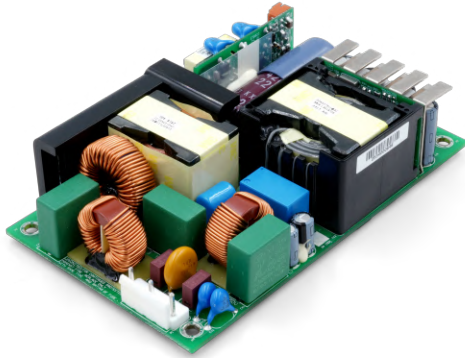


HBA600 series

V1.0

600W Medical & I.T.E.
Open Frame Switching Power Supply

FEATURES:

- 600W Fan cooled/ 250W Convection Cooled
- 3.00" x 5.00" x 1.27" / 31.5 W/in³
- IEC 60601-1 (Medical), IEC 62368-1 (ITE) dual safety approvals
- 85–264 VAC Input Voltage
- -30°C to +80°C Operating Temperature
- Efficiency up to 95%
- Input to Output 2MOPP
- Suitable for BF Application
- Class I meets Class II
- Power Good Signal
- Remote Sense
- AUX 12V Fan output



FEATURES (OPTIONAL):

Please Contact Our Sales

- 5V Standby + Remote ON-OFF / Enhanced Surge Immunity
- Support DC input 120-370 VDC
- Meets IEC 60335-1 and 61558-1
- Support and meets OVC III and ISN compliants

APPLICATIONS:



Medical / Healthcare Equipment



ITE Equipment



PRODUCT CODING:



Series Name

Max. Wattage
in the Product

Product Type

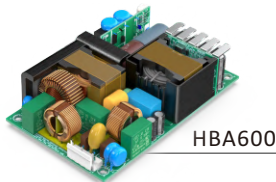
blank: Open Frame
P: Open Frame + Base Plate type
T: Enclosure + Top Fan type

Output Voltage

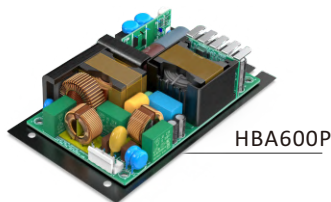
120: 12V 190: 19V
240: 24V 480: 48V

Control Option

Blank: Standard Version
(w/o Standby and Remote)
P: With 5V Standby + Remote Control



HBA600



HBA600P



HBA600T

SPECIFICATION:

MODEL NO.	Rated Output Voltage (VDC)	Rated Output Current (A)		Max.No Load Consumption w/o Fan (W)	Typ. Efficiency (%)
		Free Air	Forced Air ⁽¹⁾		
HBA600-120	12	20.83	50	0.5	92
HBA600-190	19	13.15	31.57	0.5	92
HBA600-240	24	10.41	25	0.5	93
HBA600-480	48	5.20	12.5	0.5	94
HBA600P-120	12	20.83	50	0.5	92
HBA600P-190	19	13.15	31.57	0.5	92
HBA600P-240	24	10.41	25	0.5	93
HBA600P-480	48	5.20	12.5	0.5	94

(1) Requires 29 CFM forced air cooling for maximum load.

MODEL NO.	Rated Output Voltage (VDC)	Rated Output Current (A)	Max.No Load Consumption w/o Fan (W)	Typ. Efficiency (%)
HBA600T-120	12	50	3	92
HBA600T-190	19	31.57	3	92
HBA600T-240	24	25	3	93
HBA600T-480	48	12.5	3	94

MODEL NO.	Rated Output Voltage		Rated Output Current			Max.No Load Consumption (Remote OFF)	Typ. Efficiency
	Vo	Standby	Free Air	Forced Air ⁽¹⁾	Standby ⁽²⁾		
	(VDC)		(A)				
HBA600-120P	12	5	20.83	50	2	0.15	92
HBA600-190P	19	5	13.15	31.57	2	0.15	92
HBA600-240P	24	5	10.41	25	2	0.15	93
HBA600-480P	48	5	5.20	12.5	2	0.15	94
HBA600P-120P	12	5	20.83	50	2	0.15	92
HBA600P-190P	19	5	13.15	31.57	2	0.15	92
HBA600P-240P	24	5	10.41	25	2	0.15	93
HBA600P-480P	48	5	5.20	12.5	2	0.15	94

Notes:(1) Requires 29 CFM forced air cooling for maximum load.

