# Make or buy

## Life cycle cost of ZigBee® solution

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# Agenda

- Different HW solution
- True cost of a ZigBee HW solution
  - LCC (Life cycle cost)
- RISK
- Business solution
- Key factors for choice

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# Different HW platforms

- Single chip solution (SoC)
- Dual chip solution (MCU + transceiver)
- Module

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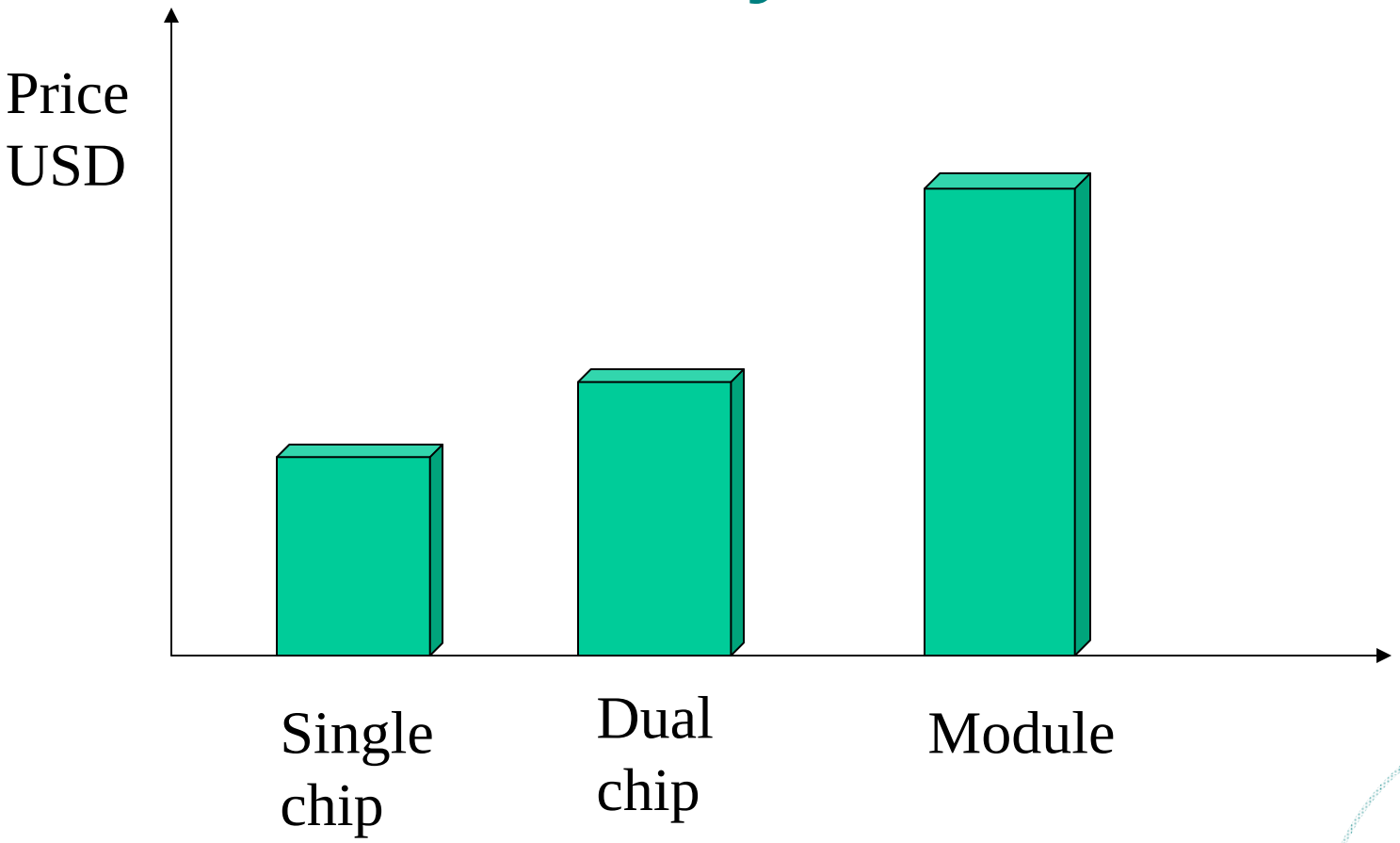
# Myth

