PWM Async Boost, Current Mode

Power Component: C351_B

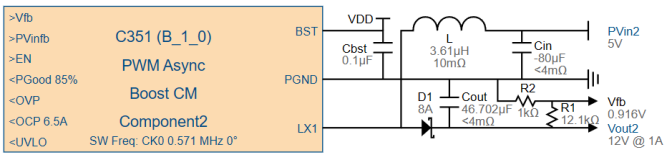
Product Description

The C351_B Power Component is a customizable, PWM Asynchronous Boost, Current Mode Switching Regulator. Combine the C351_B component with other Power Components to create a custom-defined, AnDAPT AmP on-demand power management integrated circuit (PMIC).

Features

- PWM, Current Mode, point-of-load (POL) regulator
- Maximum output current: 6A
- PV_{IN}: 3 to 14V, V_{OUT}: 3V to 12V
- Adjustable output voltage with down to 2.5 mV resolution
- Adjustable V_{OUT} soft start time from 1ms to 16ms
- Adjustable Power-good threshold.
- Adjustable protection:, Output Undervoltage Lockout, (VoUVLO), Overcurrent (OCP), Overvoltage (OVP)
- Integrated MOSFETs, $R_{DS(on)}$: 30mΩ
- 1% load regulation
- Efficiency up to 85%
- Internal compensator minimizes external part count
- Adjustable switching frequency from 500 kHz to 1 MHz
- Adaptable compensation, bandwidth, gain & phase margin
- Over Temperature Protection (OTP) (part of platform)
- Short-circuit protection (SCP)
- Soft start/stop, sequencing, pre-bias startup
- –40°C to +125°C operating junction temperature
- One SIM element; integrate up to eight C351_B Power Components in one AmP Platform

Figure 1: C351_B application schematic



Applications

- Backup supply from battery / super capacitor.
- Powering motors, speakers, server, network switcher and router platforms

Product Detail

The C351_B Asynchronous Boost Regulator includes an integrated MOSFET, customizable PWM controller and various protection circuits.

The integrated, low-resistance switching Scalable Integrated MOSFET-(SIM) provides up to 6A output current. 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. MOSFET current is sensed through an internal current mirror and compared with a current reference using digital compensation. The switching frequency is either generated internally via an oscillator with selectable frequencies or provided via an external pin.

The output voltage is specified by the power engineer during customization using AnDAPT's cloud-based WebAmp development software. The C351_B component has customizable control and status pins including enable input, power-good output, PVinLow output and optional output flags to signal when the system triggers an overvoltage (OVP), overcurrent (OCP), or input undervoltage lockout (ViUVLO) condition. The threshold values are specified by the power engineer using the WebAmp tool.

Recommended Operating Conditions

over operating free-air temperature range

Symbol	Parameter	Min	Typ	Max	Unit
PV_{IN}	Power Input Voltage	2.0		13.2	V
I_{OUT}	I_{OUT} Output Current Maximum			6	A

Electrical Characteristics

Parameters	Test Conditions	Min	Typ	Max	Units
Output Voltage (V_{OUT})		2.5		13.2	V
Voltage Regulation	Including load line and temperature variation	-1		+1	%
Switching frequency (F_{SW})		500		1000	kHz
Switching frequency accuracy		-5		+5	%
MOSFET switch on-resistance ($R_{DS(on)}$)			30		mΩ
Input Shutdown current (V_{IN})	EN = Low		3.1		mA
Input Shutdown current (PV_{IN})			0.1		mA
Input Quiescent current (V_{IN})	EN = High, I_{OUT} = 0A, Fsw = 571 kHz V_{OUT} = 5V		3.8		mA
Input Quiescent current (PV_{IN})			3.3		mA
PROTECTION					
Power Good threshold (relative to Vout Setting)		75		100	%
OCP, Over Current Protection (% I_{OUT})			140		%
OTP, Over Temperature Protection	Shutdown (Power Good goes low) Hysteresis	125			°C
OVP, Overvoltage Protection trip point range (relative to Vfb Setting)**		+100		+320	mV
VoUVLO, output Undervoltage Lockout threshold range (relative to Vfb Setting)**		-100		-320	mV

* Parameters shaded in green are user customizable as set in WebAmP development software
** Vfb is equal to Vout multiplied by the feedback resistor divider ratio, R2/(R1+R2)

Protection Features

As shown in Figure 2 the C351_B provides many protection features including VoUVLO, OVP, OCP and OTP.

Output Under Voltage (VoUVLO)

The output Under Voltage Protection, VoUVLO, indicates the output voltage status. VoUVLO goes high when the regulator output is lower than the specified Parameter Setting. VoUVLO goes low when the output voltage is above the specified Parameter Setting. On detection of VoUVLO, the regulator will power down and PGOOD will go low. On VoUVLO returning low, an EN cycling low-to-high, will restart the device with a new Soft Start cycle.

Over Voltage Protection

The Over Voltage Protection, OVP, of the regulator indicates the output voltage status. OVP is high when the regulator output is above specified Parameter Setting. OVP is low when the output is less than the specified Parameter Setting. On detection of OVP, a regulator will skip Hi-side switch pulses until the fault condition is not present.

Over Current Protection

The Over Current Protection, OCP, of the regulator indicates the over current status. When the Output Current, $I_{OUT,}$ of the regulator is greater than 142% of the Output Current setting, the regulator will limit the Hi-side switch pulse width and OCP will go high. As Vout will then decrease, VoUVLO may go high with resulting in the regulator powering down and PGood going low. In that case, an EN cycling low-to-high, will restart the device with a new Soft Start cycle.

OTP

Thermal shutdown is provided to protect the regulator from excessive junction temperature. When the junction temperature reaches 125°C the device shuts down. On detection of OTP, the C351_B will power down and PGood will go low. On OTP returning low, an EN cycling low-to-high, will restart the C351_B with a new Soft Start cycle.

Port Name Table

Port Name	I/O	Description
Vfb	input	Vout feedback
EN	input	Enable
PGOOD	output	Power Good
OVP	output	Over Voltage Protection
OCP	output	Over Current Protection
UVLO	output	Input Under Voltage Lockout
BST_refresh	output	Boost refresh
BST	input	Boost
PGND	input	Power Voltage Ground
LX	output	Switch

Additional Resources

- AnDAPT AmP Platform B datasheet

Revision History

Date	Revision
06/04/2025	First preliminary release

AnDAPT

On-Demand Power Management

www.AnDAPT.com

Trademarks