

**INTEGRATED CIRCUITS**

# DATA SHEET

## **TDA6106Q**

### Video output amplifier

Product specification  
File under Integrated Circuits, IC02

1997 Mar 03

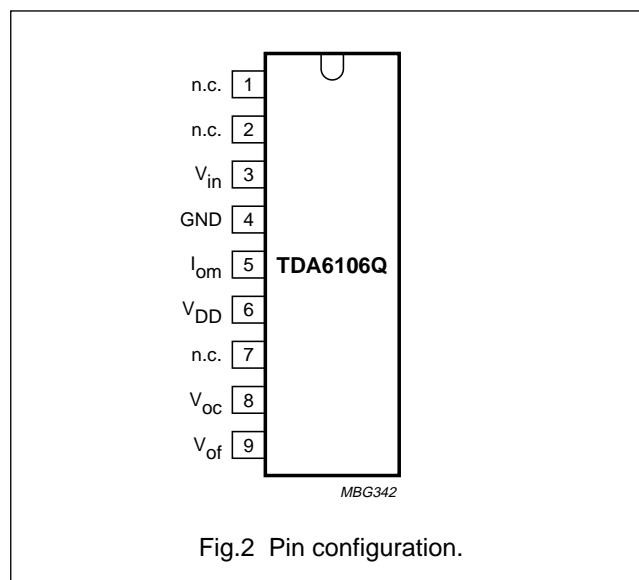


## Video output amplifier

## TDA6106Q

## PINNING

| SYMBOL   | PIN | DESCRIPTION                      |
|----------|-----|----------------------------------|
| n.c.     | 1   | not connected                    |
| n.c.     | 2   | not connected                    |
| $V_{in}$ | 3   | inverting input voltage          |
| GND      | 4   | ground, substrate                |
| $I_{om}$ | 5   | black current measurement output |
| $V_{DD}$ | 6   | supply voltage                   |
| n.c.     | 7   | not connected                    |
| $V_{oc}$ | 8   | cathode output voltage           |
| $V_{of}$ | 9   | feedback output voltage          |



## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134); voltages with respect to pin 4 (ground) unless otherwise specified; currents specified as in Fig.1.

| SYMBOL      | PARAMETER                                       | CONDITIONS                                   | MIN.  | MAX.     | UNIT         |
|-------------|-------------------------------------------------|----------------------------------------------|-------|----------|--------------|
| $V_{DD}$    | supply voltage                                  |                                              | 0     | 250      | V            |
| $V_{in}$    | inverting input voltage                         |                                              | 0     | 8        | V            |
| $V_{om}$    | black current measurement output voltage        |                                              | 0     | 6        | V            |
| $V_{oc}$    | cathode DC output voltage                       |                                              | 0     | $V_{DD}$ | V            |
| $V_{of}$    | feedback output voltage                         |                                              | 0     | $V_{DD}$ | V            |
| $I_{oc(l)}$ | low non-repetitive peak cathode output current  | flashover discharge = 100 $\mu$ C;<br>note 1 | 0     | 5        | A            |
| $I_{oc(h)}$ | high non-repetitive peak cathode output current | flashover discharge = 100 nC;<br>note 2      | 0     | 10       | A            |
| $P_{max}$   | maximum power dissipation                       |                                              | 0     | tbf      | W            |
| $T_{stg}$   | storage temperature                             |                                              | -55   | +150     | $^{\circ}$ C |
| $T_j$       | junction temperature                            |                                              | -20   | +150     | $^{\circ}$ C |
| $V_{esd}$   | electrostatic discharge                         | note 3                                       | -2000 | +2000    | V            |
|             |                                                 | note 4                                       | -300  | +300     | V            |

## Notes

- The cathode output is protected against peak currents (caused by positive voltage peaks during high-resistance flash) of 5 A maximum with a charge content of 100  $\mu$ C.
- The cathode output is also protected against peak currents (caused by positive voltage peaks during low-resistance flash) of 10 A maximum with a charge content of 100 nC.
- Human body model: equivalent to discharging a 100 pF capacitor through a 1.5 k $\Omega$  resistor.
- Machine model: equivalent to discharging a 200 pF capacitor through a 0  $\Omega$  resistor.

