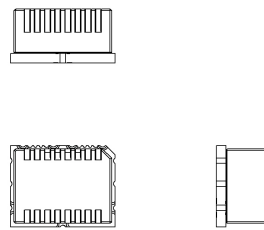
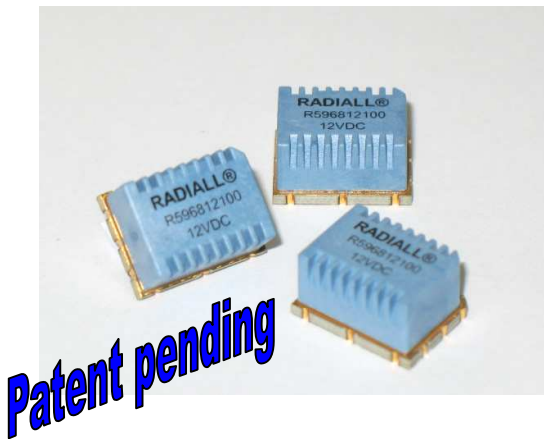
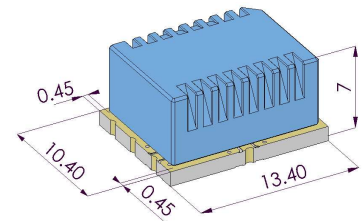


An innovative and original « micro-mechanical » design allows the R596 SMT micro-relay to bring together the excellent reliability, RF and repeatability characteristics of coaxial switches with the miniature size and low cost implementation of surface mount components. Very low return loss and insertion loss allow this relay to be used in power applications, as well as in typical SMT relay applications such as RF attenuators, RF matrices, spectrum analysers, and telecommunications.

Failsafe models are proposed in two RF configurations (direct and inverted) : The association of these two products on the same PC board allows to perform the « BYPASS » function very easily. (For Bypass mounting, further information is available on page7).


ACTUAL SIZE

TYPICAL OUTLINE DRAWING
(All dimensions in mm)
PART NUMBER SELECTION
R 596 . . . 10 .
Updated Revision
Frequency range :

- 3 : DC – 3 GHz
- 8 : DC – 8 GHz

Type :

- 1 : Failsafe
- 3 : Latching, 2 coils
- 9 : Failsafe, inverted RF path (1)

Actuator Voltage :

- 2 : 12 Vdc
- 3 : 24 Vdc

Packaging style (2) :

- 0 : Standard packaging
- 2 : Tape and reel of 200 relays (2)
- 5 : Tape and reel of 500 relays (2)
- 9 : Tape without reel (2) (4)
- T : Soldered on a connectorized test fixture (2) (3)

- (1) : To be associated with a failsafe model, so as to achieve the “BYPASS” function (see application details on page 7)
- (2) : Non standard packaging symbols (2, 5, 9 or T) are not marked on the relay
- (3) : See details about test fixture dimensions on page 3
- (4) : Tape delivered without reel, available for all specific quantities up to 200 pieces

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GENERAL SPECIFICATIONS

Operating mode	Failsafe (types 1 and 9)		Latching (type 3)	
	12 (10.2 to 13)	24 (20.5 to 30)	12 (10.2 to 13)	24 (20.5 to 30)
Nominal operating voltage (across temperature range) Vdc				
Coil resistance at 23°C (+/-10%) Ohms	330	1130	205	865
Operating current at 23°C mA	36	25	58	32
RF and command ports	½ hole gold plated, Infrared reflow, forced air oven or hand soldering (Compatible with "lead free" soldering processes)			
Switching time at nominal voltage	- Making contacts - Breaking contacts			
	Max 4ms (typical 1.8ms), including contact bounce time Max 1ms (typical 0.5ms)			
Life	Cold switching (max 120 cycles/min)			
	Hot switching (max 20 cycles/min)			
Insulation	Dielectric test voltage		300 Vrms	
	Insulation resistance at 500VDC		> 100 MOhms	
Environmental protection	"LEAD FREE" construction – Waterproof (acc. To IEC 60529 / IP67)			
Mass	< 2g			
Operating temperature range (with no icing nor condensation)	Failsafe		Latching	
	-25 to +85 (1)		-40 to +85	
Storage temperature range	-55 to +85			
Sine vibration (MIL STD 202, Method 204D)	- Condition D	: 10-2000 Hz, 20g	operating	
	- Condition G	: 10-2000 Hz, 30g	non operating	
Random vibration (MIL STD 202, Method 214A, Profile I)	- Condition F	: 50-2000 Hz, 20.71 grms	operating	
	- Condition H	: 50-2000 Hz, 29.28 grms	non operating	
Shocks (According to MIL STD 202, Method 213B, Cond. C)	100g / 6 ms, ½ sine operating			

(1) : Failsafe models may be used down to -40°C, but if coil remains permanently supplied at nominal voltage, the holding current value must be reduced by 45% to 55% so as to avoid internal condensation. (for more details, see RADIALL application note AN-R596-51).

