

Surface Mount Digital Step Attenuator DAT-15575A Series

75Ω 0 to 15.5 dB, 0.5 dB Step 1MHz to 2.5 GHz



CASE STYLE: DG983-2

The Big Deal

- Wideband, operates up to 2.5 GHz
- Glitchless attenuation transitions
- High IP3, 52 dBm

Product Overview

The DAT-15575A+ series of 75Ω digital step attenuators provides adjustable attenuation from 0 to 15.5 dB in 0.5 dB steps. The control is a 5-bit serial/parallel interface, and the attenuators operate with either single positive or dual (positive and negative) supply voltage. DAT-15575A+ series models are produced by a unique CMOS process on silicon, offering the performance of GaAs with the advantages of conventional CMOS devices.

Key Features

| Feature | Advantages |
|--|---|
| Wideband operation, specified from 1MHz to 2.5 GHz | Can be used in multiple applications such as various versions of DOCSIS, satellite and defense, reducing part count. |
| Serial or parallel interface | Models available with serial or parallel interface mode to suit customer demand. |
| Good VSWR, 1.3:1 typ. | Eases interfacing with adjacent components and results in low amplitude ripple. |
| Single positive supply models: (Model suffixes: -SP+ and -PP+) +2.3 to +3.6V+ | Use of single positive supply simplifies power supply design. An internal negative voltage generator supplies the desired negative voltage. Single positive supply results in excellent spurious performance, -140 dBm typical. |
| Dual supply models: (Model suffixes: -SN+ and -PN+) +2.7 to +3.6V (Positive) and -3.6 to -3.2V (Negative) | Dual supply provides spurious-free operation. It also allows fast switching up to 1 MHz (vs. 25 kHz for single supply). |
| Useable over a wide range of supply voltages, +2.3/2.7 to 5.2V | Wide range of positive operating voltages allows the DAT-15575A+ Series of models to be used in a wide range of applications. See Application Note AN-70-032 for operation above +3.6V |
| Footprint compatible to DAT-15575-XX+ Series (XX=SN/SP/PN/PP) | Can fit into existing footprint and provide wideband performance, to 2.5 GHz instead of 2.0 GHz. |
| Glitchless Attenuation Transitions, 0.26 typical | Compared to previous generation of digital attenuators which is a vast improvement. |

Digital Step Attenuator

75Ω 1-2500 MHz

15.5 dB, 0.5 dB Step

5 Bit, Serial Control Interface, Single Positive Supply Voltage, +3V



Generic photo used for illustration purposes only

DAT-15575A-SP+

CASE STYLE: DG983-2

+RoHS Compliant

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

Product Features

- Single positive supply voltage, +3V
- Immune to latch up
- Glitchless attenuation transitions
- Excellent accuracy, 0.1 dB Typ
- Serial control interface
- Low Insertion Loss
- High IP3, +55-69 dBm
- Very low DC power consumption
- Small size 4.0 x 4.0 mm

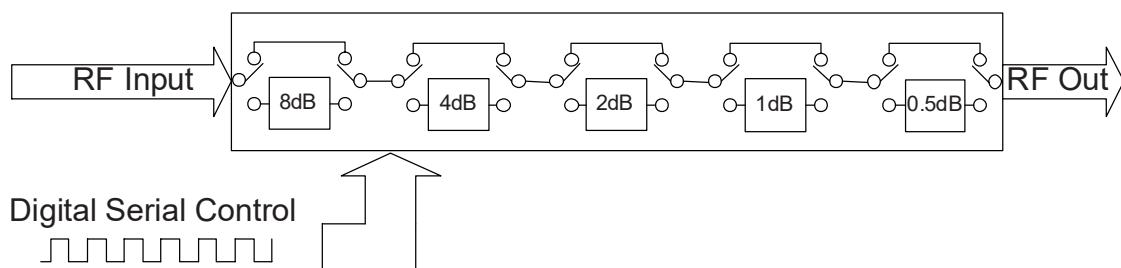
Typical Applications

- DOCSIS 3.1
- Portable Wireless
- Fiber CPE and infrastructure
- MMDS & Wireless LAN
- Satellite CPE and infrastructure
- UNII & Hiper LAN
- Power amplifier distortion canceling loop

General Description

The DAT-15575A-SP+ is a 75Ω RF digital step attenuator that offers an attenuation range up to 15.5 dB in 0.5 dB steps. The control is a 5-bit serial interface, operating on a single +3 volt supply. The DAT-15575A-SP+ is produced using a unique CMOS process on silicon, offering the performance of GaAs, with the advantages of conventional CMOS devices.

Simplified Schematic



REV. OR
M155582
DAT-15575A-SP+
RS/CP/AM
200513
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Digital Step Attenuator

DAT-15575A-SP+

RF Electrical Specifications, 1-2500 MHz, T_{AMB}=25°C, V_{DD}=+3V, 75Ω

| Parameter | Freq. Range (GHz) | Min. | Typ. | Max. | Units |
|--|-------------------|------|------------|------------|-------|
| Accuracy @ 0.5 dB Attenuation Setting | 0.001-1.2 | — | 0.03 | 0.17 | dB |
| | 1.2-2.0 | — | 0.05 | 0.18 | |
| | 2.0-2.5 | — | 0.1 | 0.19 | |
| Accuracy @ 1 dB Attenuation Setting | 0.001-1.2 | — | 0.03 | 0.18 | dB |
| | 1.2-2.0 | — | 0.1 | 0.20 | |
| | 2.0-2.5 | — | 0.1 | 0.23 | |
| Accuracy @ 2 dB Attenuation Setting | 0.001-1.2 | — | 0.07 | 0.21 | dB |
| | 1.2-2.0 | — | 0.15 | 0.26 | |
| | 2.0-2.5 | — | 0.15 | 0.31 | |
| Accuracy @ 4 dB Attenuation Setting | 0.001-1.2 | — | 0.05 | 0.27 | dB |
| | 1.2-2.0 | — | 0.15 | 0.36 | |
| | 2.0-2.5 | — | 0.2 | 0.47 | |
| Accuracy @ 8 dB Attenuation Setting | 0.001-1.2 | — | 0.1 | 0.39 | dB |
| | 1.2-2.0 | — | 0.24 | 0.60 | |
| | 2.0-2.5 | — | 0.35 | 0.79 | |
| Insertion Loss ¹ @ all attenuator set to 0dB | 0.001-1.2 | — | 1.2 | 1.8 | dB |
| | 1.2-2.5 | — | 1.6 | 1.9 | |
| VSWR | 0.001-1.2 | — | 1.3 | — | :1 |
| | 1.2-2.5 | — | 1.4 | — | |
| Input IP3 (at Min. and Max. Attenuation) | .005-2.5 | — | 55-69 | — | dBm |
| Input IP2 | .005-2.5 | — | See Fig. 1 | — | dBm |
| Input Power @ 0.2dB Compression (at Min. and Max. Attenuation) | 0.030-2.5 | — | +30 | — | dBm |
| Input Operating Power | 1 MHz to 30 MHz | — | — | See Fig. 2 | dBm |
| | >30 MHz | — | — | +24 | |
| Thermal Resistance (Junction to case) | — | — | 25 | — | °C/W |

DC Electrical Specifications

| Parameter | Min. | Typ. | Max. | Units |
|----------------------------------|------|------|------------------|-------|
| V _{DD} , Supply Voltage | 2.3 | 3 | 3.6 ² | V |
| I _{DD} Supply Current | — | — | 200 | μA |
| Control Input Low | -0.3 | — | 0.6 ³ | V |
| Control Input High | 1.17 | — | 3.6 | V |
| Control Current | — | — | 20 | μA |

1. I. Loss values are de-embedded from test board Loss (test board's Insertion Loss: 0.10dB @ 100MHz, 0.40dB @ 1200MHz, 0.55dB @ 2000MHz, 0.75dB @ 4000MHz).

2. For operation above +3.6V see application note, AN-70-032

3. 0V during power-up.

Absolute Maximum Ratings⁴

| Parameter | Ratings |
|------------------------|-----------------------|
| Operating Temperature | -40°C to 105°C |
| Storage Temperature | -65°C to 150°C |
| V _{DD} | -0.3V Min., 5.5V Max. |
| Voltage on any input | -0.3V Min., 3.6V Max. |
| 1-30 MHz | Figure 2 |
| Input Power 30-2500MHz | +30dBm |

4. Permanent damage may occur if any of these limits are exceeded.

5. Operation between max operating and absolute max input power will result in reduced reliability.

Switching Specifications

| Parameter | Min. | Typ. | Max. | Units |
|--|------|------|------|-------|
| Switching Speed, 50% Control to 0.5dB of Attenuation Value | — | 0.4 | 0.7 | μSec |
| Switching Control Frequency | — | — | 25 | kHz |

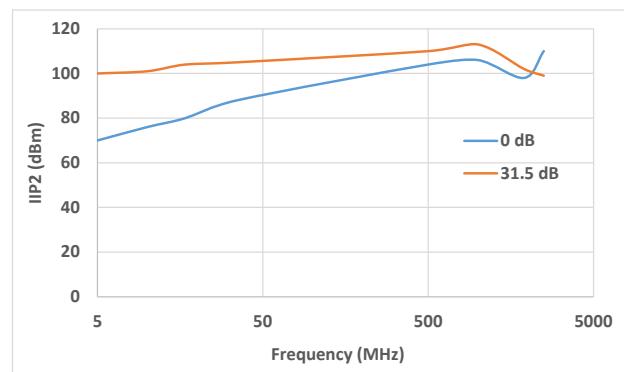


Figure 1. IP2 vs. frequency and attenuation



Digital Step Attenuator

DAT-15575A-SP+

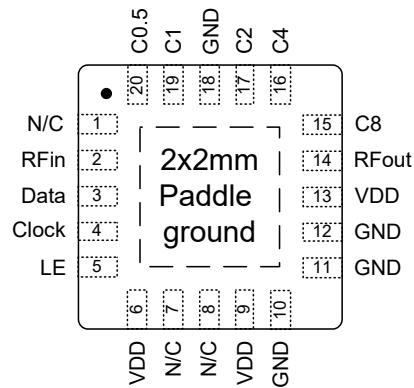
Pin Description

| Function | Pin Number | Description |
|-----------------|------------|---|
| N/C | 1 | Not connected (Note 8) |
| RF in | 2 | RF in port (Note 1) |
| Data | 3 | Serial Interface data input (Note 3) |
| Clock | 4 | Serial Interface clock input |
| LE | 5 | Latch Enable Input (Note 2) |
| V _{DD} | 6 | Power Supply |
| N/C | 7 | Not connected (Note 7) |
| N/C | 8 | Not connected |
| V _{DD} | 9 | Power Supply |
| GND | 10 | Ground connection |
| GND | 11 | Ground connection |
| GND | 12 | Ground connection (Note 6) |
| V _{DD} | 13 | Power Supply |
| RF out | 14 | RF out port (Note 1) |
| C8 | 15 | Control for attenuation bit, 8 dB (Note 4) |
| C4 | 16 | Control for attenuation bit, 4 dB (Note 4) |
| C2 | 17 | Control for attenuation bit, 2 dB (Note 4) |
| GND | 18 | Ground Connection |
| C1 | 19 | Control for attenuation bit, 1 dB (Note 4) |
| C0.5 | 20 | Control for attenuation bit, 0.5 dB (Note 4, 7) |
| GND | Paddle | Paddle ground (Note 5) |

Notes:

1. Both RF ports must be held at 0VDC or DC blocked with an external series capacitor. RF in and RF out are interchangeable.
2. Latch Enable (LE) has an internal 2MΩ pull-up resistor to V_{DD}.
3. Place a 10KΩ resistor in series to be compatible with previous generation of models. 10KΩ can be omitted in new designs.
4. Refer to Power-up Control Settings.
5. The exposed solder pad on the bottom of the package (See Pin configuration) must be grounded for proper device operation.
6. Ground must be less than 80 mil (0.08") from Pin 12 for proper device operation.
7. This pin has internal 1MΩ short resistor to ground.
8. Place 10KΩ resistor to ground externally.

