

DATA SHEET

TDA6120Q Video output amplifier

Preliminary specification
Supersedes data of 1997 Jul 17
File under Integrated Circuits, IC02

1997 Aug 27

Video output amplifier**TDA6120Q****FEATURES**

- High large signal bandwidth of 32 MHz (typ.) at 125 V (p-p)
- High small signal bandwidth of 47 MHz (typ.) at 60 V (p-p)
- Rise/fall time of 12.5 ns for 125 V (p-p)
- High slew rate of 10 V/ns
- Low static power dissipation of 2.5 W at 200 V supply voltage
- High maximum output voltage
- Bandwidth independent of voltage gain
- Maximum overall voltage gain over 46 dB
- High Power Supply Rejection Ratio (PSRR)
- Fast cathode current measurement output for dark current control loop
- Differential voltage input.

GENERAL DESCRIPTION

The TDA6120Q is a single 30 MHz, 125 V (p-p) video output amplifier contained in a plastic DIL-bent-SIL power package. The device uses high-voltage DMOS technology and is intended to drive the cathodes of a CRT in High Definition TVs (HDTVs) or monitors.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA6120Q	DBS13P	plastic DIL-bent-SIL power package; 13 leads (lead length 7.7 mm)	SOT141-8

Video output amplifier

TDA6120Q

BLOCK DIAGRAM

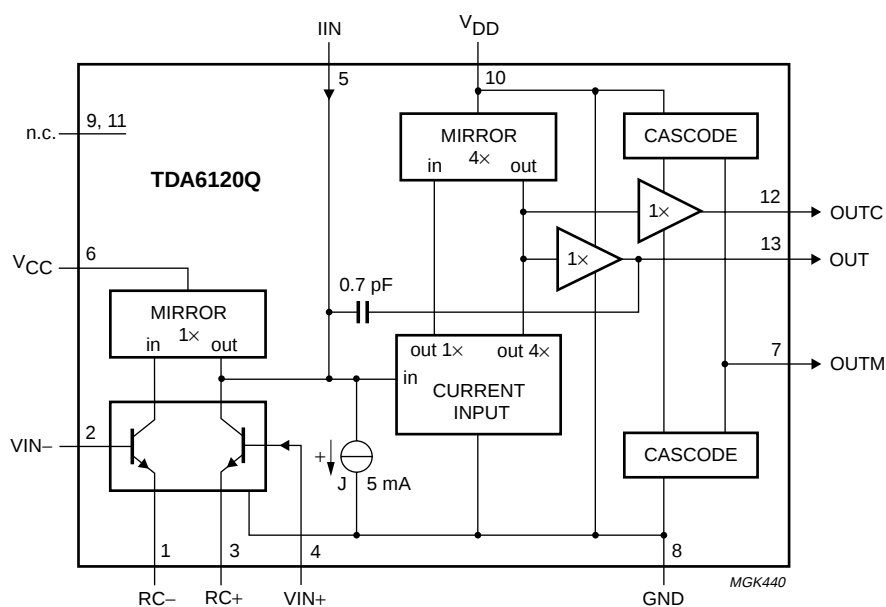


Fig.1 Block diagram.

