2011 IEI Capture Card Solutions
Kenny Jan
The latest HDC solutions are capable of compressing and decompressing full HD video (1920×1080) in real-time using the H.264 codec. The products enable recording, playing, and transmitting HD video with high-definition quality on devices such as digital video cameras, home network devices, industrial broadcasting devices, and surveillance cameras.

IEI IVC series provides standard-definition (SD) video resolution with standard or MP3 audio capture capability which provides better quality.

### H.264 Hardware Compression/Raw Video Solution
Supports high definition video resolution up to 1920 x 1080

<table>
<thead>
<tr>
<th>HDMI Interface</th>
<th>DVI Interface</th>
<th>SDI Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDC-304E</td>
<td>HDC-401</td>
<td>HDC-502E</td>
</tr>
<tr>
<td>HDC-302E</td>
<td>HDC-401E</td>
<td>HDC-501ER</td>
</tr>
<tr>
<td>HDC-301E</td>
<td>HDC-402E</td>
<td></td>
</tr>
<tr>
<td>HDC-301</td>
<td>HDC-401ER</td>
<td></td>
</tr>
</tbody>
</table>

### SDI Interface
- HDC-502E
- HDC-501ER

### Software Compression Solution
Supports standard definition video resolution up to 720 x 480 NTSC/ 720 x 576 PAL

**PCI type**
- IVC-T604
- IVC-T608
- IVC-168G
- IVC-268G

**PCIe type**
- IVCE-C604
- IVCE-C608

### High Definition Solutions
- HDMI to SDI
- SDI to HDMI
- *SDI extender

### Standard Definition Solutions
- PCIe type
  - IVCE-C604
  - IVCE-C608

### Long Distance High Quality Extension Solution
- SDI Interface
  - HD-SDI-BOX
- HDMI to SDI
- SDI to HDMI
- *SDI extender
HD Video Capture Solutions
Quick review on HD vs. SD
Quick review on HD vs. SD

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High-Definition Compression Capture Card

**Benefit**
Real time compressed files for better storage usage, cost savings and transmission rates. Best media quality HD video and audio can be provided with huge file storage capacity. With IEI HDC hardware compression function, Uncompressed Full HD video will be 373 MB/sec

\[(1920 \times 1080 \times 3 \times 60 \text{ frame/sec.} = 373.248 \text{ MByte})\]

Compressed video encoding bit rate range from 30 Mbps = 3.75 MB to 2 Mbps = 0.25 MB

The compressed file size compared to the uncompressed one is up to **1492:1**

<table>
<thead>
<tr>
<th>Un-compressed</th>
<th>Compressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encoding Bit Rate</td>
<td>373 MB</td>
</tr>
<tr>
<td>1 TB HDD capacity</td>
<td>0.75 hr</td>
</tr>
<tr>
<td>30-minute Full HD Video Recording</td>
<td>671 GB</td>
</tr>
</tbody>
</table>

Take 30-minute Full HD video recording as an example. The uncompressed video is 671 GB, while the compressed video encoding with 0.25 MB (2Mbps) bit rate is only 450 MB.

Each 120 minutes 1080p movie storage cost difference $300 VS $30

3 TB HDD (cost $300) space requirement VS 30 GB (cost $30) with compressed file

Size does matter

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High-Definition Compression Capture Card

Main difference between Hardware compression and Software compression Capture Card:

**Hardware compression**

1. Data source
2. Data compressing by IEI HDC capture card
3. Compact data size stored in HDD

**Low System loading**

**Software compression**

1. Data source
2. Data compressing by PC
3. Compact data size stored in HDD

**High CPU loading requirement**
High-Definition Compression Capture Card

**H.264 Hardware Compression Solution**
IEI HDC series products are designed with FUJITSU Codec IC MB86H46 solution which is capable of compressing and decompressing full HD video (1920 x 1080) in the H.264 format in real-time.

