NF v1

# Ka-Band (29-31GHz) BUC with Integrated Linearizer

(TSA-214144)


## Summary

This is a Ka-Band Block Up-Converter (BUC) with an integrated IF Linearizer that is designed to generate 29-30GHz or 30-31GHz from a 1-2GHz IF Band. The output band is selected via an RS-422 command, as is gain control, 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.

The unit uses a fully integrated IF Linearizer ASIC which can be used to linearize a Teledyne Microwave Solutions SSPA. As this uses an intelligent adaptive technique, SSPAs from other manufacturers may also be linearized. 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 required to utilize the RF linearizer: approximately +10dBm is required at the RF feedback input.

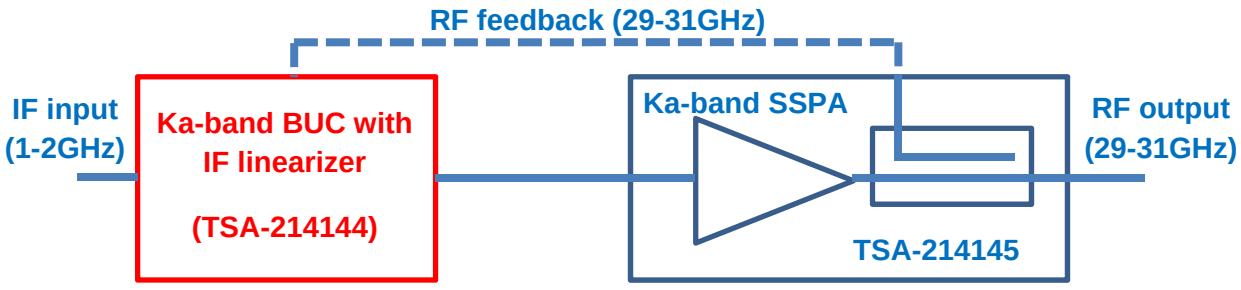



Figure 1: block diagram of the Ka-band dual band BUC implemented in TX lineup.

The unit has a wide operating voltage of +20.5V to +31.5V. The total weight is 1.5 lbs max and the size is 6” L x 4” W x 1” H. See the outline drawing attached

## Specifications

| Parameter | Value |
|---|---|
| ***Operating Frequency Range*** | 29 to 30 GHz and 30 to 31 GHz |
| ***Operating Temperature Range*** | -55 to +70 ˚C |
| ***Max RF Input Power*** | +5 dBm |
| ***Small-Signal Gain*** *(Controlled Via RS-422)* | 30 dB typ. |
| ***Gain Variation*** *Over any 40MHz IF BW*<br>*Over full IF BW* | ±0.75 dB<br>±2.0 dB |
| ***Gain Variation Over Temperature*** | ±2.0 dB |
| ***VSWR Input*** | 1.5:1 |
| ***VSWR Output*** | 1.5:1 |
| ***Output Spurious Pin=-23dBm*** *2nd Harmonic (2xIF)+LO & DC-DC Spurs* | -60 dBc |
| ***Phase Noise*** *100 Hz Offset*<br>*1 kHz Offset*<br>*10 kHz Offset*<br>*100 kHz Offset*<br>*1 MHz Offset*<br>*10 MHz Offset* | -62 dBc/Hz<br>-75 dBc/Hz<br>-75 dBc/Hz<br>-93 dBc/Hz<br>-122 dBc/Hz<br>-125 dBc/Hz |
| ***RMS Noise (w/ 10 MHz Ext. Ref)*** | <1.75 deg |
| ***Spurious @ Pout = 42dBm*** *(29-31GHz) In Band* | -60dBc |
| ***Reference Clock Input Freq.*** | 10 or 50MHz (Selectable through RS-422) |
| ***Reference Clock Input Level*** | 0dBm ± 3dB |
| ***External Reference Clock Phase Noise Requirement*** | 10 Hz Offset -120dBc/Hz<br>100 Hz Offset -145dBc/Hz<br>1 kHz Offset -165dBc/Hz |
| ***Lock Detect*** | Indicator of Lock to Reference via RS-422 |
| ***Input Voltage*** | +20.5V to +31.5V |
| ***Detected Power @ Input of Mixer*** | Read through RS-422 |
| ***Internal Temperature*** | Read through RS-422 |
| ***Mute*** | Control Via RS-422 or Discrete Pin |
| ***Reference Input Connector*** | SMA (F) |
| ***IF Input Connector*** | N (F) |
| ***Feedback Input Connector*** | 2.92mm (F) |
| ***Output Connector*** | 2.92mm (F) |
| ***DC, Monitor, Control Connector*** | 15 Pin Micro-D |
| ***Size*** | 6” L x 4” W x 1” H |
| ***Weight*** | 1.5 lbs maximum |

