

# DATA SHEET

## **TDA1016**

Recording/playback and  
2 W audio power amplifier

Product specification  
File under Integrated Circuits, IC01

August 1987

# Recording/playback and 2 W audio power amplifier

TDA1016

## GENERAL DESCRIPTION

The TDA1016 is a monolithic integrated audio power amplifier, preamplifier and A.L.C. circuit designed for applications in radio-recorders and recorders. The wide supply voltage range makes this circuit very suitable for d.c. and a.c. apparatus. The circuit incorporates the following features:

### Features

- Power amplifier/monitor amplifier
- Preamplifier/record and playback amplifier
- Automatic Level Control (A.L.C.) circuit
- Voltage stabilizer
- Short-circuit (up to 12 V a.c.) and thermal protection.

## QUICK REFERENCE DATA

|                                                |              |      |               |
|------------------------------------------------|--------------|------|---------------|
| Supply voltage range                           | $V_P$        |      | 3,6 to 15 V   |
| Supply current; total quiescent at $V_P = 6$ V | $I_{tot}$    | typ. | 10 mA         |
| Operating ambient temperature range            | $T_{amb}$    |      | -25 to 150 °C |
| <b>Power amplifier</b>                         |              |      |               |
| Output power at $d_{tot} = 10\%$               |              |      |               |
| $V_P = 6$ V; $R_L = 4 \Omega$                  | $P_O$        | typ. | 1 W           |
| $V_P = 9$ V; $R_L = 4 \Omega$                  | $P_O$        | typ. | 2 W           |
| Closed loop gain                               | $G_c$        | typ. | 36 dB         |
| <b>Preamplifier</b>                            |              |      |               |
| Open loop gain                                 | $G_O$        | min. | 70 dB         |
| Minimum closed loop voltage gain               | $G_{c min}$  | min. | 35 dB         |
| Output voltage at $d_{tot} = 1\%$              | $V_O$        | min. | 1 V           |
| <b>Automatic Level Control (A.L.C.)</b>        |              |      |               |
| Gain variation for $\Delta V_i = 40$ dB        | $\Delta G_V$ | typ. | 2 dB          |
| <b>Stabilized supply voltage</b>               |              |      |               |
| Output voltage                                 | $V_{5-16}$   | typ. | 2,6 V         |

## PACKAGE OUTLINE

16-lead DIL; plastic, with internal heat spreader (SOT38); SOT38-1; 1996 July 23.

