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Tulip Computers TC40 motherboard

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1. General information

The TC40 system board is a fully PCI compatible motherboard, designed around the Aries PCI chipset and supports the Intel, AMD and Cyrix 486 processor range. The TC40 motherboard is used in the Tulip Vision and Impression product line. The TC40 motherboard feature the following functions:

1.1 General

- Support for 486sx-33, 486sx2-50, 486dx2-50, 486dx2-66, Intel dx4-100 processors.
- Two 72-pin memory sockets for 32 or 36 bit SIMM's.
- Support for 4 Mb (dx4 model: 8 Mb) up to 64 MB DRAM, no memory soldered onboard.
- Socket for (optional) 256 KB second level cache module (standard on dx4 model).
- Fully compatible (standard) AT and PCI 2.0 functions.
- One riser card connector slot in which an ISA riser card or a combined ISA / PCI riser card can be mounted.
- DMI (desktop management interface) compliant.
- ISA bus speed is 8.3MHz
- PCI bus speed for 50MHz systems is 25MHz, and for 33, 66, 100MHz systems 33MHz
- Compatible RTC with 256 byte of battery backed CMOS RAM.
- Keyboard controller supporting PS/2 compatible keyboard interface and PS/2 compatible mouse.
- Hardware plug and play hooks for two ISA slots.

1.2 Integrated options

- Cirrus GD5434 accelerated VGA controller interfaced on the PCI bus. One Mb video DRAM, expandable up to two Mb.
- Hard disk PIO mode 0, 1, 2 and 3 support according to the ATA specification rev. 4.0.
- PIO modes can be configured for each hard disk independently. One IDE hard disk interface for primary address range.
- The IDE interface can be a 16-bit local bus interface or a 32-bit PCI bus interface. - Floppy controller with 2.88 MB support and 16 byte FIFO for speeding up DMA transfers.
- 25 Pin XT/AT compatible parallel port with ECP extension according to IEEE 1284 specification.
- Two 9 pin PC16550 compatible serial ports with 16 byte FIFO, baud rate up to 115200 baud.
- Optional ISA based Ethernet controller with UTP and AUI interface. Ethernet controller standard on ws, ds and dx4 models.

1.3 Power options

- Power management support for advanced power management calls (APM), through system management interrupt (SMI),
- CPU clock throttling, peripheral standby mode, hard disk standby mode. Intel's processor only.

2. Upgrading the processor

Upgrading the system with a normal (faster) processor is not supported by Tulip Computers. All information about other processor configurations is for reference only.

Warning:

Make sure not to upgrade a 5 Volt with a 3.3 Volt overdrive processor, this may damage both the system and the processor.

Jumper settings TC40 Level 4 and 5

CPU	J18	J19	J20	J21	J22	J32	J31
M7-Family *1	2-3 4-5	2-3 4-5	-	-	1-2	-	1-2
Intel DX2 WT	1-2 3-4	1-2 3-4 5-6	-	-	1-2	-	1-2
Intel DX2 WB *2	1-2 3-4	1-2 3-4 5-6	-	-	2-3	1-2 3-4	1-2
Intel DX4 WT	1-2 3-4	1-2 3-4 5-6	-	-	1-2	-	1-2
Intel DX4 WB	1-2 3-4	1-2 3-4 5-6	-	-	2-3	1-2 3-4	1-2
Intel P24T	1-2 3-4	1-2 3-4 5-6	-	-	2-3	1-2 3-4	1-2
AMD DX2	1-2 3-4	1-2 3-4 5-6	-	-	1-2	-	2-3
AMD DX4	1-2 3-4	1-2 3-4 5-6	-	-	1-2	-	2-3

*1) M7-Family:

- TI 486 DX2 - ST 486 DX2 - IBM 486 DX2 (Blue Lightning) - Cx486 DX2

*2) If J29 inserted the WB-CPU emulates a WT-CPU and then the WT jumper settings have to be used.

