

## FEATURES

- High output voltage 12.5 V<sub>pp</sub>
- High gain 29 dB
- Flat gain up to 20 GHz
- Single voltage power supply

## APPLICATIONS

- LiNbO<sub>3</sub> & InP modulators
- 22 Gbps DPSK
- 2x20 Gbps (D)QPSK
- Research & Development

## OPTIONS

- 13.5 V<sub>pp</sub> output voltage
- Heat-sink
- Analog version
- Low output voltage version for EAM

## RELATED EQUIPMENTS

- MXIQER-LN-40, MX-LN-20 modulators
- MBC-DG Automatic Bias Controllers

The DR-DG-20-HO is a driver module optimized for digital applications requiring an upper operation voltage. It exhibits 12.5 V<sub>pp</sub> output voltage and 29 dB gain up to 23 GHz.

The DR-DG-20-HO module is especially useful for driving LiNbO<sub>3</sub> modulators with 22 Gbps DPSK and 2x20 Gbps (D)QPSK modulation formats. It is operated from a single power supply voltage for safety and ease of use and offers gain and cross-point control.

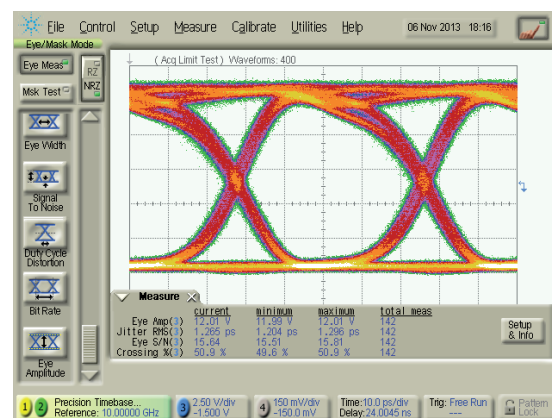
The DR-DG-20-HO comes with K type RF connectors (female in, male out) and with an optional heat sink. It is a non-inverting and single ended amplifier.

## Performance Highlights

Parameter	Min	Typ	Max	Unit
Cut-off Frequencies	80 k	23 G	25 G	Hz
Output Voltage	-	12.5	13.5	V <sub>pp</sub>
Gain	-	29	-	dB
Saturated Power	26	-	-	dBm
Added Jitter	-	1.05	-	ps
Rise / Fall Times	-	12 / 16	-	ps

Measurements for V<sub>bias</sub> = 12 V, V<sub>amp</sub> = 1.2 V, V<sub>xp</sub> = 0.7 V, I<sub>bias</sub> = 650 mA

## 20 Gbps Output Response



## DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage (fixed)	$V_{bias}$	-	12	13	V
Current consumption	$I_{bias}$	-	0.53	0.56	mA
Gain control voltage	$V_{amp}$	0	1.5	2	V
Cross point control voltage	$V_{xp}$	0	0.7	1	V

## Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Lower frequency	$f_{3dB}$ lower	-3 dB point	-	-	80	kHz
Upper frequency	$f_{3dB}$ upper	-3 dB point	-	23	25	GHz
Gain	$S_{21}$	Small signal	-	29	-	dB
Gain ripple	-	< 17 GHz	-	±1.5	-	dB
Input return loss	$S_{11}$	50 kHz < f < 18 GHz	-	-10	-	dB
Output return loss	$S_{22}$	50 kHz < f < 15 GHz	-	-10	-	dB
Saturated power	$P_{sat}$	$V_{in} = 0.65 V_{pp}$	26	-	-	dBm
Output voltage	$V_{out}$	$V_{in} = 0.65 V_{pp}$ @20 Gbps	-	12.5	13.5 ( $V_{in}=1V_{pp}$ )	$V_{pp}$
Rise time / Fall time	$t_r / t_f$	20 % - 80 %	-	12 / 16	-	ps
Added jitter	$J_{RMS}$	$J_{RMS} = \sqrt{J_{RMS-total}^2 - J_{RMS-source}^2}$	-	1.05	-	ps
Power dissipation	P	$V_{out} = 12.5 V_{pp}$	-	6.4	-	W

