BAP70Q

Quad PIN diode attenuator

Rev. 1 — 6 October 2010 | Product data sheet

1. Product profile

1.1 General description

Quad PIN diode in a SOT753 package.

1.2 Features and benefits

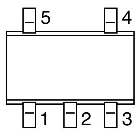
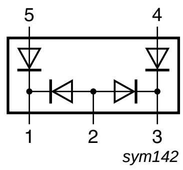
- 4 PIN diodes in a SOT753 package
- 300 kHz to 4 GHz
- High linearity
- Low insertion loss
- reduction in part count
- Low diode capacitance
- Low diode forward resistance

1.3 Applications

- Broadband system applications i.e. WCDMA, CATV, etc.
- 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		

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BAP70Q	SC-74A	plastic surface-mounted package; 5 leads	SOT753

4. Marking

Table 3. Marking

Type number	Marking code
BAP70Q	A2

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]	-	50	V
I_F	forward current		[1]	-	100	mA
P_{tot}	total power dissipation	T_{sp} = 90 °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

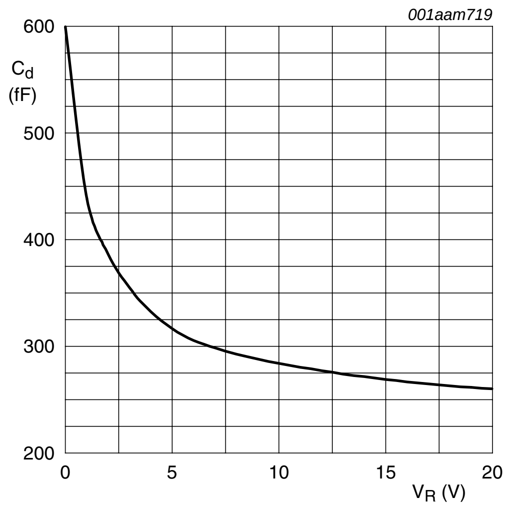
Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to soldering point		350	K/W

7. Characteristics

Table 6. Characteristics

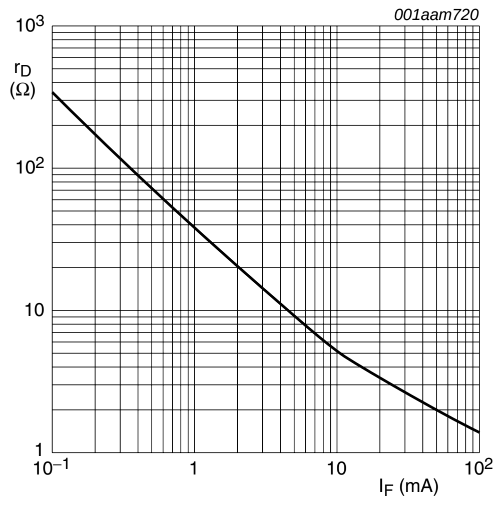
T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_F	forward voltage	I_F = 50 mA	-	0.95	1.1	V
I_R	reverse current	V_R = 50 V	-	-	100	nA
C_d	diode capacitance	see Figure 1; f = 1 MHz;				
		V_R = 0 V	-	600	-	fF
		V_R = 1 V	-	430	-	fF
		V_R = 20 V	-	250	300	fF
r_D	diode forward resistance	see Figure 2; f = 100 MHz;				
		I_F = 0.5 mA	-	77	100	Ω
		I_F = 1 mA	-	40	50	Ω
		I_F = 10 mA	-	5.4	7	Ω
		I_F = 100 mA	-	1.4	1.9	Ω
τ_L	charge carrier life time	when switched from I_F = 10 mA to I_R = 6 mA; R_L = 100 Ω; measured at I_R = 3 mA	-	1.25	-	µs



f = 1 MHz; T_j = 25 °C.

Fig 1. Diode capacitance as a function of reverse voltage; typical values.



f = 100 MHz; T_j = 25 °C.

Fig 2. Diode forward resistance as a function of forward current; typical values.

