

110 GHz Plasmonic Imbalanced Mach-Zehnder Modulator

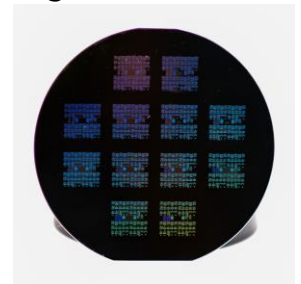
Description

The plasmonic Mach-Zehnder Modulator (MZM) is an ideal solution for high-speed electro-optic conversion in the C band. Featuring a bandwidth of beyond 110 GHz makes it a first choice for applications in measurement systems, radio-over-fiber (RoF) systems and for high-data-rate optical transport.

The imbalanced MZM has a resonant spectrum with peaks and extinctions. This allows for a change of the operating point by tuning the wavelength of the laser source, making an additional voltage source optional.

Key Features

- 3-dB electro-optical bandwidth >110 GHz
- C band operation
- Lumped, low-capacitance RF design
- Chip dimensions 1.5 mm x 2 mm



Performance Data

Insertion loss (IL)	< 17 dB
Static extinction ratio (ER)	> 25 dB
DC bias on/off voltage	< 1.5 V
3-dB EO bandwidth	> 110 GHz
$V_{\pi,eq}$ @ 100 kHz @ 50 Ohm*	< 5 V

Maximum Ratings

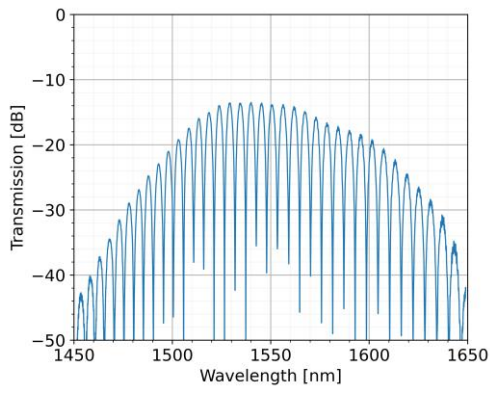
Optical input power**	0 dBm
RF input power @ 50 Ohm	18 dBm
DC voltage at RF input	0 V
DC bias voltage	2.5 V
DC bias current	20 mA
Operating / storage temperature	~ 25 °C

Mechanical and Optical Specifications

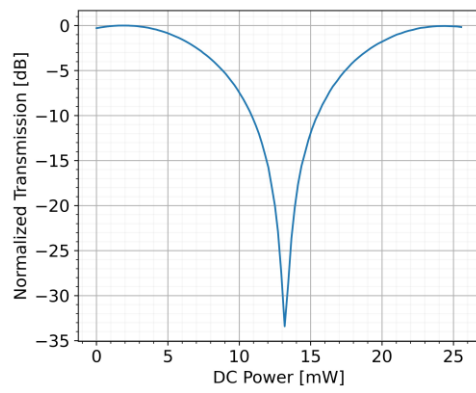
Optical input and output	Grating coupler (GC), 127 μm pitch
Center wavelength at GC angle	1550 nm at 8°
Optical source needed	Tunable Laser Source, 1550 nm ± 10 nm range
Electrical RF interface	G-S-G, 50 – 110 μm pitch
Electrical DC interface	+/-, 70 – 190 μm pitch

* Plasmonic modulators are high-impedance devices. Twice the voltage provided by a 50-Ohm signal source will drop across the plasmonic modulator. Using a DC source or a high-impedance-matched driver, double the voltage is required to switch the modulator from the on to the off state.
** Operation time of 8000 h with a $V_{\pi,eq}$ degradation < 2.5%.

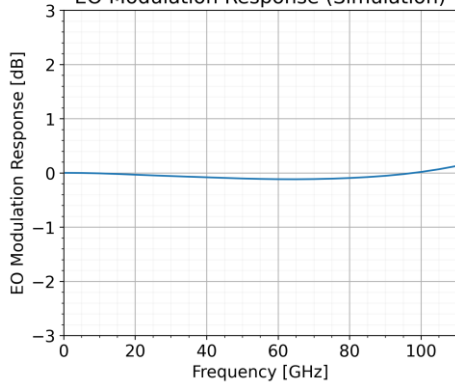
Transmission Spectrum



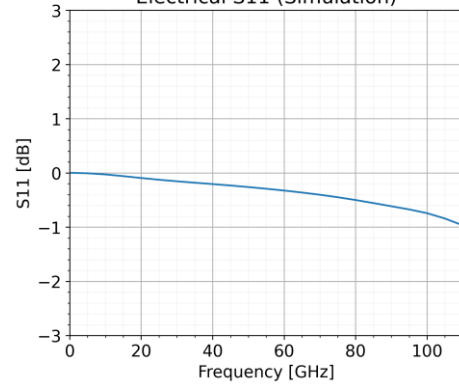
DC Bias Power



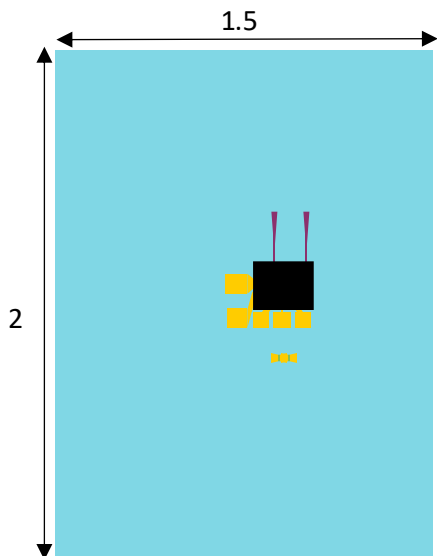
EO Modulation Response (Simulation)



Electrical S11 (Simulation)



Chip Drawing and Dimensions [mm]



Device Drawing and Dimensions [μm]

