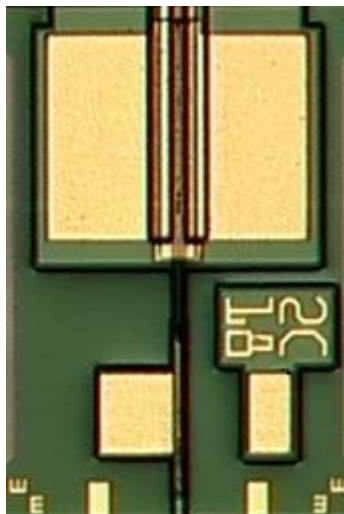


294W Electro-absorptive Modulator Laser (EML) Chip at 1550 nm and DWDM wavelengths for use in Cooled applications up to 2.5Gb/s



Description

The 294W is a 2.5Gb/sec electro-absorptive modulator chip. The device is unbonded for use as a component in a laser module with a thermal electrical cooler suitable for a single channel or DWDM applications. It is available in 640km distance with all C and L Band DWDM wavelengths. The design is a capped mesa buried hetero-structure (CMBH) grown on n-type substrate with multi-quantum well (MQW) active layers and distributed-feedback (DFB) grating layer. The facets are coated with an anti-reflectance layer on the front facet and a high reflectance coating on the rear facet. Gold bonding pads are provided on both the p and n sides. A hexadecimal number appears on both sides of the chip for identification purposes. All laser chips come from wafers that have been certified using a representative lot of devices that must achieve an acceptable yield for burn-in and other multi-temperature, CW and dynamic tests. Each shipped bare die is tested at 25C. These die are identical to those used in CyOptics components level products.

Features

- Low Threshold Current
- Supports 0 dBm average optical power applications
- Supports up to 640km applications
- Bondable junction-up or junction-down
- Long history of proven field reliability
- Very high reliability design, including
 - High quality MOCVD epitaxy
 - Patented low-penetration, ohmic p-contact design
 - Patented junction-side bonding pads providing a barrier to solder penetration
 - Patented hermetic facet coatings
- Qualified as per intent of Telcordia GR-468
- Operating temperature: 15 to 35C
- C band and L band DWDM wavelengths available
- Proven reliability in non-hermetic packages

Applications

- Supports performance up to 2.5 Gb/sec bit rate, 15 to 35C operating temperature range up to 640km
- High speed DWDM systems
- Long haul-transmission systems
- Metro transmission systems

Electro-Optical Characteristics (Pulsed, $T_C = 25^\circ\text{C}$, $NA=0.45$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Lasing Threshold Current	I_{th}	CW		11	20	mA
Slope Efficiency	η	$V(EA)=0V$, $I_F=50mA$	0.08	0.15		W/A
Front Power	P_a	$V(EA)=0V$, $I_F=50mA$		6		mW
Slope Efficiency Back Facet	η_R	$V(EA)=0V$, $I_F=50mA$	0.005			W/A
Forward Voltage	V_f	$V(EA)=0V$, $I_F=50mA$	0	1.1	1.5	V
Series Resistance	R	$V(EA)=0V$, I_F = greater of 50mA or 3I _{th}		5	13	Ohms
Reverse Current	I_{rev}	$V_f=-2V$		<0.1	1	mA
Kink Deviation ¹	-	I_{th} to 100mA		-	8	%
Wavelength ²	λ	$V(EA)=0V$, I_F = greater of 50mA or 3I _{th}	1527.1		1611.8	nm
Side Mode Suppression Ratio	SMSR	$V(EA)=0V$, I_F = greater of 50mA or 3I _{th}	35	40		dB
Isolation Resistance	R_{iso}		20	1000		kohms
Breakdown Voltage	V_{brk}	$I(EA)=-1mA$			-6	V
Leakage Voltage	V_{leak}	$I(EA)=-0.05mA$			-3	V

Typical Chip-on-Carrier Electro-Optical Characteristics³ (CW, $T_C = 25^\circ\text{C}$)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
DC Extinction Ratio	DC ER	$I_F = 75\text{ mA}$ $V(EA) = -2.5\text{ V}$		25		dB
Wavelength/Temperature Coefficient	$d\lambda/dT$	$T = 20^\circ\text{C} - 35^\circ\text{C}$		0.09		nm/C
Wavelength/Current Coefficient	$d\lambda/dI$	$I = I_{th} + 20mA$ to $I_{th} + 60mA$		0.007		nm/mA
Relative Intensity Noise	RIN	$I_F = 75\text{ mA}$ 500MHz – 12 GHz		-135		dB/Hz
Bandwidth	BW	$I_F = 75\text{ mA}$ $V(EA) = -1\text{ V}$ at -3dB		5		GHz
Rise Time	τ_r	Unfiltered 20- 80%; ER=10dB		100		ps
Fall Time	τ_f	Unfiltered 80- 20%; ER=10dB		100		ps

1. A kink is indicated by structure in the light/current slope (dI/dI). The magnitude of the structure is normalized (to the estimated maximum slope efficiency) using the deviation of the structure from the curve that would have occurred if the dI/dI had remained smoothly varying with I .

