

# BAP70Q

## Quad PIN diode attenuator

Rev. 2 — 6 March 2012

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

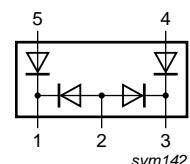
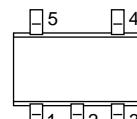
### 1.3 Applications

- 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		Version
	Name	Description	
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	$T_{sp} = 90^\circ\text{C}$	[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**

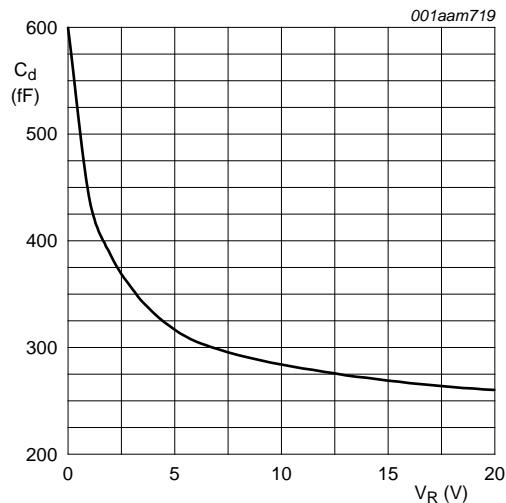
Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-sp)}$	thermal resistance from junction to solder point		350	K/W

## 7. Characteristics

**Table 6. Characteristics**

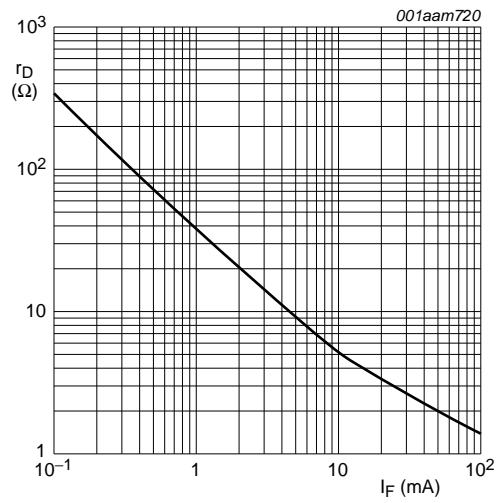
$T_j = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_F$	forward voltage	$I_F = 50\text{ mA}$	-	0.95	1.1	V
$I_R$	reverse current	$V_R = 50\text{ V}$	-	-	100	nA
$C_d$	diode capacitance	see <a href="#">Figure 1</a> ; $f = 1\text{ MHz}$ ; $V_R = 0\text{ V}$ $V_R = 1\text{ V}$ $V_R = 20\text{ V}$	-	600	-	fF
$r_D$	diode forward resistance	see <a href="#">Figure 2</a> ; $f = 100\text{ MHz}$ ; $I_F = 0.5\text{ mA}$ $I_F = 1\text{ mA}$ $I_F = 10\text{ mA}$ $I_F = 100\text{ mA}$	-	77	100	Ω
$\tau_L$	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 $I_R = 3\text{ mA}$	-	1.25	-	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

