

SIEMENS

ICs for Consumer Electronics

VPS / PDC-plus Decoder

SDA 5650/X

Data Sheet 02.97

SDA 5650/X		
Revision History:		Current Version: 02.97
Previous Version:		
Page (in previous Version)	Page (in current Version)	Subjects (major changes since last revision)

Edition 02.97

This edition was realized using the software system FrameMaker®.

**Published by Siemens AG,
Bereich Halbleiter, Marketing-
Kommunikation, Balanstraße 73,
81541 München**

© Siemens AG 1997.
All Rights Reserved.

Attention please!

As far as patents or other rights of third parties are concerned, liability is only assumed for components, not for applications, processes and circuits implemented within components or assemblies.

The information describes the type of component and shall not be considered as assured characteristics.

Terms of delivery and rights to change design reserved.

For questions on technology, delivery and prices please contact the Semiconductor Group Offices in Germany or the Siemens Companies and Representatives worldwide (see address list).

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your nearest Siemens Office, Semiconductor Group.

Siemens AG is an approved CECC manufacturer.

Packing

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport.

For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

Components used in life-support devices or systems must be expressly authorized for such purpose!

Critical components¹ of the Semiconductor Group of Siemens AG, may only be used in life-support devices or systems² with the express written approval of the Semiconductor Group of Siemens AG.

- 1 A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or effectiveness of that device or system.
- 2 Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain human life. If they fail, it is reasonable to assume that the health of the user may be endangered.

Table of Contents		Page
1	General Description	4
1.1	Features	4
1.2	Pin Configurations	5
1.3	Pin Description	6
2	System Description	8
2.1	Functions	8
2.2	I ² C Bus	9
2.2.1	General Information	9
2.2.2	Chip Address	10
2.2.3	Write Mode	10
2.2.4	Read Mode	12
2.3	Order of Data Output on the I ² C Bus and Bit Allocation of PDC/VPS Operating Modes	13
2.4	Order of Data Output on the I ² C Bus and Bit Allocation for the Header Time Mode (MAB=0)	17
2.5	Description of DAVN and EHB Outputs	25
3	Electrical Characteristics	26
4	PDC/VPS-Receiver	30
5	Appendix	31
5.1	Control Register Write (I ² C-Bus Write)	31
5.2	Data Register Read (I ² C-Bus Read)	31
5.3	DAVN and EHB Timing	32
5.4	Position of Teletext and VPS Data Lines within the Vertical Blanking Interval	33
5.5	Definition of Voltage Levels for VPS Data Line	33
5.6	BDSP 8/30 Format 1 Bit Allocation	34
5.7	Structure of the Teletext Data Packet 8/30 Format 2	35
5.8	BDSP 8/30 Format 2 Bit Allocation	35
5.9	Data Format of Programme Delivery Data in the Dedicated TV Line (VPS)	38
6	Package Outlines	40

Purchase of Siemens I²C components conveys the license under the Philips I²C patent to use the components in the I²C system provided the system conforms to the I²C specifications defined by Philips.

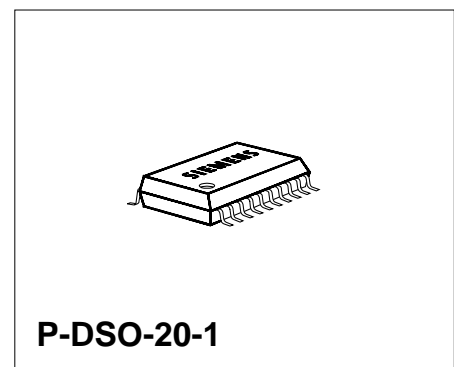
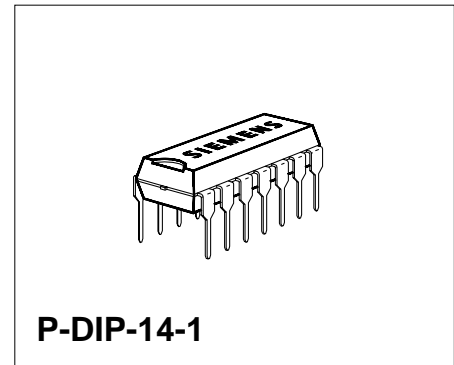
CMOS

1 General Description

The PDC plus SDA 5650 decoder chip receives all VPS and 8/30 Format 1 and 2 data together with the teletext header information for easy identification of broadcast transmitter. The SDA 5650 includes a storage capacity of 16 bytes which can be used in different ways depending on selected modes.

1.1 Features

- **Single chip receiver for PDC data for Broadcast Data Service Packet (BDSP 8/30/2** according to CCIR teletext system B.)
VPS Data in dedicated line no. 16 of the vertical blanking interval (VBI)
- **Reception of BDSP packet 8/30/1**
Unified Date and Time (UDT)
Network identification code (NIC)
Short program label (SPL)
- **Reception of teletext header row**
Bytes no. 14 - 45 containing date, clock time and identification
- **On chip data slicer**
- **Low external component count**
- **I²C-Bus interface**
Communication with external microcontroller
- **PDC/VPS operation mode selectable via I²C-Bus register**
- **Pin and software compatible to PDC/VPS decoder SDA 5649**
- **5 V supply voltage**
- **Video input signal level: 0.7 Vpp to 2.0 Vpp**
- **Technology: CMOS**
- **P-DIP-14-1 and P-DSO-20-1 package**



Type	Ordering Code	Package
SDA 5650	Q67100-H5164	P-DIP-14-1
SDA 5650X	Q67106-H5163	P-DSO-20-1 (SMD)

