

NIC OTN Features Data Sheet

PLATFORMS



MODULES



KEY FEATURES

- NIC Platform modules support the full range of OTN test:
 - OTU-1 (2.66 Gbps)
 - OTU-2 (10.7 Gbps)
 - OTU-1e (11.049 Gbps)
 - OTU-2e (11.095 Gbps)
 - OTU-3 (43 Gbps)
- ODU-1 to ODU-2 Mapping Test Option
- ODU-2 to ODU-3 Mapping Test Option
- ODU-1 to ODU-3 Mapping Test Option
- ODU-0 Mapping Test Option
- Overhead Byte Capture
- Activation via license-based Test Option
- Full overhead access/manipulation
- Intrusive/non-intrusive through mode
- GFP mapping available (10G and below)

NIC Platform OTN functionality can be added to NIC modules pictured above with only a license key. OTN uses the same ports as SONET/SDH at comparable rates:

- SONET/SDH 2.5Gbps ports support OTN rate OTU-1 (2.66 Gbps)
- SONET/SDH 10Gbps ports support OTN rates OTU-2 (10.7 Gbps), OTU-1e (11.049 Gbps), and OTU-2e (11.095 Gbps)
- SONET/SDH 40Gbps ports support OTN rate OTU-3 (43 Gbps)

The Optical Transport Network (OTN) is defined in ITU-T publication G.709/Y.1331. The standard provides a framework for operation of an all-optical network, with Optical Network Elements connected by optical fibre links, providing functionality of transport, multiplexing, switching, management, supervision and survivability of optical channels carrying client signals. OTN's Forward Error Correction (FEC) technology enables longer span length and improved reliability for NextGeneration networks.

The NIC Platform provides a complete range of OTN testing capabilities to enable the deployment and maintenance of modern networks.

OTU-1 has a line rate of 2.66 Gbps and was designed to transport a SONET OC-48 or SDH STM-16 signal.

OTU-2 has a line rate of 10.7 Gbps and was designed to transport a SONET OC-192, SDH STM-64 or 10 Gbps WAN and also can be overclocked (11.049/11.095 Gbps) to carry 10 Gigabit Ethernet LAN from IP/Ethernet switches and routers at full line rate (10.3 Gbps).

OTU-3 has line rate of 43 Gbps and was designed to transport an SONET OC-768 or SDH STM-256 signal. The Digital Lightwave NIC Platform provides a complete solution for OTN network testing, in the same unit that is used for SONET/SDH, Ethernet, Fibre Channel, ATM, PDH/T-Carrier, Optical Spectrum Analysis and more.

