HIGH DENSITY, CONFIGURABLE AC-DC POWER SUPPLY
RCB600 SERIES

DS1_RCB600_REV05_APRIL 2013

DESCRIPTION

The RCB600 is a modular, configurable power supply that provide high performance and outstanding flexibility.

Delivering 600W from a 600g and a 5"x3"x1U package, the RCB600 is the smallest commercially available configurable power solution.

RCB600 power supply consists of an input module that provides four medically isolated slots where can be plugged in up to four output modules of any type in any combination. Output modules are available in four nominal output voltages: 5, 12, 24 and 48 V and offer an extremely wide voltage adjustability range.

A built in fan speed control circuit assure proper forced air cooling minimizing operation noise and enhancing lifetime.

The RCB600 is certified to IEC/EN/UL/CSA 60950-1 2nd Edition for IT equipment. The power supply is CE marked to the LV Directive, meets EN61000-3, EN61000-4 and EN55022, class B, EMC standards.

2 Year Warranty

RoHS 2011/65/EU

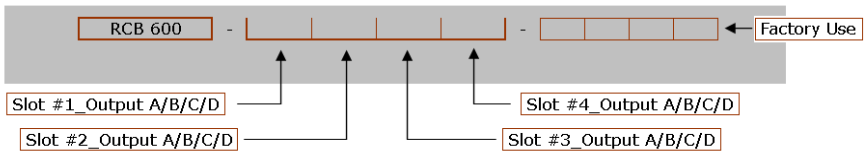
KEY FEATURES

- Universal input voltage (active PFC)
- High power density (23 W/in^3)
- 600 W output in a 5"x3"x1U form factor
- Modular configurable power supply
- Fan speed control function
- Output modules parallel / series operation
- Accurate wired current share
- Output current monitoring signal
- +5 V, 200 mA bias supply
- RoHS directive 2011/65/EU compliant
- Remote voltage programming
- Remote current programming

MARKET SEGMENTS AND APPLICATIONS

- Industrial Electronics & Computers
- Test and Measurement Equipment
- Automation and Drives
- Broadcast & Entertainment
- Printing
- Industrial & Process Controls

MODELS AND ORDERING INFORMATION



Use "0" for unused slots. A slot cover bracket will be fitted at factory

The factory might issue a 4 digit code for a specific configuration which can be used for next and future orders of the same configuration
When ordering an input unit with no ouput inserted, simply order "RCB600"

Output Module	Nominal Voltage	Voltage Adjustment	Output Rated Power	Rated Current	Max Current at Nom Voltage	Load Regulation	Over Voltage trip level
A	5 V	1.5 to 7.5 V	125 W	25.0 A	25 A	±50 mV	9.5 V
B	12 V	4.5 to 15 V	150 W	15.0 A	12.5 A	±100 mV	18 V
C	24 V	9 to 30 V	150 W	7.5 A	6.25 A	±150 mV	36 V
D	48 V	18 to 58 V	150 W	3.75 A	3.13 A	±300 mV	66 V
0 (zero)	Metal blanking plate for unused slots.						

ROAL
living energy

INPUT SPECIFICATIONS

Parameter	Details	Min	Typ	Max	Units
AC input voltage	Nominal range is 100 to 240 V_{RMS}	85		264	V_{RMS}
AC input frequency		47	50/60	63	Hz
DC input voltage		120		370	V_{DC}
Power rating	Derate by 0.83%/V_{RMS} below 120 V_{RMS} (600 W at 120 V_{RMS}, 450 W at 90 V_{RMS})			600	W
Input current	At 600 W output and 120 V_{RMS} input			6	A
Inrush current	265 V_{RMS}, cold start			20	A
Fusing	5x20 fast acting fuse			8	A
Input current limit	Maintains power factor		8		A
Efficiency	Configuration dependent		86	89	%
Idle power	All outputs fitted and enabled All outputs fitted and disabled		28 21		W
Power factor	Typical value at 300 W output at 240 V_{RMS}		0.96	0.99	
Hold up	600 W output at 120 V_{RMS} input	17	20	21	ms
UVLO	Turn on only	78		84	V_{RMS}
Over temperature	Internally monitored. Latching	115		125	°C
Reliability	At 40 °C, 80% load			2	FPMH

