

# High Performance Power Management Products from the Analog Leader



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## High Performance Power Management Products from the Analog Leader

Analog Devices has set the standard for high performance signal processing semiconductors for five decades. ADI's power management products continue that proud tradition, exceeding the high expectations of reliability, innovation, and value our customers have come to expect. Who better to understand the power requirements of high performance signal processing chains than ADI?

This brochure provides an overview of our power management product portfolio for applications including industrial, instrumentation, imaging, communications and computing infrastructure, and consumer electronics. We understand that complete solutions must include products that address real-world needs, design aids that decrease your time to market, and a world-class organization that stands behind its products. So, in addition to great products, we have developed best-in-class Web tools for product selection, design, simulation, optimization, and evaluation board customization. We have also established a corps of power management experts in locations around the world with access to our customer applications centers to help you quickly develop effective solutions.

### Power Development Centers

- San Jose, CA, USA
- Limerick, Ireland
- Beijing, China
- Edinburgh, Scotland
- Ft Collins, CO, USA
- Shanghai, China

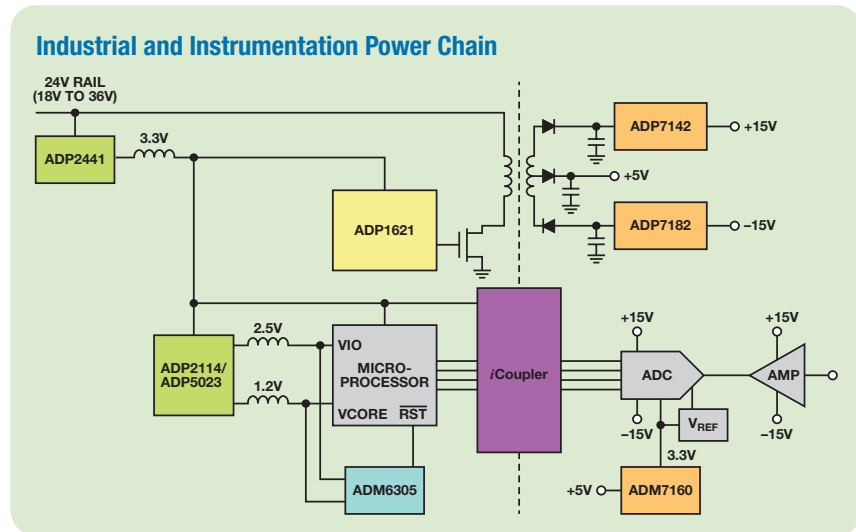
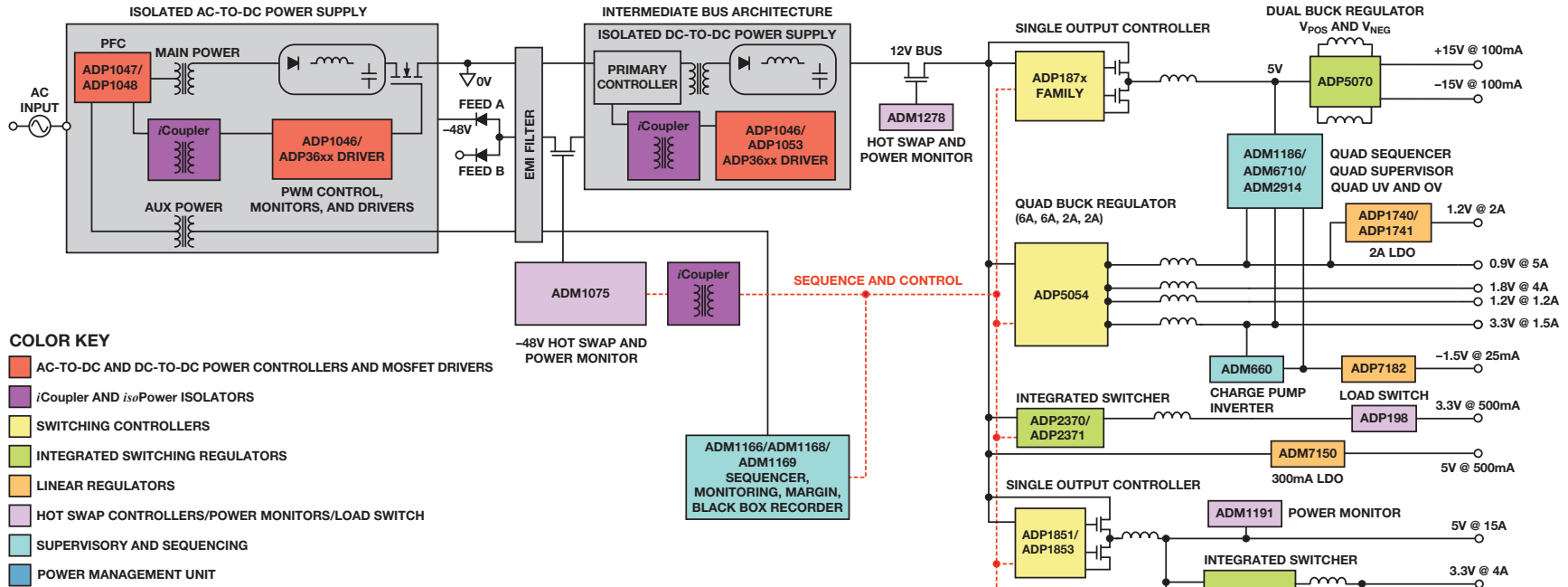


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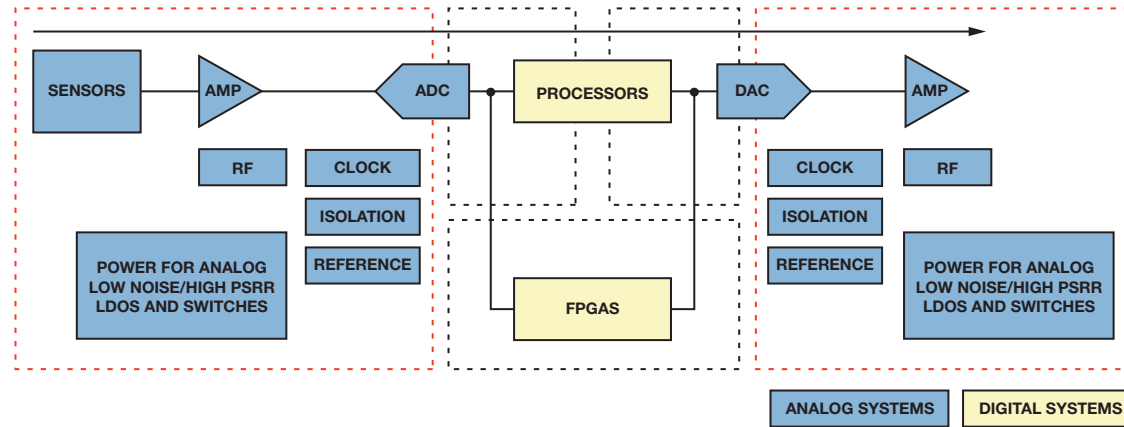
# Power Chains

## Communications Infrastructure Power Chain

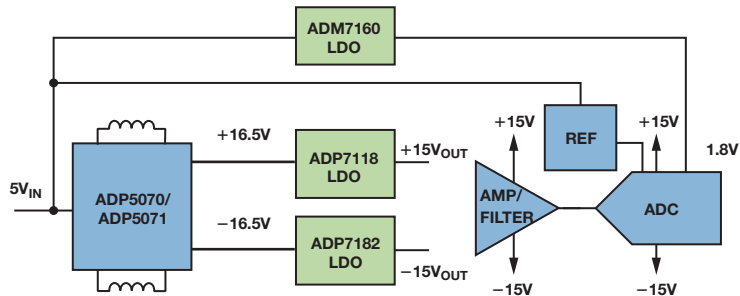


# Power for Analog

## Leveraging 50 Years of Experience Powering Analog Systems

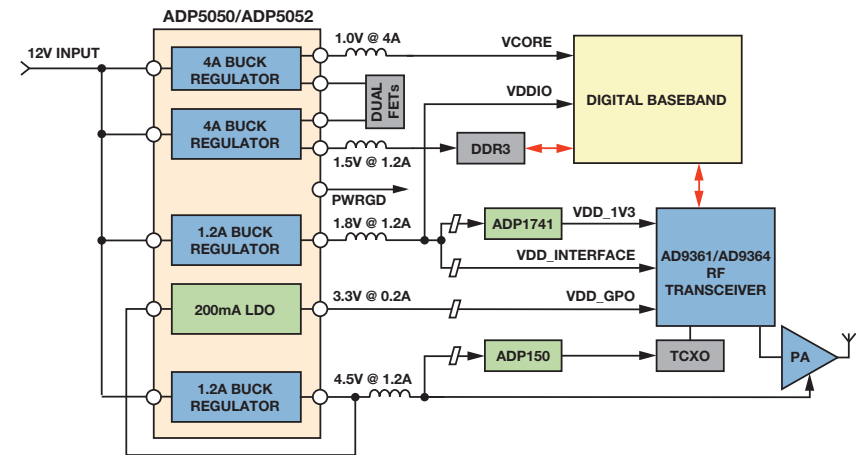


### AMP and SAR ADC



#### Power Solution Highlights

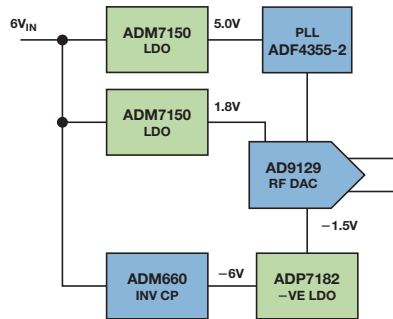
- ADP5070/ADP5071—low noise, bipolar switching power supply
- ADP7182—negative LDO with 54 dB PSRR, 9  $\mu$ V rms noise
- ADP7118—20 V, 68 dB PSRR, 11  $\mu$ V rms noise



#### Power Solution Highlights

- ADP5050—5 V/12 V quad buck in tiny LFCSP package
- ADP1741—low  $V_{IN}$  LDO with 54dB PSRR, 23  $\mu$ V rms noise
- ADP150—50 dB PSRR, 9  $\mu$ V rms noise LDO

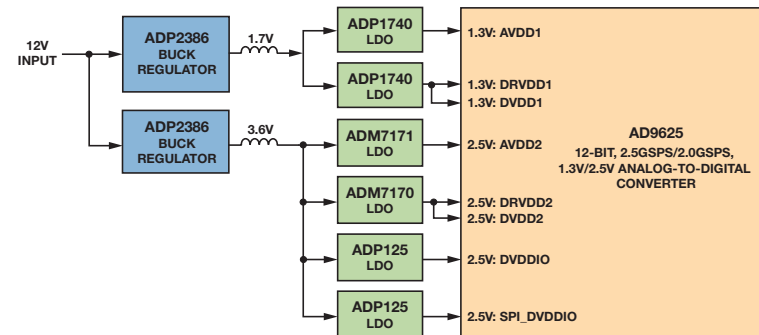
## RF DAC System



### Power Solution Highlights

- ADM7150—94 dB PSRR, 1  $\mu$ V rms noise, ultralow noise LDO
- ADP7182—negative LDO with 54 dB PSRR, 9  $\mu$ V rms noise
- ADM660—compact inverting charge pump

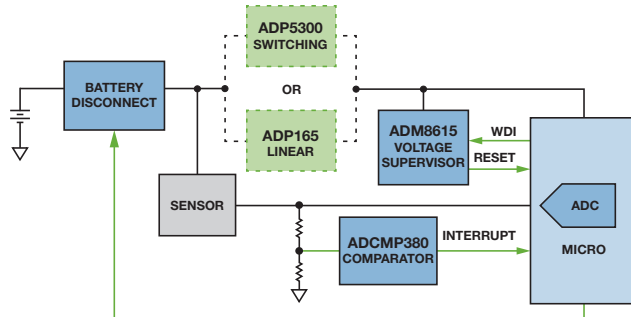
## High Speed ADC



### Power Solution Highlights

- ADM7170—fast transient, 5  $\mu$ V rms noise LDO
- ADP1740—low  $V_{IN}$ , 54 dB PSRR, 23  $\mu$ V rms noise LDO
- ADP2386—high efficiency, compact 6 A buck regulator

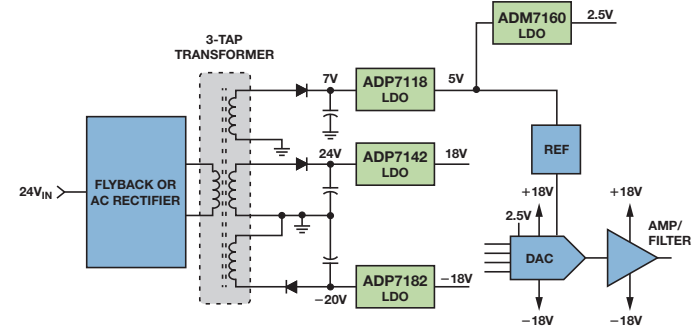
## Battery-Powered Sensor



### Power Solution Highlights

- ADP165—ultralow quiescent current LDO
- ADM8615—ultralow POR with watchdog
- ADCMP380—ultralow power voltage comparator with reference
- ADP5300—ultralow power buck regulator

## Isolated ADC/Amp/Ref



### Power Solution Highlights

- ADP7118—20 V, low noise, 200 mA LDO
- ADP7142—40 V, low noise, 200 mA LDO
- ADM7160—3 V/5 V, low noise, 200 mA LDO
- ADP7182—negative LDO with 54 dB, 9  $\mu$ V rms noise



# The Fastest and Most Accurate Voltage Regulator Design and Optimization Tool

## ADIsimPower Voltage Regulator Design Tool Benefits

- Expert voltage regulator design help available 24/7
- Over 20 different tools
- Over 300 ADI parts covered
- 99% of single and dual rail voltage regulator parts are supported
- Nine topologies supported: linear, buck (single and dual phase), boost, buck-boost, SEPIC, Cuk, SEPIC-Cuk, and inverting buck-boost

Start using ADIsimPower™ today at [www.analog.com/ADIsimPower](http://www.analog.com/ADIsimPower).

## Simple and Intuitive Interface

- No level of expertise necessary to get a working solution
- Fast execution and custom designs every time
- Easy relative comparison: cost, efficiency, size, parts count, features, topology
- Well characterized components in parts database from leading manufacturers
- Blank evaluation boards can be requested directly from the download tool
- Reliable, accurate results

## From Design to Simulation in Three Easy Steps

### Step 1

#### ADIsimPower Selector

- Smart selector
- Best part and topology identification
- Over 300 parts covered
- 10 different topologies

ADIsimPower Voltage Regulator Design Tool

Vinmin (V): 4.5 (-28 ≤ x ≤ 75)  
 Vinmax (V): 5.5 (-28 ≤ x ≤ 75)  
 Vout (V): 3.3 (-85 ≤ x ≤ 90)  
 Iout (A): 500m (0.01 ≤ x ≤ 60)  
 Tmax (C): 55 (-40 ≤ x ≤ 125)

Find Solutions

Tool Available	Part Number	IC Descriptions and Features	Topology	Selected Cost (POM (USD))	Solution
Topology: Linear (10 items)					
Download Tool	ADP2251	Dual LDO	Linear	\$0.80	
Download Tool	ADP2255	Dual LDO	Linear	\$0.80	
Download Tool	ADP2254	LDO	Linear	\$0.48	
Download Tool	ADP2256	LDO	Linear	\$0.50	
Download Tool	ADP2257	LDO	Linear	\$1.10	
Download Tool	ADP2258	LDO	Linear	\$1.17	
Download Tool	ADP2259	LDO	Linear	\$1.18	
Download Tool	ADP2259	LDO	Linear	\$1.05	
Download Tool	ADP2255	LDO	Linear	\$0.52	
Download Tool	ADP2254	LDO	Linear	\$0.54	
Download Tool	ADP2256	LDO	Linear	\$0.56	
Download Tool	ADP2257	LDO	Linear	\$1.01	
Download Tool	ADP2258	LDO	Linear	\$1.05	
Download Tool	ADP2259	LDO	Linear	\$1.13	

Vinmin (V): 10.8 (-28 ≤ x ≤ 75)  
 Vinmax (V): 13.4 (-28 ≤ x ≤ 75)  
 Vout (V): 3.3 (-85 ≤ x ≤ 90)  
 Iout (A): 1 (0.01 ≤ x ≤ 60)  
 Tmax (C): 55 (-40 ≤ x ≤ 125)

Find Solutions

### Step 2

#### Design and Optimize: ADIsimPower Designer

- Full design capability in minutes
- Real components behavior
- Bill of material
- Free prototyping board available
- No need to read a data sheet
- Full schematics
- Detailed performance data

ANALOG DEVICES

ADP2251-Buck-Designer

White Bread Evaluation Board

Full Schematic

Efficiency Graph

Power Loss Graph

Component List

### Step 3

#### Simulation: ADIsimPE

*Simulate directly from ADIsimPower*

The ADIsimPower design tools preconfigure the simulator for fast and easy simulation. Simply select export and run model. No expertise required.

ADIsimPE™ powered by SIMetrix/SIMPLIS is a personal edition circuit simulator ideally suited to evaluate Analog Devices linear and mixed-signal components.

Customize design by selecting parts from top to bottom

Item #	Desc	MFG	Component Specs	Part Number	Pkg	Qty <sup>(3)</sup>	Area (mm <sup>2</sup> )	Height (mm)	Cost <sup>(4)</sup>
1	U1	ADI	Switching Regulator	ADP184ACPZB-R7	24-Lead QFN	1	16.0	0.75	1.740
2	C1	Colorant	4.7µF, 50V, Taped	920QJ2-472MUS	33.2mm x 9.8mm x 1.5mm	1	116.8	5.2	0.920
3	Cin1	Tai ro Yuden	4.7µF, 50V, 3mΩ	EMC32E 847DIL-T	228E	1	5.1	3.6	0.050
4	Cout1	Tai ro Yuden	1µF, 50V, 3mΩ	EMC32E 847DIL-T	228E	1	5.1	3.6	0.050
5	CH1	Inf	10% tolerance	100-0P-25V	8481	1	1.1	0.6	0.020

Enter Inputs

Simulate with ADIsimPE/Simplis

Output: Simplis/Simetrix Model

**ANALOG DEVICES**

Desired Simulation

Bode + Load Transient + Ripple

Bode (only)

Load Transient (only)

Current Limit + Restart

Start Up + U/I/O

Shutdown + U/I/O

Note: At Full Load Current

Vin Minimum

Vin Maximum

Win Rise Time: 1 ms

Win Fall Time: 1 ms

Export & Run Simplis Model    Export Simplis Model (only)    Reset Defaults    Cancel

Export directory cannot be within a ZIP file.



ADIsimPE includes:

- Extensive library of ADI IC models and applications schematics
- Full schematics capture and editing capabilities with easy waveform viewing and analysis
- SPICE mode SIMetrix simulator ideal for op amps, references, linear regulators, and more
- SIMPLIS mode simulation optimized for switching power supplies, PLLs, and more
- Integration capability with ADIsimPower design tools

For help using this application, please use the help menu or our EngineerZone® forum at <https://ez.analog.com/community/power/ADIsimPE>.

Library content and instructional materials are available at [www.analog.com/ADIsimPE](http://www.analog.com/ADIsimPE).



+



= A Powerful Tool Set

## Low Dropout Regulators (LDOs)

ADI offers a wide variety of low dropout (LDO) regulators providing clean power to high performance analog loads. ADI regulators offer low output noise, high power supply rejection, high accuracy, fast transient response, low dropout for increased efficiency, small package footprint, and features such as thermal overload protection, safety current limits, reverse protection, and shutdown mode to drastically reduce energy consumption.

ADI offers fixed and adjustable LDO output voltages from  $-27\text{ V}$  to  $+40\text{ V}$  with up to  $2.0\text{ A}$  of output current.

### Analog Devices Introduces the World's Lowest Noise LDO

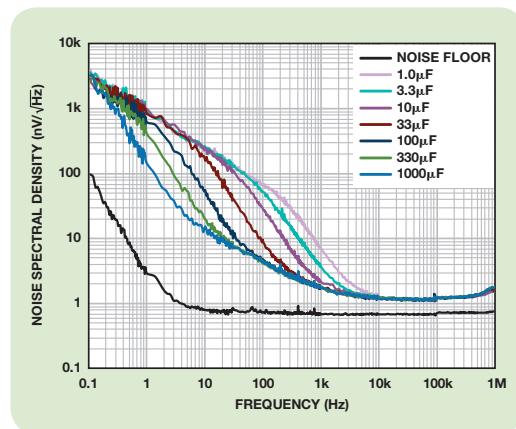
The **ADM7154/ADM7155** are ultralow noise LDO (low dropout) regulators for RF (radio frequency) signal devices. The ADM7154/ADM7155 operate from  $2.3\text{ V}$  to  $5.5\text{ V}$ , provide up to  $600\text{ mA}$  of output current, and support output voltages from  $1.2\text{ V}$  to  $3.3\text{ V}$ . The LDOs achieve an output NSD (noise spectral density) of  $1.5\text{ nV}/\sqrt{\text{Hz}}$  above  $100\text{ kHz}$ , which significantly reduces VCO (voltage controlled oscillator) phase noise in point-to-point microwave radios, satellite communications, defense electronics, and other wideband applications.

#### Features

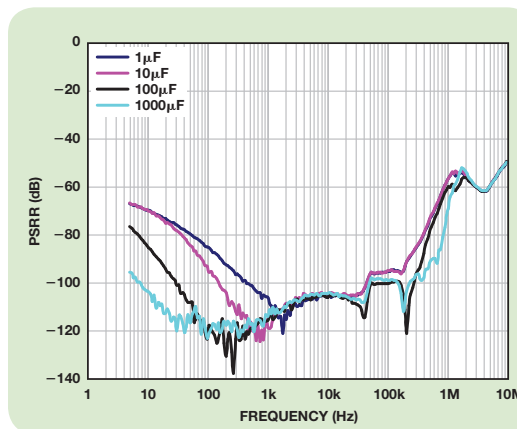
- $V_{\text{IN}}$  range:  $2.3\text{ V}$  to  $5.5\text{ V}$
- Fixed/adjustable output voltage range:  $1.2\text{ V}$  to  $3.3\text{ V}$
- $I_{\text{OUT}}$  max:  $600\text{ mA}$
- Low noise ( $C_{\text{BYP}} = 1\ \mu\text{F}$ )
  - $0.9\ \mu\text{V}$  rms total integrated noise from  $100\text{ Hz}$  to  $100\text{ kHz}$
- Power supply rejection ratio (PSRR):
  - $90\text{ dB}$  from  $1\text{ kHz}$  to  $100\text{ kHz}$
  - $58\text{ dB}$  at  $1\text{ MHz}$ 
    - $V_{\text{IN}} = 3.8\text{ V}, V_{\text{OUT}} = 3.3\text{ V}$  @  $600\text{ mA}$
- 8-lead LFCSP and 8-lead SOIC packages

#### Applications

- Regulated power noise sensitive applications
- RF mixers, phase-locked loops (PLLs)
- Voltage controlled oscillators (VCOs)
- PLLs with integrated VCOs
- Communications and infrastructure
- Cable digital-to-analog converter (DAC) drivers
- Backhaul and microwave links



ADM7154 noise spectral density.