1.2 Pin Configurations

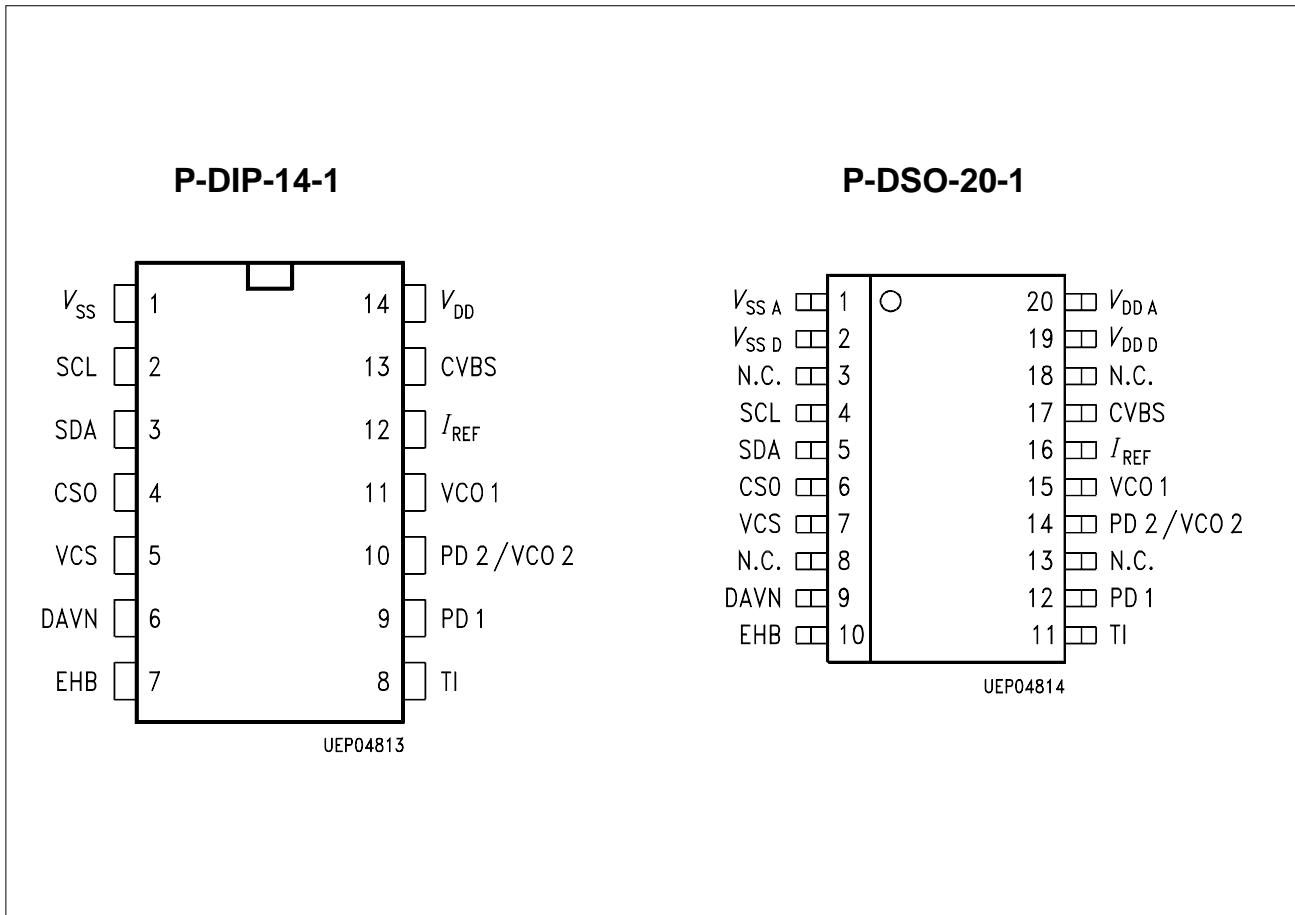


Figure 1

1.3 Pin Description

Pin No.		Symbol	Function
P-DIP-14-1	P-DSO-20-1		
1		V_{SS}	Ground (0 V)
	1	V_{SSA}	Analog ground (0 V)
	2	V_{SSD}	Digital ground (0 V)
	3, 8, 13, 18	N.C.	Not connected
2	4	SCL	Serial clock input of I ² C Bus.
3	5	SDA	Serial data input of I ² C Bus.
4	6	CS0	Chip select input determining the I ² C-Bus addresses: 20 _H / 21 _H , when pulled low 22 _H / 23 _H , when pulled high.
5	7	VCS	Video Composite Sync output from sync slicer used for PLL based clock generation.
6	9	DAVN	Data available output active low, when VPS data is received.
7	10	EHB	Output signaling the presence of the first field active high.
8	11	TI	Test input; activates test mode when pulled high. Connect to ground for operating mode.
9	12	PD1	Phase detector/charge pump output of data PLL (DAPLL).
10	14	PD2/ VCO2	Connector of the loop filter for the SYSPLL.
11	15	VCO1	Input to the voltage controlled oscillator #1 of the DAPLL.
12	16	I_{REF}	Reference current input for the on-chip analog circuit.
13	17	CVBS	Composite video signal input.
14		V_{DD}	Positive supply voltage (+ 5 V nom.).
	19	V_{DDD}	Positive supply voltage for the digital circuits (+ 5 V nom.).
	20	V_{DDA}	Positive supply voltage for the analog circuits (+ 5 V nom.).

Block Diagram

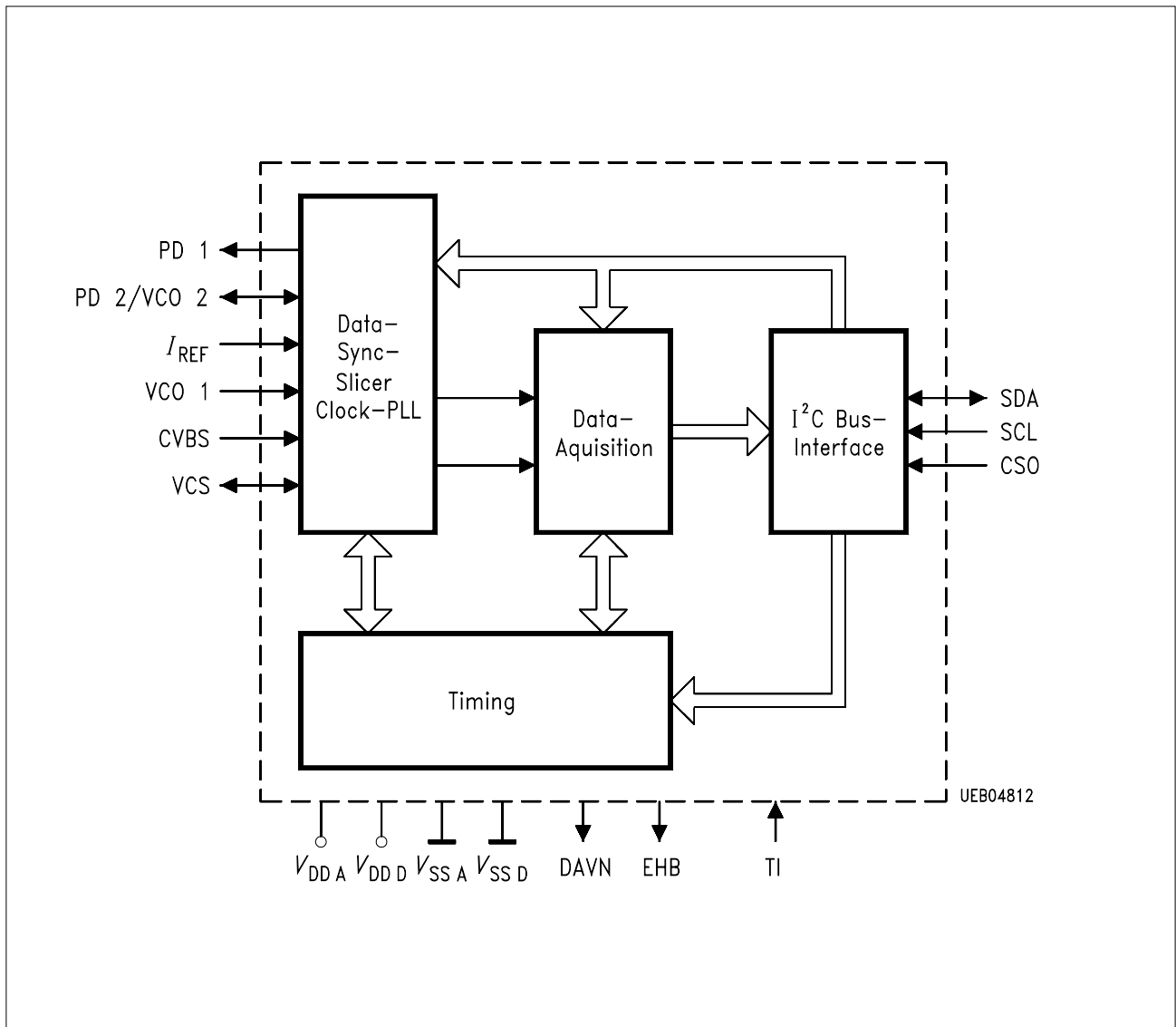


Figure 2

2 System Description

2.1 Functions

Referring to the functional block diagram of the PDC / VPS decoder, the composite video signal with negative going sync pulses is coupled to the pin CVBS through a capacitor which is used for clamping the bottom of the sync pulses to an internally fixed level. The signal is passed on to the slicer, an analogue circuitry separating the sync and the data parts of the CVBS signal, thus yielding the digital composite sync signal VCS and a digital data signal for further processing by comparing those signals to internally generated slicing levels.

The output of the sync separator is forwarded, on one hand, to the output pin VCS, and on the other hand, to the clock generator and the timing block. The VCS signal represents a key signal that is used for deriving a system clock signal by means of a PLL and all other timing signal.

The data slicer separates the data signal from the CVBS signal by comparing the video voltage to an internally generated slicing level which is found by averaging the data signal during TV line no. 16 in the VPS mode or by averaging the data signal during the clock run-in period of the teletext lines during the data entry window (DEW) in PDC mode.

The clock generator delivers the system clock needed for the basic timing as well as for the regeneration of the dataclock. It is based on two phase locked loops (PLL's) all parts of which are integrated on chip with the exception of the loop filter components. Each of the PLL's is composed of a voltage controlled relaxation oscillator (VCO), a phase/frequency detector (PFD), and a charge pump which converts the digital output signals of the PFD to an analogue current. That current is transformed to a control voltage for the VCO by the off-chip loop filter. The generated VCO frequencies are 10 MHz and 13.875 MHz for VPS mode and PDC mode, respectively.

All signals necessary for the control of sync and data slicing as well as for the data acquisition are generated by the Timing block.

The SDA 5650 can be operated in three different modes: Depending on the selected operating mode, either teletext lines carrying 8/30 packages, the dedicated TV line no. 16 (VPS) or the teletext header bytes 38-45, 30-37, 22-29 and 14-21 are acquired.

In PDC mode, only teletext rows 8/30 containing Broadcast Data Service Package (BDSP) information are acquired. The relevant bytes of 8/30 format 1 (8/30/1) and 8/30 format 2 (8/30/2) are extracted. The 8/30/1-bytes are stored in the acquisition register in a transparent way without any bit manipulation, whereas the Hamming coded bytes of packet 8/30/2 are Hamming-checked and bytes with one bit error are corrected. The storage of error free or corrected 8/30/2-data bytes in the transfer register to the I²C Bus is signalled by the DAVN output going low.

In VPS mode, the extracted data bits of TV line no. 16 are checked for biphasic errors. With no biphasic errors encountered, the acquired bytes are stored in the transfer register to the I²C Bus. That transfer is signalled by a H/L transition of the DAVN output, as well.

In TTX header mode A bytes 38-45 and 30-37 are accessed in this order. This assures software compatibility to the SDA 5649. In mode B bytes 22-29 and 14-21 are accessed in this order.

In all three operating modes data are updated when a new data line has been received, provided that the chip is not accessed via the I²C Bus at the same time.

A micro controller can read the stored bytes via the I²C-Bus interface at any time. However, one must be aware that the storage of new data from the acquisition interface is inhibited as long as the PDC decoder is being accessed via the I²C Bus.

Note: In order to achieve maximum system performance it is recommended to start the SDA 5650 in VPS mode (state after power on) and read the register to check whether line 16 is received. After reception of VPS data in line 16 the SDA 5650 can be switched to 8/30 mode and waiting for packet 8/30 data. Since VPS data in line 16 is transmitted every frame and PDC data in packet 8/30 is transmitted nearly every second the recognition of both VPS and 8/30 packets can be done within PDC-system constraints (about 1 sec).

