SONY

IMX273 / IMX287 Application Note

Additional Function of Synchronizing Sensors

The data except this specification conform to those of IMX273 / IMX287.

Description

The additional Function which can synchronize the sensors is described in this document.

Features

- This function can synchronize the sensors.
- The synchronizing method
  Synchronizing with external signals
  Synchronizing with sensor signals
- Supported serial interface
  4-wire
  I^2C
- This function can set the different values of registers like gain to each sensor exclude setting timing.
- Synchronizing sensors don't support the function of multi exposure trigger mode

Contents

Setting Method

About pin select and registers setting of selecting master or slave mode, and about SLAMODE select and slave address in case of using I^2C bus, refer to the datasheet.

Registers corresponding to Chip ID = 02h in Write mode. (I2C:30**h)

Address	Bit	Register name	Description	Default Value after reset
EFh	[0]	I2CACKEN	Select ACK response of I^2C 0h: ACK stop 1h: ACK on	1h

Description of Additional Function of Synchronizing Sensors

Additional Function of Synchronizing Sensors can synchronize the sensors by connecting as shown after next section.
Use this function to fit the system and the application.

There are notes of connection and synchronizing method as shown below.

1. Each synchronizing signal of XVS / XHS / XTRIG must be connected by same wire, and input as same timing.
   About the input specification of XVS / XHS / XTRIG, refer to the datasheet. Design the wire satisfied each specification, and use this function after evaluating and checking enough.

2. Each signal of INCK / XCLR must be connected by same wire, and input as same timing.
   About the input specification of INCK / XCLR, refer to the datasheet. Design the wire satisfied each specification, and use this function after evaluating and checking enough.

3. Use Sync. Code to synchronize each horizontal line.
   This function can synchronize frame output timing, but about each horizontal line, there is a few clocks difference because of system delay. So it is necessary to synchronize each sensor by DSP using Sync. Code

Example of Connecting Sensors

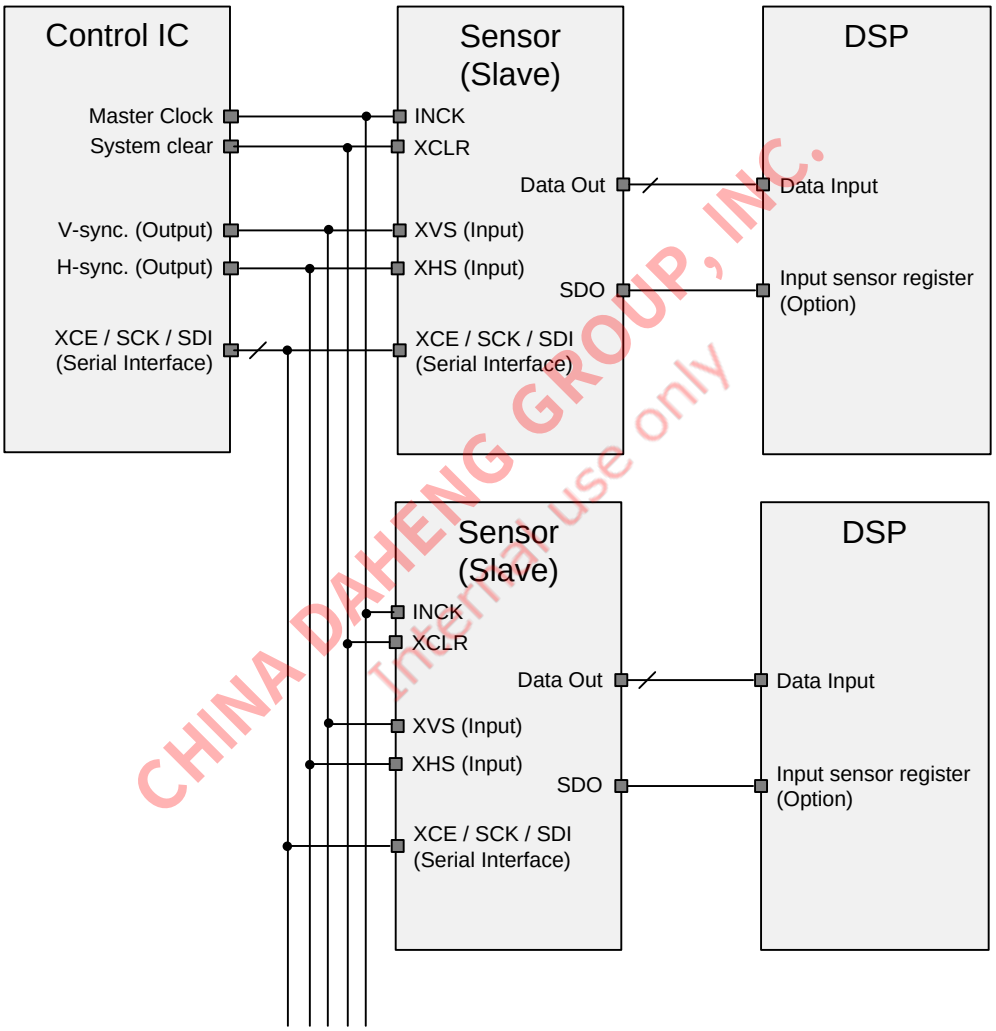
Examples of connecting sensors in each case are described.
Use this function to fit the system and the application.

In case of 4-wire

Global Shutter (Normal Mode) Operation

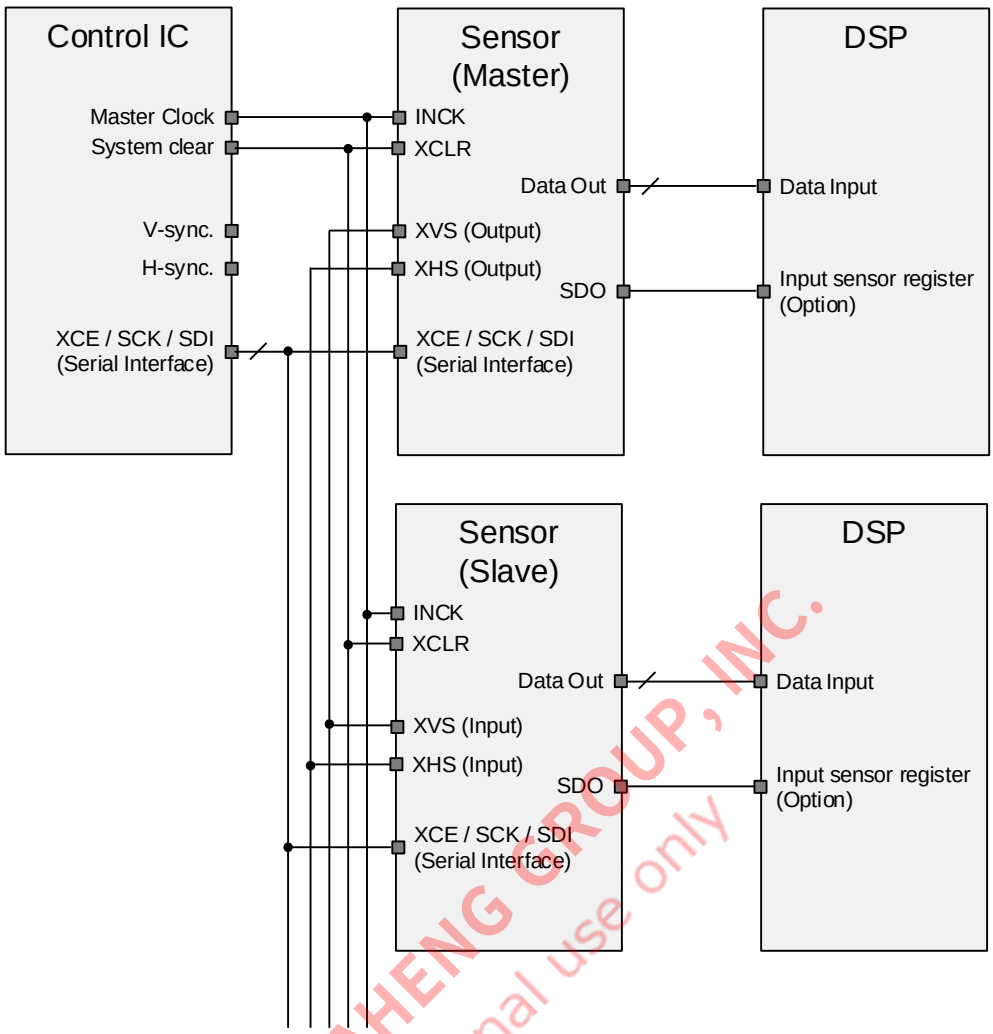
Maximum sensors to connect:
No limit on condition which satisfied the input specifications

