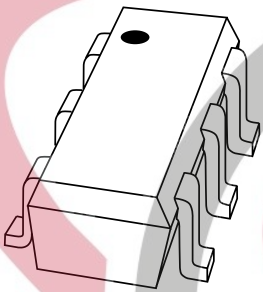
DISCRETE SEMICONDUCTORS

DATA SHEET



BGA2711
MMIC wideband amplifier

Product specification
Supersedes data of 2001 Apr 04

2001 Oct 19

Philips Semiconductors

PHILIPS

MMIC wideband amplifier BGA2711

FEATURES

- Internally matched to 50 Ω
- Very wide frequency range
- Very flat gain
- Unconditionally stable.

APPLICATIONS

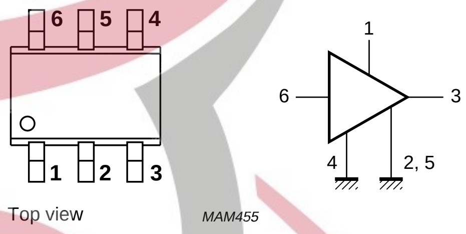
- Cable systems
- LNB IF amplifiers
- General purpose
- ISM.

DESCRIPTION

Silicon Monolithic Microwave Integrated Circuit (MMIC) wideband amplifier with internal matching circuit in a 6-pin SOT363 SMD plastic package.

PINNING

PIN	DESCRIPTION
1	V_S
2, 5	GND2
3	RF out
4	GND1
6	RF in



Marking code: G2-.

Fig.1 Simplified outline (SOT363) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_S	DC supply voltage		5	6	V
I_S	DC supply current		12.6	–	mA
$\|s_{21}\|^2$	insertion power gain	f = 1 GHz	13.1	–	dB
NF	noise figure	f = 1 GHz	4.8	–	dB
$P_{L(sat)}$	saturated load power	f = 1 GHz	2.8	–	dBm

CAUTION
This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling. For further information, refer to Philips specs.: SNW-EQ-608, SNW-FQ-302A and SNW-FQ-302B.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_S	DC supply voltage	RF input AC coupled	–	6	V
I_S	supply current		–	20	mA
P_{tot}	total power dissipation	$T_s \leq 80$ °C	–	200	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C
P_D	maximum drive power		–	10	dBm

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to solder point	P_{tot} = 200 mW; $T_s \leq 80$ °C	300	K/W

CHARACTERISTICS

V_S = 5 V; I_S = 12.6 mA; f = 1 GHz; T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_S	supply current		10	12.6	16	mA
$\|s_{21}\|^2$	insertion power gain	f = 1 GHz	–	13.1	–	dB
		f = 2 GHz	–	13.9	–	dB
$R_{L\ IN}$	return losses input	f = 1 GHz	–	11	–	dB
		f = 2 GHz	–	10	–	dB
$R_{L\ OUT}$	return losses output	f = 1 GHz	–	18	–	dB
		f = 2 GHz	–	13	–	dB
NF	noise figure	f = 1 GHz	–	4.8	–	dB
		f = 2 GHz	–	4.8	–	dB
BW	bandwidth	at $\|s_{21}\|^2$ –3 dB below flat gain at 1 GHz	–	3.6	–	GHz
$P_{L(sat)}$	saturated load power	f = 1 GHz	–	2.8	–	dBm
		f = 2 GHz	–	0.6	–	dBm
$P_{L\ 1\ dB}$	load power	at 1 dB gain compression; f = 1 GHz	–	–0.7	–	dBm
		at 1 dB gain compression; f = 2 GHz	–	–1.8	–	dBm
$IP3_{(in)}$	input intercept point	f = 1 GHz	–	–4.8	–	dBm
		f = 2 GHz	–	–8.5	–	dBm
$IP3_{(out)}$	output intercept point	f = 1 GHz	–	8.3	–	dBm
		f = 2 GHz	–	5.4	–	dBm

APPLICATION INFORMATION

Figure 2 shows a typical application circuit for the BGA2711 MMIC. The device is internally matched to 50 Ω, and therefore does not need any external matching. The value of the input and output DC blocking capacitors C2, C3 should be not more than 100 pF for applications above 100 MHz. However, when the device is operated below 100 MHz, the capacitor value should be increased.

The 22 nF supply decoupling capacitor, C1 should be located as closely as possible to the MMIC.

Separate paths must be used for the ground planes of the ground pins GND1, GND2, and these paths must be as short as possible. When using vias, use multiple vias per pin in order to limit ground path inductance.

