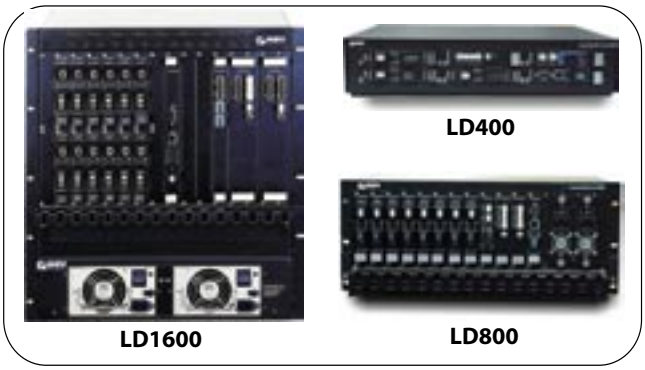
MRV Communications, Inc.

FIBER ACCESS SOLUTIONS

Datasheet

Lambda Driver® Series



Overview

The Lambda Driver® series consists of multi-functional, compact modular Wavelength Division Multiplexing (WDM) systems that can create up to 32 independent virtual fiber optic links over a single pair of fibers over distances of up to 100 km. The Lambda Driver systems are targeted for Carriers' central offices or multi-tenant office buildings and are ideally suited for MAN networks as well as large enterprise and Access networks.

The product supports different network topologies such as PTP, Linear OADM and Ring.

The Lambda Driver family operates in a DWDM (ITU Grid channels spacing) and CWDM (20 nm channels spacing) technology. Each data stream can handle rates from 10 Mbps up to 2.5 Gbps. The systems support future upgrade to 10 Gbps services.

Chassis

LD400/LD800/1600 are 19-inch rack mountable chassis with modular architecture hosting different Mux/DeMux modules with 4, 8, 16 and 32 channels or OADM modules starting from single channel up to any number and mix of channels. Such flexibility offers a lower initial cost to service providers, allowing for fewer channels units at start, and ensuring simple system upgrades or future network re-configurations.

In order to provide maximum system reliability, the systems have a redundant power supplies option.

LD1600 is 11.5U high with 16 general slots for transponders, OADMs , Muxs and 1+1 redundancy modules and 6 general slots for 16/32 channels Muxs and 2 reserve slots for 2 management cards (redundancy).

LD800 is 4.5U high with 11 general slots for transponders, LD800 size modules (OADMs , Muxs and 1+1 redundancy modules) and 1 reserve slot for Management.

LD400 is 2U high with 5 general slots for transponders, LD800 size modules (OADMs Muxs and 1+1 redundancy modules) and 1 reserve slot for Management.

Transponders

The transponders are single slot modules that provide an interface between the WDM system and single channel access port. Transponders are fully independent of the other channels and transparently support all data centric protocols, enabling service providers to mix different protocols such as SONET/SDH, Fast Ethernet, Gigabit Ethernet, Fibre Channel, ESCON, etc. in the same chassis. LD400/LD800/1600 transponders possess the "data rate selection" functionality, allowing service providers to perform remote rate provisioning.

There are two types of DWDM transponders - regular and "low dispersion". The "low dispersion" transponders allow the transmission of 2.5 Gbps over up to 400 km of SMF with the help of Optical Amplifiers, but without need for dispersion compensation.

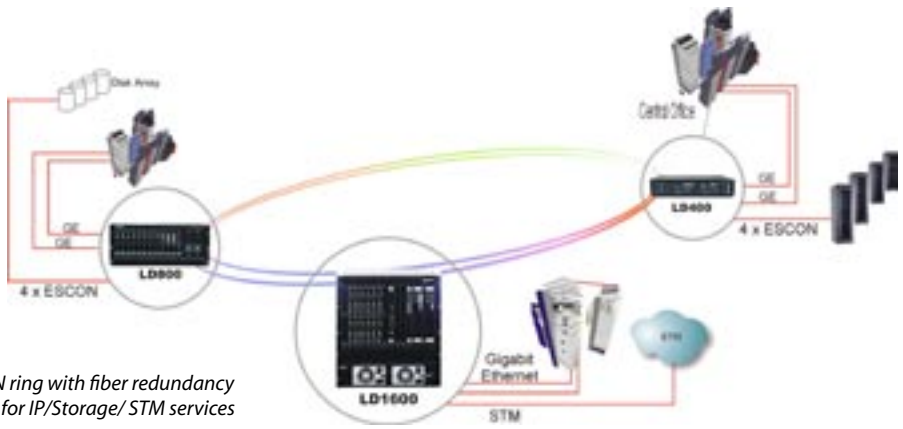
The customer (access) interface type of the transponders can be fixed, (i.e. 1310 nm MM/SM or 850 nm MM), or interchangeable (pluggable) by use of SFP (Small Form Factor Pluggable transceiver). The SFP transponders* also possess additional loopback and power monitoring functionalities as well as other SFP related information.

