POWERING ADI COMPONENTS
In Industrial and Instrumentation Applications
Powering Bipolar Components

Analog Devices offers complete power management solutions to power devices requiring bipolar supplies such as amplifiers, ADCs, and DACs in precision signal chains. ADI offers solutions both for supply generation and low noise point of loads with PSRRs specified at modern switcher frequencies.

ADC/amplifier applications diagram.

DC-to-DC for Bipolar Applications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Product Description</th>
<th>V (Vin)</th>
<th>V (Vout)</th>
<th>Number of Outputs</th>
<th>Input Current Limit (A)</th>
<th>Key Features</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP5070</td>
<td>Dual dc-to-dc with boost and inverter outputs for generating independent positive and negative outputs</td>
<td>Boost/inverter: 2.85 to 15</td>
<td>Boost: V&lt;sub&gt;In&lt;/sub&gt; to 39 V, inverter: −0.5 V to −39 V below V&lt;sub&gt;In&lt;/sub&gt;</td>
<td>1 × boost, 1 × inverter</td>
<td>Boost: 1, inverter: 0.6</td>
<td>Individual enable pin, adjustable outputs, sequence control, sync sequence, soft start, and slew rate control</td>
<td>20-lead LFCS, 20-lead TSSOP</td>
</tr>
<tr>
<td>ADP5071</td>
<td>Dual dc-to-dc with boost and inverter outputs for generating independent positive and negative outputs</td>
<td>Boost/inverter: 2.85 to 15</td>
<td>Boost: V&lt;sub&gt;In&lt;/sub&gt; to 39 V, inverter: −0.5 V to −39 V below V&lt;sub&gt;In&lt;/sub&gt;</td>
<td>1 × boost, 1 × inverter</td>
<td>Boost: 2, inverter: 1.2</td>
<td>Individual enable pin, adjustable outputs, sequence control, sync sequence, soft start, and slew rate control</td>
<td>20-lead LFCS, 20-lead TSSOP</td>
</tr>
<tr>
<td>ADP5073</td>
<td>Inverting switching regulator for generating negative output</td>
<td>Inverter: 2.85 to 15</td>
<td>Inverter: −0.5 V to −39 V below V&lt;sub&gt;In&lt;/sub&gt;</td>
<td>1 × inverter</td>
<td>Inverter: 1.2</td>
<td>Enable pin, adjustable output, soft start, and slew rate control</td>
<td>16-lead LFCS</td>
</tr>
<tr>
<td>ADP5074</td>
<td>Inverting switching regulator for generating negative output</td>
<td>Inverter: 2.85 to 15</td>
<td>Inverter: −0.5 V to −39 V below V&lt;sub&gt;In&lt;/sub&gt;</td>
<td>1 × inverter</td>
<td>Inverter: 2.4</td>
<td>Enable pin, adjustable output, soft start, and slew rate control</td>
<td>16-lead LFCS</td>
</tr>
<tr>
<td>ADP5075</td>
<td>Inverting switching regulator for generating negative output</td>
<td>Inverter: 2.85 to 15</td>
<td>Inverter: −0.5 V to −39 V below V&lt;sub&gt;In&lt;/sub&gt;</td>
<td>1 × inverter</td>
<td>Inverter: 0.8</td>
<td>Enable pin, adjustable output, soft start, and slew rate control</td>
<td>12-ball WLCSP</td>
</tr>
</tbody>
</table>

Reduced dV/dt of the Switching Node Results in a Significant Reduction of the Supply and Ground Ringing, as well as Lower Radiated EMI/EMC.
Powering bipolar output applications diagram.

