

## Model: BPA-RT5000-Series Single or 3 Phase Input

The BPA-RT5000-Series is a highly reliable, 5000W, AC to DC, redundant power supply module. With AC input range of 180 - 528 VAC in single phase, 3 phase Delta and 3 phase Y inputs. This power supply achieve the highest performance efficiency by incorporating digital control interleaved PFC and phase-shift full bridge technology. The BPA-RT5000-Series family also includes PMBus™ interface to monitor and control all essential functions of the power supply module.

**Custom controls available.**

### Special Features

- High efficiency up to 94.0%
- Active Power Factor Correction
- Dimensions: 127.0 x 63.5 x 392.43 mm.  
(5.0 x 2.5 x 15.45 in.)
- Wide input voltage range: 180 – 528VAC
  - Single Phase
  - 3 Phase Delta
  - 3 Phase Y
- Redundant operation
- Adjustable Output Voltages  $\pm 10\%$  via potentiometer ,software ,or 0.5-5V voltage pin
- Adjustable Output Current from 50%-100% of load via 0.5-5V voltage pin or software
- Optional Conformal Coating
- Optional fan airflow direction
- Variable fan speed control
- Series and Parallel Wiring Possible
- Fully secure(OTP, OVP, OCP, SCP)
- LEDs Status :OK, Fault, Warning
- AC OK, DC OK, Alert Signals
- Analog Output Current Monitor Function:0-2.5V
- CE Compliant
- RoHS Compliant
- Active Monitoring for Series Operation
- PS\_ON
- Three Year Warranty
- Design to meet latest edition of the following Safety Standards: UL/cUL, and DEMKO  
**(To be submitted)**
- **Custom modifications available**



Total Power	Input Voltage	Output Voltage	Minimum	Maximum
5000 W	180 - 528VAC	VO1	0A	416.7A
		12VSB	0A	1.0A

**See all Output Voltage on last page (from 12V-110V)**

**Single Phase 300-180VAC Derated 5000-3000W**

**Three Phase 210-180VAC Deated 5000-4500W**

**Maximum Input Current 19A**

### Applications

- Battery Charger
- LED Lighting
- Routers
- Switches (POE)
- Telecommunication
- Industrial Application
- Robotics



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# 1. Input Specifications

Parameter	Description/Condition	Min	Nom	Max	Units
$V_{i\ nom}$	Nominal Input Voltage	180		528	VAC
$I_{i\ max}$	Max. Input Current	$V_{in} = 180VAC/60HZ, Full\ Load$		19	$A_{rms}$
$I_{i\ p}$	Inrush Current	$528V_{rms}, 25^{\circ}C$		32	$A_p$
	Leakage Current			3.0	mA
$F_i$	Input Frequency	47	50/60	63	Hz
PF	Power Factor	$V_{in} = 480V/50Hz$		0.95	W/VA
$V_{i\ on}$	Turn-on Voltage	Ramping Up		178	VAC
$V_{i\ off}$	Turn-off Voltage	Ramping Down		170	VAC
$Power_i$	Input Power	$V_{in} = 180VAC\ 3\ Phase$		5600	W
		$V_{in} = 480VAC, VO1 / 20\%Load, T_A = 25^{\circ}C$		91.5	
$\eta$	Efficiency without Fan	$V_{in} = 480VAC, VO1 / 50\%Load, T_A = 25^{\circ}C$		94.0	%
		$V_{in} = 480VAC, VO1 / 100\%Load\ T_A = 25^{\circ}C$		93.0	
$T_{hold}$	Hold-up Time	12			ms

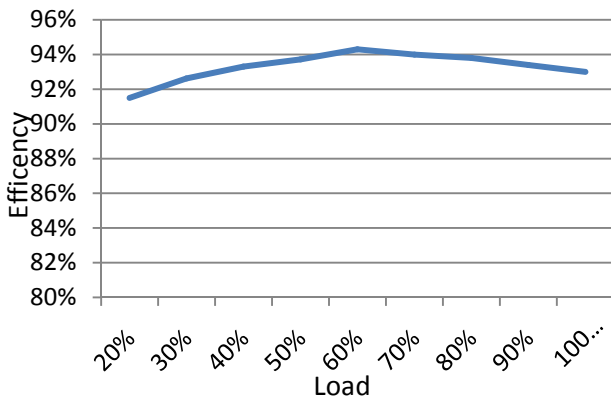
**1.1 Input Fuse** Internal 20A input fuses, in series with the input line, protects against severe defects.

**1.2 Inrush Current** When the power supply module is connected to the main input, it exhibits a low and short peak current due to an X-capacitance's initial charge. The internal bulk capacitor is charged through a controlled NTC circuit which will limit the inrush current.

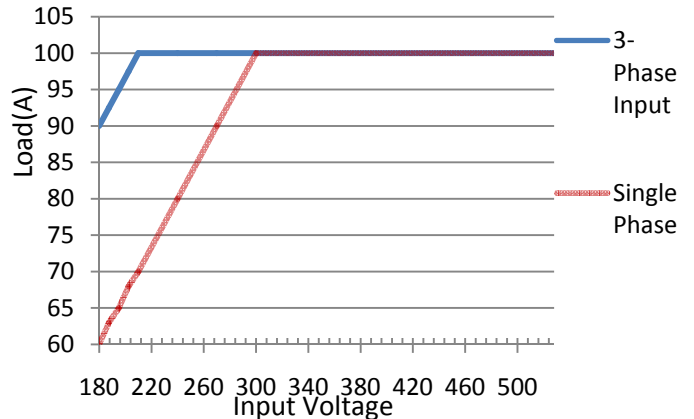
**1.3 Input Under-Voltage** If the input voltage stays below the specified input voltage range for more than 10 seconds the main output will shut down. The power supply module will automatically return to normal operational condition when the input voltage returns to the specified range.

**1.4 Power Factor Correction** Power factor correction (PFC) is achieved by controlling the input current waveform synchronous with the input voltage. A fully digital controller is implemented giving outstanding PFC results over wide input voltage and load ranges.

