



48500 Kato Road  
Fremont, CA 94538 USA

## Product Specification

**10G DPSK Demodulator,  
C-Band, 12.25GHz FSR, Tunable**

Part No.: **DI-CAEFAM007**

Revision: **2.0**

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# 10G DPSK Phase Demodulator

## C-Band, 12.25GHz FSR, Tunable

**P/N: DI-CAEFAM007**

**Rev. 2.0**

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### Revision History

Rev.	Date	Revision History	Originated	Signed by
1.0	5/10/2009	Initial Release	Yigao Sha	Nick Xiao
2.0	8/21/2019	Updated the package drawings for Type-M and Type-N	Nick Xiao	James Pang

## Product Specification

### 1. Introduction

Optoplex's **Optical DPSK Demodulator**, also known as **Delay Line Interferometer (DLI)**, converts *phase modulation* to *amplitude modulation* over the entire C+L band in support of data transmission rates of 2.5, 10 or 40 Gb/s. The DPSK demodulator is designed for phase modulated optical communication systems utilized in commercial, defense and space exploration markets. The device plays a key role in improving signal quality and performance to meet the expanding demand for higher data rates and more complex transmission formats within current and next generation systems without major capital expenditure. Optoplex's DPSK Demodulator is based on a patented free-space optical design, which is compact, athermal and polarization-independent. The measured frequency drift over temperature is only  $\sim 0.02$  GHz/ $^{\circ}$ C for our standard passive device. Further, this DPSK Demodulator exhibits a total polarization-dependent phase shift of less than 2 degrees over the entire operating temperature range with a high extinction ratio. Optoplex's DPSK Demodulators can be configured to be fully tunable, colorless tunable or purely passive. Dual-Rate DPSK Demodulator is also available.

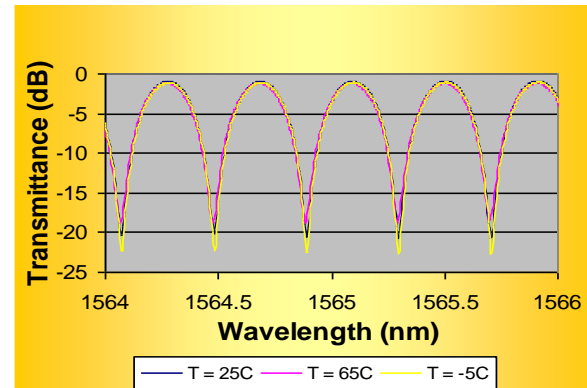


Figure 1, measured optical transmission spectra of DPSK DLI at 3 temperatures

### Key Features and Benefits

- Athermal design
- C+L band coverage by a single device
- Low temperature-dependent frequency shift (TDFS)
- Low polarization-dependent frequency shift (PDFS)
- Low insertion loss & PDL
- High power handling
- Passive, colorless tunable (both aligned to ITU Grid) or fully tunable
- Telcordia GR-1221 qualified

### Applications

- 2.5, 10, 20 or 40 Gb/s commercial DPSK signal reception
- Customized data rate for advanced applications
- Data rate optimization
- Extend transmission distance



Figure 2, Photo of a DPSK DLI



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## 2. Absolute Maximum Rating

Table 1, Absolute maximum rating

Item	Parameter	Symbol	Condition	Min	Max	Unit
1	Storage temperature range	$T_{stg}$		-40	85	°C
2	Storage humidity	$RH_{stg}$	Non Condensing	5	95	%
3	Maximal optical input power	$P_{opt\_max}$	Continuous wave		21	dBm
4	DLI tuning voltage	$V_{max}$	DC voltage		6	V
5	Minimum bending radius of the fiber	$R$	SMF-28, or equivalent	15		mm