Conditions:  $V_{in} = 0.65 V_{pp}$ ,  $T_{amb} = 25$  °C, 50 Ω system

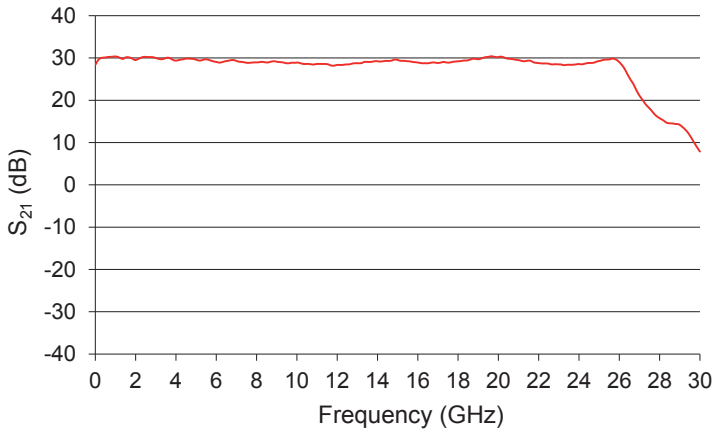
## Absolute Maximum Ratings

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	$V_{in}$	-	0.8	$V_{pp}$
Supply Voltage	$V_{bias}$	-	13	V
DC current	$I_{bias}$	-	0.56	A
Gain control voltage	$V_{amp}$	0	2	V
Cross point control voltage	$V_{xp}$	0	1	V
Power dissipation	$P_{diss}$	-	7.3	W
Temperature of operation	$T_{op}$	0	+40	°C
Storage temperature	$T_{st}$	-10	+70	°C

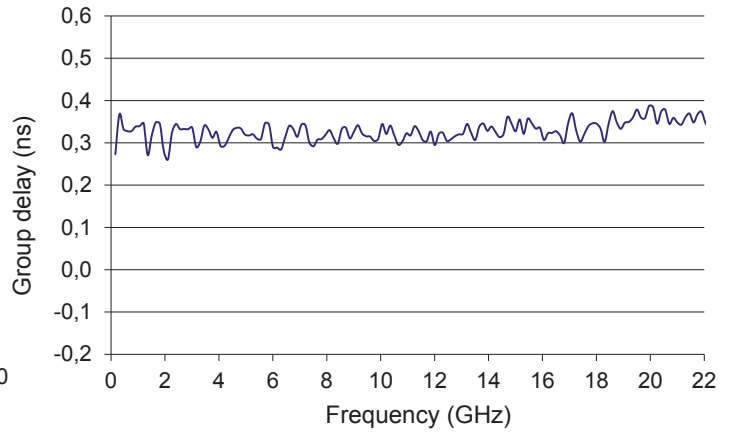
**S<sub>21</sub> Parameter Curve**

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.2\text{ V}$ ,  $V_{xp} = 0.7\text{ V}$ ,  $I_{bias} = 650\text{ mA}$



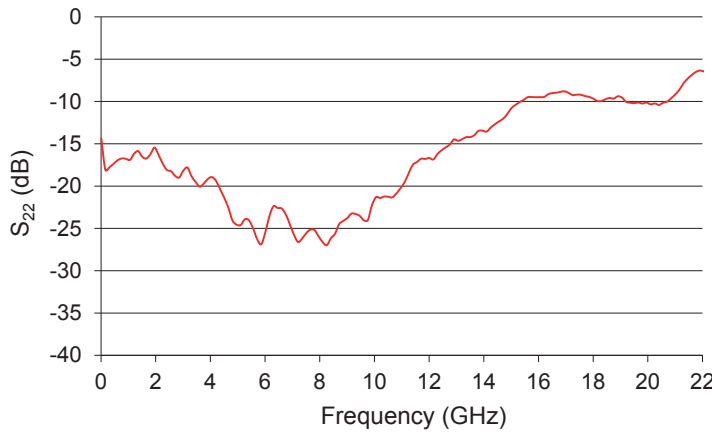
**Group Delay Parameter Curve**

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.2\text{ V}$ ,  $V_{xp} = 0.7\text{ V}$ ,  $I_{bias} = 650\text{ mA}$



