TSA-214144

Ka-Band BUC with Integrated Linearizer

Ground Mobile Applications

29 - 31 GHz Ka-Band Block Up-Converter with Integrated IF Linearizer

EXPORT RESTRICTIONS MAY APPLY

Description

This is a Ka-Band Block Up-Converter (BUC) with an integrated IF Linearizer that is designed to generate 29-30 GHz or 30-31 GHz from a 1-2 GHz IF Band. The output band is selected via an RS-422 command, as is mute, and reference frequency selection. The RS-422 interface also allows reporting of the input power to the mixer, internal temperature, and local oscillator (LO) lock detect.

Features

- Small Size Weight and Power
- Wide Input Voltage Range
- Operates over 29 to 31 GHz
- Electronic Gain Control
- Discrete/RS-422 Mute
- Enable Hermetically Sealed
- Couple Output for Linearization

Other Products

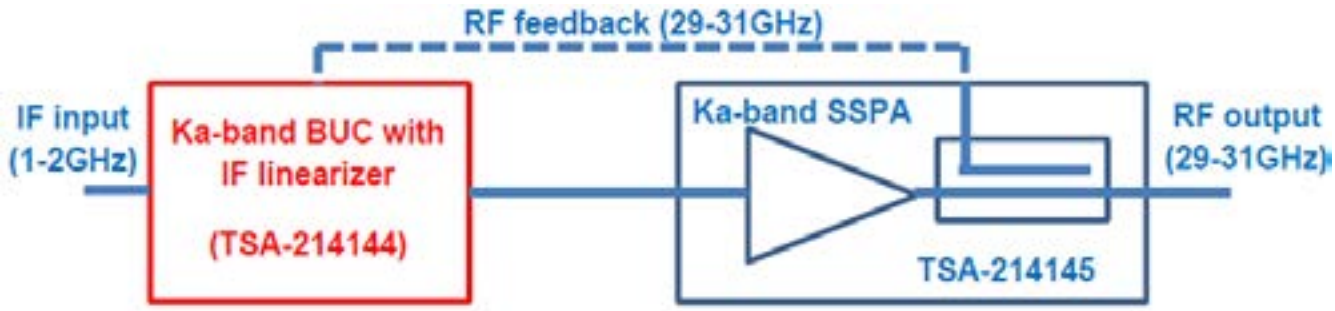
- Low Noise Block Converters (Ku & X-Band)
- Block Up Converters (Ku & X-Band)
- Low Noise Amplifiers (Ku & K-Band)
- Solid State Power Amplifiers (X, Ku & Ka-Band)
- Synthesizers (L, C or X-Band)

Specifications

Parameter	Value
Operating Frequency Range	29 to 30 GHz and 30 to 31 GHz
Operating Temperature Range	-40 to +70°C
Small Signal Gain Range	15 dB min
Gain Variation **• Over any 40 MHz IF BW** **• Over full IF BW**	 ±0.75 dB ±2.0 dB
Gain Variation Over Temperature	±2.0 dB
Input VSWR	2:1 max
Feedback VSWR	2:1 max
Output VSWR	1.7:1 max
Output Spurious Pin = -23 dBM, 2nd Harmonic (2xIF)+LO Fc ≥ ±20 MHz	-55 dBc
Phase Noise **• 100 Hz Offset** **• 1 kHz Offset** **• 10 kHz Offset** **• 100 kHz Offset** **• 1 MHz Offset** **• 10 MHz**	 -62 dBc/Hz -72 dBc/Hz -78 dBc/Hz -92 dBc/Hz -112 dBc/Hz -115 dBc/Hz
Input Voltage	+20.5V to +31.5V
Mute	Control Via RS-422 or Discrete Pin
Reference Input Connector (may be Freq Multiplexed with IF Input)	SMA (Female)
IF Input Connector	N (Female)
Feedback Input Connector	2.92 mm (Female)
Output Connector	2.92 mm (Female)
Max RF Input Power	+5 dBm
DC, Monitor, Control Connector	15 Pin Micro-D
Reference Clock Input Frequency	10 or 50 MHz (selectable through RS-422)
Reference Clock Input Level	0 dBm ±3 dB
External Reference Clock Phase Noise Requirement **10 Hz Offset** **100 Hz Offset** **1 kHz Offset**	 -120 dBc/Hz -145 dBc/Hz -165 dBc/Hz
Lock Detect	Indicator of Lock to Reference via RS-422
Detected Power @ Input of Mixer	Read through RS-422
Internal Temperature	Read through RS-422
Size	6.0”L x 4.0”W x 1.0”H
Weight	2.0 lbs max
Input DC Current (24V)	625 mA max