The transponders are hot swappable, allowing scalable, in-service expansion or channel maintenance without interruption of service on other channels. The same transponder modules can be used in all Lambda Driver family chassis.

* Note: SFP transceiver is ordered separately from the transponder.

Features

- Metro, Access, and Campus applications
- Better fiber efficiency with simpler network design at less cost
- Multi-protocol support
- Scalable design up to 32 protected services per ring
- Data rates of up to 2.5 Gbps upgradable to 10 Gbps
- DWDM - ITU - T - G.694.1 grid 100 or 200 GHz (0.8 nm or 1.6 nm) spaced
- CWDM - ITU - T - G.694.2 20 nm spaced
- Error and configuration monitoring via SNMP or CLI
- Redundant power supply
- 1+1 link protection – optional
- O-BPSR ring protection option
- Built-in Optical Amplifier (EDFA) - optional
- Access interface flexibility by use of SFP transceivers
- Digital diagnostic from SFP interface
- Power Monitoring of the WDM transceiver
- Loopback functionality for better field maintenance
- CWDM to DWDM wavelengths conversion option



Typical MAN ring with fiber redundancy application for IP/Storage/ STM services

TDM Sub-rate Multiplexers

By multiplexing multiple channels via TDM into DWDM or CWDM the number of ports in a single fiber can be multiplied by a factor of TDM implementation, thus increasing the efficiency of fiber use as well as saving precious physical space.

EM2009-EM4/P- 4x ESCON multiplexer module: the ultra compact design is ideally suited for ESCON applications, which often require many parallel links. A integration of the 4x ESCON Mux in the LD400/LD800/1600 chassis achieves extremely high levels of density - 128 ESCON services can be run over one fiber pair (with 32 wavelengths). The electrically based multiplexing allows for a significant cost reduction and higher fiber utilization when compared to a pure optical multiplexing solution. The ESCON Mux link fiber interface can be 850 nm/1310 nm or CWDM grid for direct connection to the CWDM Mux by use of SFP interface.

- **EM2009- GM2-2xGE multiplexer module :** electrically multiplexes 2 GE tributaries into one 2.5 Gbps aggregated trunk. This module allows for a significant cost reduction and higher fiber utilization when compared to pure optical multiplexin solutions. When combining it with CWDM/DWDM technology this module doubles the capacity compared to pure WDM solution. To optimize each port interface as needed, all ports use standard SFP (Small Form Pluggable) field installable transceivers. Please refer to EM2009-GM2 data sheet for a more detailed description.

Protection options

An optional 1+1 protection module provides survivability in case of a main fiber break in Point-to-Point configurations. When the module discovers a fiber severance in the main link, it automatically switches the WDM traffic to the secondary link within less than 10 ms.

For Ring topologies O-BPSR (Optical Bi-directional Path Switched Ring) protection is provided by use of two transponders for each channel (full hardware redundancy) or 1+1 module per channel (Fiber redundancy).

Management

The Lambda Driver LD series are SNMP and Web manageable (with MegaVision Web®) for configuration and fault monitoring.

Local element management interface is provided for connecting to the VT100™ style text terminal (RS-232 DB9 connector) or 10/100 Mbps (RJ45 Ethernet connector). A 100BaseFX port is provided for remote fiber access to the element manager. LD1600 has an option for a redundant Management module.

Remote login via TELNET is also supported.

Optical Supervisory Channel (OSC) which runs together with the WDM data over the same fibers is optional. This option is included in the 1+1 redundancy module or special SRV module. The SRV module combines the WDM traffic with 1310 nm Management stream and can be used also for other traffic combinations (like STMn 1310 nm).

