

# RADITEK short form Catalog

## Isolators and Circulators

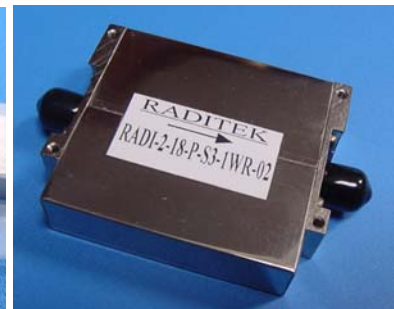
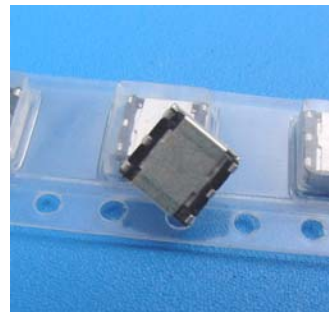
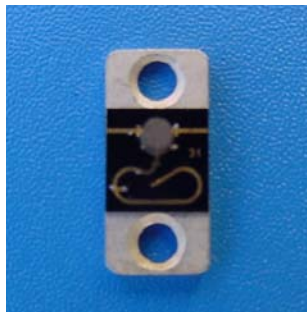
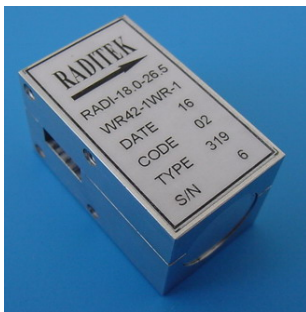
### RADITEK Inc.

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San Jose, CA 95125. USA

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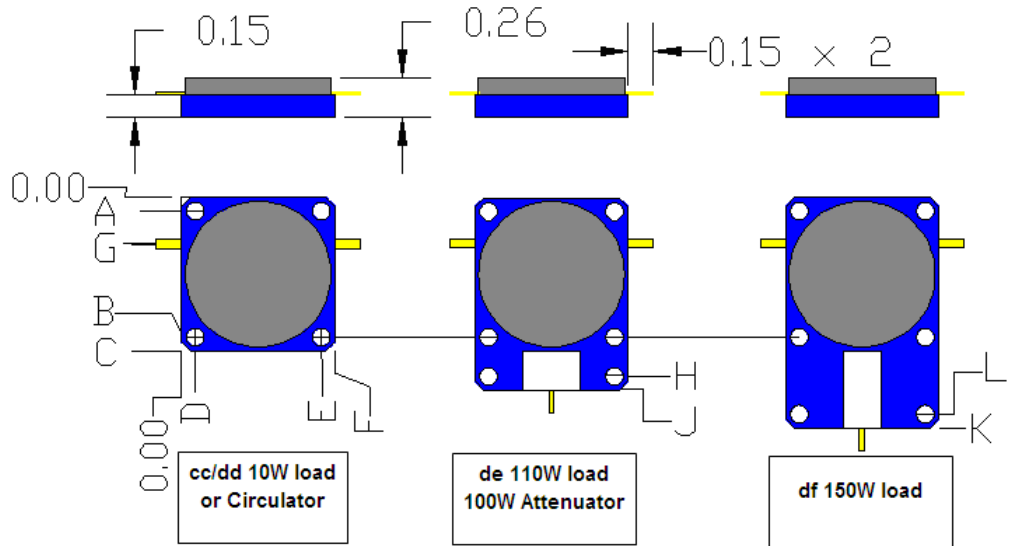
2016

# RADITEK Isolators and Circulators

## Stripline Models: SS, TT, TW

Please contact the factory or your representative with your exact requirements.

SS Stripline D=1inch		
Dimensions for DD, DE, DF		
	Inch	mm
A	0.09	2.28
B	0.91	23.11
C length	1.00	25.4
D	0.09	2.28
E	0.91	23.11
F width	1.00	25.40
G	0.30	7.62
H	1.16	29.46
I	1.41	35.81
length	1.25	31.75
K length	1.50	38.10
Hole dia.	0.116	2.95
Example: RI-SS-F1-F2-de-110WR 750MHz-2GHz typically		



The RADITEK Stripline isolator family has evolved over many years. Always using the best **ROHS compliant materials**, always lowest price for the best quality part!

The **SS family** are the RADITEK “work horse” isolator products. They have the best performance in their class with Samarium Cobalt side magnets.

**Note on reverse power handling:** Loads that are rated at 100W, for example, will only dissipate 100W (or less) up **100° C**, after which their power handling will linearly derate to 0 Watts (virtually no power handling) at and above 150° C! This is a fact for any load, for any company’s products. The customer must design amplifier heatsinks, accordingly.

SS housings are made from **ROHS compliant** Nickel plated Aluminum.

The **RADITEK “Flagship”** isolator products include the **TT** (Top magnet, low IMD type, and the latest “**TW**” model, which has improved in many ways over the original TW performance. The IMD has improved, we can now offer IMDs in excess of 86dBc (2 x 50W tones) at 869-894MHz. We also have an LP model, that has very stable phase, i.e.  $\sim \pm 1^\circ$  over a -40 to 75°C temperature range. For example RI-TW-869-894M-100WR-LP.

The **-WR** means the RF **Gyromagnetic rotation is clockwise**, the **-WL** means **counterclockwise rotation**.

The TT and TW models are both top magnet, steel designs (Nickel plated).

**The TW is especially designed to deliver the highest performance possible at the lowest cost possible. It has exceeded its design goal, by bypassing the TT performance**

### Typical examples and specs

RI-SS	F1 MHz	F2 MHz	BAND	RI-SS	F1 MHz	F2 MHz	BAND
dd/de	869	894	Cell	cc/cd	1805	1880	DCS
dd/de	915	960	GSM	cc/cd	1930	1990	PCS
dd/de	1930	1990	PCS	cc/cd	2100	2170	UMTS
In. loss dB	Isolation dB	Return loss	VSWR	In. loss dB	Isolation dB	Return loss	VSWR
<0.25	22	21	1.19:1	<0.25	22	21	1.19:1

# RADITEK Isolators and Circulators

Raditek Inc was founded in 1993, by Peter Corbett and Malcolm Lee, both telecommunications engineers.

- **RADITEK** has the largest range of isolator and circulator products in the world.
- Raditek manufactures Waveguide, Coaxial, Microstrip and Stripline units covering 30MHz to 300GHz, Power ranges are from mille Watts to Mega Watts.
- Most of the Stripline [Isolators](#) and [Circulators](#) are optimized for the Cellular, PCS Base Station markets.
- **Performance:** In addition to their superior insertion loss, isolation and VSWR, the highest performance units have been optimized to have the excellent IMD Performance necessary for the stringent growing WCDMA and CDMA requirements. The finest quality high energy Ceramic 8 and 10, Samarium Cobalt magnet models are used as they are highly inert / un-reactive in the most hostile environments (e.g. high humidity and high temperature). We have shipped hundreds of thousands of isolators and circulators.
- **Oscillators:** Raditek offers a full range of [Oscillators](#); DRO, PLO, CRO, VCO, TCXO, VCTCXO. OCXO Our Oscillator division, designs, and manufactures Phase Locked Sources, Dielectric Resonant Oscillators (DRO) from 1-45GHz.
- **Quad Hybrids and Couplers:** High Power [Quad Hybrids and Couplers](#), surface Mount, drop in and connectorized couplers and hybrids (>100W) Phase splitters and combiners, 3 way overpass with compact multi-octave models. We can cross reference to any competitor, usually with better performance.
- **Quality:** Raditek's quality is extremely important. RADITEK strives towards perfection, Our Quality system is to ISO 9000 standards, and our QA Manual and documents available on our web site, (Use Raditek Intranet Button: password ISO2000), note the QA Documentation matches the 20 ISO modules.
- **Facilities:** Raditek has extensive domestic and international manufacturing facilities, and is dedicated to continually trying to meet, or exceed the global cost and performance challenges, as the various markets grow, decline or mature.
- **R & D:** Raditek has established leading edge R & D centers. We have an expert team of Scientists and Engineers developing advanced isolator and circulator products to 300GHz.
- **Our Customers:** Raditek's products are used extensively around the globe. Raditek is the main, or in some cases, the only supplier of many US and other military suppliers. Our products can be found in military aircraft and ships, in addition to Cellular Base Stations, Microwave Radios and every kind of amplifier, to broad band, multi-octave bandwidths.
- **RADITEK TW MODEL (LOWEST IMD) page 4**

# RADITEK Isolators and Circulators

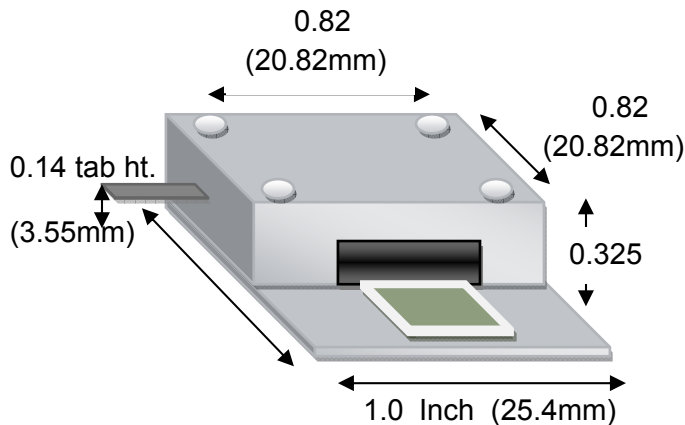
## Stripline High Performance Model... examples..

