

RCB010

Voltage Regulator Module (VRM) for PowerPC™ Processors

Features

- 5-bit digital input selects output voltage
- Programmable 1.3V to 3.5V output from 5V supply
- Maximum output current 8A
- Efficiency > 80%
- Total output accuracy within $\pm 3\%$
- Short circuit protection
- Excellent transient response
- Output voltage set by CPU or preset on VRM.

Applications

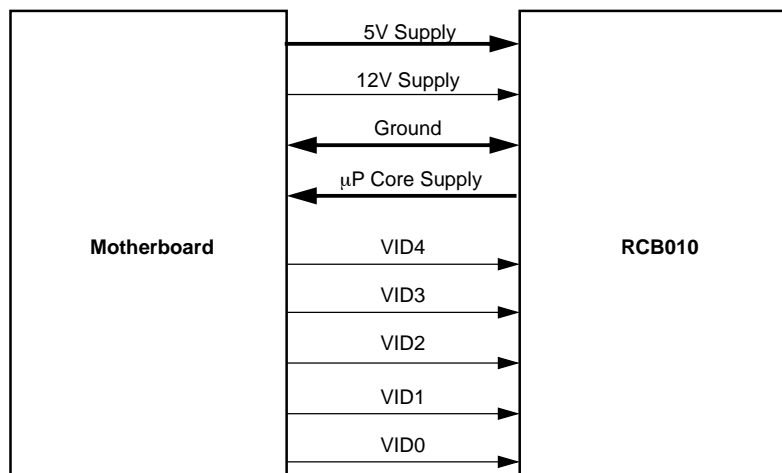
- VRM module for PowerPC motherboards
- Programmable power supply module

Description

The RCB010 is a programmable DC-DC Voltage Regulator Module designed to deliver the selectable processor core voltage required by the PowerPC microprocessors. This VRM offers flexibility to board designers to support PowerPC processors with a modular add-in power supply. The RCB010 takes full advantage of a proprietary Fairchild programmable DC-DC controller IC. This IC integrates a 5-bit DAC for automatic output programmability without the need for external precision resistors. The result is a VRM with a minimum number of components that achieves high reliability at a competitive cost.

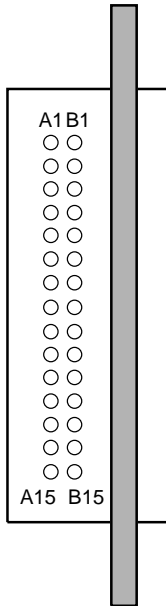
The RCB010 provides an extremely well regulated selectable output voltage from 1.3V to 3.5V. Output voltage selection is accomplished through a 5-bit interface between the processor and the module connector. Other features include high efficiency, short circuit protection, and low package weight.

Block Diagram



Pin Orientation — Top View

(Socket: AMPMOD2 532956-5 or equivalent)



RCB010 Pin Definitions

Pin #	Row A	Row B
1	GND	GND
2	GND	GND
3	3.3V ¹	3.3V ¹
4	3.3V ¹	3.3V ¹
5	5V	5V
6	5V	5V
7	VID4	VID2
8	VID3	VID1
9	VID0	12V
10	GND	GND
11	GND	GND
12	NC*	NC*
13	VOUT	VOUT
14	VOUT	VOUT
15	VOUT	VOUT

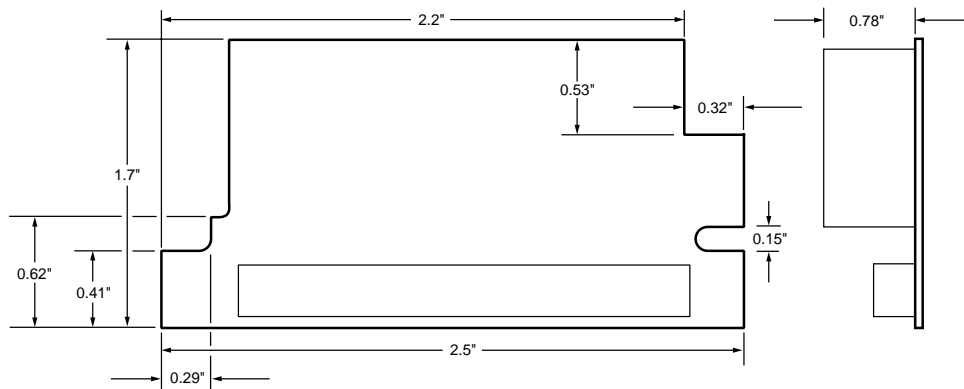
Note:

1. Not used on module; no current is drawn.

VRM Connector Pin Reference

Pin Description	Input/ Output	Function
5V	I	Supply voltage to support power to the CPU.
3.3V	I	Alternate supply voltage to support CPU. These pins are not used on this module, but are reserved for possible later use.
12V	I	Supply voltage for MOSFET drivers.
VID0 to VID4 (Voltage Identification) Open collector TTL inputs	I	These five signals are used to indicate the voltage required by the processor. The output can be programmed from 1.3V to 3.5V by setting the VID pins according to the Output Voltage Programming Codes table.
VOUT	O	Module output voltage.
GND	I, O	Ground Reference.