WDM Link distances

The link budget of the product allows distances up to 100 km with regular SM fibers (0.25 dB/km or better). For fiber spans with large attenuation, integrated Optical Amplifier (EDFA) modules can be used. 3 different types are supported:

- Booster – for amplification of the signal at the starting point of the link
- In-Line - for amplification of the signal at the middle point of the link
- Pre-Amp - for amplification of the signal at the end point of the link

The link distance limitation of 100 km for standard products, even with Optical Amplifiers, is due to the dispersion. This limit can be eliminated by usyng a DCU (dispersion compensation unit) along the link or transponders with low dispersion feature.

Regular CWDM or DWDM transponders can tolerate dispersion up to 1600 ps/nm for 2.5 Gbps data rates at 10^{-12} BER. The low dispersion transponders (TM-DL4SFP) can tolerate up to 6,500 ps/nm and the extra low dispersion transponders (TM-DL6SFP) can tolerate up to 12,800 ps/nm.

LD 1600 / 800 / 400 –Technical Specifications

Physical Dimensions	LD1600: Height: 11.5 U Size (W x D X H) 445.5 x 299 x 510.4 mm (17.54x 11.77 x 20.09 inch)			
	LD800: Height: 4.5 U Size (W x D x H) 445.5 x 267 x 199.2 mm (17.54 x 10.51 x 7.84 inch)			
	LD400: Height: 2 U Size (W x D x H) 443 x 324 x 88.01 mm (17.44 x 12.76 x 3.47 inch)			
Mounting	19-inch rack mount - EIA RS-310C standard			
Weight	LD400: 10 kg (22.04 lb) LD800: 20 kg (44.09 lb) LD1600: 35 kg (77.16 ld)			
Optical Connectors	SC - WDM, MU - Internal connection			
Power Input Voltage	AC: 90 - 240 V, 50 - 60 Hz DC: 36 - 72 V			
Power Consumption	LD400: 70 W max LD800: 130 W max. LD1600: 200 W max. (at full capacity of 16 channels)			
Standard Compliance	Designed to comply, Safety, EMC; UL - 1950,; CSA - 22.2 No. 950; FCC part 15 Class A; CE - 89/336/EEC, 73/23/EEC			
System Performance	Data rate: 2 Mbps to 2.7 Gbps per channel Capacity: LD400 - 4 channels LD800 - 8 channels LD1600 - 16 channels Link protection switching time: - 10 ms			
WDM grid	DWDM: ITU - T - G.694.1 CWDM: ITU - T - G.694.2			
Management	SNMP MegaVision™ software network management or other SNMP manager Craft interface: BT100 style text interface via RS - 232 (DB9) connector and remote login via TELNET 10/100 Ethernet (RJ45) + 100Base-Fx local port Optical Supervisory channel: at 1310 nm			
Applications	Fast Ethernet, Gigabit Ethernet, ATM or SONETH/SDH at OC1, OC3, OC12 or OC48, STM!, STM4, STM16 Fiber Channel, ESCON and other proprietary protocols			
OADM, Mux/Demux maximum Attenuation (db)	Type	In - Out loss Dual	In - Out loss Single	In - Drop/Add - Out loss
	1 channel OADM	0.9	1.3	1.3
	2 channel OADM	1.3	2.1	1.3 / 1.7
	3 channel OADM	1.7	2.9	1.3 / 1.8 / 2.1
	4 channel OADM	2.1	3.7	1.3 / 1.7 /2.1 / 2.5
	4 channel Mux			1.8
	4 channel DMux			2.1
	8 channel Mux			3
	8 channel DMux			3.3
	16 channel Mux			5.4
	16 channel DMux			5.7
Optional Modules Attenuation **1+1 Redundant Module**	Tx 3db Rx 2db OSC module 1.5db			
Transponder Optical Specifications **Transmitter Power**	DWDM +3.5dbm +/- 0.5 dBm CWDM +1.5dbm +/- 0.5 dBm			
Receiver Sensitivity	1.25Gbps -32dbm +/- 1 dBm 2.5Gbps -27dbm +/- 1 dBm			
Maximum Receiver Power	-3dbm +/- 1 dBm			
Optical Amplifier Specifications	Output Power +16dBm max. Signal Gain 10 - 26dB Input Power: Pre-amplifier -24dBm - -5dBm Line / Booster -14dBm - +5dBm			

