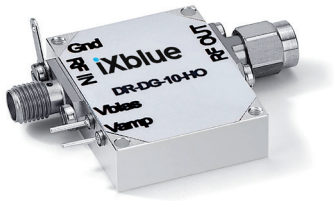
# DR-DG-10-HO

## 12 Gbps High Output Voltage Driver Module

**DRIVER**




The DR-DG-10-HO is a driver module optimized for digital applications requiring an upper operation voltage at 12.5 Gbps. It exhibits 12.5 $V_{pp}$ output voltage and 35 dB gain up to 7 GHz.

The DR-DG-10-HO module is especially useful for driving $LiNb0_3$ modulators with 12 Gbps DPSK and 2 x 12 Gbps (D)QPSK modulation formats.

It is also a key device for multi-level modulation formats and for driving phase modulators. It is operated from a single power supply voltage for safety and ease of use and offers output voltage control. The DR-DG-10-HO comes with SMA type RF connectors (female in, male out) and with an optionnal heat sink. It is a non-inverting and single ended amplifier.

### FEATURES

- High output voltage 12 $V_{pp}$
- High gain 35 dB
- High SNR
- Single voltage power supply

### APPLICATIONS

- $LiNbO_3$ & InP modulators
- 12 Gbps DPSK
- 2x12 Gbps (D)QPSK
- Research & Development

### OPTIONS

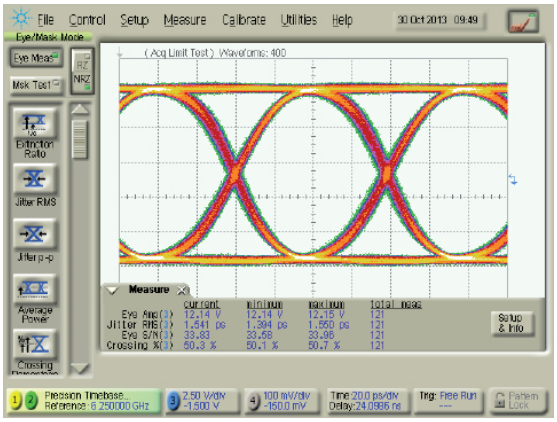
- Heat-sink

## Performance Highlights

| Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Cut-off Frequencies | 50 k | - | 8 G | Hz |
| Output Voltage | - | 12 | - | $V_{pp}$ |
| Gain | - | 30 | - | dB |
| Saturated Power | - | 26 | - | dBm |
| Added Jitter | - | 1.25 | - | ps |
| Rise / Fall Times | - | 24.5 | - | ps |

Measurements for $V_{bias}$ = 12 V, $V_{amp}$ = 1.2 V, $I_{bias}$ = 420 mA

## 12.5 Gbps Output Response




*Ordering Information:*

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800 Village Walk #316
Guilford, CT 06437
Ph: 203-401-8093
Email orders to: sales@xsoptix.com
Fax orders to: 800-878-7282

## DC Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply voltage (fixed) | $V_{bias}$ | - | 12 | - | V |
| Current consumption | $I_{bias}$ | - | 0.420 | - | A |
| Gain control voltage | $V_{amp}$ | 0 | 1.4 | - | V |

## Electrical Characteristics

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Lower frequency | $f_{3db}$, lower | -3 dB point | 45 | 50 | - | kHz |
| Upper frequency | $f_{3db}$, upper | -3 dB point | 6 | 8 | - | GHz |
| Gain | $S_{21}$ | Small signal | - | 30 | - | dB |
| Gain ripple | - | < 8 GHz | - | ±1.5 | - | dB |
| Input return loss | $S_{11}$ | 10 MHz < f < 10 GHz | - | -10 | - | dB |
| Output return loss | $S_{22}$ | 10 MHz < f < 10 GHz | - | -10 | - | dB |
| Output voltage | $V_{out}$ | $V_{in}$ = 0.5 $V_{pp}$ @10.7 Gbps | 6 | 12 | 12.5 | $V_{pp}$ |
| Rise time / Fall time | $t_r / t_f$ | 20 % - 80 % | - | 24.5 / 24.5 | - | ps |
| Added jitter | $J_{RMS}$ | $J_{RMS} = \sqrt{J^2_{RMS\text{-}total} - J^2_{RMS\text{-}source}}$ | - | 1.25 | - | ps |
| Power dissipation | P | $V_{out}$ = 12 $V_{pp}$ | - | 5 | - | W |

