

SDK API User Guide

Version 1.2

Vimu Electronic Technology

2023-6-26

<http://www.vimu.top/>

Update Log

V1.0 (2023.3.31)

- 1, New design

V1.1 (2023.5.22)

- 1, Add Logic Channel Trigger Source support

V1.2 (2023.6.26)

- 1, Add Watchdog Ctrl

Catalog

1. Introduction	1
2. Initialization and finish.....	1
3. Equipment ID	1
4. Equipment Reset	1
5. Equipment Monitor	2
5.1. callback function	2
5.2. Event.....	2
5.3. Loop Detect.....	2
6. Oscillograph.....	2
6.1. Capture Range Set	2
6.2. Sample.....	3
6.5. Capture	8
6.6. Capture Completion Notice.....	9
6.6.1. callback function	9
6.6.2. Event.....	9
6.6.3. loop detect	9
6.7. Data Read	10
7. DDS.....	10
8. IO	12
Callback functions.....	12
Event.....	13
Loop Detect.....	13

1. Introduction

As a standard DLL interface for MOS mixed-signal oscilloscopes, mixed-signal oscilloscopes can be controlled directly.

The interface supports windows systems (X86, X64 and arm64) and linux systems (X64, arm-linux-gnueabi, arm-linux-gnueabihf, and aarch64-linux).

2. Initialization and finish

Call InitDll () to complete the initialization of dynamic library, initialize memory and resources allocated for equipment monitoring and data reading.

int InitDll(unsigned int en_log , unsigned int en_hard_watchdog);

Description Dll initialization

Input: **log enable** 1 Enable Log
 0 Not Enable Log
 watchdog enable 1 Enable hard watchdog
 0 Not Enable hard watchdog

Output: **Init Status**

Return value 1 Success
 0 Failed

Call FinishDll () to complete the end of a dynamic library, freeing memory initialization and related resources in the application.

int FinishDll(void);

Description Dll finished

Input: -

Output: **-Finished Status**

Return value 1 Success
 0 Failed

3. Equipment ID

The device ID is a 64-bit integer.

int GetOnlyId0(void);

Description This routines return device id(0-31)

Input: -

Output: - **Device ID(0-31)**

int GetOnlyId1(void);

Description This routines return device id(32-63)

Input: -

Output: - **Device ID(32-63)**

4. Equipment Reset

int ResetDevice(void);

Description This routines reset device

Input: -

Output: - **Return value** 1 success
 0 failed

5. Equipment Monitor

when the device is detected, the dll have three ways to notify the main program, callback function, set Event and the main program loop detection.

5.1. callback function

When equipment is detect a function "**addcallback**" in the application can be called; when equipment is removed a function "**rmvcallback**" in the application can be called. The DLL has a function pointer which has to be set to these function, using

void SetDevNoticeCallBack(void* ppara, AddCallBack addcallback, RemoveCallBack rmvcallback);

Description	This routines sets the callback function of equipment status changed.	
Input:	ppara	the parameter of the callback function
	addcallback	a pointer to a function with the following prototype: void AddCallBack(void * ppara)
	rmvcallback	a pointer to a function with the following prototype: Void RemoveCallBack(void * ppara)

Output -

5.2. Event

When equipment is detect, an event "**addevent**" can be set by the DLL; when equipment is removed, an event "**rmvevent**" can be set by the DLL. The user must reset the event when the used them. The DLL has a function pointer which has to be set to these event using

void SetDevNoticeEvent(HANDLE addevent, HANDLE rmvevent);

Description	This routines set the event handle, these will be set, when equipment status changed.	
Input:	addevent	the event handle
	rmvevent	the event handle

Output -

5.3. Loop Detect

int IsDevAvailable();

Description	This routines return the device is available or not.
-------------	--

Input:	-
--------	---

Output	Return value 1 available 0 not available
--------	--

Note: Only need to use one of three ways. Callback and Event functions are asynchronous, more efficient; main program loop detection over a certain time needed to detect whether the device is inserted or removed.

