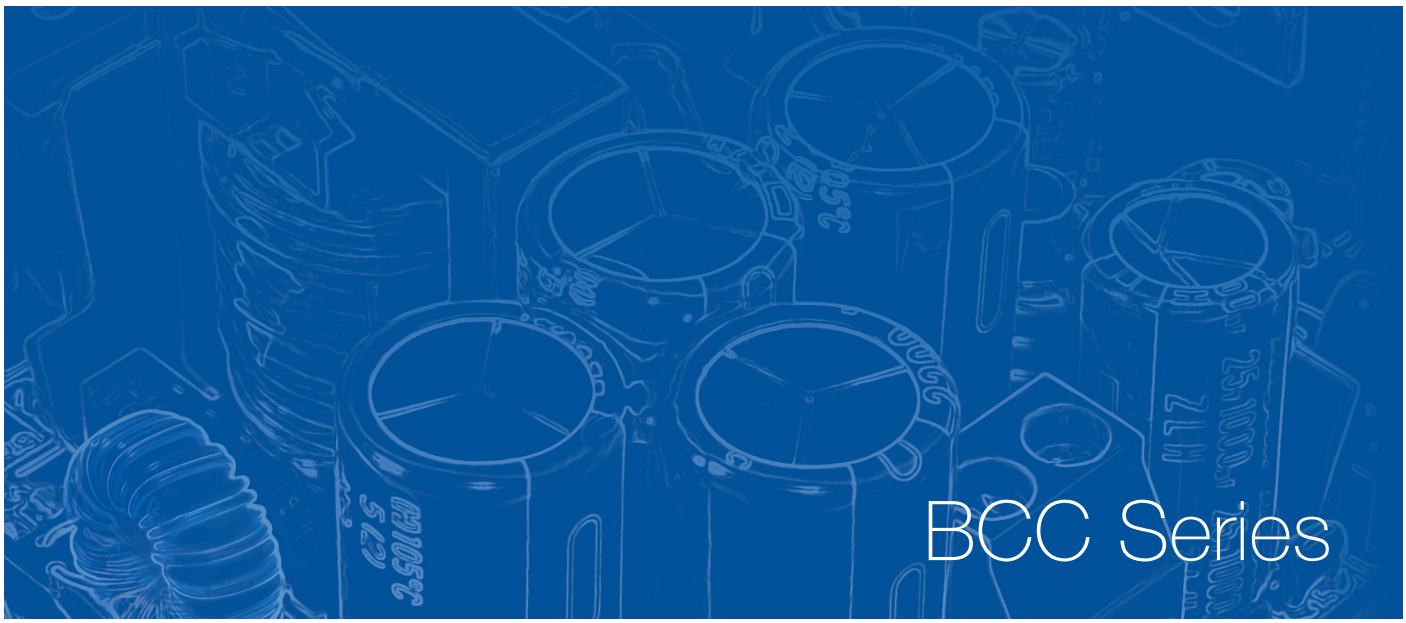


BCC Series

- Baseplate Cooled
- Wide Operating Temperature Range
- ETSI, EMC and Environmental Compliant
- Parallel Operation
- Remote On/Off
- Low Temperature Operation
- 3 Year Warranty

Designed for environmentally demanding applications such as mobile radio base stations and roadside electronic cabinets, the BCC series of 200 to 400 Watt AC/DC switching power supplies is a range of rugged units that need no de-rating over a –20 °C to +70 °C ambient temperature range. This eliminates the need for system designers to select a higher power and more expensive unit to compensate for widely varying ambient temperatures.

The high-reliability power supplies use a 6 mm thick aluminium baseplate to provide effective conduction cooling. All heat dissipating components are attached to the baseplate which in turn is attached the equipment enclosure.

The single-output units comply with international EMC and ETSI standards and the active power sharing feature allows simple parallel operation where higher output currents are needed. A version capable of operating at down to –40 °C is also available and the power supplies can be conformally coated for use in environments with high humidity.

The BCC family consists of 12 standard power supplies with universal AC inputs and outputs from 3.3 VDC (50 A) to 28 VDC (14.5 A). Output load regulation is 1.5% for output voltages up to 7.5 VDC and 1% above this.

Other features include remote on/off, active power factor correction, overload and over-voltage protection. A remote sense function compensates for drops of up to 500 mV on the output. BCC power supplies also have wide output voltage adjustment, ranging from –60% to +10% of the nominal output.

Models and Ratings

Output Power	Output Voltage	Output Current	Output Load Regulation	Model Number[1,2]
165 W	3.3 V	50.0 A	1.5%	BCC200PS03
200 W	5.0 V	40.0 A	1.5%	BCC200PS05
210 W	7.5 V	28.0 A	1.5%	BCC200PS07
240 W	12.0 V	20.0 A	1.5%	BCC200PS12
264 W	3.3 V	80.0 A	1.5%	BCC400PS03
400 W	5.0 V	80.0 A	1.5%	BCC400PS05
405 W	7.5 V	54.0 A	1.5%	BCC400PS07
408 W	12.0 V	34.0 A	1.0%	BCC400PS12
405 W	15.0 V	27.0 A	1.0%	BCC400PS15
396 W	18.0 V	22.0 A	1.0%	BCC400PS18
408 W	24.0 V	17.0 A	1.0%	BCC400PS24
406 W	28.0 V	14.5 A	1.0%	BCC400PS28

Notes:
1. For -40 şC operating temperature, add suffix '-L' to model number.
2. For conformally coated option, add suffix '-E' to model number.
3. 600 W model available for OEM quantities - contact sales.