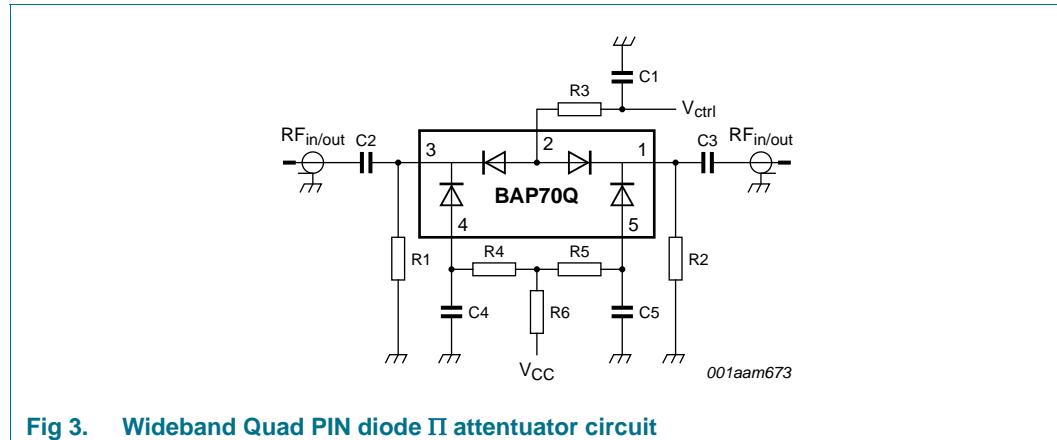


Fig 3. Wideband Quad PIN diode  $\Pi$  attenuator circuit

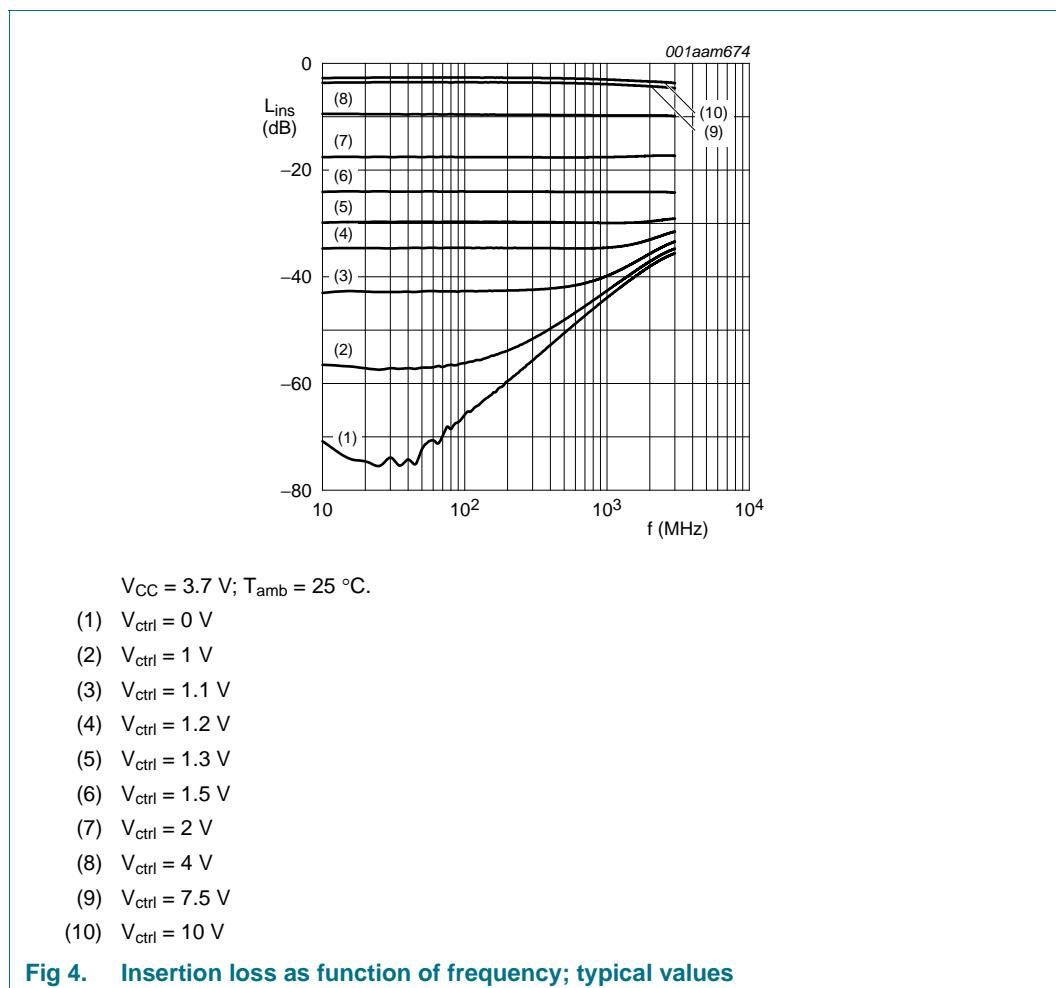
Table 7. List of components used for the typical application

