Smart Cameras made in Germany

Vision ®

Components

The Smart Camera People

VCSBC4012

Operating Manual

Hardware specifications and special software functions of VCSBC4012 Single Board Smart Cameras

Revision 2.0 April 2011
Document name: VCSBC4012.pdf

Vision Components GmbH
Ottostr. 2
76275 Ettlingen
Telefon +49 (0)7243 2167-0
Fax +49 (0)7243 2167-11

Vision Components®
The Smart Camera People
since 1996

Foreword and Disclaimer

This documentation has been prepared with most possible care. However Vision Components GmbH does not take any liability for possible errors. In the interest of progress, Vision Components GmbH reserves the right to perform technical changes without further notice.
Please notify **support@vision-components.com** if you become aware of any errors in this manual or if a certain topic requires more detailed documentation.
This manual is intended for information of Vision Component's customers only. Any publication of this document or parts thereof requires written permission by Vision Components GmbH.

Trademarks

Code Composer Studio and TMS320C6000, Windows XP, Total Commander, Tera Term, Motorola are registered Trademarks. All trademarks are the property of their respective owners.

References

Since the VCSBC40XX smart camera family employs a TI processor, the programming environment and functions for the VC20XX cameras can be used for this camera.

Please also consult the following resources for further reference:

"**Support News**" for an overview of latest updates and support information

"**Knowledge Base / FAQ**" for a searchable data base of SW and HW questions / answers

Description	Title on Website	Download Area
Quick start Manual for VC camera set up and programming	Getting Started VC Smart Cameras with TI DSP	Public Download Area ▸Getting Started VC SDK Ti
Schnellstart VC – deutsche Version of „Getting Started VC".	Schnellstart VC Smart Kameras	Customer Area ▸Getting Started VC20XX and VC40XX Cameras
Introduction to VC Smart Camera programming	Programming Tutorial for VC20XX and VC40XX Cameras	Customer Area ▸Getting Started VC20XX and VC40XX Cameras
Demo programs and sample code used in the Programming Tutorial	Tutorial_Code	Customer Area ▸Getting Started VC20XX and VC40XX Cameras
VC40XX Hardware Manual	VC40XX Smart Cameras Hardware Documentation	Public Download Area ▸Hardware Documentation VC Smart Cameras
VCRT Operation System Functions Manual	VCRT 5.0 Software Manual	Registered User Area ▸Software documentation VC Smart Cameras
VCRT Operation System TCP/IP Functions Manual	VCRT 5.0 TCP/IP Manual	Registered User Area ▸Software documentation VC Smart Cameras
VCLIB 2.0 /3.0 Image Processing Library Manual	VCLIB 2.0/ 3.0 Software Manual	Registered User Area ▸Software documentation VC Smart Cameras

- The Light bulb highlights hints and ideas that may be helpful for a development.

- This warning sign alerts of possible pitfalls to avoid. Please pay careful attention to sections marked with this sign.

Author: VC Support, **mailto:support@vision-comp.com**

Table of Contents

1 General Information

VCSBC4012 Single Board Camera

The **VCSBC4012** has been designed for high resolution image processing with a very small form factor. The VCSBC4012 is the ideal compromise between high performance and low system costs, and thus expecially suited for high volume OEM applications. This makes it viable to use a smart camera in even more products than before.

Employing a CMOS sensor, the image resolution can be changed to the ROI required.

Like with all VC Smart Cameras with Texas Instruments DSP, the operation system VCRT allows multi- tasking. This means for instance that user interface commands can execute in parallel without stopping the inspection process. It is also possible to transfer live images via TCP/IP using a background task.

The VCSBC4012 camera offers an inexpensive entrance into the world of the high performance intelligent cameras. It has a video output onto a PC via 100MBit Ethernet interface, a high speed trigger input and output, 12-24 V digital Inputs and open collector outputs and additional TTL IOs.

The extermely low power consumption of only 1.5W makes this camera ideally suitable for use in mobile devices.

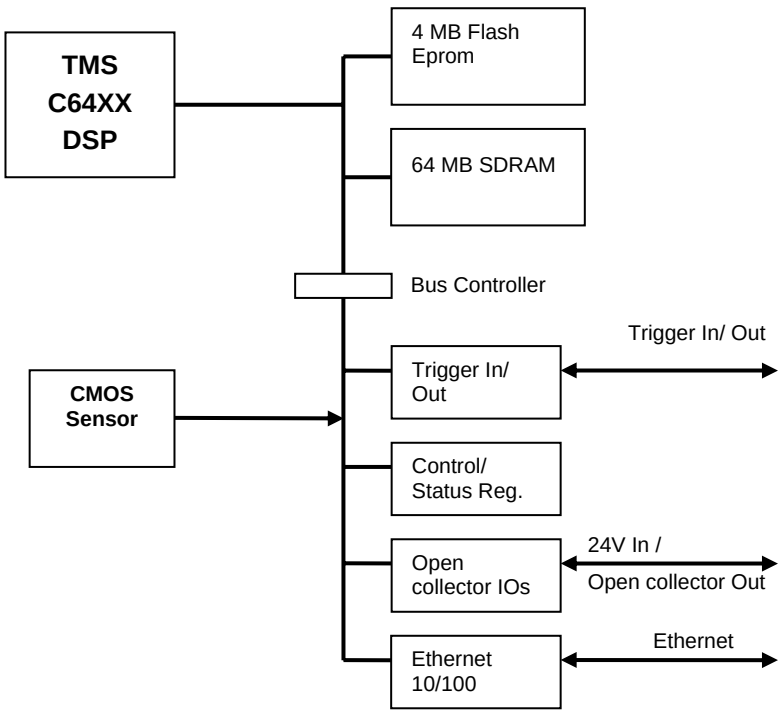
2 Basic Structure

The image is formed by a high-resolution 5 mega pixel CMOS sensor. The image is then stored in SDRAM memory, which has been increased to 64MB, due to the large camera image.