PIN IDENTIFICATION (top view)

Failsafe model
(type 1)

Voltage	RF continuity
De-energized	C <--> 1(NC)
Energized	C <--> 2(NO)

Inverted failsafe model for
by-pass applications (type 9)

Voltage	RF continuity
De-energized	C <--> 1(NC)
Energized	C <--> 2(NO)

Latching model
(type 3)

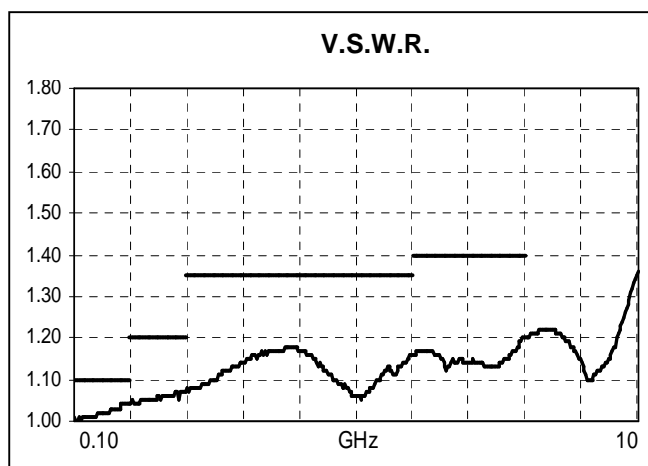
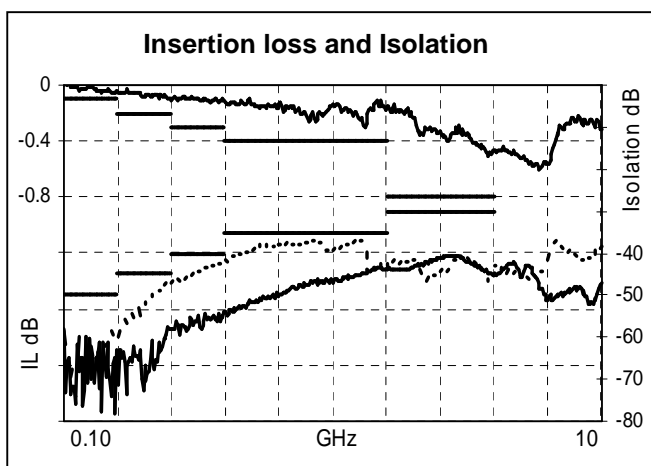
Voltage	RF continuity
-1 +1	C <--> 1
-2 +2	C <--> 2

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RF PERFORMANCES (S parameters available on request)

Frequency Range GHz		V.S.W.R (max)	Insertion Loss (max) dB	Isolation (min) dB		Average power W		Third order Inter modulation	Impedance Ohms
				switch alone	switch + board layout (1)	cold switching	hot switching		
DC - 3 DC - 8	DC - 1	1.10	0.10	50	50	400	50	-120 dBc typical (2 carriers 20W)	50
	1 - 2	1.20	0.20	45	40	280	50		
	2 - 3	1.35	0.30	40	30	175	40		
	3 - 6	1.35	0.40	35	30	50	25		
	6 - 8	1.40	0.80	30	30	35	5		

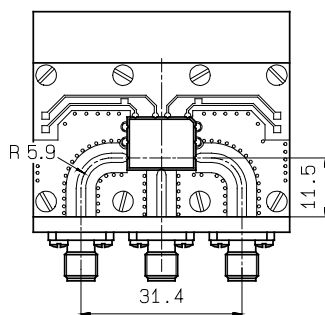
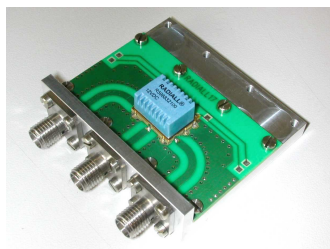
TYPICAL RF PERFORMANCES



