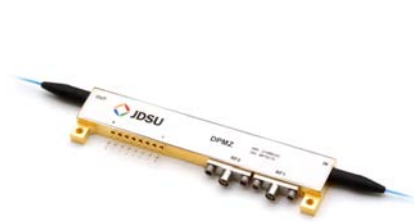


Dual Parallel Mach-Zehnder (DPMZ) Modulator



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.

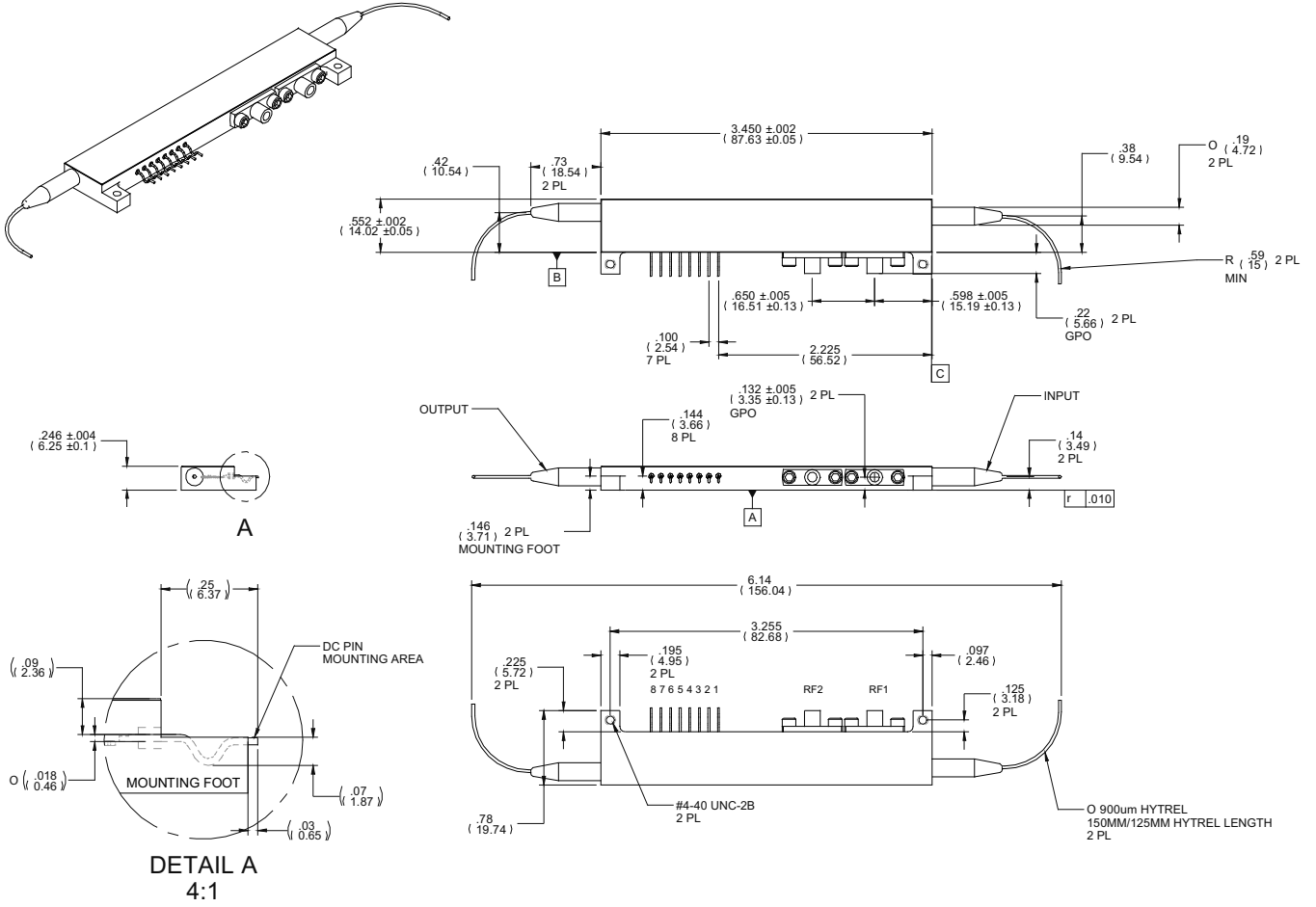
For mounting convenience and space efficiency, the modulator is designed with the electrical I/O located on one side of the package. The two RF inputs use GPO connectors. DPMZ modulators are packaged using our compact (6-mm high) hermetic packaging technology.

