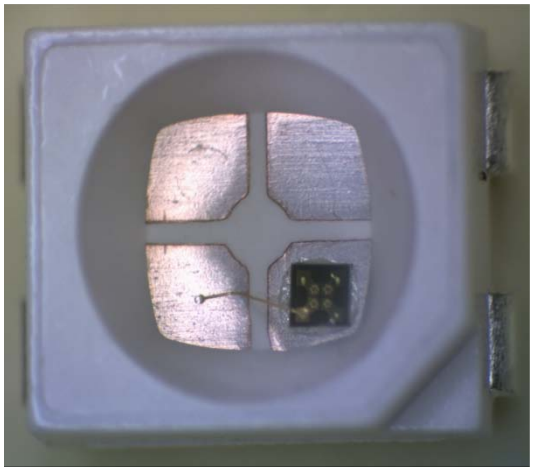
795nm Single-Mode VCSEL

795S-0000-x002, 795S-0000- x092*



PRODUCT DESCRIPTION
Single transverse mode, 795nm VCSEL in a TO-46 package with a window can, industry standard PLCC4 SMT package, or industry standard PLCC2 SMT package.

Near Infra-Red Vertical Cavity Surface Emitting Laser (VCSEL)
This single spectral and spatial mode VCSEL is designed for OEM applications such as position sensing, motion control, medical devices, printing, measurement, and spectroscopic sensing (e.g. atomic clocks). The product is specifically designed for low power dissipation, and polarization and spectral stability.

Features:

- Low divergence angle (<15º FWHM)
- Low operating current (<5mA)
- Single spectral and spatial mode, circular beam profile
- Narrow spectral width (< 100 MHz)
- Stable polarization

Package Details: See separate packages datasheet at http://www.vixarinc.com/pdf/PackagesDS.pdf .

* "x" denotes the character position of option designators. See "Ordering Information" at end of datasheet for details.

RoHS Compliant

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Absolute Maximum Ratings

Parameter	Symbol	Rating	Notes
Storage temperature		-40 to 125 °C	
Operating temperature (VCSEL)	Tv	0 to 95 °C	
Lead solder temperature		260°C, 10 seconds	
CW current (VCSEL)		3 mA	(Note 1)
Maximum pulsed current		7 mA	<1µs pulse width, 1% duty cycle, T=85°C (Note 2)
Laser reverse voltage		5 V	(Note 3)

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated for extended periods of time may affect device reliability.

Electro-Optical Characteristics

VCSEL Operating Temp (Tv) =85°C & Operating Current=1.5mA unless otherwise stated)

Parameter	Symbol	Units	Minimum	Typical	Maximum	Notes
Maximum DC current (CW)		mA	--	--	2	To remain single-mode
Threshold current	Ith	mA	0.6	0.75	0.9	
Operating voltage	Vf	Volts	--	2.1	3	
Series resistance (VCSEL)	Rs	Ohms	150	175	300	
Slope efficiency	SE	mW/mA	--	0.12	--	
Optical output power	Lop	mW	0.06	0.1	0.17	In single mode. T=85°C
Optical output power	Lop	mW	0.1	--	0.25	In single mode. T=25°C
Optical output power	Lop	mW	0.04	0.08	0.16	In single mode. T=95°C
Reverse breakdown voltage		V	10	--	--	Ir ≤ 1nA
Operating wavelength	λop	nm	794.5	795	795.5	
Side Mode Suppression Ratio	SMSR	dB	20	--	--	Unmodulated.
Spectral line width	Δλ	MHz	--	--	100	Unmodulated.
Polarization extinction ratio	PER	dB	16	--	--	0.25mA < If < 2mA (Note 4)
Beam divergence 1/e2		deg	--	15	--	Whole angle
Beam divergence FWHM	FWHM	deg	--	9	--	Whole angle
Wavelength current coefficient		nm/mA	--	0.42	0.6	
Wavelength temp. coefficient		nm/°C	--	0.055	0.061	
Rise time		ps	--	--	100	20%-80%
Fall time		ps	--	--	100	20%-80%
Modulation bandwidth (-3 dB)	BW	GHz	4	--	--	
ESD Survival		V	1000	--	--	(Notes 3, 5)

Note 1: The maximum CW laser current in the Absolute Maximum Ratings is valid for the operating temperature noted at the top of this table; however, the maximum CW laser current decreases with increasing temperature. Contact Vixar for maximum CW laser current values at other temperatures.

