DALSA customers benefit from priority technical support, ensuring a quick response and access to experienced technical/applications support staff who understand that your machine vision application is unique.

**Priority Vision Systems**

**Fast Pair and Component Replacement**

A downed inspection system can cost thousands of dollars in production yield and potentially lost business. We can work with you to ensure you have back-up components ready and waiting for you when you need them. DALSA will work with you to develop a priority delivery and order tracking program to give you 100% visibility on order fulfillment. We can also build in flexibility to modify delivery schedules, hold back or accelerate shipments to meet your needs.

**Technology, Service and Support**

With rapidly evolving technology, design engineers are rightfully concerned that components they’ve specified for their vision system today may become discontinued or supplanted by newer technology tomorrow, leaving them scrambling to redesign and retrofit. DALSA is committed to supporting legacy products and providing an efficient migration path when products are discontinued.

**Logistical Support and Training**

DALSA partners have 24/7 access to on-line, web-based tools for order tracking, account management, and technical support. These tools offer unprecedented visibility and control over the supply chain allowing them a quick response to change production demands.

We offer comprehensive training to support your front line staff. Customers can take advantage of both hardware and software training programs that can be conducted at our training facility or easily suited to a location of your choice.
For more than 30 years, DALSA has been a leading innovator of advanced imaging technology. We offer our customers and partners a fully integrated technology path - from wafers and image sensors supplied by our wholly-owned semiconductor foundry to stand-alone cameras and complete vision solutions, we’ve delivered image capture and acquisition technology to help customers increase yields, lower field failures and speed time to market.

- secure, reliable supply of image sensors from our wholly-owned foundry
- single source for your system build – from image sensors to integrated solutions
- synergistic technology design and development for easy integration and performance optimization

GET MORE VISION

INTEGRATED TECHNOLOGY PATH

• Cameras
• Frame Grabbers
• Processors
• Vision Software
• Sensors
• GRABBERS
• Solutions

DALSA Overview
Everywhere you Look Video
Annual Report
Semiconductor Overview
DALSAta cameras offer unmatched combinations of speed, responsivity, and dynamic range. With features such as 8, 10, 12 and now 16 bit output, Camera Link®, GigE™, next generation Camera Link and Smart Camera technology, DALSA cameras help lower production costs, improve quality and reduce time to market.

**DALSA Cameras**

We offer the broadest range of CCD and CMOS cameras—including multi-megapixel area scan, line scan and high sensitivity line scan (TDI, Time Delay & Integration) technology. In addition to our standard product offering, we can mostly existing technology to meet your requirements or provide a solution designed from the ground up.

**New! Smart Camera Technology**

We’ve leveraged the full breadth and depth of our design, engineering, and manufacturing expertise including sensor, camera, image processing and vision software development to deliver the next generation in smart camera technology. See BXA Smart Camera on page 15.

**BILINEAR COLOR imaging**

Bilinear imaging is built on DALSA’s dual line scan image sensor technology. The first line is made up of alternating red (R) and blue (B) pixels; the second is comprised of green (G) pixels only. There is no gap between the lines which minimizes any artifacts due to spatial correction.

**COLOR IMAGING**

RGB Trilinear sensor technology eliminates artifacts by placing a separate row of pixels for each color on a single sensor die. Our advanced design minimizes the distance between rows to eliminate image artifacts due to synchronization.

**Bayer Color Filter Array architecture**

Uses a mosaic War pattern over the area sensor’s pixels. Color information is reconstructed with a demosaic algorithm from within the camera or on the host.

**Advanced Color Software Tools**

A critical and invaluable part of any color vision application. DALSA’s Sapera Essential now offers a comprehensive library of classes for color conversion, processing, calibration, and classification. See Sapera Essential on page 15.

**GIGE VISION™**

Gigabit Ethernet (GigE) technology delivers longer cable lengths, lower costs, and simplified system setup. Using DALSAs GigE Vision cameras, images are transmitted over standard, low-cost CAT-5e or CAT-6 cables. Our GigE camera feature value added functionality designed for high speed machine vision applications.

**Camera Link®**

Camera Link has become the de facto interface for high-speed machine vision applications. DALSA offers a full range of products based on the important interface.

