

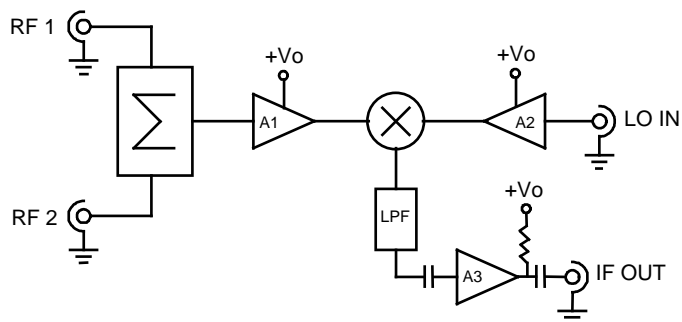
ProtoCell

Modular Prototyping System for Communications, Radar, and RF Signal Processing Circuits

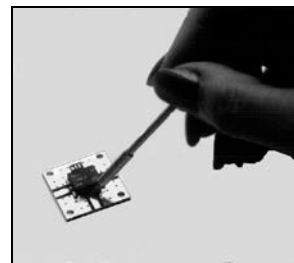
ProtoCell is a unique, modular prototyping system designed for rapid fabrication and characterization of RF signal processing circuits using small, interconnecting circuit board cells, each with a specific circuit function. ProtoCell circuit boards can be used individually, interconnected on an open rigid aluminum frame that accommodates up to 36 cells, or fit into shielded CellPax enclosures with 1, 3 or 9 cells. Each cell contains a circuit function such as a mixer, amplifier, oscillator, filter, connector, etc., which is mounted on a small circuit board that is attached to the frame or enclosure and precisely aligned with other cells.

Select from a library of circuit boards that fit a wide variety of circuit functions and component packages. The symmetric design of the circuit boards allows them to be oriented in any position for easy interconnection with other cells. RF traces between cells connect with simple solder, wire, or copper foil bridges that are quickly soldered in place. Solid ground planes and multiple plated-through holes on all circuit boards connect firmly to the metal frame to form a uniform ground plane across the entire circuit, making ProtoCell usable through 5 GHz.

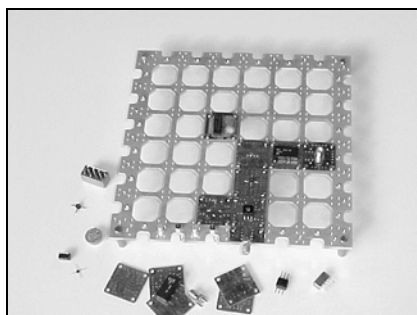
From concept.....to prototype.....in a fraction of the time and expense



Step 1: Design your circuit



Step 2: Mount components onto ProtoCell circuit boards



Step 3: Install and interconnect boards on ProtoFrame or CellPax enclosure

Using ProtoFrames

ProtoFrames are strong aluminum frames that form the foundation for ProtoCell circuit designs that can use an open-frame construction.

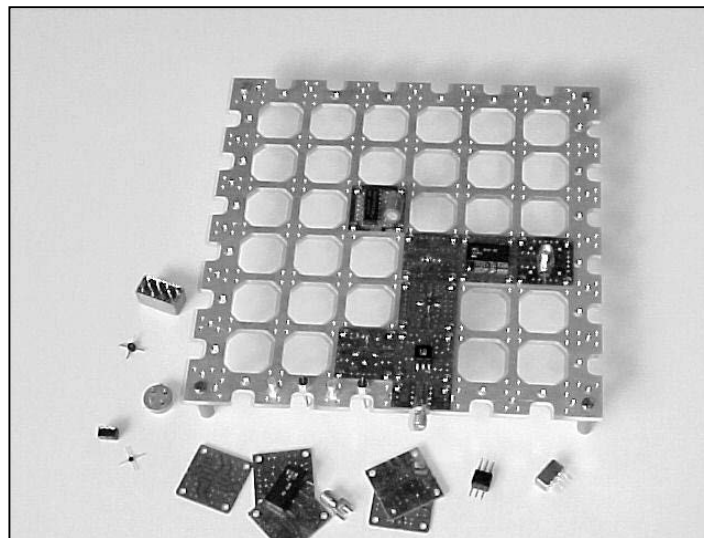
The FR-266 is a precision, machined 1/8" thick plate that is extremely versatile. It holds up to 36 circuit board cells, plus the complete periphery will accommodate CB-025 connector boards for convenient end launching. Four corner holes are provided for attaching standoffs or other mounting brackets. Multiple threaded holes for filtered feedthrus and ground terminals are located on all four sides of the frame.

Once the circuit board cells are mounted on the ProtoFrame, simply flip the frame over for access to DC bias and control circuit wiring. Analog and digital circuitry can be added to produce a fully functional sub-system in one compact package.

The large area frame is capable of supporting multiple, small prototype circuits that can be tested independently. Then, the circuits can be interconnected to form complete functional subsystems.

In an age of rapid turn-around and cost-conscious development constraints, ProtoCell open frames offers ideal solutions that allows the designer to use production components without the time and cost of custom circuit boards or poor performance of hand-wired brass boards.

ProtoCell is an ideal way to build custom RF circuits to be used in one-of-a-kind applications such as special test equipment or production test fixtures. The rugged design of ProtoCell will provide long service life, plus the added advantage that allows the circuit to be easily modified for changing applications.



FR-266

ProtoFrames are fast, flexible, and versatile

Using CellPax Modular Prototyping Enclosures

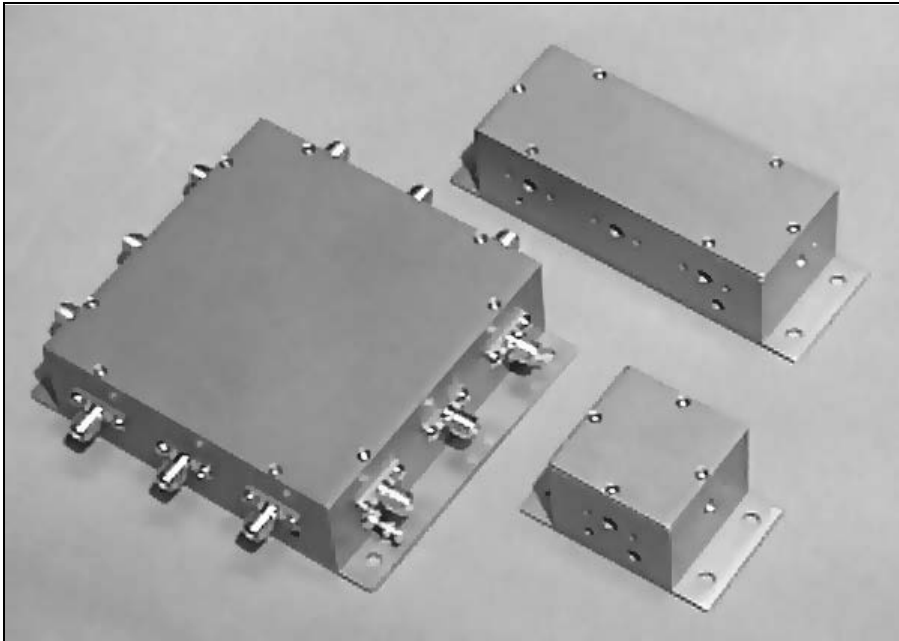
CellPax are unique, modular enclosures designed for rapid fabrication and characterization of RF signal processing circuits using the universal ProtoCell circuit boards. Three CellPax enclosure sizes are available to accommodate up to one, three, or nine ProtoCell circuit boards. Use CellPax for low volume production applications, or anywhere a professional, finished circuit is needed.

CellPax enclosures and covers are fabricated from aluminum to give superior RF shielding and a professional appearance. Provisions for RF connectors are available on all sides of the enclosures for maximum interfacing flexibility. In

addition, sides have threaded holes for ground terminals and filter feedthrus for bias or signal connections.

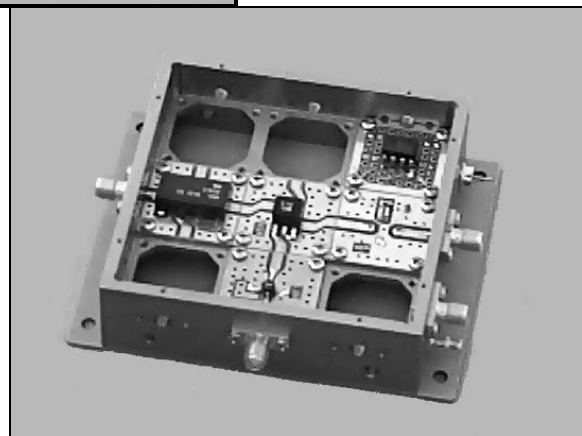
The interior of each CellPax enclosure has a matrix of 2-56 threaded holes to secure each ProtoCell circuit board and provide precise alignment to adjacent cells.

Separate top and bottom covers allow access to both sides of the circuit and provide a secure, shielded environment. Mounting CellPax enclosures is easy, with convenient mounting holes located in the bottom covers.



Three sizes offer flexibility and economy.

Combine multiple circuit functions into a single, convenient, enclosed subsystem that is suitable for prototypes or low rate production products.



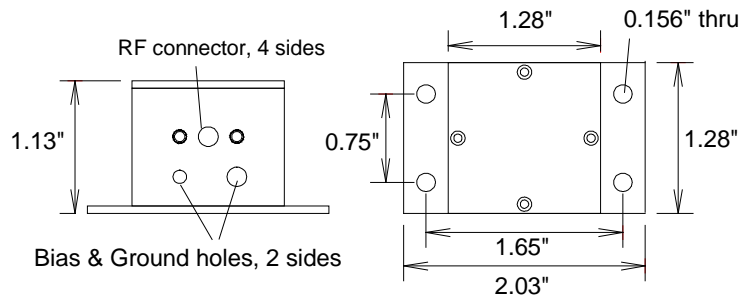
Three CellPax Enclosures to Choose From

EN-11

The EN-11 will fit a single ProtoCell circuit board. All four sides of the enclosure have a hole pattern to fit a 2-hole RF connector, and two sides have threaded holes for bias and ground terminals.

