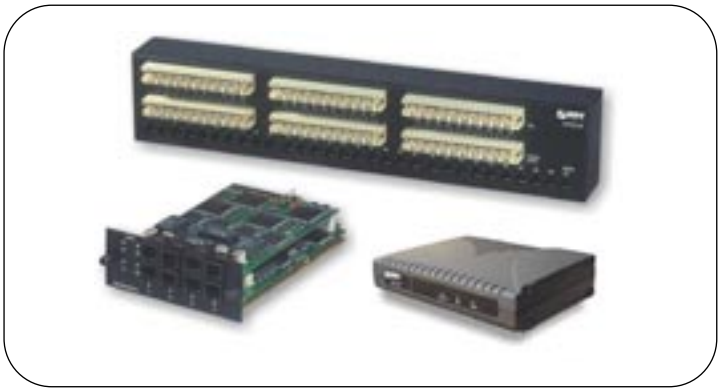
MRV Communications, Inc.

ETHERNET ACCESS SOLUTIONS

Datasheet

Ethernet over VDSL



Overview

The Ethernet over VDSL (Very high bit rate Digital Subscriber Line) or EoV technology enables the creation of high-speed links of up to 15Mbps full duplex, over standard telephone cables. The Ethernet over VDSL product line is delivering standard Ethernet traffic over VDSL transport, which reaches distances of up to 1500 m, in parallel to the POTS or ISDN service.

EoV is a two-band QAM based VDSL physical medium used as a transport for Ethernet as the layer-2 protocol. The basic upload channel frequency is between 0.9 Mhz to 3.75 Mhz and the basic download channel frequency is between 3.75 Mhz and 8.0 Mhz. EoV transmits in the basic "power spectrum density" (PSD) of –60 dBm/Hz. The Ethernet carrier uses standard Ethernet frames, and supports the full range of Ethernet features supported in the OptiSwitch™ such as Ethernet switching, QoS, Spanning tree and Virtual LAN (VLAN).

Building blocks

The EoV solution comprises three elements:

- An OptiSwitch module: available in configurations of 8 EoV ports, hybrid models of 4 EoV ports and two ports of 100Base-FX or two ports of 10/100Base-TX and a repeater module which mixes 4 ports of NT (Network Termination) side and 4 ports of LT (Line Termination) side.
- Customer premises equipment (CPE): an Ethernet over VDSL modem, with a single RJ-45 port for 10/100Base-TX, and two RJ-11ports– one connected to the voice line that carries the voice and Ethernet over VDSL traffic to the out-going line
- A splitter: a passive device which functions as a low pass filter, which separates the high-frequencies used by the VDSL carrier, from the Voice traffic. The splitter is available in a configuration of 30 ports

Dynamic Carrier Management (Self-healing)

Ethernet over VDSL uses standard copper telephone cables as the physical transmission medium. This physical medium is sensitive to a variety of interferences, which can influence the quality of the link. These interferences, which can include electromagnetic signals from other lines ("cross talk") or changes in conductivity due to temperature variations, can cause the loss of the link of an xDSL connection.

As part of a carrier class DSL solution, the EoV module installed in the OptiSwitch has the unique ability to dynamically modify the carrier (frequencies used). Furthermore the system also has the capability to measure (in real time) parameters such as Signal to Noise Ratio and Bit Error Rate, an indication of the quality of the physical line. These features allow the system to sense deterioration in the line's quality, and once a pre-defined threshold is crossed the switch automatically re-negotiates the frequencies used in order to maintain the link integrity.

ETSI Standard

The basic EoV model supports the VDSL standards – ETSI plans 997 and ETSI plan 998. When configured to comply with the frequencies allocated by these standards, EoV is limited to 4 Mbps, full duplex. Compliance to these standards is configured through the management interface.

Long range

A special model of the system delivers long-range VDSL transmission, which can reach distances of up to 2.4 Km with 4 Mbps, full duplex traffic. This solution includes a special OptiSwitch module and special Long range CPE that uses a higher PSD on an upload channel between 0.6 Mhz and 2.0 Mhz and a download channel between 2.3 Mhz and 4.8 Mhz.

NT and LT side

The OptiSwitch EoV modules as well as the CPE are available in both NT side (Network Termination) and LT side (Line Termination). This allows the installation of module-to-module and CPE-to-CPE configurations. When an 8 port NT module is connected to an 8 port LT module, a high-speed trunk line can be created using Ethernet channel. Using the CPE-to-CPE option, a high-speed point-to-point connection over a single telephone cable pair can be created using simple, low cost, unmanaged modems, which read the configuration and set-up parameters from an on-board memory chip.

