



Surge Stoppers

Compact, Precise, Overvoltage and Overcurrent Protection

Automotive, industrial, and aviation electronics need to survive and operate through power supply surges endemic to their environment. Traditional overvoltage (OV) and overcurrent (OC) protection relies on capacitors, transient voltage suppressors (TVS), fuses, diodes, and inductors, but these discrete solutions are bulky, inaccurate, and blow the fuse during a sustained fault. Our surge stopper family replaces these passive components with a controller and series protection MOSFET, enabling a compact and precise solution.

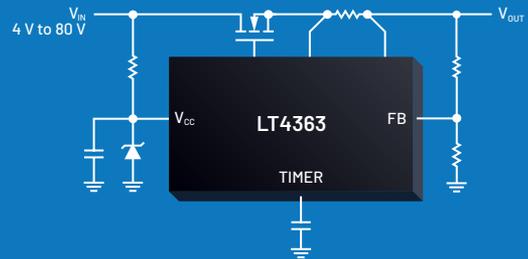
- ▶ Shields Load Electronics from High Voltage Surges
- ▶ Allows Uninterrupted System Operation Through Surges
- ▶ Protects Supply from Overload and Short Circuit
- ▶ Disconnects Load from Supply for Sustained Faults
- ▶ Adjustable Clamp Voltage Eases Design Changes and Reuse
- ▶ Tight Accuracy Minimizes Overdesign and Reduces Cost
- ▶ Low Profile, Surface-Mount Solution Enables Compact Form Factor
- ▶ Automotive and Military-Plastic Temperature Grades

Linear Surge Stoppers

During normal operation, a linear surge stopper fully turns on the MOSFET to provide a low resistance path for the load current. When the input supply voltage surges, the output is linearly regulated to a safe voltage set by a resistive divider, enabling ride-through operation. A capacitive fault timer protects the MOSFET by limiting the time spent in the high dissipation regulation state.

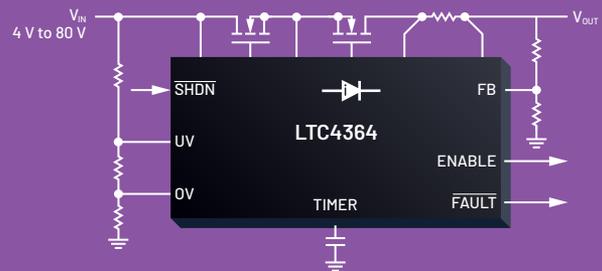
Surge Stopper with Circuit Breaker

- ▶ Resistor-Adjustable 2% Accurate Clamp Voltage
- ▶ Input Surge: Linear Regulator for Adjustable Time
- ▶ -60 V Reverse Input Protection
- ▶ Foldback Current-Limited Circuit Breaker with Adjustable Delay
- ▶ Fault Timer Accelerated by MOSFET Voltage Drop



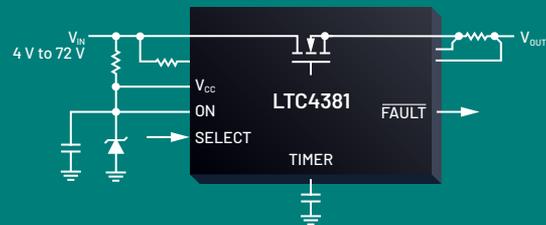
Surge Stopper with Ideal Diode

- ▶ LT4363 Functions Plus Ideal Diode Control
- ▶ Ideal Diode for Output Holdup and Reverse Protection
- ▶ Resistor-Adjustable 2.4% Accurate Clamp Voltage
- ▶ -40 V Reverse-Input, -20 V Reverse-Output Protection



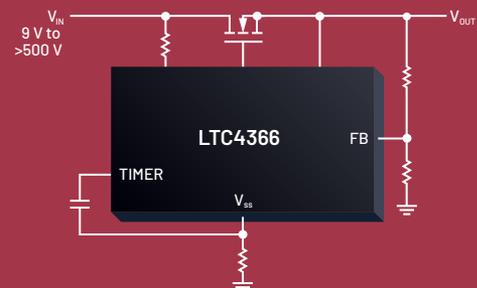
Low Quiescent Current Surge Stopper

- ▶ Low 6 μA Operating I_Q , 5 μA in Shutdown (LTC4381)
- ▶ Integrated 9 m Ω MOSFET in LTC4381
- ▶ Low 8 μA Operating I_Q , 6 μA in Shutdown (LTC4380)
- ▶ Pin-Selectable Gate Clamp for 12 V and 24 V/28 V Systems
- ▶ Input Surge: Clamps MOSFET Gate for Adjustable Time
- ▶ -60 V Reverse Input Protection
- ▶ Current-Limited Circuit Breaker with Adjustable Delay
- ▶ Fault Timer Accelerated by MOSFET Power



