

4K / UHDTV - Conversion

Description

XFM50-MPCUHD-A is a multi purpose converter solution. It comprises a powerful and flexible set of functionality especially selected to support high level processing for high resolution UHDTV video material.

The module is part of the XFM50 modular system family and uses the signal processing platform XFM50-SPC.

I/O Interfacing

Real time processing of UHDTV video material pushes the data rate up to 12 GBit/sec, depending on the format. The module supports and converts between

- QUAD-LINK (4 x 3G, 4 x 1.5G) copper transmission
- DUAL-LINK (2 x 6G, 2 x 3G, 2 x 1.5G) copper transmission
- Fiber interfacing in various configurations

Formats

The module supports the UHDTV-1 resolutions 3.840 x 2.160 and 4.096 x 2.160. 3G, HD and SD signals are also supported.

It handles mapping structures given by SMPTE 2036-3 as well as Quad split with 4:2:2 and 4:4:4 sampling.

Supported Functions

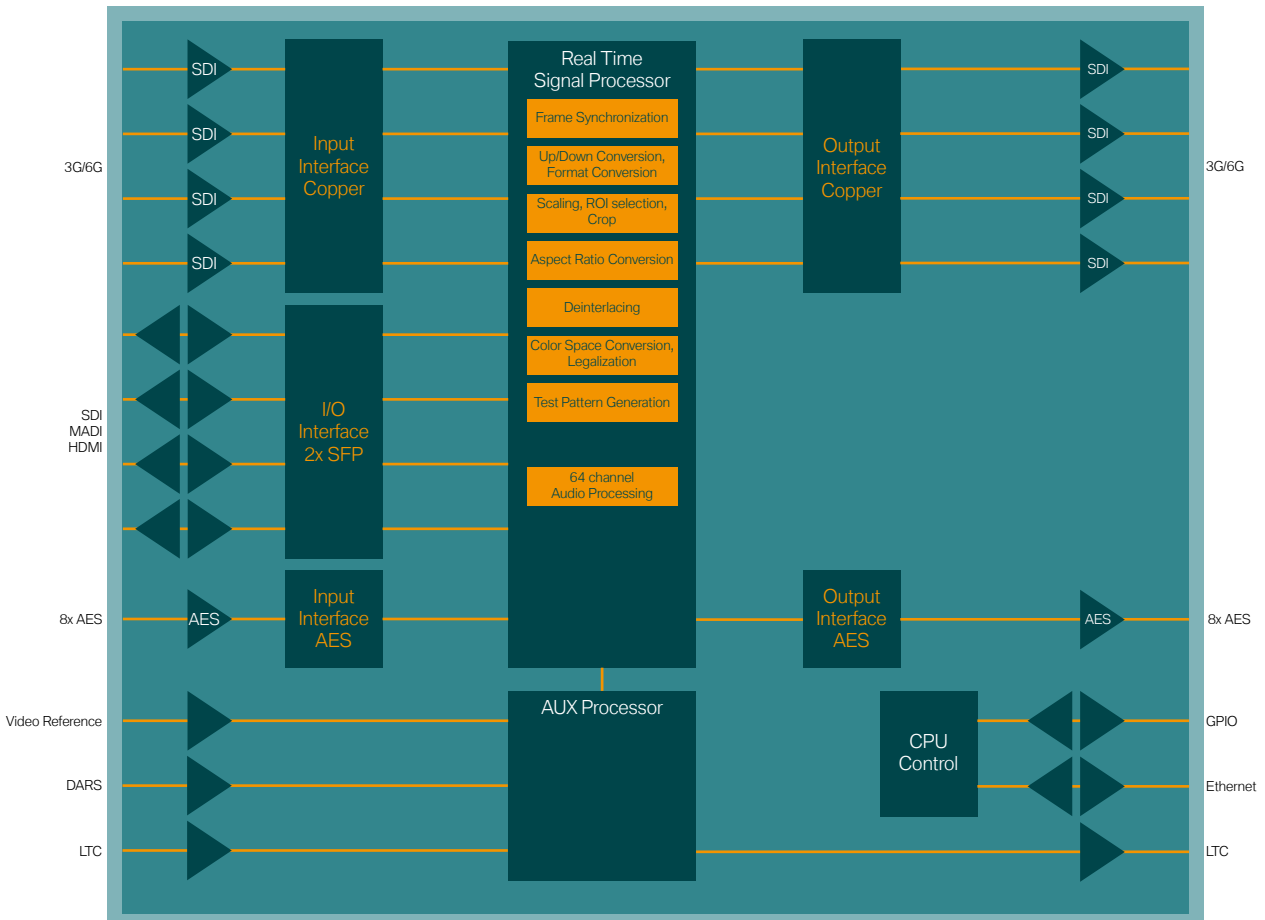
- Downconversion UHDTV > HD 1080i, 720p, SD
- Downconversion UHDTV > HD 1080p
- Upconversion SD, HD 720p, 1080i > UHDTV
- Upconversion HD 1080p > UHDTV
- Color Space conversion and Legalizing
- Scaling
- Region of Interest (ROI) selection
- Cropping
- Frame Synchronisation, Genlock
- AES Audio embedding / deembedding
- Test pattern
- Diagnosis
- GPI