SIGNALS

Parameter	Details	Min	Typ	Max	Units
Bias voltage		4.8	5	5.2	V
Bias current		0		200	mA
Power Good Voltage	PNP open collector with internal 10 KΩ pull down resistor	8	10	15	V
Power Good Current		0		20	mA
Individual inhibit voltage	Apply ≥ 5 V when used as a Global Inhibit	2		15	V
Inhibit current	10 KΩ input impedance	0.2		1.5	mA
Global inhibit voltage		3		15	V
Global inhibit current	5 KΩ input impedance	0.6		3	mA
AC_OK voltage		1		4	V
AC_OK current		-10		20	mA
AC_OK warning	See user manual for exceptions	5			ms

SAFETY

Parameter	Details	Min	Max	Units
Isolation voltage	Primary to secondary		4000	V_{RMS}
	Input to Chassis		1500	V_{RMS}
	Output to Chassis		250	V_{DC}
	Output to Output		250	V_{DC}
Isolation clearance	Primary to Secondary (Reinforced)	7		mm
	Primary to Chassis (Basic)	2.5		mm
Isolation creepage	Primary to Secondary (Reinforced)	12		mm
	Primary to Chassis (Basic)	4		mm
Leakage current	265 V_{AC}, 63 Hz, 25 °C		300	µA
Agency Approvals	$_{C}UR_{US}$, Demko, CB Certificate			
Standards	IEC/EN 60950-1; UL 60950-1 ; CAN/CSA-C22.2 No. 950.1; CE Mark: Low Voltage Directive 2006/95/EC; EMC Directive 2004/108/EC; Safety Requirements Directive 2001/104/EC.			
Agency File Numbers	UL: E134098-A35-UL CB certificate: DK-21001 Demko certificate: 152969-02			

ROAL
living energy

ENVIRONMENTAL

Parameter	Details	Min	Max	Units
Storage				
Temperature		-40	+85	°C
Humidity	Relative, non condensing	5	95	%
Altitude		-200	5000	m
Air pressure		54	106	kPa
Operating				
Temperature	Full power	-20	50	°C
	Derate by 2.5%/°C above 50 °C	50	70	°C
Humidity	Relative, non condensing	5	95	%
Altitude		-200	4600	m
Air pressure		57	106	KPa
Noise level	Variable. Measured at 1 m from fan intake	35	60	dB(A)
Shock	3000 bumps at 10 g (16 ms) half sine wave			
Vibration	1.5 g, 10 to 200 Hz sine wave, 20 g for 15 min in 3 axes random vibration			
Installation				
Equipment class	I			
Installation	Category II			
Pollution Degree	2			
Material Group	IIIb (Indoor use only)			
Flammability Rating	94V-2			
IP Rating	IP10			
RoHS Compliance	2011/65/EU			