Ordering Info

Product	Description
LD1600 Platform	
LD1600	Lambda Driver-1600, 16 channels, Chassis without power supply (EM2005 power supplies should be ordered separately)
EM2005-PS/AC	AC power supply for the LD1600 (90-240V AC)
EM2005-PS/DC	DC power supply for the LD1600 - (48V AC)
EM1600-MNG	MNG Management Module for the Lambda Driver-1600
EM1600-RED	1+1 redundant link module for LD1600
EM1600-RED/NS	redundant link module for LD1600 w/o OSC
EM1600-SRV	DWDM Service module for LD1600
EM1600-OAI	Optical In Line Amplifier for the Lambda Driver-1600
EM1600-OAP	Optical Pre-Amplifier for the Lambda Driver-1600
EM1600-OAB	Optical Booster Amplifier for the Lambda Driver-1600
LD800 Platform	
LD800/AC	Lambda Driver-800, 8 slot Chassis with single AC power supply (90-240V AC)
LD800/DC	Lambda Driver-800, 8 slot Chassis with single DC power supply (48V DC)
LD800/2AC	Lambda Driver-800, 8 slots Chassis with dual power AC supply (90-240V AC)
LD800/2DC	Lambda Driver-800, 8 slots Chassis with dual power DC supply (48V DC)
EM800-PS/AC	Redundant power supply for the LD800/AC (90-240V AC)
EM800-PS/DC	Redundant power supply for the LD800/DC (48V DC)
EM800-MNG	MNG Management Module for the Lambda Driver-800
EM800-RED	1+1 redundant link module for LD800
EM800-RED/NS	redundant link module for LD800 w/o OSC
EM800-SRV	CWDM Service module for LD800
EM800-OAP	Optical Pre-Amplifier for the Lambda Driver-800
EM800-OAB	Optical Booster Amplifier for the Lambda Driver-800
EM800-OAI	Optical in line amplifier for the Lambda Driver-800
LD400 Platform	
LD400/AC	Lambda Driver-400, 4 slot Chassis for WDM with single AC power supply (90-240V AC)
LD400/DC	Lambda Driver-400, 4 slot Chassis for WDM with single DC power supply (48V DC)
LD400/2AC	Lambda Driver-400, 4 slots Chassis for WDM with dual power AC supply (90-240V AC)
LD400/2DC	Lambda Driver-400, 4 slots Chassis for WDM with dual power DC supply (48V DC)
EM400-PS/AC	Redundant power supply for the LD400/AC (90-240V AC)
EM400-PS/DC	Redundant power supply for the LD400/DC (48V DC)
LDP300	3 slot passive chassis for LD800 Mux's or OADM's
LD1600 CWDM Mux/DeMux modules	
EM1600-MUX16C	16 wavelengths CWDM Multiplexer module for LD1600
EM1600-DMUX16C	16 wavelengths CWDM Demultiplexer module for LD1600
EM1600-MUX8C	8 wavelengths CWDM Multiplexer module for LD1600
EM1600-DMUX8C	8 wavelengths CWDM Demultiplexer module for LD1600
LD1600 DWDM Mux/DeMux modules	
EM1600-MUX32	32 100G spacing wavelengths DWDM Multiplexer module for LD1600
EM1600-DMUX32	32 100G spacing wavelengths DWDM Demultiplexer module for LD1600
EM1600-MUX16	16 wavelengths DWDM Multiplexer module for LD1600
EM1600-DMUX16	16 wavelengths DWDM Demultiplexer module for LD1600
EM1600-MUX16R	16 100G spacing Red band DWDM Multiplexer module for LD1600
EM1600-DMUX16R	16 100G spacing Red band DWDM Demultiplexer module for LD1600
EM1600-MUX16B	16 100G spacing Blue band DWDM Multiplexer with band splitter module for LD1600
EM1600-DMUX16B	16 100G spacing Blue band DWDM Demultiplexer with band splitter module for LD1600
EM1600-MUX8R	8 wavelengths DWDM Multiplexer module for LD1600 (ch#21 to ch#35)
EM1600-DMUX8R	8 wavelengths DWDM Demultiplexer module for LD1600 (ch#21 to ch#35)
EM1600-MUX8B	8 wavelengths DWDM Multiplexer module for LD1600 (ch#45 to ch#59) with band splitter
EM1600-DMUX8B	8 wavelengths DWDM Demultiplexer module for LD1600 (ch#45 to ch#59) with band splitter
LD800 DWDM Mux/DeMux modules	
EM800-MUX8B	8 wavelengths (#45 - #59) DWDM Multiplexer module for LD800
EM800-DMUX8B	8 wavelengths (#45 - #59) DWDM Demultiplexer module for LD800
EM800-MUX8R	8 wavelengths (#21 - #35) DWDM Multiplexer module for LD800
EM800-DMUX8R	8 wavelengths (#21 - #35) DWDM Demultiplexer module for LD800
LD800 CWDM Mux/DeMux modules	
EM800-MUX8/CW	8 wavelengths CWDM Multiplexer module for LD800
EM800-DMUX8/CW	8 wavelengths CWDM Demultiplexer module for LD800