(2) Standby Current: 1A (Convection) / 2A (Forced Air)

(3) Total power: 600W max. (Including Standby Output)

MODEL NO.	Rated Output Voltage		Rated Output Current		Max.No Load Consumption (Remote OFF)	Typ. Efficiency
	Vo	Standby	Vo	Standby ⁽²⁾		
	(VDC)		(A)			
HBA600T-120P	12	5	50	2	0.15	92
HBA600T-190P	19	5	31.57	2	0.15	92
HBA600T-240P	24	5	25	2	0.15	93
HBA600T-480P	48	5	12.5	2	0.15	94

Notes:(1) Requires 29 CFM forced air cooling for maximum load.

(2) Standby Output: 2A (with Forced Air)

(3) Total power: 600W max. (Including Standby Output)

INPUT:

Parameter	Condition	Min.	Typ.	Max.	Unit
Input Voltage	Nominal Input Voltage Range (AC)	100		240	VAC
	Input Voltage Range (DC) (Optional)*	120		370	VDC
Input Voltage Range	Derate Linearly from 100% Load at 115 VAC to 80% Load at 85 VAC	85		264	VAC
Input Frequency Range	Sine Wave	47		63	Hz
Power Factor	Full Load, Vin = 240 VAC	0.9		1	
Low Line Input Current	Full Load, Vin = 100 VAC		7		A
High Line Input Current	Full Load, Vin = 240 VAC		3		A
Low Line Input Inrush Current	Full Load, 25°C, Cool start, Vin = 100 VAC			20	A
High Line Input Inrush Current	Full Load, 25°C, Cool start, Vin = 240 VAC			45	A
Earth Leakage Current	Vin = 240 VAC, Fin = 60Hz			0.3	mA

Notes: Optional feature; safety approvals apply to AC input only.

OUTPUT:

Characteristic	Condition		Min.	Typ.	Max.	Unit
Output Power	See Derating Chart.				600	W
Fan Output	12 VDC / 0.5 A					Vdc/A
Accuracy				±0.5		%
Adjustability					±2.4	%
Line Regulation	Full Load, Vin = 100–120 VAC or 200–240 VAC				1	%
Load Regulation	Vin = 100–240 VAC				3	%
Total Regulation					±3	%
Ripple & Noise ⁽¹⁾				1		%
Hold-Up Time	Hold up time is measured from the end of the last charging pulse to the time which the main output drops down to low limit of main (@ 70% Rated Output current)			10		ms
Start-Up Time ⁽²⁾	Output at rated load and nominal line, at 25°C			1.2		s
Rise Time	At 115 VAC & 230 VAC				10	ms
Transient Response	Peak Voltage Deviation	50% ↔ 100% load step,		≤2		%Vo
	Recovery Time	Slew rate 1A/us		≤300		µs
Efficiency	Full Load, Vin = 230 VAC, Detail to See SPECIFICATION			92		%
Temperature Coefficient	All Condition					

Notes: (1) 12V @33A–50A ripple 2%
 (2) For models equipped with 5V STB, the startup time is 2S max.

