

## FEATURES

- Output voltage up to 8 V<sub>pp</sub>
- Low Rise/Fall time
- Flat gain up to 20 GHz
- Single voltage power supply
- Low group delay variation

## APPLICATIONS

- LiNbO<sub>3</sub> modulators
- 20 Gbps NRZ and RZ
- Research & Development

The DR-DG-20-MO is a high performance versatile driver module designed for 2.5 Gbps up to 20 Gbps data transmission with NRZ or RZ format. It exhibits a 28 dB gain and can deliver an output signal up to 9 V<sub>pp</sub>.

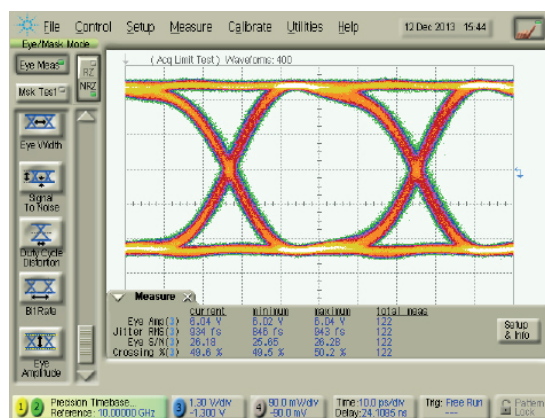
The DR-DG-20-MO is a key component to obtain high quality 2.5 Gbps up to 20 Gbps eye diagrams with low rise and fall time, low jitter and high SNR. It operates from a single power supply for safety and ease of use, and offers gain and cross point controls. It comes with K type RF connectors (female in, male out) and with an optional heat sink.

## Performance Highlights

Parameter	Min	Typ	Max	Unit
Cut-off frequencies	50 k	-	18 G	Hz
Output voltage	2	-	8	V <sub>pp</sub>
Gain	28	30	-	dB
Saturated output power	-	-	23	dBm
Added jitter	-	0.9	-	ps
Rise / Fall times	-	14	-	ps

Measurements for V<sub>bias</sub> = 12 V, V<sub>amp</sub> = 0.65 V, V<sub>xp</sub> = 1 V, I<sub>bias</sub> = 319 mA

## 20 Gbps Output Response



### Ordering Information:



800 Village Walk #316  
Guilford, CT 06437  
Ph: 203-401-8093

Email orders to: [sales@xsoptix.com](mailto: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	$I_{bias}$	-	260	-	A
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	18	20	-	GHz
Gain	$S_{21}$	Small signal	28	30	-	dB
Gain ripple	-	$f < 15$ GHz	-	$\pm 1.5$	-	dB
Input return loss	$S_{11}$	$10 \text{ MHz} < f < 12 \text{ GHz}$	-	-10	-	dB
Output return loss	$S_{22}$	$10 \text{ MHz} < f < 15 \text{ GHz}$	-	-10	-	dB
Saturated output 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	$J_{RMS}$	$J_{RMS} = \sqrt{J_{RMS-total}^2 - J_{RMS-source}^2}$	-	0.9	-	ps
Noise Figure	NF	$1 \text{ GHz} < f < 20 \text{ GHz}$	3.5	-	6	dB
Power dissipation	P	$V_{out} = 8 V_{pp}$	-	3.2	-	W

Conditions:  $V_{in} = 0.5 V_{pp}$ ,  $T_{amb} = 25^\circ\text{C}$ , 50  $\Omega$  system

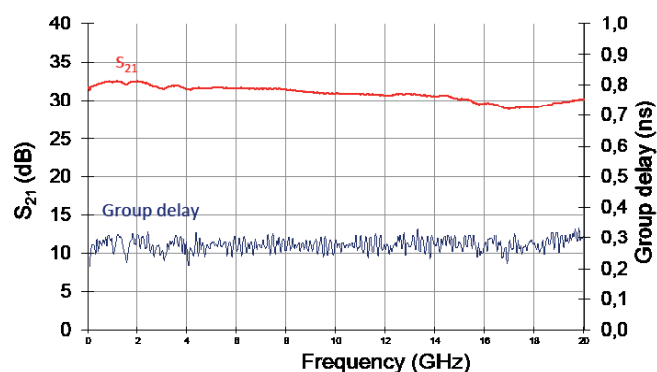
## Absolute Maximum Ratings

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
Temperature of operation	$T_{op}$	0	+40	$^\circ\text{C}$
Storage temperature	$T_{st}$	-20	+70	$^\circ\text{C}$

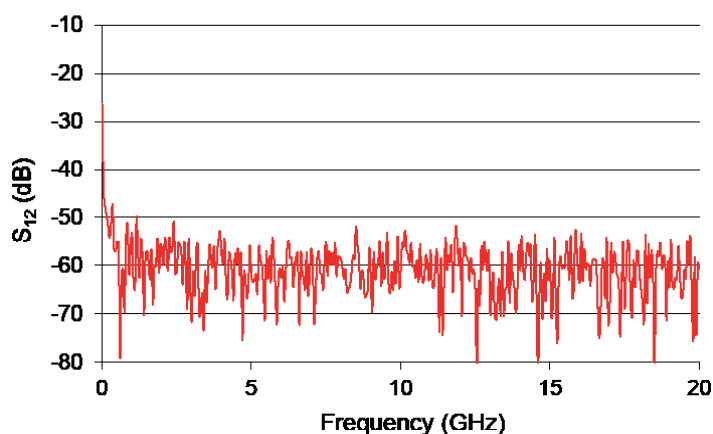
### $S_{21}$ and Group Delay Parameter Curves

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



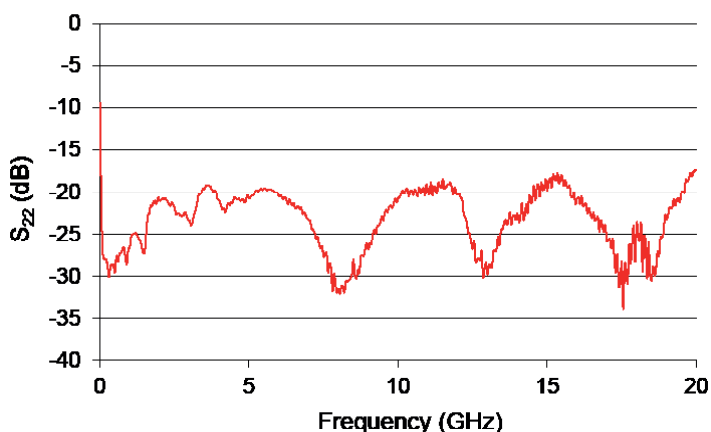
### $S_{12}$ Parameter Curve

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



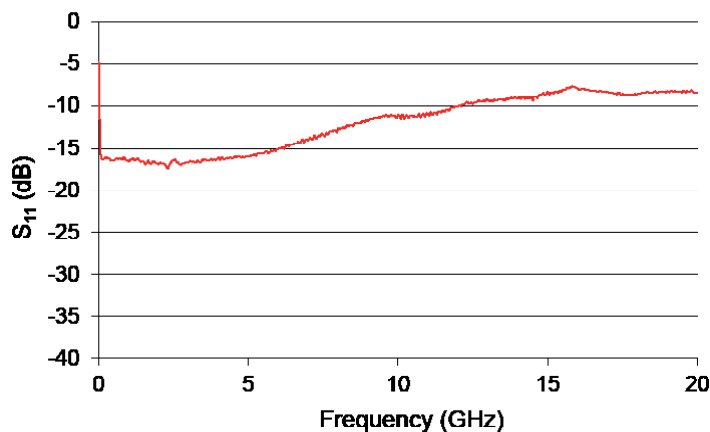
### $S_{22}$ Parameter Curve

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



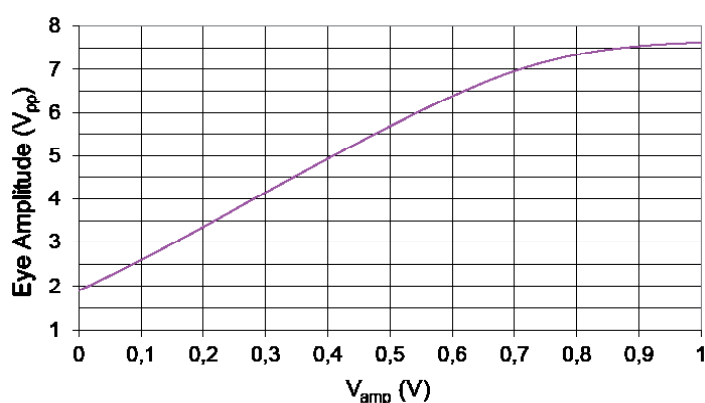
### $S_{11}$ Parameter Curve

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



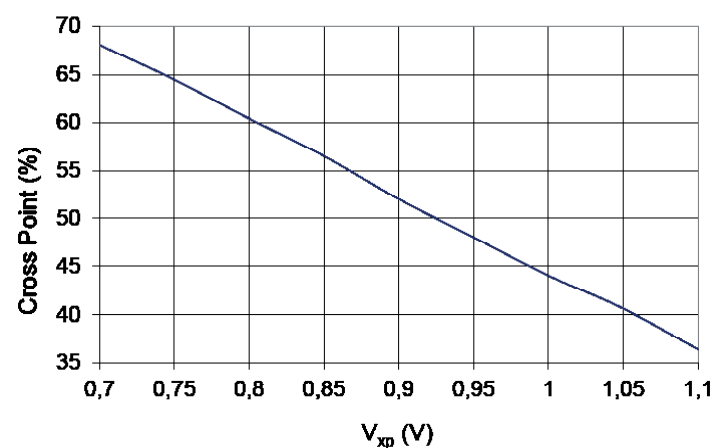
### Typical Output Voltage Amplitude vs $V_{amp}$

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



