SIEMENS

ICs for Consumer Electronics

Field Mixer
SDA 9270

Data Sheet 01.96

SDA 9270 **Revision History:** **Current Version: 01.96**	
Previous Version:	
Page	Subjects (changes since last revision)
24	HYTHL1 control bits have been increased to 6
25	HYTHL2 control bits have been increased to 6
25	HYTHH1 control bits have been increased to 6
25	HYTHH2 control bits have been increased to 6
27	Clock inputs CLL, SCA, SCAD: SCA clock frequence MIN changed to 12 MHz SCAD clock specification added Fall/rise time specification added
27	I^2C-Bus specification extended to fast mode
29	Max. average supply current: 200 mA

Edition 01.96

This edition was realized using the software system FrameMaker®.

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Table of Contents **Page**

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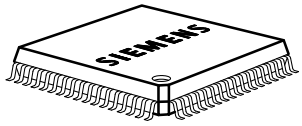
Field Mixer SDA 9270

Preliminary Data **CMOS**

1 Introduction

The Field Mixer SDA 9270 is an add-on component for the Siemens MEGAVISION IC set which enables the system to reduce large area *and* line flickering of interlaced TV standards.



P-MQFP-80-1

1.1 Features

- High performance line flicker reduction algorithm
- Two input data formats (4:1:1 and 4:2:2)
- I^2C-Bus control
- P-MQFP-80 package
- 5 V supply voltage

Supported MEGAVISION features

- Multipicture (still in picture, picture in still, 9xpicture)
- Still field
- Zoom