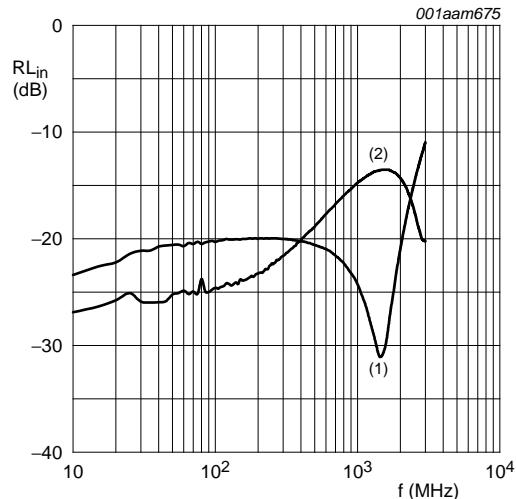
Component	Description	Conditions	Value
C1, C2, C3, C4, C5	chip capacitor	$V_{CC} = 3.7\text{ V}$	47 nF
		$V_{CC} = 5\text{ V}$	47 nF
R1, R2	chip resistor	$V_{CC} = 3.7\text{ V}$	560 $\Omega$
		$V_{CC} = 5\text{ V}$	910 $\Omega$
R3	chip resistor	$V_{CC} = 3.7\text{ V}$	330 $\Omega$
		$V_{CC} = 5\text{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

## 8.2 Quad PIN pi attenuator characteristics

**Table 8. Typical performance for BAP70Q quad PIN diode II attenuator**  
 $V_{CC} = 3.7\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

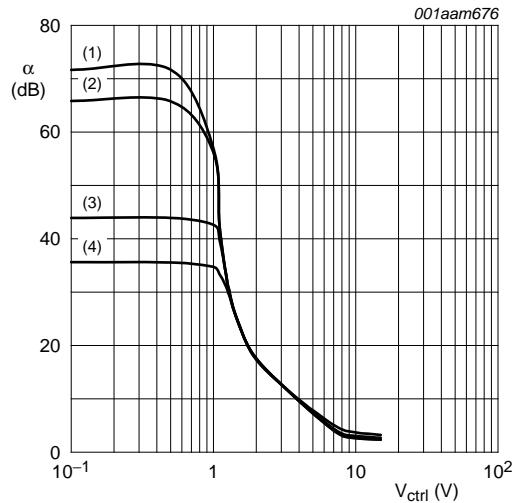
Symbol	Parameter	Test Conditions	Typ	Units
$L_{ins}$	insertion loss	$V_C = 10\text{ V}$ ; $f = 1\text{ GHz}$	3	dB
$RL_{in}$	input return loss	$V_C = 0\text{ V}$ ; $f = 1\text{ GHz}$	24	dB
$\alpha$	attenuation	$V_C = 0\text{ V}$ ; $f = 1\text{ GHz}$	44	dB
$IP3_i$	input third-order intercept point	$f =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





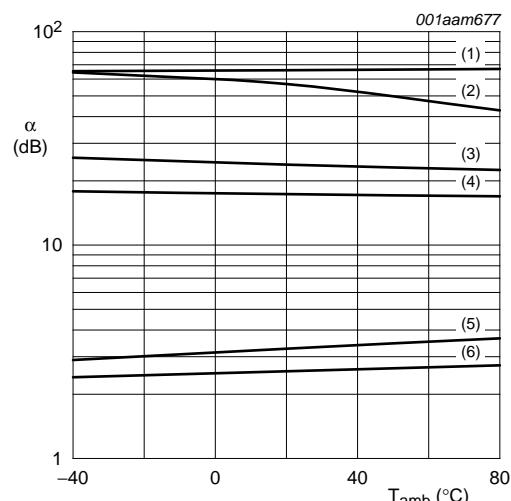
$V_{CC} = 3.7$  V;  $T_{amb} = 25$  °C.  
 (1)  $V_{ctrl} = 0$  V  
 (2)  $V_{ctrl} = 15$  V