## Example of linearizer performance.

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

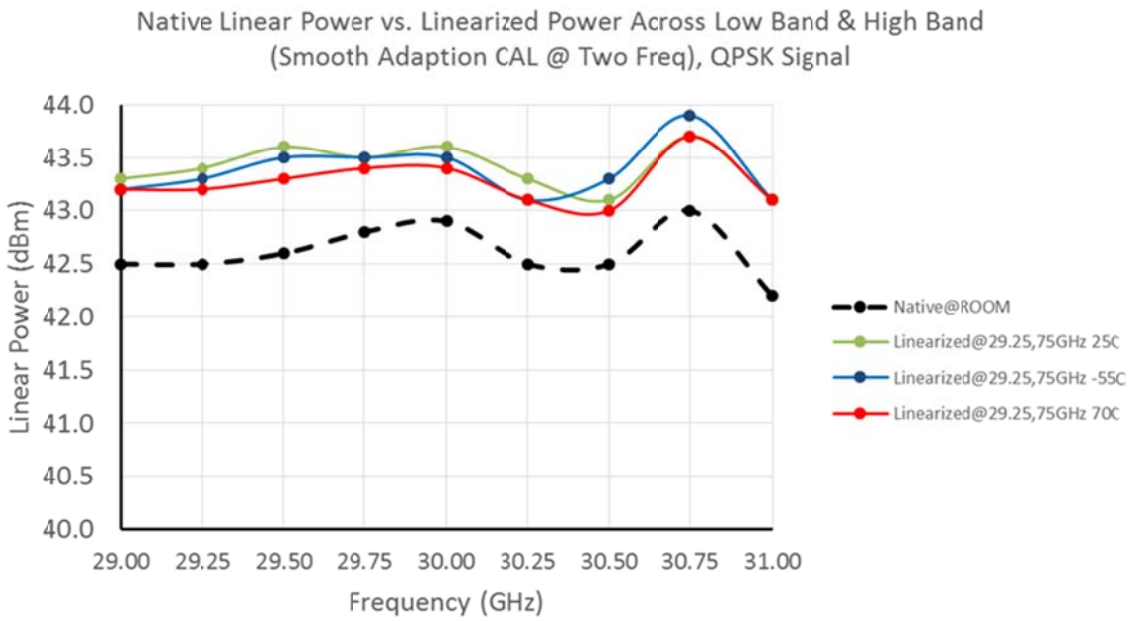
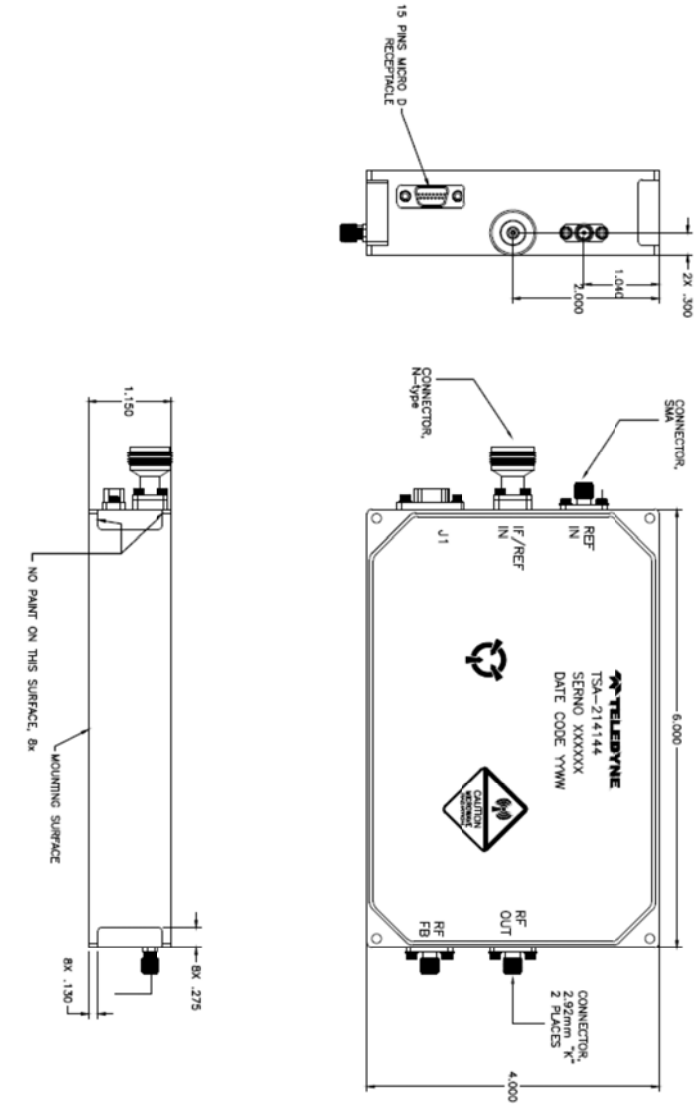



Figure 2. Performance enhancement gained through the use of the adaptive IF linearizer function. (Modulation parameters: QPSK, Symbol Rate = 10Msps, Filter = Root Raised Cosine, Filter Roll-off=0.2, Point of Linearity = 1 symbol rate offset from carrier to be -30dBc)

## Mechanical Outline:




J1: 15 PIN MICRO-D CONNECTOR

| PIN | FUNCTION | WIRE COLOR |
|---|---|---|
| J1-1 | +VDC | BLACK |
| J1-2 | GND | BROWN |
| J1-3 | GND | RED |
| J1-4 | -TX (RS422) | ORANGE |
| J1-5 | +RX (RS422) | YELLOW |
| J1-6 | VBUS (USB, OPTIONAL) | GREEN |
| J1-7 | D+ (USB, OPTIONAL) | BLUE |
| J1-8 | FACTORY USE ONLY (DO NOT CONNECT) | VIOLET |
| J1-9 | +VDC | GRAY |
| J1-10 | GND (RS422) | WHITE |
| J1-11 | +TX (RS422) | BLACK |
| J1-12 | -RX (RS422) | BROWN |
| J1-13 | RFTKEN(OPTIONAL, +3.3V=ON, 0V=OFF) | RED |
| J1-14 | D- (USB, OPTIONAL) | ORANGE |
| J1-15 | FACTORY USE ONLY (DO NOT CONNECT) | YELLOW |

- +VDC VOLTAGE IS +28VDC (RANGE IS 20.5-32.5V)
APPLY SAME VOLTAGE TO ALL +VDC PINS