DATA SHEET

BLU60/12
UHF power transistor

Product specification

March 1986

Philips
Semiconductors

PHILIPS

UHF power transistor BLU60/12

DESCRIPTION

N-P-N silicon planar epitaxial transistor in SOT-119 envelope primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

FEATURES

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- internal matching to achieve an optimum wideband capability and high power gain.
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in a common-emitter class-B circuit

MODE OF OPERATION	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	60	> 4,4	> 55

PIN CONFIGURATION

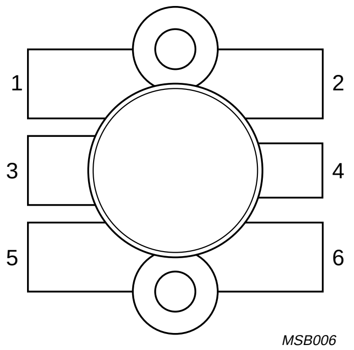


Fig.1 Simplified outline, SOT119A.

PINNING

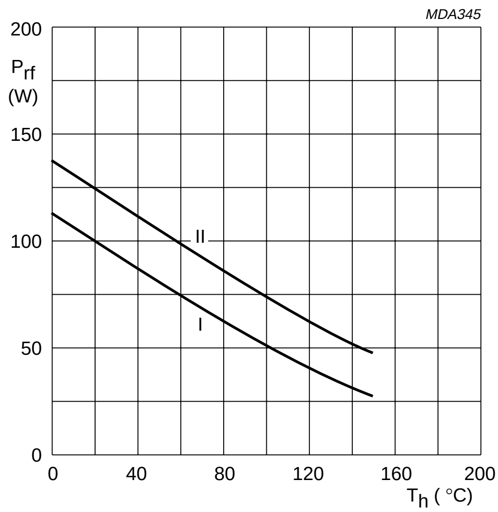
PIN	DESCRIPTION
1	emitter
2	emitter
3	base
4	collector
5	emitter
6	emitter

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.

RATINGS

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

Collector-base voltage (open emitter)				
peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C	max.	12	A
(peak value); f > 1 MHz	I_{CM}	max.	36	A
Total power dissipation				
at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	110	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C



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

Fig.2 Power/temperature derating curves.

MAXIMUM THERMAL RESISTANCE

Dissipation = 72 W; T_{amb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j\text{-}mb}$	max.	1,4	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage				
open emitter; I_C = 100 mA	$V_{(BR)CBO}$	min.	36	V
Collector-emitter breakdown voltage				
open base; I_C = 200 mA	$V_{(BR)CEO}$	min.	16,5	V
Emitter-base breakdown voltage				
open collector; I_E = 20 mA	$V_{(BR)EBO}$	min.	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 16 V	I_{CES}	max.	44	mA
Second breakdown energy				
L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	15	mJ
D.C. current gain				
V_{CE} = 10 V; I_C = 8 A	h_{FE}	min.	15	
		typ.	60	
Collector capacitance at f = 1 MHz				
$I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	170	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 12,5	C_{re}	typ.	100	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

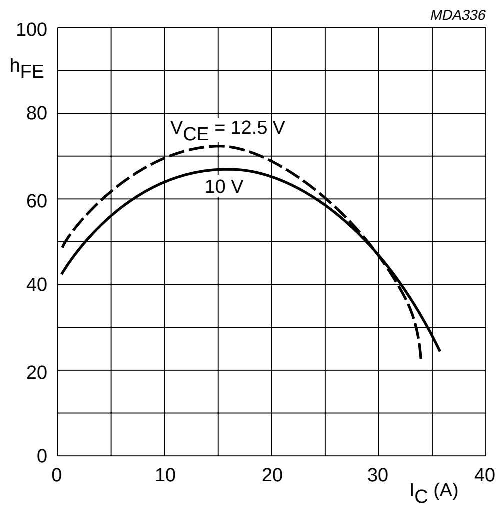


Fig.3 D.C. current gain versus collector current; T_j = 25 °C.

