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TRAK Microwave
RF and Microwave Components Catalog
Introduction

TRAK Microwave has a long history in design and production of high reliability RF and microwave components, assemblies and sub-systems dating back to 1969. Through these years, TRAK Microwave has developed the reputation for innovative and high quality products. Even though designs, products, and applications have changed through the years, TRAK's unmatched commitment to customers has not.

Catalog Capabilities

TRAK RF and microwave components cover a broad range of frequencies and product types for application in signal processing circuits in several commercial market segments such as wireless, private mobile radio and CATV. This catalog includes Voltage Variable Attenuators, Directional Couplers, IQ Modulators, IQ Demodulators, Mixers, Voltage Variable Phase Shifters, Power Splitters and Combiners, Quadratures, Junction Hybrids and Matching Transformers

This catalog is organized by product type sections with each section containing features, photographs and specification tables. Typical package drawings are located in the back of the catalog, but do not represent all possibilities available.

Not included in this catalog are a myriad of additional standard and custom design products provided by TRAK including Isolators, Circulators, High Power Filters and Diplexers, Delay Line Filters, Source Products, Control Products, Time and Frequency Systems. TRAK also provides comprehensive capability in the integration of any combination of this wide spectrum of products. TRAK welcomes the opportunity to custom design product solutions specific to your applications and environmental needs.

Together, these standard and custom product families make up the TRAK portfolio of products that span the UHF to millimeter frequency bands operating from low to high power under the most severe environmental conditions.

Company Capabilities

TRAK Microwave is a prominent leader in RF and microwave design and manufacture. TRAK has expanded and strengthened its technical capabilities and is highly regarded for close technical support. As one of the largest suppliers of RF and microwave components, TRAK is equally adept in commercial, defense and space applications.

TRAK development teams are based in facilities located in the United States and United Kingdom. These locations provide customers with on-going efficient technical support and effective product development. TRAK engineers use advanced design tools and software to support design and prototype activities. The design team, in conjunction with the TRAK sales team and network of representatives, interact closely with customers to ensure that performance and program objectives are met in the most efficient and effective manner possible. In addition to the company owned facilities, TRAK has offshore manufacturing partnerships in the People's Republic of China, Korea, Costa Rica and the Dominican Republic.

TRAK maintains a large library of mature designs, allowing us to draw upon this base and find a solution that meets the customer's individual needs. The products are "designed to cost" from the outset, with performance and high volume in mind. This capability makes TRAK an ideal partner in today's competitive and dynamic commercial climate. TRAK is committed to providing solutions to the ever-changing marketplace.

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Introduction

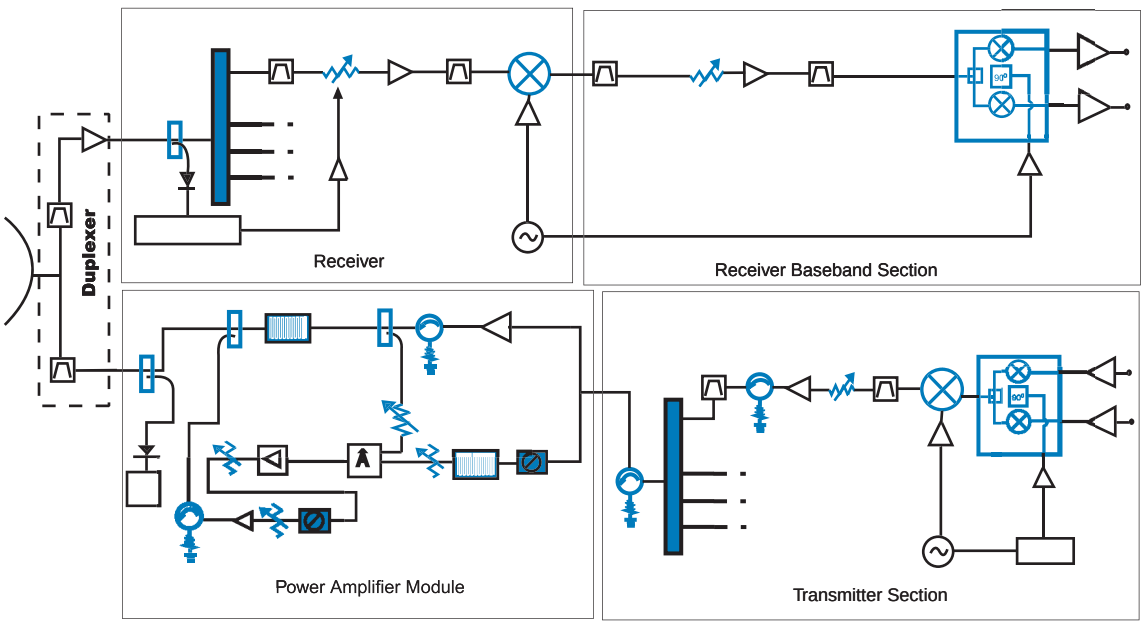
Product Capabilities

TRAK products have evolved to meet or exceed each new customer demand, which has resulted in a broad range of compact, robust, high performance devices.

TRAK commercial products provide cost-effective solutions to high performance requirements in industry standard packaging. TRAK's expertise in low intermodulation or high isolation mixers, low loss isolators, delay lines, source products and broadband components offer truly enhanced performance generally not seen elsewhere in the marketplace today. TRAK product families offer a balance between practicality and affordability, while optimizing reliability and performance for all applications.

Shown below is a block diagram of a typical wireless base transceiver station. A wide variety of TRAK Microwave products are used in the system and are depicted below in blue. Refer to the legend of symbols to identify products.

TRAK Microwave Products in a Base Transceiver Station



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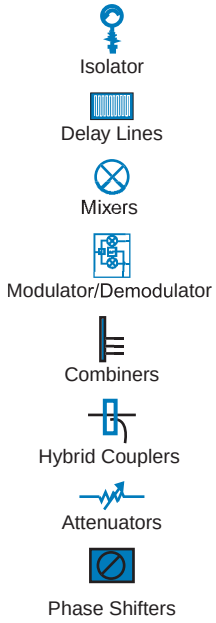

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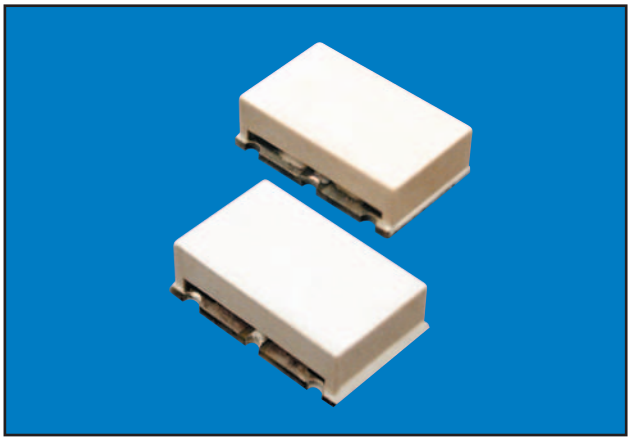
Attenuators, Voltage Variable

- Low Insertion Loss
- Good Return Loss
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Narrowband: Input Power: +5 dBm max
- Control Voltage: 0 to +5V @ 20 mA max
- Operating Temperature Range: -20 to +70C
- Other Frequencies, Bandwidths, Input Power and Packages Available



Narrowband Attenuator Specifications

* Package Code Drawings Begin on Page 18.

CENTER FREQUENCY (MHz)	MODEL NUMBER	BANDWIDTH MIN (%)	INSERTION LOSS TYP/MAX (dB)	ATTENUATION RANGE MIN (dB)	RETURN LOSS TYP/MIN (dB)	PACKAGE CODE *
260	ATV/260B-05	10	0.8/1.6	22	22/14	5
400	ATV/400F-05	10	1.0/1.5	15	20/13	5
750	ATV/750C-05	10	0.8/1.6	15	20/13	5
850	ATV/850D-05	10	0.8/1.6	12	18/12	5
950	ATV/950E-05	10	0.8/1.6	10	18/12	5
1000	ATV/1000E-05	10	0.8/1.6	10	18/12	5
1200	ATV/1200C-63	15	1.2/1.8	15	18/14	63
1400	ATV/1400C-63	15	1.2/1.8	15	18/14	63
1600	ATV/1600C-63	15	1.3/2.0	15	16/12	63
1800	ATV/1800C-63	15	1.3/2.0	15	16/10	63
1900	ATV/1900C-63	15	1.3/2.0	15	16/10	63
2000	ATV/2000C-63	15	1.3/2.0	15	16/10	63

Broadband Attenuator Specifications

* Package Code Drawings Begin on Page 18.

FREQUENCY RANGE (MHz)	MODEL NUMBER	DC BIAS (V)	INSERTION LOSS TYP/MAX (dB)	ATTENUATION RANGE MIN (dB)	RETURN LOSS TYP/MIN (dB)	PACKAGE CODE *
50-2000	ATV/2000A-64A	+5	3.5/5.0	30	20/14	64
100-1000	ATV/1000A-64A	+5	3.5/5.0	30	20/14	64
800-2000	ATV/2000A-64B	+5	3.5/4.5	30	20/14	64
1720-1990	ATV/1855C-63	+5	2.5/3.0	20	17.7/14	63

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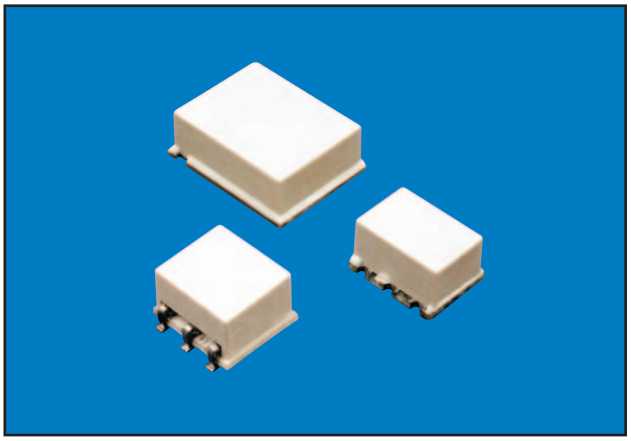
Directional Couplers

- Surface Mount
- High Directivity
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Operating Temperature: -30 to +70C
- Storage Temperature: -40 to +85C
- Other Frequencies, Bandwidths, Input Power and Packages Available



50 Ohm Directional Coupler Specifications

* Package Code Drawings Begin on Page 18.

