

SUPERSEDES DATA OF OCTOBER 1989

## CODED LOCKING CIRCUIT FOR SECURITY SYSTEMS

(one-shot output; 6.5 k codes)

### GENERAL DESCRIPTION

The TEA5501 is an encoder/decoder circuit, for security systems. In the system a complex code is transmitted between an encoding and a decoding unit by e.g. infrared radiation, RF or direct galvanic contact. It can be used as an electronic lock or for (de)activating an alarm. The device can operate as an encoder or decoder. The code (6561 combinations) is hardware programmable.

### Features

- Universal encoder/decoder circuit
- 6561 hardware programmable combinations
- Error protection: transmitted code is repeated twice
- Scanning protection: after receiving three invalid codes, data input is disabled for a short time
- Low supply voltage
- High output current

### QUICK REFERENCE DATA

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage (pin 14)		$V_p$	3.0	4.5	6.5	V
Supply current (pin 14)	$V_p = 4.5 \text{ V}$	$I_p$	1.8	2.5	3.2	mA
Operating ambient temperature range		$T_{amb}$	-40	-	+ 85	°C
Storage temperature range		$T_{stg}$	-50	-	+ 150	°C
Total power dissipation		$P_{tot}$	-	-	500	mW
Maximum voltage at output (pin 3)		$V_O$	-	-	16	V

 INTEGRATED CIRCUITS  
 ICT1

9397 288 00011

### PACKAGE OUTLINE

14-lead DIL; plastic (SOT27).



# PHILIPS

October 1990

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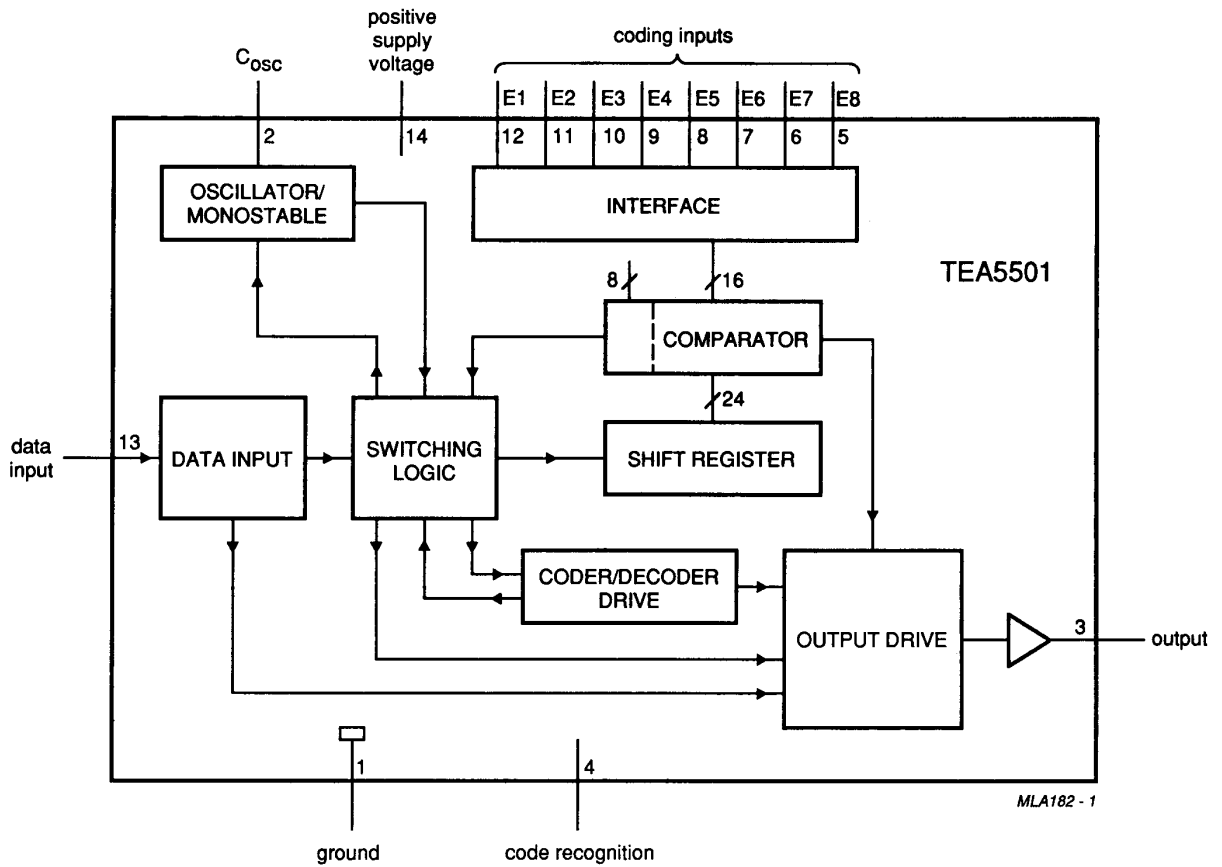


