Preliminary Data Sheet, Rev. 1
November 2001

C489-Type 2.5 Gbits/s Tunable, Stabilized, Metro-Regional DBR Laser Transmitters

Offering multiple output power options and SONET/SDH compatibility, the C489-Type Tunable Laser Transmitters support 10—20 wavelengths and can be remotely programmed.

Features

- Data rates to 2.5 Gbits/s
- Targeted at metro-regional transmission to 360 km
- SONET and ITU-T compliant at OC-48 and STM-16
- Integrated Fabry-Perot Etalon stabilizer:
  — Replaces external wavelength lockers
- Wavelength range, 1528.77 nm—1563.86 nm
- RF Extinction ratio ≥ 10 dB
- Wavelength remotely programmable over ten to twenty 50 GHz ITU-T channels
- Asynchronous serial interface for transmitter communication
- Clocked or nonclocked operation with single-ended or differential inputs
- 50 Ω ac-coupled PECL compatible data and clock inputs
- Low-profile, 24-pin package compliant with transmitter multisource design agreement.
- Output power monitor
- Transmitter-enable input

Applications

- Metro-regional networks to 360 km
- Very dense, wave-division multiplexing (DWDM)
- High-speed data communication
- Digitized video

Description

The C489-Type Tunable 2.5 Gbits/s Laser Transmitters are designed for use in transmission systems and high-speed data communication applications. The transmitter operates at the SONET OC-48 rate as well as the ITU-T SDH rate of STM-16. The device supports 10—20 wavelengths and uses an RS-232 interface to control various transmitter functions, including wavelength.

The transmitters meet all present *Telcordia Technologies*™ GR-253-CORE requirements and the ITU-T G.957 and G.958 recommendations. They are also ideally suited for extended-distance data and networking applications.

The C489 Transmitter features a 1.5 μm distributed Bragg reflector (DBR) laser with an electroabsorptive modulator and an integrated stabilizer. The device is capable of 360 km transmission at 2.5 Gbits/s in DWDM systems at a channel spacing of 50 GHz. By integrating the modulator with the laser chip, the device offers a compact, cost-effective solution for extended-reach transmissions.

Description (continued)

The versatile C489-Type transmitters are available at wavelengths compatible with the ITU-T wavelength standards at 200 GHz, 100 GHz, and 50 GHz. The package also contains a thermoelectric cooler (TEC), thermistor, back-facet monitor, and optical isolator. The laser transmitter requires 5 V and –5.2 V power supplies; the TEC operates on 3.3 V. The clock can be enabled for those applications where jitter is critical.

Pin information is listed in Table 1.

Transmitter Processing

The transmitter can withstand normal wave soldering processes. The complete transmitter module is not hermetically sealed; therefore, it should not be immersed in or sprayed with any cleaning solution or solvents. The process cap and fiber pigtail jacket can deform at temperatures greater than 85 °C. The transmitter pins can be wave-soldered at a maximum temperature of 250 °C for 10 seconds.

Installation Considerations

Although the transmitter has been designed with ruggedness in mind, care should be used during handling. The optical connector should be kept free from dust, and the process cap should be kept in place as a dust cover when the device is not connected to a cable. If contamination is present on the optical connector, the use of canned air with an extension tube should remove any debris. Other cleaning procedures are identified in the *Cleaning Fiber-Optic Assemblies* Technical Note (TN95-010LWP).

Connector Options

The standard fiber-optic pigtail is an 8 μm core single-mode fiber in a 0.036 in. (914 μm) diameter, tight-buffered outer jacket. The standard length is 39 in. ± 4 in. (1 m ± 10 cm) and is terminated with an optical connector.