PROTECTION:

Parameter	Condition	Min.	Typ.	Max.	Unit
Short Circuit	Hiccup Mode, (Non-Latching, Auto-Recovery)				
Over Temperature (input circuit)	Latch Mode				°C
Overvoltage	Latch Mode	105		130	%
Overload/Overcurrent	Hiccup Mode, (Non-Latching, Auto-Recovery)	105		150	%

SAFETY AND COMPLIANCE:

Parameter	Condition / Standard	Min.	Typ.	Max.	Unit
Safety Approvals	IEC 62368-1 Edition 2.0, IEC 62368-1 Edition 3.0, EN 62368-1, UL62368-1, IEC 60601-1 Edition 3.1, IEC 60601-1 Edition 3.2, EN60601-1, ANSI/AAMI ES60601-1, CAN/CSA-C22.2 NO. 60601-1, CAN/CSA-C22.2 NO.62368-1				
Isolation	Input to Output	4000			VAC
	Input to PE	2000			VAC
	Output to STB Output	500			VDC
Protection Classes	Class I (Meet Class II)				
OVC	Class II				

EMC

EMI (Emission)	Parameter	Standard	Test Level
MEDICAL	Conducted	EN55011	Class B
	Radiated	EN55011	Class A / Class B ⁽¹⁾
	Harmonics	EN61000-3-2	-
	Flicker	EN61000-3-3	-
ITE	Conducted	EN55032	Class B
	Radiated	EN55032	Class A / Class B ⁽¹⁾
	Harmonics	EN61000-3-2	N/A
	Flicker	EN61000-3-3	-

Notes: (1) To meet EMC specifications, the unit requires a grounded metal shield and K5B ferrite cores on AC/DC lines (2 turns / 2 passes through the core).

(2) The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives.

EMS (Immunity)	Parameter	Standard	Test Level	Criteria
MEDICAL	ESD	EN61000-4-2	15kV Air Discharge, 8kV Discharge Coupling Plane	A
	RS	EN61000-4-3	-	A
	EFT	EN61000-4-4	2kV	A
	Surge	EN61000-4-5	Line to Line ±1kV, Line to Ground ±2kV	A
			Level 4 Line to Line ±2kV, Line to Ground ±4kV (Optional)	A
	CS	EN61000-4-6	0.15–80(MHZ)	A
	PFMF	EN61000-4-8	-	
	Voltage Dips (230V & 100V)	EN61000-4-11	0% UT, 0.5 cycle (10 ms) @ Full Load 0°/45°/90°/135°/180°/225°/270°/315°/360°	A
			0% UT, 1 cycle (20ms), 0° @ Full Load	B
			70% UT, 25 cycle (500ms), 0° @ Full Load	A
	Voltage Interruptions (230V & 100V)		0% Ut, 250 cycle (5s) @ Full Load 0°/45°/90°/135°/180°/225°/270°/315°/360°	B
	Radiated Fields In Close Proximity	EN61000-4-39	-	A

EMS	Parameter	Standard	Test Level	Criteria
ITE	ESD	EN61000-4-2	8kV Air Discharge, 4kV Contact Discharge	A
	RS	EN61000-4-3	80–1000 (MHZ) 1800, 2600, 3500, 5000(MHZ) (±1%)	A
	EFT	EN61000-4-4	2kV	A
	Surge	EN61000-4-5	Line to Line ±1kV, Line to Ground ±2kV	A
			Level 4 Line to Line ±2kV, Line to Ground ±4kV (Optional)	A
	CS	EN61000-4-6	0.15-80(MHZ)	A
	PFMF	EN61000-4-8	-	A
	Voltage Dips (230V & 100V)	EN61000-4-11	0% UT, 0.5 cycle (10ms) @ Full Load 0°/45°/90°/135°/180°/225°/270°/315°/360°	A
	Voltage Interruptions (230V & 100V)		0% UT, 1 cycle (20ms), 0° @ Full Load	B
			70% UT, 25 cycle (500ms), 0° @ Full Load	A
0% UT, 250 cycle (5s) @ Full Load 0°/45°/90°/135°/180°/225°/270°/315°/360°			B	

Notes: (1) The EMC test requires the integration of the switching power supply with the load of an end system.

Consequently, variations in the application or assembly of the end system will influence the test results.

