Qualcomm® Application Processors Selector Guide

Application processors powering the next generation of high-tech devices for the Internet of Things (IoT)

87-PN002-1 Rev. C

Qualcomm

Compare Qualcomm IoT Application Processors

	Processor	CPU Clock Speed	CPU Cores	CPU Architecture	DSP Technology	Wi-Fi Standards
Premium Tier	Qualcomm® QCS8250	Up to 2.84 GHz	8x Qualcomm® Kryo™ 585 CPU	64-bit	Qualcomm® Hexagon™ 683 DSP	2x2 802.11ax MIMO
	Qualcomm® QRB5165	Up to 2.84 GHz	8x Kryo 585 CPU	64-bit	Hexagon 698 DSP	2x2 802.11ax MIMO
	Qualcomm® SDA845	Up to 2.8 GHz	8x Kryo 385 CPU	64-bit	Hexagon 685 DSP	2x2 802.11ac MU-MIMO
	Qualcomm® QCS605	Up to 2.5 GHz	8x Kryo 300 CPU	64-bit	Hexagon 685 DSP	2x2 802.11ac MU-MIMO
High Tier	Qualcomm® SDA660	Up to 2.2 GHz	8x Kryo 260 CPU	64-bit	Hexagon 680 DSP	2x2 802.11ac MU-MIMO
	Qualcomm® QCS610	Up to 2.2 GHz	8x Kryo 360 CPU	64-bit	Hexagon 685 DSP	1x1 802.11ac
	Qualcomm® APQ8053Pro	Up to 2.2 GHz	8x Arm Cortex A53 CPU	64-bit	Hexagon 546 DSP	1x1 802.11ac
	Qualcomm® APQ8053Lite	Up to 2.2 GHz	8x Arm Cortex A53 CPU	64-bit	Hexagon 546 DSP	1x1 802.11ac
Mid Tier	Qualcomm® QCS410	Up to 2.2 GHz	4x Kryo 360 CPU	64-bit	Hexagon 685 DSP	1x1 802.11ac
Entry Level	Qualcomm® APQ8009	Up to 1.3 GHz	4x Arm Cortex A7 CPU	32-bit	Hexagon 536 DSP	2x2 802.11n MU-MIMO
	Qualcomm® QCS405	Up to 1.4 GHz	4x Arm Cortex A53 CPU	64-bit	Hexagon QDSP v66 DSP	2x2 802.11ac
	Qualcomm® QCS404	Up to 1.4 GHz	4x Arm Cortex A53 CPU	64-bit	Hexagon QDSP v66 DSP	2x2 802.11ac

Qualcomm Technologies Application Processors are driving innovation beyond the smartphone and powering the next generation of high-tech devices for the Internet of Things, making them more aware, connected, intelligent & interactive.

Bluetooth® Version	GPU	Camera	Video	OS	Size	Extended Life
5.1	Qualcomm® Adreno™ 650 GPU	64 MP	4K120	Android	1099 MPSP (LPDDR5) 14.0 x 12.4 x 0.56 mm 0.35mm pitch	
5.1	Adreno 650 GPU	64 MP	4K120	Linux/Ubuntu	1099 MPSP (LPDDR5) 14.0 x 12.4 x 0.56 mm 0.35mm pitch	✓
5.0	Adreno 630 GPU up to 653 MHz	28 MP	4K60	Linux	914B MPSP 12.4 × 12.4 × 0.58 mm 0.35 mm pitch	✓
5.1	Adreno 615 GPU up to 780 MHz	32 MP	4K60	Linux/Android	771 PSP 11.1 × 10.5 × 0.99 mm 0.35mm pitch	✓
5.0	Adreno 630 GPU up to 653 MHz	25 MP	4K30	Android	692 NSP 12 x 12 x 0.90mm	✓
5.0	Adreno 612 GPU up to 845 MHz	24 MP	4K30	Linux	806 PSP 11.1 × 12 × 0.92 mm 0.35 mm pitch	✓
4.1	Adreno 506 GPU up to 650 MHz	21 MP	1080p60	Linux/Android	857 NSP 14 x 12 x 0.84mm 0.4 mm pitch	✓
4.1	Adreno 506 GPU up to 650 MHz	24 MP	4K30	Linux/Android	857 NSP 14 x 12 x 0.84mm 0.4 mm pitch	✓
5.0	Adreno 612 GPU up to 845 MHz	21 MP	1080p30	Linux	806 PSP 11.1 × 12 × 0.92 mm 0.35 mm pitch	✓
4.1	Adreno 304 GPU up to 456 MHz	16 MP	1080p30	Linux/Android	504 NSP 11.1 × 12.0 × 0.96 mm 0.4 mm pitch	✓
5.1	Adreno 306 GPU up to 600 MHz	N/A	N/A	Linux	722 NSP 14 × 14 × 0.91 mm 0.4/0.5 mm mix pitch	
5.1	N/A	N/A	N/A	Linux	722 NSP 14 × 14 × 0.91 mm 0.4/0.5 mm mix pitch	

Application Processors

IoT Product Segments and Use Cases

Robotics

- In-store service robots to provide directions and product information to customers.
- Inventory robots track shelving stock and even grab objects for customers.
- Delivery robots bring the store to the customer autonomously.
- Companion robots to keep an eye on the kids while playing in the yard and send alerts in case of unusual activities
- Household Robots to vacuum, clean and perform other shores around the house

- QRB5165
- SDA845
- QCS605
- SDA660
- QCS610
- APQ8053
- QCS410
- APQ8009
- QCS405
- QCS404

Connected Cameras

- Intelligent Motion Detection analyzes video in real-time and detects valid motion in a scene. It filters out "noise" such as lighting changes, natural tree movements, water movements, small animals, and even small video artifact noise.
- Object Tracking tracks objects of interest and draw bounding boxes around them.
- Camera Tamper Detection identifies any event that significantly changes the field of view of the camera.
- Face Detection and Recognition detects and recognizes people from an on-device database.
- Body Cams, Dash Cams, Sports Cameras, Surveillance
- Collaboration systems such conference systems with high quality video/audio and AI

- QCS8250
- SDA845
- QCS605
- QCS610
- APQ8053
- QCS410

Digital Signage/Shelf Labels

- More targeted signage with Analytics through Facial Recognition, Edge processing, and AI.
- Enhanced interactive and bonding experience by integrating touch, voice, gestures, location and camera.
- Display standards-based bi-directional, secure communication, driving display and sensors.
- Camera customer engagement / counting via anonymous edge processing.

