

Precision

# Digital Step Attenuator

50Ω TTL Control, Pin Diode 10 to 1000 MHz

TOAT-124+

## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -55°C to 100°C |
| Storage Temperature                                             | -55°C to 125°C |
| Input Power                                                     | 15 dBm         |
| DC Voltage                                                      | 5.5 V          |
| TTL                                                             | 5.5V           |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

|                |              |
|----------------|--------------|
| RF IN          | 4            |
| RF OUT         | 11           |
| TTL CONTROL #1 | 2            |
| TTL CONTROL #2 | 3            |
| TTL CONTROL #3 | 1            |
| +5V DC         | 12           |
| CASE GROUND    | 5,6,7,8,9,10 |

## Features

- wideband, 10 to 1000 MHz
- excellent step accuracy, 0.2 dB typ.
- excellent VSWR 1.3 typ.
- low DC current, 6 mA typ.
- hermetic, metal, TO-8 case

## Applications

- base stations
- cellular
- test-sets
- military, hi-rel application

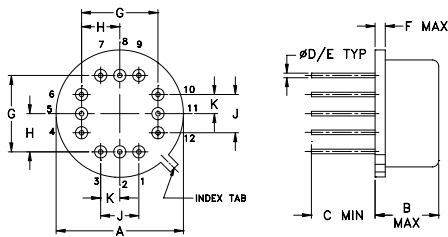
## Digital Step Attenuator Electrical Specifications

| MODEL NO. | FREQUENCY (MHz) |                | PRIMARY ATTENUATION STEPS (dB) |        |       | ATTENUATION (dB)  |                 | VSWR (:1)         |     |     |
|-----------|-----------------|----------------|--------------------------------|--------|-------|-------------------|-----------------|-------------------|-----|-----|
|           |                 |                | @TTL CONTROL PORT              |        |       |                   |                 |                   |     |     |
|           | f <sub>L</sub>  | f <sub>U</sub> | #1                             | #2     | #3    | (1,1,1)**<br>Nom. | (0,0,0)<br>Max. | L                 | M   | U   |
| TOAT-124+ | 10              | 1000           | 1±0.25                         | 2±0.25 | 4±0.3 | 7.0               | 4.0             | 1.6               | 1.4 | 1.5 |
|           |                 |                | L=10 to 100 MHz                |        |       | M=100 to 500 MHz  |                 | U=500 to 1000 MHz |     |     |

\*\* Total attenuation above thru-loss.

1. Step accuracy is specified for basic steps. For combination of steps accuracy is additive.
2. Thru-loss is minimum insertion loss with all attenuation elements bypassed (All TTL controls state are Low)
3. For optimum operation of TOAT models, ensure the device case is properly connected to the ground plane (of PC board)

## Outline Drawing



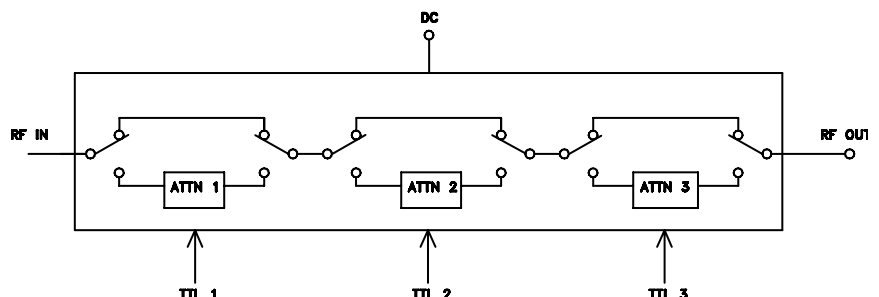
## Outline Dimensions (inch/mm)

| A     | B    | C    | D    | E     | F    |
|-------|------|------|------|-------|------|
| .600  | .250 | .25  | .016 | .020  | .04  |
| 15.24 | 6.35 | 6.35 | 0.41 | 0.51  | 1.02 |
| G     | H    | J    | K    | wt    |      |
| .400  | .200 | .200 | .100 | grams |      |
| 10.16 | 5.08 | 5.08 | 2.54 | 4.0   |      |

## Additional Specifications

|                                                                                                                                             |                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| DC Voltage                                                                                                                                  | +5V                                         |
| DC Current                                                                                                                                  | 12mA max.                                   |
| Switching Time (50% TTL to within specified accuracy of the next-selected attenuation step, and to within 0.1 dB of steady-state Thru-Loss) | 10μs typ., 15μs max.,                       |
| TTL Input High Threshold                                                                                                                    | 2V min                                      |
| TTL Input Low Threshold                                                                                                                     | 0.8V max.                                   |
| TTL Toggle Rate                                                                                                                             | 50 kHz typ.                                 |
| 1dB Compression                                                                                                                             | 0 dBm (10-100 MHz)<br>+10 dBm (100-1000MHz) |

