TECHNICAL SPECIFICATION

GPR650B-12A

Isolated AC-DC Rack-Mount Power Supply
Universal Input; Dual Outputs; 650W@12V/53A and 5V/3A

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OVERVIEW

The GPR650B-12A is an isolated AC-DC converter for POE and Telecom applications. It is packaged in an industry standard mechanical configuration and delivers up to 12A of output current, or 650 Watts of output power with a full load efficiency of typically 92% at Vin of 230Vac and half load. This unit can operate over a universal AC input range, even up to 300Vac, and provides a precisely regulated single output voltage at 12V.

The GPR650B-12A features excellent electrical and thermal performance with creative circuit design, self-cooling internal fan, and optimized component placement. With two different LED status signals, I2C/PMbus™ control, and hot plug/parallel operation, the GPR650B-12A offers flexibility for various POE and telecom applications. The unit's design integrates protection circuits such as UVP, OVP, OCP, OTP, SCP to assure users highly reliable rack performance. The module complies with UL/EN/IEC62368 safety and additional EN61000 EMC requirements.

APPLICATIONS

- Telecom Equipment and POE Systems
- Industrial Automation
- Distributed Power Architectures
- Instruments and Test Equipment
- Amplifiers and Base Stations
- LAN/WAN Hardware Racks
- Enterprise Networking Racks

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FEATURES

- Wide input voltage range: Universal AC input up to 300Vac/45-55Hz without damage
- Tightly regulated output voltage
- Hot pluggable with forced current sharing
- Highly efficient from 50% to 100% load
- Delivers up to 53Adc current or 651W power with internal cooling fan
- Active PFC (typical:0.98@115Vin, 0.95@230Vin)
- Industry standard mechanical outline
  - 12.21"L x 1.99"W x 1.58"H
  - 310.2 × 50.5mm ×40.2mm
- I2C Communication (PMbus™ compliant)
- Full protection for Input UVP, Output OVP, OCP, SCP, OTP
- 3000Vac/1Min for Pri to Sec and 1500Vac/1Min for Pri to Earth isolation voltage, 500Vdc /1Min for Sec to Earth isolation voltage
- Wide operating temperature range (-10˚ to 70˚C) with derating from 55˚C. Powers up at -40˚C
- ROHS Directive 2002/95/EC Compliant
- UL62368-1 international safety standard approved
- Meets EN61000-x international EMC standards

SCOPE

This document describes the specifications of GPR650B-12A isolated AC/DC power supply.

ABSOLUTE MAXIMUM RATINGS

Stresses that exceed the specified ratings stated in this datasheet can cause permanent damage to the unit. The ratings are absolute stress ratings; functional operation of the unit is not implied at conditions in excess of those given in the data sheet. Exposure to all absolute maximum ratings simultaneously for extended periods could adversely affect the unit's long term reliability.

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ELECTRICAL SPECIFICATIONS @ 25°C

Parameter	Symbol	Min	Nominal	Max	Unit
Operating Input Voltage	V_{IN}	90	—	264	Vac
Operation Transient **Non-operating continuous**				300 315	
Operating Frequency		47	—	63	Hz
Max Input Current (V_{IN}=100V, P_O=1110W)	$I_{IN,max}$			8	A
Input No Load Power (V_{IN} =Nominal Input, I_O=0, Module enabled)		—	—	10	W
Input Standby Power (V_{IN} =Nominal Input, Module disabled)		—	4	5	W
Inrush Current with Cold Start	230V_{IN}	—	40	—	A
Power Factor (Nominal Input and Full Load)	λ	0.95	0.98	—	
Leakage Current				3.5	mA
Input Protection	Fuse in Line Input				

NOTE: Unless otherwise indicated, specifications apply to overall operating input voltages, resistive loads, and room temperature at 25ºC.

DC OUTPUT SPECIFICATIONS

(Spec is required at +25ºC if not specified)

Parameters	Condition & Description	Min	Nominal	Max	Unit
Output Voltage 1	Half load condition, nominal input	11.64	12.00	12.36	V
Output Voltage 2	No trim requirement	4.80	5.00	5.20	V
Output Load 1		0		53	A
Output Load 2		0		3.0	V
Load Regulation	From Open to Full (Nominal Input)		12.00 5.00	±2% V_{OUT} ±3% V_{OUT}	V
Line Regulation	All Range (50% load)			±1% V_{OUT}	V
Thermal regulation				±0.03% V_{OUT}/ ºC	V
Min Load	No requirement				A