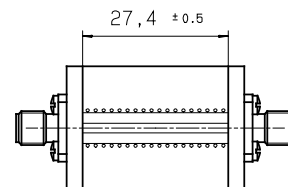
(1) : taking account of the reduction of isolation due to coupling between PCB microstrip lines (see isolation dotted curve above and measurement method below)

Measurement method

Relay soldered on Test Fixture (2)



Calibration board



Inputs/Outputs of the calibration board and test fixture are equipped with SMA type receptacle connectors, RADIALL part number R125 510 000. The length of the RF tracks are the same on the calibration board and the test fixture circuits. The insertion loss of the relay itself is calculated by subtracting the insertion loss of the "calibration board" to the insertion loss of the "relay welded on the test fixture".

(2) : Relay soldered on Test Fixture available. To order, please use the suffix « T » (part number R596 - - - - T), as explained in page 1.

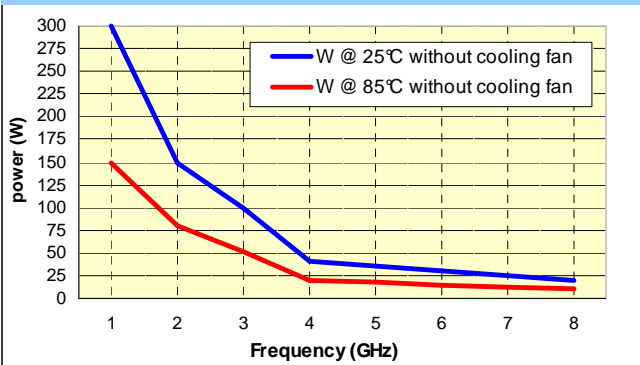
In the continual goal to improve our products, we reserve the right to make any modification judged necessary.

RF POWER RATING FOR COLD SWITCHING USE (impedance 50 Ohms , V.S.W.R<1.25)

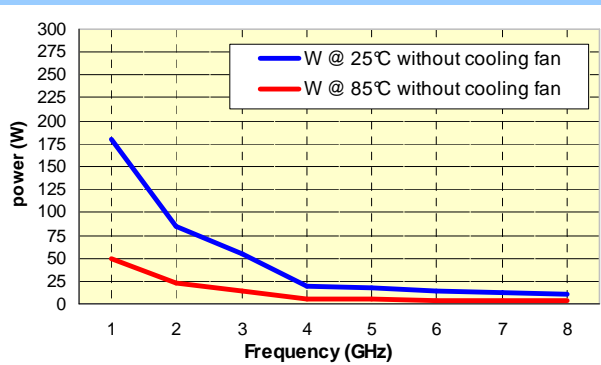
Power level depends on environmental conditions :

- R596 series relays have been designed to be used without cooling fan even for high power applications. However, the power capability may be improved by using an appropriate cooling fan.
- For failsafe models used with coil permanently supplied (NO position), the same power level as latching models may be applied: see application note Nr AN-R596-51, how to implement a "low holding current" function on your PC board, so as to avoid internal overheating and increase the RF power level.

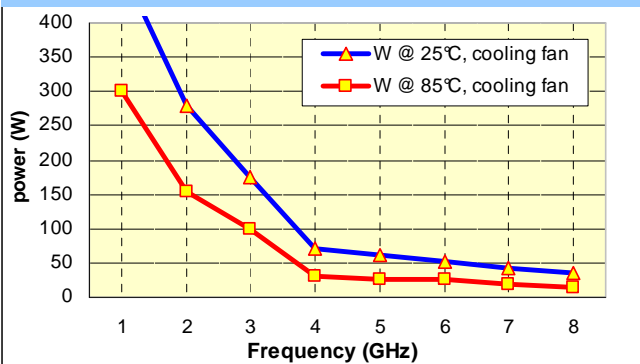
**NO COOLING FAN - LATCHING (all models)
FAILSAFE : NC pos. & NO with low holding voltage**