High Voltage LDOs

<table>
<thead>
<tr>
<th>Part Number</th>
<th>$V_{IN}$ Min (V)</th>
<th>$V_{IN}$ Max (V)</th>
<th>$V_{OUT}$ (V)</th>
<th>$I_{OUT}$ (mA)</th>
<th>Soft Start</th>
<th>Power Good</th>
<th>RMS Noise @ 10 Hz to 100 kHz (μV rms)</th>
<th>PSRR @ 100 kHz (dB)</th>
<th>PSRR @ 1 MHz (dB)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP7102</td>
<td>3.3 to 20</td>
<td>1.5 to 9</td>
<td>1.22 to 19</td>
<td>300</td>
<td>No</td>
<td>Yes</td>
<td>15</td>
<td>60</td>
<td>40</td>
<td>3 mm × 3 mm, 8-lead LFCSP, 8-lead SOIC</td>
</tr>
<tr>
<td>ADP7104</td>
<td>3.3 to 20</td>
<td>1.5 to 9</td>
<td>1.22 to 19</td>
<td>500</td>
<td>No</td>
<td>Yes</td>
<td>15</td>
<td>60</td>
<td>40</td>
<td>3 mm × 3 mm, 8-lead LFCSP, 8-lead SOIC</td>
</tr>
<tr>
<td>ADP7105</td>
<td>3.3 to 20</td>
<td>1.8, 3.3, 5</td>
<td>1.22 to 19</td>
<td>500</td>
<td>Yes</td>
<td>Yes</td>
<td>15</td>
<td>60</td>
<td>40</td>
<td>3 mm × 3 mm, 8-lead LFCSP, 8-lead SOIC</td>
</tr>
<tr>
<td>ADP7112</td>
<td>2.7 to 20</td>
<td>1.2 to 5</td>
<td>1.2 to 19</td>
<td>200</td>
<td>Yes</td>
<td>No</td>
<td>11</td>
<td>68</td>
<td>50</td>
<td>1 mm × 1.2 mm, 6-ball WL CSP</td>
</tr>
<tr>
<td>ADP7118</td>
<td>2.7 to 20</td>
<td>1.2 to 5</td>
<td>1.2 to 19</td>
<td>200</td>
<td>Yes</td>
<td>No</td>
<td>11</td>
<td>68</td>
<td>50</td>
<td>2 mm × 2 mm, 6-lead LFCSP, 8-lead SOIC, 5-lead TSOT</td>
</tr>
<tr>
<td>ADP7142</td>
<td>2.7 to 40</td>
<td>1.2 to 5</td>
<td>1.2 to 39</td>
<td>200</td>
<td>Yes</td>
<td>No</td>
<td>11</td>
<td>68</td>
<td>50</td>
<td>2 mm × 2 mm, 6-lead LFCSP, 8-lead SOIC, 5-lead TSOT</td>
</tr>
</tbody>
</table>

Negative Voltage LDOs

<table>
<thead>
<tr>
<th>Part Number</th>
<th>$V_{IN}$ Min (V)</th>
<th>$V_{IN}$ Max (V)</th>
<th>$V_{OUT}$ Options or Range (V)</th>
<th>$I_{OUT}$ (mA)</th>
<th>PSRR @ 100 kHz (dB)</th>
<th>PSRR @ 1 MHz (dB)</th>
<th>RMS Noise @ 100 kHz to 100 kHz (μV rms)</th>
<th>Noise Spectral Density @ 100 kHz (mV/Hz)</th>
<th>Dropout @ Rated $I_{OUT}$ Typ (mV)</th>
<th>Total Accuracy Max (±%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP7182</td>
<td>–2.7</td>
<td>–28</td>
<td>–200</td>
<td>–1.22 to –27</td>
<td>45</td>
<td>32</td>
<td>18</td>
<td>50</td>
<td>185</td>
<td>–3/+2</td>
<td>3 mm × 3 mm, 10-lead MSOP</td>
</tr>
<tr>
<td>ADP7183</td>
<td>–2</td>
<td>–5.5</td>
<td>–300</td>
<td>–0.5 to –5.4</td>
<td>&gt;50</td>
<td>40</td>
<td>5</td>
<td>18</td>
<td>100</td>
<td>±1</td>
<td>2 mm × 2 mm, 8-lead MSOP</td>
</tr>
</tbody>
</table>

Switching Controller

<table>
<thead>
<tr>
<th>Part Number</th>
<th>$V_{IN}$ Range (V)</th>
<th>$V_{OUT}$ Range (V)</th>
<th>$I_{OUT}$ (A)</th>
<th>Device Topology</th>
<th>Minimum Switching Frequency (kHz)</th>
<th>Maximum Switching Frequency (MHz)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP1621</td>
<td>2.9 to 5.5</td>
<td>1.22 to 100</td>
<td>—</td>
<td>Step-up</td>
<td>100</td>
<td>1.5</td>
<td>3 mm × 3 mm, 10-lead MSOP</td>
</tr>
</tbody>
</table>

1 Input voltage range extended with external components.
Powering RF Loads

When powering RF circuits, power supplies need to be as quiet as possible to avoid the injection of noise into the RF spectrum. ADI offers the industry’s largest portfolio of lowest noise linear regulators specifically designed for powering RF loads.

PLL/VCO applications diagram.

Clocking applications diagram.

ADF5355 VCO noise, powered by ADM7150.

ADM7154 PSRR vs. frequency, \( V_{\text{OUT}} = 3.3 \text{ V}, 400 \text{ mA load}, 500 \text{ mV headroom} \).

