

**Vectron International**

**Filter specification**

**TFS 110P**

**Measurement condition**

Ambient temperature: 23 °C  
 Input power level: 0 dBm  
 Terminating impedances at  $f_c$  \*:  
     input: 2.9 kΩ || -6.2 pF  
     output: 2.8 kΩ || -5.5 pF

**Characteristics**

Remark:

Reference level for the relative attenuation  $a_{rel}$  of the TFS 110P 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 reference frequency  $f_c$  is the arithmetic mean value of the upper and lower frequencies at the 30 dB filter attenuation level relative to the insertion loss  $a_e$ .

<b>Data</b>		<b>typ. value</b>	<b>tolerance / limit</b>
<b>Insertion loss</b> (reference level)	$a_e = a_{min}$	8.3 dB	10 dB
<b>Reference frequency</b>	$f_c$ (30 dB-BW)	110.592 MHz	± 60 kHz
<b>Pass band shape</b> (3 dB-BW)		Gaussian	-
3 dB bandwidth	BW	1110 kHz	-
10 dB bandwidth		1695 kHz	-
20 dB bandwidth		2255 kHz	-
30 dB bandwidth		2600 kHz	-
40 dB bandwidth		2820 kHz	-
<b>Relative attenuation</b> $a_{rel}$			
$f_c$	... $f_c + 475$ kHz	2 dB	max. 3 dB
$f_c$	... $f_c - 425$ kHz	2 dB	max. 3 dB
$f_c + 475$ kHz	... $f_c + 800$ kHz	8.5 dB	max. 10 dB
$f_c - 425$ kHz	... $f_c - 800$ kHz	8 dB	max. 10 dB
$f_c + 1200$ kHz	... $f_c + 1375$ kHz	25 dB	min. 20 dB
$f_c - 1210$ kHz	... $f_c - 1395$ kHz	23 dB	min. 20 dB
$f_c + 1375$ kHz	... $f_c + 1500$ kHz	36 dB	min. 30 dB
$f_c - 1395$ kHz	... $f_c - 1535$ kHz	36 dB	min. 30 dB
$f_c + 1500$ kHz	... $f_c + 5$ MHz	43 dB	min. 35 dB
$f_c + 5$ MHz	... $f_c + 10$ MHz	45 dB	min. 30 dB
$f_c - 1535$ kHz	... $f_c - 10$ MHz	42 dB	min. 40 dB
<b>Group delay ripple</b> within $f_c \pm 576$ kHz		250 ns	max. 400 ns
<b>Temperature coefficient of frequency</b> $TC_f$ **		- 0.04 ppm/K <sup>2</sup>	-
<b>Frequency inversion temperature</b> $T_o$		25 °C	
<b>Operating temperature range</b>			- 20 °C ... + 70 °C
<b>Storage temperature range</b>			- 40 °C ... + 85 °C
<b>Input power level</b>		-	max. 10 dBm

\*) 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

\*\*)  $\Delta f(\text{Hz}) = TC_f(\text{ppm/K}^2) \times (T - T_o)^2 \times f_{T0}(\text{MHz})$

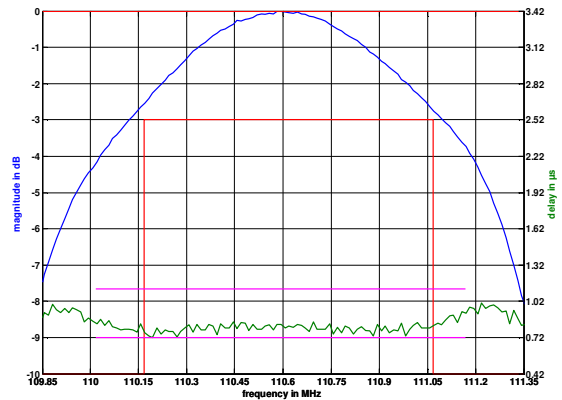
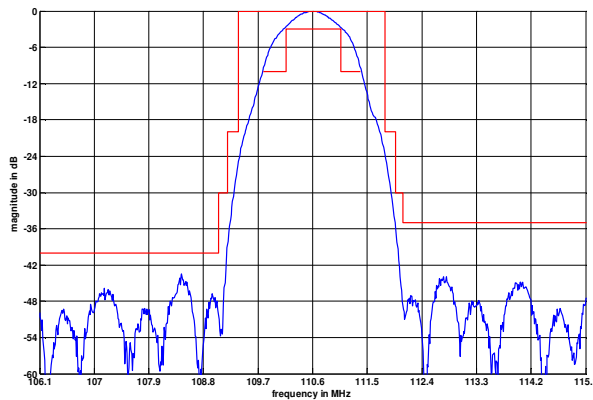
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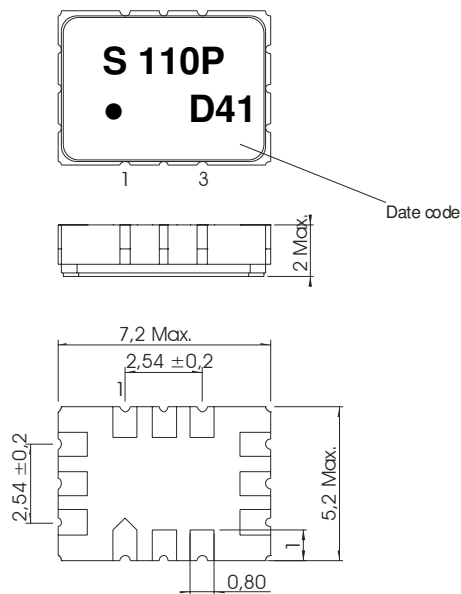
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**Filter characteristic**



**Construction and pin connection**

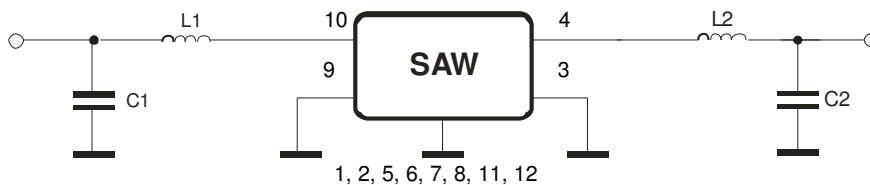
(All dimensions in mm)



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

Date code: Year + week  
 D 2013  
 E 2014  
 F 2015  
 ...