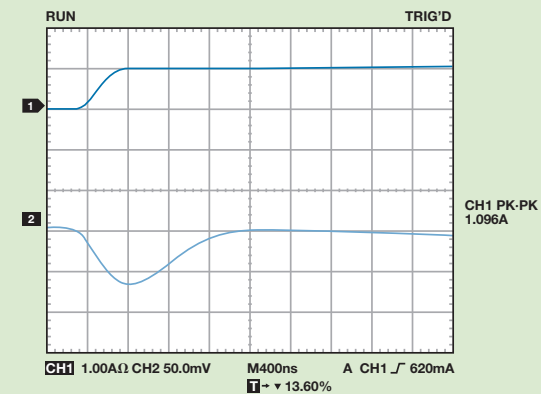
ADM7154 PSRR vs. frequency,  $V_{\text{OUT}} = 3.3\text{ V}$ ,  $400\text{ mA}$  load,  $500\text{ mV}$  headroom.

### Ultralow Noise, Fast Transient Response LDOs

#### ADM7170/ADM7171/ADM7172 500 mA to 2 A LDOs

#### Features

- Input voltage range:  $2.3\text{ V}$  to  $6.5\text{ V}$
- Any fixed voltage part can be adjusted up to give a higher output voltage
- Max current rating:
  - ADM7170:  $500\text{ mA}$
  - ADM7171:  $1\text{ A}$
  - ADM7172:  $2\text{ A}$
- Very low noise:  $5\ \mu\text{V}$  rms independent of  $V_{\text{OUT}}$ 
  - $\text{BW} = 100\text{ Hz}$  to  $100\text{ kHz}$ , no bypass cap required
- Fast transient response:  $<1.5\ \mu\text{s}$  for  $1\text{ mA}$  to  $1.5\text{ A}$  load step
- High PSRR:  $>65\text{ dB}$  at  $10\text{ kHz}$ ;  $60\text{ dB}$  at  $100\text{ kHz}$
- Low dropout voltage of  $84\text{ mV}$  at  $1\text{ A}$  load,  $V_{\text{OUT}} = 3\text{ V}$



ADM7171 full load transient response from  $1\text{ mA}$  to  $1\text{ A}$  for  $V_{\text{OUT}} = 3.3\text{ V}$ .



## LDO Selection Table

Part Number	V <sub>IN</sub> Range (V Min to V Max)	V <sub>OUT</sub> Range (V)	I <sub>OUT</sub> (mA)	Supply Current No Load (μA)	Worst-Case Accuracy (±%)	RMS Noise @ 10 Hz to 100 kHz (μV rms)	PSRR @ 100 kHz (dB)	PSRR @ 1 MHz (dB)	PSRR @ Headroom (mV) <sup>1</sup>	Package	Comments	Price (\$U.S.)
<i>Ultralow Noise, High PSRR</i>												
ADM7150 <b>New</b>	4.5 to 16	1.5 to 5.0	800	4300	2	1.6	90	55	1200	3 mm × 3 mm, 8-lead LFCSP	1.5 nV/√Hz @ 100 kHz	3.64
ADM7151 <b>New</b>	4.5 to 16	1.5 to 5.1	800	4300	2	1.6	90	55	1200	3 mm × 3 mm, 8-lead LFCSP	1.5 nV/√Hz @ 100 kHz	3.64
ADM7154 <b>New</b>	2.3 to 5.5	1.2 to 3.3	600	4000	2	1.6	90	58	500	3 mm × 3 mm, 8-lead LFCSP	1.2 nV/√Hz @ 100 kHz	2.14
ADM7155 <b>New</b>	2.3 to 5.5	1.2 to 3.3	600	4000	2	1.6	90	58	500	3 mm × 3 mm, 8-lead LFCSP	1.2 nV/√Hz @ 100 kHz	2.14
HMC976LP3E	3.3 to 5.5	1.8 to 5.1	400	1100	2	9	45	35	500	3 mm × 3 mm, 16-lead LFCSP	3 nV/√Hz @ 100 kHz	—
HMC860LP3E	3.35 to 5.6	2.5 to 5.2	240	1900	2	5.5	65	60	500	3 mm × 3 mm, 16-lead LFCSP	Quad output	—
HMC1060LP3E	3.35 to 5.6	1.8 to 5.2	500	2100	2	9	72	35	500	3 mm × 3 mm, 16-lead LFCSP	Quad output	—
<i>Low Voltage and Low Noise</i>												
ADP150	2.2 to 5.5	1.8 to 3.3	150	10	2.5	9	50	30	500	4-lead WLCSP, 5-lead TSOT	0.8 mm × 0.8 mm WLCSP option	0.31
ADP151	2.2 to 5.5	1.1 to 3.3	200	10	3	9	45	25	500	4-lead WLCSP, 5-lead TSOT, 2 mm × 2 mm, 6-lead LFCSP	0.8 mm × 0.8 mm WLCSP option	0.34
ADM7160 <b>New</b>	2.2 to 5.5	1.1 to 3.3	200	10	3	9	45	38	500	5-lead TSOT, 2 mm × 2 mm, 6-lead LFCSP	I&I applications, low tempco	0.44
ADM7170 <b>New</b>	2.3 to 6.5	1.2 to 6.4	500	700	1.25	6	53	30	500	3 mm × 3 mm, 8-lead LFCSP	Fast transient response	0.88
ADM7171 <b>New</b>	2.3 to 6.5	1.2 to 6.4	1000	700	1.5	6	53	30	500	3 mm × 3 mm, 8-lead LFCSP	Fast transient response	1.19
ADM7172 <b>New</b>	2.3 to 6.5	1.2 to 6.3	2000	700	1.5	6	53	30	500	3 mm × 3 mm, 8-lead LFCSP	Fast transient response	1.79
<i>High Voltage and Low Noise</i>												
ADP7102	3.3 to 20	1.22 to 19	300	400	3	15	60	40	1000	3 mm × 3 mm, 8-lead LFCSP, 8-lead SOIC	Power good, reverse voltage protected	1.34
ADP7104	3.3 to 20	1.22 to 19	500	400	3	15	60	40	1000	3 mm × 3 mm, 8-lead LFCSP, 8-lead SOIC	Power good, reverse voltage protected	1.67
ADP7105 <b>New</b>	3.3 to 20	1.22 to 19	500	400	2	15	60	40	1000	3 mm × 3 mm, 8-lead LFCSP, 8-lead SOIC	Power good, soft start, reverse voltage protected	1.43
ADP7112 <b>New</b>	2.7 to 20	1.2 to 19	200	50	1.8	11	68	50	2000	1 mm × 1.2 mm, 6-ball WLCSP	Soft start	0.53
ADP7118 <b>New</b>	2.7 to 20	1.2 to 19	200	50	1.8	11	68	50	2000	2 mm × 2 mm, 6-lead LFCSP, 8-lead SOIC, 5-lead TSOT	Soft start	0.96
ADP7142 <b>New</b>	2.7 to 40	1.2 to 39	200	50	1.8	11	68	50	2000	2 mm × 2 mm, 6-lead LFCSP, 8-lead SOIC, 5-lead TSOT	Soft start	1.10
<i>Negative Voltage</i>												
ADP7182 <b>New</b>	-2.7 to -28	-1.22 to -27	-200	-33	3	18	45	32	1000	2 mm × 2 mm, 6-lead LFCSP, 3 mm × 3 mm, 8-lead LFCSP, 5-lead TSOT	Positive/negative EN logic	1.29
<i>Ultralow V<sub>IN</sub></i>												
ADP170	1.6 to 3.6	0.8 to 3.0	300	23	3	30	50	32	500	5-lead TSOT	Fixed output	0.33
ADP171	1.6 to 3.6	0.8 to 3.0	300	23	3	30	50	32	500	5-lead TSOT	Adjustable output	0.33
ADP172	1.6 to 3.6	0.8 to 3.0	300	23	3	30	50	32	500	4-lead WLCSP	0.95 mm × 0.95 mm WLCSP option	0.33
ADP130	1.2 to 3.6	0.8 to 3.0	350	25	3	29	55	35	500	5-lead TSOT	V <sub>BIAS</sub> voltage required	0.33

<sup>1</sup> PSRR specifications are at this headroom voltage (headroom = V<sub>IN</sub> - V<sub>OUT</sub>).

Part Number	V <sub>IN</sub> Range (V Min to V Max)	V <sub>OUT</sub> Range (V)	I <sub>OUT</sub> (mA)	Supply Current No Load (μA)	Worst-Case Accuracy (±%)	RMS Noise @ 10 Hz to 100 kHz (μV rms)	PSRR @ 100 kHz (dB)	PSRR @ 1 MHz (dB)	PSRR @ Headroom (mV) <sup>1</sup>	Package	Comments	Price (\$U.S.)
<i>Ultralow V<sub>IN</sub> (continued)</i>												
ADP1740	1.6 to 3.6	0.75 to 2.5	2000	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	1.20
ADP1741	1.6 to 3.6	0.75 to 3.3	2000	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	1.20
ADP1752	1.6 to 3.6	0.75 to 2.5	800	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	0.90
ADP1753	1.6 to 3.6	0.75 to 3.3	800	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	0.90
ADP1754	1.6 to 3.6	0.75 to 2.5	1200	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	0.95
ADP1755	1.6 to 3.6	0.75 to 3.3	1200	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	0.95
<i>Multirail</i>												
HMC860LP3E	3.35 to 5.6	2.5 to 5.2	240	1900	2	5.5	65	60	500	3 mm × 3 mm, 16-lead LFCSP	Quad output	—
HMC1060LP3E	3.35 to 5.6	1.8 to 5.2	500	2100	2	9	72	35	500	3 mm × 3 mm, 16-lead LFCSP	Quad output	—
ADP220	2.5 to 5.5	0.8 to 3.3	200	60	2	27	60	40	1000	6-lead WLCSP	1 mm × 1.5 mm WLCSP	0.58
ADP221	2.5 to 5.5	0.8 to 3.3	200	60	2	27	60	40	1000	6-lead WLCSP	1 mm × 1.5 mm WLCSP, active pulldown	0.58
ADP222	2.5 to 5.5	0.8 to 3.3	300	65	2	27	60	40	1000	2 mm × 2 mm, 8-lead LFCSP	Dual LDO, fixed outputs	0.49
ADP223	2.5 to 5.5	0.5 to 5.0	300	65	2	27	60	40	1000	2 mm × 2 mm, 8-lead LFCSP	Dual LDO, adjustable outputs	0.49
ADP224	2.5 to 5.5	0.8 to 3.3	300	65	2	27	60	40	1000	2 mm × 2 mm, 8-lead LFCSP	Dual LDO, fixed outputs, quick output discharge	0.49
ADP225	2.5 to 5.5	0.5 to 5.0	300	65	2	27	60	40	1000	2 mm × 2 mm, 8-lead LFCSP	Dual LDO, adjustable outputs, quick output discharge	0.49
ADP320	1.8 to 5.5	0.8 to 3.3	200	85	2	24	55	45	1000	3 mm × 3 mm, 16-lead LFCSP	Triple LDO, 2.5 V <sub>BIAS</sub> min	0.54
ADP322	1.8 to 5.5	0.8 to 3.3	200	85	2	24	55	45	1000	3 mm × 3 mm, 16-lead LFCSP	Triple LDO, 2.5 V <sub>BIAS</sub> min, fixed outputs	0.54
ADP323	1.8 to 5.5	0.5 to 5.0	200	85	2	24	55	45	1000	3 mm × 3 mm, 16-lead LFCSP	Triple LDO, 2.5 V <sub>BIAS</sub> min, adjustable outputs	0.54
<i>High Current</i>												
ADM7172 <b>New</b>	2.3 to 6.5	1.2 to 6.3	2000	700	1.5	6	53	30	500	3 mm × 3 mm, 8-lead LFCSP	Fast transient response	1.79
ADP1740	1.6 to 3.6	0.75 to 2.5	2000	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	1.20
ADP1741	1.6 to 3.6	0.75 to 3.3	2000	90	2	23	54	40	1000	4 mm × 4 mm, 16-lead LFCSP	Soft start, power good, reverse voltage protected	1.20
<i>General-Purpose</i>												
ADP121	2.3 to 5.5	1.2 to 3.3	150	11	3	40	50	30	1000	5-lead TSOT, 4-lead WLCSP	0.82 mm × 0.82 mm WLCSP	0.27
ADP122	2.3 to 5.5	1.75 to 3.3	300	45	2	25	60	38	500	5-lead TSOT, 2 mm × 2 mm, 6-lead LFCSP	Fixed output	0.34
ADP123	2.3 to 5.5	0.8 to 5.0	300	45	2	25	60	38	500	5-lead TSOT, 2 mm × 2 mm, 6-lead LFCSP	Adjustable output	0.34

<sup>1</sup> PSRR specifications are at this headroom voltage (headroom = V<sub>IN</sub> - V<sub>OUT</sub>).

Part Number	V <sub>IN</sub> Range (V Min to V Max)	V <sub>OUT</sub> Range (V)	I <sub>OUT</sub> (mA)	Supply Current No Load (μA)	Worst-Case Accuracy (±%)	RMS Noise @ 10 Hz to 100 kHz (μV rms)	PSRR @ 100 kHz (dB)	PSRR @ 1 MHz (dB)	PSRR @ Headroom (mV) <sup>1</sup>	Package	Comments	Price (\$U.S.)
<i>General-Purpose (continued)</i>												
ADP124	2.3 to 5.5	1.75 to 3.3	500	45	2	25	45	33	500	8-lead MSOP, 2 mm × 2 mm, 8-lead LFCSP	Exposed pad package for high thermal conductivity	0.42
ADP125	2.3 to 5.5	0.8 to 5.0	500	45	2	25	45	33	500	8-lead MSOP, 2 mm × 2 mm, 8-lead LFCSP	Exposed pad package for high thermal conductivity	0.42
<i>Ultralow I<sub>o</sub> and Low Noise</i>												
ADP160	2.2 to 5.5	1.2 to 4.2	150	0.56	3.5	80	23	20	500	5-lead TSOT, 4-lead WLCSP	Ultralow I <sub>o</sub> , QOD	0.34
ADP161	2.2 to 5.5	1.0 to 4.2	150	0.56	3.5	80	23	20	500	5-lead TSOT	Ultralow I <sub>o</sub>	0.34
ADP162	2.2 to 5.5	1.2 to 4.2	150	0.56	3.5	80	23	20	500	5-lead TSOT, 4-lead WLCSP	Ultralow I <sub>o</sub> , QOD, 0.965 mm × 0.965 mm WLCSP	0.34
ADP163	2.2 to 5.5	1.0 to 4.2	150	0.56	3.5	80	23	20	500	5-lead TSOT	Ultralow I <sub>o</sub>	0.34
ADP165 <i>New</i>	2.2 to 5.5	1.0 to 4.2	150	0.59	3.5	80	23	20	500	1 mm × 1 mm, 4-lead WLCSP, 2 mm × 2 mm, 6-lead LFCSP, 5-lead TSOT	Ultralow I <sub>o</sub> in dropout (pass through mode), QOD	0.35
ADP166 <i>New</i>	2.2 to 5.5	1.0 to 4.2	150	0.59	3.5	80	23	20	500	1 mm × 1 mm, 4-lead WLCSP, 2 mm × 2 mm, 6-lead LFCSP, 5-lead TSOT	Ultralow I <sub>o</sub> in dropout (pass through mode)	0.35
<i>WLCSP</i>												
ADP121	2.3 to 5.5	1.2 to 3.3	150	11	3	40	50	30	1000	5-lead TSOT, 4-lead WLCSP	0.82 mm × 0.82 mm WLCSP	0.27
ADP150	2.2 to 5.5	1.8 to 3.3	150	10	2.5	9	50	30	500	4-lead WLCSP, 5-lead TSOT	0.8 mm × 0.8 mm WLCSP option	0.31
ADP151	2.2 to 5.5	1.1 to 3.3	200	10	3	9	45	25	500	4-lead WLCSP, 5-lead TSOT, 2 mm × 2 mm, 6-lead LFCSP	0.8 mm × 0.8 mm WLCSP option	0.34
ADP160	2.2 to 5.5	1.2 to 4.2	150	0.56	3.5	80	23	20	500	5-lead TSOT, 4-lead WLCSP	Ultralow I <sub>o</sub> , QOD	0.34
ADP162	2.2 to 5.5	1.2 to 4.2	150	0.56	3.5	80	23	20	500	5-lead TSOT, 4-lead WLCSP	Ultralow I <sub>o</sub> , QOD, 0.965 mm × 0.965 mm WLCSP	0.34
ADP165 <i>New</i>	2.2 to 5.5	1.0 to 4.2	150	0.59	3.5	80	23	20	500	1 mm × 1 mm, 4-lead WLCSP, 2 mm × 2 mm, 6-lead LFCSP, 5-lead TSOT	Ultralow I <sub>o</sub> in dropout (pass through mode), QOD	0.35
ADP166 <i>New</i>	2.2 to 5.5	1.0 to 4.2	150	0.59	3.5	80	23	20	500	1 mm × 1 mm, 4-lead WLCSP, 2 mm × 2 mm, 6-lead LFCSP, 5-lead TSOT	Ultralow I <sub>o</sub> in dropout (pass through mode)	0.35
ADP172	1.6 to 3.6	0.8 to 3.0	300	23	3	30	50	32	500	4-lead WLCSP	0.95 mm × 0.95 mm WLCSP option	0.33
ADP220	2.5 to 5.5	0.8 to 3.3	200	60	2	27	60	40	1000	6-lead WLCSP	1 mm × 1.5 mm WLCSP	0.58
ADP221	2.5 to 5.5	0.8 to 3.3	200	60	2	27	60	40	1000	6-lead WLCSP	1 mm × 1.5 mm WLCSP, active pulldown	0.58
ADP7112 <i>New</i>	2.7 to 20	1.2 to 19	200	50	2	11	60	40	1000	6-lead WLCSP	Soft start	0.53

<sup>1</sup> PSRR specifications are at this headroom voltage (headroom = V<sub>IN</sub> - V<sub>OUT</sub>).

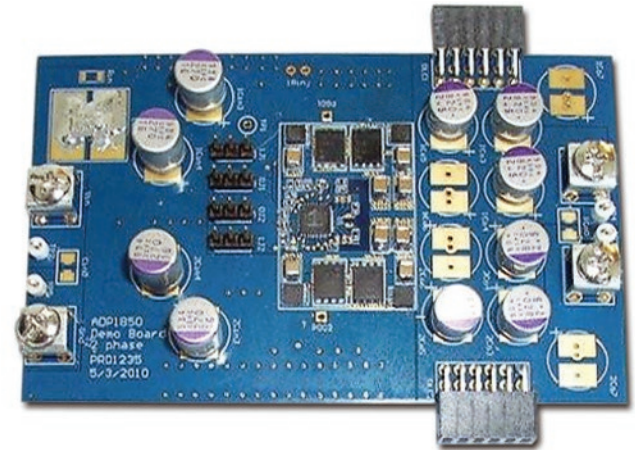
# Switching Controllers

## Switching Controllers That Deliver Highly Efficient and Easy to Use Solutions

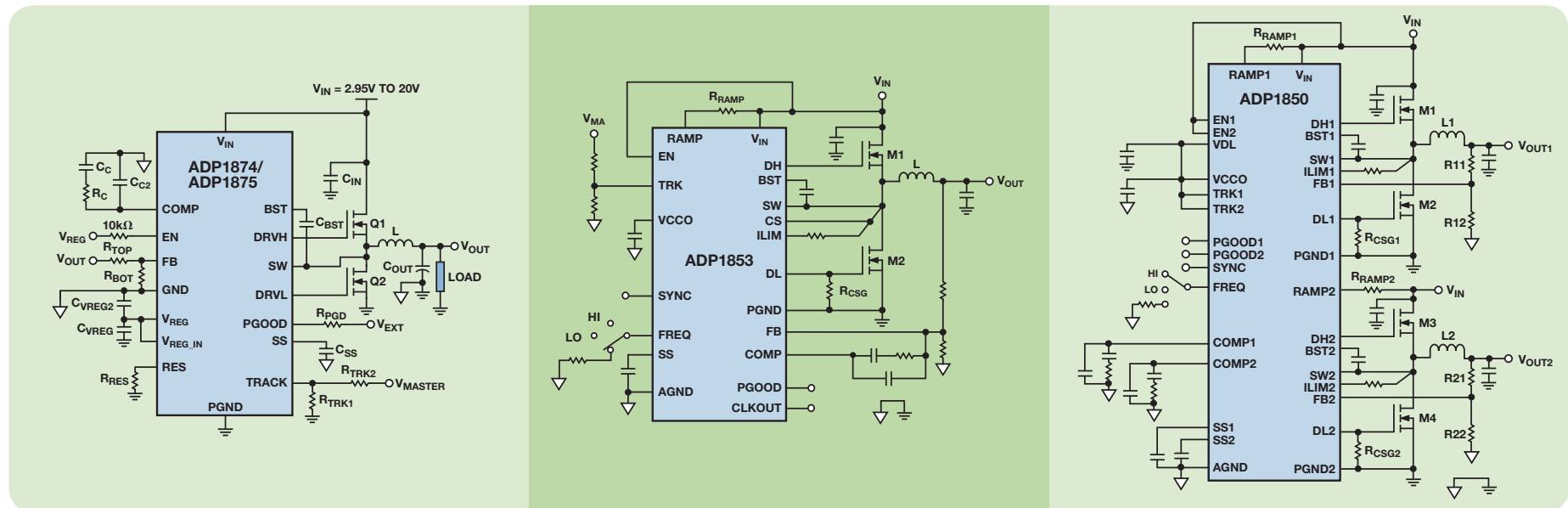
Analog Devices offers a range of versatile, single and dual synchronous switching controllers with external MOSFETs to provide efficient power conversion from a wide input voltage range to output voltages as low as 0.6 V. ADI makes power management design simple by providing easy to use ADIsimPower design software to provide schematics and BOM with a few easy steps. This, added to industry-leading applications support and 50 years of experience in high performance signal processing, makes ADI a reliable and efficient supplier of power management products.

ADI has a very broad range of switching controllers to deliver high current to your point of load. The ADP187x series of wide range input voltage, constant-on-time controllers offer fast transient response with a variety of features depending on the family member selected. The ADP1851 and ADP1853 are wide range input, single-channel, constant frequency controllers. Both devices can be configured as voltage or current mode controllers and can be synchronized to an external clock and provide tracking capability for easy system power-up. The ADP1853 offers the added feature of master clock output.

For higher power levels, the ADP1850 is a flexible, dual-channel or interleaved, current mode controller that offers synchronization, tracking, and simple sequencing capability useful for systems with multiple voltage rails on a card. Similarly, the ADP1829 offers a dual output, voltage mode controller with synchronization and tracking.



ADP1850 demo board 12 V<sub>IN</sub> to 0.9 V @ 50 A output.



ADP1874/ADP1875: single phase, constant-on-time, single output controllers with tracking and optional power saving mode.

ADP1853: single phase, constant frequency, single output controller. Selectable current or voltage mode with sync, clockout, tracking, and power saving mode.

ADP1850: configured as an interleaved, single output controller with sync, tracking, and power saving mode.