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

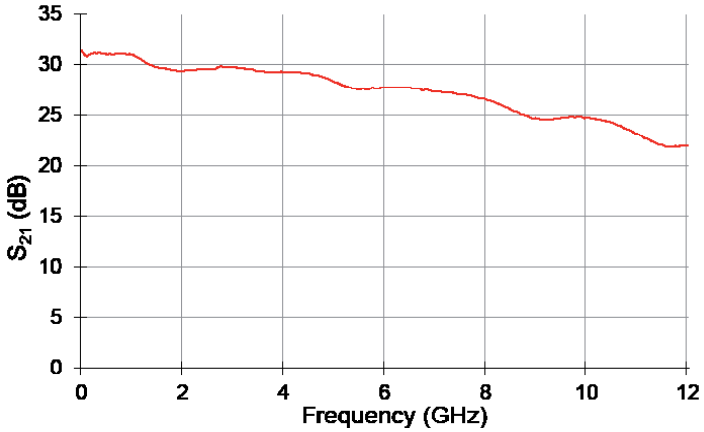
## Absolute Maximum Ratings

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 | $V_{pp}$ |
| Power Supply Voltage | $V_{bias}$ | 11.5 | 13 | V |
| DC current | $I_{bias}$ | - | 0.45 | A |
| Gain control voltage | $V_{amp}$ | 0 | 2 | V |
| Power dissipation | $P_{diss}$ | - | 5.8 | W |
| Temperature of operation | $T_{op}$ | -5 | +50 | °C |
| Storage temperature | $T_{st}$ | -40 | +70 | °C |

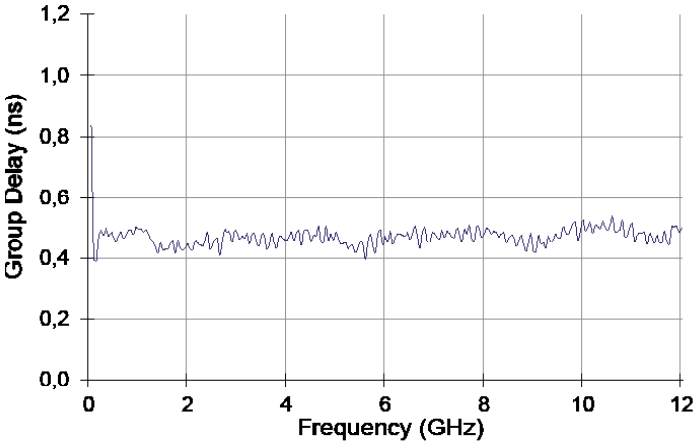
## $S_{21}$ Parameter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.6 V, $I_{bias}$ = 455 mA