8. Application information

8.1 Application circuit

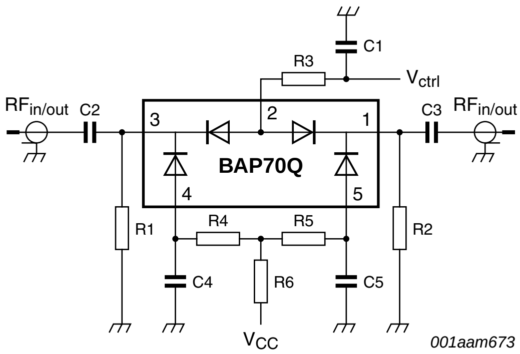


Fig 3. Wideband Quad PIN diode Π attentuator circuit

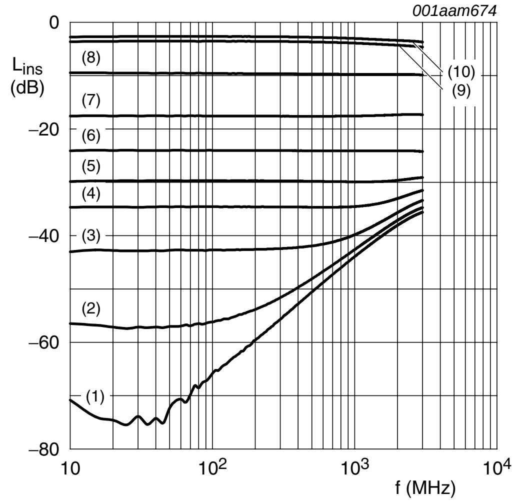
Table 7. List of components used for the typical application

Component	Description	Conditions	Value
C1, C2, C3, C4, C5	chip capacitor	V_{CC} = 3.7 V	47 nF
		V_{CC} = 5 V	47 nF
R1, R2	chip resistor	V_{CC} = 3.7 V	560 Ω
		V_{CC} = 5 V	910 Ω
R3	chip resistor	V_{CC} = 3.7 V	330 Ω
		V_{CC} = 5 V	1000 Ω
R4, R5	chip resistor	V_{CC} = 3.7 V	1500 Ω
		V_{CC} = 5 V	2000 Ω
R6	chip resistor	V_{CC} = 3.7 V	680 Ω
		V_{CC} = 5 V	1000 Ω

8.2 Quad PIN pi attentuator characteristics

Table 8. Typical performance for BAP64Q quad PIN diode Π attenuator
V_{CC} = 3.7 V; T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Test Conditions	Typ	Units
L_{ins}	insertion loss	V_C = 10 V; f = 1 GHz	3	dB
RL_{in}	input return loss	V_C = 0 V; f = 1 GHz	24	dB
α	attenuation	V_C = 0 V; f = 1 GHz	44	dB
$IP3_i$	input third-order intercept point	f = 0.1 GHz		
		V_{ctrl} = 2 V	38	dBm
		V_{ctrl} = 10 V	45	dBm
		f = 0.9 GHz		
		V_{ctrl} = 2 V	45	dBm
		V_{ctrl} = 10 V	45	dBm
		f = 1.8 GHz		
		V_{ctrl} = 2 V	45	dBm
		V_{ctrl} = 10 V	45	dBm
		f = 2.1 GHz		
		V_{ctrl} = 2 V	44	dBm
		V_{ctrl} = 10 V	44	dBm



V_{CC} = 3.7 V; T_{amb} = 25 °C.

