

RF Product — Phase Comparators



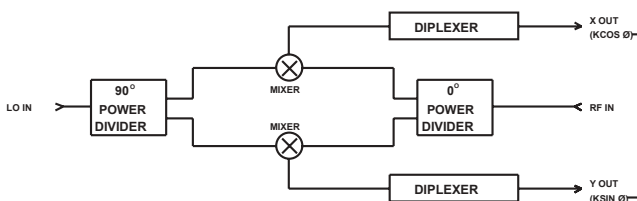
- 0.2 - 1000 MHz Frequency Range
- Up to 33% Bandwidth
- Wide Dynamic Range
- High Phase Stability
- High Accuracy
- PC Mount and Connectorized

Lorch Microwave began manufacturing custom RF and Microwave signal processing components more than 30 years ago. Today, they comprise a portion of a broad product line which includes RF and Microwave filters and Integrated Assemblies.

Phase Accuracy

Center Frequency (MHz)	Phase Error (°)		Zero Crossing @ F_0 (°)
	@ F_0	@ $F_0 \pm 5\%$	
0.2-10	+/- 1.0	+/- 3.0	+/- 1.0
10-100	+/- 1.5	+/- 3.5	+/- 1.0
100-200	+/- 1.7	+/- 4.0	+/- 1.5
200-300	+/- 2.0	+/- 4.5	+/- 1.5
300-400	+/- 2.5	+/- 5.0	+/- 1.7
400-500	+/- 2.5	+/- 5.0	+/- 2.0

Schematic, Phase Comparator



LO/RF Characteristics

	LO/RF Frequency, F_0	Bandwidth	LO Input Level	RF Input Level	Nominal Impedance	VSWR
Low-Level Comparators	0.2-500 MHz	$F_0 \pm 5\%$	+13 +/- 2 dBm	+3 dBm max.	50 Ohms	1.4:1 typ. (1.6:1 max.)
High-Level Comparators	0.2-500 MHz	$F_0 \pm 5\%$	+20 +/- 2 dBm	+10 dBm max.	50 Ohms	1.4:1 typ. (1.6:1 max.)

X/Y Video Output Characteristics

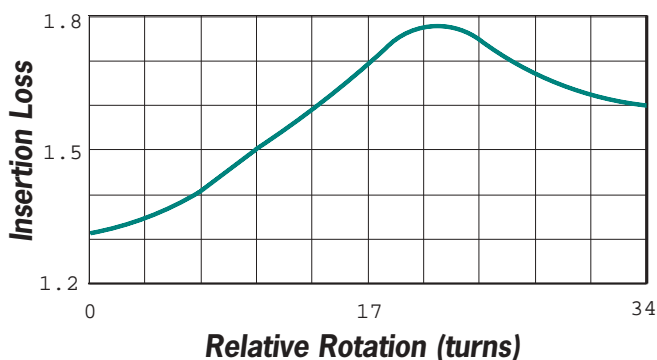
	"X" Output	"Y" Output	Bandwidth	Nominal Impedance	X/Y Amplitude Balance	Conversion Loss	DC Offset Voltage
Low-Level Comparators	k Cos \emptyset	k Sin \emptyset	DC-10% RF	50 Ohms	+/- 5 mV max.	11 dB max.	+/- 2 mV typ.
High-Level Comparators	k Cos \emptyset	k Sin \emptyset	DC-10% RF	50 Ohms	+/- 5 mV max.	11 dB max.	+/- 5 mV typ.
Low-Level Comparators	Peak Amplitude: 85 mV min. into 50 Ohms, for 0 dBm input at Port RF						
High-Level Comparators	Peak Amplitude: 190 mV min. into 50 Ohms, for +7 dBm input at Port RF						

Lorch Microwave's CP-13 Series, Low-Level Phase Comparators, are designed to accept RF input signal levels of up to +3 dBm. The CP-20 Series, High-Level Phase Comparators, are designed to accept RF input signal levels of up to +10 dBm.

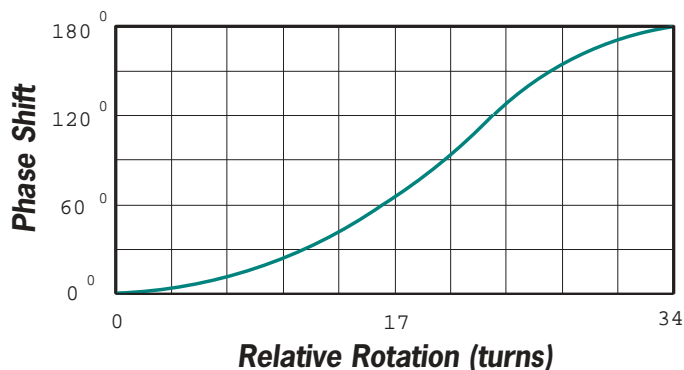


- 10 - 1000 MHz Frequency Range
- 10% Standard Bandwidth
- 0-90°, 0-180° and 0-360° Phase Shift Ranges
- Multi-Turn, Infinite Resolution
- Low Loss, High Phase Stability
- PC Mount and Connectorized

