Voltage does not incorporate any error due to external magnetic fields. See section: Impact of External Magnetic Fields.

² Percentage of $I_P$, with $I_P = I_{PR}(\text{max})$
### xLLCTR-20AU PERFORMANCE CHARACTERISTICS: $T_A$ Range L, valid at $T_A = -40^\circ C$ to $150^\circ C$, $V_{CC} = 3.3$ V, unless otherwise specified

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nominal Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Sensing Range</td>
<td>$I_{PR}$</td>
<td>$I_{PG}(\text{min}) &lt; I_P &lt; I_{PG}(\text{max})$</td>
<td>–</td>
<td>132</td>
<td>–</td>
<td>mV/A</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sens</td>
<td></td>
<td>–</td>
<td>0.1</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>Zero Current Output Voltage</td>
<td>$V_{IOUT(Q)}$</td>
<td>Unidirectional; $I_P = 0$ A</td>
<td>–</td>
<td>$V_{CC} x 0.1$</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td><strong>Accuracy Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error</td>
<td>$E_{sens}$</td>
<td>$T_A = 25^\circ C$ to $150^\circ C$; measured at $I_P = I_{PR}(\text{max})$</td>
<td>–1.5</td>
<td>–</td>
<td>1.5</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_A = -40^\circ C$ to $25^\circ C$; measured at $I_P = I_{PG}(\text{max})$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Offset Voltage$^1$</td>
<td>$V_{OE}$</td>
<td>$I_P = 0$ A; $T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–10</td>
<td>–</td>
<td>10</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = 0$ A; $T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±15</td>
<td>–</td>
<td>mV</td>
</tr>
<tr>
<td>Total Output Error$^2$</td>
<td>$E_{TOT}$</td>
<td>$I_P = I_{PR}(\text{max}), T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–2</td>
<td>–</td>
<td>2</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = I_{PR}(\text{max}), T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±3</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td><strong>Lifetime Drift Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error Lifetime Drift</td>
<td>$E_{sens_drift}$</td>
<td></td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Total Output Error Lifetime Drift</td>
<td>$E_{tot_drift}$</td>
<td></td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
</tbody>
</table>

$^1$ Offset Voltage does not incorporate any error due to external magnetic fields. See section: Impact of External Magnetic Fields.

$^2$ Percentage of $I_P$, with $I_P = I_{PR}(\text{max})$

---

### xLLCTR-20AB PERFORMANCE CHARACTERISTICS: $T_A$ Range L, valid at $T_A = -40^\circ C$ to $150^\circ C$, $V_{CC} = 3.3$ V, unless otherwise specified

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nominal Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Sensing Range</td>
<td>$I_{PR}$</td>
<td></td>
<td>–20</td>
<td>–</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sens</td>
<td>$I_{PG}(\text{min}) &lt; I_P &lt; I_{PG}(\text{max})$</td>
<td>–</td>
<td>66</td>
<td>–</td>
<td>mV/A</td>
</tr>
<tr>
<td>Zero Current Output Voltage</td>
<td>$V_{IOUT(Q)}$</td>
<td>Bidirectional; $I_P = 0$ A</td>
<td>–</td>
<td>$V_{CC} x 0.5$</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td><strong>Accuracy Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error</td>
<td>$E_{sens}$</td>
<td>$T_A = 25^\circ C$ to $150^\circ C$; measured at $I_P = I_{PR}(\text{max})$</td>
<td>–1.5</td>
<td>–</td>
<td>1.5</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_A = -40^\circ C$ to $25^\circ C$; measured at $I_P = I_{PG}(\text{max})$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Offset Voltage$^1$</td>
<td>$V_{OE}$</td>
<td>$I_P = 0$ A; $T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–10</td>
<td>–</td>
<td>10</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = 0$ A; $T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±15</td>
<td>–</td>
<td>mV</td>
</tr>
<tr>
<td>Total Output Error$^2$</td>
<td>$E_{TOT}$</td>
<td>$I_P = I_{PR}(\text{max}), T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–2</td>
<td>–</td>
<td>2</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = I_{PR}(\text{max}), T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±3</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td><strong>Lifetime Drift Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error Lifetime Drift</td>
<td>$E_{sens_drift}$</td>
<td></td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Total Output Error Lifetime Drift</td>
<td>$E_{tot_drift}$</td>
<td></td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
</tbody>
</table>

$^1$ Offset Voltage does not incorporate any error due to external magnetic fields. See section: Impact of External Magnetic Fields.

