Ceramic Balun

RF Transformer

NCS2-33D+

50Ω 2400 to 2500 MHz

The Big Deal

- Designed for Wi-Fi, Bluetooth and Zigbee applications
- Tiny size, 0805
- Low insertion loss, 0.27 dB
- Low amplitude unbalance, 0.7 dB
- Low cost

CASE STYLE: GE0805C-1

Product Overview

Mini-Circuits NCS2-33D+ is a miniature ceramic RF balun transformer specifically tailored for RF transceiver reference designs in the Wi-Fi, Bluetooth and Zigbee application bands from 2400 to 2500 MHz. This model provides a 2:1 secondary/primary impedance ratio, suitable for conversion of single-ended 50Ω lines into balanced 100Ω lines. The device provides low insertion loss, low amplitude unbalance, and RF input power handling up to 3W. Fabricated using LTCC technology, it comes housed in a tiny, ceramic monolith (0.08 x 0.05 x 0.03”), saving space in dense PCB layouts and minimizing performance variations due to parasitics.

Key Features

Feature	Advantages
Performance optimized for 2400 to 2500 MHz	NCS2-33D+ has been specifically tailored for RF transceiver chip reference designs in the Wi-Fi, Bluetooth and Zigbee application bands.
Low insertion loss, 0.27 dB	Enables excellent signal power transmission from input to output.
Low amplitude unbalance, 0.7 dB	Low unbalance can improve a system’s electromagnetic compatibility by rejecting unwanted common-mode noise.
3W power handling	Supports a wide range of power requirements
DC Isolation	Can be used to bias circuitry on the secondary while also providing DC isolation between unbalanced input and balanced output.
Tiny size, 0805	Accommodates tight space requirements for dense PCB layouts and minimizes performance variations due to parasitics.
LTCC construction	Excellent repeatability and low cost for high volume production. High reliability in touch operating environments such as high-humidity and temperature extremes from -55 to +100 °C

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+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Features

- Low phase unbalance, 5 deg. and amplitude unbalance, 0.7 dB typ.
- Miniature size, 0.079”x0.049”x0.033”
- LTCC construction
- Aqueous washable
- Low cost

Applications

- ZigBee
- WiFi
- Bluetooth

Available Tape and Reel at no extra cost

Reel Size	Devices/Reel
7”	20, 50, 100, 200, 500,1000, 2000

Electrical Specifications at 25°C

Parameter	Frequency (MHz)	Min.	Typ.	Max.	Unit
Impedance Ratio (secondary/ primary)			2		
Frequency Range		2400	—	2500	MHz
Insertion Loss[1]	2400 - 2500	—	—	0.27	dB
Amplitude Unbalance	2400 - 2500	—	—	1.7	dB
Phase Unbalance[2]	2400 - 2500	—	—	±9.7	Degree
Return Loss	2400 - 2500	10.0	—	—	dB

1. Avg. Insertion Loss is above 3 dB theoretical referenced to mid-band loss, 0.7 dB. Reference Demo Board TB-419+.
2. Relative to 180°.

Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 110°C
Storage Temperature	-55°C to 125°C
Input RF Power[3]	3W

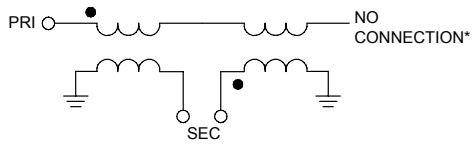
3. Derate linearly to 2W at 85°C.
Permanent damage may occur if any of these limits are exceeded.

Pad Connections

Function	Pad Number
PRIMARY DOT (Unblanced Port)	1
RF GND + DC FEED	2
SECONDARY DOT (Balanced)	4
SECONDARY (Balanced)	3
NO CONNECTION*	6
GND Externally	5

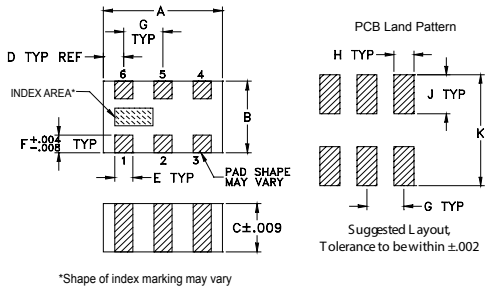
Pads 2,3,4 are DC-connected internally
**Pad 6 must be open (See PL-264)*

