

Vectron International**Filter specification****TFS 456H****1/5****Measurement condition**

Ambient temperature:	23	°C
Input power level:	0	dBm
Terminating impedance: *		
Input:	477 Ω -3.9 pF	
Output:	492 Ω -3.4 pF	

Characteristics**Remark:**

The reference level for the relative attenuation a_{rel} of the TFS 456H 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)	$a_e = a_{min}$	9.0	dB	max.	13.0	dB
		-			-	
Nominal frequency	f_N	-			456.0	MHz
Passband		-			$f_N \pm 3.4$	MHz
Pass band ripple		0.6	dB	max.	1.0	dB
Relative attenuation	a_{rel}					
$f_N - 3.4$ MHz ... $f_N + 3.4$ MHz		0.6	dB	max.	1	dB
$f_N - 3.7$ MHz ... $f_N + 3.7$ MHz		1	dB	max.	3	dB
$f_N - 455$ MHz ... $f_N - 200$ MHz		60	dB	min.	30	dB
$f_N - 200$ MHz ... $f_N - 44$ MHz		50	dB	min.	40	dB
$f_N - 44$ MHz ... $f_N - 36$ MHz		52	dB	min.	45	dB
$f_N - 36$ MHz ... $f_N - 6.7$ MHz		45	dB	min.	40	dB
$f_N + 6.7$ MHz ... $f_N + 36$ MHz		44	dB	min.	40	dB
$f_N + 36$ MHz ... $f_N + 44$ MHz		52	dB	min.	45	dB
$f_N + 44$ MHz ... $f_N + 200$ MHz		52	dB	min.	40	dB
$f_N + 200$ MHz ... $f_N + 490$ MHz		60	dB	min.	30	dB
Absolute Group Delay	at f_N	0.65	μ s	max.	0.85	μ s
Group delay ripple		60	ns	max.	250	ns
Return loss within PB		13	dB	min.	10	dB
Input power level		-		max.	15	dBm
Operating temperature range	OTR	-		- 40 °C ... + 85 °C		
Storage temperature range		-		- 45 °C ... + 85 °C		
Temperature coefficient of frequency	TC_f **	-18	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.

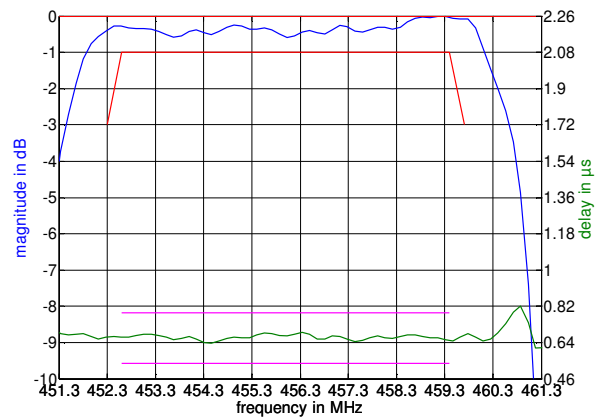
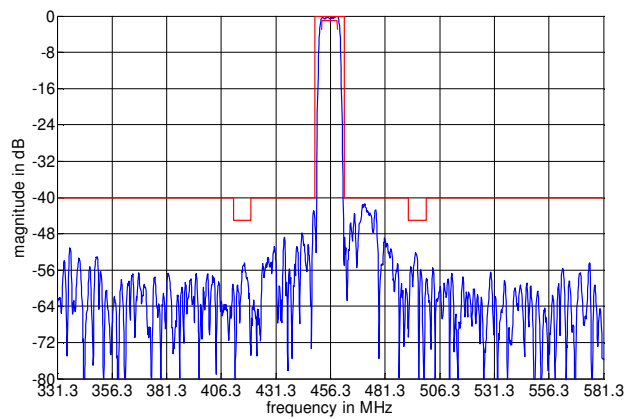
**) $\Delta f(\text{Hz}) = TC_f(\text{ppm/K}) \times (T - T_0) \times f_{cat}(\text{MHz})$.

Generated:**Checked / Approved:**

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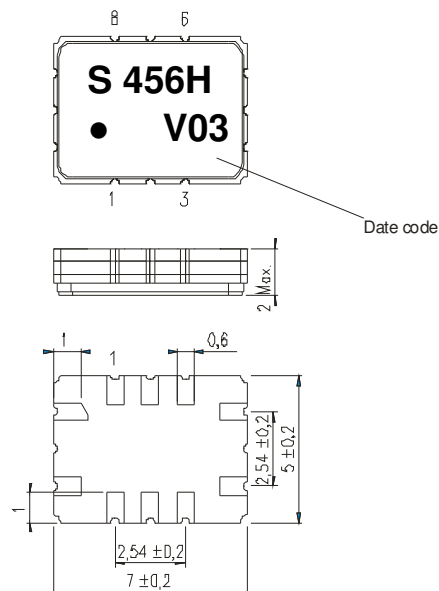
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Filter characteristic



Construction and pin connection

(All dimensions in mm)



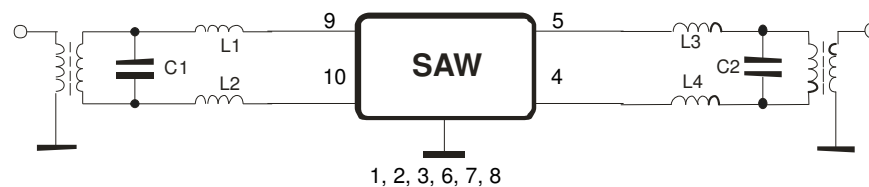
1	Ground
2	Ground
3	Ground
4	Output
5	Output or Output RF Return
6	Ground
7	Ground
8	Ground
9	Input
10	Input or Input RF Return

Date code: Year + week

D	2013
E	2014
F	2015

...

200 Ω Test circuit, balanced



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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)

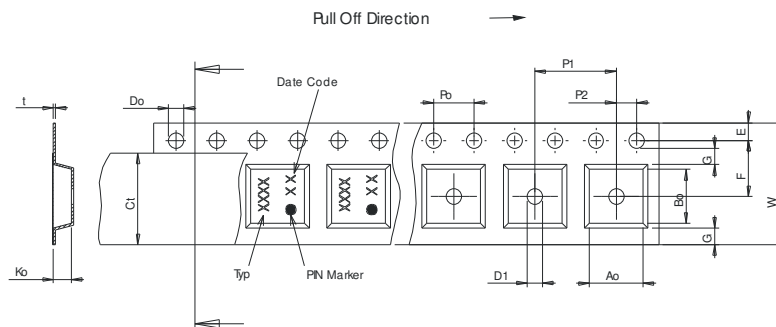
Packing

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;

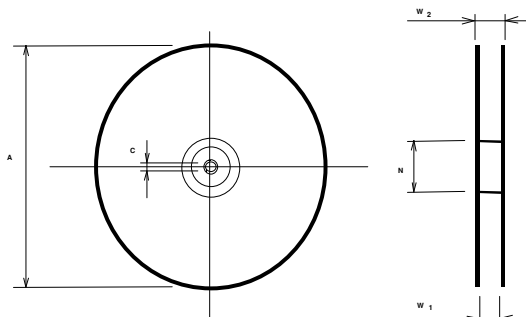
max. pieces of filters per reel:	3000
reel of empty components at start:	min. 300 mm
reel of empty components at start including leader:	min. 500 mm
trailer:	min. 300 mm

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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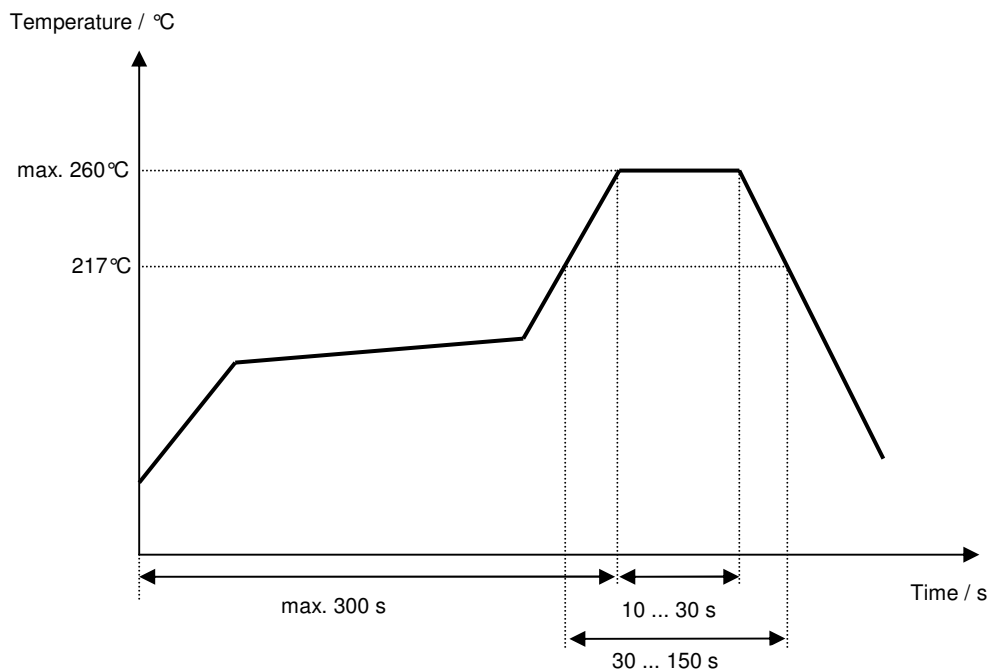
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Air reflow temperature conditions

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

Vectron International**Filter specification****TFS 456H****5/5****History**

Version	Reason of Changes	Name	Date
1.0	- Generation of development specification	Strehl	06.08.2004
1.1	- Change the passband to +/-3.5 MHz from +/-1.7 MHz - Added source and load impedance of 200 Ω - Added maximum input power level 10 dBm	Strehl	12.08.2004
1.2	- changed tolerance scheme according to new customer requirements - changed insertion loss to 13 dB	Martens	30.11.2004
1.3	- typical values added - terminating impedance (preliminary values), filter characteristic and matching configuration added	Pfeiffer	22.12.2004
1.4	- terminating impedance, filter characteristic and matching configuration changed - typical values corrected - stability characteristics concerning shock conditions modified	Pfeiffer	10.02.2005
1.5	- terminating impedance corrected	Pfeiffer	09.09.2005
1.6	- pinning for test circuit corrected - stability characteristics modified	Pfeiffer	16.11.2005
1.7	- matching configuration for single ended applications added	Pfeiffer	14.12.2005
1.8	- change absolute group delay	Alawneh	13.09.2006
1.9.	- matching configuration corrected	Pfeiffer	19.09.2006
1.10	- change input power level	Strehl	08.12.2006
1.11	- add test circuit, single ended	Strehl	15.01.2007
1.12	- removed test circuit, single ended	TCUK	30.07.2013

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