

DIGITALLY CONTROLLED

ANALOG PHASE SHIFTERS 8, 10, or 12 BITS

SERIES QQ

GENERAL INFORMATION: KDI/Triangle Microwave's digitally controlled phase shifters vary the phase of a microwave signal in response to a TTL compatible logic input signal. The unit consists of an analog phase shifter, Series PQ, plus a digital to analog converter. See Fig. 1.

A balanced stripline configuration keeps the VSWR and amplitude change to a minimum for all values of phase.

Standard units operate with eight logic input lines allowing 256 discrete values of phase. If 10 bits are required add -10 to Model No. (e.g., QQ-12-10). If 12 bits are required add -12 to Model No. (e.g., QQ-12-12).

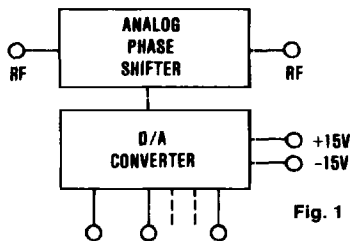


Fig. 1

FREQUENCY COVERAGE: 0.1 to 18.0 GHz

RF IMPEDANCE: 50 OHMS.

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.

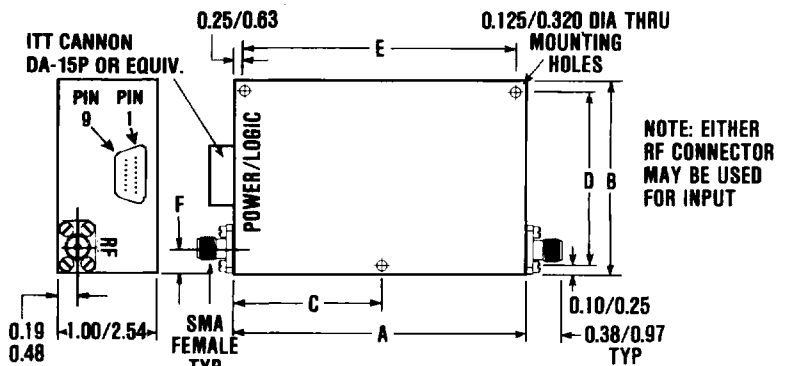
TEMPERATURE INFORMATION: The units can be used over a -55°C to +85°C temperature range. However, the phase will change either ±5° or ±5%, whichever is greater. If temperature compensation is required, this can be done on request. With compensation, the variation can be held to ±1° or ±1%, whichever is 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. (QQ-17T).

CONNECTORS: SMA standard, others on request. Mating multipin connector is supplied with each unit; ITT Cannon DA-15S or equiv.

ENVIRONMENT: MIL-E-5400

NOTES:

- The voltages required are ±15 volts at 50 mA.
- Switching speed of all models is 200 nanosec. Higher speeds on request. For 12 bits speed is 2 microsec.
- Monotonicity is guaranteed for all models.
- The load for all logic inputs is one TTL load.
- Phase Flatness:** The phase shift varies with frequency at any voltage setting. This variation, referred to 0° at logic 0 for each frequency, is approximately ±15% for octave models, ±10% for models with 25% bandwidth, and ±7.5% for models with a 10% bandwidth.
- In order to determine the step size (least significant bit) of any phase shifter listed, divide the listed value of phase shift min. by 256, e.g., the least significant bit of the QQ-49 is $180 \div 256 = 0.703^\circ$
- If a narrow frequency bandwidth is required, KDI/Triangle can supply a unit that is electrically optimized for that bandwidth. Mechanical dimensions will remain the same as the standard unit, and the price will generally be lower. Specify the frequency range when ordering a narrow bandwidth model, and a special part number will be assigned.



