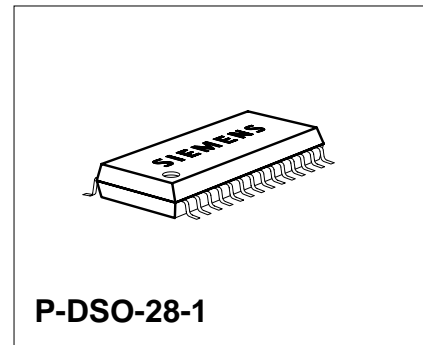
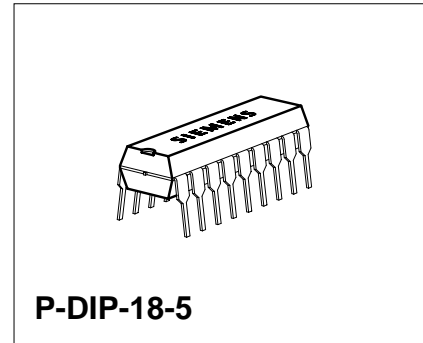


### 1 Overview

#### 1.1 Features

- Fast I<sup>2</sup>C Bus controlled (max. 400 kHz)
- Cascadable (2 bus addresses)
- 7 CVBS inputs, 5 outputs
  - 3 inputs with clamp disable by bus
- 1 input selectable as Y-input (S-VHS)
- 1 additional C-input (S-VHS)
- Y+C operation for S-VHS
  - selected by bus
- Fully ESD protected
- – 60 dB max. crosstalk at 5 MHz (P-DSO-28-1 only)
- Low operating voltage of 7.5 V
- 5 V operation is possible with reduced output signals of max. 2 V<sub>pp</sub>
- 15 MHz minimum bandwidth
- Noise insensitive clamping inputs
- Low impedance off condition
  - separate for each output



| Type      | Ordering Code    | Package    |
|-----------|------------------|------------|
| TDA 6920  | Q67000-A5200     | P-DIP-18-5 |
| TDA 6920X | Q67007-A5225 GEG | P-DSO-28-1 |

#### 1.2 General Description

The TDA 6920 switches 7 video input sources to 5 outputs. Each output can be switched to only one input, but one input can be switched to all outputs. The C-input may be combined with one CVBS input as Y for Y+C (S-VHS) operation. Y+C operation is selected by bus.

