Image Sensing Overview

Image sensing is a critical element of a variety of modern technologies – automation, robotics, security systems, medical applications, drones, traffic cameras, and driver assistance systems, are just a few examples where image sensing ensures that critical tasks are accomplished without a glitch. Image sensing has seen massive growth in recent years due to its increased application in vision systems for IoT. Embedding the right image sensor technology into IoT end nodes can drive greater accuracy in inspection, depth sensing, object recognition, and tracking.

There are many ways the latest image sensing and camera technologies amplify the impact of humans in a variety of industrial and commercial processes.

**Beyond the Human Eye:** Multispectral, microscopic and high-speed imaging are good examples of vision capabilities that can be incorporated into cameras to identify special aspects of products, personnel, or processes, regardless of the environment.

**Reach:** Cameras can go to places that humans cannot go. This makes cameras particularly valuable in mundane applications like pipe inspection to lifesaving applications in internal medicine. Space exploration and underwater exploration would not be possible without cameras.

**Exceptional Quality:** Special cameras allow for quality levels that no amount of human inspection can afford. Contactless dimension measurement, defect identification, etc. are just a few cases where image sensors augment human processes and ensure that standards for quality are met.

**Artificial Intelligence:** Cameras have become invaluable for artificial intelligence. Facial recognition for security, occupancy detection, damage assessment, gesture detection, etc. are key applications making our world safer and helping users engage with providers in new ways.
A Complete Image Sensing System

A typical image sensing system has three main hardware components – an image acquisition block comprising optics and the image sensor, a processing engine to analyze and act on the information, and a communication interface to connect to the external world. All these components play a significant role in the performance of an imaging system. Proper selection and integration of all these components, including cameras, sensors, processors, firmware, drivers, application software, and cables result in optimal system performance.

**Optics**
- Optical filter
- Focal length and zoom
- Lens mounting
- Image stabilization
- Color and IR filter
- Field of view (FOV)
- Aperture
- Options for lens grouping

**Image Sensors**
- Shutter speed
- Pixel size/count (resolution)
- Frames per second (FPS)
- Dynamic range
- Signal to noise (SNR)
- Image format/compression
- Shutter type

**Processors/ISPs**
- Required compute capacity (Number of ISP/CPU/GPU cores)
- On-chip imaging accelerators
- AI/ML accelerators
- Regulatory/certification
- I/O interface support

**Selection Criteria**
- Product requirements
  - Power: Battery-powered or plugged in
  - Performance and image quality
  - Price: High-end or cost critical
  - Product size: Mounted or handheld
- Selecting the right lens/sensor combination
  - Distance to objects: variable or fixed, aerial, zoom capability, etc.
  - Indoor or outdoor, light conditions, fixed or mobile application
  - Sensor format: Some formats have more off-the-shelf lenses available
- Time-to-market objectives
- Future-proofing, scalability, ease of upgrading
- Ease of integration

Additional Selection Criteria for Image Sensing Systems

Below are system-level considerations that play a critical role in system-level architecture definition and build vs. buy decisions.

- Product requirements
  - Power: Battery-powered or plugged in
  - Performance and image quality
  - Price: High-end or cost critical
  - Product size: Mounted or handheld
- Selecting the right lens/sensor combination
  - Distance to objects: variable or fixed, aerial, zoom capability, etc.
  - Indoor or outdoor, light conditions, fixed or mobile application
  - Sensor format: Some formats have more off-the-shelf lenses available
- Time-to-market objectives
- Future-proofing, scalability, ease of upgrading
- Ease of integration
Designing Image Sensing Solutions

Engineers have the choice to assemble various components of the system themselves by procuring individual components or buying modules. Time-to-market, in-house expertise, and the risk of failure drive the choice. Building a system has the advantage of offering the greatest flexibility of customization and can be very cost-effective for high-volume applications. However, building a system can involve high upfront development costs and pose project risks. Also, future-proofing the system and integration with other aspects of the manufacturing process will require additional effort and constant upkeep.

In contrast, modules offer a high level of integration and limit customization. Fully integrated systems that come with smart cameras are small, compact, all-in-one vision systems that incorporate lens, image sensors, system storage, and processors into a single device. These are increasingly popular as they take away the hassle of assembling all the components. Fast time-to-market and low risk are additional benefits accrued by buying a pre-built system.