J23:

1-3 = 33/66 MHz 2-4 = 25/50 MHz

J25/J26/J27:

All jumpers in the left position = 3.3V Processor

All jumpers in the right position = 5V Processor

Jumpersettings TC40 Level 1, 2 and 3 motherboard concerning (upgrade) processors

Processor	J22	J32	J23	J31	J25/J26/J27
iSX33	1-2	-	1-3	1-2	Position A
iDX2/50 (WT)	1-2	3-4*	2-4	1-2	Position A
iDX2/50 (WB)	2-3	1-2, 3-4	2-4	1-2	Position A
iDX2/66 (WT)	1-2	3-4*	1-3	1-2	Position A
iDX2/66 (WB)	2-3	1-2, 3-4	1-3	1-2	Position A
iODP DX2/50 (WT)	1-2	-	2-4	1-2	Position A
iODP DX2/50 (WB)	2-3	1-2, 3-4	2-4	1-2	Position A
iODP DX2/66 (WT)	1-2	-	1-3	1-2	Position A
iODP DX2/66 (WB)	2-3	1-2, 3-4	1-3	1-2	Position A
iODPR DX2/50 (WT)	1-2	3-4*	2-4	1-2	Position A
iODPR DX2/50 (WB)	2-3	1-2, 3-4	2-4	1-2	Position A
iODPR DX2/66 (WT)	1-2	3-4*	1-3	1-2	Position A
iODPR DX2/66 (WB)	2-3	1-2, 3-4	1-3	1-2	Position A
iODP DX4/100 (WT)	1-2	-	1-3	1-2	Position A
iODP DX4/100 (WB)	2-3	1-2, 3-4	1-3	1-2	Position A
iODPR DX4/100 (WT)	1-2	3-4*	1-3	1-2	Position A
iODPR DX4/100 (WB)	2-3	1-2, 3-4	1-3	1-2	Position A
iP24T (WB)	2-3	1-2, 3-4	1-3	1-2	Position A
SX2/66 (WT)	1-2	3-4*	1-3	2-3	Position A
DX2/66 (WT) 5V	1-2	3-4*	1-3	2-3	Position A
DX2/66 (WT) 3.3V	1-2	3-4*	1-3	1-2	Position B
iDX4/100 (WT)	1-2	3-4*	1-3	1-2	Position B
iDX4/100 (WB)	2-3	1-2, 3-4	1-3	1-2	Position B
iP24CT (WB)	2-3	1-2, 3-4	1-3	2-3	Position B
DX4/100	1-2	3-4*	1-3	2-3	Position B

* If the motherboard contains an SX 25/33MHz processor, otherwise no jumper required.

J22:

Indicates internal cache type (1-2 for WT, 2-3 for WB). To check if the jumper settings J22 are correct, boot the system after installing the upgrade processor. Check the processor type in the summary screen (WB = Write Back).

J32:

Indicates the type of upgrade processor.

J23:

Indicates the external processor speed, the speed as indicated on the processor itself is the correct processor speed.

J31:

Indicates whether the processor is Enhanced or Non-enhanced. In the table above, Enhanced processors are preceded by an "i".

J25/J26/J27:

Indicates the CPU voltage, either 5V or 3.3V

Position A = 5V

Position B = 3.3V

J29:

No jumper installed

3. Specifications

The TC40 system board is a fully PCI compatible motherboard, designed around the Aries PCI chipset and supports the Intel, AMD and Cyrix 486 processor range. The TC40 motherboard is used in the Tulip Vision and Impression product line.

3.1 Features

System:

PCA TC40 logic, based on the SX, DX, SX2, DX2 and DX4 486 processor

Chipset:

Aries chipset and PC873x3VUL SideWinder I/O controller

Flash BIOS:

21-OCT-96 TC40.FLS, based on Phoenix code

02-JAN-96 TC40AMD.FLS only needed for Pentium Overdrive on TC40 L1, L2 and L3

AMD logic without jumpers

Video:

Cirrus Logic GD5434 or GD5430 Graphics Controller, PCI-bus implementation

1Mb video memory onboard, expandable to 2Mb

Upgrading:

SX2-ODP, DX2-ODP, DX4-ODP, Pentium Overdrive P24T/P24CT-63 or P24T/P24CT-83

Memory:

Expandable up to 64Mb with 32/36-bit 70ns DRAM SIMMs

256Kb second level cache module (optional)

Power Supply:

DT/DE/WS = TCX25 145W 5V or TCX26 145W 5V/3V

DS = TCX27 180W 5V/3V

Cabinet:

DT = TE21, DE = TE20, DS = TE19

Slots:

DT = RIP1 or RIP5, DE/DS = RIP2

Interfaces:

1 bi-dir parallel port (EPP/ECP)

2 serial ports (16-bit FIFO)

Ethernet/UTP interface, ISA-bus implementation (optional)

Enhanced IDE controller, PCI-bus implementation

CT2504C Vibra Audio interface (optional)

3.2 Interface specifications

3.2.1 Sidewinder chip

The TC40 system board contains the super I/O Sidewinder chip PC87303VUL / PC87323VUL. On the TC40 system board the following parts of the PC87323VUL chip are used:

- Floppy Disk Controller
- UARTs, two serial ports
- Enhanced parallel port
- Keyboard controller
- Real Time Clock

3.2.2 Embedded Floppy-controller

Integrated on the system board is a PC/AT compatible floppy controller. The controller is 8477 / 82077 compatible and uses a 16 byte FIFO for speeding up DMA transfer. The integrated floppy controller supports both 5¼ inch 360Kb and 1.2Mb drives and Tulip qualified 3½ inch 720Kb and 1.44Mb disk drives. Also 2.88Mb disk drives are supported. Three types of diskettes are supported:

DS-DD for 720 Kb format (Double density)

DS-HD for 1.44 Mb format (High density)

DS-ED for 2.88 Mb format (Extra Density)

The following configurations are possible:

A:\ 2.88 Mb B: -

A:\ 2.88 Mb B: \ 2.88 Mb

A:\ 1.44 Mb B: -

A:\ 1.44 Mb B:\ 1.44 Mb

A:\ 1.44 Mb B:\ 1.2 Mb

A:\ 1.2 Mb B: -

A:\ 1.2 Mb B:\ 1.2 Mb

A:\ 1.2 Mb B:\ 1.44 Mb

Remark:

When a 2.88 Mb drive is used no other type of drive than a 2.88 Mb drive can be mixed with it.

The floppy controller can be enabled/disabled in the BIOS if necessary. When a conflict arises the BIOS disables also automatically the controller. When a supervisor password is set, enabling or disabling of the floppy-controller is secured by this password.

3.2.3 Serial Ports

Two serial ports are integrated on the system-board. The ports are connected to a dual 9 pin sub-D connector and are NS161450/PC16550 compatible. FIFO's are implemented to hold up 16-bytes for each port. The following port addresses and interrupts are available:

ADDRESS	IRQ
3F8	4
2F8	3
3E8	4
2E8	3
338	4
238	3
2E8	4
2E0	3
220	4
228	3

By means of these options it is also possible to swap the serial ports.

3.2.4 Parallel Port

One parallel port with ECP (IEEE 1284 compatible) features is integrated on the system board. The parallel port supports 3 operating modes:

1. AT compatible
2. Enhanced Control Port, ECP. PS/2 compatible, fully bi-directional
3. Enhanced Parallel Port, According to Xircom V1.7 specification

The following options can be set in the BIOS setup:

ADDRESS	IRQ	PORT
None	None	Disabled
3BCh	7	PP1
378h	7	PP2
278h	5	PP3

3.2.5 IDE Interface

The system board also incorporates an embedded hard disk interface. The TC40 supports one, primary interfaced, local bus IDE port. Since systems come in different configurations, it is possible to have a 16 bit or a 32 bit IDE controller.

The systems with SX and SX-2 processor are equipped with the 16 bit IDE controller. The other systems are using the 32 bit IDE controller. Each of these controllers are discussed.

3.2.6 IDE interface (included in the 82435EX chip)

The 82425EX PCI System Controller chip (PCI to Host bridge) includes a IDE controller. This IDE controller provides a 16 bit data transport which is interfaced to the local bus. All IDE embedded hard disks utilize programmed I/O (PIO) to transfer data. According to the ATA spec. 4.1. the controller supports PIO transfer modes 0 1, 2 and 3. These modes have the following characteristics for data transport.

Mode	Speed	Cycle time (burst mode)
Mode 0 (standard)	3.3 Mb/s	600 ns
Mode 1	5.2 Mb/s	383 ns
Mode 2	8.3 Mb/s	240 ns
Mode 3 (highest speed)	10 Mb/s	200 ns

When using a fast drive (mode 3), the system can not take full advantage of it. The reason for this is the 16 bit bus interface. This interface is not able to transport the data as fast as the drive can deliver. Therefore the system will still be the bottleneck.

