

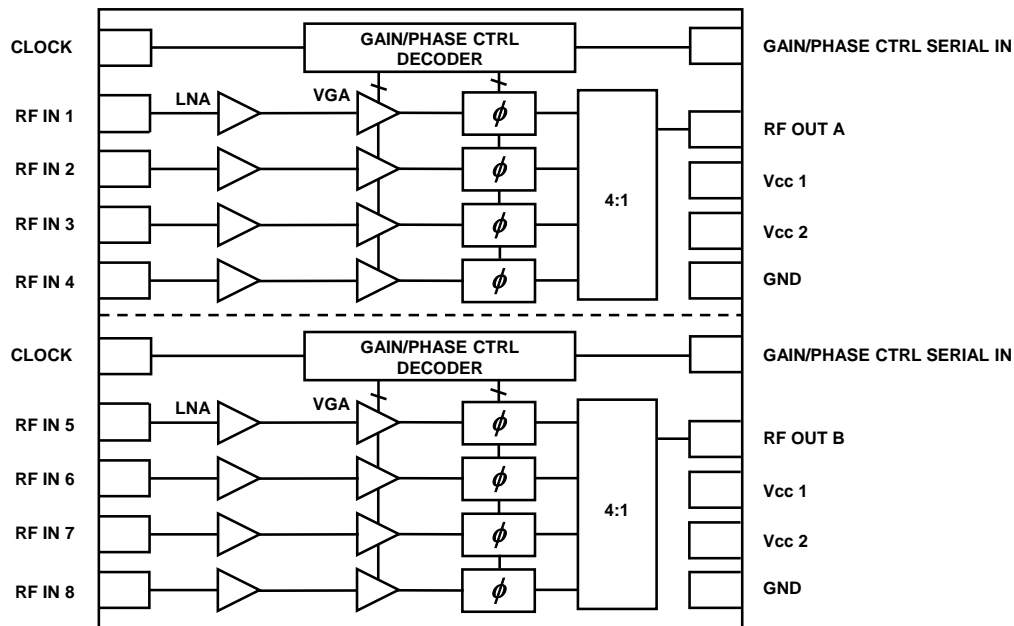
# Linear Signal, Inc.

## Eight Input L/S/C/X Band Receive Beamformer Preliminary Design Specifications

### Functional Overview

Eight input, dual output integrated 800 MHz to 12 GHz band receive beamformer combines two groups of four RF input signals with individual digitally controlled amplitudes and phases to produce two RF steered beam outputs. The beamformer provides the core of a low cost, broadband multichannel receive module for an eight element phased array or array subtile. Low noise amplifiers for each channel compensate for phase shifter loss and minimize the gain requirement for first stage off-chip LNAs. For applications with less stringent front end noise figure requirement, direct antenna element feeding is possible. Precision variable gain amplifiers (VGAs) allow array illumination shading and beam pattern sidelobe reduction.

### Functional Diagram



### DC Specifications

Supply Voltages	TBD
Power Consumption	100 mW

### RF Specifications

RF Input/Output Frequency	0.8 to 12 GHz
RF Input/Output Impedance	50 $\Omega$
Gain (One RF IN to RF OUT) At Maximum VGA Setting	20 dB

VGA Gain Range	20 dB
Number of Gain States	16 (4 bit control)
Gain Settling Time	10 ns
Gain Stability Over Temperature	0.01 dB/°C
Gain Flatness Over Any 100 MHz Bandwidth	0.2 dB
Gain Stability Over Phase States	±1 dB
Phase Range	360°
Number of Phase States	16 (4 bit control)
Phase Settling Time	10 ns
Phase Stability Over Temperature	0.02 °/ °C
VGA Phase Stability	0.1°/dB
Maximum Phase Length Difference Over All Eight RF Signal Paths	1°
Group Delay Flatness Over Any 100 MHz bandwidth	50 ps
RF Input VSWR	1.5:1
RF Output VSWR	1.5:1
Noise Figure	1.5 dB
Maximum RF Signal Crosstalk	20 dB
Intermodulation Distortion	-60 dBc
Output Power for 1 dB Compression (OP1dB)	8 dBm
Output Third Order Intercept (OIP3)	18 dBm

### Digital Control Inputs

Address High	3.3 V
Address Low	0 V
Gain/Phase Control High	3.3 V
Gain/Phase Control Low	0 V
Control Line Bandwidth	400 MHz

### Thermal Specifications

Continuously operable without heat sinking over ambient temperature range -40°C to 85 °C.

