### 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** | | |
|---|---|---|---|---|---|---|
| **Insertion loss** (reference level) | $a_e$ | 2,6 | dB | max. | 4,5 | dB |
| **Nominal frequency** | $f_N$ | - | | | 326,4 | MHz |
| **Centre frequency** | $f_C$ | 326,4 | MHz | | - | |
| **Passband** | PB | - | | $f_N$ ± | 2,50 | MHz |
| **Pass band ripple** | | 0,6 | dB | max. | 0,8 | dB |
| **Bandwidth** | BW | | | | | |
| 3 dB | | 17,5 | MHz | min. | 14,0 | MHz |
| **Relative attenuation** | $a_{rel}$ | | | | | |
| $f_N$ …. $f_N$ ± 2,5 MHz | | 0,6 | dB | max. | 0,8 | dB |
| $f_N$ ± 2,5 MHz ... $f_N$ ± 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 |
| **Group delay ripple within PB** | | 21 | ns | max | 40,0 | ns |
| **Group delay ripple within ± 7,0 MHz** | | 58 | ns | max. | 100,0 | ns |
| **Return loss within PB** | | 13,5 | dB | min. | 12,0 | dB |
| **Return loss within ± 7,0 MHz** | | 12 | dB | min. | 8,0 | dB |
| **Input power level** | | - | | max. | 15,0 | dBm** |
| **Operating temperature range** | OTR | - | | - 10 °C ... + 80°C | | |
| **Storage temperature range** | | - | | - 40 °C ... + 85°C | | |
| **Temperature coefficient of frequency** | $TC_f$ *** | - 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
***) $\Delta f_C(Hz) = Tc_f(ppm/K) \times (T - T_o) \times f_{CAT}$ (MHz).

**Generated:**

**Checked / Approved:**

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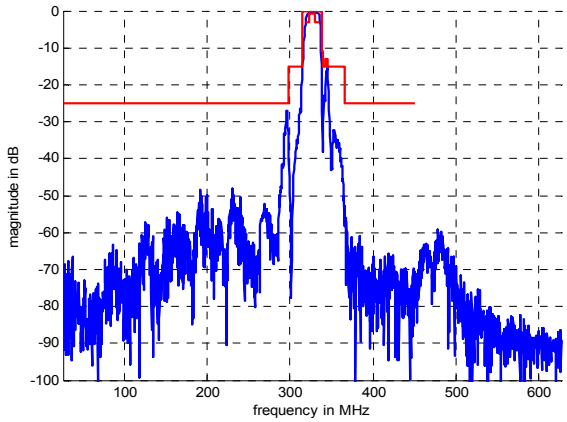
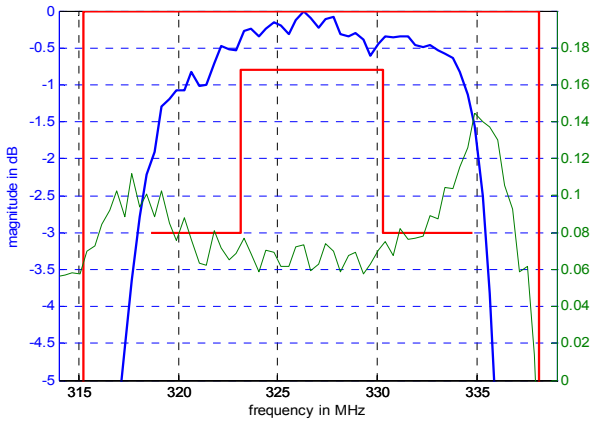
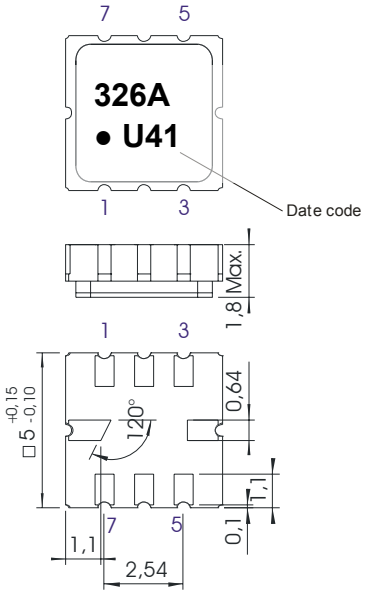
## Filter characteristic




## Construction and pin connection

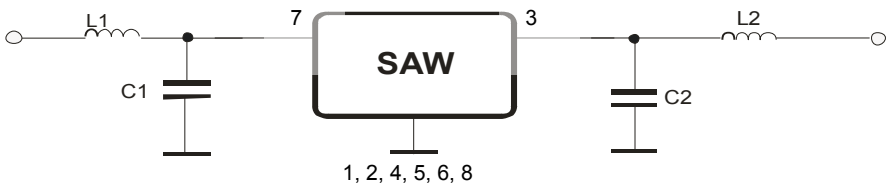
(All dimensions in mm)




| | |
|---|---|
| 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;<br>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;<br>DIN IEC 68 T2 - 6 |
| 3. Change of temperature: | -55 °C to 125°C / 30 min. each / 10 cycles<br>DIN IEC 68 part 2 – 14 Test N |
| 4. Resistance to solder heat (reflow): | reflow possible: three times max.;<br>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)

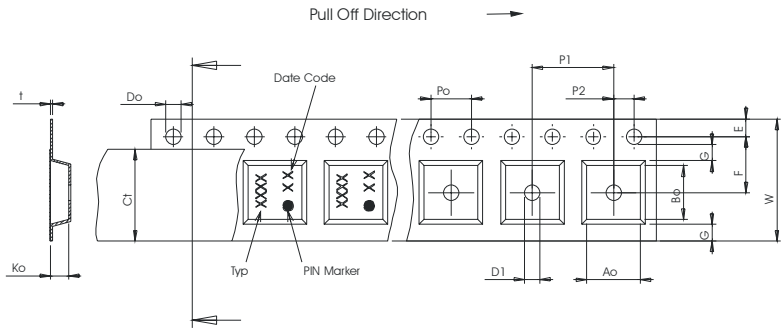
### Packing

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 |

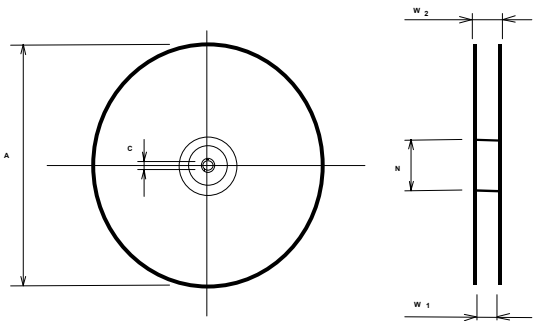
**Tape (all dimensions in mm)**

| | | |
|---|---|---|
| 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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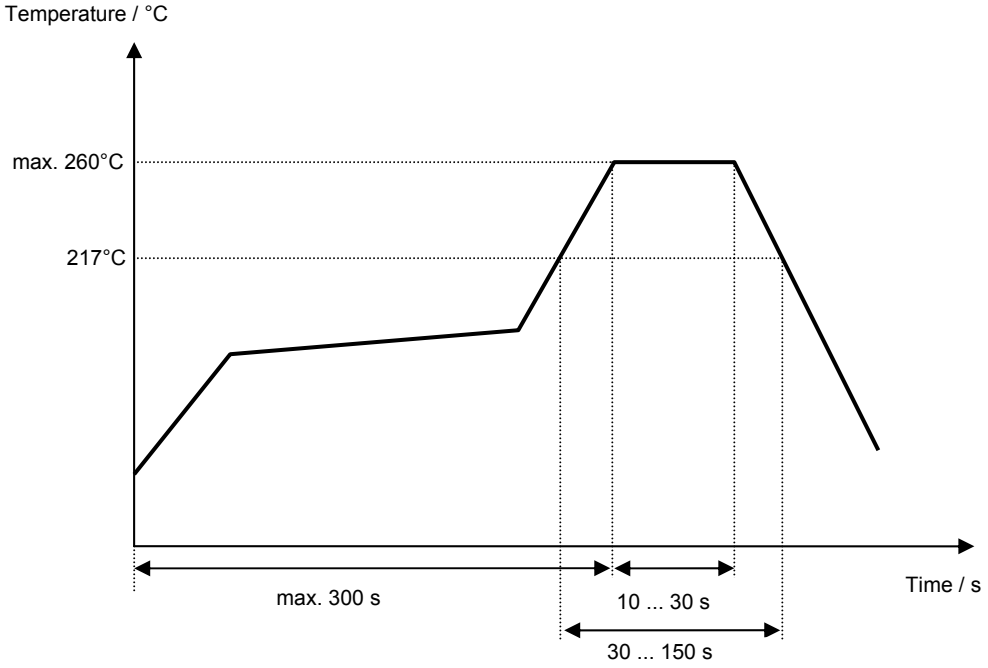
**Air reflow temperature conditions**

| 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**

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## History

| Version | Reason of Changes | Name | Date |
|---|---|---|---|
| 1.0 | - generate according customer requirement specification | Dr. Sabah | 10.08.2000 |
| 1.1 | - Groupe delay ripple within: ± 7,50 MHz Max. 90 ns | Dr. Sabah | 21.08.2000 |
| 1.2 | - Return loss within: ± 2,50 MHz Max. 10 dB<br>- Return loss within: ± 7,50 MHz Max. 6,5 dB | Dr. Sabah | 31.08.2000 |
| 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 ± 7,0 MHz<br>- changing of package to 5X5 | Dr. Sabah | 06.11.2000 |
| 1.6 | - changing of Return loss to –12dB (within: ± 2,50 MHz)<br>- changing of stopband between: 342,5 MHz .. 344,5 MHz to – 13 dB<br>- changing of –15 dB stopband to fn –13,75 MHz<br>- changing of group delay ripple within : ± 2,50 MHz to 40 ns<br>- changing of group delay ripple within : ± 7,0 MHz to 100 ns<br>28.02.2001 | | Dr. S. Sabah |
| 1.7 | - changing of relative attenation between: fn –15,6 MHz to fn +18,60 MHz<br>- changing of filter name to TFS326A<br>- changing of input power specification<br>- changing of matching circuit | Dr. S. Sabah | 15.03.2001 |
| 1.8 | - with customer agreed modification of stopband attenuation<br>- $f_N$ + 14,85 MHz...$f_N$ + 18,9 MHz to min. 13,0 dB<br>- $f_N$ - 13,75 MHz...$f_N$ – 30,0 MHz to min. 11,0 dB | Dr. S. Sabah | 14.05.2001 |
| 1.9 | - add typ. value and filter characteristic | Strehl | 13.10.2006 |

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