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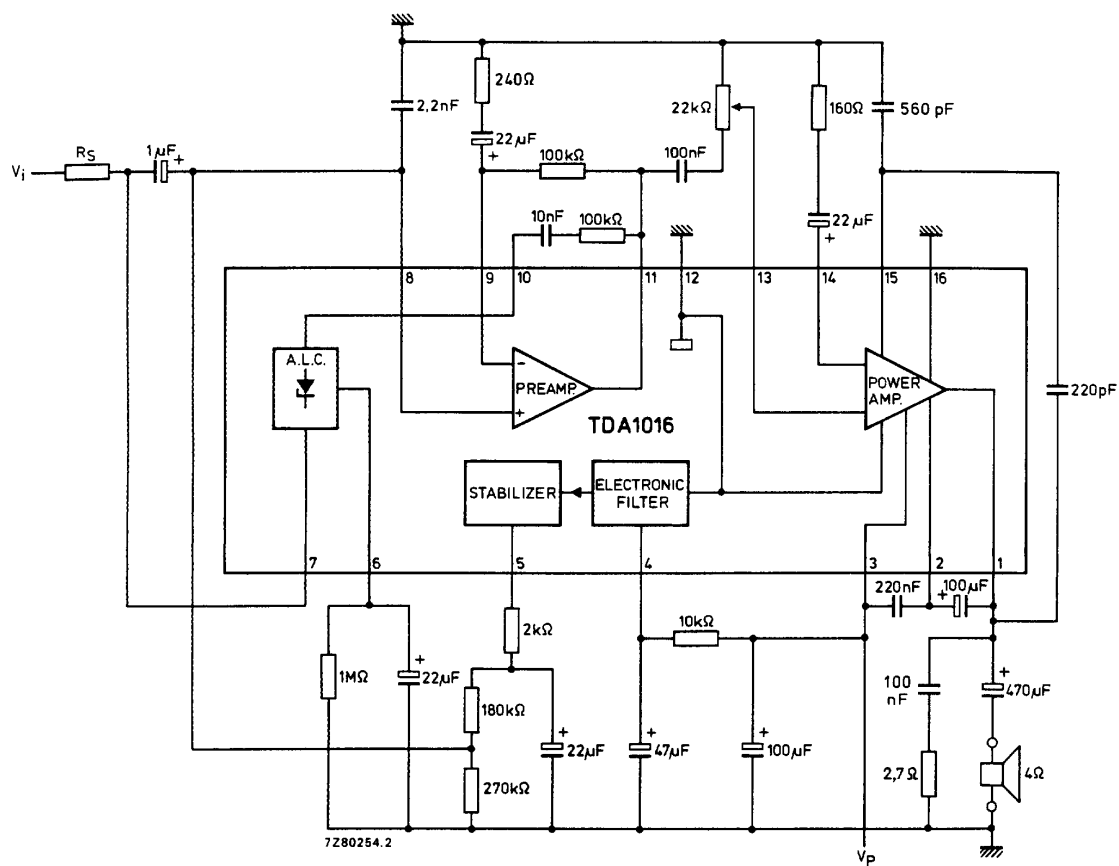


Fig.1 Block diagram with external components; also used as test circuit.

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RATINGS

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

|                                                                                   |                          |                 |           |
|-----------------------------------------------------------------------------------|--------------------------|-----------------|-----------|
| Supply voltage (pin 3)                                                            | $V_P$                    | max.            | 18 V      |
| Repetitive peak output current                                                    | $I_{ORM}$                | max.            | 1 A       |
| Non-repetitive peak output current (pin 1)                                        | $I_{OSM}$                | max.            | 2 A       |
| Total power dissipation                                                           | see derating curve Fig.2 |                 |           |
| A.C. short-circuit duration of load during<br>sinewave drive; $V_P = 12\text{ V}$ | $t_{SC}$                 | max.            | 100 hours |
| Crystal temperature                                                               | $T_C$                    | max.            | 150 °C    |
| Storage temperature range                                                         | $T_{stg}$                | −55 to + 150 °C |           |
| Operating ambient temperature range                                               | $T_{amb}$                | −25 to + 150 °C |           |

THERMAL RESISTANCE

The power derating curve (Fig.2) is based on the following data

From junction to ambient

$R_{th\ j-a}$  = 55 K/W

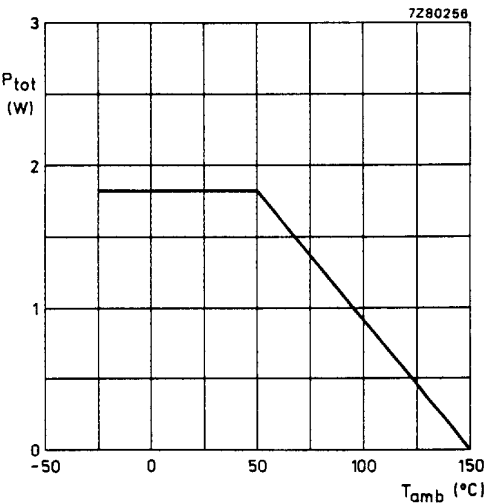


Fig.2 Power derating curve.