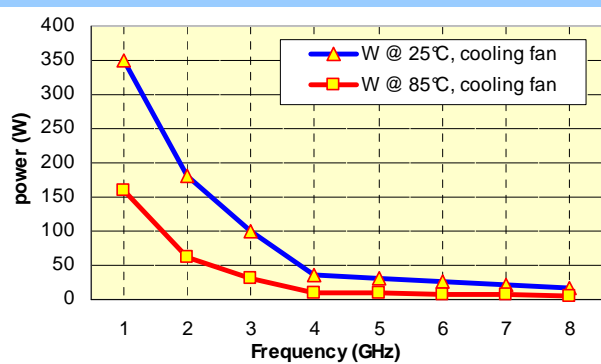
**NO COOLING FAN
FAILSAFE : NO pos. supplied at nominal voltage**



**WITH COOLING FAN - LATCHING (all models)
FAILSAFE : NC pos. & NO with low holding voltage**

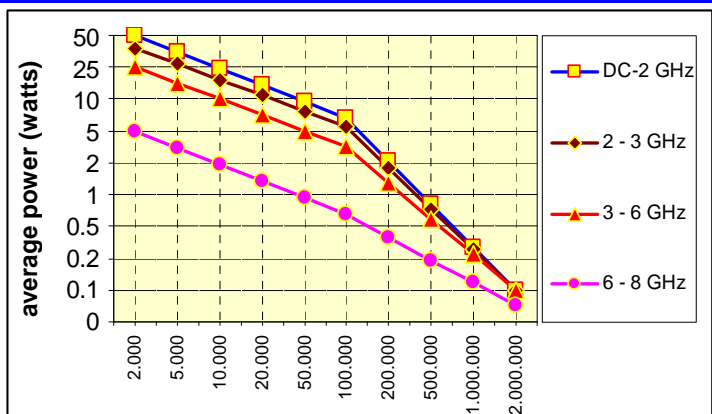


**WITH COOLING FAN
FAILSAFE : NO pos. supplied at nominal voltage**



LIFE DERATING CURVE FOR HOT SWITCHING USE

Impedance 50Ω
V.S.W.R. <1.25
max switching frequency : 30 cycles per mn



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RELAY PACKAGING

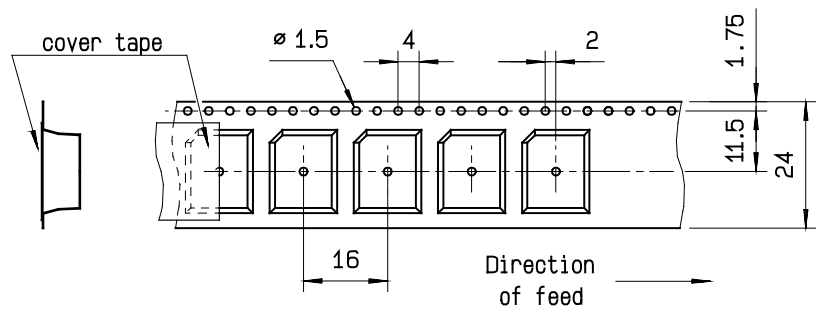
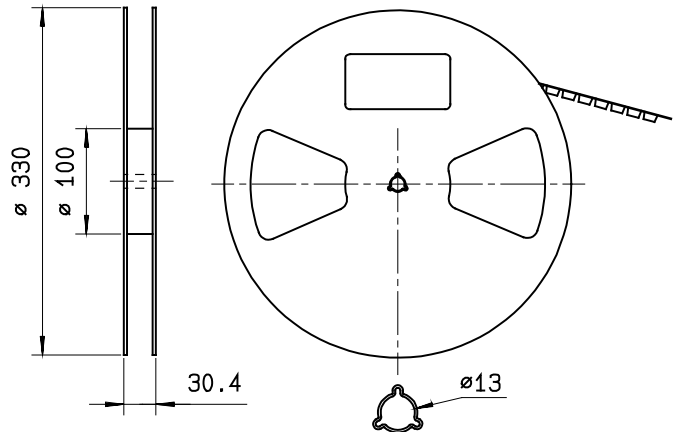
ACCORDING TO IEC 286-3 STANDARD

MATERIALS

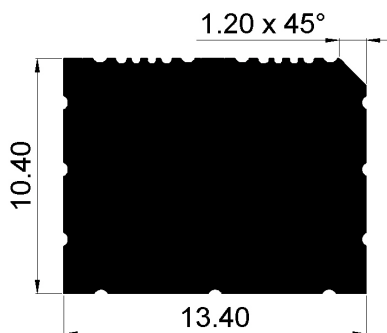
Reel : polyester

Carrier tape : antistatic PETG (polyester)

