Product Description

The IP00C331 is a true 4K60Hz up/down scaler with minimal interface requirements. It features 4 input ports up to 4K60Hz each, and 2 output ports up to 4K60Hz each. This allows it to take up to four 4K60Hz sources and scale each one independently to any size and position on a composite 4K60Hz output. Its internal architecture consists of 8 up/down scaler cores plus 4 de-interlacer cores to support interlaced input on each input port. The IP00C331 also features many other high-performance functions such as 90-degree rotation, mirror-flip, PQ and HLG HDR systems (10-bit), and 3DLUT for color management. It makes use of the high-speed serial V-by-One bus interface which is only 8 lanes in order to minimize board footprint. The IP00C331 can be used as a single or dual 4K60Hz scaler, or as a 4K display controller chip supporting multiple inputs.

Features

Input (4K60Hz, 4-port)

- RGB 30bit/YUV4:4:4 30bit/ YUV4:2:0 30bit/YUV4:2:2 20bit/YUV4:2:2 10bit(BT656)
  @V-by-One 4Gbps, 8-lane 2-port
  @LV-CMOS 166MHz supporting dual (EVEN/ODD) and DDR inputs 4-port
- 4K60Hz input up to 4-port
- 4K120Hz input supported

Output (4K60Hz, 2-port)

- RGB 30bit/YUV4:4:4 30bit/ YUV4:2:2 20bit/YUV4:2:2 10bit(BT656)
  @V-by-One 4Gbps, 8-lane 2-port
- 4K60Hz dual output (all the time, fully independent)
- 4K120Hz output supported

Input & Output Image Size

- Horizontal sync signal 16,384 pixels (max) @1ch
- Horizontal image active area 2,176 pixels (max) @1ch

External Memory

DDR3-SDRAM 64bit PC1600 (4G/2G/1G x16) x4

External/Internal Sync

- Output sync is compatible only with internal signal
- Independent sync mode is available at each input & output port

Input/Output Sync/Asynchronous Behavior

- Frame rate conversion
- Tearing protection
- External force synchronization
- Genlock

De-Interlacer

- Motion adaptive filter based on Y, U, V, YUV 4:2:2
- All major cadences supported
- Low latency processing (4-port)
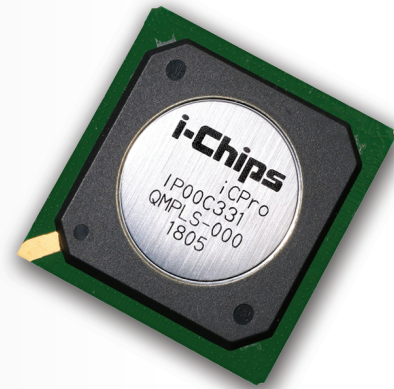
Scaler

- Zoom/shrink 6-symbol programable FIR filter (10bit/pixel)
- Embedded ROM (64set)

Noise Reduction

- 3DNR (H, V, Temporal)
- MPEG-NR (Mosquito/Block)
- Chroma error filter

Bit Map OSD

- 256 colors/High color OSD (64K colors)
- Embedded font engine (65536 words)
- Blinking and semi-transparent (4 colors OSD)
- 90-degree rotation, OSD scroll
- Serial flash to bitmap

Image Quality Control

- Color management (full color gamma)
- 3DLUT (4K60Hz 2-input supported)
- Uniformity correction (by region and per-pixel)
- Bias/Gain/Gamma correction
- H edge enhancement (9symbol) , V edge enhancement (5 to 9symbol)
- Dithering for 10 or 8 bit output

Image Manipulation

- Mirror/flip/90-degree image
- Vertical keystone
- 4-ch overlay, alpha blending, color key blending

