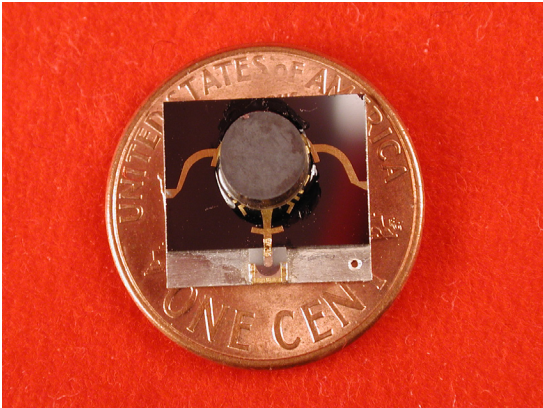


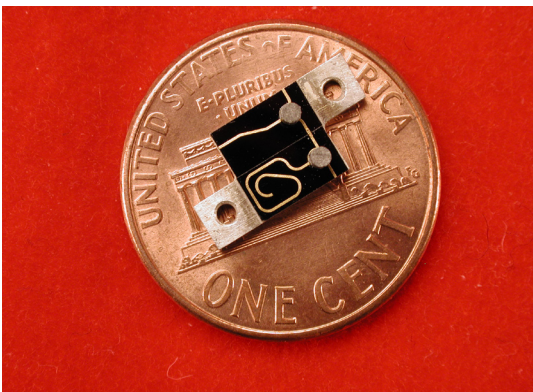
## MICROSTRIP DROP-IN DEVICES



Microstrip Isolators and Circulators are relatively simple devices consisting of a thin film circuit deposited on a ferrite substrate (dielectric) and a magnet to circulate the signal. This is the complete substrate type device. The result is the least expensive and yet the most reliable device when compared to drop-in, coaxial and all other ferrite type devices. These are usually mounted with epoxy or soldered on a steel or invar surface.



As an alternate the substrate isolator can be mounted by Dorado on a steel carrier that can be attached to any surface by epoxy or with screw mounting holes (see drawings on the following pages).



These isolators can meet a wide range of environmental conditions including ground or airborne military specifications, stringent commercial requirements as well as the vigors of space applications. We also offer custom designs with a wide range of parameters, both electrical and mechanical, to meet our customer's specific requirements.

## APPLICATION NOTES FOR MICROSTRIP DEVICES

Substrate type microstrip devices from DORADO use a single ferrite element with a circuit pattern on one face and a gold plated ground plane on the other. A permanent magnet structure is included on the ferrite substrate. DORADO devices are complete, self-contained and fully functional ferrite devices. They are designed to be directly compatible with a simple tab connection microstrip circuit. Our devices can also be used in strip transmission line applications in suitable mounting arrangements.

- **Features.**

- Small size, light weight
- Modest design allows for low unit cost
- Custom designs
- Wide range of standard products
- High Performance
- Single magnet design
- Lead free and ROHS compliant

- **Quality.**

- All products are 100% inspected to exceed MIL-STD-883E.

- **Frequency range.**

- Standard frequency range of 2.1 to 45GHz

- **Mechanical mounting.**

- Compatible with 50-ohm adjacent devices
- Substrate type microstrip devices should be mounted on a magnetic or nonmagnetic base. The type of base is indicated in the product's certificate. The surface of the base should be smooth (surface roughness should not exceed 0.4 micrometers).
- The gap between the ferrite device and the adjacent microstrip substrate to which it is to be connected must be tightly controlled. This becomes very critical at the higher frequencies. Coplanarity of the upper surfaces of the ferrite device and connecting MIC must also be controlled to avoid additional impedance discontinuities.
- It has been found that satisfactory operation is obtained with the device either thicker or thinner than the connecting MIC provided that the thickness ratio does not exceed 1.5.
- Connection tabs thickness should be 20 micrometers. The connection tabs width should be greater than 75% and should not exceed a 100% of the width of device's output (input) microstrip. The connection tabs length should not be more than twice the width of the device's output (input) microstrip.
- We recommend the parallel gap welding of the tab connections. Tab's material should be gold.
- The tabs must be tightly pressed to the microstrip and in no case lean over the microstrip's edges.
- Substrate type microstrip devices should be mounted on metal base with the minimum thickness of 1mm. Type of the base for all devices on substrate and some of devices on carrier indicated in product certificate.
- The minimum distance between the Microstrip Ferrite device and the metal screen should be 2.54mm. No additional magnetic shielding is required if the distance between two devices is kept to a minimum of 2.54 mm with face to face, back to back, or face to back. The minimum distance between two microstrip devices shoulder to shoulder is "0"mm.

- **Temperature range.**

- Standard temperature range -30 to 65°C, do not heat above 130°C.
- Electrical parameters perform at the standard operating temperature range.
- Other temperature ranges are available (Please contact DORADO).
- Maximum temperature during welding process is +350°C @ 25 microseconds

- **Magnetic fields and materials.**

- Devices typically exhibit a fringing magnetic field which is less than 1 gauss at the distance of 12.7 mm (0.5 inch). Electrical performance may be affected if device is mounted on or very close to magnetic material or exposed to strong magnetic fields from nearby magnetic devices that exceed the 1 gauss at 12.7 mm level.

- **Handling.**
  - Handle with care, using non-magnetic tools only
- **Environmental.**
  - Operated in waterproof equipment only
  - Humidity up to 80% non condensing is acceptable.
- **Thermal resistance.**
  - Must not be higher than  $10^{-4}$  m<sup>2</sup>K / W
- **Custom features.**
  - DORADO has the ability to provide a wide range of solutions to meet most applications.
- **Welding**
  - We recommend parallel gap impulse welding for connection of our standard thin film microstrip devices with PCB. We recommend using annealed gold tabs. Tabs thickness should be 20-25 micrometers. Width of the tabs shouldn't exceed the width of the input/output line of microstrip device. Width of the tabs should not be less than half of the width of the input/output line of microstrip device. Maximum temperature during welding process is +350°C @ 25 microseconds.
- **Soldering.**
  - Any solder material that does not contain Lead or Tin could be used for mounting of standard substrate type microstrip devices on the metal base. Temperature of the metal base should not exceed +150°C during 60 seconds. Maximum Storage Temperature for our standard microstrip devices is +130°C.
  - It is our recommendation that the most suitable solder for microstrip devices is Indalloy#1 (In,Sn) which has a melting point of +125°C Appropriate fluxes to be used with this Indium solder alloy would be the Kester type 135 or 197.
- **Conductive Epoxy.**
  - Any type of conductive epoxy with polymerization temperature below 130°C may be used. These are available from Emerson & Comings, Chomerics Inc., Epoxy Technology Inc. The epoxy material itself should be prepared in accordance to the manufacturer's instructions.

