ZLNB2013

DUAL TONE AND POLARITY SWITCH LNB MULTIPLEX CONTROLLER

DESCRIPTION

The ZLNB2013 dual polarization and tone switch controller is one of a wide range of satellite receiver LNB support circuits available from Zetex. It features two completely independent channels, each providing logic outputs to control LNB polarization selection, local oscillator selection and down feed disable. It is intended for use in Twin, Quad and multiple feed Universal LNBs, replacing many discrete components to save both manufacturing cost and PCB size, whilst improving reliability.

The two polarization control inputs of the ZLNB2013 have a threshold voltage of 14.75V to meet the switching requirement of 14.0V to 15.5V. To minimize drift both thresholds are temperature compensated. Each features a low and stable input current that enables threshold trimming and transient protection to be achieved with the addition of only a single resistor per channel.

Multi feed LNBs can be called to operate with one or more of their controlling receivers powered down/disconnected, with attendant cable mismatch problems. To ease design for this situation, each polarization input of the ZLNB2013 has a second threshold set at 9V. An input voltage below this threshold indicates "receiver not present" and switches the relevant control channels high. This logic output can be used to disable the associated down feed driver, eliminating any problems due to cable mismatch.

Universal LNB local oscillator selection is achieved by detection of a low level AC voltage superimposed on the polarization control voltage. To facilitate this function, the ZLNB2013 includes a separate tone detector for each channel. Control of detector bandwidth and sensitivity is provided using an external resistor and capacitor for each channel. The tone detector has been designed to give excellent rejection of low frequency control signals and DiSEqC™ tone bursts.

The ZLNB2013 has been specifically designed to minimize the solution cost whilst being flexible. The ZLNB2013 only requires two external components per channel to give full user control and functionality. The ZLNB2013 also includes complimentary outputs so that it can directly drive many multiplexer ICs without the need of an inverter. Any unused outputs can be left open circuit without any effect to the remaining circuits. Polarization switch and tone detector outputs can directly drive TTL and CMOS logic, pin diodes, IF-amp supply switching and multiplexer ICs.

The ZLNB2013 operates from a single supply which can be anything from 5-8V. Its quiescent current is typically only 9mA and this does not change significantly with load or logic state. It is available in the space saving QSOP16 surface mount package.

FEATURES

- Dual polarization and tone switch
- Temperature compensated polarization switches
- Reduced cost solution, only 2 external components per channel
- Multiplexer IC direct drive
- Tone and pol. outputs are TTL, CMOS, pin diode and IF amp capable
- Transient resistant inputs
- Includes receiver-off detector
- User adjustable filter centre frequency and bandwidth
- Low frequency and DiSEqC™ control signals rejection
- Eliminates many close tolerance discrete components
- Wide supply operating range
- Low quiescent current

APPLICATIONS

- Twin Universal LNB's
- Quad Universal LNB's
- Multi Feed Universal LNB's
- LNB switch boxes

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ZETEX SEMICONDUCTORS

ABSOLUTE MAXIMUM RATINGS

Supply voltage	-0.6V to 12V
Supply current	500mA
V_{POL1} and V_{POL2} Input voltage	25V Continous
Operating temperature	-40 to 80°C
Storage temperature	-40 to 85°C

Power dissipation (T_{amb}= 25°C)
QSOP16 500mW

ELECTRICAL CHARACTERISTICS TEST CONDITIONS (Unless otherwise stated):
T_{amb}= 25°C, V_{CC}=5V