FREQ. START (MHz)	FREQ. STOP (MHz)	MODEL NUMBER	COUPLING (dB) NOM	INS LOSS (MHz) MAX	DIRECTIVITY (dB)	POWER (W) MAX	IMPEDENCE (OHMS)	PACKAGE CODE *
1	35	CPL/20AC-08R	20.0	0.50	25	3.00	50	8
1	2000	CPL/10AF-01	10.0	1.80	12	1.00	50	1
4	1000	CPL/10BE-08S5	10.0	1.50	13	1.00	50	8
4	1000	CPL/17BE-08S	17.5	1.00	12	1.00	50	8
5	1000	CPL/10BE-01	10.0	1.30	18	1.00	50	1
5	1000	CPL/10BE-08	10.0	1.20	14	1.00	50	8
5	1000	CPL/20BE-01	20.0	0.65	14	1.00	50	1
5	1000	CPL/20BE-08	20.0	1.00	14	1.00	50	8
5	1000	CPL/20BE-08N	20.0	0.80	12	0.16	50	8L
30	950	CPL/20CE-01	20.0	0.75	13	1.00	50	1
30	2500	CPL/10CG-01R	10.0	2.50	10	1.00	50	1
200	400	CPL/20DD-08P	20.0	0.30	20	3.00	50	8
350	350	CPL/10BE-08C	10.0	0.40	20	1.00	50	8L
380	500	CPL/20DD-08E7	20.0	0.30	22	6.00	50	8
476	476	CPL/20DD-08A	20.0	0.50	20	1.00	50	8
500	1500	CPL/16EF-08	17.0	1.20	10	1.00	50	8
500	2000	CPL/16EF-08R	17.0	1.20	10	1.00	50	8
500	2000	CPL/16EF-08T	17.0	1.20	10	1.00	50	8
750	1000	CPL/20EE-01A3	20.0	0.50	20	1.00	50	1
800	1000	CPL/20EE-08C	20.0	0.50	18	1.00	50	8
835	850	CPL/10EE-08D	10.0	0.50	20	1.00	50	8
869	894	CPL/10EE-08A	10.0	1.00	15	1.00	50	8
869	894	CPL/11EE-08A	11.2	1.00	12	1.00	50	8
1350	1450	CPL/16EE-01R4	16.0	0.50	15	1.00	50	1
1800	2000	CPL/1204	20.0	0.30	13	5.00	50	8

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75 Ohm Directional Coupler Specifications

* Package Code Drawings Begin on Page 18.

FREQ. START (MHz)	FREQ. STOP (MHz)	MODEL NUMBER	COUPLING (dB) NOM	INS LOSS (MHz) MAX	DIRECTIVITY (dB)	POWER (W) MAX	IMPEDENCE (OHMS)	PACKAGE CODE *
4	250	CPL/7BD-08S7	7.0	1.50	12	1.00	75	8
4	1000	CPL/7BE-08T2	6.5	2.80	12	1.00	75	8
4	1000	CPL/10BE-08J7	10.0	1.50	10	1.00	75	8
4	1000	CPL/10BE-08S	10.0	1.90	12	1.00	75	8
4	1000	CPL/10BE-08S7	10.0	1.50	12	1.00	75	8
4	1000	CPL/17BE-08A7	17.0	1.20	13	1.00	75	8
4	1000	CPL/17BE-08S8	17.5	1.00	12	1.00	75	8
4	1000	CPL/17BE-08S7	18.2	1.00	8	1.00	75	8
4	1000	CPL/20BE-08S7	20.0	1.20	13	1.00	75	8
5	800	CPL/10BE-01B9	10.0	1.60	20	1.00	75	1
5	800	CPL/10BE-08B9	10.0	1.60	20	1.00	75	8
5	1000	CPL/10BE-08T2	10.0	1.60	12	1.00	75	8
5	1000	CPL/12BE-08A3	12.3	1.25	11	1.00	75	8
30	2000	CPL/10CF-01/75	10.0	2.60	10	1.00	75	1

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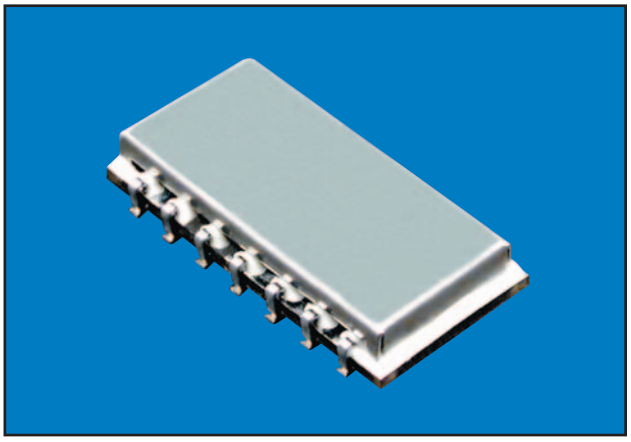
IQ Modulators

- Low Insertion Loss
- Surface Mount, Low Profile
- High Carrier and Sideband Suppression
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Standard Operating Temperature : -30 to +70C
- Storage Temperature : -40 to +85C



- Sideband Suppression IQ Inputs in Perfect Quadrature and Amp Balance
- Standard Models "A" Suffix = High Side Rejection, "B" = Low Side Rejection
- Other Frequencies, Bandwidths, LO Power, and Packages Available

Narrowband Surface Mount IQ Modulator Specifications

* Package Code Drawings Begin on Page 18.

LO FREQ. (MHz)	IQ FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MAX (dB)	SIDEBAND SUPPRESSION TYP/MIN (dBc)	CARRIER SUPPRESSION TYP/MIN (dBc)	PACKAGE CODE*
60	DC-10	MIQ/3CC-53A3	10	6.0/8.0	-35/-28	-35/-28	53L
90	DC-10	MIQ/3CC-53A4	10	6.0/8.0	-35/-28	-35/-28	53L
140	DC-10	MIQ/3DD-53A1	10	6.0/8.0	-35/-28	-35/-28	53L
200	DC-10	MIQ/3DD-53A2	10	6.0/8.0	-35/-28	-35/-28	53L
340	DC-10	MIQ/3DD-53A3	10	6.0/8.0	-35/-28	-35/-28	53L
460	DC-10	MIQ/3DD-53A4	10	6.0/8.0	-35/-28	-35/-28	53L
580	DC-10	MIQ/3EE-53A1	10	6.0/8.0	-35/-28	-35/-28	53L
720	DC-10	MIQ/3EE-53A2	10	6.0/8.0	-35/-28	-35/-28	53L
850	DC-10	MIQ/3EE-53A3	10	6.0/8.0	-35/-28	-35/-28	53L
1000	DC-10	MIQ/3EF-53A1	10	6.0/8.0	-35/-28	-35/-28	53L

Sub-Octave Band Surface Mount IQ Modulator Specifications

* Package Code Drawings Begin on Page 18.

LO FREQ. (MHz)	IQ FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MAX (dB)	SIDEBAND SUPPRESSION TYP/MIN (dBc)	CARRIER SUPPRESSION TYP/MIN (dBc)	PACKAGE CODE*
440-520	DC-20	MIQ/3DE-53B1	10	6.5/8.5	-35/-28	-35/-28	53L
520-600	DC-20	MIQ/3EE-53B1	10	6.5/8.5	-35/-28	-35/-28	53L
800-870	DC-20	MIQ/3EE-53B2	10	6.5/8.5	-35/-28	-35/-28	53L
900-1000	DC-20	MIQ/3EE-53B3	10	6.5/8.5	-35/-28	-35/-28	53L

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IQ Modulators

Single Sideband IQ Modulator Specifications

* Package Code Drawings Begin on Page 18.

IF START FREQ. (MHz)	IF STOP FREQ. (MHz)	MODEL NUMBER	CARRIER INPUT LEVEL (dBm)	CARRIER FREQ. (MHz)	CONVERSION LOSS TYP/MIN (dB)	SIDEBAND SUPPRESSION MIN (dBc)	CARRIER SUPPRESSION MIN (dBc)	PACKAGE CODE *
1	10	SSM/6DD-57A3	17	140	8.5/10.0	-25	-40	57L
1	10	SSM/6DD-57A4	17	200	8.5/10.0	-25	-40	57L
1	10	SSM/6DD-57A5	17	400	8.5/10.0	-25	-30	57L
1	10	SSM/6EE-57A2	17	500	8.5/10.0	-25	-30	57L
1	10	SSM/6EE-57A3	17	750	8.5/10.0	-25	-30	57L
1	10	SSM/6EE-57A4	17	835	8.5/10.0	-25	-30	57L

Custom Sideband IQ Modulator Specifications

* Package Code Drawings Begin on Page 18.

IF START FREQ. (MHz)	IF STOP FREQ. (MHz)	MODEL NUMBER	CARRIER INPUT LEVEL (dBm)	CARRIER FREQ. (MHz)	CONVERSION LOSS TYP/MIN (dB)	SIDEBAND SUPPRESSION MIN (dBc)	CARRIER SUPPRESSION MIN (dBc)	PACKAGE CODE *
2	17	SSM/7DD-58LM	26	150	6.0/9.0	-25	-30	58L
24	215	SSM/6DD-57H4	17	494	9.0/10.0	-25	-30	57L
22	216	SSM-6DE-57H4	17	685	9.0/10.5	-25	-30	57L
13	215	SSM/6EE-58H4	17	800	9.5/11.0	-25	-30	58L

Custom IQ Modulator Specifications

* Package Code Drawings Begin on Page 18.