Typical Insertion Loss vs. Relative Rotation



Typical Phase Shift vs. Relative Rotation



Typical Performance Specifications

Frequency (MHz)	Usable Bandwidth (%)	Phase Shift @ F_0 (°)	Insertion Loss (dB)	VSWR
10-250	10	0-90	1.3	1.6:1
10-250	10	0-180	1.7	1.6:1
250-500	10	0-90	1.4	1.6:1
250-500	10	0-180	1.8	1.8:1

Notes:

- 1) Nominal impedance is 50 Ohms.
- 2) All units rated at 0.5 Watts average, 2 Watts peak.

RF Product — Digital Phase Shifters



- 1 - 1000 MHz Frequency Range
- Up to a Full Octave Bandwidth
- 0-360° Phase Shift
- Integral TTL Driver
- 1-8 Bit Control
- Accuracy to 1/2 Least Significant Bit
- Time Shifter or Frequency Independence

Characteristics

Parameter	Type 1	Type 2
Phase Shift	Independence of Frequency	Proportional to Frequency
Group Delay	Constant with Frequency	Proportional to Phase Shift

Typical Performance Specifications

Part Number	Type	# Bits	Center Frequency (MHz)	Bandwidth (MHz)	VSWR Typ.	Insertion Loss (dB) Typ.	Phase Error / Bit (°) Typ.
DP-1-6-70-10-75	1	6	70	10	1.6:1	8	+/- 1.5
DP-1-6-305-30-75	1	6	305	30	1.6:1	8	+/- 2
DP-1-8-80-8-77	1	8	80	8	1.6:1	9	+/- 2
DP-1-8-370-5-77	1	8	370	5	1.6:1	9	+/- 2
DP-2-4-295-10-73	2	4	295	10	1.6:1	5.5	+/- 1.5
DP-2-6-255-30-75	2	6	255	30	1.6:1	7	+/- 1.5
DP-2-8-350-3-77	2	8	350	3	1.8:1	9	+/- 2
DP-2-8-860-80-77	2	8	860	80	2.0:1	9.5	+/- 3.5

Notes:

- 1) DC power supply requirements: +5VDC @ 20 mA, -5VDC @ 20 mA;
RF input power: +16 dBm max.;
Switching time: 100 ns max.
- 2) Please specify bit sequence, if other than standards

RF Product — Voltage Controlled Phase Shifters



- 1 - 4000 MHz Frequency Range
- 10%, 20% and 30% Bandwidths
- 0-90°, 0-180° and 0-360° Phase Shift Range
- Low Insertion Loss
- High Phase Stability
- Surface Mount, PC-Mount, Flatpack and Connectorized

Typical Performance Specifications

Center Frequency (MHz)	% Bandwidth	Phase Shift (°)	Insertion Loss (dB)	VSWR	Max. Input Power (dBm)	Control Voltage (VDC)
0.5-50	10	0-90	1.0	1.4:1	0	0-15
0.5-50	10	0-180	1.5	1.5:1	0	0-15
0.5-50	10	0-360	3.0	1.6:1	0	0-15
0.5-50	20-30	0-90	1.2	1.5:1	0	0-15
0.5-50	20-30	0-180	1.6	1.6:1	0	0-15
0.5-50	20-30	0-360	3.2	1.7:1	0	0-15
50-500	10	0-90	1.0	1.4:1	+5	0-15
50-500	10	0-180	1.5	1.5:1	+5	0-15
50-500	10	0-360	3.0	1.6:1	+5	0-15
50-500	20-30	0-90	1.2	1.5:1	+5	0-15
50-500	20-30	0-180	1.6	1.6:1	+5	0-15
50-500	20-30	0-360	3.2	1.7:1	+5	0-15
500-2000	10	0-90	1.5	1.6:1	+10	0-10
500-2000	10	0-180	2.0	1.8:1	+10	0-10
500-2000	10	0-360	4.0	1.8:1	+10	0-10
500-2000	20-30	0-90	1.7	1.6:1	+10	0-10
500-2000	20-30	0-180	2.2	1.8:1	+10	0-10
500-2000	20-30	0-360	4.0	2.0:1	+10	0-10
2000-3000	10	0-90	1.8	1.7:1	+10	0-10
2000-3000	10	0-180	2.3	1.8:1	+10	0-10
2000-3000	10	0-360	4.5	2.0:1	+10	0-10
2000-3000	20-30	0-90	2.0	1.8:1	+10	0-10
2000-3000	20-30	0-180	2.6	1.8:1	+10	0-10
2000-3000	20-30	0-360	5.0	2.0:1	+10	0-10

