



# Application Note

AN0009

## Customize FlexMatrix Keyboard Controller SK5126

Associated Part Family: SK5126

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## 1 Overview

Sprintek FlexMatrix keyboard controller SK5126 provides many features for keyboard manufacturers to configure the ICs for their specific applications. These features are four matrix tables, Fn modes, backlight PWM control, general purpose output (GPO), state control output (SCO), LED drivers, and KeyMouse. This article introduces how to use and configure these features.

## 2 Configuration and Test Software Tools

FlexMatrix Editor and Programmer software are the tools to configure FlexMatrix keyboard controllers. FlexMatrix Tester software is a free tool to test keyboard matrix.

The latest version can be downloaded from the link  
<http://www.sprintek.com/support/Downloads.aspx>.

Microsoft .NET framework 4.0 must be installed to run these software tools. Please download .NET framework from Microsoft.com link  
<http://msdn.microsoft.com/en-gb/netframework/default.aspx>.

Tool List:

- FlexMatrix Editor for SK5126
- FlexMatrix Programmer
- FlexMatrix Tester

Here are screen snapshots of these FlexMatrix tools.

**Sprintek FlexMatrix Editor for SK5126 V1.35.3 [New]**

File Help

Header Registers | SFunc | Matrix 0 | Matrix 1 | Matrix 2 | Matrix 3 | MacroFuncKey 0 | MacroFuncKey 1 | MacroFuncKey 2 | MacroFuncKey 3 | MacroFuncKey 4 | MacroFuncKey 5

**Header**

Format ID: AB (1 Hex)

Revision: 01 (1 Hex)

Reserved0: 00 00 13 88 (4 Hex)

Mfr Data (15 Hex): 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

**Keyboard Control Registers**

Debounce Down Time (times): 03 (1 Hex)

Debounce Up Time (times): 01 (1 Hex)

Reserved2: 3F 0C (2 Hex)

Delay Func/Key Time: 00 64 (2 Hex)

External Mouse Scroll Mapping Timeout: 19 (1 Hex)

**KeyMouse**

XY Motion Speed Profile (10 Hex): 00 80 01 80 02 80 03 80 04 00

Z Scroll Speed Profile (2 Hex): 1E 50

**Ghost Key Disable Flags**

☐ Global Disabled

Individual Ghost Key Disabled Flags

C0 00	C4 00	C8 00	C12 00	C16 00
C1 00	C5 00	C9 00	C13 00	C17 00
C2 00	C6 00	C10 00	C14 00	
C3 00	C7 00	C11 00	C15 00	

Notes: Each byte represents R0 to R7

Figure 1 – FlexMatrix Editor for SK5126 Snapshot

**Sprintek FlexMatrix Programmer 1.31**

File Action Help

**Load** **Program & Verify**

LoadedBufferChecksum: 0x0

ProgramCounter: 0

Welcome to use FlexMatrix products. One chip for everything!

Figure 2 – FlexMatrix Programmer Snapshot

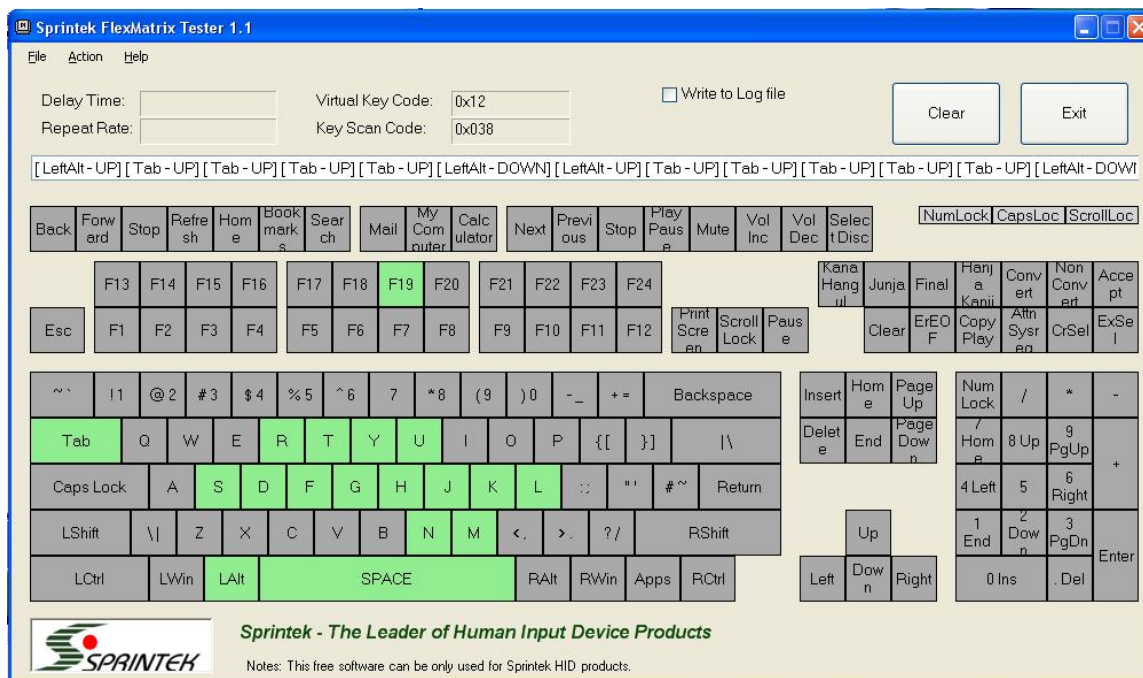


Figure 3 – FlexMatrix Tester Snapshot

### 3 Customization Workflow

FlexMatrix family keyboard controller ICs provide the ability for users to program keyboard matrix and other control parameters. To support this feature, FlexMatrix Programmer and FlexMatrix Editor software are developed. A user uses FlexMatrix Editor software to edit the keyboard matrix information and other control parameters into a binary file, then uses FlexMatrix Programmer software to download the binary file to the keyboard controllers' non-volatile memory. At the end, FlexMatrix Tester can be used to test the keyboard matrix.

FlexMatrix keyboard controllers may work in two modes: USB interface mode and PS/2 interface mode. For USB interface mode, FlexMatrix programmer (Windows) is used to download matrix data to the controllers under Windows via a USB port. For PS/2 interface mode, there is no program to support download; therefore, the IC need be set to USB mode temporarily to use this configuration feature.

