Digital Step Attenuator 50Ω DC-2400 MHz

31.5 dB, 0.5 dB Step
6 Bit, Parallel Control Interface, Single Positive Supply Voltage, +3V

Product Features
- Single positive supply voltage, +3V
- Immune to latch up
- Excellent accuracy, 0.1 dB Typ
- Parallel control interface
- 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

DAT-31R5-PP+

CASE STYLE: DG983-1

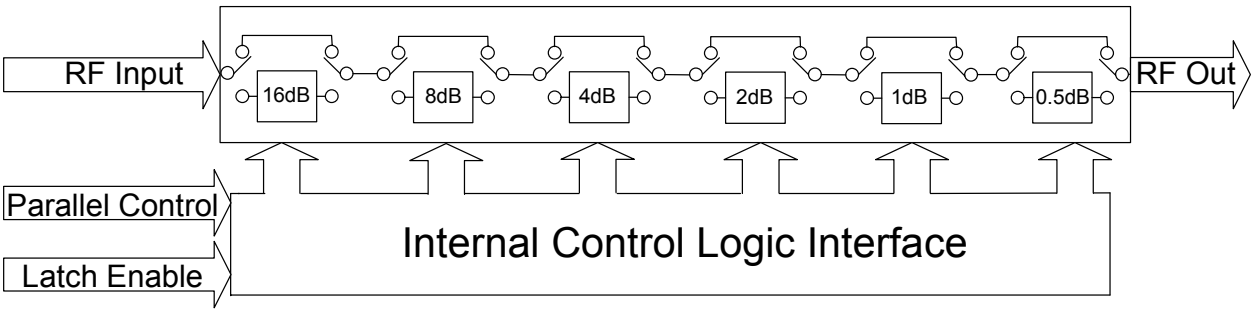
Typical Applications
- Base Station Infrastructure
- Portable Wireless
- CATV & DBS
- MMDS & Wireless LAN
- Wireless Local Loop
- UNII & Hiper LAN
- Power amplifier distortion canceling loops

+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-31R5A-PP+

General Description
The DAT-31R5-PP+ is a 50Ω RF digital step attenuator that offers an attenuation range up to 31.5 dB in 0.5 dB steps. The control is a 6-bit parallel interface, operating on a single +3 volt supply. The DAT-31R5-PP+ 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-2400 MHz, T_{AMB}=25°C, V_{DD}=+3V

Parameter	Freq. Range (GHz)	Min.	Typ.	Max.	Units
Accuracy @ **0.5 dB** Attenuation Setting	DC-1	—	0.03	0.1	dB
	1-2.4	—	0.05	0.15	dB
Accuracy @ **1 dB** Attenuation Setting	DC-1	—	0.02	0.1	dB
	1-2.4	—	0.05	0.15	dB
Accuracy @ **2 dB** Attenuation Setting	DC-1	—	0.05	0.15	dB
	1-2.4	—	0.15	0.25	dB
Accuracy @ **4 dB** Attenuation Setting	DC-1	—	0.07	0.2	dB
	1-2.4	—	0.15	0.25	dB
Accuracy @ **8 dB** Attenuation Setting	DC-1	—	0.03	0.2	dB
	1-2.4	—	0.15	0.25	dB
Accuracy @ **16 dB** Attenuation Setting	DC-1	—	0.1	0.3	dB
	1-2.4	—	0.15	0.3	dB
Insertion Loss (note 1) @ all attenuator set to 0dB	DC-1	—	1.3	1.9	dB
	1-2.4	—	1.6	2.4	dB
Input IP3 (note 2) (at Min. and Max. Attenuation)	DC-2.4	—	+52	—	dBm
Input Power @ 0.2dB Compression (note 2) (at Min. and Max. Attenuation)	DC-2.4	—	+24	—	dBm
VSWR	DC-1	—	1.2	1.5	—
	1-2.4	—	1.2	1.5	—

DC Electrical Specifications

Parameter	Min.	Typ.	Max.	Units
V_{DD}, Supply Voltage	2.7	3	3.3	V
I_{DD}, 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 @2400MHz, 0.75dB @4000MHz).
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	—	—	25	KHz

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.
Voltage on any input	-0.3V Min., V_{DD}+0.3V Max.
ESD, HBM	500V
ESD, MM	100V
Input Power	+24dBm

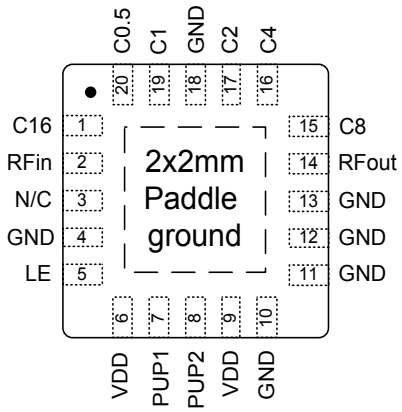
Permanent damage may occur if any of these limits are exceeded.

Pin Description

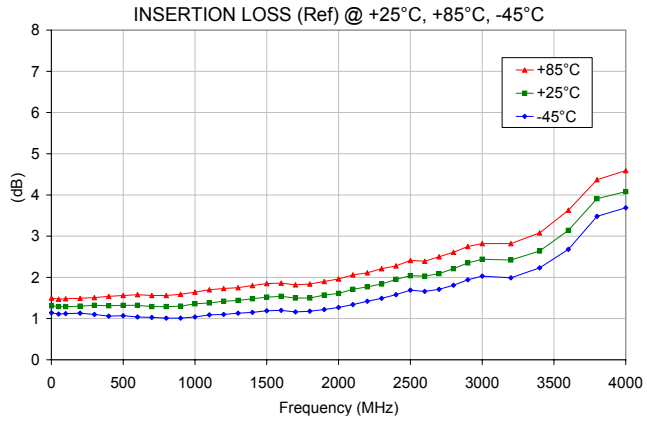
Function	Pin Number	Description
C16	1	Control for Attenuation bit, 16dB (Note 3)
RF in	2	RF in port (Note 1)
N/C	3	Not connected (Note 4)
GND	4	Ground connection
LE	5	Latch Enable Input (Note 2)
V_{DD}	6	Power Supply
PUP1	7	Power-up selection
PUP2	8	Power-up selection
V_{DD}	9	Power Supply
GND	10	Ground connection
GND	11	Ground connection
GND	12	Ground connection (Note 6)
GND	13	Ground connection
RF out	14	RF out port (Note 1)
C8	15	Control for attenuation bit, 8 dB
C4	16	Control for attenuation bit, 4 dB
C2	17	Control for attenuation bit, 2 dB
GND	18	Ground Connection
C1	19	Control for attenuation bit, 1 dB
C0.5	20	Control for attenuation bit, 0.5 dB
GND	Paddle	Paddle ground (Note 5)

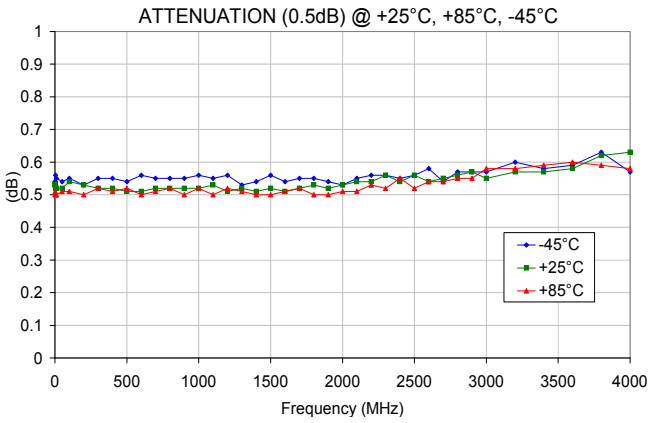
Notes:
1. Both RF ports must be held at 0VDC or DC blocked with an external series capacitor.
2. Latch Enable (LE) has an internal 100KΩ resistor to V_{DD}.
3. Place a 10KΩ resistor in series, as close to pin as possible to avoid freq. resonance.
4. Place a shunt 10KΩ resistor to GND
5. The exposed solder 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.

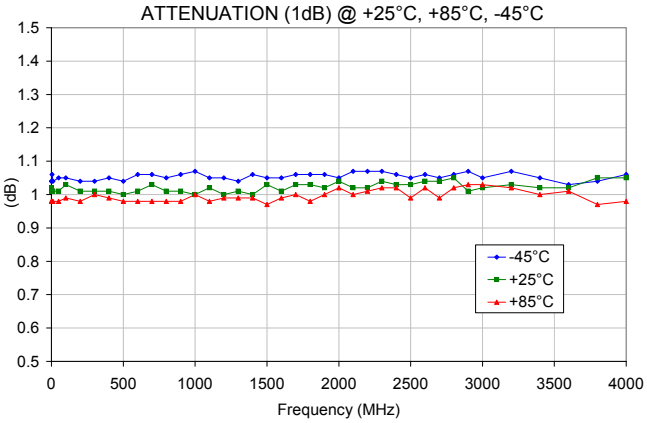
Pin Configuration (Top View)