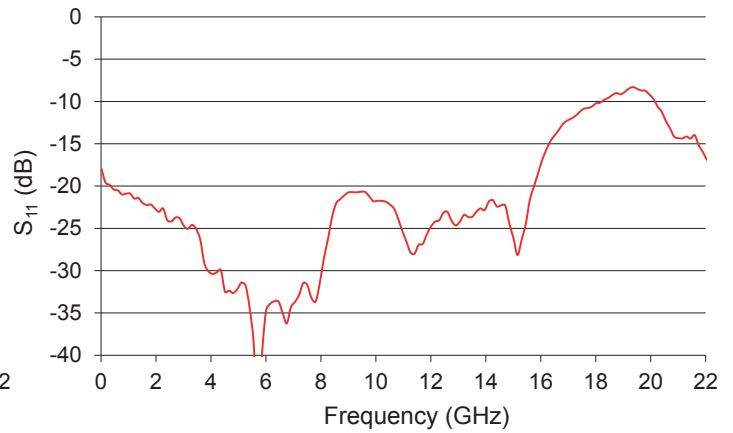
**S<sub>22</sub> Parameter Curve**

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.2\text{ V}$ ,  $V_{xp} = 0.7\text{ V}$ ,  $I_{bias} = 650\text{ mA}$



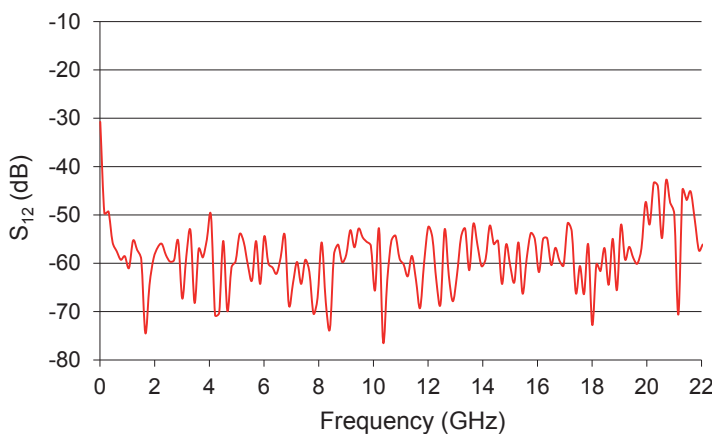
**S<sub>11</sub> Parameter Curve**

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.2\text{ V}$ ,  $V_{xp} = 0.7\text{ V}$ ,  $I_{bias} = 650\text{ mA}$



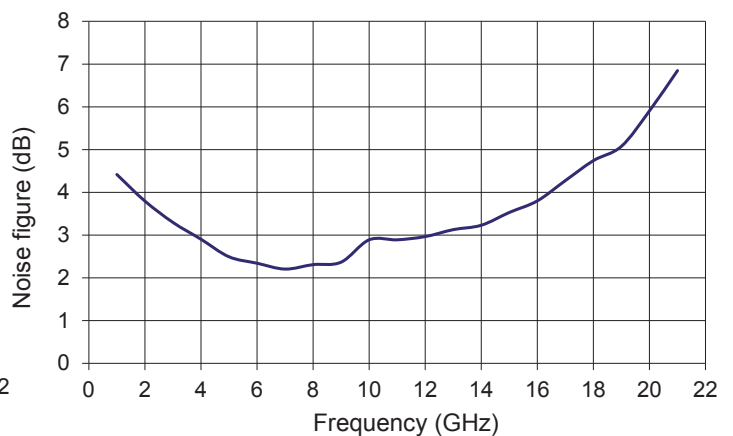
**S<sub>12</sub> Parameter Curve**

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.2\text{ V}$ ,  $V_{xp} = 0.7\text{ V}$ ,  $I_{bias} = 650\text{ mA}$



**Noise Factor Curve**

Conditions:  $V_{bias} = 12\text{ V}$ ,  $V_{amp} = 1.2\text{ V}$ ,  $V_{xp} = 0.7\text{ V}$ ,  $I_{bias} = 650\text{ mA}$

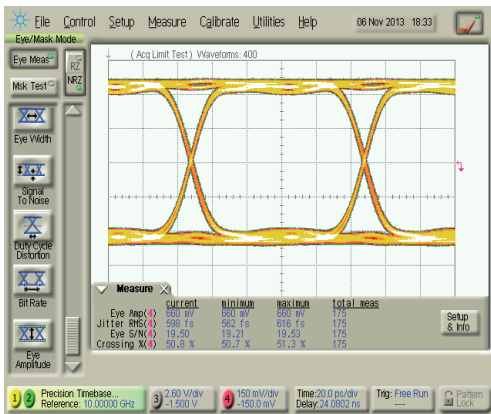


Eye Diagrams

10 Gbps data rate

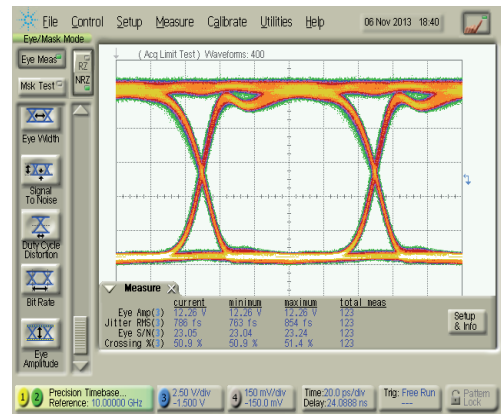
Conditions: Ratio y, Pattern 2<sup>31</sup>-1