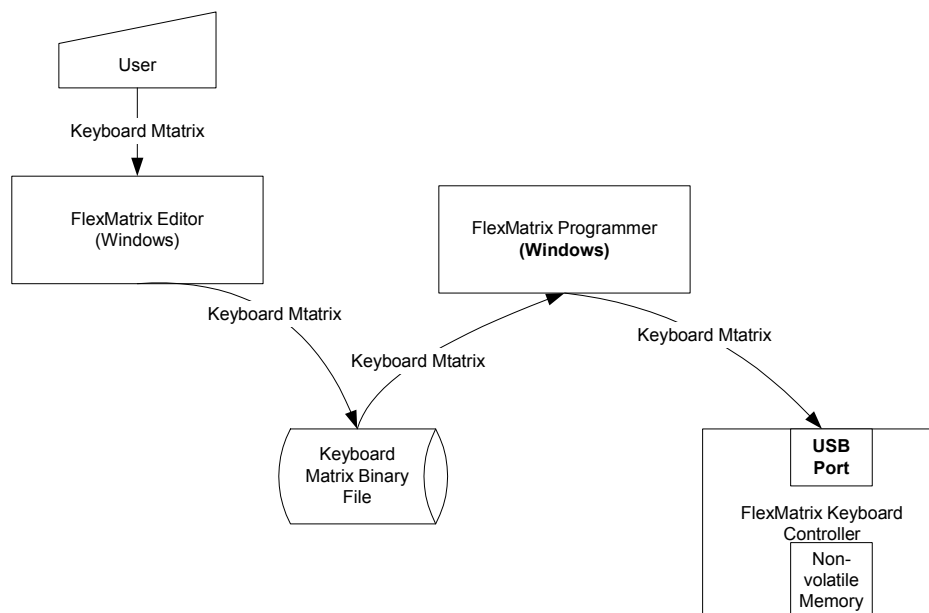


Figure 4 – Customization Workflow for FlexMatrix Controller

## 4 Download a Matrix File to FlexMatrix Controller

Follow the steps below to download a matrix data to FlexMatrix controller.

Step1 – Run FlexMatrix Programmer software in Windows;

Step2 – Click Load button and select the matrix data file;

Step3 – Plug FlexMatrix keyboard into PC's USB port;

Step4 – Click Program & Verify button to download the matrix data file.

Step5 – “Verification - Passed” shall be shown at the end of message list box.

Step6 – Repeat Step3 to Step5 for next keyboard controller.

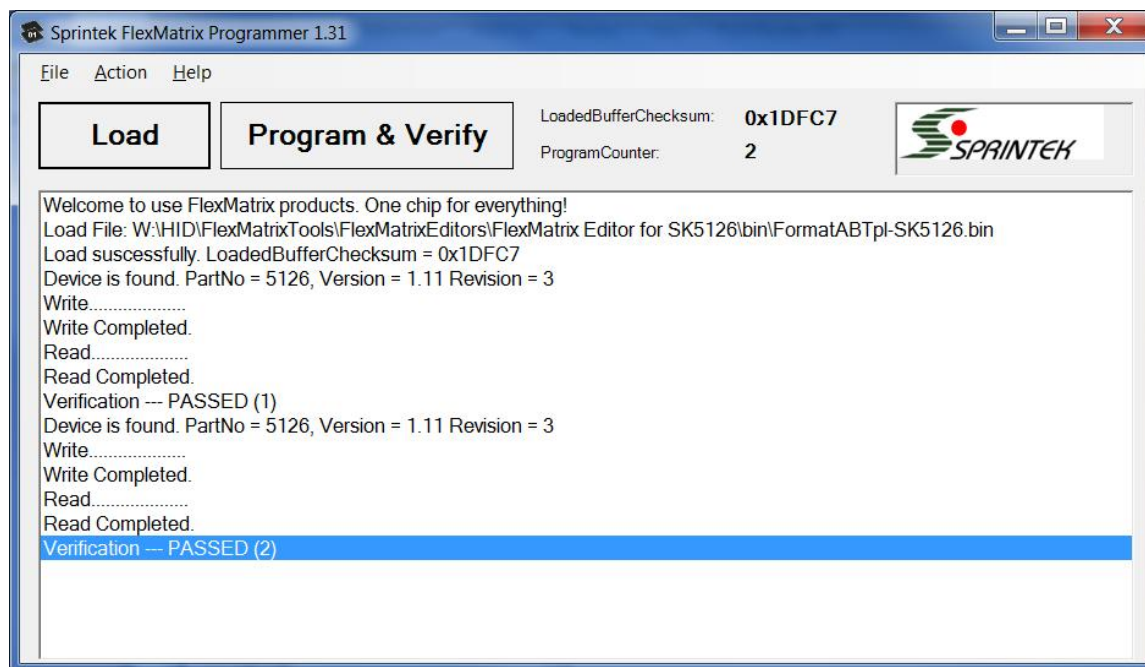


Figure 5 – FlexMatrix Programmer

## 5 Customize Keyboard Matrix

### 5.1 Concept of Matrix Tables

FlexMatrix keyboard controllers support four key matrix tables. Fn state is controlled by Fn key; Numlock state is the state of Numlock LED controlled by Numlock key. Each table has 144 keys, which is a 18-columns-8-rows matrix. The four matrix tables are configured as below.

Matrix0 – Fn Off, Numlock Off

Matrix1 – Fn Off, Numlock On

Matrix2 – Fn On, Numlock Off

Matrix3 – Fn On, Numlock On

*If your design doesn't have Fn key, you may ignore Matrix2 and Matrix3 assignment.*

Each location in the table can be assigned to a Sprintek key (SKEY). There are 256 SKEYs. Most SKEYs are predefined to USB or PS/2 scan code; but they can be redefined through “MacroFuncKey0” to “MacroFuncKey5” tabpage.

*FlexMatrix controllers have default matrix when they are shipped. The default matrix tables can be found in the datasheets. If your design maps the default matrix tables, you can use the ICs directly.*

