API5VR19 11.4Vdc~12.6Vdc Input 1.400Vdc/100A Output AMD64 Opteron™ Universal CPU Power Supply Module

FEATURES AND BENEFITS

- Small footprint solution.
- 100A application with ultra low profile.
- Typical efficiency greater than 80% maximizes the available power budget for your system.
- Proprietary control supports > 50A/us step load transient response.
- Soft-start, current limiting under-voltage lockout and short circuit protection features included.
- Output Enable pin available.
- SMBus for power manager.

OPERATION

The module is a high-frequency step-down switching regulator module optimized for applications requiring small size, high efficiency, and low output voltages. The following sections describe specific features of the module in greater detail.

APPLICATIONS

- CPU Power: AMD Opteron™ 64. 754-, 939- and 940- pin package.
- DSP Power Supplies
- Graphics Cards
- FPGAs
- Telecom Line Cards
- Datacom Equipment
- Broadband Communications ASICs
- General Purpose Point of Load Regulation

GENERAL DESCRIPTION

The AcBel 100A single output module is a new non-isolated high performance DC/DC converter designed to power advanced DSPs. This module provides a compact, highly efficient, fast, accurate, and reliable power delivery module for emerging low-output voltage applications.

SPECIFICATIONS

Specification at 25 ℃, unless otherwise noted.

Symbol	Parameter	Condition	Min	Typ	Max	Units
Vin	Input Voltage Range		11.4	12	12.6	V
Iin	Input Current Range	VID1.400V/100A (140Watts)		13.5		A
VDD	Output VID Code Range	5-bit VID code	0.800	1.400	1.550	V
	Output Ripple and Noise	IDD= 0A~100A			50	mV
△VDD	Line Regulation	Vin change to VDD change		2		mV
	Load Regulation	VDD_dc (IDD= 0A ~ 100A)	VDD-50		VDD+50	mV
		VDD_ac	VDD-100		VDD+100	
		Output Load Transient: 50A /step				
SRout	Output Current Slew Rate	Based on Cin and Cout		±50		A/uS
SRin	Input Current Slew Rate	Based on Cin and Cout			±1	A/uS
IDD	Maximum Output Current	Output Total Power =140Watts			100	A
OCP	Over-Current Protection				150	A
Eff	Efficiency	VID=1.400V IDD=100A	80			%
Top	Operating Temperature Range	VID1.400V/100A (140Watts) Airflow = 400LFM	0		50	℃
Cin	Input Capacitance	270uF *2 OS-CON		540		u F
Cout	Output Capacitance (13332.9uF)	4.7uF*7(MLCC)+ 1000uF*10(KEMET-KM)+ 3300uF*1 (SANYO-WG)	13332.9		23332.9	u F
ENABLE	Output Enable (Open collect type)	VRM Enable	0.8	3.3	5	V
		VRM Disable	0		0.4	

Symbol	Parameter	Condition	Min	Typ	Max	Units
PWRGD	Power Good (Open collect type)	Maximum Voltage	0		3.3	V
OVP	Output Over Voltage Protection (Latch Off)				2.2	V
SMBus	Communication with Processor	Advanced monitoring and control capabilities				
Tst	Storage Temperature range		0		130	℃
Weight				71		g
Size		L * W * T	93.34 * 43.84 * 22.1			mm

SMBus INTERFACE SUMMARY

Register Address (Command Code)	Name	Read/Write	Units	Description
00010001 to 00010010	Average Output Current	Read	N/A	Number representing the average system output current.
00010100 to 00010101	Maximum Output Current	Read	N/A	Number representing the maximum system output current based on current configuration.
00010111	Controller Junction Temperature	Read	1°C	Master controller junction temperature.
00011100	VID settings	Read	N/A	VID code settings.
00011010	Controller ID	Read	N/A	Controller ID number.

SMBus INFORMATION

Average Output Current

Byte 1 (Command Code 00010001)

B7	B6	B5	B4	B3	B2	B1	B0
0	0	0	0	Data Read	0	0	0

Byte 2 (Command Code 00010010)

B7	B6	B5	B4	B3	B2	B1	B0
0	IAVG 5	IAVG 4	IAVG 3	IAVG 2	IAVG 1	IAVG 0	0

An unsigned number representing the average output current during a 16ms interval is read form register addresses 00010001 through 00010010 (2 bytes).