### Chip-down Design

**Pros**
- Design flexibility and customization to fit application needs
- Cost-efficient for high-volume applications

**Cons**
- Slow time-to-market, multiple design cycles and increased chances for design failure
- Resource and expertise intensive
- Low ROI for small volume applications

---

### Module-based Design

**Pros**
- Fast development and ease of design reuse
- Faster time to market and lowered design risk, especially for small form-factor applications

**Cons**
- Less design flexibility
- Design must fit module
- The product size may be limited

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### Finished Product

**Pros**
- Extremely fast time-to-market
- Zero hardware design required. Focus on software, configuration, and application

**Cons**
- Limited hardware flexibility for customizations
- Low ROI for high-volume applications
onsemi Image Sensor Portfolio for Chip-down Designs

onsemi leverages the most advanced CMOS imaging technologies to provide the broadest, most capable portfolio of image sensors for industrial, automotive, and consumer applications. onsemi’s image sensing portfolio ranges from VGA to over 50 MP (megapixel) resolution, and from 4 to over 800 fps (frames per second). The broad portfolio enables flexibility in configuration and combines optimal performance characteristics, such as high-speed, high sensitivity, and high image quality to match specific application requirements. It also provides an easy upgrade path for existing customers and allows OEMs to leverage a single camera design to support multiple products to accelerate time-to-market.

**Industrial**
- High-speed, scalable portfolio

| PYTHON 25K | 25MP 4.5um |
| Python 16K | 16MP 4.5um |
| Python 5000 | 5MP 4.8um |
| Python 2000 | 2MP 4.8um |
| Python 1300 | 1.3MP 4.8um |
| Python 480 | VGA 4.8um |

**Machine Vision & Intelligent Traffic Systems**
- Performance, price, speed 29 x 29 mm cameras, system solutions

| XGS 32000 | 32MP 3.2um |
| XGS 20000 | 20MP 3.2um |
| XGS 12000 | 12MP 3.2um |
| XGS 8000 | 8MP 3.2um |
| XGS 3000 | 3MP 3.2um |
| XGS 2000 | 2MP 3.2um |

| XGS 45000 | 45MP 3.2um |
| XGS 30000 | 30MP 3.2um |
| XGS 16000 | 16MP 3.2um |
| XGS 9400 | 9MP 3.2um |
| XGS 5000 | 5MP 3.2um |

**Edge AI**
- Small sensors, low power NIR optimized

| AR0234 | 2MP 3.0um GS |
| AR0135 | 1MP 3.75um GS |
| AR0144 | 1MP 3.0um GS |
| AR1335 | 13MP 1.1um RS |
| AR0821 | 8MP 2.1um RS |
| AR0522 | R Series |
| AR0830 | 8MP @ 60 fps |

**Machine Vision Everywhere**
- Event detection
  - Very low power, flexible states

| ARX3A0 | VGA 2.2um pGS |
| LiDAR/SiPM | R Series |
| SPAD Arrays | Pandion |
Appletec Compact Camera Module (CCM) Offerings for Small Form-factor Applications

Arrow Electronics is introducing a family of camera modules based on sensor technology from onsemi. The modules provide original equipment manufacturers (OEMs) with a simple and cost-effective path to incorporating a wide range of camera functionalities in their products. All camera modules comply with onsemi IAS standard and have the same connector and pinout, providing compatibility with the popular 96boards development ecosystem. Arrow has partnered with Timesys for Linux drivers.

