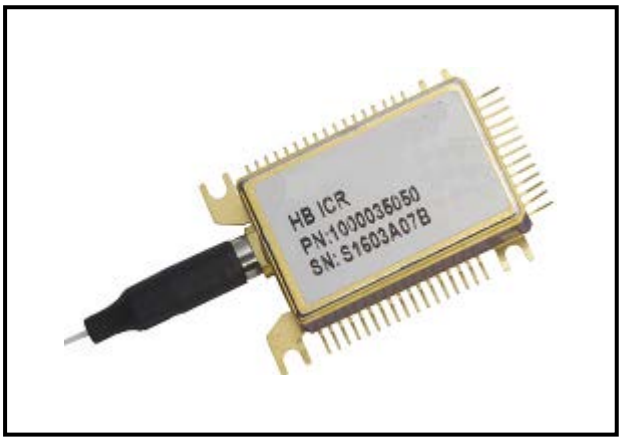
CA-HBW40-ICR 64Gbaud Micro Intradyne Coherent Receiver



1.0 PURPOSE

This document defines the specifications for an integrated micro intradyne coherent receiver (µICR), to be used in 64GBaud applications. The content is applicable for the specific device identified in the table below.

PN	DESCRIPTION
1000037128	Micro ICR – Class 40, with VOA

2.0 REFERENCED DOCUMENTS

2.1 CA OPTRONICS GROUP D000029080 Outline Drawing

3.0 GENERAL DESCRIPTION

The signal input is phase modulated and polarization multiplexed.

The local oscillator input port is a polarization maintaining fiber; its wavelength is tuned for the proper channel signal to be demodulated.

