

Precision

# Digital Step Attenuator

## TOAT-3610+

50Ω TTL Control, Pin Diode 10 to 1000 MHz



### Maximum Ratings

Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 125°C
Input Power	15 dBm
DC Voltage	5.5 V
TTL	5.5V

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

### Pin Connections

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

### Features

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

### Applications

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

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

**+ RoHS compliant in accordance with EU Directive (2002/95/EC)**

The +Suffix has been added in order to identify RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications.

### Digital Step Attenuator Electrical Specifications

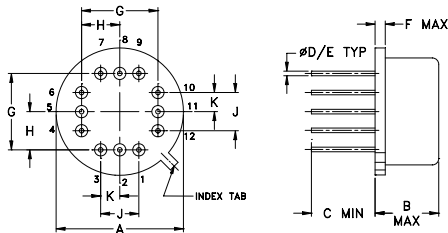
MODEL NO.	FREQUENCY (MHz)		PRIMARY ATTENUATION STEPS (dB)			ATTENUATION (dB)		VSWR (:1)		
	$f_L$	$f_U$	#1	#2	#3	(1,1,1)** Nom.	(0,0,0) Max.	L	M	U
TOAT-3610+	10	1000	3±0.3	6±0.4	10±0.4	19.0	4.0	1.6	1.4	1.5

L=10 to 100 MHz      M=100 to 500 MHz      U=500 to 1000 MHz

\*\* Total attenuation above thru-loss.

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

### Outline Drawing



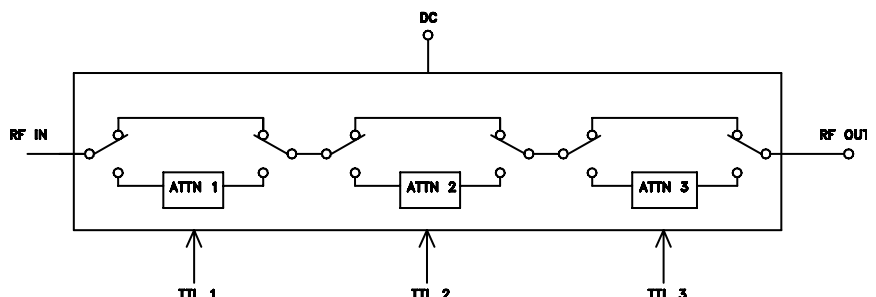
### Outline Dimensions (inch/mm)

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

### Additional Specifications

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

### Electrical Schematic



**Mini-Circuits®**  
ISO 9001 ISO 14001 AS 9100 CERTIFIED

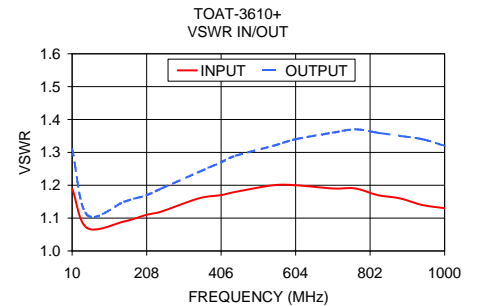
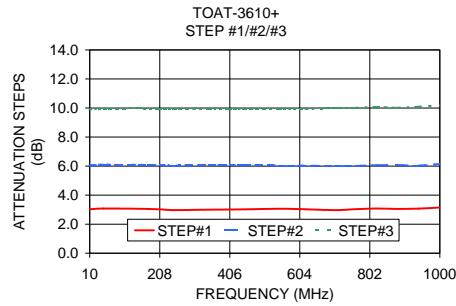
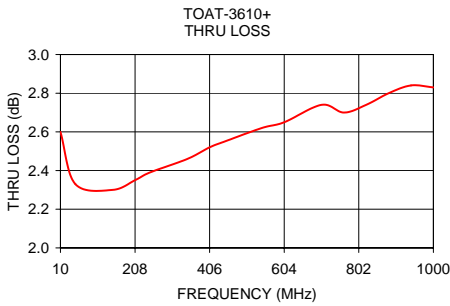
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 The Design Engineers Search Engine Provides ACTUAL Data Instantly at [minicircuits.com](http://minicircuits.com)

IF/RF MICROWAVE COMPONENTS

For detailed performance specs & shopping online see web site

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-Circuits' 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](http://www.minicircuits.com/MCLStore/terms.jsp).

