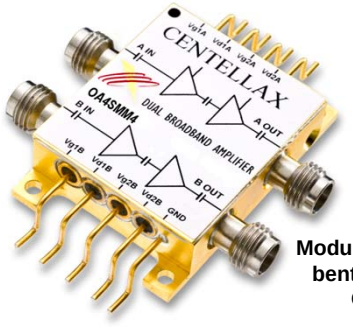
# OA4SMM4 Datasheet

## Dual Input 43 Gb/s Broadband 4.5 V Modulator Driver Amplifier




**Module shown with bent lead option OPTBLD**

### Product Highlights

- Dual 4.5 V Outputs
- 0.5 ps added RMS jitter
- 6 ps rise / fall time
- 17 dB gain to 45 GHz
- 20 dBm saturated output power
- 3.3 W power dissipation
- Size: 1.58 x 1.85 x 0.36 inch

## Description

The OA4SMM4 is a dual input high performance broadband 43 Gb/s Electro-Absorption optical modulator driver amplifier with very low jitter, 4.5 V amplitude, with excellent gain and group delay flatness, matched to 45 GHz. It is designed for electro-optical test equipment and SONET OC-768 / STM-256 optical modulator driver applications.

## Applications

The OA4SMM4 is offered in a small modularized package with superb performance, and is intended for lab use or transponder integration. The OA4SMM4 has gain and power levels that are ideally suited for driving either 40G electro-absorption modulators. The dual driver is well matched so it can be used for differential modulators or with other complex modulation schemes. It has low power dissipation, ample drive signal, very low added jitter, fast rise/fall times, and is easy to use with simple bias voltages.

## Key Characteristics @ 25°C

$Vdd_{1,2}$= 7.0 V; $Vg_{1,2}$= -0.1.0 V; $Vb_{1,2}$= N/C, Zo= 50 Ω

**Time Domain**

| Parameter | Description | Min | Typ | Max |
|---|---|---|---|---|
| Amplitude (V) | Eye Amplitude | 4.1 | 4.5 | - |
| Jitter (ps) | Added RMS Jitter | - | 0.5 | 0.6 |
| Tr/Tf (ps) | Rise/Fall Time | - | 6 | 9 |

**Frequency Domain**

| | | 0.01-26 GHz | | | 26-40 GHz | | | 40-45 GHz | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Description** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** | **Min** | **Typ** | **Max** |
| S21 (dB) | Small Signal Gain | 18 | 21 | - | 15 | 19 | - | 15 | 17 | - |
| \|S21_A-S21_B\| (dBm) | Small Signal Gain Difference | - | 0.5 | - | - | 0.75 | - | - | 1 | - |
| S11 (dB) | Input Match | - | -12 | -10 | - | -11 | -8 | - | -10 | -8 |
| S22 (dB) | Output Match | - | -12 | -10 | - | -12 | -8 | - | -10 | -6 |
| $P_{sat}$ (dBm) | Saturated Output Power | - | 20 | - | - | 20 | - | - | 17 | - |