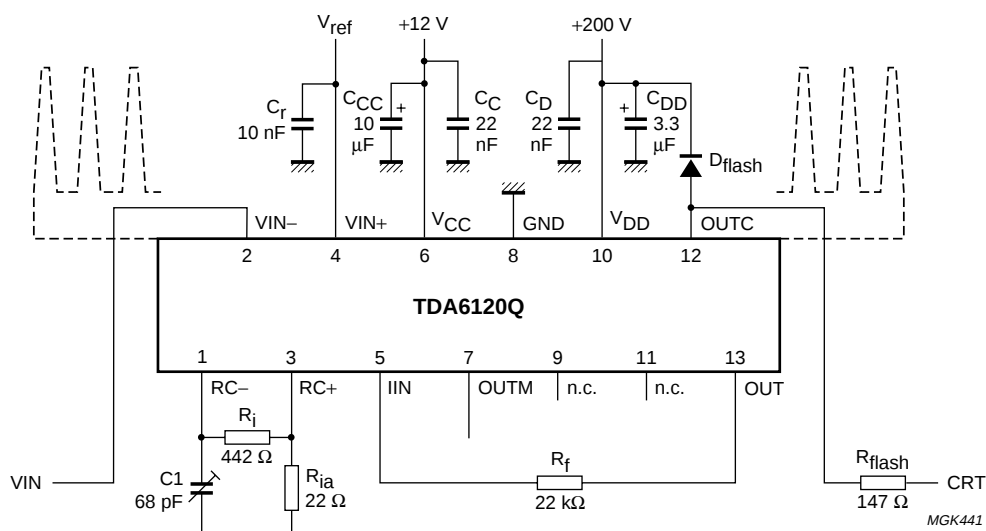


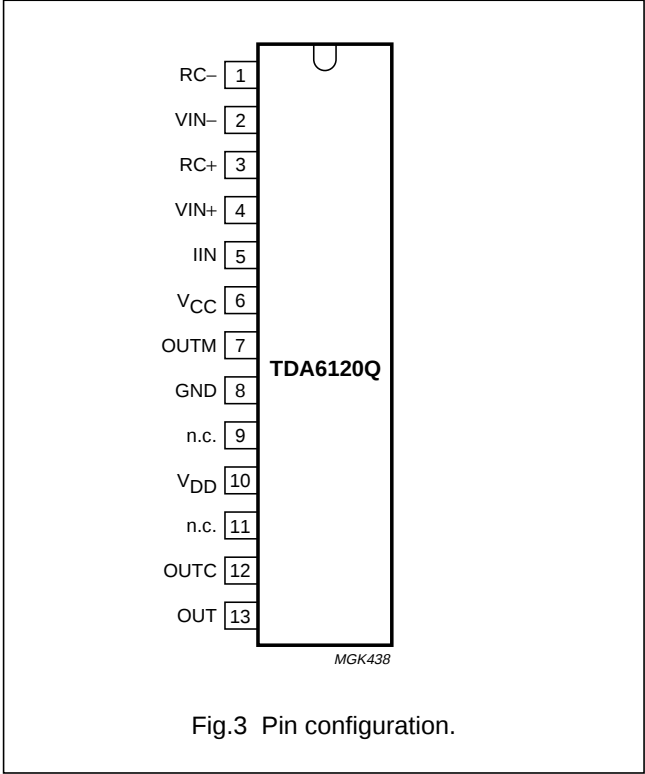
Fig.2 Top view.

Video output amplifier

TDA6120Q

PINNING

SYMBOL	PIN	DESCRIPTION
RC−	1	inverting input pre-emphasis network
VIN−	2	inverting voltage input
RC+	3	non-inverting input pre-emphasis network
VIN+	4	non-inverting voltage input
IIN	5	feedback current input
V _{CC}	6	low supply voltage (12 V)
OUTM	7	cathode current measurement output
GND	8	power ground and heatsink
n.c.	9	not connected
V _{DD}	10	high supply voltage (200 V)
n.c.	11	not connected
OUTC	12	cathode output
OUT	13	feedback output



