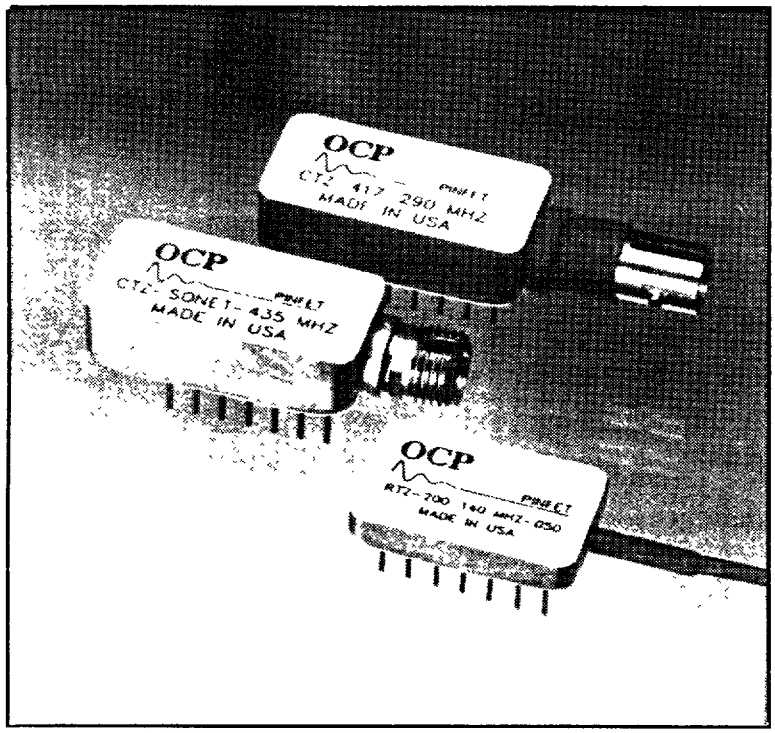
T-41-91

RTZ/CTZ Transimpedance PINFET Receivers



Features

- *Long Wavelength (1100-1600 nm)*
- *One single version for both SONET OC-3 and OC-12 Data Rates*
- *High Detection Sensitivity*
- *Wide Dynamic Range*
- *RTZ Pigtailed with 900 micron Buffered Fiber*
- *CTZ Includes Integral ST™ or FC Connectors*
- *DC Coupled*
- *Linear Analog Output*
- *±5 Volt Power Supply*
- *-40 to +85 °C Operation*
- *Hermetically Sealed High Reliability Dual-In-Line (DIP) Package*

Description

The RTZ/CTZ PINFET Optical Receiver series is a family of ultra-low noise front-end amplifiers utilizing advanced InGaAs PIN photodiodes and GaAs MESFET preamplifiers specified for operation at 1300 and/or 1550 nanometers wavelength. The transimpedance design yields wide dynamic range for easy system configuration. Fabricated as a hybrid circuit contained within a hermetically sealed, highly reliable 14-pin dual-in-line package (DIP), these receivers are designed for use in high speed digital or analog fiber optic transmission systems. This series of standard versions provides off-the-shelf receivers for operation across the spectrum of current data rate applications. For SONET (SDH) receivers, one single version RTZ-SON-435MHz can be used for all data rates from OC-1 through OC-12. For the RTZ series, the standard fiber pigtail is 50/125 microns, with other fiber sizes available on special request. For the CTZ series, both ST and FC-connectorized version are available.

Optical Communication Products, Inc.

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RTZ/CTZ Operational Characteristics (25 °C)

Parameter		Data Rate Mb/s(maximum)										SONET	Unit
		6.3	17	45	90	140	200	417	565	678	878	622/155	
Bandwidth	Min	5	12	32	65	100	140	290	400	475	600	435	MHz
Z_T[1]	Typ	750	600	120	95	50	20	7	6	3.5	2	3.5	kΩ
Receiver Sensitivity[2]	Min	-54	-50	-45	-44	-40	-38	-34	-32	-31	-28	-30[3] / -35.5[4]	dBm
	Typ	-57.5	-53	-48	-46	-43	-41	-36	-34.5	-33	-30.5	-31[3] / -36.5[4]	dBm
Saturation Level	Min	-29	-26	-20	-18.5	-15	-13	-10	-9	-8	-7	-8	dBm
	Typ	-28	-25	-18	-17.5	-14	-11	-8	-7	-5	-4.5	-5	dBm
I_{POS}	Max	30	30	30	30	35	35	55	55	55	55	55	mA
I_{NEG}	Max	15	15	15	15	18	25	25	25	30	38	30	mA
Dissipation	Typ	250	250	250	250	300	300	450	450	450	470	470	mW
Noise Power	Max	0.7	1.7	5.3	7.0	17	30	70	110	140	270	140	nW
Receiver Gain	Typ	700	450	100	80	40	16	6	5	3	1.4	3	mV/μW

