ORDERING INFORMATION

Type	Order Designation	Description Options
Evaluation Board	iC-LF EVAL LF2D	iC-LF Evaluation Board
iC-LFS	iC-LFS iCSY LF1M	iC-LFS Sensor Module
iC-LF1401	iC-LF iCSY LF1M	iC-LF Sensor Module
iC-LFL1402	iC-LFL iCSY LF1M	iC-LFL Sensor Module

LF2D BOARD AND TERMINAL DESCRIPTION

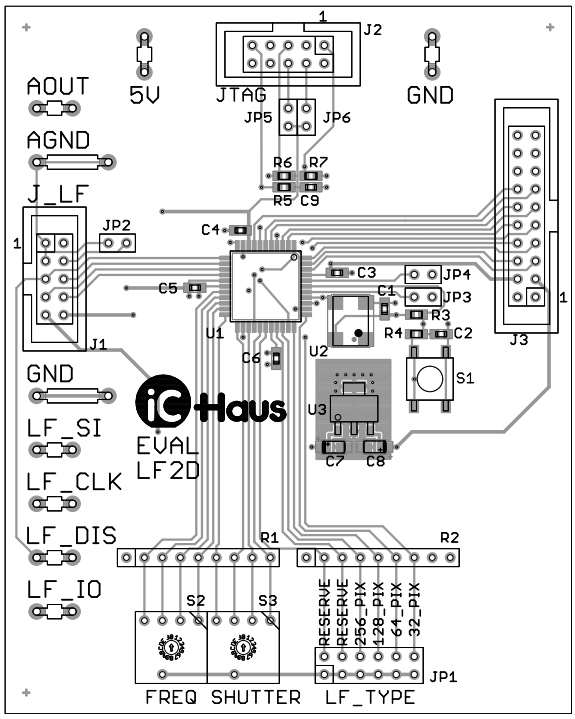

Figure 1: Component Top (size 100 mm x 75 mm)

TERMINAL	DESCRIPTION
5V	5 V Power Supply
GND	Ground
J1	Sensor Connector
J2	Programming Connector
J3	Not Used
AOUT	Analog Pixel Output
AGND	Analog Ground
GND	Ground
LF_SI	Start of Integration
LF_CLK	Pixel Clock
LF_DIS	Global Shutter
LF_IO	Not Used