- QCS8250
- SDA845
- QCS605
- SDA660

Smart Assistants

- Connected device that responds to voice commands and displays relevant information, including reminders, alerts, to-do lists, stream music and video
- Integrated camera for face detection, recognition, gesture commands, while supporting video calling
- Integrated sensors for temperature and light control as well as other appliances

- SDA845
- QCS610
- QCS410
- APQ8053
- APQ8009
- QCS405
- QCS404

IoT Product Segments and Use Cases

Retail

- Handheld POS, Electronic Cash Registers
- Eliminate overstocks and out of stocks
- Adjusting prices
- Product organization on shelves with Multimedia Video ads
- In store assistance - cashier v. customer view
- Predict and influence customer behavior
- Self service kiosk & Checkout – cashier free stores

- QCS8250
- SDA660
- QCS610
- QCS410
- APQ8009

Kiosks/Vending Machines

- Product Locator, Price Checking, Way Finding
- Advertising, Ordering and Checkout, Store Pickup
- Magic mirror (Augmented Reality)
- Vending machines with Camera, Facial Detection and Recognition

- QCS605
- QCS610
- QCS410
- APQ8009

Smart Appliances

- Connected appliance that can be triggered to start, pause and stop remotely
- Connected appliance that can be operated with voice commands
- Smart fridge with integrated Smart Assistant and internal Cameras to look up recipes, jot down notes and send them to family members' phones (and vice versa), peak at the contents inside the fridge, control other devices and perform general searches or stream music

- SDA660
- APQ8053
- APQ8009

Control Panels/Industrial Panels

- Automation control
- Remote operation, set-up and control including ability to see what's going on at home or place of business
- Monitor and Control devices such as safety light, doors and other sensors
- Program alerts
- Monitor and control power consumption, temperature, access, schedules and collaboration

- SDA845
- QCS605
- SDA660
- QCS610
- QCS410
- APQ8009

Industrial Handheld Scanners

- Superior bar code scanning and image capture in low light.
- Fast Scanning/returns
- Enhanced picture quality with low power usage.
- Inventory management which is accurate and real-time.
- Staff collaboration

- SDA660
- APQ8009

QCS8250 Application Processor

The premium-tier QCS8250 processor is designed to help you deliver maximum performance for compute intensive camera and Edge AI applications with Wi-Fi 6 and 5G for the Internet of Things (IoT).

Target Applications

- Connected Cameras
- Retail Self Checkout
- Video Collaboration
- Digital Signage
- Fleet Management
- Healthcare

Features

- Adreno GPU 650 with improved GFx benchmark and perf/W Native 8-bit integer support for efficient GPU DNN
- Native 8-bit integer support for efficient GPU DNN
- Hexagon DSP with Quad Hexagon Vector eXtensions (HVX) V66Q, 1.5 GHz, for machine learning, integrated DNN for advanced VA and Qualcomm® Neural Processing SDK framework
- Kryo 585 CPU with 4x Kryo Gold (2.85GHz) + 4x Kryo Silver (1.8 GHz) w/ 4MB L3 cache
- Camera: Dual 14-bit Qualcomm Spectra™ 480 ISP support 64MP single camera capture
- Support for up to 24 cameras, or seven concurrent cameras
- Superior image quality in zzHDR, video denoising, mid/low frequency denoising, lens shading correction, video super resolution
- Supports triple 4K display
- Video/display: Concurrent UHD encode/ decode, 3X display port, MIPI-DSINPU

Ordering Information

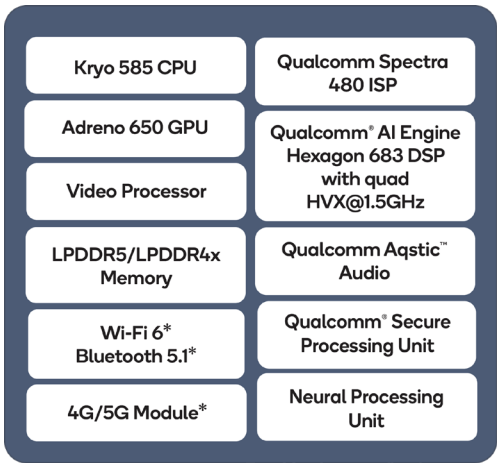
Product	Part Number*
QCS8250 SoC	QCS-8250-0-MPSP1099
Power Management ICs	PM-8150L-1-FOWPSP177 PM-3003A-5-15CWLNSP (2x) PMK-8002-0-16CWLPSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

QCS8250 Specifications

	QCS8250
Process Node/Package	7 nm FFP, 12.4 x 12.7mm LP4, 12.4 x 14mm LP5 MEP
CPU	Kryo 585 CPU, Octa-core 64-bit Arm V-8 compliant
Memory	Quad-channel PoP high speed LPDDR5/LPDDR4x SDRAM up to 2750 MHz (LPDDR5)
Camera	Dual ISP: 64 MP @ 30fps ZSL
Video	Decode : 8K60/4K120; Encode : 8K30/4K120
GPU	Adreno 650 GPU
Compute DSP	Hexagon DSP with Quad HVX V66Q, 1.5 GHz
Machine Learning	Dedicated NPU 230
Modem	5G modem attach with support for sub-6GHZ and mmWave
I/O Storage	UFS 3.0 gear 4 (2 lane) + UFS 2.1, SD 3.0, Two USB 3.1 ports, support Type-C with DisplayPort v1.4 in one port
Wireless Connectivity	WLAN 2 x 2 802.11ax with DBS, Bluetooth 5.1
Display	Adreno 995 DPU, supports up to three 4K display, 2x 4-Lane DSI, Display Port and Miracast support.
Location	GPS, Glonass, BeiDou, Galileo, QZSS, and SBAS
Security	Dedicated SPU with Improved Crypto
Operating System	Android

QCS8250 Block Diagram



* Supported with a companion module

More Info:

QCS8250 Application Processor

Get Started

Commercial Modules and Development Tools

Eragon™ SoM/Development Board

by eInfochips

COMING SOON

Qualcomm® HDK865 Dev Kit

by Qualcomm Technologies

Inforce 68A1™ SoM and Development Kit

by SMART Wireless Computing

COMING SOON

Thundercomm TurboX™ C865 SoM

by Thundercomm Technology

Thundercomm TurboX™ C865 Development Kit

by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

Qualcomm HDK865 is a product of Qualcomm Technologies, Inc. and/or its subsidiaries.

