ZLNB2006
ZLNB2009 ZLNB2010

DUAL TONE AND POLARITY SWITCH LNB MULTIPLEX CONTROLLER

DEVICE DESCRIPTION

The ZLNB2006/09/10 group of dual polarisation and tone switch controller are part of a wide range of satellite receiver LNB support circuits available from Zetex. Each part features two completely independent channels, each providing logic outputs to control LNB polarisation selection, local oscillator selection and the ZLNB2009/10 also provides downfeed disable. They are intended for use in Twin Universal and Quad LNBs, replacing many discrete components to save both manufacturing cost and PCB size whilst improving reliability.

The two polarisation control inputs of the ZLNB2006/09/10 have a nominal threshold of 14.75V. The threshold is temperature compensated to minimise drift. Each features a low and stable input current that enables 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 polarisation input of the ZLNB2009/10 has a second threshold set at 9.5V. An input voltage below this threshold indicates “receiver not present”, switching the relevant control channels high. This logic output can be used to disable the associated downfeed 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 polarisation control voltage. To facilitate this function, the ZLNB2006/09/10 includes a separate tone detector for each channel. Full control of detector bandwidth and sensitivity is provided using two external resistors and capacitors. In the ZLNB2006/9, additional control of tone switch delays is provided to assist with the rejection of low frequency control signals intended for other systems.

Polarisation switch and tone detector outputs can source and sink 10mA making them suitable to drive TTL and CMOS logic, pin diodes and IF-amp supply switching.

The ZLNB2006/09/10 operates from a single supply which can be anything from 5-10V. Their quiescent current is typically only 6mA and this does not change significantly with load or logic state. They are available in the space saving QSOP16 or QSOP20 surface mount package.

FEATURES

- Dual polarisation switch
- Temperature compensated polarisation switch threshold
- Transient resistant inputs
- Includes Receiver-Off detector (ZLNB2009/10)
- Dual tone switch
- User adjustable filter centre frequency and bandwidth
- User adjustable tone switching delays
- Tone and Pol outputs are TTL, CMOS, Pin diode and IF amp capable
- Wide supply operating range
- Low quiescent current
- Few external components
- Eliminates many discrete components

APPLICATIONS

- Twin Universal LNB
- Multi Feed Universal Lnb’s
- Twin Universal IF switch boxes
- LNB switch boxes

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ZETEX

ABSOLUTE MAXIMUM RATINGS

Supply Voltage	-0.6V to 12V
Supply Current	100mA
V_{POL1} and V_{POL2} Input Voltage	25V Continous
Operating Temperature	-40 to 85°C
Storage Temperature	-40 to 125°C

Power Dissipation (T_{amb} 25°C)

QSOP16	500mW
QSOP20	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		10	V
I_{CC}	Supply Current	$IHV_{OUT1,2}$=$IT_{OUT1,2}$=0		5.5	12	mA
		$IT_{OUT1,2}$=0,$IHV_{OUT1,2}$=10mA, V_{POL}=15.5V		26	32	mA
	V_{POL1} and V_{POL2} Inputs					
I_{POL}	Current	V_{POL1} = V_{POL2} = 25V (Note 2)	10	25	40	µA
V_{TPOL}	Threshold Voltage	T_{amb}=-40°C to 70°C (Note 2)	14.0	14.75	15.5	V
V_{TEN}	Enable Threshold Voltage (ZLNB2009/10 only)	T_{amb}=-40°C to 70°C (Note 2)	8.0	9.5	10.0	V
T_{SPOL}	Switching Speed				100	µS
	Filter Amplifier					
I_B	Input Bias Current	RF1=150k	0.02	0.07	0.25	µA
V_{OUT}	V_{OUT} (Note 1) (ZLNB2006 only)	RF1=150k	1.75	1.95	2.15	V
V_{OUT}	V_{OUT} (Note 1) (ZLNB2009/10 only)	RF1=150k		2.215		V
I_{OUT}	I_{OUT} (Note 1) (ZLNB2006 only)	V_{OUT} = 2.20V, V_{FIN} = 2.42V	440	587	733	µA
I_{OUT}	I_{OUT} (Note 1) (ZLNB2000/10 only)	V_{OUT} = 2.20V, V_{FIN} = 2.50V	470	587	782	µA
G_V	Voltage Gain	F=22kHz, Vin=1mV	0	46		dB