## Efficiency BPA-RT5000-Serie



## Derating of Input Voltage in Single and 3-Phase



Single Phase Derated Linearly from 5000W(100A) at 300VAC to 3000W(60A) at 180VAC  
 Three Phase Derated Linearly from 5000W(100A) at 210VAC to 4500W(90A) at 180VAC

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## 2. Output Specifications

Parameter	Description/Condition	Min	Nom	Max	Units
<b>Main Output V<sub>1</sub></b>					
V <sub>1 nom</sub>	Nominal Output Voltage	12		110	VDC
V <sub>1 set</sub>	Output Setpoint Accuracy	0.5 * I <sub>nom</sub> , T <sub>amb</sub> =25°C		0.1	%V <sub>1</sub>
P <sub>1 nom</sub>	Nominal Output Power	VO1		5000	W
I <sub>1 nom</sub>	Nominal Output Current	VO1	0	416.7	A <sub>DC</sub>
V <sub>1 pp</sub>	Output Ripple Voltage	V <sub>1 nom</sub> , I <sub>1 nom</sub> , 20MHz BW		1	%V <sub>pp</sub>
dV <sub>1 Load</sub>	Load Regulation	V <sub>1</sub> = V <sub>1 nom</sub> , 0 - 100% I <sub>1 nom</sub>	-0.25	0.25	%V
dV <sub>1 Line</sub>	Line Regulation	V <sub>1</sub> = V <sub>1 min</sub> .....V <sub>1 max</sub>	-0.25	0.25	%V
dV <sub>1 tot</sub>	Total Regulation	V <sub>1 min</sub> to V <sub>1 max</sub> , 0 to 100% I <sub>1 nom</sub> , T <sub>a min</sub> to T <sub>a max</sub>	-0.5	0.5	%V <sub>1</sub>
dI <sub>share</sub>	Current Sharing	When Bus load ≥ (20%)	-5	5	%A
dI <sub>share</sub>	Current Sharing	When Bus load < (20%)	-10	10	%A
dV <sub>dyn</sub>	Dynamic Load Regulation	I <sub>out</sub> : 10%--60% of full load; 50--100% of full load	-2.5	2.5	%V
T <sub>rec</sub>	Recovery Time	dI <sub>1</sub> /dt = 1A/μs, recovery within 1% of V <sub>1 nom</sub>		1	ms
t <sub>AC V1</sub>	Start-up Time from AC	Varies with Input Line		3	sec
tV <sub>1 rise</sub>	Rise Time	V <sub>1</sub> = 10%.....90% V <sub>1 nom</sub>		100	ms
C <sub>Load</sub>	Capacitive Loading	T <sub>amb</sub> =25°C		∞	μF
<b>Standby Output V<sub>SB</sub></b>					
V <sub>SB nom</sub>	Nominal Output Voltage	0.5 · I <sub>1 nom</sub> , T <sub>amb</sub> =25°C		12.0	VDC
V <sub>SB set</sub>	Output Setpoint Accuracy	0.5 · I <sub>1 nom</sub> , T <sub>amb</sub> =25°C	.3	.3	V <sub>SB</sub>
P <sub>SB nom</sub>	Nominal Output Power	V <sub>SB</sub> = 12VDC		12	W
I <sub>SB nom</sub>	Nominal Output Current	V <sub>SB</sub> = 12VDC		1.0	A <sub>DC</sub>
V <sub>SB pp</sub>	Output Ripple Voltage	V <sub>SB</sub> , I <sub>SB</sub> , 20MHz BW		120	mV <sub>pp</sub>
dV <sub>SB tot</sub>	Total Regulation	V <sub>i min</sub> to V <sub>i max</sub> , 0 to 100% I <sub>1 nom</sub> , T <sub>a min</sub> to T <sub>a max</sub>	-3	3	%V <sub>SB</sub>
dV <sub>SB</sub>	Droop	0 - 100% I <sub>SB nom</sub>		.3	V
dV <sub>SB dyn</sub>	Dynamic Load Regulation	ΔI <sub>SB</sub> = 50%, I <sub>SB nom</sub> , I <sub>SB</sub> 5.....100% I <sub>SB nom</sub> ,	-0.3	0.3	%V <sub>SB</sub>
T <sub>rec</sub>	Recovery Time	dI <sub>1</sub> /dt = 1A/μs, recovery within 1% of V <sub>SB nom</sub>		1.2	ms
t <sub>AC VSB</sub>	Start-up Time from AC	Varies with Input Line	0.2	1.2	sec
tV <sub>SB rise</sub>	Rise Time	V <sub>SB</sub> = 10% .....90% V <sub>SB nom</sub>		20	ms
C <sub>Load</sub>	Capacitive Load	T <sub>amb</sub> =25°C		10000	μF

**2.1. Output Voltage Ripple** Ripple and noise are measured with 0.1 μF of ceramic capacitance and 10 μF of tantalum capacitance on each of the outputs.

### 3. Protection

Parameter	Description/Condition	Min	Nom	Max	Units	
F <sub>1,2,3</sub>	Input Fuses	Not user accessible		20	A	
V <sub>1 OV</sub>	Overvoltage Threshold V <sub>1</sub>	110		120	%VDC	
t <sub>OV V1</sub>	Overvoltage Latch Off Time V <sub>1</sub>			1	ms	
V <sub>SB OV</sub>	Overvoltage Threshold V <sub>SB</sub>	13.2		14.4	VDC	
t <sub>OV VSB</sub>	Overvoltage Latch Off Time V <sub>SB</sub>			1	ms	
I <sub>V1 lim</sub>	Current Limit	102		105	%A	
V <sub>1 SC Max</sub>	Short Circuit Current V <sub>1</sub>			200	%A	
t <sub>V1 SC off</sub>	Short Circuit Latch Off Time	Time to latch off when in short circuit		3	s	
T <sub>SD</sub>	Over Temperature Protection	Internal temperature		115	120	°C
	Recovery Temperature			70	°C	
I <sub>VSB lim</sub>	Standby Current Limit	Auto Recovery		3	A	

**3.1 Overvoltage Protection** The power supply module will shut down if the output voltage exceeds the over voltage threshold. The power supply module must be manually repowered by recycling AC Source, by toggle PS\_ON\*, or PMBus™ operation command.

**3.2 Undervoltage Protection** The power supply module will shutdown if the output voltage falls below undervoltage threshold (90% of VO1 lowest adjustable voltage or 90% of V01 with fixed voltage) for more than 3 second. The power supply module must be manually repowered by recycling AC Source, by toggle PS\_ON\*, or PMBus™ operation command.

**3.3 Overload Protection** Constant current until the undervoltage threshold point (90% of V01 with fixed voltage).The power supply will turn off when it falls under the undervoltage threshold on the primary output for longer than 3 second. The 12V standby utilizes the hiccup method. The power supply module must be manually repowered by recycling AC Source, by toggle PS\_ON\*, or PMBus™ operation command.

**3.4 Short-circuit Protection** Constant current for 3 second then the main output shut down. The 12V standby utilizes the hiccup method. The power supply module must be manually repowered by recycling AC Source, by toggle PS\_ON\*, or PMBus™ operation command.

**3.5 Over Temperature Protection** The power supply module will shut down if temperature exceeds the over temperature threshold (internal temperature). The power supply module will automatically restart when temperature falls below recovery temperature threshold. The power supply module can also be manually repowered by recycling AC Source, by toggle PS\_ON\*, or PMBus™ operation command.