**RI-TW-869-894M-de-110WR-U**

**RI-TW-1805-1880M-kde-110WR-U**

**RI-TW-1930-1990M-kde-110WR-U**

Raditek leads with IMD performance. Using only the highest performance components, and careful, minimum cost design, RADITEK is redefining the previous cost performance baseline. Meeting an amazing 90dBc IMD (typical) with 2 x 30W tones. This model is a drop-in, equivalent sized part to the well known Raditek “TT-de and SS-de” family of parts.



Mounting holes are 0.075 inch Ø (1.9mm), 90mil (2.3mm) in from the edge.

Units: inch (mm) Base plate is 1mm thick. **Unit meets all ROHS standards**

Constructed from CRS1018 or equivalent (steel), Nickel plated per AMS-2404, 0.0003-0.0004 inch thick.

Order as **RI-TW-1805-1880M-kde-110WR-U** (WL for anti clockwise field rotation)

Replace -100WR with -20AWR and -30AWR for 100W attenuator loads. -U for low IMD.

Specifications for 1805 to 1880MHz, and 1930-1990MHz models, over: -20 to +85°C:-

Insertion loss	S21	≤0.25	dB	
Input Return Loss	S11	≤-23	dB	
Output return Loss	S22	≤-23	dB	
Isolation	S12	≤-25	dB	
IMD	2 x 30W tones	≤-82	dBc	Spec.
IMD	2 x 30W tones	≤-90	dBc	Typical
Reverse power rating (load dependent)	110W as per load rating.	100W, 20dB and 30dB attenuator loads also available		

## Best performance and lowest IMD

## Linear phase (-LP Option) has the best phase over temperature spec

Isolators and Circulators Short Form Catalog **Specifications may be subject to change**

02/04/15

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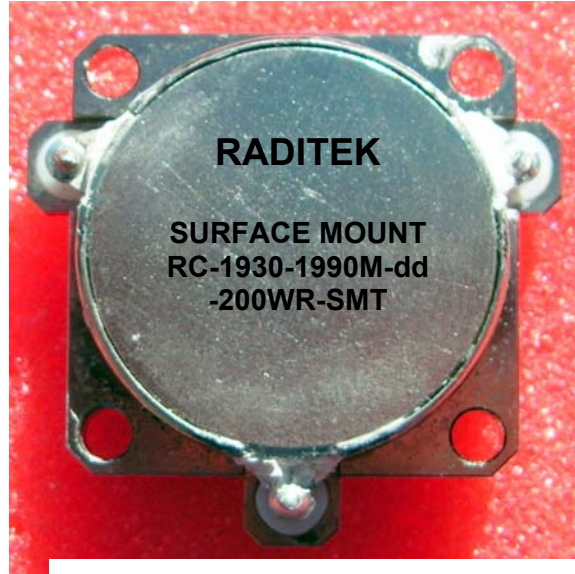
# RADITEK Isolators and Circulators

## RADITEK INC. SURFACE MOUNT Circulator product family.

- RC-869-894M-dd-200WR-SMT
- RC-921-960M-dd-200WR-SMT
- RC-1802-1880M-dd-200WR-SMT
- RC-1930-1990M-dd-200WR-SMT

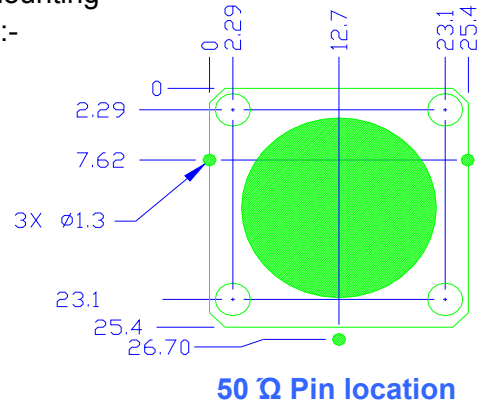
Custom bands in volume. Features:

- ✓ Solder reflow or screw down
- ✓ ROHS compliant
- ✓ Highest performance
- ✓ Same size and footprint over a wide range
- ✓ Unique Precision surface mount design
- ✓ Patent applied for.
- ✓ Unique circular pedestal mounting for best compatibility with existing round SMT models.



Footprint/mounting information:-

One of the lowest cost, SMT approaches, especially for high volume, reflow manufacture, is to design, using a high performance RADITEK Circulator, (either soldered down or screwed down-novel dual mount technique for maximum flexibility). It is always cheaper to add an external **50 Ω** load, if the very lowest cost approach is sought. Nickel plated Aluminum construction.



### SPECIFICATIONS:-

Insertion loss	<0.35dB	
Isolation	>25dB	
In/Out return loss	<23dB	
IMD	-70dBc typical	2 x 50W tones
Operating temperature	-10 to +80°C	
Storage	-40 to 100°C	
Forward power	>200W	
Peak power	>1.5kW	

Standard frequencies include:

869-894MHz, 921-960MHz, 1805-1880MHz, 1930-1990MHz.

# RADITEK Isolators and Circulators

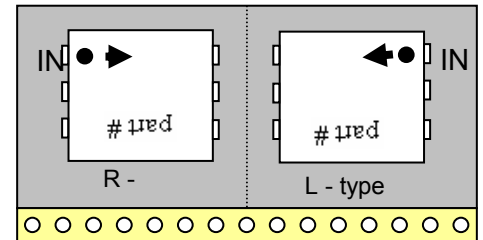
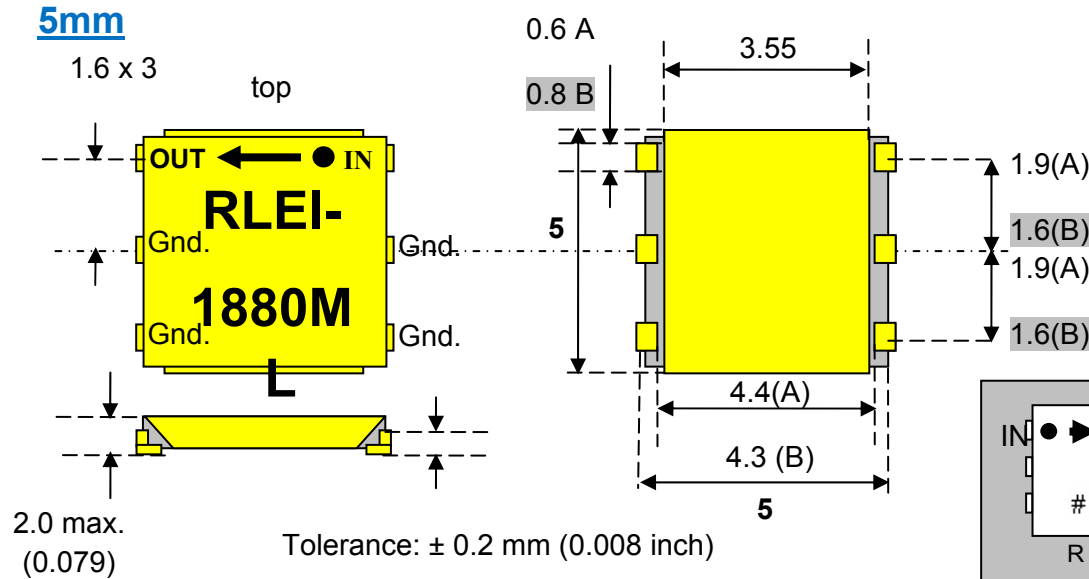
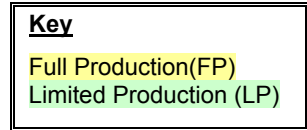
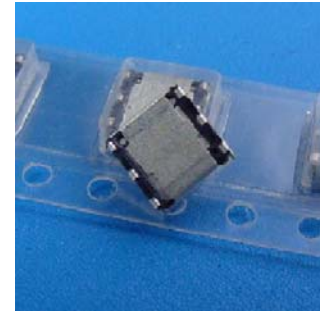
## RLEI LUMPED ELEMENT ISOLATORS **5x5 mm**

