

DM810x 4D1, 8CIF, 16CIF DVR - Use Case Guide

ABSTRACT

This document explains the capabilities and limitations of the below use-cases of DVR-RDK

- 4D1 DVR Use-case
- 8CIF DVR Use-case
- 16CIF DVR Use-case

These use-cases are targeted for DM810x SoC from TI

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1 Overview

IMPORTANT NOTE:

All striked-out (eg ~~items~~) items are not implemented in this release.

Use-case summary

A summary of the use-cases is given below

IMPORTANT NOTE:

Performance numbers given in this section below are the required specification, actual achieved performance in this release is given in section 2 Features

Product	Description
4D1 DVR (DM8107)	Enc: 4Ch D1 30fps + 4Ch CIF 30fps + 4CH JPEG 1fps Dec: 4Ch D1 30fps
8CIF DVR (DM8107)	Use Case 1: Enc: 8Ch CIF 30fps + 8Ch QCIF 30fps + 8CH JPEG 1fps Dec: 8Ch CIF 30fps
	Use Case 2: Enc: 8Ch 2CIF 30fps Enc + 8Ch CIF or QCIF 30fps Enc + 8CH JPEG 1fps Dec: 8Ch 2CIF 30fps
	Use Case 3: Enc: 8Ch D1 15fps + 8Ch CIF or QCIF 30fps Enc + 8CH JPEG 1fps Dec: 8Ch D1 15fps
16CIF DVR (DM8107)	Use Case 1: Enc: 16Ch CIF 30fps + 16Ch QCIF 4fps (~ 2QCIF 30fps) + 16CH JPEG 1fps Dec: 16Ch CIF 30fps Use Case 2: Enc: 16Ch D1 7fps + 16Ch QCIF 30fps + 16CH JPEG 1fps Dec: 16Ch D1 7fps

* All FPS numbers are mentioned assuming NTSC input, FPS should be scaled accordingly for PAL input.

Target Applications

This use-case is targeted for the below applications

- Multi-channel Digital video recorder (DVR) on DM8107.

This use-case is NOT targeted for

- Hybrid DV
- NVR

Resolutions

NTSC / PAL Resolutions	NTSC – 30fps	PAL – 25fps
D1	704x480	704x576
VGA	640x480	640x480
2CIF	704x240	704x288
CIF	352x240	352x288
QVGA	320x240	320x240
QCIF	176x120	176x144

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HD / VESA Resolutions	
1080p	1920x1080 30/60Hz
720p	1280x720 60Hz
SXGA	1280x1024 60Hz
XGA	1024x768 60Hz

2 Features

IMPORTANT NOTE:

All Clock frequencies, FPS figures and part numbers specified below are tentative and subject to change

		4D1 DVR	8CIF DVR	16CIF DVR
System				
DM8107 Part Number		DM8107AAR11 Si Rev 1.0	DM8107AAR11 Si Rev 1.0	DM8107AAR21 Si Rev 1.0 (Spec clks of some modules are yet to be finalized)
Core Voltage		1.35V	1.35V	1.35V
System Clocks	ARM	720MHz use case set (1GHz max part spec)	720MHz use case set (1GHz max part spec)	720MHz use case set (1GHz max part spec)
	M3	240Mhz	240Mhz	280Mhz
	L3 interconnect	200Mhz	200Mhz	220Mhz
	SIMCOP	480Mhz	480Mhz	560Mhz
	DDR	533Mhz	533Mhz	533Mhz
	IVA-HD	410Mhz	410Mhz	480Mhz
	HDVPSS	200Mhz	200Mhz	240Mhz
Default U Boot config		NO	NO	YES
DDR		512MB	512MB	512MB
Linux Memory		128MB	128MB	128MB
Capture				
Number of Video decoders		1x TVP5158	2x TVP5158	4x TVP5158
Video decoder Mode		8-bit 4Ch D1 pixel mux mode		
Input resolutions		<ul style="list-style-type: none"> • Input can be NTSC or PAL • No mixed NTSC/PAL • No dynamic switching between NTSC and PAL 		
Other notes		<ul style="list-style-type: none"> • Capture is in D1 mode since. Input to Live Preview uses D1. • Customer can change from TVP5158 to their own video decoder. 		