Ordering Options:

- EN-11 Enclosure only
- EN-11-001 Enclosure, 2 SMA connectors, 1 ground terminal, 1 feedthru
- EN-11-002 Enclosure, 4 SMA connectors, 1 ground terminal, 1 feedthru

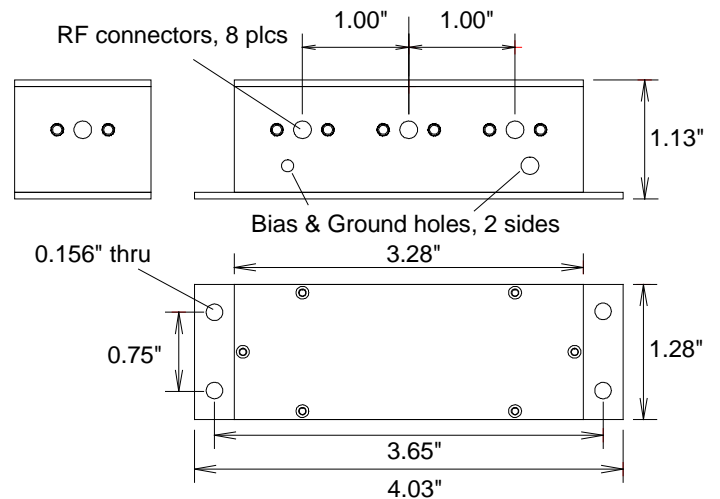


EN-13

The EN-13 will fit up to three ProtoCell circuit boards. All four sides of the enclosure have hole patterns to fit 2-hole RF connectors at all ports. Threaded holes for bias and ground terminals are located on both of the long sides.

Ordering Options:

- EN-13 Enclosure only
- EN-13-001 Enclosure, 2 SMA connectors, 1 ground terminal, 1 feedthru
- EN-13-002 Enclosure, 8 SMA connectors, 1 ground terminal, 1 feedthru

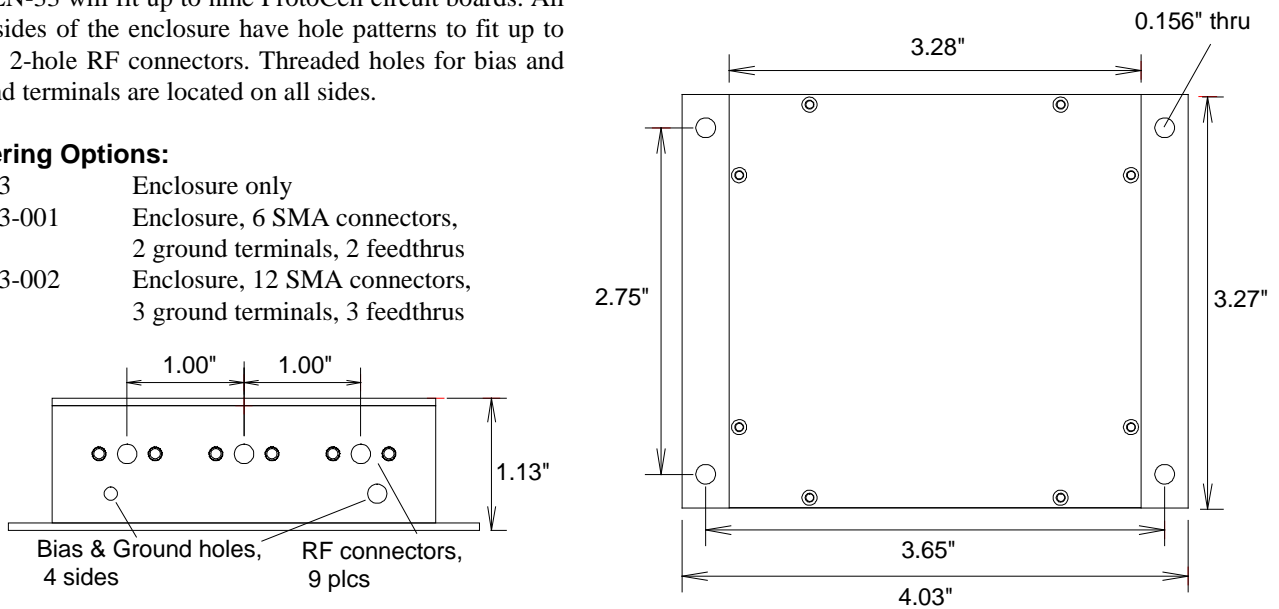


EN-33

The EN-33 will fit up to nine ProtoCell circuit boards. All four sides of the enclosure have hole patterns to fit up to three, 2-hole RF connectors. Threaded holes for bias and ground terminals are located on all sides.

Ordering Options:

- EN-33 Enclosure only
- EN-33-001 Enclosure, 6 SMA connectors, 2 ground terminals, 2 feedthrus
- EN-33-002 Enclosure, 12 SMA connectors, 3 ground terminals, 3 feedthrus



ProtoCell Circuit Boards

Etched circuit boards are available for many popular components from a wide variety of manufacturers. Amplifier, mixer, filter, attenuator, power divider, coupler, doubler, switch, phase locked loop, connector, and interconnect circuits are all available for leaded and surface mount components.

Circuit boards are fabricated from durable 0.062" thick FR-4 material. Each board mounts to the frame with 2-56 screws at each corner, insuring that the solid ground plane firmly contacts the frame on all sides to form a continuous ground plane across

the entire multi-cell circuit. Plated through via holes used generously throughout the ground plane areas insures reliable RF performance through 5 GHz.

The 1-inch square circuit board design accommodates components with up to four RF ports, depending upon the circuit function. Symmetry allows all boards to be rotated for the most convenient circuit topology. All ports are precisely aligned with adjacent cells so interconnections between cells are quickly made using simple solder, wire, or copper foil bridges.

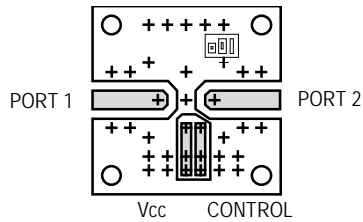
Single circuit boards can also be used without the ProtoFrame or CellPax enclosures to conveniently test individual components. End launch RF connectors solder directly to the ports on the edge of the boards, and the four circuit board mounting holes will accommodate standoffs for stable support.



Over 80 ProtoCell circuit boards are available, with new designs continuously being released. In many cases, a single board design will accommodate a variety of circuit functions with a simple modification of the board such as a cut trace, drilling out a hole, or the addition of a foil bridge. Since one component may fit several circuit boards, choose the one that is best for your needs. Use the handy package selection matrix to help locate the candidate boards.

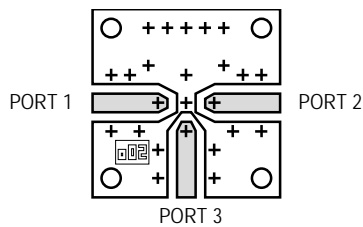


ProtoCell Circuit Boards



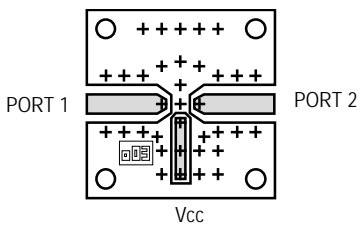
CB-001 4, 5-PIN TO-8 WITH 0.3" PIN CIRCLE

Designed for use with 2-port devices such as amplifiers, voltage-controlled oscillators, voltage-controlled attenuators, limiters, level detectors, frequency doublers, linearizers, etc. Most devices will use Port 1 as the input and Port 2 as the output. Vcc and control pin traces will accommodate wires for bias and signal lines. Leaded or chip bypass capacitor pads are provided for the Vcc and control pins. Component mounts on ground plane side.



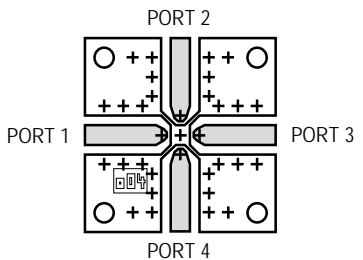
CB-002 4-PIN TO-8 WITH 0.3" PIN CIRCLE

Designed primarily for use with 2 and 3-port passive components such as mixers, power splitters, hybrids, doublers, etc. Three RF ports extend to the edge of the board and the fourth pin connects to ground. Port assignments will depend upon the specific component. Because this board is designed for passive devices, there are no provisions for bias or control signals, although any of the ports can be used for such functions if needed. Component mounts on ground plane side.



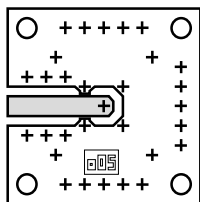
CB-003 4, 5-PIN TO-5/TO-12 WITH A 0.2" PIN CIRCLE

Designed for use with 2-port devices such as amplifiers, voltage-controlled oscillators, voltage-controlled attenuators, limiters, level detectors, frequency doublers, linearizers, etc. Most devices will use Port 1 as the input and Port 2 as the output. Packages with a center fifth pin connected to ground will fit this board. The Vcc trace will accommodate wires for bias voltage. Leaded or chip bypass capacitor pads are provided for the Vcc pin. Component mounts on ground plane side.



