

# DATA SHEET

## **SAA3049A**

### **Infrared remote control decoder**

Product specification  
Supersedes data of 1996 Apr 15  
File under Integrated Circuits, IC02

1996 Sep 13

# Infrared remote control decoder

# SAA3049A

## 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 bi-phase transmission (SAA3006, SAA3010)
- Suitable for low voltage and low SAA3049A supply current applications
- Adding circuitry for binary decoding allows a maximum of 2048 commands to be used, for example 1-of-16 decoder (HEF4515).

## GENERAL DESCRIPTION

The main function of the SAA3049A 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.

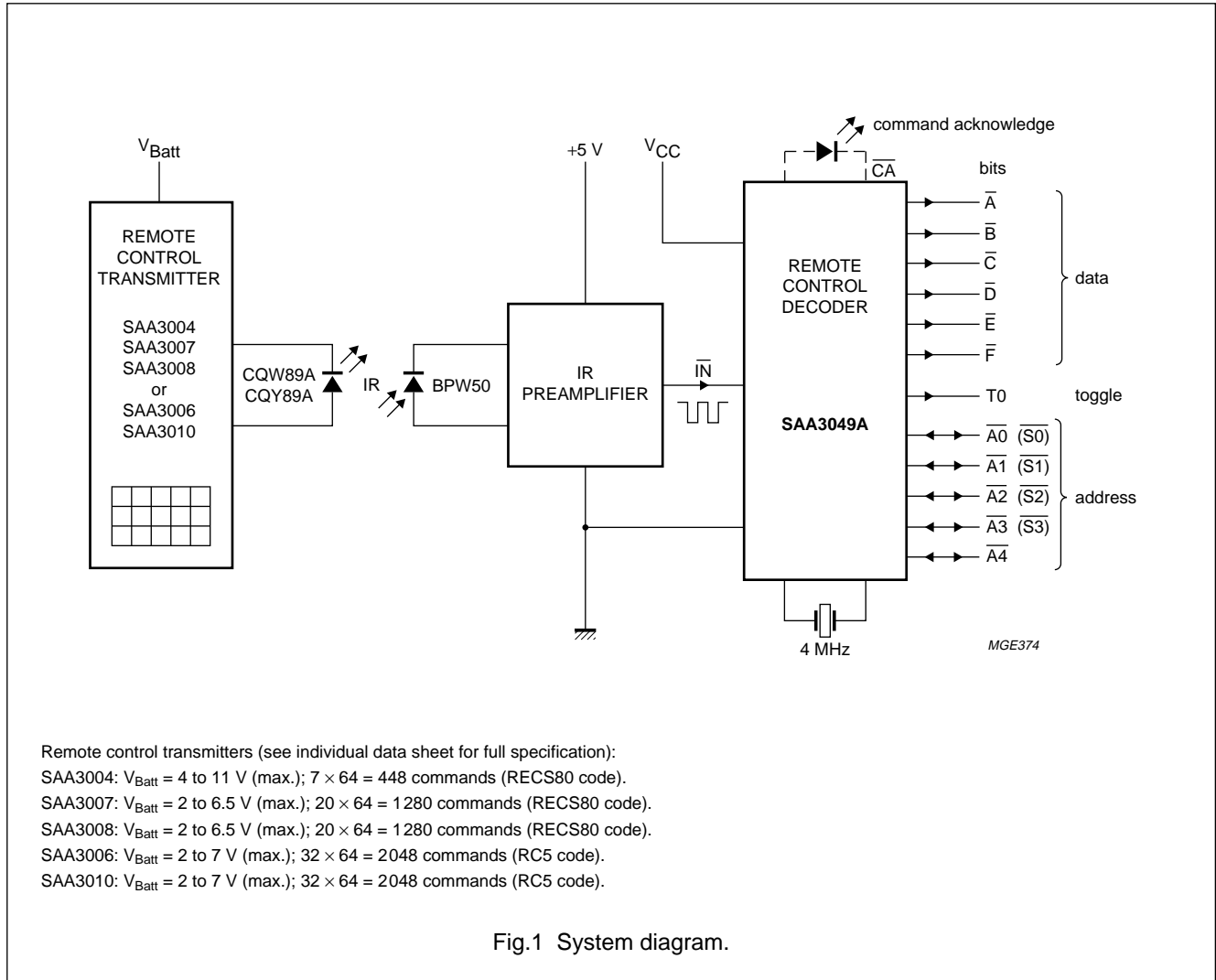
## ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
SAA3049AP	DIP20	plastic dual in-line package; 20 leads (300 mil)	SOT146-1
SAA3049AT	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1