## Video output amplifier

## TDA6106Q

**HANDLING**

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

**QUALITY SPECIFICATION**

Quality specification "SNW-FQ-611 part E" is applicable, except for ESD Human body model see Chapter "Limiting values", and can be found in the "Quality reference handbook" (ordering number 9397 750 00192).

**THERMAL CHARACTERISTICS**

| SYMBOL              | PARAMETER <sup>(1)</sup>                                | VALUE | UNIT |
|---------------------|---------------------------------------------------------|-------|------|
| R <sub>th j-a</sub> | thermal resistance from junction to ambient in free air | 56    | K/W  |
| R <sub>th j-c</sub> | thermal resistance from junction to case                | 12    | K/W  |

**Note**

1. External heatsink not required.

**CHARACTERISTICS**

Operating range: T<sub>amb</sub> = -20 to +65 °C; V<sub>DD</sub> = 180 to 210 V (see note 1), V<sub>om</sub> = 1.4 to 6 V.

Test conditions: T<sub>amb</sub> = 25 °C; V<sub>DD</sub> = 200 V; V<sub>om</sub> = 4 V; C<sub>L</sub> = 10 pF (C<sub>L</sub> consists of parasitic and cathode capacitance); measured in test circuit of Fig.5; unless otherwise specified.

| SYMBOL                                | PARAMETER                                                                    | CONDITIONS                                                                                            | MIN.                 | TYP.                 | MAX. | UNIT |
|---------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------|----------------------|------|------|
| I <sub>DD</sub>                       | quiescent voltage supply current                                             | V <sub>ocDC</sub> = 100 V                                                                             | 2.8                  | 3.0                  | 3.3  | mA   |
| I <sub>bias</sub>                     | input bias current (pin 3)                                                   | V <sub>ocDC</sub> = 100 V                                                                             | 0                    | –                    | 20   | μA   |
| V <sub>int</sub>                      | internal reference voltage input stage                                       | V <sub>ocDC</sub> = 100 V                                                                             | –                    | 2.5                  | –    | V    |
| I <sub>om(os)</sub>                   | offset current of black current measurement output                           | I <sub>oc</sub> = 0 μA;<br>V <sub>in</sub> = 1.5 to +3.5 V;<br>V <sub>om</sub> = 1.4 to 6 V           | –10                  | 0                    | +10  | μA   |
| ΔV <sub>Tint</sub>                    | temperature drift of internal reference voltage input stage                  | V <sub>ocDC</sub> = 100 V                                                                             | –                    | 0.5                  | –    | mV/K |
| $\frac{\Delta I_{om}}{\Delta I_{oc}}$ | linearity of current transfer                                                | I <sub>oc</sub> = -10 μA to 3 mA;<br>V <sub>in</sub> = 1.5 to +3.5 V;<br>V <sub>om</sub> = 1.4 to 6 V | 0.9                  | 1.0                  | 1.1  |      |
| I <sub>of(max)</sub>                  | maximum peak output current (pin 9)                                          | V <sub>oc</sub> = 20 V to V <sub>DD</sub> - 30 V                                                      | –                    | 25                   | –    | mA   |
| V <sub>oc(min)</sub>                  | minimum output voltage (pin 8)                                               | V <sub>in</sub> = 3.5 V                                                                               | –                    | 7                    | 12   | V    |
| V <sub>oc(max)</sub>                  | maximum output voltage (pin 8)                                               | V <sub>in</sub> = 1.5 V                                                                               | V <sub>DD</sub> - 14 | V <sub>DD</sub> - 10 | –    | V    |
| GB                                    | gain bandwidth product of open-loop gain V <sub>os</sub> /V <sub>i, dm</sub> | f = 500 kHz;<br>V <sub>ocDC</sub> = 100 V                                                             | –                    | 0.52                 | –    | GHz  |
| BW <sub>S</sub>                       | small signal bandwidth                                                       | V <sub>ocAC</sub> = 60 V (p-p);<br>V <sub>ocDC</sub> = 100 V                                          | 5                    | 6                    | –    | MHz  |
| BW <sub>L</sub>                       | large signal bandwidth                                                       | V <sub>ocAC</sub> = 100 V (p-p);<br>V <sub>ocDC</sub> = 100 V                                         | 4.7                  | 5.7                  | –    | MHz  |