## Single Output Switching Controllers

Part Number	V <sub>IN</sub> Range (V)	Switching Frequency	V <sub>OUT</sub> Options	Architecture	Topology	Supply Current Max (Typ)	Enable	Power Good	Tracking	Power Saving Option	Sync/ Clockout	Package	Comment/Added Features	Price (\$U.S.)
ADP1621	2.9 to 5.5	100 kHz to 1.5 MHz	Adj	Constant frequency, current mode	Step-up	1.8 mA	•					10-lead MSOP		1.32
ADP1821	3.7 to 5.5	300 kHz to 600 kHz, sync to 1 MHz	Adj	Constant frequency, voltage mode	Step-down	1 mA	•	•			•	16-lead QSOP		1.41
ADP1822	3.7 to 5.5	300 kHz to 600 kHz, synch to 1 MHz	Adj	Constant frequency, voltage mode	Step-down	1 mA	•	•	•		Sync	24-lead QSOP	Margining capability	1.46
ADP1828	3.0 to 20	300 kHz to 600 kHz, synch to 1 MHz	Adj	Constant frequency, voltage mode	Step-down	1.5 mA	•	•	•		Sync/ clockout	20-lead QSOP, 20-lead LFCSP		1.52
ADP1864	3.15 to 14	580 kHz	Adj	Constant frequency, current mode	Step-down	235 μA						6-lead TSOT	Nonsynchronous buck; pin-to-pin compatible with LTC1772, LTC3801	1.06
ADP1870/ ADP1871	2.95 to 20	300 kHz, 600 kHz, 1 MHz	Adj	Constant on time, current mode	Step-down	1.1 mA	•			• (ADP1871)		10-lead MSOP, 10-lead LFCSP		1.08
ADP1872/ ADP1873	2.75 to 20	300 kHz, 600 kHz, 1 MHz	Adj	Constant on time, current mode	Step-down	1.1 mA	•			• (ADP1873)		10-lead MSOP	Independent bias supply reduces internal dissipation	1.03
ADP1874/ ADP1875	2.95 to 20	300 kHz, 600 kHz, 1 MHz	Adj	Constant on time, current mode	Step-down	1.1 mA	•	•	•	• (ADP1875)		16-lead QSOP		1.32
ADP1878/ ADP1879	2.95 to 20	300 kHz, 600 kHz, 1 MHz	Adj	Constant on time, current mode	Step-down	1.1 mA	•	•		• (ADP1879)		14-lead LFCSP	Low thermal impedance package	1.28
ADP1851/ ADP1853	2.75 to 20	200 kHz to 1.5 MHz	Adj	Constant frequency, current/ voltage mode	Step-down	2.5 mA	•	•	•	•	Sync/ clockout	20-lead LFCSP	Configurable as voltage or current mode controller	1.20
ADP1972/ ADP1974	6 to 60	50 kHz to 300 kHz	Adj	Constant frequency, voltage mode	Step-up, step-down	1.5 mA	•				Sync/ clockout	16-lead TSSOP	Companion to AD8450 for battery systems	3.50/4.20

## Dual Output and Interleaved Controllers

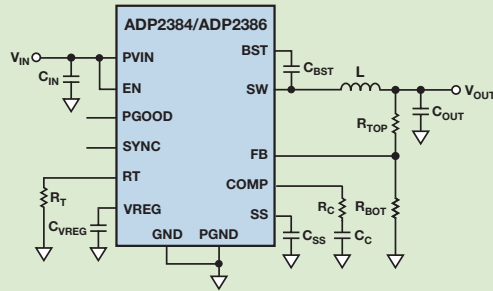
Part Number	V <sub>IN</sub> Range (V)	Switching Frequency	V <sub>OUT</sub> Options	Architecture	Topology	Supply Current Max (Typ)	Enable	Power Good	Tracking	Power Saving Option	Sync/ Clockout	Package	Comment/Added Features	Price (\$U.S.)
ADP1850	2.75 to 20	200 kHz to 1.5 MHz	Dual adj	Constant frequency, current mode	Step-down	4.5 mA	•	•	•	•	Sync	32-lead LFCSP	Configurable as interleaved, single output or dual output	1.85
ADP1829	3.0 to 20	300 kHz to 600 kHz, sync to 1 MHz	Dual adj	Constant frequency, voltage mode	Step-down	1.5 mA	•	•	•			32-lead LFCSP	Configurable as dual output device	2.13
ADP1876	2.95 to 20	600 kHz	Dual adj	Constant frequency, current mode	Step-down	4.5 mA	•	•	•			32-lead LFCSP	Additional 1.5 V <sub>OUT</sub> , 150 mA LDO	1.89

# Switching Regulators

ADI provides a wide range of switching regulators with integrated FETs for step-up (boost), invert, and step-down (buck) applications with fixed and adjustable output voltage options. This highly integrated, versatile family of products is intended to minimize external components for space challenged applications. The switching regulator devices combine with Analog Devices online ADsIm design tools to offer extremely easy to use solutions.

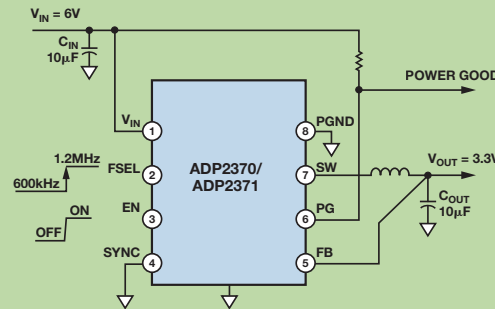
## ADP2384/ADP2386 20 V, 4 A/6 A Switching Regulator

- Best-in-class efficiency: >95%
- Accurate current limit allows the use of smaller inductor
- Power good and precision enable pin for simplified sequencing
- Adjustable frequency and frequency sync to avoid interference in multirail applications
- Ideal solution for 12 V and 5 V input rail



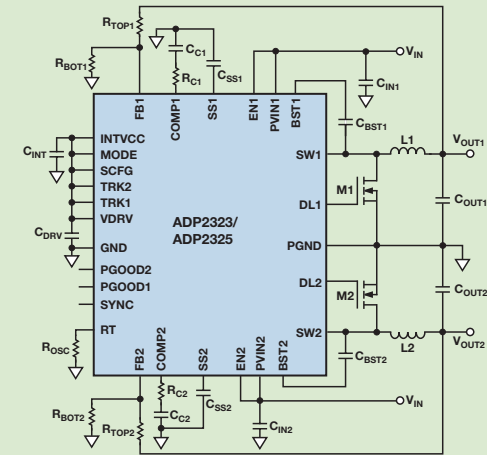
## ADP2370/ADP2371 15 V, 800 mA Switching Regulator

- Ultralow  $I_0 \sim 14 \mu\text{A}$
- Required only three external component for smallest solution size  $\sim 53 \text{ mm}^2$
- Quick output discharge (ADP2371)
- Optional light load efficiency mode
- Frequency synchronization
- Ideal solution for multicell battery source



## ADP2323/ADP2325 20 V, Dual 3 A/5 A Regulator

- ADP2323: dual 3 A or single 6 A
- ADP2325: dual 5 A or single 10 A
- Programmable switching frequency
- Optional light load efficiency
- Ideal solution for 12 V and 5 V input in multirail configuration

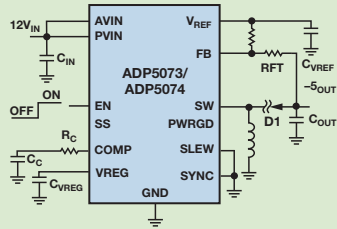


## Step-Down (Buck) Low $I_0$

Part Number	$V_{in}$ Range (V)	$V_{out}$ Options (V)	$I_{out}$ Max (A)	Typical $I_0$ ( $\mu\text{A}$ )	Switching Frequency (MHz)	Package	Additional Features	Price (\$U.S.)
<i>Very High Switching Frequency (<math>\geq 3</math> MHz), Ultralow <math>I_0</math>, and Smallest Solution Size</i>								
ADP2121	2.3 to 5.5	1.80, 1.82, 1.85, 1.875	0.5	36	6	6-ball WLFCSFP		0.80
ADP2108	2.3 to 5.5	1.0, 1.1, 1.2, 1.3, 1.5, 1.8, 1.82, 2.3, 2.5, 3.0, 3.3	0.6	19	3	5-ball WLFCSFP, 5-lead TSOT		0.60
ADP2109	2.3 to 5.5	1.0, 1.2, 1.5, 1.8	0.6	19	3	5-ball WLFCSFP	Quick output discharge	0.70
ADP2140	2.3 to 5.5	Buck: 1.2 to 3.3, LDO: 1.2 to 3.3	Buck: 0.6, LDO: 0.3	42	3	10-lead LFCSP	Independent enable or auto sequencing	1.20
ADP2138	2.3 to 5.5	0.8, 1.0, 1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3	0.8	24	3	6-ball WLFCSFP		0.90
ADP2139	2.3 to 5.5	0.8, 1.0, 1.2, 1.5, 1.8, 2.5, 2.8, 3.0, 3.3	0.8	24	3	6-ball WLFCSFP	Quick output discharge	0.90
ADP2147	2.3 to 5.5	0.9/1.3, 1.2/1.0, 0.9/1.1, 1.275/0.981	0.8	23	3	6-ball WLFCSFP	Simple dynamic voltage scaling	0.90
<i>Extended Input Range, Ultralow <math>I_0</math>, and Small Solution Size</i>								
ADP2370	3.2 to 15	1.2, 1.5, 1.8, 2.5, 3.0, 3.3, 5.0, adj (0.8 to $V_{in}$ )	0.8	14	0.6/1.2	8-lead LFCSP		1.40
ADP2371	3.2 to 15	1.2, 1.8, 3.3, adj (0.8 to $V_{in}$ )	0.8	14	0.6/1.2	8-lead LFCSP	Quick output discharge	1.40
<i>Ultralow <math>I_0</math> and Small Solution Size</i>								
ADP2105	2.7 to 5.5	1.2, 1.5, 1.8, 3.3, adj (0.8 to $V_{in}$ )	1	20	1.2	16-lead LFCSP		1.13
ADP2106	2.7 to 5.5	1.2, 1.5, 1.8, 3.3, adj (0.8 to $V_{in}$ )	1.5	20	1.2	16-lead LFCSP		1.25
ADP2107	2.7 to 5.5	1.2, 1.5, 1.8, 3.3, adj (0.8 to $V_{in}$ )	2	20	1.2	16-lead LFCSP		1.32
<i>Ultralow <math>I_0</math>, Dual-Channel Regulators</i>								
ADP2230	2.3 to 6.5	1.2, 1.8, 1.2, 3.3, 1.8, 3.3, adj (0.8 to 6)	0.8	15	2	10-lead WLFCSFP	Internal compensation, quick output discharge, synchronization	1.53

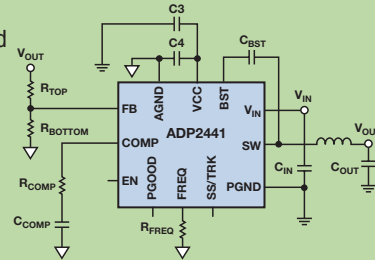
### ADP5073/ADP5074 Inverting Switching Regulator

- $V_{IN}$ : 2.85 V to 15 V
- $V_{OUT}$  adjustable negative output to  $V_{IN} - 39$  V
- Integrated 1.2 A/2.4 A main switch
- Power-good output
- Resistor programmable soft start timer
- Slew rate control for lower system noise

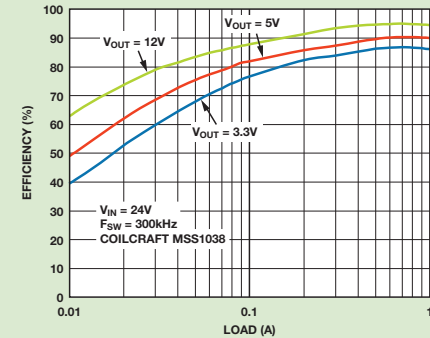


### ADP2441/ADP2442 36 V, 1 A Switching Regulator

- Wide input voltage range: 4.5 V to 36 V
- Very low minimum-on-time: ~50 ns
- Best-in-class efficiency: >95%
- ADP2441: voltage tracking and adjustable soft start
- ADP2442: optional light load efficiency mode and frequency synchronization
- Ideal solution for 24 V and 12 V input rail



### ADP2441 Ultrahigh Efficiency Conversion



Efficiency vs. load current for  $V_{IN} = 24$  V.

### Step-Up (Boost)

Part Number	$V_{IN}$ Range (V)	$V_{OUT}$ Options (V)	Switch Current Max (A)	Switching Frequency	Package	Price (\$U.S.)
ADP1111	2 to 30	3.3, 5.0, 12.0	1.5	70 kHz	8-lead PDIP, 8-lead SOIC	2.06
ADP1612	1.8 to 5.5	Adj ( $V_{IN}$ to 20)	1.4	650 kHz or 1.3 MHz	8-lead MSOP	0.78
ADP1613	2.5 to 5.5	Adj ( $V_{IN}$ to 20)	2	650 kHz or 1.3 MHz	8-lead MSOP	0.70
ADP1614	2.5 to 5.5	Adj ( $V_{IN}$ to 20)	4	650 kHz or 1.3 MHz	10-lead LFCSP	0.95
ADP1606 <b>New</b>	0.8 to $V_{OUT}$	Fixed 1.8	1	2 MHz	6-lead LFCSP	1.14
ADP1607 <b>New</b>	0.8 to $V_{OUT}$	Adj (1.8 to 3.3)	1	2 MHz	6-lead LFCSP	1.14
ADP5070 <b>New</b>	2.85 to 15	Adj ( $V_{IN}$ to 39)	1	1.2 MHz or 2.4 MHz	20-lead LFCSP	2.19
ADP5071 <b>New</b>	2.85 to 15	Adj ( $V_{IN}$ to 39)	2	1.2 MHz or 2.4 MHz	20-lead LFCSP	2.39

### Step-Down (Buck)

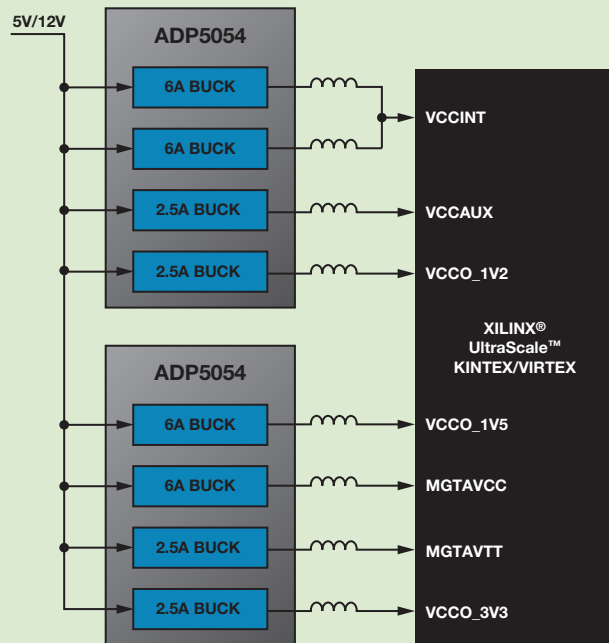
Part Number	$V_{IN}$ Range (V)	$V_{OUT}$ Options (V)	$I_{OUT}$ Max (A)	Switching Frequency (MHz)	Power Good	Power Saving Mode	Precision Enable	Voltage Tracking	Frequency Sync	Precharged Output	100% Duty Operation	Adj Soft Start	Package	Price (\$U.S.)
<i>Fully Integrated FET, High Performance, and Ease of Use</i>														
ADP2120	2.3 to 5.5	1.0, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $V_{IN}$ )	1.25	1.2	•	•	•	•	•	•	•	•	10-lead LFCSP	0.94
ADP2119	2.3 to 5.5	1.0, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $V_{IN}$ )	2	1.2	•	•	•	•	•	•	•	•	10-lead LFCSP	1.14
ADP2118	2.3 to 5.5	1.0, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $V_{IN}$ )	3	0.6/1.2	•	•	•	•	•	•	•	•	16-lead LFCSP	1.43
ADP2164	2.7 to 6.5	1.0, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $V_{IN}$ )	4	0.6/1.2/adj (0.5 to 1.4)	•	•	•	•	•	•	•	•	16-lead LFCSP	1.66
ADP2165 <b>New</b>	2.7 to 5.5	1.0, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $0.9 \times V_{IN}$ )	5	Adj (0.25 to 1.4)	•	•	•	•	•	•	•	•	24-lead LFCSP	1.73
ADP2166 <b>New</b>	2.7 to 5.5	1.0, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $0.9 \times V_{IN}$ )	6	Adj (0.25 to 1.4)	•	•	•	•	•	•	•	•	24-lead LFCSP	1.90
ADP2384	4.5 to 20	Adj (0.6 to $0.9 \times V_{IN}$ )	4	Adj (0.2 to 1.4)	•	•	•	•	•	•	•	•	24-lead LFCSP	1.74
ADP2386	4.5 to 20	Adj (0.6 to $0.9 \times V_{IN}$ )	6	Adj (0.2 to 1.4)	•	•	•	•	•	•	•	•	24-lead LFCSP	2.04
ADP2387 <b>New</b>	4.5 to 20	Adj (0.6 to $0.9 \times V_{IN}$ )	6	Adj (0.2 to 1.4)	•	•	•	•	•	•	•	•	24-lead LFCSP	2.04
ADP2389/ADP2390 <b>New</b>	4.5 to 18	Adj (0.6 to $0.9 \times V_{IN}$ )	12	Adj (0.2 to 2.2)	•	• (ADP2390)	•	•	•	•	•	•	32-lead LFCSP	2.96/3.07
ADP2441	4.5 to 36	Adj (0.6 to $0.9 \times V_{IN}$ )	1	Adj (0.3 to 1)	•	•	•	•	•	•	•	•	12-lead LFCSP	1.78
ADP2442	4.5 to 36	Adj (0.6 to $0.9 \times V_{IN}$ )	1	Adj (0.3 to 1)	•	•	•	•	•	•	•	•	12-lead LFCSP	1.83
<i>Dual Output, High Performance, and Highly Configurable</i>														
ADP2114	2.75 to 5.5	0.8, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $V_{IN}$ )	2 (dual), 4 (single)	0.3/0.6/1.2	•	•	•	•	•	•	•	•	32-lead LFCSP	1.88
ADP2116	2.75 to 5.5	0.8, 1.2, 1.5, 1.8, 2.5, 3.3, adj (0.6 to $V_{IN}$ )	3 (dual), 6 (single)	0.3/0.6/1.2	•	•	•	•	•	•	•	•	32-lead LFCSP	2.50
ADP2311	4.5 to 18	Adj (0.6 on both channels)	1 (dual), 1 (single)	0.3	•	•	•	•	•	•	•	•	24-lead LFCSP	2.38
ADP2323	4.5 to 20	Adj (0.6 to $0.9 \times V_{IN}$ )	3 (dual), 6 (single)	Adj (0.25 to 1.2)	•	•	•	•	•	•	•	•	32-lead LFCSP	2.26
ADP2325	4.5 to 20	Adj (0.6 to $0.9 \times V_{IN}$ )	5 (dual), 10 (single)	Adj (0.25 to 1.2)	•	•	•	•	•	•	•	•	32-lead LFCSP	2.71
<i>General-Purpose, Leadless Package, and Ease of Use</i>														
ADP2300	3 to 20	Adj (0.8 to $0.85 \times V_{IN}$ )	1.2	0.7	•	•	•	•	•	•	•	•	6-lead TSOT	1.02
ADP2301	3 to 20	Adj (0.8 to $0.85 \times V_{IN}$ )	1.2	1.4	•	•	•	•	•	•	•	•	6-lead TSOT	1.02
ADP2302	3 to 20	2.5, 3.3, 5.0, adj (0.8 to $0.85 \times V_{IN}$ )	2	0.7	•	•	•	•	•	•	•	•	8-lead SOIC	1.12
ADP2303	3 to 20	2.5, 3.3, 5.0, adj (0.8 to $0.85 \times V_{IN}$ )	3	0.7	•	•	•	•	•	•	•	•	8-lead SOIC	1.24
ADP2381	4.5 to 20	Adj (0.6 to $0.9 \times V_{IN}$ )	6	Adj (0.2 to 1.4)	•	•	•	•	•	•	•	•	16-lead TSSOP	1.68
ADP3050	3.6 to 30	3.3, 5.0, adj (1.2 to $0.9 \times V_{IN}$ )	1	0.2	•	•	•	•	•	•	•	•	8-lead SOIC	1.81

# Integrated Power Management Solutions (Micro-PMUs)

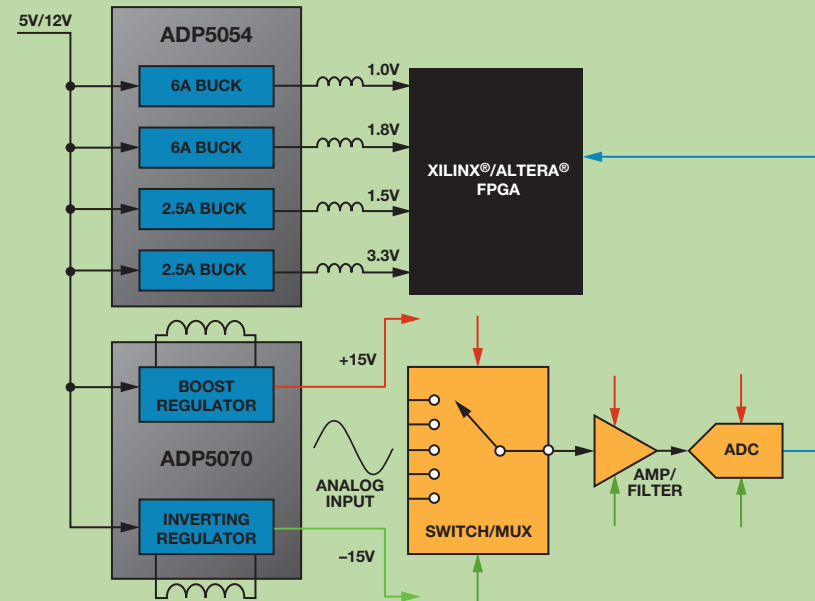
## New Multioutput Regulators Enable Smaller More Reliable Power Solutions for RF/High Speed and Precision Analog Products Along with FPGAs/Processors

Modern high performance RF/high speed and precision analog products along with FPGAs/processor-based systems require an increasing number of dedicated rails supplying core, I/O, memory, and precision analog voltage rails both positive and negative. Typically, power solutions today make use of standalone switching regulators and LDOs, but board area is shrinking, complicating the task of designing more efficient power management systems. Combining multiple switching regulators and LDOs into a single package enables very small, flexible, highly efficient power management solutions for powering high performance analog and FPGAs/processors with the highest system reliability.