## 3. Operating Conditions

Table 2, Operating Conditions

Item	Parameter	Symbol	Condition	Min	Typ.	Max	Unit
1	Operating case temperature range	$T_{case}$		-5		65	°C
2	Relative humidity range	$RH$	Long Term, non condensing	5		90	%
3	Operating frequency range	$f$	C- Band	191.15		196.1	THz
4	DLI Tuning Voltage	$V$	DC	0		5	V



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## 4. Optical Performance Specification

Table 3, optical performance specification

Item	Parameter	Unit	Specification
1	Wavelength Range (C-Band)	nm	1527 ~ 1567
2	Free Spectral Range <sup>1</sup> (FSR)	GHz	<b>12.25<sup>3</sup></b>
3	FSR Error	%	< 1
4	Insertion Loss <sup>1</sup> (including 2 connectors)	dB	2.2 Typical; 2.7 Max
5	Insertion Loss Difference <sup>1</sup> (between two Output ports)	dB	< 0.7
6	Extinction Ratio <sup>1</sup>	dB	> 18
7	PMD <sup>1</sup>	ps	< 0.1
8	Return Loss	dB	> 40
9	PDL <sup>1</sup>	dB	< 0.2
10	PDFS <sup>1</sup>	deg	< 3
11	Optical Path Delay <sup>1</sup> (between the 2 receiving ports)	ps	< 1.0
12	Tuning Time Constant <sup>2</sup>	sec	< 1.0
13	Tuning Range	FSR	> 1.5
14	Tuning Voltage Range	V	0 ~ 5
15	Tuning Power Consumption	W	0.5 Typical; 1.0 Max

**Note:**

- 1) Over the stated spectral and operating temperature ranges and all polarization states.
- 2) Defined as the time required to reach half-way from the starting and ending points.
- 3) Typical FSRs for 10Gbps application are 10, 10.24, 10.7, 11.4, 12.25, 12.5, or 13.375GHz. Custom-FSR is available. Please contact Optoplex for details.