3.2.7 IDE interface (separated CMD PCI 0640)

The separated CMD 0640A PCI IDE chip is optional for the TC40 system board. This chip contains a 16/32 bit data port, supports data transfer mode 0, 1, 2 and 3 and is interfaced to the PCI bus.

This chip is connected via a 32 bit bus to the PCI bus and therefore it can be used in 32 bit mode. Compared with a 16 bit bus the data throughput at a 32 bit bus can be twice as much. When in this case a PIO mode 3 drive is used, the data throughput on the bus is higher than the drive can deliver data. So in this case the drive will be the bottleneck.

The interface uses addresses 1F0h - 1F7h and 3F6h, 3F7h and IRQ14

3.2.8 Ethernet Interface

The TC40 system board may contain a PCnet-ISA Single-chip Ethernet controller (AMD Am79C961) which is directly interfaced on the ISA bus.

The PCnet-ISA Ethernet controller contains an ISA Plug and Play Control bus interface unit, DMA buffer management Unit, 802.3 Media Access Control function, individual 136-byte transmit and 128 byte receive FIFOs, IEEE 802.3 defined Attachment Unit Interface (AUI) and a Twisted Pair Transceiver connection. FIFO's reduce system overhead.

The PCnet-ISA controller is a DMA-based device. On the TC40 main board it is configured in bus master mode. In this mode all transfers are performed using the integrated DMA controller. This configuration enhances system performance by allowing the ethernet controller to bypass the platform DMA controller and directly address the full 24-bit memory space (16Mb).

This advanced Ethernet controller has the built-in capability of automatically selecting either the AUI port or the Twisted Pair transceiver. Only one interface is active at the time. Both an unshielded twisted pair interface (RJ45 plug and an AUI interface (2x8 header) are on the systemboard. The UTP connector on the rear side of the system allows the connection with Unshielded Twisted Pair network wiring. With an optional coax transceiver module, one can connect to coaxial network wiring via the AUI pin header interface on the system board. It is also possible to use the AUI pin header for connecting a separated Fiber Optics module or an AUI module. The connectors of these modules are placed on a bracket.

The following features are also integrated:

- Configuration through *Plug and Play*, so this will be automatically done.
- The harddisk activity LED is used also for the network controller.

Remark:

The configuration program AMINSTALL is used to set parameters for both the onboard Ethernet controller and for the add-in card TNCC16 PNP. The button "enable BNC" is applies only to the add-card and has no meaning to the on-board controller. For the add-in card it has the following meaning:

Enable BNC = on: Auto switching between BNC and UTP.

Enable BNC = off: AUI enabled

4. Memory expansion

The TC40 mainboard does not have memory soldered on-board, but 4 or 8 Mb SIMM's are placed on the mainboard. The memory is implemented through two SIMM connectors, which may contain either 32- or 36-bit 70ns SIMM's. Although you can use 36-bit SIMM's, parity check is not supported. It is allowed to combine a 32-bit SIMM with a 36-bit SIMM.

4.1 Main memory

The memory is expandable up to 64 Mb by using the following combinations:

FROM	TO	BANK 0	BANK 1
4 Mb	-	4 Mb	Empty
4 Mb	8 Mb	4 Mb	4 Mb
4 Mb	12 Mb	4 Mb	8 Mb
4 Mb	20 Mb	4 Mb	16 Mb
8 Mb	-	8 Mb	Empty
8 Mb	16 Mb	8 Mb	8 Mb
8 Mb	24 Mb	8 Mb	16 Mb
16 Mb	-	16 Mb	Empty
16 Mb	32 Mb	16 Mb	16 Mb
16 Mb	48 Mb	16 Mb	32 Mb
32 Mb	36 Mb	32 Mb	4 Mb
32 Mb	40 Mb	32 Mb	8 Mb
32 Mb	64 Mb	32 Mb	32 Mb

When installing memory, the BIOS automatically recognizes the new amount of memory and it is not necessary to run any set-up program.

Warning: this means that if one of the SIMM's fails, this will not be notified to the user! The system will re-configure and operate with the smaller amount of memory.