2.2 I²C Bus

2.2.1 General Information

The I²C-Bus interface implemented on the PDC decoder is a slave transmitter/receiver, i. e., both reading from and writing to the PDC / VPS decoder is possible. The clock line SCL is controlled only by the bus master usually being a micro controller, whereas the SDA line is controlled either by the master or by the slave. A data transfer can only be initiated by the bus master when the bus is free, i. e., both SDA and SCL lines are in a high state. As a general rule for the I²C Bus, the SDA line changes state only when the SCL line is low. The only exception to that rule are the Start Condition and the Stop Condition. Further Details are given below. The following abbreviations are used:

START: Start Condition generated by master
AS: Acknowledge by slave
AM: Acknowledge by master
NAM: No Acknowledge by master
STOP: Stop condition generated by master

2.2.2 Chip Address

There are two pairs of chip addresses, which are selected by the CS0-input pin according to the following table:

CS0 Input	Write Mode	Read Mode
Low	20 (hex)	21 (hex)
High	22 (hex)	23 (hex)

2.2.3 Write Mode

For writing to the PDC decoder, the following format has to be used:

Start	Chipaddress and Write Mode	AS	Byte to set Control Register	AS	Stop
-------	----------------------------	----	------------------------------	----	------

Description of Data Transfer (Write Mode)

- Step 1: In order to start a data transfer the master generates a Start Condition on the bus by pulling the SDA line low while the SCL line is held high.
- Step 2: The bus master puts the chip address on the SDA line during the next eight SCL pulses.
- Step 3: The master releases the SDA line during the ninth clock pulse. Thus the slave can generate an acknowledge (AS) by pulling the SDA line to a low level.
- Step 4: The controller transmits the data byte to set the Control register
- Step 5: The slave acknowledges the reception of the byte.
- Step 6: The master concludes the data communication by generating a Stop Condition.

The write mode is used to set the I²C-Bus control register which determines the operating mode:

Control Register:

Bit Number:	7	6	5	4	3	2	1	0
	T4	T3	T2	T1	MAB	HDT	PDC/ VPS	FOR1/ FOR2

Default: All bits are set to 0 on power-up.

Bits 4 through 7 are used for test purposes and must not be changed for normal operation by user software!

Bit 0: determines, which kind of data is accessed via the I²C Bus when PDC mode is active:

Value	
0	1
BDSP 8/ 30/ 2 data accessible	BDSP 8/ 30/ 1 or header row data accessible (refer to description of Bit 2)

Bit 1: determines the operating mode:

Value	
0	1
VPS mode active	PDC mode active

Bit 2: determines whether BDSP 8/30/1-data or header row data is accessible:

Value	
0	1
BDSP 8/30/1 data accessible	Bytes of teletext header in mode A or B (see Bit 3)

Bit 3: determines mode of teletext header access:

Value	
0	1
Mode A: header bytes in order 38-45, 30-37	Mode B: header bytes in order 22-29, 14-21

2.2.4 Read Mode

For reading from the PDC decoder, the following format has to be used

Start	Chipaddress	Read Mode	AS	1st Byte	AM	Last Byte	NAM	Stop
-------	-------------	-----------	----	----------	----	-------	-----------	-----	------

The contents of up to 16 registers (bytes) can be read starting with byte 1 bit 7 (refer to the table **Order of Data Output on the I²C Bus and...**) depending on the selected operating mode.

Description of Data Transfer (Read Mode)

- Step 1: To start a data transfer the master generates a Start Condition on the bus by pulling the SDA line low while the SCL line is held high. The byte address counter in the decoder is reset and points to the first byte to be output.
- Step 2: The bus master puts the chip address on the SDA line during the next eight SCL pulses.
- Step 3: The master releases the SDA line during the ninth clock pulse. Thus the slave can generate an acknowledge (AS) by pulling the SDA line to a low level. At this moment, the slave switches to transmitting mode.
- Step 4: During the next eight clock pulses the slave puts the addressed data byte onto the SDA line.
- Step 5: The reception of the byte is acknowledged by the master device which, in turn, pulls down the SDA line during the next SCL clock pulse. By acknowledging a byte, the master prompts the slave to increment its internal address counter and to provide the output of the next data byte.
- Step 6: Steps no. 4 and no. 5 are repeated, until the desired amount of bytes have been read.
- Step 7: The last byte is output by the slave since it will not be acknowledged by the master.
- Step 8: To conclude the read operation, the master doesn't acknowledge the last byte to be received. A No Acknowledge by the master (NAM) causes the slave to switch from transmitting to receiving mode. Note that the master can prematurely cease any reading operation by not acknowledging a byte.
- Step 9: The master gains control over the SDA line and concludes the data transfer by generating a Stop Condition on the bus, i. e., by producing a low/high transition on the SDA line while the SCL line is in a high state. With the SDA and the SCL lines being both in a high state, the I²C Bus is free and ready for another data transfer to be started.

2.3 Order of Data Output on the I²C Bus and Bit Allocation of PDC/VPS Operating Modes

I ² C Bus		PDC Packet 8/30				VPS Mode		
		Format 1		Format 2				
t ↓	Byte 1	bit 7	byte 15	bit 0 ²⁾	byte 16	bit 0 ¹⁾	byte 11	bit 0 ²⁾
		6		1		1		1
		5		2		2		2
		4		3		3		3
		3		4	byte 17	bit 0		4
		2		5		1		5
		1		6		2		6
		0		7		3		7
	Byte 2	bit 7	byte 16	bit 0	byte 18	bit 0	byte 12	bit 0
		6		1		1		1
		5		2		2		2
		4		3		3		3
		3		4	byte 19	bit 0		4
		2		5		1		5
		1		6		2		6
		0		7		3		7
	Byte 3	bit 7	byte 17	bit 0	byte 20	bit 0	byte 13	bit 0
		6		1		1		1
		5		2		2		2
		4		3		3		3
		3		4	byte 21	bit 0		4
		2		5		1		5
		1		6		2		6
		0		7		3		7
	Byte 4	bit 7	byte 18	bit 0	byte 22	bit 0	byte 14	bit 0
		6		1		1		1
		5		2		2		2
		4		3		3		3
		3		4	byte 23	bit 0		4
		2		5		1		5
		1		6		2		6
		0		7		3		7

1) Message bit numbers according to EBU specification of PDC system.

2) Transmission bit number.

2.3 Order of Data Output on the I²C Bus and Bit Allocation of PDC/VPS Operating Modes (cont'd)

I ² C Bus		PDC Packet 8/30				VPS Mode		
		Format 1		Format 2				
Byte 5	bit 7	byte 19	bit 0	byte 14	bit 0	byte 5	bit 0	
	6		1		1		1	
	5		2		2		2	
	4		3		3		3	
	3		4		byte 15		bit 0	4
	2		5				1	5
	1		6				2	6
	0		7				3	7
Byte 6	bit 7	byte 20	bit 0	byte 24	bit 0	byte 15	bit 0	
	6		1		1		1	
	5		2		2		2	
	4		3		3		3	
	3		4		byte 25		bit 0	4
	2		5				1	5
	1		6				2	6
	0		7				3	7
Byte 7	bit 7	byte 21	bit 0	byte 13	bit 0	– set to “1”		
	6		1		1	– set to “1”		
	5		2		2	– set to “1”		
	4		3		3	– set to “1”		
	3		4		– set to “1”		– set to “1”	
	2		5		– set to “1”		– set to “1”	
	1		6		– set to “1”		– set to “1”	
	0		7		– set to “1”		– set to “1”	
Byte 8	bit 7	byte 13	bit 0					
	6		1					
	5		2					
	4		3					
	3		4					
	2		5					
	1		6					
	0		7					

1) Message bit numbers according to EBU specification of PDC system.
 2) Transmission bit number.

2.3 Order of Data Output on the I²C Bus and Bit Allocation of PDC/VPS Operating Modes (cont'd)

I ² C Bus		PDC Packet 8/30		VPS Mode
		Format 1	Format 2	
Byte 9	bit 7	byte 14	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 10	bit 7	byte 22	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 11	bit 7	byte 23	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	

1) Message bit numbers according to EBU specification of PDC system.
 2) Transmission bit number.

2.3 Order of Data Output on the I²C Bus and Bit Allocation of PDC/VPS Operating Modes (cont'd)

I ² C Bus		PDC Packet 8/30		VPS Mode
		Format 1	Format 2	
Byte 12	bit 7 6 5 4 3 2 1 0	byte 24	bit 0 1 2 3 4 5 6 7	
Byte 13	bit7 6 5 4 3 2 1 0	byte 25	bit 0 1 2 3 4 5 6 7	

1) Message bit numbers according to EBU specification of PDC system.
 2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0)

I²C Bus		Header Time Mode		
t ↓	Byte 1	bit 7	byte 38	bit 0 ²⁾
		6		1
		5		2
		4		3
	3		4	
	2		5	
	1		6	
	0		7	
	Byte 2	bit 7	byte 39	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 3	bit 7	byte 40	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 4	bit 7	byte 41	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7

1) Message bit numbers according to EBU specification of PDC system.
 2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0) (cont'd)

I²C Bus		Header Time Mode		
t ↓	Byte 5	bit 7	byte 42	bit 0 ²⁾
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
Byte 6	bit 7	byte 43	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 7	bit 7	byte 44	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 8	bit 7	byte 45	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	

1) Message bit numbers according to EBU specification of PDC system.
 2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0) (cont'd)

I ² C Bus		Header Time Mode		
t ↓	Byte 9	bit 7	byte 30	bit 0 ²⁾
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 10	bit 7	byte 31	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 11	bit 7	byte 32	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 12	bit 7	byte 33	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7

1) Message bit numbers according to EBU specification of PDC system.

