



CEVA-XM4™

**DDMA
User Guide**

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List of Sales and Support Centers

Israel	USA	Ireland	Sweden
2 Maskit Street P.O. Box 2068 Herzelia 46120 Israel Tel: +972 9 961 3700 Fax: +972 9 961 3800	1174 Castro Street Suite 210 Mountain View, CA 94040 USA Tel: +1-650-417-7923 Fax: +1-650-417-7924	Segrave House 19/20 Earlsfort Terrace 3 rd Floor Dublin 2 Ireland Tel: +353 1 237 3900 Fax: +353 1 237 3923	Klarabergsviadukten 70 Box 70396 107 24 Stockholm Sweden Tel: +46(0)8 506 362 24 Fax: +46(0)8 506 362 20
China (Shanghai)	China (Beijing)	China (Shenzhen)	Hong Kong
Unit 1203, Building E Chamtime Plaza Office Lane 2889, Jinke Road Pudong New District Shanghai, 201203 China Tel: +86-21-20577000 Fax: +86-21-20577111	Rm 503, Tower C Raycom InfoTech Park No. 2, Kexueyuan South Road Haidian District Beijing 100190 China Tel: +86-10-5982 2285 Fax: +86-10-5982 2284	Rm 709, Tower A SCC Financial Centre No. 88 First Haide Avenue Nanshan District Shenzhen 518064 China Tel: +86-755-8435 6038 Fax: +86-755-8435 6077	Level 43, AIA Tower 183 Electric Road North Point Hong Kong Tel: +852-39751264
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#478, Hyundai Arion 147, Gungok-Dong Bundang-Gu Sungnam-Si Kyunggi-Do, 463-853 South Korea Tel: +82-31-704-4471 Fax: +82-31-704-4479	Room 621 No. 1, Industry E, 2nd Rd Hsinchu, Science Park Hsinchu 300 Taiwan R.O.C Tel: +886 3 5798750 Fax: +886 3 5798750	1-6-5 Shibuya SK Aoyama Bldg. 3F Shibuya-ku, Tokyo 150-0002 Japan Tel: +81-3-5774-8250	RivieraWaves S.A.S 400, avenue Roumanille Les Bureaux Green Side 5, Bât 6 06410 Biot - Sophia Antipolis France Tel: +33 4 83 76 06 00 Fax: +33 4 83 76 06 01

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1. Introduction

1.1 Scope

This document describes how to use direct memory access (DDMA) to do algorithm optimization for the CEVA-XM4™ core.

The CEVA-XM4 core is designed to deal with highly demanding image-processing applications. It includes a strong vector-processing unit that delivers outstanding performance. The CEVA-XM4 uses a very efficient Data DMA (DDMA) to handle data transfer from internal to external, external to internal, and internal to internal.

1.2 Audience

This document is intended for designers who want to optimize algorithms by using the PingPang buffer with the DDMA.

1.3 Related Documents

The following documents are related to the information in this document:

1. *CEVA-XM4_Arch_Spec_Vol-I*
2. *CEVA-XM4_Arch_Spec_Vol-III_MSS*
3. *CEVA-XM4_DMA_Driver_doc.html*

1.4 Terminology

Table 1-1 defines the terms that are used throughout this document.

Table 1-1: Terminology

Term	Definition
DDMA Queue	The DDMA can accept up to three pending requests using a dedicated queue. This enables the user to program the DDMA in advance.
DDMA Descriptor	Each DDMA transaction is configured using a DDMA task descriptor. Task descriptors are configured for the DDMA either using the CPM or by the QMAN.
DDMA Sync Point	The sync point is used to ensure that the DMA queue task is done.

1.5 DMA Functions

The following are the most commonly used DDMA functions:

- **dma_create_2d_desc()**: Creates a new DDMA descriptor
- **dma_dma_enqueue_desc()**: Enqueues a new DDMA descriptor
- **dma_enqueue_sync_point()**: Enqueues a new DDMA sync point, and then returns it to the user
- **dma_wait_sync_point()**: Waits for a specific DDMA sync point
- **dma_update_2d_desc_size()**: Updates a pre-existing DDMA descriptor with a different size for loading (instead of creating a new, different descriptor)

2. Basic Application

2.1 Initialization

Use the following functions to initialize the DDMA manager and queue:

- `dma_init_manager();`
- `dma_allocate_queue(& g_queue_base, (unsigned int *)g_queue , 4, sizeof(g_queue) / sizeof (dma_desc_t));`

2.2 Workflow

Figure 2-1 shows the workflow of a basic application with the DDMA.