RF Products — Voltage Controlled Attenuators

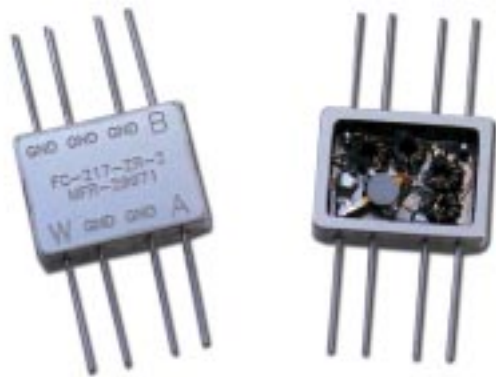


- 1 - 3000 MHz Frequency Range
- Single Control Voltage
- Low Signal Distortion
- Low Insertion Loss
- Wide Attenuation Range
- Surface Mount, PC-Mount, Connectorized

Typical Performance Specifications

Center Frequency (MHz)	% Bandwidth	Attenuation Range (dB)	Insertion Loss (dB) @ Vc = OVDC	VSWR @ Vc = OVDC	Max. Input Power (dBm)	Control Voltage, VC @ 10 mA max. (VDC)
0.5-500	10	0-20	0.6	1.4:1	+15	0-5
0.5-500	10	0-40	1.2	1.4:1	+15	0-5
0.5-500	20-30	0-20	0.8	1.4:1	+15	0-5
0.5-500	20-30	0-40	1.6	1.4:1	+15	0-5
500-1000	10	0-18	0.8	1.5:1	+20	0-5
500-1000	10	0-35	1.6	1.5:1	+20	0-5
500-1000	20-30	0-18	0.9	1.6:1	+20	0-5
500-1000	20-30	0-35	1.8	1.6:1	+20	0-5
1000-2000	10	0-18	1.2	1.6:1	+20	0-5
1000-2000	10	0-35	2.4	1.6:1	+20	0-5
1000-2000	20-30	0-18	1.5	1.8:1	+20	0-5
1000-2000	20-30	0-35	3.0	1.8:1	+20	0-5
2000-3000	10	0-15	1.5	1.8:1	+20	0-5
2000-3000	10	0-30	3.0	2.0:1	+20	0-5
2000-3000	20-30	0-15	1.7	2.0:1	+20	0-5
2000-3000	20-30	0-30	3.5	2.0:1	+20	0-5

RF Product — Broad Band Mixers



- 50 kHz - 4000 MHz Frequency Range
- Wide Range and Optimized Bands
- High Dynamic Range
- Low Insertion Loss
- High Isolation
- PC Mount, Flatpack and Connectorized

Typical Performance Specifications

Part Number	LO Power	Frequency Range MHz		Performance Bandwidth, MHz Ports LO & RF	Conversion Loss dB (max.)	Isolation		1-dB Input Comp. Level (typ.)	3rd Order Intercept Point (typ.)
		Ports LO & RF	Port IF			LO - RF dB (min.)	LO - IF dB (min.)		
FC-7-0.05-100	+7 dBm	0.05-100	DC-100	0.05-0.1	7.5	50	50	0 dBm	+13 dBm
				0.1-10	6.0	50	50		
				10-60	6.0	35	30		
				60-100	7.5	35	30		
FC-7-0.2-600	+7 dBm	0.2-600	DC-600	0.2-0.4	8.0	50	50	0 dBm	+13 dBm
				0.4-40	6.0	50	45		
				40-150	6.0	50	35		
				150-600	8.0	40	30		
FC-7-2-1200	+7 dBm	2-1200	DC-1200	2-500	8.0	35	30	0 dBm	+13 dBm
				500-1000	8.0	30	30		
				1000-1200	8.5	25	25		
FC-10-10-2000	+10 dBm	10-2000	10-2000	10-50	7.5	40	30	+3 dBm	+15 dBm
				50-500	7.5	35	25		
				500-1000	8.0	30	20		
				1000-2000	9.0	25	20		
FC-10-10-3000	+10 dBm	10-3000	10-2000	10-500	8.0	25	20	+3 dBm	+15 dBm
				500-1000	9.0	30	25		
				1000-3000	10.0	25	18		
FC-20-0.05-100	+20 dBm	0.05-100	DC-100	0.05-10	6.5	45	40	+13 dBm	+27 dBm
				10-60	6.5	35	25		
				60-100	7.5	35	25		
FC-20-0.2-500	+20 dBm	0.2-500	DC-500	0.2-25	7.0	50	40	+13 dBm	+27 dBm
				25-50	7.0	45	35		
				50-150	7.0	30	25		
				150-500	8.0	30	25		

Notes:

- 1) Nominal impedance is 50 Ohms.
- 2) DC polarity is negative.