LIMITING VALUES

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

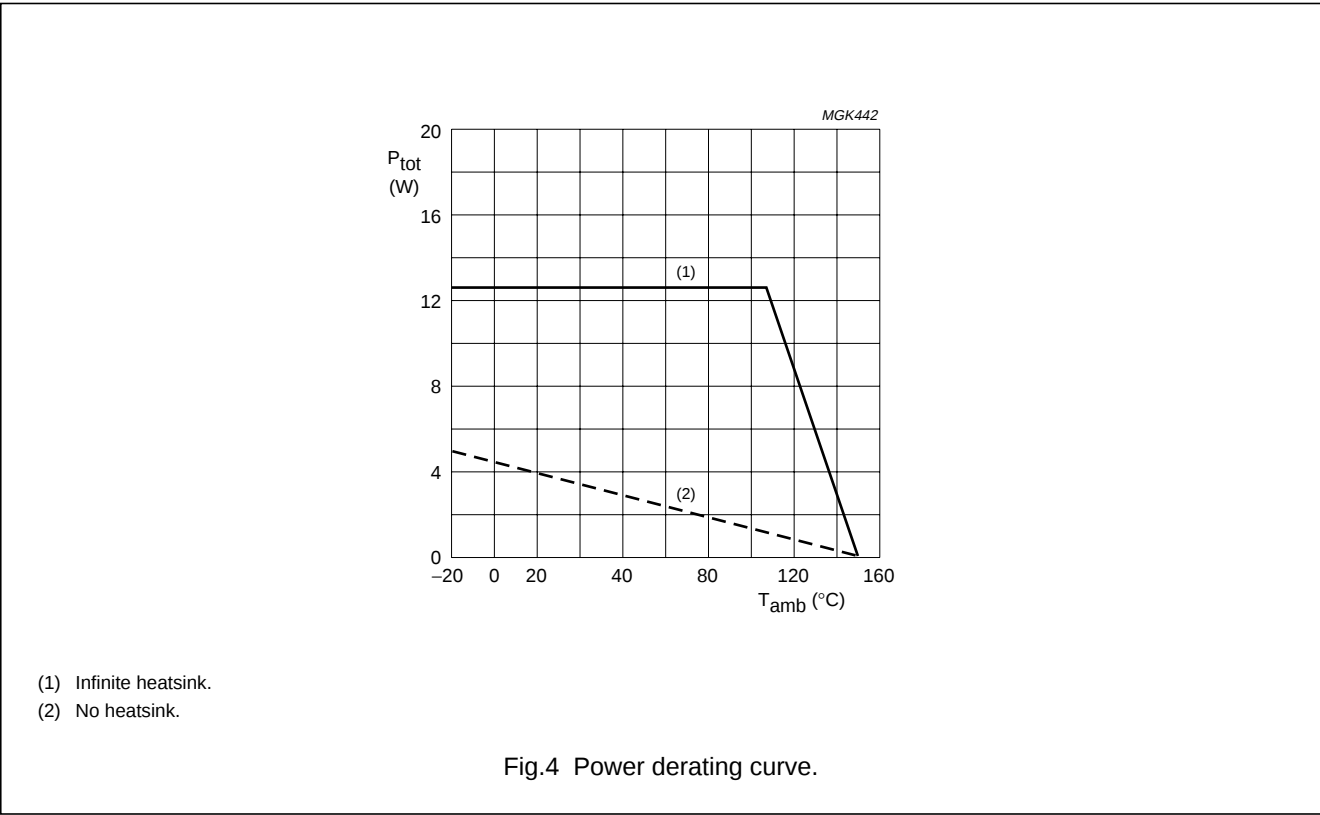
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V _{DD}	high supply voltage		0	280	V
V _{CC}	low supply voltage		0	20	V
V _i	input voltage (pins 2 and 4)		0	V _{CC}	V
V _{i(dif)}	differential mode input voltage (pins 2 and 4)		−V _{CC}	V _{CC}	V
V _{i(pe)}	pre-emphasis input voltage (pins 1 and 3)		0	V _{CC}	V
V _{i(dif)(pe)}	differential mode pre-emphasis input voltage (pins 1 and 3)		−V _{CC}	V _{CC}	V
V _{IIN}	input voltage (pin 5)		0	2V _{BE}	V
V _{OUTM}	measurement output voltage		0	20	V
V _o	output voltage (pins 12 and 13)		0	V _{DD}	V
T _{stg}	storage temperature		−55	+150	°C
T _j	junction temperature		−20	+150	°C
V _{ESD}	voltage peak human body model	note 1	−	2000	V
	voltage peak machine model		−	300	V

Note

1. 1250 V for IIN (pin 5).

Video output amplifier

TDA6120Q



QUALITY SPECIFICATION

Quality specification in accordance with "SNW-FQ-611 part E".

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-c}$	thermal resistance from junction to case	3.0	K/W

Video output amplifier

TDA6120Q

CHARACTERISTICS

Operating range: $T_j = -20$ to $+150$ °C; $V_{DD} = 180$ to 210 V; $V_{CC} = 10.8$ to 13.2 V; $V_{OUTM} = 4$ to 20 V; $V_{VIN-} = 1.5$ to 5 V; $V_{VIN+} = 1.5$ to 5 V.

Test conditions: $T_{amb} = 25$ °C; $V_{DD} = 200$ V; $V_{CC} = 12$ V; $V_{VIN+} = 3$ V; $V_{OUTM} = 6$ V; $C_L = 10$ pF (C_L consists of parasitic and cathode capacitance); $R_{thh} = 4$ K/W; test circuit of Fig.5; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{DD(q)}$	quiescent high voltage supply current	$V_{OUTC} = 100$ V	8	10	12	mA
$I_{CC(q)}$	quiescent low voltage supply current	$V_{VIN-} = V_{VIN+}$	25	31	39	mA
I_{bias}	input bias current (pins 2 and 4)	$V_{OUTC} = 100$ V	—	30	—	μA
V_{OUTC}	DC output voltage (pins 12 and 13)	$V_{VIN-} = V_{VIN+}$	70	100	130	V
$\Delta V_{OUTC(T)}$	DC output voltage temperature drift (pins 12 and 13)	$V_{VIN-} = V_{VIN+}$	—	—	5	V
$I_{(offset)OUTM}$	offset current of measurement output	note 1	−40	+20	+120	μA
$\Delta I_{OUTM}/\Delta I_{OUTC}$	linearity of current transfer	$-50 \mu A < I_{OUTC} < +50 \mu A$; note 1	—	1.0	—	
C_i	input capacitance (pins 2 and 4)	$V_{OUTC} = V_{OUTC(max)}$	—	3	—	pF
$I_{OUTC(max)}$	maximum dynamic peak output current (pin 12)	$20 \text{ V} < V_{OUTC} < V_{DD} - 20 \text{ V}$	—	100	—	mA
$V_{OUTC(min)}$	minimum output voltage (pin 12)		—	4	10	V
$V_{OUTC(max)}$	maximum output voltage (pin 12)		$V_{DD} - 10$	$V_{DD} - 6$	—	V
G_{int}	internal gain		1.68	1.87	2.08	
B_s	small signal bandwidth (pin 12)	$V_{OUTC(AC)} = 60 \text{ V (p-p)}$; $V_{OUTC(DC)} = 100 \text{ V}$	40	47	—	MHz
B_l	large signal bandwidth (pin 12)	$V_{OUTC(AC)} = 125 \text{ V (p-p)}$; $V_{OUTC(DC)} = 100 \text{ V}$	28	32	—	MHz
t_{pd}	cathode output propagation time 50% input to 50% output (pin 12)	$V_{OUTC(AC)} = 125 \text{ V (p-p)}$; $V_{OUTC(DC)} = 100 \text{ V}$; square wave; $f < 1 \text{ MHz}$; $t_{f(VIN-)} = 10 \text{ ns}$; $t_{r(VIN-)} = 10 \text{ ns}$; see Figs 6 and 7	10	—	15	ns
$t_{o(r)}$	cathode output rise time 10% output to 90% output (pin 12)	$V_{OUTC(AC)} = 125 \text{ V (p-p)}$; $V_{OUTC(DC)} = 100 \text{ V}$; square wave; $f < 1 \text{ MHz}$; $t_{f(VIN-)} = 10 \text{ ns}$; $t_{r(VIN-)} = 10 \text{ ns}$; see Fig.6	10	14	18	ns