New MEGAVISION features

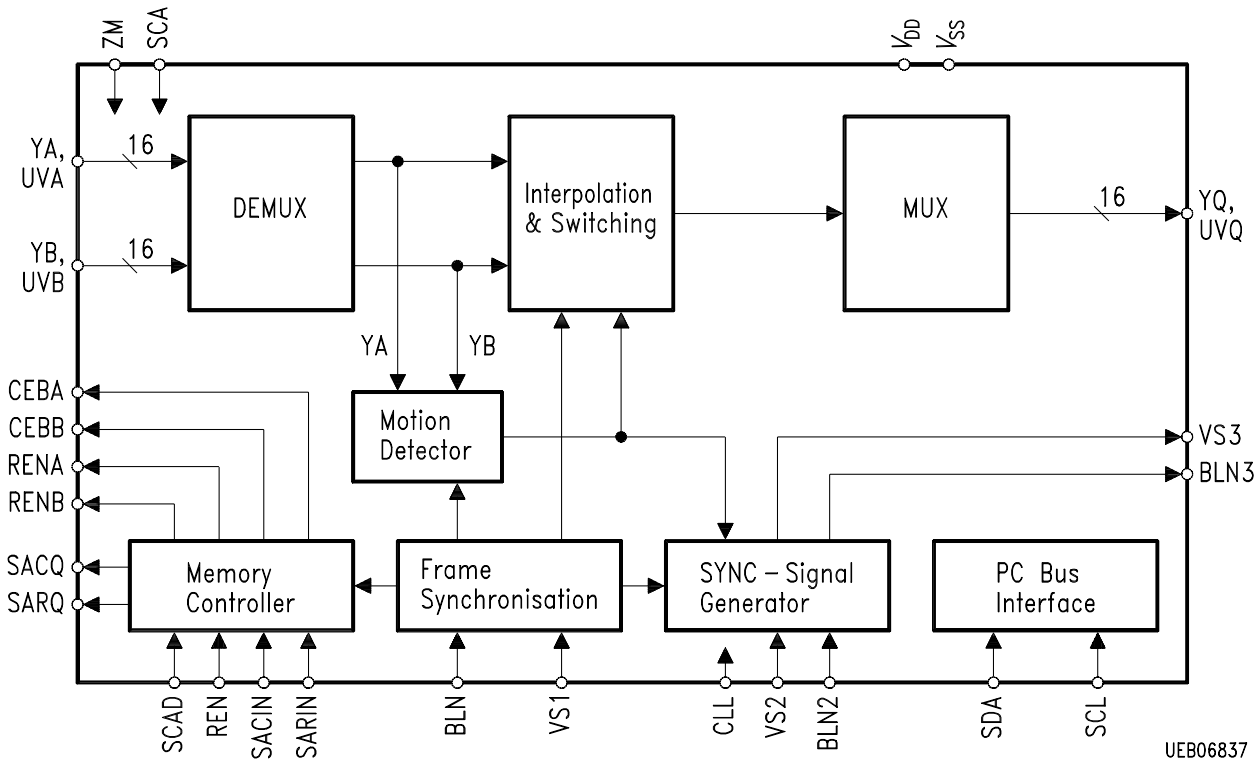
- Still frame
- Background still field

MEGAVISION features not supported

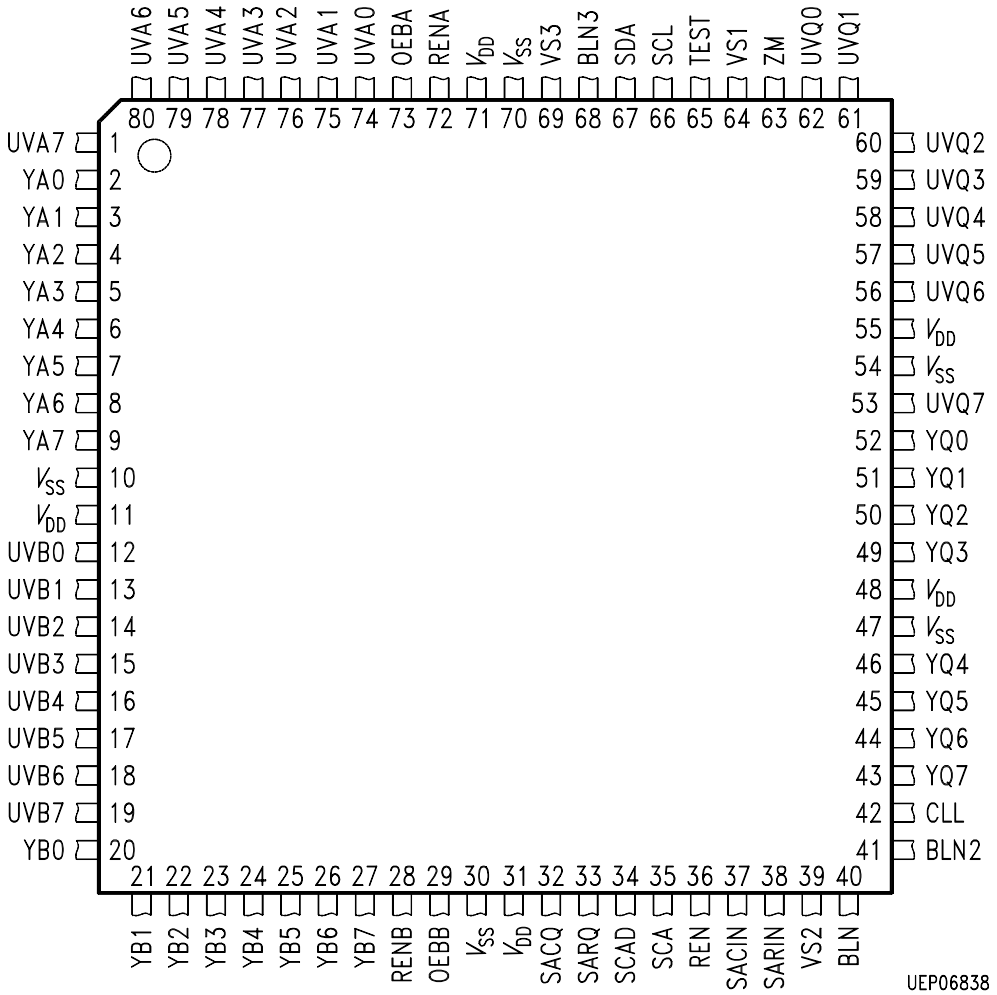
- 4:4:4
- Colored frame insertion (FRM)

Type	Ordering Code	Package
SDA 9270	Q67100-H5158	P-MQFP-80-1

1.2 Block Diagram



1.3 Pin Configuration



1.4 Pin Description

Pin No.	Name	Type	Description
10, 30, 47, 54, 70	V_{SS}	S	Supply voltage (V_{SS}) for digital parts and input stages
11, 31, 48, 55, 71	V_{DD}	S	Supply voltage (V_{DD}) for digital parts and input stages
74 .. 80,1	UVA0 .. 7	I/TTL	Data input UV of channel A (see Data Format)
2 .. 9	YA0 .. 7	I/TTL	Data input Y of channel A (see Data Format)
12 .. 19	UVB0 .. 7	I/TTL	Data input UV of channel B (see Data Format)
20 .. 27	YB0 .. 7	I/TTL	Data input Y of channel B (see Data Format)
28	RENB	Q/TTL	RAM enable field memory B
29	OEBB	Q/TTL	Output enable port B of field memory B
32	SACQ	Q/TTL	Serial column address output
33	SARQ	Q/TTL	Serial row address output
34	SCAD	I/TTL	Serial address clock input
35	SCA	I/TTL	Clock signal for data input
36	REN	I/TTL	RAM enable / input from SDA 9220
37	SACIN	I/TTL	Serial column address / input from SDA 9220
38	SARIN	I/TTL	Serial row address / input from SDA 9220
39	VS2	I/TTL	100 Hz vertical synchronization signal
40	BLN	I/TTL	Blanking signal, high level indicates active video line
41	BLN2	I/TTL	Blanking signal / double line frequency
42	CLL	I/TTL	System clock
43.. 46,49..52	YQ0 .. 7	Q/TTL	Data output Y of channel Q (see Data Format)
53,56 .. 62	UVQ0 ..7	Q/TTL	Data output UV of channel Q (see Data Format)
63	ZM	I/TTL	Zoom control input (HIGH level for zoom mode)
64	VS1	I/TTL	50 Hz vertical synchronization signal
65	TEST	I/TTL	Test pin; must be connected to V_{SS} for normal operation
66	SCL	I	I^2C-Bus clock line
67	SDA	IQ	I^2C-Bus data line

Pin Description (cont'd)

Pin No.	Name	Type	Description
68	BLN3	Q/TTL	Blanking signal / BLN2 delayed
69	VS3	Q/TTL	Vertical synchronization signal (switched raster)
72	RENA	Q/TTL	RAM enable field memory A
73	OEBA	Q/TTL	Output enable port B of field memory A

S: supply, I: input, Q: output, TTL: digital (TTL)

2 System Description

The device generates at its output an opportune sequence of 100/120 Hz fields derived by processing the field A and the field B which are stored in 2 external field memories and made available to the SDA 9270 on 2 separate input ports of 16 bit width each.

The device SDA 9270 generates also control signals for the SDA 9251 which are necessary to operate the TV - SAMs in the Frame mode, that is to write the incoming information alternatively in one or the other field memory.

Additionally the device generates a vertical sync pulse which has to be synchronized with the respective field output. A horizontal blanking signal in phase with the output data is also made available.

2.1 Input Data Format

The SDA 9270 accepts for the input channels A and B two different input formats (I^2C-Bus : INFOR) with two possible sample frequency relations of Y : (B-Y) : (R-Y). The representation of the samples is programmable separately for luminance and chrominance signals as positive dual code or 2's complement code (I^2C-Bus : INCODL, INCODC)

Data Pin	**Data Format 4:1:1 INFOR = 0**				**4:2:2 Parallel INFOR = 1**	
Yx7	Y_{07}	Y_{17}	Y_{27}	Y_{37}	Y_{07}	Y_{17}
Yx6	Y_{06}	Y_{16}	Y_{26}	Y_{36}	Y_{06}	Y_{16}
Yx5	Y_{05}	Y_{15}	Y_{25}	Y_{35}	Y_{05}	Y_{15}
Yx4	Y_{04}	Y_{14}	Y_{24}	Y_{34}	Y_{04}	Y_{14}
Yx3	Y_{03}	Y_{13}	Y_{23}	Y_{33}	Y_{03}	Y_{13}
Yx2	Y_{02}	Y_{12}	Y_{22}	Y_{32}	Y_{02}	Y_{12}
Yx1	Y_{01}	Y_{11}	Y_{21}	Y_{31}	Y_{01}	Y_{11}
Yx0	Y_{00}	Y_{10}	Y_{20}	Y_{30}	Y_{00}	Y_{10}
UVx7	U_{07}	U_{05}	U_{03}	U_{01}	U_{07}	V_{07}
UVx6	U_{06}	U_{04}	U_{02}	U_{00}	U_{06}	V_{06}
UVx5	V_{07}	V_{05}	V_{03}	V_{01}	U_{05}	V_{05}
UVx4	V_{06}	V_{04}	V_{02}	V_{00}	U_{04}	V_{04}
UVx3					U_{03}	V_{03}
UVx2					U_{02}	V_{02}
UVx1					U_{01}	V_{01}
UVx0					U_{00}	V_{00}