Table 1. Pin Descriptions

Pin Number	Name
1	Ground (TEC)
2	Back-facet Monitor
3	Laser Degrade Alarm
4	Tx Enable
5	Clock Select
6	Ground
7	Wavelength-Deviation Error Alarm
8	RS-232 Interface (Tx)
9	RS-232 Interface (Rx)
10	NC
11	Ground
12	V_{EE}
13	V_{CC}
14	V_{TEC} (TEC supply voltage)
15	Ground
16	DATA
17	Ground
18	$\overline{\text{DATA}}$
19	Ground
20	CLOCK
21	Ground
22	$\overline{\text{CLOCK}}$
23	Ground
24	V_{CC}

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Supply Voltage (positive)	V_{CC}	—	5.25	V
Supply Voltage (negative)	V_{EE}	—	–6.0	V
TEC Supply Voltage	V_{TEC}	—	3.8	V
Operating Case Temperature Range	T_C	–15	70	°C
Storage Case Temperature Range	T_{stg}	–40	85	°C
Lead Soldering Temperature/Time	—	—	250/10	°C/s
Relative Humidity (noncondensing)	RH	—	85	%
Minimum Fiber-Bend Radius	—	1.00 (25.4)	—	in. (mm)

Characteristics

(Minimum and maximum values specified over operating case temperature range at 50% duty cycle data signal. Typical values are measured at room temperature unless otherwise noted.)

Table 2. Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
dc Power Supply Voltage	V_{CC}	4.75	5.0	5.25	V
dc Power Supply Current	I_{CC}	—	350	500	mA
dc Negative Supply Voltage	V_{EE}	–5.46	–5.2	–4.94	V
dc Negative Supply Current	I_{EE}	—	—	300	mA
Power Dissipation	P_{DISS}	—	4.5	6.5	W
Input Data/Clock Voltage:[1, 2] Single-ended Input	V_{IN}	250	900	1300	mVp-p
Clocked/Nonclocked Select Voltage:[3] Clocked Operation (V_{IL}) Nonclocked Operation (V_{IH})	V_{SEL_CLK} $V_{SEL\ CLK}$	 0.0 2.0	 — —	 0.8 V_{CC}	 V V
Input Impedance	R_{IN}	—	50	—	Ω
Transmitter Disable Voltage (TTL) V_{IH}	V_{DIS}	4.2	—	—	V
Transmitter Enable Voltage (TTL) V_{IL}	V_{EN}	0.0	—	0.8	V
λ Deviation Alarm: Levels (CMOS) V_{OL} Levels (CMOS) V_{OH} Setting	 $V_{\lambda ALARM\ N}$ $V_{\lambda ALARM}$ λ_{ALARM}	 0 4.05 –20	 — — —	 0.6 — 20	 V V pm
Laser Degrade Alarm: Levels (CMOS) V_{OH} Levels (CMOS) V_{OL} Setting	 V_{ALARM} $V_{\lambda ALARM\ N}$ LD_{ALARM}	 4.05 0 —	 — — —	 — 0.6 I_{BOL} x 125%	 V V mA
Laser Bias Monitor Voltage	V_{LBM}	—	20	—	mV/mA
Laser Monitor Voltage (50% duty cycle)[4]	V_{BF}	—	TBD	—	mV/mW
TEC Current	I_{TEC}	—	0.6	1.3	A
TEC Voltage	V_{TEC}	3.0	3.3	3.8	V
Setup Time	T_{SET}	_	—	35	ps
Hold Time	T_{HOLD}	60	—	—	ps
Clock Duty Cycle	C_{DC}	40	50	60	%
Return Loss: Input Data[5] Input Clock[6]	 RL_{DATA} RL_{CLOCK}	 –10 –12	 — —	 — —	 dB dB

1. Inputs are ac-coupled internally into an equivalent input impedance of 50 Ω.
2. Single-ended or differential operation may be used. If the inputs are driven single-ended, the unused inputs must be terminated in 50 Ω.
3. Clocked operation is optional. For clocked operation, pin 5 must a logic 1. If pin 5 is left floating, the transmitter operates in the clocked mode. With clocked operation, the optical output changes state with the rising edge of the input clock signal.
4. Deviation due to temperature variation detected by the thermistor.
5. This voltage is measured from Pin 2 to GND.
6. Frequency range: 100 kHz—2 GHz.
7. At frequency of 2.5 GHz.

