DATA SHEET

BLW898
UHF linear power transistor

Product specification
Supersedes data of 1995 Oct 04

1996 Jul 16

Philips
Semiconductors

PHILIPS

UHF linear power transistor BLW898

FEATURES

- Internal input matching for wideband operation and high power gain
- Polysilicon emitter ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

APPLICATION

- Common emitter class-A operation in linear transposers/transmitters (television) in the 470 to 860 MHz frequency band.

DESCRIPTION

NPN silicon planar transistor in a SOT171A 6-lead rectangular flange package, with a ceramic cap. The transistor delivers a $P_{o\ sync}$ = 3 W in class-A operation at 860 MHz and a supply voltage of 25 V.

PINNING SOT171A

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

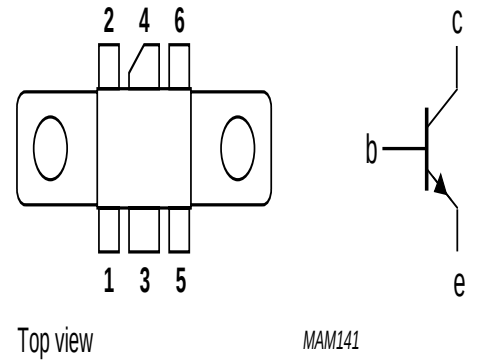


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_h = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)
CW class-A	860	25	1.1	≥3(1)	≥9(1)

Note

1. Three-tone test signal (–8, –16, and –10 dB); d_{im} = –63 dB.

WARNING
Product and environmental safety - toxic materials
This product contains beryllium oxide. The product is entirely safe provided that the BeO disc is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

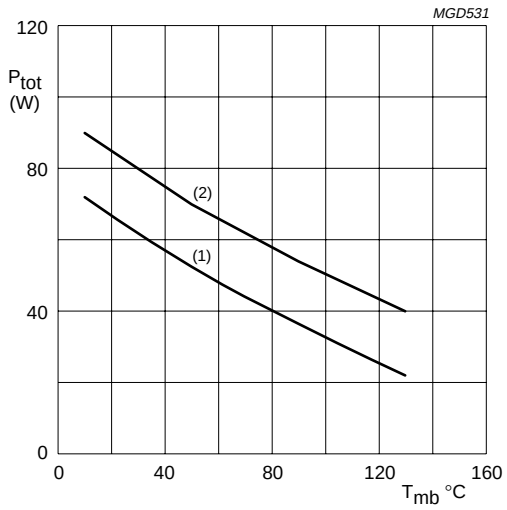
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	28	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	3.7	A
$I_{C(AV)}$	average collector current		–	3.7	A
P_{tot}	total power dissipation	up to T_{mb} = 70 °C	–	44	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	P_{tot} = 44 W; T_{mb} = 70 °C	3	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting-base to heatsink		0.3	K/W



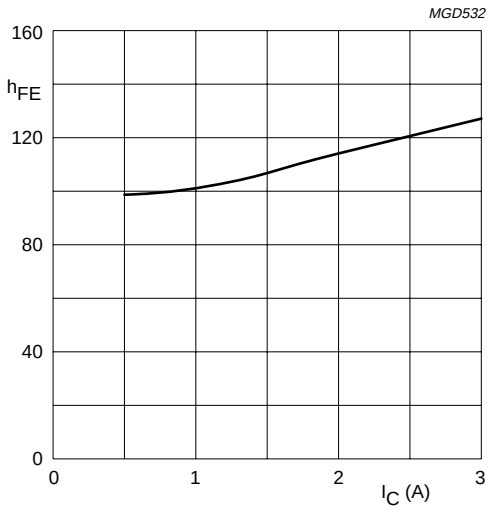
(1) Continuous operation
(2) Short-time operation during mismatch.

Fig.2 Power derating curve.

