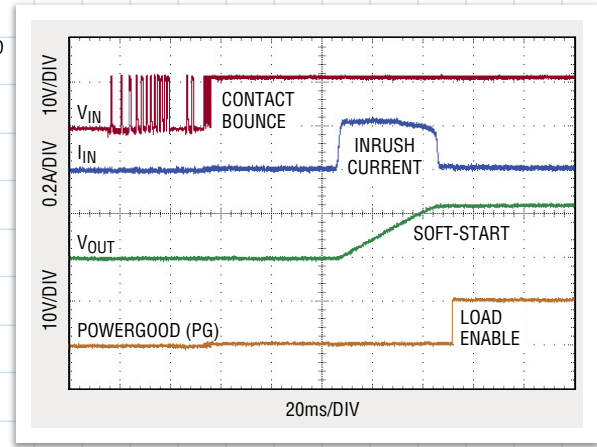
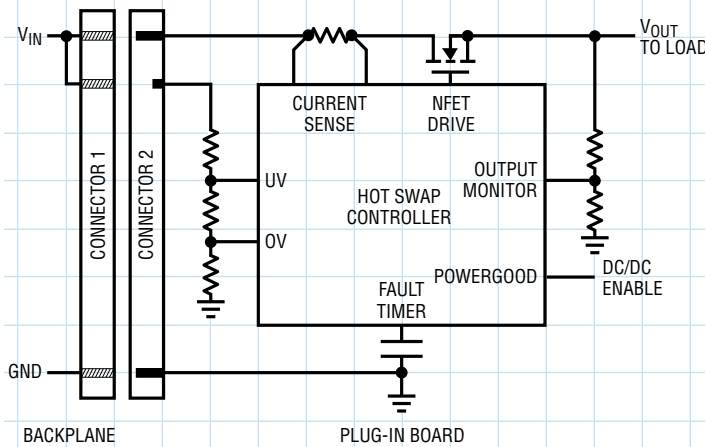


HOT SWAP CONTROLLERS



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, avoiding 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.

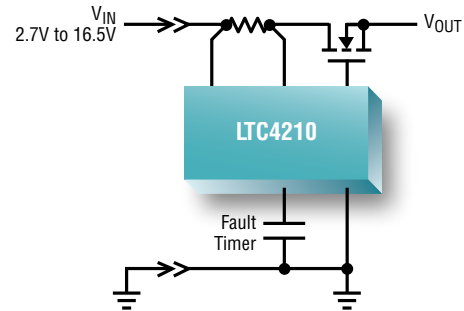
- Enables Safe Board Insertion and Removal from Live Systems
- Protects System from Overload and Short-Circuit at Board
- Validates Input Supply Against UV/OV Lockout Thresholds
- Provides Board Voltage, Current, Power, and Energy Telemetry
- Controls Supply Voltages Up to $\pm 1000V$ or Load Currents Up to 200A
- Over 500 Million Hot Swap Controllers Shipped

Year	First-to-Market Hot Swap Controller
1996	Dual Supply Controller
2001	Triple Supply Controller
2004	48V Controller with Telemetry
2005	-48V Controller with Telemetry
2006	12V Controller with Telemetry
2014	Lowest (4 μ A) Quiescent Current
2015	Integrated Controller with Tested SOA
2015	SOA Sharing Controller with EEPROM
2017	5kV _{RMS} Isolated Controller



Single Positive Supply Hot Swap Controllers

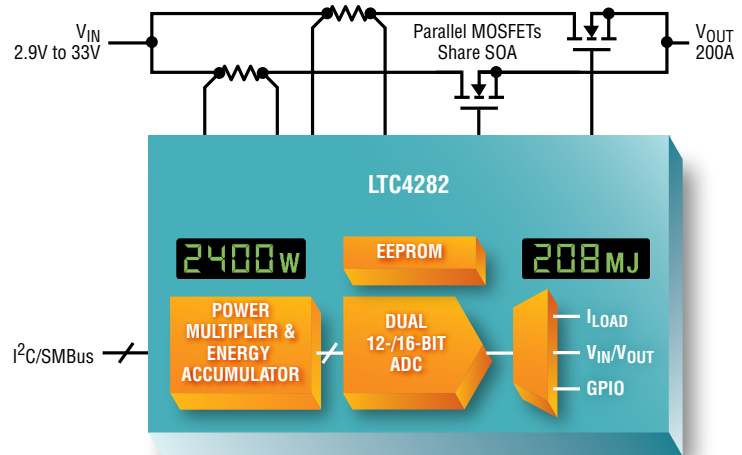
- Controls Supply in the 0V to 80V Range
- Load Soft-Start with Ramped Output or in Current Limit
- Circuit Breaker (CB) for Overcurrent Protection
- Adjustable Circuit Breaker Threshold and Delay
- Current Limiting (CL) Until CB Opens After Fault Timer Expires
- Adjustable Undervoltage/Overvoltage Thresholds



