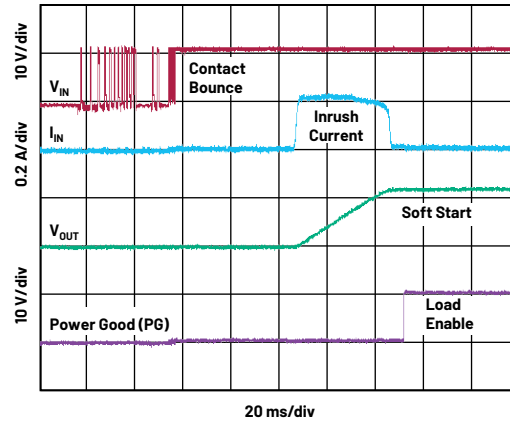
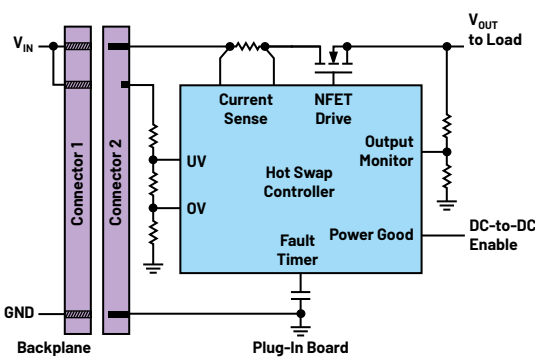


Hot Swap Controllers

- Inrush Control ► Circuit Breaker ► Telemetry ► UV/OV Protection

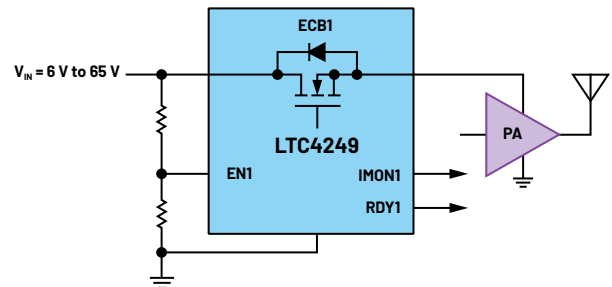


Mission-critical servers and communication equipment must continue operating even as circuit boards and cards are plugged in or pulled out for maintenance or capacity adjustment. Hot swap controllers enable board insertion and removal from live systems by soft starting the supply, which avoids connector sparks, backplane supply glitches, and card resets. In addition to inrush current control, hot swap controllers provide fault isolation with a circuit breaker, undervoltage (UV) and overvoltage (OV) lockout, and digital telemetry of board electrical parameters. Analog Devices delivers leading-edge hot swap innovations and tough, dependable protection for high availability systems.

Electronic Circuit Breakers

Key Features

- Fast disconnection of loads during overcurrent or short circuits
- Accurate fixed or adjustable ECB thresholds
- Minimal channel resistance increases power efficiency
- Protect against inrush current, overvoltage (OV), undervoltage (UV), reverse input (RI), and reverse current (RC)
- Compact solution for one or more multiple loads

