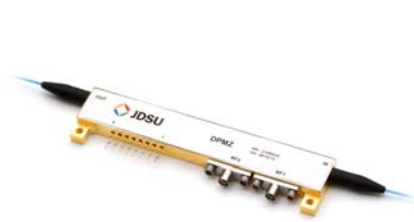


## Dual Parallel Mach-Zehnder (DPMZ) Modulator



### Key Features



- Monolithically integrated, parallel, high-speed MZ modulators, with a phase modulator superstructure
- High-speed MZ modulators with matching amplitude and phase response
- High electro-optic bandwidth
- Compatible with full band tunable lasers
- Integrated RF power monitors for precision control
- Single-sided electrical I/O

### Applications

- 40 Gbps metro, regional and LH optical networks
- 10 Gbps ULH optical networks
- Spectrally efficient DQPSK modulation

### Compliance

- Telcordia GR-468

The dual parallel Mach-Zehnder (DPMZ) modulator is ideally suited for use in metro, long-haul (LH) and ultra long-haul (ULH) optical transport applications. It is used for spectrally efficient multisymbol transmission based on differential quadrature phase shift keying (DQPSK) modulation. The DPMZ modulator is comprised of two matched, high-speed Mach-Zehnder (MZ) modulators that are monolithically integrated, in parallel, inside an MZ superstructure. The MZ superstructure also functions as a phase (shifter) modulator.

DPMZ modulators are specifically designed to yield well-behaved and matching electro-optic amplitude and phase responses over a 20 GHz frequency range and to have enhanced extinction ratios. The DPMZ is available with either single-mode or polarization maintaining output fiber.

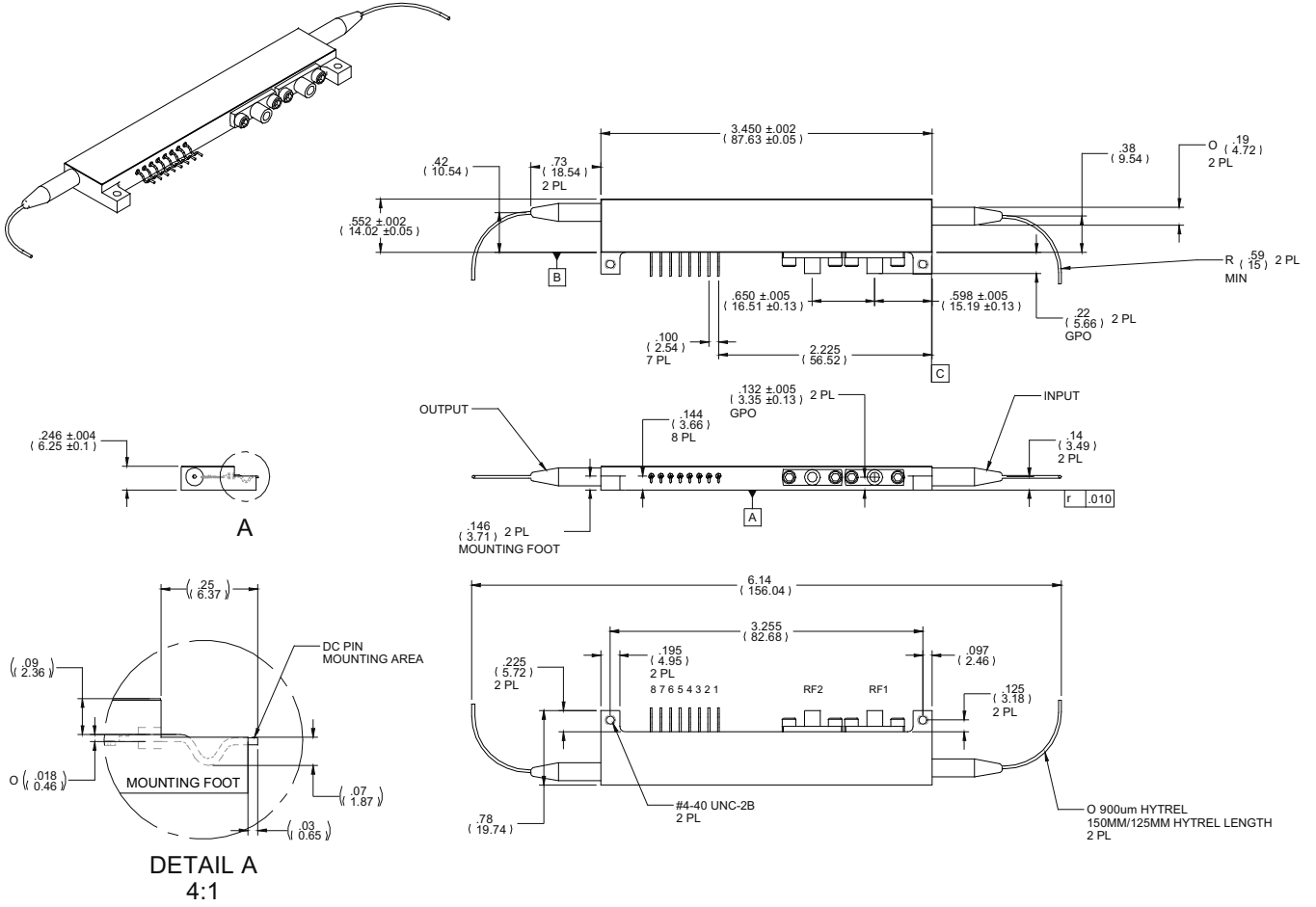
For mounting convenience and space efficiency, the modulator is designed with the electrical I/O located on one side of the package. The two RF inputs use GPO connectors. DPMZ modulators are packaged using our compact (6-mm high) hermetic packaging technology.