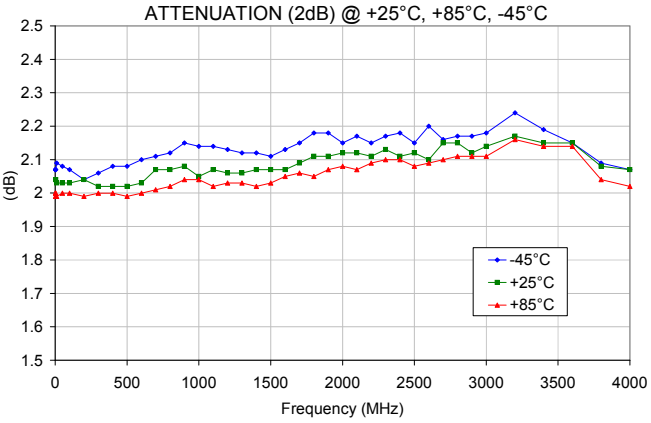


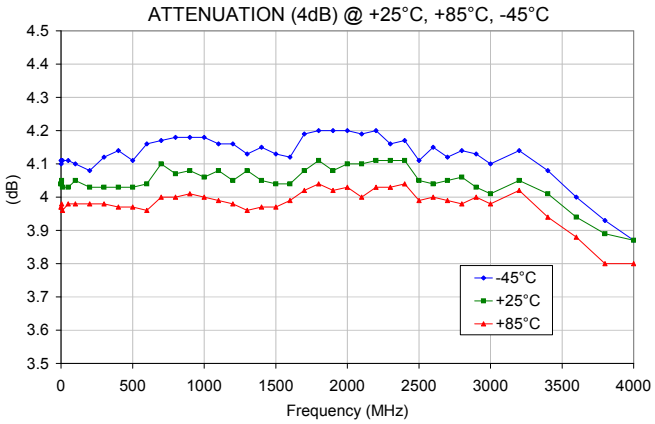
Typical Performance Curves

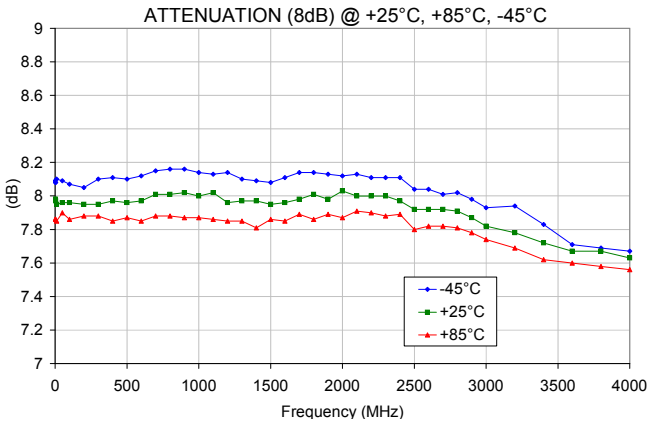




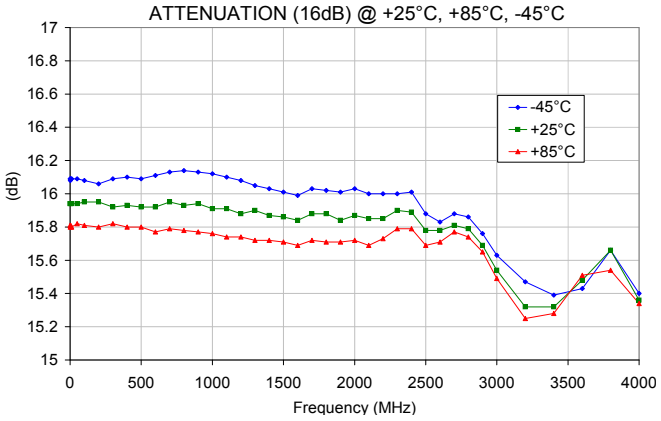


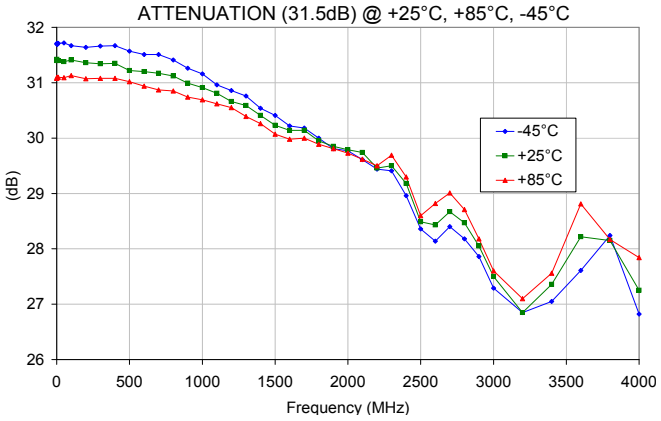


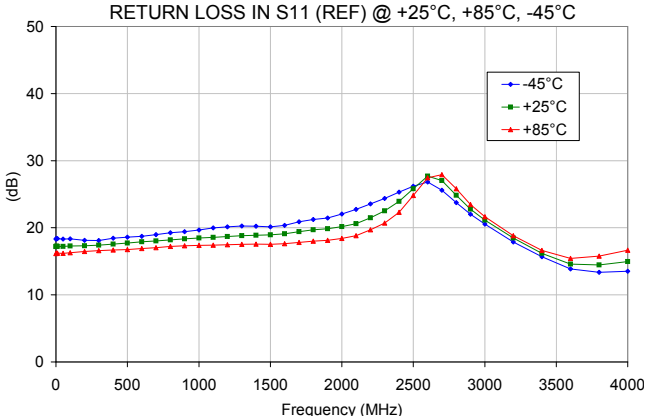


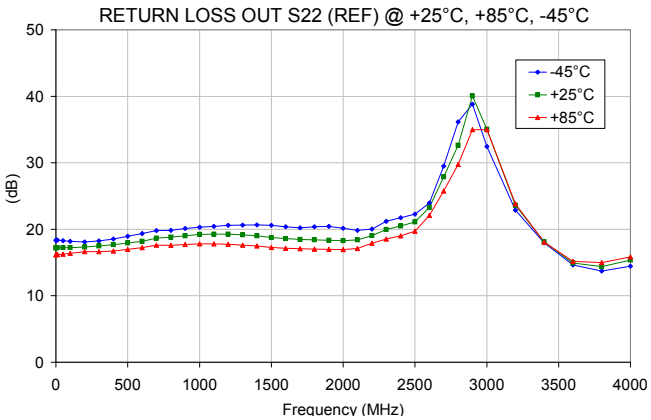


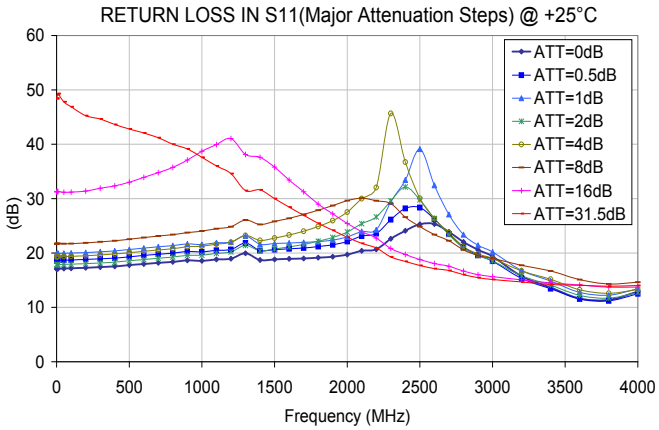
Typical Performance Curves

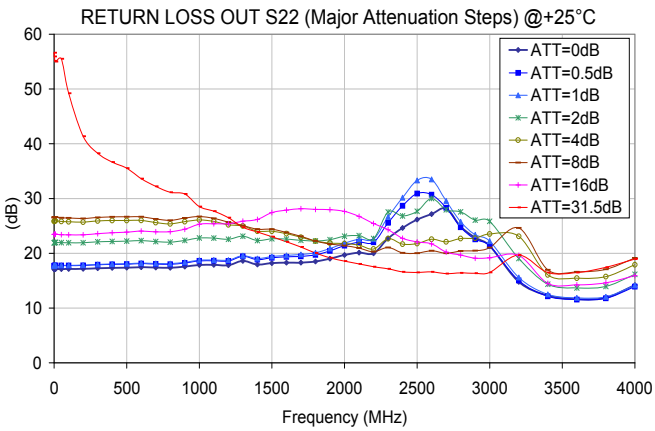




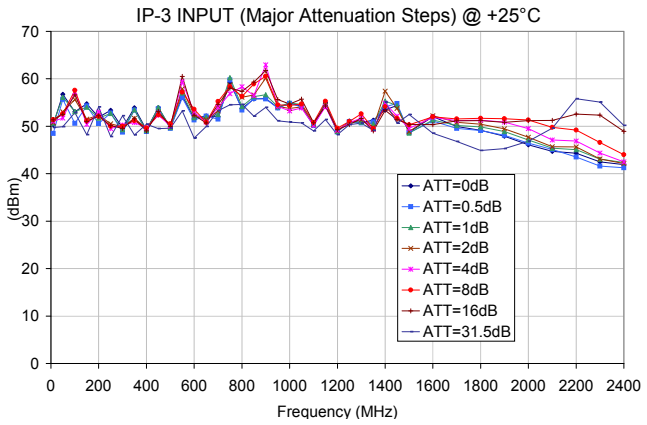


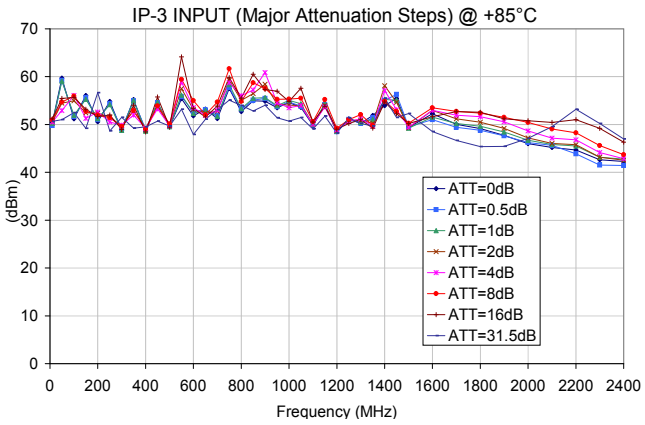


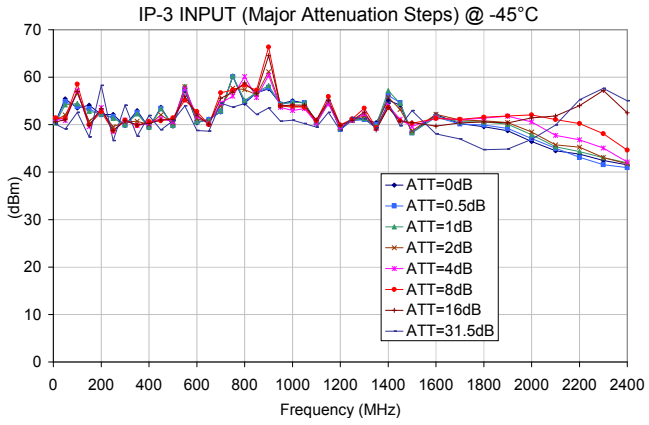


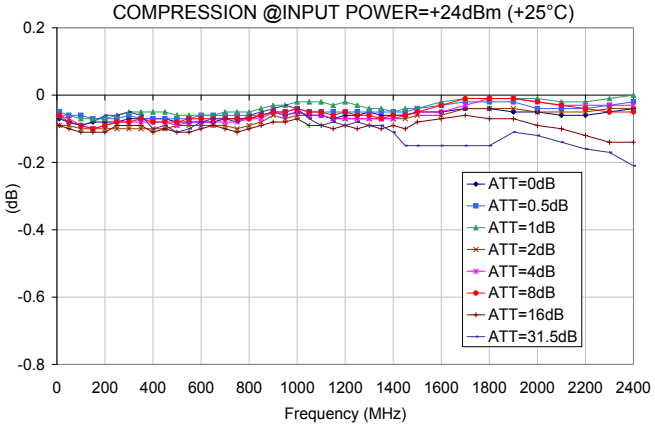


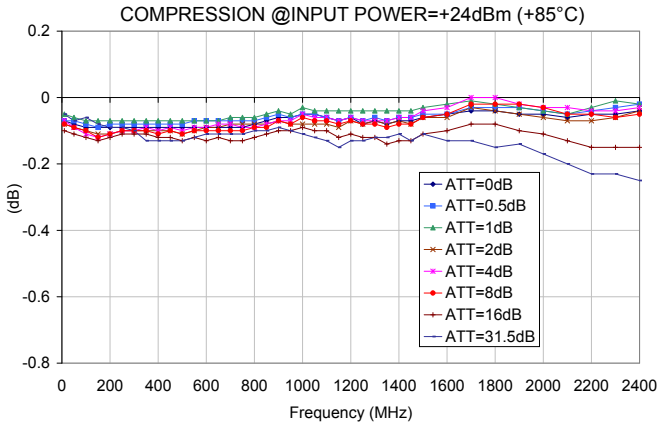
Typical Performance Curves

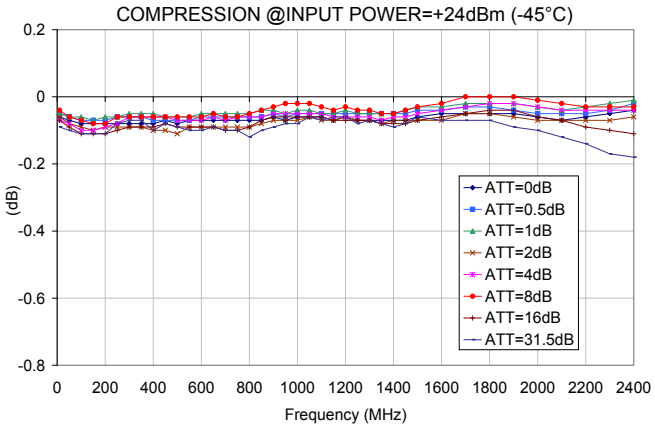




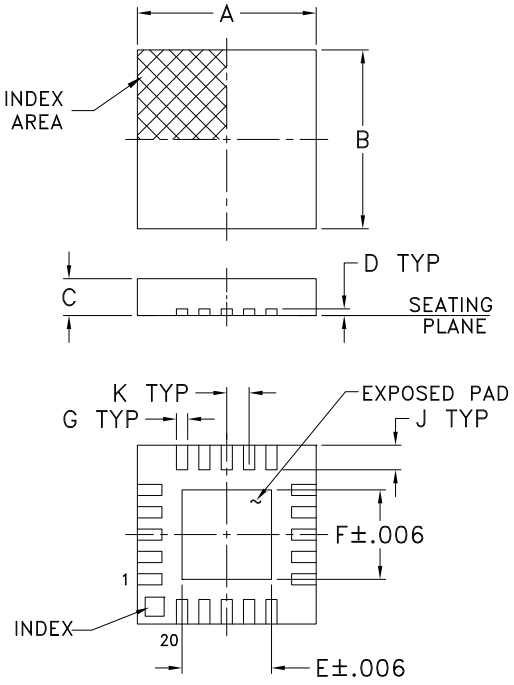




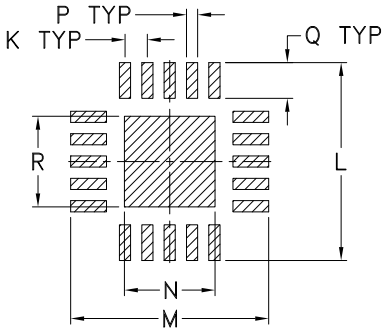




Outline Drawing (DG983-1)

