DATA SHEET

TDA1553CQ

2 × 22 W stereo BTL car radio power amplifier with loudspeaker protection and 3-state mode switch

Product specification
Supersedes data of July 1994
File under Integrated Circuits, IC01

1995 Dec 15

Philips
Semiconductors

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2 × 22 W stereo BTL car radio power amplifier with loudspeaker protection and 3-state mode switch

TDA1553CQ

FEATURES

- Few peripheral components
- High output power
- Low output offset voltage
- Fixed gain
- Loudspeaker protection
- Good ripple rejection
- 3-state mode switch (operating, mute, standby)
- Load dump protection
- AC and DC short-circuit safe to ground and to V_P
- Thermally protected
- Reverse polarity safe
- High energy handling capability at the outputs (V_P = 0)
- Electrostatic discharge protection
- No switch-on/switch-off plop
- Flexible leads
- Low thermal resistance.

GENERAL DESCRIPTION

The TDA1553CQ is a monolithic integrated class-B output amplifier in a 13-lead plastic DIL-bent-SIL power package. It contains 2 × 22 W amplifiers in BTL configuration.

The device is primarily developed for car radio applications.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	positive supply voltage					
	operating		6	14.4	18	V
	non-operating		–	–	30	V
	load dump		–	–	45	V
I_{ORM}	repetitive peak output current		–	–	4	A
I_q	total quiescent current		–	80	–	mA
I_{stb}	standby current		–	40	100	μA
$\|Z_i\|$	input impedance		50	–	–	kΩ
T_{vj}	virtual junction temperature		–	–	150	°C
Stereo application						
P_O	output power	at 4 Ω; THD = 10%	–	22	–	W
SVRR	supply voltage ripple rejection	R_s = 0 Ω; f = 100 Hz to 10 kHz	48	–	–	dB
$\|\Delta V_O\|$	DC output offset voltage		–	–	150	mV
α_{cs}	channel separation		40	–	–	dB
$\|\Delta G_v\|$	channel unbalance		–	–	1	dB

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA1553CQ	DBS13P	plastic DIL-bent-SIL power package; 13 leads (lead length 12 mm)	SOT141-6

