

Datasheet

BIOS PSP C6748 Datasheet

01.30.00.06

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1 Introduction

This PSP package consists of peripheral device drivers for the C6748 device. The drivers enable rapid software development on the C6748 platform. This document provides the performance data for each of the drivers on DSP/BIOS™.

2 BIOSPSP Drivers - Features

- Supported Devices
 - C6748
- Developed and tested on C6748 EVM
- Tools used to build DSP/BIOS™ PSP drivers
 - DSP/BIOS Version 5.41.00.06
 - Code composer studio 3.3.80.11 (Service Release 10)
 - CG tools 6.1.9
- EDMA3 LLD version used – 01.10.00.01
- Drivers supported on DSP/BIOS™:
 - I2C
 - SPI
 - UART
 - PSC
 - GPIO
 - LCD Raster
 - LCD LIDD
 - McASP
 - McBSP
 - Audio Interface
 - Aic3106 codec
 - MMCSDB
 - NAND
 - SATA
 - Block Media
 - VPIF

3 Performance data for BIOSPSP drivers

The performance data for the drivers is captured into following sections

- Features supported/not supported
- Memory usage

The following statistics are taken from drivers built in release mode.

- Program memory
- Data memory (Initialized and Un-Initialized memory)
- Resource usage
 - The OS and system resources consumed by each instance of the driver in different modes are listed.
 - OS resources include usage of semaphores
 - System resources include usage of EDMA3 resources (channels, PaRAMs), interrupts and timers
- I/O throughput and corresponding CPU loading numbers are captured for I2C, SPI, UART, McASP, McBSP, LCDDC Raster, MMC/SD and NAND, SATA and VPIF drivers.

3.1 I2C Driver

3.1.1 Features supported

- Multi-instantiable and re-entrant driver
- Each instance can operate as a receiver and/or transmitter
- Supports Polled, Interrupt and DMA Interrupt Mode of operation
- Supports slave mode in Interrupt and DMA mode of operation.

3.1.2 Features not supported

None

3.1.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------|---------------------------|-------------|----------------|--------------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| I2C | 12384 | 184 | 1376 | 13944 |
| I2c Edma | 2304 | 64 | 0 | 2368 |
| Total | 14688 | 248 | 1376 | 16312 |

3.1.4 Resource usage

3.1.4.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|-----------------------------------|
| 1 | For synchronization of submit API |

3.1.4.2 Interrupt mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| INTERRUPTS | DESCRIPTION |
|------------|-----------------------------------|
| 1 | For Transmit and receive channels |

3.1.4.3 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|----------------------|
| 1 | For Transmit Channel |
| 1 | For Receive Channel |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|----------------------|
| 1 | For Transmit Channel |
| 1 | For Receive Channel |

3.1.5 I/O Throughput and CPU Loading

CPU load and throughput are calculated between start of I/O operation and end of I/O operation at application level.

The following are setup details for measuring the throughput in different modes

Slave device: IO Expander TCA6416.

No of bytes transferred: 2 bytes.

3.1.5.1 I/O Write Performance

The following graphs represent throughput numbers and CPU loads at different bus frequencies

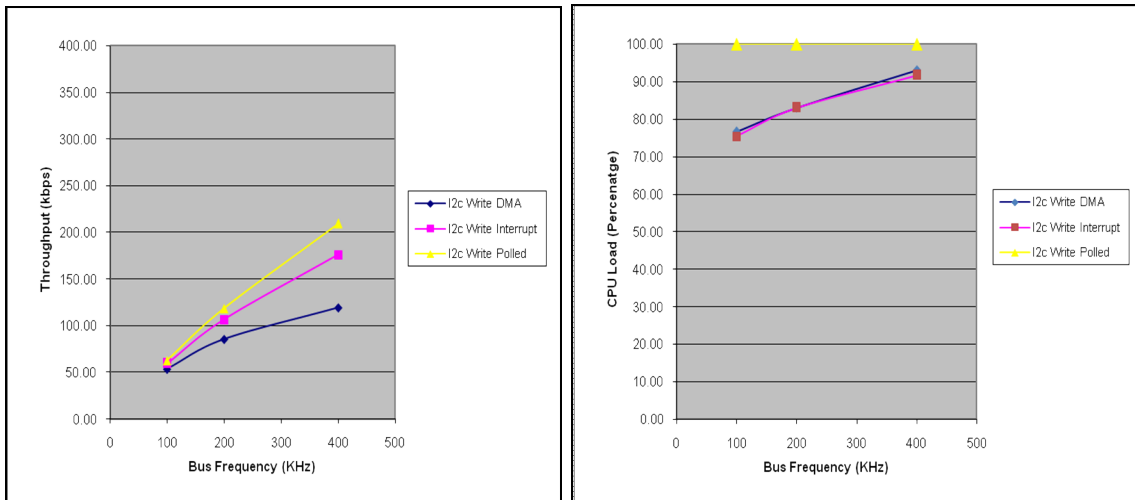


Fig: Write performance

DMA mode:

| Bus Frequency (in KHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|------------------------|------------------------|-------------------|--------------|
| 100 | 0.36 | 53.56 | 76.62 |
| 200 | 0.23 | 85.66 | 83.05 |
| 400 | 0.16 | 119.58 | 93.12 |

Interrupt mode:

| Bus Frequency (KHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 100 | 0.33 | 59.55 | 75.46 |
| 200 | 0.18 | 106.73 | 83.02 |
| 400 | 0.11 | 175.96 | 91.68 |

Polled mode:

| Bus Frequency (KHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 100 | 0.31 | 62.87 | 100.00 |
| 200 | 0.17 | 118.37 | 100.00 |
| 400 | 0.09 | 209.26 | 100.00 |

3.1.5.2 I/O Read Performance

The following graphs represent throughput numbers and CPU loads at different bus frequencies

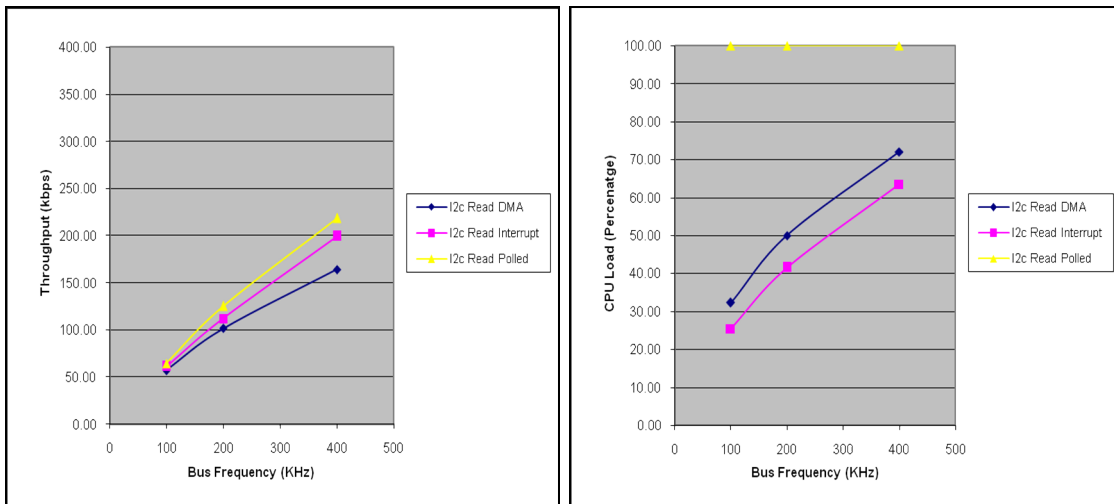


Fig: read performance

DMA mode:

| Bus Frequency (KHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 100 | 0.34 | 57.22 | 32.31 |
| 200 | 0.19 | 101.73 | 49.99 |
| 400 | 0.12 | 164.13 | 72.04 |

Interrupt mode:

| Bus Frequency (KHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 100 | 0.32 | 61.10 | 25.47 |
| 200 | 0.17 | 112.03 | 41.53 |
| 400 | 0.10 | 199.30 | 63.52 |

Polled mode:

| Bus Frequency (KHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 100 | 0.30 | 64.60 | 100.00 |
| 200 | 0.16 | 125.20 | 100.00 |
| 400 | 0.09 | 218.63 | 100.00 |

3.2 SPI Driver

3.2.1 Features supported

- Multi-instantiable and re-entrant driver
- Each instance can operate as an receiver and or transmitter
- Supports Polled, Interrupt and DMA Interrupt Mode of operation
- Supports slave mode in Polled, Interrupt and DMA mode of operation.

