DRIVER

# DR-DG-12-MO

## 12 Gbps NRZ Medium Output Voltage Driver

The DR-DG-12-MO is a high performance versatile driver module designed for 2.5 Gbps up to 12.5 Gbps data transmission with NRZ or RZ format. It exhibits a 28 dB gain and can deliver an output signal up to 9 $V_{pp}$.

The DR-DG-12-MO is a key component to obtain high quality 2.5 Gbps up to 12.5 Gbps eye diagrams with low rise and fall time, low jitter and high SNR. It operates from a single power supply for safety and ease of use, and offers gain and cross point controls. It comes with K type RF connectors (female in, male out) and with an optional heat-sink.


### Features

- Output voltage up to 9 $V_{pp}$
- Low Rise / Fall time
- Flat gain up to 15 GHz
- Single voltage power supply
- Low group delay variation

### Applications

- $LiNbO_3$ modulators
- OC-192 SONET / SDH
- 12.5 Gbps NRZ and RZ
- Research & Development

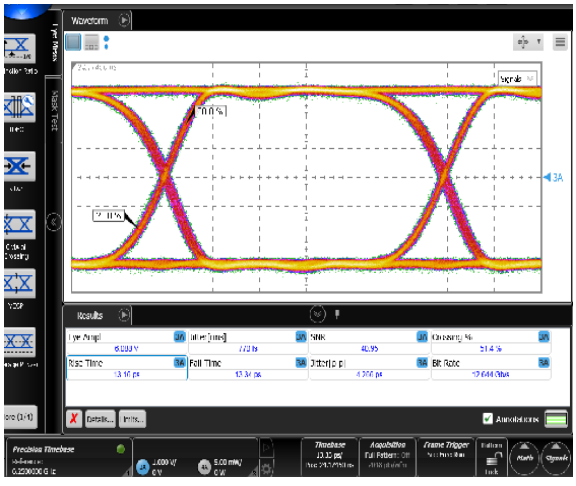
### Options

- Heat-sink

### Performance Highlights

| Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Cut-off frequencies | 50 k | - | 18 G | Hz |
| Output voltage | 2 | - | 8 | $V_{pp}$ |
| Gain | 28 | 30 | - | dB |
| Saturate output power | - | - | 23 | dBm |
| Added jitter | - | 0.9 | - | fs |
| Rise / Fall times | - | 14 | - | ps |

### 12.5 Gbps Output Response




*Ordering Information:*

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Fax orders to: 800-878-7282

# DR-DG-12-MO

## 12 Gbps NRZ Medium Output Voltage Driver

### DC Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply voltage (fixed) | $V_{bias}$ | - | 12 | - | V |
| Current consumption | $I_{bias}$ | - | 260 | - | mA |
| Gain control voltage | $V_{amp}$ | - | 0.5 | - | V |
| Cross Point control voltage | $V_{xp}$ | - | 0.9 | - | V |

### Electrical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Lower frequency | $f_{3db}$, lower | -3 dB point | - | - | 50 | kHz |
| Upper frequency | $f_{3db}$, upper | -3 dB point | - | 15 | - | GHz |
| Gain | $S_{21}$ | Small signal | - | 28 | - | dB |
| Gain ripple | - | f < 15 GHz | - | ± 1.5 | - | dB |
| Input return loss | $S_{11}$ | 10 MHz < f < 12 GHz | - | -10 | - | dB |
| Output return loss | $S_{22}$ | 10 MHz < f < 15 GHz | - | -10 | - | dB |
| Saturated ouptut power | $P_{sat}$ | $V_{in}$ = 0.5 $V_{pp}$ | 22 | 23 | - | dBm |
| Output voltage | $V_{out}$ | $V_{in}$ = 0.5 $V_{pp}$ | 2 | - | 8 | $V_{pp}$ |
| Rise / Fall time | $t_r$ / $t_f$ | 20 % - 80 % | - | 12 / 16 | - | ps |
| Added Jitter | $J_{RMS}$ | $J_{RMS} = \sqrt{J^2_{RMS\text{-}total} - J^2_{RMS\text{-}source}}$ | - | 850 | - | fs |
| Noise figure | NF | 1 GHz < f < 20 GHz | 3.5 | - | 6 | dB |
| Power dissipation | P | $V_{out}$ = 8 $V_{pp}$ | - | 3.2 | - | W |