QRB5165 Application Processor

The premium-tier QRB5165 processor is designed to help you build smarter and powerful consumer, enterprise or industrial robots with on-device AI and 5G connectivity and more.

Target Applications

- Autonomous Delivery Vehicles
- Edge AI Box
- Commercial & Enterprise Drones
- CoBots & Intelligent Machines

Features

- Qualcomm Spectra 480 Image Signal Processor designed to deliver a premium camera experience that can process 2 Gigapixels per second with high-performance capture of 200 megapixel photos, 8K video recording and 4K HDR video capture.
- Adreno 650 Visual Processing Subsystem deliver's quality graphics for larger-than-life immersive experiences using the Adreno graphics processing unit (GPU) and video processing unit (VPU).
- Hexagon 698 DSP with Hexagon Vector eXtensions (HVX), Hexagon Tensor Accelerator and Hexagon Scalar Accelerator to support sophisticated, on-device AI processing, and delivers mobile-optimized computer vision (CV) experiences for wide-array of use cases.
- Kryo 585 CPU: Manufactured in 7nm process node, optimized across four high-performance Kryo Gold cores and four low-power Kryo Silver cores.
- Qualcomm Secure Processing Unit (SPU) offers vault-like security that is designed to help safeguard your facial data, iris scan and other biometric data. It supports hardware root of trust, Qualcomm® Trusted Execution Environment, Secure boot and camera security.

Ordering Information

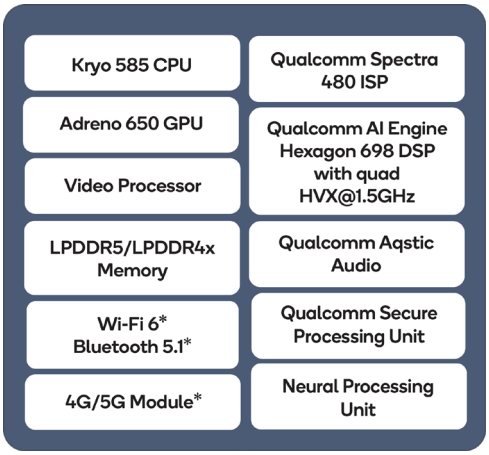
Product	Part Number*
QRB5165 SoC	QRB-5165-0-MPSP1099
Power Management ICs	PRB-5165-0-FOWPSP161 PM-8150L-1-FOWPSP177 PM-3003A-5-15CWLNSP (2x) PMK-8002-0-16CWLPSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

QRB5165 Specifications

	QRB5165
Package	12.4x12.7mm LP4, 12.4x14mm LP5 MEP
CPU	Kryo 585 CPU, 64-bit, up to 2.84 GHz
ISP	Qualcomm Spectra 480 ISP with Dual 14-bit image signal processing
Camera	Dual ISP: 64 MP @ 30fps ZSL, Support for 12 cameras by D-PHY & 18 cameras by C-PHY (7 concurrent)
Video	Decode : 8K60/4K120; Encode : 8K30/4K120
GPU	Adreno 650 GPU w/ support for Open GL ES & Open CL
Compute DSP	Hexagon 698 DSP with HVX, Hexagon Tensor Accelerator and Hexagon Scalar Accelerator
Memory	LPDDR5 up to 2750 MHz, LPDDR4X up to 2133 MHz; Memory Density: up to 16 GB
Wireless Connectivity	WLAN 2 x 2 802.11ax with DBS, Bluetooth 5.1
Audio	Qualcomm Aqstic Audio technology
Security	Camera Security, Crypto Engine, Cryptographic Accelerator, Qualcomm Trusted Execution Environment, Secure Boot, Qualcomm® Crypto Engine Core is FIPS 140-2 certified
Operating System	Ubuntu, Linux

QRB5165 Block Diagram



* Supported with a companion module

More Info:

QRB5165 Application Processor

Get Started

Commercial Modules and Development Tools

Eragon™ SoM/Development Board

by eInfochips

COMING SOON

Qualcomm® Robotics RB5 Platform Development Kit

by Thundercomm Technology

Thundercomm TurboX™C5165 SoM

by Thundercomm Technology

Thundercomm EB5 AI Box

by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

SDA845 Application Processor

The SDA845 SoC combines high-performance heterogeneous computing, Qualcomm AI Engine for on-device machine learning, computer vision, hardware-based security, multimedia and Wi-Fi.

Target Applications

- Service/Companion Robots
- Interactive Whiteboards
- Smart Assistants
- Connected Cameras
- Digital Signage
- Industrial Panels

Features

- Customized 64-bit Arm v8-compliant octacore Kryo 385 applications processor
- Always-on subsystem with RPMh for hardware-based resource and power management
- Qualcomm® Universal Bandwidth Compression (UBWC) 2.0, 2x compression with camera, display, and DSP
- Two 4-lane DSI D-PHY 1.2 at 2.5 Gbps per lane
- 3840 × 2400 display at 60 fps, 2560 buffer width (10 layers blending), and VESA DSC 1.1
- A complete 4K60 entertainment system 4K60 10b encode + 4K60 10b decode
- Qualcomm Spectra 280 camera: dual 14-bit image signal processing (ISP) + Lite ISP: 16 + 16 + 2 megapixels (MP) to support 32 MP/30 fps
- Qualcomm AI Engine for on-device intelligence

Ordering Information

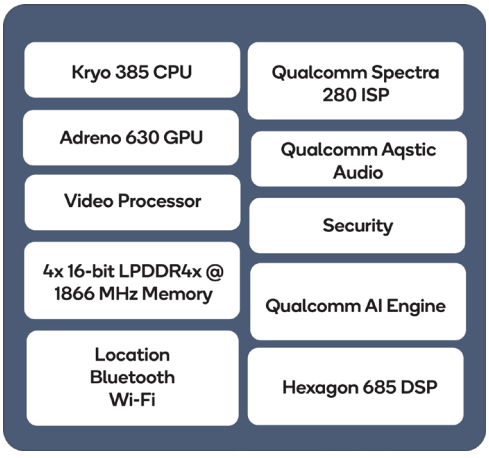
Product	Part Number*
SDA845 SoC	SDA-845-A-914BMPSP
Power Management ICs	PM-845-0-287WLPSP PMI-8998-0-182WLNSP PM-8005-0-72WLPSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