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

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

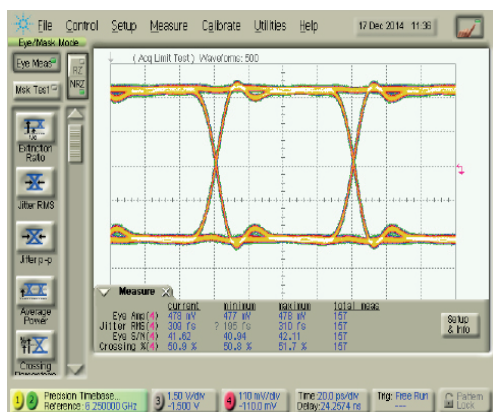


## Eye Diagrams

### 10 Gbps data rate

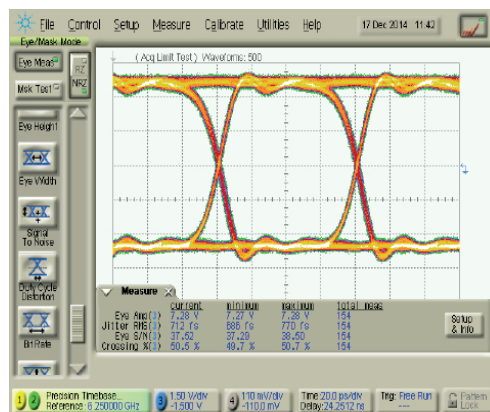
Conditions: Ratio y, Pattern 2<sup>31</sup>-1

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



#### Input signal

Eye amplitude = 0.5 V<sub>pp</sub>, Rise time = 9 ps  
Jitter RMS = 309 fs, SNR = 41



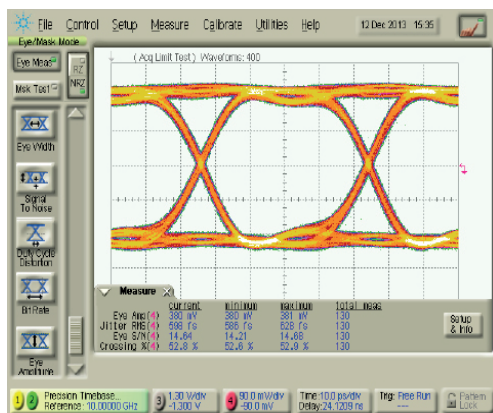
#### Output response

Eye amplitude = 7.3 V<sub>pp</sub>, Rise time = 12.4 ps  
Jitter RMS = 712 fs, SNR = 37.5