Video output amplifier

TDA6120Q

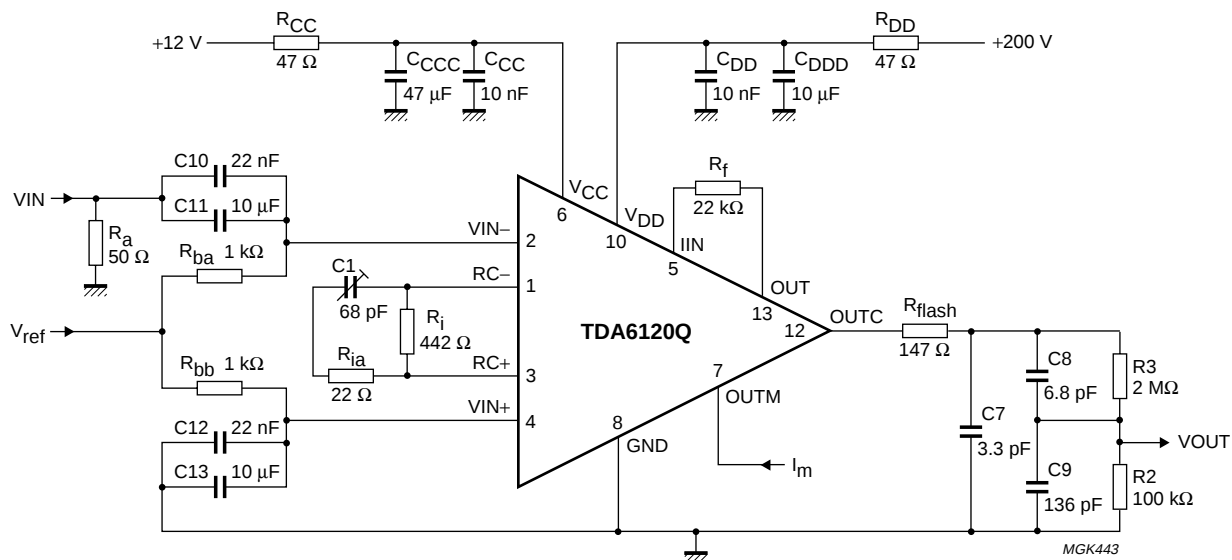
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$t_{o(f)}$	cathode output fall time 90% output to 10% output (pin 12)	$V_{OUTC(AC)} = 125\text{ V (p-p)}$; $V_{OUTC(DC)} = 100\text{ V}$; square wave; $f < 1\text{ MHz}$; $t_{f(VIN-)} = 10\text{ ns}$; $t_{r(VIN-)} = 10\text{ ns}$; see Fig. 7	10	12.5	15	ns
t_{st}	settling time 50% input to (99% < output < 101%) (pin 12)	$V_{OUTC(AC)} = 125\text{ V (p-p)}$; $V_{OUTC(DC)} = 100\text{ V}$; square wave $f < 1\text{ MHz}$; $t_{f(VIN-)} = 10\text{ ns}$; $t_{r(VIN-)} = 10\text{ ns}$; see Figs 6 and 7	—	—	250	ns
SR_r	slew rate rise between 30 V to $(V_{DD} - 30\text{ V})$ (pin 12)	$V_{VIN-} = 2\text{ V (p-p)}$ square wave; $f < 1\text{ MHz}$; $t_{f(VIN-)} = 10\text{ ns}$; $t_{r(VIN-)} = 10\text{ ns}$	—	8	—	V/ns
SR_f	slew rate fall between $(V_{DD} - 30\text{ V})$ to 30 V (pin 12)	$V_{VIN-} = 2\text{ V (p-p)}$ square wave; $f < 1\text{ MHz}$; $t_{f(VIN-)} = 10\text{ ns}$; $t_{r(VIN-)} = 10\text{ ns}$	—	10	—	V/ns
O_{Vr}	cathode output voltage overshoot rise (pin 12)	$V_{OUTC(AC)} = 125\text{ V (p-p)}$; $V_{OUTC(DC)} = 100\text{ V}$; square wave; $f < 1\text{ MHz}$; $t_{f(VIN-)} = 10\text{ ns}$; $t_{r(VIN-)} = 10\text{ ns}$; see Figs 6 and 7	—	5	—	%
O_{Vf}	cathode output voltage overshoot fall (pin 12)	$V_{OUTC(AC)} = 125\text{ V (p-p)}$; $V_{OUTC(DC)} = 100\text{ V}$; square wave; $f < 1\text{ MHz}$; $t_{f(VIN-)} = 10\text{ ns}$; $t_{r(VIN-)} = 10\text{ ns}$; see Figs 6 and 7	—	20	—	%
PSRRh	high voltage power supply rejection ratio	$f < 50\text{ kHz}$; note 2	—	44	—	dB
PSRRl	low voltage power supply rejection ratio	$f < 50\text{ kHz}$; note 2	—	48	—	dB