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# What is the true cost

- Total solution = LCC cost
  - Chip(s)
  - Supporting components
    - Crystal(s), Balun, Shielding Can,++
  - Design cost
  - Test cost/Yield loss cost
  - Supply chain cost
  - Design support cost
  - Financial cost/risk

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# What is the true component cost

- Chip (single or two)
- Two crystals
- Antenna
- Balun
- Shield can
- PCB, Passive components
- Might need EEPROM, Flash, PA, RF switches, filter, logic…

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# Design cost

- The design from an external design house of a ZigBee HW solution might be $150k*
  - *1 RF engineer: design, schematic, layout, test, qualification, documentation. 7 months=1100 hours @ $120 = $132k + prototyping.
- If you will produce 50k this will add $3 per end product

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# Test cost

- You need to test to check for failure and monitor critical parameters
- Test jig with RF instrumentation
- Automatic test program to reduce test time
- Total investment estimated to $100k
- Test time
- That equals $2 per end product for a 50k volume

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# ETSI/FCC qualification

- ETSI certification for CE marking
  - R&TTE directive 1999/5/EC.
  - ETSI EN 300 440, EN 300 328
  - ERC RECOMMENDATION 70-03
- FCC require formal certification
  - Tests must be done at FCC approved lab
- Time-consuming and costly

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# Good yield is crucial for low cost

- Example
  - 99% yield
  - 1 out of 100 must be analyzed and repaired= $50
  - Increased cost by 50 cent

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# Supply chain cost

- Compare prices and negotiate prices with many vendors
- Purchasing and logistics for 1 vs. >30 components
  - 125h @ $120 = $15k= 30 cents per product
- Shipping, insurance and payment fee

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# Design support

- Component change notification
- New suppliers
- Yield changes
- Support cost
  - 15hours*11 months=165 hours
  - 165 hours*$120= 40 cents per end-product

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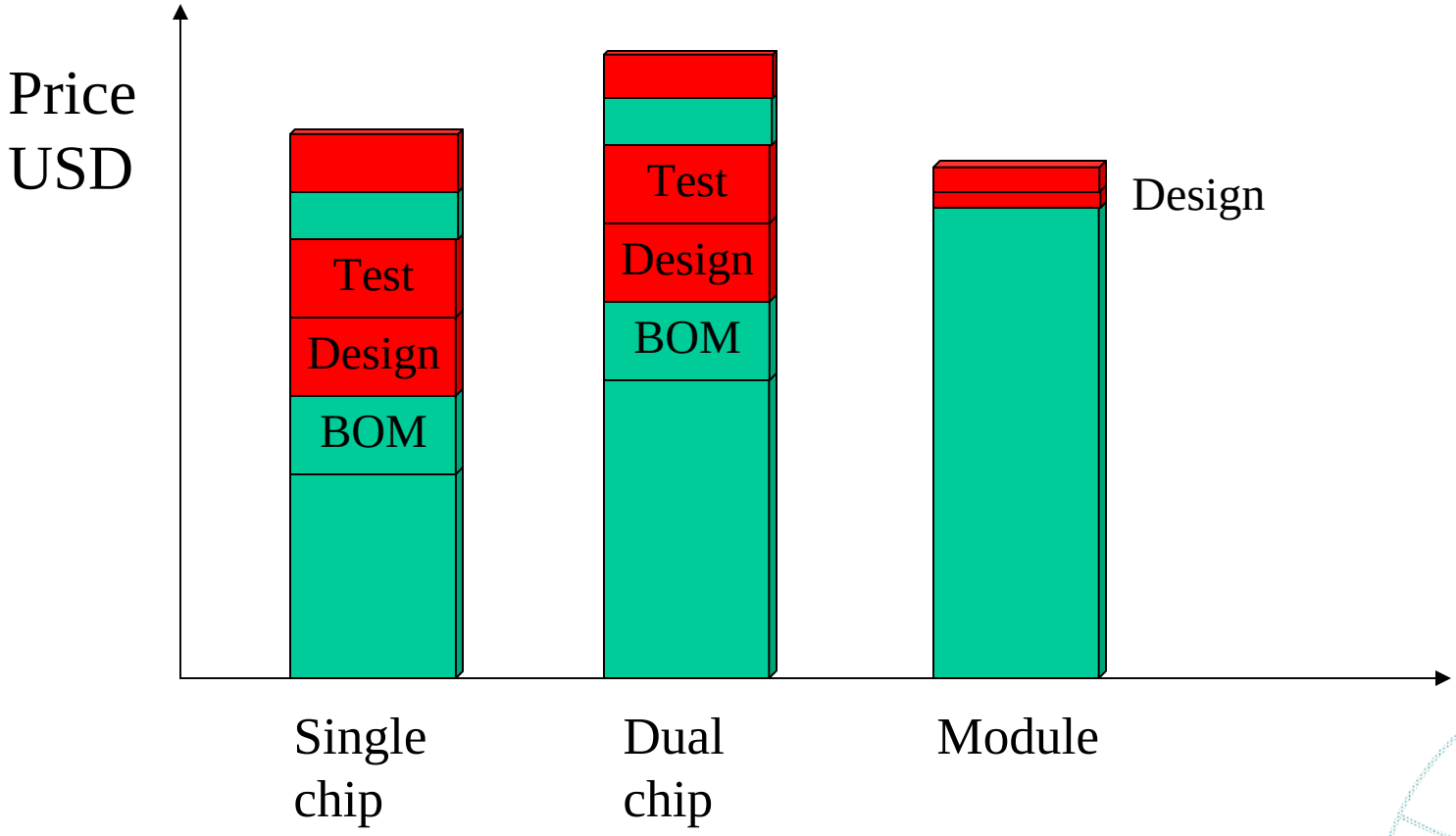
# How about that myth again..

