NON-ISOLATED DC/DC CONVERTERS

12V Input / Programmable Output / VRM11 Compatible

GRND-40A160 Rev. B

- High efficiency means less power dissipation
- Remote on/off
- Wide input range (10.8 – 13.2V)
- I2C/SMbus available – consult factory
- 2-Wire Remote sense
- 7 bit VID digital voltage programming.

Description

The GRND-40A Series is a non-isolated step down DC/DC converter providing up to 45A of output current and designed to be compatible with the Intel VRM11 requirements. Standard features include remote on/off, over current protection, remote sense, VR_Fan signal, VR_Hot signal and a power good signal. This product also makes use of adaptive positioning to improve transient response performance. These products may be used almost anywhere low-voltage silicon is being employed and a nominal 12V source is available. Typical applications include file servers, work stations and other computing applications.

Part Selection

Output Voltage	Input Voltage	Output Current (Thermal Design)	Output Current (Peak Current)	Typical Efficiency	Model Number
0.82 – 1.60V	12V	35A	45A	85%	GRND-40A160

Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Range	10.8 VDC		13.2 VDC	
Input Current (disabled)		17mA		
Input Current (full load)			8.0A	
Reflected Ripple Current			400mA rms	With 2 330uF, 25mOhm capacitor and 200nH of input inductance.

Output Specifications

Parameter	Min	Typ	Max	Notes
Output Current	0A		35A 45A	Thermal design Peak current rating
Set Point Accuracy	1.27V	1.28V	1.29V	no load, excluding Adaptive positioning, VRM11 VID 0x32
Adaptive Positioning (Droop Impedance)		1.25 mOhm		
Ripple and Noise		20mV		pk-pk, 0 to 20MHz Bandwidth Full load. Note 3
Turn on Time		15mS	30mS	
Transient Response Deviation Settling Time		 TBD TBD		di/dt = 5A/uS Load step =50% of max load.
Remote Sense Compensation			±0.3VDC	
Output Capacitance	See note	1,400uF	See note	Consult factory regarding external capacitance outside of this range

NON-ISOLATED DC/DC CONVERTERS

10.3 –13.2V Input / Programmable Output / 90A VRM11

General Specifications

Parameter	Specification
Switching Frequency	TBD MHz typical (fixed)
Dimensions inches mm	 3.8 x 1.055 x 0.393 96.5 x 26.8 x 9.98
Weight	TBD
Operating Temperature	0°C to 65°C
Non-Operating Temperature	-40°C to 100°C
Protection Features Over current Undervoltage	 110% to 170% max Io UVLO Vin < 10.0V
Remote On/Off	Active High
Efficiency (full load) 1.3V output 35A load	 85%

Pin Connections

	Row A		Row B
Pin	Function	Pin	Function
1	PWRGD	164	VBIAS
2	Reserved	163	Reserved
3	OUTEN	162	LL0
4	LL1	161	VID6
5	VID5	160	VID4
6	VID3	159	VID2
7	VID1	158	VID0
8	Reserved	157	LPL
9	+SENSE	156	-SENSE
10	Reserved	155	VIDSEL
11	VR_HOT	154	VRM_PRES
12	IMON	153	Reserved
	Key		Key
13-16	VIN	149-152	VIN
17-20	GND	145-148	GND
21-24	VOUT	141-144	VOUT
25-26	GND	139-140	GND
27-30	VOUT	135-138	VOUT
31-34	GND	131-134	GND
35-38	VOUT	127-130	VOUT
39-42	GND	123-126	GND
43-46	VOUT	119-122	VOUT
47-48	GND	117-118	GND
49-52	VOUT	113-116	VOUT
53-56	GND	109-112	GND
57-60	VOUT	105-108	VOUT
61-64	GND	101-104	GND
65-68	VOUT	97-100	VOUT
69-70	GND	95-96	GND
71-74	VOUT	91-94	VOUT
75-78	GND	87-90	GND
79-82	VOUT	83-86	VOUT

Notes:
1. Mechanical key between pins 12 & 13 and 152 & 153
2. Recommended mating connector Molex iCool P/N 87787-1011.
3. Measured with 2 X 560u 7mOhm ESR Al Poly and 28 X 10u 10mOHm ESR ceramic capacitors on output.
4. Leave Reserved pins floating in end use application.

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CORPORATE

Bel Fuse Inc.
206 Van Vorst Street
Jersey City, NJ 07302
Tel 201-432-0463
Fax 201-432-9542
www.belfuse.com

FAR EAST

Bel Fuse Ltd.
8F/ 8 Luk Hop Street
San Po Kong
Kowloon, Hong Kong
Tel 852-2328-5515
Fax 852-2352-3706
www.belfuse.com

EUROPE

Bel Fuse Europe Ltd.
Preston Technology Management Centre
Marsh Lane, Suite G7, Preston
Lancashire, PR1 8UD, U.K.
Tel 44-1772-556601
Fax 44-1772-888366
www.belfuse.com