## Video output amplifier

## TDA6106Q

| SYMBOL   | PARAMETER                                                     | CONDITIONS                                                                                     | MIN. | TYP. | MAX. | UNIT       |
|----------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------|------|------|------|------------|
| $t_{pd}$ | cathode output propagation delay time 50% input to 50% output | $V_{oc} = 50$ to 150 V square wave; $f < 1$ MHz; $t_{rin} = t_{fin} = 40$ ns; see Figs 3 and 4 | 38   | 49   | 60   | ns         |
| $t_r$    | cathode output rise time 10% output to 90% output             | $V_{oc} = 50$ to 150 V square wave; $f < 1$ MHz; $t_{fin} = 40$ ns; see Fig.4                  | 62   | 74   | 87   | ns         |
| $t_f$    | cathode output fall time 90% output to 10% output             | $V_{oc} = 150$ to 50 V square wave; $f < 1$ MHz; $t_{rin} = 40$ ns; see Fig.4                  | 62   | 74   | 87   | ns         |
| $t_s$    | settling time 50% input to (99% < output < 101%)              | $V_{oc} = 50$ to 150 V square wave; $f < 1$ MHz; $t_{rin} = t_{fin} = 40$ ns; see Figs 3 and 4 | –    | –    | 350  | ns         |
| SR       | slew rate between 50 and 150 V                                | $V_{in} = 2$ V (p-p) square wave; $f < 1$ MHz; $t_{rin} = t_{fin} = 40$ ns                     | –    | 1200 | –    | V/ $\mu$ s |
| $O_V$    | cathode output voltage overshoot                              | $V_{oc} = 50$ to 150 V square wave; $f < 1$ MHz; $t_{rin} = t_{fin} = 40$ ns; see Figs 3 and 4 | –    | 1    | –    | %          |
| PSRR     | power supply rejection ratio                                  | $f < 50$ kHz; note 2                                                                           | –    | 60   | –    | dB         |

**Notes**

1. The rating of supply voltage is 250 V, but because of flash the maximum operating range for supply voltage is 210 V.
2. PSSR: The ratio of the change in supply voltage to the change in input voltage when there is no change in output voltage.