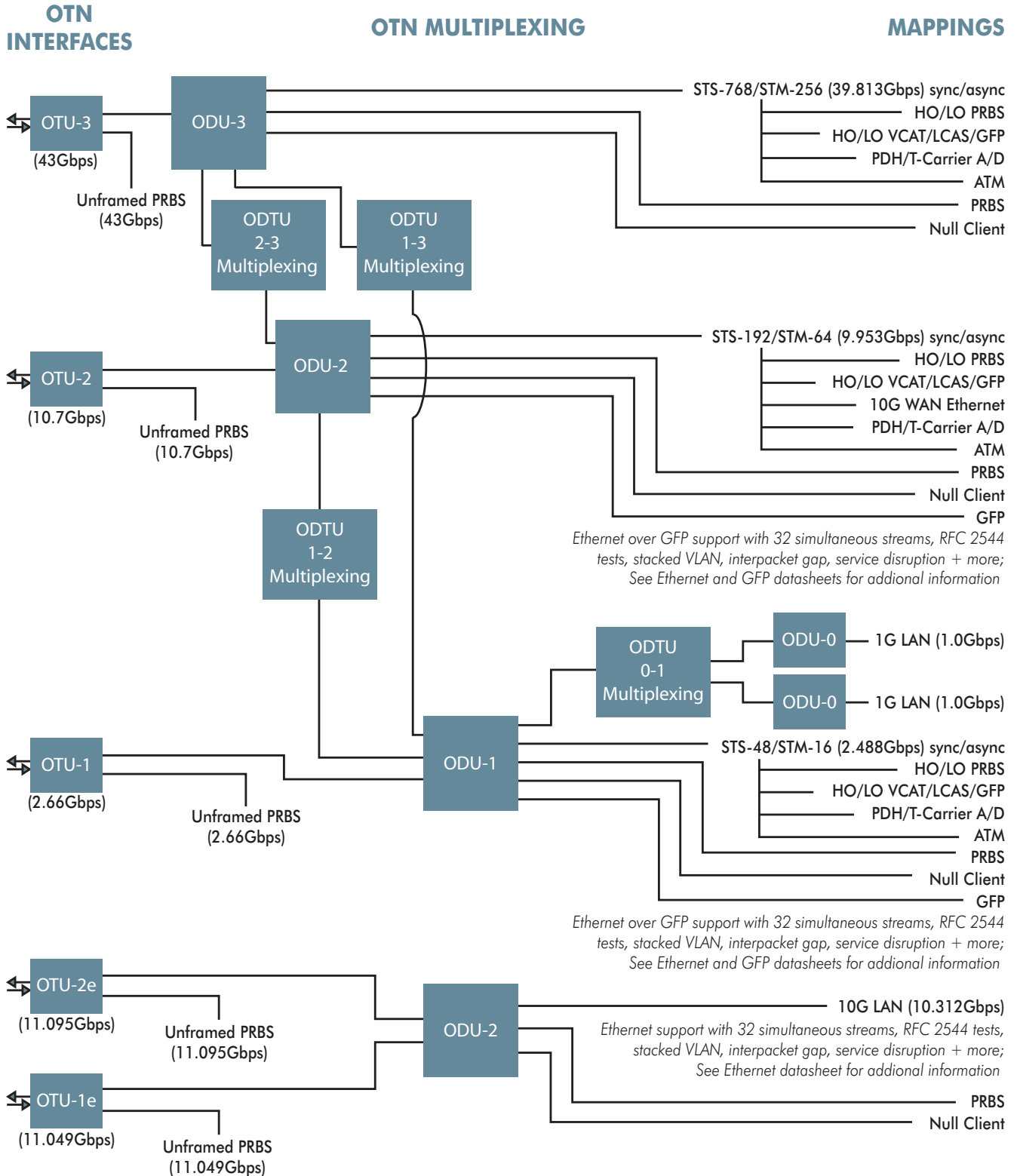
Call or email today for an on-line demonstration.

NIC OTN Features Data Sheet

Industry-leading OTN Capabilities

COMPLETE OTN TESTING SOLUTION

The NIC OTN solution provides the most complete and flexible OTN solution in the industry.



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Industry-leading OTN Capabilities

INTERFACE SPECIFICATIONS

General

Timing	Internal, external, recovered
Internal Clock	Stratum III compliant (± 4.6 ppm)
External Clock	1.544/2.048 Mbps (BITS/SETS), 1.544/2.048 MHz via Bantam connector (balanced); 8KHz/1.544/2.048/10 MHz via 75-ohm TTC BNC (unbalanced)
Input Freq. Meas.	± 200 ppm
Receiver Pulling Range	$> \pm 100$ ppm
Line Frequency Offset	± 100 ppm, in 0.1 ppm increments
TX Laser On/Off indication	Displayed on monitor
TX FEC	Enabled/Disabled (default is Enabled)
TX Scrambling	Enabled/Disabled (default is Enabled)
OPU Frequency Offset	As defined in ITU-T publication G.709/Y.1331

Note: All transmitter lasers are fully certified per class1 safety standard IEC 60825-1:1993 +A2:2001

43Gbps OPTICAL INTERFACES

Connector Type	SC, FC, or ST options available
Line Code	NRZ, Duo-Binary, DPSK or DQPSK
Interface Rate	OTU-3: 43.018 Gbps
TX wavelength range	1530nm to 1565nm
TX Center Wavelength	1550nm
Optical Level (Tx)	0 dBm to +3dBm
Optical Level (Rx)	+3 dBm to -6 dBm with a BER of 1e-12
Rx damage level	$> +3$ dBm
Accuracy reading	± 1.5 dB
OTU-3 External Clock Rate	672.163 MHz
OTU-3 External Clock Amplitude	0.5v ± 0.1 v