**Typical Output Spectrum** (measured) of a 12.25GHz DPSK DLI

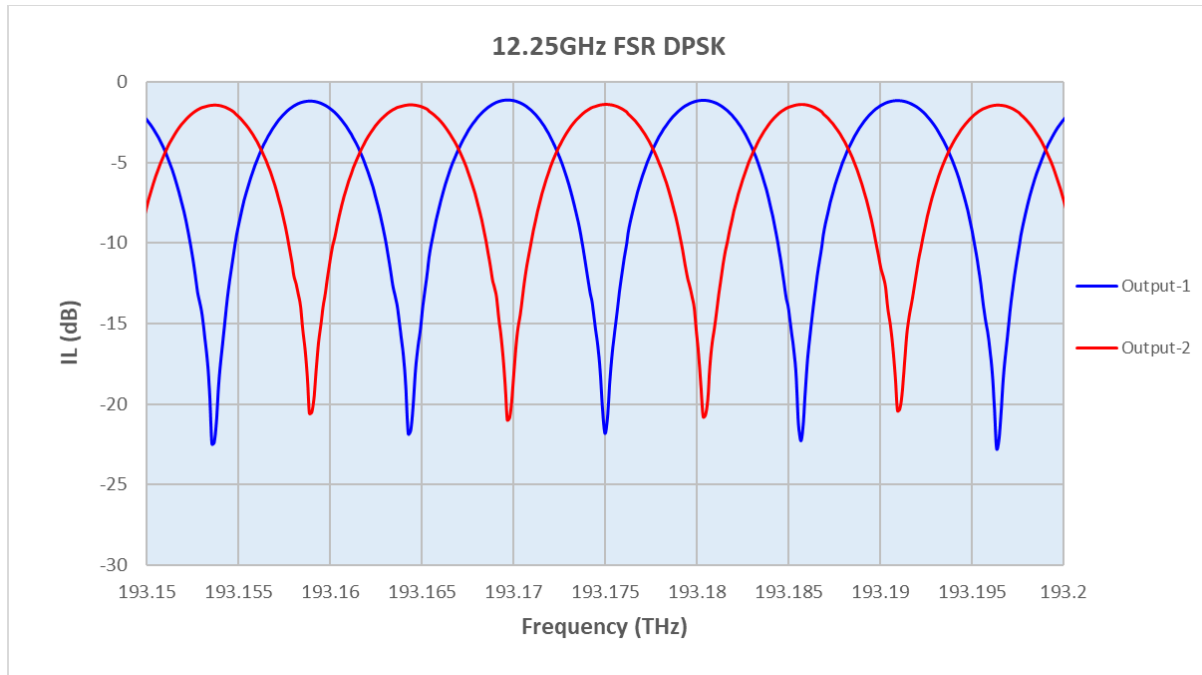


Figure 3, Typical output spectrum of a 12.25 GHz DPSK DLI

**5. Types of Packages**



Figure 4a: Package Type-M

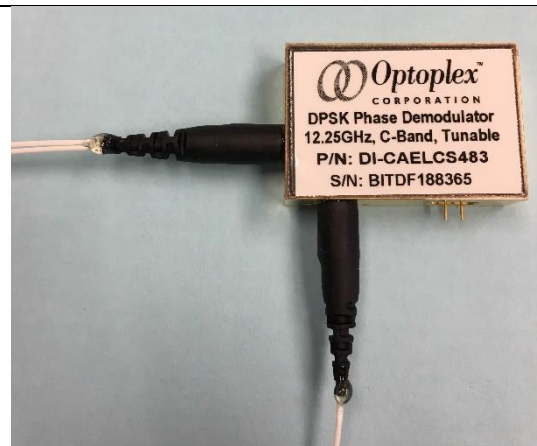


Figure 4b: Package Type-N

## 6. Physical and Mechanical Specification

### 6.1 Device Dimension

Table 4, Device Dimensions

Package Type	Length	Width	Height	Unit
M	30	30	10.5	mm
N	39	26	12	mm

