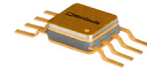


Surface Mount Switch

KSW-2-46+

50Ω SPDT, Reflective DC⁴ to 4.6 GHz



Generic photo used for illustration purposes only

CASE STYLE: XX112

+RoHS Compliant

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

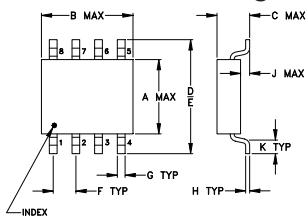
Maximum Ratings

| | |
|---|----------------|
| Operating Temperature | -55°C to 100°C |
| Storage Temperature | -55°C to 150°C |
| Input Power | see Note 1 |
| Control V | see Note 2 |
| Permanent damage may occur if any of these limits are exceeded. | |

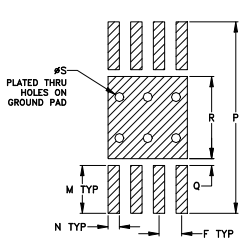
Pin Connections

| | |
|-----------|-------|
| RF IN | 2 |
| RF OUT 1 | 5 |
| RF OUT 2 | 8 |
| CONTROL 1 | 3 |
| CONTROL 2 | 1 |
| GROUND | 4,6,7 |

Outline Drawing



PCB Land Pattern

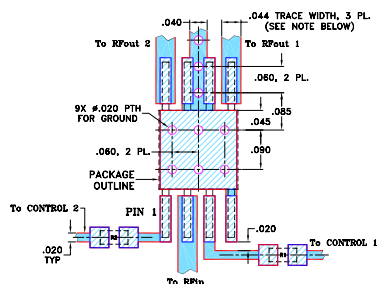


Suggested Layout, Tolerance to be within ±.002

Outline Dimensions (inch)

| | | | | | | | | | |
|------|------|------|-------|-------|------|------|------|-------|--|
| A | B | C | D | E | F | G | H | | |
| .180 | .180 | .070 | .400 | .350 | .050 | .015 | .005 | | |
| 4.57 | 4.57 | 1.78 | 10.16 | 8.89 | 1.27 | 0.38 | 0.13 | | |
| J | K | M | N | P | Q | R | S | wt. | |
| .005 | .070 | .105 | .025 | .420 | .015 | .180 | .020 | grams | |
| 0.13 | 1.78 | 2.67 | 0.64 | 10.67 | 0.38 | 4.57 | 0.51 | 0.15 | |

Demo Board MCL P/N: TB-204 Suggested PCB Layout (PL-217)



RESISTORS R1, R2: 100 Ohm, 0603 SIZE.
 NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS RO4350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
 2. 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

Features

- wideband, DC to 4.6 GHz
- low insertion loss, 1.3 dB typ.
- aqueous washable
- low video leakage, 30 mVp-p typ.

Applications

- PCN
- cellular
- 2-way radio
- receiver antenna switching

Electrical Specifications

| FREQ. ⁴ (GHz) | INSERTION LOSS (dB) | | | | 1dB COMPR. (dBm) | | | IN-OUT ISOLATION (dB) | | | | | | | | | |
|--------------------------|---------------------|--------------|---------------|---------------|------------------|--------------|---------------|-----------------------|--------------|---------------|------|------|------|----|----|----|----|
| | DC-200 MHz | 200-1000 MHz | 1000-3000 MHz | 3000-4600 MHz | DC-200 MHz | 200-1000 MHz | 1000-4600 MHz | DC-200 MHz | 200-1000 MHz | 1000-4600 MHz | | | | | | | |
| f _L | Typ. | Max. | Typ. | Max. | Typ. | Typ. | Typ. | Typ. | Min. | Typ. | Min. | Typ. | Min. | | | | |
| DC | 0.9 | 1.1 | 1.0 | 1.3 | 1.3 | 1.8 | 2.0 | 2.8 | 10 | 17 | 27 | 60 | 50 | 50 | 40 | 40 | 28 |