Synchronizing method:
External signals / Sensors signals



In case of synchronizing with external signals (all slave mode)

*1: In case of using different register setting, connect XCE pin of each sensor by the different wire and select the sensor which needs to set the register by XCE
*2: In case of using SDO, connect the output pin of each sensor by the different wire.



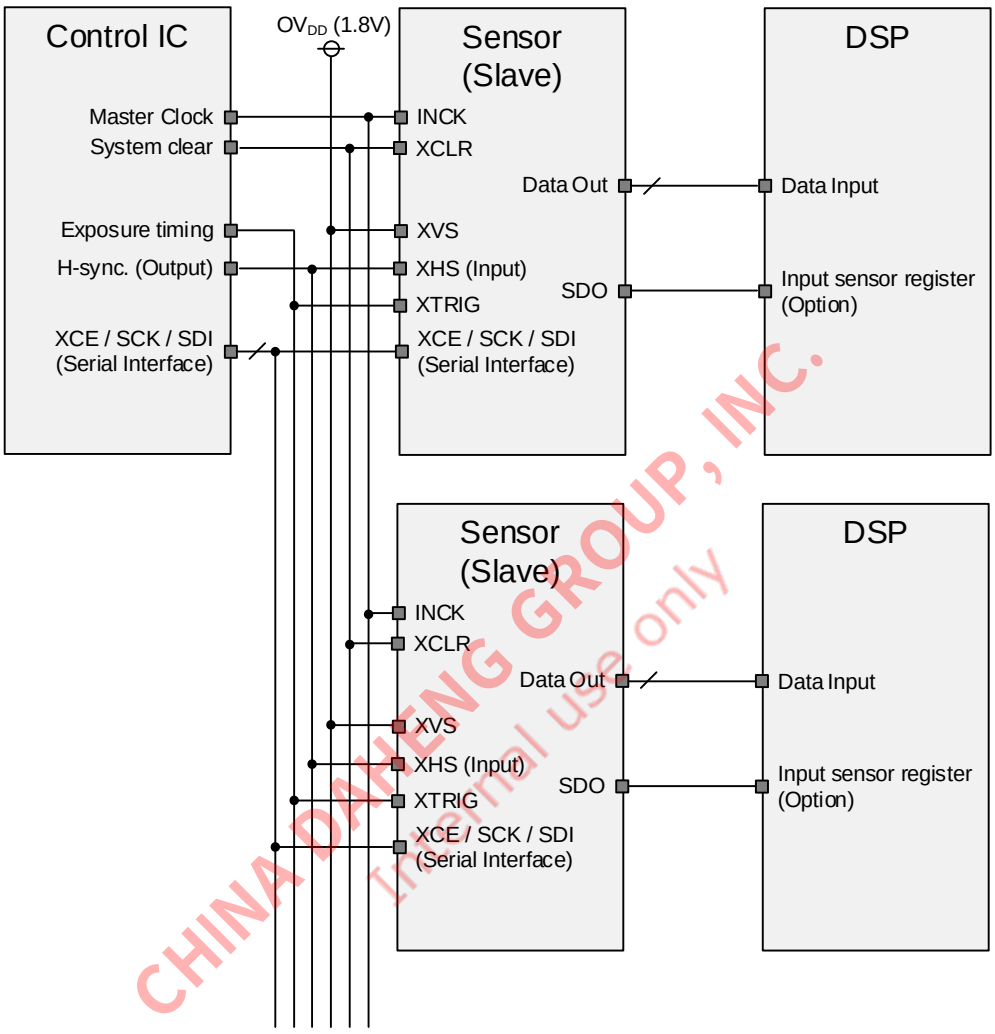
In case of synchronizing with sensor signals (one master mode and the other slave mode)

*1: Because of different register setting, connect XCE pin of each sensor by the different wire and select the sensor which needs to set the register by XCE
*2: In case of using SDO, connect the output pin of each sensor by the different wire.

Global Shutter (Sequential Trigger Mode) Operation

Maximum sensors to connect:
No limit on condition which satisfied the input specifications

Synchronizing method:
Only external signals



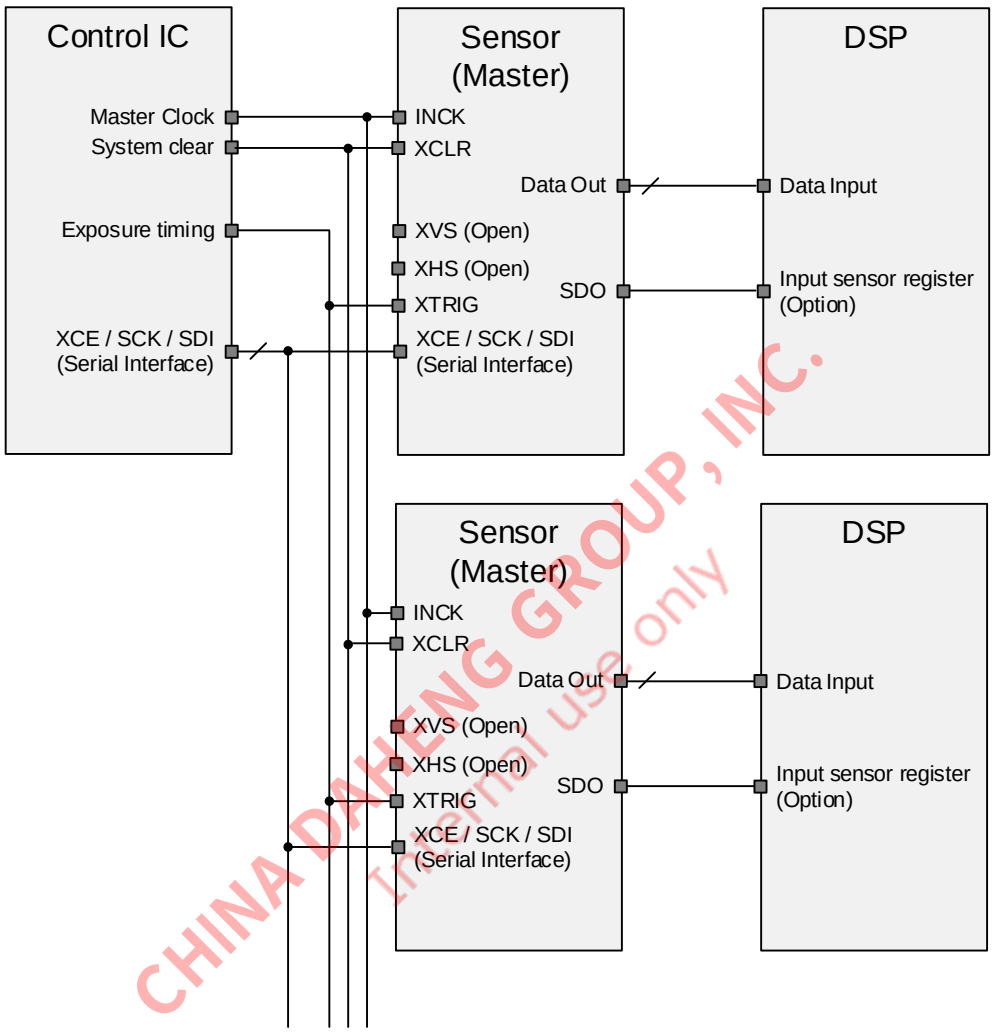
In case of synchronizing with external signals (all slave mode)

*1: In case of using different register setting, connect XCE pin of each sensor by the different wire and select the sensor which needs to set the register by XCE
*2: In case of using SDO, connect the output pin of each sensor by the different wire.