**Note:**

1. Not including the collimator sleeves extending in two adjacent sides. See the detailed drawing below.

### 6.2 Mechanical Drawing (Type-M)

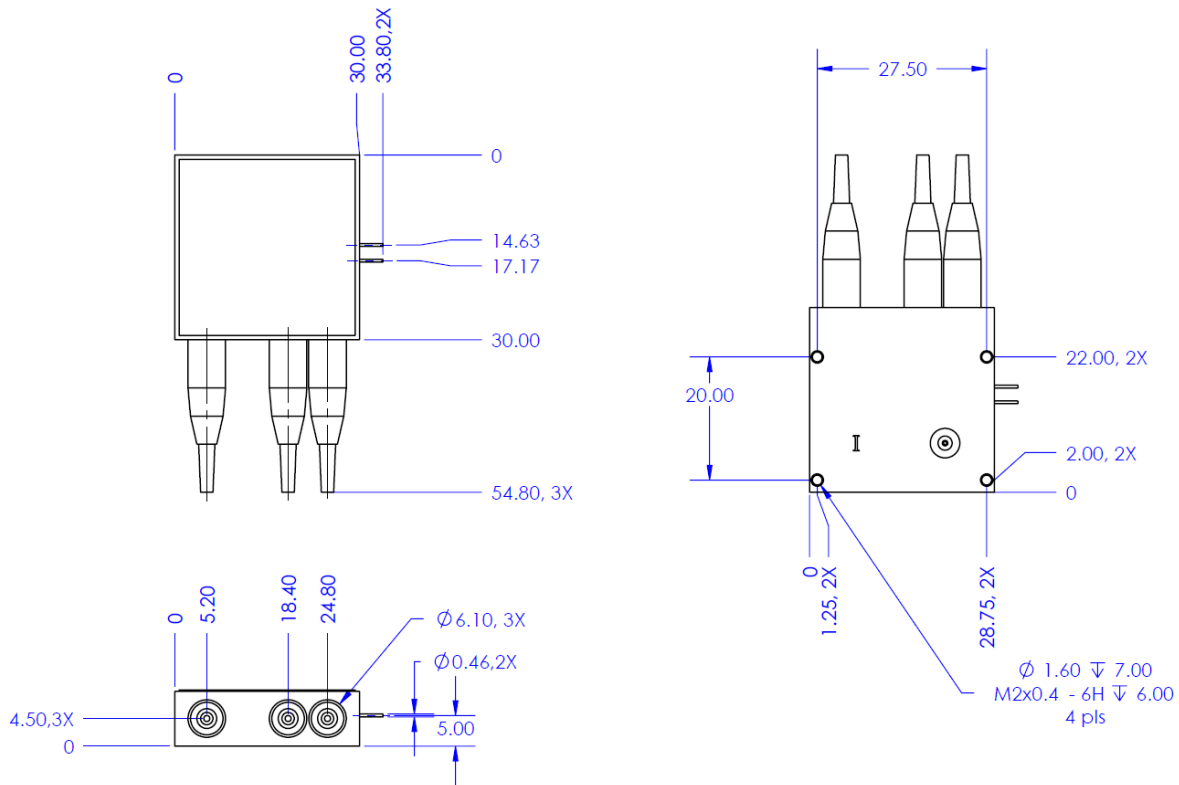


Figure 5, Mechanical drawing of 10G DPSK DLI, **Type-M**

**6.3 Mechanical Drawing (Type-N)**

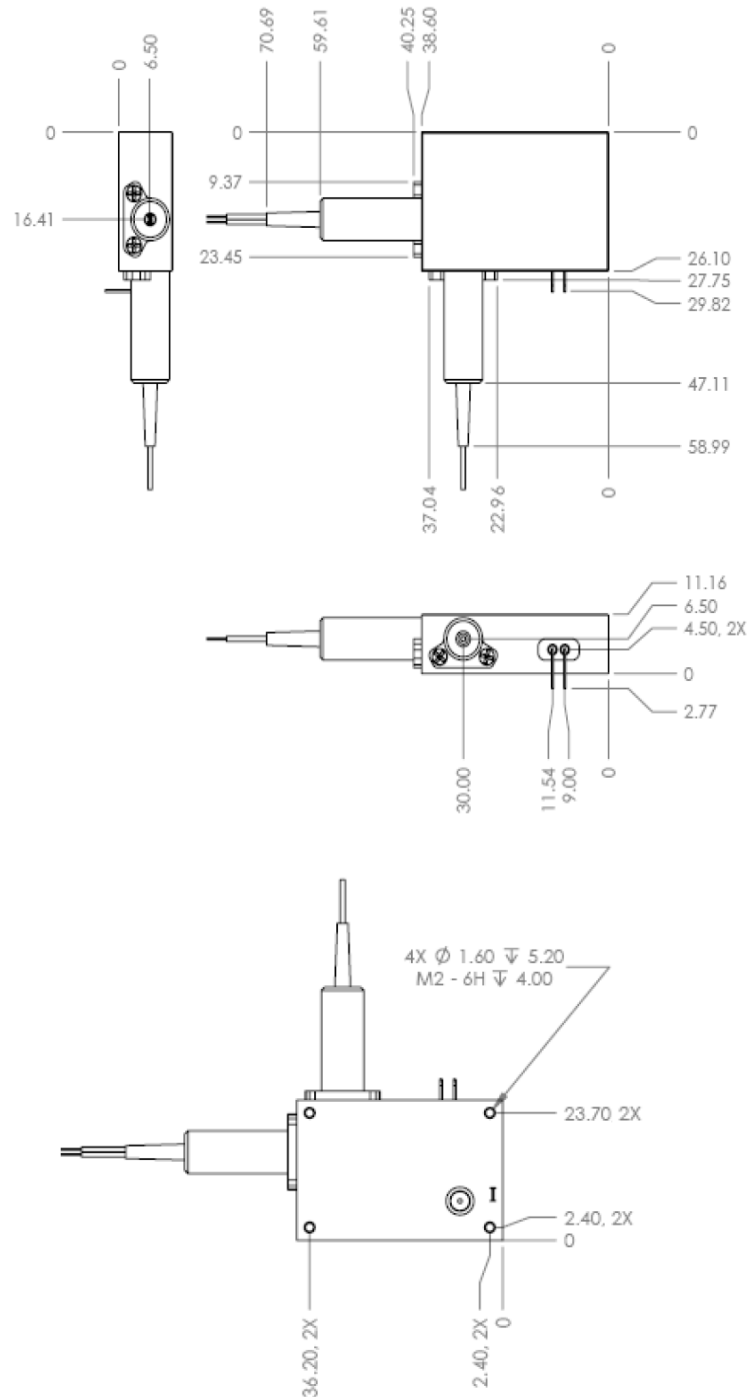


Figure 6, Mechanical drawing of 10G DPSK DLI, Type-N

**6.4 Fiber and Connector**

Table 5, Fiber and Connector Requirements