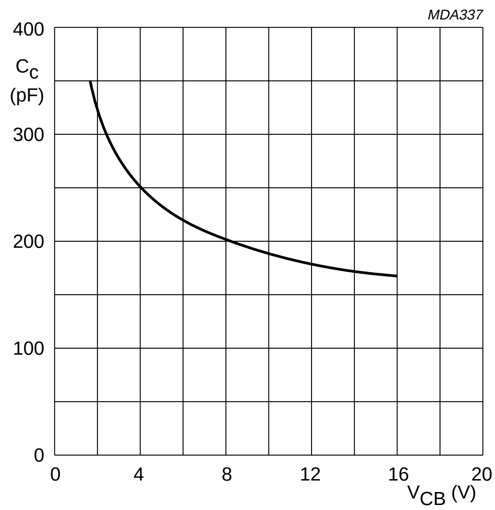


Fig.4 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1 MHz.

APPLICATION INFORMATION

R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

MODE OF OPERATION	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	60	> 4,4 typ. 5,5	> 55 typ. 62

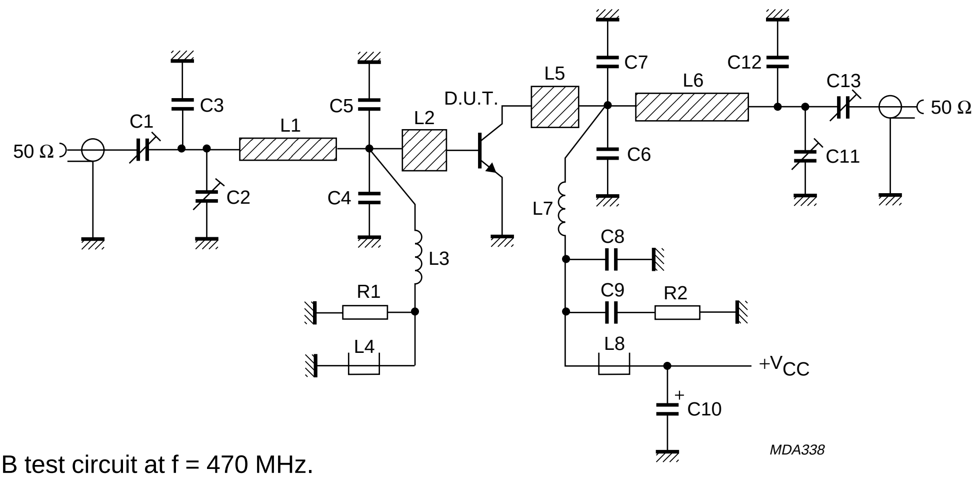


Fig.5 Class-B test circuit at f = 470 MHz.

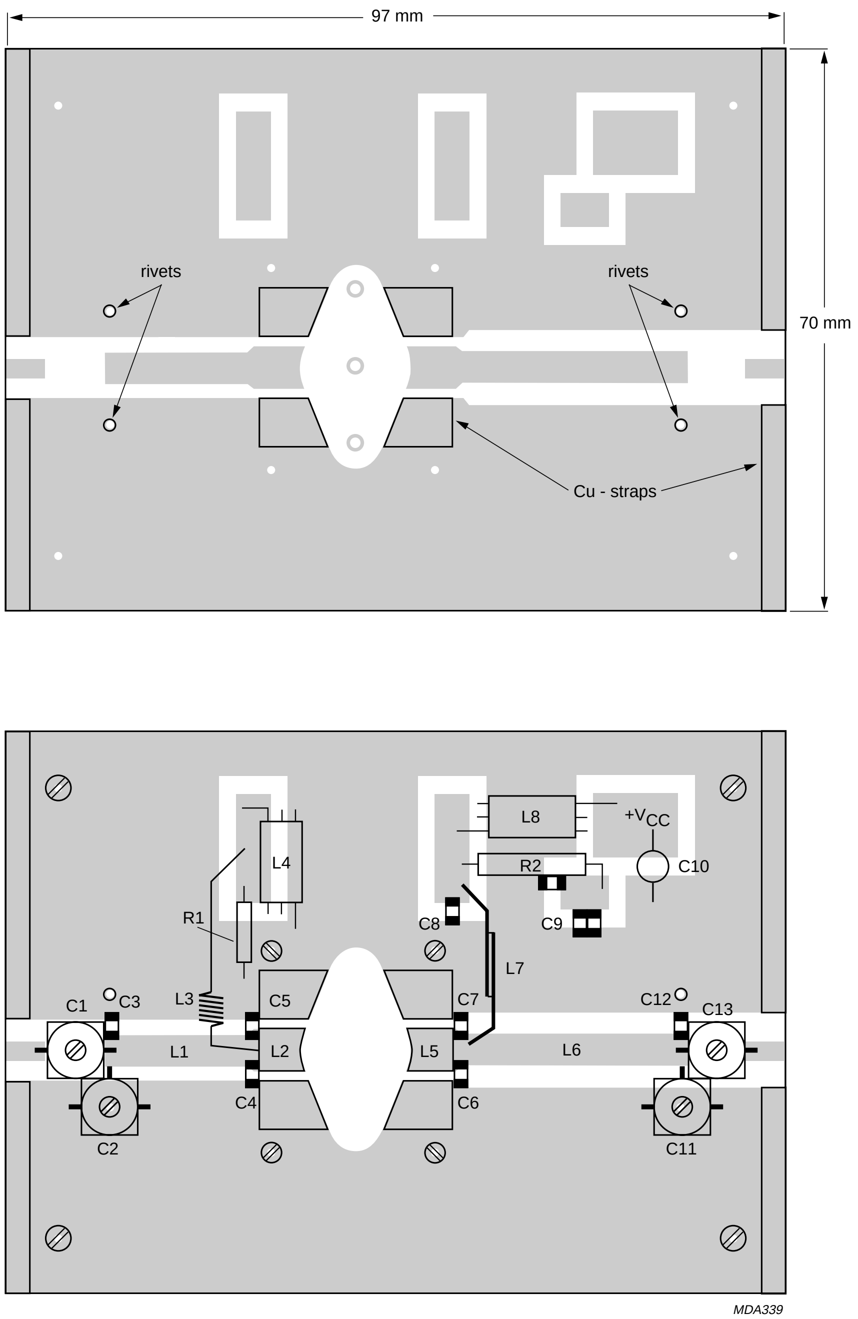
List of components:

- C1 = C13 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
- C2 = C11 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
- C3 = 12 pF multilayer ceramic chip capacitor[(1)]
- C4 = C5 = 8, 2 pF multilayer ceramic chip capacitor[(2)]
- C6 = C7 = 15 pF multilayer ceramic chip capacitor[(1)]
- C8 = 110 pF multilayer ceramic chip capacitor[(1)]
- C9 = 3 × 100 nF multilayer ceramic chip capacitor in parallel
- C10 = 2,2 μF (35 V) electrolytic capacitor
- C12 = 5,6 pF multilayer ceramic chip capacitor[(1)]
- L1 = 34,6 Ω stripline (17 mm × 4 mm)
- L2 = L5 = 25,3 stripline (6 mm × 6 mm)
- L3 = 45 nH; 4 turns, closely wound enamelled Cu-wire (0,5 mm); int. dia. 2,5 mm; leads 2 × 5 mm
- L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
- L6 = 29,2 Ω stripline (25,5 mm × 5 mm)
- L7 = 10 nH; 1 turn Cu-wire (1,0 mm); int. dia. 5 mm; leads 2 × 5 mm
- R1 = 1 Ω ± 5% (0,4 W) metal film resistor
- R2 = 10 Ω ± 5% (1,0 W) metal film resistor

Notes

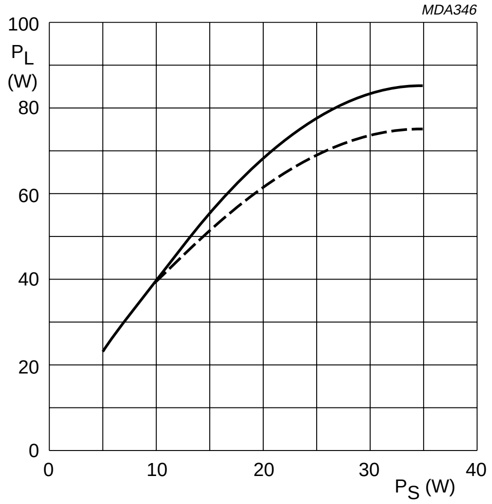
1. American Technical Ceramics capacitor type B or capacitor of the same quality.
2. Idem type A.

Striplines are on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ε_r = 2,2); thickness 1/32 inch.



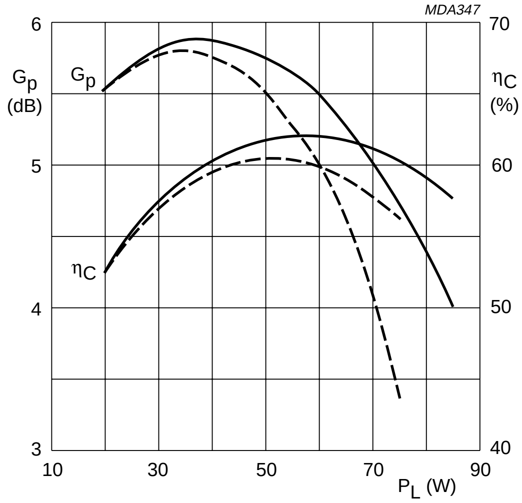
The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

Fig.6 Printed circuit board and component layout for 470 MHz class-B test circuit.