RADITEK Lumped element isolators offer a low cost inter-stage matching solution. **5 and 7mm model sizes.**

These are available currently in the frequency bands shown; other bands can be offered for high volume applications. They are currently manufactured in

**5x5 mm in lots of 2000** and **7x7 mm also available in lots of 2500**

Smaller quantities often available from stock



Standard Packaging:  
5X5mm 2000 EA and 7X7mm 2500 EA

New unit development requires a 10K piece commitment due to automated tooling and testing set up costs

Specifications:	Freq. center (MHz)	Part Mark	Full BW (MHz)	Band	Insertion loss dB (max.)	Isolation dB (min.)	VSWR	Fwd Power W.	Rev (Load) Power W.	Foot Print/ Prod
RLEI-806-824M-5mm-1WL/R	815	G815	18	TRS	0.55	15	1.5:1	5	1.0	A(LP)
RLEI-824-849M-5mm-1WL/R	836.5	G836	25	CDMA	0.65	13	1.5:1	5	1.0	A(FP)
RLEI-869-894M-5mm-1WL/R	881.5	G881	25	CDMA	0.65	13	1.5:1	5	1.0	A(FP)
RLEI-890-915M-5mm-1WL/R	902.5	G902	25	GSM	0.65	13	1.5:1	5	1.0	A(FP)
RLEI-935-960M-5mm-1WL/R	947.5	G947	25	GSM	0.65	13	1.5:1	5	1.0	A(FP)
RLEI-1429-1453M-5mm-1WL/R	1441	1G44	24		0.60	15	1.5:1	5	1.0	B(LP)
RLEI-1560-1590M-5mm-1WL/R	1575	1G57	30	GPS	0.60	13	1.5:1	5	1.0	B(FP)
RLEI-1645-1675M-5mm-1WL/R	1660	1G66	30		0.60	15	1.5:1	5	1.0	B(LP)
RLEI-1710-1785M-5mm-1WL/R	1747.5	1G74	75	DCS	0.7	13	1.6:1	5	1.0	B(FP)
RLEI-1805-1880M-5mm-1WL/R	1842.5	1G84	75	DCS	0.60	15	1.5:1	5	1.0	B(FP)
RLEI-1850-1910M-5mm-1WL/R	1880	1G88	60	US-PCS	0.60	15	1.5:1	5	1.0	B(FP)
RLEI-1920-1980M-5mm-1WL/R	1950	1G95	60	W-CDMA	0.60	15	1.5:1	5	1.0	B(FP)
RLEI-1930-1990M-5mm-1WL/R	1960	1G96	60	US-PCS	0.60	15	1.5:1	5	1.0	B(FP)
RLEI-2200-2300M-5mm-1WL/R	2250	2G25	100	W-LAN	0.70	12	1.6:1	5	1.0	B(LP)
RLEI-2300-2400M-5mm-1WL/R	2350	2G35	100	W-LAN	0.70	13	1.5:1	5	1.0	B(FP)
RLEI-2400-2500M-5mm-1WL/R	2450	2G45	100	W-LAN	0.60	12	1.5:1	5	1.0	B(LP)
RLEI-2500-2700M-5mm-1WL/R	2600	2G60	200	W-LAN	0.80	15	1.5:1	5	1.0	B(LP)
RLEI-2630-2655M-5mm-1WL/R	2642.5	2G64	25	DMB	0.7	13	1.5:1	5	1.0	B(FP)

Order as: **RLEI-F1-F2M-5mm-(Reverse Power)W ("L" or "R")**

Packing: Tape and reel (2000 per reel, minimum order).

Operating temperature: -35 to +85 °C.

Survives: 260 °C for 30 seconds (for Reflow process).

Power Forward 5.0W  
Power Reverse 1.0W

Condition for Vibration Test:

-Frequency: 10~55Hz

-Amplitude: 1.5mm

-X,Y,Z each 2Hr

Isolators and Circulators Short Form Catalog

Specifications may be subject to change

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# RADITEK Isolators and Circulators

## RDKF Isolators

2 Hole models: Microstrip isolators (6 to 36 GHz)

The RDKF series of isolators is designed to meet most of your Microstrip requirements. They can be made to your exact frequency needs.

Standard dimensions include drop-in replacements for FDK and TDK.

All thin film isolator circuits are gold on copper, suitable for soldering (very easy with regular solder), (silver solder preferred), or gold thermo-comp. bonding

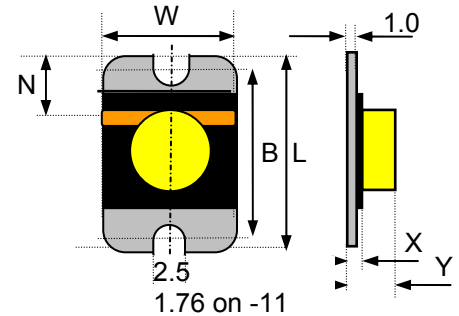
General specifications: 2 hole models



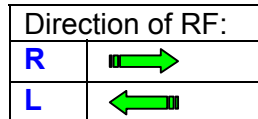
Model foot print	Frequ. (GHz)	% BW	Max. power (W)	Available loads. Watts	Pad height mm X	Ht. ax Y	Pad width mm	Equiv. to:
-51	6 to 13	10	10	1,6,10	1.65	5.5	0.43	FDK
-42	9-15	24	20	10,15, 20	1.65	5.5		FDK
-41	9-15	24	15	1, 3,5,10,15	1.65 1.40	5.5	0.45	FDK.
-41	14-17	20	15	1, 3,5,10,15 **	1.50 1.40	5.5	0.356	FDK
-41	17-20	20	15	1, 3,5,10,15	1.65 1.40	5.5 (4.2)	0.35	FDK (<opt).
-40	10-23	24	1,2	0.25, 0.5, 1	1.65	5.5		FDK
-40T	20-23	10	2	1	1.65	5.5		TDK
-39	9-15		5	1	1.65	5.0		Special
-31	17-31	8	5	1	1.50	3.8		FDK
-21	18-36	8	5	1,2	1.55	5.0	0.17	FDK
-11	30-36	10	5	1	1.14	4.5	0.14	

Units: mm

Model	W	L	B	N
-51	9	19	14	7.5
-42	7	21.5	17.5	7
-41	7	19.5	15.5	6
-40	7	16	12	6
-40T	7.11	16	12	6
-39	7	13.2	12.4	4.5
-31	6	17.5	13.5	6.15
-21	5	16.5	12.5	6.1
-11	3.38	14.0	11.0	4.75



Operating Temp.	-40°C +70°C
Storage Temp.	-40°C +130°C



Tolerance +0.00/ -0.043 outline  
 +/- 0.11 Holes/ slot centers  
 Specification may be subject to change

Ordering information: example RDKF-17.7-19.7-41-1WR (Isolator)  
 Use part # in format as: RDKF-F<sub>L</sub>-F<sub>H</sub>-Model-Power<sub>rev</sub> Direction  
 F<sub>L</sub>-Lower frequency-F<sub>H</sub> Higher frequency, Model (40/41 etc),  
 wer (ie 1Watt) Power direction  
 {R= Clockwise rotation, or left to right (**default**)  
 or L= Counter clockwise rotation.}-Option

**Do not heat above 130°C**  
 Humidity 5-95% non-condensing  
 Max temperature during welding +350°C for 25msec  
**Extended Temperature range**  
 At 80 °C, add 0.1 dB to Insertion Loss,  
 and subtract 1.0 dB from Isolation  
 At 90C °C, add 0.3 dB to Insertion Loss,  
 and subtract 4.0 dB from Isolation  
 At 100C °C, add 0.4 dB to Insertion Loss,  
 and subtract 5.0 dB from Isolation  
 Higher temperature parts with better specs are available

# RADITEK Isolators and Circulators

## RDKF Isolators / RDKC Circulators

### 4 Hole models: Microstrip isolators and circulators (1.7 to 14.5 GHz)

-recommend RADC MS51 series over 6GHz

The RDKF(C) series of isolators and circulators are designed to meet **all** of your Microstrip requirements. They can be optimized to **your exact** frequency needs. Standard dimensions include drop-in replacements for FDK and TDK (for example).



