

## 10 Gb/s Dual Drive Mach-Zehnder (DDMZ) Modulator



### Key Features



- Low differential drive voltage, typically 2 V
- Matching electro-optic amplitude and phase responses
- Wide optical bandwidth, compatible with full band tunable lasers
- 12 GHz electro-optic (E/O) bandwidth
- Single-sided electrical I/O

### Applications

- Long reach (LR) and very long reach (VR) metro networks
- Long haul (LH), ultra long haul (ULH), and submarine optical transport networks
- Optical field processing for active dispersion compensation at the transceiver
- Duo-binary transmission at 40 Gb/s
- Bandwidth grooming

### Compliance

- Telcordia GR-468

The JDSU Agile Optical Components family includes modulators, switches, attenuators and tunable filters. These products provide the basis for spectrally efficient DWDM transmission utilizing dispersion tolerant modulation, channel monitoring, wavelength switching, remote power control and dynamic channel selection. They support a wide range of flexible functionalities at lower operational expenses for the Agile Optical Network. In addition, we have a complete line of tunable lasers assemblies and sub-assemblies in our Agile Transmission Module family.

The 10 Gb/s Dual Drive Mach-Zehnder (DDMZ) modulator is ideally suited for use in long reach (LR) and very long reach (VR) metro network applications as well as in long haul (LH) transmission systems. DDMZ modulators have been specifically designed to yield well-behaved and matching electro-optic amplitude and phase responses over a broad RF frequency range. They are ideally suited for the processing of the optical field of a transceiver's laser. This application can be useful for active dispersion compensation.

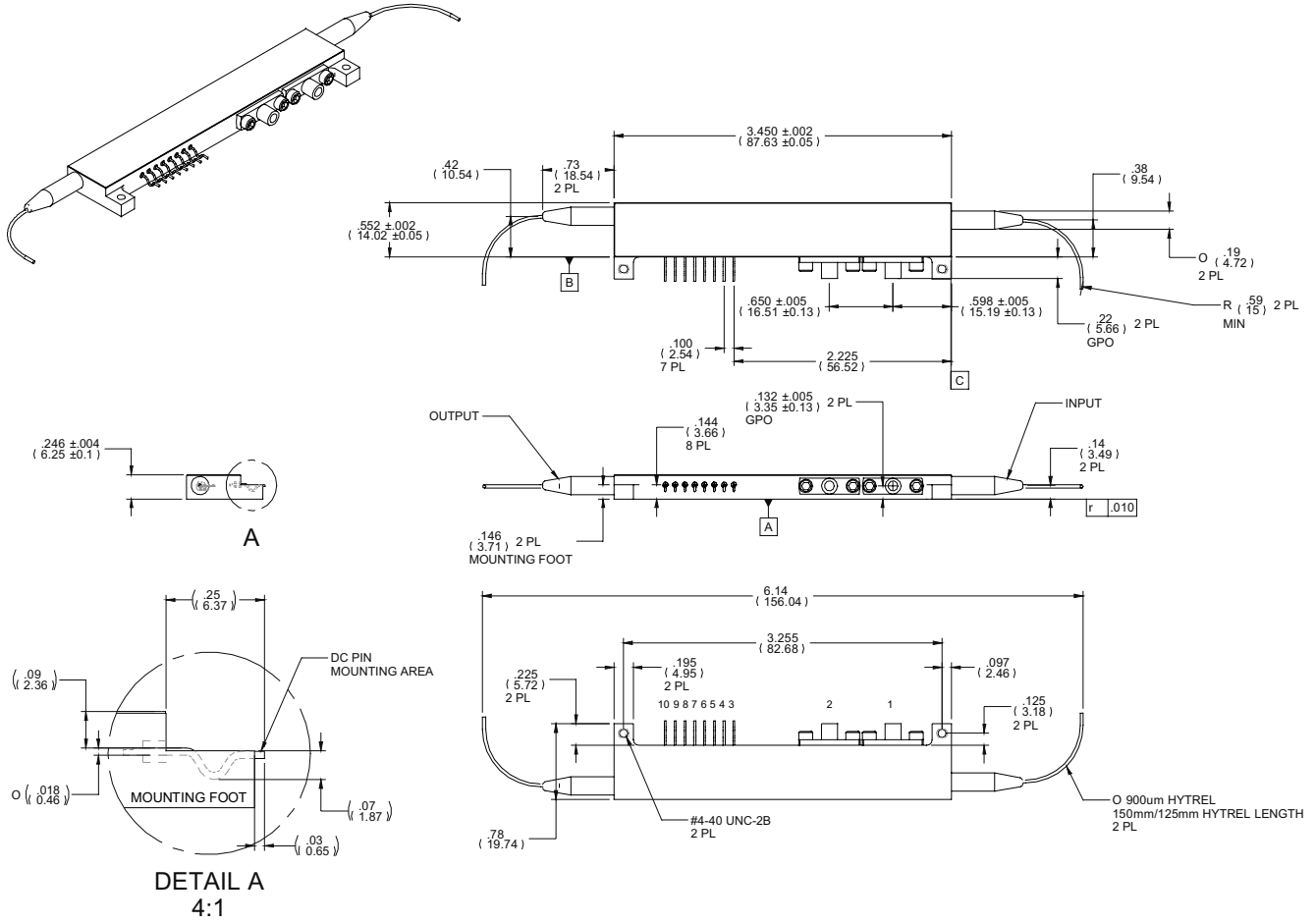
In addition, DDMZ modulators have a wide optical bandwidth. They are compatible with full band tunable lasers in either C or L band. Their low drive voltages make them compatible with low power dissipating differential modulator drivers.