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



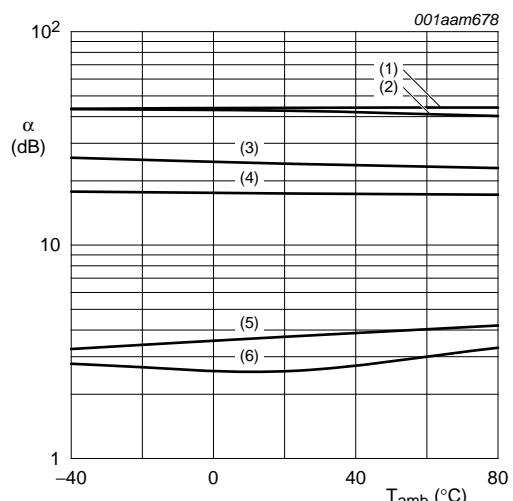
$V_{CC} = 3.7$  V;  $T_{amb} = 25$  °C.  
 (1)  $f = 10$  MHz  
 (2)  $f = 100$  MHz  
 (3)  $f = 1000$  MHz  
 (4)  $f = 3000$  MHz

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



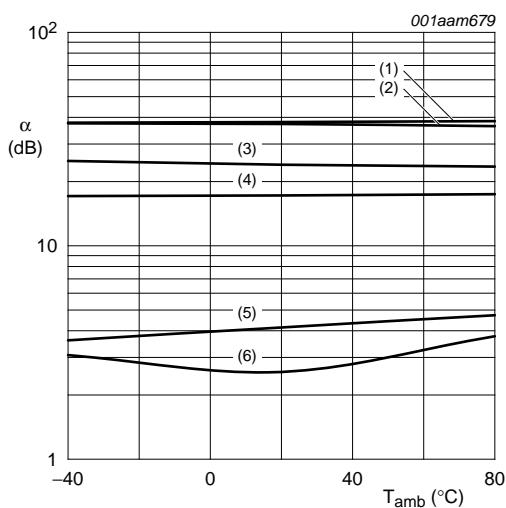
$V_{CC} = 3.7$  V;  $f = 100$  MHz.  
 (1)  $V_{ctrl} = 0$  V  
 (2)  $V_{ctrl} = 1$  V  
 (3)  $V_{ctrl} = 1.5$  V  
 (4)  $V_{ctrl} = 2$  V  
 (5)  $V_{ctrl} = 7.5$  V  
 (6)  $V_{ctrl} = 10$  V

**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

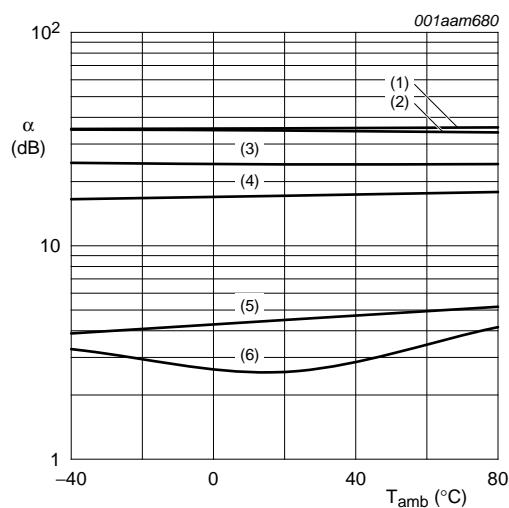
**Fig 8. Attenuation as function of temperature; typical values**



$V_{CC} = 3.7$  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

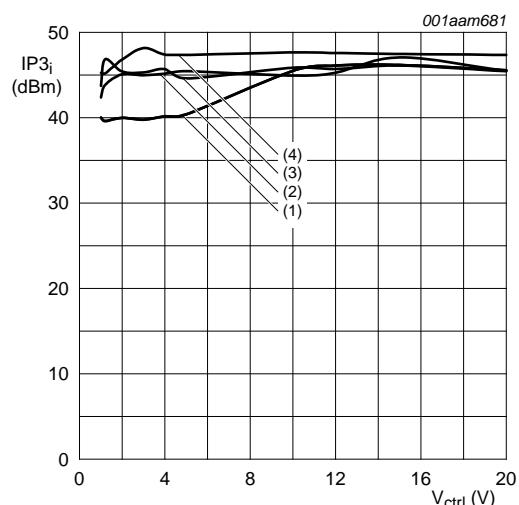
**Fig 9. Attenuation as function of temperature; typical values**



