

Infinite Capacity Engine – Extensible (ICE-X) 800G ZR/ZR+ OSFP/QSFP-DD800

ZR/ZR+ intelligent coherent pluggables with rich transponder and system-level features

Coherent pluggables are redefining network economics by reducing power consumption, simplifying the network, and enhancing service flexibility. The next generation of these pluggables raises the bar for capacity and performance. Nokia's Infinite Capacity Engine – Extensible (ICE-X) 800G pluggable DCOs are the first 800G coherent pluggables with low power consumption, multi-vendor probabilistic constellation shaping (PCS), and multi-haul reach. Leveraging the power efficiencies of 3-nm-based CMOS technology, advanced multi-vendor interoperability, and a unique level of integrated intelligence and system-level functionality, ICE-X 800G pluggable DCOs simplify deployment in a wide variety of network scenarios while maximizing performance and driving down operating costs. Nokia's ICE-X 800G pluggable DCOs stand out through:

Best-in-class optical performance: Leveraging vertical integration of a Nokia-designed and -built DSP and TROSA (ICTR140), ICE-X 800G pluggable DCOs offer leading optical performance in a low-power pluggable form factor (QSFP-DD and OSFP), with 800G transmission over 1,700+ km over SMF-28 fiber. This is enabled by the DSP's large compensation for chromatic dispersion and high-performance DAC/ADC, as well as the ICTR140 TROSA's InP-based high-density monolithic integration and low out-of-band noise. ICE-X 800G pluggable DCOs are not only about the 800G bit rate, but also about extending lower bit rates to unprecedented distances, as listed below:

- 800G at 1,700+ km
- 600G at 2,000 km
- 400G at 3,000 km

Interoperability: ICE-X 800G pluggable DCOs meet and exceed 800ZR and 400ZR OIF implementation agreements and are interoperable with any OIF-compliant ZR transceiver. Moreover, ICE-X 800G pluggable DCOs are multi-vendor interoperable through OpenROADM 6.0 for “open probabilistic shaping FEC” and compliant with OIF 800G ZR (tracking OIF 2021-144-15), OIF 400G ZR (Implementation Agreement 2.0), and OpenZR+ Rev 3.0. In bookended configurations, Nokia ICE-X 800G provides additional high baud rate with extended reach options which exceed MSA performance with very low power consumption.

Integrated system-level features: ICE-X 800G pluggable DCOs support optional MACSec and L1 (FlexOsec), streaming telemetry, and numerous troubleshooting and diagnostic tools, including loopbacks and demarcation points, that help network operators quickly pinpoint and solve network issues.



ICE-X 800G ZR/ZR+ OSFP
and QSFP-DD800

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Easy deployment over legacy infrastructure: Leveraging full programmability, ICE-X 800G pluggable DCOs can be seamlessly deployed over existing legacy infrastructure. By selecting the right modulation, launch power, and many other parameters, network operators can maximize transmission capacity over the most challenging network configurations, including cascaded ROADMs.

Applications

- Point-to-point data center interconnect (DCI)
- Metro/core aggregation
- Core transport
- Ethernet and OTN transport
- IP over DWDM (IPoDWDM) with ICE-X pluggable DCOs hosted in a router/switch or compact Layer 1 optical transport cards in a DWDM platform
- Coherent probe

Integrated System-level Functionality

- Diagnostics and troubleshooting tools
- Streaming telemetry
- Test signal generation and loopbacks
- Coherent performance monitoring
- Optional MACSec encryption and L1 (FlexOsec)

Key Benefits of ICE-X 800G ZR/ZR+ Pluggable DCOs

- Reduction in cost, power, and footprint of optical transport
- Deployment flexibility: metro, regional, and long-haul performance with support for a large number of ROADM cascades and colorless, directionless configurations
- MSA interoperability and Nokia differentiated high performance modes

Key Specifications

- OSFP and QSFP-compliant module
- Line rates from 200 Gb/s to 800 Gb/s
- Fully tunable over C-band and L-band
- OIF-800ZR-01.0 Implementation Agreement compliant
- OIF-400ZR-03.0 Implementation Agreement compliant
- OpenZR+ Rev 3.0 compliant
- Open ROADM 6.0 modes
- 800G-ETC, 800GBASE-R, 2 x 400GBASE-R, 4x200GBASE-R and 8x100GBASE-R client support, OTU4*, OTUCn* (*Future)
- Supports upgrade from 400G ZR to 800G ZR

