Laboratorio Multidisciplinare di Elettronica I

Prova individuale

Modulazione di ampiezza sinusoidale e impulsata

1. Si colleghi il Signal generator della R&S allo spectrum analyser generando un segnale alla frequenza di 100 MHz con una potenza di 0 dBm. Riportare nella relazione la traccia dello spectrum analyser. Valutare la frequenza e la potenza misurata entrambe con incertezza (utilizzare per le deviazioni i parametri dell'esercitazione 8).

2. Applicare una modulazione AM sinusoidale con modulante fmod = 10 kHz e profondità di modulazione del 50%. Visualizzare il segnale sullo SPA e con i marker misurare frequenza e potenza della portante, frequenza e potenza delle bande laterali.

Con il signal generator è anche possibile applicare modulazioni esterne collegando il segnale modulante all'ingresso modulazione.

3. Con il signal generator generare un segnale a 1 MHz. Applicare una modulazione AM con onda quadra con fmod = 1 kHz, ampiezza = 1V e duty-cycle=20%. Visualizzare l'onda quadra del generatore sull'oscilloscopio e collegare il segnale all'ingresso MOD del generatore e selezionare *AM Source Ext*. Visualizzare il segnale sullo SPA e con i marker misurare frequenza e potenza della portante, frequenza e potenza delle prime 5 bande laterali.
4. Utilizzando il programma Matlab FourierPlay.m, visualizzare l'andamento nel tempo ed in frequenza della modulazione AM quadrata ottenuta con gli stessi parametri di quella misurata. [comando Matlab: y=square(omega*t, DutyCicle)]
5. Quale armonica sparisce con Duty Cicle =20%?

Sulla relazione, riportare i parametri di configurazione dello strumento ed i grafici che ritenete significativi.

Laboratorio Multidisciplinare di Elettronica I

Prova individuale

Caratterizzazione di un filtro passabanda

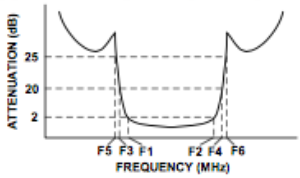
Considerare il filtro passabanda VBFZ-3590+ (di cui viene allegato il data-sheet).

1. Riprodurre i grafici di insertion-loss e VSWR presenti nel data-sheet e riportati nelle figure sottostanti. Esprimere le quantità da misurare in termini di S_{xy} del dispositivo. Fare una tabella con i valori FX del data-sheet e quelli da voi misurati.
2. Misurare con **incertezza** il ritardo introdotto dal filtro.
3. Misurare la **resistenza di ingresso** in funzione della frequenza nella banda 3dB del filtro.

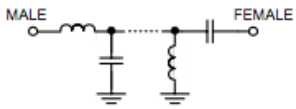
Bandpass Filter Electrical Specifications (T_{AMB}= 25°C)

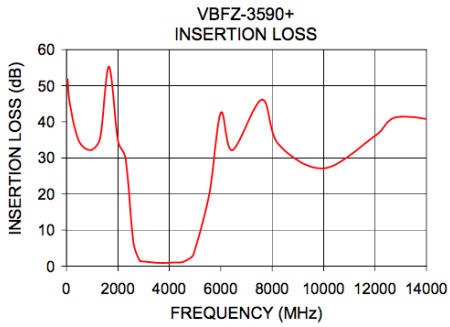
CENTER FREQ. (MHz)	PASSBAND (MHz)	STOPBANDS (MHz)				VSWR (:1)		
	(Loss < 2dB)	(Loss > 20dB)		(Loss 25dB Typ)		Passband		Stopband
Fc	F1 - F2	F3	F4	F5	F6	Typ.	Max.	Typ.
3590	3000 - 4300	2250	5950	2200	5950 - 14000	1.3	2.1	20

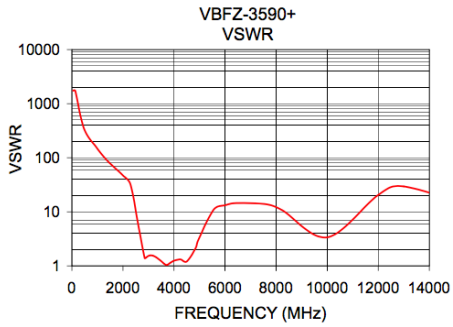
Typical Frequency Response



Functional Schematic







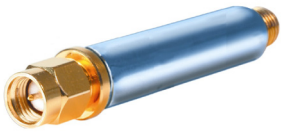
Sulla relazione, riportare i parametri di configurazione dello strumento che ritenete significativi ed i parametri della calibrazione (tipo ed intervallo di frequenza) se necessari. **Sulla relazione riportate i grafici che ritenete significativi.**

Coaxial

Bandpass Filter

VBFZ-3590+

50Ω 3000 to 4300 MHz



Maximum Ratings

Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power Input*	7W at 25°C

*Passband rating, derate linearly to 3W at 100°C ambient.
Permanent damage may occur if any of these limits are exceeded.