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Parameters	Condition & Description	Min	Nominal	Max	Unit
Ripple and Noise	115/230 in Full load (20k-20M bandwidth/10μf Tant-capacitor)		12.00 5.00	±1% V_{OUT} ±2% V_{OUT}	V V
External Capacitive load	Main Power, full load		12V 5V	10000 350	μF μF
Dynamic 1 (1A/us)	25% to 75% to 25% load			±4% V_{OUT}	V
Dynamic 2 (1A/S)	5-50% and 50%-100% load			±5% V_{OUT}	V
Recovery Time	Back to 1% V_{OUT}			500	μS
Turn On Overshoot				3%	V
Delay time	Nominal Input to 90% output			3	s
Rise time	10% output to 90% output, Monotonic. No external capacitor		20	50	mS
Output Indicator	LED and signal Indicator & PMbus				
Efficiency	230V input/50% load (-56 V_{OUT})		92		%
Current Sharing	Forced current sharing@>50%load			5	%
Holdup Time	Nominal Input & Full Load & droop to 90% of output voltage		20		mS

PROTECTION CIRCUITS

Parameters	Condition & Description	Min	Nominal	Max	Unit
Input Under Voltage (UVP)	Auto-Recovery			85	Vac
Output Over Current (OCP)	Auto-Recovery	120% of load		145% of load	A
Output Over Voltage (OVP)	Latch Mode		120%	130%	V
Over Temperature (OTP)	Auto-Recovery		75		℃
Short Circuit (SCP)	All conditions		No damage/smoke/fire		

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ENVIRONMENTAL SPECIFICATIONS

Parameters	Condition & Description	Min	Nominal	Max	Unit
Operating Ambient Temperature		-10	+25	55	°C
Working Temperature	For full load/input(<6000ft)	-10	+25	+70	ºC
Hot Spot Temperature	See application note for hot spot location			115	ºC
Airflow	Internal airflow direction from output to input				
	60-degree operation			10000	Ft
	70-degree operation			6000	Ft
Altitude				10000/3048	Ft/m
Humidity		+5%		95%	

ISOLATION SPECIFICATIONS

Description	
Isolation Voltage from Input to Output	3000Vac@1Min
Isolation Voltage from Input to Earth-Chassis	1500Vac@1Min
Isolation Voltage from Output to Earth	50Vdc@1Min
Isolation Voltage from Signal to Earth	None

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EMC SPECIFICATIONS

EMC Item	Requirement	Criteria	Reference
Conducted Emissions	Class A + system box		EN55022 QP/AV Method
Radiated Emissions	Class A + system box		EN55022/FCC Controlled by system
Conducted Immunity	Level 2		EN55024,EN61000-4-3
SURGE	DM: ±2KV CM: ±4KV	B	EN61000-4-5，EN 55024 ETSI EN 300 386 V1.3.2
EFT	±2KV (Level 2)	B	EN61000-4-4 ，EN 55024 ETSI EN 300 386 V1.3.2
ESD	Touch: ±6KV Air: ±8KV	B	EN61000-4-2，EN 55024 ETSI EN 300 386 V1.3.2
	Touch: ±8KV Air: ±15KV for Case	R	EN61000-4-2，EN 55024 ETSI EN 300 386 V1.3.2
Harmonic	Class A	NC	EN 61000-3-2 ETSI EN 300 386 V1.3.2
Flicker		NC	EN 61000-3-3 ETSI EN 300 386 V1.3.2
Radiated Susceptibility (RS)	80M~2GHz 10V/m,80% AM (level 3)	A	EN 61000-4-3，EN 55024 ETSI EN 300 386 V1.3.2
Conducted Susceptibility (CS)	150KHz~80MHz 10V, 80% AM	A	EN 61000-4-6，EN 55024 ETSI EN 300 386 V1.3.2
Lightning AC Power Fault			GR-1089 Issue 4
Voltage Dips & Interruptions	See table below		EN 61000-4-11，EN 55024 ETSI EN 300 386 V1.3.2

Voltage Drop	Duration Time	Criteria
0% Ut	20 ms	B
70% Ut	500 ms	C
40% Ut	200 ms	C
0% Ut	5000 ms	C