LO FREQ. (MHz)	IQ FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MAX (dB)	SIDEBAND SUPPRESSION TYP/MIN (dBc)	CARRIER SUPPRESSION TYP/MIN (dBc)	PACKAGE CODE*
150	D-0.64	MIQ/6DD-53Q	10	06/6.5	-30/-25	-28/-18	53L
380-400	DC-2	MIQ/1D-53N3	10	6.8/8.0	-32/-22	-28/-18	53L
410-430	DC-2	MIQ/1D-53N4	10	6.8/8.0	-30/-22	-28/-18	53L
450-470	DC-2	MIQ/1D-53N5	10	6.8/8.0	-30/-22	-28/-18	53L
470-490	DC-2	MIQ/1D-53N6	10	6.8/8.0	-30/-17	-28/-25	53L
800-900	DC-20	MIQ/3EE-53L1	10	6.5/8.5	-30/-25	-30/-25	53Q
834-860	DC-10	MIQ/3EE-53N2	10	6.8/8.0	-28/-18	-30/-22	53Q
889-915	DC-10	MIQ/3EE-53N	10	6.5/8.0	-28/-18	-30/-22	53Q
1090	60	MIQ/3FF-53C5	10	10.0/12.0	-30/-25	-30/-25	53Q
1800-1900	DC-20	MIQ/3FF-53L2	10	16.5/8.5	-30/-25	-30/-18	53Q
1800-1900	DC-2	MIQ/3FF-53N6	10	10.0/12.0	-30/-25	-30/-23	53Q

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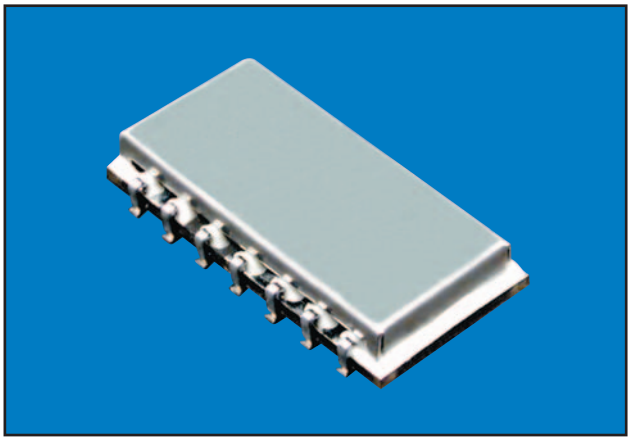
IQ Demodulators

- High Isolation
- Low Insertion Loss
- Good Phase Balance
- Surface Mount, Low Profile
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Standard Operating Temperature : -30 to +70C
- Storage Temperature : -40 to +85C
- Standard Models "A" Suffix = High Side Rejection, "B" = Low Side Rejection



Narrowband Surface Mount IQ Demodulator Specifications

* Package Code Drawings Begin on Page 18.

LO FREQ. (MHz)	RF FREQ. (MHz)	IQ FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MAX (dB)	AMPLITUDE BALANCE TYP/MAX (ddeg)	PHASE BALANCE TYP/MIN (deg)	PACKAGE CODE*
45	42-48	DC-6	DIQ/3CC-53A2	10	8.0/10.0	0.2/0.3	1.0/2.0	53L
60	55-65	DC-10	DIQ/3CC-53A3	10	8.0/10.0	0.2/0.3	1.0/2.0	53L
90	85-95	DC-10	DIQ/3CC-53A4	10	8.0/10.0	0.2/0.3	1.0/2.0	53L
140	135-145	DC-10	DIQ/3DD-53A1	10	8.0/10.0	0.2/0.3	2.0/3.0	53L
200	195-205	DC-10	DIQ/3DD-53A2	10	8.0/10.0	0.2/0.3	2.0/3.0	53L
340	335-345	DC-10	DIQ/3DD-53A3	10	8.5/10.5	0.3/0.4	2.0/3.0	53L
460	455-465	DC-10	DIQ/3DD-53A4	10	8.5/11.5	0.3/0.4	2.0/3.0	53L
580	575-585	DC-10	DIQ/3EE-53A1	10	8.5/11.5	0.3/0.4	2.0/3.0	53L
720	715-725	DC-10	DIQ/3EE-53A2	10	8.5/11.5	0.3/0.4	2.0/4.0	53L
850	845-855	DC-10	DIQ/3EE-53A3	10	8.5/11.5	0.3/0.5	2.0/4.0	53L
1000	995-1005	DC-10	DIQ/3EF-53A1	10	8.5/11.5	0.3/0.5	2.0/4.0	53L

Sub-Octave Band Surface Mount IQ Demodulator Specifications

* Package Code Drawings Begin on Page 18.

LO FREQ. (MHz)	RF FREQ. (MHz)	IQ FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MAX (dB)	AMPLITUDE BALANCE TYP/MAX (deg	PHASE BALANCE TYP/MIN (deg)	PACKAGE CODE*
30-60	30-60	DC-10	DIQ/3CC-53B1	10	8.5/10.5	0.2/0.3	1.0/2.0	53L
60-90	60-90	DC-10	DIQ/3CC-53B2	10	8.5/10.5	0.2/0.3	1.0/2.0	53L
90-120	90-120	DC-10	DIQ/3CD-53B1	10	8.5/10.5	0.2/0.3	1.0/2.0	53L
120-160	120-160	DC-20	DIQ/3DD-53B1	10	8.5/10.5	0.2/0.3	1.0/2.0	53L
160-220	160-220	DC-20	DIQ/3DD-53B2	10	8.5/10.5	0.2/0.3	2.0/3.0	53L
220-280	220-280	DC-20	DIQ/3DD-53B3	10	8.5/10.5	0.2/0.3	2.0/3.0	53L

Specifications subject to change without notice.

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IQ Demodulators

Sub-Octave Band Surface Mount IQ Demodulator Specifications

* Package Code Drawings Begin on Page 18.

LO FREQ. (MHz)	RF FREQ. (MHz)	IQ FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MAX (dB)	AMPLITUDE BALANCE TYP/MAX (deg)	PHASE BALANCE TYP/MIN (deg)	PACKAGE CODE*
280-360	280-360	DC-20	DIQ/3DD-53B4	10	8.5/11.0	0.3/0.4	2.0/4.0	53L
360-440	360-440	DC-20	DIQ/3DD-53B5	10	8.5/11.0	0.3/0.4	2.0/4.0	53L
440-520	440-520	DC-20	DIQ/3DE-53B1	10	8.5/11.0	0.3/0.4	2.0/4.0	53L
520-600	520-600	DC-20	DIQ/3EE-53B1	10	8.5/11.5	0.3/0.4	2.0/5.0	53L
800-870	800-870	DC-20	DIQ/3EE-53B2	10	8.5/11.5	0.3/0.5	2.0/5.0	53L
900-1000	900-1000	DC-20	DIQ/3EE-53B3	10	8.5/11.5	0.3/0.5	2.0/5.0	53L

Image Reject Mixers IQ Demodulator Specifications

* Package Code Drawings Begin on Page 18.

RF FREQ. (MHz)	LO FREQ. (MHz)	IF FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MIN (dB)	IMAGE REJECTION MIN (dB)	L/R ISO TYP/MIN (dB)	L/I ISO TYP/MIN (dB)	PACKAGE CODE*
285	286-287.6	1.0-2.6	IRM/6DD-57S7	16	8.5/10.0	20	45	50	57L
800	820-1015	13-215	IRM/6EE-58	17	8.5/10	30	35	35	58L
150	133-148	150	IRM/7DD-58	26	6.0/9.0	20	40	40	58L
685	707-901	22-216	IRM/6DE-57	17	8.5/10	20	40	40	57L

Custom IQ Demodulator Specifications

* Package Code Drawings Begin on Page 18s.

LO FREQ. (MHz)	RF FREQ. (MHz)	IQ FREQ. (MHz)	MODEL NUMBER	LO POWER LEVEL (dBm)	CONVERSION LOSS TYP/MAX (dB)	AMPLITUDE BALANCE TYP/MAX (deg)	PHASE BALANCE TYP/MIN (deg)	PACKAGE CODE*
10.2-11.3	5.2-16.3	DC-5	DIQ/6BC-53	17	10.0/9.0	0.2/0.4	1.0/2.0	53L
150	149.3-150.6	DC-.64	DIQ/6DD-53Q	17	6.0/7.0	0.2/0.5	2.0/3.0	53L
380-400	380-400	DC-2	DIQ/1D-53N3	10	7.0/8.0	0.2/0.5	2.0/3.0	53L
410-430	410-430	DC-2	DIQ/1D-53N3	10	7.0/8.0	0.2/0.5	2.0/3.0	53L
450-470	450-470	DC-2	DIQ/1D-53N3	10	7.0/8.0	0.2/0.5	2.0/3.0	53L
470-480	470-480	DC-2	DIQ/1D-53N3	10	7.0/8.0	0.2/0.5	2.0/3.0	53L
889-915	834-860	934-860	DIQ/3EE-53N2	10	9.0/8.0	0.3/0.5	2.0/3.0	53L
889-915	889-915	DC-10	DIQ/3EE-53N	10	9.0/8.0	0.3/0.5	2.0/3.0	53L
851-869	851-869	DC-10	DIQ/1EE-53N1	10	10.0/9.0	0.2/0.3	2.0/3.0	53L
950-1525	950-1525	DC-10	DIQ/1EF-53V9	10	10.0/12.0	0.4/0.6	4.0/7.0	53Q

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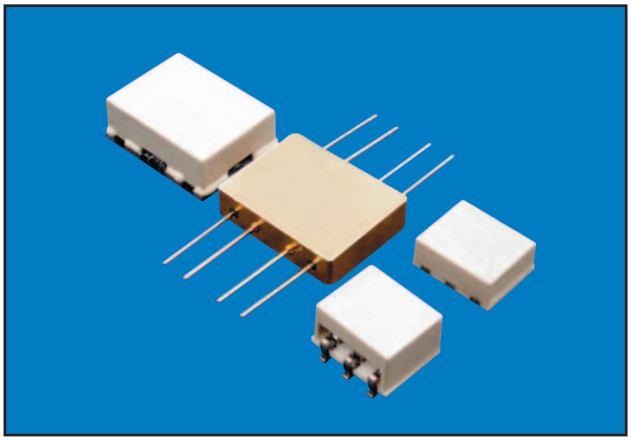
Mixers

- High Reliability
- Excellent Isolation
- Low Conversion Loss
- Surface Mount, Low Profile
- Low Cost to Performance
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Other Frequencies, Bandwidths, LO Power, and Packages Available



General Purpose Mixer Specifications

* Package Code Drawings Begin on Page 18.