### ADP5054 Powering Xilinx UltraScale FPGAs



### ADP5070 Powering Bipolar ADC, DAC, Amp, and Mux





## Integrated Power Management Solutions (Micro-PMUs)

Part Number	Product Description	V <sub>IN</sub> (V)	V <sub>OUT</sub> (V)	Number of Outputs	Output Current (mA)	I <sup>2</sup> C	Reset Trip Threshold (V)	Min Reset Timeout (ms)	Typ Watchdog Timeout (ms)	Key Features	Package	Price (\$U.S.)
ADP5022	Dual, 3 MHz buck with 150 mA LDO	Buck: 2.3 to 5.5	Buck: 3.3, 3.0, 2.8, 2.5, 2.3, 2.0, 1.82, 1.8, 1.6, 1.5, 1.3, 1.2, 1.1, 1.0, 0.9, 0.8	2 × buck	600	—	—	—	—	Mode pin, individual enable pins	16-ball WLCSP	1.80
		LDO: 1.7 to 5.5	LDO: 3.3, 3.0, 2.9, 2.8, 2.775, 2.5, 2.0, 1.875, 1.8, 1.75, 1.7, 1.65, 1.6, 1.55, 1.5, 1.2	1 × LDO	150							
ADP5023	Dual, 800 mA buck with 300 mA LDO	Buck: 2.3 to 5.5 LDO: 1.7 to 5.5	Adj (0.8 to 3.8) Adj (0.8 to 5.2)	2 × buck 1 × LDO	800 300	—	—	—	—	Mode pin, individual enable pins	24-lead LFCSP	1.59
ADP5024	Dual, 1.2 A buck with 300 mA LDO	Buck: 2.3 to 5.5 LDO: 1.7 to 5.5	Adj (0.8 to 3.8) Adj (0.8 to 5.2)	2 × buck 1 × LDO	1200 300	—	—	—	—	Mode pin, individual enable pins	24-lead LFCSP	1.79
ADP5033	Dual, 3 MHz buck regulator with dual LDO	Buck: 2.3 to 5.5	Buck: 3.3, 3.0, 2.8, 2.5, 2.3, 2.0, 1.8, 1.6, 1.5, 1.4, 1.3, 1.2, 1.1, 1.0, 0.9	2 × buck	800	—	—	—	—	Mode pin, two enable pins	16-ball WLCSP	1.90
		LDO: 1.7 to 5.5	LDO: 3.3, 3.0, 2.8, 2.5, 2.25, 2.0, 1.8, 1.7, 1.6, 1.5, 1.2, 1.1, 1.0, 0.9, 0.8	2 × LDO	300							
ADP5034	Dual, 3 MHz buck regulator with dual LDO	Buck: 2.3 to 5.5 LDO: 1.7 to 5.5	Adj (0.8 to 3.8) Adj (0.8 to 5.2)	2 × buck 2 × LDO	1200 300	—	—	—	—	Mode pin, individual enable pins	24-lead LFCSP, 28-lead TSSOP	1.99
ADP5133 <i>New</i>	Dual, 3 MHz buck regulator	Buck: 2.3 to 5.5	Adj (0.8 to 3.8) or 3.3, 3.0, 2.8, 2.5, 2.3, 2.0, 1.8, 1.6, 1.5, 1.4, 1.3, 1.2, 1.1, 1.0, 0.9	2 × buck	800	—	—	—	—	Adjustable and fixed outputs	16-ball WLCSP	1.29
ADP5134 <i>New</i>	Dual, 3 MHz buck regulator with dual LDO	Buck: 2.5 to 5.5 LDO: 1.7 to 5.5	Adj (0.8 to 3.8) Adj (0.8 to 5.2)	2 × buck 2 × LDO	1200 300	—	—	—	—	Precision enable pins and power-good pin	24-lead LFCSP	2.09
ADP5135 <i>New</i>	Triple, 3 MHz buck regulator	Buck: 3.0 to 5.5	Adj (0.8 to 3.8)	3 × buck	1800	—	—	—	—	Precision enable pins and power-good pins	24-lead LFCSP	1.69
ADP5037	Dual, 3 MHz, 800 mA buck regulator with dual 300 mA LDO	Buck: 2.3 to 5.5	Adj (0.8 to 3.8)	2 × buck	800	—	—	—	—	Mode pin, individual enable pins	24-lead LFCSP	1.69
		LDO: 1.7 to 5.5	Adj (0.8 to 5.2)	2 × LDO	300							
ADP5040	3 MHz buck regulator with dual LDO	Buck: 2.3 to 5.5 LDO: 1.7 to 5.5	Adj (0.8 to 3.8) Adj (0.8 to 5.2)	1 × buck 2 × LDO	1200 300	—	—	—	—	Individual enable pins, mode pin	20-lead LFCSP	1.39
ADP5041	3 MHz buck regulator with dual LDO, supervisor, and watchdog timer	Buck: 2.3 to 5.5	Adj (0.8 to 3.8)	1 × buck	1200	—	0.5 (adj)	20, 140	102, 1600	Individual enable pins and supervisor, WDI, mode pin, and MR pin	20-lead LFCSP	1.79
		LDO: 1.7 to 5.5	Adj (0.8 to 5.2)	2 × LDO	300							
ADP5070 <i>New</i>	Dual dc-to-dc with boost and inverter outputs for generating V <sub>POS</sub> and V <sub>NEG</sub>	Boost/inverter: 2.85 to 15	Boost: V <sub>IN</sub> to 39	1 × boost	Input current limit: boost: 1 A inverter: 0.6 A	—	—	—	—	Individual enable pin, adjustable outputs, soft start, and slew rate	20-lead LFCSP, 20-lead TSSOP	2.19
			Inverter: -0.5 to -39 below V <sub>IN</sub>	1 × inverter								
ADP5071 <i>New</i>	Dual dc-to-dc with boost and inverter outputs for generating V <sub>POS</sub> and V <sub>NEG</sub>	Boost/inverter: 2.85 to 15	Boost: V <sub>IN</sub> to 39	1 × boost	Input current limit: boost: 2 A inverter: 1.2 A	—	—	—	—	Individual enable pin, adjustable outputs, soft start, and slew rate	20-lead LFCSP, 20-lead TSSOP	2.39
			Inverter: -0.5 to -39 below V <sub>IN</sub>	1 × inverter								
ADP5073 <i>New</i>	Inverting switching regulator for generating V <sub>NEG</sub>	Inverter: 2.85 to 15	Inverter: -0.5 to -39 below V <sub>IN</sub>	1 × inverter	Inverter: 1.2 A	—	—	—	—	Enable pin, adjustable output, soft start, and slew rate	16-lead LFCSP	1.49
ADP5074 <i>New</i>	Inverting switching regulator for generating V <sub>NEG</sub>	Inverter: 2.85 to 15	Inverter: -0.5 to -39 below V <sub>IN</sub>	1 × inverter	Inverter: 2.4 A	—	—	—	—	Enable pin, adjustable output, soft start, and slew rate	16-lead LFCSP	1.79
ADP5075 <i>New</i>	Inverting switching regulator for generating V <sub>NEG</sub>	Inverter: 2.85 to 15	Inverter: -0.5 to -39 below V <sub>IN</sub>	1 × inverter	Inverter: 0.6 A	—	—	—	—	Enable pin, adjustable output, soft start, and slew rate	12-ball WLCSP	0.99
ADP5050 <i>New</i>	Quad buck regulator with LDO with I <sup>2</sup> C	Buck: 4.5 to 15 LDO: 1.7 to 5.5	0.8 to 0.85 × V <sub>IN</sub>	2 × buck	4000 <sup>1</sup>	Yes	—	—	—	I <sup>2</sup> C interface with individual enable pins and power good	48-lead LFCSP	4.39
			0.5 to 4.75	2 × buck	1200							
				1 × LDO	200							
ADP5051 <i>New</i>	Quad buck regulator, POR, and WDI with I <sup>2</sup> C	Buck: 4.5 to 15	0.8 to 0.85 × V <sub>IN</sub>	2 × buck 2 × buck	4000 <sup>1</sup> 1200	Yes	0.5 (adj)	1, 20, 140, 1120	6.3, 102, 1600, 25,600	I <sup>2</sup> C interface with individual enable pins and power good	48-lead LFCSP	4.59
ADP5052 <i>New</i>	Quad buck regulator with LDO	Buck: 4.5 to 15 LDO: 1.7 to 5.5	0.8 to 0.85 × V <sub>IN</sub>	2 × buck	4000 <sup>1</sup>	—	—	—	—	Individual enable pins with power good	48-lead LFCSP	3.59
			0.5 to 4.75	2 × buck	1200							
				1 × LDO	200							
ADP5053 <i>New</i>	Quad buck regulator with POR and WDI	Buck: 4.5 to 15	0.8 to 0.85 × V <sub>IN</sub>	2 × buck 2 × buck	4000 <sup>1</sup> 1200	—	0.5 (adj)	1, 20, 140, 1120	6.3, 102, 1600, 25,600	Individual enable pins with power good	48-lead LFCSP	3.79
ADP5054 <i>New</i>	Quad buck regulator	Buck: 4.5 to 15.5	0.8 to 0.85 × V <sub>IN</sub>	2 × buck 2 × buck	6000 <sup>2</sup> 2500	—	—	—	—	Individual enable pins with power good	48-lead LFCSP	4.29
ADP2311 <i>New</i>	Dual 1 A buck	4.5 to 18	Adj (0.6 to 0.85 × V <sub>IN</sub> )	2 × buck	1000	—	0.95 × V <sub>FB</sub>	Adj	50, 100, 150, 200	PFO, PFI, WDI	24-lead LFCSP	2.38

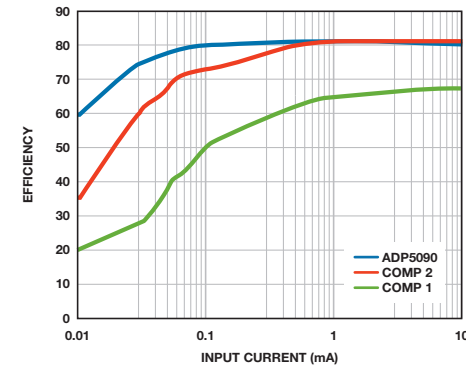
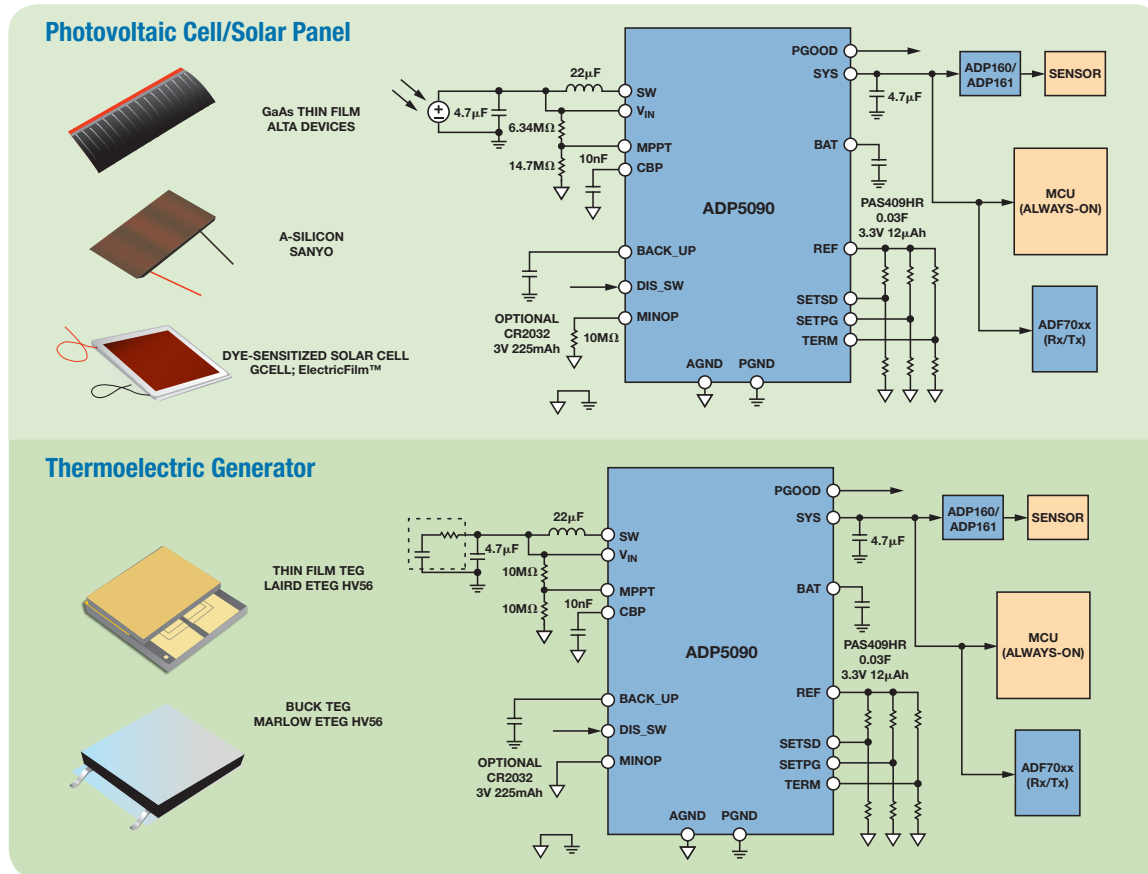
<sup>1</sup> Resistor programmable current limit (4 A, 2.5 A, or 1.2 A).

<sup>2</sup> Resistor programmable current limit (6 A, 4 A, or 2 A).

# Ultralow Power Microenergy Harvesters

Analog Devices offers ultralow power boost regulators for photovoltaic and thermoelectric energy harvesting systems. The ADP5090 delivers efficient conversion of the harvester's limited power down to the 15  $\mu$ W to 1 mW range by offering best-in-class sub- $\mu$ W power conversion losses. The ADP5090's programmable maximum power point tracking feature ensures that the most energy is extracted from the harvester and the 260 nA quiescent current deep sleep mode prolongs the system's operational time by minimizing losses in the absence of ambient energy. The integrated charge pump circuit enables cold start down to 380 mV input voltage when no energy is present on the system node.

In addition to efficient ultralow power conversion, ADP5090 provides excellent system design flexibility. For example, built-in programmability enables the part to handle the charging of different types of energy storage mediums. If an optional backup cell battery is added to the system, ADP5090 will intelligently manage and prioritize the power path via fully integrated power switches. ADP5090 can transition to a quiet, no switching mode within 10  $\mu$ s to reduce noise during RF transceiver data communication periods.



## ADP5090 Features

- Ultralow power boost regulator
- Hysteretic controller optimizes sub-1 mW efficiency
- Cold start from 16  $\mu$ W at  $V_{IN} = 380$  mV
- Ultralow quiescent current
- $I_Q$  (sys) = 320 nA when  $V_{IN}$  (OCV) > MINI\_OP
- $I_Q$  (sys) = 260 nA when  $V_{IN}$  (OCV) < MINI\_OP
- OCV (open circuit voltage) sensing maximum power point tracking
- Programmable MPPT ratio for PV or TEG
- Programmable automatic switcher shutdown point (MIN\_OP)
- Energy storage management
- Programmable charging termination voltage and shutdown voltage level to prevent overcharging and overdischarging
- Support optional back-up battery power path (primary cell battery)
- RF transmission friendly
- Ability to shut down switcher temporarily via MCU communication

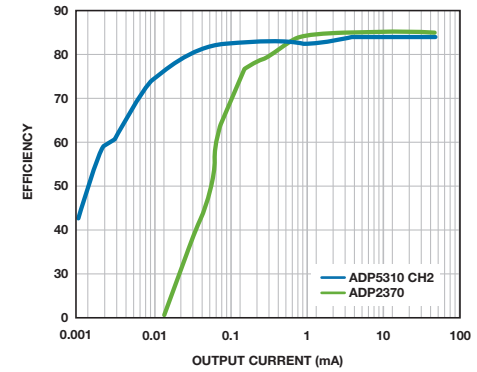
Part Number	Topology	Quiescent Current (Standby Current) (nA)	$V_{IN}$ Operating Range	$V_{IN}$ Cold Startup VSYS < 1.8 V	Max Input Current (mA)	Termination Charging Voltage (V)	Shutdown Discharging Voltage (V)	Accuracy over Temperature	Cell Type	Package	Price <sup>1</sup> (\$U.S.)
ADP5090 New	Switching/ boost	300 (CBP > MINI_OP) 260 (CBP < MINI_OP)	80 mV to 3.3 V	380 mV	100 mA	2.2 to 5.2 (Adj)	2.0 to $V_{TERM}$ (Adj)	3%	SuperCap Li-Ion	3 mm × 3 mm 16-lead LFCSP	1.99

<sup>1</sup>1000 to 4999

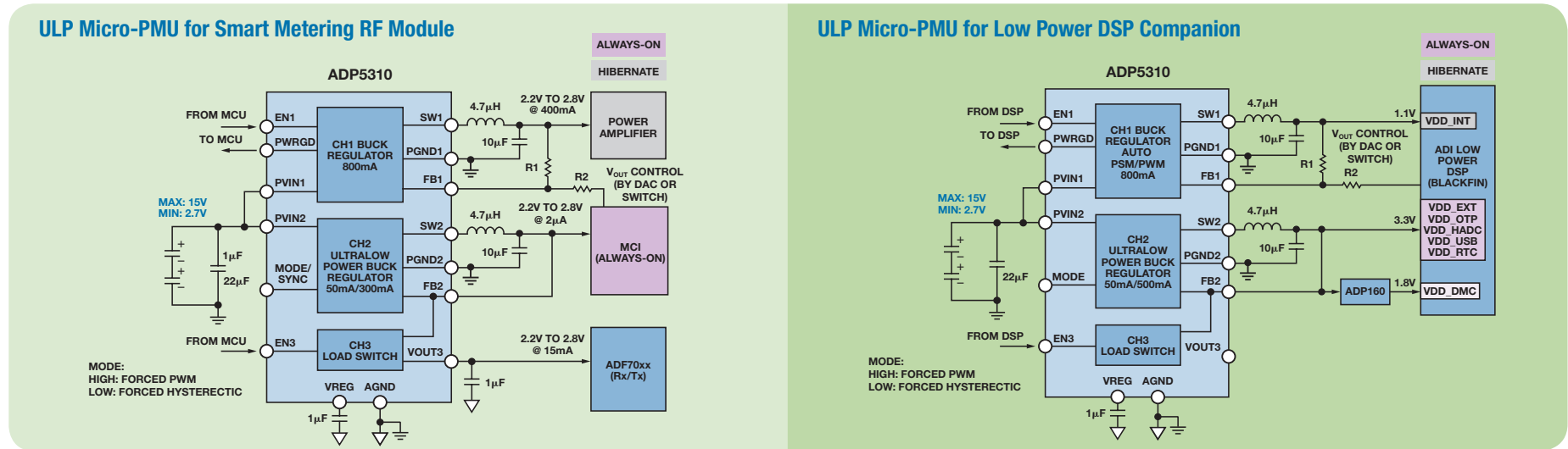
# Ultralow Power Regulators

Analog Devices has introduced a new ultralow power regulator, **ADP5310**, which consumes extremely low current during regulation and therefore generates superior efficiency, particularly in ultralight load (sub-1 mW) conditions, making it ideal for battery-powered applications in which the system is always on. Unlike switchers that employ traditional PSM (power saving mode) approaches which still may consume tens of microamps of quiescent current, ADP5310 has a proprietary scheme that consumes only 600 nA  $I_Q$ , enabling efficient conversion even for loads in the microamp range.

Moreover, ADP5310 is equipped with selectable forced PWM mode, offering a low noise output to power sensitive RF and analog loads making ADP5310 ideal for powering systems that need a low IQ standby mode as well as a low noise active mode.



Efficiency  $V_{IN} = 6 V, V_{OUT} = 2.8 V.$



Part Number	Topology	Configuration	Quiescent Current (Standby Current) (nA)	$V_{IN}$ Operating Range (V)	$V_{OUT}$ Programmable Range (V)	Max Output Current (mA)	Special Features	Package	Price <sup>1</sup> (\$U.S.)
ADP5300 <b>New</b>	Switching (buck)	1 × buck	230 nA ( $V_{IN} = 4.2 V$ )	2.05 to 6.5	Adjustable via single resistor 0.8 to 5.0 (32 options)	500	Selectable hysteretic or FPWM mode, optional SYNC clocking, QOD, and voltage monitoring	10-lead LFCSP, 9-ball WLCSFP	0.95
ADP5310 <b>New</b>	Switching (buck)	2 × buck 1 × load switch	620 nA ( $V_{IN} = 6.0 V$ ) 690 nA ( $I_{IN} = 15 V$ )	2.7 to 15.0	CH1: 1.2, 1.5, 1.8, 2.5, 2.85, 3.3, 5 or adjustable CH2: 1.2 to 5.0 (50 mV per step) or adjustable	CH1: 800 CH2: 300	Selectable hysteretic or FPWM mode, optional SYNC clocking, and QOD	16-lead TSSOP-EP	1.99
ADP160/ADP161/ ADP162/ADP163 <b>New</b>	Linear (LDO)	1 × LDO	560 nA ( $I_{OUT} = 0 \mu A$ )	2.2 to 5.5	Fixed option from 1.2 to 4.2 or adjustable	150	QOD option	5-lead TSOT, 4-ball WLCSFP	0.34
ADP165 <b>New</b>	Linear (LDO)	1 × LDO	590 nA ( $I_{OUT} = 0 \mu A$ )	2.2 to 5.5	Fixed option from 1.2 to 4.2 or adjustable	150	Pass through mode and QOD	6-lead TSOT, 6-lead LFCSP, 4-ball WLCSFP	0.35
ADP166 <b>New</b>	Linear (LDO)	1 × LDO	590 nA ( $I_{OUT} = 0 \mu A$ )	2.2 to 5.5	Fixed option from 1.2 to 4.2 or adjustable	150	Pass through mode, no QOD	6-lead TSOT, 6-lead LFCSP, 4-ball WLCSFP	0.35

<sup>1</sup>1000 to 4999

# Digital Power and Drivers

## Digital Power for Isolated Power Conversion

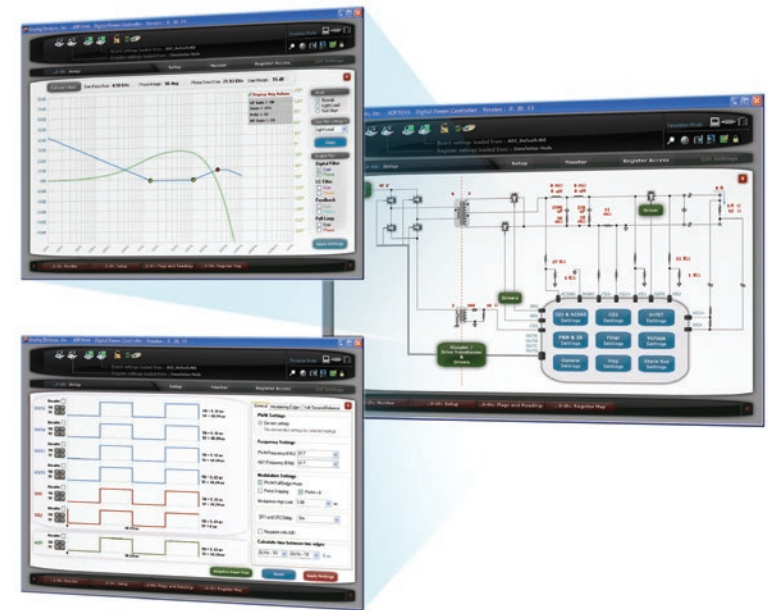
Analog Devices leads the market in digital power controllers for ac-to-dc and isolated dc-to-dc power supply systems with award winning products and technology that enable customers to capitalize on the flexibility of digital technology without the pain of complex programming. All digital controllers are complemented by an easy to use graphics user interface (GUI) that enables fast system optimization of efficiency and performance and reduces time to market.

The **ADP1046A** (W—automotive) is an advanced digital controller with seven PWM logic outputs and is suited to parallel and redundant power supply operation and offers current sharing functions and control of the external OR-FET for redundant power supply applications. The ADP1046A (W) can be used to drive the latest high efficiency LLC resonant mode architectures.

**ADP1050/ADP1051/ADP1052** are extremely compact digital controllers with 4 PWM/6 PWM logic outputs capable of controlling most high efficiency power supply topologies with synchronous rectification. All devices have an extensive PMBus™ command set with multiple energy saving modes. The ADP1051/ADP1052 are designed for parallel power supply connection with programmable passive current share, reverse current protection, precharge start-up and conditional overvoltage protection. The ADP1052 adds peak parameter measurements for system power mapping.

The **ADP1055** introduces high bandwidth, high switching frequency, and fast transient response to digital power control—approaching analogue performance. The ADP1055 adds extensive access and password protection and advanced diagnostics capability; first fault instance detection, and Blackbox capability.

All **ADP104x/ADP105x** advanced digital controllers are supported by evaluation kits and reference designs at: <http://www.analog.com/en/power-management/digital-power-management/products/index.html>.