Notes
1. Effective transimpedance.
2. Receiver Sensitivity is quoted as average optical power in dBm at 1300 nm at the recommended bit rate for 10^{-9} BER and is calculated from measured noise power at the PINFET output with a filter. Recommended bit rate is about 140% of the bandwidth. Operation at other bit rates is possible, depending on the overall receiver design.
3. At 622 Mbaud.
4. With 110 MHz filter at 155 Mbaud.

Recommended Operating Conditions

Parameter		Minimum	Typical	Maximum	Unit
Wavelength Range		1100	1300	1600	nm
Power Supply	Positive	4.75	5.0	5.25	V
	Negative	-4.75	-5.0	-5.25	V
Load Impedance		1000	-	-	Ω
Output Impedance		-	-	50	Ω

Absolute Maximum Ratings

Parameter	Minimum	Maximum	Unit
Positive Supply	-	+6.5	V
Negative Supply	-	-6.5	V
Photodiode Bias	0	-15	V
Operating Temperature	-40	+85	°C
Storage Temperature	-40	+85	°C
Humidity	0%	95%	Non-Condensing
Fiber Pullout Strength (30 seconds max.)		10.0	N

PINFET Operation

The PINFET functions as an inverting amplifier with resistive feedback (refer to Figure 1) which converts the PIN photodiode current to a proportional voltage. An output emitter follower buffer provides current gain for driving loads down to 1000 ohms impedance. For driving lower impedance loads, an external emitter follower circuit (in Figure 2) is recommended. The output DC quiescent voltage level is in the range of -1.0 to -2.0 volts with no optical input. The output voltage of the PINFET will increase linearly with input optical power up to its rated saturation level. The PINFET is DC coupled internally, but AC coupling must be employed externally to eliminate DC output shifts due to temperature and supply voltage variations.

PINFET sensitivity is a function of the signal-to-noise ratio in the receiver. It is essential the the PINFET have a solid "analog ground" free from large switching transients or digital circuit return currents. The power supplies should be well regulated and free from noise and ripple. Filtering which isolates the PINFET supply inputs from other circuits is recommended. The simplified circuit diagram below (in Figure 2) does not show internal bypass capacitors, but they should be augmented by external RF quality capacitors placed directly at the PINFET power supply pins.

The PIN photodiode current can be monitored by placing a large value resistor (R1 in Figure 2) in series with the bias supply on pin 1. The voltage drop across the resistor divided by the resistance will give the average photocurrent, which when divided by the responsivity of the photodiode (supplied with each part) will give the average optical input signal power. If this feature is not desired the resistor is still advantageous as additional filtering for the PIN bias supply.

For SONET applications the RTZ-622/155 model is designed to handle high optical input power levels while maintaining high receiver sensitivity. For use at 155 Mbaud the PINFET should be followed by a 110 MHz low pass filter to limit the noise bandwidth.