SDA845 Specifications

	SDA845
Package	12.4 × 12.4 x 0.58 mm MEP (without memory device on top)
CPU	8x Kryo 385 CPU, up to 2.8 GHz
ISP	Qualcomm Spectra 280 Image Signal Processor
Camera	Single HFR 16 MPix camera @ 60fps ZSL, Dual 16 MPix cameras @ 30fps ZSL, Single 32 MPix camera at 30fps ZSL
Video	Ultra HD Premium video capture @ 4K (3840x2160) 60fps, 10bit HDR, Rec 2020 color gamut; H.264 (AVC), H.265 (HEVC) and VP9 support; Slow motion HEVC video encoding of either HD (720p) video up to 480fps or FHD (1080p) up to 240fps
GPU	Adreno 630 GPU with support for Open GL ES 3.2 and Open CL 2.0
DSP	Hexagon 685 DSP with 3rd Gen Vector Extensions
Memory & Storage	LPDDR4x, 4x16 bit; up to 1866MHz, 8GB RAM
Wireless Connectivity	Wi-Fi integrated 802.11ac 2x2 with MU-MIMO; Tri-band Wi-Fi: 2.4 GHz and 5 GHz with Dual Band Simultaneous (DBS), Bluetooth 5.0
Audio	Qualcomm Aqstic audio technology; Qualcomm® aptX™ audio technology
Location	GPS, Glonass, BeiDou, Galileo, QZSS, and SBAS

SDA845 Block Diagram



More Info:

Get Started

Commercial Modules and Development Tools

Eragon™ 845 Development Kit
by eInfochips

Open-Q™ 845 Micro SoM Development Kit
by Lantronix

Open-Q™ 845 Micro SoM
by Lantronix

Qualcomm® Robotics RB3 Platform Development Kit
by Qualcomm Technologies, Inc

Inforce 6701™ Micro SoM
by SMART Wireless Computing

Inforce 6701™ Development Kit
by SMART Wireless Computing

Thundercomm TurboX™ AI Kit
by Thundercomm Technology

Thundercomm TurboX™ D845 Development Kit
by Thundercomm Technology

Thundercomm TurboX™ D845 SoM
by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

QCS605 Application Processor

QCS605 10nm SoC is purpose-built to deliver high-performing, power-efficient edge computing for next-generation smart cameras and smart home applications.

Target Applications

- Household Robots
- Action/VR360 Cameras
- Enterprise Surveillance
- Smart Displays
- Dash/Body Cameras
- Digital Signage

Features

- Dual 14-bit Qualcomm Spectra 270 ISP capable of supporting upto dual 16MP sensors
- Fabricated using the advanced 10nm FinFET process for exceptional thermal and power efficiency
- Adreno 615 GPU with 64-bit addressing @ up to 780MHz with latest API support
- Hexagon 685 DSP with dual hexagon vector extensions for running DNN models and advanced Qualcomm® Neural Processing Engine SDK support
- Up to eight (8) Kryo 300 CPU cores optimized for power and DMIPS
- Qualcomm AI Engine designed to support on-device machine learning
- Low power sensor core helps support always-on use cases at reduced power levels
- Supports up to 2x2 802.11ac Wi-Fi with MU-MIMO and dual band simultaneous transmission, Bluetooth 5.1

Ordering Information

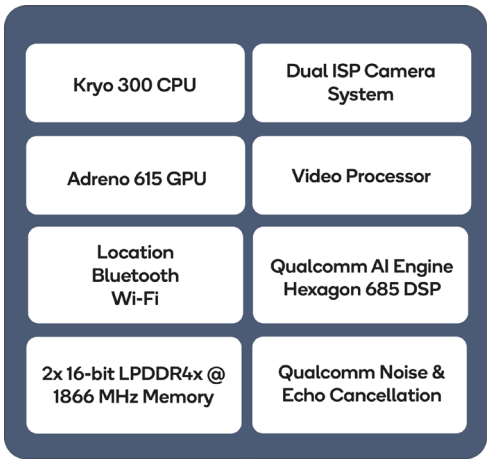
Product	Part Number*
QCS605 SoC	QCS-605-0-771PSP
Power Management ICs	PM-670-0-219WLPSP PM-670L-0-196WLPSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

QCS605 Specifications

		QCS605
CPU		Kryo 300 CPU: 64-bit octa-cores, 2x Gold (2.5GHz) + 6x Silver (1.7GHz)
Video	Decode	4K60 10-bit: HEVC/VP9, HDR 10
	Encode	4K60 HEVC/H.264 + 1080P60
Display Support		1080p + 4K60
PMIC		Qualcomm® PM670 + Qualcomm® PM670L
Wireless Connectivity		Integrated 2x2 802.11b/g/n/ac, Bluetooth v5.1
Location		GPS/GLONASS, BeiDou, Galileo
Camera	Performance	32MP (2x ISP/16+16MP), 4K60 IQ improvement: MCTF, TNR, sHDR, EIS, Dewarp, Zoom
	Interface	CSI 4+4+4 lane (or 4+4+2+1), DPHY1.2, CPHY 1.0
Audio	Analog	Qualcomm® WCD9326 / Qualcomm® WCD9341
	Playback	Hi-Res/192kHz, Native 44.1kHz, audio on dedicated DSP
	Technologies	Qualcomm® Noise and Echo Cancellation, SVA/Sense Audio w/ WCD
Memory		2x 16-bit LPDDR4.x @ 1866MHz
Storage		eMMC5.1, UFS2.1 Gear3 2-lane, SD 3.0
GPU		Adreno 615 GPU @ up to 780MHz
DSP		Qualcomm AI Engine/Hexagon 685 DSP w/ dual HVX
Sensor DSP		Hexagon DSP based
Technology / Package		10nm LPE, 10.5x11.1 mm2 non-PoP

QCS605 Block Diagram



More Info:

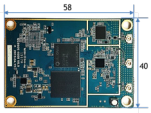
Materials are subject to change without notice.

