40-Channel 150GHz Integrated Variable Multiplexer (VMUX)

Description

Broadex Technologies offers PLC-based modules with both the Variable Optical Attenuator (VOA) and Multiplexer (MUX) functions, known as VMUX devices. High performance VOA arrays are integrated with AWG devices to produce low loss VMUX devices with high attenuation accuracy and tuning range, and low polarization dependency. The VOA functionality allows the module to pre-equalize the optical power in all channels individually before amplification.

VMUX modules are designed for use in DWDM systems, reconfigurable optical add/drop multiplexer (ROADM) systems, and metropolitan area networks (MAN).

Features

- Fast response
- Flexible Control
- Low insertion loss
- Small volume
- Low cost
- High reliability

Applications

- DWDM system
- ROADM (Reconfigurable optical add/drop multiplexer)
- Long and ultra-long-distance optical transmission network system
- MAN (Metropolitan area network)
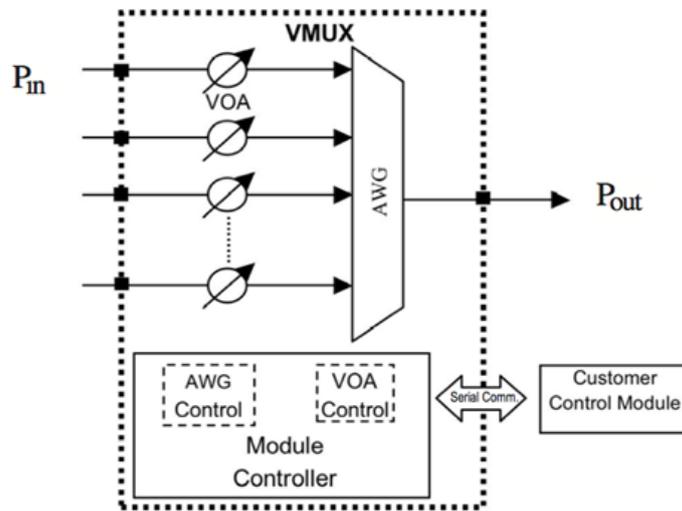
Functional Schematic Diagram

Figure 1 Functional Scheme (VMUX)

Optical Specifications

The optical specifications provided in Tables 1-3 are guaranteed over the entire operating temperature range and valid till end of life (EOL) of the products.

Table 1 Channel Plan

Product Type	Frequency (THz)	First Channel Wavelength (nm)	Last Channel Wavelength (nm)
Even	190.7125---196.5625	1525.176	1571.960
Odd	190.7875---196.6375	1524.595	1571.342

Table 2 VMUX Optical Specifications (with Thermal AWG)

Parameters	Notes	Specifications				Unit
		Min	Typ	Max	EOL	
Channels			40		40	Ch
Channel Spacing			150		150	GHz
Reference Pass Band	Relative to ITU Grid		± 16.25		± 16.25	GHz
ITU Frequency	See Table 1	ITU Frequency				
ITU Wavelength	See Table 1	ITU Wavelength				
Center Wavelength Accuracy	Maximum of the absolute deviation of the 3dB center wavelength from ITU grid over all channels			± 6.25	± 6.25	GHz
0.5dB Bandwidth	0.5dB from min Insertion Loss, full width	55			55	GHz
1dB Bandwidth	1dB from min Insertion Loss, full width	75			75	GHz
3dB Bandwidth	3dB from min Insertion Loss, full width	93.75			93.75	GHz
20dB Bandwidth	20dB from min Insertion Loss, full width			233	233	GHz
Insertion Loss	Maximum of the insertion loss across the ITU pass band over all channels, including connector at 0dB attenuation			7.5	7.5	dB
Ripple	Maximum of the loss variance across the ITU pass band			0.55	0.55	dB
Insertion Loss Uniformity	Maximum insertion loss variance across all channels			1.5	1.5	dB
Adjacent Channel Isolation	Ratio of peak transmission to the maximum transmission over both adjacent pass bands at 0dB attenuation	25			25	dB
Non-Adjacent Channel Isolation	Ratio of peak transmission in channel pass bands to maximum transmission over all non-adjacent pass bands at 0dB attenuation	30			30	dB
Total Crosstalk	Ratio of power in channel to power in all other pass bands at 0dB attenuation	22			22	dB
Polarization Dependent Loss (PDL)	Maximum ratio of transmissions over all polarization states, over the ITU pass band at 0~5dB attenuation			0.6	0.6	dB
	Maximum ratio of transmissions over all polarization states, over the ITU pass band at 10~15dB attenuation			0.8	0.8	dB
	Maximum ratio of transmissions over all polarization states, over the ITU pass band at 10~15dB attenuation			1.0	1.0	dB
Polarization Mode Dispersion (PMD)	In ITU Pass band			0.5	0.5	ps