**Main Features**
- Supports high-definition 1080p, 1080i, 720p, 480p and 480i video inputs
- Supports video and audio capture from all kinds of HD devices
- Edit and playback captured files on computer
- H.264 codec support with better storage advantages
- 8-channel hardware capture with under 10% CPU loading
- HDMI output port with hardware decoding for external HDMI monitor.
- PCI and PCIe interfaces for different system configurations
High-Definition Compression Capture Card

**Marketing Application**
DVI, VGA, HDMI or SDI video source for Security, Video Editing, Gaming, Industrial

**Post Game Analysis, Contest Record**
HD Video Recording

- PC
- SDI Camera
- HDMI Camera
- DVI/VGA
- HDMI

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High-Definition Compression Capture Card

Fast HD multimedia video/movie BD authoring

Before

Preview after video edit

Encode target video format

BD author and burn

With powerful CPU and GPU, and take very long time

Real-time full HD preview function is supported by Apple Final Cut and Cyberlink PowerDirector

Fast way

Preview after video edit

Real-time h.264 encoder

You save half of process time

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High-Definition Raw Video Capture Card

Example: The Epitaxial System.
The high quality and more thin wafer improvement.

Real time feedback and adjust the process parameters

Process analytic for silicon growth

SDI camera
Low latency
HD video
Long Distance High-Definition Compression Solution

Nowadays, more and more equipment is equipped with SDI output for the television studios and other broadcasters application. SDI is a high capacity interface used as a way of exporting uncompressed digital video in real time. That makes ideal for live feed productions (such as a live TV show), as well as for editing and monitoring video at the highest possible quality. Since SDI is designed primarily for professional use, it is also compatible with a variety of video devices found in broadcast studios, including monitors, tape decks and switchers. SDI exports uncompressed SD and HD video over a single cable. While the data rate of HDV1080i footage recorded to tape, after undergoing compression, is 25mbps, the data rate for direct SD-SDI video output reaches 270Mbps. The standard data rate for HD-SDI is an astonishing 1.485Gbps.
Long Distance High-Definition Compression Solution

Long Distance and High Quality Capture Card

SDI (Serial Digital Interface) is a family of video interfaces used for broadcast-grade video. A related standard known as high-definition serial digital interface (HD-SDI) provides a nominal data rate of 1.485 Gbit/s. IEI SDI products HDC-502E is design with 2 channels SDI input, 2 channels SDI loop through and 1 channel SDI output for high quality and long distance signal transmission through a 100 m (HD-SDI)/ 300 m (SD-SDI) coaxial cable without compression with no data loss for professional studio, broadcast and transportation video applications.

<table>
<thead>
<tr>
<th>Name</th>
<th>Bitrates</th>
<th>Video Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD-SDI (300 meters)</td>
<td>270 Mbit/s, 360 Mbit/s, 143 Mbit/s, 177 Mbit/s</td>
<td>480i, 576i</td>
</tr>
<tr>
<td>HD-SDI (100 meters)</td>
<td>1.5 Gbit/s, 1.5/1 Gbit/s</td>
<td>720p, 1080i</td>
</tr>
</tbody>
</table>

How high is 300m?

100 m or 300 m coaxial cable connection
Long Distance High-Definition Compression Solution

High-definition video recording has become a trend in industrial surveillance. The HD-CCTV camera with SDI interface is capable of longer distance transmission than analog and IP cameras. The most important benefit of the SDI interface is that it can transmit high-definition 1080p video directly through the coaxial cable without a network cable replacement. In other words, users can enjoy 1080p HD video using the existing analog system without any upgrades or additional equipment.

Using SDI for security allows transmission of 720P and 1080P resolution over coaxial cable.

High-Definition DVR by HDCCTV without IP setup.
Real-Time video without latency in raw data mode.
Long Distance and High Quality BOX

The HD-SDI-BOX kit, combining the HD-SDI-BOX-M (Master) and the HD-SDI-BOX-S (Slave), provides a high-definition serial digital interface (SDI) for long distance signal transmission. With the HD-SDI-BOX kit, the HDMI or VGA video signal can be transmitted directly through a 100 m coaxial cable without compression. The HD-SDI-BOX kit also supports touch-screen remote control. The touch-screen remote control is linked through the RJ-45 Cat5 cable and RS-232 cable.