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNITS
			Min.	Typ.	Max.	
V_{CC}	Supply voltage		5		8	V
I_{CC}	Supply current	HOR1,2= BHOR1,2= TD1,2= BTD1, 2= 0mA $V_{POL}1$= $V_{POL}2$= Don't Care $F_{IN}1$= $F_{IN}2$= Don't Care		9	12	mA
	V_{POL1} and V_{POL2} Inputs					
I_{POL}	Current	V_{POL1} = V_{POL2} = 25V (Note 2)	100	200	240	μA
V_{TPOL}	Threshold voltage	T_{amb}=-40°C to 80°C	14	14.75	15.5	V
V_{TENA}	Enable threshold voltage	T_{amb}=-40°C to 80°C	8.0	9.0	10.0	V
T_{SPOL}	Switching speed				100	μS
	$HOR_{OUT}1$ and $HOR_{OUT}2$ outputs					
$VHOR_{HIGH}$	Voltage high	$IHOR_{OUT}1,2$=-100μA,$V_{POL}1,2$=15.5V	V_{CC}-1.0	V_{CC} 0.7	V_{CC}	V
$VHOR_{LOW}$	Voltage low	$IHOR_{OUT}1,2$=5mA,$V_{POL}1,2$=14V	0	0.30	0.5	V
	$BHOR_{OUT}1$ and $BHOR_{OUT}2$ outputs					
$VBHOR_{HIGH}$	Voltage high	$IBHOR_{OUT}1,2$=-100μA,$V_{POL}1,2$=14.0V	V_{CC}-1.0	V_{CC} 0.7	V_{CC}	V
$VBHOR_{LOW}$	Voltage low	$IBHOR_{OUT}1,2$=5mA,$V_{POL}1,2$=15.5V	0	0.30	0.5	V
	Enable 1,2 outputs					
VEN_{HIGH}	Voltage high	IEnable 1,2=-100μA,$V_{POL}1,2$=10V	V_{CC}-1.0	V_{CC} 0.7	V_{CC}	V
VEN_{LOW}	Voltage low	IEnable 1,2=5mA,$V_{POL}1,2$=8.0V	0	0.30	0.5	V
	Filter amplifier					
V_{OUT}	Bias voltage[3]	I_{fin}=0	1.75	1.95	2.15	V
F_{inz}	Input impedance	V_{FIN}=100mV p/p		150		Ω
AG	Amplifier gain	V_{FIN}=100mV p/p		30		V/mA
FV_T	V Threshold[3]		100	170	350	mV p/p

Note:

1) The parameters Filter Amplifier V_{OUT}, I_{OUT}, Rectifier V_{OUT} and Comparator Threshold Voltage are all directly (linearly) related to V_{CC}.

2) Applied via 2.2k resistors

3) These parameters are linear related to V_{CC}

ELECTRICAL CHARACTERISTICS TEST CONDITIONS (Unless otherwise stated):
T_{amb}= 25°C,V_{CC}=5V

SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNITS
			Min.	Typ.	Max.	
	TD 1,2 Outputs					
V_{VHIGH}	Voltage high	ITD 1,2=-100μA, Test Circuit 1, Tone enabled	V_{CC}-1.0	V_{CC}-0.7	V_{CC}	V
V_{VLOW}	Voltage Low	ITD 1,2=5mA, Test Circuit 1, Tone disabled	0	0.3	0.5	V
	BTD 1,2 Outputs					
V_{VHIGH}	Voltage high	IBTD 1,2=-100μA, Test Circuit 1, Tone disabled	V_{CC}-1.0	V_{CC}-0.7	V_{CC}	V
V_{VLOW}	Voltage Low	IBTD 1,2=5mA, Test Circuit 1, Tone enabled	0	0.3	0.5	V

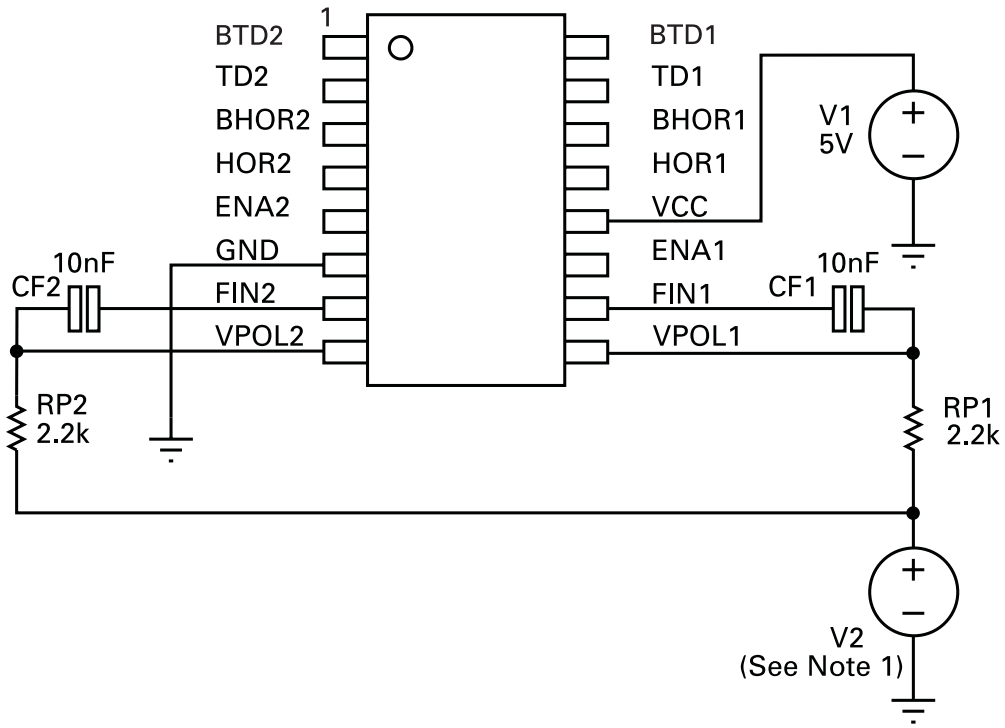
Note:

1) The parameters Filter Amplifier V_{OUT}, I_{OUT}, Rectifier V_{OUT} and Comparator Threshold Voltage are all directly (linearly) related to Vcc.

2) Applied via 2.2k resistors

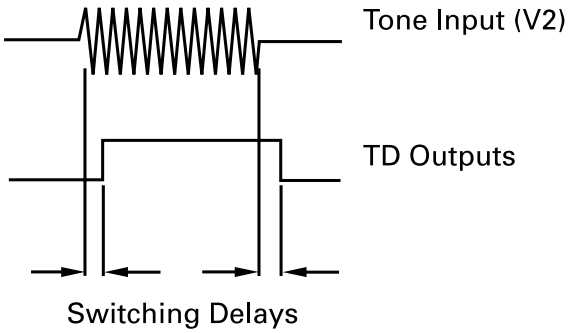
3) These parameters are linear related to V_{CC}

TEST CIRCUIT 1 (ZLNB2013 Pinout for QSOP16 package designator - Q16)



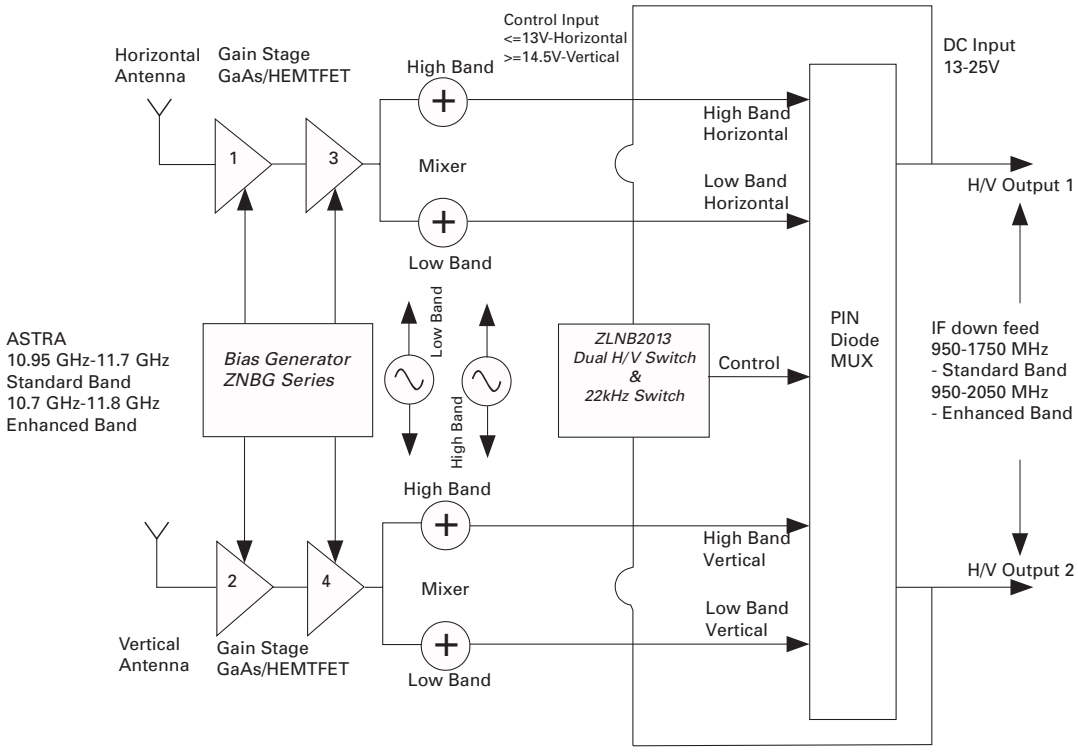
Note 1: V2 Characteristics

Type:-	AC source
Frequency:-	22kHz
Voltage:-	300mVp/p Enabled
	Zero Disabled



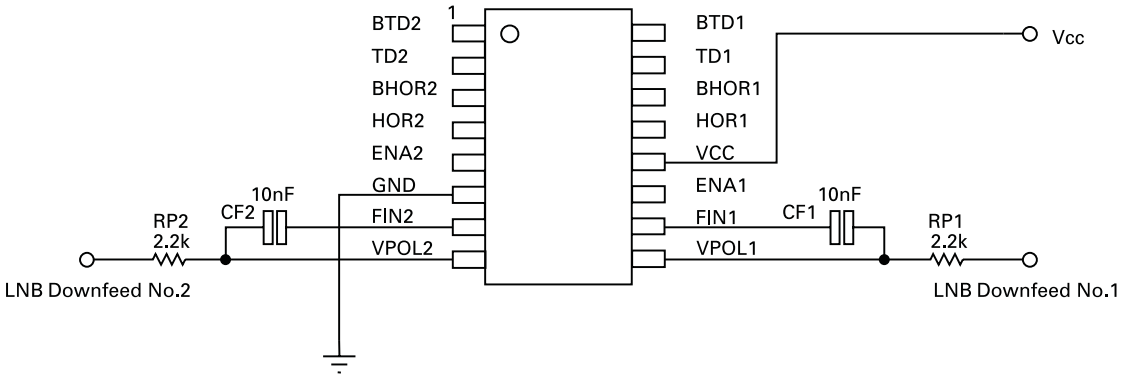
The following diagram shows a typical block diagram for a twin universal LNB design. The ZLNB2013 device provides the two polarity and two tone switches required to decode the two independent receiver feeds. The device is also able to detect the absence of a revceiver connection to either port of the LNB providing all outputs to go high hence disabling of the port. This allows the avoidance of unwanted signal reflections from an unterminated down feed cable.

Additionally the front end bias requirements of the LNB are provided by the ZNBG fixed bias range offering a very efficient and cost effective solution

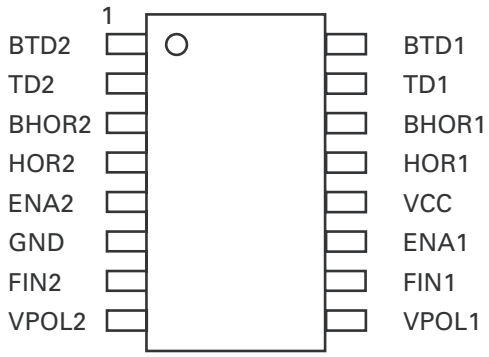


APPLICATION CIRCUIT EXAMPLES