Figure 1:

Block diagram of the Ka-Band dual band BUC implemented in TX lineup



The unit uses a fully integrated IF Linearizer ASIC which can be used to linearize a Teledyne Microwave Solutions SSPA. As this uses an intellig ent adaptive technique, a 40 mS integration measurement time is initiated upon Linearizer enable. The achievable improvement in linearity depends on the type of SSPA, modulation scheme, and symbol rates used (measured improvement for a TMS amplifier is shown in Figure 2). Feedback of the RF signal is require to utilize the RF linearizer: approximately -10dBm is required at the R F feedback input.

Example of Linearizer Performance

An example of the linearity improvement achievable using the IF linearizer is shown below in Figure 2.

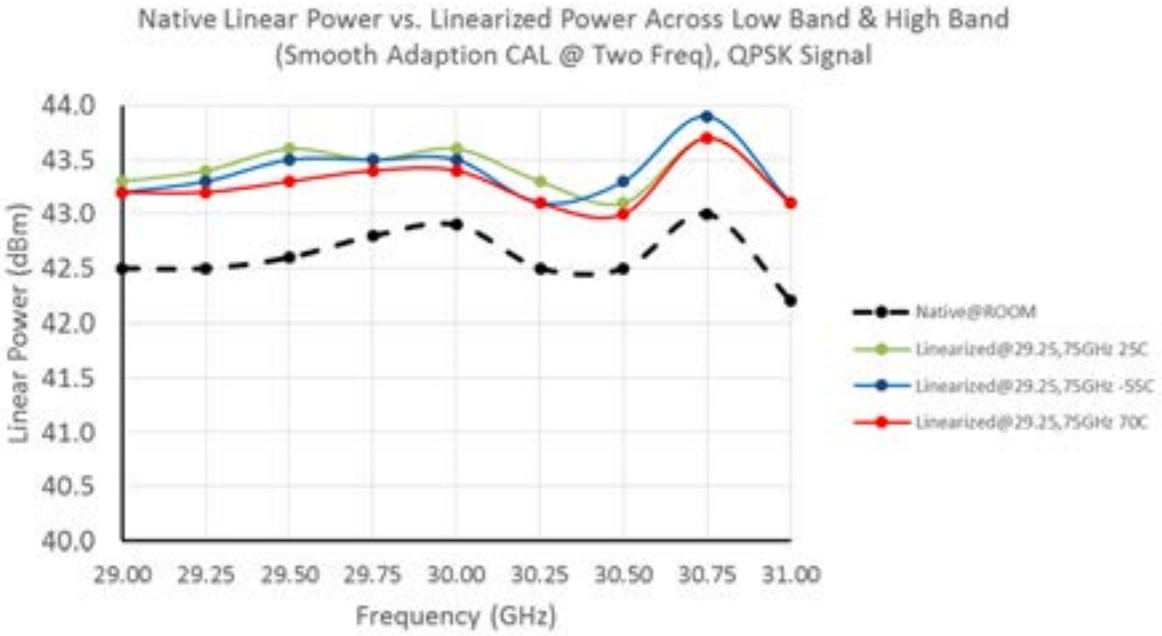


Figure 2:

TMS PA Performance enhancement gained through the use of the adaptive IF linearizer function. (Modulation parameters: QPSK, Symbol Rate = 10Msps, Filter = Root Raised Cosine, Filter Roll-off = 0.2, Point on Linearity = 1 symbol rate offset from carrier to be -30dBc.

Table 1: 25 Pin Micro-D Connector Pinout Description

J1: 15 PIN MICRO-D CONNECTOR PER MIL_DTL-83513/2		
PIN NO.	**FUNCTION**	**COLOR**
J1-1	GND	BLACK
J1-2	D+ (USB, OPTIONAL)	BROWN
J1-3	VBUS (USB, OPTIONAL)	RED
J1-4	+RX (RS-422)	ORANGE
J1-5	-TX (RS-422)	YELLOW
J1-6	GND	GREEN
J1-7	GND	BLUE
J1-8	+VDC	VIOLET
J1-9	GND	GREY
J1-10	D- (USB, OPTIONAL)	WHITE
J1-11	RFTXEN (OPEN = ON), GND = OFF)	BLACK
J1-12	-RX (RS-422)	BROWN
J1-13	+TX (RS-422)	RED
J1-14	GND (RS-422)	ORANGE
J1-15	+VDC	YELLOW

+VDC voltage range is +28VDC (range is 20.5-32.5V); apply same voltage to all +VDC pins

Digital Protocols

Communication with the BUC is done through RS-422. However, there is a descrete pin: RFTXEN. RFTXEN is a hardwired TTL controlled pin for disabling RF power is case of emergency. This pin is high through an internal pull-up. To disable the unit, simply ground this pin.

