



High Bandwidth VCSEL technology and industrial applications

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Broadcom 850nm High Speed VCSEL

AFCD-V84LP



4x100Gb/s 850nm PAM4 VCSEL Array for Datacom

- Dimensions: 1000x250um, 200um thick
- High S21 bandwidth
- Wear-out life: >10 Years

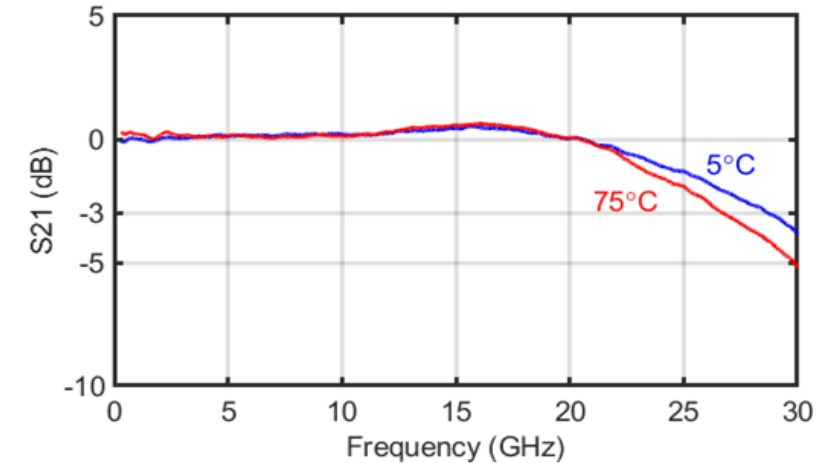
AFCD-V74KN2 4x50Gb/s PAM4 VCSEL array

- Targeted Ibias: 7.5mA over-temperature (5-75C substrate)
- Wear-out life: >10 Years
- Millions of devices shipped since 2017

AFCD-V64XT 4x25Gb/s NRZ VCSEL array

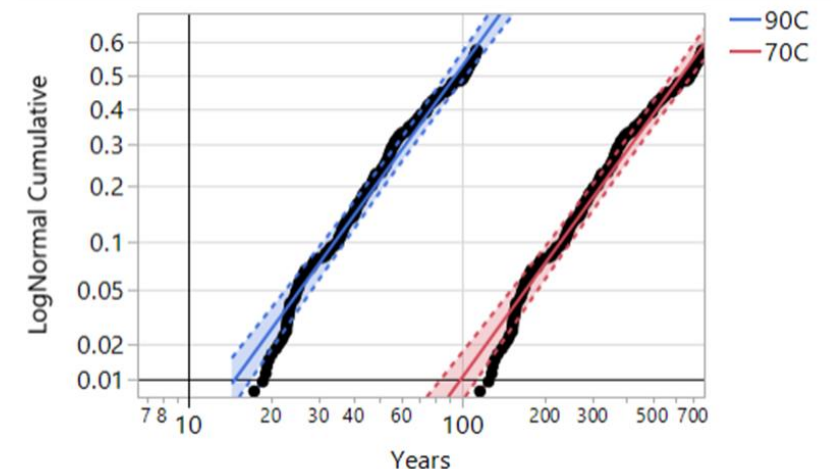
- Targeted Ibias: 7.5mA over-temperature (-20-90C substrate)
- Wear-out life: >10 Years
- Volume shipment since 2019