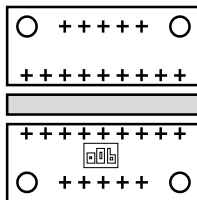
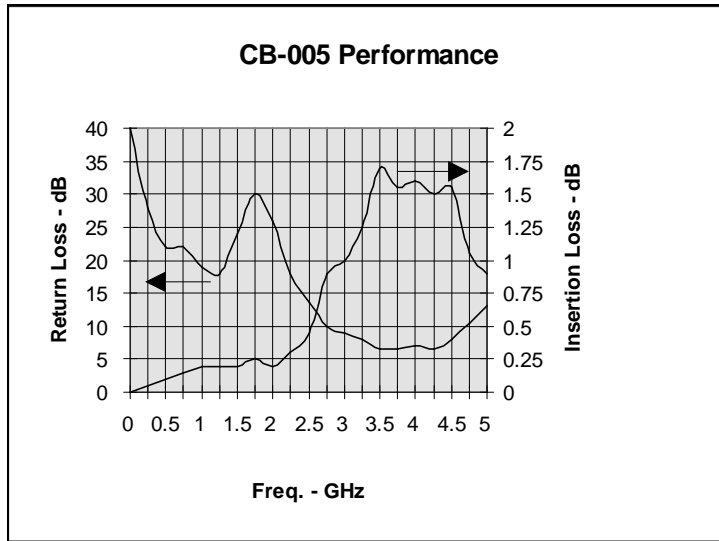
CB-004 4, 5-PIN TO-5/TO-12 WITH A 0.2" PIN CIRCLE

Designed primarily for use with 2, 3, and 4-port passive components such as mixers, power splitters, hybrids, couplers, doublers, etc. Four RF ports extend to the edge of the board, but one of the ports (Port 2) is normally grounded. When Port 2 is not used as a ground, it must be isolated from the ground plane. Packages with a grounded center fifth pin can be used with this board. Port assignments will depend upon the specific component being used. Because this board is designed for passive devices, there are no provisions for bias or control signals, although any of the ports can be used for such functions, if needed. Component mounts on ground plane side.



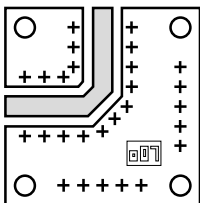
CB-005 SMA, SMB, SMC, BNC CONNECTORS

Use this board for PC-mount coaxial connectors operating up to 2 GHz. It is designed to fit a wide variety of manufacturer's SMA, SMB, SMC, BNC, PCX, and other specialty connectors. Ground pin patterns with 0.2" or 0.5" spacing will fit this board. Connectors can be mounted on either side of the board, but when mounted on the circuit side, leave a small gap between the board and connector to prevent shorting the signal path to ground. Return loss performance for two interconnected CB-005 boards with SMA connectors is better than 17 dB up to 2 GHz. Improved VSWR at frequencies above 2 GHz can be achieved using circuit board CB-025.



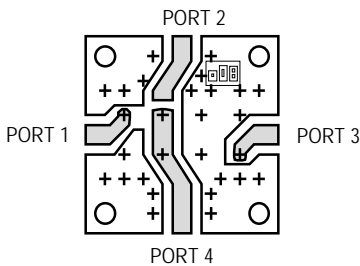
CB-006 STRAIGHT INTERCONNECT

A 50-ohm straight transmission line used to extend a port to an adjacent cell.



CB-007 RIGHT ANGLE INTERCONNECT

A 50-ohm right angle transmission line used to extend the port of a cell.



CB-008 8-PIN RELAY HEADER WITH 0.2" PIN SPACING

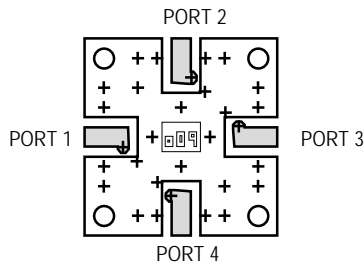
Designed primarily for use with 2, 3, and 4-port passive components such as mixers, doublers, modulators, quadrature mixers, filters, fixed attenuators, etc. Because this board is designed for passive devices, there are no provisions for bias or control signals, although any of the ports can be used for such functions, if needed. Component mounts on ground plane side.

Mixers - Although the port assignments will depend upon the specific component being used, the two pins (generally pins 3 and 4) that are most commonly used for a mixer IF port are tied together with a circuit trace and connect to Port 4. However, some mixers do not connect these pins together and may require one of the pins to be isolated. An alternate port trace is provided to Port 2 if it is desired to connect the mixer IF to the opposite side of the board to simplify the circuit topology. To use this port, solder a bridge from the IF pin to the alternate port trace, and then cut the trace between the pins.

Doublers - Some doublers require three input pins (typically 1, 3, and 4) to be connected together. For these devices, the pins are joined using a foil or wire bridge. It is also recommended that any unused port traces connected to these pins be cut and isolated.

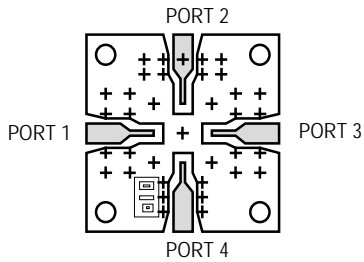
Modulators and Quadrature Mixers - BPSK and QPSK modulators and quadrature mixers may require four independent ports. For these devices, the two normally bridged IF pins must be separated by cutting the trace between the pins, then connect one pin to Port 2.

Filters and Fixed Attenuators - These devices generally only use the two opposing ports (Ports 1 and 3). If the other pins require grounding, simply bridge the traces with foil or wire.



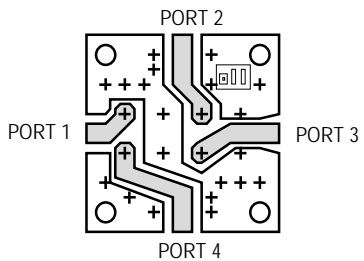
CB-009 8-PIN FLAT PACKS

Fits 8-pin flat packs with four inner ground pins. Designed for use with passive 2, 3, and 4 port components such as mixers, power dividers, hybrids, doublers, etc. This board is designed to mount the component diagonally. Component can mount on either side of board, however, if mounted on the circuit side, a small air gap is required to avoid shorting the case to the port traces.



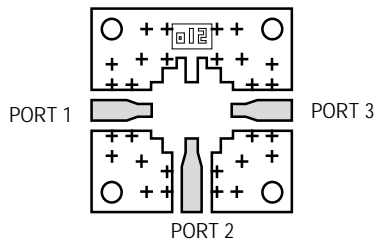
CB-010 4-PIN SMT0-8 SURFACE MOUNT

Primarily designed for use with 2 and 3-port surface mount TO-8 devices such as amplifiers, mixers, voltage controlled attenuators, etc. Port 2 is normally used for bias, so it has a hole for the bias wire. Bypassing for bias or control signals can be provided by chip capacitors. Unused ports may require grounding with a small foil or wire bridge.



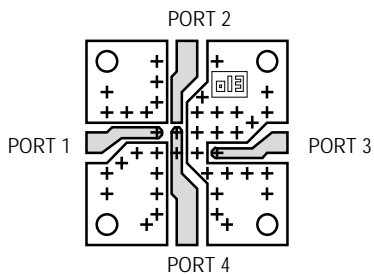
CB-011 8-PIN RELAY HEADER WITH 0.2" PIN SPACING

Designed for passive 2, 3, and 4-port hybrids, power splitters, and combiners. Although the port assignments will vary with the specific component, most devices will utilize Port 1 for the input. Popular 3-port devices, such as power splitters, will normally use Ports 2 and 3 as the outputs. Some hybrid devices have internal terminations on the fourth port, while others require external termination. If the fourth port needs to be isolated, simply drill out the hole. Component mounts on ground plane side.



CB-012 .375" X .500" SURFACE MOUNT

Fits popular surface mount package for many passive 2, and 3-port devices. Designed for mixers, splitters, hybrids, etc. Center ground terminal has been extended if isolation is required.



CB-013 8-PIN MINI RELAY HEADER WITH 0.1" PIN SPACING

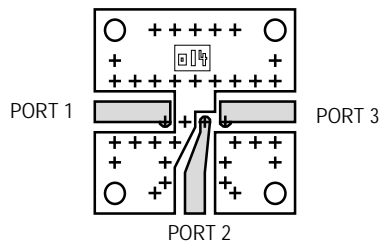
Designed for 2, 3, and 4-port devices such as mixers, doublers, filters, fixed attenuators, etc. Because this board is designed for passive devices, there are no provisions for bias or control signals, although any of the ports can be used for such functions if needed. Components mount to ground plane side. This board is functionally the same as CB-008, but fits the miniature version of the relay header package.

Mixers - Although the port assignments will depend upon the specific component being used, the two pins (generally pins 3 and 4) that are most commonly used for a mixer IF port are tied together with a circuit trace and connect to Port 4. However, some mixers do not connect these pins together and may require one of the pins to be isolated. An alternate port trace is provided to Port 2 if it is desired to connect the mixer IF to the opposite side of the board. To use this port, solder a bridge from the IF pin to the alternate port trace, and then cut the trace between the pins.

Doublers - Some doublers require three input pins (typically 1, 3, and 4) to be connected together. For these devices, the pins are joined using a foil or wire bridge. It is also recommended that any unused port traces connected to these pins be cut and isolated.

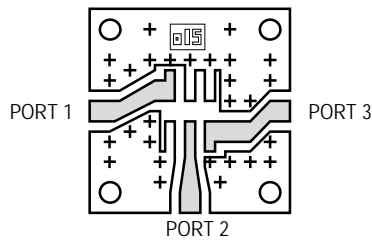
Modulators and Quadrature Mixers - BPSK and QPSK modulators and quadrature mixers may require four independent ports. For these devices, the two normally bridged IF pins must be separated by cutting the trace between the pins, then connect one pin to Port 2.

Filters and Fixed Attenuators - These devices generally only use the two opposing ports (Ports 1 and 3). If the other pins require grounding, simply bridge the trace with foil or wire.



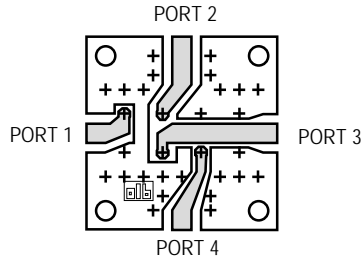
CB-014 4-PIN MINI RELAY HEADER WITH 0.1" PIN SPACING

Designed for a wide variety of 2 and 3-port devices such as mixers, doublers, splitters, hybrids, etc. Typically, pin 3 is the grounded pin. Component mounts on ground plane side.



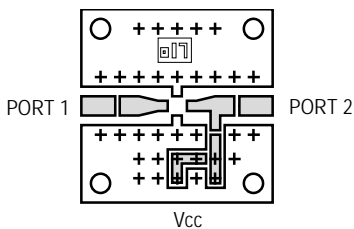
CB-015 6-PIN SURFACE MOUNT MIXER

Fits a wide variety of 6-pin surface mount packages. Designed primarily for use with balanced mixers, although some transformer configurations are also compatible with the pinout. Ports connect to pins 1, 4, and 5, with the other pins grounded. Component mounts on circuit side. Leaded packages may have various shaped leads for surface or hole mounting which may be required to be bent or cut in order to fit the pads on the board.