CHARACTERISTICS

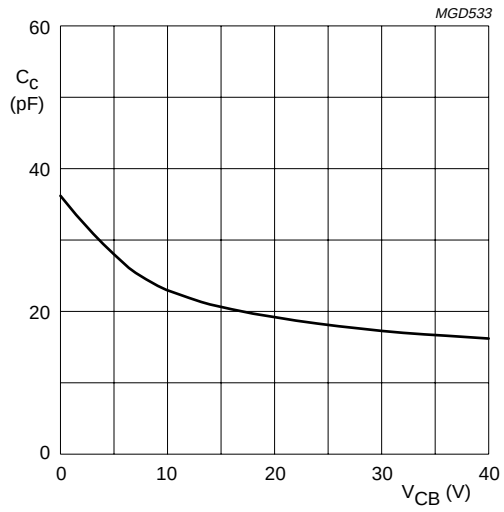
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 15 mA; I_E = 0	60	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 30 mA; I_B = 0	28	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 0.6 mA; I_C = 0	2.5	–	–	V
I_{CBO}	collector-base leakage current	V_{BE} = 0; V_{CB} = 28 V	–	–	1.5	mA
I_{CEO}	collector-emitter leakage current	V_{CE} = 20 V	–	–	3	mA
h_{FE}	DC current gain	V_{CE} = 25 V; I_C = 1.1 A	30	–	140	
C_c	collector capacitance	V_{CB} = 25 V; I_E = i_e = 0; f = 1 MHz	–	18	–	pF
C_{re}	feedback capacitance	V_{CB} = 25 V; I_C = 0; f = 1 MHz	–	11	–	pF



V_{CE} = 25 V; t_p = 500 μs; δ = <1 %.

Fig.3 DC current gain as a function of collector current; typical values.



I_E = i_e = 0; f = 1 MHz.

Fig.4 Collector capacitance as a function of collector-base voltage; typical values.

APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter class-A test circuit.

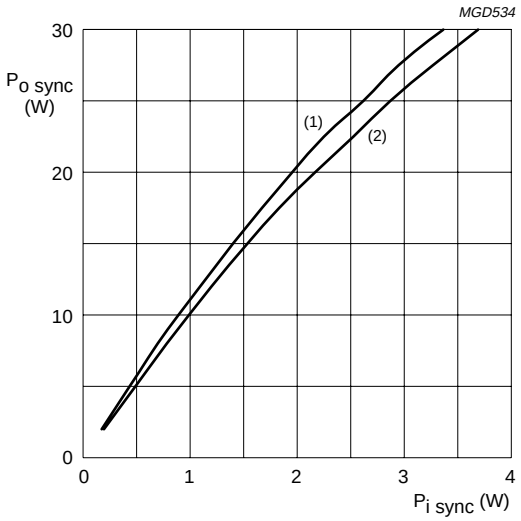
MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)	d_{im} (dB)
CW class-A	860	25	1.1	≥3(1)	≥9(1)	<–63(1)
CW class-A	860	25	1.1	≥3(2)	≥9(2)	<–60(2)

Notes

1. Three-tone test method (vision carrier –8 dB, sound carrier –10 dB, sideband signal –16 dB), 0 dB corresponds to peak sync level.
2. Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), 0 dB corresponds to peak sync level.

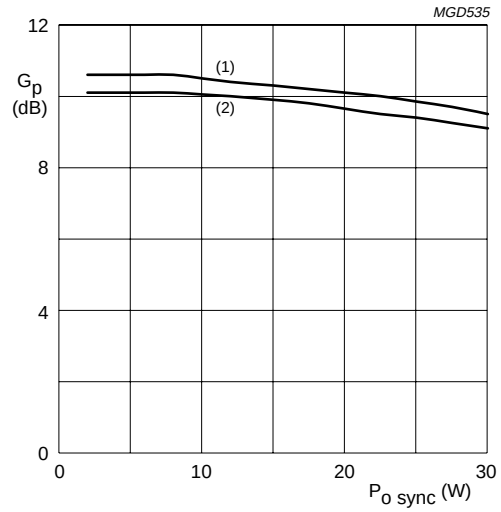
Ruggedness in class-A operation

The BLW898 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases, under the conditions: V_{CE} = 25 V; I_{CQ} = 1.1 A; T_h = 25 °C; f = 860 MHz; $P_{o\ sync}$ = 3 W.



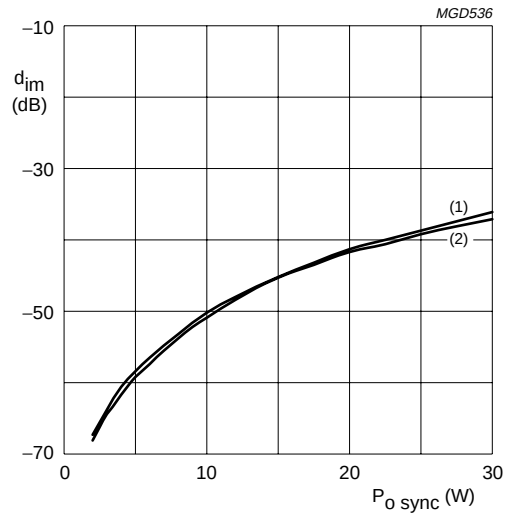
V_{CE} = 25 V; I_{CQ} = 1.1 A; f = 860 MHz; (3-tone; –8/–16/–10 dB).
(1) T_h = 25 °C.
(2) T_h = 70 °C.

