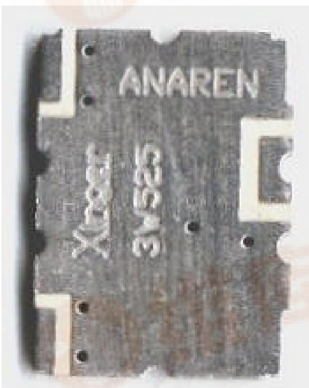
3W525

Surface Mount Balun

VER9/22/00



3W525

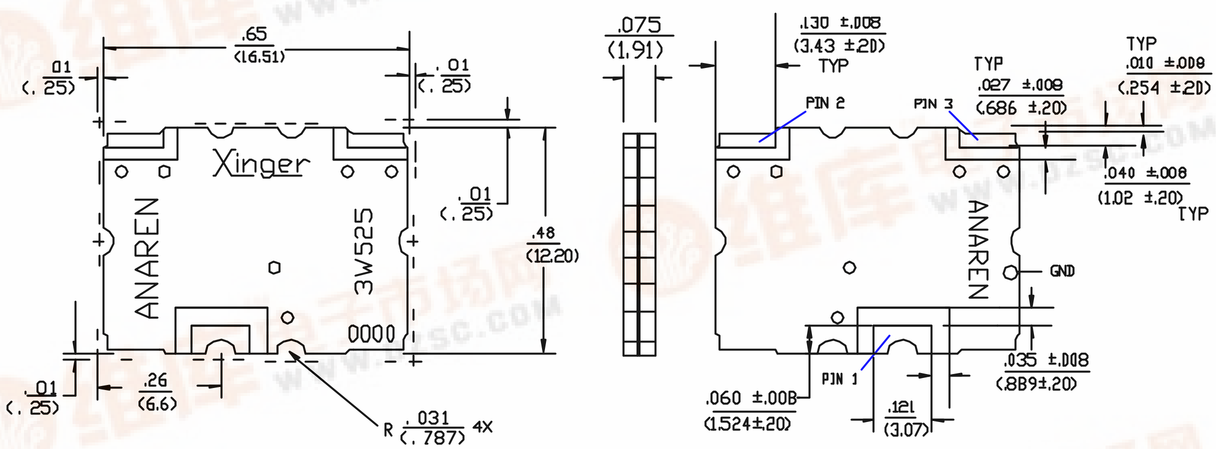
Features:

- 1.8 – 2.5 GHz
- 180° Transformer
- 50 Ohm to 25 Ohm
- Broad Band
- Low Insertion Loss
- High Power
- Even Order Harmonic Suppression
- Input to Output DC Isolation
- Surface Mountable
- Tape & Reel
- Convenient Package

Description:

The 3W525 is a low profile balanced to unbalanced transformer designed for push-pull amplifiers in an easy to use surface mount package for PCS, DCS, . These compact Xinger® surface mount baluns are ideal for high volume manufacturing and are more reliable and repeatable than traditional baluns. The 3W525 has an unbalanced port impedance of 50Ω and balanced port impedances of 25Ω to ground with a 50Ω balance between outputs. This eases the matching of the push-pull amplifier's power transistors, which have low impedance levels. The output ports have equal amplitude (-3dB) with 180 degree phase differential. The Xinger® balun is a result of years of research and development culminating with a solution so unique, a patent is pending on the design approach. The 3W525 is available on tape and reel for pick and place high volume manufacturing.