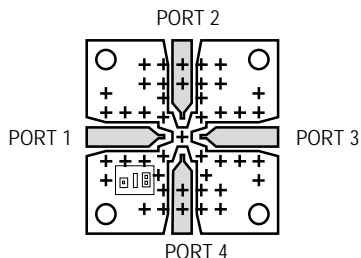
CB-016 8-PIN RELAY HEADER WITH 0.2" PIN SPACING

Designed particularly for uni-directional and bi-directional couplers. Popular versions will use Port 1 as the input, Port 3 as the output, Port 2 as the forward-coupled signal, and Port 4 as the reverse coupled signal (bi-directional only). Some uni-directional couplers may have an internal termination on Port 4 and may require it to be isolated. Component mounts to ground plane side.



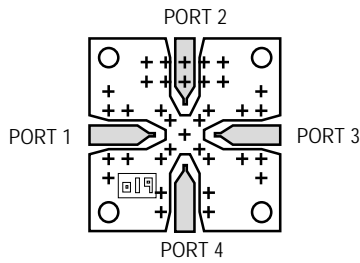
CB-017 4-PIN MONOLITHIC SURFACE MOUNT AMPLIFIER

Fits many surface mount monolithic amplifier packages (Micro-X, Mini-Circuits ERA, MAR, MAV, RAM). Input and output ports (Ports 1 and 2) have provisions for surface mount coupling capacitors. Port 2 is also used for the bias line that can be through resistive and inductive series elements. Bias line also has provisions for leaded or surface mount bypass capacitors. Components mount on circuit side.



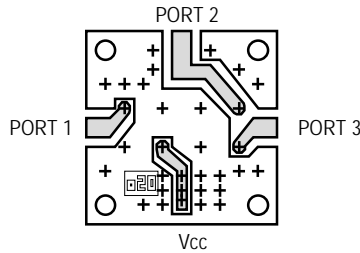
CB-018 PP-25 SURFACE MOUNT

Fits HP/Avantek PP-25 surface mount packages. Designed for mixer, amplifier, and control components. Two opposing ports (Ports 2 and 4) are designed to function as RF ports or bias ports and will accommodate leaded or chip bypass capacitors. Components mount on circuit side.



CB-019 PP-38 SURFACE MOUNT

Fits HP/Avantek PP-38 surface mount packages. Designed for mixer, amplifier, and control components. Port 2 is designed to connect to bias voltage or control signals and will accommodate leaded or chip bypass capacitors. Components mount on circuit side.



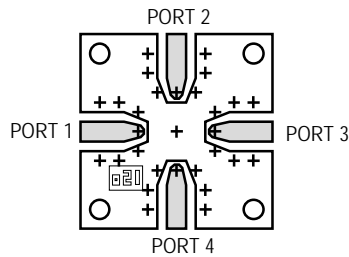
CB-020 8-PIN RELAY HEADER WITH 0.2" PIN SPACING

Designed for use with amplifiers, active mixers, filters, and fixed attenuators. Bias pin will accept leaded or chip bypass capacitors. Components mount on ground plane side.

Amplifiers - Popular amplifier packages (such as Mini-Circuits MAN series) will use Port 3 for the input (pin 1), Port 1 for the output (pin 8), and Vcc for pin 5. Unused Port 2 may be left open, isolated, or grounded, as necessary for specific device being used.

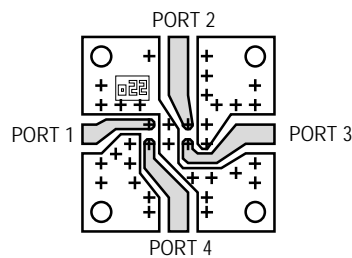
Active Mixers - For mixers with integral buffer LO, RF, or IF amplifiers, such as the Mini-Circuits UNCL series. Orient the package so that pin 1 goes to Port 1, pin 7 to Port 2, pin 8 to Port 3, and Vcc to pin 4.

Filters and Fixed Attenuators - These devices generally use only the two opposing ports (Ports 1 and 3). Remaining pins may be grounded or isolated, as required.



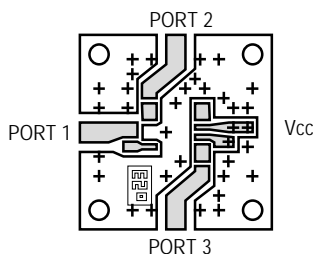
CB-021 12-PIN TO-8 WITH 0.1" PIN SPACING

Fits large footprint 12 pin TO-8 packages with 0.4" spacing between opposing rows of pins. Designed for 2, 3, or 4-port passive devices such as mixers, hybrids, splitters, modulators, etc. Only pins 2, 5, 8, and 11 connect to the RF paths; all other pins are grounded. Component mounts on ground plane side.



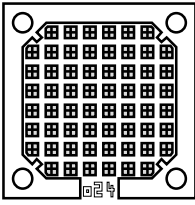
CB-022 8-PIN MINI RELAY HEADER WITH 0.1" PIN SPACING

Designed for 2, 3, and 4-port hybrids, power splitters, and combiners. Although the port assignments will vary with the specific component, most devices will utilize Port 1 for the input. Popular 3-port devices, such as power splitters, will normally use Ports 2 and 3 as the outputs. Some hybrid devices have internal terminations on the fourth port, while others require external termination. If the fourth port needs to be isolated, simply drill out the hole. Component mounts on ground plane side. This board is functionally the same as CB-011, but fits the miniature version of the relay header package.



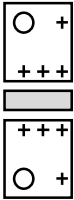
CB-023 8-PIN MIMIC SURFACE MOUNT MIXER

Fits active MIMIC surface mount mixers such as the IAM series from Hewlett-Packard. LO, RF, and IF ports as well as all bias and control lines will accommodate chip coupling capacitors. Components mount on circuit side.



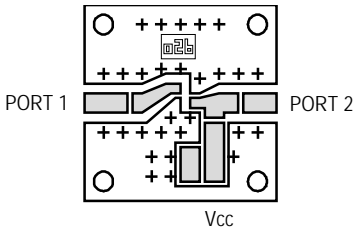
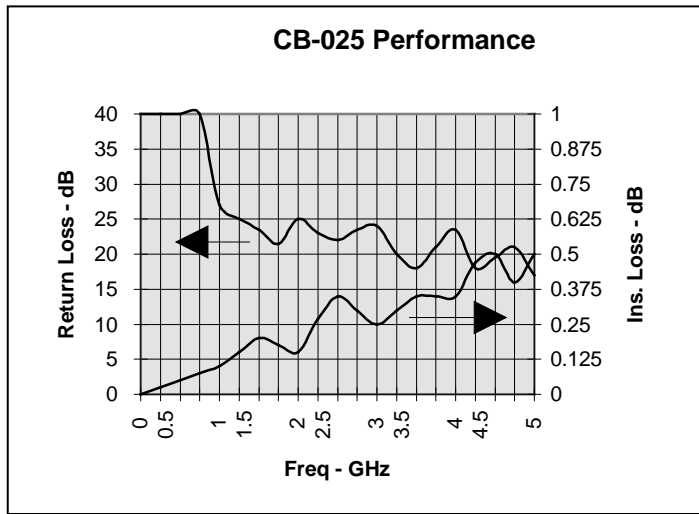
CB-024 GENERIC ANALOG/DIGITAL CIRCUIT

General purpose 0.1" pattern for analog and digital integrated circuits combined with discrete components. Designed for soldered or wire wrapped circuits that interface with other RF circuit functions. Ideal for voltage regulators, op-amps, and logic circuits.



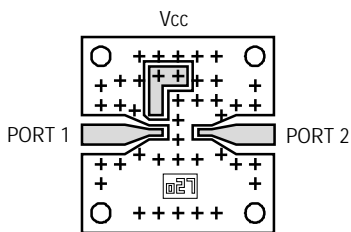
CB-025 HIGH FREQUENCY RF CONNECTOR

This board uses right angle PC-mount connectors attached in an end launch configuration to provide improved VSWR at frequencies above 2 GHz. It is designed to fit a wide variety of manufacturer's SMA, SMB, SMC, and other specialty PC mount *right angle* connectors with 0.2" ground pin spacing. When installing connector, minimize the air gap between the edge of the board and the connector body. Return loss for two interconnected CB-025 boards with SMA connectors is greater than 20 dB through 2 GHz, and 17 dB up to 5 GHz.



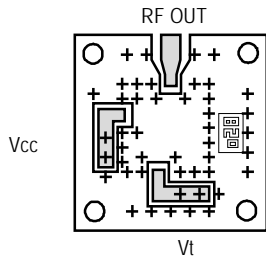
CB-026 4-PIN SOT-143 MONOLITHIC AMPLIFIER

Designed for use with monolithic amplifiers such as the Mini-Circuits VAM, HP MSA series, and other pin-compatible manufacturers. Includes provisions for bias resistor/inductor, bypass capacitors, and input/output blocking capacitors. Port 1 is the input and Port 2 is the output. Components mount on circuit side.



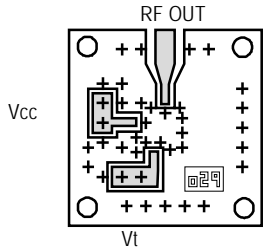
CB-027 SOIC-8 SURFACE MOUNT MONOLITHIC AMPLIFIER

Designed for use with monolithic amplifiers such as the Mini-Circuits VNA series. Devices in either a SOIC-8 or 180 mil surface mount package can be used on this board. Vcc pin trace will accommodate wire for bias and chip bypass capacitors. Input and output blocking capacitors are normally internal for these devices, but if external capacitors are required, simply cut the traces. Standard devices use Port 1 (pin 3) for input and Port 2 (pin 6) for output. Components mount on circuit side.



