

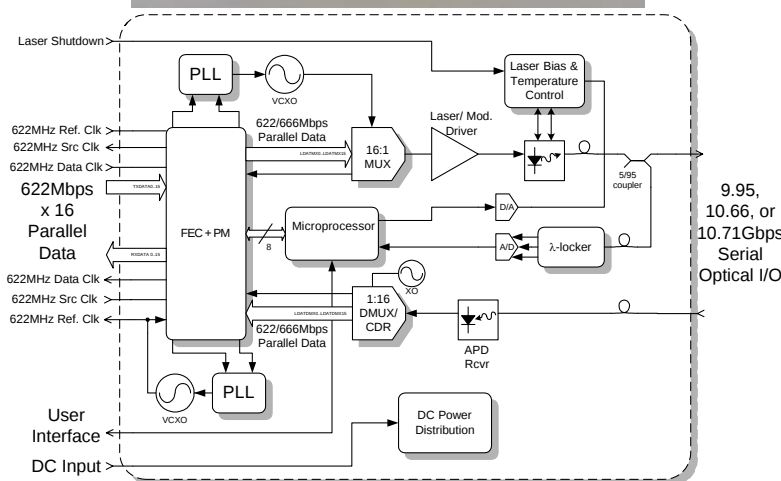
GT10-1550FEC

10Gb/s Transceiver

The GT10-1550FEC is a fully integrated, self-contained 10Gbit/s electro-optical data transceiver. Building on the performance and functionality of standard 10Gbit/s transponders, the 1550FEC's additional features include forward error correction (FEC), dense wavelength division multiplexing (DWDM), and optics suitable for long reach applications. All of this is packed into a compact housing with integrated heatsink which makes it a "line card in a module" - simple to

Features

- Highly adaptive design - works in most FEC/DWDM scenarios, including:
 - Full duplex data terminal applications
 - Regenerator applications
 - Wavelength add/drop applications
- Compliant with GR-253-CORE IR-2/LR-2
- Optical ports operate at multiple independent line rates
 - SONET OC-192 (SDH STM-64)
 - ITU G.975 10.66Gbit/s data rate
 - ITU G.709 "Digital Wrapper" 10.71Gbit/s data rate
- Reed-Solomon FEC code (255,239) yields up to 5.5dB network S/N improvement
- DWDM models have ± 2.5 GHz wavelength accuracy for 50GHz ITU wavelength spacing
- Internal system- and line-side data loopback for network troubleshooting
- Serial port user interface
- 300 pin MEG-Array™ electrical I/O with OIF SFI-4 interface



Applications

Designed for intermediate reach (IR) WDM and long reach (LR) deployments including

- Point-to-point high speed optical data communication
- Metropolitan- and Wide-Area Networks (MAN & WAN)
- Lossy networks with higher OSNR requirements

Feature Options

Option	Description	Option	Description
101,4,6	FC, SC, LC optical connector	610	Duplex mode w/OIF Frammer interface
602,4,6	Optical input data rate: OC-192, G.975, G.709	611	Forward Clocking for Duplex w/SERDES interface
603,5,7	Optical output data rate: OC-192, G.975, G.709	612,13	OIF Counter Clocking for Duplex w/SERDES interface, 622 or 155MHz Reference Clock
608	Regenerator mode	614	Forward Clocking for Duplex w/Framer interface
609	Duplex mode w/OIF SERDES interface	615	OIF Counter Clocking for Duplex w/Framer interface

Other options available. Please contact GTRAN for specific requirements.

**FOR MORE INFORMATION,
Call 1.805.499.2033, ext. 207**

Model Number GT10-1550FEC

The GT10-1550FEC is an integrated high speed data transceiver module optimized for SONET OC-192/SDH STM-64 applications. Out of band Reed-Solomon FEC is applied, resulting in a data rate of 10.66Gbit/s or 10.71Gbit/s. An application specific IC performs the FEC function, which improves module sensitivity by up to 5.5dB. A serial port user interface provides convenient access to the module's internal microprocessor. The microprocessor facilitates communication between the user and the transponder's internal components.

An externally modulated 1550nm laser module and an APD-detector-based optical receiver module convert data streams between the electrical and optical domains. A high-performance laser/modulator driver and receiver post amplifier are incorporated to provide optimum

signal levels throughout the assembly. Low-noise clock/data recovery and clock multiplication and translation electronics based on phase-locked-loops yield full SONET compliance for jitter generation, jitter transfer, and jitter tolerance. Data and clock I/Os utilize common LVDS logic levels for convenient integration with lower bit-rate VLSI chips.

