## $50 \Omega 20$ to 1600 MHz

## The Big Deal

- 1W RF power handling
- Low unbalance, $0.4 \mathrm{~dB}, 3^{\circ}$
- Small size, $0.27 \times 0.31 \times 0.22$ "


CASE STYLE: CD636

## Product Overview

Mini-Circuits' ADT2-162T+ is a surface-mount balanced-to-balanced transformer with a secondary/primary impedance ratio of $2: 1$. This model covers the 20 to 1600 MHz band with low insertion loss ( 1.2 dB typ.) as well as low phase unbalance ( $3^{\circ}$ ) and amplitude unbalance ( 0.4 dB ). The unit comes enclosed in a miniature, leadless plastic package measuring just $0.27 \times 0.31 \times 0.22^{\prime \prime}$, ideal for dense circuit board layouts.

Key Features

| Feature | Advantages |
| :--- | :--- |
| Wideband, 20 to 1600 MHz | Supports a wide range of applications including VHF/UHF, cellular, PCS and more. |
| Low insertion loss, 1.2 dB typ. | Good transmission of signal power from input to output. |
| 1W RF power handling | Supports a wide range of power requirements. |
| Low phase and amplitude unbalance, <br> $3^{\circ}, 0.4 \mathrm{~dB}$ | Low phase and amplitude unbalance can improve a system's electromagnetic compat- <br> ibility by rejecting unwanted common-mode noise |
| Small footprint, $0.27 \times 0.31 \times 0.22^{\prime \prime}$ | Accommodates tight space requirements for dense PCB layouts. |

## Maximum Ratings

| Operating Temperature | $-40^{\circ} \mathrm{C}$ to $85^{\circ} \mathrm{C}$ |
| :--- | ---: |
| Storage Temperature | $-55^{\circ} \mathrm{C}$ to $100^{\circ} \mathrm{C}$ |
| RF Power | 1.0 W |
| Permanent damage may occur if any of these limits are exceeded. |  |

## Pin Connections

| PRIMARY DOT | 3 |
| :--- | ---: |
| PRIMARY | 1 |
| SECONDARY DOT | 6 |
| SECONDARY | 4 |
| SECONDARY CT | 5 |
| NOT USED | 2 |

## Outline Drawing



Demo Board MCL P/N: TB-430+

Config. P1


Features

- leaded surface mount
- wideband frequency $20-1600 \mathrm{MHz}$
- excellent amplitude balance, 0.4 dB typ. and phase unbalance, 3 deg. typ.


Generic photo used for illustration purposes only

## CASE STYLE: CD636

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

## Applications

- VHF/UHF
- balanced amplifiers
- info structure

|  |  |
| :---: | :--- |
| Available Tape and Reel <br> at no extra cost <br> Devices/Reel |  |
| Reel Size | $20,50,100,200$ |
| $7^{\prime \prime}$ | 500,1000 |
| $13^{\prime \prime}$ |  |

- A/D and D/A converter

Transformer Electrical Specifications@25 ${ }^{\circ} \mathrm{C}$

| Parameter | Frequency (MHz) | Min. | Typ. | Max. | Unit |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Impedance Ratio (secondary / primary) |  |  | 2 |  |  |
| Frequency Range |  | 20 |  | 1600 | MHz |
| Insertion Loss* (average) | $50-1250$ | - | 0.5 | 1.0 |  |
|  | $25-1400$ | - | 1.2 | 2.0 | dB |
|  | $20-1600$ | - | 2.0 | 3.0 |  |
| Phase Unbalance $\pm$ | $50-1250$ | - | 0.4 | 0.75 | dB |
|  | $25-100$ | - | 0.5 | 0.85 |  |
| Input Return Loss | $20-1600$ | - | 0.6 | 4 | Degree |
| Common mode rejection | $50-1250$ | - | 2 | 5 |  |
|  | $25-100$ | - | 2.5 | 3.0 | - |

* Insertion Loss is referenced to mid-band loss, 1.0 dB typ.


