

## NON-ISOLATED DC/DC CONVERTERS

12V Input / Programmable Output / VRM10.2 & AMD Compatible



### GRNC-C5A250 RoHS Compliant

- High efficiency means less power dissipation
- Remote on/off
- Wide input range (10.8 – 13.2V)
- **Wider input range available – consult factory**
- 2-Wire Remote sense
- 5 or 6 bit VID digital voltage programming.



### Description

The GRNC-C5A Series is a non-isolated step down DC/DC converter providing up to 150A of output current and designed to be compatible with both the Intel VRM10.2 and AMD Opteron requirements. Standard features include current monitor, remote on/off, over current protection, remote sense, output voltage trim and a power good signal. This product also makes use of selectable 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
0.80 – 2.5V	12V	130A	150A	82%	GRNC-C5A250

### Input Specifications

Parameter	Min	Typ	Max	Notes
Input Voltage Range	10.8 VDC		13.2 VDC	
Input Current (disabled)		17mA		
Input Current (full load)			26.3A	
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		130A 150A	Thermal design Peak current rating
Set Point Accuracy	1.27V	1.28V	1.29V	no load, excluding Adaptive positioning, VRM10.2 VID 101101
Adaptive Positioning (Droop Impedance)	0 mOhm	0.91 mOhm	1.25 mOhm	Droop impedance is selectable
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	8290uF	See note	Consult factory regarding external capacitance outside of this range

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10.3 –13.2V Input / Programmable Output / 120A VRM 10.1



## General Specifications

Parameter	Specification
Switching Frequency	1.5MHz typical (fixed)
Dimensions	3.8 x 1.2 x 0.962 96.5 x 30.5 x 24.4
Weight	TBD
Operating Temperature	0°C to 70°C
Non-Operating Temperature	-40°C to 100°C
Protection Features	110% to 170% max lo UVLO Vin < 10.0V
Remote On/Off	Active High
Efficiency (full load)	82%
	1.3V output 130A load

## AMD Opteron (VID) Codes

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

## Pin Connections

Row A		Row B	
Pin	Function	Pin	Function
1	VIN-	54	VIN+
2	VIN-	53	VIN+
3	VIN-	52	VIN+
4	VID4	51	VID3
5	VID2	50	VID1
6	VID0	49	VID5
7	VO-sen+	48	VO-sen-
8	PWRGD	47	NC
9	OUTEN	46	LL0
10	Imon	45	LL1
11	NC	44	trim
12	NC	43	AMD
13	VO+	42	VO+
14	VO+	41	VO+
15	VO+	40	VO+
16	VO-	39	VO-
17	VO-	38	VO-
18	VO-	37	VO-
19	VO+	36	VO+
20	VO+	35	VO+
21	VO+	34	VO+
22	VO-	33	VO-
23	VO-	32	VO-
24	VO-	31	VO-
25	VO+	30	VO+
26	VO+	29	VO+
27	VO+	28	VO+

### Notes:

- Mechanical key between pins 3 & 4, 12 & 13, 21 & 22, 33 & 34, 42 & 43, and 51 & 52
- Recommended mating connectors Elcon 283-0172-01303B (thru hole) or Elcon 284-0202-03003 (surface mount).
- Measured with 14 X 560u 7mOhm ESR Al Poly and 45 X 10u 10mOHm ESR ceramic capacitors on output.
- Leave NC pins floating in end use application.
- Leave trim pin open for VID output voltage programming. Connect trim pin to ground to select 2.5V output. Connect trim pin to ground through a 10kohm resistor to select 1.8V output.