Typical values; V_{CE} = 12,5 V; f = 470 MHz;
T_h = 25 °C (——) and 70 °C (– – –); $R_{th\ mb-h}$ = 0,2 K/W;
class-B operation.

Fig.7 Load power versus source power.

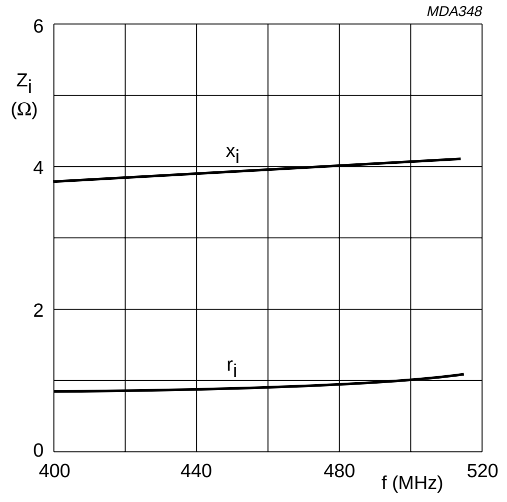


Typical values; V_{CE} = 12,5 V; f = 470 MHz;
T_h = 25 °C (——) and 70 °C (– – –); $R_{th\ mb-h}$ = 0,2 K/W;
class-B operation.

Fig.8 Power gain and efficiency versus load power.

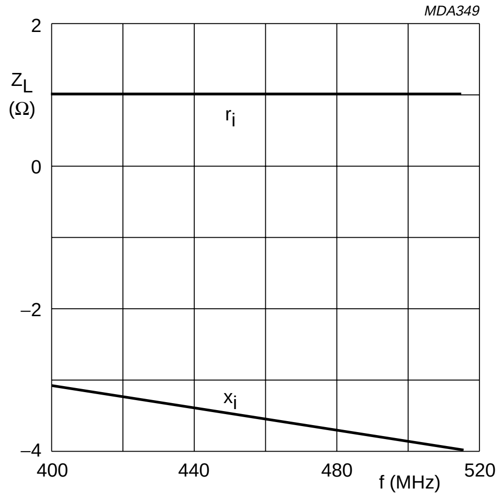
RUGGEDNESS

The BLU60/12 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) up to 70 W under the following conditions; V_{CE} = 15,5 V; f = 470 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0,2 K/W.



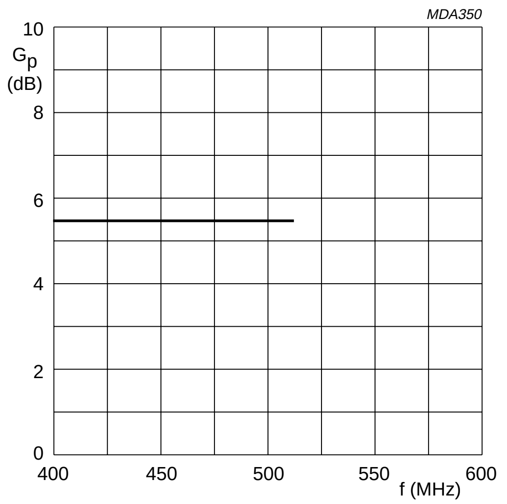
Typical values; V_{CE} = 12,5 V; P_L = 60 W; f = 400 to 512 MHz;
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W; class-B operation.

Fig.9 Input impedance (series components).



Typical values; V_{CE} = 12,5 V; P_L = 60 W; f = 400 to 512 MHz;
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W; class-B operation.

Fig.10 Load impedance (series components).

