QPS Attenuators

Qualified Parts for Space (QPS) Attenuators

Cinch Connectivity Solutions Midwest Microwave has used its experience of designing custom space parts for many space programs and QPL parts for many military programs and introduces standard line of Qualified Parts for Space (QPS) attenuators. QPS attenuators are built using materials that meet or exceed 1% TML (Total Mass Loss) and 0.1% CVCM (Collected Volatile Condensable Materials) requirements as tested per ASTM E595.

QPS attenuators were qualified using qualification testing guided by MIL-DTL-3933 level T qualification. They are available with three standard screening options with various severity of screening. Custom screening options are available on request.

Midwest Microwave Attenuators Space Flight History

- Emirates Mars Mission
- Parker Solar Probe
- Europa Clipper
- One Web
- GPS Satellites

Features

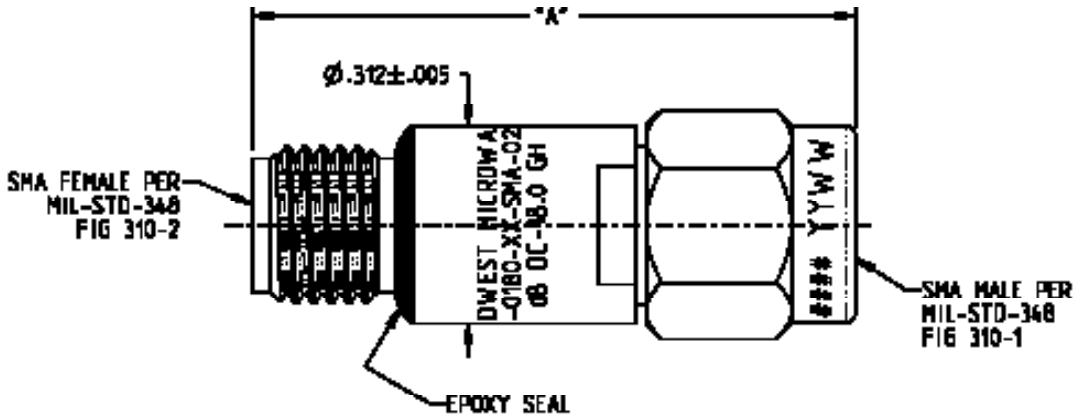
- Qualification and screening guided by MIL-DTL-3933 level T
- Meets or exceeds 1% TML and 0.1% CVCM
- Three standard screening levels available
- Standard dB values 1, 2, 3, 6, 10, and 20dB
- Custom dB values from 0 to 20dB available

Specifications

Frequency	DC-18GHz	
VSWR	1.07 + 0.015F (GHz)	
Attenuation Accuracy		
	0 dB	+0.3/ -0 dB
	1-6 dB	±0.3 dB
	7-12 dB	±0.5 dB
	13-20 dB	±0.7 dB
Average Power @25°C	2W*	
Peak Power	500W**	
Operating Temperature	-55°C to +125°C	
Weight (max.)	0.5 oz (14.2 g)	
Length, A per drawing		
0 to 12dB	0.95” (24.13 mm)	
13 to 20 dB	1.08” (27.43 mm)	

Notes:

* Derated linearly to 0.5W at 125°C
** Duty cycle of 5 x 10^{-4} max pulse duration 5µs
Each part marked with date code and serial number



