### INTEGRATED CIRCUITS

# DATA SHEET

### **TDA3507**

Video control combination circuit with automatic cut-off control

Product specification
File under Integrated Circuits, IC02

November 1987





**TDA3507** 

#### **GENERAL DESCRIPTION**

The TDA3507 is a monolithic integrated circuit which performs video control functions in a PAL/SECAM decoder.

The required input signals are: luminance and negative colour difference -(R-Y) and -(B-Y), and a 3-level sandcastle pulse for control purposes. Linear RGB signals can be inserted from an external source. RGB output signals are available for driving the video output stages. This circuit provides automatic cut-off control of the picture tube.

The TDA3507 is the same as the TDA3505 but with RGB channel bandwidths of (typical) 16 MHz and an automatic cut-off cycle that ends in line 15.

#### **Features**

- Capacitive coupling of the colour difference and luminance input signals with black level clamping in the input stages
- Linear saturation control acting on the colour difference signals
- (G-Y) and RGB matrix
- · Linear transmission of inserted signals
- Equal black levels for inserted and matrixed signals
- · 3 identical channels for the RGB signals

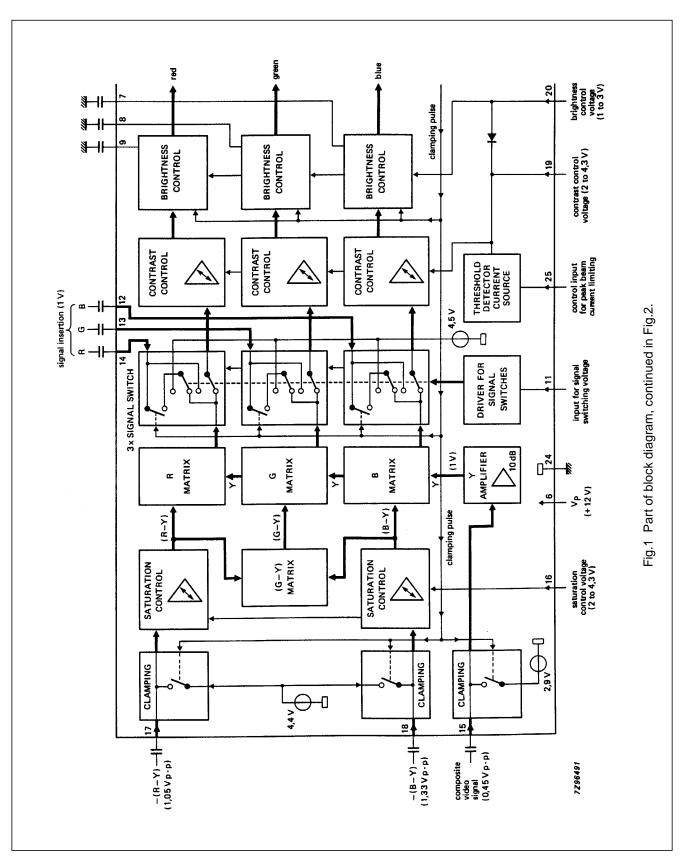
- Linear contrast and brightness controls, operating on both the inserted and matrixed RGB signals
- · Peak beam current limiting input
- Clamping, horizontal and vertical blanking of the three input signals controlled by a 3-level sandcastle pulse
- 3 DC gain controls for the RGB output signals (white point adjustment)
- Emitter-follower outputs for driving the RGB output stages
- Input for automatic cut-off control with compensation for leakage current of the picture tube