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LED AND STATUS INDICATORS

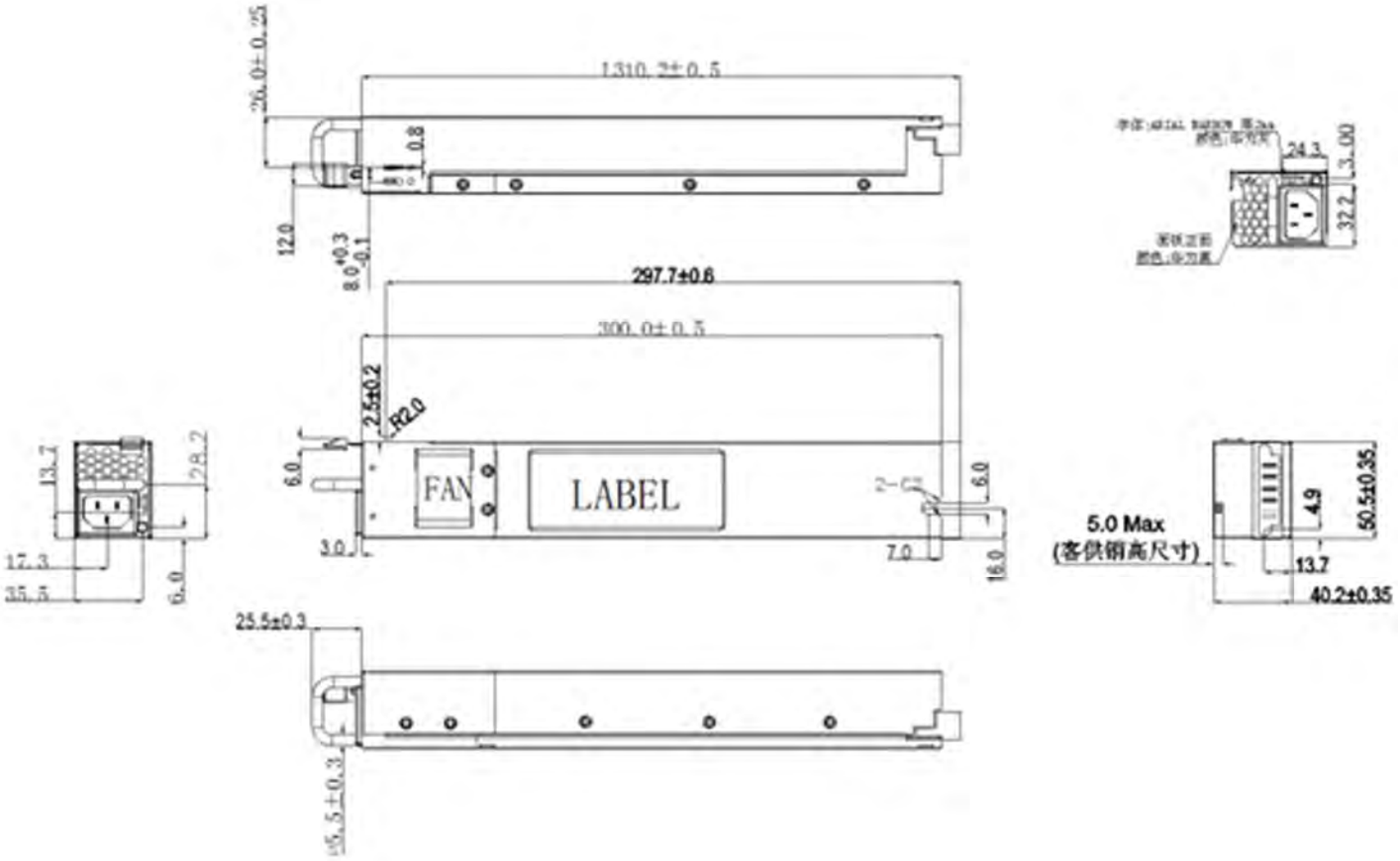
There is one LED located in the front panel to indicate input and PSU status.

Parameter	LED/Status	Min	Max	Unit
Status Signal Pin	ON/OFF	-0.3	30	Vdc
DC OK	Bi-color LED (Red & Green)	**Green:** Output Normal **Red:** PSU failure **Off:** Input over defined range Turn off PSU by signal		

PSU Status	LED Indicator	
Different Cases	OUT OK	IN OK
Input normal/Output Normal	Green	Green
No input	Off	Off
No input but with external bias(Vsso)	Red	Off
Input out of range	1Sec red /green alternative	Red
Input UVP	Red	Red
Fault (output SCP/ocp/ovp/otp/fan failure or others	Red	Green
Early warning for OCP or OTP	1Sec red /green alternative	Green
PS ON(High) or PS-KILL(High) or Off by software	1Sec Green/off alternative	Green

MECHANICAL PACKAGE

Description		
Dimensions – L x W x H in/mm	12.21" x 1.99" x 1.58" / 310.2mm x 50.5mm x 40.2mm	**Note**: Height measured from seating plane
Weight g / oz	30 / 1.06, typical	
Vibration	0.75 mm, 10Hz-55Hz, 20 minutes	