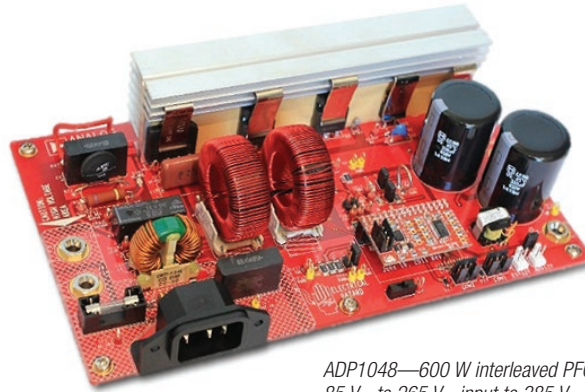


Intuitive graphic user programming eliminates complex coding and software qualification.

Part Number	Description	Key Features	V <sub>IN</sub> (V)	Interface	EEPROM	PWM Outputs	Housekeeping I/O	Protection	Package	Temperature Range (°C)	Price @ 1k (\$U.S.)
<b>ADP1046A/ADP1046AW</b>	Single-channel digital controller with LLC resonant mode, current share, and FET-Oring control	LLC resonant mode control, current share, and OR-FET control voltage feedforward	3.3	I <sup>2</sup> C	Yes	7	ACSNS, FLAGIN, PGOOD1, PGOOD2, PS <sub>ON</sub>	OVP, UVP, OTP, OCP, ACSNS, GND continuity	24-lead QSOP	-40 to +85 ambient	3.21
<b>ADP1053</b>	Configurable dual-channel digital controller	Frequency synchronization, voltage feedforward	3.3	I <sup>2</sup> C/PMBus	Yes	8	ACSNS, PGOOD (2), PS <sub>ON</sub> (2), FLAGIN, FLAGOUT, sync	OVP, UVP, OCP, OTP (2)	40-lead LFCSP	-40 to +125 junction	5.30
<b>ADP1050</b>	Single-channel digital controller with PMBus interface	PMBus interface, synchronization, power saving modes	3.3	I <sup>2</sup> C/PMBus	Yes	4	ACSNS/VF, PGOOD/ALERT, control/enable, sync/FLAGIN	OVP, UVP, OCP, OTP	20-lead LFCSP	-40 to +125 junction	3.40
<b>ADP1051/ADP1052</b>	Single-channel digital controller with PMBus interface	PMBus interface, parallel configurable, synchronization, power saving, adaptive dead time; ADP1052: peak measurement capability	3.3	I <sup>2</sup> C/PMBus	Yes	6	ACSNS/VF, PGOOD/ALERT, control/enable, sync/FLAGIN	Redundant OVP, UVP, OCP, OTP	24-lead LFCSP	-40 to +125 junction	3.90/4.10
<b>ADP1055</b>	Advanced digital controller with PMBus interface with high switching frequency capability	PMBus interface, high bandwidth, fast transient capability, active clamp snubber, power saving modes and adaptive dead time, Blackbox diagnostics and password protection	3.3	I <sup>2</sup> C/PMBus	Yes	6 + 2	ACSNS/VF, PGOOD/ALERT, control/enable, sync/FLAGIN, 4 × GPIO	Redundant OVP, UVP, OCP, OTP	32-lead LFCSP	-40 to +125 junction	4.60

## Digital Power Factor Correction (PFC) with Accurate Input Power Meter

The ADP1047 and ADP1048 digital power factor correction controller series offers versatile controllers with power metering capability to  $\pm 1\%$  accuracy. The ADP1047 is a single phase device, while the ADP1048 is an interleaved controller and can be configured as a bridgeless PFC for high system efficiency. The PMBus interface allows parameters to be adjusted and reported including accurate measurement of input voltage, current, and power. The ADP1047/ADP1048 can be programmed using the easy to use graphic user interface, enabling ac-to-dc designers and system architects to optimize efficiency and power system performance.



ADP1048—600 W interleaved PFC evaluation kit.  
85 V<sub>AC</sub> to 265 V<sub>AC</sub> input to 385 V<sub>DC</sub> output.

## Digital Power Factor Correction Controllers with Accurate Power Metering

Part Number	Description	Key Features	V <sub>IN</sub> (V)	Interface	EEPROM	PWM Outputs	Housekeeping I/O	Protection	Package	Temperature Range (°C)	Price @ 1k (\$U.S.)
ADP1047	Single phase PFC controller with accurate power metering	Inrush control, real-time efficiency optimization, enhanced dynamic response, synchronization, spread spectrum	3.3	I <sup>2</sup> C/ PMBus	Yes	2	PS <sub>ON</sub> , inrush control, ACOK, PGOOD	Programmable ac fault detection, OCP, OVP, OTP	24-lead QSOP	-40 to +85 ambient	3.00
ADP1048/ADP1048W	Interleaved PFC controller with accurate power metering	Inrush control, real-time efficiency optimization, enhanced dynamic response, synchronization, spread spectrum	3.3	I <sup>2</sup> C/ PMBus	Yes	2	PS <sub>ON</sub> , inrush control, ACOK, PGOOD	Programmable ac fault detection, OCP, OVP, OTP	24-lead QSOP	-40 to +85 ambient	3.60

## High Speed MOSFET Drivers

The ADP3654/ADP3634/ADP3624/ADP3630 family of high current, dual, high speed drivers complements the ADI digital power controllers. This family uses an industry-standard driver footprint but adds switching performance and enhanced reliability. The ADP3634/ADP3624/ADP3630 driver family has two levels of thermal protection (overtemperature warning and shutdown), provides a precision enable that can be used to provide system protection and safety, and includes UVLO to protect the power FET from supply rail droop. The ADP3650 is introduced as a dual MOSFET driver suited to driving nonisolated point-of-load synchronous buck converters.

## High Speed Drivers

Part Number	Description	V <sub>IN</sub> (V)	Peak Drive Current (A)	Propagation Delay Rising Typ (ns)	UVLO_ON/OFF Threshold Typ (V)	Precision Enable/Shutdown	OT Protection	OT Warning Signal	Package	Ambient Temperature Range (°C)	Price @ 1k (\$U.S.)
ADP3654	Dual, noninverting	4.5 to 18	4	14	4.2, 3.9	No	No	No	8-lead MSOP_EP, 8-lead SOIC_N_EP	-40 to +125 junction	0.74/0.66
ADP3633/ADP3634/ADP3635	Dual inverting (ADP3633), dual noninverting (ADP3634), inverting/noninverting (ADP3635)	9.5 to 18	4	14	8.7, 7.7	Yes	Yes	Yes	8-lead MSOP_EP, 8-lead SOIC_N_EP	-40 to +85	0.96/0.88
ADP3623/ADP3624/ADP3625	Dual inverting (ADP3623), dual noninverting (ADP3624), inverting/noninverting (ADP3625)	4.5 to 18	4	14	4.2, 3.9	Yes	Yes	Yes	8-lead MSOP_EP, 8-lead SOIC_N_EP	-40 to +85	0.96/0.88
ADP3629/ADP3630/ADP3631	Dual inverting (ADP3629), dual noninverting (ADP3630), inverting/noninverting (ADP3631)	9.5 to 18	2	14	8.7, 7.7	Yes	Yes	Yes	8-lead MSOP, 8-lead SOIC_N	-40 to +85	0.81/0.76
ADP3650	Buck sync rectifier	4.15 to 13.2	—	30	4.15, 3.0	Yes	No	No	8-lead LFCSP, 8-lead SOIC	-40 to +85	0.70/0.62

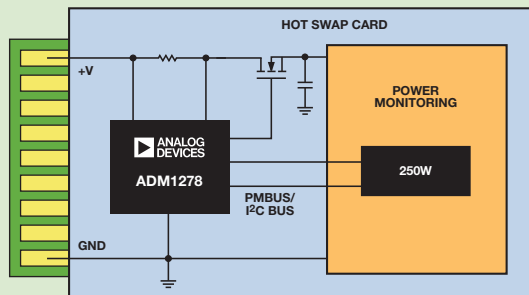
# Hot Swap

## Hot Swap ICs with Precision ADCs Deliver Greater Accuracy for Improved Energy Savings

With industry-leading power monitoring accuracy, hot swap controllers from ADI enable increased energy savings opportunities for communications infrastructure installations. Combined with FET health detection features they ensure a robust and dependable solution.

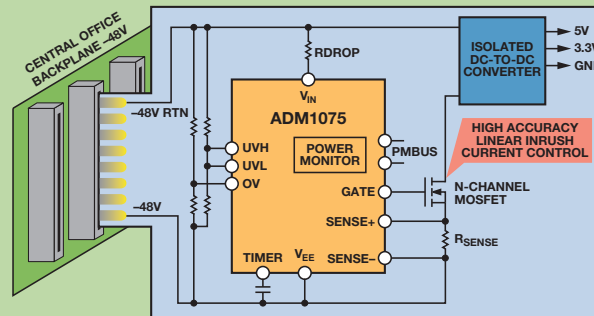
### Low Voltage Positive Hot Swap Controllers with Integrated Power Monitor

- $\pm 0.3\%$  current monitoring accuracy
- FET health detection
- Constant power fold back



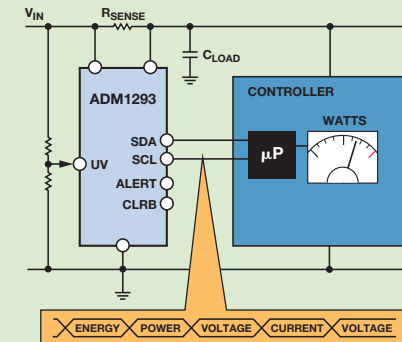
### -48 V Hot Swap Controllers with Integrated Power Monitor

- Constant power foldback for FET SOA protection
- Precision (<1.0%) current and voltage measurement
- 25 mV/50 mV full-scale sense voltage



### Power Monitors

- I<sup>2</sup>C interface
- Processor interrupt pin



## Positive Hot Swap

Part Number	Input Range (V)	Circuit Breaker Sense Voltage (mV)	Input Control	Digital Interface	Current Sense Accuracy	Other Features	Package	Price <sup>1</sup> (\$U.S.)
ADM4210	2.7 to 16.5	50	UV/enable	—	—	—	6-lead TSOT	1.99
ADM1170	1.6 to 16.5	50	UV/enable	—	—	SS	8-lead TSOT	2.13
ADM1171	2.7 to 16.5	50	UV/enable	—	$\pm 5 @ 50$ mV (analog)	SS, CSOUT	8-lead TSOT	2.23
ADM1172	2.7 to 16.5	50	UV/enable	—	—	PFI, PFO	8-lead TSOT	2.02
ADM1270	4 to 60	50	UV/OV/enable	—	$\pm 5 @ 50$ mV (analog)	Adj current limit, power good	16-lead LFPCP, 16-lead QSOP	2.49

<sup>1</sup> 1000 to 4999

## Low Voltage Positive Hot Swap and Power Monitors

Part Number	Input Range (V)	Circuit Breaker Sense Voltage (mV)	Input Control	Digital Interface	Current Sense Accuracy	Other Features	Package	Price <sup>1</sup> (\$U.S.)
ADM1175	3.15 to 16.5	100	UV/enable	I <sup>2</sup> C with 4 addresses	±1.95 @ 100 mV	CONV	10-lead MSOP	2.53
ADM1176	3.15 to 16.5	100	UV/enable	I <sup>2</sup> C with 16 addresses	±1.95 @ 100 mV	—	10-lead MSOP	2.53
ADM1177	3.15 to 16.5	100	UV/enable	I <sup>2</sup> C with 4 addresses	±1.95 @ 100 mV	SS	10-lead MSOP	2.53
ADM1178	3.15 to 16.5	100	UV/enable	I <sup>2</sup> C with 4 addresses	±1.95 @ 100 mV	—	10-lead MSOP	2.73
ADM1275	2.95 to 20	5 to 25	UV/OV/enable	PMBus with 4 addresses, readback V, I	±1 @ 20 mV	Foldback, GPO (×2)	5 mm × 5 mm, 20-lead LFCSP	4.49
ADM1276	2.95 to 20	5 to 25	UV/OV/enable	PMBus with 4 addresses, readback V, I, P, E	±1 @ 20 mV	Foldback, GPO (×2), PWRGD, energy meter	5 mm × 5 mm, 20-lead LFCSP	5.29
ADM1278 <b>New</b>	2.0 to 20	5 to 25	UV/OV/enable	PMBus with 4 addresses, readback V, I, P, E, T	±0.3 @ 20 mV	Power foldback, GPO (×2), FET fault, PWRGD, startup limit, SPI, CSOUT, temperature, energy meter	5 mm × 5 mm, 32-lead LFCSP	2.89

<sup>1</sup> 1000 to 4999

## Current Sense Amplifiers—High Side

Part Number	CM Range (V)	Gain	Max Sense Voltage (mV)	Operating Range (V)	Accuracy Typ (±%)	Package	Price <sup>1</sup> (\$U.S.)
ADM4073T	2 to 28	20	150	3 to 28	1	6-lead SOT-23	0.99
ADM4073F	2 to 28	50	150	3 to 28	1	6-lead SOT-23	0.99
ADM4073H	2 to 28	100	150	3 to 28	1	6-lead SOT-23	0.99

<sup>1</sup> 1000 to 4999

## –48 V Hot Swap Controller

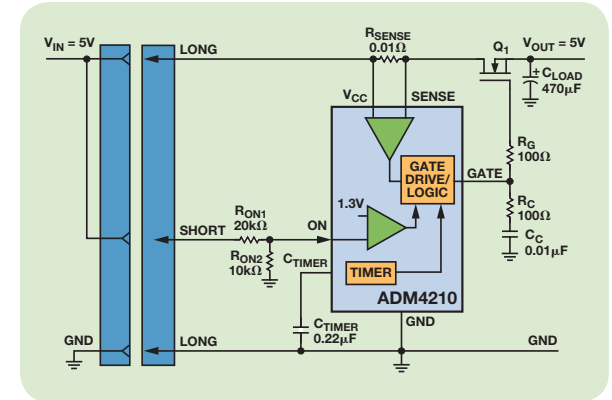
Part Number	Voltage Range (V)	Undervoltage Detection/Overvoltage Detection	Digital V and I Readback	Additional Features	Package	Price <sup>1</sup> (\$U.S.)
ADM1070	Shunt regulated	UV pin, OV pin	—	—	6-lead SOT-23	1.57
ADM1073	Shunt regulated	UV pin, OV pin	—	Soft start, drain pin monitoring, additional I/Os	14-lead TSSOP	2.13
ADM1075 <b>New</b>	Shunt regulated	UVH pin, UVL pin, OV pin	PMBus interface with four addresses; also power readback	Soft start, constant power foldback, fast gate shutdown, adj current-sense limit	28-lead LFCSP, 28-lead TSSOP	4.99

<sup>1</sup> 1000 to 4999

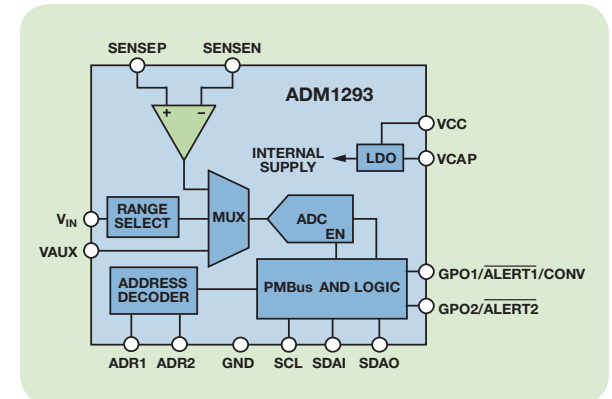
## Digital Power Monitors

Part Number	Operating Range (V)	Current Control Accuracy (±%)	Worst-Case Current Monitoring Accuracy (%)	Bidirectional Current Monitoring	ADC Conversion Input CONV	CLR Input	Alert Output	Readback Type	Peak Value Recording	Energy Meter	Communications Interface	Package	Price <sup>1</sup> (\$U.S.)
ADM1191	3.15 to 26	105	1.45 @ 75 mV	—	Yes	—	Yes	V and I	—	—	I <sup>2</sup> C interface with 4 addresses	10-lead MSSOP	1.92
ADM1192	3.15 to 26	105	1.45 @ 75 mV	—	—	Yes	Yes	V and I	—	—	I <sup>2</sup> C interface with 16 addresses	10-lead MSSOP	1.92
ADM1293A <b>New</b>	2.95 to 20	±25, ±50, ±100, ±200	0.33 @ 20 mV	Yes	Yes	—	Yes	V, I, P, E	Yes	Yes	PMBus interface with 16 addresses	16-lead, 4 mm × 4 mm LFCSP	4.19
ADM1293B <b>New</b>	2.95 to 20	±25, ±50, ±100, ±200	0.75 @ 20 mV	Yes	Yes	—	Yes	V, I, P, E	Yes	Yes	PMBus interface with 16 addresses	16-lead, 4 mm × 4 mm LFCSP	2.79
ADM1294A <b>New</b>	2.95 to shunt	±25, ±50, ±100, ±200	0.33 @ 20 mV	Yes	Yes	—	Yes	V, I, P, E	Yes	Yes	PMBus interface with 16 addresses	16-lead, 4 mm × 4 mm LFCSP	4.49
ADM1294B <b>New</b>	2.95 to shunt	±25, ±50, ±100, ±200	0.75 @ 20 mV	Yes	Yes	—	Yes	V, I, P, E	Yes	Yes	PMBus interface with 16 addresses	16-lead, 4 mm × 4 mm LFCSP	2.99

<sup>1</sup> 1000 to 4999



Low voltage positive hot swap controller.



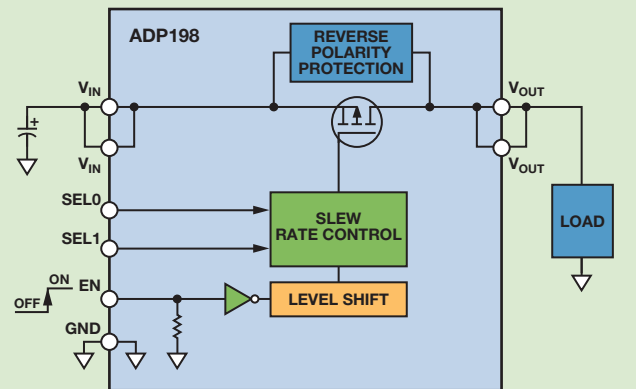
Current sense amplifier.

## Load Switches

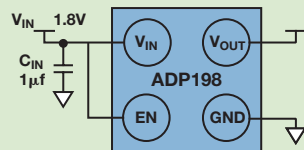
Controlling power supplies in today's systems is becoming increasingly complex, and ADI's family of load switches provide a simple way to keep them all under control.

### ADP198 6 V, Reverse Protected Load Switch

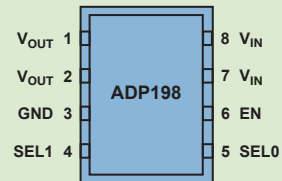
- Low  $R_{DS(ON)}$  of 50 m $\Omega$  @  $V_{IN} = 3.3$  V and  $I_{LOAD} = 200$  mA in WLCSP
- Wide input voltage range down to 1.65 V
- $I_{GND} = 2.5$   $\mu$ A with  $I_{OUT} = 0$  mA,  $V_{IN} = 2.8$  V
- 5  $\mu$ A reverse current,  $V_{OUT} = 6.2$  V
- Low shutdown current: 100 nA
- Ultrasmall size WLCSP: 4 bump, 0.5 mm pitch
- Compact 2 mm  $\times$  2 mm, 8-lead LFCSP
- Programmable start-up time: 30  $\mu$ s, 200  $\mu$ s, 450  $\mu$ s, 1000  $\mu$ s



1mm  $\times$  1mm, 4-BALL WLCSP

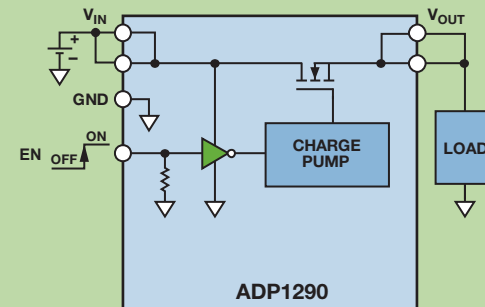


2mm  $\times$  2mm, 8-LEAD LFCSP



### ADP1290 12 V, 2 A, Logic Controlled, High-Side Power Switch

- Low  $R_{DS(ON)}$  of 40 m $\Omega$
- Wide input voltage range: 2.3 V to 13.2 V
- 2 A continuous operating current,  $T_J < 85^\circ\text{C}$
- 1.2 V logic compatible enable input
- Low 12  $\mu$ A quiescent current,  $V_{IN} = 3.3$  V
- Low 12  $\mu$ A quiescent current,  $V_{IN} = 3.3$  V
- Ultralow shutdown current: 2.0  $\mu$ A at  $V_{IN} = 6.5$  V
- Ultrasmall 1.0 mm  $\times$  1.5 mm, 6-ball, 0.5 mm pitch WLCSP





## Load Switches

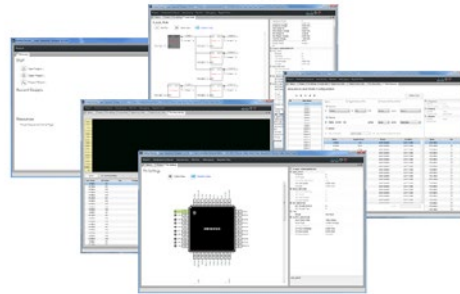
Part Number	V <sub>IN</sub> Min (V)	I <sub>D</sub> Max (A)	I <sub>D</sub> Limit (A)	Temperature Protect (°C)	Switch RDS <sub>ON</sub>	I <sub>SUPPLY</sub> @ Shutdown Typ (μA)	I <sub>GND</sub> (μA)	Enable Logic (V)	Output t <sub>ON</sub> Delay (ms)	Features	Package	Price <sup>1</sup> (\$U.S.)
ADP1190A	1.4 to 3.6	500	—	—	0.065 Ω @ 3.6 V	700 nA	—	1.2 min	—	Quad switch	1.2 mm × 1.6 mm	0.60
ADP1196 <b>New</b>	0 to 5.5	3	—	125	0.01 Ω @ 1.8 to 5.5 V	0.25	40	1.2 min	2	0 V switch	1.0 mm × 1.5 mm	0.50
ADP196	1.8 to 5.5	3	4	125	0.01 Ω @ 1.8 to 5.5 V	0.25	40	1.2 to 6	2	—	1.0 mm × 1.5 mm	0.50
ADP196-22/ ADP196-23/ ADP196-32/ ADP196-33	1.8 to 5.5	3	4	125	0.01 Ω @ 1.8 to 5.5 V	0.25	40	1.2 to 6	2	Fault, EN, latch off, retry	1.0 mm × 1.5 mm	0.50
ADP1190 <b>New</b>	1.4 to 3.5	500 mA	—	—	0.120 Ω @ 1.8V	2	2	1.2 to 3.3	5	Quad switch	1.2 mm × 1.6 mm	0.60
ADP199	0.9 to 3.6	0.5	—	—	0.04 Ω @ 1.1 to 3.6 V	0.9	6	1.1 to 3.6	0.02	—	0.8 mm × 0.8 mm	0.32
ADP198 <b>New</b>	1.65 to 6.5	1	—	—	0.120 Ω @ 1.8 V	1.1	2.5	1.2 to 6	0.11	Reverse current protection	1.0 mm × 1.0 mm	0.35
ADP194	1.1 to 3.6	500 mA	—	—	0.08 Ω @ 1.8 V	0.7	1	1.2 to 3.3	0.007	Reverse current protection	0.8 mm × 0.8 mm	0.32
ADP197	1.8 to 5.5	3	—	125	0.012 Ω @ 1.8 to 5.5 V	18	1	1.2 to 3.3	1	—	1.0 mm × 1.5 mm	0.46
ADP195	1.1 to 3.6	1.1	—	—	0.095 Ω @ 1.8 V	5	10	1.2 to 3.3	0.005	—	1.0 mm × 1.0 mm	0.35
ADP191	1.1 to 3.6	500 mA	—	—	0.105 Ω @ 1.8 V	2	2	1.2 to 3.3	0.005	Active discharge	0.8 mm × 0.8 mm	0.32
ADP190	1.1 to 3.6	500 mA	—	—	0.105 Ω @ 1.8 V	2	2	1.2 to 3.3	0.005	—	0.8 mm × 0.8 mm	0.32
ADP1290 <b>New</b>	2.3 to 13.2	2	—	—	0.04 Ω @2.3 V	—	—	—	—	—	1.0 mm × 1.5 mm	0.88

<sup>1</sup> 1000 to 4999

# Sequencing

The number of supplies being used on today's communications boards is expanding, and making the control and monitoring of these complex systems as simple as possible is what ADI sequencers do.