The GT10-1550FEC is manufactured in a low profile aluminum housing with integrated heatsink. All fiberoptic components are integrated inside: laser, tap coupler, wavelength locker, APD receiver. All sensitive active components are hermetically sealed. All electrical signals are interfaced via a single low profile connector with MSA-like pin map, while the optical signals are provided via fiber pigtailed with customer specified connectors.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T	0	+65 ¹	C
Storage Temperature	T _{stg}	-40	+85	C
Optical Input Power	P _{in}		-5	dBm
Electrical Input Voltage	V _{in}	0	+3	V
Supply Voltages		Multiple		V

Transmitter Section

Parameter	Symbol	Min	Typ	Max	Unit
Electrical					
Data Input Amplitude (622 Mb/s) ²	D _{IN}	250	350	2400	mV _{p-p}
Data Clock Input Ampl. (622 MHz) ²	DINCLK	250	350	2400	mV _{p-p}
Reference Clock Input (622 MHz) ³	REFCLK	400	600	1600	mV _{p-p}
Source Clock Output Ampl. (622 MHz) ²	CLK_SRC	250	600	1100	mV _{p-p}
Optical					
Center Wavelength	λ	1525		1565	nm
DWDM wavelength accuracy	Δλ			±20	pm
Average Power Output ⁴	P _o	-2		+2	dBm
Extinction Ratio	r _e	10			dB
Jitter Generation Peak-to-Peak RMS	τ _{p-p} τ _{RMS}	Per SONET GR-253			UI UI

Receiver Section

Parameter	Symbol	Min	Typ	Max	Unit
Electrical					
Data Output Amplitude (622 Mb/s) ²	D _o	250	300	350	mV _{p-p}
Clock Output Amplitude (622 MHz) ²	DOCLK	250	300	350	mV _{p-p}
Optical					
Wavelength Range	Δλ	1280		1580	nm
Sensitivity				-23	dBm
Overload		-7			dBm
Jitter Tolerance		Per SONET GR-253			
Jitter Transfer		Per SONET GR-253			

General

Parameter	Symbol	Min	Typ	Max	Unit
DC Power Dissipation			13 ⁵	20	W
Electrical Connector	300 pos. MEG-Array™				
Optical Connector	FC, SC, LC				

- Maximum temperature is on transponder housing
- Differential signal; LVDS compatible
- Differential signal; LVPECL compatible
- Per SONET LR-2a & c application
- Room ambient conditions

SONET Performance Monitoring

- ❖ Section Overhead, J0 (Trace) & B0 (BIP)
- ❖ Line Overhead, B2 (BIP)
- ❖ Alarm indication signaling (AIS)
- ❖ General purpose Section Overhead (SOH) monitor

ITU G.709 Digital Wrapper

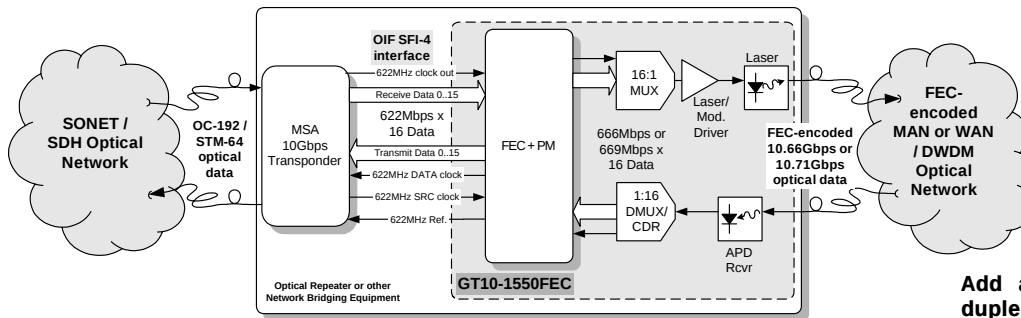
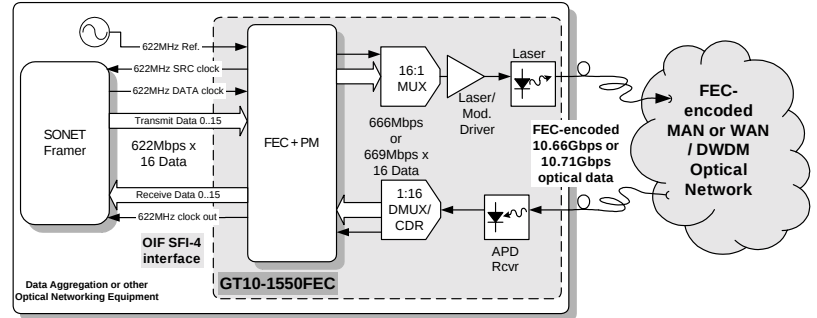
- ❖ Reed Solomon 255/239 forward error correction code
- ❖ Error correction statistics
- ❖ Inter node messaging optical channel overhead (OCOH)