The following circuit shows the additional components that will be used for polarisation mode and 22kHz tone detection in typical ZLNB2013 application (ZLNB2013 Pinout for QSOP16 package designator - Q16).



ZLNB2013 PINOUT FOR QSOP16 PACKAGE DESIGNATOR - Q16



ORDERING INFORMATION

Part number	Package	Part mark
ZLNB2013Q16	QSOP16	ZLNB2013

SAMPLE ORDERING INFORMATION

Part number	Package	Part mark
#ZLNB2013Q16	QSOP16	ZLNB2013

FURTHER INFORMATION

Inputs Vpol1 and Vpol2 are designed to be wired to the power inputs of an LNB via a high value (2.2k) resistors. Input Vpol1 controls outputs HOR1, BHOR1 and ENA1. Input Vpol2 controls outputs HOR2, BHOR2 and ENA2. With either input voltage set at or below 14V, the corresponding HOR pin will be active and the corresponding BHOR pin will be the inverse of HOR. With either input voltage at 15.5V or higher, the corresponding HOR pin will be active and the corresponding BHOR pin will be the inverse. Should the voltage applied to either Vpol input fall below 8V, the corresponding ENA (enable) pin will be low, otherwise these outputs will remain high. Any input or output may be left open circuit without any effect on the remaining circuitry.