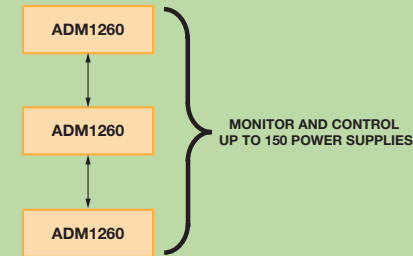
Introducing the concept of the virtual sequencer—these devices can be transparently cascaded in order to control up to 150 supplies.



New virtual sequencer software.

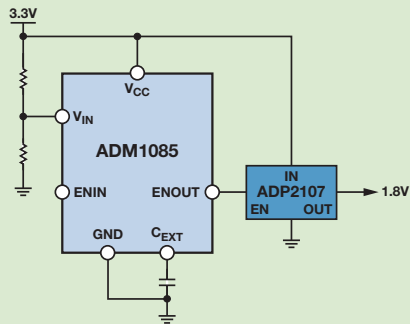
## Cascadable Super Sequencer

- Monitor and control up to 150 power rails
- Operates as one virtual sequencer



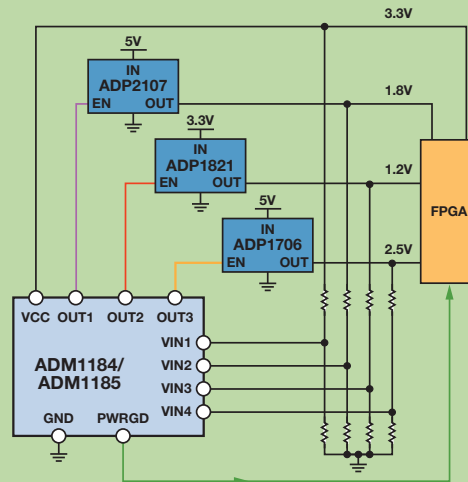
## Simple Sequencer®

- Low cost solution
- Capacitor adjustable timeout
- Cascadable devices
- FET drive output (ADM6819 and ADM6820)
- 22 V tolerant outputs
- Tiny SC70 package



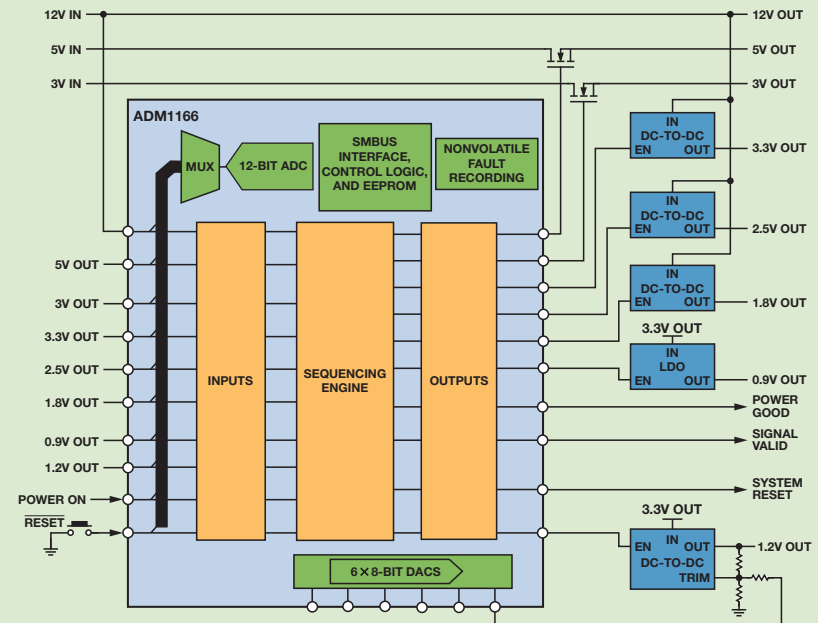
## Multivoltage Sequencers

- $\pm 0.8\%$  threshold accuracy
- Up and down sequencing
- Cascadable devices (sequence 3 rails to 12 rails)
- Capacitor adjustable timeout
- Output valid at 1 V min
- MSOP and QSOP packages



## Super Sequencer®

- Programmable sequencing engine
- $\pm 1\%$  threshold accuracy
- Closed-loop margining
- Up and down sequencing
- Nonvolatile fault recording
- Enable and FET drive output
- LFCSP and TQFP packages



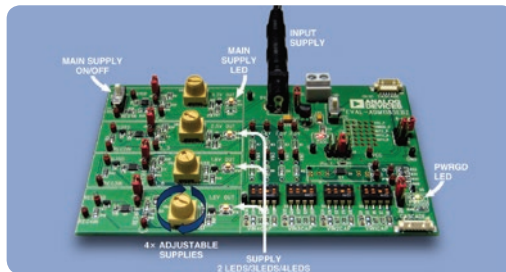
## Analog Sequencers

Part Number	Number of Supplies Monitored	Voltage Monitoring Accuracy ( $\pm\%$ )	Number of Output Drivers	FET Drive/Enable Output	Sequencing	Package	Price (\$U.S.)
ADM1085	1: cascadable	7	1	Enable	Up	6-lead SC70	0.34
ADM1086	1: cascadable	8	1	Enable	Up	6-lead SC70	0.34
ADM1087	1: cascadable	8	1	Enable	Up	6-lead SC70	0.34
ADM1184	4: cascadable	0.8	4	Enable	Up	10-lead MSOP	1.79
ADM1185	4: cascadable	0.8	4	Enable	Up	10-lead MSOP	1.21
ADM1186-1	4: cascadable	0.8	4	Enable	Up and down	20-lead QSOP	1.99
ADM1186-2	4	0.8	4	Enable	Up and down	16-lead QSOP	1.49
ADM6819	2: cascadable	2.6	1	FET drive	Up	6-lead SOT-23	1.21
ADM6820	2: cascadable	2.6	1	FET drive	Up	6-lead SOT-23	1.21

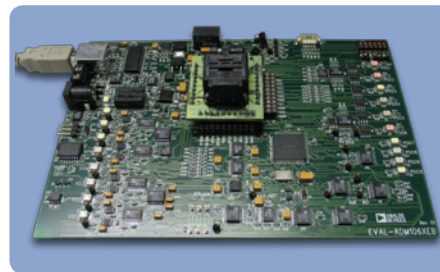
## Digital Sequencers

Part Number	Number of Supplies Monitored	Voltage Monitoring Accuracy ( $\pm\%$ )	Number of Output Drivers	Programming Method	FET Drive/Enable Output	Voltage Readback	Supply Adj/Margining	Package	Price (\$U.S.)
ADM1060	7	2.5	9	SMBus	Both	—	—	6-lead SC70	6.58
ADM1062	10	1	10	SMBus	Both	12-bit ADC	12-bit ADC, 6 DACs	40-lead LFSCP, 48-lead TQFP	7.59
ADM1063	10	1	10	SMBus	Both	12-bit ADC	—	40-lead LFSCP, 48-lead TQFP	8.35
ADM1064	10	1	10	SMBus	Both	12-bit ADC	—	40-lead LFSCP, 48-lead TQFP	7.84
ADM1065	10	1	10	SMBus	Both	—	—	40-lead LFSCP, 48-lead TQFP	5.82
ADM1066	12	1	10	SMBus	Both	12-bit ADC	12-bit ADC, 6 DACs	40-lead LFSCP, 48-lead TQFP	8.60
ADM1067	10	1	10	SMBus	Both	—	6 DACs	40-lead LFSCP, 48-lead TQFP	6.58
ADM1068	8	1	8	SMBus	Both	—	—	32-lead LQFP	4.05
ADM1069	8	1	8	SMBus	Both	12-bit ADC	12-bit ADC, 4 DACs	32-lead LQFP, 40-lead LFSCP	4.40
ADM1166	12	1	10	SMBus	Both	12-bit ADC	12-bit ADC, 6 DACs	40-lead LFSCP, 48-lead TQFP	9.99
ADM1168	8	1	8	SMBus	Both	—	—	32-lead LQFP	5.49
ADM1169	8	1	8	SMBus	Both	12-bit ADC	12-bit ADC, 6 DACs	32-lead LQFP, 40-lead LFSCP	6.49
ADM1260 <i>New</i>	10: cascadable	1	10	SMBus	Both	—	6 DACs	40-lead LFSCP	12.99

## Analog Devices Sequencer Evaluation Systems

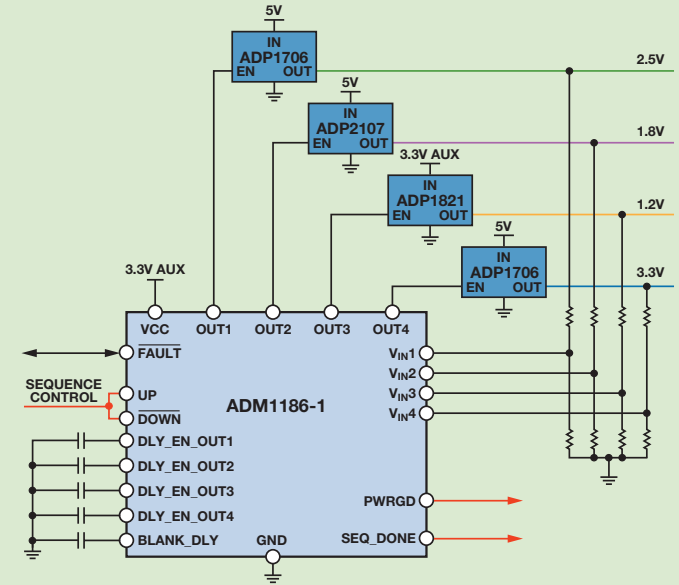


ADM1185 evaluation board.

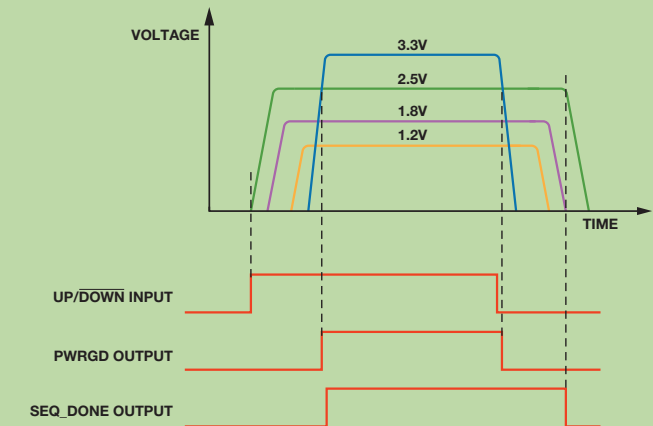


ADM1062-ADM1069 main evaluation board.

## Power-Up and Power-Down Sequencing with the ADM1186



## ADM1186 Power-Up and Power-Down Timing Diagram



# Supervisory

## Industry's Lowest Power Supervisors

As the world goes more portable, quiescent current and a small package are becoming more important. Drawing only 125 nA over temperature and available in tiny WLCSP packaging, ADI supervisory products, such as the new [ADM8611/ADM8612](#) and [ADM8641/ADM8642](#), are ideal for portable applications.

## Best Threshold Accuracy: Two Supplies to 12 Supplies

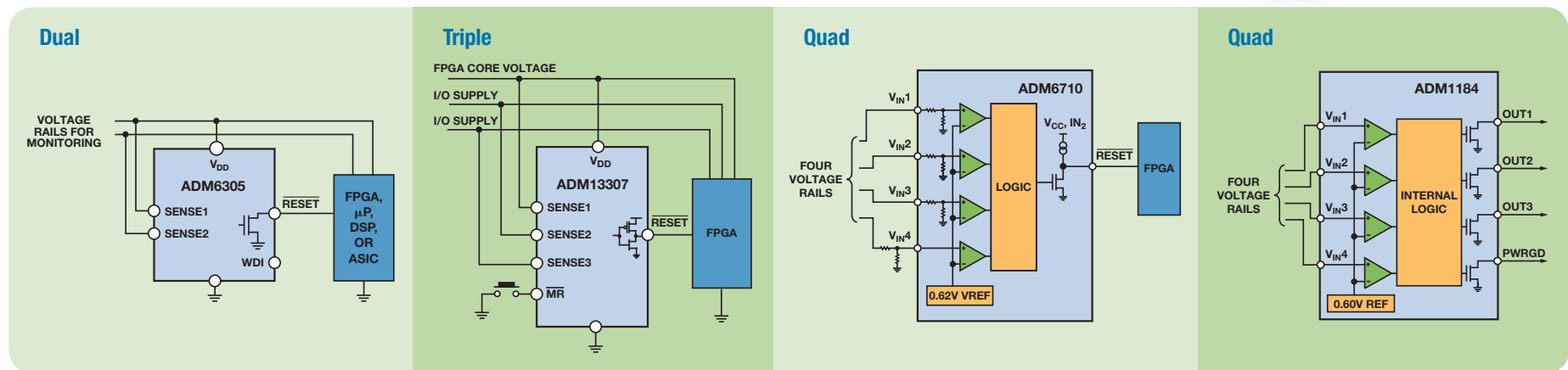
High accuracy is critical when monitoring low voltage cores. With up to 2× the accuracy over temperature of competitive parts, these ADI products offer the ability to maintain a much tighter voltage tolerance, thereby maximizing system protection.

125 nA Max  
Supply Current

Reset Thresholds  
from 1.8 V to 4.63 V

Watchdog Timers

WLCSP Packaging

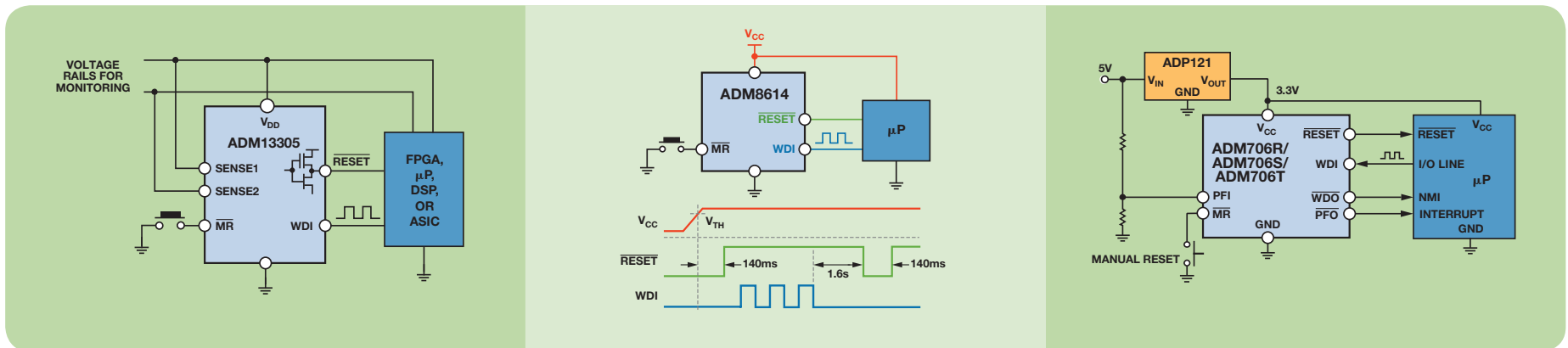


ADM6305: dual supervisor in 5-lead SOT-23.

ADM13307: ±0.8% accurate triple processor supervisor in 8-lead, narrow-body SOIC package.

ADM6710: ±1.5% accurate triple/quad voltage microprocessor supervisor in 6-lead SOT-23 package.

ADM1184: ±0.8% accurate quad voltage monitor in 10-lead MSOP package.



ADM13305: ±0.8% accurate dual processor supervisor in 8-lead, narrow-body SOIC package.

ADM8614: ultralow power ( $I_{CC} = 190$  nA, max) supervisory ICs with watchdog timer and manual reset.

ADM706: voltage monitoring microprocessor supervisory circuits.

## Supervisory—Simple Reset/Power-On Reset

Part Number	Reset Threshold (V)	Min Reset Timeout (ms)	Reset Output Stage		Manual Reset Capability	Supply Current Typ (μA)	Package	Price <sup>1</sup> (\$U.S.)
			Active Low	Active High				
ADM1810	4.35, 4.62	100	Push-pull	—	No	4	3-lead SC70, 3-lead SOT-23	0.45
ADM1811	4.35, 4.62	100	Internal pull-up	—	No	4	3-lead SC70, 3-lead SOT-23	0.45
ADM1812	4.35, 4.62	100	—	Push-pull	No	4	3-lead SC70, 3-lead SOT-23	0.45
ADM1813	4.35, 4.62	100	Internal pull-up	—	Yes	4	3-lead SC70, 3-lead SOT-23	0.39
ADM1815	2.18, 2.31, 2.55, 2.88, 3.06	100	Push-pull	—	No	4	3-lead SC70, 3-lead SOT-23	0.39
ADM1816	2.18, 2.31, 2.55, 2.88, 3.06	100	Internal pull-up	—	No	4	3-lead SC70, 3-lead SOT-23	0.45
ADM1817	2.18, 2.31, 2.55, 2.88, 3.06	100	—	Push-pull	No	4	3-lead SC70, 3-lead SOT-23	0.45
ADM1818	2.18, 2.31, 2.55, 2.88, 3.06	100	Internal pull-up	—	Yes	4	3-lead SC70, 3-lead SOT-23	0.45
ADM6315	2.63, 2.93, 3.08, 4.39, 4.5, 4.63	1, 20, 140, 1120	Open-drain	—	Yes	4	4-lead SOT-143	0.73
ADM6319	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Push-pull	Push-pull	Yes	5	5-lead SOT-23	0.50
ADM6322	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Open-drain	Push-pull	Yes	5	5-lead SOT-23	0.50
ADM6326	2.2, 2.32, 2.4, 2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08	100	Push-pull	—	No	0.5	3-lead SOT-23	0.95
ADM6328	2.2, 2.32, 2.4, 2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08	100	Open-drain	—	No	0.5	3-lead SOT-23	0.95
ADM6346	3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.38, 4.5, 4.63	100	Push-pull	—	No	1	3-lead SOT-23	0.95
ADM6348	3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.38, 4.5, 4.63	100	Open-drain	—	No	1	3-lead SOT-23	0.95
ADM6384	1.58, 1.67, 2.19, 2.31, 2.4, 2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Push-pull	—	Yes	3	4-lead SC70	0.94
ADM6711	2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	—	Yes	12	4-lead SC70	0.26
ADM6713	2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Open-drain	—	Yes	12	4-lead SC70	0.28
ADM6825	1.58, 1.67, 2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	Push-pull	Yes	7	5-lead SOT-23	0.50
ADM698	4.65	140	Push-pull	Push-pull	No	600	8-lead PDIP, 16-lead SOIC	1.35
ADM707	4.65	160	Push-pull	Push-pull	Yes	190	8-lead PDIP, 8-lead SOIC	0.96
ADM708	4.4	160	Push-pull	Push-pull	Yes	190	8-lead PDIP, 8-lead SOIC, 8-lead MSOP	0.84
ADM709	2.63, 2.93, 3.08, 4.4, 4.65	140	Push-pull	—	No	35	8-lead PDIP, 8-lead SOIC	0.70
ADM803	2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Open-drain	—	No	17	3-lead SC70	0.26
ADM809	2.32, 2.63, 2.93, 3.08, 4.0, 4.38, 4.63	140	Push-pull	—	No	17	3-lead SC70, 3-lead SOT-23	0.61
ADM810	2.32, 2.63, 2.93, 3.08, 4.0, 4.38, 4.63	140	—	Push-pull	No	17	3-lead SC70, 3-lead SOT-23	0.60
ADM811	2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	—	Yes	5	4-lead SOT-143	0.45
ADM812	2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	—	Push-pull	Yes	5	4-lead SOT-143	0.45
ADM825	2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	Push-pull	Yes	5	5-lead SC70, 5-lead SOT-23	0.50
ADM8698	4.65	140	Push-pull	Push-pull	No	70	8-lead PDIP, 8-lead SOIC_N, 16-lead SOIC_W	1.99
ADM8611 <i>New</i>	2 to 4.63	140	Open-drain	—	Yes	0.092	1.5 mm × 1 mm WLCS	0.53
ADM8612 <i>New</i>	0.6 to 1.9	140	Open-drain	—	Yes	0.092	1.5 mm × 1 mm WLCS	0.59
ADM8641 <i>New</i>	2 to 4.63	0	Open-drain	—	Yes	0.092	1.5 mm × 1 mm WLCS	0.25
ADM8642 <i>New</i>	0.6 to 1.9	0	Open-drain	—	Yes	0.092	1.5 mm × 1 mm WLCS	0.25