#### 1.3 Application

- Television sets
- Satellite receivers
- Video mixing desks

1.4 Pin Configuration  
(top view)

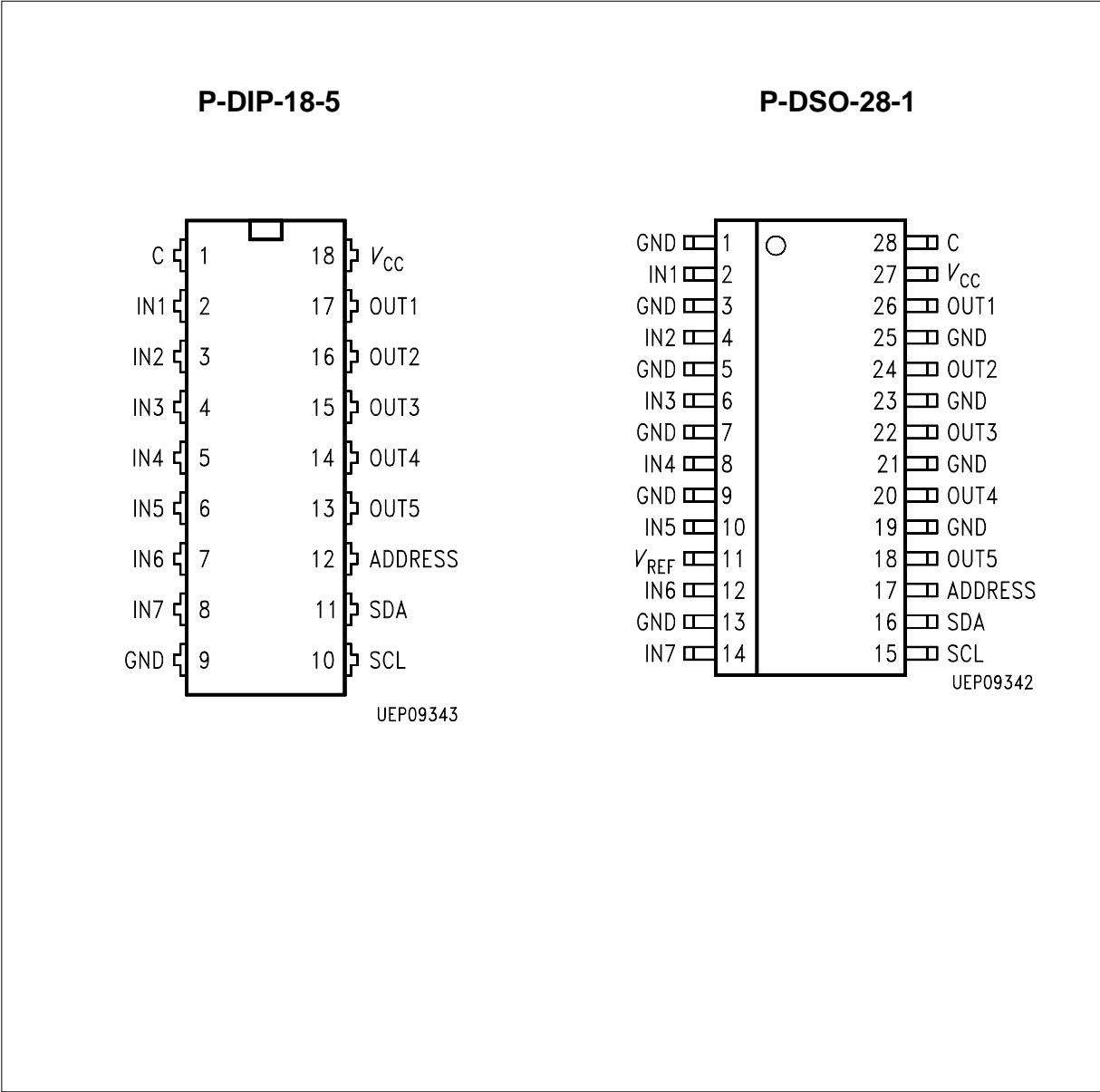


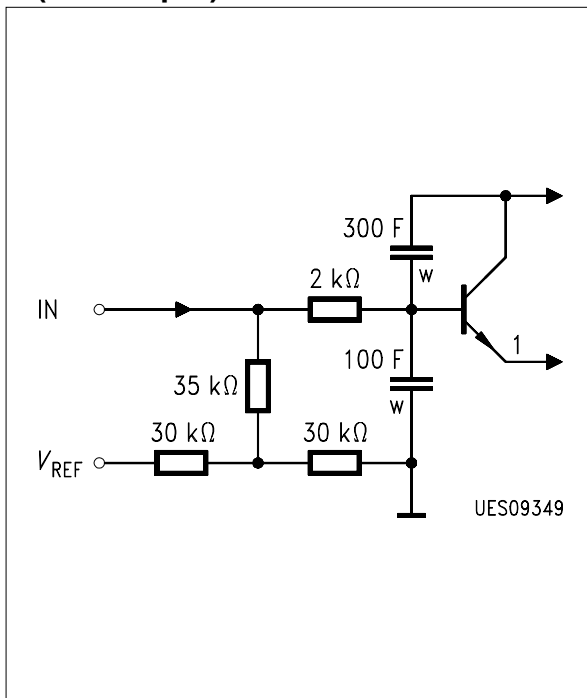
Figure 1

### 1.5 Pin Definitions and Functions

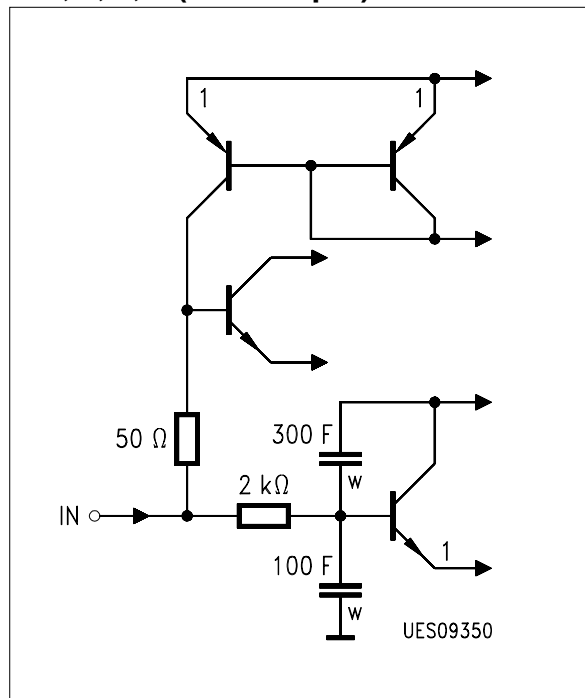
| Pin No.    |            | Symbol    | Function                                |
|------------|------------|-----------|---|
| P-DIP-18-5 | P-DSO-28-1 |           |   |
| –          | 1          | GND       | Signal and power supply ground          |
| 2          | 2          | IN1       | CVBS input 1                            |
| –          | 3          | GND       | Signal and power supply ground          |
| 3          | 4          | IN2       | CVBS input 2                            |
| –          | 5          | GND       | Signal and power supply ground          |
| 4          | 6          | IN3       | CVBS input 3                            |
| –          | 7          | GND       | Signal and power supply ground          |
| 5          | 8          | IN4       | CVBS input 4                            |
| –          | 9          | GND       | Signal and power supply ground          |
| 6          | 10         | IN5       | CVBS input 5                            |
| –          | 11         | $V_{REF}$ | Reference Voltage for external use      |
| 7          | 12         | IN6       | CVBS input 6                            |
| 9          | 13         | GND       | Power supply ground                     |
| 8          | 14         | IN7       | CVBS input 7                            |
| 10         | 15         | SCL       | I <sup>2</sup> C-Bus clock              |
| 11         | 16         | SDA       | I <sup>2</sup> C-Bus data               |
| 12         | 17         | ADDRESS   | Address selection                       |
| 13         | 18         | OUT5      | CVBS output 5                           |
| –          | 19         | GND       | Signal and power supply ground          |
| 14         | 20         | OUT4      | CVBS output 4                           |
| –          | 21         | GND       | Signal and power supply ground          |
| 15         | 22         | OUT3      | CVBS output 3                           |
| –          | 23         | GND       | Signal and power supply ground          |
| 16         | 24         | OUT2      | CVBS output 2                           |
| –          | 25         | GND       | Signal and power supply ground          |
| 17         | 26         | OUT1      | CVBS output 1                           |
| 18         | 27         | $V_{CC}$  | Positive power supply voltage           |
| 1          | 28         | C         | Separate color adding input for input 1 |

1.6 Pin Description

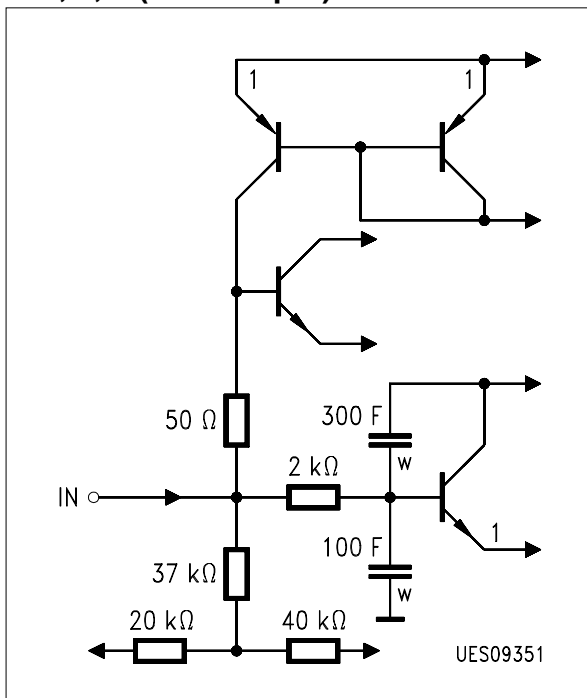
C (color input)



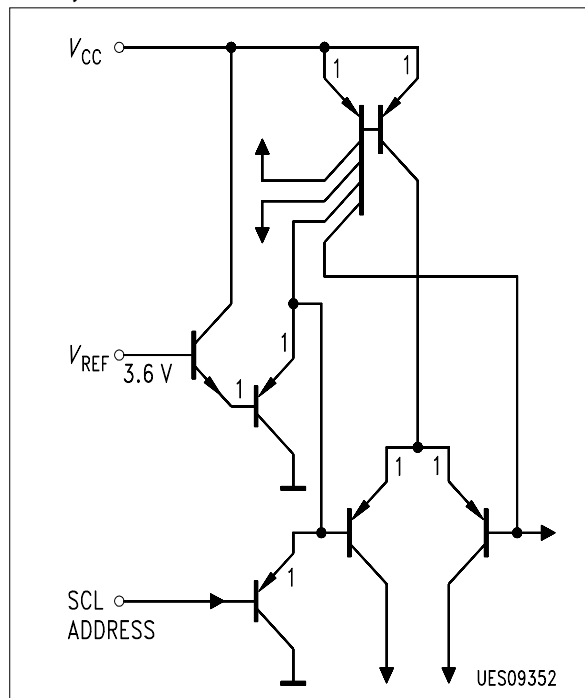
In 2, 5, 6, 7 (CVBS input)



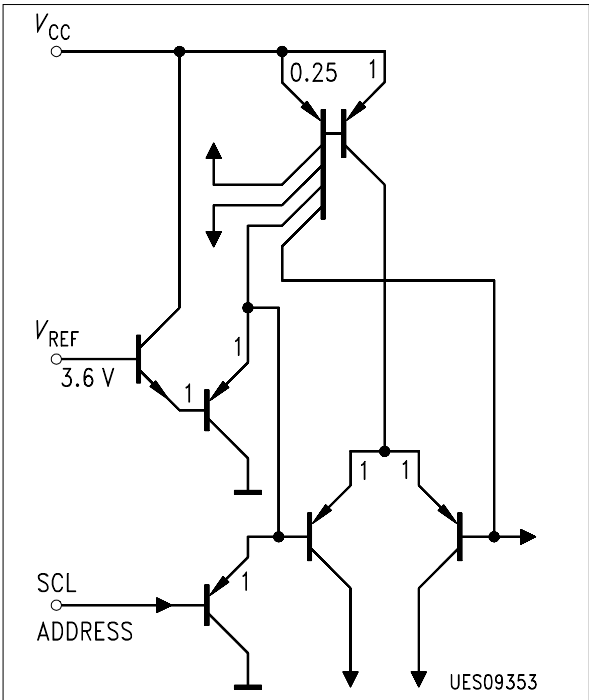
In 2, 3, 4 (CVBS input)