	4D1 DVR	8CIF DVR	16CIF DVR
Encode			
Primary stream (max resolution)	4CH D1 H264 30fps	Use Case 1: 8CH CIF H264 27fps Use Case 2: 8CH 2CIF H264 27fps Use Case 3: 8CH D1 H264 7 fps	Use Case 1: 16CH CIF H264 30fps Use Case 2: 16CH D1 H264 4fps (NTSC)
D1 channels when mixed with CIF channel for primary stream	NOT APPLICABLE	NOT APPLIABLE	NOT APPLICABLE
Sub-stream (max resolution)	4CH CIF H264 30fps	Use Case 1: 8CH QCIF H264 29fps Use Case 2: 8CH CIF or QCIF H264 28fps Use Case 3: 8CH CIF or QCIF H264 16fps	Use Case 1: 16CH QCIF H264 4 fps Use Case 2: 16CH QCIF H264 4 fps
JPEG Sub-stream (max resolution)	4CH D1 JPEG 1fps	Use Case 1, 2 , 3: 8CH D1 JPEG 1fps	Use Case 1, 2: 16CH D1 JPEG 1fps
Use-Case switching			
Time to switch from CIF/2CIF use-case to non-real time D1	NOT APPLICABLE	Seam-less	4-6secs Video Display will be turned off during this time GRPX Display (GUI) can be ON during this time.
Decode			
Decode	4CH D1 H264 30fps	Use Case 1: 8CH CIF H264 27fps Use Case 2: 8CH 2CIF H264 26fps Use Case 3:	Use Case 1: 16CH CIF H264 27fps Use Case 2: 16CH D1 H264 4fps (NTSC)

	4D1 DVR	8CIF DVR	16CIF DVR
		8CH D1 H264 13fps	
Trick Play	I-frame based fast-forward, fast-rewind		
De-interlacing			
Primary stream	DEI enabled	Use Case 1, 2, 3: DEI enabled	Use Case 1: DEI bypass for CIF channels, even fields are used to scale to CIF resolution Use Case 2: DEI enabled in 4fps non-real time mode
Sub-stream	DEI enabled	Use Case 1, 2, 3: DEI enabled	Use Case 1, 2: DEI bypass, will use even field to scale to sub-stream resolution
JPEG Sub-stream	DEI enabled	Use Case 1, 2, 3: DEI enabled	Use Case 1, 2: DEI bypass, will use even field to up-scale to JPEG sub-stream resolution
Encode Parameters			
Encoding input type	Progressive		
Primary stream codec	H264 HP Profile Level 3.1		
Sub-stream codec	H264 HP Profile Level 3.1		
JPEG Sub-stream codec	JPEG Baseline		
Primary stream resolution (Resolution can be changed dynamically. Downscaling from max resolution ONLY)	D1 – only when max resolution is D1 VGA – only when max resolution is D1 2CIF – only when max resolution is 2CIF or D1 CIF QVGA QCIF		
Sub-stream resolution (Resolution can be changed dynamically. Downscaling from max resolution ONLY)	CIF – only when max resolution is CIF QVGA – only when max resolution is CIF QCIF		