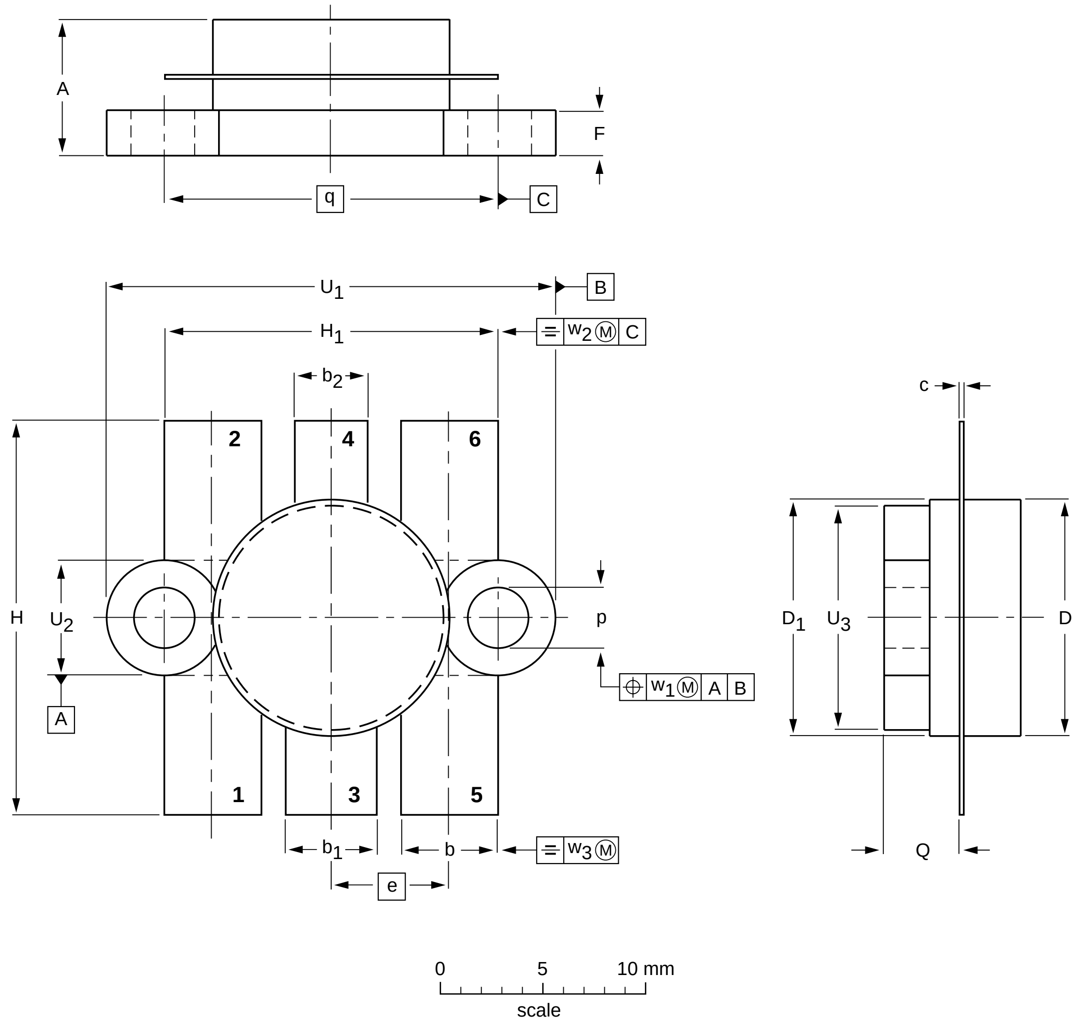


Typical values; V_{CE} = 12,5 V; P_L = 60 W; f = 400 to 512 MHz;
T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W; class-B operation.

Fig.11 Power gain versus frequency.

PACKAGE OUTLINE

Flanged ceramic package; 2 mounting holes; 6 leads **SOT119A**



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

UNIT	A	b	b_1	b_2	c	D	D_1	e	F	H	H_1	p	Q	q	U_1	U_2	U_3	w_1	w_2	w_3
mm	7.39 6.32	5.59 5.33	5.34 5.08	4.07 3.81	0.18 0.07	12.86 12.59	12.83 12.57	6.48	2.54 2.28	22.10 21.08	18.55 18.28	3.31 2.97	4.58 3.98	18.42	25.23 23.95	6.48 6.07	12.76 12.06	0.51	1.02	0.26
inches	0.291 0.249	0.220 0.210	0.210 0.200	0.160 0.150	0.007 0.003	0.505 0.496	0.505 0.495	0.255	0.100 0.090	0.870 0.830	0.730 0.720	0.130 0.117	0.180 0.157	0.725	0.993 0.943	0.255 0.239	0.502 0.475	0.02	0.04	0.01

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT119A						97-06-28

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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