Features

- Good Rejection, 25dB up to 14GHz
- Low insertion loss
- Excellent power handling, 7W
- Temperature stable LTCC internal structure
- Rugged stainless steel unibody
- Protected by US Patent 6,943,646

CASE STYLE: FF1145

Connectors	Model
SMA	VBFZ-3590-S+

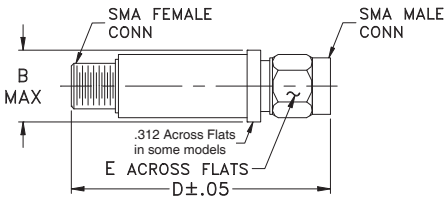
Applications

- Harmonic rejection
- Transmitters/receivers
- Lab use
- Test instrumentation

+RoHS Compliant

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

Outline Drawing



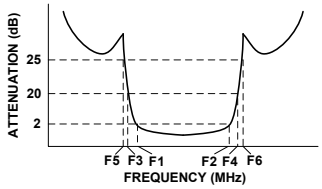
Outline Dimensions (inch / mm)

B	D	E	wt.
.410	**1.91**	**.312**	grams
10.41	48.51	7.92	11.8

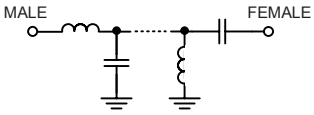
Bandpass Filter Electrical Specifications (T_{AMB}= 25°C)

CENTER FREQ. (MHz)	PASSBAND (MHz) (Loss < 2dB)	STOPBANDS (MHz) (Loss > 20dB)		(Loss 25dB Typ)		VSWR (:1) Passband		Stopband
Fc	F1 - F2	F3	F4	F5	F6	Typ.	Max.	Typ.
3590	3000 - 4300	2250	5950	2200	5950 - 14000	1.3	2.1	20

Typical Frequency Response

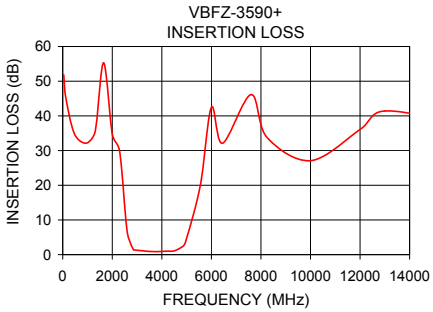


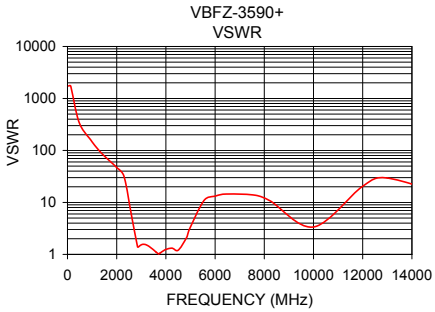
Functional Schematic



Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)
50	51.58	1737.18
1500	42.11	91.43
2200	43.33	36.97
2250	37.02	34.75
2350	24.16	26.33
2550	9.29	8.81
2650	4.57	3.72
2750	2.19	1.82
3000	1.26	1.53
3590	0.89	1.12
4300	1.03	1.30
4750	1.71	1.62
4900	2.90	2.54
5100	6.15	5.06
5300	11.21	8.60
5500	17.93	10.82
5700	24.54	10.56
5950	38.85	12.99
10000	27.08	3.36
14000	31.63	8.51





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REV. C
M151121
EDR-8455/1U
VBFZ-3590+
URJ/RAV
170130

