NON-CATALOG

Digital Step Attenuator 50Ω DC-4000 MHz

15.5 dB, 0.5 dB Step
5 Bit, Serial Control Interface, Dual Supply Voltage

Product Features

- Dual supply voltage: V_{DD}=+3V, V_{SS}=-3V
- Immune to latch up
- Excellent accuracy, 0.1 dB Typ
- Serial control interface
- Fast switching control frequency, 1MHz Typ
- Low Insertion Loss
- High IP3, +52 dBm typ
- Very low DC power consumption
- Excellent return loss, 20 dB Typ
- Small size 4.0 x 4.0 mm

Typical Applications

- Base Station Infrastructure
- Portable Wireless
- CATV & DBS
- MMDS & Wireless LAN
- Wireless Local Loop
- UNII & Hiper LAN
- Power amplifier distortion canceling loops

DAT-15R5-SN+

CASE STYLE: DG983-1

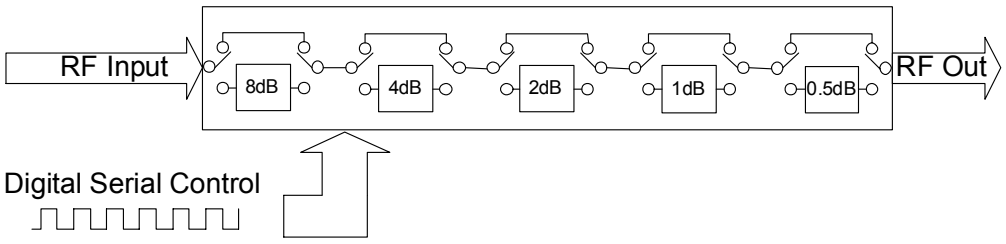
+RoHS Compliant
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Not recommended for new designs
Recommended replacement part:
DAT-15R5A-SN+

General Description

The DAT-15R5-SN+ is a 50Ω 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 dual supply voltage: V_{DD}=+3V, V_{SS}=-3V. The DAT-15R5-SN+ is produced using a unique CMOS process on silicon, offering the performance of GaAs, with the advantages of conventional CMOS devices.

Simplified Schematic



RF Electrical Specifications, DC-4000 MHz, T_{AMB}=25°C, V_{DD}=+3V, V_{SS}=-3V

Parameter	Freq. Range (GHz)	Min.	Typ.	Max.	Units
Accuracy @ **0.5 dB** Attenuation Setting	DC-1	—	0.03	0.1	dB
	1-2.2	—	0.05	0.15	dB
	2.2-4.0	—	0.1	0.3	dB
Accuracy @ **1 dB** Attenuation Setting	DC-1	—	0.02	0.1	dB
	1-2.2	—	0.05	0.15	dB
	2.2-4.0	—	0.1	0.3	dB
Accuracy @ **2 dB** Attenuation Setting	DC-1	—	0.05	0.15	dB
	1-2.2	—	0.15	0.25	dB
	2.2-4.0	—	0.2	0.45	dB
Accuracy @ **4 dB** Attenuation Setting	DC-1	—	0.07	0.2	dB
	1-2.2	—	0.15	0.25	dB
	2.2-4.0	—	0.18	0.45	dB
Accuracy @ **8 dB** Attenuation Setting	DC-1	—	0.03	0.2	dB
	1-2.2	—	0.15	0.25	dB
	2.2-4.0	—	0.5	0.8	dB
Insertion Loss (note 1) @ all attenuator set to 0dB	DC-1	—	1.3	1.9	dB
	1-2.2	—	1.1	2.5	dB
	2.2-4.0	—	3.3	4.7	dB
Input IP3 (note 2) (at Min. and Max. Attenuation)	DC-2.2	—	+52	—	dBm
	2.2-4.0	—	+42	—	dBm
Input Power @ 0.2dB Compression (note 2) (at Min. and Max. Attenuation)	DC-4.0	—	+24	—	dBm
VSWR	DC-1	—	1.2	1.5	—
	1-2.2	—	1.2	1.5	—
	2.2-4.0	—	1.8	2.1	—

DC Electrical Specifications

Parameter	Min.	Typ.	Max.	Units
V_{DD}, Supply Voltage	2.7	3	3.3	V
V_{SS}, Supply Voltage	-3.3	-3	-2.7	V
I_{DD} (I_{SS}), Supply Current, quiescent (note 3)	—	—	100	μA
Control Input Low	—	—	0.3xV_{DD}	V
Control Input High	0.7xV_{DD}	—	—	V
Control Current	—	—	1	μA

Notes:
1. I. Loss values are de-embedded from test board Loss (test board's Insertion Loss: 0.10dB @100MHz, 0.35dB @1000MHz, 0.60dB @2200MHz, 0.75dB @4000MHz, 1.50dB @6000MHz).
2. Input IP3 and 1dB compression degrades below 1 MHz.
3. During turn-on and transition between attenuation states, device may draw up to 2mA.

Switching Specifications

Parameter	Min.	Typ.	Max.	Units
Switching Speed, 50% Control to 0.5dB of Attenuation Value	—	1.0	—	μSec
Switching Control Frequency	—	1.0	—	MHz

Absolute Maximum Ratings

Parameter	Ratings
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
V_{DD}	-0.3V Min., 4V Max.
V_{SS}	-4V Min., 0.3V Max.
Voltage on any input	-0.3V Min., V_{DD}+0.3V Max.
ESD, HBM	500V
ESD, MM	100V
Input Power	+24dBm

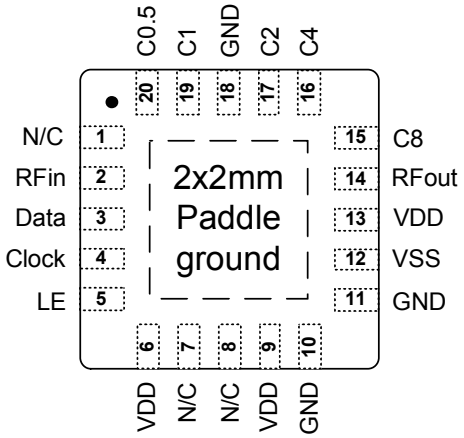
Permanent damage may occur if any of these limits are exceeded.

Pin Description

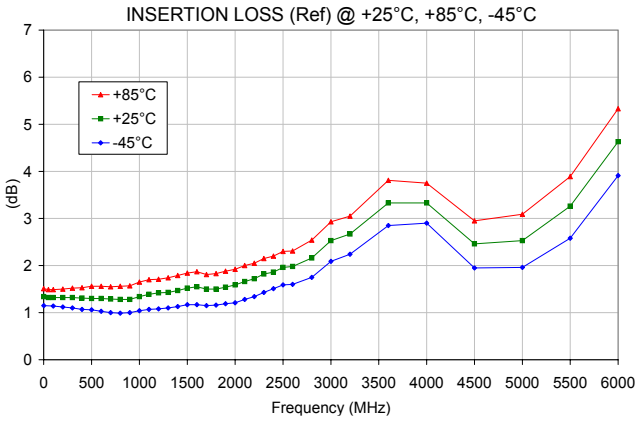
Function	Pin Number	Description
N/C	1	Not connected (Note 5)
RF in	2	RF in port (Note 1)
Data	3	Serial Interface data input (Note 3)
Clock	4	Serial Interface clock input
LE	5	Latch Enable Input (Note 2)
V_{DD}	6	Positive Supply Voltage
N/C	7	Not connected
N/C	8	Not connected
V_{DD}	9	Positive Supply Voltage
GND	10	Ground connection
GND	11	Ground connection
V_{SS}	12	Negative supply voltage
V_{DD}	13	Positive Supply Voltage
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)
GND	Paddle	Paddle ground (Note 6)

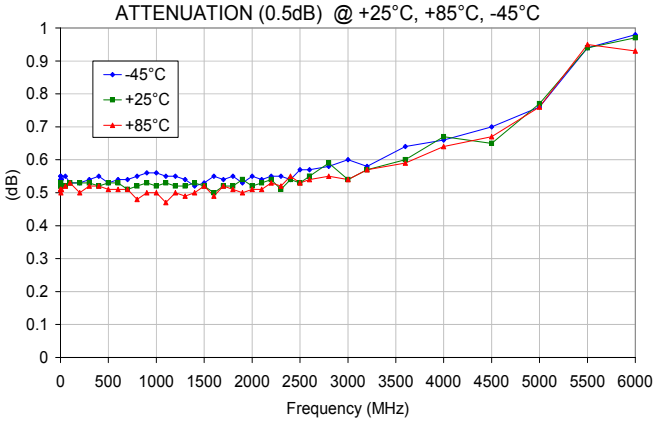
Notes:
1. Both RF ports must be held at 0VDC or DC blocked with an external series capacitor.
2. Latch Enable (LE) has an internal 100KΩ resistor to V_{DD}.
3. Place a 10KΩ resistor in series, as close to pin as possible to avoid freq. resonance.
4. Refer to Power-up Control Settings.
5. Place a shunt 10KΩ resistor to GND.
6. The exposed solder pad on the bottom of the package (See Pin Configuration) must be grounded for proper device operation.

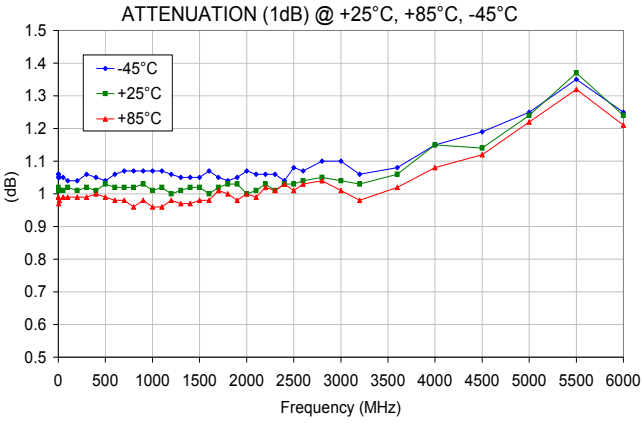
Pin Configuration (Top View)