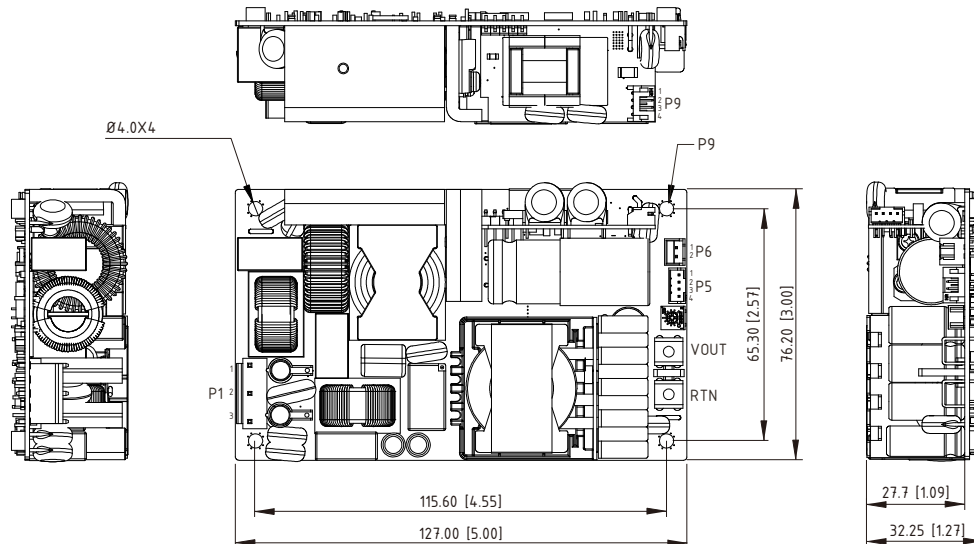
ENVIRONMENTAL & RELIABILITY

Parameter	Condition	Min.	Typ.	Max.	Unit
Operating Temperature	See Derating Chart	-30		80	°C
Operating Altitude	Up to 5,000 meters		5000		
Operating Humidity	(Non-Condensing)	10		95%	RH
Storage Temperature		-40		85	°C
Storage Humidity	(Non-Condensing)			95%	RH
MTBF (typ.)	Operating Temperature at 25°C, Vin=240VAC, Calculated per MIL-HDBK-217F	300K			h
Vibration	10–500Hz, 10min./1cycle, 60min. each along X, Y, Z axes			5	G
Capacitive Load	Full load 25°C				
	12 V			10000	μF
	19 V			4700	μF
	24 V			2200	μF
	48 V			1000	μF
Acoustic Noise					dB(A)
	Distance 30 with Fan		40		dB(A)
Pollution Degree			2		

MECHANICAL DIMENSIONS: (UNIT: mm[inch])

* Isolation between STB RTN and Vo1 RTN (Galvanic Isolation)

HBA600 - Open Frame



AC Input Connector (P1): JST#B3P5-VH or Equivalent

Pin No.	Function	Mating Connector	Terminal Block
1	AC/L	JST#VHR-5N and JST#VHR-5M or Equivalent	JST#SVH-41T-P1.1 or Equivalent
2	AC/N		
3	Ground		

Function Connector (P5): JST#B4B-PH-K-S or Equivalent

Pin No.	Function	Mating Connector	Terminal Block
1	SNS+	JST#PHR-4 or Equivalent	JST#SPH-004T-P0.5S, JST#SPH-002T-P0.5S, and JST#SPH-002T-P0.5L or Equivalent
2	SNS-		
3	PG		
4	RTN		

DC Output Connector

Function	Terminal Block
VOUT (V+)	#6-32 screw in 2 positions
RTN (V-)	Torque to 1N.m max