QPS Attenuators Complete Material List

ITEM	QTY	DESCRIPTION	MATERIAL	FINISH/OUTGASSING
1	1	COUPLING NUT	STAINLESS STEEL PER ASTM-A582. TYPE 303	PASSIVATED PER SAE AMS2700. METHOD 2
2	1	GASKET	VITON A FLUOROELASTOMER PER SAE AMS7276	N/A
3	1	RETAINING RING	BERYLLIUM COPPER PER ASTM-B197. ALLOY C172	N/A
4	1	SMA MALE CONTACT	BERYLLIUM COPPER PER ASTM-B196. ALLOY C173	50 MICROINCHES MIN GOLD PLATE PER ASTM-B488, TYPE II. GRADE C. CLASS 1.27
5	2	DIELECTRIC	PTFE TYPE 1. GRADE 1. CLASS B. PER ASTM D 1710	N/A
6	1	SMA MALE HOUSING	STAINLESS STEEL PER ASTM-A582. TYPE 303	PASSIVATED PER SAE AMS2700. METHOD 2
7	2	SHIM	STAINLESS STEEL PER ASTM-A582. TYPE 303	PASSIVATED PER SAE AMS2700. METHOD 2
8	2	BUSHING	STAINLESS STEEL PER ASTM-A582. TYPE 303	PASSIVATED PER SAE AMS2700. METHOD 2
9	2	EDGE SPRING	BERYLLIUM COPPER PER ASTM-B194. ALLOY C172	20 MICROINCHES MIN GOLD PLATE PER ASTM-B488. TYPE II. CLASS 0.5. GRADE B OR C.
10	1	CARD SPACER	BERYLLIUM COPPER PER ASTM-B196. ALLOY C173	20 MICROINCHES MIN GOLD PLATE PER ASTM-B488. TYPE II. CLASS 0.5. GRADE B OR C.
11	1	RESISTOR CARD	TANTALUM NITRIDE THIN FILM OVER ALUMINUM NITRIDE CERAMIC	40 MICROINCHES MIN GOLD SPUTTERED TERMINALS PER MIL-G-45204, TYPE III. GRADE A
12	2	CENTER PLUNGER	BERYLLIUM COPPER PER ASTM-B194. ALLOY C172	20 MICROINCHES MIN GOLD PLATE PER ASTM-B488. TYPE II. CLASS 0.5. GRADE B OR C.
13	2	PLUNGER SPRING	BERYLLIUM COPPER PER ASTM-B194. ALLOY C172	50 MICROINCHES MIN GOLD PLATE PER ASTM-B488. TYPE II. GRADE C. CLASS 1.27
14	1	SMA FEMALE HOUSING	STAINLESS STEEL PER ASTM-A582. TYPE 303	PASSIVATED PER SAE AMS2700. METHOD 2
15	1	SMA FEMALE CONTACT	BERYLLIUM COPPER PER ASTM-B196. ALLOY C173	50 MICROINCHES MIN GOLD PLATE PER ASTM-B488. TYPE II. GRADE C. CLASS 1.27
16	2	SUPPORT BEAD	ULTEM 1000 PER ASTM D7293 S-PE10111	N/A
17	A/R	EPOXY SEAL	3M SCOTCH-WELD 2214 NMF (1-HOUR CURE @ 125°C)	TML%=0.77, CVCM%=0.02
18	A/R	BLACK MARKING INK	VIDEOJET 16-5900 (1-HOUR MIN CURE @ 175 °C)	TML%=0.74, CVCM%=0.04

Screening level A

- Recommended for non-flight applications
- Thermo-vacuum chamber testing
- Pre-flight testing
- Pre-flight system evaluation

Test Sequence	Inspection Name	Test Method per ATP-09417-60-02*	Sample Size
1	Parts and Assembly Verification (PAV)	4.5	100%
2	VSWR & Attenuation	4.6.2	
3	Stability of Attenuation: After Peak Power	4.1	
4	Visual and Mechanical Inspection	4.13	

* Available upon request

Standard part numbers with Level A screening

SQA-0182-01-SMA-02, Space qualified attenuator, SMA male to SMA female, 1dB, 18 GHz, 2W, stainless steel, level A
SQA-0182-02-SMA-02, Space qualified attenuator, SMA male to SMA female, 2dB, 18 GHz, 2W, stainless steel, level A
SQA-0182-03-SMA-02, Space qualified attenuator, SMA male to SMA female, 3dB, 18 GHz, 2W, stainless steel, level A
SQA-0182-06-SMA-02, Space qualified attenuator, SMA male to SMA female, 6dB, 18 GHz, 2W, stainless steel, level A
SQA-0182-10-SMA-02, Space qualified attenuator, SMA male to SMA female, 10dB, 18 GHz, 2W, stainless steel, level A
SQA-0182-20-SMA-02, Space qualified attenuator, SMA male to SMA female, 20dB, 18 GHz, 2W, stainless steel, level A