The micro intradyne coherent receiver schematic diagram is shown in Figure 1

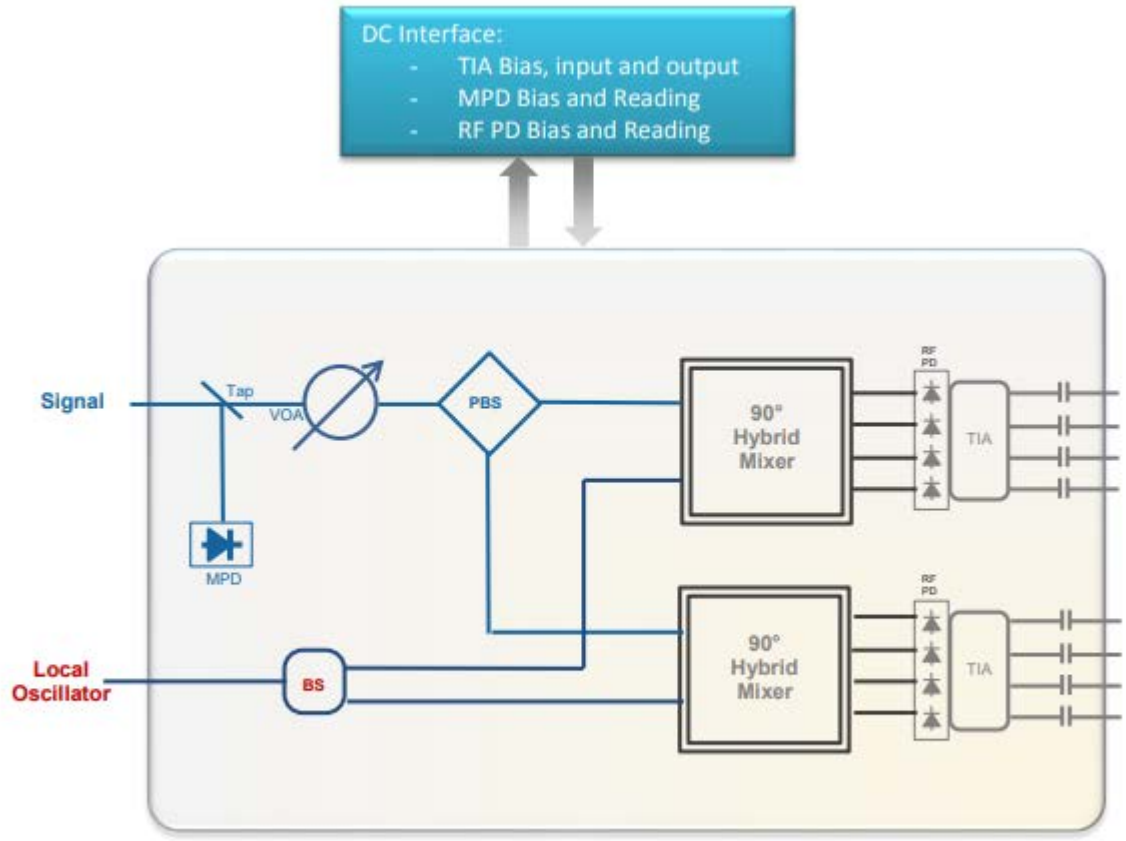


Figure 1: 64GBaud ICR Functional Diagram

The device consists in two 90° optical hybrids and optical detection circuit. The balanced detection is achieved using photodiodes and non-inverting differential TIAs with integrated variable gain stages. The device offers the possibility to adjust the output voltage amplitude.

4.0 PERFORMANCE SPECIFICATIONS

4.1 Absolute Maximum Ratings

The absolute maximum ratings given in the table below define the damage thresholds. Hence, the component shall withstand the given limits without any irreversible damage.

Table 4.1: Absolute Maximum Ratings

Item	*Parameter*	*Symbol*	*Condition*	*Min*	*Max*	*Unit*
1	Storage Temperature Range	T_{stg}		-40	85	°C
2	Storage Humidity	RH_{stg}	Non Condensing	-	85	%
3	TIA Supply Voltage	V_{CC}		-0.5	4.5	V
4	TIA Control Voltage	V_{GC}, V_{OA}, V_{MC},		-0.5	4.5	V
5	TIA Voltage for RFPD	V_{PD}		0	5.5	V
6	Bias Voltage Supply to Monitoring PD	V_{MPD}		0	5.5	V
7	VOA Control Voltage	V_{VOA}		0	7	V
8	Optical Input Power	P_{SIG}+P_{LO}		-	20	dBm
9	Electro Static Discharge (ESD) Voltage	V_{ESD}	C = 100pF; R = 1.5 kΩ; Human Body Model	-500	+500	V
10	Signal Fiber bend radius			7.5	-	mm
11	LO Fiber bend radius			7.5	-	mm

4.2 Operating Conditions

Table 4.2: Operating Conditions

Item	*Parameter*	*Symbol*	*Condition*	*Min*	*Max*	*Unit*
1	Operating Case Temperature Range	T_{case}	Measured in the "hot zone" of the case.	-5	85	°C
2	Relative Humidity Range	RH	Non condensing	-	85	%
3	Operating Wavelength Range		C-Band	1528	1568	nm
4	Signal Input Power Level	P_{SIG}		-18	+0	dBm
5	LO Power Level	P_{LO}		See Figure 2		
6	Polarization of Input Light		Signal input	Polarization multiplexed, phase modulated, random input polarization state		
			Local oscillator input	Linear polarized, continuous wave, aligned with slow axis of PMF		
7	RF Output Load Termination to GND	R_{load}		50		Ω
8	TIA Supply Voltage	V_{CC}		3.135	3.465	V
9	TIA Control Current			-1	+1	mA
10	RF Photodiode Bias Voltage	V_{PD}		3.135	3.465	V