## MICROSTRIP ISOLATORS ON CARRIERS (2.1 to 15.6GHz)

FREQ. RANGE (GHz)	MODEL NUMBER	BAND WIDTH (%)	INS. LOSS dB (MAX)	ISOLATION dB (MIN)	VSWR (MAX)	FORWARD POWER (W)	LOAD POWER (W)	OPERATING TEMP. RANGE	OUTLINE #
2.10-2.60	3IMS24-3	full	0.4	20	1.2	10	1	-30° to +70° C	4.10
3.20-3.60	3IMS34-1	full	0.4	20	1.2	10	2	-30° to +70° C	4.11
3.40-3.60	3IMS35-1	full	0.4	20	1.2	10	10	-30° to +70° C	4.11
3.40-4.20	3IMS40-1	full	0.5	20	1.25	10	2	-30° to +70° C	4.11
4.40-5.00	3IMS47-1	full	0.5	20	1.25	10	5	-30° to +70° C	TBD
5.60-6.80	3IMS61-7	full	0.5	20	1.25	10	1	-30° to +70° C	4.18
5.80-7.20	3IMS65-2	full	0.5	20	1.25	10	2	-30° to +70° C	4.12
5.80-7.20	3IMS61-5	full	0.5	20	1.25	10	5	-30° to +70° C	4.17
5.80-7.10	3IMS65-5	full	0.6	16	1.4	10	10	-10° to +70° C	4.16
6.30-8.00	3IMS71-1	full	0.5	20	1.25	10	2	-30° to +70° C	4.12
7.10-8.50	3IMS78-2	full	0.5	20	1.25	10	2	-30° to +70° C	4.12
7.10-8.50	3IMS77-3	full	0.5	20	1.25	10	1	-30° to +70° C	4.19
7.10-8.50	3IMS78-3	full	0.6	16	1.4	8	2	-10° to +70° C	4.16
8.40-10.70	3IMS95-1	full	0.5	18	1.3	10	2	-30° to +65° C	4.26
8.40-10.70	3IMS95-3	full	0.5	18	1.3	10	2	-30° to +65° C	4.13
9.50-10.50	4IMS10-6	full	0.5	20	1.25	10	2	-30° to +70° C	4.13
9.90-10.50	4IMS10-7	full	0.5	20	1.25	5	0.2	-30° to +70° C	4.15
10.00-11.00	4IMS10-4	full	0.5	20	1.25	5	0.25	-30° to +70° C	4.15
10.00-12.00	4IMS11-1	full	0.5	18	1.25	10	5	-30° to +65° C	4.13
10.00-12.00	4IMS11-8	full	0.6	20	1.3	5	1	-30° to +65° C	4.20
10.00-11.00	4IMS11-7B*	full	0.5	20	1.25	10	1	-30° to +65° C	TBD
10.00-11.80	4IMS11-6B*	full	0.6	18	1.3	10	10	-30° to +65° C	4.24
10.50-11.50	4IMS11-3	full	0.5	20	1.3	5	1	-30° to +65° C	4.20
12.00-13.00	4IMS12-2Y	full	0.5	18	1.35	10	2	-30° to +70° C	4.13
12.00-13.50	4IMS13-7	full	0.6	20	1.35	10	0.25	-30° to +70° C	4.20
13.70-14.70	4IMS14-6	full	0.6	20	1.35	10	1	-30° to +70° C	4.14
13.70-14.70	4IMS14-4	full	0.6	20	1.35	10	1	-30° to +70° C	4.22
14.00-14.50	4IMS14-8	full	0.6	20	1.3	10	1	-30° to +70° C	4.14
14.00-14.50	4IMS14-6A	full	0.6	18	1.3	10	2	-30° to +70° C	4.23
14.00-15.50	4IMS15-5	full	0.65	18	1.35	10	1	-30° to +70° C	4.14
14.00-15.60	4IMS15-7	full	0.6	20	1.3	10	1	-30° to +70° C	4.21
6.30-8.50	3IMS(xx)-1Y	18%	0.5	20	1.25	10	2	-30° to +70° C	4.12
6.30-8.50	3IMS(xx)-2Y	18%	0.5	20	1.25	10	2	-30° to +70° C	4.25

**NOTES:**

1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE
2. (xx) IDENTIFIES THE CENTER FREQUENCY OF THE DEVICE IN GHz
3. MAX. TEMPERATURE - 130°C UNLESS A SPECIAL ORDER IS PLACED FOR A HIGHER STORAGE TEMPERATURE.
4. CIRCULATION IS CLOCKWISE, INPUT ON LEFT AND OUTPUT ON RIGHT (COUNTERCLOCKWISE IS OPTIONAL)
5. ITEMS MARKED WITH A “\*” SHOULD BE MOUNTED ON A NON-MAGNETIC BASE
6. TABS ARE AVAILABLE BY SPECIAL ORDER FOR ALL MICROSTRIP DEVICES

## MICROSTRIP ISOLATORS ON CARRIERS (2.1 to 15.6GHz)

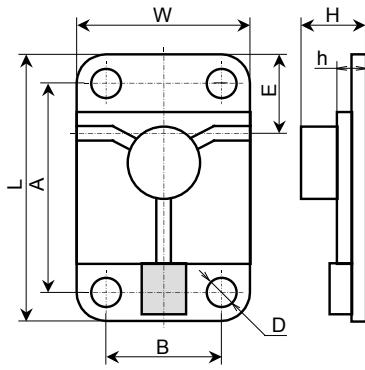


Fig. 19

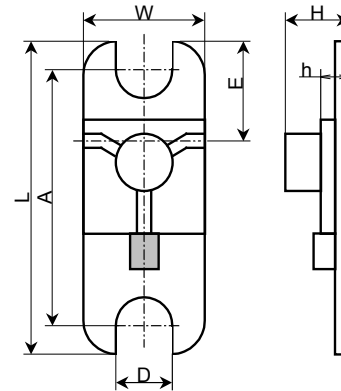


Fig. 20

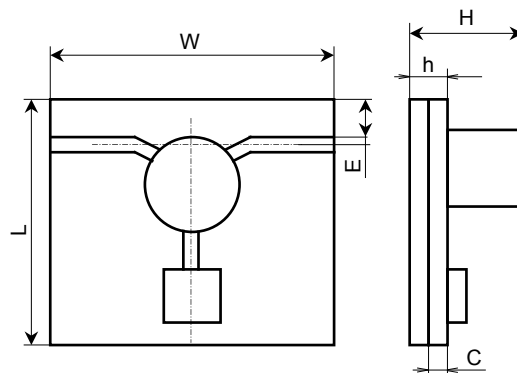


Fig. 21

OUTLINE #	DIMENSIONS, mm									
	W	L	H	h	C	A	B	E	D	Fig
4.10	20	30	6	2.2	1	25	15	10	2.5	19
4.11	15	25	6	2.2	1	20	10	9	2.5	19
4.12	12	20	5.5	1.85	0.635	15	7	6.5	2.5	19
4.13	7	19.5	5.5	1.65	0.635	15.5	-	6	2.5	20
4.14	7	19.5	5.5	1.52	0.5	15.5	-	6	2.5	20
4.15	7	6.1	4.5	1	0.635	-	-	1.5	-	21
4.16	12	10.67	3	0.635	0.38	-	-	5.335	-	21
4.17	12.8	17.8	5.5	1.85	0.635	15.2	8.6	5.59	1.6	19
4.18	12	23	6.3	1.85	1	20	-	6.5	2.5	20
4.19	10.2	17.2	5.14	1.65	0.635	14.43	7.43	6.19	1.7	19
4.20	7.1	13.2	5	1.65	0.635	10.4	4.3	4.95	1.7	19
4.21	7.1	13.2	4.6	1.5	0.5	10.4	4.3	4.64	1.7	19
4.22	8.89	12	5.25	1.77	0.5	9.5	6.35	4.45	1.6	19
4.23	7	16	5.5	1.65	0.5	12	-	6	2.5	20
4.24	8.38	7.37	3.8	0.64	0.38	-	-	3.68	-	21
4.25	9	13.7	5.14	1.65	0.635	11.2	6.35	4.45	1.8	19
4.26	9	19	5.5	1.65	0.635	14	-	7.5	2.5	20



## MICROSTRIP ISOLATORS ON CARRIERS (16 to 43GHz)

FREQ. RANGE (GHz)	MODEL NUMBER	BAND WIDTH (%)	INS. LOSS db (MAX)	ISOLATION dB (MIN)	VSWR (MAX)	FORWARD POWER (W)	LOAD POWER (W)	OPERATING TEMP. RANGE	OUTLINE #
16.0-17.00	4IMS16-3Y	full	0.7	18	1.3	2	1	-30° to +70° C	5.22
16.60-17.70	4IMS17-1	full	0.8	20	1.35	2	1	-30° to +70° C	5.1
17.20-18.20	4IMS18-2	full	0.8	20	1.35	2	1	-30° to +70° C	5.1
17.30-18.00	4IMS18-4A	full	0.8	20	1.35	2	1	-30° to +70° C	5.18
17.70-19.70	4IMS19-1	full	0.8	20	1.35	2	1	-30° to +70° C	5.2
17.70-19.70	4IMS19-6	full	0.8	20	1.35	2	1	-30° to +70° C	5.16
17.70-19.70	4IMS19-1C	full	0.8	20	1.35	2	1	-30° to +70° C	5.17
17.70-19.70	4IMS19-8	full	0.8	20	1.35	2	1	-30° to +70° C	5.13
19.60-21.60	4IMS20-1	full	0.8	20	1.35	2	1	-30° to +70° C	5.10
21.20-23.60	4IMS22-1	full	0.9	20	1.35	2	1	-30° to +70° C	5.19
21.20-23.60	4IMS22-4	full	0.9	20	1.35	2	1	-30° to +70° C	5.9
21.20-23.60	4IMS22-7	full	0.9	20	1.35	2	1	-30° to +70° C	5.21
24.00-26.00	4IMS25-3	full	0.9	20	1.35	2	1	-30° to +70° C	5.3
24.20-26.20	4IMS25-3Y	full	0.9	20	1.35	2	1	-30° to +70° C	5.23
24.50-26.50	4IMS25-4	full	0.9	20	1.35	2	1	-30° to +70° C	5.9
25.20-27.20	4IMS26-2	full	0.9	20	1.35	2	1	-30° to +70° C	5.9
27.50-29.50	4IMS29-4	full	0.9	20	1.35	2	1	-30° to +70° C	5.14
27.00-30.00	4IMS28-1	full	0.9	18	1.35	2	1	-30° to +70° C	5.20
30.00-32.00	4IMS31-1	full	0.9	20	1.35	2	1	-30° to +70° C	5.20
32.00-34.00	4IMS33-3	full	0.9	20	1.35	2	1	-30° to +70° C	5.7
32.00-34.00	4IMS33-3Y	full	0.9	20	1.35	2	1	-30° to +70° C	5.23
33.00-35.00	4IMS34-3*	full	0.9	20	1.35	2	1	-30° to +70° C	5.5
34.00-36.00	4IMS35-1	full	0.9	20	1.35	2	1	-30° to +70° C	5.7
35.00-37.00	4IMS36-1	full	0.9	20	1.35	2	1	-30° to +70° C	5.7
36.00-38.00	4IMS37-2	full	0.9	20	1.35	2	1	-30° to +70° C	5.7
37.00-40.00	4IMS39-2	full	0.9	20	1.35	2	1	-30° to +70° C	5.9
37.00-40.00	4IMS38-2C*	full	0.9	20	1.35	2	1	-30° to +70° C	5.6
39.00-41.00	4IMS40-2	full	1	19	1.35	1	0.5	-10° to +50° C	5.8
41.00-43.00	4IMS42-5	full	1	19	1.35	1	0.5	-10° to +50° C	5.8
21.20-40.00	4IMS(xx)-4X	8	0.9	20	1.35	2	1	-30° to +70° C	5.9
26.00-32.00	4IMS(xx)-9X	7	0.9	20	1.35	2	1	-30° to +70° C	5.20
26.00-32.00	4IMS(xx)-8X	7	0.9	20	1.35	2	1	-30° to +70° C	5.14
26.00-32.00	4IMS(xx)-10X*	7	0.9	20	1.35	2	1	-30° to +70° C	5.24
32.00-37.00	4IMS(xx)-2X*	5	0.9	20	1.35	2	1	-30° to +70° C	5.5
32.00-37.00	4IMS(xx)-7X	5	0.9	20	1.35	2	1	-30° to +70° C	5.7
35.00-40.00	4IMS(xx)-3X*	8	0.9	20	1.35	2	1	-30° to +70° C	5.6
35.00-40.00	4IMS(xx)-5X	8	0.9	20	1.35	2	1	-30° to +70° C	5.8
39.20-43.00	4IMS(xx)-6X	5	1	19	1.35	1	0.5	-30° to +70° C	5.8