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 10k resistors

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

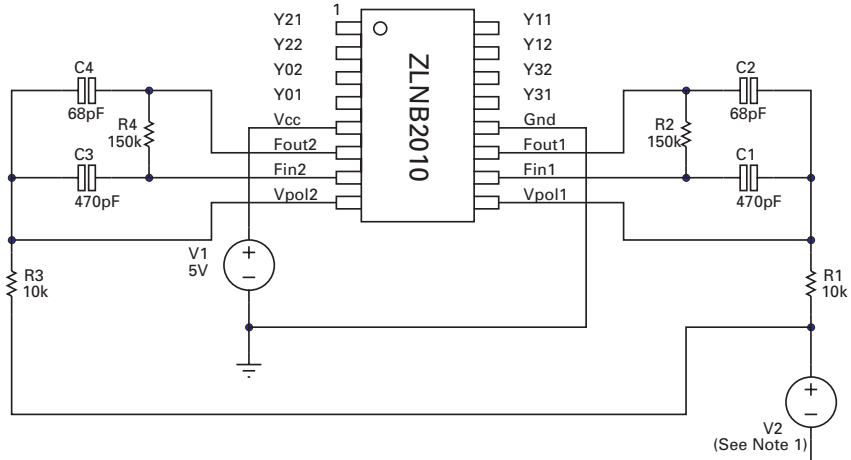
SYMBOL	PARAMETER	CONDITIONS	LIMITS			UNITS
			Min	Typ	Max	
	Rectifier (ZLNB2006 and ZLNB2009 ONLY)					
V_{REC}	VOUT (Note 1)	RF1=150k, IL=10µA	2.2	2.45	2.69	V
	ILeakage	RF1=150k, VOUT=3V (Note 1)		20	200	nA
	Comparator (ZLNB2009 and ZLNB2010 ONLY)					
V_{TH} DC	Threshold DC (Note 1)	F=0		2.980		V
V_{TH}	Threshold AC	Test Circuit 1 (ZLNB2010) Test Circuit 2 (ZLNB2009)	100	150	300	mV
	Comparator (ZLNB2006 ONLY)					
V_{TH}DC	Threshold DC (Note 1)	F=0	3.00	3.34	3.67	V
V_{TH} AC	Threshold AC	Test Circuit 2	100	150	300	mV
	Y Outputs					
Y_{VH}	Voltage High	I_{TOUT} 1,2 = -10µA	V_{CC} -0.3	V_{CC} -0.17	V_{CC}	V
Y_{VH}	Voltage High	I_{TOUT} 1,2 = -5µA	V_{CC} -1.2	V_{CC} -0.95	V_{CC}	V
Y_{VL}	Voltage Low	I_{TOUT} 1,2 = -5mA	0	0.29	0.5	V

Note:-

1) The parameters Filter Amplifier VOUT, IOUT, Rectifier VOUT and Comparator Threshold Voltage are all directly (linearly) related to Vcc.