Input Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	90		264	VAC	
Input Frequency	47		63	Hz	
Input Current			3 6	A	at 90 VAC (BCC200) at 90 VAC (BCC400)
Inrush Current			60	A	264 VAC cold start
Power Factor		>0.9			230 VAC
Earth Leakage Current			<1.5	mA	230 VAC/50 Hz
Input Protection	T10 A/250 V internal fuse in line				

Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	3.3 3.3		12 28	V	BCC200 BCC400
Initial Set Accuracy			±1	%	
Output Voltage Adjustment	60		110	%	On multi turn potentiometer
Minimum Load					No minimum load required
Start Up Delay			490	ms	See fig.1 & 2
Start Up Rise Time			9	ms	See fig.3 & 4
Hold Up Time	10	28		ms	See fig.5 & 6
Line Regulation			±0.5	%	
Load Regulation	1.0		1.5	%	See model table above
Transient Response			4	%	Recovery within 1% is less than 500 µs for a 75-25% load step (See fig.7 & 8)
Under/Overshoot			2	%	See fig.9
Ripple & Noise			1	% pk-pk	20 MHz bandwidth (see fig.10)
Overvoltage Protection	105 130		140 166	%	Vnom DC (recycle mains to recover). 3.3 V version Vnom DC (recylce mains to recover).
Overload Protection	102		140	%	Constant current limiting with auto recovery
Short Circuit Protection					Constant current.
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection			115	°C	Baseplate temperature, recycle mains to reset.

Start Up Delay from AC Turn On

Figure. 1
Minimum Input Full Load 21.2 ms

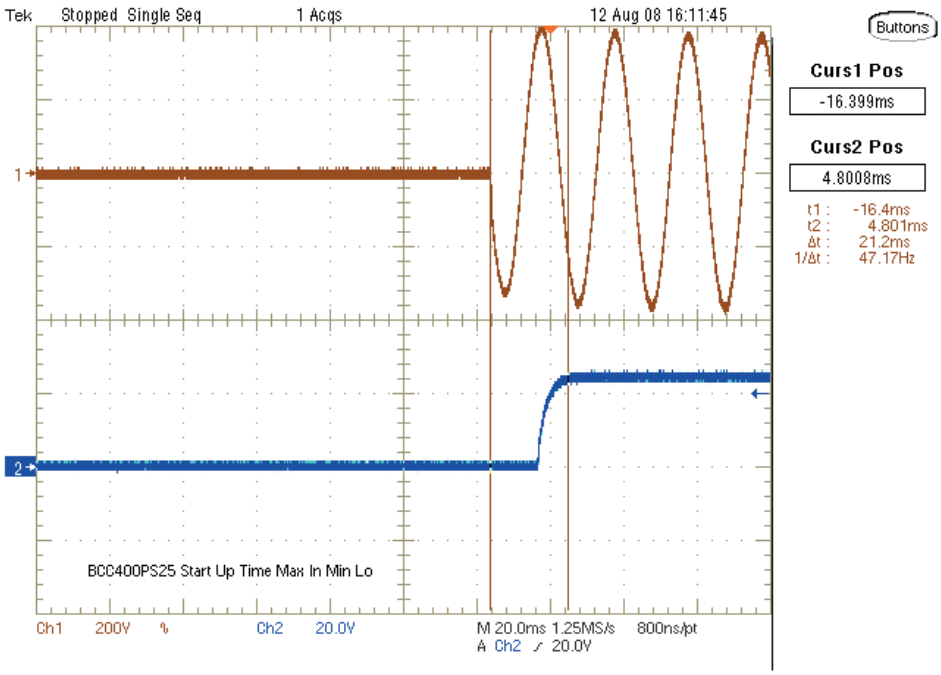
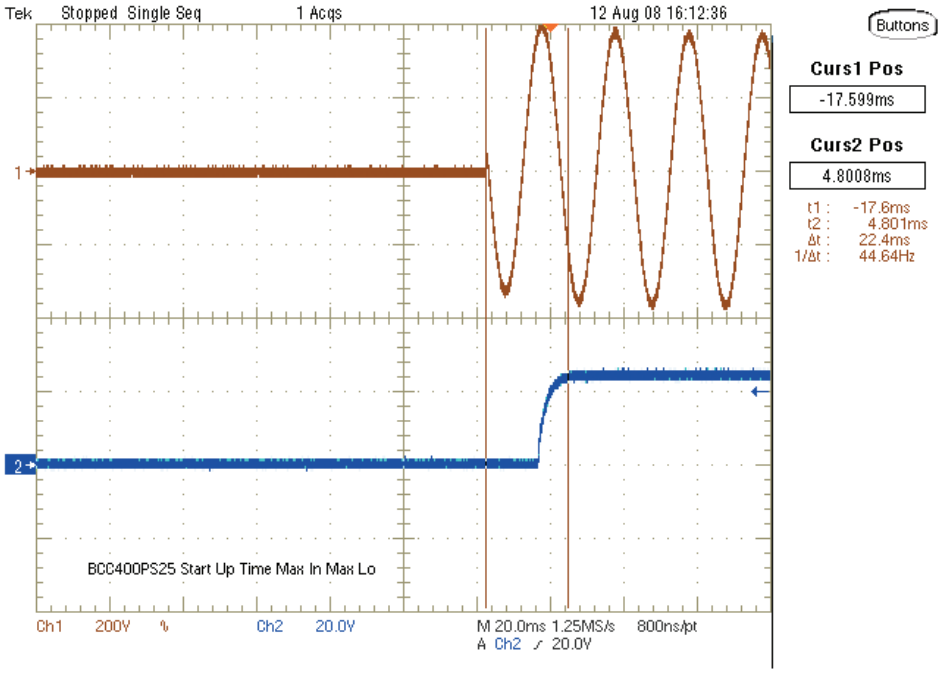