All thin film isolator circuits are gold on copper, suitable for soldering (very easy with regular solder, (silver solder preferred), or gold thermo-compression bonding

#### General specifications:

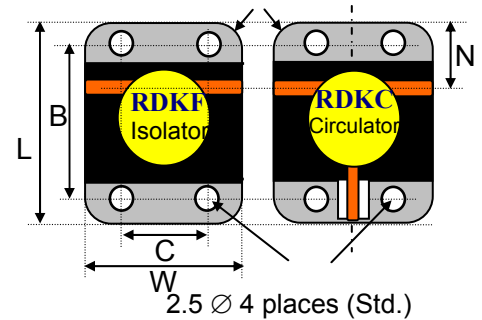
Model foot print	Frequency (GHz)	Max % bw available	Max. Fwd power (W)	Available loads. Watts	Tab height mm	Height Mm max	Pad width mm
-80	1.7-3.0	25	15	0.25,1,2,10	2.2	6.0	
-70/ 71	3.0- 6	17	10/25	0.25,1,2,10, 15,20	2.2	6.0	1.0/0.8
-68	3.7-4.1		20	0.2W	2.2	6.5	
-65	3.7 - 5.8	14	25	20,25	1.85	6.0	
-64	9.1-9.5	10	30	30	2.2	6.1	
-63	9.5-10.5	10	25	20	1.635	5.5	
-61	4 - 9	18	20/50	0.25,2,8,10, 15, 20	1.85	5.5	0.43
-43	9.0-10.5	10	15/25	1,2,10,12, 15, 20*	1.65	5.65	0.43
-49	14.0-14.5	10	12	2, 10, 12 Max	1.50	4.6	

-43 20W load sticks out 0.5mm at the base of the unit

Operating Temp.	-40°C +70°C
Storage Temp.	130°C Max

Direction of RF:	
R	
L	

Dimensions (Units: mm)					
	W	L	B	C	N
-80	20	30	25	15	10
-71	15	25	20	10	8
-70	15	25	20	10	9
-68	15	20	16	11	7.2
-65	12.7	24	19	7.7	9
64b	12.7	24	19.7	7.7	6.5
-63	9	19	14	6	7.5
-61	12.0	20	15	7	6.5
-43	10.2	17	14	7.4	7.0
-49	7.1	13.2	10.4	4.3	4.84



2.0mm (Models -68, -70)  
1.6mm (Model -43)

**Tolerance (w\*1\*h) + 0/- 0.04 mm, pad position) +/- 0.1mm +/- 0.1 Holes/ slot centers**

Specification may be subject to change  
Do not heat above 130°C

Humidity 5-95% non-condensing  
Max temperature during welding +350°C for 25msec

#### Extended Temperature range

At 80 °C, add 0.1 dB to Insertion Loss, and subtract 1.0 dB from Isolation  
At 90C °C, add 0.3 dB to Insertion Loss, and subtract 4.0 dB from Isolation  
At 100C °C, add 0.4 dB to Insertion Loss, and subtract 5.0 dB from Isolation

Higher temperature parts with better specs are available

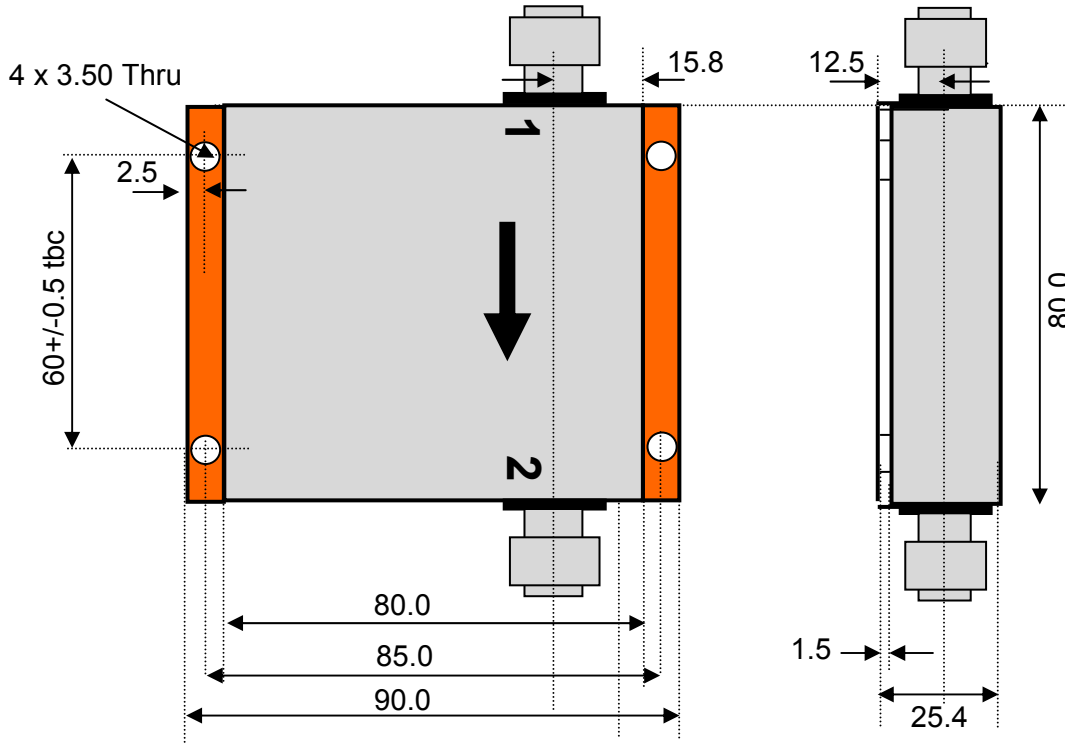
**Ordering information: example RDKF-3.7-4.2-70-1WR (Isolator)**  
**Use part # in format as: RDKF- $F_L$ - $F_H$ -Model-Power<sub>rev</sub> Direction**  
 $F_L$ -Lower frequency- $F_H$  Higher frequency, Model (70/61 etc),  
 Reverse (load) Power (ie 1Watt) Power direction {R= Clockwise, or left to right (**default**) or L= Counter clockwise.}-Option



# RADITEK Isolators and Circulators

## ISOLATOR LL1 for VHF TV Band 1

49 to 88 MHz, SMA Connectors,  
**100 Watts 6 MHz Bandwidth**



For TV Channels 2-6		
TV Channel	Freq MHz	% Bwidth
	49-57	15%
2	54-60	11%
3	60-66	10%
4	66-72	9%
5	76-82	8%
6	82-88	7%

N / SMA Connector options (X)		
Isolator		
Port 1	Port 2	
Female	Male	-1
Male	Female	-2
Female	Female	-3
Male	Male	-4

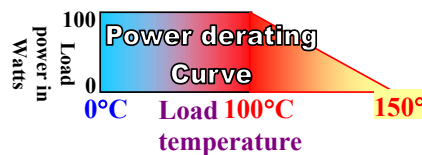
Load cooling via Conduction through housing, must be bolted to a heat sink

Not to scale, Units:mm

**Order Examples: RI-54-60M-LL1-S3-100WR**

Description: (Isolator, Coaxial, 54-60 MHz, SMA Female Connectors, 100 Watts, Clockwise Rotation, 6 MHz Bandwidth)

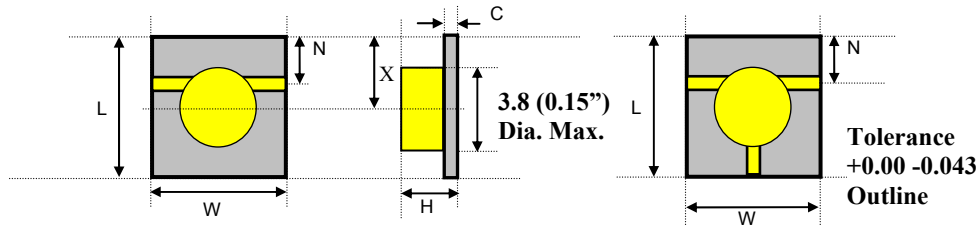
Specifications:				Units
Frequency	49-57	54-88		MHz
Bandwidth	full	6		MHz
Insertion loss	0.8	0.8 *	0.5dB target	dB
Isolation	18	17.5	18.0 target	dB
VSWR	1.3	1.28		:1
Power handling Peak	120	120		Watt.
Power handling	100	100		Watt fwd.
Power handling	100	100	500mSec max	Watt rev.
Temperature range	10-55	0 to 70		°C
Connector	SMA	SMA		



# RADITEK Isolators and Circulators

## MSS: Isolators or Circulators Microstrip Substrate only, to 55GHz.

### RADI/C-FLOW-FHIGH-MSS-XW-L/R-NM/M



All thin film isolator circuits are gold on copper, suitable for soldering.  
(Very easy with regular solder, (silver solder preferred), or gold thermo-compression bonding.

