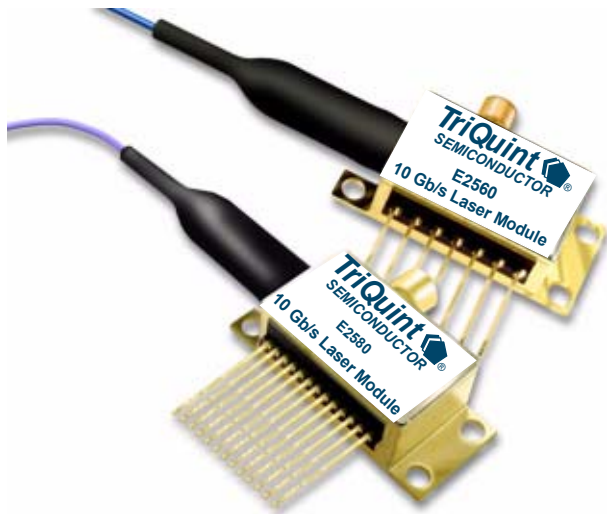


TriQuint Optoelectronics

E2560/E2580-Type 10 Gb/s EML Modules for 2 km—40 km Transmission



Features

- Integrated electroabsorptive modulator
- 1.5 μm wavelength
- Characterized for 10 Gb/s operation
- For use up to 40 km at 10 Gb/s
- Low modulation voltage
- Temperature stabilized
- Available with and without integral driver IC
- Wavelength selectable to ITU-T standards
- Ultrastable wavelength aging for DWDM

Applications

- SONET/SDH applications
- Ultrahigh capacity WDM system application
- High-speed data communication
- Digitized video

Description

The E2560-series EML (without integral driver IC) and E2580-series EML (with integral driver IC) are designed for 10 Gb/s DWDM or TDM transmission applications. They integrate a CW laser with an electroabsorptive modulator in the same semiconductor chip and are an extension of TriQuint's existing E2500-series of devices. These devices can replace external modulators that are often bulkier, more expensive, and require more drive electronics than the EML. Both series use a small-profile GPO™ connector to handle the RF signal. The package also contains a thermoelectric cooler, thermistor, rear-facet monitor photodiode, and an optical isolator.

The 2560-series is available for transmission distances of up to 20 km or 40 km. The 2580-series operates over distances of 40 km.

Description (continued)

The nominal input impedance of the E2560 version is 50 Ω . The package is qualified to the *Telcordia Technologies*™ TA-TSY-000468 standard.

The short-haul (2 km—20 km) version of the E2560-series (E2566) is offered as a single-channel device operating within a wavelength range of 1530 nm—1563 nm. For 40 km, both E2560 and E2580 are available in a range of ITU-T wavelengths for use in DWDM systems operating at 10 Gb/s per channel.

The devices exhibit excellent wavelength stability, supporting operation at 100 GHz channel spacing over 20 years (assuming an end-of-life aging condition of $<\pm 100$ pm). Typically, no external wavelength stabilization is required in systems of this type, using the TriQuint E2560- and E2580-series EMLs. The package also offers excellent stability of wavelength vs. case temperature, with a maximum coefficient of ± 0.5 pm/°C.

Module Characteristics

Table 1. Module Characteristics

Parameter	Description
Package Type	E2560: 7-pin package with GPO connector RF input. E2580: 13-pin package with GPO connector RF input.
Fiber	Standard single-mode fiber.
Connector	Various connectors available on request.
RF Input Impedance	50 Ω .
Bit Rate	10 Gb/s.