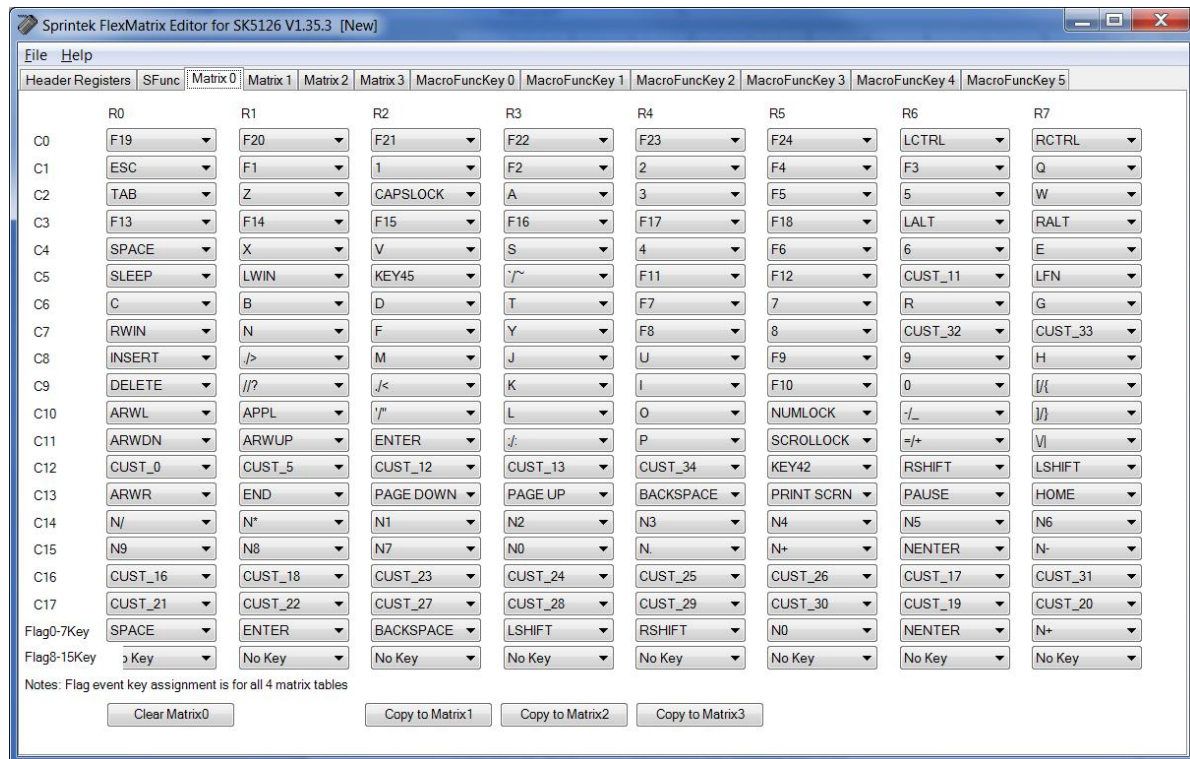


Figure 6 – Edit Matrix Tables

### 5.2 Assign a Key to a Location (Row, Column)

Each location need be assigned four keys for different Fn and Numlock state cases.

#### Example 1: Map Four Normal Keys to One Location

This example maps four keys “U”, “ARWUP”, “PAGE UP”, “VOLUP” to Matrix0-3 location R0C0 respectively.

Matrix #	Matrix Case	SKEY	Description
0	Fn Off, Numlock Off	U	Keyboard u and U
1	Fn Off, Numlock On	ARWUP	Keyboard UpArrow
2	Fn On, Numlock Off	PAGE UP	Keyboard PageUp
3	Fn On, Numlock On	VOLUP	Volume Up

The following pictures show the assignment in FlexMatrix Editor software.

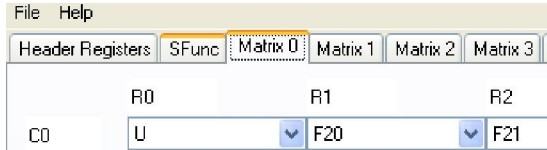


Figure 7 – U in Matrix 0

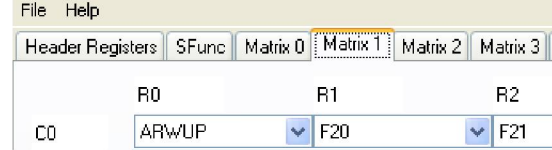


Figure 8 – ARWUP in Matrix 1

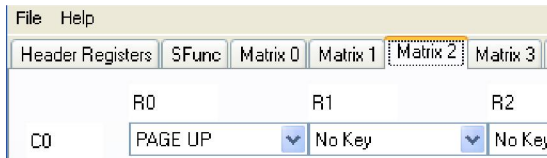


Figure 9 – PAGE UP in Matrix 2



Figure 10 – VOLUP in Matrix 3

### Example 2: Map Normal Key, Macro Key, Function Key to One Location

This example maps four keys “L”, “LOGIN”, “GPO0”, “BLCINC” to Matrix0-3 location R0C0 respectively. Macro keys and function keys can be defined or redefined through FlexMatrix Editor tabpage “MacroFuncKey0” to “MacroFuncKey5”.

Matrix #	Matrix Case	SKEY	Description
0	Fn Off, Numlock Off	L	Keyboard I and L
1	Fn Off, Numlock On	LOGIN	Macro key. LCTRL + LALT + DEL
2	Fn On, Numlock Off	GPO0	When key is pressed, GPO0 is driven to low; when key is released, GPO is driven to high.
3	Fn On, Numlock On	BLCINC	Backlight brightness cycle increase.

The following pictures show the assignment in FlexMatrix Editor software.

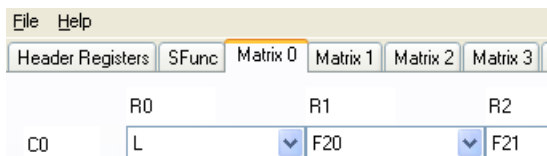


Figure 11 – L in Matrix 0

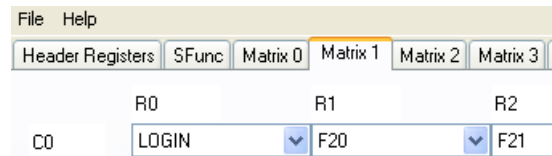


Figure 12 – LOGIN in Matrix 1





Figure 13 – GPO0 in Matrix 2

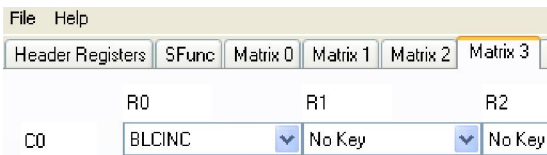


Figure 14 – BLCIN in Matrix 3

### 5.3 Define a Macro Key

A macro key is a combination of up to 5 keys. These element keys can be normal keys or function keys. A macro key cannot be nested into another macro key.

#### Example 1: Use a Macro Key to Generate ‘#’

To generate letter “#” in normal keyboard, we need press “SHIFT” key and “2” key. FlexMatrix keyboard controllers allow users to get “#” output by pressing only one key. This example defines “CUST\_41” to combination of “LSHIFT” and “2”. Then follow “Assign a Key to a Location” procedure to assign “CUST\_41” to Matrix0 to Matrix3.