For mounting convenience and space efficiency, the DDMZ modulator is packaged using JDSU's compact (6-mm high) hermetic packaging technology. For transceiver integration and mounting efficiency, the entire electrical I/O is located on one side of the modulator. The RF inputs use GPO-style RF input connectors.

## 2

## Dimensions Diagram

(Specifications in mm unless otherwise noted.)

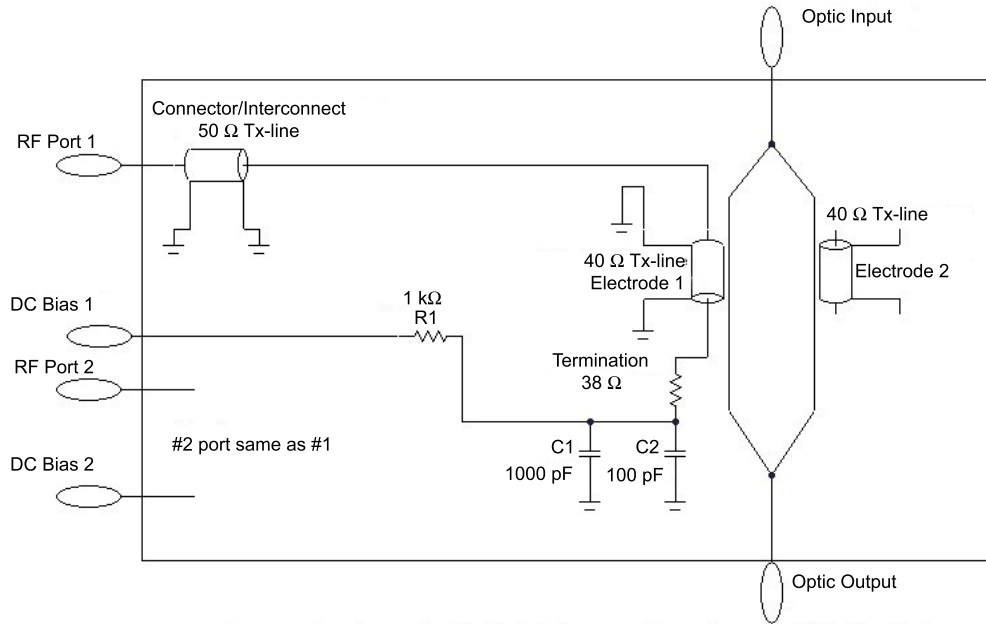


## Pinout

Pin	Description
1	GPO RF port 1
2	GPO RF port 2
3	N/A
4	N/A
5	N/A
6	DC bias 2
7	DC bias 1
8	GND
9	N/A
10	N/A

