

# Standard Level (+7 dBm LO) DOUBLE-BALANCED MIXERS

## ZAD SERIES



| MODEL    | FREQUENCY        | Z (Ohms) | COST           |
|----------|------------------|----------|----------------|
| ZAD-1    | 0.5 MHz-500 MHz  | 50       | \$27.95 (4-24) |
| ZAD-1W   | 1 MHz-750 MHz    | 50       | \$32.95 (4-24) |
| ZAD-1-1  | 0.1 MHz-500 MHz  | 50       | \$29.95 (4-24) |
| • ZAD-2  | 1 MHz-1000 MHz   | 50       | \$37.95 (4-24) |
| ZAD-3    | 25 KHz -200 MHz  | 50       | \$29.95 (4-24) |
| • ZAD-4  | 5 MHz-1250 MHz   | 50       | \$39.95 (4-24) |
| ZAD-6    | 3 KHz -100 MHz   | 50       | \$37.95 (4-24) |
| ZAD-8    | 500 Hz -10 MHz   | 50       | \$42.95 (4-24) |
| • ZAD-11 | 5 MHz-2000 MHz   | 50       | \$49.95 (4-24) |
| • ZAD-12 | 800 MHz-1250 MHz | 50       | \$49.95 (4-24) |

NATIONAL STANDARD NUMBER ZAD-1B NSN-5985-00-280-7750

• IF port is not DC coupled

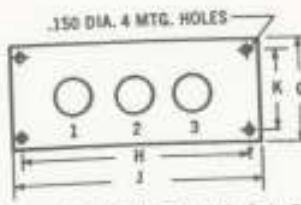
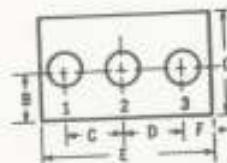
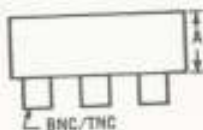
**DESCRIPTION** — The ZAD series mixers are economically priced while covering the very broad frequency range from 500 Hz to 2000 MHz. They offer low conversion loss, 6 dB, high isolation, 40 dB, and exceptional unit to unit matched performance.

BNC connectors are standard. TNC connectors are a no-cost option.

These rugged units are double shielded to meet tough RFI requirements. The die-cast aluminum case is finished with a blue baked enamel per Federal Standard 595 #25109 over phosphoric etch per MIL-C-15328A.

Only well matched hot-carrier diodes and ruggedly constructed transmission line transformers are used. Internally, every component is bonded with silicone rubber to provide protection against shock, vibration and acceleration.

## DIMENSIONS AND CONNECTIONS



MOUNTING BRACKET AVAILABLE ON REQUEST. Add suffix B to part number and \$1.30 to unit cost.  
CONNECTORS: BNC standard. TNC on request (no charge).

WEIGHT

74 grams

2.6 ounces



**Mini-Circuits**

2625 E. 14th St., Brooklyn, NY 11235 (212) 769-0200/Dom. Telex 125460/Int'l. Telex 820156

## FEATURES

- Broadband: 500 Hz to 2000 MHz
- Low Conversion Loss: typically less than 6 dB
- High Isolation: typically greater than 40 dB
- Compact: 2.25" W, 1.15" D, 1.4" H
- High Reliability: 100% tested, 1 year guarantee
- Low Cost: as low as \$27.95 in small quantity

## APPLICATIONS

- Frequency mixing
- Pulse and amplitude modulation
- Phase detection
- Current controlled attenuation
- Bi-phase modulation

## ABSOLUTE MAXIMUM RATINGS

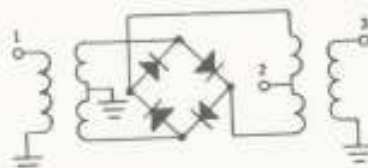
- Input Power: 50 mW
- Peak IF Input Current: 40 mA
- Operating and Storage Temp.: -55°C to +100°C
- Environmental Specifications: See Index Page

## HTRB & BURN-IN... KEY TO A 3 YEAR GUARANTEE

Schottky diodes selected for high reliability mixer service are deliberately stressed to accelerate aging and thus force temperature-related failure modes to take their toll. In the HTRB (High Temperature Reverse Bias) technique, the diode is operated at 168 hours at 150°C with 1 volt reverse bias applied.