Additional Specifications

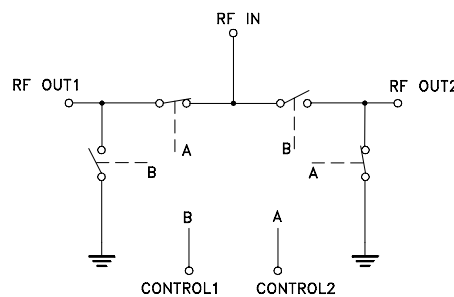
| | |
|--------------------------------------|-------------------|
| Control Voltage, volts | |
| Low State | -0.2 to 0 |
| High State (negative) | |
| for compression specs | -8 |
| for other specs | -5 to -8 |
| Control Current, mA | 2.5 typ. at -8V |
| VSWR(:1) | 1.3 typ. |
| Rise/Fall time (10%-90%), ns | 2 typ. |
| Switching time, 50% of Control to | |
| 90% RF (Turn-on), ns | 4 typ. |
| 10% RF (Turn-off), ns | 2.5 typ. |
| **Video Leakage, mVp-p 0/-5V Control | 30 typ. |
| MTBF, hrs @ 100°C case | 7X10 ⁶ |

CONTROL LOGIC

| Control Ports | | RF outputs | |
|---------------|----|------------|-----|
| 1 | 2 | 1 | 2 |
| -V | 0 | On | Off |
| 0 | -V | Off | On |

1. Max. Input RF power, +27 dBm except below 500 MHz +24 dBm
2. Control voltage (-10V) maximum.
3. Video leakage or break through is defined as leakage of switching signal to RF output ports.
4. All RF connections must be DC blocked or held at 0V DC.

Electrical Schematic



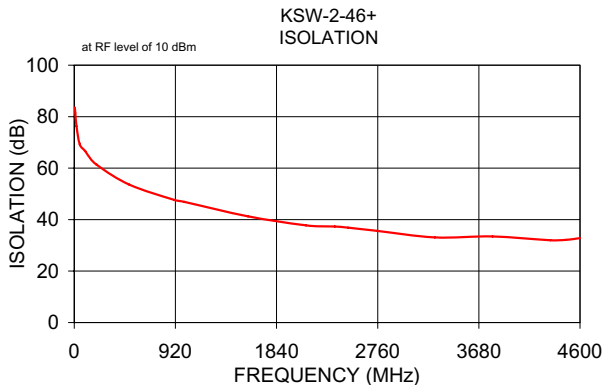
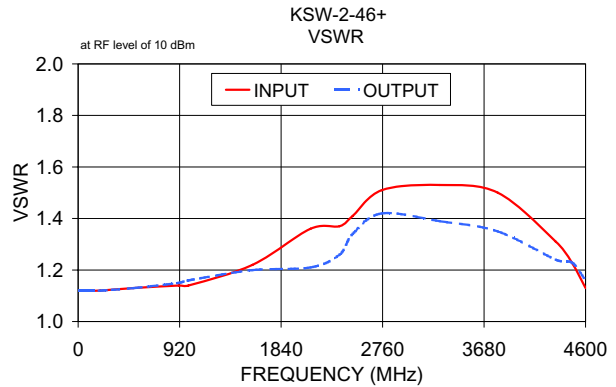
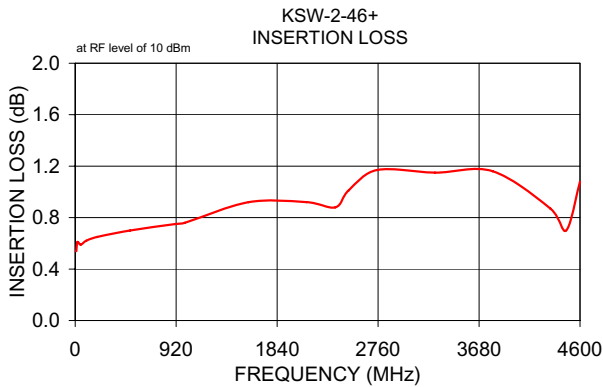
Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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