Global Shutter (Fast Trigger Mode) Operation

Maximum sensors to connect:
No limit on condition which satisfied the input specifications

Synchronizing method:
Only sensor signals



In case of synchronizing with external signals (all master mode)

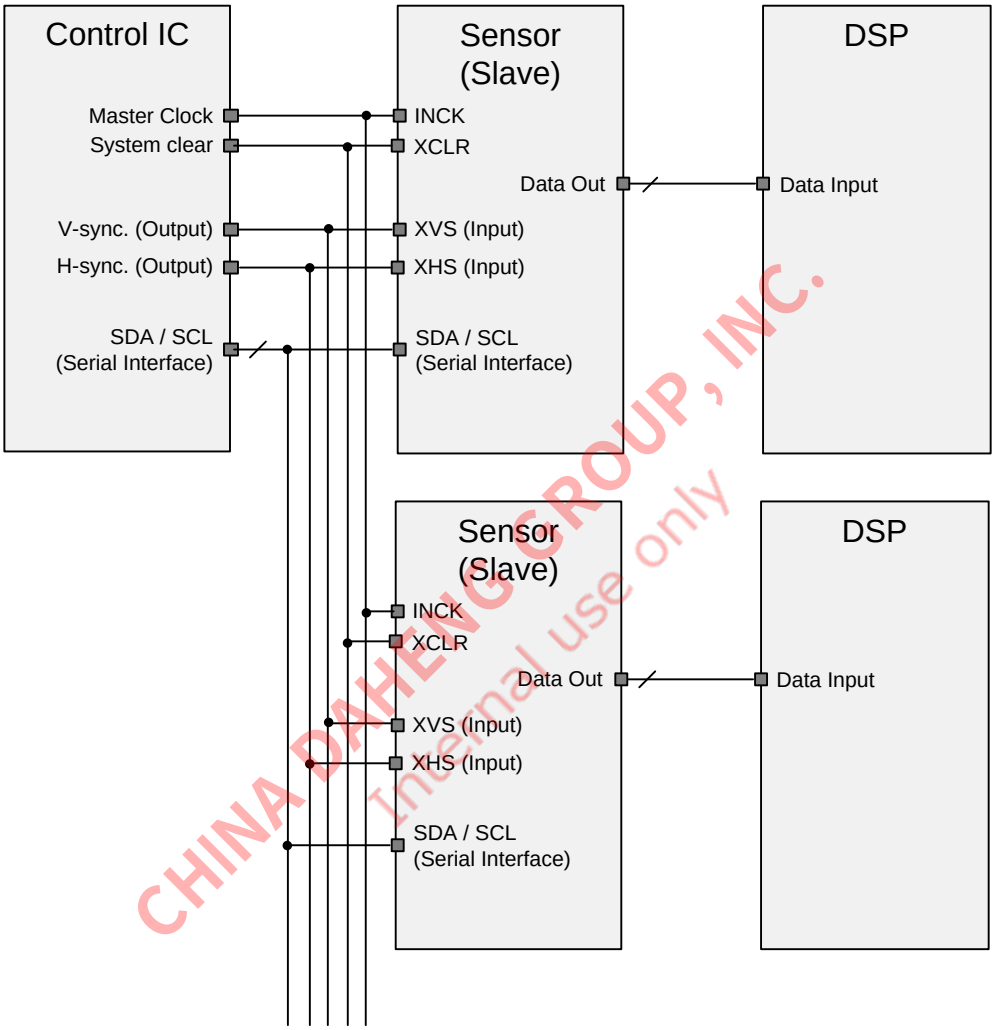
*1: In case of using different register setting, connect XCE pin of each sensor by the different wire and select the sensor which needs to set the register by XCE
*2: In case of using SDO, connect the output pin of each sensor by the different wire.
*3: XVS pin and XHS pin must be open.

In case of one I²C bus

Global Shutter (Normal Mode) Operation

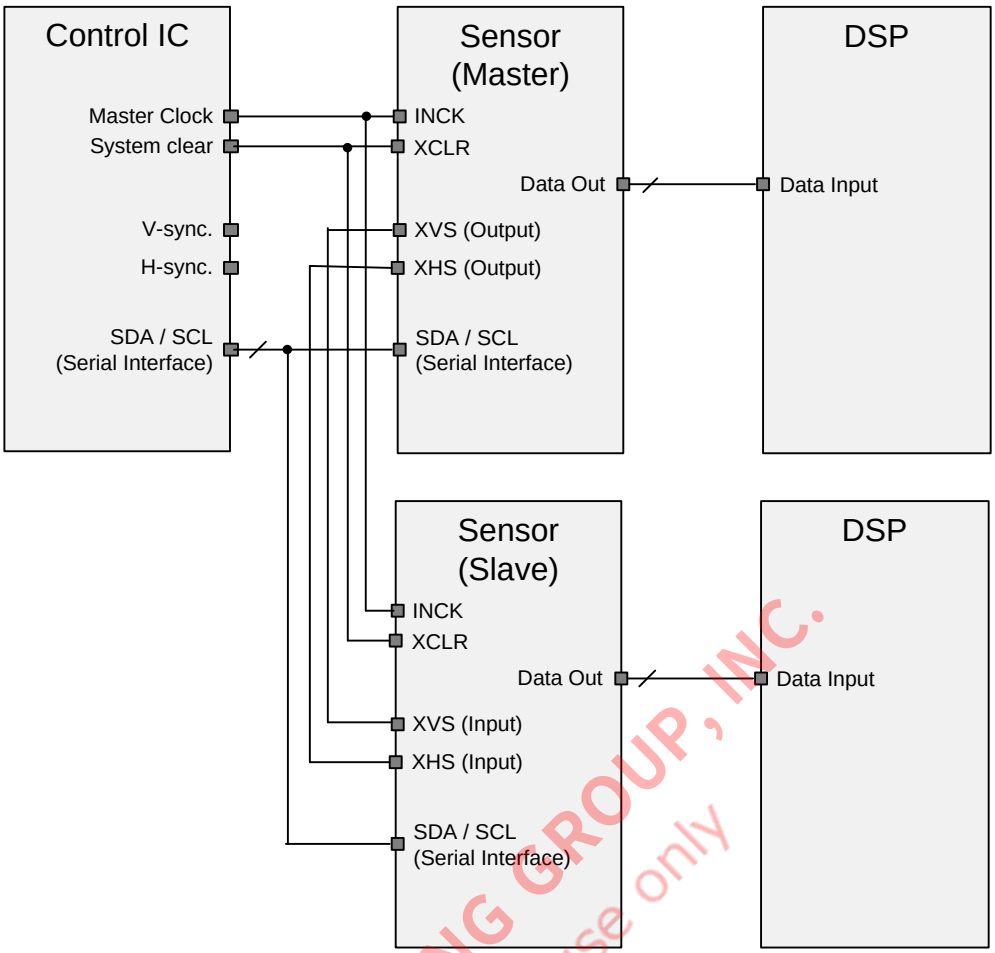
Maximum sensors to connect:
No limit on condition which satisfied the input specifications and same register setting
2 on condition with different register setting

Synchronizing method:
External signals / Sensors signals



In case of synchronizing with external signals (all slave mode)

*1: In case of using different register setting, select the target sensor by slave address.
*2: Set ACK stop by I2CACKEN register, because SDA wire is same wire.



