

Microchip**Filter specification****TFS 144****1/5****Measurement condition**

Ambient temperature T_A :	25	°C
Input power level:	0	dBm
Terminating impedance: *		
Input:	1.3 kΩ	-12.9 pF
Output:	1.2 kΩ	-12.1 pF

Characteristics

Remark:

Reference level for the relative attenuation a_{rel} of the TFS 144 is the minimum of the pass band attenuation a_{min} . It 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 1.5 dB filter attenuation level relative to the insertion loss a_e . The nominal frequency f_N is fixed on 144 MHz without tolerance. The given values for the relative attenuation a_{rel} and for the group delay ripple have to be reached at the frequencies given below also 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	12.5 dB	max. 15.0 dB
Nominal frequency	f_N	-	144.15 MHz
Centre frequency	f_C	144.15 MHz	
Passband	PB	-	$f_N \pm 1.1$ MHz
Pass band ripple (p-p)		1.0 dB	max. 1.5 dB
Relative attenuation	a_{rel}		
$f_N \pm 2.0$ MHz ... $f_N \pm 10.0$ MHz		43	min. 40 dB
$f_N \pm 10.0$ MHz ... $f_N \pm 100.0$ MHz		60	min. 35 dB
Return loss within PB		13 dB	
Input power level			max. 10 dBm
Operating temperature range	OTR	-	0 °C ... + 70 °C
Storage temperature range		-	- 55 °C ... + 125 °C
Temperature coefficient of frequency	TC_f ***	-0.036 ppm/K ²	-

*) 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.

***) $\Delta f = TC_f(T - T_0)^2 f_N$

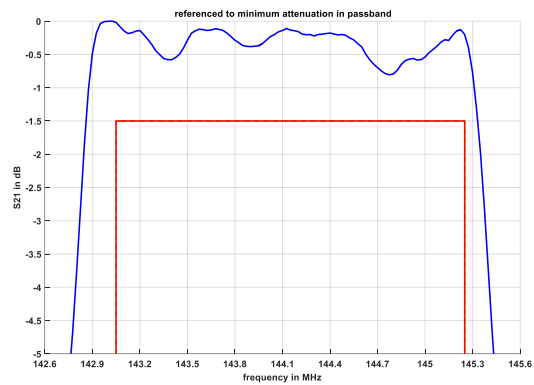
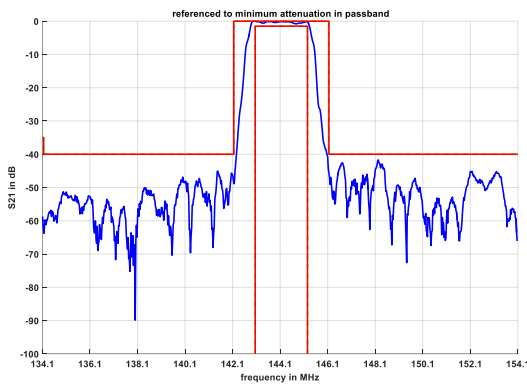
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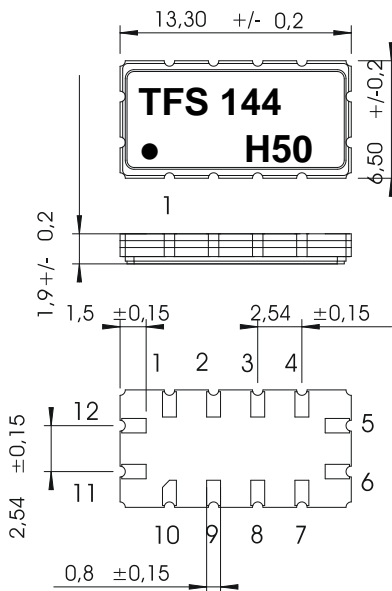
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Filter characteristic



Construction and pin connection

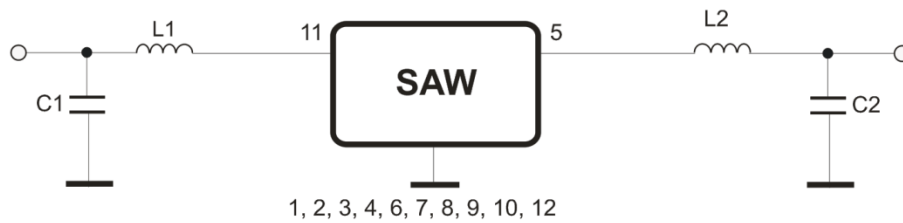
(All dimensions in mm)



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

Date code: Year + week
 H 2016
 J 2017
 K 2018
 ...

50 Ω Test circuit



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Stability characteristics, reliability

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

1. Shock: 500 g, 1 ms, half sine wave, 3 shocks each plane;
DIN IEC 60068 T2 - 27
2. Vibration: 10 Hz to 2000 Hz, 0.35 mm or 5 g respectively, 1 octave per min, 10 cycles per plane, 3 planes; DIN IEC 60068 T2 - 6
3. Change of temperature: -55 °C to 125 °C / 15 min. each / 100 cycles
DIN IEC 60068 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. SAW devices are Electrostatic Discharge (ESD) sensitive devices.

