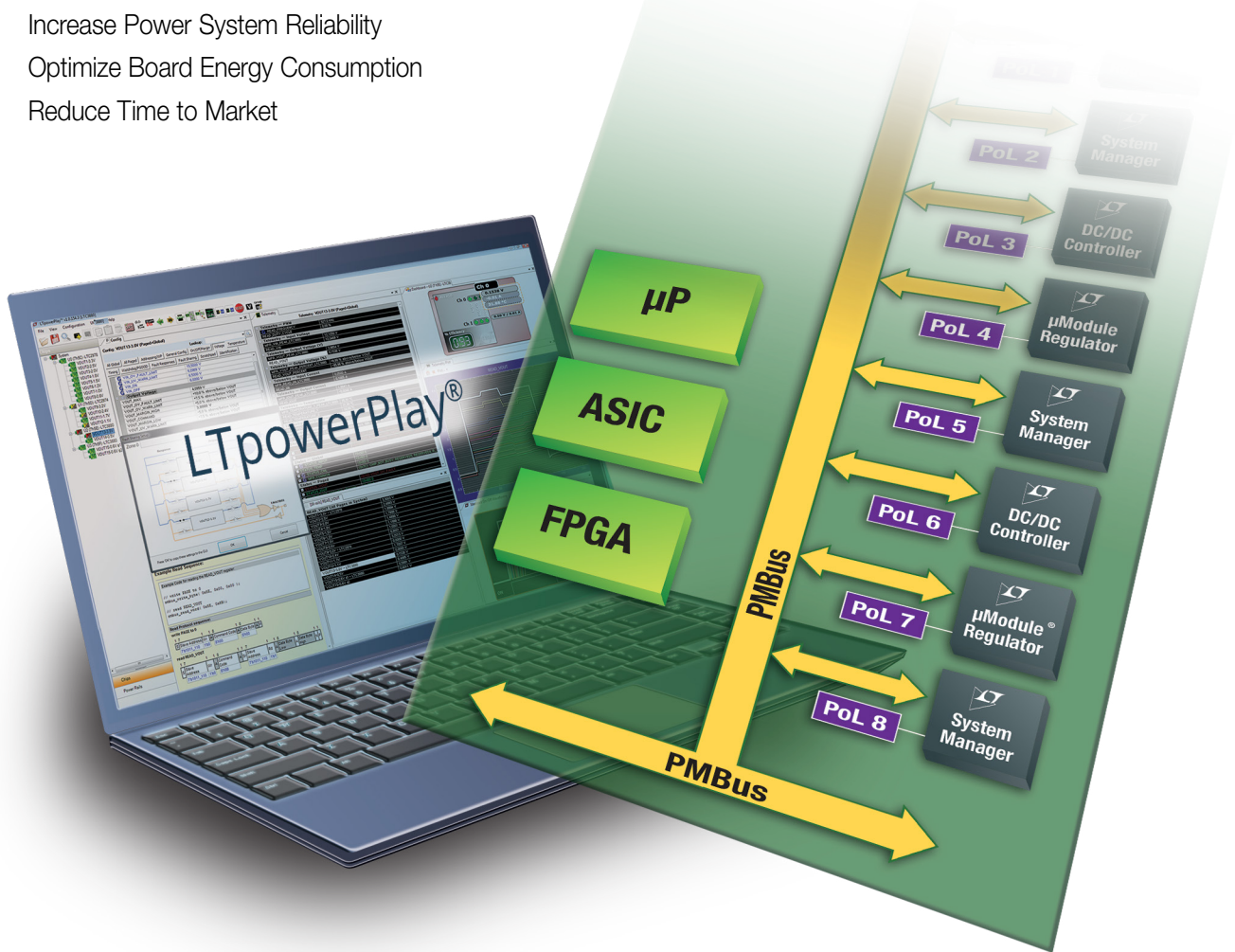


# DIGITAL POWER SYSTEM MANAGEMENT

*µModule Regulators • DC/DC ICs • Manager ICs • Sequencers • Supervisors*

- ✓ Digitally Manage Point-of-Load (POL) Power Supplies
  - Trim, Margin, Sequence, Supervise, Log Faults
  - Monitor Voltage, Current, Power, Energy, and Temperature
- ✓ Increase Power System Reliability
- ✓ Optimize Board Energy Consumption
- ✓ Reduce Time to Market