2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0) (cont'd)

I ² C Bus		Header Time Mode		
t ↓	Byte 13	bit 7	byte 34	bit 0 ²⁾
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
Byte 14	bit 7	byte 35	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 15	bit 7	byte 36	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 16	bit 7	byte 37	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	

1) Message bit numbers according to EBU specification of PDC system.

2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0) (cont'd)

I²C Bus		Header Time Mode		
t ↓	Byte 1	bit 7	byte 22	bit 0 ²⁾
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
Byte 2	bit 7	byte 23	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 3	bit 7	byte 24	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 4	bit 7	byte 25	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	

1) Message bit numbers according to EBU specification of PDC system.
 2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0) (cont'd)

I²C Bus		Header Time Mode		
t ↓	Byte 5	bit 7	byte 26	bit 0 ²⁾
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
Byte 6	bit 7	byte 27	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 7	bit 7	byte 28	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	
Byte 8	bit 7	byte 29	bit 0	
	6		1	
	5		2	
	4		3	
	3		4	
	2		5	
	1		6	
	0		7	

1) Message bit numbers according to EBU specification of PDC system.
 2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0) (cont'd)

I ² C Bus		Header Time Mode		
t ↓	Byte 9	bit 7	byte 14	bit 0 ²⁾
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 10	bit 7	byte 15	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 11	bit 7	byte 16	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7
	Byte 12	bit 7	byte 17	bit 0
		6		1
		5		2
		4		3
		3		4
		2		5
		1		6
		0		7

1) Message bit numbers according to EBU specification of PDC system.

2) Transmission bit number.

2.4 Order of Data Output on the I²C Bus and Bit Allocation for the Header Time Mode (MAB=0) (cont'd)

I ² C Bus		Header Time Mode	
t ↓	Byte 13	bit 7	byte 18 bit 0 ²⁾
		6	1
		5	2
		4	3
		3	4
		2	5
		1	6
		0	7
Byte 14	bit 7	byte 19	bit 0
	6		1
	5		2
	4		3
	3		4
	2		5
	1		6
	0		7
Byte 15	bit 7	byte 20	bit 0
	6		1
	5		2
	4		3
	3		4
	2		5
	1		6
	0		7
Byte 16	bit 7	byte 21	bit 0
	6		1
	5		2
	4		3
	3		4
	2		5
	1		6
	0		7

1) Message bit numbers according to EBU specification of PDC system.

2) Transmission bit number.

2.5 Description of DAVN and EHB Outputs

DAVN (Data Valid active low)

EHB (First Field active high)

Signal Output	VPS Mode	PDC Mode		
		8/30/2 Mode	8/30/1 Mode	Header Time

DAVN

H/L-transition (set low)	in line 16 when valid VPS data is received	in the line carrying valid 8/30/2 data	in the line carrying valid 8/30/1 data	in the line carrying valid header row X/0 data
L/H-transition (set high)	at the start of line 16	at the beginning of the next field i.e., at the start of the next data entry window		
always set high	on power-up or during I ² C-Bus accesses when the bus master doesn't acknowledge in order to generate the stop condition			

EHB

L/H-transition	at the beginning of the first field
H/L-transition	at the beginning of the second field

In test mode (i.e. TI = high), both DAVN and EHB are controlled by the CS0 pin and reproduce the state of the CS0 input.

3 Electrical Characteristics

Absolute Maximum Ratings

$T_A = 25\text{ °C}$

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Ambient temperature	T_A	0		70	°C	in operation
Storage temperature	T_{stg}	- 40		125	°C	by storage
Total power dissipation	P_{tot}			300	mW	
Power dissipation per output	P_{DQ}			10	mW	
Input voltage	V_{IM}	- 0.3		6	V	
Supply voltage	V_{DD}	- 0.3		6	V	
Thermal resistance	$R_{th\ SU}$			80	K/W	

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

Operating Range

Supply voltage	V_{DD}	4.5	5	5.5	V	
Supply current	I_{DD}		5	15	mA	
Ambient temperature range	T_A	0		70	°C	

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

Electrical Characteristics

$T_A = 25\text{ °C}$

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

Input Signals SDA, SCL, CS0

H-input voltage	V_{IH}	$0.7 \times V_{DD}$		V_{DD}	V	
L-input voltage	V_{IL}	0		$0.3 \times V_{DD}$	V	
Input capacitance	C_I			10	pF	
Input current	I_{IM}			10	μA	

Input Signal TI

H-input voltage	V_{IH}	$0.9 \times V_{DD}$		V_{DD}	V	
L-input voltage	V_{IL}	0		$0.1 \times V_{DD}$	V	
Input capacitance	C_I			10	pF	
Input current	I_{IM}			10	μA	

Input Signals CVBS

(pos. Video, neg. Sync)

Video input signal level	V_{CVBS}	0.7	1.0	2.0	V	2 Vpp with 0.8 V V_{SYNC} and 1.2 V V_{DAT}
Synchron signal amplitude	V_{SYNC}	0.15	0.3	0.8 (1.0)	V	1.0 V only related to VCS signal generation
Data amplitude	V_{DAT}	0.25 $1.5 \times V_{SYNC}$	0.5	1.2	V	
Coupling capacitor	C_C		33		nF	
H-input current	I_{IH}			10	μA	$V_I = 5\text{ V}$
L-input current	I_{IL}	- 1000	- 400	- 100	μA	$V_I = 0\text{ V}$
Source impedance	R_S			250	Ω	
Leakage resistance at coupling capacitor	R_C	0.91	1	1.2	M Ω	

Electrical Characteristics (cont'd)

$T_A = 25\text{ °C}$

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		

Output Signals DAVN, EHB, VCS

H-output voltage	V_{QH}	$V_{DD} - 0.5$			V	$I_Q = -100\text{ }\mu\text{A}$
L-output voltage	V_{QL}			0.4	V	$I_Q = 1.6\text{ mA}$

Output Signals SDA (Open-Drain-Stage)

L-output voltage	V_{QL}			0.4	V	$I_Q = 3.0\text{ mA}$
Permissible output voltage				5.5	V	

PLL-Loop Filter Components (see application circuit)

Resistance at PD2/ VCO2	R_1		6.8		k Ω	
Resistance at VCO1	R_2		1200		k Ω	
Attenuation resistance	R_3		6.8		k Ω	
Resistance at PD2/ VCO2	R_5		1200		k Ω	
Integration capacitor	C_1		2.2		nF	
Integration capacitor	C_3		33		nF	

VCO – Frequency Range Adjustment

Resistance at IREF (for bias current adjustment)	R_4		100		k Ω	
--	-------	--	-----	--	------------	--

Note: 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.