In conventional testing, or "baking", the diode does not experience anywhere near the stress encountered with the HTRB program. Thus, the HTRB process screens out potentially unreliable diodes before they are assembled into completed Hi-rel mixers.

The model ZAD-1 has become an industry standard throughout the world and is used by all branches of the Department of Defense, NASA, FAA, and every major communications company. In over 500 different military contracts, over a period of years, the ZAD-1 has proven to be one of the most reliable mixers obtainable, even when considering high priced models.



NOTE: For Models ZAD-11 and ZAD-12 connector/terminal 2 is at dc ground through an inductance.

## CONNECTOR/TERMINAL LAYOUT

| Model                          | Part  |
|--------------------------------|-------|
| -2, -4                         | L R I |
| All other Models except -2, -4 | L I R |

**ZAD Series**  
**500 Hz to 2000 MHz**  
**SPECIFICATIONS: 50 Ohms**



**MIXING**

**CONVERSION LOSS AND ISOLATION**

| Model No. | Frequency Range, MHz |          |        | Conversion Loss, dB       |             | Isolation, dB                        |       |           |           |           |       |                                     |       |    |    |    |    |    |    |
|-----------|----------------------|----------|--------|---------------------------|-------------|--------------------------------------|-------|-----------|-----------|-----------|-------|-------------------------------------|-------|----|----|----|----|----|----|
|           | LO                   | RF       | IF     | One Octave From Band Edge | Total Range | Lower Band Edge To One Decade Higher |       |           |           | Mid Range |       | Upper Band Edge To One Octave Lower |       |    |    |    |    |    |    |
|           |                      |          |        | Typ. Max.                 | Typ. Max.   | LO-RF                                | LO-IF | Typ. Min. | Typ. Min. | LO-RF     | LO-IF | LO-RF                               | LO-IF |    |    |    |    |    |    |
| ZAD-1     | 5-500                | 5-500    | DC-500 | 5.5                       | 7.0         | 6.5                                  | 8.5   | 50        | 45        | 45        | 35    | 45                                  | 30    | 40 | 25 | 35 | 25 | 30 | 20 |
| ZAD-1W    | 1-750                | 1-750    | DC-750 | 5.5                       | 7.5         | 6.5                                  | 8.5   | 50        | 45        | 45        | 30    | 45                                  | 30    | 40 | 25 | 35 | 25 | 30 | 20 |
| ZAD-1-1   | .1-500               | .1-500   | DC-500 | 5.5                       | 7.5         | 6.5                                  | 8.5   | 50        | 45        | 45        | 30    | 45                                  | 30    | 40 | 25 | 35 | 25 | 30 | 20 |
| ZAD-2     | 1-1000               | 1-1000   | 5-500  | 5.5                       | 7.5         | 6.5                                  | 8.5   | 45        | 30        | 45        | 30    | 35                                  | 20    | 35 | 20 | 30 | 20 | 30 | 20 |
| ZAD-3     | .025-200             | .025-200 | DC-200 | 5.5                       | 7.5         | 6.5                                  | 8.5   | 60        | 50        | 45        | 35    | 45                                  | 35    | 40 | 30 | 35 | 25 | 30 | 20 |
| ZAD-4     | 5-1250               | 5-1250   | 5-500  | 5.5                       | 7.5         | 6.5                                  | 8.5   | 50        | 40        | 50        | 40    | 40                                  | 20    | 40 | 20 | 30 | 20 | 30 | 20 |
| ZAD-6     | .003-100             | .003-100 | DC-100 | 5.5                       | 7.5         | 6.5                                  | 8.5   | 60        | 50        | 60        | 45    | 45                                  | 30    | 40 | 25 | 35 | 25 | 30 | 20 |
| ZAD-8     | .0005-10             | .0005-10 | DC-10  | 6.5                       | 7.5         | 7.0                                  | 8.5   | 60        | 50        | 60        | 50    | 50                                  | 40    | 50 | 40 | 45 | 35 | 45 | 35 |
| ZAD-11    | 5-2000               | 5-2000   | 10-600 | 7.0                       | 8.5         | 7.5                                  | 9.0   | 50        | 45        | 45        | 40    | 35                                  | 25    | 30 | 20 | 30 | 20 | 25 | 15 |
| ZAD-12    | 800-1250             | 800-1250 | 50-90  | 6.0                       | 7.5         | 6.0                                  | 7.5   | 35        | 25        | 30        | 20    | 35                                  | 25    | 30 | 20 | 35 | 25 | 30 | 20 |