<sup>1</sup> 1000 to 4999

## Supervisory—Watchdog Timers

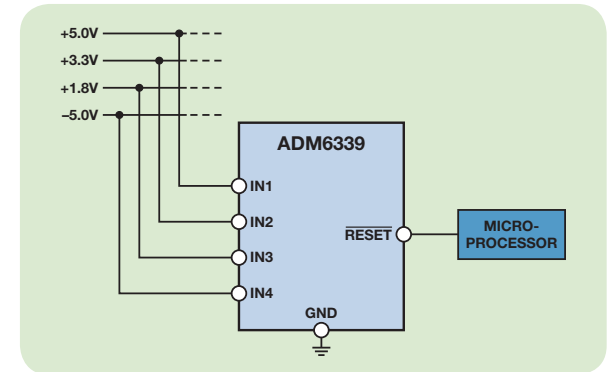
Part Number	Reset Threshold (V)	Min Reset Timeout (ms)	Reset Output Stage		Manual Reset Capability	Typ Watchdog Timeout (ms)	Power-Fail Indicator	Package	Price <sup>1</sup> (\$U.S.)
			Active Low	Active High					
ADM13305	0.6 (adj), 1.68, 2.25, 2.93, 4.55	140	Push-pull	Push-pull	Yes	1600	No	8-lead SOIC_N	0.95
ADM1232/ ADM1232A	4.37, 4.62	250	Open-drain	Push-pull	Yes	150/600/1120	No	8-lead PDIP, 8-lead SOIC, 16-lead SOIC_W, 8-lead MSOP	0.94
ADM6316	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Push-pull	—	Yes	6.3/102/1600/ 25,600	No	5-lead SOT-23	0.50
ADM6318	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Push-pull	Push-pull	No	6.3/102/1600/ 25,600	No	5-lead SOT-23	0.50
ADM6320	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Open-drain	—	Yes	6.3/102/1600/ 25,600	No	5-lead SOT-23	0.50
ADM6321	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Open-drain	Push-pull	No	6.3/102/1600/ 25,600	No	5-lead SOT-23	0.50
ADM6821	1.58, 1.67, 2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	—	Push-pull	Yes	1600	No	5-lead SOT-23	0.75
ADM6822	1.58, 1.67, 2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Open-drain	—	Yes	1600	No	5-lead SOT-23	0.75
ADM6823	1.58, 1.67, 2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	—	Yes	1600	No	5-lead SOT-23	0.75
ADM6824	1.58, 1.67, 2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	Push-pull	No	1600	No	5-lead SOT-23	0.75
ADM699	4.65	140	Push-pull	Push-pull	No	1600	No	8-lead PDIP, 16-lead SOIC	1.66
ADM705	4.65	160	Push-pull	—	Yes	1600	Yes	8-lead PDIP, 8-lead SOIC	1.01
ADM706	4.4	160	Push-pull	—	Yes	1600	Yes	8-lead PDIP, 8-lead SOIC	1.68
ADM823	2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	—	Yes	1600	No	5-lead SC70, 5-lead SOT-23	0.50
ADM824	2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	140	Push-pull	Push-pull	Yes	1600	No	5-lead SC70, 5-lead SOT-23	0.50
ADM8616	1.58, 1.67, 2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	1, 20, 140, 1120	Push-pull	—	No	6.3/102/1600	No	4-lead SC70	0.85
ADM8617	1.58, 1.67, 2.19, 2.32, 2.63, 2.93, 3.08, 4.38, 4.63	1, 20, 140, 1120	Open-drain	—	No	6.3/102/1600	No	4-lead SC70	0.85
ADM8699	4.65	140	Push-pull	Push-pull	No	1600	No	8-lead PDIP, 8-lead SOIC_N, 16-lead SOIC_W	1.99
ADM9690	4.31	10 typ, 50 typ	Push-pull	—	No	0.75/1.5/12.5/25	No	8-lead SOIC	1.50
ADP5041	0.5 (adj)	20, 140	Open-drain	—	Yes	102/1600	No	20-lead LFCSP	1.99
ADM8613 <i>New</i>	2.32 to 4.63	140	Open-drain	—	Yes	1600/25,600	No	1.5 mm × 1 mm, 6-ball WLCSP	0.65
ADM8614 <i>New</i>	2.32 to 4.63	140	Open-drain	—	—	1600/100,000	No	1.5 mm × 1 mm, 6-ball WLCSP	0.65
ADM8615 <i>New</i>	0.5 to 1.9	140	Open-drain	—	Yes	1600/25,600	No	1.5 mm × 1 mm, 6-ball WLCSP	0.65
ADM8316	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Push-pull	—	Yes	6.3/102/1600/25,600	No	5-lead SOT-23	0.69
ADM8318	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Push-pull	Push-pull	Yes	6.3/102/1600/25,600	No	5-lead SOT-23	0.69
ADM8319	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Push-pull	Push-pull	No	6.3/102/1600/25,600	No	5-lead SOT-23	0.69
ADM8320	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Open-drain	-	Yes	6.3/102/1600/25,600	No	5-lead SOT-23	0.69
ADM8321	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Open-drain	Push-pull	Yes	6.3/102/1600/25,600	No	5-lead SOT-23	0.69
ADM8322	2.5, 2.63, 2.7, 2.8, 2.93, 3.0, 3.08, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.39, 4.5, 4.63, 4.7, 4.8, 4.9, 5.0	1, 20, 140, 1120	Open-drain	Push-pull	No	6.3/102/1600/25,600	No	5-lead SOT-23	0.69

<sup>1</sup> 1000 to 4999

## Multivoltage Supervisors

Part Number	Number of Monitored Voltages	Reset Threshold (V)	Min Reset Timeout (ms)	Reset Output Stage		Manual Reset Capability	Typ Watchdog Timeout (ms)	Package	Price (\$U.S.) <sup>1</sup>
				Active Low	Active High				
ADM13305	2	0.6 (adj), 1.68, 2.25, 2.93, 4.55	140	Push-pull	Push-pull	Yes	1600	8-lead SOIC_N	0.95
ADM6305	2	0.4 (adj), 1.23 (adj)	1, 20, 140, 1120	Open-drain	—	—	—	5-lead SOT-23	1.15
ADM6306	2	0.4 (adj), 1.23 (adj), 22.5 to 5 (26 options)	1, 20, 140, 1120	Open-drain	—	—	Yes	5-lead SOT-23	1.15
ADM13307	3	0.6 (adj), 1.25 (adj), 1.68, 2.25, 2.93, 4.55	140	Push-pull	Push-pull	Yes	—	8-lead SOIC_N	0.98
ADM6710	3 or 4	0.62 (adj), 1.58, 1.67, 2.19, 2.32, 2.63, 2.78, 2.93, 3.08, 4.38, 4.63	140	Open-drain	—	No	—	6-lead SOT-23	1.60
ADM1184	4	0.6 (adj)	100	Open-drain	—	No	—	10-lead MSOP	1.79
ADM6339	4	-0.50 (adj), +0.62 (adj), +1.23 (adj), -4.38, -4.63, +1.58, 2.19, +2.63, +2.78, +2.93, +3.08, +4.38, +4.63	140	Open-drain	—	No	—	6-lead SOT-23	1.79
ADM2914	4	0.5 (adj)	Adj	Open-drain	—	—	—	16-lead QSOP	2.49
ADM12914	4	0.62 (adj)	Adj	Open-drain	—	—	—	16-lead QSOP	2.79
ADM8710	4	0.62 (adj), 1.73, 3.07	Adj	Open-drain	—	No	—	6-lead SOT-23	1.79

<sup>1</sup>1000 to 4999



Quad voltage microprocessor supervisory circuit.

## Supervisory—Battery Backup

Part Number	Reset Threshold (V)	Min Reset Timeout (ms)	Reset Output Stage		Backup Battery Switch	Chip Enable Gating	Typ Watchdog Timeout (ms)	Package	Price <sup>1</sup> (\$U.S.)
			Active Low	Active High					
ADM690	4.65	35	Push-pull	—	Yes	No	100, 1600	8-lead PDIP	2.39
ADM690A	4.65	140	Push-pull	—	Yes	No	1600	8-lead PDIP, 8-lead SOIC, 8-lead MSOP	1.50
ADM691	4.65	35 adj	Push-pull	Push-pull	Yes	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC	2.70
ADM691A	4.65	140 adj	Push-pull	Open-drain	Yes	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC_N, 16-lead SOIC_W, 16-lead TSSOP	1.66
ADM692	4.4	35	Push-pull	—	Yes	No	100, 1600, adj	8-lead PDIP	2.39
ADM692A	4.4	140	Push-pull	—	Yes	No	1600	8-lead PDIP, 8-lead SOIC	1.66
ADM693	4.4	35 adj	Push-pull	Push-pull	Yes	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC	2.70
ADM693A	4.4	140 adj	Push-pull	Open-drain	Yes	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC_N, 16-lead SOIC_W	1.83
ADM694	4.65	140	Push-pull	—	Yes	No	100, 1600, adj	8-lead PDIP	2.50
ADM695	4.65	140 adj	Push-pull	Push-pull	Yes	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC	2.70
ADM696	1.3 adj	35	Push-pull	Open-drain	Yes	No	100, 1600, adj	16-lead PDIP, 16-lead SOIC_W	2.60
ADM697	1.3 adj	35	Push-pull	Push-pull	No	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC_W	2.60
ADM800	4.3, 4.55	140 adj	Push-pull	Open-drain	Yes	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC_N, 16-lead SOIC_W	2.30
ADM802	4.4, 4.65	140	Push-pull	—	Yes	No	1600	8-lead PDIP, 8-lead SOIC	2.20
ADM805	4.4, 4.65	140	—	Push-pull	Yes	No	1600	8-lead PDIP, 8-lead SOIC	2.20
ADM8690	4.65	35	Push-pull	—	Yes	No	1600	8-lead PDIP, 8-lead SOIC	2.49
ADM8691	4.65	35 adj	Push-pull	Push-pull	Yes	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC_N, 16-lead SOIC_W, 16-lead TSSOP	2.98
ADM8694	4.65	140	Push-pull	—	Yes	No	100, 1600	8-lead PDIP, 8-lead SOIC	2.69
ADM8695	4.65	140 adj	Push-pull	Push-pull	Yes	Yes	100, 1600, adj	16-lead SOIC_W	2.16
ADM8696	1.3 adj	35 adj	Push-pull	Push-pull	Yes	No	100, 1600, adj	16-lead PDIP, 16-lead SOIC_W, 16-lead TSSOP	2.69
ADM8697	1.3 adj	35 adj	Push-pull	Push-pull	No	Yes	100, 1600, adj	16-lead PDIP, 16-lead SOIC_W, 16-lead TSSOP	2.69

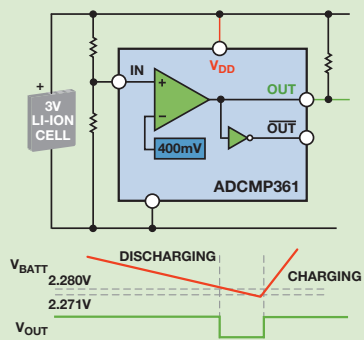
<sup>1</sup>1000 to 4999

# Low Power Comparators

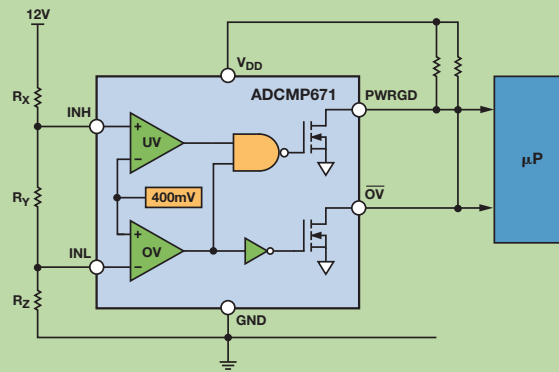
Part Number	Number Per Package	Internal Reference	Reference Accuracy ( $\pm\%$ )	Supply Voltage (V)	Supply Current Typ ( $\mu\text{A}$ )	Input Range (V)	Propagation Delay Typ ( $\mu\text{s}$ )	Hysteresis	Logic I/O	Package	Price <sup>1</sup> (\$U.S.)
ADCMP341	2	Yes	0.275	1.7 to 5.5	6.5	0 to $V_{cc}$	10.0	Adj	Open-drain	8-lead SOT-23	0.90
ADCMP343	2	Yes	0.275	1.7 to 5.5	6.5	0 to $V_{cc}$	10.0	Adj	Open-drain	8-lead SOT-23	0.90
ADCMP350	1	Yes	3.5	2.25 to 5.5	10.0	0 to 22	5.0	Internal	Open-drain/active low	4-lead SC70	0.31
ADCMP354	1	Yes	3.5	2.25 to 5.5	10.0	0 to 22	5.0	Internal	Open-drain/active high	4-lead SC70	0.31
ADCMP356	1	Yes	3.5	2.25 to 5.5	10.0	0 to 22	5.0	Internal	Push-pull/active high	4-lead SC70	0.31
ADCMP361	1	Yes	0.275	1.7 to 5.5	6.5	0 to $V_{cc}$	10.0	Internal	Open-drain	5-lead SOT-23	0.60
ADCMP370	1	No	—	2.25 to 5.5	4.0	0 to 22	5.0	Internal	Open-drain	5-lead SC70	0.28
ADCMP371	1	No	—	2.25 to 5.5	4.0	0 to 22	5.0	Internal	Push-pull	5-lead SC70	0.28
ADCMP670	2	Yes	1.50	1.7 to 5.5	5.7	0 to $V_{cc}$	10.0	Internal	Open-drain	6-lead TSOT	1.40
ADCMP671	2	Yes	1.50	1.7 to 5.5	5.7	0 to $V_{cc}$	10.0	Internal	Open-drain: PG/OV	6-lead TSOT	1.49
CMPO4	4	No	—	5	800.0	0 to $V_{cc} - 1.5$	1.3	—	Open-collector	14-lead SOIC	4.75
ADM1184	4	Yes	0.8	2.7 to 5.5	80	0 to $V_{cc}$	30.0	Fixed	Open-drain	10-lead MSOP	1.79
ADM2914	8	Yes	1.5	2.3 to shunt	62	0 to $V_{cc}$	125	Internal	Open-drain	16-lead QSOP	2.49
ADM12914	8	Yes	0.8	2.3 to shunt	62	0 to $V_{cc}$	125	Internal	Open-drain	16-lead QSOP	2.79
ADCMP391 <i>New</i>	1	No	—	2.3 to 5.5	18.5	-0.2 to $V_{cc} + 0.2$	5	Internal	Open-drain	8-lead SOIC-N	0.25
ADCMP392 <i>New</i>	2	No	—	2.3 to 5.5	20.7	-0.2 to $V_{cc} + 0.2$	5	Internal	Open-drain	8-lead SOIC-N	0.34
ADCMP393 <i>New</i>	4	Yes	—	2.3 to 5.5	26.6	-0.2 to $V_{cc} + 0.2$	5	Internal	Open-drain	14-lead SOIC	0.49
ADCMP394 <i>New</i>	1	Yes	0.8	2.3 to 5.5	35	-0.2 to $V_{cc} + 0.2$	5	Internal	Open-drain	8-lead SOIC-N	0.37
ADCMP395 <i>New</i>	2	Yes	0.8	2.3 to 5.5	38	-0.2 to $V_{cc} + 0.2$	5	Internal	Open-drain	10-lead MSOP	0.64
ADCMP396 <i>New</i>	4	Yes	0.8	2.3 to 5.5	41.32	-0.2 to $V_{cc} + 0.2$	5	Internal	Open-drain	16-lead SOIC	0.98
ADCMP380 <i>New</i>	1	Yes	1.6	2 to 5.5	0.092	0 to 5.5	23	Internal	Open-drain	1.46 mm $\times$ 0.96 mm	0.45

<sup>1</sup> 1000 to 4999

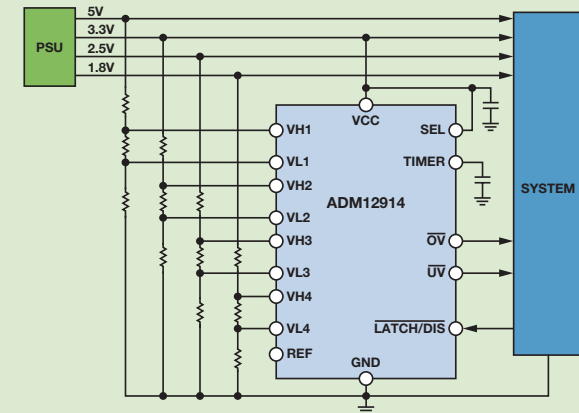
## Li-Ion Battery Monitoring



## Window Comparator



## Quad UV/OV Positive/Negative Monitor



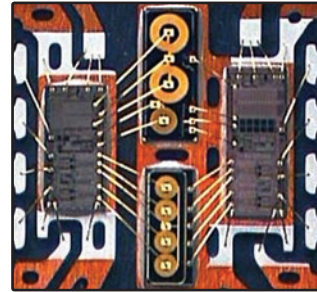


## Isolated Power

Integrating power supply isolation with data signal isolation has, until recently, been a challenge because of the difficulty of transmitting power from the nonisolated system side to the isolated field side. In the past, transferring power across an isolation barrier required a lot of area, with an expensive module or a complex discrete solution.

Analog Devices has addressed this issue by introducing *isoPower*<sup>®</sup>—an extension of the award winning *iCoupler*<sup>®</sup> technology. *isoPower* is a complete and fully integrated isolation solution for power transfer across an isolation barrier using microtransformers. The *iCoupler* technology enables both signal and power to be integrated into a single, tiny surface-mount package with isolation up to 5 kV.

Isolated switching regulators—another extension of *iCoupler* technology—provide higher efficiency, power, and board savings over discrete solutions through integration. Features include: secondary side sensing, integrated and isolated feedback, isolated dc-to-dc conversion with up to 80% efficiency, and regulated output voltages between 3.3 V to 30 V.



### Digital Isolators with *isoPower* Integrated, Isolated Power

Part Number	Number of Data Channels					Max Data Rate (Mbps)	Max Output Power (mW)	Max Temperature (°C)	Package
	Total	Reverse Direction Options							
		0	1	2	3				
<b>2.5 kV rms Isolation</b>									
ADuM5000*	0						500 @ 5 V	105	16-lead SOIC_W
ADuM5010	0						150 @ 5 V	105	20-lead SSOP
ADuM520x	2	•	•	•		1, 25	500 @ 5 V	105	16-lead SOIC_W
ADuM521x	2	•	•	•		1, 25, 100	150 @ 5 V	105	20-lead SSOP
ADuM524x	2	•	•	•		1	50 @ 5 V	105	8-lead SOIC_N
ADuM540x*	4	•	•	•	•	1, 25	500 @ 5 V	105	16-lead SOIC_W
<b>3.75 kV rms Isolation</b>									
ADuM6010	0						150 @ 5 V	105	20-lead SSOP
ADuM621x	2	•	•	•		1, 25, 100	150 @ 5 V	105	20-lead SSOP
<b>5 kV rms Isolation</b>									
ADuM6000	0						400 @ 5 V	105	16-lead SOIC_W/16-lead SOIC_IC
ADuM620x	2	•	•	•		1, 25	400 @ 5 V	105	16-lead SOIC_W/16-lead SOIC_IC
ADuM640x	4	•	•	•	•	1, 25	400 @ 5 V	105	16-lead SOIC_W/16-lead SOIC_IC

\*Automotive qualified models available. Please visit product pages for more information.

### Isolated Switching Regulators

Part Number	Number of Data Channels					Max Data Rate (Mbps)	Max Output Power (mW)		Max Temperature (°C)	Package
	Total	Reverse Direction Options					Current (mA)	Range (V)		
		0	1	2	3					
<b>2.5 kV rms Isolation</b>										
ADuM3070	0						500	3.3 to 24	105	16-lead QSOP
ADuM347x*	4	•	•	•	•	1, 25	400	3.3 to 24	105	20-lead SSOP
<b>5 kV rms Isolation</b>										
ADuM4070	0						500	3.3 to 24	105	16-lead SOIC_IC
ADuM447x	4	•	•	•	•	1, 25	500	3.3 to 24	105	20-lead SOIC_IC

\*Automotive qualified models available. Please visit product pages for more information.

# Display/Illumination Lighting

## High Performance LED Driver Solutions

ADI's wide portfolio of high efficiency and flexible driver ICs targets general illumination and backlighting applications. The portfolio is comprised of buck, boost, charge pump, and sink type LED driver solutions to meet the requirements of almost any input power source. The drivers include special features to ensure a robust and safe design and also have dimming and other control features that maximize the performance of the end application.

### Step-Up (Boost) LED Drivers

Part Number	V <sub>in</sub> (V)	V <sub>out</sub> Max (V)	Number of Strings	Max LEDs Per String	Max Current Per String (mA)	Boost Type	Switching Frequency (MHz)	I <sup>2</sup> C Support	Package	Price @ 1k (\$U.S.)
ADP5501	2.7 to 5.5	24	1	6	30	Inductive	Variable	Yes	24-lead LFCSP	1.20
ADP5520	2.7 to 5.5	24	1	6	30	Inductive	Variable	Yes	24-lead LFCSP	1.66
ADD5201	6 to 21	45	8	12	30 (240 total)	Inductive	1	Yes	28-lead LFCSP	1.40
ADD5203	6 to 21	45	8	12	30 (240 total)	Inductive	1	Yes	28-lead LFCSP	1.40
ADD5205	2.8 to 18	28	4	6	25 (100 total)	Inductive	1	No	12-lead LFCSP	1.15
ADD5207	6 to 21	36	4	10	25 (100 total)	Inductive	1	No	14-lead LFCSP	1.32
ADD5211	3.5 to 40	80	4	22	200 (800 total)	Inductive	0.2 to 1.2	No	24-lead LFCSP	1.40

### Step-Down (Buck) LED Drivers

Part Number	V <sub>in</sub> (V)	Number of Strings	Max LEDs Per String	Max Current Per String (mA)	Switching Frequency (MHz)	Package	Price @ 1k (\$U.S.)
ADP2384	4.5 to 20	1	5	4000	0.2 to 1.4	24-lead LFCSP	1.74
ADP2386	4.5 to 20	1	5	6000	0.2 to 1.4	24-lead LFCSP	2.04
ADP2441	4.5 to 36	1	10	1000	0.2 to 1	12-lead LFCSP	1.78

### Current Sink LED Drivers

Part Number	V <sub>in</sub> (V)	Number of Strings	Max LEDs Per String	Max Current Per String	Package	Price @ 1k (\$U.S.)
ADP8140	Up to 100	4	28	500 mA (2 A total)	16-lead LFCSP	1.50

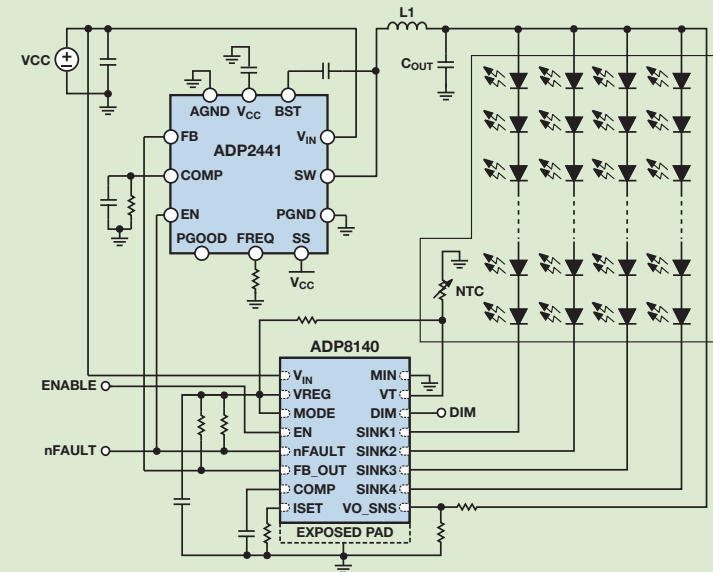
### Inductorless (Charge Pump) LED Drivers

Part Number	V <sub>in</sub> (V)	V <sub>out</sub> Max (V)	Number of Strings	LEDs Per String	Max Current Per String (mA)	Boost Type	I <sup>2</sup> C Support	Package	Price @ 1k (\$U.S.)
ADP8860	2.5 to 5.5	5.5	7	1	30	Charge pump	Yes	20-ball WLCSP, 20-lead LFCSP	1.36
ADP8861	2.5 to 5.5	5.5	7	1	30	Charge pump	Yes	20-ball WLCSP, 20-lead LFCSP	1.22
ADP8863	2.5 to 5.5	5.5	7	1	30	Charge pump	Yes	20-ball WLCSP, 20-lead LFCSP	1.22
ADP8866	2.5 to 5.5	5.5	9	1	25	Charge pump	Yes	20-lead LFCSP	1.48
ADP8870	2.5 to 5.5	5.5	7	1	30	Charge pump	Yes	20-ball WLCSP, 20-lead LFCSP	1.48
ADM8843	2.6 to 5.5	5.5	4	1	20	Charge pump	No	16-lead LFCSP	0.50
ADM8845	2.6 to 5.5	5.5	6	1	30	Charge pump	No	16-lead LFCSP	0.71

## New Product Focus: ADP8140

### 4-Channel, High Current LED Driver with Adaptable Power Control

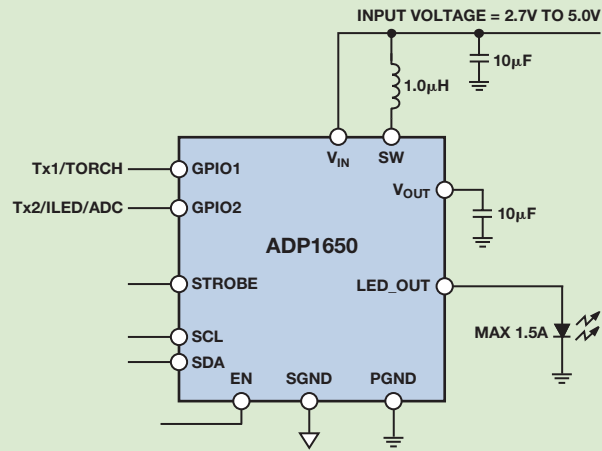
- DC dimming for noiseless operation
- 4 internal 500 mA current sinks
- 2% matching between LED channels
- Supports dc input systems up to 100 V
- Full array of safety features for robust designs
- Available in a 4 mm × 4 mm LFCSP package



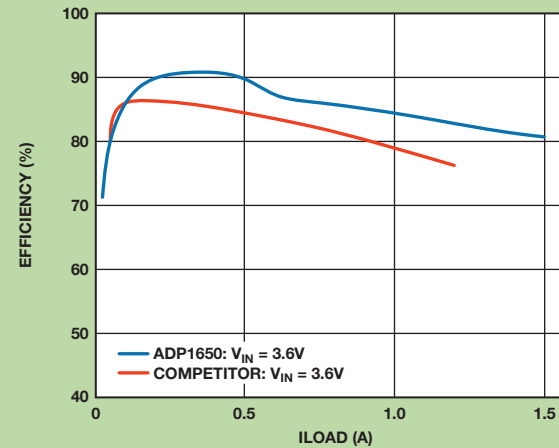
## Flash LED Drivers

ADI offers a wide portfolio of flash LED drivers that fit the requirements of almost any mobile phone application. A variety of flash currents and LED configurations are supported. The drivers enhance photo quality by maximizing LED brightness and by including programmable operating modes that mitigate flash related photo degradation. PCB area is minimized through the use of small WLCSP packages and minimal external component count.

