

# 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 20 Pin DIP

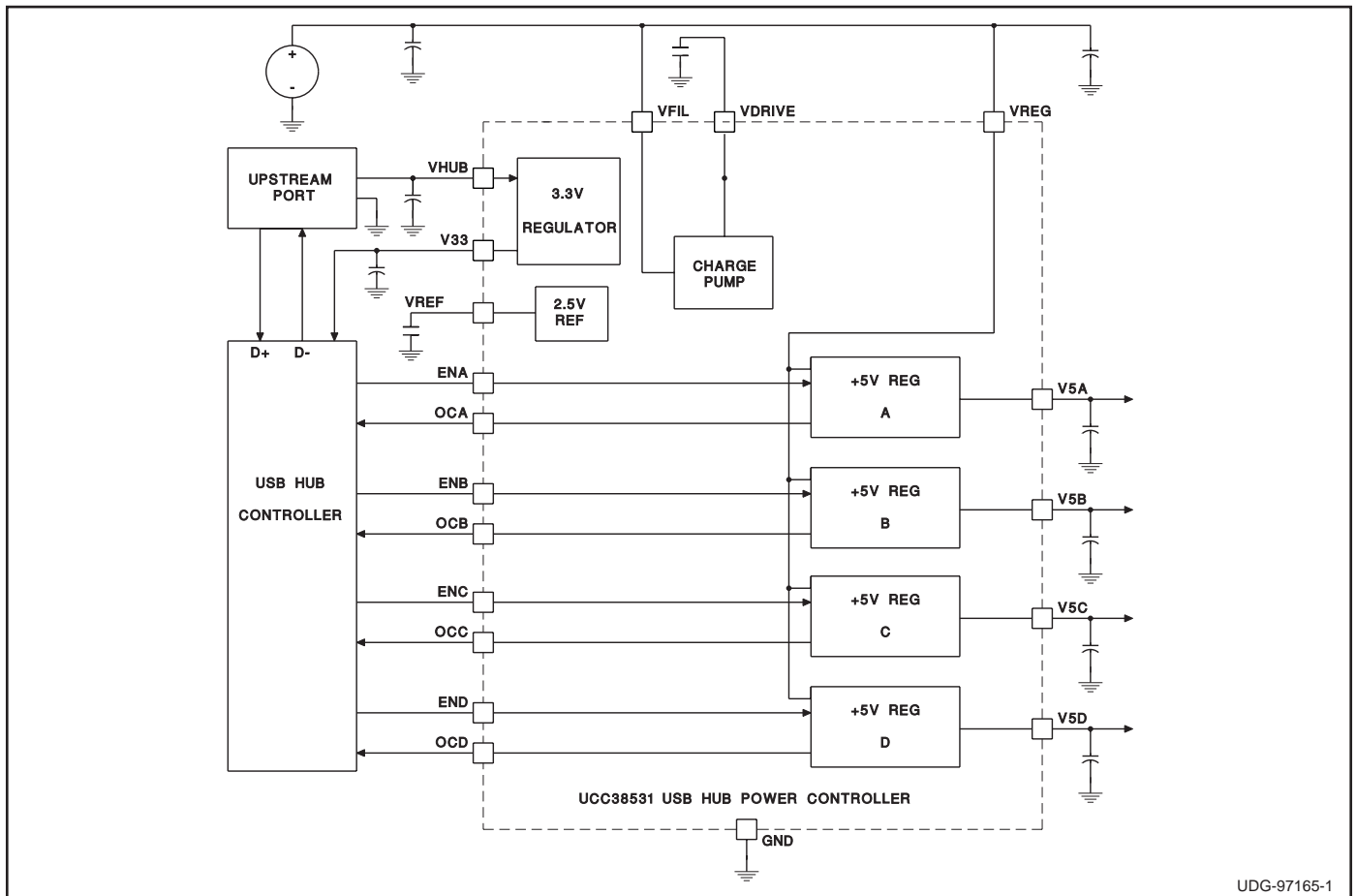
## DESCRIPTION

The UCC38531 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.

The UCC38531 is configured by connecting the VREG to a regulated 5.5V 2A source.