Conditions: Vin= 0.5 $V_{pp}$, $T_{amb}$ = 25°C, 50 Ω system

### Absolute Maximum Ratings

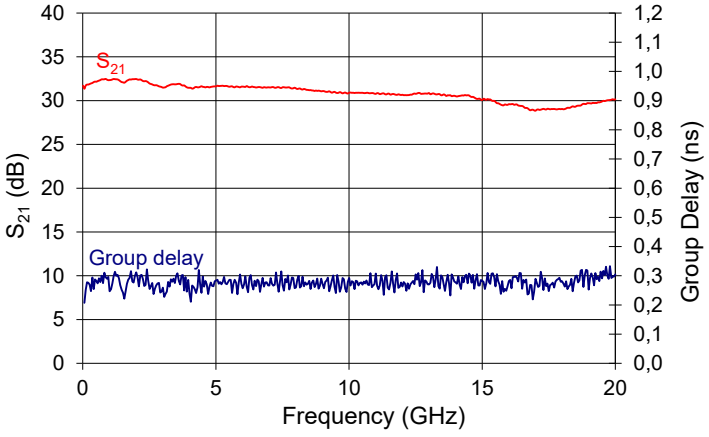
Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| RF input voltage | $V_{in}$ | - | 1 | $V_{pp}$ |
| Supply voltage | $V_{bias}$ | 11 | 13 | V |
| DC current | $I_{bias}$ | 0 | 0.4 | A |
| Gain control voltage | $V_{amp}$ | 0 | 1.2 | V |
| Cross Point control voltage | $V_{xp}$ | 0 | 1.1 | $V_{pp}$ |
| Power dissipation | $P_{diss}$ | - | 5.2 | W |
| Operating temperature | $T_{op}$ | 0 | +40 | °C |
| Storage temperature | $T_{st}$ | -20 | +70 | °C |

# DR-DG-12-MO

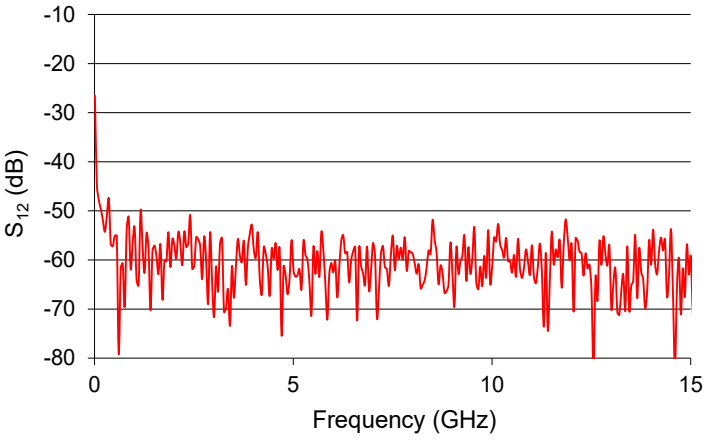
## $S_{21}$ and Group Delay Parameter Curves

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.5 V, $V_{xp}$ = 0.9 V, $I_{bias}$ = 260 mA