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# Cost @ 1k

| | Chip | Module |
|---|---|---|
| BOM | ~$ 10 (1k)* | ~$ 21 (1k)* |
| Supply chain | $ 0.3 | $ 0.1 |
| Yield loss | $ 0.5 | 0 |
| | | |
| Life support cost | $ 20 000 | $ 1000 |
| HW Development cost | $ 150 000 | $10 000 |
| Test development<br>Incl. RF instrument | $ 100 000 | 0 |
| **Total per device(1k)** | **$ 283.3** | **$ 32.2** |

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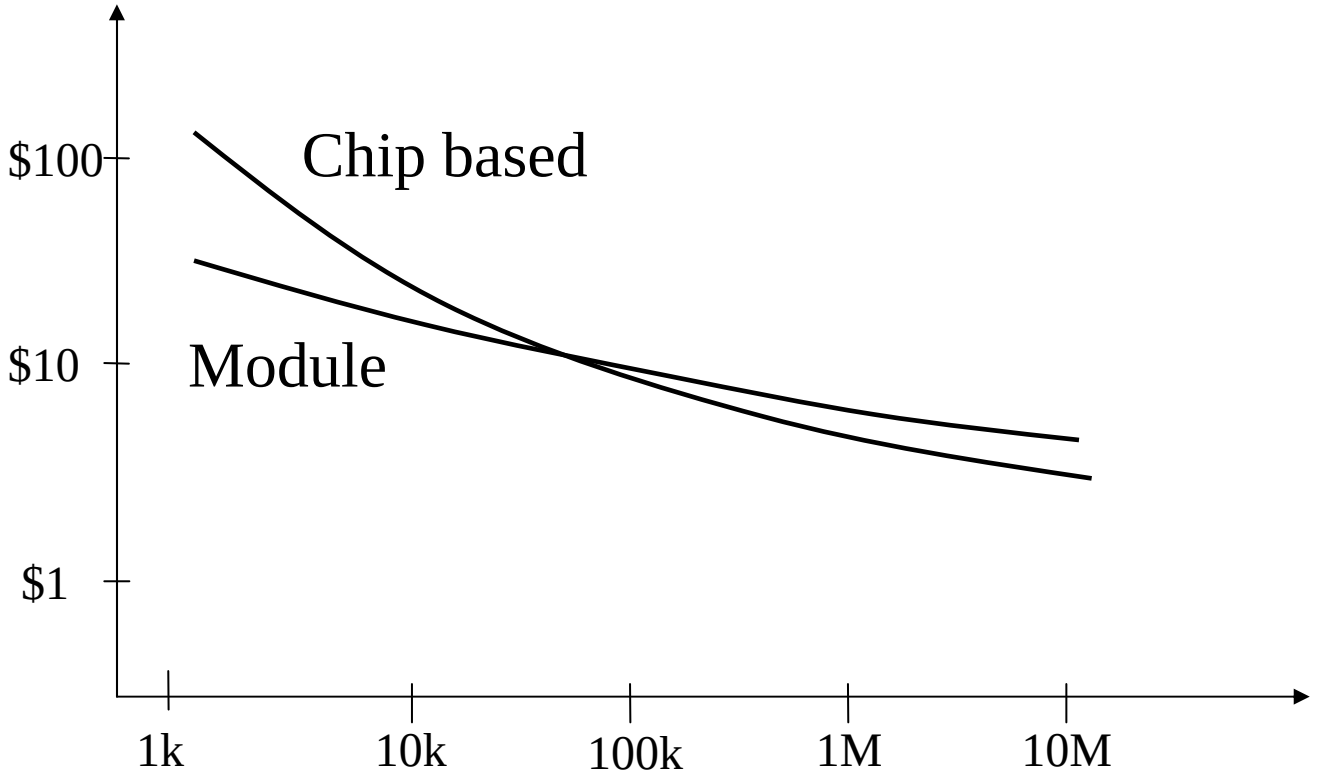
# Cost vs. volume

