

# DATA SHEET

## **BLU11/SL** UHF power transistor

Product specification

July 1986

# UHF power transistor

# BLU11/SL

## DESCRIPTION

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile transmitters in the 470 MHz band.

## FEATURES

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.
- the device can be applied at a  $P_L$  of max. 1,5 W when it is mounted on a printed wiring board (see Fig.6) without an external heatsink.

The transistor has a 4-lead envelope with a ceramic cap (SOT-122D). All leads are isolated from the mounting base.

## QUICK REFERENCE DATA

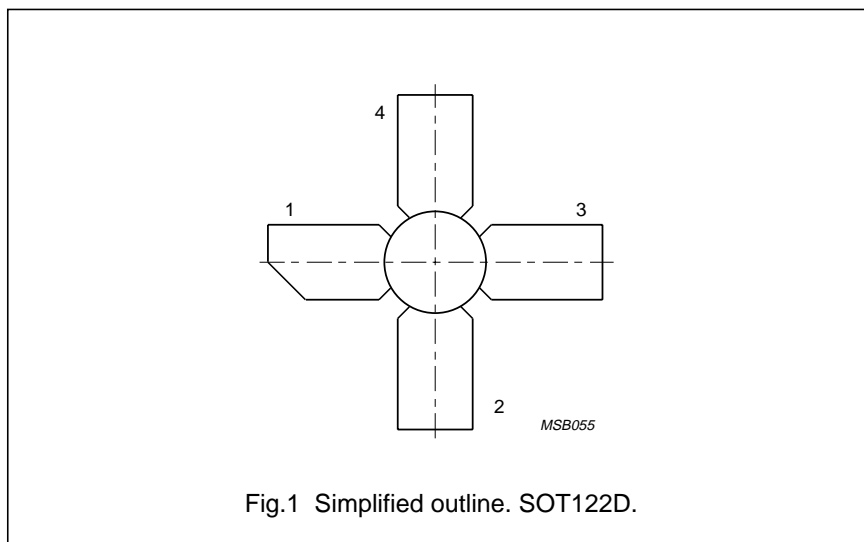
R.F. performance in a common-emitter class-B circuit.

MODE OF OPERATION	T °C	V <sub>CE</sub> V	f MHz	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>c</sub> %
narrow band; c.w.	T <sub>mb</sub> = 25	12,5	470	2,5	> 10	> 55
	T <sub>a</sub> = 25 <sup>(1)</sup>	12,5	470	1,5	> 12	> 55

### Note

1. Device mounted on a printed wiring board (see Fig.6).

## PIN CONFIGURATION



## PINNING - SOT122D.

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter

**PRODUCT SAFETY** This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

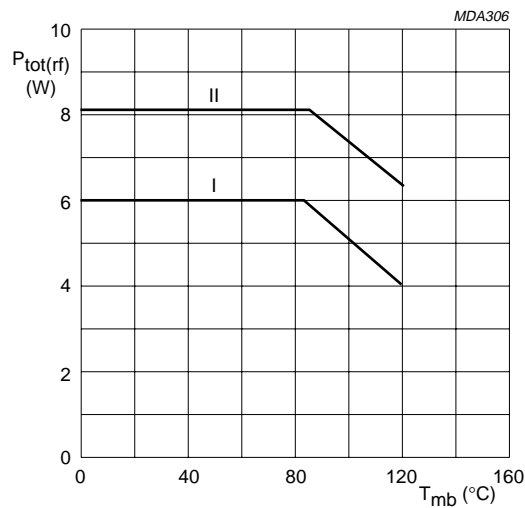
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**RATINGS**

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

Collector-base voltage (open emitter)	$V_{CBO}$	max.	36 V
Collector-emitter voltage (open base)	$V_{CEO}$	max.	16 V
Emitter-base voltage (open collector)	$V_{EBO}$	max.	3 V
Collector current			
d.c. or average	$I_C; I_{C(AV)}$	max.	0,4 A
(peak value), $f > 1$ MHz	$I_{CM}$	max.	1,2 A
Total power dissipation			
at $T_{mb} \leq 90$ °C; $f > 1$ MHz	$P_{tot(rf)}$	max.	6 W
Storage temperature	$T_{stg}$		-65 to +150 °C
Operating junction temperature	$T_j$	max.	200 °C



I Continuous r.f. operation ( $f > 1$  MHz)  
 II Short-time r.f. operation during mismatch ( $f > 1$  MHz)

Fig.2 Power/temperature derating curves.

