

Low Current Hot Swap Power Manager

FEATURES

- Integrated Circuit Breaker Function
- Integrated 0.2Ω Power FET
- 1μA ICC When Disabled
- Programmable On Time
- Accurate 0.8A Max Current
- Fixed 3% Duty Cycle
- Uni-Directional Switch
- Thermal Shutdown

DESCRIPTION

The UCC39161 low current hot swap power manager provides complete power management, hot swap capability, and circuit breaker functions with minimal external components. For most applications, the only external component required to operate the device, other than supply bypassing, is a timing capacitor which sets the fault time.

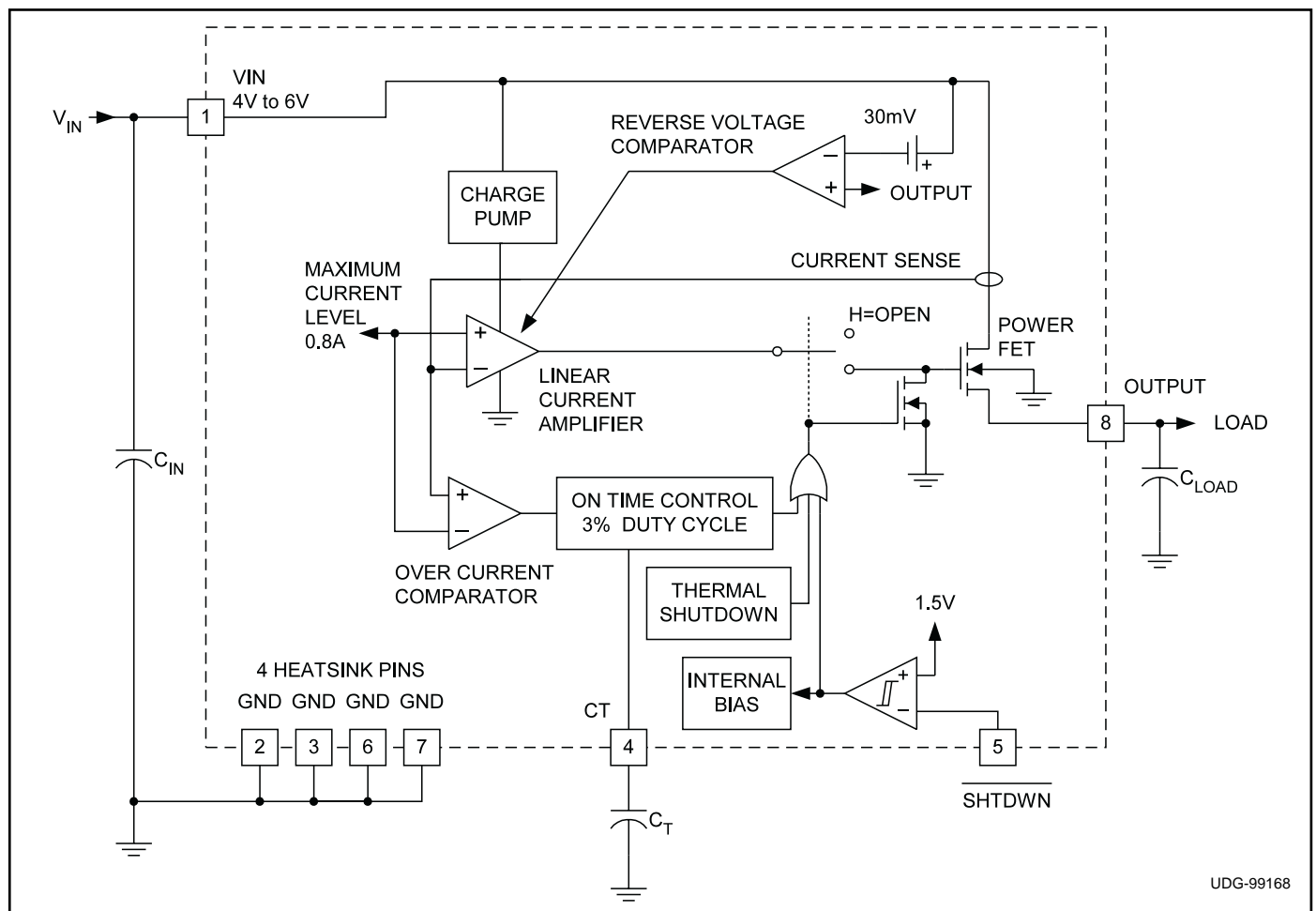
The maximum current level is internally programmed for 0.8A. While the output current is below 0.8A, the internal power MOSTFET is switched on at a nominal 220m . When the output current exceeds 0.8A, the MOSFET transitions from a switch to a constant current source and the fault timer starts charging CT. Once the fault time is reached, the current will shut off for a time, which equates to a 3% duty cycle.