Infrared remote control decoder

SAA3049A

SYSTEM DIAGRAM



Infrared remote control decoder

SAA3049A

PINNING

SYMBOL	PIN	DESCRIPTION
$\bar{A}$	1	data output
$\bar{B}$	2	data output
$\bar{C}$	3	data output
$\bar{D}$	4	data output
$\bar{E}$	5	data output
$\bar{F}$	6	data output
$\bar{A0} (\bar{S0})$	7	data/address output/input
$\bar{A1} (\bar{S1})$	8	data/address output/input
$\bar{IN}$	9	digital input
GND	10	ground
MODE	11	RC5/RECS80 mode selection
XTAL1	12	crystal oscillator
XTAL2	13	crystal oscillator
RESET	14	reset input
$\bar{A4}$	15	address output/input
$\bar{A3} (\bar{S3})$	16	address output/input
$\bar{A2} (\bar{S2})$	17	address output/input
T0	18	T0 bit
CRI	19	command received indicator
V <sub>CC</sub>	20	supply voltage

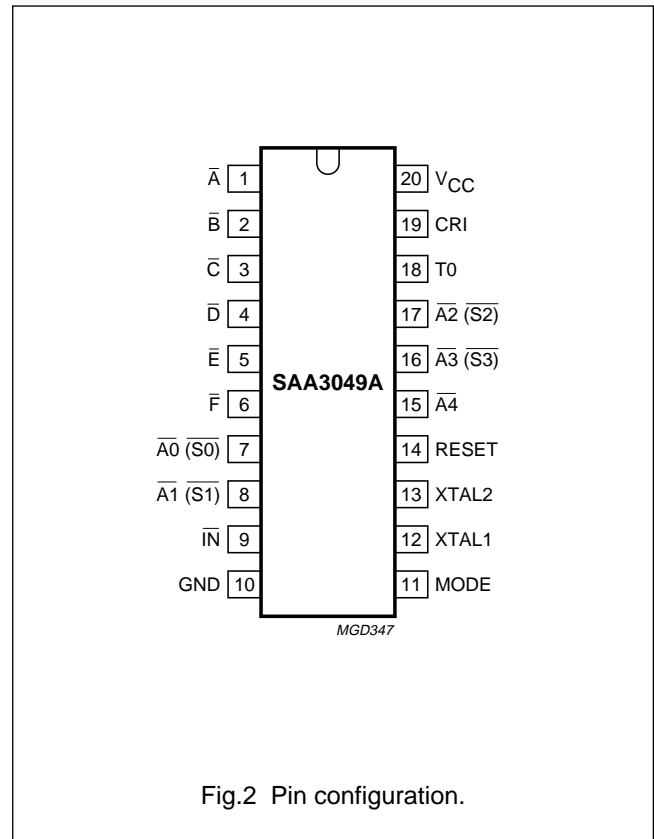


Fig.2 Pin configuration.

## Infrared remote control decoder

SAA3049A

**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CC}$	supply voltage		-0.5	+7	V
$V_I$	input voltage	any pin	-0.5	$V_{CC} + 0.5$	V
$I_I$	DC input current	any pin	-	-10	mA
$I_O$	DC output current	any pin	-	10	mA
$P_{tot}$	total power dissipation		-	125	mW
$P_o$	power dissipation per output		-	30	mW
$I_{DD}$	positive supply current		-50	+50	mA
$I_{SS}$	negative supply current		-100	+50	mA
$T_{amb}$	operating ambient temperature		-40	+85	°C
$T_{stg}$	storage temperature		-65	+150	°C

**HANDLING**

Inputs and outputs are protected against electrostatic charge in normal handling. However, to be totally safe, it is desirable to take normal precautions appropriate to handling MOS devices (see *"Handling MOS Devices"*).