**NOTES:**

1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE
2. (xx) IDENTIFIES THE CENTER FREQUENCY OF THE DEVICE IN GHz
3. MAX. TEMPERATURE - 130°C UNLESS A SPECIAL ORDER IS PLACED FOR A HIGHER STORAGE TEMPERATURE.
4. CIRCULATION IS CLOCKWISE, INPUT ON LEFT AND OUTPUT ON RIGHT (COUNTERCLOCKWISE IS OPTIONAL)
5. ITEMS MARKED WITH A “\*” SHOULD BE MOUNTED ON A NON-MAGNETIC BASE
6. TABS ARE AVAILABLE BY SPECIAL ORDER FOR ALL MICROSTRIP DEVICES

## MICROSTRIP ISOLATORS ON CARRIERS

### (16 to 43GHz)

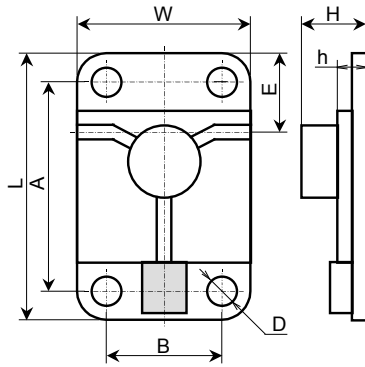


Fig. 23

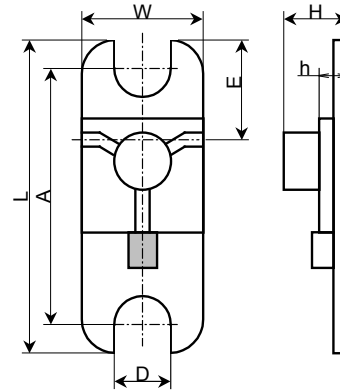


Fig. 24

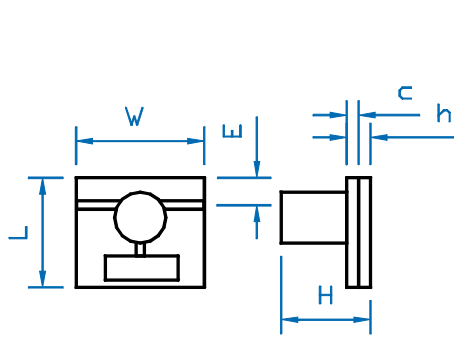


Fig. 26

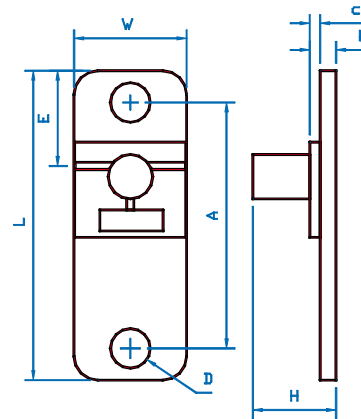


Fig. 27

OUTLINE #	DIMENSIONS, mm									
	W	L	H	h	C	A	B	E	D	Fig
5.1	8.89	12	5	1.77	0.5	9.5	6.35	4.45	1.6	23
5.2	7	19.5	5.5	1.4	0.38	15.5	-	6	2.5	24
5.3	6	12.19	5	1.4	0.25	9.15	3.3	4.67	1.7	23
5.5	3.38	6.5	3.5	0.7	0.2	-	-	1	-	26
5.6	5	5.5	3.5	0.45	0.2	-	-	1.35	-	26
5.7	3.38	14	4.5	1.14	0.2	11	-	4.75	1.75	24
5.8	5	11	4.5	1.2	0.2	8	-	4.1	2	27
5.9	5	16.5	5	1.6	0.38	12.5	-	6.1	2.5	24
5.10	6	17.5	4.3	1.5	0.38	13.5	-	6.15	2.5	24
5.13	6	12.19	5	1.53	0.38	9.15	3.3	4.12	1.7	23
5.14	5	11	4.3	1.25	0.25	8	-	4.1	2	27
5.16	7.1	13.2	4.6	1.4	0.38	10.4	4.3	4.62	1.7	23
5.17	7.1	12.2	4.8	1.5	0.38	9.14	3.3	4.18	1.7	23
5.18	7	19.5	5.5	1.65	0.38	15.5	-	6	2.5	24
5.19	6	12.19	5	1.53	0.38	9.15	3.3	4.67	1.7	23
5.20	6	12.19	5	1.4	0.25	9.15	3.3	4.6	1.7	23
5.21	7.1	12.2	4.8	1.5	0.38	9.14	3.3	4.68	1.7	23
5.22	7	7	4.5	1	0.5	-	-	1.5	-	26
5.23	6	5	4.5	1.25	0.25	-	-	1	-	26
5.24	5	5.5	3.5	0.75	0.25	-	-	1.25	-	26