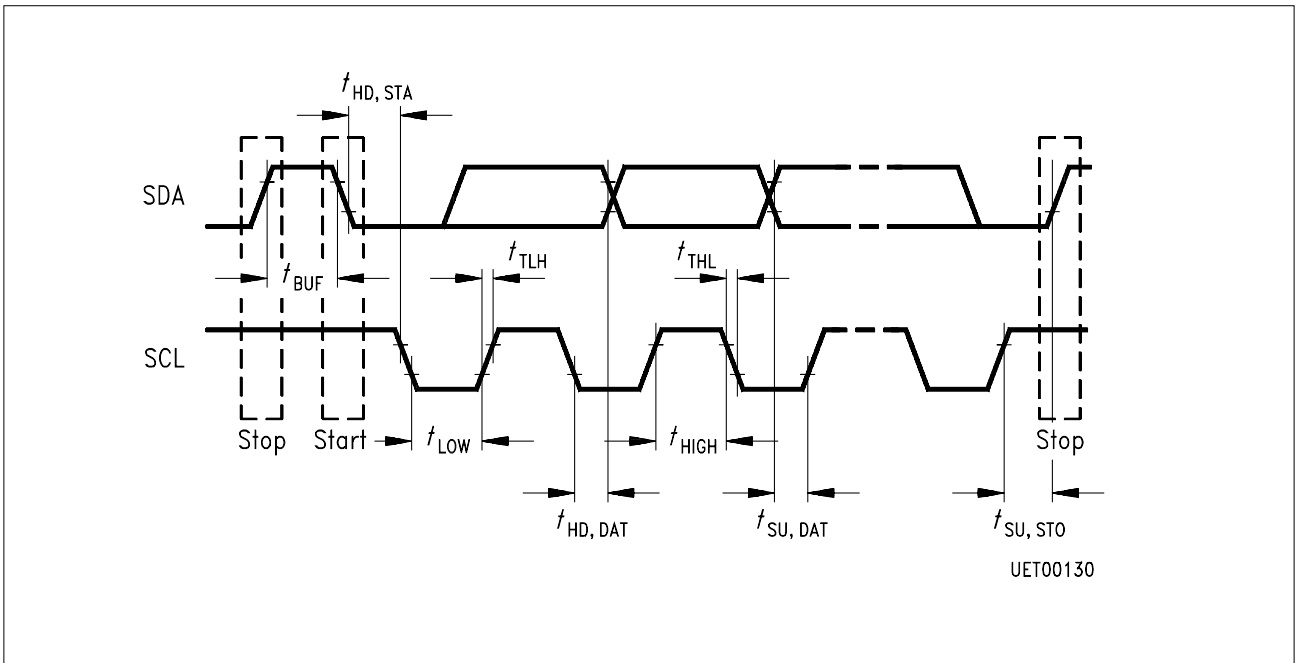


Figure 3
I²C-Bus Timing

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Clock frequency	f_{SCL}	0	100	kHz
Inactive time prior to new transmission start-up	t_{BUF}	4.7		μs
Hold time during start condition	$t_{HD; STA}$	4.0		μs
Low-period of clock	t_{LOW}	4.7		μs
High-period of clock	t_{HIGH}	4.0		μs
Set-up time for data	$t_{SU; DAT}$	250		ns
Rise time for SDA and SCL signal	t_{TLH}		1	μs
Fall time for SDA and SCL signal	t_{THL}		300	ns
Set-up time for SCL clock during stop condition	$t_{SU; STO}$	4.7		μs

All values referred to V_{IH} and V_{IL} levels.