	4D1 DVR	8CIF DVR	16CIF DVR
JPEG Sub-stream resolution (Resolution can be changed dynamically. Downscaling from max resolution ONLY. JPEG resolution change independent of primary stream)	Fixed to D1 ALWAYS	D1 VGA 2CIF CIF QVGA QCIF	
Frame-rate control	1fps to 30fps in units of 1fps		
Bit-rate control	16Kbps to 6Mbps		
QP control	H264: I-frame QP setting available, P-frame QP setting available JPEG: QP setting available		
RC Algorithm control	CBR VBR		
IP Ratio control	IP Ratio from 1..100		
Force I-frame Control	YES		
Motion Vector Output	YES – can be used for motion detect		
OSD			
Processor / HW used	SIMCOP		
OSD Content	Separate OSD content for primary, sub-stream and MJPEG sub-stream. No OSD for preview stream		
Transparency	YES (User can specify color Key for Y and C)		
Alpha Blending	YES (global alpha, 128 levels, Q7 format)		
Number of windows	8		
Size and position of OSD	Configurable		
Tamper Detect – Only available for 4ch D1 usecases			
Processor / HW used	SIMCOP		
Input Resolution	CIF or lower (same resolution as sub-stream)		
Frame-rate	5fps (configurable)		
Notification	Notification to A8 on tamper detect		

	4D1 DVR	8CIF DVR	16CIF DVR
Display			
Display 0	HD Display 0: On-Chip HDMI max 1080p60		
Display 1	HD Display 1: VGA Monitor via HDDAC max 1080p60		
Display 2	SD Display: On-Chip SDDAC		
Tied VENCs	<p>HD Display 0 and HD Display 1 will be "TIED"</p> <ul style="list-style-type: none"> o They will show same video + GRPX o @ Same frame-rate o @ Same resolution o @ Same timing o i.e Input source to the HD Displays will be the same <p>SD Display can show the same or different content as HD Display BUT at NTSC or PAL timing</p>		
Display Resolutions	<p>HDMI / VGA Monitor:</p> <p>1080p60 – 1920x1080 @ 60Hz 720p60 – 1280x720 @ 60Hz SXGA – 1280x1024 @ 60Hz XGA – 1024x768 @ 60Hz</p> <p>SD Display:</p> <p>NTSC – 720x240 @ 60Hz – interlaced PAL – 720x288 @ 50Hz – interlaced Resolution can be changed dynamically.</p>		
Display Layouts	<ul style="list-style-type: none"> o 1x1 – All CH being showed, deinterlaced at 60fps o 2x2 – All CHs being shown, deinterlaced at 60fps o 3x3 – CH being shown scaled at 30fps by taking ONLY the even fields o 4x4 – CH being shown scaled at 30fps by taking ONLY the even fields (8CIF AND 16CIF ONLY) o 4x5 – CH being shown scaled at 30fps by taking ONLY the even fields (16CIF ONLY) o 1+7 – 1 BIG CH being showed deinterlaced at 60fps. OTHER SMALL CHs scaled at 30fps by taking ONLY the even fields o 1+5 – 1 BIG CH being showed deinterlaced at 60fps. OTHER SMALL CHs scaled at 30fps by taking ONLY the even fields 		
SD Display	<ul style="list-style-type: none"> - Input to SDTV MUST to be interlaced 60fps in the following Layouts <ul style="list-style-type: none"> o 1x1 o 1+5 o 1+7 - In other layouts input to SDTV can be progressive 30fps 		