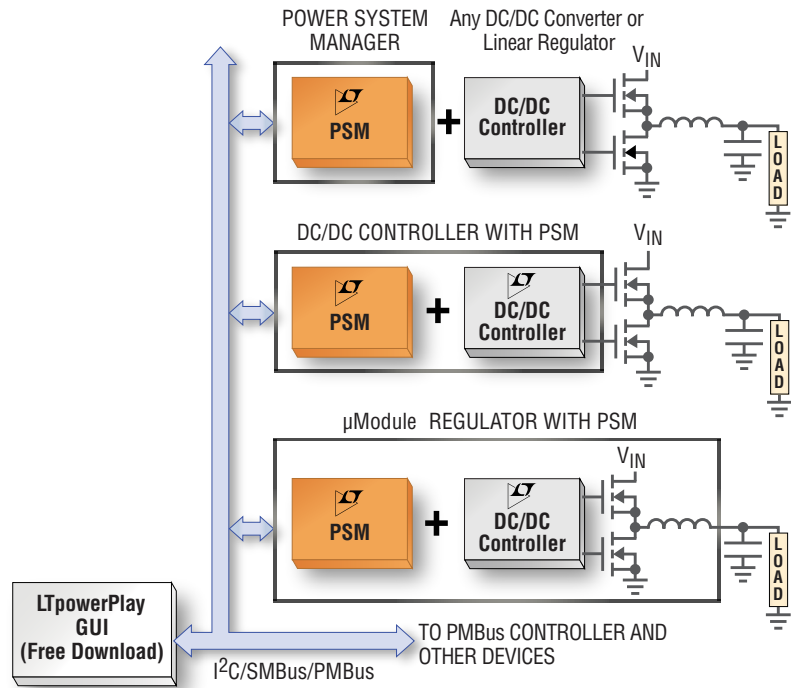
## Take Control of Your Power Supplies

Accelerate characterization and optimization during prototyping and field operation with Analog Devices' digital power system management (PSM) products, configured and monitored via a PMBus/SMBus/I<sup>2</sup>C digital interface.

# Digital Power System Management

## Benefits

- ±0.25% Voltage Accuracy
- Products
  - Power System Managers
  - DC/DC Controllers with PSM
  - Fully Integrated  $\mu$ Module<sup>®</sup> Regulators
- LTpowerPlay<sup>®</sup> GUI: Engineering-Level Development Environment
- PMBus Compliant Commands Over I<sup>2</sup>C/SMBus Digital Interface
- EEPROM for Configuration and Black Box Fault Logging
- Autonomous Operation – No Software Coding Required
- Coordinate Sequencing and Fault Management Across PSM Devices
- Reduced BOM Cost and Validation Effort



## $\mu$ Module Regulators, DC/DC Controllers and Monolithic Regulators with Power System Management

- Fast Analog Feedback Loop with Digital Telemetry and Control
- Program  $V_{OUT}$ ,  $I_{LIM}$ , OV/UV Level, Frequency, Ramp Rate, Sequencing Time Delays, Margining
- Read Back  $V_{IN}$ ,  $I_{IN}$ ,  $V_{OUT}$ ,  $I_{OUT}$ ,  $P_{OUT}$ , Duty Cycle, Temperature, Faults

### PSM Switcher Selection Guide

Features	$\mu$ Module Regulators			LTC <sup>®</sup> 3880	LTC3880-1	LTC3882
	LTM <sup>®</sup> 4676	LTM4676A	LTM4675			
PSM	Full	Full	Full	Full	Full	Full
Number of Outputs	2	2	2	2	2	2
PWM Control Mode	Current	Current	Current	Current	Current	Voltage
Start-Up Time (Typ)	153 (170 Max)	60 (70 Max)	60 (70 Max)	145	145	70
Input Current Sense	Calibrated	Calibrated	Calibrated	Inferred	Inferred	No
$V_{OUT}$ Range (V)	0.5 to 4.0, ch0 0.5 to 5.4, ch1	0.5 to 5.5	0.5 to 5.5	0.5 to 4.0, ch0 0.5 to 5.4, ch1	0.5 to 4.0, ch0 0.5 to 5.4, ch1	0.5 to 5.3
$V_{IN}$ Range (V)	4.5 to 26.5	4.5 to 17	4.5 to 17	4.5 to 24	4.5 to 24	3.0 to 38
$V_{OUT}$ Accuracy (%)	1	0.5	0.5	0.5	0.5	0.5
$I_{OUT}$ (A) Max	Dual 13 or Single 26	Dual 13 or Single 26	Dual 9 or Single 18	30/Phase*	30/Phase*	40A/Phase*
Temperature Sensing	$\Delta V_{BE}$	$\Delta V_{BE}$	$\Delta V_{BE}$	$\Delta V_{BE}$	$\Delta V_{BE}$	$\Delta V_{BE}$ and Direct
DCR Sensing	NA	NA	NA	Low	Low	Ultralow
Dedicated PGOOD Pins	No	No	No	No	No	No
Gate Drivers	NA	NA	NA	Yes	Yes	No
Three-State PWM Control	NA	NA	NA	No	No	Yes
Digitally Adjustable Loop Compensation	No	No	No	No	No	No
On-Chip LDO from $V_{IN}$	Yes	Yes	Yes	Yes	No	No
Fast ADC Mode	No	Yes	Yes	No	No	No
Corresponding Slaves	NA	NA	NA	LTC3870	LTC3870	NA
Package (mm x mm)	16 x 16 x 5.01 BGA	16 x 16 x 5.01 BGA	11.9 x 16 x 3.51 BGA	6 x 6 QFN-40	6 x 6 QFN-40	6 x 6 QFN-40