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## CHARACTERISTICS

$V_P = 6\text{ V}$ ;  $R_L = 4\ \Omega$ ;  $f = 1\text{ kHz}$ ;  $T_{\text{amb}} = 25\text{ }^\circ\text{C}$ ; measured in test circuit Fig.1; unless otherwise specified

| SYMBOL                 | PARAMETER                                                      | MIN. | TYP. | MAX. | UNIT          |
|------------------------|----------------------------------------------------------------|------|------|------|---------------|
| <b>Supply (pin 3)</b>  |                                                                |      |      |      |               |
| $V_P$                  | Supply voltage                                                 | 3,6  | 6    | 15   | V             |
|                        | Supply current; total quiescent                                |      |      |      |               |
| $I_{\text{tot}}$       | at $V_P = 6\text{ V}$                                          | –    | 10   | –    | mA            |
| <b>Power amplifier</b> |                                                                |      |      |      |               |
| $P_O$                  | Output power at $d_{\text{tot}} = 10\%$ ; see note 1           |      |      |      |               |
|                        | $V_P = 6\text{ V}$                                             | –    | 1    | –    | W             |
| $P_O$                  | $V_P = 9\text{ V}$                                             | –    | 2    | –    | W             |
| $G_c$                  | Closed loop voltage gain                                       | –    | 36   | –    | dB            |
| $d_{\text{tot}}$       | Total harmonic distortion at $P_O = 0,5\text{ W}$              | –    | –    | 1    | %             |
| $ Z_i $                | Input impedance                                                | 0,5  | –    | –    | M $\Omega$    |
| RR                     | Ripple rejection at $f = 100\text{ Hz}$ ( $R_S = 0\ \Omega$ )  | 40   | 50   | –    | dB            |
| $V_{n(\text{rms})}$    | Noise output voltage (r.m.s. value)                            |      |      |      |               |
|                        | $R_S = 0\ \Omega$ ; $B = 60\text{ Hz to }15\text{ kHz}$        | –    | 90   | 200  | $\mu\text{V}$ |
| $V_n$                  | Noise output voltage at 500 kHz                                | –    | 8    | –    | $\mu\text{V}$ |
| <b>Preamplifier</b>    |                                                                |      |      |      |               |
| $G_O$                  | Open loop voltage gain at $f = 10\text{ kHz}$                  | 70   | 78   | –    | dB            |
| $G_c$                  | Closed loop voltage gain                                       | –    | 52   | –    | dB            |
|                        | Minimum closed loop voltage gain                               |      |      |      |               |
| $G_{c\text{ min}}$     | (when changing $R_f$ )                                         | 35   | –    | –    | dB            |
| $V_O$                  | Output voltage at $d_{\text{tot}} = 1\%$                       | 1    | –    | –    | V             |
|                        | Output voltage with A.L.C.                                     |      |      |      |               |
| $V_O$                  | $V_i = 2\text{ mV}$                                            | 0,45 | 0,5  | 0,55 | V             |
| $d_{\text{tot}}$       | Total harmonic distortion with A.L.C.                          |      |      |      |               |
|                        | $V_i = 2\text{ mV}$                                            | –    | –    | 1    | %             |
| $d_{\text{tot}}$       | $V_i = 360\text{ mV}$                                          | –    | –    | 3    | %             |
| S/N                    | Signal-to-noise ratio related to $V_i = 1,2\text{ mV}$ ;       |      |      |      |               |
|                        | $R_S = 1\text{ k}\Omega$ ; $B = 60\text{ Hz to }15\text{ kHz}$ | –    | 60   | –    | dB            |
| $ Z_i $                | Input impedance                                                | 100  | –    | –    | k $\Omega$    |
|                        | Ripple rejection                                               |      |      |      |               |
| RR                     | at $f = 100\text{ Hz}$ ; $R_S = 0\ \Omega$                     | 50   | 54   | –    | dB            |
| $ Z_O $                | Output impedance; see note 2                                   | –    | –    | 50   | $\Omega$      |