**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 plane, 3 planes;  
DIN IEC 68 T2 - 6
3. Change of temperature: 55 °C to 125°C / 15 min. each / 100 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;
5. ESD ANSI/ESD S20.20-1999, class 1A for HBM

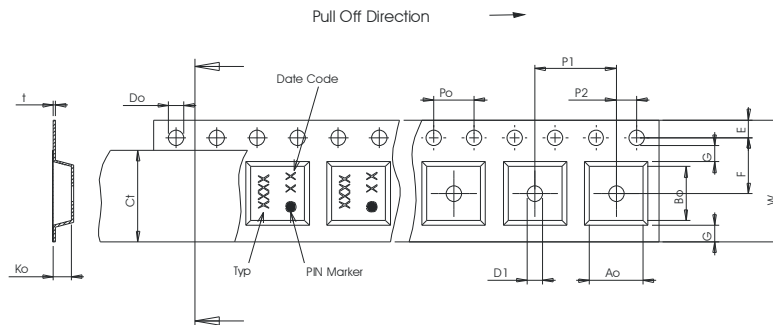
This filter is RoHS compliant (2011/65/EU)

**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 |

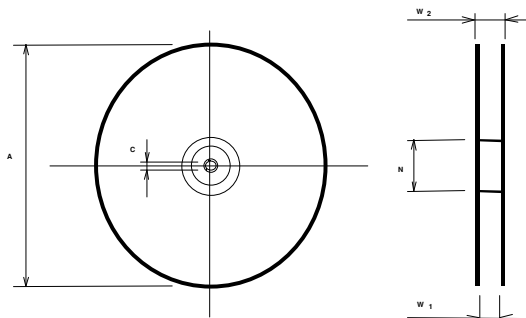
**Tape (all dimensions in mm)**

- 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.

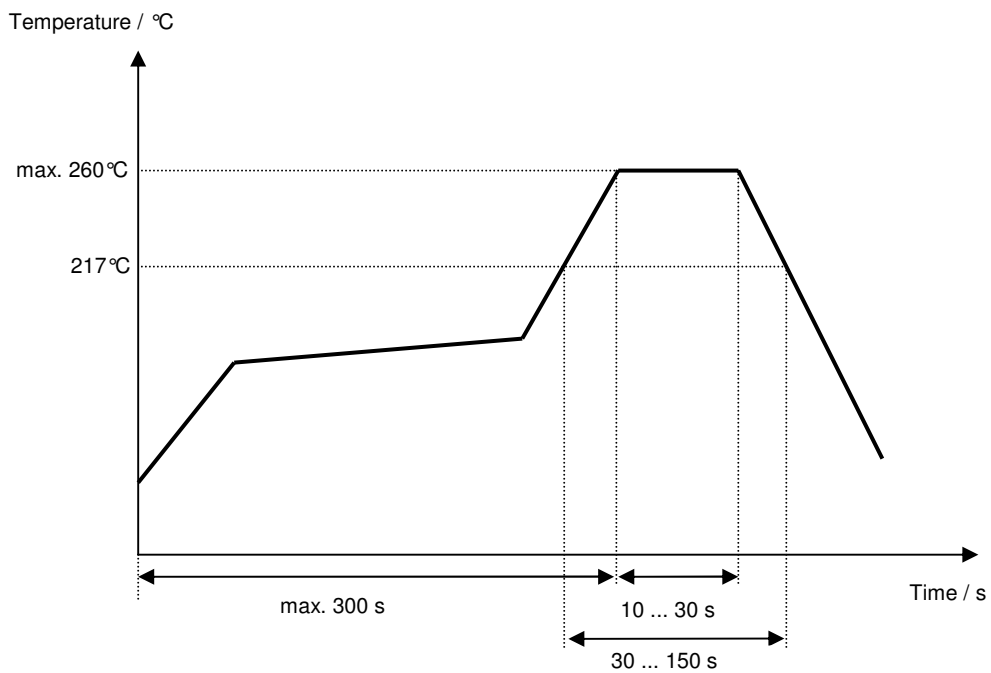
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**Air reflow temperature conditions**

<b>Conditions</b>	<b>Exposure</b>
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**

<b>Version</b>	<b>Reason of Changes</b>	<b>Name</b>	<b>Date</b>
2.2	- history added	Braun	12.05.2003
2.3	- change of operating temperature range - add of filter characteristic - stability characteristics and air reflow temperature conditions modified - typical values corrected and added	Pfeiffer	11.10.2006
3.0	- corrected relative attenuation fc + 800 kHz ... fc + 1200 kHz 8.5dB max. 10dB fc - 800 kHz ... fc - 1210 kHz 8dB max. 10dB fc - 1535 kHz ... fc - 10 MHz 42dB min. 40dB to fc + 475 kHz ... fc + 800 kHz 8.5dB max. 10dB fc - 425 kHz ... fc - 800 kHz 8dB max. 10dB fc - 1535 kHz ... fc - 10 MHz 42dB min. 40dB Updated to new format.	TCUK	19.19.2013

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