

DRIVER

DR-DG-20-HO

22 Gbps High Output Voltage Driver

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

The DR-DG-20-HO module is especially useful for driving LiNbO₃ 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.



Features

- High output voltage 12.5 V_{pp}
- High gain 29 dB
- Flat gain up to 20 GHz
- Single voltage power supply

Applications

- 22 Gbps DPSK
- 2x20 Gbps (D)QPSK
- Spectrum broadening

Options

- 13.5 V_{pp} output voltage
- Heat-sink
- Analog version

Related Equipments

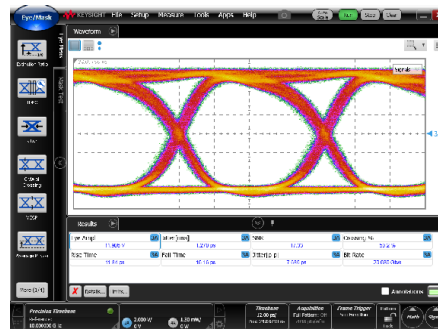
- MXIQUER-LN-40, MX-LN-20 modulators
- MBC-DG Automatic Bias Controllers

Performance Highlights

| Parameter | Min | Typ | Max | Unit |
|---------------------|------|---------|------|-----------------|
| Cut-off frequencies | 80 k | 23 G | 25 G | Hz |
| Output voltage | - | 12.5 | 13.5 | V _{pp} |
| Gain | - | 29 | - | dB |
| Saturated power | 26 | - | - | dBm |
| Added jitter | - | 1.05 | - | ps |
| Rise / Fall times | - | 12 / 16 | - | ps |

Measurements for V_{bias} = 12 V, V_{comp} = 1.2 V, V_{sp} = 0.7 V, I_{bias} = 550 mA

20 Gbps Output Response




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22 Gbps High Output Voltage Driver

DC Electrical Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit |
|-----------------------------|------------|-----|------|------|------|
| Supply voltage (fixed) | V_{bias} | - | 12 | 13 | V |
| Current consumption | I_{bias} | - | 0.53 | 0.58 | A |
| 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 | - | $f < 17$ GHz | - | ± 1.5 | - | dB |
| Input return loss | S_{11} | $50 \text{ kHz} < f < 18 \text{ GHz}$ | - | -10 | - | dB |
| Output return loss | S_{22} | $50 \text{ kHz} < f < 15 \text{ GHz}$ | - | -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 | $13.5 (V_{in} = 0.8 V_{pp})$ | V_{pp} |
| Rise / Fall time | t_r / t_f | 20 % - 80 % | - | 12 / 16 | - | ps |
| Added Jitter | J_{RMS} | $J_{RMS} = \sqrt{J_{RMS-total}^2 - J_{RMS-source}^2}$ | - | 1.05 | - | ps |
| Power dissipation | P | $V_{out} = 12.5 V_{pp}$ | - | 6.4 | - | W |

Conditions: $V_{in} = 0.65 V_{pp}$, $T_{amb} = 25^\circ\text{C}$, 50 W 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} | - | 0.58 | 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 |
| Operating temperature | T_{op} | 0 | 40 | $^\circ\text{C}$ |
| Storage temperature | T_{st} | -20 | +70 | $^\circ\text{C}$ |

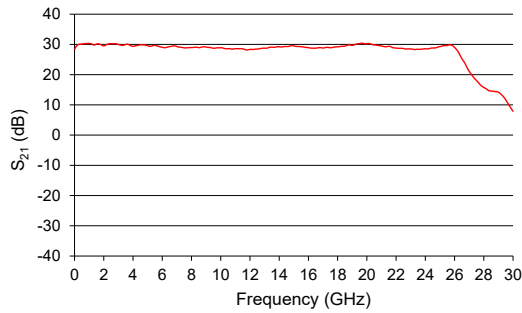


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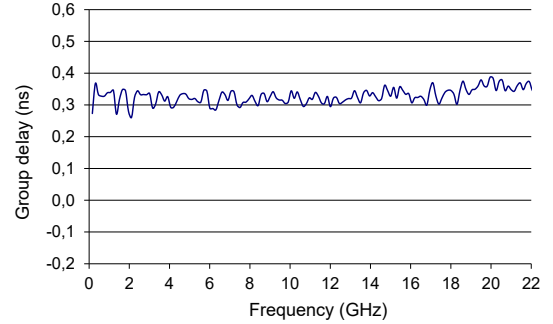
S₂₁ Parameter Curve