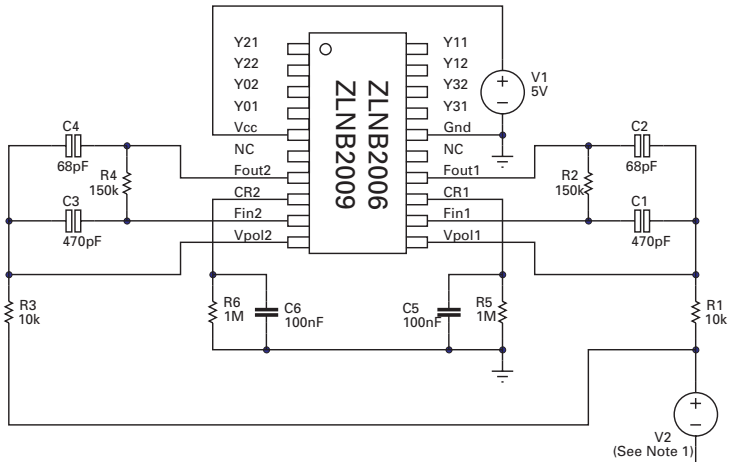
2) Applied via 10k resistors

TEST CIRCUIT 1



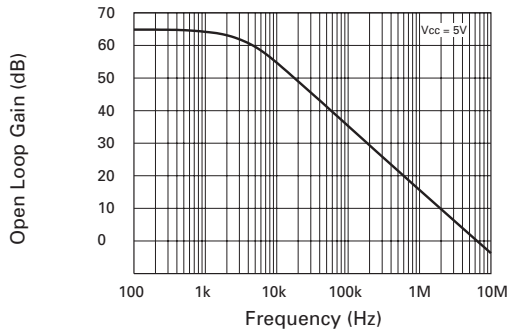
Note 1: V2 Characteristics
Type:- AC source
Frequency:- 22kHz
Voltage:- 300mVp/p Enabled
100mVp/p Disabled

TEST CIRCUIT 2

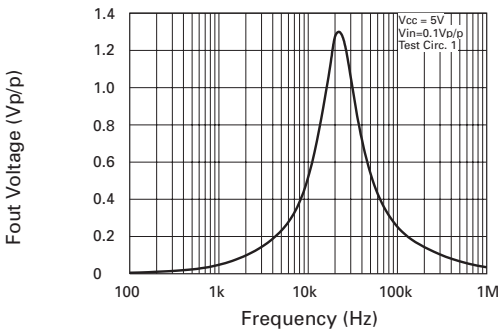


Note 1: V2 Characteristics
Type:- AC source
Frequency:- 22kHz
Voltage:- 300mVp/p Enabled
100mVp/p Disabled

