**ADI Renewable Energy—Solar PV Solutions**

**ADI Energy Segment Overview**

Analog Devices leads the industry in highly accurate and precise signal measurement and control by delivering cost competitive, high quality ICs for reliable metering, measurement, and control. These products are used in renewable energy, electrical power transmission, and distribution applications, as well as electric, gas, and water metering. The combination of ADI’s proven expertise in optimized system-level signal processing performance and its extensive range of product offerings provides developers with accurate, reliable, and easy-to-design energy management solutions.

**Main Challenges and System Considerations**

- Higher reliability and lower assembly/manufacturing costs
- Relatively harsh environment with temperatures of up to +125°C
- Power conversion efficiency is critical and need components that consume as little power as possible
- Keeping the generated harmonics below the regulatory levels
- Maintain low dc injection current levels onto the grid

**Solar PV Application Categories**

- Offline solar PV system
- Grid-connected solar PV systems
  - High power solar PV (>100 kW)
  - Medium power solar PV (1 kW to 10 kW)
  - Micro-inverter (200 W to 300 W)
- Enabling power networks using high performance processing technology engineered with robustness and reliability
- Mixed-signal conversion and processing enable ease of design and reduced time to market

**Why Choose ADI?**

- ADI’s expertise in integrated energy measurement—300 million ADI metrology-based meters deployed
- 50% of all electrical grid equipment worldwide uses ADI converters
- Precision measurement of current & voltage through highly accurate converters and amplifiers

**Main Signal Chain**

[Diagram showing the signal chain for solar PV solutions]
### ADI Product Technologies for Renewable Energy (Solar PV Systems)

- **Amps/RFs**
- **Precision ADCs**
- **Coupler isolators**—integrated isolation with USB and RS-485
- **Processors**—Blackfin® ADSP-BF50x and ARM7-based processors
- **Power management ICs**
- **Vibration sensors**—MEMS & accelerometers
- **Current and voltage measurement ICs**

### Featured Products

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Key Features</th>
<th>Benefit</th>
</tr>
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<tbody>
<tr>
<td>AD8210</td>
<td>Current sense amp</td>
<td>6 V to &gt;-500 V common-mode range, adjustable gain, current output</td>
<td>High common-mode input range</td>
</tr>
<tr>
<td>AD4091-2</td>
<td>Operational amp</td>
<td>Single-supply operation: 3 V to 30 V and wide input voltage range, rail-to-rail output swing, low supply current: 250 μA/amplifier, overvoltage protection (OVP)</td>
<td>Wide input voltage range and overvoltage protection</td>
</tr>
<tr>
<td>AD7400A/AD7401A</td>
<td>Isolated sigma-delta modulator</td>
<td>Operates from a 5 V power supply and accepts a differential input signal of ±250 mV (±320 mV full scale), Isolated and differential input</td>
<td></td>
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<tr>
<td>AD7606/AD7607</td>
<td>8-channel, 16-bit/14-bit simultaneous ADC</td>
<td>True bipolar analog input ranges: ±10 V, ±5 V, single 5 V analog supply, 2.3 V to +5 V VDRIVE, 1 MΩ analog input impedance, analog input clamp protection, 8-channel simultaneous sampling, single 5 V supply</td>
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<tr>
<td>ADuC702x</td>
<td>Micro-converter</td>
<td>41 MHz ARM7 core and embedded 12-bit ADC, 3-Pair PWM output, 32 kB or 64 kB flash</td>
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<td>ADuM5000</td>
<td>Isolated dc-to-dc</td>
<td>Isolated dc-to-dc converter, up to 500 mW output power, thermal overload protection</td>
<td>Isolated dc-to-dc</td>
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<tr>
<td>ADuM141x</td>
<td>Quad-channel digital isolator</td>
<td>High data rate: dc to 90 Mbps (NRZ), high common-mode transient immunity: &gt;-25 kV/μs, low power operation and bidirectional communication</td>
<td>Long lifetime, easy to select different direction</td>
</tr>
<tr>
<td>ADuM2587E</td>
<td>Isolated RS-485/RS-422 transceiver</td>
<td>Half or full duplex, 500 kbps, 5 V or 3.3 V operation</td>
<td>Integrated isolated dc-to-dc converter</td>
</tr>
<tr>
<td>ADuM353E</td>
<td>Isolated CAN transceiver</td>
<td>Signal and power isolated CAN transceiver, complies with ISO 11898 standard, high speed data rates up to 1 Mbps</td>
<td>Integrated isolated dc-to-dc</td>
</tr>
<tr>
<td>AD7878</td>
<td>3-phase energy meter</td>
<td>Less than 0.1% error in active and reactive energy over a dynamic range of 1000 to 1, less than 0.2% error in active and reactive energy over a dynamic range of 3000 to 1 at Ta = 25°C</td>
<td>High performance, harmonic analysis</td>
</tr>
<tr>
<td>AD7953</td>
<td>1-phase energy meter</td>
<td>Less than 0.1% error in active and reactive energy measurement over a dynamic range of 3000:1, less than 0.2% error in instantaneous IRMS and VRMS measurements over a dynamic range of 500:1</td>
<td>High performance, wide dynamic range</td>
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<tr>
<td>ADP2114</td>
<td>dc-to-dc regulator</td>
<td>Configurable 3 A/1 A or 2 A/2 A dual output load combinations or 4 A combined single output, high efficiency: up to 95%</td>
<td>Programmable frequencies, single 4 a output</td>
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<tr>
<td>ADP2118</td>
<td>dc-to-dc regulator</td>
<td>3 A continuous output current, ±1.5% output accuracy, input voltage range from 2.3 V to 5.5 V</td>
<td>3 A continuous output current</td>
</tr>
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### Circuits from the Lab™ Reference Circuits for Energy Management

- **Layout considerations for an expandable multichannel simultaneous sampling data acquisition system (DAS) based on the AD7606 16-bit, 8-channel DAS (CN0148)—www.analog.com/CN0148**
- **A low cost, 8-channel, simultaneously sampled, data acquisition system with 84 dB SNR and excellent channel-to-channel matching (CN0175)—www.analog.com/CN0175**
- **High voltage, high precision current sensing with output level shifting using the AD8210 Current sense amplifier and the AD8274 difference amplifier (CN0116)—www.analog.com/CN0116**

More reference circuits are available at www.analog.com/circuits

If you need more ADI solar PV applications and products information, please visit energy.analog.com