

1. Measurement condition :

Ambient temperature T_A : 23 °C
 Input power level: 0 dBm.
 Terminating impedances at f_C *) :
 for input: 214 Ω || - 13,022 pF.
 for output: 189 Ω || - 13,607 pF.

2. Characteristics :

Remark: Reference level for the relative attenuation a_{rel} of the TFS 140A1 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 3 dB filter attenuation level relative to the insertion loss a_e . The temperature coefficient of frequency Tc_f is valid both for the reference frequency f_C and the frequency response of the filter in the operating temperature range. The frequency shift of the filter in the operating temperature range is not included in the production tolerance scheme

Data	typ. value	tolerance / limit
Insertion loss (Reference level) a_e	23,5 dB	max. 25 dB
Centre frequency f_C at ambient temperature T_A (f_{CAT})	140,01 MHz	140 \pm 0,10 MHz
Pass band at ambient temperature T_A :		$f_C - 1,55$ MHz..... $f_C + 1,55$ MHz
Amplitude ripple (p-p): f_C ... $f_C \pm 1,35$ MHz $f_C \pm 1,35$ MHz $f_C \pm 1,42$ MHz	0,5 dB 0,7 dB	
Bandwidth at ambient temperature:		
1,0 dB - band width	2,88 MHz	
3 dB - band width	3,15 MHz	min. 3,0 MHz
20 dB - band width	3,83 MHz	
40 dB - band width	4,20 MHz	max. 4,4 MHz
45 dB - band width	4,24 MHz	max. 5,0 MHz
Relative attenuation a_{rel}		
f_C	$f_C \pm 1,5$ MHz	-
$f_C \pm 2,2$ MHz	$f_C \pm 2,5$ MHz	max. 3 dB
$f_C \pm 2,5$ MHz	$f_C \pm 40$ MHz	min. 40 dB
		min. 45 dB
Group delay (mean value in pass band):	2,49 μ s	max. 2,5 μ s
Group delay ripple in pass band (p-p):	65 ns	max. 100 ns
Deviation from linear phase in pass band (p-p):	3,5 ° (r.m.s. 1,4°)	max. 10°
S11 in PB :	8 dB	
S22 in PB :	8 dB	
Triple transit attenuation compared to main signal	52 dB	min. 40 dB
Crosstalk	55 dB	
Substrate material	Quartz	
Frequency inversion temperature (T_o)	25° C	
Temperature coefficient of frequency (Tc_f)	-0,045 ppm/K ²	
Frequency deviation of f_C over temperature: **)	$\Delta f_C(\text{Hz}) = Tc_f(\text{ppm/K}) \times (T - T_o)^2 \times f_{T_o}(\text{MHz})$	
Operating temperature range		0 °C ... + 70 °C
Storage temperature range		- 40 °C ... + 85 °C

*) 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.