Fig.5 Output power as a function of input power; typical values.



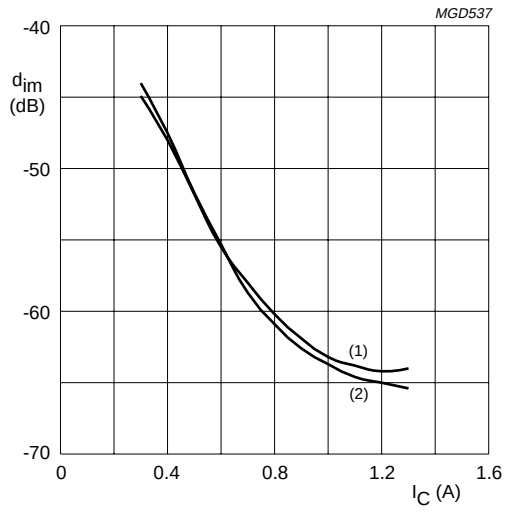
V_{CE} = 25 V; I_{CQ} = 1.1 A; f = 860 MHz; (3-tone; –8/–16/–10 dB).
(1) T_h = 25 °C.
(2) T_h = 70 °C.

Fig.6 Power gain as a function of output power; typical values.



V_{CE} = 25 V; I_{CQ} = 1.1 A; f = 860 MHz; (3-tone; –8/–16/–10 dB).
(1) T_h = 25 °C.
(2) T_h = 70 °C.

Fig.7 Intermodulation distortion as a function of output power; typical values.



V_{CE} = 25 V; I_{CQ} = 1.1 A; f = 860 MHz; $P_{o\ sync}$ = 3 W;
(3-tone; –8/–16/–10 dB).
(1) T_h = 70 °C.
(2) T_h = 25 °C.

Fig.8 Intermodulation distortion as a function of collector current; typical values.