The UCC39161 also provides unidirectional current flow, emulating a diode in series with the power MOSFET.

The UCC39161 can be put into sleep mode by grounding the SHTDWN pin. In sleep mode, the UCC39161 draws under 5μA of supply current.

Other features include thermal shutdown and a low thermal resistance Small Outline Power package.

BLOCK DIAGRAM AND TYPICAL APPLICATION



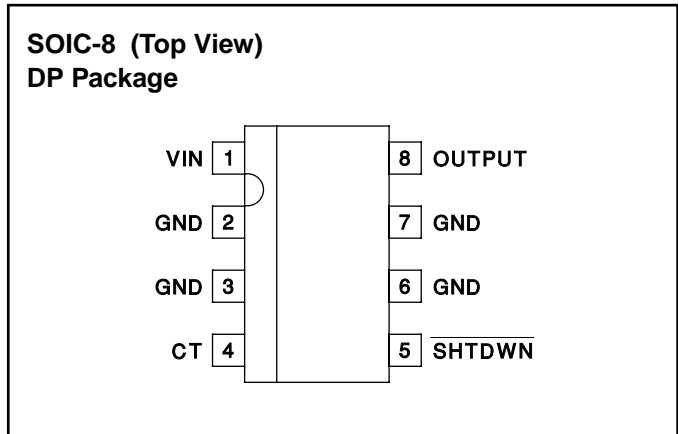
UDG-99168

ABSOLUTE MAXIMUM RATINGS

VIN	+6V
Output Current	
DC	Self Limiting
Pulse (Less than 100ns)	20A
Storage Temperature	-65°C to +150°C
Junction Temperature	-55°C to +150°C
Lead Temperature (Soldering, 10 sec.)	+300°C

Currents are positive into, negative out of the specified terminal. Consult Packaging Section of Databook for thermal limitations and considerations of packages.

CONNECTION DIAGRAM



ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these parameters apply for $T_J = 0^\circ\text{C}$ to $+70^\circ\text{C}$; $V_{IN} = 5\text{V}$, $SHTDWN = 2.4\text{V}$, $T_A = T_J$.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current Section					
ICC			1.00	2.00	mA
ICC - Sleep Mode	$SHTDWN = 0.2\text{V}$		0.50	5	μA
Output Section					
Voltage Drop	$I_{OUT} = 0.5\text{A}$		0.10	0.16	V
Max Current		-1.0	-0.8	-0.6	A
Reverse Leakage	$V_{IN} = 4.5\text{V}, V_{OUT} = 5\text{V}$		6	20	μA
	$V_{IN} = 0\text{V}, V_{OUT} = 5\text{V}$		0.50	9	μA
Soft Start Time	Initial Startup		50		μs
Short Circuit Response			100		ns
Fault Section					
CT Charge Current	$V_{CT} = 1.0\text{V}$	-45	-36.0	-27	μA
CT Discharge Current	$V_{CT} = 1.0\text{V}$	0.90	1.0	1.50	μA
Output Duty Cycle	$V_{OUT} = 0\text{V}$	2.00	3.00	6.00	%
CT Charge Threshold		0.4	0.5	0.6	V
CT Discharge Threshold		1.2	1.4	1.8	V
Thermal Shutdown			170		$^\circ\text{C}$
Thermal Hysteresis			10		$^\circ\text{C}$
Shutdown Section					
Shutdown Threshold			1.5	3.0	V
Shutdown Hysteresis			150	300	mV
Shutdown Bias Current	$SHTDWN = 1.0\text{V}$		100	500	nA

Note 1: All voltages are with respect to ground.

