

Block Upconverters

BU Series

Introduction

BU-Series Block Upconverters are designed to translate a block of L-Band IF input frequencies to C-Band, X-Band, or Ku-Band. These block upconverters have the quality, stability and performance required for demanding transmitting applications in INTELSAT, EUTELSAT, and other satellite communications systems. When used with Solid-State Power Amplifiers (SSPAs) the BU-Series converters will shift the SSPA input frequency to L-Band for use with coaxial or fiber-optic IFLs.

Application Notes

BU-Series converters may be powered by one of two methods: Either supply +Vdc between the center conductor and ground of the L-Band input cable (cable powered) or apply +Vdc to the DC power RFI and the ground lug.

The alarm RFI provides a Form 'C' contact set which indicates a fault if phase lock is lost. The alarm circuit is rated at 100 V at 50 mA.

Features

- L-Band input
- C-, X-, or Ku-Band output:
 - C-Band = 575 or 875 MHz BW
 - X-Band = 500 MHz BW
 - Ku-Band = 500 or 750 MHz BW
- Phase-locked oscillator locks to external 10 MHz reference
- INTELSAT/EUTELSAT-compliant phase noise

Options

- External reference may be diplexed with IF input or supplied via separate coaxial connector.

Table 1 — Part Number/Ordering Information

Block Upconverters		BU S - 	
Frequency Band			
C-Band	0	6	
X-Band	0	8	
Ku-Band	1	4	
Frequency Range (IF In / RF Out / Local Osc.)			
C-Band (950–1525 MHz / 5.850–6.425 GHz / 4.900 GHz)			A
C-Band (950–1825 MHz / 5.850–6.725 GHz / 4.900 GHz)			B
X-Band (950–1450 MHz / 7.900–8.400 GHz / 6.950 GHz)			A
Ku-Band (950–1450 MHz / 14.00–14.50 GHz / 13.05 GHz)			A
Ku-Band (950–1700 MHz / 13.75–14.50 GHz / 12.80 GHz)			B
10 MHz Reference Frequency (Required) Input Options			
Diplexed with IF Input			D
Supplied via separate coaxial connector			E

Table 2 — External Reference Requirements

For proper operation, the BU-Series converters require an externally applied reference with the following characteristics:					
Parameter	Notes	Min.	Typ.	Max.	Units
Frequency			10.00		MHz
Input Level		-5	+3	+10	dBm
Input Impedance			50		ohms
Phase Noise at Offset Frequency (fm)	10 Hz			-105	dBc/Hz
	100 Hz			-135	dBc/Hz
	1 kHz			-145	dBc/Hz
	10 kHz			-150	dBc/Hz

How to Apply External Reference:

Diplexed with IF Input (Option D)

Via separate connector (Option E)

Specifications

BU06Sx-x (C-Band)

Parameter	Notes	Min.	Typ. [†]	Max.	Units
IF/RF/LO Frequencies			See Table 1		
Output Spectrum			Non-Inverted		
LO Phase Noise (Using external reference reference per Table 2.)	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz			-33 -63 -73 -83 -93 -103	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
LO Leakage	At RF output (4.90 GHz)			-60	dBm
Spurious	In band Out of band; $P_{OUT} \leq -3$ dBm			-60 -60	dBc dBm
Gain Level,		20	23	25	dB
Gain Flatness	Full-band Per 40 MHz			± 1.0 ± 0.25	dB dB
Gain Stability	Per week, constant temp Vs. temperature			± 0.50 ± 1.5	dB dB
Power Output	At 1 dB compression	+10	+12		dBm
3rd Order Output Intercept	Two tones at -3 dBm each	+20	+22		dBm
Noise Figure	At +23 °C		15	18	dB
VSWR	Input (50 ohms) Output (50 ohms)			1.35 1.35	:1 :1
Fault Alarm	Phase lock		Form-C Contact (100 V/50 mA)		
Connectors	IF In/DC In, RF Out DC In/Alarm Out Ext. Ref. In (Option E)		SMA (F) RFI Feedthrough SMA (F)		
Power Requirements	Voltage Current	+10.5	390	+18.0 450	Vdc mA
Operating Temperature	Ambient	-40		+70	°C

[†] When there is only one entry on a line, the Nom./Typ. column is a nominal value; otherwise it is a typical value. Typical values are intended to illustrate typical performance, but are not guaranteed.

