

CHARACTERISTICS (continued)

|                                  | V <sub>DD</sub><br>V | symbol                            | min. | typ. | max. | conditions |
|----------------------------------|----------------------|-----------------------------------|------|------|------|------------|
| Oscillator frequency<br>ORZ, OSC | 5                    | f                                 | 3    | 4    | 4.1  | MHz        |
| Duty factor                      | 5                    | δ                                 | 0.4  | 0.5  | 0.6  |            |
| Switching times<br>see Fig. 5    | 5                    | t <sub>R</sub>                    | 1    | —    | 4    | ms         |
|                                  | 5                    | t <sub>d1</sub> , t <sub>d2</sub> | —    | —    | 20   | μs         |
|                                  | 5                    | t <sub>d3</sub>                   | —    | —    | 5    | μs         |
|                                  | 5                    | t <sub>A</sub>                    | 0    | —    | —    | μs         |
|                                  | 5                    | t <sub>SL</sub> , t <sub>W</sub>  | 5    | —    | —    | μs         |
|                                  | 5                    | t <sub>H</sub> , t <sub>L</sub>   | —    | —    | —    | μs         |
| Input rise/fall times            | 5                    | t <sub>r</sub> , t <sub>f</sub>   | —    | —    | 50   | ns         |
| Input ORZ                        | 5                    | t <sub>r</sub> , t <sub>f</sub>   | —    | —    | 1    | μs         |
| All other inputs                 | 5                    | t <sub>r</sub> , t <sub>f</sub>   | —    | —    | 1    | μs         |

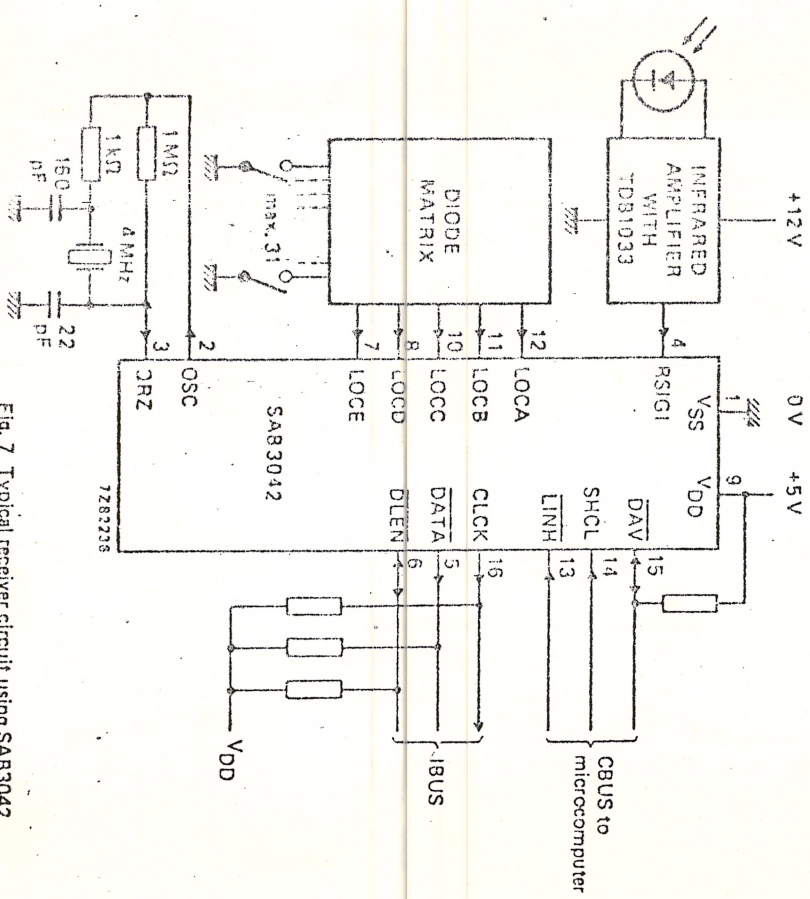


Fig. 7 Typical receiver circuit using SAB3042.