Device	V _{IN}	I _Q	UV	OV	CL	PG	Features	Demo Board	Package-Pins (mm × mm)
LTC®4216	0V to 6V	1.68mA	•		•	•	Controls 0V, CL Above CB Level	NA	4 × 3 DFN-12, MSOP-10
LTC4210	2.7V to 16.5V	655µA	•		•		Simple, Small, 6-Pin SOT-23	DC628	TSOT23-6
ADM1170/1/2	1.6V to 16.5V	670µA	•		•		Separate V _{CC} /Current Monitor/Aux Comp	EVAL-	TSOT-8
LTC4211	2.5V to 16.5V	1mA	•		•	•	Start-Up CL, 2-Level Slow, and Fast CB	DC536	SO-8, MSOP-8/10
LTC4218	2.9V to 26.5V	1.68mA	•	•	•	•	15mV±5% CB, Current Monitoring	DC1052	5 × 3 DFN-16, SSOP-16
LTC4231	2.7V to 36V	4µA	•	•	•	•	4µA I _Q , 0.3µA I _{SHDN} , Survives ±40V _{IN}	DC2161	3 × 3 QFN-12, MSOP-12
LT®4256	10.8V to 80V	1.84mA	•	•	•	•	Survives 100V _{IN} , Signals Light Load	DC1354	SO-8, SSOP-16

Hot Swap Controllers with Digital Telemetry

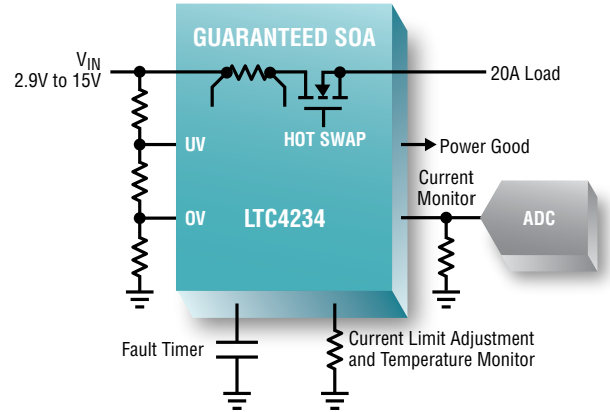
- Monitors Supply Voltage, Current, Power, Energy, and Temperature
- I²C/SMBus/PMBus Digital Interface for Configuration and Data Readback
- ADC with Low Total Unadjusted Error (TUE)
- Internal EEPROM for Nonvolatile Configuration and Fault Log
- Resistor- or Digitally-Adjustable Circuit Breaker and Undervoltage/Overvoltage Thresholds



Device	Supplies	V _{IN}	ADC		Monitor					EEPROM	PMBus	Features	Demo Board	Package-Pins (mm × mm)
			Bits	TUE	V	I	P	E	T					
LTC4215/80	1	2.9V to 15V	8	2%	•	•						dI/dt Controlled Inrush	DC874	4 × 5 QFN-24, SSOP-16
LTC4281	1	2.9V to 33V	12/16	0.7%	•	•	•	•		•		Adjust Thresholds Digitally	DC2278	4 × 5 QFN-28
ADM1278	1	4.5V to 20V	12	0.35%	•	•	•	•			•	Resistor Adjustable CL	EVAL-	5 × 5 LFCSP-32
LTC4282	1	2.9V to 33V	12/16	0.7%	•	•	•	•		•		LTC4281 + SOA Sharing	DC2024	5 × 5 QFN-32
ADM1272	1	16V to 80V	12	0.4%	•	•	•	•			•	Survives 120V _{IN}	EVAL-	7 × 8 LFCSP-48
LTC4260	1	8.5V to 80V	8	2%	•	•						Survives 100V _{IN}	DC786	5 × 5 QFN-32, SO/SSOP-24
ADM1075	1	-35V to >-80V	12	0.8%	•	•	•	•				Floating Topology	EVAL-	5 × 5 LFCSP-28, TSSOP-28
LTC4261	1	-12V to >-80V	10	1.8%	•	•						Floating Topology	DC998	4 × 5 QFN-24, SSOP-28
LTC4283/84	1	-9V to >-80V	16	0.7%	•	•	•	•		•		LTC4284: SOA Sharing	DC2480/70	5 × 7 QFN-38/5 × 8 QFN-44
LTM9100	1	-1000V to 1000V	10	1.8%	•	•						5kV _{RMS} Isolation	DC2423	22 × 9 × 5.16 BGA
LTC4222	2	2.9V to 29V	10	1%	•	•						dI/dt Controlled Inrush	DC1134	5 × 5 QFN-32, SSOP-36
LTC4245	4	±12V, 5V, 3.3V	8	2%	•	•						For cPCI/PCIe, Sequencing	DC985	5 × 7 QFN-38, SSOP-36