Die size 4.8 mm x 2.4 mm

Package: 15 x 15 BGA

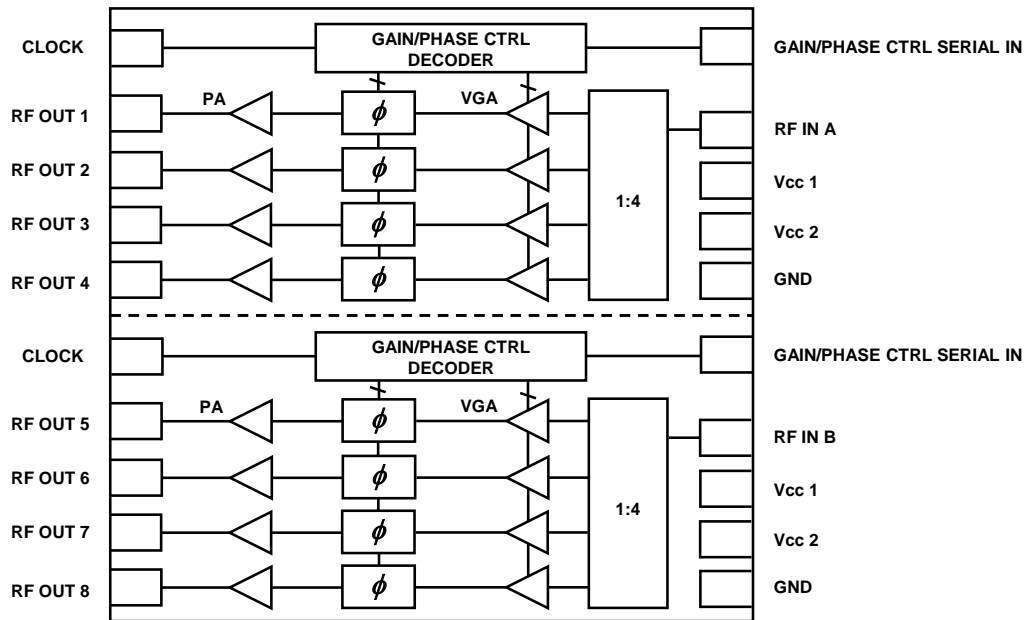
# Linear Signal, Inc.

## Eight Element L/S/C/X Band Transmit Beamformer Preliminary Design Specifications

### Functional Overview

Eight output, dual input integrated 800 MHz to 12 GHz transmit beamformer drives eight RF output ports with individual digitally controlled amplitudes and phases. The beamformer provides the core of a low cost, broadband multi-element transmit module for an eight element single polarization or four element dual polarization array antenna tile. Power amplifiers for each channel compensate for phase shifter loss and allow array elements to be driven directly by the RF outputs. Precision variable gain amplifiers (VGAs) allow array illumination shading and beam pattern sidelobe reduction.

### Functional Block Diagram



### DC Specifications

Supply Voltages	TBD
DC Supply Power At Maximum RF Output Power	800 mW
Power Added Efficiency (PA Only)	50%

### RF Specifications

RF Input/Output Frequency	0.8 to 12 GHz
RF Input/Output Impedance	50 $\Omega$
Gain (RF IN to One RF OUT) At Maximum VGA Setting	23 dB

VGA Gain Range	20 dB
Number of Gain States	16 (4 bit control)
Gain Settling Time	10 ns
Gain Stability Over Temperature	0.01 dB/°C
Gain Flatness Over Any 100 MHz Bandwidth	0.2 dB
Gain Stability Over Phase States	±1 dB
Phase Range	360°
Number of Phase States	16 (4 bit control)
Phase Settling Time	10 ns
Phase Stability Over Temperature	0.04°/ °C
VGA Phase Stability	0.1°/dB
Maximum Phase Length Difference Over All Eight RF Signal Paths	2°
Group Delay Flatness Over Any 100 MHz bandwidth	50 ps
RF Input VSWR	1.5:1
RF Output VSWR	1.5:1
Maximum RF Signal Crosstalk	20 dB
Intermodulation Distortion	-60 dBc
Output Power for 1 dB Compression (OP1dB)	15 dBm
Output Third Order Intercept (OIP3)	25 dBm

### Digital Control Inputs

Address High	3.3 V
Address Low	0 V
Gain/Phase Control High	3.3 V
Gain/Phase Control Low	0 V
Control Line Bandwidth	400 MHz

### Thermal Specifications

Continuously operable without heat sinking over ambient temperature range -40°C to 85 °C.

Die size: 4.8 mm x 2.4 mm

Package: 15 x 15 BGA