Custom Part numbers for other dB values with Level A screening

SQA-0182-XX-SMA-02, replace XX with dB value from 0 dB to 20 dB in 1 dB increments, use leading 0 for single digit values, such as 01 for 1dB

Screening level B

- Absolute minimum testing recommended for space flight applications
- Cost effective space attenuator option
- Low orbit satellite

Test Sequence	Inspection Name	Test Method per ATP-09417-60-02*	Sample Size
1	Thermal Shock	4.2	100%
2	Parts and Assembly Verification (PAV)	4.5	
3	Pre-Conditioning Electrical	4.6	
	DC Resistance	4.6.1	
	VSWR & Attenuation	4.6.2	
4	Conditioning	4.7	
5	Post-Conditioning Electrical	4.8	
	DC Resistance	4.8.1	
	VSWR & Attenuation	4.8.2	
6	Stability of Attenuation: After Peak Power	4.1	
7	Radiographic Inspection	4.11	
8	Visual and Mechanical Inspection	4.13	

* Available upon request

Standard part numbers with Level B screening

SQA-0181-01-SMA-02, Space qualified attenuator, SMA male to SMA female, 1dB, 18 GHz, 2W, stainless steel, level B
SQA-0181-02-SMA-02, Space qualified attenuator, SMA male to SMA female, 2dB, 18 GHz, 2W, stainless steel, level B
SQA-0181-03-SMA-02, Space qualified attenuator, SMA male to SMA female, 3dB, 18 GHz, 2W, stainless steel, level B
SQA-0181-06-SMA-02, Space qualified attenuator, SMA male to SMA female, 6dB, 18 GHz, 2W, stainless steel, level B
SQA-0181-10-SMA-02, Space qualified attenuator, SMA male to SMA female, 10dB, 18 GHz, 2W, stainless steel, level B
SQA-0181-20-SMA-02, Space qualified attenuator, SMA male to SMA female, 20dB, 18 GHz, 2W, stainless steel, level B

Custom Part numbers for other dB values with Level B screening

SQA-0181-XX-SMA-02, replace XX with dB value from 0 dB to 20 dB in 1 dB increments, use leading 0 for single digit values, such as 01 for 1dB

Screening level C

- Highest level of screening, recommended for all space flight applications
- Screening compatible to MIL-DTL-3933 level T
- Recommended for all orbits and for deep space missions
- As little as 10 weeks lead time

Test Sequence	Inspection Name	Test Method per ATP-09417-60-02*	Sample Size
1	VSWR & Attenuation	4.1	
2	Thermal Shock	4.2	
3	VSWR & Attenuation	4.1	
4	Random Vibration	4.3	
5	VSWR & Attenuation	4.1	
6	Monitored Thermal Cycling	4.4	
7	Parts and Assembly Verification (PAV)	4.5	
8	Pre-Conditioning Electrical	4.6	
	DC Resistance	4.6.1	
	VSWR & Attenuation	4.6.2	100%
9	Conditioning	4.7	
10	Post-Conditioning Electrical	4.8	
	DC Resistance	4.8.1	
	VSWR & Attenuation	4.8.2	
11	Peak Power	4.9	
12	Stability of Attenuation: After Peak Power	4.1	
13	Radiographic Inspection	4.11	
14	VSWR & Attenuation + Review	4.12	
15	Visual and Mechanical Inspection	4.13	