4 PDC/VPS-Receiver

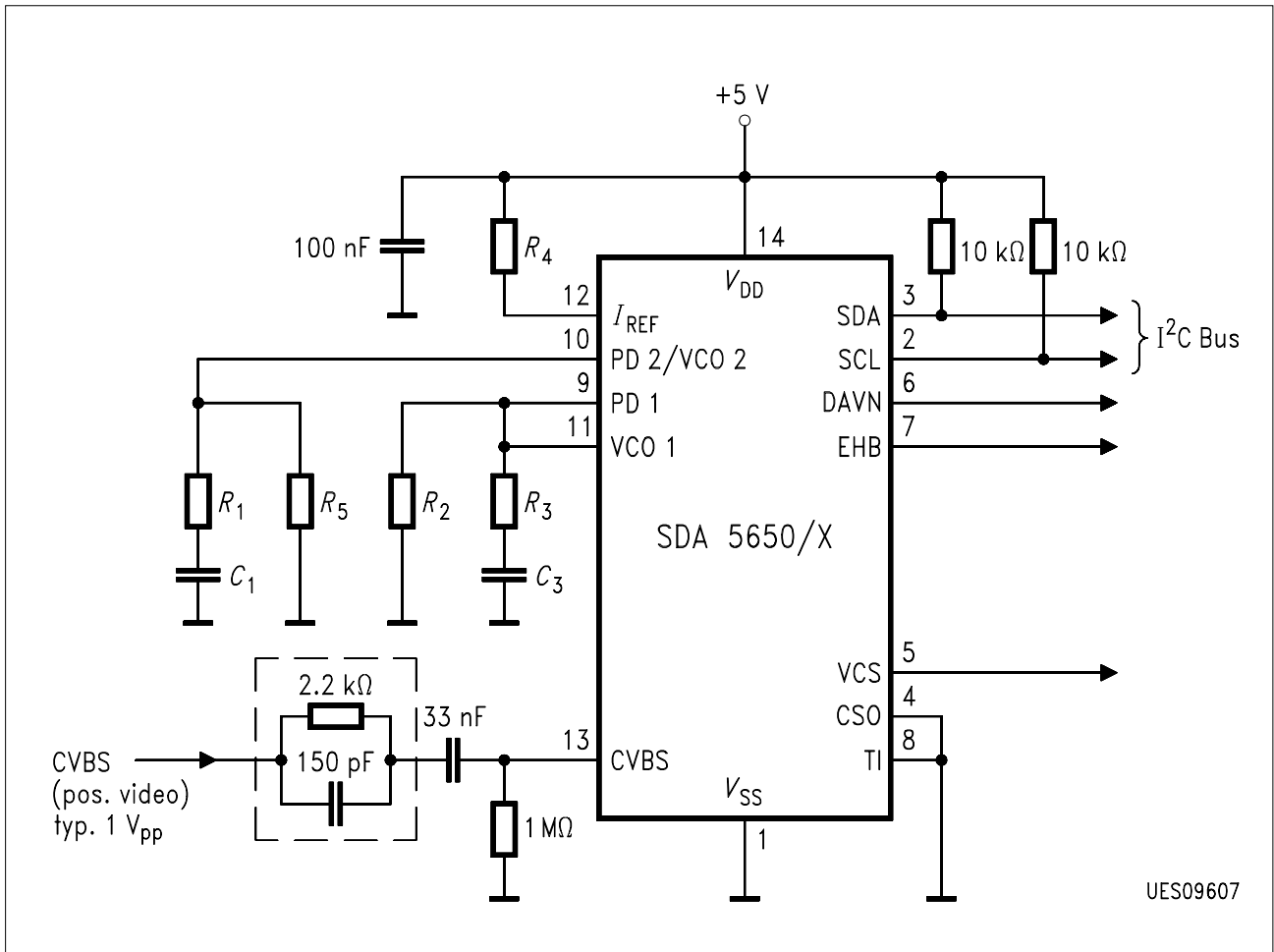


Figure 4

5 Appendix

5.1 Control Register Write (I²C-Bus Write)

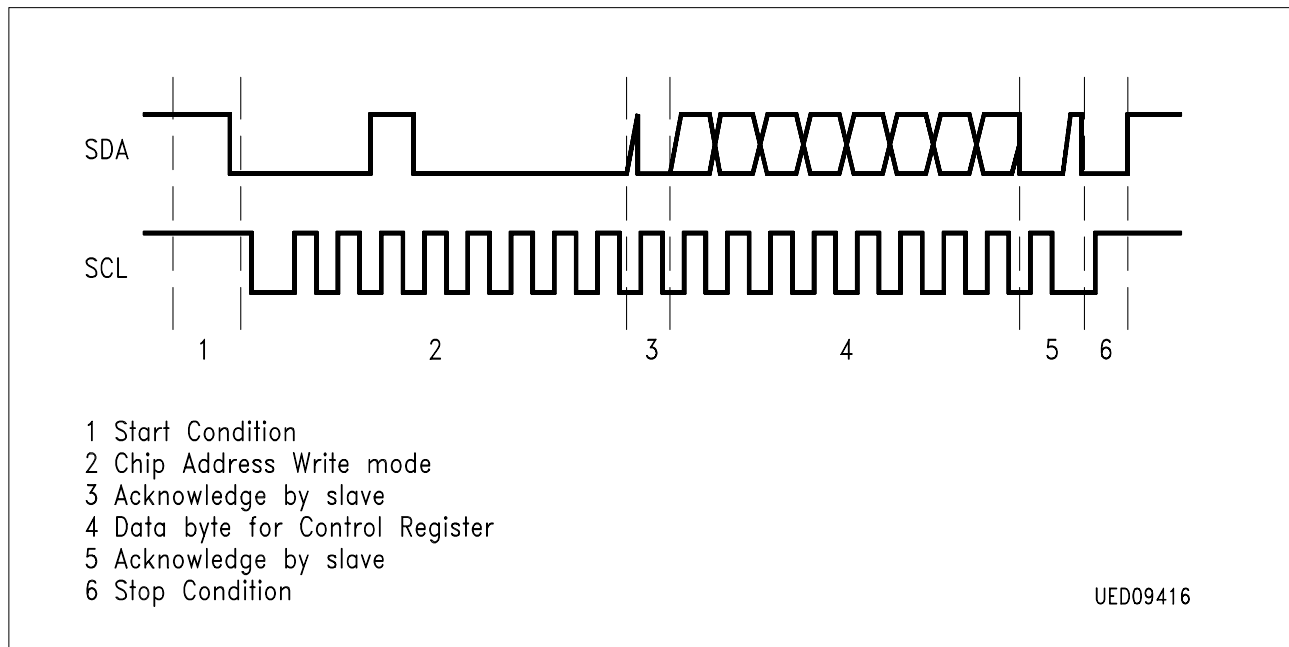


Figure 5

5.2 Data Register Read (I²C-Bus Read)

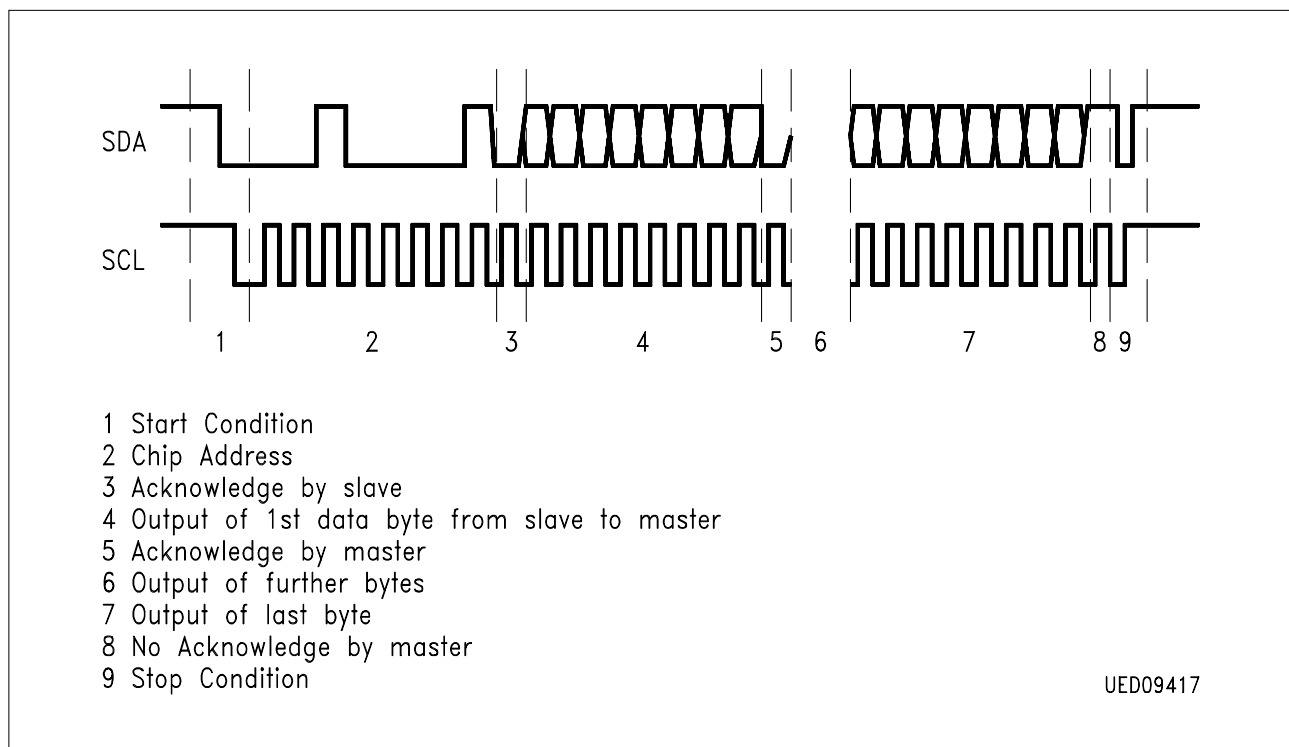


Figure 6

5.3 DAVN and EHB Timing

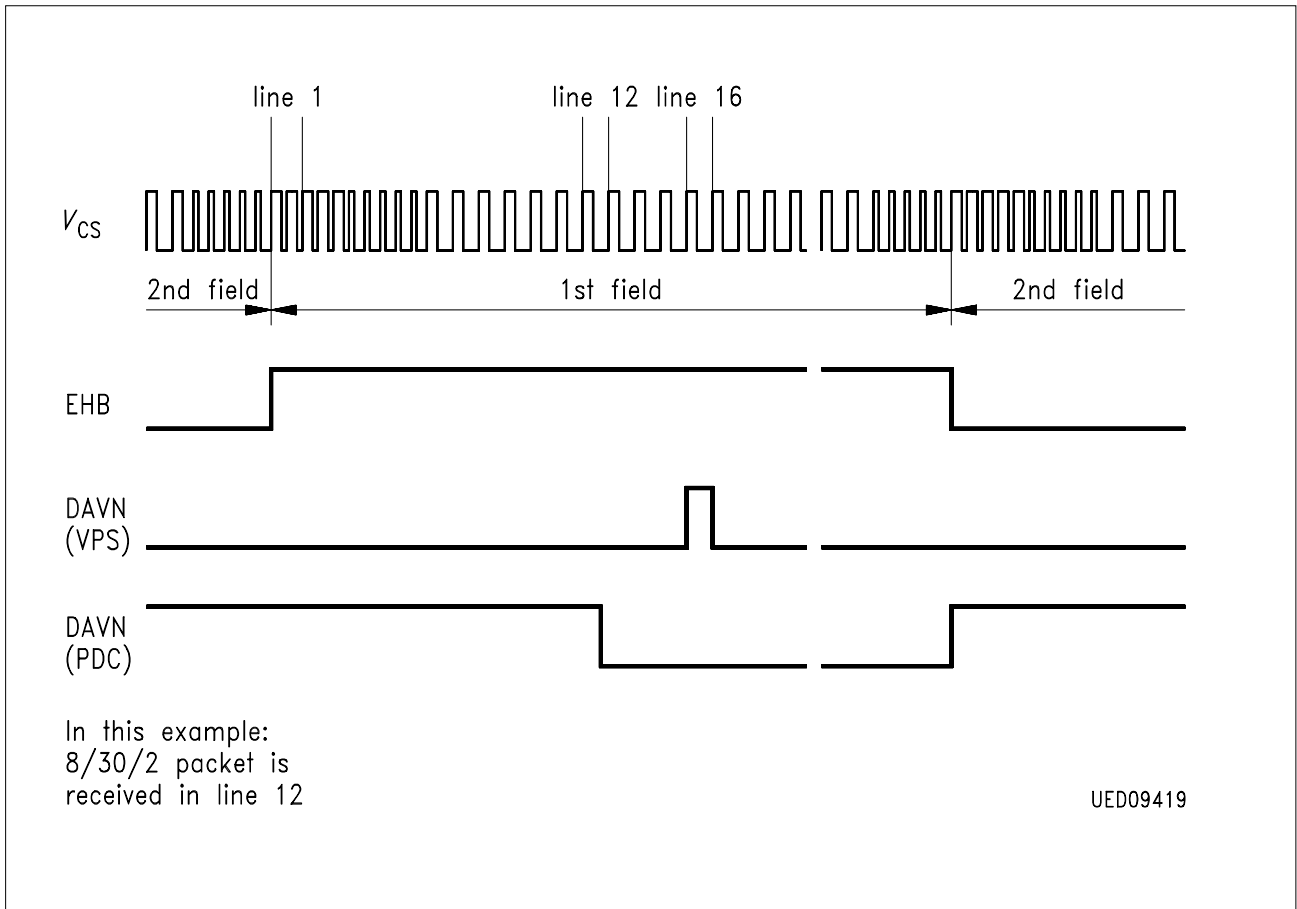


Figure 7

5.4 Position of Teletext and VPS Data Lines within the Vertical Blanking Interval

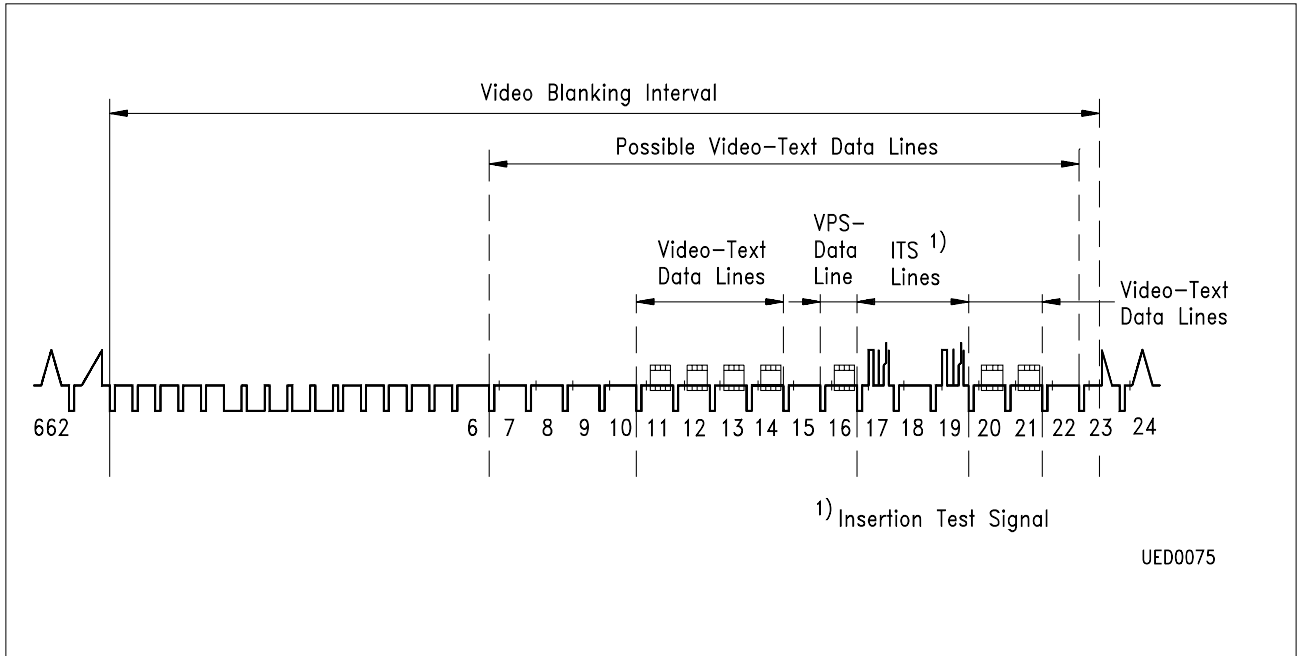


Figure 8

5.5 Definition of Voltage Levels for VPS Data Line

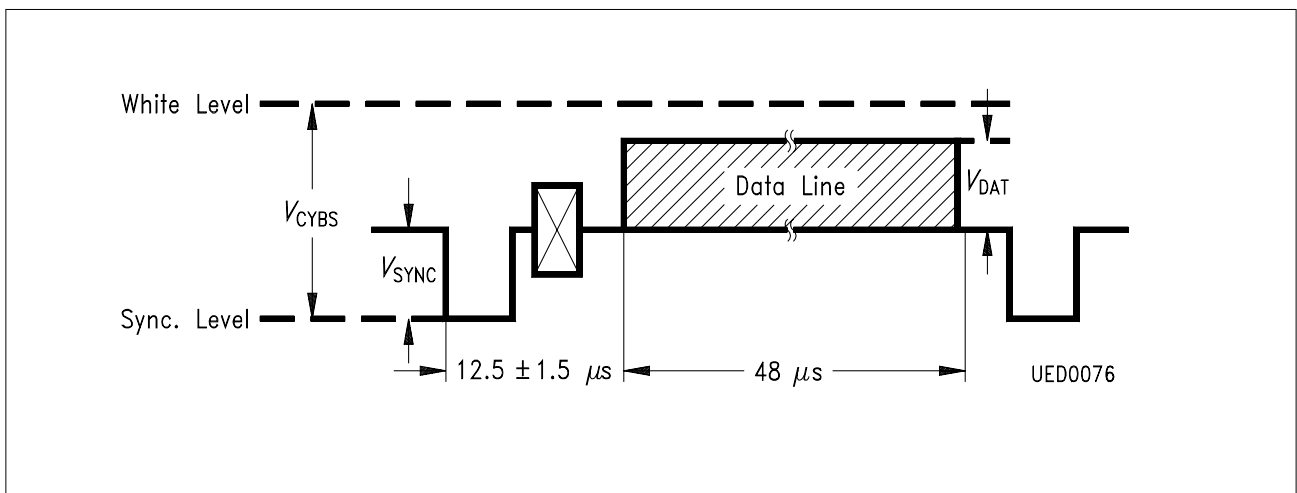


Figure 9

5.6 BDSP 8/30 Format 1 Bit Allocation

Byte No.	Bit No.								Contents
	0	1	2	3	4	5	6	7	
13									Network Identification 1. Byte
14									Network Identification 2. Byte
15	Weight			Weight			Sign		Time Offset Code
	2^{-2}	2^{-1}	2^0	2^1	2^2	2^3	0 1		
16	MJD Digit Weight 10^4			1	1	1	1	Modified Julian Date (MJD) 1. Byte	
17	MJD Digit Weight 10^2			MJD Digit Weight 10^3			Modified Julian Date 2. Byte		
18	MJD Digit Weight 10^0			MJD Digit Weight 10^1			Modified Julian Date (MJD) 3. Byte		
19	UTC Hours Units			UTC Hours Tens			Universal Time Coordinated (UTC) 1. Byte		
20	UTC Minutes Units			UTC Minutes Tens			Universal Time Coordinated 2. Byte		
21	UTC Seconds Units			UTC Seconds Tens			Universal Time Coordinated 3. Byte		
22									Short Programme Label 1. Byte
23									Short Programme Label 2. Byte
24									Short Programme Label 3. Byte
25									Short Programme Label 4. Byte