Pin Information

Table 2. Pin Descriptions

E2560 Series			E2580 Series		
Pin	Abbreviation	Definition	Pin	Abbreviation	Definition
—	—	—	13	TEC–	Thermoelectric cooler–
—	—	—	12	TEC+	Thermoelectric cooler+
—	—	—	11	Vss	Voltage supply to the IC
—	—	—	10	DCA	Duty cycle adjust
—	—	—	9	OA	Optical amplitude adjust
—	—	—	8	NC	No connect/reserved
7	TEC–	Thermoelectric cooler–	7	NC	No connect/reserved
6	TEC+	Thermoelectric cooler+	6	VEA	Modular offset (on-state)
5	BACK DET+	Monitor cathode (+)	5	BACK DET+	Monitor cathode (+)
4	BACK DET–	Monitor anode (–)	4	BACK DET–	Monitor anode (–)
3	LASER+	Laser anode	3	LASER+	Laser anode
2	THERM	Thermistor	2	THERM	Thermistor
1	THERM, LASER–, CASE	Combined thermistor/ laser cathode/case	1	THERM, LASER–, CASE	Combined thermistor/ laser cathode/case

Note: For full details of pin functions and required bias levels for the version with the IC, refer to the forthcoming *E2580 EML with Integral Driver IC: Pin Definitions And Operation* Application Note.

Target Specifications

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 operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Table 3. Absolute Maximum Ratings

Parameter	Conditions	Min	Max	Unit
Laser Diode Reverse Voltage	CW	—	2	V
Laser Diode Forward Current	CW	—	150	mA
Optical Output Power	CW	—	10	mW
Modulator Reverse Voltage	—	—	5	V
Modulator Forward Voltage	—	—	1	V
Monitor Diode Reverse Voltage	—	—	10	V
Monitor Diode Forward Voltage	—	—	1	V
Storage Temperature	—	—	-40 to +85	°C
Operating Temperature	—	—	-10 to +70	°C
DCA Voltage (pin 10) (E2580 series)	—	-6.5	0.3	V
OA Voltage (pin 9) (E2580 series)	$V_{OA} - V_{SS} > 1.2 \text{ V}$	-6.5	0.3	V
EA Bias Voltage (pin 6) (E2580 series)	$V_{OA} - V_{SS} > 1.2 \text{ V}$	-6.5	0.3	V
Supply Voltage V_{SS} (pin 11) (E2580 series)	—	-6.5	0.3	V

Characteristics

Table 4. Optical and Electrical Specifications (Chip operating temp. = 15 °C to 35 °C, except where noted.)

Parameter	Symbol	Conditions	Min	Max	Unit
Threshold Current (BOL)	I_{TH}	—	5	35	mA
Forward Voltage	V_F	$I_F = I_{OP} @ T_{OP}$	—	2.2	V
Operating Current	I_{OP}	—	50	100	mA
Threshold Power	P_{TH}	$I_F = I_{TH}$ $V_M = I_{OP}$	—	80	μW
Fiber Output Power (Peak)	P_{PK}	$V_M = 0 \text{ V}$ $I_F = I_{OP}$	1	—	dBm
Peak Wavelength (Wavelength can be specified to the ITU wavelength channels. See Table 5.)	λ_{PK}	$V_M = 0 \text{ V}$ $T_{LASER CHIP} = T_{OP}$ $I_F = I_{OP}$	1530	1563	nm
Side-mode Suppression Ratio	SMSR	$V_M = 0 \text{ V}$ $I_F = I_{OP}, T_{OP}$	35	—	dB
Dispersion Penalty, BER = 10^{-10} D = 400 ps/nm (E2566 version) D = 800 ps/nm (E2560, E2580 versions)	DP	Note 1.	—	2.0	dB
			—	2.0	dB

1. $I_F = I_{OP}$; $T = T_{OP}$; modulated 10 Gb/s.

Target Specifications (continued)

Table 4. Optical and Electrical Specifications (Chip operating temp. = 15 °C to 35 °C, except where noted.)
(continued)

