

Electronic Line Stretcher

ELS-210

50Ω 360° Voltage Variable 80 to 210 MHz

Maximum Ratings

Operating Temperature	0°C to 50 °C
Storage Temperature	-40°C to 100°C
RF Input Power	13dBm
Control Voltage	0.5V to 30V
Permanent damage may occur if any of these limits are exceeded.	

Coaxial Connections

RF IN	1
MONITOR OUT*	2
CONTROL	3

* Monitor out port should be connected to a 50-ohm load

Features

- over 360° phase shift of the reflected signal
- normalized and stable magnitude of the reflected signal
- voltage controlled for automated applications
- protected under US Patent 6,479,977

Applications

- automated load-pull measurement of oscillators¹



CASE STYLE: K18

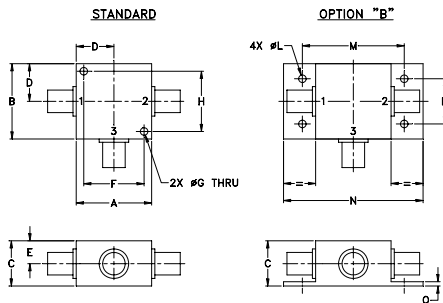
Connectors Model
SMA ELS-210-S
BRACKET (OPTION "B")

Electrical Specifications

FREQUENCY RANGE (MHz)	INPUT POWER (dBm)	PHASE RANGE (Degrees)	RETURN LOSS (dB)	CONTROL VOLTAGE (V)
f_L - f_U	Max.	Min.	Typ.	
80-210	10	360	10-12	0.5-25

1. See Application Note AN-45-002 on our web site.

Outline Drawing



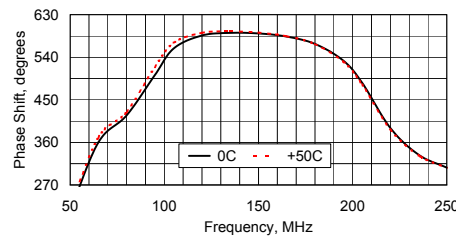
Outline Dimensions (inch/mm)

A	B	C	D	E	F	G	H
1.25	1.25	.75	.63	.38	1.00	.125	1.000
31.75	31.75	19.05	16.00	9.65	25.40	3.18	25.40
J	K	L	M	N	P	Q	wt
--	--	.125	1.688	2.18	.75	.07	grams
--	--	3.18	42.88	55.37	19.05	1.78	70.0

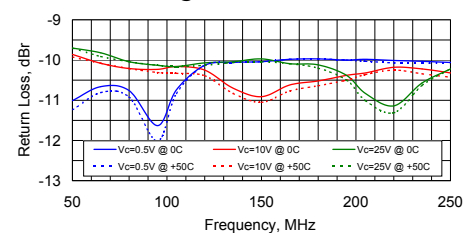
Typical Performance Data

FREQ. (MHz)	PHASE SHIFT (Deg.)		RETURN LOSS (dBr)					
			Vc=0.5V @ 0°C	Vc=10V @ 0°C	Vc=25V @ 0°C	Vc=0.5V @ +50°C	Vc=10V @ +50°C	Vc=25V @ +50°C
50	214.95	222.34	-11.01	-9.86	-9.70	-11.24	-9.92	-9.70
65	359.99	370.33	-10.66	-10.08	-9.82	-10.81	-10.08	-9.91
80	417.15	424.27	-10.76	-10.21	-10.04	-10.92	-10.21	-10.04
95	502.31	519.32	-11.63	-10.23	-10.13	-12.02	-10.31	-10.13
105	558.68	570.75	-10.74	-10.16	-10.16	-10.83	-10.33	-10.16
120	586.13	591.76	-10.13	-10.25	-10.07	-10.13	-10.39	-10.13
135	591.70	594.71	-10.06	-10.70	-10.04	-10.06	-10.83	-10.06
150	590.40	592.21	-10.04	-10.04	-9.97	-10.04	-11.05	-10.04
165	583.66	584.60	-9.98	-10.62	-10.09	-9.98	-10.77	-10.09
180	568.25	567.91	-9.97	-10.52	-10.12	-9.97	-10.64	-10.20
195	533.10	530.82	-10.00	-10.38	-10.38	-10.00	-10.50	-10.50
205	486.07	482.31	-9.98	-10.32	-10.83	-10.03	-10.36	-11.01
220	390.51	387.32	-10.01	-10.18	-11.14	-10.07	-10.25	-11.31
235	333.92	332.49	-10.03	-10.22	-10.57	-10.08	-10.34	-10.63
250	306.43	306.09	-10.06	-10.32	-10.22	-10.06	-10.43	-10.22

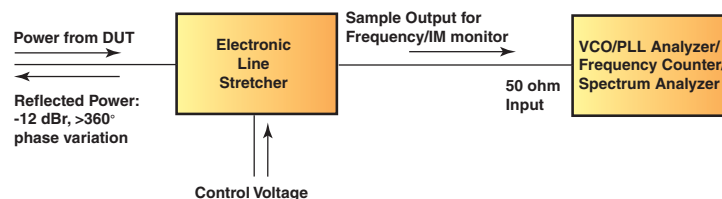
Maximum Phase Shift vs. Frequency at temperature extremes @ Pin =+7 dBm