\*Can only be repowered by PS\_ON if selected as an option.

### 4. Safety/Approval

Parameter	Description/Condition	Min	Nom	Max	Units
Agency Approvals	Design to meet latest edition of the following standards: UL/cUL 62368-1(TBD) IEC/EN 62368-1(TBD)		Approved by independent body		
Isolation Strength	Input(L/N) to case (PE)	2500	Basic		Vrms
	Input (L/N) to output	5000	Reinforced		Vrms
	Output to case (PE)		Functional		VDC
Electrical Strength Test	Input to Case	2500			VDC
	Input to Output	5000			VDC

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## 5. Electromagnetic Compatibility

### 5.1 Immunity

Parameter	Description/Condition	Criterion
ESD Contact Discharge	IEC/EN61000-4-2, Level 2 ±4kV	A
Radiated Electromagnetic Field	IEC/EN61000-4-3, Level 2 (3V/m) 80-1000MHz, 1.4-2.0GHz, Level 1 (1V/m) 2.0-2.7GHz	A A
Electrical Fast Transients/ Burst	IEC/EN61000-4-4, level 2 AC port ±1kV, 1 minute	A
Surge	IEC/EN61000-4-5, Level 2 AC port ± 1kV, 1 min CM, Level 3 AC port ±2kV, 1 min CM	A A
RF Conducted Immunity	IEC/EN 61000-4-6, Level 2, 3 V, CW, 0.15 ... 80MHz Amplitude Modulation 1kHz/80%	A
Magnetic Field Immunity	IEC/EN 61000-4-8, Level 2 3A/m	A
Voltage Dips and Interruptions	IEC/EN61000-4-11 1.0% residual voltage, 0.5 cycle 2.0% residual voltage, 1 cycle 3.40% residual voltage, 5 cycles 4.70% residual voltage, 0.5 cycle 5.70% residual voltage, 25 cycles/50Hz 6.0% residual voltage, 250 cycles/50Hz	A B B A B B

### 5.2 Emission

Parameter	Description/Condition	Criterion
Conducted Emissions	EN 55022 / EN 55016-2-1 conducted	Class A
Radiated Emission	EN 55022 / EN 55016-2-3 radiated	Class A
Harmonics Emission	IEC61000-3-2, $V_{in} = 230VAC/50Hz$ , 100% Load	Class A
Acoustical Noise	46dB at 1 meter, 25 C , 50% Load	-
AC Flicker	IEC61000-3-3, $V_{in} = 230VAC/50Hz$ , 100% Load, <20Arms	Pass

## 6. Environmental Specifications

Parameter	Description/Condition	Min	Nom	Max	Units
T <sub>A</sub> Ambient Temperature	$V_{i min}$ to $V_{i max}$ , $I_{o nom}$ , $I_{SB nom}$	-20		70*	°C
T <sub>S</sub> Storage Temperature	Non- operational	-40		85	°C
Altitude	Operational, above Sea Level		5000 16400		Meter Feet
RH Humidity	Non-condensing	5		95	%
Na Audible Noise	$V_{i nom}$ , 100% $I_{o nom}$ , $T_{amb} = 25^{\circ}C$			65	dBa

\*Derating linearly from 51° -70°C @50% load.

## 7. Signals and Controls

### 7.1 Electrical Characteristics

Parameter		Min	Nom	Max	Unit
<b>PS_ON</b>					
V <sub>IL</sub>	Input Low Level Voltage	0		0.8	V
V <sub>IH</sub>	Input High Level Voltage	2.4		3.3	V
R <sub>puPS_ON</sub>	Internal Pull Up Resistor on PS_ON		10		k Ω
<b>AC_OK/DC_OK/Alert</b>					
V <sub>IL</sub>	Input Low Level Voltage	0		0.8	V
V <sub>IH</sub>	Input High Level Voltage	2.4		3.3	V
I <sub>IL,H</sub>	Maximum Input Sink or Source Current	0		10	mA
R <sub>puAC_OK</sub>	Internal Pull Up Resistor on AC_OK		none		k Ω
R <sub>puDC_OK</sub>	Internal Pull Up Resistor on DC_OK		none		k Ω
R <sub>puAlert</sub>	Internal Pull Up Resistor on Alert		none		k Ω
<b>SCL_1/SDA_1</b>					
V <sub>IL</sub>	Input Low Level Voltage	0		0.8	V
V <sub>IH</sub>	Input High Level Voltage	2.4		3.3	V
I <sub>IL,H</sub>	Maximum Input Sink or Source Current			0.25	mA
R <sub>puSCL_1</sub>	Internal Pull Up Resistor on SCL_1		none		k Ω
R <sub>puSDA_1</sub>	Internal Pull Up Resistor on SDA_1		none		k Ω
<b>A0/A1/A2</b>					
V <sub>IL</sub>	Input Low Level Voltage	0		0.8	V
V <sub>IH</sub>	Input High Level Voltage	2.4		3.3	V
R <sub>puA0</sub>	Internal Pull Up Resistor on A0		100		k Ω
R <sub>puA1</sub>	Internal Pull Up Resistor on A1		100		k Ω
R <sub>puA1</sub>	Internal Pull Up Resistor on A2		100		k Ω

**7.2 PS\_ON** The PS\_ON signal is used to remotely enable/disable the main output V1 of the front-end. This active-low pin is also used to clear any latched fault condition.

**7.3 AC\_OK** The AC\_OK is an open collector signal with an active-high when the AC input voltage is above 178VAC and an active-low when the ac voltage falls outside the requirements for more than 10ms. This pin must be connected to an external voltage via pull up resistor on the system backplane 20V max 10mA max.

**7.4 DC\_OK** The DC\_OK is an active-high signal that indicating whether both VSB and V1 outputs are within regulation. This pin is active-low when V1 and VSB are not within regulation. This pin must be connected to an external voltage via pull up resistor on the system backplane 20V max 10mA max.

**7.5 Current Share (VCS)** When used in a redundant configuration, all the current share pins need to be interconnected in order to activate the sharing function. If a supply has an internal fault or is not turned on, the current share line will automatically disengage from the bus.

-If current share is not required the current share pin can be left open.

**7.6 Series\_CS(For Series Connection Current Monitoring)** When signal is interconnected with other supplies in series, in case of a power supply failing, the Series\_CS will turn off other power supplies connected in series if load exceeds 10% of rated output current.

**7.7 Alert** Fault/Warning - An open collector signal is provided to indicate any fault or warning such as over temperature, overvoltage, over current, undervoltage, and fan fault. This pin must be connected to an external voltage via pull up resistor on the system backplane 20V max 10mA max.