**SIGNAL 1 dB COMPRESSION LEVEL**

| Model No.           | ZAD-1 | ZAD-1-1 | ZAD-1W | ZAD-2 | ZAD-3 | ZAD-4 | ZAD-6 | ZAD-8 | ZAD-9 | ZAD-11 | ZAD-12 |
|---------------------|-------|---------|--------|-------|-------|-------|-------|-------|-------|--------|--------|
| SIGNAL LEVEL, (dBm) | +1    | +1      | +1     | +1    | +1    | +1    | +1    | +1    | +1    | +1     | +1     |

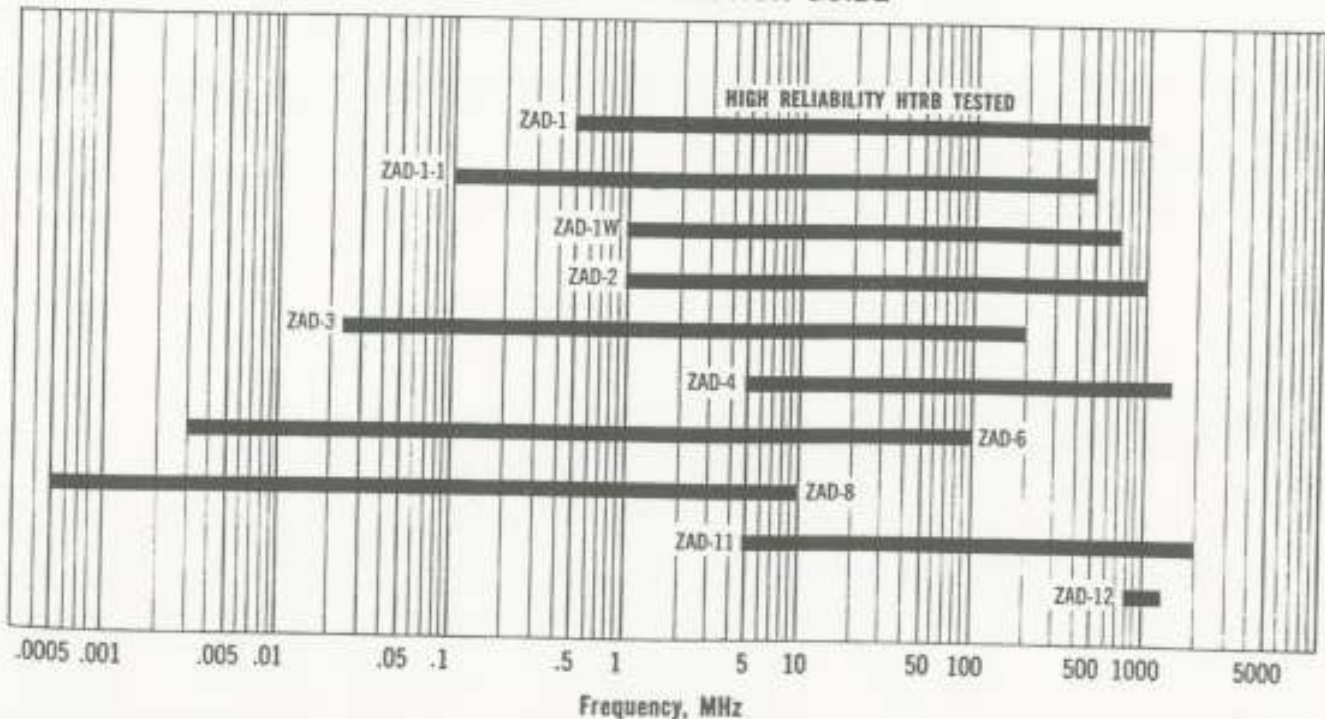
**PHASE DETECTION**

| Model No.                    | ZAD-1 | ZAD-1-1 | ZAD-1W | ZAD-2 | ZAD-3 | ZAD-4 | ZAD-6 | ZAD-8 | ZAD-9 | ZAD-11 | ZAD-12 |
|------------------------------|-------|---------|--------|-------|-------|-------|-------|-------|-------|--------|--------|
| DC OFFSET, (mV) TYP.         | 1     | 1       | 1      | —     | 1     | —     | 1     | 1     | 1     | —      | —      |
| DC POLARITY                  | NEG   | NEG     | NEG    | —     | NEG   | —     | NEG   | NEG   | NEG   | —      | —      |
| MAXIMUM OUTPUT, (VOLTS) TYP. | 0.3   | 0.3     | 0.3    | —     | 0.3   | —     | 0.3   | 0.3   | 0.3   | —      | —      |

**ELECTRONIC ATTENUATION**

| Model No.                    | ZAD-1 | ZAD-1-1 | ZAD-1W | ZAD-2 | ZAD-3  | ZAD-4 | ZAD-6 | ZAD-8 | ZAD-9 | ZAD-11 | ZAD-12 |
|------------------------------|-------|---------|--------|-------|--------|-------|-------|-------|-------|--------|--------|
| MINIMUM ATTENUATION, (20 mA) | 3 dB  | 2.5 dB  | 3.5 dB | —     | 1.5 dB | —     | 1 dB  | 1 dB  | 1 dB  | —      | —      |

**FREQUENCY SELECTION GUIDE**



**PROMPT SERVICE / ONE WEEK DELIVERY** **Mini-Circuits**



# Standard Level (+7 dBm LO) DOUBLE-BALANCED MIXERS

SPECIFICATIONS: 50 Ohms

## MIXING

SIGNAL 1 dB COMPRESSION LEVEL

| Model No. | Frequency Range, MHz |          |        | Conversion Loss, dB                    |                          | Isolation, dB                        |       |           |       |                                     |       |    |    |    |    |    |    |    |    |