AFCD-V84LP



>25GHz S21 bandwidth over temperature

AFCD-V64XT

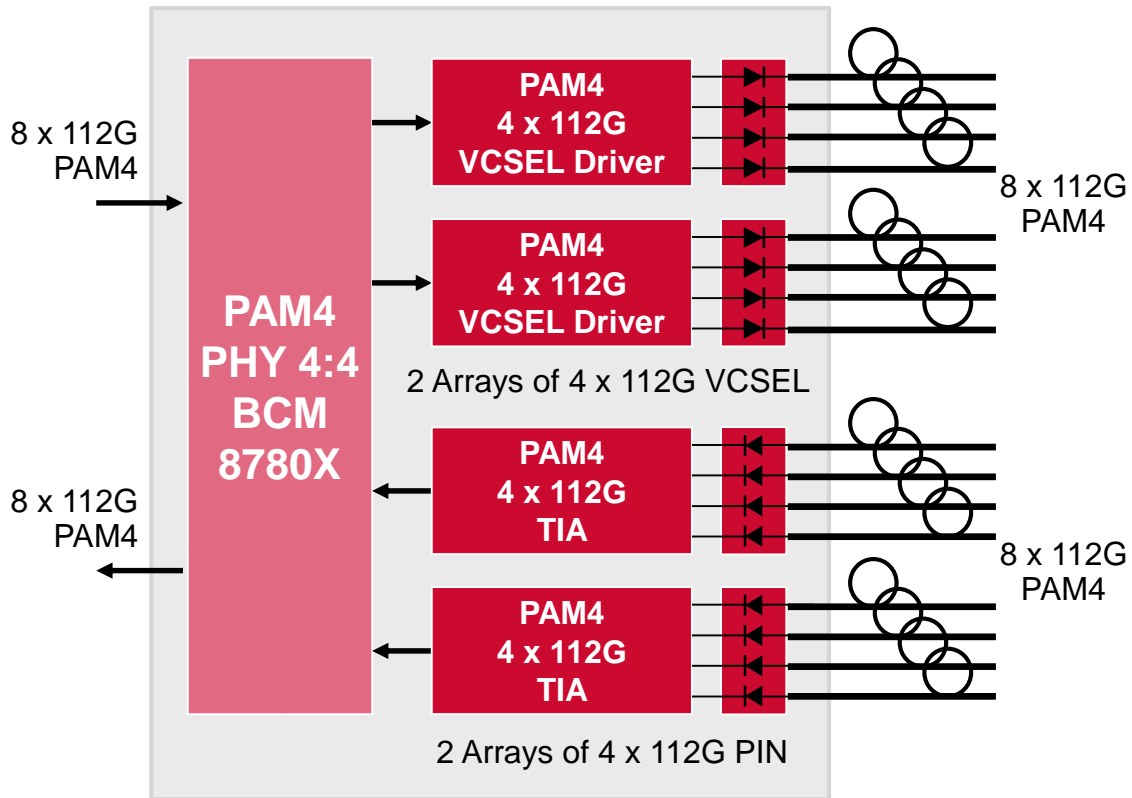


>10 years lifetime over temperature

Broadcom 100G/Ch MM Components Solution

100Gbps 850nm VCSEL Advancements

800G-SR8 100m OM4 MMF



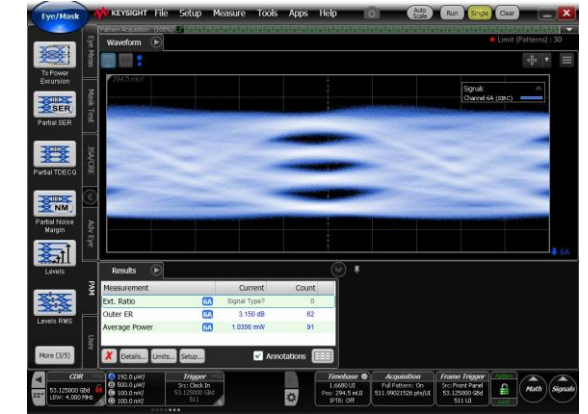
100G multimode component kit set



AFCD-V84LK



BPD3056-4

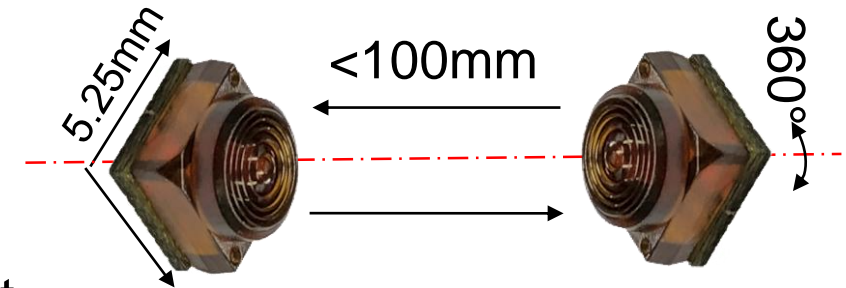


50Gb/s eyes w/ equalization

Part Number	Description	Status
BCM8780x	8x112G PAM4 PHY	Sampling
AFCD-V84LK	4x112G 850nm PAM4 VCSEL	Sampling
BPD3056-4	4x112G PIN Photodetector	Sampling
AFSI-R94C4S2	4x112G PAM4 TIA	Sampling
AFSI-N94C4S2	4x112G PAM4 Laser Driver	Sampling