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# Making your own module

- ZigBee functionality to more than ONE product
- Ending up making a company module

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# RISK

- RISK of not selecting the “best” chip
- RISK of being too late in the market
- The RISK of upfront investment
- The RISK of poor RF performance

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# Future proof

- A new and cheaper chip is available before your project ended
- Your chosen chip supplier is no longer competitive

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# Cost of upfront investments

- $250k upfront for design, sourcing, test development, prototype series
- This gives a monthly cost of $1000

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# Time to market

- Making a chip solution will take 6-9 months longer than buying a module.
- If you are 6 months behind your competition, will that matter?

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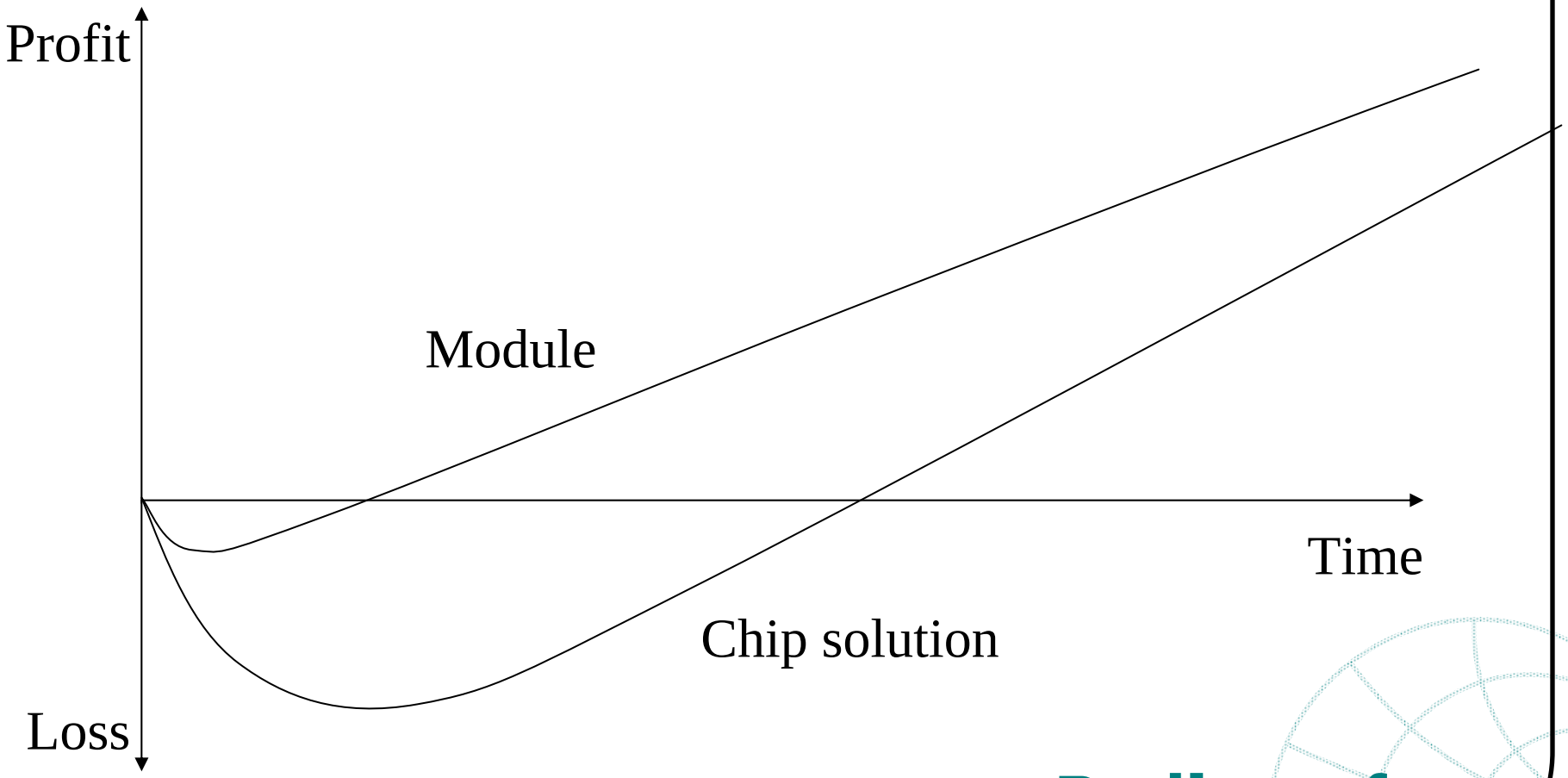
# Time to profit

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# A good RF solution

- A design that works might not be good enough
  - Compliance to standard
  - Range

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# Other business options

- Start with module for low and medium volumes and optimize cost for high volume
  - Customized modules
  - Licensing of IP
  - Making a chip based solution

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# Licensing IP

- Proven design
  - Small adjustment needed to adapt to new PCB
- No SW change when going from medium volume to large volume
- No large investment in development