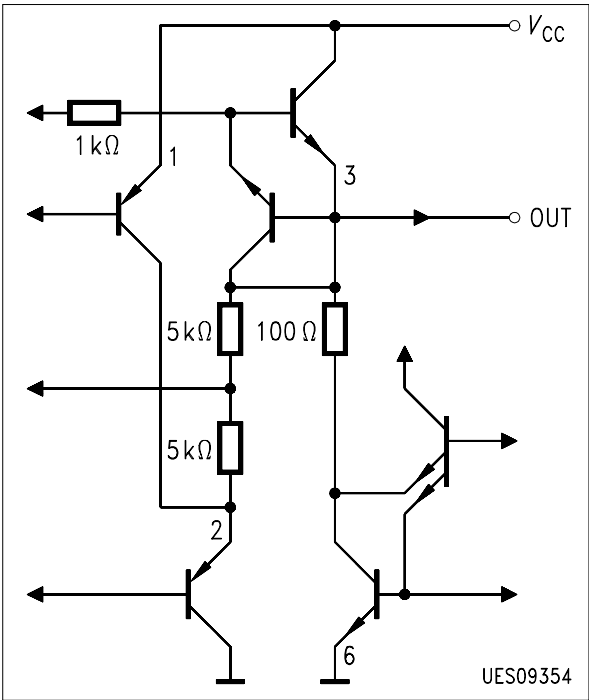
SCL, Address



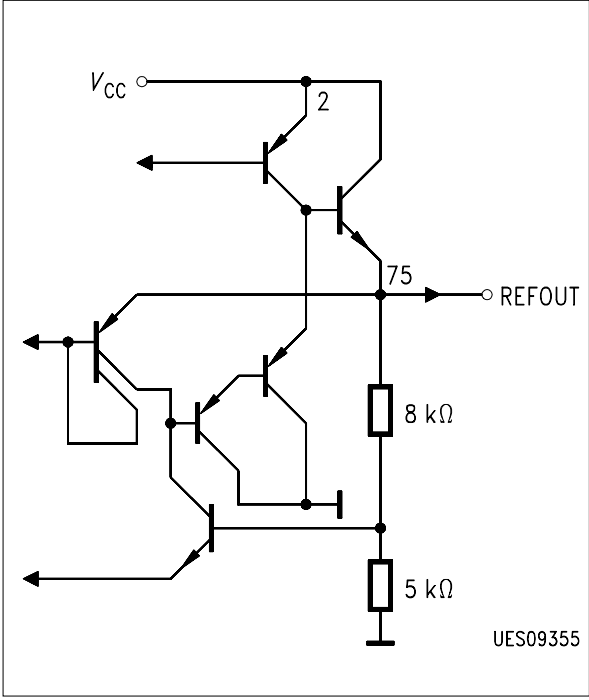
SDA



Out 1-5 (CVBS output)



V<sub>REF</sub> (SO-28 only)



1.7 Functional Block Diagram

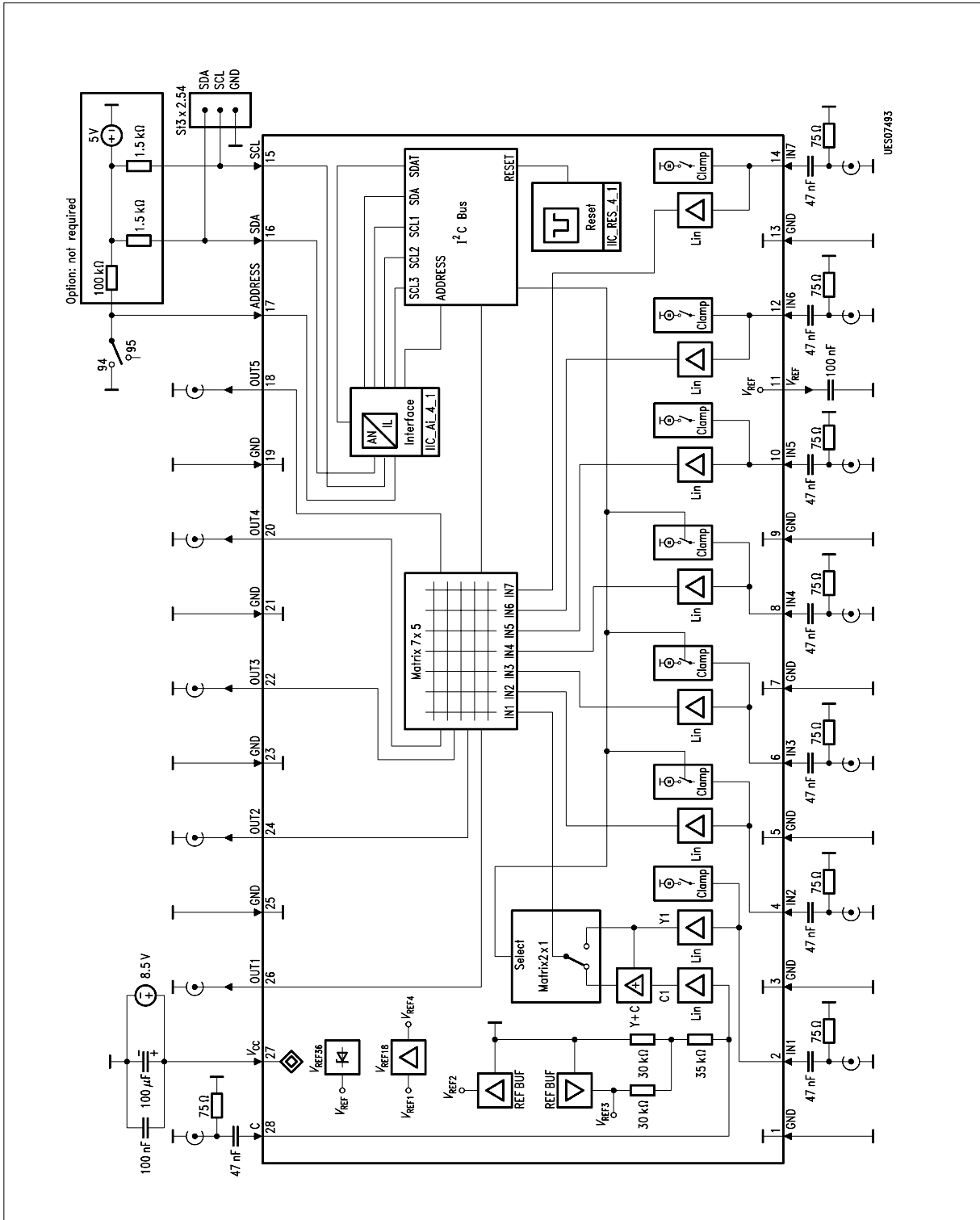


Figure 2  
Block Diagram (P-DSO-28-1)

**2 Functional Description**

The main function of the IC is to switch 7 input video sources to 5 outputs.  
 Each output can be switched to only one input.  
 It is possible to have the same input connected to several outputs.  
 3 of the inputs can be used as non-clamping-input, switching is controlled by bus.  
 The clamping function of the other 4 inputs can be overridden by external resistor divider.  
 The other 4 inputs can be switched to non-clamping mode with external R/C network.  
 All switching possibilities are controlled by the I<sup>2</sup>C Bus.  
 All outputs can be switched to low impedance off condition by the I<sup>2</sup>C Bus.  
 Driving 75 Ω load requires external transistors for best performance.  
 The recommended coupling capacitor at each input is 47 nF.  
 Each clamping input requires a 75 Ω (max. 500 Ω) termination resistor.  
 Operation without or with a termination resistor greater than 500 Ω causes malfunction of the new high performance clamping circuit.  
 Unused inputs should be directly grounded.  
 6 × 8 bits are necessary to determine one complete configuration change.  
 (1 addressbyte, 5 databytes)  
 Minimum configuration change for 1 output needs 2 × 8 bit (1 addressbyte, 1 databyte).  
 Power on reset state: all 5 outputs switched to input 1, all inputs clamped, Y+C off.