POWER LOGIC PIN CONNECTIONS

PIN	FUNCTION
1-12	Logic Inputs
13	+15 VDC
14	-15 VDC
15	GND

*Pin 1 is the least significant bit

MECHANICAL OUTLINES

Out-line	A Inches cm	B Inches cm	C Inches cm	D Inches cm	E inches cm	F Inches cm
1	5.00	2.00	N/A	1.800	4.500	0.50
	12.70	5.08	4 holes	4.570	11.430	1.27
2	7.75	2.50	N/A	2.300	7.250	0.75
	19.69	6.35	4 holes	5.842	18.420	1.91
3	6.50	2.00	N/A	1.800	6.000	0.25
	16.50	5.08	4 holes	4.570	15.240	0.64
4	3.00	2.00	1.50	1.800	2.500	0.30
	7.62	5.08	3.81	4.570	6.350	0.76
5	7.75	2.50	N/A	2.300	7.250	0.25
	19.69	6.35	4 holes	5.840	18.420	0.64
6	5.00	2.00	N/A	1.800	4.500	0.25
	12.70	5.08	4 holes	4.570	11.430	0.64

INCHES/CENTIMETERS
XX ±.03 XXX ±.010 / XXX ±.08 XXX ±.025

ELECTRICAL PERFORMANCE

Model No.	Frequency Range GHz	Phase Shift		Amplitude Ripple Max. ±dB	VSWR Max.	Out-line
		Note 5 Min. Degrees	Insertion Loss Max. dB			
QQ-12	0.1-0.2	45	0.6	0.15	1.35	4
QQ-14	0.2-0.4	45	0.6	0.15	1.35	4
QQ-16	0.25-0.5	45	0.6	0.15	1.35	4
QQ-17	0.25-0.5	360	4.5	1.25	1.70	2
QQ-22	0.45-0.5	60	0.6	0.10	1.30	4
QQ-23	0.45-0.5	120	1.0	0.20	1.50	4
QQ-26	0.5-1.0	60	0.7	0.15	1.35	4
QQ-27	0.5-1.0	180	3.0	0.40	1.50	1
QQ-28	0.5-1.0	360	4.5	1.25	1.75	5
QQ-29	0.7-0.9	60	0.6	0.10	1.35	4
QQ-31	0.95-1.25	120	1.2	0.15	1.40	4
QQ-33	1.0-2.0	45	0.8	0.15	1.50	4
QQ-34	1.0-2.0	360	4.5	1.50	1.80	5
QQ-36	1.20-1.40	60	0.7	0.10	1.35	4
QQ-39	1.7-2.4	15	0.7	0.05	1.40	4
QQ-42	1.9-2.1	60	0.7	0.10	1.40	4
QQ-44	2.0-4.0	180	3.0	0.50	1.60	6
QQ-45	2.0-4.0	360	5.0	1.50	1.90	3
QQ-47	2.2-2.3	45	0.7	0.10	1.35	4
QQ-49	2.2-2.3	180	2.0	0.30	1.50	6
QQ-52	2.9-3.1	180	2.0	0.30	1.50	1
QQ-54	3.3-3.7	45	0.8	0.15	1.50	4
QQ-59	4.0-8.0	30	1.5	0.25	1.60	4
QQ-60	4.0-8.0	360	8.0	1.50	1.90	1
QQ-63	4.4-5.0	15	0.9	0.05	1.40	4
QQ-64	4.4-5.0	60	1.0	0.15	1.50	4
QQ-65	6.0-18.0	180	12.0	2.0	2.5	4
QQ-66	7.0-12.4	360	12.0	2.0	2.20	1
QQ-68	7.7-8.4	30	1.5	0.20	1.60	4
QQ-72	8.0-12.4	60	2.0	0.25	1.75	4
QQ-73	8.0-10.0	180	4.5	1.0	1.75	4
QQ-74	8.0-18.0	360	17.0	3.5	2.50	1
QQ-75	9.0-9.6	90	3.5	0.50	1.60	4
QQ-82	12.0-15.0	45	3.0	0.70	1.65	4
QQ-91	13.0-13.5	15	2.0	0.20	1.50	4
QQ-94	16.0-17.0	45	2.0	0.20	1.65	4