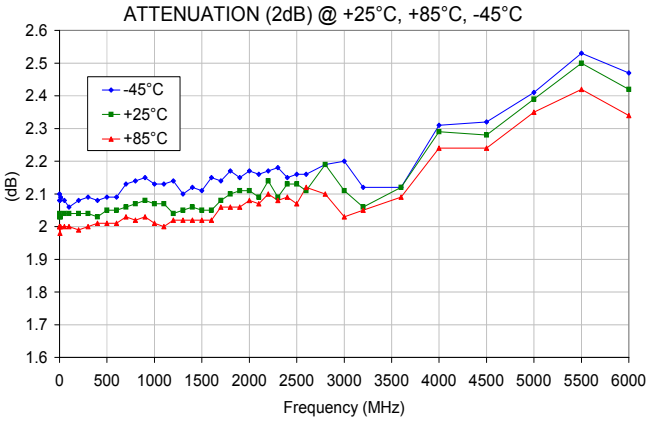


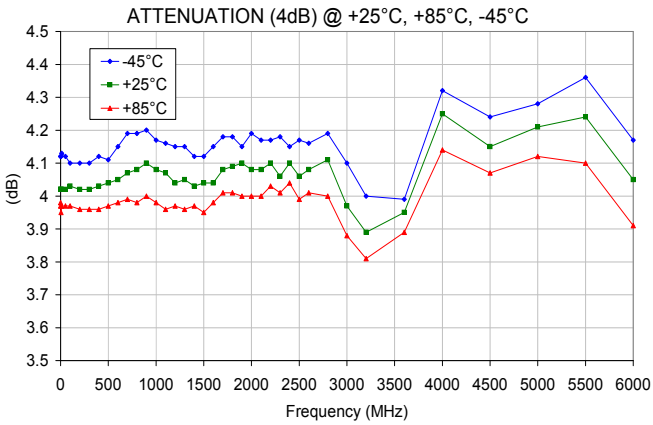
Typical Performance Curves

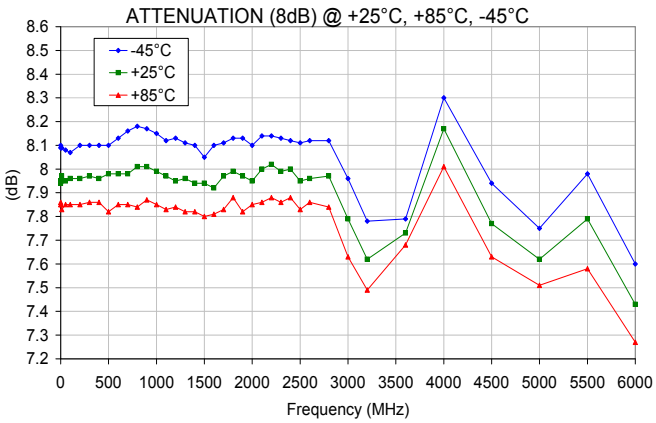




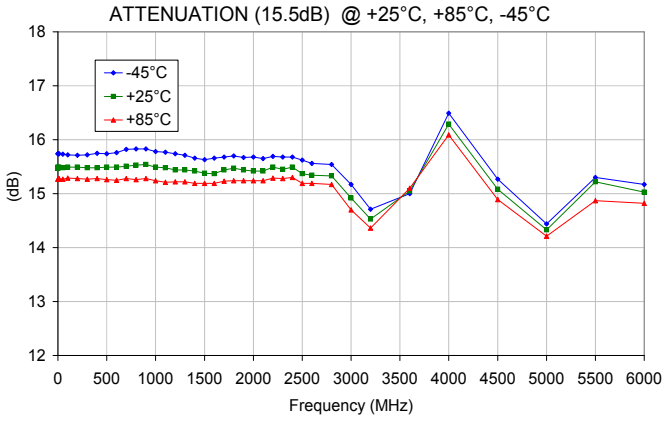


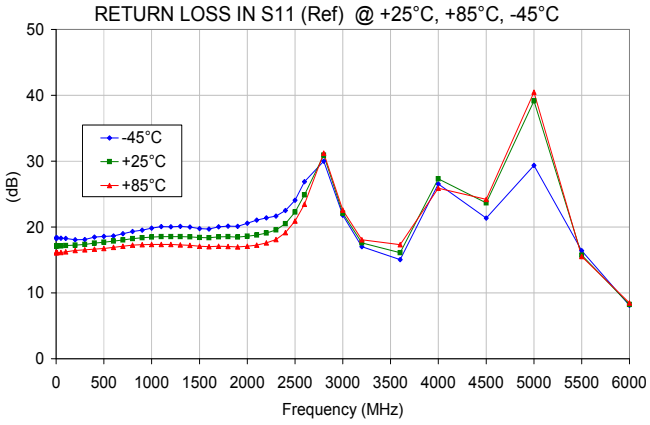


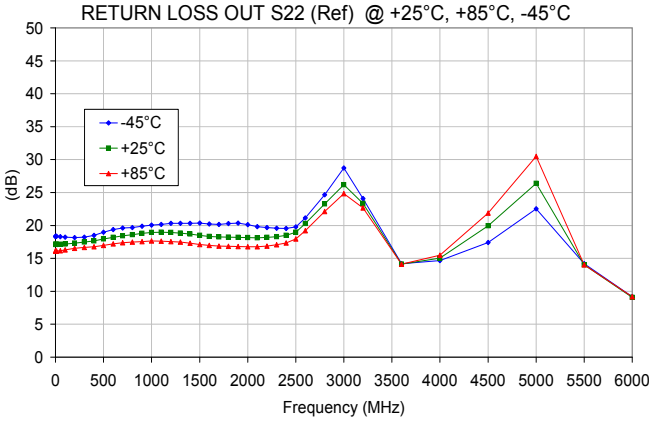


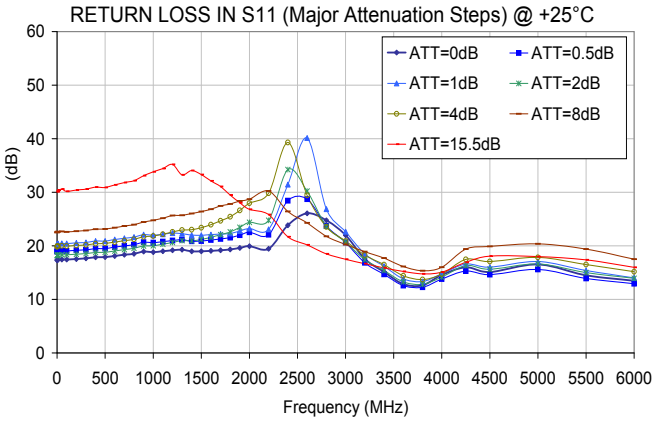


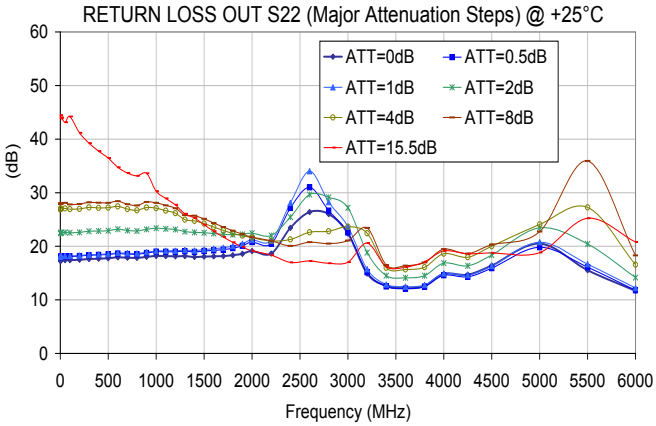
Typical Performance Curves





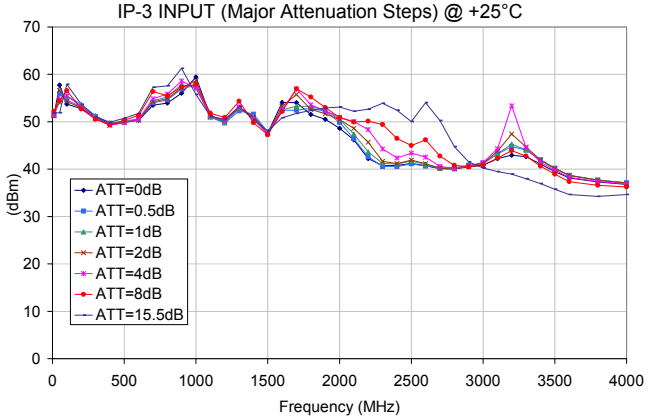




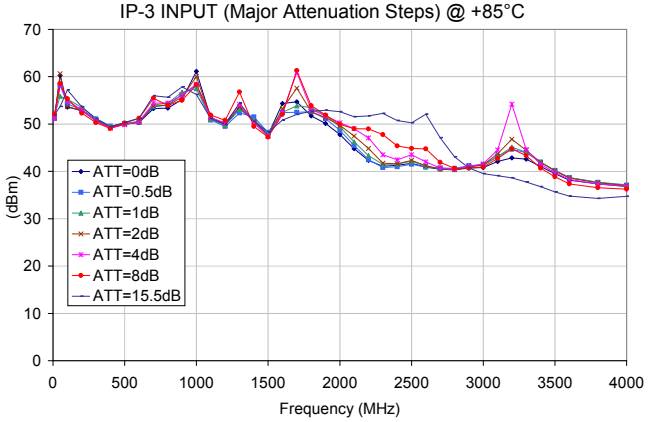


Typical Performance Curves

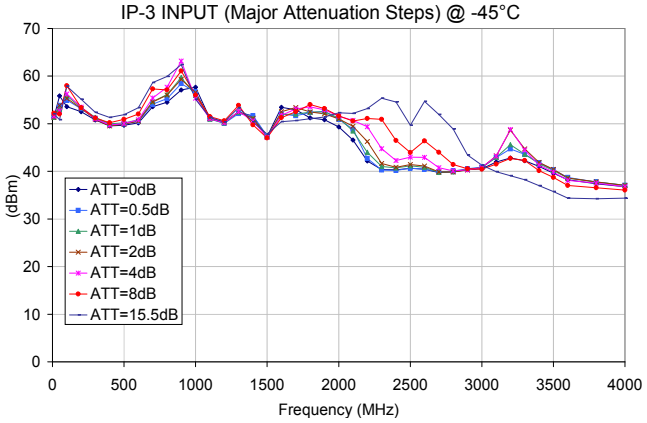
IP-3 INPUT (Major Attenuation Steps) @ +25°C



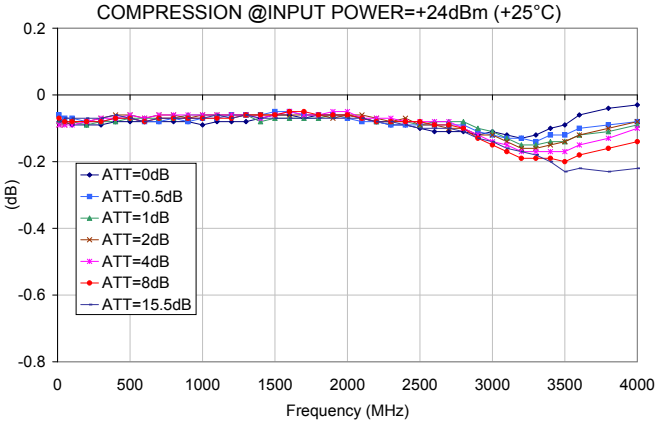
IP-3 INPUT (Major Attenuation Steps) @ +85°C



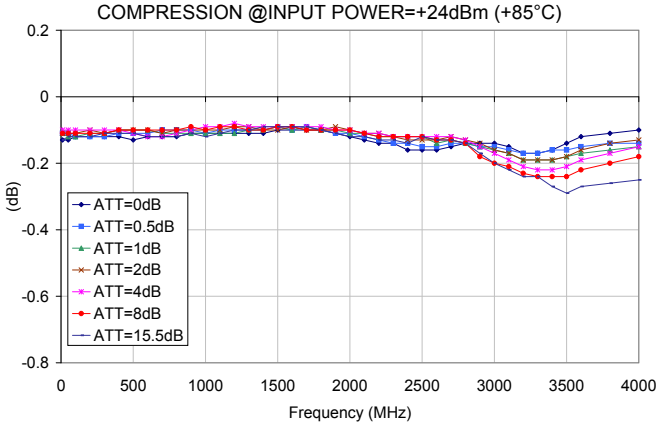
IP-3 INPUT (Major Attenuation Steps) @ -45°C



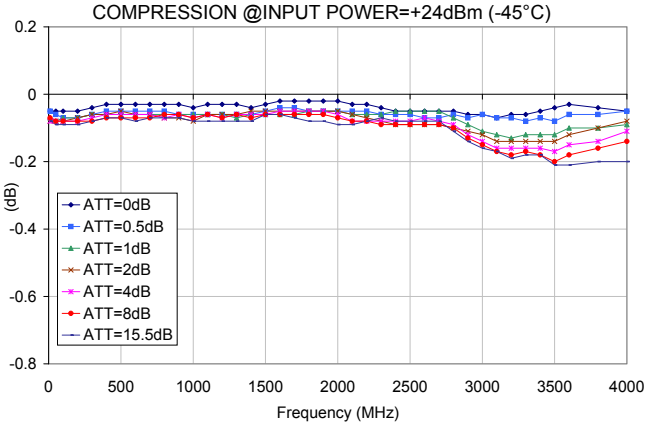
COMPRESSION @INPUT POWER=+24dBm (+25°C)



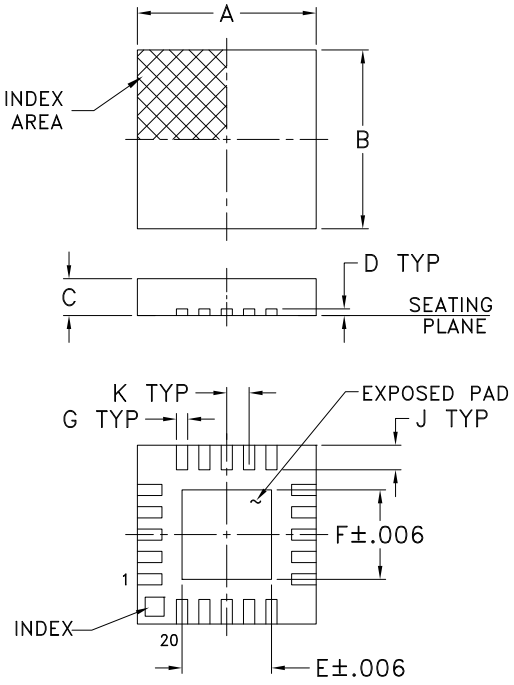
COMPRESSION @INPUT POWER=+24dBm (+85°C)