## MICROSTRIP ISOLATORS ON SUBSTRATE (2.1 to 45GHz)

FREQ. RANGE (GHz)	MODEL NUMBER	BAND WIDTH (%)	INS. LOSS db (MAX)	ISOLATION dB (MIN)	VSWR (MAX)	FORWARD POWER (W)	LOAD POWER (W)	OPERATING TEMP. RANGE	OUTLINE #
2.10-2.60	3IMM24-4	full	0.4	20	1.2	5	0.25	-10° to +50° C	6.1
3.40-4.20	3IMM38-2	full	0.4	20	1.25	5	0.25	-10° to +50° C	6.2
3.70-4.50	3IMM39-1	full	0.4	20	1.25	5	0.25	-10° to +50° C	6.2
4.30-5.10	3IMM47-1	full	0.5	20	1.25	5	0.25	-10° to +50° C	TBD
5.80-7.20	3IMM65-1	full	0.5	20	1.25	5	0.25	-30° to +70° C	6.4
5.80-7.10	3IMM65-2*	full	0.6	16	1.4	5	1	-10° to +70° C	6.20
6.30-8.00	3IMM71-1	full	0.5	20	1.25	5	0.25	-30° to +70° C	6.5
6.30-8.00	3IMM71-2	full	0.5	20	1.25	5	0.25	-30° to +70° C	6.21
7.10-8.50	3IMM78-1	full	0.5	20	1.25	5	0.25	-30° to +70° C	6.5
7.10-8.50	3IMM78-4A*	full	0.6	16	1.4	5	1	-10° to +70° C	6.20
8.40-10.70	3IMM95-3	full	0.5	18	1.3	5	0.25	-30° to +65° C	6.6
9.00-11.00	4IMM10-6	full	0.5	20	1.25	5	0.25	-30° to +65° C	6.6
9.80-10.20	4IMM10-5*	full	0.5	20	1.25	5	0.25	-30° to +65° C	6.7
10.00-12.00	4IMM11-5	full	0.6	19	1.3	5	0.25	-30° to +65° C	6.8
12.00-13.50	4IMM13-3Y	full	0.6	20	1.3	5	0.25	-30° to +70° C	6.9
13.70-14.70	4IMM14-6	full	0.6	20	1.3	5	0.25	-30° to +70° C	6.9
14.00-14.50	4IMM14-1	full	0.6	20	1.3	5	0.25	-30° to +70° C	6.9
14.00-15.60	4IMM15-5	full	0.6	19	1.3	5	0.25	-30° to +65° C	6.9
14.50-15.40	4IMM15-1	full	0.7	18	1.35	5	0.25	-30° to +70° C	6.9
15.50-17.50	4IMM16-1	full	0.6	20	1.3	2	0.25	-10° to +50° C	6.9
17.20-18.20	4IMM18-3*	full	0.8	20	1.3	2	1	-30° to +70° C	6.10
17.20-18.30	4IMM18-3Y*	full	0.8	20	1.3	2	1	-30° to +70° C	6.35
17.70-19.70	4IMM19-1C*	full	0.8	20	1.3	2	1	-30° to +70° C	6.11
17.70-19.70	4IMM19-2*	full	0.8	20	1.3	2	1	-30° to +70° C	6.34
18.40-21.30	4IMM20-1*	full	0.9	18	1.35	2	1	-30° to +70° C	6.11
21.20-23.60	4IMM22-1*	full	0.9	20	1.3	2	1	-30° to +70° C	6.12
21.20-23.60	4IMM22-5*	full	0.9	20	1.3	2	1	-30° to +70° C	6.24
24.00-26.00	4IMM25-3	full	0.9	20	1.3	2	1	-30° to +70° C	6.13
24.50-26.50	4IMM25-2	full	0.9	20	1.3	2	1	-30° to +70° C	6.25
25.27-26.98	4IMM26-5	full	0.9	20	1.3	2	1	-30° to +70° C	6.25
26.50-31.50	4IMM29-8	full	1	17	1.4	2	1	-10° to +50° C	6.14
26.50-31.50	4IMM29-9	full	1	17	1.4	2	1	-10° to +50° C	6.26
27.35-31.76	4IMM29-1	full	1	18	1.35	2	1	-30° to +70° C	6.14
27.50-29.50	4IMM28-5	full	0.9	20	1.3	2	1	-30° to +70° C	6.32
28.00-30.00	4IMM29-6	full	0.9	20	1.3	2	1	-30° to +70° C	6.14
30.00-32.00	4IMM31-5	full	0.9	20	1.3	2	1	-30° to +70° C	6.14
31.50-33.50	4IMM32-3	full	0.9	20	1.3	2	1	-30° to +70° C	6.14
33.50-36.50	4IMM35-8	full	1	18	1.35	2	1	-30° to +70° C	6.15
34.00-36.00	4IMM35-9	full	0.9	20	1.3	2	1	-30° to +70° C	6.29
34.00-36.00	4IMM35-1A	full	0.9	20	1.3	2	1	-30° to +70° C	6.15
34.50-35.50	4IMM35-1	full	0.9	20	1.3	2	1	-30° to +70° C	6.15
35.00-37.00	4IMM36-3	full	0.9	20	1.3	2	1	-30° to +70° C	6.15
36.00-38.00	4IMM37-1	full	0.9	20	1.3	2	1	-30° to +70° C	6.16
37.00-40.00	4IMM39-2	full	0.9	20	1.35	2	1	-30° to +70° C	6.15
39.00-41.00	4IMM40-1	full	1.1	18	1.35	1	0.5	-10° to +50° C	6.15
40.50-42.50	4IMM41-2	full	1.1	18	1.4	1	0.5	-10° to +50° C	6.15
43.00-45.00	4IMM44-3	full	1.1	18	1.4	1	0.5	-10° to +50° C	6.15



## MICROSTRIP ISOLATORS ON SUBSTRATE (2.1 to 45GHz)

FREQ. RANGE (GHz)	MODEL NUMBER	BAND WIDTH (%)	INS. LOSS db (MAX)	ISOLATION dB (MIN)	VSWR (MAX)	FORWARD POWER (W)	LOAD POWER (W)	OPERATING TEMP. RANGE	OUTLINE #
6.30-8.60	3IMM(XX)-1X	18	0.5	20	1.25	5	0.25	-30° to +70° C	6.5
6.30-8.60	3IMM(XX)-2X	18	0.5	20	1.25	5	0.25	-30° to +70° C	6.21
6.30-8.60	3IMM(XX)-7X	18	0.6	16	1.4	10	1	-30° to +70° C	6.20
23.50-34.00	4IMM(XX)-3X	7	0.9	20	1.3	2	1	-30° to +70° C	6.14
31.00-40.00	4IMM(XX)-4X	7	0.9	20	1.3	2	1	-30° to +70° C	6.15
31.00-40.00	4IMM(XX)-5X	7	0.9	20	1.3	2	1	-30° to +70° C	6.16

**NOTES:**

1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE
2. ALL DEVICES SHOULD BE MOUNTED ON A STEEL (OR KOVAR) BASE EXCEPT ITEMS MARKED WITH A “ \* ”
3. MAX. TEMPERATURE - 130°C UNLESS A SPECIAL ORDER IS PLACED FOR A HIGHER STORAGE TEMPERATURE.
5. CIRCULATION IS CLOCKWISE, INPUT ON LEFT AND OUTPUT ON RIGHT (COUNTERCLOCKWISE IS OPTIONAL)
6. TABS ARE AVAILABLE BY SPECIAL ORDER FOR ALL MICROSTRIP DEVICES

OUTLINE #	DIMENSIONS, mm				
	W	L	H	C	E
6.1	20	25	5	1	5,00
6.2	15	20	5	1	4
6.4	12	11	5	0.635	2
6.5	10	9	5	0.635	2.5
6.6	7	10	5.5	0.635	1.5
6.7	6.35	6.35	5	0.635	1.5
6.8	7	6	4.5	0.635	1.5
6.9	7	7	4.5	0.5	1.5
6.10	8.82	6.3	4	0.38	1.575
6.11	6	6	4	0.38	1
6.12	6	6	4	0.38	1.5
6.13	6	6	4	0.25	1.5
6.14	6	5	4	0.25	1
6.15	3.33	6.5	4	0.2	1
6.16	5	5	4	0.2	1.1
6.17	3.33	5	4	0.12	1.1
6.18	2	7	2.7	0.12	1.62
6.19	1	7	2.7	0.11	-
6.20	12	10.67	3.5	0.635	5.335
6.21	12	8	5	0.635	1.5
6.24	5	7	4	0.38	1.35
6.25	5	7	4	0.25	1.35
6.26	5	5	4	0.25	1
6.27	4.5	9	4	0.25	1.5
6.29	5	6	4	0.2	1.5
6.28	3.33	8.5	4	0.2	1
6.30	6	5	4	0.2	1
6.31	7	7	4	0.38	1.5
6.32	6	6	4	0.25	1
6.33	4.5	9	4	0.2	1.5
6.34	7	6	4	0.38	1
6.35	6.2	6.2	4	0.38	1.5

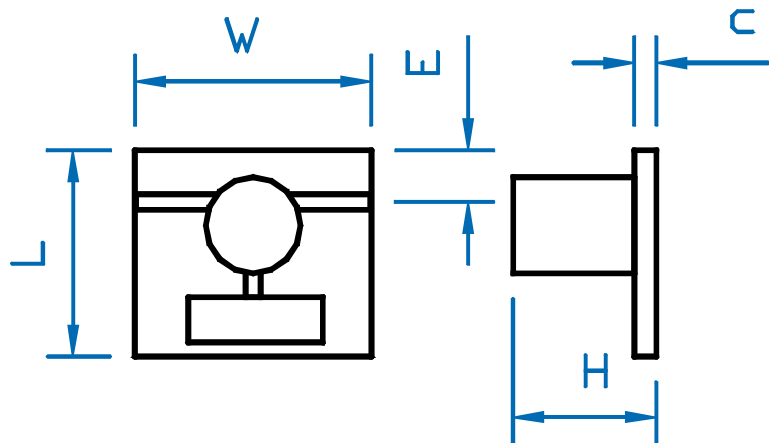


Fig. 28

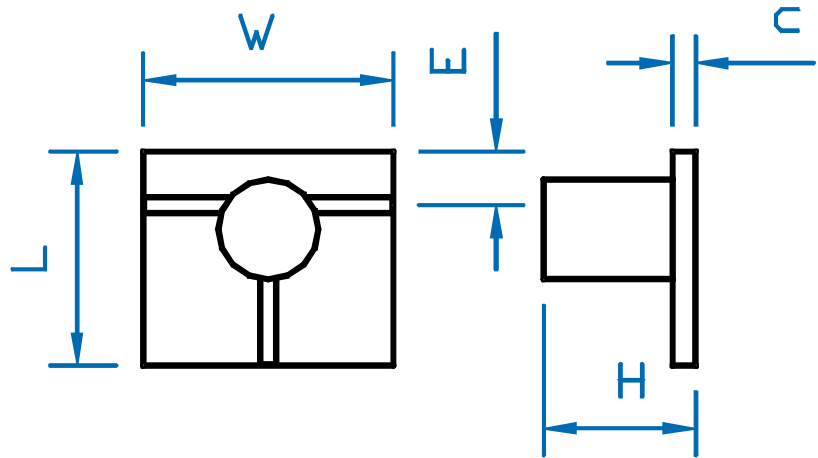
## MICROSTRIP CIRCULATORS ON SUBSTRATE (2.4 to 42.5GHz)