Get Started

Commercial Modules and Development Tools

QCS605 VR360 Camera Software Development Kit
by Altek Corp.

SOM605 4058
by Insignal Co., Ltd.



QCS605 DVKIT-R3 Board
by Insignal Co., Ltd.

Open-Q™ 605 SBC Development Kit
by Lantronix

IMX577 Camera Module for S605 SBC
by Thundercomm Technology

Thundercomm TurboX S605 SBC
by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

SDA660 Application Processor

The SDA660 System-on-Chip (SoC) supports a leap in performance, engineered to allow enhanced user experiences and battery performance. It is designed to support on-device artificial intelligence, advanced photography and enhanced user experiences with low power consumption.

Target Applications

- Household Robots
- Handheld POS
- Smart Displays
- Electronic Cash Registers
- Smart Appliances
- Digital Signage

Features

- Custom built 64-bit octa-core Arm v8-compliant Kryo 260 CPU arranged in two dual-clusters:
  - Quad high-performance Kryo cores operating at 2.2 GHz – Gold cluster with 1 MB L2
  - Quad low-power Kryo cores operating at 1.8 GHz – Silver cluster with 1 MB L2
- Hexagon DSP with HVX (dual-HVX512) 787 MHz
- Adreno GPU 512 with 64-bit addressing; designed for 650 MHz
- Dual-channel non package-on-package (non-PoP) high-speed memory, LPDDR4/4x SDRAM designed for 1866 MHz clock
- Display support: up to 2560 × 1600 10-bit at 60 Hz, up to eight hardware layers
- Video support: 3840 × 2160 at 30 Hz, HEVC Main 10, VP9, H264, and other popular video formats
- Dual 14-bit image signal processing (ISP): 16 +16 MP, 540 MHz each; 24MP30 ZSL with dual ISP; 16 MP 30 ZSL with a single ISP

Ordering Information

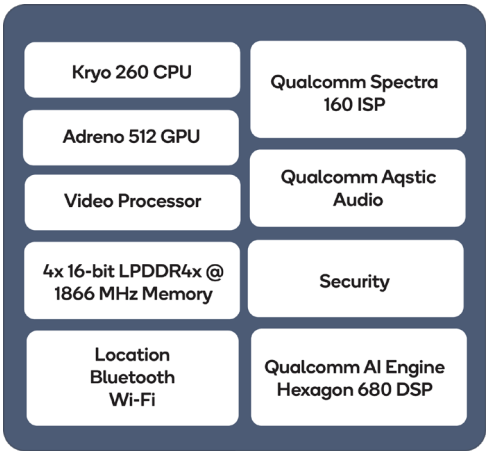
Product	Part Number*
SDA660 SoC	SDA-660-0-692NSP
Power Management ICs	PM660-0-219-WLPSP PM-660L-0-196WLPSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

SDA660 Specifications

	SDA660
Package	12.4 × 12.4 x 0.58 mm MEP (without memory device on top)
CPU	8x Kryo 260 CPU, from 1.95 up to 2.2 GHz
ISP	Qualcomm Spectra 160 Image Signal Processor
Camera	Up to 25 MP single camera, up to 16 MP dual camera
Video	Up to 4K UltraHD capture @ 30 fps; Up to 4K UltraHD playback @30fps; H.264 (AVC), H.265 (HEVC), VP9
GPU	Adreno 512 GPU with support for Open GL ES 3.2, Open CL 2.0 full, Vulkan, DX12
DSP	Hexagon 680 DSP with HVX
Memory & Storage	LPDDR4x dual channel, up to 1866MHz, 8GB RAM, eMMC and UFS
Wireless Connectivity	Wi-Fi integrated 802.11ac 2x2 with MU-MIMO, 2.4 GHz/5 GHz, Bluetooth 5.0
Audio	Qualcomm Aqstic audio technology; aptX audio technology
Location	GPS, Glonass, BeiDou, Galileo, QZSS, and SBAS

SDA660 Block Diagram



More Info:

SDA660 Application Processor

Get Started

Commercial Modules and Development Tools

Eragon™ 660 Development Kit
by eInfochips

Eragon™ 660 SBC
by eInfochips

Open-Q™ 660 µSOM
by Lantronix

Inforce 6502™ Micro SoM
by SMART Wireless Computing

Inforce 6502™ Development Kit
by SMART Wireless Computing

Thundercomm TurboX™ D660/ D660Pro Dev Kit
by Thundercomm Technology

Thundercomm TurboX™ D660/ D660Pro Dev Kit
by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

QCS610/QCS410 Application Processors

QCS410/610 11nm SoCs are purpose-built to deliver high-performing, power-efficient edge computing for next-gen smart cameras and smart enterprise/home applications for the mid-tier segment.

Target Applications

- Service/Companion Robots
- Industrial Panels
- Enterprise Surveillance Camera/AI Gateway
- Vending Machines/Kiasks
- Dash/Body Cameras
- Collaboration Devices/Video Conferencing

Features

- Dual 14-bit Qualcomm Spectra 250L ISP capable of supporting up to dual sensors. 24 MP @ 30 fps with dual ISPs; each ISP capable of 16 MP
- Fabricated using the advanced 11nm FinFET process for exceptional thermal and power efficiency
- Adreno 612 GPU with 64-bit addressing @ up to 845MHz
- Hexagon DSP with dual Hexagon Vector eXtensions (HVX), 1.1Ghz for running DNN models and advanced Qualcomm® Neural Processing Engine SDK support
- Up to eight Kryo 460 CPU cores optimized for power and DMIPS
- Qualcomm AI Engine designed to support on-device machine learning
- Low power sensor core helps support always-on use cases at reduced power levels

Ordering Information

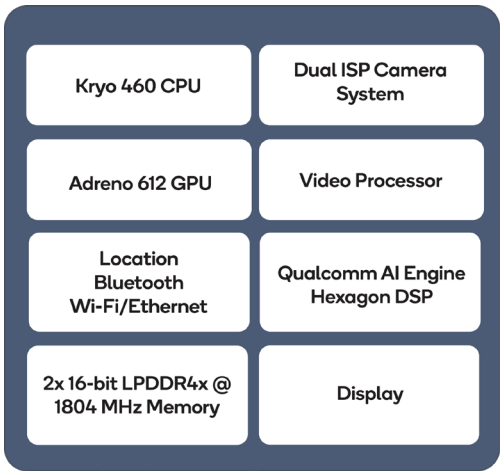
Product	Part Number*
QCS 610 SoC	QCS-610-0-PSP806-MT-01-0-AC
QCS 410 SoC	QCS-410-0-PSP806-MT-01-0-AC
PMIC	PM-6150-0-WLPSP199 PM-6150L-1-FOWPSP177