MECHANICAL OUTLINE:



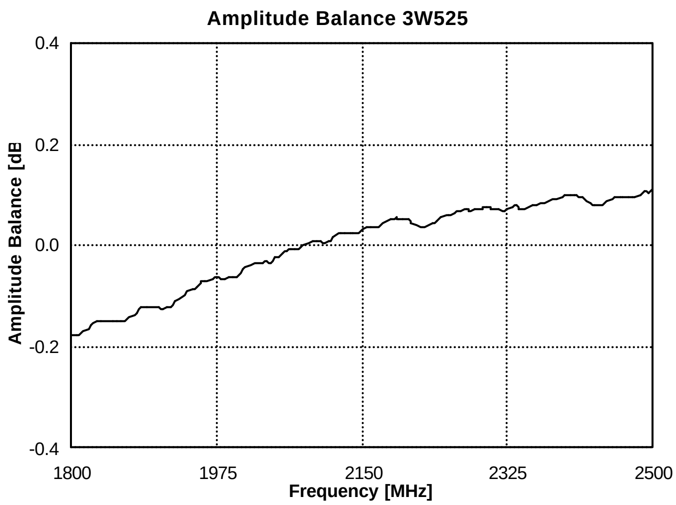
ELECTRICAL SPECIFICATIONS:

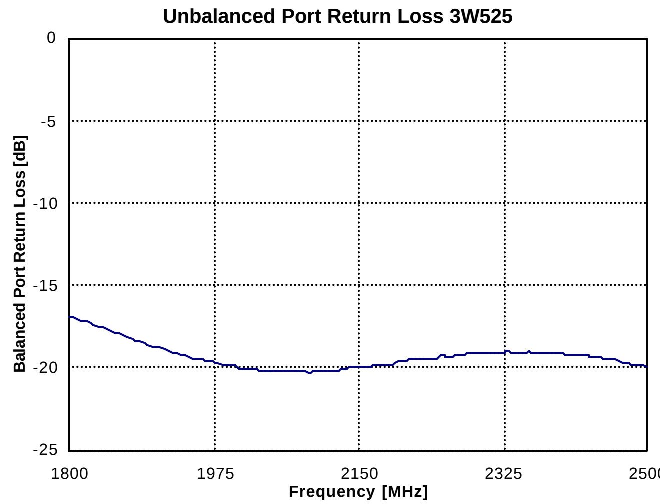
3W525 - Surface Mount Balun

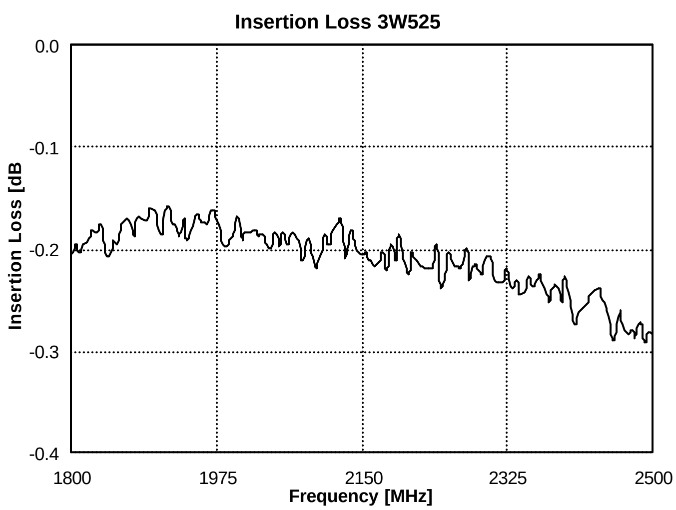
Parameter	Specification
Operating Frequency	1.8-2.5 GHz
Unbalanced Port Impedance	50Ω
Balanced Port Impedance (2⇔3)	50Ω (25Ω to Ground)
Unbalanced Port Return Loss	-15dB
Insertion Loss (max)	0.30 dB
Output Amplitude Balance (p-p)	0.40 dB
Phase Balance	180 ± 5 degrees
Power Rating (max)	150 Watts CW
ΘJC	11.3 °C/Watt