Figure 1

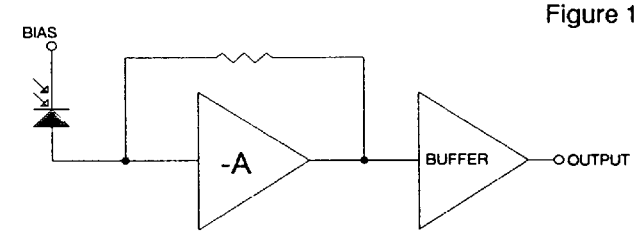
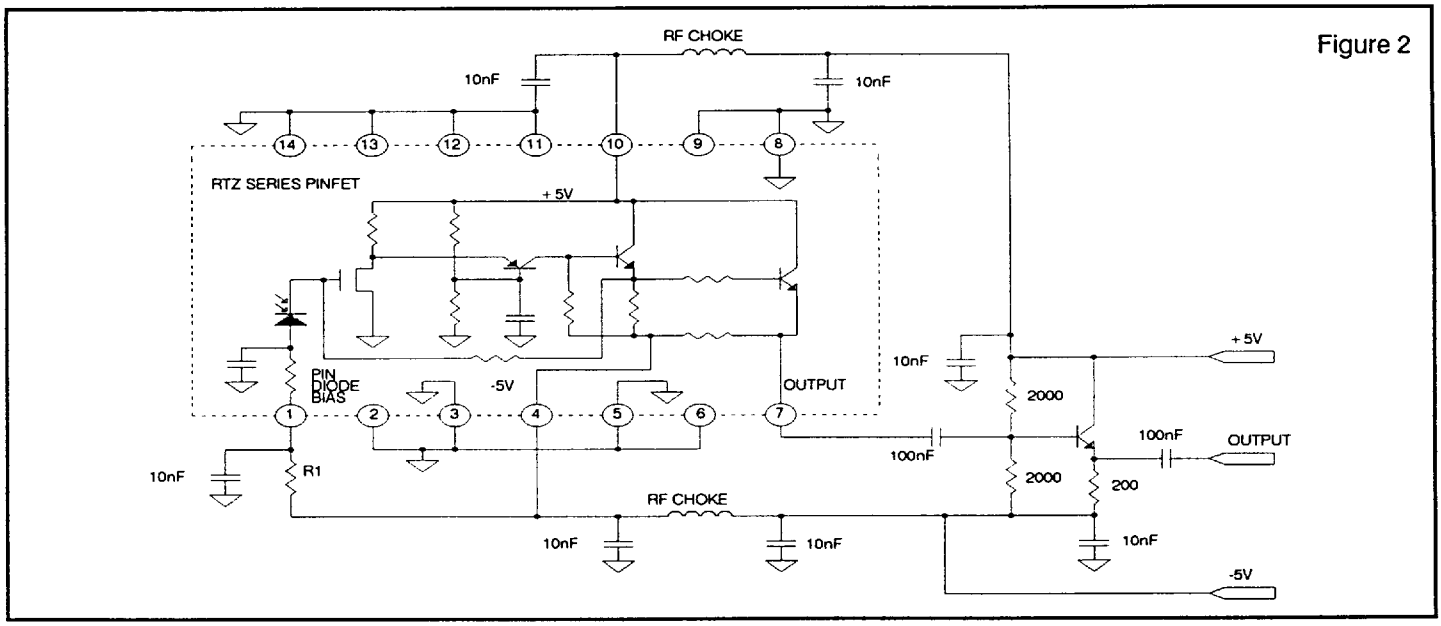


Figure 2



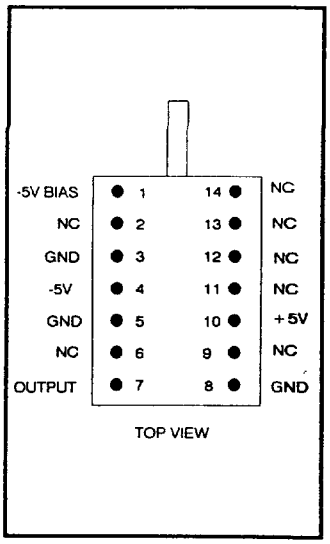
Pin	Function	Connect to:
1	PIN Diode Bias	Negative Bias Supply
2	No Internal Connection	Ground
3	Circuit Ground *	Ground
4	Negative Supply	-5 V DC
5	Circuit Ground *	Ground
6	No Internal Connection	Ground
7	Output	