## Infrared remote control decoder

SAA3049A

**CHARACTERISTICS** $V_{CC} = 2.5$  to  $5.5$  V;  $T_{amb} = -40$  to  $+85$  °C; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>Supply</b>						
$V_{CC}$	supply voltage		2.5	–	5.5	V
$I_{CC}$	supply current	$V_{DD} = 3$ V, $f_{xtal} = 4$ MHz	–	0.3	0.7	mA
<b>Input signals (pin 9)</b>						
$V_{IH}$	HIGH level input voltage		$0.7V_{CC}$	–	$V_{CC}$	V
$V_{IL}$	LOW level input voltage		0	–	$0.3V_{CC}$	V
<b>Mode selection (pin 11)</b>						
$V_{IH}$	HIGH level input voltage		$0.7V_{CC}$	–	$V_{CC}$	V
$V_{IL}$	LOW level input voltage		0	–	$0.3V_{CC}$	V
<b>Command received indicator and mode control (pin 19); note 1</b>						
$V_{IH}$	HIGH level input voltage		$0.7V_{CC}$	–	$V_{CC}$	V
$V_{IL}$	LOW level input voltage		0	–	$0.3V_{CC}$	V
<b>Crystal oscillator</b>						
$f_{osc}$	oscillator frequency	note 2	–	4	–	MHz
<b>Outputs</b>						
OPEN-DRAIN WITHOUT INTERNAL PULL-UP RESISTOR; note 3						
$I_{OL(sink)}$	LOW level output sink current	$V_{CC} = 5$ V; $V_{OL} = 0.4$ V	–1.6	–12	–	mA

**Notes**

- 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 5, 6 and 7 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.4) while a valid command is acknowledged, can be used to activate (flash) an LED indicator.
- A quartz crystal with a frequency of 4 MHz is recommended for the standard transmitter application.
- Application as output requires connection of an external pull-up resistor.

# Infrared remote control decoder

# SAA3049A

### Reset

The circuit is shown in Figs 5, 6 and 7. The alternative reset circuit shown in Fig.3 protects against short term power supply transients by generating a reset.

The reset pin should either be connected to external reset circuitry as proposed or connected to  $V_{SS}$ . If connected to  $V_{SS}$ , a reset pulse will be generated by the on-chip Power-on reset circuit at typically 1.3 V ( $\pm 500$  mV accuracy).