UHDTV related processing

The primary purpose of XFM50-MPCUHD-A is bridging between the different Ecosystems, like common HD and SD formats and UHDTV. It therefore comes with unique features which ease integration of UHDTV in common workflows.

As an example, Region of Interest selection chooses one or two HD or SD sub-images from an UHDTV image and outputs them in the desired format.

Functional Block Diagram



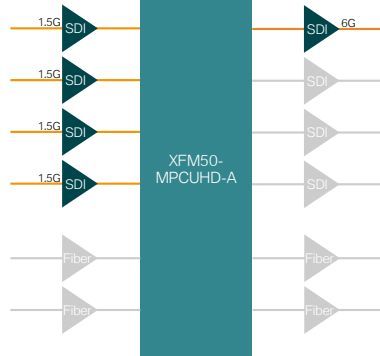
XFM50-MPCUHD-A

UHDTV / 3G / HD / SD
Multi Purpose Converter

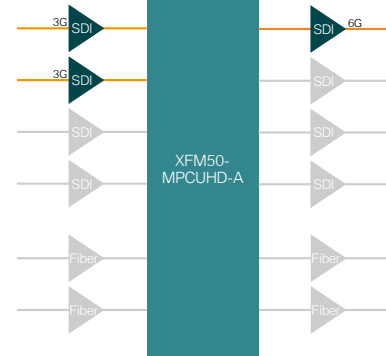
Interface Conversion Examples

One of the unique features of XFM50-MPCUHD-A processing module is the flexible conversion between any of the possible wiring variations. Some examples are shown here.

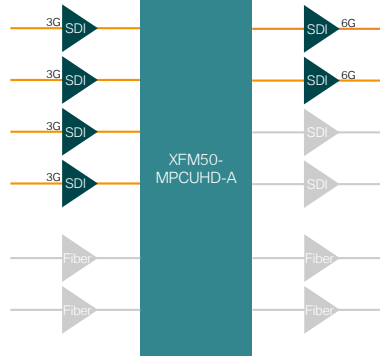
6G UHDTV-1 via 4x 1.5G ⇔ 6G UHDTV-1 via 1x 6G



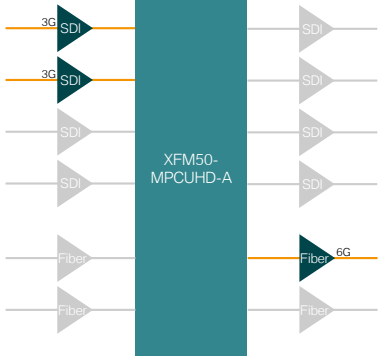
6G UHDTV-1 via 2x 3G ⇔ 6G UHDTV-1 via 1x 6G