Pin Configuration (Top View)



Device Marking

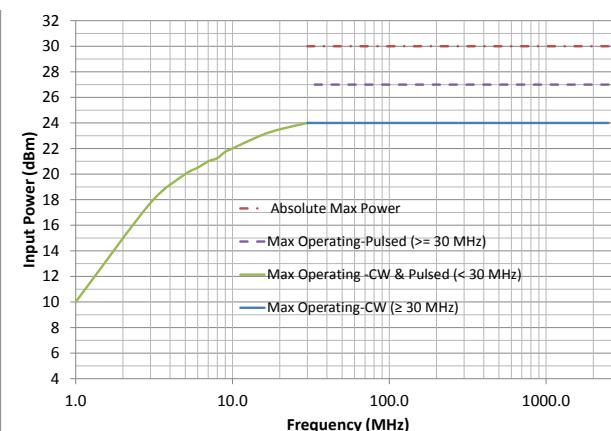
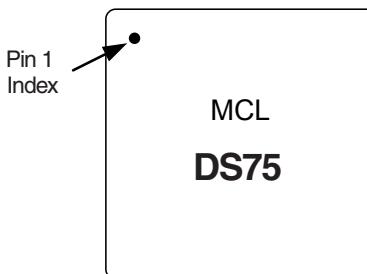
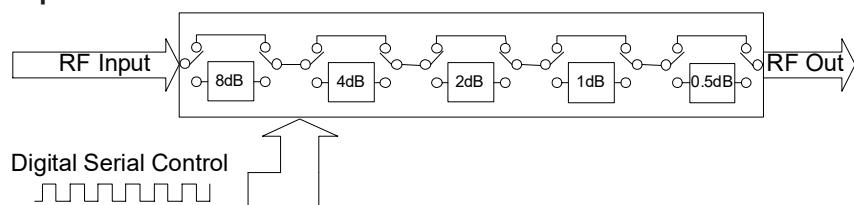


Figure 2. Max Input power vs. frequency.
Pulsed Power: 5% duty cycle, 4620 μS period

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Simplified Schematic

The DAT-15575A-SP+ Serial interface consists of 5 control bits that select the desired attenuation state, as shown in **Table 1: Truth Table**

| Table 1. Truth Table | | | | | |
|----------------------|----|----|----|----|------|
| Attenuation State | C8 | C4 | C2 | C1 | C0.5 |
| Reference | 0 | 0 | 0 | 0 | 0 |
| 0.5 (dB) | 0 | 0 | 0 | 0 | 1 |
| 1 (dB) | 0 | 0 | 0 | 1 | 0 |
| 2 (dB) | 0 | 0 | 1 | 0 | 0 |
| 4 (dB) | 0 | 1 | 0 | 0 | 0 |
| 8 (dB) | 1 | 0 | 0 | 0 | 0 |
| 15.5 (dB) | 1 | 1 | 1 | 1 | 1 |

Note: Not all 32 possible combinations of C0.5 - C8 are shown in table

The serial interface is a 5-bit serial in, parallel-out shift register buffered by a transparent latch.

It is controlled by three CMOS-compatible signals: Data, Clock, and Latch Enable (LE). The Data and Clock inputs allow data to be serially entered into the shift register, a process that is independent of the state of the LE input.

The LE input controls the latch. When LE is HIGH, the latch is transparent and the contents of the serial shift register control the attenuator. When LE is brought LOW, data in the shift register is latched.

The shift register should be loaded while LE is held LOW to prevent the attenuator value from changing as data is entered. The LE input should then be toggled HIGH and brought LOW again, latching the new data. The timing for this operation is defined by **Figure 3** (Serial Interface Timing Diagram) and **Table 2** (Serial Interface AC Characteristics).

Figure 3: Serial Interface Timing Diagram

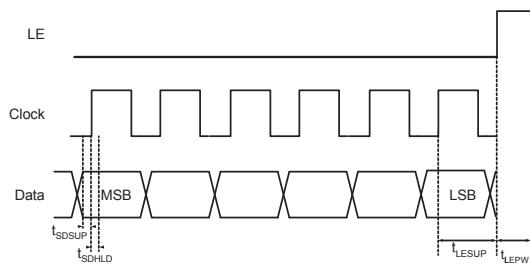


Table 2. Serial Interface AC Characteristics

| Symbol | Parameter | Min. | Max. | Units |
|-------------|--|------|------|-------|
| f_{clk} | Serial data clock frequency (Note 1) | | 10 | MHz |
| t_{clkH} | Serial clock HIGH time | 30 | | ns |
| t_{clkL} | Serial clock LOW time | 30 | | ns |
| t_{LESUP} | LE set-up time after last clock falling edge | 10 | | ns |
| t_{LEPW} | LE minimum pulse width | 30 | | ns |
| t_{SDSUP} | Serial data set-up time before clock rising edge | 10 | | ns |
| t_{SDHLD} | Serial data hold time after clock falling edge | 10 | | ns |

Note 1. f_{clk} verified during the functional pattern test. Serial programming sections of the functional pattern are clocked at 10MHz to verify f_{clk} specification.

Digital Step Attenuator

DAT-15575A-SP+

The DAT-15575A-SP+, uses a common 5-bit serial word format, as shown in **Table 3**: 5-Bit attenuator Serial Programming Register Map.

The bit B4, corresponds to the 8-dB Step and the last bit, the LSB, corresponds to the 0.5 dB step.

| Table 3. 6-Bit attenuator Serial Programming Register Map | | | | | |
|---|----|----|----|----|--------------------|
| B5 | B4 | B3 | B2 | B1 | B0 |
| 0 | C8 | C4 | C2 | C1 | C0.5 |
| ↑ MSB (first in) | | | | | ↑ LSB (last in) |

Power-up Control Settings

The DAT-15575A-SP+ always assumes a specifiable attenuation setting on power-up, allowing a known attenuation state to be established before an initial serial control word is provided.

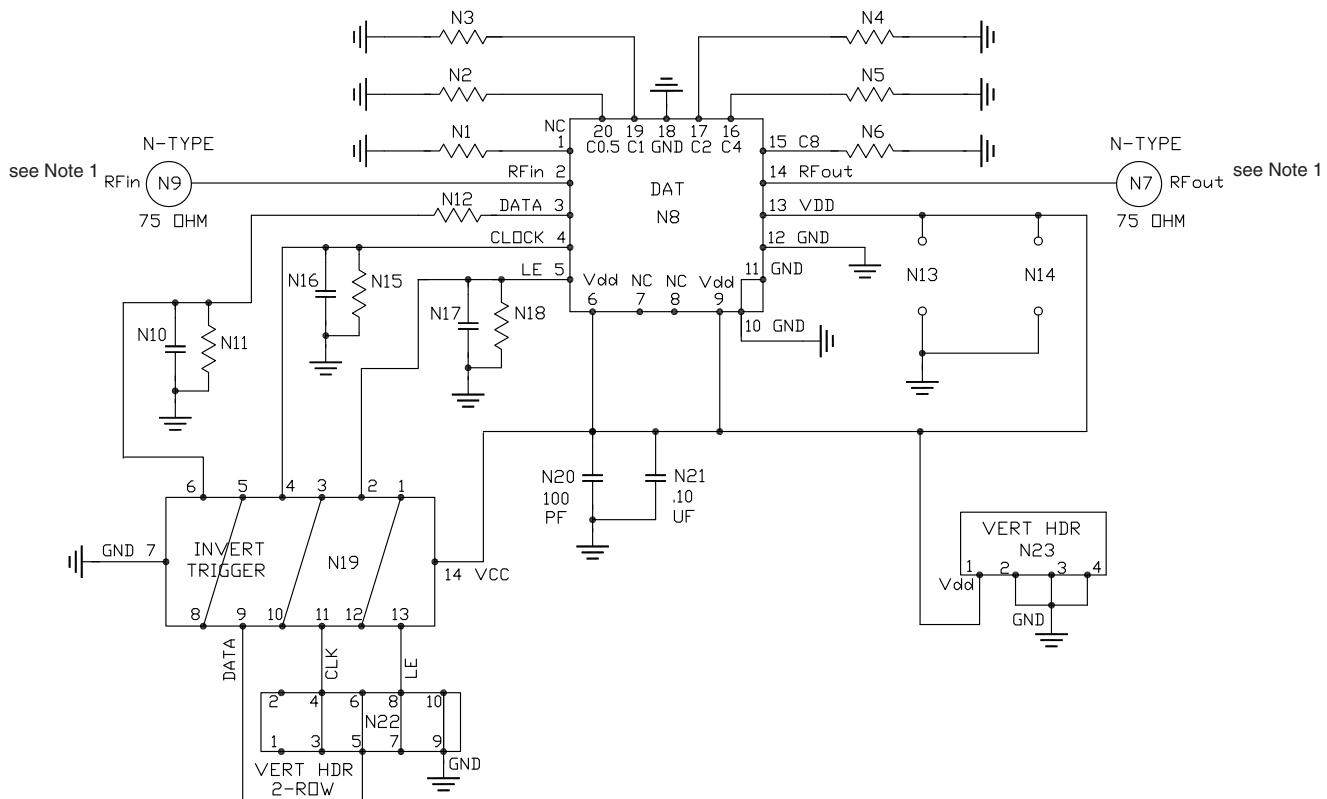
When the attenuator powers up, the five control bits are set to whatever data is present on the six data inputs (C0.5 to C8).

This allows any one of the 32 attenuation settings to be specified as the power-up state.

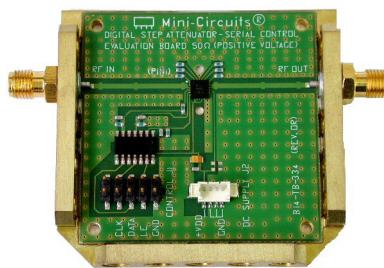
Digital Step Attenuator

DAT-15575A-SP+

TB-344 Evaluation Board Schematic Diagram



Note 1: Both RF ports must be held at 0VDC or DC blocked with an external series capacitor.



TB-344

| Bill of Materials | |
|---------------------------|---------------------------------------|
| N1-N6, N11, N12, N15, N18 | Resistor 0603 10 KOhm +/- 1% |
| N10, N16, N17, N20 | NPO Capacitor 0603 100pF +/- 5% |
| N21 | Tantalum Capacitor 0805 100nF +/- 10% |
| N19 | Hex Invert Schmitt Trigger MSL1 |

**N12 can be reduced to 0 Ohms

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Additional Detailed Technical Information

additional information is available on our dash board. To access this information [click here](#)

| | |
|---|--|
| Performance Data | Data Table |
| | Swept Graphs |
| | S-Parameter (S2P Files) Data Set (.zip file) |
| Case Style | DG983-2 Plastic package, exposed paddle, lead finish: NiPdAu |
| Tape & Reel Standard quantities available on reel | F87 7" reels with 20, 50, 100 or 200 devices 13" reels with 3K devices |
| Suggested Layout for PCB Design | PL-203 |
| Evaluation Board | TB-344 |
| Environmental Ratings | ENV33T1 |

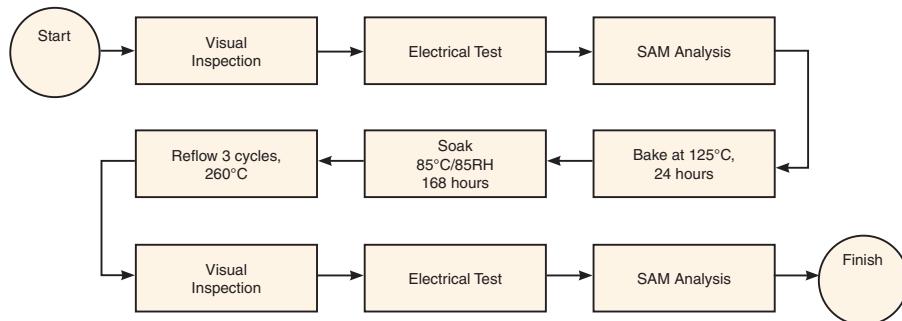
ESD Rating

Human Body Model (HBM): Class 1C (1000 to <2000V) in accordance with MIL-STD-883 method 3015 (pass 1500V).