4.2 Cache memory

The TC40 mainboard is equipped with an option connector in which a 256 Kb 20 ns Second Level Cache module can be inserted. This is a Tulip proprietary cache module. Upon installation, the cache module is automatically detected. The Setup utility from BIOS should be run in order to activate the module.

The following memory expansions can be obtained from Tulip:

11-130035-0 MEMORY EXPANSION 4MB SIMM 70NS (36-bit)
11-130036-0 MEMORY EXPANSION 8MB SIMM 70NS (36-bit)
11-130037-0 MEMORY EXPANSION 16MB SIMM 70NS (36-bit)
11-130038-0 MEMORY EXPANSION 32MB SIMM 70NS (36-bit)

11-130050-0 MEMORY EXPANSION 4MB SIMM 70NS (32-bit)
11-130051-0 MEMORY EXPANSION 8MB SIMM 70NS (32-bit)
11-130052-0 MEMORY EXPANSION 16MB SIMM 70NS (32-bit)
11-130053-0 MEMORY EXPANSION 32MB SIMM 70NS (32-bit)

11-130040-0 CACHE MEMORY 256KB FOR TC40

5. Onboard video controller

The TC40 system board includes a Cirrus Logic 5434 or 5430 based VGA controller. The VGA controller is directly interfaced to the PCI bus. The VGA BIOS is located in the system BIOS from C000:0000 to C800:0000 and is always shadowed.

The VGA is standard equipped with 1 MB of DRAM, and can be expanded to 2 MB by adding two RAM packages in the ZIP sockets next to the soldered DRAMs. The following video memory expansion can be obtained from Tulip:

11-130019-0 MEMORY EXPANSION 1MB VIDEO TC40

With a multisync monitor you can make use of all the text and graphics possibilities mentioned in the following tables.

VGA modes with 1Mb of video memory

Mode	Resolution Hor. x Vert.	Colours	Characters columns	Characters rows
0/1	360 x 400 (char.)	16	40	25
2/3	720 x 400 (char.)	16	80	25
4/5	320 x 200 (graph.)	4	40	25
6	640 x 200 (graph.)	2	80	25
7	720 x 400 (char.)	monochrome	80	25
D	320 x 200 (graph.)	16	40	25
E	640 x 200 (graph.)	16	80	25
F	640 x 350 (graph.)	monochrome	80	25
10	640 x 350 (graph.)	16	80	25
11	640 x 480 (graph.)	2	80	30
12	640 x 480 (graph.)	16	80	30
12+	640 x 480 (graph.)	16	80	30
13	320 x 200 (graph.)	256	40	25

Extended VGA modes with 1Mb of video memory

Mode	Resolution Hor. x Vert.	Colours	Characters columns	Characters rows
54	1056 x 350 (char.)	16	132	43
55	1056 x 350 (char.)	16	132	25
58, 6A	800 x 600 (graph.)	16	100	37
5C	800 x 600 (graph.)	256	100	37
5D	1024 x 768 (graph.)	16	128	48
5F	640 x 480 (graph.)	256	80	30
60	1024 x 768 (graph.)	256	128	48
64	640 x 480 (graph.)	65,536		
65	800 x 600 (graph.)	65,536		
66	640 x 480 (graph.)	32,768		
67	800 x 600 (graph.)	32,768		
6C	1280 x 1024 (graph.)	16	160	64
71	640 x 480 (graph.)	16.7 M		

With 2Mb of video memory

Mode	Resolution Hor. x Vert.	Colours	Characters columns	Characters rows
6D	1280 x 1024 (graph.)	256	160	64
72	800 x 600 (graph.)	16.7 M		
74	1024 x 768 (graph.)	65,536		
76	640 x 480 (graph.)	16.7 M		

Depending on the BIOS version, the following monitor timing parameters can be set within the BIOS Setup utility:

640 * 480 * 60/72Hz
800 * 600 * 56/60/72Hz
1024 * 768 * 43/60/70Hz
1280 * 1024 * 43/60Hz

Remarks:

Only the GD 5434 E- and F-step supports 1024 * 768 * 64K at 70Hz and 75Hz (use BIOS 27-JUN-95 or higher).

These options are disabled for GD 5434 B-, C- and D-steps.