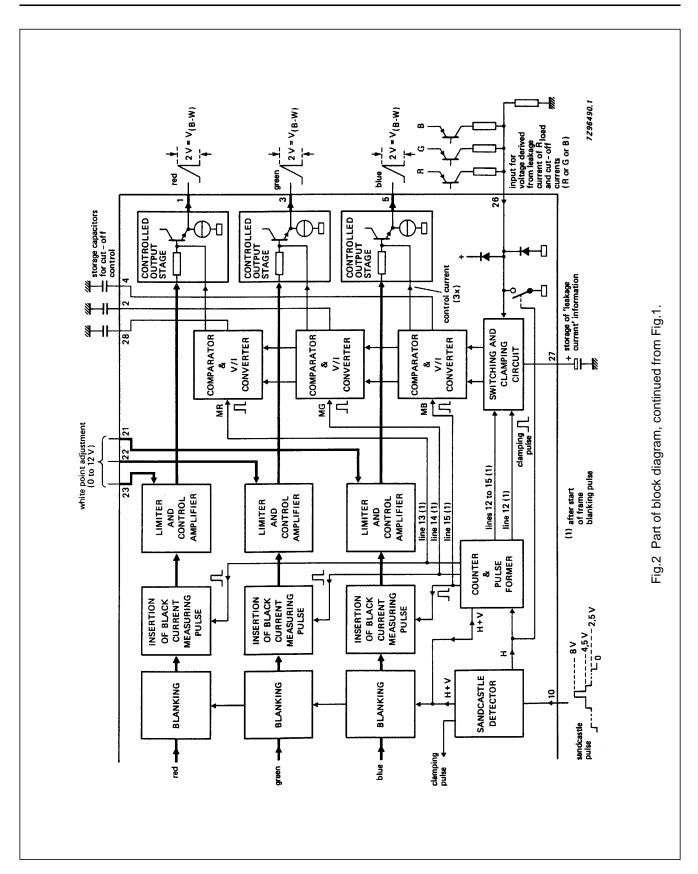
### **QUICK REFERENCE DATA**

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply voltage (pin 6)		$V_P = V_{6-24}$	_	12	_	V
Supply current		$I_P = I_6$	_	100	_	mA
Composite video input						
signal (peak-to-peak value)		V <sub>15-24(p-p)</sub>	_	0,45	_	V
Colour difference input						
signals (peak-to-peak value)						
-(B-Y)		V <sub>18-24(p-p)</sub>	_	1,33	_	V
-(R-Y)		V <sub>17-24(p-p)</sub>	_	1,05	_	V
Inserted RGB signals						
(black-to-white value)		V <sub>12,13,14-24</sub>	_	1,0	_	V
Three-level sandcastle pulse		V <sub>10-24</sub>	_	2,5	_	V
			_	4,5	_	V
			_	8,0	_	V
Control voltage ranges						
brightness		V <sub>20-24</sub>	1,0	_	3,0	V
contrast		V <sub>19-24</sub>	2,0	_	4,3	V
saturation		V <sub>16-24</sub>	2,0	_	4,3	V

### PACKAGE OUTLINE

28-lead DIL; Plastic (SOT117); SOT117-1; 1996 November 21.





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### **PINNING**

PIN	I DESCRIPTION
1	red output
2	green storage capacitor for cut-off control
3	green output
4	blue storage capacitor for cut-off control
5	blue output
6	positive supply voltage (+12 V)
7	blue storage for brightness
8	green storage for brightness
9	red storage for brightness
10	sandcastle pulse input
11	fast switch for RGB inputs
12	blue input (external signal)
13	green input (external signal)
14	red input (external signal)
15	luminance input
16	saturation control input
17	–(R–Y) colour difference input
18	–(B–Y) colour difference input
19	contrast control input
20	brightness control input
21	white point adjustment, blue
22	white point adjustment, green
23	white point adjustment, red
24	ground (0 V)
25	control input for peak beam current limiting
26	automatic cut-off control input
27	storage capacitor for leakage current
28	red storage capacitor for cut-off control