Item	unit	Description
Connector Type	-	FC/APC (or customer specific)
Fiber Pigtail Type	-	SMF-28 with 900 μm loose tube
Fiber Pigtail Length	mm	1,000 ± 100

**6.5 Port Definition and Labeling**

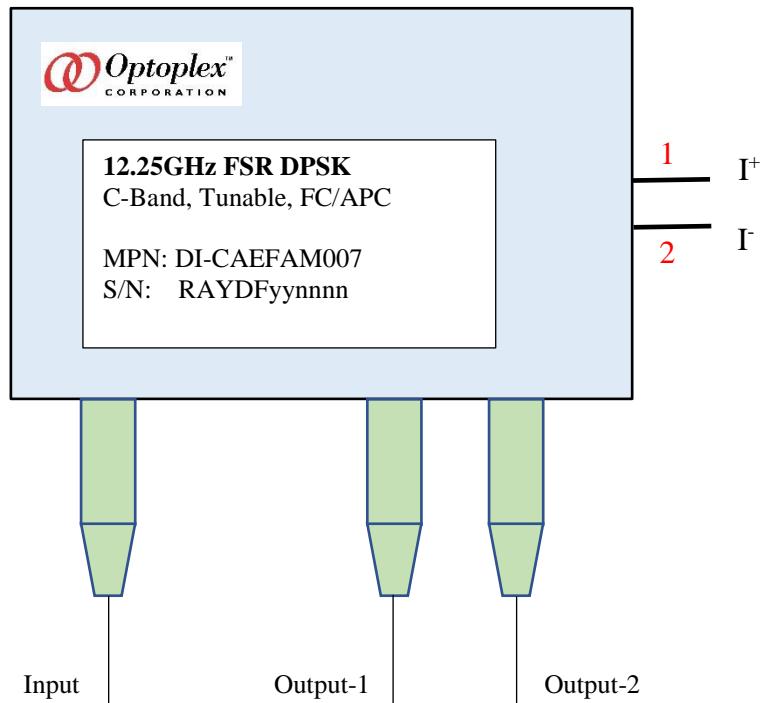


Figure 7, port definition and labeling. **Package Type -M**

Input — Flag-type label on fiber near connector. Content: IN.

Output — Flag-type label on fiber near connector. Content: O<sub>1</sub> and O<sub>2</sub>, respectively.