Laboratorio Multidisciplinare di Elettronica I

Prova individuale

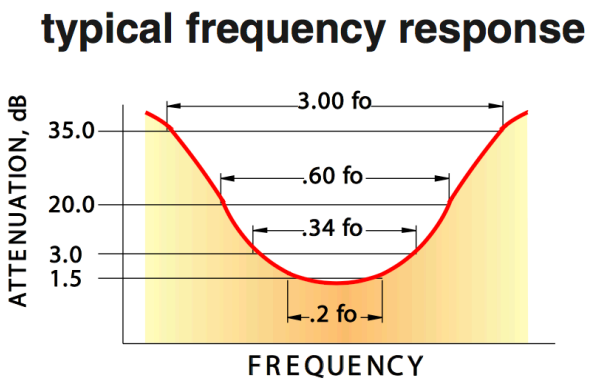
Caratterizzazione di un filtro passabanda

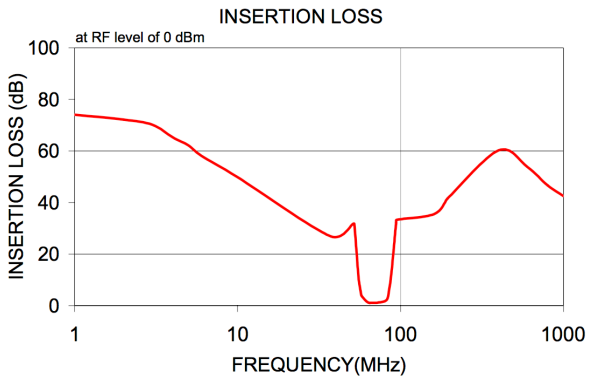
Considerare il filtro passabanda NBP70+ (di cui viene allegato il data-sheet).

1. Riprodurre i grafici di insertion-loss, return loss e group delay presenti nel data-sheet e riportati nelle figure sottostanti; riportare anche il VSWR. Esprimere le quantità misurate in termini di S_{xy} del dispositivo. Riportare la tabella delle specifiche, aggiungendo una linea con i valori misurati da voi.
2. Misurare con **incertezza** il ritardo introdotto dal filtro.
3. Misurare la **resistenza di ingresso** in funzione della frequenza nella banda 3dB del filtro.

Bandpass Filter Electrical Specifications

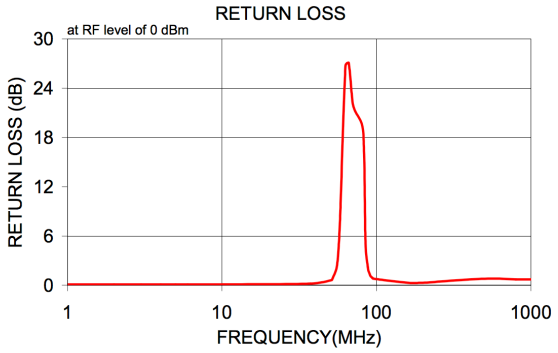
MODEL NO.	CENTER FREQ. (MHz)	PASSBAND (MHz)	3dB BANDWIDTH (MHz)	STOPBANDS		VSWR (:1)	
		I.L. 1.5 dB Max.	*Typ.*	*(I. loss > 20 dB) at MHz*	*(I. loss > 35 dB) at MHz*	*Passband Max.*	*Stopband Typ.*
NBP-70(+)	70	63-77	58-82	51 & 94	6.0 & 193-1000	1.7	16

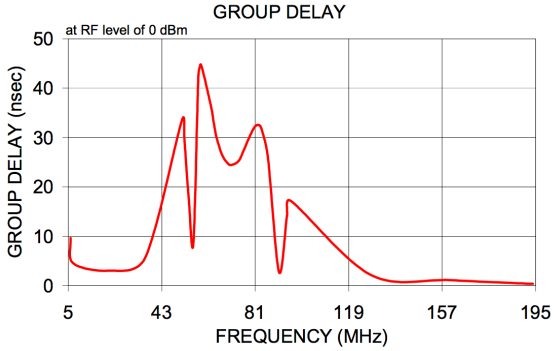




Laboratorio Multidisciplinare di Elettronica I

Prova individuale





Sulla relazione, riportare i parametri di configurazione dello strumento che ritenete significativi ed i parametri della calibrazione (tipo ed intervallo di frequenza) se necessari. **Sulla relazione riportate i grafici che ritenete significativi.**

Coaxial

Bandpass Filter

NBP-70+
NBP-70

50Ω Elliptic Response 63 to 77 MHz

CASE STYLE: FF57

Connectors	Model
N-Type	NBP-70(+)

Maximum Ratings

Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W max.

