



BAP64Q

Quad PIN diode attenuator

Rev. 2.1 — 1 February 2019

Product data sheet

1 Product profile

1.1 General description

Quad PIN diode in a SOT753 package.

1.2 Features and benefits

- 4 PIN diodes in a SOT753 package
- 300 kHz to 4 GHz
- High linearity
- Low insertion loss
- reduction in part count
- Low diode capacitance
- Low diode forward resistance

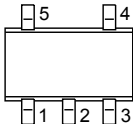
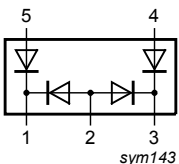
1.3 Applications

- RF attenuators
- Broadband system applications
- General-purpose Voltage Controlled Attenuators for high linearity applications



2 Pinning information

Table 1. Discrete pinning

Pin	Description		Simplified outline	Graphic symbol
1	RF in			
2	series bias			
3	RF out			
4	shunt 1 bias			
5	shunt 2 bias			

Top view

3 Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BAP64Q	SC-74A	plastic surface-mounted package; 5 leads	SOT753

4 Marking

Table 3. Marking

Type number	Marking code
BAP64Q	A1

5 Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_R	reverse voltage		[1]	-	100	V
I_F	forward current		[1]	-	100	mA
P_{tot}	total power dissipation	$T_{sp} \leq 90\text{ °C}$	[1]	-	125	mW
T_{stg}	storage temperature			-65	+150	°C
T_j	junction temperature			-65	+150	°C

[1] single diode.

6 Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		350	K/W

7 Characteristics

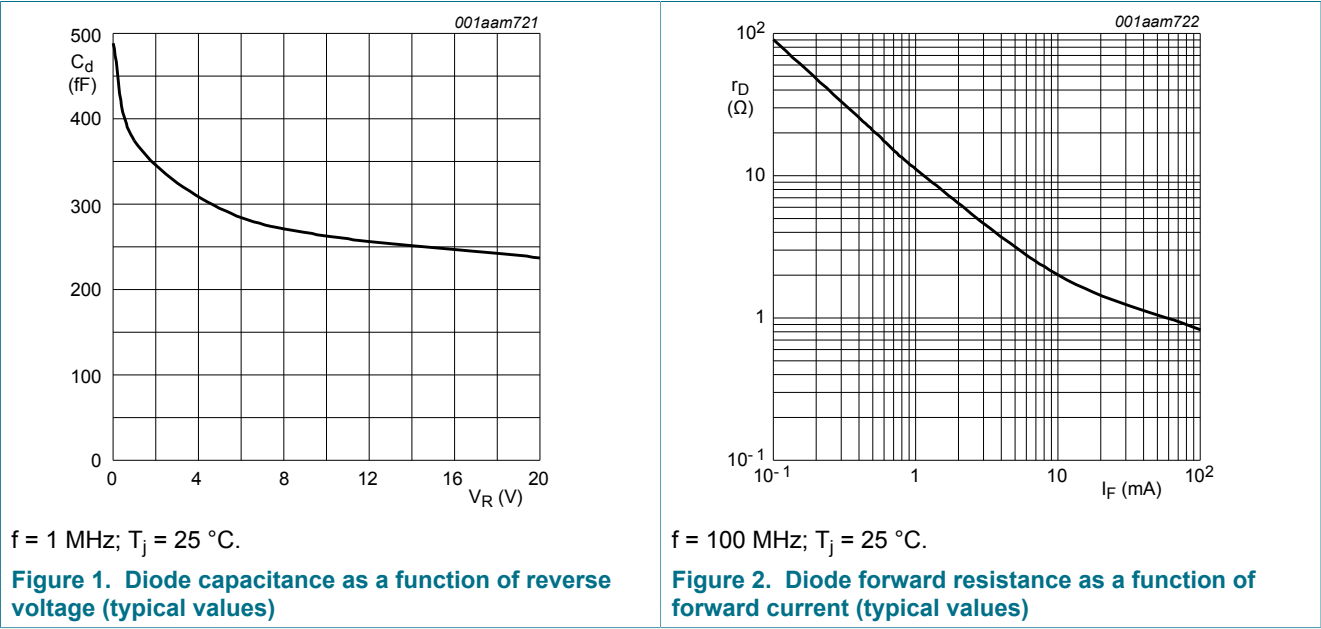
Table 6. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per diode							
V_F	forward voltage	$I_F = 50\text{ mA}$		-	0.95	1.1	V
I_R	reverse current	$V_R = 60\text{ V}$		-	-	10	μA
		$V_R = 20\text{ V}$		-	-	1	μA
C_d	diode capacitance	$f = 1\text{ MHz}$ (see Figure 1)					
		$V_R = 0\text{ V}$		-	0.52	-	pF
		$V_R = 1\text{ V}$		-	0.37	-	pF
		$V_R = 20\text{ V}$		-	0.23	0.35	pF
r_D	diode forward resistance	$f = 100\text{ MHz}$ (see Figure 2)					
		$I_F = 0.5\text{ mA}$	[1]	-	20	40	Ω
		$I_F = 1\text{ mA}$	[1]	-	10	20	Ω
		$I_F = 10\text{ mA}$	[1]	-	2	3.8	Ω
		$I_F = 100\text{ mA}$	[1]	-	0.7	1.35	Ω
τ_L	charge carrier life time	when switched from $I_F = 10\text{ mA}$ to $I_R = 6\text{ mA}$; $R_L = 100\text{ }\Omega$; measured at $I_R = 3\text{ mA}$		-	1.55	-	μs