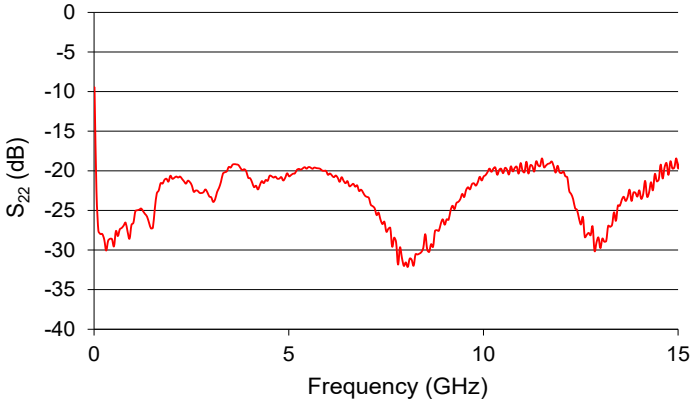

## $S_{12}$ Parameter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.5 V, $V_{x}p$ = 0.9 V, $I_{bias}$ = 260 mA



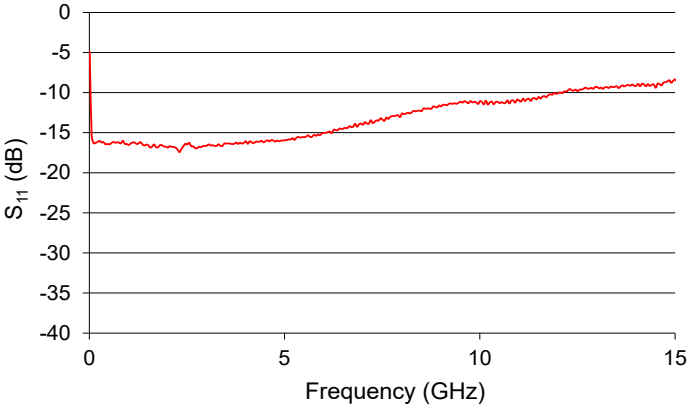

## $S_{22}$ Parameter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.5 V, $V_{xp}$ = 0.9 V, $I_{bias}$ = 260 mA



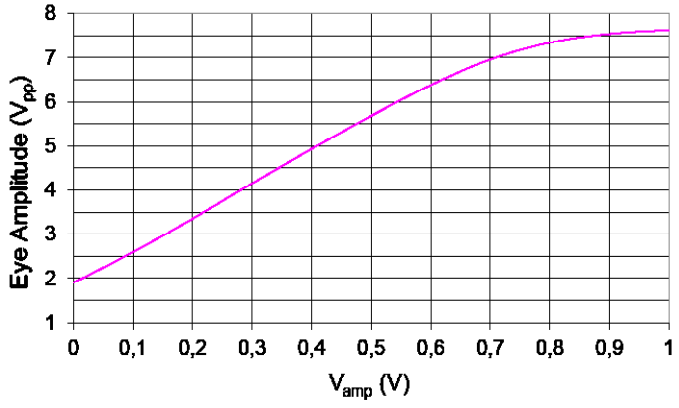

## $S_{11}$ Parameter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.5 V, $V_{xp}$ = 0.9 V, $I_{bias}$ = 260 mA



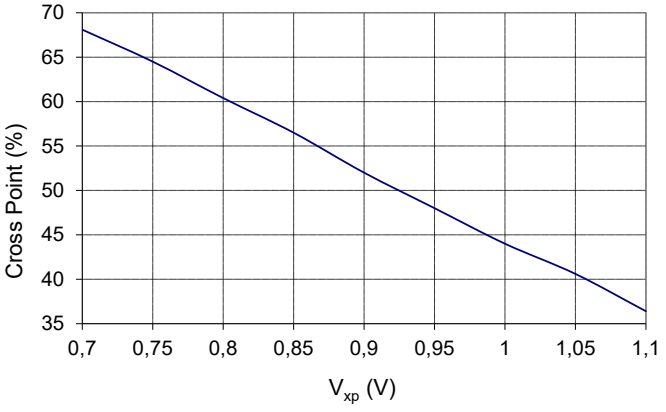

## Typical Output Voltage Amplitude vs $V_{amp}$

Conditions: $V_{bias}$ = 12 V, $V_{in}$ = 0.5 V




## Typical Cross point vs $V_{xp}$

Conditions: $V_{bias}$ = 12 V, $V_{in}$ = 0.5 V



# DR-DG-12-MO

## Eye Diagrams

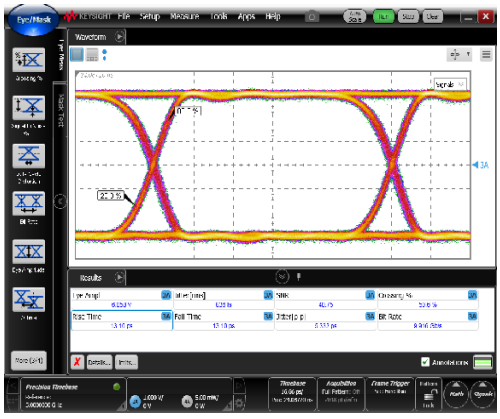
### 10 Gbps data rate

Conditions: Ratio 1/2, Pattern $2^{31}$–1