Ordering Info

Product	Description
Single fiber DWDM OADM modules	
ADDxx/yy/zz/ww*	4 wavelengths DWDM OADM module
ADDxx/yy/zz*	3 wavelengths DWDM OADM module
ADDxx/yy*	2 wavelengths DWDM OADM module
ADDxx*	1 wavelength DWDM OADM module
Dual fiber DWDM OADM modules	
ADDDxx/yy/zz/ww*	4 wavelengths DWDM OADM module for LD800
ADDDxx/yy/zz*	3 wavelengths DWDM OADM module for LD800
ADDDxx/yy*	2 wavelengthsDWDM OADM module for LD800
ADDDxx*	1 wavelength DWDM OADM module for LD800
Single fiber CWDM OADM modules	
ADCxx/yy/zz/ww*	4 wavelengths CWDM OADM module for LD800
ADCxx/yy/zz*	3 wavelengths CWDM OADM module for LD800
ADCxx/yy*	2 wavelengths CWDM OADM module for LD800
ADCxx*	1 wavelength CWDM OADM module for LD800
Dual fiber CWDM OADM modules	
ADCDxx/yy/zz/ww*	4 wavelengths CWDM OADM module for LD800
ADCDxx/yy/zz*	3 wavelengths CWDM OADM module for LD800
ADCDxx/yy*	2 wavelengths CWDM OADM module for LD800
ADCDxx*	1 wavelength CWDM OADM module for LD800
SFP Access port Transponder Modules	
TM-CSFP/xx*	SFP Access port, any rate (up to 2.5Gbps) CWDM ch #xx transponder
TM-DSFP/xx	SFP Access port, any rate (up to 2.5Gbps) DWDM ch #xx transponder
TM-DL4SFP/xx	SFP Access port, any rate (up to 2.5Gbps) DWDM ch #xx transponder with low dispersion up to 360 km
TM-DL6SFP/xx	SFP Access port, any rate (up to 2.5Gbps) DWDM ch #xx transponder with extra low dispersion up to 640 km
ESCON TDM module	
EM2009-EM4/P	4 ESCON ports (1310nm MM) TDM Multiplexer channel card with SFP trunk interface.
EM2009-GM2	2 GE ports TDM Multiplexer channel card with SFP receptacles
Accessories	
CA-SMD-SC/SC-5	Duplex F/O cable SC-SC, 5m , SM
CA-SMS-SC/SC-1	F/O cable SC-SC 1m, SM
CA-SMS-MU/MU-06	F/O cable MU-MU 65 cm, SM
CA-MMS-MU/MU-06	F/O cable MU-MU 65 cm, MM 62.5/125∝,
CA-SMS-MU/PC-1	F/O cable MU-FC/PC 1m, SM
CA-SMS-SC/MU-06	F/O cable SC-MU 65 cm, SM
CA-SMS-SC/MU-5	F/O cable SC-MU 5 m, SM
CA-SMS-LC/MU-06	F/O cable LC-MU 65 cm, SM
CA-SMS-LC/MU-5	F/O cable LC-MU 5 m, SM
CA-SMS-LC/LC-06	F/O cable LC-LC 65 cm, SM
CA-SMS-LC/SC-5	F/O cable LC-SC 5 m, SM

*Note1: xx,yy,zz,ww represents ITU Grid channel number, e.g. 21 (1560.61nm) for DWDM or 47 (1470 nm) for CWDM