Measurement condition

Ambient temperature:	23	°C
Input power level:	0	dBm
Terminating impedance: *		
Input:	614 Ω || -12.2 pF	
Output:	766 Ω || -10.3 pF	

Characteristics

Remark:
The reference level for the relative attenuation a_{rel} of the TFS159B 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 159.4 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.

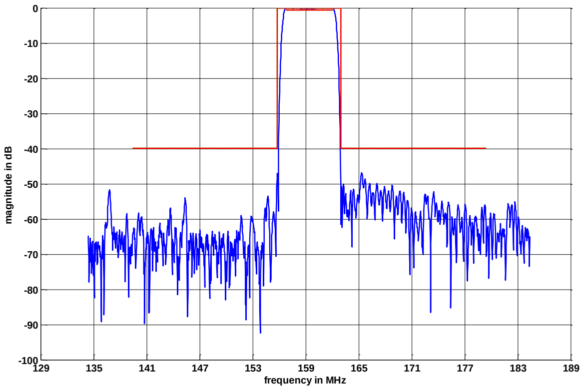
Data			**typ. value**		**tolerance / limit**		
Insertion loss (reference level)	a_e		23	dB	max.	24	dB
Nominal frequency	f_N					159.4	MHz
Passband	PB				f_N ± 2.65	MHz	
Passband 1	PB1 ***				156.775 ± 0.025	MHz	
Passband 2	PB2 ***				156.825 ± 0.025	MHz	
Passband 3	PB3 ***				161.975 ± 0.025	MHz	
Passband 4	PB4 ***				162.025 ± 0.025	MHz	
Amplitude variation (at only 25°C) between PB1, PB2, PB3, PB4			0.24	dB	max.	0.6	dB
Amplitude variation between PB1, PB2, PB3, PB4			0.5	dB	max.	1	dB
Passband ripple within PB1, PB2, PB3, PB4		p-p	0.02	dB	max.	0.2	dB
Relative attenuation	a_{rel}						
f_N … f_N ± 2.65 MHz	(at only 25°C)		0.24	dB	max.	0.6	dB
f_N … f_N ± 2.65 MHz			0.5	dB	max.	1	dB
f_N ± 3.6 MHz … f_N ± 20 MHz			47	dB	min.	40	dB
Phase ripple within PB1, PB2, PB3, PB4			0.1	°	max.	1.5	°
Group delay ripple within PB1, PB2, PB3, PB4			20	ns	max.	100	ns
Return loss within PB			10	dB	min.	4	dB
Input Power			-	dB	max.	20	dBm
Operating temperature range	OTR				- 10 °C ... + 65 °C		
Storage temperature range					- 45 °C ... + 125 °C		
Temperature coefficient of frequency	TC_f **		-0.036	ppm/K^2	-		

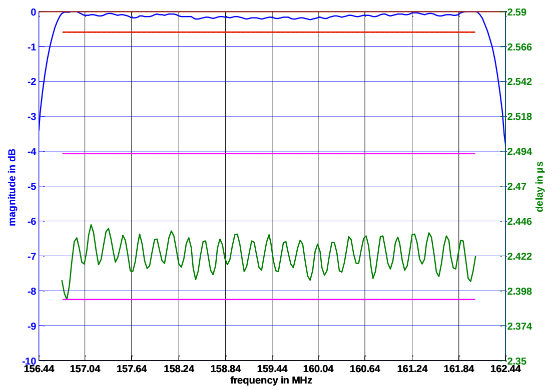
*) The terminating impedances depend on parasites and q-values of matching elements and the board used, and are to be understood as reference values only. Should there be additional questions do not hesitate to ask for an application note or contact our design team.
**) $\Delta f(Hz) = TCf(ppm/K^2) \times (T-T_0)^2 \times f\ T_0\ (MHz)$, where T_0 is typically 25°C.
***) PB1, PB2, PB3, PB4 passbands have been exteded to ±25 kHz, from ±12.5kHz, to allow for doppler shifts.

Generated:

Checked / Approved:

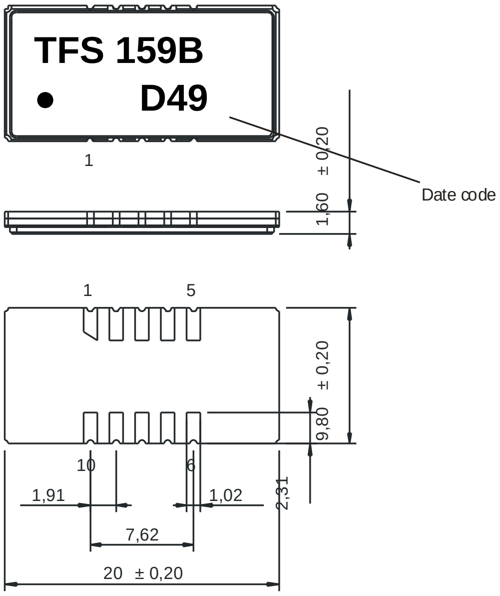
Filter characteristic





Construction and pin connection

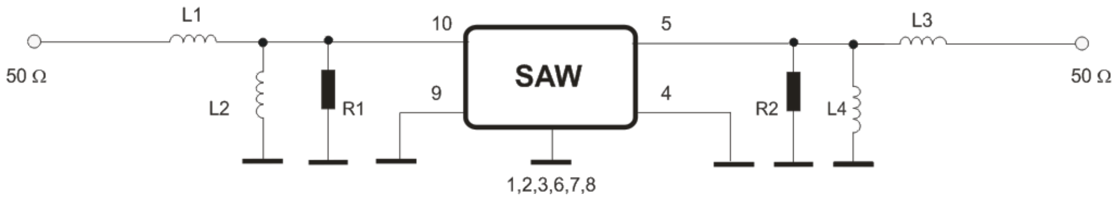
(All dimensions in mm)



