Digital Power System Management

µModule Regulators | DC-to-DC ICs | Manager ICs | Sequencers | Supervisors

Take Control of Your Power Supplies

Accelerate characterization and optimization during prototyping and field operation with Analog Devices' digital power system management (DPSM) products, which are configured and monitored via a PMBus/SMBus/I²C digital interface.

Benefits

- ±0.25% voltage accuracy
- Products
  - Power system managers
  - DC-to-DC controllers with PSM
  - Fully integrated µModule® regulators
- LTpowerPlay® GUI: engineering-level development environment
- Reduced BOM cost and validation effort
- PMBus compliant commands over I²C/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

Features

- Digitally manage point-of-load (POL) power supplies
- Trim, margin, sequence, supervise, and record fault logs
- Monitor voltage, current, power, energy, and temperature
- Increase power system reliability
- Optimize board energy consumption
- Reduce time to market

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ANALOG DEVICES
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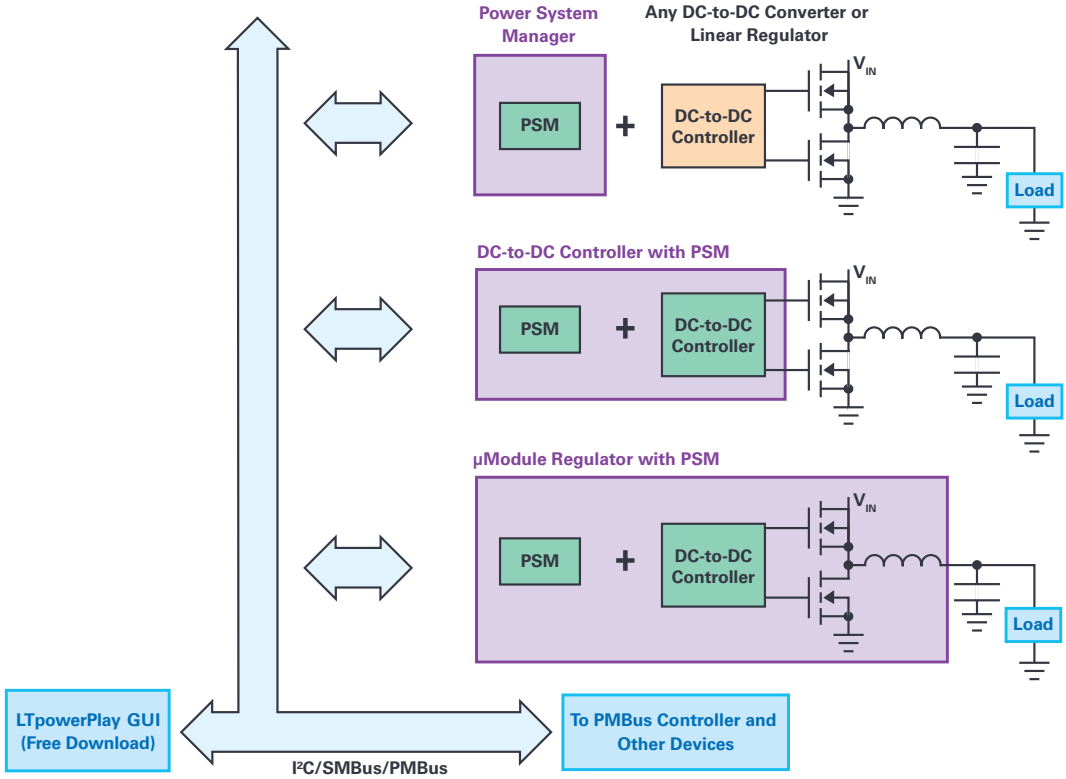


Programmable 6-Channel Sequencer and Supervisors with EEPROM

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

Power System Managers

- Manage any adjustable point-of-load power supply
- Read back voltage, current, power, energy, temperature, and faults
- Trim, margin, sequence, supervise, manage faults, monitor telemetry, and record fault logs

