

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

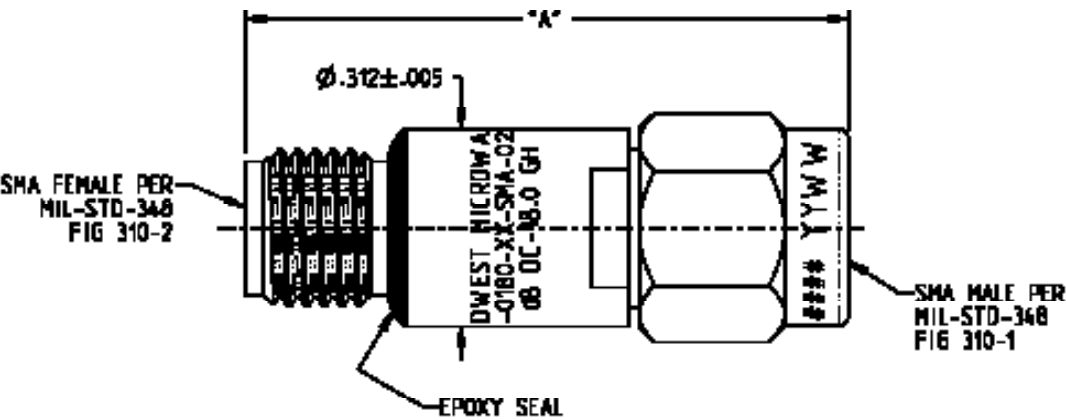
Frequency	DC-18GHz
VSWR	1.07 + 0.015F (GHz)
Attenuation Accuracy	
	0 dB +0.3/ -0 dB
	1-6 dB ±0.3 dB
	7-12 dB ±0.5 dB
	13-20 dB ±0.7 dB
Average Power @25°C	2W*
Peak Power	500W**
Operating Temperature	-55°C to +125°C
Weight (max.)	0.5 oz (14.2 g)
Length, A per drawing	
0 to 12dB	0.95" (24.13 mm)
13 to 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	100%
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	
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



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Cinch Connectivity Solutions:

M3933/16-01N	M3933/16-01S	M3933/16-02N	M3933/16-02S	M3933/16-03N	M3933/16-03S	M3933/16-45S
M3933/16-42S	M3933/16-43N	M3933/16-43S	M3933/16-44N	M3933/16-44S	M3933/16-45N	M3933/16-39S
M3933/16-40N	M3933/16-40S	M3933/16-41N	M3933/16-41S	M3933/16-42N	M3933/16-36S	M3933/16-37N
M3933/16-37S	M3933/16-38N	M3933/16-38S	M3933/16-39N	M3933/16-33S	M3933/16-34N	M3933/16-34S
M3933/16-35N	M3933/16-35S	M3933/16-36N	M3933/16-30S	M3933/16-31N	M3933/16-31S	M3933/16-32N
M3933/16-32S	M3933/16-33N	M3933/16-27S	M3933/16-28N	M3933/16-28S	M3933/16-29N	M3933/16-29S
M3933/16-30N	M3933/16-24S	M3933/16-25N	M3933/16-25S	M3933/16-26N	M3933/16-26S	M3933/16-27N
M3933/16-21S	M3933/16-22N	M3933/16-22S	M3933/16-23N	M3933/16-23S	M3933/16-24N	M3933/16-18N
M3933/16-19N	M3933/16-19S	M3933/16-20N	M3933/16-20S	M3933/16-21N	M3933/16-16N	M3933/16-16S
M3933/16-17N	M3933/16-17S	M3933/16-10N	M3933/16-10S	M3933/16-11N	M3933/16-11S	M3933/16-07N
M3933/16-07S	M3933/16-08N	M3933/16-08S	M3933/16-09N	M3933/16-09S	M3933/16-04N	M3933/16-04S
M3933/16-05N	M3933/16-05S	M3933/16-06N	M3933/16-06S	M3933/14-01N	M3933/14-01S	M3933/14-02N
M3933/14-02S	M3933/14-03N	M3933/14-03S	M3933/14-23S	M3933/14-20S	M3933/14-21N	M3933/14-21S
M3933/14-22N	M3933/14-22S	M3933/14-23N	M3933/14-18N	M3933/14-18S	M3933/14-19N	M3933/14-19S
M3933/14-20N	M3933/14-10S					