**NEW! HS INTERFACE (HSLink)**

DALSA is leading the development of the next generation camera-to-frame grabber interface. Designed to meet the needs of its new Piranha HS 12k cameras and Xcelera PX8 frame grabbers, the new HS interface will carry image and configuration data, while enabling low jitter, real time triggering signals over a simple topology.

See sidebar on page 5 for more details or download the new interface primer from our web site.
**OVERVIEW**

**Cost effective**
Compact
45 Mpix/s

**Product Features**
- High Color Fidelity
- Flexibility
- Dual line scan

**Resolution**
- 14/10 μm
- 14/7 μm
- 14/13 μm
- 5.2 μm
- 40 x 85 x 54 mm

**Camera Link**
GigE

**Dynamic Range**
- 50 x 85 x 54 mm
- 43 / 21 DN/(nJ/cm²)

**Temperature**
- -5 to 50 °C
- 10 to 50 °C

**LINE SCAN**

**PIRANHA 2 COLOR**

**PIRANHA 7 MCM2**

**PIRANHA 12K**

**PIRANHA HS**

**PIRANHA HS 12K**

**OVERVIEW**

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Compact
45 Mpix/s

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**PIRANHA HS 12K**

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**LINE SCAN**

**PIRANHA 2 COLOR**

**PIRANHA 7 MCM2**

**PIRANHA 12K**

**PIRANHA HS**

**PIRANHA HS 12K**
**GLOBAL SHUTTER IMAGING**

High-speed, smear-free still image capture is the hallmark of DALSA’s X legislature cameras. Applications such as traffic management, metrology and robotics inspections all need to capture fast-moving objects without smear or distortion. To meet this need, DALSA offers true global shutter CMOS and interline transfer CCDs. With both technologies, the sensor has the ability to electronically shutter itself and “stop the action.”

To stop the action, the camera starts and stops exposure of all pixels in an array simultaneously, under electronic control. This functionality requires specific design features, and not all sensors have them.

- **Full-frame CCDs** require mechanical shutters or strobing to achieve this result, introducing more cost and complexity into the visualization system.
- **Frame-transfer CCDs** may not provide the speed required, or may be difficult to cost-justify due to the extra silicon required for the storage area.
- **Standard rolling-shutter CMOS sensors** distort images of moving objects because they read out only one line of their arrays at a time—by the time they read the next line, the object has moved. This deviation is a major obstacle for machine vision applications such as automated sorting or defect inspection—objects that should be a “pass” are judged as “fail” because the image fed into the pattern-matching algorithms is distorted. As an example, instead of solid round holes, the system would see unacceptable ellipses.

Interline CCDs and true global shutter CMOS sensors are ideally suited for imaging fast-moving objects. They capture crisp images without smear or distortion by electronically shuttering all pixels simultaneously at short exposure times. DALSA’s Falcon camera (Camera Link) and Genie cameras (S GigE) both provide true global shuttling.

**FEATuRES**

- Global shutter
- Liquid-cooled, Mini Camera Link® connection
- Full support and calibration

**RESOLUTION**

- 45 x 40 to 1024 x 1024

**LINE/FRAME RATE**

- Up to 300 fps

**PIXEL SIZE**

- 4.4 μm to 6.5 μm

**DATA FORMAT**

- 8, 10, 14 bit

**INTERFACe**

- High Voltage Base Mini Camera Link®
- Base Mini Camera Link®

**sIZe**

- 45 x 20 to 65 x 65 mm

**sAMPLE APPLICATIONS**

- Electronic Manufacturing
- Medical Imaging

**COMPLIANCe**

- RoHS, CE

**RESPONSIBILITY**

- See Genie datasheet

**OPERATING TEMPERATURE**

- -40°C to 85°C

DALSA cameras are supported by DALSA’s Sapera™ vision software libraries featuring CamExpert for simplified camera set-up and configuration.

See Sapera vision software on page 15.
Genie camera models combine standard gigabit Ethernet technology with DALSA’s Trigger-to-Image Reliability framework to dependably capture and transfer images from the camera to the host PC. Small and compact, the Genie series includes Color (C), Monochrome (M) and High speed (HM) models. With options that include mounts for C- or CS-type lenses and right-angle lensing, Genie cameras provide flexibility for almost any application.

