

BC SYSTEMS INC.

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BC121 Series

Dual Output, DC/DC Converters



DESCRIPTION

The BC121 Series of DC/DC converters feature high power density over the full military temperature range. This series is offered as part of a complete family of converters providing single and dual output voltages and operating from nominal +160 volt input with output power ranging from 60 to 120 watts. The dual output converters feature two separately trimmable independently regulated outputs. For applications requiring higher output power, individual converters can be operated in parallel. The internal current sharing circuits assure accurate current distribution among paralleled converters. This series incorporates a proprietary control technology which provides extremely high speed dynamic line and load regulation response. Multiple converters can be synchronized to a system clock in the 500 KHz to 700 KHz range or to the synchronization output of one converter. Undervoltage lockout, primary and secondary referenced inhibit, overload protection, overvoltage protection and output trim functions are provided on all models.

These converters are hermetically packaged with rugged lead-to-package seals assuring long term hermeticity in the most harsh environments.

Manufactured in a facility qualified to ISO 9001, these converters are available in most popular output voltages. Variations in electrical and mechanical specifications can be accommodated. Contact BC Systems, Inc. with specific requirements.



FEATURES

- ◆ 96 to 237 Volt Input Range
- ◆ Input Transient to 260 VDC
- ◆ ± 5 , ± 12 , and ± 15 Volt Outputs Available
- ◆ 15 μ Sec load transient response, 25% to 100% load step. 70 KHz effective loop bandwidth
- ◆ High Power Density - up to 70 W / in³
- ◆ Up to 120 Watt Output Power
- ◆ Parallel Operation with Power Sharing
- ◆ Low Profile (0.40") Package
- ◆ Two Independently Regulated Outputs
- ◆ High Efficiency
- ◆ Full Military Temperature Range
- ◆ Continuous Short Circuit and Overload Protection
- ◆ Overvoltage Protection for Each Output
- ◆ Output Voltage Trim for Each Output
- ◆ Primary and Secondary Referenced Inhibit Functions
- ◆ Line Rejection > 80 dB
- ◆ External Synchronization Input
- ◆ Single Output Versions Available

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS	
Input Voltage	-0.5V to 500V
Soldering Temperature	300° C for 10 seconds
Case Temperature	Operating -55°C to +100 °C
	Storage -65°C to +135°C

Static Characteristics $-55^{\circ}\text{C} \leq T_{\text{CASE}} \leq +100^{\circ}\text{C}$, $96 \leq V_{\text{IN}} \leq 237$ unless otherwise specified.

Parameter	Test Condition	Min	Nom	Max	Unit
INPUT VOLTAGE	Continuous Surge 50 mSec Max	96	160	237 260	V V
OUTPUT VOLTAGE	$V_{\text{in}} = 160$ Volts, 100% Load				
BC121-05D	Positive Output	4.95	5.00	5.05	V
	Negative Output	-5.05	-5.00	-4.95	V
BC121-12D	Positive Output	11.88	12.00	12.12	V
	Negative Output	-12.12	-12.00	-11.88	V
BC121-15D	Positive Output	14.85	15.00	15.15	V
	Negative Output	-15.15	-15.00	-14.85	V
OUTPUT CURRENT					
BC121-05D	Positive Output		20		A
	Negative Output		4		A
BC121-12D	Positive Output		10		A
	Negative Output		3		A
BC121-15D	Positive Output		8		A
	Negative Output		3		A
OUTPUT POWER	Total of Both Outputs.				
BC121-05D		100			W
BC121-12D		120			W
BC121-15D		120			W
MAXIMUM CAPACTIVE LOAD	Each Output	5,000			ufd
OUTPUT VOLTAGE TEMPERATURE COEFFICIENT	$V_{\text{in}} = 160$ Volts, 100% Load	-0.015		+0.015	%/°C
OUTPUT VOLTAGE REGULATION					
Line Regulation	No Load, 50% Load, 100% Load	-0.5		+0.5	%
Load Regulation	$V_{\text{in}} = 96, 160, 237$ Volts	-0.5		+0.5	%
Cross Regulation	$V_{\text{in}} = 96, 160, 237$ Volts, Note 6				
	Positive Output	-0.5		+0.5	%
	Negative Output	-0.5		+0.5	%
OUTPUT RIPPLE VOLTAGE	$V_{\text{in}} = 96, 160, 237$ Volts, 100% Load BW = 20 MHz				
BC121-05D			30	50	mVpp
BC121-12D			70	120	mVpp
BC121-15D			80	150	mVpp

Static Characteristics (continued)