Transponder Alarms & Status Monitors

- ❖ Loss of receive data signal (LOS)
- ❖ Laser temperature alarm
- ❖ Laser optical alarm
- ❖ Laser wavelength alarm
- ❖ MUX/DMUX PLL Lock detect
- ❖ SONET-to-FEC clock gear-box PLL Lock detect
- ❖ Transmit optical power monitor
- ❖ Laser temperature monitor
- ❖ Laser bias current monitor
- ❖ Received optical power monitor

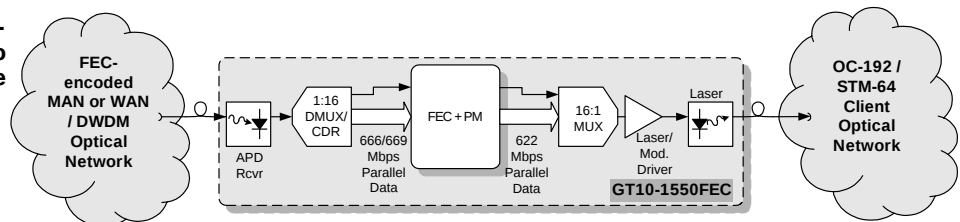
Typical GT10-FEC Transponder Configurations

Full-duplex terminal application.
GT10-FEC configured with MSA OIF SFI-4 transponder interface for direct launch of aggregated data onto a long haul/DWDM optical network.

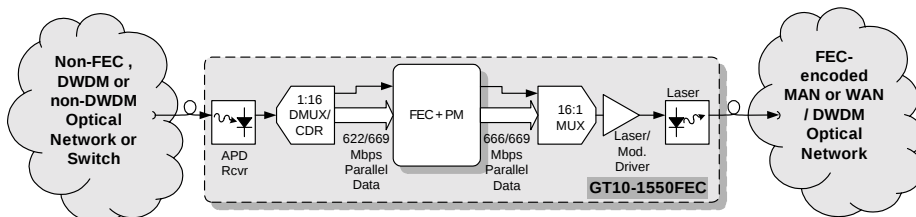


Add an MSA transponder for full-duplex optical SONET-to-FEC line rate translation. DWDM optional. GT10-FEC configured to look like SONET framer with OIF SFI-4 electrical interface. No intermediate electronics required.

Wavelength drop - GT10-FEC converts FEC-DWDM optical signal to OC-192 non-WDM signal in a simple 2 port application.



OC-192 optical output from OXC passes through the GT10-FEC which FEC-encodes data and modulates a DWDM optical source for launch into long haul DWDM network.



The pin map of the GT10-1550FEC is based on the one utilized in GTran's line of standard MSA-compatible 10Gbps Optical Transponders. Because the GT10-1550FEC transponder adds numerous features not found in a standard 10Gbps transponder, there are differences in the pin maps. The added functionality of the GT10-1550FEC is mostly defined by the features described in the ITU standards G.975 and G.709.

All high speed clock and data lines appear in the pin map exactly as they appear in GTran's standard transponder pin map. Additionally, the clock/data timing is 100% OIF compliant. This makes designing printed circuit boards for the GT10-1550FEC very familiar in terms of high speed, controlled impedance signal traces.

There are 30 pins on the GT10-1550FEC pin map which directly conflict with the standard 10Gbps transponder pin map. The conflicting

MSA signals, however, are mostly GND connections and little-used control signals. Of these, 18 are used to accommodate the optical channel overhead (OCOH) feature of G.975 and G.709. Others are used for bias voltage inputs to accommodate the onboard FEC ASIC's extensive use of 1.8V and 2.5V logic. There are another 27 pins used in the GT10-1550FEC pin map which are either unused or reserved for future use on the standard MSA pin map. Again, these pins are used to further accommodate the OCOH and bias voltage requirements described above.

In addition, there are 25 pins which are unused in the GT10-1550FEC, but may contain MSA control or monitoring signals in a standard 10Gbps transponder. These are unused on the GT10-1550FEC since many of the same control and monitoring functions are implemented via the serial user interface.