Typical Performance Data

| FREQ. (MHz) | ON INSERTION LOSS (dB) Control @ 0V/-5V IN-OUT | | OFF ISOLATION (dB) Control @ 0V/-5V IN-OUT | | VSWR | | |
|----------------|--|----------|--|----------|-----------------|-----------------|------------------|
| | \bar{x} | σ | \bar{x} | σ | IN \bar{x} | ON \bar{x} | OUT \bar{x} |
| | | | | | | | |
| 3.00 | 0.54 | 0.04 | 83.44 | 4.68 | 1.12 | 1.12 | 16.46 |
| 5.00 | 0.54 | 0.04 | 83.46 | 2.97 | 1.12 | 1.12 | 16.21 |
| 10.00 | 0.54 | 0.04 | 81.44 | 2.66 | 1.12 | 1.12 | 16.21 |
| 20.00 | 0.61 | 0.06 | 76.29 | 2.13 | 1.12 | 1.12 | 16.04 |
| 50.00 | 0.59 | 0.04 | 69.27 | 0.92 | 1.12 | 1.12 | 15.37 |
| 100.00 | 0.62 | 0.04 | 66.59 | 1.42 | 1.12 | 1.12 | 14.63 |
| 200.00 | 0.65 | 0.04 | 61.43 | 0.74 | 1.12 | 1.12 | 14.00 |
| 500.00 | 0.70 | 0.04 | 53.61 | 0.93 | 1.13 | 1.13 | 12.83 |
| 911.55 | 0.75 | 0.04 | 47.64 | 0.59 | 1.14 | 1.15 | 11.86 |
| 1000.00 | 0.76 | 0.04 | 46.91 | 0.61 | 1.14 | 1.16 | 11.79 |
| 1581.00 | 0.92 | 0.05 | 41.27 | 0.47 | 1.22 | 1.20 | 11.85 |
| 2107.00 | 0.92 | 0.06 | 37.77 | 0.41 | 1.36 | 1.21 | 11.91 |
| 2370.00 | 0.88 | 0.06 | 37.33 | 0.42 | 1.37 | 1.26 | 9.64 |
| 2489.55 | 1.01 | 0.07 | 36.86 | 0.43 | 1.41 | 1.34 | 9.98 |
| 2752.55 | 1.17 | 0.09 | 35.65 | 0.39 | 1.51 | 1.42 | 9.70 |
| 3278.55 | 1.15 | 0.11 | 33.10 | 0.42 | 1.53 | 1.39 | 13.14 |
| 3804.55 | 1.16 | 0.08 | 33.46 | 0.37 | 1.50 | 1.35 | 13.37 |
| 4330.55 | 0.87 | 0.05 | 31.99 | 0.42 | 1.31 | 1.24 | 15.41 |
| 4474.00 | 0.70 | 0.04 | 32.16 | 0.40 | 1.23 | 1.23 | 17.84 |
| 4600.00 | 1.08 | 0.04 | 32.78 | 0.42 | 1.13 | 1.16 | 14.40 |



Notes

- 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.
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Switch SPDT , 50Ω