Notes

- The operating range of the measurement output OUTM is 4 to 20 V. Below 4 V, OUTM acts as a voltage source with an output resistance such that the maximum current input from OUTM is 2 mA.
 - The linearity of the current transfer is guaranteed until a junction temperature of 125 °C.
- 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

TDA6120Q



$$\text{Overall gain} = G_{\text{int}} \times \frac{R_f}{R_i}$$

Fig.5 Test circuit with gain of 40 dB.

Video output amplifier

TDA6120Q

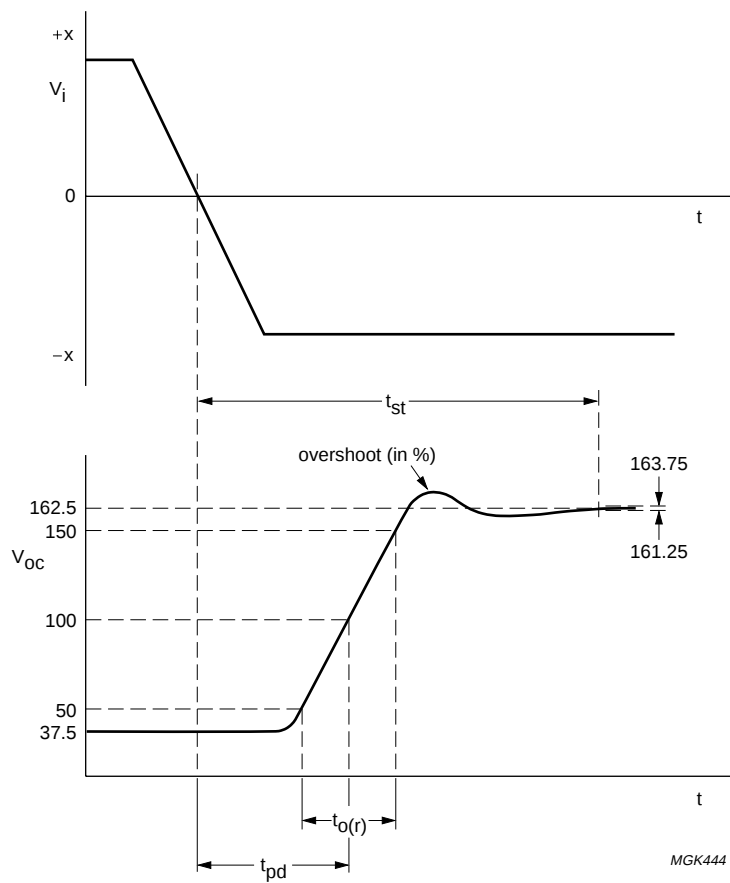


Fig.6 Output (pins 12 and 13; rising edge) as a function of input signal.