12G UHDTV-1 via 4x 3G ⇔ 12G UHDTV-1 via 2x 6G



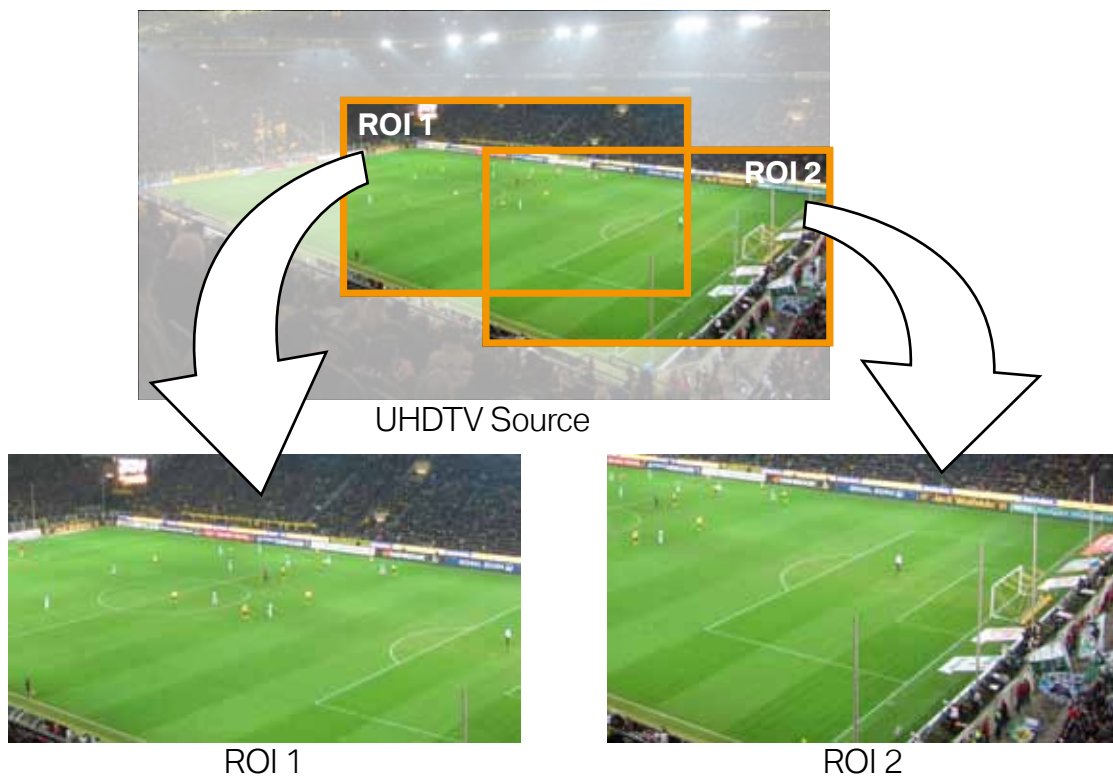
6G UHDTV-1 via 2x 3G ⇔ 6G UHDTV-1 via 1x 6G Fiber



Region of Interest (ROI) Selection

XFM50-MPCUHD-A supports to use the enhanced resolution of UHDTV to shoot a given scene in full view and then select one or more Regions of Interest to be used as subimages. Thanks to the high resolution of UHDTV these subimages are available in Full HD resolution, pixel by pixel without any need for scaling.

This method enhances the workflow as it is possible to select the Regions of Interest in Post Production and not while shooting the scene anymore.