Figure. 2
Maximum Input Full Load 22.4 ms



Start Up Rise Time

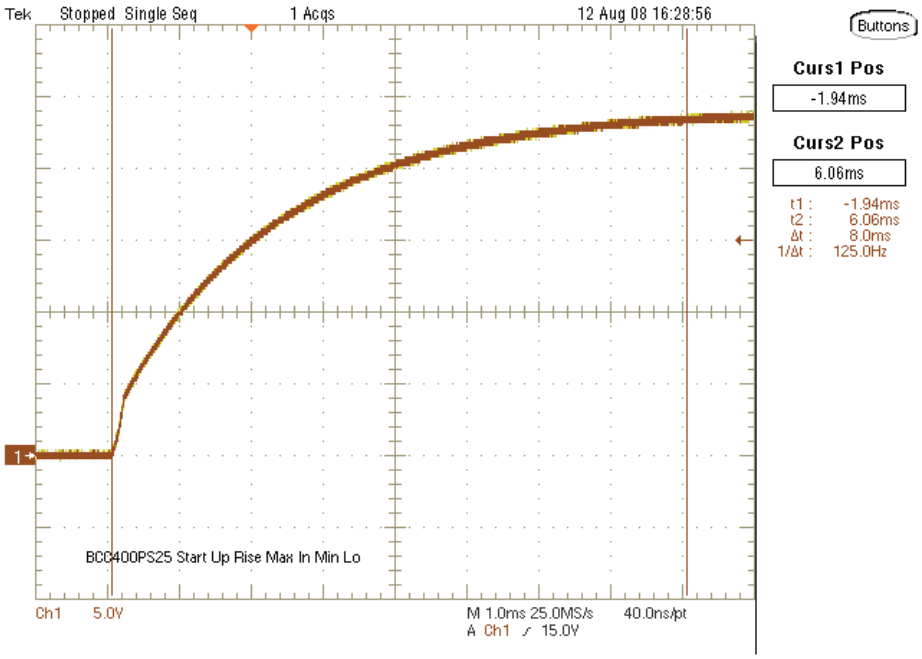


Figure 3
Maximum Input
- Full Load 8 ms

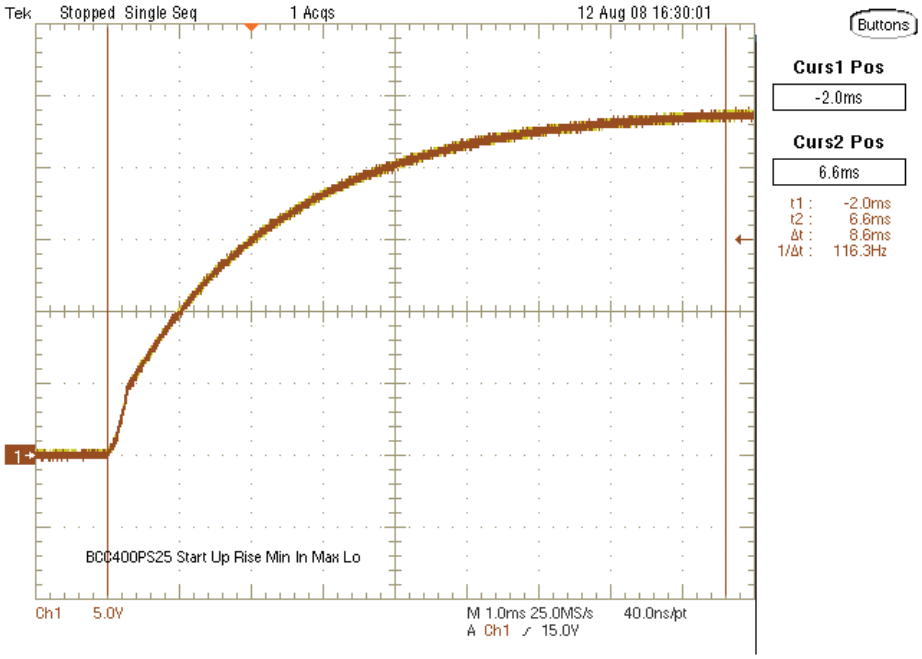


Figure 4
Minimum Input
- Full Load 8.6 ms

Hold Up Time from Loss of AC

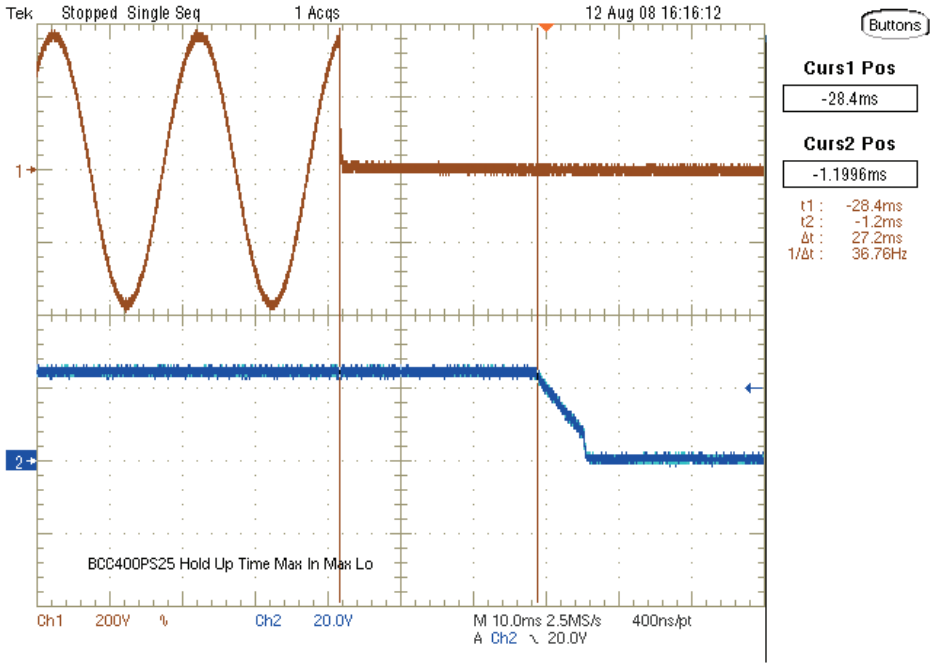


Figure 5