### Cost-Effective High Performance Flash LED Driver



### Industry Best Efficiency



Efficiency vs. load current (high  $V_F$ ).

### HPWLED Flash Drivers

Part Number	$V_{IN}$ (V)	Max $V_{OUT}$ (V)	WLED Configuration	WLED Current	Torch Mode	LED Control	Boost Type	WLED Brightness Control	Switching Frequency (MHz)	Package	Price @ 1k (\$U.S.)
ADP1649	2.7 to 5.0	5	1	1000	Yes	Source	Inductive	I <sup>2</sup> C programmable	3	12-ball WLCSP	0.85
ADP1650	2.7 to 5.0	5	1	1500	Yes	Source	Inductive	I <sup>2</sup> C programmable	3	12-ball WLCSP, 10-lead LFCSP	1.00
ADP1653	2.75 to 5.5	12	2 in series	500	Yes	Sink	Inductive	I <sup>2</sup> C programmable	1.2	16-lead LFCSP	1.45
ADP1655	2.5 to 5.5	10	2 in series	400	Yes	Source	Inductive	I <sup>2</sup> C programmable	2	12-ball WLCSP	0.95
ADP1660	2.7 to 5.0	5	2 in parallel	1500	Yes	Source	Inductive	I <sup>2</sup> C programmable	3	12-ball WLCSP	1.00

# Battery Chargers

**ADP506x** is a new series of battery chargers compatible with USB 3.0 and USB 1.2 battery charging specifications. The ADP506x series features power path control with integrated battery isolation FET between the battery and system load, enabling a system to be booted up instantly even if the battery is overdepleted or dead. An I<sup>2</sup>C interface and three fuse selected GPIOs\* maximize design flexibility and programmability. The ADP506x series is designed for use with an NTC thermistor in the battery pack to monitor temperature. Compatible with the JEITA battery charging specification, the ADP506x series automatically changes charging current or charging termination voltage dependent on different battery temperature range.

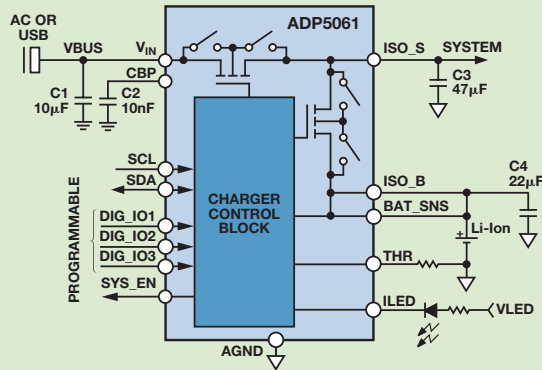
**ADP5063** was recently released for emerging LiFePO<sub>4</sub> (lithium iron phosphate) batteries where the termination charging voltage is lower than other Li-Ion batteries with 3.6 V as a typical value. ADP5063 has a default termination charging voltage at 3.6 V to comply with LiFePO<sub>4</sub> battery charging.

**ADP5090** is a new ultralow power boost charger targeted at emerging photovoltaic/solar harvesters and thermoelectric generators. It comes with 320 nA quiescent current to generate best efficiency under ultralow input power conditions. Integrated charge control allows maximized design flexibility for different energy storage like supercapacitors or Li-Ion batteries.

\*GPIO is a factory programmable general-purpose input/output.

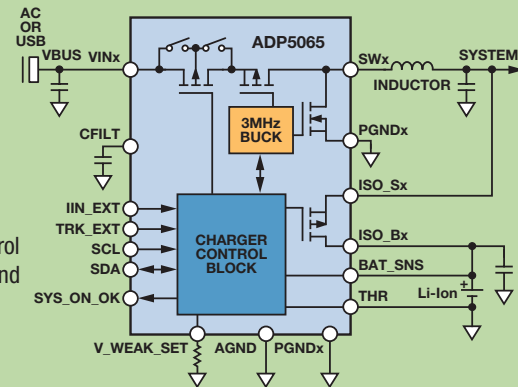
## Cost-Effective Linear Mode Charger

- USB battery charging spec compliance
- Up to 1.3 A charge current
- Integrated power path control
- Flexible programmability with I<sup>2</sup>C interface and three fuse programmable digital GPIOs
- Ideal for limited PCB space and cost sensitive charging applications



## Fast and High Efficiency Linear Mode Charger

- 3 MHz switching buck regulator
- USB battery charging spec compliance
- Up to 680 mA charge current from 500 mA USB Host
- Integrated power path control
- Flexible programmability with I<sup>2</sup>C interface and two hardware control inputs to set input current limit and enable/disable trickle charging
- Ideal for shortening full charging time and cooler



Part Number	Switching/ Linear	Number of Cells Charged	Cell Type	Max Charge Current (A)	V <sub>in</sub> Protection (V)	V <sub>in</sub> Operating Range (V)	Final Voltage Options (V)	Accuracy Over Temperature (%)	Power Path Control		Comply with JEITA Battery Charging	I <sup>2</sup> C Interface	Package	Price <sup>1</sup> (\$U.S.)
									Support	SYS-BAT FET On Resistance				
ADP5065	Switching	1	Li-Ion	1.25	Up to 20	4.0 to 5.5	3.5 to 4.4 (20 mV per step)	1	Yes	75 mΩ	Yes	Yes	2.7 mm × 2.1 mm, 20-ball WLCSP	1.60
ADP5061	Linear	1	Li-Ion	1.3	Up to 20	4.0 to 7.0	3.8 to 4.5 (20 mV per step)	1	Yes	32 mΩ	Yes	Yes	2.6 mm × 2.0 mm, 20-ball WLCSP	1.50
ADP5062	Linear	1	Li-Ion	1.3	Up to 20	4.0 to 7.0	3.6 to 4.5 (20 mV per step)	1	Yes	54 mΩ	Yes	Yes	4.0 mm × 4.0 mm, 20-lead LFCSP	1.50
ADP5063 <b>New</b>	Linear	1	LiFePO <sub>4</sub>	1.3	Up to 20	4.0 to 7.0	3.6	1	Yes	54 mΩ	Yes	Yes	4.0 mm × 4.0 mm, 20-lead LFCSP	1.50
ADP5090 <b>New</b>	Switching (boost/step-up)	1	Li-Ion super cap	50 mA	Up to 3.6	80 mV to 3.3	2.0 to 5.5 (adjustable)	3	Yes	1 Ω	No	No	3.0 mm × 3.0 mm, 16-lead LFCSP	1.99
ADP2291	Linear	1	Li-Ion	1.5	Up to 13.5	4.5 to 12	4.2	1	No	—	No	No	8-lead LFCSP, 8-lead MSOP	1.12

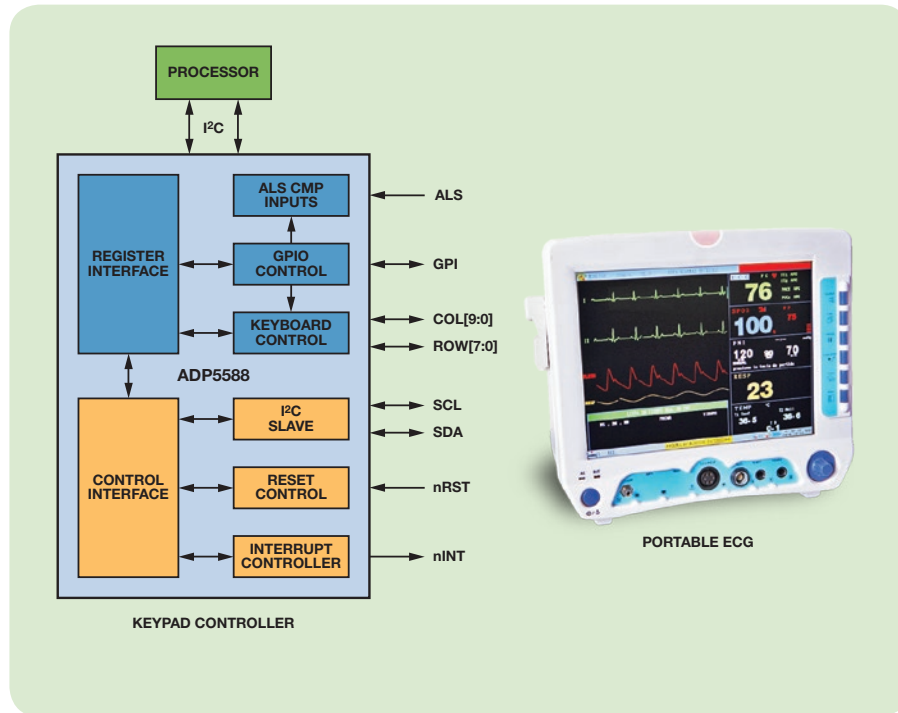
<sup>1</sup> 1000 to 4999

# Keypad I/O Expanders

ADI's family of keypad controllers reduces the power consumption in devices while simplifying the design and PCB routing of keypad systems.

## Benefits

- Reduced power consumption during idle state
- Simplified PCB layout
- Reduced EMI in system
- Decreased GPIO requirements in main PCB
- LFCSP packages for flex PCB mounting

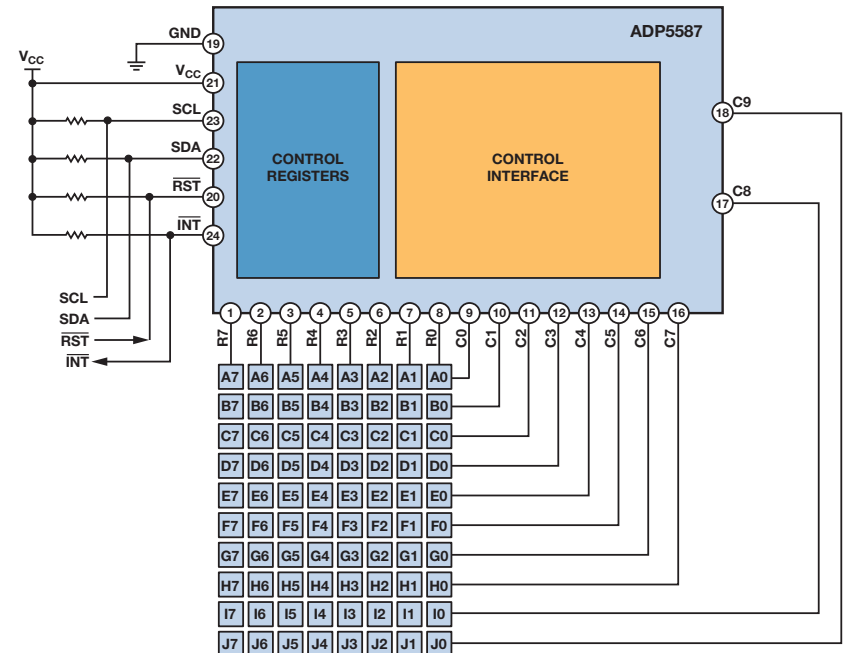


## ADI Keypad Controllers vs. Processor-Based Keypad Controllers

ADI Keypad Controllers	Processor-Based Keypad Controllers
Typical polling current—55 $\mu$ A	Typical pulling current—60 mA
Only draws current during key press	Constant high current drain
Simple board to board interface	Complex board to board interface

## I/O Expanders and QWERTY Keypad Controllers

Part Number	V <sub>in</sub> (V)	Number of I/Os	Number of Keys	Support for QWERTY	Other Functions	Package	Price @ 1k (\$U.S.)
ADP5585	1.8 to 3	16	30	No	10 mA sinks, PWM generator, logic functions	16-ball WLCSP	0.75
ADP5586	1.8 to 3	16	30	No	10 mA sinks, 2 PWM generators, logic functions	16-ball WLCSP	0.75
ADP5587	1.8 to 3	18	80	Yes	I <sup>2</sup> C interface and register programmable GPIOs, keypad lock, reset, interrupt	24-lead LFCSP, 25-ball WLCSP	1.15
ADP5588	1.8 to 3	16	80	Yes	I <sup>2</sup> C interface and register programmable GPIOs, ALS, reset, interrupt	24-lead LFCSP	1.20
ADP5589	2.5 to 5.5	19	96	Yes	I <sup>2</sup> C interface and register programmable GPIOs, ALS, reset, interrupt	24-lead LFCSP, 25-ball WLCSP	1.20



# DSP Companion Guide

## Companion Power Selection Guide: Blackfin Processors

ADI power management products provide optimized power for Blackfin®, SHARC®, and microcontroller products—whether it's a single processor or multiple processors, in handheld or high power applications, ADI has a solution to meet your needs.

### How to Use This Guide

Determine the peak current requirement for each rail of your processor by referring to the relevant data sheets and engineer-to-engineer notes. The ADIsimPower design tool offers a complete set of features to create a complete BOM for all of these solutions. Visit [www.analog.com/ADIsimPower](http://www.analog.com/ADIsimPower).



Part Number	I <sub>bur</sub> Max (mA) <sup>1</sup>	V <sub>out</sub> (V)	Linear Regulators					Switching Regulators					Micro-PMUs					SC
			V <sub>in</sub> (V) <sup>2</sup>					I <sub>bur</sub> Max (mA)					V <sub>out</sub> (V)					
ADP121	150	1.2 to 3.3	2.5 to 5.5					2.5 to 5.5										
ADP123	300	0.8 to 5.0	2.3 to 5.5					2.3 to 5.5										
ADP125	500	0.8 to 5.0	2.3 to 5.5					2.3 to 5.5										
ADP151	200	1.2 to 3.3	2.2 to 5.5					2.2 to 5.5										
ADP160	150	1.2 to 4.2	2.2 to 5.5					2.2 to 5.5										
ADP170	300	0.8 to 3.0	1.6 to 3.6					1.6 to 3.6										
ADP220, 2 LDOs	2 outputs: 200, 200	0.8 to 2.8	2.5 to 5.5					2.5 to 5.5										
ADP1706	1000	0.75 to 3.3, soft start	2.5 to 5.5					2.5 to 5.5										
ADP1707	1000	0.75 to 3.3, with tracking	2.5 to 5.5					2.5 to 5.5										
ADP1715	500	0.8 to 5.0	2.5 to 5.5					2.5 to 5.5										
ADP1720	50	1.225 to 5.0	4.0 to 28					4.0 to 28										
ADP1740, ADP1741	2000	0.75 to 3.0	1.6 to 3.6					1.6 to 3.6										
ADP1752, ADP1753	800	0.75 to 2.5	1.6 to 3.6					1.6 to 3.6										
ADP1754, ADP1755	1200	0.75 to 2.5	1.6 to 3.6					1.6 to 3.6										
ADP2102	600	0.8 to 1.785	2.7 to 5.5					2.7 to 5.5										
ADP2106	1500	1.2 to 3.3	2.7 to 5.5					2.7 to 5.5										
ADP2107	2000	1.2 to 3.3	2.7 to 5.5					2.7 to 5.5										
ADP2108	600	1.0 to 3.3	2.3 to 5.5					2.3 to 5.5										
ADP2114	4000	0.8 to 3.3	2.7 to 5.5					2.7 to 5.5										
ADP2118	3000	0.8 to 3.3	2.7 to 5.5					2.7 to 5.5										
ADP2138	800	1.0 to 3.3	2.3 to 5.5					2.3 to 5.5										
ADP2140, 1 buck, 1 LDO	2 outputs: 600, 300	1.0 to 3.3	2.3 to 5.5					2.3 to 5.5										
ADP2504	1000	2.8 to 5.0	2.3 to 5.5					2.3 to 5.5										
ADP2370	800	0.8 to 5.0	3.2 to 15					3.2 to 15										
ADP5023, 2 bucks, 1 LDO	SW: 800, 800; LDO: 300	0.8 to 3.8	Buck: 2.3 to 5.5; LDO: 1.7 to 5.5					Buck: 2.3 to 5.5; LDO: 1.7 to 5.5										
ADP5024, 2 bucks, 1 LDO	SW: 1.2 A, 1.2 A; LDO: 300	0.8 to 3.8	Buck: 2.3 to 5.5; LDO: 1.7 to 5.5					Buck: 2.3 to 5.5; LDO: 1.7 to 5.5										
ADP5134, 2 bucks, 2 LDOs	SW: 1.2 A, 1.2 A; LDO: 300, 300	0.8 to 3.8	Buck: 2.3 to 5.5; LDO: 1.7 to 5.5					Buck: 2.3 to 5.5; LDO: 1.7 to 5.5										
ADP5037, 2 bucks, 2 LDOs	SW: 800, 800; LDO: 300, 300	0.8 to 3.8	Buck: 2.3 to 5.5; LDO: 1.7 to 5.5					Buck: 2.3 to 5.5; LDO: 1.7 to 5.5										
ADP5040, 1 buck, 2 LDOs	SW: 1.2 A; LDO: 300, 300	0.8 to 3.8	Buck: 2.3 to 5.5; LDO: 1.7 to 5.5					Buck: 2.3 to 5.5; LDO: 1.7 to 5.5										
ADP5135, 3 bucks	SW: 1.8 A	0.8 to 3.8	Buck: 3.0 to 5.5					Buck: 3.0 to 5.5										
ADP5041, 1 buck, 2 LDOs	SW: 1.2 A; LDO: 300, 300	0.8 to 3.8	Buck: 2.3 to 5.5; LDO: 1.7 to 5.5					Buck: 2.3 to 5.5; LDO: 1.7 to 5.5										
ADP1829	30 A	0.6 to 15.3	3.0 to 18					3.0 to 18										
ADP1864	8 A	0.8 to 14	3.15 to 14					3.15 to 14										

		Blackfin Processors	Speed (MHz)	Min Voltage (V)	Max Voltage (V)	Max IDD <sub>INT</sub> (mA)																	
VDD <sub>INT</sub> Domain	ADSP-BF50x	All	1.1	1.47	175																		
	ADSP-BF51x	All	1.1	1.47	225																		
	ADSP-BF522/ADSP-BF524/ADSP-BF526	All	1.235	1.47	250																		
	ADSP-BF523/ADSP-BF525/ADSP-BF527	All	0.95	1.26	500																		
	ADSP-BF531/ADSP-BF532/ADSP-BF533	400	0.8	1.32	350																		
	ADSP-BF533	500, 533, 600	0.8	1.45	900																		
	ADSP-BF534/ADSP-BF536	300, 400	0.8	1.32	400																		
	ADSP-BF534/ADSP-BF536/ADSP-BF537	500, 533, 600	0.8	1.43	900																		
	ADSP-BF538/ADSP-BF539	400, 533	0.8	1.375	850																		
	ADSP-BF54x	400	0.9	1.43	750																		
	ADSP-BF54x	533, 600	0.9	1.43	1350																		
ADSP-BF561	All	0.8	1.42	1600																			
ADSP-BF592	All	1.1	1.47	150																			
ADSP-BF60x	All	1.1875	1.3125	1000																			
Other Domains		Min Voltage (V)	Nom Voltages (V)	Max Voltage (V)	Max Current (mA)																		
	VDDEXT		1.8, 2.5, 3.3		N/A																		
	VDDMEM		1.8, 2.5, 3.3		N/A																		
	VDDDDR		2.6		N/A																		
	VDD_DMC		1.8		N/A																		
	VDDUSB		3.3		30																		
	VDDOTP		2.5		25																		
Reset/Watchdog Support																							

<sup>1</sup> In micro-PMUs the larger current value refers to bucks while the lower number refers to LDOs.  
<sup>2</sup> In the micro-PMU case the two voltage ranges refer to the bucks and LDOs respectively.  
<sup>3</sup> Not all the speed versions supported.  
<sup>4</sup> Assumes low power DDR2 memories.



## Online Tools and Resources

In addition to providing world-class products and technical support, ADI takes great pride in offering design engineers the very best in online design tools. These tools have been specifically designed to provide power designers and nonpower designers alike the tools needed to design, optimize, and implement the very best power circuits available.

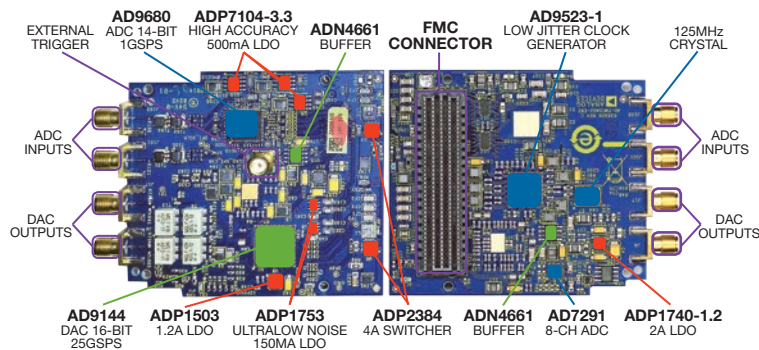
Tools like the recently released ADIsimPower tool provide users with an easy four-step process using an intuitive graphical user interface via your Web browser. This particular tool allows the designer to preselect their key goals, whether they be cost, size, or performance, and optimizes the solution to meet those goals. Additional tools are available online (as Excel-based downloadable versions) that make product selection and design a snap. ADI puts the power back in your hands.

### Available Online Tools

- ADIsimPE: linear and mixed-signal circuit simulator
- ADIsimPower: part selection and design tool
- Parametric search tools for linear regulators, supervisors, and others
- Design and control tools for hot swap, digital power, and sequencers

### Other Power Brochures Available:

- High Performance LDOs
- Hot Swap and Power Monitoring
- Integrated Power Management Solutions
- Integrated Power Solutions for Xilinx FPGAs
- Integrated Power Solutions for Altera FPGAs
- Voltage Monitoring and Sequencing
- Digital Isolator Product Selection and Resource Guide



Proven reference design.

I<sup>2</sup>C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

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### EngineerZone Online Support Community

- Find answers to your power management questions. Join our power management community at [ez.analog.com](http://ez.analog.com).



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