**AP-Vision-ARX3A0-55 & 55-C**
- onsemi ARX3A0 Sensor
  - 1/10.3" 560 x 560 Mono + NIR and RGB
  - 0.3Mp @ 360fps
  - Fixed focus 49° FOV
  - F#2.0
  - Length: 21.95 mm

**AP-Vision-AR0830-83**
- onsemi AR0830 Sensor
  - 1/2.9" 3840 x 2160 color
  - 8Mp @ 60fps
  - Fixed focus 74.4° FOV
  - F#TBD
  - Length: 23.48 mm

**AP-Vision-AR1335-74**
- onsemi AR1335 Sensor
  - 1/3.2" 4208 x 3120 color
  - 13Mp @ 30fps
  - Auto focus 64° FOV
  - F#2.0
  - Length: TBD mm

**Target Applications:**
- IoT applications
- Super low power applications
- Machine vision
- Artificial intelligence
- Eye tracking

These modules can be customized, or new modules developed for a low NRE cost.
Development Resources for Appletec CCM Modules

Arrow created camera mezzanine cards compliant with the 96boards specification. Compatibility with the 96boards open platform enables customers to rapidly start implementation of new imaging designs and to optimize systems once operational. The mezzanine board has the onsemi AP1302 image signal processor (ISP). The ISP offloads core functions like sensor configuration and calibration, image format conversion, basic transformations, and autofocus from the processor.

Development Board Connectivity

<table>
<thead>
<tr>
<th>NXP</th>
<th>STMicroelectronics</th>
<th>Qualcomm</th>
<th>NVIDIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCIMX8M-EVKB, Mini-SAS cable to ARR-ONS-IAS2-NXP adapter board</td>
<td>STM32MP1 Avenger96, SRT-VISION96-AR0830 / AR1335 / ARX3AO Mezzanine board</td>
<td>elinfichips EICQR85165, ARR-ONS-IAS2-QRB adapter board and 30-pin ribbon cable</td>
<td>Jetson Nano Developer Kit, ARR-ONS-IAS2-CSI2 adapter board and 15-pin ribbon cable</td>
</tr>
<tr>
<td>I.MX8 Thor96, SRT-VISION96-AR0830 / AR1335 / ARX3AO Mezzanine board</td>
<td>Linux driver available <a href="#">Here</a></td>
<td>ARR-ONS-IAS2-QRB adapter board and 30-pin ribbon cable</td>
<td>Orin – JetCarrier96, SRT-VISION96-AR0830 / AR1335 / ARX3AO or onsemi Mezzanine board (PN: TBD)</td>
</tr>
<tr>
<td>Linux driver available <a href="#">Here</a></td>
<td></td>
<td>Linux driver available <a href="#">Here</a></td>
<td></td>
</tr>
</tbody>
</table>

Appletec CCM modules compatible with onsemi Demo3 System and DevWareX

The modules are compatible with onsemi’s Demo3 EVK system and DevWareX software which allows for many possibilities for testing, debugging, and analysis.

- Generate initialization files
- Log register changes when setting modes
- Save or load images for analysis
- Watch specific registers
- Manual white balance adjustments

Image Analytics
- Intensity graphs
- Noise measurements
- Image histograms
- Vectorscope graphs
Basler Camera Module Solutions and Development Kits

Basler is a leading international manufacturer of high-quality imaging components for computer vision applications. In addition to classic area scan and line scan cameras, lenses, frame grabbers, light modules, 3D products, and software, the company offers embedded vision solutions, that comprise consulting services, customer specific software development as well as customized products. Basler's products are used in a variety of markets and applications, including factory automation, medical, logistics, retail, and robotics. They are characterized by high reliability, an excellent price/performance ratio, and long-term availability.

Core Offerings

<table>
<thead>
<tr>
<th>Product category</th>
<th>Product families</th>
<th>onsemi products featured</th>
</tr>
</thead>
</table>
| Modules          | Basler dart BCON for MIPI Cameras (5, 8 & 13 MP) | - onsemi AR0821 - daA3840-30mci (S-Mount) - Basler dart  
- onsemi AR1335 - daA4200-30mci (S-Mount) - Basler dart |
| Kits             | Different development Kits for NVIDIA Jetson Family and NXP i.MX8 Applications Processor series | - onsemi AR1335 - daA4200-30mci-JNANO-NVDK-AIA - Embedded Vision Kits  
- onsemi AR1335 - daA4200-30mci-MX8MM-VAR - Embedded Vision Kits |
| Firmware and application-level software | Complete Driver Packages & Application-specific software | N/A |
| Services         | Complete Solution Design (From Product idea to Life Cycle Management) | N/A |

Core Market - Factory Automation

Featured Solutions

Embedded Vision Development Kits
All components in one package
Embedded Vision Development Kits include a camera, a processing board and all accessories and therefore are ready-to-use kits to start prototyping your application immediately. The software including camera driver and pylon Software Development Kit (SDK) are pre-installed.

