

# SIEMENS

## ICs for Consumer Electronics

### MEGATEXT

Crystal Oscillator

Edition 10.94

<b>MEGATEXT® Crystal Oscillator</b>	
<b>Revision History:                      Original Version 10.94</b>	
Previous Releases:	
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®.

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

© Siemens AG 1994. All Rights Reserved.

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.

Contents	Page
MEGATEXT® Crystal Oscillator Description . . . . .	4
Equivalent Circuit . . . . .	5
Frequency Tolerance . . . . .	6
Example: . . . . .	6
Operation Conditions for Crystal Tests . . . . .	6
Crystal Specification for SDA 5273 . . . . .	8
Crystal Specification for SDA 5273 P, S . . . . .	8

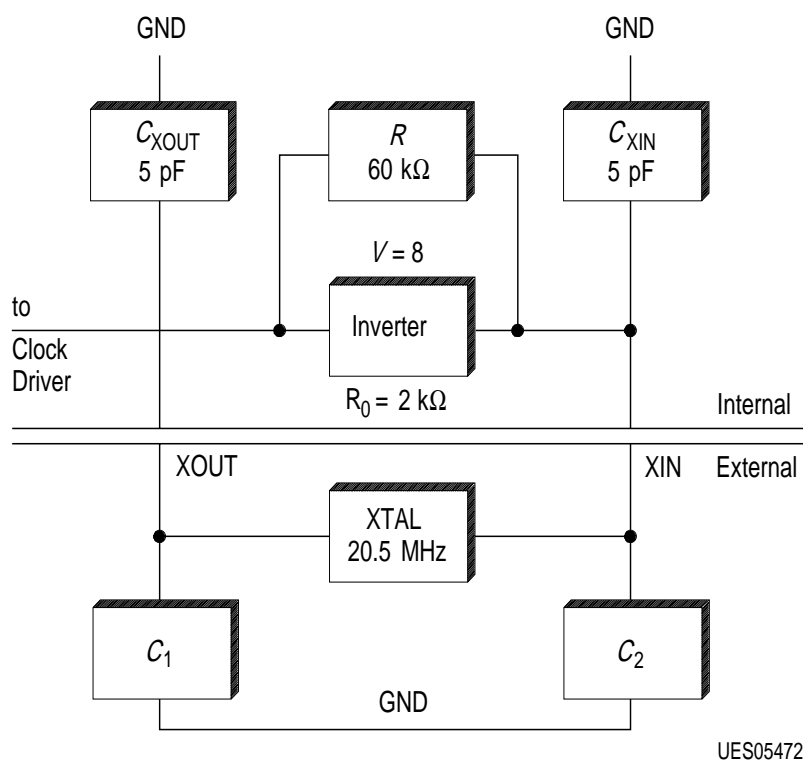
MEGATEXT® and SIESTA® are registered trademarks of Siemens AG.

Purchase of SIEMENS I<sup>2</sup>C components conveys a licence under the Philips' I<sup>2</sup>C patent to use the components in the I<sup>2</sup>C system provided the system conforms to the I<sup>2</sup>C specifications defined by Philips.  
Copyright Philips 1983.

## MEGATEXT® Crystal Oscillator Description

The MEGATEXT crystal oscillator is a 2-pin oscillator for crystals or ceramic resonators which oscillate on their fundamental frequency of 20.48 MHz (not on a harmonic). SDA 5273 P, S has an improved oscillator compared to SDA 5273 with respect to oscillation condition and latch-up sensitivity.

