Introducing the World’s Smallest, Lowest Loss AC Current Sensor
Differentiated Power Portfolio

- Leveraging expertise in isolation, high-voltage and digital control technologies
- All parts based on mixed-signal CMOS design
- Expanding portfolio of unique power products
AC Current Sensor Market

- AC Current Sensors are used in power system of all kinds
  - Power supplies, motor controls, lighting controls
- AC Current Sensors provide critical information for system control and safety
  - Generate an output signal proportional to measured current
Customer Challenges

♦ Power dissipation
  ➢ Low series R: A 50mΩ current sensor in a 20A supply burns 20 Watts

♦ Accuracy
  ➢ Factory system calibration required

♦ Quality and reliability
  ➢ Hand-wound current transformers result in poor lead alignment and mechanical failures
  ➢ Discrete sensing approaches require a large bill of materials reducing reliability and yields

♦ Size
  ➢ Shrinking power system form factors afford less space
  ➢ Traditional current transformers are large bulky magnetic components that are at least 0.25 in³ and can be larger than 1 in³
Introducing the Si85xx AC Current Sensor

- Highly integrated AC Current Sensor
  - Integrates the entire current sensing bill-of-materials in a tiny footprint

- Industry’s lowest power dissipation
  - Higher efficiency

- Ease of design and manufacturing
  - Very low parasitics and no need for factory calibration at assembly
Si8500: Complete Integration

- Tiny, 4 x 4 x 1 QFN package
  - Integrates current transformer, blocking diode, burden resistor and output RC filter
  - Decreases board space by up to 75%, reduces enclosure volume requirements by 80%
  - Integrates temperature and offset compensation circuitry

- Replaces two current transformer circuits
  - “Ping-pong” output Si851x supports most full-bridge applications
  - Enables a single Si851x to replace two current transformers in a Full Bridge
Industry’s Best Performance: Low Loss

- Power efficiency is a critical performance metric for power supplies
- Si85xx has the industry’s lowest power dissipation in the high current power path
  - ~1mΩ series resistance and <2nH of series inductance
- Low resistance translates into high efficiency and simplified design
  - +/- 5% accuracy further simplifies design and eliminates need to oversize components to account for inaccuracies in the current measurement device
Improved Reliability

♦ Ease of design and manufacturing

- No hand winding or calibration at assembly required
- No variations in electrical characteristics that can cause design problems or require calibration at assembly
- Operates from -40°C to +125°C in a standard surface mount package, improving reliability and manufacturability
Industry’s Best Performance: How it Works

Current Flow

PC Board Trace

Current through slug induces a voltage on chip inductor

Current waveform is recovered and conditioned

Metal Slug

DIE

INTEGRATOR CIRCUIT

TEMP AND OFFSET COMPENSATION

RESET CIRCUIT

OUTPUT

Si85xx

Clean current signal!

RESET INPUTS

Si85xx
Industry’s Best Performance: Ultra-Clean Output

♦ No output filter needed or leading-edge blanking needed!

* Differential oscilloscope probe across current sense resistor
Industry’s Best Performance: Lower Noise

- Low series inductance and on-board signal processing reduces ringing commonly found in current transformer circuits

![Graph showing Si85xx output and CT Output](image)
## Si85xx: The Competition

<table>
<thead>
<tr>
<th></th>
<th>Si85xx</th>
<th>Series Resistor</th>
<th>Hall Effect/MR Sensor</th>
<th>CT</th>
<th>DCR</th>
<th>Low-Side MOSFET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series R (mΩ)</td>
<td>1</td>
<td>10</td>
<td>No loss</td>
<td>6 - 20</td>
<td>No loss</td>
<td>No loss</td>
</tr>
<tr>
<td>Relative Cost</td>
<td>1.0</td>
<td>1.8</td>
<td>1.8</td>
<td>1.0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Bandwidth (KHz)</td>
<td>50-1,000</td>
<td>DC - 200</td>
<td>DC - 300</td>
<td>50 – 1,000</td>
<td>50 – 1,000</td>
<td>50 – 1,000</td>
</tr>
<tr>
<td>BOM</td>
<td>1C</td>
<td>1R, 1C</td>
<td>1R, 2C</td>
<td>1D, 1R, 1C</td>
<td>2 Opamps, 6R, 2C</td>
<td>Opamp, 4R, 1C</td>
</tr>
<tr>
<td>Accuracy (±%)</td>
<td>5</td>
<td>5</td>
<td>10 - 30</td>
<td>15</td>
<td>25</td>
<td>35</td>
</tr>
<tr>
<td>Output (mV)</td>
<td>2,000</td>
<td>10-200</td>
<td>10-100</td>
<td>100-500</td>
<td>100</td>
<td>10-100</td>
</tr>
<tr>
<td>Footprint (mm²)</td>
<td>16</td>
<td>20</td>
<td>25 –150</td>
<td>60</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Height (mm)</td>
<td>1</td>
<td>1</td>
<td>2 -5</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Solder-In EVB Helps Customers

**Si85xx solder-in board**
Enables customers to install the Si85xx in their system immediately and without laying-out a new board

Customer’s system
Summary

♦ AC Current Sensor integrates the entire current sensing bill-of-materials in a tiny footprint

♦ Industry’s lowest power dissipation results in higher efficiency

♦ Very low parasitics and no need for factory calibration ease design and manufacturing