300 pin MEG-Array pin map

NOT USED this product

MSA Conflict

MSA unused

	A	B	C	D	E	F	G	H	J	K
row 1	DO0	GND	DO4	GND	DO8	+1R8V	DO12	GND	+1R8V	+5R0V
row 2	DON0	GND	DON4	GND	DON8	+1R8V	DON12	GND	+1R8V	+5R0V
row 3	GND	WAV_ALM	GND	NOT USED	GND	NOT USED	GND	NOT USED	+1R8V	NOT USED
row 4	DO1	GND	DO5	GND	DO9	+3R3V	DO13	GND	+1R8V	+3R3V
row 5	DON1	GND	DON5	GND	DON9	+3R3V	DON13	GND	+1R8V	+3R3V
row 6	GND	NOT USED	GND	NOT USED	GND	NOT USED	GND	NOT USED	+1R8V	NOT USED
row 7	DO2	GND	DO6	GND	DO10	+3R3V	DO14	GND	+1R8V	NOT USED
row 8	DON2	GND	DON6	GND	DON10	+3R3V	DON14	GND	+1R8V	NOT USED
row 9	GND	RXLCKREF	GND	NOT USED	GND	NOT USED	GND	NOT USED	GND	NOT USED
row 10	DO3	GND	DO7	GND	DO11	+1R8V	DO15	GND	-5R2V	-5R2V
row 11	DON3	GND	DON7	GND	DON11	+1R8V	DON15	GND	-5R2V	-5R2V
row 12	GND	NOT USED	GND	NOT USED	GND	LOSALM	GND	NOT USED	-5R2V	RXMUTE_MCLK
row 13	DMXREFCLKP	GND	RXMCLKP	GND	RXCLK_DATP	RXREFCLKP	RXCLK_SRCp	GND	-5R2V	-5R2V
row 14	DMXREFCLKN	GND	RXMCLKN	GND	RXCLK_DATN	RXREFCLKN	RXCLK_SRCN	GND	EIFPO	-5R2V
row 15	GND	DMXLOCK	GND	NOT USED	GND	RXREFSEL	GND	SUM_ALM	SOHCK_0	NOT USED
row 16	DI0	GND	DI4	GND	DI8	NOT USED	DI12	SOHRPI	SOHCK_1	+5R0V
row 17	DIN0	GND	DIN4	GND	DIN8	NOT USED	DIN12	SOHIE	SOHCK_2	+5R0V
row 18	GND	NOT USED	GND	NOT USED	GND	NOT USED	GND	SOHRPO	SOHCLK_3	NOT USED
row 19	DI1	GND	DI5	GND	DI9	+3R3V	DI13	SOHDO_3	SOHDI_0	+3R3V
row 20	DIN1	GND	DIN5	GND	DIN9	+3R3V	DIN13	SOHDO_2	SOHDI_1	+3R3V
row 21	GND	NOT USED	GND	NOT USED	GND	LSR_SD	GND	SOHDO_1	SOHDI_2	NOT USED
row 22	DI2	GND	DI6	GND	DI10	+3R3V	DI14	SOHDO_0	SOHDI_3	+3R3V
row 23	DIN2	GND	DIN6	GND	DIN10	+3R3V	DIN14	NOHRPI	NOHDO_3	+3R3V
row 24	GND	NOT USED	GND	NOT USED	GND	LSROPALM	GND	NOHIE	NOHDO_2	NRESET
row 25	DI3	GND	DI7	GND	DI11	NOT USED	DI15	NOHGCCI	NOHDO_1	+2R5V
row 26	DIN3	GND	DIN7	GND	DIN11	SCLK/SCL	DIN15	NOHRPO	NOHDO_0	+2R5V
row 27	GND	TXPICKSEL	GND	NOT USED	GND	LTMPALM	GND	NOHDI_3	NOHCLK_3	NOT USED
row 28	TXREFCLKP	GND	TXMCLKP	GND	TXCLK_SRCp	TXD/MISO/SDA	TXCLK_DATP	NOHDI_2	NOHCLK_2	+2R5V
row 29	TXREFCLKN	GND	TXMCLKN	GND	TXCLK_SRCN	RXD/MOSI	TXCLK_DATN	NOHDI_1	NOHCLK_1	+2R5V
row 30	GND	MUXLOCK	GND	TXMCLKSEL	GND	TXREFSEL	GND	NOHDI_0	NOHCLK_0	NOT USED

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