

# InGaAs-APD/Preamplifier Receiver *FRM5W621KT/LT*

## FEATURES

- Data rate up to 622Mb/s
- High Responsibility: typ. 0.85A/W at 1,550nm
- 30μm active area APD chip with GaAs pre-amplifier
- High temperature operation up to +85°C
- Small co-axial package with single mode fiber

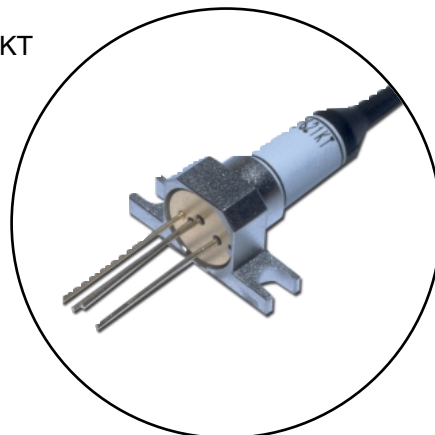
## APPLICATIONS

- Medium bit rate long haul optical transmission systems at STM-4 (OC-12)

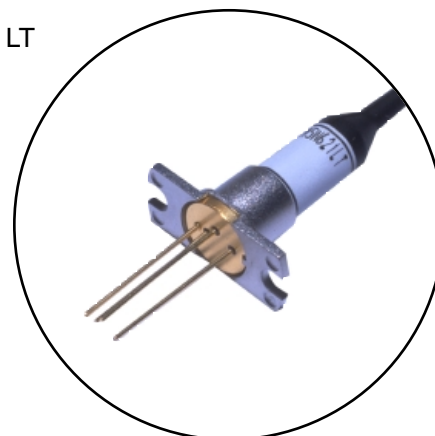
## DESCRIPTION

These APD preamplifiers use an InGaAs APD chip with GaAs IC preamplifier. The KT package is designed for a horizontal PC board mount. The LT package is secured by a vertical flange. Each package is connected with single-mode fiber by Nd: YAG welding. The detector preamplifier is DC coupled and has a low electrical output when the APD is illuminated.

KT



LT



# FRM5W621KT/LT InGaAs-APD/Preamplifier Receiver

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub>=25°C)

| Parameter             | Symbol                  | Ratings             | Unit |
|-----------------------|-------------------------|---------------------|------|
| Storage Temperature   | T <sub>stg</sub>        | -40 to +85          | °C   |
| Operating Temperature | T <sub>op</sub>         | -40 to +85          | °C   |
| Supply Voltage        | V <sub>SS</sub>         | -7 to 0             | V    |
| APD Supply Voltage    | V <sub>R</sub> (Note 1) | 0 to V <sub>B</sub> | V    |
| APD Reverse Current   | I <sub>R</sub> (Note 2) | 1.0                 | mA   |

## OPTICAL & ELECTRICAL CHARACTERISTICS (T<sub>C</sub>=25°C, λ=1,310/1,550nm, V<sub>SS</sub>=-5.2V, unless otherwise specified)

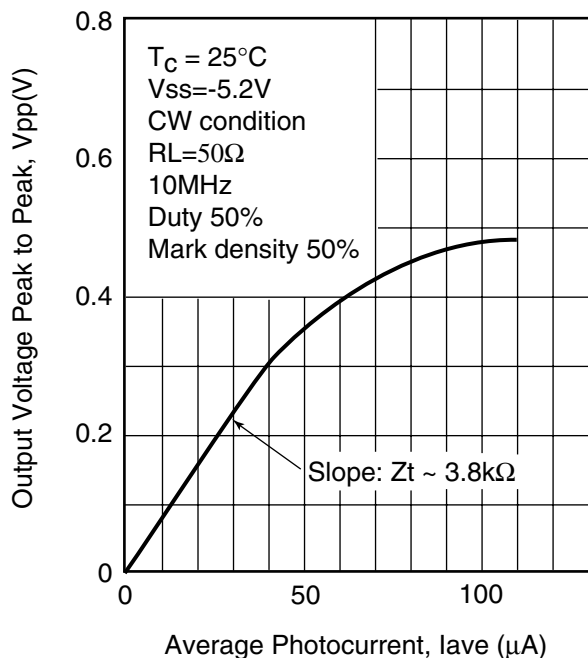
| Parameter                                 | Symbol          | Test Conditions   | Limits |      |       | Unit   |
|---|-----------------|---|--------|------|-------|--------|
|   |                 |   | Min.   | Typ. | Max.  |        |
| APD Responsivity                          | R <sub>15</sub> | 1,550nm, M=1  | 0.80   | 0.85 | -     | A/W    |
|   | R <sub>13</sub> | 1,310nm, M=1  | 0.75   | 0.85 | -     | A/W    |
| APD Breakdown Voltage                     | V <sub>B</sub>  | I <sub>D</sub> =10μA  | 40     | 50   | 70    | V      |
| Temperature Coefficient of V <sub>B</sub> | γ               | (Note 3)  | 0.08   | 0.12 | 0.15  | V/°C   |
| AC Transimpedance                         | Z <sub>t</sub>  | AC-Coupled, f=10MHz,<br>R <sub>L</sub> =50Ω,<br>P <sub>in</sub> ≤ -20dBm,   | 3.0    | 3.8  | -     | kΩ     |
| Bandwidth                                 | BW              | AC-Coupled, R <sub>L</sub> =50Ω,<br>M=3 to 15,<br>-3dBm from 1MHz   | 467    | 550  | -     | MHz    |
| Equivalent Input Noise Current Density    | i <sub>n</sub>  | AC-Coupled, R <sub>L</sub> =50Ω,<br>Average within BW   | -      | 2.64 | 3.2   | pA/√Hz |
| Sensitivity                               | P <sub>r</sub>  | 622Mb/s NRZ,<br>PRBS=2 <sup>23</sup> -1,<br>B.E.R.=10 <sup>-10</sup> ,<br>V <sub>R</sub> is set at optimum value      | -      | -42  | -40   | dBm    |
|   |                 | T <sub>C</sub> =-40 to +85°C  | -      | -41  | -39   | dBm    |
| Maximum Overload                          | P <sub>O</sub>  | 622Mb/s NRZ, M=3,<br>PRBS=2 <sup>23</sup> -1,<br>B.E.R.=10 <sup>-10</sup> ,<br>V <sub>R</sub> is set at optimum value | -5     | -    | -     | dBm    |
|   |                 | T <sub>C</sub> =-40 to +85°C, M=3   | -7     | -    | -     | dBm    |
| Power Supply Current                      | I <sub>SS</sub> | -   | -      | -    | 40    | mA     |
| Power Supply Voltage                      | V <sub>SS</sub> | -   | -5.46  | -5.2 | -4.94 | V      |

