

INFRARED REMOTE CONTROL DECODERS

GENERAL DESCRIPTION

The main function of the SAA3009 and SAA3049 ICs is to check and convert the received coded data (RECS80/RC5) into latched binary outputs. The device address can be hard-wired for a particular address allowing several devices in one location. Alternatively, received data with any address can be accepted, the received data and address are then outputs.

Features

- Decodes 64 remote control commands with a maximum of 32 subaddresses
- Accepts RECS80 codes with pulse position modulation (SAA3004, SAA3007, SAA3008) or RC5 codes with biphasic transmission (SAA3006, SAA3010)
- Available at SAA3009 with 8 high current (10 mA) open-drain outputs and internal pull-ups for direct LED drive via resistors or as SAA3049 for low supply current applications
- Adding circuitry for binary decoding allows a maximum of 2048 commands to be used, for example 1-of-16 decoder (HEF4515)

QUICK REFERENCE DATA

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage						
SAA3009	note 1	V_{CC}	4.5	5.0	5.5	V
SAA3049	note 2	V_{CC}	2.5	—	5.5	V
Supply current						
SAA3009	note 1	I_{CC}	—	—	70	mA
SAA3049	note 2	I_{CC}	—	1.0	2.0	mA
Oscillator frequency		f_{osc}	—	4	—	MHz
Output sink current LOW (pins 1 to 8)						
SAA3009	note 3	I_{OL}	—	—	10	mA
SAA3049	note 4	I_{OL}	1.6	3.0	—	mA

Notes to the QUICK REFERENCE DATA

1. $T_{amb} = 0$ to $+70\text{ }^{\circ}\text{C}$.
2. $T_{amb} = -40$ to $+85\text{ }^{\circ}\text{C}$.
3. Open-drain with 20 to 50 k Ω internal pull-up resistor.
4. Open-drain without internal pull-up resistor at $V_{CC} = 5\text{ V} \pm 10\%$; $V_O = 0.4\text{ V}$.

PACKAGE OUTLINES

SAA3009P; SAA3049P: 20 lead DIL; plastic (SOT146).
SAA3049T: 20 lead mini-pack; plastic (SO20; SOT163A).

