

# Brolis Semiconductors

## Case study

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BEYOND STATE-OF-THE-ART TECHNOLOGY  
FOR INFRARED APPLICATIONS

# Story

BSc Electronics  
Lithuania



MSc Nanotechnology  
Sweden



ROYAL INSTITUTE  
OF TECHNOLOGY

PhD Semiconductors  
Germany



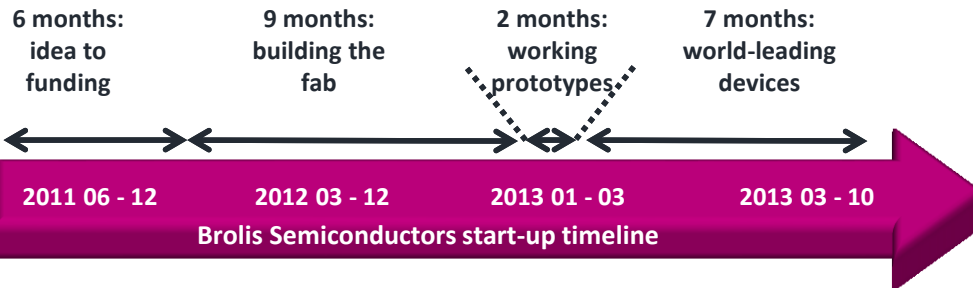
MSc Management  
Belgium



Universiteit  
Antwerpen

## Brolis Semiconductors affair:

- Three **brothers**;
- **Elite** European education;
- **Leading** scientific results;
- **Successful** lab to fab conversion;
- Market-ready **cutting-edge technology**;



# Company



**Brolis Semiconductors UAB**  
Molėtų pl. 73  
LT-14259 Vilnius  
Lietuva  
[www.brolis-semicon.com](http://www.brolis-semicon.com)



**Brolis Semiconductors BVBA**  
Bollebergen 2B  
9025 Zwijnaarde/Ghent  
Belgium  
[www.brolis-semicon.com](http://www.brolis-semicon.com)



**Brolis Photonics Solutions LTD**  
Willowbank Business Park  
Larne, County Antrim, BT40 2SF  
Northern Ireland, UK  
[www.b-photonics.com](http://www.b-photonics.com)

## Business:

- Laser diodes (0.8 – 3.5  $\mu\text{m}$ )
- E-O systems for defence & security
- GaSb/SOI photonic integrated circuits

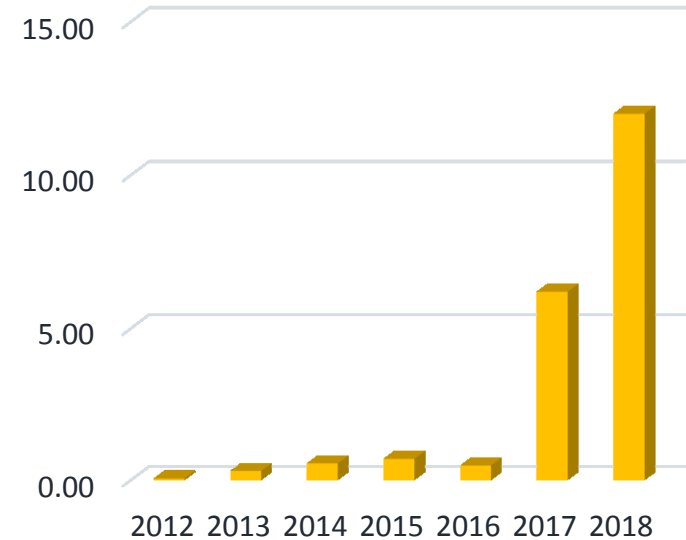
## Factsheet:

- Company established in **August, 2011;**
- Number of employees : **23** (2017)
- 210 m<sup>2</sup> state-of-the-art cleanroom facility
- ISO 9001:2015
- Revenues: 6.5 M EUR (2017)
- Order book: 20 M EUR (2018 – 2021)
- IP portfolio: 2 US patents granted, 3 pending

# History

- 2011 m. spin-out from TU Munich, Germany
- From IDEA to the START of operations – 18 months
- From LOSS to PROFIT – 4 years
- Total investment over 10 M EUR

Brolis historical revenues  
(M, EUR)





# Target markets

Laser diode based:

- Spectroscopy
- Dermatology
- Surgery



Healthcare / Consumer electronics

- Covert surveillance
- Warrior systems
- DIRCM
- NIR, SWIR, Thermal



Defence & Security



## Unique technology platform for **IR wavelength range**

*From material synthesis to final solutions*

- Ex-SWIR spectral range (1.7 – 3.5)
- Industrial scaling
- Developed and manufactured from **A to Z in Lithuania**

- System on the chip
- Biomedical sensors
- Industrial sensors



System on the Chip  
(Lab on the chip)

# Business model: vertical integration

- Multi-wafer MBE wafer growth
- High-throughput backend technology
- System integration and assembly