Signal Definitions

Symbol	Definitions
VIN	Input power to the converter
GND	Common return for both input and output
VID0, VID1, VID2, VID3, VID4, VID5 VID6	Logic level inputs used to set the output voltage, refer to VID table. Connect VID0 thru VID6 pins to open-drain outputs with external pull-up resistors. Valid logic low is -0.3V to 0.4V, valid logic high level is 0.8V to 5.5V.
VIDSEL	Digital input used to select between extended VR10 and VR11 VID tables.
PWRGD	The open drain power good signal indicates the output voltage is within 10% of the VID setpoint.
+SENSE -SENSE	Remote voltage sense lines. Connect these at the point of load, to VOUT and GND respectively.
VOUT	Output voltage available to the load.
OUTEN	Logic level input used to enable the converter when high. Valid logic low is -0.3V to 0.4V, valid logic high level is 0.8V to 5.5V.
LL0/LL1	Load line select pins. Working in conjunction with VID_Select, LL0/LL1 are used to select load line slope. Currently only 1.25mohm slope is supported. Module can be configured to support multiple load line slopes.
IMON	Analog average load current signal, scaling TBD.
VBIAS	3.3V Bias input. 3.1 – 3.5V, 200mA max, required for operation of unit.
VR_HOT	Open-drain output signal, pulled actively low indicating a thermal event has been detected on the VRM
VRM_PRES	Signal used by system to indicate the VRM is present in the design.
LPL	Low Power Lockout. This signal has a 10k pull-down resistor internal to the VRM. The application board ties this signal to OUTEN, so the VRM will turn on only when plugged into a socket with this configuration. LPL and OUTEN are AND'ed in the VRM, both must be logic high in order for the VRM output to be enabled.

VRM11.0 VID Codes

HEX		Vo (VDC)
0	0	Off
0	1	Off
0	2	1.60000
0	3	1.59375
0	4	1.58750
0	5	1.58125
0	6	1.57500
0	7	1.56875
0	8	1.56250
0	9	1.55625
0	A	1.55000
0	B	1.54375
0	C	1.53750
0	D	1.53125
0	E	1.52500
0	F	1.51875
1	0	1.51875
1	1	1.51250
1	2	1.50625
1	3	1.50000
1	4	1.49375
1	5	1.48750
1	6	1.48125
1	7	1.47500
1	8	1.46875
1	9	1.46250
1	A	1.45625
1	B	1.45000
1	C	1.44375
1	D	1.43750
1	E	1.43125
1	F	1.42500
2	0	1.41875
2	1	1.41250
2	2	1.40625
2	3	1.40000
2	4	1.39375
2	5	1.38750
2	6	1.38125
2	7	1.37500
2	8	1.36875
2	9	1.36250
2	A	1.35625
2	B	1.35000
2	C	1.34375
2	D	1.33750
2	E	1.33125
2	F	1.32500

HEX		Vo (VDC)
3	0	1.31250
3	1	1.30625
3	2	1.30000
3	3	1.29375
3	4	1.28750
3	5	1.28125
3	6	1.27500
3	7	1.26875
3	8	1.26250
3	9	1.25625
3	A	1.25000
3	B	1.24375
3	C	1.23750
3	D	1.23125
3	E	1.22500
3	F	1.21875
4	0	1.21250
4	1	1.20625
4	2	1.20000
4	3	1.19375
4	4	1.18750
4	5	1.18125
4	6	1.17500
4	7	1.16875
4	8	1.16250
4	9	1.15625
4	A	1.15000
4	B	1.14375
4	C	1.13750
4	D	1.13125
4	E	1.12500
4	F	1.11875
5	0	1.11250
5	1	1.10625
5	2	1.10000
5	3	1.09375
5	4	1.08750
5	5	1.08125
5	6	1.07500
5	7	1.06875
5	8	1.06250
5	9	1.05625
5	A	1.05000
5	B	1.04375
5	C	1.03750
5	D	1.03125
5	E	1.02500
5	F	1.01875

HEX		Vo (VDC)
6	0	1.01250
6	1	1.00625
6	2	1.00000
6	3	0.99375
6	4	0.98750
6	5	0.98125
6	6	0.97500
6	7	0.96875
6	8	0.96250
6	9	0.95625
6	A	0.95000
6	B	0.94375
6	C	0.93750
6	D	0.93125
6	E	0.92500
6	F	0.91875
7	0	0.91250
7	1	0.90625
7	2	0.90000
7	3	0.89375
7	4	0.88750
7	5	0.88125
7	6	0.87500
7	7	0.86875
7	8	0.86250
7	9	0.85625
7	A	0.85000
7	B	0.84375
7	C	0.83750
7	D	0.83125
7	E	0.82500
7	F	0.81875

Note: VIDs with VID7=1 not shown because this VRM does not have a VID7 pin.

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FAR EAST

Bel Fuse Ltd.
8F/ 8 Luk Hop Street
San Po Kong
Kowloon, Hong Kong
Tel 852-2328-5515
Fax 852-2352-3706
www.belfuse.com

EUROPE

Bel Fuse Europe Ltd.
Preston Technology Management Centre
Marsh Lane, Suite G7, Preston
Lancashire, PR1 8UD, U.K.
Tel 44-1772-556601
Fax 44-1772-888366
www.belfuse.com

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