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MEMS VARIABLE OPTICAL ATTENUATORS SINGLE/MULTI-CHANNEL

Features:

- Small size, low cost
- Single channel up to 8 channels per module for MEMS VOA arrays and up to 40 channels for MEMS VOA with electronic drivers
- Standard or custom arrays.
- Continuous attenuation control for each channel.
- Integrated output power monitoring (optional).
- Fast response.
- Low insertion loss.
- High dynamic range.
- Flat wavelength response.
- SM or PM fiber versions are available
- Low power consumption
- Very low crosstalk
- High attenuation acuracy

MEMS Variable Optical Attenuator

Applications:

- Active gain equalization in DWDM systems
- Local power monitoring and feedback control
- Power control into receivers
- Gain tilt control in EDFAs
- Channel balancing for optimizing transmission performance in long-haul and metro networks
- Power balancing before modulation and multiplexing
- Dynamic optical power control and channel equalization in add/drop multiplexers

Product Description:

OZ Optics Ltd. introduces a MEMS based variable optical attenuator (VOA) in a fast, low cost miniature package. The attenuators are available either in individual units or as an integrated array of separate attenuators, each with independent continuous control. The attenuation is controlled by a simple analog voltage input signal. Up to 8 attenuators can be incorporated into one module. Integrated optical power monitoring of each channel is available as an option. The combination of ease of control with integrated power monitoring makes the unit an attractive choice for DWDM optical networks, where automated control is essential.

MEMS based VOAs using either singlemode or Polarization Maintaining (PM) fibers are available. An ingenious manufacturing technique ensures optimum alignment of PM fibers while keeping assembly costs to minimal levels. This reduces costs dramatically.
MEMS VOAs can be provided in 4 configurations: single channel; multi channel VOA arrays without any electronics; multi channel VOA arrays with 0-5V drive electronics; and multi channel VOA arrays with 0-5V drive electronics and serial port communication interface.

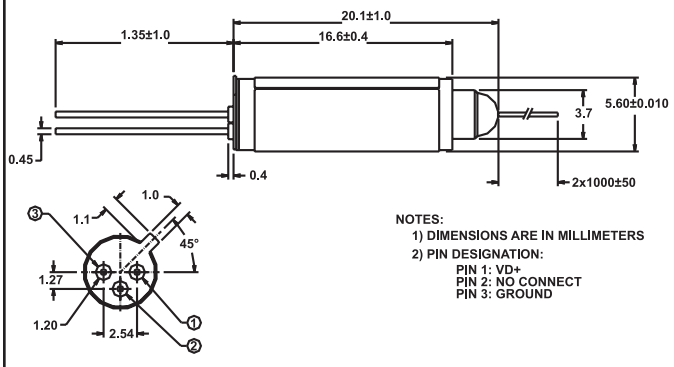

Figure 1: Single Channel MEMS VOA

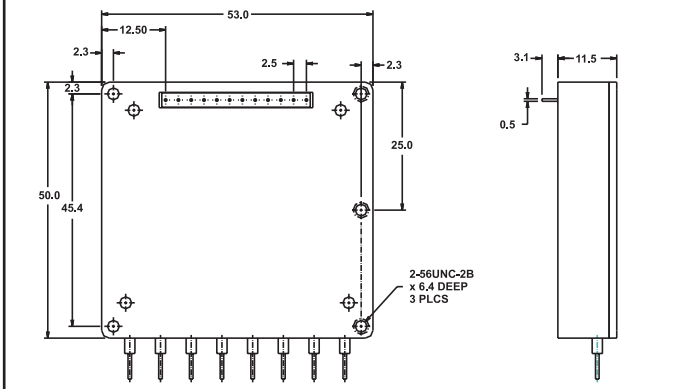

Figure 2: 8 Channel MEMS VOA Module

Standard Product Specifications:

PARAMETERS	MEMS VOA	8-CHANNEL MEMS VOA ARRAYS	8-CHANNEL MEMS VOA RS232
Wavelength range [1]	C or L Band	C or L Band	C or L Band
Attenuation range (dB)	40	40	40
Attenuation w/o power	Dark / Bright	Dark / Bright	Dark / Bright
Attenuator resolution	Continuous	Continuous	Continuous
Insertion loss (dB) [2]	< 0.6	< 0.7	< 0.7
Response time (ms)	< 1.0	< 0.8	< 2.0 [6]
Wavelength Dependent Loss (WDL) (dB) [3]			
at 0 dB	0.10	0.15	0.15
at 10 dB	0.30	0.50	0.50
at 20 dB	0.80	1.00	1.00
Polarization Dependent Loss (PDL) (dB) [3]			
at 0 dB	0.10	0.10	0.10
at 10 dB	0.20	0.20	0.20
at 20 dB	0.40	0.60	0.60
Temperature Dependent Loss (TDL) (dB) [3]			
at 0 dB	± 0.15	± 0.15	± 0.15 / ± 0.15
at 10 dB	± 0.70	± 0.70	± 0.70 / ± 0.15
at 20 dB	± 1.25	± 1.25	± 1.25 / ± 0.15
Differential Group Delay (DGD) (ps)	0.05	0.05	0.05
Ripple (dB) [4]	< 0.2	< 0.2	< 0.2
Return loss (dB) [2]	55	55	55
Drive voltage (V) [5]	0 - 6.5V	0 - 6.5V	5
Drive power (mW)	< $1x10^{-6}$	< $1x10^{-5}$	200/400
Fiber type	SMF-28	SMF-28	SMF-28
Maximum optical power (mW)	500	500	500
Operating temperature (ºC)	-5 to 75	-5 to 75	-5 to 65
Package size (mm)	5.6 (diameter) x 16.6 L	50 L x 18 W x 6.5 H (mm)	55 L x 53 W x 6.5 H (mm)
Reliability Telcordia	GR-1209, GR-1221	GR-1209, GR-1221	GR-1209, GR-1221

[1] 1310nm, 1060 nm and other wavelengths available.
[2] Excluding connectors.
[3] For all polarization states, over operating temperature range, measured over operating wavelength range i.e. ITU defined C or L band.
[4] The worst case variation in attenuation (peak to peak) over any 0.4nm window for all polarization states, over operating temperature and wavelength range.
[5] Maximum DC voltage for full attenuation range (0-5V for up to 25dB).
[6] 10%-90% response in open loop without overshoot/undershoot.

Ordering Information For Custom Parts:

OZ Optics welcomes the opportunity to provide custom designed products to meet your application needs. As with most manufacturers, customized products do take additional effort so please expect some differences in the pricing compared to our standard parts list. In particular, we will need additional time to prepare a comprehensive quotation, and lead times will be longer than normal. In most cases non-recurring engineering (NRE) charges, lot charges, and a 50 piece minimum order will be necessary. These points will be carefully explained in your quotation, so your decision will be as well-informed as possible. We strongly recommend buying our standard products.

Questionnaire For Custom Parts:

1. How many fiber channels do you intend to control?
2. What wavelengths are you using?
3. Are you using singlemode or polarization maintaining fiber? What core/cladding size?
4. What type of connectors are you using?
5. How long should the fibers be? What size jacketing?
6. Do you need integrated power monitoring?
7. Are there any other special requirements?

MEMS Multichannel VOA

MMVOA-*C*-*W*-*F*-*a/b*-*XY* -*JD* -*L*(-M)[1]

C = Number of Channels:
1, 2, 4, 8, 16, 32, or 40

W = Wavelength
Specify in nm 1550 for 1470 - 1620nm operating range (C, L, and S bands)

F = Fiber type
S = Singlemode
P = Polarization Maintaining

a/b = Fiber core/cladding size, in microns
9/125 for standard Corning SMF-28 singlemode fiber
8/125 for 1550nm PANDA style PM fiber

L = Fiber length, in meters on each side of the device:
1 meter is standard. If the inputs and outputs are different lengths, then specify the input and output lengths with a comma. Example: To order 1 meter on the input, and 7 meters on the output, enter 1,7 for L in the part number.