Charge Device Model (CDM): Class C3 (>1000V) per JESD22-C101F

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL Test Flow Chart**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.
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Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=-45degC

| FREQUENCY (MHz) | STEP ATTENUATION* AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 THRU LOSS | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 0.93 | 0.54 | 1.06 | 2.07 | 4.14 | 8.22 | 15.80 |
| 50 | 0.94 | 0.54 | 1.05 | 2.06 | 4.13 | 8.20 | 15.81 |
| 100 | 0.94 | 0.53 | 1.05 | 2.05 | 4.13 | 8.20 | 15.80 |
| 150 | 0.96 | 0.53 | 1.05 | 2.05 | 4.12 | 8.20 | 15.79 |
| 200 | 0.96 | 0.53 | 1.05 | 2.05 | 4.12 | 8.20 | 15.80 |
| 250 | 0.96 | 0.53 | 1.05 | 2.06 | 4.13 | 8.20 | 15.80 |
| 300 | 0.96 | 0.54 | 1.05 | 2.06 | 4.13 | 8.21 | 15.80 |
| 350 | 0.97 | 0.53 | 1.05 | 2.06 | 4.13 | 8.21 | 15.82 |
| 400 | 0.98 | 0.53 | 1.05 | 2.06 | 4.13 | 8.21 | 15.82 |
| 450 | 0.99 | 0.53 | 1.04 | 2.05 | 4.12 | 8.20 | 15.80 |
| 500 | 1.00 | 0.53 | 1.04 | 2.05 | 4.12 | 8.19 | 15.79 |
| 550 | 1.02 | 0.53 | 1.04 | 2.05 | 4.11 | 8.18 | 15.77 |
| 600 | 1.04 | 0.53 | 1.04 | 2.04 | 4.10 | 8.17 | 15.77 |
| 700 | 1.07 | 0.52 | 1.03 | 2.03 | 4.09 | 8.15 | 15.74 |
| 800 | 1.12 | 0.52 | 1.03 | 2.03 | 4.08 | 8.14 | 15.71 |
| 900 | 1.13 | 0.52 | 1.03 | 2.03 | 4.08 | 8.14 | 15.73 |
| 1000 | 1.16 | 0.52 | 1.03 | 2.03 | 4.07 | 8.15 | 15.76 |
| 1100 | 1.19 | 0.52 | 1.02 | 2.02 | 4.07 | 8.14 | 15.75 |
| 1200 | 1.21 | 0.51 | 1.02 | 2.02 | 4.07 | 8.13 | 15.71 |
| 1300 | 1.20 | 0.51 | 1.02 | 2.02 | 4.06 | 8.12 | 15.67 |
| 1400 | 1.19 | 0.51 | 1.02 | 2.02 | 4.06 | 8.11 | 15.62 |
| 1500 | 1.22 | 0.51 | 1.02 | 2.02 | 4.08 | 8.15 | 15.72 |
| 1600 | 1.27 | 0.51 | 1.02 | 2.03 | 4.09 | 8.18 | 15.81 |
| 1700 | 1.27 | 0.51 | 1.02 | 2.02 | 4.10 | 8.18 | 15.78 |
| 1800 | 1.28 | 0.51 | 1.02 | 2.03 | 4.10 | 8.17 | 15.74 |
| 1900 | 1.29 | 0.51 | 1.03 | 2.03 | 4.11 | 8.17 | 15.68 |
| 2000 | 1.31 | 0.51 | 1.03 | 2.03 | 4.11 | 8.17 | 15.64 |
| 2100 | 1.32 | 0.51 | 1.03 | 2.03 | 4.12 | 8.19 | 15.64 |
| 2200 | 1.32 | 0.51 | 1.03 | 2.03 | 4.14 | 8.22 | 15.63 |
| 2300 | 1.39 | 0.51 | 1.03 | 2.04 | 4.15 | 8.27 | 15.73 |
| 2400 | 1.46 | 0.51 | 1.04 | 2.05 | 4.19 | 8.34 | 15.88 |
| 2500 | 1.25 | 0.51 | 1.04 | 2.05 | 4.18 | 8.30 | 15.67 |
| 2600 | 1.15 | 0.52 | 1.05 | 2.07 | 4.24 | 8.39 | 15.77 |
| 2700 | 1.13 | 0.52 | 1.06 | 2.09 | 4.30 | 8.46 | 15.85 |
| 2800 | 1.28 | 0.51 | 1.05 | 2.09 | 4.33 | 8.53 | 16.03 |
| 2900 | 1.59 | 0.49 | 1.03 | 2.05 | 4.31 | 8.51 | 16.11 |
| 3000 | 2.06 | 0.47 | 0.99 | 2.00 | 4.26 | 8.49 | 16.33 |

* Step Attenuation above Thru Loss (TTL Logic 00000).



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IF/RF MICROWAVE COMPONENTS



REV. OR

DAT-15575A-SN+

10/14/2016

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Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=-45degC

| FREQUENCY (MHz) | INPUT RETURN LOSS AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 0 dB | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 20.22 | 21.76 | 23.01 | 24.78 | 35.88 | 28.43 | 24.30 |
| 50 | 19.91 | 21.36 | 22.55 | 24.17 | 38.28 | 29.62 | 25.12 |
| 100 | 20.03 | 21.51 | 22.65 | 24.24 | 37.04 | 29.52 | 25.17 |
| 150 | 19.73 | 21.10 | 22.19 | 23.65 | 39.01 | 30.91 | 26.08 |
| 200 | 19.80 | 21.19 | 22.29 | 23.74 | 39.08 | 30.77 | 26.04 |
| 250 | 19.57 | 20.96 | 22.03 | 23.49 | 41.55 | 31.44 | 26.35 |
| 300 | 19.65 | 21.05 | 22.19 | 23.72 | 38.04 | 30.31 | 25.70 |
| 350 | 19.48 | 20.89 | 22.02 | 23.54 | 36.79 | 30.15 | 25.65 |
| 400 | 19.51 | 20.92 | 22.02 | 23.56 | 33.05 | 28.84 | 25.07 |
| 450 | 19.42 | 20.80 | 21.89 | 23.34 | 32.11 | 28.83 | 25.25 |
| 500 | 19.42 | 20.74 | 21.77 | 23.12 | 30.25 | 28.10 | 25.12 |
| 550 | 19.41 | 20.71 | 21.71 | 22.99 | 30.35 | 28.52 | 25.60 |
| 600 | 19.39 | 20.66 | 21.60 | 22.82 | 29.52 | 28.15 | 25.65 |
| 700 | 19.48 | 20.68 | 21.60 | 22.72 | 29.19 | 28.11 | 25.94 |
| 800 | 19.32 | 20.49 | 21.35 | 22.34 | 28.16 | 27.46 | 25.81 |
| 900 | 19.05 | 20.16 | 20.96 | 21.87 | 27.08 | 26.60 | 25.40 |
| 1000 | 18.61 | 19.67 | 20.44 | 21.30 | 26.43 | 26.18 | 25.35 |
| 1100 | 18.07 | 19.08 | 19.83 | 20.63 | 25.88 | 26.07 | 25.80 |
| 1200 | 17.68 | 18.64 | 19.33 | 20.07 | 25.54 | 26.11 | 26.57 |
| 1300 | 17.29 | 18.20 | 18.87 | 19.55 | 25.55 | 26.67 | 28.14 |
| 1400 | 16.80 | 17.66 | 18.32 | 18.97 | 25.26 | 26.94 | 29.70 |
| 1500 | 16.60 | 17.45 | 18.09 | 18.76 | 25.55 | 27.96 | 32.56 |
| 1600 | 16.77 | 17.62 | 18.26 | 18.92 | 26.46 | 29.93 | 39.27 |
| 1700 | 17.69 | 18.51 | 19.15 | 19.73 | 27.85 | 31.49 | 33.29 |
| 1800 | 19.01 | 19.72 | 20.29 | 20.74 | 26.87 | 28.13 | 26.56 |
| 1900 | 20.02 | 20.48 | 20.88 | 21.22 | 23.93 | 24.33 | 22.80 |
| 2000 | 20.36 | 20.53 | 20.73 | 21.05 | 21.32 | 21.48 | 20.20 |
| 2100 | 20.47 | 20.31 | 20.33 | 20.59 | 19.25 | 19.18 | 18.11 |
| 2200 | 20.06 | 19.76 | 19.70 | 19.91 | 17.93 | 17.75 | 16.81 |
| 2300 | 21.78 | 21.40 | 21.21 | 21.36 | 18.25 | 17.69 | 16.58 |
| 2400 | 26.45 | 25.08 | 24.09 | 23.31 | 17.95 | 16.81 | 15.65 |
| 2500 | 32.58 | 28.13 | 25.50 | 23.20 | 16.99 | 15.48 | 14.42 |
| 2600 | 24.79 | 23.94 | 22.55 | 20.68 | 15.68 | 14.04 | 13.11 |
| 2700 | 19.06 | 19.34 | 19.06 | 18.19 | 14.67 | 13.09 | 12.28 |
| 2800 | 14.86 | 15.41 | 15.63 | 15.58 | 13.70 | 12.44 | 11.81 |
| 2900 | 12.26 | 12.86 | 13.26 | 13.60 | 12.88 | 12.06 | 11.63 |
| 3000 | 10.49 | 11.10 | 11.59 | 12.14 | 12.32 | 11.97 | 11.82 |



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Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=-45degC

| FREQUENCY (MHz) | OUTPUT RETURN LOSS AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|---|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 0 dB | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 20.09 | 21.82 | 22.48 | 24.72 | 28.83 | 28.94 | 24.39 |
| 50 | 19.76 | 21.36 | 22.07 | 24.00 | 27.63 | 30.16 | 25.20 |
| 100 | 19.67 | 21.24 | 21.91 | 23.78 | 27.21 | 30.39 | 25.43 |
| 150 | 19.27 | 20.79 | 21.40 | 23.13 | 26.26 | 32.30 | 26.53 |
| 200 | 19.43 | 20.98 | 21.59 | 23.40 | 26.62 | 31.85 | 26.26 |
| 250 | 19.40 | 20.94 | 21.57 | 23.37 | 26.70 | 32.07 | 26.29 |
| 300 | 19.56 | 21.16 | 21.81 | 23.73 | 27.19 | 30.41 | 25.46 |
| 350 | 19.36 | 20.91 | 21.58 | 23.45 | 26.79 | 30.28 | 25.46 |
| 400 | 19.13 | 20.68 | 21.33 | 23.16 | 26.14 | 29.01 | 25.02 |
| 450 | 18.78 | 20.25 | 20.87 | 22.62 | 25.37 | 29.52 | 25.58 |
| 500 | 18.45 | 19.84 | 20.44 | 22.05 | 24.47 | 29.13 | 25.81 |
| 550 | 18.38 | 19.75 | 20.31 | 21.86 | 24.22 | 30.02 | 26.58 |
| 600 | 18.30 | 19.62 | 20.15 | 21.67 | 23.80 | 29.98 | 26.91 |
| 700 | 18.42 | 19.73 | 20.22 | 21.67 | 23.65 | 30.44 | 27.62 |
| 800 | 18.60 | 19.89 | 20.33 | 21.74 | 23.46 | 30.24 | 27.96 |
| 900 | 19.26 | 20.65 | 21.06 | 22.50 | 24.00 | 29.11 | 26.93 |
| 1000 | 19.58 | 20.93 | 21.30 | 22.62 | 23.80 | 28.38 | 26.68 |
| 1100 | 19.17 | 20.40 | 20.69 | 21.83 | 22.60 | 27.19 | 26.60 |
| 1200 | 18.89 | 20.05 | 20.26 | 21.26 | 21.76 | 26.34 | 26.54 |
| 1300 | 19.08 | 20.24 | 20.41 | 21.35 | 21.61 | 25.95 | 26.21 |
| 1400 | 19.26 | 20.44 | 20.54 | 21.45 | 21.56 | 25.90 | 26.27 |
| 1500 | 19.04 | 20.18 | 20.26 | 21.11 | 21.28 | 26.94 | 28.04 |
| 1600 | 18.11 | 19.13 | 19.19 | 19.95 | 20.14 | 26.12 | 28.26 |
| 1700 | 17.92 | 18.92 | 19.01 | 19.80 | 20.15 | 27.25 | 30.57 |
| 1800 | 17.84 | 18.80 | 18.98 | 19.84 | 20.66 | 30.51 | 39.82 |
| 1900 | 17.90 | 18.82 | 19.09 | 20.04 | 21.67 | 32.79 | 34.08 |
| 2000 | 17.92 | 18.66 | 19.07 | 20.01 | 22.57 | 27.39 | 25.77 |
| 2100 | 17.73 | 18.45 | 18.94 | 19.92 | 23.03 | 24.78 | 22.94 |
| 2200 | 18.95 | 19.61 | 20.20 | 21.13 | 25.19 | 22.41 | 20.43 |
| 2300 | 20.55 | 20.97 | 21.59 | 22.04 | 25.54 | 19.72 | 18.00 |
| 2400 | 23.22 | 23.53 | 24.15 | 24.19 | 26.88 | 19.02 | 17.28 |
| 2500 | 33.21 | 32.92 | 33.28 | 28.77 | 25.00 | 17.63 | 16.09 |
| 2600 | 31.80 | 35.09 | 31.55 | 26.88 | 21.17 | 16.12 | 14.76 |
| 2700 | 21.25 | 22.76 | 22.41 | 21.92 | 17.98 | 14.79 | 13.62 |
| 2800 | 15.48 | 16.59 | 16.77 | 17.43 | 15.52 | 14.06 | 13.18 |
| 2900 | 11.84 | 12.71 | 13.01 | 13.83 | 13.12 | 13.01 | 12.56 |
| 3000 | 9.65 | 10.39 | 10.72 | 11.57 | 11.47 | 12.26 | 12.27 |