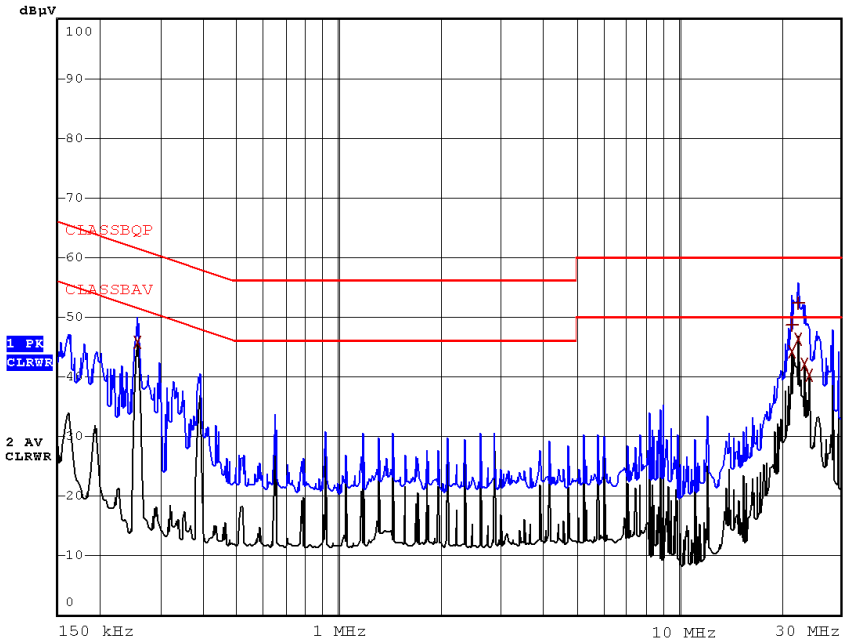
ELECTROMAGNETIC COMPATIBILITY EMC

Parameter	Standard	Level
Emissions		
Radiated electric field	EN55011, EN55022, FCC	B
Conducted emissions	EN55011, EN55022, FCC	B
Harmonic distortion	EN61000-3-2	Compliant
Flicker and fluctuation	EN61000-3-3	Compliant
Immunity		
Electrostatic discharge	EN61000-4-2 (15 kV air, 8 kV contact)	4
Radiated RFI	EN61000-4-3 (10 V/m)	3
Fast transient, burst	EN61000-4-4 (4 kV)	4
Input line surges	EN61000-4-5 (1 kV L-N, 2 kV L-E)	3
Conducted RFI	EN61000-4-6 (10 V)	4
Power freq. Magnetic field	EN61000-4-8 (10 A/m)	3
Voltage dips	EN61000-4-11 (EN55024)	Compliant

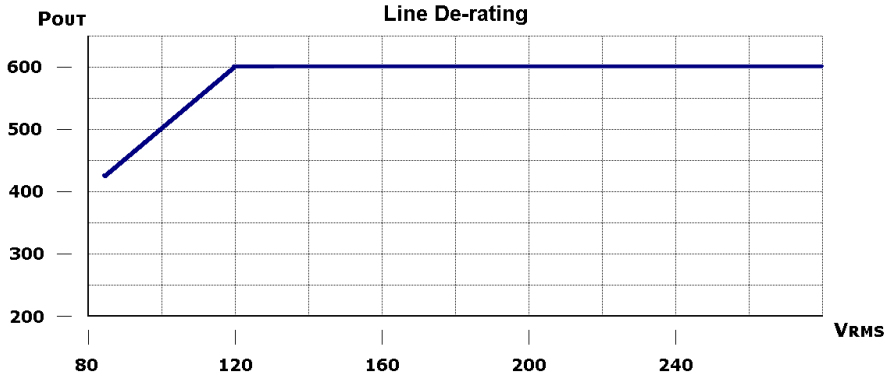
RELIABILITY

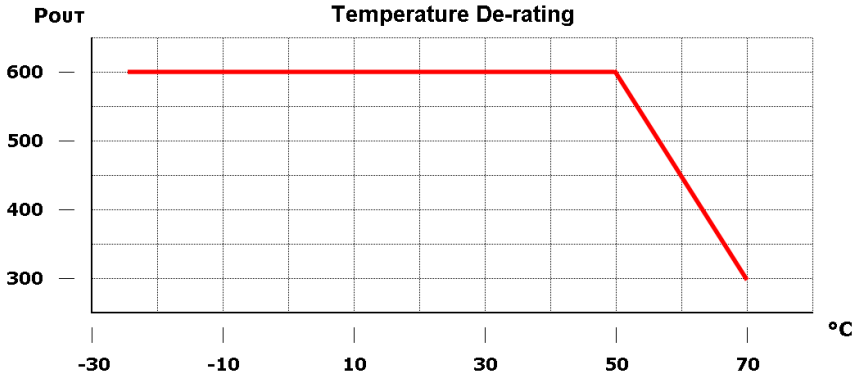
Component	Details	Max	Units
Fan	Mag. Lev. Standard	2.7	FPMH
Input	Excluding Fan	2	FPMH
Output	See output specifications	1	FPMH
Warranty		2	Years

