

*Achieve your dream with ABOV Semiconductor!
Control Your Innovative Drama!*



2022 Y

ABOV
SEMICONDUCTOR

Index

| | | | |
|---|-----------|---|-----------|
| Index | 2 | ABOV TWS (True Wireless Stereo) Touch Solution | 40 |
| ABOV Company Introduction | 3 | ABOV Capacitive Touch Solution | 42 |
| ABOV Product Lineup | 4 | ABOV Power Solution | 44 |
| Glossary | 5 | ABOV BLE (Bluetooth Low Energy) MCU | 47 |
| ABOV 32-bit MCU | 7 | ABOV Optic Sensor | 48 |
| G1 Series | 8 | 8-bit GP MCU & Application Specific Standard Products (ASSP) | 50 |
| G2 Series | 11 | 8-bit GP MCU | 51 |
| G3 Series | 14 | Universal Remote Control MCU | 54 |
| G5 Series | 17 | LCD MCU | 55 |
| L1 Series | 19 | Capacitive Touch Solution | 58 |
| L2 Series | 21 | Development Ecosystem | 59 |
| M4 Series | 25 | Office Location | 63 |
| ABOV 8-bit New Product (G1 Series) | 27 | Contact Information | 64 |
| A96G(A)14x / A96G150 Series | 29 | | |
| A96G(S)166 Series | 30 | | |
| A96G(S)174 / A96G181 Series | 31 | | |
| ABOV Motor Solution | 32 | | |
| ABOV Smoke Detector Solution | 37 | | |

ABOV Introduction

ABOV Semiconductor is the one and only MCU dedicated manufacturer providing total solutions with its R&D expertise in the field of microcontrollers, growing continuously and sustainably to address the global market.

| | | | | | |
|-------------|--|-------------|-----------------|---------|-----|
| VISION | World's Best MCU Innovator | | | | |
| MISSION | Challenge and Innovate for Customer Satisfaction | | | | |
| CORE VALUES | Customer First | Best Talent | Best Technology | Passion | Joy |

ABOV Semiconductor History

>30 Years of Industry Expertise

2006 ~ Present



2004 ~ 2006



1999 ~ 2003



1979 ~ 1998



ABOV Product Lineup

8-bit 8051 Cores

Remote Controller

- Universal Remote
- LCD Remote



32-bit Cortex®-M Cores

Bluetooth® Low Energy SoC

Bluetooth® 4.2 Bluetooth® 5.3



Universal Fast Charge Solution

- USB PD 3.0 PPS
- Quick Charge 4+
- Wireless Charger
- Travel Adaptor
- Car Charger



Ultra Low Power GP MCU

- under 100uA/MHz active mode
- RTC current : ~1uA
- deep Sleep : under 450uA
- shut down : ~45nA
- Fast wakeup : ~ 6us
- IoT, Smart Home
- Measurement

Optic Sensor

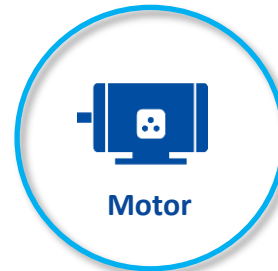
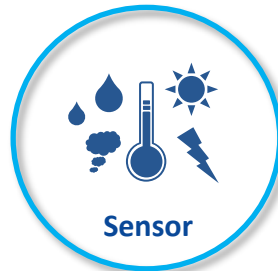
- Ambient Light Sensor
- RGB Sensor
- Proximity Sensor

Capacitive Sensor

- Touch Key Sensor
- Grip/SAR Sensor
- TWS Touch Solution

Fire & Safety Products

- Smoke Detector
- Heat Detector



Inverter & Motor Solution

- 6-step BLDC Motor
- Inverter Motor
- Compressor Solution
- HVAC Control Solution

Glossary

| | Term | Definition |
|---------------|------------|---|
| | MCU | Microcontroller unit |
| Memory | Flash | Flash memory constitutes the main nonvolatile memory store for applications |
| | Data Flash | Data Flash memory constitutes the nonvolatile memory store for data |
| | Endurance | The number of times that a Flash memory location can be erased and reprogrammed |
| | SRAM | Static Random Access Memory: SRAM provides volatile storage for program variables |
| | iRAM | Internal RAM for 8-bit MCU only |
| | xRAM | External RAM for 8-bit MCU only |
| | OTP | One Time Program Memory |
| | FMC | Flash Memory Controller |
| | ECC | Error Code Correction |
| | Mask ROM | Mask ROM is a read-only memory programmed by the manufacturer from wafer level |
| | DMA | Direct Memory Access: Allows certain hardware subsystems to access system memory independently of the CPU |
| | CRC | Cyclic Redundancy Code: An error detecting code to detect accidental changes to raw data |
| | Analog | ADC |
| DAC | | Digital to Analog Converter: Converts a digital code to an analog signal |
| CMP | | Comparator: Compares two voltages or currents |
| PGA | | Programmable Gain Amplifier: Amplifies low voltage signal to high voltage signal |
| OPAMP | | Operational Amplifier |
| Voice ADC | | An ADC with integrated PGA, AAF and MICBIAS used specifically for Analog MIC interface |
| AAF | | Antialiasing filter |
| MICBIAS | | Bias voltage output for Analog MIC interface |
| Communication | CAN | Controller Area Network: A Peripheral interface targeting automotive and industrial applications |
| | LIN | Local Interconnect Network: Serial network protocol used for communication between components in vehicles |
| | USART | Universal Synchronous Asynchronous Receiver Transmitter (UART+SPI) |
| | SPI | Serial Peripheral Interface |
| | I2C | Inter IC bus: Two wire communication interface |
| | USI | Universal Serial Interface |
| | UART | Universal Asynchronous Receiver Transmitter |
| | I2S | Integrated Interchip Sound, or Inter-IC Sound: serial bus interface standard used to communicate PCM audio data |
| | LPUART | Low Power UART |
| Timer | Timer | Timer generates time based periodic interrupt events for systems. It can be configured to operate as a periodic timer mode, or a capture mode, or a PWM pulse mode, one shot mode. (In case of GP Timer) |
| | PWM | Pulse Width Modulation |
| | RTC | Real Time Clock |
| | RTCC | Real Time Clock Calendar |
| | WDT | Watch Dog Timer: Resets the MCU after a selectable length of time |
| Clock | PLL | Phase Locked Loop : Used to multiply clock sources |
| | HSI | High Speed Internal Oscillator |
| | LSI | Low Speed Internal Oscillator |
| | HSE | High Speed External Oscillator: Direct clock from external oscillator |
| | LSE | Low Speed External Oscillator: Direct clock from external oscillator / 32.768kHz |

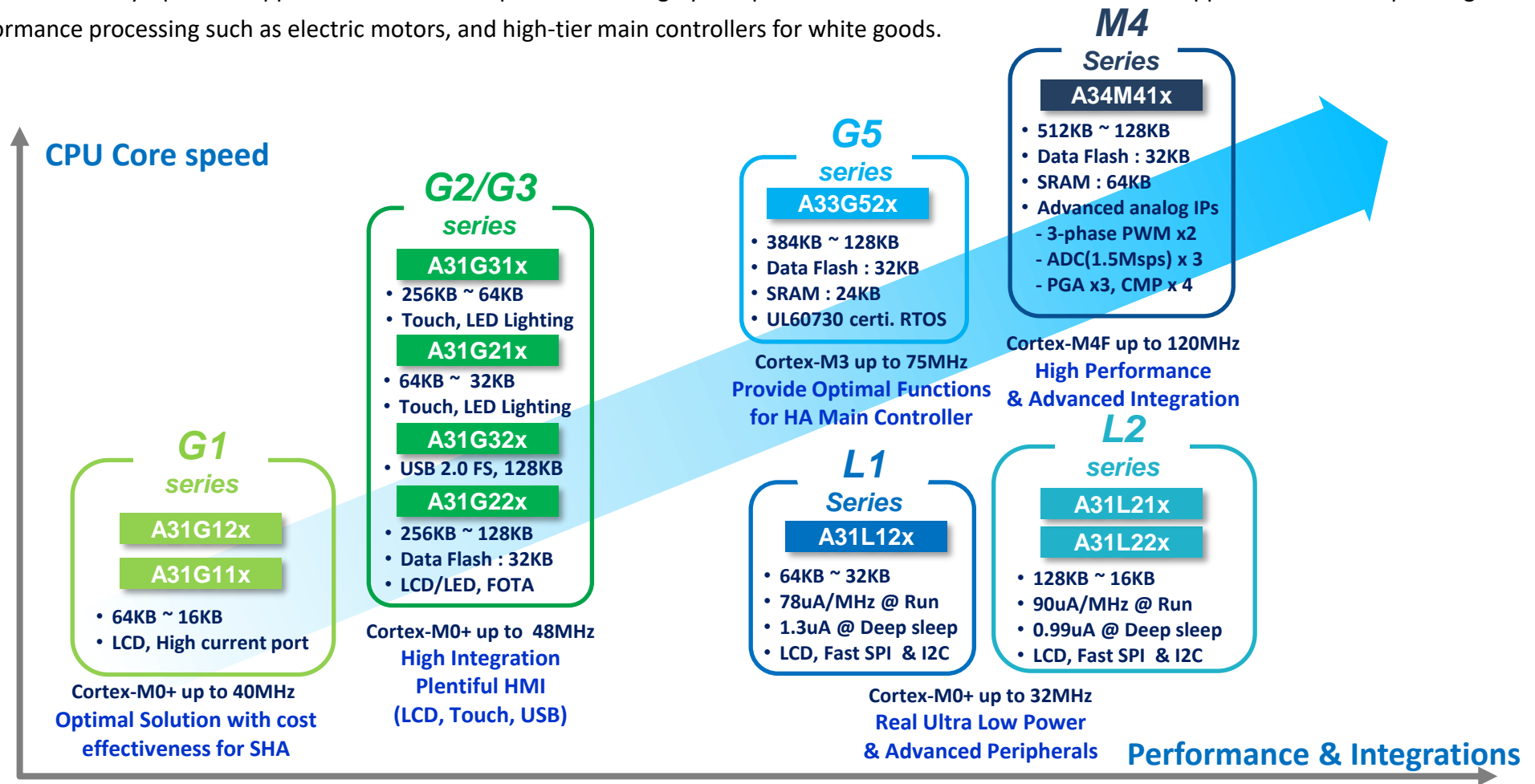
Glossary

| | Term | Definition |
|----------|----------------------------|--|
| Debug | JTAG | Joint Test Action Group: JTAG debug port (JTAG-DP) provides a 5-pin standard interface based on the JTAG protocol |
| | SWD | Serial Wire Debug: SWD debug port (SWD-DP) provides a 2-pin interface based on the SWD protocol |
| | Trace | The trace function enables users to observe variable update, interrupt entry/exit timing, etc. while the MCU is running |
| | ISP | In System Programming: ISP means that the device can be programmed in the circuit by using a utility such as the ULINK USB-JTAG Adapter |
| | IAP | In Application Programming: IAP means that the application itself can re-program the on-chip Flash |
| I/O | GPIO | General Purpose Input Output |
| | Open drain output | An Open-drain output can only sink current. It is used for bidirectional single line communication interfaces (I2C) The output has two states: Low (GND) and high impedance (A Pull-up resistor is required when the output has to be high). |
| | Push pull output | A push-pull GPIO has the ability to both source and sink current. The output has two states: Low(GND) and high(VDD) level. It used for communication interfaces that have single direction lines (SPI, UART). |
| | HVI | High Voltage Input |
| Security | AES | Advanced Encryption Standard |
| | TRNG | True Random Number Generator |
| | PRNG | Pseudo Random Number Generator |
| | RNG | Random Number Generator |
| LCD | LCD | Liquid Crystal Display: A passive display panel with terminals driving segments |
| | Segment | The smallest viewing element |
| | Common | Electrical connection terminal connected to several segments |
| | Bias | Bias indicates the number of voltage levels used when driving an LCD |
| | Boost circuit | Contrast controller circuit |
| BLE | LE | Low Energy |
| | PHY | Physical layer |
| | Tx | Transmit |
| | Rx | Receive |
| Power | POR | Power On Reset |
| | LVR | Low Voltage Reset |
| | LVI | Low Voltage Indicator |
| | IVR | Internal Voltage Reference |
| | LDO | Low Drop Out |
| | Deep Sleep | Chip state in which RTC is running and RAM memory is retained |
| | Hibernate | Chip state in which RTC is running but RAM memory is not retained |
| | Stop | Chip state in which only GPIO wakeup pins are awake |
| | UFC™ | Universal Fast Charge IP |
| | PPS | Programmable Power Supply |
| | CS | Current Sense |
| Sensor | Line Interface | The line interface mode have two operating mode : Receive mode, Transmit mode |
| | Constant current generator | Constant current generator means that constant sink current generator for external infrared LED |
| | Power line transceiver | Power line transceiver means that using 8~24V Power Line communication |

ABOV 32-bit MCU

G1 / G2 / G3 / G5 / L1 / L2 / M4 Series

ABOV Semiconductor's 32-bit general purpose microcontroller covers the widest range of customer applications such as personal healthcare, small home appliances, white goods, motor driving, and low power applications. G1/G2/G3 Series are Cortex®-M0+ based microcontrollers that deliver 32-bit performance for customers with general purpose applications. G5 Series is Cortex®-M3 based microcontrollers that deliver 32-bit performance for customers with various other features needed by customers. L1/L2 Series products are the 32-bit ultra-low-power microcontroller for various battery-operated applications. M4 Series products are highly competitive 32-bit MCU which is suitable for applications that require high-performance processing such as electric motors, and high-tier main controllers for white goods.



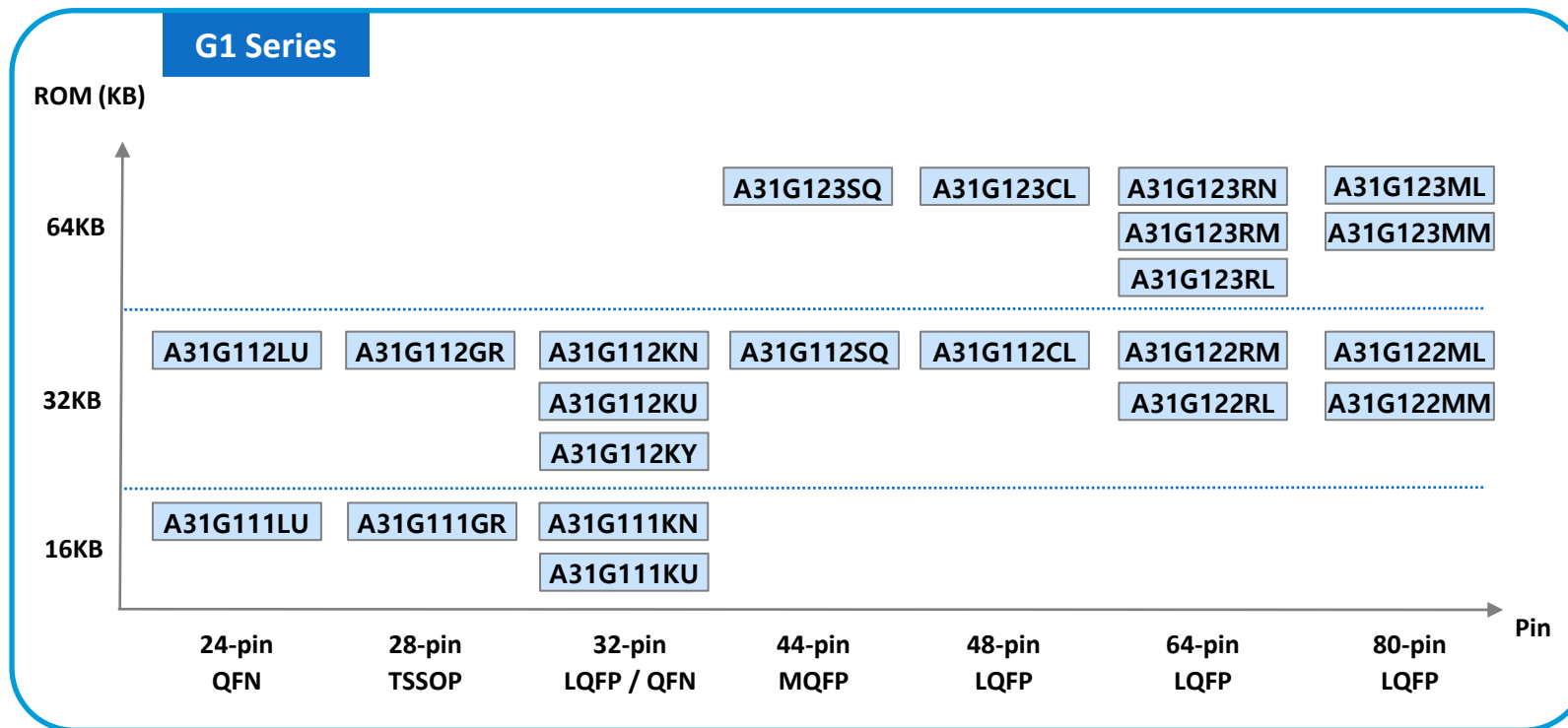
32-bit G1 Series

A31G11x, A31G12x

Devices in ABOV Semiconductor's Cortex[®]-M0+-based 32-bit G1 Series deliver optimal functions for home appliances.

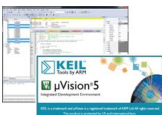
- ▶ **A31G11x** : Max. 32KB Flash memory/ 4KB SRAM/ 6-High current port; Communication: USART/ UART/ I2C(Max. 2-ch)
- ▶ **A31G12x** : Max. 64KB Flash memory/ 6KB SRAM/ 8-High current port; Communication: USART(Max. 4-ch)/ UART(Max. 2-ch)/ I2C(Max. 3-ch)

- **Operating Frequency** : 40MHz
- **Operating Voltage** : 1.8V ~ 5.5V
- **Operating Temperature** : - 40°C ~ 85/105°C
- **Key Features** : LCD driver/ High current port/ 12-bit ADC / ADC trigger function/ 96-bit Unique ID
- **Potential Application** : Mass consumer & Small home appliances / Various controllers & modules / IoT products / Other home appliances




Tools

Development Tool




KEIL™
uVision




IAR
Embedded
Workbench

H/W




Starter Kit




Debug Interface

S/W



Driver



Example Code

32-bit G1 Series

A31G112, A31G111

The A31G11x series offers the following features : 16/32 Kbytes of Flash, 4 Kbytes of SRAM, LED display drive capability, 16-bit timers, 32-bit timers, 16-bit 3-phase PWM, 12-bit ADC, CRC generator, UART, USART, I2C, LCD driver, POR, LVR, LVI, internal RC Oscillator, sleep, and deep sleep modes.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) | ADC Speed (ksps) | Int. Voltage Reference | LCD Driver | LED Driver / High current port | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|----------------|----------------|----------------------|--------------|------------------|------------------------|------------|--------------------------------|--------------|-----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---------------------------|---------------|
| | | | | | | | | | | | | | USART (ch) | UART (ch) | I2C | | | | | | | | | | | |
| A31G112CL | 40 | 32 | 4 | 45 | 3 | 2 | 1 | 11 | 50 | N | 23x8 | 6 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 48-LQFP 7x7 |
| A31G112SQ | 40 | 32 | 4 | 41 | 3 | 2 | 1 | 9 | 50 | N | 21x8 | 6 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 44-MQFP 10x10 |
| A31G112KN | 40 | 32 | 4 | 29 | 3 | 2 | 1 | 5 | 50 | N | 16x8 | 6 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 32-LQFP 7x7 |
| A31G112KU | 40 | 32 | 4 | 29 | 3 | 2 | 1 | 5 | 50 | N | 16x8 | 6 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 32-QFN 5x5 |
| A31G112KY | 40 | 32 | 4 | 29 | 3 | 2 | 1 | 9 | 50 | N | 13x8 | 4 | 2 | 1 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 32-QFN 5x5 |
| A31G112GR | 40 | 32 | 4 | 25 | 3 | 2 | 1 | 5 | 50 | N | 12x8 | 4 | 1 | 1 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 28-TSSOP |
| A31G112LU | 40 | 32 | 4 | 21 | 3 | 2 | 1 | 4 | 50 | N | 11x8 | 4 | 1 | 1 | 2 | 40 | 3.5 | 4.5 | N | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 24-QFN 4x4 |
| A31G111KN | 40 | 16 | 4 | 29 | 3 | 2 | 1 | 5 | 50 | N | 16x8 | 6 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 32-LQFP 7x7 |
| A31G111KU | 40 | 16 | 4 | 29 | 3 | 2 | 1 | 5 | 50 | N | 16x8 | 6 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 32-QFN 5x5 |
| A31G111GR | 40 | 16 | 4 | 25 | 3 | 2 | 1 | 5 | 50 | N | 12x8 | 4 | 1 | 1 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 28-TSSOP |
| A31G111LU | 40 | 16 | 4 | 21 | 3 | 2 | 1 | 4 | 50 | N | 11x8 | 4 | 1 | 1 | 2 | 40 | 3.5 | 4.5 | N | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 24-QFN 4x4 |

32-bit G1 Series

A31G123, A31G122

The A31G12x series offers the following features : 32/64 Kbytes of Flash, 6 Kbytes of SRAM, 16-bit timers, 32-bit timers, 16-bit 3-phase PWM, 12-bit ADC, CRC generator, UART, USART, I2C, LCD driver, POR, LVR, LVI, and an internal RC oscillator, sleep and deep sleep modes.

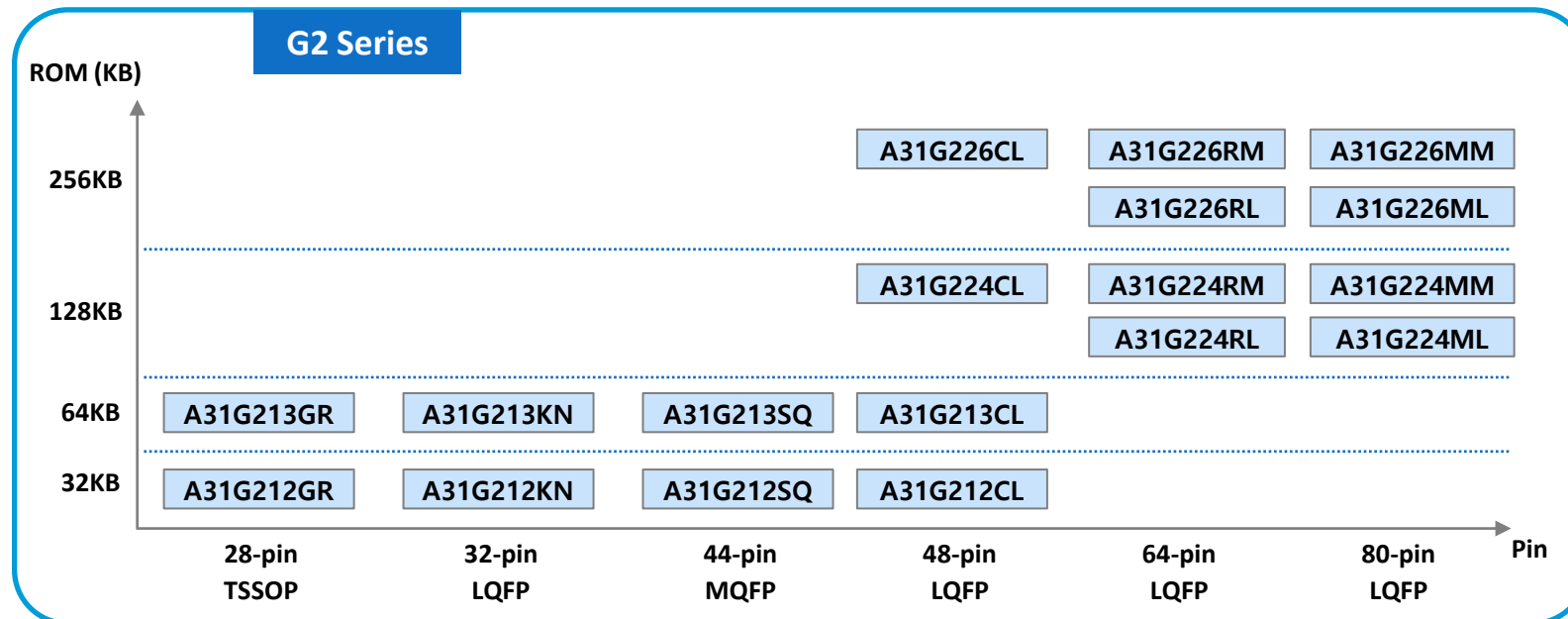
| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) | ADC Speed (ksp/s) | Int. Voltage Reference | LCD Driver | LED Driver / High current port | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|----------------|----------------|----------------------|--------------|-------------------|------------------------|------------|--------------------------------|--------------|-----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---------------------------|---------------|
| | | | | | | | | | | | | | USART (ch) | UART (ch) | I2C | | | | | | | | | | | |
| A31G123ML | 40 | 64 | 6 | 77 | 7 | 2 | 1 | 14 | 50 | N | 39x8 | 8 | 4 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 80-LQFP 12x12 |
| A31G123MM | 40 | 64 | 6 | 77 | 7 | 2 | 1 | 14 | 50 | N | 39x8 | 8 | 4 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 80-LQFP 14x14 |
| A31G123RL | 40 | 64 | 6 | 61 | 7 | 2 | 1 | 14 | 50 | N | 31x8 | 8 | 3 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 64-LQFP 10x10 |
| A31G123RM | 40 | 64 | 6 | 61 | 7 | 2 | 1 | 14 | 50 | N | 31x8 | 8 | 3 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 64-LQFP 12x12 |
| A31G123RN | 40 | 64 | 6 | 61 | 7 | 2 | 1 | 14 | 50 | N | 31x8 | 8 | 3 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 64-LQFP 14x14 |
| A31G123CL | 40 | 64 | 6 | 45 | 7 | 2 | 1 | 11 | 50 | N | 23x8 | 8 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 48-LQFP 7x7 |
| A31G123SQ | 40 | 64 | 6 | 41 | 7 | 2 | 1 | 9 | 50 | N | 21x8 | 6 | 2 | 2 | 2 | 40 | 3.5 | 4.5 | N | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 44-MQFP 10x10 |
| A31G122ML | 40 | 32 | 6 | 77 | 7 | 2 | 1 | 14 | 50 | N | 39x8 | 8 | 4 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 80-LQFP 12x12 |
| A31G122MM | 40 | 32 | 6 | 77 | 7 | 2 | 1 | 14 | 50 | N | 39x8 | 8 | 4 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 80-LQFP 14x14 |
| A31G122RL | 40 | 32 | 6 | 61 | 7 | 2 | 1 | 14 | 50 | N | 31x8 | 8 | 3 | 2 | 3 | 40 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 64-LQFP 10x10 |
| A31G122RM | 40 | 32 | 6 | 61 | 7 | 2 | 1 | 14 | 50 | N | 31x8 | 8 | 3 | 2 | 3 | 40 | 3.5 | 4.5 | N | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 64-LQFP 12x12 |

32-bit G2 Series

A31G21x

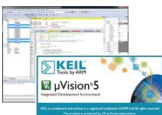
Devices in ABOV Semiconductor's Cortex®-M0+-based 32-bit G2 Series deliver flexible performances not only for kitchen appliances but also for general customer electronics with their high integration. G2 series supports solutions for the IEC60730 safety standard that ensures the safe operation of a device for home appliances.

