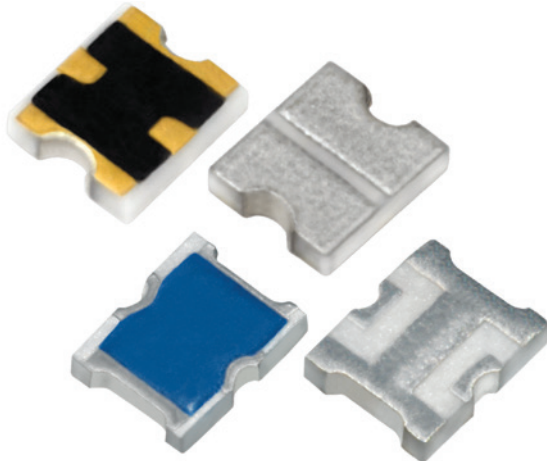


HR Series - High Reliability Components

Resistive Product for High Reliability Applications



Smiths Interconnect offers high reliability testing based on MIL-PRF-55342 for most standard products designed to ensure long term reliability in demanding applications while simplifying the procurement process through standard test plans.

Smiths Interconnect offers fixed attenuators, Thermopad®, and resistive products in a high reliability S-level common platform for space, military, and aerospace designs. This eliminates the need for costly and time-consuming custom drawings and specifications, through the requirements of Mil-PRF-55342. Parts may be ordered 100% tested to Group A with the option to add Group B or Group C for qualification. With Smiths Interconnect's smart part numbering system, customers may designate the level of testing required simply by indicating Group A, B, & C at the appropriate location in the part number. Purchasing is simplified with standardized lead times and part number identifiers.

Smiths Interconnect has supplied RF passive components for space flight missions for over 35 years, participating in more than 200 military, commercial and scientific satellite programs. Our capabilities support our customers through launch by providing 100% flight testing, qualification testing, serialized data and packaging requirements. Over the years Smiths Interconnect has earned a reputation of excellent performance with many of the world's major space organizations through our design and manufacturing of high performance component products utilizing our core technologies to ensure compliance with the extremely high reliability levels required for long life in defense, commercial and civil satellite applications.

The HR Series of products offers proven space level performance and complete qualification documentation for mission assurance.

Features and Benefits

- S-Level Tested based on MIL PRF-55342
- Serialized Packaging with Test Data
- Group A, B, or C Test Options

Applications

- Amplifier Circuits
- Transmit/Receive Modules
- Up/Down Converters
- Instrumentation
- Satellite Communications
- Radar
- Broadcast

Technical Characteristics

High Reliability Product Offering

Fixed Attenuator Products

Standard Product Series	HR (High Reliability) Series	Test Plan	Frequency Range (GHz)	Input Power CW (Watts)	Component Size (Inches)	Component Size (mm)
TS03	HR03	TP-8965	DC-12.4	2.00	0.145 X 0.122	3.68 X 3.10
TS05	HR05	TP-8965	DC-18	0.10	0.075 X 0.060	1.90 X 1.52
TS09	HR09	TP-9030	DC-20	0.20	0.060 X 0.075	1.52 X 1.90
KFA	HRKFA	TP-9010	16-36	0.20	0.120 X 0.065	3.05 X 1.65

Thermopad® Products

Standard Product Series	HR (High Reliability) Series	Test Plan	Frequency Range (GHz)	Input Power CW (Watts)	Component Size (Inches)	Component Size (mm)
TVA	HRT	TP-8965	DC-6	2.00	0.145 X 0.122	3.68 X 3.10
MTVA	HRM	TP-8965	DC-18	0.20	0.075 X 0.060	1.90 X 1.52
WTVA	HRW	TP-9030	DC-20	0.20	0.060 X 0.075	1.52 X 1.90
KTVA	HRK	TP-9010	16-36	0.10	0.120 X 0.065	3.05 X 1.65

Diamond RF Resistives® Products (Resistors, Terminations, Attenuators)

