1. Introduction

This application note introduces the key features on K65/K66, where pins can be multiplexed between the SDRAM and FLEXBUS port. This helps save many pins in the application and is useful in applications that require many function pins.
2. Pins multiplexed between SDRAM and FLEXBUS

Table 1 shows the list of pins that can be multiplexed. When the SDRAM and FLEX BUS are both working, the multiplexed pins switch automatically. No other configuration is required when it is running.

<table>
<thead>
<tr>
<th>SDRAM</th>
<th>FLEX BUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>D15 – D0</td>
<td>A15 – A0</td>
</tr>
<tr>
<td>D31 – D16</td>
<td>AD31 – AD16</td>
</tr>
<tr>
<td>A23 – A9</td>
<td>AD15 – AD1</td>
</tr>
<tr>
<td>DQM3</td>
<td>BE31-24/CS4</td>
</tr>
<tr>
<td>DQM1</td>
<td>BE15-8/CS2</td>
</tr>
<tr>
<td>DQM0</td>
<td>BE7-0/CS3</td>
</tr>
</tbody>
</table>

The FLEX BUS BE function is configured in FB_CSPMCR.
3. Example for hardware connection

In this application, the following design connects to both SDRAM and 16-bit FLEX BUS-based LCD with multiplexed pins. The multiplexed pins are identified with green rectangles.

Figure 1. Multiplexed pins on SDRAM
For the full schematic document, refer to the TWR-K65/K66 Freescale Tower System development board link.

As shown in the images, if these pins are not multiplexed, multiple additional pins are required.

4. Demo to show this feature

The picture is loaded from on-chip to SDRAM after powering on. The picture is then loaded from SDRAQMA to the FLEX BUS based LCD screen. Figure 3 shows this feature.
The running result:

![Figure 4. Running result of the demo](image-url)

The two pictures are loaded from SDRAM to LCD alternatively in this demo.

5. Code for the demo

The main code is shown below.

Initialize the SDRAM and FLEX BUS, then initialize LCD and copy picture data from on-chip flash to SDRAM. Show the two pictures alternatively from SDRAM to LCD.

The full software package is also attached with this application note.

```c
void lcd_show(void)
{
    // point to SDRAM
    short * p1 = (short*)0x70000000;
    short * p2 = (short*)0x70100000;
    int i;

    // initiate SDRAM, flex bus and LCD
    sdrmc_init(120*1000);
    flex_bus_init();
    lcdc_init();

    // load image from on-chip flash to SDRAM
    for(i=0; i<320*240; i++)
```
{  
    p1[i] = pic1[i];
    p2[i] = pic2[i];
}

// show image from SDRAM to LCD which is connected by flex bus
while(1)
{
    lcdc_fill_window_pic(0,0,319, 239, (unsigned short *)p1);  
    for(i=0; i<1000*1000*10; i++);
    lcdc_fill_window_pic(0,0,319, 239, (unsigned short *)p2);
    for(i=0; i<1000*1000*10; i++);
}

6. Conclusion
This application note discusses how to share pins between SDRAM and FLEX BUS, which is an important feature of K65/K66. This feature is useful in using applications that require many pins. A demo also shows how to make hardware connection and how to make code to implement this feature.

7. References
The following reference documents are available on www.freescale.com.

- K65 Sub-Family Reference Manual (document K65P169M180SF5RMV2)
- K66 Sub-Family Reference Manual (document K66P144M180SF5RMV2)
8. Revision History

Table 2. Revision history

<table>
<thead>
<tr>
<th>Revision Number</th>
<th>Date</th>
<th>Substantive changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>03/2015</td>
<td>Initial Release</td>
</tr>
</tbody>
</table>