The serial format is shown in Table 3. As standard, a high-to-low transition indicates the start of the data. A newline ("\n") following the command indicates the end of the command.

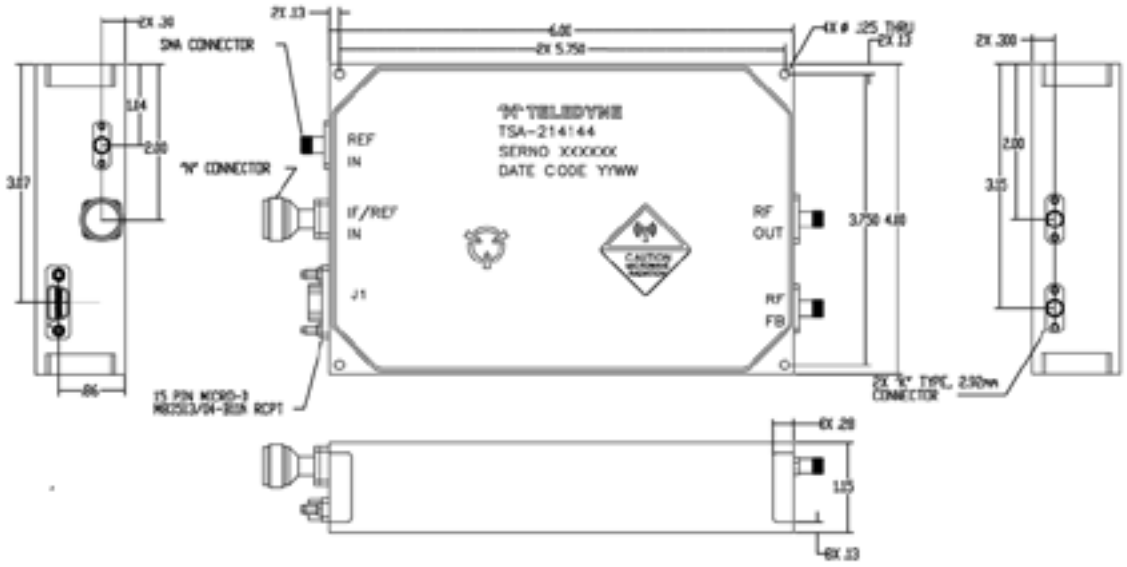
Table 2: Serial Format

Baud Rate	115,200 bps
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

Table 3: RS-422 Command List

"BUCVER"	Indicates Firmware Version
"BUCSN"	Indicates Unit Serial Number
"MUTE1"	Turns RF Power OFF
"MUTE0"	Turns RF Power ON
"BANDH"	Switches output frequency range to 30-31 GHz
"BANDL"	Switches output frequency range to 29-30 GHz
"FILT1"	Enables Filter for 1 GHz signal
"FILT0"	Disables Filter for 1 GHz signal
"LOCKSTA"	Reports Lock Status
"REFSEL50"	Sets internal settings to be used with 50 MHz reference
"REFSEL10"	Sets internal settings to be used with 10 MHz reference
"LIN1"	Enables Linearizer
"LIN0"	Disables Linearizer
"PINMIX"	Pwer (dBm) at Input of Mixer
"BUC TEMP"	Indicates Internal Temperature (°C)

Outline Drawing



Notes (unless otherwise specified):

1. Marking as shown shall be permanent and legible per MIL-STD-130 using black epoxy based ink. Marking to be on top of SSPA and on top cover.
1. Case material: Aluminum.
2. Finish: Electroless nickel per MIL-C-26074, Type I, Class 4, Grade B, 200-400 microinches except for welded cover, mounting surface and waveguide flange. Welded cover, mounting surface and waveguide finish is chemical film per MIL-DTL-541, latest revision, Type 1, Class 3, Yellow.