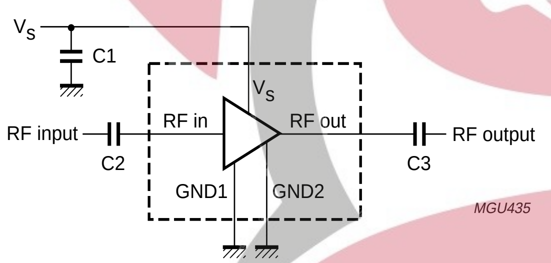


Fig.2 Typical application circuit.

Figure 3 shows two cascaded MMICs. This configuration doubles overall gain while preserving broadband characteristics. Supply decoupling and grounding conditions for each MMIC are the same as those for the circuit of Fig.2.

The excellent wideband characteristics of the MMIC make it and ideal building block in IF amplifier applications such as LBNs (see Fig.4).

As a buffer amplifier between an LNA and a mixer in a receiver circuit, the MMIC offers an easy matching, low noise solution (see Fig.5).

In Fig.6 the MMIC is used as a driver to the power amplifier in part of a transmitter circuit. Good linear performance and matched input and output offer quick design solutions in such applications.

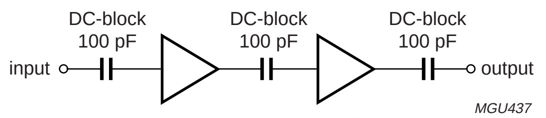


Fig.3 Easy cascading application circuit.

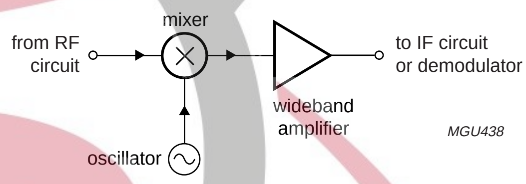


Fig.4 Application as IF amplifier.

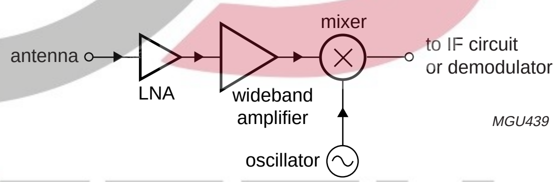


Fig.5 Application as RF amplifier.

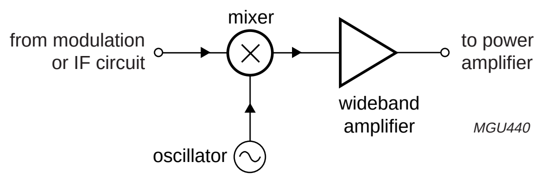
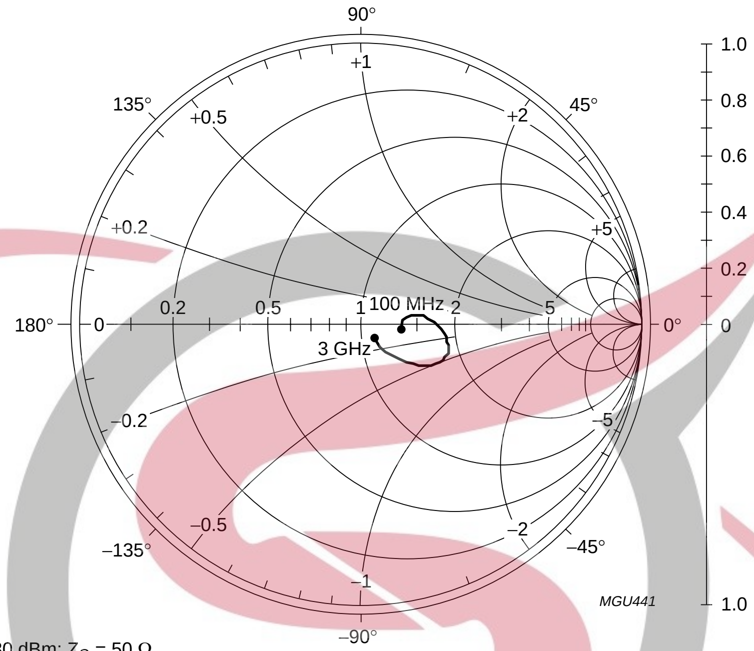
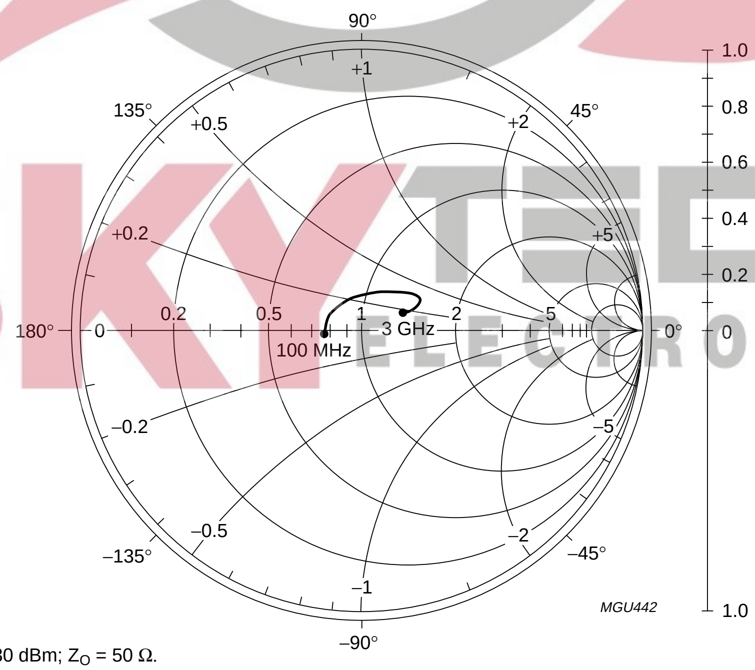