$V_{CC} = 3.7$  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. Attenuation 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

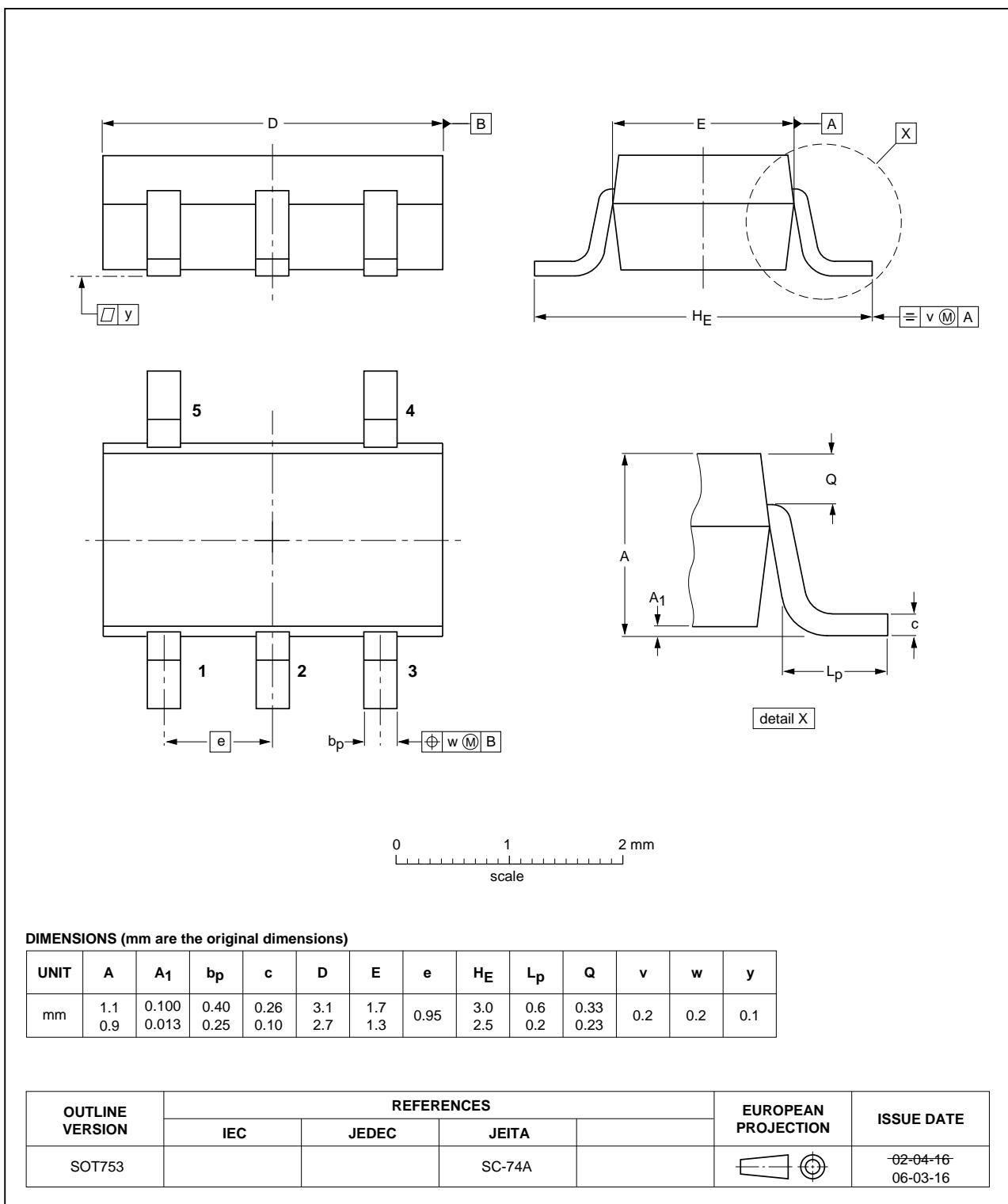


Fig 12. Package outline SOT753

## 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.2	20120306	Product data sheet	-	BAP70Q v.1
Modifications:		• <a href="#">Table 8</a> : updated the title		
BAP70Q v.1	20101006	Product data sheet	-	-

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