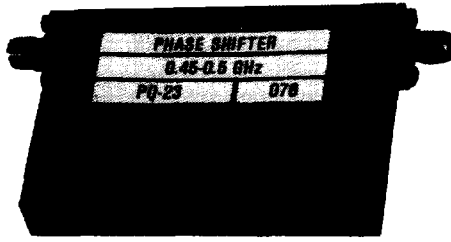


ANALOG DIODE PHASE SHIFTERS, CONTINUOUSLY VARIABLE STANDARD SIZE PQ SERIES



GENERAL INFORMATION: An analog phase shifter continuously changes the phase of a microwave signal by varying a D.C. voltage. Since the D.C. voltage applied to the diode is a reverse bias, the current drain is negligible (typically less than 10 microamperes). A balanced stripline configuration keeps the VSWR and amplitude ripple to a minimum for all values of phase.

FREQUENCY COVERAGE: 0.1 to 18.0 GHz.

RF IMPEDANCE: 50 OHMS.

D.C. VOLTAGE: 0 volts to +28 volts (standard), or 0 volts to -28 volts (optional) will vary the phase of any of the models over the minimum phase shift listed.

RF POWER: 10 mW peak or CW, operating. Destruct level is 1 W, CW, 100 W peak. Phase shifters can be built for operational levels to 1 watt CW or peak on request.

TEMPERATURE INFORMATION: The units can be used over a -55°C to +85°C temperature range. However, the phase will change either $\pm 5^\circ$ or $\pm 5\%$, whichever is greater. If temperature compensation is required, this can be done on request. With compensation, the variation can be held to $\pm 1^\circ$ or $\pm 1\%$, whichever is greater, from -55°C to +85°C. Compensation increases the cost by 10%. The size remains the same. If compensation is desired, add a suffix T to the model number (e.g., PQ-17T).

SWITCHING SPEED: Series PQ phase shifters can be driven from any phase value to any other value in 10 nanoseconds. With linearizers, the response time is 50 nanoseconds. With temperature compensation the response time is 100 nanoseconds.

ENVIRONMENT: MIL-E-5400, MIL-STD-202, MIL-E-16400, MIL-STD-883 (Special request only).

CONNECTORS: SMA standard, others on request.

NOTES:

1. **LINEARIZATION:** For phase shifters with linearizers add a suffix L to the model number (e.g., PQ-23L). Linearity is $\pm 2.0^\circ$ for phase shifters of 150° or less, and $\pm 4^\circ$ for phase shifters between 150° and 360° . With linearization, DC voltages of $\pm 15V$ at $\pm 30mA$ are required. The control voltage is 0-10 volts. A control voltage of 0-5 volts can be supplied at no additional cost, by adding a suffix 5 to the model number (e.g., PQ-23L5). Linearity is measured at f_c .

2. **PHASE FLATNESS:** The phase shift varies with frequency at any voltage setting. This variation, referenced to 0° at 0 volts for each frequency, is approximately $\pm 15\%$ for octave models, $\pm 10\%$ for models with 25% bandwidth, and $\pm 7.5\%$ for models with a 10% bandwidth.

3. Any value of phase shift or frequency range not shown can be quoted on request.

4. A connector, (SMA Female) is available in place of the bias pin at no extra charge. This will be placed at the center of the surface marked F on the drawing. This is the $0.38 \times A$ surface. If a (SMA Female) is desired, add suffix C to the model number (e.g., PQ-23C).

5. If a narrow frequency bandwidth is required, KDI/Triangle can supply a unit that is electrically optimized for that bandwidth.