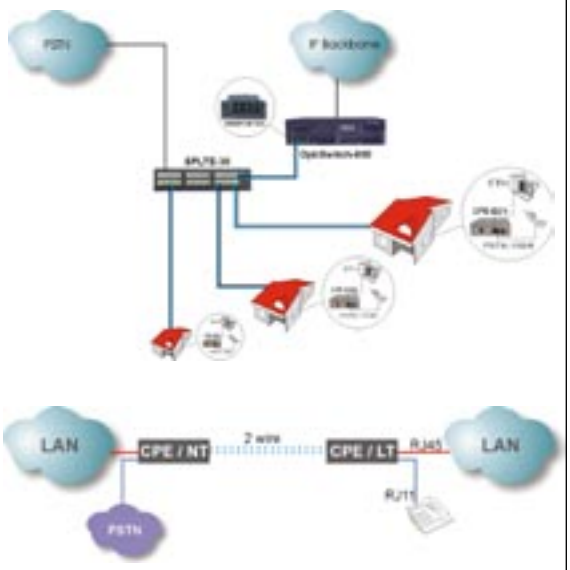
Features

- Full duplex 15 Mbps Ethernet to distances up to 1500 m (5000 ft)
- Long range EoV for distances up to 2.4 km
- Ethernet over QAM based VDSL
- Spectral allocation allows operation with POTS and ISDN services on a single line
- Supports ETSI 997 and 998 standards
- Module and CPE are available as NT and LT side, for modem-to-modem and module-to-module connectivity
- Rate limit per port
- QoS EM2004 EoV modules
- Comprehensive SNMP graphical managed solution

Applications

- A complete solution for High speed service over existing copper lines
- Ideal for high speed access of up to 15 Mbps full duplex connection for Small Office/Home office
- Provides a complete solution for the hospitality industry facilities such as hotels, convention centers and business centers
- High speed connection to Multi-tenant and Multi-dwelling units

Application examples



Technical Specifications: Ethernet over VDSL

General	CPE - EoV	EM2003 - 8EoV	SPLTR -30
Physical Dimensions	110 x 45 x150 mm	110 x 45 x150 mm	110 x 45 x150 mm
(Wx Hx D)	4.33 x 1.77 x 5.90 inch	4.33 x 1.77 x 5.90 inch	4.33 x 1.77 x 5.90 inch
Weight	426 gr - 0.93 lb	426 gr - 0.93 lb	426 gr - 0.93 lb
Pinout	PHONE: 3 -- line signal; 4 -- line signal	PHONE: 3 -- line signal; 4 -- line signal	PHONE: 3 -- line signal; 4 -- line signal
	LINE: 3 -- line signal; 4 -- line signal	LINE: 3 -- line signal; 4 -- line signal	LINE: 3 -- line signal; 4 -- line signal
	ETHERNET: 1 -- Tx+; 2 -- Tx-; 3 --Rx+; 6 -- Rx-	ETHERNET: 1 -- Tx+; 2 -- Tx-; 3 --Rx+; 6 -- Rx-	ETHERNET: 1 -- Tx+; 2 -- Tx-; 3 --Rx+; 6 -- Rx-

Band Allocation table

Mode	Downstream (Mhz)	Upstream (Mhz)	Distance	Speed
EoV	0.9 - 3.75	3.75 – 8.0	1500m	15Mbps
ETSI 997 and 998 Compliant EoV	0.9 – 3.0	3.75 - 5.1	1500m	4 Mbps
Long Range EoV	0.6 – 2.0	2.3 – 4.8	2400m	4 Mbps

Expected Rate: Reach in Mbps

General	Cable Lenght		Downstream					Upstream				
AWG 24 0.5 mm	(km)	(ft)	FEXT20	FEXT4	FEXT2	FEXT1	NoFEXT	FEXT20	FEXT4	FEXT2	FEXT1	NoFEXT
	0.2	660	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
	0.4	1320	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
	0.6	1980	15.00	15.00	15.00	15.00	15.00	14.30	15.00	15.00	15.00	15.00
	0.8	2640	15.00	15.00	15.00	15.00	15.00	12.80	15.00	15.00	15.00	15.00
	1	3300	14.36	15.00	15.00	15.00	15.00	11.40	15.00	15.00	15.00	15.00
	1.2	3960	13.55	15.00	15.00	15.00	15.00	9.40	12.40	13.6	14.60	15.00
	1.4	4620	12.60	15.00	15.00	15.00	15.00	5.8	7.0	7.4	7.6	8.2
	1.6	5280	11.19	12.91	13.44	13.86	14.88	2.2	2.4	2.4	2.5	2.5
	1.8	5940	8.95	9.79	10.01	10.16	10.47	0.5	0.5	0.5	0.5	0.5
	2	6600	6.04	6.33	6.39	6.43	6.51	0.1	0.1	0.1	0.1	0.1
AWG 26 0.4 mm	0.2	660	15.0	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
	0.4	1320	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
	0.6	1980	15.00	15.00	15.00	15.00	15.00	14.20	15.00	15.00	15.00	15.00
	0.8	2640	15.00	15.00	15.00	15.00	15.00	12.30	15.00	15.00	15.00	15.00
	1	3300	14.03	15.00	15.00	15.00	15.00	9.10	11.40	12.20	12.80	14.70
	1.2	3960	12.51	14.49	15.00	15.00	15.00	3.70	4.10	4.20	4.30	4.50
	1.4	4620	9.85	10.70	10.97	11.13	11.47	0.6	0.7	0.7	0.7	0.7
	1.6	5280	6.08	6.30	6.35	6.39	6.45	0.1	0.1	0.1	0.1	0.1
	1.8	5940	2.80	2.84	2.85	2.86	2.87	0.0	0.0	0.0	0.0	0.0
	2	6600	1.00	2.80	1.01	1.01	1.01	0.0	0.0	0.0	0.0	0.0