JD = Fiber Jacket Size:
0.25 = 250µ OD acrylate coating (standard)
1 = 900µ OD Hytrel Buffer (optional)

X*,*Y = Input and Output Connector types
3S = FC connector, Super PC finish
3U = FC connector, Ultra PC finish
3A = FC connector, Angled PC (APC) finish
8 = AT&T-ST connector
SC = SC connector, Super PC finish
SCA = SC connector, Angled PC (APC) finish
LC = LC connector
MU = MU connector
X = No connector
Note: All fibers on one side are terminated with one connector type.

Note:[1] Add RS232 or I²C to the part number to have integrated 0-5V drive electronics with serial interface.
Add "NC" for normally closed (Dark VOA) option.

Ordering Examples For Custom Parts:

A customer needs an eight channel, 1550nm PM MEMS VOA. The fibers on each side are 1 meter long, with 900 micron loose tube hytrel jacketing. The ends of the fibers are to be terminated with FC/APC connectors. The customer wants built in power monitoring. The part number and description are as follows:

Part Number	Description
MMVOA-8-1550-P-8/125-3A3A-1-1-M	MEMS Multichannel VOA, with eight channels. Each channel uses PM fiber for 1550nm, 1 meter long on both ends, 900 micron loose tube hytrel jacketing, with FC/APC connectors on each end. Integrated power monitoring is included.

Frequently Asked Questions (FAQs):

Q: How does the integrated power monitoring work?
A: Integrated power monitoring is achieved through the use of a unique tapping process and a photodiode. The output signal from the photodiode can be measured by a feedback circuit to control the attenuation.

Application Notes:

Application example: Load balancing on a WDM network
As illustrated in figure 2, an eight channel wavelength multiplexed signal from a trunk line is demultiplexed into individual signals. The signals are of different intensities, and have to be balanced to avoid saturating any of the receivers. To do so, each channel is sent through a corresponding port on an eight channel MEMS VOA. The signal strength through the attenuator outputs is monitored by a control circuit. If the output signal on one channel gets too high or too low, the corresponding attenuator is adjusted to bring the light level to the correct range. The complete module is very compact.

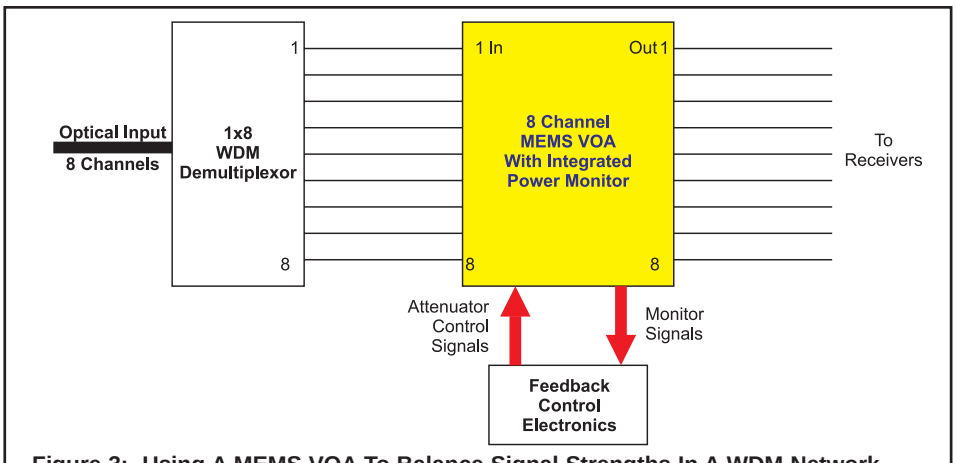

Figure 3: Using A MEMS VOA To Balance Signal Strengths In A WDM Network