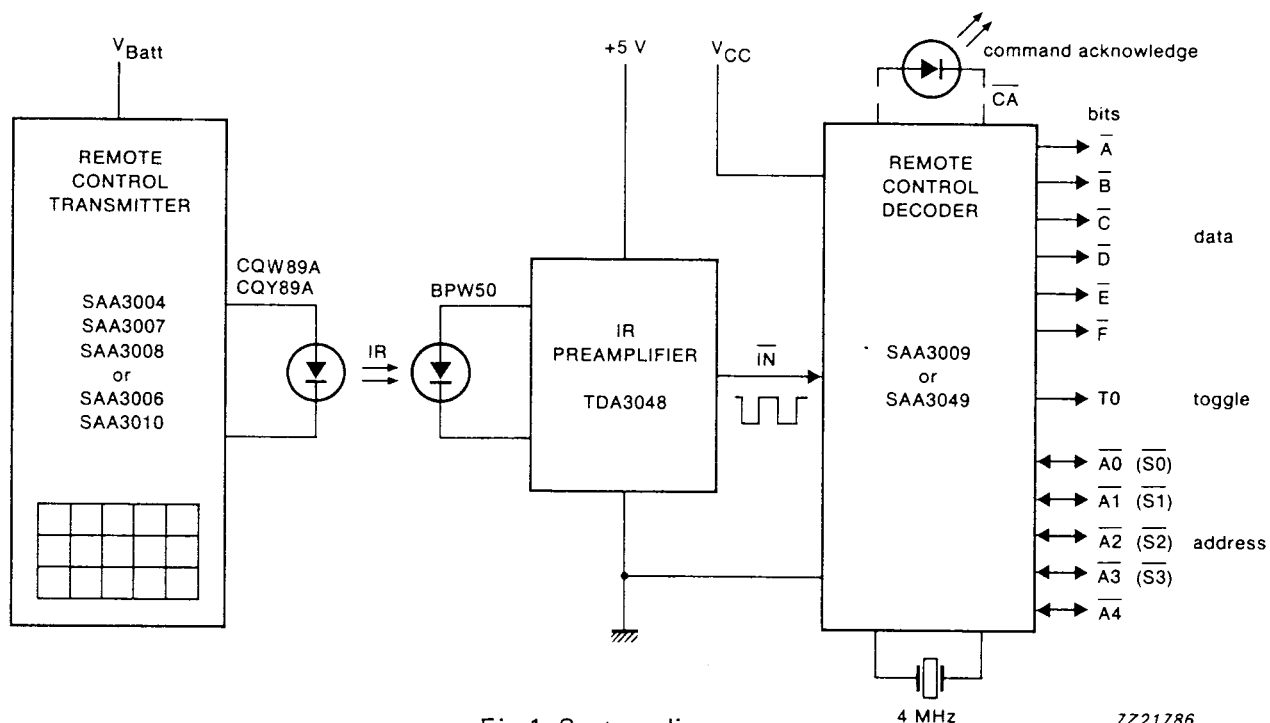


Fig.1 System diagram.

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TRANSMITTERS (see individual data sheets for full specifications)

- SAA3004 $V_{Batt} = 4$ to 11 V (max.); $7 \times 64 = 448$ commands (RECS80 code)
- SAA3007 $V_{Batt} = 2$ to 6.5 V (max.); $20 \times 64 = 1280$ commands (RECS80 code)
- SAA3008 $V_{Batt} = 2$ to 6.5 V (max.); $20 \times 64 = 1280$ commands (RECS80 code)
- SAA3006 $V_{Batt} = 2$ to 7.0 V (max.); $32 \times 64 = 2048$ commands (RC5 code)
- SAA3010 $V_{Batt} = 2$ to 7.0 V (max.); $32 \times 64 = 2048$ commands (RC5 code)

RATINGS

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

parameter	symbol	min.	max.	unit
Supply voltage				
SAA3009	V_{CC}	-0.5	7.0	V
SAA3049	V_{CC}	-0.8	8.0	V
Input voltage (any pin)				
SAA3009	V_I	-0.5	7.0	V
SAA3049	V_I	-0.8	$V_{CC} + 0.8$	V
DC input/output current				
SAA3009 (pins 1 to 8)	$\pm I_I, \pm I_O$	—	20	mA
SAA3009 (all other pins)	$\pm I_I, \pm I_O$	—	10	mA
SAA3049 (any pin)	$\pm I_I, \pm I_O$	—	10	mA
Total power dissipation				
SAA3009	P_{tot}	—	1	W
SAA3049	P_{tot}	—	0.5	W
Operating ambient temperature range				
SAA3009	T_{amb}	0	+ 70	°C
SAA3049	T_{amb}	-40	+ 85	°C
Storage temperature range				
SAA3009	T_{stg}	-65	+ 150	°C
SAA3049	T_{stg}	-65	+ 150	°C

DEVELOPMENT DATA

CHARACTERISTICS

All voltages measured with respect to ground ($V_{EE} = 0$ V).

SAA3009: $V_{CC} = 4.5$ to 5.5 V; $T_{amb} = 0$ to $+70$ °C unless otherwise specified

SAA3049: $V_{CC} = 2.5$ to 5.5 V; $T_{amb} = -40$ to $+85$ unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage						
SAA3009		V_{CC}	4.5	5.0	5.5	V
SAA3049		V_{CC}	2.5	—	5.5	V
Supply current						
SAA3009		I_{CC}	—	—	70	mA
SAA3049		I_{CC}	—	0.8	2.0	mA
Input signals (pin 9)						
Input voltage HIGH						
SAA3009		V_{IH}	2.0	—	$V_{CC} + 0.5$	V
SAA3049		V_{IH}	$0.7 V_{CC}$	—	V_{CC}	V
Input voltage LOW	active					
SAA3009		V_{IL}	0.5	—	0.8	V
SAA3049		V_{IL}	0	—	$0.3 V_{CC}$	V
Mode selection (pin 11)						
Input voltage HIGH	note 1					
SAA3009		V_{IH}	2.0	—	$V_{CC} + 0.5$	V
SAA3049		V_{IH}	$0.7 V_{CC}$	—	V_{CC}	V
Input voltage LOW	note 2					
SAA3009		V_{IL}	-0.5	—	0.8	V
SAA3049		V_{IL}	0	—	$0.3 V_{CC}$	V
Command received indicator and mode control (pin 19)	note 3					
Input voltage HIGH						
SAA3009		V_{IH}	3.0	—	$V_{CC} + 0.5$	V
SAA3049		V_{IH}	$0.7 V_{CC}$	—	V_{CC}	V
Input voltage LOW						
SAA3009		V_{IL}	-0.5	—	1.5	V
SAA3049		V_{IL}	0	—	$0.3 V_{CC}$	V
Crystal oscillator						
Oscillator frequency	note 4	f_{osc}	—	4	—	MHz

