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# Fiber Optic “Light to Logic” Receiver with Clock Recovery

## Technical Data

### Features

- **Light to Logic 20-Pin DIP Receiver Offers ECL Compatibility**
- **Typical Sensitivity: -33 dBm**
- **Phase-Locked Loop (PLL) Timing Recovery Circuit**
- **Meets SONET Jitter Requirements (ITU G.958)**
- **Single +5 V Supply, Typically <1.00 W**
- **Exceeds Optical Performance Requirements in SONET GR253 and SDH ITU G957**
- **Squelched Clock and Data Outputs**

### Applications

- **Telecommunication Networks**
- **SONET OC12 and SDH STM4 Compatible**
- **Local and Metropolitan Area Networks**
- **ATM Single Mode Public Network**
- **Military Communications and Control Systems**
- **Digital Cable TV Networks**

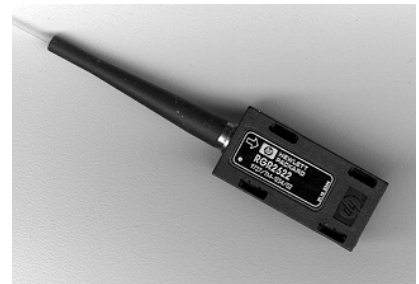
### Description

The RGR2622 receiver provides optical signal conversion and processing. It converts 1200 nm to 1600 nm wavelength lightwave information into an electrical signal at data rates of 622 Mb/s.

Each receiver contains an InGaAs PIN photodiode, a high sensitivity, wide dynamic range transimpedance amplifier and mid-amplifier, capacitively coupled to a PLL based clock recovery circuit. An output squelch circuit is provided for the retimed complementary PECL Clock and Data Outputs.

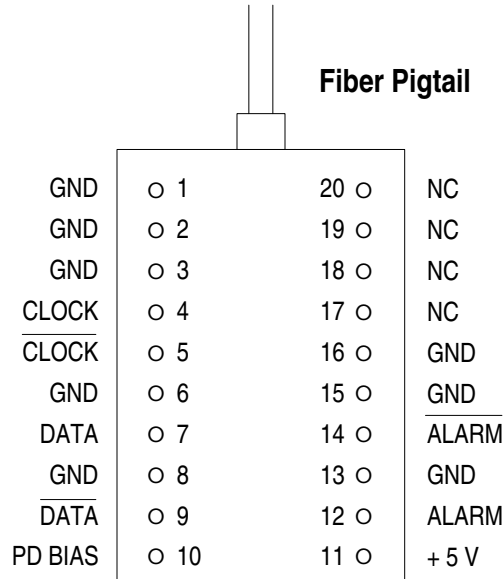
A complementary CMOS compatible low light alarm is also provided.

### RGR2622



## Connection Diagram

### Top View



### Pin Descriptions

#### Pins 1, 2, 3, 6, 8, 13, 15, 16, GND:

These pins should be connected to the circuit ground.

#### Pins 4, 5, CLOCK, CLOCK:

These pins provide complementary PECL CLOCK and CLOCK outputs.

#### Pins 7, 9, DATA, DATA:

These pins provide complementary PECL DATA and DATA outputs.

The RGR2622 DATA output is noninverting, an optical pulse causes the DATA output to go to the PECL logic high state (+4 V nominal).

#### Note:

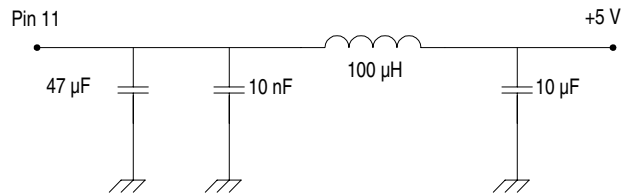
When the output squelch circuit is activated, during loss of signal conditions, all clock and data outputs are held at a constant dc level according to the selected dc termination voltage.