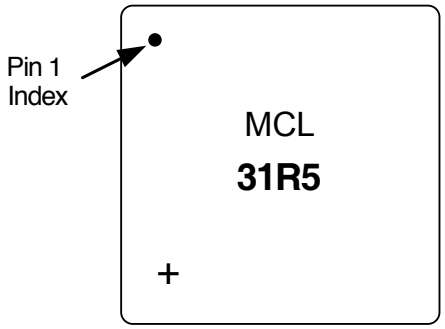


PCB Land Pattern



Suggested Layout,
Tolerance to be within ±.002

Device Marking

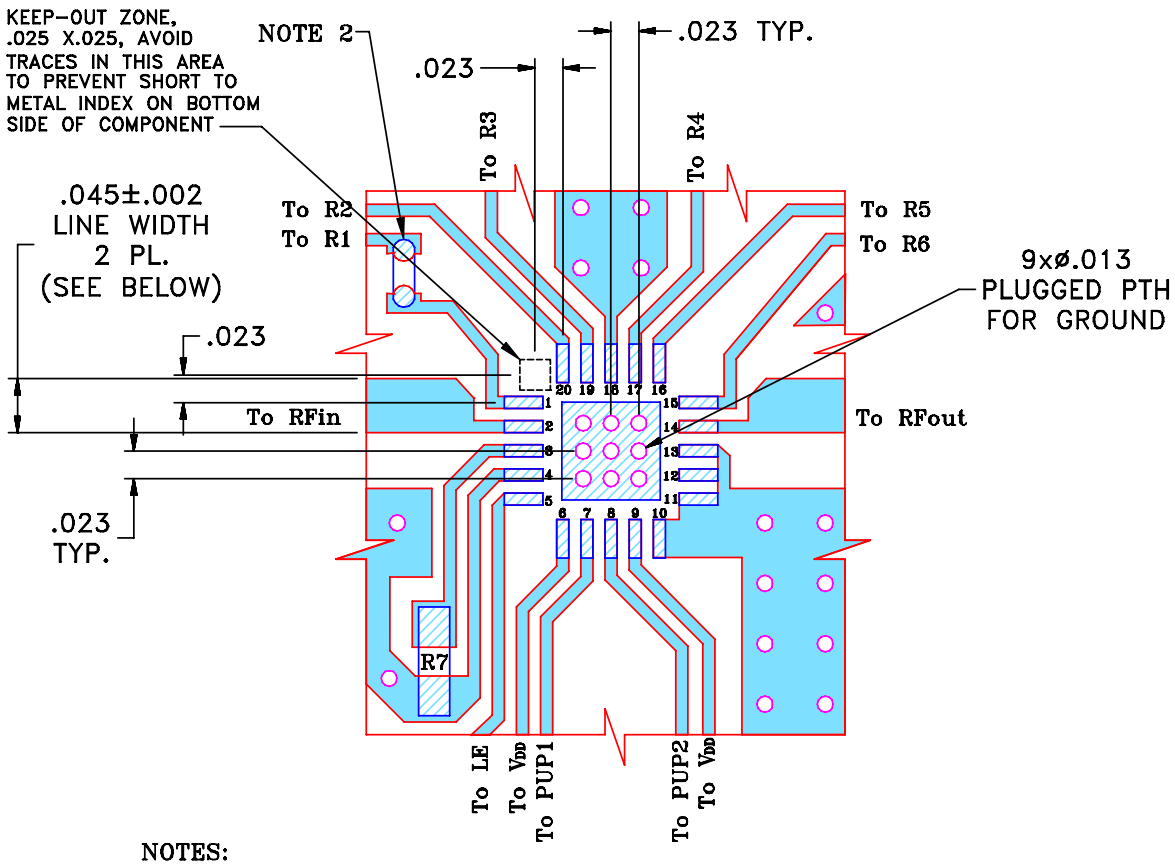


Outline Dimensions (inch/mm)

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-180)

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.



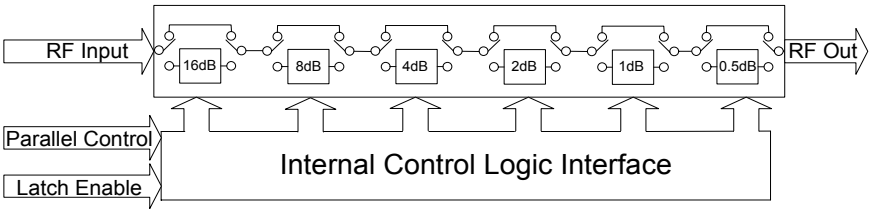
NOTES:

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, 0402 SIZES 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

Simplified Schematic



The DAT-31R5-PP+ parallel interface consists of 6 control bits that select the desired attenuation state, as shown in Table 1: Truth Table

Table 1. Truth Table

Attenuation State	C16	C8	C4	C2	C1	C0.5
Reference	0	0	0	0	0	0
0.5 (dB)	0	0	0	0	0	1
1 (dB)	0	0	0	0	1	0
2 (dB)	0	0	0	1	0	0
4 (dB)	0	0	1	0	0	0
8 (dB)	0	1	0	0	0	0
16 (dB)	1	0	0	0	0	0
31.5 (dB)	1	1	1	1	1	1
Note: Not all 64 possible combinations of C0.5 - C16 are shown in table						

The parallel interface timing requirements are defined by Figure 1 (Parallel Interface Timing Diagram) and Table 2 (Parallel Interface AC Characteristics), and switching speed.

For latched parallel programming the Latch Enable (LE) should be held LOW while changing attenuation state control values, then pulse LE HIGH to LOW (per Figure 1) to latch new attenuation state into device.

For direct parallel programming, the Latch Enable (LE) line should be pulled HIGH. Changing attenuation state control values will change device state to new attenuation. Direct mode is ideal for manual control of the device (using hardwire, switches, or jumpers).

Figure 1: Parallel Interface Timing Diagram

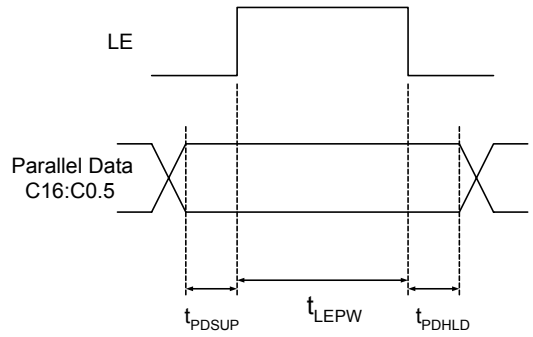


Table 2. Parallel Interface AC Characteristics

Symbol	Parameter	Min.	Max.	Units
t_{LEPW}	LE minimum pulse width	10		ns
t_{PDSUP}	Data set-up time before clock rising edge of LE	10		ns
t_{PDHLD}	Data hold time after clock falling edge of LE	10		ns

Power-up Control Settings

The DAT-31R5-PP+ always assumes a specifiable attenuation setting on power-up, allowing a known attenuation state to be established before an initial parallel control word is provided.

When the attenuator powers up with LE=0, the control bits are automatically set to one of four possible values .These four values are selected by the two power-up control bits,PUP1 and PUP2 ,as shown in table 3: (Power-Up Truth Table, Parallel Mode).

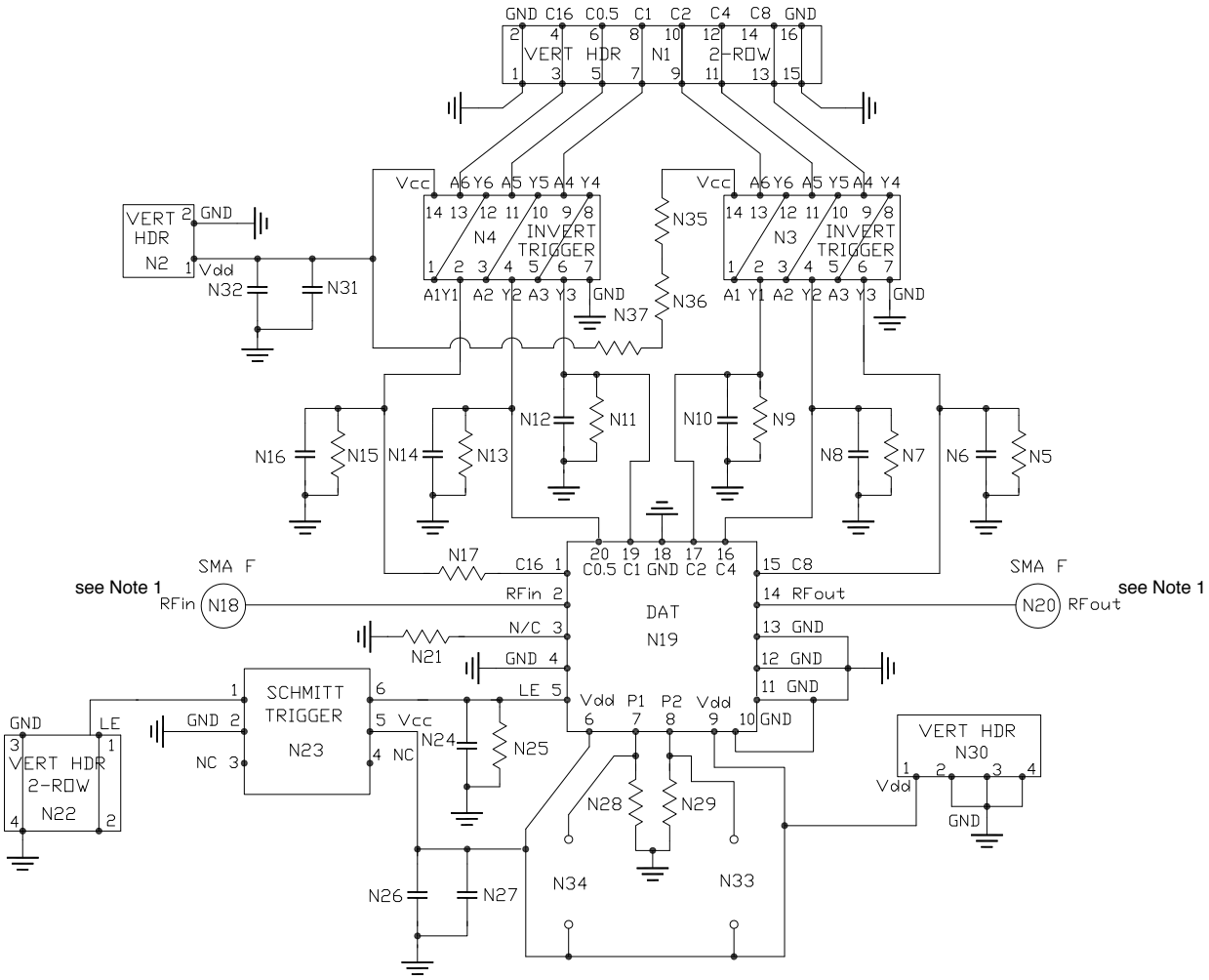
Table 3. Power-Up Truth Table, Parallel Mode

Attenuation State	PUP1	PUP2	LE
Reference	0	0	0
8 (dB)	0	1	0
16 (dB)	1	0	0
31 (dB)	1	1	0
Defined by C0.5-C16 (See Table 1-Truth Table)	X (Note 1)	X (Note 1)	1

Note 1: PUP1 and PUP2 Connection may be 0, 1, GROUND, or not connect, without effect on attenuation state.

Power-Up with LE=1 provides normal parallel operation with C0.5-C16, and PUP1 and PUP2 are not active.

TB-339 Evaluation Board Schematic Diagram



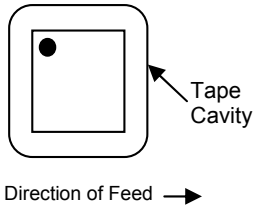
Note 1: Both RF ports must be held at 0VDC or DC blocked with an external series capacitor.

Bill of Materials	
N5, N7, N9, N11, N13, N15, N21 & N25	Resistor 0603 10 KOhm +/- 1%
N28 & N29	Resistor 0603 475 Ohm +/- 1%
N35 - N37	Resistor 0603 0 Ohm
N17	Resistor 0402 10 KOhm +/- 1%
N6, N8, N10, N12, N14, N16, N24, N26 & N32	NPO Capacitor 0603 100pF +/- 5%
N27 & N31	Tantalum Capacitor 0805 100nF +/- 10%
N3 & N4	Hex Invert Schmitt Trigger MSL1
N23	Dual Schmitt Trigger Buffer SC-70 MSL1

TB- 339

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-31R5A-PP+

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	STEP ATTENUATION* AT TTL CONTROL STATE (dB)							
	000000 THRU LOSS	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	1.14	0.54	1.04	2.07	4.11	8.09	16.09	31.70
1	1.14	0.54	1.04	2.07	4.10	8.08	16.08	31.71
5	1.14	0.56	1.06	2.07	4.11	8.08	16.09	31.69
10	1.15	0.55	1.04	2.09	4.11	8.10	16.09	31.71
50	1.16	0.54	1.05	2.08	4.11	8.09	16.09	31.72
100	1.20	0.55	1.05	2.07	4.10	8.07	16.08	31.67
200	1.25	0.53	1.04	2.04	4.08	8.05	16.06	31.64
300	1.25	0.55	1.04	2.06	4.12	8.10	16.09	31.66
400	1.25	0.55	1.05	2.08	4.14	8.11	16.10	31.67
500	1.29	0.54	1.04	2.08	4.11	8.10	16.09	31.57
600	1.29	0.56	1.06	2.10	4.16	8.12	16.11	31.51
700	1.29	0.55	1.06	2.11	4.17	8.15	16.13	31.51
800	1.30	0.55	1.05	2.12	4.18	8.16	16.14	31.41
900	1.32	0.55	1.06	2.15	4.18	8.16	16.13	31.26
1000	1.37	0.56	1.07	2.14	4.18	8.14	16.12	31.16
1100	1.44	0.55	1.05	2.14	4.16	8.13	16.10	30.96
1200	1.48	0.56	1.05	2.13	4.16	8.14	16.08	30.86
1300	1.53	0.53	1.04	2.12	4.13	8.10	16.05	30.76
1400	1.58	0.54	1.06	2.12	4.15	8.09	16.03	30.54
1500	1.65	0.56	1.05	2.11	4.13	8.08	16.01	30.41
1600	1.68	0.54	1.05	2.13	4.12	8.11	15.99	30.22
1700	1.68	0.55	1.06	2.15	4.19	8.14	16.03	30.18
1800	1.71	0.55	1.06	2.18	4.20	8.14	16.02	30.00
1900	1.77	0.54	1.06	2.18	4.20	8.13	16.01	29.81
2000	1.84	0.53	1.05	2.15	4.20	8.12	16.03	29.77
2100	1.92	0.55	1.07	2.17	4.19	8.13	16.00	29.61
2200	2.01	0.56	1.07	2.15	4.20	8.11	16.00	29.44
2300	2.09	0.56	1.07	2.17	4.16	8.11	16.00	29.41
2400	2.20	0.55	1.06	2.18	4.17	8.11	16.01	28.96
2500	2.32	0.56	1.05	2.15	4.11	8.04	15.88	28.36
2600	2.31	0.58	1.06	2.20	4.15	8.04	15.83	28.14
2700	2.38	0.54	1.05	2.16	4.12	8.01	15.88	28.40
2800	2.51	0.57	1.06	2.17	4.14	8.02	15.86	28.18
2900	2.66	0.57	1.07	2.17	4.13	7.98	15.76	27.86
3000	2.77	0.57	1.05	2.18	4.10	7.93	15.63	27.29
3200	2.79	0.60	1.07	2.24	4.14	7.94	15.47	26.85
3400	3.08	0.58	1.05	2.19	4.08	7.83	15.39	27.05
3600	3.59	0.59	1.03	2.15	4.00	7.71	15.43	27.61
3800	4.45	0.63	1.04	2.09	3.93	7.69	15.66	28.24
4000	4.73	0.57	1.06	2.07	3.87	7.67	15.40	26.82

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

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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.

