

Electronic Line Stretcher

ELS-950

50Ω 360° Voltage Variable 400 to 950 MHz



CASE STYLE: K18

Connectors Model
SMA ELS-950-S
BRACKET (OPTION "B")

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

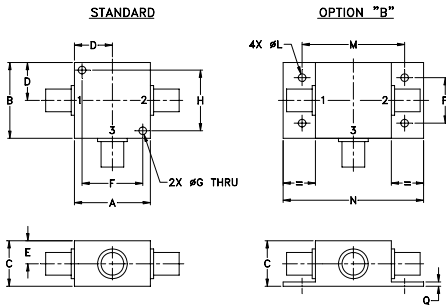
- automated load-pull measurement of oscillators¹

Electrical Specifications

| FREQUENCY RANGE (MHz) | INPUT POWER (dBm) | PHASE RANGE (Degrees) | RETURN LOSS (dB) | CONTROL VOLTAGE (V) |
|-----------------------|-------------------|-----------------------|------------------|---------------------|
| f_L - f_U | Max. | Min. | Typ. | |
| 400-950 | 10 | 360 | 10-12 | 0.5-25 |

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

Outline Drawing



Outline Dimensions (inch/mm)

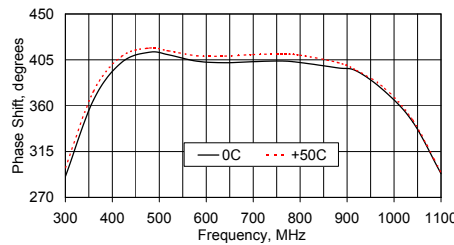
| | | | | | | | |
|-------|-------|-------|-------|------|-------|------|-------|
| A | B | C | D | E | F | G | H |
| 1.25 | 1.25 | .75 | .63 | .38 | 1.00 | .125 | 1.000 |
| 31.75 | 31.75 | 19.05 | 16.00 | 9.65 | 25.40 | 3.18 | 25.40 |

| | | | | | | | |
|----|----|------|-------|-------|-------|------|-------|
| 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 |

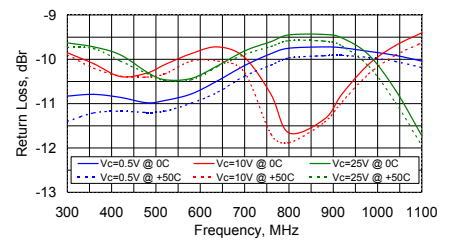
Typical Performance Data

| FREQ. (MHz) | PHASE SHIFT (Deg.) | | RETURN LOSS (dB) | | | | | |
|-------------|--------------------|--------|------------------|--------------|--------------|-----------------|----------------|----------------|
| | 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 |
| 300 | 290.51 | 299.06 | -10.83 | -9.85 | -9.63 | -11.40 | -9.90 | -9.73 |
| 360 | 365.70 | 374.24 | -10.79 | -10.10 | -9.72 | -11.21 | -10.20 | -9.76 |
| 420 | 402.47 | 408.38 | -10.86 | -10.39 | -9.90 | -11.17 | -10.38 | -10.04 |
| 480 | 412.55 | 416.59 | -10.98 | -10.31 | -10.29 | -11.20 | -10.40 | -10.32 |
| 520 | 409.93 | 413.82 | -10.93 | -10.12 | -10.46 | -11.17 | -10.33 | -10.48 |
| 580 | 403.67 | 408.94 | -10.78 | -9.87 | -10.43 | -10.99 | -10.04 | -10.46 |
| 640 | 402.14 | 408.69 | -10.48 | -9.72 | -10.14 | -10.74 | -10.04 | -10.16 |
| 700 | 403.23 | 410.19 | -10.14 | -9.96 | -9.81 | -10.38 | -10.30 | -9.89 |
| 760 | 403.87 | 410.63 | -9.87 | -10.80 | -9.60 | -10.13 | -11.70 | -9.71 |
| 800 | 402.32 | 409.49 | -9.75 | -11.66 | -9.45 | -9.97 | -11.88 | -9.58 |
| 880 | 397.09 | 402.32 | -9.72 | -11.35 | -9.44 | -9.92 | -11.42 | -9.59 |
| 920 | 394.06 | 394.63 | -9.74 | -10.78 | -9.52 | -9.91 | -10.96 | -9.70 |
| 980 | 374.13 | 377.19 | -9.82 | -10.11 | -9.90 | -9.96 | -10.33 | -10.16 |
| 1040 | 343.98 | 345.70 | -9.91 | -9.69 | -10.69 | -10.05 | -9.91 | -10.98 |
| 1100 | 293.33 | 294.33 | -10.04 | -9.40 | -11.73 | -10.19 | -9.63 | -11.96 |

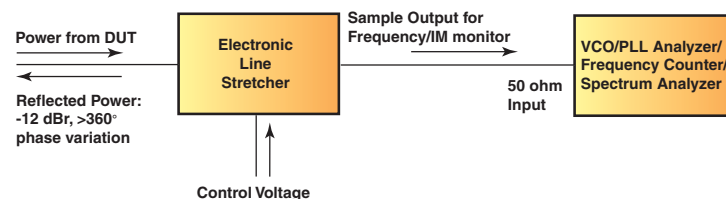
Maximum Phase Shift vs. Frequency at temperature extremes @ Pin=+7dBm