Video output amplifier

TDA6120Q

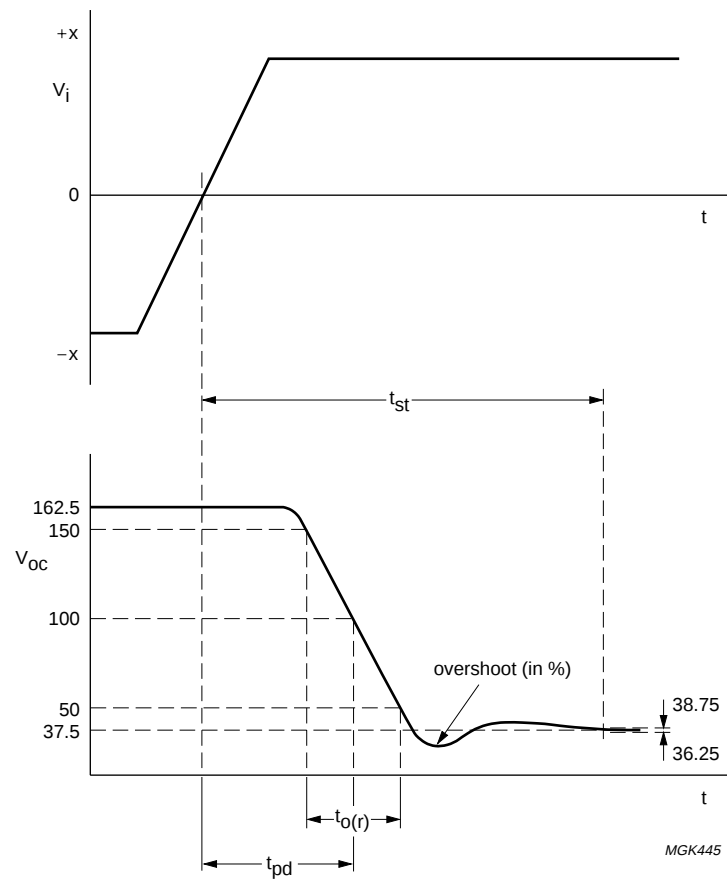


Fig.7 Output (pins 12 and 13; falling edge) as a function of input signal.

FLASHOVER PROTECTION

The TDA6120Q does NOT include protection diodes that clamp the cathode output pin to the high voltage supply pin during a CRT flashover discharge. Therefore an external high voltage reverse biased diode has to be connected between the OUTC pin and the V_{DD} pin. An external 147 Ω carbon high-voltage resistor in combination with a 2 kV spark gap between the cathode and ground will limit the maximum clamp current (for this resistor value, the CRT has to be connected to the main printed-circuit board).

This external network causes an increase in the rise and fall times and a decrease in the overshoot.

Pin 10 must be decoupled to pin 8:

- By a capacitor >22 nF with good HF behaviour (e.g. foil). This capacitor must be placed as close as possible to pin 10 and pin 8; definitely within 5 mm.
- By a capacitor >3.3 μ F on the picture tube base printed circuit board (common for three output stages).

Video output amplifier

TDA6120Q

TEST AND APPLICATION INFORMATION**Dissipation**

Regarding dissipation, distinction must be made between static dissipation (independent of frequency) and dynamic dissipation (proportional to frequency). The static dissipation of the TDA6120Q is due to supply currents, and currents in the feedback network and CRT.

The static dissipation is given by the following equation:

$$P_{\text{stat}} = V_{\text{CC}} \times I_{\text{CC}} + V_{\text{DD}} \times I_{\text{DD}} - V_{\text{OUTC}} \times \frac{V_{\text{OUTC}}}{R_f - I_{\text{OUTC}}}$$

Where:

R_f = feedback resistance

I_{OUTC} = DC cathode current.

The dynamic dissipation is given by the following equation:

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

Where:

C_L = load capacitance

C_{int} = effective internal load capacitance (approximately 7 pF)

f = frequency

$V_{\text{OUTC (p-p)}}$ = output voltage (peak-to-peak value)

b = non-blanking duty cycle (0.8).

The IC must be mounted on the picture tube base printed-circuit board to minimize the load capacitance C_L .

Switch-off

The voltage at output pins OUT and OUTC will be pulled to ground when the low voltage supply voltage (V_{CC}) is switched off.