$^2$ Percentage of $I_P$, with $I_P = I_{PR}(\text{max})$
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*High Accuracy, Galvanically Isolated Current Sensor IC*

*With Small Footprint SOIC8 Package*

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**xLLCTR-40AU PERFORMANCE CHARACTERISTICS:** $T_A$ Range L, valid at $T_A = -40^\circ C$ to $150^\circ C$, $V_{CC} = 3.3$ V, unless otherwise specified

<table>
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<tr>
<th>Characteristic</th>
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</thead>
<tbody>
<tr>
<td><strong>Nominal Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Sensing Range</td>
<td>$I_{PR}$</td>
<td>$I_{PG}(min) &lt; I_P &lt; I_{PG}(max)$</td>
<td>0</td>
<td>–</td>
<td>40</td>
<td>A</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sens</td>
<td>$I_{PG}(min) &lt; I_P &lt; I_{PG}(max)$</td>
<td>–</td>
<td>66</td>
<td>–</td>
<td>mV/A</td>
</tr>
<tr>
<td>Zero Current Output Voltage</td>
<td>$V_{OUT(Q)}$</td>
<td>Unidirectional; $I_P = 0$ A</td>
<td>–</td>
<td>$V_{CC} \times 0.1$</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td><strong>Accuracy Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error</td>
<td>$E_{sens}$</td>
<td>$T_A = 25^\circ C$ to $150^\circ C$; measured at $I_P = I_{PR}(max)$</td>
<td>–1.5</td>
<td>–</td>
<td>1.5</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_A = -40^\circ C$ to $25^\circ C$; measured at $I_P = I_{PG}(max)$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Offset Voltage</td>
<td>$V_{OE}$</td>
<td>$I_P = 0$ A; $T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–10</td>
<td>–</td>
<td>10</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = 0$ A; $T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±15</td>
<td>–</td>
<td>mV</td>
</tr>
<tr>
<td>Total Output Error</td>
<td>$E_{TOT}$</td>
<td>$I_P = I_{PR}(max), T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–2</td>
<td>–</td>
<td>2</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = I_{PR}(max), T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±3</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td><strong>Lifetime Drift Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error Lifetime Drift</td>
<td>$E_{sens_drift}$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Total Output Error Lifetime Drift</td>
<td>$E_{tot_drift}$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

---

$n$ Offset Voltage does not incorporate any error due to external magnetic fields. See section: Impact of External Magnetic Fields.

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**xLLCTR-40AB PERFORMANCE CHARACTERISTICS:** $T_A$ Range L, valid at $T_A = -40^\circ C$ to $150^\circ C$, $V_{CC} = 3.3$ V, unless otherwise specified

<table>
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<td><strong>Nominal Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Sensing Range</td>
<td>$I_{PR}$</td>
<td>$I_{PG}(min) &lt; I_P &lt; I_{PG}(max)$</td>
<td>–40</td>
<td>–</td>
<td>40</td>
<td>A</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sens</td>
<td>$I_{PG}(min) &lt; I_P &lt; I_{PG}(max)$</td>
<td>–</td>
<td>33</td>
<td>–</td>
<td>mV/A</td>
</tr>
<tr>
<td>Zero Current Output Voltage</td>
<td>$V_{OUT(Q)}$</td>
<td>Bidirectional; $I_P = 0$ A</td>
<td>–</td>
<td>$V_{CC} \times 0.5$</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td><strong>Accuracy Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error</td>
<td>$E_{sens}$</td>
<td>$T_A = 25^\circ C$ to $150^\circ C$; measured at $I_P = I_{PR}(max)$</td>
<td>–1.5</td>
<td>–</td>
<td>1.5</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_A = -40^\circ C$ to $25^\circ C$; measured at $I_P = I_{PG}(max)$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td>Offset Voltage</td>
<td>$V_{OE}$</td>
<td>$I_P = 0$ A; $T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–10</td>
<td>–</td>
<td>10</td>
<td>mV</td>
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<tr>
<td></td>
<td></td>
<td>$I_P = 0$ A; $T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±15</td>
<td>–</td>
<td>mV</td>
</tr>
<tr>
<td>Total Output Error</td>
<td>$E_{TOT}$</td>
<td>$I_P = I_{PR}(max), T_A = 25^\circ C$ to $150^\circ C$</td>
<td>–2</td>
<td>–</td>
<td>2</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_P = I_{PR}(max), T_A = -40^\circ C$ to $25^\circ C$</td>
<td>–</td>
<td>±3</td>
<td>–</td>
<td>%</td>
</tr>
<tr>
<td><strong>Lifetime Drift Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity Error Lifetime Drift</td>
<td>$E_{sens_drift}$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>Total Output Error Lifetime Drift</td>
<td>$E_{tot_drift}$</td>
<td>–</td>
<td>±2</td>
<td>–</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

---

$n$ Offset Voltage does not incorporate any error due to external magnetic fields. See section: Impact of External Magnetic Fields.