Unlike most other Vision Component Smart Cameras, the VCSBC4012 does not have a direct video output. However if monitoring of the camera image is required, this can be done by downloading via Fast Ethernet port to PC and display on screen (see "Image Transfer" demo software under "Support -> Customer Area -> Software Utilities").

The TMS320C64xx DSP is one of the fastest 32bit DSPs. It features a RISC-like instruction set, up to 8 instructions can be executed in parallel, two L1 cache memories (16 Kbytes each) and a 128 Kbytes L2 cache on chip. Its high speed 64-channel DMA controller gives additional performance. The DSP uses fast external SDRAM as main memory. A flash EPROM provides non-volatile memory.

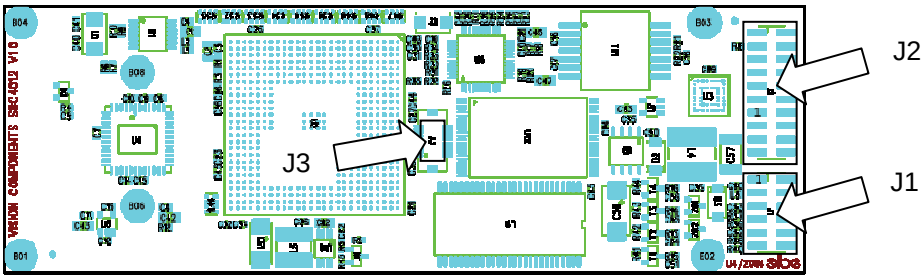
Block diagram VCSBC4012 Camera



3 Technical Specifications VCSBC4012

Component / Feature	Specification
CMOS Sensor:	1/ 2.5" Micron MT9P031 - also available with color sensor (Bayer Filter)
eff. no. of pixels:	2592(H) x 1944(V)
Pixel size:	2.2(H) x 2.2(V) µm
Chip size:	5.70(H) x 4.28(V) mm
High-speed shutter:	“Electronic rolling shutter” (ERS) and “Global Reset Release” (GRR), 15µs, 45µs, 75 µs, … in steps of 30 µs
Low-speed shutter:	up to 30 sec. adjustable integration time
Integration:	ERS / GRR
Picture taking:	program-controlled, full-frame / 11.6 frames per second, external high speed trigger
Parallel image acquisition	Not available
Clamping:	Internal to sensor
A/D conversion:	80 MHz / 12 bit, only the 8 most significant bits used for grey values
Input LUT	none
Image Display	Via 100 Mbit Ethernet onto PC
Processor:	Texas Instruments TMS320C64XX signal processor 400 MHz, 3200MIPS
RAM:	64 Mbytes SDRAM (synchronous dynamic RAM)
Memory capacity:	Up to 13 full-size grey value images in format 2592 x 1944
Flash EPROM:	4 Mbytes flash EPROM (nonvolatile memory) for programs and data, in-system programmable, 3 MB available to user
SD card:	Not available
Process interface:	2 inputs / 4 outputs, outputs 4x80 mA
Additional LVTTL IOs:	4 Inputs, 4 Outputs, I2C Clock and Data signals (I2C also used internally for Sensor control), trigger Input, Flash output
Ethernet interface:	10/100 Mbit
CE certification:	No CE Certification from Vision Components as the OEM customer is required to certify entire system (including housing, cabling, etc.).
Storage Conditions	Temperature: -20 to 60 deg C, Max. humidity: 90%, non condensing.
Operating Conditions	Temperature: 0… +55 deg C, Max. humidity: 80%, non condensing.
Power Supply	12V… 24V
Power Consumption	≈1.5W (current drawn from PLC outputs or onboard 3.3 V signal additional)

4 Camera Interfaces



The VCSBC4012 camera board incorporates the following connector interfaces:

J 1 : VCSBC4012/ VCSBC50 Power and IO Connector
J 2: Ethernet, trigger and Expansion Port Connector
J 3: Emulator Connector

The pin assignments, electrical specifications as well as available accessories are shown for each interface connector in the following sections.

Please refer to Please refer to “Appendix B: Drawing Circuit Board VCSBC4012” for the pin 1 orientation of the camera board sockets.

4.1 J1: Power Supply and IO Interface

The J1 connector includes the camera power supply and the digital IOs.