### 7.7.1 Front LED

<b>Power Supply Condition</b>	<b>Alert State</b>	<b>Green LED</b>	<b>Red LED</b>	<b>AC_OK</b>	<b>DC_OK</b>
Normal Operation	High	On	Off	High	High
Standby Mode	High	Blink	Off	High	Low
<b>PSU Faults Condition</b>					
Input Undervoltage	Low*	Off	On	Low	Low
Output Overvoltage	Low	Off	On	High	Low
Fan	Low	Off	On	High	Low
Over Temperature	Low	Off	On	High	Low
Output Over Current	Low	Off	On	High	Low
<b>PSU Warning Condition</b>					
Over Temperature	Low	On	Blink	High	High
Fan Speed(Low Speed)	Low	On	Blink	High	High
Output Overvoltage	Low	On	Blink	High	High
Output Over Current	Low	On	Blink	High	High
Input Undervoltage	Low	On	Blink	Low	High
AC below turn on point	Low	Off	Blink	Low	High

See Page 4 (3.Protections) for fault Threshold.

For Faults the power supply module must be manually repowered by recycling AC Source, by toggle PS\_ON, or PMBus™ operation command.

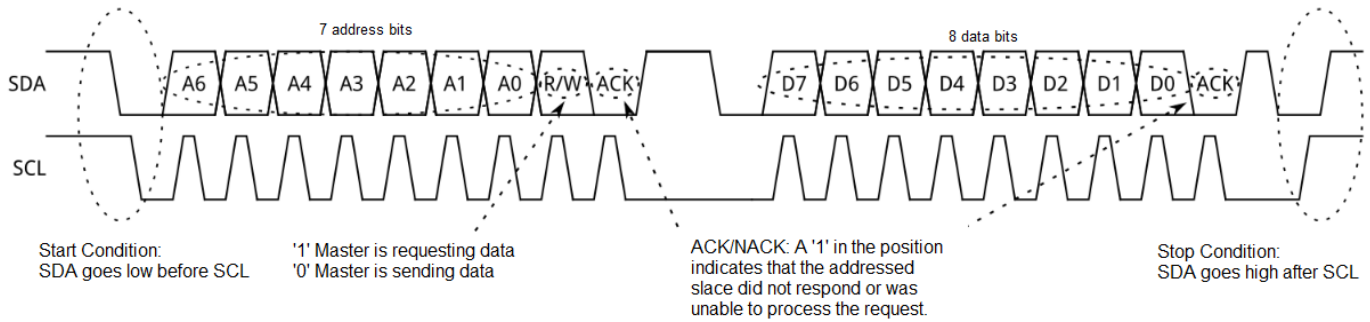
### 7.7.2 Warnings

<b>PSU Warning Triggers</b>	<b>Min</b>	<b>Nom</b>	<b>Max</b>	<b>Units</b>
Over Temperature		115		°C
Fan Speed(Low RPM)		500		RPM
Output Over Current	102		105	%A
Input Undervoltage		175		VAC

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**7.9 SDA & SCL** The I2C bus consist of a Serial Clock (SCL) and a Serial Data Line (SDA). Both signals lines must be pull up to 3.3V via a 1.5k resistor.



**7.10 Address Select (A0, A1, A2)** These digital input lines are used to set the address of the power supply module. These addresses are used to differentiate between multiple power supply modules utilize in a redundant mode within the same system.

**7.11 PSU Address Table** (Address Bit Settings)

A0, A1, & A2	PSU Address Value	A2	A1	A0	Recognize Address
00h	B0h	0	0	0	Yes
01h	B2h	0	0	1	Yes
02h	B4h	0	1	0	Yes
03h	B6h	0	1	1	Yes
04h	B8h	1	0	0	Yes
05h	BAh	1	0	1	Yes
06h	BCh	1	1	0	Yes
07h	BEh	1	1	1	Yes

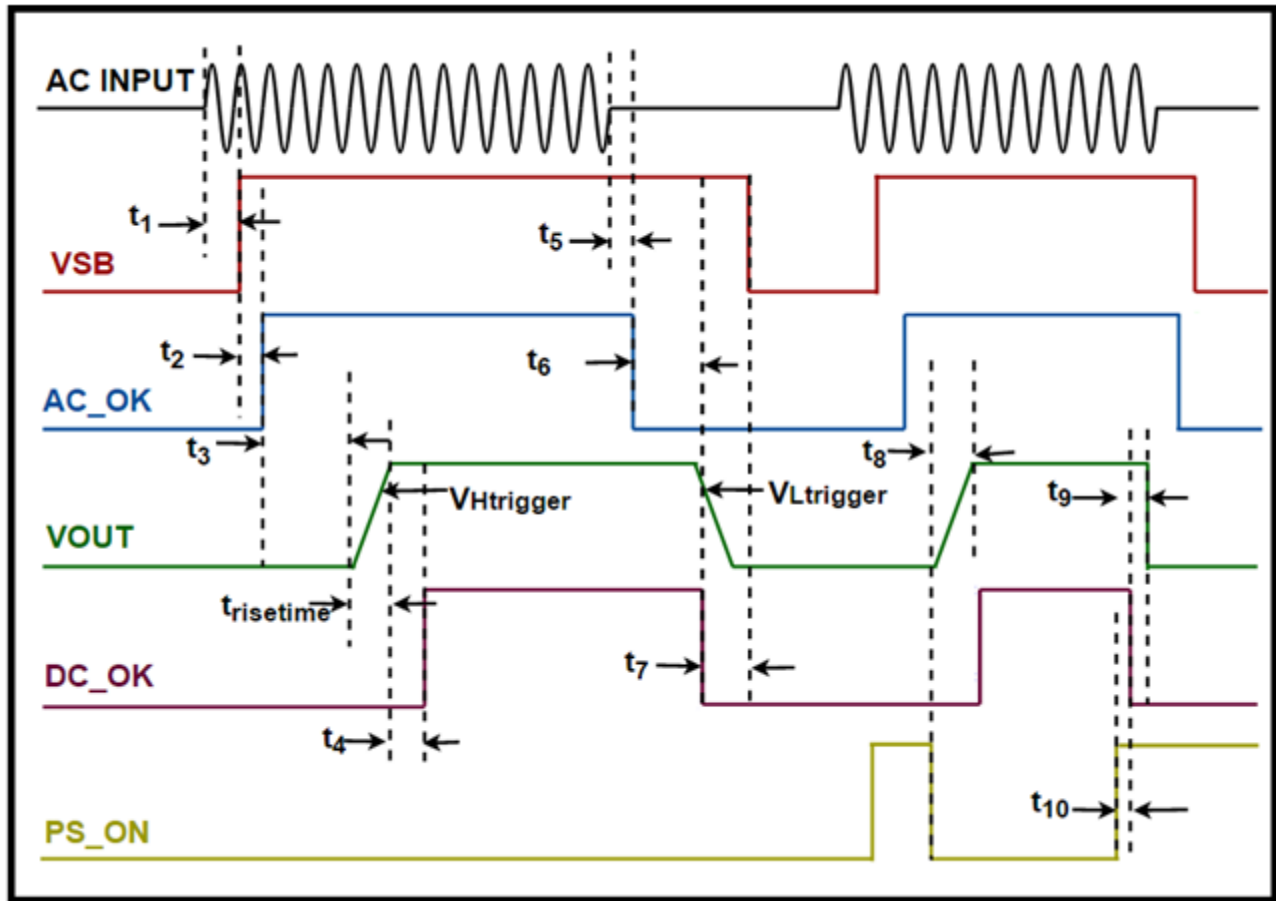
**7.12 Current Monitor** The current monitor signal is reference to common. The analog signal 0V to 2.5V is proportional to the load when increasing from 0 to 100% load.