HD / SD media source input

Video In HDMI/ VGA

HD-SDI-BOX kit

Master

Slave

Slave

Slave

HD display

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Long Distance High-Definition Compression Solution

Combining HDC capture and HD-SDI box for marketing application
Long Distance High-Definition Compression Solution

► Marketing Application
Using one HD-SDI-BOX Master and two HD-SDI-BOX Slave systems to connect to PC and display device for up to 200 m long distance signal transmission. The user can extend the connection distance by adding more HD-SDI-BOX Slave systems. Adding one HD-SDI-BOX Slave system can extend 100 m ~ 300 m for HD or SD video quality.

Applications

Shopping mall digital signage

Airport information

Restaurant video

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Market Coverage

**Intelligent Transportation Systems (ITS)**
- Providing timely information on highway traffic conditions is a major function of intelligent transportation systems (ITS), and video surveillance systems are critical tools for ITS to monitor and control any emergency evacuation event.
- The toll road payment stations process large numbers of micro transactions. The surveillance system minimizes fraud by recording all transactions including those carried out by potential gatecrashers.

**Automotive Video Surveillance**
Automotive video surveillance is now widely used to monitor vehicle interiors on public transportation systems to ensure the safety of the onboard passengers. Automotive video surveillance systems can record the interior of train, cars and buses and can also be adopted in police vehicles to monitor patrol activity.

**Banking Security System**
In a bank, the surveillance system easily monitors a teller line and automated teller machine transactions. Bank surveillance systems can also record robberies, unauthorized withdrawals, and other disputed transactions.

**Building, Airport, Road Surveillance System**
Video surveillance has emerged as a vital technology in the war against terror. Video surveillance enables the easy identification of culprits behind terrorist bombings. As a result, since 911, governments around the world have started to leverage high-performance surveillance equipment in their efforts to protect their country and people from terrorist attacks.

**Industrial Automation**
Latest Supervisory Control And Data Acquisition (SCADA) systems adopt video capturing technologies to collect factory data and thereby provide operators and supervisors access to real-time data and video feeds enabling them to make increasingly accurate assessments faster.
Standard Definition Compression Capture Card

Introduction

The world has seen increasing demand for security applications, and the video surveillance system has been a popular security tool for years. Security cameras are an everyday occurrence, and chances are, you’re used to watching yourself walk into a store on a security monitor. Banks and retail stores have come to depend on the protection provided by video surveillance. Digital technology have made video surveillance more flexible and easy to use than ever, and allow you to create the security system that conforms exactly to your needs.

<table>
<thead>
<tr>
<th>2011 New Solution</th>
<th>Capture Chip</th>
<th>4 Channels</th>
<th>8 Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI Slot</td>
<td>Techwell TW6816</td>
<td>IVC-T604</td>
<td>IVC-T608</td>
</tr>
<tr>
<td>PCle Slot</td>
<td>Techwell TW6864</td>
<td>IVC-T604</td>
<td>IVC-T608</td>
</tr>
<tr>
<td></td>
<td>Conexant CX25850</td>
<td>IVC-C604</td>
<td>IVC-C608</td>
</tr>
<tr>
<td></td>
<td>Conexant CX25853</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2010 Solution</th>
<th>Capture Chip</th>
<th>4 Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCI Slot</td>
<td>Techwell TW6802/6805</td>
<td>IVC-168G</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IVC-268G</td>
</tr>
<tr>
<td></td>
<td>Conexant BT878A</td>
<td>IVC-100G</td>
</tr>
<tr>
<td></td>
<td>Multiplexer AT2041</td>
<td>IVC-8371P</td>
</tr>
<tr>
<td>PCle Slot</td>
<td>Techwell TW6802/6805</td>
<td>IVC-268G</td>
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<tr>
<td></td>
<td>Conexant BT878A</td>
<td>IVC-8784</td>
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<td>PCI-104</td>
<td>Conexant BT878A</td>
<td>PM-1056</td>
</tr>
<tr>
<td></td>
<td>Multiplexer AT2041</td>
<td>PM-1059</td>
</tr>
</tbody>
</table>