Fan Connector (P6): JST#B2B-XH-A or Equivalent

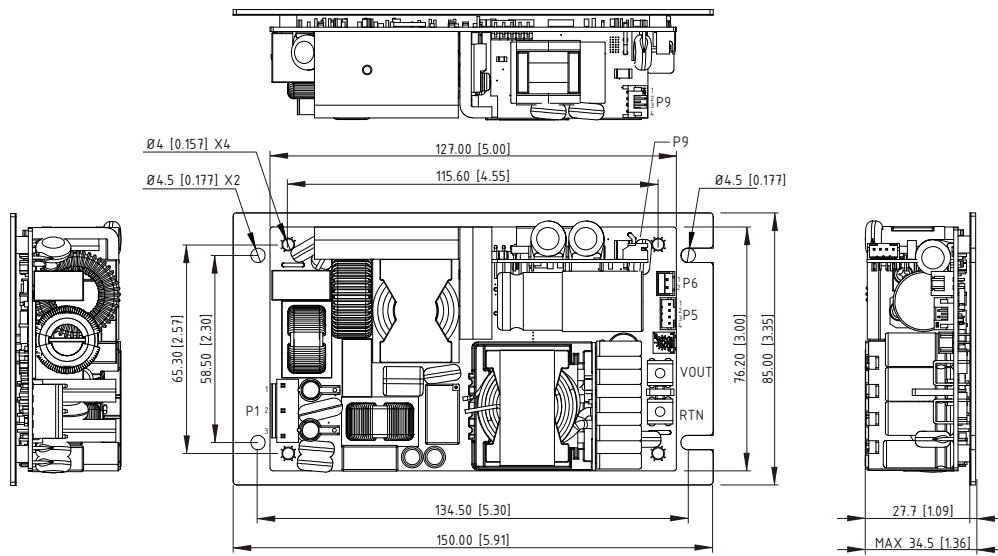
Pin No.	Function	Mating Connector	Terminal Block
1	FAN+	JST#XHP-2 or Equivalent	JST#SXH-001T-P0.6 or Equivalent
2	FAN-		

Standby Power & Remote-Control Connector (P9):
JST#S4B-PH-K-S or Equivalent

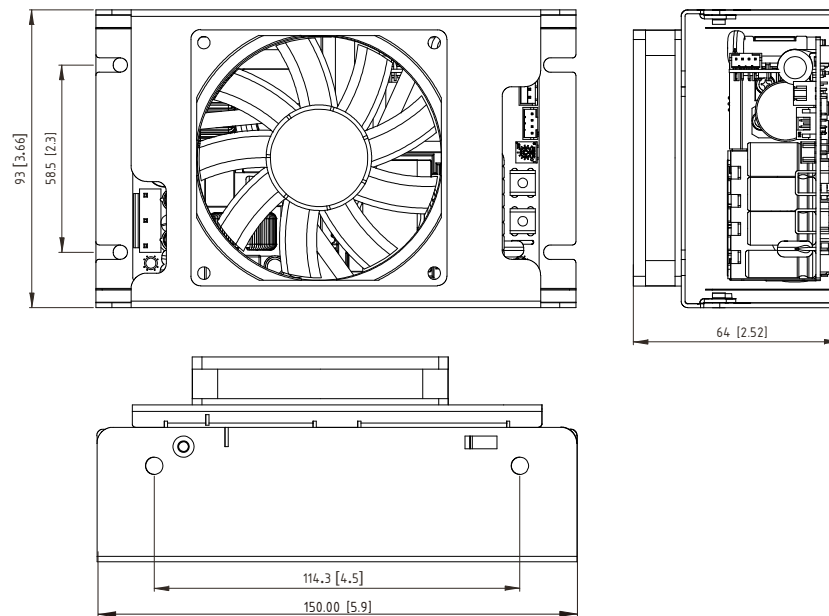
Pin No.	Function	Mating Connector	Terminal Block
1	STB 5V/2A	JST#XHP-2 or Equivalent	JST#SPH-002T-P0.5S and JST#SPH-002T-P0.5L or Equivalent
2	RC+		
3	RC-		
4	STB RTN		