parameter	conditions	symbol	min.	typ.	max.	unit
SAA3009 OUTPUTS						
10 mA open-drain with internal pull-up resistor (pins 1 to 8)						
Output voltage HIGH	$I_{OH} = -50\text{ }\mu\text{A}$	V_{OH}	2.4	—	V_{CC}	V
Output voltage LOW	$I_{OL} = 10\text{ mA}$	V_{OL}	—	—	1.0	V
Output sink current LOW		I_{OL}	—	—	10	mA
5 mA open-drain without internal pull-up resistor (pins 18 and 19)						
Output voltage HIGH	$I_{OL} = 5\text{ mA}$	V_{OH}	—	—	V_{CC}	V
Output voltage LOW		V_{OL}	—	—	0.45	V
Output sink current LOW		I_{OL}	—	—	5	mA
1.6 mA open-drain with internal pull-up resistor (pins 15, 16 and 17)						
Output voltage HIGH	$I_{OL} = 1.6\text{ mA}$	V_{OH}	—	—	V_{CC}	V
Output voltage LOW		V_{OL}	—	—	0.45	V
Output sink current LOW		I_{OL}	—	—	1.6	mA
SAA3049 OUTPUTS						
Open-drain without internal pull-up resistor						
Output sink current LOW	note 5 $V_{CC} = 5\text{ V} \pm 10\%$; $V_{OL} = 0.4\text{ V}$	I_{OL}	1.6	3.0	—	mA

Notes to the characteristics

1. RECS80 decoder for transmitters SAA3004, SAA3007 or SAA3008; SAA3009 has an internal pull-up resistor.
2. RC5 decoder for transmitters SAA3006 or SAA3010.
3. With pin 19 = HIGH, then pins 7, 8, 15, 16 and 17 are address inputs.
With pin 19 = LOW, then pins 7, 8, 15, 16 and 17 are 4 or 5 address received outputs.

In Figs 4, 5 and 6 this HIGH/LOW switching is dependent on whether the transistor on pin 19 is fed via a series resistor or not. In both applications pin 19, which toggles several times (see Fig.3) while a valid command is acknowledged, can be used to activate (flash) an LED indicator.

4. A quartz crystal with a frequency of 4 MHz is recommended for the standard transmitter application.
4. Application as output requires connection of an external pull-up resistor.

CHARACTERISTICS (continued)

Reset (pin 14)

The simple circuit is shown in Figs 4, 5 and 6. The alternative reset circuit shown in Fig.2 protects against short term power supply transients by generating a reset.

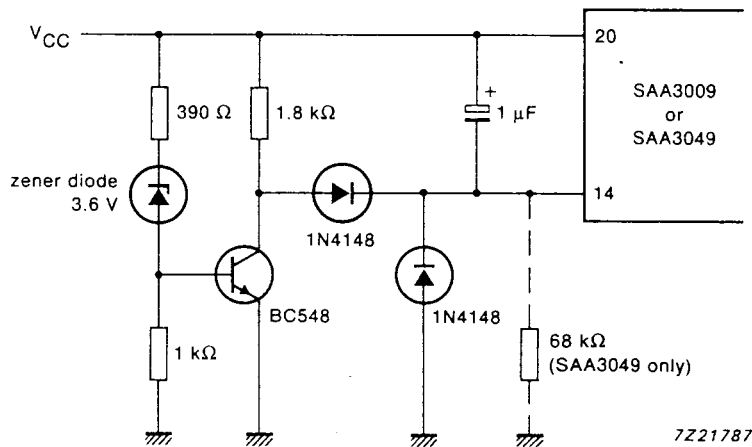


Fig.2 Proposed improved reset circuit.

Infrared signal input (pin 9)

This pin is sensitive to a negative-going edge.