The ZLNB2013 includes all the circuitry necessary to detect the presence of a 22kHz tone modulated on the supply input to the LNB. The main elements of the detector are an op-amp, a rectifier/smoother and a comparitor. The op-amp has a pre-set internal feedback resistor so that just a simple RC network wired to the input gives user defined gain and low frequency cut filter characteristics.

The RC network components also serve two other purposes. The resistor provides overvoltage protection for the Vpol pin and the capacitor minimises tone interference of the Vpol threshold. The upper frequency roll-off of the op-amp has been set internally at above 100kHz to allow the amplifier to be used with other common tone switch frequencies.

The rectifier/smoother/comparitor function is provided by a complex propriety circuit that allows the ZLNB2013 to reliably detect wanted tones whilst ignoring low frequency square wave switch box signals, DiSEqC™ bursts and supply switching transients common when using DiSEqC-2™ ready set-top boxes. This is all achieved without the need for any further external components. The threshold of the comparitor is supply dependent, hence the gain of the preceding op-amp must be adjusted in line with supply voltage.

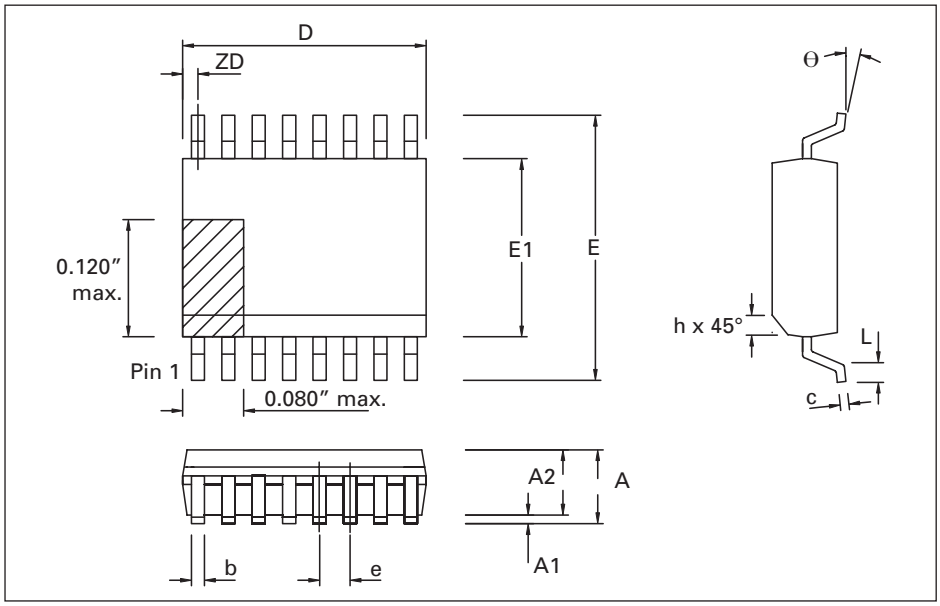
Output truth table

The ZLNB2013 includes two independent channels, each containing a voltage detector and tone detector. The following truth table applies to each channel:-

Tone	Vpol	TD	BTD	HOR	BHOR	ENA
Off	⩽14V	Low	High	Low	High	High
Off	⩾15.5V	Low	High	High	Low	High
On	⩽14V	High	Low	Low	High	High
On	⩾15.5V	High	Low	High	Low	High
-	<8V	-	-	Low	High	Low

ZLNB2013

QSOP16



PACKAGE DIMENSIONS

Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069	L	0.41	1.27	0.016	0.050
A1	0.10	0.25	0.004	0.010	e	0.64 BSC.		0.025 BSC.	
A2	1.25	1.50	0.049	0.059	b	0.20	0.30	0.008	0.012
D	4.80	5.00	0.189	0.197	c	0.18	0.25	0.007	0.010
ZD	0.23 REF.		0.009 REF.		θ	0°	8°	0°	8°
E	5.79	6.20	0.228	0.244	h	0.25	0.50	0.010	0.020
E1	3.81	3.99	0.150	0.157	-	-	-	-	-

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