(1) V_{ctrl} = 0 V

(2) V_{ctrl} = 1 V

(3) V_{ctrl} = 1.1 V

(4) V_{ctrl} = 1.2 V

(5) V_{ctrl} = 1.3 V

(6) V_{ctrl} = 1.5 V

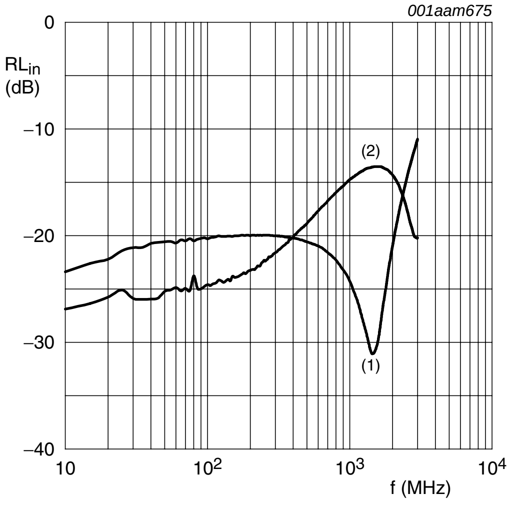
(7) V_{ctrl} = 2 V

(8) V_{ctrl} = 4 V

(9) V_{ctrl} = 7.5 V

(10) V_{ctrl} = 10 V

Fig 4. Insertion loss as function of frequency; typical values

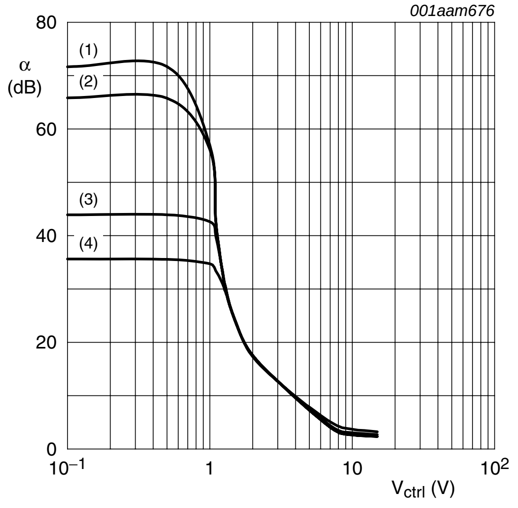


V_{CC} = 3.7 V; T_{amb} = 25 °C.

(1) V_{ctrl} = 0 V

(2) V_{ctrl} = 15 V

Fig 5. Return loss as function of frequency; typical values



V_{CC} = 3.7 V; T_{amb} = 25 °C.

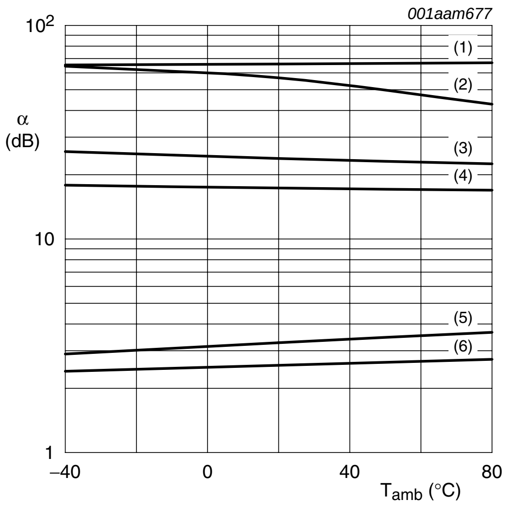
(1) f = 10 MHz

(2) f = 100 MHz

(3) f = 1000 MHz

(4) f = 3000 MHz

Fig 6. Attenuation as function of control voltage; typical values



V_{CC} = 3.7 V; f = 100 MHz.

(1) V_{ctrl} = 0 V

(2) V_{ctrl} = 1 V

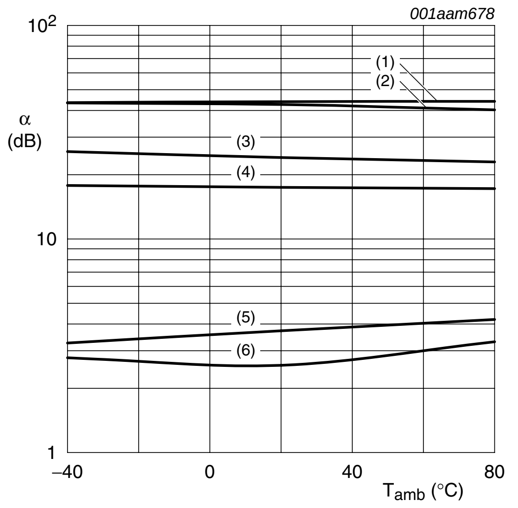
(3) V_{ctrl} = 1.5 V

(4) V_{ctrl} = 2 V

(5) V_{ctrl} = 7.5 V

(6) V_{ctrl} = 10 V

Fig 7. Attenuation as function of temperature; typical values



V_{CC} = 3.7 V; f = 1000 MHz.