2.66/10.7/11.049/11.095Gbps OPTICAL INTERFACES

Connector Type	LC; Adapters available (e.g. LC to SC, ST or FC)
Line Code	NRZ
Interface Rates	OTU-1: 2.66 Gbps; OTU-2: 10.71 Gbps, OTU-1e: 11.049 Gbps, OTU-2e: 11.095 Gbps Unframed: 10.71/2.66 Gbps
Modules	All optical interfaces are hot-swappable modules: SFP for 51/155/622Mbps and 1/2.5/2.66 Gbps XFP for 10/10.7/11.049/11.095 Gbps
OTU-1 External Clock Rate	166.629 MHz
OTU-2 External Clock Rate	167.332 MHz
External Clock Amplitude	0.5v ± 0.1 v

Power Levels
Note: Actual power levels depend upon which SFP or XFP is selected. Specifications below are typical Power Levels but may not reflect all modules available:

XFP: 9.953/10.3/10.7/11.049/11.095 Gbps (1550nm Intermediate Range)

Optical Level (Rx): -1 dBm to -14 dBm with a BER of 1e-12

Optical Level (Tx): -1 dBm to +2 dBm

Input Pwr. Meas.: -1 dBm to -14 dBm, accuracy ± 1.5 dB

XFP: 9.953/10.3/10.7/11.049/11.095 Gbps (1310nm Intermediate Range)

Optical Level (Rx): 0 dBm to -14 dBm with a BER of 1e-12

Optical Level (Tx): -6 dBm to -1 dBm

Input Pwr. Meas.: -1 dBm to -14 dBm, accuracy ± 1.5 dB

XFP: 9.953/10.3/10.7/11.049/11.095 Gbps (850nm Intermediate Range)

Optical Level (Rx): -1 dBm to -8 dBm with a BER of 1e-12

Optical Level (Tx): -5 dBm to -1 dBm

Input Pwr. Meas.: -1 dBm to -8 dBm, accuracy ± 1.5 dB

SFP: 52/155/622 Mbps and 1/2.5 Gbps/2.66 Gbps (1310nm & 1550nm)

Optical Level (Rx): -9 dBm to -27 dBm with a BER of 1e-10

Optical Level (Tx): -2 dBm to +3 dBm

Input Pwr. Meas.: -9 dBm to -28 dBm, accuracy ± 1.5 dB

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Industry-leading OTN Capabilities