## Video control combination circuit with automatic cut-off control

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

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply voltage (pin 6)	V <sub>P</sub> = V <sub>6-24</sub>	_	13,2	V
Voltage ranges				
at pins 10, 21, 22, 23, 25, 26	V <sub>n-24</sub>	0	V <sub>P</sub>	V
at pin 11	V <sub>11-24</sub>	-0,5	3,0	V
at pins 16, 19, 20	V <sub>16, 19, 20-24</sub>	0	0,5V <sub>P</sub>	V
at pins 1, 2, 3, 4, 5, 7, 8, 9,				
12, 13, 14, 15, 17, 18, 27, 28	no exte	rnal DC voltage		
Currents				
at pins 1, 3, 5	-I <sub>1, 3, 5</sub>	_	3	mA
at pin 19	I <sub>19</sub>	_	10	mA
at pin 20	I <sub>20</sub>	_	5	mA
at pin 25	-l <sub>25</sub>	_	5	mA
Total power dissipation	P <sub>tot</sub>	_	1,7	W
Storage temperature range	T <sub>stg</sub>	-25	+150	°C
Operating ambient temperature range	T <sub>amb</sub>	0	+70	°C

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### **CHARACTERISTICS**

 $V_P = V_{6-24} = 12.0 \text{ V}; V_{12, 13, 14(p-p)} = 1.0 \text{ V}; V_{15-24(p-p)} = 0.45 \text{ V}; V_{17-24(p-p)} = 1.05 \text{ V}; V_{18-24(p-p)} = 1.33 \text{ V}; T_{amb} = 25 ^{\circ}\text{C};$  measured in Fig.3; nominal settings of brightness, contrast, saturation and white point adjustment; all voltages are referred to pin 24; unless otherwise specified

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply (pin 6)						
Supply voltage		$V_P = V_6$	10,8	12,0	13,2	V
Supply current		I <sub>P</sub>	_	100	130 <sup>(1)</sup>	mA
Colour difference inputs						
(pins 17, 18)						
–(R–Y) input signal (pin 17)	for saturated colour					
(peak-to-peak value)	bar with 75% of maximum amplitude	V <sub>17(p-p)</sub>	_	1,05	1,48	V
–(B–Y) input signal (pin 18)	for saturated colour					
(peak-to-peak value)	bar with 75% of maximum amplitude	V <sub>18(p-p)</sub>	_	1,33	1,88	V
Input current during						
scanning		I <sub>17, 18</sub>	_	_	1,0	μΑ
Input resistance		R <sub>17, 18-24</sub>	1,0	_	_	ΜΩ
Internal DC voltage due to						
clamping	note 2	V <sub>17, 18</sub>	3,8	4,4	4,8	V
Saturation control (pin 16)						
Control voltage for						
maximum saturation	note 2	V <sub>16</sub>	4,0	4,2	4,4	V
Control voltage for						
nominal saturation	6 dB below max.					
	note 2	V <sub>16</sub>	2,9	3,1	3,3	V
Control voltage for						
<ul><li>–26 dB saturation referred to maximum</li></ul>	note 2	V <sub>16</sub>	1,9	2,1	2,3	V
Minimum saturation	V <sub>16</sub> = 1,8 V	d	46	50	_	dB
Input current		I <sub>16</sub>	-	_	20	μΑ
(G-Y) matrix Matrixed according to the equation V <sub>(</sub>	$G_{-Y} = -0.51 V_{(R-Y)} -0.11$	9 V <sub>(B-Y)</sub>				
Luminance input (pin 15)						
Composite video input signal						
(peak-to-peak value)		V <sub>15(p-p)</sub>	_	450	630	mV
Input resistance		R <sub>15-24</sub>	100	_	_	kΩ
Input capacitance		C <sub>15-24</sub>	_	_	5	pF
Input current during						
scanning		I <sub>15</sub>	_	_	1	μΑ