Characteristics (continued)

Table 3. Optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Average Optical Power Output:[1]					
BOL	$P_{AVG\ BOL}$	–2.0	—	2	dBm
EOL	$P_{AVG\ EOL}$	TBD	—	TBD	dBm
Center Wavelength Range	λ_C	1528.77	—	1563.86	nm
Wavelength Stability over Life, over Temperature	$\Delta\lambda_T$	–20	—	20	pm
Side-mode Suppression Ratio [2]	SMSR	30	—	—	dB
Jitter, Intrinsic (12 kHz—20 MHz)[3]	—	—	—	0.05	UIp-p
Extinction Ratio[4]	r_e	11.0	—	—	dB
Eye Mask of Optical Output [5, 6]	—	Meets SONET and ITU-T			—
Optical Rise/Fall Time (20%—80%)	t_R, t_F	—	—	125	ps
Maximum Return Loss (optical)	O_{RL}	—	—	24	dB

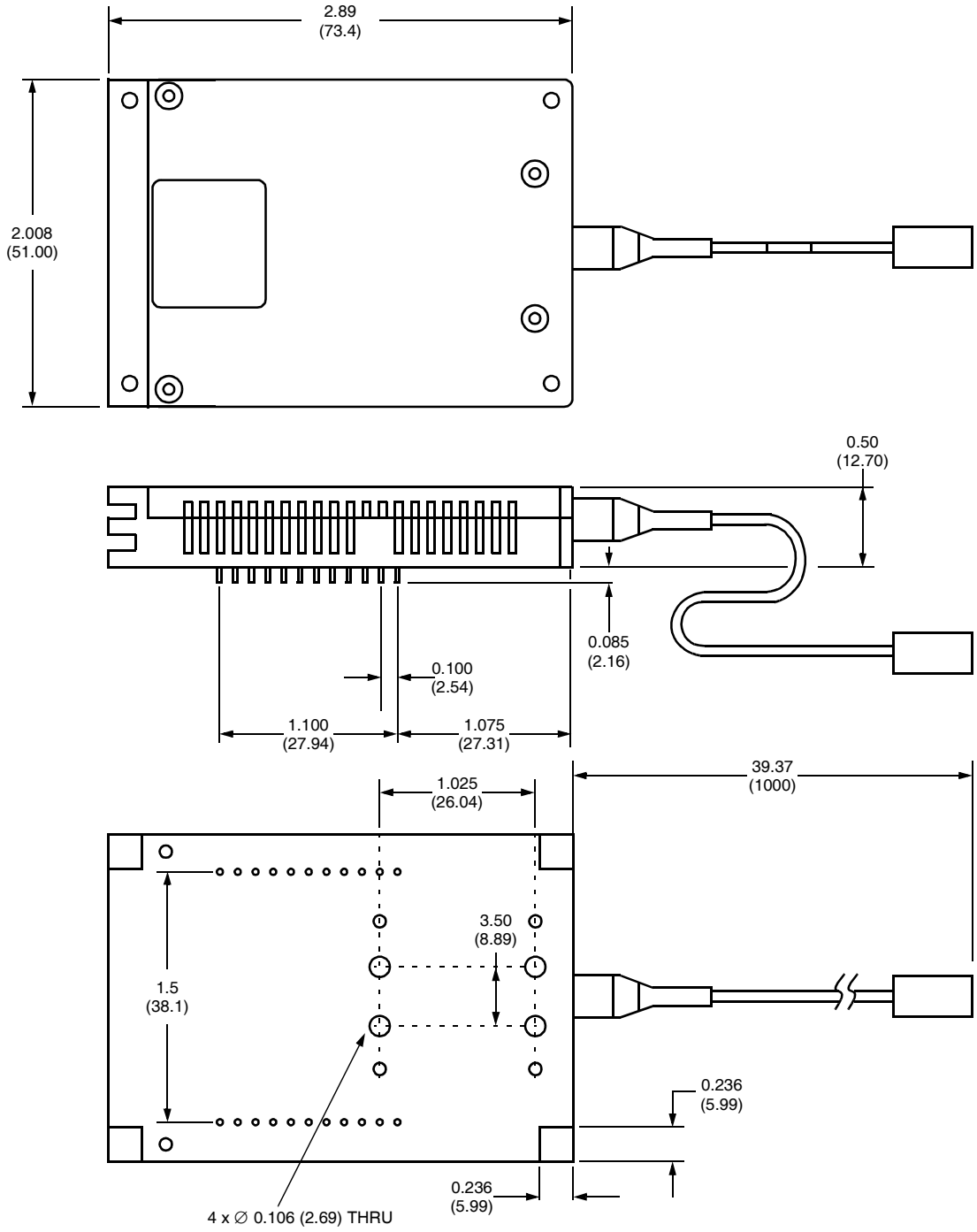
1. Output power definitions and measurement per ITU-T Recommendation G.957.
2. Ratio of the average output power in the dominant longitudinal mode to the power in the most significant side mode under fully modulated conditions.
3. Filter bandwidth from 12 kHz—20 MHz, according to ITU-T G813.
4. Ratio of logic 1 output power to logic 0 output under fully modulated conditions, Bessel filter on.
5. GR-253-CORE, *Synchronous Optical Network (SONET) Transport Systems: Common Generic Criteria.*
6. ITU-T Recommendation G.957, *Optical Interfaces for Equipment and Systems Relating to the Synchronous Digital Hierarchy.*