Fig.1 Block diagram.

## PINNING

### Pin functions

pin	mnemonic	description
1	GND	ground
2	C <sub>osc</sub>	oscillator capacitor
3	S	output
4	E <sub>recogn</sub>	code recognition
5	E8	coding inputs
6	E7	
7	E6	
8	E5	
9	E4	
10	E3	
11	E2	
12	E1	
13	DATA	data input
14	V <sub>p</sub>	positive supply voltage

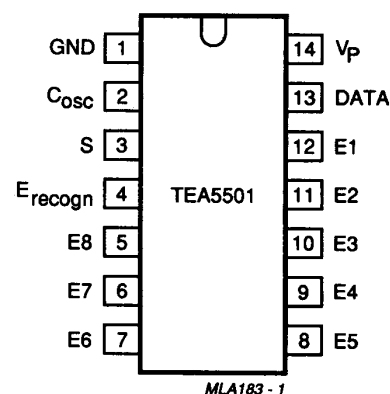


Fig.2 Pinning diagram.

## FUNCTIONAL DESCRIPTION

The TEA5501 is an encoder/decoder circuit, for security systems. The system has the ability to transmit a complex code between an encoding and decoding unit by e.g. infrared radiation, RF or galvanic contact. The device can operate as an encoder or decoder depending on the external circuitry connected to the data input. The code is made by the 8 input pins E1 to E8 by connecting them either to ground (LOW) or to the positive supply (HIGH), or leaving them floating ( $\infty$ ). This allows  $3^8$  combinations.

### Encoding

In encoding mode the data input is connected to V<sub>p</sub>. The encoded signal (programmed code plus recognition code) appears at the output S. After every start the encoder completes three coding runs then stops automatically.

### Decoding

In decoding mode the data input is open for data from the encoder. If the input data is recognized, the data input of the decoder is temporarily closed (disregarding immediately following data) and the output is activated for a predetermined time.

If the input data is not recognized, the output is not activated and after the third coding run is completed the data input of the decoder is temporarily closed.

### Output

The output is an open-collector configuration (npn), which is active LOW. It can handle a higher supply voltage than V<sub>p</sub> (i.e. 16 V max.).

### Coding input (recognition code)

Pin 4 must either be at ground level or at a maximum level of 0.3 V.

**RATINGS**

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

parameter	symbol	min.	max.	unit
Supply voltage (pin 14)	$V_p$	—	7	V
Supply current (pin 14)	$I_p$	0	50	mA
Input voltage (pins 2 and 5 to 12)	$V_I$	-0.3	$V_p + 0.3$	V
Voltage at output (pin 3)	$V_O$	-0.3	16	V
Total power dissipation	$P_{tot}$	—	500	mW
Storage temperature range	$T_{stg}$	-50	+ 150	°C
Operating ambient temperature range	$T_{amb}$	-40	+ 85	°C