#### Pin 10, PD Bias:

This pin must be connected to any voltage from 0 V (GND) to -5 V. This provides the photodiode bias. The current drawn is directly proportional to the average received photocurrent  $I = \text{Responsivity} \times \text{Mean Power}$ . The Responsivity will be between 0.8 A/W and 1.0 A/W.

#### Pin 11, +5 V:

This pin should be connected to +5 V supply. The network shown below should be placed as close as possible to Pin 11.



#### Pins 12, 14, ALARM, ALARM:

These pins provide complementary ALARM and ALARM outputs. This is the low light alarm. ALARM goes to a logic low (CMOS compatible) state when the optical power drops below the threshold level (insufficient optical power).

The optical power must increase to a higher level than the level where the alarm went low before ALARM will return to a logic high. This difference is the alarm hysteresis.

#### Pins 17, 18, 19, 20, NC:

These pins are not connected.

## Functional Description

### Design

The receiver contains an InGaAs photodetector, transimpedance amplifier, mid-amplifier and interface amplifier circuit, including a clock recovery and data retiming function. Figure 2 illustrates the relative timing relationship between output retimed Data and Recovered Clock signals. It is designed with a multimode fiber pigtail to allow maximum flexibility in connector options.

### Terminating the Outputs

The data outputs of the RGR2622 are PECL compatible. Care should be taken to match termination impedances to the interconnect to minimize reflection effects. In order to balance the drive currents drawn from the RGR2622 all serial data outputs (DATA and DATA, CLOCK and CLOCK) should be terminated identically, even if only one output is used.

This will lower the power supply noise generated by the RGR2622 and improve performance at low optical input power levels.

### Power Supplies

The RGR2622 will operate to specifications with a single +5 V power supply. (Pin 10 grounded) The -5 V pin bias is provided to maintain functional compatibility with second sources.

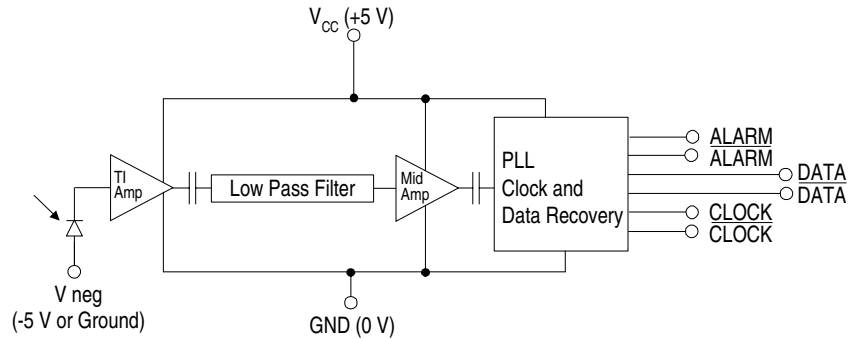


Figure 1. Block Diagram

### Circuit Layout

The RGR2622 use very high bandwidth circuitry to achieve its high level of performance. Care must be taken to ensure stable operation. The use of ground planes and transmission line interconnects is required. The use of a standard evaluation board is highly recommended for those users who are not familiar with these techniques.

Signal traces should conform to ECL design rules to prevent reflections and ringing from degrading performance.

### Manufacturing

The fiber pigtail on the device requires normal fiber handling considerations. Care should be taken to avoid tight bends as well as excessive tension on the fiber pigtail.

The allowable temperature range for the RGR2622 is limited by the material used in the pigtail. Exposure to temperatures over +85°C is not recommended. Low profile sockets or hand soldering are recommended for this part.