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IF/RF MICROWAVE COMPONENTS

Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=25degC

| FREQUENCY (MHz) | STEP ATTENUATION* AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 THRU LOSS | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 1.07 | 0.51 | 1.01 | 2.02 | 4.03 | 8.03 | 15.57 |
| 50 | 1.07 | 0.52 | 1.02 | 2.03 | 4.03 | 8.05 | 15.55 |
| 100 | 1.08 | 0.52 | 1.02 | 2.03 | 4.03 | 8.04 | 15.56 |
| 150 | 1.09 | 0.51 | 1.02 | 2.02 | 4.03 | 8.04 | 15.56 |
| 200 | 1.10 | 0.52 | 1.02 | 2.03 | 4.03 | 8.05 | 15.55 |
| 250 | 1.11 | 0.52 | 1.02 | 2.02 | 4.03 | 8.04 | 15.57 |
| 300 | 1.12 | 0.51 | 1.02 | 2.02 | 4.03 | 8.04 | 15.54 |
| 350 | 1.14 | 0.51 | 1.01 | 2.02 | 4.03 | 8.03 | 15.55 |
| 400 | 1.16 | 0.51 | 1.01 | 2.02 | 4.03 | 8.03 | 15.54 |
| 450 | 1.17 | 0.51 | 1.01 | 2.02 | 4.02 | 8.02 | 15.53 |
| 500 | 1.18 | 0.51 | 1.01 | 2.01 | 4.02 | 8.02 | 15.54 |
| 550 | 1.20 | 0.51 | 1.01 | 2.01 | 4.02 | 8.01 | 15.53 |
| 600 | 1.22 | 0.51 | 1.01 | 2.01 | 4.01 | 8.02 | 15.52 |
| 700 | 1.26 | 0.50 | 1.01 | 2.01 | 4.00 | 8.00 | 15.51 |
| 800 | 1.31 | 0.50 | 1.00 | 2.01 | 4.00 | 7.99 | 15.50 |
| 900 | 1.33 | 0.50 | 1.01 | 2.00 | 4.00 | 8.00 | 15.52 |
| 1000 | 1.37 | 0.50 | 1.00 | 2.00 | 4.00 | 8.01 | 15.55 |
| 1100 | 1.40 | 0.50 | 1.00 | 2.00 | 4.00 | 8.00 | 15.54 |
| 1200 | 1.42 | 0.50 | 1.00 | 2.00 | 3.99 | 8.00 | 15.51 |
| 1300 | 1.43 | 0.50 | 1.00 | 2.00 | 3.99 | 7.98 | 15.46 |
| 1400 | 1.44 | 0.49 | 1.00 | 1.99 | 3.99 | 7.98 | 15.42 |
| 1500 | 1.49 | 0.50 | 1.00 | 2.00 | 4.01 | 8.02 | 15.54 |
| 1600 | 1.52 | 0.50 | 1.00 | 2.00 | 4.02 | 8.05 | 15.60 |
| 1700 | 1.53 | 0.49 | 1.01 | 2.00 | 4.03 | 8.05 | 15.57 |
| 1800 | 1.55 | 0.49 | 1.00 | 2.00 | 4.03 | 8.05 | 15.56 |
| 1900 | 1.57 | 0.49 | 1.00 | 2.00 | 4.03 | 8.05 | 15.50 |
| 2000 | 1.60 | 0.49 | 1.00 | 2.00 | 4.03 | 8.05 | 15.45 |
| 2100 | 1.60 | 0.49 | 1.00 | 1.99 | 4.04 | 8.06 | 15.46 |
| 2200 | 1.58 | 0.50 | 1.01 | 2.00 | 4.05 | 8.08 | 15.47 |
| 2300 | 1.57 | 0.49 | 1.01 | 2.01 | 4.07 | 8.14 | 15.58 |
| 2400 | 1.50 | 0.50 | 1.01 | 2.01 | 4.11 | 8.19 | 15.64 |
| 2500 | 1.28 | 0.49 | 1.01 | 2.01 | 4.11 | 8.18 | 15.48 |
| 2600 | 1.22 | 0.50 | 1.02 | 2.02 | 4.16 | 8.24 | 15.57 |
| 2700 | 1.28 | 0.49 | 1.01 | 2.02 | 4.18 | 8.28 | 15.62 |
| 2800 | 1.47 | 0.48 | 1.00 | 2.01 | 4.18 | 8.31 | 15.73 |
| 2900 | 1.81 | 0.47 | 0.98 | 1.98 | 4.16 | 8.29 | 15.81 |
| 3000 | 2.27 | 0.44 | 0.95 | 1.93 | 4.11 | 8.27 | 16.01 |

* Step Attenuation above Thru Loss (TTL Logic 00000).



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Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=25degC

| FREQUENCY (MHz) | INPUT RETURN LOSS AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 0 dB | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 19.07 | 20.02 | 20.64 | 21.24 | 32.45 | 38.64 | 43.21 |
| 50 | 18.84 | 19.74 | 20.36 | 21.00 | 31.28 | 36.43 | 50.29 |
| 100 | 18.98 | 19.89 | 20.49 | 21.20 | 31.85 | 37.50 | 44.74 |
| 150 | 18.71 | 19.60 | 20.21 | 20.89 | 30.64 | 35.37 | 46.49 |
| 200 | 18.80 | 19.70 | 20.30 | 20.98 | 30.70 | 35.18 | 42.20 |
| 250 | 18.62 | 19.50 | 20.09 | 20.73 | 29.80 | 33.71 | 42.19 |
| 300 | 18.66 | 19.54 | 20.14 | 20.80 | 29.57 | 33.06 | 39.08 |
| 350 | 18.53 | 19.37 | 19.95 | 20.56 | 28.93 | 32.17 | 39.19 |
| 400 | 18.56 | 19.39 | 19.98 | 20.58 | 28.67 | 31.59 | 37.25 |
| 450 | 18.54 | 19.37 | 19.93 | 20.52 | 28.52 | 31.40 | 37.98 |
| 500 | 18.59 | 19.43 | 19.97 | 20.53 | 28.33 | 30.85 | 36.58 |
| 550 | 18.65 | 19.47 | 20.01 | 20.54 | 28.35 | 30.87 | 37.40 |
| 600 | 18.69 | 19.50 | 20.04 | 20.54 | 28.07 | 30.35 | 35.91 |
| 700 | 18.75 | 19.54 | 20.06 | 20.51 | 27.81 | 29.72 | 34.88 |
| 800 | 18.57 | 19.35 | 19.84 | 20.26 | 27.07 | 28.61 | 32.82 |
| 900 | 18.34 | 19.07 | 19.58 | 19.99 | 26.26 | 27.56 | 31.04 |
| 1000 | 17.98 | 18.70 | 19.20 | 19.61 | 25.51 | 26.66 | 29.84 |
| 1100 | 17.49 | 18.18 | 18.66 | 19.05 | 24.60 | 25.71 | 28.81 |
| 1200 | 17.00 | 17.65 | 18.12 | 18.48 | 23.72 | 24.75 | 27.72 |
| 1300 | 16.58 | 17.19 | 17.63 | 17.94 | 22.93 | 23.86 | 26.54 |
| 1400 | 16.28 | 16.84 | 17.24 | 17.49 | 22.22 | 22.98 | 25.33 |
| 1500 | 16.25 | 16.80 | 17.17 | 17.37 | 22.11 | 22.83 | 24.99 |
| 1600 | 16.54 | 17.05 | 17.40 | 17.51 | 22.25 | 22.91 | 24.64 |
| 1700 | 17.15 | 17.59 | 17.88 | 17.91 | 22.34 | 22.85 | 23.77 |
| 1800 | 17.79 | 18.11 | 18.30 | 18.26 | 21.86 | 22.30 | 22.44 |
| 1900 | 18.19 | 18.35 | 18.46 | 18.41 | 20.83 | 21.34 | 21.07 |
| 2000 | 18.28 | 18.34 | 18.39 | 18.43 | 19.72 | 20.34 | 19.87 |
| 2100 | 18.33 | 18.28 | 18.30 | 18.43 | 18.65 | 19.30 | 18.72 |
| 2200 | 18.19 | 18.11 | 18.10 | 18.36 | 17.99 | 18.60 | 18.03 |
| 2300 | 19.84 | 19.75 | 19.75 | 20.12 | 18.90 | 19.32 | 18.49 |
| 2400 | 24.19 | 23.84 | 23.62 | 23.95 | 19.97 | 19.60 | 18.46 |
| 2500 | 38.83 | 33.54 | 30.24 | 28.05 | 19.51 | 18.22 | 17.18 |
| 2600 | 26.49 | 26.64 | 25.70 | 23.72 | 17.87 | 16.28 | 15.51 |
| 2700 | 19.39 | 19.98 | 20.15 | 19.53 | 16.49 | 14.96 | 14.38 |
| 2800 | 15.13 | 15.76 | 16.19 | 16.24 | 15.16 | 14.02 | 13.68 |
| 2900 | 12.50 | 13.12 | 13.64 | 14.01 | 14.14 | 13.48 | 13.39 |
| 3000 | 10.71 | 11.30 | 11.84 | 12.39 | 13.38 | 13.26 | 13.50 |