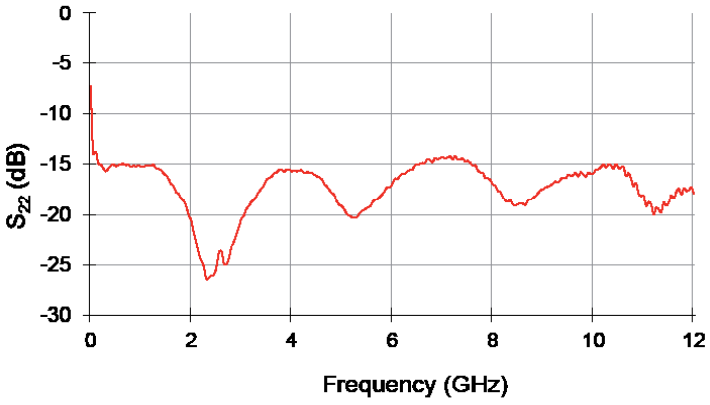

## Group Delay Parameter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.6 V, $I_{bias}$ = 455 mA



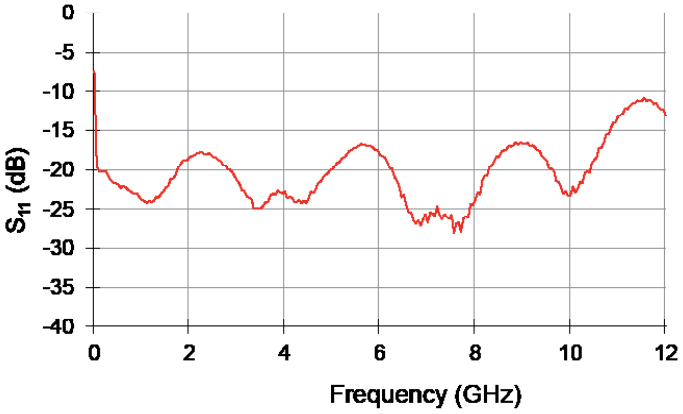

## $S_{22}$ Parameter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.65 V, $V_{xp}$ = 1 V, $I_{bias}$ = 319 mA



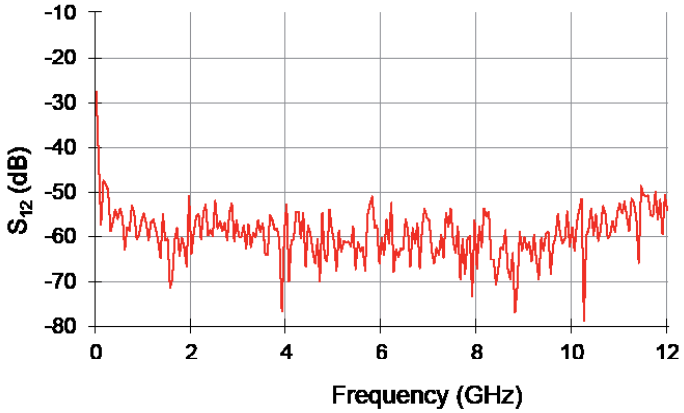

## $S_{11}$ Parameter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.6 V, $I_{bias}$ = 455 mA



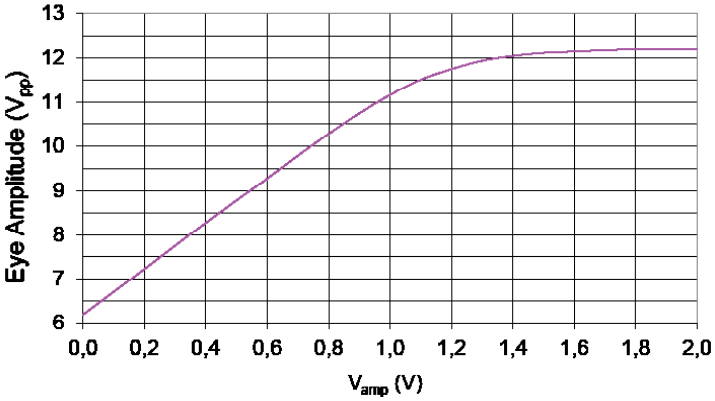

## $S_{12}$ Paremeter Curve

Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.6 V, $I_{bias}$ = 455 mA




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

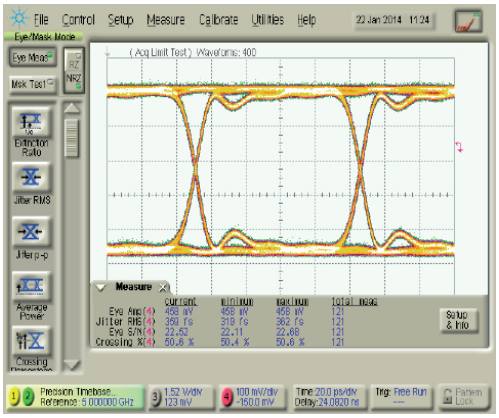
Conditions: $V_{bias}$ = 12 V, $V_{amp}$ = 0.6 V, $I_{bias}$ = 455 mA



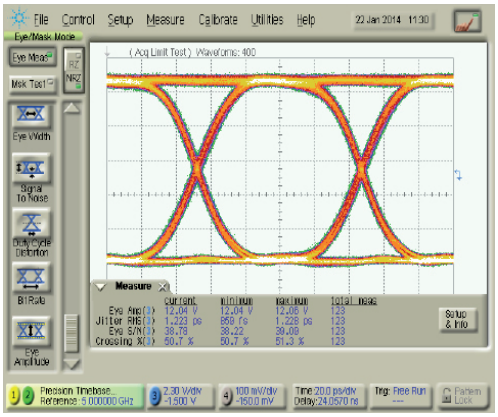
## Eye Diagrams

### 10 Gbps data rate

Conditions: Ratio y, Pattern $2^{31}$-1
$V_{bias}$ = 12 V, $V_{amp}$ = 1.35 V, $I_{bias}$ = 379 mA



Input signal
Eye amplitude = 0.458 V, Rise time = 10 ps
Jitter RMS = 359 fs, SNR = 22.5