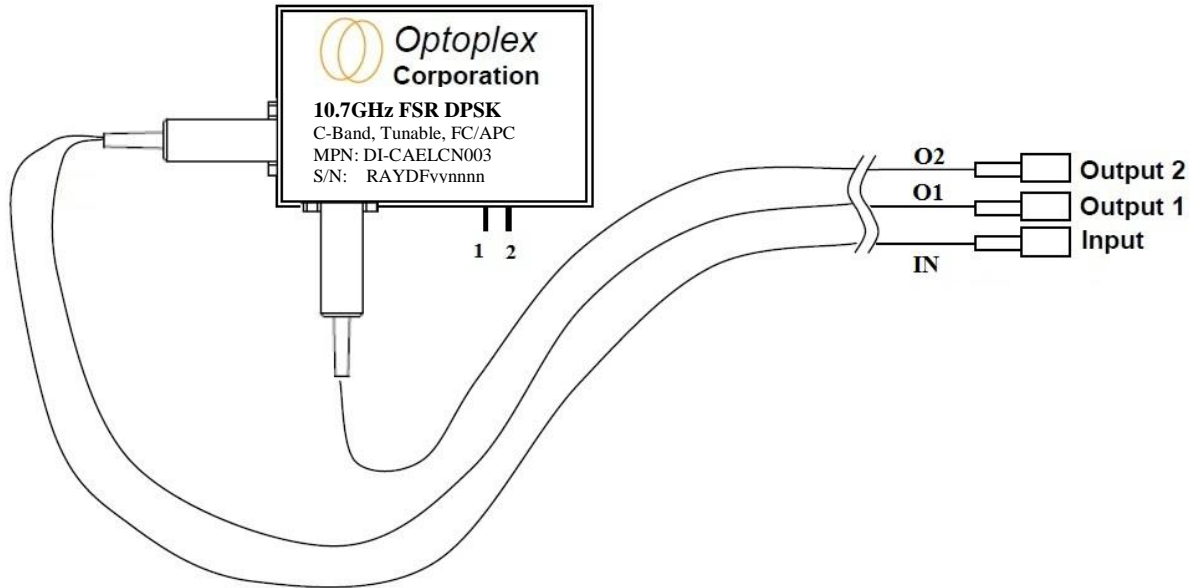


Figure 7, port definition and labeling. **Package Type -N**

Input — Flag-type label on fiber near connector. Content: IN.

Output — Flag-type label on fiber near connector. Content: O<sub>1</sub> and O<sub>2</sub>, respectively.

## 6. Electrical Specification

Table 6, Electrical Pin Definition

Pin	Name	Function
1	I+	Control the phase tuner. No parity. The driving voltage (0 ~ 5VDC) applied to Pin#1 and #2.
2	I-	

(See Figure 5 for Pin#1 and Pin#2 locations)



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## 7. Product Label Requirements

7.1 Port label position and type — Flag tape on pigtail near connector. Width of tape: ~3 mm.

7.2 Port label contents — See Figure 5.

7.3 Device label — On top, contains the following information:

- a) Optoplex logo
- b) Product description: **DPSK Phase Demodulator, C-Band, 12.25 FSR, Tunable**
- c) Manufacturer P/N: **DI – CAEFAM007**
- d) Manufacturer S/N: (TBD)

*Note: xx and nn are determined by customer's selection; see Section 9, "Ordering Information"*

## 8. Quality and Reliability

- RoHS 6 compliance
- Telcordia 1221-CORE qualified

## 9. Ordering Information

Part Number:

<b>D</b>	<b>I</b>	<b>-</b>	<b>C</b>	<b>A</b>	<b>E</b>	<b>x</b>	<b>x</b>	<b>M</b>	<b>0</b>	<b>n</b>	<b>n</b>
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**xx** – Type of Connector

xx = FC: FC/UPC

xx = LC: LC/UPC

xx = FA: FC/APC

Other types of connectors are available upon request.

**nn** – To specify FSR in GHz

nn = 05: 10 GHz

nn = 06: 10.24 GHz

**nn = 03: 10.7 GHz**

nn = 09: 11.4 GHz

nn = 02: 12 GHz

**nn = 07: 12.25 GHz**

**nn = 04: 12.5 GHz**

nn = 08: 13.375 GHz

Package Type:

**M**: Type – M

**N**: Type – N

*Notes:*

- **107, 12.25 and 12.5GHz are the most popular ones for 10Gb/s applications.**
- Custom FSR available upon request.