FREQ. RANGE (GHz)	MODEL NUMBER	BAND WIDTH (%)	INS. LOSS db (MAX)	ISOLATION dB (MIN)	VSWR (MAX)	FORWARD POWER (W)	OPERATING TEMP. RANGE	OUTLINE #
2.40-2.80	3CMM26-3Y	full	0.5	20	1.22	5	-10° to +50° C	7.1
4.20-5.20	3CMM48-3	full	0.5	20	1.22	5	-10° to +50° C	7.3
5.20-5.80	3CMM55-3	full	0.5	20	1.22	5	-10° to +50° C	7.2
5.80-7.20	3CMM65-2	full	0.5	20	1.22	5	-30° to +70° C	7.4
5.80-7.20	3CMM65-3	full	0.5	20	1.22	5	-30° to +70° C	7.19
6.30-8.00	3CMM71-1	full	0.6	20	1.22	5	-30° to +70° C	7.5
6.30-8.00	3CMM71-5	full	0.6	20	1.22	5	-30° to +70° C	7.21
7.10-8.50	3CMM78-1	full	0.6	20	1.22	5	-30° to +70° C	7.6
7.10-8.50	3CMM78-3	full	0.6	20	1.22	5	-30° to +70° C	7.5
8.40-10.70	3CMM95-1	full	0.6	18	1.3	5	-30° to +65° C	7.7
8.50-10.50	3CMM95-2	full	0.6	20	1.22	5	-30° to +65° C	7.7
9.50-10.50	4CMM10-2	full	0.6	20	1.22	5	-30° to +65° C	7.7
10.00-12.00	4CMM11-3	full	0.6	20	1.25	5	-30° to +65° C	7.8
11.70-14.50	4CMM10-3Y	full	0.6	18	1.3	5	-30° to +70° C	7.9
13.70-14.70	4CMM14-6	full	0.6	20	1.3	5	-30° to +70° C	7.9
14.00-14.50	4CMM14-1	full	0.6	20	1.3	5	-30° to +70° C	7.9
14.50-15.40	4CMM15-1	full	0.65	18	1.35	5	-30° to +70° C	7.9
15.50-17.50	4CMM16-1	full	0.6	18	1.35	2	-10° to +50° C	7.10
17.70-19.70	4CMM19-1*	full	0.9	19	1.25	2	-30° to +70° C	7.11
19.00-21.20	4CMM20-2*	full	0.9	19	1.25	2	-30° to +70° C	7.11
21.20-23.60	4CMM22-1*	full	0.9	19	1.25	2	-30° to +70° C	7.12
24.00-25.50	4CMM25-2	full	0.9	19	1.25	2	-30° to +70° C	7.13
25.20-27.00	4CMM26-2	full	0.9	19	1.3	2	-30° to +70° C	7.14
27.00-29.00	4CMM28-5	full	0.9	18	1.35	2	-30° to +70° C	7.13
30.00-32.00	4CMM31-1	full	0.9	19	1.25	2	-30° to +70° C	7.13
32.00-34.00	4CMM33-1	full	0.9	19	1.25	2	-30° to +70° C	7.15
34.00-36.00	4CMM35-1	full	0.9	19	1.25	2	-30° to +70° C	7.15
35.00-37.00	4CMM36-4	full	0.9	19	1.25	2	-30° to +70° C	7.15
36.00-38.00	4CMM38-2	full	0.9	19	1.25	2	-30° to +70° C	7.15
36.00-38.00	4CMM37-1	full	0.9	19	1.25	2	-30° to +70° C	7.18
37.00-40.00	4CMM39-2	full	0.9	18	1.3	2	-30° to +70° C	7.15
39.00-41.00	4CMM40-1	full	1	18	1.35	1	-10° to +50° C	7.15
40.50-42.50	4CMM41-2	full	1	17	1.4	1	-10° to +50° C	7.16

## MICROSTRIP CIRCULATORS ON SUBSTRATE (2.4 to 42.5GHz)

FREQ. RANGE (GHz)	MODEL NUMBER	BAND WIDTH (%)	INS. LOSS db (MAX)	ISOLATION dB (MIN)	VSWR (MAX)	FORWARD POWER (W)	OPERATING TEMP. RANGE	OUTLINE #
6.3-8.6	3CMM(XX)-1x	18	0.6	20	1.22	10	-30° to +70° C	7.5
6.3-8.6	3CMM(XX)-2x	18	0.6	20	1.22	10	-30° to +70° C	7.6
6.3-8.6	3CMM(XX)-6x	18	0.6	20	1.22	10	-30° to +70° C	7.20
6.3-8.6	3CMM(XX)-3x	18	0.6	20	1.22	10	-30° to +70° C	7.21
25.2-28.0	4CMM(XX)-4x	5	0.9	19	1.25	2	-30° to +70° C	7.14
34.0-40.0	4CMM(XX)-5x	8	0.9	19	1.25	2	-30° to +70° C	7.15

OUTLINE #	W, mm	L, mm	H, mm	C, mm	E, mm
7.1	20	20	5	1	5
7.2	12	12	4.5	1	2.54
7.3	15	15	5	1	2.5
7.4	12	8.5	5	1	1.5
7.5	12	8	4.5	0.635	1.5
7.6	10	9	4.5	0.635	1.5
7.7	7	7	4.5	0.635	1.5
7.8	7	6	4.5	0.635	1.5
7.9	7	7	4.5	0.5	1.5
7.10	7	6	4	0.38	1.5
7.11	6	6	4	0.38	1
7.12	6	6	4	0.38	1.5
7.13	6	5	4	0.25	1
7.14	5	5	4	0.25	1.35
7.15	5	5	4	0.2	1
7.16	4.5	4.5	3.5	0.2	1.5
7.17	2	3	2.5	0.12	1.62
7.18	6	5	4	0.2	1.5
7.19	12.7	8	4.5	0.635	1.588
7.20	12	9	4.5	0.635	2.5
7.21	10.15	8	4.5	0.635	1.5



**NOTES:**

1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE
2. ALL DEVICES SHOULD BE MOUNTED ON A STEEL (OR KOVAR) BASE EXCEPT ITEMS MARKED WITH A “ \* ”
3. MAX. TEMPERATURE - 130°C UNLESS A SPECIAL ORDER IS PLACED FOR A HIGHER STORAGE TEMPERATURE.
4. CIRCULATION IS CLOCKWISE, INPUT ON LEFT AND OUTPUT ON RIGHT (COUNTERCLOCKWISE IS OPTIONAL)
6. TABS ARE AVAILABLE BY SPECIAL ORDER FOR ALL MICROSTRIP DEVICES

