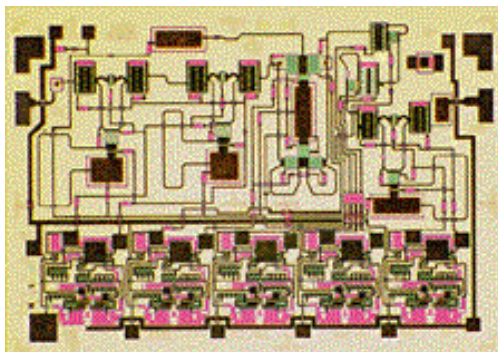


## 6 - 18 GHz Phase Shifter

## TGP6336-EEU



### Key Features and Performance

- 6 to 18 GHz Frequency Range
- 5-Bit Phase Shifter
- On-Chip CMOS-Compatible Drivers
- 9 dB Typical Insertion Loss at Midband
- 2:1 Typical Input SWR: 2.6:1 Typical Output SWR
- 3.556 x 2.540 x 0.1016 mm (0.140 x 0.100 x 0.004 in.)

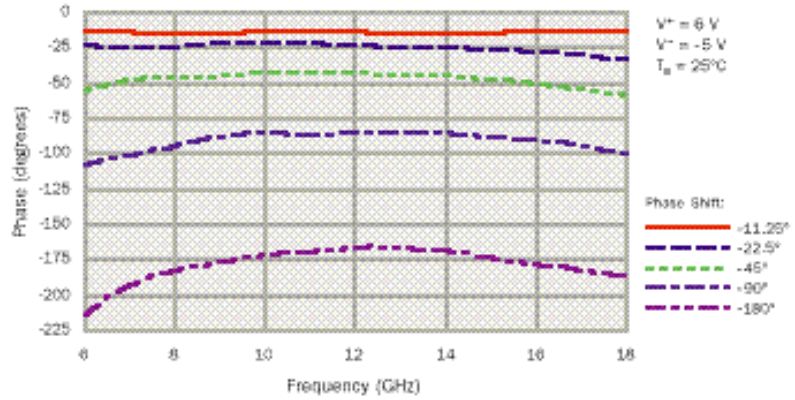
### Description

The TriQuint TGP6336-EEU is a GaAs MMIC 5-bit phase shifter which operates from 6 to 18 GHz. Phase can be shifted from 0 to 348.75 degrees in 11.25 degree steps. Control bias voltages are 0 and 5 V. The insertion loss is typically 9 dB.

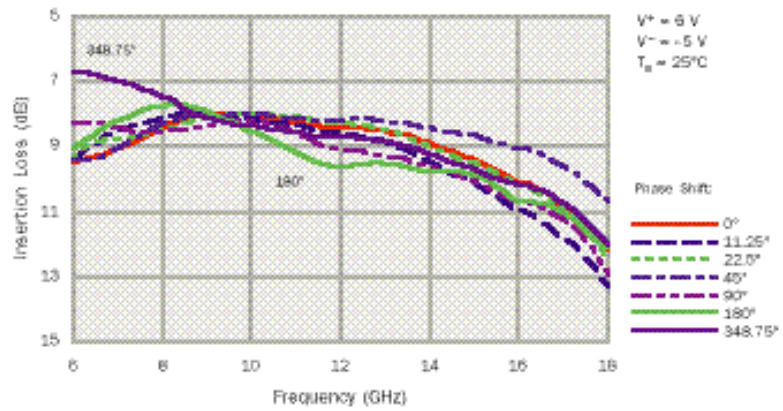
The TGP6336-EEU features on-chip CMOS-compatible drivers. The FET based phase shifter offers wide band performance and small size for use in T/R modules for EW applications.

Bond pad and backside metallization is gold plated for compatibility with eutectic alloy attach methods as well as thermocompression and thermosonic wire-bonding processes. Ground is provided to the circuitry through vias to the backside metallization.

