MX8870

16M PIXEL HIGH-END PROFESSIONAL CAMERA CONTROLLER

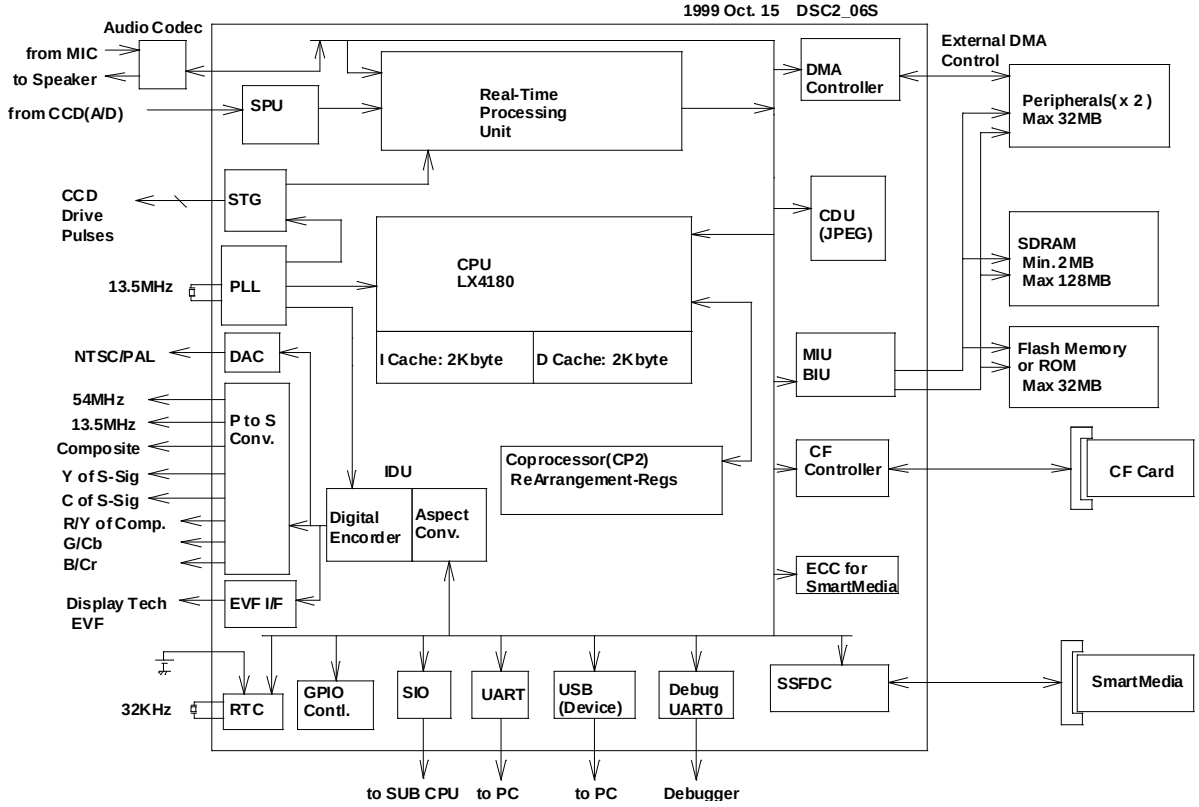
General Description

The MX8870 (DSC-2) is a general purpose LSI for Digital Still Camera application. It implements all necessary functions in hardware, but also allows maximum flexibility for customization. It provides a variety of choices for internal processing and peripheral configurations. Customer can always make the combination to fit their own application.

Overview

- Real Time Monitoring Function
- RGB bayer, RGB stripe, Complementary color filter array CCD supported
- Real-time Processing Unit (High-speed and programmable Image Processing)
- H/W JPEG Decode / Encode unit
- Compact Flash / Smart Media / SD Card / Memory Stick supported
- Displaytech's QVGA module supported
- Built in USB controller (Device Function)

Block Diagram



Application

This LSI is mostly suitable for Digital Still Camera, Scanners, Printers, Fax etc.