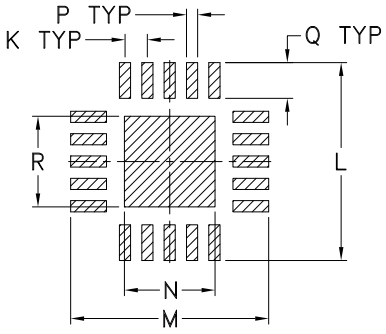
COMPRESSION @INPUT POWER=+24dBm (-45°C)



Outline Drawing (DG983-1)

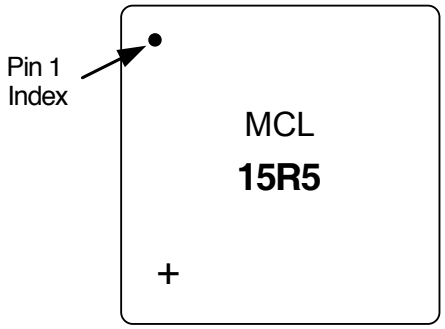


PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

Device Marking

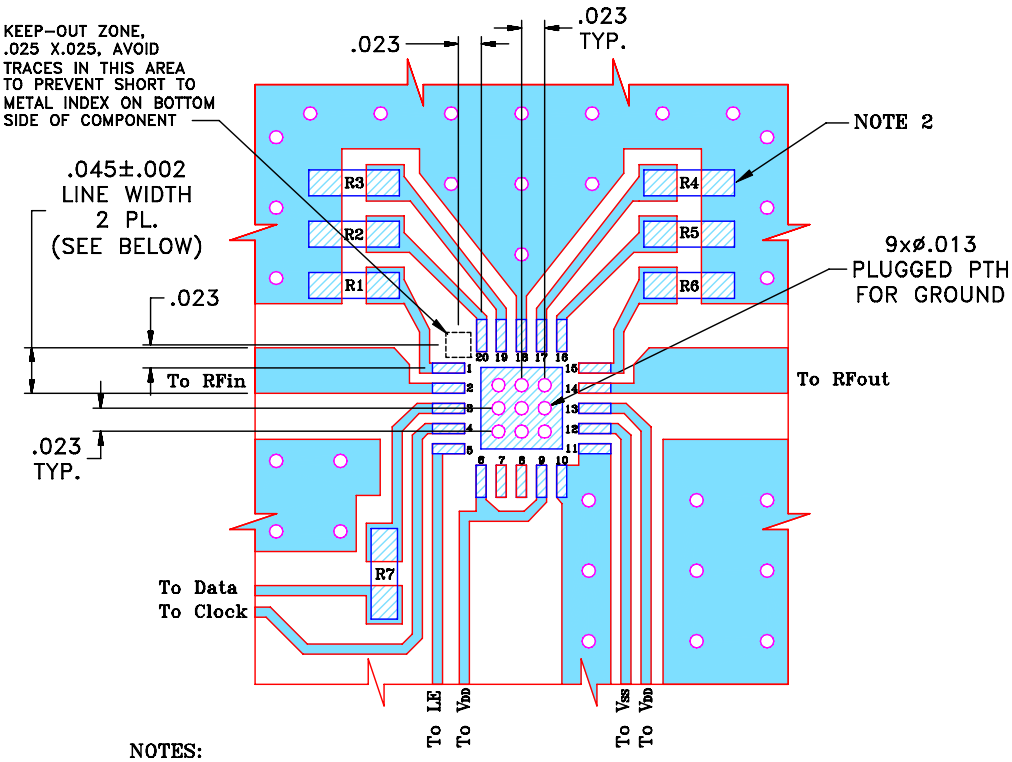


Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	WT. GRAMS
.157	**.157**	**.035**	**.008**	**.081**	**.081**	**.010**	—	**.022**	**.020**	**.177**	**.177**	**.081**	**.010**	**.032**	**.081**	.04
4.00	4.00	0.90	0.20	2.06	2.06	0.25	—	0.56	0.50	4.50	4.50	2.06	0.25	0.81	2.06	

Suggested Layout for PCB Design (PL-198)

The suggested Layout shows only the footprint area of the DAT, and the components located near this area (i.e.: R1-R7). For the complete Layout, see photo and schematic diagram on page 11 of 12.



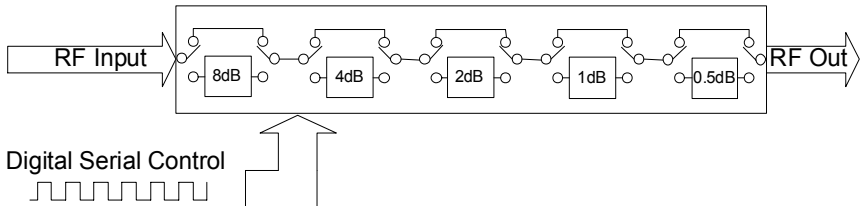
NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS. .025"±.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 SOLDERMASK

Simplified Schematic



The DAT-15R5-SN+ 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 1** (Serial Interface Timing Diagram) and **Table 2** (Serial Interface AC Characteristics).

Figure 1: Serial Interface Timing Diagram

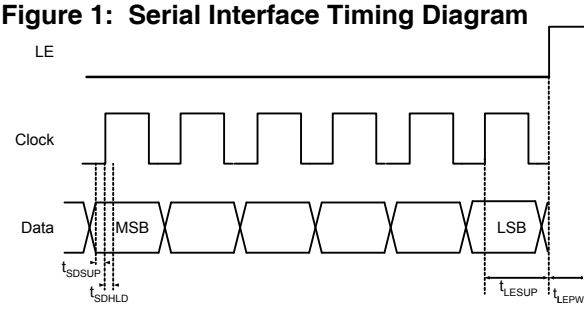


Table 2. Serial Interface AC Characteristics

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 rising edge	10		ns
t_{LEPW}	LE minimum pulse width	30		ns
t_{SDSUP}	Serial data set-up rising edge	10		ns
t_{SDHLD}	Serial data hold time after clock rising edge	10		ns

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

The DAT-15R5-SN+, uses a common 5-bit serial word format, as shown in **Table 3**: 5-Bit attenuator Serial Programming Register Map.

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

Table 3. 5-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)

Note: The start bit (B5) must always be low to prevent the attenuator from entering an unknown state.

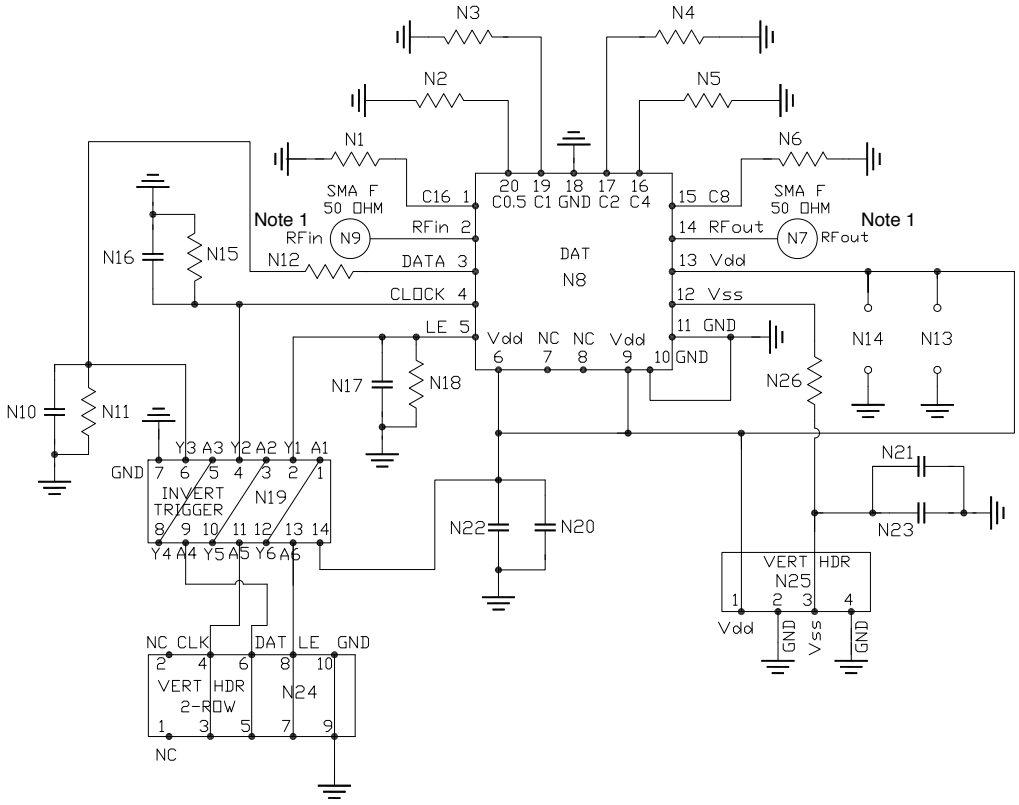
Power-up Control Settings

The DAT-15R5-SN+ 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 five data inputs (C0.5 to C8).

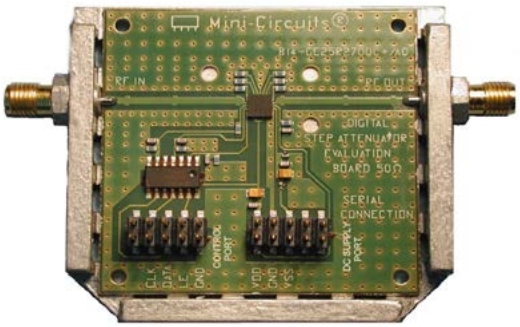
This allows any one of the 32 attenuation settings to be specified as the power-up state.

TB-342 Evaluation Board Schematic Diagram



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

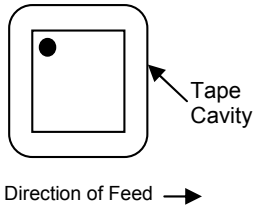
Bill of Materials	
N1-N6, N11, N12, N15 & N18	Resistor 0603 10 KOhm +/- 1%
N26	Resistor 0603 0 Ohm
N10, N16, N17, N20 & N23	NPO Capacitor 0603 100pF +/- 5%
N21 & N22	Tantalum Capacitor 0805 100nF +/- 10%
N19	Hex Invert Schmitt Trigger MSL1



TB-342

Tape and Reel Packaging Information

Table T&R

TR No.	No. of Devices	Reel Size	Tape Width	Pitch	Unit Orientation
F87	Small quantity standards 20, 50, 100, 200	7 inch	12 mm	8 mm	
	3000 (Standard)	13 inch			