### 20 Gbps data rate

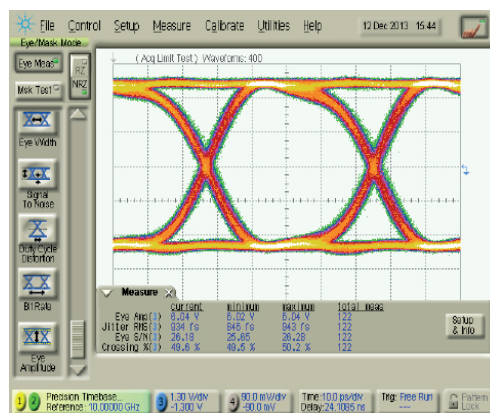
Conditions: Ratio y, Pattern 2<sup>31</sup>-1

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



#### Input signal

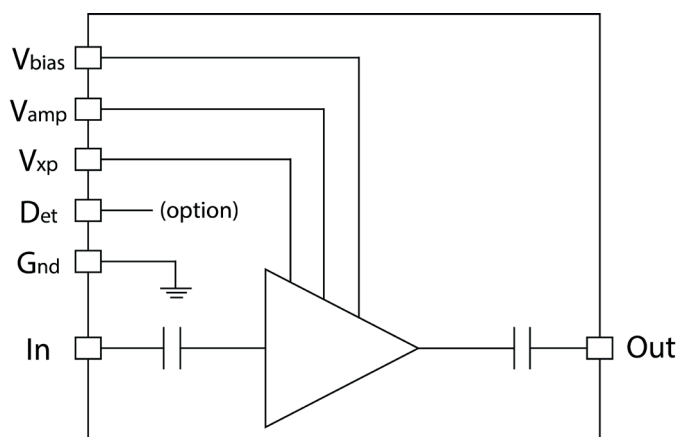
Eye amplitude = 0.5 V<sub>pp</sub>, Rise time = 12.4 ps  
Jitter RMS = 598 fs, SNR = 14.6



#### Output response

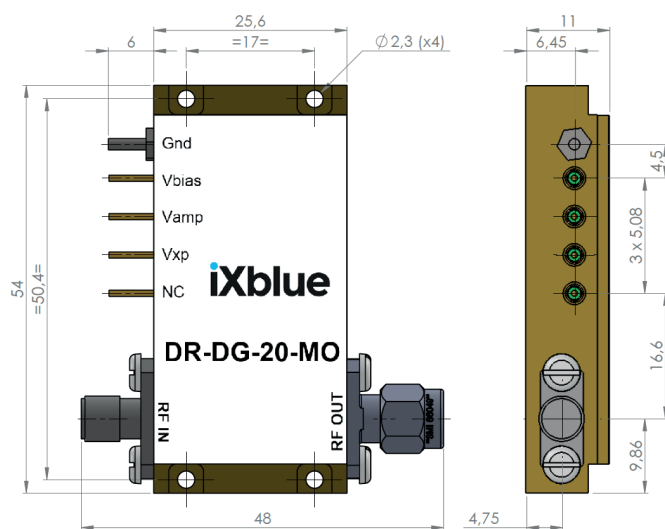
Eye amplitude = 6 V<sub>pp</sub>, Rise time = 12.67 ps  
Jitter RMS = 934 fs, SNR = 26