Yx,UVx : x : A,B

X_{ab}: X: signal component a: sample number b: bit number

The amplitude resolution for each input signal component is 8 bit, the maximum clock frequency is 30 MHz. Consequently the SDA 9270 is dedicated for applications in high quality digital video systems. The data input stages and the internal data multiplexer operate with a special input clock (SCA). For applications in the Siemens MEGAVISION System the SCA-clock is identical with the memory output clock.

2.2 Output Data Format

The data format for the output channel Q will be a 4:2:2 parallel format in 2's complement code representation.

Data Pin	4:2:2 Parallel	
YQ7	Y_{07}	Y_{17}
YQ6	Y_{06}	Y_{16}
YQ5	Y_{05}	Y_{15}
YQ4	Y_{04}	Y_{14}
YQ3	Y_{03}	Y_{13}
YQ2	Y_{02}	Y_{12}
YQ1	Y_{01}	Y_{11}
YQ0	Y_{00}	Y_{10}
UVQ7	U_{07}	V_{07}
UVQ6	U_{06}	V_{06}
UVQ5	U_{05}	V_{05}
UVQ4	U_{04}	V_{04}
UVQ3	U_{03}	V_{03}
UVQ2	U_{02}	V_{02}
UVQ1	U_{01}	V_{01}
UVQ0	U_{00}	V_{00}

X_{ab}: X: signal component a: sample number b: bit number

2.3 Field Interpolation and Switching

In order to reduce the annoying line and edge flickering a frame rate upconversion is implemented. The upconversion includes a combination of interpolation algorithms which are determined via I^2C-Bus and then selected automatically depending on the picture motion content.

The field interpolation and switching block accepts at its input the data of the two channels A and B, which are the combined luminance and chrominance information respectively of the field A and the field B. The field rate is 100/120 Hz.

A fallback mode which corresponds to the operating mode AABB of the original MEGAVISION system is made available. This mode is selected automatically in case of non-standard input signals carrying unstable sync informations or it can be forced via I^2C-Bus.

2.4 Motion Detection

The motion detection output is switched in a 25/30 Hz frame synchronous raster. As input signals for this block are accepted the luminance signal components of the input channels A and B. By comparing the two fields the motion detector generates an information about 3 possible motion content levels: LOW, MEDIUM and HIGH.

2.5 Field Memory Control

The Field Mixer SDA 9270 has to provide the two external field memories – composed of TV-SAM SDA 9251 – with two pairs of control signals. One pair RENA and RENB enables the MEGAVSION system to write the incoming field A and field B information alternately into one field memory block and then into the other. A second pair of control signals OEBA and OEBB enables alternately the output back channels of field memory A and B for the noise reduction in the Picture Processor SDA 9290. Because of the timing the serial address signals SAC and SAR generated by the MSC SDA 9220 must be delayed by 4 SCAD-clock periods. This delay is implemented in the SDA 9270.

The Sync signals VS1 and BLN and the clock signal SCAD are used as timing reference signals.

2.6 Frame Synchronization

In order to synchronize the data flows within field memories and Field Mixer and to coordinate the signal information with the associated deflection control the Field Mixer SDA 9270 has to generate 25 Hz picture frame sync signals.

One 25 Hz frame sync signal is necessary for generating the field memory control signals RENA, RENB, OEBA, OEBB with a pattern repetition of 25 Hz each. This signal is synchronized to the front end side video signal of the MEGAVISION block and uses therefore as input signals the 50 Hz vertical sync signal VS1 generated by the MSC SDA 9220 and the horizontal blanking signal BLN.

A second 25 Hz frame sync signal is needed in the interpolation and switching block and in the VS3 pulse generation block for assuring an output data sequence of the channel Q synchronized with the VS3 pulse. As reference signals for this second frame sync signal are used the 100 Hz vertical sync signal VS2 and the blanking signal BLN2 both generated by the MSC SDA 9220.

2.7 SYNC-Signal Generation

This functional block generates a couple of sync signal needed in the processing stages following the Field Mixer device. This couple includes the vertical sync signal VS3 and the horizontal blanking signal BLN3. All these signals are synchronized with the output channel Q.

2.8 I^2C-Bus

2.8.1 I^2C-Bus Address

0	0	0	1	1	1	1

2.8.2 I^2C-Bus Format

write:

S	0	0	0	1	1	1	1	0	A	Subaddress	A	Data Byte	A	*****	A	P

S: Start condition
A: Acknowledge
P: Stop condition
NA: Not Acknowledge

An automatical address increment function is implemented.

After switching on the IC (RES=0), all bits are set to defined states. Particularly:

Register	Default Value	Register	Default Value
00	00_H	0B	50_H
01	00_H	0C	03_H
02	00_H	0D	$0D_H$
03	00_H	0E	08_H
04	40_H	0F	28_H
05	$F4_H$	10	$A5_H$
06	58_H	11	55_H
07	20_H	12	$0A_H$
08	$F8_H$	13	18_H
09	70_H	14	05_H
0A	$E8_H$	15	03_H