\* Depends on choice of external components

## Power System Managers

- Manage Any Adjustable Point-of-Load Power Supply
- Trim, Margin, Sequence, Supervise, Manage Faults, Monitor Telemetry, Record Fault Logs
- Read Back Voltage, Current, Power, Energy, Temperature, and Faults

Device	Voltage Supply Channels Managed <sup>1</sup>	Number of Current Sensed Loads	Input Energy	Temp Sense		Digital Interface			EEPROM	Includes Res/Cap	Trim/Margin/Monitor Accuracy	Sequencing			Bias Supply			Package (mm × mm)	Demo Board
				Internal	External	PMBus	SMBus	I <sup>2</sup> C				Time	Cascade	Tracking	3.3V	5V	12V		
LTC2970 <sup>2</sup>	2	2		•			•	•			±0.50%				•	•	4 x 5 QFN-24	DC980	
LTC2972	2	3	•	•	2	•	•	•	•		±0.25%	•	•	•	•	•	6 x 7 QFN-44	DC2619	
LTC2974	4	4		•	4	•	•	•	•		±0.25%	•	•	•	•	•	9 x 9 QFN-64	DC1978	
LTC2975	4	5	•	•	4	•	•	•	•		±0.25%	•	•	•	•	•	9 x 9 QFN-64	DC2022	
LTC2977	8			•		•	•	•	•		±0.25%	•		•	•	•	9 x 9 QFN-64	DC2028	
LTC2979	16			•		•	•	•	•		±0.50%	•		•			12 x 12 BGA		
LTC2980	16			•		•	•	•	•		±0.25%	•		•	•	•	12 x 12 BGA	DC2198	
LTM2987	16			•		•	•	•	•	•	±0.25%	•		•	•	•	15 x 15 BGA	DC2023	

<sup>1</sup> A channel refers to the collection of functions that trims, supervises and monitors a given power supply rail.

<sup>2</sup> See LTC2970-1 for sequencing.

## Programmable 6-Channel Sequencer and Supervisors with EEPROM

Device	Sequencer/Supervisor	Comparator Outputs	Threshold Range	Threshold Accuracy	Power Supply	Package (mm × mm)	Demo Board
LTC2933	Supervisor	No	1 V to 13.9V (1×) 0.2V to 5.8V (5×)	±1%	3.4V to 13.9V	5×4 DFN-16, SSOP-16	DC1633
LTC2936	Supervisor	Yes	0.2V to 5.8V (6×)	±1%	3.13V to 13.9V	4×5 QFN-24, SSOP-24	DC1605
LTC2937	Both	No	0.2V to 6V (6×)	±0.75%	2.9V to 16.5V	5×6 QFN-28	DC2313