Mechanical Dimensions (Inches)



Electrical Specifications

($V_{IN} = +5V$, $T_A = 0^{\circ}C$ to $60^{\circ}C$ unless otherwise specified.)

Parameter	Test Conditions	Min.	Typ.	Max.	Units
Input Specifications					
Main supply voltage, 5V	Steady State	4.75	5	5.25	V
	100 msec maximum			6.5	
MOSFET supply voltage, 12V	Steady State	11.4	12	12.6	V
	100 msec maximum			18	
Output Specifications					
Output Voltage Range, V_{OUT}	See Output Programming Codes	1.3		3.5	V
DC Output Current, I_{OUT}		0	5	8	A
Set Point Accuracy ¹	$I_{LOAD} = 2A$, $T_A = 25^{\circ}C$		± 1.0		%
Load Regulation	$I_{LOAD} = 0.5A$ to $7A$		± 30		mV
Line Regulation	$V_{IN} = 5.0 \pm 0.25 V$		± 3	± 5	mV
Output Temperature Drift			20		ppm/ $^{\circ}C$
Load Transient (See Figure 1) ³	$I_{LOAD} = 0.5A$ to $6A$, $20A/sec$		10	20	mV
Step Recovery Time ³	$I_{LOAD} = 0.5A$ to $6A$			100	μsec
Output Ripple ³	$I_{LOAD} = 6A$		20	25	mV _{p-p}
Cumulative Accuracy ²			± 2	± 3	%
Efficiency	$I_{LOAD} = 8A$, $V_{OUT} = 1.8V$	75	79		%
	$I_{LOAD} = 8A$, $V_{OUT} = 2.8V$	80	82		%
General Specifications					
Switching Frequency			300		KHz
Short Circuit Protection		8	9	13	A

Notes:

1. Set Point Accuracy is defined as the static accuracy of the output voltage at 2A.
2. Cumulative Accuracy includes Set Point Accuracy, Output Temperature Drift, Line and Load Regulation.
3. Test fixture includes 3 x 100 μF Tantalum capacitors (ESR < 100m Ω) and 48 x 1 μF from output to GND at the CPU socket.

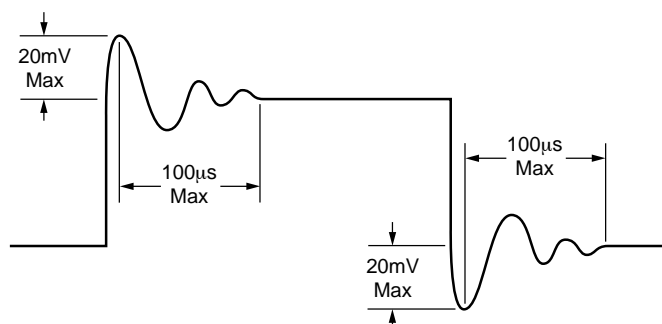


Figure 1. Load Transient

Output Voltage Programming Codes

VID4	VID3	VID2	VID1	VID0	Vout to CPU
0	1	1	1	1	1.30V
0	1	1	1	0	1.35V
0	1	1	0	1	1.40V
0	1	1	0	0	1.45V
0	1	0	1	1	1.50V
0	1	0	1	0	1.55V
0	1	0	0	1	1.60V
0	1	0	0	0	1.65V
0	0	1	1	1	1.70V
0	0	1	1	0	1.75V
0	0	1	0	1	1.80V
0	0	1	0	0	1.85V
0	0	0	1	1	1.90V
0	0	0	1	0	1.95V
0	0	0	0	1	2.00V
0	0	0	0	0	2.05V

VID4	VID3	VID2	VID1	VID0	Vout to CPU
1	1	1	1	1	2.0V
1	1	1	1	0	2.1V
1	1	1	0	1	2.2V
1	1	1	0	0	2.3V
1	1	0	1	1	2.4V
1	1	0	1	0	2.5V
1	1	0	0	1	2.6V
1	1	0	0	0	2.7V
1	0	1	1	1	2.8V
1	0	1	1	0	2.9V
1	0	1	0	1	3.0V
1	0	1	0	0	3.1V
1	0	0	1	1	3.2V
1	0	0	1	0	3.3V
1	0	0	0	1	3.4V
1	0	0	0	0	3.5V

Note:

- 0 = processor pin is tied to GND
1 = processor pin is open

Ordering Information

Part Number	Input	Output Current
RCB010	5V DC	8A

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