BLOCK DIAGRAM

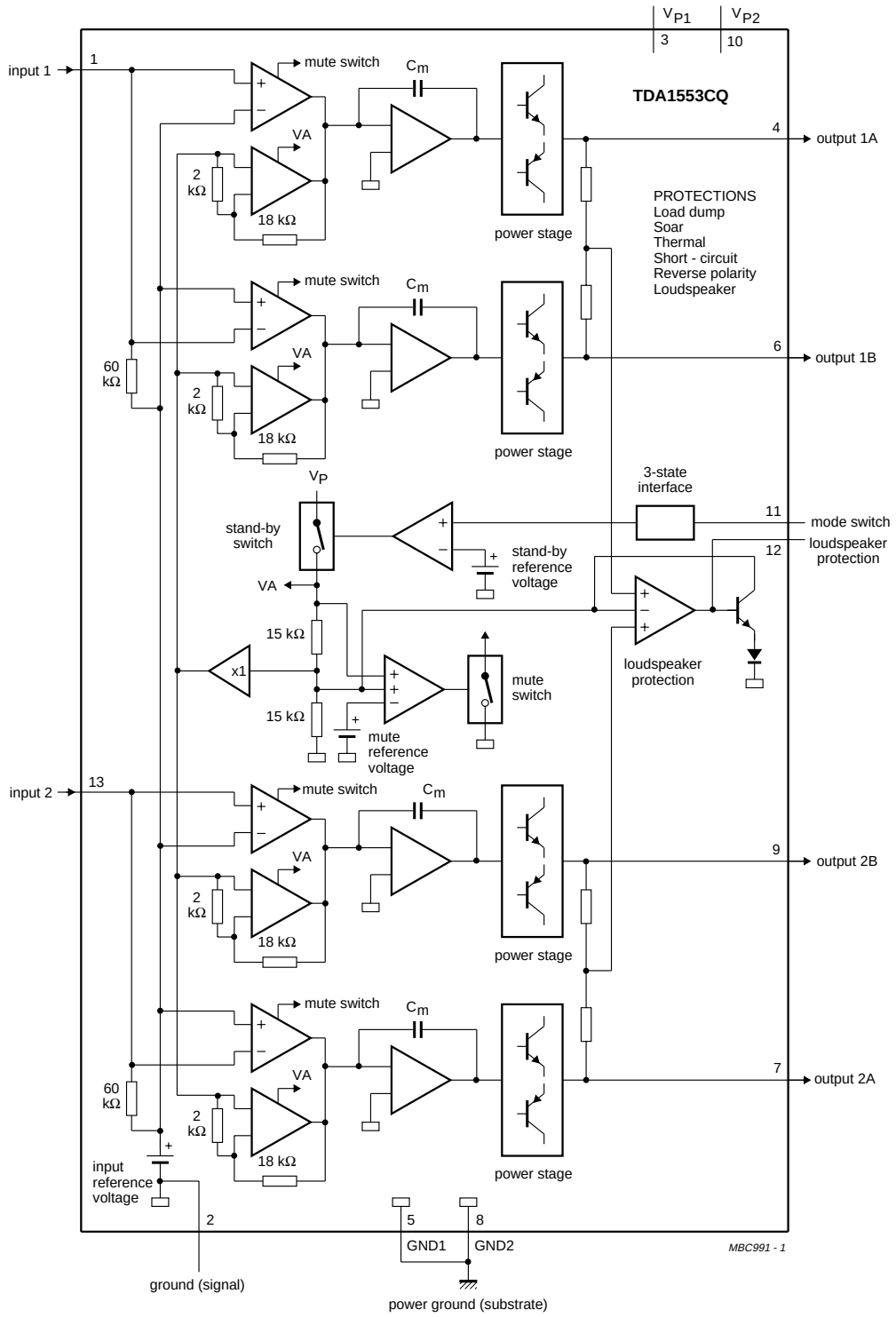


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
IN1	1	input 1
GND(S)	2	signal ground
V_{P1}	3	supply voltage
OUT1A	4	output 1A
GND1	5	power ground 1
OUT1B	6	output 1B
OUT2A	7	output 2A
GND2	8	power ground 2
OUT2B	9	output 2B
V_{P2}	10	supply voltage
MODE	11	mode switch input
LSP	12	loudspeaker protection
IN2	13	input 2

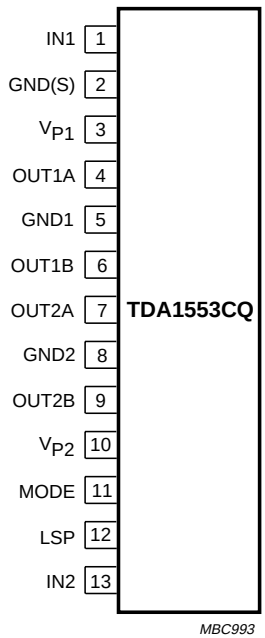


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

The TDA1553CQ contains two identical amplifiers with differential input stages and can be used for bridge applications. The gain of each amplifier is fixed at 26 dB. Special features of the device are:

3-state mode switch

- standby: low supply current (<100 μA)
- mute: input signal suppressed
- operating: normal on condition.

Loudspeaker protection

When a short-circuit to ground occurs, which forces a DC voltage across the loudspeaker of ≥1 V, a built-in protection circuit becomes active and limits the DC voltage across the loudspeaker to ≤1 V.

Pin 12 detects the status of the protection circuit (e.g. for diagnostic purposes).

Short-circuit protection

If any output is short-circuited to ground during the standby mode, it becomes impossible to switch the circuit to the mute or operating condition. In this event the supply current will be limited to a few milliamps.

LIMITING VALUES

In accordance with the absolute maximum system (IEC 134).

SYMBOL	PARAMETER	CONDITION	MIN.	MAX.	UNIT
V_P	positive supply voltage				
	operating		–	18	V
	non-operating		–	30	V
	load dump protection	during 50 ms; $t_r \geq 2.5$ ms	–	45	V
I_{OSM}	non-repetitive peak output current		–	6	A
I_{ORM}	repetitive peak output current		–	4	A
T_{stg}	storage temperature range		–55	+150	°C
T_{amb}	operating ambient temperature range		–40	+85	°C
T_{vj}	virtual junction temperature		–	150	°C
V_{psc}	AC and DC short-circuit safe voltage		–	18	V
	energy handling capability at outputs	$V_P = 0$	–	200	mJ
V_{pr}	reverse polarity		–	6	V
P_{tot}	total power dissipation		–	60	W

THERMAL CHARACTERISTICS

In accordance with IEC 747-1.