2011 New feature

1. Single card with 8 channels capture up to 128 channels.
2. Direct PCle bus with better bandwidth flow.
3. Better power consumption.
4. Real time video/audio output for real time monitoring.
5. MP3 quality audio capture
Multiple Card with Digit LED Card ID Support

One Digit LED for Card Identification (ID)
Because the IEI IVC series support multiple IVC cards, users need to know which card is related to which device name in the Device Manager of Windows 7. Each IVC card provides one digit LED to show its ID (identification), and the ID is programmed by a rotate switch. The IEI IVC SDK also provides an application programming interface (API) to get device name and the demo application software shows how to display device names on screen. The advantages are for ease of maintenance and debugging. When a display channel malfunctions, the users can quickly find out which IVC card should be checked for error via the device name and LED ID.

Multiple Card Support
The IEI IVC series are designed to support multiple IVC cards in a system, its driver can recognize and support multiple IVC cards plugged into a system. The limitation of how many IVC cards can be plugged into a system is dependent on system resources such as CPU performance, interface bandwidth, and number of available IRQs.

<table>
<thead>
<tr>
<th>Card Number</th>
<th>Card ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>11</td>
<td>A</td>
</tr>
<tr>
<td>12</td>
<td>B</td>
</tr>
<tr>
<td>13</td>
<td>C</td>
</tr>
<tr>
<td>14</td>
<td>D</td>
</tr>
<tr>
<td>15</td>
<td>E</td>
</tr>
<tr>
<td>16</td>
<td>F</td>
</tr>
</tbody>
</table>

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IEI’s latest software compressive capture (IVC series) provides a multiple card reset cascade function. In the event of system failure, the system can be restored through an external hardware reset button.

<table>
<thead>
<tr>
<th>CARD Type</th>
<th>CNa</th>
<th>CNb</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVCE-C604</td>
<td>CN4</td>
<td>CN5</td>
</tr>
<tr>
<td>IVCE-C608</td>
<td>CN4</td>
<td>CN5</td>
</tr>
<tr>
<td>IVCE-T604</td>
<td>CN2</td>
<td>CN3</td>
</tr>
<tr>
<td>IVCE-T608</td>
<td>CN4</td>
<td>CN5</td>
</tr>
<tr>
<td>IVC-T604</td>
<td>CN2</td>
<td>CN3</td>
</tr>
<tr>
<td>IVC-T608</td>
<td>CN3</td>
<td>CN4</td>
</tr>
</tbody>
</table>
Multiple Zones Real Time Monitoring

Central control room
System monitor and control with video/audio capture

Local security site
Real time monitoring with video and audio

IEI video capture card is capable of video and audio output for second location real time monitoring. Using this function, local on site monitoring can focus on capturing video and audio with no need to operate system control. Local channel switch can be assigned by the system administrator or switch by GPIO module.
Standard Definition Compression Capture Card

Benefits
The software compression card is used to transfer analog NTSC/PAL signal to digital raw data signal. Uncompressed raw data that can provide better video quality without distortion. It is useful for real-time video surveillance applications.

The software compression process is first transferring data into PC through PCI or PCIe interface then the CPU compresses the video and stores it in the HDD. Since compression and decompression are handled by the CPU, the software compression card needs a more powerful hardware system.
**4-Bits GPIO port support**

The IEI VIOCARD-GPIO is an optional card providing a 4-bits alarm input and 4-bits alarm output function with normal open relay. The card is compatible with IVC software compressive capture for connecting to external I/O detective devices.