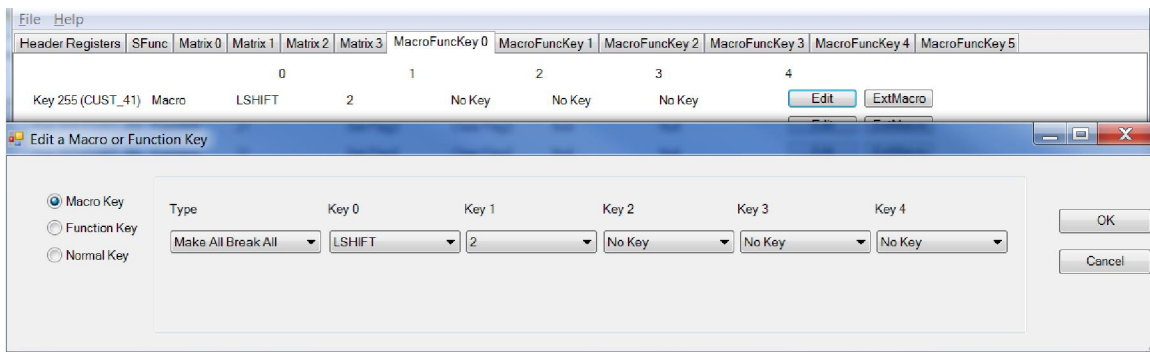


Figure 15 – Define a Macro Key of “#”

#### Example 2: Associate a GPO pin with a Normal Key

This example defines that “CUST\_40” associates GPO0 pin with “A” key. When “CUST\_40” is pressed, “A” letter down event is reported and GPO0 is driven to low; when “CUST\_40” is released, “A” letter up event is reported and GPO0 is driven to high.

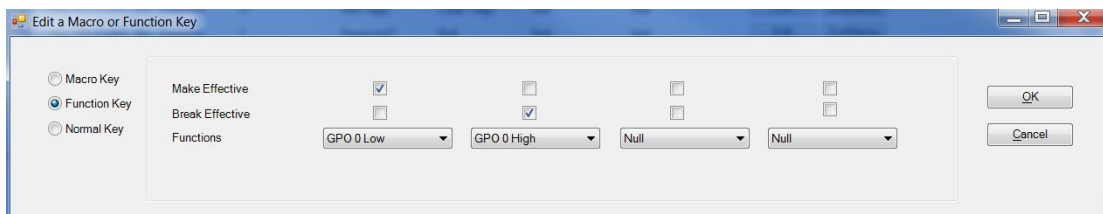


Figure 16 – GPO0 function key definition

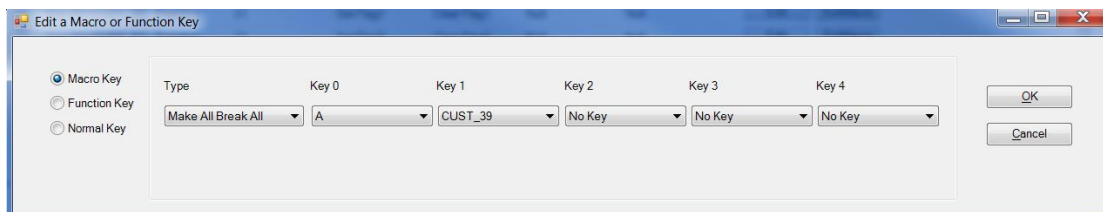


Figure 17 – Define a Key Associated with GPO pin

## 5.4 Three Types of Macro Key

SK5126 support 3 types of macro keys: make-all-break-all, sequential-at-press, sequential-at-release. The make-all-break-all is same to the standard macro key definition in SK5126 described in previous section. Besides the short definition support up to 5 keys, SK5126 also support extended long definition which can be extended up to 29 keys;

**Make-all-break-all:** When the physical key is pressed, the Key0 to Key4's make codes are sent to the system in order; when the physical key is released, the key4 to key0's break codes are sent to the system in order. For example, generate keys LCTRL+LALT+DEL to pop up task window.

**Sequential-at-press:** When the physical key is pressed, the key0's make code and break code are sent to the system; then so do key1, key2, key3 and key4; when the physical key is released, nothing is sent. For example, generate '0', '0' and '0' sequentially to get text "000" at key press.

**Sequential-at-release:** When the physical key is released, the key4's make code and break code are sent to the system; then so do key3, key2, key1 and key0; when the physical key is pressed, nothing is sent.

**Modifier Key Toggle Features:** For Sequential-at-press and Sequential-at-release keys, modifier key toggle feature is supported. CapsLock in the sequence will turn off current CapsLock LED setting; LShift/RShift will toggle current LShift/RShift status; LControl/RControl will toggle current LControl/RControl status; LAlt/RAlt will toggle current LAlt/RAlt status. At the end of execution, the original setting will be recovered.

### Example 1: Use a Macro Key to Generate '000'

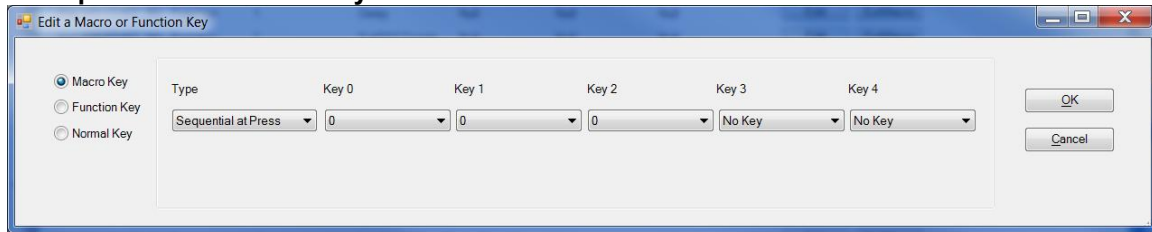


Figure 18 – Define a Key to Generate "000"

### Example 2: Use a Macro Key to Generate 'Diet Coke'

Press button "ExtMacro" to define up to 29-key macro key.

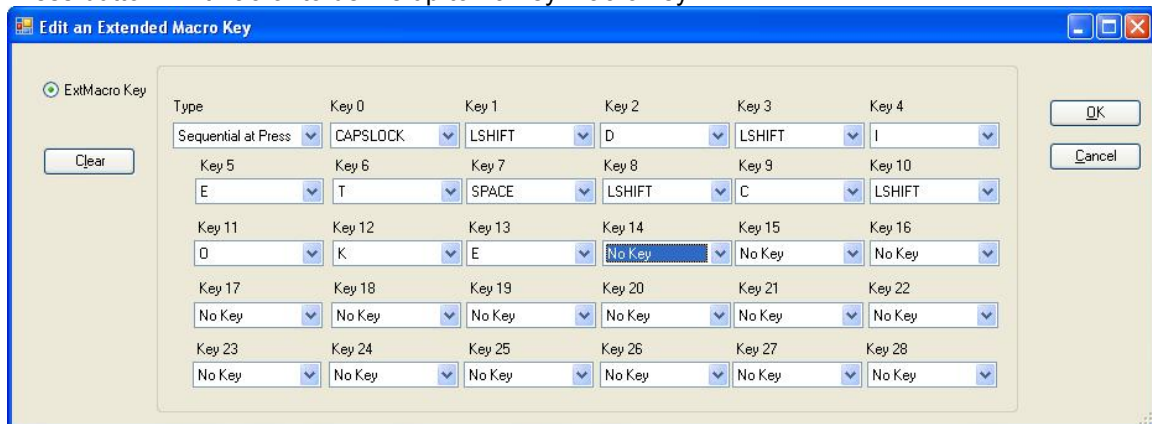


Figure 19 – Define a Key to Generate "Diet Coke"



## 5.5 Define a Function Key

A function key can be defined as a group of up to 4 Sprintek functions (SFunc). A function can be triggered at when the key is pressed (make effective) or when the key is released (break effective).