2. For wavelength available for DWDM applications, see attached tables

3. Sample test with chip-on-carrier, CW, $T = 25^\circ\text{C}$ with single mode fiber. Please refer to the CyOptics Homepage for the datasheet of E2500 for representative packaged device performance of the 294W chip.

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.

	Unit	Min	Recommended	Max
Forward Current	mA		-	150
Front Power*	mW			40
Reverse Voltage	V		-	2
Operating Temp	C	15		35
Storage Temperature	C	-40	25	100
Storage Relative Humidity	%		35	85

* These maximum stresses are to be applied only after the chip is properly bonded to a heat sink. Applying current to a bare chip can damage the device.

Handling Procedures

- These devices are static sensitive. Take appropriate ESD precautions to avoid damage.
- InP chips are inherently fragile and easily damaged. Special caution should be used when handling. Do not handle with tweezers. A vacuum tip with a flat surface is recommended.
- Facets should not be touched.
- Suggested bonding condition:
 - o Eutectic AuSn solder
 - o Bonding temperature: 350C
 - o Bonding force: 30 grams (not exceed 40 grams)
 - o Bonding force and temperature should be applied in a gradual fashion
 - o Bonding time: <= 10 seconds
- Suggested burn-in conditions:
 - o Chip heatsink temperature: 100C
 - o Current: 200mA
 - o Time: 12 hours
 - o Pass Criteria: Delta I_{th} (T=50C) between -2mA and +2mA

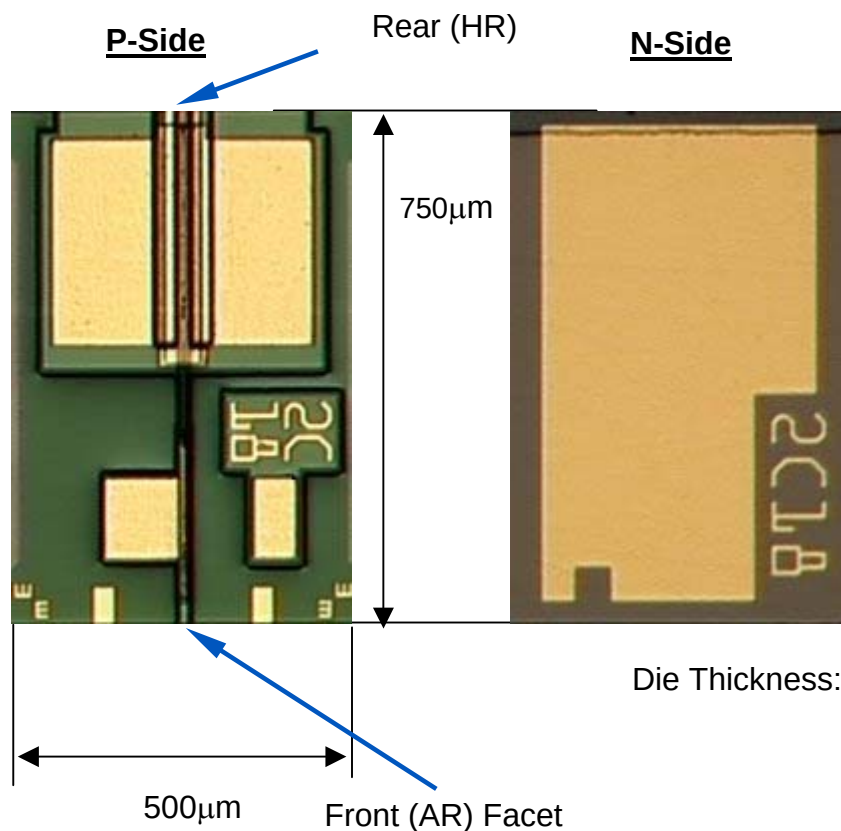
Electrical and Optical Overstress (ESD/EOS) Information

Switching transients can cause electrical overstress (EOS) damage in a chip. EOS may result from improper ESD handling, improper power sequencing, a faulty power supply or an intermittent connection.