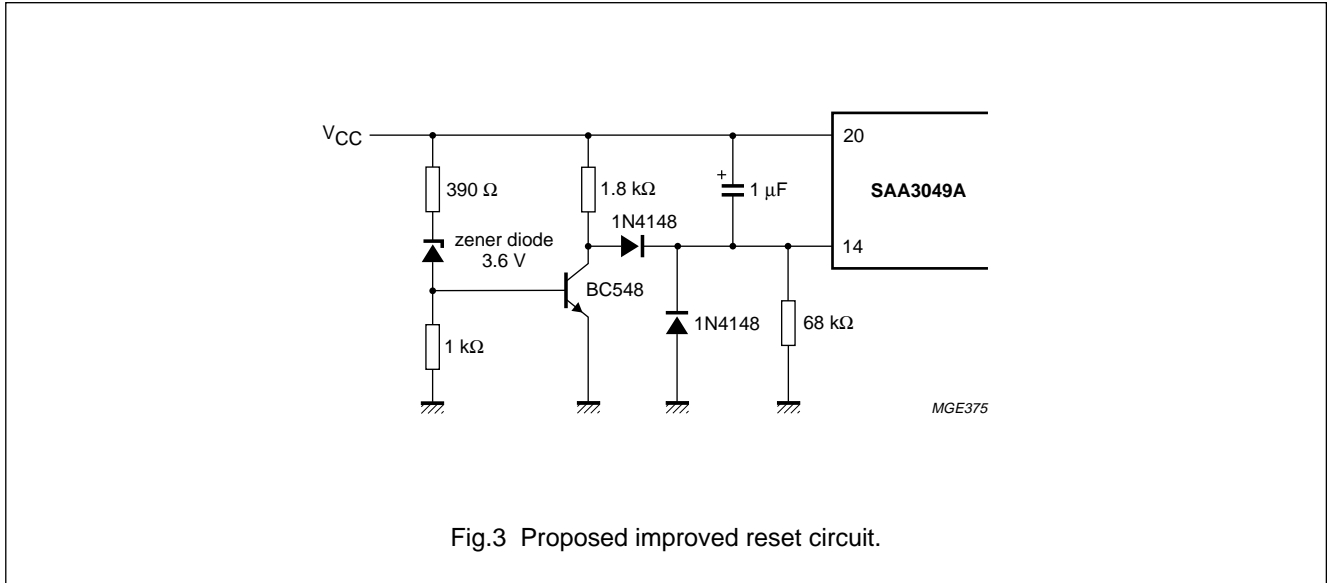


Fig.3 Proposed improved reset circuit.

### Infrared signal input (pin 9)

This pin is sensitive to a negative-going edge.

### Command received indicator (pin 19)

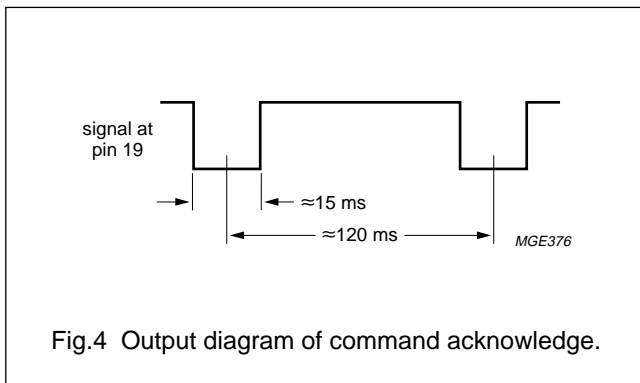


Fig.4 Output diagram of command acknowledge.