Specifications

BU08SA-x (X-Band)

Parameter	Notes	Min.	Typ. [†]	Max.	Units
IF/RF/LO Frequencies			See Table 1		
Output Spectrum			Non-Inverted		
LO Phase Noise (Using external reference reference per Table 2.)	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz			-33 -63 -73 -83 -93 -103	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
LO Leakage	At RF output (6.95 GHz)			-60	dBm
Spurious	In band Out of band; $P_{OUT} \leq -3$ dBm			-60 -60	dBc dBm
Gain Level,		20	23	25	dB
Gain Flatness	Full-band Per 40 MHz			± 1.0 ± 0.25	dB dB
Gain Stability	Per week, constant temp Vs. temperature			± 0.50 ± 1.5	dB dB
Power Output	At 1 dB compression	+10	+12		dBm
3rd Order Output Intercept	Two tones at -3 dBm each	+20	+22		dBm
Noise Figure	At +23 °C		15	18	dB
VSWR	Input (50 ohms) Output (50 ohms)			1.35 1.35	:1 :1
Fault Alarm	Phase lock		Form-C Contact (100 V/50 mA)		
Connectors	IF In/DC In, RF Out DC In/Alarm Out Ext. Ref. In (Option E)		SMA (F) RFI Feedthrough SMA (F)		
Power Requirements	Voltage Current	+10.5	390	+18.0 450	Vdc mA
Operating Temperature	Ambient	-40		+70	°C

[†] When there is only one entry on a line, the Nom./Typ. column is a nominal value; otherwise it is a typical value. Typical values are intended to illustrate typical performance, but are not guaranteed.

Specifications

BD14Sx-x (Ku-Band)

Parameter	Notes	Min.	Typ. [†]	Max.	Units
IF/RF/LO Frequencies			See Table 1		
Output Spectrum			Non-Inverted		
LO Phase Noise (Using external reference reference per Table 2.)	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz			-33 -63 -73 -83 -93 -103	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz
LO Leakage	At RF output (A, 13.05 GHz; B, 12.80 GHz)			-60	dBm
Spurious	In band Out of band; $P_{OUT} \leq -3$ dBm			-60 -60	dBc dBm
Gain Level,		20	23	25	dB
Gain Flatness	Full-band Per 40 MHz			± 1.0 ± 0.25	dB dB
Gain Stability	Per week, constant temp Vs. temperature			± 0.50 ± 1.5	dB dB
Power Output	At 1 dB compression	+10	+12		dBm
3rd Order Output Intercept	Two tones at -3 dBm each	+20	+22		dBm
Noise Figure	At +23 °C		15	18	dB
VSWR	Input (50 ohms) Output (50 ohms)			1.35 1.35	:1 :1
Fault Alarm	Phase lock		Form-C Contact (100 V/50 mA)		
Connectors	IF In/DC In, RF Out DC In/Alarm Out Ext. Ref. In (Option E)		SMA (F) RFI Feedthrough SMA (F)		
Power Requirements	Voltage Current	+10.5	390	+18.0 450	Vdc mA
Operating Temperature	Ambient	-40		+70	°C

[†] When there is only one entry on a line, the Nom./Typ. column is a nominal value; otherwise it is a typical value. Typical values are intended to illustrate typical performance, but are not guaranteed.

The drawing shows the top and bottom views of the PCB. The top view is a rectangle with overall dimensions of 4.50 inches [114.3 mm] by 3.50 inches [88.9 mm]. It features 16 mounting holes arranged in a 4x4 grid. The bottom view shows the component layout, including two SMA female connectors, a GND pad, and several test points labeled V+, OF, C, and CF. Dimensions for the bottom view include 0.93 inches [23.5 mm] for the connector spacing, 0.54 inches [13.7 mm] for the GND pad, 0.70 inches [17.8 mm] for the test point spacing, and 3.78 inches [95.9 mm] for the overall width.