**7.13 Programmable Voltage Adjust** 0.5V to 5V input voltage source going to pin (CNT2-7) that will adjust the main output voltage, linearly from -10% to +10% of rated output voltage.

**7.13 Programmable Current Adjust** 0.5V to 5V input voltage source going to pin (CNT2-9) that will adjust the current limit of the main output from 50 to 100% of the rated output current.



## 7.15 Timing Graph



Parameter	Description/Condition	Min	Nom	Max	Unit
$t_{risetime}$	VOUT at 0% to VOUT at 90%	80	100	120	ms
$V_{Htrigger}$	DCOK(high) Varies due to Load	95	-	100	%V
$V_{Ltrigger}$	DCOK(low) Varies due to Load	90	-	95	%V
<b>Turn-On</b>					
$t_1$	AC INPUT - VSB Varies due to Line and Load	-	-	1000	ms
$t_2$	VSB - AC_OK	-	-	1000	ms
$t_3$	AC_OK - VOUT Varies due to Line and Load	.4	-	1.5	s
$t_4$	VOUT - DC_OK	100	-	150	ms
$t_8$	PS_ON(low) - VOUT PS_ON Turn-On	.8	-	1.5	s
<b>Turn-Off</b>					
$t_5$	AC INPUT - AC_OK AC IN Turn-Off	10	-	-	ms
$t_6$	AC_OK - DC_OK AC IN Turn-Off Varies due to Load	1	-	-	ms
$t_7$	DC_OK - VSB AC IN Turn-Off Varies due to Line and Load	66	-	-	ms
$t_{10}$	PS_ON(high) - DC_OK(low) PS_ON Turn-Off	-	10	-	ms
$t_9$	DC_OK - VOUT PS_ON Turn-Off	400	440	480	$\mu$ s

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### 7.13 PMBus™ Functionality Supported By PSU(PMBus™ Info)

Address	Commands	Description	Supported	Transaction-Type	Byte_Size
01h	Operation_ON_OFF	Used to enable or disable the output of the PSU depending value of the second byte that follows.	Y	Read/Write	2-bytes
03h	Clear_Fault	Used to clear all status registers and error flags. This command also affects the SMB_ALERT signal.	Y	Write Only	1-byte
19h	Capability	Used by the end user system to query the PSU, to determine if it supports certain features, or not. Features such packet error checking, SMB_ALERT and the max SMBUS clock rate.	Y	Read Only	1-byte
20h	VOUT_Mode	Sets/reads the formats (Linear, VID, and Direct) and exponents for VOUT related commands.	Y	Read Only	1-byte
3Bh	Fan_Command_1	Used by the end user system to override the fan speed versus temperature algorithm of the PSU, so that the system can set the fan speed to where ever it requires within the limits of the fan specification.	Y	Read/Write	2-bytes
78h	Status_Byte	Used to retrieve and report one byte containing a summary of the most critical faults. All bits in this register should read as zero when the PSU is operating normally.	Y	Read/Write	1-byte
79h	Status_Word	Used to retrieve and report two bytes containing a summary of faults conditions. All bits in this register should read as zero when the PSU is operating normally. This register acts as an index to all the other status registers.	Y	Read/Write	2-bytes
7Ah	Status_VOUT	Used to retrieve and report the status of the output voltages. It reports information such as output under-voltage, output over-voltage, output undervoltage-warning	Y	Read/Write	1-byte
7Bh	Status_IOUT	Used to retrieve and report the status of the device output current. It relays information, such as output over current conditions, exceeded and output current approaching it maximum rating.	Y	Read/Write	1-byte
7Ch	Status_INPUT	Used to retrieve and report the status of the device input. It relays information, such as input over current, input over power, input OVP rating exceeded and input current approaching it maximum rating.	Y	Read/Write	1-byte

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### 7.13 PMBus™ Functionality Supported By PSU(PMBus™ Info) - Continued

Address	Commands	Description	Supported	Transaction-Type	Byte_Size
7Dh	Status_Temperature	Used to retrieve and report the status of the device operating temperatures both ambient and heat-sinks.	Y	Read/Write	1-byte
7Eh	Status_CML	Used to retrieve and report the status of the I2C or SMBUS communication bus; error such as packet error checking (PEC), receive an unsupported command etc...	Y	Read/Write	1-byte
81h	Status_Fans_1&2	Used to retrieve and report the operating status of fan_1 & 2.	Y	Read/Write	1-byte
88h	Read_VIN	Used to retrieve a two bytes value in Little Endian format representing the active input voltage of the device in a linear format ( $VIN = Y \cdot 2^n$ ), where n is the exponent in two's complement represented by the five most significant bits of the upper byte. Y is the mantissa represented the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
89h	Read_IIN	Used to retrieve a two bytes value in Little Endian format representing the active input current of the device in a linear format ( $IIN = Y \cdot 2^n$ ), where n is the exponent in two's complement represented by the five most significant bits of the upper byte. Y is the mantissa represented the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
8Bh	Read_VOUT	Used to retrieve a two bytes value in Little Endian format representing the active output voltage of the device in a linear format ( $VOUT = Y \cdot 2^9$ ), VOUT is a special case where the mantissa and the exponent are not combined, but listed separately.	Y	Read Only	2-bytes
8Ch	Read_IOOUT	Used to retrieve a two bytes value in Little Endian format representing the active output current of the device in a linear format ( $I\_OUT = Y \cdot 2^n$ ), where n is the exponent in two's complement represented by the five most significant bits of the upper byte. Y is the mantissa represented the eleven lower bits of the two byte word.	Y	Read Only	2-bytes