	4D1 DVR	8CIF DVR	16CIF DVR
Graphics	<ul style="list-style-type: none">- Via FBDev- 16-bit- 720p or SXGA size in DDR upscaled for HDTV- D1 size graphics in DDR for SDTV- Different GRPX buffer used for SDTV and HDTV- Mouse Cursor drawn in SW on same GRPX plane.		
Live preview resolution	1x1 Layout: D1 1+7 Layout: 1CH D1, other channels 2CIF 1+5 Layout: 1CH D1, other channels 2CIF 2x2 Layout: D1 Other layouts: 2CIF		
Live preview frame-rate	1x1 Layout: 60fps 1+7 Layout: 1CH 60fps, other channels 30fps 1+5 Layout: 1CH 60fps, other channels 30fps 2x2 Layout: 60fps Other layouts: 30fps		
Decode channels can be mixed with live channels	YES		
Layout Grid lines	Should be done using GRPX plane		
Display OSD	Should be done using GRPX plane		
Audio			
Capture	TVP5158 and McASP, via ALSA library		
Playback	McASP, via ALSA library (Tested on TI EVM, NOT SUPPORTED on 8107 DVR)		
HDMI Audio	Yes, via ALSA library using Sample Rate Converter to generate 32KHz sampling frequency		
Audio encode/decode	To be taken care by customer, sample G711 provided in demo		
Audio Video Sync	To be taken care by customer		
Other requirements			
Boot logo	Yes, via Uboot 480P60 display of 720x480 resolution bitmap on On-Chip HDMI. HDMI TV should support 480P60 mode.		
Boot time	<ul style="list-style-type: none">- Power ON to boot logo – 5 secs- Power ON to Display live preview – 30-45 secs		
Networking	Linux drivers provided, application to be taken care by customer		
USB	Linux drivers provided, application to be taken care by customer		

	4D1 DVR	8CIF DVR	16CIF DVR
SATA	2x SATA. Port Multiplier can be used to extend SATA. Linux drivers provided, application to be taken care by customer		

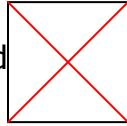
3 Limitations

These data flows have the following limitations / constraints

- These data flows are implemented for DM8107 SoC.
- These data flows support dual independent display but one of the display has to be SD resolution.
 - Dual independent HD Display or triple independent display is not supported.
 - Dual HD Display (along with SD display) can be supported but they MUST be tied, i.e same resolution, same frame-rate, same timing, same content.
- For 16CIF Use-case 1, 2 and non-real time FPS on secondary channels is due IVA-HD Mhz being completely used.

