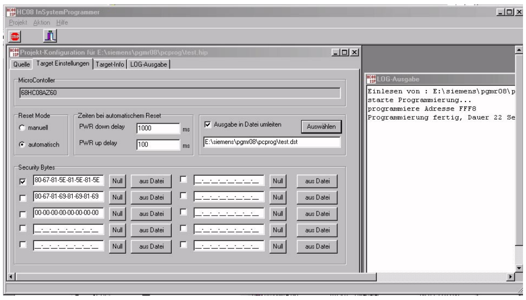
Features MONIF08-E3

- Target connection via 10 pin ribbon cable (EB08-xx compatible) or 16 pin ribbon cable (MON08 /P&E-compatible)
- MON4 – MON8 High/Low software configurable for flexible setup of monitor mode entry conditions
- supports all Debug – Features (Break-Interrupt, Reset on DTR-Edge)
- Oscillator with driver IC (user selectable frequency) for HC08 types with internal oscillator (or to overdrive 32kHz clock quartz), activated by software for automatic trimming of controllers with ICG (e.g. Nitron)
- 9-pin DSUB-Plug (female) to connect to PC serial port
- Supply by external mains adaptor (provided). Target could optionally be supplied by MONIF08-E3.
- Supports low voltage derivatives (2.5 to 5V) with flexible configuration of target supply voltages by DIP switch, Vhi auto adoption to fit Motorola specs
- All configuration data saved in EEPROM
- automatic power on reset for target circuit via relay contact in plus rail (supports up to 1A, 30V)

Features PC-Software HC08-ISP

- Speed optimized In-Circuit-Programming of flash-memory and EEPROM
- Flexible adoption to different target configuration
- User friendly GUI on WIN32 (95/98/NT/2000/XP)
- Supports many HC08-types (AZ60, AB32, AS60, JB8, JL3, GP32,GZ16, GZ60, QT/QY, SR12, LJ .....), also NITRON with our without pre trimmed internal oscillator
- supports automatic trimming for controllers with internal oscillator (Nitron QT / QY series)
- Optional insertion of date and serial number into flash data
- Setting of Flash block protect register
- Also available as Command Line Programmer for production purposes, integrates into all common Windows programming systems (e.g. Visual Basic, Labview, C / C++)



Projekt-Konfiguration für E:\siemens\pgmr08\pcprog\test.hip

MicroContoller: 68HC08AZ60

Reset Mode: ○ manuell ● automatisch

Zeiten bei automatischem Reset: PWR down delay 1000 ms; PWR up delay 100 ms

☑ Ausgabe in Datei umleiten: E:\siemens\pgmr08\pcprog\test.dst

Security Bytes:
☑ 80-67-81-5E-81-5E-81-5E
□ 80-67-81-69-81-69-81-69
□ 00-00-00-00-00-00-00-00

LOG-Ausgabe

```
Einlesen von : E:\siemens\pgmr08\p
starte Programmierung...
programmiere Adresse FFF8
Programmierung fertig, Dauer 22 Se
```

General

The monitor mode interface MONIF08-E3 connects between the PC serial interface and the monitor mode connections of a HC08 micro controller.

The monitor mode supports in-circuit debugging and in-circuit flash programming.