The JDSU family of agile optical components includes modulators, switches, attenuators, and tunable filters. These products provide the basis for spectrally efficient DWDM transmission using dispersion-tolerant modulation. They support a broad range of flexible functionalities at lower operating costs for agile optical network. DPMZ modulators have a wide optical bandwidth, and are compatible with full band tunable lasers in either C or L band.

2

Dimensions Diagram

(Specifications in mm unless otherwise noted.)

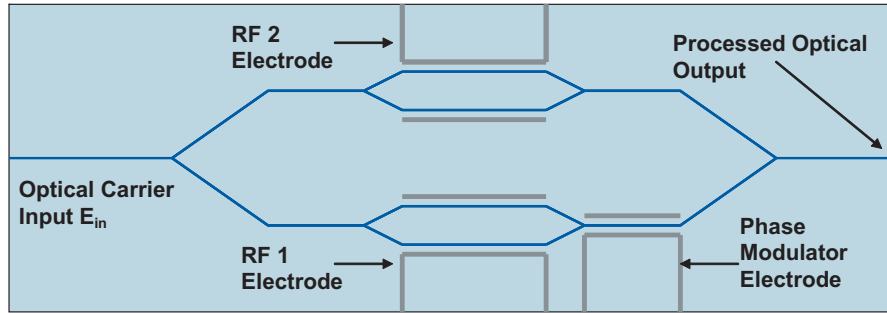


<b>Pinout</b>	(GPO RF Port 1, GPO RF Port 2)
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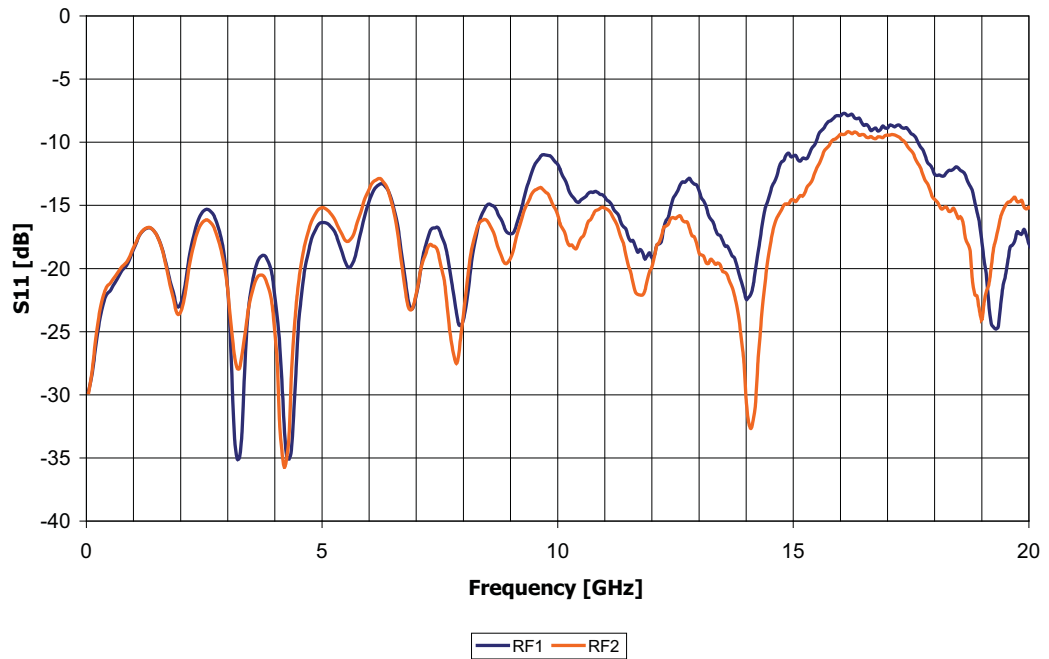
Pin	Description
1	RF Detector (-) RF2
2	RF Detector (+) RF2
3	RF Detector (-) RF1
4	RF Detector (+) RF1
5	RF2 bias
6	RF1 bias
7	Phase Modulator
8	GND