LO POWER (dBm)	RF FREQ. (MHz)	LO FREQ. (MHz)	IF FREQ. (MHz)	MODEL NUMBER	CONVERSION LOSS TYP/MIN (dB)	IIP3 (dBm)	L/R ISO TYP/MIN (dB)	L/I ISO TYP/MIN (dB)	PACKAGE CODE*
7	950-1450	530	420-920	MXR/2EF-04N7	8.3/9.0	+14 MIN	20	25	4
7	0.1-500	0.1-500	DC-500	MXR/1121	6.3/7.0	+16 MIN	35	25	4
7	1800-1900	1000-1100	800-900	MXR/1120	8.7/10.0	+15 TYP	20	16	4
7	10-1000	10-1000	DC-1000	MXR/2CE-12M2	6.5/8.0	+14 TYP	33	20	12
7	1-1000	1-1000	DC-1000	MXR/2BE-02	7.2/8.5	+12 MIN	30	25	2
7	1-1050	1-1050	DC-500	MXR/1133	6.5/7.5	+12 TYP	25	18	4L
7	1500-1670	1250-1370	DC-250	MXR/2FF-04N9	7.5/8.5	+12 TYP	25	15	4
7	1-2600	1-2600	DC-500	MXR/2BG-02M2	5.5/8.0	+8 MIN	33	20	2
7	1350-1350	1350-2350	DC-1000	MXR/2FF-02R9	7.5/8.5	+12 TYP	36	25	2
7	1500-2200	1500-2200	10-400	MXR/1132	8.5/10.0	+12 TYP	20	18	8L
7	1700-2000	1700-2000	DC-1.0	MXR/2FF-02A6	7.5/9.0	+10 MIN	25	10	2
7	2400-2500	2000-2300	200-400	MXR/2GG-02-T	9.5/10.2	+12 TYP	36	20	2
7	3300	2000-3350	530-1330	MXR/2GG-02R	8.0/9.0	+12 TYP	20	20	2
7	250-300	250-300	DC-10	MXR/1108	5.2/6.5	+15 TYP	30	25	4
7	3000-3500	3100-3100	100-500	MXR/2GG-02T2	7.0/9.5	+12 TYP	25	18	2
7	350-2000	350-2000	10-350	MXR/2DF-02-T	7.8/9.0	+12 MIN	30	20	2
7	500-2500	500-2500	140	MXR/2EG-04A7	8.2/10.5	+16 TYP	20	17	4
7	5-1000	5-1000	DC-1000	MXR/1116	6.7/9.5	+12 TYP	18	12	8L
7	5-1000	5-1000	DC-1000	MXR/2BE-04N	6.7/9.5	+12 TYP	18	12	4
7	5-1000	5-1000	DC-500	MXR/2BE-53M1	5.5/9.5	+12 TYP	23	20	53L
7	5-3500	5-3500	DC-1200	MXR/2BG-02	8.2/10.5	+14 TYP	25	15	2
7	700-2000	700-2000	DC-10	MXR/2EG-04L	6.5/8.0	+10 TYP	20	17	4
7	864-960	783-879	81.2	MXR/2EE-02E8	6.8/8.7	+11 MIN	35	20	2
7	800-1000	800-1000	45-90	MXR/2EE-08G5	5.7/7.5	+12.5MIN	30	30	8
7	800-1050	800-1050	DC-250	MXR/2EF-04M	5.4/7.5	+8 MIN	28	20	4L

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Mixers

General Purpose Mixer Specifications

* Package Code Drawings Begin on Page 18.

LO POWER (dBm)	RF FREQ. (MHz)	LO FREQ. (MHz)	IF FREQ. (MHz)	MODEL NUMBER	CONVERSION LOSS TYP/MIN (dB)	IIP3 (dBm)	L/R ISO TYP/MIN (dB)	L/I ISO TYP/MIN (dB)	PACKAGE CODE*
7	864-960	864-960	DC-1.0	MXR/2EE-02A6	6.8/8.7	+11 MIN	30	20	2
7	40-760	880-1620	840-860	MXR/1125	7.2/9.0	+12 MIN	27	22	4
7.5	1850-1950	1650-1700	240-270	MXR/1110	9.0/10.0	+14 TYP	25	20	4
7.5	1850-1950	1650-1700	240-270	MXR/1115A	6.8/7.5	+14 TYP	25	20	4
10	0.5-500	0.5-500	DC-500	MXR/1122	5.2/7.0	+22 TYP	35	30	4
10	100-500	100-500	45	MXR/1134	6.3/7.0	+19 MIN	35	25	4
10	40-2200	1200-2100	40-800	MXR/3CG-02B4	8.0/7.2	+20 TYP	30	25	2
10	1350-3050	1600-3300	195-295	MXR/3FG-02A4	7.2/10.0	+10 TYP	35	20	2
10	1850-1950	1650-1700	240-270	MXR/1111	9.0/10.0	+18 TYP	25	20	4
10	1850-1910	1702-1762	148	MXR/3FF-02HD5	6.7/8.5	+21 MIN	25	25	2
10	5-4000	5-4000	DC-500	MXR/1131	5.3/8.5	+14 TYP	18	15	2
10	650-950	700-1000	10-130	MXR/3EE-04N1	6.5/7.0	+17 MIN	35	25	4
10	800-1000	800-1000	10-200	MXR/3EE-02HD	7.0/8.0	+21 MIN	30	28	2
11	350-750	1190-1590	840-840	MXR/1127	7.5/9.0	+20 TYP	25	20	8L
11	5-3000	5-3000	5-800	MXR/1107	7.5/10.5	+20 TYP	35	30	4
11	5-3000	5-3000	5-800	MXR/1107H	7.5/10.5	+20 TYP	35	30	4L
11	5-3000	5-3000	5-800	MXR/1126	7.5/10.5	+20 TYP	20	15	4L
13	700-1000	700-100	70-74	MXR/4EE-O2A	6.6/8.0	+24 TYP	30	24	2
13	710-745	880-915	170	MXR/4EE-04MU	6.5/7.5	+22 MIN	30	25	2
14	1930-1990	1060-1100	869-869	MXR/1130	6.8/8.0	+18 MIN	20	20	4L
14	5-3000	5-3000	2-1200	MXR/1130R	7.5/10.5	+25 TYP	20	15	4L
15	300-4300	300-4300	321.4	MXR/6BG-02H5	8.2/10.0	+20 MIN	20	20	2
15	90-200	90-200	18-30	MXR/1101	5.6/6.5	+28 MIN	40	30	4L
16	945-946	900	45-46	MXR/6EF-02C	6.2/8.0	+25 TYP	30	20	2
16	945-946	900	45-46	MXR/1130C	7.5/9.0	+25 TYP	25	20	4L

High Isolation Mixer Specifications

* Package Code Drawings Begin on Page 18.

LO POWER (dBm)	RF FREQ. (MHz)	LO FREQ. (MHz)	IF FREQ. (MHz)	MODEL NUMBER	CONVERSION LOSS TYP/MIN (dB)	IIP3 (dBm)	L/R ISO TYP/MIN (dB)	L/I ISO TYP/MIN (dB)	PACKAGE CODE*
7	1217-1237	1337	100-120	MXR/2CG-02M2	6.9/8.0	+12 TYP	40	22	2
7	100-240	120-220	10-20	MXR/2DD-04N2	5.50/7.25	+16 TYP	50	25	4L
7	135-145	125-135	10	MXR/2DD-02L	6.0/7.0	+14 MIN	64	40	2
8	800-880	700-980	50-180	MXR/2EE-02S3	7.8/9.0	+12 TYP	43	20	2
10	1200-1600	1350-1450	100-250	MXR/3FF-02C5	7.1/7.7	+19 TYP	42	25	2

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High Dynamic Mixer Specifications

* Package Code Drawings Begin on Page 18.

LO POWER (dBm)	RF FREQ. (MHz)	LO FREQ. (MHz)	IF FREQ. (MHz)	MODEL NUMBER	CONVERSION LOSS TYP/MIN (dB)	IIP3 (dBm)	L/R ISO TYP/MIN (dB)	L/I ISO TYP/MIN (dB)	PACKAGE CODE*
15	2547-2607	2477-2537	70	MXR/6GG-12H9	7.2/9.0	+22 TYP	20	10	2
17	902-2500	1095-2300	183.5	MXR/6FF-02M6	7.2/8.0	+25 MIN	30	25	2
17	1626-1660	1806-1840	180	MXR/6FF-02J3	6.8/8.0	+25 MIN	30	25	2
17	870-915	670-815	100-200	MXR/6EE-02S3	6.8/8.0	+27 MIN	30	25	2
17	800-1000	800-1000	10-200	MXR/6EE-02HD	7.0/8.0	+32 TYP	30	25	2
17	800-1000	800-1000	10-200	MXR/6EE-02HD1	7.0/8.0	+28 TYP	30	25	2
17	80-2000	800-2000	10-200	MXR/6EF-02HD	7.2/8.0	+30 TYP	30	25	2
17	1760-2000	935-1175	700-940	MXR/6FF-02HDK2	7.2/8.0	+26 MIN	30	25	2
18	800-900	800-900	10-50	MXR/6EE-02T	6.2/7.5	+30 MIN	30	20	2
19	1000-3000	1500-2100	250-900	MXR/6FG-12H2	7.0/9.0	+25 MIN	30	25	12
20	2200-2650	2243-2693	44	MXR/7FF-02A2	7.2/9.0	+30 MIN	30	23	2
20	83	80-120	1.5-30	MXR/7BD-12L	6.8/8.0	+32 MIN	30	25	12
21	1850-1910	1020-1070	825-845	MXR/7FF-02A3	7.0/8.0	+30 MIN	30	25	2
21	10-1000	1200-2200	1221.4	MXR/6FG-12H1	7.0/8.0	+28 MIN	30	30	12
21	1890-1920	1610-1640	265-295	MXR/7FF-02A9	7.0/8.0	+30 MIN	30	25	2
23	34-58	39	3-18	MXR/7CC-02S4	5.2/6.5	+32 MIN	45	40	2
23	1200-1400	1200-1400	DC-200	MXR/7FF-02D3	8.0/9.0	+29 MIN	25	17	2
23	410-490	710-790	310	MXR/7DD-02R5	6.5/8.0	+35 MIN	30	25	2

Ultra-Miniature Mixer Specifications

* Package Code Drawings Begin on Page 18.