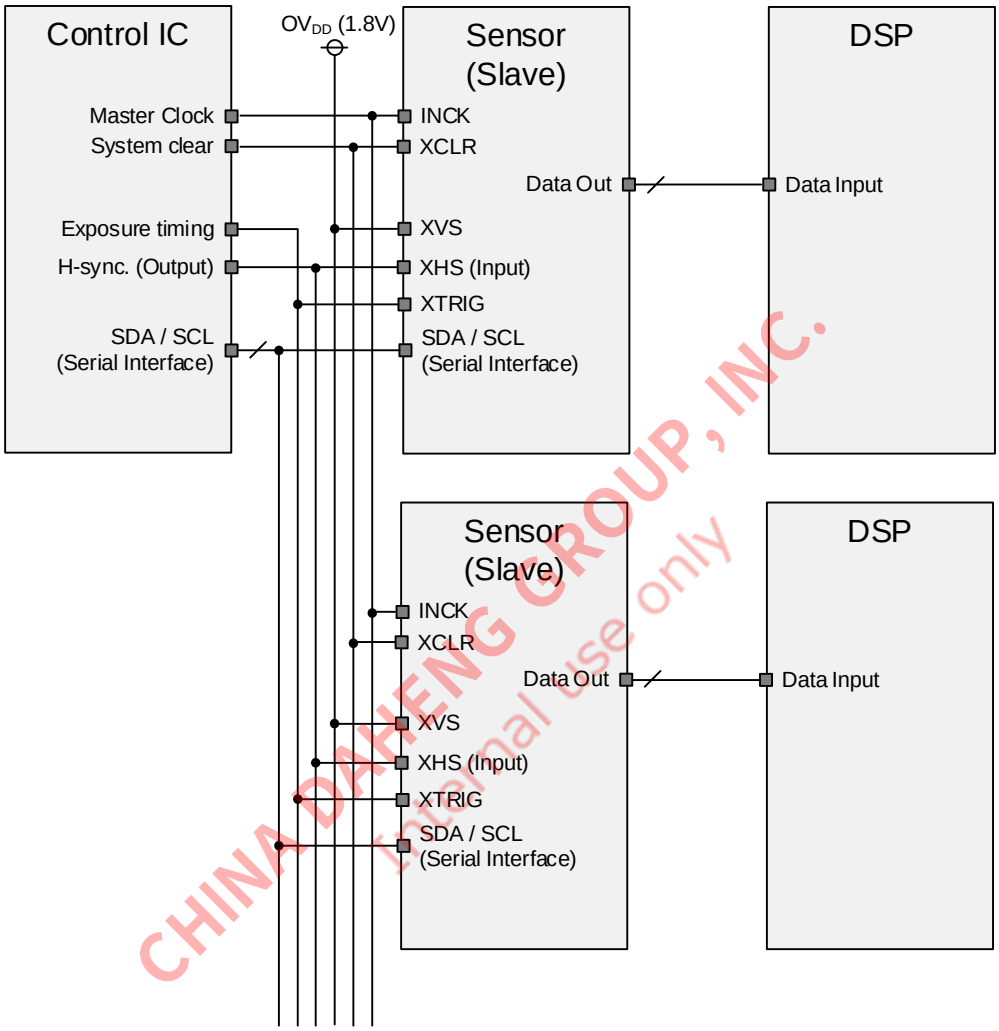
In case of synchronizing with sensor signals (one master mode and one slave mode)

*1: Because of using different register setting, select the target sensor by slave address.
*2: Set ACK stop by I2CACKEN register, because SDA wire is same wire.

Global Shutter (Sequential Trigger Mode) Operation

Maximum sensors to connect:
No limit on condition which satisfied the input specifications and same register setting
2 on condition with different register setting

Synchronizing method:
Only external signals



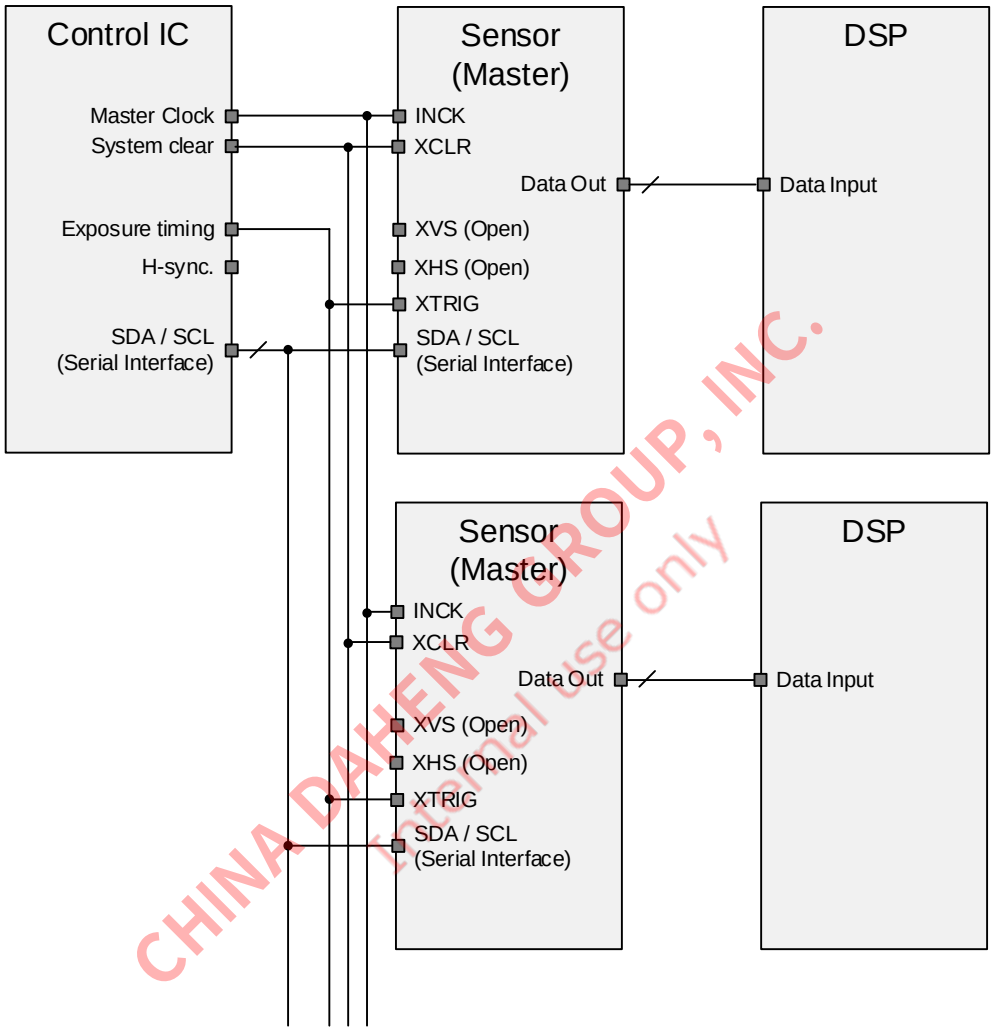
In case of synchronizing with external signals (all slave mode)

*1: In case of using different register setting, select the target sensor by slave address.
*2: In case of using SDO, connect the output pin of each sensor by the different wire.