3.2.2 Features not supported

- NA

3.2.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Spi | 13056 | 286 | 1370 | 14712 |
| Spi Edma | 4064 | 247 | 0 | 4311 |
| Total | 17120 | 533 | 1370 | 19023 |

3.2.4 Resource usage

3.2.4.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|-----------------------------------|
| 1 | For synchronization of submit API |

3.2.4.2 Interrupt mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| INTERRUPTS | DESCRIPTION |
|------------|----------------------------------|
| 1 | For Transmit and receive channel |

3.2.4.3 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|----------------------|
| 1 | For Transmit Channel |

| | |
|---|---------------------|
| 1 | For Receive Channel |
|---|---------------------|

| EDMA3 PARAMS | DESCRIPTION |
|--------------|----------------------|
| 1 | For Transmit Channel |
| 1 | For Receive Channel |

3.2.5 I/O Throughput and CPU Loading

CPU load and through put are calculated between start of I/O operation and end of I/O operation at application level.

The following are setup details for measuring the throughput in different modes

Slave device: SPI Flash (M25P64)

No of bytes transferred: 256 bytes

3.2.5.1 I/O Write Performance

The following graphs represent throughput numbers and CPU loads at different bus frequencies

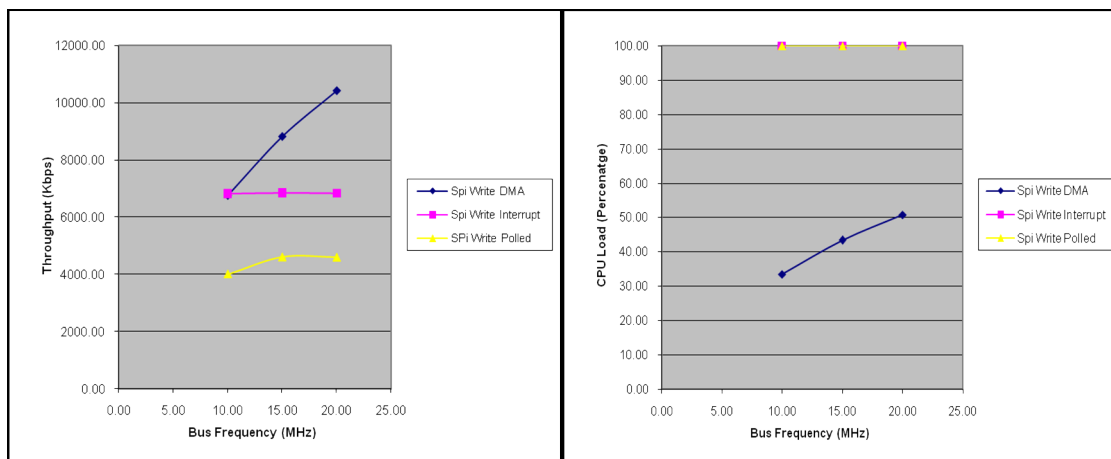


Fig: Write performance

DMA mode:

| Bus Frequency (MHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 10.00 | 0.30 | 6772.01 | 33.46 |
| 15.00 | 0.23 | 8823.53 | 43.37 |
| 20.00 | 0.19 | 10416.67 | 50.85 |

Interrupt mode:

| Bus Frequency (MHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 10.00 | 0.29 | 6825.94 | 100.00 |
| 15.00 | 0.29 | 6857.14 | 100.00 |
| 20.00 | 0.29 | 6841.51 | 100.00 |

Polled mode:

| Bus Frequency (MHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 10.00 | 0.50 | 4008.02 | 100.00 |
| 15.00 | 0.43 | 4608.29 | 100.00 |
| 20.00 | 0.43 | 4601.23 | 100.00 |

3.2.5.2 I/O Read Performance

The following graphs represent throughput numbers and CPU loads at different bus frequencies

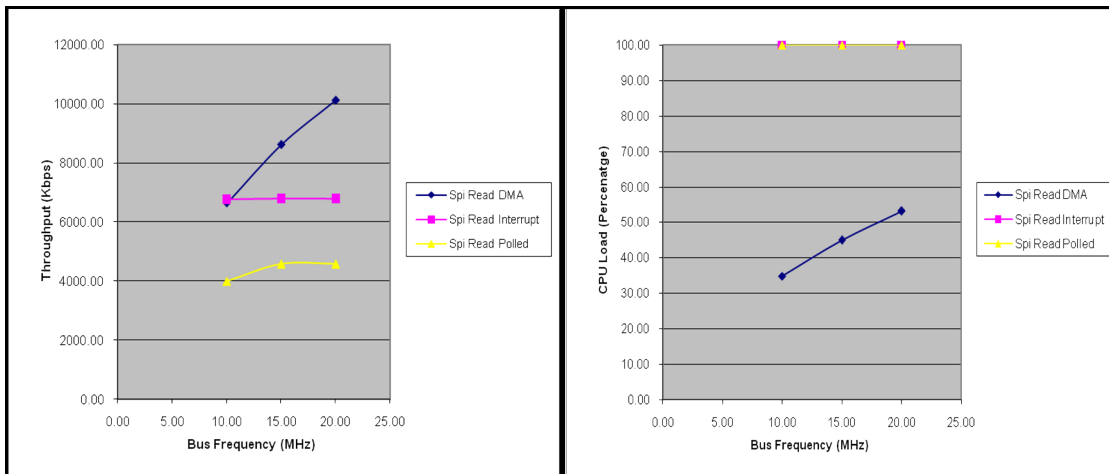


Fig: Read performance

DMA mode:

| Bus Frequency (MHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 10.00 | 0.30 | 6644.52 | 34.86 |
| 15.00 | 0.23 | 8620.69 | 44.98 |
| 20.00 | 0.20 | 10118.04 | 53.17 |

Interrupt mode:

| Bus Frequency (MHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 10.00 | 0.30 | 6756.76 | 100.00 |
| 15.00 | 0.29 | 6795.02 | 100.00 |
| 20.00 | 0.29 | 6787.33 | 100.00 |

Polled mode:

| Bus Frequency (MHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|---------------------|------------------------|-------------------|--------------|
| 10.00 | 0.50 | 3992.02 | 100.00 |
| 15.00 | 0.44 | 4576.66 | 100.00 |
| 20.00 | 0.44 | 4576.66 | 100.00 |

3.3 UART Driver

3.3.1 Features supported

- Multi-instance support and re-entrant driver
- Each instance supports a transmit channel and a receive channel
- Supports Polled, Interrupt and DMA Interrupt Mode of operation

3.3.2 Features not supported

- Loopback is not supported in interrupt mode
- In case of time bound IO requests, on timeout the driver is not able to perform any operations on the peripheral. (This peripheral limitation is documented in the technical reference manual of I2C under ICMDR register).

3.3.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| UART | 10816 | 176 | 25088 | 36080 |
| UART EDMA | 1664 | 64 | 0 | 1728 |
| Total | 12480 | 240 | 25088 | 37808 |

3.3.4 Resource usage

3.3.4.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|-----------------------------------|
| 1 | For synchronization of submit API |

3.3.4.2 Interrupt mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| INTERRUPTS | DESCRIPTION |
|------------|-----------------------------------|
| 1 | For Transmit and receive channels |

3.3.4.3 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|----------------------|
| 1 | For Transmit Channel |
| 1 | For Receive Channel |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|----------------------|
| 1 | For Transmit Channel |
| 1 | For Receive Channel |

3.3.5 I/O Throughput and CPU Loading

CPU load and through put are calculated between start of I/O operation and end of I/O operation at application level.

