## Measurement condition

Ambient temperature: 23 °C
Input power level: 0 dBm
Terminating impedance: *
Input: 800 Ω || -4,4 pF
Output: 900 Ω || -3,9 pF

## Characteristics

Remark:
The reference level for the relative attenuation $a_{rel}$ of the TFS 456AG is the minimum of the pass band attenuation. This value is defined as the insertion loss $a_e$. The nominal frequency $f_N$ is fixed at 456,0 MHz without any tolerance. The values of relative attenuation $a_{rel}$ are guaranteed for the whole operating temperature range. The frequency shift of the filter in the operating temperature range is included in the production tolerance scheme.

| D a t a | | typ. value | | tolerance / limit | | |
|---|---|---|---|---|---|---|
| **Insertion loss** (reference level) | $a_e$ | 9,6 | dB | max. | 14,0 | dB |
| **Nominal frequency** | $f_N$ | - | | | 456,0 | MHz |
| **Centre frequency** | $f_C$ | 456,0 | MHz | | - | |
| **Passband** | PB | - | | $f_N$ ± | 2,5 | MHz |
| **Pass band ripple** p-p | | 0,3 | dB | max. | 1 | dB |
| **Bandwidth** | BW | | | | | |
| 1 dB | | 5,28 | MHz | min. | 5 | MHz |
| 37 dB | | 8,82 | MHz | max. | 9,2 | MHz |
| **Relative attenuation** | $a_{rel}$ | | | | | |
| $f_N$ … $f_N$ ± 2,5 MHz | | 0,7 | dB | max. | 1 | dB |
| $f_N$ ± 4,6 MHz … $f_N$ ± 20 MHz | | 43 | dB | min. | 37 | dB |
| $f_N$ ± 20 MHz … $f_N$ ± 50 MHz | | 54 | dB | min. | 47 | dB |
| **Group delay ripple within PB** | | 39 | ns | max. | 150 | ns |
| **Return loss within PB** | | 17 | dB | min. | 10 | dB |
| **Input power level** | | - | | max. | 15 | dBm |
| **Operating temperature range** | OTR | - | | - 40 °C ... + 85 °C | | |
| **Storage temperature range** | | - | | - 40 °C ... + 85 °C | | |
| **Frequency inversion temperature** | | 25 | °C | | - | |
| **Temperature coefficient of frequency** | $TC_f$ ** | -0,046 | ppm/K² | | - | |

*) 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.
**) $\Delta f(Hz) = TC_f(ppm/K^2) \times (T-T_0)^2 \times f_{cat}(MHz)$.

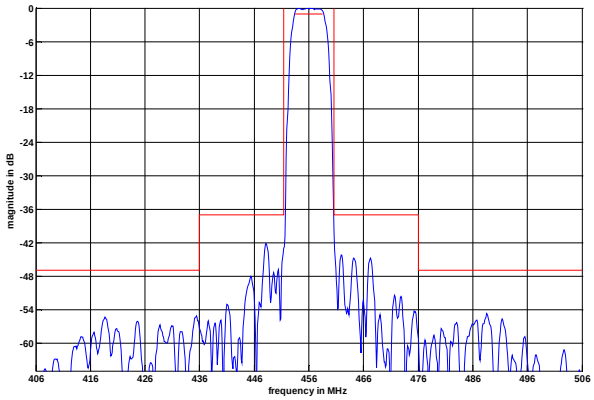
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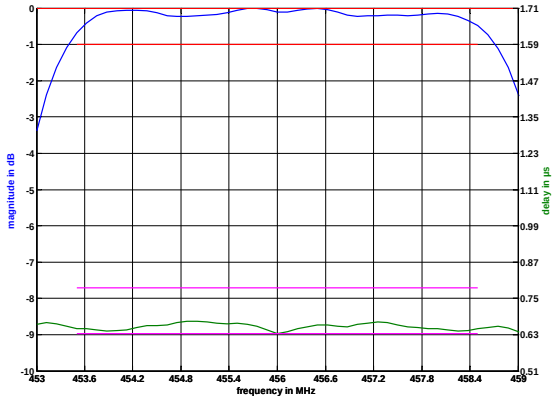
**Checked / Approved:**

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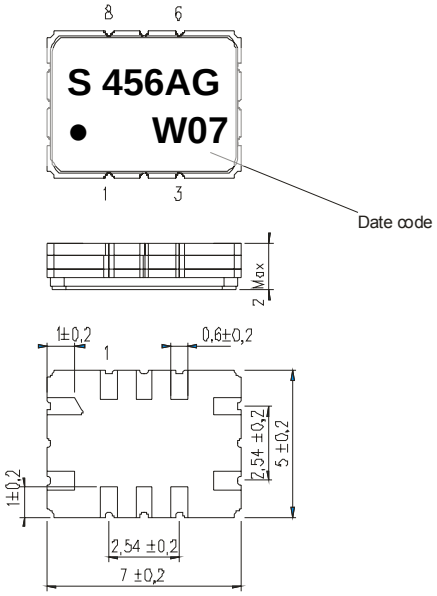
## Filter characteristic




## Construction and pin connection

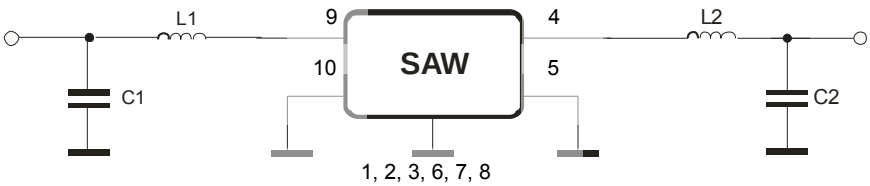
(All dimensions in mm)




| | |
|---|---|
| 1 | Ground |
| 2 | Ground |
| 3 | Ground |
| 4 | Output |
| 5 | Output RF Return |
| 6 | Ground |
| 7 | Ground |
| 8 | Ground |
| 9 | Input |
| 10 | Input RF Return |

| Date code: | Year + week |
|---|---|
| W | 2008 |
| X | 2009 |
| A | 2010 |
| ... | |