Typical Conducted Emissions



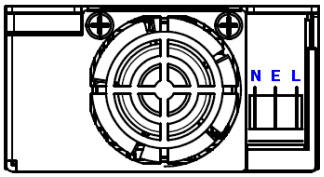
Temperature and Line De-rating



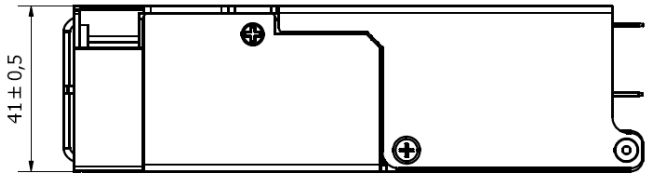


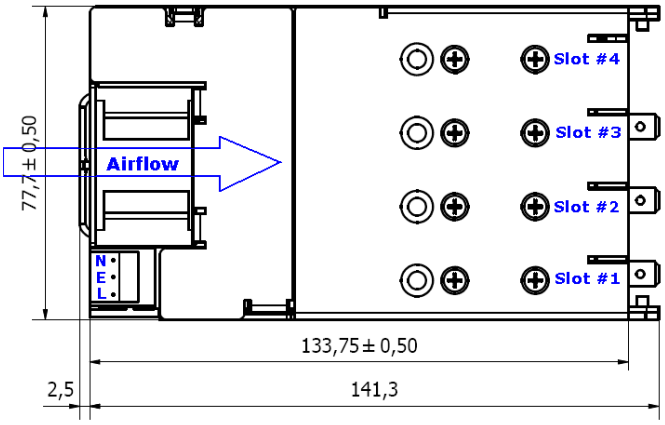
MECHANICAL SPECIFICATIONS – OUTLINE DRAWING AND DIMENSIONS

Specification	Details	Nominal	Units
Overall dimensions	Height is 1U	77.7 x 143.8 x 41.0 3.06 x 5.63 x 1.61	mm in
Weight	Chassis + input	360	g
	Output modules	60	g
	Chassis + input	0.794	lb
	Output modules	0.132	lb
Mounting	Bottom or side mounting through M4 screws	M4	

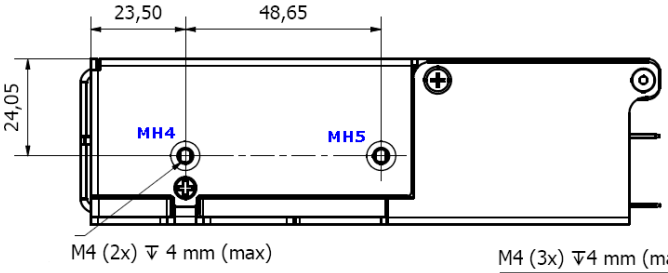


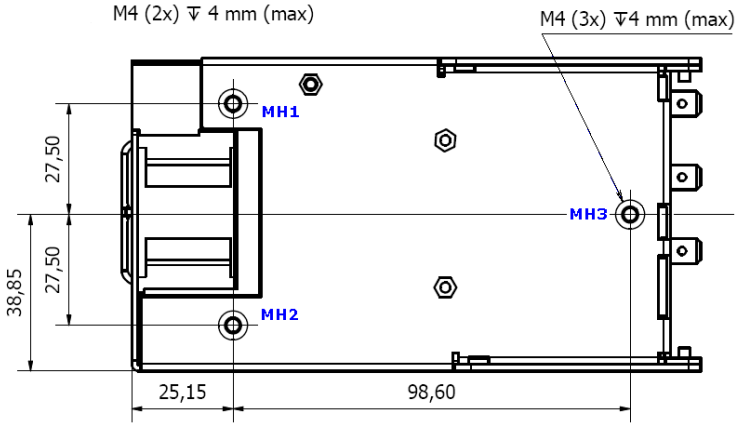
N - Neutral
E - Earth
L - Live





SCREWS	
MH1, MH2, MH3, MH4, MH5	
Screw type	M4
Tightening torque	Tighten to 1.5 Nm
Penetration depth	4.00 mm max, including chassis
OUTPUT MODULES X 8	
Screw type	M3X5, C/Sink, Pozidriv, Stainless steel
Tightening torque	Tighten to 0.75 Nm
Penetration depth	Defined by screw
CHASSIS X 2	
Screw type	M3X5, C/Sink, Pozidriv, Stainless steel
Tightening torque	Tighten to 0.75 Nm
Penetration depth	Defined by screw
CHASSIS X 2	
Screw type	M2.5X4, C/Sink, Pozidriv, Stainless steel
Tightening torque	Tighten to 0.45 Nm
Penetration depth	Defined by screw
FAN X 2	
Screw type	M3X30, C/Sink, Pozidriv, Stainless steel
Tightening torque	Tighten to 0.70 Nm
Penetration depth	Defined by screw