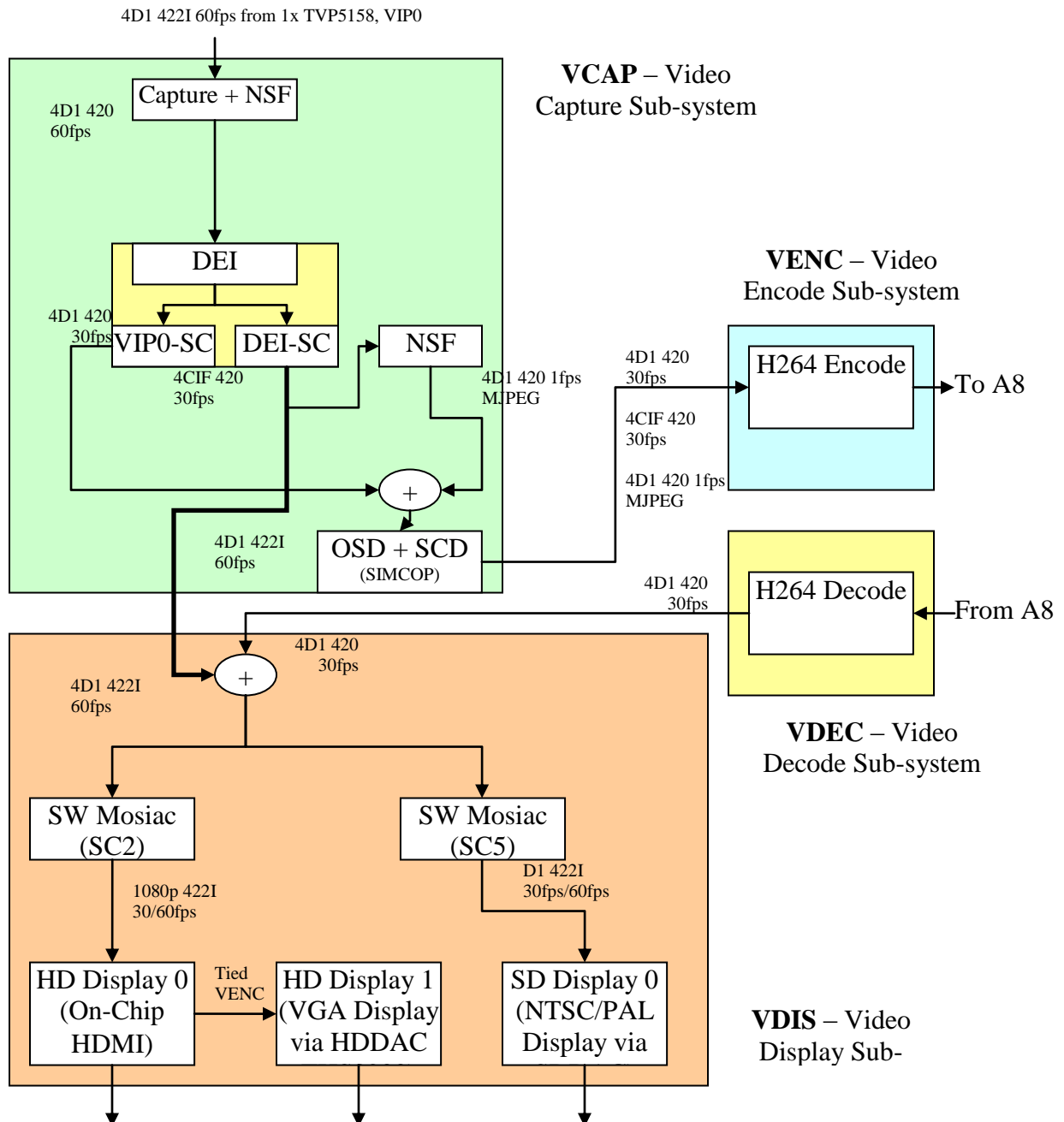
4 DM8107 4D1 DVR – Additional Details

Note: Blocks marked



are not supported in the current release.

Data Flow



Measured Performance

Frame-rate

Refer to sub-section Encode, Decode in section 2 Features for details

CPU Load (Measured)

Processor	CPU load in %
M3 VPSS	88 %
M3 Video	41 %
DSP	NOT APPLICABLE

- VIP0-SC is not switched between primary stream and secondary stream since the CPU overhead to program RT params for every frame is very high and results in DEI not being real time
- 1fps MJPEG is instead generated from VIP0-SC since CPU overhead to change RT params at 1fps is very low
- The VIP0-SC output resolution and FPS can be dynamically changed to support seamless switch between the different use-cases
 - 2D1 + 6CIF
 - 8CH 2CIF
 - 8CH D1 non-real time