**Color or Monochrome Image Capture**

<table>
<thead>
<tr>
<th>Resolutions</th>
<th>640 x 480</th>
<th>640 x 480</th>
<th>1280 x 960</th>
<th>1360 x 1024</th>
<th>1400 x 1024</th>
<th>1400 x 1024</th>
<th>1600 x 1200</th>
<th>640 x 480</th>
<th>1024 x 768</th>
<th>1400 x 1024</th>
<th>1400 x 1024</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line/Frames</td>
<td>64 fps</td>
<td>64 fps</td>
<td>24 fps</td>
<td>15 fps</td>
<td>21.8 fps</td>
<td>15 fps</td>
<td>300 fps</td>
<td>64 fps</td>
<td>117 fps</td>
<td>64 fps</td>
<td>64 fps</td>
</tr>
<tr>
<td>Pixel Size</td>
<td>7.4 μm</td>
<td>9.9 μm</td>
<td>4.65 μm</td>
<td>3.75 μm</td>
<td>4.65 μm</td>
<td>6.45 μm</td>
<td>4.40 μm</td>
<td>7.4 μm</td>
<td>7.4 μm</td>
<td>7.4 μm</td>
<td>7.4 μm</td>
</tr>
</tbody>
</table>

**Dynamic Range**

<table>
<thead>
<tr>
<th>4.80 x 3.60 mm</th>
<th>6.40 x 4.80 mm</th>
<th>4.80 x 3.60 mm</th>
<th>4.60 x 3.60 mm</th>
<th>6.40 x 4.80 mm</th>
<th>6.80 x 6.00 mm</th>
<th>7.20 x 4.40 mm</th>
<th>6.80 x 6.00 mm</th>
<th>10.40 x 7.60 mm</th>
<th>10.40 x 7.60 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mm (1/4”)</td>
<td>6 mm (1/2”)</td>
<td>6 mm (1/2”)</td>
<td>8 mm (1/2”)</td>
<td>6 mm (1/2”)</td>
<td>8 mm (1/2”)</td>
<td>11 mm (2/3”)</td>
<td>9 mm (3/8”)</td>
<td>8 mm (1/2”)</td>
<td>11 mm (2/3”)</td>
</tr>
<tr>
<td>8 mm (1/2”)</td>
<td>6 mm (1/8”)</td>
<td>6 mm (1/8”)</td>
<td>8 mm (1/8”)</td>
<td>6 mm (1/2”)</td>
<td>8 mm (1/2”)</td>
<td>11 mm (2/3”)</td>
<td>9 mm (3/8”)</td>
<td>8 mm (1/2”)</td>
<td>11 mm (2/3”)</td>
</tr>
</tbody>
</table>

**Sample Applications:**
- Industrial Inspection
- Medical Imaging
- Medical & Life Sciences
- Intelligent traffic systems
- Entertainment
- Roller conveyor
- Sport

**Software:**
- DALSA’s Sapera™ vision software libraries featuring CamExpert for simplified camera set-up and configuration.
- See Sapera vision software on page 15.
Meet the industry’s most reliable and versatile family of frame grabbers and vision processors with the ability to acquire images from multiple cameras and formats. DALSA offers both board-based and standalone image processors to meet a wide-range of applications from general purpose to more complex embedded FPGA based programming applications, high-bandwidth acquisition, real-time scalable processing, and autonomous operation.

VERSELLATE CAMERA INTERFACE
DALSA frame grabbers and vision processors support monochrome and color applications and are available in a wide variety of camera interfaces including analog-to-digital as well as direct from digital. Our image acquisition boards support common interface standards including Camera Link, LVDS, and the new HSLink interfaces.

ON-BOARD PROCESSING
Many DALSA boards are equipped with Field Programmable Gate Array (FPGA) based image processing. Fast and efficient, this embedded processing capability frees up the host CPU and performs tasks such as shading correction and Bayer decoding at a board level, delivering images that can be readily used by demanding vision applications without further pre-processing.

CAMEXPERT™ CAMERA CONFIGURATION UTILITY
DALSA has developed one of the industry’s most efficient and easy-to-use proprietary camera configuration utilities specifically designed to leverage the power of our image acquisition boards. CamExpert is Windows based and provides an interactive environment to create new or modify existing configuration files.