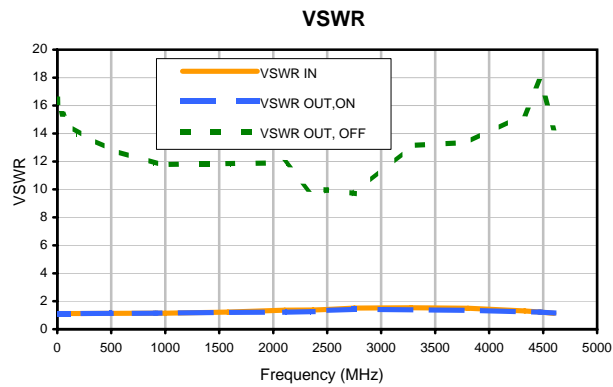
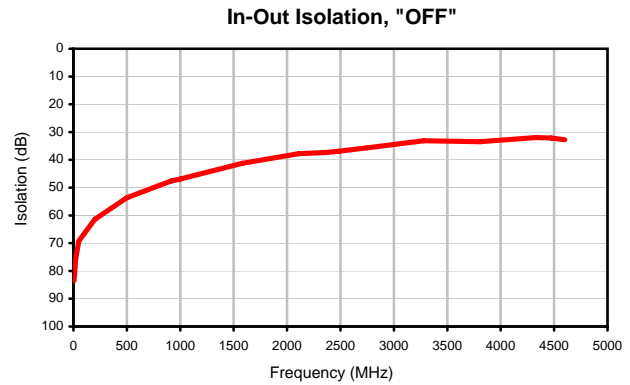
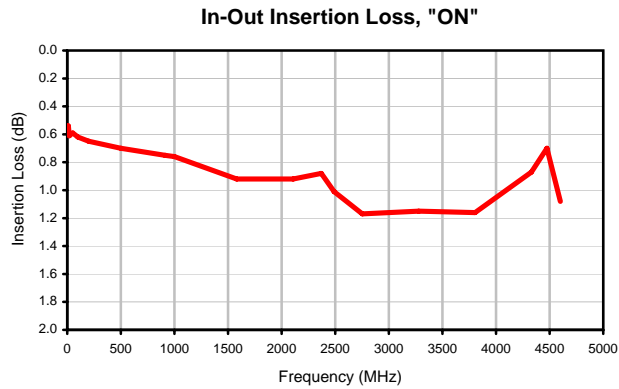
KSW-2-46+

Typical Performance Data

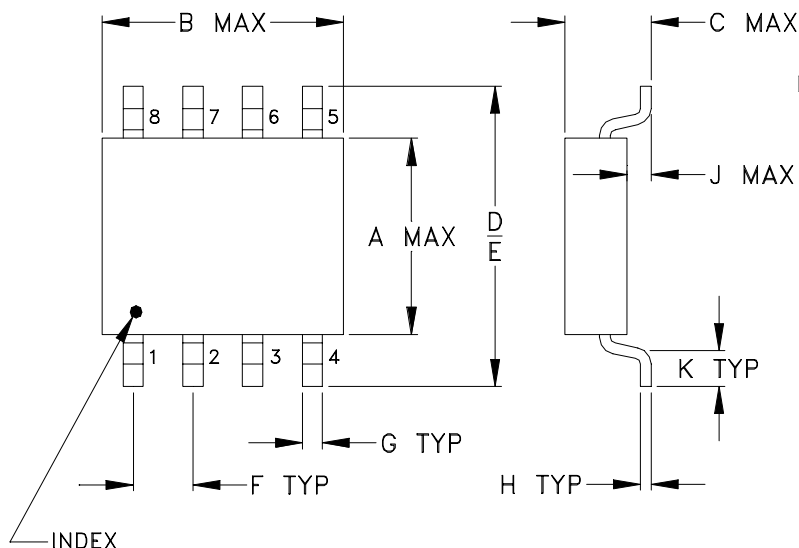
| FREQUENCY (MHz) | INSERTION LOSS Control @ 0V/-5V (dB) IN-OUT , "ON" | ISOLATION Control @ 0V/-5V (dB) IN-OUT , "OFF" | VSWR (:1) | | |
|--------------------|---|---|--------------|------------|-------------|
| | | | IN | OUT , "ON" | OUT , "OFF" |
| 3 | 0.54 | 83.44 | 1.12 | 1.12 | 16.46 |
| 5 | 0.54 | 83.46 | 1.12 | 1.12 | 16.21 |
| 10 | 0.54 | 81.44 | 1.12 | 1.12 | 16.21 |
| 20 | 0.61 | 76.29 | 1.12 | 1.12 | 16.04 |
| 50 | 0.59 | 69.27 | 1.12 | 1.12 | 15.37 |
| 100 | 0.62 | 66.59 | 1.12 | 1.12 | 14.63 |
| 200 | 0.65 | 61.43 | 1.12 | 1.12 | 14.00 |
| 500 | 0.70 | 53.61 | 1.13 | 1.13 | 12.83 |
| 912 | 0.75 | 47.64 | 1.14 | 1.15 | 11.86 |
| 1000 | 0.76 | 46.91 | 1.14 | 1.16 | 11.79 |
| 1581 | 0.92 | 41.27 | 1.22 | 1.20 | 11.85 |
| 2107 | 0.92 | 37.77 | 1.36 | 1.21 | 11.91 |
| 2370 | 0.88 | 37.33 | 1.37 | 1.26 | 9.64 |
| 2490 | 1.01 | 36.86 | 1.41 | 1.34 | 9.98 |
| 2753 | 1.17 | 35.65 | 1.51 | 1.42 | 9.70 |
| 3279 | 1.15 | 33.10 | 1.53 | 1.39 | 13.14 |
| 3805 | 1.16 | 33.46 | 1.50 | 1.35 | 13.37 |
| 4331 | 0.87 | 31.99 | 1.31 | 1.24 | 15.41 |
| 4474 | 0.70 | 32.16 | 1.23 | 1.23 | 17.84 |
| 4600 | 1.08 | 32.78 | 1.13 | 1.16 | 14.40 |