Proper turn-on sequence:

- a. All ground connections
- b. Most negative supply
- c. Most positive supply
- d. All remaining connections

Reverse order to turn-off.

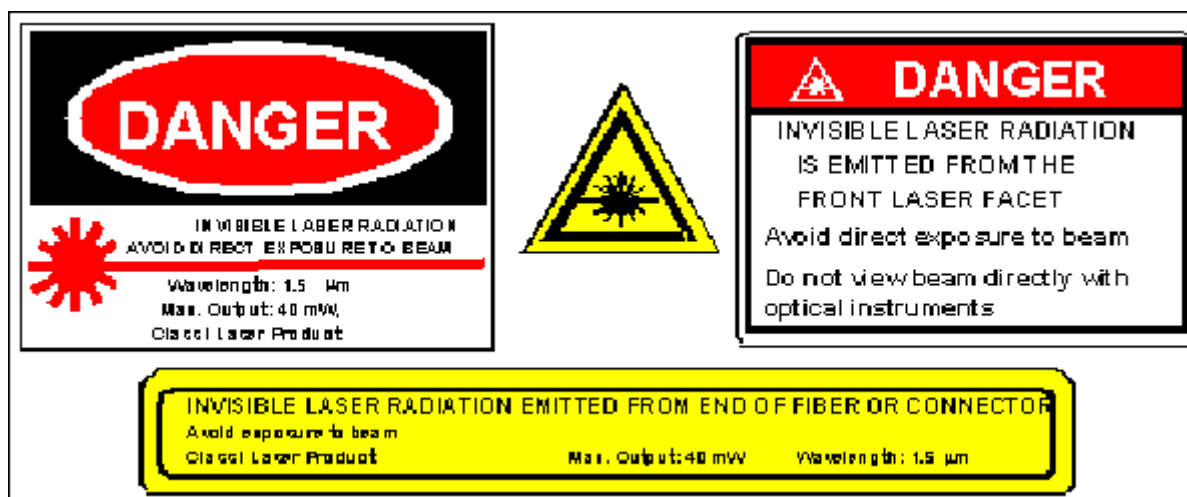
Dimensions**Laser Safety**

All versions of these laser chips are classified as Class I per CDRH, 21 CFR 1040 Laser Safety requirements.

All versions are classified as Class 1M laser chips consistent with IEC[®] 60825-2: 2001.

This product complies with 21 CFR 1040.10 and 1040.11.

Because of size constraints, laser safety labeling is attached to the outside of the shipping carton.



Qualification Information

- Hazardous substance content is RoHS compliant
- 294W laser chips have passed all qualification requirements as specified by Telcordia GR-468.
- Although all chips shipped come from wafers certified to meet stringent burn-in requirements individual chips should be burned-in to filter out a small percentage of infant failures.
- Hazard rate for CyOptics EML chips are estimated to be ~ 1 FIT over 20 years assuming usage at 25C (effective 30C junction temperature) where failure is defined as a 50% degradation of power.

Ordering Information

Code	Comcode	Wavelength (nm)	Frequency (THz)	Temperature Range*
294W862		1610.056	186.20	15 to 35°C
294W863		1609.192	186.30	15 to 35°C
294W864		1608.329	186.40	15 to 35°C
294W865		1607.467	186.50	15 to 35°C
294W866		1606.605	186.60	15 to 35°C
294W867		1605.745	186.70	15 to 35°C
294W868		1604.885	186.80	15 to 35°C
294W869		1604.026	186.90	15 to 35°C
294W870		1603.168	187.00	15 to 35°C
294W871		1602.312	187.10	15 to 35°C
294W872		1601.456	187.20	15 to 35°C
294W873		1600.601	187.30	15 to 35°C
294W874		1599.747	187.40	15 to 35°C
294W875		1598.893	187.50	15 to 35°C
294W876		1598.041	187.60	15 to 35°C
294W877		1597.190	187.70	15 to 35°C
294W878		1596.339	187.80	15 to 35°C
294W879		1595.490	187.90	15 to 35°C
294W880		1594.641	188.00	15 to 35°C
294W881		1593.793	188.10	15 to 35°C
294W882		1592.946	188.20	15 to 35°C
294W883		1592.100	188.30	15 to 35°C
294W884		1591.255	188.40	15 to 35°C
294W885		1590.411	188.50	15 to 35°C
294W886		1589.568	188.60	15 to 35°C
294W887		1588.726	188.70	15 to 35°C
294W888		1587.884	188.80	15 to 35°C
294W889		1587.043	188.90	15 to 35°C
294W890		1586.204	189.00	15 to 35°C
294W891		1585.365	189.10	15 to 35°C
294W892		1584.527	189.20	15 to 35°C
294W893		1583.690	189.30	15 to 35°C
294W894		1582.854	189.40	15 to 35°C
294W895		1582.019	189.50	15 to 35°C
294W896		1581.184	189.60	15 to 35°C
294W897		1580.351	189.70	15 to 35°C
294W898		1579.518	189.80	15 to 35°C
294W899		1578.686	189.90	15 to 35°C
294W900		1577.855	190.00	15 to 35°C
294W901		1577.025	190.10	15 to 35°C
294W902		1576.196	190.20	15 to 35°C
294W903		1575.368	190.30	15 to 35°C
294W904		1574.540	190.40	15 to 35°C
294W905		1573.714	190.50	15 to 35°C
294W906		1572.888	190.60	15 to 35°C
294W907		1572.064	190.70	15 to 35°C
294W908		1571.240	190.80	15 to 35°C