### APPLICATION INFORMATION

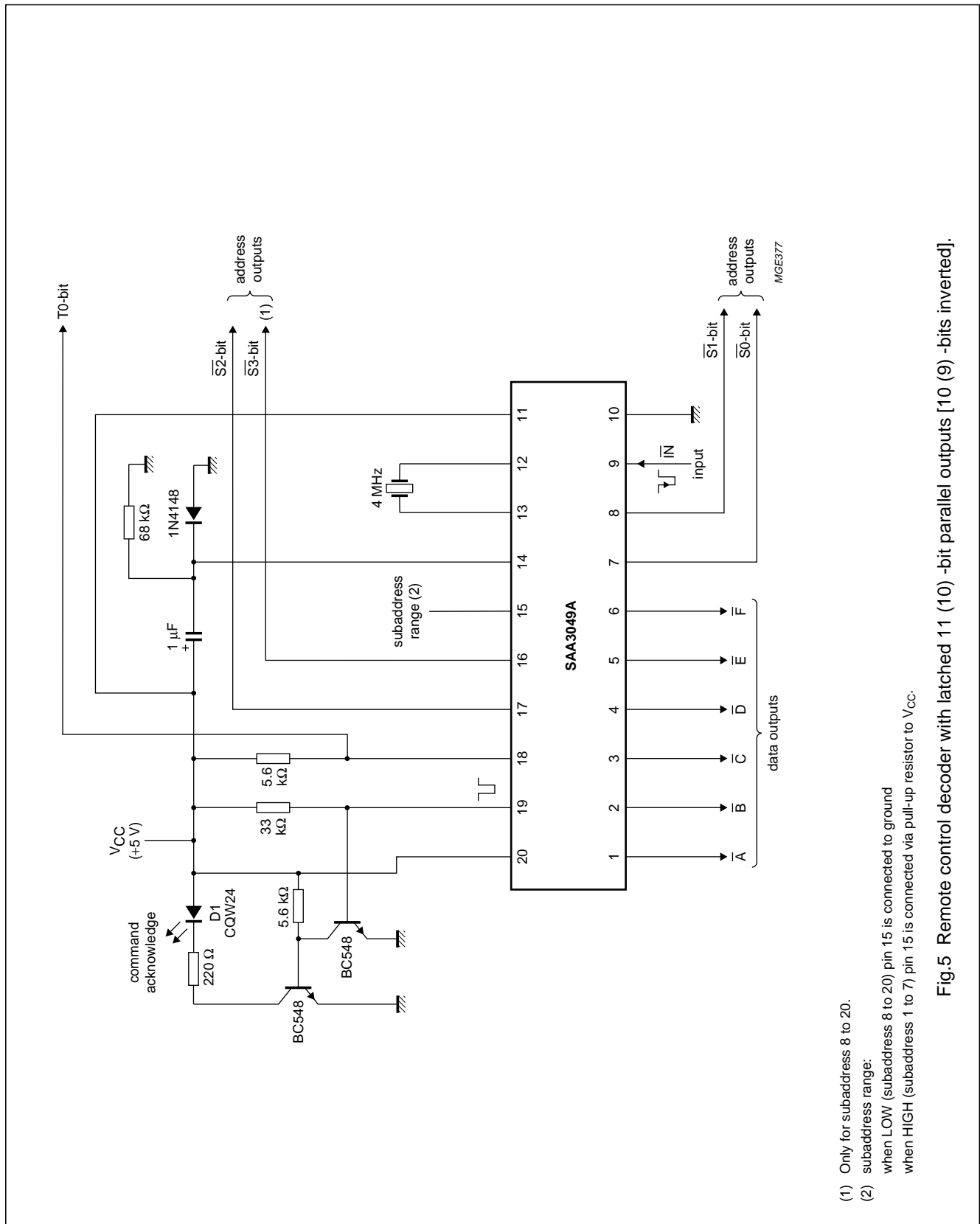
In Fig.5, the circuit shown is for use with transmitters SAA3004, SAA3007 or SAA3008; pin 11 is HIGH for RECS80 code.

In Fig.6, the circuit shown is for use with transmitter types SAA3006 or SAA3010; pin 11 is LOW for RC5 code.

In Fig.7, the decoder is set for the required subaddress by holding the address pins HIGH or LOW. Pin 11 is HIGH for use with transmitter types SAA3004, SAA3007 or SAA3008 (RECS80 code). Pin 11 is LOW for use with transmitter types SAA3006 or SAA3010 (RC5 code). The remote control decoder is for up to 32 subaddresses with 6 + 1-bit parallel outputs (RC5 code).

Infrared remote control decoder

SAA3049A



- (1) Only for subaddress 8 to 20.
- (2) subaddress range:  
 when LOW (subaddress 8 to 20) pin 15 is connected to ground  
 when HIGH (subaddress 1 to 7) pin 15 is connected via pull-up resistor to V<sub>CC</sub>.

Fig.5 Remote control decoder with latched 11 (10) -bit parallel outputs [10 (9) -bits inverted].