- ▶ **A31G21x** : Max. 64KB Flash memory/ 6KB SRAM/ LED Driver; Communication: USART(Max. 2-ch)/ UART(2-ch)/ I2C(2-ch)/ SPI(Max. 2-ch)
- ▶ **A31G22x** : Max. 256KB Flash memory/ 20KB SRAM/ 32KB DATA Flash/ LED, LCD Driver/ Firmware Over-the-air function; Communication: USART(Max. 4-ch)/ UART(2-ch)/ I2C(Max. 3-ch)/ SPI(2-ch)
- **Operating Frequency** : 48MHz
- **Operating Voltage** : 1.8V ~ 5.5V
- **Operating Temperature** : - 40°C ~ 85/105°C
- **Key Features** : Capacitive touch key Max. 24-ch/ High current port/ LCD driver (G22x only)/ IEC60730/ 12-bit ADC/ DAC/ Temp sensor/ DMA
- **Potential Application** : Rice cooker/ Microwave oven/ Washing machine/ Small home applications/ Consumer products that use batteries




Tools

Development Tool



KEIL™
uVision




IAR
Embedded
Workbench

H/W




Starter Kit



Debug Interface

S/W



Driver



Example Code

32-bit G2 Series

A31G213, A31G212

The A31G21x offers the following features : 32/64 Kbytes of Flash, 6 Kbytes of SRAM, high precise internal RC oscillator, reset and power management, WDT, 32-bit timers, 16-bit 3-phase PWM, 12-bit ADC, capacitive touch switch, LED driver, CRC generator, POR.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) | ADC Speed (Ksps) | DAC (5-bit) | Int. Voltage Reference | DMA (ch) | LED Driver / High current port | Touch Key (ch) | Connectivity | | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|----------------|----------------|----------------------|--------------|------------------|-------------|------------------------|----------|--------------------------------|----------------|--------------|-----------|----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---------------------------|------------------|
| | | | | | | | | | | | | | | | USART (ch) | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | |
| A31G213CL | 48 | 64 | 6 | 44 | 4 | 2 | 1 | 14 | 150 | 1 | Y | 4 | 10x16 | 24 | 2 | 2 | 2 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 48-LQFP 7x7 |
| A31G213SQ | 48 | 64 | 6 | 40 | 4 | 2 | 1 | 12 | 150 | 1 | Y | 4 | 8x14 | 21 | 2 | 2 | 2 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 44-MQF 10x10 |
| A31G213KN | 48 | 64 | 6 | 28 | 4 | 2 | 1 | 8 | 150 | 1 | Y | 4 | 8x8 | 13 | 2 | 2 | 1 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 32-LQFP 7x7 |
| A31G213GR | 48 | 64 | 6 | 24 | 4 | 2 | 1 | 6 | 150 | 1 | Y | 4 | 6x8 | 11 | 1 | 2 | 1 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 28-TSSOP 9.7x4.4 |
| A31G212CL | 48 | 32 | 6 | 44 | 4 | 2 | 1 | 14 | 150 | 1 | Y | 4 | 10x16 | 24 | 2 | 2 | 2 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 48-LQFP 7x7 |
| A31G212SQ | 48 | 32 | 6 | 40 | 4 | 2 | 1 | 12 | 150 | 1 | Y | 4 | 8x14 | 21 | 2 | 2 | 2 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 44-MQFP 10x10 |
| A31G212KN | 48 | 32 | 6 | 28 | 4 | 2 | 1 | 8 | 150 | 1 | Y | 4 | 8x8 | 13 | 2 | 2 | 1 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 32-LQFP 7x7 |
| A31G212GR | 48 | 32 | 6 | 24 | 4 | 2 | 1 | 6 | 150 | 1 | Y | 4 | 6x8 | 11 | 1 | 2 | 1 | 2 | 32 | 1.0 | 1.5 | Y | Y | Y | Y | Y | SWD | LSI(500KHz), PLL, WT, WDT | 28-TSSOP 9.7x4.4 |

32-bit G2 Series

A31G226, A31G224

The A31G22x offers the following features : 128/256 Kbytes of Flash, 20 Kbytes of SRAM, high precise internal RC oscillator, reset and power management, 12-bit ADC, 12-bit DAC, POR, LDO, comparator, PLL, WDT, 32-bit timers, 16-bit 3-channel PWM, high current port, LCD driver, CRC generator, temp sensor, memory swap, IEC60730.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | Data Flash(KB) | I/O | Timer (16-bit) | Timer (32-bit) | PWM (16-bit) | ADC (12-bit, ch) | ADC Speed (Mpsps) | DAC (12-bit) | Int. Voltage Reference | DMA (ch) | LED Driver / High current port | LCD Driver | Connectivity | | | | HSI Freq. (MHz) | HSI Err. (±%) @ - 20 °C ~ 85 °C | HSI Err. (±%) @ - 40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|------------|-----------------|----------------|--------------|----------------|-----|----------------|----------------|--------------|------------------|-------------------|--------------|------------------------|----------|--------------------------------|------------|--------------|-----------|----------|-----|-----------------|---------------------------------|----------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---|---------------|
| | | | | | | | | | | | | | | | | USART (ch) | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | |
| A31G226MMN | 48 | 256 | 20 | 32 | 75 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x44 | 4 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 80-LQFP 14x14 |
| A31G226MLN | 48 | 256 | 20 | 32 | 75 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x44 | 4 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 80-LQFP 12x12 |
| A31G226RMN | 48 | 256 | 20 | 32 | 59 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x34 | 3 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 64-LQFP 12x12 |
| A31G226RLN | 48 | 256 | 20 | 32 | 59 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x34 | 3 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 64-LQFP 10x10 |
| A31G226CLN | 48 | 256 | 20 | 32 | 43 | 7 | 2 | 3 | 14 | 1.5 | 1 | 1.5 | 8 | 10 | 8x26 | 3 | 2 | 2 | 2 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 48-LQFP 7x7 |
| A31G224MMN | 48 | 128 | 20 | 32 | 75 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x44 | 4 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 80-LQFP 14x14 |
| A31G224MLN | 48 | 128 | 20 | 32 | 75 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x44 | 4 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 80-LQFP 12x12 |
| A31G224RMN | 48 | 128 | 20 | 32 | 59 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x34 | 3 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 64-LQFP 12x12 |
| A31G224RLN | 48 | 128 | 20 | 32 | 59 | 7 | 2 | 3 | 18 | 1.5 | 1 | 1.5 | 8 | 10 | 8x34 | 3 | 2 | 2 | 3 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 64-LQFP 10x10 |
| A31G224CLN | 48 | 128 | 20 | 32 | 43 | 7 | 2 | 3 | 14 | 1.5 | 1 | 1.5 | 8 | 10 | 8x26 | 3 | 2 | 2 | 2 | 32 | ±1.0 | ±1.5 | Y | Y | Y | Y | Y | SWD | IEC60730, Memory swap, Temp sensor, PLL | 48-LQFP 7x7 |

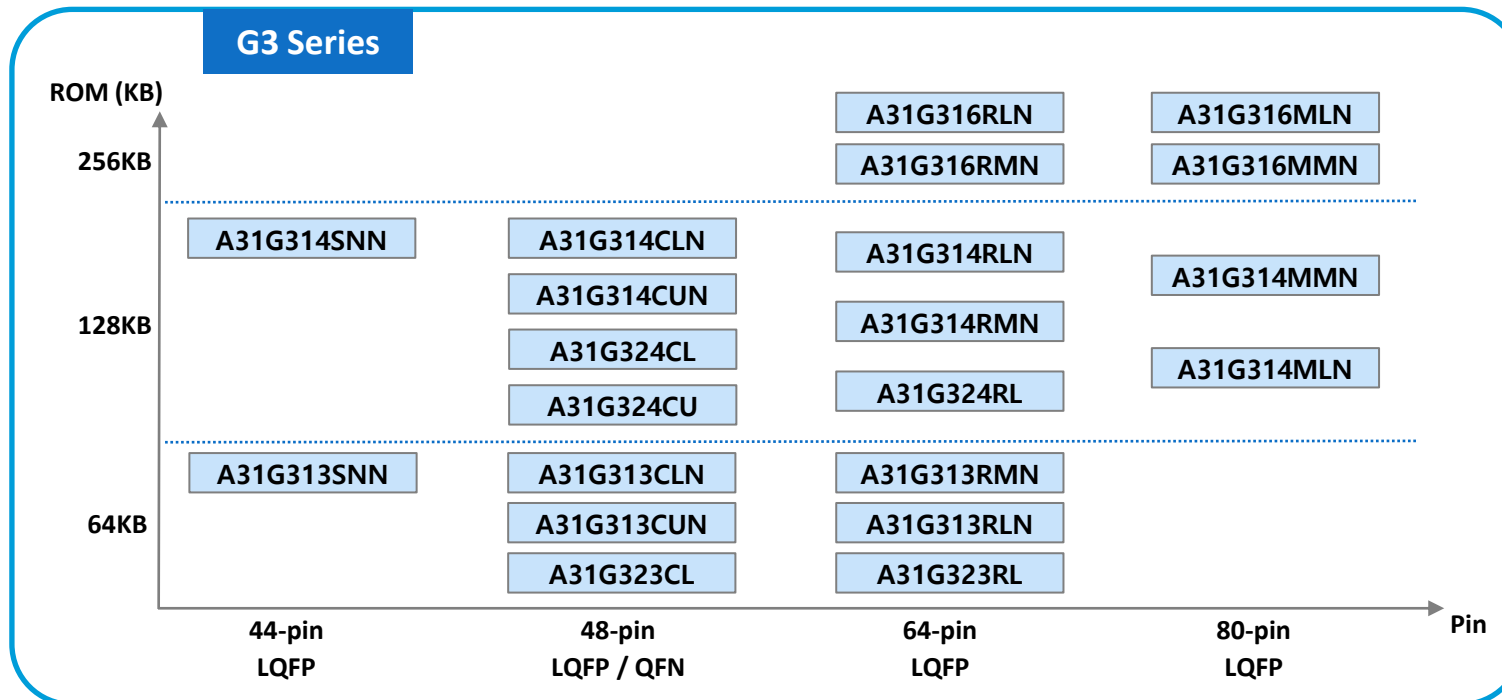
32-bit G3 Series

A31G31x, A31G32x

Devices in ABOV Semiconductor's Cortex®-M0+-based 32-bit G3 Series could be utilized for various categories of consumer appliances with plentiful HMI and peripherals including a USB interface. The G3 series maintains maximum compatibility with G1 Series.

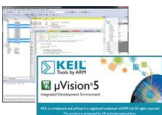
- ▶ **A31G31x** : Max. 256KB Flash memory/ 16KB SRAM/ Touch Key(24-ch); Communication: USART(Max. 4-ch)/ UART(2-ch)/ I2C(Max. 3-ch)
- ▶ **A31G32x** : Max. 128KB Flash memory/ 16KB SRAM/ Motor PWM/ RTC; Communication: USART(Max. 4-ch)/ SPI(2-ch)/ I2C(2-ch)/ USB FS

- **Operating Frequency** : 48MHz
- **Operating Voltage** : 1.8V ~ 5.5V
- **Operating Temperature** : - 40°C ~ 85°C
- **Key Features** : LCD, LED driver/ Capacitive touch key Max. 24-ch/ 12-bit ADC/ 12-bit DAC /Comparator/ Flash read protection/ Temp sensor / USB FS (A31G32x only)
- **Potential Application** : Mass consumer/ Small home appliance/ IoT products/ Door lock/ Electronic cigarette/ Various module/ Other consumer products (Smart cover, Data logger, Laser distance measurer etc.)




Tools

Development Tool




KEIL™
uVision




IAR
Embedded
Workbench

H/W




Starter Kit




Debug Interface

S/W



Driver



Example Code

32-bit G3 Series

A31G316, A31G314, A31G313

The A31G31x series offers the following features : 64/128/256 Kbytes of Flash, 16 Kbytes of SRAM, LCD driver, LED driver, 32-bit timers, 16-bit 3-phase PWM, 24-bit WDT, WT, direct memory access controller, 12-bit ADC, POR, comparator, 12-bit DAC, capacitive touch switch, on-chip RC oscillator, CRC generator, LVR, LVI.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) | ADC Speed (ksps) | DAC (12-bit) | Comparator | Int. Voltage Reference | DMA (ch) | LCD Driver | LED Driver / High current port | Touch Key (ch) | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|------------|-----------------|----------------|--------------|-----|----------------|----------------|----------------------|--------------|------------------|--------------|------------|------------------------|----------|------------|--------------------------------|----------------|--------------|-----------|-----|-----------------|--------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---------|---------------|
| | | | | | | | | | | | | | | | | | USART (ch) | UART (ch) | I2C | | | | | | | | | | |
| A31G316MMN | 48 | 256 | 16 | 74 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 44x8 | 11x27 | 24 | 4 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 80-LQFP 14x14 |
| A31G316MLN | 48 | 256 | 16 | 74 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 44x8 | 11x27 | 24 | 4 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 80-LQFP 12x12 |
| A31G316RMN | 48 | 256 | 16 | 58 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 34x8 | 11x27 | 20 | 3 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 64-LQFP 12x12 |
| A31G316RLN | 48 | 256 | 16 | 58 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 34x8 | 11x27 | 20 | 3 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 64-LQFP 10x10 |
| A31G314MMN | 48 | 128 | 16 | 74 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 44x8 | 11x27 | 24 | 4 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 80-LQFP 14x14 |
| A31G314MLN | 48 | 128 | 16 | 74 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 44x8 | 11x27 | 24 | 4 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 80-LQFP 12x12 |
| A31G314RMN | 48 | 128 | 16 | 58 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 34x8 | 11x27 | 20 | 3 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 64-LQFP 12x12 |
| A31G314RLN | 48 | 128 | 16 | 58 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 34x8 | 11x27 | 20 | 3 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 64-LQFP 10x10 |
| A31G314CLN | 48 | 128 | 16 | 43 | 7 | 2 | 1 | 11 | 150 | 1 | 2 | Y | 4 | 26x8 | 11x27 | 13 | 2 | 2 | 2 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 48-LQFP 7x7 |
| A31G314CUN | 48 | 128 | 16 | 43 | 7 | 2 | 1 | 11 | 150 | 1 | 2 | Y | 4 | 26x8 | 11x27 | 13 | 2 | 2 | 2 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 48-QFN 6x6 |
| A31G314SNN | 48 | 128 | 16 | 39 | 7 | 2 | 1 | 9 | 150 | 1 | 2 | Y | 4 | 24x7 | 9x25 | 11 | 2 | 2 | 2 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 44-LQFP 10x10 |
| A31G313RMN | 48 | 64 | 16 | 58 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 34x8 | 11x27 | 20 | 3 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 64-LQFP 12x12 |
| A31G313RLN | 48 | 64 | 16 | 58 | 7 | 2 | 1 | 14 | 150 | 1 | 2 | Y | 4 | 34x8 | 11x27 | 20 | 3 | 2 | 3 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 64-LQFP 10x10 |
| A31G313CLN | 48 | 64 | 16 | 43 | 7 | 2 | 1 | 11 | 150 | 1 | 2 | Y | 4 | 26x8 | 11x27 | 13 | 2 | 2 | 2 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 48-LQFP 7x7 |
| A31G313CUN | 48 | 64 | 16 | 43 | 7 | 2 | 1 | 11 | 150 | 1 | 2 | Y | 4 | 26x8 | 11x27 | 13 | 2 | 2 | 2 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 48-QFN 6x6 |
| A31G313SNN | 48 | 64 | 16 | 39 | 7 | 2 | 1 | 9 | 150 | 1 | 2 | Y | 4 | 24x7 | 9x25 | 11 | 2 | 2 | 2 | 48 | 3.5 | Y | Y | Y | Y | Y | SWD | PLL | 44-LQFP 10x10 |

32-bit G3 Series

A31G324, A31G323

The A31G32x series offers the following features : 64/128 Kbytes of Flash, 16 Kbytes of SRAM, USB FS, 32-bit timers, 16-bit 3-phase PWM, 24-bit WDT, WT, direct memory access controller, 12-bit ADC, 10-bit DAC, comparator, on-chip RC oscillator, clock monitoring, CRC generator, POR, LVR, LVI, power-down mode.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) | ADC Speed (Mpsps) | DAC (10-bit) | Comparator | Int. Voltage Reference | DMA (ch) | Connectivity | | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|----------------|----------------|----------------------|--------------|-------------------|--------------|------------|------------------------|----------|--------------|------------|----------|-----|-----------------|--------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|--|---------------|
| | | | | | | | | | | | | | | USB FS | USART (ch) | SPI (ch) | I2C | | | | | | | | | | |
| A31G324RL | 48 | 128 | 16 | 51 | 5 | 2 | 1 | 16 | 1 | 1 | 2 | Y | 4 | Y | 4 | 2 | 2 | 48 | 3.0 | Y | Y | Y | Y | Y | SWD | TempSensor, Window WDT, RTC, EBI, VBAT | 64-LQFP 10x10 |
| A31G324CL | 48 | 128 | 16 | 37 | 5 | 2 | 1 | 10 | 1 | 1 | 2 | Y | 4 | Y | 3 | 2 | 2 | 48 | 3.0 | Y | Y | Y | Y | Y | SWD | TempSensor, Window WDT, RTC, EBI, VBAT | 48-LQFP 7x7 |
| A31G324CU | 48 | 128 | 16 | 37 | 5 | 2 | 1 | 10 | 1 | 1 | 2 | Y | 4 | Y | 3 | 2 | 2 | 48 | 3.0 | Y | Y | Y | Y | Y | SWD | TempSensor, Window WDT, RTC, EBI, VBAT | 48-QFN 5x5 |
| A31G323RL | 48 | 64 | 16 | 51 | 5 | 2 | 1 | 16 | 1 | 1 | 2 | Y | 4 | Y | 4 | 2 | 2 | 48 | 3.0 | Y | Y | Y | Y | Y | SWD | TempSensor, Window WDT, RTC, EBI, VBAT | 64-LQFP 10x10 |
| A31G323CL | 48 | 64 | 16 | 37 | 5 | 2 | 1 | 10 | 1 | 1 | 2 | Y | 4 | Y | 3 | 2 | 2 | 48 | 3.0 | Y | Y | Y | Y | Y | SWD | TempSensor, Window WDT, RTC, EBI, VBAT | 48-LQFP 7x7 |

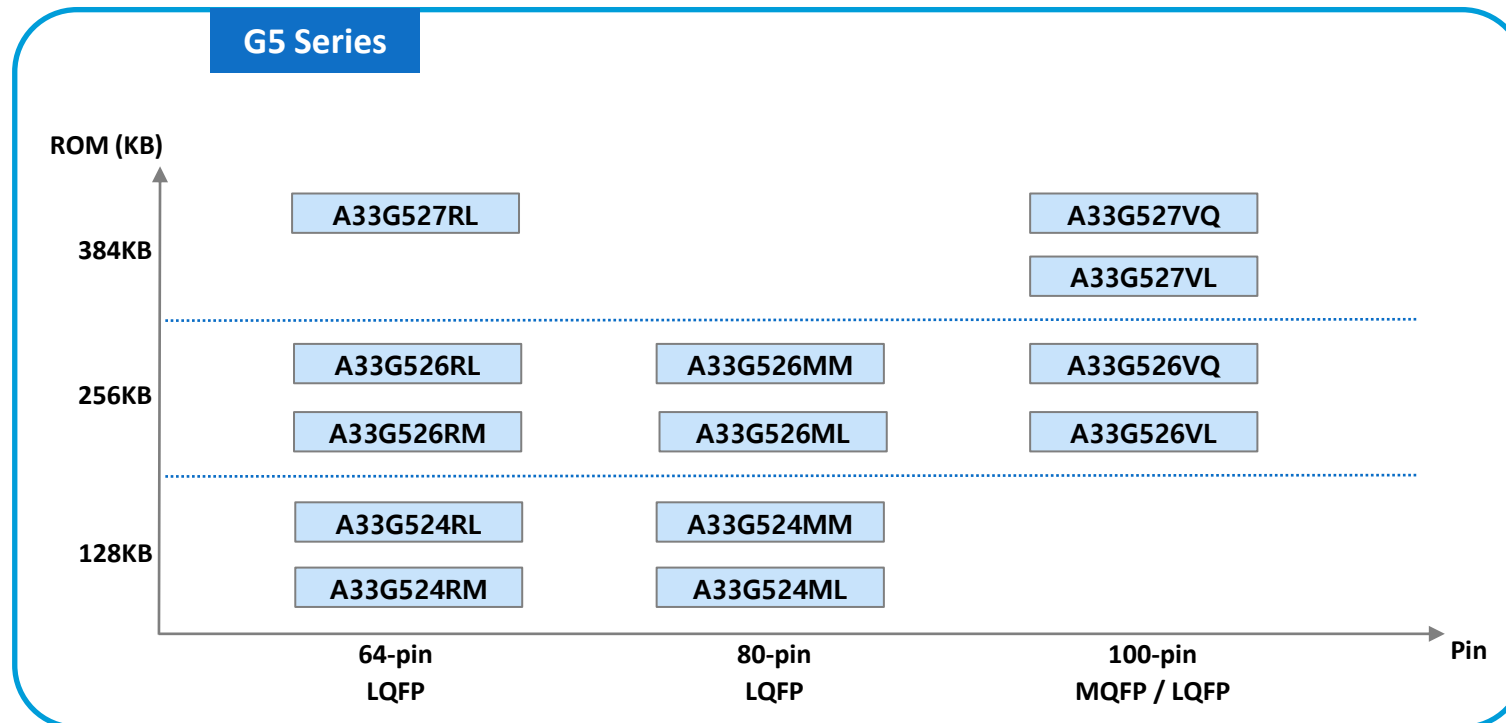
32-bit G5 Series

A33G52x

Devices in ABOV Semiconductor's Cortex®-M3-based 32-bit G5 Series provide optimal function as main controllers for home appliances with their high speed and performance. G5 series products are well-suited for cost-sensitive applications with their effectiveness.

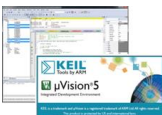
▶ **A33G52x** : Max. 384KB Flash memory/ 24KB SRAM/ Max. 32KB DATA Flash; Communication: UART(4-ch)/ SPI(2-ch)/ I2C(2-ch)

- **Operating Frequency** : 75MHz
- **Operating Voltage** : 3.0V ~ 5.5V
- **Operating Temperature** : -45°C ~ 85°C
- **Key Features** : Household safety standard UL/ IEC 60730/ Flash Read Protection (code security)/ Flash Self-PGM
- **Potential Application** : Washing machine/ Air conditioner/ Refrigerator/ Air purifier/ Robot cleaner/ Sound bar/ IoT products/ Residential boiler/ Other home appliances




Tools

Development Tool




KEIL™
uVision




IAR
Embedded
Workbench

H/W




Starter Kit




Debug Interface

S/W



Driver



Example Code

32-bit G5 Series

A33G527, A33G526, A33G524

The A33G52x series offers the following features : 128/256/384 Kbytes of Flash, 32 Kbytes of DATA Flash, 24 Kbytes of SRAM, sleep and deep sleep modes, internal RC Oscillator, clock monitoring, PLL, POR, LVD, LDO, 16-bit timers, 32-bit WDT, FRT, 16-bit PWM, and 12-bit ADC.