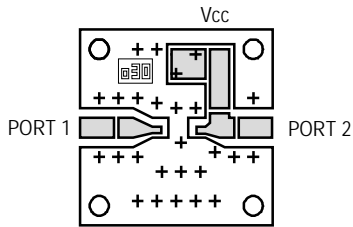
CB-028 SURFACE MOUNT MINI PACKAGE VCO

Accommodates surface mounted mini package voltage controlled oscillators from Z-COMM, MACOM, and other popular VCO vendors. Separate traces are provided for the oscillator bias and frequency control functions. Chip capacitors can be added to either of these traces. Components mount on circuit side.



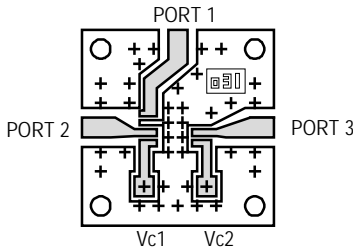
CB-029 SURFACE MOUNT SUB-MINI PACKAGE VCO

Accommodates surface mounted sub-mini package voltage controlled oscillators from Z-COM and other vendors. Separate traces are provided for the oscillator bias and frequency control functions. Chip capacitors can be added to either of these traces. Components mount on circuit side.



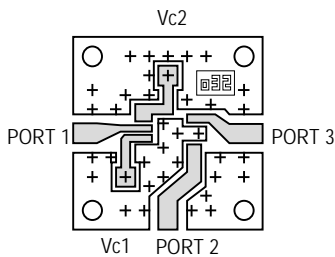
CB-030 SOIC-8 SURFACE MOUNT MONOLITHIC AMPLIFIER

Designed for use with low cost monolithic amplifiers such as the RF Micro Devices RF2306/7/8 series. Devices in either a SOIC-8 or 180 mil surface mount package can be used on this board. Port 1 is the input port (pin 1) and accommodates a blocking chip capacitor. Port 2 is the output port (pin 8) and is also used for biasing. The bias circuit can utilize a series resistor and/or inductor as well as a bypass capacitor. An output blocking chip capacitor can be installed on the output port trace. All other package pins connect to ground. All components mount on circuit side.



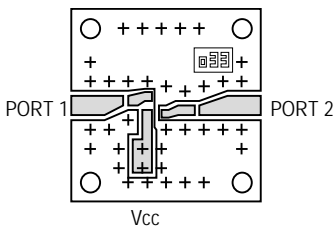
CB-031 SOIC-8 SURFACE MOUNT GaAs SPDT SWITCH

Designed for use with GaAs SPDT switches such as the Mini-Circuits MSW series, HP MGS series, selected MACOM SW series. Devices in either a SOIC-8 or 180 mil surface mount package can be used on this board. Port 1 (pin 1) is generally the common port, while Ports 2 (pin 3) and 3 (pin 6) are the switched ports. Two control pin traces (pins 4 and 5) accommodate complementary bias signals. Components mount on circuit side.



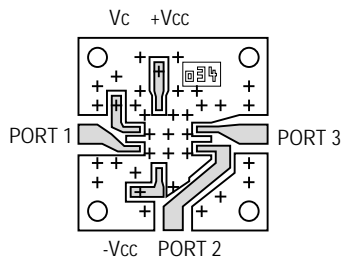
CB-032 SOIC-8 SURFACE MOUNT GaAs SPDT SWITCH

Designed for use with GaAs SPDT switches such as the Mini-Circuits MSWA, KSW, and KSWA series, HP MGS series, selected MACOM SW series. Devices in either a SOIC-8 or 180 mil surface mount package can be used on this board. Port 1 (pin 2) is generally the common port, while Ports 2 (pin 5) and 3 (pin 8) are the switched ports. Two control pins (pins 1 and 3) accommodate complementary bias signals. Components mount on circuit side.



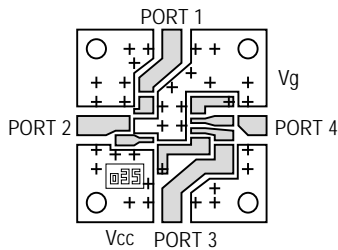
CB-033 6-PIN SURFACE MOUNT MONOLITHIC AMPLIFIER

Designed for use with 6-pin monolithic amplifiers in a T-06 package such as the NEC UPC series. Port 1 is normally the input (pin 1), with Port 2 as the output (pin 4), and bias applied to pin 6. Input and output ports have provisions for chip blocking capacitors. The separate bias line has ample space for bypass capacitors. Components mount on circuit side.



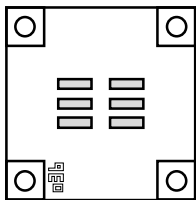
CB-034 20-PIN SURFACE MOUNT GaAs SPDT SWITCH

Designed for use with reflective and absorptive GaAs SPDT switches with integral drivers such as the Mini-Circuits YSW/YSWA/VSW/VSWA series. Port 1 is the common port (pin 4), while Ports 2 (pin 12) and 3 (pin 14) are the switched ports. One TTL compatible control pin trace (pin 2) is provided along with two traces for the positive (pin 19) and negative (pin 7) bias voltages. Chip bypass capacitors can be installed on the bias lines. Components mount on circuit side.



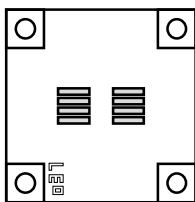
CB-035 SOIC-8 SURFACE MOUNT DIFFERENTIAL AMPLIFIER

Designed for use with variable gain differential amplifiers such as the HP IVA series. Devices in either a SOIC-8 or 180 mil surface mount package can be used on this board. Ports 1 (pin 1) and 2 (pin 4) are the differential inputs, while Ports 3 (pin 6) and 4 (pin 7) are the differential outputs. All input and output ports have provisions for chip blocking capacitors. Vcc (pin 5) and gain control (pin 8) traces will accommodate chip bypass capacitors. Components mount on circuit side.



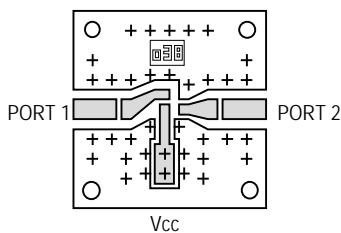
CB-036 GENERIC 6-PIN SURFACE MOUNT

Mounting pads for generic 6-pin surface mount components with 0.1 inch pin spacing. Used to create custom circuits for components with non-standard pinouts. Adhesive backed copper foil easily forms circuit. Back side is solid ground plane that can be connected to circuit using z-wires.



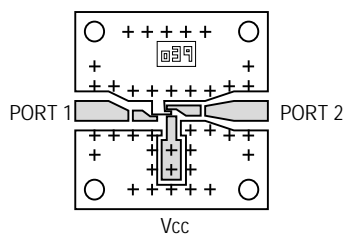
CB-037 GENERIC 8-PIN SURFACE MOUNT

Mounting pads for generic 8-pin surface mount components in SOIC-8 or 180 mil packages. Used to create custom circuits for components with non-standard pinouts. Adhesive backed copper foil easily forms circuit. Back side is solid ground plane that can be connected to circuit using z-wires.



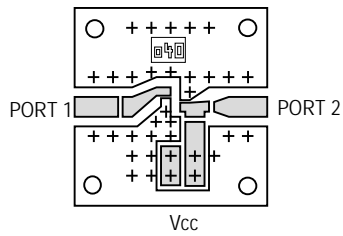
CB-038 4-PIN SOT-143 MONOLITHIC AMPLIFIER

Designed for use with monolithic amplifiers such as the HP INA series. This type of amplifier uses a separate bias line that is isolated from the output port. Port 1 is the input and Port 2 is the output, each with provisions for DC blocking capacitors. The bias line can accommodate chip bypass capacitors. Components mount on circuit side.



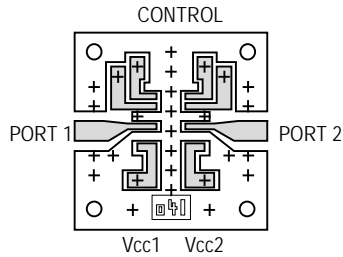
CB-039 6-PIN SOT-363 MONOLITHIC AMPLIFIER

Designed for use with monolithic amplifiers such as the HP INA and MGA series in the ultra-miniature SOT-363 package. This type of amplifier uses a separate bias line that is isolated from the output port. Port 1 is the input and Port 2 is the output, each with provisions for DC blocking capacitors. The bias line can accommodate chip bypass capacitors. Components mount on circuit side.



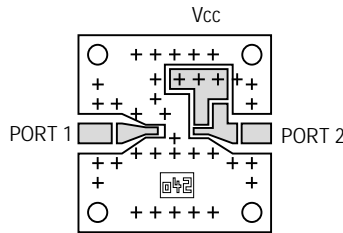
CB-040 6-PIN SOT-363 MONOLITHIC AMPLIFIER

Designed for use with monolithic amplifiers such as the HP MGA series in the ultra-miniature SOT-363 package. This type of amplifier uses a common bias and RF output port. Port 1 is the input and Port 2 is the output, each with provisions for DC blocking capacitors. The bias circuit can utilize a series resistor and/or inductor as well as a bypass capacitor. Components mount on circuit side.



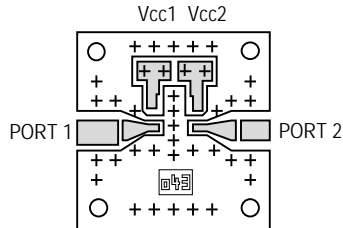
CB-041 14 PIN SURFACE MOUNT DIGITAL ATTENUATOR

Designed for use with 4-bit digital attenuators such as the Samsung SMP-11103. It uses a bipolar bias voltage and has four separate digital control lines with internal drivers. Bias lines can accommodate chip bypass capacitors. Components mount on circuit side.



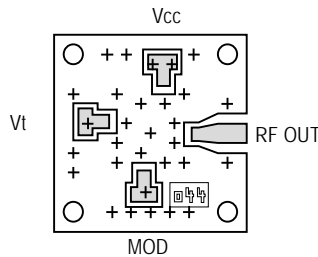
CB-042 SOIC-8 SURFACE MOUNT MONOLITHIC AMPLIFIER

Designed for use with low cost monolithic amplifiers such as the RF Micro Devices RF2301/4 series. Devices in either a SOIC-8 or 180 mil surface mount package can be used on this board. Port 1 is the input port (pin 3) and Port 2 is the output port (pin 6), both having provisions for DC blocking chip capacitors. The output pin also accommodates a bias resistor/inductor that connects to Vcc. Pins 7 and 8 are tied together and can utilize a bypass capacitor. All components mount on circuit side.