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

Not recommended for new designs.
Recommended replacement part: DAT-15R5A-SN+

Digital Step Attenuator DAT-15R5-SN+

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
0.5	1.15	0.55	1.06	2.10	4.12	8.10	15.74
1	1.15	0.54	1.05	2.08	4.12	8.09	15.74
5	1.15	0.55	1.06	2.08	4.12	8.09	15.74
10	1.16	0.54	1.05	2.09	4.13	8.09	15.74
50	1.17	0.55	1.05	2.08	4.12	8.08	15.73
100	1.22	0.53	1.04	2.06	4.10	8.07	15.72
200	1.24	0.53	1.04	2.08	4.10	8.10	15.71
300	1.25	0.54	1.06	2.09	4.10	8.10	15.72
400	1.26	0.55	1.05	2.08	4.12	8.10	15.75
500	1.28	0.53	1.04	2.09	4.11	8.10	15.74
600	1.28	0.54	1.06	2.09	4.15	8.13	15.76
700	1.26	0.54	1.07	2.13	4.19	8.16	15.82
800	1.28	0.55	1.07	2.14	4.19	8.18	15.83
900	1.31	0.56	1.07	2.15	4.20	8.17	15.83
1000	1.37	0.56	1.07	2.13	4.17	8.15	15.78
1100	1.42	0.55	1.07	2.13	4.16	8.12	15.77
1200	1.46	0.55	1.06	2.14	4.15	8.13	15.74
1300	1.50	0.54	1.05	2.10	4.15	8.11	15.71
1400	1.56	0.52	1.05	2.12	4.12	8.10	15.66
1500	1.63	0.53	1.05	2.11	4.12	8.05	15.63
1600	1.65	0.55	1.07	2.15	4.15	8.10	15.66
1700	1.67	0.54	1.05	2.14	4.18	8.11	15.68
1800	1.69	0.55	1.04	2.17	4.18	8.13	15.70
1900	1.74	0.53	1.05	2.15	4.15	8.13	15.67
2000	1.78	0.55	1.07	2.17	4.19	8.10	15.68
2100	1.86	0.54	1.06	2.16	4.17	8.14	15.65
2200	1.93	0.55	1.06	2.17	4.17	8.14	15.69
2300	2.03	0.55	1.06	2.18	4.18	8.13	15.68
2400	2.13	0.54	1.04	2.15	4.15	8.12	15.68
2500	2.22	0.57	1.08	2.16	4.17	8.11	15.62
2600	2.25	0.57	1.07	2.16	4.16	8.12	15.56
2800	2.45	0.58	1.10	2.19	4.19	8.12	15.54
3000	2.83	0.60	1.10	2.20	4.10	7.96	15.17
3200	3.04	0.58	1.06	2.12	4.00	7.78	14.71
3600	3.76	0.64	1.08	2.12	3.99	7.79	15.00
4000	3.94	0.66	1.15	2.31	4.32	8.30	16.49
4500	3.13	0.70	1.19	2.32	4.24	7.94	15.27
5000	3.23	0.76	1.25	2.41	4.28	7.75	14.44
5500	3.99	0.94	1.35	2.53	4.36	7.98	15.30
6000	5.51	0.98	1.25	2.47	4.17	7.60	15.17

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

Digital Step Attenuator DAT-15R5-SN+

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
0.5	18.32	20.46	22.48	20.34	23.32	29.50	37.46
1	18.34	20.48	22.50	20.36	23.35	29.55	37.36
5	18.36	20.52	22.54	20.39	23.38	29.60	37.25
10	18.35	20.51	22.52	20.39	23.38	29.59	37.23
50	18.31	20.43	22.43	20.29	23.21	29.23	38.35
100	18.28	20.36	22.29	20.17	22.95	28.56	41.09
200	18.07	20.06	21.86	19.97	22.63	27.69	36.41
300	18.09	20.15	21.93	20.31	23.23	28.51	31.23
400	18.47	20.71	22.64	21.01	24.38	30.62	29.69
500	18.56	20.85	22.86	21.25	24.82	31.63	29.64
600	18.63	20.93	22.97	21.44	25.15	31.97	29.01
700	18.99	21.40	23.58	21.98	25.97	33.02	28.12
800	19.33	21.85	24.13	22.49	26.78	34.09	27.62
900	19.53	22.13	24.47	22.90	27.43	34.39	27.05
1000	19.83	22.55	25.03	23.44	28.47	35.17	26.40
1100	20.06	22.82	25.46	23.82	29.25	36.62	26.23
1200	20.03	22.81	25.48	23.89	29.40	37.60	26.29
1300	20.09	22.80	25.47	23.91	29.52	37.47	26.43
1400	20.00	22.68	25.24	23.84	29.27	36.87	26.72
1500	19.75	22.36	24.70	23.59	28.68	34.92	27.15
1600	19.70	22.32	24.56	23.69	28.70	33.71	26.97
1700	20.03	22.77	24.98	24.31	29.82	32.52	26.10
1800	20.13	23.01	25.02	24.78	30.33	30.66	25.26
1900	20.10	23.06	24.91	25.11	30.47	29.20	24.54
2000	20.59	23.77	25.48	26.23	31.58	27.78	23.48
2100	21.06	24.62	26.08	27.59	32.35	26.40	22.41
2200	21.38	25.27	26.21	28.90	31.78	25.06	21.39
2300	21.65	25.92	26.23	30.16	30.22	23.54	20.31
2400	22.51	27.59	27.30	33.12	28.81	22.29	19.21
2500	24.08	31.02	29.98	39.92	27.70	21.30	18.28
2600	26.89	38.19	33.61	36.39	25.79	20.32	17.42
2800	30.00	27.53	29.33	25.20	21.96	18.43	15.90
3000	21.78	19.47	20.48	18.79	17.92	16.33	14.42
3200	17.02	15.59	16.26	15.34	15.14	14.64	13.30
3600	15.05	13.88	14.17	13.40	13.16	13.07	12.18
4000	26.54	21.05	21.08	19.58	17.76	16.01	13.78
4500	21.35	19.62	22.34	21.98	21.83	19.64	15.82
5000	29.37	22.29	23.29	21.40	18.75	15.82	13.49
5500	16.39	14.48	15.87	15.36	15.44	14.15	12.21
6000	8.10	7.66	8.45	8.47	9.24	9.96	8.69

Digital Step Attenuator DAT-15R5-SN+

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
0.5	18.31	19.39	19.76	26.14	38.33	58.44	26.14
1	18.32	19.40	19.78	26.16	38.28	59.39	26.17
5	18.35	19.44	19.81	26.19	38.42	58.32	26.16
10	18.35	19.43	19.82	26.18	38.27	59.83	26.18
50	18.28	19.34	19.70	25.90	37.10	57.65	26.62
100	18.21	19.23	19.56	25.53	35.24	44.34	27.30
200	18.15	19.15	19.48	24.93	31.16	33.49	26.52
300	18.22	19.31	19.73	25.03	29.39	30.18	24.25
400	18.50	19.72	20.18	25.90	29.72	29.41	23.16
500	18.96	20.24	20.76	26.92	29.95	28.86	22.59
600	19.39	20.72	21.29	27.86	29.92	28.33	22.11
700	19.60	21.02	21.60	28.63	30.21	28.20	21.89
800	19.69	21.14	21.76	28.95	30.11	27.93	21.72
900	19.89	21.42	22.06	29.37	29.54	27.36	21.42
1000	20.04	21.63	22.31	29.90	29.40	27.04	21.17
1100	20.16	21.79	22.54	30.60	29.57	26.90	21.05
1200	20.31	21.97	22.76	31.26	29.60	26.81	20.96
1300	20.32	21.99	22.77	31.23	29.59	26.84	21.01
1400	20.31	22.06	22.81	30.95	29.00	26.48	20.88
1500	20.35	22.10	22.87	30.56	28.36	26.02	20.71
1600	20.24	22.03	22.82	30.07	27.94	25.68	20.61
1700	20.17	22.01	22.79	29.30	27.13	25.10	20.38
1800	20.28	22.23	23.04	28.65	26.07	24.25	19.94
1900	20.35	22.47	23.24	28.11	25.21	23.58	19.55
2000	20.13	22.30	23.04	27.10	24.40	22.91	19.21
2100	19.83	22.06	22.74	25.78	23.28	21.96	18.69
2200	19.68	21.97	22.53	24.19	21.74	20.61	17.82
2300	19.58	21.89	22.33	22.82	20.36	19.38	16.93
2400	19.55	21.86	22.13	21.80	19.32	18.33	16.13
2500	19.80	22.15	22.35	21.38	18.77	17.70	15.59
2600	21.14	23.98	24.08	22.03	18.72	17.45	15.23
2800	24.66	28.61	27.25	21.77	17.87	16.38	14.29
3000	28.74	39.98	34.87	24.01	18.95	17.01	14.58
3200	24.09	24.93	27.14	28.53	22.10	19.02	15.57
3600	14.19	14.03	14.57	16.34	18.17	18.57	17.10
4000	14.67	13.91	14.26	15.06	15.68	15.85	15.35
4500	17.42	16.35	17.01	17.83	18.13	17.70	16.13
5000	22.54	19.52	20.26	19.30	17.12	15.65	13.82
5500	14.21	12.82	13.43	13.07	12.30	11.29	9.86
6000	9.18	8.84	9.41	9.54	9.83	9.56	8.30

Digital Step Attenuator DAT-15R5-SN+

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
0.5	1.34	0.52	1.02	2.04	4.02	7.95	15.49
1	1.34	0.52	1.01	2.03	4.02	7.94	15.47
5	1.35	0.53	1.01	2.03	4.02	7.95	15.48
10	1.36	0.52	1.01	2.03	4.02	7.97	15.49
50	1.37	0.52	1.01	2.04	4.02	7.95	15.48
100	1.40	0.53	1.02	2.04	4.03	7.96	15.49
200	1.44	0.53	1.01	2.04	4.02	7.96	15.49
300	1.47	0.53	1.02	2.04	4.02	7.97	15.48
400	1.50	0.52	1.01	2.03	4.03	7.96	15.48
500	1.52	0.53	1.03	2.05	4.04	7.98	15.49
600	1.55	0.53	1.02	2.05	4.05	7.98	15.49
700	1.55	0.51	1.02	2.06	4.07	7.98	15.51
800	1.57	0.52	1.02	2.07	4.08	8.01	15.53
900	1.59	0.53	1.03	2.08	4.10	8.01	15.54
1000	1.67	0.52	1.01	2.07	4.08	7.99	15.49
1100	1.74	0.53	1.02	2.07	4.07	7.97	15.48
1200	1.80	0.52	1.00	2.04	4.04	7.95	15.44
1300	1.83	0.52	1.01	2.05	4.05	7.96	15.44
1400	1.90	0.53	1.02	2.06	4.03	7.94	15.42
1500	1.98	0.52	1.02	2.05	4.04	7.94	15.38
1600	2.03	0.50	1.00	2.05	4.04	7.92	15.37
1700	2.02	0.52	1.02	2.08	4.08	7.97	15.44
1800	2.03	0.52	1.03	2.10	4.09	7.99	15.47
1900	2.09	0.54	1.03	2.11	4.10	7.97	15.44
2000	2.16	0.52	1.00	2.11	4.08	7.95	15.42
2100	2.24	0.53	1.01	2.09	4.08	8.00	15.42
2200	2.31	0.54	1.03	2.14	4.10	8.02	15.49
2300	2.42	0.51	1.01	2.09	4.06	7.99	15.45
2400	2.48	0.54	1.03	2.13	4.10	8.00	15.49
2500	2.59	0.53	1.03	2.13	4.06	7.95	15.37
2600	2.63	0.55	1.04	2.11	4.08	7.96	15.34
2800	2.86	0.59	1.05	2.19	4.11	7.97	15.33
3000	3.27	0.54	1.04	2.11	3.97	7.79	14.92
3200	3.47	0.57	1.03	2.06	3.89	7.62	14.53
3600	4.24	0.60	1.06	2.12	3.95	7.73	15.05
4000	4.37	0.67	1.15	2.29	4.25	8.17	16.29
4500	3.64	0.65	1.14	2.28	4.15	7.77	15.08
5000	3.80	0.77	1.24	2.39	4.21	7.62	14.33
5500	4.67	0.94	1.37	2.50	4.24	7.79	15.22
6000	6.23	0.97	1.24	2.42	4.05	7.43	15.03

