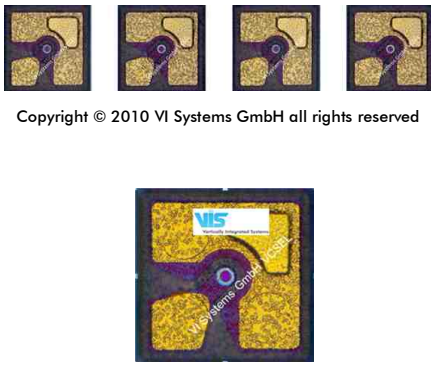
Datasheet

Vertically Integrated Systems

40 Gbit/s VCSEL and VCSEL Array chips (850 nm)

Product Code:	V40-850C1	1x1 chip
	V40-850C4	1x4 array
	V40-850C12	1x12 array



Microscope images of a 1x4 VCSEL array chip and a single VCSEL die. The actual products may vary in appearance and size.

Preliminary

Product Description

These compact and ultrahigh modulation rate top-emitting GaAs-based vertical cavity surface emitting laser (VCSEL) chips and 1xN (N=1, 2, 4, 12, etc.) arrays are available as engineering samples for use in the development and evaluation of optical interconnections, optical backplanes and integrated waveguides, and next-generation optical data communications systems. The VCSELs are contacted on the top-surface individually using ground-source (GS) microprobes, wire bonds, or flip-chip bonds.

Features

- Up to 12 parallel channels
- Up to 40 Gbit/s per channel
- High temperature stability
- A device-to-device pitch of 250 μm
- Suitable for wire or flip-chip bonding

Applications

- Active optical cables (AOCs)
- High-speed optical interconnections and links
- Infiniband EDR (eight data rate)
- Short-reach 40/100 Gbit/s Ethernet
- Chip-to-chip interconnects

Parameter	**Typical**	**Notes** (T = 25°C)
Emission wavelength	850 nm	840 – 860 nm
Data bit rate (BR)	up to 40 Gbit/s per channel	
-3dB modulation bandwidth (BW)	20 GHz	
Threshold current	0.4 mA	
Peak output power	4 mW	multiple transverse modes
Wall plug efficiency	> 20%	I_{op} = 1-5 mA
Differential L-I slope efficiency	> 0.5 W/A	I_{op} = 1-6 mA
Rise time (20% to 80%)	< 10 ps	

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Electro-Optical Specifications (T = 25°C unless noted otherwise)

Parameter	Symbol	Test Condition	Min	Typical Value	Max	Unit
Maximum data bit rate	BR			40		Gbit/s
Maximum small signal bandwidth	BW (f_{3dB})			20		Gbit/s
Rise / Fall time	τ_R / τ_F	20%-80%		<10/10		ps
Slope efficiency	η	I_{op} = 1-6 mA		0.5		W/A
Threshold current	I_{th}			0.4		mA
Differential resistance	R_d	I_{op} = 6 mA		90		Ω
Operating power	P_{op}			8	15	mW
Operating voltage	V_{op}	I_{op} = 6 mA		2.5		V
Beam divergence	θ	FWHM		24		°
Emission wavelength	λ	I_{op} = 6 mA	835	850	865	nm
Spectral bandwidth (RMS)	$\Delta\lambda_{RMS}$	I_{op} = 6 mA		0.5	0.7	nm
Capacitance	C			310		fF
Threshold uniformity	ΔI_{th}	1x4 array		0.1		mA
Slope efficiency uniformity	$\Delta\eta$	1x4 array		0.1		W/A
Slope efficiency variation	$\Delta\eta_T$	0 to 85°C I_{op} ≤ 8 mA		≤-0.5		%/K
Thermal resistance	$R_{thermal}$			3		°C/mW

Absolute Maximum Ratings

Parameter	Symbol	Test Condition	Min	Max	Unit
Optical output power	P_{max}			4.5	mW
Peak forward current	I_f			9	mA
VCSEL reverse voltage	V_{rv}			5	V
Operating temperature	T_{op}			85	°C
Storage temperature	T_{st}		-40	100	°C
Soldering Temperature	T_{sl}	max 260 sec		150	°C

Mechanical Dimensions

Parameter	Type	Min	Typ	Max	Unit
VCSEL pitch	all		250		µm
Length 1x1 VCSEL chip	V40-850C1		210	250	µm
Length 1x4 VCSEL array	V40-850C4		960	1000	µm
Length 1x12 VCSEL array	V40-850C12		2960	3000	µm
Height	all	140	150	160	µm
Width	all		210	250	µm

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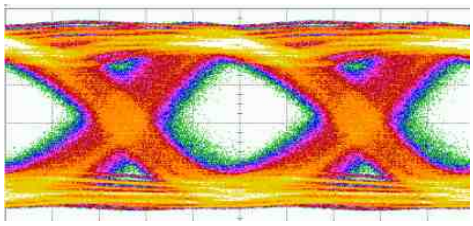
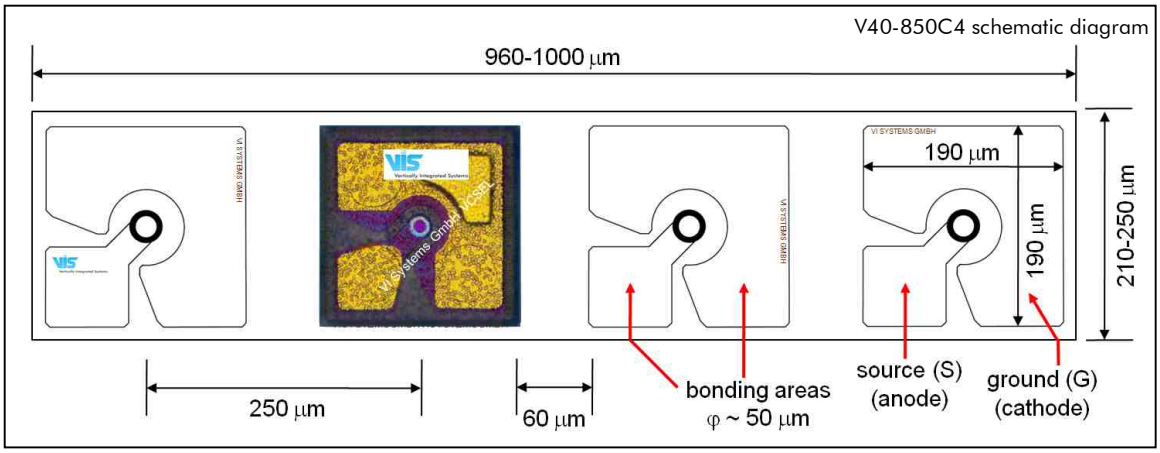
40 Gbit/s Optical Eye Diagram at 25°C



Test of a single channel using a fiber-coupled VI Systems (VIS) VCSEL transmitter module and a VIS R40-850-TB receiver

Dimensions



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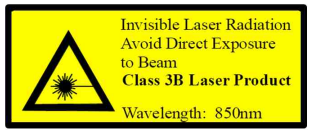
Limited Qualification Notification

The V25-850CX has been tested to meet specifications outlined in this datasheet at room temperature. However it has not undergone full qualification testing or characterization and therefore may not meet the performance specifications over all extremes.



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