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Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=25degC

| FREQUENCY (MHz) | OUTPUT RETURN LOSS AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|---|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 0 dB | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 18.99 | 20.06 | 20.28 | 21.25 | 22.34 | 37.78 | 42.50 |
| 50 | 18.73 | 19.77 | 19.99 | 20.95 | 22.01 | 35.53 | 49.71 |
| 100 | 18.78 | 19.82 | 20.05 | 21.02 | 22.14 | 36.04 | 44.62 |
| 150 | 18.46 | 19.47 | 19.68 | 20.63 | 21.73 | 34.02 | 45.61 |
| 200 | 18.39 | 19.43 | 19.65 | 20.61 | 21.70 | 33.50 | 41.50 |
| 250 | 18.12 | 19.12 | 19.33 | 20.26 | 21.32 | 32.22 | 41.79 |
| 300 | 18.06 | 19.04 | 19.27 | 20.19 | 21.22 | 31.48 | 38.90 |
| 350 | 17.86 | 18.80 | 19.03 | 19.92 | 20.88 | 30.70 | 38.55 |
| 400 | 17.84 | 18.80 | 19.02 | 19.90 | 20.85 | 30.27 | 37.26 |
| 450 | 17.81 | 18.75 | 18.93 | 19.81 | 20.70 | 30.05 | 38.02 |
| 500 | 17.75 | 18.69 | 18.89 | 19.75 | 20.60 | 29.67 | 36.89 |
| 550 | 17.81 | 18.74 | 18.91 | 19.76 | 20.56 | 29.63 | 37.35 |
| 600 | 17.80 | 18.74 | 18.90 | 19.74 | 20.48 | 29.26 | 36.46 |
| 700 | 18.03 | 18.95 | 19.09 | 19.90 | 20.53 | 29.37 | 36.77 |
| 800 | 18.35 | 19.29 | 19.40 | 20.19 | 20.68 | 29.46 | 36.68 |
| 900 | 18.97 | 19.97 | 20.04 | 20.84 | 21.20 | 30.47 | 38.35 |
| 1000 | 19.08 | 20.07 | 20.11 | 20.85 | 21.01 | 29.54 | 36.00 |
| 1100 | 18.74 | 19.67 | 19.65 | 20.34 | 20.28 | 27.45 | 31.96 |
| 1200 | 18.29 | 19.16 | 19.13 | 19.72 | 19.52 | 25.58 | 28.98 |
| 1300 | 18.02 | 18.83 | 18.75 | 19.30 | 18.96 | 24.48 | 27.42 |
| 1400 | 17.89 | 18.66 | 18.55 | 19.02 | 18.60 | 23.99 | 26.77 |
| 1500 | 17.54 | 18.23 | 18.09 | 18.48 | 18.11 | 23.36 | 25.85 |
| 1600 | 17.00 | 17.65 | 17.51 | 17.84 | 17.54 | 22.47 | 24.66 |
| 1700 | 17.04 | 17.69 | 17.55 | 17.90 | 17.72 | 22.87 | 25.02 |
| 1800 | 17.19 | 17.78 | 17.72 | 18.05 | 18.12 | 23.35 | 25.07 |
| 1900 | 17.49 | 18.00 | 17.98 | 18.36 | 18.87 | 23.71 | 24.48 |
| 2000 | 17.60 | 17.95 | 18.03 | 18.40 | 19.51 | 22.82 | 22.66 |
| 2100 | 17.90 | 18.27 | 18.42 | 18.86 | 20.50 | 22.73 | 22.01 |
| 2200 | 19.03 | 19.17 | 19.46 | 19.89 | 22.64 | 22.17 | 20.88 |
| 2300 | 19.60 | 19.66 | 20.04 | 20.41 | 23.92 | 20.88 | 19.45 |
| 2400 | 21.10 | 21.29 | 21.84 | 22.32 | 27.63 | 21.46 | 19.60 |
| 2500 | 25.61 | 26.48 | 27.74 | 28.54 | 35.77 | 20.78 | 18.78 |
| 2600 | 26.65 | 31.45 | 33.58 | 43.70 | 25.95 | 19.45 | 17.64 |
| 2700 | 20.38 | 22.32 | 22.58 | 24.07 | 19.99 | 17.65 | 16.32 |
| 2800 | 15.19 | 16.32 | 16.59 | 17.73 | 16.11 | 16.09 | 15.40 |
| 2900 | 11.94 | 12.79 | 13.09 | 14.07 | 13.39 | 14.49 | 14.41 |
| 3000 | 9.88 | 10.60 | 10.90 | 11.79 | 11.59 | 13.32 | 13.79 |

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Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=85degC

| FREQUENCY (MHz) | STEP ATTENUATION* AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 THRU LOSS | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 1.25 | 0.49 | 1.00 | 1.99 | 3.94 | 7.87 | 15.36 |
| 50 | 1.25 | 0.50 | 0.99 | 2.00 | 3.94 | 7.88 | 15.30 |
| 100 | 1.25 | 0.50 | 0.99 | 2.00 | 3.94 | 7.88 | 15.30 |
| 150 | 1.26 | 0.50 | 1.00 | 2.00 | 3.94 | 7.88 | 15.31 |
| 200 | 1.27 | 0.50 | 0.99 | 2.00 | 3.94 | 7.88 | 15.30 |
| 250 | 1.29 | 0.50 | 0.99 | 2.00 | 3.95 | 7.88 | 15.30 |
| 300 | 1.32 | 0.50 | 0.99 | 2.00 | 3.94 | 7.87 | 15.29 |
| 350 | 1.35 | 0.49 | 0.99 | 1.99 | 3.93 | 7.87 | 15.29 |
| 400 | 1.38 | 0.49 | 0.99 | 1.99 | 3.93 | 7.87 | 15.29 |
| 450 | 1.40 | 0.49 | 0.99 | 1.99 | 3.93 | 7.86 | 15.28 |
| 500 | 1.41 | 0.49 | 0.98 | 1.99 | 3.93 | 7.86 | 15.27 |
| 550 | 1.43 | 0.49 | 0.98 | 1.99 | 3.93 | 7.86 | 15.27 |
| 600 | 1.45 | 0.49 | 0.98 | 1.99 | 3.93 | 7.86 | 15.28 |
| 700 | 1.48 | 0.49 | 0.99 | 1.99 | 3.93 | 7.86 | 15.28 |
| 800 | 1.52 | 0.49 | 0.98 | 1.99 | 3.93 | 7.87 | 15.28 |
| 900 | 1.55 | 0.49 | 0.98 | 1.99 | 3.93 | 7.87 | 15.30 |
| 1000 | 1.60 | 0.49 | 0.98 | 1.99 | 3.93 | 7.88 | 15.32 |
| 1100 | 1.65 | 0.48 | 0.98 | 1.98 | 3.92 | 7.88 | 15.31 |
| 1200 | 1.70 | 0.48 | 0.98 | 1.98 | 3.92 | 7.86 | 15.27 |
| 1300 | 1.73 | 0.48 | 0.98 | 1.98 | 3.92 | 7.85 | 15.22 |
| 1400 | 1.75 | 0.48 | 0.98 | 1.98 | 3.92 | 7.86 | 15.22 |
| 1500 | 1.81 | 0.47 | 0.98 | 1.99 | 3.94 | 7.90 | 15.33 |
| 1600 | 1.83 | 0.47 | 0.98 | 1.99 | 3.96 | 7.92 | 15.37 |
| 1700 | 1.83 | 0.48 | 0.98 | 1.99 | 3.96 | 7.93 | 15.34 |
| 1800 | 1.83 | 0.48 | 0.98 | 1.99 | 3.97 | 7.94 | 15.32 |
| 1900 | 1.82 | 0.47 | 0.98 | 1.99 | 3.96 | 7.94 | 15.30 |
| 2000 | 1.81 | 0.48 | 0.98 | 1.99 | 3.97 | 7.95 | 15.30 |
| 2100 | 1.75 | 0.47 | 0.98 | 1.98 | 3.98 | 7.97 | 15.29 |
| 2200 | 1.70 | 0.47 | 0.98 | 1.98 | 3.99 | 7.99 | 15.29 |
| 2300 | 1.68 | 0.47 | 0.98 | 1.98 | 4.01 | 8.05 | 15.41 |
| 2400 | 1.53 | 0.47 | 0.97 | 1.97 | 4.01 | 8.04 | 15.31 |
| 2500 | 1.40 | 0.47 | 0.97 | 1.97 | 4.01 | 8.02 | 15.24 |
| 2600 | 1.40 | 0.46 | 0.97 | 1.97 | 4.03 | 8.06 | 15.28 |
| 2700 | 1.48 | 0.46 | 0.96 | 1.96 | 4.04 | 8.08 | 15.31 |
| 2800 | 1.68 | 0.44 | 0.95 | 1.95 | 4.05 | 8.10 | 15.42 |
| 2900 | 2.02 | 0.43 | 0.93 | 1.93 | 4.03 | 8.09 | 15.51 |
| 3000 | 2.45 | 0.42 | 0.91 | 1.89 | 4.01 | 8.09 | 15.69 |

* Step Attenuation above Thru Loss (TTL Logic 00000).

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Digital Step Attenuator

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Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=85degC

| FREQUENCY (MHz) | INPUT RETURN LOSS AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|--|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 0 dB | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 17.84 | 18.23 | 18.44 | 18.51 | 23.10 | 23.26 | 25.00 |
| 50 | 17.55 | 17.99 | 18.16 | 18.21 | 22.79 | 22.91 | 24.60 |
| 100 | 17.67 | 18.13 | 18.32 | 18.42 | 23.18 | 23.42 | 25.27 |
| 150 | 17.45 | 17.89 | 18.12 | 18.24 | 22.89 | 23.21 | 25.06 |
| 200 | 17.50 | 17.97 | 18.19 | 18.32 | 22.99 | 23.35 | 25.25 |
| 250 | 17.29 | 17.74 | 17.95 | 18.07 | 22.50 | 22.80 | 24.51 |
| 300 | 17.28 | 17.72 | 17.94 | 18.01 | 22.29 | 22.50 | 24.14 |
| 350 | 17.15 | 17.56 | 17.73 | 17.79 | 21.83 | 21.92 | 23.35 |
| 400 | 17.19 | 17.57 | 17.74 | 17.75 | 21.71 | 21.73 | 23.09 |
| 450 | 17.23 | 17.59 | 17.72 | 17.70 | 21.55 | 21.48 | 22.70 |
| 500 | 17.36 | 17.72 | 17.84 | 17.78 | 21.64 | 21.47 | 22.64 |
| 550 | 17.50 | 17.84 | 17.95 | 17.86 | 21.70 | 21.48 | 22.56 |
| 600 | 17.67 | 18.01 | 18.13 | 18.02 | 21.94 | 21.68 | 22.80 |
| 700 | 18.09 | 18.44 | 18.55 | 18.43 | 22.58 | 22.32 | 23.47 |
| 800 | 18.27 | 18.65 | 18.81 | 18.72 | 23.19 | 22.97 | 24.35 |
| 900 | 18.17 | 18.60 | 18.80 | 18.76 | 23.41 | 23.25 | 24.90 |
| 1000 | 17.62 | 18.06 | 18.30 | 18.32 | 22.77 | 22.74 | 24.46 |
| 1100 | 16.77 | 17.20 | 17.46 | 17.50 | 21.54 | 21.57 | 23.20 |
| 1200 | 15.92 | 16.33 | 16.57 | 16.62 | 20.25 | 20.28 | 21.67 |
| 1300 | 15.26 | 15.63 | 15.85 | 15.85 | 19.12 | 19.06 | 20.18 |
| 1400 | 14.93 | 15.24 | 15.42 | 15.35 | 18.32 | 18.15 | 18.97 |
| 1500 | 14.98 | 15.22 | 15.35 | 15.19 | 17.98 | 17.66 | 18.27 |
| 1600 | 15.38 | 15.54 | 15.59 | 15.33 | 17.86 | 17.45 | 17.77 |
| 1700 | 15.97 | 16.02 | 15.97 | 15.63 | 17.79 | 17.34 | 17.38 |
| 1800 | 16.47 | 16.40 | 16.28 | 15.91 | 17.61 | 17.28 | 17.08 |
| 1900 | 16.73 | 16.60 | 16.44 | 16.16 | 17.36 | 17.30 | 16.94 |
| 2000 | 16.96 | 16.79 | 16.65 | 16.51 | 17.26 | 17.52 | 17.04 |
| 2100 | 17.32 | 17.16 | 17.01 | 17.06 | 17.30 | 17.87 | 17.25 |
| 2200 | 17.88 | 17.75 | 17.65 | 17.83 | 17.83 | 18.67 | 17.92 |
| 2300 | 20.07 | 19.99 | 19.92 | 20.23 | 19.90 | 20.98 | 19.76 |
| 2400 | 24.66 | 24.77 | 24.81 | 25.51 | 23.29 | 24.17 | 21.93 |
| 2500 | 30.58 | 33.47 | 36.71 | 42.01 | 24.58 | 23.56 | 21.56 |
| 2600 | 25.02 | 26.69 | 28.35 | 28.21 | 22.82 | 20.95 | 19.79 |
| 2700 | 19.54 | 20.47 | 21.40 | 21.65 | 20.68 | 18.97 | 18.38 |
| 2800 | 15.94 | 16.68 | 17.42 | 17.88 | 18.60 | 17.50 | 17.43 |
| 2900 | 13.45 | 14.09 | 14.78 | 15.35 | 16.97 | 16.47 | 16.85 |
| 3000 | 11.58 | 12.16 | 12.80 | 13.42 | 15.57 | 15.67 | 16.56 |