(1) V_{ctrl} = 0 V

(2) V_{ctrl} = 1 V

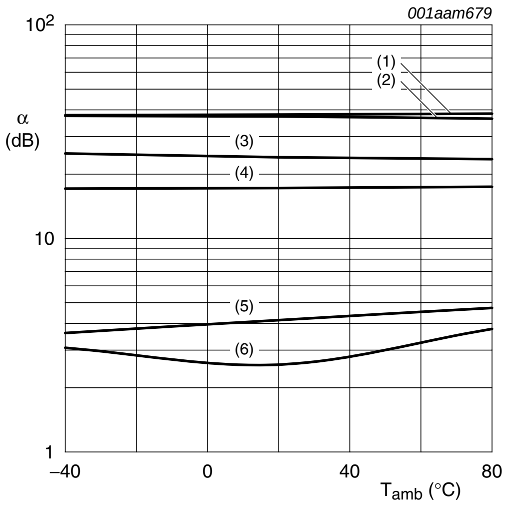
(3) V_{ctrl} = 1.5 V

(4) V_{ctrl} = 2 V

(5) V_{ctrl} = 7.5 V

(6) V_{ctrl} = 10 V

Fig 8. Attenuation as function of temperature; typical values



V_{CC} = 3.7 V; f = 2000 MHz.

(1) V_{ctrl} = 0 V

(2) V_{ctrl} = 1 V

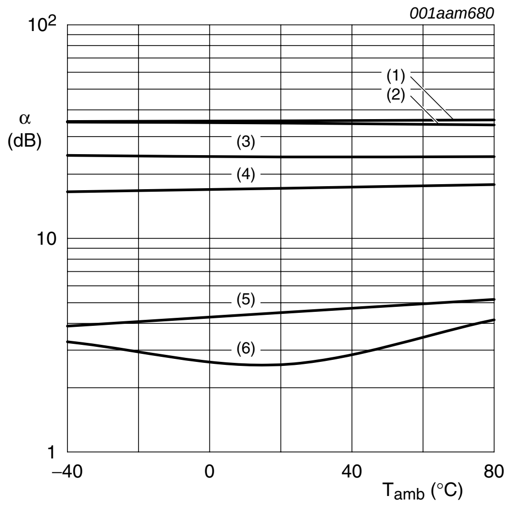
(3) V_{ctrl} = 1.5 V

(4) V_{ctrl} = 2 V

(5) V_{ctrl} = 7.5 V

(6) V_{ctrl} = 10 V

Fig 9. Attentuation as function of temperature; typical values



V_{CC} = 3.7 V; f = 3000 MHz.

(1) V_{ctrl} = 0 V

(2) V_{ctrl} = 1 V

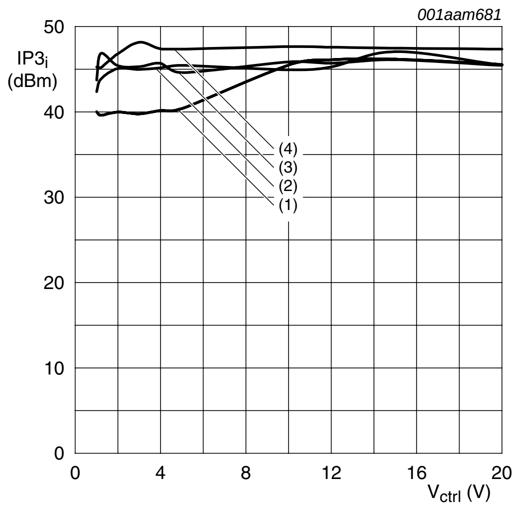
(3) V_{ctrl} = 1.5 V

(4) V_{ctrl} = 2 V

(5) V_{ctrl} = 7.5 V

(6) V_{ctrl} = 10 V

Fig 10. Attentuation as function of temperature; typical values



V_{CC} = 3.7 V; T_{amb} = 25 °C.