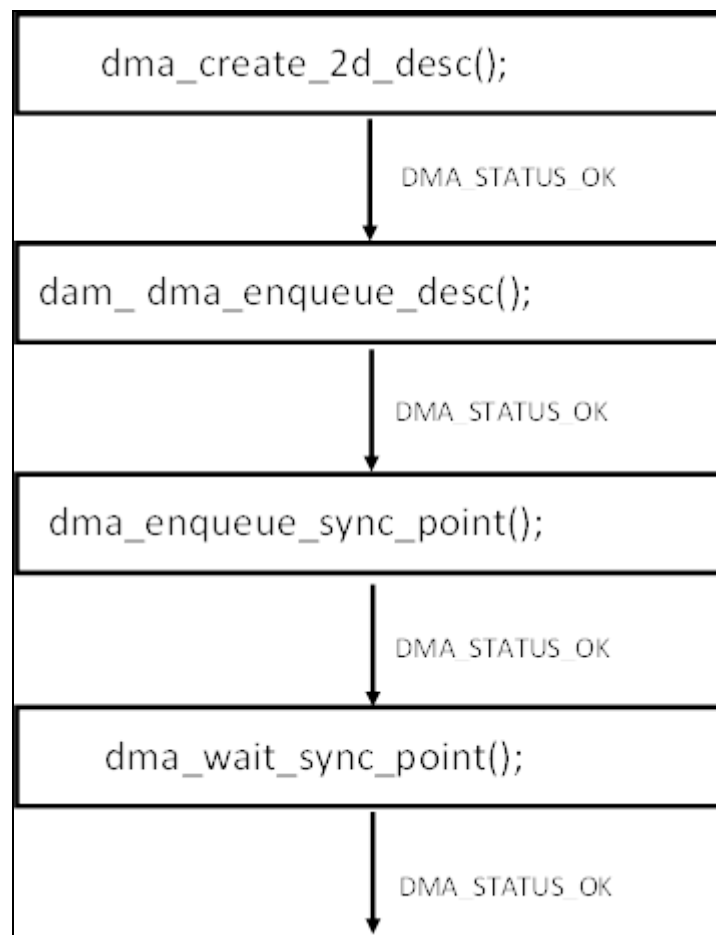


Figure 2-1: Basic Application Workflow

2.3 Code Example

Example 2-1 demonstrates a basic application code of a DDMA workflow.

Example 2-1: Basic Application Code

```
void transfer_2d()  
{  
    unsigned int transfer_width = 49;  
    unsigned int transfer_height = 20;  
    unsigned int src_stride = 49;  
    unsigned int dst_stride = 64;  
    unsigned int src_offset = 1039;  
    unsigned int dst_offset = 2043;  
  
    unsigned int sync_point_val;  
  
    printf("Starting transfer_2d Test:\n");  
    //Create one dimension task descriptor  
    if (DMA_STATUS_OK != dma_create_2d_desc(&desc_2d,  
transfer_width, transfer_height, src_stride, dst_stride,  
DMA_DIR_EXTERNAL_INTERNAL, DMA_TYPE_LINEAR))  
    {  
        printf("Error creating 2d descriptor - Test failed!\n");  
    }  
    else  
    {  
        //enqueue task  
        if (DMA_STATUS_OK != dma_enqueue_desc(&myqueue_base,  
&desc_2d, ext_buff + src_offset, int_buff+dst_offset))  
        {  
            printf("Error enqueueing 2d descriptor - Test  
failed!\n");  
        }  
        else  
        {  

```

```
        //Set sync point
        if (DMA_STATUS_OK !=
dma_enqueue_sync_point(&myqueue_base, &sync_point_val))
        {
            printf("Error enqueueing sync point - Test
failed!\n");
        }
        else
        {
            //Poll on sync point
            dma_wait_sync_point(&myqueue_base,
sync_point_val);
            printf("Test Passed\n");
        }
    }
}
```

2.4 Image Process

Figure 2-2 shows the DDMA algorithm optimization.