Video output amplifier

TDA6106Q

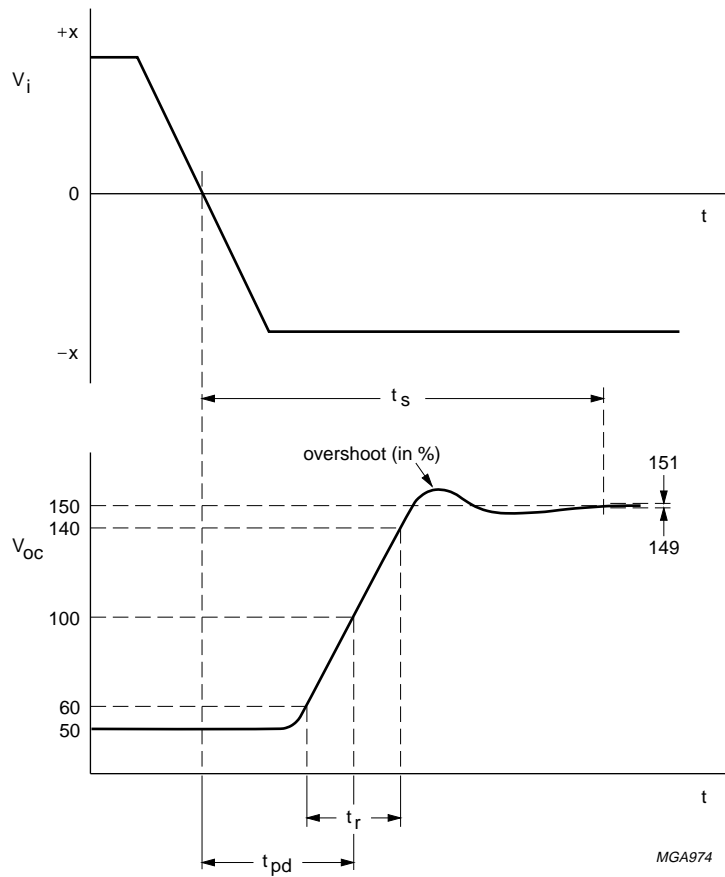


Fig.3 Output voltage (pin 8 rising edge) as a function of AC input signal.