**THERMAL RESISTANCE**

From junction to ambient

$$R_{th\ j-a} = 125\ K/W$$

**CHARACTERISTICS**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ ; voltages with respect to pin 1; unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
<b>Supply</b>						
Supply voltage (pin 14)		$V_P$	3	4.5	6.5	V
Supply current	$V_P = 4.5\text{ V}$	$I_P$	1.8	2.5	3.2	mA
Zener diode voltage across supply	note 1	$V_Z$	—	—	8	V
<b>Inputs E1 to E8</b>						
Input voltage HIGH		$V_{IH}$	$V_P - 0.3$	—	—	V
Input voltage LOW		$V_{IL}$	—	—	0.3	V
Input voltage floating		$V_{IFL}$	1	—	$V_P - 1$	V
Input current HIGH		$I_{IH}$	2	7	12	$\mu\text{A}$
Input current LOW		$I_{IL}$	-4	-9	-15	$\mu\text{A}$
Input current floating		$I_{IFL}$	—	—	2	$\mu\text{A}$
<b>Data input</b>						
Input voltage						
for encoding mode		$V_{de}$	$V_P - 0.6$	$V_P$	$V_P + 0.3$	V
for decoding mode HIGH		$V_{ddH}$	0.8	—	$0.5 V_P$	V
for decoding mode LOW		$V_{ddL}$	—	—	0.5	V
Input current						
in encoding mode	$V_{13} = V_P = 4.5\text{ V}$	$I_{de}$	8	16	25	$\mu\text{A}$
in decoding mode HIGH	$V_{13} = 2\text{ V}; V_P = 4.5\text{ V}$	$I_{ddH}$	—	—	2	$\mu\text{A}$
in decoding mode LOW	$V_{13} = 0.3\text{ V}; V_P = 4.5\text{ V}$	$I_{ddL}$	-8	-16	-25	$\mu\text{A}$
Minimum pulse width of DATA input signal		$t_{dp}$	2	—	—	$\mu\text{s}$
Output (pin 3)						
Output sink current	output active; $V_P = 4.5\text{ V}$	$I_{O(\text{sink})}$	25	—	—	mA
Voltage at output		$V_O$	—	—	16	V
Recognition code (pin 4)						
Input voltage		$V_I$	—	—	0.3	V
Input current		$I_I$	-4	-9	-15	$\mu\text{A}$

**Note to the supply characteristics**

1. Maximum Zener diode current 10 mA.

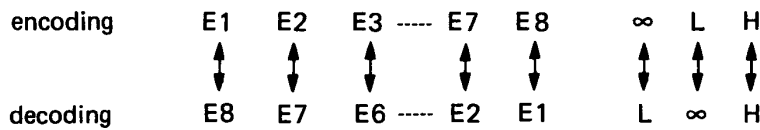
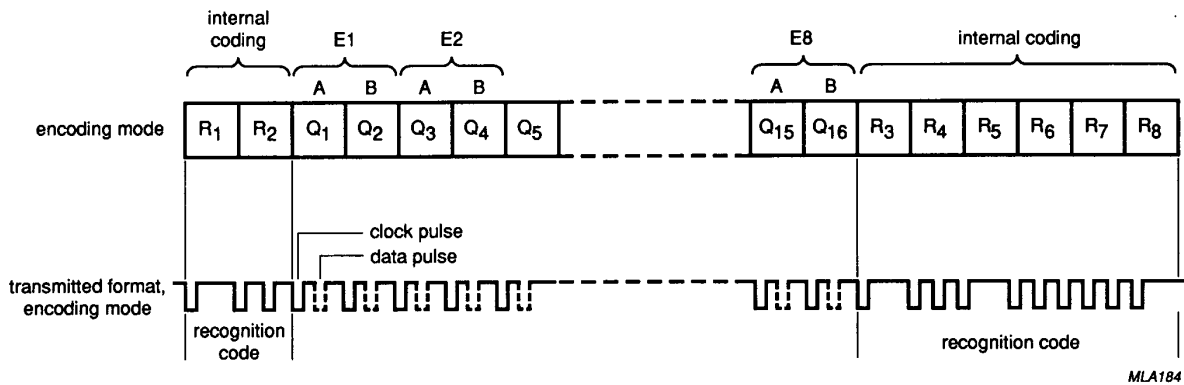
parameter	conditions	symbol	min.	typ.	max.	unit
<b>Oscillator characteristics</b>						
V <sub>p</sub> = 4.5 V						
Switching voltage thresholds						
high level		V <sub>th</sub>	3.10	3.32	3.50	V
low level		V <sub>tl</sub>	0.65	0.71	0.90	V
Input current						
after switching high level		I <sub>th</sub>	27	36	45	μA
after switching low level		I <sub>tl</sub>	-6.7	-9	-11.3	μA
Ratio I <sub>th</sub> /I <sub>tl</sub>		ΔI <sub>osc</sub>	3	4	5	
Duration of oscillator pulse						
in coding mode	note 1	τ <sub>c</sub>	20	0.4 · C <sub>osc</sub> (pF)	—	μs
in decoding mode		τ <sub>d</sub>	3 · τ <sub>c</sub>	0.4 · C <sub>osc</sub> (pF)	5 · τ <sub>c</sub>	μs
Oscillator capacitor						
in coding mode	notes 1 and 2	C <sub>osc</sub>	56	—	—	pF
Duration of						
output active status		τ <sub>o</sub>	—	384 · τ <sub>d</sub>	—	
data input disabled status		τ <sub>x</sub>	—	576 · τ <sub>d</sub>	—	
Influence of temperature on						
duration of oscillator pulse		$\frac{\Delta\tau_c/\tau_c}{\Delta T}$	—	0.002	—	K <sup>-1</sup>
Influence of supply voltage on						
duration of oscillator pulse		$\frac{\Delta\tau_c/\tau_c}{\Delta V_p}$	—	—	0.16	V <sup>-1</sup>