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PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Linearity	nominal settings	m	0,85	_	-	
Internal DC voltage due						
to clamping	note 2	V <sub>15</sub>	2,5	2,9	3,3	V
RGB channels						
Signal switching input						
(pin 11)						
Normal state; no insertion		V <sub>11</sub>	0	_	0,4	V
Level for insertion-on		V <sub>11</sub>	0,9	-	3,0	V
Input capacitance		C <sub>11-24</sub>	_	_	10	pF
Input current	$V_{11} = 0 \text{ to } 3 \text{ V}$	I <sub>11</sub>	-100	_	+450	μΑ
Signal insertion						
(pins 12, 13, 14)						
External RGB input signals						
(black-to-white value)		V <sub>12, 13, 14</sub>	_	1,0	1,4	V
Input current during						
scanning		I <sub>12, 13, 14</sub>	_	_	1,0	μΑ
Internal DC voltage due						
to clamping	notes 2, 3	V <sub>12, 13, 14</sub>	4,0	4,5	5,0	V
Contrast control (pin 19)	note 2					
Control voltage for						
maximum contrast		V <sub>19</sub>	4,0	4,2	4,4	V
Control voltage for						
nominal contrast	3 dB below max.	V <sub>19</sub>	3,4	3,6	3,8	V
Control voltage for						
–10 dB below max.		V <sub>19</sub>	2,6	2,8	3,0	V
Minimum contrast						
referred to max.	V <sub>19</sub> = 2 V	d	18	21	29	dB
Input current	$V_{25} > 6 V$	I <sub>19</sub>	_	-	2	μΑ
Difference between						
RGB channels	contrast –10 dB below max.		-	-	0,6	dB
Peak beam current limiting						
(pin 25)						
Internal DC bias voltage	note 2	V <sub>25</sub>	5,3	5,5	5,7	V
Input resistance		R <sub>25-24</sub>	_	10	_	kΩ
Input current at contrast						
control input	V <sub>25</sub> = 4,5 V	I <sub>19</sub>	10	20	34	mA
Brightness control (pin 20)	note 2					
Control voltage range		V <sub>20</sub>	1	_	3	V

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PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input current		-l <sub>20</sub>	_	-	10	μΑ
Change of black level in the						
control range related to the luminance signal (black/white)	$\Delta V_{20} = 1 \text{ V}$		_	±50	_	%
Tracking			95	_	_	%
Internal signal limiting						
(RGB)						
Signal limiting referred to						
nominal luminance and nominal black level						
black			_	-25	_	%
white			115	120	125	%
White point adjustment						
(pins 21, 22, 23)	note 2					
AC voltage gain	note 4					
V <sub>21,22,23</sub> = 5,5 V		G <sub>V</sub>	_	100	_	%
V <sub>21,22,23</sub> = 0 V		G <sub>V</sub>	-35	-40	_	%
V <sub>21,22,23</sub> = 12 V		G <sub>V</sub>	+35	+40	_	%
Input resistance		R <sub>21,22,23-24</sub>	-	20	_	kΩ
RGB outputs						
(emitter follower) (pins 1, 3, 5)						
Output voltage; black-to-						
white positive		V <sub>1,3,5</sub>	1,5	2,0	2,5	V
Black level without						
automatic cut-off control	note 2					
	$V_{28,2,4} = 10 \text{ V}$	V <sub>1,3,5</sub>	6,1	6,9	7,7	V
Difference in black level						
between RGB channels due to variation of contrast control		$\Delta V_{1,3,5}$	_	_	10	mV
Cut-off control range	note 2	V <sub>1,3,5</sub>	4,0	4,6	_	V
Internal current source		I <sub>1,3,5</sub>	2,0	3,0	-	mA
Automatic cut-off control						
(pin 26)	notes 2, 5					
Input voltage range		V <sub>26</sub>	0	-	6,5	V