Standard Product Series	HR (High Reliability) Series	Test Plan	Frequency Range (GHz)	Input Power CW (Watts)	Component Size (Inches)	Component Size (mm)
CR0402D	HRXCR0402D	TP-9046	DC-30	10	0.045 X 0.025	1.14 X 0.64
CR0505D	HRXCR0505D	TP-9046	DC-18	25	0.055 X 0.055	1.40 X 1.40
CR0603D	HRXCR0603D	TP-9046	DC-18	40	0.065 X 0.035	1.65 X 0.89
CR1010D	HRXCR1010D	TP-9046	DC-12.4	62.5	0.105 X 0.105	2.67 X 2.67
CT0402D	HRXCT0402D	TP-9046	DC-26.5	5	0.045 X 0.025	1.14 X 0.64
CT0505D	HRXCT0505D	TP-9046	DC-20	30	0.055 X 0.055	1.40 X 1.40
CT0603D	HRXCT0603D	TP-9046	DC-28	30	0.065 X 0.035	1.65 X 0.89
CT1310D	HRXCT1310D	TP-9046	DC-14	70	0.130 X 0.105	3.30 X 2.67
CT2010D	HRXCT2010D	TP-9046	DC-12.4	150	0.205 X 0.105	5.21 X 2.67
CA0505D	HRXCA0505D	TP-9046	DC-26.5	25	0.055 X 0.055	1.40 X 1.40

HR Series Attenuators and Thermopads

Test Parameters per Test Plan TP-8965

Test	Sample Qty	Test Standard and Method	Test Condition
Pre-Cap Visual and Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification

Group A Inspection

Visual / Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification
Initial Electrical (RF) Inspection	100%	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
Thermal Shock	100%	MIL-PRF-55342, MIL-STD-202, Method 107	10 Cycles -55°C to +125°C
Electrical (RF) Inspection	100%	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
Burn In	100%	MIL-PRF-55342, MIL-STD-202, Method 108	Maximum Rated Input Power @ 125°C for *Exception 168 Hours
Final Electrical (RF) Inspection	100%	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
Percent Defective Allowable (PDA)	100%	Per Smiths Interconnect TP-8965	10% allowable

Subgroup 1 [TVA product only]

3

Temperature Coefficient of Attenuation TCA (If Temp Variable Product)	3	Per Smiths Interconnect TP-8965	-55°C to +125°C - ±0.001 dB/dB/°C allowable
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Group B Inspection

7

Subgroup 1	3		
Electrical (RF) Inspection	3	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
Low Temperature Operation	3	MIL-PRF-55342	Maximum Rated Input Power @-55°C *Exception -55°C
Electrical (RF) Inspection	3	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
High Temperature Exposure	3	MIL-PRF-55342	100 hours @ *Exception 125°C
Electrical (RF) Inspection	3	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
Termination Adhesion	3	MIL-PRF-55342, MIL-STD-202, Method 211	Test Condition A - Pull Test - *Exception 15 Grams
Bondability	3	MIL-PRF-55342	Mounted to metallized substrate, a minimum of 2 bonds per chip using .001" diameter gold wire - Pull rate 50 ± 10 seconds per inch max
Termination Solderability (Resistance to Soldering Heat)	3	MIL-PRF-55342, MIL-STD-202, Method 210	Test Condition B - Solder Dip - Sn/Pb 220°C for 5 seconds
Terminal Lead Strength	3	MIL-PRF-55342, MIL-STD-202, Method 221	Test Condition A - 1.5 pounds for 15 seconds

Subgroup 2

4

Initial Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
Life Test	4	MIL-PRF-55342, MIL-STD-202, Method 108	Test Condition D - Maximum Rated Input Power @ 70°C for 1000 Hours, Electrical measurements made @ 250, 500, 1000 hours
Final Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value

HR Series Attenuators and Thermopads

Test Parameters per Test Plan TP-8965

Test	Sample Qty	Test Standard and Method	Test Condition
Pre-Cap Visual and Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification
Group C Inspection	4		
Initial Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
Load Life Test	4	MIL-PRF-55342, MIL-STD-202, Method 108	Test Condition D - Maximum Rated Input Power @ 70°C for 1000 Hours, Electrical measurements made @ 0, 250, 500, 1000 hours
Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value

Sample Quantities and Lead Times

Product Series Test Sample Requirements and Lead Times for TP-8965

Test Level	Fixed Attenuators: HR03/HR05	Thermopads: HRT/HRM	Lead time
Group A Total TCA	None None Required	3 Samples Total Add 3 Samples TCA	12 Weeks ARO
Group A & B Total Group B Sub-group 1 Group B Sub-group 2	7 Samples Total Add 3 Samples Add 4 Samples Burn-In	10 Samples Total Add 3 Samples Add 4 Samples Burn-In	18 Weeks ARO
Group A, B & C Total Group C Life	11 Samples Total Add 4 Samples for Stepped Burn-In	14 Samples Total Add 4 Samples for Stepped Burn-In	20 Weeks ARO