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

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

50 Ohm Test circuit



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)

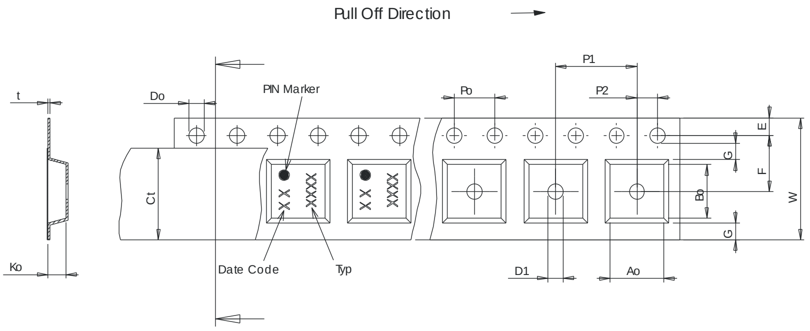
Packing

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

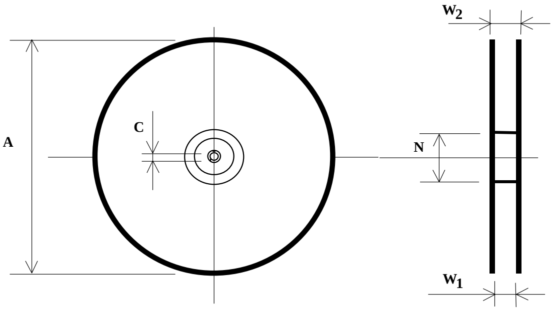
Tape (all dimensions in mm)

W	: 32.00	
Po	: 4.00	± 0.1
Do	: 1.50	+0.1/-0
E	: 1.75	± 0.1
F	: 14.20	± 0.1
G(min)	:	
P2	: 2.00	± 0.1
P1	: 16.00	± 0.1
D1(min)	: 2.00	
Ao	: 10.25	± 0.1
Bo	: 20.45	
Ct	: 25.5	



Reel (all dimensions in mm)

A	:330
W1	: 32.4
W2(max)	: 38.4
N(min)	:100
C	: 13.0

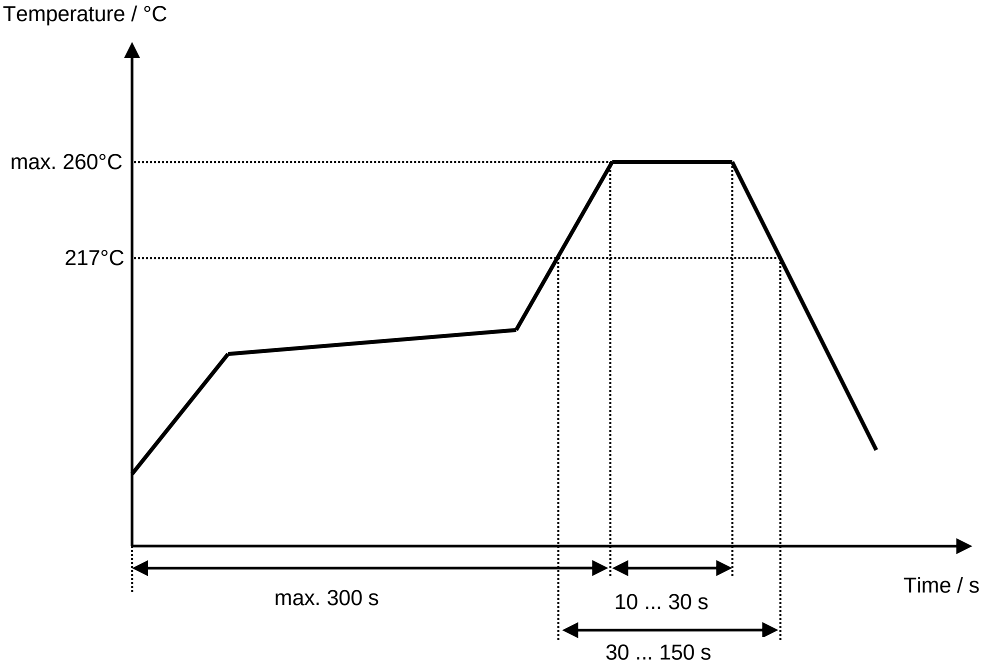


The minimum bending radius is 45 mm.

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



History

Version	Reason of Changes	Name	Date
1.0	- Generation of development specification	TCUK	13.09.2013
1.1	- Add typ values, test circuit uses L-L match and move development to filter specification.	TCUK	18.12.2013