● **Address Selection (fast I<sup>2</sup>C Bus)**  
 1st byte of transmission (8 bit)

| Hex | Binary |      | Address Pin                |
|-----|--------|------|----------------------------|
|     | MSB    | LSB  |                            |
| 96  | 1001   | 0110 | V <sub>CC</sub> (min. 3 V) |
| 94  | 1001   | 0100 | GND                        |

- **Data Mode Selections** (fast I<sup>2</sup>C Bus)

2nd byte of transmission (8 bit)

**Output Selection (3 bit, bit 7 must always be 0)**

| b7 b6 <sup>1)</sup> | b5 b4 b3 | b2 b1 b0 <sup>1)</sup> | Selected Output |
|---------------------|----------|------------------------|-----------------|
| 0X                  | 000      | XXX                    | - not used      |
| 0X                  | 001      | XXX                    | OUT1            |
| 0X                  | 010      | XXX                    | OUT2            |
| 0X                  | 011      | XXX                    | OUT3            |
| 0X                  | 100      | XXX                    | OUT4            |
| 0X                  | 101      | XXX                    | OUT5            |
| 0X                  | 110      | XXX                    | - not used      |
| 0X                  | 111      | XXX                    | - not used      |

<sup>1)</sup> ..X = don't care

**Input Selection Clamped (3 bit, bit 7 must always be 0)**

| b7 b6 | b5 b4 b3 <sup>1)</sup> | b2 b1 b0 | Selected Input       |
|-------|------------------------|----------|----------------------|
| 0X    | XXX                    | 000      | Output off condition |
| 00    | XXX                    | 001      | IN1                  |
| 00    | XXX                    | 010      | IN2                  |
| 00    | XXX                    | 011      | IN3                  |
| 00    | XXX                    | 100      | IN4                  |
| 0X    | XXX                    | 101      | IN5                  |
| 0X    | XXX                    | 110      | IN6                  |
| 0X    | XXX                    | 111      | IN7                  |

<sup>1)</sup> ..X = don't care



● **Data Mode Selections** (fast I<sup>2</sup>C Bus) continued

2nd byte of transmission (8 bit)

**Input Selection Non Clamped / Y+C** (Y: always clamped. C: non clamped)

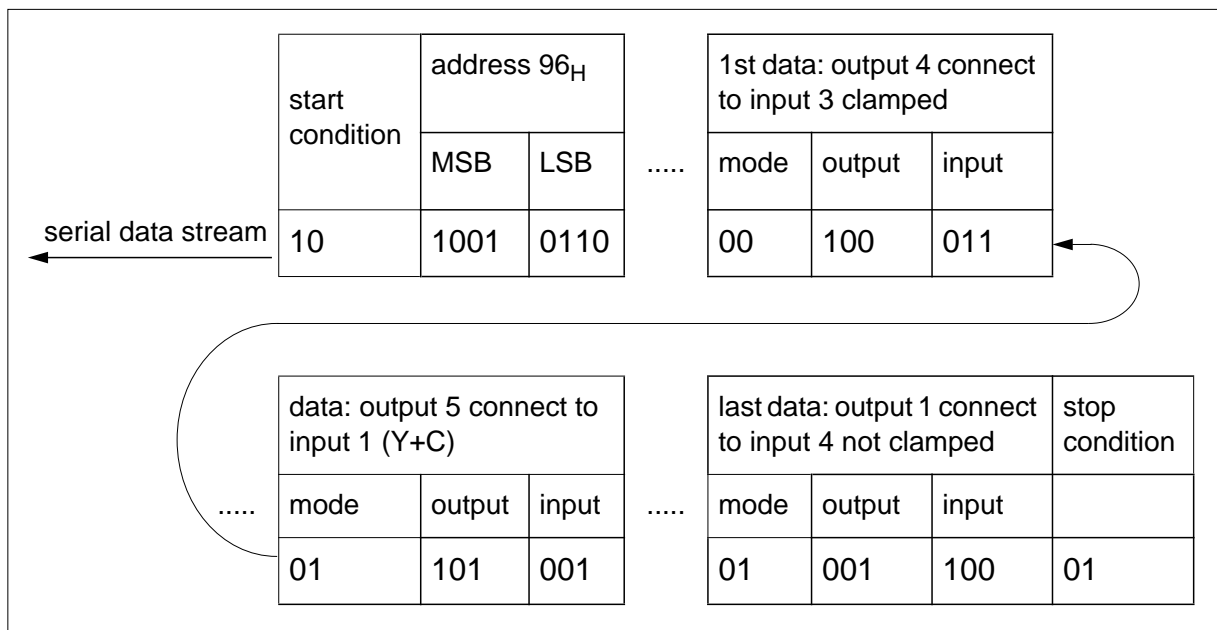
(3 bit, bit 7 must always be 0)

| b7 b6 | b5 b4 b3 <sup>1)</sup> | b2 b1 b0 | Selected input |
|-------|------------------------|----------|----------------|
| 00    | XXX                    | 001      | in1, (Y+C) off |
| 00    | XXX                    | 010      | in2, clamp on  |
| 00    | XXX                    | 011      | in3, clamp on  |
| 00    | XXX                    | 100      | in4, clamp on  |
| 01    | XXX                    | 001      | in1, (Y+C) on  |
| 01    | XXX                    | 010      | in2, clamp off |
| 01    | XXX                    | 011      | in3, clamp off |
| 01    | XXX                    | 100      | in4, clamp off |

1) X = don't care (if only input operation mode change is requested, b5, b4 b3 should be 0, 0, 0: no output configuration is changed.)

● **Bus Protocol** (fast I<sup>2</sup>C Bus)

Programming Example: SDA sequence



### 3 Electrical Characteristics

#### 3.1 Absolute Maximum Ratings

| Parameter   | Symbol                     | Limit Values |          | Unit | Test Condition |
|---|----------------------------|--------------|----------|------|----------------|
|   |                            | min.         | max.     |      |                |
| Supply voltage ( $V_{CC}$ )   | $V_{CC}$                   | 0            | 14       | V    |                |
| Reference voltage<br>(P-DSO-28-1 only)                                      | $V_{REF}$                  | 0            | 5        | V    |                |
| Reference current<br>( $R_{Lmin} = 1\text{ k}\Omega$ )                      | $I_{REF}$                  |              | 3.5      | mA   |                |
| Output voltage  | $V_{OUT1 - OUT5}$          | 0            | $V_{CC}$ | V    |                |
| Output current<br>( $R_{Lmin} = 500\ \Omega$ )                              | $I_{OUT1 - OUT5}$          |              | 5        | mA   |                |
| Input voltage   | $V_C$                      | 0            | $V_{CC}$ | V    |                |
| Input voltage   | $V_{IN1 - IN7}$            | 0            | $V_{CC}$ | V    |                |
| SCL, SDA, address input<br>voltage  | $V_{SDA, SCL,}$<br>Address | 0            | $V_{CC}$ | V    |                |
| ESD-voltage all pins HBM<br>( $R = 1.5\text{ k}\Omega, C = 100\text{ pF}$ ) | $V_{ESD}$                  | - 6          | 6        | kV   |                |
| Junction temperature  | $T_j$                      |              | 150      | °C   |                |
| Storage temperature   | $T_{stg}$                  | - 40         | 125      | °C   |                |
| Thermal resistance<br>(system - air)  | $R_{th\ SA}$               |              | 75       | K/W  |                |