Note 2: For details refer to the Vixar Application Note "Operation of VCSELs Under Pulsed Conditions". (http://www.vixarinc.com/technology/applicationnotes.html)

Note 3: For details refer to the Vixar Application Note "VCSEL EOS/ESD Considerations and Lifetime Optimization". (http://www.vixarinc.com/technology/applicationnotes.html)

Note 4: For customers with a product application that is polarization sensitive, Vixar recommends an epoxy curing process of 85°C for 3 hours to ensure the polarization stability is not altered. (Higher temperatures and shorter cure times can change the polarization stability.)

Note 5: Applies only to parts that include an ESD diode. ESD diodes cannot be used if the device is being modulated at rates higher than ~ 35MHz. VCSEL shall survive 3 ESD events applied in both the positive and negative polarity. ESD failures are defined as more than a 15% drop in output power or a 10% increase in reverse leakage current. This test is considered destructive and shall not be conducted on prototype or production parts that are shipped for use by the customer.

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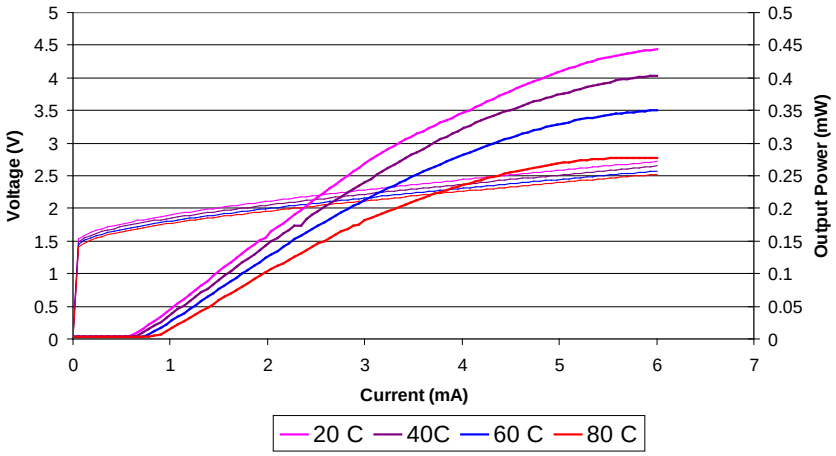
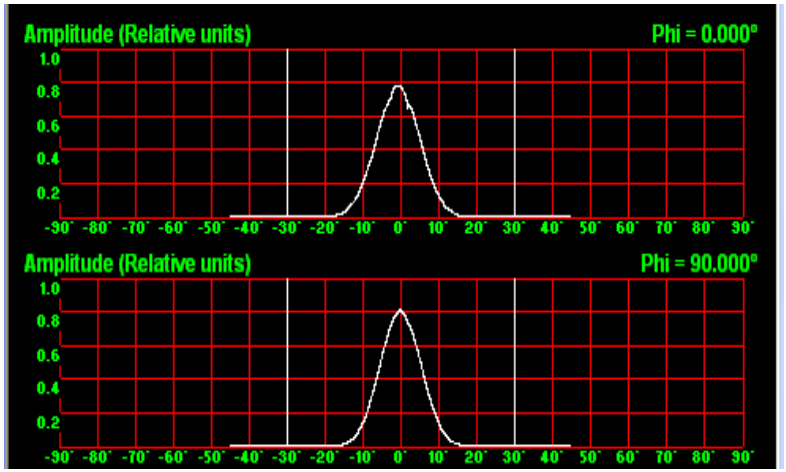
TYPICAL PERFORMANCE CURVES:

Light vs. Current over Temperature

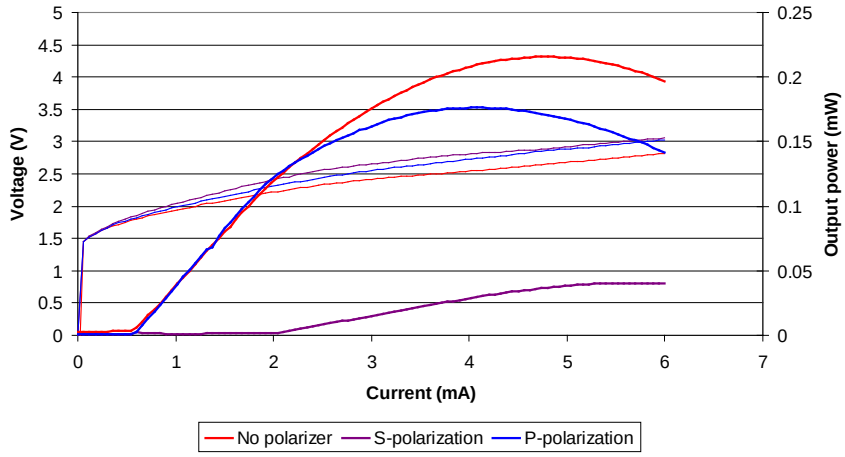
(Single mode to approximately 2mA)