294W909		1570.416	190.90	15 to 35°C
294W910		1569.594	191.00	15 to 35°C
294W911		1568.773	191.10	15 to 35°C
294W912		1567.952	191.20	15 to 35°C
294W913		1567.133	191.30	15 to 35°C
294W914		1566.314	191.40	15 to 35°C
294W915		1565.496	191.50	15 to 35°C
294W916		1564.679	191.60	15 to 35°C
294W17		1563.863	191.70	15 to 35°C
294W18		1563.047	191.80	15 to 35°C
294W19		1562.233	191.90	15 to 35°C
294W20		1561.419	192.00	15 to 35°C
294W21		1560.606	192.10	15 to 35°C
294W22		1559.794	192.20	15 to 35°C
294W23		1558.983	192.30	15 to 35°C
294W24		1558.173	192.40	15 to 35°C
294W25		1557.363	192.50	15 to 35°C
294W26		1556.555	192.60	15 to 35°C
294W27		1555.747	192.70	15 to 35°C
294W28		1554.940	192.80	15 to 35°C
294W29		1554.134	192.90	15 to 35°C
294W30		1553.329	193.00	15 to 35°C
294W31		1552.524	193.10	15 to 35°C
294W32		1551.721	193.20	15 to 35°C
294W33		1550.918	193.30	15 to 35°C
294W34		1550.116	193.40	15 to 35°C
294W35		1549.315	193.50	15 to 35°C
294W36		1548.515	193.60	15 to 35°C
294W37		1547.715	193.70	15 to 35°C
294W38		1546.917	193.80	15 to 35°C
294W39		1546.119	193.90	15 to 35°C
294W40		1545.322	194.00	15 to 35°C
294W41		1544.526	194.10	15 to 35°C
294W42		1543.730	194.20	15 to 35°C
294W43		1542.936	194.30	15 to 35°C
294W44		1542.142	194.40	15 to 35°C
294W45		1541.349	194.50	15 to 35°C
294W46		1540.557	194.60	15 to 35°C
294W47		1539.766	194.70	15 to 35°C
294W48		1538.976	194.80	15 to 35°C
294W49		1538.186	194.90	15 to 35°C
294W50		1537.397	195.00	15 to 35°C
294W51		1536.609	195.10	15 to 35°C
294W52		1535.822	195.20	15 to 35°C
294W53		1535.036	195.30	15 to 35°C
294W54		1534.250	195.40	15 to 35°C
294W55		1533.465	195.50	15 to 35°C
294W56		1532.681	195.60	15 to 35°C
294W57		1531.898	195.70	15 to 35°C
294W58		1531.116	195.80	15 to 35°C
294W59		1530.334	195.90	15 to 35°C

294W60		1529.553	196.00	15 to 35°C
294W61		1528.773	196.10	15 to 35°C

* Wavelength range is +/- 0.4 nm from center channel wavelength. Chip channel selection is based on an empirically determined 0.9 nm offset between 25°C bare chip testing and 25°C CW operation in a CyOptics laser package.

* Performance of the laser will depend on a number of factors, including the customers RF and thermal design, fiber length, wavelength, bit rate and temperature range.
For particular applications please contact CyOptics.

For additional information, contact your CyOptics Account Manager or the following:

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