UNREVIEWED SAMPLE DATA  
This information is derived from development samples made available for evaluation. It does not form part of our data handbook system and does not necessarily apply to the device will go into production.

INFRARED DECODER, MICROCOMPUTER COMPATIBLE

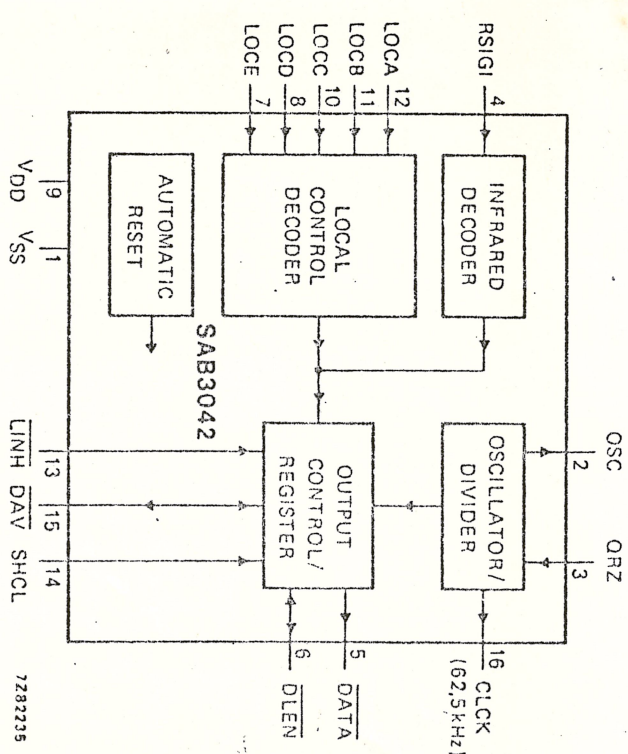


Fig. 1 Block diagram.

Features

- Remote control receiver for 128 commands to be used in combination with the remote transmitter SAB3011 in microcomputer controlled tuning concepts.
- High security against interferences by word format checking and double word testing, also in case of a simultaneous infrared sound transmission.
- Asynchronous serial command output to the microcomputer with processing of acknowledgement signals produced by the microcomputer.
- Relieving the microcomputer of real time processing, e.g. incoming signals are permanently checked with the command format validity and freedom from interferences.
- Separate inputs for local operation (up to 31 commands); mask-programmable.
- Only three terminals of the microcomputer are necessary for the control part of the television receiver.
- Internal clock oscillator.

QUICK REFERENCE DATA

|                                                                 |                              |
|-----------------------------------------------------------------|------------------------------|
| Supply voltage                                                  | V <sub>DD</sub> typ. 5 V     |
| Operating ambient temperature range                             | T <sub>amb</sub> 0 to +70 °C |
| Oscillator frequency                                            | f <sub>ORZ</sub> typ. 4 MHz  |
| Supply current; V <sub>DD</sub> = 5 V; T <sub>amb</sub> = 25 °C | I <sub>DD</sub> typ. 20 mA   |

PACKAGE OUTLINE

16-lead DIL, plastic (SOT-38Z).

GENERAL DESCRIPTION

The SAB3042 decodes the pulse code modulated signals from the remote transmitter SAB3011. Correct reception of two command words activates the IBUS outputs DLEN and DATA, as well as the CBUS signals DAV, LINH and SHCL. The IBUS outputs can be used for driving systems which are accessible via this type of interface, e.g. Teletext and Videodata. The CBUS output data can be used for control of a microcomputer. For local operation, 5 inputs are available (LOCA to LOCE), via which up to 31 commands can be loaded into the command register.

OPERATION DESCRIPTION

Remote control signal input (RSIGI)

The signals from the remote control transmitter are applied to the RSIGI input, where they are checked and decoded. The instruction bus (IBUS) is then enabled and an output operation takes place. The microcomputer is also warned via DAV, that a message is waiting. The response time is about 110 ms.