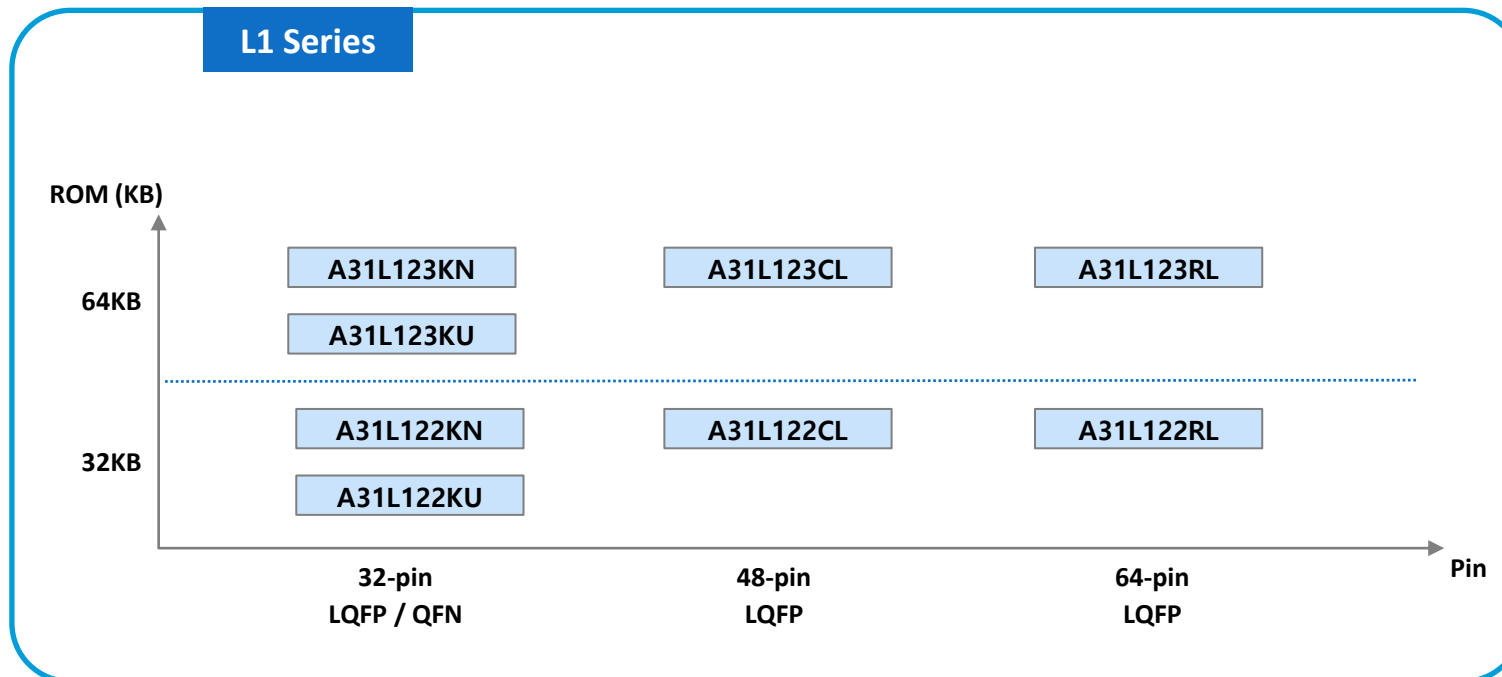
| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | Data Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | PWM (16-bit) | ADC (12-bit) | ADC Speed (ksps) | Int. Voltage Reference | LED Driver / High current port | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | LVR/LVI | Debug Interface | Package |
|-----------|-----------------|----------------|---------------------|--------------|-----|----------------|----------------|--------------|--------------|------------------|------------------------|--------------------------------|--------------|----------|-----|-----------------|--------------------------------|--------------------|--------------------|-----|---------|-----------------|----------------|
| | | | | | | | | | | | | | UART (ch) | SPI (ch) | I2C | | | | | | | | |
| A33G527VQ | 75 | 384 | 32 | 24 | 90 | 10 | Y | 8 | 16 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG/Trace | 100-MQFP 14x20 |
| A33G527VL | 75 | 384 | 32 | 24 | 90 | 10 | Y | 8 | 16 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG/Trace | 100-LQFP 14x14 |
| A33G527RL | 75 | 384 | 32 | 24 | 60 | 10 | Y | 8 | 10 | 70 | 1.5 | 14 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 64-LQFP 12x12 |
| A33G526VQ | 75 | 256 | 32 | 24 | 90 | 10 | Y | 8 | 16 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG/Trace | 100-MQFP 14x20 |
| A33G526VL | 75 | 256 | 32 | 24 | 90 | 10 | Y | 8 | 16 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG/Trace | 100-LQFP 14x14 |
| A33G526MM | 75 | 256 | 32 | 24 | 71 | 10 | Y | 8 | 15 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 80-LQFP 14x14 |
| A33G526ML | 75 | 256 | 32 | 24 | 71 | 10 | Y | 8 | 15 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 80-LQFP 12x12 |
| A33G526RL | 75 | 256 | 32 | 24 | 60 | 10 | Y | 8 | 10 | 70 | 1.5 | 14 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 64-LQFP 12x12 |
| A33G526RM | 75 | 256 | 32 | 24 | 60 | 10 | Y | 8 | 10 | 70 | 1.5 | 14 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 64-LQFP 10x10 |
| A33G524MM | 75 | 128 | 32 | 24 | 71 | 10 | Y | 8 | 15 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 80-LQFP 14x14 |
| A33G524ML | 75 | 128 | 32 | 24 | 71 | 10 | Y | 8 | 15 | 70 | 1.5 | 16 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 80-LQFP 12x12 |
| A33G524RL | 75 | 128 | 32 | 24 | 60 | 10 | Y | 8 | 10 | 70 | 1.5 | 14 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 64-LQFP 12x12 |
| A33G524RM | 75 | 128 | 32 | 24 | 60 | 10 | Y | 8 | 10 | 70 | 1.5 | 14 | 4 | 2 | 2 | 16 | 4.0 | Y | Y | Y | Y | SWD/JTAG | 64-LQFP 10x10 |

32-bit L1 Series

A31L12x

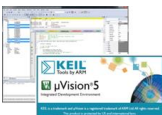
Devices in ABOV Semiconductor's Cortex®-M0+-based 32-bit L1 Series deliver 32-bit performance including external communication and deep sleep mode, along with Ultra Low Power (ULP) function. L1 series can be applied to various battery-operated applications.

- ▶ **A31L12x** : Max. 64KB Flash memory/ 8KB SRAM;
Communication: USART(1-ch)/ UART(2-ch)/ LP UART(1-ch)/ 1Mbps I2C(Max. 2-ch)/ SPI(Max. 2-ch)/ Smart card I/F: ISO-7816-3(2-ch)
- ▶ **Power Consumption**: Run mode: 78uA/MHz
Deep sleep mode: 1.3uA (with RTC)/ 200nA (LVR on)
- **Operating Frequency** : 32MHz
- **Operating Voltage** : 1.65V ~ 3.6V
- **Operating Temperature** : -40°C ~ 85/105°C
- **Key Features** : LCD driver/ ULP/ LP UART/ LP Timer/ Comparator/ 12-bit ADC (1Mps)/ 128-bit Unique ID/ Deep sleep mode
- **Potential Application** : Smart meters / Smart card readers / Door lock / Building and home control / IoT devices / Wireless sensor networks / Portable healthcare / Portable consumer electronics / Battery operated applications




Tools

Development Tool



KEIL™
uVision



IAR
Embedded
Workbench

H/W




Starter Kit




Debug Interface

S/W



Driver



Example Code

32-bit L1 Series

A31L123, A31L122

The ultra-low-power A31L12x series offers the following features : 32/64 Kbytes of Flash, 8 Kbytes of SRAM, 16-bit timers, real-time clock and calendar, WDT, 12-bit ADC, comparator, LCD driver, CRC generator, UART, USART, LPUART, I2C, SPI, smart card interface, DMA, POR, LVR, LVI, internal RC oscillator, sleep and deep sleep modes.

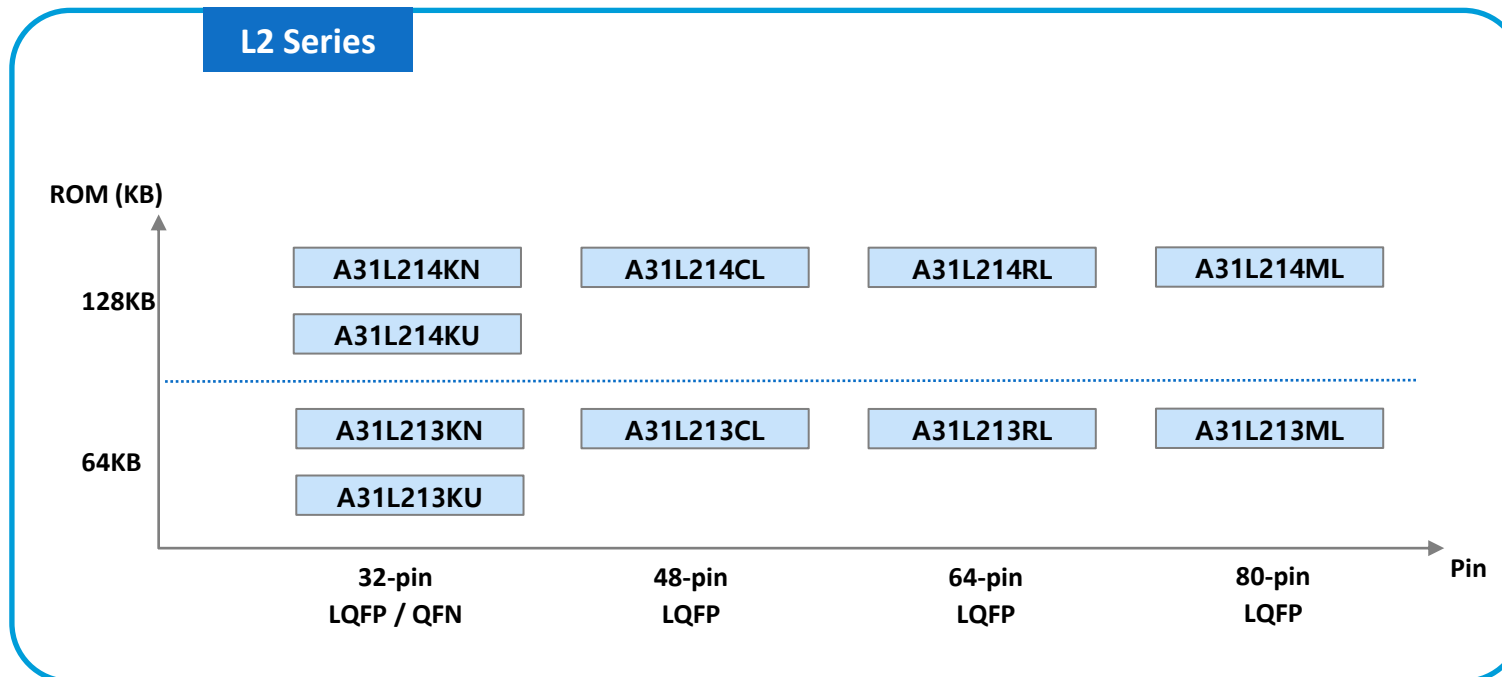
| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | ADC (12-bit) | ADC Speed (Mpsps) | Comparator | Int. Voltage Reference | DMA (ch) | LCD Driver | Connectivity | | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|----------------|--------------|-------------------|------------|------------------------|----------|------------|--------------|-----------|----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|----------------------------|---------------|
| | | | | | | | | | | | | USART (ch) | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | |
| A31L123RL | 32 | 64 | 8 | 52 | 5 | 16 | 1 | 2 | Y | 5 | 29x8 | 1 | 2 | 2 | 2 | 32 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 64-LQFP 10x10 |
| A31L123CL | 32 | 64 | 8 | 38 | 5 | 10 | 1 | 2 | Y | 5 | 18x4 | 1 | 2 | 1 | 2 | 32 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 48-LQFP 7x7 |
| A31L123KN | 32 | 64 | 8 | 26 | 5 | 10 | 1 | 2 | Y | 5 | 11x3 | 1 | 2 | 1 | 1 | 32 | 3.5 | 4.5 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 32-LQFP 7x7 |
| A31L123KU | 32 | 64 | 8 | 28 | 5 | 10 | 1 | 2 | Y | 5 | 13x3 | 1 | 2 | 1 | 1 | 32 | 3.5 | 4.5 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 32-QFN 5x5 |
| A31L122RL | 32 | 32 | 8 | 52 | 5 | 16 | 1 | 2 | Y | 5 | 29x8 | 1 | 2 | 2 | 2 | 32 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 64-LQFP 10x10 |
| A31L122CL | 32 | 32 | 8 | 38 | 5 | 10 | 1 | 2 | Y | 5 | 18x4 | 1 | 2 | 1 | 2 | 32 | 3.5 | 4.5 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 48-LQFP 7x7 |
| A31L122KN | 32 | 32 | 8 | 26 | 5 | 10 | 1 | 2 | Y | 5 | 11x3 | 1 | 2 | 1 | 1 | 32 | 3.5 | 4.5 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 32-LQFP 7x7 |
| A31L122KU | 32 | 32 | 8 | 28 | 5 | 10 | 1 | 2 | Y | 5 | 13x3 | 1 | 2 | 1 | 1 | 32 | 3.5 | 4.5 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, SC | 32-QFN 5x5 |

32-bit L2 Series

A31L21x

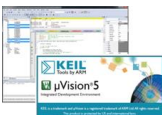
Devices in ABOV Semiconductor's Cortex®-M0+-based 32-bit L2 Series deliver 32-bit performance including external communication and deep sleep mode, along with Ultra Low Power (ULP) function. L2 series can be applied to various battery-operated applications.

- ▶ **A31L21x** : Max. 128KB Flash memory/ 20KB SRAM/ 4KB Data Flash memory;
Communication: USART(2-ch)/ UART(1-ch)/ LP UART(1-ch)/ 1Mbps I2C(Max. 3-ch)/ SPI(Max. 4-ch)/ Smart card I/F: ISO-7816-3(1-ch)
- ▶ **Power Consumption**: Run mode: 90uA/MHz
Deep sleep mode 0: 0.99uA (with RTC), Shutdown mode: 45nA (All off)
- **Operating Frequency** : 32MHz
- **Operating Voltage** : 1.71V ~ 3.6V
- **Operating Temperature** : -40°C ~ 85/105°C
- **Key Features** : LCD driver/ ULP/ LP UART/ LP Timer/ Comparator/ 12-bit ADC (1MSPS)/ AES-128/ 128-bit Unique ID/ Deep sleep mode
- **Potential Application** : Smart meters / Smart card readers / Door lock / Building and home control / IoT devices / Wireless sensor networks / Portable healthcare / Portable consumer electronics / Battery operated applications




Tools

Development Tool




KEIL™
uVision




IAR
Embedded
Workbench

H/W




Starter Kit




Debug Interface

S/W



Driver



Example Code

32-bit L2 Series

A31L214, A31L213

The ultra-low-power A31L21x series offers the following features : 64/128 Kbytes of Flash, 4 Kbytes Data Flash, 20 Kbytes of SRAM, 16-bit timers, real time clock and calendar, WDT, 12-bit ADC, comparator, LCD driver, CRC generator, UART, USART, LPUART, I2C, SPI, smart card interface, AES-128 and RNG, DMA, POR, LVR, LVI, internal RC oscillator, sleep, and deep sleep modes.

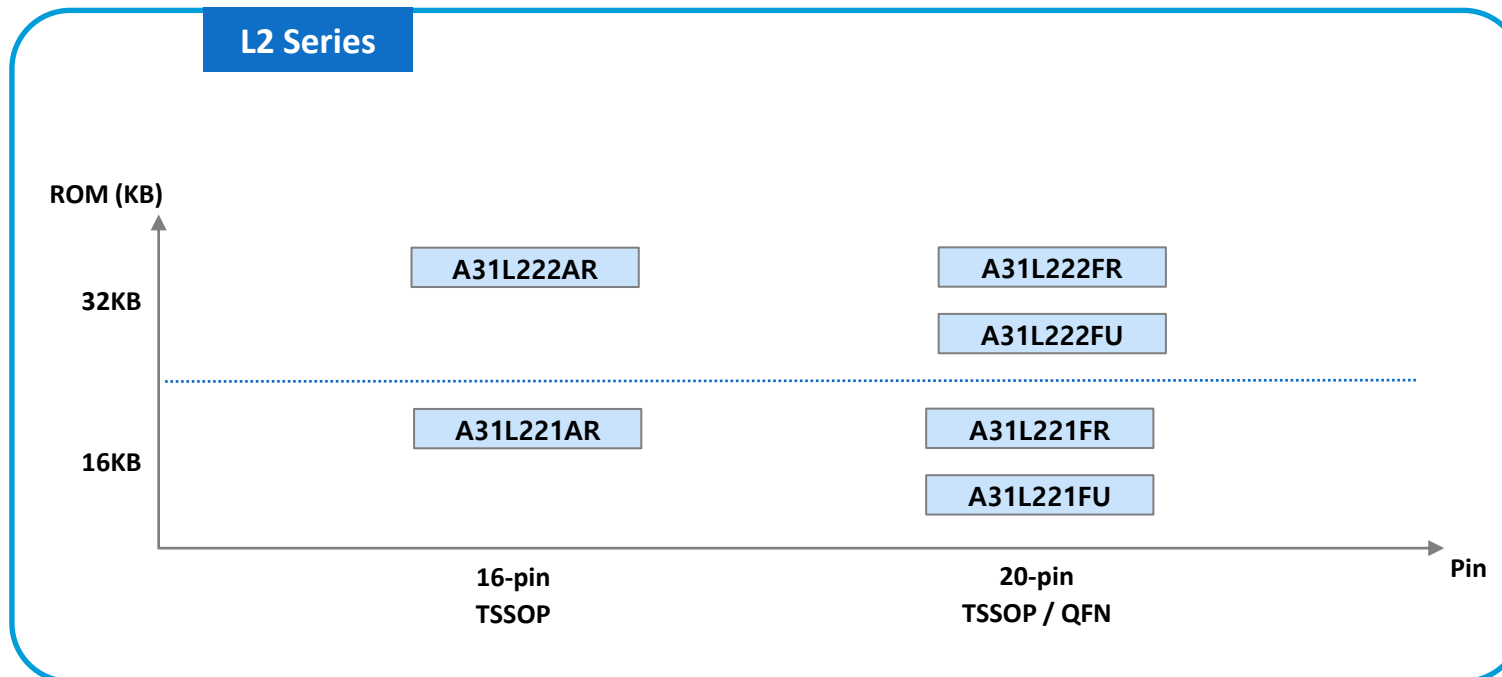
| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | ADC (12-bit) | ADC Speed (Mpsps) | Comparator | Int. Voltage Reference | DMA (ch) | LCD Driver | Connectivity | | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|----------------|--------------|-------------------|------------|------------------------|----------|------------|--------------|-----------|----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---|---------------|
| | | | | | | | | | | | | USART (ch) | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | |
| A31L214ML | 32 | 128 | 20 | 73 | 9 | 16 | 1 | 2 | Y | 7 | 39x8 | 2 | 1 | 4 | 3 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 80-LQFP 12x12 |
| A31L214RL | 32 | 128 | 20 | 57 | 9 | 16 | 1 | 2 | Y | 7 | 27x8 | 2 | 1 | 4 | 3 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 64-LQFP 10x10 |
| A31L214CL | 32 | 128 | 20 | 41 | 8 | 8 | 1 | 2 | Y | 7 | 15x4 | 2 | 1 | 3 | 3 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 48-LQFP 7x7 |
| A31L214KN | 32 | 128 | 20 | 28 | 3 | 8 | 1 | 2 | Y | 7 | - | 2 | 1 | 1 | 3 | 32 | 2.0 | 3.0 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 32-LQFP 7x7 |
| A31L214KU | 32 | 128 | 20 | 28 | 4 | 8 | 1 | 2 | Y | 7 | - | 2 | 1 | 1 | 3 | 32 | 2.0 | 3.0 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 32-QFN 5x5 |
| A31L213ML | 32 | 64 | 20 | 73 | 9 | 16 | 1 | 2 | Y | 7 | 39x8 | 2 | 1 | 4 | 3 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 80-LQFP 12x12 |
| A31L213RL | 32 | 64 | 20 | 57 | 9 | 16 | 1 | 2 | Y | 7 | 27x8 | 2 | 1 | 4 | 3 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 64-LQFP 10x10 |
| A31L213CL | 32 | 64 | 20 | 41 | 8 | 8 | 1 | 2 | Y | 7 | 15x4 | 2 | 1 | 3 | 3 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 48-LQFP 7x7 |
| A31L213KN | 32 | 64 | 20 | 28 | 3 | 8 | 1 | 2 | Y | 7 | - | 2 | 1 | 1 | 3 | 32 | 2.0 | 3.0 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 32-LQFP 7x7 |
| A31L213KU | 32 | 64 | 20 | 28 | 4 | 8 | 1 | 2 | Y | 7 | - | 2 | 1 | 1 | 3 | 32 | 2.0 | 3.0 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, SC, LP Timer, TS, AES-128, RNG, Data Flash 4k | 32-QFN 5x5 |

32-bit L2 Series

A31L22x

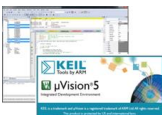
Devices in ABOV Semiconductor's Cortex®-M0+-based 32-bit L2 Series deliver 32-bit performance including external communication and deep sleep mode, along with Ultra Low Power (ULP) function. L2 series can be applied to various battery-operated applications.

- ▶ **A31L22x** : Max. 32KB Flash memory/ 4KB SRAM;
Communication: USART(1-ch)/ UART(1-ch)/ LP UART(1-ch)/ 1Mbps I2C(1-ch)/ SPI(1-ch)
- ▶ **Power Consumption**: Run mode: 75uA/MHz
Deep sleep mode 0: 0.95uA (with RTC), Shutdown mode: 36nA (All off)
- **Operating Frequency** : 32MHz
- **Operating Voltage** : 1.71V ~ 3.6V
- **Operating Temperature** : -40°C ~ 85/105°C
- **Key Features** : ULP/ LP UART/ LP Timer/ Comparator/ TS/ 12-bit ADC (1Msp)/ 128-bit Unique ID/ Deep sleep mode
- **Potential Application** : Smart meters / Smart card readers / Door lock / Building and home control / IoT devices / Wireless sensor networks / Portable healthcare / Portable consumer electronics / Battery operated applications




Tools

Development Tool




KEIL™
uVision




IAR
Embedded
Workbench

H/W




Starter Kit




Debug Interface

S/W



Driver



Example Code

32-bit L2 Series

A31L222, A31L221

The ultra-low-power A31L22x series offers the following features : 16/32 Kbytes of Flash, 4 Kbytes of SRAM, 16-bit timers, real-time clock and calendar, WDT, 12-bit ADC, comparator, CRC generator, UART, USART, LPUART, I2C, SPI, DMA, POR, LVR, LVI, internal RC oscillator, sleep, and deep sleep modes.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | ADC (12-bit) | ADC Speed (MSPS) | Comparator | Int. Voltage Reference | DMA (ch) | LCD Driver | Connectivity | | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|----------------|--------------|------------------|------------|------------------------|----------|------------|--------------|-----------|----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|----------------------------|----------|
| | | | | | | | | | | | | USART (ch) | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | |
| A31L222FR | 32 | 32 | 4 | 17 | 5 | 8 | 1 | 2 | Y | - | - | 1 | 1 | 1 | 1 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, TS | 20-TSSOP |
| A31L222FU | 32 | 32 | 4 | 17 | 5 | 8 | 1 | 2 | Y | - | - | 1 | 1 | 1 | 1 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, TS | 20-QFN |
| A31L222AR | 32 | 32 | 4 | 13 | 4 | 6 | 1 | 2 | Y | - | - | 1 | 1 | 1 | 1 | 32 | 2.0 | 3.0 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, TS | 16-TSSOP |
| A31L221FR | 32 | 16 | 4 | 17 | 5 | 8 | 1 | 2 | Y | - | - | 1 | 1 | 1 | 1 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, TS | 20-TSSOP |
| A31L221FU | 32 | 16 | 4 | 17 | 5 | 8 | 1 | 2 | Y | - | - | 1 | 1 | 1 | 1 | 32 | 2.0 | 3.0 | Y | Y | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, TS | 20-QFN |
| A31L221AR | 32 | 16 | 4 | 13 | 4 | 6 | 1 | 2 | Y | - | - | 1 | 1 | 1 | 1 | 32 | 2.0 | 3.0 | Y | N | Y | Y | Y | SWD | RTCC, LPUART, LP Timer, TS | 16-TSSOP |

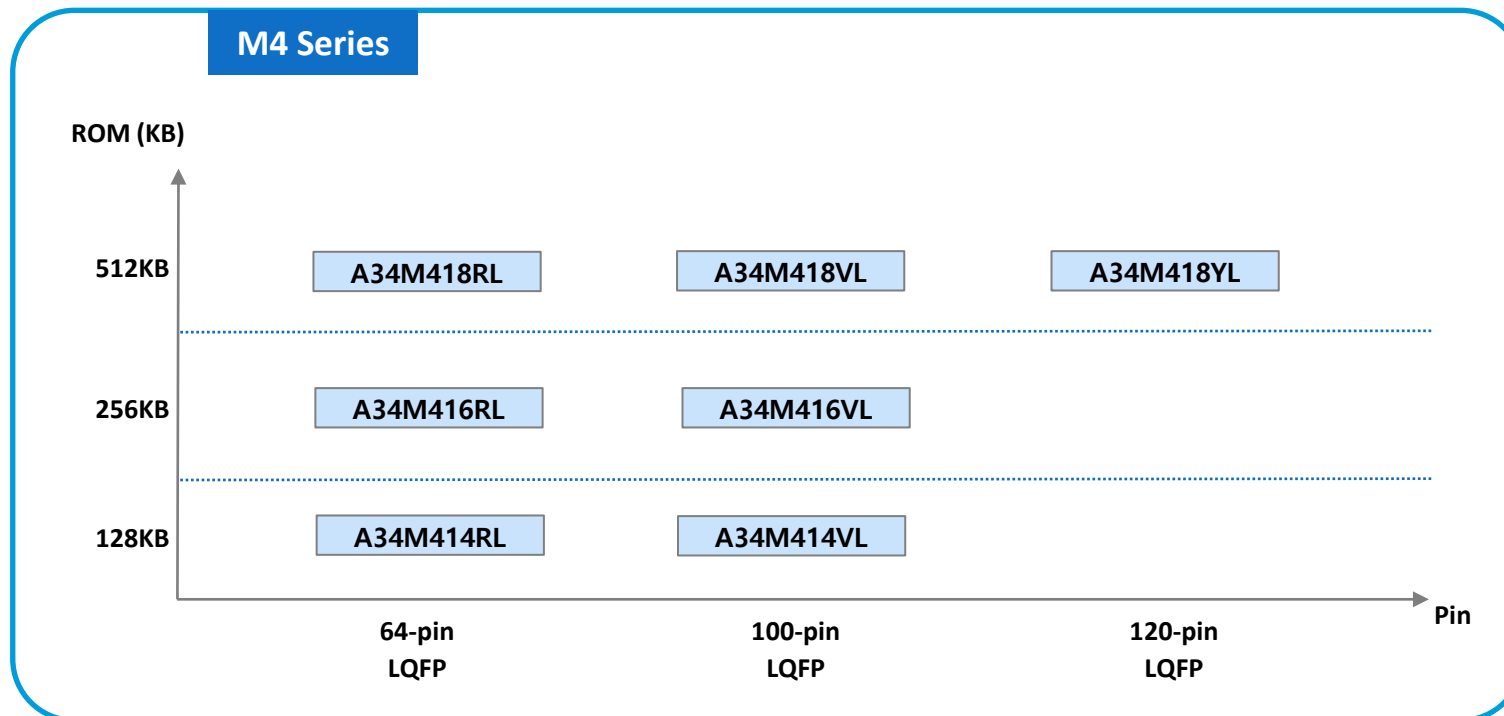
32-bit M4 Series

A34M41x

Devices in ABOV Semiconductor's Cortex®-M4F-based 32-bit M4 Series are designed for various high-performance-required applications including electric motors and high-tier main controllers for white goods.