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

QCS610/QCS410 Specifications

		QCS410	QCS610
Technology / Package		11nm LPE, , 12x11.1 mm2 non-PoP	
CPU		Kryo 460 CPU: 64-bit quad-cores, 2x Gold (2.2GHz) + 2x Silver (1.8GHz)	Kryo 460 CPU: 64-bit Octa-cores, 2x Gold (2.2GHz) + 6x Silver (1.8GHz)
Memory		2x 16-bit LPDDR4.x 1804MHz	
Location		GPS/GLONASS, BeiDou, Galileo	
Wired/Wireless Connectivity		Ethernet RGMII, Integrated 1x1 802.11a/b/g/n/ac, Bluetooth 5.0, FM	
PMIC		Qualcomm® PM6150 + Qualcomm® PM6150L	
Display	Resolution	2520x1080 60 fps + 1920x1200 60 fps (External)	
	Interface	1x4 lane DSI DPHY 1.2 support + DP over USB-C (external)	
Camera	Performance	21MP (2x ISP/16+16MP), 1080p30 IQ improvement: MCTF, TNR, sHDR, EIS, Dewarp, Zoom	24MP (2x ISP/16+16MP), 4K30 IQ improvement: MCTF, TNR, sHDR, EIS, Dewarp, Zoom
	Interface	CSI 4+4+4 lane (or 4+4+2+1), DPHY1.2, CPHY 1.0	
Video	Decode	1080p 8-bit: HEVC/VP9	4K30 8-bit: HEVC/VP9
	Encode	1080p 8-bit HEVC	4K30 8-bit HEVC
GPU		Adreno 612 GPU @ up to 845MHz	
Audio	Analog	Integrated Qualcomm® WCD9370/ Qualcomm® WCD9341 codec + Qualcomm® WSA8810/ Qualcomm® WSA8815 speaker amplifier	
	Playback	Hi-Res/192kHz, Native 44.1kHz, audio on dedicated DSP	
Compute DSP		Hexagon DSP with dual Hexagon Vector eXtensions (HVX), 1.1Ghz	
Sensor DSP		Hexagon DSP based	
Storage		eMMC 5.1, UFS 2.1 Gear3 1-lane, SD 3.0	
Peripherals		1x USB3.1 Type-C with Display Port and USB 2.0	

QCS610/QCS410 Block Diagram



More Info:

Get Started

Commercial Modules and Development Tools

Altek Development Kit
by Altek Corp.

Eragon™ QCS610/QCS410 SOM
by eInfochips

Eragon™ QCS610/QCS410 Development Kit
by eInfochips

Open-Q™ 610 µSOM
by Lantronix

4K PoE AI Dome Development Kit
by Sercomm

Thundercomm QCS610/QCS410 SoM
by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

APQ8053Pro/APQ8053Lite Application Processors

Designed with a high-value combination of advanced features and power efficiency, the APQ8053Pro and APQ8053Lite SoCs help support advanced use cases, including machine learning, robust edge computing, sensor processing and voice user interface (UI) enablement.

Target Applications

- Household Robots
- Sports Cameras
- Enterprise Surveillance
- Smart Displays
- Dash/Body Cameras
- Smart Appliances

Features

- Dual ISP ideal for supporting intelligent camera features for sports cameras, IP security cameras and VR cameras
- Fabricated using the advanced 14 nm FinFET process for low active power dissipation & fast peak CPU performance
- Adreno 506 GPU with 64-bit addressing @ up to 650MHz with latest API support
- Hexagon 546 DSP designed to provide battery-efficient audio, video, and computer vision use cases
- Heterogeneous architecture includes 64-bit, octa-core Arm Cortex-A53 CPU @ up to 2.2GHz per core
- Qualcomm® AI Platform designed to support on-device machine learning
- Low power sensor core helps support always-on use cases at reduced power levels
- Integrated 802.11ac, Bluetooth 4.1 low energy and GPS support

Ordering Information

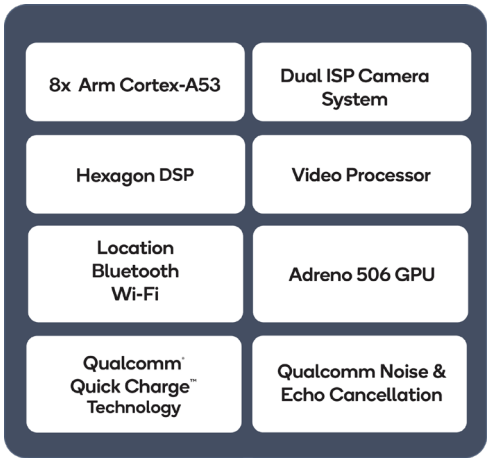
Product	Part Number*
APQ8053	APQ-8053-A-792NSP
Power Management ICs	PM-8953-0-187FOWNSP PMI-8952-0-144WLNSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

APQ8053Pro/APQ8053Lite Specifications

Product		APQ8053Pro	APQ8053Lite
Technology / Package		14LPP, 12x14 mm2, non-POP	
CPU		8xA53 @2.2 GHz, 1MB L2	8xA53 @1.8 GHz, 1MB L2
Memory		1x 32-bit LPDDR3 933MHz	
Location		GPS/GLONASS, BeiDou, Galileo	
Wireless Connectivity		Integrated 1x1 802.11b/g/n/ac, Bluetooth 4.x, FM	
PMIC		Qualcomm® PM8953 + Qualcomm® PMI8952	
Display	Resolution	1920x1200 60fps + 1080p30 Miracast	
	Interface	2x DSI 4+4 lane	
Camera	Performance	Dual ISP 24MP30 ZSL, 930Mpix/sec, HW WNR, LTM, Advanced AF	Dual ISP 21MP30 ZSL, 930Mpix/sec, HW WNR, LTM, Advanced AF
	Interface	CSI 4+4+4 lane (or 4+4+2+1), DPHY1.2, CPHY 1.0	
Video	Decode	4K30 HEVC	1080p60 HEVC
	Encode	4K30	1080p90
GPU		Adreno 506 GPU @ 650MHz	
Audio	Analog	Integrated Codec PM8953 or Qualcomm® WCD9326/ Qualcomm® WCD9335	
	Audio	HD-Audio, Dolby, SVA	
	Voice	Qualcomm Noise and Echo Cancellation v6.1, HD, Pro v2.2	
Sensor DSP		Hexagon DSP based	
Storage		eMMC5.1, SD3.0	
Peripherals		1x USB3.0	