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	INPUT RETURN LOSS AT TTL CONTROL STATE (dB)							
	000000 0 dB	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	18.33	20.43	22.33	20.25	23.09	28.91	32.02	26.51
1	18.35	20.45	22.35	20.27	23.11	28.94	32.03	26.52
5	18.38	20.50	22.39	20.31	23.15	28.97	32.04	26.50
10	18.37	20.48	22.38	20.30	23.14	28.99	32.01	26.49
50	18.31	20.38	22.26	20.20	22.96	28.59	32.71	26.88
100	18.35	20.38	22.18	20.13	22.80	28.10	33.80	27.41
200	18.14	20.12	21.81	19.92	22.49	27.26	32.96	27.40
300	18.11	20.12	21.80	20.19	22.99	28.05	29.37	25.44
400	18.44	20.58	22.40	20.80	23.92	29.76	27.83	24.27
500	18.60	20.80	22.71	21.09	24.40	30.80	27.50	24.01
600	18.74	20.97	22.94	21.37	24.81	31.42	26.95	23.68
700	18.98	21.30	23.33	21.80	25.47	32.42	26.24	23.17
800	19.27	21.67	23.77	22.19	26.12	33.28	25.75	22.85
900	19.42	21.88	24.04	22.55	26.68	33.66	25.16	22.45
1000	19.68	22.25	24.52	23.10	27.63	34.38	24.44	21.93
1100	19.99	22.65	25.09	23.59	28.60	35.61	24.01	21.62
1200	20.14	22.86	25.39	23.88	29.31	36.53	23.74	21.43
1300	20.27	22.97	25.63	24.08	29.69	37.10	23.67	21.41
1400	20.22	22.93	25.51	24.10	29.66	36.67	23.73	21.50
1500	20.15	22.79	25.27	24.06	29.47	34.98	23.70	21.51
1600	20.35	23.08	25.60	24.52	30.45	33.94	23.19	21.15
1700	20.89	23.84	26.56	25.63	32.65	32.56	22.36	20.50
1800	21.25	24.40	27.23	26.52	34.87	31.08	21.65	19.97
1900	21.45	24.68	27.70	27.13	36.63	30.10	21.20	19.59
2000	22.04	25.55	28.88	28.40	41.63	28.76	20.50	19.05
2100	22.74	26.60	30.65	30.21	53.90	27.27	19.76	18.39
2200	23.55	27.70	33.27	31.92	40.38	25.98	19.03	17.77
2300	24.36	28.75	36.88	33.03	34.41	24.72	18.34	17.21
2400	25.31	29.15	41.85	31.62	30.37	23.50	17.66	16.65
2500	26.19	28.05	35.06	28.37	26.98	22.26	16.98	16.08
2600	26.82	26.40	29.58	25.44	24.14	20.94	16.30	15.52
2700	25.61	24.21	26.29	23.17	22.21	19.85	15.70	15.00
2800	23.76	22.02	23.50	21.06	20.43	18.78	15.14	14.55
2900	22.02	20.18	21.26	19.35	18.88	17.73	14.53	14.04
3000	20.56	18.85	19.68	18.06	17.66	16.80	13.97	13.55
3200	17.88	16.51	17.25	16.01	15.87	15.48	13.10	12.78
3400	15.69	14.66	15.40	14.43	14.52	14.50	12.49	12.29
3600	13.85	13.02	13.65	12.95	13.11	13.34	11.78	11.71
3800	13.35	12.58	12.99	12.34	12.38	12.52	11.19	11.21
4000	13.51	12.75	12.93	12.31	12.16	12.12	10.80	10.86

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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-31R5A-PP+

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	OUTPUT RETURN LOSS AT TTL CONTROL STATE (dB)							
	000000 0 dB	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	18.34	19.39	19.71	25.93	36.87	55.97	37.22	26.14
1	18.35	19.38	19.71	25.90	36.71	54.75	37.00	26.22
5	18.39	19.42	19.76	25.98	36.86	56.10	37.14	26.19
10	18.37	19.42	19.74	25.95	36.82	55.59	37.14	26.20
50	18.28	19.31	19.62	25.62	35.53	47.52	35.59	26.73
100	18.18	19.17	19.47	25.27	34.12	41.67	33.99	27.35
200	18.09	19.06	19.37	24.70	30.83	33.31	31.85	26.60
300	18.26	19.32	19.66	24.95	29.58	30.44	32.04	24.35
400	18.53	19.68	20.10	25.74	29.95	29.78	32.96	23.27
500	18.96	20.16	20.62	26.77	30.46	29.41	33.51	22.69
600	19.35	20.63	21.11	27.77	31.02	29.28	34.34	22.39
700	19.79	21.16	21.68	28.74	30.55	28.36	33.38	21.81
800	19.83	21.24	21.79	28.79	29.93	27.76	32.72	21.51
900	20.11	21.57	22.16	29.23	29.26	27.09	31.94	21.15
1000	20.31	21.82	22.45	29.71	28.93	26.63	31.19	20.84
1100	20.44	22.07	22.75	30.47	28.76	26.23	30.52	20.53
1200	20.60	22.22	22.98	31.38	28.97	26.21	30.33	20.39
1300	20.62	22.29	23.03	31.53	29.04	26.19	30.35	20.38
1400	20.66	22.35	23.12	31.35	28.50	25.74	29.84	20.18
1500	20.58	22.33	23.16	31.18	28.11	25.42	29.47	20.03
1600	20.37	22.14	22.95	30.52	27.79	25.13	29.24	19.91
1700	20.22	22.05	22.87	29.73	26.91	24.46	28.44	19.57
1800	20.38	22.33	23.21	29.70	26.20	23.77	27.41	19.17
1900	20.43	22.41	23.32	29.78	25.96	23.49	26.98	18.99
2000	20.15	22.13	23.05	28.79	25.48	23.15	26.79	18.90
2100	19.82	21.87	22.73	27.87	24.90	22.68	26.26	18.64
2200	20.03	22.17	23.09	28.03	24.53	22.18	25.52	18.28
2300	21.21	23.85	24.93	27.58	22.64	20.49	22.91	17.06
2400	21.75	24.70	25.76	26.32	21.47	19.45	21.53	16.34
2500	22.28	25.37	26.51	26.04	21.02	18.98	20.80	15.90
2600	23.95	27.70	29.94	28.70	21.49	19.06	20.26	15.63
2700	29.50	35.47	43.29	25.95	19.93	17.73	18.25	14.65
2800	36.14	35.07	34.27	23.69	18.86	16.86	17.19	14.06
2900	38.81	29.83	28.98	22.11	18.03	16.22	16.34	13.55
3000	32.44	27.24	26.94	21.73	17.93	16.11	16.04	13.37
3200	22.87	21.23	21.64	20.60	17.96	16.18	15.46	13.14
3400	17.97	17.14	17.60	18.35	17.48	16.21	14.97	13.17
3600	14.65	14.15	14.50	15.78	16.24	15.86	14.38	13.36
3800	13.72	13.19	13.42	14.67	15.34	15.48	14.08	13.83
4000	14.46	13.80	13.96	15.18	15.78	16.03	14.42	14.69

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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-31R5A-PP+

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	STEP ATTENUATION* AT TTL CONTROL STATE (dB)							
	000000 THRU LOSS	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	1.31	0.53	1.02	2.04	4.04	7.98	15.94	31.40
1	1.31	0.53	1.01	2.04	4.04	7.98	15.94	31.42
5	1.32	0.52	1.01	2.04	4.05	7.97	15.94	31.40
10	1.34	0.52	1.01	2.03	4.03	7.95	15.94	31.40
50	1.34	0.52	1.01	2.03	4.03	7.96	15.94	31.38
100	1.37	0.54	1.03	2.03	4.05	7.96	15.95	31.41
200	1.42	0.53	1.01	2.04	4.03	7.95	15.95	31.36
300	1.47	0.52	1.01	2.02	4.03	7.95	15.92	31.34
400	1.50	0.52	1.01	2.02	4.03	7.97	15.93	31.35
500	1.54	0.51	1.00	2.02	4.03	7.96	15.92	31.22
600	1.57	0.51	1.01	2.03	4.04	7.97	15.92	31.20
700	1.55	0.52	1.03	2.07	4.10	8.01	15.95	31.17
800	1.58	0.52	1.01	2.07	4.07	8.01	15.93	31.12
900	1.61	0.52	1.01	2.08	4.08	8.02	15.94	30.99
1000	1.69	0.52	1.00	2.05	4.06	8.00	15.91	30.91
1100	1.73	0.53	1.02	2.07	4.08	8.02	15.91	30.81
1200	1.80	0.51	1.00	2.06	4.05	7.96	15.88	30.66
1300	1.84	0.52	1.01	2.06	4.08	7.97	15.90	30.59
1400	1.91	0.51	1.00	2.07	4.05	7.97	15.87	30.41
1500	1.98	0.52	1.03	2.07	4.04	7.95	15.86	30.23
1600	2.02	0.51	1.01	2.07	4.04	7.96	15.84	30.14
1700	2.02	0.52	1.03	2.09	4.08	7.98	15.88	30.14
1800	2.03	0.53	1.03	2.11	4.11	8.01	15.88	29.95
1900	2.12	0.52	1.02	2.11	4.08	7.98	15.84	29.85
2000	2.18	0.53	1.04	2.12	4.10	8.03	15.87	29.79
2100	2.29	0.54	1.02	2.12	4.10	8.00	15.85	29.74
2200	2.36	0.54	1.02	2.11	4.11	8.00	15.85	29.46
2300	2.44	0.56	1.04	2.13	4.11	8.00	15.90	29.50
2400	2.57	0.54	1.03	2.11	4.11	7.97	15.89	29.18
2500	2.67	0.56	1.03	2.12	4.05	7.92	15.78	28.49
2600	2.68	0.54	1.04	2.10	4.04	7.92	15.78	28.43
2700	2.76	0.55	1.04	2.15	4.05	7.92	15.81	28.67
2800	2.91	0.56	1.05	2.15	4.06	7.91	15.79	28.47
2900	3.07	0.57	1.01	2.12	4.03	7.87	15.69	28.05
3000	3.18	0.55	1.02	2.14	4.01	7.82	15.54	27.50
3200	3.22	0.57	1.03	2.17	4.05	7.78	15.32	26.85
3400	3.49	0.57	1.02	2.15	4.01	7.72	15.32	27.36
3600	4.05	0.58	1.02	2.15	3.94	7.67	15.48	28.22
3800	4.88	0.62	1.05	2.08	3.89	7.67	15.66	28.15
4000	5.12	0.63	1.05	2.07	3.87	7.63	15.36	27.25

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

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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.