Ordering Information

Modules with QoS for Central Office side	
EM2004-8EOV/L	8 port Ethernet over VDSL Uplink with QoS Support for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m), LT side (Central Office/Switch side)
EM2004-8EOV/SL	8 port Ethernet over VDSL (for Smart Phones) Uplink with QoS Support for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m), LT side (Central Office/Switch side)
Modules for Central Office side	
EM2003-8EOV/L	8 port Ethernet over VDSL Uplink for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m), LT side (Central Office/Switch side)
EM2003-8EOV/SL	8 port Ethernet over VDSL (for Smart Phones) Uplink for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m), LT side (Central Office/Switch side)
EM2003-8LEOV/L	8 port Long range Ethernet over VDSL Uplink for OptiSwitch Family (4Mbps full duplex up to 2400m), LT side (Central Office/Switch side)
EM2003-4E+2T	4 port Ethernet over VDSL (LT side) and two ports 10/100Base-TX (RJ45) Uplink for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m)
EM2003-4E+2F/M	4 port Ethernet over VDSL (LT side) and two ports 100Base-FX (MM, 0-2Km, 1310nm, DSC) Uplink for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m)
EM2003-4L+4N	4 port Ethernet over VDSL LT side and 4 port Ethernet over VDSL NT side Uplink for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m)
Modules for Customer Premises side	
EM2003-8EOV/N	8 port Ethernet over VDSL Uplink for OptiSwitch Family (15Mbps Full duplex/ETSI997/ETSI998 up to 1500m), NT side (Customer Premises side)
EM2003-8LEOV/N	8 port Long range Ethernet over VDSL Uplink for OptiSwitch Family (4Mbps full duplex up to 2400m), NT side (Customer Premises side)
Splitters (to be used with VDSL modules)	
SPLTR-30	30 port Ethernet over VDSL splitter (30 port RJ11, 30 local loop punchdown ports, 30 PSTN punchdown ports)
SPLTR-30/S	30 port Ethernet over VDSL (for Smart Phones) splitter (30 port RJ11, 30 local loop punchdown ports, 30 PSTN punchdown ports)
CPE's Customer Premises side	
CPE-EOV	Ethernet over VDSL home unit, 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL 1500m. External AC Power supply.
CPE-EOV/SN	Ethernet over VDSL home unit (for Smart Phones), 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL, 1500m. External AC Power supply.
CPE-LEOV/N	Long range Ethernet over VDSL home unit, 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL, 2400m. External AC Power supply. NT side (Customer's side)
CPE-EOV/N	Ethernet over VDSL unmanaged Modem, NT Side (Customer's side), 10Mbps Ethernet, Full duplex.1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL, 1500 m. External AC Power Supply.
CPE-EOV7/N	Ethernet over VDSL unmanaged Modem, ETSI 997 compliant, NT Side (Customer's side), 4Mbps Ethernet, Full duplex, 1500 m. 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL. External AC Power Supply.
CPE-EOV8/N	Ethernet over VDSL unmanaged Modem, ETSI 998 compliant, NT Side (Customer's side), 4Mbps Ethernet, Full duplex, 1500 m. 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL. External AC Power Supply.
CPE's Central Office side	
CPE-LEOV/L	Long range Ethernet over VDSL home unit (4Mbps), 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL. External AC Power supply. LT side (Central Office)
CPE-EOV/L	Ethernet over VDSL unmanaged Modem, LT Side (Central Office), 10Mbps Ethernet, Full duplex, 1500 m.1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL. Exernal AC Power Supply.
CPE-EOV7/L	Ethernet over VDSL unmanaged Modem, ETSI 997 compliant, LT Side (Central Office), 4Mbps Ethernet, Full duplex, 1500 m. 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL. Exernal AC Power Supply.
CPE-EOV8/L	Ethernet over VDSL unmanaged Modem, ETSI 998 compliant, LT Side (Central Office), 4Mbps Ethernet, Full duplex, 1500 m. 1 port 10/100Base-Tx, 1 port RJ-11 (Telephone), 1 port Ethernet over VDSL. Exernal AC Power Supply.