Maximum Input - maximum load 27.2 ms

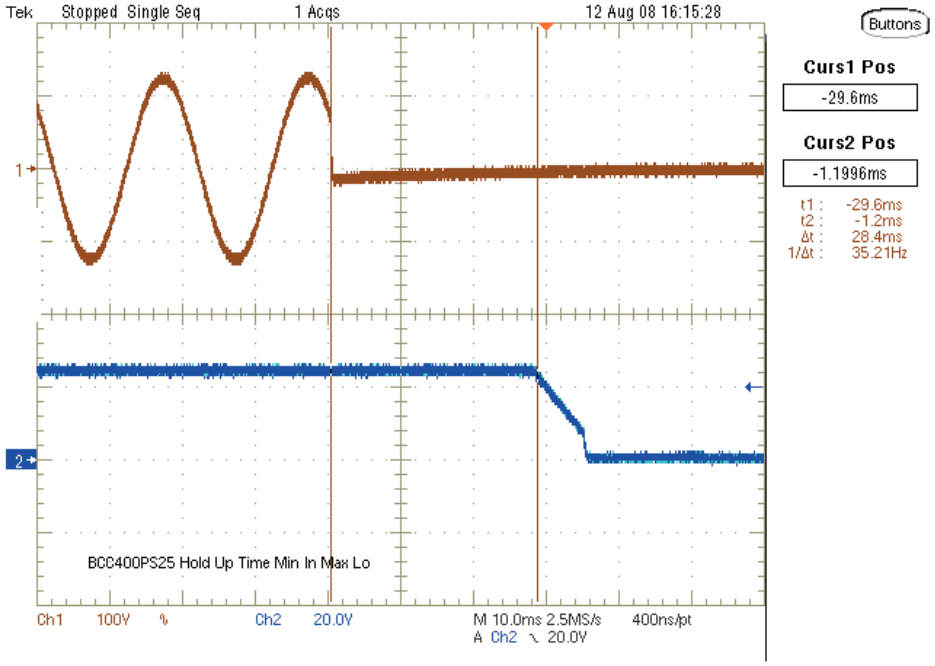


Figure 6
Minimum Input - maximum load 28.4 ms

Output Transient Response 25-75% & 75-25% Load Step

Figure 7 - 25-75% load step

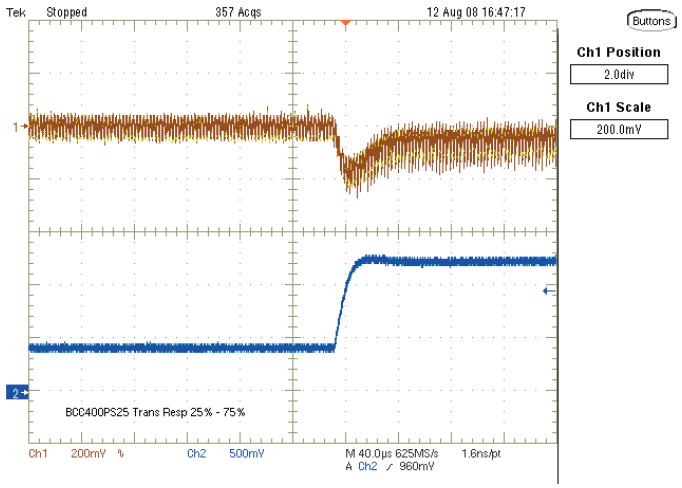
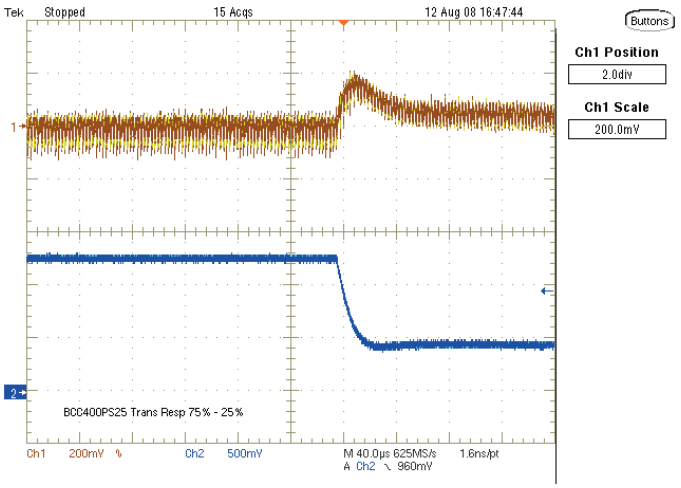
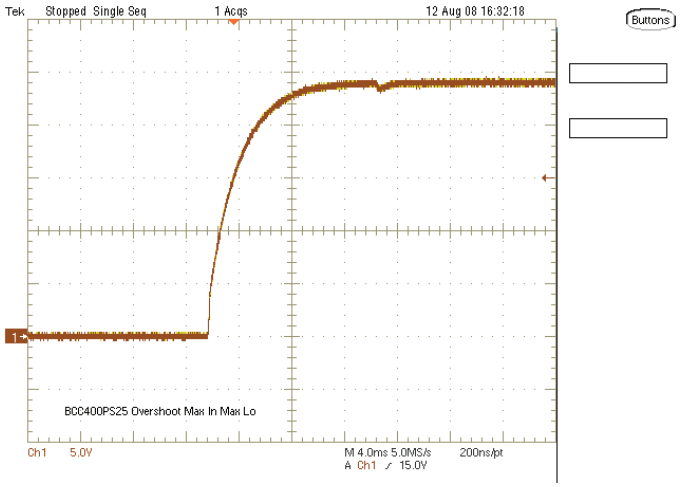