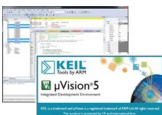
▶ **A34M41x** : Max. 512KB Flash/ Max. 64KB SRAM; Communication: UART(Max. 6-ch)/ SPI(Max. 2-ch)/ I2C(Max. 2-ch)

- **Operating Frequency** : 120MHz
- **Operating Voltage** : 2.7V ~ 5.5V
- **Operating Temperature** : -40°C ~ 85°C
- **Key Features** : 3-Phase motor PWM/ 12-bit ADC (1.5MSPS)/ 32-bit CRC/ 32-bit WDT QEI/ PGA/ COMP/ AES-128
- **Potential Application** : Air conditioner / Fan / Inverter washing machine / Refrigerator / Humidifier / Air purifier / Other white goods / Applications that require high-performance processing




Tools

Development Tool




KEIL™
uVision




IAR
Embedded
Workbench

H/W




Starter Kit




Debug Interface

S/W



Driver



Example Code

32-bit M4 Series

A34M418, A34M416, A34M414

A34M41x series offers the following features : 128/256/512 Kbytes of Flash, 32 Kbytes of DATA Flash, 32/64 Kbytes of SRAM, clock monitoring function, Run/Sleep/Stop operating modes, MPWM generator, QEI, POR, LVR, LVI, LDO, 16-bit timers, 16-bit 3-phase PWM, 16-bit 3-phase PWM, WDT, FRT, 12-bit ADC, PGA, comparator, AES-128, RNG, CRC generator.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | Data Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | PWM (16-bit) | 3-phase PWM (16-bit) | ADC (12-bit) | ADC Speed (MSPS) | PGA (utit) | Comparator | Int. Voltage Reference | DMA (ch) | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ 0 °C ~ 85 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|---------------------|--------------|-----|----------------|----------------|--------------|----------------------|--------------|------------------|------------|------------|------------------------|----------|--------------|----------|-----|-----------------|------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|------------------------|----------------|
| | | | | | | | | | | | | | | | | UART (ch) | SPI (ch) | I2C | | | | | | | | | | |
| A34M418YL | 120 | 512 | 32 | 64 | 107 | 10 | 2 | 16 | 2 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 3 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 120-LQFP 16x16 |
| A34M418VL | 120 | 512 | 32 | 64 | 89 | 10 | 2 | 16 | 2 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 2 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 100-LQFP 14x14 |
| A34M418RL | 120 | 512 | 32 | 64 | 51 | 10 | 2 | 16 | 2 | 16 | 1.5 | 3 | 2 | Y | 16 | 3 | 1 | 1 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 64-LQFP 10x10 |
| A34M416VL | 120 | 256 | 32 | 64 | 89 | 10 | 2 | 16 | 2 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 2 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 100-LQFP 14x14 |
| A34M416RL | 120 | 256 | 32 | 64 | 51 | 10 | 2 | 16 | 2 | 16 | 1.5 | 3 | 2 | Y | 16 | 3 | 1 | 1 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 64-LQFP-10x10 |
| A34M414VL | 120 | 128 | 32 | 32 | 89 | 10 | 2 | 16 | 2 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 2 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 100-LQFP 14x14 |
| A34M414RL | 120 | 128 | 32 | 32 | 51 | 10 | 2 | 16 | 2 | 16 | 1.5 | 3 | 2 | Y | 16 | 3 | 1 | 1 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 64-LQFP 10x10 |

ABOV 8-bit New Product (G1 Series)

8-bit G1 Series

ABOV Semiconductor's 8-bit general purpose microcontroller G1 Series covers the widest range of customer applications such as small home appliances, personal healthcare, white goods, battery-operated devices, and even further, industrial applications. It is also proven with noise immunity and noise-tolerant solutions under various circumstances. ABOV Semiconductor's 8-bit microcontroller can be used in various high-performance electronic devices due to its many useful features; high precision on-chip Analog IPs such as an internal precise oscillator, 12-bit ADC, and various power modes for enhanced energy savings. The 8-bit G1 series also provides cost-effective peripherals and high-temperature support functions.

G1 Series

A96G140

- 64KB (2.5KB)
- 12-bit 133Ksps
- LED 8-COM 180mA / PPG
- High Current Port
- 1.8~5.5V, -40~85/105°C

A96G(A)148

- 32KB (2.5KB)
- 12-bit 133Ksps
- LED 8-COM 180mA / PPG
- High Current Port
- 1.8~5.5V, -40~85/105°C

A96G(S)166

- 16KB (768B)
- 12-bit 133Ksps
- LED 8-COM 180mA
- High Current Port
- 1.8~5.5V, -40~85/105°C

A96G(S)174

- 8KB (512B)
- 12-bit 133Ksps with Input ch. Vref 1.2V
- IRC 32MHz $\pm 2\%$
- 1.8V~5.5V, -40~85/105°C

A96G150

- 64KB (2.5KB)
- 12-bit x 16ch 133Ksps
- LCD/ High Current Port
- IRC 32MHz $\pm 2\%$
- 1.8V~5.5V, -40~85/105°C

A96G181

- 2KB (256B)
- 12-bit 133Ksps with Input ch. Vref 1.2V
- IRC 32MHz $\pm 2\%$
- 1.8V~5.5V, -40~85/105°C

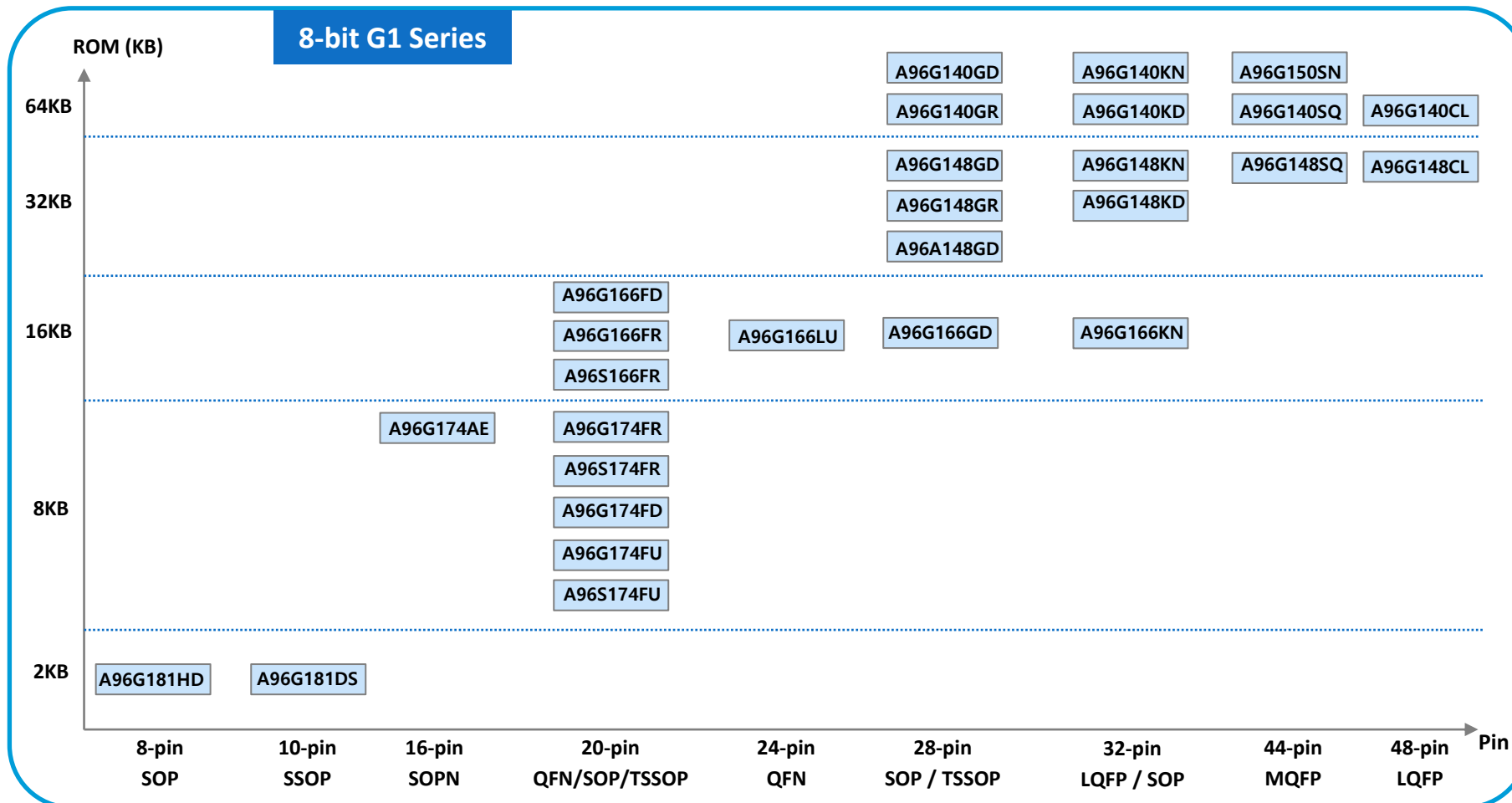
Application

- Air Conditioner
- Microwave oven
- Electric water heater
- Kitchen appliances
- Rice cooker
- Battery charge modules
- Battery operated devices
- Other home applications

8-bit G1 Series

A96G(A)14x, A96x166, A96x174, A96G150, A96G181

- ▶ **A96G150 series** : This is a powerful microcontroller that provides a highly flexible and cost-effective solution to many embedded control applications.
- ▶ **A96G(A)14x series** : specialized for LED driving and low-power applications with their high current ports and “power down mode”.
The series provides highly flexible and cost-effective solutions to many embedded control applications and home appliances.
- ▶ **A96x166 series** : satisfies stability and security with CRC and password function that are essential in small home appliance & customer electronics market.
- ▶ **A96x174 series** : has improved low-voltage operation features which provide a highly flexible and cost-effective solution to many embedded control applications.
- ▶ **A96G181 Series** : This is an advanced CMOS 8-bit microcontroller with 2K bytes Flash and a wide range of applications such as electric shavers, LED lighting, etc.

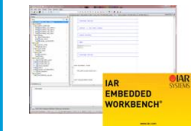


Tools

Development Tool



KEIL™
uVision



IAR
Embedded
Workbench

H/W



Starter Kit



E-OCD II
Debug Interface



Programmers

S/W



Driver



Example Code

8-bit G1 Series

A96G140, A96G148, A96A148, A96G150

The A96G(A)14x / A96G150 series offers the following features : 32/64 Kbytes of Flash, 256 Bytes of iRAM, 2304 Bytes of xRAM, ROM checksum, basic interval timer, WDT, 8/16-bit timer/counter, 16-bit PPG, 8-bit PWM, 16-bit PWM, WT, high current port, USI, 12-bit ADC, on-chip POR, LVR, LVI, on-chip oscillator and clock circuitry.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (8-bit) | Timer (16-bit) | PWM (8-bit) | PWM (16-bit) | ADC (12-bit) | ADC Speed (Ksps) | LED Driver / High current port | Connectivity | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|---------------|----------------|-------------|--------------|--------------|------------------|--------------------------------|--------------------|----------------|-----------------|--------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|-------------|---------------|
| | | | | | | | | | | | | USI(USART/SPI/I2C) | USART/SPI (ch) | | | | | | | | | | |
| A96G150SN | 16 | 64 | 2.5 | 42 | 1 | 5 | 1 | 5 | 16 | 133 | 8 | 2 | 1 | 32 | 2 | Y | Y | Y | Y | Y | E-OCD II | Buzzer, WDT | 44-LQFP 10x10 |
| A96G140CL | 16 | 64 | 2.5 | 46 | 1 | 5 | 1 | 5 | 16 | 133 | 8 | 2 | 1 | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 48-LQFP 7x7 |
| A96G140SQ | 16 | 64 | 2.5 | 42 | 1 | 5 | 1 | 5 | 16 | 133 | 8 | 2 | 1 | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 44-MQFP 10x10 |
| A96G140KN | 16 | 64 | 2.5 | 30 | 1 | 5 | 1 | 5 | 12 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 32-LQFP 7x7 |
| A96G140KD | 16 | 64 | 2.5 | 30 | 1 | 5 | 1 | 5 | 12 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 32-SOP |
| A96G140GD | 16 | 64 | 2.5 | 26 | 1 | 5 | 1 | 5 | 11 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 28-SOP |
| A96G140GR | 16 | 64 | 2.5 | 26 | 1 | 5 | 1 | 5 | 11 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 28-TSSOP |
| A96G148CL | 16 | 32 | 2.5 | 46 | 1 | 5 | 1 | 5 | 16 | 133 | 8 | 2 | 1 | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 48-LQFP 7x7 |
| A96G148SQ | 16 | 32 | 2.5 | 42 | 1 | 5 | 1 | 5 | 16 | 133 | 8 | 2 | 1 | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 44-MQFP |
| A96G148KN | 16 | 32 | 2.5 | 30 | 1 | 5 | 1 | 5 | 12 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 32-LQFP 7x7 |
| A96G148KD | 16 | 32 | 2.5 | 30 | 1 | 5 | 1 | 5 | 12 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 32-SOP |
| A96G148GD | 16 | 32 | 2.5 | 26 | 1 | 5 | 1 | 5 | 11 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 28-SOP |
| A96G148GR | 16 | 32 | 2.5 | 26 | 1 | 5 | 1 | 5 | 11 | 133 | 4 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 28-TSSOP |
| A96A148GD | 16 | 32 | 2.5 | 26 | 1 | 5 | 1 | 5 | 10 | 133 | 8 | 2 | - | 32 | 3 | Y | Y | Y | N | Y | E-OCD II | Buzzer, WDT | 28-SOP |

8-bit G1 Series

A96G166, A96S166

The A96G(S)166 series offers the following features: 16 Kbytes of Flash, 256 Bytes of iRAM, 512 Bytes of xRAM, WWDT, basic interval timer, WT, 8/16-bit timer/counter, 16-bit PPG, 8-bit PWM, 16-bit PWM, high current port, USART, I2C, 12-bit ADC, on-chip POR, LVR, LVI, on-chip oscillator and clock circuitry. A96x166 series also supports power-saving modes to reduce power consumption.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (8-bit) | Timer (16-bit) | PWM (8-bit) | PWM (16-bit) | ADC (12-bit) | ADC Speed (ksp/s) | LED Driver / High current port | Connectivity | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | Sub. X-tal | Ext. X-tal (MHz) | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|------------------|-----------------|----------------|--------------|-----|---------------|----------------|-------------|--------------|--------------|-------------------|--------------------------------|----------------|----------|-----------------|--------------------------------|------------|------------------|-----|-----|---------|-----------------|-------------------------------|-------------|
| | | | | | | | | | | | | USART/SPI (ch) | I2C (ch) | | | | | | | | | | |
| A96G166KN | 16 | 16 | 0.75 | 30 | 1 | 2 | 1 | 2 | 15 | 133 | 8 | 2 | 1 | 32 | 2.0 | Y | Y | Y | Y | Y | E-OCD II | Buzzer, HW CRC-16, Window WDT | 32-LQFP 7x7 |
| A96G166GD | 16 | 16 | 0.75 | 26 | 1 | 2 | 1 | 2 | 12 | 133 | 8 | 2 | 1 | 32 | 2.0 | Y | Y | Y | Y | Y | E-OCD II | Buzzer, HW CRC-16, Window WDT | 28-SOP |
| A96G166LU | 16 | 16 | 0.75 | 22 | 1 | 2 | 1 | 2 | 11 | 133 | 4 | 2 | 1 | 32 | 2.0 | Y | Y | Y | Y | Y | E-OCD II | Buzzer, HW CRC-16, Window WDT | 24-QFN |
| A96G166FD | 16 | 16 | 0.75 | 18 | 1 | 2 | 1 | 2 | 8 | 133 | 4 | 1 | 1 | 32 | 2.0 | N | Y | Y | Y | Y | E-OCD II | Buzzer, HW CRC-16, Window WDT | 20-SOP |
| A96G166FR | 16 | 16 | 0.75 | 18 | 1 | 2 | 1 | 2 | 8 | 133 | 4 | 1 | 1 | 32 | 2.0 | N | Y | Y | Y | Y | E-OCD II | Buzzer, HW CRC-16, Window WDT | 20-TSSOP |
| A96S166FR | 16 | 16 | 0.75 | 18 | 1 | 2 | 1 | 2 | 8 | 133 | 4 | 1 | 1 | 32 | 2.0 | N | Y | Y | Y | Y | E-OCD II | Buzzer, HW CRC-16, Window WDT | 20-TSSOP |

8-bit G1 Series

A96S174, A96G174

The A96G(S)174 series offers the following features : 8 Kbytes of Flash, 512 Bytes of SRAM, 8/16-bit timer, WWDT, USART, I2C, POR and LVI, LVR, 12-bit ADC, Vref, 8/16-bit PWM, on-chip oscillator and clock circuitry.

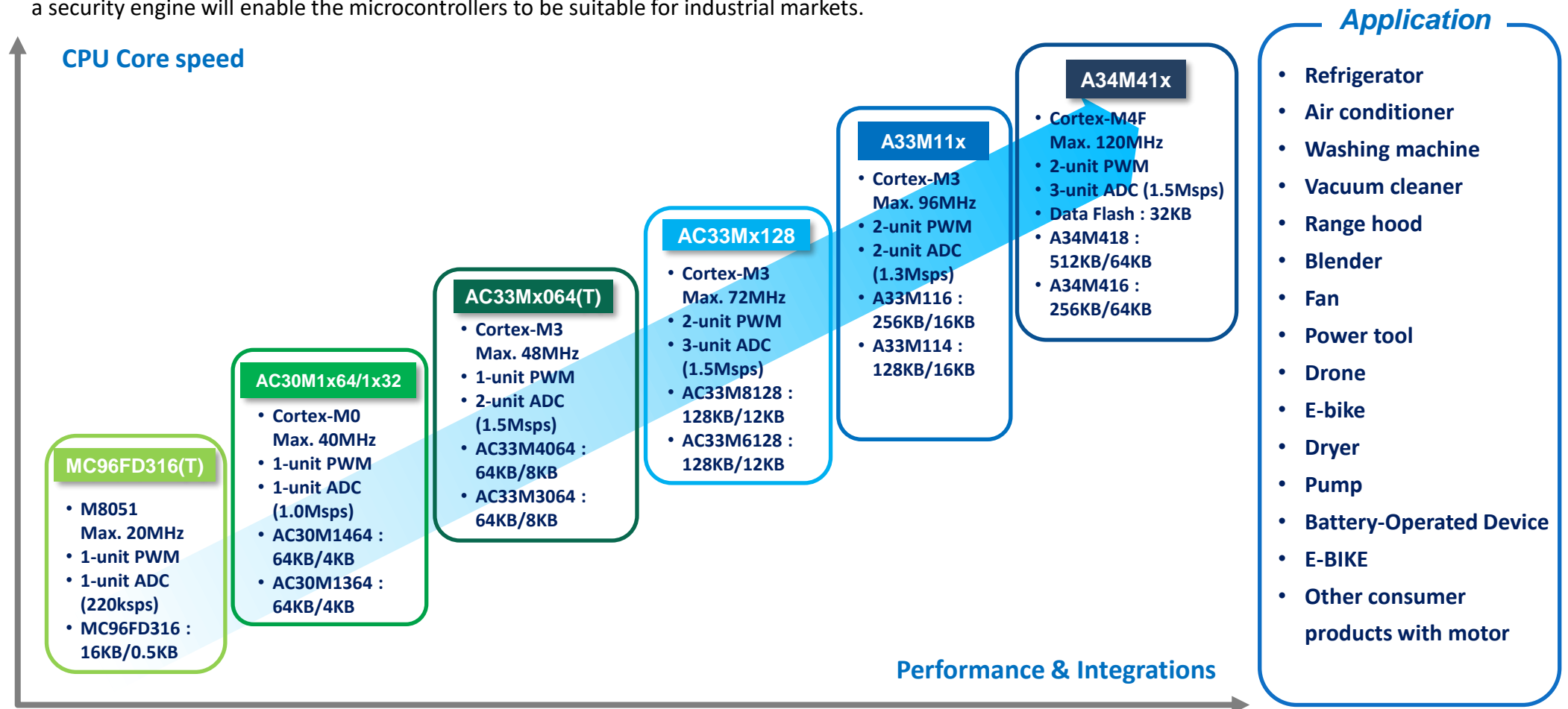
A96G181 is an advanced CMOS 8-bit microcontroller with 2K bytes of Flash. This product has the following features : 2K bytes of Flash, 256 bytes of SRAM, General purpose I/O, 8/16-bit Timer, Window Watchdog timer, POR, and LVI, LVR, on-chip oscillator, 12-bit A/D converter, 8/16-bit PWM output, and clock circuitry.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (8-bit) | Timer (16-bit) | PWM (8-bit) | PWM (16-bit) | ADC (12-bit) | ADC Speed (ksps) | Connectivity | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | Sub. X-tal | Ext. X-tal (MHz) | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|-----------|-----------------|----------------|--------------|-----|---------------|----------------|-------------|--------------|--------------|------------------|----------------|----------|-----------------|-----------------------------------|------------|------------------|-----|-----|---------|-----------------|------------------|----------|
| | | | | | | | | | | | USART/SPI (ch) | I2C (ch) | | | | | | | | | | |
| A96G174FR | 16 | 8 | 0.5 | 18 | 1 | 2 | 1 | 2 | 15 | 133 | 1 | 1 | 32 | 2.0 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 20-TSSOP |
| A96S174FR | 16 | 8 | 0.5 | 18 | 1 | 2 | 1 | 2 | 14 | 133 | 1 | 1 | 32 | 2.0 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 20-TSSOP |
| A96G174FD | 16 | 8 | 0.5 | 18 | 1 | 2 | 1 | 2 | 15 | 133 | 1 | 1 | 32 | 2.0 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 20-SOP |
| A96G174FU | 16 | 8 | 0.5 | 18 | 1 | 2 | 1 | 2 | 15 | 133 | 1 | 1 | 32 | 2.0 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 20-QFN |
| A96S174FU | 16 | 8 | 0.5 | 18 | 1 | 2 | 1 | 2 | 14 | 133 | 1 | 1 | 32 | 2.0 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 20-QFN |
| A96G174AE | 16 | 8 | 0.5 | 14 | 1 | 2 | 1 | 2 | 13 | 133 | 1 | 1 | 32 | 2.0 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 16-SOPN |
| A96G181DS | 16 | 2 | 0.256 | 8 | 1 | 2 | 1 | 2 | 8 | 133 | 0 | 0 | 32 | 2.5 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 10-SSOP |
| A96G181HD | 16 | 2 | 0.256 | 6 | 1 | 2 | 0 | 2 | 6 | 133 | 0 | 0 | 32 | 2.5 | N | N | Y | N | Y | E-OCD II | Vref, Window WDT | 8-SOP |

ABOV Motor Solution

High Performance / Motor MCU

ABOV Semiconductor's High Performance / Motor microcontroller products provide the most advanced features to support the customer's high-end devices. The high-performance microcontroller portfolio features high-speed cores, and high-performance analog IPs to support BLDC and FOC motor applications. ABOV's high-performance microcontrollers cover from 8-bit to Cortex®-M0, Cortex®-M3, and Cortex®-M4F cores. With powerful cores and motor functions, devices in motor solutions serve as the main controller for home appliances. In addition, advanced peripherals such as a security engine will enable the microcontrollers to be suitable for industrial markets.