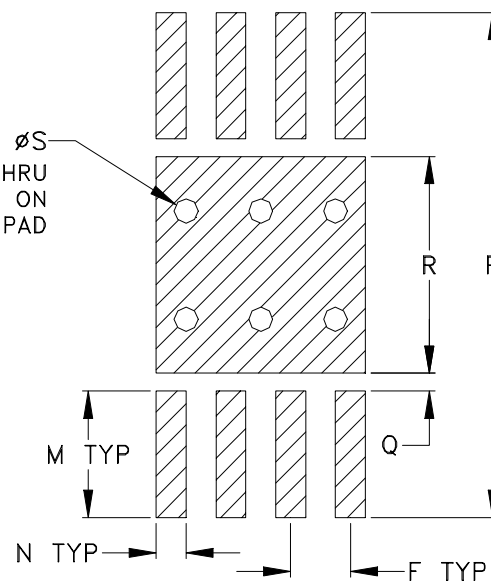
Typical Performance Curves



Outline Dimensions



PCB Land Pattern



Suggested Layout,
Tolerance to be within $\pm .002$

| CASE # | A | B | C | D | E | F | G | H | J | K | L | M | N | P |
|--------|----------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----|----------------|----------------|-----------------|
| XX112 | .180 (4.57) | .180 (4.57) | .070 (1.78) | .400 (10.16) | .350 (8.89) | .050 (1.27) | .015 (0.38) | .005 (0.13) | .005 (0.13) | .070 (1.78) | -- | .105 (2.67) | .025 (0.64) | .420 (10.67) |

| CASE # | Q | R | S | WT. GRAM |
|--------|----------------|----------------|----------------|----------|
| XX112 | .015 (0.38) | .180 (4.57) | .020 (0.51) | .15 |

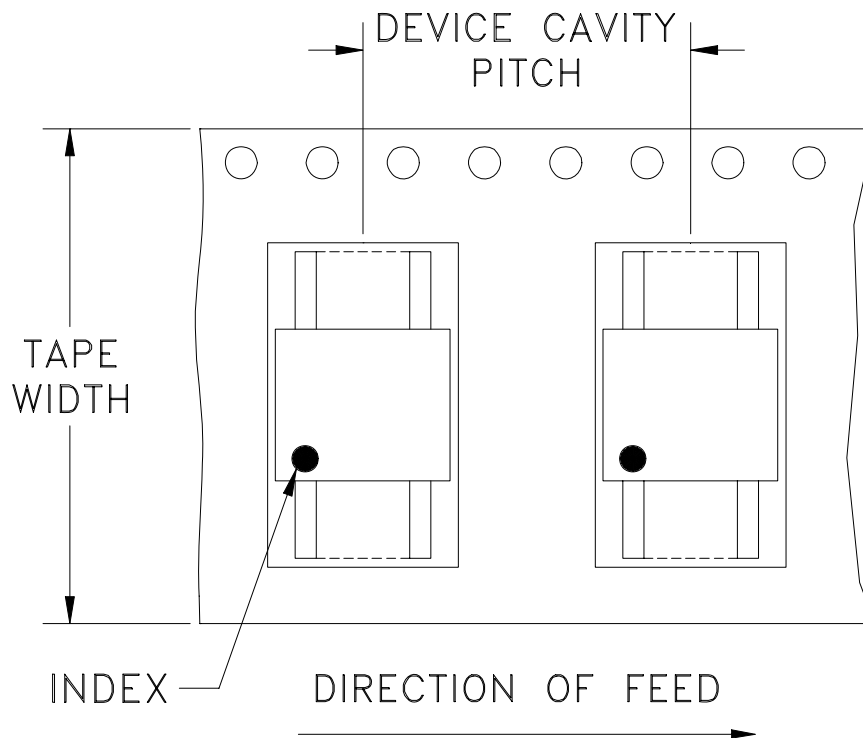
Dimensions are in inches (mm). Tolerances: 2 Pl. $\pm .01$; 3 Pl. $\pm .005$