Return Loss vs. Frequency at temperature extremes @ Pin =+7 dBm



Application Block Diagram



Notes

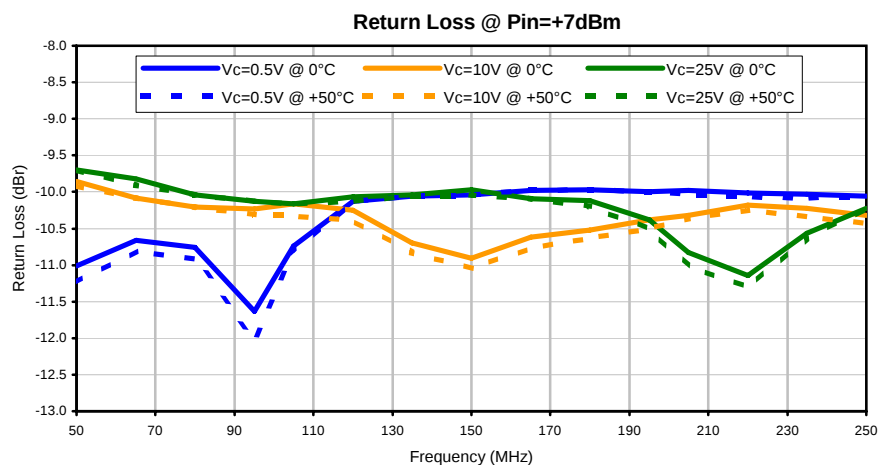
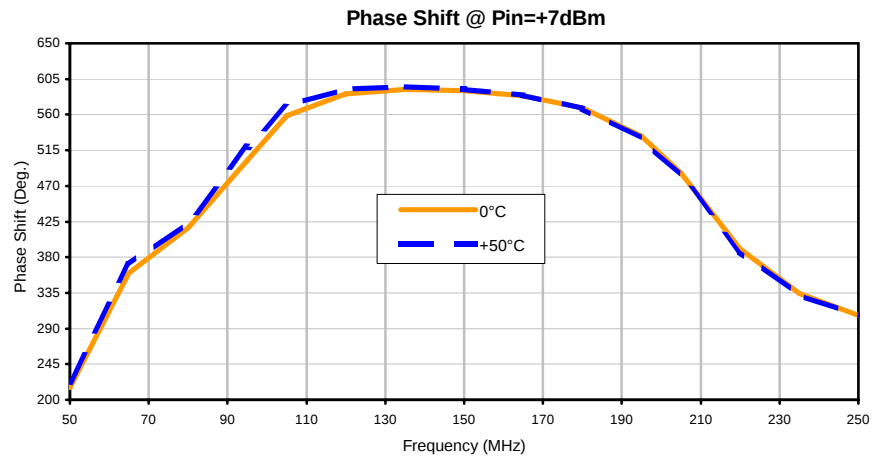
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Typical Performance Data

FREQUENCY (MHz)	PHASE SHIFT		RETURN LOSS					
	(Deg.)		(dBr)					
	0°C	+50°C	Vc=0.5V @ 0°C	Vc=10V @ 0°C	Vc=25V @ 0°C	Vc=0.5V @ +50°C	Vc=10V @ +50°C	Vc=25V @ +50°C
50.0	214.95	222.34	-11.01	-9.86	-9.70	-11.24	-9.92	-9.70
65.0	359.99	370.33	-10.66	-10.08	-9.82	-10.81	-10.08	-9.91
80.0	417.15	424.27	-10.76	-10.21	-10.04	-10.92	-10.21	-10.04
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205.0	486.07	482.31	-9.98	-10.32	-10.83	-10.03	-10.36	-11.01
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235.0	333.92	332.49	-10.03	-10.22	-10.57	-10.08	-10.34	-10.63
250.0	306.43	306.09	-10.06	-10.32	-10.22	-10.06	-10.43	-10.22

Typical Performance Curves



Outline Dimensions



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
K18	1.25 (31.75)	1.25 (31.75)	.75 (19.05)	.63 (16.00)	.38 (9.65)	1.000 (25.40)	.125 (3.18)	1.000 (25.40)	--	--	.125 (3.18)	1.688 (42.88)	2.18 (55.37)

CASE#	P	Q	WT. GRAMS
K18	.75 (19.05)	.07 (1.78)	70.0

Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .03$; 3 Pl. $\pm .015$

Notes:

- Case material: Aluminum alloy.
- Case finish:
For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
- Mounting bracket available on request. Add suffix B to part number.
- For port marking 1, 2, and 3 see specifications data sheet.
- For bracket version, option B, dimension "C" changes from .75 to .94 inches when connectors are type N.
- Refer to the individual model data sheet for the type of connectors available.



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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	-0° to 50° C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-40° to 100° C Ambient Environment	Individual Model Data Sheet
Barometric Pressure	100,000 Feet	MIL-STD-202, Method 105, Condition D
Humidity	90% RH, 65°C Units may require bake-out after humidity to restore full performance.	MIL-STD-202, Method 103
Thermal Shock	-65° to 125°C, 5 cycles	MIL-STD-202, Method 107, Condition B
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)	MIL-STD-202, Method 213, Condition I