Command received indicator (pin 19)

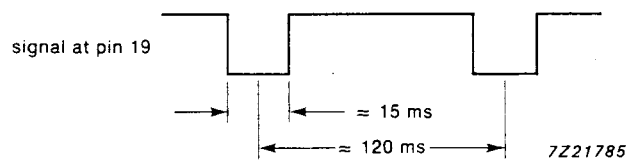
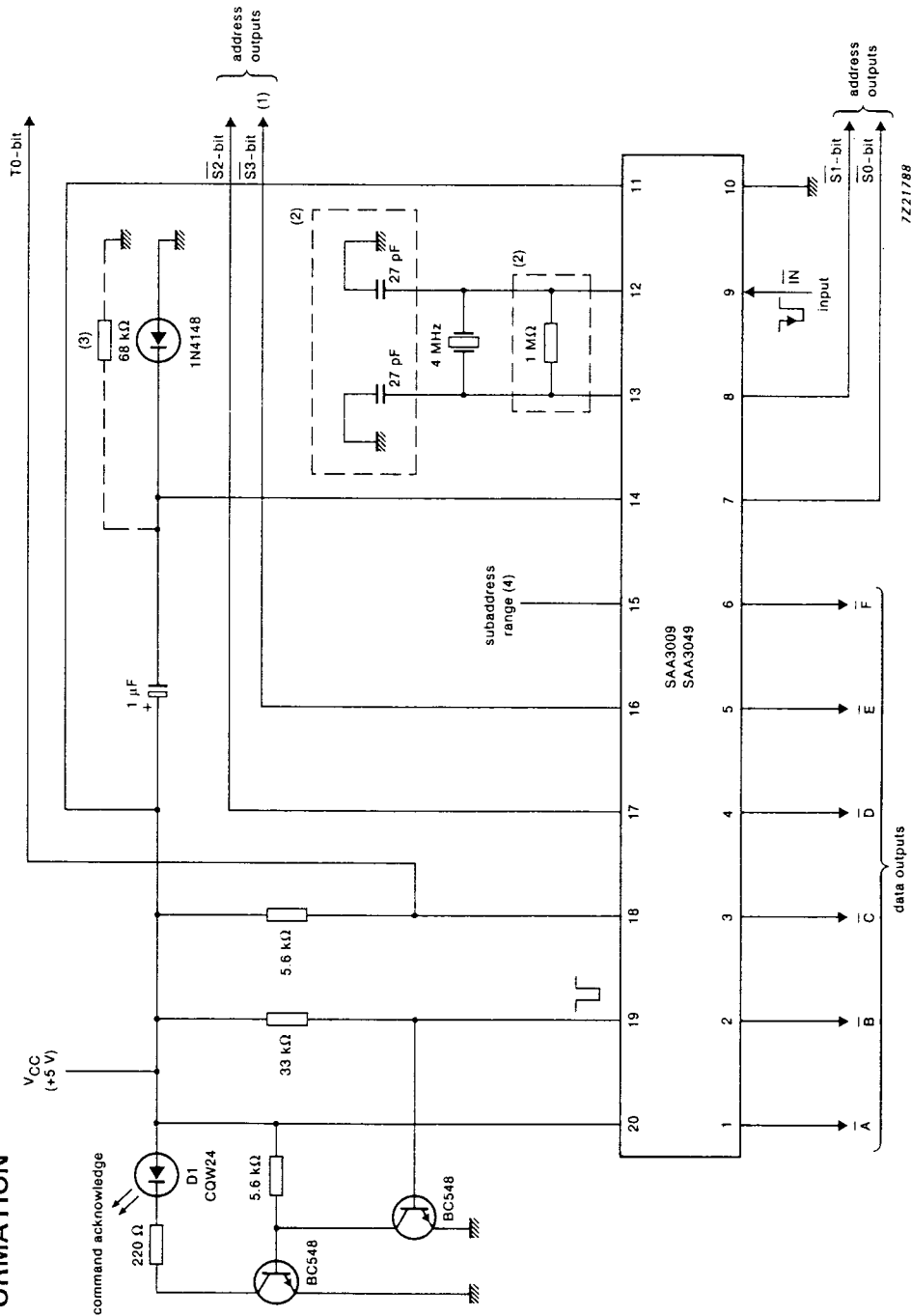


Fig.3 Output diagram of command acknowledge.