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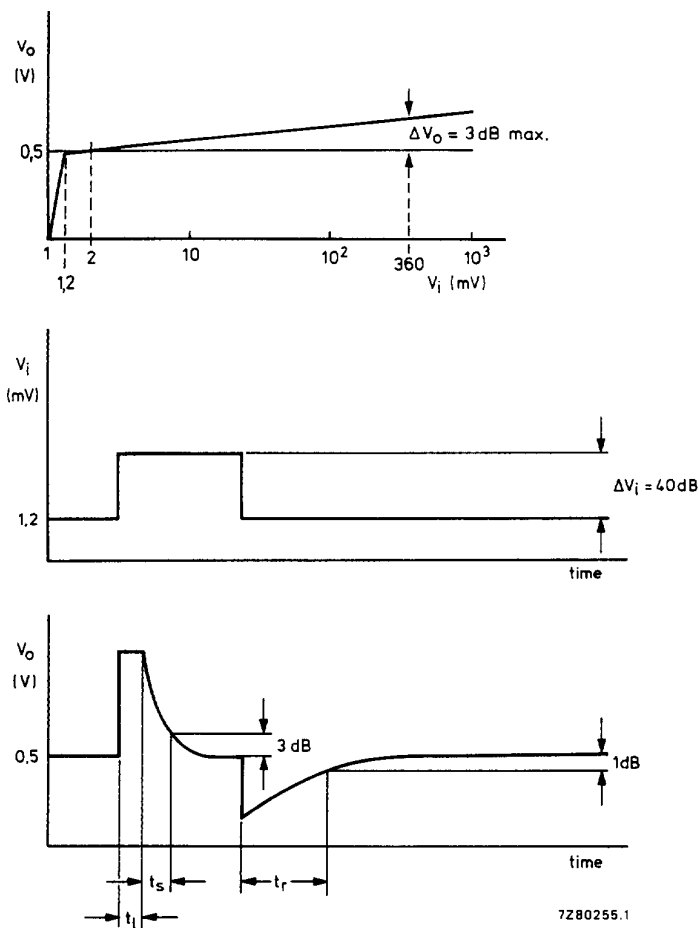
| SYMBOL                                                          | PARAMETER                               | MIN. | TYP. | MAX. | UNIT |
|-----------------------------------------------------------------|-----------------------------------------|------|------|------|------|
| <b>Automatic Level Control (A.L.C.) (see Fig.3); see note 4</b> |                                         |      |      |      |      |
| $\Delta G_v$                                                    | Gain variation for $\Delta V_i = 45$ dB | –    | 2    | 3    | dB   |
| $t_l$                                                           | Limiting time; see note 3               | –    | –    | 50   | ms   |
| $t_s$                                                           | Level setting time; see note 3          | –    | –    | 50   | ms   |
| $t_r$                                                           | Recovery time; see notes 3 and 5        | –    | 100  | –    | s    |
| <b>Voltage stabilizer</b>                                       |                                         |      |      |      |      |
| $V_{11-15}$                                                     | Output voltage                          | –    | 2,6  | –    | V    |
| $I_{11}$                                                        | Load current                            | –    | –    | 1,5  | mA   |
| RR                                                              | Ripple rejection at $f = 100$ Hz        | 40   | –    | –    | dB   |

## Notes

1. Measured with an ideal coupling capacitor connected to the speaker load.
2.  $I_p$  (effective value) must not exceed 1 mA.
3. At  $\Delta V_i =$  dB with respect to  $V_i = 1,2$  mV.
4. The A.L.C. tracking in stereo has a typical spread of 1 dB if pins 6 of both ICs are connected to the same RC network.
5. Without a shunt resistor across A.L.C. With 1 M $\Omega$  or 2,2 M $\Omega$  across A.L.C. recovery time becomes 22 or 50 seconds.

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Fig.3 Typical A.L.C. curve with  $R_S = 10 \text{ k}\Omega$ .