HR Series Attenuators and Thermopads

Test Parameters per Test Plan TP-9010

Test	Sample Qty	Test Standard and Method	Test Condition
Pre-Cap Visual and Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification
Group A Inspection			
Thermal Shock	100%	MIL-PRF-55342, MIL-STD-202, Method 107	10 Cycles -55°C to +125°C
Burn In/Bake	100%	MIL-PRF-55342, MIL-STD-202, Method 108	Stabilization Bake @ 150°C for *Exception 100 Hours
Final Electrical (RF) Inspection	100%	MIL-PRF-55342	VSWR Attenuation mid frequency band Limits per datasheet and dB Value
Subgroup 1 [TVA product only]	3		
Temperature Coefficient of Attenuation TCA (If Temp Variable Product)	3	Per Smiths Interconnect TP-9010	-55°C to +125°C - ±0.001 dB/dB/°C allowable
Group B Inspection 7			
Subgroup 1	3		
High Temperature Exposure	3	MIL-PRF-55342	100 hours @ *Exception 125°C
Electrical (RF) Inspection	3	MIL-PRF-55342	VSWR Attenuation mid frequency band Limits per datasheet and dB Value
Bondability	3	MIL-PRF-55342	Mounted to metallized substrate, a minimum of 2 bonds per chip using .001" diameter gold wire - Pull rate 50 ± 10 secondsper inch max
Termination Solderability (Resistance to Soldering Heat)	3	MIL-PRF-55342, MIL-STD-202, Method 210	Test Condition B - Solder Dip - Sn/Pb 220°C for 5 seconds
Subgroup 2	4		
Load Life Test	4	MIL-PRF-55342, MIL-STD-202, Method 108	Test Condition D - Maximum Rated Input Power @ 100°C for 1000 Hours, Electrical measurements made after 1000 hours
Final Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR Attenuation mid frequency band Limits per datasheet and dB Value
Group C Inspection 4			
Load Life Test	4	MIL-PRF-55342, MIL-STD-202, Method 108	Test Condition D - Maximum Rated Input Power @ 100°C for 1000 Hours, Electrical measurements made after 1000 hours
Final Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR Attenuation mid frequency band Limits per datasheet and dB Value

Sample Quantities and Lead Times

Product Series Test Sample Requirements and Lead Times for TP-9010

Test Level	Fixed Attenuators: HRKFA	Thermopads: HRK	Lead time
Group A Total TCA	None None Required	3 Samples Total Add 3 Samples TCA	12 Weeks ARO
Group A & B Total Group B Sub-group 1 Group B Sub-group 2	7 Samples Total Add 3 Samples Add 4 Samples Burn-In	10 Samples Total Add 3 Samples Add 4 Samples Burn-In	18 Weeks ARO
Group A, B & C Total Group C Life	11 Samples Total Add 4 Samples for Stepped Burn-In	14 Samples Total Add 4 Samples for Stepped Burn-In	20 Weeks ARO

HR Series Attenuators and Thermopads

Test Parameters per Test Plan TP-9030

Test	Sample Qty	Test Standard and Method	Test Condition
Pre-Cap Visual and Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification
Group A Inspection			
Initial Electrical (RF) Inspection	100%	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
Thermal Shock	100%	MIL-PRF-55342, MIL-STD-202, Method 107	10 Cycles -55°C to +125°C
Electrical (RF) Inspection	100%	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
Burn In/Bake	100%	MIL-PRF-55342, MIL-STD-202, Method 108	Stabilization Bake @ 150°C for *Exception 168 Hours
Final Electrical (RF) Inspection	100%	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
Percent Defective Allowable (PDA)	100%	Per Smiths Interconnect TP-9030	10% allowable
Subgroup 1 [TVA product only]			
Temperature Coefficient of Attenuation TCA (If Temp Variable Product)	3	Per Smiths Interconnect TP-9030	-55°C to +125°C - ±0.001 dB/dB/°C allowable
Group B Inspection			
7			
Subgroup 1			
Electrical (RF) Inspection	3	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
Low Temperature Operation	3	MIL-PRF-55342	Maximum Rated Input Power @-55°C *Exception -55°C
Electrical (RF) Inspection	3	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
High Temperature Exposure	3	MIL-PRF-55342	100 hours @ *Exception 150°C
Electrical (RF) Inspection	3	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
Termination Adhesion	3	MIL-PRF-55342, MIL-STD-202, Method 211	Test Condition A - Pull Test - *Exception 15 Grams
Bondability	3	MIL-PRF-55342	Mounted to metallized substrate, a minimum of 2 bonds per chip using .001" diameter gold wire - Pull rate 50 ± 10 secondsper inch max
Termination Solderability (Resistance to Soldering Heat)	3	MIL-PRF-55342, MIL-STD-202, Method 210	Test Condition B - Solder Dip - Sn/Pb 22-°C for 5 seconds
Subgroup 2			
Initial Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value
Life Test	4	MIL-PRF-55342, MIL-STD-202, Method 108	Test Condition D - Maximum Rated Input Power @ 70°C for 1000 Hours, Electrical measurements made @ 250, 500, 1000 hours
Final Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ 1.0 GHz @ 25°C - Limits per datasheet and dB Value