Notes:

1. Case material: Kovar.
2. Termination Finish: 50 μ inch (1.27 microns) Gold over 50-350 μ inch (1.27-8.89 microns) Nickel plate.
3. Special Tolerances: Termination thickness $\pm .002$ inch.

Tape & Reel Packaging TR-F19

DEVICE ORIENTATION IN T&R



| Tape Width, mm | Device Cavity Pitch, mm | Reel Size, inches | Devices per Reel | |
|----------------|-------------------------|-------------------|-------------------------------------|-----|
| 16 | 8 | 7 | Small quantity standards (see note) | 20 |
| | | | | 50 |
| | | | | 100 |
| | | | | 200 |
| | | 7 | Standard | 500 |

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



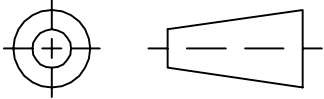
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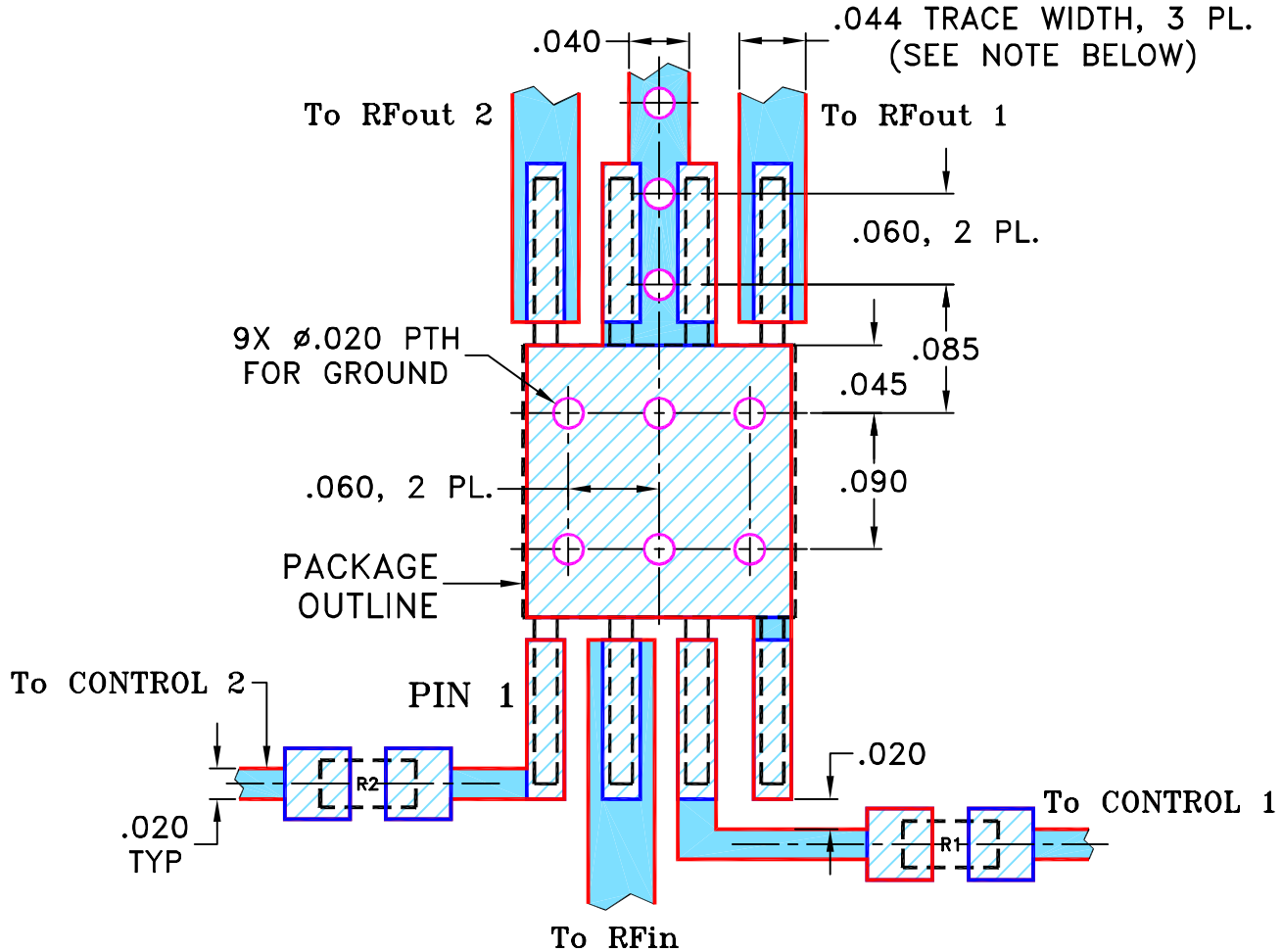
THIRD ANGLE PROJECTION