Note: This corresponds to the coding adopted in CCIR teletext system B BDSP 8/30 format 1.

NB: The received bytes are output on the I²C Bus in a transparent way, i.e., on a bit-first-in-first-out basis. No bit manipulation is performed on the chip in this operating mode.

Concerning bytes no. 16 through 21: When evaluating the numbers, note that each 4-bit-digit has been incremented by one prior to transmission, and the least significant bits are transmitted first.

5.7 Structure of the Teletext Data Packet 8/30 Format 2

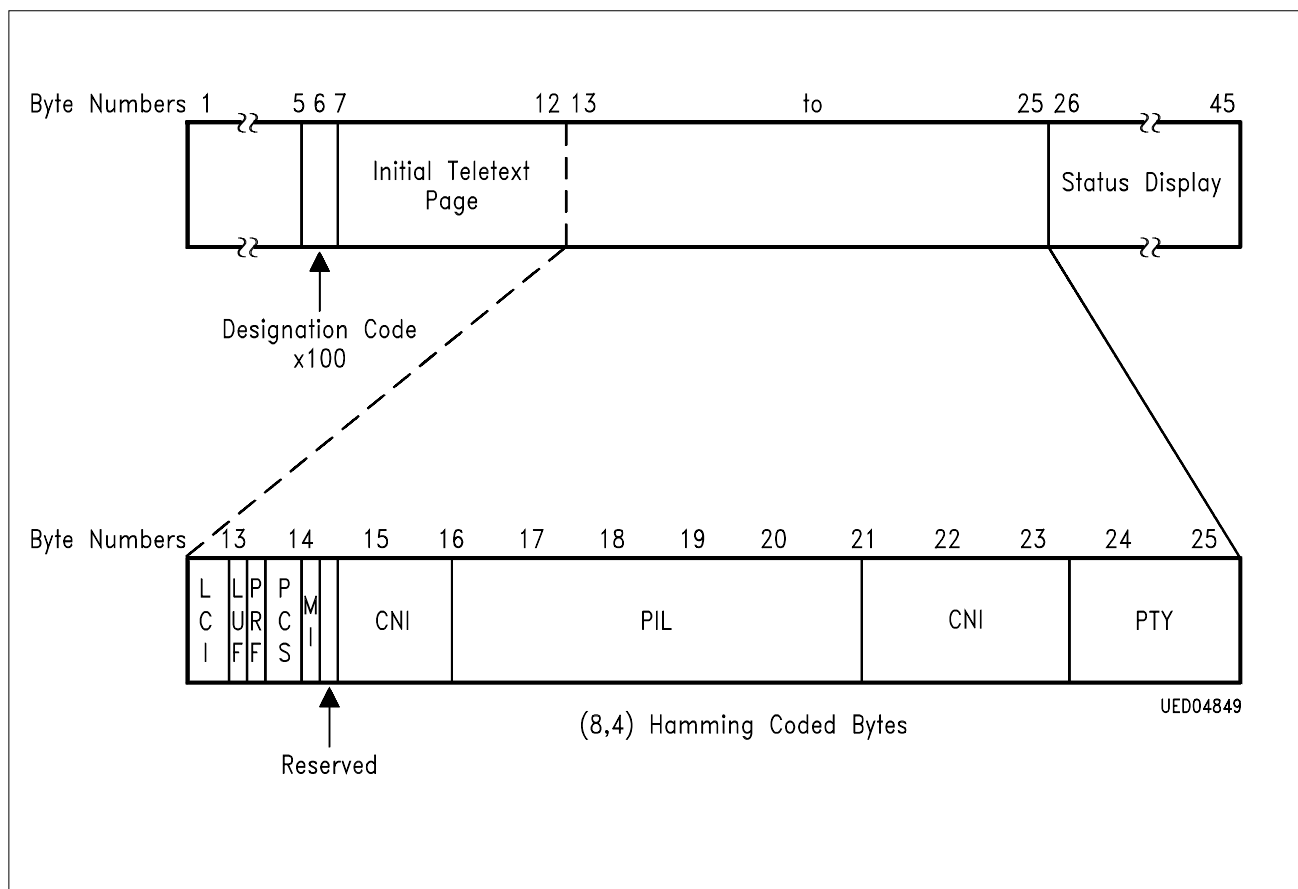


Figure 10

5.8 BDSP 8/30 Format 2 Bit Allocation

The four message bits of byte 13 are used as follows

byte 13	bit	0 – LCI	b ₁	label channel identifier
		1 – LCI	b ₂	
		2 – LUF		label update flag
		3 – reserved but as yet undefined		

5.8 BDSP 8/30 Format 2 Bit Allocation (cont'd)

The message bits of bytes 14-25 are used in a way similar to the coding of the label in the dedicated television line as follows:

byte 14	bit	0 PCS	b ₁	status of analogue sound	
		1 PCS	b ₂		
		2		reserved but yet	
		3		undefined	
byte 15	bit	0 CNI	b ₁	country	
		1 CNI	b ₂		
		2 CNI	b ₃		
		3 CNI	b ₄		
byte 16	bit	0 CNI	b ₉	network (or programme provider)	
		1 CNI	b ₁₀		
		2 PIL	b ₁	day	
		3 PIL	b ₂		
byte 17	bit	0 PIL	b ₃	month	
		1 PIL	b ₄		
		2 PIL	b ₅		
		3 PIL	b ₆		
byte 18	bit	0 PIL	b ₇		hour
		1 PIL	b ₈		
		2 PIL	b ₉		
		3 PIL	b ₁₀		
byte 19	bit	0 PIL	b ₁₁		
		1 PIL	b ₁₂		
		2 PIL	b ₁₃		
		3 PIL	b ₁₄		

