

PhotonWave Technologies
Nanotechnology and Photonics based solutions for smarter digital communications

ABSTRACT

We present a path-breaking patented product innovation that will revolutionize fiber-optic communications worldwide. Our disruptive technology, based on ‘Silicon Photonics & Nanotechnology’ will provide high-performance optical interconnect solutions (1 - 40 Gbps) at a fraction of the current costs.

BUSINESS OPPORTUNITY

Fiber-Optic Networks

A fiber-optic link mainly comprises the optical fiber and a Transmitter/Receiver at either end of the fiber. In order to reach the end-customer’s computer/device, the ‘light data’ needs to be converted into electrical pulses by components called ‘Transceivers’.

Currently, transceivers which are produced from exotic materials like Lithium-Niobate, are expensive to manufacture and impose additional overhead costs in terms of fabrication, testing and packaging. This precludes optic-fiber links from being installed in the ‘last-mile’. Present optical network infrastructure is underutilized because the last-mile copper cables act as a bottleneck to the otherwise mind-boggling speeds that can be provided by fiber optic technology.

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Microprocessors

The microprocessor industry has been trying to increase the speeds of microprocessors without increasing their size. However, as the number of transistors increases, so does the heat generated on-chip which limits the ability to increase processor speed.

SILICON NANO-PHOTONICS: OUR UNIQUE SOLUTION

Patented Technology

Our patented procedure based on Silicon Nano-Photonics successfully employs silicon (instead of exotic materials) as a ‘fabrication base’ for high-speed optical communication. This was previously not possible since silicon exhibited poor ‘light properties’ and was not conducive to optical communication.

Economies of Scale/Scope

The fabrication industry has built its expertise around silicon. Manufacturing of silicon based transceivers (SBTs) thus reduces manufacturing costs of optical transceivers by almost 500% through reduced material and overhead costs.

Performance Augmentation

Our research pushes the communication industry’s technology limits beyond 10 Gbps and enables speeds of upto 40 Gbps. For microprocessors, SBTs can be placed on-chip to facilitate communication at the speed of light thus avoiding heat generation through electrical pulses.

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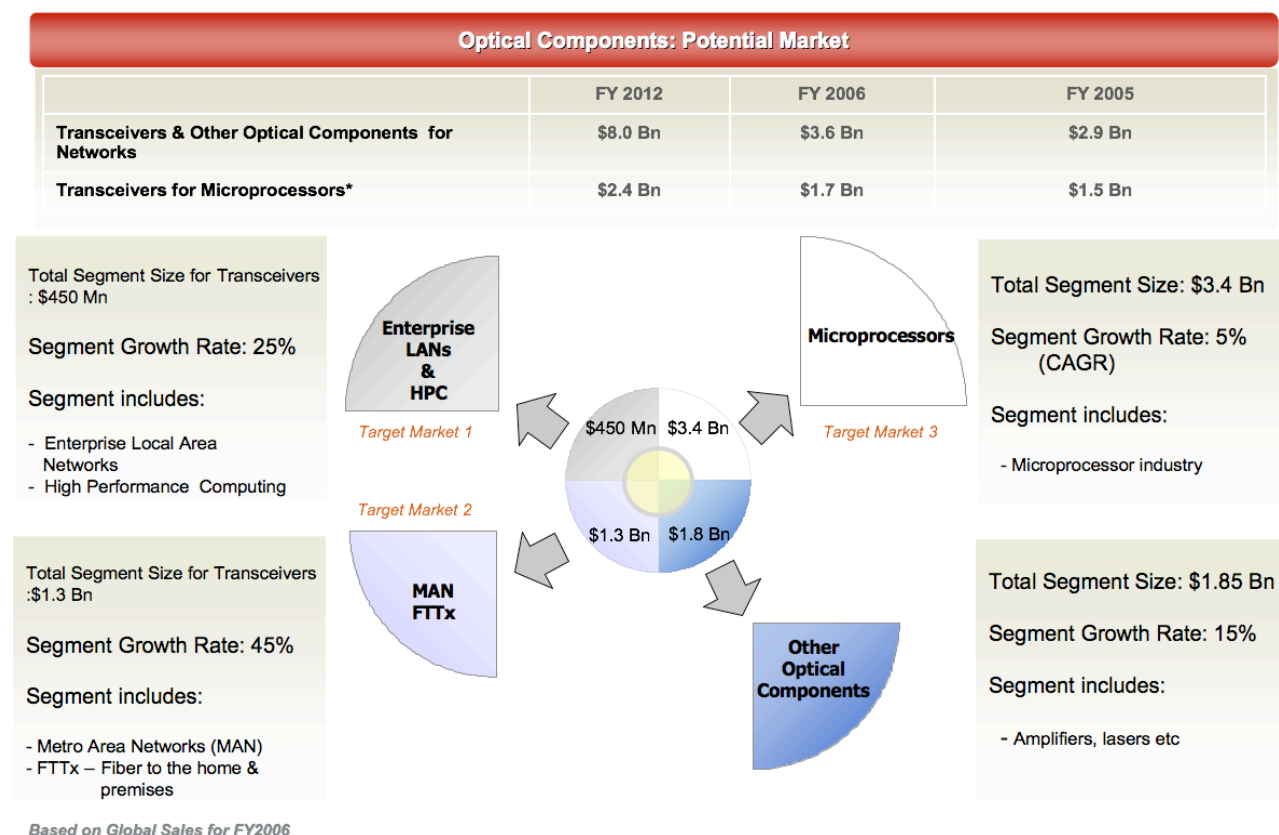
Product Offering