Figure 8 - 75-25% load step



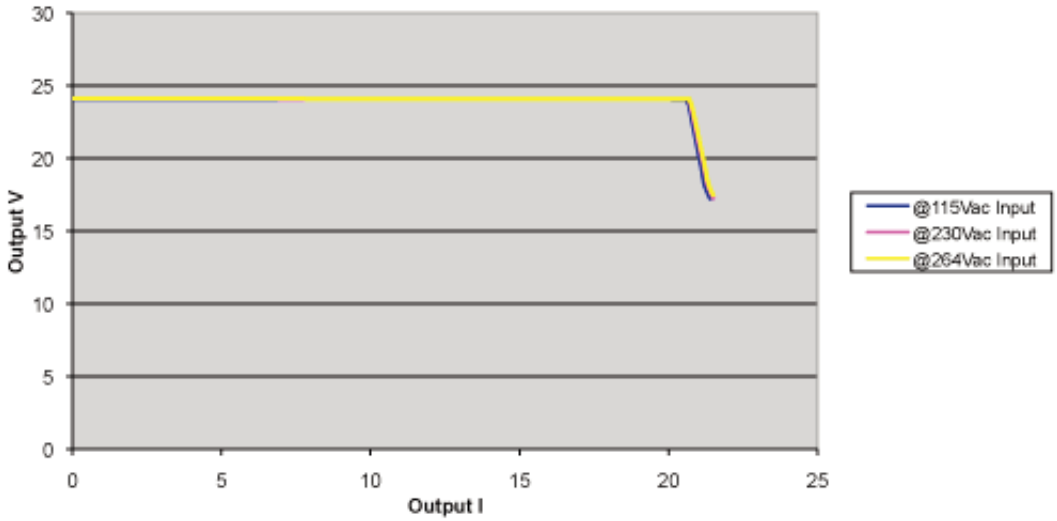
Typical Output Overshoot

Figure 9



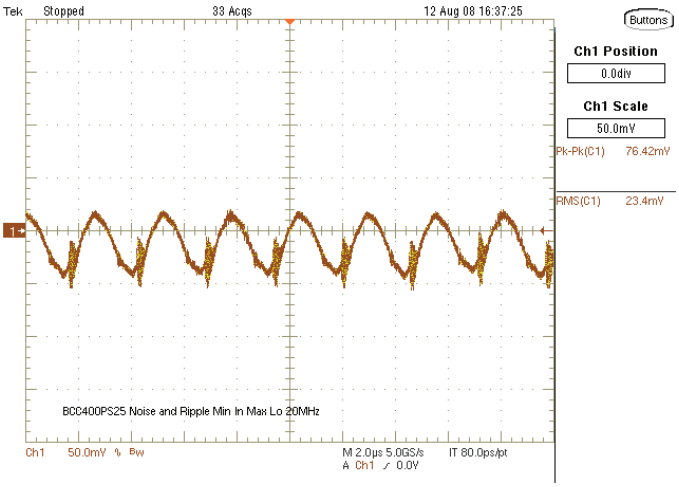
Output Overload Characteristics

Figure 10



Output Ripple & Noise

Figure 11 - Typical Ripple & Noise 24 V unit full load 76.4 mV (20 MHz bandwidth)



General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		80		%	See fig.12 & 13
Isolation: Input to Output Input to Ground Output to Ground	300 1500 500			VAC	
Switching Frequency: PWM PFC		360 90		KHz	
Mean Time Between Failure		160		KHrs	MIL-HDBK-217F, ground benign at 25 şC
Weight			2.87 (1300)	lb (g)	

Figure 12

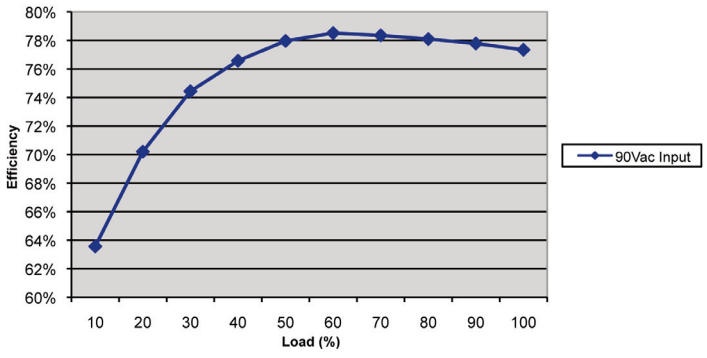
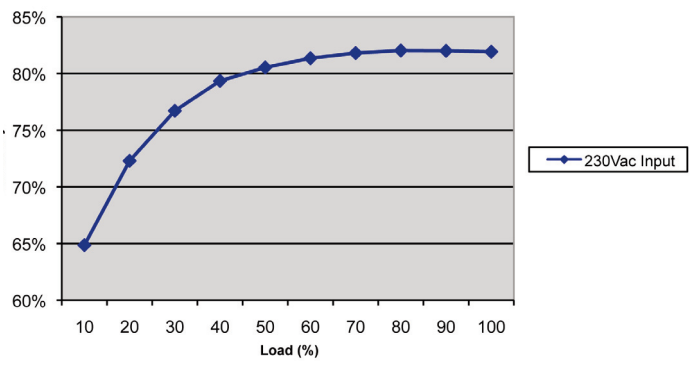
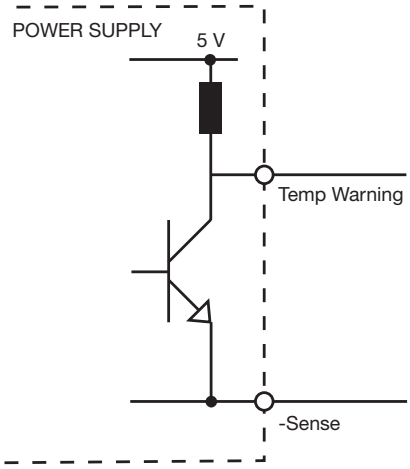


Figure 13



Characteristic	Notes & Conditions
Signals	
Remote On/Off	
Temp Warning	TTL compatible signal. Gives TTL low in over temperature conditions
Current / Voltage Balance	When using these connections up to 3 power supplies can be used in parrallel. Units will share within 10% of each other

Temp Warning



An internal device monitors the baseplate temperature to give a warning of potential overheat conditions. This 'temp' signal is available on the Molex header and changes from about 5 V through a 22 k resistor down to less than 0.5 V at 5 mA to indicate overheating. If overheating continues after the temp signal is asserted, the output will be shutdown to protect the power supply.

It should be noted that this is a protection circuit and should not be relied on to correct a poor heatsinking arrangement. Once the thermal shutdown has operated, the AC input will need to be removed, allow the chassis to cool down and then reapply the AC supply.