APQ8053Pro/APQ8053Lite Block Diagram



More Info:

Get Started

Commercial Modules and Development Tools

Eragon™ 624 Development Kit
by eInfochips

Eragon™ 624 Micro SoM
by eInfochips

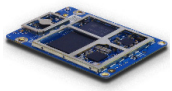
Open-Q™ 626 µSOM
by Lantronix

Open-Q™ 624A SOM
by Lantronix

Open-Q™ 626 µSOM Development Kit
by Lantronix

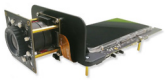
Open-Q™ 624A Development Kit
by Lantronix

Thundercomm TurboX™ S626 SOM
by Thundercomm Technology



Thundercomm TurboX™ S626 Development Kit
by Thundercomm Technology

Thundercomm TurboX Smart Camera Reference Platform - SDA626
by Thundercomm Technology



For additional information for a chosen product please check directly with the manufacturer.

APQ8009 Application Processor

The APQ8009 System-on-Chip (SoC) is designed to help support various platforms for Internet of Things (IoT) applications. It is engineered to support industry-standard Bluetooth and Wi-Fi connectivity alongside quad-core processing power, supplemented by low-power Hexagon DSP processing and an Adreno GPU, for IoT applications.

Target Applications

- Household Robots
- Smart Appliances
- Smart Assistants
- Vending Machines
- Handheld POS
- Control Panels

Features

- Adreno 304 GPU 3D graphics accelerator (up to 456 MHz) with latest API support
- Hexagon 536 DSP designed to provide battery-efficient audio/video use cases
- Heterogeneous architecture includes 32-bit, quad-core Arm Cortex-A7 CPU @ up to 1.3GHz per core
- Fabricated using the advanced 28 nm LP CMOS process
- Qualcomm® Location Suite Gen 8C; support for three bands concurrently:
  - GPS, BeiDou and GLONASS or
  - GPS, BeiDou and Galileo
- Integrated 802.11a/b/g/n, Bluetooth 4.1 low energy and GPS support
- Designed to povide dedicated support for industry-leading codecs and other multimedia formats to support carrier deployments around the world.
- Worldwide ecosystem of QTI vendors, customers, developers and embedded device OEMs

Ordering Information

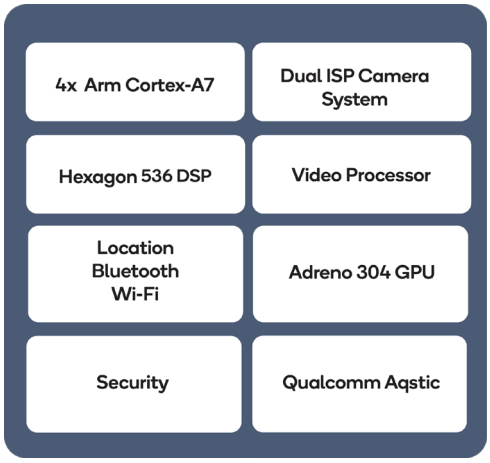
Product	Part Number*
APQ8009 SoC	APQ-8009W-0-575PNSP
Power Management ICs	PM-8916-0-176NSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

APQ8009 Specifications

	APQ8009
Package	504 NSP; 11.1 × 12.0 × 0.96 mm; 0.4mm pitch
CPU	4x Arm Cortex-A7 quad-core CPU 32-bit @ up to 1.3 GHz
Memory & Storage	Non-PoP LPDDR2, LPDDR3 up to 533 MHz; eMMC v4.5/SD 3.0
Connectivity	802.11a/b/g/n with 2x2 MU-MIMO, Bluetooth Low Energy 4.1, FM Rx
Location	Qualcomm Location Gen 8C GNSS
GPU	Adreno 304 GPU; 3D graphics accelerator (up to 456MHz) OpenGL ES 3.0
DSP	Hexagon 536 DSP
Display Support	Up to 720p
Camera Support	Single ISP/12bit – 8M; 8M@30fps by single ISP; CSI: 4 or 2/1; DPHY – 1.5Gbps
Multimedia	1080p decode, 720p encode (30fps)
Audio	Qualcomm Aqstic audio technologies
Security Features	Qualcomm® Processor Security, Qualcomm® Content Protection

APQ8009 Block Diagram



More Info:

APQ8009 Application Processor

Get Started

Commercial Modules and Development Tools

Open-Q™ 212A SoM
by Lantronix

Open-Q™ 212A Home Hub Development Kit
by Lantronix

Thundercomm TurboX™ S212 SoM
by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

QCS404/QCS405 Application Processors

The QCS400 series SoCs are designed for innovation with flexibility across various levels of processing power, scalable connectivity options and machine learning capabilities that product developers can use to generate new and customized experiences.

Target Applications

- Household Robots
- Home Hubs/Security Panels
- Smart Assistants
- Smart Speakers
- Smart Soundbars
- AV Receivers

Features

- Highly-integrated architecture, with up to four cores, Dual-DSP, Wi-Fi, Bluetooth, powerful audio features and our AI engine on a single chip
- Qualcomm AI Engine supports highly efficient on-device inferences and machine learning-based, embedded automatic speech recognition
- Cutting-edge connectivity with advanced Wi-Fi, Bluetooth and Zigbee coexistence technology and low-latency streaming
- Adreno GPU and display (QCS405 only)
- Superior audio performance, with support for Dolby Atmos and DTS:X immersive home audio
- High performance, low-power keyword detection pre-loaded and running on an integrated DSP
- Configurable multi-keyword detection with Local Automatic Speech Recognition for customizable user experiences
- Includes multi-mic beamforming noise suppression with mono, stereo and multi-channel echo cancellation