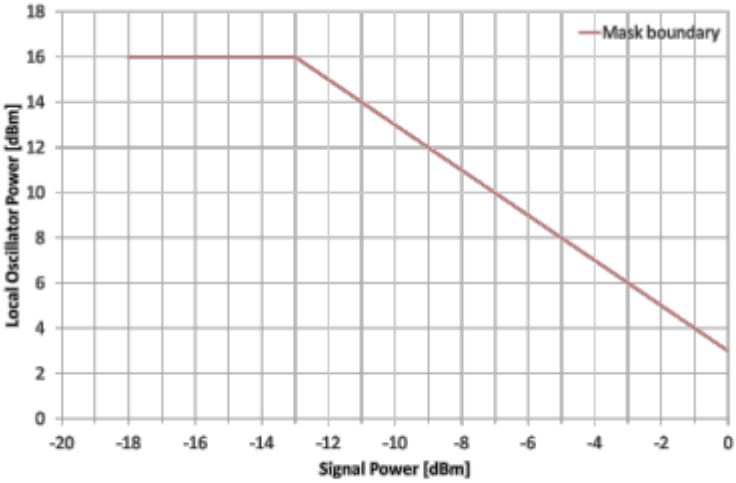


Figure 2: Signal Input power range and maximum allowable LO power mask

4.3 Module Control Specification

Table 4.3.a: Gain Mode Definition and Control Specification					
Parameter	*Symbol*	*Comments*	*Min*	*Max*	*Unit*
Output Control Voltage	V_{OC}	Digital Control, Squelch Mode	0	0.6	V
		Digital Control, Normal Operation	2.0 / FLT	2.7	V
Mode Control Voltage	V_{MC}	Digital Control, MGC mode	0	0.6	V
		Digital Control, AGC mode	2.0 / FLT	2.7	V
Gain Adjustment Voltage	V_{GA}	Analog Control, MGC mode	0	2.7	V
		Analog Control, AGC mode	FLT (must be floating)		V
Output Amplitude Adjustment voltage	V_{OA}	Analog Control, MGC mode	FLT (must be floating)		V
		Analog Control, AGC mode	0	2.7	V
Table 4.3.b: Variable Attenuator Control					
VOA Control Voltage	V_{VOA}	Analog Control	0	5	V

Table 4.3.b: Peaking Setting Control		
PEAKING SETTING	***ZPKL***	***ZPKH***
0	LOW	LOW
1	HIGH	LOW
2	LOW	HIGH
3	HIGH	HIGH

LOW: 0.0 to 0.6V
HIGH: 1.3 to 2.7V, or FLT

4.4 Optical and Electrical specification

Table 4.4: Optical and Electrical Specification
(Unless noted otherwise, all items in this table have to be met under the operating conditions given in Table 4.2)

Item	Parameter	Symbol	Comments	Min	Typ	Max	Unit
1	Responsivity of Individual Tributaries	R_{SIG}	Dual Polarization	0.035	-	-	A/W
		R_{LO}		0.040	-	-	A/W
2	RF Photodiode Dark Current	I_{Dark}	Per photodiode at typical V_{PD}	-	-	150	nA
3	Monitoring PD Responsivity	R_{MPD}		0.03	-	0.10	A/W
4	MPD Crosstalk from LO		$10*\log(R_{SIG}/R_{LO})$	40	-	-	dB
5	Attenuation Range	*Att.*	Typical control curve in Figure 3	10	-	-	dB
6	VOA Current		VOA Control to Common pin	-	-	80	mA
7	DC Common Mode Rejection Ratio	$CMRR_{DC}$	Signal	-	-	-20	dBe
			L.O.	-	-	-20	dBe
8	RF Common Mode Rejection Ratio	$CMRR_{40GHz}$	Signal and L.O., 40GHz	-	-	-16	dBe
9	Total Harmonic Distortion	THD_{diff}		-	-	5	%
10	Small Signal Bandwidth	f_{-3dB}	Maximum Gain Setting	-	40	-	GHz
11	Low Frequency 3dB Cutoff	f_{-3dB_low}		-	-	1	MHz
12	Input Refereed Noise Current Density	I_{noise}	Differential, no optical input, at maximum gain setting.	-	17	-	pA/√Hz
13	Phase Angle Error	θ_{in}	Deviation from 90° angle between I and Q	-5	-	+5	°
14	Polarization Extinction Ratio	*PER*		17	-	-	dB
15	Optical Return Loss	*ORL*	Each input	27	-	-	dB
16	Optical Directivity		Return Loss to the other fiber	38	-	-	dB
17	Output Electrical Return Loss	$IS_{22}I$	Differential S_{22} f < 32GHz f = 32 GHz to 48 GHz	 10 8	 - -	 - -	dB
18	Skew	ΔT_{bal}	Between P and N	-	-	2	ps
19	Channel Skew	ΔT_{path}	Time difference between earliest and latest channel	-	-	50	ps
20	Channel Skew Variation	ΔT_{var}	Temporal variation in the skew between any 2 channels due to case temperature, wavelength, input optical power, amplifier gain, and aging.	-	-	5	ps
21	Total TIA Supply Current	$I_{CC-X} + I_{CC-Y}$		-	370	-	mA
22	ICR Total Power Dissipation	P_{dis}		-	1.5	1.7	W

