INFRARED DECODER; MICROCOMPUTER COMPATIBLE

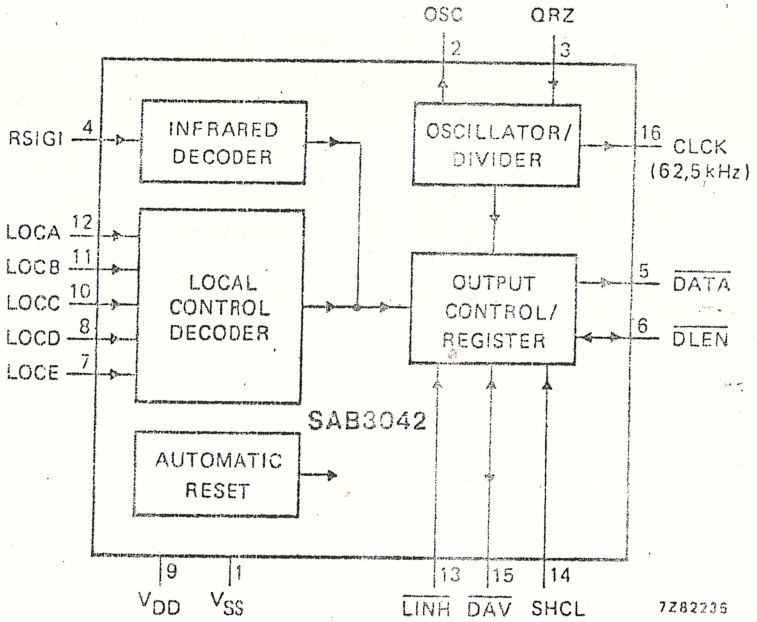


Fig. 1 Block diagram.

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_{DD}	typ.	5 V
Operating ambient temperature range	T_{amb}		0 to + 70 °C
Oscillator frequency	f_{QRZ}	typ.	4 MHz
Supply current; V_{DD} = 5 V; T_{amb} = 25 °C	I_{DD}	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 $\overline{DLEN}$ and $\overline{DATA}$, as well as the CBUS signals $\overline{DAV}$, $\overline{LINH}$ and SHCL. The IBUS outputs can be used for driving systems which are accessible via this type of interface, e.g. Teletext and Viewdata. 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 $\overline{DAV}$, 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 ($\overline{DATA}$, $\overline{DLEN}$)

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 $\overline{DATA}$ synchronous with the system clock; the word length is 7 bits, one start bit and 6 data bits (see Fig. 3).

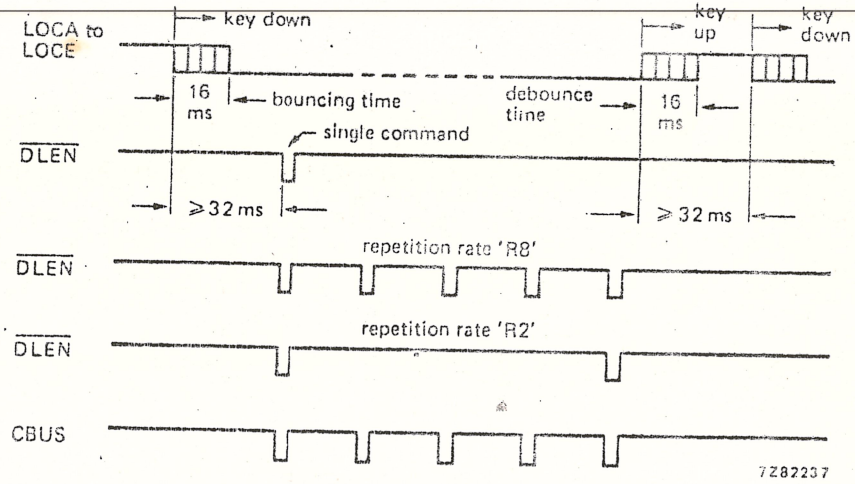


Fig. 2 Relationship between key operation and command output.