Ordering Information

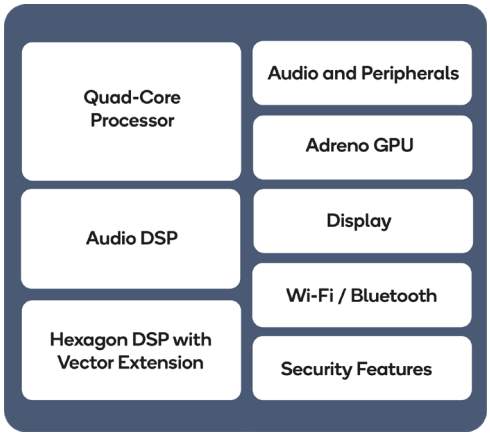
Product	Part Number*
QCS405 SoC	QCS-405-0-NSP722
QCS404 SoC	QCS-404-0-NSP722
Power Management ICs	PMS-405-0-116WLNSP

* Part numbers are subject to change. Please check with the distributor for most accurate ordering information.

QCS404/QCS405 Specifications

FEATURES	QCS404	QCS405
Compute	Quad Core	Quad Core
Adreno 306 GPU/Display	N/A	✓
Display	N/A	✓
Audio DSP	✓	✓
Compute DSP with Qualcomm AI Engine	✓	✓
Voice and Machine Learning	• Multi-mic Qualcomm Noise and Echo Cancellation • Simultaneous multi-keyword detection • ML based wake word detection • Local Automatic Speech Recognition	
Security Features	• Security rich boot • Debug security features • Cryptographic accelerators • Supports trusted execution environment • Key provisioning security features	
Connectivity	• Integrated 2x2 11ac • Co-ex with Bluetooth and Zigbee/15.4 • Bluetooth 5.1 compliant • aptX adaptive audio • Low-latency whole-home multi-channel audio networking • Expandability to 1x1 or DBS (2x2 + 2x2/4x4)	
Audio I/F Channels DMIC, SPDIF, ARC	32	12
Wired I/F USB 2.0, USB 3.0, SDIO 3.0, PCIe, Ethernet, UART/SPI/I^2C	✓ + HDMI, SPI, RGB	✓

QCS404/QCS405 Block Diagram



More Info:

Get Started

Commercial Modules and Development Tools

QCS405 SoM

by LITE-ON Technology

QCS404 SoM

by LITE-ON Technology

Thundercomm TurboX™ C404/405 SoM

by Thundercomm Technology

Thundercomm TurboX™ C404/405 Development Kit

by Thundercomm Technology

For additional information for a chosen product please check directly with the manufacturer.

Locate Module Vendors

Company	Website	Products based on
Altek	https://store.altek.com.tw/qualcomm/	QCS605, QCS610
eInfochips	https://eragon.einfochips.com/	QCS8250, QRB5165, APQ8053, SDA660, QCS610, QCS410
Insignal Co., Ltd.	http://www.insignal.co.kr/	QCS605
Lantronix/ Intrinsyc Technologies	https://www.lantronix.com/products-class/embedded-solutions/	APQ8053, SDA845, QCS605, SDA660, APQ8009, QCS610, QCS410
LITE-ON Technology	https://www.liteon.com	QCS404, QCS405
Sercomm	https://www.sercomm.com	QCS610
SMART Wireless/ Inforce Computing	https://www.inforcecomputing.com/products	QCS8250, SDA845, SDA660, QCS410, QCS610
Thundercomm Technology	https://www.thundercomm.com/app_en/store	QCS8250, QRB5165, SDA845, QCS605, APQ8053, APQ8009, SDA660, QCS404, QCS405, QCS610, QCS410

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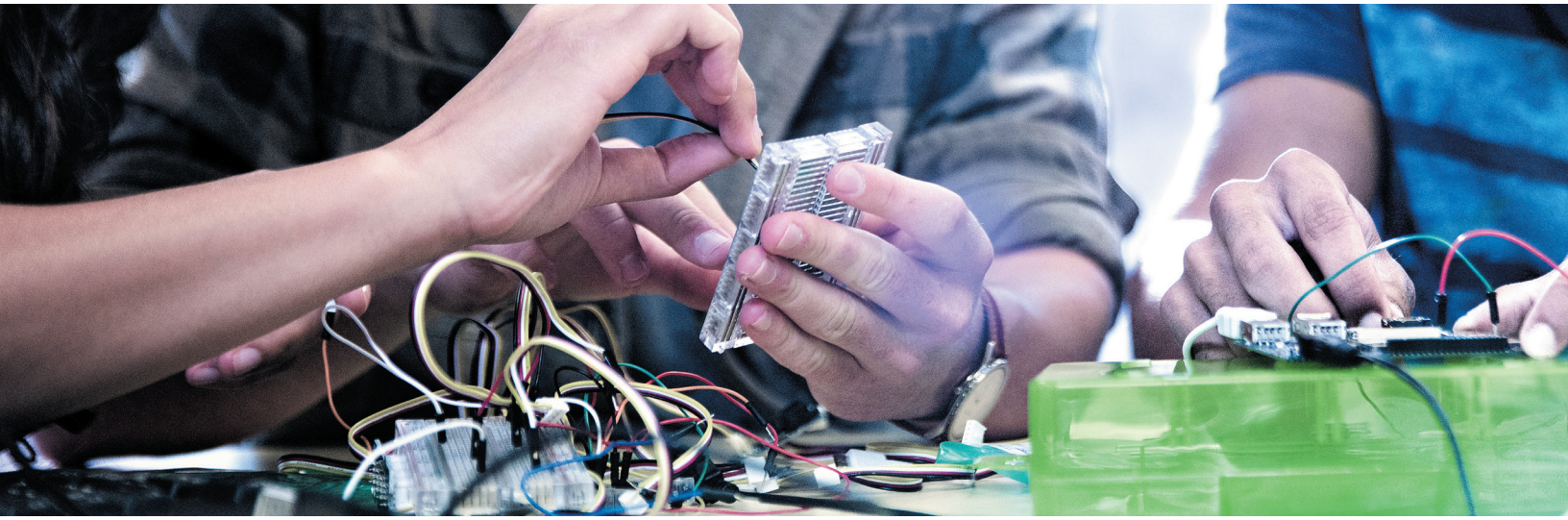

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