$$V_{\text{bias}} = 12 \text{ V}, V_{\text{amp}} = 1.4 \text{ V}, V_{\text{xp}} = 0.7 \text{ V}, I_{\text{bias}} = 501 \text{ mA}$$



Input signal

Eye amplitude = 660 mV, Rise time = 15.11 ps  
Jitter RMS = 598 fs, SNR = 19.5



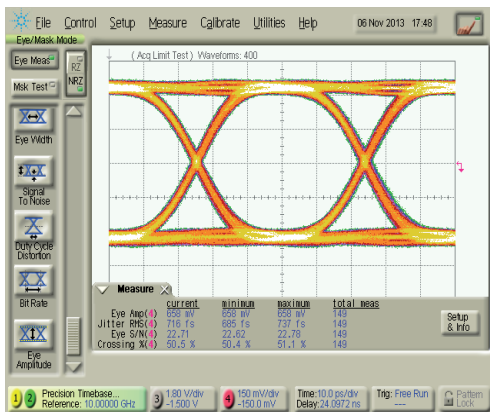
Output response

Eye amplitude = 12.26 V, Rise time = 12.89 ps  
Jitter RMS = 786 fs, SNR = 23.05

20 Gbps data rate

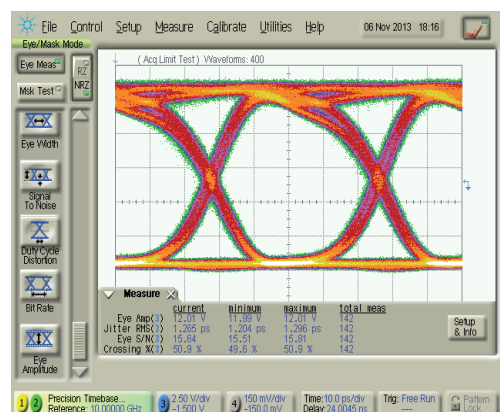
Conditions: Ratio y, Pattern 2<sup>31</sup>-1

$$V_{\text{bias}} = 12 \text{ V}, V_{\text{amp}} = 1.5 \text{ V}, V_{\text{xp}} = 0.8 \text{ V}, I_{\text{bias}} = 575 \text{ mA}$$



Input signal

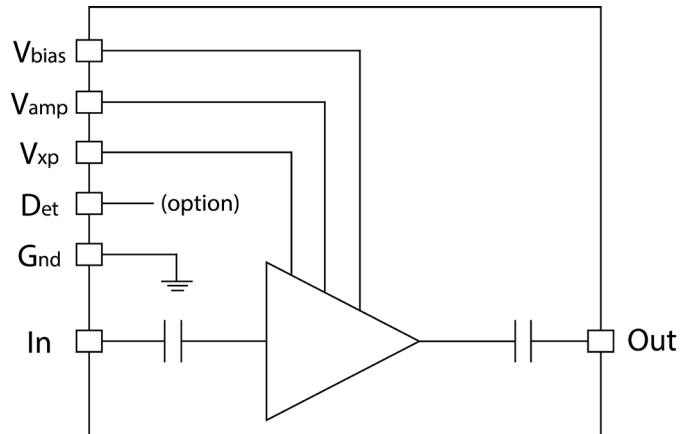
Eye amplitude = 658 mV, Rise time = 14 ps  
Jitter RMS = 716 fs, SNR = 22.71