**THERMAL RESISTANCE**

Dissipation = 4,5 W

From junction to ambient<sup>(1)</sup>

at  $T_a = 25$  °C;  $f > 1$  MHz (r.f. operation)  $R_{th\ j-a}$  (rf) max. 50 K/W

From junction to mounting base

at  $T_{mb} = 25$  °C;  $f > 1$  MHz (r.f. operation)  $R_{th\ j-mb}$  (rf) max. 15 K/W

**Note**

1. Device mounted on a printed wiring board (see Fig.6).

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**CHARACTERISTICS**

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified

Collector-base breakdown voltage

open emitter;  $I_C = 5\text{ mA}$

$V_{(BR)CBO}$  min. 36 V

Collector-emitter breakdown voltage

open base;  $I_C = 10\text{ mA}$

$V_{(BR)CEO}$  min. 16 V

Emitter-base breakdown voltage

open collector;  $I_E = 0,5\text{ mA}$

$V_{(BR)EBO}$  min. 3 V

Collector cut-off current

$V_{BE} = 0$ ;  $V_{CE} = 16\text{ V}$

$I_{CES}$  max. 2,5 mA

Second breakdown energy

$L = 25\text{ mH}$ ;  $f = 50\text{ Hz}$ ;  $R_{BE} = 10\text{ }\Omega$

$E_{SBR}$  min. 0,55 mJ

D.C. current gain

$I_C = 0,3\text{ A}$ ;  $V_{CE} = 10\text{ V}$

$h_{FE}$  min. 25

Collector capacitance at  $f = 1\text{ MHz}$

$I_E = i_e = 0$ ;  $V_{CB} = 12,5\text{ V}$

$C_c$  typ. 4 pF

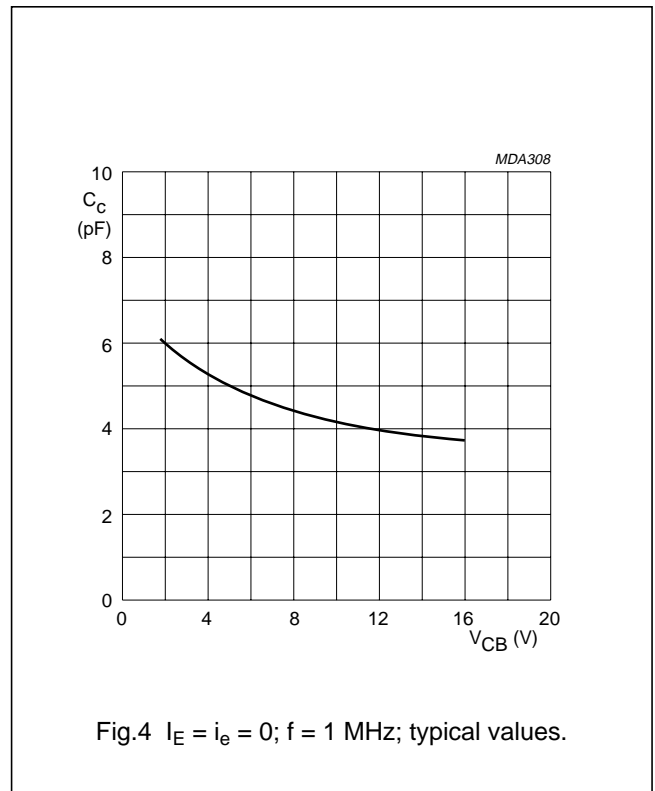
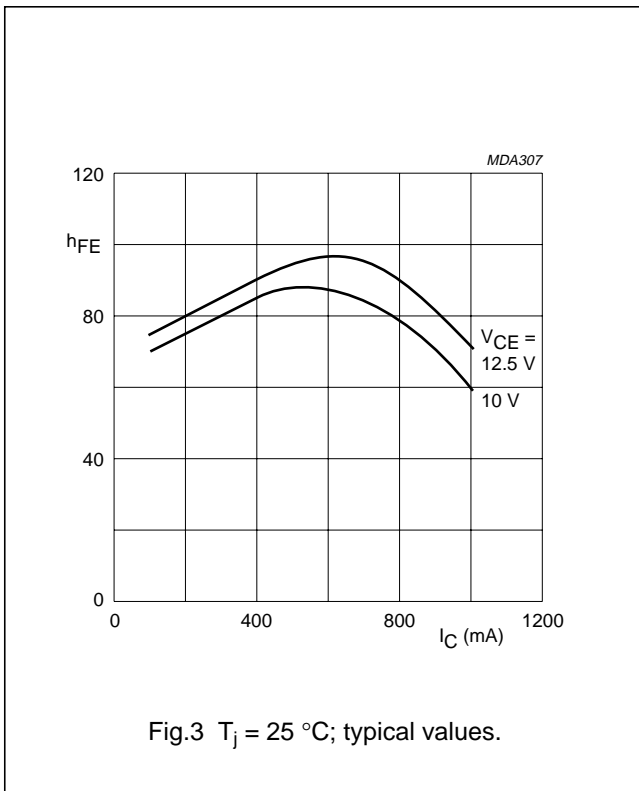
Feedback capacitance at  $f = 1\text{ MHz}$

$I_C = 0$ ;  $V_{CE} = 12,5\text{ V}$

$C_{re}$  typ. 2,5 pF

Collector-mounting base capacitance

$C_{c-mb}$  typ. 1,2 pF



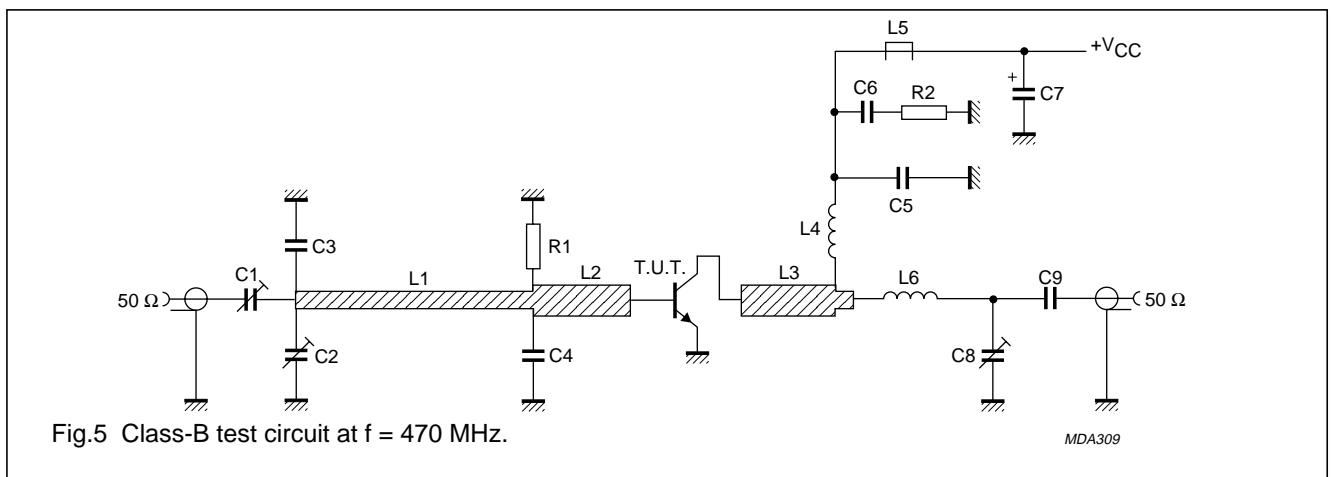
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## APPLICATION INFORMATION

R.F. performance in common-emitter circuit; class-B;  $f = 470$  MHz; circuit tuned at  $P_L = 2,5$  W.