## MICROSTRIP CIRCULATORS ON CARRIERS (2.1 to 40GHz)

FREQ. RANGE (GHz)	MODEL NUMBER	BAND WIDTH (%)	INS. LOSS db (MAX)	ISOLATION dB (MIN)	VSWR (MAX)	FORWARD POWER (W)	OPERATING TEMP. RANGE	OUTLINE #
2.10-2.50	3CMS23-4	full	0.4	20	1.22	5	-10° to +50° C	8.4
2.60-3.00	3CMS26-1	full	0.4	20	1.22	5	-10° to +50° C	8.4
3.00-3.50	3CMS26-1	full	0.4	20	1.22	5	-10° to +50° C	8.4
3.60-4.20	3CMS39-1	full	0.5	20	1.3	5	-10° to +50° C	8.6
5.00-5.90	3CMS54-1	full	0.5	20	1.3	5	-10° to +50° C	TBD
5.80-7.20	3CMS65-1	full	0.55	18	1.3	5	-30° to +70° C	8.7
6.30-8.00	3CMS71-1	full	0.55	18	1.3	5	-30° to +70° C	8.7
7.10-8.50	3CMS78-2	full	0.55	18	1.3	5	-30° to +70° C	8.7
8.40-10.70	3CMS95-1	full	0.6	18	1.3	5	-30° to +65° C	8.8
8.50-10.50	4CMS10-3Y	full	0.6	18	1.3	5	-30° to +65° C	8.17
10.00-12.00	4CMS11-1	full	0.5	18	1.3	5	-10° to +50° C	8.9
11.70-14.50	4CMS12-3Y	full	0.6	18	1.3	5	-30° to +70° C	8.18
13.50-14.50	4CMS14-3	full	0.6	18	1.3	5	-30° to +70° C	8.11
14.00-14.50	4CMS14-2	full	0.6	18	1.3	5	-30° to +70° C	8.11
14.00-15.50	4CMS15-5	full	0.7	18	1.35	5	-30° to +70° C	8.11
17.70-19.70	4CMS19-1	full	0.8	18	1.35	2	-30° to +70° C	8.12
21.20-23.60	4CMS22-1	full	0.9	18	1.35	2	-30° to +70° C	8.13
22.50-25.00	4CMS24-3Y	full	0.9	18	1.35	2	-30° to +70° C	8.19
24.00-25.5	4CMS25-3Y	full	0.9	18	1.35	2	-30° to +70° C	8.14
27.50-28.50	4CMS28-3Y	full	0.9	18	1.35	2	-30° to +70° C	8.14
29.00-31.50	4CMS29-1	full	0.9	18	1.35	2	-30° to +70° C	8.14
30.00-35.00	4CMS33-3Y	full	1	17	1.35	2	-30° to +70° C	8.20
34.00-36.00	4CMS35-1	full	0.9	18	1.35	2	-30° to +70° C	8.15
34.40-38.60	4CMS36-1	full	1	17	1.4	2	-10° to +50° C	8.16
35.00-37.00	4CMS36-2	full	0.9	18	1.35	2	-30° to +70° C	8.15
36.00-38.00	4CMS37-1	full	0.9	18	1.35	2	-30° to +70° C	8.15
37.00-40.00	4CMS39-3	full	0.9	18	1.35	2	-30° to +70° C	8.15
5.70-7.40	4CMS(xx)-3X	18	0.5	20	1.22	10	-30° to +70° C	8.7
34.00-40.00	4CMS(xx)-1X	5	0.9	18	1.35	2	-30° to +70° C	8.15
34.00-40.00	4CMS(xx)-2X	5	0.9	18	1.35	2	-30° to +70° C	8.16

**NOTES:**

1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE
2. (xx) IDENTIFIES THE CENTER FREQUENCY OF THE DEVICE IN GHz
3. MAX. TEMPERATURE - 130°C UNLESS A SPECIAL ORDER IS PLACED FOR A HIGHER STORAGE TEMPERATURE.
4. CIRCULATION IS CLOCKWISE, COUNTERCLOCKWISE IS OPTIONAL.
5. TABS ARE AVAILABLE BY SPECIAL ORDER FOR ALL MICROSTRIP DEVICES

## MICROSTRIP CIRCULATORS ON CARRIERS (2.1 to 40GHz)

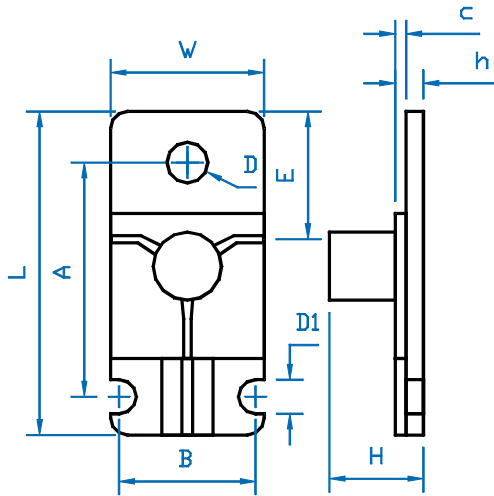


Fig. 31

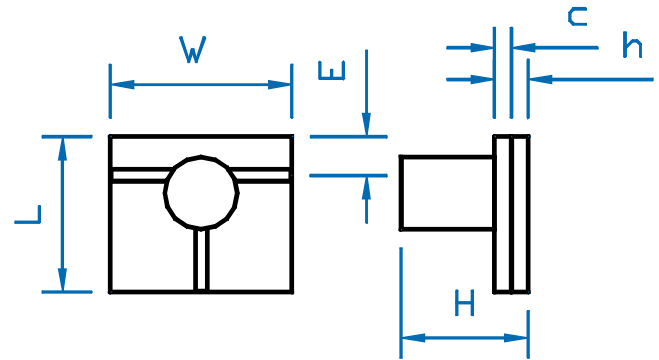


Fig. 33

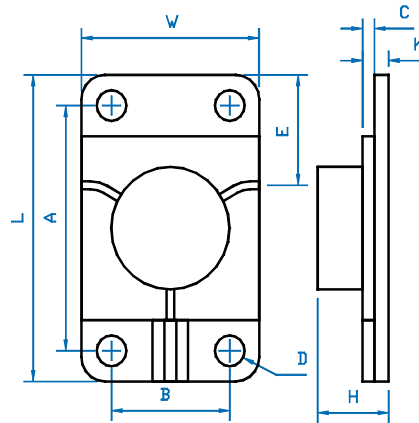


Fig. 34

OUTLINE #	DIMENSIONS, mm										Fig
	W	L	H	h	C	A	B	E	D1	D2	
8.4	20	30	6.5	2.2	1	25	15	10	2.5	-	34
8.6	15	25	6	2.2	1	20	10	9	2.5	-	34
8.7	12	20	5.5	1.85	0.635	15	7	6.5	2.5	-	34
8.8	9	19	5.5	1.65	0.635	13.75	8	7.5	2.4	2	31
8.9	7.1	20	5.5	-	-	-	-	-	-	-	31
8.10	7	15.5	5.5	1.64	0.635	11	6	6.5	2.5	2	31
8.11	7	15.5	5.5	1.5	0.5	11	6	6.5	2.5	2	31
8.12	6	12.19	5.5	1.65	0.38	9.14	5.05	4.67	1.8	2	31
8.13	6	12.19	5.5	1.65	0.38	9.14	5.05	5.17	1.8	2	31
8.14	6	12.19	5.5	1.52	0.25	9.14	5.05	4.67	1.8	2	31
8.15	5	12.19	4.5	1.2	0.2	9.2	4.83	4.67	1.8	1.8	31
8.16	5	5.5	4	0.7	0.2	-	-	1.5	-	-	33
8.17	7	7	5	1.64	0.635	-	-	1.5	-	-	33
8.18	7	7	5	1.5	0.5	-	-	1.5	-	-	33
8.19	5	5	3.8	1.25	0.25	-	-	1	-	-	33
8.20	5	5	3.8	1.2	0.2	-	-	1	-	-	33

## DUAL JUNCTION MICROSTRIP CIRCULATOR (3.1 to 39.5GHz)

FREQUENCY (GHz)	MODEL NUMBER	BAND WIDTH %	INSERTION LOSS (dB)		ISOLATION (dB)			VSWR	OUTLINE #
			1-2	3-1	2-1	1-3	3-2		
3.1 – 3.5	3CMD34-1	full	0.4	0.8	20	33	20	1.25	9.1
8.5 – 10.5	4CMD(xx)-1X	10	0.5	0.9	20	33	20	1.25	9.2
8.5 – 10.5	4CMD(xx)-2X	10	0.5	0.9	20	33	20	1.25	9.3
8.5 – 10.5	4CMD(xx)-3X	10	0.5	0.9	20	33	20	1.25	9.4
25.27 – 26.98	4CMD26-1	full	1	2	20	33	20	1.3	9.5
37.0 – 39.5	4CMD38-1	full	1	2	20	33	20	1.3	9.6

**NOTES:**

1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE OVER FREQUENCY RANGE OF 3.0 TO 40.0 GHz
2. OPERATING TEMPERATURE RANGE IS -30° to +70° C
3. MAX. TEMPERATURE - 130°C UNLESS A SPECIAL ORDER IS PLACED FOR A HIGHER STORAGE TEMPERATURE.
4. ITEMS MARKED WITH A “\*” SHOULD BE MOUNTED ON A NON-MAGNETIC BASE
5. AVERAGE POWER: 1 WATT
6. LOAD POWER UP TO 20W
7. ALL DIMENSIONS ARE IN mm.
8. (xx) IDENTIFIES THE CENTER FREQUENCY OF THE DEVICE IN GHz

OUTLINE #	DIMENSIONS, mm												Fig.
	W	L	A	B	C	D	E	E1	h	J	H (max)	G	
9.1	30.0	25.0	20.0	25.00	1.00	2.5	7.5	-	2.00	-	6.0	16.00	D1
9.2	9.4	12.7	-	-	0.50	-	3.0	6	1.00	-	3.0	6.35	D2
9.3	9.4	12.7	-	-	0.50	-	3.0	6	1.00	-	3.0	6.35	D3
9.4	9.4	14.0	-	-	0.50	1.6	3.0	6	1.50	3.4	3.8	6.35	D4
9.5	10.0	13.0	10.0	7.06	0.25	M1.4	5.5	-	1.25	3.0	4.5	2.50	D5
9.6	6.0	6.0	9.0	3.06	0.20	M1.4	5.0	-	1.20	3.0	4.5	1.00	D5