The following are setup details for measuring the throughput in different modes

No of bytes transferred: 1024, 8192 and 51200 bytes

Baud rate: 115200

3.3.5.1 I/O Write Performance

The following graphs represent throughput numbers and CPU loads at different bus frequencies

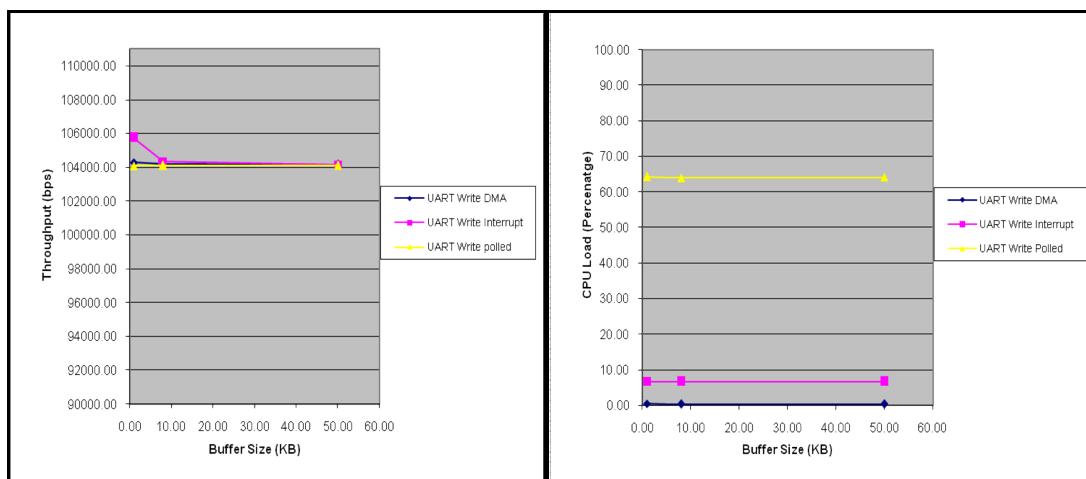


Fig: Write performance

DMA mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (bps) | CPU LOAD (%) |
|------------------|------------------------|------------------|--------------|
| 1.00 | 88.37 | 104294.69 | 0.39 |
| 8.00 | 707.69 | 104181.11 | 0.30 |
| 50.00 | 4423.61 | 104168.28 | 0.30 |

Interrupt mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (bps) | CPU LOAD (%) |
|------------------|------------------------|------------------|--------------|
| 1.00 | 87.16 | 105735.77 | 6.68 |
| 8.00 | 706.75 | 104320.02 | 6.66 |
| 50.00 | 4424.51 | 104147.15 | 6.66 |

Polled mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (bps) | CPU LOAD (%) |
|------------------|------------------------|------------------|--------------|
| 1.00 | 88.53 | 104099.52 | 64.28 |
| 8.00 | 708.11 | 104118.83 | 63.94 |
| 50.00 | 4425.89 | 104114.75 | 64.11 |

Note: Please note that CPU load "NA" represent data load is negligible.

3.3.5.2 I/O Read Performance

The following graphs represent throughput numbers and CPU loads at different bus frequencies

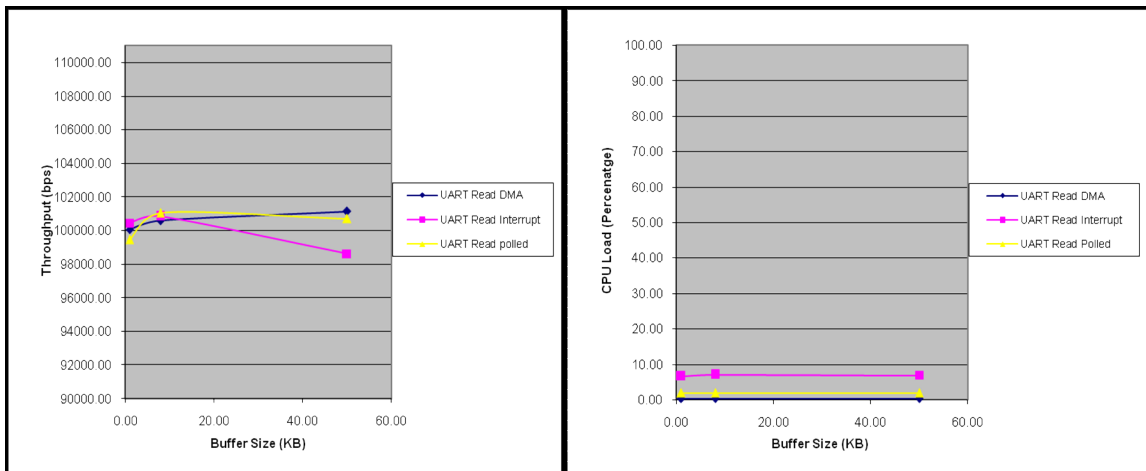


Fig: Read performance

DMA mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (bps) | CPU LOAD (%) |
|------------------|------------------------|------------------|--------------|
| 1.00 | 92.10 | 100063.34 | 0.33 |
| 8.00 | 733.05 | 100576.63 | 0.29 |
| 50.00 | 4556.35 | 101133.66 | 0.29 |

Interrupt mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (bps) | CPU LOAD (%) |
|------------------|------------------------|------------------|--------------|
| 1.00 | 91.75 | 100449.42 | 6.64 |
| 8.00 | 731.05 | 100851.60 | 7.03 |
| 50.00 | 4672.82 | 98612.79 | 6.88 |

Polled mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (bps) | CPU LOAD (%) |
|------------------|------------------------|------------------|--------------|
| 1.00 | 92.67 | 99450.02 | 1.87 |
| 8.00 | 729.70 | 101039.24 | 1.88 |
| 50.00 | 4575.86 | 100702.45 | 1.87 |

3.4 BLOCKMEDIA Driver

3.4.1 Features supported

- Provides both Sync access for File system as well as for Raw/Sector level access (for e.g. USB MSC Class).
- Provides interfaces for Mass Storage Class devices like USB, NAND, MMC/SD etc.
- Provides support for big block sector sizes.
- Supports cache alignment on unaligned buffers from application.
- Provides Write Protect support and Removable media support.

3.4.2 Features not supported

None

3.4.3 Memory usage Raw

| Component | Memory Statistics (Bytes) | | | |
|-----------------|---------------------------|-------------|----------------|---------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| blkmedia | 9824 | 297 | 1563052 | 1573173 |
| Total | 9824 | 297 | 1563052 | 1573173 |

3.4.4 Memory usage File System

| Component | Memory Statistics (Bytes) | | | |
|-----------------|---------------------------|-------------|----------------|---------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| blkmedia | 12704 | 297 | 1576053 | 1589054 |
| Total | 12704 | 297 | 1576053 | 1589054 |

3.4.5 Resource usage

3.4.5.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.4.5.2 Interrupt mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.4.5.3 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
|------------|-------------|

| | |
|----|--|
| 25 | Assuming MMC0, MMC1, NAND,USB0, USB1, ATA0 and ATA1 are attached to BlockMedia EDMA memcopy for I/O (Filesystem) is Enabled. EDMA memcopy for I/O (Sector level) is Enabled. |
|----|--|

3.4.5 Brief usage of Semaphores:

1. Semaphore-1: For Block Media Event i.e. for attaching of device.
2. Semaphore-1: For Block Media Mount i.e. Mounting drives on File system.
3. Semaphores-21: For each Block Media device Semaphores-3, each for Sector I/O, File system I/O & IOCTLs invocation.
4. Semaphores-2: Each For Block Media EDMA memcopy for File system I/O and async (Sector Level I/O).

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|------------------------|
| 1 | For file system access |
| 1 | For RAW access |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|------------------------|
| 1 | For file system access |
| 1 | For RAW access |

3.4.6 I/O Throughput and CPU Loading for MMC/SD using Block media

CPU load and through put are calculated between start of I/O operation and end of I/O operation at application level.