## Typical Performance Data

| FREQUENCY <br> (MHz) | INSERTION <br> LOSS <br> (dB) | INPUT <br> R. LOSS <br> (dB) | AMPLITUDE <br> UNBALANCE <br> (dB) | PHASE <br> UNBALANCE <br> (Deg.) |
| :---: | :---: | :---: | :---: | :---: |
| 20 | 2.47 | 4.74 | 0.35 | 0.06 |
| 25 | 1.92 | 5.94 | 0.35 | 0.03 |
| 50 | 1.07 | 9.79 | 0.35 | 0.07 |
| 100 | 0.88 | 11.86 | 0.36 | 0.25 |
| 200 | 0.96 | 10.98 | 0.33 | 0.41 |
| 600 | 1.51 | 7.53 | 0.10 | 0.42 |
| 1000 | 1.15 | 11.44 | 0.16 | 0.70 |
| 1218 | 1.02 | 13.23 | 0.06 | 1.96 |
| 1400 | 1.47 | 7.63 | 0.11 | 3.70 |
| 1600 | 2.55 |  |  | 0.01 |



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-Circciit'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

Typical Performance Data

| FREQUENCY $(\mathrm{MHz})$ | AVERAGE INSERTION LOSS (dB) | INPUT RETURN LOSS <br> (dB) | AMPLITUDE UNBALANCE <br> (dB) | PHASE UNBALANCE (deg.) |
| :---: | :---: | :---: | :---: | :---: |
| 15 | 3.45 | 3.39 | 0.36 | 0.16 |
| 20 | 2.47 | 4.74 | 0.35 | 0.12 |
| 25 | 1.92 | 5.94 | 0.35 | 0.06 |
| 50 | 1.07 | 9.79 | 0.35 | 0.14 |
| 70 | 0.93 | 11.17 | 0.35 | 0.22 |
| 90 | 0.89 | 11.77 | 0.34 | 0.39 |
| 95 | 0.88 | 11.83 | 0.35 | 0.44 |
| 100 | 0.88 | 11.86 | 0.36 | 0.50 |
| 105 | 0.88 | 11.89 | 0.36 | 0.54 |
| 150 | 0.89 | 11.72 | 0.33 | 0.66 |
| 200 | 0.96 | 10.98 | 0.33 | 0.81 |
| 300 | 1.14 | 9.44 | 0.30 | 1.09 |
| 400 | 1.31 | 8.37 | 0.26 | 1.13 |
| 500 | 1.44 | 7.75 | 0.19 | 1.10 |
| 600 | 1.51 | 7.53 | 0.10 | 0.84 |
| 680 | 1.52 | 7.61 | 0.03 | 0.65 |
| 684 | 1.51 | 7.63 | 0.03 | 0.63 |
| 700 | 1.51 | 7.67 | 0.01 | 0.56 |
| 800 | 1.43 | 8.25 | 0.06 | 0.06 |
| 900 | 1.31 | 9.40 | 0.13 | 0.60 |
| 1000 | 1.15 | 11.44 | 0.16 | 1.41 |
| 1100 | 1.03 | 15.18 | 0.14 | 2.39 |
| 1200 | 1.01 | 24.18 | 0.08 | 3.65 |
| 1218 | 1.02 | 27.23 | 0.06 | 3.93 |
| 1300 | 1.14 | 22.21 | 0.01 | 5.32 |
| 1400 | 1.47 | 13.83 | 0.11 | 7.40 |
| 1500 | 1.96 | 9.93 | 0.12 | 9.85 |
| 1600 | 2.55 | 7.63 | 0.01 | 12.13 |
| 1700 | 3.19 | 6.16 | 0.21 | 13.60 |
| 1800 | 3.81 | 5.20 | 0.47 | 13.84 |