6. Oscillograph

6.1. Capture Range Set

Device with a programmable gain amplifier, when the signal acquisition time is less than the AD range, the signal amplification gain amplifier to use more AD digits, improving the quality of signal acquisition. Dll will adjusted the range of settings according to the pre-gain amplifier

automatically.

int SetOscChannelRange(int channel, int minmv, int maxmv);

Description This routines set the range of input signal.

Input: **channel** the set channel

0 channel 1

1 channel 2

minmv the minimum voltage of the input signal (mV)

maxmv the maximum voltage of the input signal (mV)

Output **Return value** 1 Success

0 Failed

Note: The maximum range of the probe collection X1, the maximum voltage oscilloscope can capture. Like MSO20 is[-12000mV,12000mV].

Note: In order to achieve better waveform, you need to set the acquisition range, based on the magnitude of the measured waveform. When necessary, you can dynamically change the acquisition range.

6.2.Sample

int GetOscSupportSampleNum();

Description This routines get the number of samples that the equipment support.

Input: -

Output **Return value** the support sample number

int GetOscSupportSamples(unsigned int* sample, int maxnum);

Description This routines get support samples of equipment.

Input: **sample** the array store the support samples of the equipment

maxnum the length of the array

Output **Return value** the sample number of array stored

int SetOscSample(unsigned int sample);

Description This routines set the sample.

Input: **sample** the set sample

Output **Return value** 0 Failed

other value new sample

6.3.Trigger(hardware trigger)

This feature requires hardware trigger support. The hardware trigger point is the intermediate data, such as the acquisition of 128K data, trigger point is the 64K point.

Trigger Mode

#define TRIGGER_MODE_AUTO 0

#define TRIGGER_MODE_LIANXU 1

Trigger Style

#define TRIGGER_STYLE_NONE 0x0000 //not trigger

#define TRIGGER_STYLE_RISE_EDGE 0x0001 //Rising edge

```

#define TRIGGER_STYLE_FALL_EDGE 0x0002    //Falling edge
#define TRIGGER_STYLE_EDGE 0x0004        //Edge
#define TRIGGER_STYLE_P_MORE 0x0008      //Positive Pulse width(>)
#define TRIGGER_STYLE_P_LESS 0x0010      //Positive Pulse width(>)
#define TRIGGER_STYLE_P      0x0020      //Positive Pulse width(<>)
#define TRIGGER_STYLE_N_MORE 0x0040      //Negative Pulse width(>)
#define TRIGGER_STYLE_N_LESS 0x0080      //Negative Pulse width(>)
#define TRIGGER_STYLE_N      0x0100      //Negative Pulse width(<>)

```

int IsSupportHardTrigger();

Description This routines get the equipment support hardware trigger or not .

Input: -

Output **Return value** 1 support hardware trigger
0 not support hardware trigger

unsigned int GetTriggerMode();

Description This routines get the trigger mode.

Input: -

Output **Return value** TRIGGER_MODE_AUTO
TRIGGER_MODE_LIANXU

void SetTriggerMode(unsigned int mode);

Description This routines set the trigger mode.

Input: **mode** TRIGGER_MODE_AUTO
TRIGGER_MODE_LIANXU

Output -

unsigned int GetTriggerStyle();

Description This routines get the trigger style.

Input: -

Output **Return value** TRIGGER_STYLE_NONE
TRIGGER_STYLE_RISE_EDGE
TRIGGER_STYLE_FALL_EDGE
TRIGGER_STYLE_EDGE
TRIGGER_STYLE_P_MORE
TRIGGER_STYLE_P_LESS
TRIGGER_STYLE_P
TRIGGER_STYLE_N_MORE
TRIGGER_STYLE_N_LESS
TRIGGER_STYLE_N

void SetTriggerStyle(unsigned int style);

Description This routines set the trigger style.

Input: **style** TRIGGER_STYLE_NONE
TRIGGER_STYLE_RISE_EDGE

TRIGGER_STYLE_FALL_EDGE
 TRIGGER_STYLE_EDGE
 TRIGGER_STYLE_P_MORE
 TRIGGER_STYLE_P_LESS
 TRIGGER_STYLE_P
 TRIGGER_STYLE_N_MORE
 TRIGGER_STYLE_N_LESS
 TRIGGER_STYLE_N

Output -

int GetTriggerPulseWidthNsMin();

Description This routines get the min time of pulse width.