New AI Vision Solution Kit with Cloud Connectivity
The Basler AI Vision Solution Kit with Cloud Connectivity is a Development Kit for integrating a Basler dart camera with a BCON for MIPI interface. It contains a dart BCON for MIPI camera module, an NVIDIA® Jetson Nano™ Developer Board, a lens and a cable. Additionally, it includes all necessary drivers, software as well as cloud support and thus offers a complete plug and play design-in package for rapid prototyping of AI-based IoT applications.
D3 Pre-Configured and Custom Cameras
Grow Seamlessly from Concept to Production

D3 is an NVIDIA Elite Partner and Intel® Gold Partner that provides U.S.-based products, design services, and manufacturing of vision solutions. By leveraging our unique Define - Design - Deploy methodology, our team can optimize our solutions to meet the requirements of your desired use case.

**DEFINE:** Enable off-the-shelf cameras with software pre-configured on our NVIDIA, Texas Instruments, and Intel® processing platforms to quickly find the embedded vision system that best suits your application.

**DESIGN:** Work with our design services team to customize the standard cameras used in defining your system and refine the design to your volume production requirements.

**DEPLOY:** Leverage our dependable capabilities as an American original design manufacturer (ODM) to deploy the final product and establish your market position faster than the competition.

Core Offerings

<table>
<thead>
<tr>
<th>Category</th>
<th>D3 Products</th>
<th>Integrated onsemi Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision Starter Kits</td>
<td>DesignCore® Velocity Series Cameras + DesignCore® NVIDIA® Jetson Xavier™ NX 12-Camera Carrier Board</td>
<td>AR0234</td>
</tr>
<tr>
<td>Pre-Configured Cameras</td>
<td>DesignCore® Velocity Series: FPD-Link™ III, GMSL2, MIPI CSI-2 in 55° - 180° FOV Variants</td>
<td>AR0234</td>
</tr>
<tr>
<td>Custom Cameras</td>
<td>Email Arrow to learn more about our custom camera offerings</td>
<td>AR0234, AR0820, AR0821</td>
</tr>
<tr>
<td></td>
<td>(offered in full-color &amp; IR-enabled)</td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>- ISP tuning</td>
<td>AR0234, AR0820, AR0821</td>
</tr>
<tr>
<td></td>
<td>- 3rd party processor and camera integration</td>
<td>(offered in full-color &amp; IR-enabled)</td>
</tr>
<tr>
<td></td>
<td>- Vision systems architecture consultation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Custom deep learning and synthetic model development</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Integration of AI accelerators into hardware design</td>
<td></td>
</tr>
</tbody>
</table>

- Robotics
- Industrial
- Machine Vision
- Autonomous Mobility
- Automotive (ADAS)
- Transportation
- Aerospace
- Medical
- Smart Cities

**Featured Solutions**

**Vision Starter Kits**
Embedding vision solutions into your product has never been easier thanks to D3’s new plug-and-play starter kits. Gather high-quality data with two of D3’s DesignCore® Velocity Series cameras, powered by onsemi image sensors, which can be placed meters away from the processor by leveraging a SerDes interface into your robotics or industrial application. Run powerful AI algorithms on the included NVIDIA® Jetson Xavier™ NX processing platform or newly compatible UP Squared Pro 7000 powered by Intel®.

**Pre-Configured Camera Module Expansion**
D3’s camera selection tool to expand your starter kit into a system tailored to your application with pre-configured 55° - 180° FOV offerings. Go PRO for uncompromising image quality and an IP67 seal rating.
Leopard Imaging Camera Module Solutions and Development Kits

Leopard Imaging is a global leader that provides high definition (HD) embedded cameras and AI-based camera solutions — focusing on core technologies that improve image processing in autonomous vehicles, drones, IoT, robotics, and healthcare devices. As a Preferred NVIDIA Partner and a member of the AWS Partner Network, Leopard Imaging also works closely with Intel, Qualcomm, onsemi, and other companies in producing advanced camera solutions. With high-tech and manufacturing capabilities in the US and Asia, the entire team at Leopard Imaging is dedicated to providing camera technology with excellent quality products and extraordinary services — consistently aligning with certified quality management systems.