FUNCTIONS

OTN Mapping	Unframed BERT, Framed BERT, Null Client, Synchronous SONET/SDH, Asynchronous SONET/SDH, 10G WAN ^{2,3} , ODTU-12 ^{2,3} (enables mux/demux of ODU-1 signals within ODU-2 on OTU-2 interface), ODTU-13 ³ (enables mux/demux of ODU-1 signals within ODU-3 on OTU-3 interface), ODTU-23 ³ (enables mux/demux of ODU-2 signals within ODU-3 on OTU-3 interface), GFP Framed, GFP Bulk, GFP Transparent ^{1,2}	SAPI, ODU(PM):DAPI, TCM(1-6):BDI, TCM(1-6):SAPI, TCM(1-6):DAPI, TCM(1-6):BIAE, OPU:PLM
Test Patterns	PRBS 9, PRBS 9 inverted, PRBS 11, PRBS 11 inverted, PRBS 15, PRBS 15 inverted, PRBS 20, PRBS 20 inverted, PRBS 23, PRBS 23 inverted, PRBS 31, PRBS 31 inverted, user-defined (32-bit), all 0's, all 1's	Alarm Generation LOS, LOF, OOF, LOM, OOM, OTU(SM):AIS, OTU(SM):IAE, OTU(SM):BDI, ODU(PM):AIS, ODU(PM):OCI, ODU(PM):LCK, ODU(PM):BDI, TCM(1-6):BDI
Error Detection	Frame (OA1, OA2), MFAS, Correctable FEC errors, Uncorrectable FEC errors, OTU(SM):BIP8, OTU(SM):BEI, ODU(PM):BIP8, ODU(PM):BEI, BIT, TCM(1-6):BIP8, TCM(1-6):BEI	Intrusive Through Mode Provides the ability to regenerate optical signal and optionally modify OTN overhead bytes and generate errors and alarms
Error Generation	Frame (OA1, OA2), MFAS, Correctable FEC errors, Uncorrectable FEC errors, OTU(SM):BIP8, OTU(SM):BEI, ODU(PM):BIP8, ODU(PM):BEI, BIT, TCM(1-6):BIP8, TCM(1-6):BEI	Service Disruption Measurement Criteria: OOF, OTU(SM):AIS, OTU(SM):BIP8, ODU(PM):AIS, ODU(PM):BIP8, BIT errors; Resolution (one frame duration): OTU-1 is 49µs; OTU-2 is 12µs; OTU-3 is 3µs; OTU-1e is 12µs; OTU-2e is 12µs Range: From one frame duration to ∞ Note: Simultaneous measurements for all processors displayed in convenient table format
Error Generation Rate	BIT/Frame: Single, 10 ⁻¹⁰ to 10 ⁻³ , user-programmable; Other errors: Single, 10 ⁻¹⁰ to maximum, user-programmable	Round-Trip Delay Supported for OTN; OTU-1 resolution is 49 microseconds; OTU-2 resolution is 12 microseconds; OTU-3 resolution is 3 microseconds
Periodic Burst Generation	Burstable Errors: FRAME, MFAS, OTU(SM):BIP8, OTU(SM):BEI, ODU(PM):BIP8, ODU(PM):BEI, TCM(1-6):BIP8, TCM(1-6):BEI Burstable Alarms: OTU(SM):IAE, OTU(SM):BDI, ODU(PM):BDI, TCM(1-6):BDI Burst Size: 0 to 65535 Frames; OTU-1: 0 to 3209.35ms; OTU-2: 0 to 798.964ms; OTU-3: 0 to 198.898ms; OTU-1e: 0 to 774.389ms; OTU-2e: 0 to 771.136ms Burst Period: 0 to 1048575 Frames; OTU-1: 0 to 51350.392ms; OTU-2: 0 to 12783.603ms; OTU-3: 0 to 3182.409ms; OTU-1e: 0 to 12390.403ms; OTU-2e: 0 to 12338.354ms	Overhead Capture Up to 255 overhead bytes can be captured and displayed in HEX and ASCII values, and can be printed or saved to a report file. Any one of the following bytes can be captured: OTU(SM):FAS OA1(1-3), OTU(SM):FAS OA2(1-3), OTU(SM):MFAS, OTU(SM):TTI, OTU(SM):BIP, OTU(SM):BEI, OTU(SM):GCC0(1-2), OTU(SM):RES(1-2), ODU(PM):TCM(1-6) TTI, OPU:RES(1-3), OPU:PSI, ODU(PM):TCM(1-6)BIP, OPU:JC(1-3), OPU:NJO, ODU(PM):TCM(1-6)BEI, ODU(PM):RES(1-9), ODU(PM):TCM ACT, ODU(PM):FTFL, ODU(PM):TTI, ODU(PM):BIP, ODU(PM):BEI, ODU(PM):EXP(1-2), ODU(PM):GCC1(1-2), ODU(PM):GCC2(1-2), ODU(PM):APS PCC(1-4) Triggers: selected OTN errors or alarms, specified byte values, OPU justifications, manual
Alarm Detection	LOS, Power Hot, Power Warm, Power Low, LOF, OOF, OOM, LOM, OTU(SM):AIS, OTU(SM):IAE, OTU(SM):BDI, OTU(SM):SAPI, OTU(SM):DAPI, OTU(SM):BIAE, ODU(PM):AIS, ODU(PM):OCI, ODU(PM):LCK, ODU(PM):BDI, ODU(PM):	Notes 1 Applicable only to OTU-1 interface 2 Applicable only to OTU-2 interface 3 Applicable only to OTU-3 interface

ORDERING INFORMATION

OTN test capabilities are available as license-based Test Options at the time of initial purchase or can be added later.

MSA 2020/MSA 2030 Module:

OTU-1 (2.66G) Test Option
OTU-2 (10.7G) Test Option
ODU-1 to ODU-2 Mapping Test Option
GFP over OTN Test Option
OTU-1e and OTU-2e (10GigE FEC) Test Option

MSA 4043 Module (40/43G):

OTU-3 (43G) Test Option
ODU-1 to ODU-3 and ODU-2 to ODU-3 Mapping Test Option

For more information or a sales quote, visit www.lightwave.com/contact or email dlsales@lightwave.com



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