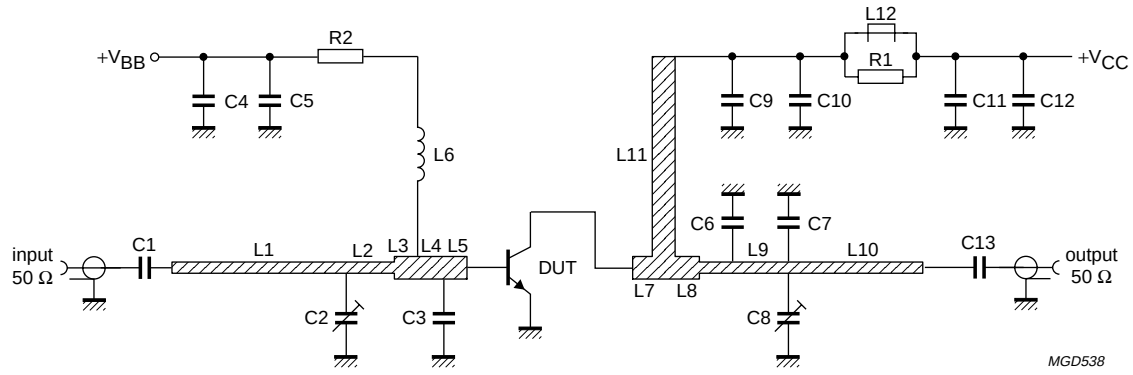
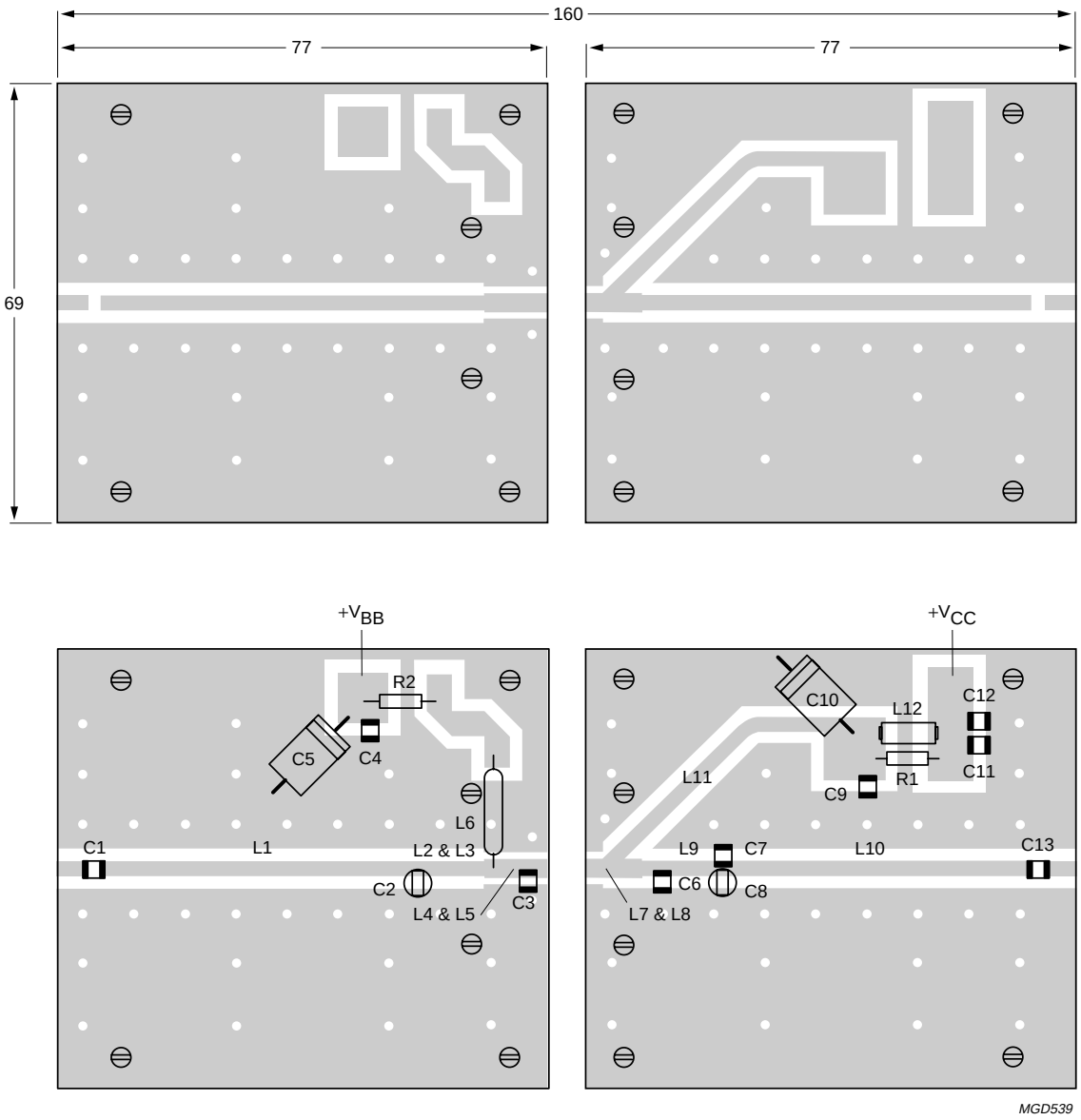


Fig.9 Class-A test circuit at 860 MHz.



Dimensions in mm.

Fig.10 Printed-circuit board and component lay-out for 860 MHz class-A test circuit.

List of components

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1	multilayer ceramic chip capacitor; note 1	8.2 pF		
C2, C8	Tekelec Giga trim 37271	0.6 to 4.5 pF		
C3	multilayer ceramic chip capacitor; note 1	15 pF		
C4, C12	multilayer ceramic chip capacitor	10 nF; 63 V		2222 592 16627
C5	solid aluminium capacitor	10 μF; 63 V		2222 030 38109
C6	multilayer ceramic chip capacitor; note 2	10 pF		
C7	multilayer ceramic chip capacitor; note 2	2.4 pF		
C9	multilayer ceramic chip capacitor; note 2	500 pF		
C10	solid aluminium capacitor	47 μF; 63 V		2222 031 38479
C11	multilayer ceramic chip capacitor; note 2	330 pF		
C13	multilayer ceramic chip capacitor; note 1	5.1 pF		
L1	stripline; note 3	50 Ω	50 × 2.3 mm	
L2	stripline; note 3	50 Ω	10 × 2.3 mm	
L3	stripline; note 3	40 Ω	2 × 3.25 mm	
L4, L5	stripline; note 3	40 Ω	4 × 3.25 mm	
L6	RF choke	220 nH		
L7	stripline; note 3	40 Ω	9 × 3.25 mm	
L8	stripline; note 3	40 Ω	3.5 × 3.25 mm	
L9	stripline; note 3	50 Ω	9 × 2.3 mm	
L10	stripline; note 3	50 Ω	48.5 × 2.3 mm	
L11	stripline; note 3	40 Ω	41.5 × 3.25 mm	
L12	grade 4S2 ferroxcube wideband RF choke			4330 030 36301
R1	metal film resistor	50 Ω; 0.6 W		2322 156 14999
R2	metal film resistor	10 Ω; 0.6 W		2322 156 11009