Performance Measured

Frame-rate

Refer to sub-section Encode, Decode in section 2 Features for details

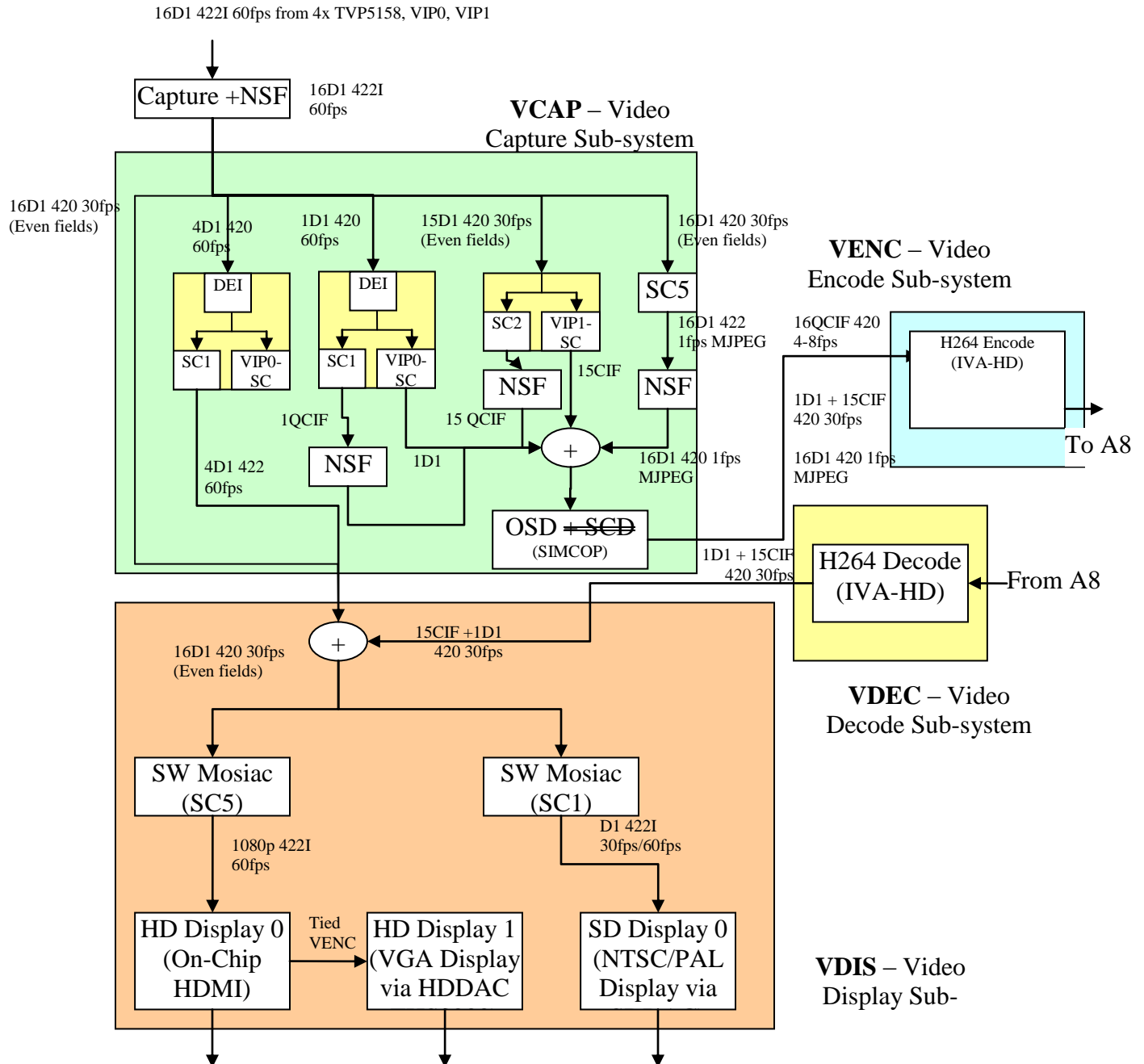
CPU Load

Processor	CPU load in %
M3 VPSS	94%
M3 Video	45%
DSP	NOT APPLICABLE

6 DM8107 16CIF DVR – Additional Details

There are three use-cases and two different data flows for the 16CIF DVR.

Data Flow 1 –16CIF



Notes

- H264 encode for sub-stream (16QCIF) FPS would be reduced in order to meet primary encode and decode performance
- 16CIF use-case and 1D1+15CIF use-case have the same data flow.
- 16CIF use-case is made from 1D1+15CIF by
 - dynamically changing the CH0 resolution to CIF
 - and dynamically changing the FPS of secondary channels to 8fps