Video output amplifier

TDA6120Q

INTERNAL PIN CONFIGURATION

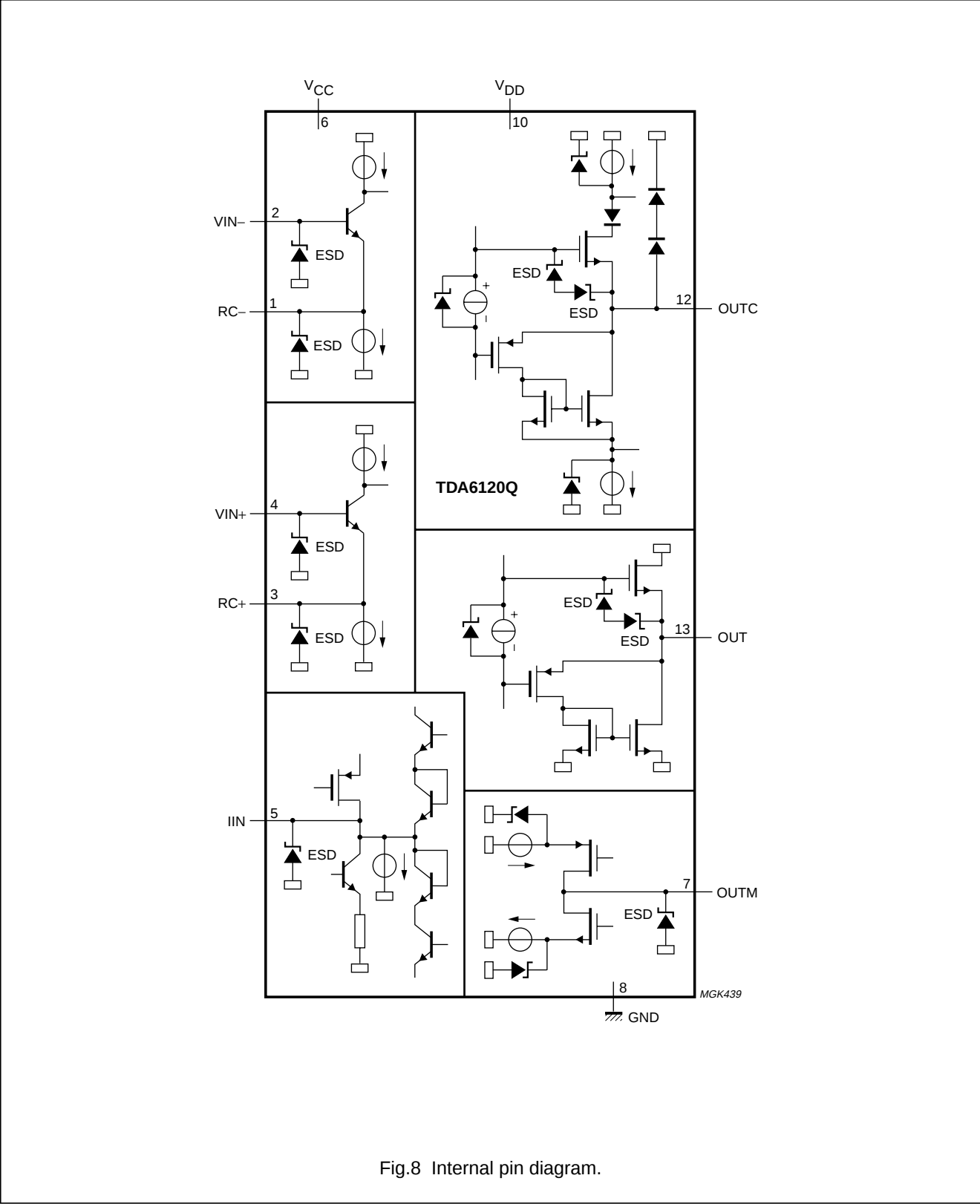


Fig.8 Internal pin diagram.

