

## ICs for Consumer Electronics MEGATEXT

Firmware Overview

<b>MEGATEXT® Firmware Overview</b>	
<b>Revision History: 10.94</b>	
Previous Releases: 08.93, 02.94	
Page	Subjects (changes since last revision)

## Data Classification

## Maximum Ratings

Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

## Characteristics

The listed characteristics are ensured over the operating range of the integrated circuit. Typical characteristics specify mean values expected over the production spread. If not otherwise specified, typical characteristics apply at  $T_A = 25\text{ °C}$  and the given supply voltage.

## Operating Range

In the operating range the functions given in the circuit description are fulfilled.

For detailed technical information about “**Processing Guidelines**” and “**Quality Assurance**” for ICs, see our “**Short Form Catalog**”.

## Edition 10.94

This edition was realized using the software system FrameMaker®

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## 1 Summary

MEGATEXT® has a powerful RISC which handles task performed in former teletext decoder generations by dedicated hardware or by an external controller. A ROM of 8K command words contains the firmware which realizes many MEGATEXT features. This concept is very flexible and renders excellent performance. Via the M3L Bus the external controller can send commands to the RISC. The MEGATEXT command interface MCI will then start a sequence of firmware routines that perform the functions specified in the MCI reference manual.

The firmware executes acquisition, display and data transfer tasks.

The display task is essentially the conversion of teletext data of level 1 with serial display attributes into the corresponding format of the display memory with parallel attributes. Rolling header, rolling time and display-relevant control bits are also processed by firmware.

The data transfer to an external controller via the M3L Bus is another task handled by firmware. Data transfers within the RAM (internal and external) are supported by move commands.

The most important and complex task of the RISC is teletext data acquisition. To give an impression of the functions of the acquisition firmware, MEGATEXT acquisition is described in the next chapter.

### Summary of Important Functions of MEGATEXT Acquisition Firmware

- Requesting reception of pages or other data packets
  - reception of basic pages
  - reception of subpages
  - reception of non-page-related data
  - page update conditions
- Memory administration
  - memory allocation for pages
  - overflow control
  - wrap-around on overflow
  - cleaning up
- Basic acquisition control
  - WST/VPS/PDC
  - PAL/NTSC
  - tracing of data transmission (page trace table)
  - treatment of transmission errors
- Support for special services (TOP, FLOF)

## 2 MEGATEXT® Acquisition Overview

MEGATEXT acquisition is realized with the support of software routines integrated in the MEGATEXT processing unit. Acquisition can be controlled by M3L registers and commands of the MEGATEXT command interface MCI. For details of the meaning of M3L bits and MCI commands refer to the documents

“M3L-Bus Registers Reference” and  
“MCI Description”.

In this chapter the word “user” stands for external MEGATEXT application software normally developed by the TV set maker.

### How Does MEGATEXT Acquisition Work?

To convert the incoming serial data from the slicer into parallel format, a controllable line buffer is used, whose output data are processed by the RISC. All packets (except X/30 and X/31) are error checked and compressed before storing. By programming this interface you can select two modes:

625-line mode (PAL) with flyback buffer

525-line mode (NTSC) with flyback buffer

In flyback mode the contents of the line buffer are first copied into a larger buffer in the RAM, before the received data and the request records are evaluated. The building of the RAM buffer and the evaluation of data are completely asynchronous. The start address and the length of the RAM buffer can be configured by the user. To obtain maximum acquisition performance the length of the buffer must be 18 lines at least. MEGATEXT acquisition routines have highest priority, so other tasks have to wait. Depending on the acquisition parameters and the transmitted teletext data, the number of M3L Bus accesses is dynamically limited (wait function). As the integrated memory manager calculates the physical memory address of a page, the user only has to think in terms of page numbers and not with memory addresses.

Several MCI commands are available for convenient evaluation of TOP pages.

### Acquisition Groups

The number of page request circuits in hardware acquisition in former TTX processors was limited to eight. With these circuits it was possible to search eight pages in parallel. After reception, those circuits had to be programmed again to request other pages. The simultaneous search of non-page-related data and pages was not possible.

In the MEGATEXT software system

#### **eight acquisition groups**

are defined. An acquisition group contains two parameters:

**search type** and

**do care mask.**

The do care mask defines the control bits of a page header which are used for comparison with the request record. The do care mask of a group is valid for every request record of this group. To each group different numbers of page request records may be attached. So the number of pages which

can be searched in parallel in one cycle is not limited to eight. The performance of the acquisition depends on use of the search types and is in the range from 140 to 2048 pages.

The sequence of the groups, their search types and the sequence in which the requests of a user page are programmed determine the priority of a page request. First a received page header is compared with the records of group 0. If it does not match, it is compared to the request records of the next group. Each page is stored only once. Mixed use of search types is allowed. So it is possible to search non-page-related data, normal pages and TOP pages at the same time.

### 3 Search Types

The MEGATEXT acquisition system defines three search types.

With **type 0** it is possible to search all basic pages of all magazines (2048). This feature is realized by building an address table (table look-up). The administration of this table is done by the memory manager. The user only has to reserve memory space for it (4 Kbyte). Type 0 should be applied if a large external memory is available and many or all pages are requested. It is also recommended for smaller memories to save CPU time for other tasks than acquisition (i.e. display features, graphic, M3L access). This search type has a fixed do care mask so that only the bits belonging to magazine and page number are evaluated. The search of subpages can be done by page-related control parameters. The definition of search type 0 is allowed once only and excludes use of type 1 in parallel.