## Video control combination circuit with automatic cut-off control

PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Voltage difference between						
cut-off current measurement (note 6) and leakage current measurement (note 7)		V <sub>26</sub>	0,5	0,64	0,72	V
Input pin 26 switches to ground during	g horizontal flyback					
Gain data	at nominal brightness, contrast, saturation and white point settings					
Voltage gain with respect						
to luminance input (pin 15)		G <sub>1,3,5-15</sub>	14	16	18	dB
Frequency response of						
luminance path	0 to 5 MHz	d <sub>1,3,5-15</sub>	-	_	3	dB
Voltage gain with respect						
to colour difference inputs (pins 17 and 18)		G <sub>5-18</sub> G <sub>1-17</sub>	3	6	9	dB
Frequency response of						
colour difference paths	0 to 2 MHz	d <sub>5-18</sub>	_	_	3	dB
		d <sub>1-17</sub>				
Voltage gain with respect						
to inserted signals		G <sub>1-14</sub>				
		G <sub>3-13</sub>	4	6	8	dB
		G <sub>5-12</sub>				
Frequency response of						
inserted signal paths	0 to 16 MHz	d <sub>1-14</sub>				
		d <sub>3-13</sub>	-	3	_	dB
		d <sub>5-12</sub>				
Frequency response of						
inserted signal paths	0 to 13 MHz	d <sub>1-14</sub>				
		d <sub>3-13</sub>	-	_	3	dB
		d <sub>5-12</sub>				
Rise and fall times of RGB						
output signals				40		
(pins 1, 3, 5)		t <sub>r</sub> ,t <sub>f</sub>	_	40	-	ns
Difference in transit times					45	
between R, G and B channels		$\Delta t_{1,3,5}$	_	0	15	ns
Delay time between signal			05		.05	
switching and signal insertion		t <sub>d</sub>	-25	_	+25	ns

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PARAMETER	CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNIT
Difference in gain between						
normal mode and signal insertion mode		$\Delta G_{1,3,5}$	_	_	10	%
Sandcastle pulse detector						
(pin 10)	note 8					
Levels for separating the						
following pulses:						
horizontal and vertical						
blanking pulses	note 9	V <sub>10</sub>	1,0	1,5	2,0	V
required pulses (H+V)		V <sub>10</sub>	2,1	2,5	2,9	V
horizontal pulses		V <sub>10</sub>	3,0	3,5	4,0	V
required pulses (H)		V <sub>10</sub>	4,1	4,5	5,0	V
clamping pulses	note 10	V <sub>10</sub>	6,5	7,0	7,5	V
required pulses		V <sub>10</sub>	7,6	_	12,0	V
no keying		V <sub>10</sub>	_	_	1,0	V
Input current		-I <sub>10</sub>	_	_	110	μΑ

#### **Notes**

- 1. < 115 mA after warm-up.
- 2. Values are proportional to the supply voltage.
- 3. When  $V_{11-24} < 0.4$  V during clamping time the black levels of the inserted RGB signals are clamped on the black levels of the internal RGB signals.

When  $V_{11-24} > 0.9$  V during clamping time — the black levels of the inserted RGB signals are clamped on an internal DC voltage (correct clamping of the external RGB signals is possible only when they are synchronous with the sandcastle pulse).

- 4. When pins 21, 22 and 23 are not connected, an internal bias voltage of 5,5 V is supplied.
- 5. Automatic cut-off control measurement occurs in the following lines after start of the vertical blanking pulse:
  - line 12: measurement of leakage current (R + G + B)
  - line 13: measurement of red cut-off current
  - line 14: measurement of green cut-off current
  - line 15: measurement of blue cut-off current
- 6. Black level of the measured channel is nominal; the other two channels are blanked to ultra-black.
- 7. All three channels blanked to ultra-black.

The cut-off control cycle occurs when the vertical blanking part of the sandcastle pulse contains more than 3 line pulses.