Floating Surge Stopper

- ▶ Rugged Floating Topology for >500 V Operation
- ▶ Resistor-Adjustable 3% Accurate Clamp Voltage
- ▶ Input Surge: Linear Regulator for Adjustable Time

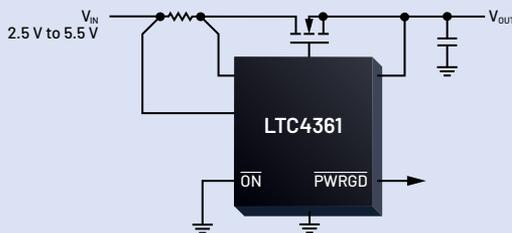
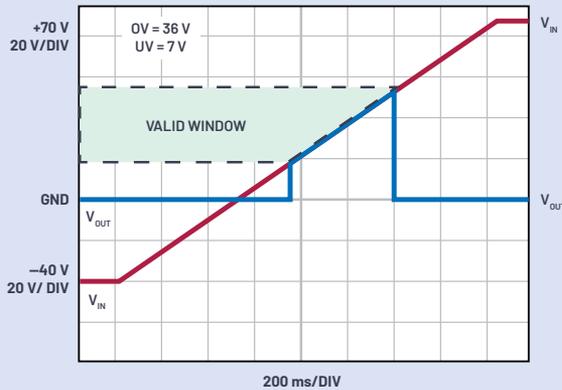
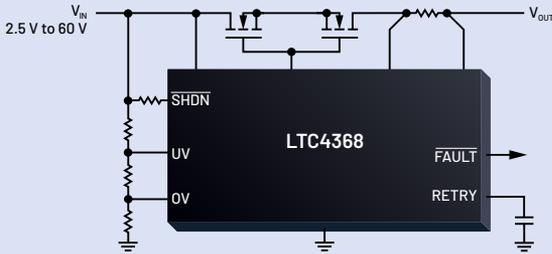
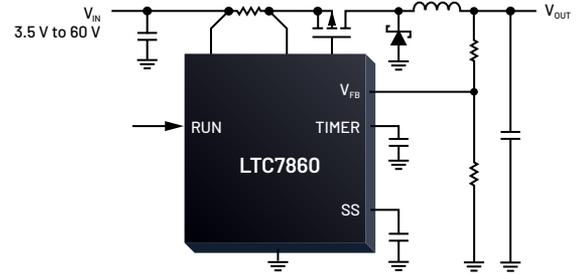


Switching Surge Stopper

During normal operation, a switching surge stopper turns on an external MOSFET continuously to pass the input voltage through to the output with minimum conduction loss. When an input voltage surge occurs, it starts switching the external MOSFET to operate as a high efficiency switching DC-to-DC regulator to protect critical downstream components by limiting the output voltage and current.

High Efficiency Switching Surge Stopper

- ▶ High Efficiency for High Power (>5 A) Surges
- ▶ Normal Operation: 100% Duty Cycle with MOSFET On
- ▶ Input Surge: Switching Regulator with Adjustable Timer
- ▶ Resistor Adjustable 1.1% Accurate Clamp Voltage
- ▶ Adjustable Current Limit
- ▶ Inherent LC Filter Improves Input EMI



Protection Controllers

Protection controllers disconnect immediately during overvoltage and provide a compact solution for power entry protection in battery-powered portable equipment.

Undervoltage (UV), Overvoltage (OV), Overcurrent (OC), and Reverse Input (RI) Protection Controllers

- ▶ Block Voltages Outside UV-OV Window
- ▶ -40 V Reverse Input Protection
- ▶ Adjustable 1.5% Accurate UV, OV Thresholds
- ▶ Low Quiescent and Shutdown Currents
- ▶ Compact Solution Footprint

Device	V _{IN} (V)	UV	OV	RI	OC	Forward Current Trip	Reverse Current Trip
LTC4365	2.5 to 34	•	•	•			
LTC4367	2.5 to 60	•	•	•			
LTC4368	2.5 to 60	•	•	•	•	50 mV	-50 mV/-3 mV

Overvoltage and Overcurrent Protection Controllers

- ▶ 2.5 V to 5.5 V Operation
- ▶ Fixed 5.8 V ±2% Overvoltage Turn-Off Threshold
- ▶ <1 μs Fast Overvoltage Turn-Off
- ▶ Reverse Input Protection FET Driver Output
- ▶ Compact Solution Footprint