Switching Regulators

<table>
<thead>
<tr>
<th>Part Number</th>
<th>( V_{\text{IN}} ) Range (V)</th>
<th>( V_{\text{OUT}} ) Range (V)</th>
<th>( I_{\text{OUT}} ) (A)</th>
<th>Device Topology</th>
<th>Minimum Switching Frequency (kHz)</th>
<th>Maximum Switching Frequency (MHz)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP2164</td>
<td>2.7 to 6.5</td>
<td>0.6 to ( V_{\text{IN}} )</td>
<td>4</td>
<td>Step-down</td>
<td>500</td>
<td>1.4</td>
<td>4 mm × 4 mm, 16-lead LFCSPP</td>
</tr>
<tr>
<td>ADP2360</td>
<td>4.5 to 60</td>
<td>0.8 to ( V_{\text{IN}} )</td>
<td>0.05</td>
<td>Step-down</td>
<td>Variable frequency control</td>
<td>3 mm × 3 mm, 8-lead LFCSPP</td>
<td></td>
</tr>
<tr>
<td>ADP2370</td>
<td>3.2 to 15</td>
<td>0.8 to 14</td>
<td>0.8</td>
<td>Step-down</td>
<td>600</td>
<td>1.2</td>
<td>3 mm × 3 mm, 8-lead LFCSPP</td>
</tr>
<tr>
<td>ADP5073</td>
<td>2.85 to 15 (-0.5 to V_{\text{IN}}-39)</td>
<td>0.7</td>
<td>Inverting</td>
<td>1000</td>
<td>2.6</td>
<td>3 mm × 3 mm, 16-lead LFCSPP</td>
<td></td>
</tr>
</tbody>
</table>
High Speed Converters

Powering High Speed ADCs

High speed converters need low noise analog core rails, and ADI offers both LDO and switching regulators to solve these problems.

2.5 V: AVDD2
1.8 V: SPIVDD
AD9680
14-Bit, 1000 MSPS JESD204B, Dual Analog-to-Digital Converter
1.25 V: AVDD1
14-Bit, 1000 MSPS
JESD204B, Dual Analog-to-Digital Converter
1.25 V: AVDD1_SR
ADP2164
Buck Regulator
ADP2370
Buck Regulator
1.25 V: DVDD
1.25 V: DRVDD
3.3 V: AVDD3
3.8 V
5 V/12 V
Input
3.3 V
Input
Powering High Speed DACs

RF DACs require very low noise power supplies in order to achieve spectral purity at the outputs and Analog Devices offers low noise, positive and negative power supply solutions.

ADM7150
LDO
+5.0 V
PLL
ADF4355-2
-6 V
AD9129
RF DAC
-1.5 V
ADP5073
−VE LDO
ADP7183
−VE LDO

Ultralow Noise LDOs

<table>
<thead>
<tr>
<th>Part Number</th>
<th>VIN Range (V)</th>
<th>VOUT Range (V)</th>
<th>IOUT (mA)</th>
<th>PSRR @ 100 kHz (dB)</th>
<th>PSRR @ 1 MHz (dB)</th>
<th>RMS Noise @ 10 Hz to 100 kHz (μV RMS)</th>
<th>Noise Spectral Density 100 kHz (nV/√Hz)</th>
<th>Dropout @ Rated IOUT Typ (mV)</th>
<th>Total Accuracy Max (±%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADM7150</td>
<td>4.5 to 16</td>
<td>1.5 to 5.0</td>
<td>800</td>
<td>94</td>
<td>62</td>
<td>1.6</td>
<td>2.5 V: AVDD2</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADM7151</td>
<td>4.5 to 16</td>
<td>1.5 to 5.1</td>
<td>800</td>
<td>94</td>
<td>62</td>
<td>1.6</td>
<td>2.5 V: AVDD2</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADM7154</td>
<td>2.3 to 5.5</td>
<td>1.2 to 3.3</td>
<td>600</td>
<td>90</td>
<td>58</td>
<td>1.6</td>
<td>2.5 V: AVDD2</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADM7155</td>
<td>2.3 to 5.5</td>
<td>1.2 to 3.3</td>
<td>600</td>
<td>90</td>
<td>58</td>
<td>1.6</td>
<td>2.5 V: AVDD2</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADM7160</td>
<td>2.2 to 5.5</td>
<td>1.8 to 3.3</td>
<td>200</td>
<td>54</td>
<td>47</td>
<td>9</td>
<td>20 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADM7170</td>
<td>2.3 to 3.6</td>
<td>1.2 to 6.4</td>
<td>500</td>
<td>60</td>
<td>31</td>
<td>6</td>
<td>12 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADM7171</td>
<td>2.3 to 3.6</td>
<td>1.2 to 6.4</td>
<td>1000</td>
<td>60</td>
<td>31</td>
<td>6</td>
<td>12 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADM7172</td>
<td>2.3 to 6.5</td>
<td>1.2 to 6.4</td>
<td>2000</td>
<td>60</td>
<td>31</td>
<td>6</td>
<td>12 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>ADP71741</td>
<td>1.6 to 3.6</td>
<td>0.75 to 3.3</td>
<td>2000</td>
<td>54</td>
<td>40</td>
<td>23</td>
<td>&lt;60 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>HMC860LP3E</td>
<td>3.35 to 5.6</td>
<td>2.5 to 5.2</td>
<td>240</td>
<td>65</td>
<td>60</td>
<td>1.5</td>
<td>3 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>HMC976LP3E</td>
<td>3.3 to 5.5</td>
<td>1.8 to 5.1</td>
<td>400</td>
<td>45</td>
<td>30</td>
<td>9</td>
<td>3 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
<tr>
<td>HMC1060LP3E</td>
<td>3.35 to 5.6</td>
<td>1.8 to 5.2</td>
<td>500</td>
<td>71</td>
<td>60</td>
<td>1.5</td>
<td>3 V: AVDD1</td>
<td>600</td>
<td>2</td>
</tr>
</tbody>
</table>