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air	40	K/W
$R_{th\ j\text{-}c}$	thermal resistance from junction to case (see Fig.3)	1.5	K/W

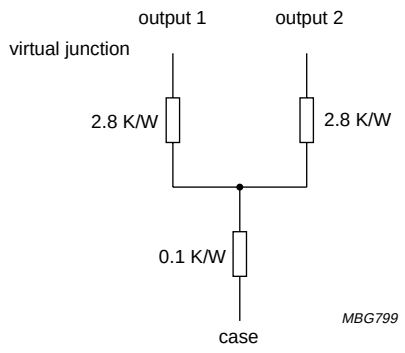


Fig.3 Equivalent thermal resistance network.

DC CHARACTERISTICS

V_P = 14.4 V; T_{amb} = 25 °C; measured in Fig.4; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_P	positive supply voltage	note 1	6	14.4	18	V
I_q	quiescent current					
		$R_L = \infty$	–	80	160	mA
		note 2	–	5.5	–	mA
Operating condition						
V_{11}	mode switch voltage level		2.2	–	7	V
I_{11}	mode switch current	V_{11} = 2.2 V	–	50	100	µA
V_O	DC output voltage	note 3	–	6.9	–	V
$\lvert\Delta V_O\rvert$	DC output offset voltage		–	–	150	mV
Mute condition						
V_{11}	mode switch voltage level		0	–	0.6	V
I_{11}	mode switch current	V_{11} = 0.6 V	–	50	100	µA
V_O	DC output voltage	note 3	–	6.9	–	V
$\lvert\Delta V_O\rvert$	DC output offset voltage		–	–	150	mV
standby condition						
$\lvert I_{11}\rvert$	mode switch 3-state leakage current		–	–	10	µA
I_{stb}	standby current	I_{11} = 0 µA	–	40	100	µA
Loudspeaker protection						
$\lvert\Delta V_{4-6}\rvert$ or $\lvert\Delta V_{7-9}\rvert$	DC voltage across R_L		–	–	1	V
Protection active ($\lvert\Delta V_{4-6}\rvert$ or $\lvert\Delta V_{7-9}\rvert \geq$ 1.0 V)						
I_{12}	current information		–	25	–	µA
V_{12}	voltage information		3.6	–	–	V
Protection not active ($\lvert\Delta V_{4-6}\rvert$ and $\lvert\Delta V_{7-9}\rvert \leq$ 0.15 V)						
V_{12}	voltage information		–	–	0.3	V

Notes

1. The circuit is DC adjusted at V_P = 6 to 18 V and AC operating at V_P = 9 to 18 V.
2. If any output is short-circuited to ground during the standby mode and in this condition the circuit is switched to mute or operating condition.
3. At 18 V < V_P < 30 V the DC output voltage ≤V_P/2.