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REV. OR

DAT-15575A-SN+

10/14/2016

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Digital Step Attenuator

DAT-15575A-SP+

Typical Performance Data

TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=85degC

| FREQUENCY (MHz) | OUTPUT RETURN LOSS AT TTL CONTROL STATE (dB) | | | | | | |
|--------------------|---|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|
| | 00000 0 dB | 00001 0.5 dB | 00010 1.0 dB | 00100 2.0 dB | 01000 4.0 dB | 10000 8.0 dB | 11111 15.5 dB |
| 10 | 17.76 | 18.33 | 18.13 | 18.44 | 18.17 | 23.04 | 25.06 |
| 50 | 17.57 | 18.13 | 17.98 | 18.25 | 18.10 | 22.86 | 24.74 |
| 100 | 17.74 | 18.30 | 18.18 | 18.50 | 18.39 | 23.38 | 25.49 |
| 150 | 17.55 | 18.13 | 18.03 | 18.36 | 18.29 | 23.27 | 25.34 |
| 200 | 17.45 | 18.05 | 17.96 | 18.32 | 18.26 | 23.23 | 25.37 |
| 250 | 17.05 | 17.63 | 17.54 | 17.88 | 17.84 | 22.47 | 24.39 |
| 300 | 16.82 | 17.37 | 17.26 | 17.60 | 17.55 | 21.94 | 23.72 |
| 350 | 16.55 | 17.06 | 16.96 | 17.26 | 17.16 | 21.27 | 22.84 |
| 400 | 16.53 | 17.03 | 16.93 | 17.20 | 17.06 | 21.06 | 22.54 |
| 450 | 16.54 | 17.04 | 16.90 | 17.15 | 16.95 | 20.81 | 22.17 |
| 500 | 16.66 | 17.14 | 17.01 | 17.22 | 17.01 | 20.84 | 22.20 |
| 550 | 16.85 | 17.33 | 17.16 | 17.35 | 17.11 | 20.91 | 22.15 |
| 600 | 17.03 | 17.50 | 17.33 | 17.51 | 17.24 | 21.08 | 22.32 |
| 700 | 17.41 | 17.90 | 17.71 | 17.89 | 17.57 | 21.56 | 22.80 |
| 800 | 17.76 | 18.30 | 18.09 | 18.29 | 17.92 | 22.24 | 23.59 |
| 900 | 18.23 | 18.83 | 18.61 | 18.85 | 18.40 | 23.16 | 24.70 |
| 1000 | 18.17 | 18.78 | 18.57 | 18.83 | 18.29 | 23.16 | 24.86 |
| 1100 | 17.68 | 18.29 | 18.09 | 18.37 | 17.75 | 22.40 | 24.14 |
| 1200 | 17.10 | 17.69 | 17.49 | 17.73 | 17.05 | 21.28 | 22.91 |
| 1300 | 16.69 | 17.22 | 17.00 | 17.20 | 16.43 | 20.27 | 21.67 |
| 1400 | 16.50 | 16.97 | 16.69 | 16.78 | 15.94 | 19.43 | 20.51 |
| 1500 | 16.14 | 16.50 | 16.17 | 16.15 | 15.34 | 18.36 | 19.14 |
| 1600 | 16.01 | 16.32 | 15.96 | 15.88 | 15.08 | 17.90 | 18.54 |
| 1700 | 16.25 | 16.48 | 16.11 | 15.99 | 15.28 | 17.95 | 18.38 |
| 1800 | 16.49 | 16.66 | 16.32 | 16.19 | 15.68 | 18.14 | 18.37 |
| 1900 | 16.70 | 16.78 | 16.53 | 16.44 | 16.28 | 18.37 | 18.35 |
| 2000 | 16.50 | 16.53 | 16.41 | 16.40 | 16.71 | 18.34 | 18.11 |
| 2100 | 16.84 | 16.86 | 16.84 | 16.93 | 17.82 | 19.04 | 18.64 |
| 2200 | 17.39 | 17.38 | 17.50 | 17.63 | 19.28 | 19.63 | 18.89 |
| 2300 | 17.94 | 17.94 | 18.15 | 18.35 | 20.72 | 20.19 | 19.17 |
| 2400 | 19.94 | 20.08 | 20.36 | 20.75 | 24.14 | 22.78 | 21.00 |
| 2500 | 22.98 | 23.65 | 24.15 | 25.18 | 30.95 | 24.97 | 21.98 |
| 2600 | 23.58 | 25.86 | 26.35 | 29.95 | 26.75 | 25.08 | 22.07 |
| 2700 | 19.59 | 21.30 | 21.52 | 23.59 | 20.49 | 22.04 | 20.69 |
| 2800 | 15.48 | 16.60 | 16.81 | 18.12 | 16.51 | 19.02 | 18.98 |
| 2900 | 12.54 | 13.38 | 13.62 | 14.66 | 13.79 | 16.56 | 17.25 |
| 3000 | 10.49 | 11.18 | 11.42 | 12.34 | 11.88 | 14.79 | 15.93 |



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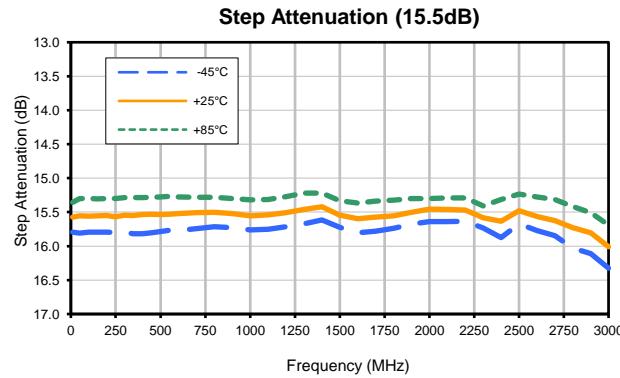
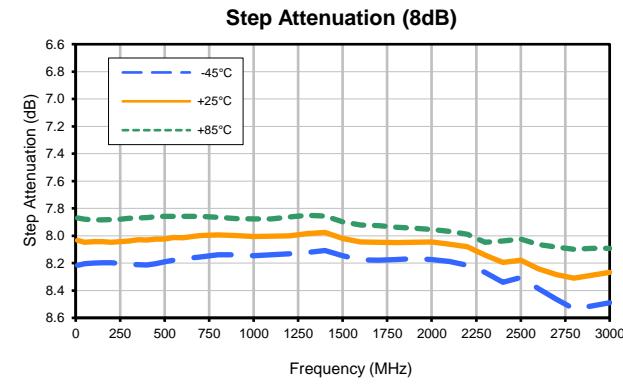
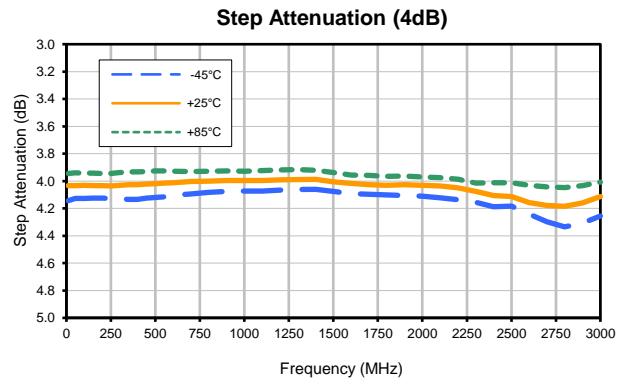
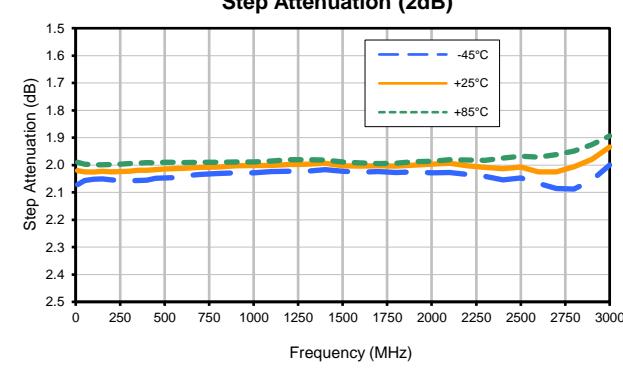
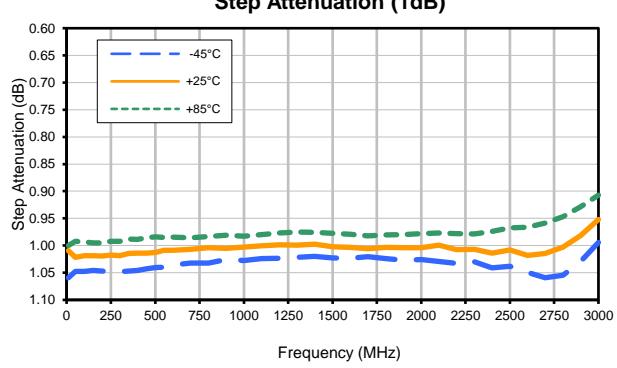
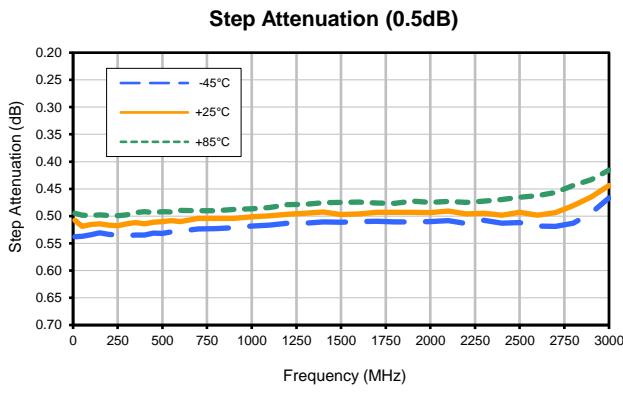
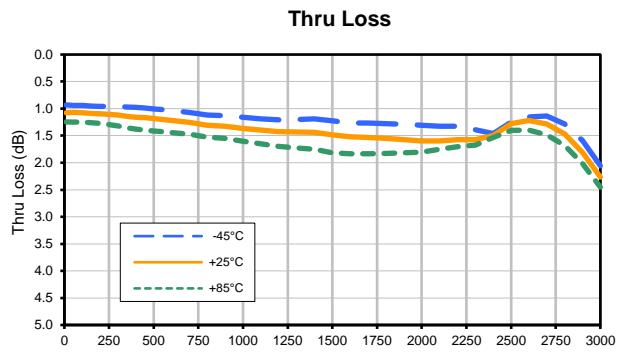
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Digital Step Attenuator

