Use Case Guide

Feb 2012

DM816x SD/HD Encode Card - Use Case Guide

ABSTRACT

This document explains the capabilities and limitations of the below use-case of DVR-RDK
- SD Encode Card Use-case
- HD Encode Card Use-case

These use-cases are targeted for DM816x SoC from TI

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1 Overview

Use-case summary

A summary of the use-cases is given below

Product	Description
Video Matrix (DM816x)	**SD Encode Card** Enc: 16CH D1 30fps Enc + 16CH CIF 30fps Enc
	HD Encode Card Enc: 4CH 1080p30 Enc + 4CH D1 30fps Enc

Target Applications

This use-case is targeted for the below applications
- Multi-channel Digital Video Matrix SD/HD Encoder Card on DM816x

This use-case is NOT targeted for
- DVR
- Hybrid DVR
- 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

	SD Encoder	HD Encoder
System		
DM8168 Part Number	DM8168 PG2.0	DM8168 PG2.0
DDR	1GB	1GB
Linux Memory	128MB	128MB
Capture		
Number of Video decoders	4x TVP5158	4x TVP5158, Fake HD mode * * See limitation section for details.
Video decoder Mode	8-bit 4Ch D1 pixel mux embedded sync mode	8-bit BT656 non-mux embedded sync mode
Input resolutions	• Input can be NTSC or PAL selectable via GUI • No mixed NTSC/PAL • No dynamic switching between NTSC and PAL	1080p30
Encode		
Primary stream (max resolution)	16CH D1 H264 30fps	4CH 1080p H264 30fps
Sub-stream (max resolution)	16CH CIF H264 30fps	4CH 960x540 H264 30fps
JPEG Sub-stream (max resolution)	16CH D1 JPEG 1fps	4CH 1080p JPEG 1fps
Decode		
Decode	NO Decode	
De-interlacing		
Primary stream	DEI enabled	NOT APPLICABLE, since input is progressive
Sub-stream	DEI enabled	
JPEG Sub-stream	DEI enabled	
Encode Parameters		
Encoding input type	Progressive	

|	SD Encoder	HD Encoder
	Interlaced encode is not ACCEPTABLE	
Primary stream codec	H264 MP	
Sub-stream codec	H264 MP	
JPEG Sub-stream codec	JPEG Baseline	
Primary stream resolution (Resolution can be changed dynamically. Downscaling from max resolution ONLY)	D1 VGA 2CIF CIF QVGA QCIF	1080p 720p 960x540 D1 VGA 2CIF CIF QVGA QCIF
Sub-stream resolution (Resolution can be changed dynamically. Downscaling from max resolution ONLY)	CIF QVGA QCIF	960x540 D1 VGA 2CIF CIF QVGA QCIF
JPEG Sub-stream resolution (Resolution can be changed dynamically. Downscaling from max resolution ONLY JPEG resolution change independent of primary stream)	D1 VGA 2CIF CIF QVGA QCIF	1080p 720p 960x540 D1 VGA 2CIF CIF QVGA QCIF
Frame-rate control	1fps to 30fps in units of 1fps	
Bit-rate control	From 128Kbps to 20Mbps	
QP control	H264: I-frame QP setting available, P-frame QP setting available JPEG: QP setting available	
RC Algorithm	CBR	

	SD Encoder	HD Encoder
control	VBR CVBR	
IP Ratio control	IP Ratio from 1..100	
Force I-frame Control	YES	
Motion Vector Output	YES – can be used for motion detect	

OSD

	SD Encoder	HD Encoder
Processor / HW used	DSP	
OSD Content	Separate OSD content for primary, sub-stream and MJPEG sub-stream. No OSD for preview stream	
Transparency	YES	
Alpha Blending	YES (global alpha, 128 levels)	
Number of windows	10	
Size and position of OSD	Configurable	

Tamper Detect

	SD Encoder	HD Encoder
Processor / HW used	DSP	NA
Input Resolution	CIF or lower (same resolution as sub-stream)	
Frame-rate	2fps (configurable)	
Notification	Notification to A8 on tamper detect	

Live Preview

	SD Encoder	HD Encoder
Live preview stream	Independent of Primary, sub-stream and JPEG stream Live preview stream will be available on A8 for transfer over PCIe	
Live preview resolution	- Any resolution from 1x upto 1/8x – dynamically changeable - DOWNSCALING only. - Up scaling if needed should be done on decoder Card. - This is efficient from PCIe point of view	
Live preview FPS	1fps to 60fps – user controllable	1fps to 30fps - user controllable