Video output amplifier

TDA6106Q

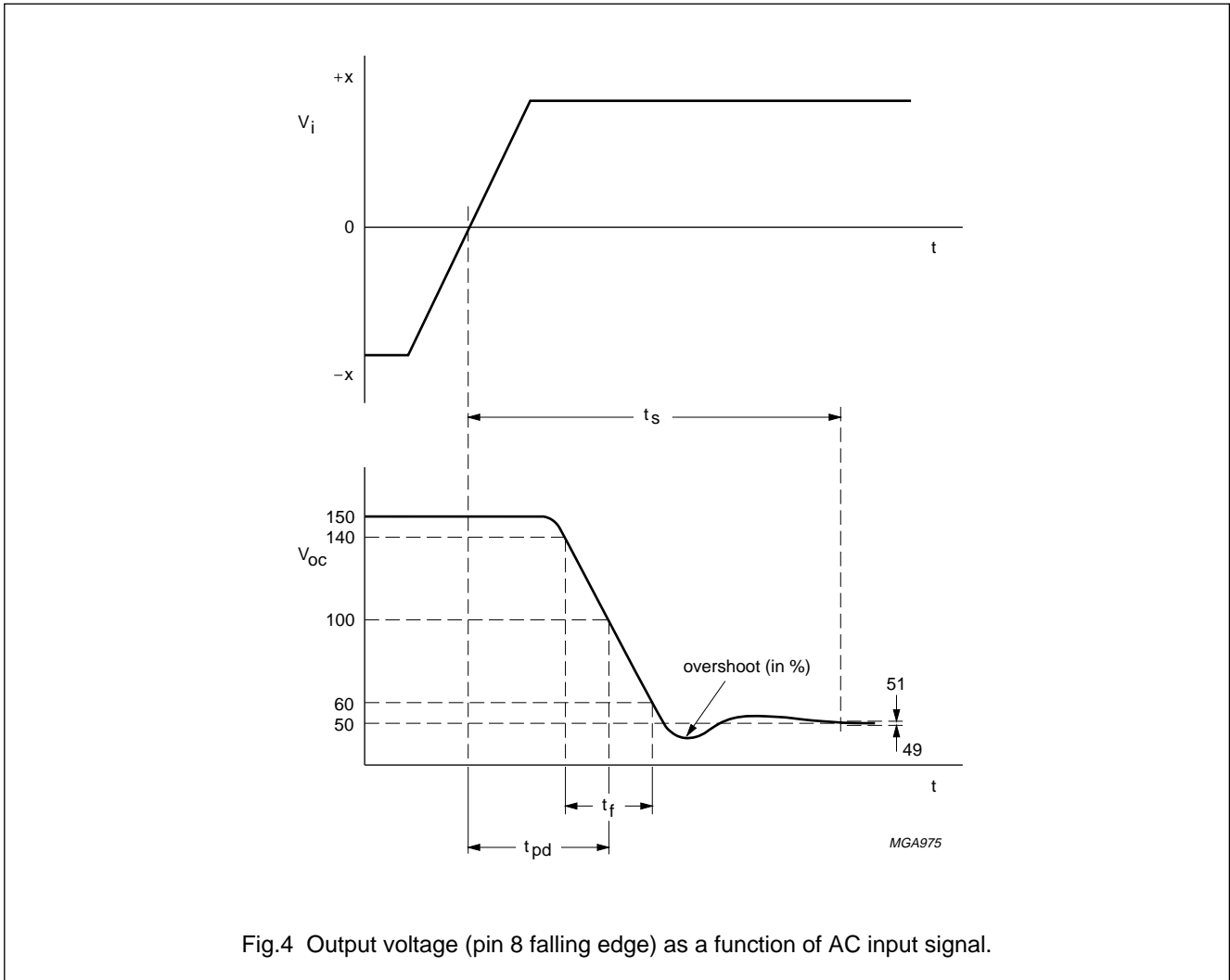


Fig.4 Output voltage (pin 8 falling edge) as a function of AC input signal.

**Flashover protection**

The TDA6106Q incorporates a protection diode against CRT flashover discharges that clamp the cathode output voltage to a maximum of  $V_{DD} + V_{diode}$ . To limit the diode current, an external 1.5 kΩ carbon high-voltage resistor in series with the cathode output and a 2 kV spark gap are needed (for this resistor-value, the CRT has to be connected to the main PCB). This addition produces an increase in the rise and fall times of approximately 7.5 ns and a decrease in the overshoot of approximately 1.3%.

$V_{DD}$  to GND must be decoupled:

1. With a capacitor larger than 20 nF with good HF behaviour (e.g. foil). This capacitor must be placed as close as possible to pins 6 and 4, but definitely within 5 mm.
2. With a capacitor larger than 10 μF on the picture tube base print (shared by three output stages).