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

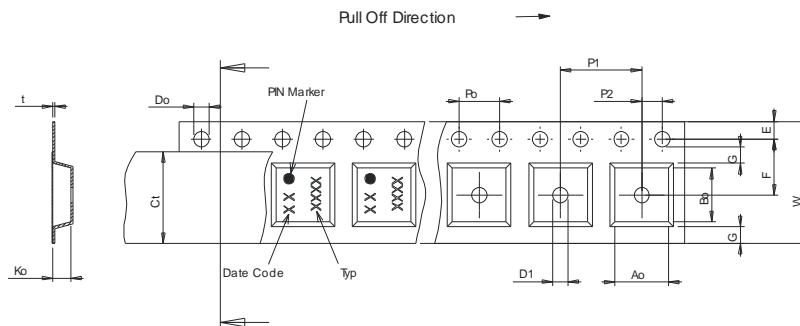
Packing

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:	1700
reel of empty components at start:	min. 300 mm
reel of empty components at start including leader:	min. 500 mm
trailer:	min. 300 mm

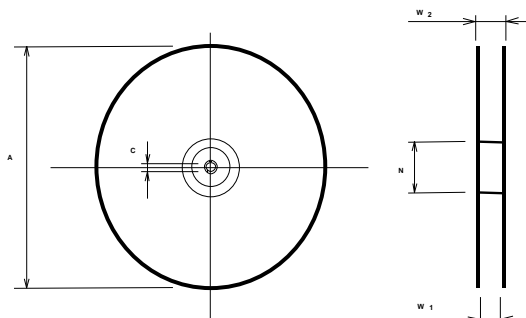
Tape (all dimensions in mm)

- W : 24.00 +0.30/-0.10
- Po : 4.00 ±0.1
- Do : 1.50 +0.1/0
- E : 1.75 ±0.10
- F : 11.50 ±0.10
- G(min) : 0.60
- P2 : 2.00 ±0.1
- P1 : 12.00 ±0.1
- D1(min) : 1.50
- Ao : 7.00 ±0.10
- Bo : 13.80 ±0.10
- Ct : 21.00 ±0.1
- Ko : 2.10 ±0.10
- t : 0.30 ±0.05



Reel (all dimensions in mm)

- A : 330 or 180
- W1 : 24.4 +2/-0
- W2(max) : 30.40
- N(min) : 60.00
- C : 13.0 +0.5/-0.2



The minimum bending radius is 45 mm.

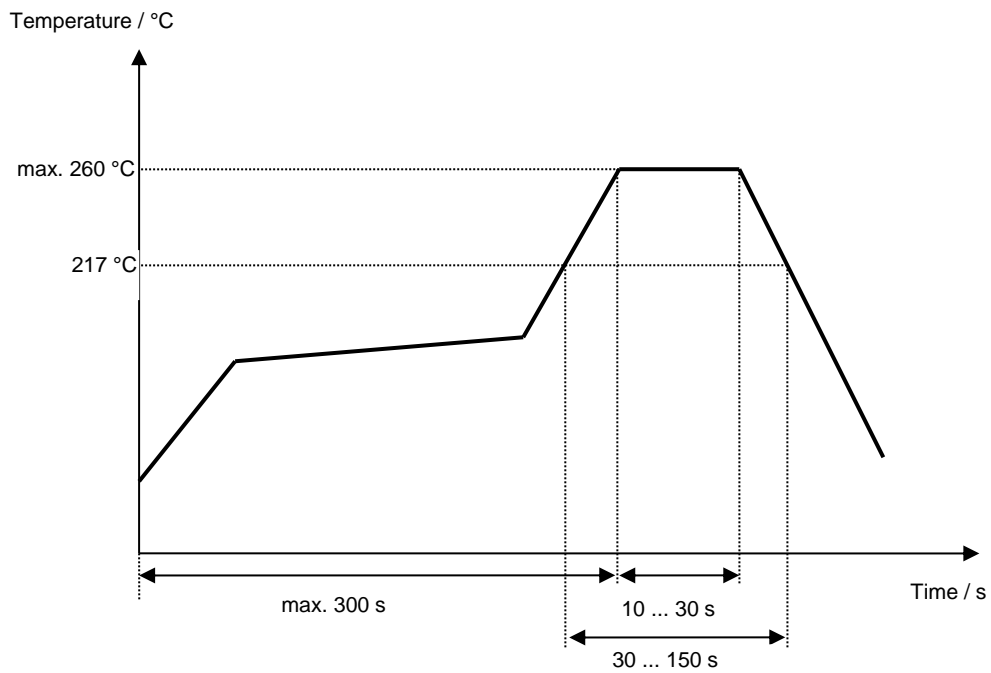
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Air reflow temperature conditions

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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Microchip**Filter specification****TFS 144****5/5****History**

Version	Reason of changes	Name	Date
1.0	- Generation of development specification	Steiner	13.07.2000
2.0	- passband ripple relaxed to 1.5dB	Steiner	27.04.2001
3.0	- terminating impedance and typical values for final samples	Steiner	07.11.2001
3.1	- terminating impedance slightly corrected on final samples	Steiner	16.11.2001
4.0	- Update header and footer sections - Update data section - Update storage temperature range - Update stability characteristics, reliability - Change tape & reel dimensions	Bonnen	16.12.2016

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