General Features

Items	Content
Process	0.25um
Power Supply	I/O:3.3V/2.5V, Logic: 2.5V (2 power supply)
Package	304pin CSP, 0.8 mm pitch, 19mm square
CPU	Lexra LX4180 (MIPS ISA-I) Max 90MHz (Variable speed)
Coprocessor	Picture Rotation, Format transform
Cache(I/D)	Instruction 2Kbyte / Data 2Kbyte
Ext. Flash(ROM)	Bus width x16, Max.32Mbyte
Ext. DRAM	SDRAM:Min.2Mbyte .. Max.128Mbyte x16 or x32
Ext. Peripheral	Up to 2 external devices. Bus width (x8, x16)
CCD Support	RGB Bayer, RGB Stripe/Complimentary Progressive / Interlace
CCD Size	Max 4000 pixel x 4000pixel
CCD Defect Correction	16 internal Regs, Non-limited by DMA
Internal TG	Programmable, H4096 x V4096
CCD Pre-Process	12bit input, Black Level, White Balance
Interpolation	Filter size 5x5
Edge Enhance	Filter size : 5(V)x5(H) (1 path up to H2048, Extendable)
LUT	1 x 12 to 8 bit LUT or 4 x 10 to 8 bit LUT
Linear Matrix	4x4 Color Linear Matrix before Gamma LUT
A/D	External 12bit or 10bit
Monitor Speed	CCD readout rate
Processing Speed	0.16Sec/3M pixel (Excluding read out and card write, without monitoring)
JPEG	Hardware 36MByte/Sec
VideoEncoder	NTSC/PAL
OSD Func.	4bit / Pixel (16 Colors display, blended display function)
Media I/F	Compact Flash / Smart Media / SD Card / Memory Stick supported
Display	TV, LCD, Displaytech's QVGA module supported
UART	2ch Max., Upto 230 Kbps
IrDA1.1	By external controller with DMA
USB	Built in USB (only device function)
IEEE1394	By external controller with DMA
Audio	By external Audio Codec dedicated I/F
Standby func.	3-Modes - Active, Sleep, RTC only.
RTC	Built in RTC
OS	micro ITRON and Nucleus+

Comparison with other LSI

- MX8870 (DSC-2) supports max 4000 x 4000 pixel, and RGB bayer, RGB stripe, Complementary color filter array, and Progressive or Interlace type CCD.
- Support both 16-bit and 32-bit SDRAM bus. --> Only one 1Mb x 16 SDRAM required for progressive sensors.
- Embedded 3 PLL --> Only one external crystal required for TV, USB, and CPU.

Main Functions

Monitor mode

Monitoring speed is same as CCD readout rate. Monitor image processing (interpolation, Edge Enhancement, Color space conversion, Resolution translate) is done by H/W. (If CCD read rate is 30-fps, monitoring speed is 30-fps).

Capturing mode

Processing speed is just 0.16-Sec for 3M CCD, excluding read out time and card writing time. This operation speed includes JPEG encode and interpolation, Edge Enhancement, Color Space Conversing, Re-sizing.

Display mode

Display speed is only 0.2-Sec for 3M pixel image excluding card reading time. This operation speed includes JPEG decode and Color space conversion, Recision.

Real-time Processing Unit(RPU) Function

RPU has following functions.

- Monitoring operation is same as CCD readout rate.
- Real Time capturers operation : For progressive CCD, all processing including JPEG encode is completed at just after the end of CCD readout.
- Post processing operation : After capturing the full-frame raw data, RPU can process the Interpolation, Edge Enhancement, Color Space Conversion, Re-sizing, etc. much faster than CPU operations. This operation can extend the filter size for Edge Enhancement. And also many kinds of adaptive and nonlinear processing is avaliable with RPU in very shot time.
- Improvement of the Signal to Noise ratio : There is a special circuit for improvement of Signal to Noise ratio at the multiple frames image capturing.

Real Time OS

DSC-2 supports following OS :
micro ITRON and Nucleus+

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