Parameter	Symbol	Conditions	Min	Max	Unit
Modulator/Driver					
Extinction Ratio: 40 km versions	ER _{RF}	V _{IN} = 0.5 Vp-p to 1.0 Vp-p 10 Gb/s (E2580);	10	—	dB
E2566, 20 km version		V _M = 0 V to -2.5 V 10 Gb/s (E2560)	9	—	dB
RF Return Loss (E2560-series) (0 GHz to 6 GHz)	S ₁₁	V _M = -1 V I _F = I _{OP}	10	—	dB
RF Return Loss (E2560-series) (6 GHz to 8 GHz)	S ₁₁	V _M = -1 V I _F = I _{OP}	7	—	dB
RF Return Loss (E2560-series) (8 GHz to 10 GHz)	S ₁₁	V _M = -1 V I _F = I _{OP}	5	—	dB
-3 dB Bandwidth (E2560-series)	BW	V _M = -1 V I _F = I _{OP}	11	—	GHz
RF Return Loss (E2560-series) (0 GHz to 10 GHz)	S ₁₁	V _{IN} = 0.5 Vp-p to 1.0 Vp-p 10 Gb/s	10	—	dB
Input Voltage (E2580-series) (Peak to Peak) (ac coupled input)	V _{IN}	—	0.5	1.0	V
Rise/Fall Time (20%—80%)	tr/tf	—	—	40	ps
Monitor Diode					
Monitor Current	I _{BD}	V _{BD} = 5 V I _F = I _{OP}	40	1100	μA
Dark Current	I _D	V _{BD} = 5 V	—	0.1	μA
Capacitance	C	V _{BD} = 5 V F = 1 MHz	—	25	pF
Thermistor					
Resistance	R _{THERM}	T = 25 °C	9.5	10.5	kΩ
Thermistor Current	I _{TC}	—	10	100	μA
Thermistor B Constant	B	—	3700	4100	—
Thermoelectric Cooler					
TEC Current	I _{TEC}	Note 2.	—	1.1	A
TEC Voltage	V _{TEC}	Note 2.	—	2.6	V
TEC Power	P _{TEC}	Note 2.	—	2.9	W
TEC Capacity	ΔT	Note 2.	55	—	C
Optical Isolation					
Optical Isolation	—	Note 2.	30	—	dB
Package					
Wavelength vs. Case Temp.	dλ/ dT	T _{CASE} = -10 °C to +70 °C	-0.5	0.5	pm/°C

1. I_F = I_{OP}; T = T_{OP}; modulated 10 Gb/s.

2. T_{CASE} = 70 °C, T_{LASER CHIP} = 15 °C to 35 °C (E2560-series), 20 °C to 35 °C (E2580-series).

Electrostatic Discharge

CAUTION: This device is susceptible to damage as a result of electrostatic discharge. Take proper precautions during both handling and testing. Follow guidelines such as JEDEC Publication No. 108-A (Dec. 1988).

TriQuint Semiconductor employs a human-body model (HBM) for ESD-susceptibility testing and protection-design evaluation. ESD voltage thresholds are dependent on the critical parameters used to define the model. A standard HBM (resistance = 1.5 k Ω , capacitance = 100 pF) is widely used and can be used for comparison purposes.

Laser Safety Information

Class IIIb Laser Product

FDA/CDRH Class IIIb laser product. All versions are Class IIIb laser products per CDRH, 21 CFR 1040 Laser Safety requirements. All versions are classified Class 3B laser products consistent with IEC[®] 60825-1: 1993. This device family has been classified with the FDA under accession number 8720010. Measurements were made to classify the product per IEC60825-1: 1993.

This product complies with 21 CFR 1040.10 and 1040.11.

8.8 μm /125 μm single-mode fiber pigtail and connector

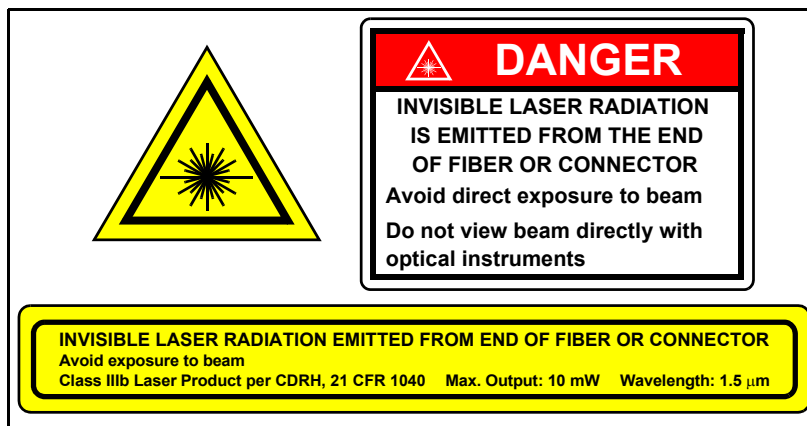
Wavelength = 1530 nm—1563 nm

Maximum power = 10 mW

Because of size constraints, laser safety labeling (including an FDA Class IIIb label) is not affixed to the module but attached to the outside of the shipping carton.