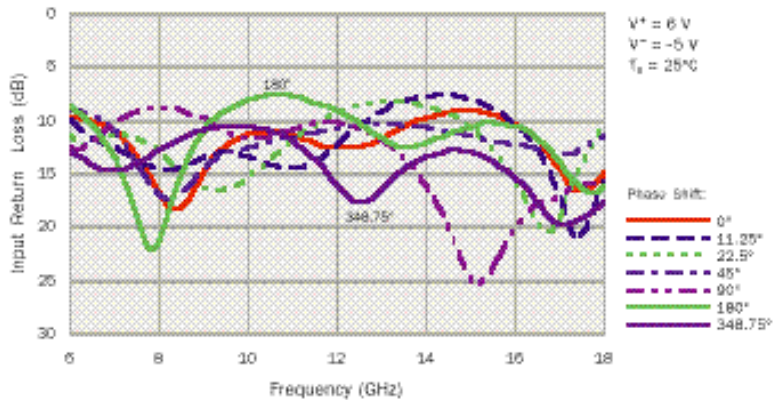
**TYPICAL  
RELATIVE  
PHASE**



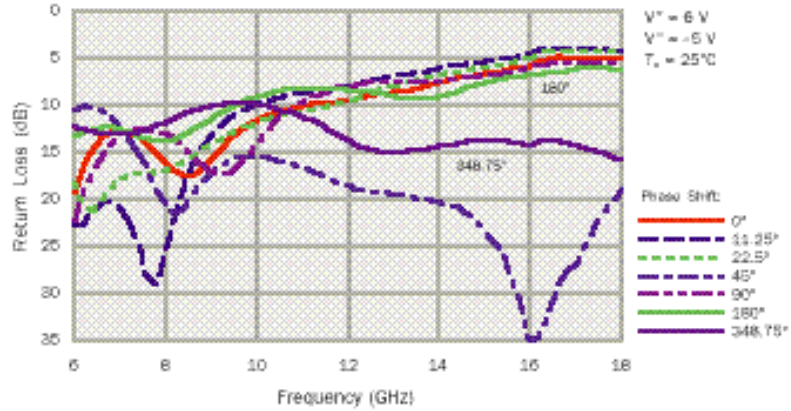
**TYPICAL  
INSERTION  
LOSS**



**TYPICAL  
INPUT  
RETURN LOSS**



**TYPICAL OUTPUT  
RETURN LOSS**



**ABSOLUTE  
MAXIMUM  
RATINGS**

Positive supply voltage, V+.....	8 V
Positive supply voltage range with respect to negative supply voltage, V+ - V-.....	0 V to 12 V
Negative supply voltage range, V-.....	0 V to -6 V
Input continuous wave power, P <sub>IN</sub> .....	1 W
Control voltage range, SHF 90, SHF180, SHF11.25, SHF 22.5, SHF 45.....	0 V to V+
Operating Channel temperature, T <sub>CH</sub> *.....	150°C
Mounting temperature (30 sec.), T <sub>M</sub> .....	320°C
Storage temperature range, T <sub>STG</sub> .....	-65 to 150°C

**Ratings over operating channel temperature range, T<sub>CH</sub> (unless otherwise noted).**

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "RF Characteristics" is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

\* Operating channel temperature (T<sub>CH</sub>) will directly affect the device MTTF. For maximum life, it is recommended that channel temperature be maintained at the lowest possible level.

**BIAS TRUTH TABLE**

RELATIVE PHASE SHIFT (degrees)	SHF 180 (Bond pad #10)	SHF 90 (Bond pad #11)	SHF 45 (Bond pad #7)	SHF 22.5 (Bond pad #8)	SHF 11.25 (Bond pad #9)
0.00	5	5	5	5	5
-11.25	5	5	5	5	0
-22.50	5	5	5	0	5
-33.75	5	5	5	0	0
-45.00	5	5	0	5	5
-56.25	5	5	0	5	0
-67.50	5	5	0	0	5
-78.75	5	5	0	0	0
-90.00	5	0	5	5	5
-101.25	5	0	5	5	0
-112.50	5	0	5	0	5
-123.75	5	0	5	0	0
-135.00	5	0	0	5	5
-146.25	5	0	0	5	0
-157.50	5	0	0	0	5
-168.75	5	0	0	0	0
-180.00	0	5	5	5	5
-191.25	0	5	5	5	0
-202.50	0	5	5	0	5
-213.75	0	5	5	0	0
-225.00	0	5	0	5	5
-236.25	0	5	0	5	0
-247.50	0	5	0	0	5
-258.75	0	5	0	0	0
-270.00	0	0	5	5	5
-281.25	0	0	5	5	0
-292.50	0	0	5	0	5
-303.75	0	0	5	0	0
-315.00	0	0	0	5	5
-326.25	0	0	0	5	0
-337.50	0	0	0	0	5
-348.75	0	0	0	0	0