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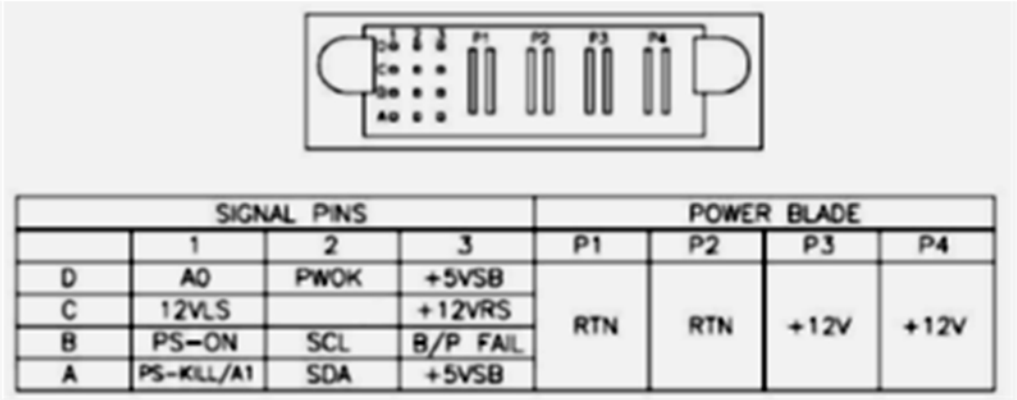
INPUT/OUTPUT CONNECTOR AND PIN ASSIGNMENT

Input connector: IEC320-C14. Application must use safety-compliant input cords/cables. The cable AWG must be rated to match maximum rated input current.

Output connector: FCI#51731-042LF is used in the PSU. The system connector should be 51731-017-747617 from FCI or 1-6450161-5 from Tyco.

OUTPUT PIN ASSIGNMENTS



	SIGNAL PINS			POWER BLADE			
	1	2	3	P1	P2	P3	P4
D	A0	PWOK	+5VSB	RTN	RTN	+12V	+12V
C	12VLS		+12VRS				
B	PS-ON	SCL	B/P FAIL				
A	PS-KILL/A1	SDA	+5VSB				

	1	2	3	P1	P2	P3	P4
D	A0	PWOK	+5VSB	RTN	RTN	12V	12V
C	12VLS	NC	12VRS				
B	PS-ON	SCL	B/P FAIL				
A	PSKILL/A1	SDA	+5VSB				

C2: NC is no connection

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PIN DESCRIPTIONS

All signal pin is referred to power return (P1 and P2)

P3 and P4 (+12V)
P1 and P2 (+12V return)
P1, P2, P3, and P4 are for main outputs. P3 and P4 are for +12V output, P1 and P2 are for power ground (+12V return).
All the signal pins should be based on power return (P1 and P2)

A1(PSKILL) and B1(PSON)
When PSON <1V and PSKILL < 4.5V, PSU is on, otherwise PSU is off.
The AUX power is always on when input voltage is normal.
A1 has 10K pull up resistor to 5V standby power

A1(A1) and D1 (A0)
These two pins for I2C address.
For A1, as function of address, A1 is lower than 1V, A1 is as logic low. A1 is higher than 2.5V, it is logic high.
D1 has 10K ohm pull up resistor to 5V standby power

A2--SDA
I2C data wire by I2C standard

A3 and D3 (+5V standby power)
The PSU has +5V standby output with 3A by pin A3 and D3. The return of standby power is main power return, which is P1 and P2

B2--SCL
I2C clock wire by I2C standard. 100Khz Max

B3--B/P FAIL
When OCP/OVP from system side, the pin will become logic high to turn off main power.

C1---12VLS
Current sharing wire for main output. All C1 should be connected together when configure 1+1 or N+1 current sharing.

C2---NC

C3---12VRS
Remote sense for +12V output to compensate 0.5V voltage drop.

PMBUS™ AND EEPROM

The PSU has 8Kbytes of EEPROM and can communicate with a Host system controller via I2C using the PMBus1.2 standard.