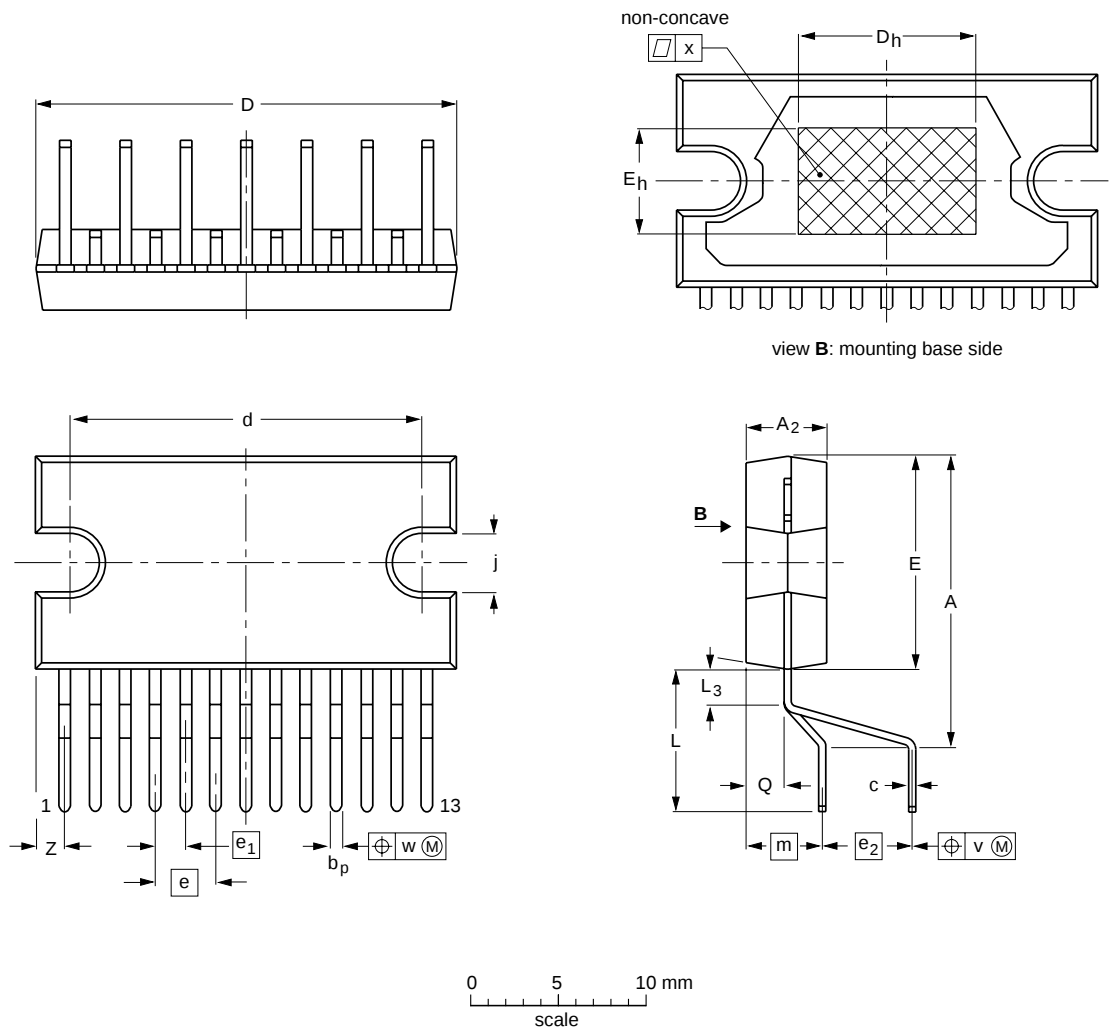
Video output amplifier

TDA6120Q

PACKAGE OUTLINE

DBS13P: plastic DIL-bent-SIL power package; 13 leads (lead length 7.7 mm)

SOT141-8

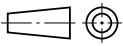


DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₂	b _p	c	D ⁽¹⁾	d	D _h	E ⁽¹⁾	e	e ₁	e ₂	E _h	j	L	L ₃	m	Q	v	w	x	Z ⁽¹⁾
mm	17.0 15.5	4.6 4.2	0.75 0.60	0.48 0.38	24.0 23.6	20.0 19.6	10	12.2 11.8	3.4	1.7	5.08	6	3.4 3.1	8.4 7.0	2.4 1.6	4.3	2.1 1.8	0.6	0.25	0.03	2.00 1.45

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			
SOT141-8						92-11-17 95-03-11

Video output amplifier

TDA6120Q

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

Data sheet status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

Video output amplifier

TDA6120Q

NOTES

Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113,
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213, Tel. +43 160 1010,
Fax. +43 160 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
Tel. +45 32 88 2636, Fax. +45 31 57 0044

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 9 615800, Fax. +358 9 61580920

France: 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex,
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Band Box Building, 2nd floor,
254-D, Dr. Annie Besant Road, Worli, MUMBAI 400 025,
Tel. +91 22 493 8541, Fax. +91 22 493 0966

Indonesia: see Singapore

Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, PO Box 18053,
TEL AVIV 61180, Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +9-5 800 234 7381

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 82785, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA,
Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 755 6918, Fax. +7 095 755 6919

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231,
Tel. +65 350 2538, Fax. +65 251 6500

Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Rua do Rocio 220, 5th floor, Suite 51,
04552-903 São Paulo, SÃO PAULO - SP, Brazil,
Tel. +55 11 821 2333, Fax. +55 11 829 1849

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 3 301 6312, Fax. +34 3 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 632 2000, Fax. +46 8 632 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2686, Fax. +41 1 481 7730

Taiwan: Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,
TAIPEI, Taiwan Tel. +886 2 2134 2865, Fax. +886 2 2134 2874

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,
Tel. +381 11 625 344, Fax. +381 11 635 777

For all other countries apply to: Philips Semiconductors, Marketing & Sales Communications,
Building BE-p, P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

Internet: <http://www.semiconductors.philips.com>

© Philips Electronics N.V. 1997

SCA55

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands

547047/1200/02/pp16

Date of release: 1997 Aug 27

Document order number: 9397 750 02701

Let's make things better.

Philips
Semiconductors



PHILIPS