2.8.3 I²C-Bus Commands

Sub-add. (Hex.)	Data Byte							
	D7	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**
00	LINFRA	PIXLIN	WRMODE2	WRMODE1	WRMODE0	NRDEL	RASTER1	RASTER0
01	0	INCODL	INCODC	INFOR	FALLBACK	FIWIN2	FIWIN1	FIWIN0
02	ZMMODE1	ZMMODE0	0	0	INTMODLL1	INTMODLL0	INTMODCL1	INTMODCL0
03	RDMODE1	RDMODE0	0	0	INTMODLM1	INTMODLM0	INTMODCM1	INTMODCM0
04	EDCONST1	EDCONST0	0	0	INTMODLH1	INTMODLH0	INTMODCH1	INTMODCH0
05	CFHENA07	CFHENA06	CFHENA05	CFHENA04	CFHENA03	CFHENA02	CFHENA01	CFHENA00
06	CFHENA17	CFHENA16	CFHENA15	CFHENA14	CFHENA13	CFHENA12	CFHENA11	CFHENA10
07	CFHENB07	CFHENB06	CFHENB05	CFHENB04	CFHENB03	CFHENB02	CFHENB01	CFHENB00
08	CFSCHA007	CFSCHA006	CFSCHA005	CFSCHA004	CFSCHA003	CFSCHA002	CFSCHA001	CFSCHA000
09	CFSCHA107	CFSCHA106	CFSCHA105	CFSCHA104	CFSCHA103	CFSCHA102	CFSCHA101	CFSCHA100
0A	CFSCHA017	CFSCHA016	CFSCHA015	CFSCHA014	CFSCHA013	CFSCHA012	CFSCHA011	CFSCHA010
0B	CFSCHA117	CFSCHA116	CFSCHA115	CFSCHA114	CFSCHA113	CFSCHA112	CFSCHA111	CFSCHA110
0C	CFSCHB007	CFSCHB006	CFSCHB005	CFSCHB004	CFSCHB003	CFSCHB002	CFSCHB001	CFSCHB000
0D	CFSCHB107	CFSCHB106	CFSCHB105	CFSCHB104	CFSCHB103	CFSCHB102	CFSCHB101	CFSCHB100
0E	CFSCHB017	CFSCHB016	CFSCHB015	CFSCHB014	CFSCHB013	CFSCHB012	CFSCHB011	CFSCHB010

I^2C-Bus Commands (cont'd)

Sub-add. (Hex.)	Data Byte							
	D7	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**
0F	CFSCHB117	CFSCHB116	CFSCHB115	CFSCHB114	CFSCHB113	CFSCHB112	CFSCHB111	CFSCHB110
10	MDTHL21	MDTHL20	MDTHL11	MDTHL10	0	MDBLTH2	MDBLTH1	MDBLTH0
11	MDTHU21	MDTHU20	MDTHU11	MDTHU10	MDTHM21	MDTHM20	MDTHM11	MDTHM10
12	0	0	HYTHL15	HYTHL14	HYTHL13	HYTHL12	HYTHL11	HYTHL10
13	0	0	HYTHL25	HYTHL24	HYTHL23	HYTHL22	HYTHL21	HYTHL20
14	0	0	HYTHH15	HYTHH14	HYTHH13	HYTHH12	HYTHH11	HYTHH10
15	0	0	HYTHH25	HYTHH24	HYTHH23	HYTHH22	HYTHH21	HYTHH20

2.8.4 Detailed Description

Subaddress 00		
Bit	**Name**	**Function**
D7	LINFRA	Lines per frame: 0 : 625 lines per frame (default value) 1 : 525 lines per frame
D6	PIXLIN	Pixels per line: 0 : 864 pixels per line (default value) 1 : 858 pixels per line
D5...D3	WRMODE*	Write Mode: 000 : Normal operation: field memory A and field memory B are written alternately (default value) 001 : Still picture A and B: writing is suppressed for both field memories 010 : Still picture A: writing is suppressed for field memory A, **all** incoming fields are written to field memory B 011 : Still picture A: writing is suppressed for field memory A, **every second** field is written to field memory B (Field Mode B) 100 : Still picture B: writing is suppressed for field memory B, **all** incoming fields are written to field memory A 101 : Still picture B: writing is suppressed for field memory B, **every second** field is written to field memory A (Field Mode A) 110 : Reserved 111 : Reserved
D2	NRDEL	Noise Reduction Delay: conditions: 2 field memory configuration, WRMODE = 000 0: Data delay for recursive filtering is one frame (default value) 1: Data delay for recursive filtering is one field
D1...D0	RASTER*	Deflection Raster control: 00: Control by interpolation algorithm (default value) 01: $\alpha\alpha\beta\beta$ 10: $\alpha\beta\alpha\beta$ 11: $\alpha\alpha\alpha\alpha$

Note: SDA 9220 programming:

– Subaddress 00 / D7 (EXSYN): For EXSYN=1 WRMODE=100 is required.

– Subaddress 01 / D7 (FLDM), Subaddress 02 / D7 (STB): FLDM and STB should always be set to 0.

– Subaddress 00 / D1, D0 (VDM): VDM must be set to 00.

Subaddress 01		
Bit	**Name**	**Function**
D6	INCODL	Coding of luminance input data: 0: positive dual code (default value) 1: 2's complement
D5	INCODC	Coding of chrominance input data: 0: positive dual code (default value) 1: 2's complement
D4	INFOR	Input data format: 0: 4:1:1 luminance, chrominance parallel (8+4 wires) (default value) 1: 4:2:2 luminance, chrominance parallel (8+8 wires)
D3	FALLBACK	Fallback mode: 0: Normal operation (default value) 1: programmed fall back mode is activated for current display
D2...D0	FIWIN	Field identification window Definition of a time window. Switching from fall back mode to programmed display mode is not performed until the field identification algorithm is working in a stable condition during the programmed time. 000 : 7 field periods (default value) 001 : 15 field periods : : 110 : 55 field periods 111 : 63 field periods

Subaddress 02		
Bit	**Name**	**Function**
D7..D6	ZMMODE	zoom mode (enabled only if pin ZM = 1 and RDMODE = 00) 00: field sequence at output Q: AABB (default value) 01: field sequence at output Q: ABAB 10: display with raster correction 11: Reserved
D3..D2	INTMODLL	luminance interpolation mode, low degree of motion 00: field sequence AABB without interpolation ($\alpha\alpha\beta\beta$) (default value) 01: field sequence ABAB without interpolation ($\alpha\beta\alpha\beta$) 10: Schröder algorithm ($\alpha\beta\alpha\beta$) 11: Hentschel algorithm ($\alpha\beta\alpha\beta$)
D1..D0	INTMODCL	chrominance interpolation mode, low degree of motion 00: field sequence AABB without interpolation ($\alpha\alpha\beta\beta$) (default value) 01: field sequence AABB without interpolation ($\alpha\beta\alpha\beta$) 10: field sequence ABAB without interpolation ($\alpha\beta\alpha\beta$) 11: linear interpolation ($\alpha\beta\alpha\beta$)