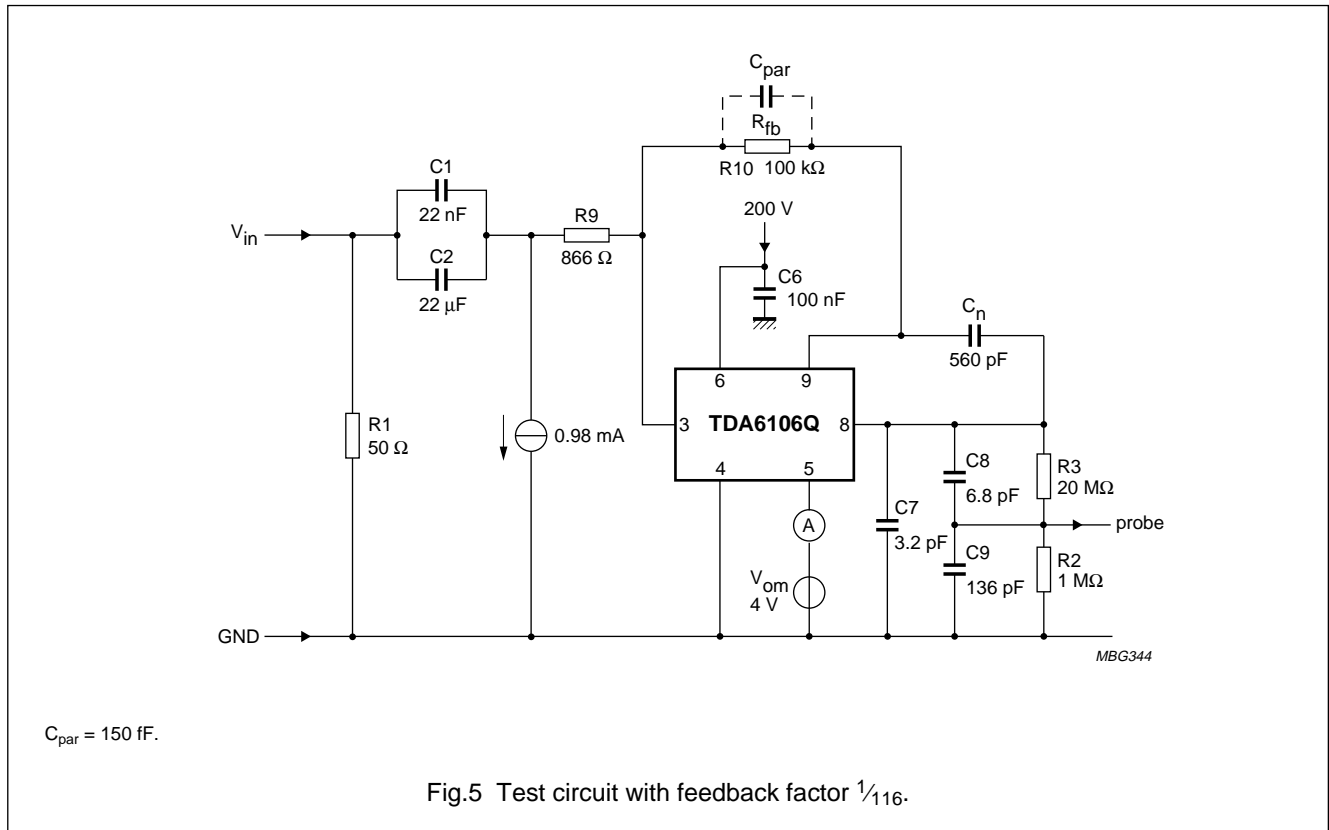
**Switch-off behaviour**

The output pins of the TDA6106Q are still under the control of the input pin for a supply voltage down to approximately 30 V.

Video output amplifier

TDA6106Q

TEST AND APPLICATION INFORMATION



**Dissipation**

With respect to dissipation, distinction must be made between static dissipation (independent of frequency) and dynamic dissipation (proportional to frequency).

The static dissipation of the TDA6106Q is due to supply currents and load currents in the feedback network and CRT.

$$P_{\text{stat}} = V_{\text{DD}} \times I_{\text{DD}} + V_{\text{oc}} \times I_{\text{oc}} - V_{\text{of}} \times \left( \frac{V_{\text{of}}}{R_{\text{fb}}} \right)$$

Where:

- $R_{\text{fb}}$  = value of feedback resistor.
- $I_{\text{oc}}$  = DC value of cathode current.

The dynamic dissipation equals:

$$P_{\text{dyn}} = V_{\text{DD}} \times (C_{\text{L}} + C_{\text{fb}} + C_{\text{int}}) \times f \times V_{\text{o(p-p)}} \times b$$

Where:

- $C_{\text{L}}$  = load capacitance.
- $C_{\text{fb}}$  = feedback capacitance.
- $C_{\text{int}}$  = internal load capacitance ( $\approx 4$  pF).
- $f$  = input frequency.
- $V_{\text{o(p-p)}}$  = output voltage (peak-to-peak value).
- $b$  = non-blanking duty-cycle.

The IC must be mounted on the picture tube base print to minimize the load capacitance ( $C_{\text{L}}$ ).