|-----------|----------------------|----------|--------|--|--------------------------|--------------------------------------|-------|-----------|-------|-------------------------------------|-------|----|----|----|----|----|----|----|----|
|           | LO                   | RF       | IF     | One Octave From Band Edge<br>Typ. Max. | Total Range<br>Typ. Max. | Lower Band Edge To One Decade Higher |       | Mid Range |       | Upper Band Edge To One Octave Lower |       |    |    |    |    |    |    |    |    |
|           |                      |          |        |  |                          | LO-RF                                | LO-IF | LO-RF     | LO-IF | LO-RF                               | LO-IF |    |    |    |    |    |    |    |    |
| ZAD-1     | .5-500               | .5-500   | DC-500 | 5.5                                    | 7.0                      | 6.5                                  | 8.5   | 50        | 45    | 45                                  | 35    | 45 | 30 | 40 | 25 | 35 | 25 | 30 | 20 |
| ZAD-1W    | 1-750                | 1-750    | DC-750 | 5.5                                    | 7.5                      | 6.5                                  | 8.5   | 50        | 45    | 45                                  | 30    | 45 | 30 | 40 | 25 | 35 | 25 | 30 | 20 |
| ZAD-1-1   | .1-500               | .1-500   | DC-500 | 5.5                                    | 7.5                      | 6.5                                  | 8.5   | 50        | 45    | 45                                  | 30    | 45 | 30 | 40 | 25 | 35 | 25 | 30 | 20 |
| ZAD-2     | 1-1000               | 1-1000   | .5-500 | 5.5                                    | 7.5                      | 6.5                                  | 8.5   | 45        | 30    | 45                                  | 30    | 35 | 20 | 35 | 20 | 30 | 20 | 30 | 20 |
| ZAD-3     | .025-200             | .025-200 | DC-200 | 5.5                                    | 7.5                      | 6.5                                  | 8.5   | 60        | 50    | 45                                  | 35    | 45 | 35 | 40 | 30 | 35 | 25 | 30 | 20 |