Core Offerings

<table>
<thead>
<tr>
<th>Product families</th>
<th>Product types</th>
<th>onsemi product featured</th>
<th>Firmware support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver monitoring systems (DMS) cameras</td>
<td>Modules (with USB 3.0)</td>
<td>AR0144IVEC</td>
<td>Gesture and facial expression recognition software solutions</td>
</tr>
<tr>
<td>DMS cameras</td>
<td>Modules (Qualcomm automotive platform)</td>
<td>AR0234AT</td>
<td>Runs Qualcomm automotive platform</td>
</tr>
<tr>
<td>Robotics and drones</td>
<td>Modules (USB 3.0, GMSL2 with RAW or YUV)</td>
<td>AR0234CS</td>
<td>Runs on USB 3.0, GMSL2</td>
</tr>
<tr>
<td>OMS cameras</td>
<td>Modules (Ambarella CV2 or GMSL2)</td>
<td>AR0239</td>
<td>Runs on Ambarella CV2 and GMSL2</td>
</tr>
<tr>
<td>Camera for IoT and drones</td>
<td>Modules (NVIDIA Jetson or USB 3.0)</td>
<td>AR0821CS</td>
<td>Runs on Jetson and USB 3.0</td>
</tr>
<tr>
<td>Stereo camera</td>
<td>Modules (NVIDIA Jetson platform)</td>
<td>AR0234CS</td>
<td>3D Depth engine on NVIDIA Jetson platform</td>
</tr>
</tbody>
</table>

Markets Served

- Autonomous Driving, ADAS, Drone, Robotics, and IoT

Featured Solutions

**LI-AR0144IVEC-GMSL2-055H Camera**

The LI-AR0144IVEC-GMSL2-055H is equipped with ON Semiconductor In-Vehicle Experience Camera Module (IVEC) AR0144 1/4-Inch CMOS Camera Module, Maxim GMSL2 Serializer MAX9295A and built-in IR LED. This camera outputs 1280 x 800 YUYV image data.

**LI-USB30-AR0234CS-YUV-GMSL2-060H Camera**

The LI-USB30-AR0234CS-YUV-GMSL2 is equipped with ON Semiconductor CMOS digital image sensor AR0234CS, AP1302 ISP and Maxim GMSL2 Serializer MAX9295A/B. This camera outputs 1920 x 1200 YUV data.
TechNexion Camera Module Solutions and Development Kits

TechNexion Embedded Vision Solutions provide embedded system developers access to high-performance, industrial-grade camera solutions to accelerate their time-to-market for embedded vision projects.

**TechNexion Solutions Based on onsemi Image Sensors**

**Rolling Shutter**

- **TEV/TEVI**
  - Optional Image Signal Processor (ISP)
  - OEM Integration
  - 12mm Lens Options
  - Resolutions from 1MP to 8MP
  - Global and Rolling shutter

- **VizionCam**
  - Rugged, Compact housing
  - USB 3.0 Type C Interface
  - UVC Support
  - Resolutions from 1MP to 8MP
  - Global and Rolling shutter

- **VizionLink**
  - High-speed Serial Link up to 15m
  - Single-wire Coax (FAKRA)
  - Robust, Compact, IP68 Housing
  - Resolutions from 1MP to 8MP
  - Global and Rolling shutter

**Global Shutter**

- **AR1335**
  - 13MP
  - Applications: Access Control, Security, Surveillance, Inspection, Microscopy

- **AR0821**
  - 8MP

- **AR0521**
  - 5MP

- **AR0234**
  - 2.3MP
  - Applications: Navigation, High-speed Inspection, Failure Analysis, Machine Vision

- **AR0144**
  - 1MP

Web link: [Embedded Vision Solutions](#)
Watch video: [TechNexion Vision Solutions](#)
Implementing an imaging system requires a thorough analysis of the requirements, evaluation, and prototyping to ensure that the final solution achieves business objectives. Comprehensive solution providers like Arrow offer solutions for chip-down and module options and can also support with design services.