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

Features
- low insertion loss, 1.5 dB max.
- good selectivity, 1.76 typ. 20 dB/3dB ratio
- rugged shielded case

Applications
- high rejection applications
- image rejection
- IF signal processing

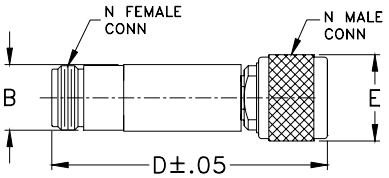
+RoHS Compliant

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

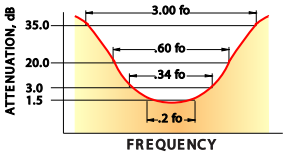
Bandpass Filter Electrical Specifications

MODEL NO.	CENTER FREQ. (MHz)	PASSBAND (MHz)	3dB BANDWIDTH (MHz)	STOPBANDS		VSWR (:1)	
		I.L. 1.5 dB Max.	*Typ.*	*(I. loss > 20 dB) at MHz*	*(I. loss > 35 dB) at MHz*	*Passband Max.*	*Stopband Typ.*
NBP-70(+)	70	63-77	58-82	51 & 94	6.0 & 193-1000	1.7	16

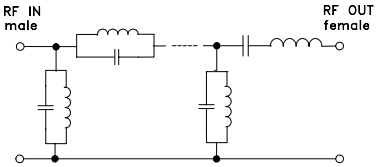
Outline Drawing



typical frequency response



electrical schematic

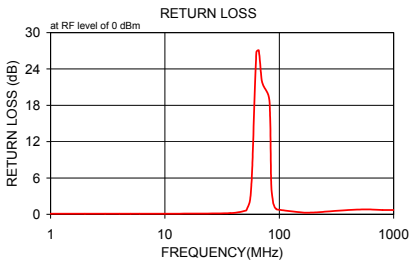


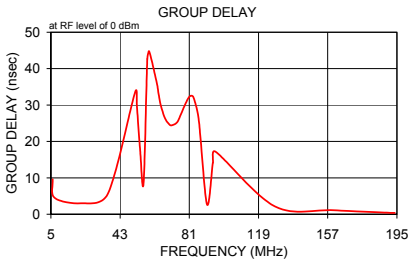
Outline Dimensions (inch / mm)

B	D	E	wt
.67	2.90	.82	grams
17.02	73.66	20.83	90.0

Typical Performance Data

Frequency (MHz)	Insertion Loss (dB) $\bar{x}$	Insertion Loss (dB) σ	Return Loss (dB)	Frequency (MHz)	Group Delay (nsec)
1.0	74.05	9.9	0.1	6.0	9.637
2.0	72.12	9.9	0.1	7.0	4.541
3.0	70.17	9.9	0.1	21.6	3.025
4.0	65.27	9.9	0.1	36.3	5.629
5.0	62.16	9.9	0.1	51.3	33.642
6.0	58.09	9.9	0.1	52.2	29.619
10.0	49.84	8.7	0.1	54.0	17.384
37.3	26.90	2.5	0.2	55.9	8.664
51.0	31.67	1.6	0.6	57.9	42.682
52.0	31.71	6.1	0.8	58.9	44.815
55.3	10.89	2.4	2.2	63.1	36.286
57.0	5.56	1.5	4.8	64.2	32.857
58.0	3.59	1.0	7.7	65.3	30.036
63.0	1.24	0.1	26.8	67.6	26.418
66.2	1.10	0.1	27.1	70.0	24.706
70.0	1.11	0.1	22.3	71.2	24.425
72.7	1.18	0.1	21.2	73.7	24.966
82.0	2.13	0.6	18.8	75.0	25.878
85.0	6.18	2.4	5.1	77.6	28.843
88.0	12.70	3.1	2.1	80.4	31.882
91.0	22.06	4.0	1.2	81.8	32.569
94.0	32.17	1.3	0.9	83.2	32.242
95.0	33.31	2.7	0.8	86.1	26.228
160.3	35.43	0.7	0.3	90.7	2.764
193.0	41.33	1.0	0.3	93.9	14.126
200.0	42.38	1.0	0.3	95.5	17.176
400.0	60.24	9.9	0.7	128.1	2.113
600.0	53.81	8.2	0.8	160.3	1.095
800.0	46.59	4.3	0.7	190.5	0.413
1000.0	42.50	2.9	0.7	193.9	0.375





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Laboratorio Multidisciplinare di Elettronica I