MODE OF OPERATION	T °C	V <sub>CE</sub> V	f MHz	P <sub>L</sub> W	G <sub>p</sub> dB	η <sub>c</sub> %
narrow band; c.w.	T <sub>mb</sub> = 25	12,5	470	2,5	> 10	> 55
	T <sub>mb</sub> = 25				typ. 12	typ. 60
	T <sub>a</sub> = 25 <sup>(2)</sup>	12,5	470	1,5	> 12	> 55



List of components:

C1 = C2 = 2-9 pF film dielectric trimmer (cat. no. 2222 809 09002)

C3 = 1,6 pF multilayer ceramic chip capacitor<sup>(1)</sup>

C4 = 10 pF multilayer ceramic chip capacitor<sup>(1)</sup>

C5 = 100 pF multilayer ceramic chip capacitor

C6 = 3 × 100 nF multilayer ceramic chip capacitor (cat. no. 2222 809 47104)

C7 = 2,2 μF (35 V) tantalum electrolytic capacitor

C8 = 1,4 - 55 pF film dielectric trimmer (cat. no. 2222 809 09001)

C9 = 5,6 pF multilayer ceramic chip capacitor<sup>(1)</sup>

L1 = 56 Ω stripline (25,5 mm × 2 mm)

L2 = L3 = 25 Ω stripline (11 mm × 6 mm)

L4 = 132 nH; 6 turns closely wound enamelled Cu-wire (1 mm), int. dia. 6 mm, leads 2 × 5 mm

L5 = Ferroxcube h.f. choke, grade 3B (cat. no. 4312 020 36642)

L6 = 16 nH; 1 turn enamelled Cu-wire (1 mm), int. dia. 6 mm, leads 2 × 5 mm

R1 = 10 Ω; ± 5% 0,4 W metal film resistor

R2 = 10 Ω; ± 5% 0,4 W metal film resistor

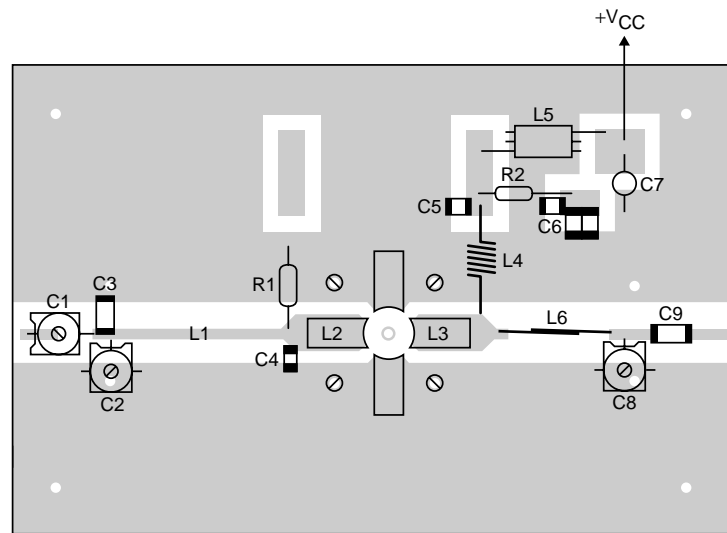
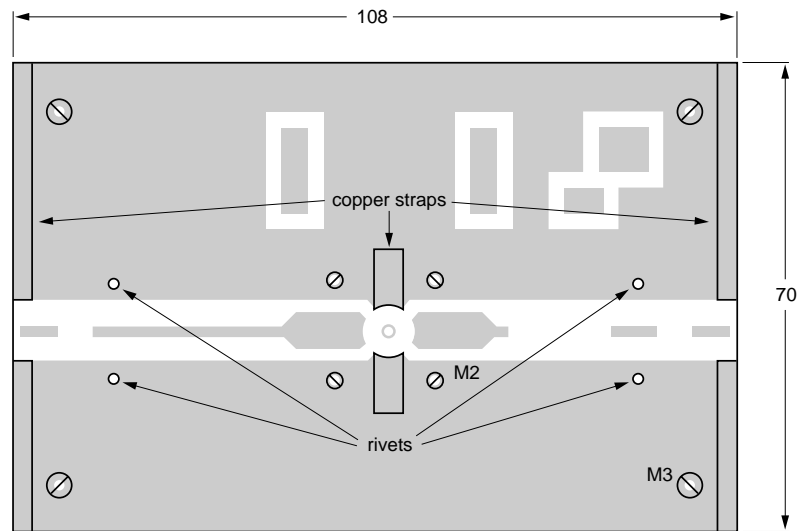
L1, L4 and L5 are striplines on a double Cu-clad printed wiring board with PTFE fibre-glass dielectric ( $\epsilon_r = 2,2$ ) and a thickness  $\frac{1}{32}$  inch; thickness of copper-sheet 2 × 35 μm.