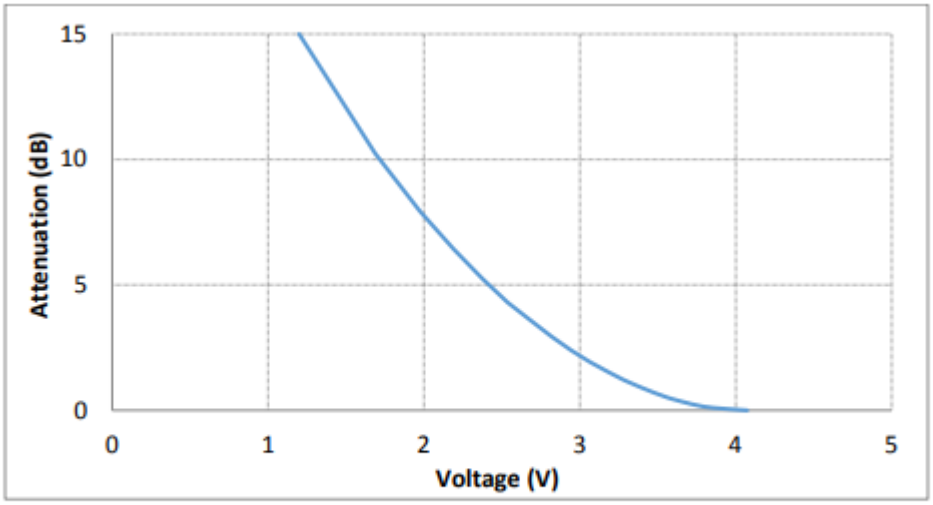


Figure 3: Typical VOA Attenuation Curve

The voltage is measured between the control and the common pins of the VOA (pin #31 and #30)

5.0 ELECTRICAL PIN CONFIGURATION

5.1 DC PINs

PIN #	Symbol	Description	PIN #	Symbol	Description
1	n.c.	Not connected (1)	34	n.c.	Not connected (1)
2	ZPKH	Peaking Adjust High	33	ZPKL	Peaking Adjust Low
3	MGC/AGC	MGC/AGC Selection	32	OC	Output Control
4	MPD+	Monitor Photodiode Cathode	31	VOA_CTRL	VOA Control Voltage
5	MPD-	Monitor Photodiode Anode	30	VOA_COM	VOA Common
6	PD-YI	PD Supply Voltage YI	29	PD-XQ	PD Supply Voltage XQ
7	n.c.	Not connected (1)	28	n.c.	Not connected (1)
8	PD-YQ	PD Supply Voltage YQ	27	PD-XI	PD Supply Voltage XI
9	n.c.	Not connected (1)	26	n.c.	Not connected (1)
10	PI-YI	Peak Indicator YI	25	PI-XQ	Peak Indicator XQ
11	GA-YI	Gain Adjust YI	24	GA-XQ	Gain Adjust XQ
12	OA-YI	Output Amplitude Adjust YI	23	OA-XQ	Output Amplitude Adjust XQ
13	VCC-Y	Supply-Voltage Amplifier Y	22	VCC-X	Supply-Voltage Amplifier X
14	GND	Ground Reference	21	GND	Ground Reference
15	OA-YQ	Output Amplitude Adjust YQ	20	OA-XI	Output Amplitude Adjust XI
16	GA-YQ	Gain Adjust YQ	19	GA-XI	Gain Adjust XI
17	PI-YQ	Peak Indicator YQ	18	PI- XI	Peak Indicator XI

(1): All pins reserved for future use are not connected. Customizations or additional features may require the use of these pins in the future and it is recommended that they are not connected on the PCBA interface.

5.2 RF PINs

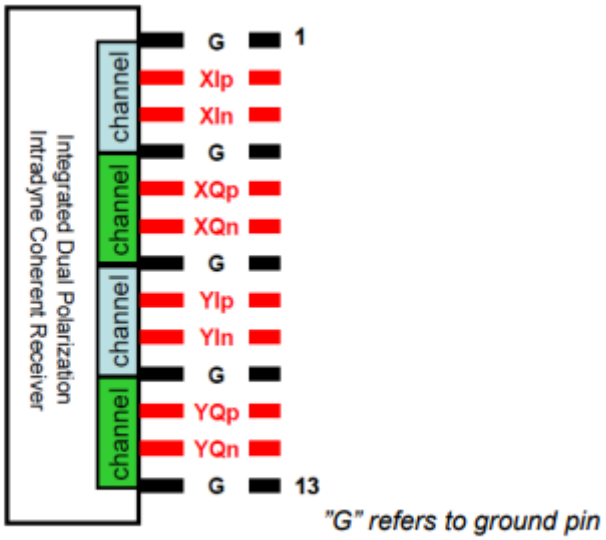


Figure 4: RF Pin assignment (top view)

6.0 MECHANICAL SPECIFICATION