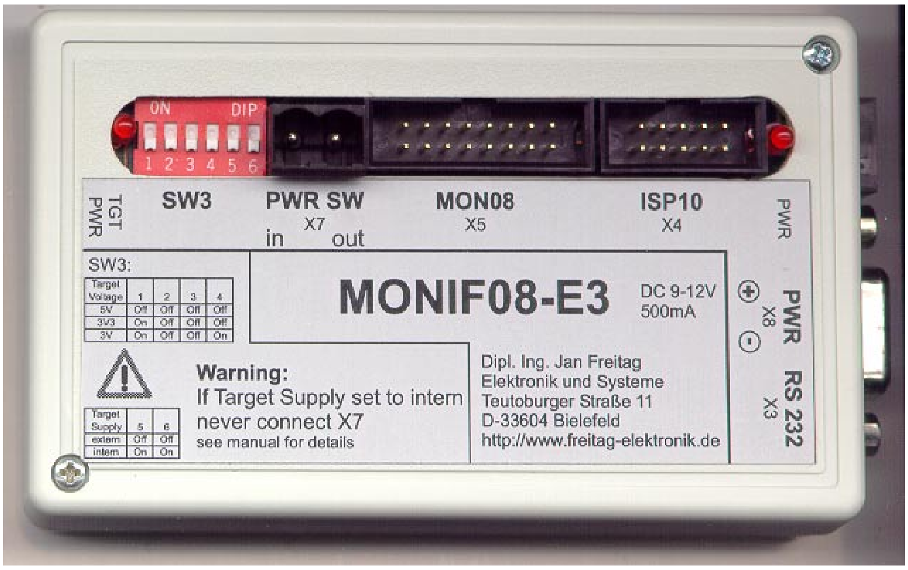
This interface supports the common debug –features (Break-Interrupt, Reset on DTR-edge).

It is compatible with common monitor mode debugger software (e.g. the P&E or MON08 debugger integrated into the CodeWarrior IDE or COSMIC ZAP) and our high speed flash programming software HC08-ISP.

1 Connection and Setup

The MONIF08-E3 is connected to the target controller via a 10 pin ribbon cable or a 16 pin ribbon cable.
Target power supply can be external, internal or separate.
The MONIF08-E3 is connected to the PC via 9-pin DSUB RS232 connector.
The interface itself is supplied via an external power supply (wall plug type or similar) with 9 to 12V DC, max. 500mA.

Position of connectors



view from above

View from side

1.1 LEDs

TGT PWR	Lights, if target supply (signal TVCC on X4 and X5) is powered
PWR	Lights, if MONIF08-E3 is powered

1.2 Supply of the Interface

The power supply is connected to the interface via connector X8.
Voltage of 9 to 12V and current capability of 500mA is required.

1.3 X4 - 10 Pin Connector

The connector shown here is 1 to 1 compatible with the 10pin connector on the EB08-xx series of our evaluation boards.
For details of connection to your target controller and meaning of the signals, see 3 (monitor mode details)

X4 – Target Connector 10 Pin	Signal
1	MON7
2	MON6
3	MON8 *1)
4	MON5 *1)
5	GND
6	TVCC Target supply (2.5 to 5V)
7	HC08_IRQ
8	HC08_PTA0 (monitor mode communication)
9	HC08_OSC1 (Clock out of MONIF08-E3)
10	HC08_RST Reset of Target

NC: no connect, do not connect anything here.
*1): pin 3 can be HC08_RxD and pin 4 can be HC08_TxD for RS232-TTL, MONIF08-LC, PGMR08, PGMR08-B, for serial connection of target controller

Layout of corresponding pinheader, view from above

		K		
9	7	5	3	1
10	8	6	4	2

K: Coding interleave
Pin 1 is marked with an arrow

1.4 X5 - 16 pin connector

The 16p pin connector is compatible with the MON08 widely used by Motorola EVBs and is also compatible with the P&E Cyclone / Multilink devices.
For details of connection to your target controller and meaning of the signals, see 3 (monitor mode details)

X5 – Target Connector 16-pin (MON08-ICP / P&E-Cyclone compatible)		
Pin Nr.	Signal Name	
1	NC	
2	GND	
3	NC	
4	RES/	
5	NC	
6	IRQ/	
7	NC	
8	MON4	
9	NC	
10	MON5	
11	NC	
12	MON6	
13	OSC	
14	MON7	
15	VIN	
16	MON8	

1.5 DSUB RS232 Connector

The 9pin DSUB connector is to be connected to the PC COM interface with a 1:1 (straight) cable.