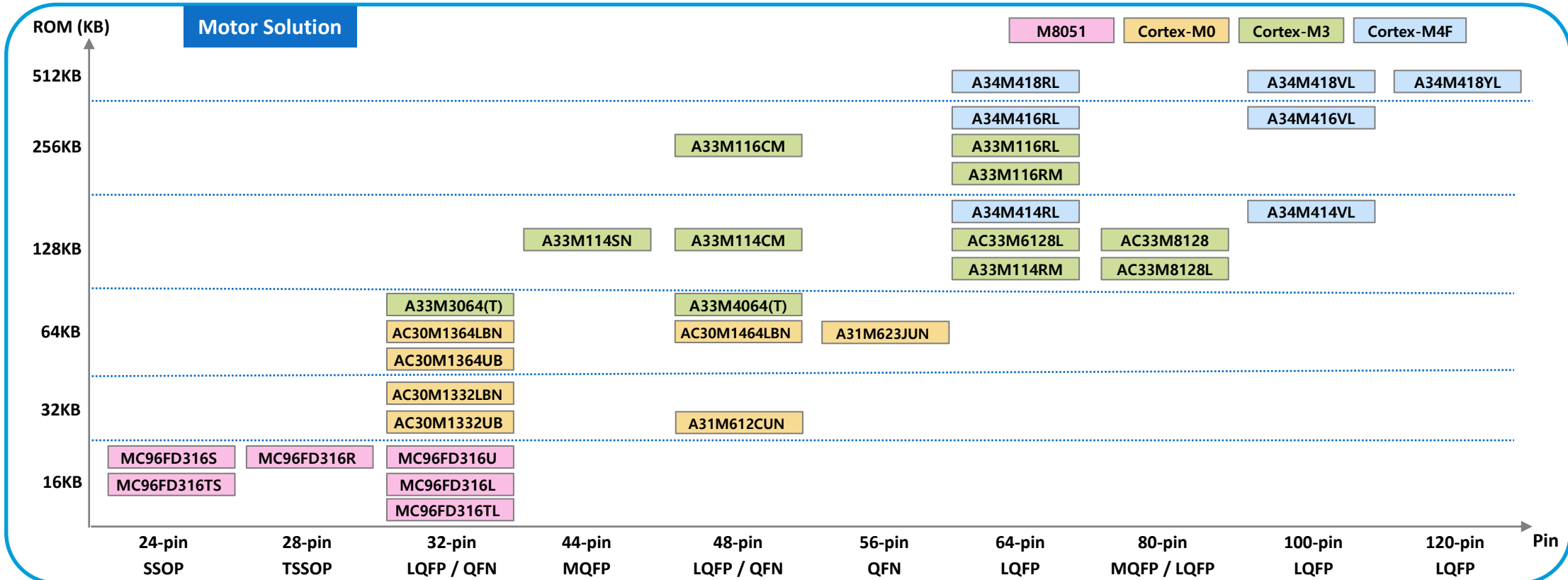
ABOV Motor Solution

Solution Description

Devices in ABOV Semiconductor's motor solutions deliver optimal functions for home appliances at a highly competitive cost.

- ▶ **A34M41x:** Cortex-M4F up to 120MHz / 2-Inverter Control +1-PFC for Air conditioner, Compressor, Washing machine, other FOC
- ▶ **A33M11x:** Cortex-M3 up to 96MHz / 2-Inverter Control for Air conditioner, Compressor, Washing machine, other FOC
- ▶ **AC33Mx128:** Cortex-M3 up to 72MHz / 2-Inverter Control for Air conditioner, Compressor, Washing machine, other FOC
- ▶ **AC33Mx064(T):** Cortex-M3 up to 48MHz / 1-Inverter Control for Air Conditioner, Fridge, White goods
- ▶ **A31M623/A31M61x:** Cortex-M0 up to 50MHz / with Gate driver for Electric tool, wireless vacuum cleaners
- ▶ **AC30M1x64/1x32:** Cortex-M0 up to 40MHz / 1-Inverter Control for Fan, Pump, FOC
- ▶ **MC96FD316(T):** M8051 core up to 20MHz / Basic motor solution line

* Devices with (T) have different operating temperature : -40°C ~105°C



ABOV Motor Products

A34M41x, A33M11x

A34M41x series offers the following features : 128/256/512 Kbytes of Flash, 32 Kbytes of DATA Flash, 32/64 Kbytes of SRAM, 12-bit ADC, IVR, MPWM generator, PGA, comparator, Run/Sleep/Stop operating modes, 16-bit timers, 32-bit timers, 16-bit 3-phase PWM, internal RC oscillator, PLL, DMA, QEI, POR, LVR, LDO, LVI, WDT, FRT, AES-128, RNG, and CRC generator.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | Data Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) (unit) | ADC (12-bit) (ch) | ADC Speed (MSPS) | PGA (unit) | Comparator | Int. Volt. Ref. | DMA (ch) | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ 0 °C ~ 85 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package | |
|-----------|-----------------|----------------|---------------------|--------------|-----|----------------|----------------|----------------------|---------------------|-------------------|------------------|------------|------------|-----------------|----------|--------------|----------|-----|-----------------|------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|----------|------------------------|----------------|
| | | | | | | | | | | | | | | | | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | |
| A34M418YL | 120 | 512 | 32 | 64 | 107 | 10 | 2 | 16 | 2 | 3 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 3 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 120-LQFP 16x16 |
| A34M418VL | 120 | 512 | 32 | 64 | 89 | 10 | 2 | 16 | 2 | 3 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 2 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 100-LQFP 14x14 |
| A34M418RL | 120 | 512 | 32 | 64 | 51 | 10 | 2 | 16 | 2 | 3 | 16 | 1.5 | 3 | 2 | Y | 16 | 3 | 1 | 1 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 64-LQFP 10x10 |
| A34M416VL | 120 | 256 | 32 | 64 | 89 | 10 | 2 | 16 | 2 | 3 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 2 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 100-LQFP 14x14 |
| A34M416RL | 120 | 256 | 32 | 64 | 51 | 10 | 2 | 16 | 2 | 3 | 16 | 1.5 | 3 | 2 | Y | 16 | 3 | 1 | 1 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 64-LQFP-10x10 |
| A34M414VL | 120 | 128 | 32 | 32 | 89 | 10 | 2 | 16 | 2 | 3 | 24 | 1.5 | 3 | 4 | Y | 16 | 6 | 2 | 2 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 100-LQFP 14x14 |
| A34M414RL | 120 | 128 | 32 | 32 | 51 | 10 | 2 | 16 | 2 | 3 | 16 | 1.5 | 3 | 2 | Y | 16 | 3 | 1 | 1 | 32 | 3.0 | Y | Y | Y | Y | Y | SWD/JTAG | PLL, RNG, AES-128, QEI | 64-LQFP 10x10 |

A33M11x offers the following features: 128/256 Kbytes of Flash, 32 Kbytes of DATA Flash, 16 Kbytes of SRAM, 12-bit ADC, IVR, MPWM generator, OP Amp, comparator, Run/Sleep/Stop operating modes, MPWM generator, 16-bit timers, 32-bit timers, 16-bit 3-phase PWM, internal RC oscillator, PLL, QEI, DMA, POR, LVR, LVI and CRC generator.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | Data Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) (unit) | ADC (12-bit) (ch) | ADC Speed (MSPS) | OP Amp. (ch) | Comparator | Int. Volt. Ref. | DMA (ch) | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ - 20 °C ~ 85 °C | HSI Err. (±%) @ - 40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package | |
|-----------|-----------------|----------------|---------------------|--------------|-----|----------------|----------------|----------------------|---------------------|-------------------|------------------|--------------|------------|-----------------|----------|--------------|----------|-----|-----------------|---------------------------------|----------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---------|---------|---------------|
| | | | | | | | | | | | | | | | | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | | |
| A33M116RL | 96 | 256 | 32 | 16 | 56 | 8 | 1 | 2 | 2 | 16 | 1.3 | 4 | 4 | Y | 8 | 4 | 2 | 2 | 32 | 1.0 | 1.5 | N | Y | Y | Y | Y | Y | SWD | QEI | 64-LQFP 10x10 |
| A33M116RM | 96 | 256 | 32 | 16 | 56 | 8 | 1 | 2 | 2 | 16 | 1.3 | 4 | 4 | Y | 8 | 4 | 2 | 2 | 32 | 1.0 | 1.5 | N | Y | Y | Y | Y | Y | SWD | QEI | 64-LQFP 12X12 |
| A33M114RM | 96 | 128 | 32 | 16 | 56 | 8 | 1 | 2 | 2 | 16 | 1.3 | 4 | 4 | Y | 8 | 4 | 2 | 2 | 32 | 1.0 | 1.5 | N | Y | Y | Y | Y | Y | SWD | QEI | 64-LQFP 12X12 |
| A33M116CM | 96 | 256 | 32 | 16 | 45 | 8 | 1 | 2 | 2 | 20 | 1.3 | 4 | 4 | Y | 8 | 3 | 2 | 2 | 32 | 1.0 | 1.5 | N | Y | Y | Y | Y | Y | SWD | QEI | 48-LQFP 7X7 |
| A33M114CM | 96 | 128 | 32 | 16 | 45 | 8 | 1 | 2 | 2 | 20 | 1.3 | 4 | 4 | Y | 8 | 3 | 2 | 2 | 32 | 1.0 | 1.5 | N | Y | Y | Y | Y | Y | SWD | QEI | 48-LQFP 7X7 |
| A33M114SN | 96 | 128 | 32 | 16 | 41 | 6 | 1 | 2 | 2 | 18 | 1.3 | 4 | 4 | Y | 8 | 3 | 2 | 2 | 32 | 1.0 | 1.5 | N | Y | Y | Y | Y | Y | SWD | QEI | 44-MQFP 10x10 |

ABOV Motor Products

AC33Mx128, AC33Mx064, AC30M1x64/AC30M1x32, A31M6xx

AC33Mx128 offers the following features: 128 Kbytes of Flash, 12 Kbytes of SRAM, 12-bit ADC, MPWM generator, OP Amp, comparator, 16-bit timers, 16-bit 3-phase PWM, internal RC oscillator, PLL, DMA, WDT, JTAG, SWD, POR, LVR, LVI, and CRC generator

AC33Mx064(T) offers the following features: 64 Kbytes of Flash, 8 Kbytes of SRAM, 12-bit ADC, MPWM generator, 16-bit timers, 16-bit 3-phase PWM, PLL, DMA, WDT, JTAG, SWD, POR, BOD, LVR, LVI, and CRC generator

AC30M1x64/ AC30M1x32 offer the following features: 32/64 Kbytes of Flash, 4 Kbytes of SRAM, 12-bit ADC, MPWM generator, 16-bit timers, 32-bit timers, 16-bit 3-phase PWM, internal RC oscillator, WDT, FRT, SWD, POR, LVR, LVI, and CRC generator

A31M623/ A31M61x offer the following features: 32/48/64 Kbytes of Flash, 6 Kbytes of SRAM, 12-bit ADC, MPWM generator, OP Amp, comparator 16-bit timers, 16-bit MPWM, internal RC oscillator, WDT, FRT, SWD, POR, LVR, LVI, Gate driver, Charge pump, HV LDO, and CRC generator

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | Timer (32-bit) | 3-phase PWM (16-bit) | ADC (12-bit) (unit) | ADC (12-bit) (ch) | ADC Speed (MSPS) | OP Amp. (ch) | Comparator | Int. Volt. Ref. | DMA (ch) | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|--------------|-----------------|----------------|--------------|-----|----------------|----------------|----------------------|---------------------|-------------------|------------------|--------------|------------|-----------------|----------|--------------|----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|--------------------------|---------------|
| | | | | | | | | | | | | | | | UART (ch) | SPI (ch) | I2C | | | | | | | | | | | |
| AC33M8128 | 72 | 128 | 12 | 64 | 6 | - | 2 | 3 | 16 | 1.5 | 4 | 4 | N | 15 | 4 | 2 | 2 | 20 | 3.0 | - | N | Y | Y | Y | Y | JTAG / SWD | Ring Oscillator (1MHz) | 80-MQFP 14x20 |
| AC33M8128L | 72 | 128 | 12 | 64 | 6 | - | 2 | 3 | 16 | 1.5 | 4 | 4 | N | 15 | 4 | 2 | 2 | 20 | 3.0 | - | N | Y | Y | Y | Y | JTAG / SWD | Ring Oscillator (1MHz) | 80-LQFP 12x12 |
| AC33M6128 | 72 | 128 | 12 | 48 | 6 | - | 2 | 3 | 16 | 1.5 | 4 | 4 | N | 15 | 2 | 2 | 1 | 20 | 3.0 | - | N | Y | Y | Y | Y | JTAG / SWD | Ring Oscillator (1MHz) | 64-LQFP 10x10 |
| A33M4064(T) | 48 | 64 | 8 | 44 | 6 | - | 1 | 2 | 11 | 1.5 | - | - | N | 4 | 2 | 1 | 1 | - | - | - | N | Y | Y | Y | Y | JTAG / SWD | Ring Oscillator (1MHz) | 48-LQFP 7x7 |
| A33M3064(T) | 48 | 64 | 8 | 28 | 6 | - | 1 | 2 | 7 | 1.5 | - | - | N | 4 | 2 | 1 | 1 | - | - | - | N | Y | Y | Y | Y | SWD | Ring Oscillator (1MHz) | 32-LQFP 7x7 |
| AC30M1464LBN | 40 | 64 | 4 | 44 | 4 | 1 | 1 | 1 | 12 | 1 | - | - | N | - | 2 | 1 | 1 | 40 | - | 3.0 | Y | Y | Y | Y | Y | SWD | Ring Oscillator (40MHz) | 48-LQFP 7x7 |
| AC30M1364LBN | 40 | 64 | 4 | 30 | 4 | 1 | 1 | 1 | 10 | 1 | - | - | N | - | 2 | 1 | 1 | 40 | - | 3.0 | Y | Y | Y | Y | Y | SWD | Ring Oscillator (40MHz) | 32-LQFP 7x7 |
| AC30M1364UB | 40 | 64 | 4 | 30 | 4 | 1 | 1 | 1 | 10 | 1 | - | - | N | - | 2 | 1 | 1 | 40 | - | 3.0 | Y | Y | Y | Y | Y | SWD | Ring Oscillator (40MHz) | 32-QFN 5x5 |
| A31M623JUN | 50 | 64 | 6 | 35 | 4 | - | 1 | 1 | 16 | 1 | 1 | 3 | Y | 4 | 2 | 1 | 1 | 32 | | 2.0 | N | Y | Y | Y | Y | SWD | Gate driver, charge pump | 56-QFN 8x8 |
| A31M613JUN | 50 | 48 | 4 | 35 | 4 | - | 1 | 1 | 16 | 1 | 1 | 3 | Y | 4 | 2 | 1 | 1 | 32 | | 2.0 | N | Y | Y | Y | Y | SWD | Gate driver, charge pump | 56-QFN 8x8 |
| A31M612CUN | 50 | 32 | 4 | 27 | 4 | - | 1 | 1 | 16 | 1 | 1 | 3 | Y | 4 | 2 | 1 | 1 | 32 | | 2.0 | N | Y | Y | Y | Y | SWD | Gate driver, charge pump | 48-QFN 7x7 |
| AC30M1332LBN | 40 | 32 | 4 | 30 | 4 | 1 | 1 | 1 | 10 | 1 | - | - | N | - | 2 | 1 | 1 | 40 | - | 3.0 | Y | Y | Y | Y | Y | SWD | Ring Oscillator (40MHz) | 32-LQFP 7x7 |
| AC30M1332UB | 40 | 32 | 4 | 30 | 4 | 1 | 1 | 1 | 10 | 1 | - | - | N | - | 2 | 1 | 1 | 40 | - | 3.0 | Y | Y | Y | Y | Y | SWD | Ring Oscillator (40MHz) | 32-QFN 5x5 |

* Devices with (T) have different operating temperature : -40 °C ~ 105 °C

MC96FD316(T) offers the following features: 16 Kbytes Flash, 512 Bytes of SRAM, 10-bit ADC, OP Amp, comparator, 16-bit 3-phase PWM, internal RC oscillator, WDT, POR, LVR, LVI, 16x16 multiplier, 32 ÷ 16 divider and CRC generator

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (8-bit) | Timer (16-bit) | PWM (16-bit) | 3-phase PWM (16-bit) | ADC (10-bit ch) | ADC Speed (ksps) | OP Amp. (ch) | Comparator | USI(USART/SP/I2C) | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal | Ext. X-tal (MHz) | ISP | CRC | LVR/LVI | Package |
|-------------|-----------------|----------------|--------------|-----|---------------|----------------|--------------|----------------------|-----------------|------------------|--------------|------------|-------------------|-----------------|--------------------------------|---------------------------------|------------|------------------|-----|-----|---------|-------------|
| MC96FD316U | 20 | 16 | 0.5 | 28 | 1 | 3 | 2 | 1 | 11 | 220 | 1 | 4 | 1 | 20 | 4.0 | 5.0 | N | Y | Y | Y | Y | 32-QFN |
| MC96FD316L | 20 | 16 | 0.5 | 28 | 1 | 3 | 2 | 1 | 11 | 220 | 1 | 4 | 1 | 20 | 4.0 | 5.0 | N | Y | Y | Y | Y | 32-LQFP 7x7 |
| MC96FD316TL | 20 | 16 | 0.5 | 28 | 1 | 3 | 2 | 1 | 11 | 220 | 1 | 4 | 1 | 20 | 4.0 | 5.0 | N | Y | Y | Y | Y | 32-LQFP 7x7 |
| MC96FD316R | 20 | 16 | 0.5 | 24 | 1 | 3 | 2 | 1 | 9 | 220 | 1 | 4 | 1 | 20 | 4.0 | 5.0 | N | Y | Y | Y | Y | 28-TSSOP |
| MC96FD316S | 20 | 16 | 0.5 | 20 | 1 | 3 | 2 | 1 | 7 | 220 | 1 | 4 | 1 | 20 | 4.0 | 5.0 | N | Y | Y | Y | Y | 24-SSOP |
| MC96FD316TS | 20 | 16 | 0.5 | 20 | 1 | 3 | 2 | 1 | 7 | 220 | 1 | 4 | 1 | 20 | 4.0 | 5.0 | N | Y | Y | Y | Y | 24-SSOP |

* Devices with (T) have different operating temperature : -40 °C ~ 105 °C

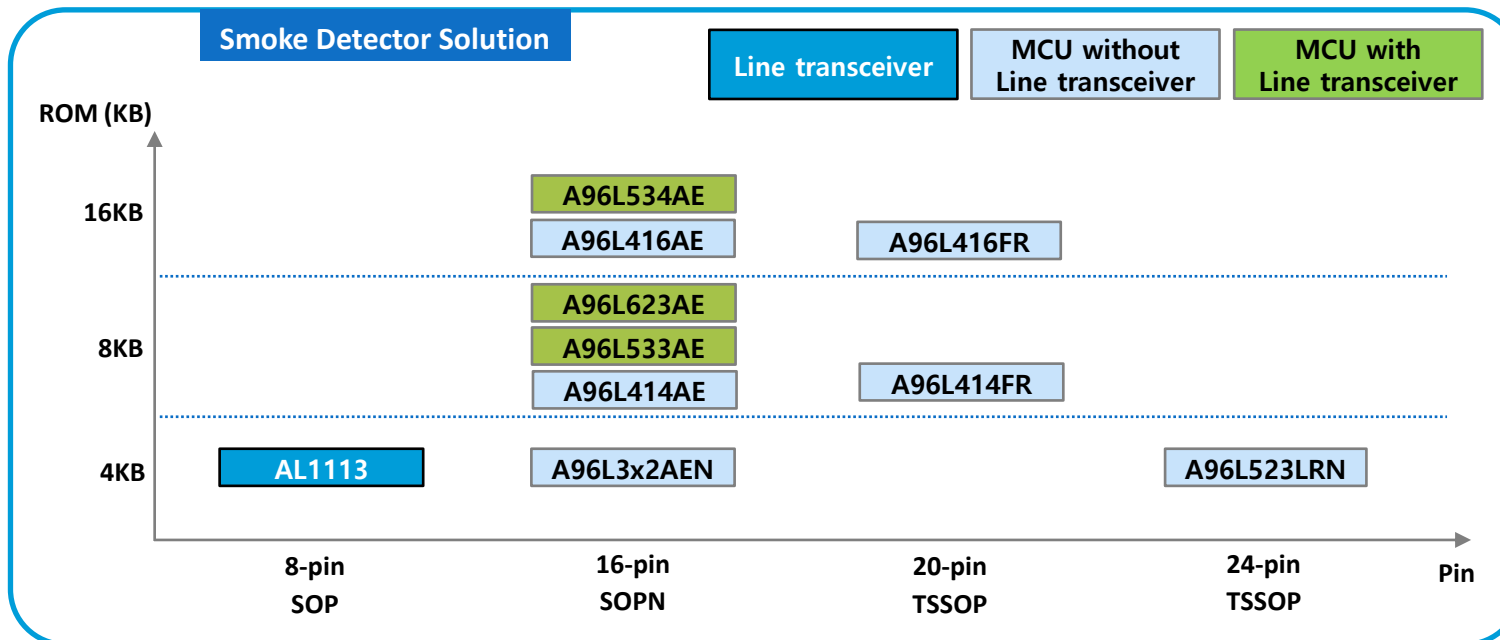
ABOV Smoke Detector Solution

Solution Description

ABOV Semiconductor's fire and safety product lineup address the entire spectrum of the low- to high-end markets. Integrating a high precision analog front-end circuitry and line interface for Tx/Rx, these MCUs and ICs provide the most optimized solution for smoke detectors and heat detectors.

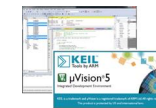
- ▶ **A96L623** : Network smoke detector SoC product that includes a high voltage power line transceiver IC and OP-Amp, constant current generator.
- ▶ **A96L53x** : Network smoke detector SoC that includes 16KB Flash, Rx, Tx power Line transceiver.
- ▶ **A96L523** : Network smoke detector SoC that includes 4KB Flash, Rx, Tx power Line transceiver.
- ▶ **A96L322** : Network smoke detector that includes Line interface, Precision OP-Amp, constant current generator.
- ▶ **A96L41x** : specialized for the independent smoke detector that includes Precision OP-Amp, constant current generator.
- ▶ **AL1113** : a high-voltage power line transceiver IC that includes Rx, Tx power line interface network fire system.

- **Operating Frequency** : 1MHz, 4MHz
- **Operating Temperature** : - 40 °C ~ 85 °C
- **Key Features** : EEPROM, Line interface, 8-bit WDT, Self-read/write capability embedded, On-chip debug and ISP, 16-bit CRC, Checksum generator, Siren, Constant current generator (Max. 274mA), High precision OP-Amp, 10-bit ADC
- **Potential Application** : Smoke detector and fire system.



Tools

Development Tool



KEIL™
uVision



IAR
Embedded
Workbench

H/W



Starter Kit



E-OCDDII
Debug Interface



Programmable
Logic Controller

S/W



Driver



Ref code

GUI



Smoke Detector
GUI

ABOV Smoke Detector Products

A96L302, A96L322, A96L523,
A96L53x, A96L623 & AL1113

A96L302, A96L322 are advanced CMOS 8-bit Low power microcontrollers The products provide the following features : 4 Kbytes of Flash, 256 Bytes of iRAM, 128 Bytes of data EEPROM, basic interval timer, WDT, 16-bit timer/counter, 16-bit PPG output, line interface, 10-bit ADC, a programmable gain amplifier, constant sink current generator.