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

Digital Step Attenuator DAT-15R5-SN+

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
0.5	17.10	18.65	20.00	17.86	19.35	21.84	28.72
1	17.12	18.67	20.02	17.88	19.37	21.86	28.76
5	17.16	18.71	20.05	17.91	19.40	21.89	28.84
10	17.14	18.70	20.04	17.91	19.40	21.90	28.85
50	17.13	18.68	20.03	17.91	19.41	21.92	28.88
100	17.17	18.74	20.09	17.98	19.49	22.03	29.08
200	17.24	18.81	20.18	18.08	19.64	22.22	29.39
300	17.37	18.96	20.31	18.26	19.84	22.48	29.88
400	17.55	19.16	20.55	18.50	20.13	22.87	30.62
500	17.71	19.33	20.75	18.72	20.40	23.23	31.36
600	17.86	19.51	20.96	18.95	20.69	23.63	32.17
700	18.05	19.74	21.21	19.22	21.03	24.09	33.26
800	18.25	19.96	21.48	19.47	21.34	24.53	34.45
900	18.38	20.12	21.66	19.67	21.62	24.91	35.44
1000	18.48	20.22	21.75	19.83	21.82	25.20	36.38
1100	18.53	20.28	21.81	19.92	21.93	25.33	36.55
1200	18.54	20.27	21.79	20.03	22.02	25.43	36.49
1300	18.55	20.29	21.75	20.10	22.12	25.43	35.87
1400	18.52	20.26	21.66	20.18	22.18	25.39	35.19
1500	18.42	20.15	21.47	20.19	22.16	25.19	33.89
1600	18.38	20.11	21.35	20.27	22.27	25.25	33.52
1700	18.51	20.33	21.47	20.60	22.72	25.59	33.08
1800	18.54	20.40	21.42	20.91	23.05	25.64	31.53
1900	18.49	20.42	21.28	21.15	23.38	25.61	30.11
2000	18.60	20.66	21.36	21.67	23.99	25.85	28.80
2100	18.77	20.96	21.51	22.38	24.82	25.99	27.18
2200	19.10	21.50	21.87	23.40	25.96	25.99	25.49
2300	19.57	22.27	22.43	24.64	27.26	25.61	23.97
2400	20.52	23.77	23.66	26.89	29.25	25.21	22.61
2500	22.26	26.47	26.06	31.26	31.71	24.68	21.37
2600	24.87	31.27	29.76	44.31	31.15	23.60	20.15
2800	30.93	29.46	32.57	26.87	24.46	20.98	18.00
3000	22.11	20.04	21.31	19.30	19.02	18.16	16.16
3200	17.58	16.31	17.14	15.96	16.06	16.16	14.87
3600	16.10	14.95	15.45	14.47	14.41	14.71	13.79
4000	27.33	22.84	24.25	22.35	20.98	19.73	16.54
4500	23.66	23.05	27.57	25.79	26.72	24.46	19.21
5000	39.16	25.29	24.82	22.40	19.65	16.88	14.52
5500	15.72	14.22	15.43	14.78	15.13	14.76	12.76
6000	8.25	7.93	8.68	8.58	9.33	10.30	9.31

Digital Step Attenuator DAT-15R5-SN+

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
0.5	17.10	17.75	17.81	22.02	26.10	26.94	55.76
1	17.12	17.77	17.83	22.03	26.12	26.93	56.79
5	17.14	17.79	17.87	22.07	26.15	26.97	56.14
10	17.14	17.80	17.86	22.06	26.12	26.95	55.44
50	17.15	17.80	17.87	22.06	26.06	26.93	48.51
100	17.17	17.85	17.91	22.10	26.17	27.00	43.07
200	17.31	17.97	18.06	22.30	26.30	27.19	37.72
300	17.49	18.17	18.26	22.53	26.57	27.50	34.72
400	17.66	18.39	18.49	22.82	26.86	27.83	32.60
500	17.94	18.67	18.80	23.24	27.28	28.29	31.06
600	18.18	18.94	19.08	23.63	27.72	28.71	30.09
700	18.42	19.22	19.36	24.05	28.17	29.21	29.36
800	18.60	19.42	19.60	24.35	28.50	29.59	28.79
900	18.79	19.63	19.82	24.68	28.77	29.96	28.35
1000	18.92	19.80	20.01	24.92	28.97	30.11	28.02
1100	18.96	19.85	20.07	24.94	28.95	30.12	27.82
1200	18.94	19.86	20.05	24.85	28.57	29.77	27.51
1300	18.84	19.78	20.00	24.58	27.99	29.20	27.16
1400	18.70	19.66	19.91	24.24	27.30	28.43	26.54
1500	18.50	19.50	19.75	23.81	26.49	27.61	25.85
1600	18.34	19.37	19.65	23.44	25.69	26.74	25.02
1700	18.27	19.34	19.66	23.10	24.84	25.74	24.05
1800	18.24	19.38	19.71	22.73	23.96	24.75	22.94
1900	18.20	19.40	19.74	22.32	23.05	23.70	21.82
2000	18.15	19.47	19.82	21.87	22.13	22.65	20.74
2100	18.12	19.53	19.91	21.44	21.30	21.72	19.70
2200	18.20	19.73	20.09	21.03	20.48	20.74	18.68
2300	18.30	19.96	20.34	20.68	19.77	19.89	17.81
2400	18.49	20.23	20.60	20.42	19.21	19.18	17.10
2500	18.97	20.79	21.19	20.64	19.11	18.94	16.74
2600	20.28	22.54	22.95	21.55	19.35	18.86	16.44
2800	23.28	26.75	26.78	22.47	19.19	18.23	15.76
3000	26.20	32.06	33.39	26.04	20.98	19.39	16.40
3200	23.35	24.49	25.92	35.83	25.99	22.45	17.79
3600	14.13	13.95	14.28	16.45	18.55	19.48	19.59
4000	15.03	14.47	14.72	16.18	17.32	17.81	18.10
4500	19.94	18.98	19.54	21.99	23.06	22.45	20.44
5000	26.40	22.25	22.56	21.87	18.81	17.19	15.15
5500	14.02	12.84	13.27	13.41	12.92	12.04	10.67
6000	9.07	8.84	9.25	9.80	10.39	10.31	9.25

Digital Step Attenuator DAT-15R5-SN+

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
0.5	1.51	0.51	0.99	2.00	3.98	7.86	15.27
1	1.50	0.51	0.99	2.00	3.97	7.85	15.27
5	1.53	0.50	0.97	1.98	3.95	7.85	15.27
10	1.53	0.51	0.98	2.00	3.97	7.83	15.28
50	1.54	0.52	0.99	2.00	3.97	7.85	15.27
100	1.57	0.53	0.99	2.00	3.97	7.85	15.29
200	1.62	0.50	0.99	1.99	3.96	7.85	15.28
300	1.67	0.52	0.99	2.00	3.96	7.86	15.27
400	1.72	0.52	1.00	2.01	3.96	7.86	15.28
500	1.78	0.51	0.99	2.01	3.97	7.82	15.26
600	1.81	0.51	0.98	2.01	3.98	7.85	15.25
700	1.81	0.51	0.98	2.03	3.99	7.85	15.28
800	1.85	0.48	0.96	2.02	3.98	7.84	15.26
900	1.88	0.50	0.98	2.03	4.00	7.87	15.28
1000	1.98	0.50	0.96	2.01	3.98	7.85	15.24
1100	2.05	0.47	0.96	2.00	3.96	7.83	15.21
1200	2.09	0.50	0.98	2.02	3.97	7.84	15.22
1300	2.14	0.49	0.97	2.02	3.96	7.82	15.22
1400	2.22	0.50	0.97	2.02	3.97	7.82	15.19
1500	2.30	0.52	0.98	2.02	3.95	7.80	15.19
1600	2.35	0.49	0.98	2.02	3.98	7.81	15.19
1700	2.33	0.52	1.01	2.06	4.01	7.83	15.23
1800	2.36	0.51	1.00	2.06	4.01	7.88	15.24
1900	2.43	0.50	0.98	2.06	4.00	7.82	15.24
2000	2.49	0.51	1.00	2.08	4.00	7.85	15.24
2100	2.58	0.51	0.99	2.07	4.00	7.86	15.24
2200	2.64	0.53	1.02	2.10	4.03	7.88	15.29
2300	2.75	0.52	1.01	2.08	4.01	7.86	15.28
2400	2.82	0.55	1.03	2.09	4.04	7.88	15.30
2500	2.93	0.53	1.01	2.07	3.99	7.83	15.19
2600	2.96	0.54	1.03	2.12	4.01	7.86	15.19
2800	3.24	0.55	1.04	2.10	4.00	7.84	15.17
3000	3.67	0.54	1.01	2.03	3.88	7.63	14.70
3200	3.85	0.57	0.98	2.05	3.81	7.49	14.36
3600	4.72	0.59	1.02	2.09	3.89	7.68	15.10
4000	4.79	0.64	1.08	2.24	4.14	8.01	16.09
4500	4.13	0.67	1.12	2.24	4.07	7.63	14.89
5000	4.36	0.76	1.22	2.35	4.12	7.51	14.21
5500	5.30	0.95	1.32	2.42	4.10	7.58	14.87
6000	6.93	0.93	1.21	2.34	3.91	7.27	14.82

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

Digital Step Attenuator DAT-15R5-SN+

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
0.5	16.10	17.29	18.28	16.18	17.03	18.40	22.15
1	16.13	17.32	18.30	16.21	17.05	18.42	22.16
5	16.14	17.35	18.32	16.23	17.07	18.44	22.21
10	16.13	17.34	18.32	16.22	17.07	18.44	22.22
50	16.13	17.34	18.34	16.26	17.13	18.54	22.33
100	16.23	17.46	18.48	16.42	17.32	18.79	22.76
200	16.43	17.69	18.75	16.65	17.62	19.20	23.41
300	16.54	17.79	18.84	16.73	17.65	19.17	23.24
400	16.65	17.87	18.89	16.75	17.62	19.03	22.94
500	16.75	17.95	18.97	16.84	17.67	19.07	22.87
600	16.92	18.12	19.12	17.01	17.86	19.25	23.09
700	17.10	18.32	19.34	17.22	18.07	19.49	23.35
800	17.26	18.47	19.49	17.38	18.25	19.65	23.54
900	17.32	18.53	19.54	17.51	18.37	19.78	23.66
1000	17.35	18.57	19.56	17.62	18.50	19.92	23.83
1100	17.36	18.58	19.55	17.73	18.62	20.07	23.98
1200	17.34	18.57	19.50	17.80	18.74	20.21	24.15
1300	17.29	18.54	19.45	17.88	18.84	20.28	24.24
1400	17.22	18.47	19.34	17.92	18.89	20.33	24.19
1500	17.10	18.32	19.12	17.91	18.89	20.28	24.01
1600	17.02	18.28	19.03	17.97	18.98	20.38	24.11
1700	17.08	18.38	19.04	18.22	19.27	20.64	24.42
1800	17.05	18.39	18.95	18.42	19.53	20.83	24.55
1900	16.99	18.39	18.83	18.63	19.78	21.02	24.65
2000	17.08	18.57	18.92	19.06	20.31	21.52	25.10
2100	17.24	18.84	19.07	19.63	20.99	22.08	25.34
2200	17.60	19.35	19.45	20.51	22.03	22.87	25.49
2300	18.11	20.10	20.05	21.64	23.32	23.65	25.18
2400	19.15	21.52	21.26	23.51	25.41	24.74	24.68
2500	20.93	24.04	23.38	26.86	28.97	25.80	23.86
2600	23.46	27.83	26.41	33.26	34.00	26.18	22.69
2800	31.22	31.33	37.99	28.68	27.23	23.84	20.15
3000	22.58	20.64	22.37	19.91	20.07	20.05	17.90
3200	18.08	16.86	17.98	16.54	16.89	17.60	16.36
3600	17.32	16.12	16.88	15.64	15.68	16.32	15.36
4000	25.91	23.78	26.99	24.43	24.19	24.14	19.54
4500	24.20	25.77	31.86	29.75	34.31	30.60	22.97
5000	40.48	27.50	25.46	23.30	20.54	17.81	15.42
5500	15.52	14.15	15.41	14.58	15.05	15.13	13.19
6000	8.48	8.22	8.97	8.77	9.47	10.54	9.78

Digital Step Attenuator DAT-15R5-SN+

Typical Performance Data

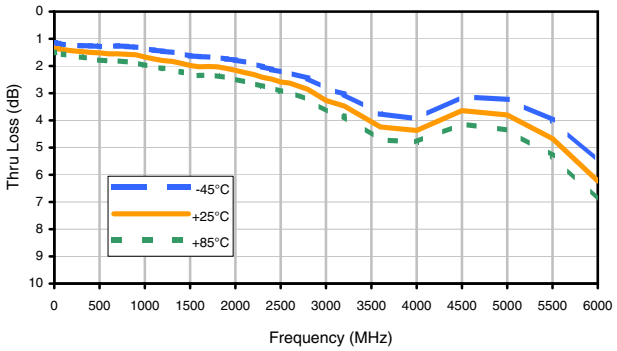
TEST CONDITIONS: INPUT POWER=-10dBm, Vdd=+3V, TEMPERATURE=+85degC