LO POWER (dBm)	RF FREQ. (MHz)	LO FREQ. (MHz)	IF FREQ. (MHz)	MODEL NUMBER	CONVERSION LOSS TYP/MIN (dB)	IIP3 (dBm)	L/R ISO TYP/MIN (dB)	L/I ISO TYP/MIN (dB)	PACKAGE CODE*
7	10-2000	10-2000	5-250	MXR/2001	10.0/11.0	+12 TYP	30	18	66
7	10-3000	10-3000	5-250	MXR/2002	10.5/11.5	+12 TYP	25	15	66
7	700-1000	700-1000	5-250	MXR/2003	8.5/9.5	+14 TYP	40	20	66
7	1700-2100	1700-2100	5-250	MXR/2004	10.0/11.0	+14 TYP	35	20	66
7	2200-2700	2200-2700	5-250	MXR/2005	10.0/11.0	+14 TYP	30	18	66
7	5-4000	5-4000	5-350	MXR/2006	9.5/9.5	+12 TYP	27	15	66

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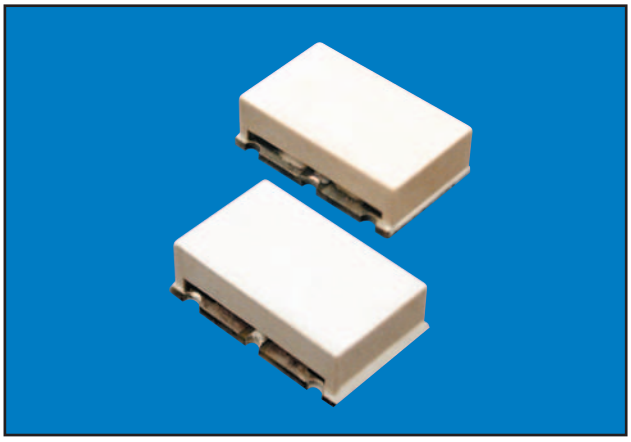
Phase Shifters, Voltage Variable

- Low Insertion Loss
- Good Return Loss
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Input Power: +5 dBm Max
- Control Voltage: 0 to +15V @ 20 uA Max
- Operating Temperature: -20 to +70C
- Storage Temperature Range: -40 to +100C
- Other Frequencies, Bandwidths and Packages Available



General Purpose Phase Shifter Specifications

* Package Code Drawings Begin on Page 18.

CENTER FREQUENCY (MHz)	MODEL NUMBER	BANDWIDTH MIN (%)	INSERTION LOSS TYP/MAX (dB)	PHASE SHIFT RANGE MAX (deg)	RETURN LOSS TYP/MIN (dB)	PACKAGE CODE *
140	PSV/140A-05	10	0.8/1.6	180	22/14	5
150	PSV/150A-05	10	0.5/1.2	180	17.7/11.7	5
1800	PSV/1800E-63	15	1.3/2.0	90	16/10	63
1800	PSV/1800D-63W	05	1.3/2.0	100	19.1/11.7	63
2000	PSV/2000D-63E	50	1.2/2.0	90	19.1/11.7	63
2000	PSV/2000E-63	10	1.2/2.0	90	20.2/13.0	63
2000	PSV/2000E-63	15	1.3/2.0	90	16/10	63

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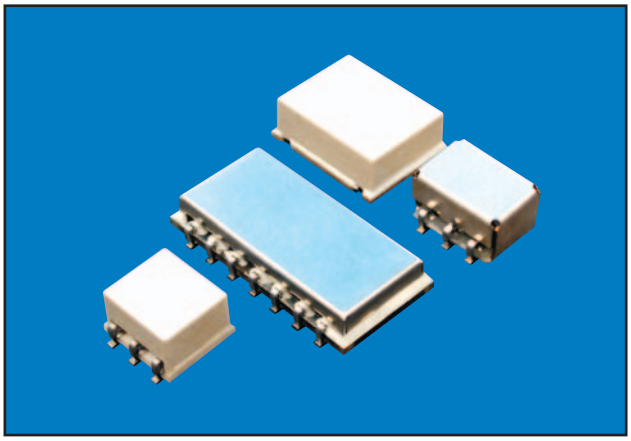
Power Splitters and Combiners

- High Isolation
- Low Insertion Loss
- High Return Loss
- Good Phase Balance
- Surface Mount, Low Profile
- Tight Phase and Amplitude Matching
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Standard Operating Temperature : -30 to +70C
- Storage Temperature : -40 to +85C
- Other Frequency, Bandwidth, Input Power, and Packages Available



50 Ohm Power Splitter and Combiner Specifications

* Package Code Drawings Begin on Page 18.

FREQ. START (MHz)	FREQ. STOP (MHz)	MODEL NUMBER	INSERTION LOSS MAX (dB)	ISOLATION MIN (dB)	POWER MAX (W)	N-WAY	PACKAGE CODE*
0.5	2000	SPL/2AF-01	2.0	13	1.0	2	1
1	500	SPL/2BD-01	0.8	23	1.0	2	1
1	500	SPL/2BD-08	0.8	23	1.0	2	8
4	500	SPL/2BE-01C2	0.8	20	1.0	2	1
4	1000	SPL/2BE-01	1.3	18	1.0	2	1
4	1000	SPL/2BE-08S5	1.5	20	1.0	2	8
4	2000	SPL/2BF-01	2.0	14	1.0	2	1
5	500	SPL/2BD-08A6	1.0	20	1.0	2	8L
5	1000	SPL/4BE-53C	1.5	20	1.0	4	53L
100	1000	SPL/2CE-01A	0.5	20	1.0	2	1
500	2000	SPL/2EF-01	2.0	13	1.0	2	1
902	928	SPL/3EE-53M1	0.5	20	1.0	3	53L
1200	1600	SPL/2EF-01C7	1.5	19	1.0	2	1
1400	2000	SPL/2FG-01T	0.5	16	3.0	2	1
1420	1520	SPL/2FF-01T4	0.5	20	3.0	2	1
1700	2100	SPL/2FF-01M2	0.5	15	3.0	2	1
1800	2800	SPL/2FG-01M1	0.6	15	3.0	2	1
1850	1950	SPL/2FF-01T	0.4	18	3.0	2	1
2400	2500	SPL/2GG-01A	0.5	20	3.0	2	1
3400	3600	SPL/2GG-01B	0.5	20	3.0	2	1

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75 Ohm Power Splitter and Combiner Specifications

* Package Code Drawings Begin on Page 18.

FREQ. START (MHz)	FREQ. STOP (MHz)	MODEL NUMBER	INSERTION LOSS MAX (dB)	ISOLATION MIN (dB)	POWER MAX (W)	N-WAY	PACKAGE CODE*
1	2000	SPL/2BF-01/75	2.0	14	1.0	2	1
4	1000	SPL/2BE-01/75	1.3	17	1.0	2	1
4	1000	SPL/2BE-01S3	1.3	20	1.0	2	1
4	1000	SPL/4BE-53T	1.8	15	1.0	4	53L
5	65	SPL/2BC-08G7	0.4	26	1.0	2	8
5	300	SPL/2BD-53A2	0.8	20	1.0	2	53L
5	300	SPL/4BD-53A2	1.5	20	1.0	4	53L
5	500	SPL/2BD-08T	0.6	17	0.5	2	8
5	1000	SPL/2BE-08S7	1.5	15	1.0	2	8
5	1000	SPL/2BE-53/75	1.0	22	1.0	2	53L
5	1000	SPL/4BE-53/75	1.5	20.5	1.0	4	53L
5	1000	SPL/4BE-53T7	1.5	20.5	1.0	4	53L
500	2000	SPL/2EF-01/75	2.0	14	1.0	2	1

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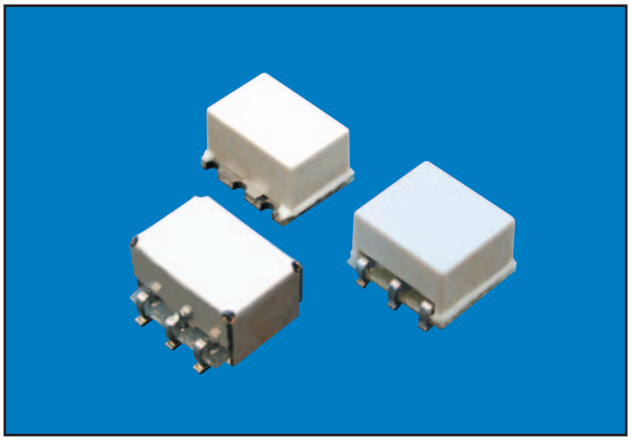
Quadrature and Junction Hybrids

- Bandwidth: 10%
- Impedance: 50 Ohm, Asterisk Denotes 75 Ohm
- Most ("E" Suffix) Models Available in 4-Port Option
- Operating Temperature = -20C to +70C
- Storage Temperature = -40 to +85C
- All 4-Port Devices Externally Terminated
- All 3-port Devices Internally Terminated with 250 mW Load
- JHB Models Center Frequency 0.1 - 2000 MHz Available
- Quadrature Models Center Frequency 0.1-1100 MHz Available
- Other Frequency, Bandwidth, Impedance, and Packages Available



Quadrature Specifications

* Package Code Drawings Begin on Page 18.

CENTER FREQUENCY (MHz)	MODEL NUMBER	INSERTION LOSS MAX (dB)	ISOLATION MIN (dB)	AMPLITUDE BALANCE MAX (dB)	PHASE BALANCE MAX (deg)	POWER MAX (W)	PACKAGE CODE*
60	QHB/60A-08	0.75	18	+/- 0.5	+/- 3.0	2	8
70	QHB/70A-08	0.75	18	+/- 0.5	+/- 3.0	2	8
70	QHB/70A-01	0.6	18	+/- 0.5	+/- 3.0	2	1
140	QHB/140A-08E	0.4	20	+/- 0.5	+/- 3.0	2	8
310	QHB/310-08S4	0.75	18	+/- 0.5	+/- 3.0	2	8
350	QHB/350A-08E	0.4	20	+/- 0.5	+/- 1.0	2	8
370	QHB/370A-08N	0.4	20	+/- 0.5	+/- 1.0	2	8
390	QHB/390A-08	0.5	20	+/- 0.5	+/- 3.0	2	8
495	QHB/495-08B	0.75	18	+/- 0.6	+/- 3.0	2	8
700	QHB/700-01	0.5	17	+/- 0.6	+/- 4.0	2	1
1090	QHB/1090A-08	0.75	18	+/- 0.7	+/- 3.0	2	8

Broadband Junction Hybrids Specifications

* Package Code Drawings Begin on Page 18.