A96L523, A96L53x, A96L623 are advanced CMOS 8-bit Low power microcontrollers The products provide the following features : 4~16 Kbytes of Flash, 256B~1KB SRAM, 128/256 Bytes of data Flash, basic interval timer, WDT, 16-bit timer/counter, 16-bit PPG output, line interface, 10-bit ADC, a programmable gain amplifier, constant sink current generator, Power line transceiver, 3V/5V LDO, Tx / Rx Circuit

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | E2P (Bytes) | Data Flash (Bytes) | RAM (Kbytes) | I/O | Timer (16-bit) | PWM (16-bit) | ADC (10-bit) | ADC Speed (ksp/s) | Op Amp. (ch) | LED Driver / High current port | USART (ch) | HSI Freq. (MHz) | HSI Err. (±%) @ -40°C ~ 85°C | Sub. X-tal Supp ort | Ext. X-tal Supp ort | ISP | CRC | LVR/LVI | LDO | Remarks | Package |
|------------|-----------------|----------------|-------------|--------------------|--------------|-----|----------------|--------------|--------------|-------------------|--------------|--------------------------------|------------|-----------------|------------------------------|---------------------|---------------------|-----|-----|---------|-----|--|----------|
| A96L302AEN | 1 | 4 | 128 | - | 0.25 | 14 | 2 | 2 | 9 | 18 | - | - | - | 1 | 3.0 | N | N | Y | Y | Y | - | Line Interface | 16-SOPN |
| A96L322AEN | 1 | 4 | 128 | - | 0.25 | 14 | 2 | 2 | 9 | 36 | 2 | 2 | 1 | 1 | 3.0 | N | N | Y | Y | Y | - | Line Interface, Siren, Constant current Generator(Max274mA) | 16-SOPN |
| A96L523LRN | 1 | 4 | 128 | - | 0.25 | 14 | 2 | 2 | 9 | 36 | 2 | 2 | 1 | 1 | 3.0 | N | N | Y | Y | Y | 3V | Line Interface, Siren, Constant current Generator(Max274mA) Power line transceiver, Tx Transistor, Rx Transister | 24-TSSOP |
| A96L533AEN | 4 | 8 | - | 256 | 0.5 | 12 | 3 | - | 5 | 36 | 2 | 2 | 1 | 1 | 3.0 | N | N | Y | Y | Y | 3V | Line Interface, Constant current Generator(Max274mA) Power line transceiver, Tx Transistor, Rx Transister | 16-SOPN |
| A96L534AEN | 4 | 16 | - | 256 | 1 | 12 | 3 | - | 5 | 36 | 2 | 2 | 1 | 1 | 3.0 | N | N | Y | Y | Y | 3V | Line Interface, Constant current Generator(Max274mA) Power line transceiver, Tx Transistor, Rx Transister | 16-SOPN |
| A96L623AEN | 4 | 8 | - | 256 | 0.5 | 12 | 3 | - | 5 | 36 | 2 | 2 | 1 | 1 | 3.0 | N | N | Y | Y | Y | 5V | Line Interface, Constant current Generator(Max274mA) Power line transceiver, Tx Transistor, Rx Transister | 16-SOPN |

AL1113 is a high voltage power line transceiver IC that includes Rx, Tx power line interface for network fire system. The product provides the following features : 3V LDO, Comparator for line interface Rx, TR for line interface Tx.

| Part No. | Op. Voltage (V) | I/O | Comparator | Int. LDO (V) | Int. LDO Err. (±%) @ -40°C ~ 85°C | Remarks | Package |
|-----------|-----------------|-----|------------|--------------|-----------------------------------|--|---------|
| AL1113HDN | 8.5~42 | 2 | 1 | 3V | 3.0 | Power line transceiver Tx Transistor, Rx Transister | 8-SOPN |

ABOV Smoke Detector Products

A96L41x

A96L41x is an advanced CMOS 8-bit microcontroller with 8/16 Kbytes of Flash. This powerful microcontroller provides low power consumption and cost-effective solution to the independent smoke detector. The product provides the following features : 8/16 Kbytes of Flash, 256 Bytes of Iram, 256/768 Bytes of Xram, 256 Bytes of data Flash, basic interval timer, WDT, 16-bit timer/counters, 10-bit ADC, operational amplifier, constant sink current generator, Flash CRC/checksum generator, on-chip POR, LVR, USART, on-chip oscillator, and clock circuitry. The device also supports power down and sleep modes to reduce power consumption.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | Data Flash (Kbytes) | RAM (Kbytes) | I/O | Timer (16-bit) | PWM (16-bit) | ADC (10-bit) | ADC Speed (ksp/s) | Op Amp. (ch) | Int. Voltage Reference | LED Driver / High current port | USART (ch) | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Remarks | Package |
|------------|-----------------|----------------|---------------------|--------------|-----|----------------|--------------|--------------|-------------------|--------------|------------------------|--------------------------------|------------|-----------------|--------------------------------|--------------------|--------------------|-----|-----|---------|--------------------------------------|----------|
| A96L416FRN | 4 | 16 | 0.25 | 1 | 18 | 3 | 3 | 7 | 72 | 2 | Y | 2 | 1 | 4 | 3.0 | N | N | Y | Y | Y | Constant current Generator(Max274mA) | 20-TSSOP |
| A96L416AEN | 4 | 16 | 0.25 | 1 | 14 | 3 | 3 | 5 | 72 | 2 | Y | 2 | 1 | 4 | 3.0 | N | N | Y | Y | Y | Constant current Generator(Max274mA) | 16-SOPN |
| A96L414FRN | 4 | 8 | 0.25 | 0.5 | 18 | 3 | 3 | 7 | 72 | 2 | Y | 2 | 1 | 4 | 3.0 | N | N | Y | Y | Y | Constant current Generator(Max274mA) | 20-TSSOP |
| A96L414AEN | 4 | 8 | 0.25 | 0.5 | 14 | 3 | 3 | 5 | 72 | 2 | Y | 2 | 1 | 4 | 3.0 | N | N | Y | Y | Y | Constant current Generator(Max274mA) | 16-SOPN |

ABOV TWS Touch Products


Solution Description

ABOV Semiconductor offers low-power capacitive touch sensors for TWS (True Wireless Stereo) and smart headphones. Integrated with low-power MCU and high-performance analog front-end circuit, ABOV Semiconductor's touch sensor detects the touch key, slide, proximity, or capacitive force sensing based on the changes of capacitance.

- **Key Features** : Self capacitive touch sensor, Capacitive force touch, Smallest package, Lowest power consumption (20~30uA), High sensitivity, Field-proven solution by mass-producing TWS products for top-tier TWS companies
- **Potential Application** : Wireless earphones and smart headphones

TWS Solution


Single Touch



Touch Key Function

- Short / Double / Long touch
- Recommended Device: A96T346, A96T365, A96T516, A96T396

Proximity + Touch/Slide




Proximity

Proximity + Touch/Slide Function

- Single / Double Tap
- Single / Double Tap + Long Touch
- TWS In-ear detection
- Recommended Device: A96T346, A96T516, A96T376, A96T396, A96T3A6

Slide Touch







Touch Slide Function

- Single / Double Tap
- Single / Double Tap + Long Touch
- Volume Up / Down Slide
- Recommended Device: A96T346, A96T516, A96T396

Tools

H/W


Proximity & Key Demo Board

Touch Key Demo Board

Slide Key Demo Board

GUI Tool

S/W



GUI Program

ABOV TWS Touch Products

A96T346, A96T376 & A96T516

A96T396, A96T3A6

A96T346, A96T365, A96T376, A96T516, A96T396, and A96T3Ax are advanced CMOS 8-bit microcontrollers with capacitive touch sensors. These powerful microcontrollers provide low power consumption with the smallest package size for TWS and smart headphone applications. The products provide the following features : Flash, RAM, 16-bit timer, 16-bit PWM, WDT, I2C, POR, and BOD.

The special waterproof feature has been adapted to A96T396 and A96T3A5/6.

| Part No. | Touch Channels | I2C (ch) | USART (ch) | Min Op Voltage (V) | Max Op Voltage (V) | Min Op Temp (°C) | Max Op Temp (°C) | Remarks | Package |
|------------|----------------|----------|------------|--------------------|--------------------|------------------|------------------|---|---------------------|
| A96T3A6UFN | 9 | 1 | - | 1.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide, Enhanced Waterproof | 14-DFN(9ch) 1.4x2.5 |
| A96T346AUN | 8 | 1 | - | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide | 16-QFN 3x3 |
| A96T346DFN | 8 | 1 | - | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide | 10-DFN 1.8x2.1 |
| A96T376EF | 7 | 1 | 1 | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide | 12-DFN 1.8x2.1 |
| A96T3A6EFN | 7 | 1 | - | 1.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide, Enhanced Waterproof | 12-DFN(7ch) 1.4x2.1 |
| A96T376DF | 5 | 1 | 1 | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide | 10-DFN 1.8x2.1 |
| A96T3A5DFN | 5 | 1 | - | 1.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide, Enhanced Waterproof | 10-DFN 1.8x2.1 |
| A96T346HW | 4 | 1 | - | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide | 8-WLCSP 1.54x1.79 |
| A96T516BW | 3 | 1 | - | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide | 9-WLCSP 1.03x1.53 |
| A96T516HF | 3 | 1 | - | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide | 8-DFN 1.6x1.9 |
| A96T396HFN | 3 | 1 | - | 2.7 | 3.6 | -40 | 85 | Single Touch, Slide Touch, Proximity + Touch/Slide, Waterproof | 8-DFN1.4x1.7 |

ABOV Capacitive Touch Solution

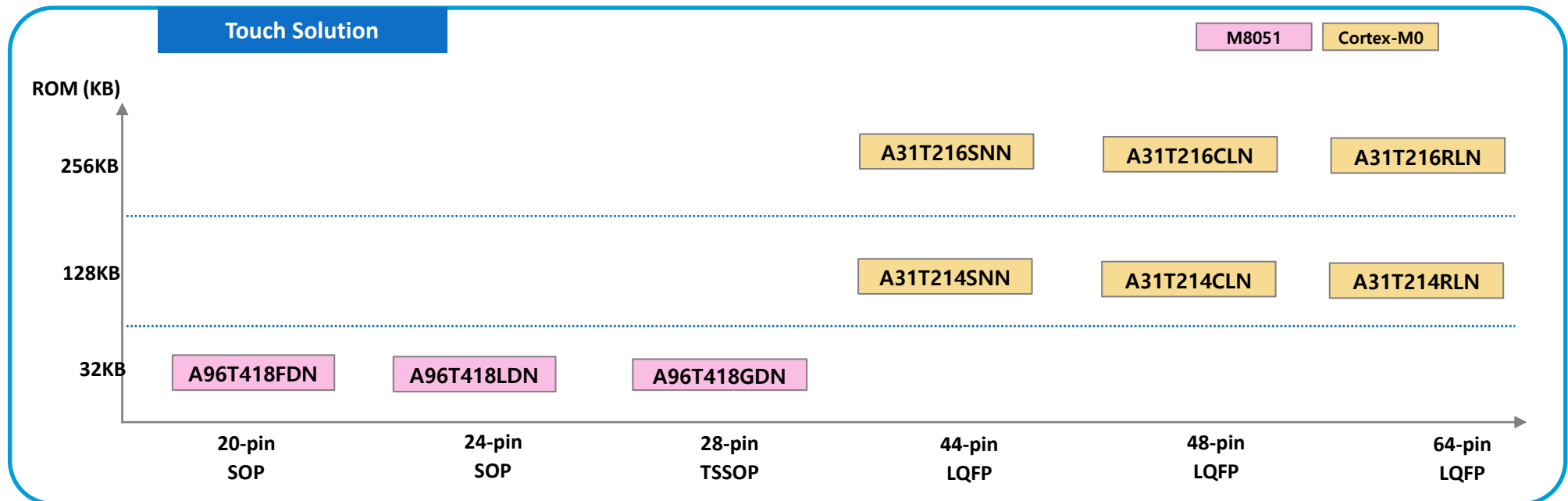
Solution Description

ABOV Semiconductor's touch products offer years of proven solutions in fields that can withstand high sensitivity touch sensing and CS10V resistance.

In particular, it provides optimized features for applications with integrated touch and display capabilities.

The A31T21x series has a built-in shield channel to prevent touch malfunction caused by water droplets

- ▶ **A31T21x** : Cortex-M0 up to 48MHz, Max 256KB Flash memory / 12-bit ADC, I2C, USART, I2C, LED driver (8COM x 16SEG), LCD driver (8COM x 32SEG), CS10V
- ▶ **A96T418** : M8051 up to 16MHz, 32KB Flash memory / 12-bit ADC, I2C, USART, I2C, LED driver (8COM x 16SEG), CS10V
- **Potential Application** : Washing Machine, Air Conditioner, Refrigerator, Water Purifier, Rice Cooker, MWO, Thermostat



ABOV Capacitive Touch Solution

A31T214, A31T216, A96T418

A31T214/216 series are 32-bit touch sensing microcontrollers.

These microcontrollers provide an effective solution for applications that use both touch and display.

A96T418 series are 8-bit touch sensing microcontrollers.

These microcontrollers provide an effective solution for applications that use both touch and display.

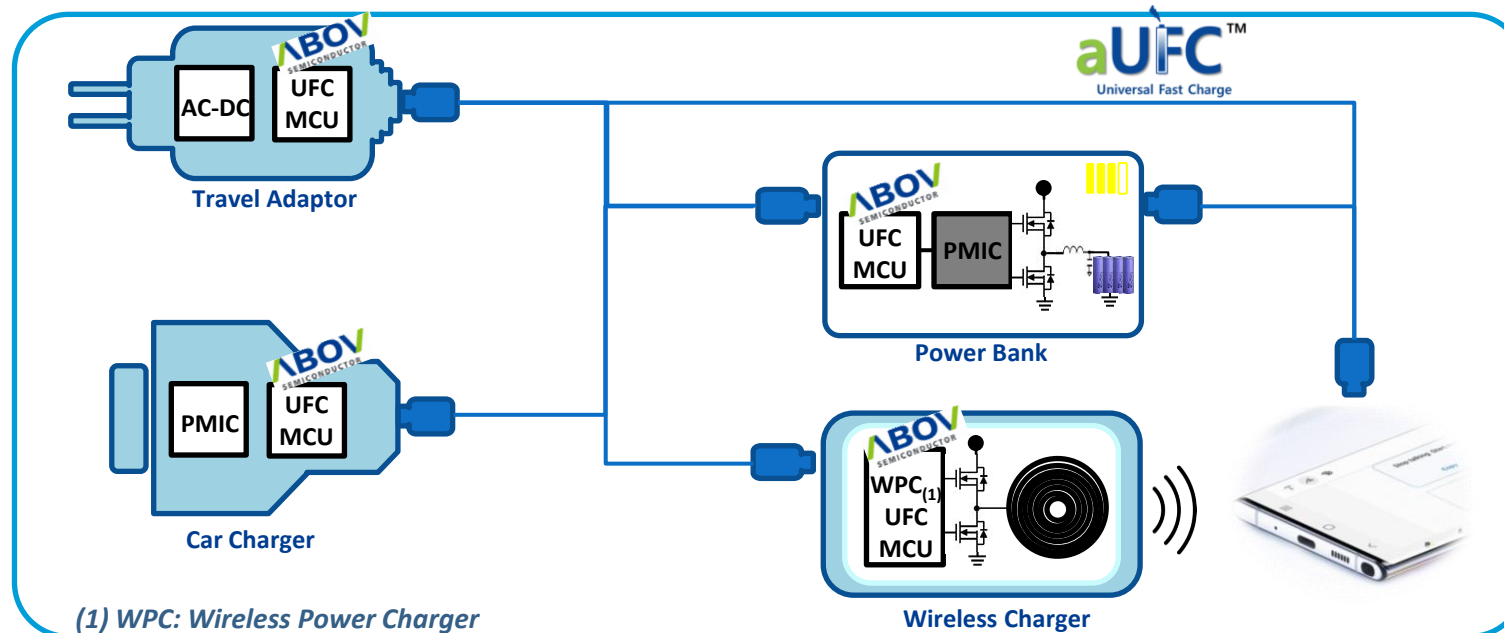
| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | RAM (Kbytes) | I/O | Touch Channel | Timer (8-bit) | Timer (16-bit) | Timer (32-bit) | PWM (16-bit) | ADC (12-bit) | ADC Speed (ksp/s) | LCD Driver | LED Driver | DMA (ch) | Connectivity | | | HSI Freq. (MHz) | HSI Err. (±%) @ -40 °C ~ 85 °C | HSI Err. (±%) @ -40 °C ~ 105 °C | Sub. X-tal Support | Ext. X-tal Support | ISP | CRC | LVR/LVI | Debug Interface | Remarks | Package |
|------------|-----------------|----------------|--------------|-----|---------------|---------------|----------------|----------------|--------------|--------------|-------------------|------------|------------|----------|--------------|-----------|-----|-----------------|--------------------------------|---------------------------------|--------------------|--------------------|-----|-----|---------|-----------------|---------------------------|---------------|
| | | | | | | | | | | | | | | | USART (ch) | UART (ch) | I2C | | | | | | | | | | | |
| A31T216RLN | 48 | 256 | 16 | 60 | 24 | - | 4 | 2 | 6 | 15 | 150 | 32x8 | 16x13 | 4 | 2 | 2 | 2 | 48 | 1.5 | 1.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, DMA | 64-LQFP 10x10 |
| A31T216CLN | 48 | 256 | 16 | 44 | 24 | - | 4 | 2 | 6 | 11 | 150 | 20x8 | 16x13 | 4 | 2 | 2 | 2 | 48 | 1.5 | 1.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 48-LQFP 7x7 |
| A31T216SNN | 48 | 256 | 16 | 40 | 21 | - | 4 | 2 | 6 | 9 | 150 | 18x8 | 14x11 | 4 | 2 | 2 | 2 | 48 | 1.5 | 1.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 44-LQFP 10x10 |
| A31T214RLN | 48 | 128 | 16 | 60 | 24 | - | 4 | 2 | 6 | 15 | 150 | 16x8 | 16x13 | 4 | 2 | 2 | 2 | 48 | 1.5 | 1.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 64-LQFP 10x10 |
| A31T214CLN | 48 | 128 | 16 | 44 | 24 | - | 4 | 2 | 6 | 11 | 150 | 13x8 | 16x13 | 4 | 2 | 2 | 2 | 48 | 1.5 | 1.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 48-LQFP 7x7 |
| A31T214SNN | 48 | 128 | 16 | 40 | 21 | - | 4 | 2 | 6 | 9 | 150 | 12x8 | 14x11 | 4 | 2 | 2 | 2 | 48 | 1.5 | 1.5 | Y | Y | Y | Y | Y | SWD | LDO, POR, WDT, WT, CRC-16 | 44-LQFP 10x10 |
| A96T418GDN | 16 | 32 | 2 | 29 | 20 | 1 | 5 | - | 5 | 8 | 125 | - | 16x8 | - | 2 | 2 | 1 | 40 | 3.0 | - | Y | Y | Y | Y | Y | E-OCD II | LDO, POR, WDT, WT, CRC-16 | 28-SOP |
| A96T418LDN | 16 | 32 | 2 | 29 | 17 | 1 | 5 | - | 5 | 7 | 125 | - | 16x8 | - | 2 | 2 | 1 | 40 | 3.0 | - | Y | Y | Y | Y | Y | E-OCD II | LDO, POR, WDT, WT, CRC-16 | 24-SOP |
| A96T418FDN | 16 | 32 | 2 | 21 | 13 | 1 | 5 | - | 5 | 5 | 125 | - | 15x8 | - | 2 | 2 | 1 | 40 | 3.0 | - | Y | Y | Y | Y | Y | E-OCD II | LDO, POR, WDT, WT, CRC-16 | 20-SOP |

ABOV Power Solution

Solution Description

ABOV Semiconductor's power products provide UFC IP and Flash ROM, enabling USB PD3.x PPS(AVS) and various original USB legacy charging methods, and at the same time satisfying the customer to use user-defined fast charging method. Also, an accurate demodulator and gate driver which supports high power allows the customer to develop a wireless charging pad with a single chip.

- ▶ **A94P237/A94S137 (High Power Adaptor)** : USB Universal Fast Charging (UFC) controller for Travel Adaptor (TA) secondary side.
- ▶ **A94B458 (Power Bank)** : Simultaneous support on one USB-C & two USB-A
- ▶ **A94B391 (High Power Adaptor)** : VCONN
- ▶ **A94B361 (Adaptor)** : Low-end product of A94B391
- ▶ **A94Q427 (Car Charger)** : Simultaneous support on one USB-C and two USB-A, AEC-Q100 for Automotive
- ▶ **A94P829 (Power Bank)** : Simultaneous support on two USB-C & one USB-A
 - **MCU Operating Voltage** : 2.2V ~ 5.5V
 - **UFC Operating Voltage** : 3.3V ~ 5.5V
- ▶ **A94B517 (Wireless Charger Tx)** : USB PD 3.0 (UFP), Gate driver for two Half-bridges, Precise Demodulator, etc.
 - **Operating Voltage** : 4.25V ~ 5.5V



Tools

Development Tool



KEIL™
uVision



IAR
Embedded
Workbench



E-OCD II
Debugger

H/W & S/W



Reference Kit



SDK



E-OCD II
Debug Interface



USB PD (UFC) Board
F/W Downloader



Programmable Logic
Controllers

ABOV Power Products

A94B458, A94B391, A94B361, A94Q427

A94P237 A94S137, A94P829

ABOV's power solution products have completed USB PD 3.0 PPS certification to USB-Interface and are also certified with Qualcomm's QC 2.0. Qualcomm QC4+ certification is also in progress and is expected to be certified by the end of 2022. ABOV owns a number of USB legacy fast charging protocols, and the customer can implement the user-defined high-speed charging protocol by using ABOV's UFC IP register.

* We thoroughly keep the rules of each standard for support.

| Part No. | Core | Op. Freq. (MHz) | Flash ROM | RAM (Kbytes) | I/O | ECC | CC1/2-Port | DPDM-Port | Timer (16-bit) | PWM | PWM Duty Unit (ns) | ADC (12-bit) | I2C | Int. OSC Freq. (MHz) | CC/CV | Driver for NMOSFET Load Switch | High Voltage LDO | Discharger | USB PD3.x | PD Role | *PPS(AVS) | VCONN | F/W Download through USB-C Port | DPDM Legacy Fast Charging Protocols | Protection | | Op. Temp. [°C] | AEC-Q100 | Package | | | |
|-------------|--------|-----------------|-----------|--------------|-----|-----|------------|-----------|----------------|-----|--------------------|--------------|-----|----------------------|-------|--------------------------------|------------------|------------|-----------|---------|-----------|-------|---------------------------------|-------------------------------------|------------|-------------------------------------|----------------|----------|-----------|--------------|------------|------------|
| | | | | | | | | | | | | | | | | | | | | | | | | | USB BC1.2 | DPDM, CC1/2 High Voltage Port & OVP | | | | Hiccup, UVLO | | |
| A94B458LUN | cm8051 | 16 | Y | 1.25 | 15 | - | 1 | 3 | 4 | 3 | 5 | 14 | 2 | 16 | - | - | - | - | 3.0 | DRP | Y | - | Y | Y | Y | Y | Y | - | -40 ~ 85 | - | 24-QFN 4x4 | |
| A94B458KUN | cm8051 | 16 | Y | 1.25 | 23 | - | 1 | 3 | 4 | 3 | 5 | 14 | 2 | 16 | - | - | - | - | 3.0 | DRP | Y | - | Y | Y | Y | Y | Y | - | -40 ~ 85 | - | 32-QFN 5x5 | |
| A94B391FUN | cm8051 | 16 | Y | 1.25 | 14 | - | 1 | 1 | 4 | 3 | 5 | 9 | 1 | 16 | - | - | - | - | 3.0 | DFP | Y | Y | Y | Y | Y | Y | Y | - | -40 ~ 85 | - | 20-QFN 4x4 | |
| A94B361FUN | cm8051 | 16 | Y | 1.25 | 14 | - | 1 | 1 | 4 | 3 | 5 | 9 | 1 | 16 | - | - | - | - | 3.0 | DFP | Y | - | Y | Y | Y | Y | Y | - | -40 ~ 85 | - | 20-QFN 4x4 | |
| A94Q427LU2N | cm8051 | 16 | Y | 1.25 | 15 | Y | 1 | 3 | 4 | 3 | 5 | 14 | 2 | 16 | - | - | - | - | 3.0 | DFP | Y | - | Y | Y | Y | Y | Y | - | -40 ~ 105 | Y | 24-QFN 4x4 | |
| A94S137AZ2N | cm8051 | 16 | Y | 1.25 | 3 | - | 1 | 1 | 4 | 4 | - | 2 | 1 | 16 | Y | Y | Y | Y | 3.0 | DFP | Y | Y | Y | Y | Y | Y | Y | Y | - | -40 ~ 105 | - | 16-QFN 4x4 |
| A94P237LU2N | cm8051 | 16 | Y | 1.25 | 6 | - | 1 | 2 | 4 | 4 | - | 3 | 2 | 16 | Y | Y | Y | Y | 3.0 | DFP | Y | Y | Y | Y | Y | Y | Y | Y | - | -40 ~ 105 | - | 24-QFN 4x4 |
| A94P829KUN | cm8051 | 16 | Y | 3 | 19 | - | 2 | 3 | 4 | - | - | 1 | 5 | 16 | - | - | - | - | 3.1 | DRP | Y | Y | Y | Y | Y | Y | Y | - | -40 ~85 | - | 32-QFN 5x5 | |
| A94P829LUN | cm8051 | 16 | Y | 3 | 12 | - | 2 | 3 | 4 | - | - | 1 | 5 | 16 | - | - | - | - | 3.1 | DRP | Y | Y | Y | Y | Y | Y | - | -40 ~85 | - | 24-QFN 4x4 | | |

Wireless Charger Tx supports WPS transmitters and USB UFC controller type-C to help implement various charging protocols via USB. It can control the transmitting coil to generate the correct amount of power requested by the receiver which is located in the battery-powered appliance such as smartphones. A94B517 continuously provides the transmitter with the correct power level by modulating the transmitter carrier through the controlled resistive or capacitive load.

| Part No. | Core | Op. Freq. (MHz) | Flash ROM | I/O | ECC | CC1/2-Port | DPDM-Port | PWM (8-bit) for GP | PWM (8-bit) for Gate Driver | I2C | ADC (12-bit) | | | Half Bridge Gate Driver | Voltage Demodulator | Current Demodulator | PLL (128MHz) | Int. OSC Freq. (MHz) | Int. OSC Err. (±%) | Int. Sub OSC (KHz) | Ext. X-tal (MHz) | USB PD3.0 | PD Role | F/W Download through CC1/2 | DPDM Legacy Fast Charging Protocols | USB BC1.2 | Protection | | Op. Temp. [°C] | Remarks | Package |
|------------|--------|-----------------|-----------|-----|-----|------------|-----------|--------------------|-----------------------------|-----|--------------|------|---------------|-------------------------|---------------------|---------------------|--------------|----------------------|--------------------|--------------------|------------------|-----------|---------|----------------------------|-------------------------------------|-----------|------------|-------------------|----------------|------------------|------------|
| | | | | | | | | | | | Int. | Ext. | Speed (kpsps) | | | | | | | | | | | | | | Line Short | Max Volt. I/O (V) | | | |
| A94B517KUN | cm8051 | 16 | Y | 14 | - | 1 | 1 | 1 | 2 | 1 | 9 | 3 | 128 | 2 | Y | Y | Y | 16 | 3 | 32 | 16 | Y | UFP | Y | Y | Y | Y | 40 | -40 ~ 85 | Max. 20dB CS AMP | 32-QFN 5x5 |

ABOV BLE Solution

Solution Description

BLE stands for Bluetooth Low Energy. aBLE 4.2 Series is a lineup of Bluetooth Low Energy SoCs, powered by ABOV Semiconductor's in-house BLE 4.2 stack and RF IPs optimized to provide the most user-friendly development ecosystem and ultra low power performance all at the same time.