EXTENSIVE CAMERA SUPPORT
DALSA image acquisition boards are field tested and approved for use with more than 200 cameras covering a wide range of characteristics, requirements and specifications, including:
- Digital (Camera Link, LVDS, RS422)
- Analog video source
- NTSC/RS170, PAL/CCIR, and non-standard cameras
- Monochrome and Color – composite video, Y/C and RGB
- Area and line scan cameras
- Variable length acquisition using line scan cameras
- Custom formats – analog and digital

Please visit our website for a complete listing of frame grabbers along with specifications and full datasheets.
### FRAME GRABBERS

#### PCie Analog Solutions

<table>
<thead>
<tr>
<th>X4-AN QUAD</th>
<th>X4-CL EXPRESS</th>
<th>X4-CL PRO</th>
<th>X4-CL-LINK</th>
<th>X4-CL-DFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC2-VISION</td>
<td>PC2-COMPRESS</td>
<td>PC2-COMPRESS</td>
<td>PC2-VISION</td>
<td>PC2-VISION</td>
</tr>
<tr>
<td>X4 CLEVERA-AN</td>
<td>X4 CLEVERA-CL LXT QUAD</td>
<td>JULY PRO</td>
<td>X4 CLEVERA-CL, PX4 DUALLINK</td>
<td>X4 CLEVERA-HS</td>
</tr>
<tr>
<td>X4-AN QUAD</td>
<td>X4-CL EXPRESS</td>
<td>X4-CL PRO</td>
<td>X4-CL-LINK</td>
<td>X4-CL-DFS</td>
</tr>
</tbody>
</table>

#### Digital Solutions

- **Camera Interface**: PCie, XMC, XMC2, XMC2+, PCIeDCC
- **Camera Format**: YUV, PAL, NTSC, SECAM, 3G-SDI, SDI, HDMI, DP
- **Camera Inputs**: 4 independentinput pins, 4 independent 6 composite video (6:1 mux), 4:2:2, 4:2:0
- **Pixel Clock**: Variable, 300 MHz per input, Dual: 50, 75 MHz
- **Bits/pixels**: 8-bit, 10-bit, 12-bit, 14-bit, 16-bit
- **Bus Interface**: Single: FrameGrabber, Dual: FrameGrabberX
- **Image Processing**: ILUTs/FFC/DPC2, ILUTs/FFC/DPC2, ILUTs/FFC/DPC2

#### Compliance

- **HDMI 1.4**: Compliant
- **90° Rear Panel Mickey Mouse**: NA
- **PCI Express**: 2.0, 3.0
- **Safety Certification**: CE, FCC, RoHS, CE, FCC, RoHS, CE, FCC, RoHS, CE, FCC, RoHS, CE, FCC

### VISION PROCESSORS

DALSA vision processors combine high-speed image acquisition capability with PC/AT compatible PCs through the PCIe interface, and streamlined memory architectures to deliver real-time image processing capability on a single slot board. The vision processors support multiple camera interface technologies on the PCIe platform.

DALSA's X8I-1600® is a vertically targeted vision processor offering PC-like real-time digital image processing boards specifically engineered for demanding X-ray instrumentation and radiography applications.

#### Key Features

- Adaptive Image Averaging—reduces noise in both still and dynamic images.
- Programmable Digital Filter—improves image quality and contrast.
- Local Image Storage—eliminates reliability and processing time.
- Flexible Input Data Format—supports higher resolution detections with both single (10, 12, 14 bit) and 32-bit, CCID, CMS, fixed panel and linear.
- Available in Camera Link
- Windows compatible C++ Library for image acquisition and processor control—include easy to use tools, utilities, and installation scripts

#### DALSA Platform Development Advantage—Full Free Running License (FRL)

The Saperia vision software standard processing tool FRL is offered at no additional charge when combined with DALSA frame grabbers and cameras. This run-time license includes access to over 1000 image processing functions for a broad range of hardware-based (normalized correlation based) template matching tools, blob analysis and lens correction tools.