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	INPUT RETURN LOSS AT TTL CONTROL STATE (dB)							
	000000 0 dB	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	17.19	18.71	20.00	17.89	19.34	21.76	31.23	48.35
1	17.21	18.74	20.03	17.92	19.37	21.78	31.27	48.73
5	17.24	18.77	20.08	17.96	19.40	21.82	31.31	49.33
10	17.23	18.77	20.07	17.96	19.41	21.83	31.34	49.46
50	17.22	18.74	20.03	17.94	19.40	21.81	31.26	48.03
100	17.28	18.79	20.07	18.01	19.47	21.91	31.49	46.94
200	17.32	18.86	20.14	18.08	19.58	22.02	31.71	43.53
300	17.42	18.96	20.27	18.23	19.73	22.25	32.18	41.74
400	17.58	19.13	20.45	18.44	19.98	22.56	32.85	39.50
500	17.73	19.31	20.65	18.65	20.24	22.89	33.89	38.16
600	17.92	19.54	20.89	18.90	20.54	23.28	35.01	36.87
700	18.04	19.65	21.03	19.11	20.83	23.71	36.42	35.73
800	18.20	19.86	21.27	19.38	21.15	24.15	38.09	34.79
900	18.35	20.04	21.46	19.60	21.44	24.54	39.71	34.04
1000	18.47	20.18	21.65	19.79	21.71	24.93	41.07	33.26
1100	18.58	20.30	21.73	19.98	21.94	25.27	41.67	32.68
1200	18.68	20.41	21.87	20.20	22.20	25.58	40.79	31.83
1300	18.81	20.55	22.00	20.40	22.48	25.91	39.31	31.11
1400	18.89	20.68	22.06	20.61	22.73	26.19	37.63	30.31
1500	18.94	20.74	22.08	20.77	22.94	26.30	36.10	29.70
1600	19.09	20.93	22.25	21.08	23.35	26.84	34.78	28.89
1700	19.42	21.34	22.71	21.68	24.16	27.75	32.56	27.54
1800	19.71	21.76	23.01	22.32	25.01	28.48	30.23	26.14
1900	19.86	22.03	23.18	22.85	25.81	29.09	28.61	25.07
2000	20.18	22.49	23.66	23.67	27.12	30.22	26.95	23.88
2100	20.61	23.19	24.38	24.78	29.00	31.28	25.25	22.69
2200	21.48	24.40	25.79	26.50	32.37	31.83	23.69	21.55
2300	22.52	25.94	27.76	28.58	38.38	30.91	22.36	20.49
2400	23.94	27.82	31.44	30.54	44.90	29.36	21.16	19.57
2500	25.82	29.31	39.32	30.13	33.16	27.17	20.05	18.72
2600	27.70	28.97	37.16	27.66	27.76	24.78	18.99	17.90
2700	27.05	26.04	29.93	24.59	24.47	22.84	18.02	17.15
2800	24.84	23.17	25.43	21.95	21.92	21.14	17.20	16.49
2900	22.76	21.03	22.60	19.98	19.99	19.66	16.39	15.87
3000	21.14	19.56	20.81	18.67	18.65	18.57	15.74	15.33
3200	18.48	17.25	18.36	16.69	16.83	17.11	14.81	14.55
3400	16.20	15.33	16.32	15.03	15.35	15.91	14.07	13.97
3600	14.59	13.86	14.68	13.69	14.01	14.69	13.29	13.35
3800	14.47	13.74	14.30	13.48	13.61	14.10	12.82	12.92
4000	14.95	14.23	14.53	13.74	13.68	13.87	12.48	12.62

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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-31R5A-PP+

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	OUTPUT RETURN LOSS AT TTL CONTROL STATE (dB)							
	000000 0 dB	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	17.19	17.82	17.87	22.01	25.94	26.67	23.39	57.71
1	17.21	17.84	17.88	22.02	25.95	26.66	23.38	59.43
5	17.23	17.87	17.92	22.06	25.98	26.69	23.42	58.27
10	17.23	17.87	17.91	22.05	25.98	26.69	23.42	57.69
50	17.23	17.87	17.92	22.02	25.90	26.59	23.37	49.43
100	17.23	17.88	17.92	22.03	25.92	26.69	23.46	43.61
200	17.32	17.97	18.04	22.16	26.03	26.76	23.66	37.86
300	17.49	18.16	18.21	22.38	26.25	26.98	24.01	34.57
400	17.67	18.34	18.42	22.63	26.45	27.19	24.38	32.42
500	17.92	18.62	18.70	23.01	26.80	27.54	24.89	30.92
600	18.20	18.93	19.03	23.48	27.37	28.08	25.52	30.06
700	18.66	19.44	19.55	24.19	28.08	28.71	26.62	28.55
800	18.81	19.60	19.74	24.41	28.13	28.74	27.10	27.80
900	19.02	19.83	19.99	24.74	28.39	28.92	27.72	27.24
1000	19.22	20.04	20.22	25.02	28.64	29.13	28.42	26.80
1100	19.28	20.17	20.33	25.21	28.62	29.18	28.97	26.47
1200	19.26	20.18	20.39	25.16	28.45	29.06	29.33	26.10
1300	19.17	20.10	20.33	24.98	28.03	28.64	29.60	25.73
1400	19.02	19.98	20.23	24.67	27.44	28.04	29.94	25.20
1500	18.76	19.78	20.09	24.28	26.78	27.38	30.12	24.68
1600	18.59	19.63	19.98	23.95	26.07	26.61	30.41	23.97
1700	18.46	19.56	19.89	23.56	25.24	25.67	30.64	23.14
1800	18.41	19.58	19.95	23.24	24.47	24.75	30.77	22.27
1900	18.35	19.61	19.97	22.97	23.72	23.83	30.66	21.40
2000	18.28	19.62	20.05	22.62	22.97	23.02	30.25	20.60
2100	18.40	19.81	20.26	22.64	22.68	22.55	30.15	19.98
2200	19.05	20.65	21.19	23.55	22.94	22.55	30.86	19.50
2300	19.95	21.90	22.48	23.79	22.04	21.32	27.67	18.22
2400	20.50	22.59	23.25	23.70	21.40	20.54	25.90	17.54
2500	21.11	23.35	24.14	24.32	21.50	20.44	25.23	17.24
2600	23.30	26.18	27.45	27.54	22.52	20.85	24.43	17.06
2700	27.87	33.39	36.98	27.31	21.47	19.67	21.64	16.16
2800	32.65	41.70	47.34	25.77	20.59	18.89	20.22	15.60
2900	40.06	34.93	34.23	24.48	19.93	18.28	19.13	15.14
3000	35.05	30.30	30.31	24.39	19.98	18.27	18.67	15.00
3200	23.60	22.12	22.56	22.98	20.21	18.50	17.58	14.86
3400	18.10	17.37	17.74	19.75	19.56	18.58	16.59	15.08
3600	14.93	14.47	14.72	16.79	17.84	17.97	15.60	15.58
3800	14.39	13.88	14.04	15.92	17.09	17.67	15.27	16.47
4000	15.36	14.73	14.87	16.89	18.12	18.84	15.85	18.11

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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-31R5A-PP+

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	STEP ATTENUATION* AT TTL CONTROL STATE (dB)							
	000000 THRU LOSS	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	1.50	0.50	0.98	2.00	3.97	7.86	15.81	31.08
1	1.50	0.51	0.98	1.99	3.97	7.86	15.80	31.10
5	1.50	0.50	0.98	2.00	3.98	7.86	15.81	31.09
10	1.52	0.50	0.98	1.99	3.96	7.85	15.80	31.10
50	1.52	0.51	0.98	2.00	3.98	7.90	15.82	31.09
100	1.56	0.51	0.99	2.00	3.98	7.86	15.81	31.13
200	1.61	0.50	0.98	1.99	3.98	7.88	15.80	31.07
300	1.66	0.52	1.00	2.00	3.98	7.88	15.82	31.08
400	1.73	0.51	0.99	2.00	3.97	7.85	15.80	31.08
500	1.78	0.52	0.98	1.99	3.97	7.87	15.80	31.02
600	1.83	0.50	0.98	2.00	3.96	7.85	15.77	30.94
700	1.82	0.51	0.98	2.01	4.00	7.88	15.79	30.87
800	1.85	0.52	0.98	2.02	4.00	7.88	15.78	30.85
900	1.90	0.50	0.98	2.04	4.01	7.87	15.77	30.74
1000	1.97	0.52	1.00	2.04	4.00	7.87	15.76	30.69
1100	2.05	0.50	0.98	2.02	3.99	7.86	15.74	30.62
1200	2.11	0.52	0.99	2.03	3.98	7.85	15.74	30.55
1300	2.15	0.51	0.99	2.03	3.96	7.85	15.72	30.39
1400	2.23	0.50	0.99	2.02	3.97	7.81	15.72	30.26
1500	2.31	0.50	0.97	2.03	3.97	7.86	15.71	30.07
1600	2.34	0.51	0.99	2.05	3.99	7.85	15.69	29.98
1700	2.34	0.52	1.00	2.06	4.02	7.89	15.72	30.00
1800	2.37	0.50	0.98	2.05	4.04	7.86	15.71	29.89
1900	2.45	0.50	1.00	2.07	4.02	7.89	15.71	29.81
2000	2.53	0.51	1.02	2.08	4.03	7.87	15.72	29.73
2100	2.64	0.51	1.00	2.07	4.00	7.91	15.69	29.62
2200	2.70	0.53	1.01	2.09	4.03	7.90	15.73	29.50
2300	2.81	0.52	1.02	2.10	4.03	7.88	15.79	29.69
2400	2.90	0.55	1.02	2.10	4.04	7.89	15.79	29.30
2500	3.04	0.52	0.99	2.08	3.99	7.80	15.69	28.60
2600	3.04	0.54	1.02	2.09	4.00	7.82	15.71	28.82
2700	3.17	0.54	0.99	2.10	3.99	7.82	15.77	29.01
2800	3.31	0.55	1.02	2.11	3.98	7.81	15.74	28.71
2900	3.47	0.55	1.03	2.11	4.00	7.78	15.65	28.18
3000	3.56	0.58	1.03	2.11	3.98	7.74	15.49	27.60
3200	3.62	0.58	1.02	2.16	4.02	7.69	15.25	27.10
3400	3.93	0.59	1.00	2.14	3.94	7.62	15.28	27.56
3600	4.54	0.60	1.01	2.14	3.88	7.60	15.51	28.81
3800	5.34	0.59	0.97	2.04	3.80	7.58	15.54	28.17
4000	5.63	0.58	0.98	2.02	3.80	7.56	15.34	27.84

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

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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-31R5A-PP+

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	INPUT RETURN LOSS AT TTL CONTROL STATE (dB)							
	000000 0 dB	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	16.17	17.33	18.26	16.17	16.96	18.27	22.74	26.39
1	16.18	17.34	18.27	16.19	16.98	18.27	22.74	26.36
5	16.21	17.38	18.31	16.22	17.00	18.30	22.76	26.42
10	16.21	17.37	18.31	16.23	17.01	18.31	22.79	26.47
50	16.19	17.36	18.30	16.25	17.06	18.38	22.91	26.62
100	16.28	17.47	18.45	16.40	17.24	18.65	23.39	27.34
200	16.46	17.68	18.68	16.62	17.52	19.03	24.02	28.34
300	16.59	17.77	18.78	16.68	17.53	18.95	23.77	27.86
400	16.69	17.84	18.81	16.68	17.45	18.78	23.33	27.10
500	16.76	17.88	18.84	16.73	17.46	18.74	23.18	26.74
600	16.91	18.04	18.99	16.88	17.62	18.86	23.35	26.86
700	17.04	18.17	19.13	17.06	17.80	19.08	23.66	27.22
800	17.23	18.36	19.31	17.26	18.01	19.28	23.97	27.51
900	17.33	18.47	19.41	17.41	18.16	19.44	24.19	27.69
1000	17.37	18.52	19.43	17.54	18.33	19.64	24.54	27.95
1100	17.42	18.59	19.47	17.71	18.55	19.87	24.95	28.29
1200	17.47	18.67	19.53	17.88	18.79	20.16	25.44	28.66
1300	17.54	18.75	19.58	18.08	19.02	20.44	25.93	28.95
1400	17.57	18.81	19.63	18.25	19.24	20.68	26.34	29.08
1500	17.55	18.80	19.58	18.36	19.38	20.84	26.65	29.08
1600	17.62	18.91	19.66	18.61	19.68	21.19	27.34	29.44
1700	17.83	19.17	19.89	19.01	20.16	21.72	28.23	29.56
1800	18.00	19.45	20.07	19.45	20.69	22.27	28.92	29.07
1900	18.14	19.64	20.22	19.86	21.23	22.83	29.53	28.49
2000	18.42	20.04	20.55	20.51	22.07	23.78	30.31	27.84
2100	18.83	20.62	21.11	21.37	23.22	25.04	30.27	26.69
2200	19.70	21.72	22.20	22.77	25.07	26.91	29.14	25.37
2300	20.71	23.13	23.61	24.46	27.56	29.25	27.47	24.05
2400	22.31	25.32	26.16	26.90	31.87	32.74	25.65	22.81
2500	24.82	28.50	31.28	29.52	37.58	34.48	23.85	21.60
2600	27.44	30.43	42.25	29.25	32.30	30.51	22.17	20.51
2700	27.93	27.71	34.90	25.88	26.85	26.75	20.67	19.47
2800	25.81	24.28	27.71	22.79	23.32	23.76	19.40	18.57
2900	23.45	21.82	23.98	20.62	21.01	21.65	18.31	17.71
3000	21.65	20.19	21.89	19.20	19.50	20.24	17.48	17.10
3200	18.83	17.75	19.20	17.15	17.53	18.47	16.37	16.21
3400	16.62	15.84	17.12	15.56	16.04	17.15	15.59	15.65
3600	15.42	14.73	15.78	14.55	14.97	16.09	14.87	15.08
3800	15.79	15.04	15.84	14.77	15.05	15.91	14.59	14.80
4000	16.67	15.94	16.37	15.43	15.44	15.91	14.35	14.58

Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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-31R5A-PP+