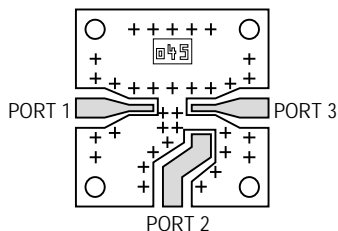
CB-043 SOIC-8 MONOLITHIC AMPLIFIER/ATTENUATOR

Designed for use with single bias, dual bias, or gain-controlled monolithic amplifiers and attenuators such as the Samsung SMP-11206, Tri-Quint TQ91XX, or MACOM AT series. Devices in either a SOIC-8 or 180 mil surface mount package can be used on this board. Port 1 is the input port (pin 3) and Port 2 is the output port (pin 6), both having provisions for DC blocking chip capacitors. Pins 1 and 8 are brought out on separate bias lines that can utilize bypass capacitors. All components mount on circuit side.



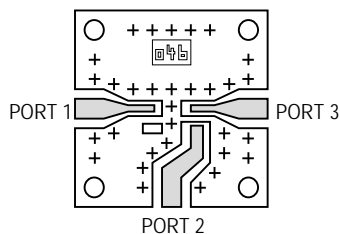
CB-044 VARI-L SURFACE MOUNT VCO

Accommodates all Vari-L surface mounted voltage controlled oscillators in the T-package. Separate traces are provided for the oscillator bias, frequency control, and optional modulation functions. Chip capacitors can be added to either of these traces. Components mount on circuit side.



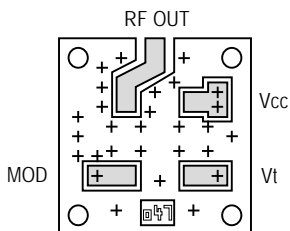
CB-045 SOIC-8 SURFACE MOUNT MONOLITHIC MIXER

Designed for use with MMIC balanced mixers like the Hittite HMC series packaged in either the SOIC-8 or 180 mil package. Port 1 is typically the RF port (pin 1), Port 2 is the IF port (pin 5), and Port 3 is the LO port (pin 8), although the specific port assignments may vary with different manufacturers.



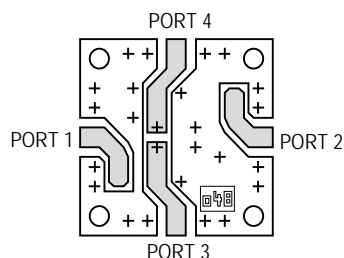
CB-046 SOIC-8 SURFACE MOUNT MONOLITHIC MIXER

Designed for use with MMIC balanced mixers like the Hittite HMC series in the SOIC-8 package. Port 1 is typically the LO port (pin 2), Port 2 is the IF port (pin 5), and Port 3 is the RF port (pin 7), although the specific port assignments may vary with different manufacturers.



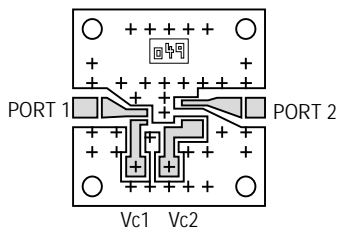
CB-047 FDK SURFACE MOUNT VCO

Accommodates all FDK (Fuji Electronics) surface mounted voltage controlled oscillators in the ID series package. Separate traces are provided for the oscillator bias, frequency control, and optional modulation functions. Chip capacitors can be added to either of these traces. Components mount on circuit side.



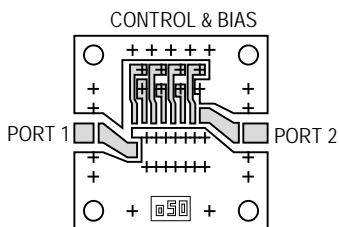
CB-048 8-PIN SURFACE MOUNT RELAY HEADER

Designed for the 8-pin surface mount version of the conventional relay header package, such as the Mini-Circuits YY and MACOM SM-3/SM-7 case styles. This board will specifically accommodate balanced mixers, phase detectors, filters, and some designs of power splitters and hybrids. Port 1 is typically a mixer RF/LO port (pin 1), Port 2 is the LO/RF port (pin 8), and Ports 3/4 can be configured for the IF port (pins 3/4 or 5/6) depending upon the specific mixer design. Some mixers require the IF pins to be connected together, and others require them to be isolated. Component mounts on circuit side.



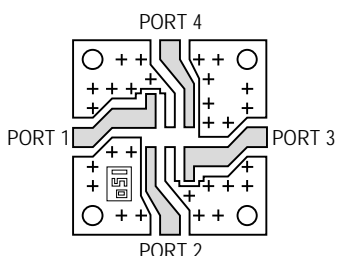
CB-049 SOIC-8 SURFACE MOUNT ATTENUATORS/AMPLIFIERS

Designed for use with voltage variable attenuators or MMIC amplifiers in a SOIC-8 or 180 mil package. Specifically compatible with selected MACOM AT series attenuators. Ports 1 and 2 (pins 3/7) are the RF ports, while pins 4 and 5 are brought out to separate bias lines which can be bypassed with chip capacitors. Chip blocking capacitors can be added to the RF ports. Components mount on circuit side.



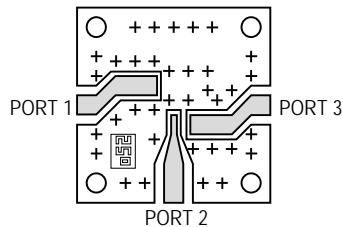
CB-050 SOIC-16 SURFACE MOUNT DIGITAL ATTENUATOR

Designed for use with a five-bit digital attenuator in a SOIC-16 package such as the RF Micro Devices RF2410. The five control bits, bias, and power down functions connect to a pad area that will fit a standard two-row 0.1" connector header. The input and output RF ports have provisions for blocking capacitors. Components mount on circuit side.



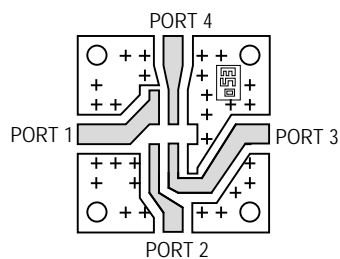
CB-051 6-PIN SURFACE MOUNT SPLITTER/COUPLER

A very versatile board designed for use with popular 6-pin surface mount passive components such as power dividers, hybrids, couplers, transformers, etc. The four ports connect to pins 1, 3, 4, and 6 of the device, with pins 2 and 5 tied to ground. Components mount on circuit side.



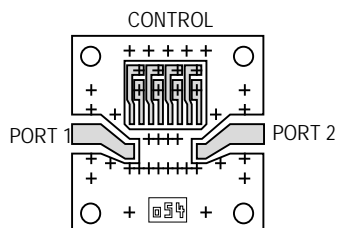
CB-052 10-PIN SURFACE MOUNT MIXER

Designed to fit most SM-10 package Blue Cell mixers from RF Prime and other compatible manufacturers. Typical pin outs are Port 1 (pin 10) for the LO, Port 2 (pin 3) for the IF, and Port 3 (pin 5) for the RF port. Components mount on circuit side.



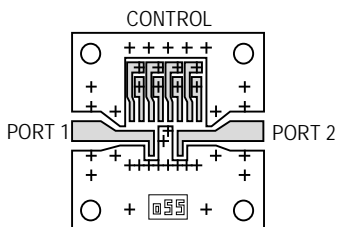
CB-053 6-PIN SURFACE MOUNT SPLITTER/COUPLER

A very versatile board designed for use with popular 6-pin surface mount passive components such as power dividers, hybrids, couplers, transformers, etc. The four ports connect to pins 1, 2, 5, and 6 of the device, with pins 3 and 4 tied to ground. Components mount on circuit side.



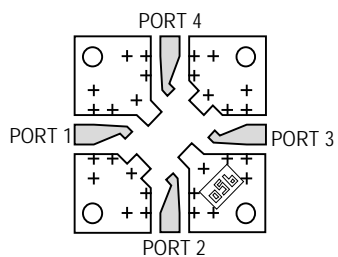
CB-054 SOIC-16 SURFACE MOUNT DIGITAL ATTENUATOR

Designed for use with surface mount digital attenuators such as the Alpha AT001D4 and AT002D8 series in a SOIC-16 package. Standard devices use Port 1 (pin 9) and Port 2 (pin 16) for RF connections, while the control lines are on pins 1-8. Components mount on circuit side.



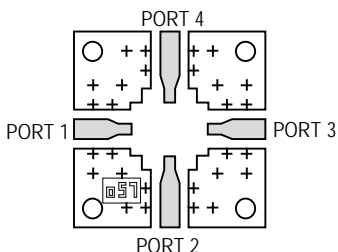
CB-055 SOIC-16 SURFACE MOUNT DIGITAL ATTENUATOR

Designed for use with surface mount digital attenuators such as the Alpha AT001D6 series in a SOIC-16 package. Standard devices use Port 1 (pin 11) and Port 2 (pin 14) for RF connections, while the control lines are on pins 1-8. Components mount on circuit side.



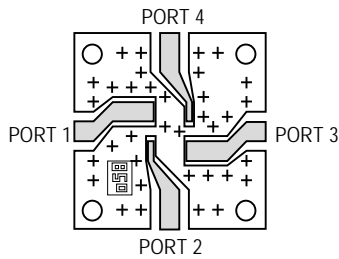
CB-056 4-PORT, 0.375" x 0.5", SURFACE MOUNT PACKAGE

Accommodates all 0.375" x 0.5", 4-port surface mount components such as directional couplers, power dividers, mixers, hybrids, etc. Fits many popular devices from Pulsar (Outline C), Mini-Circuits (Case AH), Merrimac (Size B), MACOM (SF-1 and SM-4 packages) and other manufacturers. Components mount on circuit side with a diagonal orientation.