The following are setup details for measuring the throughput in different modes

No of bytes transferred: 10485760 bytes (10 MB)

Card Size: 2GB SD.

Card Make: Elite Pro.

3.4.6.1 I/O Write Performance

The following graphs represent throughput numbers and CPU loads at different buffer sizes.

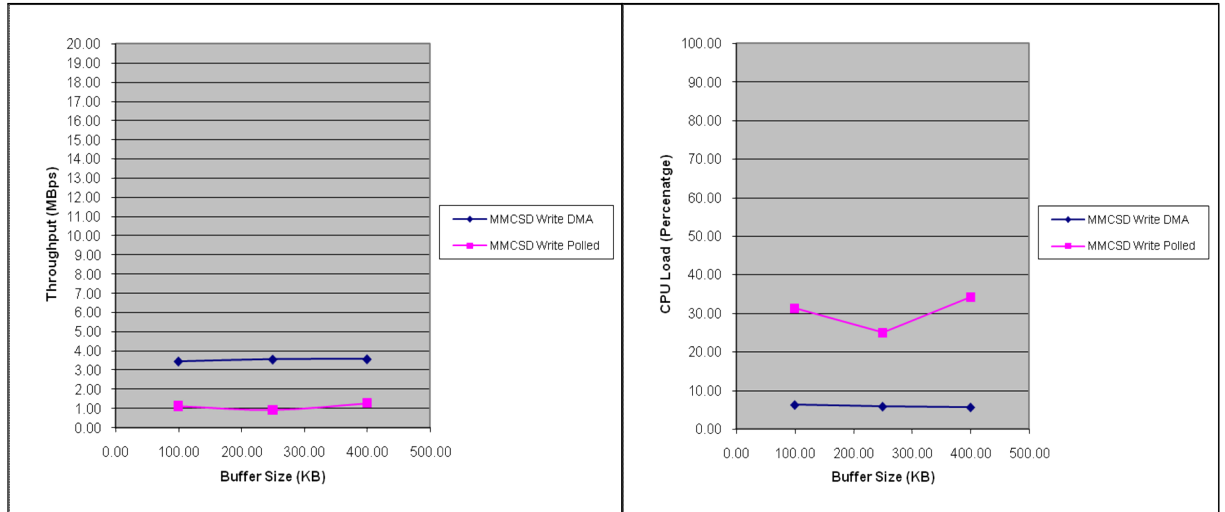


Fig: Write performance

DMA mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 100.00 | 2.89 | 3.46 | 6.23 |
| 250.00 | 2.81 | 3.56 | 5.80 |
| 400.00 | 2.80 | 3.58 | 5.59 |

Polled mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 100.00 | 8.88 | 1.13 | 31.29 |
| 250.00 | 10.82 | 0.92 | 24.92 |
| 400.00 | 7.82 | 1.28 | 34.21 |

3.4.6.2 I/O Read Performance

The following graphs represent throughput numbers and CPU loads at different buffer sizes.

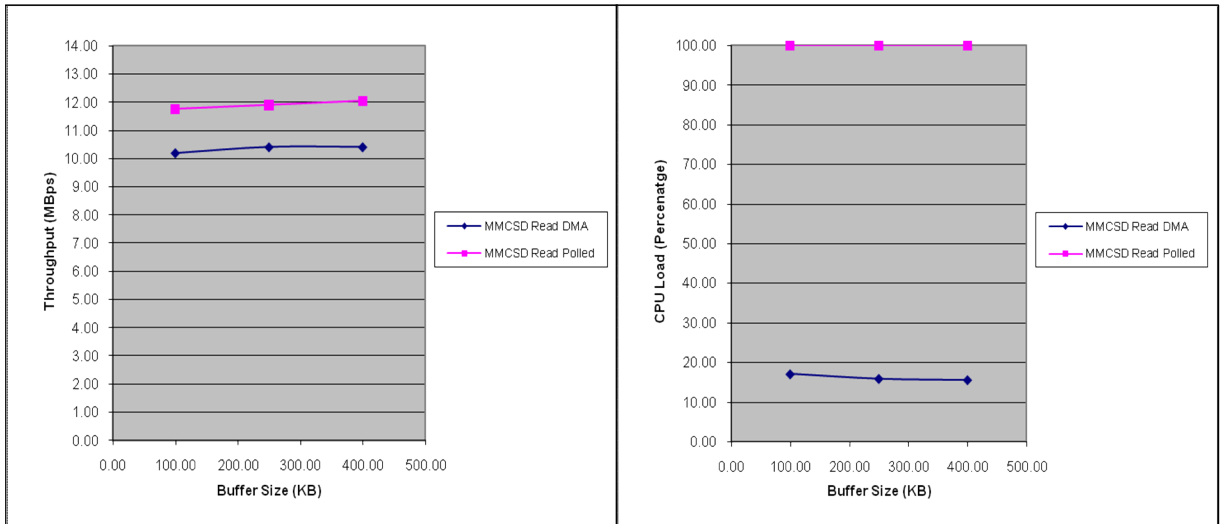


Fig: Read performance

DMA mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 100.00 | 0.98 | 10.20 | 17.05 |
| 250.00 | 0.96 | 10.42 | 15.89 |
| 400.00 | 0.96 | 10.42 | 15.60 |

Polled mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 100.00 | 0.85 | 11.76 | 100.00 |
| 250.00 | 0.84 | 11.90 | 100.00 |
| 400.00 | 0.83 | 12.05 | 100.00 |

3.4.7 I/O Throughput and CPU Loading for NAND using Block media

The following are setup details for measuring the throughput in different modes

No of bytes transferred: 5242880 bytes (5 MB)

Size of NAND: 512 MB.

3.4.7.1 I/O Write Performance

The following graphs represent throughput numbers and CPU loads at different buffer sizes.

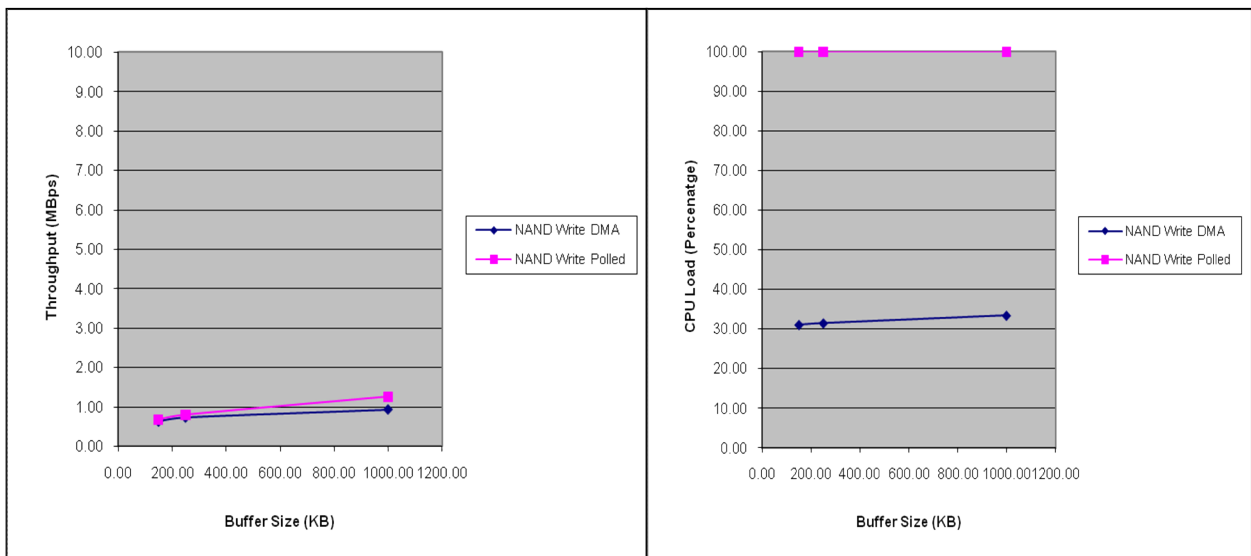


Fig: Write performance

DMA mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 150.00 | 7.99 | 0.63 | 30.98 |
| 250.00 | 6.87 | 0.73 | 31.40 |
| 1000.00 | 5.35 | 0.93 | 33.37 |

Polled mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 150.00 | 7.30 | 0.68 | 100.00 |
| 250.00 | 6.22 | 0.80 | 100.00 |
| 1000.00 | 3.98 | 1.26 | 100.00 |

3.4.7.2 I/O Read Performance

The following graphs represent throughput numbers and CPU loads at different buffer sizes.