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1 Percentage of $I_P$, with $I_P = I_{PR}(max)$
CHARACTERISTIC PERFORMANCE

xLLCTR-5AB Key Parameters

- Zero Current Output Voltage vs. Temperature
- Offset Voltage vs. Temperature
- Sensitivity vs. Temperature
- Sensitivity Error vs. Temperature
- Nonlinearity vs. Temperature
- Total Error at I_{PRM} vs. Temperature
xLLCTR-10AB Key Parameters

Zero Current Output Voltage vs. Temperature

Offset Voltage vs. Temperature

Sensitivity vs. Temperature

Sensitivity Error vs. Temperature

Nonlinearity vs. Temperature

Total Error at $I_{PRRMS}$ vs. Temperature

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ACS722 High Accuracy, Galvanically Isolated Current Sensor IC With Small Footprint SOIC8 Package

xLLCTR-10AU Key Parameters

Zero Current Output Voltage vs. Temperature

Offset Voltage vs. Temperature

Sensitivity vs. Temperature

Sensitivity Error vs. Temperature

Nonlinearity vs. Temperature

Total Error at \( |I_{\text{in}}| = \text{PR(max)} \) vs. Temperature

Temperature (ºC)

Figure Legend:
- +3 Sigma
- Average
- -3 Sigma
xLLCTR-20AB Key Parameters

Zero Current Output Voltage vs. Temperature

Offset Voltage vs. Temperature

Sensitivity vs. Temperature

Sensitivity Error vs. Temperature

Nonlinearity vs. Temperature

Total Error vs. Temperature

+3 Sigma

Average

-3 Sigma
xLLCTR-20AU Key Parameters

- Zero Current Output Voltage vs. Temperature
- Offset Voltage vs. Temperature
- Sensitivity vs. Temperature
- Sensitivity Error vs. Temperature
- Nonlinearity vs. Temperature
- Total Error vs. Temperature
- Total Error at I_{flood} vs. Temperature
xLLCTR-40AB Key Parameters

Zero Current Output Voltage vs. Temperature

Offset Voltage vs. Temperature

Sensitivity vs. Temperature

Sensitivity Error vs. Temperature

Nonlinearity vs. Temperature

Total Error at I_{max} vs. Temperature

Temperature (ºC)

Sensitivity (mV/A)

Sensitivity Error (%)

Nonlinearity (%)

Total Error (%)

Temperature (ºC)

V_{zero} (mV)

Offset Voltage (mV)

Temperature (ºC)

V_{zero} (mV)

Offset Voltage (mV)

Temperature (ºC)

Sensitivity (mV/A)

Sensitivity Error (%)

Temperature (ºC)

Sensitivity (mV/A)

Sensitivity Error (%)

Temperature (ºC)

Nonlinearity (%)
xLLCTR-40AU Key Parameters

- Zero Current Output Voltage vs. Temperature
- Offset Voltage vs. Temperature
- Sensitivity vs. Temperature
- Sensitivity Error vs. Temperature
- Nonlinearity vs. Temperature
- Total Error at I_{IN} vs. Temperature
DEFINITIONS OF ACCURACY CHARACTERISTICS

**Sensitivity (Sens)**

The change in sensor IC output in response to a 1 A change through the primary conductor. The sensitivity is the product of the magnetic circuit sensitivity (G/A) (1 G = 0.1 mT) and the linear IC amplifier gain (mV/G). The linear IC amplifier gain is programmed at the factory to optimize the sensitivity (mV/A) for the full-scale current of the device.

**Nonlinearity (E\text{LIN})**

The nonlinearity is a measure of how linear the output of the sensor IC is over the full current measurement range. The nonlinearity is calculated as:

\[ E_{\text{LIN}} = \left[ 1 - \frac{V_{\text{IOUT}}(I_{\text{PR}}(\text{max})) - V_{\text{IOUT}}(Q)}{2 \times V_{\text{IOUT}}(I_{\text{PR}}(\text{max})/2) - V_{\text{IOUT}}(Q)} \right] \times 100 \ (\%) \]

where \( V_{\text{IOUT}}(I_{\text{PR}}(\text{max})) \) is the output of the sensor IC with the maximum measurement current flowing through it and \( V_{\text{IOUT}}(I_{\text{PR}}(\text{max})/2) \) is the output of the sensor IC with half of the maximum measurement current flowing through it.

**Zero Current Output Voltage (V_{\text{IOUT}}(Q))**

The output of the sensor when the primary current is zero. For a unipolar supply voltage, it nominally remains at 0.5 × V_{CC} for a bidirectional device and 0.1 × V_{CC} for a unidirectional device. For example, in the case of a bidirectional output device, V_{CC} = 3.3 V translates into \( V_{\text{IOUT}}(Q) = 1.65 \) V. Variation in \( V_{\text{IOUT}}(Q) \) can be attributed to the resolution of the Allegro linear IC quiescent voltage trim and thermal drift.