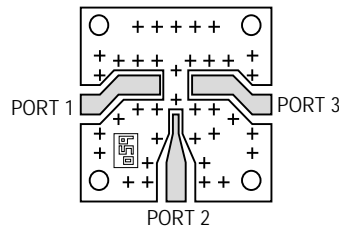
CB-057 4-PORT, 0.375" x 0.5", SM MIL-STD PACKAGE

Accommodates all 0.375" x 0.5", 4-port MIL-STD surface mount components such as directional couplers, power dividers, mixers, modulators, hybrids, etc. Fits many popular devices from Synergy (Package 139), Pulsar (Outline B), and other manufacturers. Components mount on circuit side.



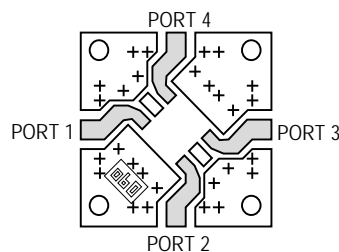
CB-058 10-PIN POWER SPLITTER/COMBINER OR MIXER

Designed to fit SM-10 package Blue Cell power quadrature dividers/combiners and some balanced mixers from RF Prime, Mini-Circuits (ALY Series) and other compatible manufacturers. Pin outs are Port 1 (pin 1), Port 2 (pin 5), Port 3 (pin 6), and Port 4 (pin 10). Mixer components may require grounding of one pin, while some splitters may use one port for a termination. Components mount on circuit side.



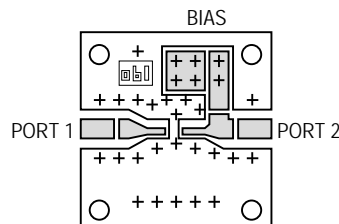
CB-059 10-PIN SM POWER SPLITTER/COMBINER

Designed to fit SM-10 package Blue Cell power dividers/combiners from RF Prime and other compatible manufacturers. Pin outs are Port 1 (pin 10), Port 2 (pin 3), and Port 3 (pin 6). Components mount on circuit side.



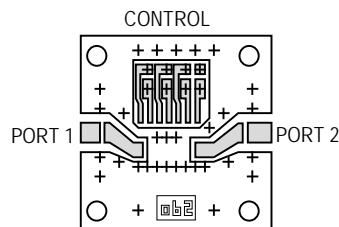
CB-060 4-PORT, 0.375" x 0.5", SURFACE MOUNT PACKAGE

Accommodates all 0.375" x 0.5", 4-port surface mount components such as directional couplers, power dividers, mixers, hybrids, etc. Fits many popular devices from Synergy (Package 129), and other manufacturers. Components mount on circuit side with a diagonal orientation.



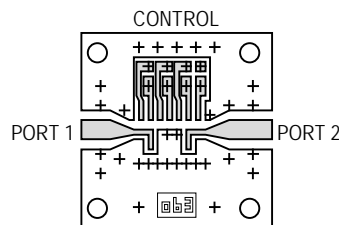
CB-061 6-PIN SOT-89 MONOLITHIC AMPLIFIER

Designed for use with monolithic amplifiers such as the MACOM MAAM series in the miniature SOT-89 package. This type of amplifier uses a common bias and RF output port. Port 1 is the input and Port 2 is the output, each with provisions for DC blocking capacitors. The bias circuit can utilize a series resistor and/or inductor as well as a bypass capacitor. Components mount on circuit side.



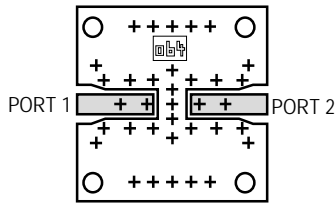
CB-062 SOIC-14 SURFACE MOUNT ATTENUATOR

For use with attenuators such as the Alpha AT001D3, AK002D4 series, or MACOM AT635 in a SOIC-14 package. When using the AT001D3, the RF ports connect to pins 8 and 14, with control lines on pins 2-7. When used with the AK002D4, RF ports connect to pins 1 and 7, with pins 8-11 connected to the control lines. The AT635 is an analog attenuator and requires some control pins to be grounded. RF ports have provisions for chip blocking capacitors, although the attenuators can be used at DC. If capacitors are not needed, simply bridge the gaps with copper foil.



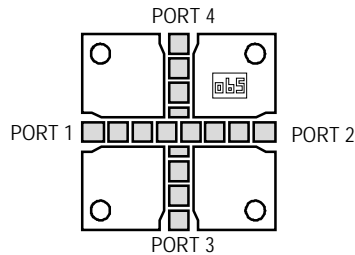
CB-063 SOIC-14 SURFACE MOUNT DIGITAL ATTENUATOR

Designed for use with surface mount digital attenuators such as the Alpha AK402D4 series in a SOIC-14 package. Standard devices use Port 1 (pin 2) and Port 2 (pin 6) for RF connections, while the control lines are on pins 9-12, and driver bias connections are made to pins 8 and 14. Components mount on circuit side.



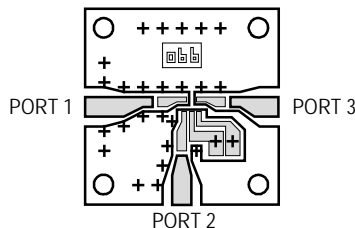
CB-064 PIN-MOUNT AND SURFACE MOUNT CERAMIC FILTERS

Designed for use with two and three-pole ceramic filters such as the Toko 4DF and 6DF series and compatible devices from other manufacturers. Devices in either a pin-mounted package (Toko 6DFA and 6DFB) or surface mount package (Toko 4DFA and 4DFB) can be used on this board, although some trimming of the RF traces may be required for the larger filters.



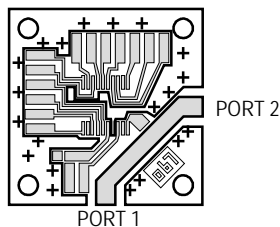
CB-065 PASSIVE LUMPED ELEMENT NETWORKS

A very versatile board for designing passive surface mount filters, diplexers, equalizers, etc. The main line path between Ports 1 and 2 can accommodate up to seven series elements and eight shunt elements. Ports 3 and 4 can be used when designing diplexers or coupled networks with more than two ports. Components mount on circuit side.



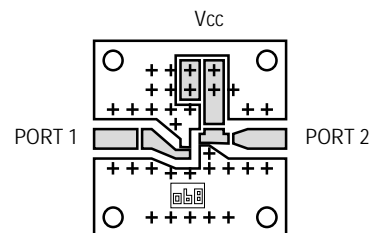
CB-066 NEC T06 UPCONVERTERS

Designed for use with surface mount frequency converters such as the NEC UPC2757T, UPC2758T, UPC8106T and UPC8109T in a six lead T06 package. When used with the UPC2757 or 2758, Port 1 connects to the RF input (pin 1), Port 2 connects to the IF output (pin 6), and Port 3 connects to the LO input (pin 3). When used with the UPC8109 or 8109, Port 1 will be the IF input, Port 2 the RF output, and Port 2 the LO input. All ports have provisions for DC blocking capacitors. Components mount on circuit side.



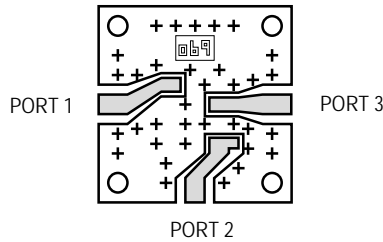
CB-067 NATIONAL PLLatinum FREQUENCY SYNTHESIZER

Designed for use with the National LMX2320, LMX2325, and other pin-compatible frequency synthesizers in a 20-lead small outline surface mount package. Ports 1 and 2 are used as a pass-through line for the VCO that is located on an adjacent cell. A resistor connected to the VCO transmission line serves to sample the VCO signal and connect it to the input of the synthesizer chip (pin 10). Chip component pads are provided to install the loop filter components, the output of which is then connected back to the VCO tuning pin. All other pins are brought out to pads for connection to external circuitry. Components mount on circuit side.



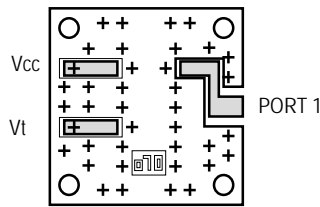
CB-068 6-PIN SOT-363 MONOLITHIC AMPLIFIERS

Designed for use with monolithic amplifiers such as the HP MGA series in the ultra-miniature SOT-363 package. This type of amplifier uses a common bias and RF output port. Port 1 is the input and Port 2 is the output, each with provisions for DC blocking capacitors. The bias circuit can utilize a series resistor and/or inductor as well as a bypass capacitor. Components mount on circuit side. This is similar to the CB-040, except for the location of the ground pins.



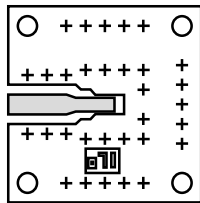
CB-069 8-PIN MINI-CIRCUITS SKY MIXERS

Designed for use with the SKY series of mixers from Mini-Circuits. Port assignments will vary with the specific mixer being used, but the more popular devices use Port 1 for the LO, Port 2 for the RF, and Port 3 for the IF. Components mount on circuit side.



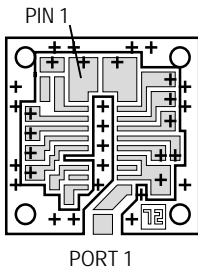
CB-070 14-PIN MINI-CIRCUITS JTOS VCOs

Designed for use with the JTOS series of voltage controlled oscillators (VCOs) from Mini-Circuits. Port 1 is the RF output port, Vcc connects to the supply voltage, and Vt connects to the tuning voltage. Through holes are provided on the Vcc and Vt ports for wire connections, and there is adequate space provided for chip bypass capacitors, if required. Components mount on circuit side.



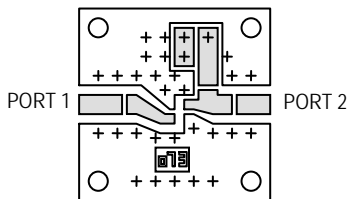
CB-071 SURFACE MOUNT COAXIAL CONNECTORS

Designed for use with miniature surface mount connectors such as the MCX, OSX, and OSMT series.