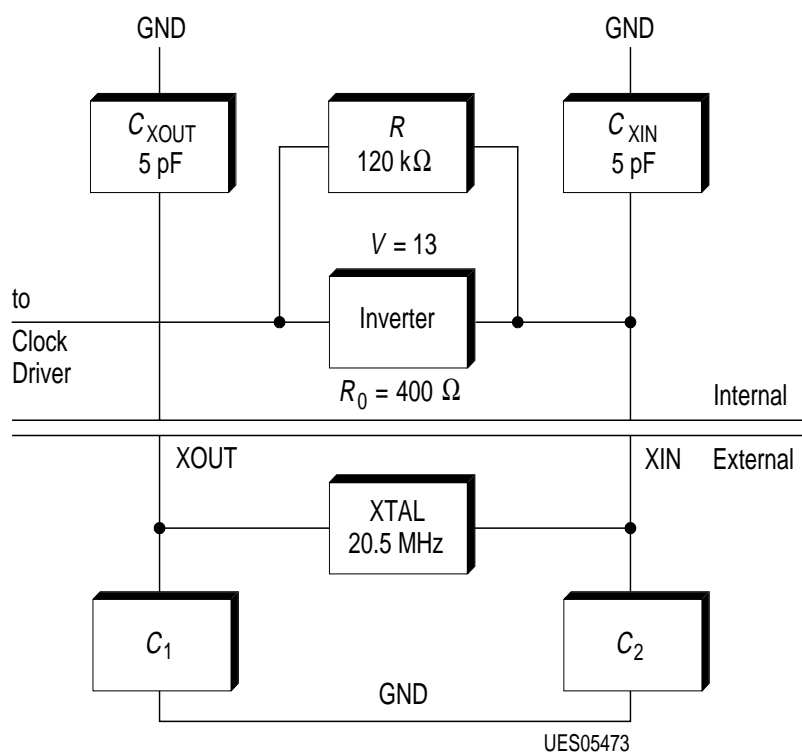
### SDA 5273 XTAL oscillator circuit



### Figure 1

#### SDA 5273 XTAL-Oscillator Circuit

## SDA 5273 P, S XTAL oscillator circuit



**Figure 2**  
**SDA 5273 P, S XTAL-Oscillator Circuit**

### Equivalent Circuit

$X_{IN}$ , $X_{OUT}$ pin capacitance	ca. 7 pF
Small signal gain of inverter	– 8 SDA 5273 – 13 SDA 5273 P, S
3-dB bandwidth	determined by output resistance and capacitive load
Output resistance	2 kΩ SDA 5273 400 Ω SDA 5273 P, S
Internal feedback resistor	60 kΩ SDA 5273 120 kΩ SDA 5273 P, S

### Frequency Tolerance

The specification allows  $\pm 5\%$  frequency deviation. The consequences are explained below. Whether this tolerance is acceptable depends on the IC application.

The freerun frequencies of the display are proportional to the crystal frequency. It depends on the application which precision is required and which maximum drift is allowed.

The centre frequencies of the PLLs are also proportional to the crystal frequency. The PLLs can lock on a frequency range around the centre frequency. Crystal tolerance will reduce the margins for PLL locking.

### Example:

	crystal	$f_h$ lock range
Display-PLL	20.5 MHz	15.625 kHz $\pm 10\%$
Display-PLL	21.0 MHz	16.006 kHz $\pm 10\%$ = 15.625 kHz + 12.7 % / – 7.8 %
CVBS-PLL	20.5 MHz	15.625 kHz $\pm 5.3\%$

### Operation Conditions for Crystal Tests

To operate the crystal oscillator it is necessary to feed all supply pins  $V_{DDD}$ ,  $V_{DDA}$  with 5 V and to connect all pins  $V_{SSD}$ ,  $V_{SSA}$  to ground. If the crystal oscillates a waveform with a period of 0.500  $\mu$ s (2.00 MHz) appears at pin RASQ. The frequency of RASQ is proportional to the crystal frequency, but has a lower limit of app. 1.6 MHz. If the crystal does not work the RASQ period is app. 0.6  $\mu$ s.