REVISIONS

| REV | ECN No. | DESCRIPTION | DATE | DR | AUTH |
|-----|---------|-----------------------|----------|-----|------|
| OR | M100859 | NEW RELEASE | 10/12/05 | MMG | IG |
| A | M102713 | ADDED "...WITH SMOBC" | 01/12/06 | GT | IL |
| | | | | | |
| | | | | | |

**SUGGESTED MOUNTING CONFIGURATION
FOR XX112 CASE STYLE, "eh" PIN CONNECTION.**



RESISTORS R1, R2: 100 Ohm, 0603 SIZE.

- NOTE: 1. TRACE WIDTH IS SHOWN FOR ROGERS R04350B WITH DIELECTRIC THICKNESS .020" ± .0015"; COPPER: 1/2 OZ. EACH SIDE. FOR OTHER MATERIALS TRACE WIDTH MAY NEED TO BE MODIFIED.
2. 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 MMG | 09/22/05 |
| TOLERANCES ON: | CHECKED IL | 10/12/05 |
| 2 PL DECIMALS ± | APPROVED IG | 10/12/05 |
| 3 PL DECIMALS ± .005 | | |
| ANGLES ± | | |
| FRACTIONS ± | | |

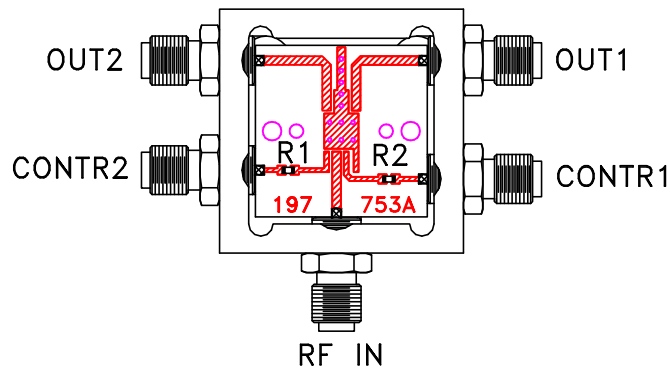
Mini-Circuits® 13 Neptune Avenue
Brooklyn NY 11235