Note: (1) V<sub>B</sub> differs from device to device. V<sub>B</sub> data is attached to each device.

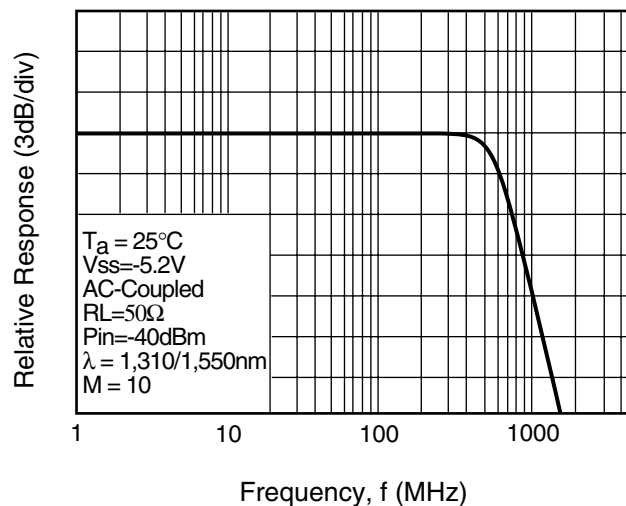
(2) CW condition

(3) γ=dV<sub>B</sub>/dT<sub>C</sub>

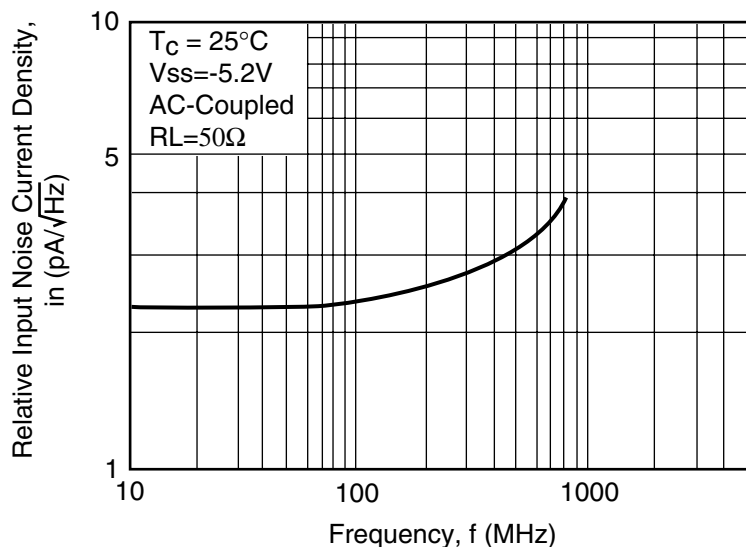
**Fig. 1 Output Characteristics**



**Fig. 2 Relative Frequency Response**

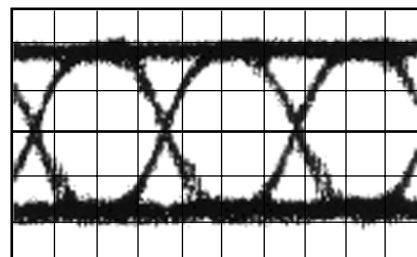


**Fig.3 Equivalent Input Noise Current Density**

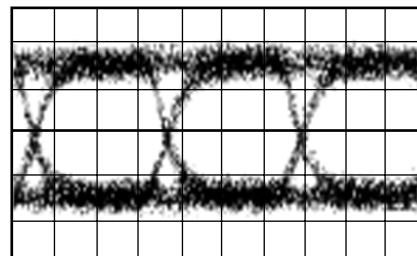


**Fig.4 Eye Diagram with a 1,550nm, 622Mb/s NRZ,  $2^{23}-1$  PRBS incident signal**

Input optical wave form with Bessel filter