Input: -

Output Return min time value of pulse width(ns)

int GetTriggerPulseWidthNsMax();

Description This routines get the max time of pulse width.

Input: -

Output Return max time value of pulse width(ns)

int GetTriggerPulseWidthDownNs();

Description This routines get the down time of pulse width.

Input: -

Output Return down time value of pulse width(ns)

int GetTriggerPulseWidthUpNs();

Description This routines set the down time of pulse width.

Input: down time value of pulse width(ns)

Output -

void SetTriggerPulseWidthNs(int down_ns, int up_ns);

Description This routines set the up time of pulse width.

Input: up time value of pulse width(ns)

Output -

unsigned int GetTriggerSource();

Description This routines get the trigger source.

Input: -

Output **Return value** TRIGGER_SOURCE_CH1 0 //CH1
 TRIGGER_SOURCE_CH2 1 //CH2
 TRIGGER_SOURCE_LOGIC0 16 //Logic 0
 TRIGGER_SOURCE_LOGIC1 17 //Logic 1
 TRIGGER_SOURCE_LOGIC2 18 //Logic 2
 TRIGGER_SOURCE_LOGIC3 19 //Logic 3


```

        TRIGGER_SOURCE_LOGIC4 20 //Logic 4
        TRIGGER_SOURCE_LOGIC5 21 //Logic 5
        TRIGGER_SOURCE_LOGIC6 22 //Logic 6
        TRIGGER_SOURCE_LOGIC7 23 //Logic 7

```

void SetTriggerSource(unsigned int source);

Description This routines set the trigger source.

Input: **source** TRIGGER_SOURCE_CH1 0 //CH1
 TRIGGER_SOURCE_CH2 1 //CH2
 TRIGGER_SOURCE_LOGIC0 16 //Logic 0
 TRIGGER_SOURCE_LOGIC1 17 //Logic 1
 TRIGGER_SOURCE_LOGIC2 18 //Logic 2
 TRIGGER_SOURCE_LOGIC3 19 //Logic 3
 TRIGGER_SOURCE_LOGIC4 20 //Logic 4
 TRIGGER_SOURCE_LOGIC5 21 //Logic 5
 TRIGGER_SOURCE_LOGIC6 22 //Logic 6
 TRIGGER_SOURCE_LOGIC7 23 //Logic 7

Output -

Note: If the logic analyzer and IO are multiplexed (for example, MSO20, MSO21), the corresponding IO needs to be turned on and set to the input state.

int GetTriggerLevel();

Description This routines get the trigger level.

Input: -

Output **Return value** level (mV)

void SetTriggerLevel(int level);

Description This routines set the trigger level.

Input: level (mV)

Output

int IsSupportTriggerSense();

Description This routines get the equipment support trigger sense or not.

Input: -

Return value 1 support
 0 not support

int GetTriggerSenseDiv();

Description This routines get the trigger sense.

Input: -

Output **Return value** Sense (0-1 div)

void SetTriggerSenseDiv(int sense);

Description This routines set the trigger sense.

Input: Sense (0-1 div)

Output -

Note: The Range of Trigger Sense is 0.1 Div-1.0 Div. 1 Div =(Sample Range Max Value-Sample Range Min Value)/10.0. For example, Sample Range is [-1000,1000]mV, 1Div=(1000--1000)/10.0 =200mV.

bool IsSupportPreTriggerPercent();

Description This routines get the equipment support Pre-trigger Percent or not .

Input: -

Output Return value 1 support
0 not support

int GetPreTriggerPercent();

Description This routines get the Pre-trigger Percent.

Input: -

Output Return value Percent (5-95)

void SetPreTriggerPercent(int front);

Description This routines set the Pre-trigger Percent.

Input: Percent (5-95)

Output -

int IsSupportTriggerForce();

Description This routines get the equipment support trigger force or not.