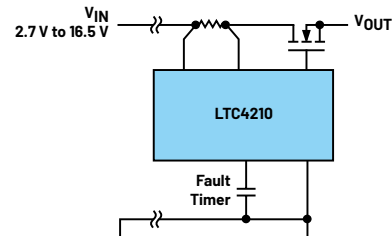


Device	# Loads	Load Voltage (V)	Load Current Threshold	R _{ON} (mΩ)	Inrush	OV	UV	RI	RC	Temp Range (°C)	Demo Board	Package (mm × mm)
LTC4213	1	0 to 6	×3 selectable	Ext FET						-40 to +85	DC872	3 × 2, 8-lead DFN
LTC4361	1	2.5 to 5.5	Ext R _{SENSE}	Ext R _{SENSE} + ext FET	Ext C	5.8 V		Ext FET		-40 to +125	DC1506	2 × 2, 8-lead DFN, 8-lead TSOT
LTC4362	1	2.5 to 5.5	1.5 A	71	3 V/ms	5.8 V		Ext FET		-40 to +85	DC1575	3 × 2, 8-lead DFN
LTC4368	1	2.5 to 60	Ext R _{SENSE}	Ext R _{SENSE} + ext FET	Ext C	Ext R	Ext R	-40 V	Ext FET	-40 to +125	DC2418	3 × 3, 10-lead DFN, 10-lead MSOP
LTC1647	2	2.7 to 16.5	Ext R	Ext R + ext FET	Ext C					-40 to +85	DC1358	8-lead SO, 16-lead SSOP
LTC4249	2	1.5 to 65	30 mA to 1.2 A	75	1 A	Ext R	Ext R		2 ECBs	-40 to +125	DC2733	3 × 3, 16-lead QFN, 3 × 4, 12-lead QFN
LTC4246	8	0 to 13.2	50 mA to 1.5 A	30					2 ECBs	-40 to +125	DC2945	3 × 5, 24-lead QFN
MAX15162	2	8 to 60	0.5 A to 1.5 A	180 (TQFN)/140 (WLP)	28 mA		7.6 V			-40 to +125	MAX15162TLEVKIT/ MAX15162TAEVKIT	4 × 4, 24-lead TQFN, 2 × 2, 16-bump WLP

Single Positive Supply Hot Swap Controllers

Key Features

- ▶ Controls supply in the 0 V to 80 V range
- ▶ Load soft start with ramped output or inrush current limit
- ▶ Circuit breaker (CB) for overcurrent protection
- ▶ Adjustable circuit breaker threshold and delay
- ▶ Current limiting (CL) until CB opens after fault timer expires
- ▶ Adjustable undervoltage/overvoltage thresholds

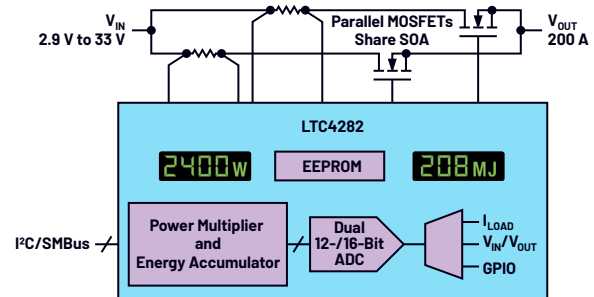


Device	V_{IN} (V)	I_D	UV	OV	CL	PG	Features	Demo Board	Package (mm × mm)
LTC4216	0 to 6	1.68 mA	•		•	•	Controls UV, CL above CB level	—	4 × 3, 12-lead DFN, 10-lead MSOP
LTC4210	2.7 to 16.5	655 μ A	•		•		Simple, small, 6-lead SOT-23	DC628	6-lead TSOT-23
ADM1170/ ADM1171/ ADM1172	1.6 to 16.5	670 μ A	•		•		Separate V_{CC} /current monitor/aux comp	EVAL-ADM1170/ EVAL-ADM1171/ EVAL-ADM1172EBZ	8-lead TSOT
LTC4211	2.5 to 16.5	1 mA	•		•	•	Start-up CL, 2-level slow, and fast CB	DC536	8-lead SO, 8-lead MSOP, 10-lead MSOP
LTC4218	2.9 to 26.5	1.68 mA	•	•	•	•	15 mV, \pm 5% CB, current monitoring	DC1052	5 × 3, 16-lead DFN, 16-lead SSOP
LTC4231	2.7 to 36	4 μ A	•	•	•	•	4 μ A I_{OV} , 0.3 μ A I_{SHDN} , survives \pm 40 V_{IN}	DC2161	3 × 3, 12-lead QFN, 12-lead MSOP
LT4256-1/ LT4256-2/ LT4256-3	10.8 to 80	1.84 mA	•	•	•	•	Survives 100 V_{IN} , signals light load	DC1354	8-lead SO (LT4256-1/LT4256-2), 16-lead SSOP (LT4256-3)

Hot Swap Controllers with Digital Telemetry

Key Features

- ▶ Monitors supply voltage, current, power, energy, and temperature
- ▶ I²C/SMBus/PMBus® digital interface for configuration and data readback
- ▶ ADC with low total unadjusted error (TUE)
- ▶ Internal EEPROM for nonvolatile configuration and fault log
- ▶ Resistor or digitally adjustable circuit breaker and undervoltage/overvoltage thresholds