1.6 Target Circuit Power Supply

The target circuit can be supplied in 3 different ways, dependent on the actual setup:

- external (that is, the target has its own supply and supplies some part of the target connected electronics of the MONIF08-E3),
- internal (target is supplied from the MONIF08-E3)
- separated (the target has its own supply, and the of the target connected electronics of the MONIF08-E3 are supplied from the MONIF08-E3 itself, supplies are not connected except GND connection)

1.6.1 Internal supply

Internal supply is useful if the target circuit does't not need more than about 250mA during programming, and if it is possible to supply the circuit with only the logic supply. This is possible, for example, using our evaluation boards EB08-xx.

Switch SW3.5 and SW3.6 are to be switched to “on” position. Do not connect anything to X7 PWRSW, as these pins are connected to the supply voltages.

For the setup of the target supply voltage the switches SW3.1 to SW3.4 are to be setup according to this table:

Switch Position				
SW3.1	SW3.2	SW3.3	SW3.4	Voltage
On	on	On	on	1,25
On	on	On	off	1,50
On	on	off	on	1,75
On	on	off	off	2,00
On	**off**	**on**	**on**	**2,50**
On	off	on	off	2,75
On	**off**	**off**	**on**	**3,00**
On	**off**	**off**	**off**	**3,30**
Off	on	on	on	2,90
Off	on	on	off	3,20
Off	on	off	on	3,40
Off	on	off	off	3,60
Off	off	on	on	4,10
Off	off	on	off	4,40
Off	off	off	on	4,60
Off	**off**	**off**	**off**	**5,00**

Tolerance of voltage settings is about 3%.

1.6.2 External Supply

For external supply the logic supply voltage is generated in the target circuit and supplied to the MONIF08-E3. Switch SW3.5 and SW3.6 are to be switched to “off”. If automatic power on in required (this should be considered as it is very comfortably during debugging and programming) a single target suppy voltage (up to 30V, 1A) is routed via the X7, PWR SW connector. This connector is internally wired to a relay contact. To discharge electrolytic capacitors in the target circuit the “PWR OUT” pin is connected to GND via a 430 Ohms resistor in the power down state.

If more than a single voltage or higher currents or voltages are required, an additional external relay can be used. The coil of this relay is switched via X7.

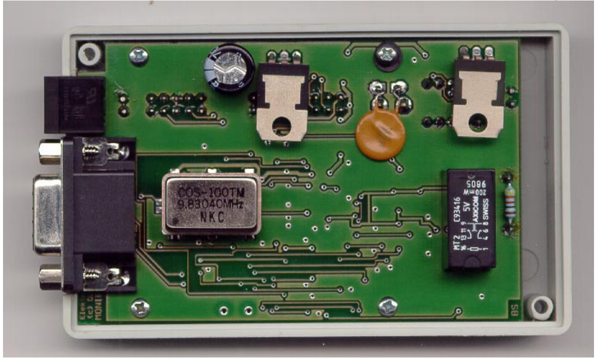
1.6.3 Separate supply

This setup is only used in special cases. A mixture of internal and external supply is used. Automatic power on reset is only possible if an external relay with 5V coil (or additional driver transistor in case of lower target supply voltages) is connected. The SW3.5 and SW3.6 are switched to “on” position, and nothing is connected to X7 (PWR SW). The target is supplied by its own supply, and the TVCC pin of X4 or X5 is not connected to the target, but can drive the relay coil. The GND pin is to be connected to the target, of course.

Target supply voltage is to be selected according to the table in paragraph 1.6.1 .

1.7 Clock Oscillator

In the delivery state a 9.8304 MHz oscillator is fitted. The clock oscillator can be changed by opening the case of the MONIF08-E3. Disconnect power supply and target connection before opening, and observe ESD protection precautions. Place the alternative oscillator in the same position (sharp edge of case or dot in direction to the lower left side) as shown on the picture:



2 PC Software Setup

2.1 Flash Programming with HC08-ISP

HC08-ISP is used ofr two purposes:

- for the configuration of the interface (MON4 .. MON8 pull-up / pull down, clock on / off, communication via MON4 or MON 5), if the interface is used for debugging
- for flash programming

Installation is explained in the readme.txt file on the installation disk.
The HC08_ISP offers a quick start guide as part of the help system.