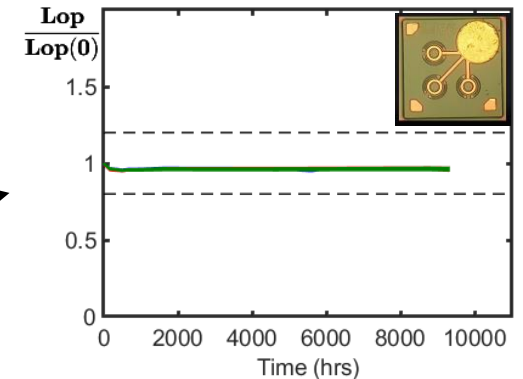
VCSEL for freespace datalink and ToF sensing

- AFBR-S13B25: Optical freespace communication
 - 1.25Gbps Full Duplex, 360° symm., integrated Rx/Tx
 - Reflow solderable SMD module, 5.25 x 5.25 x 4.8 mm³
 - Applications: Medical (through glass), Lidar scanner
 - **New: Extension of 5Gbps+ Full Duplex**
 - Challenge for VCSELs: Target to use <3mA Modulation current



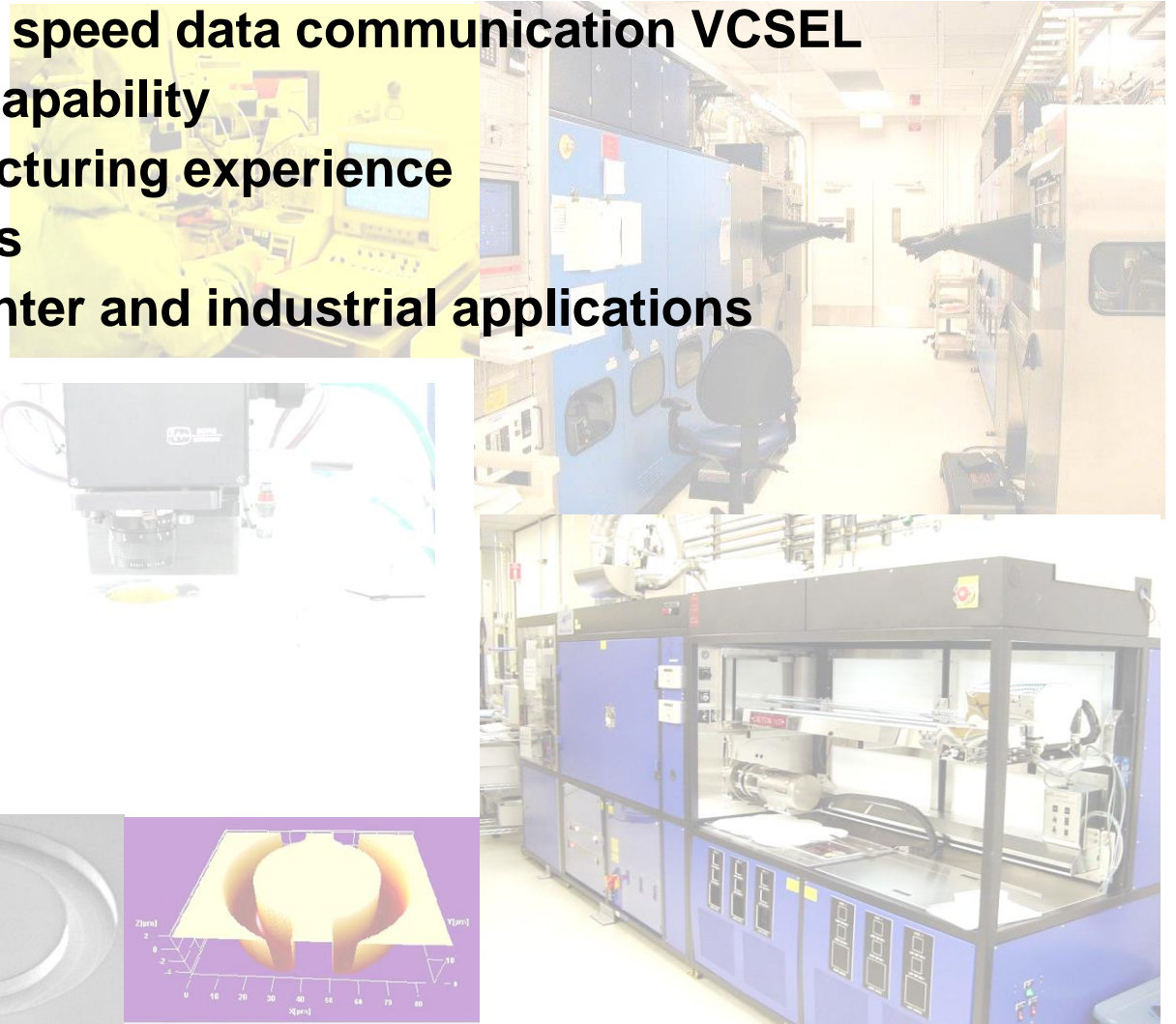
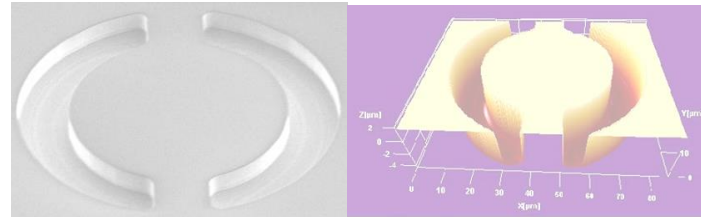
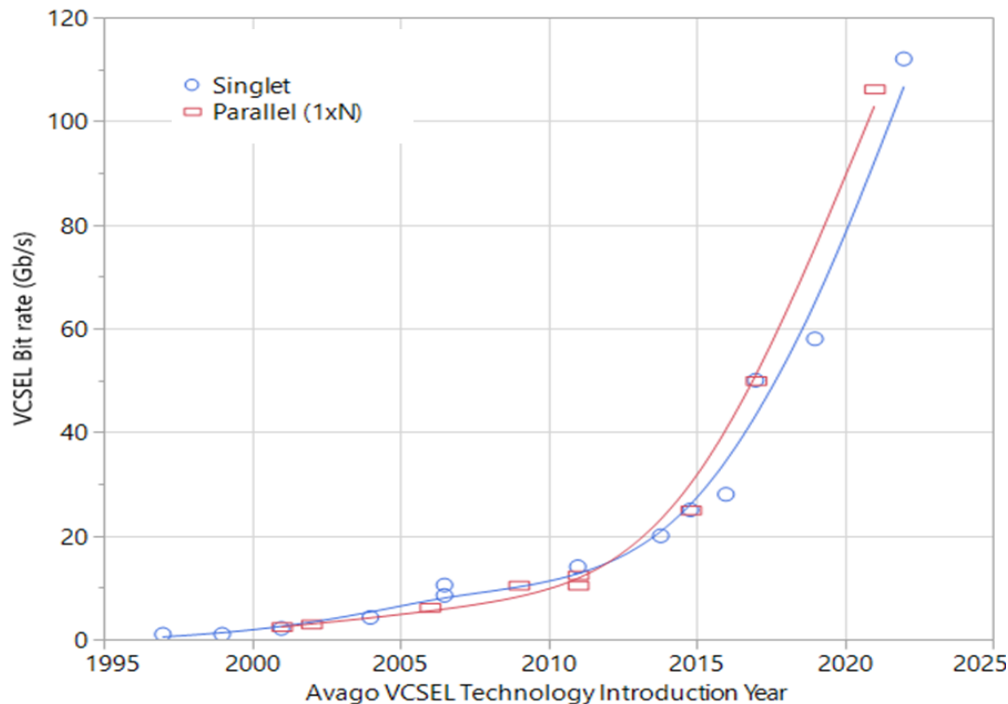
- AFBR-S50 Time-of-Flight sensor series

- Series of modules with outdoor ranges from 5m (32 pixels) up to 30m (1 Pixel)
- Integrated and factory calibrated modules, 12.4 x 7.6 x 7.8 mm³
- Main Applications: AGVs (robots) and UAVs (drones)
- **New: Extended Range for up to 50m distance (outdoor)** using new High Power VCSEL with higher brightness:
long term stability proven: 40mA cw / 100°C (3x30 devices, >9k hours)
(for AFBR-S50 laser class1 modules, only about 1% Duty Cycle is used)



VCSEL at Broadcom

- **Broadcom is a leader in manufacture of high speed data communication VCSEL**
- **Complete in house R&D and manufacturing capability**
- **Over 20 years of high volume VCSEL manufacturing experience**
- **Track record of doubling bit rate every 3 years**
- **Proven reliability and low FIT rate for data center and industrial applications**



Thank You





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