Video output amplifier

TDA6106Q

INTERNAL PIN CONFIGURATION

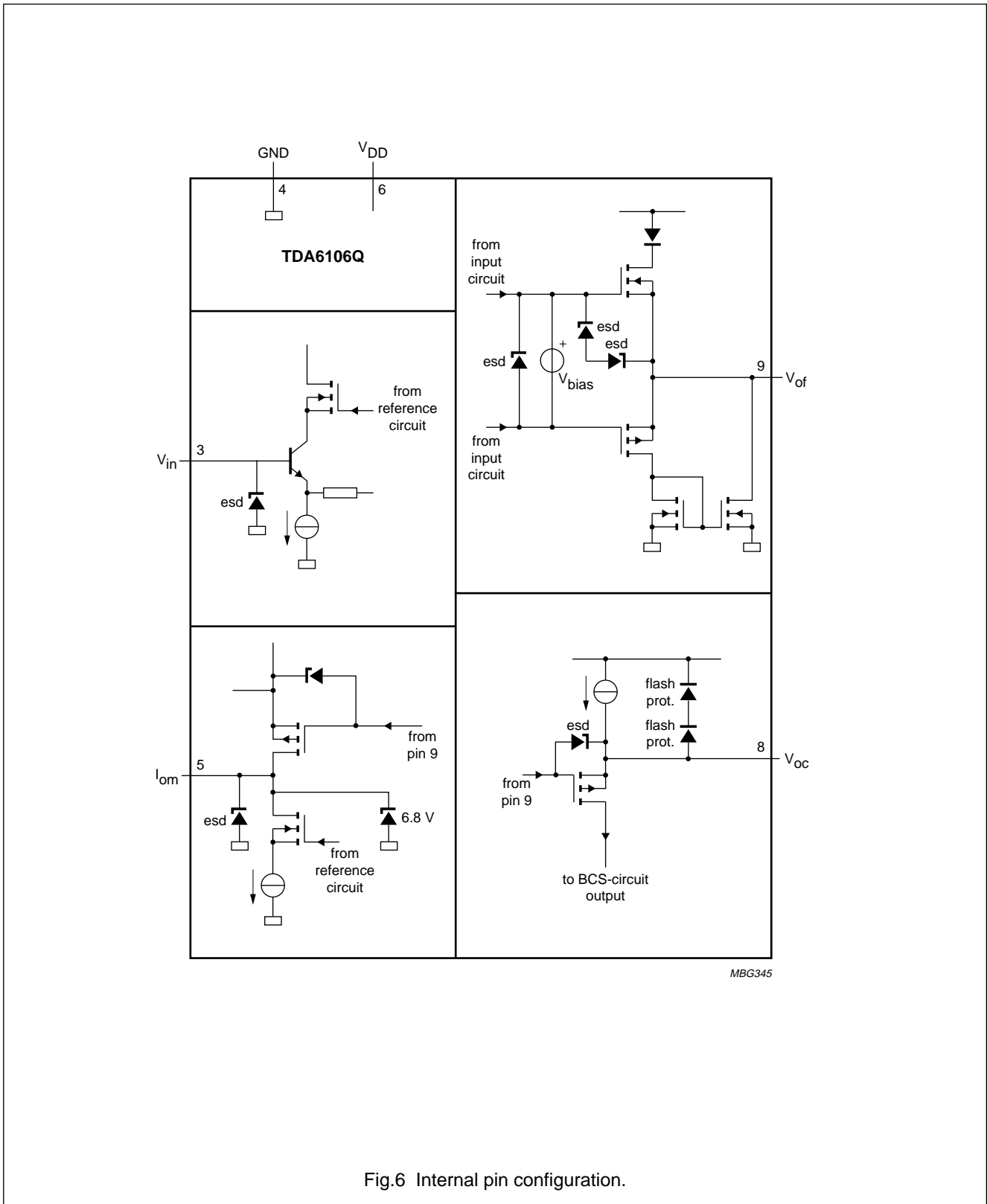


Fig.6 Internal pin configuration.