## CONVERSION LOSS AND ISOLATION

| Model No.           | ZAD-1 | ZAD-1-1 | ZAD-1W | ZAD-2 | ZAD-3 |
|---------------------|-------|---------|--------|-------|-------|
| SIGNAL LEVEL, (dBm) | +1    | +1      | +1     | +1    | +1    |

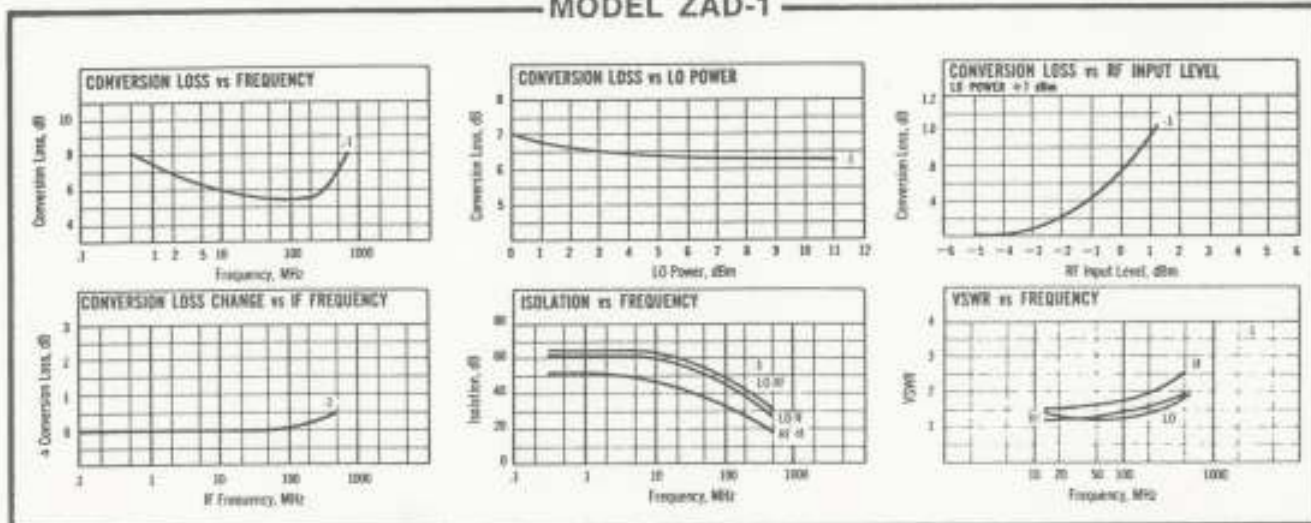
## ELECTRONIC ATTENUATION

| Model No.                    | ZAD-1 | ZAD-1-1 | ZAD-1W | ZAD-2 | ZAD-3  |
|------------------------------|-------|---------|--------|-------|--------|
| MINIMUM ATTENUATION, (20 mA) | 3 dB  | 2.5 dB  | 3.5 dB | —     | 1.5 dB |

## PHASE DETECTION

| Model No.                    | ZAD-1 | ZAD-1-1 | ZAD-1W | ZAD-2 | ZAD-3 |
|------------------------------|-------|---------|--------|-------|-------|
| DC OFFSET, (mV) TYP.         | 1     | 1       | 1      | —     | 1     |
| DC POLARITY                  | NEG   | NEG     | NEG    | —     | NEG   |
| MAXIMUM OUTPUT, (VOLTS) TYP. | 0.3   | 0.3     | 0.3    | —     | 0.3   |

### MODEL ZAD-1



### MODEL ZAD-1W