Units: mm (inch). Not to scale. Specifications over full operating temperature (-30 to +70 °C)

Examples (there are many not included here)

<i>RADI/C:- (GHz)-MSS</i>	<i>W mm</i>	<i>L mm</i>	<i>H mm max</i>	<i>N mm</i>	<i>X mm</i>	<i>C mm</i>	<i>In. loss dB</i>	<i>Isol dB</i>	<i>VSWR</i>	<i>Pwr W</i>	<i>Pwr W</i>
<b>Tolerance</b>	<b>±.03</b>	<b>±.03</b>	<b>±.03</b>	<b>±.03</b>	<b>±.03</b>	<b>±.01</b>				<b>fwd</b>	<b>Rev</b>
2.1-2.4	20	12	5	2.54		1	0.5	20	1.3	2	0.2
3.05-3.5	15	16	5	3.5		1	0.7	17	1.6	2.5	0.6
3.9-4.4	12	12	5				0.5	20	1.25		1
4.3-5.1	12	12	5	2.54		1	0.5	20	1.3	2	0.2
5.0-5.9	10.6	9	5	2.54		1	0.5	20	1.3	2	0.2
5.6-6.4	9.97	9	4.02				0.5	20	1.22	2	0.2
5.6-7.4	10	9	5	2.54		0.635	0.5	20	1.3	2	0.2
7.7-8.5	9.9	9	5	2.49		0.635	0.4	20	1.2	2	0.2
8.0-8.6	10	9	5	2.54		0.635	0.45	20	1.30	2	0.2
9.0-10.0	6.35	6.35	4	1.5	3	0.635	0.5	19	1.25	2	0.2
10.0-12.0	7	7	4	1.5	3	0.5	0.6	17	1.35	2	0.2
11.4-11.75	7	7	4	1.5	3	0.5	0.4	22	1.0	5	5
12-13.5	7	7	4	1.5	3	0.5	0.6	17	1.35	2	0.2
13-15	7	7	5	1.5		0.5	0.7	18	1.35	1	0.25
13.9-14.55	7	7	4	1.5	3	0.5	0.4	22	1.0	5	5
14.5-15.6	7	7	4	1.5	3	0.5	0.6	17	1.35	2	0.2
15.5-17.5	7	7	4.5	1.5		0.5	0.6	20	1.3	2	0.25
16.5-17.5	7	7	4	1.5	3	0.5	0.5	18	1.25	2	0.25
17.7-19.7	6	6	4	1.0	2	0.38	0.8	20	1.25	2	0.2*
18.0-19.0	6	6	4	1.0	2	0.38	0.8	20	1.25	2	0.2*
19.5-19.8	6	6	4.38	1.0		0.38	0.8	20	1.35	1	0.25*
20.0-22.5	5	5	3.8	1.5		0.38	0.8	18	1.3	0.2	0.2
22.0-25.0	6	6	2.5	1.0		0.38	1.0	17.5	1.30	0.2	0.2
28.0-32.0	5	5	2.5	1.0		0.25	1.0	20	1.35	2	0.2*
29.5-31.5	5	5	4.00	1.0		0.25	0.9	20	1.35	2	0.5
30-37.0	4.5	9	3.5	1.0		0.20	0.8	17	1.25	1	0.2*
30-40.0	4.5	4.5	3.5	1.0		0.38	0.8	17	1.25	1	0.2*
37.0-40.0	3.33	6.5	4	1.0		0.20	0.9	20	1.35	2	1
46.5-47.5	5.0	5.0	2.5	1.1		0.20	1-1.2	18	1.3	1	0.5*
54.25-55.25	2.0	5.5	2.0			0.15	1.2	20	1.5	1	0.25

Options:.. Ferromagnetic (add **M**) and non ferromagnetic mounting structure (add **NM**) options

Isolators and Circulators Short Form Catalog Specifications may be subject to change

02/04/15

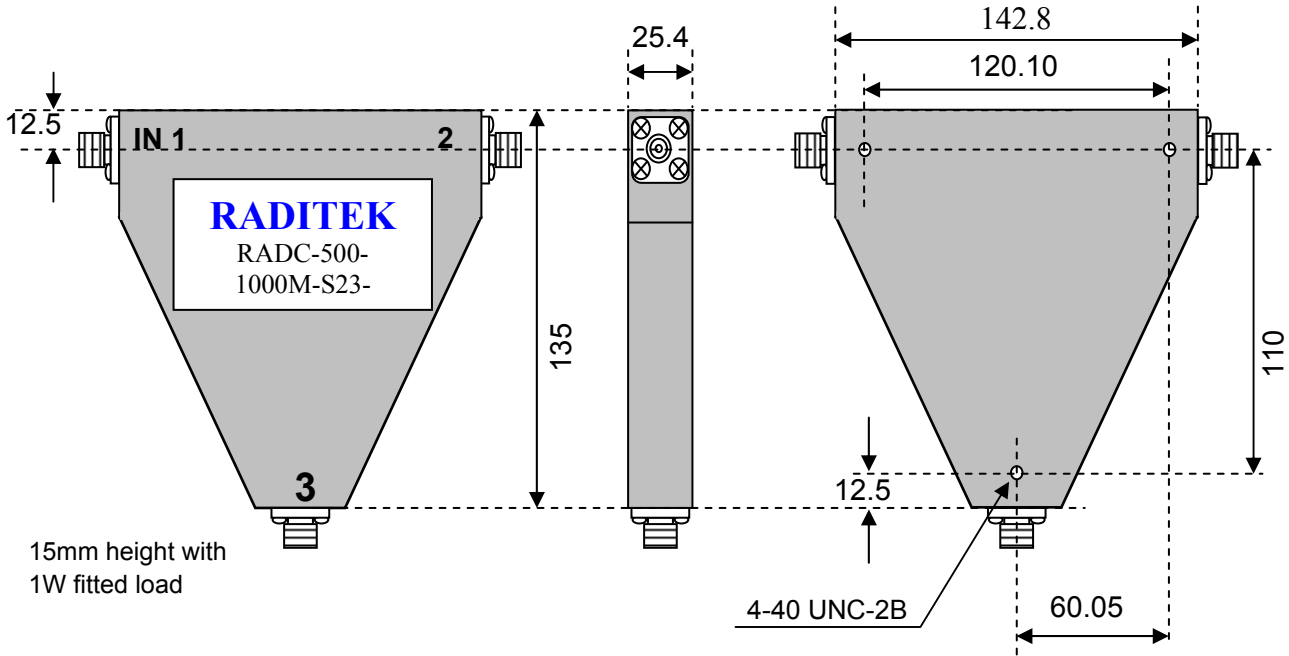
WORLD HQ: 1702H Meridian Ave. Suite 127, San Jose, Ca 95125, U.S.A.

Telephone: (408) 266-7404 FAX: (408) 266-4483

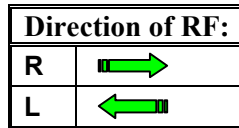
WEB: [www.raditek.com](http://www.raditek.com) , E-mail: [sales@raditek.com](mailto:sales@raditek.com)

# RADITEK Isolators and Circulators

## Coaxial Isolator (RADI-) or Circulator (RADC-) 500-1000MHz SMA Connector



SMA Connector options (X)				
Isolator			Circulator	
Port 1	Port 2		Port 3 Male	Port 3 Female
Female	Male	-1	-11	-21
Male	Female	-2	-12	-22
Female	Female	-3	-13	-23
Male	Male	-4	-14	-24



Specifications: MHz	Insertion loss dB (max)	Isolation dB (min)	VSWR :1 (input and output)	Rated Power (Fwd) Watts (avg)	Rated Power (Rev) Watts (avg)	Operating Temp°C
500-1000 (C)	0.6	17	1.35	50	10	+15 to +35
500-1000 (I)	0.6	17	1.35	50	1, 5, 10	+15 to +35
450-900 (C)	0.8	15	1.5	1	1	+15 to +35

Forward operating Power for RADC-500-1000MHz is ≤ 50W.

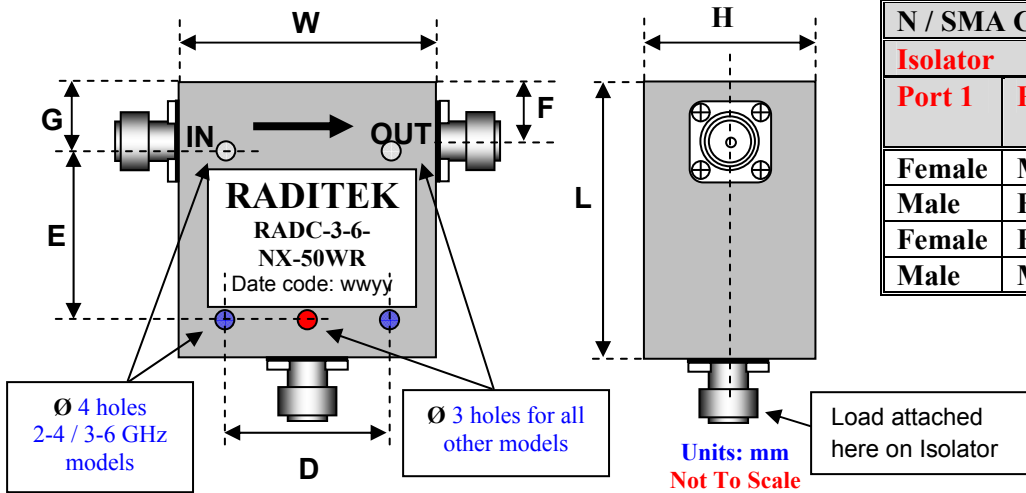
⊗ Order Examples: **RADC-500-1000M-S23-10WR** (or -50WR)  
**I=ISOLATOR / C=CIRCULATOR**