The “data read” bit indicates whether this value has been read since it was last updated. A ’1’ indicates the value has been read since the last update; a ‘0’ indicates that it has not been read.

Maximum Output Current							
Byte 1 (Command Code 00010100)							
B7	B6	B5	B4	B3	B2	B1	B0
0	0	0	0	0	0	0	0
Byte 2 (Command Code 00010101)							
B7	B6	B5	B4	B3	B2	B1	B0
0	IMAX 5	IMAX 4	IMAX 3	IMAX 2	IMAX 1	IMAX 0	0

An unsigned number representing the maximum output current is read from register addresses 00010100 through 00010101 (2 bytes). This number, represents the maximum regulator output current, based on system configuration.

Controller Junction Temperature							
Byte (Command Code 00010111)							
B7	B6	B5	B4	B3	B2	B1	B0
TEMP 7	TEMP 6	TEMP 5	TEMP 4	TEMP 3	TEMP 2	TEMP 1	TEMP 0

The controller junction temperature value is read form register address 00010111. The result is a two's complement representation of the die temperature (in degrees Celsius).
When byte_en[0] is set high outputs temperature. Otherwise, output all 0's.

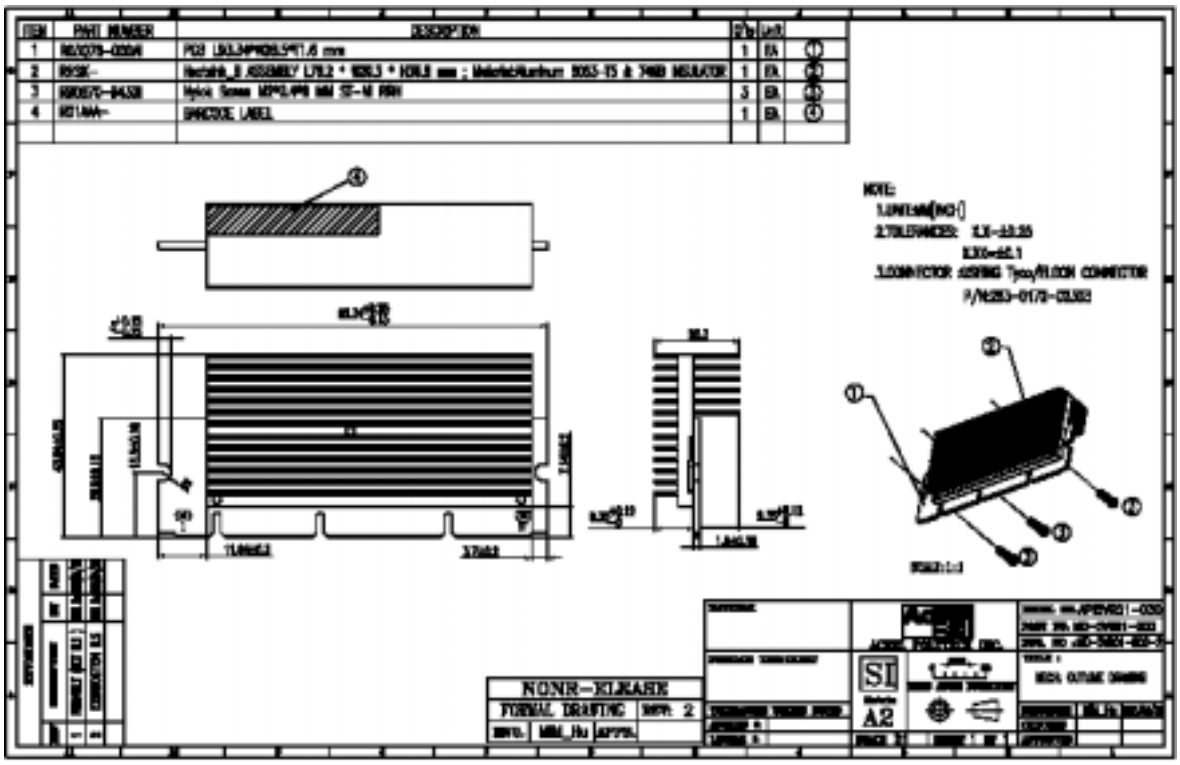
VID Code Settings							
Byte (Command Code 00011100)							
B7	B6	B5	B4	B3	B2	B1	B0
0	0	VID5	VID4	VID3	VID2	VID1	VID0