### Basic Functions

SFunc	Description
LFn	LFn function
RFn	RFn function
Backlight Cycle Inc	Backlight brightness increase in cycle
Backlight Cycle Dec	Backlight brightness decrease in cycle
Backlight Inc	Backlight brightness increase
Backlight Dec	Backlight brightness decrease
Backlight Toggle	Backlight brightness toggle
Backlight Off	Backlight brightness is off
Backlight On	Backlight brightness is on
SCO Cycle Inc	SCO increase in cycle
SCO Cycle Dec	SCO decrease in cycle
SCO Inc	SCO increase
SCO Dec	SCO decrease
GPO # Low	GPO # is driven to low. # is from 0 to 1
GPO # High	GPO # is driven to high. # is from 0 to 1
GPO # Toggle	GPO # toggle output. # is from 0 to 1

### External PS/2 Functions

SFunc	Description
External PS/2 Lock	Lock external PS/2 port
External PS/2 Unlock	Unlock external PS/2 port
External PS/2 Lock Toggle	Toggle external PS/2 port lock
External PS/2 Map Mouse X to Horizontal Scroll	Map mouse X movement to horizontal scroll
External PS/2 Map Mouse Y to Vertical Scroll	Map mouse Y movement to vertical scroll
External PS/2 Mouse Single scroll enable	When both X to HScroll and Y to VScroll mapping are enabled, the single scroll control is enabled
External PS/2 Mouse Single scroll disable	When both X to HScroll and Y to VScroll mapping are enabled, the single scroll control is disabled

### KeyMouse Functions

SFunc	Description
KeyMs LBtn Down	Simulate mouse left button is pressed
KeyMs RBtn Down	Simulate mouse right button is pressed
KeyMs MBtn Down	Simulate mouse middle button is pressed
KeyMs 4Btn Down	Simulate mouse 4 <sup>th</sup> button is pressed
KeyMs 5Btn Down	Simulate mouse 5 <sup>th</sup> button is pressed
KeyMs X Plus Down	Simulate mouse X positive movement
KeyMs X Minus Down	Simulate mouse X minus movement
KeyMs Y Plus Down	Simulate mouse Y positive movement
KeyMs Y Minus Down	Simulate mouse Y minus movement

KeyMs Z Plus Down	Simulate mouse vertical scroll down movement
KeyMs Z Minus Down	Simulate mouse vertical scroll up movement
KeyMs H Plus Down	Simulate mouse horizontal scroll right movement
KeyMs H Minus Down	Simulate mouse horizontal scroll left movement
KeyMs LBtn Up	Simulate mouse left button is released
KeyMs RBtn Up	Simulate mouse right button is released
KeyMs MBtn Up	Simulate mouse middle button is released
KeyMs 4Btn Up	Simulate mouse 4 <sup>th</sup> button is released
KeyMs 5Btn Up	Simulate mouse 5 <sup>th</sup> button is released
KeyMs X Plus Up	Stop simulating mouse X positive movement
KeyMs X Minus Up	Stop simulating mouse X minus movement
KeyMs Y Plus Up	Stop simulating mouse Y positive movement
KeyMs Y Minus Up	Stop simulating mouse Y minus movement
KeyMs Z Plus Up	Stop simulating mouse vertical scroll down movement
KeyMs Z Minus Up	Stop simulating mouse vertical scroll up movement
KeyMs H Plus Up	Stop simulating mouse horizontal scroll right movement
KeyMs H Minus Up	Stop simulating mouse horizontal scroll left movement

## Flag Functions

SFunc	Description
Flag # Clear	Clear internal variable flag. # is from 0 to 15
Flag # Set	Set internal variable flag. # is from 0 to 15
Flag # Toggle	Toggle internal variable flag. # is from 0 to 15

### Example: A Key-Controlled GPO Key

This example demonstrates that a key press to control a GPO pin output state. When the key is pressed, the GPO outputs low; when the key is released, the GPO outputs high.

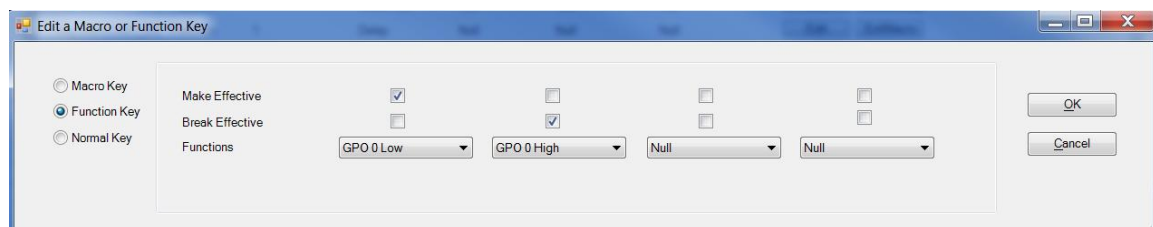


Figure 20 – Define a Key-Controlled GPO Key

## 6 Design Backlight

### 6.1 Method 1 – Backlight PWM Control

FlexMatrix keyboard controllers control a PWM output to control the backlight brightness. A function key associated to a SFunc backlight function can control the PWM high duty of the BKPWM pin output.

The SK5126 supports the following backlight functions.

SFunc	Description
Backlight Cycle Inc	Backlight brightness increase in cycle. When the

	level reaches the highest, it wraps to the lowest level.
Backlight Cycle Dec	Backlight brightness decrease in cycle. When the level reaches the lowest, it wraps to the highest level.
Backlight Inc	Backlight brightness increase. When the level reaches the highest, it stays at the highest level.
Backlight Dec	Backlight brightness decrease. When the level reaches the lowest, it stays at the lowest level.
Backlight Toggle	Backlight brightness toggle. Toggle between level 0 and the highest level.
Backlight Off	Backlight brightness is off. Set the level to 0.
Backlight On	Backlight brightness is on. Set the level to the highest level.