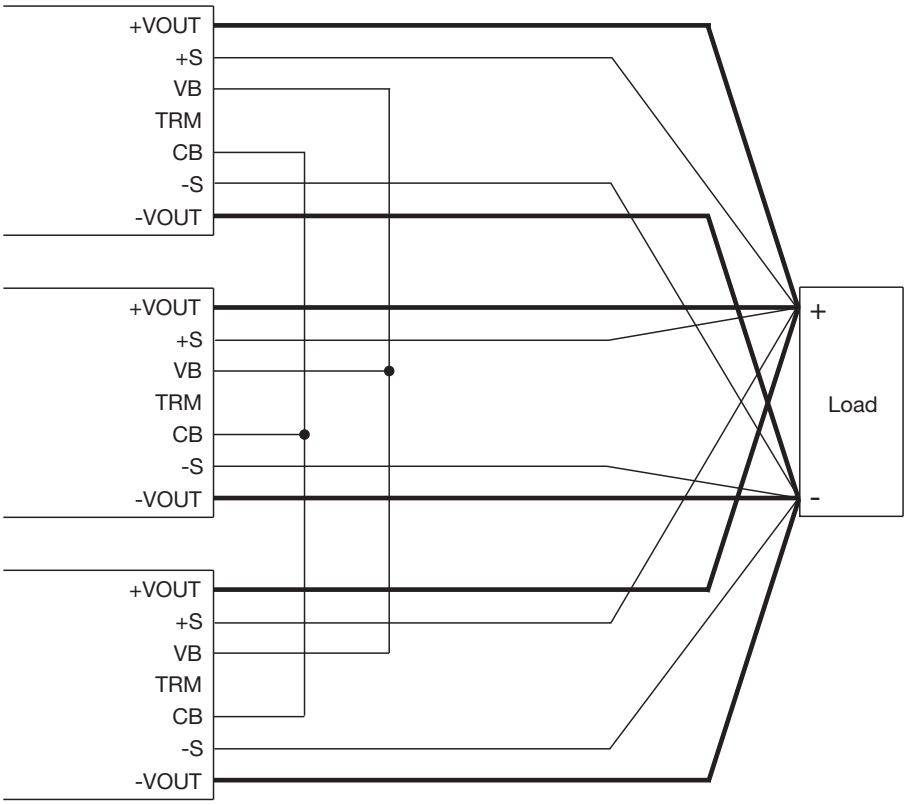
Number	Item	TMP
1	Function	Normal 'H' Overheat 'L'
2	Base Pin	-S
3	Level Voltage 'L'	0.5 V max at 5 mA
4	Level Voltage 'H'	5 V typical
5	Maximum Sink Current	10 mA max
6	Maximum Applicable Voltage	35 V max

Parrallel and Redundant Configurations

Current and voltage balance pins are used to connect units in parallel - see drawing. Remote On/Off: Output is on with pin left floating, pull pin down to -Output to turn output off.

Remote sense pins are used to compensate for lead drops, for up to 0.5 V maximum. When not used, move switch SW1 to local positions. See below for switch positions. The BCC series is approximately 80% efficient, so for 400 W load consumption, the cooling system used will have to be able to absorb 100 W while maintaining the baseplate to a maximum of +83 °C.

Examples of parallel operation



Ensure output power leads are of equal length and type for all units and that they are capable of carrying the load current. Set all units to the required output ±0.1V. The voltage setting pot on unit 1 can be used to set the overall output voltage if required.

Remote sense switchers - single unit		
	Remote	Local
SW1 D (1)	OFF	ON
SW1 C (2)	OFF	ON
SW1 B (3)	ON	OFF
SW1 A (4)	ON	OFF

Parallel units with remote sense			
	PSU 1	PSU 2	PSU 3
SW1 D (1)	OFF	OFF	OFF
SW1 C (2)	OFF	OFF	OFF
SW1 B (3)	ON	OFF	OFF
SW1 A (4)	ON	OFF	OFF

Parallel units without remote sense			
	PSU 1	PSU 2	PSU 3
SW1 D (1)	ON	OFF	OFF
SW1 C (2)	ON	OFF	OFF
SW1 B (3)	OFF	OFF	OFF
SW1 A (4)	OFF	OFF	OFF

Contact sales office for a full set of application notes.

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-20		70	şC	With baseplate maintained below 83 şC utilising system cooling.
	-40				-40 şC option available, add suffix -L to model number
Storage Temperature	-40		85	şC	
Cooling					Conduction via baseplate
Humidity	20		95	% RH	Non-condensing. Unit can be conformally coated for high humidity environments. Add suffix -E to model number.
Operating Altitude			3000	m	
Shock & Vibration	2 g 10 min / 1 cycle, 10 Hz to 500 Hz, 60 mins each axis.				

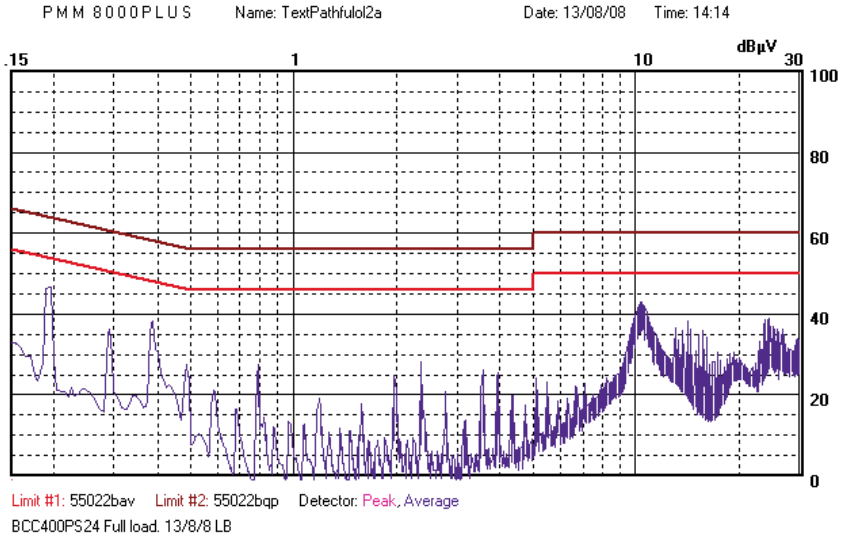
Electromagnetic Compatibility - Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Harmonic Current	EN61000-3-2		Class A	
ESD Immunity	EN61000-4-2	3	A	
Radiated Immunity	EN61000-4-3	3	A	
EFT/Burst	EN61000-4-4	3	A	
Surge	EN61000-4-5	3	A	
Conducted Immunity	EN61000-4-6	3		
Dips and Interruptions	EN61000-4-11	30% 10 ms	A	
		60% 100 ms	B	
		100% 5000 ms	B	

Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55022	Class B		See fig.11?
Radiated	EN55022	Class A		
Voltage Flicker	EN61000-3-3			