Fig.6 Application as driver amplifier.



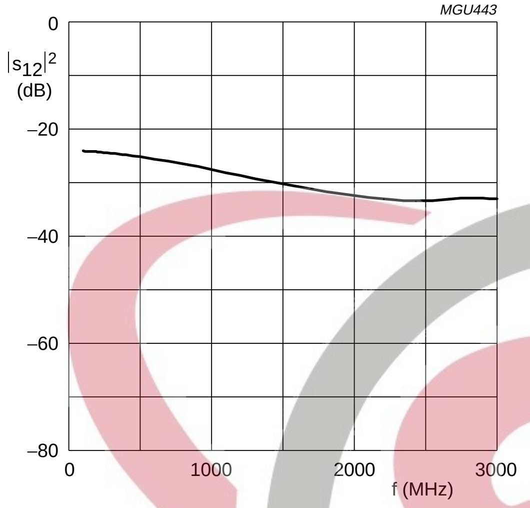
I_S = 12.6 mA; V_S = 5 V; P_D = −30 dBm; Z_O = 50 Ω.

Fig.7 Input reflection coefficient (s_{11}); typical values.



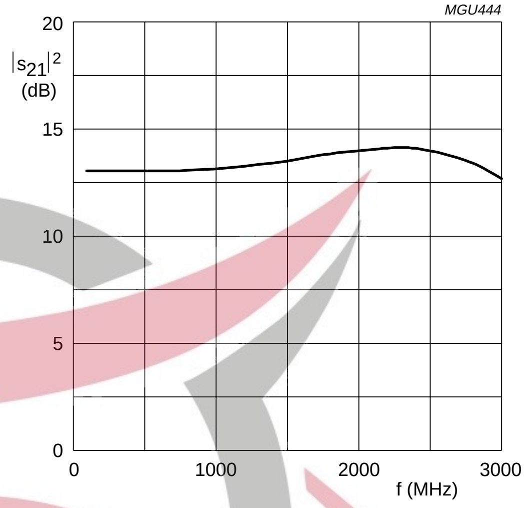
I_S = 12.6 mA; V_S = 5 V; P_D = −30 dBm; Z_O = 50 Ω.

Fig.8 Output reflection coefficient (s_{22}); typical values.



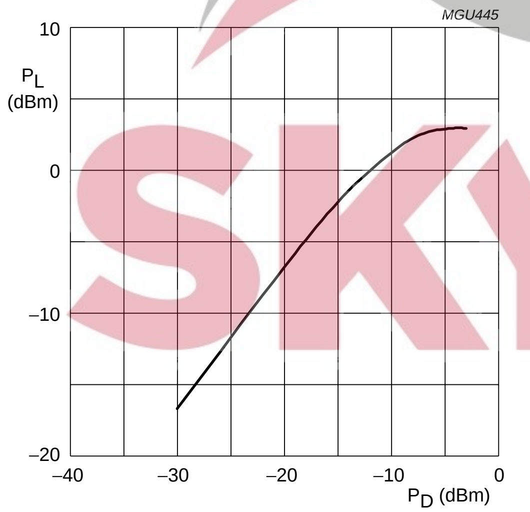
I_S = 12.6 mA; V_S = 5 V; P_D = −30 dBm; Z_O = 50 Ω.

Fig.9 Isolation ($|s_{12}|^2$) as a function of frequency; typical values.