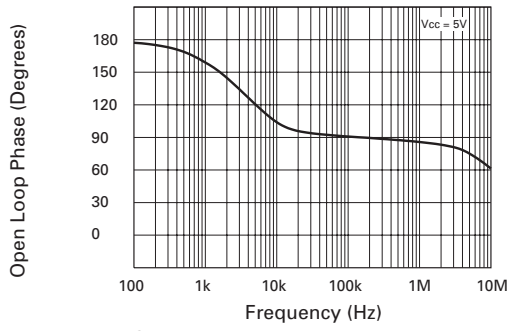
TYPICAL CHARACTERISTICS



Open Loop Gain v Frequency



Filter Response

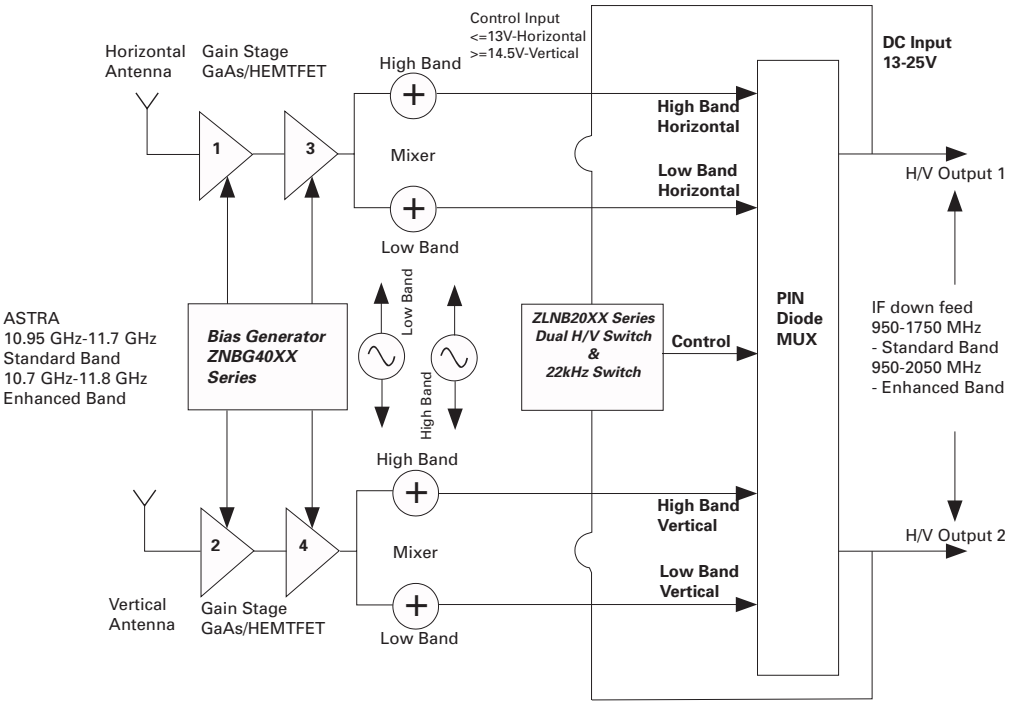


Open Loop Phase v Frequency

ZLNB2006
ZLNB2009 ZLNB2010

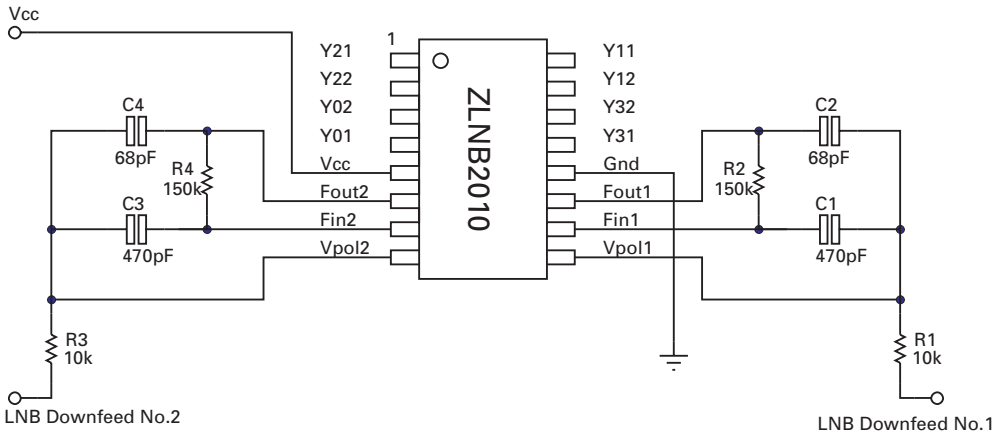
The following diagram shows a typical block diagram for a twin universal LNB design. The ZLNB2006/09/10 group of devices provides the two polarity and two tone switches required to decode the two independent receiver feeds. The ZLNB2009/10 devices are also able to detect the absence of receiver connection 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 ZNBG4000 or ZNBG6000 offering a very efficient and cost effective solution

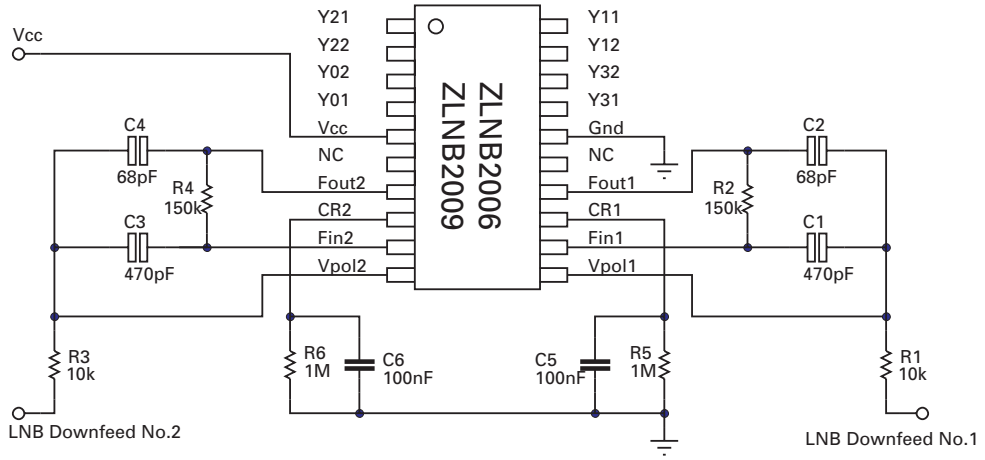


APPLICATION CIRCUIT EXAMPLES

The following circuit shows the additional components that will be used for polarisation mode and 22kHz tone detection in typical ZLNB2010 application



The following circuit shows the additional components that will be used for polarisation mode and 22kHz tone detection in typical ZLNB2006/9 application



FURTHER INFORMATION

1) Inputs V_{POL1} and V_{POL2} are designed to be wired to the power inputs of an LNB via high value (10k) resistors. Input V_{POL1} controls a combination of the Yn1 outputs. Input V_{POL2} controls a combination of the Yn2 outputs. With either input voltage set at or below 14V, one of the corresponding Y0n or Y2n outputs becomes active dependent upon the presence of a tone. With either input voltage set at or above 15.5V, one of the corresponding Y1n or Y3n outputs becomes active dependent upon the presenence of a tone. Should the voltage applied to either V_{POL} input fall below 9.5V, all outputs on the corresponding output will go high, otherwise these outputs are as normal. Any input or output not required may be left open-circuit.