Conditions: $V_{bias} = 12\text{ V}$, $V_{amp} = 1.2\text{ V}$, $V_{xp} = 0.7\text{ V}$, $I_{bias} = 550\text{ mA}$



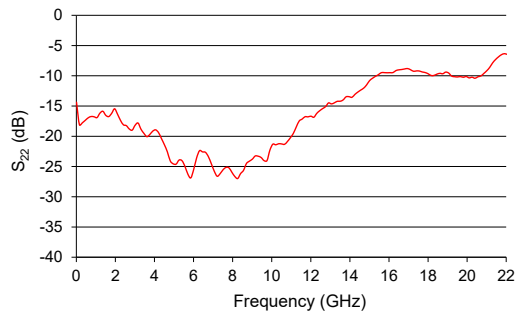
Group Delay Parameter Curve

Conditions: $V_{bias} = 12\text{ V}$, $V_{amp} = 1.2\text{ V}$, $V_{xp} = 0.7\text{ V}$, $I_{bias} = 550\text{ mA}$



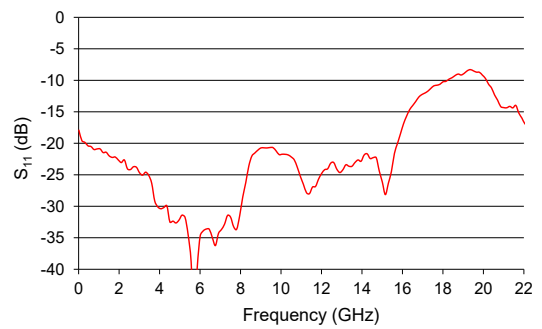
S₂₂ Parameter Curve

Conditions: $V_{bias} = 12\text{ V}$, $V_{amp} = 1.2\text{ V}$, $V_{xp} = 0.7\text{ V}$, $I_{bias} = 550\text{ mA}$



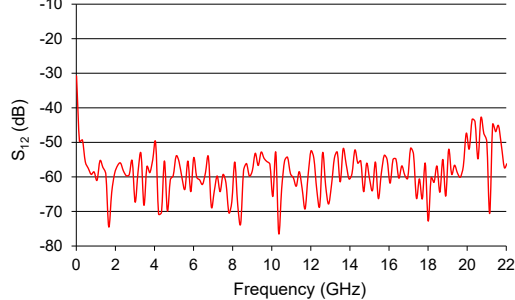
S₁₁ Parameter Curve

Conditions: $V_{bias} = 12\text{ V}$, $V_{amp} = 1.2\text{ V}$, $V_{xp} = 0.7\text{ V}$, $I_{bias} = 550\text{ mA}$



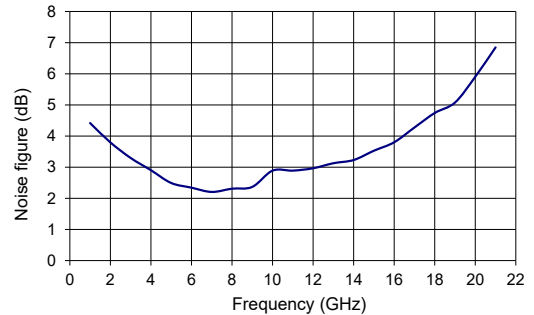
S₁₂ Parameter Curve

Conditions: $V_{bias} = 12\text{ V}$, $V_{amp} = 1.2\text{ V}$, $V_{xp} = 0.7\text{ V}$, $I_{bias} = 550\text{ mA}$



Noise Factor Curve

Conditions: $V_{bias} = 12\text{ V}$, $V_{amp} = 1.2\text{ V}$, $V_{xp} = 0.7\text{ V}$, $I_{bias} = 550\text{ mA}$