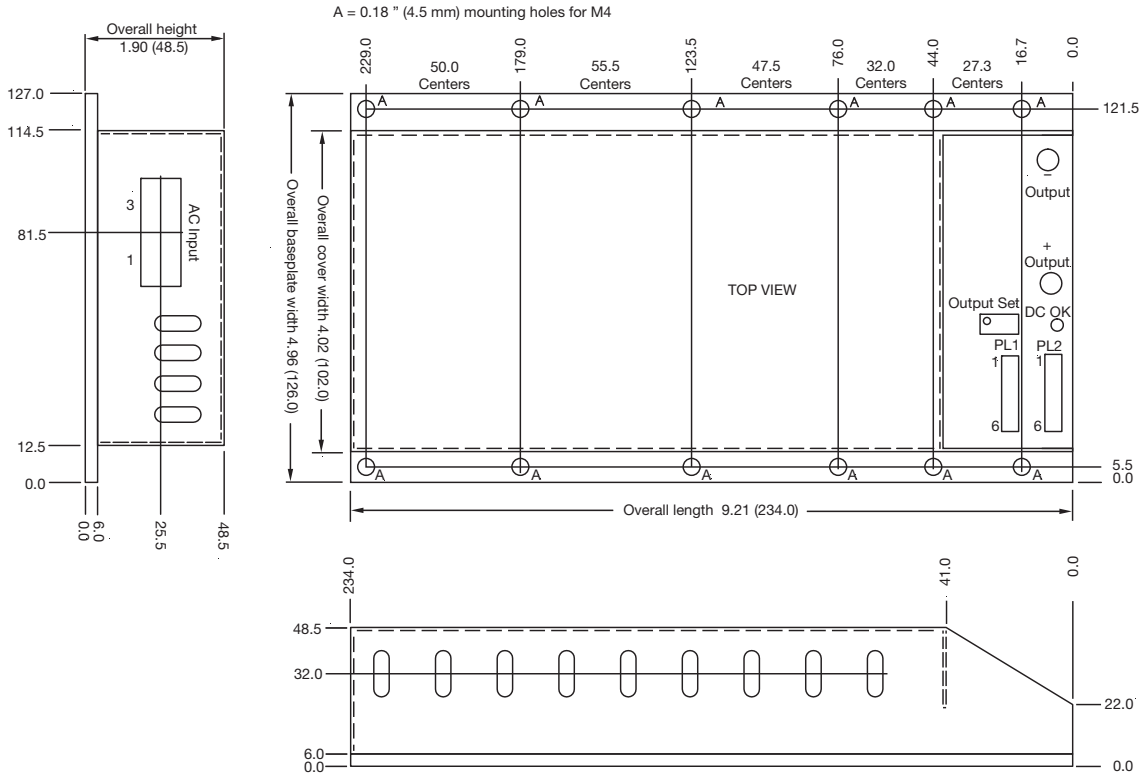
Figure 11



Safety Agency Approvals

Safety Agency	Safety Standard	Category
UL	UL File #	Information Technology

Mechanical Details



Input:
AMP Mate'n'lok 3 way.
Mating housing AMP 350766-1.
Socket crimp AMP 926893-1.
Pin 3: Live
Pin 2: Earth
Pin 1: Neutral

Output:
Power output +ve and -ve by M6 studs.
Use appropriate ring terminals and wire for the load current.
Maximum torque: 17.7 lbs-in (2 Nm)
Signal connections on two 0.1 (2.5) headers (PL1 & PL2).
Mating Housing: Molex 22-01-2065.
Mating Crimp: Molex 08-50-0032.

PL1 Connections	
Pin	Function
1	Current Balance
2	Voltage Balance
3	Trim
4	-Remote Sense
5	+Remote Sense
6	Remote On/Off

PL2 Connections	
Pin	Function
1	Current Balance
2	Voltage Balance
3	Trim
4	-Remote Sense
5	+Remote Sense
6	Remote On/Off

Accessories
1. Input & output connector kit - order part 'BCC CONKIT'.
2. For thermal pad, order part 'BCC THERM'.

Notes
Overall dimensions are in inches (mm)
Weight: 2.87 lbs (1.3 kg)
Tolerance: ±0.05 in (±1.5 mm) length and width
±0.02 in (±0.5 mm) height

Installation Instructions

Basic Installation

The BCC series of power supplies need to be mounted on a suitable flat surface which is capable of removing the dissipated heat. It should be fixed down using the ten mounting holes in the base flanges. These are designed to accommodate M4 or similar screws which should have a spring and flat washer under the head.
The BCC will accept a wide range of AC input voltages through the AMP 'Mat'n'Lok' style input connector. This input lead must be earthed as it is a class 1 product needing a safety earth.
M6 studs are used to connect the power supply output with suitable ring or fork terminals. Two 0.1" Molex style headers provide the signal interface for remote sense, inhibit and parallelling controls. A connector kit is available, order part BCC CONN KIT. To set the remote sense facility to monitor the output terminal studs, set the switches to 1 & 2 off, i.e. towards the end of the power supply and 3 & 4 on i.e. towards the cover.
Once powered up correctly and operating, a green LED will illuminate to indicate DC OK.

Output Connections

The main output is connected via two M6 captive studs for use with suitable ring terminals for the cable to be used. These ring terminals should be retained by using the supplied plain and spring washers under the nut. The nut should be torqued down to 3 Nm and care should be taken to avoid damaging any surrounding components on the power supply PCB.
All auxiliary connections are on a pair of 0.1" Molex headers. These can mate with crimp or IDC style housings to provide the signal interface.

Thermal Considerations

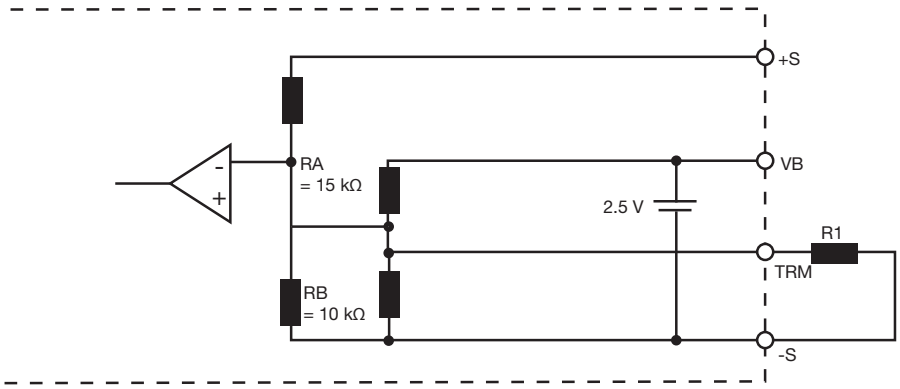
BCC power supplies rely on intimate thermal contact between the bottom of the baseplate and the host surface. A method of reducing this thermal interface resistance should be used such as either heatsink paste or a suitable pad which is available, order part BCC THERM.
The mounting surface should be flat and true to within 0.25 mm across the unit and 0.5 mm along the length. A standard extrusion should be capable of meeting this but if there is any doubt then the surface should be milled flat.
The BCC series will start and operate to -20 ºC as a standard with an option to specify a -40 ºC if required. Between -20 and 0 ºC, the output ripple will be slightly higher than specified.
Providing the baseplate is kept below 83 ºC by conduction cooling into the host surface, the BCC units may be operated at ambient temperatures up to 70 ºC. The baseplate temperature needs to be measured and confirmed in the application by monitoring the temperature reached at point halfway along the baseplate on both sides. At full output power, the host chassis or heatsink will need to draw 100 W away from the BCC whilst keeping the baseplate below 83 ºC.