Display

	NO Display in final product

	SD Encoder	**HD Encoder**
Audio		
Capture	via TVP5158 and McASP	
Playback	NO Audio playback	
Audio encode/decode	Taken care by Customer	
Audio Video Sync	Taken care by Customer	
Other requirements		
Boot logo	Yes, via Uboot 720P60 display of 1280x720 resolution bitmap on On-Chip HDMI. **HDMI TV should support 720P60 mode.**	
Boot time	- Power ON to boot logo – 7secs - Power ON to Display live preview – 30-45 secs	
Networking	NOT USED	
SATA	NOT USED	
USB	NOT USED	
PCIe	Taken care by Customer	

3 Limitations

These data flows have the following limitations / constraints
- These data flows are implemented for DM816x SoC.
- No display requirement in final product. The usecases have only one HD display and only for test and demo purpose.
- In the HD demo, fake HD mode is used wherein 4 capture channels are actually 0th capture channel from 4 different TVP5158. In the fake HD mode, captured frame from TVP5158 is padded up with grey pixels to make it HD. It is shown in the below figure. For real HD capture user can use HD-SDI decoder via FPGA and update usecase accordingly.
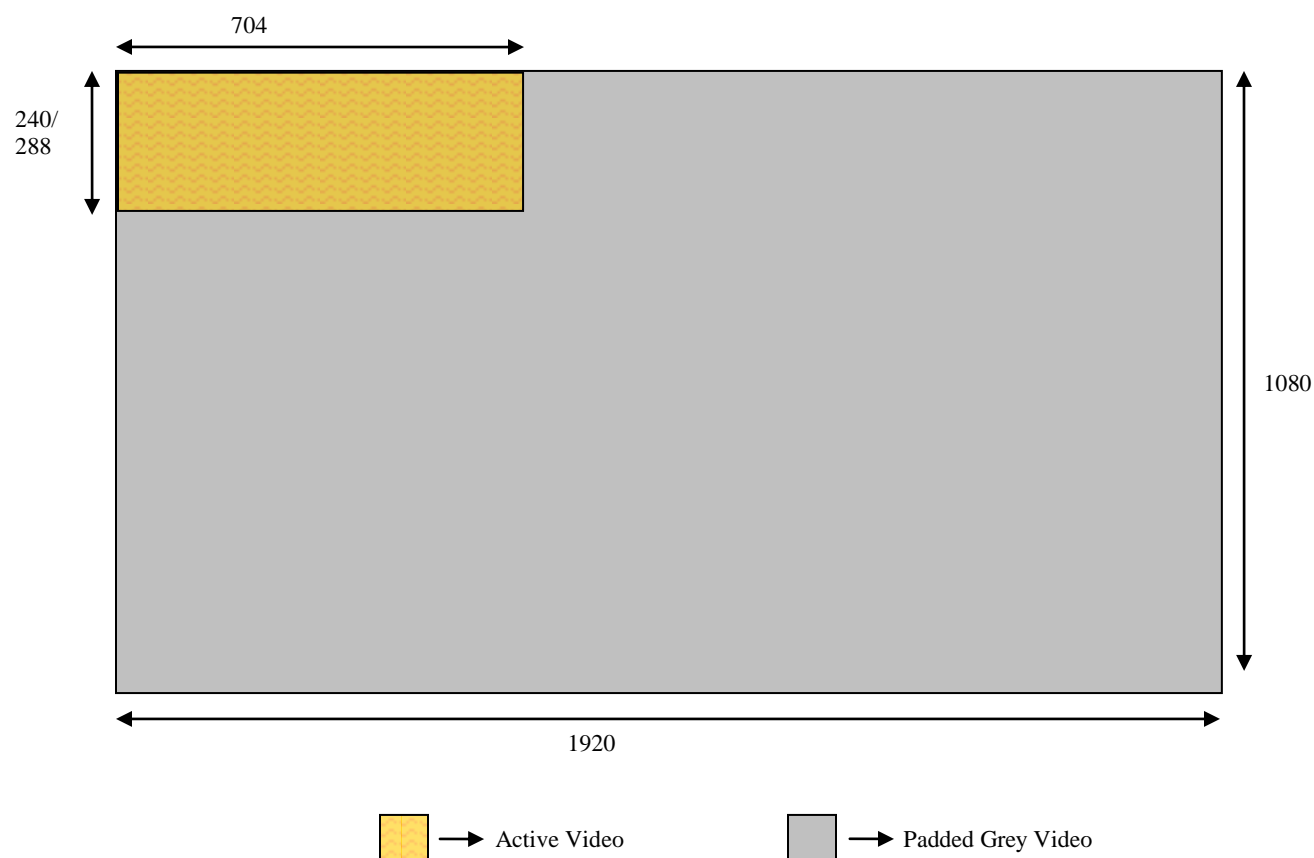
Note: In the HD demo, if camera cable is disconnected and reconnected, flicker or spurious content is observed at the bottom of active video content. This happens due to TVP5158 limitations wherein TVP5158 pads up extra lines when input content is not available.