CENTER FREQUENCY (MHz)	MODEL NUMBER	INSERTION LOSS MAX (dB)	ISOLATION MIN (dB)	AMPLITUDE BALANCE MAX (dB)	PHASE BALANCE MAX (deg)	POWER MAX (W)	PACKAGE CODE*
5-200	JHB/1BD-08S*	1.2	20	0.3	2	1	8L
5-200	JHB/1BD-08SM*	1.2	20	0.3	2	1	8L
40-1000	JHB/1BE-08S	1.3	20	0.3	3	1	8L

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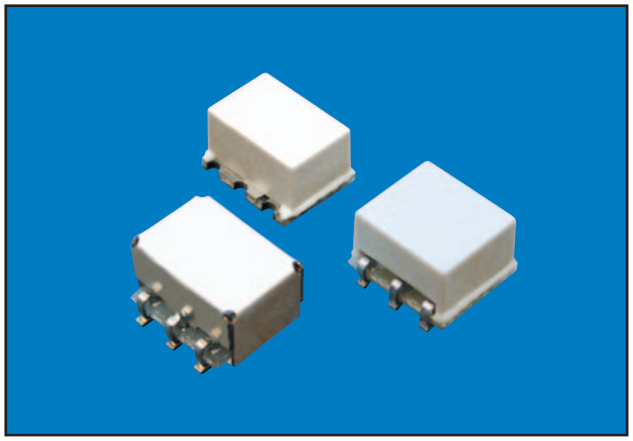
Transformers, Matching

- High Isolation
- Low Insertion Loss
- Surface Mount, Small Size
- Excellent Lot to Lot Reliability
- Tape and Reel Available
- Standard Operating Temperature : -30 to +70C
- Storage Temperature : -40 to +85C
- Package Codes: Models Available in 03 (SMD Hi-Rel) and 12 (Hi-Rel)
- Impedance Codes: CT= Center Tapped Secondary, U=Unbalanced, B= Balanced



General Purpose Transformer Specifications

* Package Code Drawings Begin on Page 18.

FREQUENCY RANGE (MHz)	MODEL NUMBER	INSERTION LOSS TYP/MAX (dB)	PRIMARY IMPEDENCE (OHMS)	SECONDARY IMPEDENCE (OHMS)	POWER MAX (W)	PACKAGE CODE *
0.03-50	TRF-1103	0.5/1.0	50-B	50-B,CT	2	8L
4.0-750	TRF/1127	0.7/1.8	50-B	50-B	1	8L
4.0-1000	TRF/1105	0.8/1.5	50-B	50-B	1	8L
30-88	TRF/1111	0.35/0.45	50-B	50-B,CT	1	8L
30-88	TRF/1141	0.5/0.6	50-B	100-B	1	8L
40-1000	TRF/1113	0.8/1.0	75-U	50-U	1	8L
50-550	TRF/1CD-08CD	0.5/0.7	50-U	150-U	1	8L

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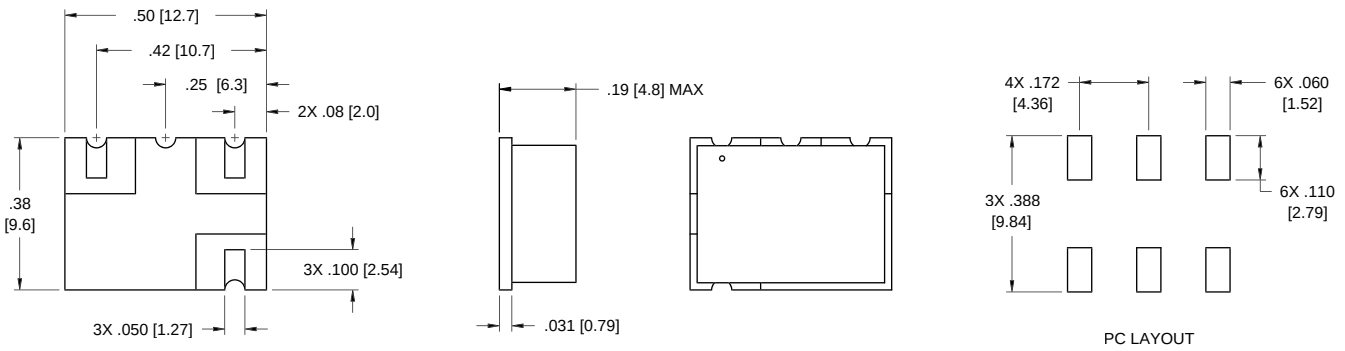
Package Drawings

Component Package Drawings

01



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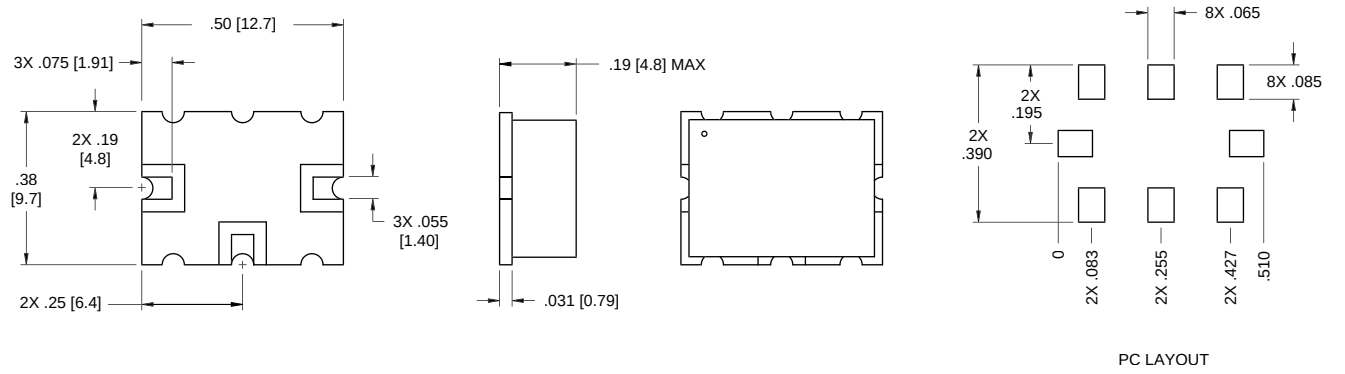

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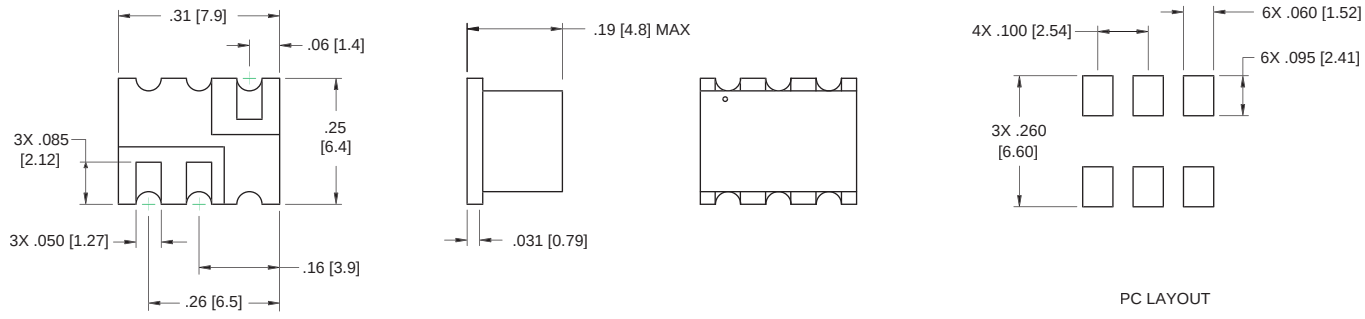

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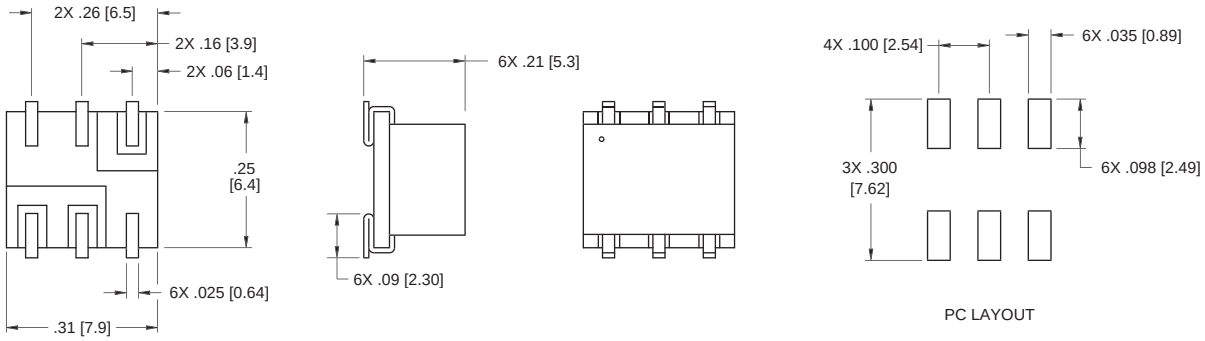
Package Drawings

04L



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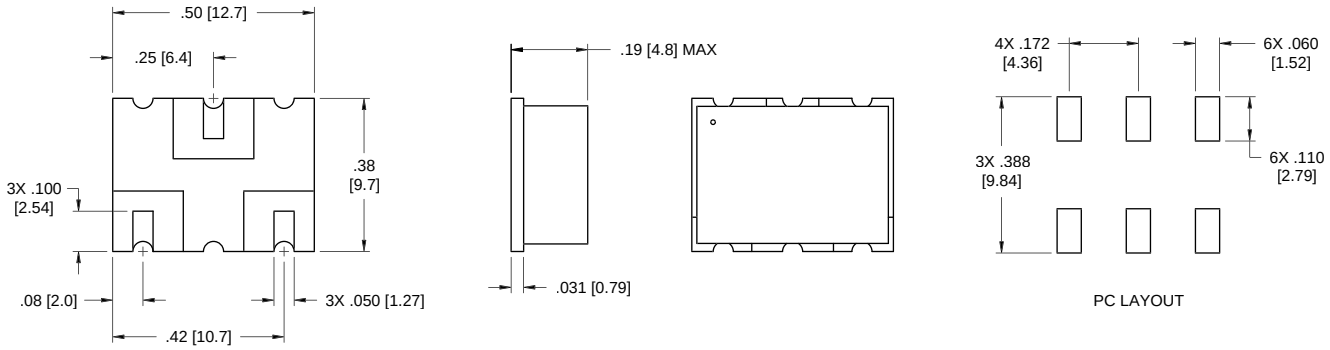