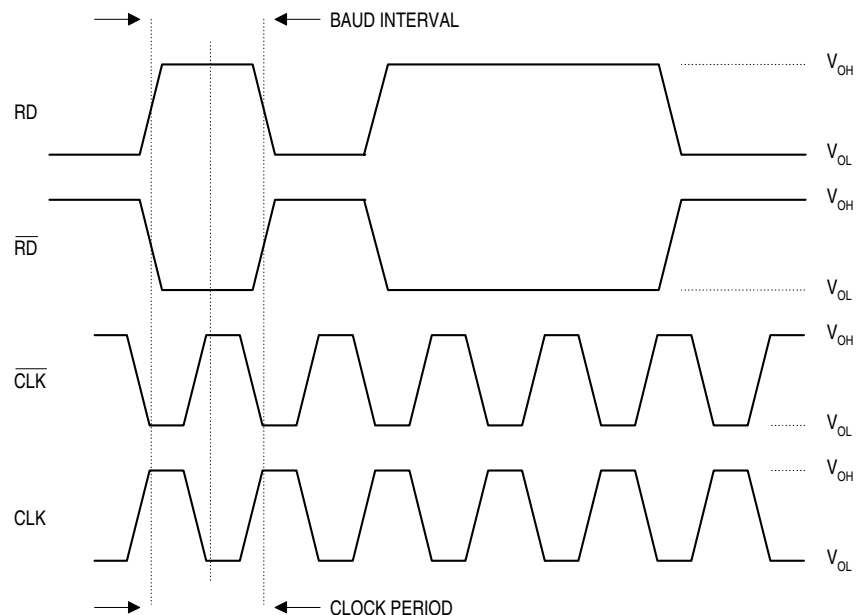


Figure 2. Relative timing relationship between output retimed Data and Recovered Clock Signals

## Performance Specifications

### Absolute Maximum Ratings

Absolute maximum limits mean that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided each limiting parameter is in isolation and all other parameters have values within the performance specification. It should not be assumed that limiting values of more than one parameter can be applied to the product at the same time.

Parameter	Symbol	Minimum	Maximum	Units	Note
Supply Voltage	$V_{CC}$	-0.5	+5.5	V	1
Supply Voltage	$V_{NEG}$	-10	+0.5	V	1

### Environmental Parameters

Parameter	Symbol	Minimum	Maximum	Units	Note
Operating Temperature	-	-40	+85	°C	-
Storage Temperature	-	-40	+85	°C	-
Humidity	-	-	85	%RH	-

### Electrical Parameters (-40°C to +85°C)

Parameter	Symbol	Minimum	Maximum	Units	Note
Supply Voltage	$V_{CC}$	4.75	5.25	V	-
$V_{CC}$ Supply Current	-	-	250	mA	4
DATA Output Level (high)	-	3.8	4.15	V	2, 3
DATA Output Level (low)	-	3.1	3.5	V	2, 3
ALARM Output Level (high)	V off	4.5	5.0	V	3
ALARM Output Level (low)	V on	0	0.5	V	3

#### Notes:

1. On an RGR2622  $V_{CC}$  of -0.5 V and  $V_{NEG}$  of +0.5 V may not be applied simultaneously.
2. Output terminated to ( $V_{CC}$  -2) with 50  $\Omega$  load or equivalent.
3. Output voltages are for  $V_{CC}$  = 5.0 V.
4. Outputs not loaded.

### Optical Parameters (-40°C to +85°C)

Parameter	Symbol	Minimum	Typical	Maximum	Units	Note
Wavelength	-	1200	-	1600	nm	-
Receiver Sensitivity	-	-	-33.0	-31.0	dBm	<sup>1</sup>
Maximum Input Power	-	-7	-4	-	dBm	-
Alarm ON	-	-45	-	-31.5	dBm	-
Alarm OFF	-	-	-	-31.0	dBm	-
Hysteresis	-	0.5	-	6	dB	-
Alarm Response Time	-	-	-	600	μS	-
Reliability Target	-	-	-	2000	FIT	-

Jitter Tolerance	ITU G.958 Compliant
Jitter Transfer	ITU G.958 Compliant
Jitter Generation <sup>2</sup>	ITU G.958 Compliant