## Electrical Schematic



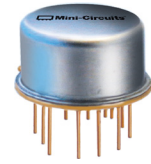
## Notes

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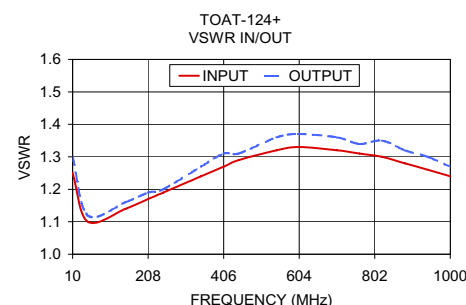
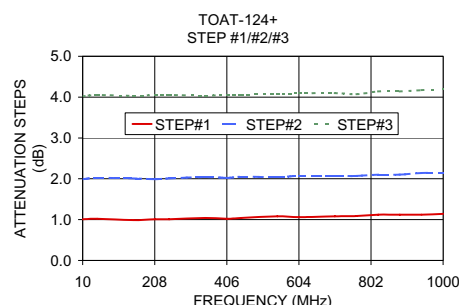
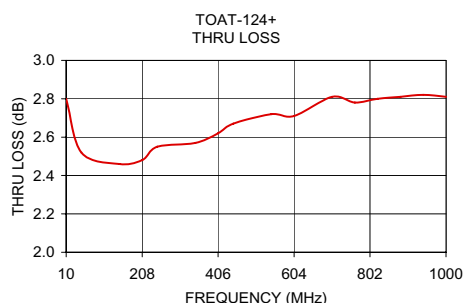
REV. B  
M108294  
TOAT-124+  
DJ/VV/CP  
140709



CASE STYLE: QQ96  
PRICE: \$64.45 ea. QTY (1-9)

## +RoHS Compliant

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



## Step Attenuation\* at TTL Control State

| FREQ.   | 000            | 001  | 010  | 011  | 100  | 101  | 110  | 111  |
|---------|----------------|------|------|------|------|------|------|------|
| (MHz)   | THRU LOSS (dB) | (dB) | (dB) | (dB) | (dB) | (dB) | (dB) | (dB) |
| 10.00   | 2.80           | 1.01 | 1.99 | 3.01 | 4.02 | 5.03 | 6.03 | 7.03 |
| 49.60   | 2.52           | 1.02 | 2.02 | 3.05 | 4.05 | 5.06 | 6.05 | 7.09 |
| 148.60  | 2.46           | 0.99 | 2.01 | 3.02 | 4.03 | 5.03 | 6.02 | 7.07 |
| 208.00  | 2.48           | 1.01 | 1.99 | 3.00 | 4.05 | 5.07 | 6.02 | 7.05 |
| 247.60  | 2.55           | 1.01 | 2.01 | 3.03 | 4.05 | 5.06 | 6.02 | 7.02 |
| 346.60  | 2.57           | 1.04 | 2.04 | 3.03 | 4.04 | 5.07 | 6.08 | 7.06 |
| 406.00  | 2.62           | 1.02 | 2.02 | 3.03 | 4.05 | 5.06 | 6.04 | 7.05 |
| 445.60  | 2.67           | 1.04 | 2.05 | 3.09 | 4.06 | 5.11 | 6.06 | 7.09 |
| 544.60  | 2.72           | 1.08 | 2.04 | 3.11 | 4.08 | 5.14 | 6.06 | 7.13 |
| 604.00  | 2.71           | 1.06 | 2.07 | 3.11 | 4.09 | 5.14 | 6.11 | 7.15 |
| 703.00  | 2.81           | 1.08 | 2.07 | 3.11 | 4.10 | 5.17 | 6.09 | 7.16 |
| 762.40  | 2.78           | 1.09 | 2.07 | 3.17 | 4.07 | 5.20 | 6.10 | 7.21 |
| 821.80  | 2.80           | 1.12 | 2.10 | 3.20 | 4.14 | 5.25 | 6.17 | 7.27 |
| 881.20  | 2.81           | 1.12 | 2.10 | 3.19 | 4.14 | 5.23 | 6.22 | 7.30 |
| 940.60  | 2.82           | 1.12 | 2.14 | 3.20 | 4.17 | 5.31 | 6.22 | 7.35 |
| 1000.00 | 2.81           | 1.14 | 2.14 | 3.28 | 4.19 | 5.37 | 6.28 | 7.42 |