### 7.13 PMBus™ Functionality Supported By PSU(PMBus™ Info) - Continued

Address	Commands	Description	Supported	Transaction-Type	Byte_Size
8Dh	Read_Temperature_1	Used to retrieve a two bytes value in Little Endian format representing the air intake ambient temperature of the device in a linear format ( $Temp\_1 = Y \cdot 2^n$ ), where n is the exponent in two's compliment format, represented by the five most significant bits of the upper byte. Y is the mantissa represented by the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
8Eh	Read_Temperature_2	Used to retrieve a two bytes value in Little Endian format representing the air exhaust ambient temperature of the device in a linear format ( $Temp\_2 = Y \cdot 2^n$ ), where n is the exponent in two's compliment format, represented by the five most significant bits of the upper byte. Y is the mantissa represented by the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
DAh	Read_Temperature_3	Used to retrieve a two bytes value in Little Endian format representing the heat-sink temperature of the device in a linear format ( $Temp\_3 = Y \cdot 2^n$ ), where n is the exponent in two's compliment format, represented by the five most significant bits of the upper byte. Y is the mantissa represented by the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
DBh	Read_Temperature_4	Used to retrieve a two bytes value in Little Endian format representing the heat-sink temperature of the device in a linear format ( $Temp\_3 = Y \cdot 2^n$ ), where n is the exponent in two's compliment format, represented by the five most significant bits of the upper byte. Y is the mantissa represented by the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
90h	Read_Fan_Speed_1	Used to retrieve a two bytes value in Little Endian format representing the fan_1 speed of the device in a linear format ( $Fan\_Speed\_1 = Y \cdot 2^n$ ), where n is the exponent in two's compliment format, represented by the five most significant bits of the upper byte. Y is the mantissa represented by the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
96h	Read_POUT	Used to retrieve a two bytes value in Little Endian format representing the active output power of the device in a linear format ( $POUT = Y \cdot 2^n$ ), where n is the exponent in two's compliment format, represented by the five most significant bits of the upper byte. Y is the mantissa represented by the eleven lower bits of the two byte word.	Y	Read Only	2-bytes

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### 7.13 PMBus™ Functionality Supported By PSU(PMBus™ Info) - Continued

Address	Commands	Description	Supported	Transaction-Type	Byte_Size
97h	Read_PIN	Used to retrieve a two bytes value in Little Endian format representing the active input power of the device in a linear format ( $PIN = Y \cdot 2^n$ ), where n is the exponent in two's compliment represented by the five most significant bits of the upper byte. Y is the mantissa represented by the eleven lower bits of the two byte word.	Y	Read Only	2-bytes
98h	PMBus™_Revision	Used to set and retrieve the version of the PMBus™ specification, with which the PSU is in compliance.	Y	Read Only	1-byte
9Ah	MFR_Model	Used to set and retrieve the manufacturer's model number assign to the device.	Y	Read/Write	Variable plus 1-byte count
9Bh	MFR_Revision	Used to set and retrieve the manufacturer's revision of the device.	Y	Read/Write	1-byte
9Ch	MFR_Location	Used to set and retrieve the location of manufacturing of the device.	Y	Read/Write	Variable plus 1-byte count
9Dh	MFR_Date	Used to set and retrieve the date of manufacturing of the device.	Y	Read/Write	4-bytes plus 1byte count
9Eh	MFR_Serial	Used to set and retrieve the value of the manufacturer's serial number assigned to the device.	Y	Read/Write	Variable plus 1-byte count
A0h	MFR_VIN_MIN	Used to retrieve the value of the minimum rated input voltage, that the PSU can be operated.	Y	Read Only	2-bytes
A1h	MFR_VIN_MAX	Used to retrieve the value of the maximum rated input voltage, that the PSU can be operated safely.	Y	Read Only	2-bytes
A2h	MFR_IIN_MAX	Used to retrieve the value of the maximum rated input current in Amps, that the PSU can be operated.	Y	Read Only	2-bytes
A3h	MFR_PIN_MAX	Used to retrieve the value of the maximum rated output power in Watts, that the PSU can be operated.	Y	Read Only	2-bytes
A4h	MFR_VOUT_MIN	Used to retrieve the value of the minimum rated output voltage that the PSU can provide.	Y	Read Only	2-bytes
A5h	MFR_VOUT_MAX	Used to retrieve the value of the maximum rated output voltage that the PSU can provide.	Y	Read Only	2-bytes
A6h	MFR_IOUT_MAX	Used to retrieve the value of the maximum rated output current in Amps, that the PSU is expected to provide.	Y	Read Only	2-bytes
A7h	MFR_POUT_MAX	Used to retrieve the value of the maximum rated output power in Watts, that the PSU is expected provide.	Y	Read Only	2-bytes
A8h	MFR_TAMBIENT_MAX	Used to retrieve the value of the maximum ambient temperature that the PSU can be operated, in degree Celsius.	Y	Read Only	2-bytes
A9h	MFR_TAMBIENT_MIN	Used to retrieve the value of the minimum ambient temperature that the PSU can be operated, in degree Celsius.	Y	Read Only	2-bytes

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## 8. PMBus™ Monitoring

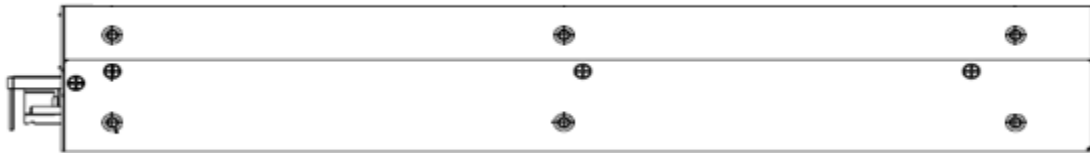
Parameter	Description/Condition	Min	Nom	Max	Units
$V_{i\ mon}$	Input RMS Voltage $V_{i\ min} \leq V_i \leq V_{i\ max}$	-3.5		3.5	%
$I_{i\ mon}$	Input RMS Current	-2		2	%
$P_{i\ mon}$	True Input Power	-4		4	%
$V_{1\ mon}$	V1 Voltage	-0.5		0.5	%
$I_{1\ mon}$	V1 Current	-2		2	%
$P_{o\ nom}$	Total Output Power	-1.5		-1.5	%
$V_{SB\ mon}$	Standby Voltage	-1		1	%
$I_{SB\ mon}$	Standby Current	-2		2	%
$t_1$	Temperature1 Intake	-2		2	°C
$t_2$	Temperature2 Exhaust	-2		2	°C
$t_3$	Temperature3 Primary Section	-2		2	°C
$t_4$	Temperature4 Secondary Section	-2		2	°C
$F_S$	Fan Speed Measurement Accuracy	-5		5	%
	Fan Speed Control Range(0-5500RPM)	0		100	%

## 9. Fan Speed & Direction

Fan Speed	RPM
Nominal Fan Speed (Fan will start to speed up when the internal power supply module temperature exceeds 50°C or exceeds 30% Load)	2000 RPM
Maximum Fan Speed (Fan will reach its maximum speed of 5500 RPM when the internal power supply module temperature reaches 80°C.)	5500 RPM
Minimum Warning Fan Speed	500 RPM

**9.1 Fan Airflow** To achieve best cooling results sufficient airflow through the supply must be maintained. Do not block or obstruct the airflow on either side of the power supply.