Global Shutter (Fast Trigger Mode) Operation

Maximum sensors to connect:
No limit on condition which satisfied the input specifications and same register setting
2 on condition with different register setting

Synchronizing method:
Only sensor signals



In case of synchronizing with external signals (all master mode)

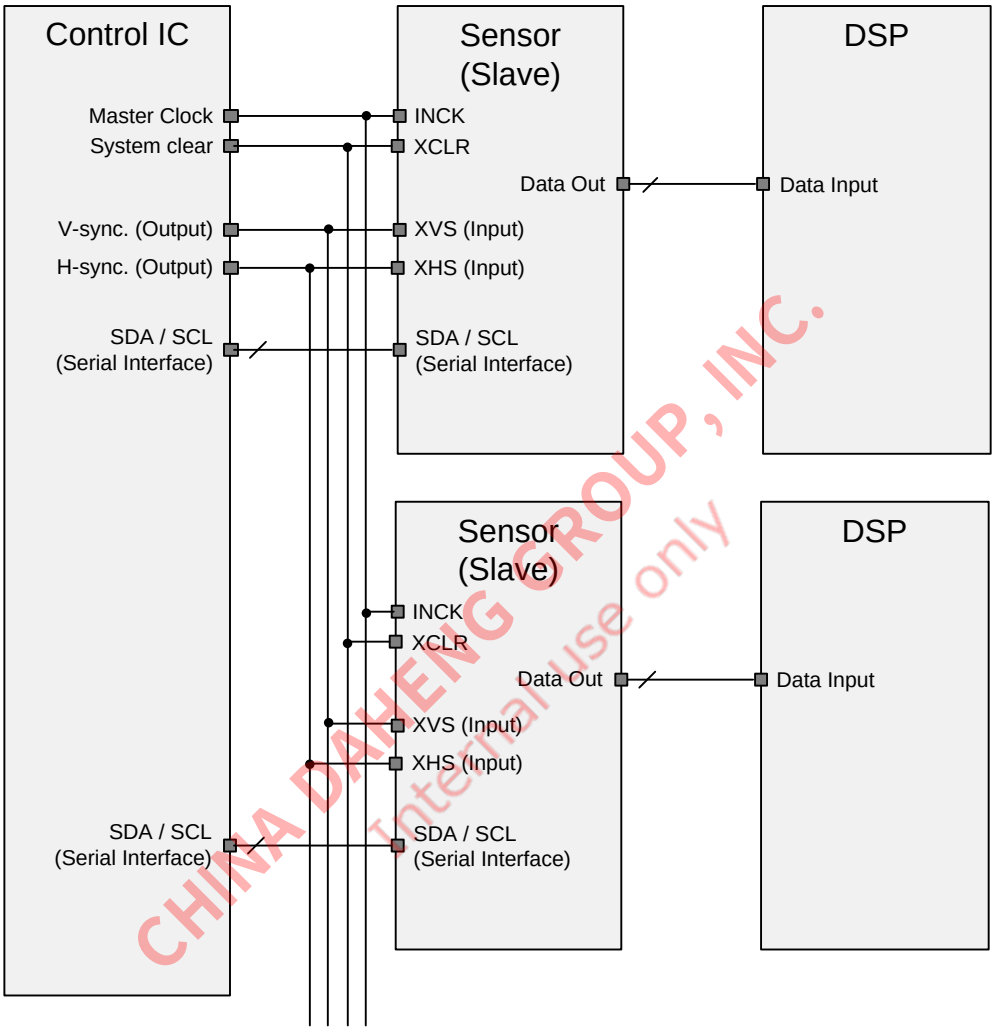
*1: In case of using different register setting, select the target sensor by slave address.
*2: Set ACK stop by I2CACKEN register, because SDA wire is same wire.
*3: XVS pin and XHS pin must be open.

In case of I²C bus × n

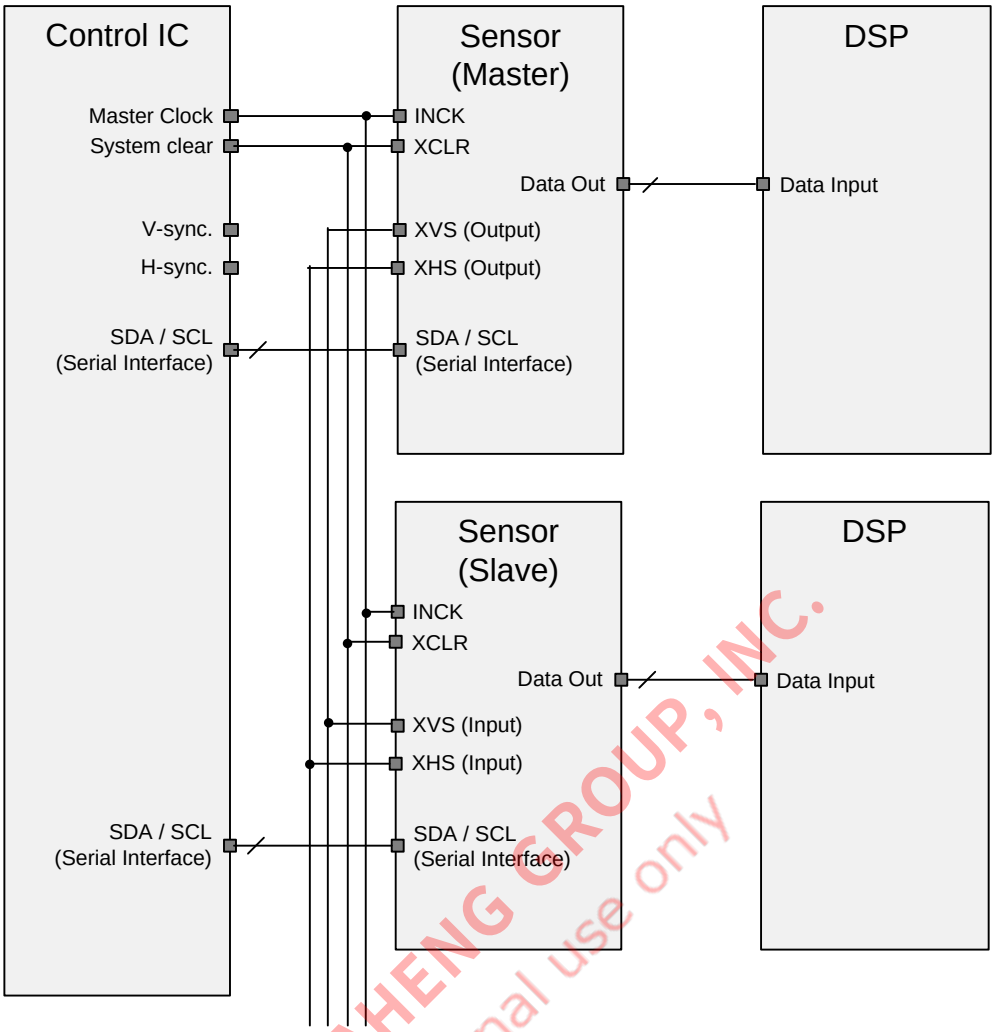
Global Shutter (Normal Mode) Operation

Maximum sensors to connect:
No limit on condition which satisfied the input specifications