## INPUT VSWR

| FREQ.   | 001  | 010  | 011  | 100  | 101  | 110  | 111  |
|---------|------|------|------|------|------|------|------|
| (MHz)   |      |      |      |      |      |      |      |
| 10.00   | 1.25 | 1.26 | 1.22 | 1.27 | 1.23 | 1.24 | 1.20 |
| 49.60   | 1.10 | 1.10 | 1.09 | 1.10 | 1.09 | 1.09 | 1.08 |
| 148.60  | 1.14 | 1.12 | 1.12 | 1.13 | 1.12 | 1.11 | 1.11 |
| 208.00  | 1.17 | 1.15 | 1.15 | 1.16 | 1.16 | 1.14 | 1.14 |
| 247.60  | 1.19 | 1.17 | 1.17 | 1.17 | 1.18 | 1.16 | 1.16 |
| 346.60  | 1.24 | 1.21 | 1.22 | 1.22 | 1.23 | 1.20 | 1.22 |
| 406.00  | 1.27 | 1.24 | 1.25 | 1.24 | 1.26 | 1.22 | 1.24 |
| 445.60  | 1.29 | 1.25 | 1.27 | 1.26 | 1.27 | 1.24 | 1.26 |
| 544.60  | 1.32 | 1.28 | 1.30 | 1.29 | 1.31 | 1.27 | 1.30 |
| 604.00  | 1.33 | 1.29 | 1.31 | 1.31 | 1.33 | 1.29 | 1.32 |
| 703.00  | 1.32 | 1.28 | 1.32 | 1.31 | 1.33 | 1.29 | 1.34 |
| 762.40  | 1.31 | 1.28 | 1.32 | 1.31 | 1.34 | 1.29 | 1.34 |
| 821.80  | 1.30 | 1.26 | 1.31 | 1.30 | 1.33 | 1.29 | 1.35 |
| 881.20  | 1.28 | 1.25 | 1.31 | 1.29 | 1.33 | 1.29 | 1.35 |
| 940.60  | 1.26 | 1.23 | 1.30 | 1.27 | 1.32 | 1.27 | 1.34 |
| 1000.00 | 1.24 | 1.21 | 1.29 | 1.25 | 1.31 | 1.26 | 1.34 |

## OUTPUT VSWR

| FREQ.   | 001  | 010  | 011  | 100  | 101  | 110  | 111  |
|---------|------|------|------|------|------|------|------|
| (MHz)   |      |      |      |      |      |      |      |
| 10.00   | 1.30 | 1.27 | 1.25 | 1.16 | 1.16 | 1.15 | 1.15 |
| 49.60   | 1.12 | 1.10 | 1.10 | 1.07 | 1.07 | 1.07 | 1.06 |
| 148.60  | 1.16 | 1.13 | 1.14 | 1.09 | 1.10 | 1.09 | 1.09 |
| 208.00  | 1.19 | 1.16 | 1.16 | 1.11 | 1.11 | 1.09 | 1.10 |
| 247.60  | 1.20 | 1.18 | 1.18 | 1.13 | 1.13 | 1.11 | 1.12 |
| 346.60  | 1.27 | 1.23 | 1.23 | 1.16 | 1.17 | 1.16 | 1.15 |
| 406.00  | 1.31 | 1.25 | 1.26 | 1.18 | 1.19 | 1.17 | 1.19 |
| 445.60  | 1.31 | 1.27 | 1.28 | 1.19 | 1.20 | 1.18 | 1.18 |
| 544.60  | 1.36 | 1.30 | 1.30 | 1.21 | 1.22 | 1.21 | 1.21 |
| 604.00  | 1.37 | 1.31 | 1.31 | 1.21 | 1.22 | 1.21 | 1.23 |
| 703.00  | 1.36 | 1.32 | 1.33 | 1.22 | 1.23 | 1.24 | 1.23 |
| 762.40  | 1.34 | 1.30 | 1.32 | 1.23 | 1.24 | 1.25 | 1.25 |
| 821.80  | 1.35 | 1.30 | 1.31 | 1.22 | 1.24 | 1.25 | 1.24 |
| 881.20  | 1.32 | 1.29 | 1.28 | 1.22 | 1.22 | 1.23 | 1.25 |
| 940.60  | 1.30 | 1.27 | 1.29 | 1.23 | 1.23 | 1.25 | 1.25 |
| 1000.00 | 1.27 | 1.26 | 1.27 | 1.23 | 1.23 | 1.27 | 1.24 |

\* Step attenuation above thru-loss (TTL logic 000)

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