**Notes to the oscillator characteristics**

1. Minimum value encoder – capacitor must provide minimum pulse width of DATA pulse τ<sub>dp</sub> (= 0.2 τ<sub>c</sub>).
2. Ratio encoder/decoder capacitor 1 : 4.

**Code**

The code consists of 24 bits. Each bit is represented by presence or absence of a data pulse following a clock pulse. The first 2 and last 6 bits form the recognition code. The intermediate 8 pairs of bits are determined by the connections of the input pins (E1 to E8). For the corresponding code in decoding mode the order of the input pins is reversed and connections "LOW" (L) and "floating" ( $\infty$ ) are interchanged.



E	A	B	$Q_A$	$Q_B$
L	1	0	0	1
$\infty$	0	1	1	0
H	1	1	0	0

example

encoding    E1 = L   E2 = H   E3 =  $\infty$    E4 = H   .....   E7 = L   E8 =  $\infty$

decoding    E8 =  $\infty$    E7 = H   E6 = L   E5 = H   .....   E2 =  $\infty$    E1 = L

Fig. 3 Coding diagram.

**TIMING**

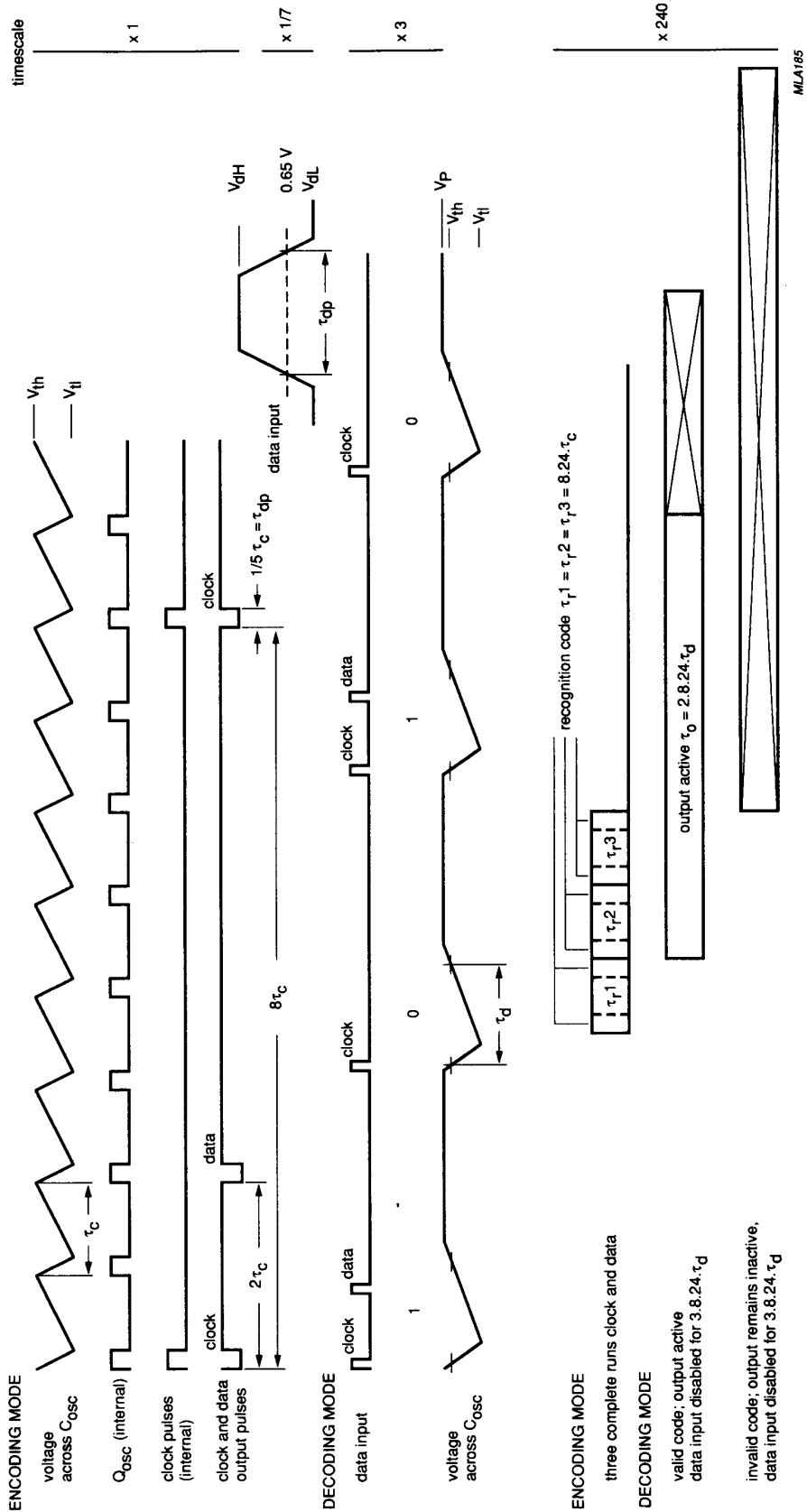
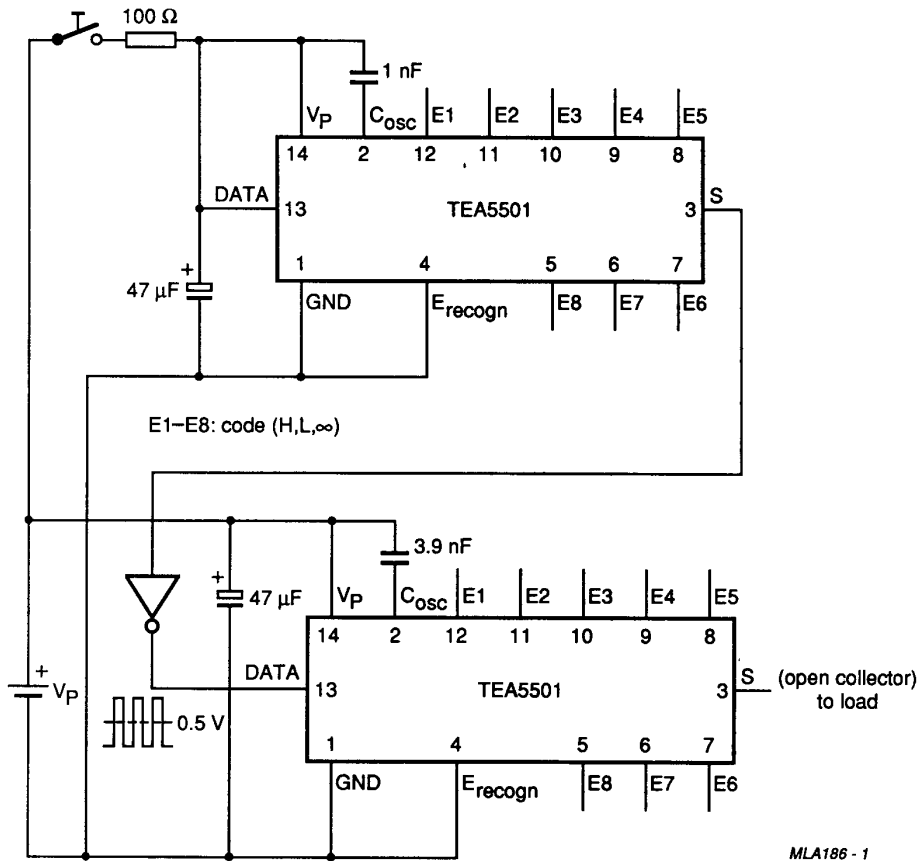


Fig.4 Timing diagram of TEA5501.