Technical Data

Input

SDI 4x BNC connector
Serial Digital Component, 10 / 12 Bit,
SD / HD / 3G / 6G, single / dual / quad link

SFP 2 SFP slots, configurable as input and/or output
Genlock Trilevel / blackburst input

AES 8 balanced inputs via D-Sub connector

Output

SDI 4x BNC connector
Serial Digital Component, 10 / 12 Bit,
SD / HD / 3G / 6G, single / dual / quad link

SFP 2 SFP slots, configurable as input and/or output
AES 8 balanced outputs via D-Sub connector

Video Processing

Interfacing 10 / 12 Bit

Processing 12 / 14 Bit

Colour Space ITU-R BT.601, ITU-R BT.709, ITU-R BT.2020

GPI

Connector 8-pin Terminal Block

No. of Inputs 2

No. of Outputs 2

Formats and Video Standards

Formats 4096x2160p (60, 59.94, 50, 30, 29.97, 25 Hz)
3840x2160p (60, 59.94, 50, 30, 29.97, 25 Hz)
1920x1080p (60, 59.94, 50 Hz)
1920x1080i (60, 59.94, 50 Hz)
1280x720p (60, 59.94, 50 Hz)
720x488i (59.94 Hz)
720x576i (50 Hz)

Standards ITU BT.656 / SMPTE 259M (270 MBit)
SMPTE 292M (1.485 GBit)
SMPTE 424M Level A & B-DL (2.97 GBit)
SMPTE 2036-1 (UHDTV-1)
SMPTE 435 (Quad 3G SDI)
(available formats and standards depend on options)

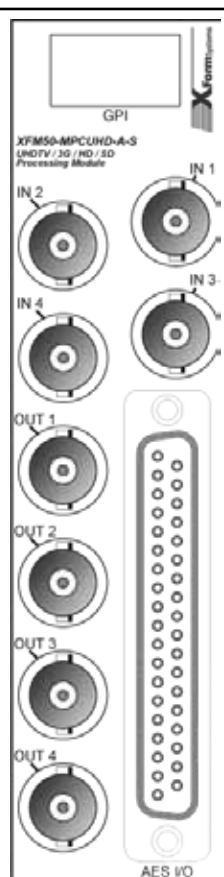
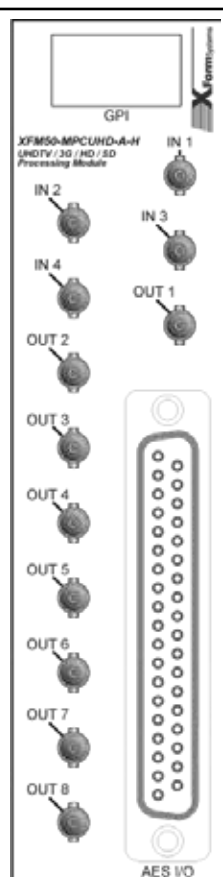
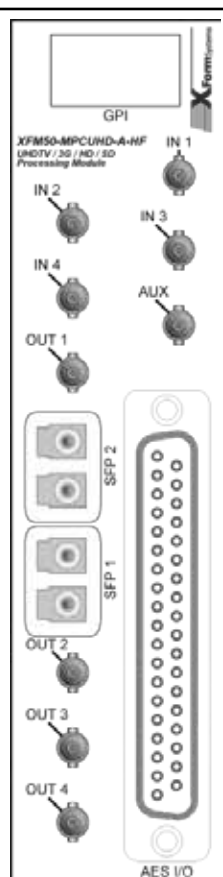
Physical

Temperature 0°C - 35°C (operation)
-20°C - 75°C (storage)

Humidity 10% - 90% non condensing

Power Requirements 16 Watts

Available I/O Panels

Name	XFM50-MPCUHD-A-S	XFM50-MPCUHD-A-H	XFM50-MPCUHD-A-HF
Layout			
SDI Inputs	4 BNC	4 HD-BNC	4 HD-BNC, 2 Fiber (SFP)
SDI Outputs	4 BNC	8 HD-BNC	4 HD-BNC, 2 Fiber (SFP)
AES Inputs	8 via D-Sub	8 via D-Sub	8 via D-Sub
AES Outputs	8 via D-Sub	8 via D-Sub	8 via D-Sub

Some facts about UHDTV

Bandwidth

The main advantages of UHDTV are greater resolution and greater color space.