3

Dual Parallel Mach-Zehnder Modulator Configuration

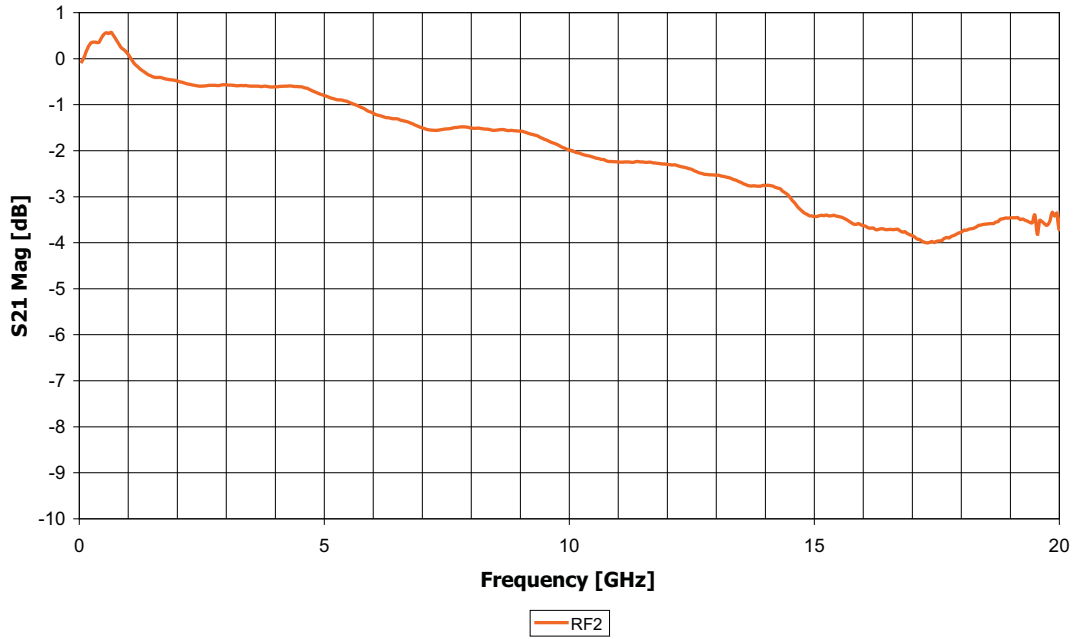


DPMZ S11 Characteristics

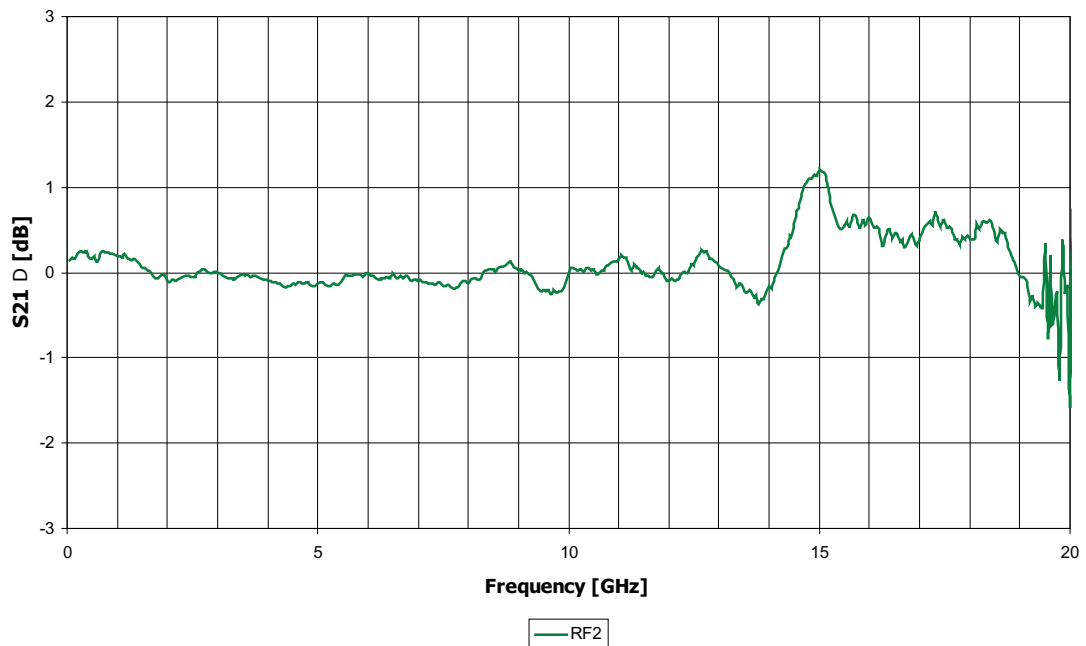


4

DPMZ S21 Characteristics

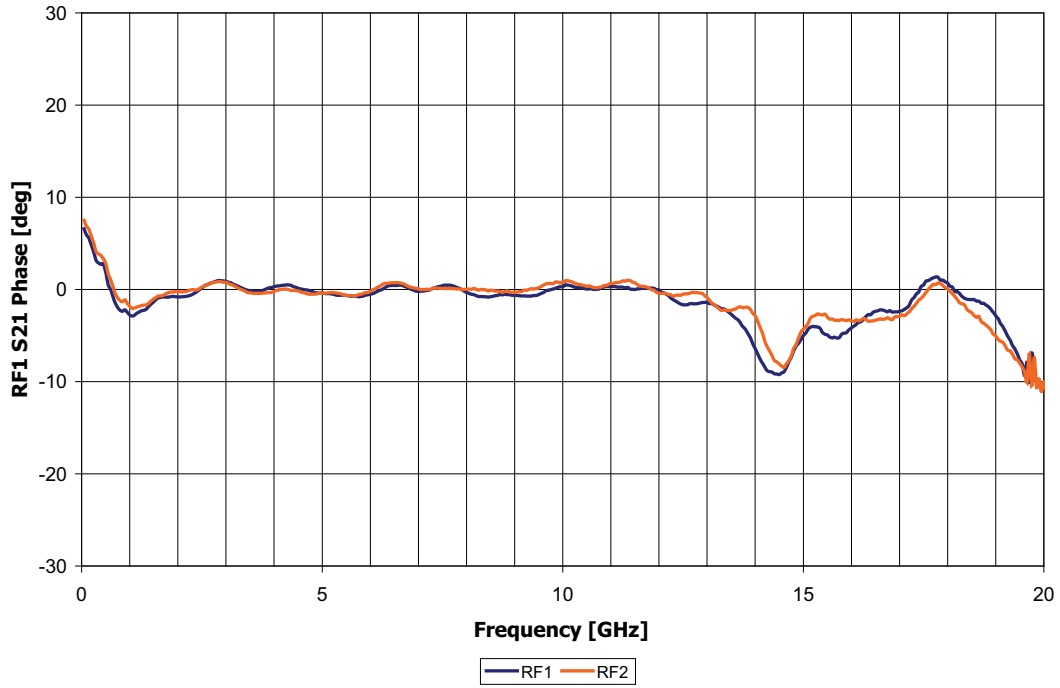


DPMZ S21 Difference MZ2 - MZ1

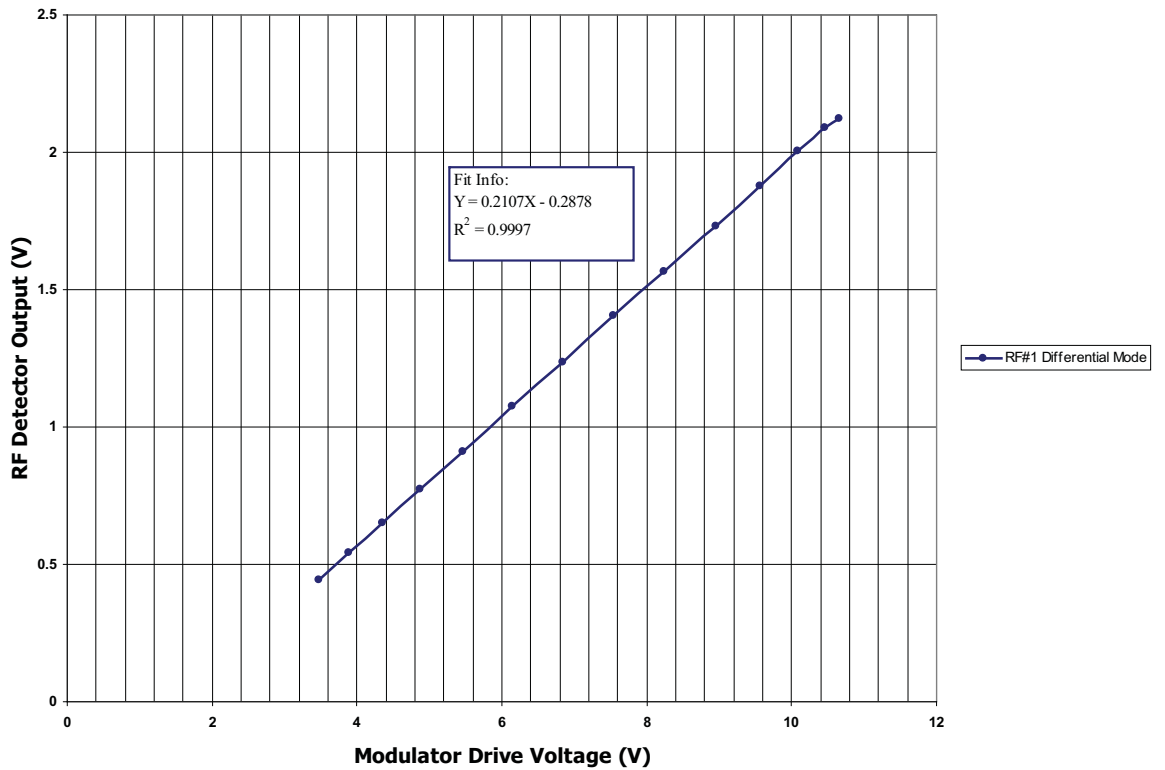


5

DPMZ Electro-optic Phase Response Characteristics



RF Detector Response



## 6

**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
<b>General</b>			
Wavelength		1528 nm	1564 nm
Optical insertion loss <sup>1</sup>		-	6 dB
Optical return loss	Input and output ports	35 dB	-
S11	130 MHz – 10 GHz	-	-10 dB
Inner MZ extinction ratio	Both MZMs	26 dB	-
Phase modulator extinction ratio	Inner MZMs on	26 dB	-
<b>Inner RF Modulators Electrical and Electro-optical</b>			
RF drive voltage <sup>2</sup>	At 2 GHz	3.5 V	6.5 V
DC $V\pi$		2.5 V	6.2 V