The addresses for the internal MCU and EEPROM are:

Device	Address	Address Allocation (From high bit to low bit)							
MCU	0xBx	1	0	1	1	A2	A1	A0	R/W
EEPROM	0xAx	1	0	1	0	A2	A1	A0	R/W

DEFINITION FOR EEPROM

Byte address (decimal)	Byte address (hex)	item	format	value
0000	0000h	Block signal		01
0001	0001h	Block signal		00
0002	0002h	Block signal		00
0003	0003h	Block signal		00
0004	0004h	Block signal		01
0005	0005h	Block signal		0B
0006	0006h			00
0007	0007h			F3
0008	0008h			01
0009	0009h			0A
0010	000Ah			19
0011	000Bh			C8
0012-0019	000Ch-0013h	MFG	Char*8	
0020	0014h			CA
0021-0044	0015h-002Ch	Product_number	Char*24	*GPR650B-12A1H*(ASCII)
0045	002Dh			D2
0046-0063	002Eh-003Fh	SN	Char*18	
0064-2047	0040h-07FFh		Char*1984	Reserved

PMBUS™ COMMANDS FOR GPR650B-12A UNIT

Data in linear format: x = y * 2^n
(For reference only)

CMD Code	Name	Type	Bytes	Conditions
03h	CLEAR_FAULTS	Send Byte	0	
19h	CAPABILITY	Read Byte	1	Value 00h
1Ah	QUERY	Block Write-Block Read Process Call	See PMBUS SPEC	
79h	STATUS_WORD	Read Word	2	
7Ah	STATUS_VOUT	Read Byte	1	
7Bh	STATUS_IOUT	Read Byte	1	
7Ch	STATUS_INPUT	Read Byte	1	
7Dh	STATUS_TEMPERATURE	Read Byte	1	
81h	STATUS_FANS_1_2	Read Byte	1	
8Bh	READ_VOUT	Read Word	2	
8Ch	READ_IOUT	Read Word	2	
8Dh	READ_TEMPERATURE_1	Read Word	2	
90h	READ_FAN_SPEED_1	Read Word	2	Rpm value
91h	READ_FAN_SPEED_2	Read Word	2	Rpm value
94h	READ_DUTY_CYCLE	Read Word	2	
96h	READ_POUT	Read Word	2	
97h	READ_PIN*	Read Word	2	
98h	PMBUS_REVISION	Read Byte	1	Value 11h
99h	MFR_ID	Read Block	Variable	See MFR Data table
9Ah	MFR_MODEL	Read Block	Variable	See MFR Data table
9Bh	MFR_REVISION	Read Block	Variable	See MFR Data table
A0h	MFR_VIN_MIN	Read Word	2	See MFR Data table
A1h	MFR_VIN_MAX	Read Word	2	See MFR Data table
A2h	MFR_IIN_MAX	Read Word	2	See MFR Data table
A3h	MFR_PIN_MAX	Read Word	2	See MFR Data table
A4h	MFR_VOUT_MIN	Read Word	2	See MFR Data table
A5h	MFR_VOUT_MAX	Read Word	2	See MFR Data table
A6h	MFR_IOUT_MAX	Read Word	2	See MFR Data table
A7h	MFR_POUT_MAX	Read Word	2	See MFR Data table
A8h	MFR_TAMBIENT_MAX	Read Word	2	See MFR Data table
A9h	MFR_TAMBIENT_MIN	Read Word	2	See MFR Data table
AAh	MFR_EFFICIENCY_LL	Read Word	2	See MFR Data table
ABh	MFR_EFFICIENCY_HL	Read Word	2	See MFR Data table
ACh	MFR_FW_REVISION	Read Block	Variable	See MFR Data table
ADh	MFR_FW_ID	Read Block	Variable	See MFR Data table

MFR Data Table

CMD Code	Name	PSR650B-12A1
99h	MFR_ID	GRE
9Ah	MFR_MODEL	PSR650B-12A1
9Bh	MFR_REVISION	V100
A0h	MFR_VIN_MIN	85V
A1h	MFR_VIN_MAX	264V
A2h	MFR_IIN_MAX	10A
A3h	MFR_PIN_MAX	750W
A4h	MFR_VOUT_MIN	11.63V
A5h	MFR_VOUT_MAX	12.36V
A6h	MFR_IOUT_MAX	53A
A7h	MFR_POUT_MAX	650W
A8h	MFR_TAMBIENT_MAX	80
A9h	MFR_TAMBIENT_MIN	0
AAh	MFR_EFFICIENCY_LL	0.90
ABh	MFR_EFFICIENCY_HL	0.92
ACh	MFR_FW_REVISION	V100
ADh	MFR_FW_ID	PSR650B-12A1

ORDERING INFORMATION

Input Voltage	Output Voltage	Output Current	Aux Power Voltage	Aux Power Current	Model Number	Note
100VAC-240VAC	12V	53A	5V	3A	GPR650B-12A	Base Model

All specifications are typical at nominal input, full load, at 25°C ambient unless otherwise noted. Specifications are subject to change without notice. Please consult our Applications Engineering office at 858-275-6423 for additional technical data and support or email us at info@brightworks-usa.com.

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