Digital Step Attenuator DAT-31R5-PP+

Typical Performance Data

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

FREQUENCY (MHz)	OUTPUT RETURN LOSS AT TTL CONTROL STATE (dB)							
	000000 0 dB	000001 0.5 dB	000010 1.0 dB	000100 2.0 dB	001000 4.0 dB	010000 8.0 dB	100000 16 dB	111111 31.5 dB
0.5	16.17	16.55	16.44	19.54	21.68	21.36	18.81	27.92
1	16.17	16.54	16.43	19.50	21.63	21.31	18.79	27.80
5	16.22	16.59	16.47	19.55	21.69	21.35	18.81	27.83
10	16.21	16.59	16.46	19.55	21.68	21.36	18.83	27.85
50	16.25	16.62	16.51	19.60	21.76	21.44	18.91	27.96
100	16.37	16.78	16.68	19.86	22.12	21.86	19.27	28.90
200	16.62	17.02	16.94	20.25	22.65	22.45	19.73	30.21
300	16.63	17.04	16.95	20.18	22.51	22.22	19.52	29.51
400	16.72	17.08	16.98	20.15	22.29	21.91	19.30	28.34
500	16.97	17.34	17.21	20.37	22.42	21.96	19.38	27.88
600	17.24	17.61	17.47	20.67	22.71	22.18	19.60	27.96
700	17.61	17.98	17.83	21.09	23.11	22.59	20.00	28.05
800	17.60	17.98	17.85	21.03	22.97	22.43	20.00	27.31
900	17.71	18.09	17.98	21.09	22.92	22.42	20.15	26.77
1000	17.80	18.21	18.10	21.16	22.94	22.52	20.39	26.38
1100	17.80	18.26	18.18	21.16	22.88	22.56	20.66	25.97
1200	17.75	18.24	18.20	21.12	22.77	22.61	20.95	25.55
1300	17.63	18.18	18.18	20.97	22.62	22.54	21.21	25.13
1400	17.48	18.05	18.09	20.82	22.40	22.46	21.47	24.58
1500	17.28	17.90	17.98	20.57	22.09	22.23	21.68	23.96
1600	17.14	17.83	17.94	20.38	21.77	22.03	21.95	23.30
1700	17.07	17.81	17.93	20.23	21.44	21.77	22.23	22.56
1800	17.03	17.83	17.98	20.08	21.10	21.44	22.61	21.77
1900	16.98	17.86	18.02	19.89	20.70	21.06	22.95	20.97
2000	16.96	17.88	18.08	19.73	20.39	20.74	23.40	20.36
2100	17.12	18.13	18.37	19.93	20.44	20.79	24.30	20.03
2200	17.91	19.12	19.42	20.82	20.95	21.23	26.51	19.66
2300	18.55	19.94	20.28	21.03	20.55	20.64	27.37	18.60
2400	19.02	20.55	20.96	21.20	20.32	20.30	27.42	18.02
2500	19.72	21.35	21.83	22.07	20.85	20.65	28.72	17.97
2600	22.09	24.26	24.98	25.04	22.31	21.60	29.95	17.95
2700	25.75	29.56	30.84	26.50	22.11	21.00	25.97	17.22
2800	29.75	36.90	40.18	26.54	21.68	20.44	23.69	16.78
2900	34.97	43.00	44.78	25.93	21.27	19.97	22.17	16.39
3000	34.99	32.85	33.64	26.61	21.66	20.20	21.42	16.34
3200	23.83	22.53	22.96	25.37	22.57	20.97	19.65	16.51
3400	18.07	17.45	17.75	20.82	21.56	21.05	17.92	17.13
3600	15.19	14.75	14.97	17.68	19.36	20.02	16.48	18.08
3800	14.98	14.52	14.63	17.20	18.91	19.90	16.18	19.87
4000	15.84	15.30	15.42	18.16	20.18	21.36	16.77	22.98

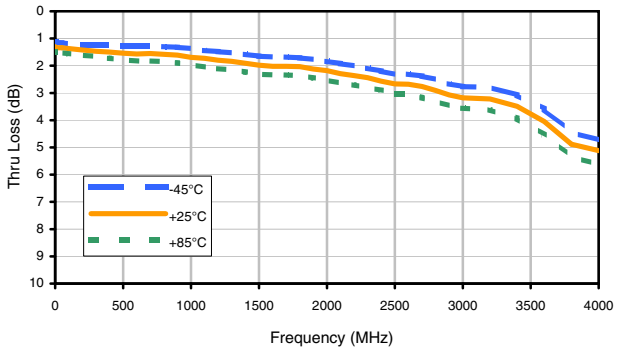
Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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-31R5A-PP+

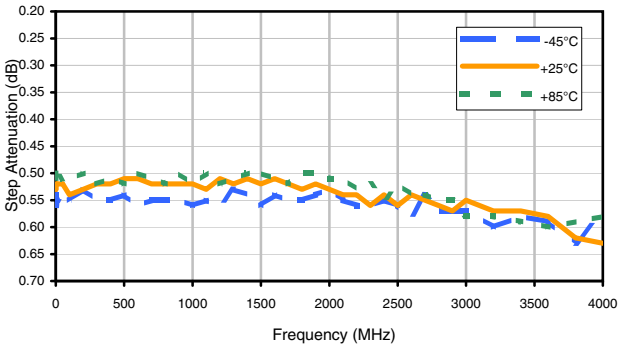
Digital Step Attenuator DAT-31R5-PP+

Typical Performance Curves

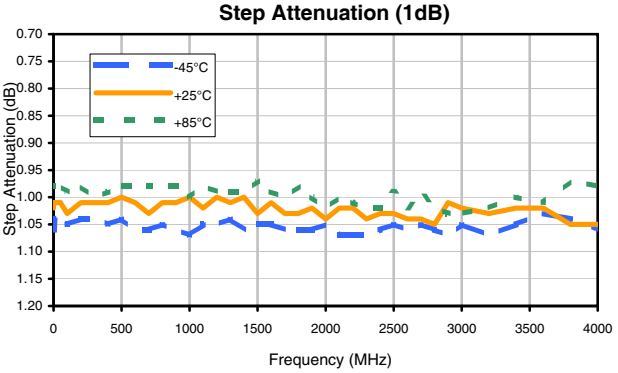
Thru Loss



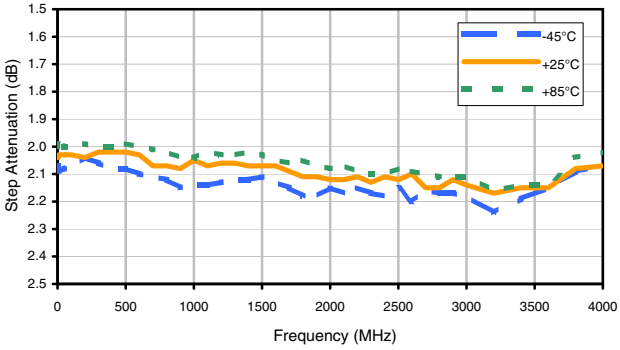
Step Attenuation (0.5dB)



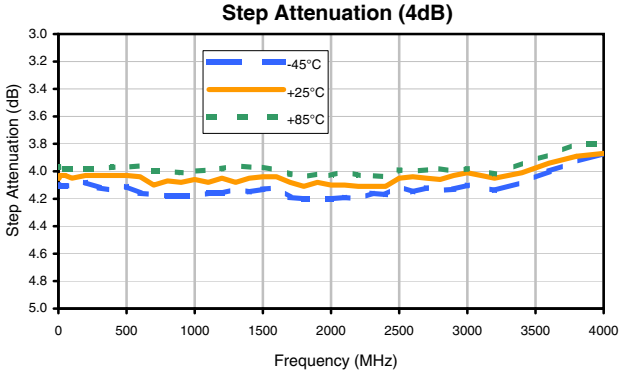
Step Attenuation (1dB)



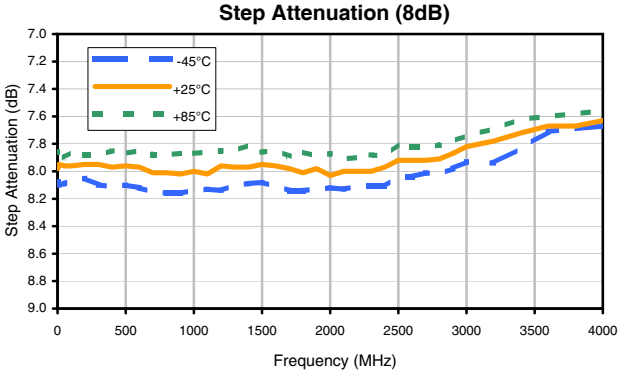
Step Attenuation (2dB)



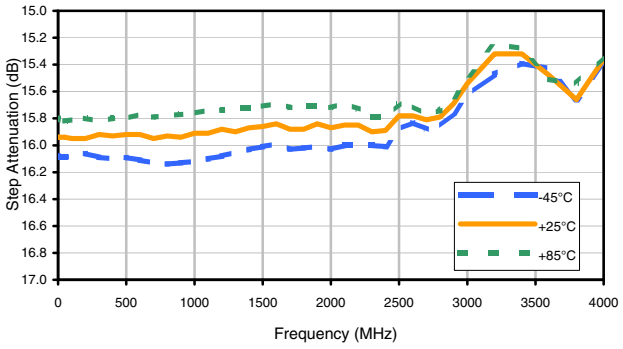
Step Attenuation (4dB)



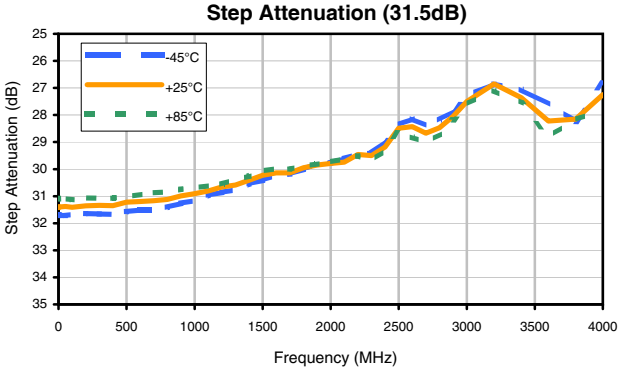
Step Attenuation (8dB)



Step Attenuation (16dB)



Step Attenuation (31.5dB)

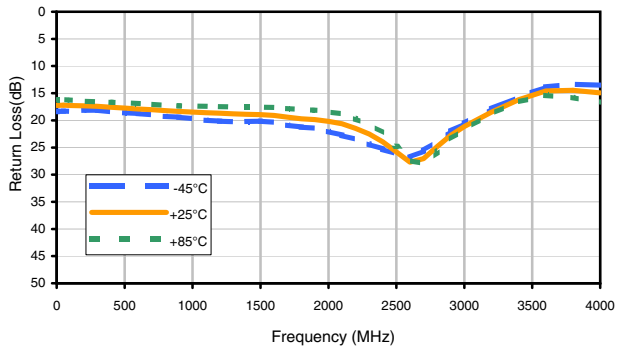


Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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.

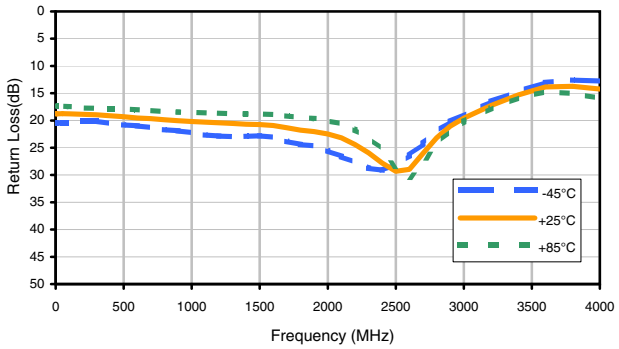
Digital Step Attenuator DAT-31R5-PP+

Typical Performance Curves

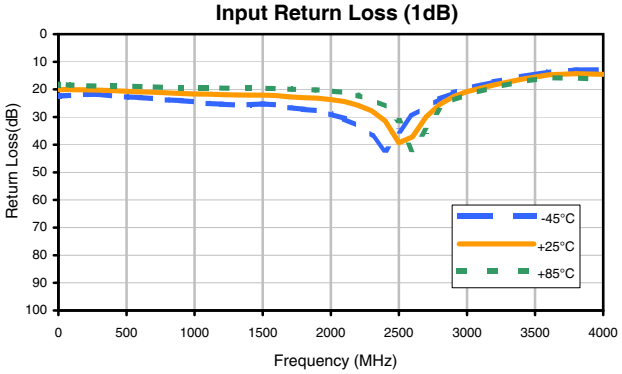
Input Return Loss (0dB)



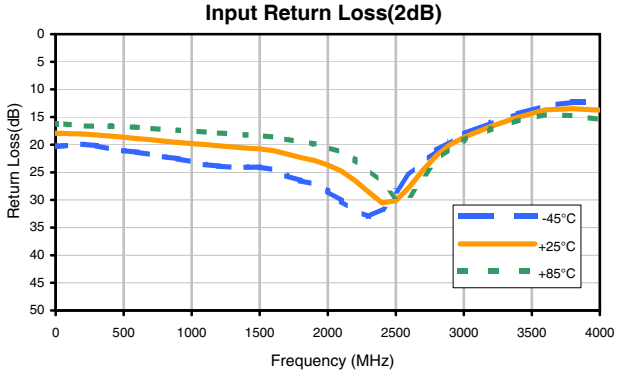
Input Return Loss (0.5dB)



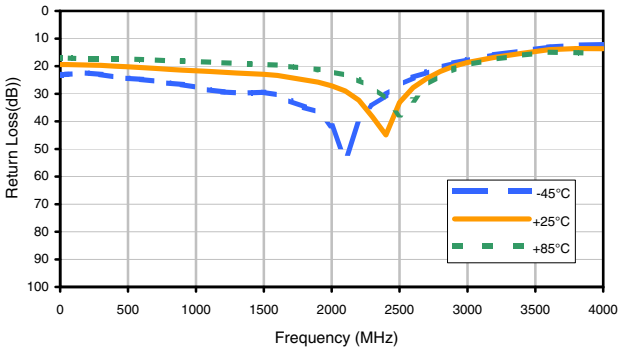
Input Return Loss (1dB)