LF2D CIRCUIT DESCRIPTION

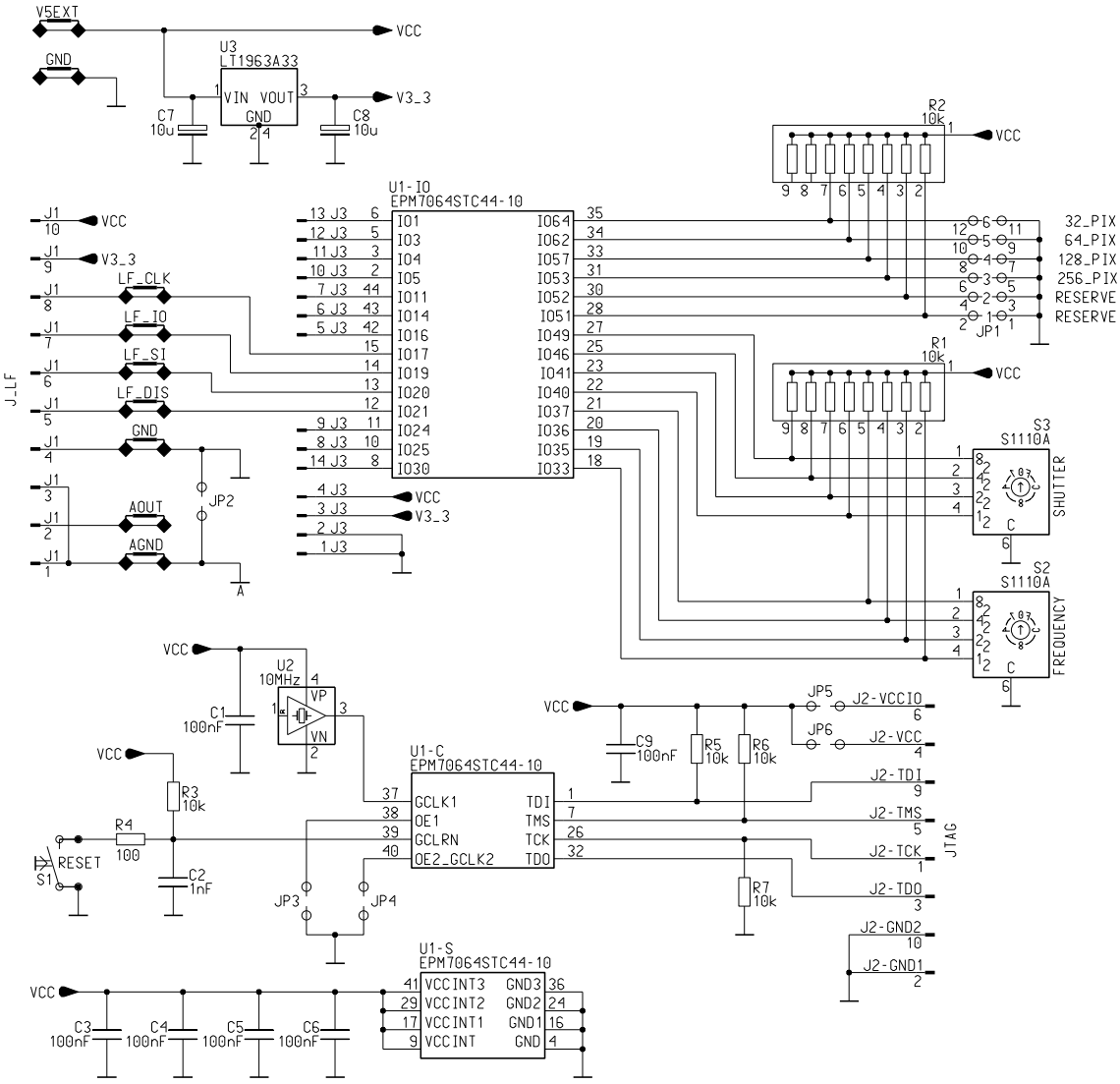

Figure 2: Circuit diagram

JUMPER DESCRIPTION

JP1 sets the sensor mode of LF2D. It supports 256x1 (LFL1402), 128x1 (LF1401), 64x1 (LFM) or 32x1 (LFS) sensors.

Caution! Only one jumper at a time is valid.

Jumper JP1	Function
11-12	iC-LFS (32 pixels)
9-10	iC-LFM (64 pixels)
7-8	iC-LF (128 pixels)
5-6	iC-LFL (256 pixels)
3-4	not used, no function
1-2	not used, no function

SWITCH DESCRIPTION

Switch	Description
S1	Reset
S2	Pixel Clock Frequency
S3	Exposure Time

Pixel Clock Frequency
S2 sets the pixel clock frequency. The 16 positions set the frequency between 100 kHz and 5 MHz.

Pos.	Frequency	Pos.	Frequency
0	100 kHz	8	625 kHz
1	200 kHz	9	714.3 kHz
2	312.5 kHz	A	833 kHz
3	384.6 kHz	B	1 MHz
4	416.7 kHz	C	1.25 MHz
5	454.5 kHz	D	1.67 MHz
6	500 kHz	E	2.5 MHz
7	555.6 kHz	F	5 MHz

Exposure Time
S3 sets the length of the asynchronous, global shutter, which is used to set shorter exposure times than defined by the pixel clock alone. With switch S3 at position 0 no shutter signal will be generated. The resulting exposure time is calculated to

$$T_{exposure} = n * (1 - \frac{S3}{16}) * \frac{1}{f}$$

With n = number of pixels as per JP1, S3 = position of S3 (0 to 15) and f = pixel clock frequency as set with S2.

SENSOR MODULE LF1M

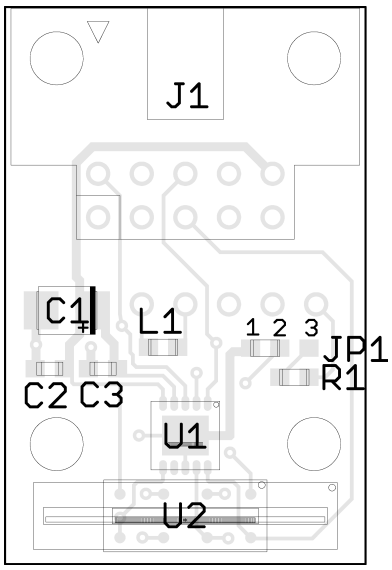

Figure 3: Module Top (size 50.8 mm x 59 mm)

TERMINAL	DESCRIPTION
J1	Sensor Connector

J1: LF1M Sensor Connector
10-pin Connector - male

PIN	Name	Function
1	GNDA	Analog Ground
2	AO	Analog Pixel Output
3	GNDA	Analog Ground
4	GND	Digital Ground
5	DIS	Global Shutter
6	SI	Start of Integration
7	IO50	Not used
8	CLK	Pixel Clock
9		Not used
10	VDD	5 V Power Supply

The sensor module is currently available for iC-LFS, iC-LF1401, and iC-LFL1402 (see ordering information).