The backlight control parameters are defined in “Backlight GPO/PWM” section of FlexMatrix Editor tabpage “SFunc”.

Backlight GPO/PWM

☒ Backlight Enabled ☐ IO Mode ☒ PWM Mode

Backlight GPO Mask/PWM Period: 50 (1 Hex) ☐ AutoOn When Key Pressed

Backlight Level Number: 06 (1 Hex) ☐ AutoOn When Power On

Backlight Power On Level: 05 (1 Hex) ☐ PWM Output Inverted (PWM Mode)

Backlight Level Table: 00 10 20 30 40 50 00 00 (16 Hex)

Backlight Level Table: 00 00 00 00 00 00 00 00

Backlight AutoOff Time: FF FF FF (3 Hex High, Mid, Low)

Notes: In PWM mode, period >= 0x20. Typical value is 0x50.

Figure 21 – Backlight PWM Parameters

Parameters	Description
Backlight Enabled	Checked = Backlight enabled; Unchecked = disabled
IO Mode/PWM Mode	Select PWM mode to use GPO1 to control backlight circuit.
AutoOn When Key Pressed	When a key is pressed, Checked = Backlight is set to level [Power On Level]; Unchecked = Backlight level is not changed.
AutoOn When Power On Reset	When the device is powered on, Checked = Backlight is set to level [Power On Level]; Unchecked = Backlight level is set to level 0.
Backlight PWM Period	The PWM one cycle period time based on a 32k clock. Typical setting is 0x50 (400Hz). The min value shall be not less than 0x20 (>=1kHz).
Backlight Level Number	The total level number defined in level table.
Backlight Power On Level	[Power On Level] - Backlight level when power on. The level starts from 0 to [Backlight Level Number] – 1.
Backlight Level Table	The elements define PWM duty cycle. The number is between 0 to [PWM Period].

Backlight AutoOff Time	The time is kept on after no key is pressed. The LSB is 1.95ms.
------------------------	---

**Example: Level Settings**

Backlight GPO/PWM

☒ Backlight Enabled ☐ IO Mode ☒ PWM Mode

Backlight GPO Mask/PWM Period: 50 (1 Hex) ☐ AutoOn When Key Pressed

Backlight Level Number: 06 (1 Hex) ☐ AutoOn When Power On

Backlight Power On Level: 05 (1 Hex) ☐ PWM Output Inverted (PWM Mode)

Backlight Level Table: 00 10 20 30 40 50 00 00 (16 Hex)

Backlight AutoOff Time: FF FF FF (3 Hex High, Mid, Low)

Notes: In PWM mode, period >= 0x20. Typical value is 0x50.

Figure 22 – Backlight PWM Mode Example

The above settings are interpreted as below.

Total level number is 6; power on/auto on level is 5 (highest level).

Level#	Level Settings	Duty %
0	00	0
1	10	20
2	20	40
3	30	60
4	40	80
5	50	100

**6.2 Method 2 – Backlight GPO Control**

FlexMatrix keyboard controllers control a group GPO pin output to control the backlight brightness. A function key associated to a SFunc backlight function can control the GPO pin state. You may use these GPOs to control current sensing resistor combination to set different brightness; or use these GPOs to control a resistor network and generate variable analog voltage to interface an LED circuit.

The SK5126 supports the following backlight functions.

SFunc	Description
Backlight Cycle Inc	Backlight brightness increase in cycle. When the level reaches the highest, it wraps to the lowest level.
Backlight Cycle Dec	Backlight brightness decrease in cycle. When the level reaches the lowest, it wraps to the highest level.
Backlight Inc	Backlight brightness increase. When the level reaches the highest, it stays at the highest level.
Backlight Dec	Backlight brightness decrease. When the level reaches the lowest, it stays at the lowest level.
Backlight Toggle	Backlight brightness toggle. Toggle between level 0 and the highest level.
Backlight Off	Backlight brightness is off. Set the level to 0.

Backlight On	Backlight brightness is on. Set the level to the highest level.
--------------	---

The backlight control parameters are defined in “Backlight GPO/PWM” section of FlexMatrix Editor tabpage “SFunc”.

Figure 23 – Backlight GPO Parameters

Parameters	Description
Backlight Enabled	Checked = Backlight enabled; Unchecked = disabled
IO Mode/PWM Mode	Select IO mode to use GPO0 and GPO1 to control backlight circuit.
AutoOn When Key Pressed	When a key is pressed, Checked = Backlight is set to level [Power On Level]; Unchecked = Backlight level is not changed.
AutoOn When Power On Reset	When the device is powered on, Checked = Backlight is set to level [Power On Level]; Unchecked = Backlight level is set to level 0.
Backlight GPO Mask	Defines which GPOs are used. Bit5 (GPO1) and Bit3 (GPO0) are valid bits.
Backlight Level Number	The total level number defined in level table.
Backlight Power On Level	[Power On Level] - Backlight level when power on. The level starts from 0 to [Level Number] – 1.
Backlight Level Table	The elements define GPO combination state. Bit3 and 5 are valid; other bits are ignored.
Backlight AutoOff Time	The time is kept on after no key is pressed. The LSB is 1.95ms.

The SK5126 supports two GPOs: BIT3 - GPO0 and BIT5 - GPO1. The each GPO supports 4 output modes: strong drive low, strong drive high, high impedance, and pull-up. The mode is set by upper level table and lower level table combination.

Lower Bit	Upper Bit	Mode
0	0	Low
0	1	High
1	0	Floating
1	1	Pull-up

#### Example: Level Settings

Backlight GPO/PWM

☒ Backlight Enabled ☒ IO Mode ☐ PWM Mode

Backlight GPO Mask/PWM Period 28 (1 Hex) ☐ AutoOn When Key Pressed

Backlight Level Number 05 (1 Hex) ☐ AutoOn When Power On

Backlight Power On Level 04 (1 Hex) ☐ PWM Output Inverted (PWM Mode)

Backlight Level Table 00 00 00 08 28 00 00 00 (16 Hex)

00 20 28 20 00 00 00 00

Backlight AutoOff Time FF FF FF (3 Hex High, Mid, Low)

Notes: In PWM mode, period >= 0x20. Typical value is 0x50.

Figure 24 – Backlight IO Mode Example

The above settings are interpreted as below.

Total level number is 5; power on/auto on level is 4 (highest level).

Level#	Lower	Upper	GPO1 Setting	GPO0 Settings	GPO1 Mode	GPO0 Mode
0	00	00	0,0	0,0	Low	Low
1	20	00	1,0	0,0	Floating	Low
2	28	00	1,0	1,0	Floating	Floating
3	20	08	1,0	0,1	Floating	High
4	00	28	0,1	0,1	High	High

## 7 GPO Configuration

The FlexMatrix Controllers provide eight GPO pins. A function key associated to SFunc GPO functions can control the GPO pins.