Prova individuale

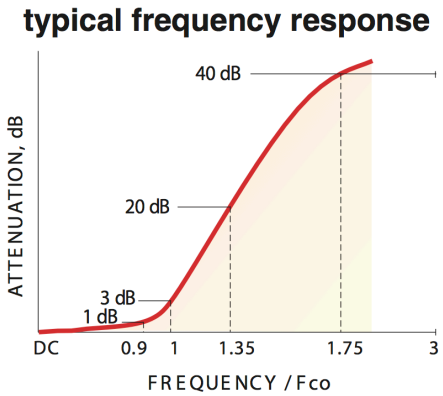
Caratterizzazione di un filtro passabasso

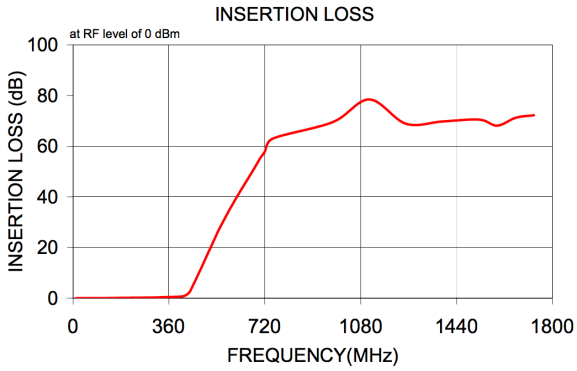
Considerare il filtro passabasso BLP-450+ (di cui viene allegato il data-sheet).

1. Riprodurre i grafici di insertion-loss, return loss e group delay presenti nel data-sheet e riportati nelle figure sottostanti; riportare anche il VSWR. Esprimere le quantità misurate in termini di S_{xy} del dispositivo. Riportare la tabella delle specifiche, aggiungendo una linea con i valori misurati da voi.
2. Misurare con **incertezza** il ritardo introdotto dal filtro.
3. Misurare la **resistenza di ingresso** in funzione della frequenza nella banda 3dB del filtro.

Low Pass Filter Electrical Specifications

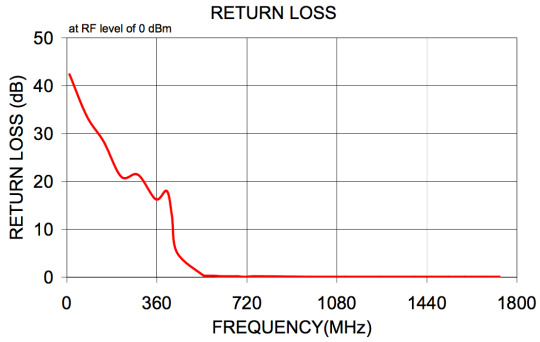
PASSBAND (MHz)	fco (MHz) Nom.	STOPBAND (MHz)		VSWR (:1)	
(loss < 1 dB)	(loss 3 dB)	(loss > 20 dB)	(loss > 40 dB)	Passband Typ.	Stopband Typ.
DC-400	440	580-750	750-1800	1.7	18

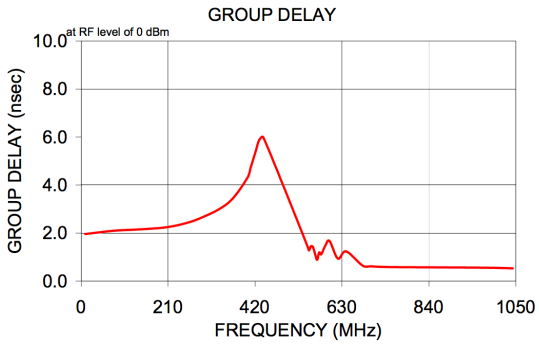




Laboratorio Multidisciplinare di Elettronica I

Prova individuale





Sulla relazione, riportare i parametri di configurazione dello strumento che ritenete significativi ed i parametri della calibrazione (tipo ed intervallo di frequenza) se necessari. **Sulla relazione riportate i grafici che ritenete significativi.**

Coaxial

Low Pass Filter

BLP-450+

50Ω DC to 400 MHz

CASE STYLE: FF55

Connectors	Model
BNC	BLP-450+

Maximum Ratings

Operating Temperature	-55°C to 100°C
Storage Temperature	-55°C to 100°C
RF Power Input	0.5W max.