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Eye Diagrams

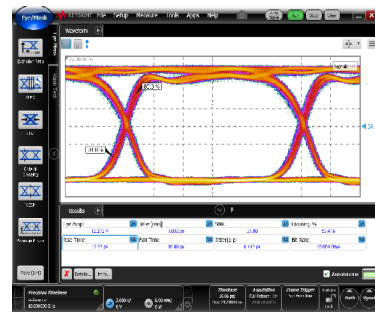
10 Gbps data rate

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

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



Input signal
Eye amplitude = 0.66 V_{pp}

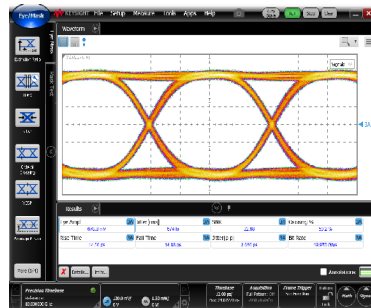


Output response
Eye amplitude = 12.2 V_{pp}

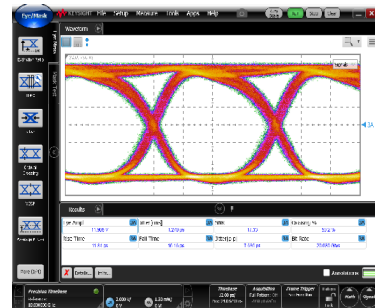
20 Gbps data rate

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

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



Input signal
Eye amplitude = 0.66 V_{pp}

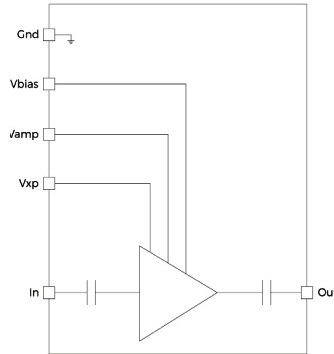


Output response
Eye amplitude = 11.9 V_{pp}



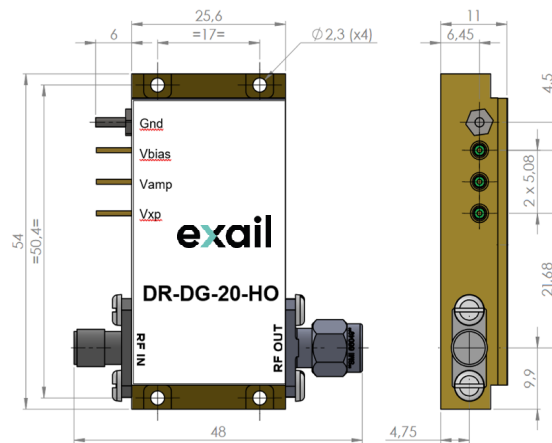
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Electrical Schematic Diagram



Mechanical Diagram and Pinout

All measurements in mm



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

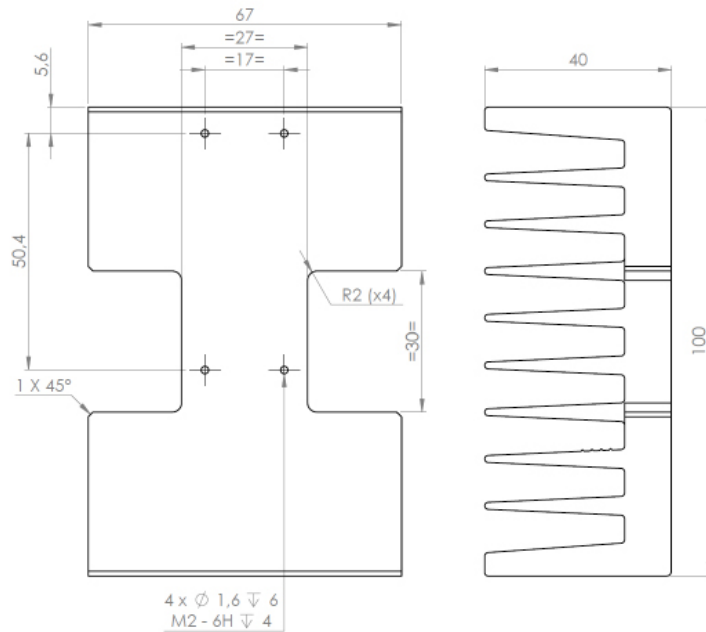
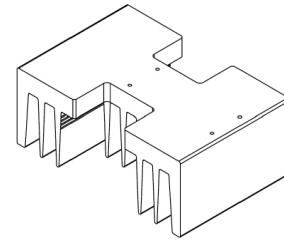
| Port | Function | Unit |
|------------|---------------------------------------|---------------------------------------|
| IN | RF In | Female K connector |
| OUT | RF Out | Male K connector |
| V_{bias} | Power supply voltage | Set a typical operating specification |
| V_{amp} | Output voltage amplitude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



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Mechanical Diagram and Pinout with HS-HO1 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 (LiNbO₃) 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.

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