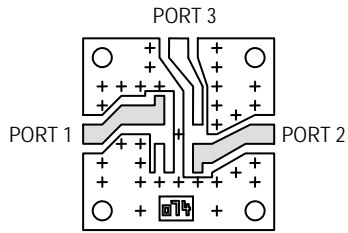
CB-072 MOTOROLA MC145XXX PLL SYNTHESIZERS

Designed for use with the Motorola family of MC145XXXXF single phase locked loop synthesizer chips (145190, 145191, 145192, 145200, 145201, 145202). Provisions are made for an on-board crystal or external reference connection. Pads are provided for an on-board single-ended loop filter, or external connection to a differential loop filter/op-amp. Port 1 is the RF input from the VCO. All components mount on the circuit side.



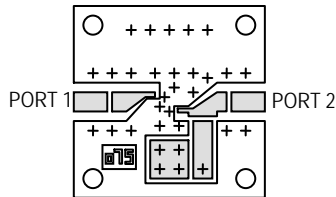
CB-073 SOT-143 SURFACE MOUNT AMPLIFIER

Designed for use with SOT-143 monolithic amplifiers such as the Stanford Microdevices SLN Series and other compatible manufacturers. This board is suitable for amplifiers using pins 2 and 4 as inputs or outputs. Port 1 is the input port and has provisions for a blocking chip capacitor. Port 2 is the output and has traces for the bias network as well as an output blocking capacitor.



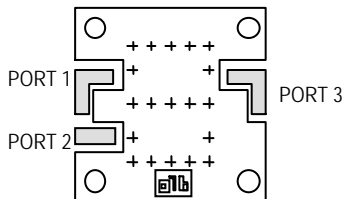
CB-074 6-PIN MINI-CIRCUITS ADE MIXERS

Designed to fit the ADE Series of compact surface mount mixers from Mini-Circuits or other compatible manufacturers. Pins 3, 4, and 6 are used for the LO, RF and IF connections to the circuit board ports, but the specific pin function depends upon the particular mixer model number. Pins 1, 2, and 5 are connected to ground.



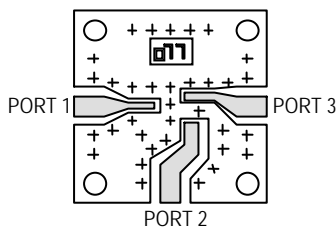
CB-075 MSOP-8 MONOLITHIC AMPLIFIER

Designed to fit miniature MSOP-8 packaged surface mount amplifiers such as the Stanford Microdevices SLN Series and other compatible manufacturers. This package has the close pitch lead spacing (25.6 mils). Port 1 connects to the RF input on pin 1 and has provisions for a DC blocking chip capacitor. Port 2 connects to the RF output and bias network on pin 5 and also has pads for a chip capacitor.



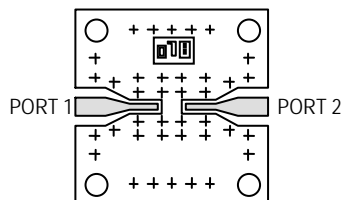
CB-076 SURFACE MOUNT CRYSTAL OSCILLATORS

Designed to fit surface mount TCXOs, VCXOs, and XOs from Rakon, Tellurian, and other compatible manufacturers. Ports are not specifically assigned, but many oscillators will use Port 1 for the Vcc connection, Port 2 for a tuning or gating function, and Port 3 for the output. Although there are no industry standard packages, the board is designed to fit cases that are nominally 0.72" x 0.46" (18.3 x 11.7 mm).



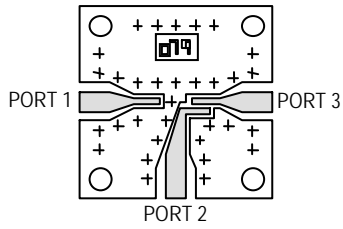
CB-077 SOIC-8 TWO-WAY POWER DIVIDERS

Designed to fit surface mount monolithic two-way power dividers in a SOIC-8 package. These boards are compatible with the MACOM DS52 Series dividers and similar parts from other manufacturers. Port 1 normally connects to pin 2 for the RF input, while Ports 2 and 3 are the divided outputs connected to pins 5 and 8. All other pins are grounded.



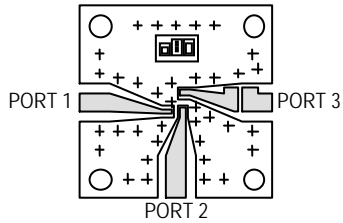
CB-078 SOIC-8 MONOLITHIC FILTERS

Designed to fit monolithic low pass and other filters in SOIC-8 surface mount packages such as the MACOM FLO7 Series and similar devices from other manufacturers. The board design is generic and can handle any pinout that has the two ports on opposing pins (Pins 1 & 8, pins 2 & 7, pins 3 & 6, pins 4 & 5).



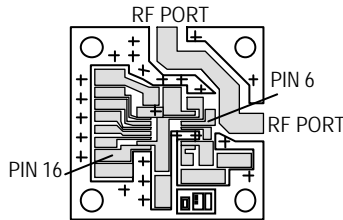
CB-079 SOIC-8 MONOLITHIC MIXERS

Designed to fit monolithic mixers in SOIC-8 surface mount packages such as the MD54 Series (MD54-0001 etc.) from MACOM and other compatible manufacturers. Port 1 normally connects to pin 2, Port 2 connects to pin 6, and Port 3 connects to pin 7. All other pins are grounded.



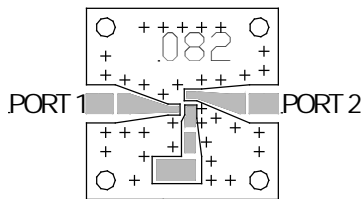
CB-080 SOT-25 MONOLITHIC MIXERS

Designed to fit monolithic mixers in the ultra-miniature SOT-25 package such as the MD54 Series (MD54-0006 etc.) from MACOM and other compatible manufacturers. Port 1 is normally the RF input on pin 1, Port 2 is the IF port on pin 2, and Port 3 is the LO input on pin 3. Port 3 also has provisions for a LO matching network which can be any combination of required shunt and series elements in a PI configuration.



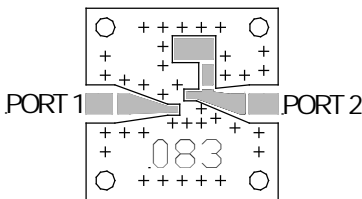
CB-081 NATIONAL PLLatinum FREQUENCY SYNTHESIZER

Designed for use with the National LMX2326, LMX2316, LMX2306, and other pin-compatible phase locked loop synthesizers in a 16-pin TSSOP surface mount package. The RF Ports are used as a pass-through line for the VCO that is located on an adjacent cell. Pin 6 is the RF input pin to the PLL chip and can couple the VCO signal from the RF Port line through a chip capacitor. All required loop and bias components have pads for chip components and external connections are easily made through wire connections on oversized pads.



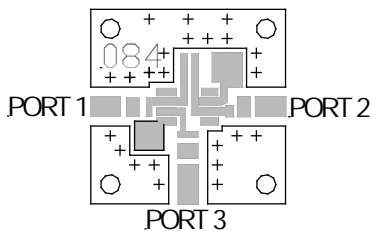
CB-082 SOT-23 MONOLITHIC AMPLIFIER

Designed for use with SOT-23 MMIC amplifiers that use Port 1 as the input and Port 2 as the RF output with a separate pin for the DC bias. Both ports have provisions for DC blocking capacitors, and the bias path allows the use of surface mount resistors and inductors.



CB-083 SOT-23 MONOLITHIC AMPLIFIER

Designed for use with SOT-23 MMIC amplifiers that use Port 1 as the input and Port 2 as a common port for the RF output and DC bias. Both ports have provisions for DC blocking capacitors, and the bias path allows the use of surface mount resistors and inductors.



CB-084 SOIC-8 OPERATIONAL AMPLIFIER

Designed for use with any single operational amplifier in the SOIC-8 package. Port 1 connects to the inverting input and Port 3 connects to the non-inverting input. Provisions for series/shunt elements allows versatile configurations of the input circuits as well as the feedback path between pins 2 and 6. Port 2 serves as the amplifier output. Bias pads allow amplifiers to be operated from single or dual power supplies.

ProtoCell Package Compatibility

Package Style	Compatible Circuit Boards
.375" x .500" surface mount	012, 056, 057, 060
20-pin surface mount	034, 067, 072
4-pin mini-relay header	014
6-pin surface mount	015, 033, 036, 039, 040, 051, 053, 068, 074
8-pin leaded flatpack	009
8-pin mini-relay header	013, 022
8-pin standard relay header	008, 011, 016, 020
8-pin surface mount relay header	048
Cell interconnects	006, 007
Ceramic & lumped element filters	064, 065
Connectors	005, 025, 071
Crystal oscillators	076
Discrete components	024, 065
Frequency synthesizer PLL chips	067, 072, 081
Leaded "TO-" style	001, 002, 003, 004, 021
Micro-X	017
Mini-Circuits "ADE"	074
Mini-Circuits "Blue Cell"	052, 058, 059
Mini-Circuits "SKY"	069
NEC T-06	033, 066
HP/Avantek PP-25	018
HP/Avantek PP-38	019
SOIC-14	041, 062, 063
SOIC-16	050, 054, 055
SOIC-8	023, 027, 030, 031, 032, 035, 037, 042, 043, 045, 046, 049, 077, 078, 079, 084
SOT-23	033, 066, 082, 083
SOT-25	080
SOT-143	026, 038, 073
SOT-363	039, 040, 068
SOT-89	061
Surface mount	012, 015, 017, 018, 019, 023, 026, 027, 028, 029, 030, 031, 032, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042, 043, 044, 045, 046, 047, 048, 049, 050, 051, 052, 053, 054, 055, 056, 057, 058, 059, 060, 061, 062, 063, 064, 065, 066, 067, 068, 069, 070, 071, 072, 073, 074, 075, 076, 077, 078, 079, 080, 081
Surface mount "TO-" style	010
MSOP-8	075
VCO's	028, 029, 044, 047, 070