CPU Interface

8-bit parallel/4-wire serial

xvYCC/Bt-2020

Fully supported

HDR Standard

SMPTE ST2084(PQ) and HLG both methods supported (RGB 10-bit each)
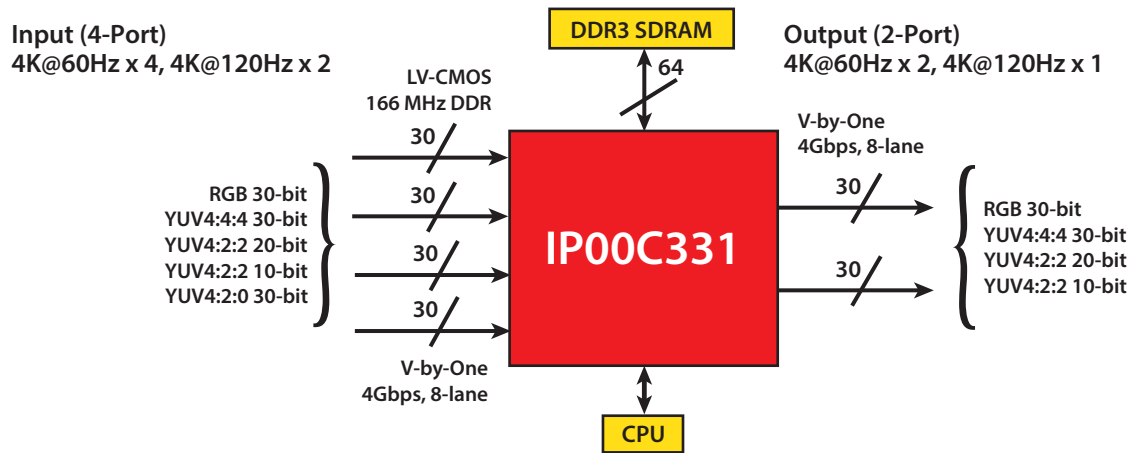
Power Supply

3.3V/1.5V/1.1V

Package
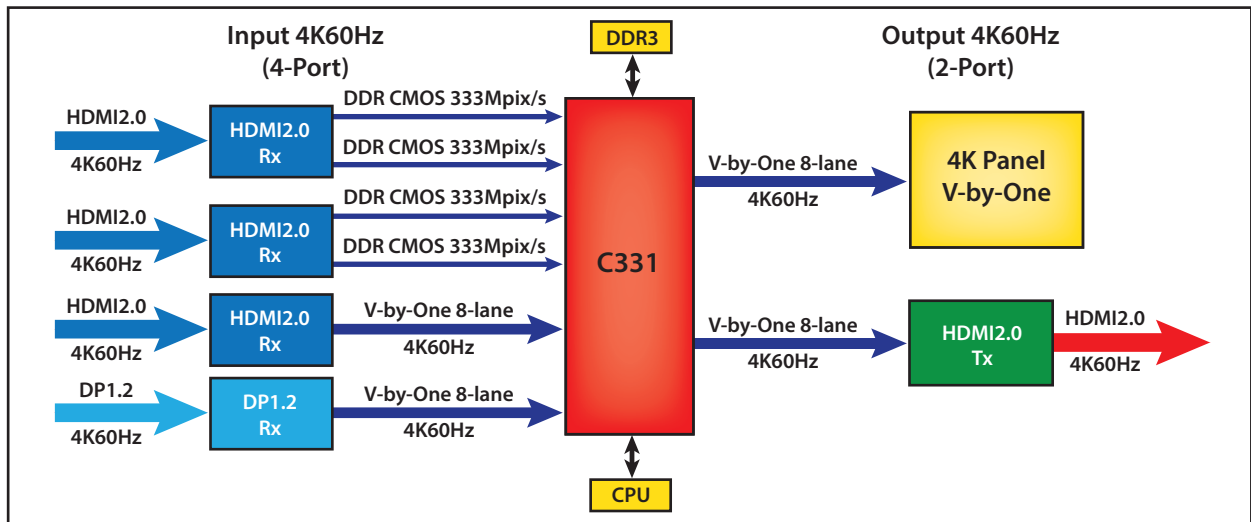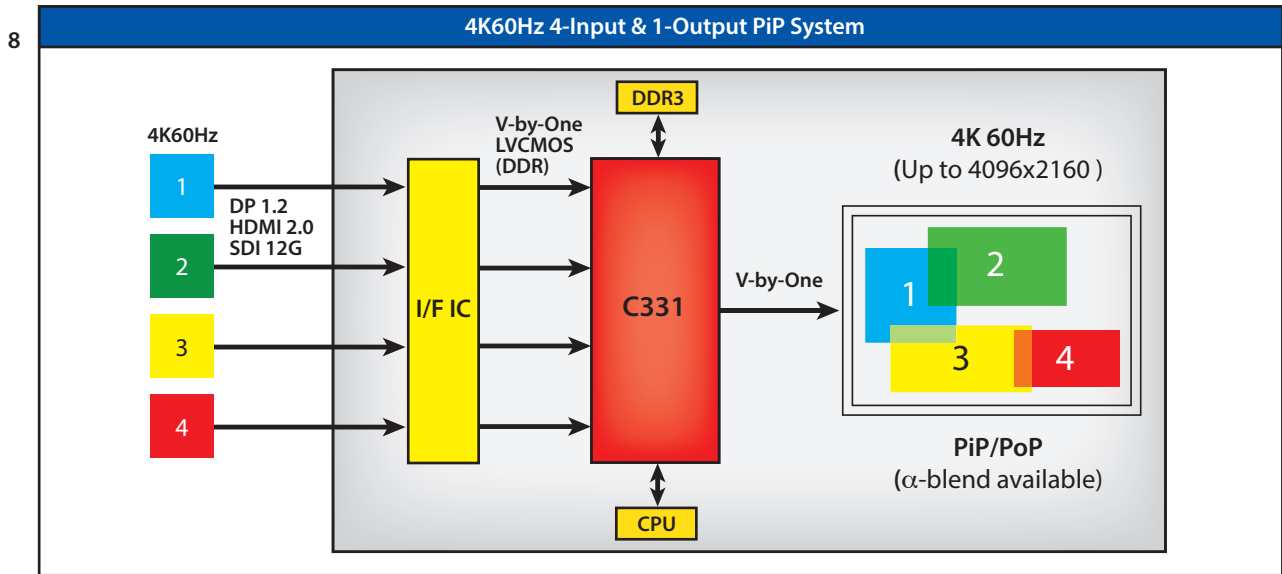
684-pin BGA (0.8mm pitch), 27mmx27mm

