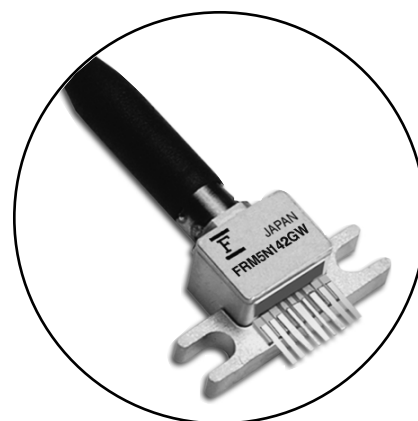


## FEATURES

- Small Form Factor Package(GW): 9 pins coplanar
- Integrated Design Optimizes Performance at Bit Rates up to 10.7Gb/s
- High Gain: 4k $\Omega$ (Single-ended), 8k $\Omega$ (Differential)
- High Sensitivity: -27dBm (typ.)
- Electrical Differential Output
- Wide Bandwidth: 8.5GHz (typ.)
- Operates in both C and L wavelength bands
- Wide Operating Temperature Range: -5°C to +75°C



## APPLICATIONS

This APD with HBT preamplifier is intended to function as an optical receiver at 1,310nm or 1,530-1,610nm in SONET, SDH, DWDM or other optical fiber systems operating up to 10.7Gb/s. The typical transimpedance ( $Z_t$ ) value of 4,000 $\Omega$  optimizes the total bandwidth for 10Gb/s application. The detector preamplifier is DC coupled and has an electrical differential output.

## DESCRIPTION

The FRM5N142GW incorporates a high bandwidth InGaAs APD photo diode, a GaAs HBT IC amplifier in a hermetically sealed Small Form Factor package (SFF). The APD is processed with modern MOVPE techniques resulting in a reliable performance over a wide range of operating conditions. The lens coupling system and the single mode fiber are assembled using Nd YAG welding.

## ABSOLUTE MAXIMUM RATINGS ( $T_c=25^\circ\text{C}$ )

| Parameter             | Symbol        | Ratings           | Unit             |
|-----------------------|---------------|-------------------|------------------|
| Storage Temperature   | $T_{stg}$     | -40 to +85        | $^\circ\text{C}$ |
| Operating Temperature | $T_{op}$      | -5 to +75         | $^\circ\text{C}$ |
| Supply Voltage        | $V_{ss}$      | -6 to 0           | V                |
| PIN Reverse Voltage   | $V_R$         | 0 to $V_B$ (Note) | V                |
| PIN Reverse Current   | $I_{R(peak)}$ | 5                 | mA               |

Note: Since  $V_B$  may vary from device-to-device,  $V_B$  data is attached to each device for reference.

## OPTICAL &amp; ELECTRICAL CHARACTERISTICS

(T<sub>C</sub>=25°C, λ=1,550nm, V<sub>SS</sub>=-5.2V, unless otherwise specified)

