Product Description

The C200 Power Component is a customizable, high-output-current PWM Synchronous Buck, Voltage Mode Switching Regulator. Combine the C200 component with other Power Components to create a custom-defined, AnDAPT AmP on-demand power management device. The I200 Power Component includes the C200 Synchronous Buck and extends it with I2C communication for dynamic voltage scaling, and optional current telemetry.
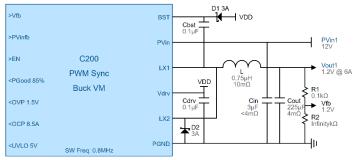
Features

- PWM, voltage mode, point-of-load (POL) regulator
- Maximum output current: Defined by selected device 1A=AmP8D1, 3A=AmP8D3, 6A=AmP8D6
- PV_{IN}: 3.0 to 13.2 V, V_{OUT}: 0.6V to 5.5V
- Adjustable output voltage with down to 2.4 mV resolution
- Integrated MOSFETs, $R_{DS(on)}$: 30mΩ
- 1% typical load regulation
- Efficiency up to 93%
- Internal single pole compensator minimizes external part count
- Adjustable switching frequency
- Additional capabilities – see I200, P200
- Adaptable stability, bandwidth, gain & phase margin
- Frequency synchronization: adjustable up to 2000 kHz
- Adjustable protection: Input Undervoltage Lockout, (ViUVLO), Ouput Undervoltage Lockout, (VoUVLO), Overcurrent (OCP), Overvoltage (OVP)
- Over Temperature Protection (OTP) (part of platform)
- Short-circuit protection (SCP)
- Power-good flag output and Enable input
- Soft start/stop, sequencing, pre-bias startup
- –40°C to +125°C operating junction temperature
- Two SIM elements; integrate up to four C200 Power Components in one AmP Platform
- Included free with WebAmP™ development tool

Applications

- On-demand power management, multi-rail power integration
- Powering server, processor, memory, storage, network switcher and router platforms
- FPGA, processor, SSD, subsystem power control & sequencing

Product Detail

The C200 Synchronous Buck Regulator includes integrated MOSFETs, customizable PWM controller and various protection circuits.

The integrated, low-resistance switching Scalable Integrated MOSFETs (SIM) provide up to 6A output current. The maximum current is defined by the AmP device selected.

Output voltage feedback is compared against an internal reference using a high-performance, voltage-error digitizer that provides tight voltage regulation accuracy under transient conditions. Pulse-width modulated (PWM), voltage-mode regulation is implemented with PID compensation. The switching frequency is either generated internally via an oscillator with selectable frequencies or provided via an external pin.

The customizable output voltage is specified by the power engineer during customization using AnDAPT's cloud-based WebAmp development software. The C200 component has customizable control and status pins including enable input, an optional power-good output, and optional output flags to signal when the system triggers an overvoltage (OVP), overcurrent (OCP), or undervoltage lockout (UVLO) condition. The threshold values are specified by the power engineer using the WebAmp tool.

The customizable soft-start and soft-stop slew rates are also specified by the power engineer using the WebAmp tool. Additional sequencing options are available when used in conjunction with the C410 customizable Sequencer, by interconnecting signals EN and PGood to provide customizable dependencies and customizable delays between each sequence step.

Figure 1: C200 application schematic

Customizable Options

Table 1 lists the various customizable options available for the C200 Power Component. These options are set graphically in the WebAmp development software.

Table 1: C200 Customizable Options

Option	Units
Switching frequency	MHz
Input voltage*	V
Output voltage	V
Ripple, % of output voltage*	%
Overshoot, output voltage*	V
Output Current	A
Ripple, % of maximum output current*	%
Output Current Delta*	A
utput UVLO voltage	V
LC Component Manual/Auto select	On/Off
Inductor	µH
Inductor DCR	mΩ
Capacitor	µF
Capacitor ESR	mΩ
PID regulation coefficients (K_P, K_I, K_D)	
Enable OCP output to signal when overcurrent protection is triggered	On/Off
Overcurrent protection level (Read only)	A
Enable OVP output to signal when overvoltage protection is triggered	On/Off
Overvoltage protection level	V
Enable input UVLO to signal when undervoltage lockout protection is triggered	On/Off
Undervoltage lockout sense level	V
UVLO sense	Ext/Int
Soft start rise time after enable	ms
Use optional PGood output to signal "power good"	On/Off
"Power good" threshold, percentage of output	%

* to generate passive component recommendations

Advanced Capabilities and Options

Table 2 lists derivatives of the C200 component with additional capabilities plus other similar components potentially suitable for this application.

Table 2: C200 Advanced Capabilities Options

Description	Part Number
Standard Pro Series version (this component)	C200
Add I^{2}C bus interface for telemetry and dynamic output voltage specification	I200
Add telemetry and dynamic voltage scaling via DVS interface	P200
Single-phase buck regulator, asynchronous, PWM, voltage mode regulation	C250

System Characteristics

Table 3 lists the system characteristics for the C200 Power Component when implemented in an AnDAPT AmP device. "Prog" column specifies parameters that are user selectable.

Table 3: C200 System Characteristics

Parameters		Min	Typ	Max	Units	Prog
Input Drain Voltage (PV_{IN})		3		13.2	V	
Output Voltage (V_{OUT})		0.6		5.5	V	√
Output Current (I_{OUT})	D6			6	A	√
	D3			3		
	D1			1		
Switching frequency (F_{SW})				2	MHz	√
Switching frequency accuracy		-5		+5	%	
Output MOSFET switch ($R_{DS(on)}$)			30		mΩ	
Voltage Regulation			1*		%/V	
Peak efficiency (V_{IN}=5V, V_{OUT}=3.3V, F_{SW}=500kHz)			95		%	
Current Limit – OCP		0.2		8.5	A	
Overvoltage protection trip point range (OVP)				8.5	V	
Undervoltage lockout threshold range (Vout UVLO)				5.3	V	√

*1% regulation tolerance requires no voltage divider feedback.

For other device specifications, see the AnDAPT AmP Platform datasheet.