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12V Input / Programmable Output / VRM10.2 & AMD Compatible



## Signal Definitions

### VRM10.2 VID Codes

VID4	VID3	VID2	VID1	VID0	VID5	Vo (VDC)
0	1	0	1	0	0	0.8375
0	1	0	0	1	1	0.85
0	1	0	0	1	0	0.8625
0	1	0	0	0	1	0.875
0	1	0	0	0	0	0.8875
0	0	1	1	1	1	0.9
0	0	1	1	1	0	0.9125
0	0	1	1	0	1	0.925
0	0	1	1	0	0	0.9375
0	0	1	0	1	1	0.95
0	0	1	0	1	0	0.9625
0	0	1	0	0	1	0.975
0	0	1	0	0	0	0.9875
0	0	0	1	1	1	1
0	0	0	1	1	0	1.0125
0	0	0	1	0	1	1.025
0	0	0	1	0	0	1.0375
0	0	0	0	1	1	1.05
0	0	0	0	1	0	1.0625
0	0	0	0	0	1	1.075
0	0	0	0	0	0	1.0875
1	1	1	1	1	1	Output Off
1	1	1	1	1	0	Output Off
1	1	1	1	0	1	1.1
1	1	1	1	0	0	1.1125
1	1	1	0	1	1	1.125
1	1	1	0	1	0	1.1375
1	1	1	0	0	1	1.15
1	1	1	0	0	0	1.1625
1	1	0	1	1	1	1.175
1	1	0	1	1	0	1.1875
1	1	0	1	0	1	1.2
1	1	0	1	0	0	1.2125
1	1	0	0	1	1	1.225
1	1	0	0	1	0	1.2375
1	1	0	0	0	1	1.25
1	1	0	0	0	0	1.2625
1	0	1	1	1	1	1.275
1	0	1	1	1	0	1.2875
1	0	1	1	0	1	1.3
1	0	1	1	0	0	1.3125
1	0	1	0	1	1	1.325
1	0	1	0	1	0	1.3375
1	0	1	0	0	1	1.35
1	0	1	0	0	0	1.3625
1	0	0	1	1	1	1.375
1	0	0	1	1	0	1.3875
1	0	0	1	0	1	1.4
1	0	0	1	0	0	1.4125
1	0	0	0	1	1	1.425
1	0	0	0	1	0	1.4375
1	0	0	0	0	1	1.45
1	0	0	0	0	0	1.4625
0	1	1	1	1	1	1.475
0	1	1	1	1	0	1.4875
0	1	1	1	0	1	1.5
0	1	1	1	0	0	1.5125
0	1	1	0	1	1	1.525
0	1	1	0	1	0	1.5375
0	1	1	0	0	1	1.55
0	1	1	0	0	0	1.5625
0	1	0	1	1	1	1.575
0	1	0	1	1	0	1.5875
0	1	0	1	0	1	1.6

Symbol	Definitions
VIN+	Input power to the converter
VIN-	Common return for both input and output
VID0, VID1, VID2, VID3, VID4, VID5	Logic level inputs used to set the output voltage, refer to VID tables. Connect these pins to open-drain outputs with or without external pull-up resistors. In AMD mode, VID5 is ignored. Valid logic low is 0V to 0.8V, valid logic high level is 2V to 5V.
Trim	Trim pin used to adjust the output voltage. See note 5.
PWRGD	The open drain power good signal detects output under voltage only. It transitions to the high state after soft start has completed. If the output voltage falls below 84% of the nominal output voltage, the signal is de-asserted.
VO-sen+ VO-sen-	Remote voltage sense lines. Connect these at the point of load, to VO+ and VO- respectively.
VO-	Common return for both input and output
VO+	Output voltage available to the load.
OUTEN	Logic level input used to enable the converter when high. Valid logic low is 0V to 0.8V, valid logic high level is 2V to 5V.
Imon	Optional current monitor output. Voltage on this pin is proportional to output current.
LL0/LL1	Load line select pins. Logic 0 on LL1 selects 1.25mΩ mode. Logic 1 on LL1 selects 0.91mΩ mode. Valid logic low is 0V to 0.8V, valid logic high level is 2V to 5V.
AMD	AMD Opteron operating mode select. Logic 0 on this pin selects VRM10.2 VID table. Logic 1 on this pin selects AMD Opteron mode.

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**bel**  
POWER PRODUCTS

### RoHS Compliance

Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products.



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