Subaddress 03		
Bit	**Name**	**Function**
D7..D6	RDMODE	read mode 00: both inputs are used (interpolation enabled if ZM = 0) (default value) 01: only input A is used (without interpolation) 10: only input B is used (without interpolation) 11: Reserved
D3..D2	INTMODLM	luminance interpolation mode, medium degree of motion 00: field sequence AABB without interpolation (αααββ) (default value) 01: field sequence ABAB without interpolation (αβαβ) 10: Schröder algorithm (αβαβ) 11: Hentschel algorithm (αβαβ)
D1..D0	INTMODCM	chrominance interpolation mode, medium degree of motion 00: field sequence AABB without interpolation (αααββ) (default value) 01: field sequence AABB without interpolation (αβαβ) 10: field sequence ABAB without interpolation (αβαβ) 11: linear interpolation (αβαβ)

Subaddress 04		
Bit	**Name**	**Function**
D7..D6	EDCONST	edge detector gain factor 00: 2 01: 3 (default value) 10: 4 11: 5
D3..D2	INTMODLH	luminance interpolation mode, high degree of motion 00: field sequence AABB without interpolation ($\alpha\alpha\beta\beta$) (default value) 01: field sequence ABAB without interpolation ($\alpha\beta\alpha\beta$) 10: Schröder algorithm ($\alpha\beta\alpha\beta$) 11: Hentschel algorithm ($\alpha\beta\alpha\beta$)
D1..D0	INTMODCH	chrominance interpolation mode, high low degree of motion 00: field sequence AABB without interpolation ($\alpha\alpha\beta\beta$) (default value) 01: field sequence AABB without interpolation ($\alpha\beta\alpha\beta$) 10: field sequence ABAB without interpolation ($\alpha\beta\alpha\beta$) 11: linear interpolation ($\alpha\beta\alpha\beta$)

Subaddress 05		
Bit	**Name**	**Function**
D7..D0	CFHENA0	Hentschel algorithm, 8-bit coefficient a_0 (2's complement) (default value $F4_H$)

Subaddress 06		
Bit	**Name**	**Function**
D7..D0	CFHENA1	Hentschel algorithm, 8-bit coefficient a_1 (2's complement) (default value 58_H)

Subaddress 07		
Bit	**Name**	**Function**
D7..D0	CFHENB0	Hentschel algorithm, 8-bit coefficient b_0 (2's complement) (default value 20_H)

Subaddress 08		
Bit	**Name**	**Function**
D7..D0	CFSCHA00	Schröder algorithm, 8-bit coefficient a_{00} (2's complement) (default value $F8_H$)

Subaddress 09		
Bit	**Name**	**Function**
D7..D0	CFSCHA10	Schröder algorithm, 8-bit coefficient a_{10} (2's complement) (default value 70_H)

Subaddress 0A		
Bit	**Name**	**Function**
D7..D0	CFSCHA01	Schröder algorithm, 8-bit coefficient a_{01} (2's complement) (default value $E8_H$)

Subaddress 0B		
Bit	**Name**	**Function**
D7..D0	CFSCHA11	Schröder algorithm, 8-bit coefficient a_{11} (2's complement) (default value 50_H)

Subaddress 0C		
Bit	**Name**	**Function**
D7..D0	CFSCHB00	Schröder algorithm, 8-bit coefficient b_{00} (2's complement) (default value 03_H)

Subaddress 0D		
Bit	**Name**	**Function**
D7..D0	CFSCHB10	Schröder algorithm, 8-bit coefficient b_{10} (2's complement) (default value $0D_H$)

Subaddress 0E		
Bit	**Name**	**Function**
D7..D0	CFSCHB01	Schröder algorithm, 8-bit coefficient b_{01} (2's complement) (default value 08_H)

Subaddress 0F		
Bit	**Name**	**Function**
D7..D0	CFSCHB11	Schröder algorithm, 8-bit coefficient b_{11} (2's complement) (default value 28_H)

Subaddress 10		
Bit	**Name**	**Function**
D7..D6	MDTHL2	threshold for low degree of motion (small blocks) 00: 0 01: 64 10: 128 (default value) 11: 192
D5..D4	MDTHL1	threshold for low degree of motion (large blocks) 00: 0 01: 64 10: 128 (default value) 11: 192
D2..D0	MDBLTH	threshold in front of the blocking module 000: 4 001: 8 : : 111: 32 (default value 101)

Subaddress 11		
Bit	**Name**	**Function**
D7..D6	MDTHU2	threshold for high degree of motion (small blocks) 00: 384 01: 512 (default value) 10: 640 11: 768
D5..D4	MDTHU1	threshold for high degree of motion (large blocks) 00: 384 01: 512 (default value) 10: 640 11: 768
D3..D2	MDTHM2	threshold for second field difference (small blocks) 00: 64 01: 128 (default value) 10: 192 11: 256
D1..D0	MDTHM1	threshold for second field difference (large blocks) 00: 64 01: 128 (default value) 10: 192 11: 256

Subaddress 12		
Bit	**Name**	**Function**
D5..D0	HYTHL1	hysteresis threshold, low degree of motion (large blocks) 000000: 1 000001: 1 000010: 2 : 111111: 63 (default value 001010)

Subaddress 13		
Bit	**Name**	**Function**
D5..D0	HYTHL2	hysteresis threshold, low degree of motion (small blocks) 000000: 1 000001: 1 000010: 2 : 111111: 63 (default value 011000)

Subaddress 14		
Bit	**Name**	**Function**
D5..D0	HYTHH1	hysteresis threshold, high degree of motion (large blocks) 000000: 1 000001: 1 000010: 2 : 111111: 63 (default value 000101)

Subaddress 15		
Bit	**Name**	**Function**
D5..D0	HYTHH2	hysteresis threshold, high degree of motion (small blocks) 000000: 1 000001: 1 000010: 2 : 111111: 63 (default value 000011)