Adjusting the Output Voltage

The output voltage is adjusted by either a onboard potentiometer or by an external voltage. The potentiometer is marked with 'VSET' and will alter the output up by 10% and down by about 60% adjustment. It is possible to override this by applying a voltage to the trim pin on the Molex header. Nominal output is achieved with 1.0 V on this pin relative to -sense and by altering this it is possible to change the output of the power supply proportionately. Note that this voltage must be stable and low noise and must not exceed 1.1 V.

External Adjustment - Decreasing Output Voltage with fixed Resistors

By connecting the external resistor (R1) more than 1/10 W, output voltage becomes adjustable to decrease as show in Fig.1.6.1



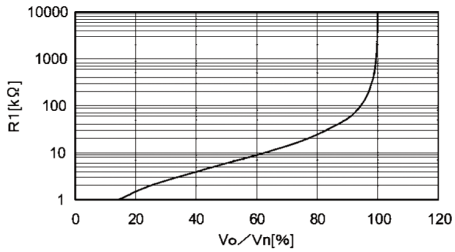
Output voltage is calculated by the following equation. Vn: Rated output voltage, Vo: Desire output voltage.

$$R1\ (k\Omega) = \frac{Vo}{Vn-Vo} \times 6.0$$

Example Vn = 5.0 (V) Vo = 4.5 (V)

$$R1\ (k\Omega) = \frac{4.5}{5.0 - 4.5} \times 6.0$$

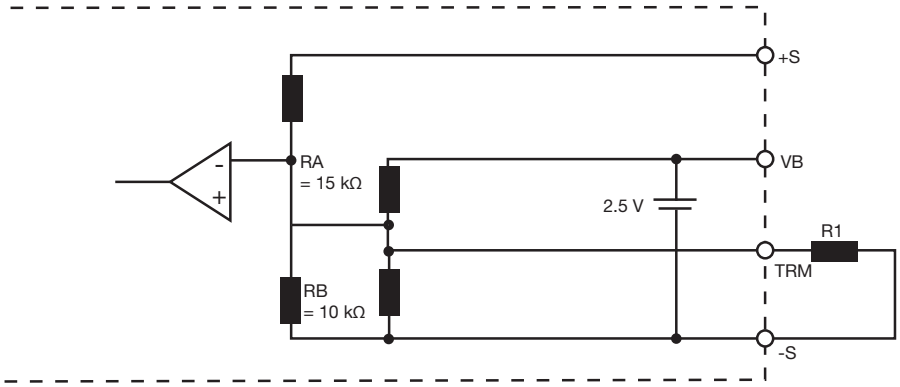
= 54 (k)



Adjusting the Output Voltage continued

Increasing Output Voltage with fixed Resistors

By connecting the external resistor (R1) more than 1/10 W, output voltage becomes adjustable to increase as show in fig.1.6.3

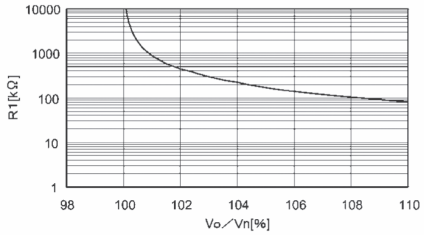


Output voltage is calculated by the following equation. Vn: Rated output voltage, Vo: Desire output voltage.

Example Vn = 5.0 (V) Vo = 5.5 (V) = 84 (k)

$$R1\ (k\%) = \frac{2.5\ Vn - Vo}{Vn - Vo} \times 6.0$$

$$R1\ (k\%) = \frac{2.5 \times 5.0 - 5.5}{5.5 - 5.0} \times 6.0$$

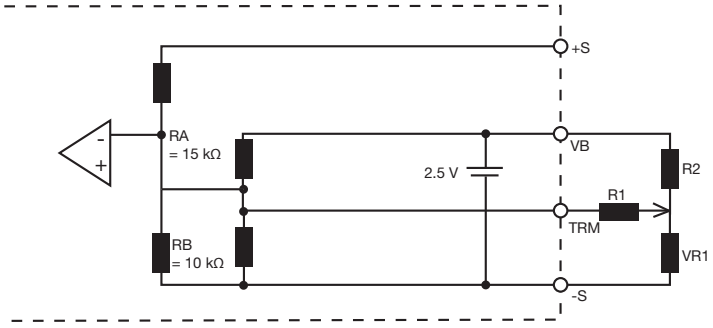


Output Voltage Adjustment using External Potentiometer

By connecting the external potentiometer (VR1) and resistors (R1, R2) more than 1/10 W, output voltage becomes adjustable, as shown in Fig.1.6.5, recommended external parts are shown in table 1.6.1.

The wiring to the potentiometer should be as short as possible. The temperature coefficient becomes worse, depending on the type of a resistor or potentiometer. Following parts are recommended for the power supply.

Resistor: Metal film type, coefficient of less than ±100 ppm/ºC **Potentiometer:** Cerment type, coefficient less than ±300 ppm/ºC



No.	Adjustable Range (%)	No. of units	External Parts Value (Ω)		
			VR1	R1	R2
1	±5	Single	5 k	75 k	1 k
2		2 Sets		36 k	
3		3 Sets		24 k	
4	±10	Single	5 k	36 k	910
5		2 Sets		18 k	
6		3 Sets		12 k	