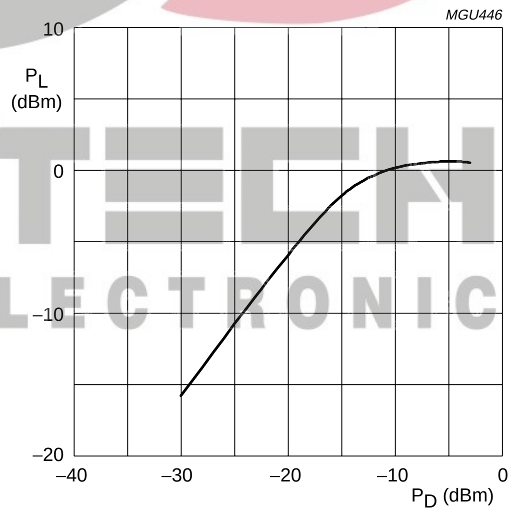
I_S = 12.6 mA; V_S = 5 V; P_D = −30 dBm; Z_O = 50 Ω.

Fig.10 Insertion gain ($|s_{21}|^2$) as a function of frequency; typical values.



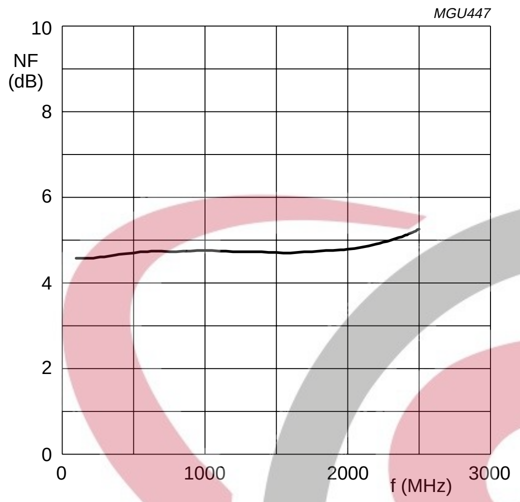
V_S = 5 V; f = 1 GHz; Z_O = 50 Ω.

Fig.11 Load power as a function of drive power at 1 GHz; typical values.



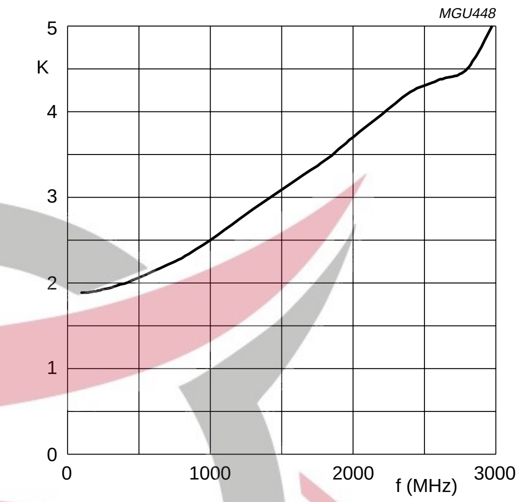
V_S = 5 V; f = 2 GHz; Z_O = 50 Ω.

Fig.12 Load power as a function of drive power at 2 GHz; typical values.



I_S = 12.6 mA; V_S = 5 V; Z_O = 50 Ω.

Fig.13 Noise figure as a function of frequency; typical values.



I_S = 12.6 mA; V_S = 5 V; Z_O = 50 Ω.