HR Series Attenuators and Thermopads

Test Parameters per Test Plan TP-9030

Test	Sample Qty	Test Standard and Method	Test Condition
Pre-Cap Visual and Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification
Group C Inspection	4		
Initial Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value
Load Life Test	4	MIL-PRF-55342, MIL-STD-202, Method 108	Test Condition D - Maximum Rated Input Power @ 125°C for 1000 Hours, Electrical measurements made @ 0, 250, 500, 1000 hours
Electrical (RF) Inspection	4	MIL-PRF-55342	VSWR @1.0 GHz and Attenuation @ DC & 1.0 GHz - Limits per datasheet and dB Value

Sample Quantities and Lead Times

Product Series Test Sample Requirements and Lead Times for TP-9030

Test Level	Fixed Attenuators: HRKFA	Thermopads: HRK	Lead time
Group A Total TCA	None None Required	3 Samples Total Add 3 Samples TCA	12 Weeks ARO
Group A & B Total Group B Sub-group 1 Group B Sub-group 2	7 Samples Total Add 3 Samples Add 4 Samples Burn-In	10 Samples Total Add 3 Samples Add 4 Samples Burn-In	18 Weeks ARO
Group A, B & C Total Group C Life	11 Samples Total Add 4 Samples for Stepped Burn-In	14 Samples Total Add 4 Samples for Stepped Burn-In	20 Weeks ARO

HR Series Diamond RF Resistives

per Test Plan TP-9046

Test	Sample Qty	Test Standard and Method	Test Condition
Pre-Cap Visual and Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification

Group A Inspection

Visual / Mechanical	100%	MIL-PRF-55342	30X to 60X Magnification
Initial Electrical (RF) Inspection	100%	MIL-PRF-55342	DC Resistance / DC Attenuation - Limits per datasheet and dB Value
Thermal Shock	100%	MIL-PRF-55342, MIL-STD-202, Method 107	10 Cycles -55°C to +125°C
Burn In/Bake	100%	MIL-PRF-55342, MIL-STD-202, Method 108	Stabilization Bake @ 150°C for *Exception 168 Hours
Final Electrical (RF) Inspection	100%	MIL-PRF-55342	DC Resistance / DC Attenuation - Limits per datasheet and dB Value
Percent Defective Allowable (PDA)	100%	Per Smiths Interconnect TP-8965	10% allowable

Group B Inspection

6

Subgroup 1	3		
Resistance to Temperature Characteristics	3	MIL-PRF-55342, MIL-STD-202, Method 304	DC Resistance / DC Attenuation @ -55°C and 125°C and calculate percent change
Final Electrical (RF) Inspection	3	MIL-PRF-55342	DC Resistance / DC Attenuation - Limits per datasheet and dB Value
Bondability	3	MIL-PRF-55342	Mounted to metallized substrate, a minimum of 2 bonds per chip using .001" diameter gold wire - Pull rate 50 ±10 seconds per inch max
Termination Solderability (Resistance to Soldering Heat)	3	MIL-PRF-55342, MIL-STD-202, Method 210	Test Condition B - Solder Dip - Sn/Pb 220°C for 5 seconds

Group C Inspection

3

Initial Electrical (RF) Inspection	4	MIL-PRF-55342	DC Resistance / DC Attenuation - Limits per datasheet and dB Value
Load Life Test	4	MIL-PRF-55342, MIL-STD-202, Method 108	Test Condition D - Maximum Rated Input Power @ 100°C for 1000 Hours, Electrical measurements made @ 0, 250, 500, 1000 hours
Final Electrical (RF) Inspection	4	MIL-PRF-55342	DC Resistance / DC Attenuation - Limits per datasheet and dB Value

Sample Quantities and Lead Times

Product Series Test Sample Requirements and Lead Times for TP-9046

Test Level	Diamond Rf Resistives	Lead time
Group A Total	None	14 Weeks ARO
Group A & B Total	6 Samples Total	20 Weeks ARO
Group B TCR	Add 3 samples	
Group B Bondability	Add 3 samples	
Group A, B & C Total	9 Samples Total	22 Weeks ARO
Group C Life	Add 3 Samples for Stepped Burn-In	

Additional Testing Service

In addition to standard HR Series testing, Smiths Interconnect offers a wide array of additional test services to support various application and market requirements. We can develop a custom test plan per a customer supplied test plan or unique application specific requirements offering ultimate flexibility. With over 40 years of heritage, Smiths Interconnect is a global leader in high reliability board level components supporting the stringent requirements of the space, aerospace, defense and medical markets.