See web site for more information [www.raditek.com](http://www.raditek.com)

# RADITEK Isolators and Circulators

## Octave Band, Coaxial SMA/N, Low power

### RADC-Flow-Fhigh-SX-50W / RADI Flow-Fhigh-SX-1W



N / SMA Connector options (X)				
Isolator			Circulator	
Port 1	Port 2		Port 3 Male	Port 3 Female
Female	Male	-1	-11	-21
Male	Female	-2	-12	-22
Female	Female	-3	-13	-23
Male	Male	-4	-14	-24

Octave Bands GHz	Additional Sub-Set Frequencies GHz	W	L	H	D	E	F	G	Ø
2.0-4.0	1.7-3.7, 2-3, 2.5-5.0 bands	41.8	44.1	19.0	33.0	32.0	7.7	7.7	M3
2.0-4.0	2.0-4.0 FULL BAND (20 Watt model)	41.8	60	19.0					
3.0-6.0	3.4-6.5, 3.4-7.2, 3.6-7.1, 3.625-6.500	41.8	44.1	19.0	33.0	32.0	7.7	7.7	M3
4.0-8.0	4.5-6, 4.6-8.8, 5-10, 6-8	28.6	33.2	16.5	21.0	20.8	7.5	7.4	M3
4.0-8.0	4.0-8.0 (20 Watt model)	28.6	50	16.5					
6.0-12.0	6.6-10.6, 6.6-12.5, 7-12.4, 7-12.5	21.3	24.7	15.3	15.0	14.5	7.5	7.4	M3
8.0-18.0	8.0-18.0 (20 Watt model)	34.6	120	30					
9.0-18.0	8-12, 8-16, 8-16.5, 9-12, 9-13, 10-12, 10-18, 10.5-15, 11-18, 12-18, 12-18.3, 12.0-18.5, 12-19, 13-16 BANDS	17.1	19.7	14.6	12.5	10.2	6.7	6.8	M3

∅ Order Examples: RADC-2.0-4.0-N23-50WR

I=ISOLATOR / C=CIRCULATOR

Direction of RF:	
R	Default ►
L	◄

Specifications:	2.0-4.0	3.0-6.0	4.0-8.0	6.0-12.0	9.0-18.0	GHz
Room Temp/Over Temp	RT/OT	RT/OT	RT/OT	RT/OT	RT/OT	
Insertion loss	0.4/0.6	0.4/0.6	0.4/0.6	0.4/0.6	0.6/0.8	dB (maximum)
Isolation	20*/16	20/16	20/16	20/16	16/15	dB (minimum)
VSWR (input and output)	1.25/1.4:1	1.25/1.4:1	1.25/1.4:1	1.25/1.4:1	1.45/1.5:1	
Rated power (forward) {reverse also if circulator}	50	35	60	25	25	Watts (average)
Rated power (reverse) {power in load Isolator Only }	1, 2, 5, 10, 20	1, 2, 10, 15, 20	1, 5, 10, 15, 20	1, 5, 10, 15, 20	1, 5, 10, 15, 20	Watts (average)
Peak Power	150		500			Watts (average)
Operating temperature	0 to+70	0 to+70	0 to+70	0 to+70	0 to+70	°C

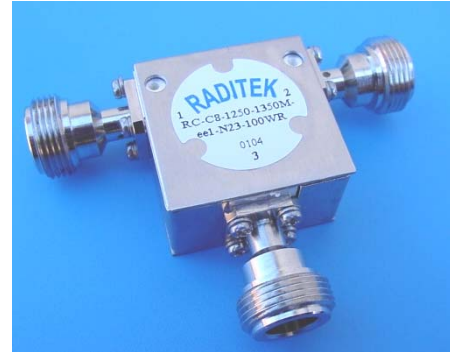
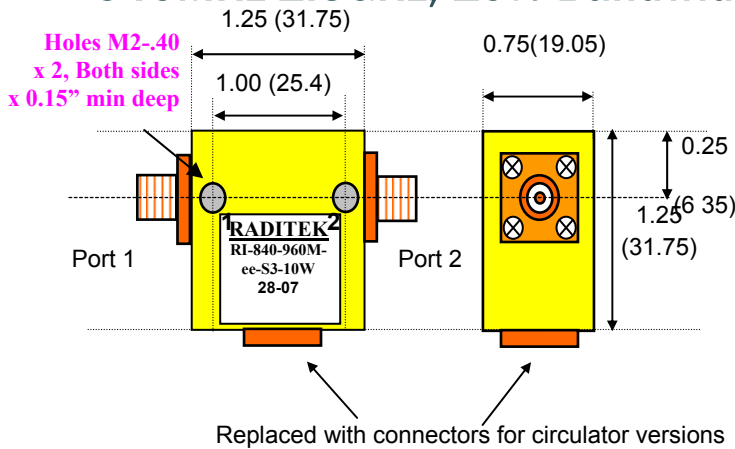
\*For 2-4 GHz unit, we can provide 20 dB in temperature range +15°C to +35°C

# RADITEK Isolators and Circulators

**RI-EE1 ISOLATOR 120W FORWARD AND 35W REVERSE POWER\*(500W PEAK POWER)**

**RC-EE1 CIRCULATOR 120W FORWARD AND 120W REVERSE POWER (500W PEAK POWER)**

**640MHz-2.5GHz, 10% Bandwidth, SMA or N-Type Connectors**



N / SMA Connector options (X)				
Isolator			Circulator	
Port 1	Port 2		Port 3 Male	Port 3 Female
Female	Male	-1	-11	-21
Male	Female	-2	-12	-22
Female	Female	-3	-13	-23
Male	Male	-4	-14	-24

Units: Inch (mm)  
 Tolerance:  
 x.xx ±0.02  
 x.xxx ±0.01  
 Machined surfaces <sup>63</sup>√  
 Bend radius 1/32 inch

Most types and gender connectors are available.

**Standard circulation: In at 1, Out at 2 (-R), for In at 2, Out at 1 (-L).**

Frequency	Low IMD Models <b>-U option</b> Parameters	dBc (max.)	
		-H	-U
800-960M	Model 2X 50W tones 1MHz Apart	-70	-75
1.9-2.2G	Model 2X 30W tones 1MHz Apart	-70	-75

**Operating Temperature: -20 to 85°C**  
**\*Load and Base plate temperature to be kept below 85°C**  
**Weight = 0.0980 Kg or 0.216Lbs**

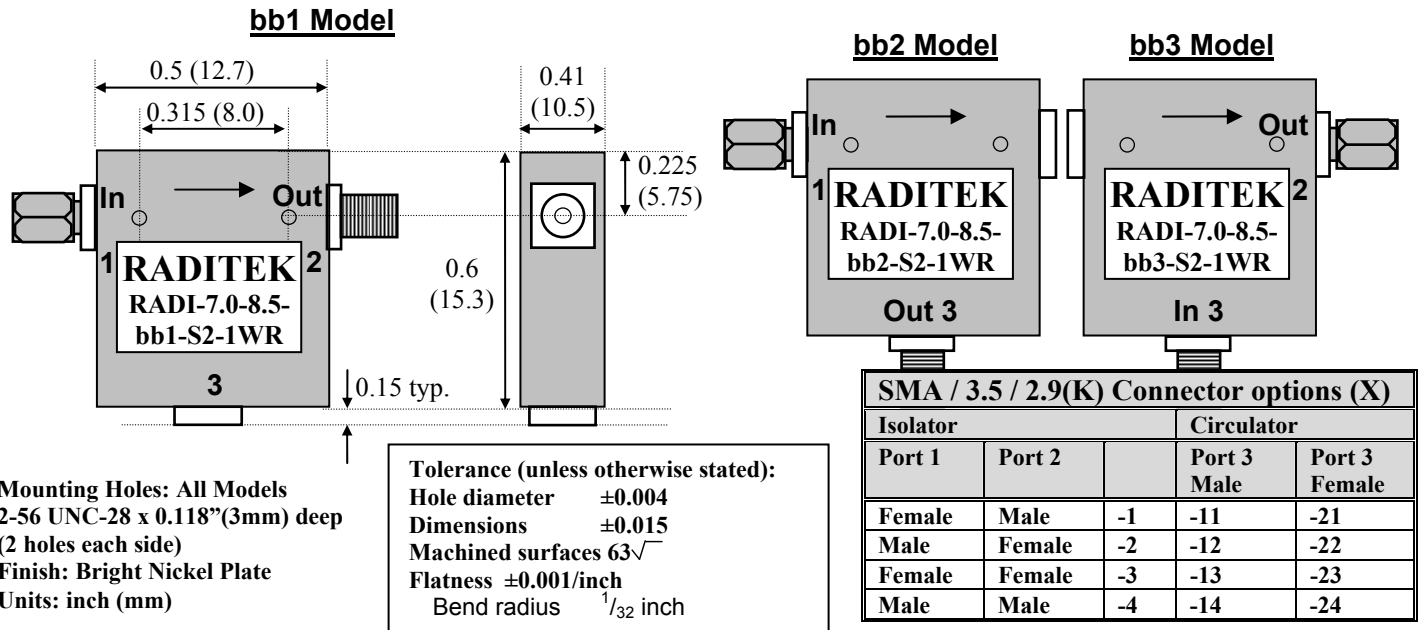
**Option: -PM3 (Phase Matching ±3 degrees)**