Beam Divergence



Output Power and Polarization at 70°C



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ORDERING INFORMATION

Description	ESD Diode[1]	Package	Hermetically Sealed [2]	Part Number
795 nm single-mode VCSEL, λ tolerance ±0.5 nm		bare die (see Notes 1 & 2)		795S-0000-A002
795 nm single-mode VCSEL, λ tolerance ±0.5 nm		TO-46		795S-0000-B002
795 nm single-mode VCSEL, λ tolerance ±0.5 nm	✓	TO-46		795S-0000-B092
795 nm single-mode VCSEL, λ tolerance ±0.5 nm		TO-46	✓ (2)	795S-0000-G002
795 nm single-mode VCSEL, λ tolerance ±0.5 nm	✓	TO-46	✓ (2)	795S-0000-G092

[1] Do not include an ESD diode if the part will be modulation frequency ≥ 35 MHz.
[2] Hermetically sealed (highly recommended for single-mode VCSELs used in reliability testing and for production).

IMPORTANT: When ordering these model numbers, the following must be specified:

- Precise wavelength desired (i.e., with no tolerance)
- Precise current at which the VCSEL will be operated (i.e., with no tolerance)
- Temperature range at which the desired wavelength is to be achieved (range must be at least 20°C wide)

NOTE 1: 795S-0000-A002 (bare die) that meet a specific wavelength at a given temperature and current may not meet this criteria after the die have been packaged (in any type of package). This phenomenon is due to the fact that packaging changes the thermal characteristics of the VCSEL, which impacts the internal temperature of the VCSEL, which changes the wavelength. If a customer expects this to be an issue for your application, it is the customer's responsibility to resolve this prior to Vixar shipping the ordered products. To help customers resolve this issue, Vixar offers to provide a bare die "calibration part" for customer to assess any packaging or mounting effect on wavelength as function of temperature and current. If this part meets the customer's specifications after packaging and/or mounting, the customer will be billed for the test part(s) that satisfied the customer's wavelength/temperature/current requirement, and obligated to return the other calibration part(s). Vixar takes no responsibility for 795S-0000-A002 (bare die) parts that are shipped without first resolving this issue by using "calibration part(s)" available from Vixar. Solder attachment of 795S-0000-A002 (bare die) parts voids the warranty.

NOTE 2: 795S-0000-A002 (bare die) must be burned in at 125°C and 3 mA for 72 hours (after packaging or mounting).

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PRELIMINARY

895nm Single-Mode VCSEL

895S-0000-x001, 895S-0000- x091*

PRODUCT DESCRIPTION
Single transverse mode, 895nm VCSEL in a TO-46 package with a window can, industry standard PLCC4 SMT package, or industry standard PLCC2 SMT package.

Near Infra-Red Vertical Cavity Surface Emitting Laser (VCSEL)
This single spectral and spatial mode VCSEL is designed for OEM applications such as position sensing, motion control, medical devices, printing, measurement, and spectroscopic sensing (e.g. atomic clocks). The product is specifically designed for low power dissipation, and polarization and spectral stability.

Features:

- Low divergence angle (<15º FWHM)
- Low operating current (<5mA)
- Single spectral and spatial mode, circular beam profile
- Narrow spectral width (< 100 MHz)
- Stable polarization

Package Details: See separate packages datasheet at http://www.vixarinc.com/pdf/PackagesDS.pdf .

* "x" denotes the character position of option designators. See "Ordering Information" at end of datasheet for details.

RoHS Compliant

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Absolute Maximum Ratings

Parameter	Symbol	Rating	Notes
Storage temperature		-20 to 125 °C	
Operating temperature (VCSEL)	Tv	-20 to 90 °C	
Lead solder temperature		260°C, 10 seconds	
CW current (VCSEL)		1.5 mA	(Note 1)
Maximum pulsed current		5 mA	<1µs pulse width, 1% duty cycle, T=85°C (Note 2)
Laser reverse voltage		5 V	(Note 3)

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated for extended periods of time may affect device reliability.