Output response

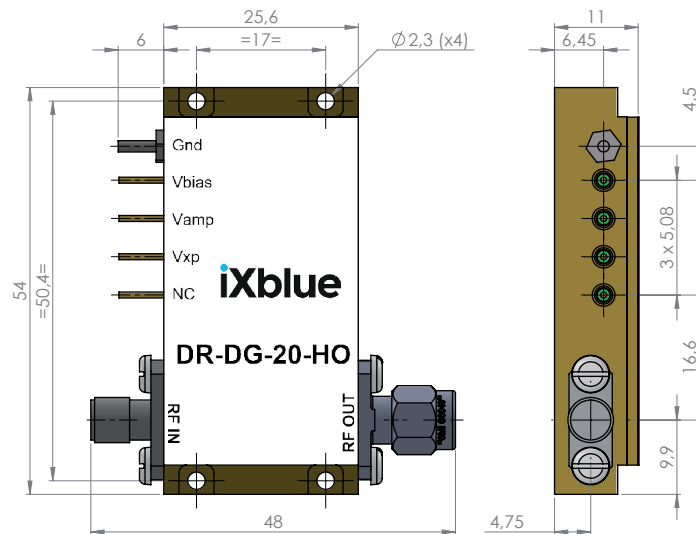
Eye amplitude = 13.01 V, Rise time = 13.11 ps  
Jitter RMS = 1.277 ps, SNR = 17.60

Electrical Schematic Diagram



Mechanical Diagram and Pinout

All measurements in mm

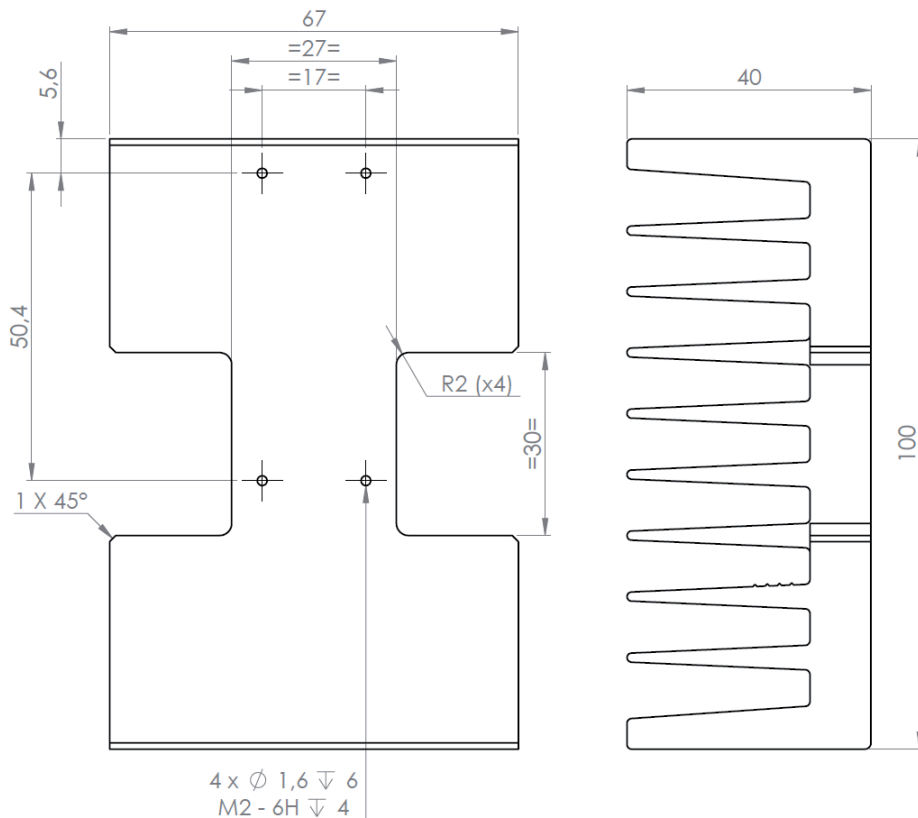
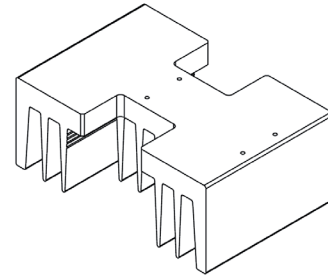


The heatsinking of the module is necessary. It's user responsibility to use an adequate heatsink. Refer to page 6 for ixBlue recommended heatsink.

PIN	Function	Unit
IN	RF In	K connector female
OUT	RF Out	K connector male
V <sub>bias</sub>	Power supply voltage	Set a typical operating specification
V <sub>amp</sub>	Output voltage amplitude adjustment	Adjust for gain control tuning
V <sub>xp</sub>	Output voltage cross point adjustment	Adjust for cross point control tuning
Det	RF power detector	Option

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<sub>3</sub>) 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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