AC CHARACTERISTICS

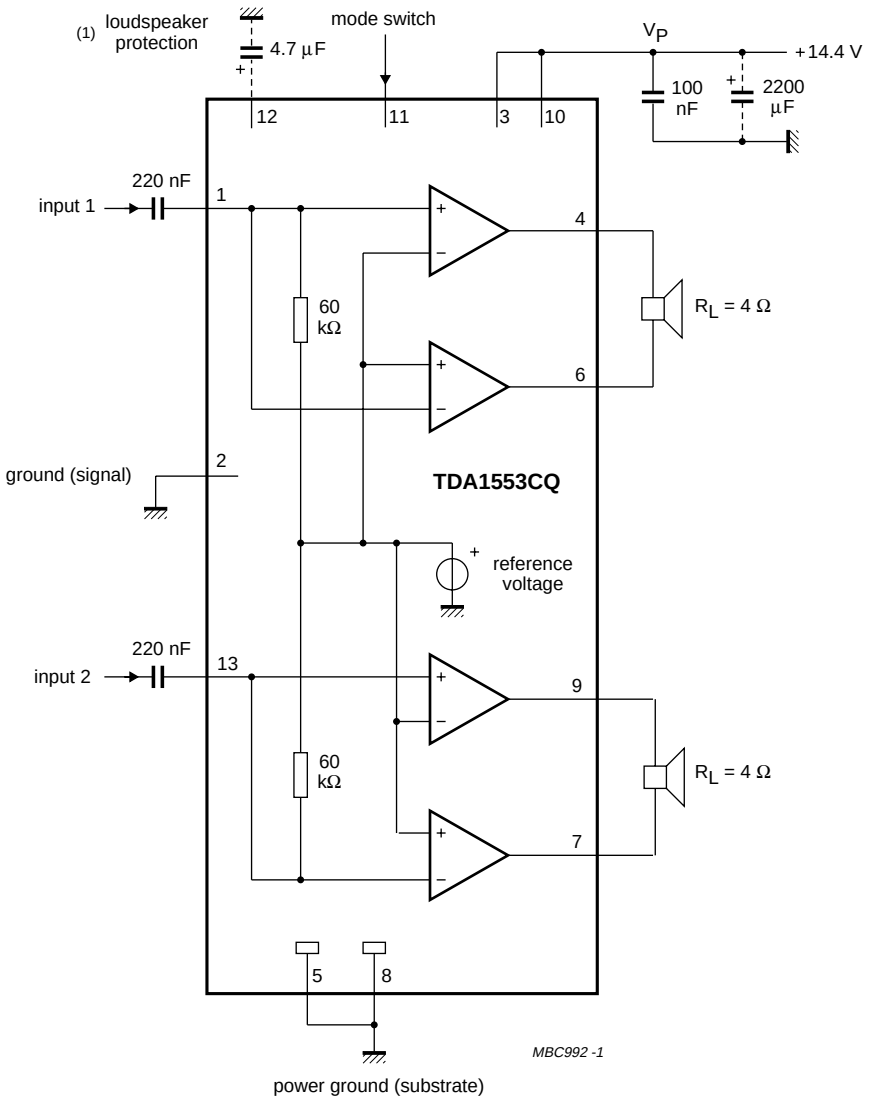
V_P = 14.4 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C; measured in Fig.4; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
P_O	output power	V_P = 14.4 V				
		THD = 0.5%	15	17	–	W
		THD = 10%	20	22	–	W
THD	total harmonic distortion	P_O = 1 W	–	0.1	–	%
P_O	output power	V_P = 13.2 V				
		THD = 0.5%	–	12	–	W
		THD = 10%	–	17	–	W
B	power bandwidth	THD = 0.5%; P_O = –1 dB; with respect to 15 W	–	20 to 15 000	–	Hz
f_l	low frequency roll-off	at –1 dB; note 1	–	25	–	Hz
f_h	high frequency roll-off	at –1 dB	20	–	–	kHz
G_v	closed loop voltage gain		25	26	27	dB
SVRR	supply voltage ripple rejection	note 2				
	on		48	–	–	dB
	mute		48	–	–	dB
	standby		80	–	–	dB
$\|Z_i\|$	input impedance		50	60	75	kΩ
V_{no}	noise output voltage	note 3				
	on	R_S = 0 Ω	–	70	120	μV
	on	R_S = 10 kΩ	–	100	–	μV
V_{no}	noise output voltage	notes 3 and 4				
	mute		–	60	–	μV
α_{cs}	channel separation	R_S = 10 kΩ	40	–	–	dB
$\|\Delta G_v\|$	channel unbalance		–	–	1	dB
V_O	output voltage in mute	note 5	–	–	2	mV

Notes

1. Frequency response externally fixed.
2. Ripple rejection measured at the output with a source-impedance of 0 Ω, maximum ripple amplitude of 2 V (p-p) and at a frequency between 100 Hz and 10 kHz.
3. Noise measured in a bandwidth of 20 Hz to 20 kHz.
4. Noise output voltage independent of R_S (V_I = 0 V).
5. $V_I = V_{Imax}$ = 1 V RMS.