Parameter	Test Condition	Min	Nom	Max	Unit
INPUT CURRENT	No Load			10	mA
	Inhibit 1			12	mA
	Inhibit 2			5	mA
				5	mA
INPUT RIPPLE CURRENT	Vin = 160 Volts, 100% Load BW = 20 MHz				
	BC121-05D			60	mArms
	BC121-12D			70	mArms
	BC121-15D			80	mArms
CURRENT LIMIT POINT Expressed as a Percentage of Full Rated Load	Each Output. Note 4	105		130	%
LOAD FAULT POWER DISSIPATION Overload or Short Circuit	Vin = 160 Volts			3	W
EFFICIENCY	Vin = 160 Volts, 100% Load				
		BC121-05D	77	79	%
		BC121-12D	81	84	%
		BC121-15D	82	85	%
INHIBIT INPUTS	Converter Off	Logical Low, Pin 4 or Pin 12		0.8	V
	Sink Current				
	Converter On	Open Circuit, Pin 4 and Pin 12, Note 7		400	uA
OVERVOLTAGE THRESHOLD Expressed as percentage of nominal output voltage	Each output	115		130	%
OUTPUT VOLTAGE TRIM Expressed as percentage of nominal output voltage	Each output	-10		+10	%
SWITCHING FREQUENCY		500	550	600	KHz
SYNCHRONIZATION INPUT	Frequency Range	500		700	KHz
	Pulse Amplitude, Hi	2.0		10	V
	Pulse Amplitude, Lo	-0.5		0.8	V
	Pulse Rise Time			100	nSec
	Pulse Duty Cycle	20		80	%
ISOLATION	Input to Output @ 500 VDC	100			MΩ
	Input to Case @ 500 VDC	100			
	Output to Case @ 100VDC	100			
DEVICE WEIGHT			60		gms
HERMETICITY	Tested to MIL-R-83726				
MTBF	MIL-HDBK-217F, AIF @ Tc=70°C	300			KHrs

Dynamic Characteristics $-55^{\circ}\text{C} \leq T_{\text{CASE}} \leq +100^{\circ}\text{C}$, $V_{\text{IN}} = 160$ Volts unless otherwise specified.

Parameter	Test Condition	Min	Nom	Max	Unit
LOAD TRANSIENT RESPONSE	Note 1,5				
BC121-05D Positive Output Amplitude Recovery	Load step 25% \Leftrightarrow 100%	-300	15	+400 25	mV μ Sec
BC121-05D Negative Output Amplitude Recovery	Load step 25% \Leftrightarrow 100%	-400	15	+300 25	mV μ Sec
BC121-12D Positive Output Amplitude Recovery	Load step 25% \Leftrightarrow 100%	-400	15	+600 25	mV μ Sec
BC121-12D Negative Output Amplitude Recovery	Load step 25% \Leftrightarrow 100%	-600	15	+600 25	mV μ Sec
BC121-15D Positive Output Amplitude Recovery	Load step 25% \Leftrightarrow 100%	-600	15	+600 25	mV μ Sec
BC121-15D Negative Output Amplitude Recovery	Load step 25% \Leftrightarrow 100%	-600	15	+600 25	mV μ Sec
LINE TRANSIENT RESPONSE	Note 1,2				
Amplitude Recovery	V_{in} Step = 96 \Leftrightarrow 237 Volts	-500	25	+500	mV μ Sec
TURN-ON CHARACTERISTICS	Note 3				
Overshoot	Enable 1,2 on (Pins 4,12 open)			100	mV
Delay		50	70	90	mSec
LOAD FAULT RECOVERY		60	80	100	mSec
LINE REJECTION	MIL-STD-461D, CS101, 30Hz to 50KHz	70	80		dB

Notes to Specifications:

1. Recovery time is measured from the initiation of the transient to where V_{OUT} has returned to within $\pm 1\%$ of V_{OUT_i} .
2. Line transient transition time $\geq 10 \mu\text{Sec}$.
3. Turn-on delay is measured with an input voltage rise time of between 100 and 500 volts per millisecond.
4. Current limit point is that condition of excess load causing output voltage to drop to 90% of nominal.
5. Load transient transition time $\geq 10 \mu\text{Sec}$.
6. Cross regulation measured with load on tested output at 20% while changing the load on other output from 20% to 80%.
7. Enable inputs pulled high internally. Nominal open circuit voltage for Pin 4 and Pin 12 is 14VDC and 1.2VDC respectively. Note that Pin 12 doubles as trim pin for negative output. Open collector Enable must be used so as not to disrupt the trim function.