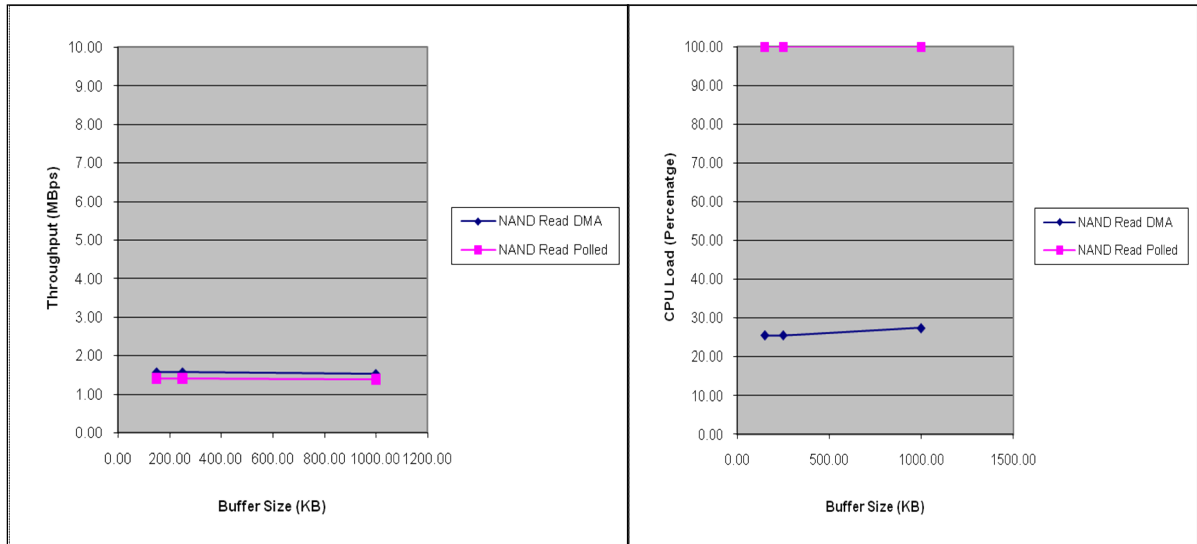


Fig: Read performance

DMA mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 150.00 | 3.19 | 1.57 | 25.58 |
| 250.00 | 3.19 | 1.57 | 25.58 |
| 1000.00 | 3.28 | 1.52 | 27.45 |

Polled mode:

| Buffer Size (KB) | Time Taken (seconds) | Throughput (MBps) | CPU LOAD (%) |
|------------------|----------------------|-------------------|--------------|
| 150.00 | 3.53 | 1.42 | 100.00 |
| 250.00 | 3.53 | 1.42 | 100.00 |
| 1000.00 | 3.61 | 1.39 | 100.00 |

3.4.8 I/O Throughput and CPU Loading for SATA using Block media

The following are setup details for measuring the throughput in different modes

No of bytes transferred: 104857600 bytes (100 MB)

Drive Size: 500 GB.

Make: SEAGATE SATA HDD.

3.4.8.1 I/O Write Performance

The following graphs represent throughput numbers and CPU loads at different buffer sizes.

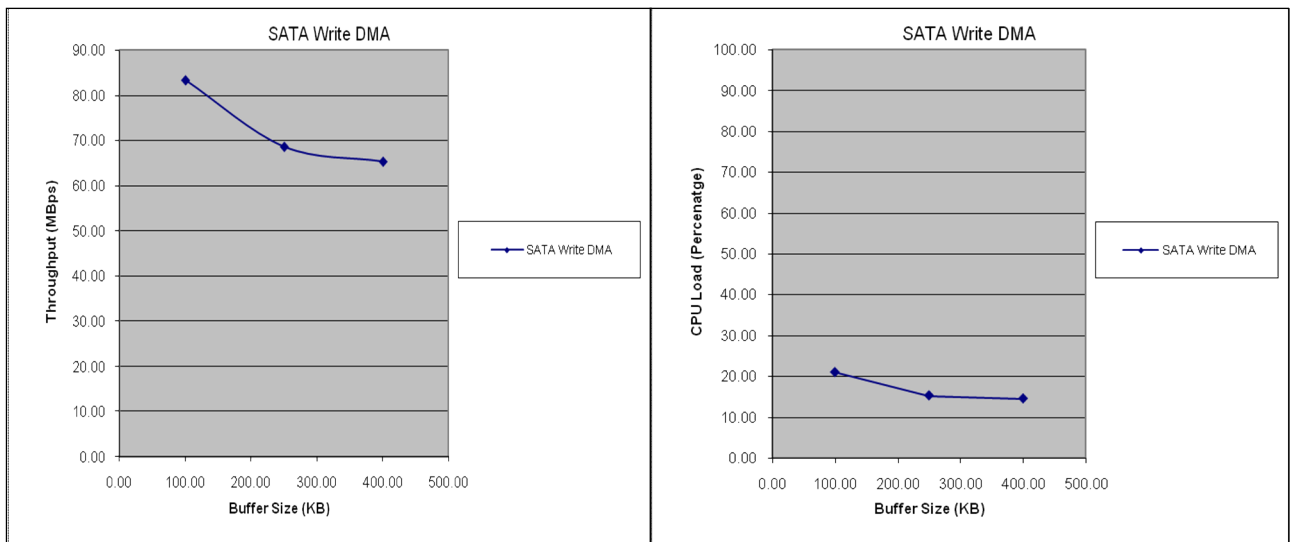


Fig: Write performance

DMA mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (MBps) | CPU LOAD (%) |
|------------------|------------------------|-------------------|--------------|
| 100.00 | 1198.78 | 83.42 | 20.96 |
| 250.00 | 1455.73 | 68.69 | 15.25 |
| 400.00 | 1528.92 | 65.41 | 14.50 |

3.4.8.2 I/O Read Performance

The following graphs represent throughput numbers and CPU loads at different buffer sizes.

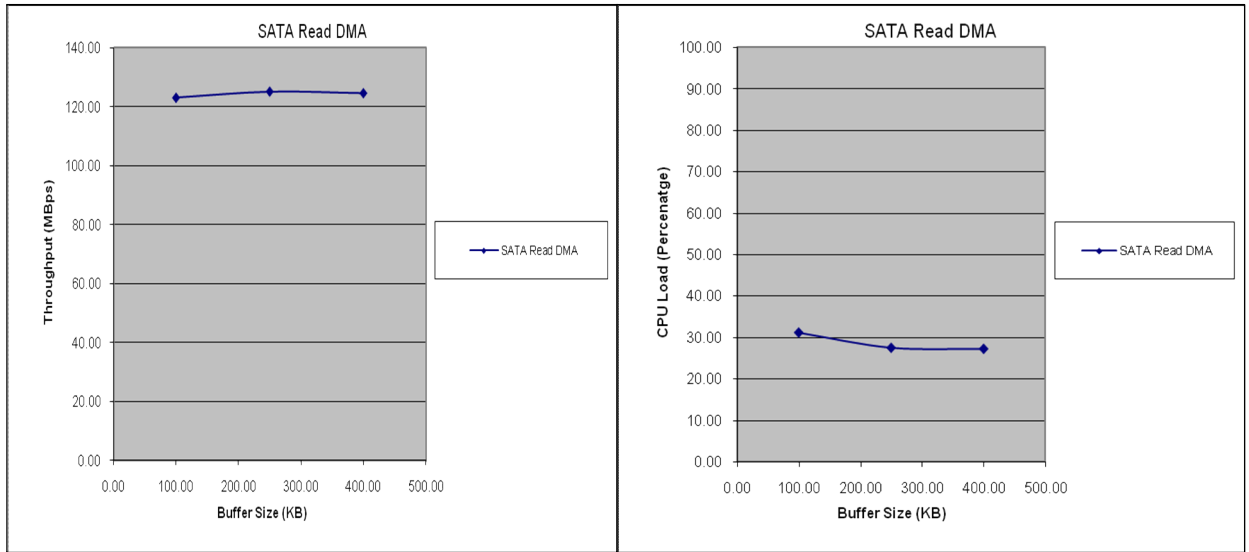


Fig: Read performance

DMA mode:

| Buffer Size (KB) | Time Taken (milli-sec) | Throughput (MBps) | CPU LOAD (%) |
|------------------|------------------------|-------------------|--------------|
| 100.00 | 812.89 | 123.02 | 31.14 |
| 250.00 | 799.34 | 125.10 | 27.49 |
| 400.00 | 802.74 | 124.57 | 27.24 |