| Parameter                     | Symbol            | Test Conditions                                                                              | Limits |       |       | Unit              |
|-------------------------------|-------------------|----------------------------------------------------------------------------------------------|--------|-------|-------|-------------------|
|                               |                   |                                                                                              | Min.   | Typ.  | Max.  |                   |
| APD Responsivity              | R13               | λ = 1,310nm, M=1                                                                             | 0.70   | 0.85  | -     | A/W               |
|                               | R15               | λ = 1,550nm, M=1                                                                             | 0.70   | 0.90  | -     |                   |
|                               | R16               | λ = 1,610nm, M=1                                                                             | -      | 0.80  | -     |                   |
| APD Breakdown Voltage         | VB                | ID = 10μA                                                                                    | 20.0   | 25.0  | 30.0  | V                 |
| Temperature Coefficient of VB | γ                 | Note (1)                                                                                     | 0.03   | 0.05  | 0.07  | V/°C              |
| AC Transimpedance             | Z <sub>t</sub>    | f = 750MHz, Single-end                                                                       | 3500   | 4000  | -     | Ω                 |
| Maximum Output Voltage Swing  | V <sub>clip</sub> | Saturated Output Voltage, Single-ended                                                       | 250    | 350   | 450   | mV                |
| Bandwidth                     | BW                | -3dB from 750MHz, Pin=-24dBm, M=9                                                            | 7.5    | 8.5   | -     | GHz               |
|                               |                   | M=3                                                                                          | 7.5    | 8.5   | -     |                   |
| Lower Cut-off Frequency       | f <sub>cl</sub>   | -3dB from 750MHz, Pin=-24dBm                                                                 | -      | 40    | 100   | kHz               |
| Peaking                       | d <sub>pk</sub>   | 130MHz to BW, Pin=-24dBm, M=9                                                                | -      | 1.5   | 2.0   | dB                |
| Group Delay Deviation         | GD                | 1GHz to 6GHz, Pin=-24dBm, M=9                                                                | -      | 30    | -     | ps <sub>p-p</sub> |
|                               |                   | 1GHz to 8GHz, Pin=-24dBm, M=9                                                                | -      | 60    | -     |                   |
| Output Return Loss            | S <sub>22</sub>   | 130MHz to 6GHz                                                                               | -      | 10    | -     | dB                |
|                               |                   | 130MHz to 8GHz                                                                               | -      | 7     | -     |                   |
| Minimum Sensitivity           | P <sub>r</sub>    | 10Gb/s, NRZ, 25°C, R <sub>ext</sub> =13dB                                                    | -      | -27.0 | -25.0 | dBm               |
|                               |                   | PRBS=2 <sup>31</sup> -1, 25°C, R <sub>ext</sub> =10dB                                        | -      | -26.0 | -     |                   |
|                               |                   | B.E.R.=10 <sup>-12</sup> , 25°C, R <sub>ext</sub> =8.2dB                                     | -      | -25.0 | -     |                   |
|                               |                   | VR=Optimum, 75°C, R <sub>ext</sub> =13dB                                                     | -      | -26.0 | -24.0 |                   |
| Maximum Overload              | P <sub>o</sub>    | 10Gb/s, NRZ, PRBS=2 <sup>31</sup> -1, B.E.R.=10 <sup>-12</sup> , R <sub>ext</sub> =13dB, M=3 | -4     | -2    | -     | dBm               |
| Optical Return Loss           | ORL               | λ = 1,550nm                                                                                  | 27     | -     | -     | dB                |
|                               |                   | λ = 1,310nm                                                                                  | 27     | -     | -     |                   |
| Power Supply Current          | I <sub>ss</sub>   | -                                                                                            | -      | 80    | 130   | mA                |
| Power Supply Voltage          | V <sub>ss</sub>   | -                                                                                            | -5.46  | -5.20 | -4.94 | V                 |
| Thermistor Resistance         | R <sub>th</sub>   | -                                                                                            | 9.5    | 10.0  | 10.5  | kΩ                |
| Thermistor B Constant         | B                 | -                                                                                            | 3800   | 3900  | 4000  | K                 |

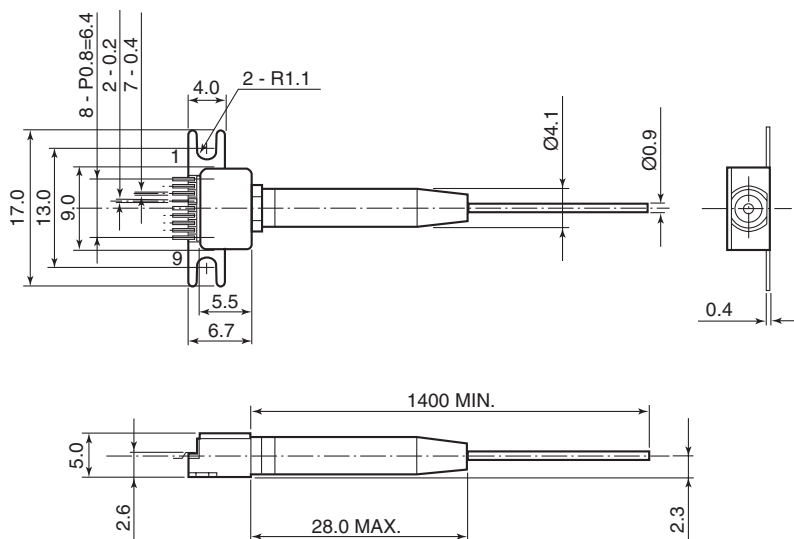
Note 1: γ=ΔVB/ΔT<sub>C</sub>

Note: All the parameters are measured with 50Ω, AC-coupled.

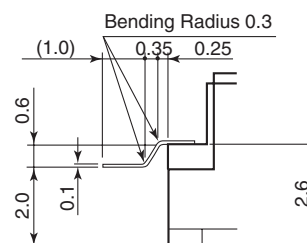
Notes

## “GW” PACKAGE

UNIT: mm



## Lead Detail (x10)



| PIN # | Symbol  | Function    |
|-------|---------|-------------|
| 1     | VPD     | PD BIAS (+) |
| 2     | Vpreamp | Preamp BIAS |
| 3     | GND     | CASE GROUND |
| 4     | OUT     | OUTPUT (-)  |
| 5     | GND     | CASE GROUND |
| 6     | OUT     | OUTPUT (+)  |
| 7     | GND     | CASE GROUND |
| 8     | -       | NC          |
| 9     | Rth     | THERMISTOR  |

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