## 50 Ohm 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)

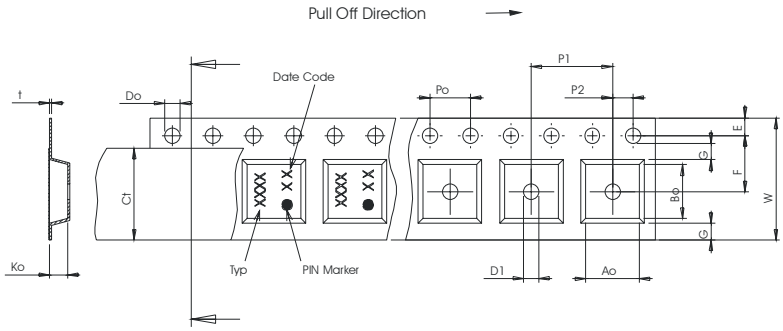
### Packing

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 |

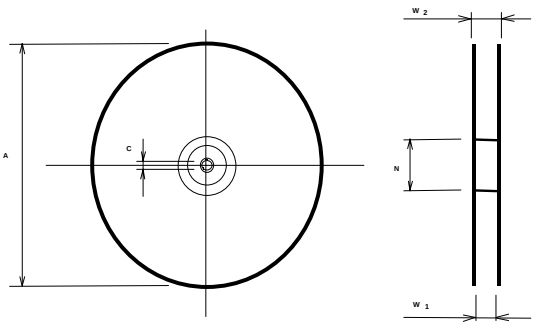
**Tape (all dimensions in mm)**

| | | |
|---|---|---|
| W | : 16,00 | ± 0,3 |
| Po | : 4,00 | ± 0,1 |
| Do | : 1,50 | +0,1/-0 |
| E | : 1,75 | ± 0,1 |
| F | : 7,50 | ± 0,1 |
| G(min) | : 0,60 | |
| P2 | : 2,00 | ± 0,1 |
| P1 | : 8,00 | ± 0,1 |
| D1(min) | : 1,50 | |
| Ao | : 5,50 | ± 0,1 |
| Bo | : 7,50 | ± 0,1 |
| Ct | : 13,5 | ± 0,1 |




**Reel (all dimensions in mm)**

| | | |
|---|---|---|
| A | :330 | |
| W1 | : 16,4 | +2/-0 |
| W2(max) | : 22,4 | |
| N(min) | : 50 | |
| C | : 13,0 | +0,5/-0,2 |




The minimum bending radius is 45 mm.

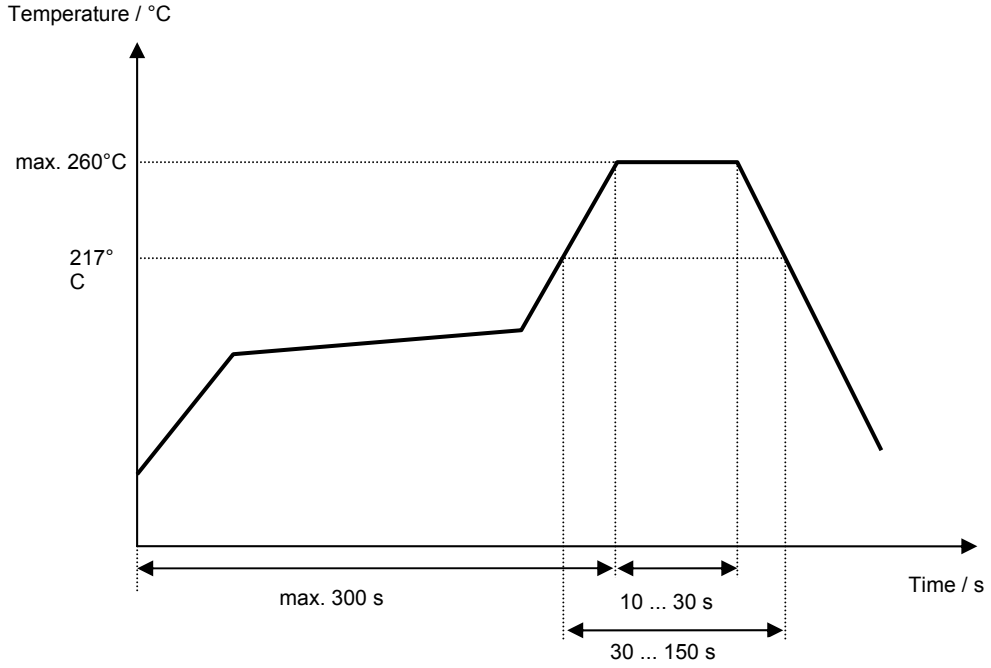
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**Air reflow temperature conditions**

| 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 | - Generation of development specification | Strehl | 21.05.2007 |
| 1.1 | - Change relative attenuation<br>- Add terminating impedance<br>- Add typical values<br>- Add filter characteristics<br>- Add matching ciruit | Alawneh | 18.10.2007 |
| 1.2 | - terminating impedances changed and fixed<br>- change of typical values, filter characteristics and matching configuration | Pfeiffer | 14.02.2008 |

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