APPLICATION INFORMATION

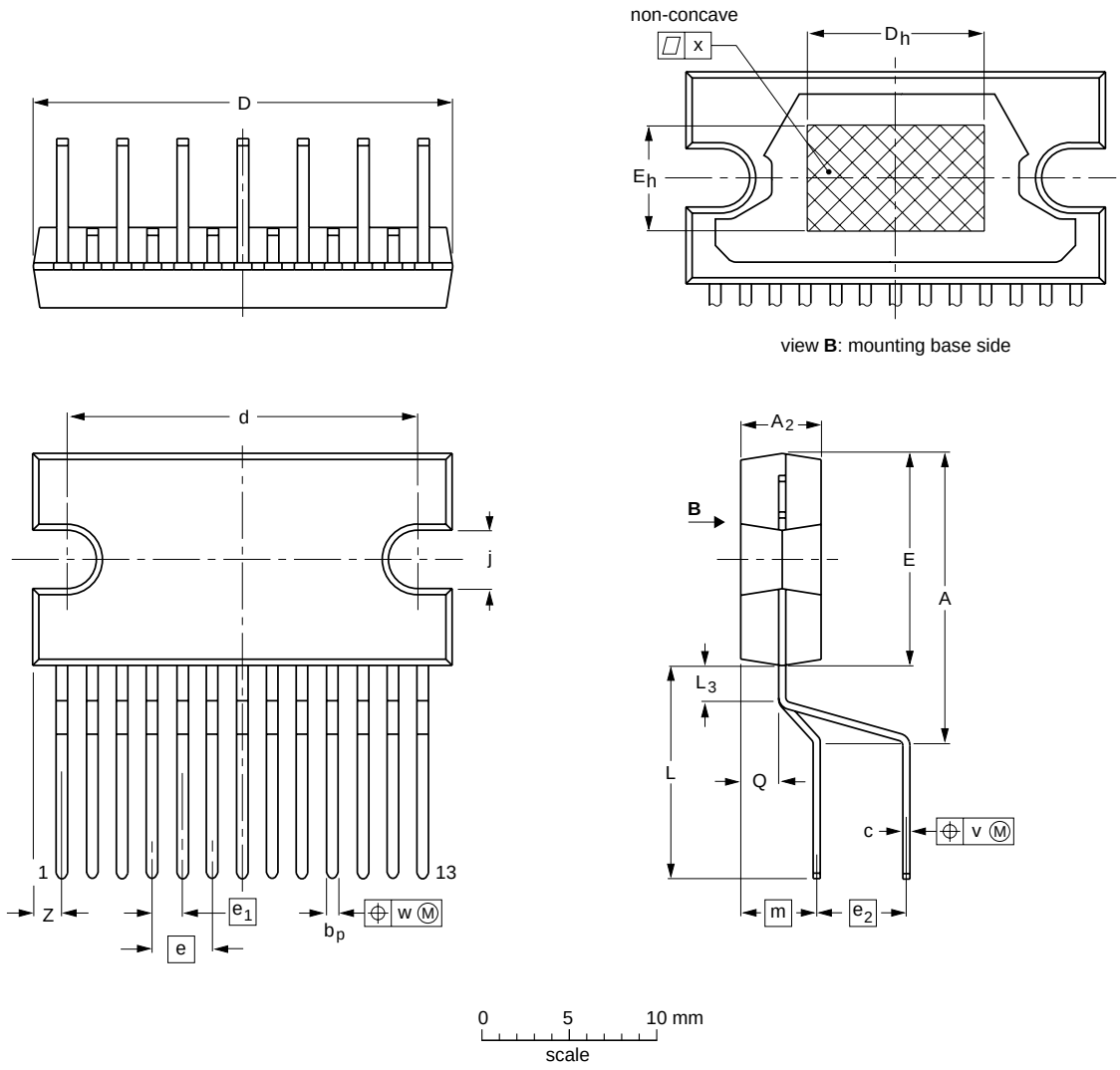


(1) With C = 4.7 µF the delay time of the loudspeaker protection is typically 0.5 s.

Fig.4 Stereo BTL application diagram.

PACKAGE OUTLINE

DBS13P: plastic DIL-bent-SIL power package; 13 leads (lead length 12 mm) **SOT141-6**



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	12.4 11.0	2.4 1.6	4.3	2.1 1.8	0.8	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			
SOT141-6						~~95-03-11~~ 97-12-16

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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