2.2 Debugging with Metrowerks / P&E

There are two possibilities to use a the MONIF08-E3 with the Metrowerks IDE:
MON08 – interface (this is limited to 1KB in the special edition) or P&E Debug (limited to 4 KB) .
Additional information on issues regarding PE debug can be found in the documentation in the MetroWerks installation directory
.....\Metrowerks\CodeWarrior CW08_V2.1\CodeWarrior Manuals\pdf\Manual Engine HC08.pdf

To select PE Debug, choose an appropriate example from the MetroWerks examples directory.
As an example we use to '908GZ16.
For the GZ16, there is an small assembly language example that can be run in demo mode (not even a special edition license key is required).
To check this example, go down the examples path
....\Metrowerks\CodeWarrior CW08_V2.1\(CodeWarrior_Examples)\HC08\HC08 PEDebug\GR_GZ Demos\GZ16 Demo\
and open the project „GZ16 Demo.mcp“.
Click on the green Debug button. The project assembles and links and after this the debugger is launched.
Change the debug mode to “In circuit debug / programming” (PE Debug Menu, Mode:)
Now a window comes up "Attempting to contact target...". Here setup as shown:

Target Hardware Type = class II, even if the text „Motorola ICS without processor,..., 16pin ribbon cable“ seems to be unlikely.
The reason for this is that the circuit inside the MONIF08-E3 is compatible with the circuit on the Motorola ICS kits.
Select the proper COM port number. To change settings, first click on “close“. For the ‘GZ16 Starterkit the Baud rate is to be set to 4430. Set the drop-down menu to “specified” and enter 4430.
In general baud rate depends on clock frequency and the “double baud rate setting” that is possible on some controller by setting a port pin to low.

Set Target MCU Security Bytes = "Blank Device" (If the controller is blank, select FF-FF-FF-FF-FF-FF-FF as security bytes) . If not, select the right security bytes or select the ignore checkbox and delete the device before programming. More details are available with the “help” button. See also 3.1

If programming was successful, the debugger comes up and the program can be single stepped, a breakpoint can be set and so on.
If the break interrupt feature (see 3.2) is to be used to stop a program that did not run on a break point, some additional assembly lines have to be added. The updated project GZ16ASM_break is included on the GZ16STK-CD in the GZ16STK_CodeWarriorExamples directory.
The break interrupt is issued with the red “Halt” button or with pressing F6.

3 Technical Background Information for Monitor Mode

Additional information to Monitor Mode related questions can be found on the Motorola web site and in the documentation on the MetroWerks installation directory
.....\Metrowerks\CodeWarrior CW08_V2.1\CodeWarrior Manuals\pdf\Manual Mon08.pdf
Hardware issues are shown in the appropriate ‘HC08 controllers technical data, section Monitor ROM (MON).

3.1 Monitormode-Entry

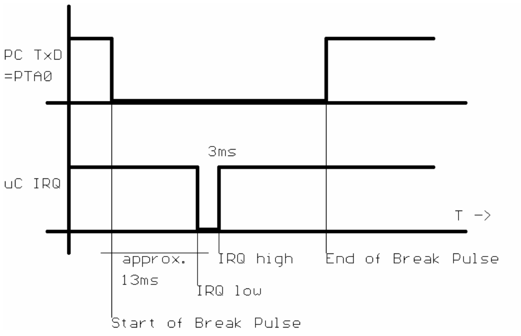
For monitor mode entry the following sequence is performed:
After starting the debugging / programming software the software sets DTR to low. This switches IRQ-pin of the target µC to Vhi (8 volts) for entering the monitor mode. The falling edge of the DTR-signal triggers reset low for about 10ms. After release of the reset line the controller checks the pin conditions for monitor mode entry as described in the appropriate ‘HC08 controllers technical data, section Monitor ROM (MON). Part of this conditions is that PTA0 is set to high level and IRQ set to Vhi (Vdd+2.5 V). The other conditions (additional pins set to high or low) are to be met by the target circuitry or by connecting these pins to the signals MON4 to MON8 and configuring these signals via the HC08-ISP. If all conditions are met the target uC enters the monitor mode and the debug / programming tool sends the security bytes.
If the security bytes ever didn’t match at first try, a power on reset of the board is needed for second try. In all other circumstances, no additional power on reset is needed.