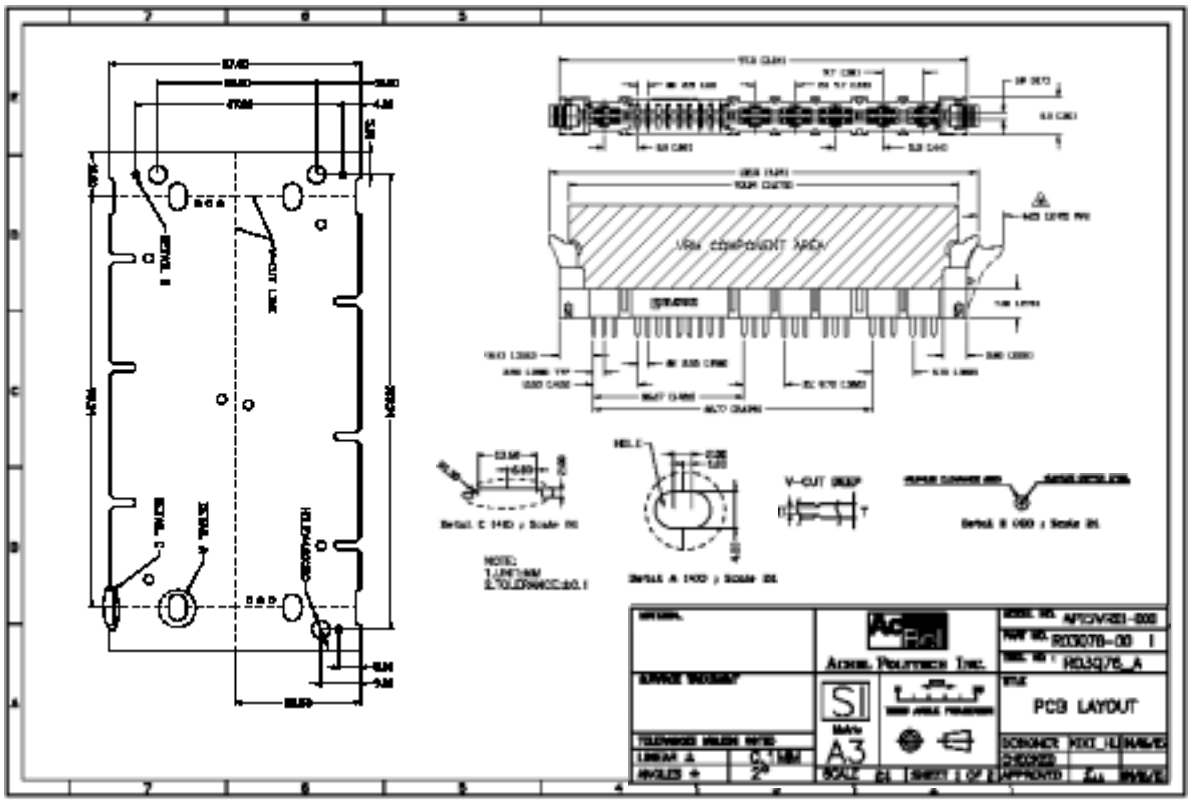
VID code settings are read form register address 00011100.

Controller ID							
Byte (Command Code 00011010)							
B7	B6	B5	B4	B3	B2	B1	B0
ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0

The controller ID is read form register address 00011010.

MECHANICAL DRAWING





VRM PIN ASSIGNMENT

Pin No.	Signal	Pin No.	Signal
1	GND	54	+12 VIN
2	GND	53	+12 VIN
3	GND	52	+12 VIN
4	VID4	51	VID3
5	VID2	50	VID1
6	VID0	49	Reserved
7	COREFB_H	48	COREFB_L
8	PWRGD	47	CBOUT
9	Enable	46	ADD_0
10	SmDA	45	ADD_1
11	SmCL	44	VRMPRES_L
12	SGND	43	+5V_ALWAYS
13	VDD	42	VDD
14	VDD	41	VDD
15	VDD	40	VDD
16	GND	39	GND
17	GND	38	GND
18	GND	37	GND
19	VDD	36	VDD
20	VDD	35	VDD
21	VDD	34	VDD
22	VDD	33	VDD
23	VDD	32	VDD
24	VDD	31	VDD
25	GND	30	GND
26	GND	29	GND
27	GND	28	GND

VRM SIGNAL NAME DEFINITIONS

+12 VIN (Pin:52~54)

VRM power input. These pins connect directly to the input power supply source.