## DUAL JUNCTION MICROSTRIP CIRCULATOR (3.1 to 39.5GHz)

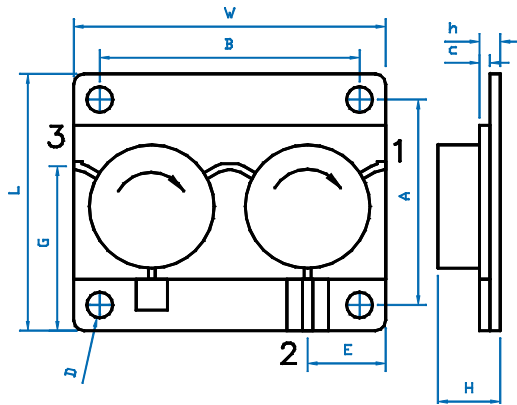


Fig. D1

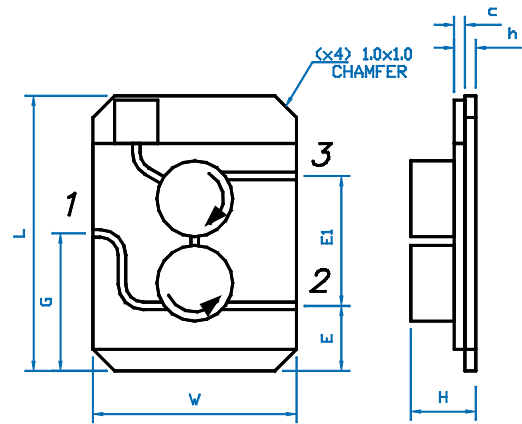


Fig. D2

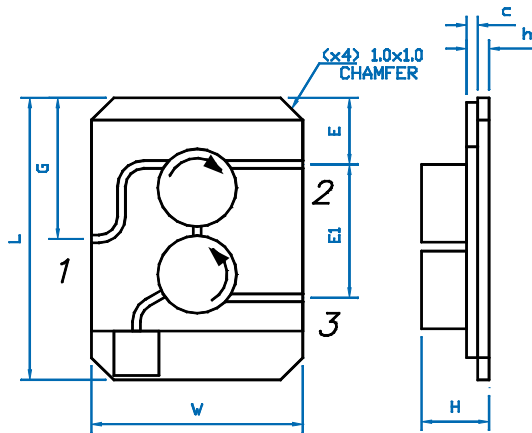


Fig. D3

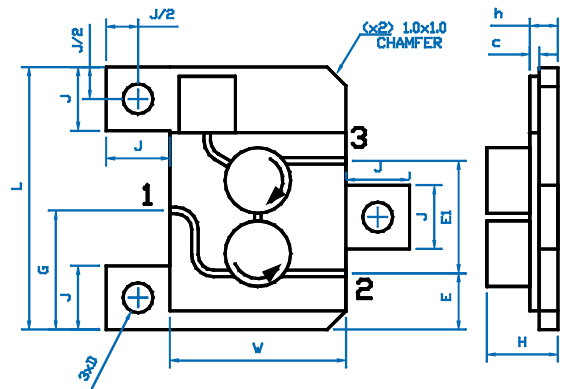


Fig. D4

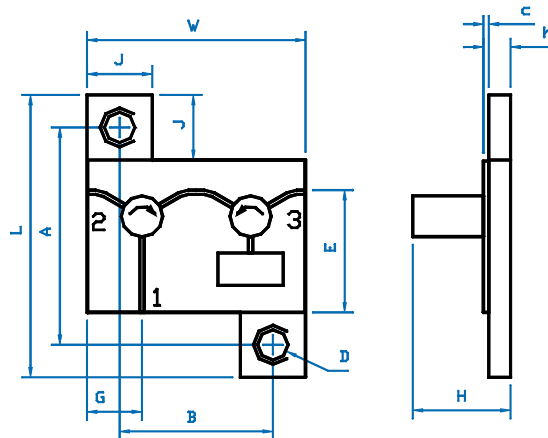


Fig. D5

## APPLICATION NOTES FOR SMT DEVICES

Dorado International SMT devices use a single ferrite element with a circuit pattern on one face and the ground plane on the other. With a permanent magnet structure included on the ferrite substrate, Dorado International devices are complete, self-contained and fully functional ferrite devices.

- **Features:**
  - Small size, light weight
  - Low cost
  - Broad offering
  - High performance
  - Custom design
  - Lead free and ROHS compliant
- **Frequency range:**
  - Standard frequency range of 5 to 27GHz
- **Mechanical mounting:**
  - SMT devices should be mounted on a nonmagnetic basis.
  - Maximum temperature soldering process:
    - If the plating of the SMT device is gold then use Pb free and Sn free solder. The recommended solder should be 97% In plus 3% Ag with the maximum melting point of 150°C. The maximum processing time is 1 minute.
    - If the plating of the SMT device is silver then use a Pb free reflow profile up to a peak temperature of 250°C within 40 seconds.
- **Temperature range:**
  - Standard temperature range –30 to 65°C, Do not heat above 130°C.
  - Electrical parameters perform over the standard operating temperature range
  - Other temperature ranges are available
- **Magnetic fields and materials:**
  - Devices typically exhibit a fringing magnetic field which is less than 1 gauss at the distance of 12.7 mm. Electrical performance may be affected if device is mounted on or very close to magnetic material or exposed to strong magnetic fields from nearby magnetic devices
- **Handling:**
  - Handle with care, using nonmagnetic tools only
- **Environmental:**
  - Operate in waterproof equipment only
  - Humidity up to 95% noncondensing
- **Thermal resistance:**
  - Must not be higher than  $10^{-4}$  m<sup>2</sup>K / W
- **Custom features:**
  - Ability to provide a wide range of solutions to meet most applications

## Recommended Soldering Parameters

### Introduction

The purpose of the following discussion is to define recommended soldering techniques and parameters for Dorado International products. Using these techniques and parameters will prevent damage to the SMT devices through the soldering processes and help ensure product quality and reliability.

### Convection Reflow Soldering Parameters

Surface Mount Technology (SMT) reflow parameters are primarily a function of solder paste chemistry and board technology. Therefore, Dorado International's first order recommendation is to follow the solder paste supplier's soldering parameters, while not violating the maximum parameters listed in Table 1. These parameters apply to both mass SMT assembly and individual site rework. The following information describes Dorado International convection reflow soldering parameters for mass SMT assembly and *reworked products*. Dorado International floor-life recommendations, based on the moisture sensitivity level of the component, are designed to prevent component damage during reflow processing. The component packaging label notes the rated floor life for each type of component. The moisture sensitivity level is determined in accordance with J-STD-020A, "Moisture/ Reflow Sensitivity Classification for Non-Hermetic Solid State Surface Mount Devices."

**Note:** These guidelines also apply to component removal from board assemblies.

Figure 1, Illustration of a Reflow Heating Profile, on the next page, shows examples of reflow heating profiles for various maximum peak temperatures.