1-40 Gbps Micro-scale Modulator: Our high range product provides modulation rates comparable to the best available Lithium based modulators and is 100 times smaller (50 x 50 Microns).

Product portfolio comprises SBTs of 1, 10, 20 and 40 Gbps capacities.

MARKET ANALYSIS

The market for optical components comprises four segments, three of which will be our target markets.



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Enterprise LANs & High Performance Computing (HPC)

This segment comprises users like academic & research institutions and data storage companies who require ultra-high bandwidths (10-40 Gbps) for their distributed/grid computing activities. Current transceiver solutions are very expensive and due to the cost constraints the technology frontier has not moved beyond 10 Gbps.

FTTx (Fiber to the premise) & Metro Area Networks (MANs)

With the adoption of SBTs set to revolutionize communication networks both in terms of costs and speeds, the Fiber channel (FTTx) segment is expected to have a great future potential. This radical change will trigger a stream of next generation services such as video on demand, video-mail, HDTV etc that are waiting to take off but are constrained by the low adoption of FTTx and the resulting low bandwidths today. Despite the high costs, companies like Verizon have started deploying fiber at 3 million households per annum.

Microprocessors

While there is no existing SBTs market for microprocessors, we estimate optical components to cost $1/10^{\text{th}}$ that of a microprocessor chip and have estimated our market size accordingly. There is a great future potential to adopt our technology for this market to address the need for high-performance communications while reducing the heat and the size of the chip.

BUSINESS MODEL & ROLL-OUT PLAN

Technology Leadership & Innovation

We envision PhotonWave to be the technology leader in the field of Silicon Photonics and revolutionize data communication across various sectors such as telecommunications, computing, mobiles etc.

Our SBT for telecommunications & computing has been beta-tested and is ready to be launched.

The next step is to take our path-breaking research to the market.

In line with our vision, we will explore new areas and applications of this technology and our immediate R&D plans include adopting/testing this technology for microprocessors.

Operations

Our operations strategy involves working on a distributed model to leverage on the competitive advantage of different geographies.

We will operate on a fab-less model by outsourcing product manufacturing to fabrication facilities in China/Taiwan. Product design & development will be performed by our research team in the USA whereas product support, prototyping and testing will be implemented by our offshore team in India.

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Sales & Marketing

We will pursue a differentiation strategy for the Enterprise LANs and HPC segment which is niche market providing high margins. Our premium products (10, 20 & 40 Gbps) will be positioned for this segment.

For FTTx and MANs market, which allows high volumes at low margins, we will pursue a cost leadership strategy. We will position our 1 Gbps (and lower) products to this segment and pass on to our customers the tremendous cost savings we will achieve through standardized industry procedures from our patented procedures.

We intend to build a global distribution channel within a short period through both distributors/re-sellers and direct sales force employment to be better positioned to cater to the future explosive growth of these markets. We will target the North-American market to begin with, followed by Asia-Pacific.

Strategic Alliances

We will focus on building strategic relationships with established network equipment manufacturers. Partnering with OEMs to provide SBTs as components will create a win-win situation as the OEMs will have access to our high-performance SBTs customized to their equipment while we would have created a new customer segment to cater to. Further, such strategic partnerships will help us build a sustainable business.

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FINANCIALS

Our venture requires an investment of US\$4.5 mn that includes capital outlay and operating cash.

We expect a 5 year sales CAGR of 139%. The breakeven period is 2.1 years with an IRR of 132% and an NPV of \$32.25 mn. Going forward, including our current and future funding requirements, we intend to issue upto 26% equity in the venture.