DEVELOPMENT DATA

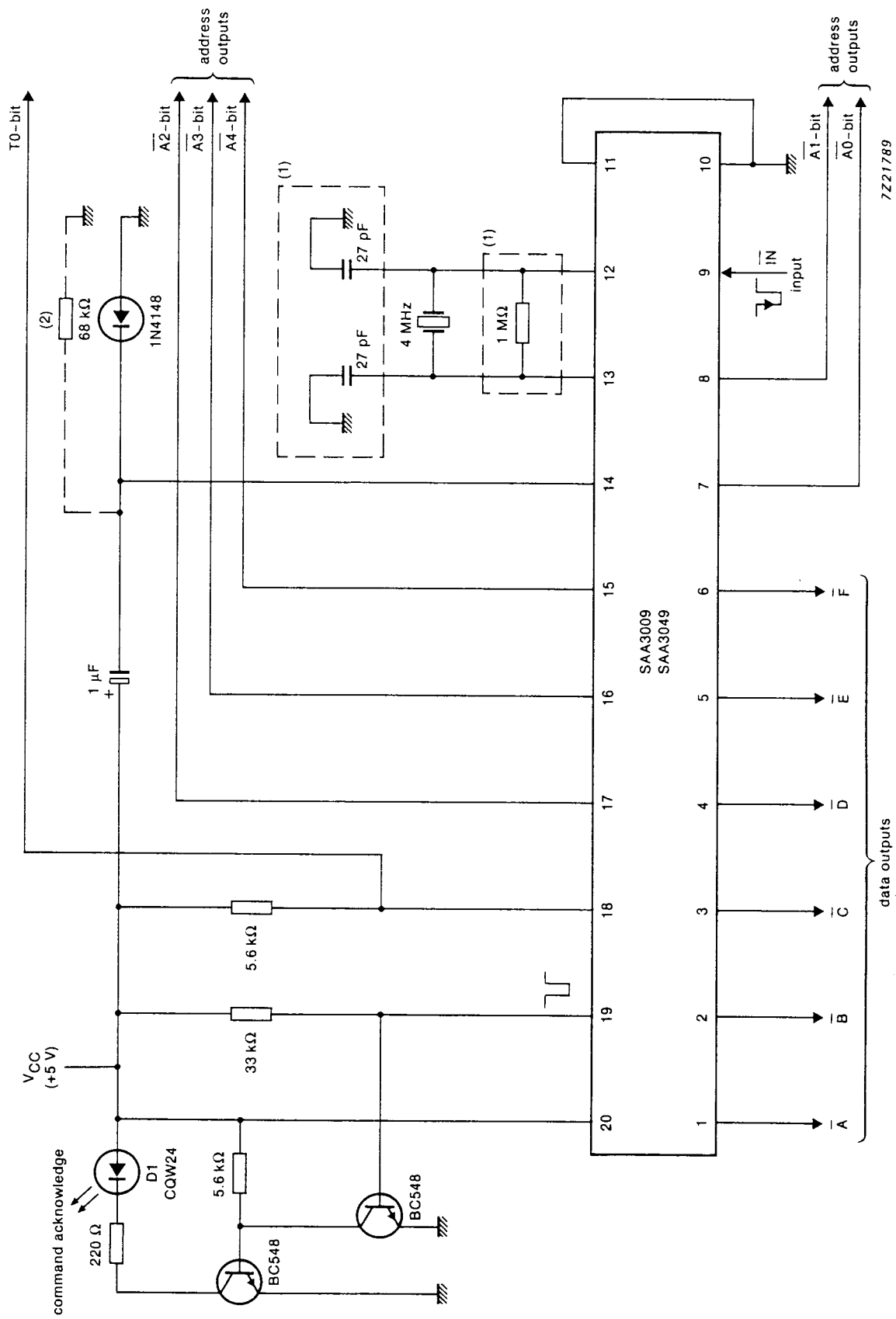
APPLICATION INFORMATION



(1) only for subaddress 8 to 20.
(2) only for SAA3009.
(3) only for SAA3049.
(4) subaddress range:
when LOW (subaddress 8 to 20) pin 15 is connected to ground
when HIGH (subaddress 1 to 7) pin 15 is open (SAA3009)
when HIGH (subaddress 1 to 7) pin 15 is connected via pull-up resistor to V_{CC} (SAA3049)

Fig.4 Remote control decoder with latched 11 (10) -bit parallel outputs (10 (9) -bits inverted) for use with transmitter types SAA3004, SAA3007 or SAA3008; pin 11 is HIGH for RECS80 code.

APPLICATION INFORMATION (continued)



- (1) only for SAA3009.
(2) only for SAA3049.

Fig.5 Remote control decoder with latched 12-bit parallel outputs (11 bits inverted) for use with transmitter types SAA3006 or SAA3010; pin 11 is LOW for RC5 code.