## Notes

- American Technical Ceramics capacitor type B or capacitor of the same quality.
- Device mounted on a printed wiring board (see Fig.6).

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MDA310

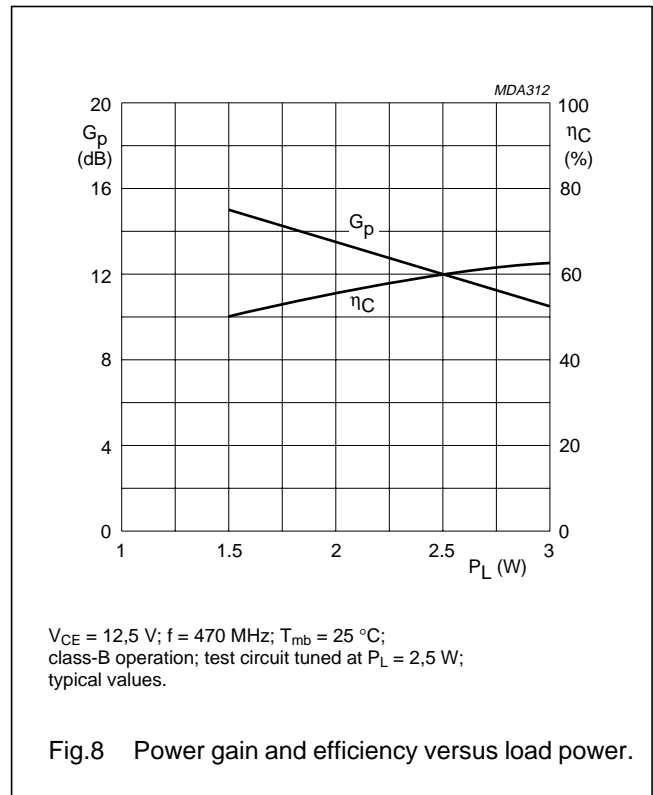
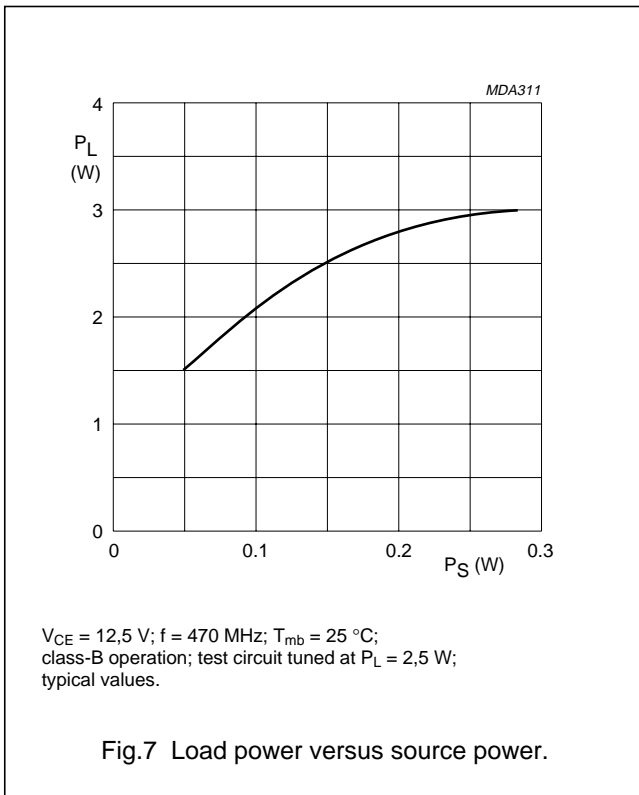
The circuit and the components are situated on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as a groundplane. Earth connections are made by using hollow rivets, fixing-screws and copper straps at the input and output and under the two emitters to provide a direct contact between the copper on the component side and the groundplane.