DC/DC Controllers								Monolithic Regulators
LTC3882-1	LTC3883	LTC3883-1	LTC3884	LTC3884-1	LTC3886	LTC3887	LTC3887-1	LTC3815
Full	Full	Full	Full	Full	Full	Full	Full	Partial
2	1	1	2	2	2	2	2	1
Voltage	Current	Current	Current	Current	Current	Current	Current	Current
70	145	145	65	65	65	70	70	<10
No	Yes	Yes	Yes	Yes	Yes	Inferred	Inferred	Yes
0.5 to 5.3	0.5 to 5.4	0.5 to 5.4	0.5 to 5.4	0.5 to 5.4	0.5 to 13.2	0.5 to 5.5	0.5 to 5.5	0.4 – 0.72 • V <sub>IN</sub>
3.0 to 38	4.5 to 24	4.5 to 24	4.5 to 38	4.5 to 38	4.5 to 60	4.5 to 24	4.5 to 24	2.2 to 5.5
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1
40A/Phase*	30/Phase*	30/Phase*	30/Phase*	30/Phase*	30/Phase*	30/Phase*	30/Phase*	6A
ΔV <sub>BE</sub> and Direct	ΔV <sub>BE</sub>	ΔV <sub>BE</sub>	ΔV <sub>BE</sub> and Direct	ΔV <sub>BE</sub> and Direct	ΔV <sub>BE</sub> and Direct	ΔV <sub>BE</sub>	ΔV <sub>BE</sub>	Internal
Ultralow	Low	Low	Very Low	Very Low	Low	Low	Low	NA
Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes
No	Yes	Yes	Yes	No	Yes	Yes	No	NA
Yes	No	No	No	Yes	No	No	Yes	NA
No	No	No	Yes	Yes	Yes	No	No	No
No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
No	No	No	Yes	Yes	Yes	Yes	Yes	NA
NA	LTC3870	LTC3870	LTC3874	LTC3874	LTC3870	LTC3870	LTC3870	NA
6 x 6 QFN-40	5 x 5 QFN-32	5 x 5 QFN-32	7 x 7 QFN-48	7 x 7 QFN-48	7 x 8 QFN-46	6 x 6 QFN-40	6 x 6 QFN-40	4 x 6 QFN-38

## Hardware Support

A DC1613 USB-to-I<sup>2</sup>C/SMBus/PMBus controller (adapter) is used to interface any PSM demo board to a computer. Every PSM device comes with at least one specific demo board. Some PSM demo boards can be cascaded together for evaluating multiple rails.

To USB Port of  
Computer Running  
LTpowerPlay

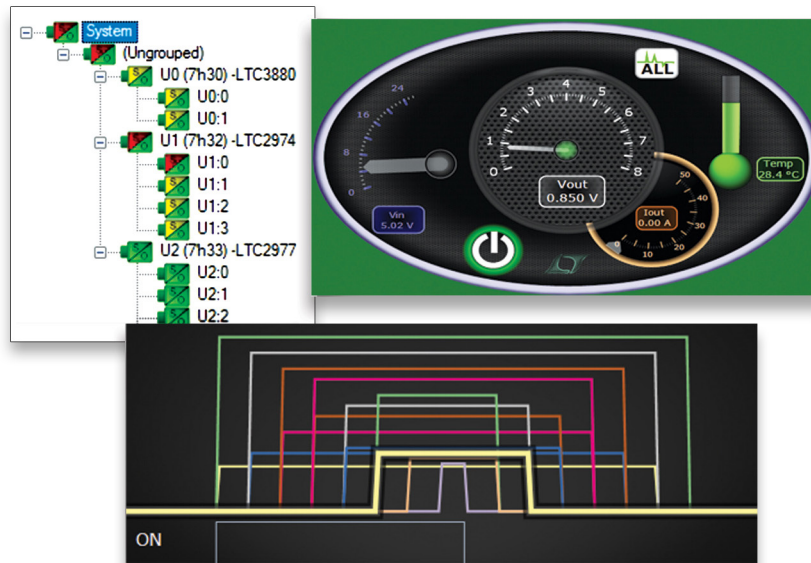


12-Pin Ribbon Cable  
to PSM Demo Board

If Needed, DC2086 Adapts  
12-Pin Cable to 4-Pin Header

## Software Support

LTpowerPlay is a powerful and intuitive Windows-based development environment used to configure and interrogate PSM devices. It can also be used in an offline mode (with no hardware present) in order to build a multichip configuration file that can be saved and reloaded at a later time. It is available as a free download at: [www.analog.com/LTpowerPlay](http://www.analog.com/LTpowerPlay)



## Device Programming

PSM devices ship from Analog Devices with a default register configuration loaded in EEPROM. The options to ship with a customized, application-specific configuration developed during the prototyping phase are as follows:

- **Analog Devices NVM Programming Service:** This involves submitting the configuration file, then receiving a few custom programmed samples (First Articles) for verification and approval. Contact Linear Express: [express@analog.com](mailto:express@analog.com)
- **In-Circuit Programming:** Use LTpowerPlay on a computer with a DC1613 USB-to-PMBus controller (adapter) to program PSM devices on circuit boards with pin headers accessing the PSM device.
- **JTAG Programming:** Use third-party programmers from Asset Intertech or JTAG Technologies to program PSM devices on circuit boards connected to JTAG scan chains without needing additional programmers or pin headers.

## Getting Started

1. Obtain the PSM Starter Kit, **DC1962C-KIT**
2. Download **LTpowerPlay**
3. Watch the **Video**



Scan to watch video:  
<http://ltpowerplay.com/ps1full>

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