Chromatic Dispersion	In ITU Pass band	-20		20	+/-20	ps/nm
Return Loss	At all optical ports of the module	40			40	dB
Directivity	At all optical ports of the module	45			45	dB

Table 3 VOA Specifications

Parameters	Notes	Specifications				Unit
		Min	Typ	Max	EOL	
Attenuation Range		0~15			0~15	dB
Attenuation Resolution	Over 15dB attenuation range	0.1			0.1	dB
Repeatability of attenuation setting	Over 15dB attenuation range	+/-0.1			+/-0.1	dB
Attenuation Accuracy	Over 0~10dB attenuation range	+/-0.8			+/-0.8	dB
	Over 10~15dB attenuation range	+/-1.2			+/-1.2	dB
VOA Response Time	Excluding communication lag			150	150	ms
VOA Power Off Status	VOA's attenuation value while no voltage is applied to the module, excluding AWG insertion loss	15			15	dB

Environmental Conditions and VOA Status

Table 4 Environmental Conditions

Parameters	Notes	Specifications			Units
		Min	Typ	Max	
Operating Temperature		-5		+65	°C
Storage Temperature		-40		+85	°C
Relative Humidity		5		95	%RH
Storage Humidity		5		95	%RH
ESD Level	HBM	2000			V
Power Level @ Common Port	For Common port			27	dBm
Power Level @ Channel N	For VOA port			24	dBm

Table 5 VOA Status

VMUX Status	VOA Status(Attenuation Value)
Factory Setting	15dB
Power On (till receiving commands from host)	30dB(>15dB)
Power Off (during and after hard reset)	30dB(>15dB)
During and after Soft Reset	Attenuation value is maintained in flash memory

Electrical Specifications

Hardware

Tables 6-8 provide specifications for temperature control, electrical interfaces and electrical connectors. The VMUX module communicates with the host board by a RS232 serial port as defined in Table 9.

Table 6 Temperature Control Specifications (with Thermal AWG)

Parameters	Notes	Specifications			Unit
		Min	Typ	Max	
Set-Point Temperature of AWG	Optimal operating temperature	66		87	°C
Set-Point Temperature Stability of AWG	Over entire operating temperature range			±0.2	°C
Temperature Settling Time of AWG（set-point temperature +/-0.2°C)	At room temperature			5	min
	Over entire operating temperature range			8	
Wavelength Stabilized Time (ITUT +/-6GHZ)	AT room Temperature			3	min
	Over entire operating temperature range			5	
Power Source	15V			1.5	A
	5V			2.5	A
Power Consumption				30	W

Table 7 Electrical Interface Definitions

Pin#	Signal Name	Type	Direction	Descriptions
1	GND（+5V Return）			Ground
2	GND（+5V Return）			Ground
3	GND（+5V Return）			Ground
4	GND（+5V Return）			Ground
5	+5V	Power		Power supply
6	+5V	Power		Power supply
7	+5V	Power		Power supply
8	+5V	Power		Power supply
9	GND（+15V Return）			Ground
10	GND（+15V Return）			Ground
11	GND（+15V Return）			Ground
12	GND（+15V Return）			Ground
13	+15V	Power		Power supply
14	+15V	Power		Power supply
15	+15V	Power		Power supply
16	+15V	Power		Power supply
17	Reserved			
18	Reserved			
19	TX (3.3 V logic)			Not available
20	RX (3.3 V logic)			Not available
21	GND			Ground
22	RS232 sel (active low)			Not available
23	RS232-TX	RS232	O	RS232 serial transmit signal to host
24	RS232-RX	RS232	I	RS232 serial received signal to host
25	Reset (active low)	3.3 V TTL	I	
26	Soft Reset (active low)	3.3 V TTL	I	