Output response
Eye amplitude = 12 V, Rise time = 26 ps
Jitter RMS = 1.23 ps, SNR = 38.8

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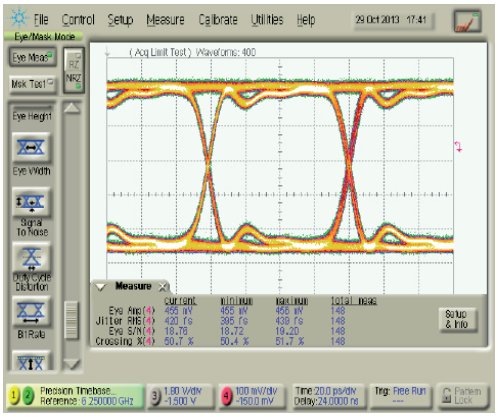
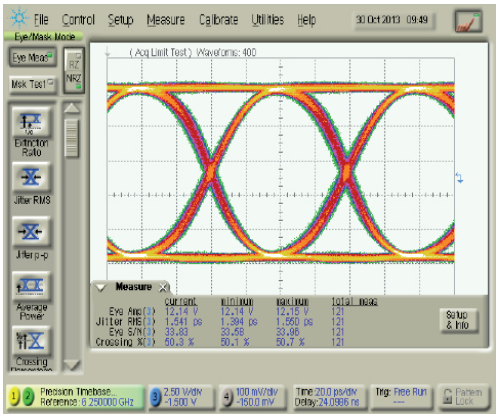
### 12.5 Gbps data rate

Conditions: Ratio y, Pattern $2^{31}$-1
$V_{bias}$ = 12 V, $V_{amp}$ = 1.7 V, $I_{bias}$ = 400 mA

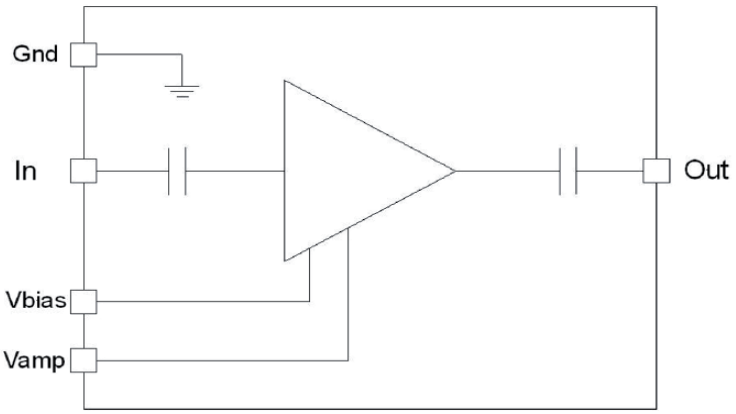


Input signal
Eye amplitude = 0.455 V, Rise time = 10 ps
Jitter RMS = 420 fs, SNR = 18.8



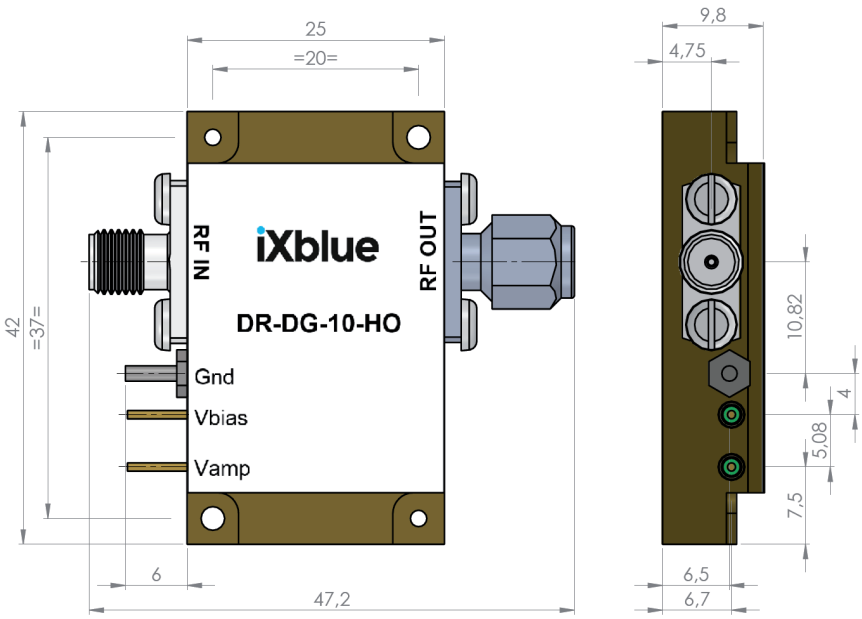
Output response
Eye amplitude = 12.14 V, Rise time = 24.9 ps
Jitter RMS = 1.5 ps, SNR = 33.8