DC bias voltage range <sup>3</sup>	EOL voltage rail	-15 V	+15 V
RF bandwidth	Linear fit (2 – 12 GHz)	11 GHz	-
Amplitude ripple	S21 amplitude difference (50 MHz – 2 GHz)	-1.5 dB	1.5 dB
	S21 amplitude difference (2 – 20 GHz)	-1 dB	1 dB
$\Delta$ phase	50 MHz – 0 GHz	-10°	10°
Phase ripple	Peak to peak (50 MHz – 20 GHz)	-5°	5°
RF imbalance	$\Delta$ outputs of MZMs	-0.06	0.06
Differential RF delay	RF1 to RF2	-5 ps	5 ps
<b>Phase Modulator Electrical and Electro-optical</b>			
DC input $V\pi$	At 50 Hz	-	6 V
DC $V\pi$ voltage rail	EOL voltage rail	-15 V	15 V
E/O bandwidth	-3 dB	1 MHz	-
<b>RF Detectors</b>			
Threshold		-	2 V
Slope	RF drive voltage 4 – 11 V	0.1 V/V <sub>pk-pk</sub>	0.4 V/V <sub>pk-pk</sub>
Linearity	RF drive voltage 4 – 11 V	-5%	5%

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 Gbps 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.

**Fiber and Connector 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	Corning SMF-28 or Fujikura Panda PM
Cabling	900 $\mu$ m diameter loose tube Hytrel over buffered fiber
Qualification standard	Telcordia GR-468
Qualification document references	
Fiber connectors	FC/APC, FC/UPC, SC/UPC

**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: 21090286-001**

Product Code	Description
21090286-001	DPMZ with SMF-28 fiber on the output
21090286-005	DPMZ with Corning SMF-28 output and FC/UPC connector
21090286-007	DPMZ with Corning SMF-28 output and SC/UPC connector
21090286-010	DPMZ with Corning SMF-28 output and FC/APC connector
21101281-001	DPMZ with Fujikura Panda PMF output
21101281-005	DPMZ with Fujikura Panda PMF output and FC/UPC connector
21101281-007	DPMZ with Fujikura Panda PMF output and SC/UPC connector
21101281-010	DPMZ with Fujikura Panda PMF output and FC/APC connector