3.5 GPIO

3.5.1 Features supported

- Setting GPIO pin directions
- Marking pins or banks as available for use
- Enabling and Disabling of bank interrupts
- Registering interrupt handlers for a pin or bank interrupt
- Getting or setting a group of pins to a value

3.5.2 Features not supported

None

3.5.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Gpio | 3872 | 1254 | 2862 | 7988 |
| Total | 3872 | 1254 | 2862 | 7988 |

3.5.4 Resource usage

3.5.4.1 Semaphores

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.5.4.2 EDMA resources

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|-------------|
| NA | NA |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|-------------|
| NA | NA |

3.6 LCDC LIDD Driver

3.6.1 Features supported

- Multi-instance able, asynchronous and re-entrant driver.
- Each instance operates as a LIDD controller instance of the LCDC.
- Supports only character LCD type.

3.6.2 Features not supported

- The LCDC controller has two modes of operation. One is the Raster mode and the other is the LIDD mode. However, only one mode can be operation can be chosen at a time. Following this constraint, the drivers for these two modes have been separated out and the each mode has a different driver/module, namely Raster and Lidd. Only one driver should be used at a time.

3.6.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Lidd | 5888 | 92 | 232 | 6212 |
| Total | 5888 | 92 | 232 | 6212 |

3.6.4 Resource usage

3.6.4.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.6.4.2 Interrupt mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.6.4.3 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|-------------|
| None | None |

3.7 LCDC RASTER Driver

3.7.1 Features supported

- Supports QVGA display.
- Supports enabling and disabling of raster.
- Supports display at various bits per pixel configurations – 1, 2, 4, 8, 12 and 16bpp.
- Supports channel creation and deletion through SIO create and delete APIs and queueing and dequeing of buffers through SIO issue and reclaim APIs.
- Supports ioctls to retrieve the raster and sub panel configuration.
- Supports ioctls for setting the sub panel and DMA configurations(frame buffer mode, burst size and end of frame interrupt).
- Supports adding and clearing events and event stats.

3.7.2 Features not supported

- The LCDC controller has two modes of operation. One is the Raster mode and the other is the LIDD mode. However, only one mode can be operation can be chosen at a time. Following this constraint, the drivers for these two modes have been separated out and the each mode has a different driver/module, namely Raster and Lidd. Only one driver should be used at a time.

3.7.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|---------------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Raster | 12608 | 477 | 320 | 13405 |
| Total | 12608 | 477 | 320 | 13405 |

3.7.4 Resource usage

3.7.4.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.7.4.2 Interrupt mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.7.4.3 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|-------------|
| None | NA |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|-------------|
| None | NA |

3.7.5 I/O CPU Loading

CPU load and through put are calculated between start of I/O operation and end of I/O operation at application level.

In 16 bpp mode, here are the performance values:

Frames per second = 60

CPU Load = 21.04%

3.8 McASP Driver

3.8.1 Features supported

- Multi-instance support and re-entrant driver
- Each instance can operate as a receiver and/or transmitter
- Supports multiple data formats
- Can be configured to operate in multi-slot TDM, I2S, DSP and DIT (S/PDIF) modes
- Mechanism to transmit desired data (such as NULL tone) when idle
- Explicit control of PIN directions for High Clock, Bit Clock and Frame Sync PINS.
- FIFO support for both TX and RX sections.

3.8.2 Features not supported

- Sample rate change IOCTL is not supported in master mode.

3.8.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|--------------------|---------------------------|-------------|----------------|--------------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Mcasp | 16704 | 328 | 1260 | 18292 |
| Mcasp Edma | 5312 | 124 | 0 | 5436 |
| Mcasp ioctl | 7808 | 116 | 0 | 7924 |
| Total | 29824 | 568 | 1260 | 31652 |

3.8.4 Resource usage

3.8.4.1 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| 0 | NA |

| INTERRUPTS | DESCRIPTION |
|------------|------------------------------------|
| 1 | For transmit and receive combined. |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|-------------|
| 1 | Per channel |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|-------------|
| 2 | Per channel |

3.8.5 I/O Throughput and CPU Loading

CPU load and throughput are calculated between start of I/O operation and end of I/O operation at application level at different number of samples with below mentioned configurations.

The following are setup details for measuring the performance in different number of samples.

Codec device: AIC3106

Sample Rate: 48 KHz

Word Length: 32 bit

Mode of MCASP: DSP

3.8.5.1 I/O Read-Write Performance

The following graphs represent latency period and CPU loads at different sample size.

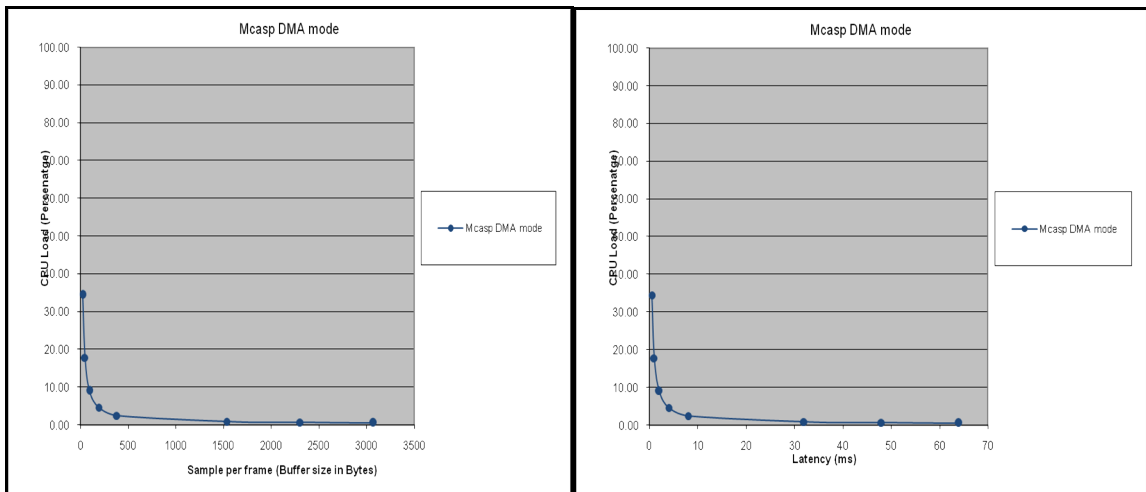


Fig: Read-Write performance

The following graph represent latency period at different sample size.