Infrared remote control decoder

SAA3049A

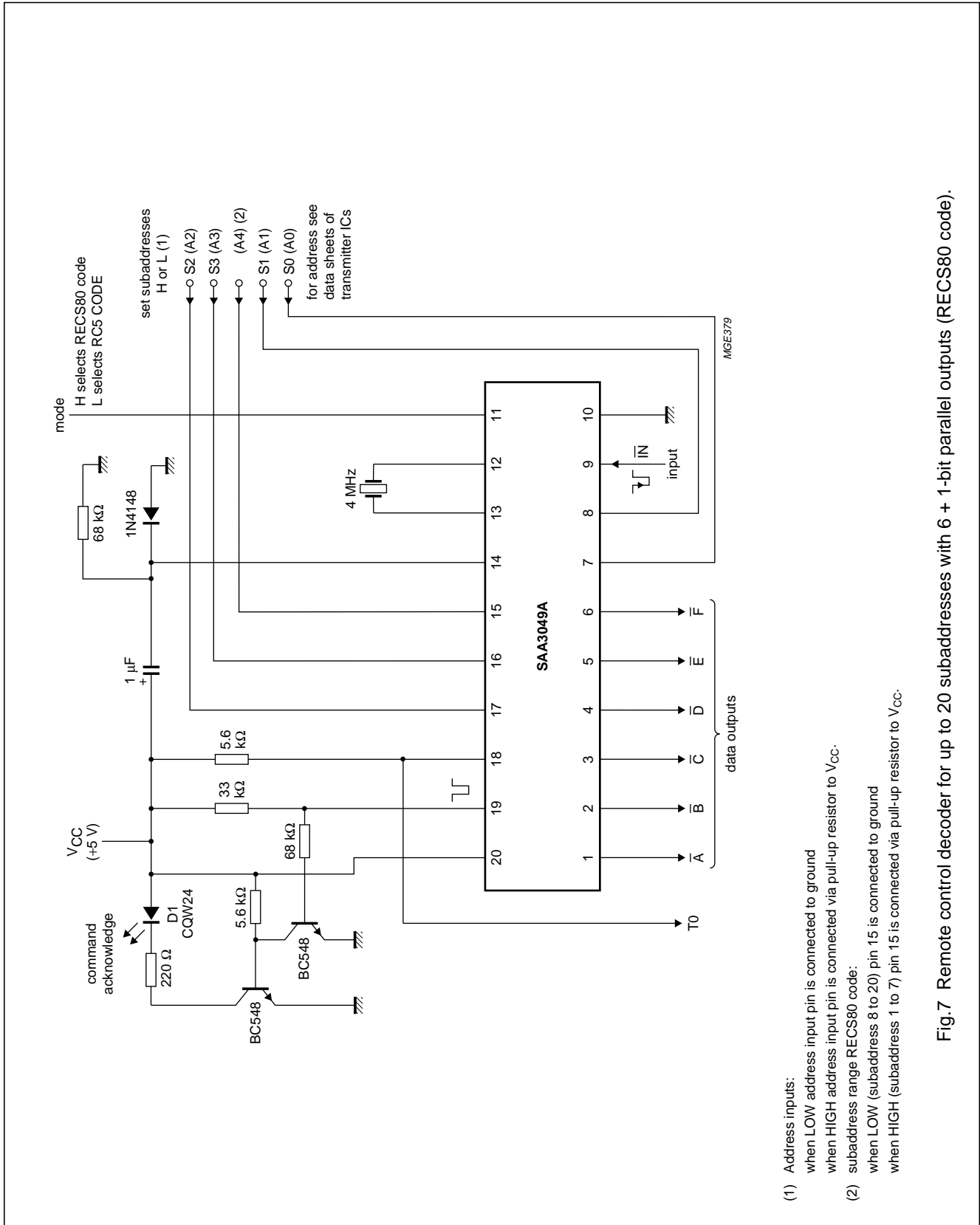


Fig.7 Remote control decoder for up to 20 subaddresses with 6 + 1-bit parallel outputs (RECS80 code).

- (1) Address inputs:
  - when LOW address input pin is connected to ground
  - when HIGH address input pin is connected via pull-up resistor to V<sub>CC</sub>.
- (2) subaddress range RECS80 code:
  - when LOW (subaddress 8 to 20) pin 15 is connected to ground
  - when HIGH (subaddress 1 to 7) pin 15 is connected via pull-up resistor to V<sub>CC</sub>.