Device	Voltage Supply Channels Managed[1]	Number of Current Sensed Loads	Input Energy	Temp Sense		Digital Interface			EEPROM	Includes Res/Cap	Trim/ Margin/ Monitor Accuracy	Differential Voltage Sense Range	Sequencing			Bias Supply					Package (mm × mm)	Demo Board
				Internal	External	PMBus	SMBus	I²C					Time	Cascade	Tracking	3.3 V	5 V	12 V	24 V	48 V		
LTC2970[2]	2	2		•			•	•			±0.50%	0 V to 6 V					•	•			4 × 5, 24-lead QFN	DC980
LTC2971	2	3	•	•	2	•	•	•	•		±0.25%	0 V to 60 V -60 V to 0 V	•	•	•	•	•	•	•	•	7 × 7, BGA	DC2875
LTC2972	2	3	•	•	2	•	•	•	•		±0.25%	0 V to 6 V	•	•	•	•	•	•			6 × 7, 44-lead QFN	DC2619
LTC2974	4	4		•	4	•	•	•	•		±0.25%	0 V to 6 V	•	•	•	•	•	•			9 × 9, 64-lead QFN	DC1978
LTC2975	4	5	•	•	4	•	•	•	•		±0.25%	0 V to 6 V	•	•	•	•	•	•			9 × 9, 64-lead QFN, 7.5 × 6.25, BGA	DC2022
LTC2977	8			•		•	•	•	•		±0.25%	0 V to 6 V	•		•	•	•	•			9 × 9, 64-lead QFN	DC2028
LTC2979	16			•		•	•	•	•		±0.50%	0 V to 6 V	•		•	•					12 × 12, BGA	
LTC2980	16			•		•	•	•	•		±0.25%	0 V to 6 V	•		•	•	•	•			12 × 12, BGA	DC2198
LTM2987	16			•		•	•	•	•	•	±0.25%	0 V to 6 V	•		•	•	•	•			15 × 15, BGA	DC2023

[1] A channel refers to the collection of functions that trims, supervises, and monitors a given power supply rail. [2] See LTC2970-1 for sequencing.

DC-to-DC Controllers and µModule Regulators with Power System Management

- Fast analog feedback loop with digital telemetry and control
- Read back V_{IN}, I_{IN}, V_{OUT}, I_{OUT}, P_{OUT}, duty cycle, temperature, faults
- Program V_{OUT}, I_{LIM}, OV/UV level, frequency, ramp rate, sequencing time delays, margining

Features	DC-to-DC Controllers							
	LTC3880/ LTC3880-1	LTC3882/ LTC3882-1	LTC3883/ LTC3883-1	LTC3884/ LTC3884-1	LTC3886/ LTC3886-1	LTC3887/ LTC3887-1/ LTC3887-2	LTC3889	LTC7880
Converter Type	Synchronous buck	Synchronous buck	Synchronous buck	Synchronous buck	Synchronous buck	Synchronous buck	Synchronous buck	Synchronous boost
PSM	Full	Full	Full	Full	Full	Full	Full	Full
Number of Outputs	2	2	1	2	2	2	2	2
PWM Control Mode	Current	Voltage	Current	Current	Current	Current	Current	Current
Start-Up Time (ms)	120	35	35	35	35	30	35	35
Input Current Sense	Inferred	No	Yes	Yes	Yes	Inferred	Yes	Yes
V_{OUT} Range (V)	0.5 to 4.0, ch0 0.5 to 5.4, ch1	0.5 to 5.3	0.5 to 5.4	0.5 to 5.4	0.5 to 13.8/ 0 to 13.8	0.5 to 5.5	1 to 40	Up to 60
V_{IN} Range (V)	4.5 to 24	3 to 38	4.5 to 24	4.5 to 38	4.5 to 60	4.5 to 24/24/34	5 to 60	5 to 40 down to 2.5 after startup
V_{OUT} Accuracy (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
I_{OUT} (A) Max/Phase*	35	40	35	35	35	35/40/35	35	10
Temperature Sensing	ΔV_{BE}	ΔV_{BE} and direct	ΔV_{BE}	ΔV_{BE} and direct	ΔV_{BE} and direct	ΔV_{BE}	ΔV_{BE} and direct	ΔV_{BE} and direct
DCR Sensing	Low	Ultralow	Low	Very low	Low	Low	Low	Low
Dedicated PGOOD Pins	No	No/yes	Yes	Yes	Yes	No	Yes	Yes
Gate Drivers	Yes	No	Yes	Yes/no	Yes	Yes/no/yes	Yes	Yes
Three-State PWM Control	No	Yes	No	No/yes	No	No/yes/no	No	No
Digitally Adjustable Loop Compensation	No	No	No	Yes	Yes	No	Yes	Yes
On-Chip LDO from V_{IN}	Yes/no	No	Yes/no	Yes	Yes	Yes	Yes	Yes
Fast ADC Mode	No	No	No	Yes	Yes	Yes	Yes	Yes
Corresponding Slave	LTC3870	—	LTC3870	LTC3874	LTC3870	LTC3870	—	—
Package (mm × mm)	6 × 6, 40-lead QFN	6 × 6, 40-lead QFN	5 × 5, 32-lead QFN	7 × 7, 48-lead QFN	7 × 8, 52-lead QFN	6 × 6, 40-lead QFN	7 × 8, 52-lead QFN	7 × 8, 52-lead QFN