**Offset Voltage (V_{\text{OE}})**

The deviation of the device output from its ideal quiescent value of 0.5 × V_{CC} (bidirectional) or 0.1 × V_{CC} (unidirectional) due to nonmagnetic causes. To convert this voltage to amperes, divide by the device sensitivity, Sens.

**Total Output Error (E_{\text{TOT}})**

The difference between the current measurement from the sensor IC and the actual current (I_P), relative to the actual current. This is equivalent to the difference between the ideal output voltage and the actual output voltage, divided by the ideal sensitivity, relative to the current flowing through the primary conduction path:

\[ E_{\text{TOT}}(I_P) = \frac{V_{\text{IOUT ideal}}(I_P) - V_{\text{IOUT}}(I_P)}{\text{Sens}_{\text{ideal}}(I_P) \times I_P} \times 100 \ (\%) \]

The Total Output Error incorporates all sources of error and is a function of I_P. At relatively high currents, \( E_{\text{TOT}} \) will be mostly due to sensitivity error, and at relatively low currents, \( E_{\text{TOT}} \) will be mostly due to Offset Voltage (V_{OE}). In fact, at \( I_P = 0 \), \( E_{\text{TOT}} \) approaches infinity due to the offset. This is illustrated in Figures 1 and 2. Figure 1 shows a distribution of output voltages versus \( I_P \) at 25°C and across temperature. Figure 2 shows the corresponding \( E_{\text{TOT}} \) versus \( I_P \).
Impact of External Magnetic Fields

The ACS722 works by sensing the magnetic field created by the current flowing through the package. However, the sensor cannot differentiate between fields created by the current flow and external magnetic fields. This means that external magnetic fields can cause errors in the output of the sensor. Magnetic fields which are perpendicular to the surface of the package affect the output of the sensor, as it only senses fields in that one plane. The error in Amperes can be quantified as:

\[ \text{Error}(B) = \frac{B}{C_F} \]

where \( B \) is the strength of the external field perpendicular to the surface of the package in Gauss, and \( C_F \) is the coupling factor in G/A. Then, multiplying by the sensitivity of the part, Sens, gives the error in mV.

For example, an external field of 1 Gauss will result in around 0.1 A of error. If the ACS722LLCTR-10AB, which has a nominal sensitivity of 132 mV/A, is being used, that equates to 13.2 mV of error on the output of the sensor.

<table>
<thead>
<tr>
<th>External Field (Gauss)</th>
<th>Error (A)</th>
<th>Error (mV)</th>
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<tbody>
<tr>
<td></td>
<td>5AB</td>
<td>10AB</td>
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<tr>
<td>0.5</td>
<td>0.05</td>
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<td>1</td>
<td>0.1</td>
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<tr>
<td>2</td>
<td>0.2</td>
<td>52.8</td>
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DEFINITIONS OF DYNAMIC RESPONSE CHARACTERISTICS

Power-On Time (t\textsubscript{PO})

When the supply is ramped to its operating voltage, the device requires a finite time to power its internal components before responding to an input magnetic field. Power-On Time, \( t_{PO} \), is defined as the time it takes for the output voltage to settle within ±10% of its steady state value under an applied magnetic field, after the power supply has reached its minimum specified operating voltage, \( V_{CC}(\text{min}) \), as shown in the chart at right.

Rise Time (\( t_r \))

The time interval between a) when the sensor IC reaches 10% of its full scale value, and b) when it reaches 90% of its full scale value. The rise time to a step response is used to derive the bandwidth of the current sensor IC, in which \( f(-3\text{ dB}) = 0.35/t_r \). Both \( t_r \) and \( t_{\text{RESPONSE}} \) are detrimentally affected by eddy current losses observed in the conductive IC ground plane.

Propagation Delay (\( t_{pd} \))

The propagation delay is measured as the time interval a) when the primary current signal reaches 20% of its final value, and b) when the device reaches 20% of its output corresponding to the applied current.

Response Time (\( t_{\text{RESPONSE}} \))

The time interval between a) when the primary current signal reaches 90% of its final value, and b) when the device reaches 90% of its output corresponding to the applied current.
Figure 6: Package LC, 8-pin SOIC8
ACS722  
High Accuracy, Galvanically Isolated Current Sensor IC  
With Small Footprint SOIC8 Package  

Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Revision Date</th>
<th>Description of Revision</th>
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<tbody>
<tr>
<td>1</td>
<td>October 29, 2014</td>
<td>Added Magnetic Coupling Factor characteristic and Error Due to External Magnetic Fields section</td>
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<tr>
<td>2</td>
<td>April 29, 2015</td>
<td>Added Characteristic Performance graphs</td>
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