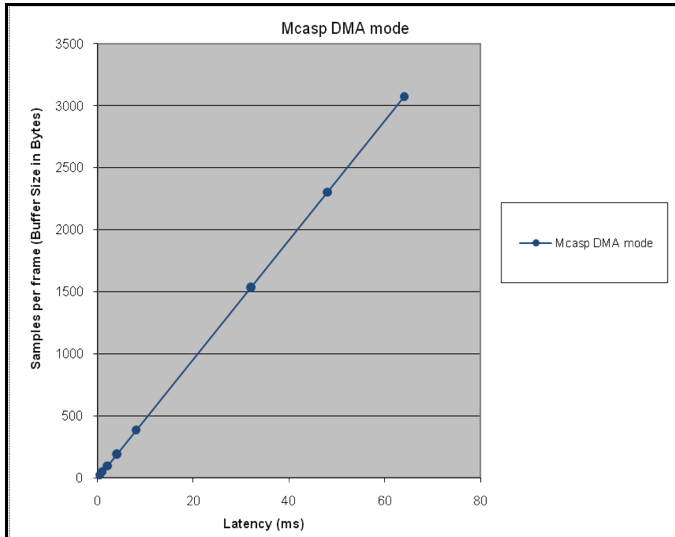


Fig: Sample size v/s Latency

DMA mode:

| Latency (ms) | Sample Size | CPU Load (%) |
|--------------|-------------|--------------|
| 0.5 | 24 | 34.44 |
| 1 | 48 | 17.75 |
| 2 | 96 | 9.03 |
| 4 | 192 | 4.67 |
| 8 | 384 | 2.49 |
| 32 | 1536 | 0.87 |
| 48 | 2304 | 0.69 |
| 64 | 3072 | 0.61 |

3.9 McBSP Driver

3.9.1 Features supported

- Multi-instance support and re-entrant driver
- Each instance can operate as a receiver and/or transmitter
- Supports multiple data formats
- Mechanism to transmit desired data (such as NULL tone) when idle

3.9.2 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|---------------------|---------------------------|-------------|----------------|--------------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Mcbbsp | 10016 | 148 | 1696 | 11860 |
| Mcbbsp Edma | 3744 | 64 | 0 | 3808 |
| Mcbbsp ioctl | 2176 | 0 | 0 | 2176 |
| Total | 15936 | 212 | 1696 | 17844 |

3.9.3 Resource usage

3.9.3.1 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| 0 | NA |

| INTERRUPTS | DESCRIPTION |
|------------|------------------------------------|
| 1 | For transmit and receive combined. |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|-------------|
| 1 | Per channel |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|-------------|
| 2 | Per channel |

3.9.4 I/O Throughput and CPU Loading

CPU load and throughput are calculated between start of I/O operation and end of I/O operation at application level at different number of samples with below mentioned configurations.

The following are setup details for measuring the performance in different number of samples.

Buffer Length: 100

Word Length: 32 bit

No of Channel: 1

3.9.4.1 I/O Read-Write Performance

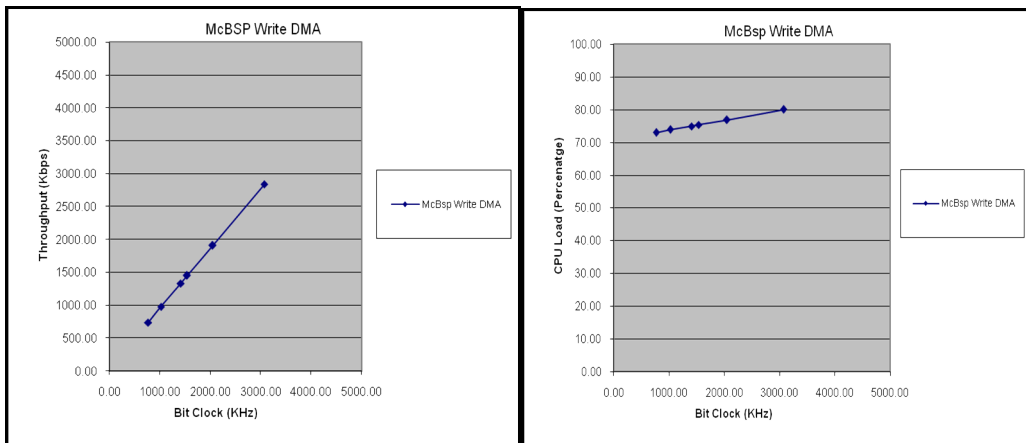


Fig: Write performance

DMA mode:

| Bit Clock (KHz) | Time Taken (milli-sec) | Throughput (Kbps) | CPU LOAD (%) |
|-----------------|------------------------|-------------------|--------------|
| 768.00 | 4.25 | 735.35 | 73.05 |
| 1024.00 | 3.20 | 976.66 | 73.97 |
| 1411.20 | 2.34 | 1333.76 | 75.01 |
| 1536.00 | 2.15 | 1453.49 | 75.37 |
| 2048.00 | 1.64 | 1910.54 | 76.91 |
| 3072.00 | 1.10 | 2838.33 | 80.09 |

3.10 Audio Interface Driver

3.10.1 Features supported

- Multi-instance support and re-entrant driver.
- Each instance can be used to configure a complete receive and transmit section of an audio configuration consisting of an audio device and multiple audio codecs.

3.10.2 Features not supported

None

3.10.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Audio | 2688 | 89 | 364 | 3141 |
| Total | 2688 | 89 | 364 | 3141 |

3.10.4 Resource usage

None

3.11 Aic3106 codec Driver

3.11.1 Features supported

- Multi-instance support and re-entrant driver.
- Each instance can operate as a receiver and or transmitter.
- Interfaces to control the codec specific features like sample rate etc.

3.11.2 Features not supported

None

3.11.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|--------------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Aic31 | 8768 | 93 | 164 | 9025 |
| Total | 8768 | 93 | 164 | 9025 |

3.11.4 Resource usage

| SEMAPHORES | DESCRIPTION |
|------------|---------------------------------------|
| 1 | For Both TX and RX channels combined. |

3.12 MMCSd Driver

3.12.1 Features supported

- Plain module like interface (non-IOM drivers)
- Re-entrant safe driver
- Provides Async IO mechanism
- Configurable to operate in Polled and DMA mode
- Supports hot removal and insertion of MMC/SD card
- Supports variety of SD and MMC cards
 - Patriot 8GB SD card
 - Transcend 512 MB SD card
 - Sandisk 4GB SD card
 - Transcend 128MB MMC card
 - Transcend 256MB MMC card
 - Transcend 1GB MMC card
 - Transcend 2GB MMC card
 - 2GB High speed Elite pro SD card

3.12.2 Features not supported

- 4 bit and 8 bit MMC operation

3.12.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|---------------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| dda_mmcsdBios | 3808 | 248 | 68 | 4124 |
| dda_mmcsdCfg | 0 | 14 | 8 | 22 |
| ddc_mmcsd | 33728 | 162 | 2434 | 36324 |
| llc_mmcsd | 2880 | 0 | 0 | 2880 |
| Total | 40416 | 424 | 2510 | 43350 |

3.12.4 Resource usage

3.12.4.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|--|
| 6 | Blkmedia callback, driver alignment and sync operations. |

3.12.4.2 *Interrupt mode*

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.12.4.3 *DMA mode*

| SEMAPHORES | DESCRIPTION |
|------------|--|
| 6 | Blkmedia callback, driver alignment and sync operations. |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|----------------------|
| 2 | For Transmit Channel |
| 2 | For Receive Channel |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|----------------------|
| 2 | For Transmit Channel |
| 2 | For Receive Channel |

3.13 NAND Driver

3.13.1 Features supported

- Plain module like interface (non-IOM drivers)
- Supports 512-byte page and 2048-byte page NAND devices.
- Supports 8-bit and 16-bit NAND devices
- Error correction using 4-bit ECC mechanism
- Supports wear-leveling and bad-block management functionalities
- Supports protecting a portion of the NAND flash from application access

3.13.2 Features not supported

None

3.13.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|--------------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| dda_nandBios | 2176 | 47 | 28 | 2251 |
| ddc_nandFtl | 7616 | 0 | 20288 | 27904 |
| ddc_nand | 992 | 36 | 32 | 1060 |
| llc_nand | 9248 | 331 | 392 | 9971 |
| Total | 20032 | 414 | 20740 | 41186 |

3.13.4 Resource usage

3.13.4.1 Polled mode

| SEMAPHORES | DESCRIPTION |
|------------|---|
| 1 | For exclusive locking of IO APIs, erase IOCTL, driver registration, and completion callback to blkmedia driver. |

3.13.4.2 Interrupt mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| NA | NA |

3.13.4.3 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|---|
| 2 | For exclusive locking of IO APIs, erase IOCTL, driver registration, completion callback to blkmedia driver and edma synchronization |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|----------------------------------|
| 1 | For Transmit and receive Channel |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|-----------------------------------|
| 1 | For Transmit and receive Channels |

3.14 SATA

3.14.1 Features supported

- Support ATA/ATAPI protocol

3.14.2 Features not supported

- Port Multiplier support
- Power Management support.
- CD/DVD – ATAPI support
- SATA as removable media
- Native command Queuing.