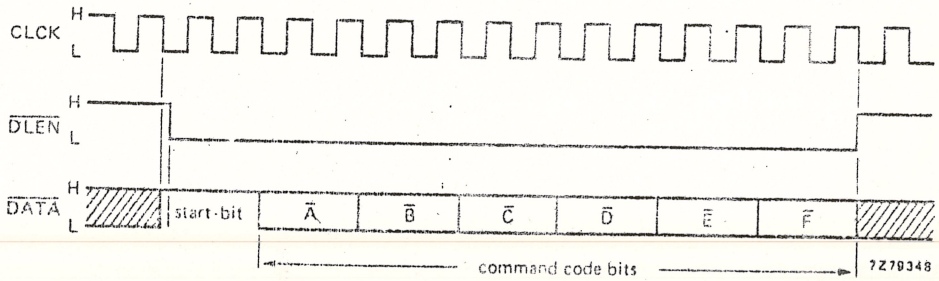


Fig. 3 Output waveforms of a command transmission.

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

Inputs/outputs ($\overline{DAV}$, $\overline{LINH}$, 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 $\overline{DAV}$ signal to LOW (see Fig. 5). The output will be delayed in case of an occupied BUS ($\overline{DAV}$ = LOW or $\overline{LINH}$ = LOW). Input $\overline{DAV}$ is an input for this control. If the external unit recognizes $\overline{DAV}$ = LOW the request for information is started by setting $\overline{LINH}$ to LOW. The SAB3042 indicates the reception $\overline{LINH}$ = LOW by setting $\overline{DAV}$ 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 $\overline{DAV}$ = HIGH by applying further clock pulses, after the data word is shifted out.
The request will be terminated by setting $\overline{LINH}$ = HIGH, also in case the data word is not completely shifted out.

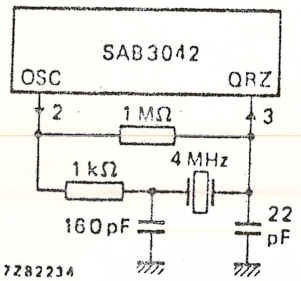
A new incoming command can overrule an enclosed command for as long as the request is not yet started ($\overline{LINH}$ = HIGH). A command, which is overruled, is lost. A stored command cannot be overruled when $\overline{LINH}$ is set LOW.

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, QRZ)