5.8 BDSP 8/30 Format 2 Bit Allocation (cont'd)

byte 20	bit	0 PIL	b ₁₅	minute
		1 PIL	b ₁₆	
		2 PIL	b ₁₇	
		3 PIL	b ₁₈	
byte 21	bit	0 PIL	b ₁₉	country
		1 PIL	b ₂₀	
		2 CNI	b ₅	
		3 CNI	b ₆	
byte 22	bit	0 CNI	b ₇	network (or programme provider)
		1 CNI	b ₈	
		2 CNI	b ₁₁	
		3 CNI	b ₁₂	
byte 23	bit	0 CNI	b ₁₃	
		1 CNI	b ₁₄	
		2 CNI	b ₁₅	
		3 CNI	b ₁₆	
byte 24	bit	0 PTY	b ₁	programme type
		1 PTY	b ₂	
		2 PTY	b ₃	
		3 PTY	b ₄	
byte 25	bit	0 PTY	b ₅	
		1 PTY	b ₆	
		2 PTY	b ₇	
		3 PTY	b ₈	

5.9 Data Format of Programme Delivery Data in the Dedicated TV Line (VPS)

Parameter →	<div style="display: flex; justify-content: space-around; align-items: center;"> PCS CNI CNI </div>															
Byte No. →	1	2	3 & 4	5				6 to 10	11							
Parameter Bits b, l				1 2 3 4	1 2 3 4			9 10	1 2 3 4 5							
Transmission Bit No.				0 1 2 3	4 5 6 7			0 1	2 3 4 5 6							
Content →	Clock rom-In	Start Code	Not relevant to PDC	Bits b ₁ and b ₂ 00 don't know 01 mono 10 stereo 11 dual sound Bits b ₃ and b ₄ are reserved		M	L			M	L					
					Reserved for enhancement of VPS			Not relevant to PDC	Net. or prog. prov. bin.	Day binary						
Reserved code values for receiver control (Service codes)	Timer Control code			N . . N					N	N	0	0	0	0	0	0
	Record Inhibit / Term.			N . . N					N	N	0	0	0	0	0	0
	Interruption code			N . . N					N	N	0	0	0	0	0	0
	Continuation code			N . . N					N	N	0	0	0	0	0	0
	Unenhanced VPS			1 1 1 1					N	N	P.....					
	PTY not in use			N . . N					N	N	P.....					

Abbreviations: CNI = Country and Network Identification M = Most-significant Bit
 PCS = Programme Control Status L = Least-significant Bit
 PIL = Programme Identification Label
 PTY = Programme Type

UEA09420

Figure 11

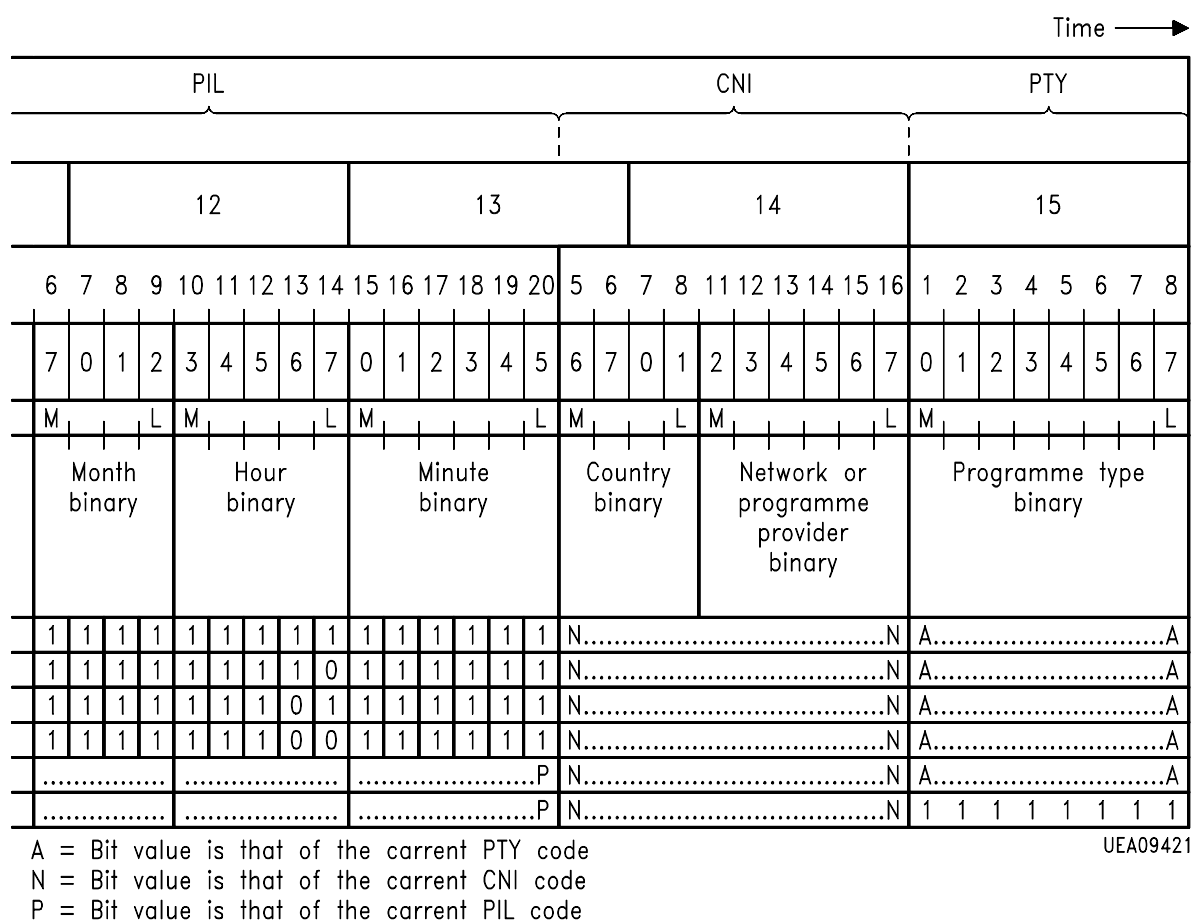
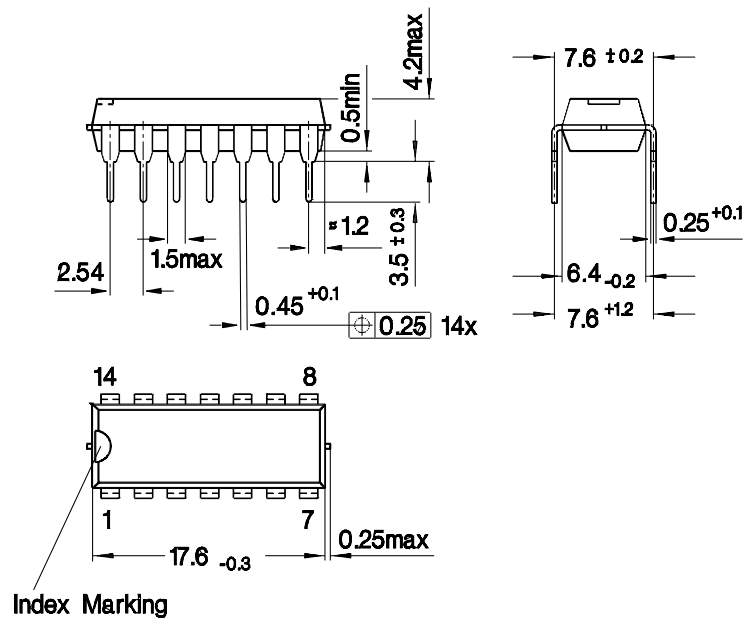


Figure 12

6 Package Outlines

P-DIP-14-1
(Plastic Dual In-line Package)



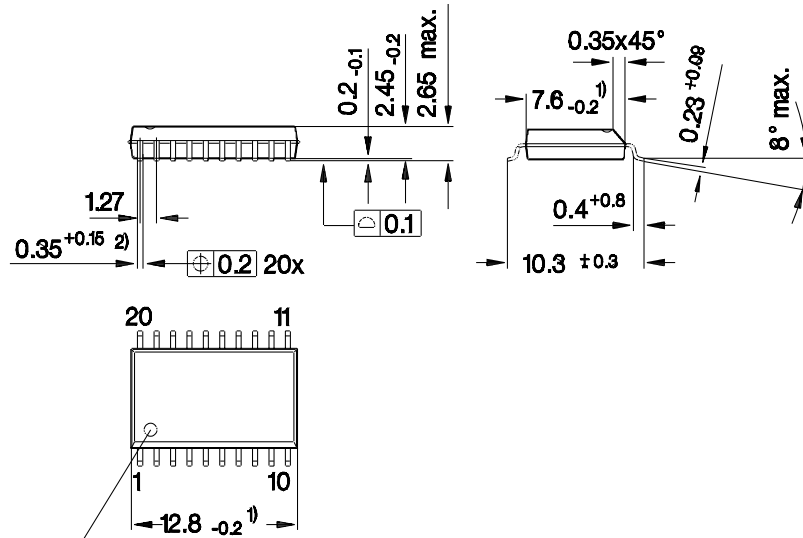
GPD05005

Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

Dimensions in mm

P-DSO-20-1
(Plastic Dual Small Outline Package)



Index Marking

- 1) Does not include plastic or metal protrusion of 0.15 max. per side
- 2) Does not include dambar protrusion

GPS05094

Sorts of Packing

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

SMD = Surface Mounted Device

Dimensions in mm