- Management
 - I2C/CMIS-compliant host interface
 - CMIS 5.2, C-CMIS 1.3
 - Firmware upgrades
 - Enhanced optical monitoring capabilities
- System-level features
 - MACSec encryption available
 - Compatible with transport networks with colorless add-drop including Colorless add/drop (Colorless/Colorless Directionless/Colorless Directionless Contentionless) and Fixed Add/Drop (F-AD) architectures

Technical Specifications (Preliminary)

Environmental Specifications				800G OSFP-DCO			
Parameter	Conditions		Symbol	Min	Typ	Max	Unit
Storage temperature			Ts	-40		85	°C
Case operating temperature	Central office applications (C-temp)	Long term	Top	0		70	°C
		Short term <96h		-5		75	
Relative humidity	Non-condensing	Long term	RH	5		85	%

DC Electrical Characteristics						
Power supply voltage		Vcc	3.135	3.30	3.465	V
Power supply current	Low-power mode	Icc			0.64	A
	Steady-state current, C-temp, all operating modes				9.6	
Power dissipation	Low-power mode	Pdiss			2	W
	Steady state power consumption, C-temp			30W		

Interface Specification
Client Interface (Supported Protocol)
100 GbE (100GAUI-1, 100GAUI-2), 200 GbE (200GAUI-4), 200GAUI-2 400 GbE (400GAUI-8), 400GAUI-4, 800 GbE (1 x 800GAUI-8), 800G-ETC

General Optical Characteristics						
Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Symbol rate		R _{baud}	60		135	Gbaud
Modulation formats		16QAM, 16QAM-PS, QPSK				
Channel frequency range	C-band	ν _c	191.275		196.15	THz
	L-band		186.05		191.050	
Channel spacing	Flexible grid (6.25 GHz) compliant	Δν _c	50	150	150	GHz
Frequency fine tuning (FTF) range			-6.25		+6.25	GHz
Frequency accuracy (EOL)			-1.5		+1.5	GHz
Tx optical output power			-10		0	dBm
Tx in-band optical signal-to-noise ratio			39		45	dB/12.5GHz
Tx out-of-band optical signal-to-noise ratio			39		45	dB/12.5GHz

Mode type**	800ZR	400ZR	800G-OR	600G-OR	400G-OR ULR	400G-ZR+	200G-ZR+	800G-HP	400G-HP1	400G-HP2
Interoperable standard/MSA	OIF	OIF	OpenROADM 6.0	OpenROADM 6.0	OpenROADM 6.0	OpenZR+	OpenZR+	Custom HP	Custom HP	Custom HP
Baud rate (GBd)	118	60	131	119	118	60	60	135	72	64
Modulation format	16QAM	16QAM	16QAM-PCS	16QAM-PCS	QPSK	16QAM	QPSK	16QAM-PCS	16QAM-PCS	16QAM-PCS
FEC algorithm	OFEC	CFEC	OFEC	OFEC	OFEC	OFEC	OFEC	LDPC	LDPC	LDPC
CD Reach [km]	140	140	1,100	1,650	2,650	1,750	4,700	1,300	2,650	2,650
ROSNR (dB)	27.0	26.0	24.8	21.8	17.1	24.0	14.0	23.8	19.2	20.2
Channel spacing (GHz)	150	75	150	150	150	75	75	150	87.5	75
Supported Ethernet client modes	800GbE-ETC	400 GbE	800GbE-ETC, 400 GbE, 200 GbE, 100 GbE	400 GbE, 200 GbE, 100 GbE	400 GbE, 200 GbE, 100 GbE	400 GbE, 200 GbE, 100 GbE	200 GbE, 100 GbE	800 GbE-ETC, 400 GbE, 200 GbE, 100 GbE	400 GbE, 200 GbE, 100 GbE	400 GbE, 200 GbE, 100 GbE

** Additional modes, including proprietary FEC modes, are available. Please contact your Nokia sales contact.
 Data in this table is preliminary and may be subject to update with experimental validation.
 HP = High performance

About Nokia

At Nokia, we create technology that helps the world act together.

As a B2B technology innovation leader, we are pioneering networks that sense, think and act by leveraging our work across mobile, fixed and cloud networks. In addition, we create value with intellectual property and long-term research, led by the award-winning Nokia Bell Labs.

With truly open architectures that seamlessly integrate into any ecosystem, our high-performance networks create new opportunities for monetization and scale. Service providers, enterprises and partners worldwide trust Nokia to deliver secure, reliable and sustainable networks today – and work with us to create the digital services and applications of the future.

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