3.14.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|--------------|---------------------------|-------------|----------------|--------------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Ahci | 7168 | 330 | 10768 | 18266 |
| Ata | 26528 | 164 | 3328 | 30020 |
| Ata_remed | 2208 | 0 | 28 | 2236 |
| Atadv | 1568 | 234 | 56 | 1858 |
| Atapi | 2368 | 20 | 0 | 2388 |
| Sata_intf | 2560 | 136 | 60 | 2756 |
| Sata_pm | 1280 | 0 | 0 | 1280 |
| Total | 43680 | 884 | 14240 | 58804 |

3.14.4 Resource usage

NA

3.15 PSC

3.15.1 Features supported

- Simple module level functions.
- Standalone module (driver).

3.15.2 Features not supported

- PSC does NOT support instances.
- PSC does not implement IOM interface.

3.15.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Psc | 768 | 0 | 256 | 1024 |
| Total | 768 | 0 | 256 | 1024 |

3.15.4 Resource usage

NA

3.16 Evmlnit

3.16.1 Features supported

- Evm specific initializations for the required modules.

3.16.2 Features not supported

- Initializations specific only to those instances used by the sample application are supported.

3.16.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-------------------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| audio_evmlnit | 256 | 12 | 44 | 312 |
| common_evmlnit | 32 | 0 | 0 | 32 |
| gpio_evmlnit | 96 | 12 | 4 | 112 |
| i2c_evmlnit | 96 | 12 | 4 | 112 |
| lcdlidd_evmlnit | 1344 | 6 | 48 | 1398 |
| lcdrafter_evmlnit | 672 | 12 | 8 | 692 |
| mcbasp_evmlnit | 96 | 12 | 4 | 112 |
| mmcsd_evmlnit | 480 | 0 | 0 | 480 |
| mmcsd_startup | 320 | 0 | 0 | 320 |
| nand_evmlnit | 160 | 0 | 0 | 160 |
| nand_startup | 352 | 0 | 0 | 352 |
| sata_evmlnit | 64 | 0 | 0 | 64 |
| sata_startup | 448 | 28 | 20 | 496 |
| spi_evmlnit | 128 | 12 | 4 | 144 |
| uart_evmlnit | 128 | 12 | 4 | 144 |
| vpif_evmlnit | 1696 | 11 | 48 | 1755 |
| Total | 6368 | 129 | 188 | 6685 |

3.16.4 Resource usage

NA

3.17 VPIF Driver

3.17.1 Features supported

- Supports Multiple VPIF channels (2 capture and 2 display channels are supported on C6748 EVM)
- Supports dual channel 8-bit BT.656 capture and single channel 8, 10 or 12-bit RAW capture.
- Supports dual channel 8-bit BT.656 display.
- External Device Control Interface using EDC driver for seamless integration with different video encoder or decoder devices
- Supports flipping/exchange of multiple frame buffers for seamless capture and display operation

3.17.2 Features not supported

- HD Capture and Display
- RAW Display
- VBI data Capture and Display

3.17.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Vpif | 18368 | 1448 | 1160 | 20976 |
| Total | 18368 | 1448 | 1160 | 20976 |

3.17.4 Resource usage

3.17.4.1 DMA mode

| SEMAPHORES | DESCRIPTION |
|------------|-------------|
| None | NA |

| EDMA3 CHANNELS | DESCRIPTION |
|----------------|-------------|
| None | NA |

| EDMA3 PARAMS | DESCRIPTION |
|--------------|-------------|
| None | NA |

3.17.5 I/O Throughput and CPU Loading

CPU load and throughput are calculated between start of I/O operation and end of I/O operation at application level at different number of samples with below mentioned configurations.

The following are setup details for measuring the performance in different number of samples.

No of frames: 300

3.17.5.1 I/O Read-Write Performance

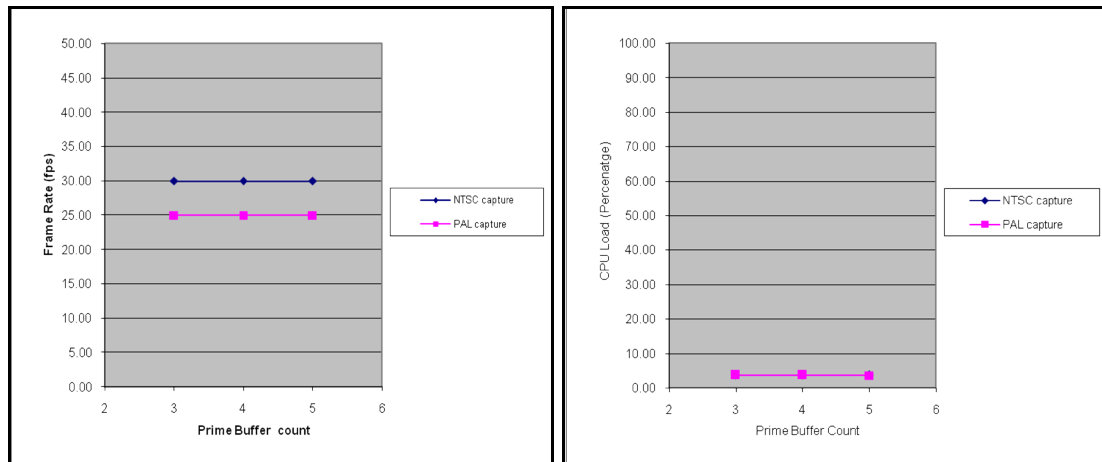


Fig: Read-Write performance

NTSC mode:

| Buffer Size | Time Taken (seconds) | Throughput (fps) | CPU LOAD (%) |
|-------------|----------------------|------------------|--------------|
| 3 | 10.01 | 29.97 | 3.66 |
| 4 | 10.01 | 29.97 | 3.66 |
| 5 | 10.01 | 29.97 | 3.65 |

PAL mode:

| Buffer Size | Time Taken (seconds) | Throughput (fps) | CPU LOAD (%) |
|-------------|----------------------|------------------|--------------|
| 3 | 12.00 | 25.00 | 3.62 |
| 4 | 12.00 | 25.00 | 3.62 |
| 5 | 12.00 | 25.00 | 3.62 |

3.18 VPIF EDC Driver

3.18.1 Features supported

- Generic interface for codec interaction
- Plain Module like interface (non-IOM drivers)
- ADV7343 encoder support
- TVP5147 decoder support
- MT9T001 external image sensor support

3.18.2 Features not supported

- ED and HD parameter settings are not supported

3.18.3 Memory usage

| Component | Memory Statistics (Bytes) | | | |
|-----------------------|---------------------------|-------------|----------------|-------|
| | Program Memory | Data Memory | | Total |
| | | Initialized | Un-Initialized | |
| Adv7343 | 6208 | 218 | 88 | 6514 |
| CodecInterface | 1568 | 42 | 52 | 1662 |
| Mt9t001 | 4864 | 318 | 64 | 5246 |
| Tvp5147 | 6432 | 382 | 176 | 6990 |
| Total | 19072 | 960 | 380 | 20412 |

3.18.4 Resource usage

| SEMAPHORES | DESCRIPTION |
|------------|-----------------------------------|
| 1 | For synchronization of submit API |