The following tests are carried out for each signal:

- Control of pulse distance for logic 0 or 1 and word separation.
- Comparison of two successive transmitted words.
- Detection of noise between the signals.

Signals which do not come within the zero or one 'window', restart the timing procedure. The commands are transmitted as 7-bit words (1 start bit, 6 data bits).

Local keyboard inputs (LOCA, LOCB, LOCC, LOCD and LOCE)

The SAB3042 has 5 keyboard inputs for local control. The coding of the commands is initiated via an external diode matrix; up to 31 commands (see Table 1) for local control are possible. The selection of these commands (31 out of 64 available) are stored in a mask-programmable ROM (according to the wishes of the customer).

The inputs are drawn internally to  $V_{DD}$ , if the keys are not used.

The response time is 32 ms for local commands.

A local command overrides a remote control command at input RSIGI. The current output data at the IBUS or the CBUS will, however, be completed. For waveforms see Fig. 2.

IBUS outputs (DATA, DLEN)

Correctly received commands are available for the duration of a key operation as a single command or as repeated commands, in accordance with the sub-system requirements (see Table 1). The following output modes are provided:

- Single command; e.g. digits; instruction class 'S'.
- Repetition rate: 2/second; e.g. step function; instruction class 'R2'.
- Repetition rate: 8/second; e.g. analogue functions; instruction class 'R8'.

The IBUS command is available at output DATA synchronous with the system clock; the word length is 7 bits, one start bit and 6 data bits (see Fig. 3).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

|                                     |           |                |
|-------------------------------------|-----------|----------------|
| Supply voltage range                | $V_{DD}$  | -0,3 to +7,5 V |
| Input voltage range                 | $V_I$     | -0,3 to +15 V  |
| Input current                       | $\pm I_I$ | max. 10 mA     |
| Output current                      | $\pm I_Q$ | max. 10 mA     |
| Power dissipation per output        | $P_Q$     | max. 50 mW     |
| Total power dissipation per package | $P_{Tot}$ | max. 800 mW    |
| Operating ambient temperature range | $T_{amb}$ | 0 to +70 °C    |
| Storage temperature range           | $T_{stg}$ | -55 to +150 °C |