PIN DESCRIPTIONS

CT: A capacitor is applied between this pin and ground to set the maximum fault time. The maximum fault time must be more than the time to charge external capacitance. The maximum fault time is defined as:

$$T_{FAULT} = 28 \cdot 10^3 \cdot CT.$$

Once the fault time is reached the output will shutdown for a time given by:

$$T_{SD} = 1 \cdot 10^6 \cdot CT$$

this results in a 3% duty cycle.

SHTDWN: The IC enters a low-power sleep mode when this pin is low and exits the sleep mode when this pin is high.

VIN: Input voltage to the circuit breaker, ranging from 4V to 6V.

VOUT: Output voltage of the circuit breaker. When switched, the output voltage is approximately:

$$V_{OUT} = V_{IN} - 220m\Omega \cdot I_{OUT}.$$

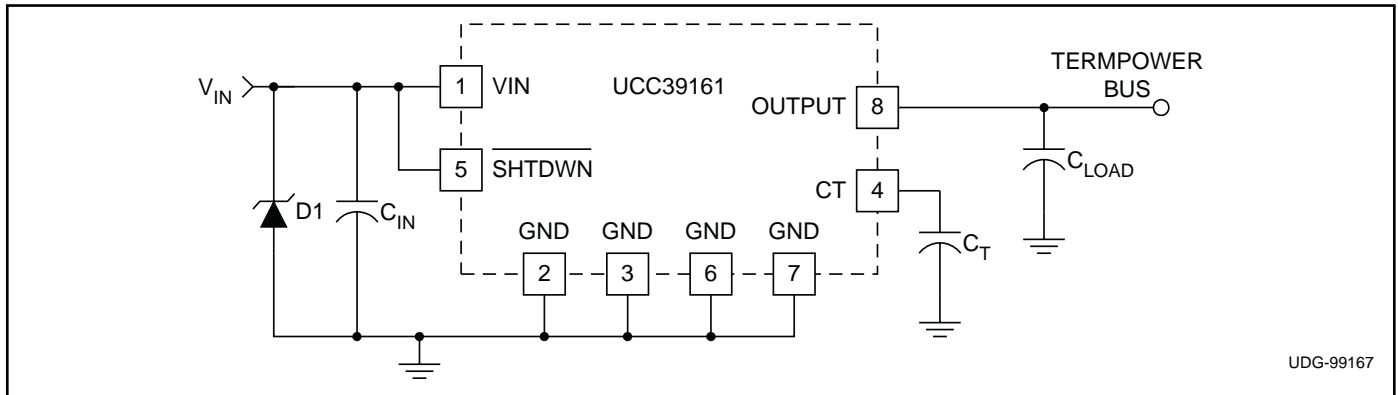


Figure 1. Typical application.

APPLICATION INFORMATION

Protecting The UCC39161 From Voltage Transients

The parasitic inductance associated with the power distribution can cause a voltage spike at VIN if the load current is suddenly interrupted by the UCC39161. It is important to limit the peak of this spike to less than 6V to prevent damage to the UCC39161. This voltage spike can be minimized by:

- Reducing the power distribution inductance (e.g., twist the positive (+) and negative (-) leads of the power supply feeding VIN, locate the power supply close to the UCC39161 or use a PCB ground plane).
- Decoupling VIN with a capacitor, CIN (refer to Fig. 1), located close to the VIN pin. This capacitor is typically less than 1µF to limit the inrush current.
- Clamping the voltage at VIN below 6V with a Zener diode, D1(refer to Fig. 1), located close to the VIN pin.

SAFETY RECOMMENDATIONS

Although the UCC39161 is designed to provide system protection for all fault conditions, all integrated circuits can ultimately fail short. For this reason, if the UCC39161 is intended for use in safety critical applications where UL® or some other safety rating is required, a redundant safety device such as a fuse should be placed in series with the device. The UCC39161 will prevent the fuse from blowing virtually all fault conditions, increasing system reliability and reducing maintenance cost, in addition to providing the hot swap benefits of the device.