

# INTEGRATED CIRCUITS FOR TV AND RADIO RECEIVERS

**SAA1250, SAA1251 IC Kit for 64 Channel Infrared Remote Control** (both in 24-Pin Plastic Package)

**SAA1250:** Transmitter IC in CMOS Technology  
**SAA1251:** Receiver IC in P-Channel Si-Gate Technology

## Description of the System

This IC kit, developed for the remote control of television and radio receivers is based on an interference-rejecting infrared transmission principle. It consumes a minimal current at the transmitting end and, due to its large instruction repertoire is highly flexible in application. This is why it may also be employed for industrial remote-control. Pulsecode modulated infrared light serves for the transmission of remote-control commands, the information being defined by the varying time intervals between a sequence of very short infrared pulses. This enables the emitter diode to be driven with a high current (1 A or more), thus achieving a large transmission distance and high interference immunity while ensuring a long battery life.

A photo-diode converts the received IR-transmissions into electrical signals. These are then amplified and fed to the receiver IC SAA1251, where certain signals are converted into command signals for television and wireless receivers, e.g. for on/off switching, choice of program and for the setting of four analog control values such as volume, brightness etc. All the received signals appear on the data output DA of the SAA1251 in amplitude-modulated form and may be processed further by the adapter ICs SAA1271 or SAA1272, and/or by the frequency synthesizer IC kit SAA1272, SAA1075, SAA1276 resp. SAA1174, SAA1075, SAA1276, all of ITT.

Each remote-control signal word contains ten information bits. The transmitter IC SAA1250, therefore, is capable of delivering 1024 different signals. The word is usually structured into four bits and six bits offering 16 addresses and 64 commands. However, this separation must by no means be rigidly adhered to. The receiver IC allows an operational mode in which commands for calling up subsystems are also used. So, the number of transmittable commands and addressable additional integrated circuits becomes practically unlimited.

The signals are transmitted by means of infrared light in the shape of packaged pulses. For the transmission of a 10-bit word, 14 pulses are required. The binary information of a bit is contained in the time interval between two pulses. We define the time T (approx. 100  $\mu$ s) as the basis for the code to be employed. A short interval of duration T between any two pulses corresponds to the binary digit "0", while a long interval of the duration 2T signifies the binary digit "1". For a 10-bit word, 11 data pulses are therefore required. In addition, every signal contains a preliminary pulse, a start pulse and a stop pulse. The spacing between preliminary pulse and start pulse is 3T. This is followed after 1T by the 11 data pulses and terminated after a 3T interval by the stop pulse.

**The Transmitter IC SAA1250** may operate in one of three modes which are determined via the two address inputs (pins 6 and 7):

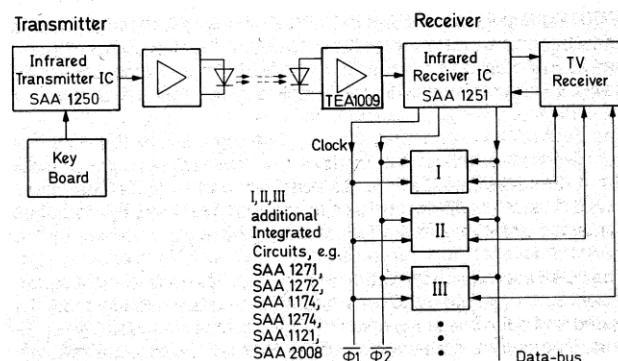
Option I: After contact actuation the first command is issued with address 1, all following with address 16 as long as the contact is actuated.

Option II: All commands are sent with address 15.

Option III: All commands are sent with address 10.

The first command is given about 20 ms after contact actuation. All following commands are sent periodically every 130 ms.

Additionally, the free address selection mode can be operated with every one of the above-described options. For this purpose a Free Address Selection (FAS) flip-flop contained in the transmitter IC SAA1250 must be set. This is done by the brief application of an L signal to both address inputs, OA and OB (min. 30  $\mu$ s). In this mode the required address must be initially entered into the address register of the transmitter IC SAA1250, using one of the commands 17 to 32. Then all following commands are transmitted together with the stored address,



**Infrared Remote Control System with SAA1250, SAA1251**

including commands 17 to 32. Exceptions to this rule are the FAS off commands 2, 3, 33 and 39. These commands clear the address register and reset the FAS flip-flop. Immediately following this, the command is processed in the preselected option.

If commands are to be transmitted consecutively to various addresses with free address selection, the L signal must be permanently applied to both address inputs. The commands 2, 3, 33 and 39 (FAS off) will, under these conditions, clear only the address register. The operational mode of Free Address Selection remains in force.

**The Receiver IC SAA1251** can be made to function in four different modes. The mode is selected in that the option input, pin 18 is connected to different pins of the integrated circuit.

Option I: The receiver operates with address 16. The only additional function, via address 14, affects the D/A converters. This functional mode is intended for the remote control of television receivers.

Option II: This functional mode is likewise intended for remote-controlled television receivers via address 16. Apart from address 14, also the address 13 can be employed for controlling the D/A converters. The remaining addresses as well as the unused commands of partially occupied addresses stay available for further circuits connected to the data-bus.

Option III: In this variant, all functions of the receiver IC are activated only via address 15. This enables parallel operation of one SAA1251, as under option I, and a further receiver IC SAA1251 provided in a radio receiver (option III).

Option IV: According to this option, the signals are processed in different ways, depending on the condition of a SUB flip-flop contained in the receiver IC. When the latter is initialised, this flip-flop is set to "off". The receiver will then operate via address 1 and 16, as in the above-described options I to III. However, commands 57 to 64 set the SUB flip-flop to "on". When this changeover has taken place, the program commands are code converted and given out by the data output DA, without effecting any change in the program location memory. The commands 2, 3, 33 and 39 are used to reset the SUB flip-flop to "off".

Option IV is intended for the control of television receivers with video text, television games and similar accessories. These accessories are treated as "Subsystems". This results in the following operating advantages. The same transmitter keys which change the program in the condition "Subsystem off" can be used to input numbers when the condition is "Subsystem on". If the television receiver is switched off while operating in the subsystem mode, it returns automatically to TV operation (Subsystem off) when it is switched on again. It is therefore not necessary to provide functional mode indication.

All signals transmitted via infrared are outputted by the data output DA, regardless of address and operation mode.