Table 8 Electrical Connector Specifications

Item		Parameter	Unit
Electrical Connector Type		2.54mm female header,26pin, dual row	
Mating Pin Type		2.54mm straight DIP header,26pin dual row	
Electrical Connector	Insulator Height	3.55	mm
	Current Rating	3.0	A
	Mating Pin	0.64*0.64mm, square	
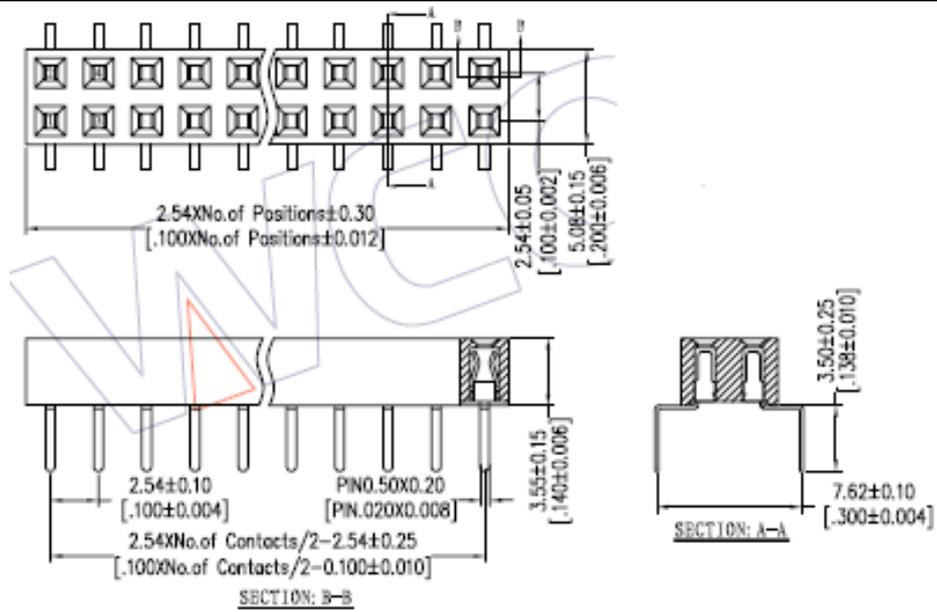
Figure 2 Drawing of Electrical Connector

Table 9 RS232 Definitions

Description	Setting
Baud Rate Supported	9600
Data Bits	8
Parity Bit	None
Stop Bit	1
Flow Control	None
Reply Time	<1s

Software
Customized.