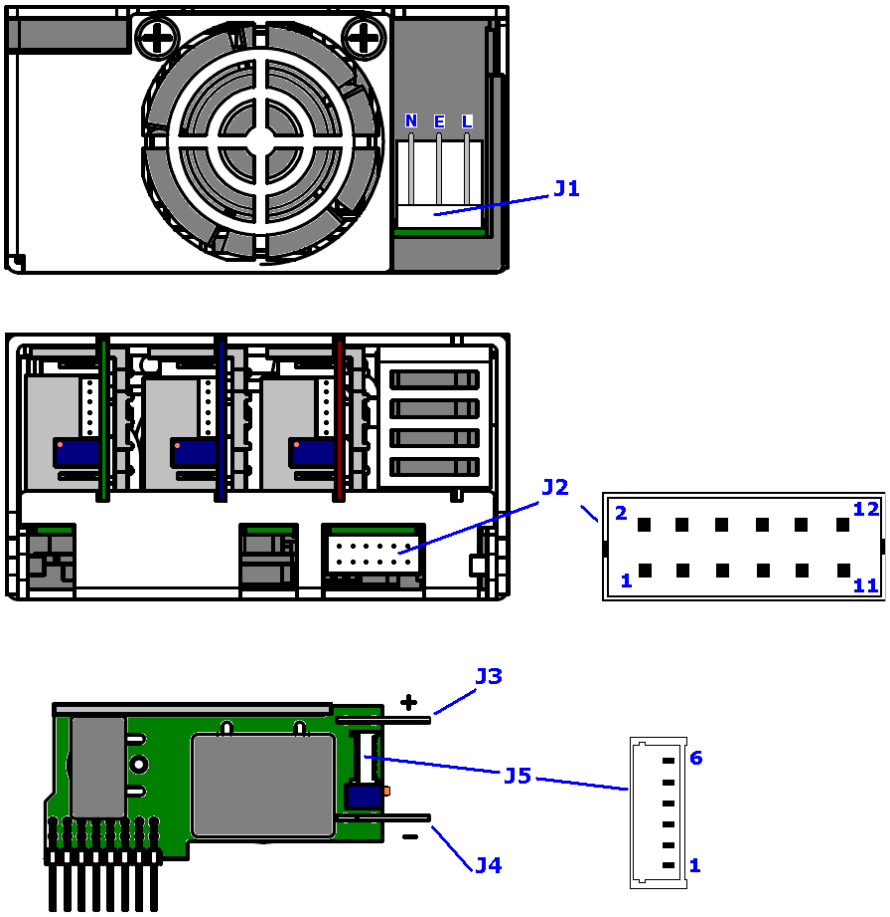




ROAL
living energy

Mechanical Specifications – Connectors and Pin Assignment

PIN ASSIGNMENT	
Circuit	**Details**
J1	
1	Neutral
2	Earth
3	Live
J2	
1	Power Good Slot #1
2	Inhibit Slot #1
3	Power Good Slot #2
4	Inhibit Slot #2
5	Power Good Slot #3
6	Inhibit Slot #3
7	Power Good Slot #4
8	Inhibit Slot #4
9	Global Inhibit
10	AC OK
11	+5V 200mA, Bias Supply
12	Unit Signals COM
J5	
1	–Sense
2	+Sense
3	Voltage Control
4	Current Control Current Sharing Current Monitor
5	Module Signals COM
6	+5V 10mA, Bias Supply
J3	
Positive Output	
J4	
Negative Output	