Please refer exhibits II-IV for detailed financials.

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Exhibit I – Executive Team

EXECUTIVE TEAM		
Sasikanth Manipatruni	CTO	Doctoral candidate at Cornell University's Electrical & Computer Engineering (ECE) department. President of Cornell's Electron Devices Society. PhotonWave's technology is founded on Sasikanth's research work at Cornell. He owns the patent for our technology and will function as the Chief Technology Officer for PhotonWave.
Sanjna Rao	COO	An entrepreneur, has extensive experience in managing several aspects of start-up environments including business strategy, operations and financial planning. Has a degree in Artificial Intelligence from Cornell University and has worked with emerging technologies while at Cornell.
Pradeep Machineni	VP - Business Development	Six years of experience with leading consulting companies such as Deloitte & Keane Inc. Areas of expertise include business development, sales & marketing. Extensive experience in selling to Silicon Valley Customer Base such as Cisco.
Nirman R Shetty	General Manager - India Operations	Program Manager at Microsoft Corp, has extensive experience in a product development environment. Proficient in product lifecycle management & networks management. He has managed product development efforts for startups prior to joining Microsoft and will head the India Operations for PhotonWave.
<i>Sanjna, Pradeep & Nirman are currently pursuing a management program at the Indian School of Business (Hyderabad, India)</i>		

Exhibit II – 5 Year P&L Projections

PROFITABILITY STATEMENT					
Particulars	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Annual Sales</i>	<i>13000</i>	<i>52600</i>	<i>201600</i>	<i>725800</i>	<i>2063200</i>
<i>Inventory Carried Fwd</i>	<i>2300</i>	<i>9260</i>	<i>36160</i>	<i>72580</i>	<i>206320</i>
Sales Projections					
<i>40 Gbps</i>	<i>0.00</i>	<i>200</i>	<i>600</i>	<i>1800</i>	<i>7200</i>
<i>20 Gbps</i>	<i>0</i>	<i>400</i>	<i>1000</i>	<i>4000</i>	<i>16000</i>
<i>10 Gbps</i>	<i>1000</i>	<i>4000</i>	<i>12000</i>	<i>24000</i>	<i>36000</i>
<i>1 Gbps</i>	<i>2000</i>	<i>8000</i>	<i>28000</i>	<i>56000</i>	<i>84000</i>
<i>SBTs for FTTx</i>	<i>10000</i>	<i>40000</i>	<i>160000</i>	<i>640000</i>	<i>1920000</i>

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Revenue Projections					
40 Gbps	0	1000000	2850000	7695000	24624000
20 Gbps	0	1200000	2850000	10260000	32832000
10 Gbps	1000000	3800000	10260000	16416000	19699200
1 Gbps	600000	2280000	7182000	11491200	13789440
SBTs for FTTx (< 1Gbps)	1000000	3600000	12960000	46656000	111974400
SBTs for microprocessors	0	0	0	0	0
Total Sale Realization	\$ 2,600,000	\$ 11,880,000	\$ 36,102,000	\$ 92,518,200	\$ 202,919,040
Top line Growth		356.92%	203.89%	156.27%	119.33%
Cost of Revenue					
Production Cost (Outsourcing Model)	\$ 696,300.00	\$2,739,600.00	\$9,777,510.00	\$32,475,831.00	\$88,892,195.20
Shipping/Logistics	3560	6312	24192	87096	247584
Total	\$699,860.00	\$2,745,912.00	\$9,801,702.00	\$32,562,927.00	\$89,139,779.20
As a percentage of sales	26.92%	23.11%	27.15%	35.20%	43.93%
Gross Profit	\$ 1,903,700	\$ 9,140,400	\$ 26,324,490	\$ 60,042,369	\$ 114,026,845
Gross Margin	73.22%	76.94%	72.92%	64.90%	56.19%
Product Development Expenses					
SOI Wafer Costs	960000	800000	800000	720000	680000
Processing Costs	240000	160000	160000	144000	128000
CAD License Costs	500000	2000000	2000000	2500000	2500000
B Testing Costs	480000	240000	240000	240000	240000
New R&D Costs	100000	594000	3610200	11102184	24350285
Salaries	175238	367857	707524	1301952	1611071
Total	\$ 2,455,238.10	\$ 4,161,857.14	\$ 7,517,723.81	\$ 16,008,136.38	\$ 29,509,356.23
As a percentage of Sales	94.43%	35.03%	20.82%	17.30%	14.54%
Sales & Marketing Expenses					
Sales/Marketing Personnel	165000	501143	865286	1301429	1490929
Advertising/Promotion	200000	300000	450000	675000	1012500
Comission	195000	891000	2707650	6938865	18262714
Other (Royalty)	260000	1188000	3610200	9251820	20291904
Total	\$ 820,000.00	\$ 2,880,142.86	\$ 7,633,135.71	\$ 18,167,113.57	\$ 41,058,046.17
As a percentage of Sales	31.54%	24.24%	21.14%	19.64%	20.23%
General & Admin Expenses					
Salaries (Mgmt &	249048	574952	746524	836781	888364