## Case Style

CD541
Outline Dimensions
CD542
CD636
CD637



Suggested Layout,
Tolerance to be within $\pm .002$

| CASE\# | A | B | C | D | E | F | G | H | J | K | L | WT, GRAM |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CD541 | $\begin{gathered} .272 \\ (6.91) \end{gathered}$ | $\begin{gathered} .310 \\ (7.87) \end{gathered}$ | $\begin{gathered} .220 \\ (5.58) \end{gathered}$ | $\begin{gathered} .100 \\ (2.54) \end{gathered}$ | $\begin{gathered} .082 \\ (2.08) \end{gathered}$ | $\begin{gathered} .055 \\ (1.40) \end{gathered}$ | $\begin{gathered} .100 \\ (2.54) \end{gathered}$ | $\begin{gathered} .030 \\ (0.76) \end{gathered}$ | $\begin{gathered} .026 \\ (0.66) \end{gathered}$ | $\begin{gathered} .065 \\ (1.65) \end{gathered}$ | $\begin{gathered} .300 \\ (7.62) \end{gathered}$ | . 15 |
| CD542 |  |  |  |  | $\begin{gathered} .112 \\ (2.84) \end{gathered}$ |  |  |  |  |  |  | . 20 |
| CD636 |  |  |  |  | $\begin{gathered} .162 \\ (4.11) \end{gathered}$ |  |  |  |  |  |  | . 25 |
| CD637 |  |  |  |  | $\begin{gathered} .206 \\ (5.23) \end{gathered}$ |  |  |  |  |  |  | . 40 |

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .01 ; 3$ Pl. $\pm .005$

## Notes:

1. Case material: Plastic.
2. Termination finish:

For RoHS Case Styles: Tin plate over Nickel plate. All models, (+) suffix.
For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

## Tape \& Reel Packaging TR-F34

## DEVICE ORIENTATION IN T\&R



DIRECTION OF FEED

| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | $\begin{array}{r} \text { Device } \\ \text { see } \end{array}$ | Reel |
| :---: | :---: | :---: | :---: | :---: |
| 16 | 12 | 7 | Small quantity standard (see note) | 20 |
|  |  |  |  | 50 |
|  |  |  |  | 100 |
|  |  |  |  | 200 |
|  |  | 13 | Standard | 500 |
|  |  |  |  | 1000 |

Note: Availability of small reel quantity varies by model.
Refer to pricing and availability on individual model dashboard.

Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

Go to: www.minicircuits.com/pages/pdfs/tape.pdf

## Mini-Circuits ISO 9001 \& ISO 14001 Certified

## WMini-Circuits

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification | Test/Inspection Condition | Reference/Spec |
| :---: | :---: | :---: |
| Operating Temperature | $-40^{\circ} \text { to } 85^{\circ} \mathrm{C}$ <br> Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | $-55^{\circ} \text { to } 100^{\circ} \mathrm{C}$ <br> Ambient Environment | Individual Model Data Sheet |
| Humidity | 90 to $95 \%$ RH, 240 hours, $50^{\circ} \mathrm{C}$ | MIL-STD-202, Method 103, Condition A, Except $50^{\circ} \mathrm{C}$ and end-point electrical test done within 12 hours |
| Thermal Shock | $-55^{\circ}$ to $100^{\circ} \mathrm{C}, 100$ cycles | MIL-STD-202, Method 107, Condition A-3, except $+100^{\circ} \mathrm{C}$ |
| Solder Reflow Heat | Sn-Pb Eutetic Process: $225^{\circ} \mathrm{C}$ peak Pb -Free Process $245^{\circ}-250^{\circ} \mathrm{C}$ peak | J-STD-020, Table 4-1, 4-2 and 5-2, Figure 5-1 |
| Solderability | 10X Magnification | J-STD-002, 95\% Coverage |
| Vibration (High Frequency) | 20 g peak, $10-2000 \mathrm{~Hz}$, 12 times in each of three perpendicular directions (total 36) | MIL-STD-202, Method 204, Condition D |
| Mechanical Shock | $50 \mathrm{~g}, 11 \mathrm{~ms}, 1 / 2$-sine, 18 shocks: 3 each direction, each of 3 axes | MIL-STD-202, Method 213, Condition A |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at $25^{\circ} \mathrm{C}$; terpene defluxer at $25^{\circ} \mathrm{C}$; <br> distilled water + proylene glycol monomethyl ether + monoethanolamine at $63^{\circ} \mathrm{C}$ to $70^{\circ} \mathrm{C}$ | MIL-STD-202, Method 215 |
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