

**VI TELEFILTER**

**Filter specification**

**TFS 326A**

**1/5**

**Measurement condition**

Ambient temperature:	23	°C
Input power level:	0	dBm
Terminating impedance: *		
Input:	237 Ω    -0,30 pF	
Output:	237 Ω    -0,30 pF	

**Characteristics**

Remark:

The reference level for the relative attenuation  $a_{rel}$  of the TFS 326A is the minimum of the pass band attenuation  $a_{min}$ . The minimum of the pass band attenuation  $a_{min}$  is defined as the insertion loss  $a_e$ . The centre frequency  $f_C$  is the arithmetic mean value of the upper and lower frequencies at the 3 dB filter attenuation level relative to the insertion loss  $a_e$ . The nominal frequency  $f_N$  is fixed at 326,4 MHz without any tolerance. The given values for both the relative attenuation  $a_{rel}$  and the group delay ripple have to be achieved at the frequencies given below even if the centre frequency  $f_C$  is shifted due to the temperature coefficient of frequency  $TC_f$  in the operating temperature range and due to a production tolerance for the centre frequency  $f_C$ .

D a t a		typ. value		tolerance / limit	
<b>Insertion loss</b> (reference level)		$a_e$	2,6 dB	max.	4,5 dB
<b>Nominal frequency</b>		$f_N$	-		326,4 MHz
<b>Centre frequency</b>		$f_C$	326,4 MHz		-
<b>Passband</b>		PB	-	$f_N \pm$	2,50 MHz
<b>Pass band ripple</b>			0,6 dB	max.	0,8 dB
<b>Bandwidth</b>		BW			
3 dB			17,5 MHz	min.	14,0 MHz
<b>Relative attenuation</b>		$a_{rel}$			
$f_N \pm$	2,5 MHz	$f_N \pm$	2,5 MHz	0,6 dB	max. 0,8 dB
$f_N \pm$	7,0 MHz	$f_N \pm$	7,0 MHz	2,0 dB	max. 3,0 dB
$f_N +$	12,5 MHz	$f_N +$	13,28 MHz	24 dB	min. 11 dB
$f_N +$	13,28 MHz	$f_N +$	14,85 MHz	19 dB	min. 15 dB
$f_N +$	14,85 MHz	$f_N +$	18,9 MHz	15 dB	min. 13 dB
$f_N +$	18,9 MHz	$f_N +$	40,0 MHz	18 dB	min. 15 dB
$f_N -$	12,5 MHz	$f_N -$	13,75 MHz	14 dB	min. 11 dB
$f_N -$	13,75 MHz	$f_N -$	30,0 MHz	18 dB	min. 15 dB
$f_N -$	30,0 MHz	$f_N -$	316,4 MHz	27 dB	min. 25 dB
$f_N +$	40,0 MHz	$f_N +$	123,6 MHz	52 dB	min. 25 dB
<b>Group delay ripple within PB</b>			21 ns	max.	40,0 ns
<b>Group delay ripple within <math>\pm 7,0</math> MHz</b>			58 ns	max.	100,0 ns
<b>Return loss within PB</b>			13,5 dB	min.	12,0 dB
<b>Return loss within <math>\pm 7,0</math> MHz</b>			12 dB	min.	8,0 dB
<b>Input power level</b>			-	max.	15,0 dBm**
<b>Operating temperature range</b>		OTR	-		- 10 °C ... + 80 °C
<b>Storage temperature range</b>			-		- 40 °C ... + 85 °C
<b>Temperature coefficient of frequency</b>		$TC_f$ ***	- 73 ppm/K		

\*) The terminating impedances depend on parasitics and q-values of matching elements and the board used, and are to be understood as reference values only. Should there be additional questions do not hesitate to ask for an application note or contact our design team.

\*\*\*) peaks with 20 dBm allowed for 1:100 duty cycle

\*\*\*\*)  $\Delta f_C(\text{Hz}) = TC_f(\text{ppm/K}) \times (T - T_0) \times f_{CAT}(\text{MHz})$ .

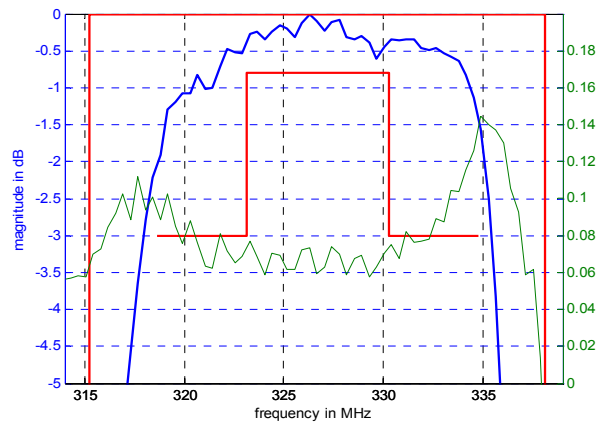
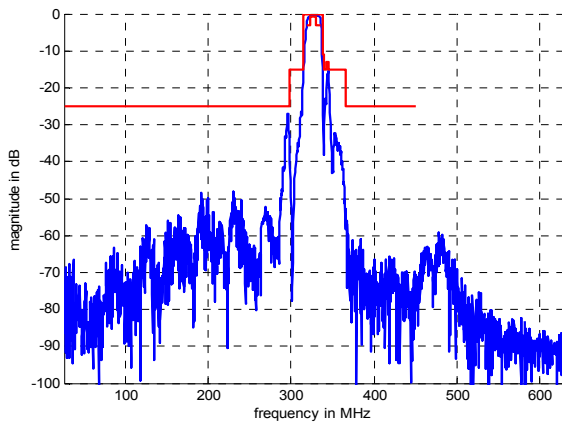
**Generated:**

**Checked / Approved:**

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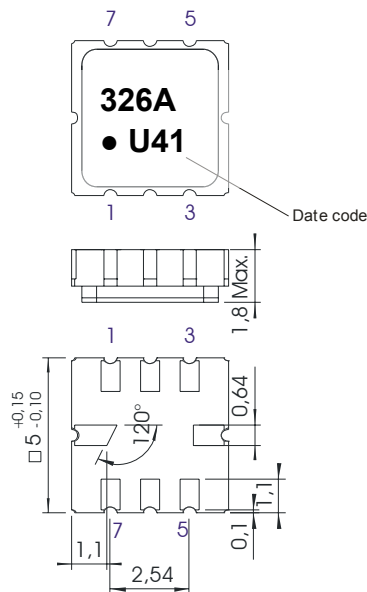
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**Filter characteristic**



**Construction and pin connection**

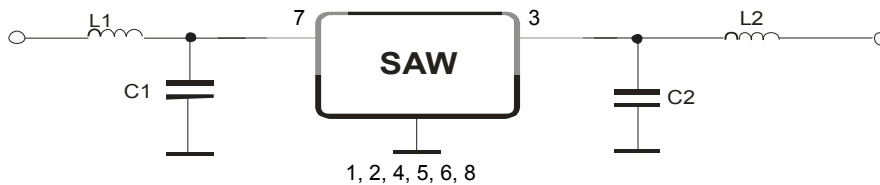
(All dimensions in mm)



- 1 Ground
- 2 Ground
- 3 Output
- 4 Ground
- 5 Ground
- 6 Ground
- 7 Input
- 8 Ground

Date code: Year + week  
 U 2006  
 V 2007  
 W 2008  
 ...

**50 Ω Test circuit**



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**Stability characteristics, reliability**

After the following tests the filter shall meet the whole specification:

1. Shock: 500g, 1 ms, half sine wave, 3 shocks each plane;  
DIN IEC 68 T2 - 27
2. Vibration: 10 Hz to 500 Hz, 0,35 mm or 5 g respectively, 1 octave per min, 10 cycles per plan, 3 plans;  
DIN IEC 68 T2 - 6
3. Change of temperature: -55 °C to 125°C / 30 min. each / 10 cycles  
DIN IEC 68 part 2 – 14 Test N
4. Resistance to solder heat (reflow): reflow possible: three times max.;  
for temperature conditions refer to the attached "Air reflow temperature conditions" on page 4;

This filter is RoHS compliant (2002/95/EG, 2005/618/EG)

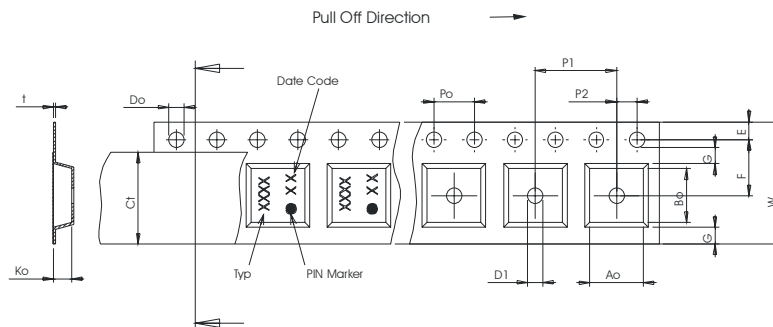
**Packing**

Tape & Reel: IEC 286 – 3, with exception of value for N and minimum bending radius;  
tape type II, embossed carrier tape with top cover tape on the upper side;

max. pieces of filters per reel: 3000  
 reel of empty components at start: min. 300 mm  
 reel of empty components at start including leader: min. 500 mm  
 trailer: min. 300 mm

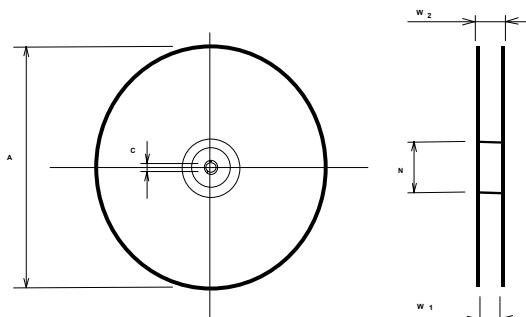
**Tape (all dimensions in mm)**

- W : 12,00 ± 0,3
- Po : 4,00 ± 0,1
- Do : 1,50 +0,1/-0
- E : 1,75 ± 0,1
- F : 5,50 ± 0,05
- G(min) : 0,75
- P2 : 2,00 ± 0,05
- P1 : 8,00 ± 0,1
- D1(min) : 1,50
- Ao : 5,30 ± 0,1
- Bo : 5,30 ± 0,1
- Ct : 9,5 ± 0,1



**Reel (all dimensions in mm)**

- A : 330
- W1 : 12,4 +2/-0
- W2(max) : 18,4
- N(min) : 50
- C : 13,0 +0,5/-0,2



The minimum bending radius is 45 mm.

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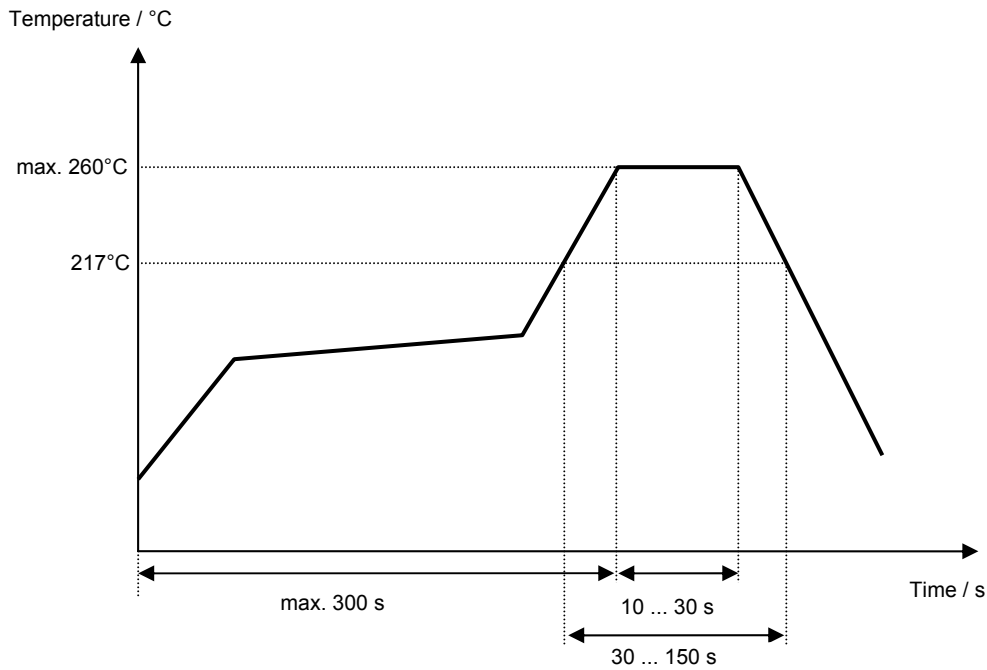
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**Air reflow temperature conditions**

Conditions	Exposure
Average ramp-up rate (30°C to 217°C)	less than 3°C/second
> 100°C	between 300 and 600 seconds
> 150°C	between 240 and 500 seconds
> 217°C	between 30 and 150 seconds
Peak temperature	max. 260°C
Time within 5°C of actual peak temperature	between 10 and 30 seconds
Cool-down rate (Peak to 50°C)	less than 6°C/second
Time from 30°C to Peak temperature	no greater than 300 seconds

**Chip-mount air reflow profile**



**VI TELEFILTER****Filter specification****TFS 326A****5/5****History**

<b>Version</b>	<b>Reason of Changes</b>	<b>Name</b>	<b>Date</b>
1.0	- generate according customer requirement specification	Dr. Sabah	10.08.2000
1.1	- Groupe delay ripple within: $\pm 7,50$ MHz	Dr. Sabah	21.08.2000
1.2	- Return loss within: $\pm 2,50$ MHz	Dr. Sabah	31.08.2000
	- Return loss within: $\pm 7,50$ MHz		
1.3	- Pin connection changed : pin 9 input; pin 3 output	Dr. Sabah	31.08.2000
1.4	- Add preliminary values for terminating impedance	Dr. Sabah	11.10.2000
1.5	- changing of 3dB bandwidth to $\pm 7,0$ MHz - changing of package to 5X5	Dr. Sabah	06.11.2000
1.6	- changing of Return loss to $-12$ dB (within: $\pm 2,50$ MHz)	Dr. S. Sabah	28.02.2001
	- changing of stopband between: 342,5 MHz .. 344,5 MHz to $- 13$ dB		
	- changing of $-15$ dB stopband to $f_N - 13,75$ MHz		
	- changing of group delay ripple within : $\pm 2,50$ MHz to 40 ns		
	- changing of group delay ripple within : $\pm 7,0$ MHz to 100 ns		
1.7	- changing of relative attenuation between: $f_N - 15,6$ MHz to $f_N + 18,60$ MHz	Dr. S. Sabah	15.03.2001
	- changing of filter name to TFS326A		
	- changing of input power specification		
	- changing of matching circuit		
1.8	- with customer agreed modification of stopband attenuation	Dr. S. Sabah	14.05.2001
	- $f_N + 14,85$ MHz... $f_N + 18,9$ MHz to min. 13,0 dB		
	- $f_N - 13,75$ MHz... $f_N - 30,0$ MHz to min. 11,0 dB		
1.9	- add typ. value and filter characteristic	Strehl	13.10.2006