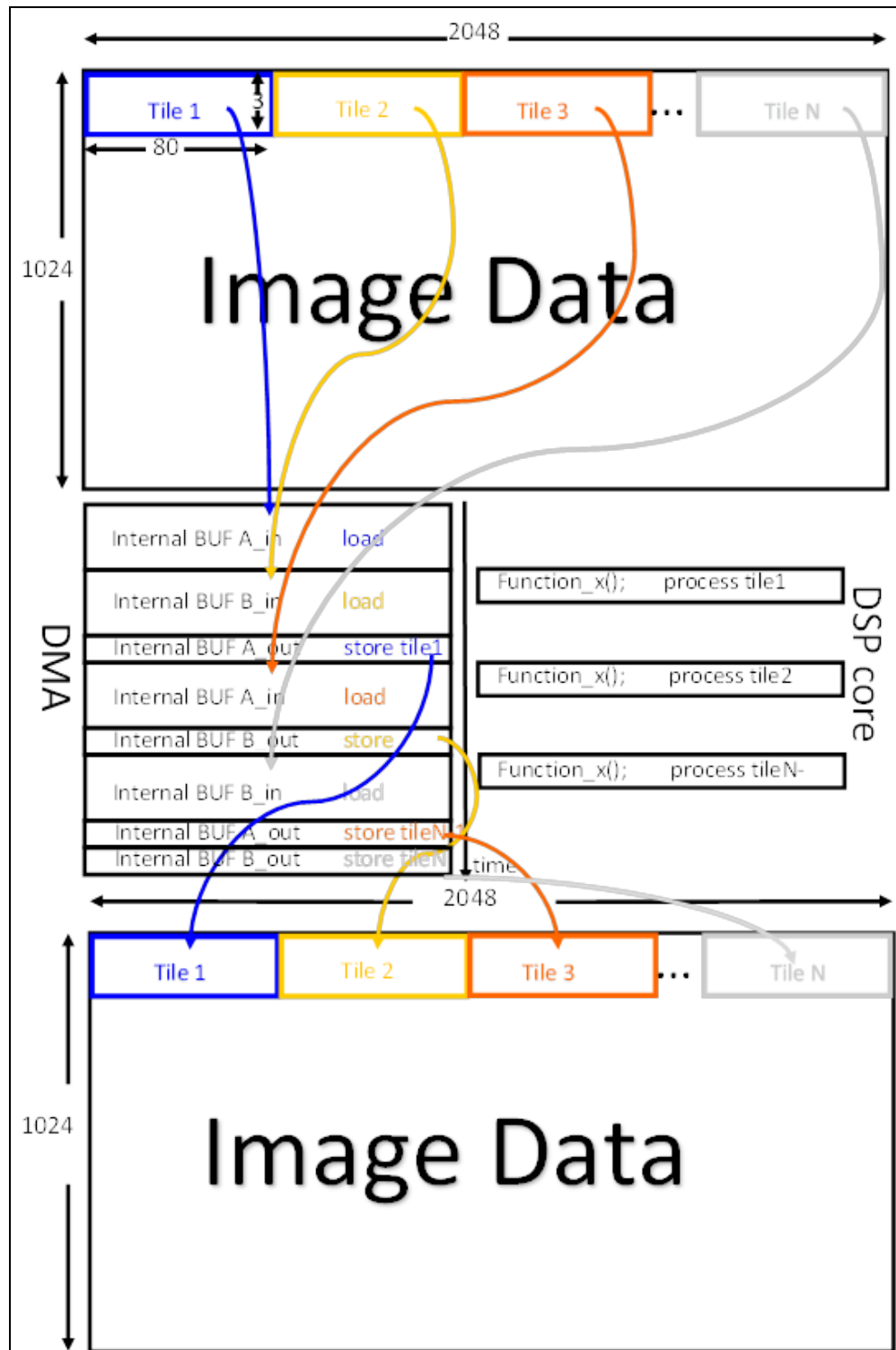


Figure 2-2: DDMA Algorithm Optimization

Example 2-2 demonstrates the code for a PingPang buffer with the DDMA.

Example 2-2: Image Process Code

```
void Img_process_with_DMA_demo()
{
    unsigned char ext_buf[EXT_BUF_SIZE];
    unsigned char buf_A_in[BUF_SIZE];
    unsigned char buf_A_out[BUF_SIZE];
    unsigned char buf_B_in[BUF_SIZE];
    unsigned char buf_B_out[BUF_SIZE];
    unsigned char*p_buf_src[2] = { buf_A_in, buf_B_in };
    unsigned char*p_buf_dst[2] = { buf_A_out, buf_B_out };

    //Create task descriptor
    dma_create_desc(&desc_2d, transfer_width, transfer_height,
src_stride, dst_stride, DMA_DIR_EXTERNAL_INTERNAL,
DMA_TYPE_LINEAR))

    for (i = 0; i < row_loop; i += row_step)
    {
        for (j = 0; j < line_loop; j += line_step)
        {
            //DMA process
            dma_enqueue_desc(&myqueue_base, &desc_2d,
p_buf_src[], p_buf_dst[phase ^ 1]);
            dma_enqueue_sync_point(&myqueue_base,
&sync_point_val[phase^ 1]););
            //DSP core process
            dma_wait_sync_point(&myqueue_base,
sync_point_val[phase]);
            process(buffer[[phase]]);
            phase ^= 1;
        }
    }
}
```