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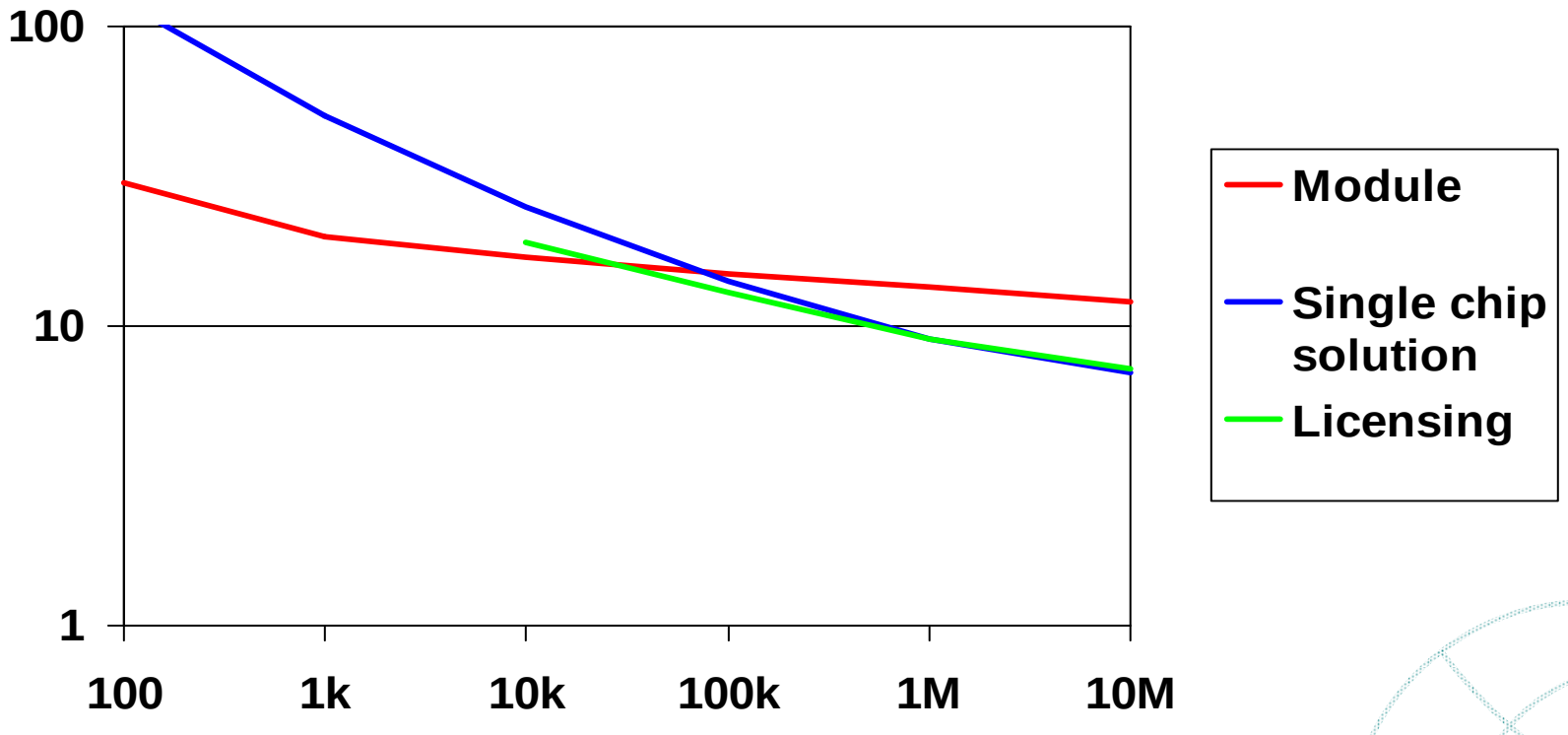
# Licensing IP

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# Key factors in choice

- Do you have the competence?
- Do you have the instrumentation?
- What is your time schedule?
- What is your volume?
- Do you have the money to take financial RISK?

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# Competence

- RF resources are hard to find
- Hiring RF consultants is expensive
- Utilizing unused internal resources is a good option, if they exist

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# Instrumentation

- RF instruments are expensive
  - RF signal generator
  - RF spectrum analyzer
  - RF network analyzer

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# Time schedule

- If you need to release your product within one year, you should go with module
- If you shall enter the market in 18 months you could evaluate a chip solution

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# What is your volume

- <50k – Buy module
- >500k – Chip design or licensing
- 50k-500k – Depends on other factors

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# Summary

- Life cycle cost vs. chip
- RISK
- Business model
- Factor that influence choice

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# Using ZigBee has never been easier than it is today!

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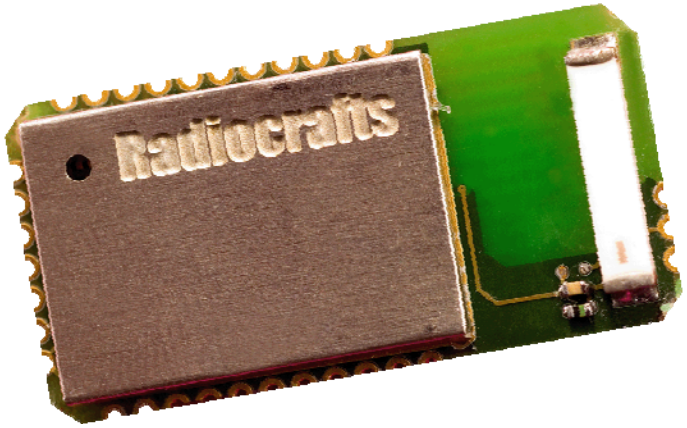
# Questions?

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