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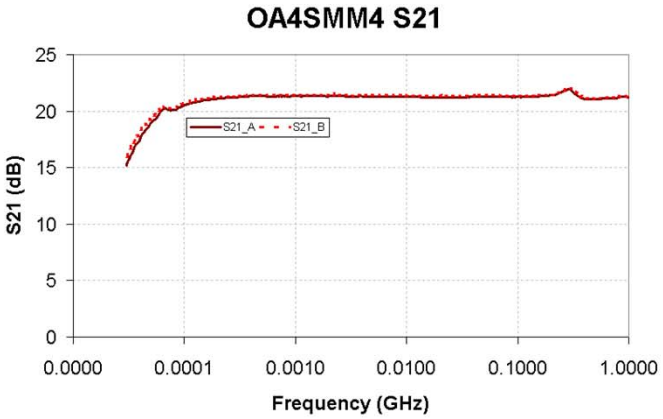
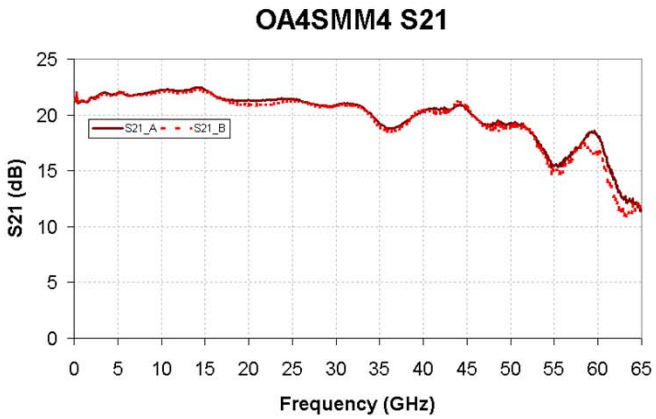
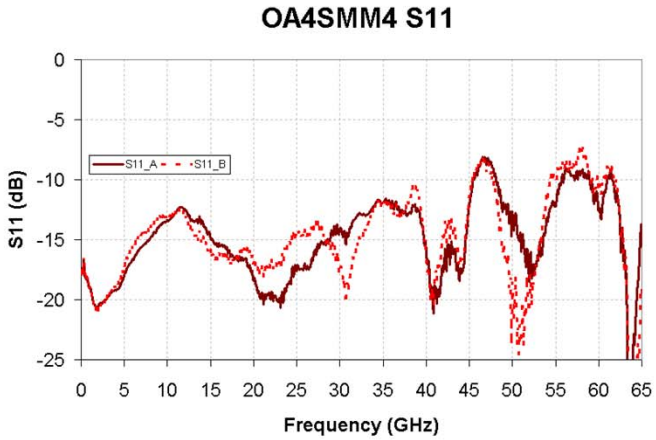
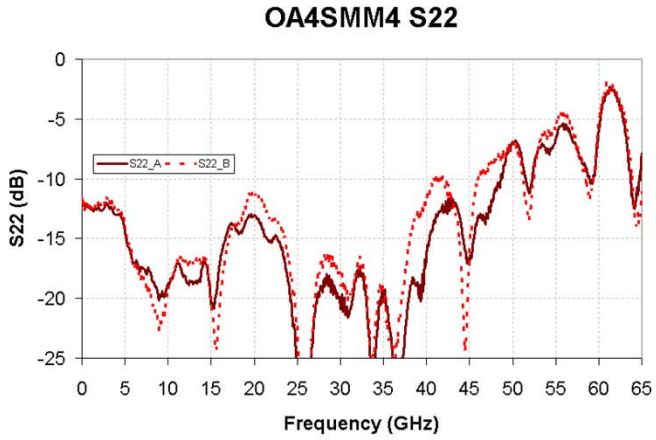
SIGNAL INTEGRITY MEASUREMENT