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admin)					
Rent	50000	100000	240000	300000	300000
Pre-Operative Exp	25500				
Other (Maintenance etc)	18000	36000	36000	3000	3000
Total	342548	710952	1022524	1139781	1191364
Earnings Before Interest, Taxes & Depreciation	-1714086	1387448	10151107	24727338	42268079
Depreciation	123000	123000	323000	523000	523000
Interest	0	0	0		
Total	123000	123000	323000	523000	523000
Net profit	-\$1,837,086	\$1,264,448	\$9,828,107	\$24,204,338	\$41,745,079

Exhibit III – 5 Year Balance Sheet

BALANCE SHEET					
Particulars	Year 1	Year 2	Year 3	Year 4	Year 5
LIABILITIES					
Owned Capital					
Equity	4,500,000	4,500,000	4,500,000	4,500,000	4,500,000
Reserves and Surplus	(1,837,086)	(572,638)	9,255,469	33,459,807	75,204,885
Total Equity	2,662,914	3,927,362	13,755,469	37,959,807	79,704,885
Borrowed Capital	-	-	-	-	-
Accounts Payable	34,815	136,980	488,876	1,623,792	4,444,610
TOTAL LIABILITIES	2,697,729	4,064,342	14,244,344	39,583,598	84,149,495
ASSETS					
Fixed Assets	492,000	369,000	1,046,000	1,523,000	1,000,000
Working Capital					
Bank	1,712,229	1,496,642	6,264,324	21,134,508	44,458,839
Inventory	103,500	416,700	1,518,720	3,048,360	8,252,800
Accounts Receivable	390,000	1,782,000	5,415,300	13,877,730	30,437,856
TOTAL ASSETS	2,697,729	4,064,342	14,244,344	39,583,598	84,149,495

Exhibit IV – Project Cost Projections & Financial Indicators

PROJECT COST		FINANCIAL INDICATORS	
Project Cost Component	USD		
Fixed assets	615000	Internal Rate of Return (5 yr)	132%
Preoperative	25500	Pay Back Period (years)	2.04
Operating Expenses (Year 1)	3617786	Net profit 2nd Year	1264448

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Contingency	242389		Av. Net Profit for 5 Years	15040977
Annual Setup Costs	0		Top-line CAGR	139%
Total Project Cost	4,500,675			

Exhibit V – PhotonWave – Competitive Analysis

<div> <ul style="list-style-type: none"> Technology Innovation IP Protection Standard Operating Procedures – Silicon Reduced Mfg lead -time & inventory holding Relationships with OEMs powered by technology leadership </div> <div> <div>Competitive Advantage</div> <div>Risk Factors</div> </div> <div> <ul style="list-style-type: none"> IP Infringement Qualification Process (OEMs) Dependence on Fab Changing Market & Technology requirements Hiring Technical Talent </div>	Present Competition	Evaluation Factors	PhotonWave	Finisar	JDS Uniphase
		Optical Technology	Strong	Average	Average
		Speed	Strong (40 Gbps)	Average (1-10 Gbps)	Average (1-10 Gbps)
		Power Consumption	Strong (0.1 W)	Average (2-10 W)	Average (2-10 W)
		Size	Strong (50 ² μ/device)	Average (Entire Chip)	Average (Entire Chip)
		Leaming Curve	Average	Strong	Strong
		Cost	Strong	Average	Average
		Sales & Distribution	-	Strong	Strong
		Evaluation Factors	PhotonWave	Luxtera	Intel
		Optical Technology	Strong	-	Strong
Future Competition		Speed	Strong (40 Gbps)	Average (1-10 Gbps*)	NA
		Power Consumption	Strong (0.1 W)	Average (2 W)	NA
		Size	Strong (50 ² μ/device)	Average (Module – many per chip)	NA
		Leaming Curve	Average	Average	Strong
		Cost	Strong	-	-
		Sales & Distribution	-	Average	Strong