Dimensions in mm.

Fig.6 Printed wiring board and component lay-out for 470 MHz class-B test circuit.

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**RUGGEDNESS**

The BLU11/SL is capable of withstanding a full load mismatch ( $V_{SWR} = 50$  through all phases) at  $P_L = 2,5$  W up to a supply voltage of 15,5 V at  $T_{mb} = 25$  °C.

Input and output impedances (series components) versus frequency:

$V_{CE} = 12,5$  V;  $P_L = 2,5$  W;  $f = 400$  to 512 MHz;  
 $T_{mb} = 25$  °C; class-B operation; typical values.

FREQUENCY (MHz)	$Z_i$ ( $\Omega$ )	$Z_o$ ( $\Omega$ )
400	4,0 - j 4,1	13,1 + j 7,2
430	4,0 - j 3,3	13,3 + j 7,0
460	4,0 - j 2,6	13,6 + j 6,9
490	4,1 - j 1,9	13,8 + j 6,8
512	4,1 - j 1,5	13,8 + j 6,7

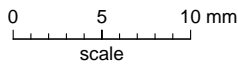
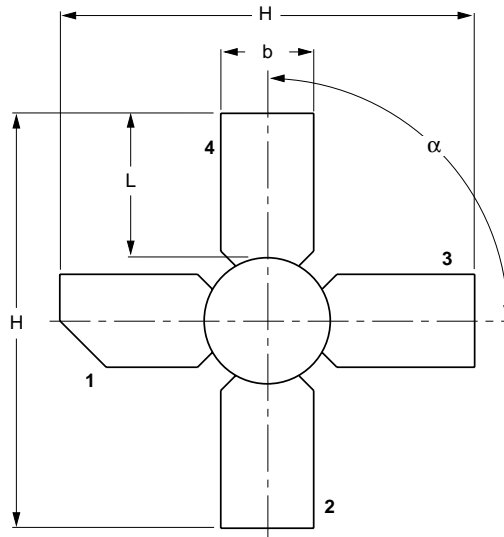
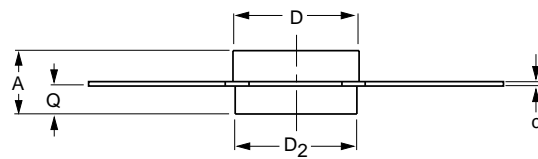
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PACKAGE OUTLINE

Studless ceramic package; 4 leads

SOT122D



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D <sub>2</sub>	H	L	Q	α
mm	4.17 3.27	5.85 5.58	0.18 0.14	7.50 7.23	7.24 6.98	27.56 25.78	9.91 9.14	1.58 1.27	90°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT122D						97-04-18



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**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.	

**LIFE SUPPORT APPLICATIONS**

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