REV. A  
M113397  
TOAT-3610+  
DJ/VV/CP/AM  
080129



### Step Attenuation\* at TTL Control State

FREQ. (MHz)	000 (dB)	001 (dB)	010 (dB)	011 (dB)	100 (dB)	101 (dB)	110 (dB)	111 (dB)
10.00	2.60	3.03	6.03	9.12	9.91	13.02	16.00	19.02
49.60	2.33	3.08	6.10	9.15	9.95	13.03	15.97	19.03
148.60	2.30	3.06	6.09	9.12	9.97	12.98	16.03	19.03
208.00	2.35	3.02	6.06	9.06	9.94	12.97	16.03	19.01
247.60	2.39	2.97	6.04	9.04	9.94	12.99	15.93	19.04
346.60	2.46	3.00	6.07	9.05	9.95	12.95	16.02	19.00
406.00	2.52	3.01	6.07	9.04	9.93	12.94	15.99	18.94
445.60	2.55	3.02	6.06	9.00	9.95	12.95	15.98	18.82
544.60	2.62	3.06	6.04	9.01	9.95	12.98	16.02	18.98
604.00	2.65	3.04	6.04	8.94	9.93	13.00	15.97	18.94
703.00	2.74	2.97	6.00	8.94	9.99	12.94	15.91	18.89
762.40	2.70	3.03	6.01	8.97	10.01	12.96	16.00	18.91
821.80	2.74	3.08	6.06	9.05	10.07	13.08	16.07	18.97
881.20	2.80	3.05	6.07	9.01	10.02	13.11	15.98	19.00
940.60	2.84	3.07	6.03	9.04	10.09	13.15	16.13	19.01
1000.00	2.83	3.15	6.14	9.07	10.18	13.25	16.08	19.24

### INPUT VSWR

FREQ. (MHz)	001	010	011	100	101	110	111
10.00	1.19	1.22	1.14	1.28	1.17	1.21	1.14
49.60	1.07	1.08	1.05	1.11	1.07	1.08	1.05
148.60	1.09	1.09	1.06	1.13	1.08	1.08	1.05
208.00	1.11	1.11	1.07	1.15	1.09	1.10	1.07
247.60	1.12	1.12	1.08	1.17	1.10	1.11	1.08
346.60	1.16	1.15	1.11	1.20	1.13	1.13	1.10
406.00	1.17	1.16	1.12	1.23	1.15	1.15	1.12
445.60	1.18	1.18	1.13	1.24	1.16	1.16	1.13
544.60	1.20	1.20	1.15	1.27	1.18	1.19	1.15
604.00	1.20	1.21	1.16	1.29	1.19	1.20	1.17
703.00	1.19	1.21	1.18	1.30	1.20	1.22	1.19
762.40	1.19	1.21	1.19	1.30	1.20	1.22	1.20
821.80	1.17	1.22	1.20	1.31	1.20	1.23	1.21
881.20	1.16	1.21	1.20	1.30	1.20	1.24	1.22
940.60	1.14	1.21	1.21	1.29	1.19	1.24	1.23
1000.00	1.13	1.21	1.22	1.28	1.19	1.25	1.24

### OUTPUT VSWR

FREQ. (MHz)	001	010	011	100	101	110	111
10.00	1.31	1.24	1.22	1.12	1.11	1.11	1.10
49.60	1.11	1.09	1.08	1.05	1.05	1.04	1.05
148.60	1.15	1.11	1.10	1.07	1.07	1.06	1.06
208.00	1.17	1.11	1.11	1.07	1.07	1.07	1.06
247.60	1.19	1.13	1.13	1.09	1.09	1.09	1.08
346.60	1.24	1.17	1.17	1.13	1.12	1.12	1.12
406.00	1.27	1.21	1.21	1.15	1.15	1.14	1.14
445.60	1.29	1.21	1.19	1.14	1.15	1.15	1.14
544.60	1.32	1.25	1.24	1.19	1.19	1.18	1.19
604.00	1.34	1.26	1.26	1.20	1.19	1.20	1.20
703.00	1.36	1.28	1.28	1.22	1.24	1.23	1.23
762.40	1.37	1.29	1.31	1.24	1.25	1.26	1.27
821.80	1.36	1.31	1.33	1.25	1.26	1.26	1.28
881.20	1.35	1.30	1.31	1.26	1.26	1.26	1.27
940.60	1.34	1.32	1.35	1.29	1.30	1.30	1.30
1000.00	1.32	1.33	1.35	1.29	1.30	1.30	1.33

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



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