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.



Ordering Information

Table 5. Ordering Information: 40 km Codes

Parameter		Device Description			
ITU-T Wave-length (nm)	Frequency	E2560-Series, 40 km, without IC		E2580-Series, 40 km, with IC	
		Code	Comcode	Code	Comcode
1530.33	195.9	E2560H59	108414722	E2580H59	108415183
1531.12	195.8	E2560H58	108414780	E2580H58	108415191
1531.90	195.7	E2560H57	108414798	E2580H57	108415209
1532.68	195.6	E2560H56	108414806	E2580H56	108415217
1533.47	195.5	E2560H55	108414814	E2580H55	108415225
1534.25	195.4	E2560H54	108414822	E2580H54	108415233
1535.04	195.3	E2560H53	108414830	E2580H53	108415241
1535.82	195.2	E2560H52	108414848	E2580H52	108415258
1536.61	195.1	E2560H51	108414855	E2580H51	108415266
1537.40	195.0	E2560H50	108414863	E2580H50	108415274
1538.19	194.9	E2560H49	108414871	E2580H49	108415282
1538.98	194.8	E2560H48	108414889	E2580H48	108415290
1539.77	194.7	E2560H47	108415142	E2580H47	108415308
1540.56	194.6	E2560H46	108414897	E2580H46	108415316
1541.35	194.5	E2560H45	108414905	E2580H45	108415324
1542.14	194.4	E2560H44	108414913	E2580H44	108415332
1572.94	194.3	E2560H43	108414921	E2580H43	108415340
1543.73	194.2	E2560H42	108414939	E2580H42	108415357
1544.53	194.1	E2560H41	108414947	E2580H41	108415365
1545.32	194.0	E2560H40	108414954	E2580H40	108415373
1546.12	193.9	E2560H39	108414962	E2580H39	108415381
1546.92	193.8	E2560H38	108414970	E2580H38	108415399
1547.72	193.7	E2560H37	108414988	E2580H37	108415407
1548.51	193.6	E2560H36	108414996	E2580H36	108415415
1549.32	193.5	E2560H35	108415001	E2580H35	108415423
1550.12	193.4	E2560H34	108415019	E2580H34	108415431
1550.92	193.3	E2560H33	108415027	E2580H33	108415449
1551.72	193.2	E2560H32	108415035	E2580H32	108415456
1552.52	193.1	E2560H31	108415043	E2580H31	108415464
1553.33	193.0	E2560H30	108415050	E2580H30	108415472
1554.13	192.9	E2560H29	108415068	E2580H29	108415480
1554.94	192.8	E2560H28	108415076	E2580H28	108415498
1555.75	192.7	E2560H27	108415084	E2580H27	108415506
1556.56	192.6	E2560H26	108415092	E2580H26	108415514
1557.36	192.5	E2560H25	108415100	E2580H25	108415522
1558.17	192.4	E2560H24	108415118	E2580H24	108415530
1558.98	192.3	E2560H23	108415126	E2580H23	108415548
1559.79	192.2	E2560H22	108415134	E2580H22	108415555
1560.61	192.1	E2560H21	108415159	E2580H21	108415563
1561.42	192.0	E2560H20	108415167	E2580H20	108415571
1562.23	191.9	E2560H19	108415175	E2580H19	108415589
1530.60	—	E2560H	108422494	E2580H	108422510

Ordering Information (continued)

Table 6. Ordering Information: 20 km Codes

Product Code	Product Description	Comcode
E2566H	2 km—20 km, single-channel without IC; ST Connector	108743337M

GPO is a trademark of Gilbert Engineering.
Telcordia Technologies is a trademark of Telcordia Technologies, Inc.
IEC is a registered trademark of The International Electrotechnical Commission.

Additional Information

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