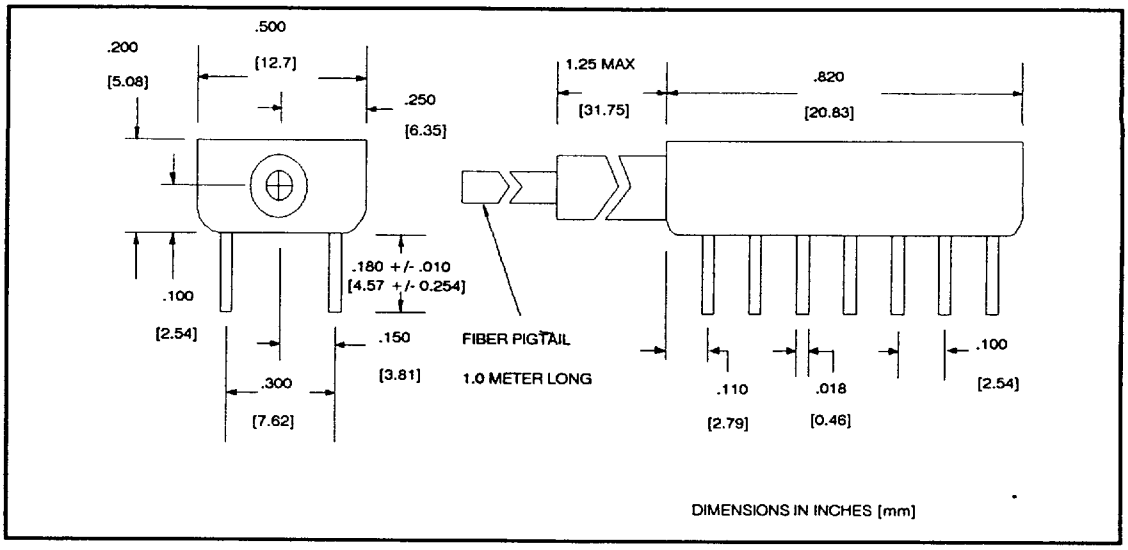
Pin	Function	Connect to:
8	Circuit Ground *	Ground
9	No Internal Connection	Ground
10	Positive Supply	+5 V DC
11	No Internal Connection	Ground
12	No Internal Connection	Ground
13	No Internal Connection	Ground
14	No Internal Connection	Ground

* Internally connected to the case

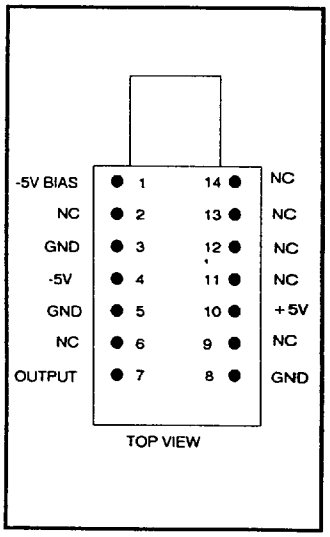
21737-0012 Rev. D
05/21/92

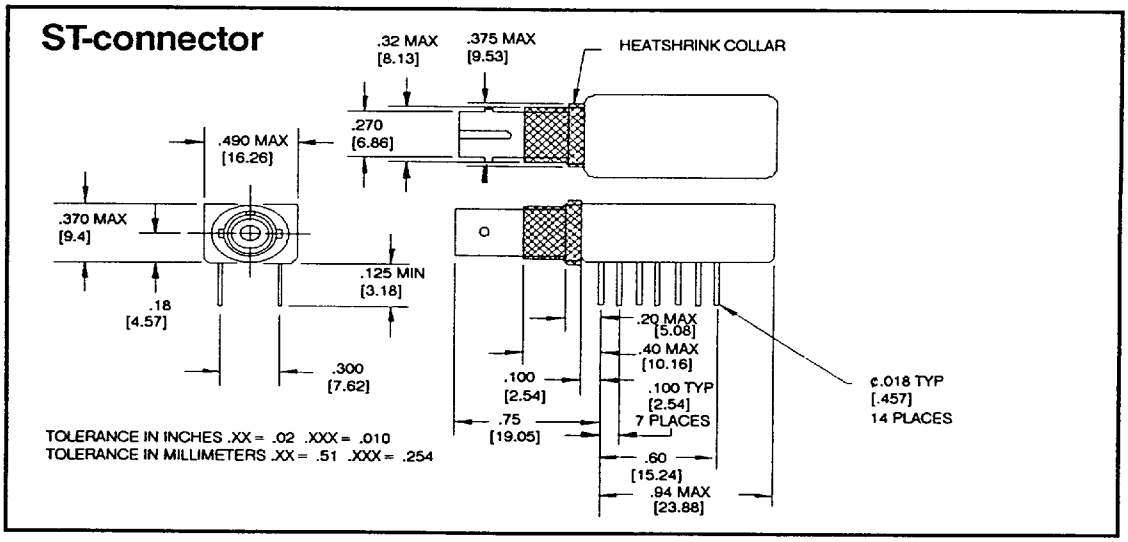
RTZ Outline Drawing





CTZ Outline Drawing





Ordering Information

CTZ - XXX - XXXMHz - XX

Bit Rate | Min. Bandwidth | Connector (ST or FC)

SONET: CTZ-SON-435MHz-ST or FC

RTZ - XXX - XXXMHz - 050

Bit Rate | Min. Bandwidth | Fiber Size

SONET: RTZ-SON-435MHz-050

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