* Depends on choice of external components

Features	µModule Regulators							
	LTM4675	LTM4686/ LTM4686-1	LTM4676A	LTM4677	LTM4678	LTM4664	LTM4680	LTM4700
PSM	Full	Full	Full	Full	Full	Full	Full	Full
Number of Outputs	2	2	2	2	2	2	2	2
PWM Control Mode	Current	Current	Current	Current	Current	Current	Current	Current
Start-Up Time (ms) (typ)	35 (40 max)	35 (40 max)	35 (40 max)	35 (40 max)	30	30	30	30
Input Current Sense	Calculated	Calculated	Calculated	Calculated	Measured	Measured	Measured	Measured
V_{OUT} Range (V)	0.5 to 5.5	0.5 to 2.75	0.5 to 5.5	0.5 to 1.8	0.5 to 3.3	0.5 to 1.5	0.5 to 3.3	0.5 to 1.8
V_{IN} Range (V)	4.5 to 17	4.5 to 17/ 2.375* to 17	4.5 to 26.5	4.5 to 16	4.5 to 16	30 to 58	4.5 to 16	4.5 to 16
V_{OUT} Accuracy (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
I_{OUT} (A) (max)	Dual 9 or single 18	Dual 10 or single 20	Dual 13 or single 26	Dual 18 or single 36	Dual 25 or single 50	Dual 25 or single 50	Dual 30 or single 60	Dual 50 or single 100
Parallel Operation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Temperature Sensing	ΔV_{BE}	ΔV_{BE}	ΔV_{BE}	ΔV_{BE}	ΔV_{BE}	ΔV_{BE}	ΔV_{BE}	ΔV_{BE}
Dedicated PGOOD Pins	No	No	No	No	Yes	Yes	Yes	Yes
Digitally Adjustable Loop Compensation	No	No	No	No	Yes	Yes	Yes	Yes
Fast ADC Mode	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Package (mm × mm)	16 × 11.9 × 3.51 BGA	16 × 11.9 × 1.82 LGA	16 × 16 × 5.01 BGA	16 × 16 × 5.01 BGA	16 × 16 × 5.86 BGA	16 × 16 × 7.72 BGA	16 × 16 × 7.72 BGA	15 × 22 × 7.82 BGA

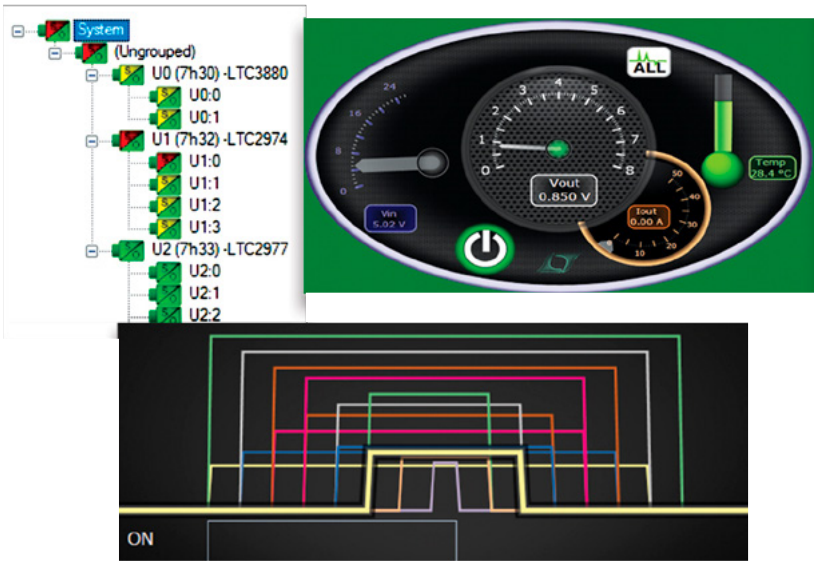
* Requires external bias voltage

Hardware Support

A DC1613 USB-to-I²C/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.

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: 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. Visit Analog Devices Express (ADX) at: analog.com/programming.
- **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.