3.2 Break-Interrupt

If you loose the control of program flow during debugging you could re-enter the monitor mode by a break interrupt. The RAM status is left unchanged and the program could continue its flow from the interruption. You also know the address of the interruption in the program flow. The Break-interrupt pulls the IRQ-signal to low for about 2ms and thus triggers the external interrupt. You have to extend the service routine for external interrupt (see below). The external interrupt must not be disabled. Polling PTA0 could detect the interrupt source (break or user circuit) and switch to the monitor mode or the user-ISR.

Timing diagram of break pulse:

(low pulses on TxD shorter than 13 ms will not generate an interrupt, so the serial communication is not disturbed if baud rate is higher than 700 Bd)



The example external interrupt service routine shows how this works:
(This example (GZ16ASM_break) is included in the CodeWarrior example project on the GZ16 starterkit disk)

```
EXTISR:
       brset 0,PTA,nobreak          ;if PTA0 = high User Routine
                                    ;if not, Break Interrupt
waitwhile0:
       brclr 0,PTA,waitwhile0       ;Wait until PTA0 goes high again
                                    ;(End of Break pulse on TxD)
       jmp   $ff63                  ;jump into Monitor ROM on GZ16

nobreak: ;here the User ext Int ISR can be placed
        rti
```

The adress $ff63 may be different for every maskset and for every type of micro controller. This defines the entry point for monitor mode in the ROM. It must match the content of $fefc and $fefd which is the vector adress for SWI in monitor mode.
Therefore, a universal but bit more complicated solution can be used:

```
EXTISR:
       brset 0,PTA,nobreak          ;if PTA0 = high User Routine
                                    ;if not, Break Interrupt
waitwhile0:
       brclr 0,PTA,waitwhile0       ;Wait until PTA0 goes high again
                                    ;(End of Break pulse on TxD)
       lda  $fefd                   ;push contents of MON SWI vector
       psha
       lda  $fefc
       psha
       rts                          ;jump to SWI handler

nobreak: ;here the User ext Int ISR can be placed
        rti
```

The software shown here may not work with other types of monitor mode interfaces, as some of them will generate the interrupt on the rising edge of TxD, so the state of TxD during the ISR will be high all the time.

4 Precautions

MOS devices in general are sensitive to electrostatic discharge.
The MONIF08-E3 itself is protected by means of protection diodes. Nevertheless, be sure to perform a potential equalization (connect ground first) before connecting the MONIF08-E3 to the target circuit. This protects the target controller and the interface from damage.
The MONIF-E3 gets its supply voltage from the target supply for the external supply setup. The typical current consumption is less than 20mA. The tolerable voltage is 2.5 to 5V+/- 10%. Always check the correct polarity and supply voltage level before switching on power. Especially higher voltages (even on the signal lines) may destroy the device.
Always disconnect power before connecting the interface.
The PC and the power supply of the target circuit have to meet the requirements of a SELV-circuit (safety extra low voltage circuits) as described in EN60950 / UL950.
The allowed temperature range is 10..30°C.

5 Package content

Basic device MONIF08-E3
Target-Connection-Cable ca. 25cm, both ends with 10pin Crimp-Plug
This user documentation
1:1-RS232-Cabel 9pin (male-female) for longer RS232 connections (1,8m long)
Power supply 9.5V 500mA stabilized, wall plug type for European (Schuko) outlets

6 Contact

If you have questions about the product or application, please feel free to contact us.
We are also grateful for hints regarding errors or ambiguous phrases in this document.