#### DALSA's X8I-1600®

*Available as of 2010* 2 Dead Zone Compensation (DPC2)

**X8I-1600** is covered by DALSA's EULA and software license agreement. All rights are reserved. No parts of this manual may be reproduced or transmitted in any form or by any means without the written consent of DALSA.
Sapera™

Field proven vision software with powerful imaging libraries and application tools

New “Nitrous” Suite and Measurement Tool

New Enhanced Color Tools

Sapera vision software bundles image acquisition and control with image processing and analysis tools to provide developers with the critical functionality to design, develop and deploy high-performance vision systems. Choose from two integrated platforms Sapera Essential or Sapera Nitrous optimized for GPU and Multi-core CPUs.

SAPERA™ ESSENTIAL
ADVANCED IMAGE ACQUISITION, PROCESSING AND ANALYSIS

Sapera Essential vision software delivers a full suite of software boxes for image acquisition, display and control and includes an extensive list of image processing functions. Sapera Essential’s feature set includes program portability, versatile camera controls, functions for direct management and easy-to-use application development wizards. Sapera Essential applications can be developed using C++, C, C# or Visual Basic with Microsoft® Visual Studio® .NET® or using Borland® C++ Builder™ and supports Windows® XP Professional, Windows Vista (32 / 64-bit), Windows 7 and Windows 2000 platforms.

Sapera Essential’s New Measurement Tool is a video metrology tool for inspection applications that require positioning, identification and guidance. Key features include:
- Automatic simultaneous multiple measurements
- Sub-pixel accuracy
- Measurement statistics for distances and angles.
- Built-in calibration tools
- Extensive set of markers: single or multiple points, lines, arcs and circles

NEW!
SAPERA NITROUS
GPU/MULTI-CORE CPU OPTIMIZATION

Sapera Nitrous

Sapera Nitrous is a smart set of add-on image processing functions optimized for GPU (graphical processing unit) and multi-core CPU platforms. Building on the field proven functionality of Sapera Essential, Nitrous leverages the GPU and multi-core optimization MCO in a seamless fashion. The GPU implementation of nitrous is based on Nvidia’s Cuda rev 2.3. The MCO is based on Intel’s latest instruction set technology.

SAPERA Software Overview
Brochure: Sapera Essential Interactive Product Tour

KEY FEATURES
Image Acquisition
- Supports Area scan, Line scan and GigE Cameras
- Includes over 500 camera configurations files for various camera models
- Built-in powerful camera configuration

Image Processing and Analysis
- Application specific tools perform Search, OCR, 1D/2D barcode decoding and blob analysis
- Modular components help reduce application footprint and deployment costs

Performance
- Now supports multi-core and GPU platforms
- Delivers maximum performance using SSE4

Flexibility
- Hardware independent
- Supports both 32-bit and 64-bit Microsoft Windows platform
- Incorporates Trigger-to-Image Reliability—DALSA’s proprietary engineering frame work to ensure reliability of the image acquisition process
- High-level C++ classes and .NET support simplified application development on Windows XP and Vista platforms

POWERFUL IMAGE PROCESSING AND ANALYSIS

Sapera Essential processing libraries include highly optimized functions for morphology, filters, geometric, measurement, segmentation, point-to-point operations, transforms, and other processing functions with sub-pixel accuracy. Sapera Essential includes a powerful board configuration and camera setup utility plus a suite of image processing tools including a highly advanced, yet cost effective search package.

VISION SOFTWARE
DALSA automated vision solutions are designed specifically for factory floor deployment. Our innovative vision appliances and smart cameras offer scalable solutions to satisfy a wide range of application needs, from positioning robotic handlers to complete assembly verification.

**INDUSTRIAL VISION SOLUTIONS**

**DESIGNED FOR ALL USERS**
DALSA is committed to helping manufacturers improve product quality, lower costs and increase production yields by providing automated machine vision solutions that meet the diverse needs of industry and end-user alike. Designed specifically for factory floor deployment, our innovative vision appliances and smart cameras offer scalable solutions that satisfy a wide range of application needs, from positioning robotic handlers to complete assembly verification.

DALSA vision solutions are equipped with two distinct styles of application interface to accommodate the differing needs and experiences of end-users:
- **Sherlock™** software offers experienced vision integrators additional flexibility, together with a rich suite of capabilities and options that can be applied to the most challenging of applications. Sherlock provides advanced functionality in terms of scripting, customization and support for 3rd-party tools.
- **iNspect™** software allows experienced users and 1st-time adopters alike to setup and deploy solutions with little or no prior machine vision knowledge. iNspect's logical setup is built from the experience and algorithms that have been put to the test over the course of many years.