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



Application Block Diagram



Notes

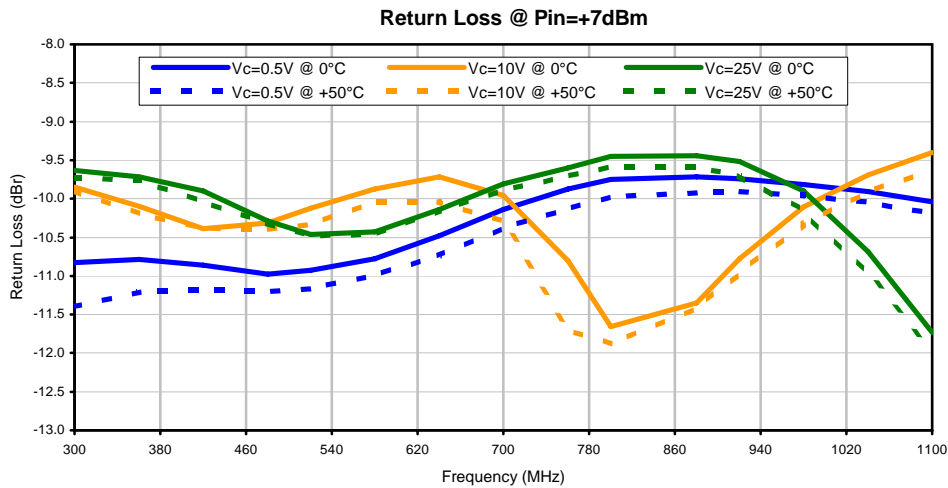
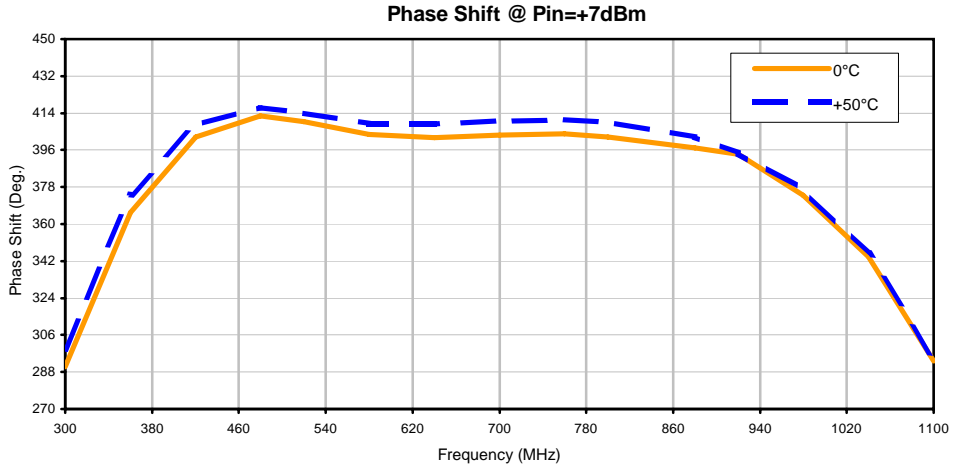
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Typical Performance Data

| 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 |
| 300.0 | 290.51 | 299.06 | -10.83 | -9.85 | -9.63 | -11.40 | -9.90 | -9.73 |
| 360.0 | 365.70 | 374.24 | -10.79 | -10.10 | -9.72 | -11.21 | -10.20 | -9.76 |
| 420.0 | 402.47 | 408.38 | -10.86 | -10.39 | -9.90 | -11.17 | -10.38 | -10.04 |
| 480.0 | 412.55 | 416.59 | -10.98 | -10.31 | -10.29 | -11.20 | -10.40 | -10.32 |
| 520.0 | 409.93 | 413.82 | -10.93 | -10.12 | -10.46 | -11.17 | -10.33 | -10.48 |
| 580.0 | 403.67 | 408.94 | -10.78 | -9.87 | -10.43 | -10.99 | -10.04 | -10.46 |
| 640.0 | 402.14 | 408.69 | -10.48 | -9.72 | -10.14 | -10.74 | -10.04 | -10.16 |
| 700.0 | 403.23 | 410.19 | -10.14 | -9.96 | -9.81 | -10.38 | -10.30 | -9.89 |
| 760.0 | 403.87 | 410.63 | -9.87 | -10.80 | -9.60 | -10.13 | -11.70 | -9.71 |
| 800.0 | 402.32 | 409.49 | -9.75 | -11.66 | -9.45 | -9.97 | -11.88 | -9.58 |
| 880.0 | 397.09 | 402.32 | -9.72 | -11.35 | -9.44 | -9.92 | -11.42 | -9.59 |
| 920.0 | 394.06 | 394.63 | -9.74 | -10.78 | -9.52 | -9.91 | -10.96 | -9.70 |
| 980.0 | 374.13 | 377.19 | -9.82 | -10.11 | -9.90 | -9.96 | -10.33 | -10.16 |
| 1040.0 | 343.98 | 345.70 | -9.91 | -9.69 | -10.69 | -10.05 | -9.91 | -10.98 |
| 1100.0 | 293.33 | 294.33 | -10.04 | -9.40 | -11.73 | -10.19 | -9.63 | -11.96 |

Typical Performance Curves



Case Style

K

K18

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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| 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 |