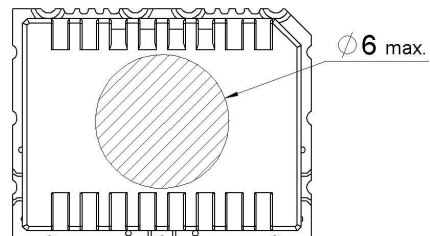
Cover tape : polyester



Video shadow of the relay



Aspiration area

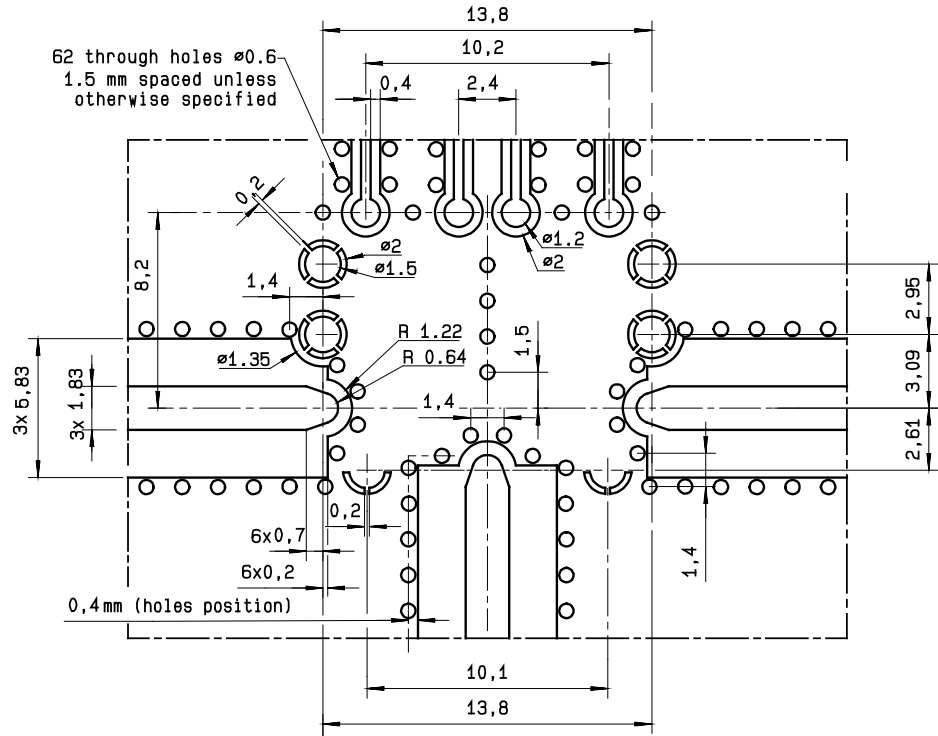


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PC BOARD MOUNTING

Board layout

DXF or GERBER format file available upon request (1)



Substrate Types

Recommended substrates are **ROGERS RO4003** or **ARLON 25N**,

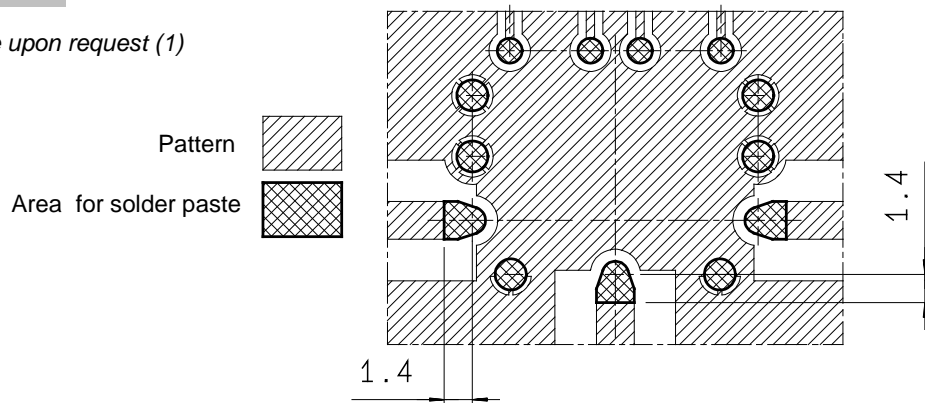
- **Mounting face** : Thickness 0.813 mm Cu double side 17.5µm. Width of track 1.83 mm
 Others substrates : **RO4350** , thickness 0.813 mm Cu double side 17.5µm. Width of track 1.80 mm
25FR , thickness 0.813 mm Cu double side 17.5µm. Width of track 1.76 mm
- **Opposite face** : Plating all over the face.