Electro-Optical Characteristics

VCSEL Operating Temp (Tv) =85°C & Operating Current=1mA unless otherwise stated)

Parameter	Symbol	Units	Minimum	Typical	Maximum	Notes
Maximum DC current (CW)		mA	--	--	1.2	To remain single-mode
Threshold current	Ith	mA	0.23	0.45	0.75	
Operating voltage	Vf	Volts	--	1.8	2.45	
Series resistance (VCSEL)	Rs	Ohms	85	300	890	
Slope efficiency	SE	mW/mA	--	0.2	--	
Optical output power	Lop	mW	0.05	0.1	0.25	In single mode. T=85°C
Optical output power	Lop	mW	0.08	--	0.35	In single mode. T=30°C
Optical output power	Lop	mW	--	0.1	--	In single mode. T=90°C
Reverse breakdown voltage		V	10	--	--	Ir ≤ 1nA
Operating wavelength	λop	nm	885	896	906	
Side Mode Suppression Ratio	SMSR	dB	20	--	--	Unmodulated.
Spectral line width	Δλ	MHz	--	--	100	Unmodulated.
Polarization extinction ratio	PER	dB	13	--	--	(Note 4)
Beam divergence 1/e2		deg	--	18	--	Whole angle
Beam divergence FWHM	FWHM	deg	--	10.5	--	Whole angle
Wavelength current coefficient		nm/mA	--	0.6	--	
Wavelength temp. coefficient		nm/°C	--	0.06	--	
Rise time		ps	--	--	100	20%-80%
Fall time		ps	--	--	100	20%-80%
Modulation bandwidth (-3 dB)	BW	GHz	4	--	--	
ESD Survival		V	1000	--	--	(Notes 3, 5)

Note 1: The maximum CW laser current in the Absolute Maximum Ratings is valid for the operating temperature noted at the top of this table; however, the maximum CW laser current decreases with increasing temperature. Contact Vixar for maximum CW laser current values at other temperatures.

Note 2: For details refer to the Vixar Application Note "Operation of VCSELs Under Pulsed Conditions". (http://www.vixarinc.com/technology/applicationnotes.html)

Note 3: For details refer to the Vixar Application Note "VCSEL EOS/ESD Considerations and Lifetime Optimization". (http://www.vixarinc.com/technology/applicationnotes.html)

Note 4: For customers with a product application that is polarization sensitive, Vixar recommends an epoxy curing process of 85°C for 3 hours to ensure the polarization stability is not altered. (Higher temperatures and shorter cure times can change the polarization stability.)

Note 5: Applies only to parts that include an ESD diode. ESD diodes cannot be used if the device is being modulated at rates higher than ~ 35MHz. VCSEL shall survive 3 ESD events applied in both the positive and negative polarity. ESD failures are defined as more than a 15% drop in output power or a 10% increase in reverse leakage current. This test is considered destructive and shall not be conducted on prototype or production parts that are shipped for use by the customer.