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.)

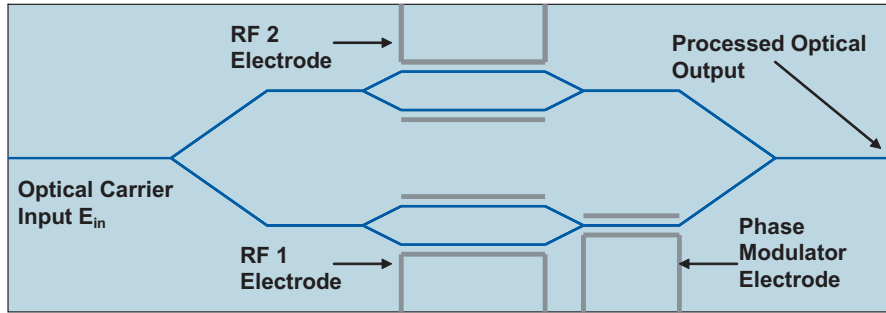


| | |
|---------------|--------------------------------|
| Pinout | (GPO RF Port 1, GPO RF Port 2) |
|---------------|--------------------------------|

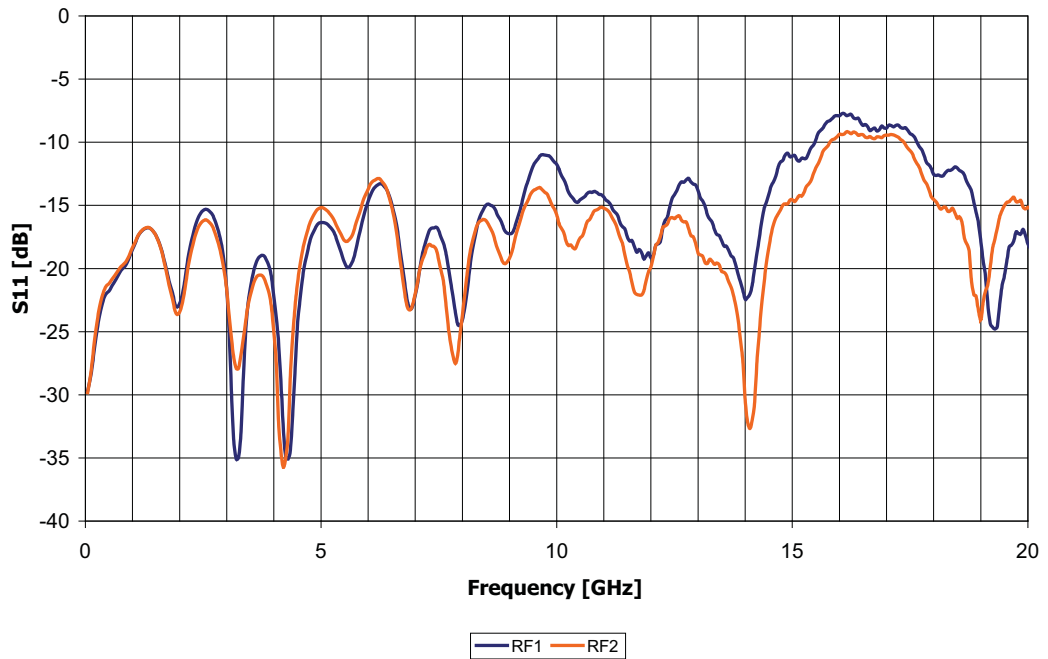
| Pin | Description |
|-----|---------------------|
| 1 | RF Detector (-) RF2 |
| 2 | RF Detector (+) RF2 |
| 3 | RF Detector (-) RF1 |
| 4 | RF Detector (+) RF1 |
| 5 | RF2 bias |
| 6 | RF1 bias |
| 7 | Phase Modulator |
| 8 | GND |