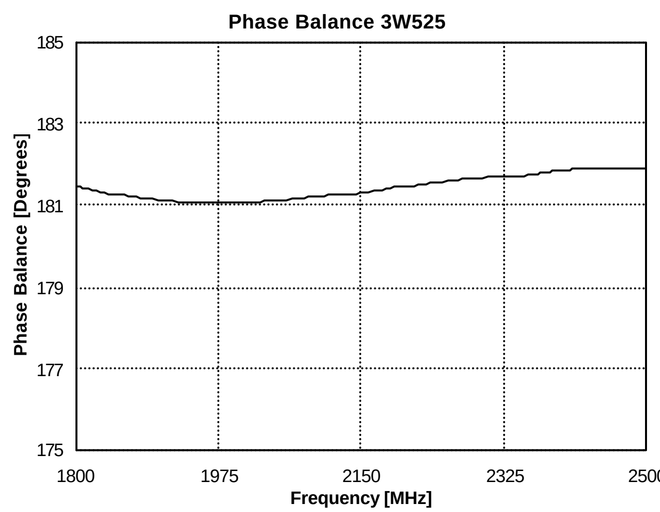
Specifications based on performance of units installed in an RF microstrip test fixture. 50 ohms nominal input impedance, and 25 ohm nominal output impedance. Temperature of operation, -55°C to +85°C. Unit will operate to +125°C with minor degradation in Insertion Loss performance. Specifications subject to change without notice.

TYPICAL PERFORMANCE: (@ 25°C on test board)



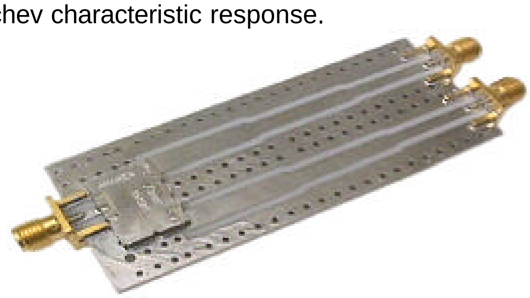






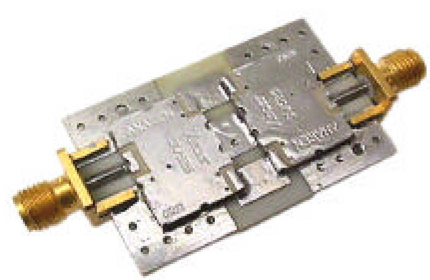
PERFORMANCE DATA:

Due to the fact the output impedances of the balun are 25Ω to ground, a circuit board was produced to transform the output impedances back to 50Ω in order to test the phase and amplitude balance of the balun (see plots above). The test fixture is shown below. This wideband transformer has a Chebychev characteristic response.



The unbalanced port return loss plot was measured at the input of the aforementioned test board. Unbalanced port return loss performance can be improved as narrow band matching is performed at the output of the balun (input of the transistor).

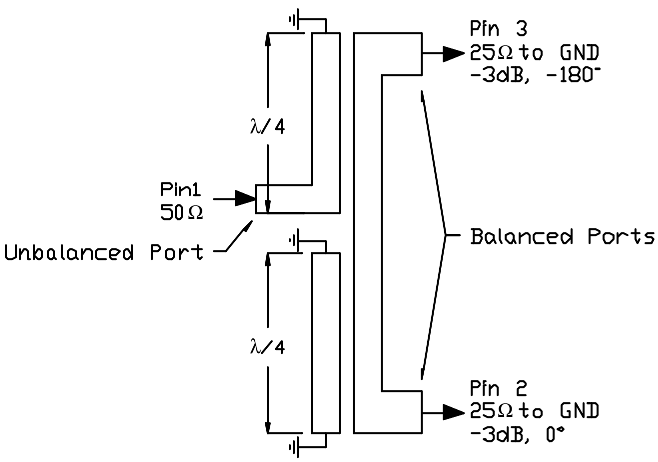
The insertion loss measurement was taken by connecting two baluns back to back and a true insertion loss measurement was collected, the fixture is shown below. The insertion loss was calculated by taking the transmission loss of the board assembly and factoring out reflected loss and, since there are two baluns on the test board, that result



was then halved.