COUNTERPART CONNECTORS				
Reference	**Details**	**Manufacturer**	**Housing PN**	**Terminal PN**
AC Mains Input **J1**	• 5.08 mm (0.200 in), 3 circuits housing, with friction lock, or, any direct equivalent. • Crimp terminal, 18-24 AWG, tin finish, or, any direct equivalent.	Molex	0010013036	0008701031
Power Unit Signal **J2**	• 2.00 mm (0.079 in) 12 circuits housing with locking ramp, or, any direct equivalent. • Crimp terminal 24-30 AWG, gold finish, or, any direct equivalent.	Molex	0511101260	0503948051
Output Power **J3/J4**	• Quick Disconnect Receptacle compatible with PCB mounting TAB, size 0.80X6.35 mm. Tin finish.	Vogt AG Tyco Electronics	NA	3967 640907-1
Output Signal **J5**	• 1.25 mm (0.049 in), 6 circuits housing, • Crimp terminal 28-32 AWG, tin finish, or , any direct equivalent	Molex	0510210600	050058800

Notes:

1. Output power terminal and wire current rating must exceed maximum short circuit output current. E.g. OP-A: 25*1.25 = 31.25 A.
2. Direct equivalents may be used for any connectors parts
3. All cables must be rated 105°C min, equivalent to UL1015.

ROAL
living energy

OUTPUT SPECIFICATIONS – MODULE A (OP-A)

Parameter	Test conditions / Notes	Min	Nominal	Max	Units
Output voltage range		1.5	5	7.5	V
Rated current				25	A
Average output power				125	W
Peak output power	At V_{SET} = 7.5V, no longer than 5s 50% duty cycle, average power ≤150W.			187.5	W
Initial voltage accuracy	Factory set units, Measured at sense terminals	-0.5		0.5	% V_{SET}
Output voltage adjustment	Manual: 11-turns potentiometer		0.545		V/turn
Load regulation	Measured at sense terminals	-50		50	mV
Line regulation	Measured at sense terminals	-0.1		0.1	%V_{NOM}
Cross regulation	Measured at sense terminals	-0.2		0.2	%V_{NOM}
Minimum load			0		A
Output temperature drift		-0.02		0.02	%/°C
Ripple and Noise	20 MHz bandwidth, peak-peak			1	%V_{NOM}
Transient response	25% to 75% load transient, at 1A/µs, recovery to within 10% of V_{SET}			1 100	V µs
Turn on rise time	Monotonic, 10% to 90%	1.5		3.5	ms
Turn on overshoot				0.1	%V_{SET}
Turn on delay	From AC on to Power Good From Enable to Power Good		600 15	750 20	ms ms
Current sharing accuracy				5	%I_{MAX}
Open sense offset	Open sense, voltage offset due to bias currents			2	%V_{NOM}
Hold-up voltage				6	V
Isolation to ground	Each terminal			250	V
Over current protection	% of rated current	105		125	%I_{RATED}
Reverse current protection	% of rated current	-6		0	%I_{RATED}
Short circuit protection (Hiccup mode)	Period Duty cycle Voltage threshold (at sense)		125 3 1		ms % V
Over voltage protection	Latching		9.5		V
Over temperature protection	Internally monitored, latching	115		125	°C
Sense cable protection	On positive terminal On negative terminal	-1 none		2 1	V
Power good threshold	Low threshold only		90		%V_{SET}
Output current signal	I_{SGN} = 0.6 + I_{OUT}/(I_{RTD}*1.25)	0		110	%I_{RATED}
Current limit control	I_{LMT} = (V_{CTRL} – 0.6) * I_{RTD}*1.25	0		110	%I_{RATED}
Remote voltage control	V_{OUT} = V_{SET} (1.8- V_{CTRL}) / 0.6)	0		300	%V_{SET}
Bias supply	10 mA max	4.5	5	5.2	V
Reliability	At 40 °C, 80% load			1	FPMH
Warranty				2	Years
Wire size	Power cables	12	10		AWG
Weight				60	g
Size	60 mm x 35 mm x 17 mm, or, 2.36 in x 1.38 in x 0.67 in				

ROAL
living energy

OUTPUT SPECIFICATIONS – MODULE B (OP-B)