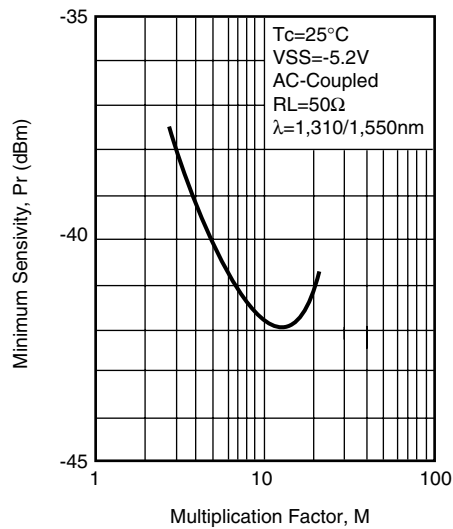


Equivalent output wave form at  $P_{in} = -42\text{dBm}$ ,  $T_c = 25^\circ\text{C}$ ,  $M = \text{optimum}$

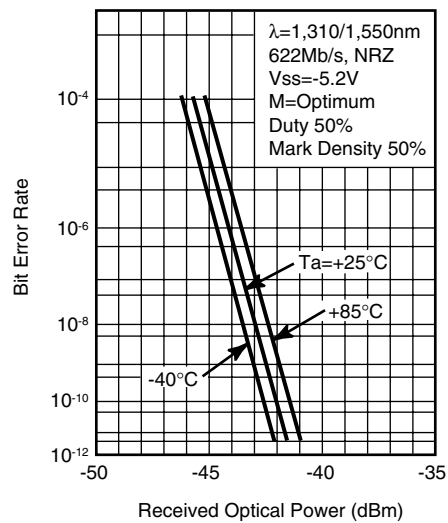


500ps/div

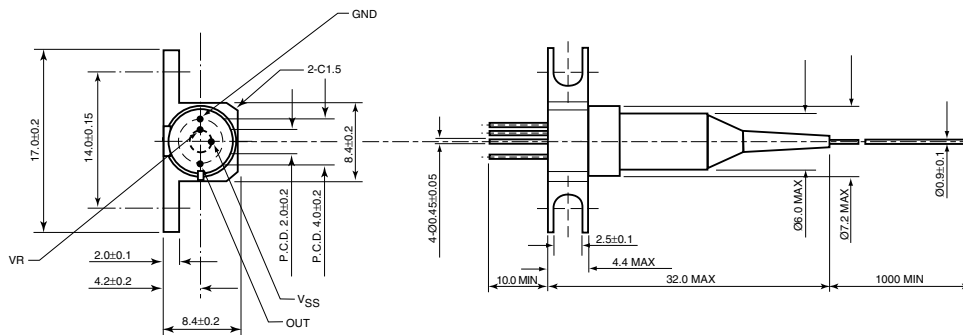
**Fig.5 Sensitivity**



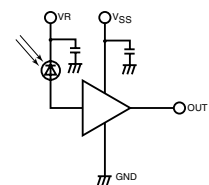
**Fig.6 Bit Error Rate**



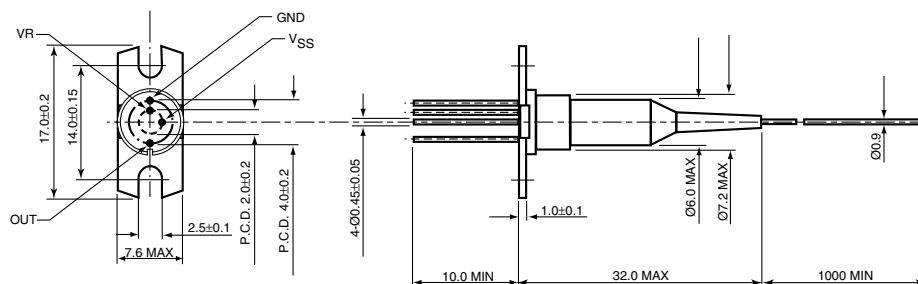
**“KT” PACKAGE**



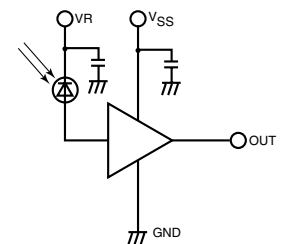
UNIT: mm



**“LT” PACKAGE**



UNIT: mm



# **InGaAs-APD/Preamp Receiver** *FRM5W621KT/LT*

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