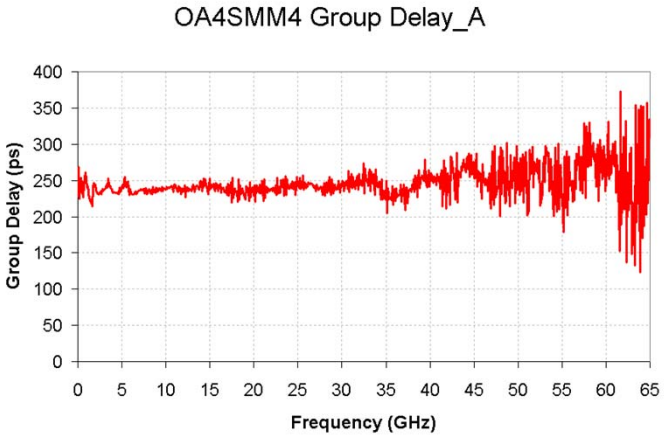
## Typical Performance

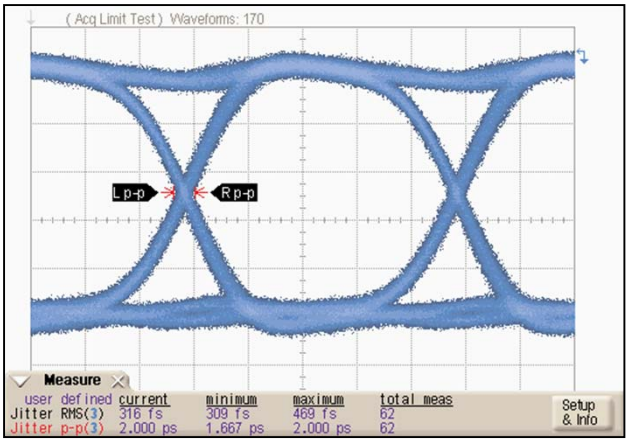


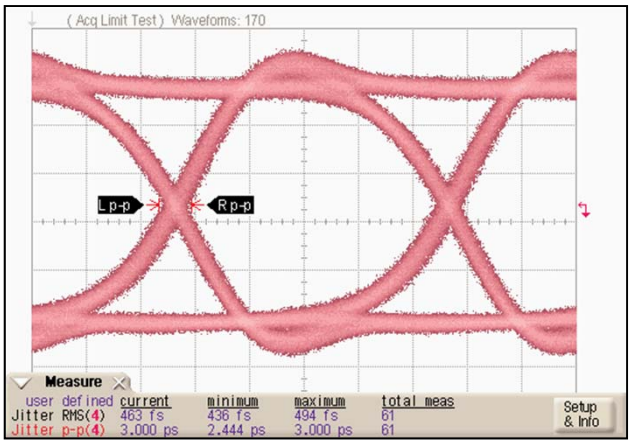




40 Gb/s input signal to OA4SMM4:

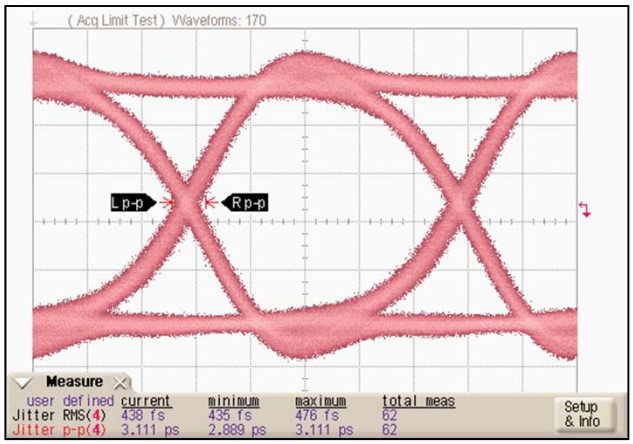
- 378 mV height, 442 mV amplitude
- 316 fs RMS, 2.00 ps p-p jitter
- 6.56 ps rise, 6.44 ps fall

## Typical Performance




Output Eye Side A

- 463 fs RMS, 3.000 ps p-p jitter
- 3.19 V height, 4.42 V amplitude
- 8.22 ps rise, 8.22 ps fall



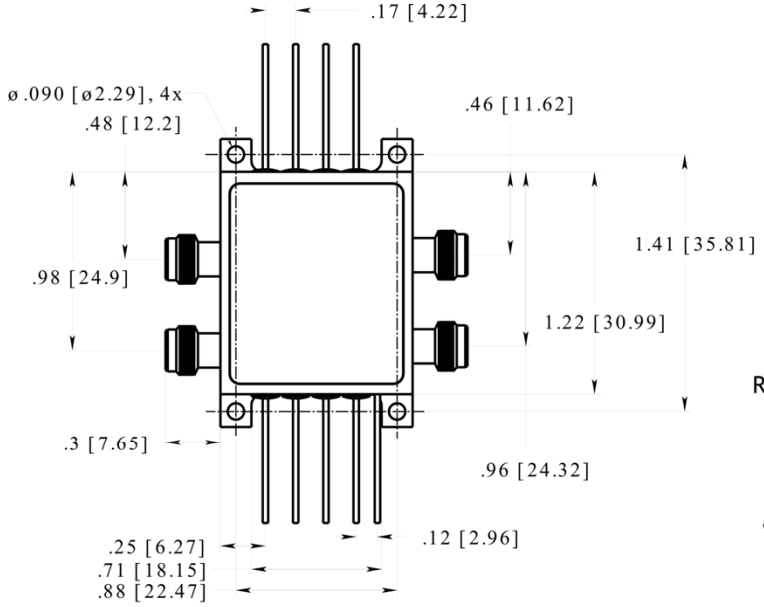

Output Eye Side B

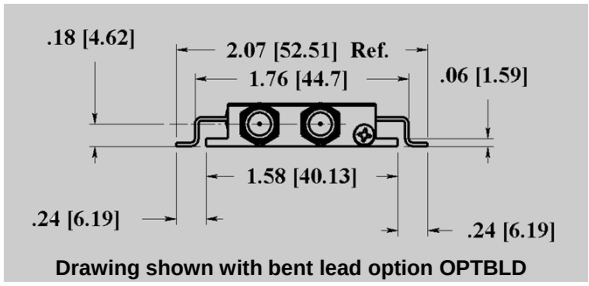
- 438 fs RMS, 3.111 ps p-p jitter
- 3.25 V height, 4.45 V amplitude
- 8.33 ps rise, 8.22 ps fall