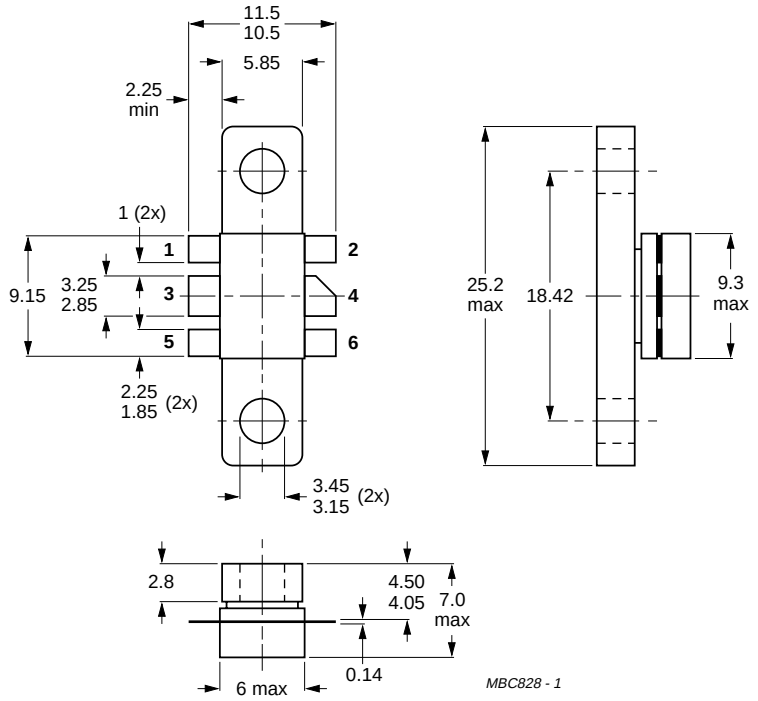
Notes

1. American Technical Ceramics type 100A or capacitor of same quality.
2. American Technical Ceramics type 100B or capacitor of same quality.
3. The striplines are on a double copper-clad PCB with PTFE fibre-glass dielectric (ε_r = 2.2); thickness 0.79 mm.

Table 1 Common emitter scattering parameter, I_{CQ} = 1.1 A; V_{CE} = 25 V.

f (MHZ)	S_{11}		S_{21}		S_{12}		S_{22}		G_{UM} (dB)
	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (RAT)	ANG. (DEG)	MAG. (ANG)	ANG. (DEG)	
470	0.962	176.1	1.002	68.3	0.017	32.6	0.802	–178.2	15.7
495	0.961	175.9	0.961	66.9	0.017	32.8	0.803	–178.2	15.2
520	0.959	175.7	0.923	65.7	0.017	33.6	0.804	–178.2	14.7
545	0.958	175.5	0.891	64.4	0.018	34.9	0.803	–178.3	14.3
570	0.957	175.3	0.861	63.2	0.018	35.8	0.804	–178.2	14.0
595	0.955	175.0	0.835	62.0	0.018	36.1	0.805	–178.2	13.5
620	0.953	174.8	0.815	61.0	0.019	36.8	0.804	–178.2	13.0
645	0.951	174.5	0.795	59.7	0.019	37.3	0.805	–178.1	12.7
670	0.950	174.2	0.775	58.6	0.019	37.4	0.807	–178.0	12.5
695	0.947	173.9	0.757	57.7	0.020	37.8	0.806	–178.0	12.0
720	0.943	173.7	0.744	56.6	0.021	38.5	0.805	–178.1	11.5
745	0.942	173.4	0.732	55.4	0.021	38.6	0.807	–177.9	11.3
770	0.941	173.1	0.724	54.4	0.021	39.8	0.808	–177.8	11.1
795	0.938	172.8	0.716	53.3	0.021	40.1	0.807	–177.8	10.8
820	0.935	172.5	0.707	51.8	0.022	39.1	0.808	–177.8	10.6
845	0.933	172.1	0.701	50.9	0.021	39.3	0.810	–177.6	10.4
860	0.932	171.9	0.700	50.2	0.022	39.4	0.809	–177.5	10.3

PACKAGE OUTLINE



Dimensions in mm.

Fig.11 SOT171A.

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.	

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