**Front Exhaust**



**Rear Exhaust**

Normal (Front Exhaust) and reverse (Rear Exhaust) airflow options are available.  
See ordering Information for details.

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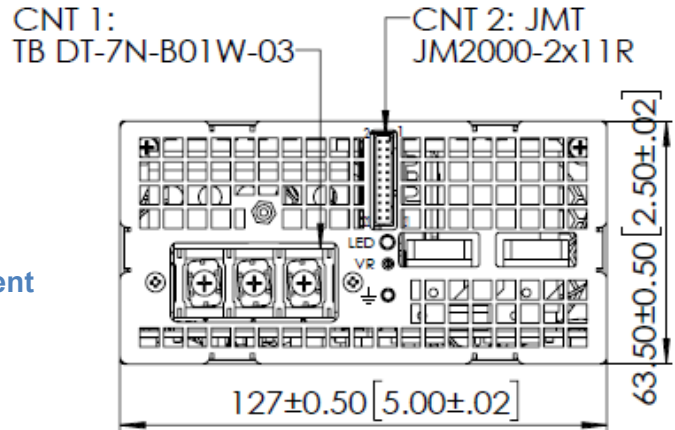
## 10. Connection

### 10.1 Connectors

**Input Connector: CNT1 :DT-7N-B01W-03**

**Main Output Connector: Bus Bar (+)(-)**

**Signal Connector: CNT2:JM2000-2x11R or equivalent**



Pins	Pin Type	Assignment	Description/Function
<b>Output</b>			
BusBar(+)	Power	VO1_PWR	These are the +VO1 voltage output pins.
BusBar(-)	Power	VO1_RTN	These are the -VO1 return output pins.
CNT2-20 CNT2-22	Signal	VCS (SHARE)	Current Share - This pin must be connected to the current share pins of the redundant power supplies on the system backplane. This pin is reference to VO1_RTN. This pin can be left open if current share is not required.
<b>Control</b>			
<i>All pins below are referenced to COM pin CNT2-1&amp;CNT2-13</i>			
CNT2-15	Signal House Keeping	12VSB	12V Stand by - This is the 12V standby output voltage pin.
CNT2-16	Signal	Series_CS	For Series Connection Current Monitoring- When Signal pin is interconnected with other supply in series .In case of a power supply failing, this pin will turn off other power supply in series if load exceeds 10% of rated current.
CNT2-2	Signal	PS_ON	Power Supply On - This is the power supply module control pin. This pin must be directly connected to common or controlled by a transistor connected to common on the system backplane.
CNT2-1 CNT2-13	Signal	COM (LOGIC COM)	Logic Return/Common - This is the common return pin for the power supply module. 12Vstby Return
CNT2-12	Signal Open Collector	DC_OK	DC Okay - This pin is used to monitor the output voltage. The signal on this pin will go high 100 to 150mSecs after the output voltage has reached regulation (above 95%). This signal will go low when the output voltage drops out of regulation (below 90%). This pin must be connected to an external voltage via pull up resistor on the system backplane 20V max 10mA max.
CNT2-14	Signal Open Collector	ALERT	Fault/Warning - An open collector signal is provided to indicate any fault or warning such as over temperature, overvoltage, over current, undervoltage, and fan fault. This pin must be connected to an external voltage via pull up resistor on the system backplane 20V max 10mA max.
CNT2-10	Signal Open Collector	AC_OK	AC Okay - This pin is used to monitor the AC input voltage. The signal on this pin will go high when the AC input voltage is above 178VAC. When the AC input voltage drops below 174VAC this signal will go low a minimum of 10mSec before the output voltage drops out of regulation. This pin must be connected to an external voltage via pull up resistor on the system backplane 20V max 10mA max.
CNT2-7	Signal	Voltage ADJ	0.5V - 5V Input voltage source. This pin is used to adjust the power supply's main output voltage from 45-55V.
CNT2-9	Signal	Current ADJ	0.5V - 5V Input voltage source. This pin will set the power supply current limit set point between 50%-100% of the rated output current.
CNT2-11	Signal	Current Monitor	The current monitor signal is referenced to com/logic return. The analog signal 0V to 2.5V is proportional to the load when increased from no load to maximum load.
CNT2-8	Signal	SDA	Communication Data pin.
CNT2-6	Signal	SCL	Communication Clock pin.
CNT2-4	Signal	A0	Address Pin 0.
CNT2-5	Signal	A1	Address Pin1.
CNT2-3	Signal	A2	Address Pin 2.

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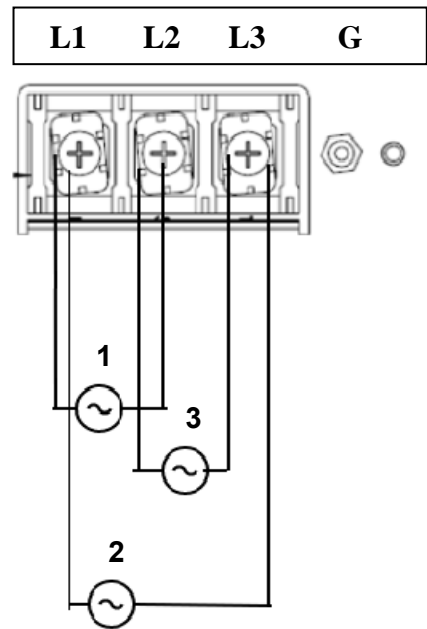
## 10.2 Input Configurations

### 10.2.1 Single Phase Connection

#### Input Connector CNT1(180-528VAC, 47-63Hz)

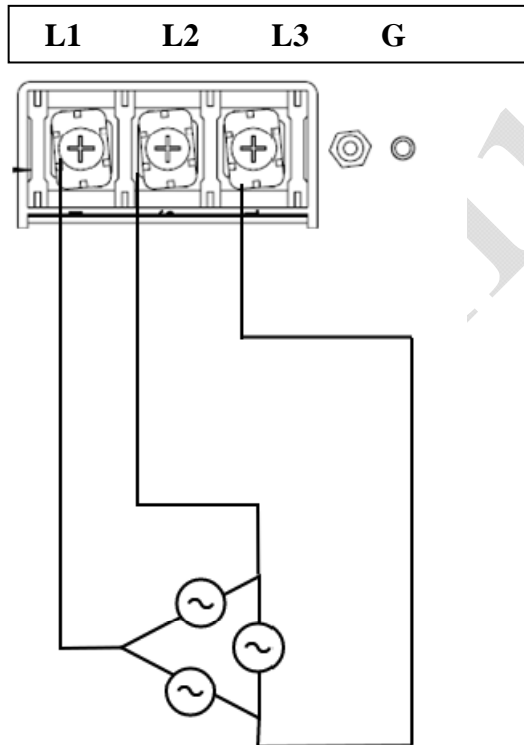
For single phase, connect the AC source in one of the 3 different configurations.