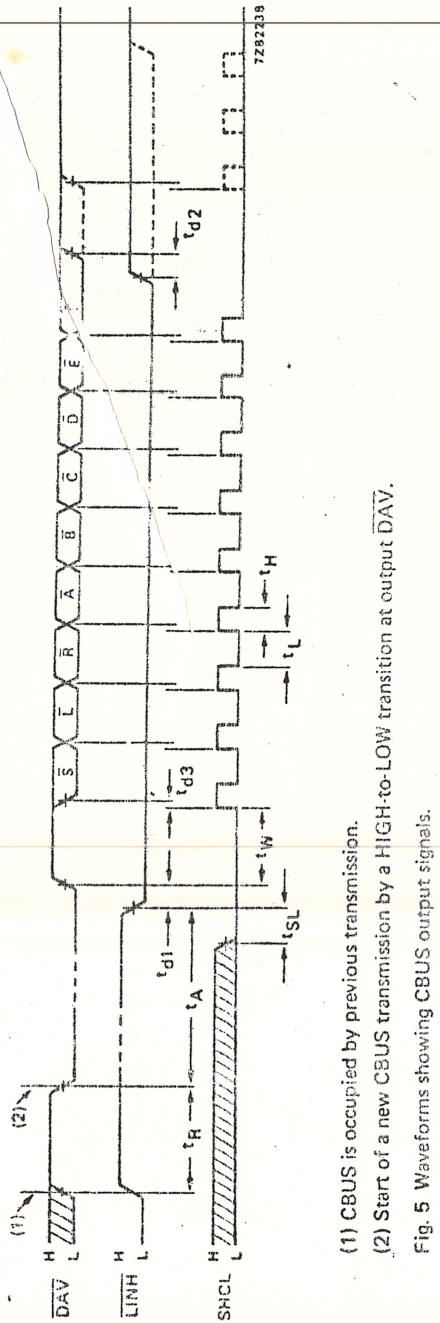


The system clock frequency of 62,5 kHz is generated internally from a 4 MHz quartz crystal oscillator. The terminals QRZ and OSC are the input/output of the 4 MHz oscillator. An external oscillator signal of 4 MHz can be applied to terminal QRZ.

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 $\overline{DATA}$, $\overline{DLEN}$ and the CBUS output $\overline{DAV}$ are then HIGH.



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

Fig. 5 Waveforms showing CBUS output signals.

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

RSIGI/ IBUS code no.	local control inputs *					$\overline{DATA}/\overline{DAV}$ output code							IBUS instr. class **
	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	0	1	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	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	0	1	0	0	1	1	0	1	1	S
28						0	0	1	1	1	0	0	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

* ** See next page.

DEVELOPMENT SAMPLE DATA

RSIGI/ IBUS code no.	local control inputs *					$\overline{DATA}/\overline{DAV}$ output code							IBUS instr. class **
	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	1	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	0	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	0	1	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	1	0	R8
59						0	1	1	1	0	1	1	R8
60						0	1	1	1	1	0	0	R8
61						0	1	1	1	1	0	1	R8
62						0	1	1	1	1	1	0	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.

SAB3042

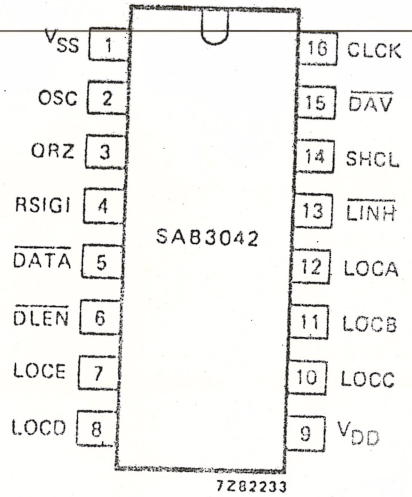


Fig. 6 Pinning diagram.

PINNING

1	V_{SS}	negative supply (0 V)	
9	V_{DD}	positive supply	
4	RSIGI	data input; remote control	
12	LOCA	local keyboard inputs (5-bits)	
11	LOCB		
10	LOCC		
8	LOCD		
7	LOCE		
6	$\overline{DLEN}$	data line enable input/output	IBUS
5	$\overline{DATA}$	data output	
16	CLCK	clock output (62,5 kHz)	
14	SHCL	asynchronous clock-burst	CBUS
15	$\overline{DAV}$	data output	
13	$\overline{LINH}$	control signal	
3	ORZ	oscillator input	
2	OSC	oscillator output	

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	$\pm I_O$	max. 10	mA
Power dissipation per output	P_O	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} 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, $\overline{LINH}$, ORZ, 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	μA	V_I = −0,3 to + 15 V
Input current LOW LOCA to LOCE	5	$-I_{IL}$	10	–	100	μA	V_I = 0
Outputs $\overline{DATA}$, $\overline{DAV}$, OSC (open drain)							
Output leakage current	5	I_{OR}	–	–	20	μA	V_O = 15 V
Output voltage LOW $\overline{DATA}$	5	V_{OL}	–	–	1	V	$-I_O$ = 1 mA
$\overline{DAV}$, OSC	5	V_{OL}	–	–	0,4	V	$-I_O$ = 1,6 mA
Input/output $\overline{DLEN}$ (open drain)							internal high-ohmic pull-up transistor
Input values	–	–	see RSIGI				
Output values	–	–	see $\overline{DATA}$				
Input current LOW	5	$-I_{IL}$	10	–	100	μA	V_I = 0
Input/output CLCK							
Input values	–	–	see RSIGI				
Input current LOW	5	$-I_{IL}$	10	–	100	μA	V_I = 0
Output voltage LOW	5	V_{OL}	–	–	1	V	$-I_O$ = 5 mA
Output leakage current	5	I_{OR}	–	–	20	μA	V_O = 15 V