4 DM816x SD Encode Card – Additional Details

Data Flow
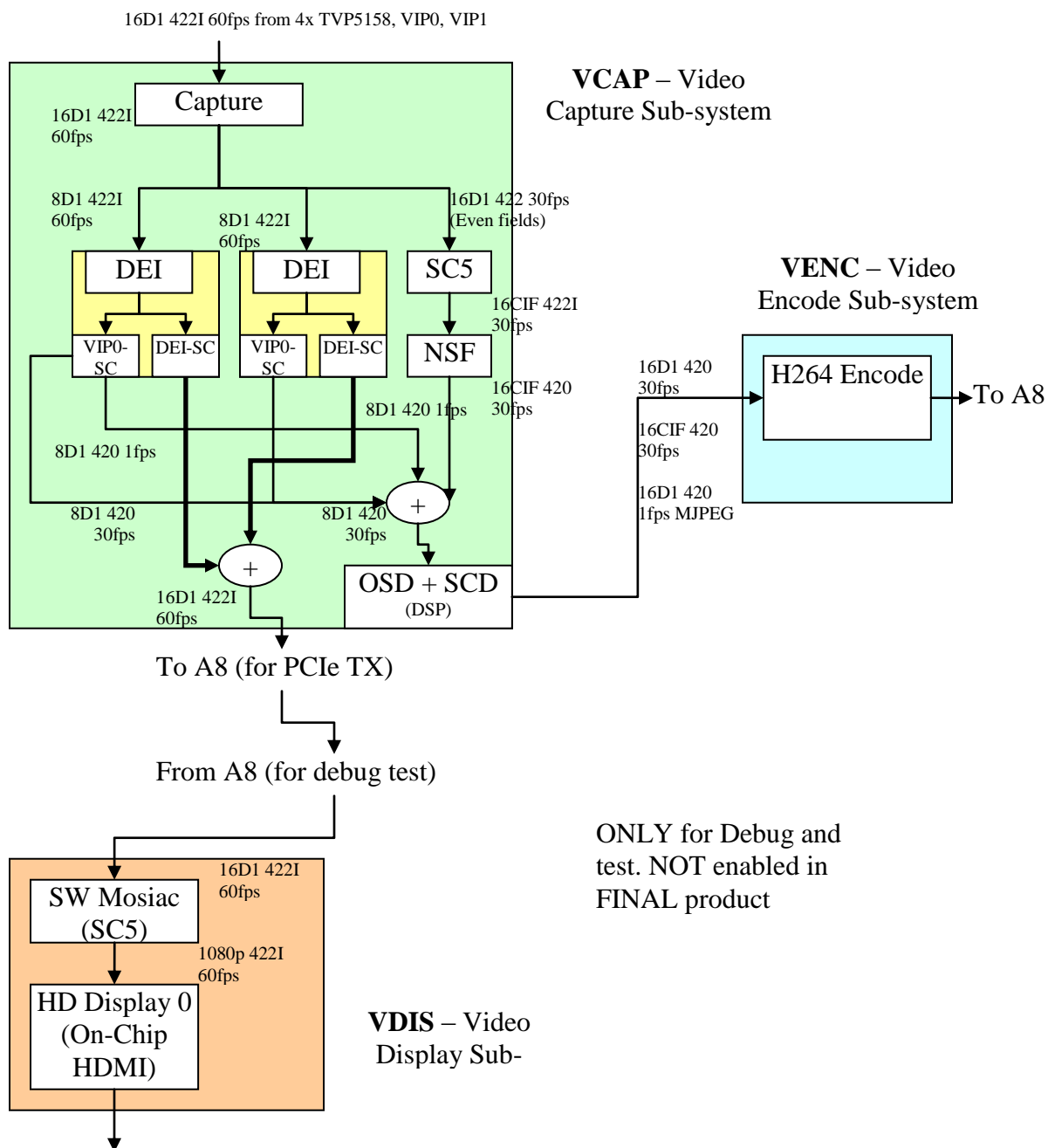
Notes

- CIF secondary stream is generated by taking even fields and scaling them to CIF using SC5. NSF is used after SC5 to convert 422I to 420 for encode

