

Nokia ICTR140 transmit-receive optical sub-assembly (TROSA)

Unlocking high performance, flexibility, and high-volume manufacturability with the design simplicity of the Nokia TROSA

The Nokia ICTR140 transmit-receive optical sub-assembly (TROSA) design enables low-power coherent optical pluggables capable of covering short-haul and long-haul distances, including 800G transmission over 2,000 kilometers.

The ICTR140 TROSA delivers leading optical performance, including 0 dBm output power, low out-of-band noise for successful deployment over colorless ROADMs architectures, high transmit (Tx) optical signal-to-noise ratio (OSNR), and high receive (Rx) sensitivity.

The ICTR140 integrates all key optical functions on a monolithic indium phosphide (InP) photonic integrated circuit (PIC), including a widely tunable laser, Mach-Zender modulators, semiconductor optical amplifiers (SOAs) and photodetectors. This distinguishes the ICTR140 from most TROSAs in the market, which rely on multiple discrete building blocks based on silicon photonics (SiPh) and/or individual InP functions. In a conventional design, optical gain is provided by a dedicated TROSA function, while the ICTR140 InP implementation enables gain to be distributed through the optical path, offering greater design flexibility and optimization opportunities.

The ICTR140 integrates discrete functions with industry-leading density. In addition to the PIC, the sub-assembly incorporates radio frequency (RF) integrated circuits (ICs) (a transimpedance amplifier (TIA) and a driver) as well as a wavelength

locker and thermoelectric cooling (TEC), all precisely aligned electrically and mechanically into a single compact submodule.



The image shown is for illustration purposes only and may not be an exact representation of the product.

The ICTR140 minimizes subcomponent use. Conventional InP or SiPh TROSAs use two to three PICs, compared to the single monolithic InP PIC in the ICTR140. Similarly, current TROSAs typically require multiple RF ASICs and TEC/fiber couplings, compared to just one or two in the ICTR140. This high-density integration drives lower power consumption, smaller footprint, higher reliability, and simpler manufacturing.



The ICTR140 provides fully programmable baud rates up to 140 GBd, enabling network operators to maximize capacity over virtually any given link. With its highly integrated yet simple design, the ICTR140 makes coherent optical pluggables in high-bitrate applications across multiple reaches a market reality, addressing cost, optical performance and high-volume manufacturability challenges while enabling high reliability and consistent performance.

Features:

- High-density integration of discrete functions into a single submodule, including PIC, RF ICs, and thermoelectric cooling.
- High performance, with up to 140 Gbd, 0 dBm, low out-of-band noise for successful deployment over colorless ROADMs architectures, high transmit OSNR and high receive sensitivity.
- Fully tunable narrow-linewidth laser with flexible-grid tuning for high-performance applications for 100G, 200G, 400G, 600G and 800G, in metro/regional/long-haul networks.

- Directly integrates on customer boards, requiring only external TEC controller and power supplies.
- C-band or L-band
- TROSA management: I2C interface using register sets compatible with OIF-IC-TROSA-01.0 specification.
- Fully ROHS compliant.

Benefits:

- Easy integration: deploys quickly into 800G digital coherent optics (DCO); designed for compatibility with QSFP-DD and OSFP form factors, also suitable for CFP2-DCOs and high-density coherent line card designs.
- High efficiency: low power consumption, compact footprint and high reliability.
- High-volume manufacturability: for deployment in both coherent pluggables and embedded optical engines.
- Deployment flexibility: metro, regional and long-haul performance with support for a large number of cascaded ROADMs.

Key technical specifications (preliminary)

Wavelength capacities	100G, 200G, 400G, 600G, 800G
Target module	QSFP-DD MSA, OSFP MSA; Also suitable for CFP2-DCOs and high-density coherent line cards
Target application	Metro/regional/long-haul networks
Symbol rate	Up to 140 GBd
Output power	Up to 0 dBm
Wavelength range	C-band tunable, 191.3-196.1 THz L-band tunable, 186.1-190.9 THz
Operating temperature	0°C to 75°C

Data in this table is preliminary and may be subject to update with experimental validation.

About Nokia

Nokia is a global leader in connectivity for the AI era. With expertise across fixed, mobile, and transport networks, powered by the innovation of Nokia Bell Labs, we're advancing connectivity to secure a brighter world.

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