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Remark
		min.	max.		
Operating temperature	T_A	0	70	˚C	
Storage temperature	T_{stg}	– 65	125	˚C	
Junction temperature	T_j		125	˚C	
Soldering temperature	T_S		260	˚C	
Soldering time	t_S		10	s	
Input voltage	V_I	– 0.3 V	V_{DD} + 0.3 V	V	V_{CC} respectively
Output voltage	V_Q	– 0.3 V	V_{DD} + 0.3 V	V	V_{CC} respectively
Supply voltages	V_S	– 0.3	6	V	
Supply voltage Differentials	V	– 0.25	0.25	V	between any internally non-connected supply pins of the same kind, see Pin Description
Total power dissipation	P_{tot}		1	W	
ESD protection	ESD	– 2	2	kV	MIL STD 883C method 3015.6, 100 pF, 1500 Ω
Latch-up protection		– 100	100	mA	all inputs/outputs

All voltages listed are referenced to ground (0 V, V_{SS}) except where noted.

Note: Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions or at any other condition beyond those indicated in the operational sections of this specification is not implied.
Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

3.2 Recommended Operating Conditions

Parameter	Symbol	Limit Values			Unit	Test Conditions
		min.	typ.	max.		
Supply voltages	V_{DD} V_{CC}	4.5	5	5.5	V	
Ambient temperature	T_A	0	25	70	˚C	
All TTL Inputs						
High-level input voltage	V_{IH}	2.0 V		V_{DD}	1	
Low-level input voltage	V_{IL}	0		0.8	V	
All TTL outputs						
High-level output voltage	V_{QH}	2.4			V	I_{QH} = – 2.0 mA
Low-level output voltage	V_{QL}			0.4	V	I_{QL} = 3.0 mA
Clock TTL Inputs CLL, SCA, SCAD						
Clock frequency		12	27	30	MHz	
Low time	t_{WL}	10			ns	Rise/fall time ≤ 5 ns
High time	t_{WH}	10			ns	
Rise time	t_{TLH}			5	ns	
Fall time	t_{THL}			5	ns	
SCA - CLL skew time	t_{SK}	0		15	ns	Diagram on page 22
I²C Bus (all values are referred to min(V_{IH}) and max(V_{IL}))						
High-level input voltage	V_{IH}	3 V		V_{DD}	1	
Low-level input voltage	V_{IL}	0		1.5	V	
SCL clock frequency	f_{SCL}	0		400	kHz	
Inactive time before start of transmission	t_{BUF}	1.3			µs	
Set-up time start condition	$t_{SU;STA}$	0.6			µs	
Hold time start condition	$t_{HD;STA}$	0.6			µs	
SCL low time	t_{LOW}	1.3			µ	
SCL high time	t_{HIGH}	0.6			µs	
Set-up time DATA	$t_{SU;DAT}$	100			ns	

3.2 Recommended Operating Conditions (cont'd)

Parameter	Symbol	Limit Values			Unit	Test Conditions
		min.	typ.	max.		
Hold time DATA	$t_{HD;DAT}$	0			µs	
SDA/SCL rise times	t_R			300	ns	f_{SCL} = 400 kHz
SDA/SCL fall times	t_F			300	ns	
Set-up time stop condition	$t_{SU;STO}$	0.6			µs	
Low-level output current	I_{OL}			3	mA	

Note: Under this conditions the functions given in the circuit description are fulfilled. Nominal conditions specify mean values expected over the production spread and are the proposed values for interface and application. If not stated otherwise, nominal values will apply at T_A = 25 ˚C and the nominal supply voltage.