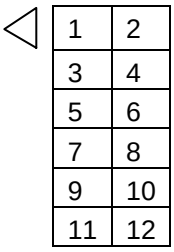
4.1.1 Pin Assignments J1 camera socket

Pin Number	Signal	Core Color[1]
1	Out0	Blue
2	Power (24V)	Red
3	Out1	purple
4	Power GND	Black
5	Out2	Grey/ red
6	In0	Green
7	Out3	Blue/ red
8	In1	Yellow
9	GND	grey
10	GND	white
11	N.C.	pink
12	3.3V out	brown

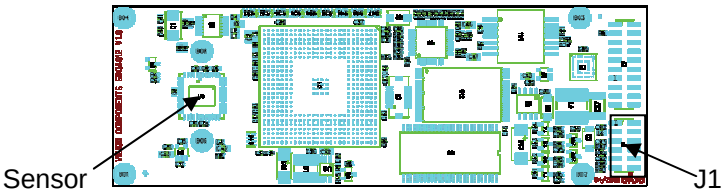
J1 Standard VCSBC4012 socket:
Molex: ***8783212-20***

Note that the pin allocation differs from the J3 connector of the VCSBC4018/16 board cameras!

Pin Locations



If board orientation as shown below:



4.1.2 Electrical specifications digital IO s J1 interface

The camera has two PLC compatible inputs and four PLC compatible open-collector outputs for controlling machines and processes.

Inputs and outputs are not galvanically separated from the supply voltage.

A protective diode ensures, the poles of the supply voltage from the power supply of the PLC can not be swapped.
The outputs are floating when high – external pull up resistor required.

[1] According to matching Power / PLC Cable VK000173

Input Signals IO interface

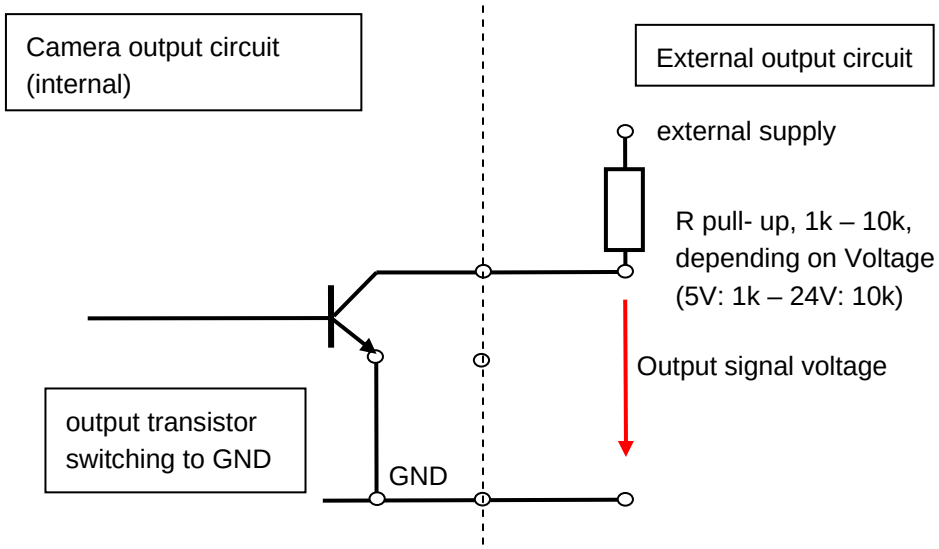
Nominal voltage:	12 – 24 V
Absolute maximum voltage:	voltages greater than 40 V can destroy the inputs
Type:	Circuit GND directly connected
Input current:	1 mA @ 24V
Threshold value:	10 V
Internal signal delay:	- No delay for direct IO access - 10ms delay for DSP polling

The PLC-compatible inputs (24-V level, the positive signal is detected) include input protection circuits. A minimum voltage of 10V is required to reliably sense a logic high signal.

Output Signals IO Interface

Operating voltage:	Depends on external output supply
Absolute maximum voltage:	voltages greater than 40 V can destroy the outputs
Type:	BC850 open collector
Switching voltage:	negative switching (NPN), output high switching to GND
Current:	max. 80 mA per output
Absolute maximum current:	total currents greater than 80 mA per output can destroy plugs and cables no inductive/ capacitive load allowed
Switching power:	max. 1.0 W per output
Protection against inductive loads:	no
Resistance when switched on:	20 Ohm
Short circuit protection:	No protection

Suggested external circuit for using camera outputs NPN



4.1.3 Electrical specifications of the VCSBC4012 Power Supply J1 interface

Nominal Voltage:	12V – 24V
Nominal Power Consumption[2]:	1.5W
Minimum operational voltage (including ripple):	9V
Minimum nominal Operating voltage and corresponding current:	12V 116mA [3]
Maximum nominal Operating voltage and corresponding current:	24V 70mA [3]
Maximum operational Voltage (including ripple):	30V

Power must be connected to the 12 pin J1 I/O connector.

Camera power is regulated, so only an unregulated power source of 12 V to 24V is required. The camera is, however, very sensitive to power supply interruption. Please make sure, that the voltage never exceeds the limits of < 9V, > 30V even for a short period of time. In case of trouble it is recommended to backup the power supply by a capacitor or a battery large enough to prevent power interruptions.

Power consumption depending on suply voltage [3]:

Supply Voltage [V]	Current drawn [mA]	Power [3] Consumption [W]
9	153	1.37
10	138	1.38
12	116	1.39
14	100	1.40
16	90	1.44
18	80	1.44
20	72	1.44
22	66	1.45
24	62	1.48
26	57	1.48
28	54	1.51
30	51	1.53

[2] Typical power consumption without using the onboard 3.3V supply.