Hot Swap Controllers with Integrated MOSFET

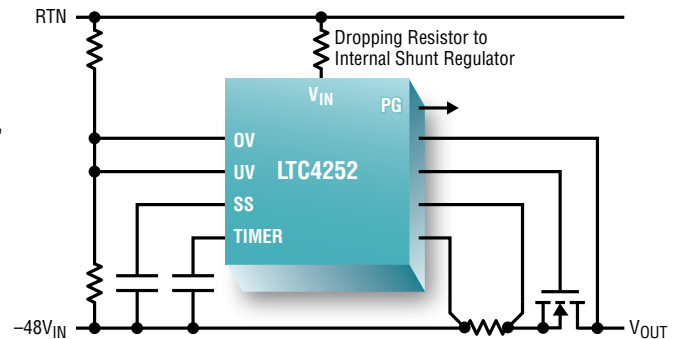
- Internal Power MOSFET and Current Sense Resistor
- Controllers for Up to 20A Applications
- Output Voltage Soft-Start
- Foldback Current-Limited Circuit Breaker with Adjustable Delay
- Resistor-Adjustable Circuit Breaker Threshold
- Current & Temperature Monitor, Power Good, and Fault Outputs
- Undervoltage, Overvoltage, and Overtemperature Protection
- Production Tested and Guaranteed SOA
- Pin-Compatible Controllers



Device	V _{IN}	Max I _{LOAD}	R _{ON}	UV	OV	CL	PG	Tested SOA	Pin Compatible	Temp Range	Demo Board	Package-Pins (mm × mm)
LTC4217	2.9V to 26.5V	1.85A	33mΩ	•	•	•	•		LTC4232	-40°C to 125°C	DC1051	5 × 3 DFN-16, TSSOP-20
LTC4219	5V or 12V	5A	33mΩ		•	•	•		NA	-40°C to 85°C	DC1594	5 × 3 DFN-16
LTC4232	2.9V to 15V	5A	33mΩ	•	•	•	•		LTC4217	-40°C to 85°C	DC1886	5 × 3 DFN-16
LTC4233	2.9V to 15V	10A	10mΩ	•	•	•	•	•	LTC4234	-40°C to 125°C	DC2116	5 × 9 QFN-38
LTC4234	2.9V to 15V	20A	4mΩ	•	•	•	•	•	LTC4233	-40°C to 125°C	DC2116	5 × 9 QFN-38

Negative Supply Hot Swap Controllers

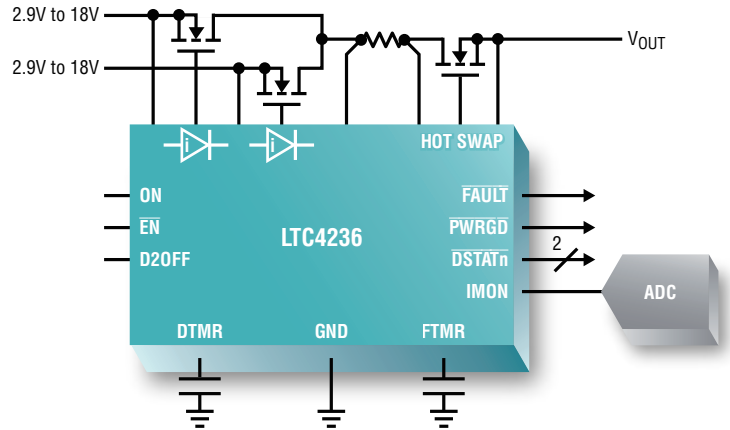
- Controls Supply in the 0V to Above -80V Range
- Floating Topology with Internal Shunt Regulator Enables Very High Voltage Operation
- 3-Stage Overcurrent Protection (OCP): Filtered Circuit Breaker, Current Limit, Fast Comparator
- Adjustable Circuit Breaker Threshold and Delay
- Soft-Started Current Limit
- Telecom-Compatible Undervoltage/Overvoltage Thresholds