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
0.5	16.09	16.49	16.41	19.59	21.88	21.60	28.49
1	16.11	16.50	16.42	19.59	21.88	21.60	28.46
5	16.13	16.54	16.45	19.62	21.90	21.62	28.49
10	16.12	16.54	16.45	19.62	21.89	21.61	28.47
50	16.16	16.57	16.49	19.68	21.97	21.72	28.68
100	16.29	16.71	16.65	19.91	22.32	22.12	29.50
200	16.54	16.99	16.94	20.33	22.90	22.75	30.93
300	16.66	17.08	17.01	20.38	22.87	22.64	30.54
400	16.76	17.18	17.10	20.41	22.74	22.42	29.57
500	16.98	17.38	17.30	20.59	22.86	22.47	29.08
600	17.20	17.61	17.52	20.85	23.11	22.71	29.07
700	17.39	17.80	17.72	21.06	23.30	22.90	29.06
800	17.47	17.90	17.82	21.13	23.32	22.95	28.74
900	17.56	18.01	17.94	21.21	23.32	22.98	28.23
1000	17.65	18.10	18.03	21.24	23.29	23.05	27.83
1100	17.62	18.10	18.07	21.19	23.18	23.05	27.44
1200	17.56	18.11	18.08	21.12	23.04	23.02	26.90
1300	17.47	18.01	18.01	20.97	22.80	22.89	26.33
1400	17.32	17.90	17.94	20.74	22.52	22.70	25.63
1500	17.10	17.75	17.79	20.43	22.07	22.39	24.81
1600	16.97	17.62	17.72	20.19	21.66	22.06	23.98
1700	16.87	17.61	17.71	19.98	21.25	21.74	23.09
1800	16.83	17.63	17.75	19.74	20.84	21.36	22.16
1900	16.80	17.66	17.81	19.53	20.36	20.97	21.19
2000	16.76	17.70	17.89	19.30	19.88	20.58	20.34
2100	16.77	17.80	18.03	19.10	19.47	20.21	19.50
2200	16.88	18.04	18.29	18.96	19.05	19.74	18.69
2300	17.07	18.32	18.60	18.86	18.70	19.34	17.95
2400	17.33	18.66	18.99	18.91	18.46	19.00	17.42
2500	17.97	19.43	19.76	19.40	18.70	19.13	17.24
2600	19.22	21.06	21.42	20.43	19.17	19.36	17.08
2800	22.11	24.85	25.12	22.02	19.61	19.27	16.67
3000	24.84	28.91	29.78	26.16	22.07	21.12	17.67
3200	22.66	23.60	24.62	40.13	30.42	26.42	19.91
3600	14.11	13.96	14.16	16.55	18.69	19.76	21.81
4000	15.49	15.00	15.19	17.14	18.62	19.12	20.87
4500	21.87	21.43	22.06	27.20	31.39	29.76	25.72
5000	30.49	24.26	24.35	23.12	19.50	18.00	15.84
5500	14.03	13.00	13.33	13.81	13.50	12.67	11.39
6000	9.18	9.03	9.39	10.25	10.99	11.02	10.23

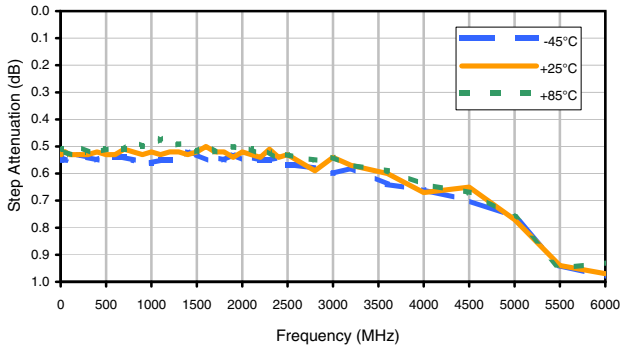
Digital Step Attenuator DAT-15R5-SN+

Typical Performance Curves

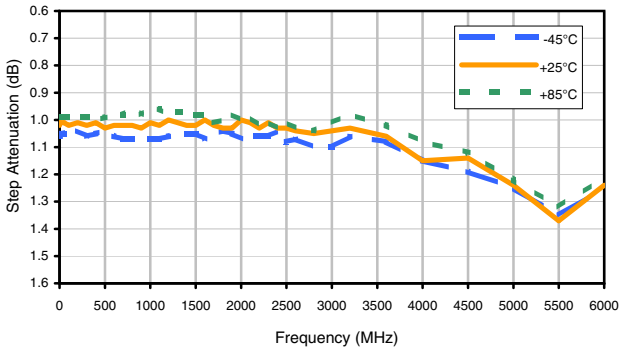
Thru Loss



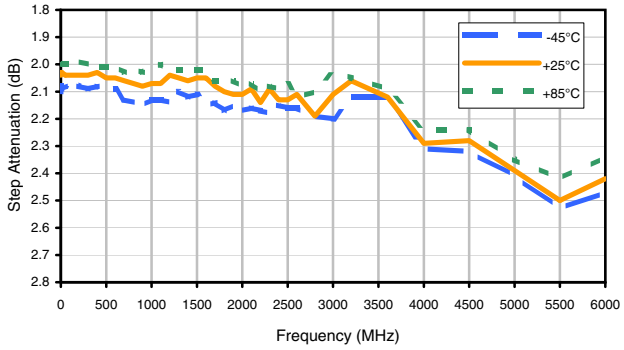
Step Attenuation (0.5dB)



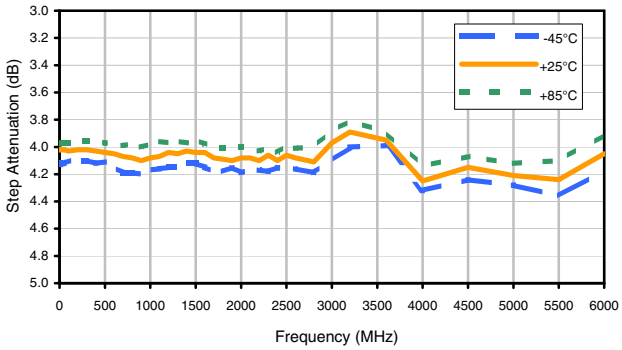
Step Attenuation (1dB)



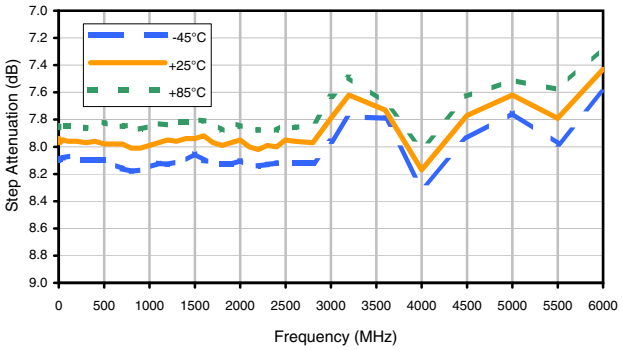
Step Attenuation (2dB)



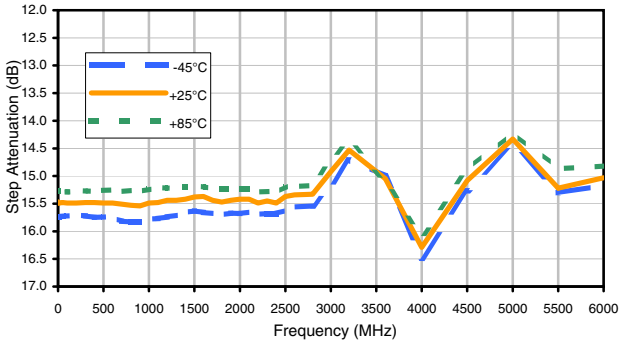
Step Attenuation (4dB)



Step Attenuation (8dB)



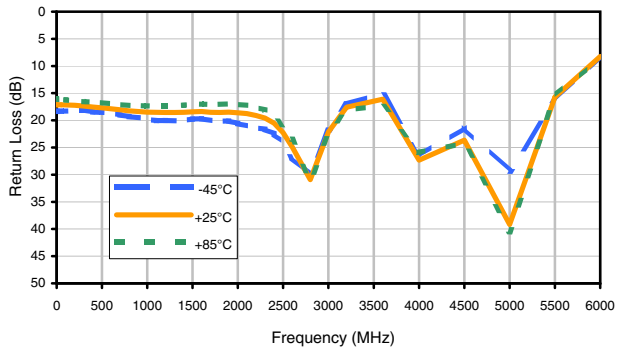
Step Attenuation (15.5dB)



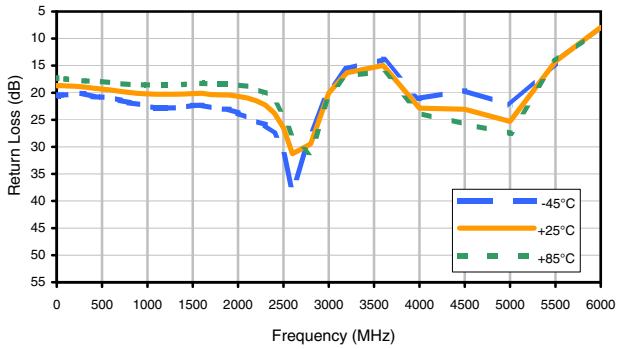
Digital Step Attenuator DAT-15R5-SN+

Typical Performance Curves

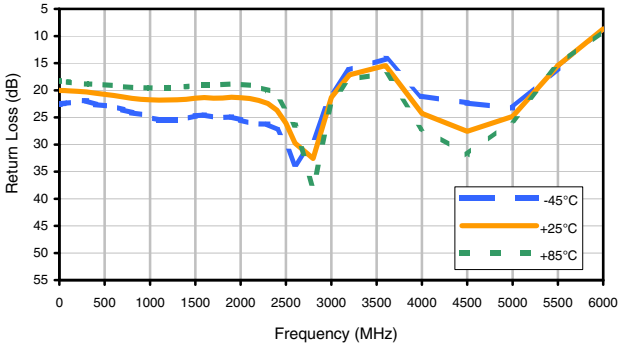
Input Return Loss (0 dB)



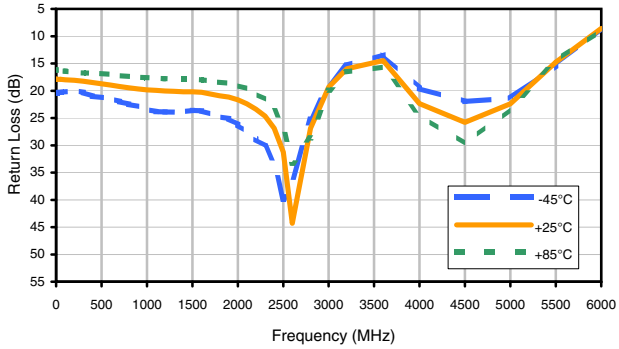
Input Return Loss (0.5dB)



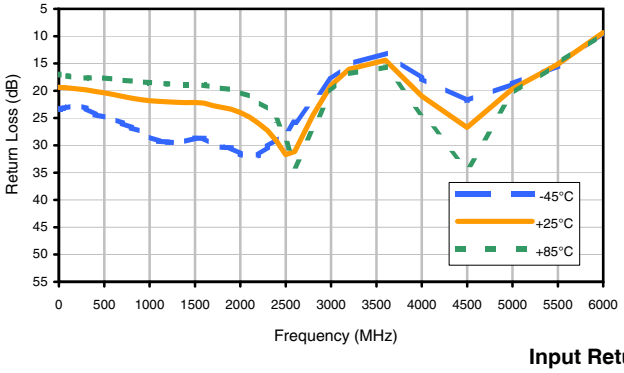
Input Return Loss (1dB)