Total thickness of the tracks (copper over thickness + plating) : 40µm.

Other substrates may be used (for instance standard FR4), if provided with adequate modification of the track width.

Relay soldering pattern

DXF format file available upon request (1)



(1) : Please contact us by E-Mail : switchingproducts@radiall.com

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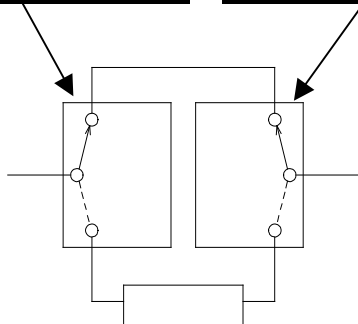
BYPASS APPLICATION : FAILSAFE MICRO-RELAYS TYPICAL IMPLANTATION

SPDT relays (Single Pole Double Throw) can be used to achieve a Bypass switch function. For SMT applications, R596 series relays are available in two failsafe versions - standard and inverted - to provide symmetric RF ports implantation possibility. The "side by side" implementation of these two versions on a PCB effectively produces a « BYPASS » function : the package size is reduced and interconnecting tracks are shortened.

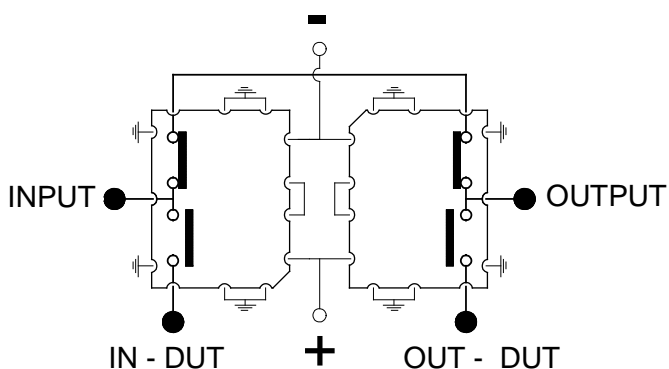
As required to protect the receiver for transmit/receive applications, and depending on the distance between the two relays, this configuration can achieve high isolation levels, up to: 80 dB @ 1GHz, 70 dB @ 2 GHz, and 60 dB @ 6GHz .

BYPASS TYPICAL IMPLANTATION AND PIN IDENTIFICATION (TOP VIEW)

R596.X1X.XXX / R596.X9X.XXX



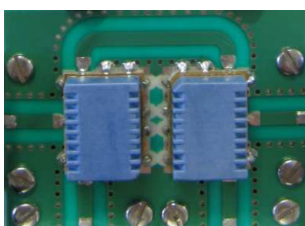
R596.X1X.XXX + R596.X9X.XXX



Voltage	RF continuity
De-energized	INPUT <--> OUTPUT (direct line)
Energized	INPUT <--> IN-DUT / OUT-DUT <--> OUTPUT

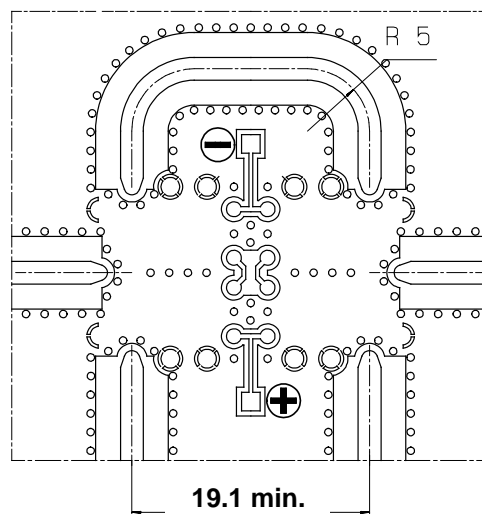
BYPASS PC BOARD MOUNTING

Example of Board layout for BY-PASS application.