Input: -

Return value 1 support
0 not support

void TriggerForce();

Description This routines force capture once.

Input: -

Output: -

6.4.AC/DC

int IsSupportAcDc(unsigned int channel);

Description This routines get the device support AC/DC switch or not.

Input: channel 0 :channel 1
1 :channel 2

Output **Return value** 0 : not support AC/DC switch
1 : support AC/DC switch

void SetAcDc(unsigned int channel, int ac);

Description This routines set the device AC coupling.

Input: channel 0 :channel 1
 1 :channel 2
 ac 1 : set AC coupling
 0 : set DC coupling
 Output -

int GetAcDc(unsigned int channel,);

Description This routines get the device AC coupling.

Input: channel 0 :channel 1
 1 :channel 2

Output **Return value** 1 : AC coupling
 0 : DC coupling

6.5. Capture

Call capture function to begin collecting data, **length** is the length you want to capture, using K Units, such as length = 10, is 10K 10240 points. For sample rate greater than or equal the length of the depth of the collection is stored, take the minimum **length** and depth of storage;For the sampling rate is less than the memory depth, take the minimum **length** and one second data collection length. **force_length** can be forced to cancel the limit of only 1 seconds to be collected.

int Capture(int length, char capture_channel,char force_length);

Description This routines set the capture length and start capture.

Input: **length** capture length(KB)

capture_channel ch1=0x0001 ch2=0x0020 ch3=0x0040 ch4=0x0080
 logic=0x0100

 ch1+ch2 0x0003

 ch1+ch2+ch3 0x0007

 ch1+logic 0x0101

force_length 1: force using the length, no longer limits the max collection 1
 seconds

Output **Return value** the real capture length(KB)

When using normal trigger mode (TRIGGER_MODE_LIANXU). The collection command was sent, and the data notification that the collection was complete has not been received. Now, you want to stop the software.

1. Recommended method: You change the trigger mode to TRIGGER_MODE_AUTO, wait for the data notification to be collected, and then stop the software.

2. Use **AbortCapture**.

DLL_API int WINAPI AbortCapture();

Description This routines set the abort capture

Input:

Output Return value 1:success 0:failed

unsigned int GetMemoryLength();

Description This routines get memory depth of equipment (KB).

Input: -
Output memory depth of equipment(KB)

Roll Mode: In this mode, the sampling rate is set to a minimum sample rate, and the acquisition length is fixed to a second acquisition data length. Normal call Capture, connect the each data together, is the complete waveform.

int IsSupportRollMode();

Description This routines get the equipment support roll mode or not .

Input: -

Output **Return value** 1 support roll mode
0 not support roll mode

int SetRollMode(unsigned int en);

Description This routines enable or disenable the equipment into roll mode.

Input: -

Output **Return value** 1 success
0 failed

6.6. Capture Completion Notice

when capture is complete, the dll have three ways to notify the main program, callback function, set Event and the main program loop detection.

6.6.1. callback function

when capture is complete, if the callback function "**datacallback**" is registered, it will be called. he DLL has a function pointer which has to be set to this function, using

void SetDataReadyCallBack(void* ppara, DataReadyCallBack datacallback);

Description This routines sets the callback function of capture complete.

Input: **ppara** the parameter of the callback function
datacallback a pointer to a function with the following prototype:
void **DataReadyCallBack** (void * **ppara**)

Output -

6.6.2. Event

when capture is complete, if the Event handle "**dataevent**" is registered, it will be set. The user must reset the event when the used it. he DLL has a function pointer which has to be set to this function, using

void SetDevDataReadyEvent(HANDLE dataevent);

Description This routines set the event handle, these will be set, when capture complete

Input: **dataevent** the event handle

Output -

6.6.3. loop detect

int IsDataReady();

Description This routines return the capture is complete or not.

Input: -

Output **Return value** 1 complete

0 not complete

Note: Only need to use one of three ways. Callback and Event functions are asynchronous, more efficient; main program loop detection over a certain time needed to detect whether the capture is complete or not.