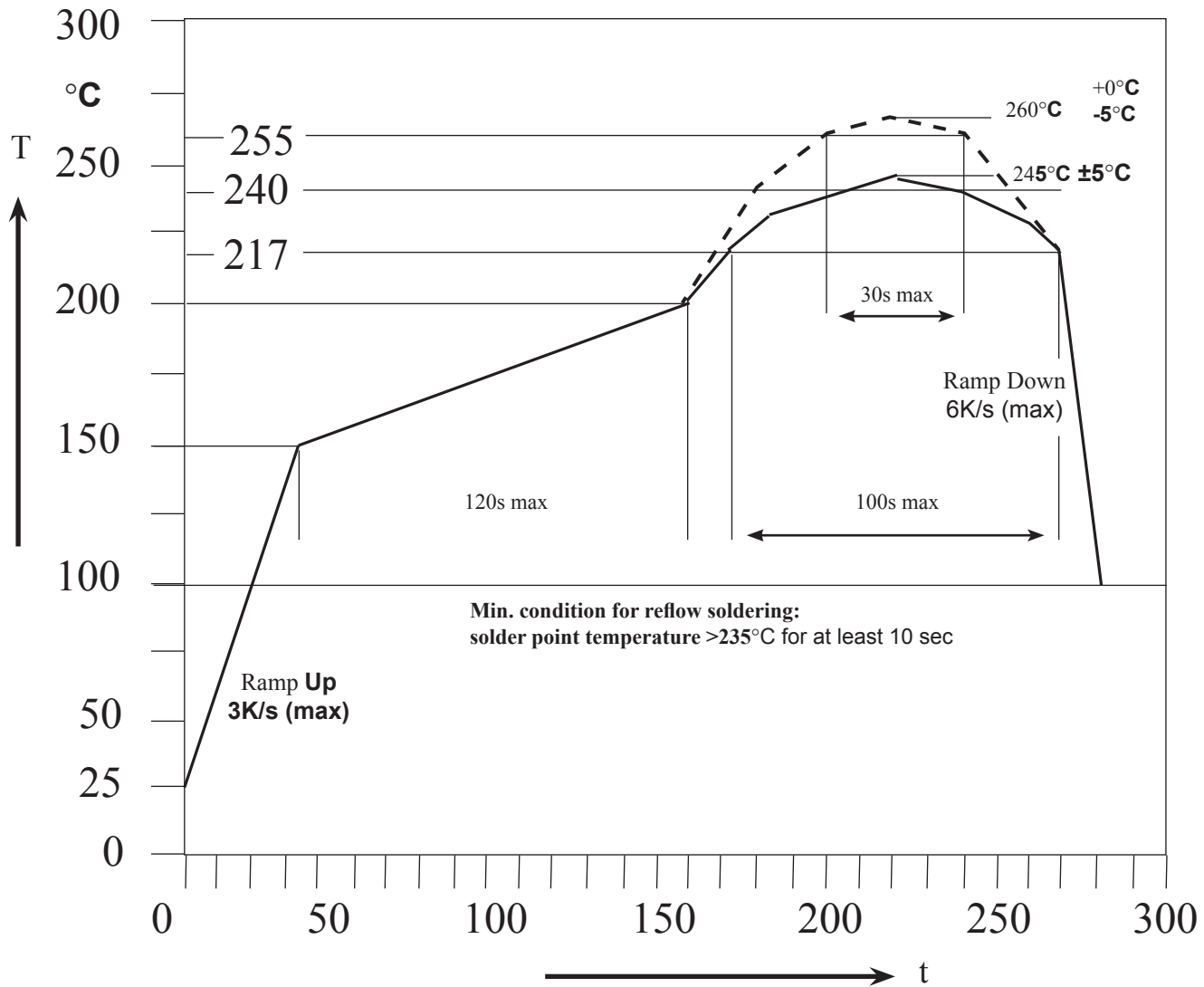
**Table 1: Convection Reflow Soldering Parameters**

	MAX PEAK TEMPERATURE	MAX DWELL TIME @ PEAK	MAX HEATING/ COOLING RATE	TOTAL TIME IN CHAMBER	NO. OF REFLOW CYCLES
Pb-Free <sup>1</sup> Soldering	260°C	10s–30s	4°C/s	~ 9 min.	3

**Notes:** 1. If a component is compatible with Pb-free processing temperatures, the floor life recommendation will be listed on the packaging label.

## APPLICATION NOTES FOR SMT DEVICES

Figure 1: Illustration of a Reflow Heating Profile



### Wave Soldering Parameters

Table 2 shows recommended conditions for topside-mounted PCB.

**Note:** Components must never be immersed in molten solder.

Table 2: Wave Soldering Parameters

	MAX PEAK TEMPERATURE	MAX DWELL TIME @ PEAK	MAX HEATING/COOLING RATE
Pb-Free <sup>1</sup> Soldering	260°C	10s–30s	3°C/s

**Notes:** 1. If a component is compatible with Pb-free processing temperatures, the floor life recommendation will be listed on the packaging label. Instructions for soldering

## 1. Solder cream deposition

- 1.1 The substrate must have Pb-free solder protection. Please optically verify that the edges of the zones are clean, without contaminates and that the PCB zoned areas have not oxidated.
- 1.2 Solder cream may be applied on the board with screen printing or dispenser techniques. For either method, the paste solder must be coated to appropriate thickness and shapes to achieve good solder wetting and adequate insulation.

## 2. Placement of the device

- 2.1 SMT components require precise positioning on their soldering pads. Dependin on the frequency range.
- 2.2 Place the device onto the PCB with automatic pick and place equipment. Various types of suction can be used.
- 2.3 Does not recommend using adhesive agents on the component or on the PCB .

## 3. Soldering

- 3.1 Please follow Dorado International's recommended temperature profile.

## 4. Cleaning of the PCB

- 4.1 When using a conventional solder cream with high level of residue, please clean the PCB with a substitute product, similar to CFC, that complies to the International Environment Agency rules. It is important to do the cleaning operation step less than fifteen minutes after reflow.
- 4.2 Recommended using ultrasonic waves or vapor phase process.

## 5. Quality Check

- 5.1 Verify by visual inspection that component is centred on the mounting pads.
- 5.2 Solder joints : verify by visual inspection that the formation of meniscus on the pads and inside the hole are proper, and have a capilarity amount upper the third of the height.

## Element Key

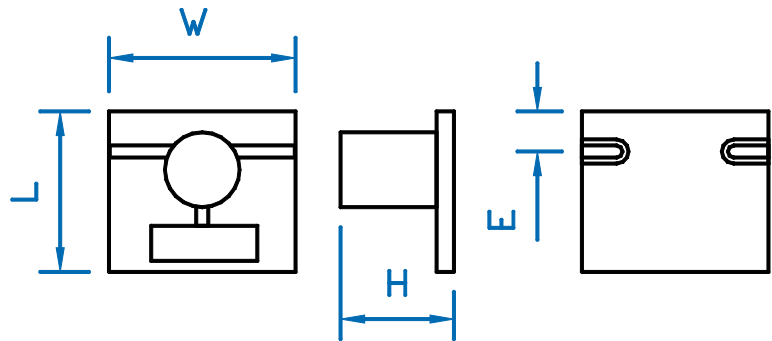
English names from the Periodic Table of elements for symbols used in this document are:

- Sn = tin
- Ag = silver

## SURFACE MOUNT ISOLATORS (5 to 27GHz)

FREQUENCY (GHz)	MODEL NUMBER	BAND WIDTH (%)	INSERTION LOSS (dB)	ISOLATION (dB)	VSWR	PCB PROPERTY		OUTLINE #
						THICKNESS, MM	DK@1MHZ	
5.0 – 5.6	3IMG55-4	5	0.7	16	1.35	0.254	3.9±5%	SM1
5.0 – 5.6	3IMG55-1	full	0.6	20	1.25	0.254	3.9±5%	SM2
21.2 – 23.6	4IMG22-1	full	1	20	1.3	0.125	2.2±5%	SM3
25.27 – 27.0	4IMG26-1	full	1.3	19	1.32	0.125	2.2±5%	SM4

OUTLINE #	DIMENSIONS, mm			
	W	L	H (max)	E
SM1	12.0	12.0	1.8	3.00
SM2	12.0	12.0	4.0	3.00
SM3	6.0	6.0	4.0	1.50
SM4	5.0	7.0	4.0	1.35



**NOTES:**

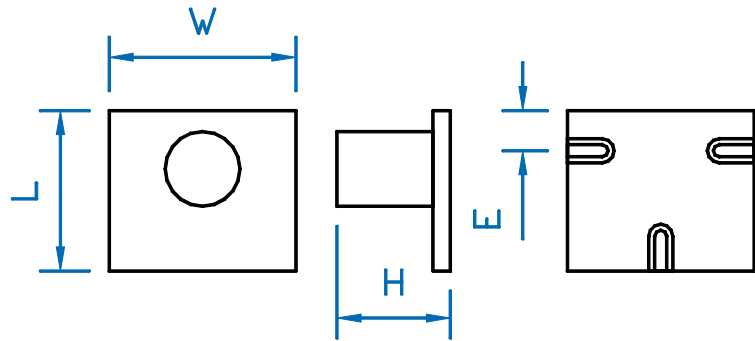
1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE
2. LOAD POWER UP TO 1W



## SURFACE MOUNT CIRCULATORS (8.5 to 27GHz)

FREQUENCY (GHz)	MODEL NUMBER	BAND WIDTH (%)	INSERTION LOSS (dB)	ISOLATION (dB)	VSWR	PCB PROPERTY		OUTLINE #
						THICKNESS, MM	DK@1MHZ	
8.5 – 10.5	4CMG(xx)-2	10	0.6	20	1.25	0.254	3.9±5%	SM5
21.2 – 23.6	4CMG22-1	full	1.1	18	1.3	0.125	2.2±5%	SM6
25.0-27.0	4CMG26-1	full	1.1	18	1.3	0.125	2.2±5%	SM7

OUTLINE #	DIMENSIONS, mm			
	W	L	H (max)	E
SM5	12.0	12.0	4.0	2.5
SM6	6.0	6.0	3.5	1.5
SM7	4.0	4.0	3.0	1.2



**NOTES:**

1. MODIFIED VERSIONS OF ALL DEVICES ARE AVAILABLE
2. (xx) IDENTIFIES THE CENTER FREQUENCY OF THE DEVICE IN G