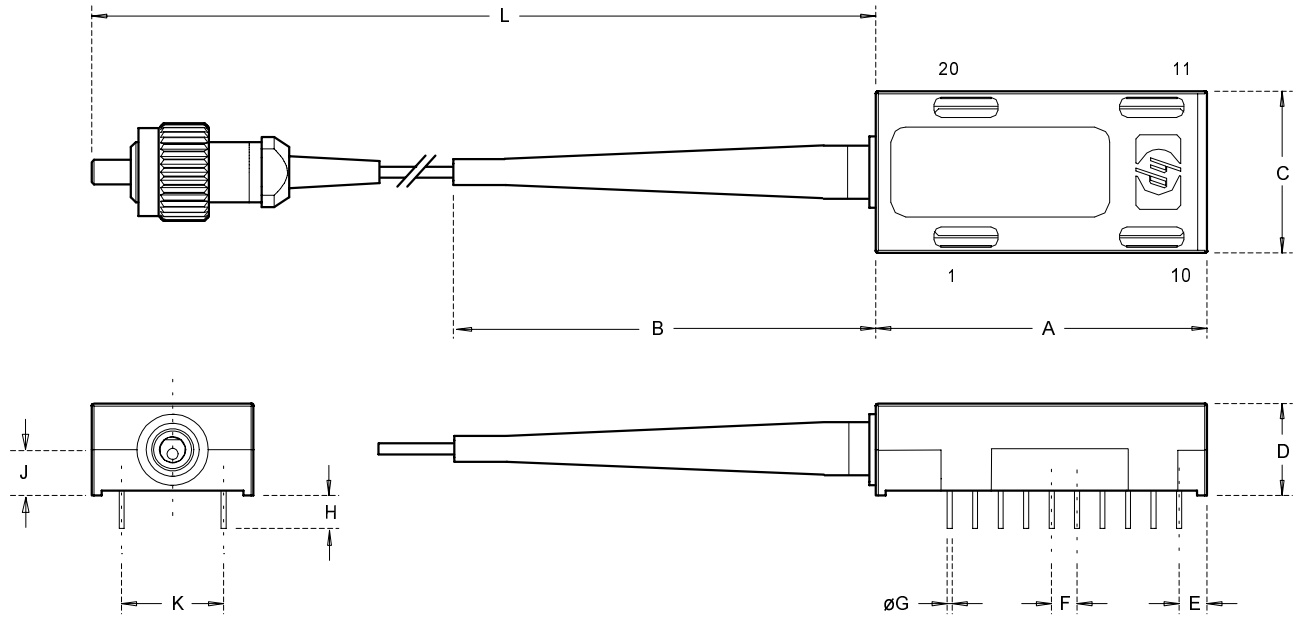
**Notes:**

1. At a BER of  $1 \times 10^{-10}$ ,  $2^{23-1}$  PRBS pattern NRZ data at the line rate with 10:1 extinction ratio. EOL.
2. Measured on Clock output.

### Fiber Parameters

Fiber Pigtail	Typical	Units
Core Diameter	50	microns
Cladding Diameter	125	microns
Secondary Coating Diameter	900	microns

## Drawing Dimensions



Dimensions	Minimum	Nominal	Maximum
A	32.9	-	33.2
B	39.5	40	40.5
C	16.0	-	16.3
D	-	-	9.27
E	2.6	-	2.95
F	-	2.54	-
ØG	-	0.46	-
H	2.7	-	3.2
J	-	-	4.64
K	-	10.16	-
L	400	-	1220

All dimensions in mm

## Ordering Information

**RGR2622 - XX**

Connector:  
FP = FC/PC Polish  
ST = ST®  
SC = SC  
DN = DN

Allowable Part Numbers:  
RGR2622

ST® is a Registered Trademark of AT&T

## Handling Precautions

1. The RGR2622 can be damaged by current surges or overvoltage.  
Power supply transient precautions should be taken.
2. Normal handling precautions for electrostatic sensitive devices should be taken.

## Supporting Documentation

RGR2622 Application Note  
RGR2622 Characterization Report  
RGR2622 Qualification Report



[www.hp.com/go/fiber](http://www.hp.com/go/fiber)

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Data subject to change.

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Obsoletes: 5968-1792E (9/98)

5968-1792E (7/99)