Mechanical Specifications

Table 10 Module Dimensions and Fiber Type

Item		Parameter	Unit
Dimension (LxWxH)		150x75x28	mm
Fiber Type		G.657 A2	
Fiber Length	Common fiber	Customized	mm
	CH1~CH48 Fiber	Customized	mm
Connector Type		LC/UPC	
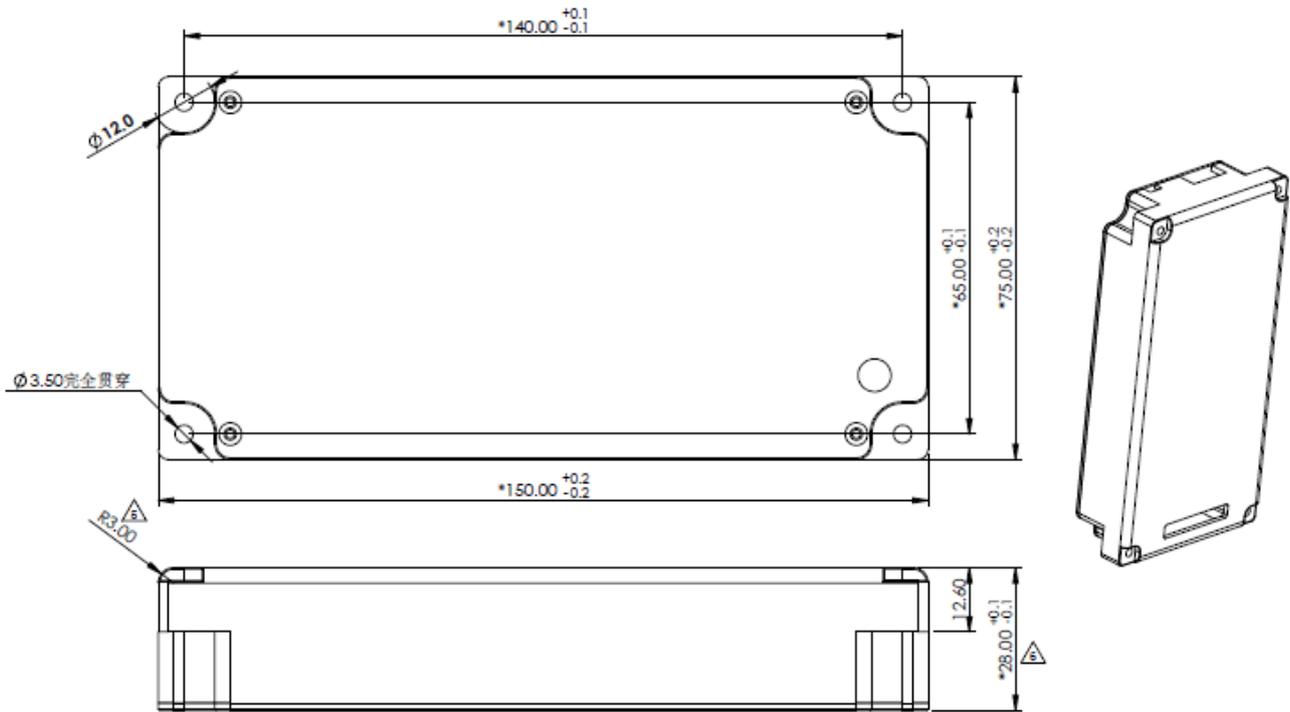
Figure 3 Mechanical Drawings of VMUX

Packaging:

Ordering Information:

BVMUX	X	XX		XX	XXX	X	X
B=Broadex	Wavelength	AWG Type		Channel Count	Channel Spacing	Connector Type	Temperature Controller

Wavelength	AWG Type	Channel Count	Channel Spacing	Connector Type	Temperature Controller
S=S Band	FT=Flat-top Thermal	6=6 Channel	050=050GHZ	0=None	0=Internal
L=L Band	SFT=Small Flat-top Thermal	14=14 Channel	100=100GHZ	1=FC/UPC	1=External
C=C Even Band	SGT=Small Gaussian Thermal	16=16 Channel	150=150GHZ	2=FC/APC	2=Athermal
D=C ODD Band	GT=Gaussian Thermal	20=20 Channel	200=200GHZ	3=SC/UPC	3=Athermal+TAP
E=C Even +Band	FA=Flat-top Athermal	24=24 Channel	800=800GHZ	4=SC/APC	4=Athermal+WDM(1310/1550)+TAP
F=C ODD+Band	GA=Gaussian Athermal	26=26 Channel	XXX=Customized	5=LC/UPC	5=Athermal+R/B Filter+TAP
G=L Even Band	DW=DWDM	28=28 Channel		6=LC/APC	
H=L ODD Band	CW=CWDM	32=32 Channel		X=Customized	
X=Customized	LW=LWDM	40=40 Channel			
	SWB=Small Wide Bandwidth	44=44 Channel			
	XX=Customized	48=48 Channel			
		60=60 Channel			
		64=64 Channel			
		70=70 Channel			
		80=80 Channel			
		XX=Customized			

Channel Plan(THz)
196.000-191.300 : C Even Band
196.050-161.350 : C ODD Band
196.255-161.325 : C Even+ Band
196.075-191.375 : C ODD+Band

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