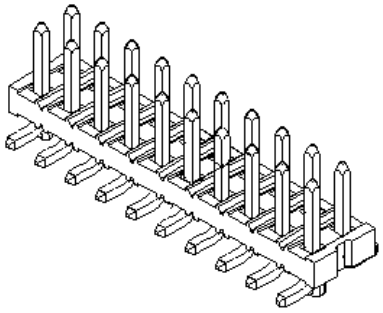
[3] Current drawn from the 3.3V on board signal needs to be added to these figures.

4.2 J2: Expansion Port / Trigger Interface

Note that the LVTTL IOs are very sensitive. Only use driving electronics suitable for LVTTL IO's!

4.2.1 Pin Assignments J2 camera socket

Pin Number	Signal	
1	I2C_Clock	
2	I2C_Data	
3	Trig_in	
4	Trig_out	
5	Q00	
6	I01	
7	Q01	
8	I01	
9	Q02	
10	I02	
11	Q03	
12	I03	Core Colors Ethernet
13	TxD+	Blue
14	TxD-	Red
15	GND	N.C.
16	GND	N.C.
17	RxD+	Pink / black
18	RxD-	Green
19	GND	N.C.
20	GND	N.C.



Cable colors shown valid for using VC's Ethernet cables – see the accessory overview in section 5.

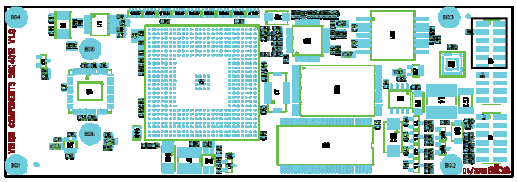
Signal description:

Q00 – Q03	digital LVTTL outputs
I00 – I03:	Digital LVTTL input (without pull-up resistor)
I2C_Clock and I2C_Data	I2C serial Bus Interface for additional peripherals (Refer to the Texas Instruments documentation[4] for further details) Note that the I2C Bus is used internally to program the sensor! Caution is advised when programming the I2C in order not to block system tasks!
Trig_in and Trig_out	Trig_in and Trig_out – are not opto isolated, so special care must be taken or Isolation has to be done externally!

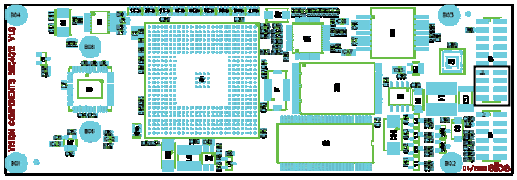
[4] "TMS320C6000 DSP Inter-Integrated Circuit (I2C) Module Reference Guide", Literature Number: SPRU175A, Oct. 2002

Pin Locations

1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20



top part of J2 interface for I2C Bus, Trigger Interface and additional LVTTL



lower part of socket for Ethernet

Please refer to “Appendix B: Drawing Circuit Board VCSBC4012” for the pin 1 orientation on the camera board socket.

4.2.2 Matching connector and cable for J2 camera socket

4.2.2.1 Manufacture own cable / pcb that sits on top of camera board

The socket J2 has the following part number: 8775967-2050, manufacturer Molex (www.molex.com)
The matching connector has the following part number: 51110-2050

Vision Components does not currently manufacture a cable for this connector. Please order the matching connector from the manufacturer Molex.

4.2.2.2 Using VC’s wide Ribbon Cable covering J1 and J2

There is a new Ribbon Cable available using a 24 pin Molex conector that connects to all 12 J1 and 20 J2 pins. This cable can be ordered with one connector / open and 2 female molex connectors. For further details please contact sales at this stage: **sales@vision-comp.com** .

4.2.2.3 Use Power and Ethernet cable side by side

Alternatively an additional 12 pin Power Supply /PLC and a 8 pin Ethernet cable (Cable set for VCSBC4018, VK000229 see section 5) can be used next to each other to cover all contacts. Since only pin 1,2,5 and 6 of the 8 pin Ethernet connector are connected, place these two plugs on the J2 sockets as shown below:

Pin 1-12 use J1 cable Pin 13-20 use one of the Ethernet calbes, (pin number of connector given here):

2	4	6	8	10	12	2	NC	6	NC
1	3	5	7	9	11	1	NC	5	NC

∇

Please refer to section 4.1.1, section 4.2.1 and sectio 5 for details on these cables.

Pin assignment Ethernet cable VK000251:

PIN (J4)	Cable Color (J4)	Signal	Cable Color (RJ45)	PIN (RJ45)
1	blue	TXD+	Orange/ white	1
2	red	TXD-	Orange	2
3	N/C	GND	N/C	
4	N/C	GND	N/C	
5	Pink / black	RXD+	Green/ white	3
6	green	RXD-	Green	6
7	N/C	GND	N/C	
8	N/C	GND	N/C	

The change of core colors results from connecting two cables (VK000206 and a standard Ethernet cat 5 cable).

4.2.3 Electrical specifications J2 camera socket

All Signals are Low Level TTL (3.3V), not opto isolated.
The electrical specifications given for the trigger input and output are also valid for the remaining LVTTL IOs.

The following Signals have a 1k5 pull up resistor on board:

- I2C_Clock
- I2C_Data
- Trig_in

Trigger IO Specifications:

The board features a dedicated fast TTL trigger input (for use as image capture trigger) and a fast TTL trigger output (as strobe-light trigger). Since both signals are fast at a very low noise margin, it is recommended to keep the cable as short as possible. Use twisted pair or even coaxial cable for this purpose. The trigger input assures a constant image capture delay without jitter.