Frequency MHz	Insertion Loss dB Max.	Isolation Min. dB	Ret Loss dB	VSWR Max.	Notes	Direction of RF:	
						R	L
824-849	0.3	24	23	1.15	Cellular	R	Default ►
869-894	0.3	24	23	1.15	Cellular	L	◄
900-960	0.4	20	21	1.20	Cellular		
1805-1880	0.3	23	23	1.15	DCS		
1930-1990	0.4	22	22	1.17	PCS 8/30/06		
2110-2170	0.3	23	23	1.15	UMTS		
2200-2500	0.5	23	22	1.17			
2250-2450	0.3	23	23	1.15			
2300-2400	0.3	23	23	1.15			



# RADITEK Isolators and Circulators

## RADI BB1: Coaxial Broadband Series



WP=Waterproof, the connectors Flange joint is totally sealed, and the housing is finished in a tough epoxy paint finish.

Order as **RADI(or C)-F1-F2-bb(1,2,or 3)-S(##)-1WR (or L)**

Specifications: Freq GHz	BW %	Insertion loss dB (max)	Isolation dB (min)	VSWR	Power Fwd Watts(Avg.)	Power Rev Watts(Avg.)	Power Peak Watts (10µsec)	Op.Temp °C	Seorage Temp °C
5.8-16	10	0.4 0.5	20 19	1.20:1 1.25:1	10	1-2	50	-30 to +70 -40 to +95	-42 to +85
5.8-16	20	0.6 0.7	17 16	1.35:1 1.40:1	10	1-2	50	-30 to +70 -40 to +95	-42 to +85
16-19	10	0.5 0.4	20 20	1.25:1 1.25:1	10	1	50	-30 to +70 -30 to +50	-42 to +85
16-19	20	0.8 1.0	16 15	1.40:1 1.45:1	10	1	50	-30 to +70 -40 to +95	-42 to +85
19-26	10	0.6	20	1.30:1	10	1	50	-30 to +70	-42 to +85
Specifications: Freq GHz	BW %	Insertion loss dB (max)	Isolation dB (min)	VSWR :1(max)	Power Fwd Watts(Avg.)	Power Rev Watts(Avg.)	Power Peak Watts (10µsec)	Op. Temp °C	
5.8-6.5	Full	0.4	20	1.25	10	1	50	-30 to +50	
6-18	Full	1.2	12	1.67	5	5	10-20	-40 to +100	
7.1-7.9	Full	0.35	23	1.15	10	1	50	-30 to +70	
7.25-8.4	Full	0.8	20	1.25	10	1	50	-30 to +50	
8.0-8.6	Full	0.5	20	1.25	10	1	50	-30 to +70	
8-20	Full	1.2	14	1.6	10	1	50	0 to +60	
8.9-10.5	Full	0.5	20	1.25	10	1	50	-40 to +85	
12.7-15.4	Full	0.4	20	1.20	10	1	50	-30 to +70	
12-18	Full	0.5	20	1.25	10	1	50	-30 to +70	
13-16	Full	0.5	20	1.25	10	1	50	-30 to +70	
14.0-14.5	Full				10	1, 2	50	-30 to +70	
14-15	Full	0.4	20	1.20	5	2	50	-30 to +70	
15-18	Full	0.6	18	1.30	10	1	50	-40 to +95	
		0.5	20	1.25				-30 to +70	
16-17	Full	0.6	20	1.25	1	1	50	-30 to +70	
17.15-18.25 iso	Full	0.6	20	1.30	1	1	50	-30 to +70	

# RADITEK Isolators and Circulators

## Wide band Peripheral Mode isolators

**RADI- 1-3 1-4.3 2-6 2-8.2 2-18 3.2-8.3 8-18GHz-P-S3-1W-02**

Note: isolator version only, no circulator option



SMA Connector options (X)		
Isolator		
Port 1	Port 2	
Female	Male	-1
Male	Female	-2
Female	Female	-3
Male	Male	-4

Hole Option	
-01	No-Holes
-02	Default w/Holes

Direction of RF:	
R	Default ►
L	◄

Order Examples: RADI-2.0-18.0-P-N23-1WR-02

The **Peripheral mode BROADBAND isolator** is one of the most difficult to make, as it has high performance over a broad frequency range. Raditek is one of the very few companies in the world to offer this advanced product line. **Standard Bands (more are available)**

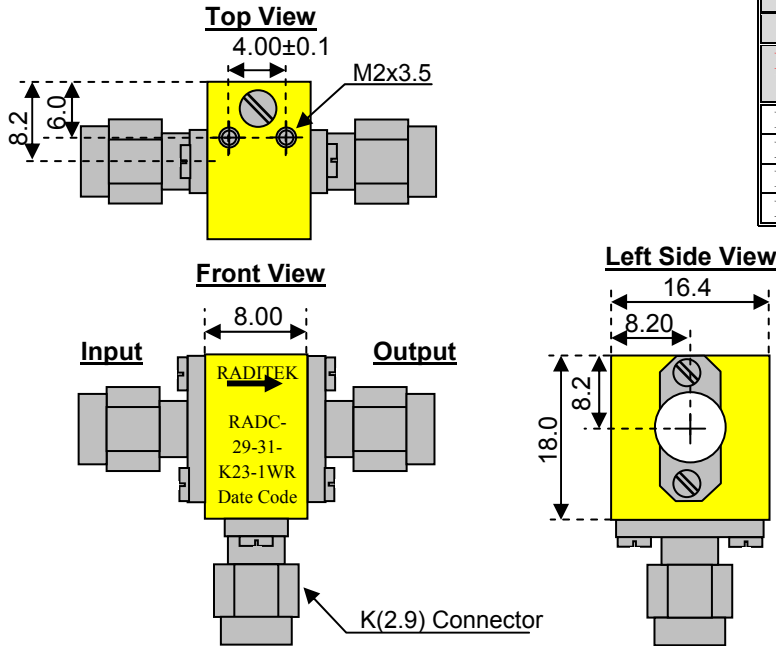
Frequency	Insertion loss dB (max)		Isolation dB (min)		VSWR (Maximum)		Peak Power	Rated Power (Fwd)	Rated Power (Rev)	Operating Temperature
	GHz	+25°C	Over Temp	+25°C	Over Temp	+25°C				
1 to 4.3	2.0	2.2 <sup>3</sup>	20	15 <sup>4</sup>	1.50:1	1.60:1	10	1	1	-10 to 60
2 to 8.2	1.5 <sup>10</sup>	1.5	20	17	1.50:1	1.50:1 <sup>1</sup>	10	1	1 or 2	-10 to 60
2 to 18	3.5	4	14-15 <sup>8</sup>	10	1.77:1	1.80:1	10	1	1	-10 to 60
3.2-8.3	0.9	1.0 <sup>2</sup>	20	20	1.50:1	1.50:1	10	1	1	-10 to 60
8 to 18	1.0	1.1	20	20	1.50:1	1.50:1	10	1	1	-10 to 60

# RADITEK Isolators and Circulators

## Coaxial Circulator, 25-40 GHz, Split Bands, 5% Bandwidth Standard

(>5% Bandwidth Special), K(2.9)mm Connector, 1-2 Watts

RADC-f1-f2-Kx-1WR



K(2.9) Connector options (X)			
Circulator			
Port 1	Port 2	Port 3 Male	Port 3 Female
Female	Male	-11	-21
Male	Female	-12	-22
Female	Female	-13	-23
Male	Male	-14	-24



Specifications:	RADC-29-31-K23-1WR (circulator)					Units
Frequency	25-27	27-31	31-34	34-37	37-40	GHz
Bandwidth	5%	5%	5%	5%	5%	%
Connector	K	K	K	K	K	
Insertion loss	1.1	1.3	1.3	1.4	1.6	dB
Isolation	20	20	18	18	18	dB
VSWR	1.40:1	1.40:1	1.40:1	1.40:1	1.50:1	
Power handling Forward	2	2	2	2	2	Watt
Power handling Reverse	2	2	2	2	2	Watt
Temperature range	-30 to +65	-30 to +65	-30 to +65	-30 to +65	-30 to +65	°C



Coaxial mm isolators with K-connectors also available

Specifications:	RADC-f1-f2-2.4x-1WR			Units
Frequency	40-45	41-43	43-45	GHz
Bandwidth	5%	Full	Full	%
Connector	2.4	2.4	2.4	
Insertion loss	1.6	1.6	1.6	dB
Isolation	18	18	18	dB
VSWR	1.50:1	1.50:1	1.50:1	
Power handling Forward	2	2	2	Watt
Power handling Reverse	2	2	2	Watt
Temperature range	-30 to +65	-30 to +65	-30 to +65	°C

# RADITEK Isolators and Circulators

## Waveguide isolators

The vastness of RADITEK's range of waveguide isolators would warrant its own catalog. All the bands to over 100GHz are covered, in all kinds of form factors, flanges and bandwidths. Waveguide gives the lowest insertion loss, and are popular for the Point to Point/Multipoint, VSAT and Radar applications, for example. Both commercial and Military applications are covered by Raditek. A very small sample of products is shown here.