DEVELOPMENT SAMPLE DATA

CHARACTERISTICS (continued)

	V_{DD} V	symbol	min.	typ.	max.		conditions
Oscillator frequency ORZ, OSC	5	f	3	4	4,1	MHz	
Duty factor	5	δ	0,4	0,5	0,6		
Switching times see Fig. 5	5	t_R	1	–	4	ms	f_{ORZ} = 4 MHz
	5	t_{d1}; t_{d2}	–	–	20	μs	f_{ORZ} = 4 MHz
	5	t_{d3}	–	–	5	μs	
	5	t_A	0	–	–	μs	
	5	t_{SL}; t_W; t_H; t_L	5	–	–	μs	
Input rise/fall times							
Input ORZ	5	t_r; t_f	–	–	50	ns	
All other inputs	5	t_r; t_f	–	–	1	μs	

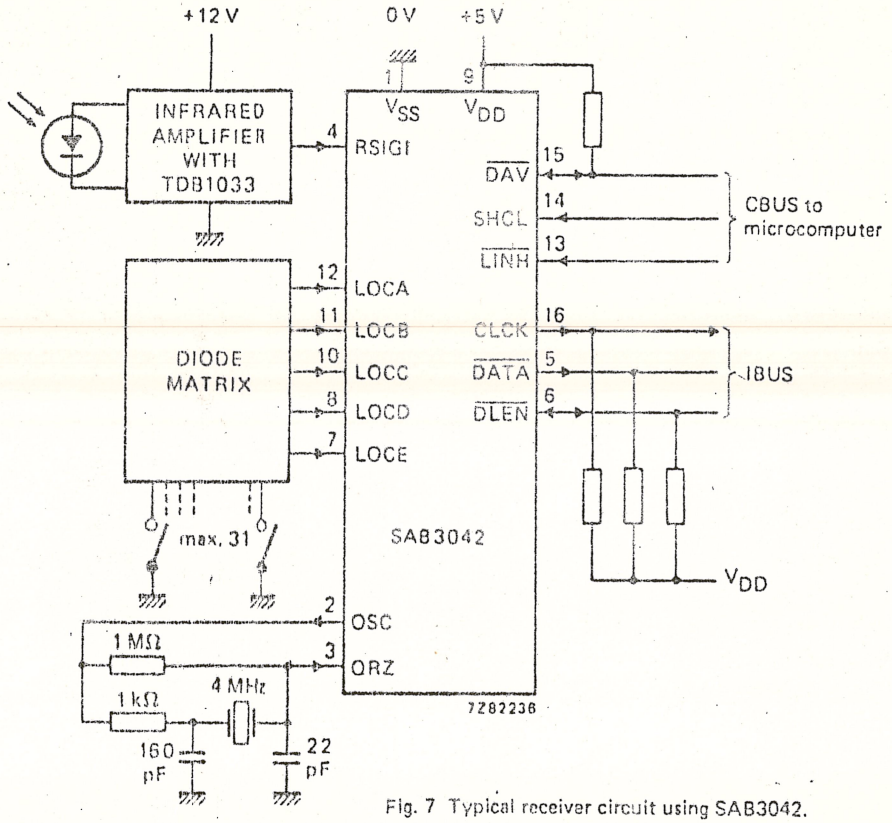


Fig. 7 Typical receiver circuit using SAB3042.