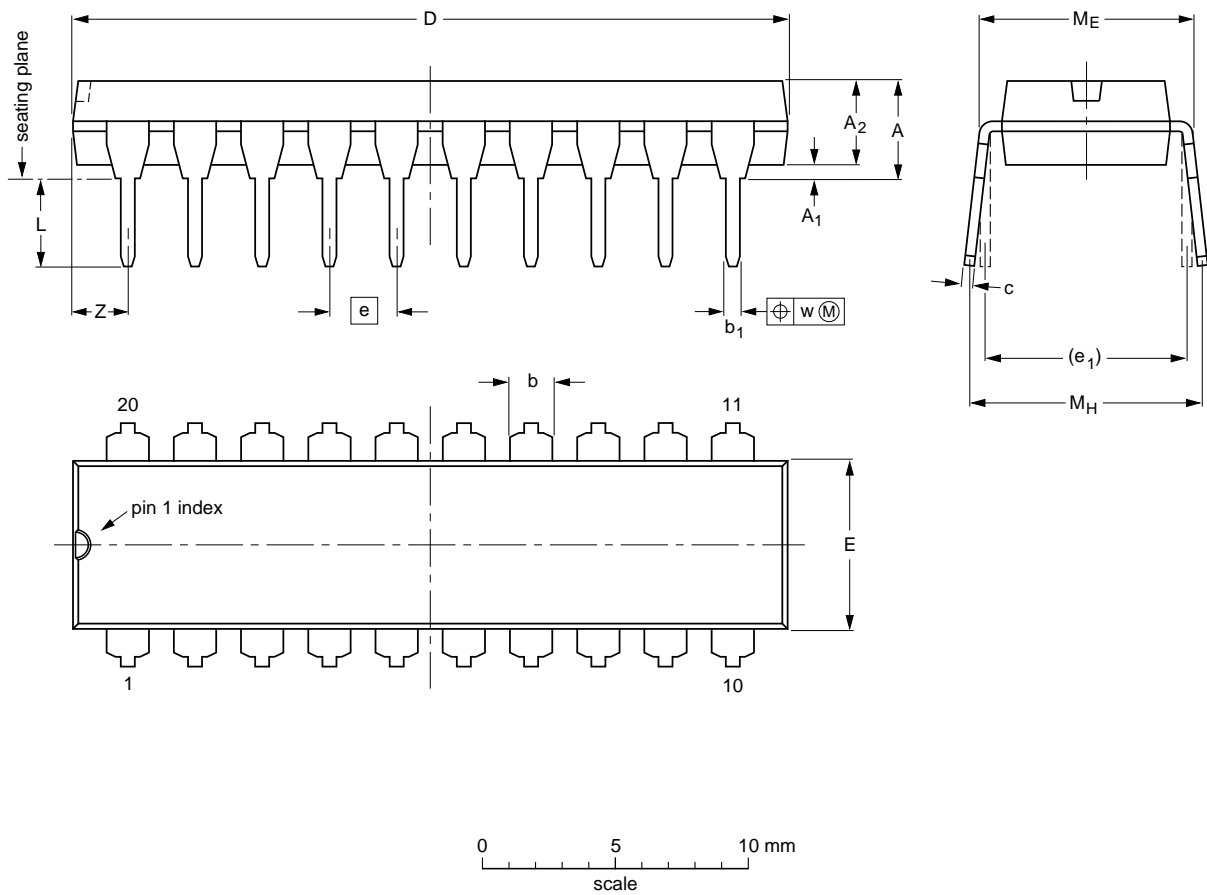
Infrared remote control decoder

SAA3049A

PACKAGE OUTLINES

DIP20: plastic dual in-line package; 20 leads (300 mil)

SOT146-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	0.36 0.23	26.92 26.54	6.40 6.22	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.0
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.014 0.009	1.060 1.045	0.25 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.078

