

NLM Narrow Linewidth and High Linearity DFB Laser Module



The Narrow Linewidth and High Linearity DFB Laser Module (NLM) enables customers to quickly start coherent sensing system design and proof of concept initiatives based on TeraXion's monolithic DFB laser diode technology.

TeraXion's Narrow Linewidth and High Linearity DFB Laser Module provides 40 mW fiber coupled optical power centered at 1550 nm. A frequency modulation analog interface allows users to control up to 2 GHz chirps at a repetition rate of up to few hundreds of kHz.

Thanks to its unique epitaxy design, TeraXion's DFB laser diode combines stunning performances with ease of drive and modulation. This monolithic semiconductor laser represents a key building block to achieve low-cost coherent sensing systems that usually rely on expensive narrow linewidth lasers and external modulators.

TeraXion's laser is perfectly suited for frequency modulated continuous wave (FMCW) LiDAR, distributed acoustic sensing (DAS) and precision metrology applications.

Top 4 Features

- **Narrow Linewidth Monolithic Design:** Down to 10 kHz linewidth, equivalent to a coherence length of about 10 km.
- **High Linear Frequency Modulation Response:** $\leq 0.3\%$ native distortion over 1 GHz frequency excursion, which is 50 times better than a standard DFB laser.
- **Built-in Low Noise Current Source and Temperature Controller:** Factory calibrated and tested for quick user's system implementation.
- **Analog Interface for Frequency Modulation Waveform Control:** 0-4 V input, allowing total freedom in waveform type and repetition rate.

Optical Specifications

Parameters	Linearity optimized module	Frequency noise optimized module	Units
Center wavelength	1550 ± 5		nm
Instantaneous linewidth ⁽¹⁾	< 100 (Typ. 60)	< 20 (Typ. 10)	kHz
Frequency noise @ 10 MHz	< 3.5 × 10 ⁴ (Typ. 2 × 10 ⁴)	< 0.7 × 10 ⁴ (Typ. 0.4 × 10 ⁴)	Hz ² /Hz
Output power	> 20 (Typ. 40)		mW
Output type	CW		-
Relative intensity noise at > 1 MHz	< -155		dBc/Hz
Side mode suppression ratio	> 40		dB
Polarization extinction ratio	> 15		dB

(1) Lorentzian contribution to linewidth calculated from white frequency noise value at >10 MHz: $\Delta\nu = \pi S_{\nu}$

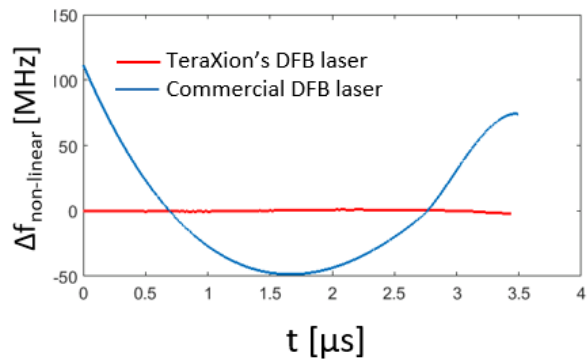
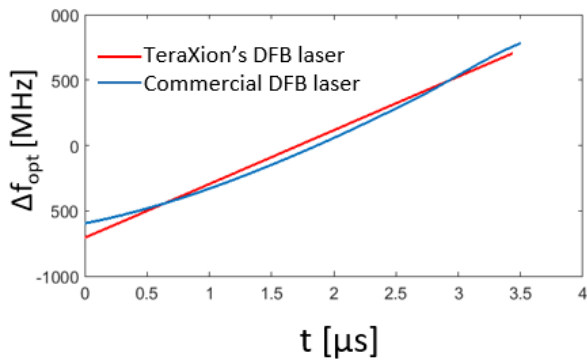
Fast Frequency Tuning

Parameters	Linearity optimized module	Frequency noise optimized module	Units
Residual non-linearity ⁽¹⁾	≤ 0.3 e.g. 3 MHz standard deviation for 1 GHz pp	NA	%
Frequency tuning amplitude	1	2	GHzpp
Frequency tuning method	Analog voltage input		-
Tuning voltage magnitude	4		Vpp
Waveform ⁽²⁾	Triangular ramp up & ramp down		-
Full triangle rep rate ⁽²⁾	1 to 100		kHz

(1) Measured standard deviation of the optical frequency after removal of a linear fit over 90% of the ramp. Valid for 1GHz frequency tuning amplitude.

(2) Modulation parameters applied to specify maximum frequency tuning amplitude and residual non-linearity.

TeraXion's DFB Laser vs Commercial DFB Laser Frequency Modulation Response Comparison



Mechanical/Electrical

Parameters	Values	Units
Dimensions (H x W x L)	30 x 70 x 130	mm
Optical fiber	Panda polarization maintaining, slow axis aligned to key	-
Optical connector	FC / APC (narrow key)	-
Frequency modulation connector	MMCX	-
Power & communication connector	Hirose # DF51K-10DP-2DS(805)	-
Communication interface	RS-485	-
Interface control document (ICD)	Includes laser status, monitoring and control information	-
Power supply voltage	5	VDC
Power consumption	< 15 at start up, Typ. 6 steady-state	W
Interlock shut down time	< 10	ms

External PS-PU Power and Communication Unit Option

Parameters	Values	Units
Power supply voltage	120 to 240	VAC
Computer interface	USB	-
Communication connector	USB-B	-
PC-side software	NLM control and monitoring software	-

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