6. Monotonicity guaranteed for all models.

MECHANICAL OUTLINES

Out-line	A Inches cm	B Inches cm	C Inches cm	D Inches cm	E Inches cm	F Inches cm
1	2.75 6.99	2.25 5.72	1.38 3.51	2.050 5.207	2.250 5.715	0.53 1.33
2	2.50 6.35	1.75 4.45	1.25 3.18	1.550 3.937	2.000 5.080	0.20 0.51
3	1.25 3.18	2.00 5.08	0.63 1.60	1.800 4.572	0.750 1.905	0.25 0.64
4	5.00 12.70	2.00 5.08	N/A 4 holes	1.800 4.572	1.800 11.430	4.500 0.64
5	7.75 19.69	2.50 6.35	N/A 4 holes	2.300 5.842	7.250 18.415	0.25 0.64
6	6.50 16.50	2.00 5.08	N/A 4 holes	1.800 4.572	6.000 15.240	0.25 0.64
7	2.50 6.35	2.00 5.08	1.25 3.18	1.800 4.572	2.000 5.080	0.25 0.64
8	2.00 5.08	2.00 5.08	1.00 2.54	1.800 4.572	1.800 3.810	1.500 0.64
9	3.00 7.62	2.00 5.08	1.50 3.81	1.800 4.572	2.500 6.350	0.25 0.64
10	6.50 16.51	2.50 6.35	N/A 4 holes	2.300 5.842	6.000 15.240	0.25 0.64
11	5.00 12.70	2.00 5.08	N/A 4 holes	1.800 4.572	4.500 11.430	0.50 1.27
12	7.75 19.69	2.50 6.35	N/A 4 holes	2.300 5.842	7.250 18.415	0.75 1.91

INCHES / CENTIMETERS
XX $\pm .03$ XXX $\pm .010$ / XX $\pm .08$ XXX $\pm .025$

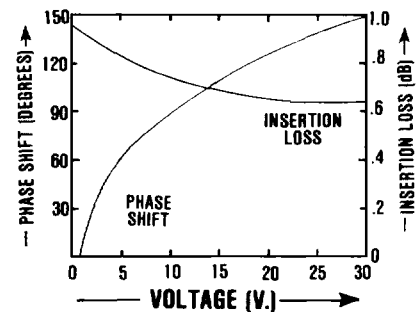


Fig. 1 TYPICAL PHASE & INSERTION LOSS VS. VOLTAGE CURVES FOR PQ-31

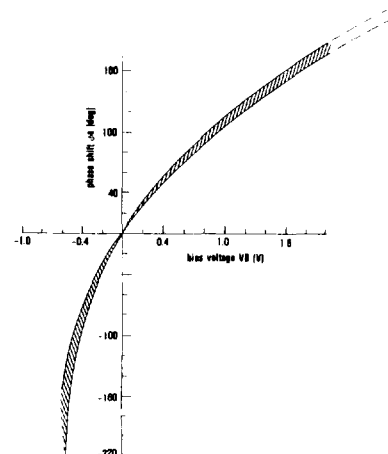
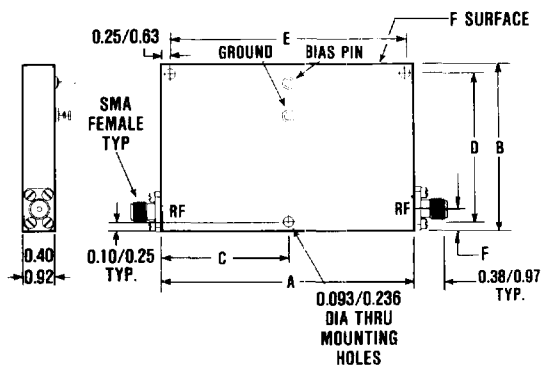


Fig. 2 Phase shifter characteristic of PQ-45 or MQ-45 with negative voltage.