Device	V _{IN}	UV	OV	CL	PG	Features	Demo Board	Package-Pins (mm × mm)
LTC4214	0V to -16V	•	•	•	•	3-Stage OCP, V _{DS} Accelerated Timer	NA	MSOP-10
LT4250	-18V to -80V	•	•	•	•	500μs Internal Fault Timer	DC429	SO-8, PDIP-8
LTC4251	-15V to > -80V	•	•	•	•	3-Stage OCP, Simple, Small, 6-Pin SOT-23	NA	TSOT23-6
LTC4252	-15V to > -80V	•	•	•	•	3-Stage OCP, V _{DS} Accelerated Timer	DC787	MSOP-8/10
LTC4253	-15V to > -80V	•	•	•	•	LTC4252 Features + 3 Sequenced PG	NA	SSOP-16

Hot Swap Controllers with Ideal Diode

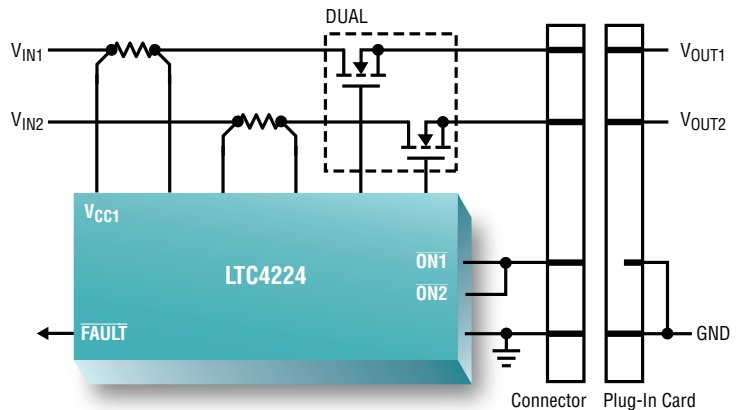
- Ideal Diode (ID) for Low Loss Redundant Supply Active ORing, Reverse Current Blocking, and Supply Holdup
- Eliminates Power Schottky Diodes and Heat Sinks
- Fast 0.5µs Ideal Diode Turn-On and Turn-Off Time
- Current-Limited Circuit Breaker with Adjustable Delay
- Current Monitoring (CM), Power Good, Circuit Breaker Fault, and Diode Status (DS) Outputs



Device	Configuration	V _{IN}	UV	OV	Output		Features	Demo Board	Package-Pins (mm × mm)
					CM	DS			
LTC4229	ID + HS	2.9V to 18V	•	•		•	Prioritizer, Adj Debounce Delay	DC2060	4 × 5 QFN-24, SSOP-24
LTC4227	2 • ID + HS	2.9V to 18V	•				100ms/1.6ms Debounce Options	DC1625	4 × 5 QFN-20, SSOP-16
LTC4235	2 • ID + HS	9V to 14V	•		•		Preset 12V Power Good Threshold	DC2315	4 × 5 QFN-20
LTC4236	2 • ID + HS	2.9V to 18V	•		•	•	Prioritizer, Adj Debounce Delay	DC2314	4 × 5 QFN-28
LTC4228	2 • [ID + HS]	2.9V to 18V	•			•	Complete Dual for µTCA Systems	DC1899	4 × 5 QFN-28, SSOP-28

Multiple Supply Hot Swap Controllers

- Compact Solution for Multiple Supplies
- Supports Advanced Mezzanine Card (AMC), MicroTCA (µTCA), 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}	UV	OV	CL	PG	Independent	Features	Demo Board	Package-Pins (mm × mm)
LTC4221	2	1V to 13.5V	•	•		2		Sequencing, 2-Level Slow/Fast CB	DC1355	SSOP-16
LTC4223	2	12V, 3.3V	•		•	2		AMC, Internal Aux FET, I _{12V} Monitor	DC1162	5 × 4 DFN-16, SSOP-16
LT4220	2	±2.7V to ±16.5V	•		•	1		Supply Tracking Mode	DC665	SSOP-16
LTC4226	2	4.5V to 44V	•		•	0	•	3-Selectable CL:CB Ratio	DC1627	3 × 3 QFN-16, MSOP-16
LTC4230	3	1.7V to 16.5V				3		2-Level Slow/Fast Circuit Breaker	DC537	SSOP-20
LTC4244	4	±12V, 5V, 3.3V	•		•	1		For cPCI, Internal ±12V FETs	NA	SSOP-20
LTC4241	5	±12V, 5V, 3.3V	•		•	1		PCI with 3.3V _{AUX} , Internal ±12V FET	NA	SSOP-20
LTC4242	6	12V, 3.3V	•		•	4	•	For 2 PCIe Slots, Internal Aux FETs	DC1054	5 × 7 QFN-38, SSOP-36



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