[1] Guaranteed on AQL basis: inspection level S4, AQL 1.0.

8 Graphical data



9 Application information

9.1 Application circuit

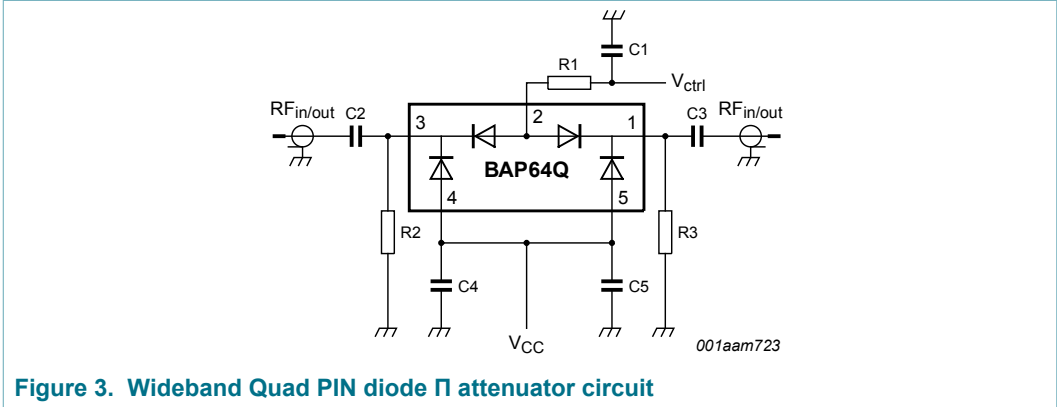


Figure 3. Wideband Quad PIN diode Π attenuator circuit

Table 7. List of components used for the typical application

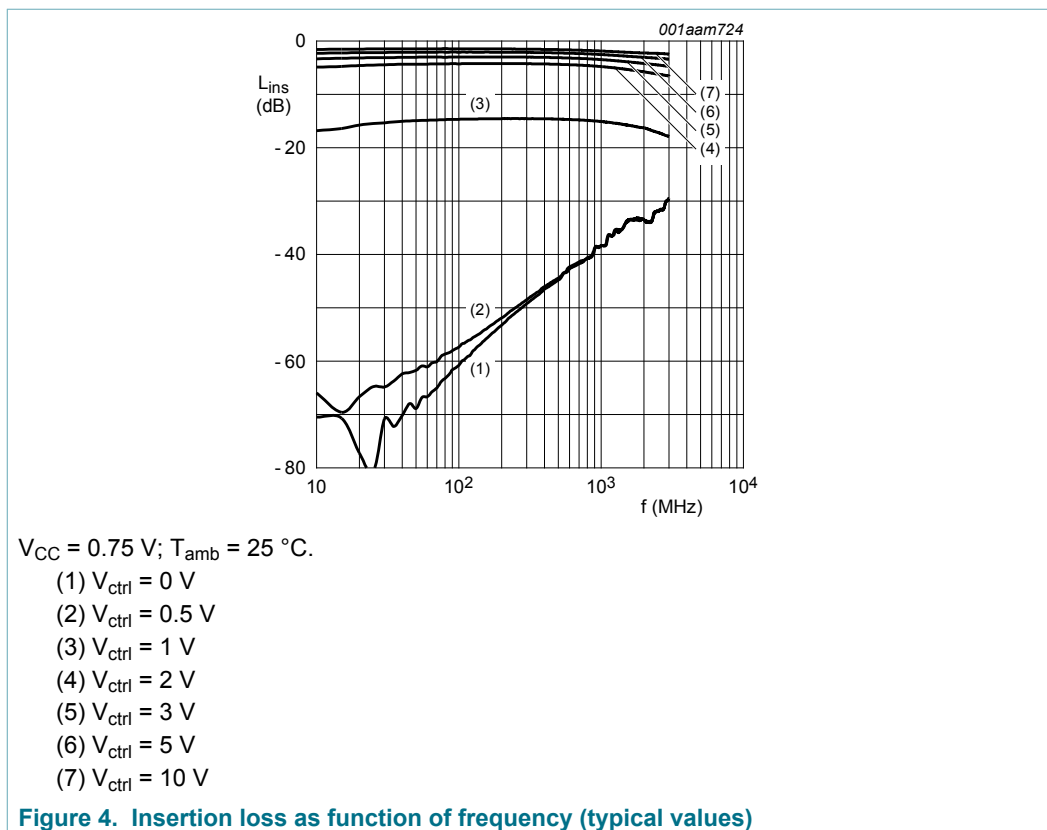
Component	Description	Value
C1; C2; C3; C4; C5	chip capacitor	10 nF
R1; R2; R3	chip resistor	1000 Ω

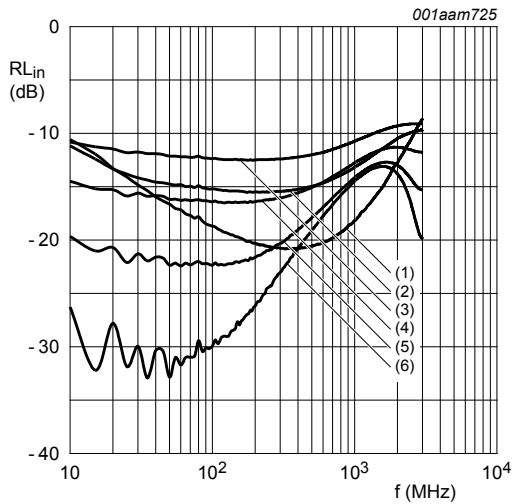
9.2 Quad PIN Π attenuator characteristics

Table 8. Typical performance for BAP64Q quad PIN diode Π attenuator

$V_{CC} = 0.75\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Test Conditions	Typ	Units
L_{ins}	insertion loss	$V_{ctrl} = 10\text{ V}$; $f = 1\text{ GHz}$	1.8	dB
RL_{in}	input return loss	$V_{ctrl} = 0\text{ V}$; $f = 1\text{ GHz}$	18	dB
α	attenuation	$V_{ctrl} = 0\text{ V}$; $f = 1\text{ GHz}$	38	dB
$IP3_i$	input third-order intercept point	$f = 0.1\text{ GHz}$		
		$V_{ctrl} = 2\text{ V}$	32	dBm
		$V_{ctrl} = 10\text{ V}$	42	dBm
		$f = 0.9\text{ GHz}$		
		$V_{ctrl} = 2\text{ V}$	40	dBm
		$V_{ctrl} = 10\text{ V}$	41	dBm
		$f = 1.8\text{ GHz}$		
		$V_{ctrl} = 2\text{ V}$	40	dBm
		$V_{ctrl} = 10\text{ V}$	37	dBm
		$f = 2.1\text{ GHz}$		
		$V_{ctrl} = 2\text{ V}$	38	dBm
		$V_{ctrl} = 10\text{ V}$	39	dBm

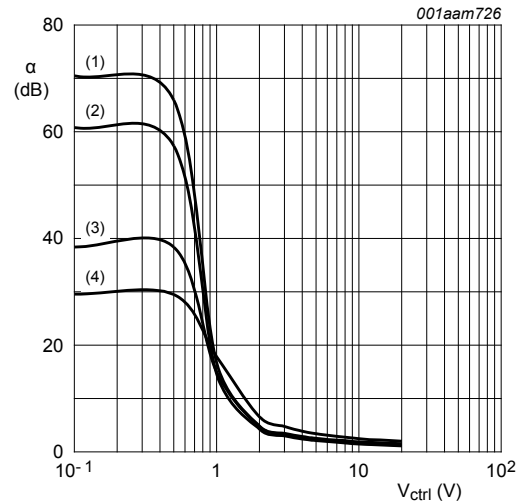




$V_{CC} = 0.75 \text{ V}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$.

- (1) $V_{ctrl} = 0 \text{ V}$
- (2) $V_{ctrl} = 1 \text{ V}$
- (3) $V_{ctrl} = 2 \text{ V}$
- (4) $V_{ctrl} = 3 \text{ V}$
- (5) $V_{ctrl} = 5 \text{ V}$
- (6) $V_{ctrl} = 10 \text{ V}$

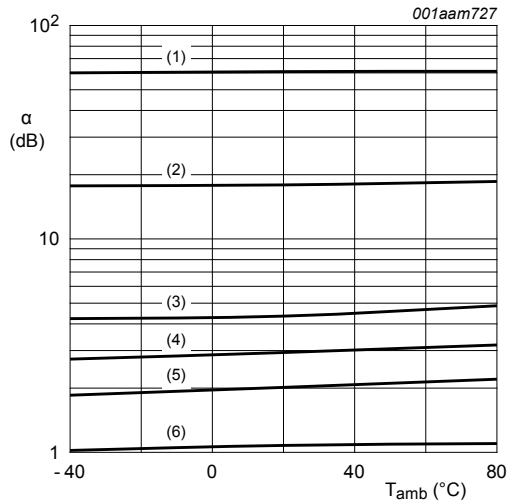
Figure 5. Return loss as function of frequency (typical values)



$V_{CC} = 0.75 \text{ V}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$.

- (1) $f = 10 \text{ MHz}$
- (2) $f = 100 \text{ MHz}$
- (3) $f = 1000 \text{ MHz}$
- (4) $f = 3000 \text{ MHz}$

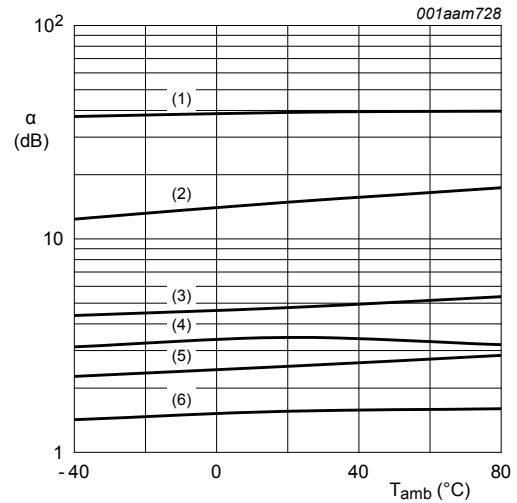
Figure 6. Attenuation as function of control voltage (typical values)



$V_{CC} = 0.75 \text{ V}$; $f = 100 \text{ MHz}$.

- (1) $V_{ctrl} = 0 \text{ V}$
- (2) $V_{ctrl} = 1 \text{ V}$
- (3) $V_{ctrl} = 2 \text{ V}$
- (4) $V_{ctrl} = 3 \text{ V}$
- (5) $V_{ctrl} = 5 \text{ V}$
- (6) $V_{ctrl} = 10 \text{ V}$

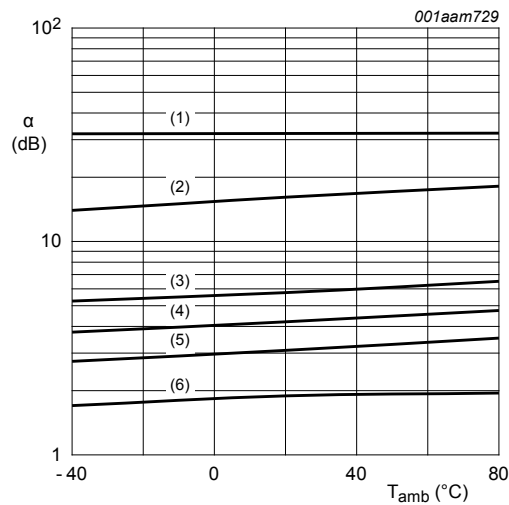
Figure 7. Attenuation as function of temperature (typical values)



$V_{CC} = 0.75 \text{ V}$; $f = 1000 \text{ MHz}$.

- (1) $V_{ctrl} = 0 \text{ V}$
- (2) $V_{ctrl} = 1 \text{ V}$
- (3) $V_{ctrl} = 2 \text{ V}$
- (4) $V_{ctrl} = 3 \text{ V}$
- (5) $V_{ctrl} = 5 \text{ V}$
- (6) $V_{ctrl} = 10 \text{ V}$

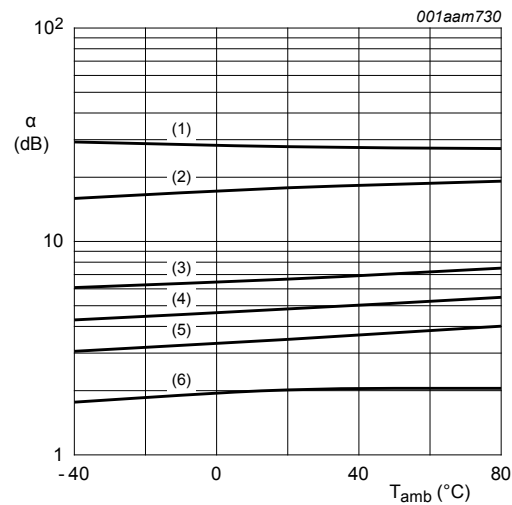
Figure 8. Attenuation as function of temperature (typical values)



$V_{CC} = 0.75\text{ V}$; $f = 2000\text{ MHz}$.

- (1) $V_{ctrl} = 0\text{ V}$
- (2) $V_{ctrl} = 1\text{ V}$
- (3) $V_{ctrl} = 2\text{ V}$
- (4) $V_{ctrl} = 3\text{ V}$
- (5) $V_{ctrl} = 5\text{ V}$
- (6) $V_{ctrl} = 10\text{ V}$

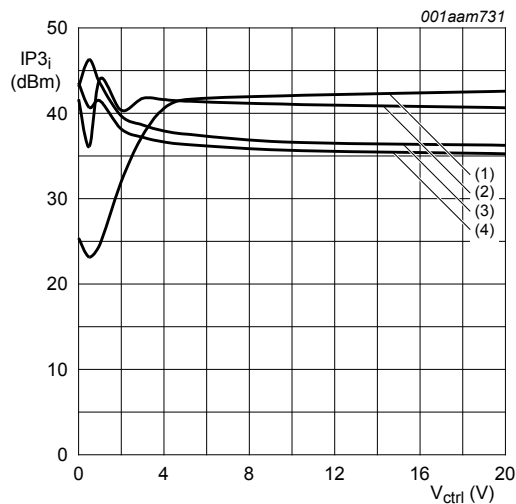
Figure 9. Attenuation as function of temperature (typical values)



$V_{CC} = 0.75\text{ V}$; $f = 3000\text{ MHz}$.

- (1) $V_{ctrl} = 0\text{ V}$
- (2) $V_{ctrl} = 1\text{ V}$
- (3) $V_{ctrl} = 2\text{ V}$
- (4) $V_{ctrl} = 3\text{ V}$
- (5) $V_{ctrl} = 5\text{ V}$
- (6) $V_{ctrl} = 10\text{ V}$

Figure 10. Attenuation as function of temperature (typical values)



$V_{CC} = 0.75\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

- (1) $f = 100\text{ MHz}$
- (2) $f = 900\text{ MHz}$
- (3) $f = 1800\text{ MHz}$
- (4) $f = 2100\text{ MHz}$

Figure 11. Input third-order intercept point as control voltage (typical values)