6.7.Data Read

```
unsigned int ReadVoltageDatas(char channel, double* buffer,unsigned int length);
```

Description	This routines read the voltage datas. (V)
-------------	---

Input:	channel	read channel	0 :channel 1
			1 :channel 2

buffer the buffer to store voltage datas

length the buffer length

Output	Return value the read length
--------	-------------------------------------

int IsVoltageDatasOutOfRange(char channel);

Description This routines return the voltage datas is out range or not.

Input:	channel	read channel	0 :channel 1
			1 :channel 2

Output	Return value	0 :not out range
		1 :out range

```
double GetVoltageResolution(char channel);
```

Description	This routines return the current voltage resolution value
-------------	---

One ADC resolution for the voltage value:

Full scale is 1000mv

the ADC is 8 bits

voltage resolution value = 1000mV/256

Input:	channel	read channel	0:channel 1
			1:channel 2

Output	Return value	voltage resolution value
--------	---------------------	--------------------------

```
unsigned int ReadLogicDatas(unsigned char* buffer, unsigned int length);
```

Description	This routines read the logic data of mso.
-------------	---

Input:

buffer the buffer to store logic datas

length the buffer length

Output	Return value the read length
--------	------------------------------

7. DDS

int IsSupportDDSDevice();

Description This routines get support dds or not

Input: -

Output	Return value support dds or not
1	Yes
2	Yes
3	Yes
4	Yes
5	Yes
6	Yes
7	Yes
8	Yes
9	Yes
10	Yes
11	Yes
12	Yes
13	Yes
14	Yes
15	Yes
16	Yes
17	Yes
18	Yes
19	Yes
20	Yes
21	Yes
22	Yes
23	Yes
24	Yes
25	Yes
26	Yes
27	Yes
28	Yes
29	Yes
30	Yes
31	Yes
32	Yes
33	Yes
34	Yes
35	Yes
36	Yes
37	Yes
38	Yes
39	Yes
40	Yes
41	Yes
42	Yes
43	Yes
44	Yes
45	Yes
46	Yes
47	Yes
48	Yes
49	Yes
50	Yes
51	Yes
52	Yes
53	Yes
54	Yes
55	Yes
56	Yes
57	Yes
58	Yes
59	Yes
60	Yes
61	Yes
62	Yes
63	Yes
64	Yes
65	Yes
66	Yes
67	Yes
68	Yes
69	Yes
70	Yes
71	Yes
72	Yes
73	Yes
74	Yes
75	Yes
76	Yes
77	Yes
78	Yes
79	Yes
80	Yes
81	Yes
82	Yes
83	Yes
84	Yes
85	Yes
86	Yes
87	Yes
88	Yes
89	Yes
90	Yes
91	Yes
92	Yes
93	Yes
94	Yes
95	Yes
96	Yes
97	Yes
98	Yes
99	Yes
100	Yes

int GetDDSSupportBoxingStyle(int* style);

Description This routines get support wave styles
Input: **style** array to store support wave styles
Output: **Return value** if style==NULL return number of support wave styles
else store the styles to array, and return number of wave styles

void SetDDSBoxingStyle(unsigned int boxing);

Description This routines set wave style
Input: **boxing** **W_SINE = 0x0001,**
 W_SQUARE = 0x0002,
 W_RAMP = 0x0004,
 W_PULSE = 0x0008,
 W_NOISE = 0x0010,
 W_DC = 0x0020,
 W_ARB = 0x0040

Output: -

void SetDDSPinlv(unsigned int pinlv);

Description This routines set frequency
Input: **pinlv** frequency
Output: -

void SetDDSDutyCycle(int cycle);

Description This routines set duty cycle
Input: **cycle** duty cycle
Output: -

int GetDDSCurBoxingAmplitudeMv(unsigned int boxing);

Description This routines get dds amplitude of wave
Input: **boxing** **BX_SINE~BX_ARB**
Output: Return the amplitude(mV) of wave

void SetDDSAmplitudeMv(unsigned char channel_index, int amplitude);