## Electrical Schematic Diagram




## Mechanical Diagram and Pinout

All measurements in mm

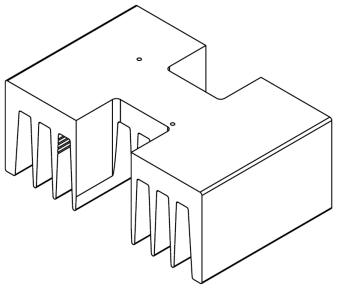


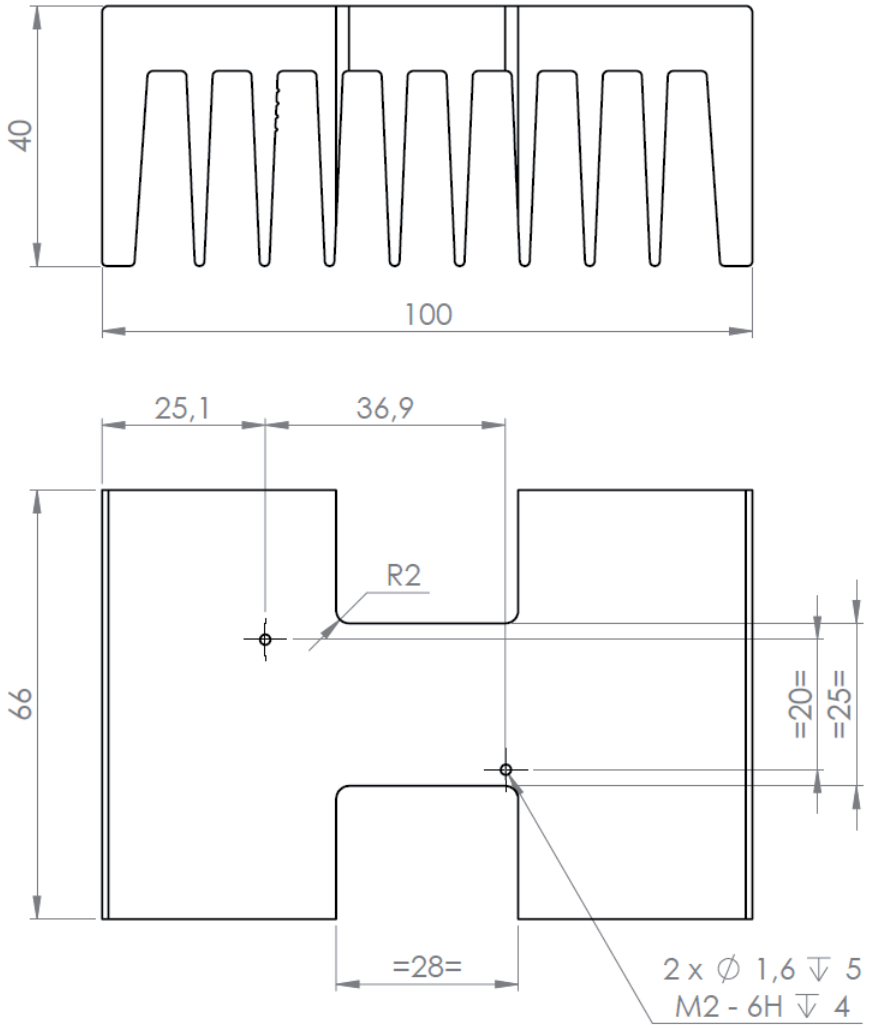

The heatsinking of the module is necessary. It's user responsability to use an adequate heatsink. Refer to page 6 for iXBlue recommended heatsink.

| PIN | Function | Unit |
|---|---|---|
| IN | RF In | SMA - connector female |
| OUT | RF Out | SMA - connector male |
| $V_{bias}$ | Power supply voltage | Set a typical operating specification |
| $V_{amp}$ | Output voltage amplitude adjustment | Adjust for gain control tuning |

## Mechanical Diagram And Pinout With HS-HO1 Heatsink

All measurements in mm






## About us

iXBlue 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.
iXBlue 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.

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