- 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

Measured Performance

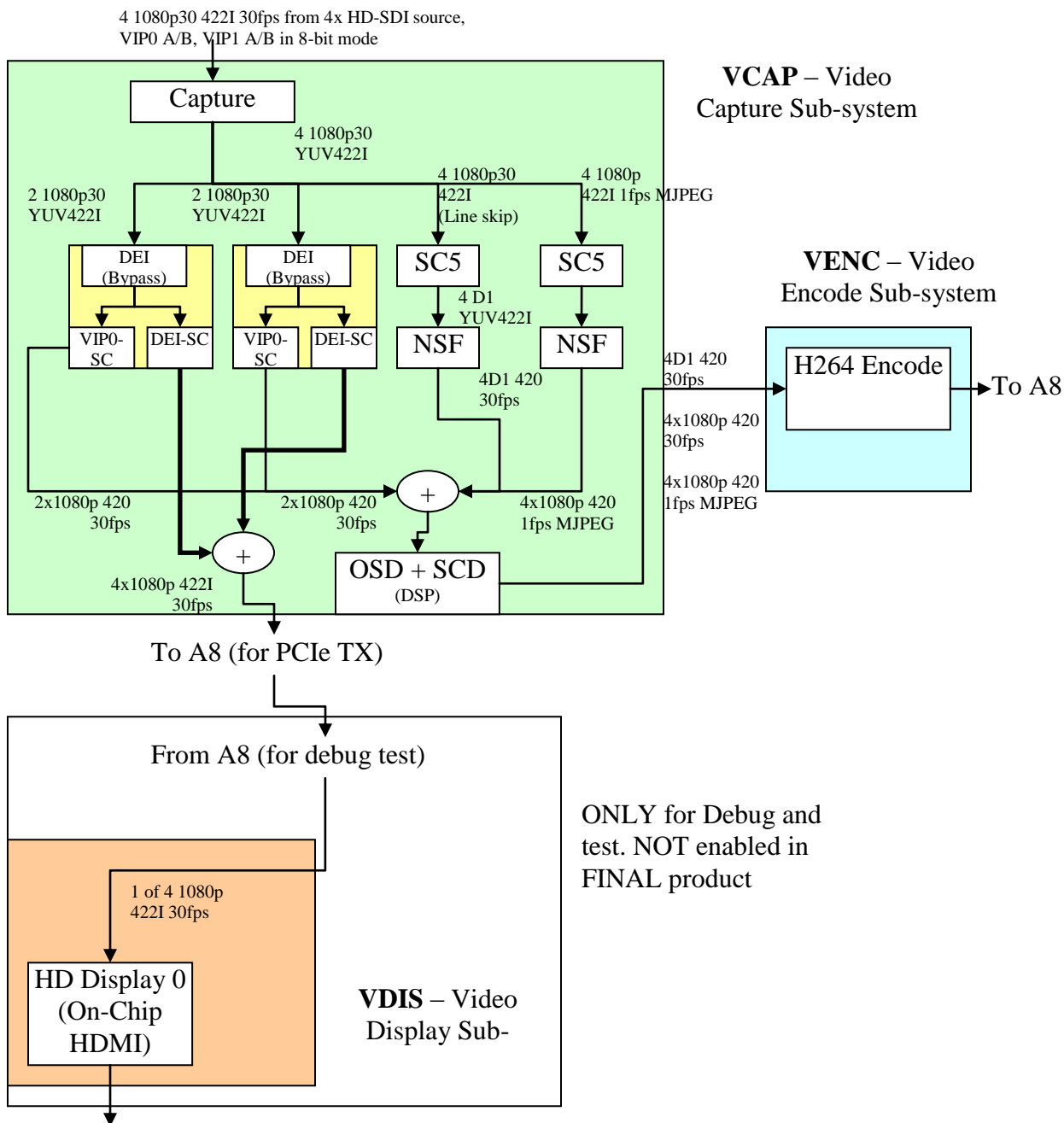### Frame-rate
Refer to sub-section Encode in section 2 Features for details

CPU Load (Measured)

Processor	CPU load in %
M3 VPSS	91 %
M3 Video	67 %
DSP	65 %

5 DM816x HD Encode Card – Additional Details

Data Flow

4 1080p30 422I 30fps from 4x HD-SDI source,
VIP0 A/B, VIP1 A/B in 8-bit mode

VCAP – Video Capture Sub-system

Capture

4 1080p30 YUV422I

2 1080p30 YUV422I

2 1080p30 YUV422I

4 1080p30 422I (Line skip)

4 1080p 422I 1fps MJPEG

DEI (Bypass)

DEI (Bypass)

SC5

SC5

VENC – Video Encode Sub-system

VIP0-SC

DEI-SC

VIP0-SC

DEI-SC

4 D1 YUV422I

NSF

NSF

4D1 420 30fps

H264 Encode

To A8

4x1080p 420 30fps

4D1 420 30fps

2x1080p 420 30fps

2x1080p 420 30fps

+

4x1080p 420 1fps MJPEG

4x1080p 420 1fps MJPEG

+

OSD + SCD (DSP)

4x1080p 422I 30fps

To A8 (for PCIe TX)

From A8 (for debug test)

ONLY for Debug and test. NOT enabled in FINAL product

1 of 4 1080p 422I 30fps

HD Display 0 (On-Chip HDMI)

VDIS – Video Display Sub-

Performance Measured

Frame-rate

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

CPU Load

Processor	CPU load in %
M3 VPSS	34 %
M3 Video	14 %
DSP	5 %