<b>Specifications:</b>			
Frequency	8.2-12.4	9.36-9.84	GHz
Insertion loss	0.2 /0.3	0.2	dB (Typical/Max)
Isolation	20	24	dB
VSWR	1.22	1.15	:1 max
Power Forward	1Watts	1Watts	Watts
Operating Temperature	+15 to +35	+15 to +35	° C
Flange	WR90 (UBR-100)	WR90 (UBR-100)	

Order Example: **RADI-8.2-12.4-WR90-1WR (or L for counter clockwise)**

Frequency GHz WR28	Insertion loss dB (max)	Isolation dB (min)	Return loss dB (min)	VSWR	Power Fwd Watts	Power Rev Watts	Temp. °C
27.5-29.5	0.4 0.5	20 17	19.1	1.25:1	<5	<5	+25 -30 to +70
31.8-33.4	0.4 0.5	20 17	19.1	1.25:1	<5	<5	+25 -30 to +70
33.5-36.0	0.4	20	20	1.22:1	5	5	0 to +60
37-39	0.4 0.5	20 17	19.1	1.25:1	<5	<5	+25 -30 to +70
38.6-40	0.4 0.5	20 17	19.1	1.25:1	<5	<5	+25 -30 to +70

Order Example: **RADI-27.5-29.5-WR28-1WR**

Frequency	<b>93-95</b>	<b>GHz</b>
Bandwidth	<b>2</b>	<b>GHz</b>
Insertion loss	0.4	dB (maximum)
Isolation	20	dB (minimum)
VSWR	1.25:1	All ports
Waveguide interface (flange)	WR-10	(UG387/U)
Operating Forward Power	8.125	Watts
Operating Reverse Power	2.5	Watts
Operating Peak Power	125	Watts
	@	6.5
		µsec pulse
Operating temperature	-40 to 70	°C
Non operating	-55 to 80	°C
Humidity	%	95
Operation Shock		6G, 11mS, saw tooth

BAND (GHz)	WAVEGUIDE SIZE	BAND LETTERS
1.12 - 1.7	WR-650	D, L
1.7 - 2.6	WR-430	D, LS, M, R
2.6 - 3.95	WR-284	S
3.95 - 5.85	WR-187	C, G, H
5.4 - 8.2	WR-137	A, C, G, J, XB, XN
7.05 - 10	WR-112	B, H, W, XB, XL
8.2 - 12.4	WR-90	X, XS
12.4 - 18	WR-62	G, Ku, P, U, Y
18 - 26.5	WR-42	K
26.5-40	WR-28	A, Ka, R, T, U, Y

Order as: **RADI-93-95-WR10-2.5WR (125W Peak, 8.125W Fwd)**

# RADITEK Isolators and Circulators

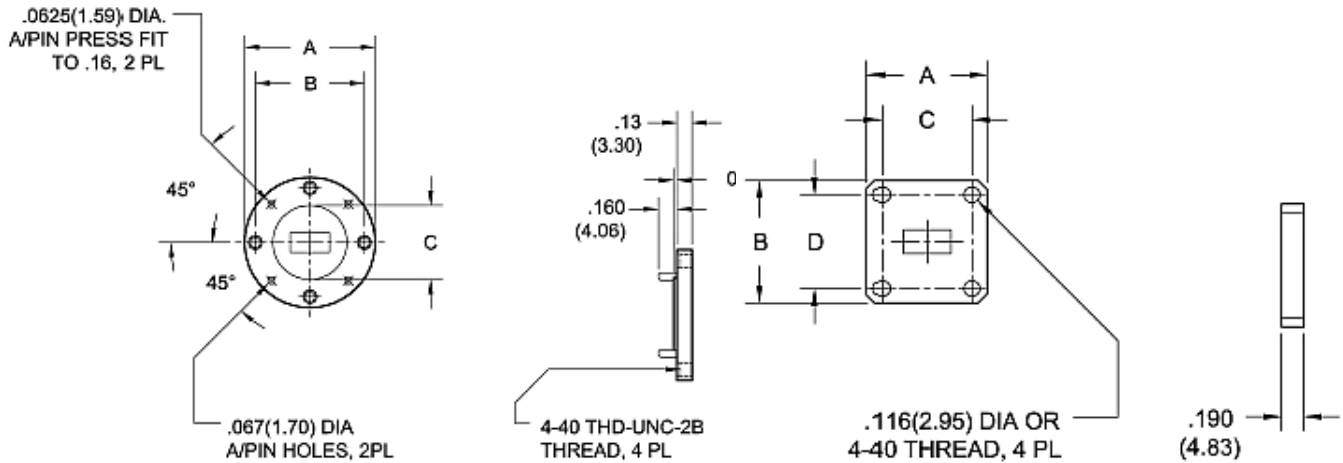
## History of Waveguides

The first waveguide was proposed by J. J. Thomson in 1893 and experimentally verified by O. J. Lodge in 1894; the mathematical analysis of the propagating modes within a hollow metal cylinder was first performed by Lord Rayleigh in 1897. (McLachan, 1947.)

Electromagnetic waveguides are analyzed by solving Maxwell's equations, or their reduced form, the electromagnetic wave equation, with boundary conditions determined by the properties of the materials and their interfaces. These equations have multiple solutions, or modes, which are eigenfunctions of the equation system. Each mode is therefore characterized by an eigenvalue, which corresponds to the axial propagation velocity of the wave in the guide.

Waveguide propagation modes depend on the operating wavelength and polarization and the shape and size of the guide. The longitudinal mode of a waveguide is a particular standing wave pattern formed by waves confined in the cavity. The transverse modes are classified into different types:

- TE modes (Transverse Electric) have no electric field in the direction of propagation.
- TM modes (Transverse Magnetic) have no magnetic field in the direction of propagation.
- TEM modes (Transverse Electro Magnetic) have no electric nor magnetic field in the direction of propagation.
- Hybrid modes are those which have both electric and magnetic field components in the direction of propagation



ROUND FLANGE TABLE, inches/mm		
FREQUENCY BAND	WR-22 and WR-42 through WR-19	WR-15 through WR-5
A	1.125/28.6	0.750/19.0
B	0.937/23.8	0.562/14.3
C	0.500/12.7	0.375/9.5

SQUARE FLANGE TABLE, inches/mm		
FREQUENCY BAND	WR-42	WR-28
A, B	0.875/22.2	0.750/16.6
C	0.640/16.2	0.500/12.7
D	0.670/17.0	0.530/13.5

Frequency, GHz	Band	WR #	Inside Dimensions, inches/mm	Cover Flange Reference*	Flange Type
18-26.5	K	42	.420 x .170/4.32 x 4.32	UG-595/U	Square
22-33	WR-34	34	.340 x .170/8.64 x 4.32	UG-595/U	Square
26.5-40	Ka	28	.280 x .140/7.11 x 3.55	UG-599/U	Square
33-50	Q	22	.112 x .224/2.84 x 5.68	UG-383/U	Round
40-60	U	19	.188 x .094/4.77 x 2.38	UG-383/U-M	Round
50-75	V	15	.148 x 0.74/3.75 x 18.8	UG-385/U	Round
60-90	E	12	.122 x .061/3.09 x 1.54	UG-387/U	Round
75-110	W	10	.100 x .050/2.54 x 1.27	UG-387/U-M	Round
90-140	F	8	.080 x .040/2.03 x 1.01	UG-387/U-M	Round
110-170	D	6	.065 x .0325/1.65 x 0.825	UG-387/U-M	Round
140-220	G	5	.051 x .0255/1.29 x 0.65	UG-387/U-M	Round