Parameter	Test conditions / Notes	Min	Nominal	Max	Units
Output voltage range		4.5	12	15	V
Rated current				15	A
Average output power				150	W
Peak output power	At V_{SET} = 15V, no longer than 5s 50% duty cycle, average power ≤150W.			225	W
Initial voltage accuracy	Factory set units, Measured at sense terminals	-0.5		0.5	% V_{SET}
Output voltage adjustment	Manual: 11-turns potentiometer		0.954		V/turn
Load regulation	Measured at sense terminals	-100		100	mV
Line regulation	Measured at sense terminals	-0.1		0.1	%V_{NOM}
Cross regulation	Measured at sense terminals	-0.2		0.2	%V_{NOM}
Minimum load			0		A
Output temperature drift		-0.02		0.02	%/°C
Ripple and Noise	20 MHz bandwidth, peak-peak			1	%V_{NOM}
Transient response	25% to 75% load transient, at 0.5A/µs; recovery to within 10% of V_{SET}			1.5 100	V µs
Turn on rise time	Monotonic, 10% to 90%	1.5		3.5	ms
Turn on overshoot				0.1	%V_{SET}
Turn on delay	From AC on to Power Good From Enable to Power Good		600 15	750 20	ms ms
Current sharing accuracy				5	%I_{MAX}
Open sense offset	Open sense, voltage offset due to bias currents			2	%V_{NOM}
Hold-up voltage				12.5	V
Isolation to ground	Each terminal			250	V
Over current protection	% of rated current	105		125	%I_{RATED}
Reverse current protection	% of rated current	-6		0	%I_{RATED}
Short circuit protection (Hiccup mode)	Period Duty cycle Voltage threshold (at sense)		125 3 2		ms % V
Over voltage protection	Latching		18		V
Over temperature protection	Internally monitored, latching	115		125	°C
Sense cable protection	On positive terminal On negative terminal	-1 none		2 1	V
Power good threshold	Low threshold only		90		%V_{NOM}
Output current signal	I_{SGN} = 0.6 + I_{OUT}/(I_{RTD}*1.25)	0		110	%I_{RATED}
Current limit control	I_{LMT} = (V_{CTRL} – 0.6) * I_{RTD}*1.25	0		110	%I_{RATED}
Remote voltage control	V_{OUT} = V_{SET} (1.8- V_{CTRL}) / 0.6)	0		300	%V_{SET}
Bias supply	10 mA maximum	4.5	5	5.2	V
Reliability	At 40 °C, 80% load			1	FPMH
Warranty				2	Years
Wire size	Power cables	16	14	10	AWG
Weight				60	g
Size	60 mm x 35 mm x 17 mm, or, 2.36 in x 1.38 in x 0.67 in				

ROAL
living energy

OUTPUT SPECIFICATIONS – MODULE C (OP-C)

Parameter	Test conditions / Notes	Min	Nominal	Max	Units
Output voltage range		9	24	30	V
Rated current				7.5	A
Average output power				150	W
Peak output power	At V_{SET} = 30V, no longer than 5s 50% duty cycle, average power ≤150W.			225	W
Initial voltage accuracy	Factory set units, Measured at sense terminals	-0.5		0.5	% V_{SET}
Output voltage adjustment	Manual: 11-turns potentiometer		1.9		V/turn
Load regulation	Measured at sense terminals	-150		150	mV
Line regulation	Measured at sense terminals	-0.1		0.1	%V_{NOM}
Cross regulation	Measured at sense terminals	-0.2		0.2	%V_{NOM}
Minimum load			0		A
Output temperature drift		-0.02		0.02	%/°C
Ripple and Noise	20 MHz bandwidth, peak-peak			1	%V_{NOM}
Transient response	25% to 75% load transient, at 0.25A/µs; recovery to within 10% of V_{SET}			3 100	V µs
Turn on rise time	Monotonic, 10% to 90%	1.5		3.5	ms
Turn on overshoot				0.1	%V_{SET}
Turn on delay	From AC on to Power Good From Enable to Power Good		600 15	750 20	ms ms
Current sharing accuracy				5	%I_{MAX}
Open sense offset	Open sense, voltage offset due to bias currents			2	%V_{NOM}
Hold-up voltage				25	V
Isolation to ground	Each terminal			250	V
Over current protection	% of rated current	105		125	%I_{RATED}
Reverse current protection	% of rated current	-6		0	%I_{RATED}
Short circuit protection (Hiccup mode)	Period Duty cycle Voltage threshold (at sense)		125 3 3.5		ms % V
Over voltage protection	Latching		36		V
Over temperature protection	Internally monitored, latching	115		125	°C
Sense cable protection	On positive terminal On negative terminal	-1 none		2 1	V
Power good threshold	Low threshold only		90		%V_{SET}
Output current signal	I_{SGN} = 0.6 + I_{OUT}/(I_{RTD}*1.25)	0		110	%I_{RATED}
Current limit control	I_{LMT} = (V_{CTRL} – 0.6) * I_{RTD}*1.25	0		110	%I_{RATED}
Remote voltage control	V_{OUT} = V_{SET} (1.8- V_{CTRL}) / 0.6)	0		300	%V_{SET}
Bias supply	10 mA max	4.5	5	5.2	V
Reliability	At 40 °C, 80% load			1	FPMH
Warranty				2	Years
Wire size	Power cables	20	18	10	AWG
Weight				60	g
Size	60 mm x 35 mm x 17 mm, or, 2.36 in x 1.38 in x 0.67 in				

