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UCC3831 PRELIMINARY

# Universal Serial Bus Power Controller

#### FEATURES

- Fully USB Compliant
- Support Four 5V Peripherals and One USB 3.3V Controller
- Separate Power Enables
- 500mA Current Limiting per Channel
- Separate Open Drain Fault
  Indicator for Each Channel
- 3.3V Output for USB Controller
- Available in 28 Pin Wide Surface Mount and DIP

#### DESCRIPTION

The UCC3831 Power Controller is designed to provide a self powered USB hub with a local 3.3V regulated voltage and four 5V regulated voltages for USB ports. Each of the 5V output ports is individually enabled for optimal port control. Each port also provides an overcurrent fault signal indicating that the port has exceeded a 500mA current limit. The 3.3V linear regulator is used to power the local USB microcontroller. This regulator is protected with a 100mA current limit and has a logic level enable input.

The UCC3831 can be configured to provide USB port power from a loosely regulated voltage such as a Filament voltage internal to a monitor. Pre-regulation is provided by an internal linear regulator controller and one external logic level N-channel MOSFET. The UCC3831 can also be configured without using the pre-regulator stage by connecting the VREG pins to a regulated 5.5V 2A source.

The UCC3831 comes in a 28-pin wide SOIC power package optimized for power dissipation, and is protected by internal over-temperature shutdown mechanism, which disables the outputs should the internal junction temperature exceed 150°C.



## UCC3831

#### ABSOLUTE MAXIMUM RATINGS

VFIL
VCON Supply Votage
Logic Inputs (ENA-D, ENHUB)
Maximum Forced Voltage
Maximum Forced Current
V33
Maximum Forced Voltage5V
Maximum Current 200mA
V5A-D
Maximum Voltage9V
Maximum Current
Storage Temperature65°C to +150°C
Junction Temperature55°C to +150°C
Lead Temperature (Soldering, 10 sec.)+300°C
Unless otherwise indicated, voltages are reference to ground.
Pulsed is defined as a less than 10% duty cycle with a maximum
duration of 500µS. Currents are positive into, negative out of the
specified terminal. All voltages are with respect to ground. Con-
sult Packaging Section of Databook for thermal limitations and
considerations of packages.

## **CONNECTION DIAGRAM**

SOIC-28 (Top View	v)	
DWP Package		
•	$\cup$	
DRIVE 1		28 N/C
OCA 2		27 000
ENA 3		26 ENC
V5A 4		25 V5C
VREG 5		24 VREG
V5B 6		23 V5D
GND* 7		22 GND*
GND* 8		21 GND*
GND* 9		20 GND*
OCB 10		19 OCD
ENB 11		18 END
V33 12		17 VREF
VHUB 13		16 VFIL
ENHUB 14		15 GATE
* DWP package pin 2	8 serves as signal a	ound: pins 7, 8. 9.
20, 21, 22 serve as h	eatsink/ground.	, - , -, <del>-</del> ,

**ELECTRICAL CHARACTERISTICS** Unless otherwise specified,  $T_J = 0^{\circ}C$  to 125°C for the UCC3831. VFIL = 6.5V, VHUB = 5V. TA = TJ.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Supply Currents					
VHUB Supply Current	No External Load on V33		1	3	mA
VFIL Supply Current			1	3	mA
Reference					
VREF Voltage	Over Temperature	2.35	2.5	2.65	V
Line Regulation	VHUB = 4.5V to 9V		3	10	mV
3.3V Regulator					
V33 Voltage	$T_J = 25^{\circ}C$ , $I_{LOAD} = 10mA$	3.2	3.3	3.4	V
	0mA to 100mA, 0°C to 125°C, VHUB = 4.5V to 9V	3.165	3.3	3.435	V
Short Circuit Current Limit	VHUB = 6V, Output shorted to Ground	100	120	150	mA
Pre-Regulator					
VREG Voltage	0A to 2A, 0°C to 125°C, VFIL = 6V to 9V	5.25	5.5	5.7	V
5V Regulator					
V5A-D Voltage	TJ = 25°C, ILOAD = 250mA, VREG = 5.5V	4.85	5	5.15	V
	0mA to 500mA, 0°C to 125°C	4.8	5	5.2	V
Short Circuit Current Limit	VREG = 5.5V, Output Shorted to Ground	500	600	750	mA
Charge Pump					
Quiescent Output Voltage	TJ = 25°C, VFIL = 6V, ENA-D = 5V, ENHUB = 5V	11	11.45	12	V
	0°C to 125°C, VFIL = 6V	10.5	11.45	12	V
Output Impedance			9	15	kΩ
Enable Inputs					
ENA-D Inputs - Guaranteed Low				0.7	V
ENA-D Inputs - Guaranteed High		3			V
Enable Inputs (cont.)					
ENHUB Input - Guaranteed Low				0.7	V

**ELECTRICAL CHARACTERISTICS** Unless otherwise specified, TJ = 0°C to 125°C for the UCC3831. VFIL = 6.5V, VHUB = 5V. TA = TJ.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS			
ENHUB Input - Guaranteed High		3			V			
Overcurrent Signals								
Active Sink Current	locx =100μA		140	500	mV			

#### **PIN DESCRIPTIONS**

**ENA-D:** Separate enables pins for each of the four 5V supplies.

**ENHUB:** Enables the 3.3V output V33. Pulling this pin low disables V33.

**GATE:** Gate drive for an external NMOS used to regulate the 5.5V VREG supply. Minimum available drive is 11V.

**GND:** All 6 GND pins must be tied to the system ground. In addition to serving as electrical conductors, these 6 pins are heat sinks. Refer to the Packaging Device Temperature Management guide in the Packaging section of the Unitrode Databook.

**OCA-D:** Open drain overcurrent indicator. OCA-D can be wire OR'ed by the user to create a single overcurrent indicator.

**V5A-D:** 5V regulated output with enable, 500mA (minimum) current limit, and overcurrent indicator. **V33:** 3.3V regulator output. Enable when ENHUB is high. Current limit is 100mA minimum.

**VDRIVE:** Internal charge pump voltage is brought out for external decoupling. Nominal voltage is between 11V and 13V. No external loading permitting. Decouple with at least  $0.001\mu$ F capacitor.

**VFIL:** Bias supply for all four of the 5V regulators. VFIL voltage must be between 6V and 9V.

**VHUB:** Supply for the 3.3V USB controller power supply and bandgap reference.

**VREF:** Internal 2.5V reference is brought out for external decoupling only. Decouple with 0.01µF capacitor.

**VREG:** Regulated to 5.5V by means of an external NMOS. 2 pins supply up to a total of 2.5A to the four 5V bus voltages (V5A, V5B, V5C, V5D).

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