**) f_{T_o} is reference frequency f_C at frequency inversion temperature (T_o)

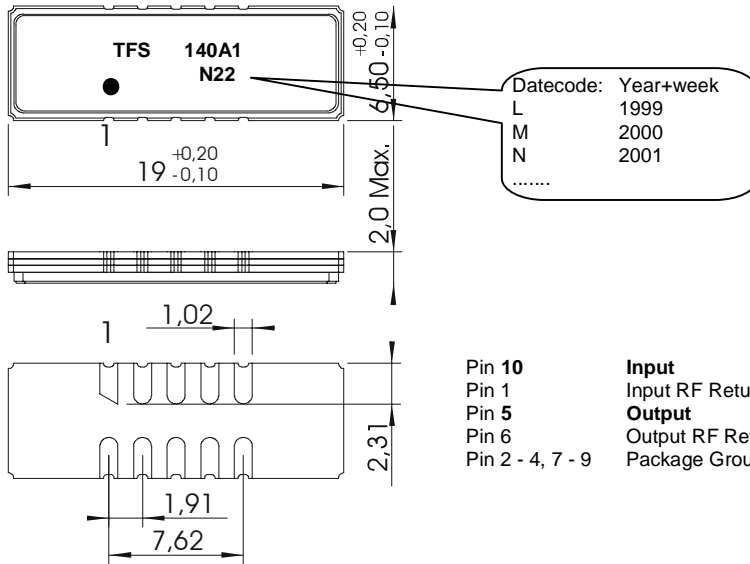
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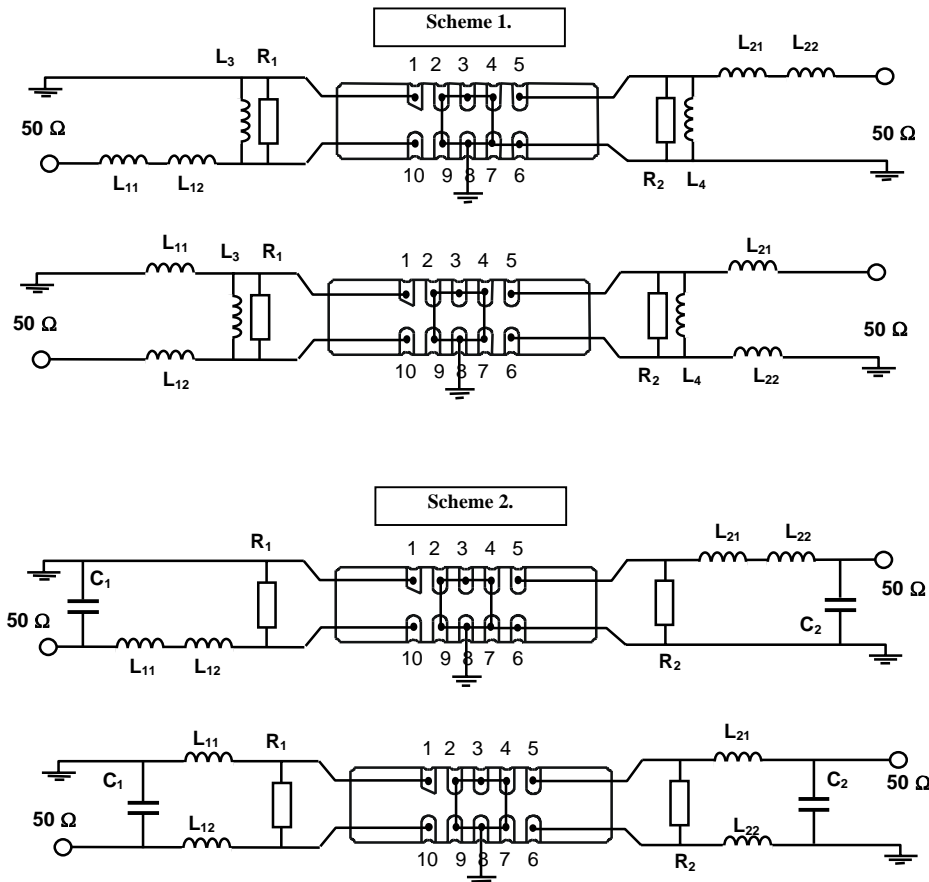
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3. Package : (all dimensions in mm)



4. 50 Ω matching network (see Application Note) :



For final test we use scheme 1.

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5. Stability characteristics :

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

1. Shock: 500g, 18 ms, half sine wave, 3 shocks each plane;
DIN IEC 68 T2 - 27
2. Vibration: 10 Hz to 500 Hz, 0,35 mm or 5g respectively, 1 octave per min, 10 cycles per plan, 3 plans;
DIN IEC 68 T2 - 6
3. Change of temperature: -55 °C to 125°C / 30 min. each / 10 cycles
DIN IEC 68 part 2 – 14 Test N
4. Resistance to solder heat (reflow): max. 2 times reflow process;
for temperature conditions refer to the attached "Air reflow temperature conditions" on page 4;

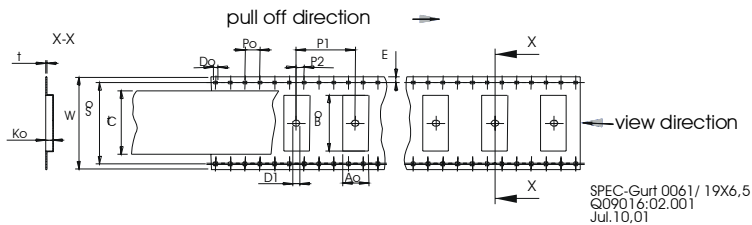
6. Packing :

Tape & Reel: DIN 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;

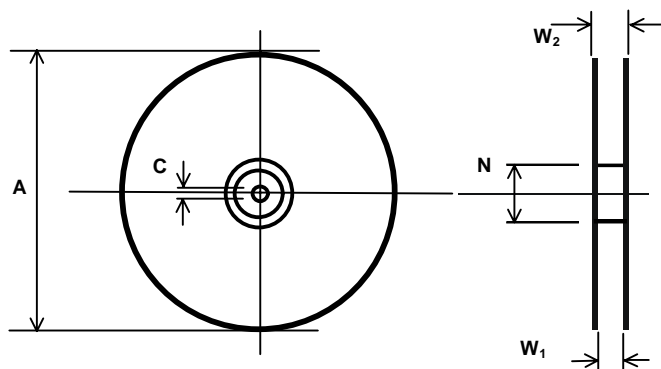
max. pieces of filters per reel:	2000
reel of empty components at start:	min 300 mm
reel of empty components at start including leader:	min 500 mm
Trailer	min 300 mm

Tape (all dimensions in mm)