GND (Pin:1~3, 16~18, 25~30, 37~39)

VRM and mother board common ground. Input and Output ground.

VID0, 1, 2, 3, 4 (Pin:6, 50, 5, 51, 4)

Voltage Identification input pins. These pins are used to program the VRM output voltage. Voltage programming is achieved by pulling these pins LOW or HIGH. Detail VID table see the Table 1.

COREFB_H (Pin:7)

Positive processor core remote voltage sense input.

COREFB_L (Pin:48)

Negative processor core remote voltage sense input.

PWRGD (Pin:8)

VDD Power Good signal (active High).

Enable (Pin:9)

The Enable Pin is used to enable or disable the output voltage. Standard TTL levels, active High.

SmDA (Pin:10)

This pin provides an SMBus data signal connection to the VRM. An external R_{SD} pull-up resistor is required for proper SMBus operation.

SmCL (Pin:11)

SMBus serial clock pin. It provides SMBus clock connection to the VRM. An external R_{SC} pull-up resistor is required for proper SMBus operation.

SGND (Pin:12)

Signal ground for sensitive analog reference.

VDD (Pin:13~15, 19~24, 31~36, 40~42)

Output voltage supply.

+5V_ ALWAYS (Pin:43)

+5V_ALWAYS source for Auxiliary and SMBus power (150mA maximum).

VRMPRES_L (Pin:44)

VRM presence pin (active Low).

ADD0, 1 Reserved (Pin:46, 45, 49)

SMBus address select ADD_0 through ADD_1. These ADD_0, ADD_1 and Reserved pins are unused.

CB_OUT (Pin:47)

Crowbar Output Signal. This is used to terminate the input power provided by the silver box. This signal remains high until the over-voltage even terminates.

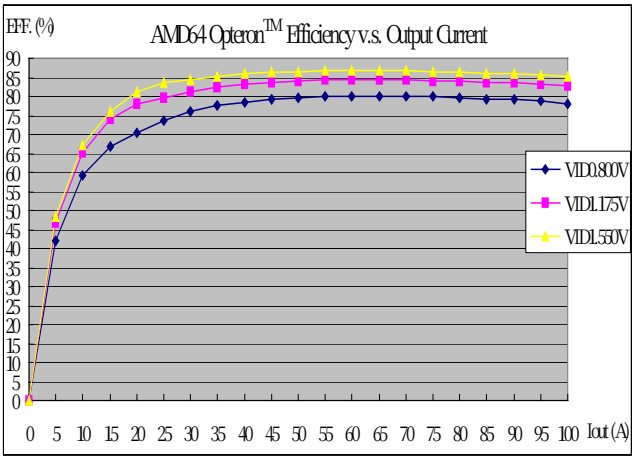
TYPICAL CHARACTERISTICS

Table 1. Five-Bit Voltage Identification (VID) Codes.

VID Pins (0=Low, 1=High)					VID Voltage (V)	VID Pins (0=Low, 1=High)					VID Voltage (V)
VID4	VID3	VID2	VID1	VID0		VID4	VID3	VID2	VID1	VID0	
1	1	1	1	1	OFF	0	1	1	1	1	1.175
1	1	1	1	0	0.800	0	1	1	1	0	1.200
1	1	1	0	1	0.825	0	1	1	0	1	1.225
1	1	1	0	0	0.850	0	1	1	0	0	1.250
1	1	0	1	1	0.875	0	1	0	1	1	1.275
1	1	0	1	0	0.900	0	1	0	1	0	1.300
1	1	0	0	1	0.925	0	1	0	0	1	1.325
1	1	0	0	0	0.950	0	1	0	0	0	1.350
1	0	1	1	1	0.975	0	0	1	1	1	1.375
1	0	1	1	0	1.000	0	0	1	1	0	1.400
1	0	1	0	1	1.025	0	0	1	0	1	1.425
1	0	1	0	0	1.050	0	0	1	0	0	1.450
1	0	0	1	1	1.075	0	0	0	1	1	1.475
1	0	0	1	0	1.100	0	0	0	1	0	1.500
1	0	0	0	1	1.125	0	0	0	0	1	1.525
1	0	0	0	0	1.150	0	0	0	0	0	1.550