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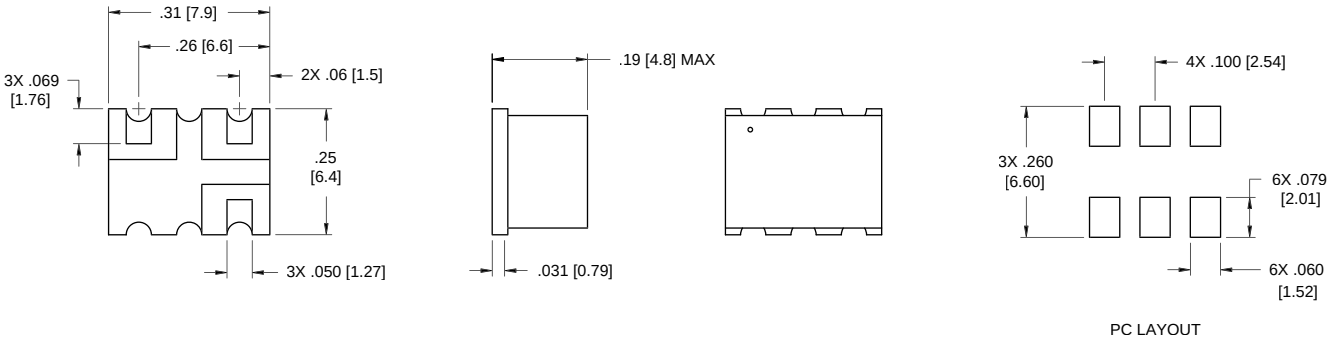

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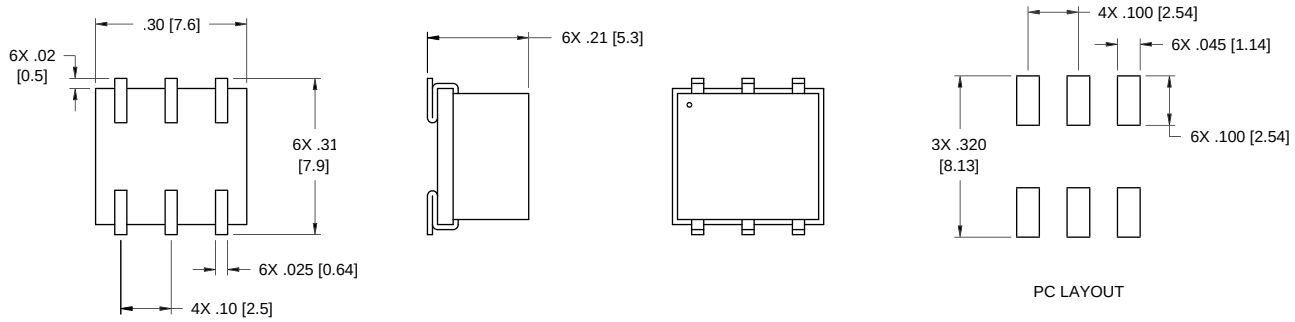
Package Drawings

08L



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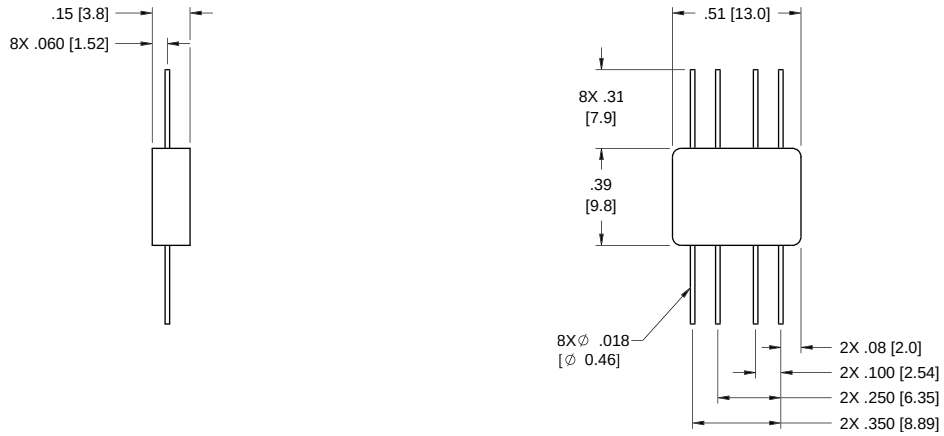

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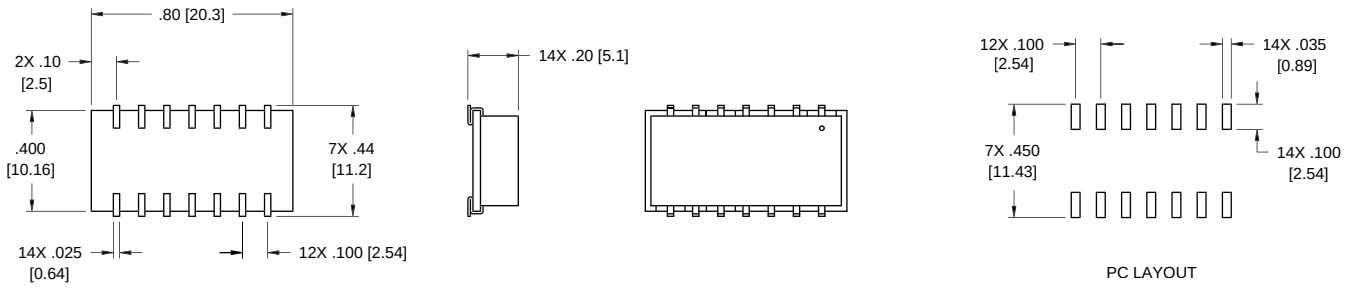

DIM = INCHES [MM]

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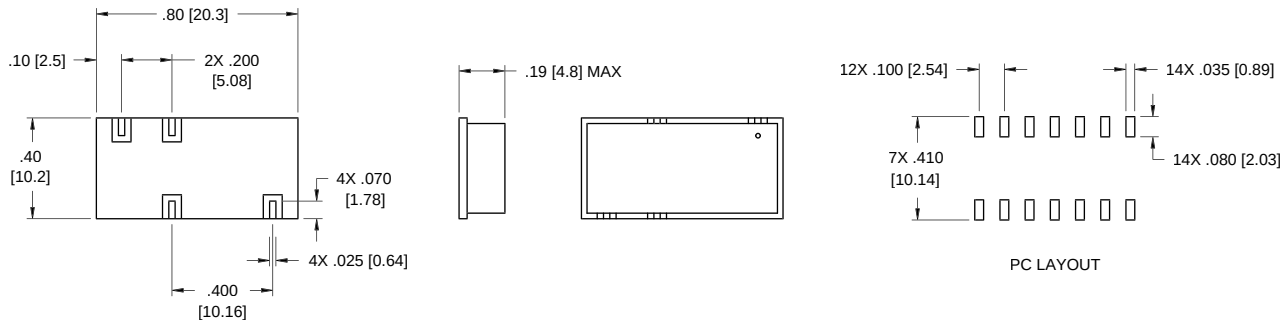
Package Drawings

53Q



DIM = INCHES [MM]

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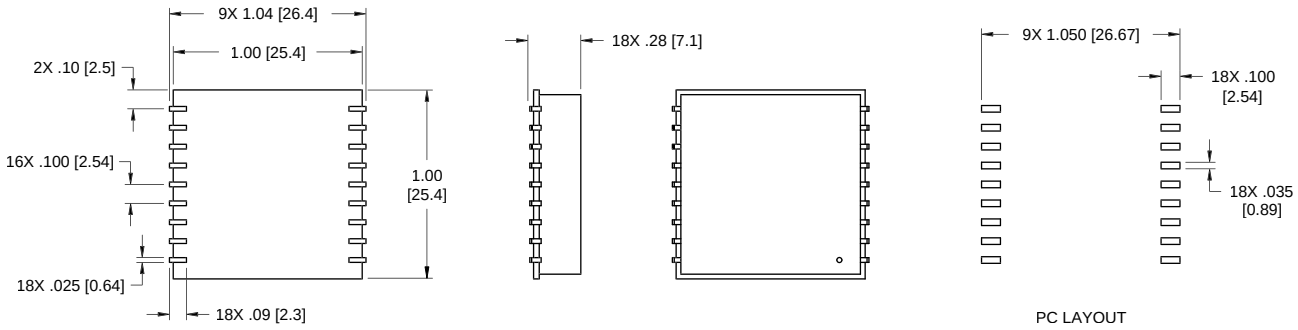

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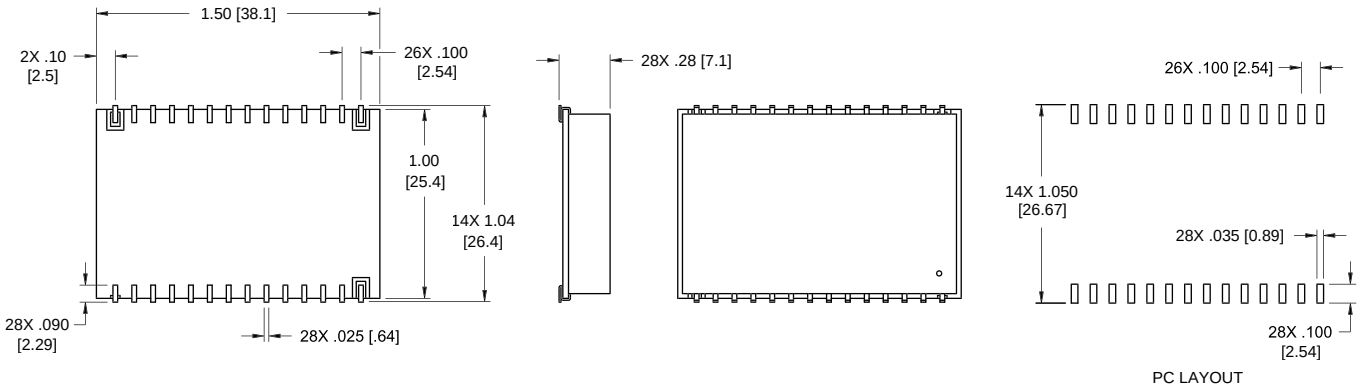