0.15 [3.8]

4.50 [114.3]

4.20 [106.7]

3.50 [88.9]

3.20 [81.3]

0.15 [3.8]

0.15 [3.8] DIA THRU (4 PLACES)

RF OUT (SMA FEMALE)

GND

IF/REF/DC IN (SMA FEMALE)

0.93 [23.5]

0.54 [13.7]

0.70 [17.8]

3.78 [95.9]

V+

OF

C

CF

NOTES:

1. DIMENSIONS ARE IN INCHES [MILLIMETERS]

2. TOLERANCE: +/-0.02 [0.5]

The drawing consists of two views: a top view and a side view.

Top View:

- Overall width: 4.50 [114.3]
- Distance from left edge to center of RF OUT: 0.15 [3.8]
- Distance from center of RF OUT to center of IF IN/DC IN: 4.20 [106.7]
- Overall height: 3.50 [88.9]
- Distance from top edge to center of RF OUT: 3.20 [81.3]
- Distance from bottom edge to center of RF OUT: 0.15 [3.8]
- Four 0.15 [3.8] DIA THRU holes are located at the corners.
- An EXTERNAL REFERENCE INPUT (SMA FEMALE) is located on the right edge, 1.05 [26.7] from the bottom edge.
- Along the bottom edge, from left to right, are: a ground pad, a V+ pad, an OF pad, a C pad, a CF pad, and another ground pad.

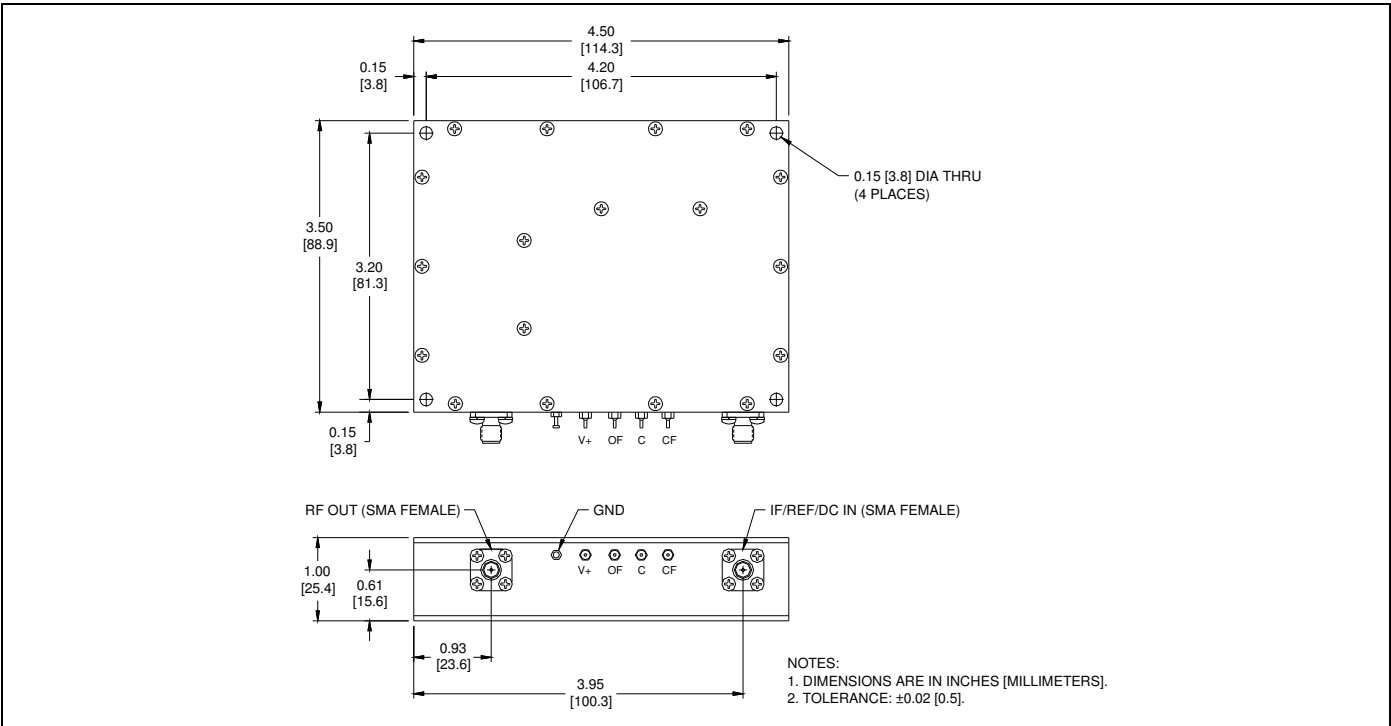
Side View:

- RF OUT (SMA FEMALE) is on the left, with a mounting hole 0.93 [23.5] from the top edge and a distance of 0.54 [13.7] between the two SMA connectors.
- GND is the central mounting point.
- IF IN/DC IN (SMA FEMALE) is on the right, with a mounting hole 0.21 [5.4] from the top edge.
- The distance from the center of the RF OUT to the center of the IF IN/DC IN is 3.78 [95.9].
- The distance from the center of the RF OUT to the center of the GND pad is 0.70 [17.8].
- Along the bottom edge, from left to right, are: a ground pad, a V+ pad, an OF pad, a C pad, a CF pad, and another ground pad.

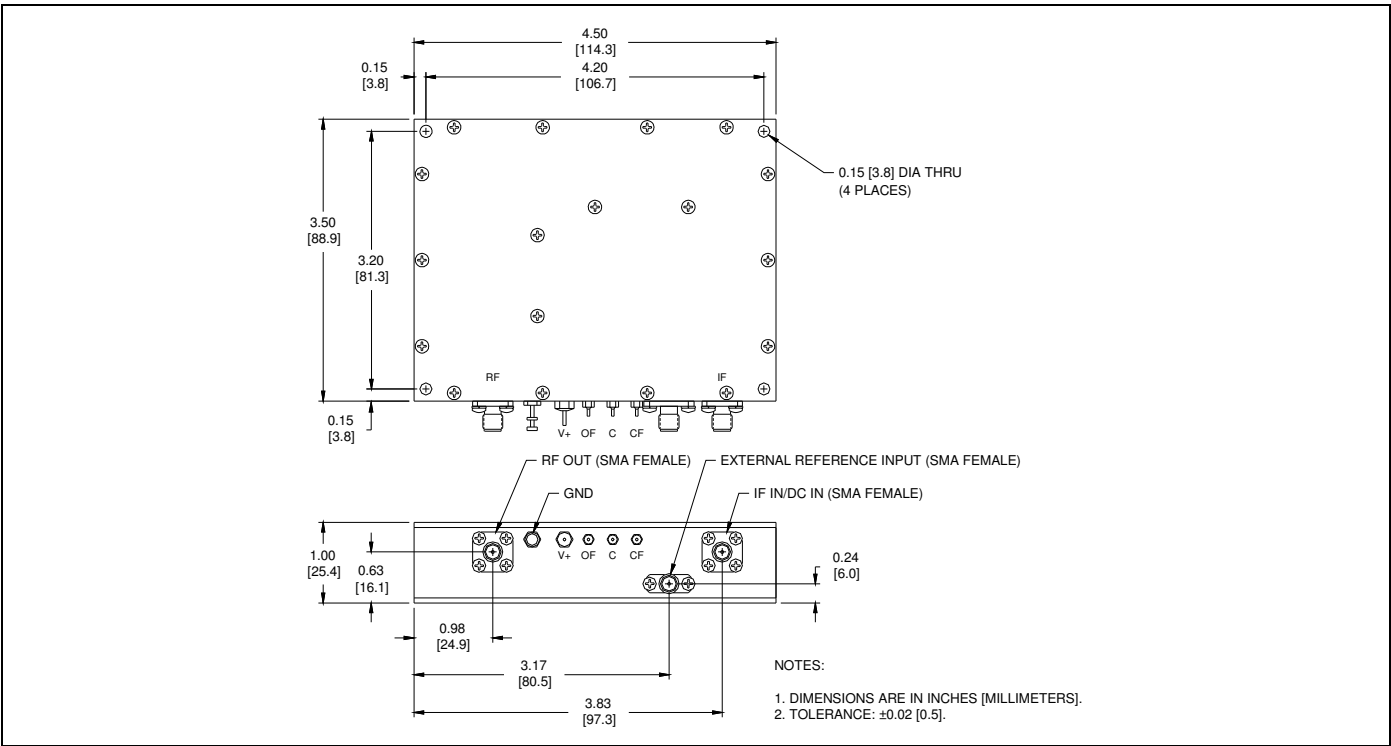
NOTES:

1. DIMENSIONS ARE IN INCHES [MILLIMETERS]
2. TOLERANCE: +/-0.02 [0.5]

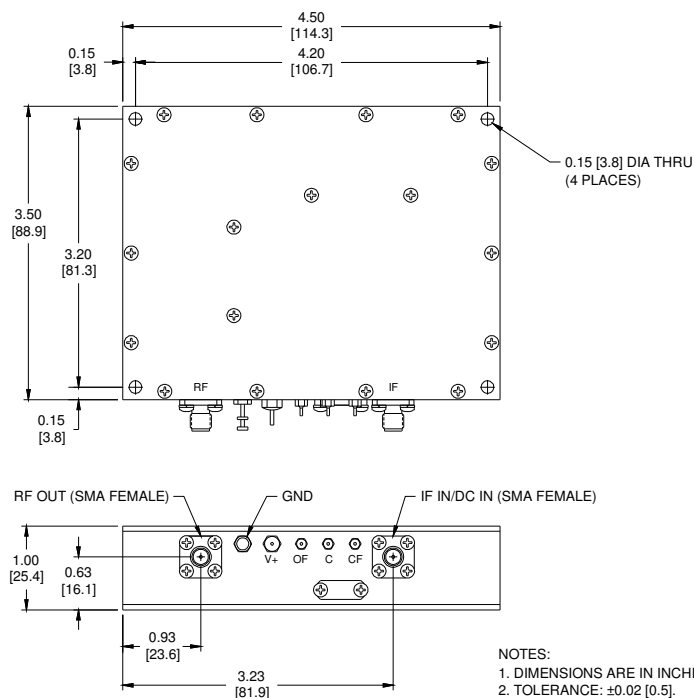
Outline Drawing, X-Band, Option D



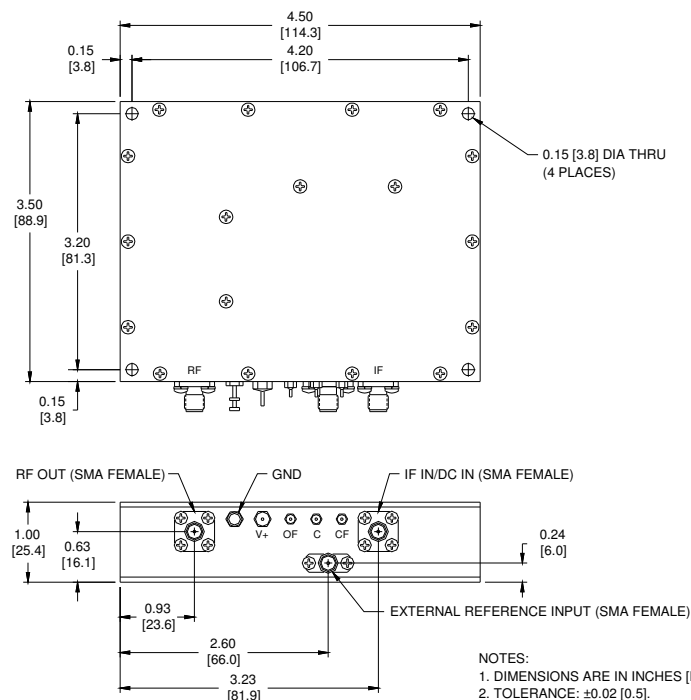
Outline Drawing, X-Band, Option E



Outline Drawing, Ku-Band, Option D



Outline Drawing, Ku-Band, Option E



GENERAL DYNAMICS SATCOM Technologies

60 Decibel Road, Suite 200 • State College, PA 16801 USA • Tel. +1-814-238-2700 • FAX +1-814-238-6589
Email: satcom@gd-ms.com • www.gdsatcom.com/electronics.php

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Planet Communications Asia PLC.

157 Soi Ramindra 34, Ramindra Rd., Tarang, Bangkok, 10230
Tel: +66 2 792 2400 | Fax: +66 2 792 2499, +66 2 943 5771 | E-mail: sales@planetcomm.com

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