Synchronizing method:
External signals / Sensors signals



In case of synchronizing with external signals (all slave mode)

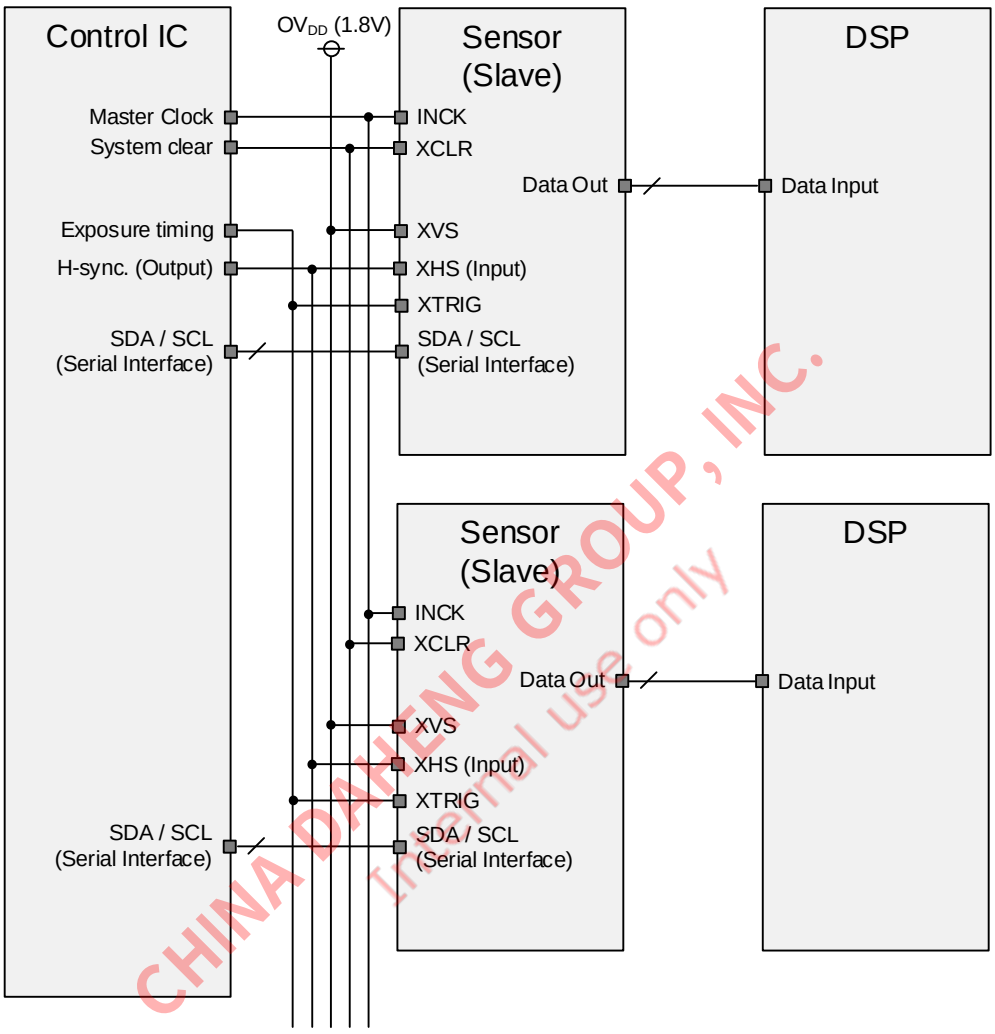


In case of synchronizing with sensor signals (one master mode and the other slave mode)

Global Shutter (Sequential Trigger Mode) Operation

Maximum sensors to connect:
No limit on condition which satisfied the input specifications

Synchronizing method:
Only external signals

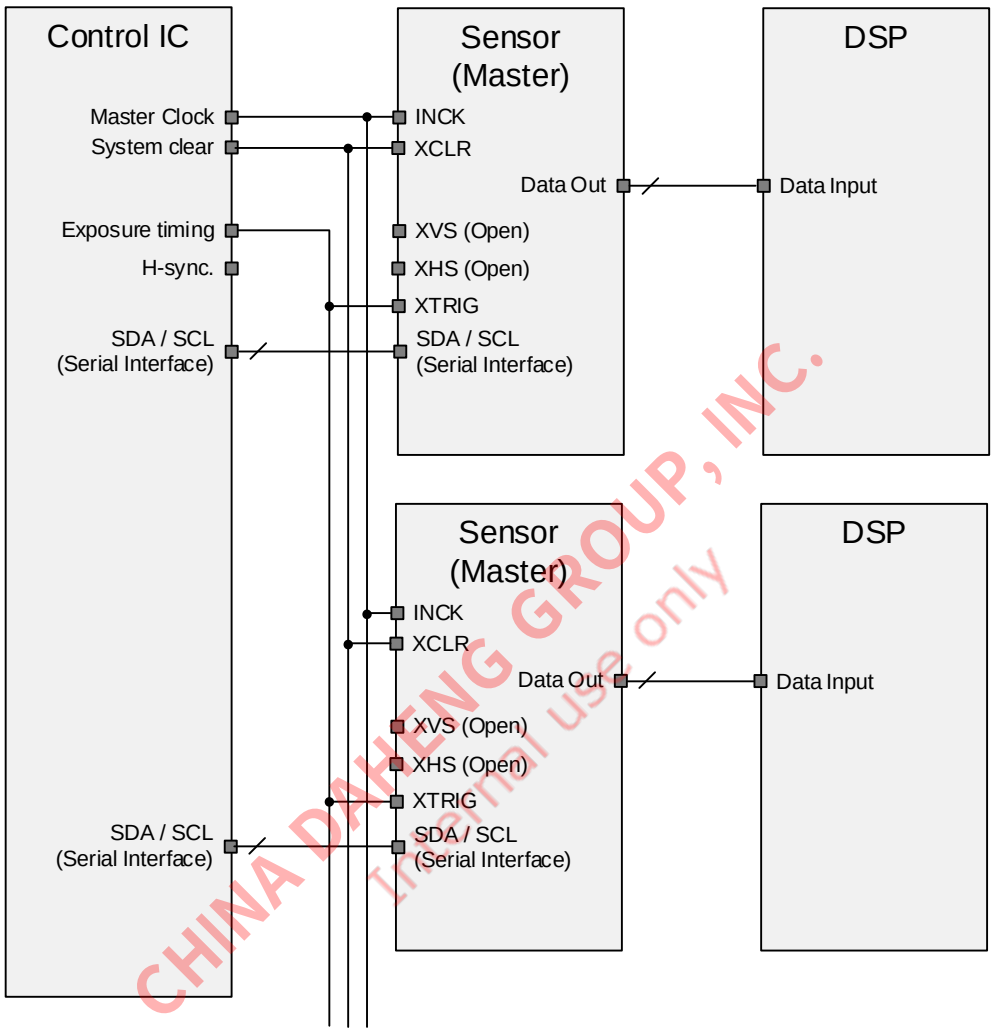


In case of synchronizing with external signals (all slave mode)

Global Shutter (Fast Trigger Mode) Operation

Maximum sensors to connect:
No limit on condition which satisfied the input specifications