Electrical Specification of trigger input [5]:

input voltage: Signal LOW	-0.3V – 0.8V (LVTTL)
Input voltage: Signal HIGH	2V – 3.9V (LVTTL)
input current:	N/A
limiting resistor:	1K5 pull up
reverse voltage protection:	none
switching delay:	none

Image trigger on rising or falling input signal works as before – see section 6.5.1 for details.

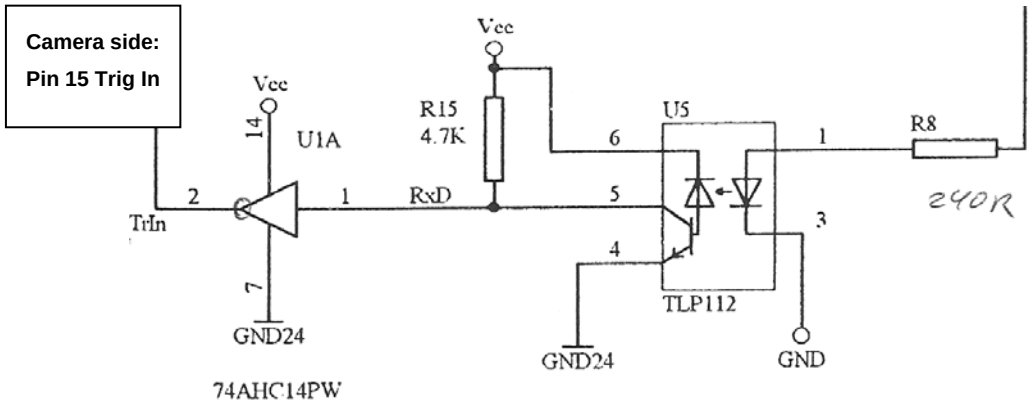
The trigger input and output are very sensitive and not galvanically separated. Opto isolation of the driving circuit is therefore strongly recommended. The following page shows suitable circuits for trigger input and output.

Please note that input and output are not protected against over current. The output is neither protected against short circuit nor reverse voltage spikes from inductive loads.

Use the VC4018 or VC4016 cameras if you can not provide a suitable trigger input driving circuit. These cameras include the same hardware as the VCSBC4018 / -16, but opto isolation of the trigger input and output is already included.

[5] The electrical specifications given for the trigger input and output are also valid for the remainingLVTTL IOs.

Recommended driving circuit for the trigger input:

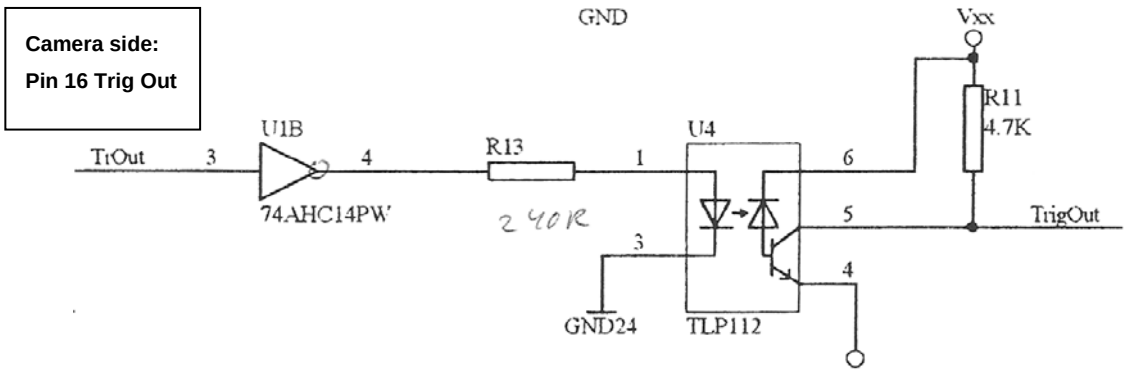


Electrical Specification of trigger output[6]:

output voltage signal LOW:	0.4 V with 2mA output current 0.2 V with 1mA output current
output voltage signal HIGH:	2.9 V with 8mA output current 3.1 V with 1mA output current max. 3 V LVTTL
Maximum output current:	max. 8 mA (high), 2mA (low)
pull-up resistor:	none, LVTTL push-pull output

Caution: Place the connectors at the correct position – not reversed or shifted.

Recommended circuit for trigger output:



[6] The electrical specifications given for the trigger input and output are also valid for the remainingLVTTL IOs.

5 Accessories

For interface cables and connectors available also consult the corresponding section in chapter 4 of this manual.

5.1 Camera and Lens holder order numbers:

Product / Service description	Order Number
VCSBC4012 Single Board Smart Camera ***without*** lens holder, b/w CCD	VK000368
VCSBC4012 Single Board Smart Camera ***without*** lens holder, Bayer CCD	VK000369
Lens holder C Mount incl. adjustment (IR Filter EK000625 included)	VK
Lens holder 12mm (Clear glass window EK000624 included)	VK

5.2 Further accessories available for the VCSBC4012:

Product description	Order Number
Power adapter for rail mounting, Input Voltage 100 – 240VAC 50/60 Hz Output Voltage DC 24V +/-5%, max. 300 mA (7.5 W) Equipped with connecting clamps for AC input and 24V output, CE cert. Using this power supply with VCSBC4018 and VCSBC4016 is only possible when booting by switching the 24V secondary side! 15W power supply needed if switching the mains supply!	VK000036
Cable for Expansion Port J2 (use cable set VK000229 see section 4.2) It is recommended to manufacture matching circuit board	VK000229
Power Supply and IO Interface cable for J1	VK000173
Ethernet OEM Cable for J2 (0.5m length, 4 single cores)	VK000206
Ethernet testing Cable for J2 (2.5m length, other end with RJ45 connector)	VK000251
Emulator Adaptor Cable for J3	VK
Cable set for VCSBC4012 (contains VK000206 and VK000173)	VK000229
Cable for Emulator interface J3	VK
Clear glass protective sensor window (replaces IR filter in camera head)	EK000624
IR cut filter (camera is shipped with this filter mounted) refer to Appendix B	EK000625

All cable lengths are 0.5m unless stated otherwise.