$V_{bias}$ = 12 V, $V_{amp}$ = 0.8 V, $V_{xp}$ = 0.82 V, $I_{bias}$ = 279 mA

Input signal

Eye amplitude = 0.45 $V_{pp}$



Output response

Eye amplitude = 6 $V_{pp}$

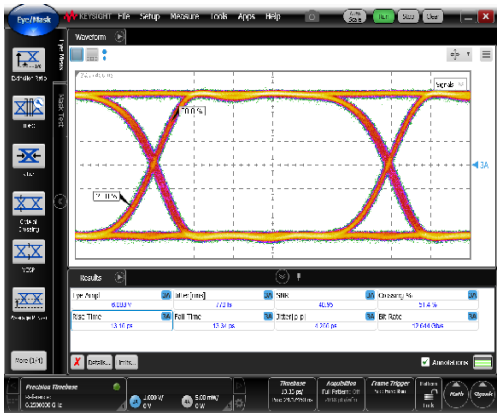
### 12.5 Gbps data rate

Conditions: Ratio 1/2, Pattern $2^{31}$–1

$V_{bias}$ = 12 V, $V_{amp}$ = 0.75 V, $V_{xp}$ = 0.88 V, $I_{bias}$ = 277 mA

Input signal

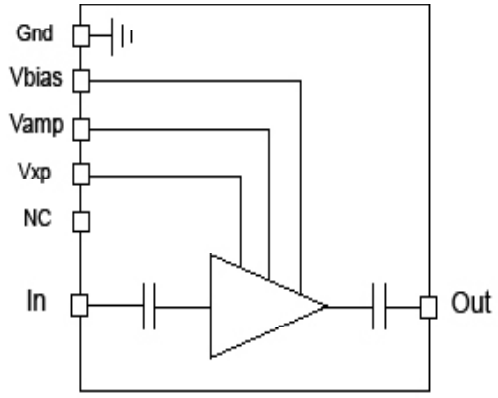
Eye amplitude = 0.45 $V_{pp}$



Output response

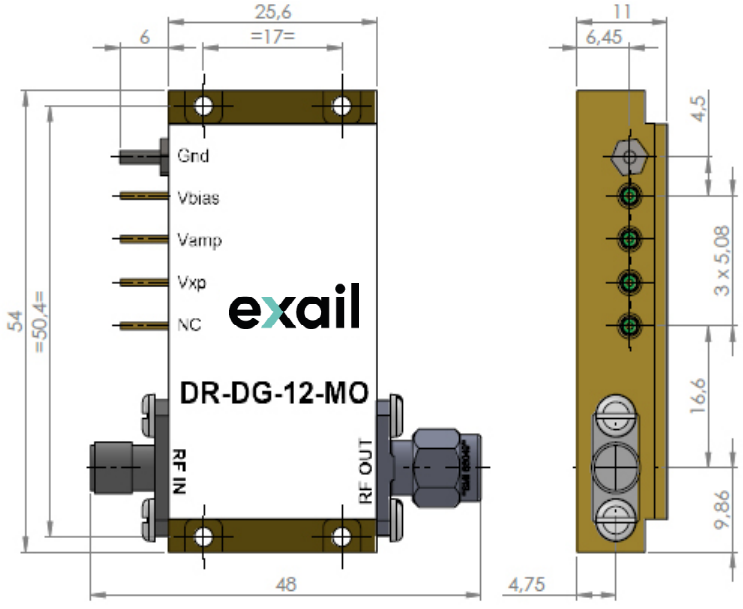
Eye amplitude = 6 $V_{pp}$

## Electrical Schematic Diagram




## Mechanical Diagram and Pinout

All measurements in mm

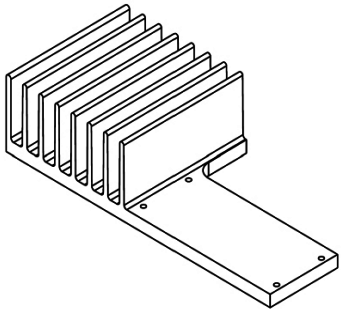


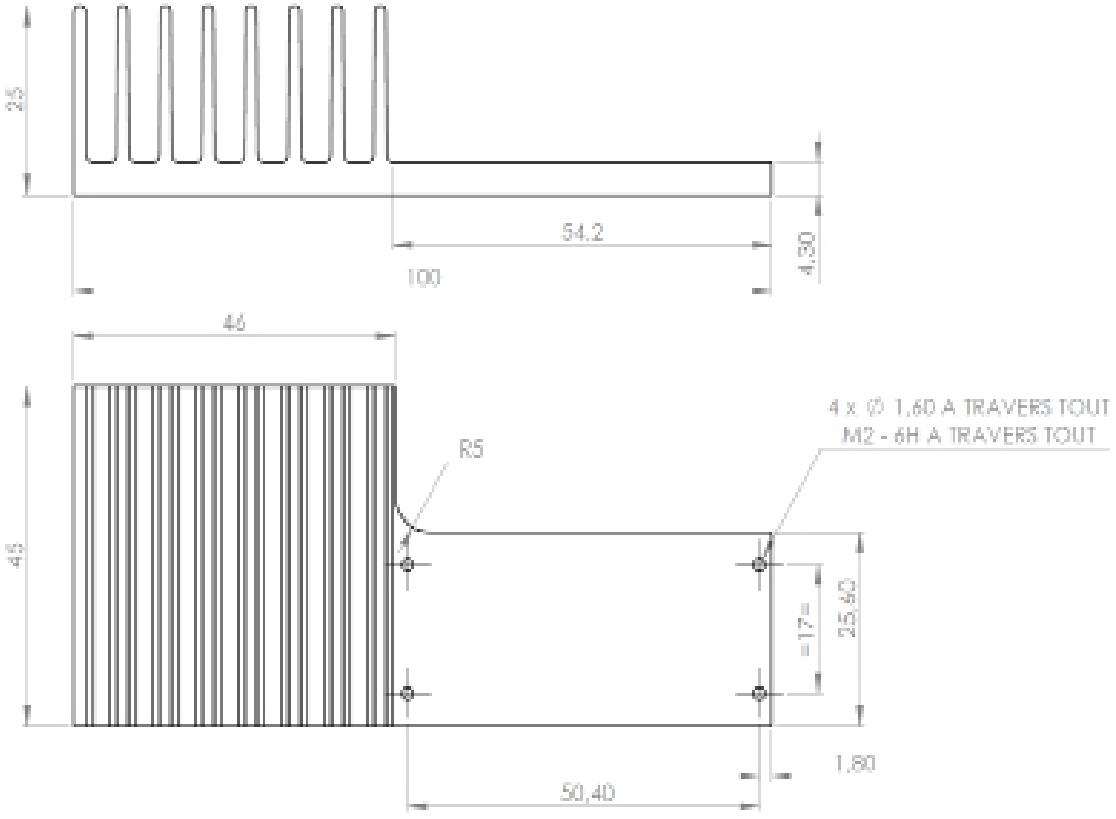

The heat-sinking of the module is necessary. It's user responsability to use an adequate heat-sink. Refer to page 6 for Exail recommended heat-sink.

| Port | Function | Unit |
|---|---|---|
| IN | RF In | Female K connector |
| OUT | RF Out | Male K connector |
| $V_{bias}$ | Power supply voltage | Set a typical operating specification |
| $V_{amp}$ | Output voltage amplitude adjustment | Adjust for gain control tuning |
| $V_{amp}$ | Output voltage cross point adjustment | Adjust for cross point control tuning |

## Mechanical Diagram and Pinout with HS-MO2 Heat-sink

All measurements in mm






## About us

Exail Photonics produces specialty optical fibers and Bragg gratings based fiber optics components and provides optical modulation solutions based on the company lithium niobate ($LiNbO_3$) modulators and RF electronic modules.
Exail Photonics serves a wide range of industries: sensing and instruments, defense, telecommunications, space and fiber lasers as well as research laboratories all over the world.



07_2023_ED8 / 00024988

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