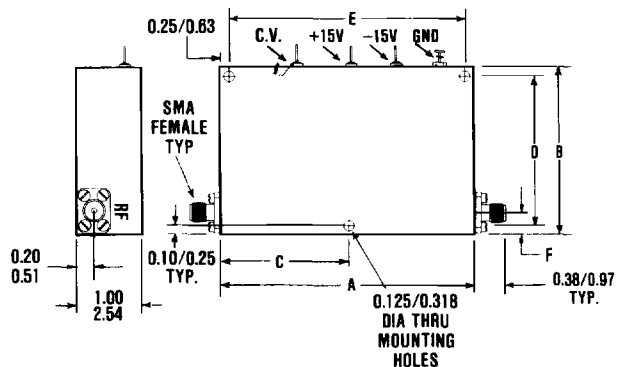
ANALOG DIODE PHASE SHIFTERS, CONTINUOUSLY VARIABLE STANDARD SIZE PQ SERIES

ELECTRICAL PERFORMANCE

Model No.	Frequency Range GHz	Phase Shift Note 2 Min. Degrees	Insertion Loss Max. dB	Amplitude Ripple Max. \pm dB	VSWR Max.	Outline	
						No Linearizer	With Linearizer
PQ-12	0.1-0.2	50	0.6	0.15	1.35	1	1
PQ-14	0.2-0.4	50	0.6	0.15	1.35	1	1
PQ-16	0.25-0.5	50	0.6	0.15	1.35	2	7
PQ-17	0.25-0.5	360	4.5	1.25	1.70	12	12
PQ-22	0.45-0.5	60	0.6	0.10	1.30	2	7
PQ-23	0.45-0.5	120	1.0	0.20	1.50	1	1
PQ-26	0.5-1.0	60	0.7	0.15	1.35	2	7
PQ-27	0.5-1.0	180	3.0	0.4	1.50	4	4
PQ-28	0.5-1.0	360	4.5	1.25	1.75	5	5
PQ-29	0.7-0.9	60	0.6	0.10	1.35	2	7
PQ-31	0.95-1.25	120	1.2	0.15	1.40	1	1
PQ-33	1.0-2.0	60	0.8	0.15	1.50	3	8
PQ-34	1.0-2.0	360	4.5	1.5	1.80	10	5
PQ-36	1.20-1.40	60	0.7	0.10	1.35	3	8
PQ-39	1.7-2.4	15	0.7	0.05	1.40	3	8
PQ-42	1.9-2.1	60	0.7	0.10	1.40	3	8
PQ-44	2.0-4.0	180	3.0	0.50	1.60	4	4
PQ-45	2.0-4.0	360	5.0	1.5	1.90	6	6
PQ-47	2.2-2.3	60	0.7	0.10	1.35	3	8
PQ-49	2.2-2.3	180	2.0	0.30	1.50	4	4
PQ-52	2.9-3.1	180	2.0	0.30	1.50	4	4
PQ-54	3.3-3.7	60	0.8	0.15	1.50	3	8
PQ-59	4.0-8.0	40	1.2	0.25	1.60	3	8
PQ-60	4.0-8.0	360	8.0	1.5	1.90	11	11
PQ-63	4.4-5.0	15	0.9	0.05	1.40	3	8
PQ-64	4.4-5.0	60	1.0	0.15	1.50	3	8
PQ-65	6.0-18.0	180	12.0	2.0	2.5	9	9
PQ-66	7.0-12.4	360	12.0	2.0	2.20	11	11
PQ-68	7.7-8.4	60	1.5	0.20	1.60	3	8
PQ-72	8.0-12.4	60	2.0	0.50	1.75	3	8
PQ-73	8.0-10.0	180	5.0	1.0	1.75	9	9
PQ-74	8.0-18.0	360	17.0	3.5	2.50	11	11
PQ-75	9.0-9.6	90	3.50	0.5	1.60	1	1
PC-82	12.0-15.0	50	3.0	0.7	1.65	3	8
PC-91	13.0-13.5	20	2.0	0.20	1.50	3	8
PC-94	16.0-17.0	50	2.0	0.20	1.65	3	8



OUTLINE
WITHOUT
LINEARIZER



OUTLINE
WITH
LINEARIZER