▶ **A31R118CUN-02** : the most flexible BLE SoC with 512KB of user-disposable Flash memory, and rich peripherals to address a wide range of applications

- **Operating Frequency** : 32MHz
- **Operating Voltage** : 1.9V ~ 3.6V, 2.3V ~ 3.6V
- **Operating Temperature** : -20°C ~ 70 °C
- **Key Features** : IR TR, IR learning, TRNG, AES-128, Key scan, Microphone interface
- **Potential Application** : IoT devices / Smart remote controllers / Voice recognition hubs / Disposable IoT / Beacons / RF repeaters / Human interface devices

BLE MCUs consist of aBLE 4.2 product line with a competitive edge in power efficiency and various functions essential for Internet-of-Things devices. ABOV BLE products provide an outstanding Bluetooth Smart wireless communication performance through its patented receiver architecture.

| Part No. | Op. Freq. (MHz) | Flash (Kbytes) | OTP (Kbytes) | Mask ROM (Kbytes) | RAM (Kbytes) | DMA (ch) | BLE Performance | | | | Power Consumption | | | | | | | Connectivity | | | | | Remarks | Package | | | | | | | | | | | | | | |
|---------------|-----------------|----------------|--------------|-------------------|--------------|----------|-----------------|-----------------|----------------------|-------------------|-------------------|---------------|--------------|--------------|-----------------|----------------|-----------|--------------|----------------|----------------|--------------|--------------------|---------|---------|--------------|-------------------|----------------------|-----------|----------|----------|----------|---------|------|--------------------|--------------------|------------------|------------------|------------|
| | | | | | | | LE PHY (Mbps) | Max Power (dBm) | Rx Sensitivity (dBm) | Line-of-Sight (m) | Tx Total (mA) | Rx Total (mA) | Tx Only (mA) | Rx Only (mA) | Deep Sleep (uA) | Hibernate (nA) | Stop (nA) | I/O | Timer (16-bit) | Timer (32-bit) | PWM (16-bit) | Voice ADC (14-bit) | | | ADC (12-bit) | ADC Speed (ksp/s) | Digital DAC (16-bit) | UART (ch) | SPI (ch) | I2C (ch) | I2S (ch) | AES-128 | TRNG | Min Op Voltage (V) | Max Op Voltage (V) | Min Op Temp (°C) | Max Op Temp (°C) | |
| A31R118CUN-02 | 32 | 512 | - | 128 | 48 | 16 | 1 | 0 | -94 | 42 | 7 | 7 | 1.6 | 5.4 | 5.4 | 1.3 | 900 | 700 | 28 | 4 | 3 | 5 | - | 4 | 128 | 1 | 2 | 2 | 2 | 1 | Y | Y | 1.9 | 3.6 | -20 | 70 | - | 48-QFN 6x6 |

Tools

Development Tool



MDK



GNU Compiler



EWB



OpenOCD

H/W



Starter Kit



Debug Interface



Programmiers



E-PGM Serial

S/W



SDK



App



Test GUI

ABOV Optic Sensor

Solution Description

ABOV Semiconductor offers a portfolio of light and color sensors with high sensitivity and a wide dynamic range. It helps reduce the power consumption of applied applications by implementing display brightness control and accurate color measurement and discrimination.

▶ **AL8844** : A filter that blocks IR components is applied in the visible light region, and highly accurate color measurement is possible through its own data processing algorithm.

- **Operating Voltage** : 2.7V ~ 3.6V
- **Operating Temperature** : -40°C ~ 70 °C
- **Potential Application** : TV
- **Key Features** : Small optical package [4-OPLGA, 2.95x1.5x1.5mm], Screen brightness adjustment, Low Power

KEY BENEFITS

AL8844 Provides Color and IR (red, green, blue, clear, and IR) light sensing. The color sensing provides for improved accuracy lux and color temperature measurements.

The key benefits of AL8844, color light to digital converter are listed below.

Integrated optical solution
CS(RGBS) and ALS support



- Photo diode array structure
- Built in IR cut filter

Very High sensitivity
Ideal for operation behind glass



- High Sensitivity
- High precision on-chip AFE with 16-bit ADC

Reduce power consumption
and extend battery run time



- Low stop current
- 2.4V to 3.6V supply voltage

Tools

H/W



E- OCDII
Debug Interface

GUI



aLightSens



Evaluation board
&
mobile app

ABOV Optic Sensor

AL8844

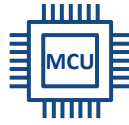
The AL8844 is a high-resolution color and IR(red, green, blue, clear, and IR) light sensor which can transform illuminance (light intensity) to digital signal output. With the RGB color sensor, the brightness and color temperature of the backlight can be adjusted based on the ambient light source that makes the panel look more comfortable for human eyes. Additionally, it can be used for detecting light source type as it reports the IR content of the light. The wide dynamic range also allows for operation in short-distance detection behind dark glass such as a cell phone. The operation voltage ranges from 2.7 to 3.6 V.

| Part No. | ALS / CS | PD Structure | OTP (bit) | I2C | I2C Speed (kHz) | 16-bit ADC | Min Op Voltage (V) | Max Op Voltage (V) | Operating Temp (°C) | Filter Channel | Power consumption | |
|----------|----------|--------------|--------------|-----|-----------------|------------|--------------------|--------------------|---------------------|----------------|-------------------|----------------|
| | | | | | | | | | | | RUN mode (uA) | STOP mode (uA) |
| AL8844PA | ALS | 4x5 | MTP (32Byte) | Y | 400 | Y | 2.7 | 3.6 | -40 ~ 70 | R/G/B/IR/C | 410 | 1 |

8-bit GP MCU, Application Specific Standard Products (ASSP)

8-bit (M8051) GP MCU

ABOV Semiconductor's broad range of feature-rich and field proven 8-bit microcontrollers based on M8051 core are bestsellers sold more than 3 billion units up to date. ABOV's extensive experiences in consumer electronics are forged into these 8-bit microcontrollers to provide various functions.



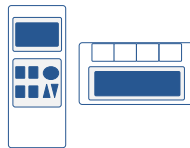
Single & Universal Remote Control MCU

ABOV Semiconductor's single and universal remote controller products are cost-effective 4/8-bit core MCUs suitable for low-power remote controllers with user-friendly ecosystem. Especially, ABOV universal remote MCU embeds a world-class learning amplifier to retrieve any IR control signal for IoT control.



Boost LCD MCU for GP and Remote Control

ABOV Semiconductor's boost LCD MCU products support capacitor-biased LCD for crystal clear LCD display and its variant of LCD Remote Control MCUs integrate additional IR LED Drivers to better serve remote controller needs with minimized Bill of Materials.



Capacitive Touch Solution

ABOV Semiconductor's capacitive touch sensor provides the most flexible and field proven solution boasting high sensitivity, along with CS 10V tolerance for the new products to provide a robust touch sensing performance for use in the most extreme environments for customer applications.



Sensor: Optic Sensor

ABOV Semiconductor's optic sensor products consist of color, and ambient light sensors that are widely used for TVs, monitors, laptops, mobile devices, and lighting devices, with sophisticated light sensitive photodiodes and highly precise low-noise readout circuitry embedded within the chip.



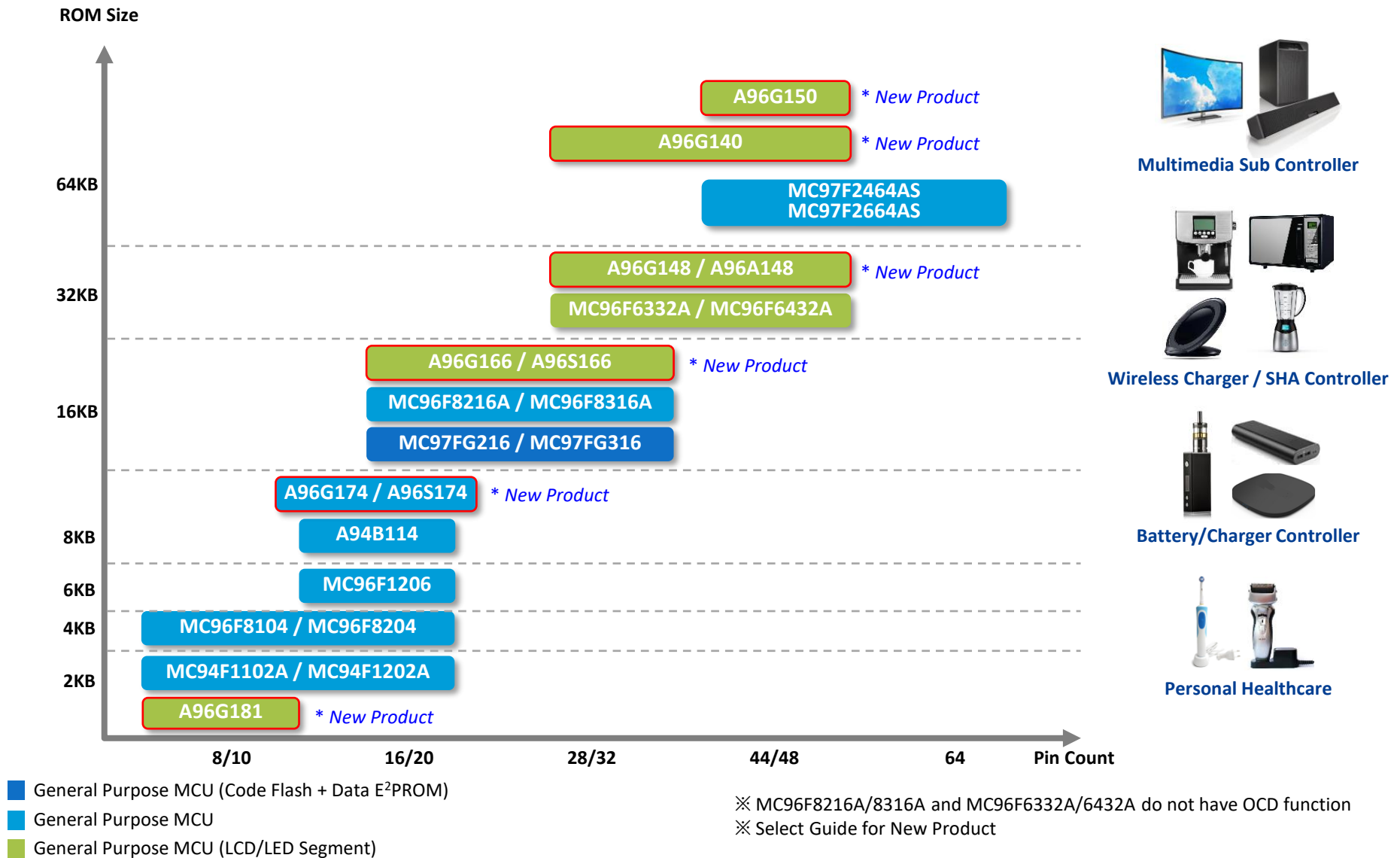
Tailor-Made MCU

ABOV Semiconductor's Tailor-Made MCUs are custom products serving customer's special applications. Voice MCU features audio codecs, an MCU system, and a DSP to generate audible sound from pure digital data. PPG MCU provides hardware programmable pulse generator ideal for IH Cookers.



8-bit (M8051) GP MCU

Product Lineup



8-bit (M8051) GP MCU

Selection Guide

General Purpose 8-bit Flash MCU

| Product | Core | ROM | E2P | RAM | I/O | Package | Timer / Counter | PWM | ADC | | LCD | USI* [ch] | UART [ch] | USART * [ch] | SPI [ch] | I2C [ch] | Internal OSC | | Sub. X-tal | Ext. X-tal [MHz] | Op. Volt. [V] | Op. Temp. [°C] | Remarks |
|--------------------------|--------|------|------|------------------------|----------------------------------|--|--|---|--------------------------------------|----------------------------|-----|-----------|-----------|--------------|----------|----------|--------------|----------|-------------------|-------------------|------------------|--|---|
| | | | | | | | | | Bit | ch | | | | | | | Freq. [MHz] | Err. [%] | | | | | |
| MC94F1102A MC94F1202A | cm8051 | 2KB | - | 256B iRAM | 6 8 8 10 14 16 | SOP SSOP SOPN/QFN | 8-bit x 1 16-bit x 2 | 16-bit x 2 | 6 12 8 14 | - | - | - | - | - | - | - | 32 | ±3.0 | - | - | 2.2 to 5.5 | -40 to 85 | POR, BOD, LVR/LVI |
| MC96F8104 MC96F8204 | M8051 | 4KB | - | 256B iRAM | 6 8 8 10 14 16 18 20 | SOP SSOP SOPN/QFN SOP/TSSOP | 8-bit x 1 16-bit x 2 | 16-bit x 2 | 6 12 8 8 8 | - | - | - | 1 | - | 1 | 8 | ±4.0 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, WT 200kHz IRC (±3% at -20~85°C) | |
| MC96F1206 | M8051 | 6KB | - | 256B iRAM | 14 16 18 20 | SOPN TSSOP/QFN | 16-bit x 2 | 16-bit x 2 | 12 13 15 | - | - | - | - | - | - | 32 | ±5.0 | - | - | 2.2 to 5.5 | -40 to 85 | POR, BOD, LVR ADC w/ Internal 2.5V(2%) LDO, Matrix PWM | |
| A94B114 | cm8051 | 8KB | - | 256B iRAM 256B xRAM | 14 16 18 20 | SOPN TSSOP/SOP | 8-bit x 1 16-bit x 2 | 16-bit x 2 (1-ch Complementary PWM) | 12 8 10 | - | - | - | 1 | - | 1 | 32 | ±3.0 | - | 1.0 to 16.0 | 2.0 to 5.5 | -40 to 85 | Analog Comparator 256kHz internal LFO POR, LVR, CRC, ADC w/ 2.5V LDO | |
| MC97FG216 MC97FG316 | M8051 | 16KB | 512B | 256B iRAM 768B xRAM | 18 20 26 28 30 32 | TSSOP TSSOP LQFP/QFN | 8-bit x 4 16-bit x 3 | 10-bit MPWM* 10-bit x 1 | 12 10 12 12 15 | - | - | - | 2 | 1 | 1 | 16 | ±3.0 | Y | 1.0 to 16.0 | 1.8 to 5.5 | -40 to 85 | 128MHz PLL, Comparator | |
| MC96F8216 MC96F8316 | M8051 | 16KB | - | 256B iRAM 512B xRAM | 18 20 22 24 26 28 30 32 | SOP/PDIP QFN SOP/TSSOP/SKDIP SOP/QFN/LQFP | 8-bit x 1 16-bit x 2 | 8-bit x 1 16-bit x 2 | 12 8 11 12 15 | - | - | 1 | - | 1 | 1 | 16 | ±3.0 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, I _{OL} 160mA Port 6ea "S" Version Available | |
| MC96F8216A MC96F8316A | M8051 | 16KB | - | 256B iRAM 512B xRAM | 18 20 26 28 30 32 | SOP SOP SOP/LQFP | 8-bit x 1 16-bit x 2 | 8-bit x 1 16-bit x 2 | 12 8 12 12 15 | - | - | 1 | - | 1 | 1 | 16 | ±3.5 | Y | 0.4 to 12.0 | 2.2 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, I _{OL} 160mA Port 6ea | |
| MC96F6332 MC96F6432 | M8051 | 32KB | - | 256B iRAM 768B xRAM | 26 28 30 32 42 44 46 48 | SOP SOP/LQFP MQFP LQFP | 8-bit x 1 16-bit x 3 (8-bit x 2) | 8-bit x 1 16-bit x 2 10-bit MPWM | 12 11 12 12 16 16 16 21 x 8 | 10 x 4 14 x 4 21 x 8 | - | 2 | - | - | 1 | - | 16 | ±3.0 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, HS 8-bit PWM 6, "S" Version Available |

※ Refer page on 29 and 30 of Select Guide for New Product

* USI : (UART mode or SPI mode or I2C mode)
* USART : (UART mode or SPI mode)
* MPWM : (Motor PWM)

8-bit (M8051) GP MCU

Selection Guide

General Purpose 8-bit Flash MCU

| Product | Core | ROM | E2P | RAM | | I/O | | Package | Timer / Counter | PWM | ADC | | LCD | USI* [ch] | UART [ch] | USART *[ch] | SPI [ch] | I2C [ch] | Internal OSC | | Sub. X-tal | Ext. X-tal [MHz] | Op. Volt. [V] | Op. Temp. [°C] | Remarks |
|--------------------------|-------|------|-----|--------------|--------------|--|----------------------|--------------------------------|--|--|-----|--|--------------------------------------|-----------|-----------|-------------|----------|----------|--------------|----------|------------|-------------------|------------------|-----------------|---|
| | | | | | | | | | | | Bit | ch | | | | | | | Freq. [MHz] | Err. [%] | | | | | |
| MC96F6332A MC96F6432A | M8051 | 32KB | - | 256B 768B | iRAM xRAM | 26 30 32 42 44 46 48 | 28 32 44 48 | SOP SOP/LQFP MQFP QFP | 8-bit x 1 16-bit x 3 (8-bit x 2) | 8-bit x 1 16-bit x 2 10-bit MPWM | 12 | 11 12 12 14 x 4 16 21 x 8 21 x 8 | 10 x 4 14 x 4 21 x 8 21 x 8 | 2 | - | - | 1 | - | 16 | ±3.5 | Y | 0.4 to 8.5 | 2.2 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, HS 8-bit PWM 6 |
| MC97F2464 MC97F2664 | M8051 | 64KB | - | 256B 4KB | iRAM xRAM | 41 61 | 44 64 | MQFP LQFP10/14, QFN | 8-bit x 4 16-bit x 6 | 8-bit x 4 16-bit x 1 | 12 | 10 15 | - | 2 | 2 3 | - | 1 2 | - | 16 | ±3.5 | Y | 0.4 To 16.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer |
| MC97F2464A MC97F2664A | M8051 | 64KB | - | 256B 4KB | iRAM xRAM | 41 61 | 44 64 | MQFP LQFP10/14, QFN | 8-bit x 4 16-bit x 6 | 8-bit x 4 16-bit x 1 | 12 | 10 15 | - | 2 | 2 3 | - | 1 2 | - | 16 | ±3.5 | Y | 0.4 To 16.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer |

* USI : (UART mode or SPI mode or I2C mode)

* USART : (UART mode or SPI mode)

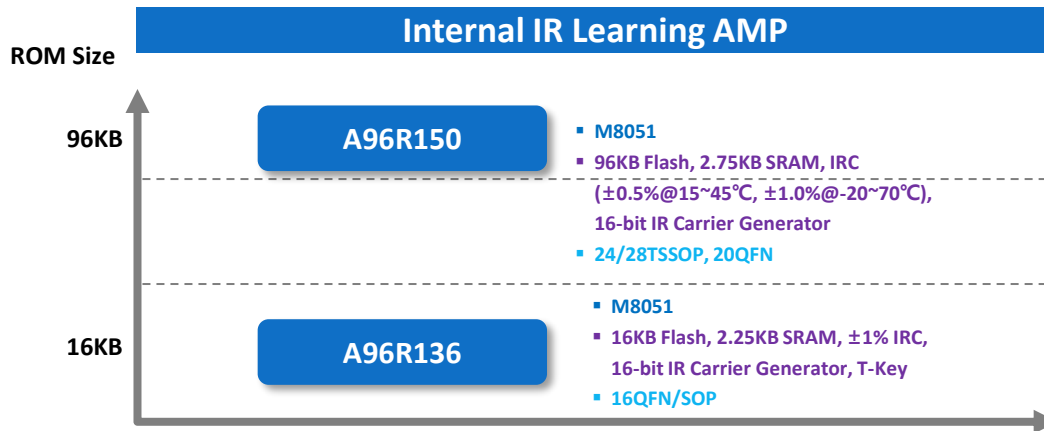
* MPWM : (Motor PWM)

Universal Remote Control MCU

Product Lineup

Universal Remote Control MCU Solution

ABOV Universal Remote Control MCU products are 4/8-bit MCUs optimized for remote controller applications, especially for multi-purpose remote controllers commonly used by TVs and set-top boxes that need to control various different devices with a single controller. ABOV UR MCUs cover the entire spectrum of universal remote requirements with memories ranging from 16KB to 96KB, and integrate state-of-the-art IR learning amplifier circuit within the chip to acquire IR signals from numerous different controllers to support true universal remote control through a single device. These MCUs can learn IR from half a meter away, making them ideal for IoT hub devices such as AI Speakers or Smart IR Hub devices.



ABOV UR Benefits

- **World Best Learning Performance**
 - Extended IR Learning Distance
 - Expanded Frequency Range
- **Built-in Constant Current IR Driver Tr.**
 - Constant Range @ Low Battery
- **Excellent Technical Support**

Universal Remote Control MCU

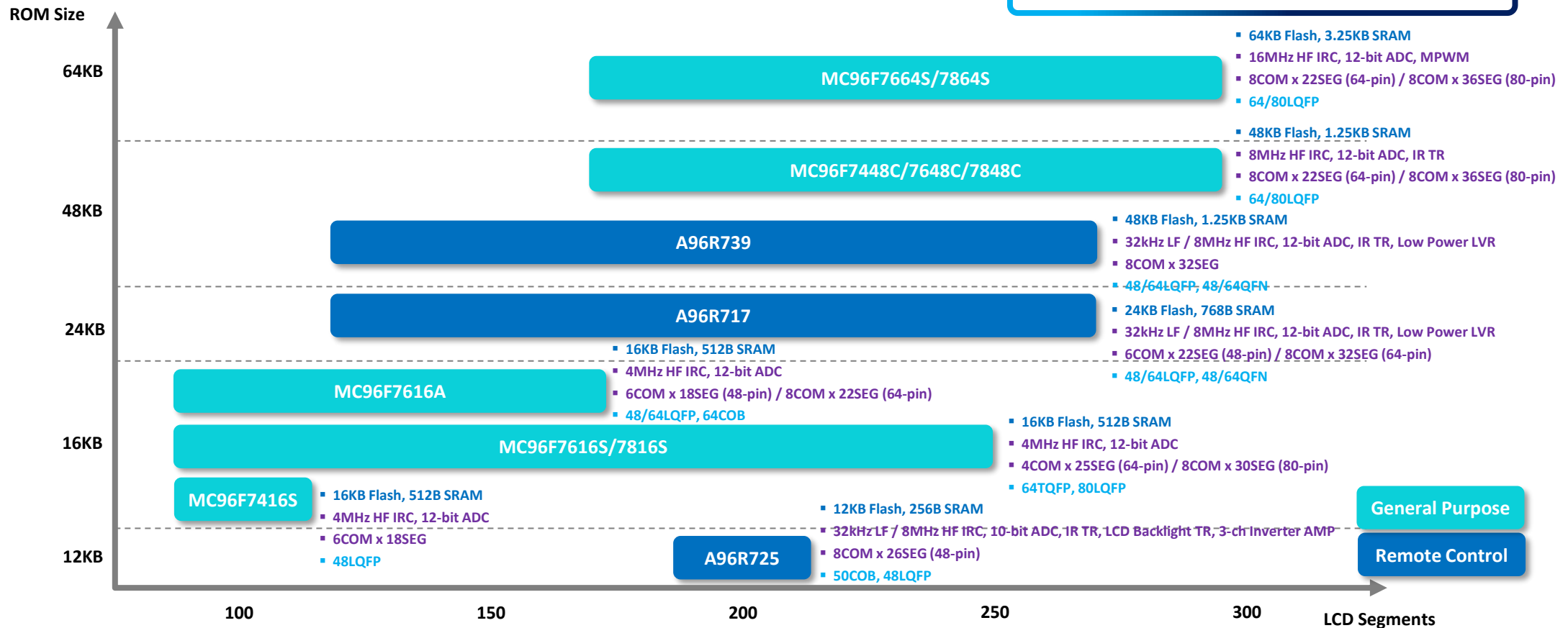
| Product | Core | Op. Freq. [MHz] | Mem. Type | ROM | RAM | | Timer /Counter | I/O | Input | Output | Package | T-Key | WDT | USART [ch] | I2C [ch] | ISP | IAP | LVD | LVI [Lv.] | Internal OSC | | IOSC Condition [°C] | Tr | Op. Volt. [V] | Op. Temp [°C] | Remarks | | | | | |
|---------|-------|-----------------|-----------|------|------------|-----------|----------------|------------|-------|--------|---------|-------|---------|------------|----------|-----------|-----|-----|-----------|--------------|------------|---------------------|---------|---------------|---------------|--------------------|----------------------|---|-------------|-----------|---|
| | | | | | 256B 2KB | iRAM XRAM | | | | | | | | | | | | | | 8-bit x 2 | 16-bit x 2 | | | | | | 13 | - | - | 16 | QFN SOP |
| A96R136 | M8051 | 1.0 to 12.0 | Flash | 16KB | 256B 2KB | iRAM XRAM | 8-bit x 2 | 16-bit x 2 | 13 | - | - | 16 | QFN SOP | Y | Y | 1 | 1 | Y | Y | Y | 5 | 12 | ± 1 | -20 ~ 70 | Y | 1.71 To 3.6 | -20 To 70 | Integrated IR Learning AMP, Supports Boot Lock Mask | | | |
| A96R150 | M8051 | 1.0 to 12.0 | Flash | 96KB | 256B 2.5KB | iRAM xRAM | 8-bit x 2 | 16-bit x 2 | 17 | 21 | - | - | 20 | 24 | 28 | QFN TSSOP | - | Y | 1 | 1 | Y | Y | Y | 3 | 12 | ± 1 ± 2 | -20 ~ 70 -25 ~ 85 | Y | 1.71 to 3.6 | -25 to 85 | Integrated IR Learning AMP, Supports Boot Lock Mask |

LCD MCU Solution

ABOV LCD MCU products are equipped with capacitor-biased boost circuitry within the chip to provide a crystal clear LCD display VLC precision within 7%. A96R7xx Series is specially engineered to integrated all necessary functions for LCD remote controllers, while MC96F7xxx Series are built for general purpose devices requiring LCD displays.