Search **type 1** was defined during MEGATEXT development history. Its realization has been dropped because it showed no advantage over the other request types.

With search **type 2** each bit of the do care mask can be programmed independently, i.e. you may request only pages that have a certain language code, for example, or only subtitle pages or pages with a certain range of page or subpage number. If this group type is used exclusively (8 times) with only one record attached to every group, the hardware acquisition of the older textdecoder generation, e.g. SDA5243, is emulated.

The number of pages to be requested with this type depends on the usage of the other types and is limited.

**Type 3** is reserved for acquiring non-page-related and non magazine-related data. This type can be used more than once and can be combined with every other type. The storage of each packet consumes 80 bytes of memory. The acquisition firmware supports the data packets already defined in the world system teletext norm. These are:

X/29	with	designation codes:	0000,0001,0100
8/30	with	designation codes:	000X,001X

The number of packets to be requested with this type depends on use of the other types and is limited.

#### Pseudopackets

Page-related pseudopackets (X/25, X/26, X/27, X/28) are stored in a special data section, the so-called p40 chain. The storage of each packet consumes 40 bytes only. The request of pseudopackets can be controlled in general (for all pages) and for each page separately. The allocation of memory is managed by the acquisition and depends on the transmitted data. The user only has to define the memory segment in which the pseudopackets of all received pages should be stored. With this dynamic memory allocation feature a lot of memory space is saved, because the acquisition only consumes memory for those packets that are really transmitted. If you remove a page, all related pseudopackets will be removed too.

### Subpage Support

The following four convenient subpage modes are supported by firmware if search type 0 is used. They can be set for every basic page independently of each other. In the **Subpage Collect Mode** the acquisition allocates memory space for as many chapters as subpages are transmitted. The allocation is done whenever a subpage is received that is not stored yet. The number of subpages can be limited. A subpage buffer overflow interrupt is given to the user. The user does not need to know which subpage numbers are transmitted in order to store them. In the **Subpage Collect Mode with Overwrite** the buffer will be overwritten starting with the oldest subpage whenever the subpage buffer overflows. In the **Selected Subpage Mode** the user can request a subpage with a specific subpage number. The collect mode and the don't care mode is automatically stopped. The **Subpage Don't Care Mode** is for "running through" subpages or "foiled pages". All received subpages with the same basic page number are now stored in the same chapter. Of course you can also request a subpage with the user-defined request and an appropriate do care mask (type 2). In this case the subpage is not related to the basic page and the modes just described are not supported. The subpage is treated in the same way as any other basic page.

### Treatment of Transmission Errors

All data received are checked online by acquisition before storing them. The user may decide when, where and which kind of checks have to be done so that the reception threshold and data reliability can be adjusted to different applications. During first reception of a packet or a page, parity protected bytes will be discarded if an error is detected. Instead of the received data byte, a blank (20 hex) is stored. If the data are received again with a parity error, the byte will not be stored.

### Programmable Framing Code

The framing code for teletext packets is programmable with the MCI command "ACQ\_CONTROL". For programming of the data entry window, refer to the timing features described in "M3L-Bus Registers Programmer's Reference".

### Page Tracing

If page trace is enabled, the following information is stored in a page trace table: transmitted basic page numbers and their subpage indicators. The table is updated with every received header. The position of the table in the memory can be programmed.

### Pseudopacket Trace

For every received pseudopacket number a flag is set in a RAM register.



### **Acquisition Page Control Bits**

Acquisition page control bits are used for page selective control of acquisition features and must not be confused with the bits in M3L registers, which apply to the control of acquisition in general. Not all control bits are available in each mode and by each command. The following list shows all available page control bits.

- Hold Enable
- Disable Clear
- Page\_Being\_Received
- Page\_Being\_Looked\_For
- First\_Reception
- End of Page Interrupt
- Page-Selective Pseudopacket Disable
- Pseudopacket Memory Overflow Indicator
- Subpage Buffer Overflow Indicator
- Compress Basic TOP Tables
- Remove Protection

### **TOP and FLOF**

The request of Basic TOP Tables, the Additional TOP Table, the Multipage TOP Table and the Multipage Extension Table can be received and checked in accurate way. If the do-care bits of the magazine number of the Basic TOP Page are set to 0, the pages of all magazines will be mixed together. However, if the Compress TOP Table bit (C\_BTT) is set, the acquisition will look for the c8 bit in the header of the page (parallel magazine mode). If it is set, the Basic TOP Tables of all magazines will be compressed into two pages. Page Linking Table and Basic TOP Table list of all magazines will be stored in a special chapter in the IAT/XAT section. The user is responsible for allocation of memory for this feature. Several MCI commands are available for conveniently evaluating these two pages. For details about FLOF, refer to the MCI Reference Manual.

### **VPS Support**

The reception of VPS data is possible from data lines programmed by the M3L register "SINGLE\_DATA\_LINE". The framing code for VPS reception is fixed to 8A99<sub>H</sub>. The "byphase" coded data are decoded, compressed and stored in internal RAM. If there is any error in any data byte of the VPS line, the whole line will be discarded. All 16 bytes (decoded VPS words) can be read.

### **PAL/NTSC Switch**

In flyback mode it is possible to receive data transmitted in 525-line mode as well as in 625-line mode.