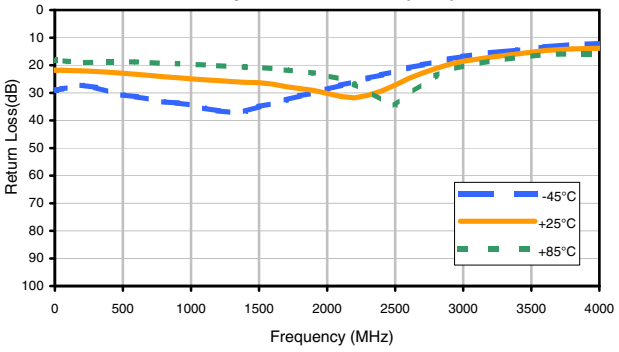
Input Return Loss(2dB)



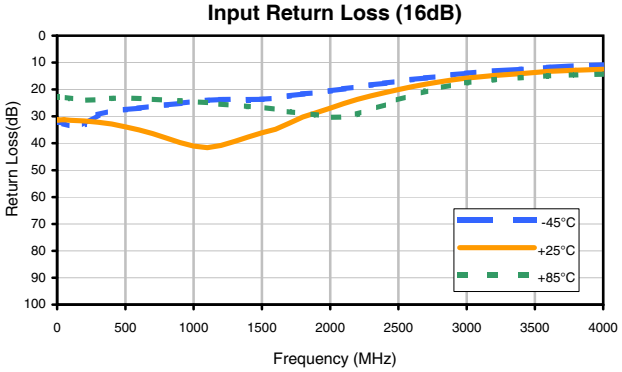
Input Return Loss (4dB)



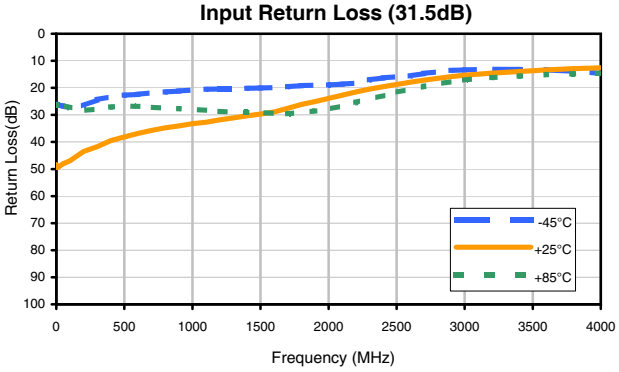
Input Return Loss (8dB)



Input Return Loss (16dB)



Input Return Loss (31.5dB)

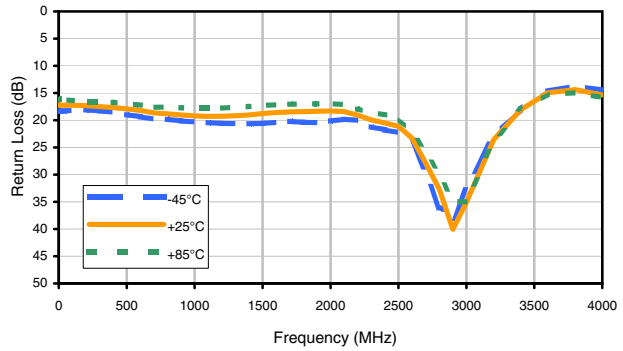


Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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.

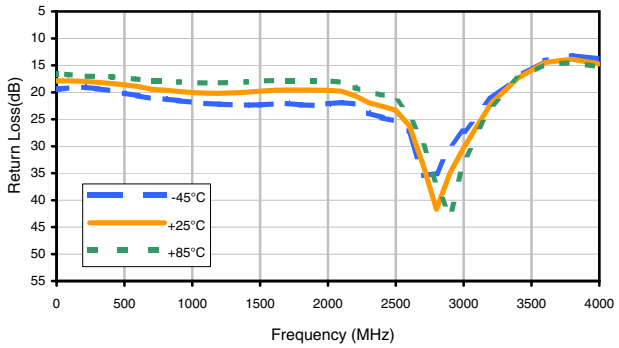
Digital Step Attenuator DAT-31R5-PP+

Typical Performance Curves

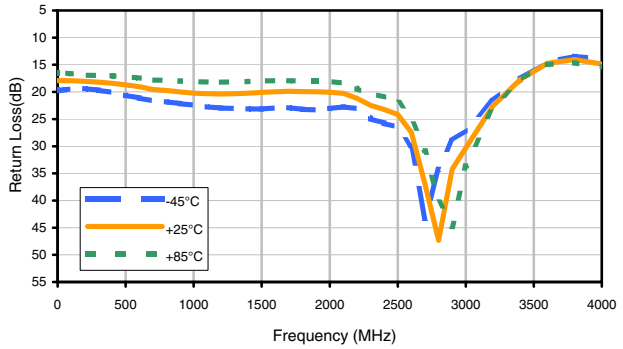
Output Return Loss (0dB)



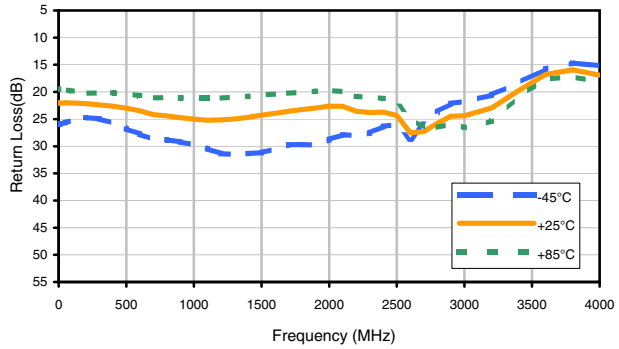
Output Return Loss (0.5dB)



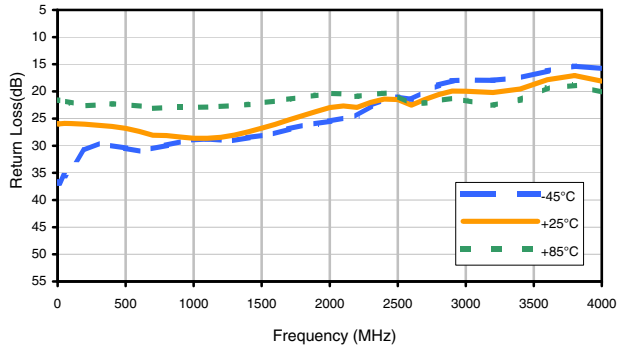
Output Return Loss (1dB)



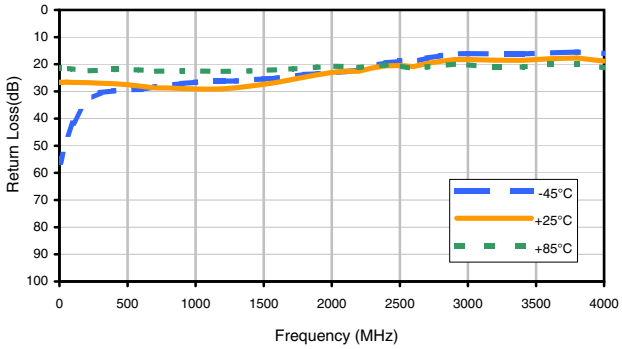
Output Return Loss (2dB)



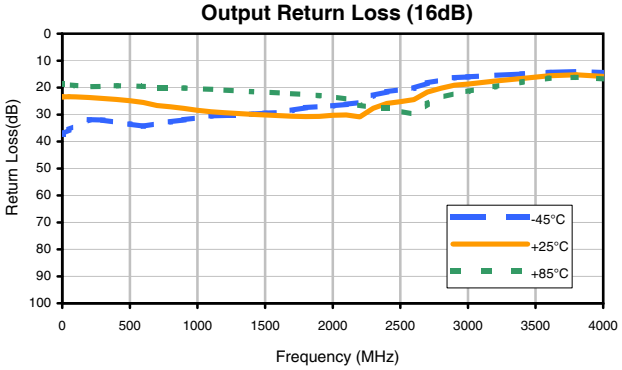
Output Return Loss (4dB)



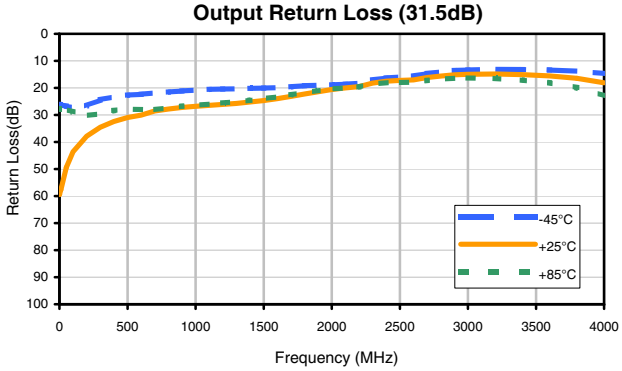
Output Return Loss (8dB)



Output Return Loss (16dB)



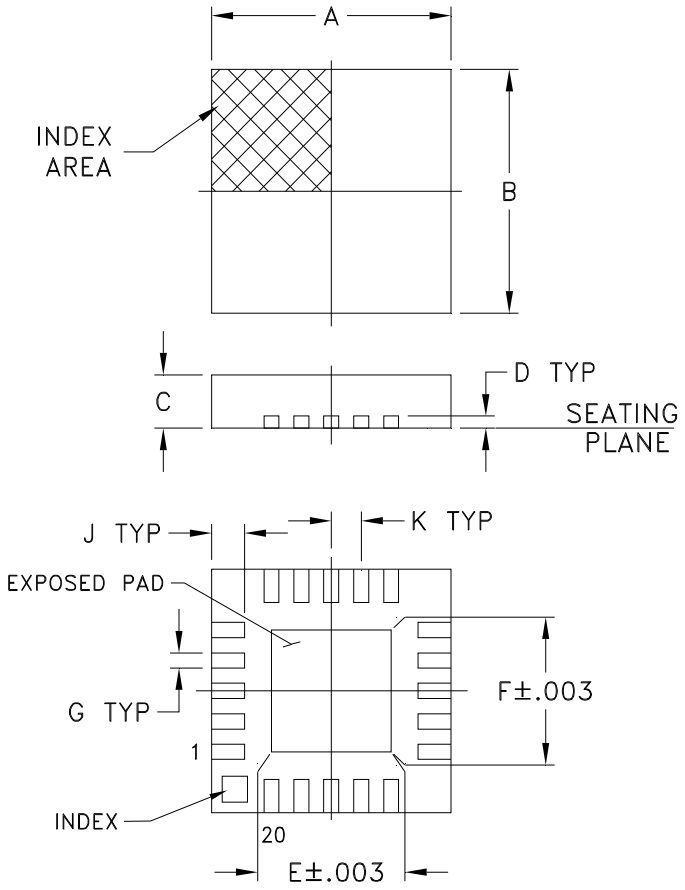
Output Return Loss (31.5dB)



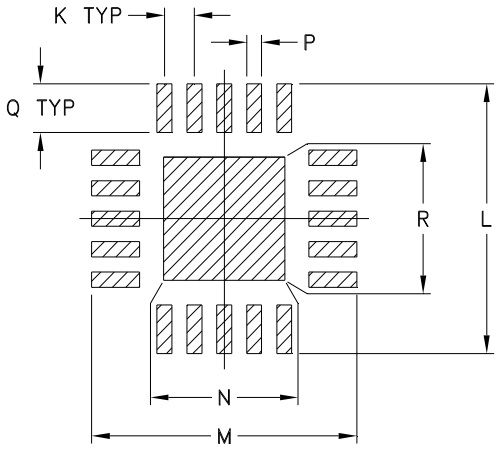
Notes: 1. Performance and quality attributes and conditions not expressly stated in this specification sheet are intended to be excluded and do not form a part of this specification sheet. 2. Electrical specifications and performance data contained herein are based on Mini-Circuit's applicable established test performance criteria and measurement instructions. 3. The parts covered by this specification sheet 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.

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

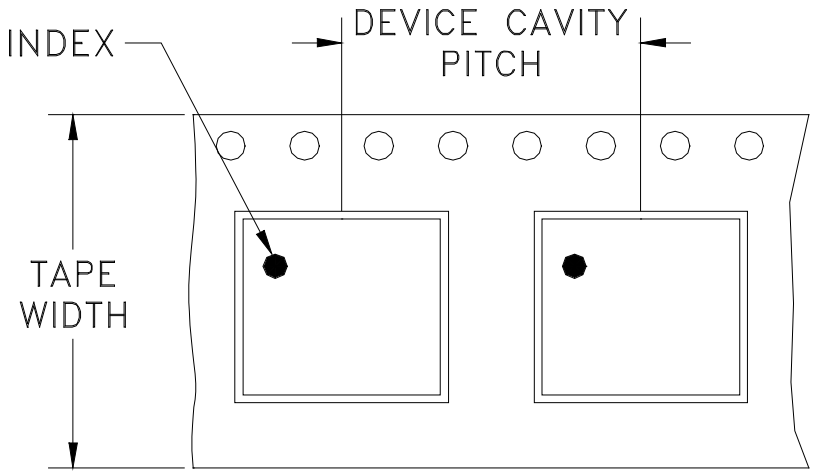
Dimensions are in inches (mm). Tolerances: 2 Pl. ± .01; 3 Pl. ± .005

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

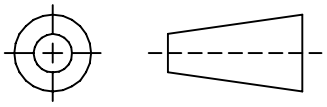
Mini-Circuits carrier tape materials provide protection from ESD (Electro-Static Discharge) during handling and transportation. Tapes are static dissipative and comply with industry standards EIA-481/EIA-541.