CHARACTERISTICS

$V_{SS} = 0$ ;  $T_{amb} = 0$  to +70 °C; unless otherwise specified

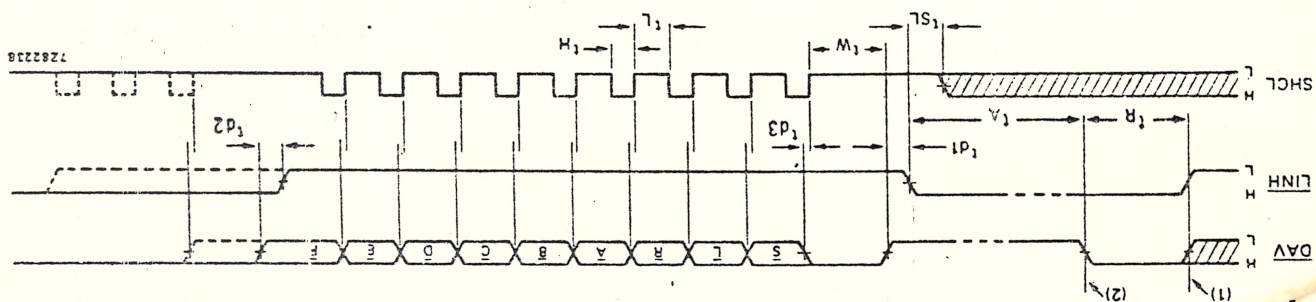
|                                                            | $V_{DD}$<br>V | symbol    | min.            | typ. | max. | conditions                                                                 |
|------------------------------------------------------------|---------------|-----------|-----------------|------|------|----------------------------------------------------------------------------|
| Supply voltage                                             | -             | $V_{DD}$  | 4,5             | 5,0  | 5,5  | V                                                                          |
| Supply current                                             | 5             | $I_{DD}$  | -               | -    | 25   | mA                                                                         |
| Inputs RSIGI, LINH, QZ, LOCA to LOCE                       |               |           |                 |      |      |                                                                            |
| Input voltage LOW                                          | 5             | $V_{IL}$  | -0,3            | -    | 1,2  | V                                                                          |
| Input voltage HIGH                                         | 5             | $V_{IH}$  | 2,0             | -    | 15   | V                                                                          |
| Input leakage current                                      | 5             | $I_{IR}$  | -               | -    | 1    | $\mu A$                                                                    |
| Input current LOW LOCA to LOCE                             | 5             | $-I_{IL}$ | 10              | -    | 100  | $\mu A$                                                                    |
| Outputs <u>DATA</u> , <u>DAV</u> , <u>OSC</u> (open drain) |               |           |                 |      |      |                                                                            |
| Output leakage current                                     | 5             | $I_{QR}$  | -               | -    | 20   | $\mu A$                                                                    |
| Output voltage LOW <u>DATA</u> , <u>DAV</u> , <u>OSC</u>   | 5             | $V_{QL}$  | -               | -    | 1    | V                                                                          |
| Input/output <u>DLEN</u> (open drain)                      | 5             | $V_{QL}$  | -               | -    | 0,4  | V                                                                          |
| Input values                                               | -             | -         | see RSIGI       | -    | -    | $-I_Q = 1$ mA<br>$-I_Q = 1,6$ mA<br>internal high-ohmic pull-up transistor |
| Output values                                              | -             | -         | see <u>DATA</u> | -    | -    |                                                                            |
| Input current LOW                                          | 5             | $-I_{IL}$ | 10              | -    | 100  | $\mu A$                                                                    |
| Input/output <u>CLK</u>                                    |               |           |                 |      |      | $V_I = 0$                                                                  |
| Input values                                               | -             | -         | see RSIGI       | -    | -    |                                                                            |
| Input current LOW                                          | 5             | $-I_{IL}$ | 10              | -    | 100  | $\mu A$                                                                    |
| Output voltage LOW                                         | 5             | $V_{QL}$  | -               | -    | 1    | V                                                                          |
| Output leakage current                                     | 5             | $I_{QR}$  | -               | -    | 20   | $\mu A$                                                                    |

DEVELOPMENT SAMPLE DATA

Table 1. Specifications of the IBUS/CBUS code (continued on next page)