Synchronizing method:
Only sensor signals



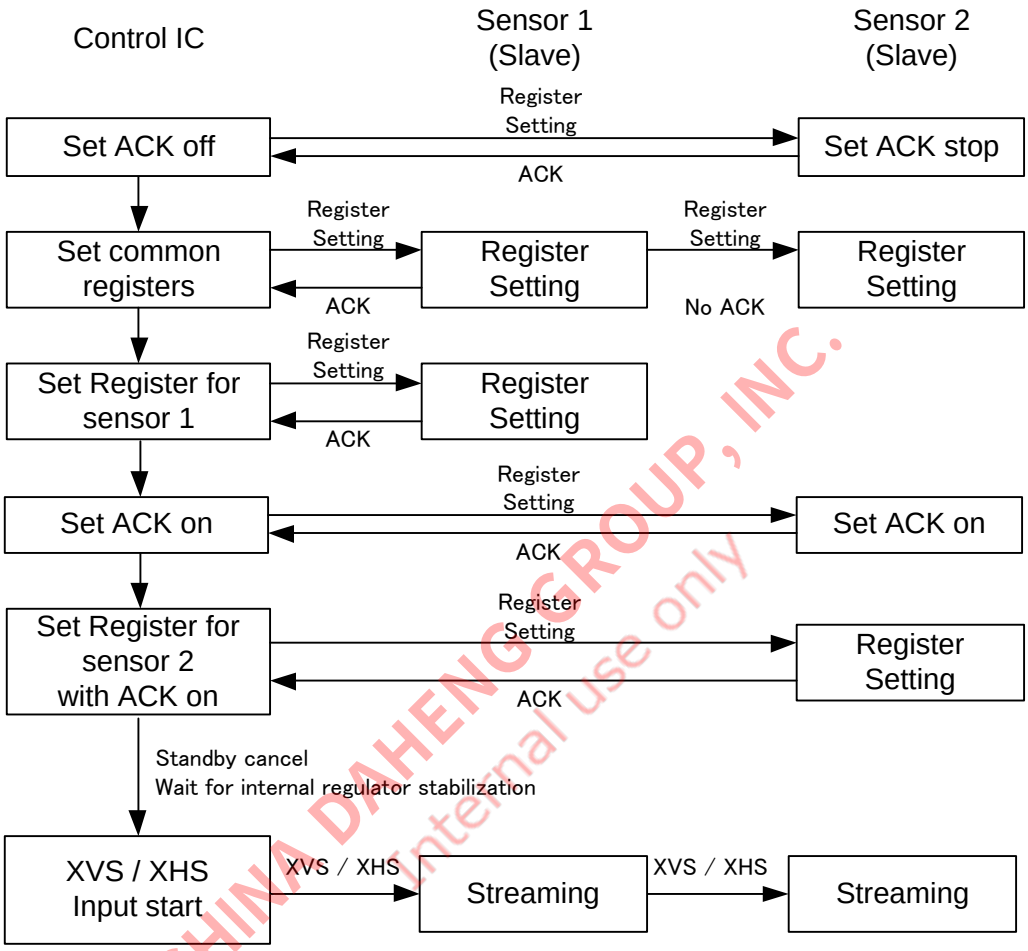
In case of synchronizing with external signals (all master mode)

*1: XVS pin and XHS pin must be open.

Example of register setting method in case of one I^2C bus

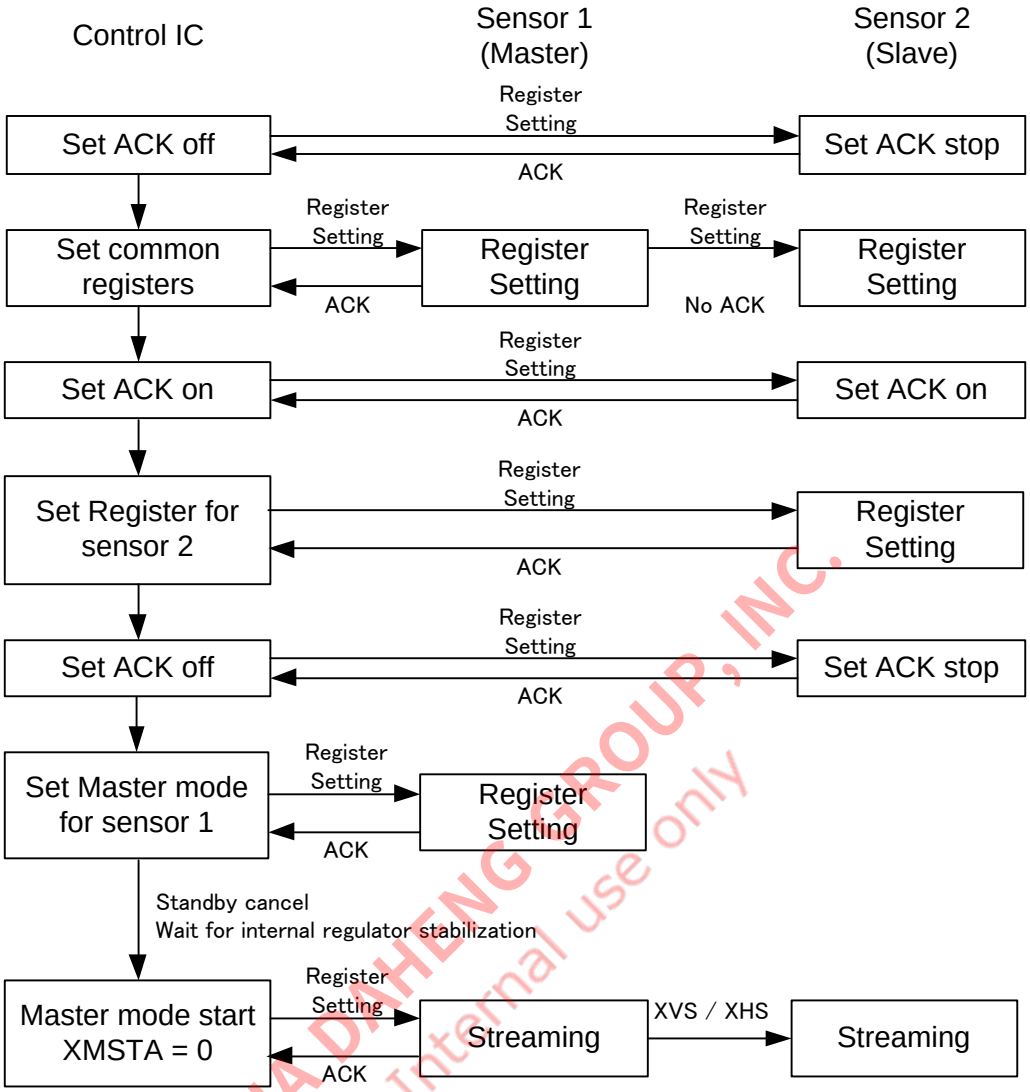
When the registers set by I^2C, the sensor outputs Acknowledge (ACK). So in case of same setting to all sensors wired by same I^2C bus, ACK must be stop because all sensors output it.
Example of register setting method is described by using 2 sensors on same I^2C bus as shown below.