*Note: Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.*

### 3.2 Operating Range

| Parameter   | Symbol                 | Limit Values |      | Unit     | Test Condition |
|---|------------------------|--------------|------|----------|----------------|
|   |                        | min.         | max. |          |                |
| Supply voltage  | $V_{CC}$               | 7.5          | 13.2 | V        |                |
| Absolute minimum supply voltage (only usable with reduced output signals of max. 2 Vpp) | $V_{CC}$               | 4.5          |      | V        |                |
| Reference voltage (P-DSO-28-1 only)   | $V_{REF}$              | 3.3          | 3.9  | V        |                |
| Video-input frequency range – 3 dB  | $f_{IN\ IN1 - IN7, C}$ | 0            | 20   | MHz      |                |
| Video-input AC-voltage (color)  | $V_C$                  |              | 1.0  | Vpp      |                |
| Video-input AC-voltage (Y, CVBS)  | $V_{IN1 - IN7}$        |              | 1.7  | Vpp      |                |
| Video-output AC-voltage   | $V_{OUT1 - OUT5}$      |              | 3.4  | Vpp      |                |
| Input DC-voltage  | $V_C$                  | 1.3          | 2.3  | V        |                |
| Input DC-voltage (clamping)   | $V_{IN1 - IN7}$        | 1.8          | 3.5  | V        |                |
| Input DC-voltage (non clamping)   | $V_{IN2, 3, 4}$        | 1.5          | 3.2  | V        |                |
| Input source-impedance (clamping)   | $RI_{IN1 - IN7}$       | 0            | 500  | $\Omega$ |                |
| I <sup>2</sup> C-Bus clock  | $f_{IN\ SDA, SCL}$     | 0            | 500  | kHz      |                |
| Ambient temperature during operation  | $T_A$                  | – 10         | 85   | °C       |                |

*Note: In the operating range the functions given in the circuit description are fulfilled.*

**3.3 DC Characteristics**

$T_A = 25\text{ °C}$ ,  $V_{CC} = 8.5\text{ V}$

| Parameter                                       | Symbol                          | Limit Values |      |          | Unit          | Test Condition   |
|---|---------------------------------|--------------|------|----------|---------------|--|
|   |                                 | min.         | typ. | max.     |               |  |
| Total current consumption                       | $I_{CC}$                        |              | 42   | 58       | mA            | $R_L = \infty$   |
| Reference voltage (P-DSO-28-1 only)             | $V_{REF}$                       | 3.4          | 3.6  | 3.8      | V             | $R_L = \infty$   |
| Output DC-voltage (clamping)                    | $V_{OUT1 - OUT5}$               |              | 1.8  |          | V             | $V_{C, IN1 - IN7} = 0\text{ Vpp}$                            |
| Output DC-voltage (output off)                  | $V_{OUT1 - OUT5}$               |              | 0.8  |          | V             | $V_{C, IN1 - IN7} = 0\text{ Vpp}$                            |
| Output current                                  | $I_{OUT1 - OUT5}$               | 0.5          | 1.0  | 2.0      | mA            | $V_{OUT} = 2\text{ V}$ ,<br>$I_n = 0\text{ Vpp}$             |
| Input DC-voltage                                | $V_C$                           |              | 1.8  |          | V             | $V_C = 0\text{ Vpp}$   |
| Input DC-voltage (clamping)                     | $V_{IN1 - IN7}$                 |              | 1.8  |          | V             | $V_{IN1 - IN7} = 0\text{ Vpp}$                               |
| Input current (clamping)                        | $I_{IN1 - IN7}$                 |              | 0.33 | 1        | $\mu\text{A}$ | $I_{IN1 - IN7} = 0\text{ Vpp}$                               |
| Input DC-voltage (for ext. clamping override)   | $V_{IN1 - IN7}$                 |              | 2.4  |          | V             | $V_{IN1 - IN7} = 0\text{ Vpp}$                               |
| Input DC-voltage (non-clamping, Bus controlled) | $V_{IN2, 3, 4}$                 |              | 2.4  |          | V             | $V_{IN2, 3, 4} = 0\text{ Vpp}$                               |
| Input current (SCL, SDA, address)               | $I_{SDA, SCL}$<br>$I_{Address}$ |              | 0.1  | 0.4      | $\mu\text{A}$ | $V_{SDA, SCL} = 0\text{ V}$<br>$V_{Address} = 0\text{ V}$    |
| Output current (SDA)                            | $I_{SDA}$                       | 6            |      |          | mA            | $V_{SDA} = 0.6\text{ V}$                                     |
| Output voltage low (SDA)                        | $V_{SDA}$                       | 0            | 0.2  | 0.4      | V             | $I_{SDA} = 3\text{ mA sink}$<br>$I_{SDA} = 3\text{ mA sink}$ |
|   | $V_{SDA}$                       | 0            | 0.3  | 0.6      | V             |  |
| SCL, SDA, address (96 hex) : high               | $V_{SDA, SCL}$<br>$V_{Address}$ | 3.0          |      | $V_{CC}$ | V             |  |
| SCL, SDA, address (94 hex) : low                | $V_{SDA, SCL}$<br>$V_{Address}$ | 0            |      | 1.5      | V             |  |
| SCL, SDA, address (hysteresis)                  | $V_{SDA, SCL}$<br>$V_{Address}$ | 0.2          |      | 1        | V             | dependant on input frequency                                 |

### 3.4 AC Characteristics

$$T_A = 25\text{ }^\circ\text{C}, V_{CC} = 8.5\text{ V}$$

| Parameter                              | Symbol             | Limit Values |          |      | Unit            | Test Condition                     |
|--|--------------------|--------------|----------|------|-----------------|------------------------------------|
|  |                    | min.         | typ.     | max. |                 |                                    |
| Video bandwidth                        | $P_{OUT/IN}$       | 15           | 20       |      | MHz             | – 3 dB point                       |
| Video gain                             | $V_{OUT/IN}$       | 1.9          | 2.0      | 2.1  |                 |                                    |
| Crosstalk (0 - 5 MHz)<br>P-DSO-28-1    | $A$                |              | – 65     | – 60 | dB              | inputs 75 $\Omega$ to GND          |
| Crosstalk (0 - 5 MHz)<br>P-DSO-28-1    | $A$                |              | – 55     | – 50 | dB              | inputs 500 $\Omega$ to GND         |
| Crosstalk (0 - 5 MHz)<br>P-DIP-18-5    | $A$                |              | – 62     | – 60 | dB              | inputs 75 $\Omega$ to GND          |
| Crosstalk (0 - 5 MHz)<br>P-DIP-18-5    | $A$                |              | – 45     | – 50 | dB              | inputs 500 $\Omega$ to GND         |
| Input AC-voltage                       | $V_C$              |              | 0.75     | 1    | V <sub>pp</sub> | sinus                              |
| Input AC-voltage                       | $V_{IN1 - IN7}$    |              | 1        | 1.5  | V <sub>pp</sub> | clamped                            |
| Input AC-voltage (sinus)               | $V_{IN2, 3, 4}$    |              | 1        | 1.5  | V <sub>pp</sub> | non clamped                        |
| Output AC-voltage                      | $V_{OUT1 - OUT5}$  |              | 2        | 3    | V <sub>pp</sub> |                                    |
| I <sup>2</sup> C-Bus clock             | $f_{IN\ SDA, SCL}$ |              | 400      | 500  | kHz             |                                    |
| Output linearity                       | $DG_{OUT1 - OUT5}$ |              | 0.2      | 1    | %               | $R_L = \infty$                     |
| Input resistance<br>(non-clamping)     | $R_{C, IN2, 3, 4}$ | 40           | 50       |      | k $\Omega$      |                                    |
| Input source-impedance<br>(clamping)   | $R_{IN1 - IN7}$    | 0            | 75       | 500  | $\Omega$        |                                    |
| Input coupling-capacitor<br>(clamping) | $C_{IN1 - IN7}$    |              | 47<br>10 |      | nF<br>$\mu$ F   | CVBS-signal ><br>20 Hz Audiosignal |
| Output dyn. impedance                  | $R_{OUT1 - OUT5}$  |              | 50       | 75   | $\Omega$        |                                    |

*Note: The listed characteristics are ensured over the operating range of the integrated circuit. Typical characteristics specify mean values expected over the production spread. If not otherwise specified, typical characteristics apply at  $T_A = 25\text{ }^\circ\text{C}$  and the given supply voltage.*