Notes: (1) SNS: Remote Sense, (2) RC: Remote Control, (3) PG: Power Good Signal

HBA600P - Base Plate type



HBA600T - Enclosure + Top Fan type



AC Input Connector (P1): JST#B3P5-VH or Equivalent

Pin No.	Function	Mating Connector	Terminal Block
1	AC/L	JST#VHR-5N and JST#VHR-5M or Equivalent	JST#SVH-41T-P1.1 or Equivalent
2	AC/N		
3	Ground		

Function Connector (P5): JST#B4B-PH-K-S or Equivalent

Pin No.	Function	Mating Connector	Terminal Block
1	SNS+	JST#PHR-4 or Equivalent	JST#SPH-004T-P0.5S, JST#SPH-002T-P0.5S, and JST#SPH-002T-P0.5L or Equivalent
2	SNS-		
3	PG		
4	RTN		

DC Output Connector

Function	Terminal Block
VOUT (V+)	#6-32 screw in 2 positions
RTN (V-)	Torque to 1N.m max

Notes: (1) SNS: Remote Sense, (2) RC: Remote Control, (3) PG: Power Good Signal

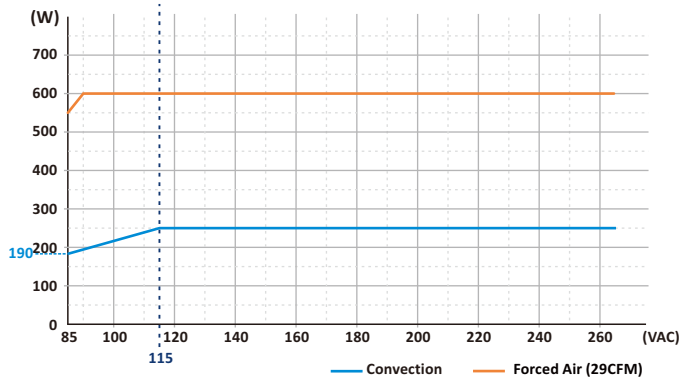
Fan Connector (P6): JST#B2B-XH-A or Equivalent

Pin No.	Function	Mating Connector	Terminal Block
1	FAN+	JST#XHP-2 or Equivalent	JST#SXH-001T-P0.6 or Equivalent
2	FAN-		

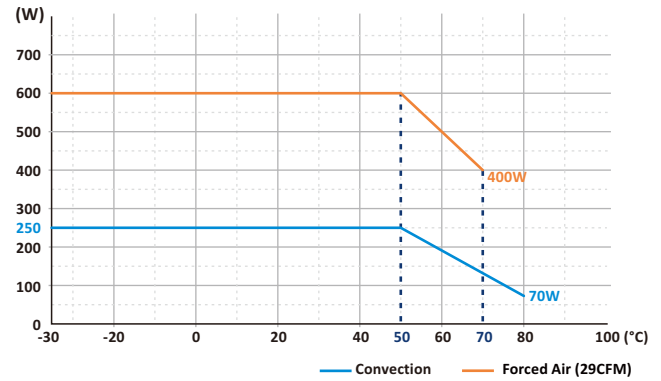
Standby Power & Remote-Control Connector (P9):
JST#S4B-PH-K-S or Equivalent

Pin No.	Function	Mating Connector	Terminal Block
1	STB 5V/2A	JST#XHP-2 or Equivalent	JST#SPH-002T-P0.5S and JST#SPH-002T-P0.5L or Equivalent
2	RC+		
3	RC-		
4	STB RTN		

POWER DE-RATING CURVE:

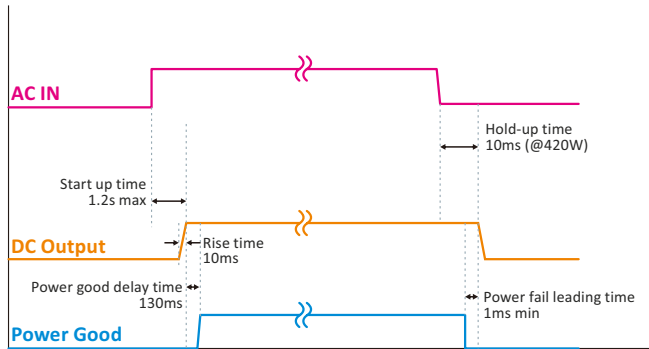


TEMPERATURE DE-RATING CURVE:

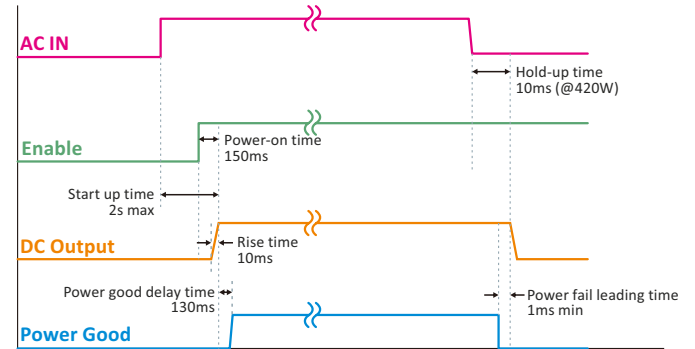


Notes: Cold Start (-20°C to -30°C) : Min.STB load 2-5W; Startup load ≤ 150W; Full load after 5s.

POWER SUPPLY TIMING DIAGRAM (Non-STB Models):

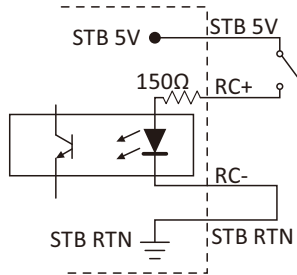


POWER SUPPLY TIMING DIAGRAM (STB Models):



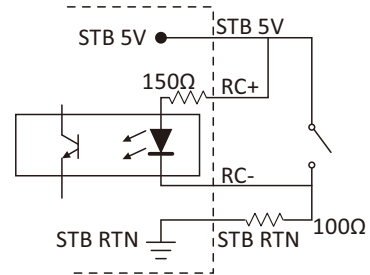
REMOTE CONTROL:

Enable



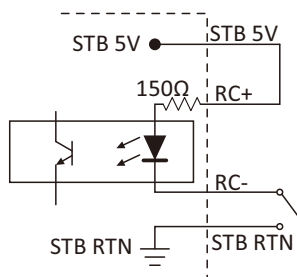
Enable	ON	OFF	OFF
RC+	Short to 5V	Short to RTN	Floating
RC-	Short to RTN		

Inhibit



Inable	OFF	ON	ON
RC+	Short to 5V		
RC-	Short to 5V	Pull LOW to RTN	

PSON



PSON	OFF	ON	OFF
RC+	Short to 5V		
RC-	Short to 5V	Short to RTN	Floating

Notes: (1) Optocoupler LED ON→Main output ON.
(2) RC: Remote Control

SPECIFICATION NOTE :

1. The unit can handle a momentary power surge during initial startup, but it is not designed to operate above its rated load for extended periods.
2. Every unit is tested at the factory under a 60% load to ensure the output voltage remains accurate.
3. Line regulation value is determined by measuring the output while shifting the input voltage by $\pm 10\%$ from nominal line at rated load.
4. Load regulation is calculated by observing how the voltage reacts when the electrical demand changes by $\pm 40\%$ from a baseline 60% load.
5. Electrical ripple is recorded peak-to-peak using a 20MHz frequency limit and specific filtering capacitors (0.1uF ceramic and 47uF electrolytic) at the connection point.
6. Hold-up time represents the duration the power supply can maintain a steady output after the incoming AC power is interrupted.
7. Energy efficiency is calculated based on the unit running at its rated load and standard input voltage.