2) The ZLNB2010 includes the circuitry necessary to detect the presence of 22kHz tones modulated on either of two supply inputs to the LNB. The main elements of the detectors in each channel are an op-amp enabling the construction of a Sallen Key filter, a rectifier/smoother and a comparator. Full user control is given over the centre frequency and bandwidth of the filter using two external resistors and capacitors (one of these resistors shares the function of overvoltage protection of the corresponding V_{POL} pin, i.e. the 10k referenced in note 1). The comparator circuit utilises no external components. The presence of a 22kHz tone applied to pin Fin1 or Fin2 switches the corresponding output Yn1 or Yn2 high.

3) The ZLNB2006/9 includes the circuitry necessary to detect the presence of 22kHz tones modulated on either of two supply inputs to the LNB. The main elements of the detectors in each channel are an op-amp enabling the construction of a Sallen Key filter, a rectifier/smoother and a comparator. Full user control is given over the centre frequency and bandwidth of the filter using two external resistors and capacitors (one of these resistors shares the function of overvoltage protection of the corresponding Vpol pin, i.e. the 10k referenced in note 1). The comparator circuit utilises no external components. The presence of a 22kHz tone applied to pin Fin1 or Fin2 switches the corresponding output Yn1 or Yn2 high. Pins Crec1 and Crec2 on the ZLNB2006/9 make accessible the outputs of the tone switch rectifiers and provides a means of controlling tone switch delays. Significant switching delays may be necessary to avoid incorrect operation in the presence of unwanted interference (e.g. switching tones intended for other signalling systems). For correct operation of the IC, a capacitor and a parallel connected resistor should be connected between each Crec pin and ground. The Yout low to high delays are set solely by the added capacitors at approximately 22ms/uF. The high to low delays are set by the time constant of each resistor capacitor combination at approximately 0.2CR seconds. A capacitor of 100nF and resistor of 1MΩ will give a low to high delay of around 2.2ms and a high to low delay of 20ms, providing immunity to the 60Hz square wave signal occasionally used for switching between multiple LNB units.

CONTROL TABLES

ZLNB2006

Channel 1:-

Tone 1	Vpol1	Y01	Y11	Y21	Y31
Off	⩽14V	Low	High	High	High
Off	⩾15.5V	High	Low	High	High
On	⩽14	High	High	Low	High
On	⩾15.5	High	High	High	Low

Channel 2:-

Tone 2	Vpol2	Y02	Y12	Y22	Y32
Off	⩽14V	Low	High	High	High
Off	⩾15.5V	High	Low	High	High
On	⩽14	High	High	Low	High
On	⩾15.5	High	High	High	Low

ZLNB2009/10

Channel 1:-

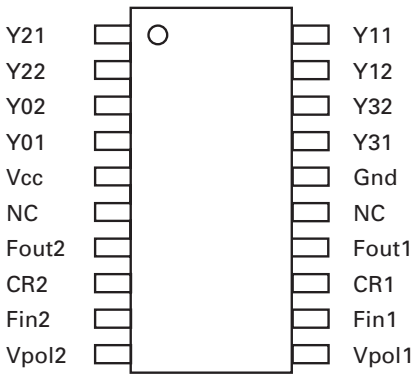
Tone 1	Vpol1	Y01	Y11	Y21	Y31
Off	⩽14V	Low	High	High	High
Off	⩾15.5V	High	Low	High	High
On	⩽14	High	High	Low	High
On	⩾15.5	High	High	High	Low
Don't Care	⩽8V	High	High	High	High