4 Test Circuits

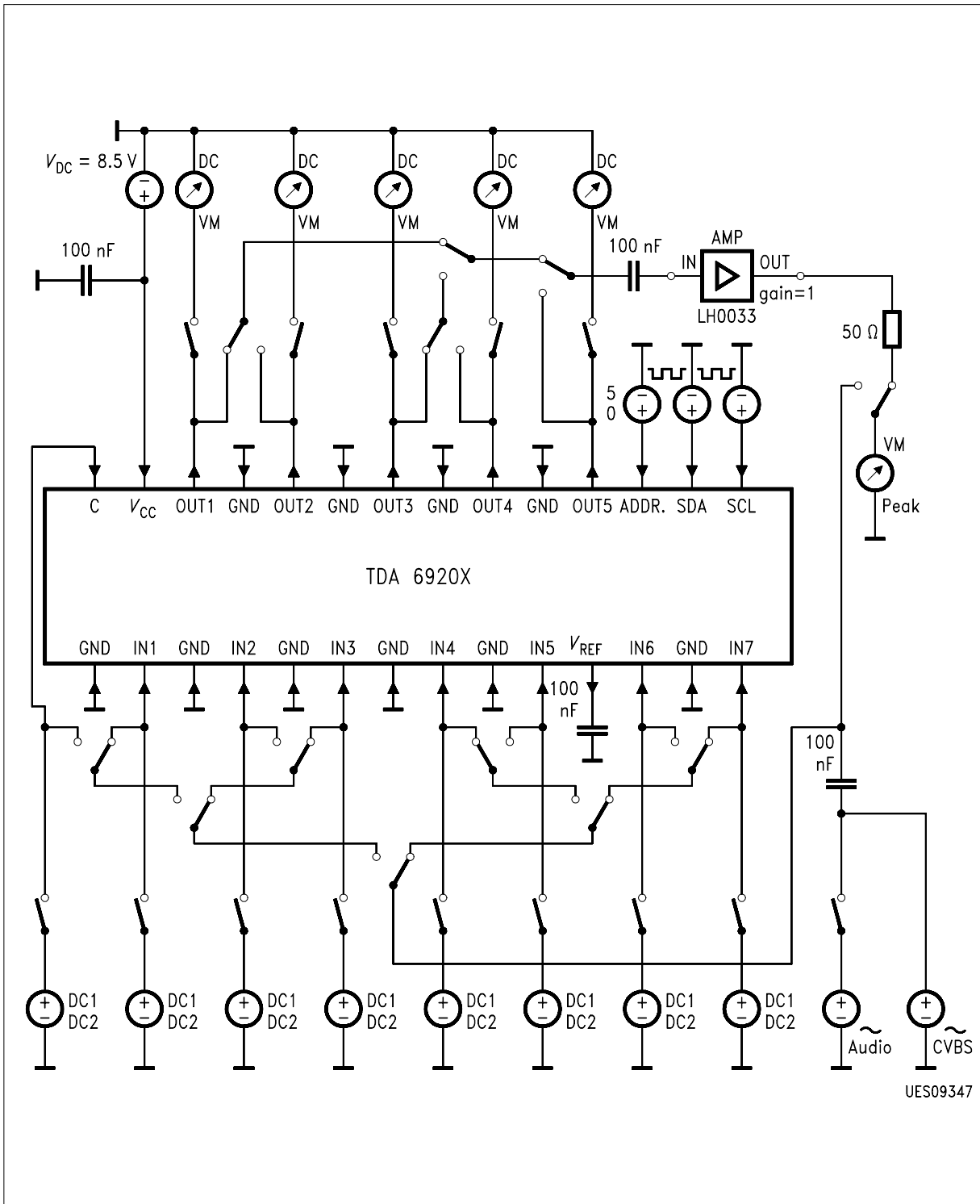


Figure 3  
Test Circuit (P-DSO-28-1)



5 Application Circuits

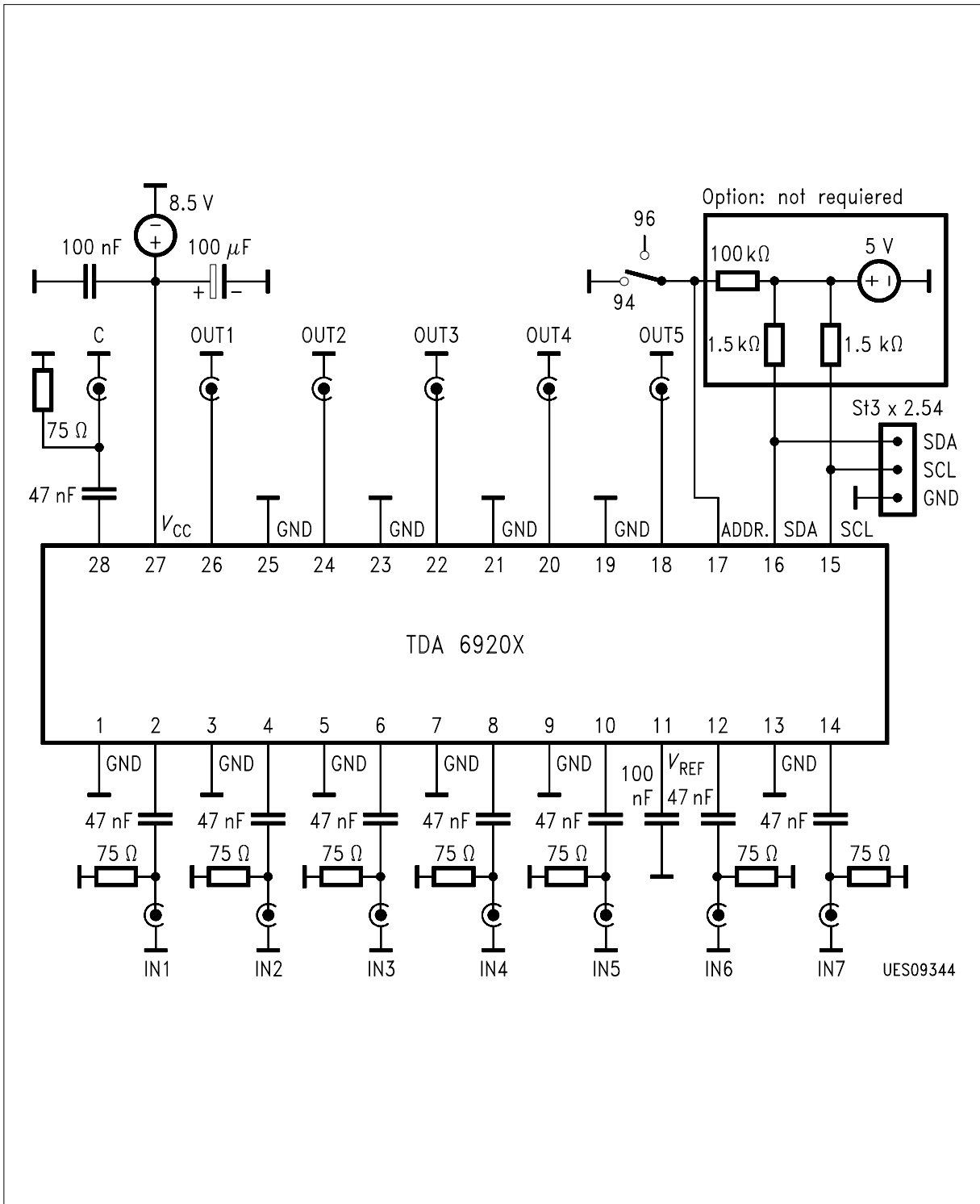
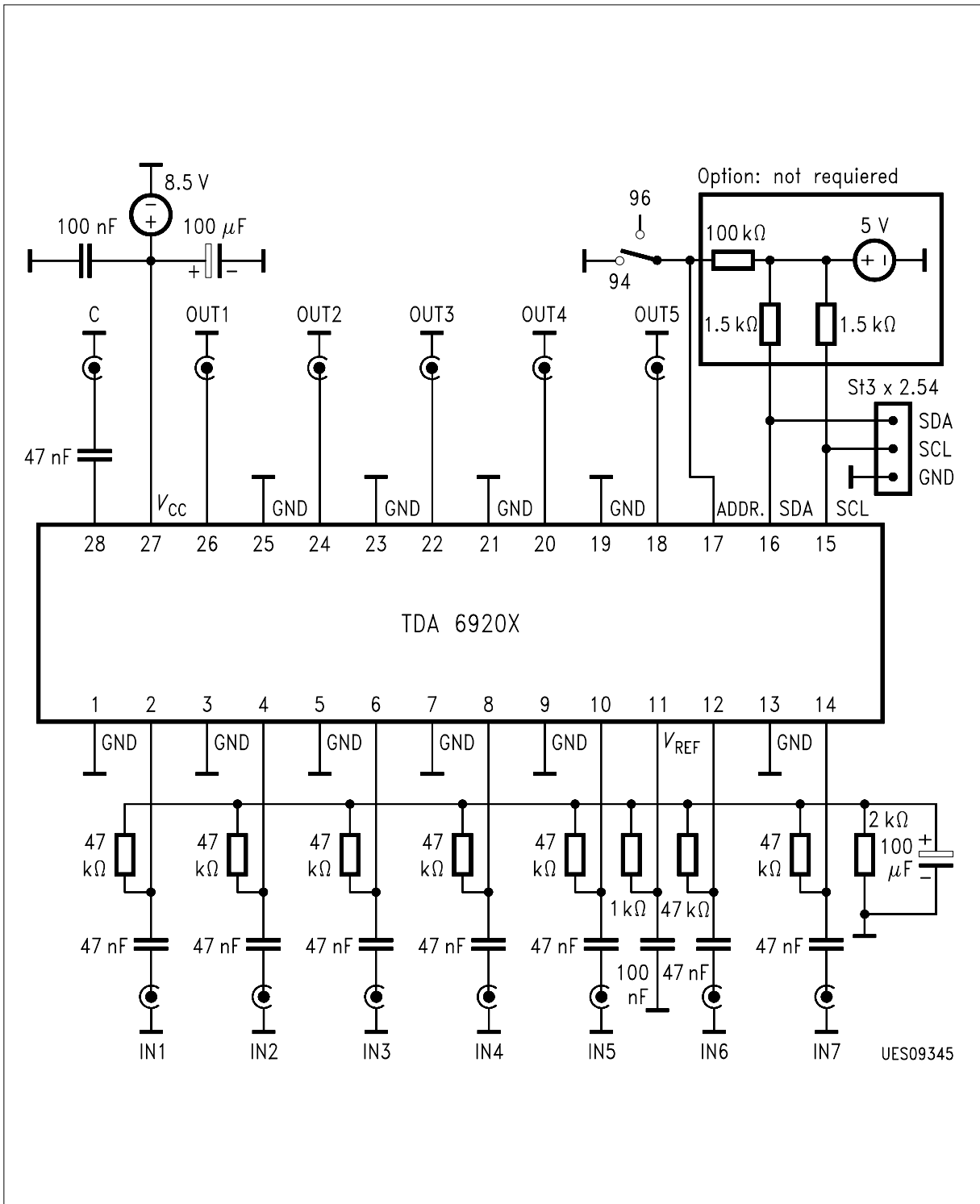


