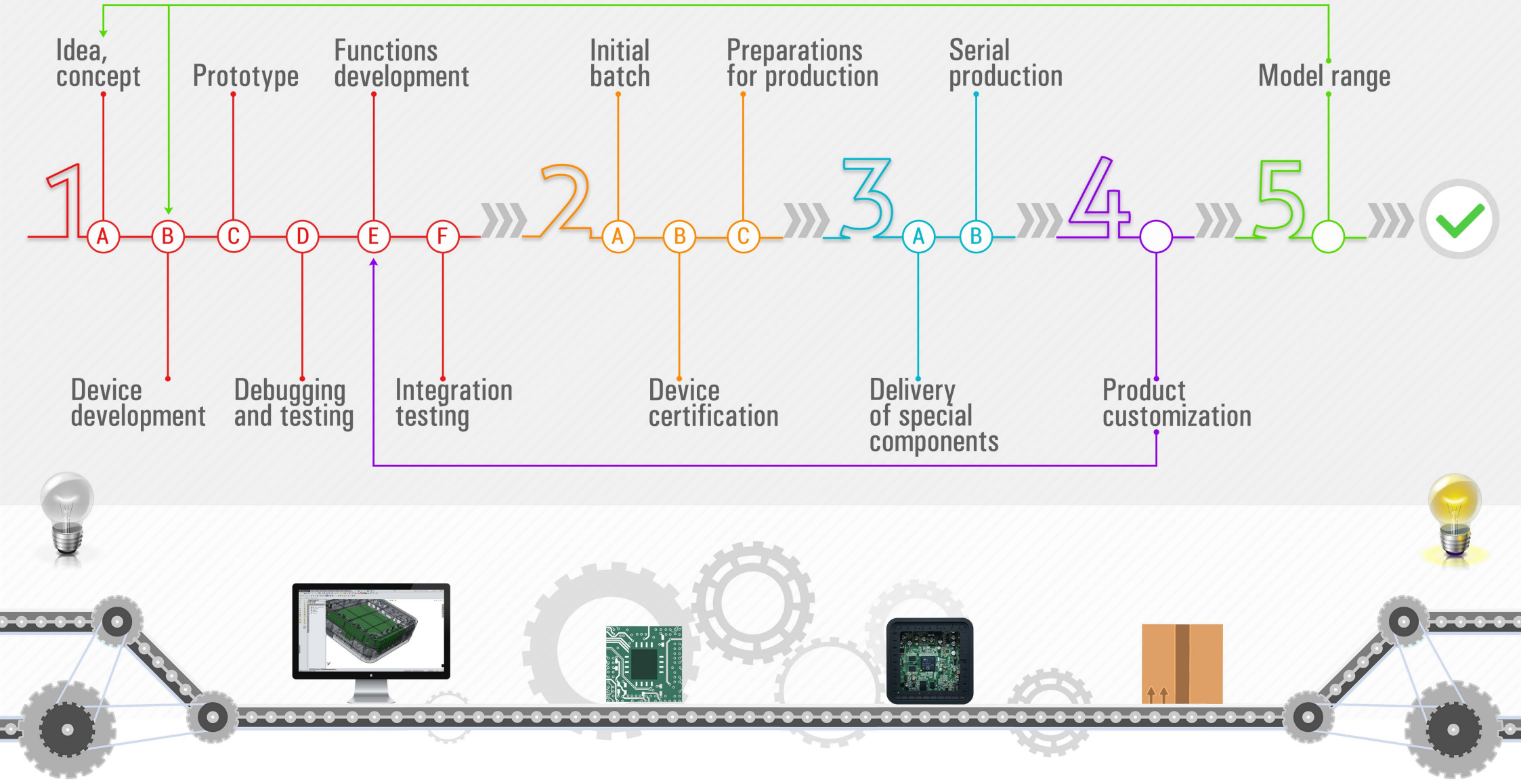
PROM WAD
ELECTRONICS DESIGN

Electronic Device Development



Development stages of an electronic device

		Stage	Services	Result
Development	1A	Idea, concept	1. Consulting, idea development	— Document: evaluation of technical feasibility of the device
			2. Determination of the technical and functional requirements	— Document: technical, structural, cost-performance, software etc. requirements to the device
			3. Requirements and device specifications development	— Document: The Requirements Specification for development work
			4. Costs calculation of main components (BOM), feasibility study	— Document: preliminary list of components and their indication cost
			5. Creating a mockup or a prototype, and a proof of concept for feasibility	— A mockup that confirms the feasibility of the main requirements
			6. Presentation materials design	— Presentations, sketches, pamphlets for investors or potential customers
			7. Develop an implementation of the production plan	— Project schedule of the project: tasks, necessary recourses, stages

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	1B	Device development	1. Elements selection	— Bill Of Materials (BOM): a list of electronic components of the device, and their cost estimation
			2. Circuitry development 3. PCB design 4. Structure design	— Circuit diagram — List of hardware platform elements — Product specification — Documentation for PCB production
			5. Industrial design	— Three – five 2D sketches of the design — One detailed 2D sketch or a 3D model — 3D model of the enclosure to make prototypes in accordance with a chosen design
			6. Embedded software development	— Binary firmware files
			7. Simulation of various characteristics	— The results of PCB analysis, heat simulation, enclosure molding, internal stress and drop simulation
			8. Development of support documentation for a device	— Supporting documentation: architecture, test plan, instructions

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	1C	Prototype	1. PCB manufacture 2. Case prototyping 3. PCB mounting 4. Prototype assembly 5. Prototype bring-up	Device prototypes: from a PCB to a working device in the enclosure
	1D	Debugging and testing	1. Development and JTAG test conducting 2. Critical errors and bugs elimination 3. Production of software with limited functionality	— An upgraded device firmware version where critical errors corrected — Supporting documentation with corrections and amendments after debugging
	1E	Functions development	Short term stages with new version deliveries: 1. Adding functions to the software 2. Device testing 3. Certification tests 4. Making a schedule, monitoring certification	— At each stage — the next firmware version with new functions — An updated supporting documentation — Certification tests schedule
	1F	Integration testing	1. Integration testing of a device 2. Making amendments in documents upon integration testing results	Design documentation kit for the initial batch production

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Pre-production	2A	Initial batch	1. Initial batch production 2. Manual testing 3. Field testing by end users	— Device samples from the initial batch — User comments upon the results of using the device
	2B	Device certification	Certification supervision	Reports of accredited laboratories that conducted certification tests
	2C	Preparations for production operation	1. Amendments in documentation, bill of materials optimization 2. Working-out a testing program at the production site 3. Production of testbenches and software for function tests 4. Production of testbenches and software for in-circuit testing 5. Production of technological tooling to produce enclosure parts and packaging	— Design documentation kit for the selected production site — Testbench at the manufacture — Molds and extruding dies for serial production

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Serial production	3A	Delivery of special components	Delivery of enclosure parts and specialized components for the assembly site	A complete set of components in the desired part of the world to assemble the finished product
	3B	Serial production	1. Continuous or random testing in production 2. Overload tests 3. Statistics collection on accepted units 4. Trial operation of the devices. Improvements related to mass operation of the device 5. Migration to other production sites, production scaling 6. Warranty service provision	Finished products with a forecasted quality level and production volume
+	4	Product customization	Transition to Stage 5	The product modified under certain requirements
+	5	Model range	Transition to Stage 1 or 2	New products in the line