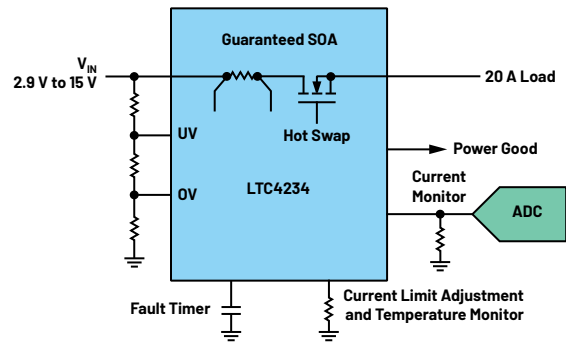


Device	Supplies	V_{IN} (V)	ADC		Monitor					EEPROM	PMBus/ I ² C	Features	Demo Board	Package (mm × mm)
			Bits	TUE (%)	V	I	P	E	T					
LTC4215/ LTC4280	1	2.9 to 15	8	2	•	•					I ² C	dI/dt controlled inrush (LTC4215)	DC874 (LTC4215)/ DC1704 (LTC4280)	4 × 5, 24-lead QFN, 16-lead SSOP (LTC4215 only)
ADM1278	1	4.5 to 20	12	0.35	•	•	•	•	•		PMBus	Resistor adjustable CL	EVAL-ADM1278	5 × 5, 32-lead LFCSOP
LTC4281/ LTC4282	1	2.9 to 33	12/16	0.7	•	•	•	•		•	I ² C	SOA sharing (LTC4282)	DC2278 (LTC4281)/ DC2024 (LTC4282)	4 × 5, 28-lead QFN (LTC4281), 5 × 5, 32-lead QFN (LTC4282)
LTC4286	1	8.5 to 80	12	1	•	•	•		•		PMBus	Configurable by resistors, no programming required	EVAL-LTC4286-A1Z	7 × 7, 39-lead QFN
ADM1272	1	16 to 80	12	0.4	•	•	•	•	•		PMBus	Survives 120 V_{IN}	EVAL-ADM1272	7 × 8, 48-lead LFCSOP
LTC4260	1	8.5 to 80	8	2	•	•					I ² C	Survives 100 V_{IN}	DC786	5 × 5, 32-lead QFN, 24-lead SO, 24-lead SSOP
ADM1075	1	-35 to >-80	12	0.8	•	•	•	•			PMBus	Floating topology	EVAL-ADM1075	5 × 5, 28-lead LFCSOP, 28-lead TSSOP
LTC4261	1	-12 to >-80	10	1.8	•	•					I ² C	Floating topology	DC998	4 × 5, 24-lead QFN, 28-lead SSOP
LTC4283/ LTC4284	1	-9 to >-80	16	0.7	•	•	•			•	I ² C	SOA sharing (LTC4284)	DC2480 (LTC4283)/ DC2470 (LTC4284)	5 × 7, 38-lead QFN (LTC4283), 5 × 8, 44-lead QFN (LTC4284)
LTC4222	2	2.9 to 29	10	1	•	•					I ² C	dI/dt controlled inrush	DC1134	5 × 5, 32-lead QFN, 36-lead SSOP

Hot Swap Controllers with Integrated MOSFET

Key Features

- ▶ Internal power MOSFET and current sense resistor
- ▶ Able to extend up to 120 A applications with additional followers
- ▶ Foldback current-limited circuit breaker with adjustable delay
- ▶ Current and temperature monitor, power-good, and fault outputs
- ▶ Undervoltage, overvoltage, and overtemperature protection