Typical Performance Curves

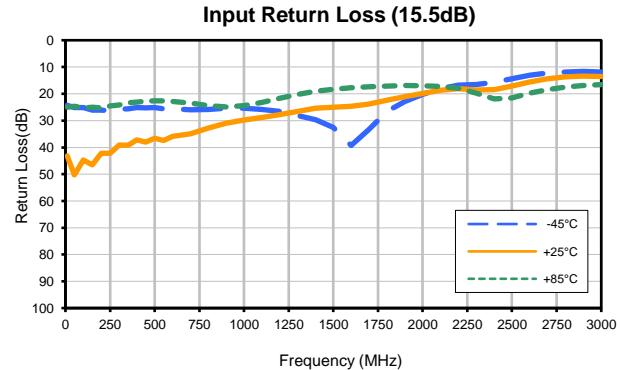
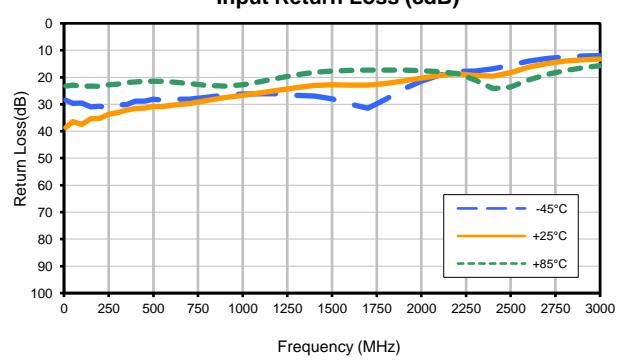
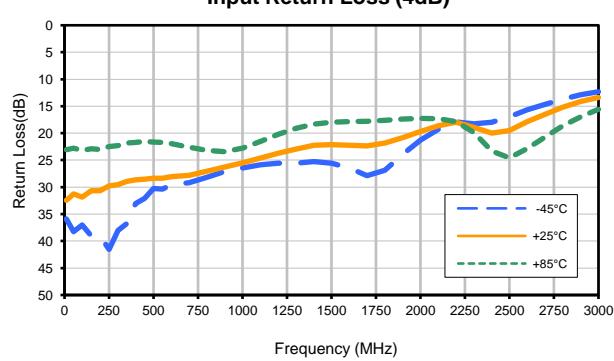
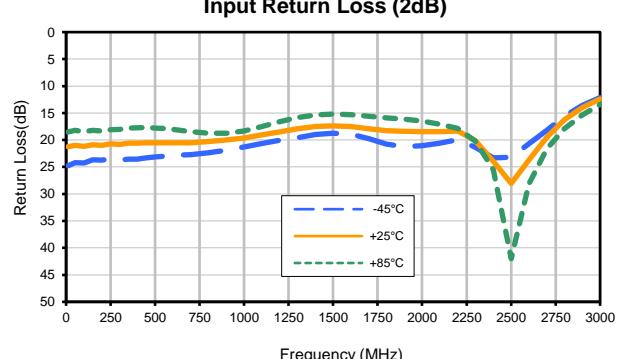
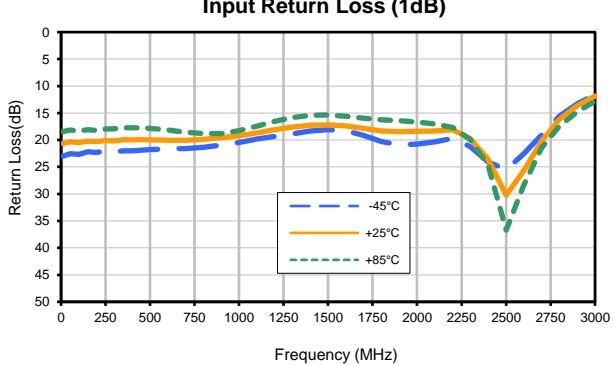
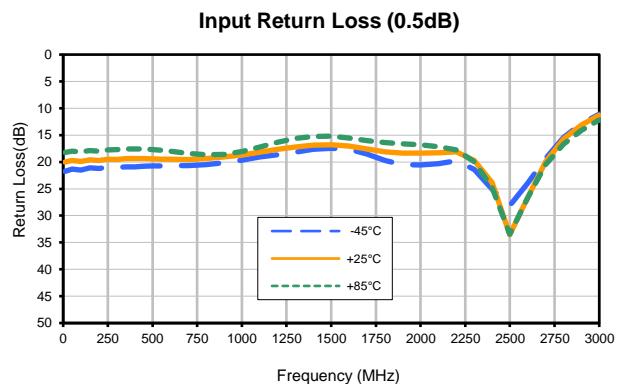
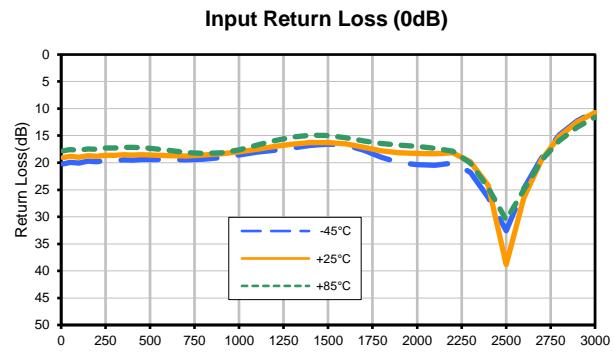
DAT-15575A-SP+



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Typical Performance Curves

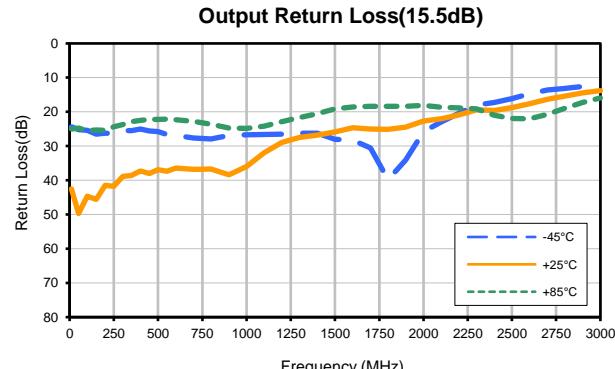
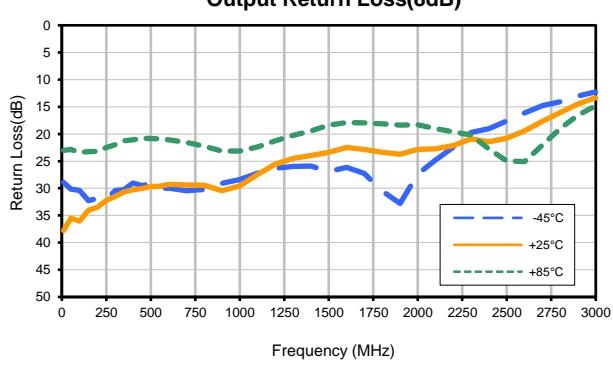
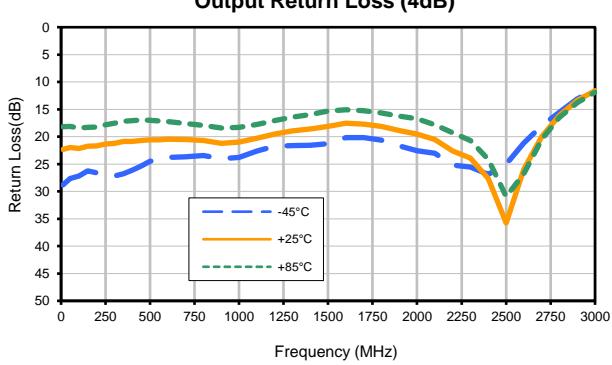
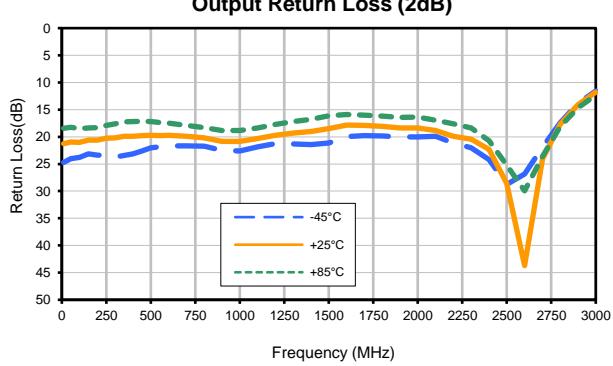
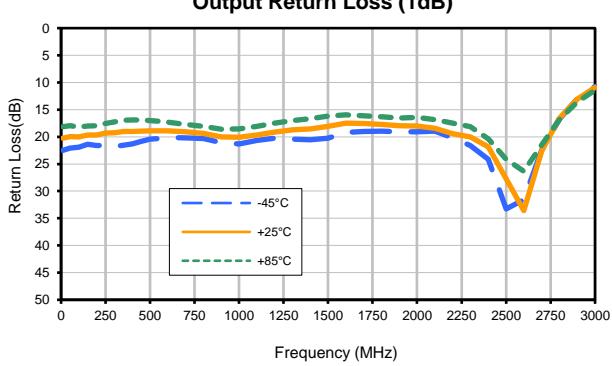
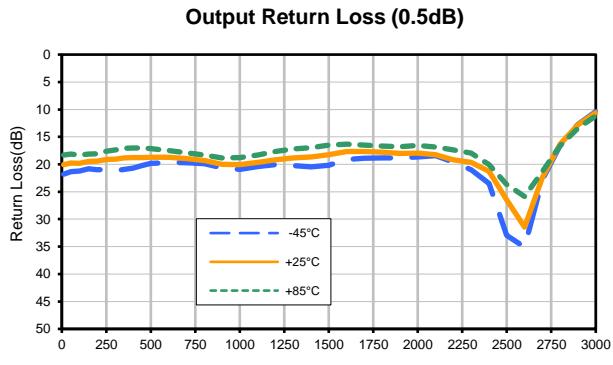
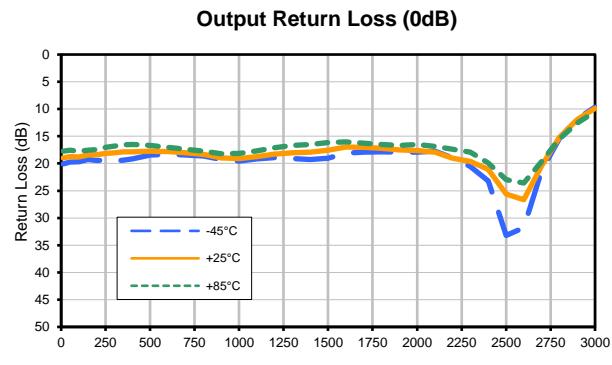
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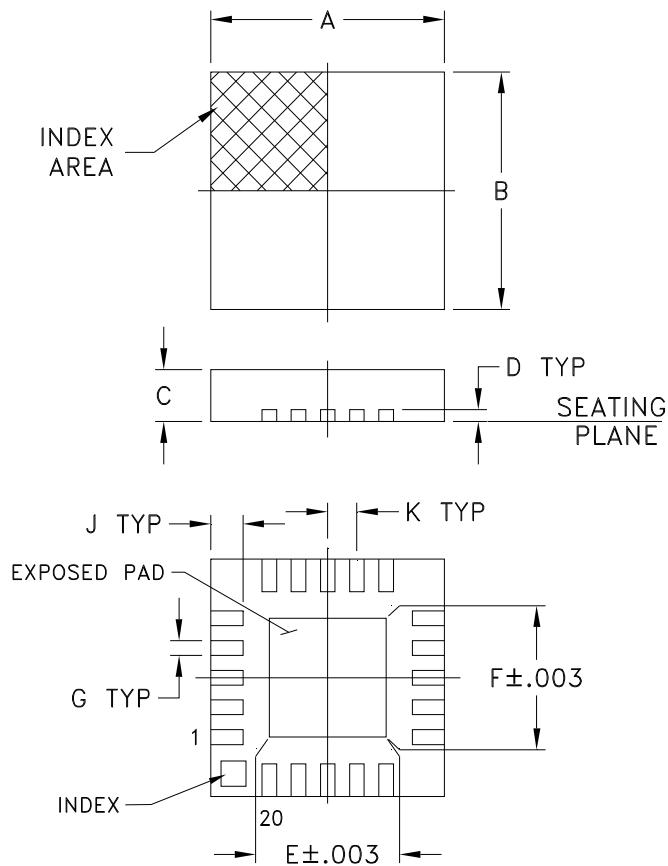
Digital Step Attenuator

Typical Performance Curves

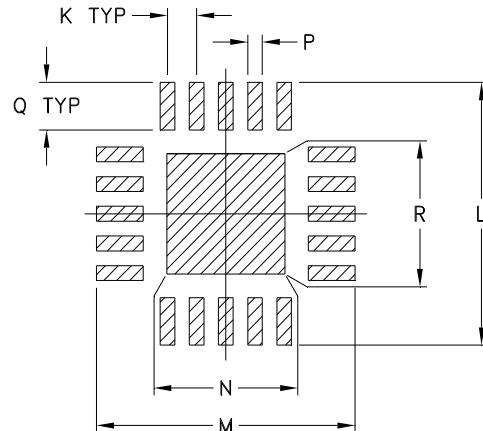
DAT-15575A-SP+



Outline Dimensions



PCB Land Pattern



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

| CASE # | A | B | C | D | E | F | G | H | J | K |
|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----|----------------|----------------|
| DG983-2 | .157 (4.00) | .157 (4.00) | .033 (0.85) | .008 (0.20) | .085 (2.15) | .085 (2.15) | .009 (0.23) | -- | .022 (0.55) | .020 (0.50) |

| CASE # | L | M | N | P | Q | R | WT. GRAM |
|---------|----------------|----------------|----------------|----------------|----------------|----------------|----------|
| DG983-2 | .177 (4.50) | .177 (4.50) | .081 (2.06) | .010 (0.25) | .032 (0.81) | .081 (2.06) | .04 |

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: 0.2 μ inches of Gold (Au) over 0.1 μ inch of Palladium (Pd) over 10 μ inches of Nickel (Ni). All models, (+) suffix.