Negative Ultralow Noise LDO

<table>
<thead>
<tr>
<th>Part Number</th>
<th>VIN Min (V)</th>
<th>VIN Max (V)</th>
<th>IOUT (mA)</th>
<th>PSRR @ 100 kHz (dB)</th>
<th>PSRR @ 1 MHz (dB)</th>
<th>RMS Noise @ 100 kHz to 100 kHz (μV RMS)</th>
<th>Noise Spectral Density 100 kHz (nV/√Hz)</th>
<th>Dropout @ Rated IOUT Typ (mV)</th>
<th>Total Accuracy Max (±%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADP7183</td>
<td>-2</td>
<td>-5.5</td>
<td>-300</td>
<td>-0.5 to -5.4</td>
<td>&gt;50</td>
<td>40</td>
<td>5</td>
<td>18</td>
<td>100</td>
</tr>
</tbody>
</table>
Upcoming Solutions for Powering High Speed Converters

**ADP1761/ADP1762/ADP1763**
- 1 A, 2 A, and 3 A versions available
- **Ultra low Dropout Voltage**
  - 80 mV @ 2 A load
  - ±1.5% accuracy over line, load, and temperature
- **Excellent PSRR Performance**
  - 55 dB @ 100 kHz @ 2 A load
  - 40 dB @ 1 MHz @ 2 A load
- 16-lead, 3 mm x 3 mm LFCSP package

**ADP7183**
- Input voltage range: –2 V to –5.5 V
- Max current rating: –300 mA
- Very low noise 5 μV rms independent of V_{out}
- PSRR at 1 MHz 40 dB, 100 kHz >50 dB
- Fixed output voltage options: –0.5 V to –4.5 V
- Initial accuracy: ±0.5%
- Precision enable at –1.2 V
- Positive enable control
- 8-lead, 2 mm x 2 mm LFCSP

**ADP5003**
- **Low Noise Buck and LDO**
  - 3 A low noise buck regulator
  - Buck wide input range: 4.2 V to 15 V
  - Buck programmable output range: 0.6 V to 5 V
  - <40 μV rms buck output noise (independent of V_{out} setting)
  - Internal 3 A, low noise NFET LDO acts as an active filter for sensitive analog supplies
  - LDO wide input range: 0.65 V to 5 V
  - LDO fixed/programmable output range: 0.6 V to 3.3 V
  - True differential remote sensing
  - Below 10 μV rms LDO output noise (independent of V_{out})
  - PSRR >50 dB (up to 100 kHz) @ 200 mV headroom at 2 A
  - Power-good output
Step 1. Select parts
Step 2. Design and optimize
Step 3. Simulate

The ADIsimPower™ design center lets you design your power circuits in three easy steps.

The ADIsimPower selector uses your specific application requirements and compares solutions from over 300 power management parts and over 10 different topologies.

Each solution takes into consideration the IC, external components, and operating condition to be able to compare expected performance. For more information, visit [http://www.analog.com/adisimpower](http://www.analog.com/adisimpower).

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**Step 1**

**Smart Web selector.**

**Step 2**

**Design and optimize for size, cost, or efficiency.**

The design report includes BOM and thermals at operating conditions.

**Step 3**

**Simulation.**
Industrial Applications Diagrams

Typical Block Diagram Showing an Isolated 24 V Power Chain for Industrial Applications

Typical Block Diagram for a Low Power, Battery-Operated System

Online Support Community

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