From **NIR** – through **SWIR** – to **MIR**

0.8  $\mu\text{m}$

1.5  $\mu\text{m}$

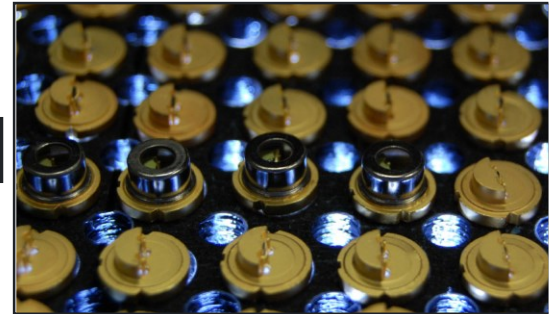
3  $\mu\text{m}$

$\lambda$

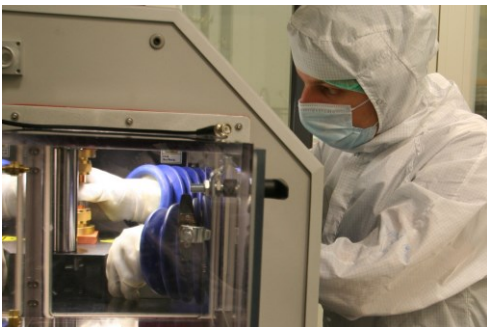
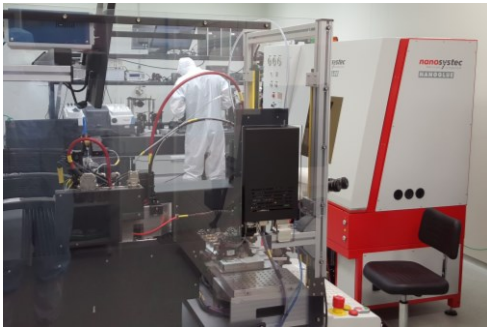
Wafer

Component

System



# Technology: production – assembly – full product qualification



Brolis Semiconductors Ltd. Moletu pl. 73, Vilnius LT-14259, Lithuania  
phone: +370 5 219 95 92, info@brolis-semicon.com, www.brolis-semicon.com  
Manufactured and packed with pride in Lithuania.



# Financial instruments used

- Nr. VP2-1.3- ŪM-02-K-03-047
- Intelektas LT (“soft”)
- 2012 – 2015
- Total project value: 944 402 EUR ( EU part: 414 026 EUR)
- VP2-1.3-ŪM-03-K-03-002
- Intelektas LT+ (hardware)
- 2012 – 2013
- Total project value: 3 073 663 EUR ( EU part: 2 151 564 EUR)

## EP2-1.3-ŪM-03-K-04-003

- Intelektas LT+ (hardware)
- 2014 – 2015
- Total project value: 1 630 888 EUR ( EU part: 752 736 EUR)

## EUROSTARS-2

- E!10051 SWIRSENSE ranked #6 from ~300 projects from 34 countries
- 2016 – 2018
- Total project value: 380 000 EUR ( EU part: 300 000 EUR)

**Total financial aid: ~ 3.6 M EUR**



# Financial instruments

- Intelektas LT+, LT excellent instrument for hardware funding
- BUT not for start-ups – financial backing requirement.
- Brolis had to raise VC money to become eligible for the instrument
- VC money hard to get and most expensive in the industry
- Also a bureaucratic burden focusing on processes not the essence
- Expert reviews at times were very amateur – lack of expertise!
  
- Eurostars-2
- Application/review and examining is through Brussels
- International independent expert review – found remarks very valuable
- Project progress status reports – directly to EUROSTARS (MITA on cc)
- Additional bureaucracy in Lithuania – translate the same progress report with more details
- Additional review (of WHAT and by WHOM?)
- Partners in Switzerland have 0 extra bureaucracy vs Brolis having double and 3 months delay in funding.

# High-tech intellectual property protection

- PATENTS are vital to protect and monetize value of know-how and technology
- PATENTS are EXPENSIVE
- PATENTS also protect the investments into the technology ( relevant for FI)

- Since 2012, Brolis has 2 US patents granted and 3 more filed
- Total money spent up to now: **200 kEUR**, or ~ **40 kEUR/patent**
- For SME's this is very expensive, therefore a relevant FI is necessary

- Until 2017 no long-term FI existing, or existing FI's excluded US patents (???)
- In 2017 INOPATENTAS was introduced

- **INOPATENTAS:**

- **US patent included (+)**
- **Max funding amount/patent: 30 kEUR (+)**
- **Max funding intensity: 80 % (+)**