3

Dual Parallel Mach-Zehnder Modulator Configuration

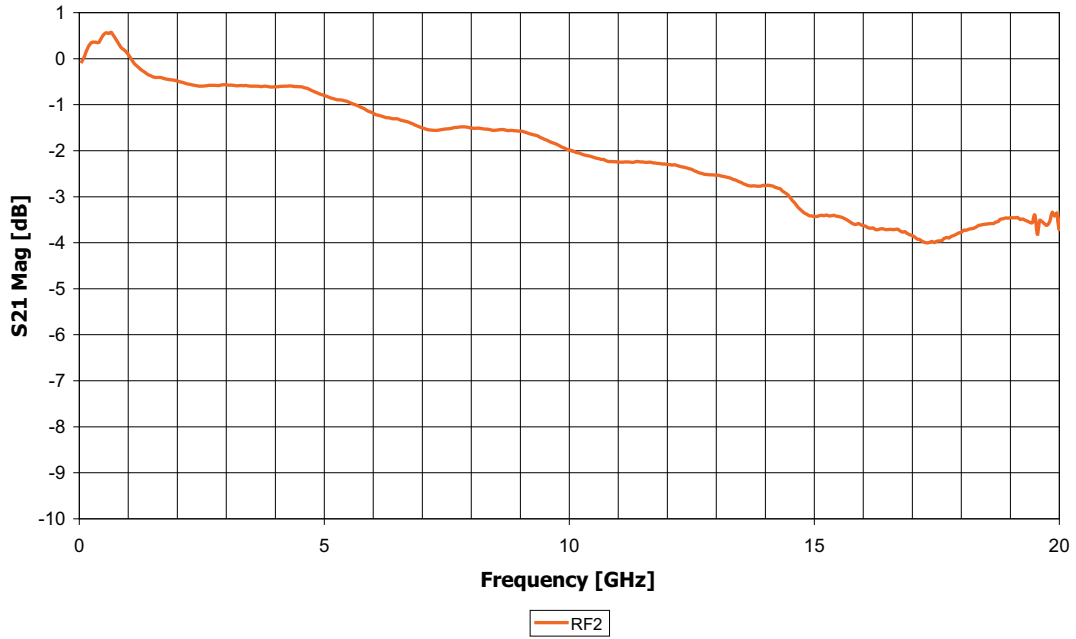


DPMZ S11 Characteristics

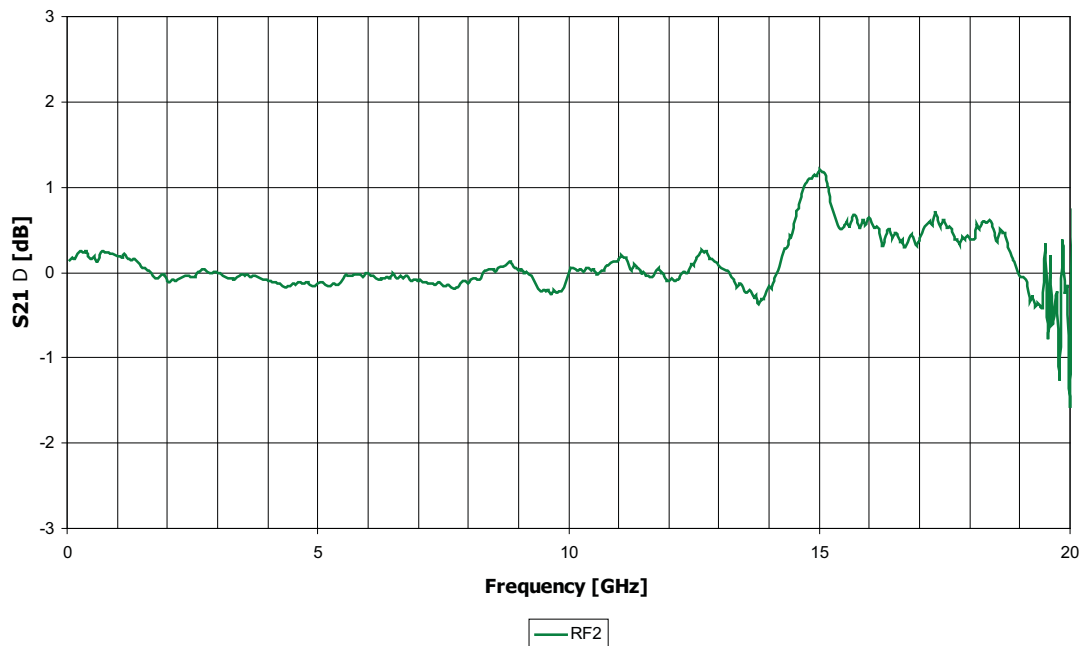


4

DPMZ S21 Characteristics

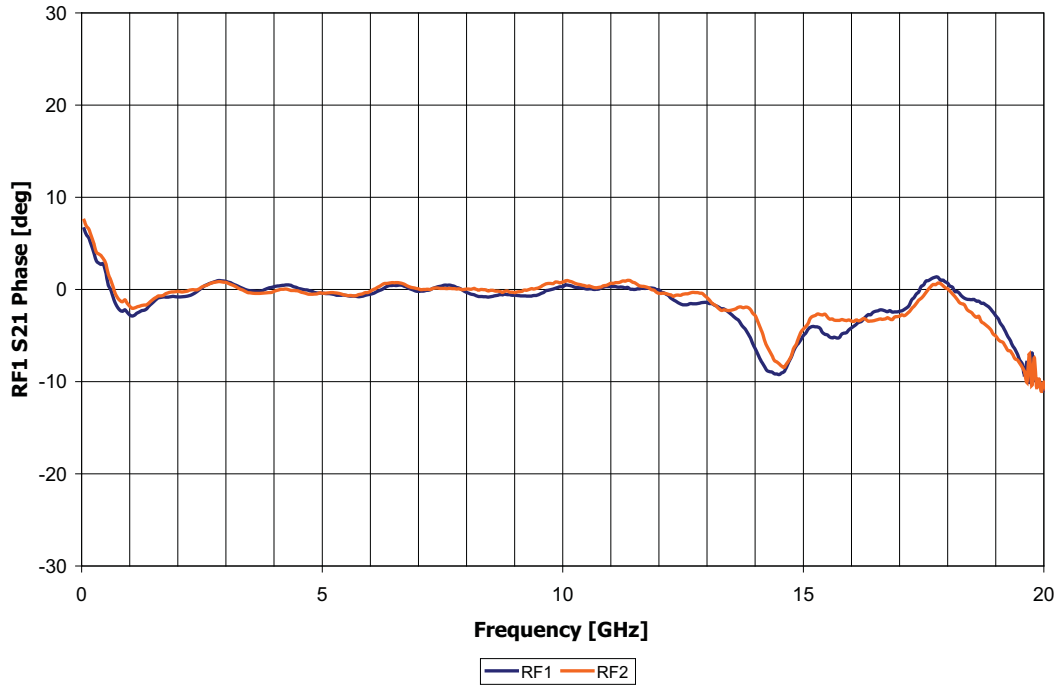


DPMZ S21 Difference MZ2 - MZ1

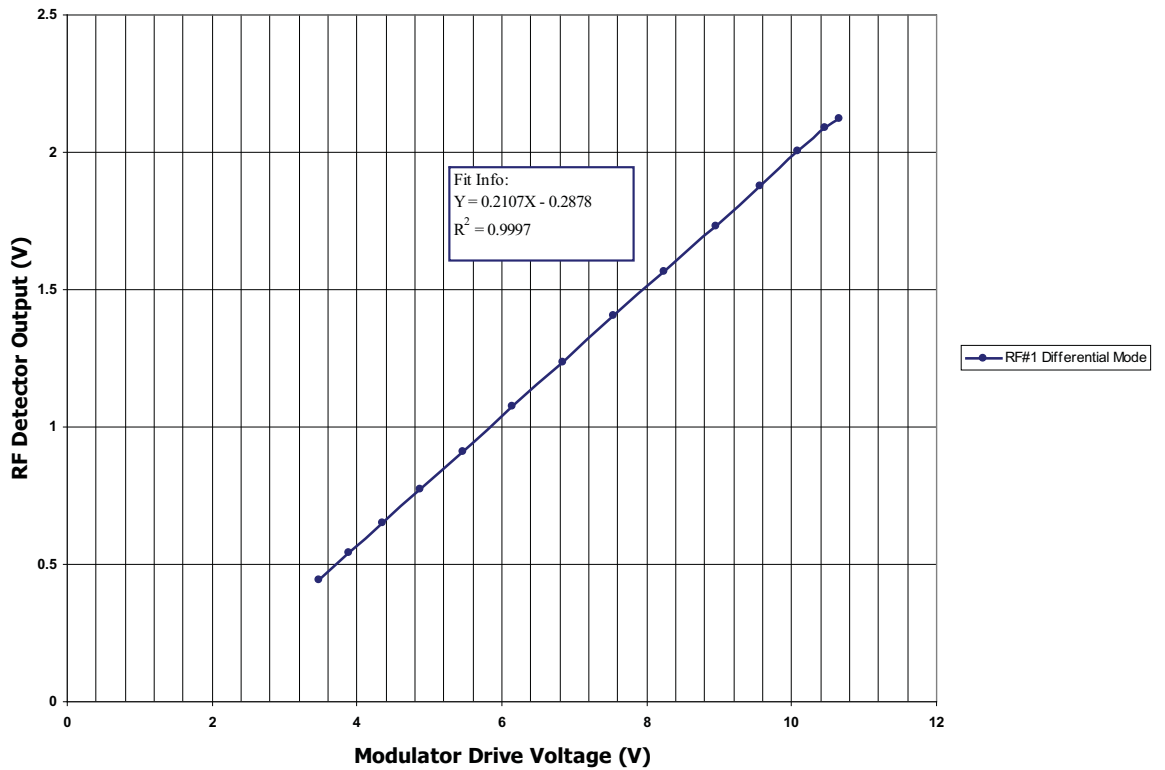


5

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 |
|---|---|--------------------------|--------------------------|
| General | | | |
| Wavelength | | 1528 nm | 1564 nm |
| Optical insertion loss ¹ | | - | 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 | - |
| Inner RF Modulators Electrical and Electro-optical | | | |
| RF drive voltage ² | At 2 GHz | 3.5 V | 6.5 V |
| DC $V\pi$ | | 2.5 V | 6.2 V |
| DC bias voltage range ³ | 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 |
| Δ phase | 50 MHz – 0 GHz | -10° | 10° |
| Phase ripple | Peak to peak (50 MHz – 20 GHz) | -5° | 5° |
| RF imbalance | Δ outputs of MZMs | -0.06 | 0.06 |
| Differential RF delay | RF1 to RF2 | -5 ps | 5 ps |
| Phase Modulator Electrical and Electro-optical | | | |
| 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 | - |
| RF Detectors | | | |
| Threshold | | - | 2 V |
| Slope | RF drive voltage 4 – 11 V | 0.1 V/V _{pk-pk} | 0.4 V/V _{pk-pk} |
| 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 2³¹-1 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 μ 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.

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 |