| RSIG/<br>IBUS<br>code<br>no. | local control inputs * |      |      |      |      |   | DATA/DAV<br>output code |   |   |   |   |   |    |  | IBUS<br>instr.<br>class<br>** |
|------------------------------|------------------------|------|------|------|------|---|-------------------------|---|---|---|---|---|----|--|-------------------------------|
|                              | LOCE                   | LOCD | LOCC | LOCB | LOCA | S | F                       | E | D | C | B | A |    |  |                               |
| 0                            | 1                      | 1    | 0    | 0    | 0    | 0 | 0                       | 0 | 0 | 0 | 0 | 0 | S  |  |                               |
| 1                            | 0                      | 0    | 0    | 0    | 1    | 0 | 0                       | 0 | 0 | 0 | 0 | 1 | S  |  |                               |
| 2                            | 1                      | 1    | 1    | 1    | 0    | 0 | 0                       | 0 | 0 | 0 | 1 | 0 | S  |  |                               |
| 3                            | 1                      | 1    | 1    | 0    | 1    | 0 | 0                       | 0 | 0 | 0 | 1 | 1 | S  |  |                               |
| 4                            | 0                      | 0    | 0    | 1    | 0    | 0 | 0                       | 0 | 1 | 0 | 0 | 0 | R8 |  |                               |
| 5                            | 1                      | 1    | 0    | 1    | 1    | 0 | 0                       | 0 | 0 | 1 | 0 | 1 | S  |  |                               |
| 6                            |                        |      |      |      |      | 0 | 0                       | 0 | 0 | 1 | 1 | 0 | S  |  |                               |
| 7                            |                        |      |      |      |      | 0 | 0                       | 0 | 0 | 1 | 1 | 1 | S  |  |                               |
| 8                            |                        |      |      |      |      | 0 | 0                       | 0 | 1 | 0 | 0 | 0 | R8 |  |                               |
| 9                            |                        |      |      |      |      | 0 | 0                       | 0 | 1 | 0 | 0 | 1 | R8 |  |                               |
| 10                           |                        |      |      |      |      | 0 | 0                       | 0 | 1 | 0 | 1 | 0 | R8 |  |                               |
| 11                           | 0                      | 0    | 1    | 0    | 0    | 0 | 0                       | 0 | 1 | 0 | 1 | 1 | R8 |  |                               |
| 12                           |                        | 0    |      |      |      | 0 | 0                       | 0 | 1 | 1 | 0 | 0 | R8 |  |                               |
| 13                           |                        |      |      |      |      | 0 | 0                       | 0 | 1 | 1 | 0 | 1 | R8 |  |                               |
| 14                           |                        |      |      |      |      | 0 | 0                       | 0 | 1 | 1 | 1 | 0 | R8 |  |                               |
| 15                           | 0                      | 1    | 0    | 0    | 0    | 0 | 0                       | 0 | 1 | 1 | 1 | 1 | R8 |  |                               |
| 16                           | 0                      | 0    | 0    | 1    | 1    | 0 | 0                       | 1 | 0 | 0 | 0 | 0 | S  |  |                               |
| 17                           | 1                      | 0    | 1    | 1    | 1    | 0 | 0                       | 1 | 0 | 0 | 0 | 1 | S  |  |                               |
| 18                           | 0                      | 0    | 1    | 0    | 1    | 0 | 0                       | 1 | 0 | 0 | 1 | 0 | S  |  |                               |
| 19                           | 0                      | 0    | 1    | 1    | 0    | 0 | 0                       | 1 | 0 | 0 | 1 | 1 | S  |  |                               |
| 20                           | 0                      | 1    | 0    | 0    | 1    | 0 | 0                       | 1 | 0 | 1 | 0 | 0 | S  |  |                               |
| 21                           | 0                      | 1    | 0    | 1    | 0    | 0 | 0                       | 1 | 0 | 1 | 0 | 1 | S  |  |                               |
| 22                           | 0                      | 1    | 1    | 0    | 0    | 0 | 0                       | 1 | 0 | 1 | 1 | 0 | S  |  |                               |
| 23                           | 1                      | 0    | 0    | 0    | 1    | 0 | 0                       | 1 | 0 | 1 | 1 | 1 | S  |  |                               |
| 24                           | 1                      | 0    | 0    | 1    | 0    | 0 | 0                       | 1 | 1 | 0 | 0 | 0 | S  |  |                               |
| 25                           | 1                      | 0    | 1    | 0    | 0    | 0 | 0                       | 1 | 1 | 0 | 0 | 1 | S  |  |                               |
| 26                           | 0                      | 1    | 1    | 1    | 0    | 0 | 0                       | 1 | 1 | 0 | 1 | 0 | S  |  |                               |
| 27                           | 0                      | 1    | 1    | 1    | 0    | 0 | 0                       | 1 | 1 | 0 | 1 | 1 | S  |  |                               |
| 28                           |                        |      |      |      |      | 0 | 0                       | 1 | 1 | 1 | 0 | 1 | S  |  |                               |
| 29                           | 0                      | 1    | 0    | 1    | 1    | 0 | 0                       | 1 | 1 | 1 | 0 | 1 | S  |  |                               |
| 30                           |                        |      |      |      |      | 0 | 0                       | 1 | 1 | 1 | 1 | 0 | S  |  |                               |
| 31                           |                        |      |      |      |      | 0 | 0                       | 1 | 1 | 1 | 1 | 1 | S  |  |                               |

## DEVELOPMENT SAMPLE DATA



(1) CBUS is occupied by previous transmission.  
(2) Start of a new CBUS transmission by a HIGH-to-LOW transition at output DAV.