Please also refer to the VC website **www.vision-components.com** for an up to date list of accessories.

6 Programming VCSBC4012 Camera

The VCSBC4012 operating system includes some additional functions, mainly for the control of the additional interfaces. Without direct VGA output some video control functions are not implemented for this camera.
This manual describes the differences between the standard VCRT 5 operating system functions and the special function library of the VCSBC40. For programming please also consult the VCRT 5 and VCLIB 2.0 and VCLIB 3.0 manuals (see the list of references at the beginning of this manual).

6.1 Special Software requirements for the VCSBC4012

The following table shows the minimum compatible setup options using the VCSBC4012 camera:

Code Composer Studio Version	VCRT PC Lib Version	VCLIB Version	VCRT Camera OS Version:
CCS 3.1 (C6000) or CCS 3.3 (C6000)	VCRT 5.27	VCLIB 3.0	VCRT 5.27

Refer to the **“Support News”** section, under “Support and Download” on the VC website for an overview of the latest compatible set up.

The VCRT PC lib Operation System PC library, the VCLIB Image Processing Library as well as the VCRT Camera Operation System can be downloaded from Support section of the Vision Components Website.
Software manuals are located in the “Registered User Area”. This download area can be accessed after registration and log in on the VC Website.
Software updates are available from the “Customer Area”. For access to the customer area please register your Vision Components development software for VC cameras with TI processor. Software registration can be done after logging in using the license key code shipped with each development bundle. For this please follow the “Register your Software” link under the “User Menu”.

6.2 Ethernet Communication

The default camera IP address is 192.168.0.65 – as with all Ethernet cameras from VC.
The IP address can be changed to a different loading a #IP file into camera memory.
Refer to the “Getting Started VC Smart Cameras” guide for further details.

The camera supports DHCP server IP address allocation. In order to use DHCP allocation, the entry “DHCP” needs to be added to the #IP file as shown:

```
DHCP
IP:  192.168.0.81
MSK: 255.255.255.0
GTW: 192.168.0.1
```

The camera uses the specified IP address if DHCP allocation is not successful. If no IP address is specified in the #IP file, the camera falls back to the default address:

192.168.0.65

Please use DHCP server functions to determine the IP address allocated to the camera. Most server show a list of mac addresses and corresponding IP addresses or allow to allocate fixed IP addresses to a certain mac address. Determine the mac address of the camera using the shell command “type #ID” to prior to using DHCP IP address allocation!

The “Getting Started VC Smart Cameras” and section 6.4.1 include advice on re-setting a camera with unknown or invalid IP Address.

6.3 Using FTP with the VCSBC4012

With VCRT 5.18 and higher, the use of any standard ftp client is now possible. The following server commands have been added: SYSTEM,PWD,CWD,LIST,DEL
Programs have to be uploaded as “out” files into the camera flash memory. Ascii files like the autoexec or #IP files can be uploaded as “*.txt” files – the conversion into *.msf” files is not required.

6.4 Preventing Autoexec Execution / IP number reset

Preventing the execution of an Autoexec file by attempting a connection with the camera (as described in the programming tutorial) does not work, due to the increased processor speed. Resetting the camera using a keypad as with the VC20XX cameras is also not possible.

There are three ways of preventing the Autoexec execution and resetting the IP address:

Option 1:

1. Upload an empty autoexec/ #IP file via FTP into the camera memory, overwriting the existing file(s).
2. Hardware reset of camera.

Option 2: CPU reset with help of an Emulator.

Option 3: Resetting the camera with help of the “VCnet Recovery Tool” as described in the following section.

6.4.1 Resetting the Camera with help of the VCnet Recovery Tool

A new tool – the “Vcnet Recovery Tool” is provided for resetting the IP address of the VCSBC4012 and VC4012 cameras. Vcnet Recovery is supported from camera OS VCRT 5.21.

In order to use the VCnet Recovery tool, follow the steps below:

1. Download and install the “**Java(TM) 2 Runtime Environment, Standard Edition 1.4.XX**” on your PC (Download from **www.sun.com** - > Downloads - > J2SE v 1.4.2_11 JRE).
2. Download **VCnet Recovery Tool for VC4012 and VCSBC4012** from **www.vision–comp.com** -> Support -> Customer Area ▸*Software Utilities*
3. Unpack the “vcnet1.2.zip” folder a directory on your hard drive (for instance C:\ti\Util…).
4. Open the Dos command line window and change to the directory containing “vcnet.jar”.
5. Execute the following command from the DOS Window "java -jar vcnet.jar -snr 5912345" , by specifying the camera serial number as shown. This command sends vcp packets via UDP broadcast for the next 15 seconds. Sending this command resets the corresponding camera to the default IP address and bypasses Autoexec execution. Further options below.
6. Boot the corresponding camera (power on) during the next 15 seconds. During start up the camera listens 0.5 seconds for cvp packets send with vcnet.jar.
7. If a valid vcp packet is received from camera an answer packet is sent (see example below). The camera continues booting in standard configuration:

Default IP address:	192.168.0.65
Mask:	255.255.255.0
Gateway:	none

An autoexec in flash memory is not executed.