V+ = 6 V, V- = -5 V, T<sub>A</sub> = 25°C

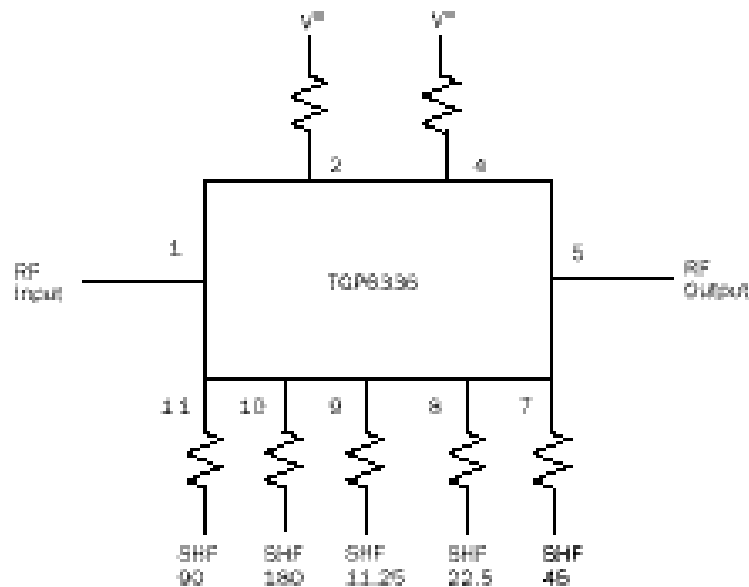
**RF CHARACTERISTICS**

PARAMETER		TEST CONDITIONS	TYP	UNIT
IL	Insertion loss (all states)	f = 6 - 18 GHz	9	dB
SWR(in)	Input standing wave ratio	f = 6 - 18 GHz (all states)	2.0:1	-
SWR(out)	Output standing wave ratio	f = 6 - 18 GHz (all states)	2.6:1	-
P <sub>1dB</sub> (in)	Input power at 1-dB gain compression	see next table		

PHASE SHIFT (degrees)	TYPICAL RELATIVE PHASE SHIFT			TYPICAL INPUT POWER at 1-dB GAIN COMPRESSION at MIDBAND(dBm)
	at 6GHz (degrees)	at 12GHz (degrees)	at 18GHz (degrees)	
-11.25	-13±2	-13.5±2	13±4	26
-22.5	-23±2	-23±2	32±4	27
-45	-55±4	-43±3	58±7	26
-90	-107±5	-84±7	99±8	25
-180	-214±4	-165±8	186±16	25
-348.75	-416±8	-326±9	380±11	25

V<sub>+</sub> = 6 V, V<sub>-</sub> = -5 V, T<sub>A</sub> = 25°C

**RECOMMENDED BIAS NETWORK**



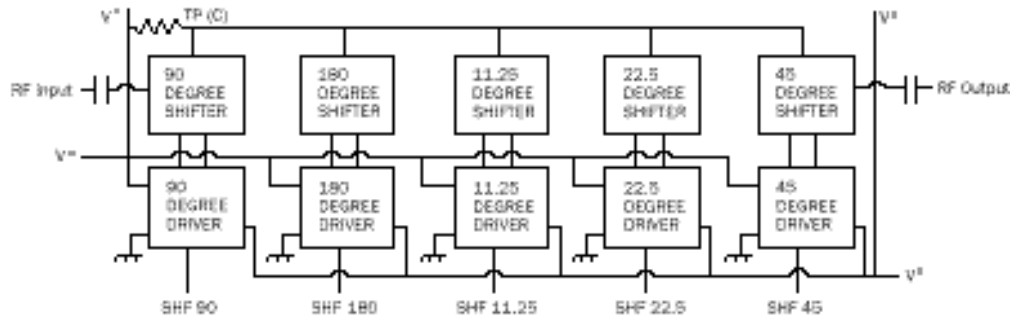
All bias resistors have a nominal value of 25-Ohms.

RF connections: Bond one 1-mil diameter, 20 to 25-mil-length gold bond wires at both RF Input and RF Output for optimum RF performance.