Config. J



*Internal open circuit

Outline Drawing



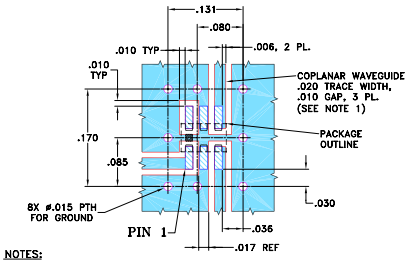
*Shape of index marking may vary

Outline Dimensions (inch / mm)

A	B	C	D	E	F
.079	.049	.033	.014	.012	.012
2.01	1.24	0.84	0.36	0.30	0.30

G	H	J	K		wt
.026	.014	.039	.110		grams
0.66	0.36	1.00	2.80		.008

Demo Board MCL P/N: TB-419+
Suggested PCB Layout (PL-264)
(without DC Feed)

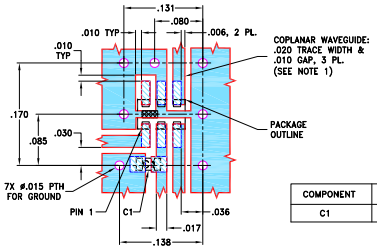


NOTES:
1. COPLANAR WAVEGUIDE PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010" ± .001". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH AND GAP MAY NEED TO BE MODIFIED.
2. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

Demo Board MCL P/N: TB-419DC+
Suggested PCB Layout (PL-535)
(with DC Feed)



COMPONENT	SIZE
C1	0402

NOTES:
1. TRACE WIDTH & GAP PARAMETERS ARE SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .010"±.001". COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH & GAP MAY NEED TO BE MODIFIED.
2. CHIP COMPONENT FOOT PRINT SHOWN FOR REFERENCE. FOR COMPONENT VALUES REFER TO TB-419DC+.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

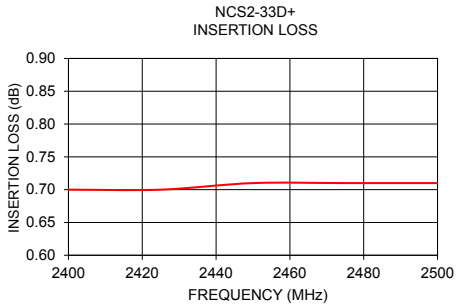
DENOTES PCB COPPER LAYOUT WITH SMOBC (SOLDER MASK OVER BARE COPPER).

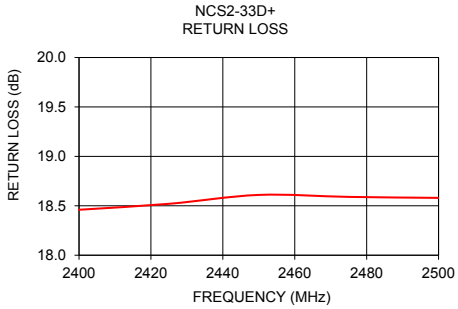
DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK.

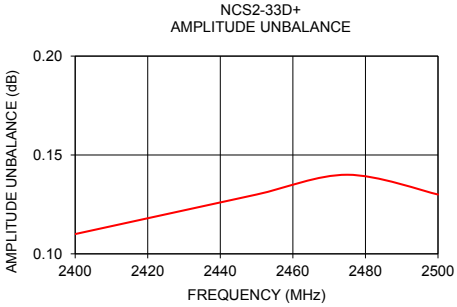
Typical Performance Data[4] at 25°C

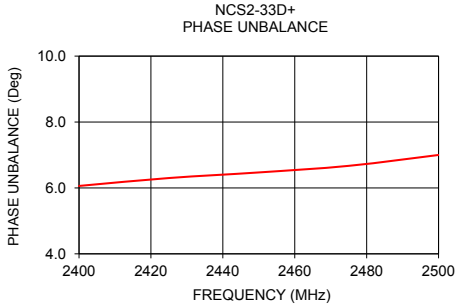
FREQUENCY (MHz)	INSERTION LOSS (dB)	INPUT R. LOSS (dB)	AMPLITUDE UNBALANCE (dB)	PHASE UNBALANCE (Deg.)
2400	0.70	18.46	0.11	6.06
2425	0.70	18.52	0.12	6.30
2450	0.71	18.61	0.13	6.47
2475	0.71	18.59	0.14	6.67
2500	0.71	18.58	0.13	7.00

4. Measured with Agilent E5071B network analyzer using impedance conversion and port exten-









Additional Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp