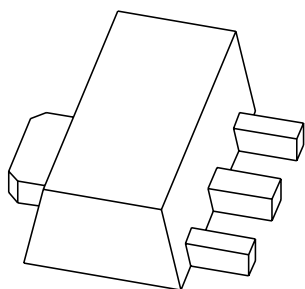


DATA SHEET



PXT4401 NPN switching transistor

Product specification
Supersedes data of 1999 Apr 14

2004 Nov 22

NPN switching transistor

PXT4401

FEATURES

- High current (max. 600 mA)
- Low voltage (max. 40 V).

APPLICATIONS

- Switching and linear amplification in industrial and consumer applications.

DESCRIPTION

NPN switching transistor in a SOT89 plastic package.
PNP complement: PXT4403.

MARKING

TYPE NUMBER	MARKING CODE ⁽¹⁾
PXT4401	*2X

Note

1. * = p: Made in Hong Kong.
* = t: Made in Malaysia.
* = W: Made in China.

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

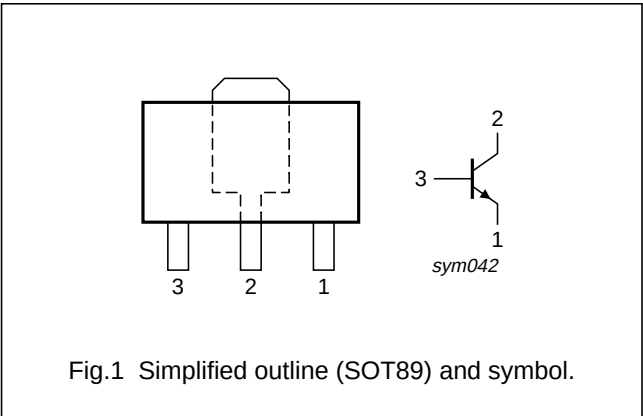


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PXT4401	SC-62	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

NPN switching transistor

PXT4401

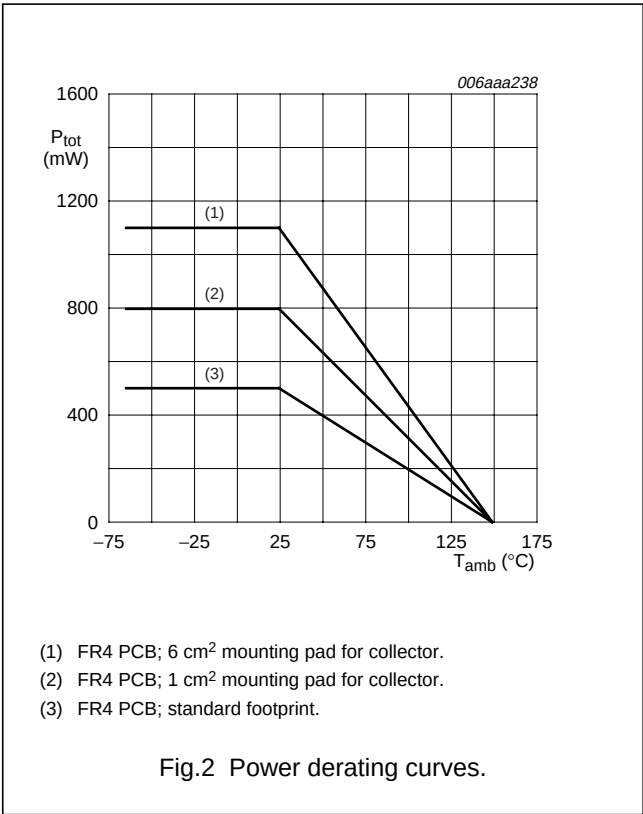
LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V _{CBO}	collector-base voltage	open emitter	–	60	V
V _{CEO}	collector-emitter voltage	open base	–	40	V
V _{EBO}	emitter-base voltage	open collector	–	5	V
I _C	collector current (DC)		–	600	mA
I _{CM}	peak collector current		–	800	mA
I _{BM}	peak base current		–	200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C note 1 note 2 note 3	–	0.5 0.8 1.1	W W W
T _{stg}	storage temperature		–65	+150	°C
T _j	junction temperature		–	150	°C
T _{amb}	ambient temperature		–65	+150	°C

Notes

1. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm².
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm².



NPN switching transistor

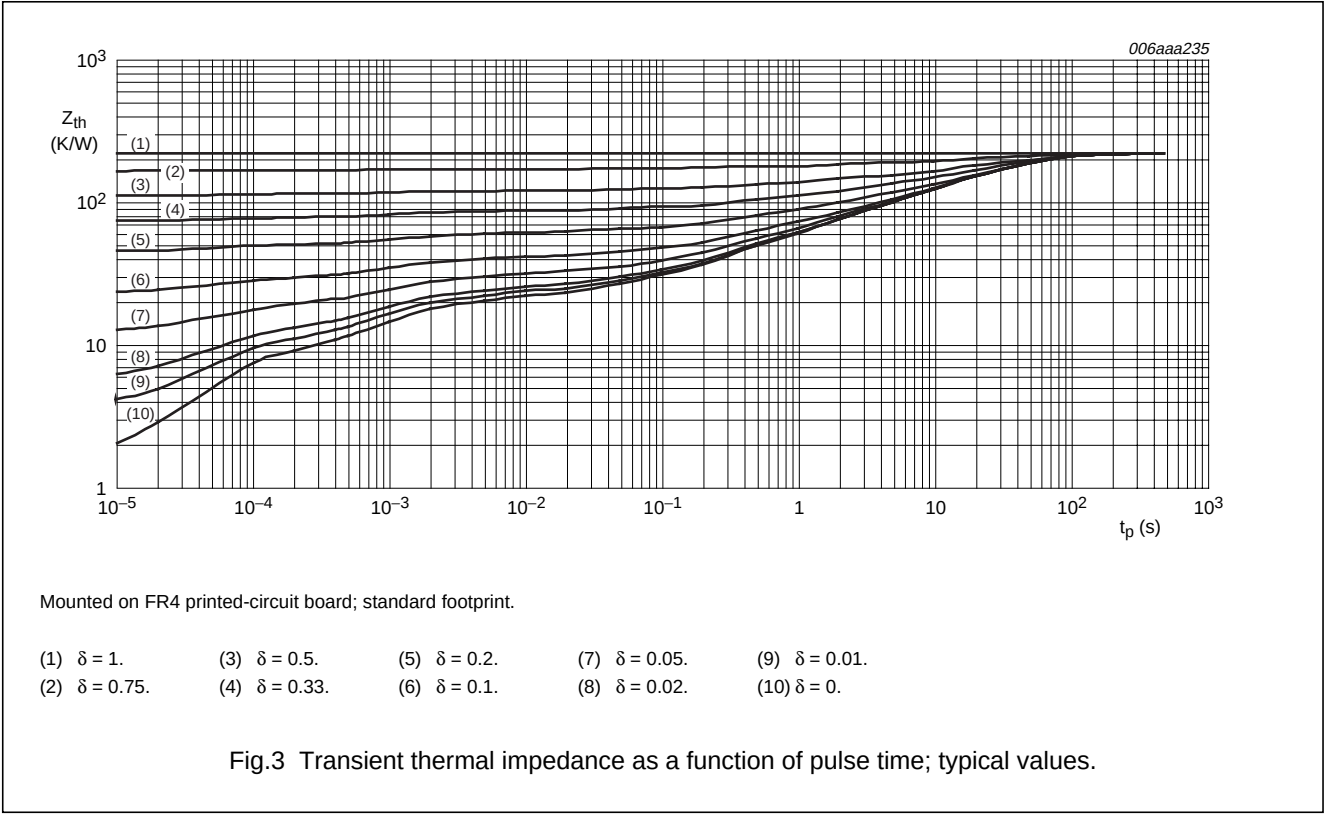
PXT4401

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		
		note 1	250	K/W
		note 2	156	K/W
		note 3	113	K/W
$R_{th(j-s)}$	thermal resistance from junction to soldering point		30	K/W

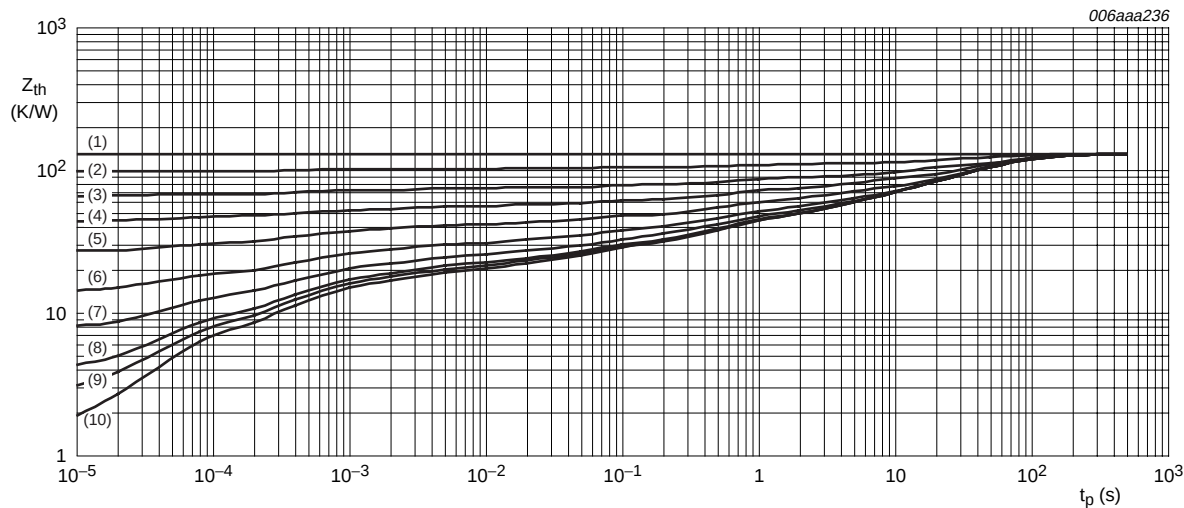
Notes

1. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm².
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm².



NPN switching transistor

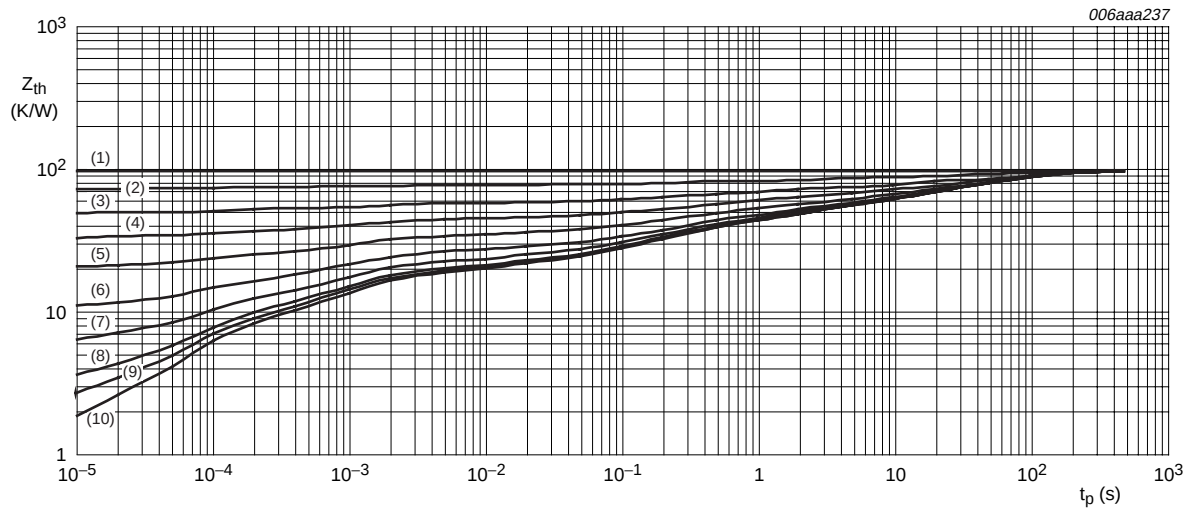
PXT4401



Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm².

- | | | | | |
|----------------------|----------------------|---------------------|----------------------|----------------------|
| (1) $\delta = 1.$ | (3) $\delta = 0.5.$ | (5) $\delta = 0.2.$ | (7) $\delta = 0.05.$ | (9) $\delta = 0.01.$ |
| (2) $\delta = 0.75.$ | (4) $\delta = 0.33.$ | (6) $\delta = 0.1.$ | (8) $\delta = 0.02.$ | (10) $\delta = 0.$ |

Fig.4 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm².

- | | | | | |
|----------------------|----------------------|---------------------|----------------------|----------------------|
| (1) $\delta = 1.$ | (3) $\delta = 0.5.$ | (5) $\delta = 0.2.$ | (7) $\delta = 0.05.$ | (9) $\delta = 0.01.$ |
| (2) $\delta = 0.75.$ | (4) $\delta = 0.33.$ | (6) $\delta = 0.1.$ | (8) $\delta = 0.02.$ | (10) $\delta = 0.$ |

Fig.5 Transient thermal impedance as a function of pulse time; typical values.

NPN switching transistor

PXT4401

CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	$I_E = 0\text{ A}$; $V_{CB} = 60\text{ V}$	–	50	nA
I_{EBO}	emitter-base cut-off current	$I_C = 0\text{ A}$; $V_{EB} = 6\text{ V}$	–	50	nA
h_{FE}	DC current gain	$V_{CE} = 1\text{ V}$; (see Fig.6)	20	–	
		$I_C = 0.1\text{ mA}$	20	–	
		$I_C = 1\text{ mA}$	40	–	
		$I_C = 10\text{ mA}$	80	–	
		$I_C = 150\text{ mA}$; note 1	100	300	
		$I_C = 500\text{ mA}$; $V_{CE} = 2\text{ V}$; note 1	40	–	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 150\text{ mA}$; $I_B = 15\text{ mA}$; note 1	–	400	mV
		$I_C = 500\text{ mA}$; $I_B = 50\text{ mA}$; note 1	–	750	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 150\text{ mA}$; $I_B = 15\text{ mA}$; note 1	–	950	mV
		$I_C = 500\text{ mA}$; $I_B = 50\text{ mA}$; note 1	–	1.2	V
C_c	collector capacitance	$I_E = i_e = 0\text{ A}$; $V_{CB} = 5\text{ V}$; $f = 1\text{ MHz}$	–	8	pF
C_e	emitter capacitance	$I_C = i_c = 0\text{ A}$; $V_{EB} = 500\text{ mV}$; $f = 1\text{ MHz}$	–	30	pF
f_T	transition frequency	$I_C = 20\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 100\text{ MHz}$	250	–	MHz
Switching times (between 10% and 90% levels); (see Fig.7)					
t_{on}	turn-on time	$I_{Con} = 150\text{ mA}$; $I_{Bon} = 15\text{ mA}$; $I_{Boff} = -15\text{ mA}$	–	35	ns
t_d	delay time		–	15	ns
t_r	rise time		–	20	ns
t_{off}	turn-off time		–	250	ns
t_s	storage time		–	200	ns
t_f	fall time		–	60	ns

Note

1. Pulse test: $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.

NPN switching transistor

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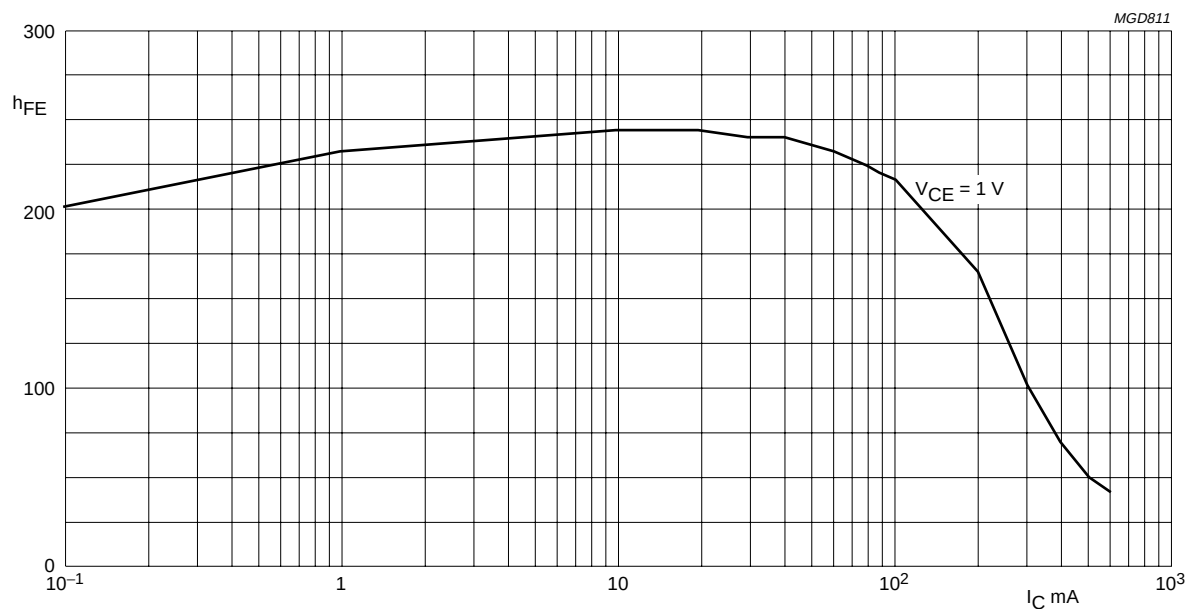
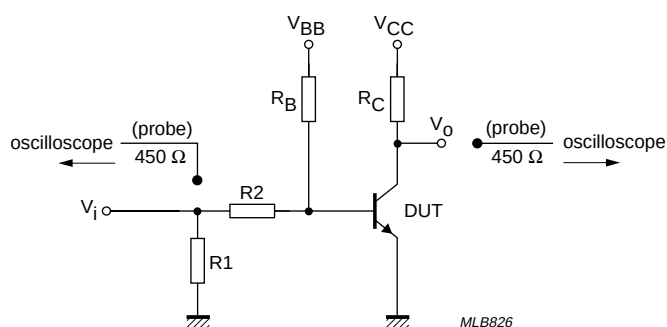


Fig.6 DC current gain; typical values.



$V_i = 9.5\text{ V}$; $T = 500\text{ }\mu\text{s}$; $t_p = 10\text{ }\mu\text{s}$; $t_r = t_f \leq 3\text{ ns}$.
 $R_1 = 68\text{ }\Omega$; $R_2 = 325\text{ }\Omega$; $R_B = 325\text{ }\Omega$; $R_C = 160\text{ }\Omega$.
 $V_{BB} = -3.5\text{ V}$; $V_{CC} = 29.5\text{ V}$.
 Oscilloscope: input impedance $Z_i = 50\text{ }\Omega$.

Fig.7 Test circuit for switching times.

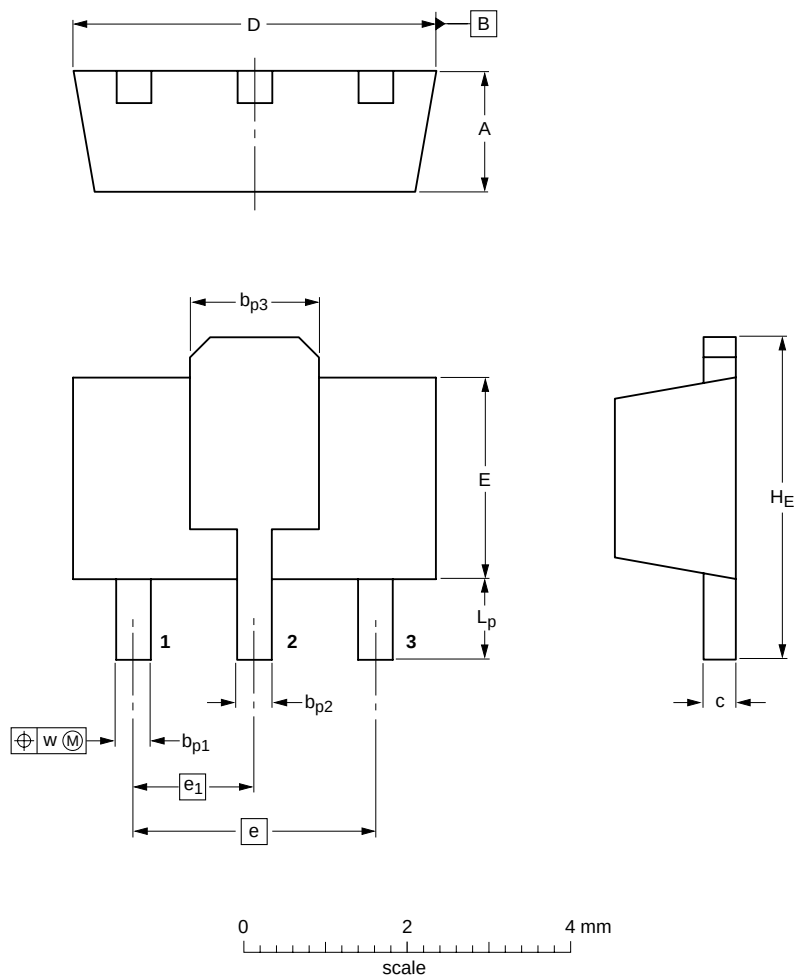
NPN switching transistor

PXT4401

PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 3 leads

SOT89



DIMENSIONS (mm are the original dimensions)

UNIT	A	b _{p1}	b _{p2}	b _{p3}	c	D	E	e	e ₁	H _E	L _p	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.23	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	1.2 0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT89		TO-243	SC-62			99-09-13 04-08-03

NPN switching transistor

PXT4401

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾⁽³⁾	DEFINITION
I	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.
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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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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