ROAL
living energy

OUTPUT SPECIFICATIONS – MODULE D (OP-D)

Parameter	Test conditions / Notes	Min	Nominal	Max	Units
Output voltage range		18	48	58	
Rated current				3.75	A
Average output power				150	W
Peak output power	At V_{SET} = 58V, no longer than 5s 50% duty cycle, average power ≤150W.			225	W
Initial voltage accuracy	Factory set units, Measured at sense terminals	-0.5		0.5	% V_{SET}
Output voltage adjustment	Manual: 11-turns potentiometer		3.6		V/turn
Load regulation	Measured at sense terminals	-300		300	mV
Line regulation	Measured at sense terminals	-0.1		0.1	%V_{NOM}
Cross regulation	Measured at sense terminals	-0.2		0.2	%V_{NOM}
Minimum load			0		A
Output temperature drift		-0.02		0.02	%/°C
Ripple and Noise	20 MHz bandwidth, peak-peak			1	%V_{NOM}
Transient response	25% to 75% load transient, at 0.25A/µs; recovery to within 10% of V_{SET}			3 100	V µs
Turn on rise time	Monotonic, 10% to 90%	1.5		3.5	ms
Turn on overshoot				0.1	%V_{SET}
Turn on delay	From AC on to Power Good From Enable to Power Good		600 15	750 20	ms ms
Current sharing accuracy				5	%I_{MAX}
Open sense offset	Open sense, voltage offset due to bias currents			2	%V_{NOM}
Hold-up voltage				50	V
Isolation to ground	Each terminal			250	V
Over current protection	% of rated current	105		125	%I_{RATED}
Reverse current protection	% of rated current	-6		0	%I_{RATED}
Short circuit protection (Hiccup mode)	Period Duty cycle Voltage threshold (at sense)		125 3 3.5		ms % V
Over voltage protection	Latching		66		V
Over temperature protection	Internally monitored, latching	115		125	°C
Sense cable protection	On positive terminal On negative terminal	-3 none		3 2	V
Power good threshold	Low threshold only		90		%V_{SET}
Output current signal	I_{SGN} = 0.6 + I_{OUT}/(I_{RTD}*1.25)	0		110	%I_{RATED}
Current limit control	I_{LMT} = (V_{CTRL} – 0.6) * I_{RTD}*1.25	0		110	%I_{RATED}
Remote voltage control	V_{OUT} = V_{SET} (1.8- V_{CTRL}) / 0.6)	0		300	%V_{SET}
Bias supply	10 mA max	4.5	5	5.2	V
Reliability	At 40 °C, 80% load			1	FPMH
Warranty				2	Years
Wire size	Power cables	20	18	10	AWG
Weight				60	g
Size	60 mm x 35 mm x 17 mm, or, 2.36 in x 1.38 in x 0.67 in				

Eu and RoW

ROAL Electronics S.p.A
Via Jesina 56/A
60022 – Castelfidardo (AN) - Italy
Tel:+ 39 071 721461
Fax:+ 39 071 72146 480

www.roallivingenergy.com

North America

ROAL Electronics USA, Inc.
701, Main St. Suite 405
Stroudsburg, PA18360
Phone: + 1 570 421 5750
Fax: +1 570 421 5687

Rev. 05 – April 5, 2013