* Available upon request

Standard part numbers with Level C screening

SQA-0180-01-SMA-02, Space qualified attenuator, SMA male to SMA female, 1dB, 18 GHz, 2W, stainless steel, level C
SQA-0180-02-SMA-02, Space qualified attenuator, SMA male to SMA female, 2dB, 18 GHz, 2W, stainless steel, level C
SQA-0180-03-SMA-02, Space qualified attenuator, SMA male to SMA female, 3dB, 18 GHz, 2W, stainless steel, level C
SQA-0180-06-SMA-02, Space qualified attenuator, SMA male to SMA female, 6dB, 18 GHz, 2W, stainless steel, level C
SQA-0180-10-SMA-02, Space qualified attenuator, SMA male to SMA female, 10dB, 18 GHz, 2W, stainless steel, level C
SQA-0180-20-SMA-02, Space qualified attenuator, SMA male to SMA female, 20dB, 18 GHz, 2W, stainless steel, level C

Custom Part numbers for other dB values with Level C screening

SQA-0180-XX-SMA-02, replace XX with dB value from 0 dB to 20 dB in 1 dB increments, use leading 0 for single digit values, such as 01 for 1dB

Qualification Testing

Qualification testing performed on QPS attenuators was guided by MIL-DTL-3933 level T and consisted of the tests indicated.

INSPECTION NAME	MIL-DTL-3933 METHOD	MIL-DTL-3933 REQUIREMENTS	Sample Size
Group 1 Stability of Attenuation 1/			
With Temperature Change	4.7.11.1	4.7.11, 3.5.10	5
After Thermal Shock	4.7.11.2	4.7.11, 3.5.10	
After Vibration	4.7.11.3	4.7.11, 3.5.10	
After Shock	4.7.11.4	4.7.11, 3.5.10	
After Moisture Resistance	4.7.11.5	4.7.11, 3.5.10	
After Salt Atmosphere	4.7.11.6	4.7.11, 3.5.10	
After Peak Power	4.7.11.7	4.7.11, 3.5.10	
Group 1 Extended MTC			
Extended MTC 2/	4.7.2.5	3.5.1.5	5
Group 1 Sensitivity of Attenuation 1/			
With Change in Frequency	4.7.12	3.5.11	5
With Change in Power	4.7.12	3.5.11	
With Change in Temperature	4.7.12	3.5.11	
Resistance to Solvents	4.7.10	3.5.9	
Visual and Mechanical Inspection 3/	4.7.1	3.1, 3.3, 3.4, 3.6, 3.8	
Group 2			
Life Test	4.7.13	3.5.12	5
DC Resistance & Change	4.7.2.2.1	3.5.1.4	
VSWR & Attenuation	4.7.4, 4.7.5	3.5.3, 3.5.4	
Group 3 1/			
Sensitivity of Attenuation: With Change in Temperature	4.7.12	3.5.11	5
Coaxial Connector Repeatability	4.7.7	3.5.6	
VSWR & Attenuation	4.7.4, 4.7.5	3.5.3, 3.5.4	
EMI/RF Leakage 4/	4.7.6	3.5.5	
Force to Engage/Disengage	4.7.14	3.5.13	
Coupling Proof Torque	4.7.15	3.5.14	
Force to Engage/Disengage	4.7.14	3.5.13	
VSWR & Attenuation	4.7.4, 4.7.5	3.5.3, 3.5.4	
DC Resistance	4.7.2.2.1	3.5.1.4	
Visual and Mechanical Inspection 3/	4.7.1	3.1, 3.3, 3.4, 3.6, 3.8	

Notes:
1/: Use performance limits of MIL-DTL-3933 Appendix B Class IV where applicable. The reference frequency shall be 8 GHz.
2/: Number of cycles shall be 100.
3/: Required marking shall be defined by the outline & assembly drawings.
4/: RF leakage shall be at least 80 dB below the incoming signal level.

For more information and custom options please contact Midwest Microwave product manager Tibor Urbanek at Tibor.Urbanek@US.Cinch.com

cinch CONNECTIVITY SOLUTIONS a bel group

North America
+1 507.833.8822
ccsorders@us.cinch.com

belfuse.com/cinch