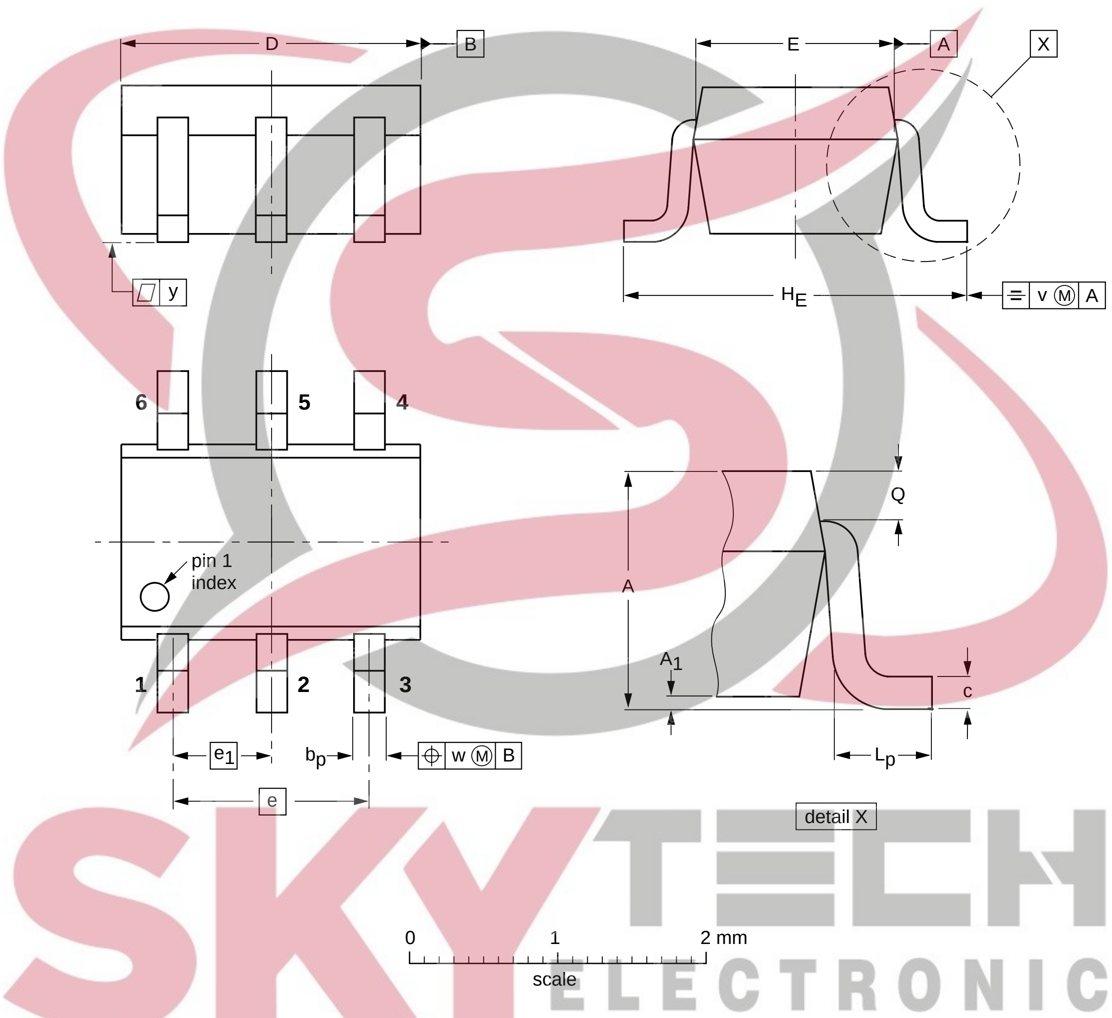
Fig.14 Stability factor as a function of frequency; typical values.

Scattering parameters: I_S = 12.6 mA; P_D = −30 dBm; Z_O = 50 Ω; T_{amb} = 25 °C

f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
100	0.14563	−3.502	4.4867	−1.843	0.06220	−2.939	0.13029	−174.50
200	0.15253	5.557	4.4944	−6.788	0.06117	−8.095	0.12640	169.58
400	0.18735	10.06	4.4841	−15.22	0.05751	−16.61	0.11957	148.02
600	0.22695	8.206	4.4862	−22.94	0.05240	−22.85	0.11288	126.58
800	0.26122	2.635	4.4985	−30.57	0.04744	−27.72	0.11286	104.24
1000	0.28776	−2.465	4.5390	−38.34	0.04187	−31.17	0.12236	82.570
1200	0.30888	−8.179	4.6052	−46.14	0.03666	−32.98	0.14066	65.815
1400	0.32055	−13.16	4.6862	−54.45	0.03251	−33.25	0.16341	53.911
1600	0.32492	−17.85	4.7929	−63.29	0.02903	−32.38	0.18689	45.122
1800	0.31849	−22.43	4.9219	−72.67	0.02624	−29.24	0.20662	38.894
2000	0.30085	−26.75	4.9973	−83.08	0.02395	−26.62	0.22092	33.706
2200	0.27106	−31.57	5.0755	−93.96	0.02228	−22.20	0.22754	29.699
2400	0.23157	−35.78	5.0668	−106.1	0.02134	−17.95	0.22679	26.622
2600	0.18594	−40.38	4.9143	−118.1	0.02176	−13.86	0.21806	23.868
2800	0.13159	−44.34	4.6797	−129.6	0.02276	−12.70	0.19660	22.060
3000	0.07266	−41.76	4.3139	−140.5	0.02241	−17.06	0.16355	22.273

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads **SOT363**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT363			SC-88			97-02-28

DATA SHEET STATUS

DATA SHEET STATUS[1]	PRODUCT STATUS[2]	DEFINITIONS
Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A.

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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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