PL, eh, XX112, KSW(A)-2-46, TB-204

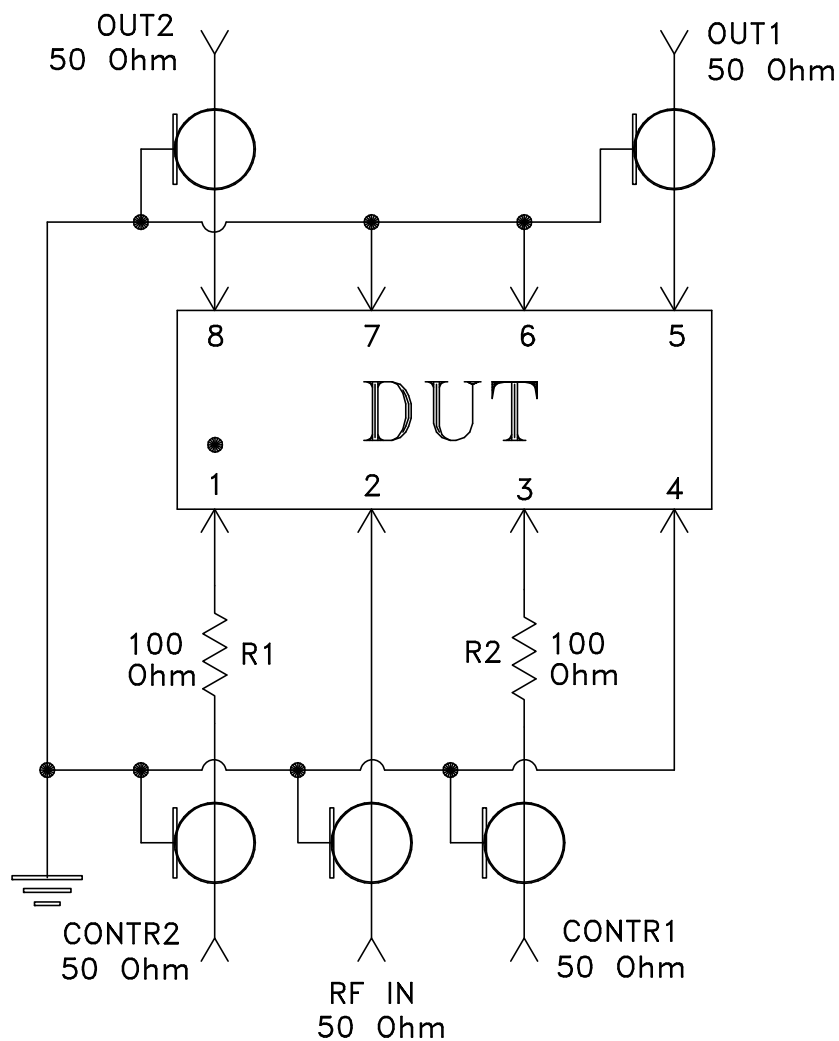
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| SIZE | CODE IDENT | DRAWING NO: | REV: |
|-------|------------|-------------|---------------|
| A | 15542 | 98-PL-217 | A |
| FILE: | 98PL217 | SCALE: 8:1 | SHEET: 1 OF 1 |

Evaluation Board and Circuit




TB-204



Schematic Diagram

Notes:

1. SMA Female connectors.
2. PCB Material: Rogers RO4350 or equivalent,
Dielectric Constant=3.5, Thickness=.020 inch.

 **Mini-Circuits®**



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 | -55° to 100°C Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 150°C Ambient Environment | Individual Model Data Sheet |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Humidity | 90 to 95% RH, 240 hours, 50°C | MIL-STD-202, Method 103, Condition A, Except 50°C and end-point electrical test done within 12 hours |
| Solderability | 10X Magnification | J-STD-002, 95% Coverage |
| 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 | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes | MIL-STD-202, Method 213, Condition A |
| Seal | Gross leak | MIL-STD-202, Method 112, Condition.D |
| Lead Integrity | Tension parallel to axis of lead, 1.70 x 10 ⁷ grams-force per square inch of cross-sectional lead area (1.3 kg-force) | MIL-STD-883, Method 2028 |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C; distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215 |