Performance Measured – 16CIF

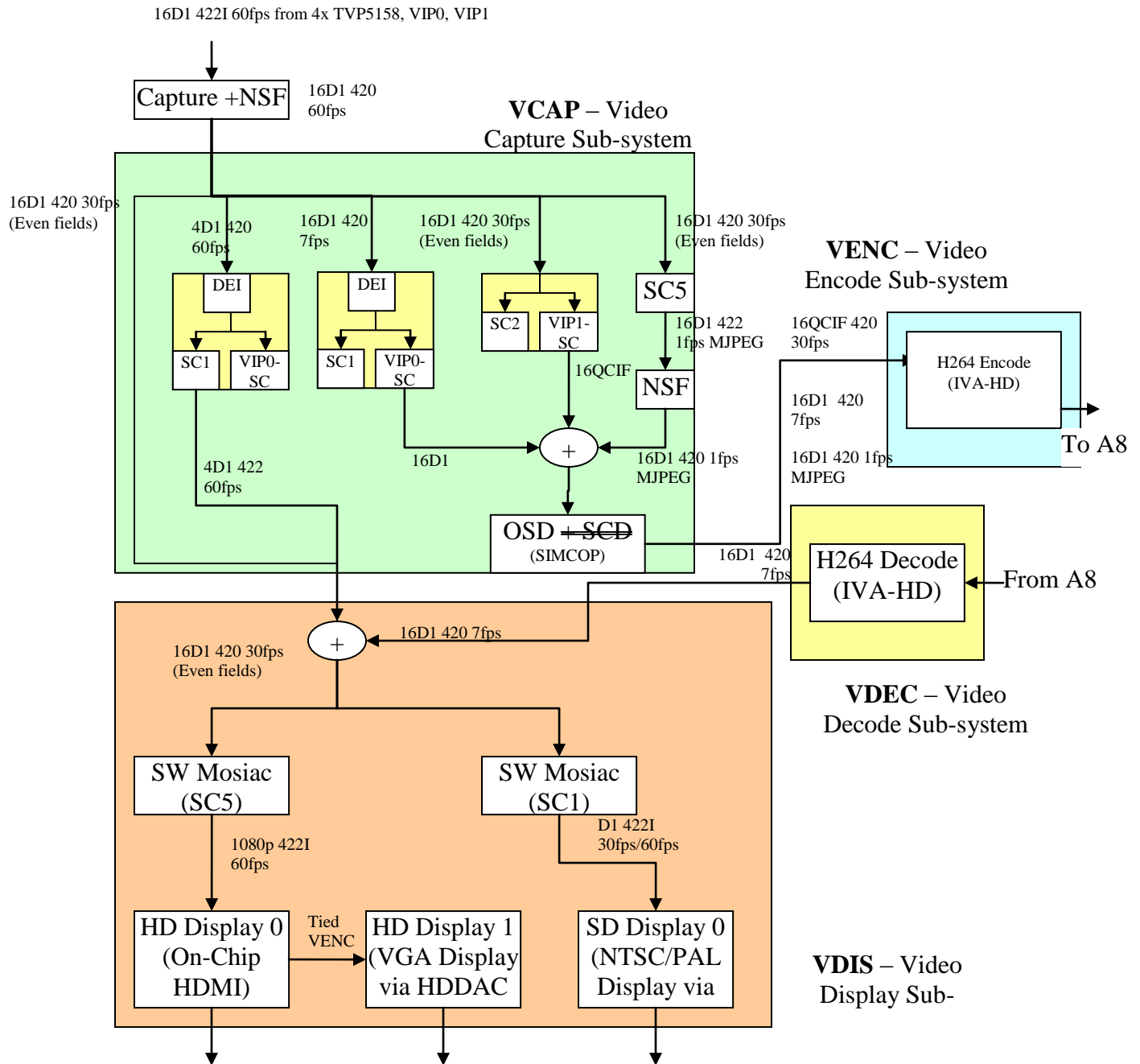
Frame-rate

Refer to sub-section Encode, Decode in section 2 Features for details

CPU Load

Processor	CPU load in %
M3 VPSS	91%
M3 Video	46%
DSP	NOT APPLICABLE

Data Flow 2 – 16D1 non real-time



Performance Measured – 16D1 non real-time

Frame-rate

Refer to sub-section Encode, Decode in section 2 Features for details

CPU Load

Processor	CPU load in %
M3 VPSS	77%
M3 Video	28%
DSP	NOT APPLICABLE