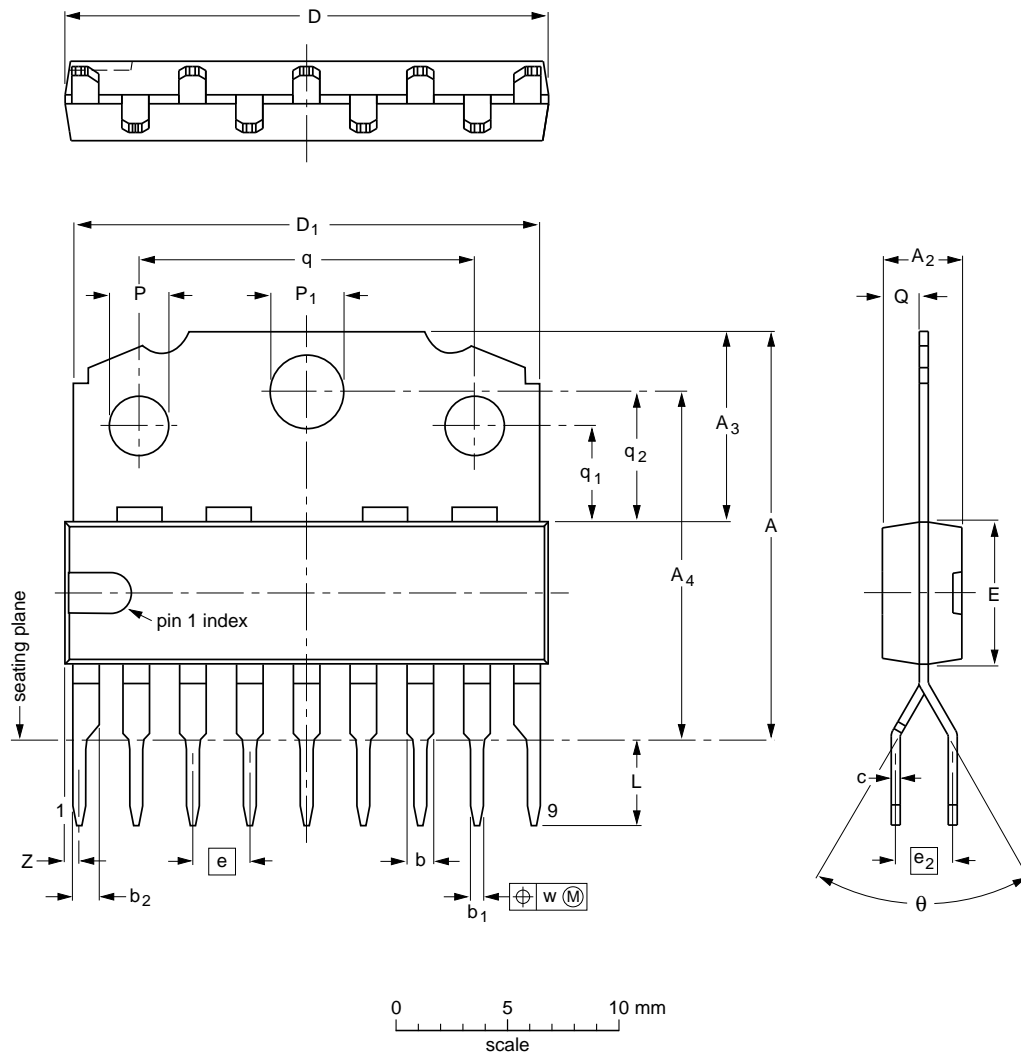
Video output amplifier

TDA6106Q

PACKAGE OUTLINE

DBS9MPF: plastic DIL-bent-SIL medium power package with fin; 9 leads

SOT111-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A            | A <sub>2</sub> max. | A <sub>3</sub> | A <sub>4</sub> | b            | b <sub>1</sub> | b <sub>2</sub> | c            | D <sup>(1)</sup> | D <sub>1</sub> | E <sup>(1)</sup> | e    | e <sub>2</sub> | L          | P            | P <sub>1</sub> | Q            | q            | q <sub>1</sub> | q <sub>2</sub> | w    | Z <sup>(1)</sup> max. | θ          |
|------|--------------|---------------------|----------------|----------------|--------------|----------------|----------------|--------------|------------------|----------------|------------------|------|----------------|------------|--------------|----------------|--------------|--------------|----------------|----------------|------|-----------------------|------------|
| mm   | 18.5<br>17.8 | 3.7                 | 8.7<br>8.0     | 15.5<br>15.1   | 1.40<br>1.14 | 0.67<br>0.50   | 1.40<br>1.14   | 0.48<br>0.38 | 21.8<br>21.4     | 21.4<br>20.7   | 6.48<br>6.20     | 2.54 | 2.54           | 3.9<br>3.4 | 2.75<br>2.50 | 3.4<br>3.2     | 1.75<br>1.55 | 15.1<br>14.9 | 4.4<br>4.2     | 5.9<br>5.7     | 0.25 | 1.0                   | 65°<br>55° |

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 |                     |                      |
| SOT111-1        |            |       |      |                     | 92-11-17<br>95-03-11 |

## Video output amplifier

## TDA6106Q

**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).

**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.

**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.                                                                                                                                                                                                                                                                                                                                                       |                                                                                       |

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