10 Package outline

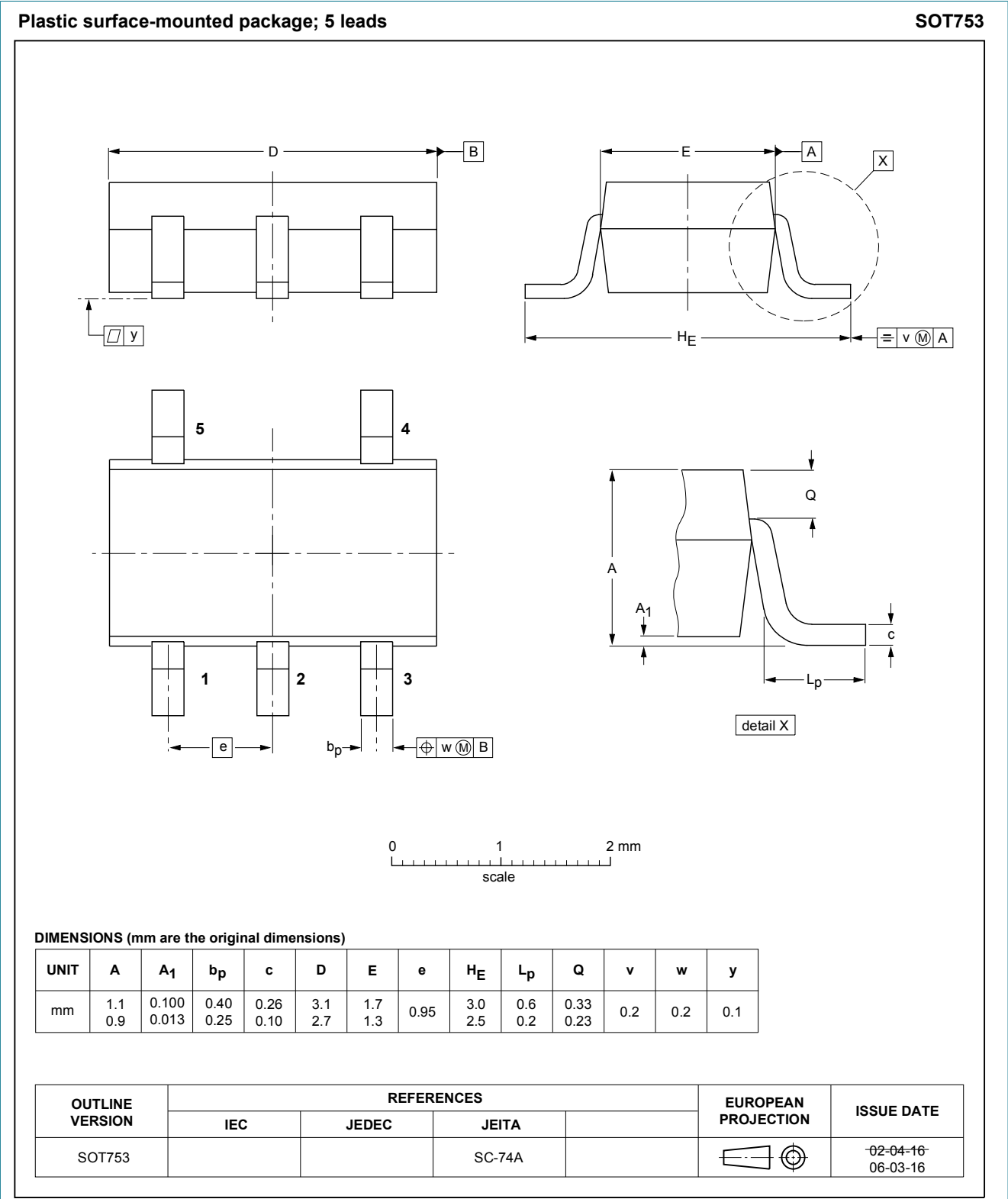


Figure 12. Package outline SOT753

11 Abbreviations

Table 9. Abbreviations

Acronym	Description
AQL	acceptable quality level
PIN	P-type, intrinsic, N-type
RF	radio frequency
S4	special inspection level 4

12 Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAP64Q v.2.1	20190201	Product data sheet	-	BAP64Q v.2
Modifications:	• changed condition for reverse current for V_R from 100 V to 60 V			
BAP64Q v.2	20181213	Product data sheet	-	BAP64Q v.1
Modifications:	• The "Legal information" pages have been updated. • Adjusted Limiting Value P_{tot} to $T_{sp} \leq 90\text{ °C}$			
BAP64Q v.1	20101007	Product data sheet	-	-

13 Legal information

13.1 Data sheet status

Document status ^{[1][2]}	Product status ^[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
2	Pinning information	2
3	Ordering information	2
4	Marking	2
5	Limiting values	2
6	Thermal characteristics	2
7	Characteristics	3
8	Graphical data	4
9	Application information	5
9.1	Application circuit	5
9.2	Quad PIN Π attenuator characteristics	5
10	Package outline	9
11	Abbreviations	10
12	Revision history	10
13	Legal information	11

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