## Electrical Schematic Diagram



## Mechanical Diagram and Pinout

All measurements in mm

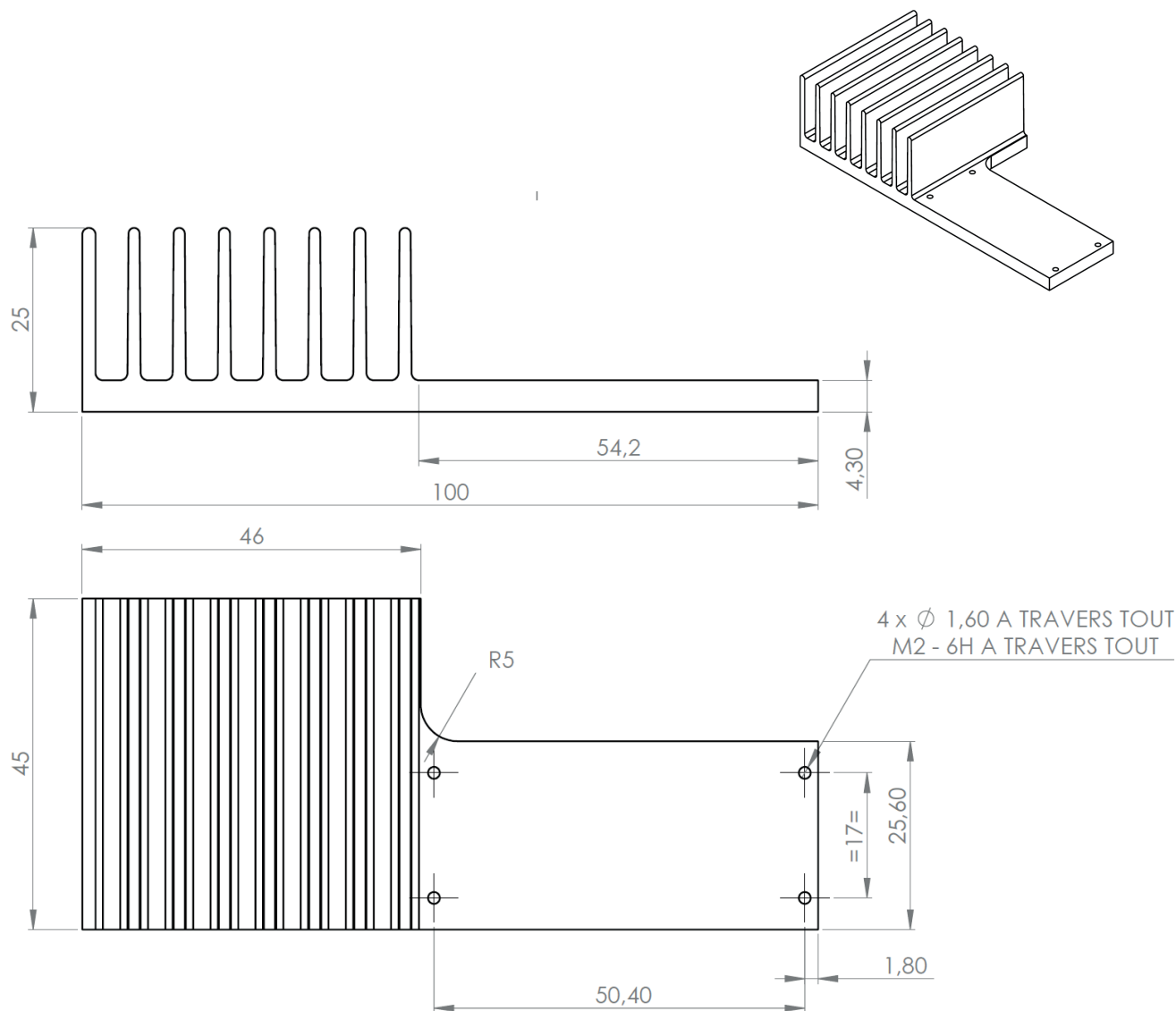


The heatsinking of the module is necessary. It's user responsibility to use an adequate heatsink. Refer to page 6 for ixBlue recommended heatsink.

PIN	Function	Operational Notes
IN	RF In	K-connector female
OUT	RF Out	K-connector male
$V_{bias}$	Power supply voltage	Set at typical operating specification
$V_{amp}$	Output voltage amplitude adjustment	Adjust for gain control tuning
$V_{xp}$	Output voltage cross point adjustment	Adjust for cross point control tuning

## Mechanical Diagram And Pinout With HS-M02 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 ( $\text{LiNbO}_3$ ) 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.