Channel 2:-

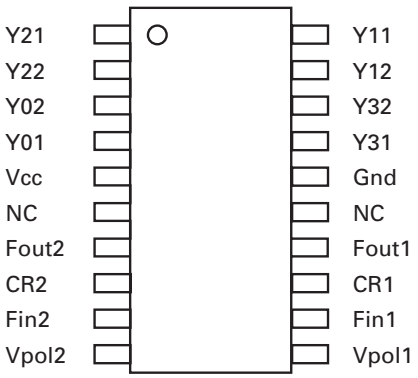
Tone 2	Vpol2	Y02	Y12	Y22	Y32
Off	⩽14V	Low	High	High	High
Off	⩾15.5V	High	Low	High	High
On	⩽14	High	High	Low	High
On	⩾15.5	High	High	High	Low
Don't Care	⩽8V	High	High	High	High

ZLNB2006
ZLNB2009 ZLNB2010

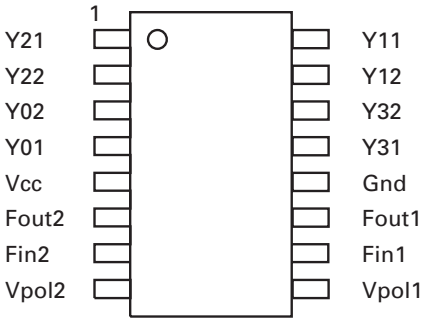
ZLNB2006 PINOUT FOR QSOP20 PACKAGE DESIGNATOR - Q20



ZLNB2009 PINOUT FOR QSOP20 PACKAGE DESIGNATOR - Q20



ZLNB2010 PINOUT FOR QSOP16 PACKAGE DESIGNATOR - Q16



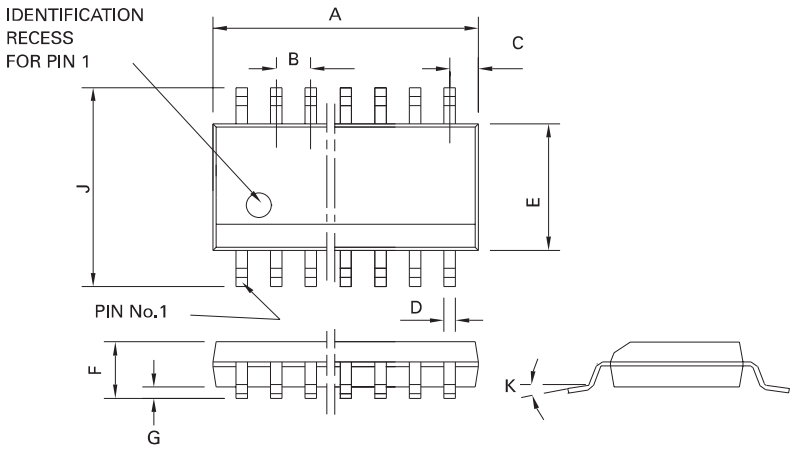
ORDERING INFORMATION

Part Number	Package	Part Mark
ZLNB2006Q20	QSOP20	ZLNB2006
ZLNB2009Q20	QSOP20	ZLNB2009
ZLNB2010Q16	QSOP16	ZLNB2010

SAMPLE ORDERING INFORMATION

Part Number	Package	Part Mark
#ZLNB2006Q20	QSOP20	ZLNB2006
#ZLNB2009Q20	QSOP20	ZLNB2009
#ZLNB2010Q16	QSOP16	ZLNB2010

PACKAGE DIMENSIONS



QSOP16

DIM	Millimetres		Inches	
	MIN	MAX	MIN	MAX
A	4.80	4.98	0.189	0.196
B	0.635		0.025 NOM	
C	0.23 REF		0.009 REF	
D	0.20	0.30	0.008	0.012
E	3.81	3.99	0.15	0.157
F	1.35	1.75	0.053	0.069
G	0.10	0.25	0.004	0.01

QSOP20

DIM	Millimetres		Inches	
	MIN	MAX	MIN	MAX
A	8.55	8.74	0.337	0.344
B	0.635		0.025 NOM	
C	1.47 REF		0.058 REF	
D	0.20	0.30	0.008	0.012
E	3.81	3.99	0.15	0.157
F	1.35	1.75	0.053	0.069
G	0.10	0.25	0.004	0.01

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