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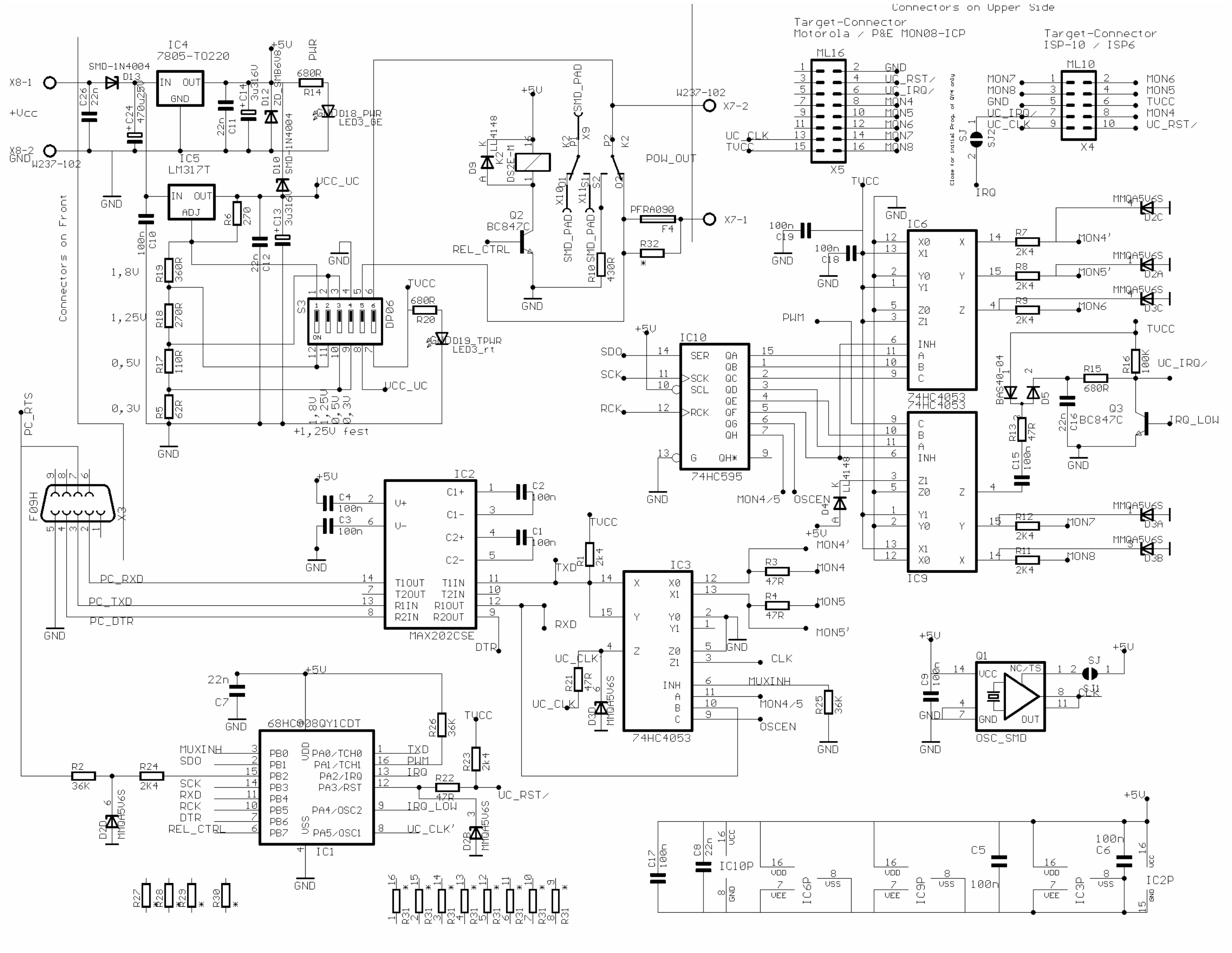
7 Circuit diagram