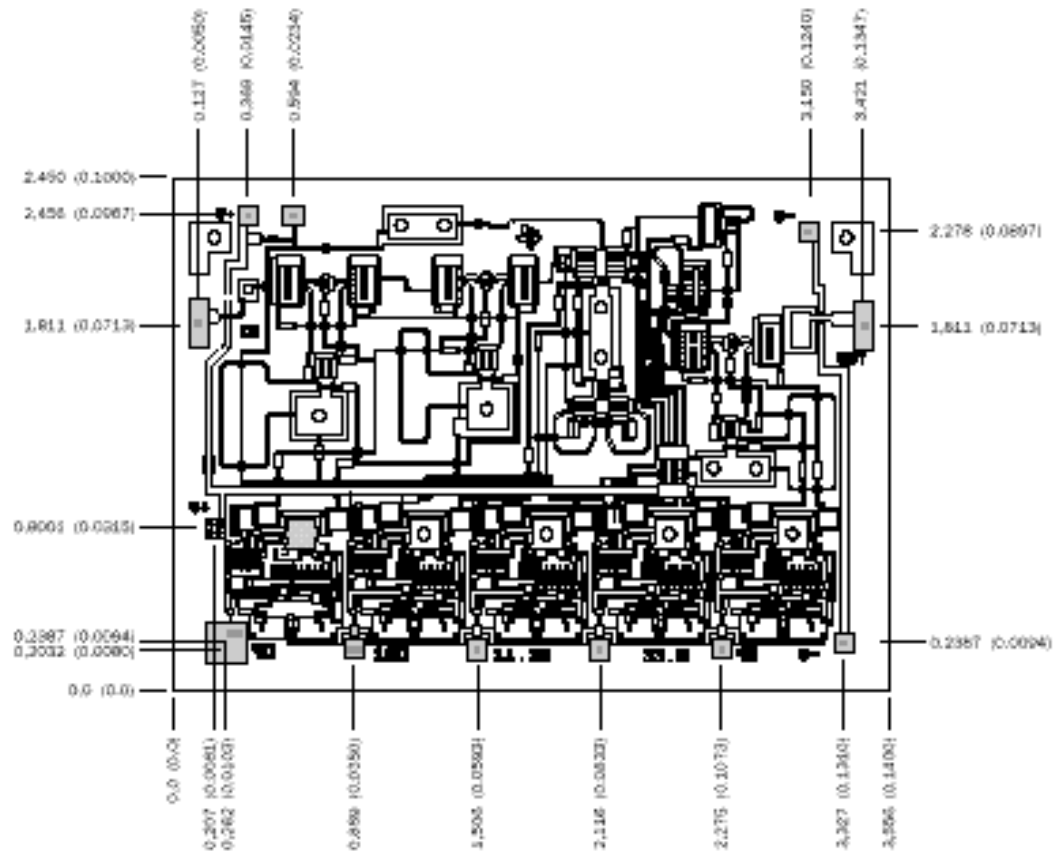
Close placement of external components is essential for resonant-free performance.

Refer to TriQuint's Gallium Arsenide Products Designers' Information on our website under Application Information.

**FUNCTIONAL BLOCK  
DIAGRAM**



**MECHANICAL  
DRAWING**



Units: Millimeters (Inches)

Thickness: 0,1016 (0,004) (reference only)

Chip edge to bond pad dimensions are shown to center of bond pad.

Chip size  $\pm 0,0508$  (0,002)

Bond pad #1 (RF Input):	0,0980 x 0,2400 (0,0038 x 0,0094)
Bond pad #2 (V <sup>+</sup> ):	0,0980 x 0,0980 (0,0038 x 0,0038)
Bond pad #3:	0,0980 x 0,0980 (0,0038 x 0,0038)
Bond pad #4 (V <sup>-</sup> ):	0,0980 x 0,0980 (0,0037 x 0,0037)
Bond pad #5 (RF Output):	0,0980 x 0,2400 (0,0038 x 0,0094)
Bond pad #6 (V <sup>-</sup> ):	0,1025 x 0,1025 (0,0040 x 0,0040)
Bond pad #7 (SHF 45):	0,1025 x 0,1025 (0,0040 x 0,0040)
Bond pad #8 (SHF 22.5):	0,1025 x 0,1025 (0,0040 x 0,0040)
Bond pad #9 (SHF 11.25):	0,1025 x 0,1025 (0,0040 x 0,0040)
Bond pad #10 (SHF 180):	0,1025 x 0,1025 (0,0040 x 0,0040)
Bond pad #11 (SHF 90):	0,2025 x 0,2025 (0,0080 x 0,0080)
Bond pad #12 (V <sup>+</sup> ):	0,1100 x 0,1100 (0,0043 x 0,0043)

**GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.**