IP00C331   4K60Hz Quad Input 4K Multiple Input/Output De-Interlacer/Scaler LSI

IP00C331 Block Diagram

Input (4-Port)
4K@60Hz x 4, 4K@120Hz x 2

DDR3 SDRAM

Output (2-Port)
4K@60Hz x 2, 4K@120Hz x 1

LV-CMOS
166 MHz DDR

64

V-by-One
4Gbps, 8-lane

30

30

RGB 30-bit
YUV4:4:4 30-bit
YUV4:2:2 20-bit
YUV4:2:2 10-bit
YUV4:2:0 30-bit

30

IP00C331

30

30

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RGB 30-bit
YUV4:4:4 30-bit
YUV4:2:2 20-bit
YUV4:2:2 10-bit

30

V-by-One
4Gbps, 8-lane

CPU

Application Diagrams

4K60Hz 4-Input & 1-Output PiP System

4K60Hz

1

2

3

4

DP 1.2
HDMI 2.0
SDI 12G

I/F IC

V-by-One
LVCMOS
(DDR)

DDR3

C331

V-by-One

CPU

4K 60Hz
(Up to 4096x2160)

1 2 3 4

PiP/PoP
(α-blend available)

Input 4K60Hz
(4-Port)

DDR3

Output 4K60Hz
(2-Port)

HDMI2.0
4K60Hz

HDMI2.0
Rx

DDR CMOS 333Mpix/s
DDR CMOS 333Mpix/s

HDMI2.0
4K60Hz

HDMI2.0
Rx

DDR CMOS 333Mpix/s
DDR CMOS 333Mpix/s

HDMI2.0
4K60Hz

HDMI2.0
Rx

V-by-One 8-lane
4K60Hz

DP1.2
4K60Hz

DP1.2
Rx

V-by-One 8-lane
4K60Hz

C331

V-by-One 8-lane
4K60Hz

4K Panel
V-by-One

V-by-One 8-lane
4K60Hz

HDMI2.0
Tx

HDMI2.0
4K60Hz

CPU

"V-by-One" is a trademark of Thine Electronics, Inc.

For more information please visit: **www.i-chips.co.jp** or **info@i-chips.co.jp**

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