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

Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

This document and its contents are the property of Mini-Circuits.

THIRD ANGLE PROJECTION

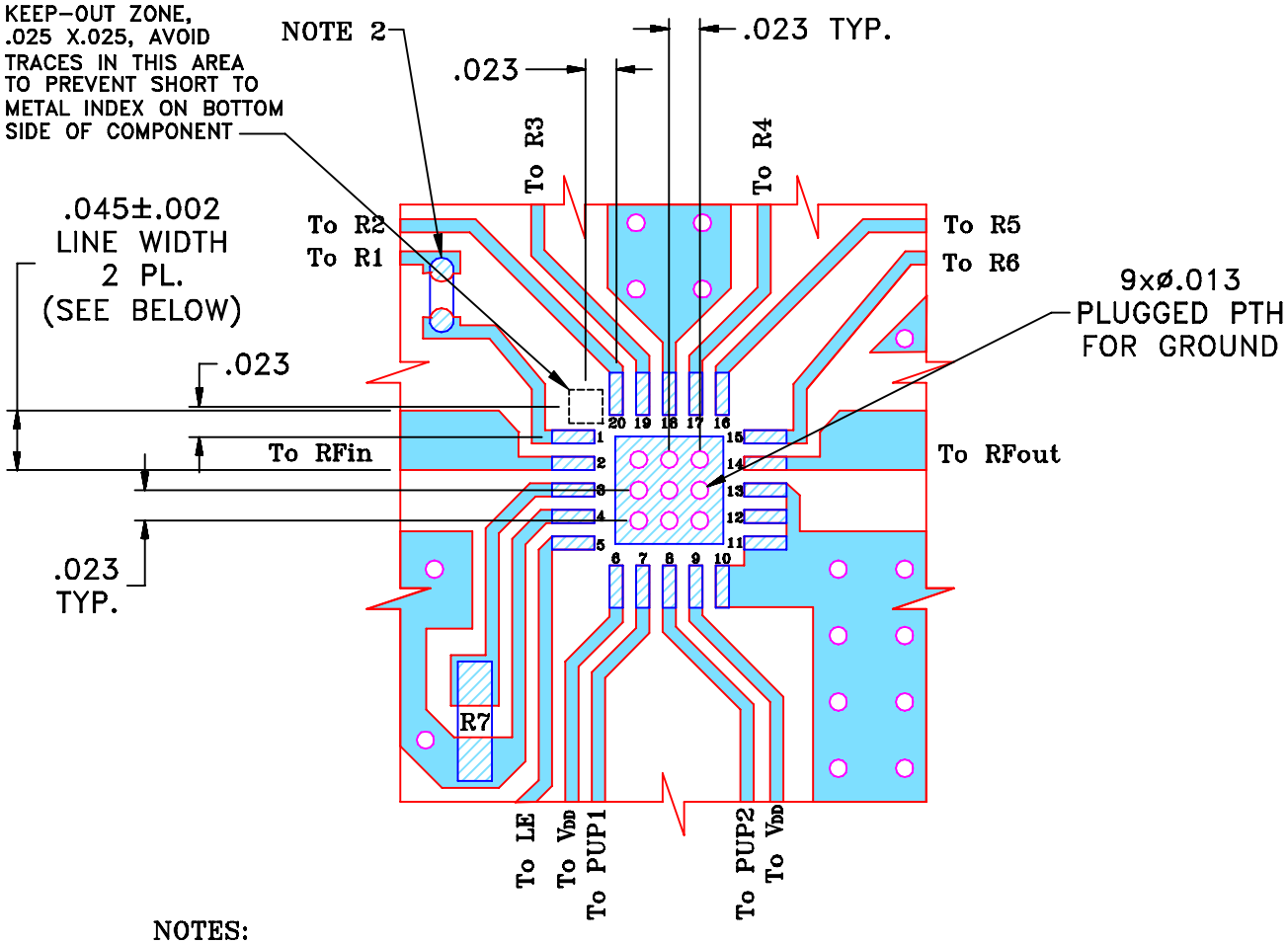


REVISIONS

REV	ECN No.	DESCRIPTION	DATE	DR	AUTH
OR	M96972	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, qp 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, 0402 SIZES 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		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 ±			

Mini-Circuits®
THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS. EXCEPT FOR USE EXPRESSLY GRANTED, IN WRITING, TO ITS VENDORS, VENDEE AND THE UNITED STATES GOVERNMENT, MINI-CIRCUITS RESERVES ALL PROPRIETARY DESIGN, USE , MANUFACTURING AND REPRODUCTION RIGHTS THERETO. THESE CONTENTS SHALL NOT BE USED, DUPLICATED OR DISCLOSED TO ANY OUTSIDE PARTY, IN WHOLE OR IN PART, WITHOUT WRITTEN PERMISSION OF MINI-CIRCUITS.

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

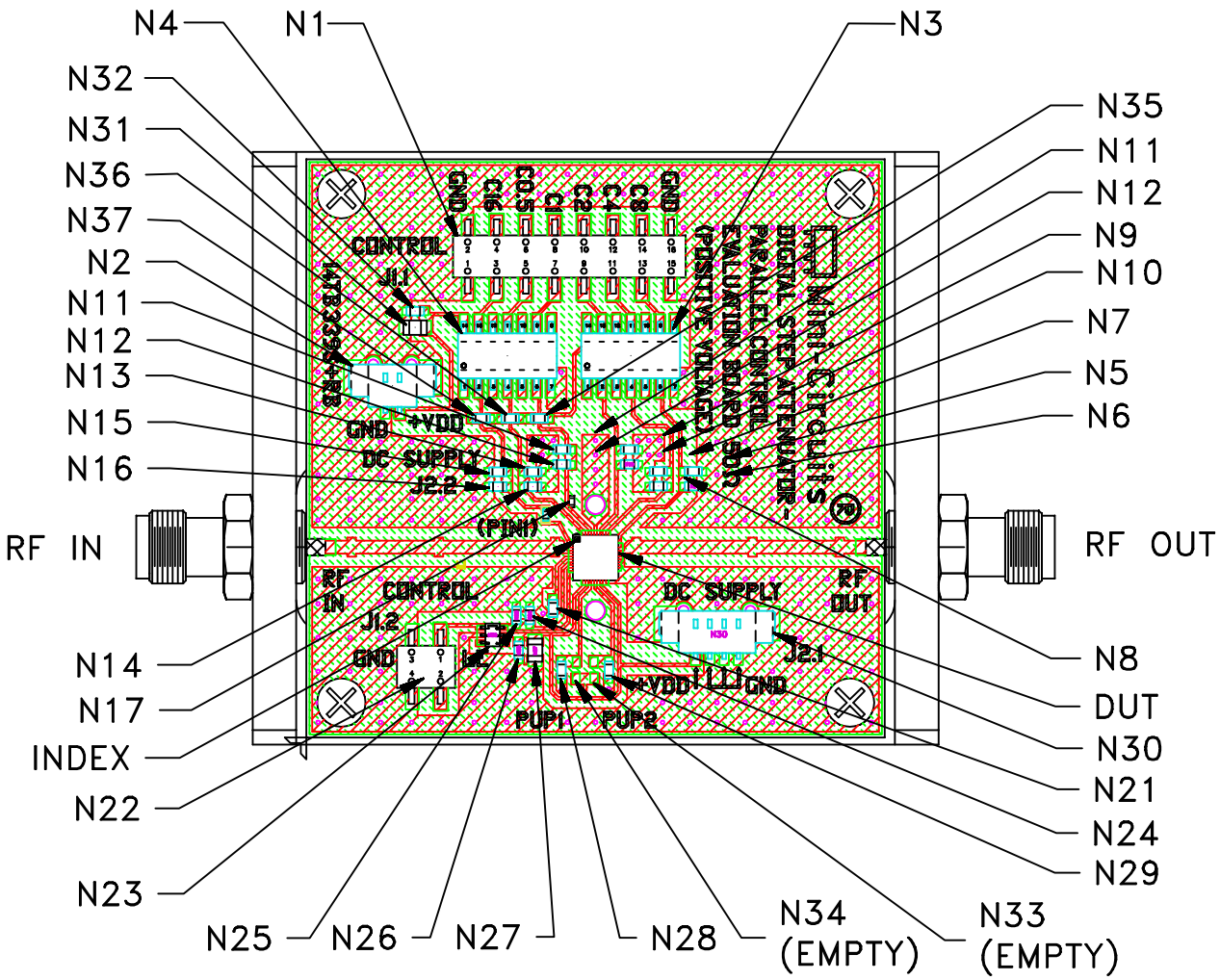
Mini-Circuits® 13 Neptune Avenue Brooklyn NY 11235

PL, qp, DG983-1
TB-339 (50 Ω)

SIZE	CODE IDENT	DRAWING NO:	REV:
A	15542	98-PL-180	B

FILE:	SCALE:	SHEET:
98PL180	7:1	1 OF 1

Evaluation Board and Circuit

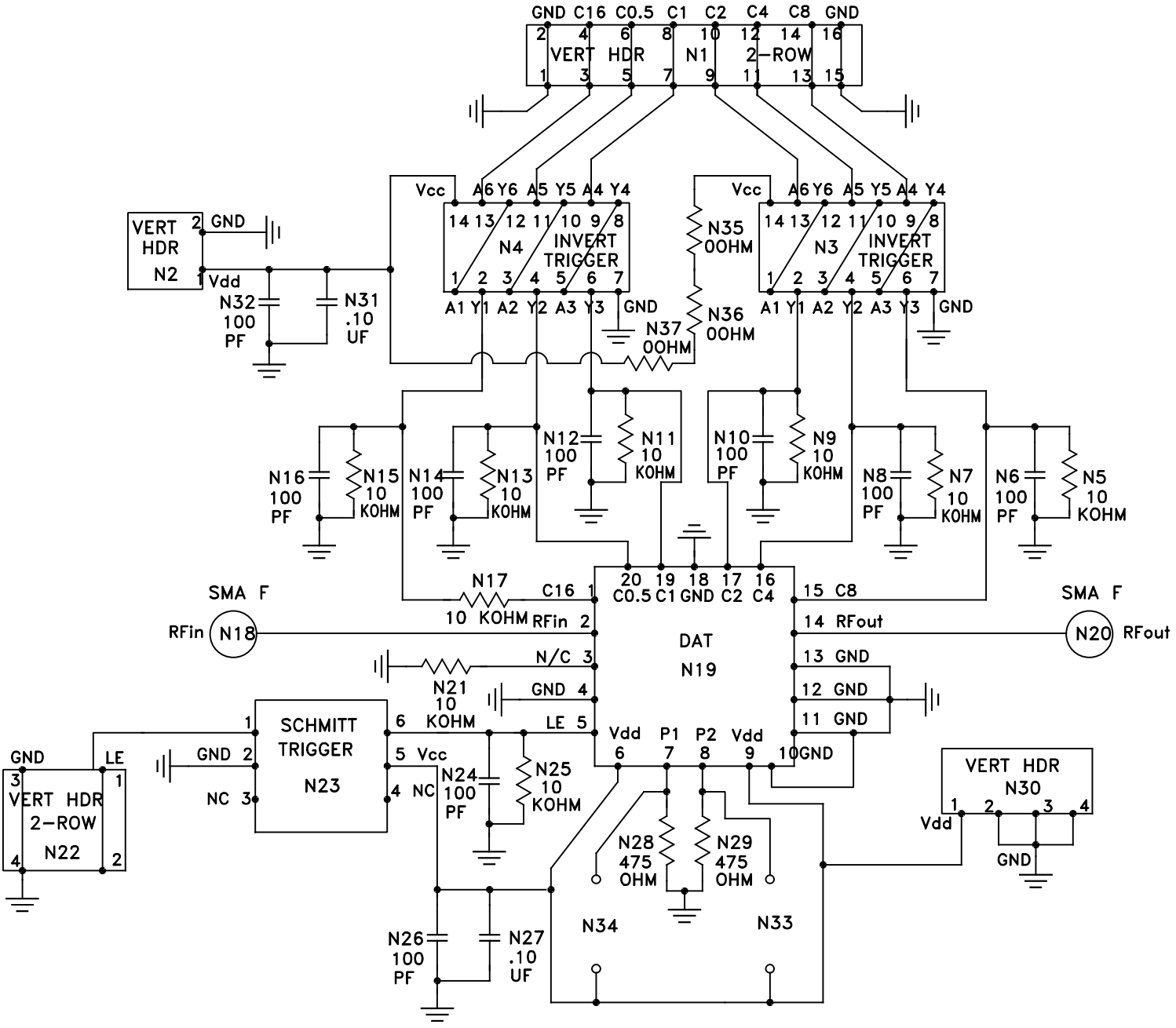


TB-339

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®

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS.



Schematic Diagram

THIS DOCUMENT AND ITS CONTENTS ARE THE PROPERTY OF MINI-CIRCUITS.

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

This document and its contents are the property of Mini-Circuits.