Fig. 5 Waveforms showing CBUS output signals.

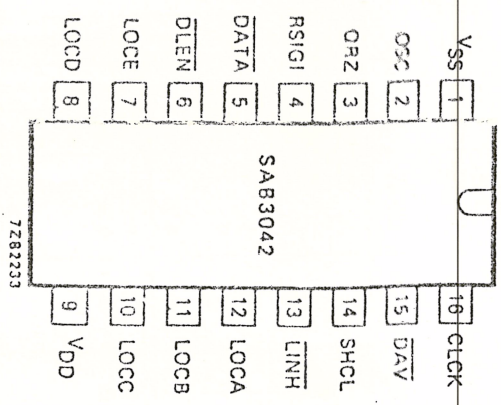


Fig. 6 Pinning diagram.

| PINNING |       |
|---------|-------|
| 1       | VSS   |
| 9       | VDD   |
| 4       | RSIGI |
| 12      | LOCA  |
| 11      | LOCB  |
| 10      | LOCC  |
| 8       | LOCD  |
| 7       | LOCE  |
| 6       | DLEN  |
| 5       | DATA  |
| 16      | CLK   |
| 14      | SHCL  |
| 15      | DAV   |
| 13      | LINH  |
| 3       | QNZ   |
| 2       | OSC   |

negative supply (0 V)  
positive supply  
data input; remote control  
local keyboard inputs (5-bits)  
data line enable input/output  
data output  
clock output (62.5 kHz)  
asynchronous clock burst  
data output  
control signal  
oscillator input  
oscillator output

CBUS  
IBUS

DEVELOPMENT SAMPLE DATA

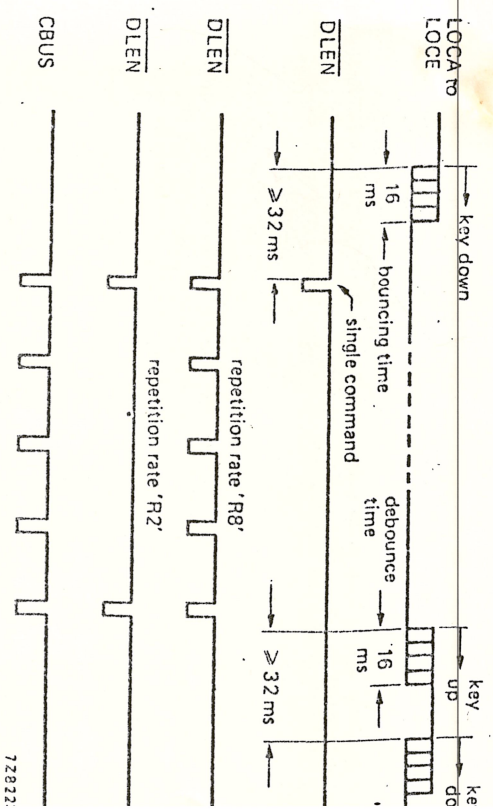


Fig. 2 Relationship between key operation and command output.

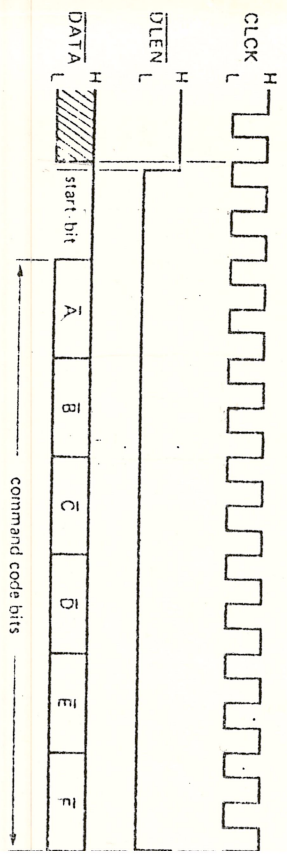


Fig. 3 Output waveforms of a command transmission.