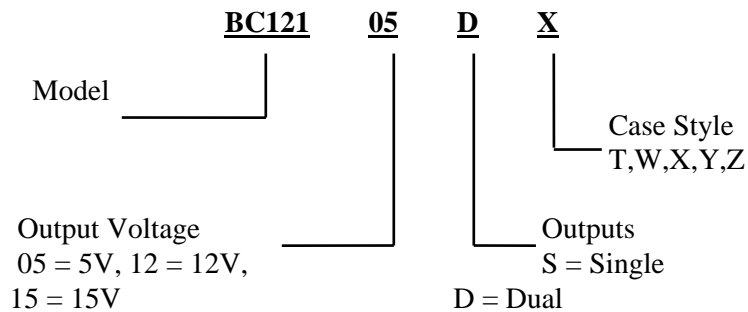
BC121XXD Pin Designation

1	Positive Input
2	Input Return
3	Case
4	Enable 1
5	Sync Output
6	Sync Input
7	Positive Output
8	Output Return
9	Negative Output
10	Positive Output Voltage Trim
11	Share
12	Enable 2/Neg Output Voltage Trim

Environmental Stress Screening

Each DC/DC converter undergoes 15 minutes of .04G²/Hz random vibration, followed by ten thermal cycles. Each thermal cycle consists of a cold soak at -55°C (de-energized) followed by a ramp-up to 100°C baseplate temperature at full load. The thermal cycle is completed by maintaining the baseplate temperature at 100°C at full load for a minimum of 4 hours.

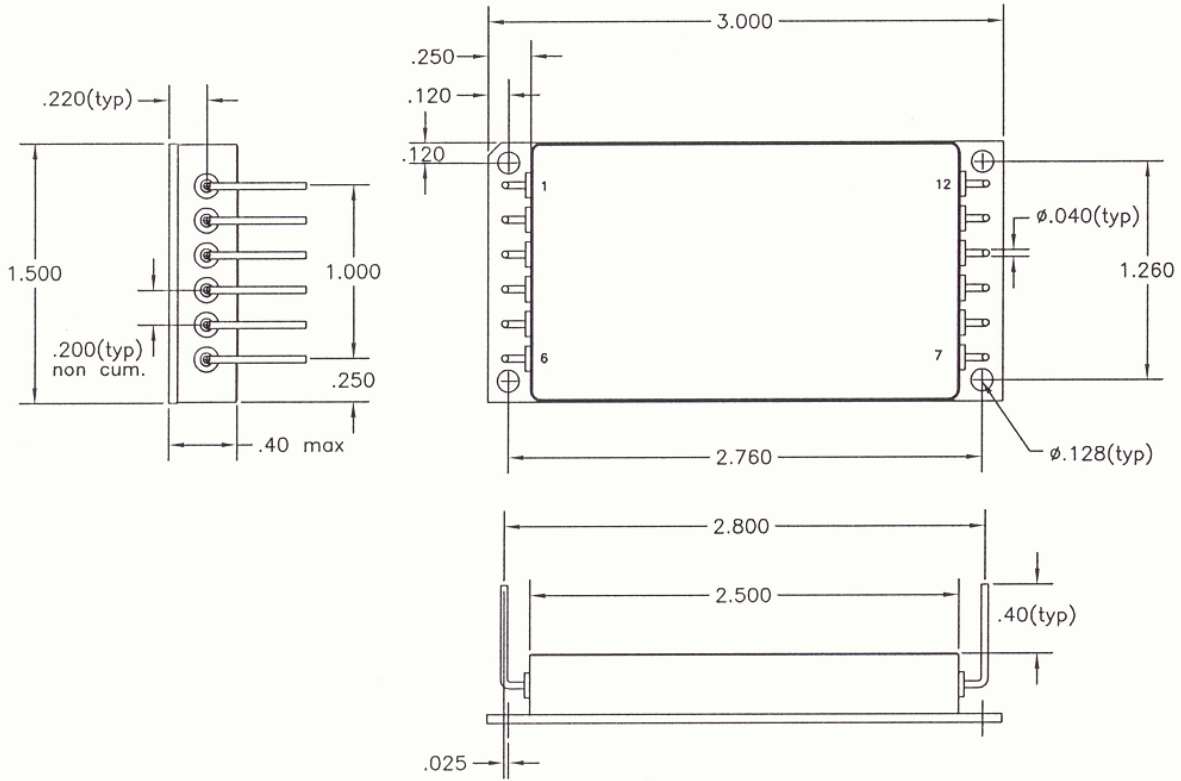
Part Numbering



TOLERANCES, UNLESS OTHERWISE SPECIFIED:
.XX = ±.01
.XX X = ±.005

BC-120D CASE OUTLINES

CASE T



CASE X