- **Upper limit for PA hourly rate: 120 EUR/h**

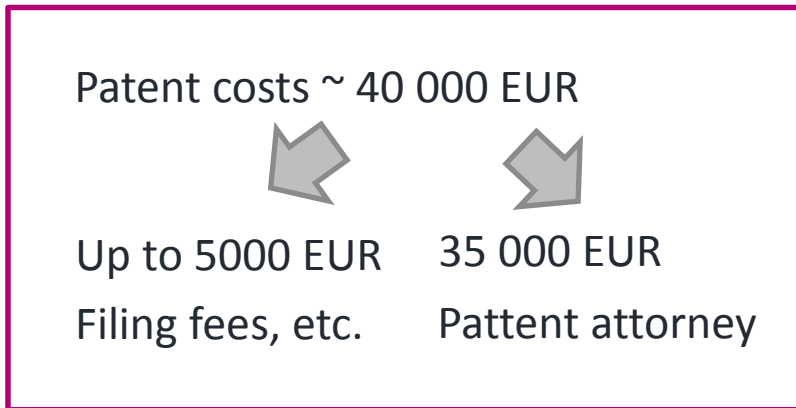
This kills the entire FI!

# High-tech intellectual property protection

- Patent attorney (PA) qualification are absolutely essential for the quality of the patent
- Preparing a US patent it is a good idea to work with US IP firms
- PA must specialize in a narrow field and be field-specific
- At Brolis we changed 4 IP firms in DE, UK, LT and US to find a suitable firm for our field

Market prices for a PA are:

- Top level IP firm in US: **750 EUR – 1000 EUR/h**
- Average level firm in DE, BE, UK: **500 EUR/h**
- **Where does the 120 EUR/h come from?**



	INOPATENTAS	ACTUAL
Max amount	30 000	40 000
Max intensity	80%	<20%
PA rate	120 EUR/h	1000 EUR/h

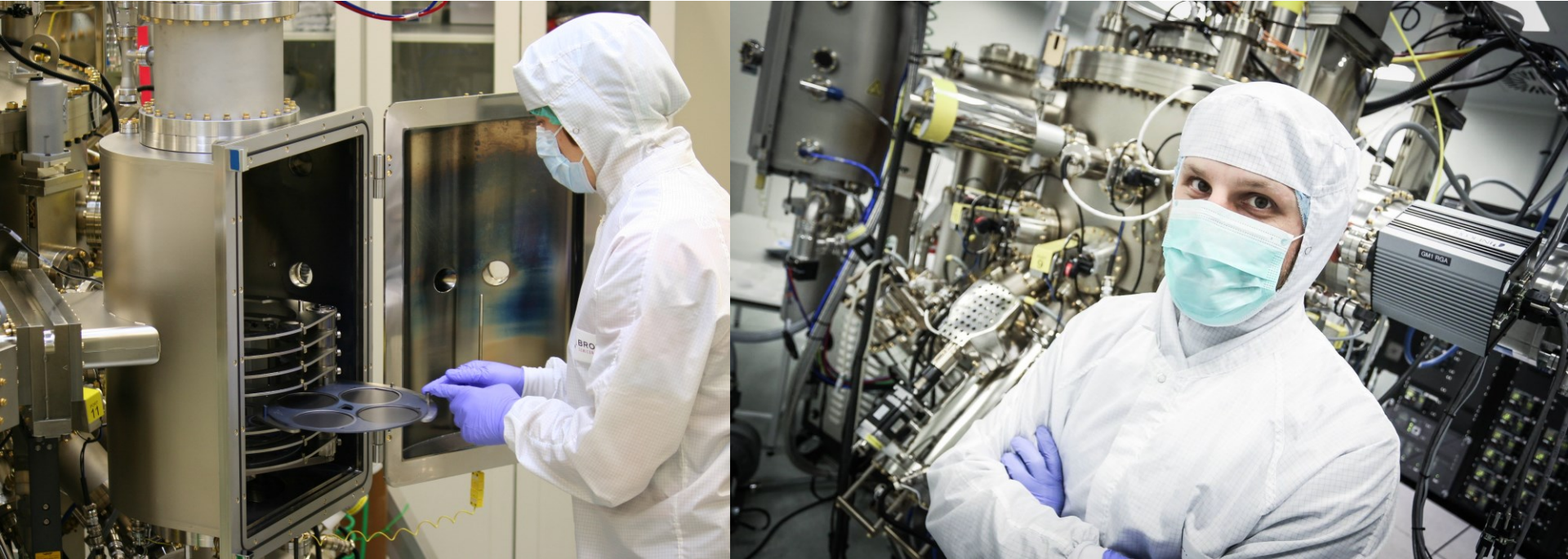
This instrument will never result in anything  
Money will be spent

# Financial instruments: resume

- Good FI ideas but no communication/feedback with end-user
- Early stage business is left on its own in LT
- Duplication of EU bureaucracy and failing at doing so kills the FI
- Lack of local expertise leads to poor project review quality
- Lack of long-term FI's for priority fields
- There are so many good working examples in other countries – have a look
- When creating rules of specific FI, PLEASE talk to **end users**



# Thank You!



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[www.b-photonics.com](http://www.b-photonics.com)