Description This routines set dds amplitude(mV)
Input: **channel_index** 0 :channel 1
 1 :channel 2
 amplitude amplitude(mV)

Output: -

int GetDDSAmplitudeMv(unsigned char channel_index);

Description This routines get dds amplitude(mV)
Input: **channel_index** 0 :channel 1
 1 :channel 2
Output: return amplitude(mV)

int GetDDSCurBoxingBiasMvMin(unsigned int boxing);

int GetDDSCurBoxingBiasMvMax(unsigned int boxing);

Description This routines get dds bias of wave

Input: **boxing** BX_SINE~BX_ARB

Output: Return the bias(mV) range of wave

void WINAPI SetDDSBiasMv(unsigned char channel_index, int bias);

Description This routines set dds bias(mV)

Input: **channel_index** 0 :channel 1
1 :channel 2

bias bias(mV)

Output: -

int GetDDSBiasMv(unsigned char channel_index);

Description This routines get dds bias(mV)

Input: **channel_index** 0 :channel 1
1 :channel 2

Output: Return the bias(mV) of wave

void DDSOutputEnable(int enable);

Description This routines enable dds output or not

Input: **enable** 1 enable
0 not enable

Output: -

int IsDDSOutputEnable();

Description This routines get dds output enable or not

Input: -

Output **Return value** dds enable or not

8. IO

int IsSupportIODevice();

Description This routines get support IO ctrl or not

Input: -

Output Return value support io ctrl or not

int GetSupportIoNumber();

Description This routines get support io nums of equipment.

Output Return value the sample number of io nums

When IO is set as input, there are three ways to read the IO status, drop the function, trigger the Event, and the main program loop detection.

Callback functions

The SDK will read the IO status periodically, and if the main program registers the fallback

function "datacallback", it will be called. DLLs have a function dedicated to setting this fallback function.

void SetIOReadStateCallBack(void* ppara, IOReadStateCallBack callback);

Description This routines sets the callback function of read io status.

Input: **ppara** the parameter of the callback function
callback a pointer to a function with the following prototype

Event

The SDK will read the IO status regularly, and if the main program registers the Event handle "dataevent", it will be set. It should be noted that after the main program detects the Event, it needs to reset the Event. The DLL has a function specifically for setting this Event handle

void SetIOReadStateReadyEvent(HANDLE dataevent);

Description This routines set the event handle, these will be set, when capture complete

Input: **dataevent** the event handle

Output -

Loop Detect

int IsIOReadStateReady();

Description This routines return read io is complete or not.

Input: -

Output **Return value** 1 complete
0 not complete

Note: Only need to use one of three ways. Callback and Event functions are asynchronous, more efficient; main program loop detection over a certain time needed to detect whether the capture is complete or not.

void IOEnable(unsigned char channel, unsigned char enable);

Description This routines set io enable or not

Input: **channel** dio0 0
dio1 1
dio2 2
.....
enable not enable 0
enable 1

Output: -

unsigned char IsIOEnable(unsigned char channel);

Description This routines get io enable or not

Input: **channel** dio0 0
dio1 1
dio2 2
.....

Output: **return** not enable 0 or enable 1

void SetIOInOut(unsigned char channel, unsigned char inout);

Description This routines set io in or out

Input: **channel** dio0 0

dio1 1

dio2 2

.....

inout in 0

out 1

Output: -

unsigned char GetIOInOut(unsigned char channel);

Description This routines get io in or out

Input: **channel** dio0 0

dio1 1

dio2 2

.....

Output: **return** in 0

out 1

void SetIOOutState(unsigned char channel, unsigned char state);

Description This routines set io state

Input: **channel** dio0 0

dio1 1

dio2 2

.....

state 0 or 1

Output: -

char GetIOInState(unsigned char channel);

Description This routines get io state

If the SetIOReadStateCallBack setting callback function is used, IOReadStateCallBack will directly notify the IO input status; If use SetIOReadStateReadyEvent and IsIOReadStateReady to read the query, you need to call GetIOState to get the IO input status

Input: **channel** dio0 0

dio1 1

dio2 2

.....

Output: **return** 0 state

1 state