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

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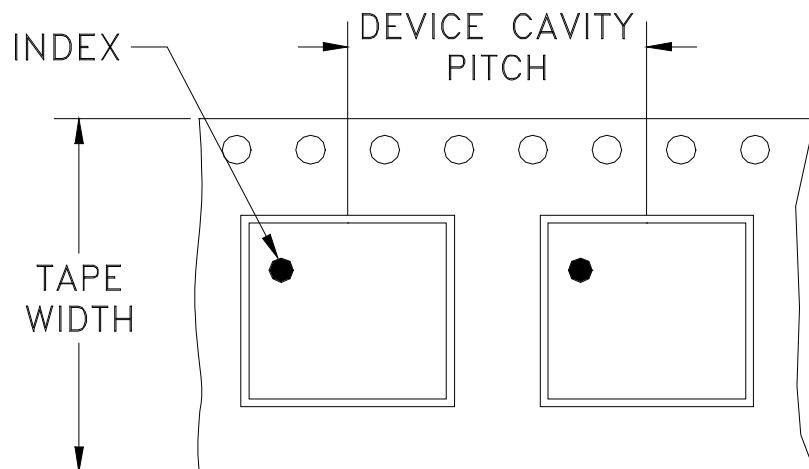


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Tape & Reel Packaging TR-F87

DEVICE ORIENTATION IN T&R



DIRECTION OF FEED

| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|----------------|-------------------------|-------------------|-------------------------------------|------|
| 12 | 8 | 7 | Small quantity standards (see note) | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | | | 500 |
| | | | | 1000 |
| | | 13 | Standard | 3000 |

Note : Please Consult individual model data sheet to determine device per reel availability

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



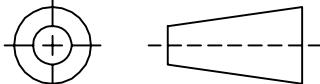
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THIRD ANGLE PROJECTION



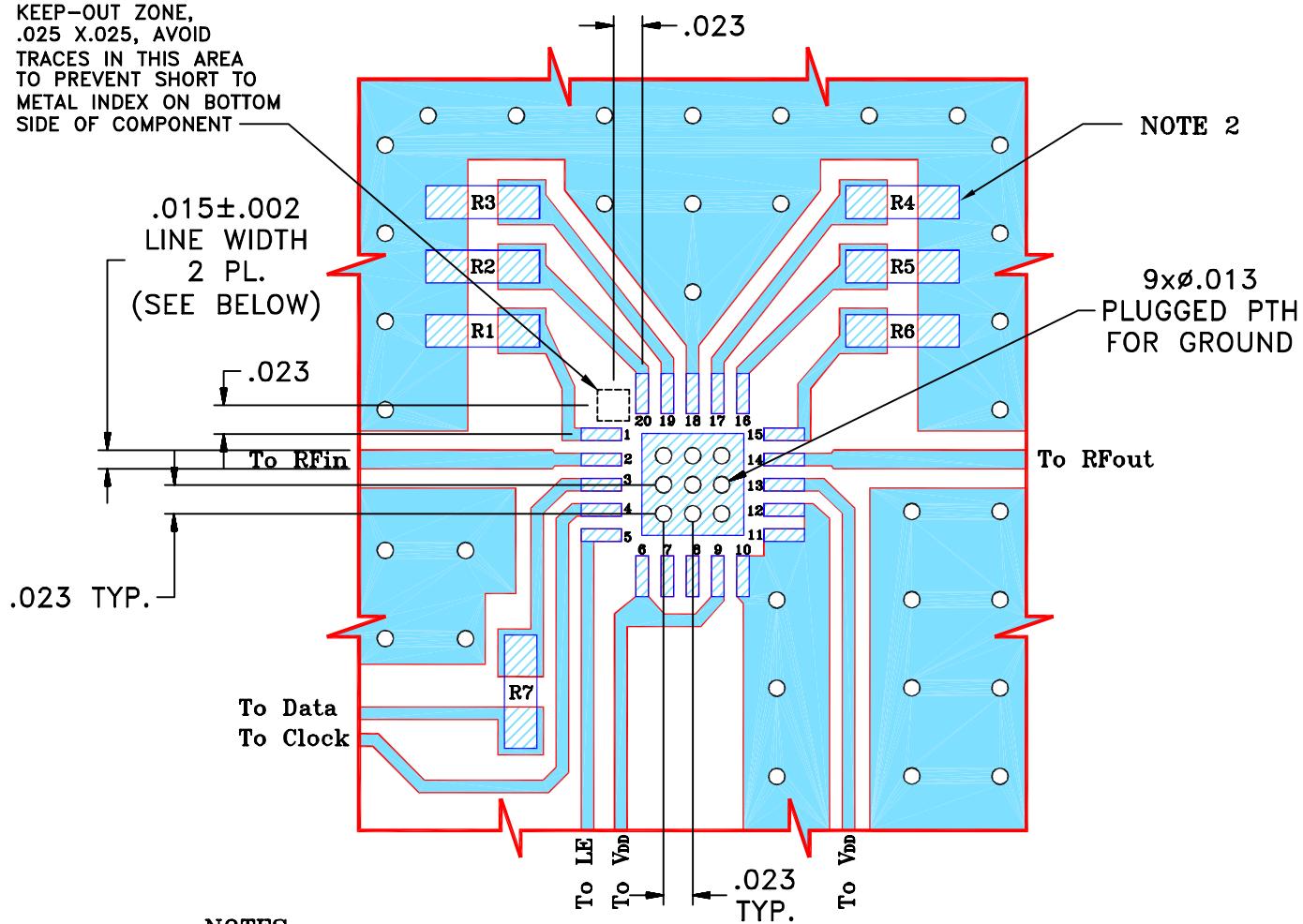
REVISIONS

| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
|-----|---------|---|-------|----|------|
| OR | M97254 | NEW RELEASE (FROM RAVON) | 03/05 | DK | HH |
| A | M102713 | MODIFIED HATCH, NOTES & ADDED "...WITH SMOBC" | 01/06 | GT | HH |
| B | M103510 | ADD R7 & CHANGE LOCATION DESIGNATORS | 07/09 | EM | KN |
| B | R63339 | ADD R7 & CHANGE LOCATION DESIGNATORS | 07/09 | EM | KN |

SUGGESTED MOUNTING CONFIGURATION

FOR DG983-1 CASE STYLE, qm PIN CONNECTION, 75Ω .

KEEP-OUT ZONE,
.025 X.025, AVOID
TRACES IN THIS AREA
TO PREVENT SHORT TO
METAL INDEX ON BOTTOM
SIDE OF COMPONENT



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS $.025'' \pm .002''$. COPPER: 1/2 OZ. EACH SIDE.
FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 0603 SIZE CHIP FOOT PRINTS SHOWN FOR REFERENCE,
VALUES OF RESISTORS WILL VARY BASED ON APPLICATION.
3. BOTTOM SIDE OF THE PCB IS CONTINUOUS GROUND PLANE.

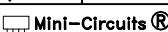
DENOTES PCB COPPER LAYOUT WITH SMOBC
(SOLDER MASK OVER BARE COPPER)

DENOTES COPPER LAND PATTERN FREE OF SOLDER MASK

UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES

TOLERANCES ON:

2 PL DECIMALS \pm 3 PL DECIMALS $\pm .005$ ANGLES \pm FRACTIONS \pm 

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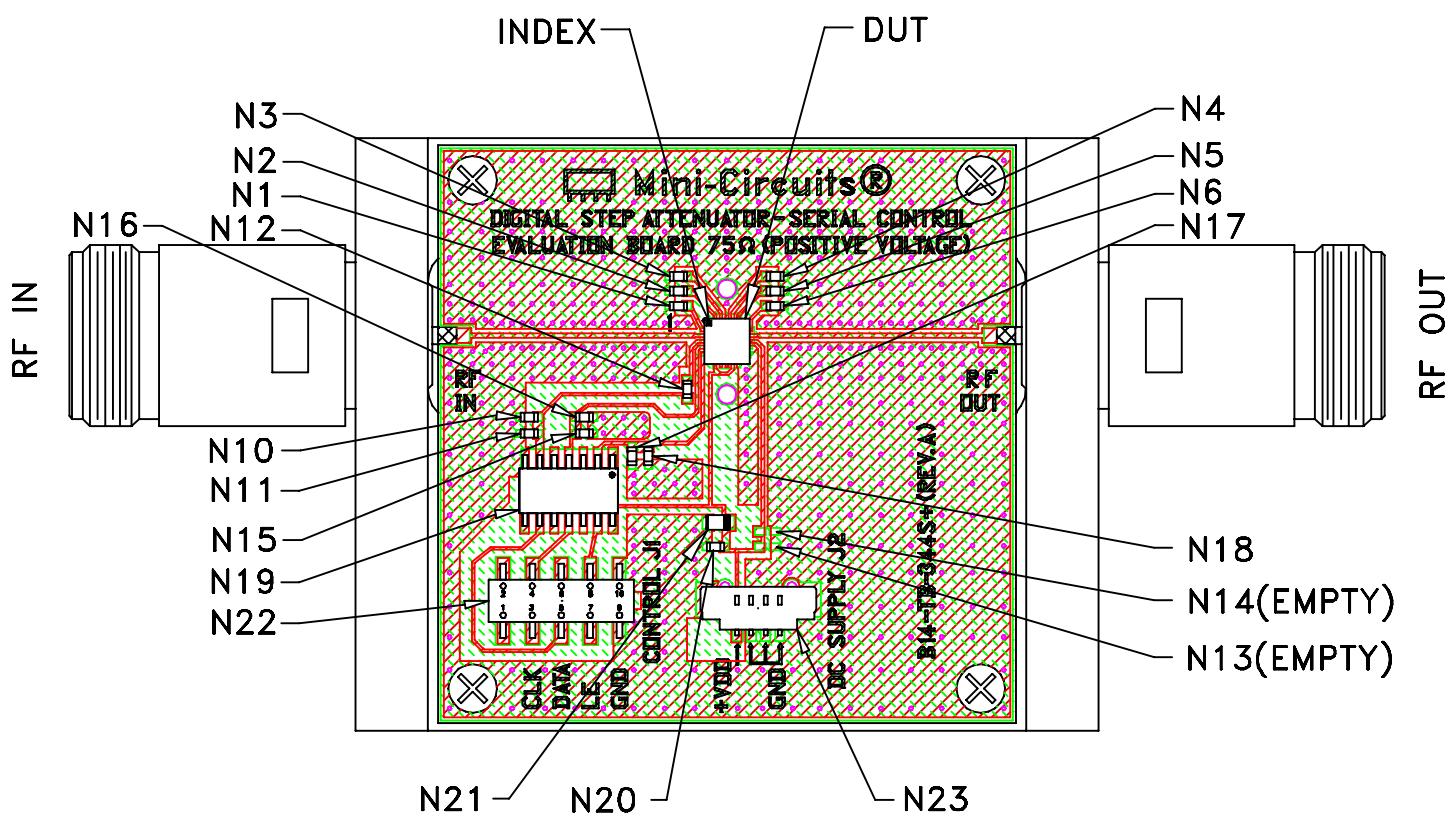


Mini-Circuits®

13 Neptune Avenue
Brooklyn NY 11235PL, qm, DG983-1
TB-344 (75 Ω)

| SIZE | CODE IDENT | DRAWING NO: | REV: |
|---------------|------------|-------------|------|
| A | 15542 | 98-PL-203 | B |
| FILE: 98PL203 | SCALE: 7:1 | SHEET: 1 | OF 1 |

Evaluation Board and Circuit



TB-344

Notes:

1. N-Type Female connectors.
2. PCB Material: FR4 Grade IT 180TC (ITEQ Corporation) or equivalent,
Dielectric Constant=4.7, Thickness=.025 inch.

 Mini-Circuits®



Environmental Specifications

ENV33T1

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° to 85° C or -40° to 105° C Ambient Environment | Refer to Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C or -65° to 150° C Ambient Environment | Refer to Individual Model Data Sheet |
| Temperature Humidity Bias | 85°C, 85% RH, 96 hours | JESD22-A101B |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Solder Reflow Heat | Pb-Free Process: 260°C peak | J-STD-020, Table 4-1, 4-2 and 5-2; Figure 5-1 |
| Solderability | 10X magnification, 95% coverage | JESD22-B102, Method 1: Dip and Look Test |
| Marking Resistance to Solvents | Laser marked, visual observation | Mini-Circuits D4-Q4T0-04 |