In case of Synchronizing with external signals (Normal Mode)



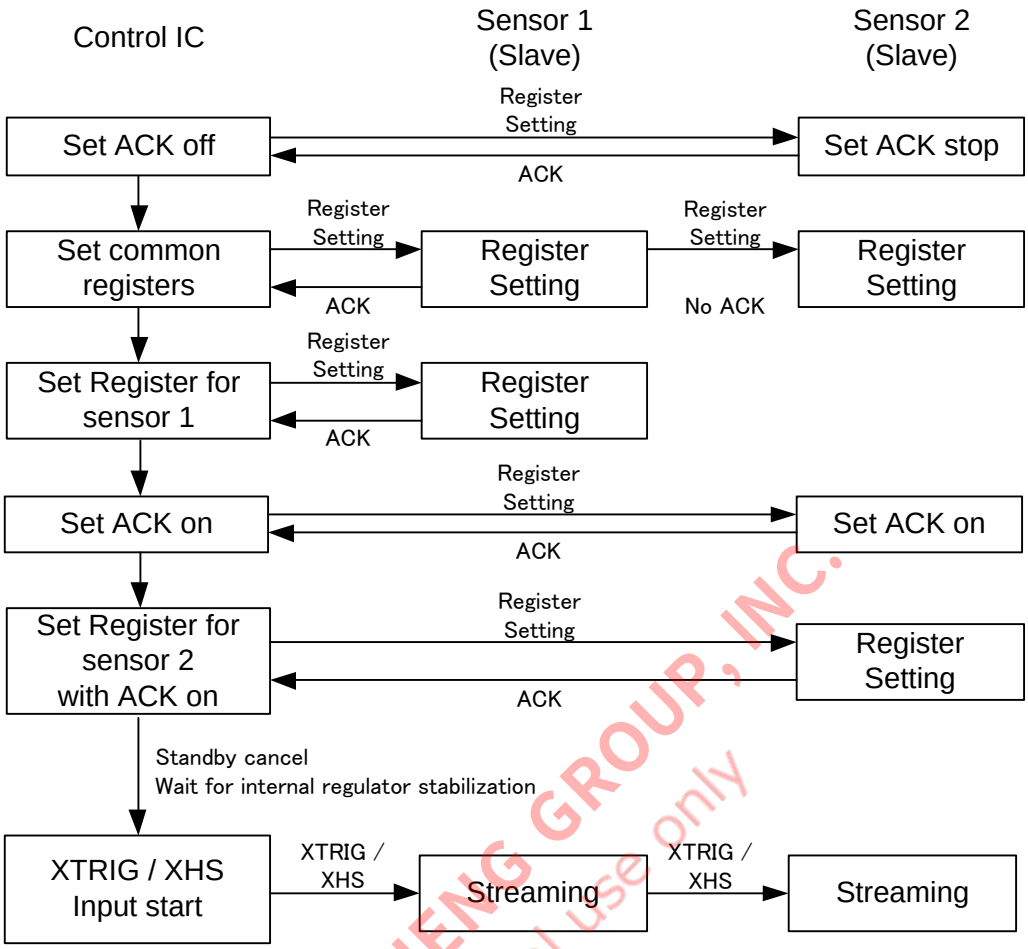
Example of setting by using ACK stop (Synchronizing with external signals)

In case of Synchronizing with sensor signals (Normal Mode)



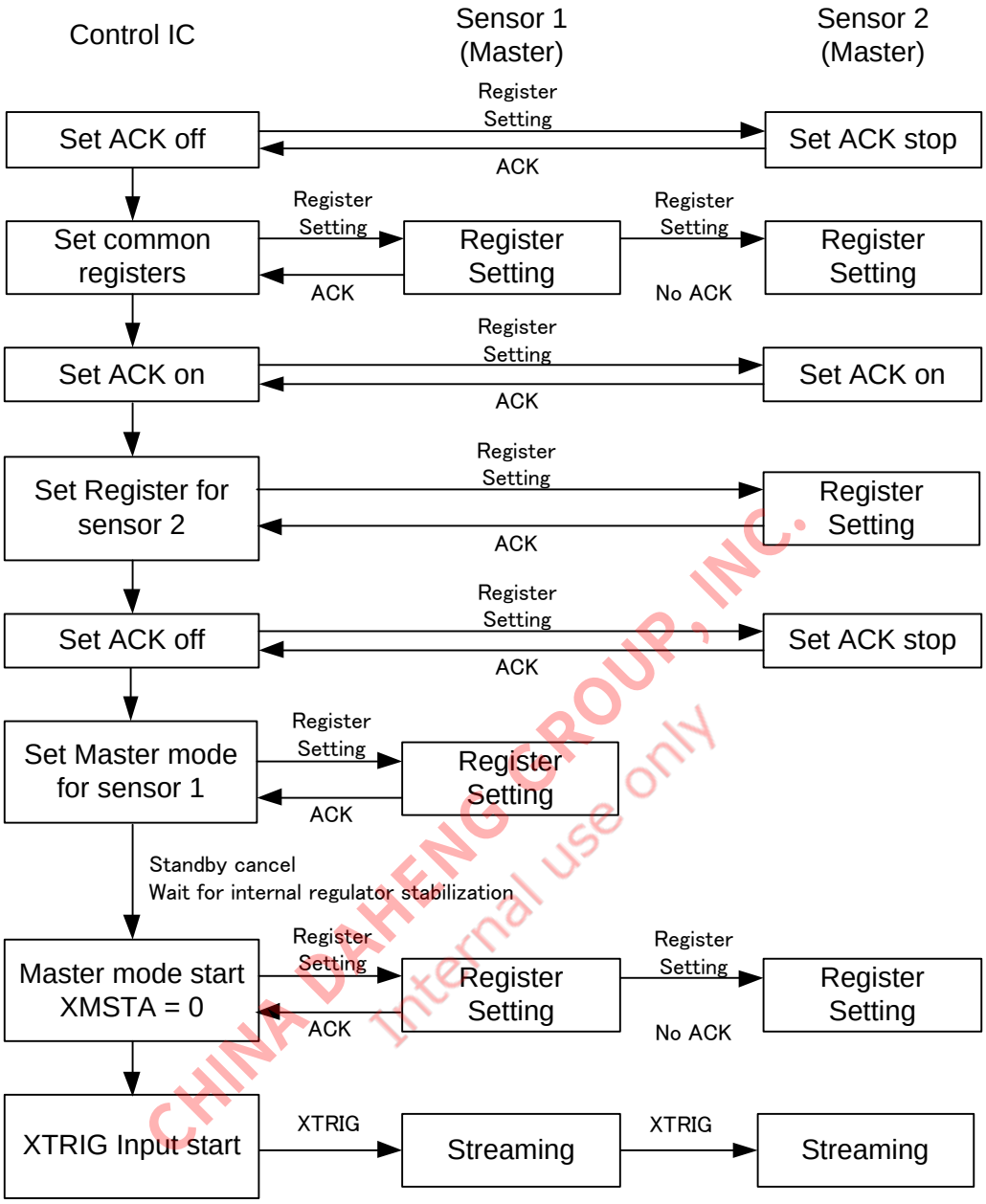
Example of setting by using ACK stop (Synchronizing with sensor signals)

In case of Synchronizing with sensor signals (Sequential Trigger Mode)



Example of setting by using ACK stop (Synchronizing with external signals)

In case of Synchronizing with sensor signals (Fast Trigger Mode)



Example of setting by using ACK stop (Synchronizing with sensor signals)

Mode transition of synchronizing Sensors

In case of mode transition of synchronizing sensors, via the Standby state is necessary.

Revision History

Version	Date	Page	Remarks
Rev.0.1	10–Feb–17	–	First Edition
Rev.1.0	7–Jul–17	3	Add: Description of the register name of address EFh
		6	Correction: Wiring of V-sync and H-sync of Control IC in figure
		6	Correction: Description of V-sync in figure (V-sync (Output) => V-sync)
		6	Correction: Description of H-sync in figure (H-sync (Output) => H-sync)
		7, 11, 15	Add: Pin of XVS and connection of XVS of sensors in figure
		8, 12, 16	Add: Pin of XVS of sensors in figure
		8, 12	Correction: Description of note*3 in figure
		12, 16	Correction: Description of pin of sensors in figure (XHS=>XHS (OPEN))
		16	Correction: Description of note*1 in figure