Connectors on Upper Side
Target-Connector
Motorola / P&E MON08-ICP
ML16
X5
Target-Connector
ISP-10 / ISP6
ML10
X4
GND
UC_RST/
UC_IRQ/
MON4
MON5
MON6
MON7
MON8
UC_CLK
TVCC
TUCC
MON7
MON8
GND
UC_IRQ/
UC_CLK
MON6
MON5
TUCC
MON4
UC_RST/
SJ
SJ2
Close for initial Prog. of QY4 only
IRQ
X8-1
+Ucc
X8-2
GND
W237-102
SMD-1N4004
D13
C26
22n
C24
470u25V
IC4
7805-TO220
IN OUT
GND
C11
22n
C14
3u316V
D12
ZD_SMB6V8
+5V
PWR
680R
R14
D18_PWR
LED3_GE
IC5
LM317T
IN OUT
ADJ
C10
100n
R6
270
C12
22n
C13
3u316V
D10
SMD-1N4004
UCC_UC
Connectors on Front
1,8V
R19
360R
1,25V
R18
270R
0,5V
R17
110R
0,3V
R5
62R
GND
S3
DP06
ON
TUCC
680R
R20
D19_TPWR
LED3_rt
UCC_UC
1,8V
1,25V
0,5V
0,3V
+1,25V fest
+5V
LL4148
D9
K2
DS2E-M
Q2
BC847C
REL_CTRL
SMD_PAD
X9
K2
P1
P2
S1
S2
O1
O2
X10
X11
SMD_PAD
SMD_PAD
R10
430R
POW_OUT
W237-102
X7-2
PFRA090
F4
X7-1
R32
*
100n
C19
GND
100n
C18
GND
IC6
74HC4053
X0 X1 X
Y0 Y1 Y
Z0 Z1 Z
INH A B C
R7
2K4
MON4'
MMQA5V6S
D2C
R8
2K4
MON5'
D2A
R9
2K4
MON6
D3C
TUCC
PWM
+5V
IC10
SDO
SER
SCK
SCL
RCK
G
QA QB QC QD QE QF QG QH QH*
74HC595
GND
MON4/5
OSCEN
LL4148
D4
+5V
MON4'
IC9
74HC4053
R16
100K
UC_IRQ/
BAS40-04
D5
R15
680R
Q3
BC847C
IRQ_LOW
C16
22n
R13
47R
C15
100n
GND
R12
2K4
MON7
D3A
R11
2K4
MON8
D3B
PC_RTS
F09H
X3
PC_RXD
PC_TXD
PC_DTR
GND
+5V
C4
100n
C3
100n
GND
IC2
V+
V-
C1+
C1-
C2+
C2-
C2
100n
C1
100n
T1OUT T2OUT R1IN R2IN
T1IN T2IN R1OUT R2OUT
MAX202CSE
DTR
TXD
RXD
TUCC
R1
2k4
IC3
74HC4053
X X0 X1
Y Y0 Y1
Z Z0 Z1
INH A B C
R3
47R
MON4
R4
47R
MON5
MON5'
GND
CLK
MUXINH
MON4/5
OSCEN
R25
36K
GND
UC_CLK
R21
47R
D3D
MMQA5V6S
UC_CLK
22n
C7
GND
+5V
68HC908QY1CDT
IC1
MUXINH
SDO
SCK
RXD
RCK
DTR
REL_CTRL
PB0 PB1 PB2 PB3 PB4 PB5 PB6 PB7
VDD
VSS
PA0/TCH0
PA1/TCH1
PA2/IRQ
PA3/RST
PA4/OSC2
PA5/OSC1
TXD
PWM
IRQ
R22
47R
UC_RST/
IRQ_LOW
UC_CLK'
R26
36K
TUCC
R23
2k4
D2B
MMQA5V6S
GND
R2
36K
R24
2K4
D2D
MMQA5V6S
R27 R28 R29 R30
R31
+5V
C9
100n
GND
Q1
VCC
NC/TS
GND
OUT
OSC_SMD
SJ
SJ1
CLK
+5V
+5V
C17
100n
C8
22n
IC10P
VCC
GND
IC6P
VDD VEE VSS
IC9P
C5
100n
IC3P
C6
100n
IC2P