ABOV LCD MCU Benefits

- **Reduced Bill of Materials**
 - $\pm 1\%$ Precision IRC
 - Integrated IR LED Driver for A96R7xx Series
- **Maximized LCD Performance**
 - Crystal Clear LCD with VLC Precision $\pm 7\%$
- **High Flexibility to Use for General Purpose**



LCD MCU

Selection Guide

■ LCD MCU

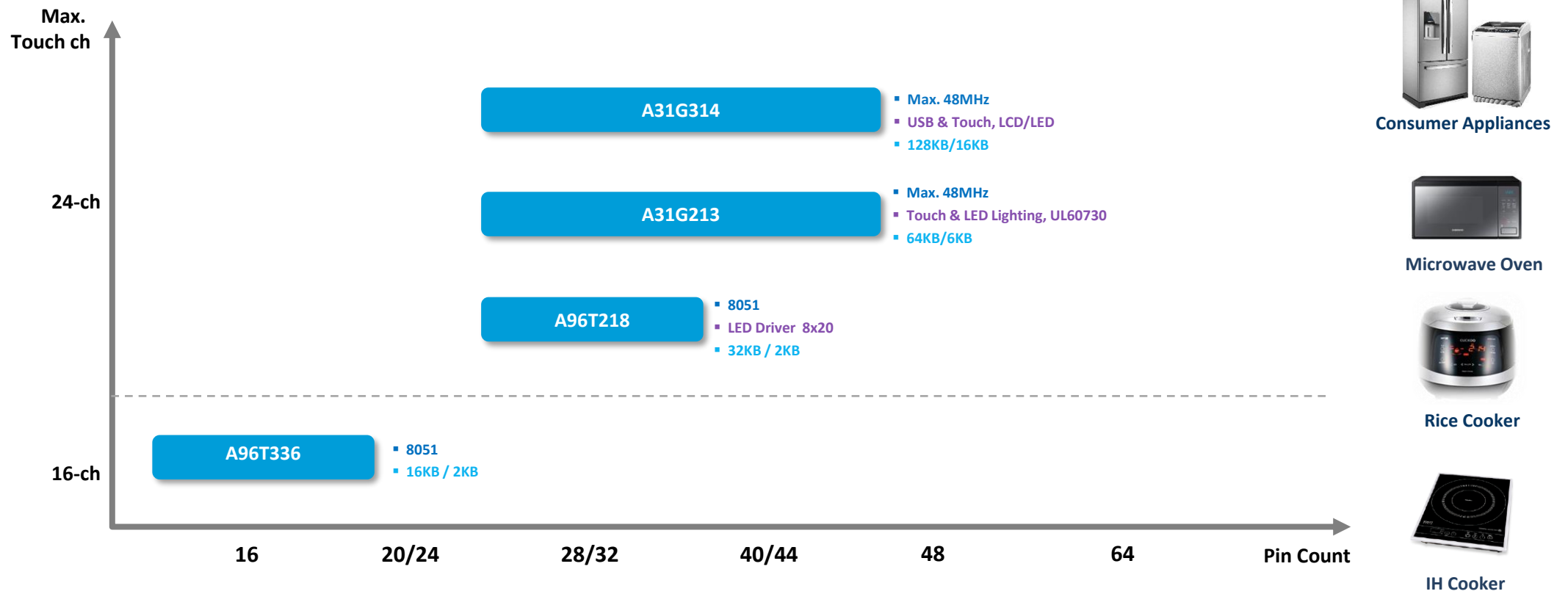
| Product | Core | ROM | RAM | | I/O | Package | | Timer / Counter | ADC | | LCD | USI* [ch] | UART [ch] | SIO [ch] | USART (SPI) [ch] | I2C [ch] | Internal OSC | | Sub. X-tal | Ext. X-tal [MHz] | Op. Volt. [V] | Op. Temp. [°C] | Remarks |
|--------------------------|-------|------|--------------|--------------|----------|----------|----------------------|-------------------------|-----|----------|------------------|-----------|-----------|----------|------------------|----------|--------------|----------|------------|-------------------|------------------|-----------------|--|
| | | | | | | | | | Bit | ch | | | | | | | Freq. [MHz] | Err. [%] | | | | | |
| A96R725 | M8051 | 12KB | 256B | iRAM | 43 | 48 50 | LQFP Pellet | 8-bit x 2 16-bit x 2 | 10 | 8 | 26 x 8 | - | - | - | - | - | 8 | ±1 | Y | 0.4 To 12.0 | 1.8 to 3.6 | -40 To 85 | POR, LVR/LVI, Buzzer, CRC/Checksum, Inverter Amplifier 3-ch, LCD Backlight Driver 2-ch |
| A96R717 | M8051 | 24KB | 256B 512B | iRAM xRAM | 43 59 | 48 64 | LQFP/QFN LQFP/QFN | 8-bit x 2 16-bit x 2 | 12 | 2 5 | 22 x 6 32 x 8 | - | 1 | - | - | - | 8 | ±1 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, Low Power LVR (0.9uA), CRC/Checksum |
| A96R739 | M8051 | 48KB | 256B 1KB | iRAM xRAM | 43 59 | 48 64 | LQFP/QFN LQFP/QFN | 8-bit x 2 16-bit x 2 | 12 | 5 | 22 x 6 32 x 8 | - | 1 | - | - | - | 8 | ±1 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, Low Power LVR (0.9uA), CRC/Checksum |
| MC96F7616S MC96F7816S | M8051 | 16KB | 256B 256B | iRAM xRAM | 55 71 | 64 80 | TQFP LQFP | 8-bit x 2 16-bit x 2 | 12 | 8 | 25 x 4 30 x 8 | - | 1 | 1 | - | - | 4 | ±3.5 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer |
| MC96F7664S MC96F7864S | M8051 | 64KB | 256B 3KB | iRAM xRAM | 55 71 | 64 80 | LQFP LQFP | 8-bit x 5 16-bit x 4 | 12 | 10 12 | 22 x 8 36 x 8 | 2 | 3 | - | 2 | - | 16 | ±3.5 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, 16MHz PLL, Flash Parity Bit |

■ LCD Legacy MCU

| Product | Core | ROM | RAM | | I/O | Package | | Timer / Counter | ADC | | LCD | USI* [ch] | UART [ch] | SIO [ch] | USART (SPI) [ch] | I2C [ch] | Internal OSC | | Sub. X-tal | Ext. X-tal [MHz] | Op. Volt. [V] | Op. Temp. [°C] | Remarks |
|--|-------|------|--------------|--------------|----------------|----------------|---------------------------|-------------------------|-----|-------------|----------------------------|-----------|-----------|----------|------------------|----------|--------------|----------|------------|-------------------|------------------|-----------------|--|
| | | | | | | | | | Bit | ch | | | | | | | Freq. [MHz] | Err. [%] | | | | | |
| MC96F7416S MC96F7616A | M8051 | 16KB | 256B 256B | iRAM xRAM | 41 57 | 48 64 | LQFP07 LQFP10 | 8-bit x 2 16-bit x 2 | 12 | 4 8 | 18 x 6 22 x 8 | - | 1 | - | - | - | 4 | ±3.5 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer (64-pin), 8MHz FLL (MC96F7416S) |
| MC96F7616 MC96F7816 | M8051 | 16KB | 256B 256B | iRAM xRAM | 55 71 | 64 80 | TQFP LQFP | 8-bit x 2 16-bit x 2 | 12 | 8 | 25 x 4 30 x 8 | - | 1 | 1 | - | - | 4 | ±3.5 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer |
| MC96F7448C MC96F7648C MC96F7848C | M8051 | 48KB | 256B 1KB | iRAM xRAM | 43 58 74 | 48 64 80 | LQFP LQFP LQFP12/14 | 8-bit x 2 16-bit x 4 | 12 | 3 5 8 | 23 x 4 33 x 4 36 x 8 | 2 | 1 | 1 | - | - | 8 | ±4.0 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, 8MHz FLL |
| MC96F7664 MC96F7864 | M8051 | 64KB | 256B 3KB | iRAM xRAM | 55 71 | 64 80 | LQFP MQFP/LQFP | 8-bit x 5 16-bit x 4 | 12 | 10 12 | 22 x 8 36 x 8 | 2 | 3 | - | 2 | - | 16 | ±3.5 | Y | 0.4 to 12.0 | 1.8 to 5.5 | -40 to 85 | POR, LVR/LVI, Buzzer, 16MHz PLL, Flash Parity Bit |

Capacitive Touch Solution

Product Lineup



Capacitive Touch Solution

Selection Guide

Capacitive Touch Solution

| Product | Touch Key Only | Touch Key + MCU | Touch + LED Func. | Core | ROM | RAM | I/O | | Package | Timer /Counter | DAC | Comparator | ADC | | USART [ch] | UART [ch] | I2C [ch] | IAP | Internal OSC | | Ext. X-tal [kHz] | Op. Freq. | Op. Volt. [V] | Op. Temp [°C] | Remarks |
|---------|----------------|----------------------------------|-------------------|----------------|----------------|------|----------------------|----------------------|-------------------------------|--------------------------|--------|------------|-----|--------------------|------------------|-----------|----------|-----|--------------|----------|------------------|-----------------------|------------------|------------------|---|
| | | | | | | | | | | | | | Bit | ch | | | | | Freq. [MHz] | Err. [%] | | | | | |
| A96T336 | - | 8-ch 16-ch | - | M8051 | 16KB Flash | 2KB | 14 22 | 16 24 | QFN QFN | 16-bit x 2 | - | - | 10 | 8 16 | 1 | - | 1 | Y | 16 | ±3 | - | 16MHz | 2.7 to 5.5 | -40 to 85 | - |
| A96T218 | - | 20-ch 24-ch 24-ch | o | M8051 | 32KB Flash | 2KB | 26 30 34 | 28 32 40 | SOP SOP QFN | 16-bit x 3 | - | - | 12 | 8 | 2 | - | 1 | Y | 16 | ±3 | 32.768 | 16MHz | 2.7 to 5.5 | -40 to 85 | LED Driver 20SEG x 8COM (40-QFN) 18SEG x 8COM (32-SOP) 14SEG x 8COM (28-SOP) |
| A31G213 | - | 11-ch 13-ch 21-ch 24-ch | o | Cortex- M0+ | 64KB Flash | 6KB | 24 28 40 44 | 28 32 44 48 | TSSOP LQFP MQFP LQFP | 16-bit x 4 32-bit x 2 | 5-bit | 1-ch | 12 | 6 8 12 14 | 1 2 2 2 | 2 | 2 | Y | 48 | ±1 | 32.768 | 500kHz to 48MHz | 1.8 to 5.5 | -40 to 105 | LED Driver 10SEG x 16COM DMA 4-ch |
| A31G314 | - | 24-ch | o | Cortex- M0+ | 128KB Flash | 16KB | 44 | 80 | LQFP14 | 16-bit x 7 32-bit x 2 | 12-bit | 1-ch | 12 | 14 | 4 | 2 | 3 | Y | 48 | ±3.5 | 32.768 | 500kHz to 48MHz | 1.8 to 5.5 | -40 to 85 | LCD Driver 42SEG x 8COM LED Driver 11SEG x 27COM DMA 4-ch |

Development Ecosystem

Development Software

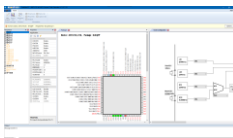
ABOV Semiconductor supports the entire development ecosystem of the customers including user-friendly code generators specialized for ABOV's devices, standardized commercial IDEs and compilers, and ABOV's own free OCD tool that is based on Eclipse IDE.

Code Generator



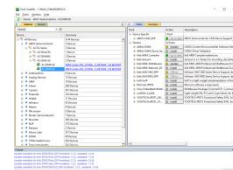
CodeGen8

- Code generator for M8051 MCU
- Automatically generates C-based frame source program
- User-friendly UI



CodeGen32

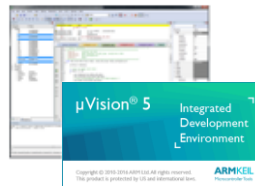
- Code generator for Cortex-Mx MCUs
- Package and Clock Configurator
- KEIL/IAR/Eclipse Project support



KEIL MDK5 S/W Pack for Cortex-Mx Series

- Additional software components and support for ABOV Cortex-Mx MCUs
- Source code, header files, and software libraries
- Documentation and source code templates
- Device parameters along with startup code and programming algorithms
- Board descriptions and support files
- Example projects

Compiler



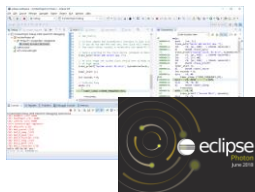
KEIL uVision (3rd party)

- M8051 / Cortex-Mx compiler
- Project management
- Includes Editor, Assembler, Compiler, Linker, Debugger



IAR EWARM (3rd party)

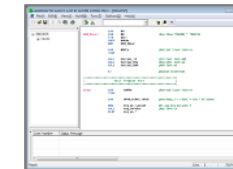
- M8051 / Cortex-Mx compiler
- Project management
- Includes Editor, Assembler, Compiler, Linker, Debugger



ABOV OpenOCD

- Flash downloader and debug interface using CMSIS-DAP
- Eclipse Embedded CDT support
- GCC-based compiler
- Project management

Legacy



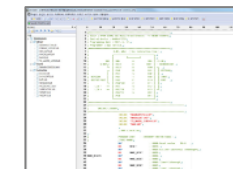
SR Magic Assembler

- Supported product : G400
- Generates hexadecimal file
- Manages projects & library
- IDE environment



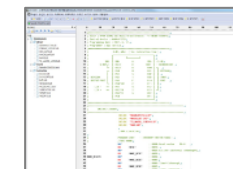
ADAM2 Series Simulator

- Supported product : ADAM2X
- Simulates in various run modes
- Variable key matrices
- Real-time tracing



ADAM4 Assembler/Linker

- Supported product : ADAM4x
- Supports local label in MACRO
- Standalone execution file
- Uses structured command



ADAM8 Assembler/Linker

- Supported product : ADAM8x
- Supports local label in MACRO
- Standalone execution file
- Uses structured command

Development Ecosystem

Debugger and Software Tools

Debugger and Software Tools

These are powerful development ecosystems provided by ABOV Semiconductor and various companies for ABOV's 8-bit and 32-bit microcontroller products.

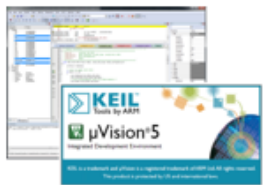
The development tools are in IDE (Integrated Development Environment) style, and have many user-convenient features such as a project manager, text editors for code entry, and debug emulation function with an instruction set level simulator. The development environment guides you to easy development platforms.

8-bit Debugger



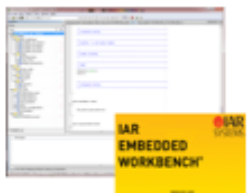
E-OCD II (On Chip Debugger)

- Supports all ABOV 8051 MCUs
- OCD Debug and ISP Support
- 2-wire interface using DSCL and DSDA
- Real-time emulation and debugging
- Real-time monitoring feature for OCD 2 devices



KEIL Support Kit (3rd Party Tool)

- KEIL PK51 Support
- ABOV E-OCD II Interface
- Flash and OTP option download
- Additional Installation Package



IAR Support Kit (3rd Party Tool)

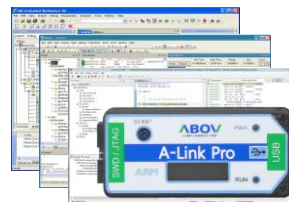
- IAR EW 8051 Support
- ABOV E-OCD II Interface
- Flash and OTP option download
- Additional DLL package

32-bit Cortex-Mx Debug Interface



A-Link (CMSIS-DAP)

- Supports all ABOV Cortex-M MCUs
- Uses SWD interface
- Real-time emulation and debugging
- Works with KEIL, IAR GUI



A-Link Pro (CMSIS-DAP)

- Includes all features of A-Link
- Supports Standalone programming without host PC
- OLED display to show status

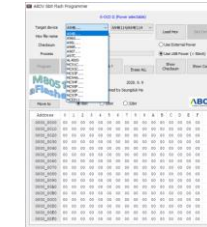


3rd Party Tools

- All CMSIS-DAP interfaces can support our Cortex-Mx MCUs
- KEIL(ULINK), IAR(I-JET), SEGGER(J-Link), etc.



Software Tools



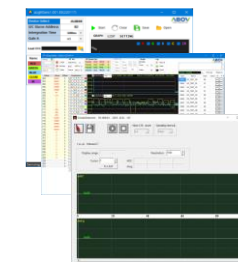
aFlasher8

- Flash downloader using E-OCD II
- Supports all ABOV 8051 MCUs
- Uses 2-wire OCD interface
- Option programming



aFlasher32

- Flash downloader using A-Link/Pro
- Supports all Cortex-M series
- Uses SWD interface
- Option programming



Etc GUI Tools

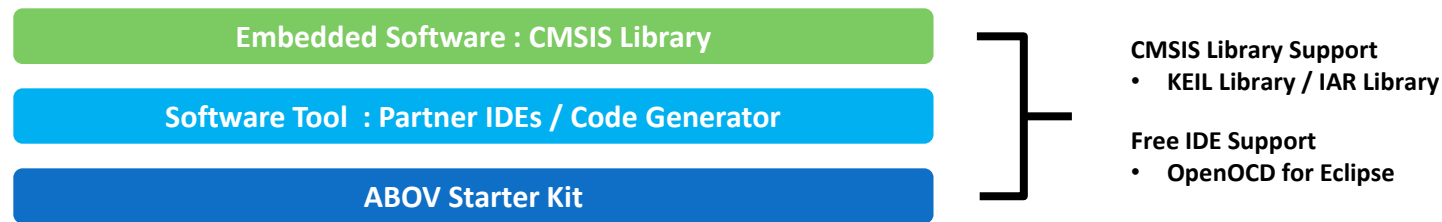
- GUI Tools for Sensor devices
- MCU System Analysis Tools

Development Ecosystem

Development Hardware – Starter Kit

Starter Kit Development Environment

ABOV Semiconductor's Starter Kit is a development hardware kit that delivers many convenient features for evaluation and a fast prototype with expansion ports. By including the debug interface module in the Starter Kit, developers have the freedom to experience our microcontroller development environment. ABOV Semiconductor provides various types of Starter Kit boards – 8-bit Starter Kit and 32-bit Cortex-M Series Starter Kit boards for general purpose MCU, high-performance MCU and low power MCU line-up.



Starter Kit Configuration

ABOV Semiconductor's Starter Kit provides a built-in debugger interface to the target development board. (CMSIS-DAP + Target MCU Board)

- Starter Kit for 32-bit Cortex-M Series



A-Link Debug Interface for USB
(CMSIS-DAP Compatible interface)

ABOV Starter Kit
allows to try out new ideas
and to develop product prototypes

- Starter Kit for 8-bit 8051 Microcontrollers



E-OCD II Debug Interface for USB

Programmer Ecosystem

Universal Programmers

Universal Programmers and third parties

ABOV Semiconductor's programmers support dual environments — PC mode for development, and standalone mode for production. They are easy to use, set up, and update with user downloadable software available on ABOV website. All of our programmers operate on PC-based hardware with a USB connector.

Standalone Programmer



E-PGM+

- PC / Standalone type
- TFT LCD Display
- TEXTTOOL Socket and ISP Port
- PC interface : USB



E-PGM Serial

- PC / Standalone type
- TFT LCD Display
- ISP Port only
- PC interface : USB

Gang Programmer



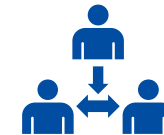
E-GANG4

- PC / Standalone type
- 4-Gang E-PGM+ array
- 4-TEXTTOOL Socket
- 4-ISP Port with status output
- PC interface : USB



E-GANG6

- PC / Standalone type
- 6-Gang E-PGM+ array
- 6-TEXTTOOL Socket
- 6-ISP Port with status output
- PC interface : USB

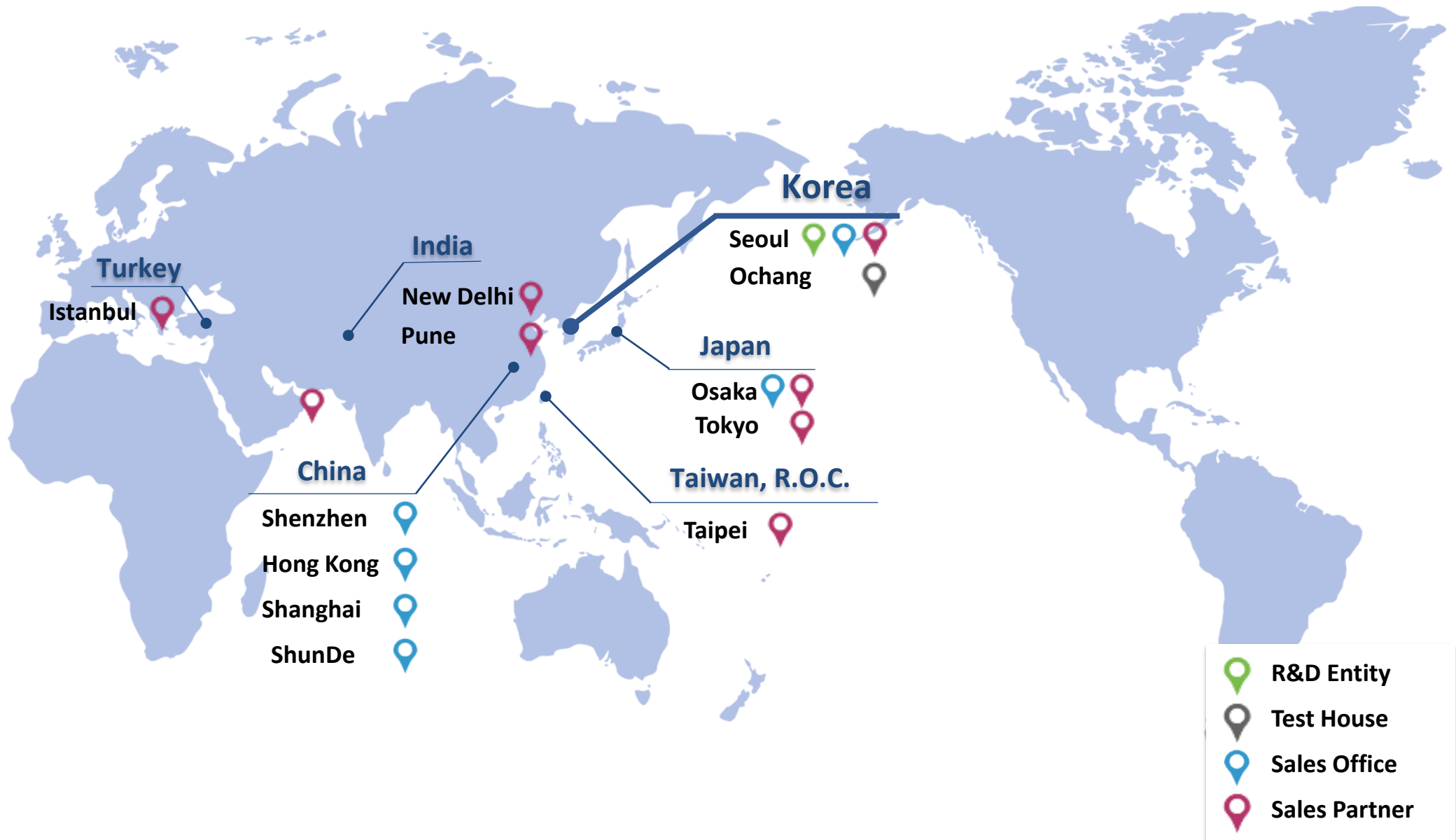


3rd Party Programmer

3rd party tools

- Universal Programmer
- Gang Programmer
- Etc Mass Manufacturing Tools

Office Locations



Contact Information

Korea Sales



sales_kr@abov.co.kr

China Sales



sales_cn@abov.co.kr

Global Sales



sales_gl@abov.co.kr

HQ & Korea Office



Seoul Office / R&D / Marketing & Sales

8Fl., 330, Yeongdong-daero,
Gangnam-gu, Seoul, 135-851, Korea

Tel : +82-2-2193-2200



Ochang HQ / R&D / QA / Test Center

93, Gangni 1-gil, Ochang-eup,
Cheongwon-gun, Chungcheongbuk-do, 363-885, Korea

Tel : +82-43-219-5200

Japan Office



Osaka Office

Room 613, 1-18-24, Nishi-Miyahara,
Yodogawa, Osaka, Japan

Tel : +81-6-7878-5971

China Office



Shenzhen Office

Room 1401, Youse Building,
No.6013 ShenNan Road, Shenzhen, China



Shunde Office

Room 307, 1 Building, Ramada Plaza,
6 LinShang Road, BeiJiao Town
ShunDe District, FoShan, China



Shanghai Office

Room 203-1, No. 1905 Hongmei Road
Much Research Floor, Shanghai, China



Hong Kong Office

Room 25B, 25/FI., 235 Wing Lok Street,
Trade Centre, Sheung Wan, Hong Kong

Global Top Smart MCU Innovator

For more information about our product and package, please contact our sales team
or visit our website: www.abovsemi.com

(Korea) sales_kr@abov.co.kr

(Global) sales_gl@abov.co.kr

(China) sales_cn@abov.co.kr



© Copyrights 2022 ABOV Semiconductor Co., Ltd. All rights reserved.