3.3 Characteristics (Assuming Recommended Operating Conditions)

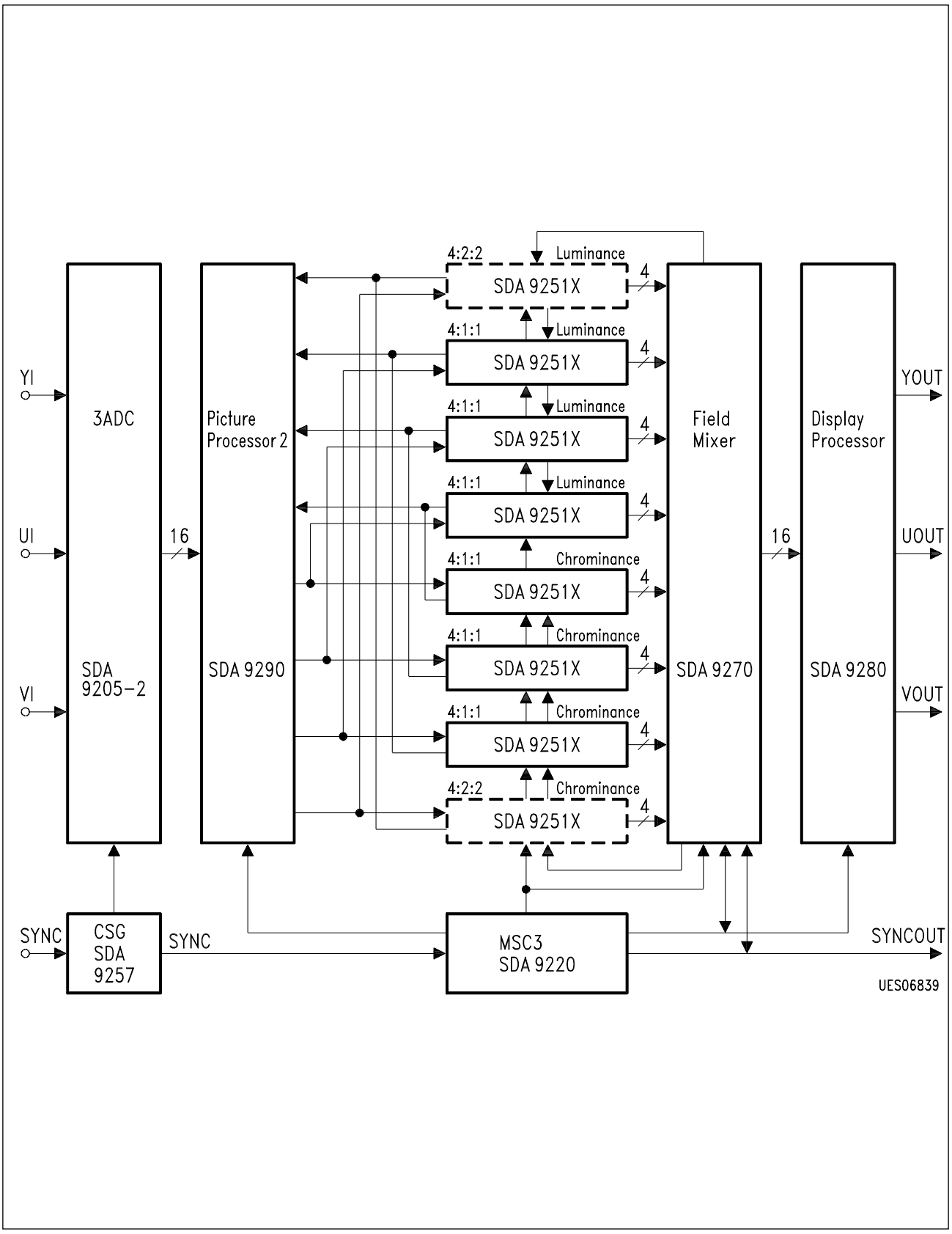
Parameter	Symbol	Limit Values		Unit	Remark
		min.	max.		
Average supply current	I_S		200	mA	All V_{CC} and V_{DD} pins
All Digital Inputs (including I/O inputs)					
Input capacitance	C_I		10	pF	Not tested; max. 7 pF for SCA, CLL
Input leakage current	I_I	– 10	10	µA	
TTL Inputs: YA, YB, UVA, UVB (referenced to SCA)					
Set-up time	t_{SU}	7		ns	
Input hold time	t_{IH}	6		ns	
TTL Inputs: REN, SACIN, SARIN (referenced to SCAD)					
Set-up time	t_{SU}	7		ns	
Input hold time	t_{IH}	6		ns	
TTL Inputs: BLN, BLN2, VS1, VS2, ZM (referenced to CLL) Note: For BLN a jitter of ± 1 CLL is allowed					
Set-up time	t_{SU}	7		ns	
Input hold time	t_{IH}	6		ns	
TTL Outputs: YQ, UVQ (referenced to CLL)					
Hold time	t_{QH}	6		ns	
Delay time	t_{QD}		25	ns	C_L = 30 pF
TTL Outputs: VS3, BLN3 (referenced to CLL)					
Hold time	t_{QH}	6		ns	
Delay time	t_{QD}		25	ns	C_L = 30 pF
TTL Outputs: RENA, RENB, SACQ, SARQ (referenced to SCAD)					
Hold time	t_{QH}	6		ns	
Delay time	t_{QD}		20	ns	C_L = 50 pF

3.3 Characteristics (Assuming Recommended Operating Conditions) (cont'd)

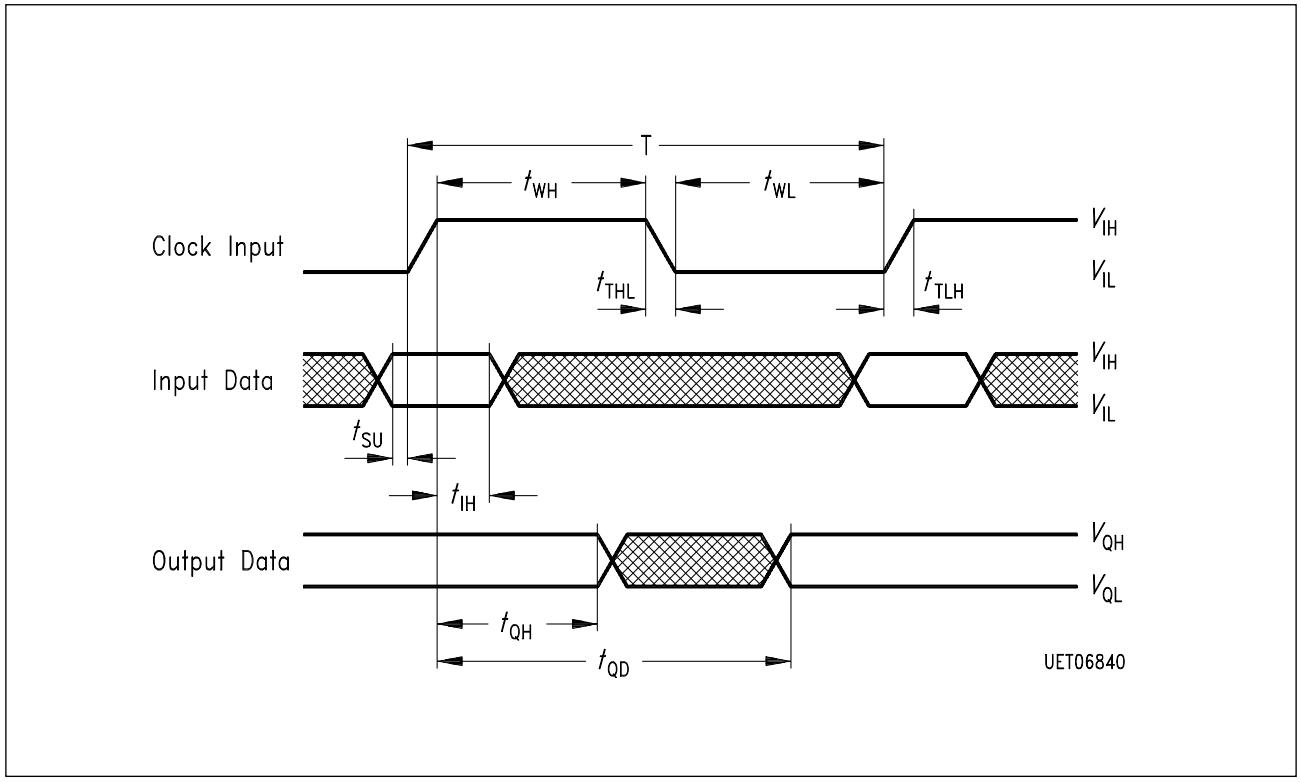
Parameter	Symbol	Limit Values		Unit	Remark
		min.	max.		
TTL Outputs: OEBA, OEBB (referenced to SCAD)					
Hold time	t_{QH}	6		ns	
Delay time	t_{QD}		20	ns	C_L = 30 pF
Input/Output: SDA (referenced to SCL; Open Drain Output)					
Low-level output voltage	V_{OL}		0.5	V	at I_{OL} = max

Note: The listed characteristics are ensured over the operating range of the integrated circuit.