TYPICAL PERFORMANCE CURVE

Figure 1

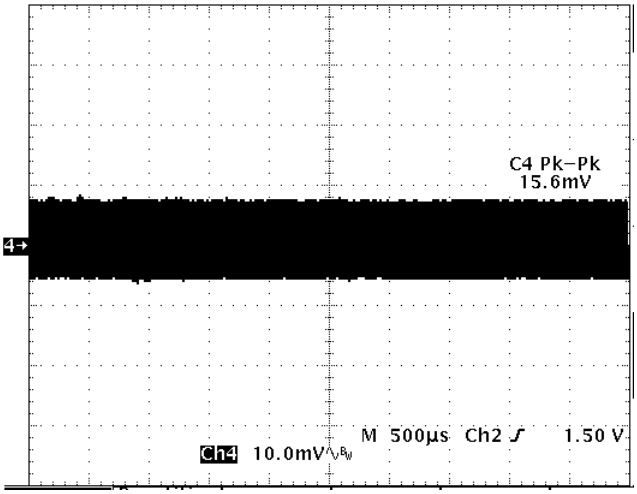


Efficiency (%) V.S Output Current (A)

VID0.800V, VID1.175V, VID1.550V

IDD= 0A ~ 100A

Figure 2

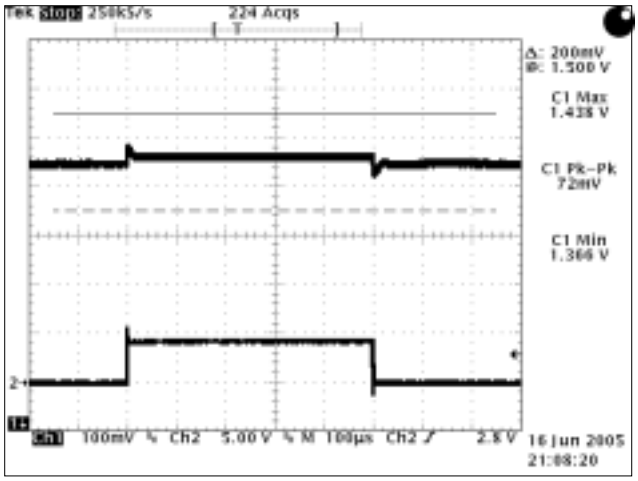


Output Ripple & Noise

VID=1.400V, Iout= 0A ~ 100A

Output Capacitance: 13332.9uF

Figure 3



Output Dynamic

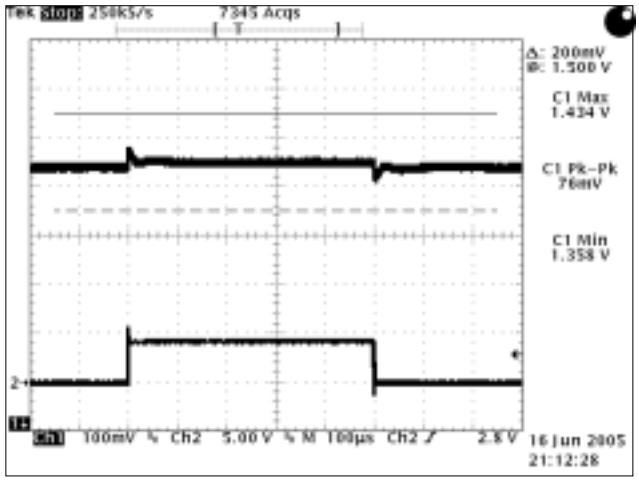
VID=1.400V , IDD= 15A ~ 65A ~ 15A

Frequency =1KHz

Output Current Slew Rate =96A/uS

Output Capacitance: 13332.9uF

Figure 4



Output Dynamic

VID=1.400V , IDD= 50A ~ 100A ~ 50A

Frequency =1KHz

Output Current Slew Rate =96A/uS

Output Capacitance: 13332.9uF