<table>
<thead>
<tr>
<th>CARD Type</th>
<th>CNx</th>
<th>CNy</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVCE-C604</td>
<td>CN3</td>
<td></td>
</tr>
<tr>
<td>IVCE-C608</td>
<td>CN3</td>
<td>CN2</td>
</tr>
<tr>
<td>IVCE-T604</td>
<td>CN1</td>
<td></td>
</tr>
<tr>
<td>IVCE-T608</td>
<td>CN3</td>
<td>CN2</td>
</tr>
<tr>
<td>IVC-T604</td>
<td>CN1</td>
<td></td>
</tr>
<tr>
<td>IVC-T608</td>
<td>CN1</td>
<td>CN2</td>
</tr>
</tbody>
</table>
Mini PCIe Software Compress Card with Conexant Solution (8 D1)

IVCME-C608-R10

A/V Input
8 Video
8 Audio

#1 GPIO
4 DI
4 DO

#2 GPIO
4 DI
4 DO

Top

Bottom

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Benefits of new generation capture cards

Conexant 8 CHANNELS
- New chip: Much lower power consumption
- DirectShow: easy to develop the SW
- 5.3W

Techwell 8 CHANNELS
- Old chip: Much less the space requirement
- DirectDraw: lower CPU utilization
- 2.97W

Conexant
- Old chip: 7.8W
- New chip: 5.3W

Techwell
- Old chip: 12W
- New chip: 2.97W
# Standard Definition Compression Capture Card

## How to choose Conexant and Techwell Solution

<table>
<thead>
<tr>
<th>TECHWELL</th>
<th>TECHWELL</th>
<th>CONEXANT</th>
<th>TECHWELL</th>
<th>CONEXANT</th>
<th>TECHWELL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW6816</td>
<td>TW6816</td>
<td>CX25850</td>
<td>TW6864</td>
<td>CX25853</td>
<td>TW6868</td>
</tr>
<tr>
<td>IVC-T604</td>
<td>IVC-T608</td>
<td>IVCE-C604</td>
<td>IVCE-T604</td>
<td>IVCE-C608</td>
<td>IVCE-T608</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Bus</th>
<th>PCI</th>
<th>PCIe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video input</td>
<td>4 Channels</td>
<td>8 Channels</td>
</tr>
<tr>
<td>Frame rate</td>
<td>120/100 IPS</td>
<td>240/200 IPS</td>
</tr>
<tr>
<td>Video input format</td>
<td>NTSC/PAL/SECAM</td>
<td>NTSC/PAL/SECAM</td>
</tr>
<tr>
<td>Video Format Auto Detection</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Video output</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Audio output</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Audio Sampling rate</td>
<td>8/16/32/44.1/48KHz</td>
<td>8/16/32/44.1/48KHz</td>
</tr>
<tr>
<td>Static Power consumption (Hardware)</td>
<td>1.1W</td>
<td>2.2W</td>
</tr>
<tr>
<td>Dynamic Power consumption</td>
<td>8.8W</td>
<td>15.4W</td>
</tr>
<tr>
<td>CPU usage (Preview only)</td>
<td>3%</td>
<td>6%</td>
</tr>
<tr>
<td>Driver for Windows 32/64</td>
<td>Directdraw</td>
<td>Directdraw</td>
</tr>
<tr>
<td>Driver for LINUX 32/64</td>
<td>V4L2</td>
<td>V4L2</td>
</tr>
</tbody>
</table>
Video Capture Software
IEI SDK Software support

IEI provides complete software solutions such as device drivers and software development kit (SDK), the flexible open architecture allows easy integration of cameras, video signal processing, storage, and video management/security.

- **SDK Install**
- **HDC series demo AP**
- **Video capture and preview video**
- **Encode setting**
  - Video input format
  - Output file saving location
  - Video output bitrate
  - Rate control (CBR/VBR/CVBR)
- **Decode setting**
  - Video input format
  - Input file name / path

Support up to eight channels input
IEI provides two demonstration application programs for different solutions: Cview AP is for Conexant solution and Tview AP is for Techwell solution. The program demonstrates the following functions:

- Video and audio capture. Video and audio data recording to AVI file. Testing of device I2C and GPIO ports. Channel parameters configuration.