DIM = INCHES [MM]

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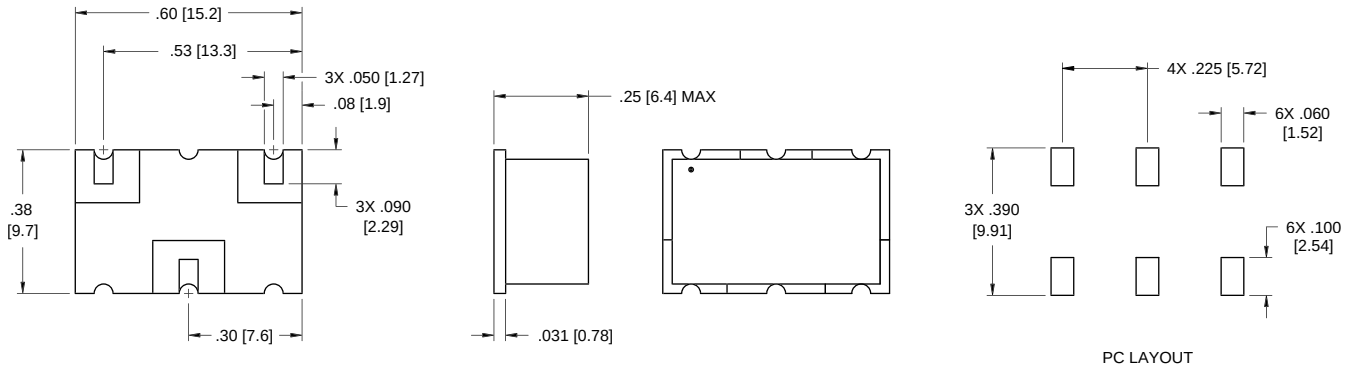
Package Drawings

63



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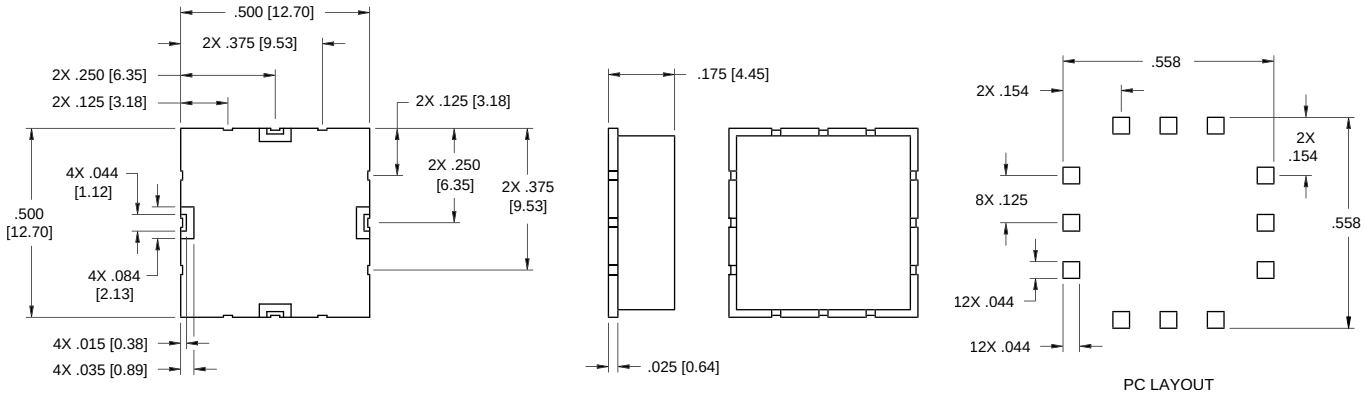

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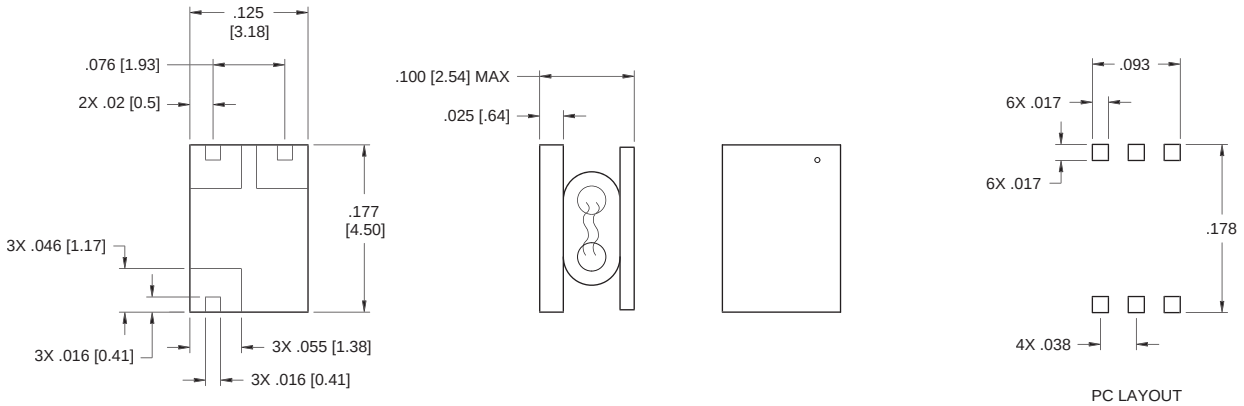

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Technical Tables and Charts

Couplers - Theoretical Loss in Coupling Coefficients

Coupling	10	15	20	30	dB
Insertion Loss	0.7	0.7	0.7	0.7	dB
Theoretical Loss	0.46	0.14	0.04	0.004	dB
Total	1.16	0.86	0.74	0.704	dB

Loss for the most common coupling values

Power Splitters - Ratio of Power Input to the Power Output at any Output Port

Ports	Ratio Input to Output (dB)
2	3
3	4.8
4	6
6	7.8
8	9
12	10.8

Add insertion loss to these figures for actual power output.

VSWR - Return Loss Conversion Table

RETURN LOSS (dB)	VSWR	RETURN LOSS (dB)	VSWR	RETURN LOSS (dB)	VSWR
-32.26	1.05	-11.29	1.75	-7.53	2.45
-26.44	1.10	-10.88	1.80	-10.88	1.80
-23.13	1.15	-10.51	1.85	-10.51	1.85
-20.83	1.20	-10.16	1.90	-10.16	1.90
-19.08	1.25	-9.84	1.95	-9.84	1.95
-17.69	1.30	-9.54	2.00	-9.54	2.00
-16.54	1.35	-9.26	2.05	-9.26	2.05
-15.56	1.40	-9.00	2.10	-9.00	2.10
-14.72	1.45	-8.75	2.15	-8.75	2.15
-13.98	1.50	-8.52	2.20	-8.52	2.20
-13.32	1.55	-8.30	2.25	-8.30	2.25
-12.74	1.60	-8.09	2.30	-8.09	2.30
-12.21	1.65	-7.89	2.35	-7.89	2.35
-11.73	1.70	-7.71	2.4	-7.71	2.40

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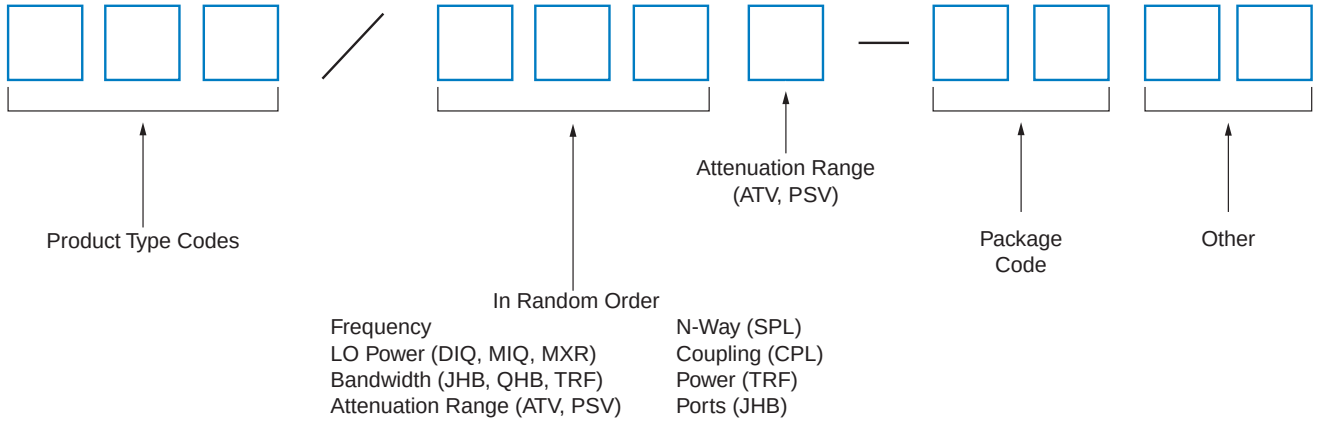
Model Number Configuration



Product Type Codes

ATV	Attenuator, Voltage Variable
CPL	Directional Coupler
DIQ	IQ Demodulator
JHB	Junction Hybrid
MIQ	IQ Modulator
MXR	Mixer
PSV	Phase Shifter, Voltage Variable
QHB	Quadrature & Junction Hybrid
SPL	Power Splitter & Combiner
TRF	Transformer, Matching

Frequency Range (MHz)

A	Below 1
B	1 - 10
C	10 - 100
D	100 - 500
E	500 - 1000
F	1000 - 2000
G	2000 - 4000
H	4000 - 6000
J	> 6000

LO Power Level (dBm)
(DIQ, MIQ, MXR)

1	=	0-4
2	=	+ 7
3	=	+10
4	=	+13
5	=	+15
6	=	+17
7	=	+21
8	=	+23
9	=	+27

Attenuation Range (dB)
(ATV)

A	25 +
B	20 - 25
C	15 - 20
D	10 - 15
E	5 - 10
F	< 5

Attenuation Range (Degrees)
(PSV)

A	180 +
B	150 - 180
C	120 - 150
D	90 - 120
E	90

Port/Power
(JHB)

1	4 Port Low Power
2	4 Port High Power
3	3 Port 180 Degree Low Power
4	3 Port 180 Degree High Power

Bandwidth
(JHB, QHB, TRF)

A	10 %
B	30 %

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Model Number Index

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