Example of resetting a VCSBC4012, S/N 0100151:

```
C:\Programme\VCnet>java -jar vcnet.jar -snr 0100151
VCnet Recovering Tool Version 1.2 - Copyright Vision Components 2005

Recovering Serial Number = 100151

Listening on port 67 for incoming packets!

Packet 2 from: /0.0.0.0

===Data as Text:===

model: VC4018E
S/N:   0100151
DC:    06/10/05 09:23:06
MAC:   00-06-1F-01-87-37
IP:  192.168.0.81
MSK: 255.255.255.0
GTW: 192.168.0.1
….
```

6.5 Special VCRT functions for programming VCSBC4012 cameras

This sections explains the specifics of programming VCSBC4012 cameras.

6.5.1 Trigger Functions

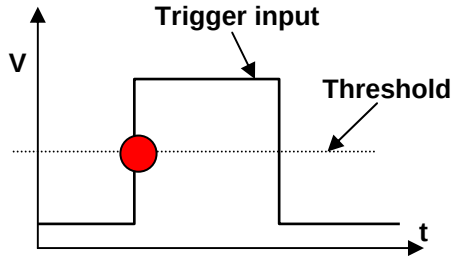
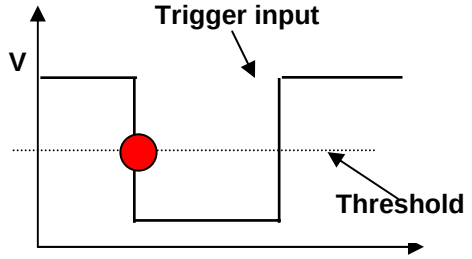
Apart form the inverse TTL logic (see section 4.2.3) and the different status register shown below, the trigger works like with the VC4XXX cameras.

Please refer to the VCRT5.pdf manual – available form the Registered User Area of the VC website.

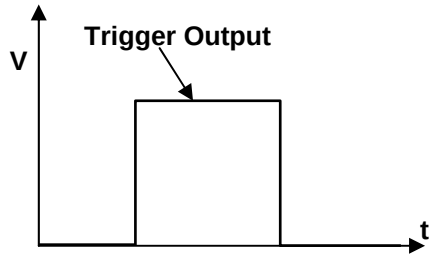
To query the trigger input, use the following command (see demo program trigin.c):

```
…
if (TRIGINP_PIN)
  print("external trigger = 1\n");
else
  print("external trigger = 0\n");
…
```

A capture can be triggered on rising edge with TRIGINP_POS() and on falling edge with TRIGINP_NEG().

Signal	Trigger Mode
	TRIGINP_POS() Rising Edge Trigger Signal
	TRIGINP_NEG() Falling Edge Trigger Signal

The trigger output can be set to exposure controlled mode – for instance to control a light source. With TRIGOUT_EXP() combined with TRIGOUT_POS(), the trigger output is high during exposure. TRIGOUT_EXP() combined with TRIGOUT_NEG(), the trigger output is low during exposure.

	Trigger Output Signal in Exposure Controlled Mode: TRIGOUT_EXP(); AND Trigger output set positive: TRIGOUT_POS();

The trigger macros are also described in our programming tutorial.

The use of TRIGOUT_USR(), SET_TRIGOUT() and RES_TRIGOUT() is limited on the VCSBC4012 camera! Use only with slow applications and long shutter times (the sensor needs several milliseconds to execute the signal change).

6.5.2 Controlling the TTL IOs on socket J2

Setting and reading the 4LVTTL inputs and outputs is done with help of the hardware registers.

The following macros are available for easier operation (see “vcrt.h”):

- Setting the 4 outputs is done with help of a 4 bit value:

  ```
  #define TTL_OUT(x)   *((volatile int *)FA40_LED) = x          /* SBC4018 TTL output */
  ```

- For queering the TTL inputs use the following function:

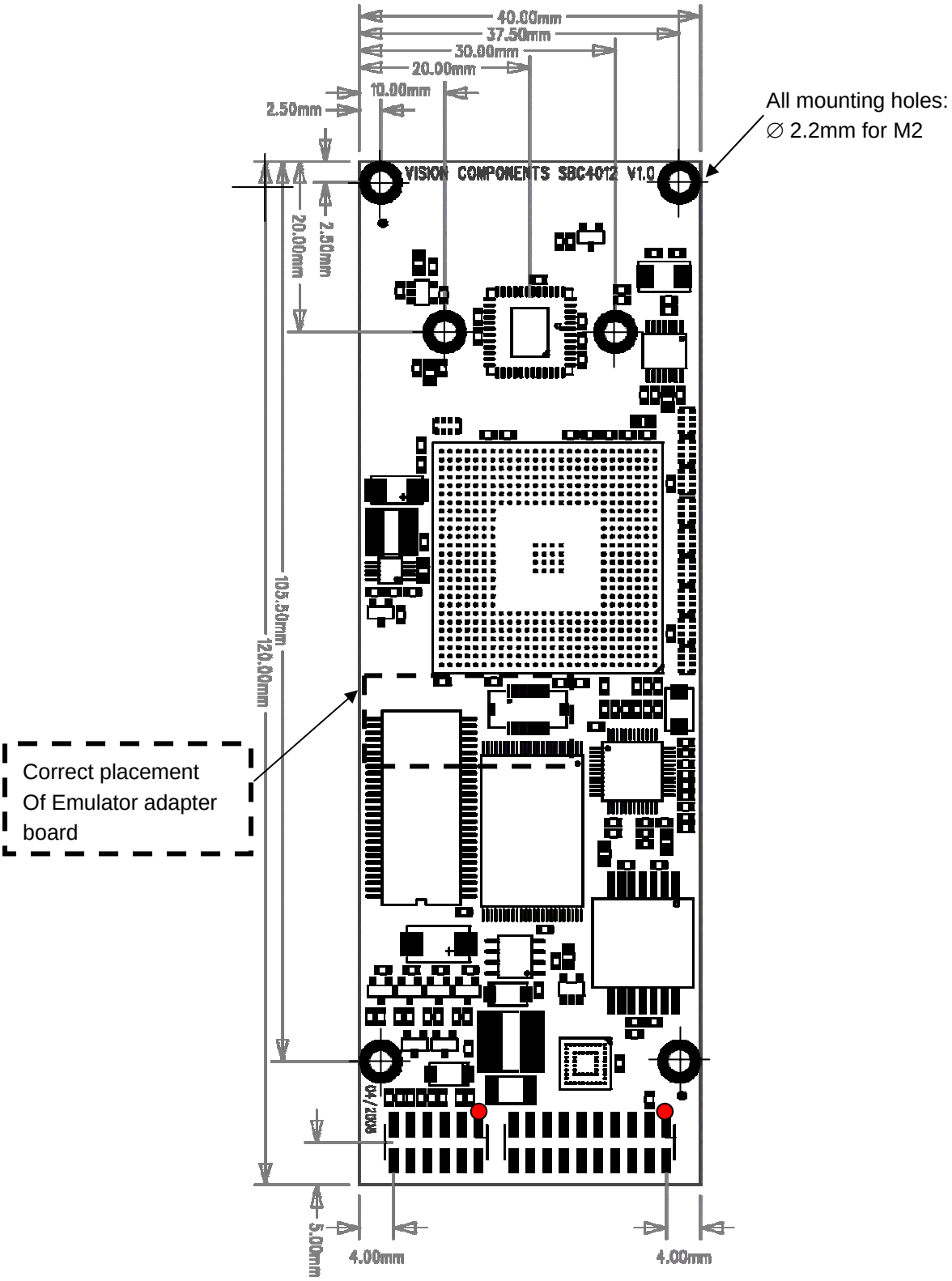
  ```
  #define GET_TTL_IN()  (*((volatile int *)FA40_TTL) & 0x0F)    /* SBC4018 TTL input */
  ```

Appendix A: New VCRT Functions VCSBC4012

New VCRT functions (see section 6 and vcrt.h):

#define GET_HW_STATUS()	(*((volatile int *)FA40_STATUS) & 0x3F)	/* CPLD relase number*/
#define TTL_OUT(x)	*((volatile int *)FA40_LED) = x	/* SBC4012 TTL output*/
#define GET_TTL_IN()	(*((volatile int *)FA40_TTL) & 0x0F)	/* SBC4012 TTL input*/

Appendix B: Drawing Circuit Board VCSBC4012



The red dot ● marks the Pin 1 position of each connector.

Tolerances: All circuit board dimensions: +/- 0.1mm

Smart Cameras made in Germany

Visit the Vision Components site **www.vision-components.com** for further information, documentation and software downloads:

Web Site Menu Links	Content
Contact	Distributor list / Enquiry forms
Home	Latest News from VC
Our Company	VC Company Information
News and Events	Trade Show dates VC Publications Sign in for free VC Seminars
VC Network	Description of Partner Companies Application Overview 3rd Party Hard- and SW Products for VC Smart Cameras
Products VC Smart Camera Overview	Product Overview: VC44XX VC Optimum VC40XX VC Professional Family VC4016 / 18 VC Base Family VC4002L Line Scan Camera VCSBC Single Board Cameras VC20XX Smart Cameras VCSBC Board Cameras VCM + Viscube Camera Sensors
VC Smart Camera Software VC Software Development Kit Ti:	VCRT Operating System VCLIB Image Processing Library
VC Special Libraries:	M200 Data Matrix Code Reader VCOCR Text Recognition Library Color Lib
Support: Support News (User Registration required)	Tech News – new SW and Documentation
Knowledge Base / FAQ (User Registration required)	Searchable FAQ Database with programming Examples and Demo Code
Download Area Public Download Area (free Access) Registered User Area (User Registration required) Customer Download Area (User- and SW License Registration required)	Download of: - Product Brochures - Camera Operating Manuals - Getting Started - Programming Manuals - Training Manuals and Demo Code - Software Updates (Libs and camera OS) - Demo Code - Utility Software
RMA Number Form	Form for Allocation of Repair Numbers.

Vision Components GmbH
Ottostr. 2
76275 Ettlingen
Telefon +49 (0)7243 2167-0
Fax +49 (0)7243 2167-11