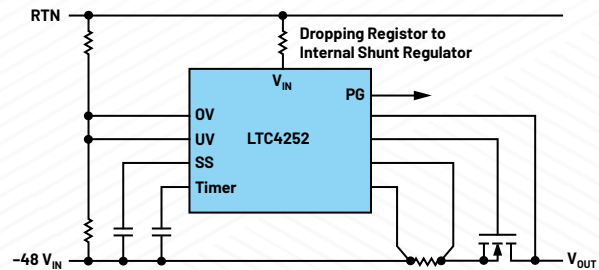


Device	V _{IN} (V)	Max I _{LOAD} (A)	R _{DS(on)} (mΩ)	UV	OV	CL	PG	Temp Range (°C)	Demo Board	Package (mm × mm)
LTC4217	2.9 to 26.5	1.85	33	•	•	•	•	-40 to +125	DC1051	5 × 3, 16-lead DFN, 20-lead TSSOP
LTC4219	5 or 12	5	33		•	•	•	-40 to +85	DC1594	5 × 3, 16-lead DFN
LTC4232	2.9 to 15	5	33	•	•	•	•	-40 to +85	DC1886	5 × 3, 16-lead DFN
MAX15096	2.7 to 18	6	12	•	•	•	•	-40 to +105	MAX15096/A/DEVKIT	2 × 2, 16-ball WLP
MAX15095	2.7 to 18	6.6	10.6	•	•	•	•	-40 to +105	MAX15095AEVKIT	2.5 × 2.5, 12-lead FC2QFN
MAX15091	2.7 to 18	9	18	•	•	•	•	-40 to +85	MAX15091/AEVKIT	5 × 5, 28-lead TQFN
LTC4233	2.9 to 15	10	10	•	•	•	•	-40 to +125	DC2116A-B	5 × 9, 38-lead QFN
MAX15090B/ MAX15090C	2.7 to 18	12	6	•	•	•	•	-40 to +85	MAX15090B/CEVKIT	2.1 × 3.5, 28-ball WLP
MAX15093	2.7 to 18	15	3.8	•	•	•	•	-40 to +105	MAX15093/AEVKIT	2.6 × 4, 40-ball WLP
LTC4234	2.9 to 15	20	4	•	•	•	•	-40 to +125	DC2116A-A	5 × 9, 38-lead QFN
MAX16550	10.8 to 13.2	30	1.9	•	•	•	•	0 to +125	MAX16550EVKIT	4 × 4.5, 18-lead FCQFN
LT4200	2.9 to 15	50	1.2	•	•	•	•	-40 to +85	DC3024	5 × 8, 36-lead QFN
MAX16545B/ MAX16545C/ MAX16543	10.8 to 13.2	60 to 120	0.95 (MAX16545B/ MAX16545C)/ 1.5 (MAX16543)	•	•	•	•	0 to +125	MAX16545BEVKIT120	4 × 6.5, 22-lead FCQFN/ 3.75 × 4, 12-lead FCQFN

Negative Supply Hot Swap Controllers

Key Features

- ▶ Controls supply in the 0 V to above -80 V range
- ▶ Floating topology with internal shunt regulator enables very high voltage operation
- ▶ 3-stage overcurrent protection (OCP): filtered circuit breaker, current limit, fast comparator
- ▶ Telecom-compatible undervoltage/overvoltage thresholds

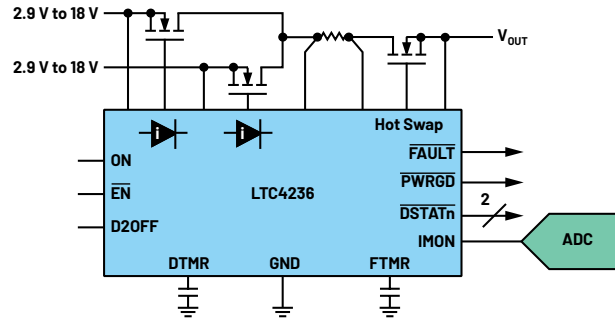


Device	V _{IN} (V)	UV	OV	CL	PG	Features	Demo Board	Package (mm × mm)
LTC4214	0 to -16	•	•	•	•	3-stage OCP, V _{DS} accelerated timer	—	10-lead MSOP
LT4250	-18 to -80	•	•	•	•	500 μs internal fault timer	DC429	8-lead SO, 8-lead PDIP
LTC4251	-15 to > -80	•	•	•	•	3-stage OCP, simple, small, 6-lead SOT-23	—	6-lead TSOT-23
LTC4252	-15 to > -80	•	•	•	•	3-stage OCP, V _{DS} accelerated timer	DC787	8-lead MSOP, 10-lead MSOP
LTC4253	-15 to > -80	•	•	•	•	LTC4252 features plus 3 sequenced PG	—	16-lead SSOP