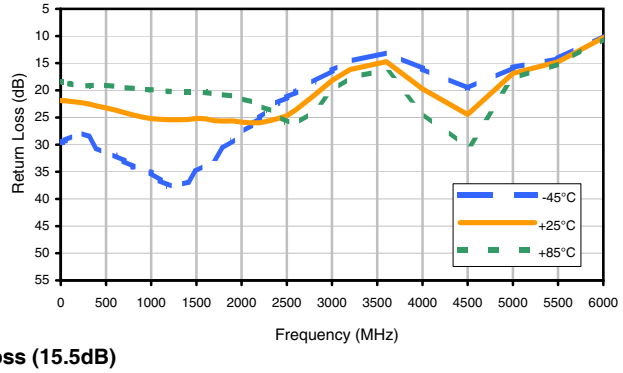
Input Return Loss (2dB)



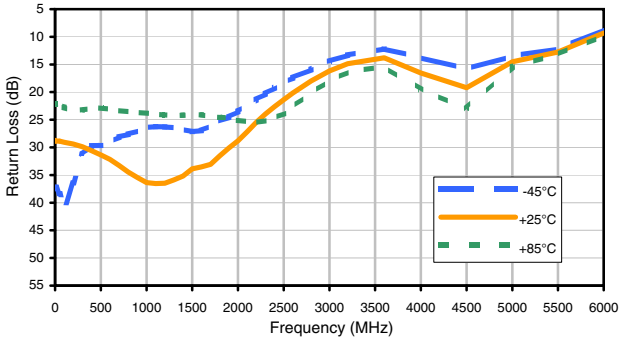
Input Return Loss (4dB)



Input Return Loss (8dB)



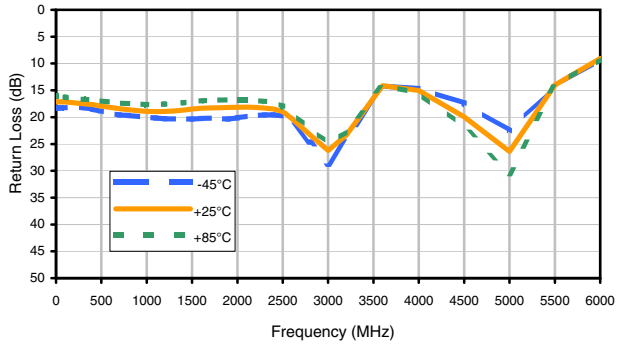
Input Return Loss (15.5dB)



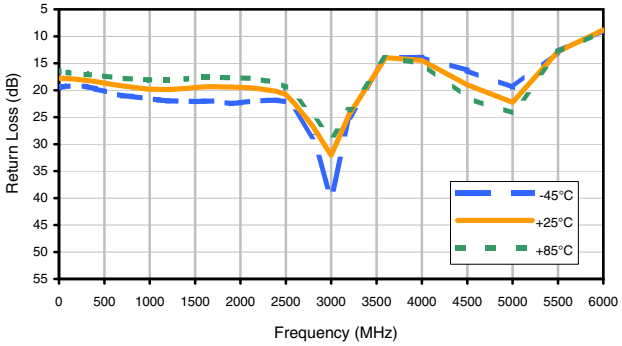
Digital Step Attenuator DAT-15R5-SN+

Typical Performance Curves

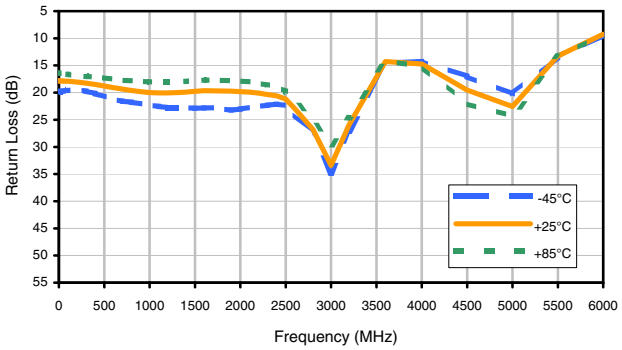
Output Return Loss (0 dB)



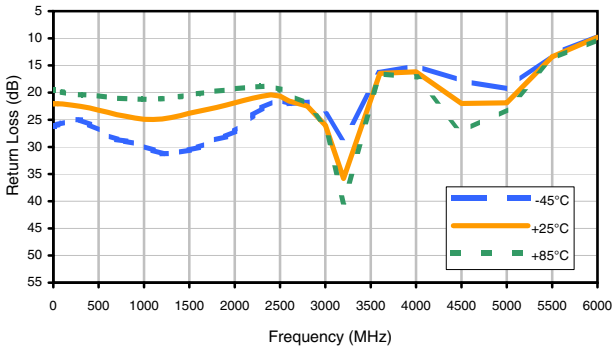
Output Return Loss (0.5dB)



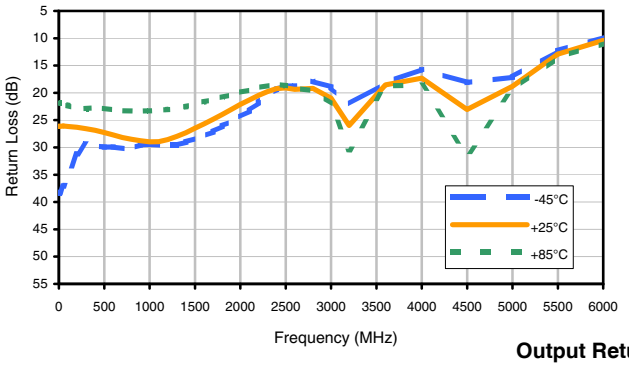
Output Return Loss (1dB)



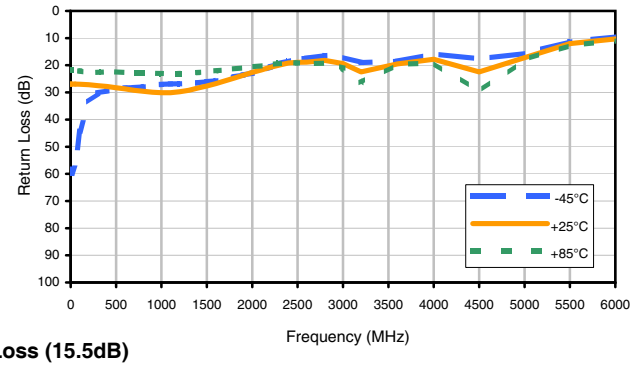
Output Return Loss (2dB)



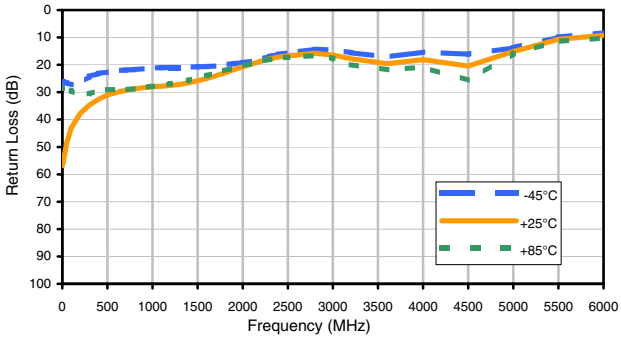
Output Return Loss (4dB)



Output Return Loss (8dB)

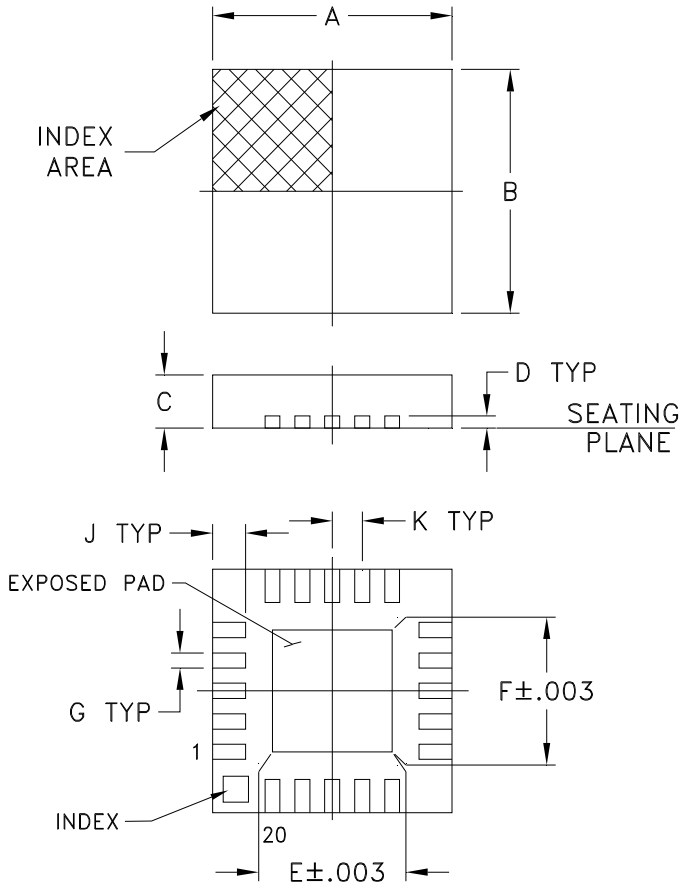


Output Return Loss (15.5dB)

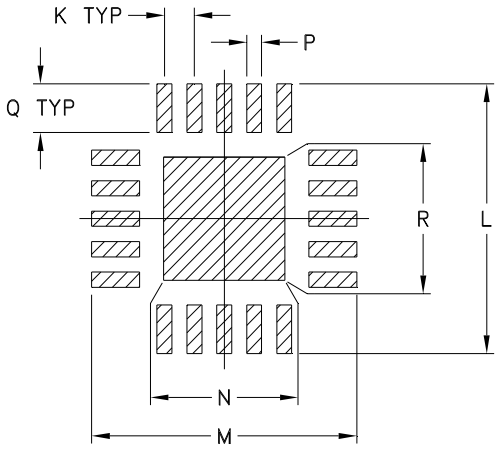


DG983-1

Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

CASE #	A	B	C	D	E	F	G	H	J	K
DG983-1	.157 (4.00)	.157 (4.00)	.035 (0.90)	.008 (0.20)	.081 (2.06)	.081 (2.06)	.010 (0.25)	-- --	.022 (0.56)	.020 (0.50)

CASE #	L	M	N	P	Q	R	WT. GRAM
DG983-1	.177 (4.50)	.177 (4.50)	.081 (2.06)	.010 (0.25)	.032 (0.81)	.081 (2.06)	.04

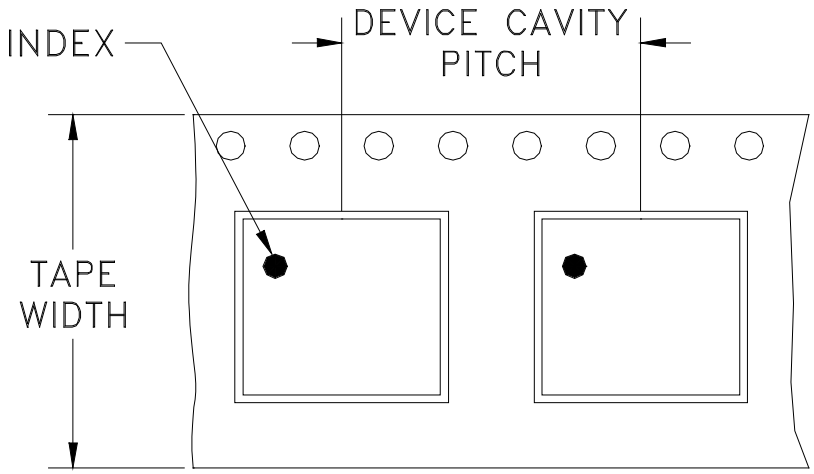
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

Notes:

1. Case material: Plastic.
2. Termination finish:
   For RoHS Case Styles: Tin plate. All models, (+) suffix.
   For RoHS-5 Case Styles: Tin-Lead plate. All models, no (+) suffix.