1. L1 to L2, or
2. L1 to L3, or
3. L2 to L3



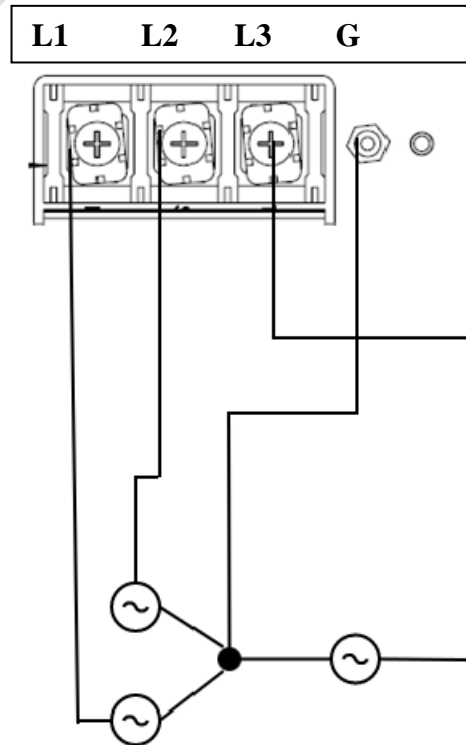
### 10.2.2 3 Phase Delta Connection

#### Input Connector CNT1(180-528VAC, 47-63Hz)



### 10.2.3 3 Phase Y Connection

#### Input Connector CNT1(180-528VAC, 47-63Hz)



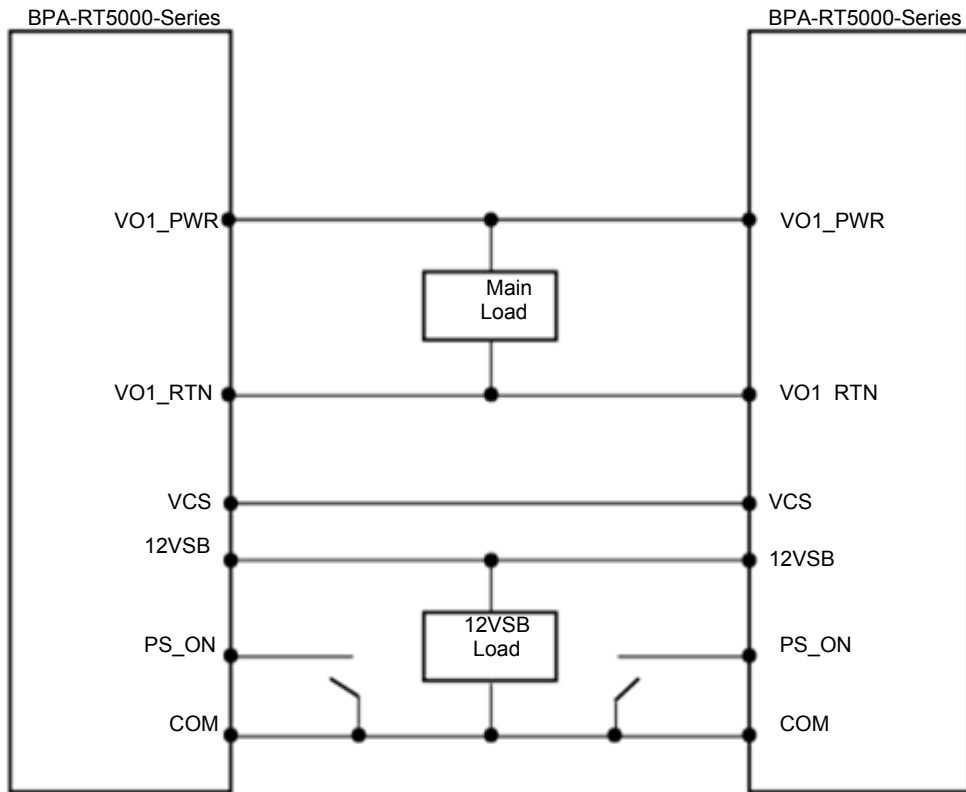
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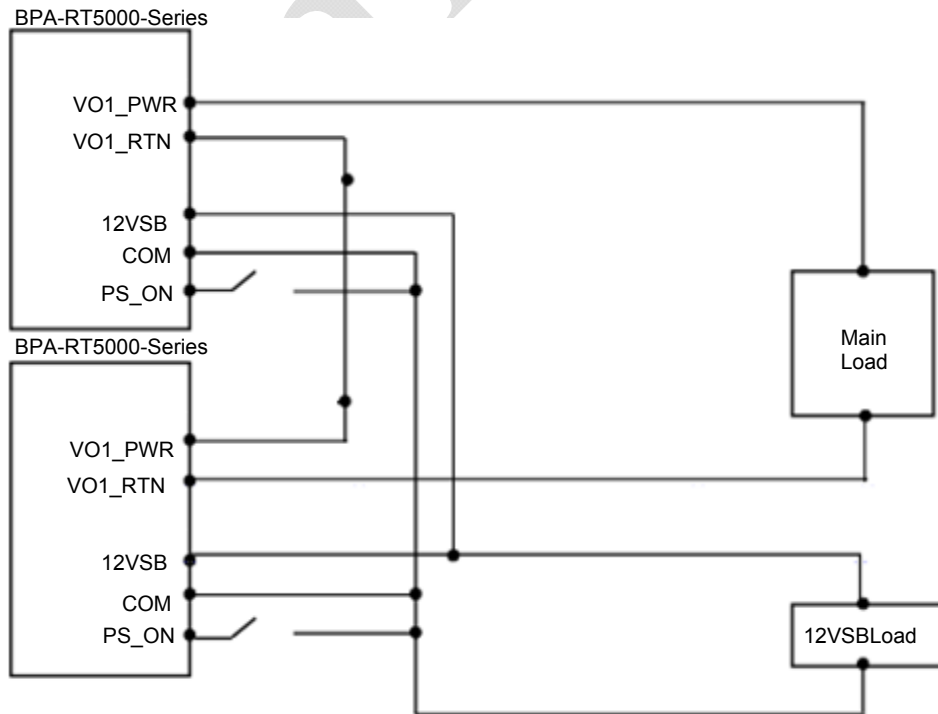


### 10.3 Parallel Wiring Diagram

Dash lines show remote sense connections.



### 10.4 Series Wiring Diagram



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