## 3

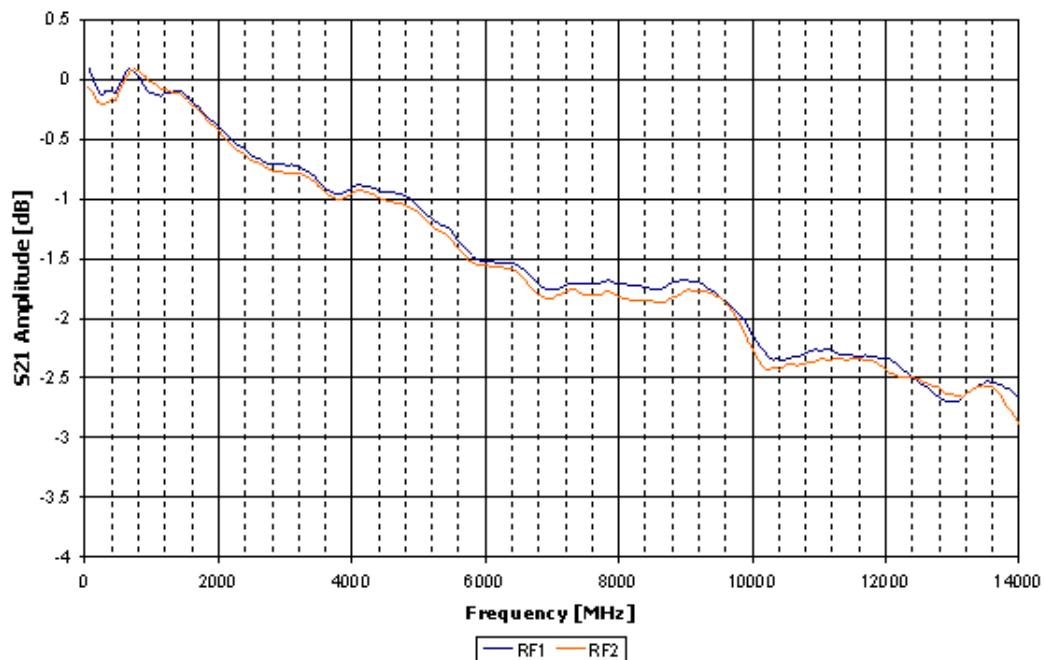
## DDMZ Modulator Bias Circuit Diagram



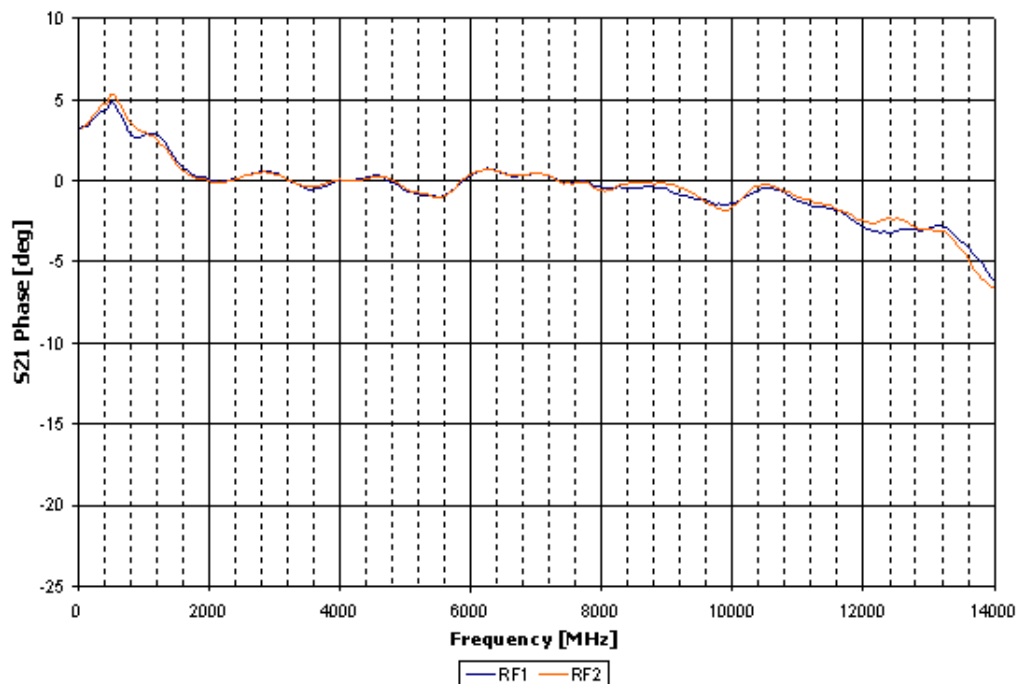
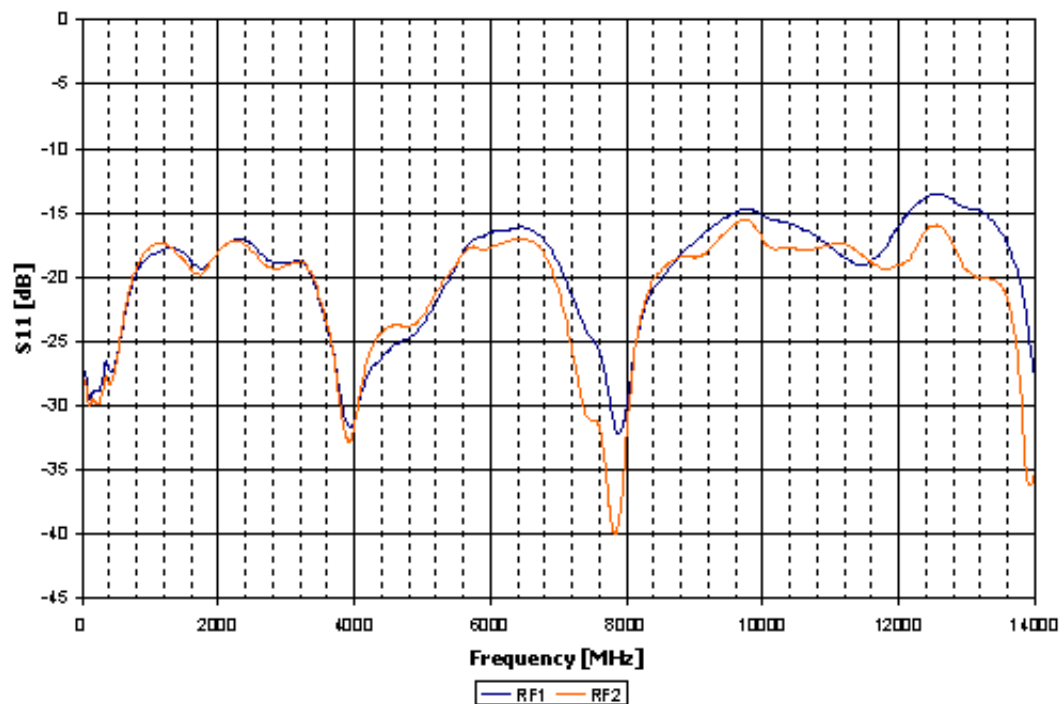
Notes:

1. DC electrode capacitance is approximately 20 pF. Package capacitance of approximately 10 pF is added.
2. Transmission impedance values are approximate. S11 and S21 graphs provide detailed nature of impedances.