One very important point worth noting: it is strongly recommended, when implementing the surface mount balun, that pin 1 of the first balun is offset from pin 1 of the opposing balun, note the above test board with two mounted baluns. This insures proper phase relationships for the combining of signals. This convention **must** be followed if multiple push-pull networks are combined. Otherwise, the signals would cancel at the output port.

PIN CONFIGURATION



Surface Mount Balun Layout

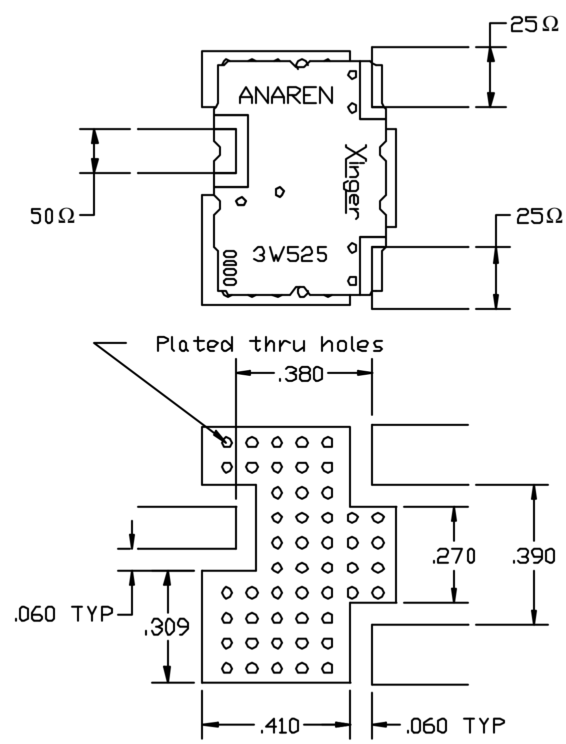
The internal configuration of the Xinger® balun is diagramed above, the unbalanced port is DC connected to ground and the two balanced ports have DC continuity with each other. The DC isolation between the balanced ports and the unbalanced port has some advantages, such as added transistor protection from any DC surges (e.g. lightning) which may be applied to the unbalanced port. Also, there is an opportunity to share DC biasing of the transistors at the balanced ports (dependent upon transistor repeatability), improving overall reliability. The construction is bonded multilayered stripline made of low loss dielectric with plated through vias connecting the internal circuitry to the external printed circuit board, similar to that of the Xinger® hybrids and directional couplers.

MOUNTING

In order for Xinger surface mount components to work optimally, there must be a 50Ω transmission line to the balanced port and 25Ω transmission lines from the unbalanced ports. Also, there must be a very good ground plane under the balun to insure proper electrical performance. If either of these two conditions are not satisfied, amplitude balance, insertion loss and VSWR may not meet published specifications.

Overall ground is improved if a dense population of plated through holes connect the top and bottom ground layers of the PCB (Printed Circuit Board). This minimizes ground inductance and improves ground continuity. All of the Xinger components are constructed from ceramic filled PTFE composites which possess excellent electrical and mechanical stability having X and Y thermal coefficient of expansion (CTE) of 17 ppm/^{o}C

When a surface mount balun is mounted to a printed circuit board, the primary concerns are; insuring the RF pads of the device are in contact with the circuit traces of the PCB and insuring the ground plane of neither the component nor the PCB is in contact with the RF signal. As long as the geometry of the unit fits onto the layout of the circuit trace on the PCB, and the conditions of the previous paragraph are followed, the balun's performance is ensured. An example of how the PCB footprint could look is shown below. In specific designs, the transmission line widths need to be adjusted to the unique dielectric coefficients and thicknesses as well as varying pick and place equipment tolerances.



Suggested Board Layout