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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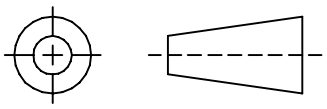
THIRD ANGLE PROJECTION

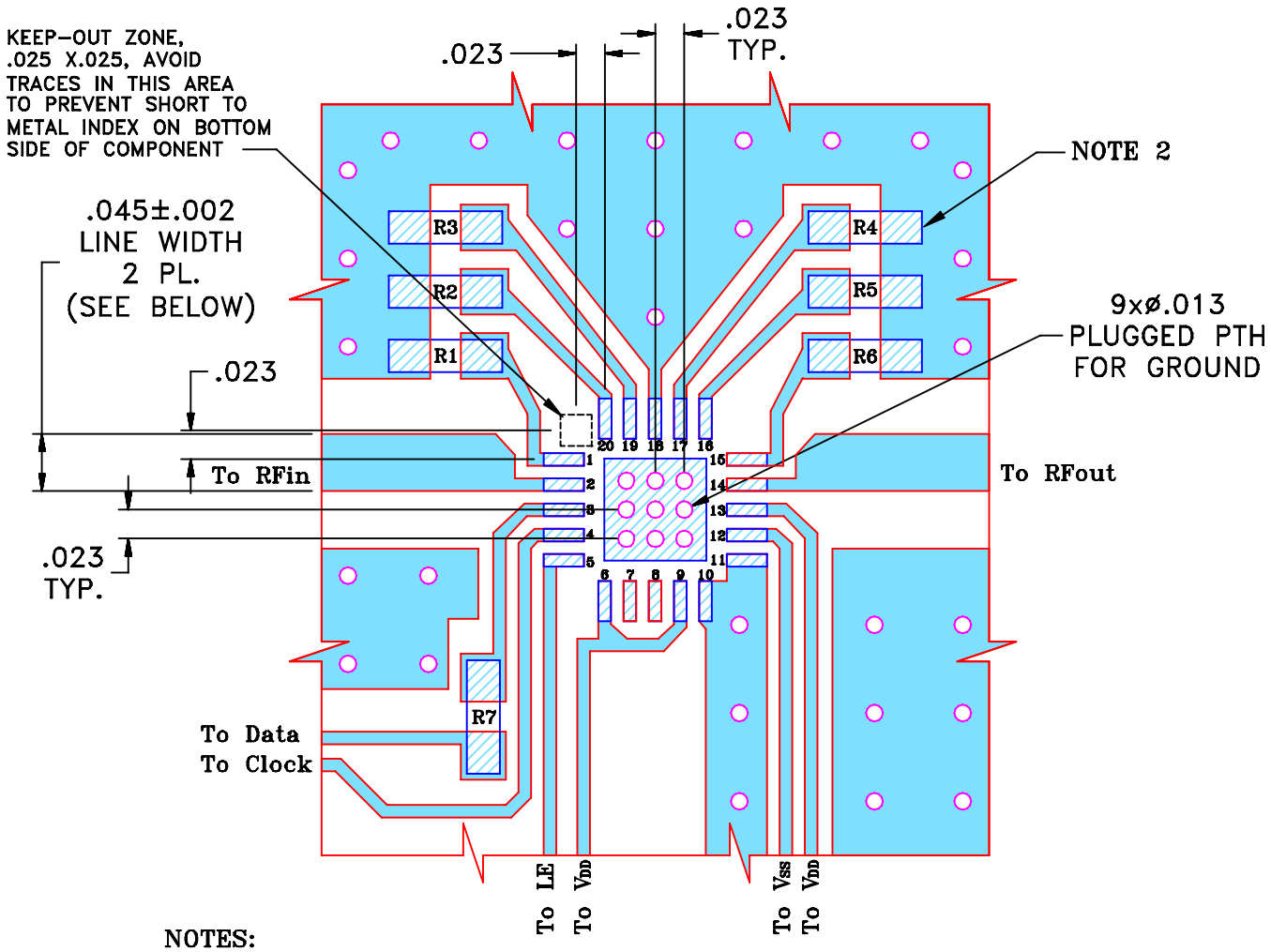


REVISIONS

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	IL
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, ql PIN CONNECTIONS, 50 Ω.



NOTES:

1. TRACE WIDTH IS SHOWN FOR FR4 WITH DIELECTRIC THICKNESS. .025"±.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 SOLDERMASK

UNLESS OTHERWISE SPECIFIED		INITIALS	DATE
DIMENSIONS ARE IN INCHES	DRAWN	DK (RAVON)	08 MAR 05
TOLERANCES ON:	CHECKED	RZ (RAVON)	08 MAR 05
2 PL DECIMALS ±	APPROVED	HH (RAVON)	08 MAR 05
3 PL DECIMALS ± .005			
ANGLES ±			
FRACTIONS ±			

ASHEETA1.DWG REV:A DATE:01/12/95

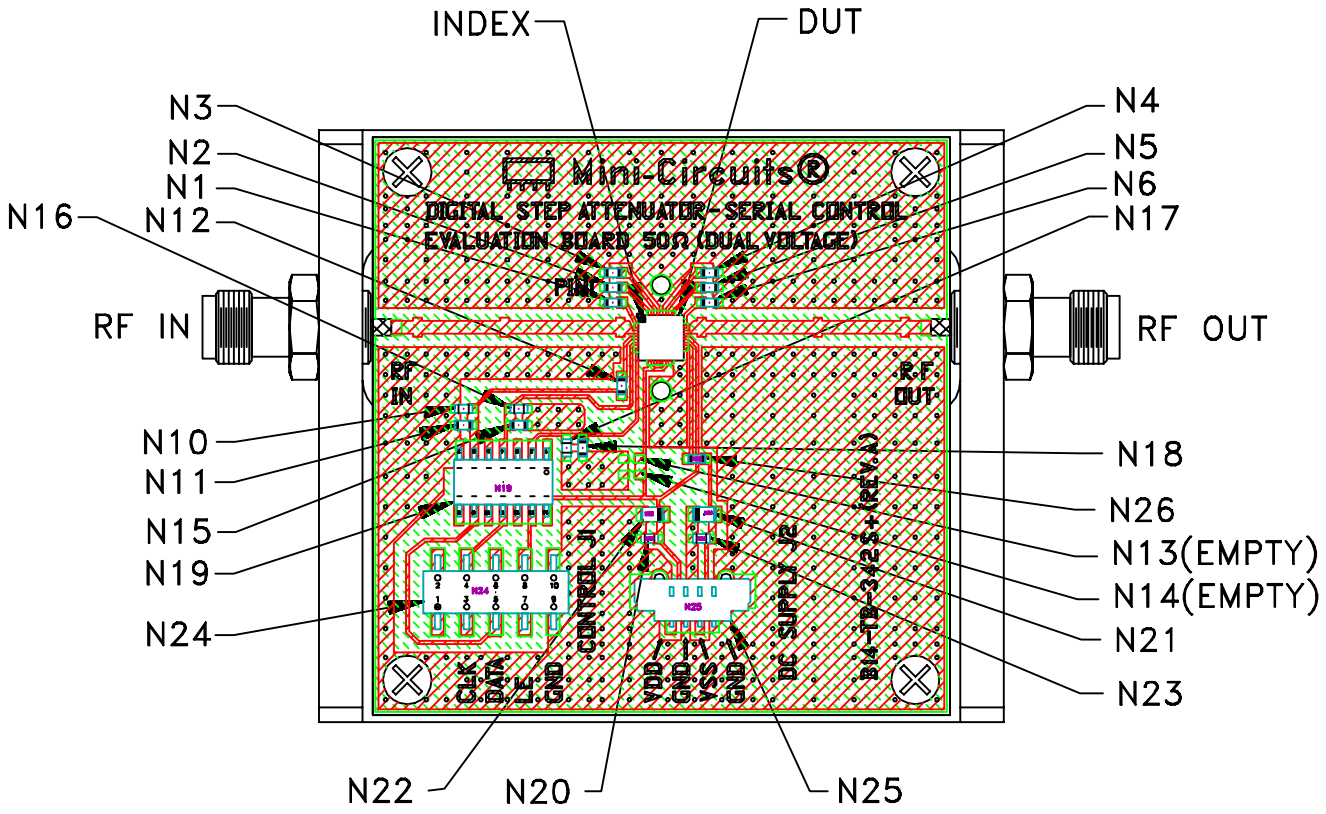
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, ql, DG983-1
TB-342 (50 Ω)

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-198	B

FILE:	SCALE:	SHEET:
98PL198	7:1	1 OF 1

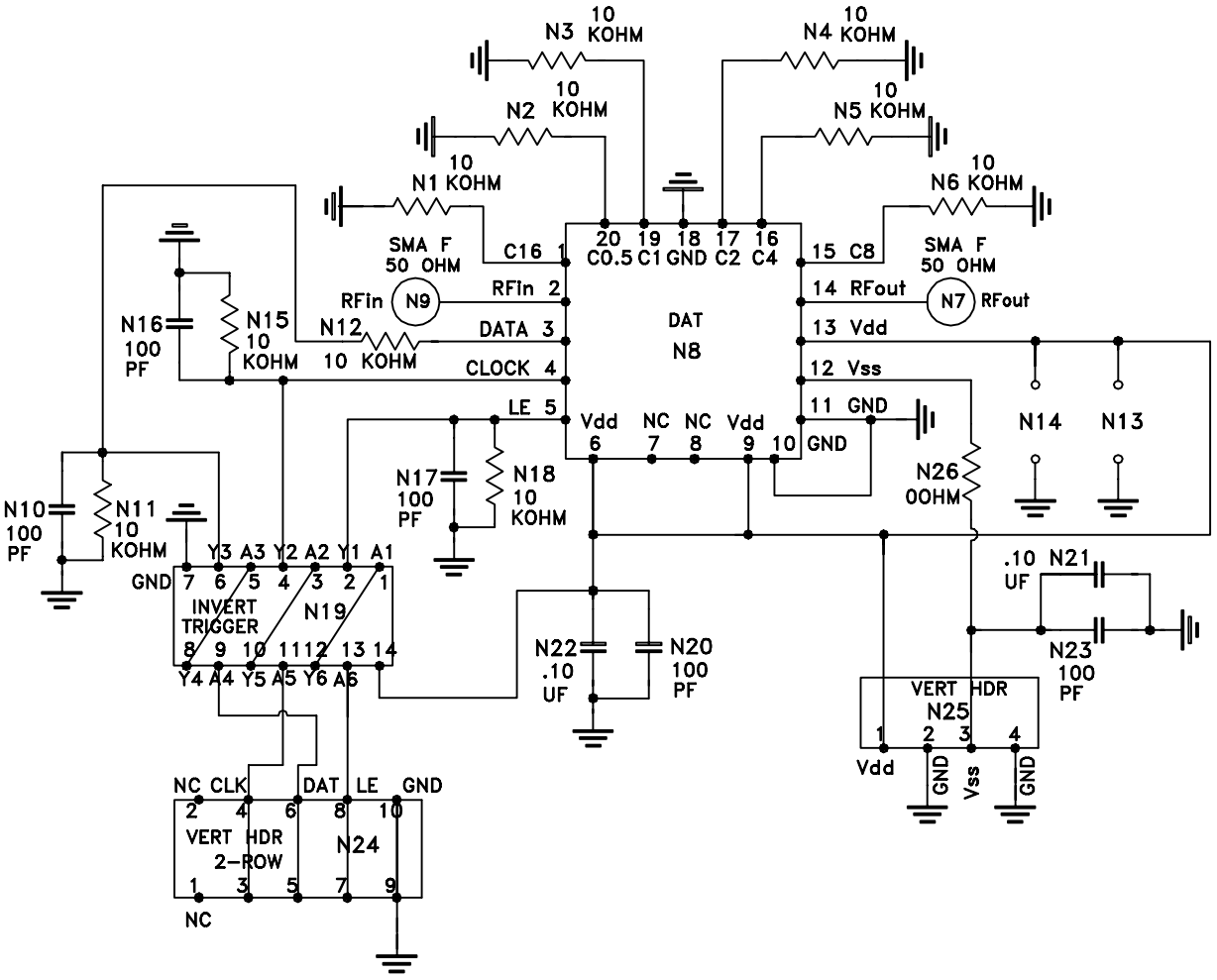
Evaluation Board and Circuit



TB-342

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®



Schematic Diagram

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