APPLICATION INFORMATION



E8 – E1: code (H, ∞, L).

Fig.5 Application diagram; data transmission via direct galvanic contact.

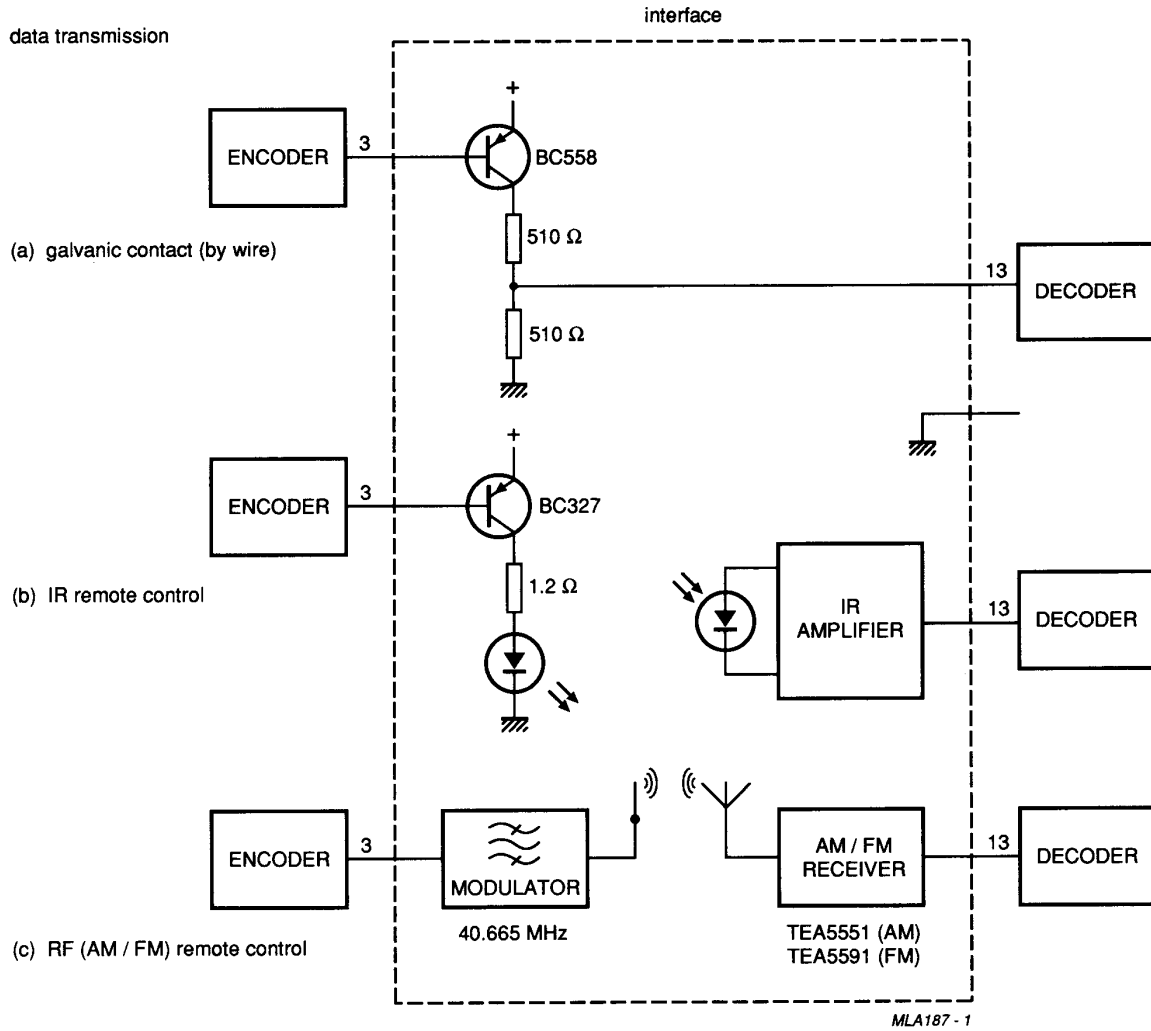
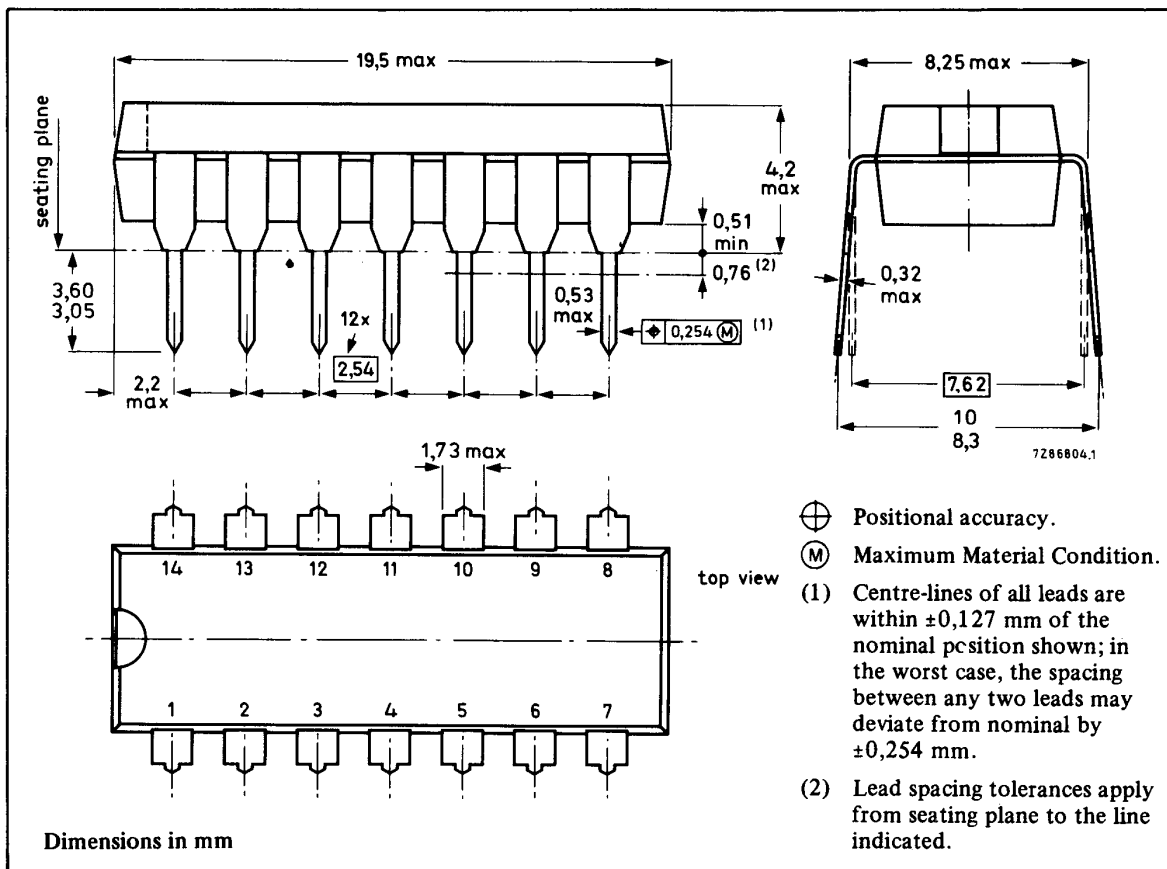


Fig.6 Application diagram; types of data transmission possible by using different interfaces.

14-LEAD DUAL IN-LINE; PLASTIC (SOT27)



SOLDERING PLASTIC DUAL IN-LINE PACKAGES

1. By hand

Apply the soldering iron below the seating plane (or not more than 2 mm above it). If its temperature is below 300 °C it must not be in contact for more than 10 seconds; if between 300 and 400 °C, for not more than 5 seconds.

2. By dip or wave

The maximum permissible temperature of the solder is 260 °C; 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 storage maximum. 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.

3. Repairing soldered joints

The same precautions and limits apply as in (1) above.