## DDMZ S21 Electro-optic Amplitude Response Characteristics



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**DDMZ S21 Electro-optic Phase  
Response Characteristics****DDMZ S11 Characteristics**

## 5

**Absolute Maximum/Minimum Ratings**

Parameter	Minimum	Maximum
Operating temperature	0 °C	75 °C
Storage temperature	-40 °C	85 °C
RF input power	-	24 dBm
Optical input power	-	16 dBm

**Specifications**

Parameter	Condition	Minimum	Maximum
Wavelength		1528 nm	1564 nm
Optical insertion loss <sup>1</sup>		2.5 dB	5 dB
Optical return loss	Input and output ports	35 dB	-
S11	130 MHz - 10 GHz	-	-10 dB
MZ extinction ratio		25 dB	-
RF drive voltage <sup>2</sup>	At 2 GHz	-	2.6 V
$\Delta$ RF drive voltage	At 2 GHz (difference between RF1 and RF2)	-	0.2 V
DC $V\pi$	Differential drive	-	2 V
DC bias voltage range <sup>3</sup>	EOL voltage rail	-15 V	+15 V
RF bandwidth	Linear fit (2 GHz - 15 GHz)	12 GHz	-
Amplitude ripple	S21 amplitude difference (300 kHz - 2 GHz)	-1.5 dB	1.5 dB
	S21 amplitude difference (2 GHz - 12 GHz)	-1 dB	1 dB
S21 difference	RF1 to RF2 (300 kHz - 2 GHz)	-0.5 dB	0.5 dB
	RF1 to RF2 (2 GHz - 8 GHz)	-0.4 dB	0.4 dB
	RF1 to RF2 (8 GHz - 12 GHz)	-0.75 dB	0.75 dB
$\Delta$ from linear phase	Deviation from a least squares fit line (50 MHz - 12 GHz)	-8°	8°
RF timing skew		-5 ps	5 ps

1. Measured at peak of DC bias transmission with no RF input and no optical connectors.

2. Maximum driving voltage to achieve 15 dB ER for 12.5 Gb/s 2<sup>31</sup>-1 PRBS signal over the operating wavelength and temperature ranges.

3. Maximum voltage range required to maintain optimum bias point over life and temperature.

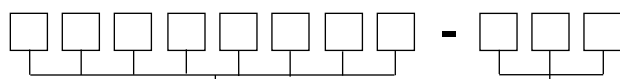
**Mechanical Specifications**

Parameter	Specification
RF port connector	GPO connectors
Input fiber type	Fujikura PANDA-type single-mode polarization maintaining (PMF) fiber, silica, self mode stripping
Output fiber type	
21105245	SM-28
21084655	Fujikura PANDA-type single-mode polarization-maintaining (PMF) fiber, silica, self mode stripping
Cabling	900 $\mu$ m diameter loose tube Hytrel over buffered fiber
Qualification standard	Telcordia GR-468
Qualification document references	

## Ordering Information

For more information on this or other products and their availability, please contact your local JDSU account manager or JDSU directly at 1-800-498-JDSU (5378) in North America and +800-5378-JDSU worldwide or via e-mail at [customer.service@jdsu.com](mailto:customer.service@jdsu.com).

**Sample: 21105245-001**

			
Code	Modulator	Code	Connectors <sup>1</sup>
21105245	DDMZ Dual Drive Modulator with PM input fiber, SM output fiber	001	No optical connectors
21084655	DDMZ Dual Drive Modulator with PM input fiber, PM output fiber	005	FC/PC input and output optical connectors
		007	SC/UPC input and output optical connectors
		010	FC/APC input and output optical connectors

1. Other connector configurations available upon request

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