## Operating Specifications

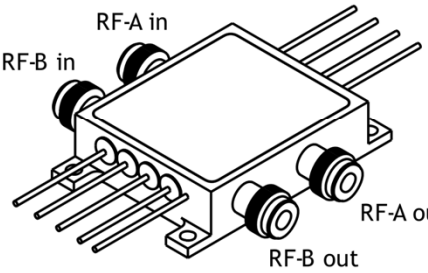
| Parameter | Description | Min | Typ | Max |
|---|---|---|---|---|
| Vd1_A, Vd1_B (V) | Drain Bias Voltage FET1 | - | 7 | 8 |
| Vd2_A, Vd2_B (V) | Drain Bias Voltage FET2 | - | 7 | 8 |
| Id1_A, Id1_B (mA) | Drain Bias Current FET1 | - | 85 | 120 |
| Id2_A, Id2_B (mA) | Drain Bias Current FET2 | - | 150 | 280 |
| Vg1_A, Vg1_B (V) | Gate Bias Voltage FET1 | -4 | -0.1 | 0.5 |
| Vg2_A, Vg2_B (V) | Gate Bias Voltage FET2 | -4 | -0.1 | 0.5 |
| $P_{in}$ (dBm) | Input Power (CW) | - | - | 20 |
| $P_{dc}$ (W) | Power Dissipation | - | 3.3 | - |
| $T_{bs}$ (ºC) | Backside Case Temperature | - | - | 75 |

## Physical Dimensions and Pin Assignment

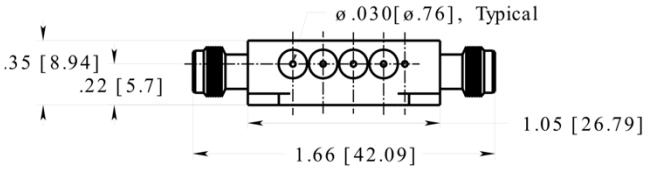


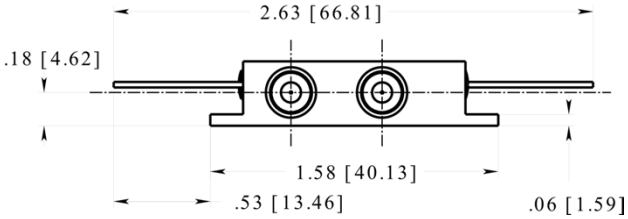




**Drawing shown with bent lead option OPTBLD**




**Default configuration has straight leads**




Measurements in inches [mm]
DC pin diameter is 0.03 in [0.76 mm]

| Pin | Function | Operational Notes |
|---|---|---|
| RFin | RF Input Sides A&B | 1.85 mm RF Connector (female) |
| RFout | RF Output Sides A&B | 1.85 mm RF Connector (female) |
| 1 (Vg1_B) | 1st Stage Gate Bias, Side B | Set at typical operating specification, adjust for desired eye cross-over and jitter |
| 2 (Vd1_B) | 1st Stage Drain Bias, Side B | Set at typical operating specification |
| 3 (Vg2_B) | 2nd Stage Gate Bias, Side B | Set at typical operating specification, adjust for desired eye cross-over and jitter |
| 4 (Vd2_B) | 2nd Stage Drain Bias. Side B | Set at typical operating specification, adjust for desired eye amplitude |
| 5 (Gnd) | Supply Ground | Connect to power supply ground |
| 6 (Vd2_A) | 2nd Stage Drain Bias, Side A | Set at typical operating specification, adjust for desired eye amplitude |
| 7 (Vg2_A) | 2nd Stage Gate Bias, Side A | Set at typical operating specification, adjust for desired eye cross-over and jitter |
| 8 (Vd1_A) | 1st Stage Drain Bias, Side A | Set at typical operating specification |
| 9 (Vg1_A) | 1st Stage Gate Bias, Side A | Set at typical operating specification, adjust for desired eye cross-over and jitter |

**Bias Recommendations (in order):**
1) Bias gates; 2) Bias drains; 3) Adjust for EYE amplitude and cross-over