**TView Demo AP introduction**

- **Properties setting**
- **Display mode**
- **Image functionality setting**
CView Demo AP introduction

Recording setting

Properties setting

Display mode

Video information

Image functionality setting

Other functionality setting
Properties

Main Functions
- Stop
- Pause
- Start

Display Mode
- Single channel
- Four channels
- Nine channels

Other functionality setting
- Audio recording
- Flip
- Mirror
- Snapshot
- Full screen

Camera information
- Video output resolution setting

Video format
- Y422
- Y411

Video Standard
- NTSC
- PAL

Camera setup
- Record setup
- Color control
- AGC/VG

It is the function introduction for each bottom
Product Roadmap
High Definition Capture Card Naming Rule

HDC series

HDC — A B C D E

High Definition Capture 1920 x 1080

A
3: HDMI interface
4: DVI/VGA interface
5: SDI interface

BC
01: 1 input channel
02: 2 input channel
04: 4 input channel

D
E: PCIe bus
X: PCI bus

E
R: Uncompressed

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Standard Definition Capture Card Naming Rule

**IVC series**

**IEI Video Capture**
720 x 480

**IVC X X – A B C D E**

- **A**: Techwell
- **B**: 6: Software compressive, 5: Hardware compressive
- **C**: Conexant
- **D**: CD
  - 04: 4 channel input
  - 08: 8 channel input
- **E**: E: PCIe interface, PM: PCI-104, ME: Mini PCIe
- **XX**: Default, P: Plus

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High Definition Hardware Compressive Capture Card

HDC-304E
HDMIx4 input
HDMIx1 output

HDC-302E
HDMIx2 input
HDMIx1 output

HDC-301
HDMIx1 input
HDMIx1 output

HDC-401
DVIx1 input
DVIx1 output

HDC-301E
HDMIx1 input
HDMIx1 output

HDC-401E
DVIx1 input
DVIx1 output

HDC-402E
DVIx2 input
DVIx2 output

HDC-502E
SDIx2 input
SDIx1 output
SDI loop throughx2

HDC-501ER
SDIx1 input
SDIx1 output
SDI loop throughx1
Uncompression

HDC-401ER
DVIx1 input
DVIx1 output

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Software Compressive Capture Card

Input Channel

4 Channels

8 Channels

MP

Planning

IVCE-C608
Conexant CX25853
PCIe/8CH/240fps

IVCE-C608P
Conexant CX25853
PCIe/8CH/240fps

IVCME-C608
Conexant CX25853
PCIe/8CH/240fps

IVCME-C608P
Conexant CX25853
PCIe/8CH/240fps

IVC-268G
Techwell TW6805
PCI/4CH/120fps

IVC-8784
Conexant BT878
PCIe/4CH/120fps

IVCE-C604
Conexant CX25850
PCIe/4CH/120fps

IVCE-C604P
Conexant CX25850
PCIe/4CH/120fps

IVC-100G
Conexant BT878
PCI/4CH/30fps

IVC-200G
Conexant BT878
PCIe/4CH/120fps

IVC-168G
Techwell TW6805
PCI/4CH/30fps

IVC-268G
Techwell TW6805
PCIe/4CH/120fps

IVC-T604
Techwell TW6864
PCI/4CH/120fps

IVC-T604
Techwell TW6864
PCIe/4CH/120fps

PM-1056
Conexant BT878
PCI-104/4CH/30fps

IVCPM-T604
Techwell TW6816
PCI-104/4CH/120fps

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Standard Definition Hardware Compressive Capture Card

- **Input Channel**
- **Channels**
  - 8 Channels
  - 4 Channels

- **MP 2011/Q2**
- **Developing**
  - IVCE-T508
    - Techwell
    - TW5864x2 + bridge
  - IVC-T504
    - Techwell
    - TW5864x1
  - IVCME-T504
    - Techwell
    - TW5864 + bridge
  - IVCE-T504
    - Techwell
    - TW5864 + bridge
  - IVCPM-T504
    - Techwell
    - TW5864x1

- **Planning**
  - IVC-8371P
    - PentaMicro
    - AT2041 x1
  - PM-1059
    - PentaMicro
    - AT2041 x1

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Thanks for your attention!