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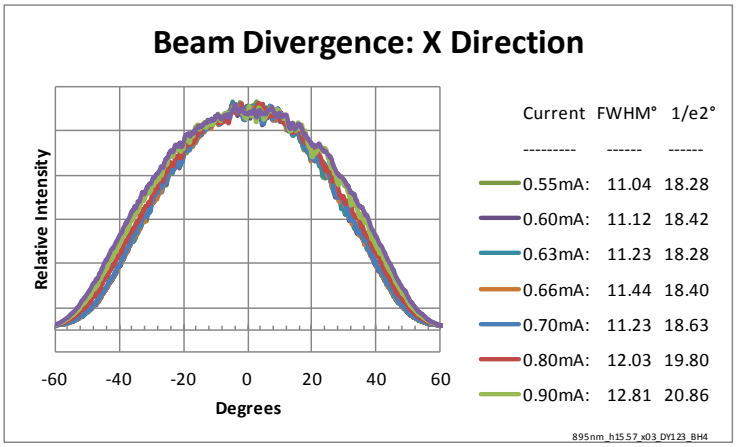
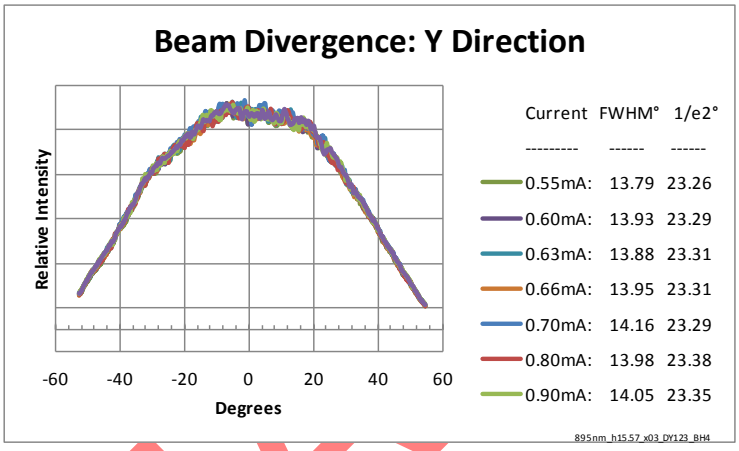
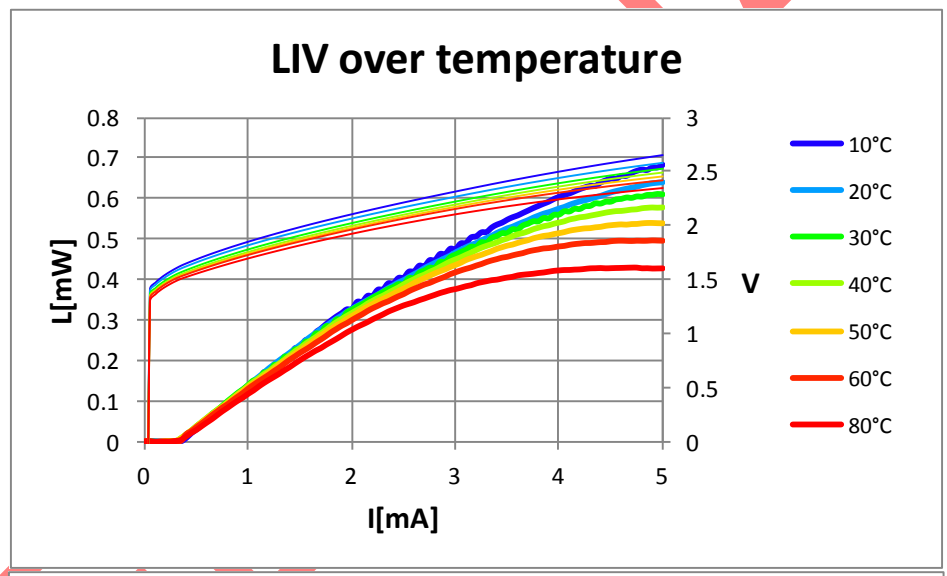
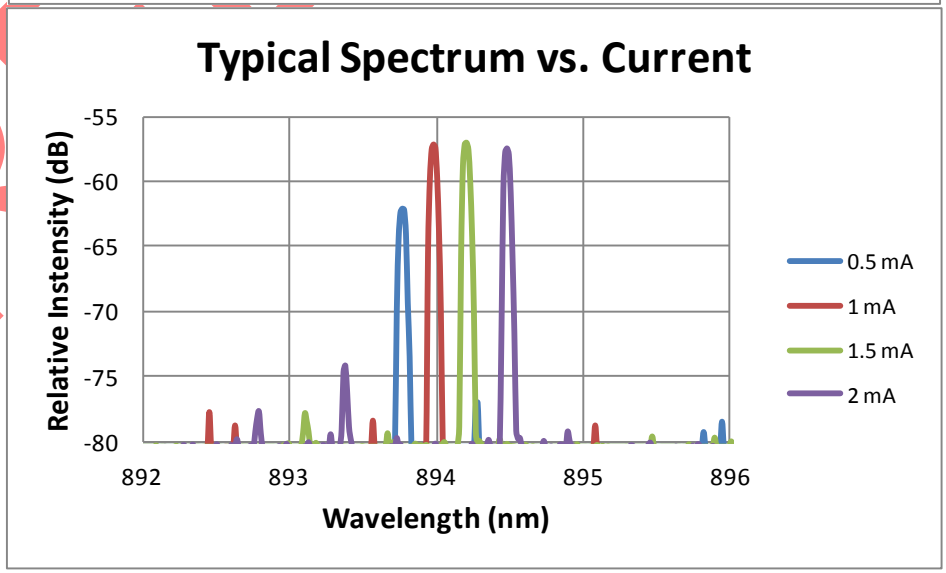
TYPICAL PERFORMANCE CURVES:









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ORDERING INFORMATION

Description	ESD Diode*	Package	Part Number
895 nm single-mode VCSEL, λ tolerance ±0.5 nm		TO-46	895S-0000-B001
895 nm single-mode VCSEL, λ tolerance ±0.5 nm	✓	TO-46	895S-0000-B092
895 nm single-mode VCSEL, λ tolerance ±0.5 nm		TO-46**	895S-0000-G001
895 nm single-mode VCSEL, λ tolerance ±0.5 nm	✓	TO-46**	895S-0000-G092

* -- Do not include an ESD diode if the part will be modulation frequency ≥ 35 MHz.
** -- Hermetically sealed (recommended for single-mode VCSELs).

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