Figure 5 Application Circuit P-DSO-28-1 (clamping inputs)





**Figure 6**  
**Application Circuit P-DSO-28-1 (no clamping inputs with clamping override)**

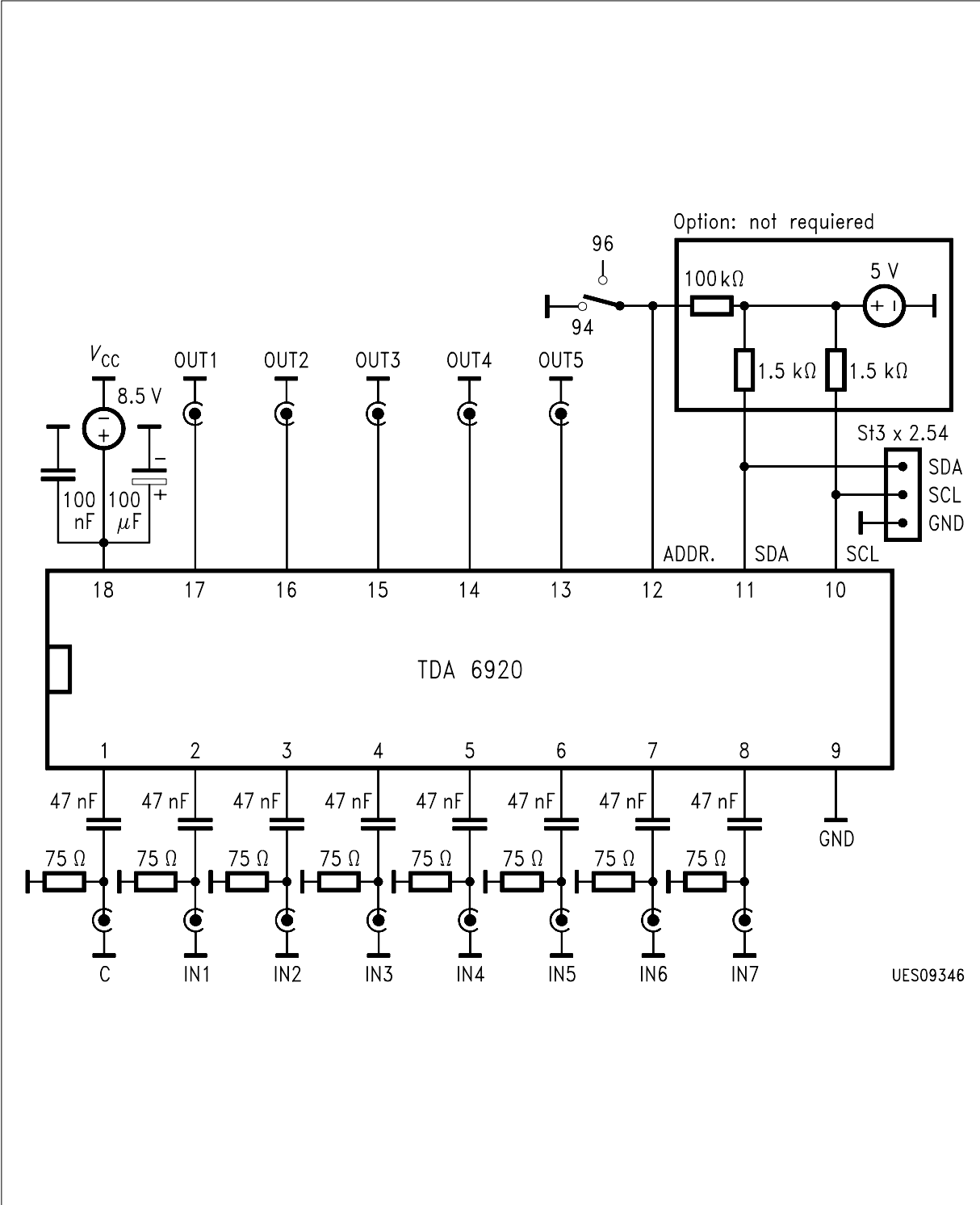
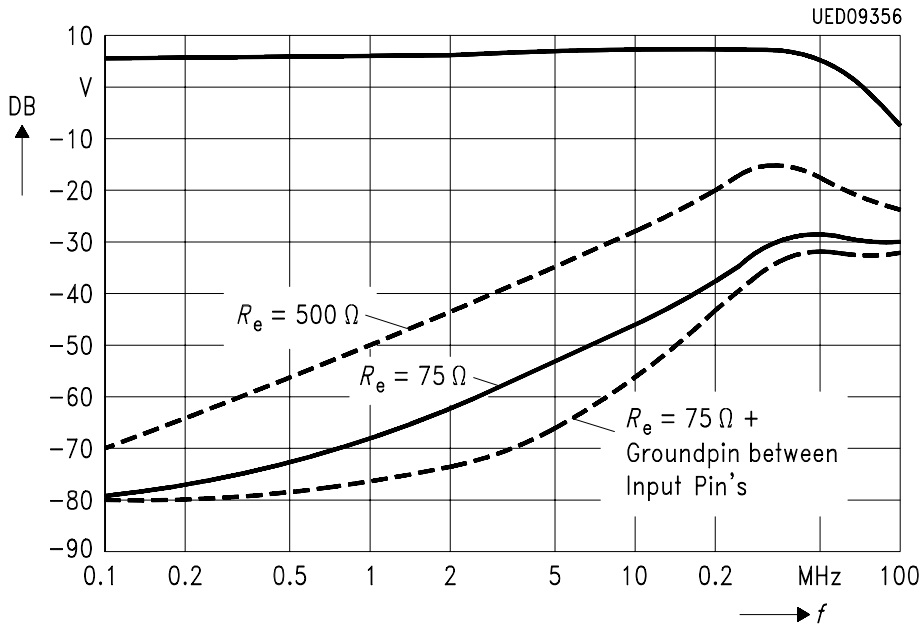