**READY FOR ANY CHALLENGE**
DALSA’s vision systems are available in a range of cost-effective models to satisfy a broad variety of user requirements – from single 640 x 480 standard camera configurations to high-performance multi-camera models with 1600 x 1200 color resolution. In addition, Vision Appliances support DALSA line scan technology to address challenging large format or cylindrical vision applications.
**Single Point Inspection** - BOA is a highly integrated vision system in a compact smart camera format engineered specifically for factory floor automation. With application software embedded, BOA offers new and experienced users alike, an easy-to-deploy, cost effective vision solution for single point industrial inspections.

### BOA FEATURES
- Tightly integrated vision system
- Easy to use Embedded Software
- Multiple Processing Engines
- Factory Communications
- Industrial Enclosure
- 360° Direct Mounting
- Factory Style Connectors
- Ideal for single point inspections

### EMBEDDED SOFTWARE
BOA comes bundled with DALSA's intuitive and versatile iNspect application software. iNspect offers a complete set of field proven tools that can be readily applied to a multitude of inspection tasks, such as positioning, identification, measurement, verification and flaw detection. The iNspect development interface and runtime engine is embedded within the BOA camera.

### Full Range of Vision Capabilities
DALSA vision solutions provide a full suite of vision tools and capabilities for performing the following inspection tasks:

- **01. POSITIONING**
  - Guide robotic handlers or adjust vision tools for part movement

- **02. IDENTIFYING**
  - Identify product for verification or traceability

- **03. VERIFYING**
  - Verify parts for correctness, assembly or packaging

- **04. MEASURING**
  - Measure parts for dimensional accuracy

- **05. FLAW DETECTING**
  - Check part surfaces for scratches and other defects
DALSA’s custom solutions team offers design and manufacturing expertise and engineering services for the most challenging vision applications, including cameras, data acquisition, optical measurement systems and image processing.

Concept to Completion
DALSA offers specialized imaging technologies with in-house capabilities for all areas of development including product design, wafer fabrication, support electronics design, flexible hardware options, customized software, production, and complete technical support.

We have been successfully providing custom and semi-custom solutions for over 25 years in a myriad of highly demanding applications.

Our technologies, installed in imaging products of Fortune 500 companies, have provided performance advantages that deliver breakthrough results to benefit demanding and highly competitive vision applications.

Markets
- Medical X-ray
- Industrial X-ray
- Flat Panel Display
- Scientific
- Mask and Wafer
- Earth Observation/Mapping
- Defense and Security
- Electronics
- Non Destructive Testing

Capabilities
- 1k to 17k line scan / Time Delay and Integration (TDI) with massively parallel outputs for high speed
- Water scale CCD and CMOS
- Down to 2.4 µm CCD pixels
- Up to 60 MHz per output
- Up to 1 Gigapixel per second
- High dynamic range and low noise
  - single chip and panchromatic technology
  - multispectral technology including various spectral responses and different line rates for different zones
- Backside thinning for CCD and CMOS devices
  - High density packaging including SMT for more than 300 pins
    - in-package cooling
    - specialized antiblooming
    - rolling and global shutter
    - stitching
    - buffering and tiling
- Imaging technologies for extreme environments
- High speed serialized data interfaces up to 10 Gigabits per second
- Remote head, stackable and single board camera designs
- High speed serialized data interfaces up to 10 Gigabits per second
- In-camera image sensor cooling
  - Image processing and pattern recognition application software
  - Fiber optics and copper based data interfaces
  - MIL STD environment tests

Digital Cameras
Custom CCD and CMOS features include:
- Line scan cameras from 1k to 17k
- TDI cameras from 1k to 12k
- Area scan cameras from 1 Megapixel to 48 Megapixels
- Camera with 700 KHz line rate
- 12-bit dynamic range at 1.2 Gigapixels per second
- High speed laser bar design
- Remote head, stackable and single board camera designs
- High speed serialized data interfaces up to 10 Gigabits per second
- In-camera image sensor cooling
  - Image processing and pattern recognition application software
  - Fiber optics and copper based data interfaces
  - MIL STD environment tests

Custom Solutions Overview
Image Sensor Technology