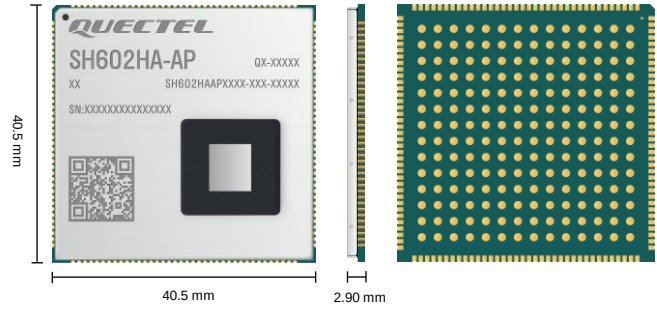


# Quectel SH602HA-AP

## Smart Robotic Computing Module



The SH602HA-AP module is Quectel's new-generation smart robotic computing module based on the D-Robotics chip platform Horizon X5M. With the Ubuntu operating system integrated, the module features up to 10 TOPS of BPU computing power with excellent power efficiency. It not only supports end-to-end computing and complex LLMs (Large Language Models) such as Transformer, BEV and Occupancy, but also efficiently executes the full-stack computing tasks of robots. Additionally, the module supports the data input and fusion processing for multiple sensors, including LiDAR, structured light, ToF (Time of Flight) and voice, fully meeting the requirements for AI and vision functions in robotic applications.

The SH602HA-AP module integrates a variety of interfaces, including 1 × BT.1120, 1 × DSI, 1 × RGMII, 1 × USB 3.0, 1 × USB 2.0, 1 × SDIO, 7 × UART, 7 × I2C, 1 × QSPI, and 2 × I2S. The module supports a 4K @ 60 fps video encoder and decoder, binocular depth processing, AI + VSLAM (Visual Simultaneous Localization and Mapping), 3D point cloud computing, and other mainstream robot perception algorithms, as well as speech recognition. Additionally, the module can be used with Quectel's independent Cat 1/ 4, 5G, Wi-Fi 6, and GNSS modules, thus greatly expanding the module's applicability to the robotics field and many other use cases such as smart displays, express lockers, electricity equipment, industrial control terminals, and smart home appliances.



### Key Features

- ✓ 10 TOPS computing power
- ✓ Octa-core Cortex-A55 CPU @ 1.5 GHz
- ✓ ISP 16 MP @ 30 fps
- ✓ 4K @ 60 fps video encoder and decoder
- ✓ HiFi 5
- ✓ Excellent power efficiency
- ✓ 3D OpenGL ES and 2D GPU
- ✓ Various mainstream robot perception algorithms
- ✓ USB 3.0 and USB 2.0
- ✓ SD 3.0



10 TOPS Powerful Computing Power



3D OpenGL ES & 2D GPU



Octa-core Cortex-A55 CPU



Rich Peripheral Interfaces



Multimedia Processing Engine



LCC + LGA Package

| Computing Module            | SH602HA-AP                                                                                                                                                                                 |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Platform                    | X5M                                                                                                                                                                                        |
| Dimensions (mm)             | 40.5 × 40.5 × 2.90                                                                                                                                                                         |
| Package                     | LCC + LGA                                                                                                                                                                                  |
| Weight (g)                  | Approx. 9.73                                                                                                                                                                               |
| OS                          | Ubuntu 22.04                                                                                                                                                                               |
| CPU                         | Octa-core ARM Cortex-A55 @ 1.5 GHz                                                                                                                                                         |
| BPU                         | 10 TOPS                                                                                                                                                                                    |
| Kernel                      | 6.1.83                                                                                                                                                                                     |
| DSP                         | HiFi 5 Audio @ 812 MHz                                                                                                                                                                     |
| ISP                         | Up to 4K @ 60 fps<br>Up to 4096 × 3072 pixels resolution<br>3D-NR, WDR, HDR, RGB-IR and PDAF                                                                                               |
| Video                       | <b>Encoder:</b><br>H.264/ H.265, with up to 4K @ 60 fps<br>MJPEG, with up to 16 MP @ 30 fps<br><b>Decoder:</b><br>H.264/ H.265, with up to 4K @ 60 fps<br>MJPEG, with up to 16 MP @ 30 fps |
| Memory                      | LPDDR4/ LPDDR4X,<br>Default: 4 GB + 32 GB<br>Optional: 2 GB + 64 GB, 4 GB + 64 GB                                                                                                          |
| Temperature Range           |                                                                                                                                                                                            |
| Operating Temperature       | -25 °C to +70 °C                                                                                                                                                                           |
| Electrical Features         |                                                                                                                                                                                            |
| Supply Voltage Range        | 3.6–5 V; Typ. 3.8 V                                                                                                                                                                        |
| Power Consumption (Typical) | 15 mA @ sleep                                                                                                                                                                              |
| Interfaces                  |                                                                                                                                                                                            |
| Display                     | 1 × BT.1120, with up to 4K @ 30 fps<br>1 × 4-Lane MIPI DSI TX, with up to 2560 × 1440 @ 60 fps                                                                                             |
| Camera                      | MIPI CSI RX: 2 × 4-lane MIPI CSIs, which can be divided into 4 × 2-lane MIPI CSIs, with up to 2.5 Gbps/lane data rate                                                                      |
| USB                         | 1 × USB 3.0 (compatible with USB 2.0), DRD<br>1 × USB 2.0, DRD                                                                                                                             |
| UART                        | × 7 Max.                                                                                                                                                                                   |
| SD Card                     | × 1 Max., SD 3.0                                                                                                                                                                           |
| SDIO                        | × 1 Max.                                                                                                                                                                                   |
| RGMII                       | × 1                                                                                                                                                                                        |
| I2C                         | × 7 Max.                                                                                                                                                                                   |
| I2S                         | × 2 Max.                                                                                                                                                                                   |
| ADC                         | × 4 Max., 10 bits                                                                                                                                                                          |
| SPI                         | × 6 Max., both slave and master modes                                                                                                                                                      |
| QSPI                        | × 1 Max.                                                                                                                                                                                   |
| PWM                         | × 8 Max.                                                                                                                                                                                   |
| LPWM                        | × 8 Max.                                                                                                                                                                                   |
| PDM                         | × 4 Max.                                                                                                                                                                                   |
| RTC*                        | Supported                                                                                                                                                                                  |
| Button                      | RESET_N/ BOOT                                                                                                                                                                              |
| GPIO                        | × 111 Max.                                                                                                                                                                                 |

Note:  
\*: Under development