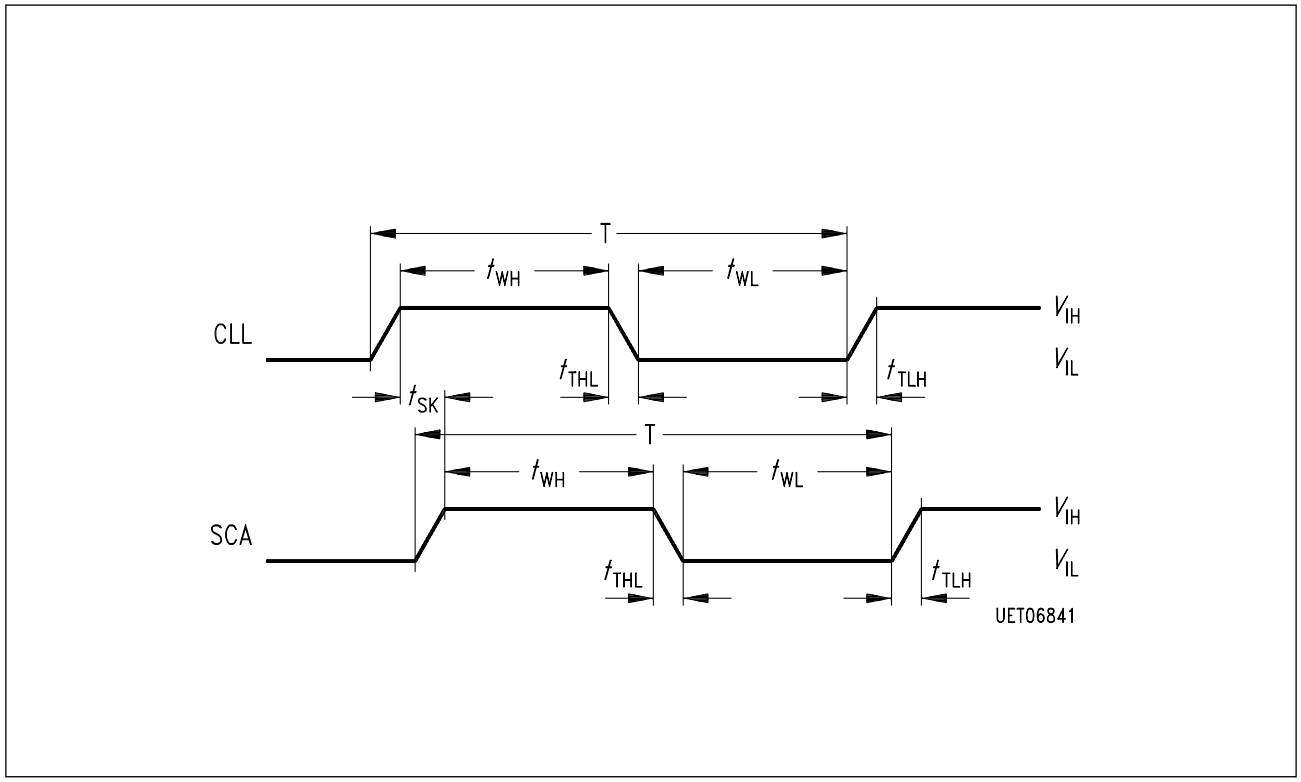
4 Application Information



5 Waveforms



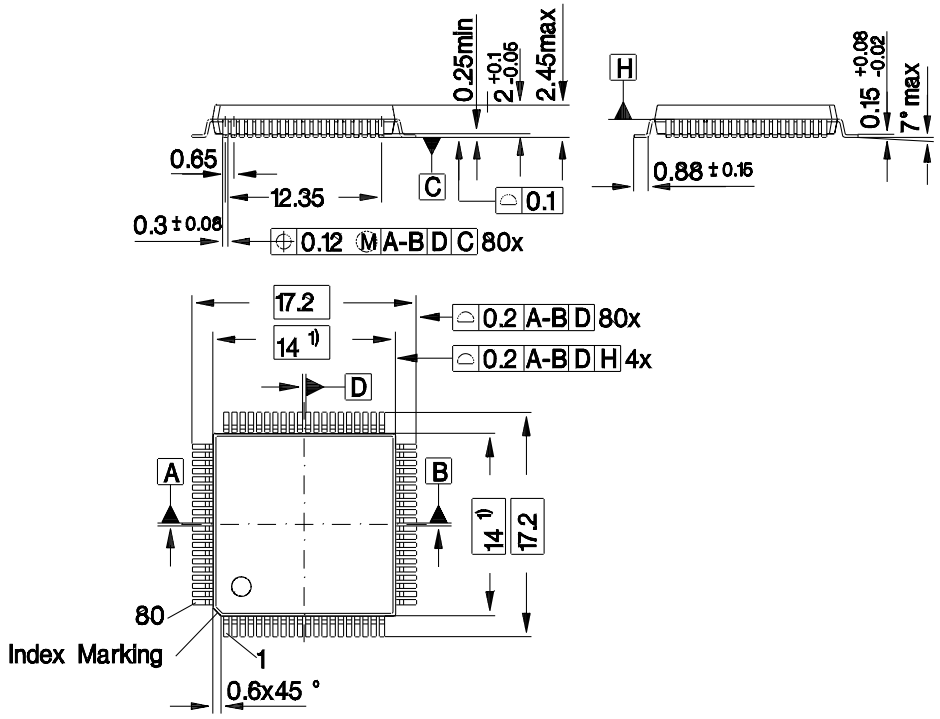
Timing Diagram Data Input/Output Referenced to the Clock



Timing Diagram Clock Skew SCA - CLL

6 Package Outlines

P-MQFP-80-1
(Plastic Metric Quad Flat Package)



Sorts of Packing
Package outlines for tubes, trays etc. are contained in our Data Book “Package Information”.

SMD = Surface Mounted Device

Dimensions in mm