Table 4. Dispersion Performance

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Dispersion Penalty for Extended Reach (360 km)	DP	6500 ps/nm	—	—	2.0	dB
Dispersion Penalty for Extended Reach (640 km)	DP	11500 ps/nm	—	—	2.0	dB

Outline Drawings

Dimensions are in inches and (millimeters).



1-1263 (F).

Qualification and Reliability

To help ensure high product reliability and customer satisfaction, Agere Systems is committed to an intensive quality program that starts in the design phase and proceeds through the manufacturing process. Optoelectronics modules are qualified to Agere Systems internal standards using MIL-STD-883 test methods and procedures and using sampling techniques consistent with *Telcordia Technologies* requirements. This qualification program fully meets the intent of *Telcordia Technologies* reliability practices TR-NWT-000468 and TA-TSY-000983. In addition, the Agere Systems design, development, and manufacturing facility has been certified to be in full compliance with the latest *ISO*® 9001 Quality System Standards.

Laser Safety Information

Class I Laser Product

All versions of the C489-type transmitters will be classified as Class I laser products per FDA/CDRH, 21 CFR 1040 Laser Safety requirements. The transmitters will be registered/certified with the FDA. All versions are classified as Class I laser products per *IEC*® 60825-1:1993.

This product complies with 21 CFR 1040.10 and 1040.11.
8 μm/125 μm diameter single-mode fiber pigtail with 914 μm tight-buffered jacket and connector
Wavelength range = 1527.77 nm—1563.86 nm
Maximum power = 10 mW
Product is not shipped with power supply.

Caution: Use of controls, adjustments, and procedures other than those specified herein may result in hazardous laser radiation exposure.

NOTICE
Unterminated optical connectors can emit laser radiation. Do not view with optical instruments.

.

Ordering Information

To be determined.

For additional information, contact your Agere Systems Account Manager or the following:
INTERNET: **http://www.agere.com**
E-MAIL: **docmaster@agere.com**
N. AMERICA: Agere Systems Inc., 555 Union Boulevard, Room 30L-15P-BA, Allentown, PA 18109-3286
1-800-372-2447, FAX 610-712-4106 (In CANADA: **1-800-553-2448**, FAX 610-712-4106)
ASIA: Agere Systems Hong Kong Ltd., Suites 3201 & 3210-12, 32/F, Tower 2, The Gateway, Harbour City, Kowloon
Tel. (852) 3129-2000, FAX (852) 3129-2020
CHINA: **(86) 21-5047-1212** (Shanghai), **(86) 10-6522-5566** (Beijing), **(86) 755-695-7224** (Shenzhen)
JAPAN: **(81) 3-5421-1600** (Tokyo), KOREA: **(82) 2-767-1850** (Seoul), SINGAPORE: **(65) 778-8833**, TAIWAN: **(886) 2-2725-5858** (Taipei)
EUROPE: **Tel. (44) 7000 624624**, FAX (44) 1344 488 045

November 2001
DS00-337OPTO-1 (Replaces DS00-337OPTO

agere systems