The FlexMatrix Controllers support the following SFunc.

SFunc	Description
GPO # Low	GPO # is driven to low. # is from 0 to 1
GPO # High	GPO # is driven to high. # is from 0 to 1
GPO # Toggle	GPO # toggle output. # is from 0 to 1

The GPO configuration parameters are defined in “GPO & SCO” section of FlexMatrix Editor tabpage “SFunc”.



GPO & SCO

GPO Power On State  (1 Hex)

GPO Config0  (1 Hex)

GPO Config1  (1 Hex)

SCO State Number  (1 Hex)

SCO Power On State  (1 Hex)

SCO State Table (16 Hex)

<input type="text" value="88"/>	<input type="text" value="80"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>
<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>	<input type="text" value="00"/>

SCO GPO Mask  (1 Hex)

Figure 25 – GPO Parameters

The SK5126 provides the following GPOs.

BIT3 - GPO0

BIT5 - GPO1

Parameters	Description																				
GPO Power On State	GPO output state after power on. Bit3, and Bit5 are mapped to the state of GPO0 to GPO1. 1=High; 0=Low.																				
GPO Config0, Config1	GPO Config1 and Config0's Bit3 and Bit5 are mapped to the control mode of GPO0 to GPO1; <table><tr><th>Config1,0</th><th>Drive Mode</th><th>Data0</th><th>Data1</th></tr><tr><td>00</td><td>Resistive Pull Up</td><td>Strong</td><td>Resistive</td></tr><tr><td>01</td><td>Strong Drive</td><td>Strong</td><td>Strong</td></tr><tr><td>10</td><td>High Impedance</td><td>Hi-Z</td><td>Hi-Z</td></tr><tr><td>11</td><td>Open Drain</td><td>Strong</td><td>Hi-Z</td></tr></table>	Config1,0	Drive Mode	Data0	Data1	00	Resistive Pull Up	Strong	Resistive	01	Strong Drive	Strong	Strong	10	High Impedance	Hi-Z	Hi-Z	11	Open Drain	Strong	Hi-Z
Config1,0	Drive Mode	Data0	Data1																		
00	Resistive Pull Up	Strong	Resistive																		
01	Strong Drive	Strong	Strong																		
10	High Impedance	Hi-Z	Hi-Z																		
11	Open Drain	Strong	Hi-Z																		

Notes: If the GPO is part of Backlight control, then the settings will be overwritten by Backlight control.

## 8 SCO Configuration

The FlexMatrix Controllers provide eight GPO pins. These GPOs can be grouped together and is controlled by one function. A function key associated to SFunc SCO functions can control the group of GPO pins. These key-controlled SCO pins can be used to control a state-machine logic.

The FlexMatrix controllers support the following SFunc.

SFunc	Description
SCO Cycle Inc	SCO increase in cycle. When the state reaches the highest, it wraps to the lowest state.
SCO Cycle Dec	SCO decrease in cycle. When the state reaches the lowest, it wraps to the highest state.
SCO Inc	SCO increase. When the state reaches the highest, it stays at the highest state.
SCO Dec	SCO decrease. When the state reaches the lowest, it stays at the lowest state.

The SCO configuration parameters are defined in “GPO & SCO” section of FlexMatrix Editor tabpage “SFunc”.

GPO & SCO

GPO Power On State  (1 Hex)

GPO Config0  (1 Hex)

GPO Config1  (1 Hex)

SCO State Number  (1 Hex)

SCO Power On State  (1 Hex)

SCO State Table (16 Hex)

88	80	00	00	00	00	00	00
00	00	00	00	00	00	00	00

SCO GPO Mask  (1 Hex)

Figure 26 – SCO Parameters

Parameters	Description
SCO State Number	The total level number defined in SCO state table. The effective state definition is from index 0 to index “SCO State Number” – 1.
SCO Power On State	SCO output state after power on.
SCO State Table	The elements define the GPO output for the state. 16 states can be defined at maximum. The Bit0 to Bit7 of a state are mapped to the physical port output pin.
SCO GPO Mask	Defines which GPOs are grouped to SCO control logic. The Bit0 to Bit7 are mapped to the enable bit of the physical port output. 1 = Enabled to be grouped to SCO; 0 = Disabled.

The SK5126 provides the following GPOs.

BIT3 - GPO0

BIT5 - GPO1

## 9 LED Driver Configuration

The FlexMatrix Controllers provide six direct LED drivers to drive Fn, Numlock, Scrolllock, Capslock, Composite, Kana LEDs. These LEDs is controlled by its own keyboard logic.

The LED configuration parameters are defined in “LEDs, Suspend & Alert LED” section of FlexMatrix Editor tabpage “SFunc”.

LEDs, Suspend & Reset		
LED Inverted Output	00	(1 Hex)
Reserved	00	(1 Hex)
Suspend Control	04	(1 Hex)
External PS/2 Lock	00	(1 Hex)
3.3V Reset Delay	32	(1 Hex 2ms per LSB)
5.0V Reset Delay	32	(1 Hex 2ms per LSB)

Figure 27 – LEDs Parameters

Parameters	Description
LED Inverted Output	Invert the output logic. 1 = Inverted; 0 = Normal. In normal mode, LED on means the output is low.  Bit0: NumLock LED output mode; Bit1: CapsLock LED output mode; Bit2: ScrollLock LED output mode; Bit3: Composite LED output mode; Bit4: Kana LED output mode; Bit5: Fn LED output mode.
Suspend Control	Bit0: 0 = Turned off LEDs and PWM backlight during USB suspend, restore their original state after wakeup; 1 = Keep their existing settings during USB suspend.

## 10 KeyMouse Configuration

The FlexMatrix Controller SK5126 can simulate mouse functions by mapping keyboard keys. A function key associated to SFunc KeyMs functions can simulate mouse movement and mouse button operations.