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

Features

- rugged shielded case
- other standard and custom BLP models available with wide selection of fco

Applications

- test equipment
- lab use
- video equipment

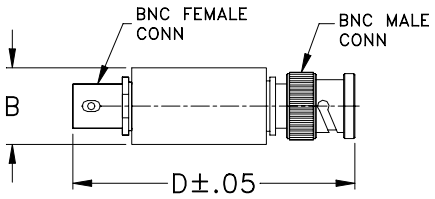
+RoHS Compliant

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

Low Pass Filter Electrical Specifications

PASSBAND (MHz)	fco (MHz) Nom.	STOPBAND (MHz)		VSWR (:1)	
(loss < 1 dB)	(loss 3 dB)	(loss > 20 dB)	(loss > 40 dB)	Passband Typ.	Stopband Typ.
DC-400	440	580-750	750-1800	1.7	18

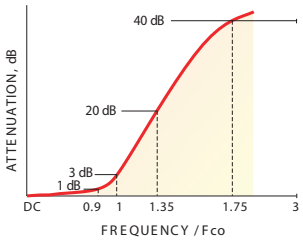
Outline Drawing



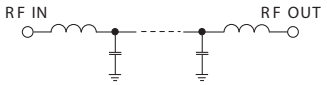
Outline Dimensions (inch / mm)

B	D	wt
.54	2.59	grams
13.72	65.79	40.0

typical frequency response



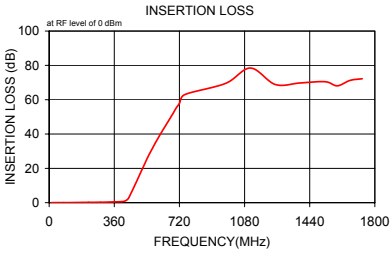
electrical schematic



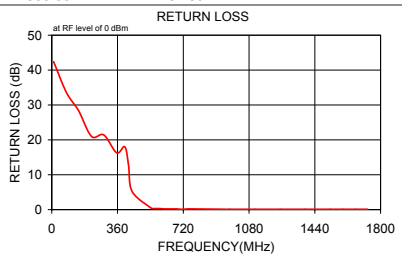
Typical Performance Data

Frequency (MHz)	Insertion Loss (dB) x̄	σ	Return Loss (dB)	Frequency (MHz)	Group Delay (nsec)
10.00	0.02	0.1	42.4	10.00	1.96
80.00	0.06	0.1	33.6	80.00	2.10
147.50	0.10	0.1	28.3	147.50	2.16
217.50	0.19	0.1	21.0	217.50	2.27
285.00	0.25	0.1	21.4	285.00	2.60
355.00	0.46	0.1	16.3	355.00	3.25
400.00	0.63	0.1	18.0	400.00	4.26
420.00	1.01	0.1	12.8	410.00	4.76
440.00	2.84	0.2	5.2	420.00	5.32
545.00	26.52	0.9	0.4	430.00	5.87
555.00	28.57	0.9	0.3	440.00	5.99
565.00	30.55	1.0	0.3	545.00	1.52
570.00	31.51	1.0	0.3	550.00	1.28
575.00	32.52	1.0	0.3	555.00	1.45
580.00	33.47	1.0	0.3	560.00	1.42
590.00	35.44	1.0	0.3	565.00	1.12
620.00	40.86	1.1	0.2	570.00	0.88
680.00	51.19	1.6	0.2	575.00	1.20
700.00	54.79	1.8	0.1	580.00	1.11
720.06	57.91	1.2	0.1	590.00	1.48
750.00	62.99	2.7	0.2	600.00	1.67
975.00	69.53	2.1	0.1	620.00	0.93
1112.50	78.46	9.9	0.1	640.00	1.24
1250.00	68.87	2.9	0.1	680.00	0.64
1387.50	69.76	8.2	0.1	700.00	0.62
1525.00	70.50	5.6	0.1	720.00	0.59
1592.50	68.09	0.9	0.1	750.00	0.58
1662.50	71.23	4.9	0.1	975.00	0.56
1730.00	72.22	6.0	0.1	1042.50	0.53
1800.00	67.80	4.1	0.1	1112.50	0.52

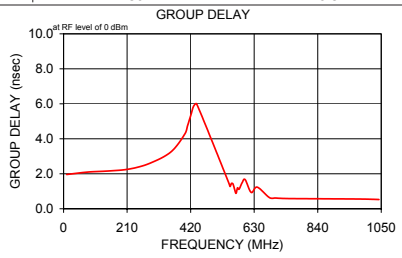
INSERTION LOSS



RETURN LOSS



GROUP DELAY



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