Data output; e.g. request at the CBUS interface

Inputs/outputs (DAV, LINH, SHCL)

The CBUS inputs/outputs are assigned for the asynchronous request of a command by external units. The commands activate the CBUS with a repetition rate of 8/second during a key operation. The receiving of a command will be indicated by setting the DAV signal to LOW (see Fig. 5). The output will be delayed in case of an occupied BUS (DAV = LOW or LINH = LOW). Inout DAV is an input for this control. If the external unit recognizes DAV = LOW the request for information is started by setting LINH to LOW. The SAB3042 indicates the reception LINH = LOW by setting DAV to HIGH. The data word can be shifted out after a certain hold time by a series of clock pulses, the frequency of which can be chosen in a wide range. The SAB3042 generates DAV = HIGH by applying further clock pulses, after the data word is shifted out. The request will be terminated by setting LINH = HIGH, also in case the data word is not completely shifted out.

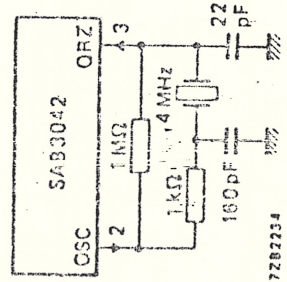
A new incoming command can override an enclosed command for as long as the request is not yet started (LINH = HIGH). A command, which is overruled, is lost. A stored command cannot be overruled when LINH is set LOW.

The following information is shifted out at the CBUS in addition to the 7-bit information of the remote transmitter (start bit S and data bits A to F).

L-bit: this bit indicates, whether the command has been initiated by the local control inputs LOCA to LOCE (L = HIGH), or by the remote control (L = LOW).

R-bit: this bit indicates, whether the previous command is still applied without interruption of the key operation. R is LOW in case the command is on the CBUS output for the first time; R is HIGH for all following commands. The R-bit enables the external system to execute commands as single commands or repeated commands.

Oscillator inputs (OSC, ORZ)



The system clock frequency of 62.5 kHz is generated internally from a 4 MHz quartz crystal oscillator. The terminals ORZ and OSC are the input/output of the 4 MHz oscillator. An external oscillator signal of 4 MHz can be applied to terminal ORZ.

Fig. 4 Application advice for the oscillator.

Reset

The circuit generates a reset signal internally. A reset-cycle with a duration of two clock cycles is automatically initiated after switching on the supply. The IBUS outputs DATA, DLEN and the CBUS output DAV are then HIGH.