Figure 7  
Application Circuit (P-DIP-18-5)

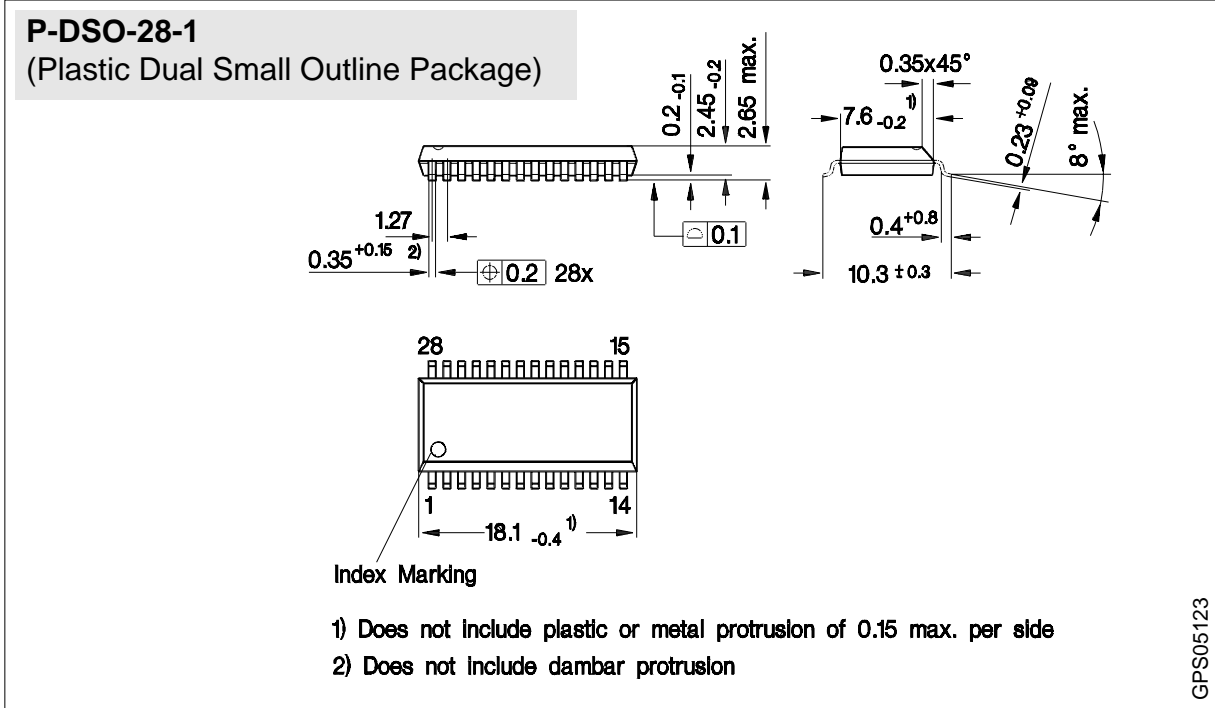
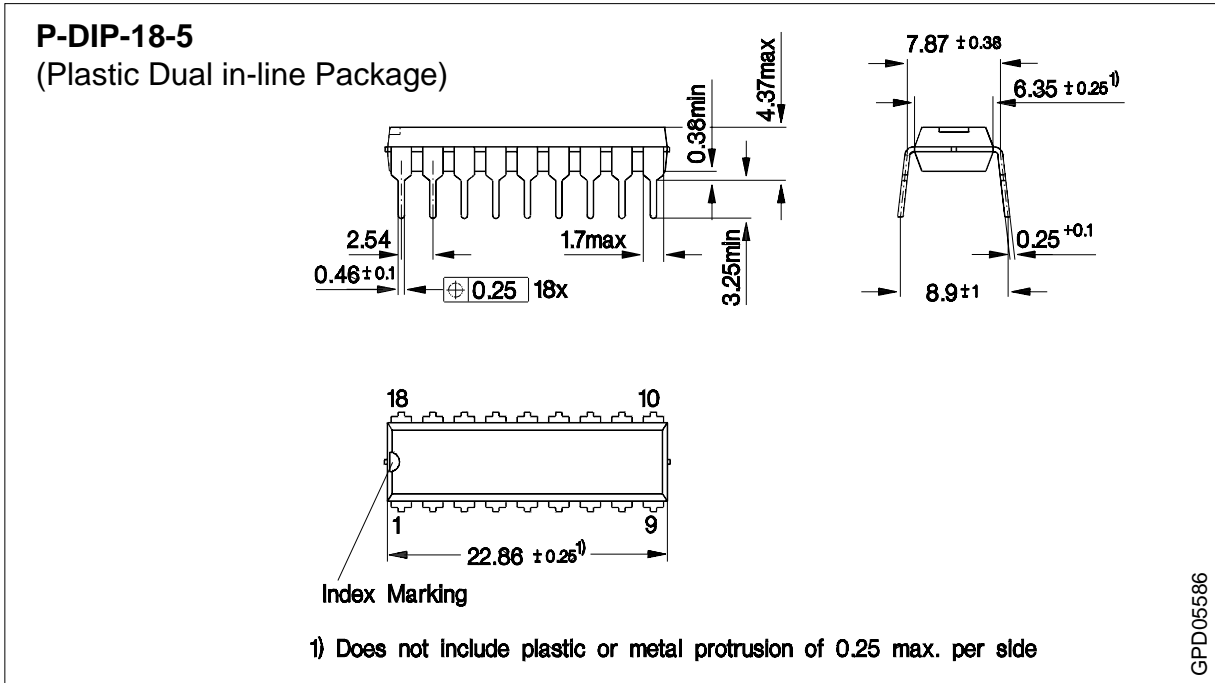
6 Electrical Diagrams

Typical frequency response and crosstalk (simulated) for P-DSO-28-1 package



Conditions:  $V_{CC} = 8.5 \text{ V}$ , all outputs selected to one different input;  
 response: the measured output has max. signal on the selected input;  
 crosstalk: the measured output has no signal on the selected input, another input has max. signal

7 Package Outlines



**Sorts of Packing**

Package outlines for tubes, trays etc. are contained in our Data Book "Package Information".

SMD = Surface Mounted Device

Dimensions in mm