HR Series Products Test Capabilities

Stability of Attenuation After:

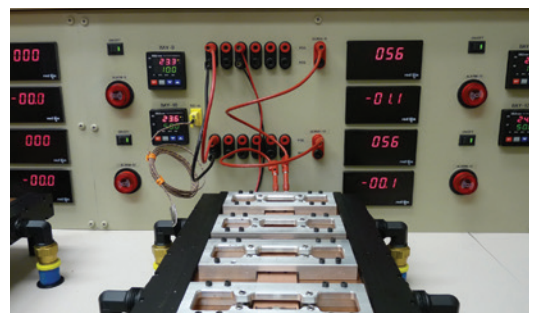
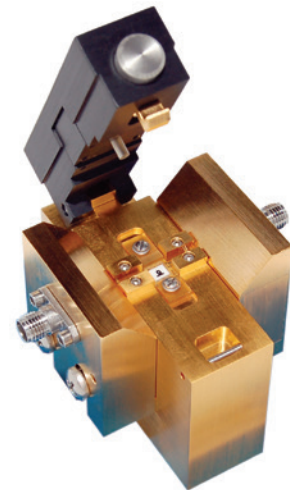
- Temperature Change
- Thermal Shock
- Vibration
- Shock
- Moisture Resistance
- Peak Power
- Salt Spray

Sensitivity of Attenuation After:

- Change in Input Power
- Change in Frequency
- Change in Temperature

Additional Test Capabilities:

- Vibration and Shock Testing
- Moisture Resistance
- Peak Power
- Salt Spray
- Barometric Pressure
- Outgassing
- Endurance
- Resistance to Bonding Exposure
- Low Temperature Operation
- Short Term Overload
- High Temperature Exposure
- Solderable Mounting Integrity
- Bondable Mounting Integrity
- Resistance to Solvents
- Gross and Fine Leak Detection
- Radiographic Inspection
- First Article Inspection
- Pre-Cap Inspection
- Source Inspection
- Additional testing services available upon request



How To Order

Specify Model Number: **Fixed Attenuators** HRXXXXXXXXXX

	H R					
	1	2	3	4	5	
1 Series Name	H R 0 3 HR03	H R 0 5 HR05	H R 0 9 HR09	H R K F A HRKFA		
2 Attenuation Value	0 0 00 dB through	2 0 20 dB				
3 Test Group Option	A A	B B	C C			
4 Options	Planar	W 1 Single Wrap Ground	W 3 Triple Wrap - All Ports	W B 1 Wire Bondable		
5 Terminal Finish	Standard	S Pretinning	F RoHS	G Gold		

How To Order

Specify Model Number: **Thermopad®** HRXXXXXXXXXX

	H R		0	N	0		
	1	2	3	4	5	6	7
1 Series Name	H R T HRT	H R M HRM	H R W HRW	H R K HRK			
2 Attenuation Value	0 0 00 dB through	2 0 20 dB					
3 Test Group Option	0 A OA	0 B OB	0 C OC				
4 TCA Slope	N Negative						
5 TCA Shift Option (dB/dB/°C)	0 1 01=0.001	0 2 02=0.002	0 3 03=0.003	0 4 04=0.004	0 5 05=0.005	0 6 06=0.006	0 7 07=0.007
		0 8 08=0.008	0 9 09=0.009				
6 Options	Planar	W 1 Single Wrap Ground	S M T Surface Mount	W 3 Triple Wrap - All Ports	W B 1 Wire Bondable	W B 2 Wire Bondable Gold	
7 Terminal Finish	Standard	S Pretinning	F RoHS	G Gold			

How To Order

Specify Model Number: **Diamond RF Resistives® HRXCXXXXD XXX,X**

	HR		C		D	
	1	2	3	4	5	6
1 High Reliability	H R High Reliability					
2 Test Group Option	A A	B B	C C			
3 Series Name	C R Chip Resistor	C T Chip Termination	C A Chip Attenuator			
4 Product Size	0 4 0 2 Example: 0402 - 0.045" x 0.025"					
5 SINT Code	D CVD Diamond					
6 Value, Tolerance						

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