DEVELOPMENT SAMPLE DATA

| RSIGI/<br>IBUS<br>code<br>no. | local control inputs * |      |      |      |      |   | DATA/DAV<br>output code |   |   |   |   |   |    | IBUS<br>instr.<br>class<br>** |
|-------------------------------|------------------------|------|------|------|------|---|-------------------------|---|---|---|---|---|----|-------------------------------|
|                               | LOCE                   | LOCD | LOCC | LOCB | LOCA | S | F                       | E | D | C | B | A |    |                               |
| 32                            |                        |      |      |      |      | 0 | 1                       | 0 | 0 | 0 | 0 | 0 | S  |                               |
| 33                            | 0                      | 0    | 1    | 1    | 1    | 0 | 1                       | 0 | 0 | 0 | 0 | 0 | S  |                               |
| 34                            | 1                      | 0    | 0    | 1    | 1    | 0 | 1                       | 0 | 0 | 0 | 1 | 0 | S  |                               |
| 35                            |                        |      |      |      |      | 0 | 1                       | 0 | 0 | 0 | 1 | 1 | S  |                               |
| 36                            | 1                      | 0    | 1    | 0    | 1    | 0 | 1                       | 0 | 0 | 1 | 0 | 0 | R2 |                               |
| 37                            | 1                      | 0    | 1    | 1    | 0    | 0 | 1                       | 0 | 0 | 1 | 0 | 1 | R2 |                               |
| 38                            |                        |      |      |      |      | 0 | 1                       | 0 | 0 | 1 | 1 | 0 | R2 |                               |
| 39                            | 1                      | 1    | 1    | 0    | 0    | 0 | 1                       | 0 | 0 | 1 | 1 | 1 | R2 |                               |
| 40                            | 1                      | 1    | 0    | 0    | 1    | 0 | 1                       | 0 | 1 | 0 | 0 | 0 | R8 |                               |
| 41                            | 1                      | 1    | 0    | 1    | 0    | 0 | 1                       | 0 | 1 | 0 | 0 | 1 | R8 |                               |
| 42                            |                        |      |      |      |      | 0 | 1                       | 0 | 1 | 0 | 1 | 0 | R8 |                               |
| 43                            |                        |      |      |      |      | 0 | 1                       | 0 | 1 | 0 | 1 | 1 | R8 |                               |
| 44                            |                        |      |      |      |      | 0 | 1                       | 0 | 1 | 1 | 0 | 0 | R8 |                               |
| 45                            |                        |      |      |      |      | 0 | 1                       | 0 | 1 | 1 | 0 | 1 | R8 |                               |
| 46                            |                        |      |      |      |      | 0 | 1                       | 0 | 1 | 1 | 1 | 1 | R8 |                               |
| 47                            |                        |      |      |      |      | 0 | 1                       | 0 | 1 | 1 | 1 | 1 | R8 |                               |
| 48                            |                        |      |      |      |      | 0 | 1                       | 1 | 0 | 0 | 0 | 0 | S  |                               |
| 49                            |                        |      |      |      |      | 0 | 1                       | 1 | 0 | 0 | 1 | 0 | S  |                               |
| 50                            | 0                      | 1    | 1    | 1    | 1    | 0 | 1                       | 1 | 0 | 0 | 1 | 0 | S  |                               |
| 51                            |                        |      |      |      |      | 0 | 1                       | 1 | 0 | 0 | 1 | 1 | S  |                               |
| 52                            |                        |      |      |      |      | 0 | 1                       | 1 | 0 | 1 | 0 | 0 | R8 |                               |
| 53                            |                        |      |      |      |      | 0 | 1                       | 1 | 0 | 1 | 0 | 1 | R8 |                               |
| 54                            |                        |      |      |      |      | 0 | 1                       | 1 | 0 | 1 | 1 | 0 | R8 |                               |
| 55                            |                        |      |      |      |      | 0 | 1                       | 1 | 0 | 1 | 1 | 1 | R8 |                               |
| 56                            | 1                      | 0    | 0    | 0    | 0    | 0 | 1                       | 1 | 1 | 0 | 0 | 0 | R8 |                               |
| 57                            | 0                      | 0    | 0    | 0    | 0    | 0 | 1                       | 1 | 1 | 0 | 0 | 1 | R8 |                               |
| 58                            |                        |      |      |      |      | 0 | 1                       | 1 | 1 | 0 | 0 | 1 | R8 |                               |
| 59                            |                        |      |      |      |      | 0 | 1                       | 1 | 1 | 0 | 1 | 0 | R8 |                               |
| 60                            |                        |      |      |      |      | 0 | 1                       | 1 | 1 | 1 | 0 | 1 | R8 |                               |
| 61                            |                        |      |      |      |      | 0 | 1                       | 1 | 1 | 1 | 0 | 0 | R8 |                               |
| 62                            |                        |      |      |      |      | 0 | 1                       | 1 | 1 | 1 | 1 | 1 | R8 |                               |
| 63                            |                        |      |      |      |      | 0 | 1                       | 1 | 1 | 1 | 1 | 1 | R8 |                               |
| 64-127                        |                        |      |      |      |      | 1 | -                       | - | - | - | - | - | S  |                               |

\* The selection of local commands is mask-programmable. The table gives local commands for the standard version SAB3042B.  
\*\* Instruction class: S = single  
R2 = repeat ≈ 2/second  
R8 = repeat ≈ 8/second.