(1) f = 100 MHz

(2) f = 900 MHz

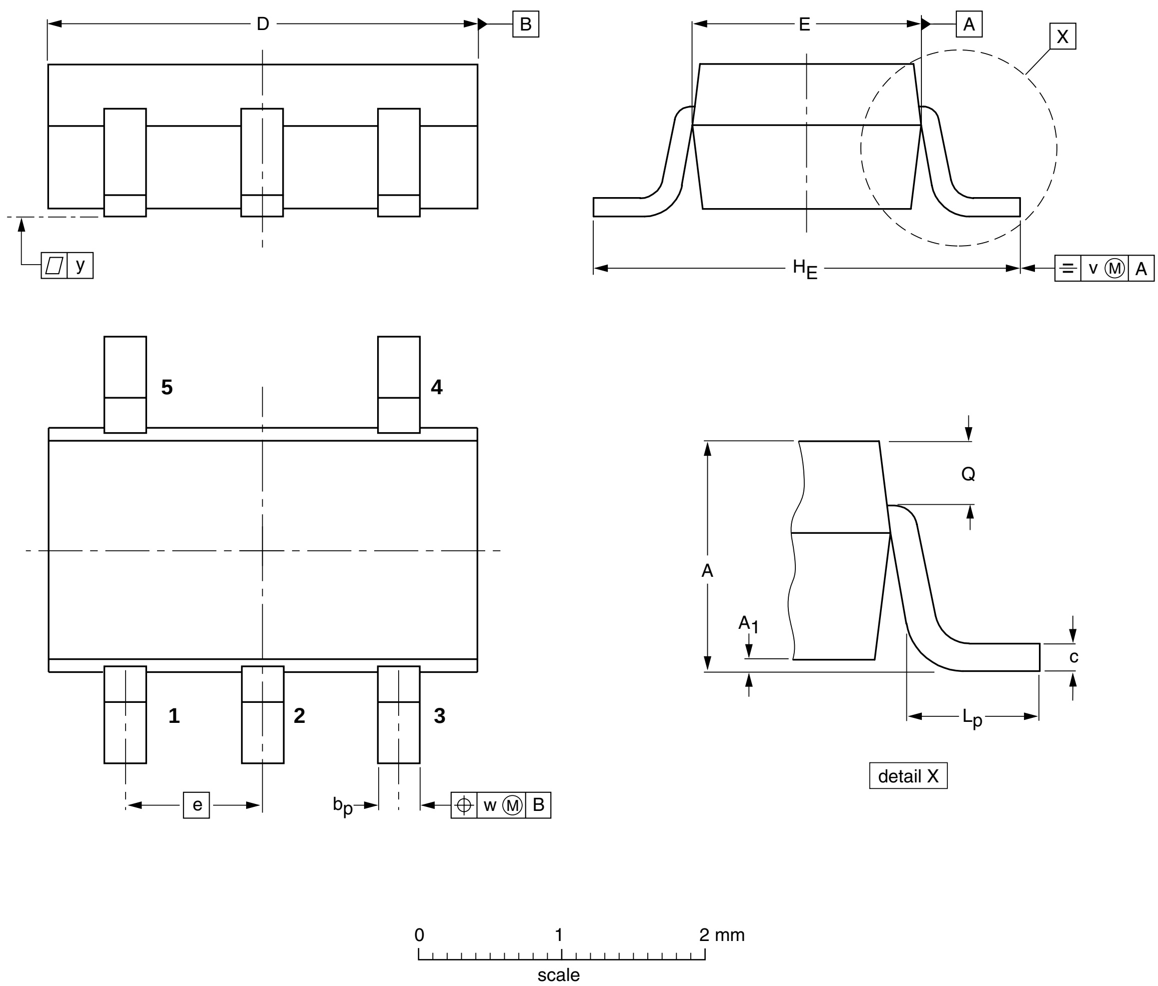
(3) f = 1800 MHz

(4) f = 2100 MHz

Fig 11. Input third-order intercept point as control voltage; typical values

9. Package outline

Plastic surface-mounted package; 5 leads **SOT753**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.100 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT753			SC-74A			~~02-04-16~~ 06-03-16

Fig 12. Package outline SOT753

10. Abbreviations

Table 9. Abbreviations

Acronym	Description
PIN	P-type, Intrinsic, N-type
RF	Radio Frequency

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BAP70Q v.1	20101006	Product data sheet	-	-

12. Legal information

12.1 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.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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14. Contents

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