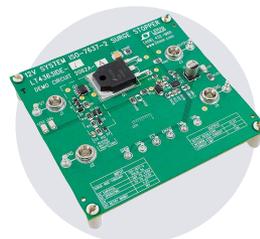
Device	V _{IN} (MAX) (V)	OV	OC	MOSFET
LTC4360	80	•		External N-Ch
LTC4361	80	•	•	External N-Ch
LTC4362	28	•	•	Internal 1.5 A

Solutions for Automotive and Military Surge Standards

Analog Devices provides evaluation boards demonstrating surge stopper circuits for automotive and military surge standards such as ISO 7637-2 and MIL-STD-1275D. Each board has been tested by an independent lab with the complete test report available online.

DC2062 for 12 V, 3.8 A ISO 7637-2 Application

- ▶ Features LT4363 Surge Stopper
- ▶ Rides through 100 V, 500 ms Load Dump Pulse
- ▶ Latchoff and Auto-Retry Options



Parameter	Min	Typ	Max	Units
Input Supply Operating Range	5	12	23.5	V
Input Supply 500 ms Surge	100			V
Output Regulation Voltage	23.5	25	25.4	V
Current Limit	3	3.8	4.6	A

DC2150 for 28 V, 5 A MIL-STD-1275D Application

- ▶ Features LTC4366 and LT4363 Surge Stoppers
- ▶ Rides through 100 V, 500 ms Surge
- ▶ Four Assembly Options; Full-Featured Option Available



Device	OVP Type*	OC	Operating V _{IN} (V)	Stops V _{IN} (V)	Reverse Input (V)	I ₀ (μA)	I _{SHDN} (μA)	MOSFET	OVP Accuracy % (V)	Fault Timer	Blocks I _{REV}	Temp Grades	Demo Board	Package (mm × mm)
Surge Stoppers														
LT4356	1	†	4 to 80	>100	-60	1210	7	Ext N-ch	2	•		C, I, H, MP	DC1018	4 × 3, 12-lead DFN, 10-lead MSOP, 16-lead SO
LT4363	1	•	4 to 80	>100	-60	970	7	Ext N-ch	2	•		C, I, H, MP	DC1935	4 × 3, 12-lead DFN, 12-lead MSOP, 16-lead SO
LTC4364	1	•	4 to 80	>100	-40	483	10	Ext N-ch	2.4	•	•	C, I, H	DC2027	4 × 3, 14-lead DFN, 16-lead MSOP, 16-lead SO
LTC4366	1		9 to >500	>500	External	159	5	Ext N-ch	3	•		C, I, H, MP	DC1850	3 × 2, 8-lead DFN, 8-lead TSOT
LTC4380	2	•	4 to 72	>100	-60	8	6	Ext N-ch	~10	•		C, I, H	DC2178	3 × 3, 10-lead DFN, 10-lead MSOP
LTC4381	2	•	4 to 72	>100	-60	6	5	Int N-ch	~10	•		C, I, H	DC2713	7 × 5, 32-lead DFN
LTC7860	3	•	3.5 to 60	>100	External	770	7	Ext P-ch	1.1	•		E, I, H, MP	DC2239	12-lead MSOPE
Protection Controllers														
LTC4365	4		2.5 to 34	>100	-40	125	10	Ext N-ch	1.5			C, I, H	DC1555	3 × 2, 8-lead DFN, 8-lead TSOT
LTC4367	4		2.5 to 60	>100	-40	70	5	Ext N-ch	1.5			C, I, H	DC2417	3 × 3, 8-lead DFN, 8-lead MSOP
LTC4368	4	•	2.5 to 60	>100	-40	80	5	Ext N-ch	1.5		•	C, I, H	DC2418	3 × 3, 10-lead DFN, 10-lead MSOP
LTC4360	4		2.5 to 5.5	80	External	230	1.5	Ext N-ch	2			C, I	DC1505	8-lead SC70
LTC4361	4	•	2.5 to 5.5	80	External	230	1.5	Ext N-ch	2			C, I, H	DC1506	2 × 2, 8-lead DFN, 8-lead TSOT
LTC4362	4	•	2.5 to 5.5	28	External	220	1.5	1.5 A	2			C, I	DC1575	2 × 3, 8-lead DFN

OC = Overcurrent protection, * Overvoltage protection type: 1 = Linear regulation of output; 2 = Clamps MOSFET gate voltage; 3 = Switching regulation of output; 4 = Disconnects output from input; † Overcurrent protection only below 100 V