Arrow's image sensing ecosystem simplifies design, reduces risk, and lowers time-to-market for solutions based on onsemi image sensors. Coupled with service offerings for every step of the design and deployment phase, Arrow helps OEMs develop leading applications for industrial, automotive, consumer, and healthcare markets.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Ecosystem</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADLINK</td>
<td>Leopard Imaging</td>
</tr>
<tr>
<td>APPLETEC Ltd.</td>
<td>Basler</td>
</tr>
<tr>
<td>Camera Module</td>
<td>√</td>
</tr>
<tr>
<td>ISP/MPU/FPGA</td>
<td>√</td>
</tr>
<tr>
<td>SW Firmware/Driver, Tuning</td>
<td>√</td>
</tr>
<tr>
<td>Smart Camera</td>
<td>√</td>
</tr>
</tbody>
</table>
Arrow Engineering Services for Image Sensing Application Design

**Module Customization**
- Small changes can be made to the existing module for a low NRE
  - Flex length, connector or the pinout, FOV, etc.
- New module can be designed in as short as four weeks for $1,000-$1,500 NRE
  - Using a different camera sensor depending on sensor
  - Different off-the-shelf lens

**Imaging System Design**
- Sensor Selection
- ISP/FPGA selection
- Integration with host processor
- Training on imaging systems
- Image Tuning
  - Sensor characterization for parameters that affect image quality
  - Lens and color shading compensation
  - Auto exposure and auto white balance tuning
  - High-performance image pipe tuning
  - High-quality image pipe tuning
  - Subjective and custom image tuning

**Complete System Design**
- Hardware development
- Multilayer PCB design
- Lighting and illumination
- SW driver development
- SW OS porting
- SW application development
- Inventory management
- AI app development
- Video analytics
  - Motion detection
  - Situation analysis
## Ordering Information

### Appletec Compact Camera Modules (CCM)

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact camera module based on onsemi ARX3A0 sensor</td>
<td>AP-Vision-ARX3A0-55-C</td>
</tr>
<tr>
<td>Compact camera module based on onsemi AR1335 sensor</td>
<td>AP-Vision-AR1335-74</td>
</tr>
</tbody>
</table>

### Interface Boards

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface board to the NXP MCIMX8M-EVKB mini SAS camera connector</td>
<td>ARR-ONS-IAS2-NXP</td>
</tr>
<tr>
<td>Adapter board to the eInfochips Qualcomm EICQRB5165 30-pin camera connector</td>
<td>ARR-ONS-IAS2-QRB</td>
</tr>
<tr>
<td>Adapter board to the Jetson Nano 15-pin camera connector</td>
<td>ARR-ONS-IAS2-CSI2</td>
</tr>
<tr>
<td>Shiratech 96boards mezzanine card based on onsemi AR1335 image sensor</td>
<td>SRT-Vision96-AR1335</td>
</tr>
<tr>
<td>Shiratech 96boards mezzanine card based on onsemi ARX3A0 image sensor</td>
<td>SRT-Vision96-ARX3A0</td>
</tr>
</tbody>
</table>

### Development Boards

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>onsemi Demo3 base board</td>
<td>AG81NOCS-GEVK</td>
</tr>
<tr>
<td>NXP evaluation board</td>
<td>MCIMX8M-EVKB</td>
</tr>
<tr>
<td>96boards single-board computer powered by the NXP i.MX 8M SoC, incorporating a quad-core 64-bit ARM® Cortex A53</td>
<td>JIMX8_THOR96</td>
</tr>
<tr>
<td>ST Microelectronics Avenger96 board features dual ARM® Cortex-A7 cores and an ARM® Cortex-M4 core</td>
<td>STM32MP157AAC</td>
</tr>
<tr>
<td>eInfochips Qualcomm® ARR-ONS-IAS2-QRB adapter board and 30-pin ribbon cable</td>
<td>EICQRB5165</td>
</tr>
<tr>
<td>ARR-ONS-IAS2-CSI2 adapter board and 15-pin ribbon cable</td>
<td></td>
</tr>
<tr>
<td>Jetson Nano developer kit</td>
<td></td>
</tr>
</tbody>
</table>
Contact Information

Online: www.arrow.com