This results in increasing bandwidth needs. Compared to 3G HD an UHDTV-1 signal demands a bandwidth which is four times higher, compared to 1.5G HD even eight times higher.

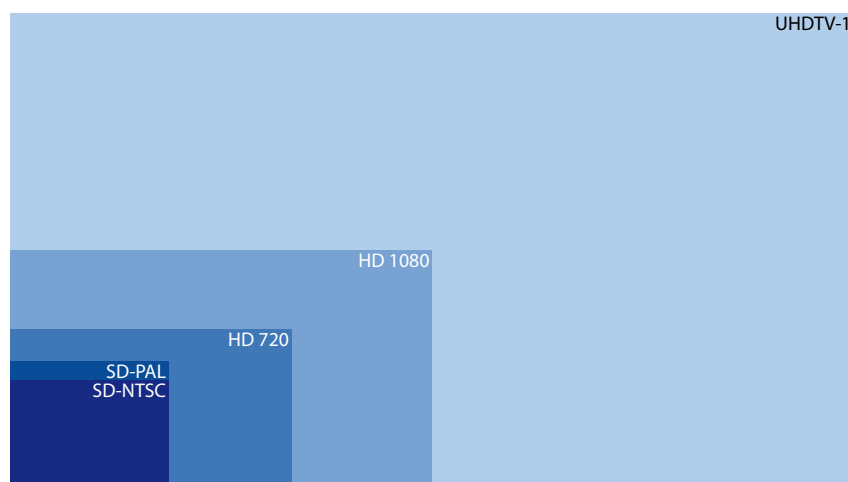
This results in a UHDTV-1 transmission with a resolution of 50, 59.94 or 60 frames per second requiring a SDI connection capable of transporting 12 GBit per second. As the SDI standard which will be able to transport such a high bandwidth on a single cable is only available as a SMPTE proposal, several standards which make use of two or more parallel cable connections have been defined.

Usual connections are Dual Link 6G or Quad Link 3G.

Image Area Overview

UHDTV-1 increases the resolution compared to Full HD in both horizontal and vertical direction by a factor of two. Only progressive formats are supported which means that no deinterlacing is required when working in UHDTV.

This figure illustrates the image sizes of common standards used in broadcast and TV production environments.



UHDTV, HD & SD Resolution and Bandwidth Overview

This table gives a short overview which bandwidth is needed for which format and which SDI connection is able to handle it.

Pixels per Line	Lines per Frame	Frames per Second	1.5G SDI	3G / 2x 1.5G SDI	6G / 2x 3G / 4x 1.5G SDI	12G / 2x 6G / 4x 3G SDI	3G Fiber	6G Fiber	10G Fiber
3840	2160	60p, 59.94p	x	x	x	✓	x	x	✓
3840	2160	50p	x	x	x	✓	x	x	✓
3840	2160	30p, 29.97p	x	x	✓	✓	x	✓	✓
3840	2160	25p	x	x	✓	✓	x	✓	✓
1920	1080	60p, 59.94p	x	✓	✓	✓	✓	✓	✓
1920	1080	50p	x	✓	✓	✓	✓	✓	✓
1920	1080	30p, 29.97p	✓	✓	✓	✓	✓	✓	✓
1920	1080	25p	✓	✓	✓	✓	✓	✓	✓
1920	1080	60i, 59.94i	✓	✓	✓	✓	✓	✓	✓
1920	1080	50i	✓	✓	✓	✓	✓	✓	✓
1280	720	60p, 59.94p	✓	✓	✓	✓	✓	✓	✓
1280	720	50p	✓	✓	✓	✓	✓	✓	✓
1280	720	30p, 29.97p	✓	✓	✓	✓	✓	✓	✓
1280	720	25p	✓	✓	✓	✓	✓	✓	✓
720	488	59.94i	✓	✓	✓	✓	✓	✓	✓
720	576	50i	✓	✓	✓	✓	✓	✓	✓