The 20-pin DIP package is protected by internal over-temperature shutdown mechanism, which disables the outputs should the internal junction temperature exceed 150°C.

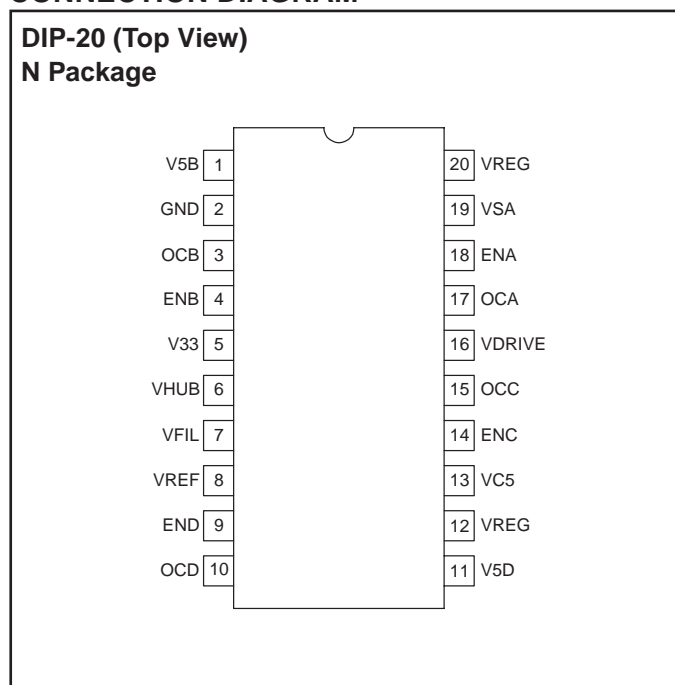
## APPLICATION AND BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS**

VFIL . . . . . 9V  
VCON Supply Voltage . . . . . 9V  
Logic Inputs (ENA-D)  
    Maximum Forced Voltage . . . . . -0.3V to 7V  
    Maximum Forced Current . . . . . ±1mA  
V33  
    Maximum Forced Voltage. . . . . 5V  
    Maximum Current . . . . . 200mA  
V5A-D  
    Maximum Voltage . . . . . 9V  
    Maximum Current . . . . . 750mA  
Storage Temperature . . . . . -65°C to +150°C  
Junction Temperature . . . . . -55°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**



**ELECTRICAL CHARACTERISTICS** Unless otherwise specified, T<sub>J</sub> = 0°C to 125°C for the UCC38531. VFIL = 6.5V, VHUB = 5V. T<sub>A</sub> = T<sub>J</sub>.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
<b>Input Supply Currents</b>					
VHUB Supply Current	No External Load on V33		1	3	mA
VFIL Supply Current			1	3	mA
<b>Reference</b>					
VREF Voltage	Over Temperature	2.35	2.5	2.65	V
Line Regulation	VHUB = 4.5V to 9V		3	10	mV
<b>3.3V Regulator</b>					
V33 Voltage	T <sub>J</sub> = 25°C, I <sub>LOAD</sub> = 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
<b>5V Regulator</b>					
V5A-D Voltage	T <sub>J</sub> = 25°C, I <sub>LOAD</sub> = 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
<b>Charge Pump</b>					
Quiescent Output Voltage	T <sub>J</sub> = 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
<b>Enable Inputs</b>					
ENA-D Inputs - Guaranteed Low				0.7	V
ENA-D Inputs - Guaranteed High		3			V
<b>Overcurrent Signals</b>					
Active Sink Current	I <sub>OCX</sub> = 100µA		140	500	mV

## PIN DESCRIPTIONS

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

**GND:** All voltages are measured with respect to this pin. Bypass capacitors should be connected to GND as close to this pin as possible.

**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. 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 0.01 $\mu$ F capacitor.

**VREG:** Input supply for all four 5V regulators. 2 pins supply up to a total of 2.5A to the four 5V bus voltages (V5A, V5B, V5C, V5D). Can be tied directly to VFIL.

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
UCC38531N	OBSOLETE	PDIP	N	20		TBD	Call TI	Call TI

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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