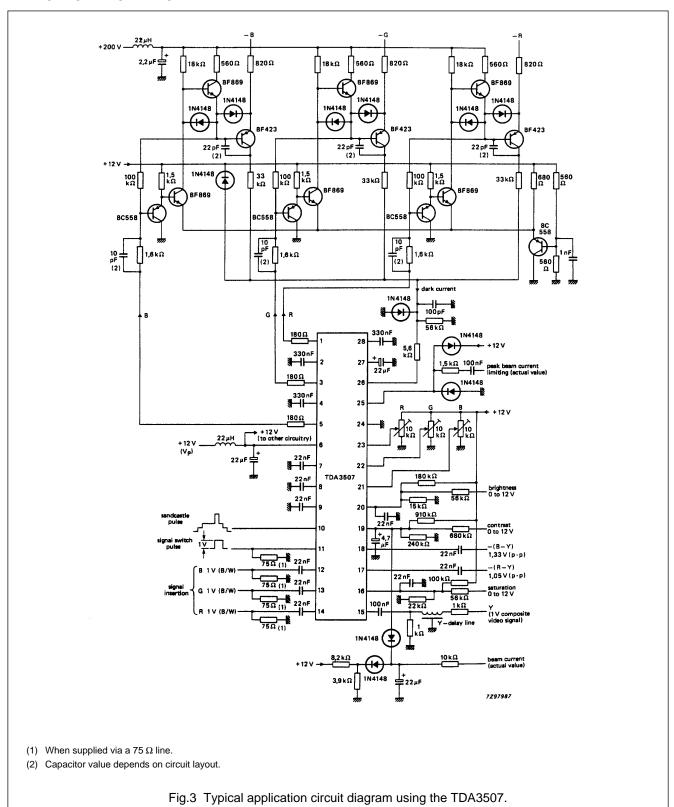
The internal blanking continues until the end of the last measured line.

The vertical blanking pulse is not allowed to contain more than 34 line pulses, otherwise another control cycle begins.

- 8. The sandcastle pulse is compared with three internal thresholds (proportional to  $V_P$ ) and the given levels separate the various pulses.
- 9. Blanked to ultra-black (-25%).
- 10. Pulse duration  $\geq$  3,5  $\mu$ s.

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### **APPLICATION INFORMATION**

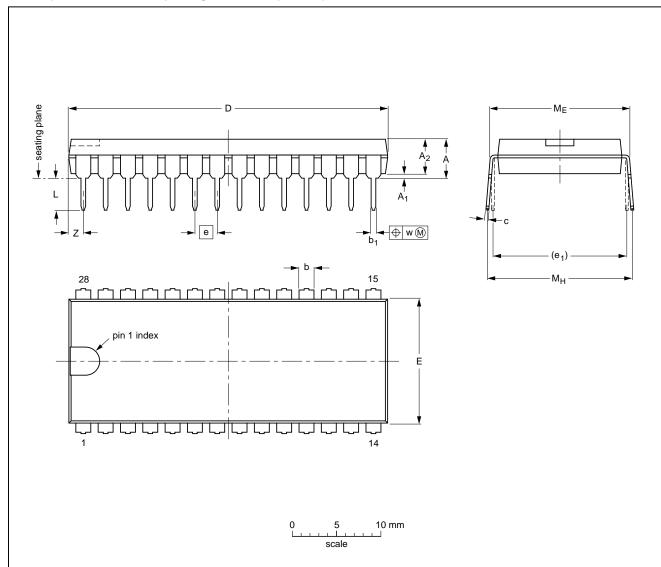


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### **PACKAGE OUTLINE**

DIP28: plastic dual in-line package; 28 leads (600 mil)

SOT117-1



### DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	С	D <sup>(1)</sup>	E <sup>(1)</sup>	е	e <sub>1</sub>	L	ME	Мн	w	Z <sup>(1)</sup> max.
mm	5.1	0.51	4.0	1.7 1.3	0.53 0.38	0.32 0.23	36.0 35.0	14.1 13.7	2.54	15.24	3.9 3.4	15.80 15.24	17.15 15.90	0.25	1.7
inches	0.20	0.020	0.16	0.066 0.051	0.020 0.014	0.013 0.009	1.41 1.34	0.56 0.54	0.10	0.60	0.15 0.13	0.62 0.60	0.68 0.63	0.01	0.067

#### Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE		REFER	ENCES	EUROPEAN ISSUE DATE			
VERSION	IEC	JEDEC	EIAJ	PROJECTION ISSUE DATE			
SOT117-1	051G05	MO-015AH			<del>92-11-17</del> 95-01-14		

### Video control combination circuit with automatic cut-off control

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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	
	n 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.