SDA 5273 supply pins:

1	$V_{SSA}$	Analog ground
2	$V_{DDA}$	+ 5 V supply
7	$V_{SSA}$	Analog ground
10	$V_{SS}$	0 V digital supply
20	$V_{DD}$	+ 5 V digital supply
25	$V_{DD}$	+ 5 V digital supply
26	$V_{DD}$	+ 5 V digital supply
44	$V_{SS}$	0 V digital supply
45	$V_{SS}$	0 V digital supply
50	$V_{SS}$	0 V digital supply
59	$V_{DD}$	+ 5 V digital supply
60	$V_{DDA}$	+ 5 V analog supply
61	$V_{SSA}$	analog ground
66	$V_{DDA}$	+ 5 V analog supply
12	$V_{BB}$	Substrate bias voltage (app. – 2 V int. generated) connect with block capacitor 100 nF
38	RASQ	Row address strobe (DRAM)
52	XOUT	20.5-MHz crystal oscillator output
53	XIN	20.5-MHz crystal oscillator input

### SDA 5273 S supply pins:

10	$V_{DD1}$	+ 5 V digital supply
11	$V_{DDA}$	+ 5 V analog supply
12	$V_{SSA1}$	analog ground
13	$V_{DD2}$	+ 5 V digital supply
15	$V_{DD3}$	+ 5 V digital supply
17	$V_{DD4}$	+ 5 V digital supply
36	$V_{SS4}$	0 V digital supply
38	$V_{SS3}$	0 V digital supply
39	$V_{SS2}$	0 V digital supply
40	$V_{BB}$	substrate bias voltage
41	$V_{SSA2}$	analog ground
43	$V_{SS1}$	0 V digital supply
40	$V_{BB}$	Substrate bias voltage (app. – 2 V int. generated) connect with block capacitor 100 nF
30	RASQ	Row address strobe (DRAM)
5	XOUT	20.5-MHz crystal oscillator output
6	XIN	20.5-MHz crystal oscillator input

### SDA 5273 P supply pins:

11	$V_{DD1}$	+ 5 V digital supply
12	$V_{DDA}$	+ 5 V analog supply
13	$V_{SSA1}$	analog ground
16	$V_{DD2}$	+ 5 V digital supply
21	$V_{DD3}$	+ 5 V digital supply
25	$V_{DD4}$	+ 5 V digital supply
44	$V_{SS4}$	0 V digital supply
49	$V_{SS3}$	0 V digital supply
55	$V_{SS2}$	0 V digital supply
58	$V_{SSA2}$	analog ground
60	$V_{SS1}$	0 V digital supply
56	$V_{BB}$	Substrate bias voltage (app. – 2 V int. generated) connect with block capacitor 100 nF
38	RASQ	Row address strobe (DRAM)
6	XOUT	20.5-MHz crystal oscillator output
7	XIN	20.5-MHz crystal oscillator input

### Crystal Specification for SDA 5273

Basis for specification:	simulation of open loop gain typical value: 3.4
Criterion:	open loop gain greater 1 for 360 degrees phaseshift under worst case conditions
Accuracy:	1000 ppm !!!! (depends on application)
Load capacitance:	11 pF
Crystal impedance:	20 $\Omega$ maximum
Peripheral capacitors	$C_1 = C_2 = 15$ pF symmetric to avoid voltage clipping at pin XIN

#### Experimental results

showed no problems with typical MEGATEXT devices in a supply voltage range from 2 V to 6 V and with a crystal impedance of up to 100  $\Omega$ .

### Crystal Specification for SDA 5273 P, S

Basis for specification:	simulation of open loop gain
Criterion:	open loop gain greater 1 for 360 degrees phaseshift under worst case conditions
Accuracy:	1000 ppm !!!! (depends on application)
Load capacitance:	11 pF
Crystal impedance:	40 $\Omega$ maximum
Peripheral capacitors	$C_1 = C_2 = 15$ pF symmetric to avoid voltage clipping at pin XIN

#### Experimental results

showed no problems with typical MEGATEXT devices in a supply voltage range from 2 V to 6 V and with a crystal impedance of up to 100  $\Omega$ .