Hot Swap Controllers with Ideal Diode

Key Features

- ▶ Ideal diode (ID) for low loss redundant supply active OR'ing, reverse current blocking, and supply holdup
- ▶ Eliminates power Schottky diodes and heat sinks
- ▶ Fast 0.5 μ s ideal diode turn-on and turn-off time
- ▶ Current-limited circuit breaker with adjustable delay
- ▶ Current monitoring (CM), power-good, circuit breaker fault, and diode status (DS) outputs

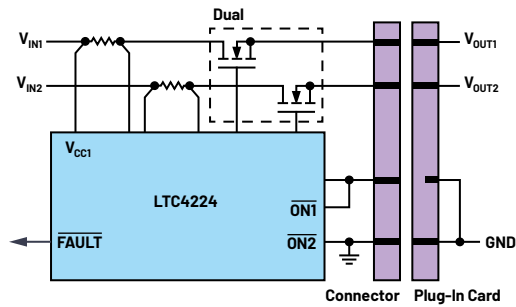


Device	Configuration	V_{IN} (V)	UV	OV	Output		Features	Demo Board	Package (mm × mm)
					CM	DS			
LTC4229	ID + HS	2.9 to 18	•	•		•	Prioritizer, adj debounce delay	DC2060	4 × 5, 24-lead QFN, 24-lead SSOP
LTC4227	2 × ID + HS	2.9 to 18	•				100 ms/1.6 ms debounce options	DC1625	4 × 5, 20-lead QFN, 16-lead SSOP
LTC4235	2 × ID + HS	9 to 14	•	•			Preset 12 V power-good threshold	DC2315	4 × 5, 20-lead QFN
LTC4236	2 × ID + HS	2.9 to 18	•	•	•	•	Prioritizer, adj debounce delay	DC2314	4 × 5, 28-lead QFN
LTC4228	2 × [ID + HS]	2.9 to 18	•			•	Complete dual for μ TCA systems	DC1899	4 × 5, 28-lead QFN, 28-lead SSOP

Multiple Supply Hot Swap Controllers

Key Features

- ▶ Compact solution for multiple supplies
- ▶ Supports Advanced Mezzanine Card (AMC), MicroTCA[®] (μ TCA), PCI Express (PCIe), CompactPCI (cPCI), and PCI standards
- ▶ Internal MOSFET for low current supply rails
- ▶ Circuit breaker for each supply with coupled or independent turn-offs on fault



Device	Supplies	V_{IN} (V)	UV	OV	CL	PG	Independent	Features	Demo Board	Package (mm × mm)
LTC4224	2	1 to 6			•	0	•	Simple, small, internal timers	DC1364	3 × 2, 10-lead DFN, 10-lead MSOP
LTC4221	2	1 to 13.5	•	•		2		Sequencing, 2-level slow/fast CB	DC1355	16-lead SSOP
LTC4223	2	12, 3.3	•		•	2		AMC, internal aux FET, I_{QV} monitor	DC1162	5 × 4, 16-lead DFN, 16-lead SSOP
LT4220	2	± 2.7 to ± 16.5	•	•		1		Supply tracking mode	DC665	16-lead SSOP
LTC4226	2	4.5 to 44	•	•		0	•	3-selectable CL:CB ratio	DC1627	3 × 3, 16-lead QFN, 16-lead MSOP
LTC4230	3	1.7 to 16.5				3		2-level slow/fast circuit breaker	DC537	20-lead SSOP
LTC4244	4	± 12 , 5, 3.3	•	•		1		For cPCI, internal ± 12 V FETs	–	20-lead SSOP
LTC4241	5	± 12 , 5, 3.3	•	•		1		PCI with 3.3 V_{aux} , internal ± 12 V FET	–	20-lead SSOP
LTC4242	6	12, 3.3	•	•		4	•	For two PCIe slots, internal aux FETs	DC1054	5 × 7, 38-lead QFN, 36-lead SSOP

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