GETTING STARTED

1. Connect the sensor module to connector J1.
2. Set jumper JP1 according to the connected sensor module.
3. Select the desired pixel frequency and shutter time using S2 and S3.
4. Connect an oscilloscope probe to "LF_SI"; select this signal as trigger source (level 2.5 V).
5. Connect an oscilloscope probe to "AOUT" (use "AGND" next to "AOUT" as ground).
6. Connect a 5 V power supply.

You should see the analog pixel output voltage at "AOUT". To adjust the output signal you can change either the pixel frequency "LF-CLK" and/or the shutter time ("LF-DIS") using switches S2 and S3.

The examples show the control signals (Ch1 = LF_SI, Ch2 = LF_CLK, Ch3 = LF_DIS) and the analog output (Ch4 = AOUT) of an iC-LFS with some pixels covered (Figure 5). The response to the shutter function (= shorter integration time = lower output amplitude) is shown in Figure 5.

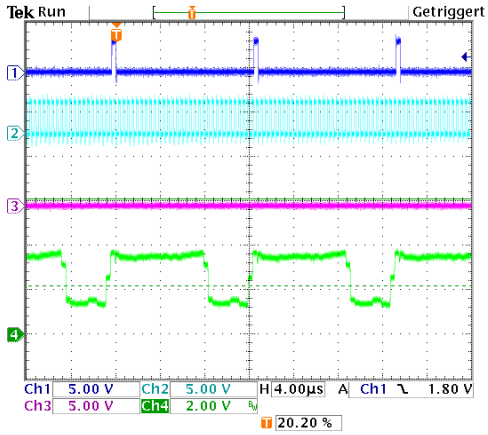

Figure 4: LFS with no shutter active

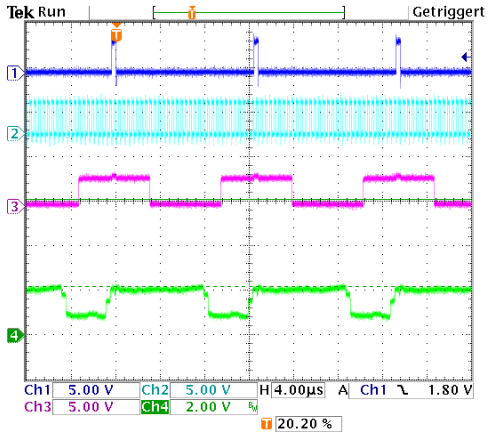

Figure 5: LFS with shutter active

BOARD AND CONNECTOR PINOUT

J1: LF2D Sensor Connector
10-pin Connector - male

PIN	Name	Function
1	AGND	Ground Shield
2	AOUT	Sensor Output
3	AGND	Ground Shield
4	GND	Ground
5	LF_DIS	Shutter Input
6	LF_SI	Start of Integration
7	LF_IO	Not used
8	LF_CLK	Pixel Clock
9	V3_3	+3.3 V Supply Voltage
10	VCC	+5 V Sensor Supply

J2: LF2D Programming Connector
10-pin Connector - male

PIN	Name	Function
1	TCK	Test Clock
2	GND1	Ground 1
3	TDO	Test Data Out
4	VCC	5 V Supply Voltage
5	TMS	Test Mode Select
6	VCCIO	5 V Supply Voltage
7	n.c.	Not used
8	n.c.	Not used
9	TDI	Test Data Out
10	GND2	Ground 2

(JTAG interface for PLD programming)

ASSEMBLY PART LIST

Device	Value (typical)	Comment
C2	1 nF	Backup Capacitor
C1, C3-C6, C9	100 nF	Backup Capacitor
C7-C8	10 µF	Backup Capacitor
R1-R3, R5-R7	10k	Resistor
R4	100k	Resistor
J1, J2	WSL10	10 Pole Smd
J3	WSL20	20 Pole Smd
JP1	Jumper	12 Pole Smd
JP2-JP6	Jumper	2 Pole Smd
U1	EPM7064	Altera FPGA
U2	OSCI	10 MHz
U3	LT1963	Voltage Regulator
S1	Switch	Reset
S2	Switch	Frequency Selector
S3	Switch	Shutter Selector

RELATED DOCUMENTS

- iC-LFL1402 256x1 Linear Image Sensor with Electronic Shutter Function Data Sheet - Specification -

→ http://www.ichaus.de/product/iC-LFL1402

- iC-LF1401 128x1 Linear Image Sensor with Electronic Shutter Function Data Sheet - Specification -

→ http://www.ichaus.de/product/iC-LF1401

- iC-LFM 64x1 Linear Image Sensor with Electronic Shutter Function Data Sheet - Specification -

→ http://www.ichaus.de/product/iC-LFM

- iC-LFS 32x1 Linear Image Sensor with Electronic Shutter Function Data Sheet - Specification -

→ http://www.ichaus.de/product/iC-LFS

REVISION HISTORY

Rev	Notes	Pages affected
A1	Initial Version	all