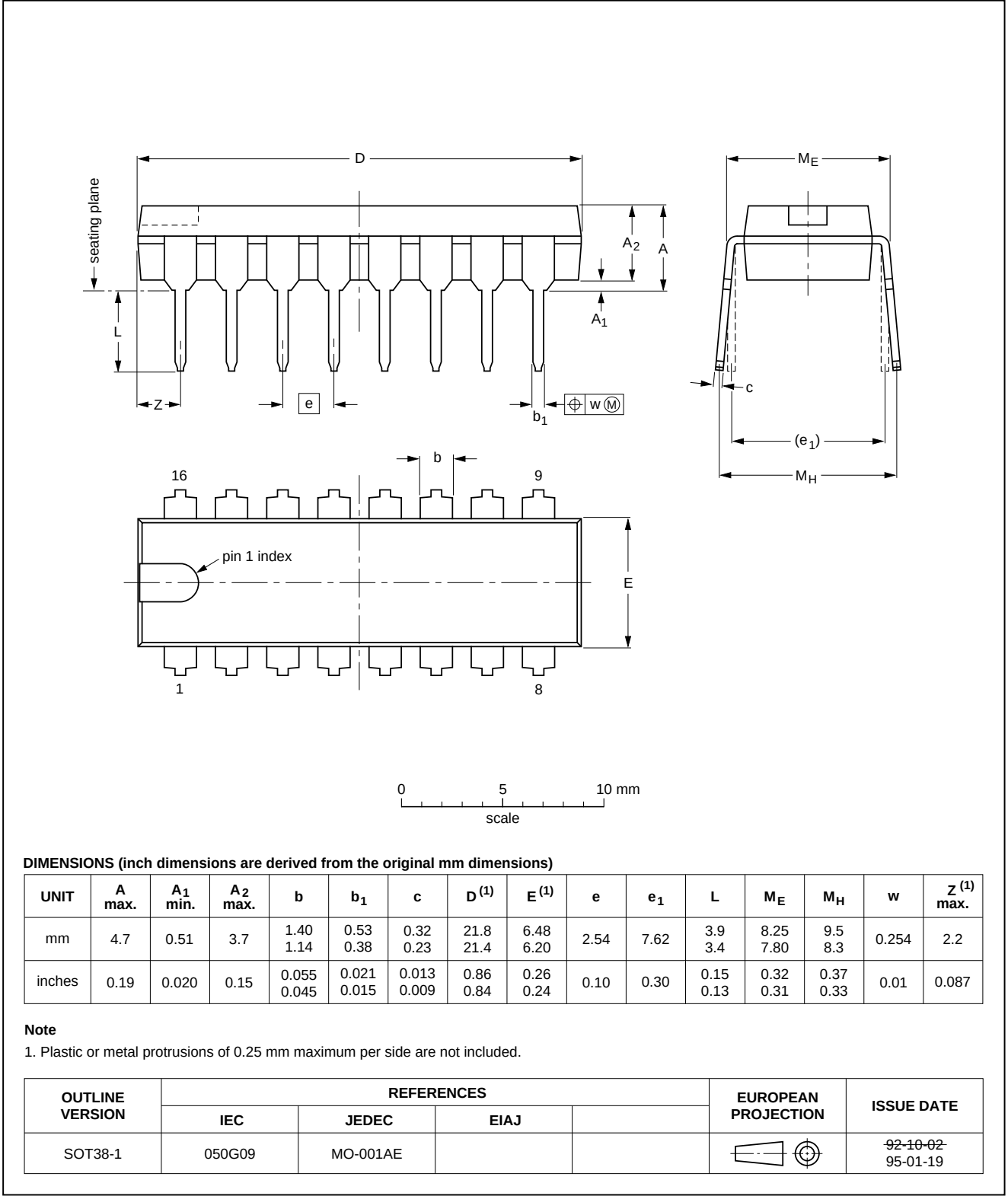
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PACKAGE OUTLINE

DIP16: plastic dual in-line package; 16 leads (300 mil); long body

SOT38-1





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## 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

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