ACTUAL SIZE

(See detailed board layout on page 6)



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RECOMMENDED SOLDERING PROCEDURE

A – Soldering procedure using automatic pick and place equipment

1-Solder paste :

R596 series are « Lead Free », and Lead Free Sn-Ag3.5-Cu0.7 solder cream may be used as well as standard Sn63–Pb35–Ag2. RADIALL recommends using a « no clean - low residue » solder cream (5% solid residue of flux quantity) that will permit the elimination of the cleaning operation step after soldering.

Note : Due to the gold plating of the switch PCB interface, it is important to use a paste made with silver. This will help in avoiding formation of intermetallics as part of the solder joint.

2-Solder paste deposition :

Solder cream may be applied on the board with screen printing or dispenser technologies. For either method, the solder paste must be coated to appropriate thickness and shapes to achieve good solder wetting. Please optically verify that the edges of the zone are clean and without contaminates, and that the PCB zoned areas have not oxydated. The design of the mounting pads and the stenciling area are given on page 6, for a thickness of the silk-screen printing of 0.15 mm (0.006 ").

3-Placement of the component :

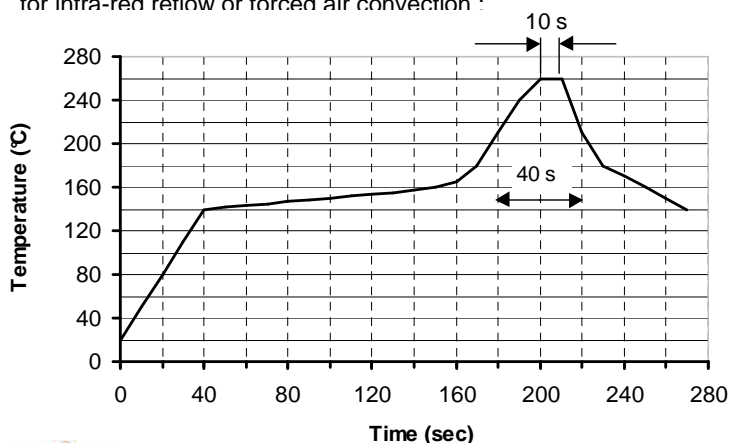
For small lightweight components such as chip components, a self-alignment effect can be expected if small placement errors exist. However, this effect is not as expected for relays components and they require a accurate positioning on their soldering pads, typically +/- 0.1mm (+/-0.004").

Place the relay onto the PCB with automatic pick and place equipment. Various types of suction can be used.

RADIALL does not recommend using adhesive agents on the component or on the PCB.

4-Soldering : infra-red process

Please follow the RADIALL recommended temperature profile for infra-red reflow or forced air convection :



Higher temperature (>260°C) and longer process duration would damage permanently the switches.

5-Cleaning procedure : On miniature relays, high frequency cleaning may cause the contacts to stick. If cleaning is needed, please avoid ultrasonic cleaning and use alcohol based cleaning solutions.



In-line cleaning process, spraying, immersion, especially under temperature, may cause a risk of degradation of internal contacts.

6-Quality check :

Verify by visual inspection that the component is centered on the mounting pads.

Solder joints : verify by visual inspection that the formation of meniscus on the pads are proper, and have a capilarity amount upper the third of the height.

B – Soldering procedure by manual operation

1-Solder paste and flux deposition :

Refer to procedure A – 1

Deposite a thin layer of flux on mounting zone.

Allow the flux to evaporate a few seconds before applying the solder paste, in order to avoid dilution of the paste.

2-Solder paste deposition :

RADIALL recommends depositing a small amount of solder paste on the mounting zone area by syringe.

Be careful, not to apply solder paste outside of the zone area.

3-Placement of the component :

During manipulation, avoid contaminating the lead surfaces by contact with fingers.

Place the component on the mounting zone by pressing on the top of the relay lid.

4-Hand soldering :

Iron wattage 30 to 60 W.

Tip temperature 280 to 300°C for max. 5 seconds

To keep good RF characteristics above 3GHz, it is important to solder RF ports first, and apply pressure on the relay lid during all the soldering stage, so as to reduce the air gap between the PC board and the relay.

5-Cleaning procedure :

Refer to procedure A – 5.

6-Quality check:

Verify by visual inspection that component is centred on the mounting pads.

Solder joints : verify by visual inspection that the formation of meniscus on the RF pads are proper, and have a capilarity amount higher than one third of the height.

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