SFunc	Description
KeyMs LBtn Down	Simulate mouse left button is pressed
KeyMs RBtn Down	Simulate mouse right button is pressed
KeyMs MBtn Down	Simulate mouse middle button is pressed
KeyMs 4Btn Down	Simulate mouse 4 <sup>th</sup> button is pressed
KeyMs 5Btn Down	Simulate mouse 5 <sup>th</sup> button is pressed
KeyMs X Plus Down	Simulate mouse X positive movement
KeyMs X Minus Down	Simulate mouse X minus movement
KeyMs Y Plus Down	Simulate mouse Y positive movement
KeyMs Y Minus Down	Simulate mouse Y minus movement
KeyMs Z Plus Down	Simulate mouse vertical scroll down movement
KeyMs Z Minus Down	Simulate mouse vertical scroll up movement
KeyMs H Plus Down	Simulate mouse horizontal scroll right movement
KeyMs H Minus Down	Simulate mouse horizontal scroll left movement
KeyMs LBtn Up	Simulate mouse left button is released

KeyMs RBtn Up	Simulate mouse right button is released
KeyMs MBtn Up	Simulate mouse middle button is released
KeyMs 4Btn Up	Simulate mouse 4 <sup>th</sup> button is released
KeyMs 5Btn Up	Simulate mouse 5 <sup>th</sup> button is released
KeyMs X Plus Up	Stop simulating mouse X positive movement
KeyMs X Minus Up	Stop simulating mouse X minus movement
KeyMs Y Plus Up	Stop simulating mouse Y positive movement
KeyMs Y Minus Up	Stop simulating mouse Y minus movement
KeyMs Z Plus Up	Stop simulating mouse vertical scroll down movement
KeyMs Z Minus Up	Stop simulating mouse vertical scroll up movement
KeyMs H Plus Up	Stop simulating mouse horizontal scroll right movement
KeyMs H Minus Up	Stop simulating mouse horizontal scroll left movement

At default, SK5126 has defined a set of function keys to operate KeyMouse.

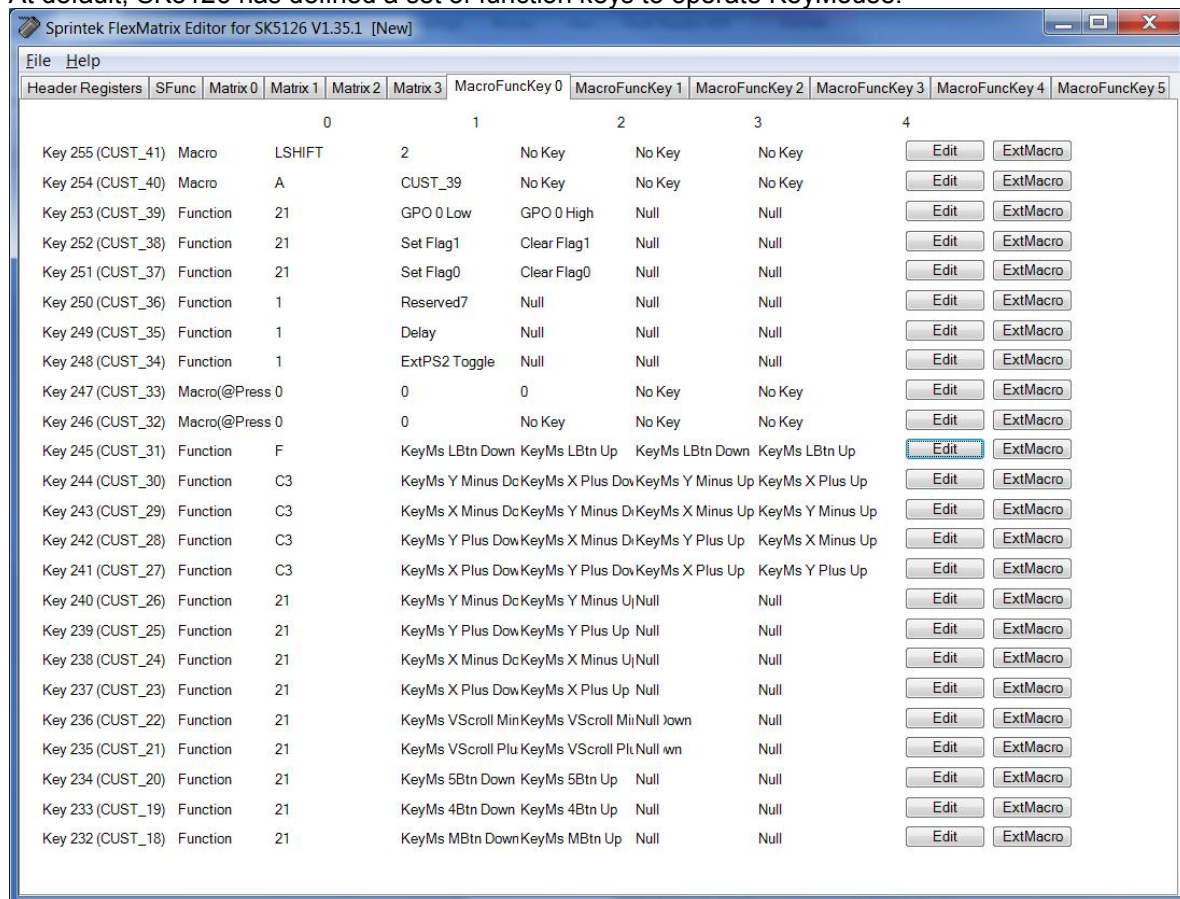


Figure 28 – Default KeyMouse Function Key Definition

## 11 External PS/2 Mouse Mapping XY Movement to HScroll and VScroll

The FlexMatrix Controller SK5126 can map X, Y movement to horizontal scroll, vertical scroll via the following Sfunc functions.

SFunc	Description
External PS/2 Map Mouse X to Horizontal	Map mouse X movement to horizontal scroll

Scroll	
External PS/2 Map Mouse Y to Vertical Scroll	Map mouse Y movement to vertical scroll
External PS/2 Mouse Single scroll enable	When both X to HScroll and Y to VScroll mapping are enabled, the single scroll control is enabled
External PS/2 Mouse Single scroll disable	When both X to HScroll and Y to VScroll mapping are enabled, the single scroll control is disabled

The following example maps X movement to HScroll, Y movement to VScroll when Fn key is pressed.

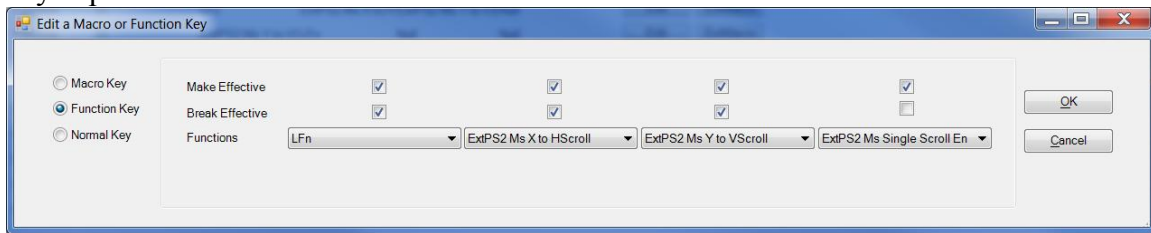


Figure 29 – Fn enabled X to HScroll, Y to VScroll Function Key Definition

## 12 History

Version	Date	Description
V1.00	2015-02-20	Initial Release