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

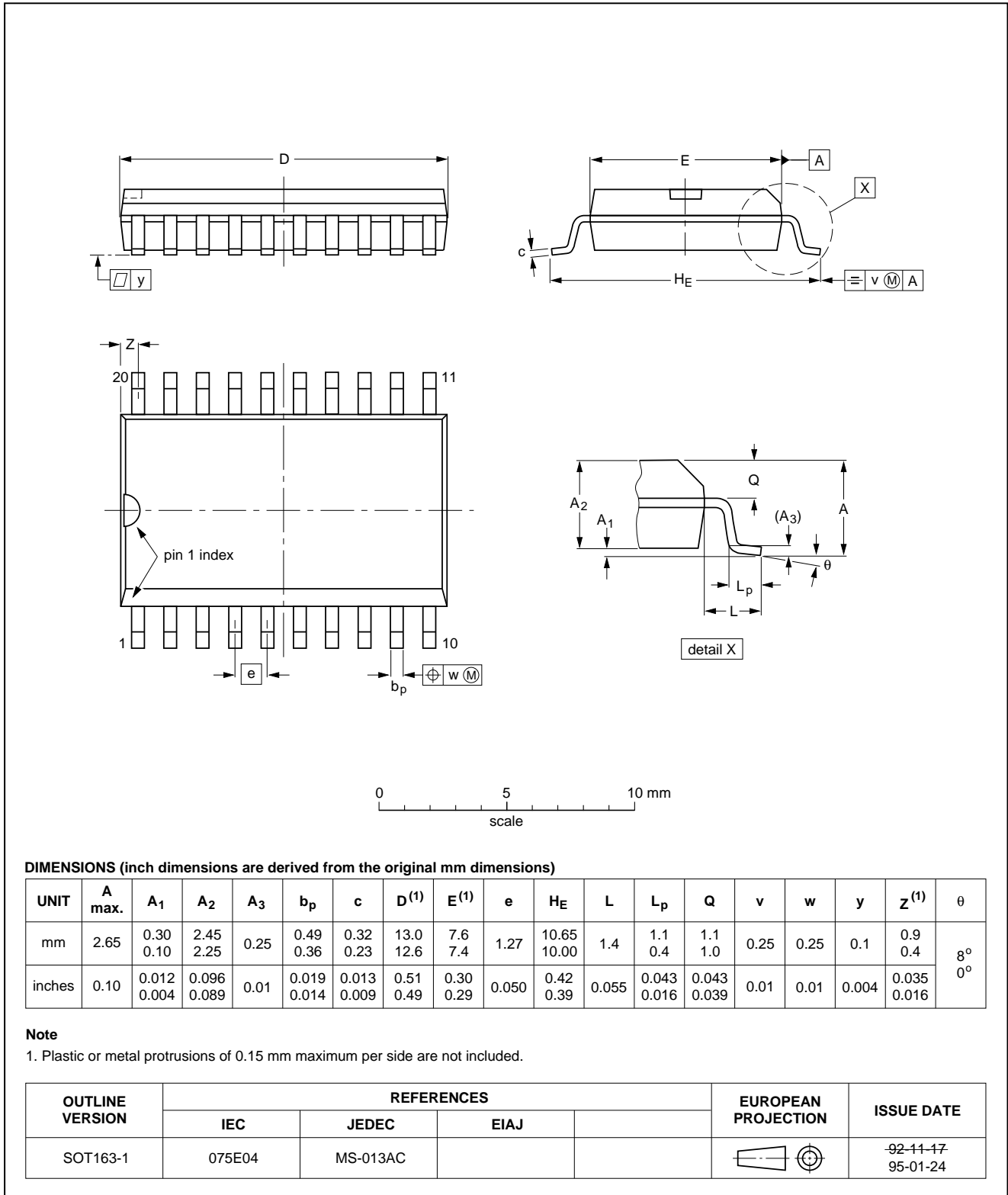
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT146-1			SC603			92-11-17 95-05-24

Infrared remote control decoder

SAA3049A

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



## Infrared remote control decoder

SAA3049A

### SOLDERING

#### Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

#### DIP

##### SOLDERING BY DIPPING OR BY WAVE

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ( $T_{stg\ max}$ ). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

##### REPAIRING SOLDERED JOINTS

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

#### SO

##### REFLOW SOLDERING

Reflow soldering techniques are suitable for all SO packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt.

Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

##### WAVE SOLDERING

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

##### REPAIRING SOLDERED JOINTS

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

## Infrared remote control decoder

SAA3049A

**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

**LIFE SUPPORT APPLICATIONS**

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Printed in The Netherlands

537021/25/02/pp16

Date of release: 1996 Sep 13

Document order number: 9397 750 01145

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