W	:	32	± 0,3
Po	:	4	± 0,1
Do	:	1,5	+ 0,1
E	:	1,75	± 0,1
So	:	28,4	± 0,1
F	:	14,2	± 0,1
G (min)	:	0,6	
P2	:	2	± 0,1
P1	:	12	± 0,1
D1(min)	:	2,0	
Ao	:	7,1	± 0,1
Bo	:	19,6	± 0,1
Ko	:	2,0	± 0,1
t	:	0,35	± 0,35
Ct	:	25,5	± 0,1

**Reel (all dimensions in mm):**

A	:	330
W1	:	32,4 + 2
W2(max)	:	38,4
N(min)	:	100
C	:	13 ± 0,5 / - 0,2



The minimum bending radius is 45 mm. The mounting surface of the filters faces the bottom side of the embossed carrier tape. The marking of the filters is able to read if the view is directed on the upper side of the carrier tape in the above shown direction.

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7. Air reflow temperature conditions :

1st and 2nd air reflow profile

Name:	pre-heating periods	main-heating periods	peak temperature
Temperature:	150 °C - 170 °C	over 200 °C	255 °C ± 5 °C
Time:	60 sec. - 90 sec.	20 sec. - 25 sec.	

Air reflow profile

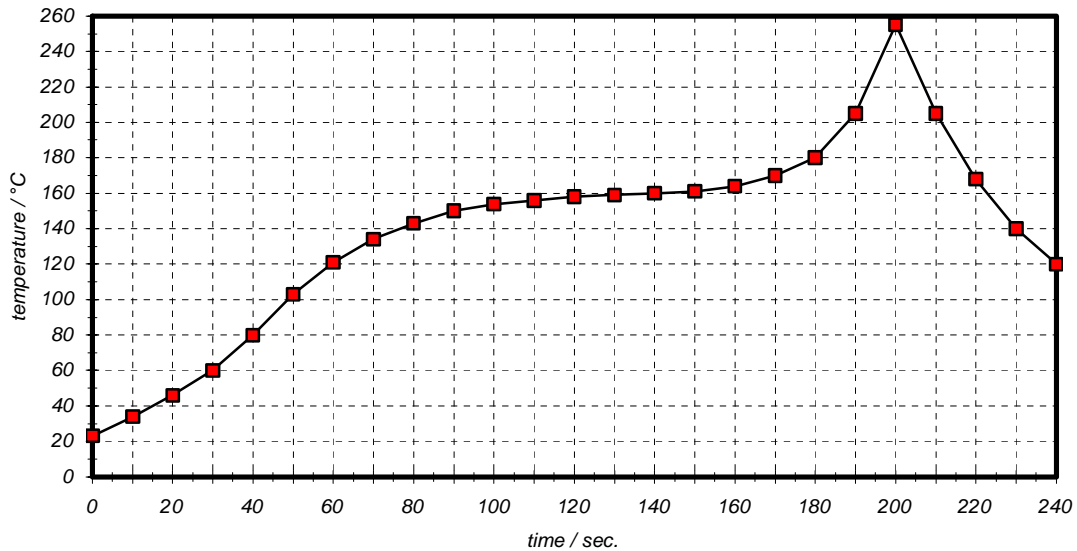


Table for temperature vs. time during the air reflow process

Tolerance of temperatures: ± 5 °C

time / sec.	temperature / °C	time / sec.	temperature / °C
0	23	140	160
10	34	150	161
20	46	160	164
30	60	170	170
40	80	180	180
50	103	190	205
60	121	195	230
70	134	200	255
80	143	205	230
90	150	210	205
100	154	215	180
110	156	220	165
120	158	230	140
130	159	240	120

History :

Version	Reason of changes	Name	Date
1.0	Generate specification according to customer requirements.	Dunzow W.	15.05.2000
1.1	Add theoretical matching network scheme. Change filter name from TFS 140A11 to TFS 140A1. Change input and output pin positions according to customer requirements.	Dunzow W.	31.05.2000
1.2	Correct errors in matching network scheme.	Dunzow W.	05.06.2000
1.3	Change limit value ILo : from ILo = max. 19 dB to ILo = max. 20 dB. Correct wrong unit for limit value of TTS (ns → dB). Add VSWR according to customer requirement.	Dunzow W.	22.06.2000
1.4	Edit typical values after measured. Edit termination impedances .	Dunzow W.	18.07.2000
1.5	correct " 5. Stability characteristics ". add one modified matching networks. change limit lines and tolerance for centre frequency.	Dunzow W.	25.10.2001
1.6	change limit value of the group delay ripple : from max.200 ns to max.100 ns according to customer requirements. change termination impedances and insertion loss . change specification name (from 140A1 to 140A2) delete limits value for VSWR.	Dunzow W.	14.11.2001