1. Measurement condition :

Ambient temperature T_A:	23 °C		
Input power level:	0 dBm		
Terminating impedances at f_C *) :	for input:	48 Ω | -21,5 pF.	(typical value)
	for output:	48 Ω | -21,5 pF.	(typical value)

2. Characteristics :

Remark:
Reference level for the relative attenuation a_{rel} of the **TFS173A** 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 (f_{3dB+}) and lower (f_{3dB-}) 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	26,5	dB	max.	28	dB
Reference frequency f_C at ambient temperature (f_{CTA})	174,175	MHz	174,050 ... 174, 300		MHz
Pass band (PB) in O.T.R. :			min.	(BW_3 - 0,35)	MHz
Amplitude ripple in PB (p-p)	1,1...1,2	dB	max.	1,5	dB
Bandwidth :					
3 dB - band width **(BW_3) in O.T.R. :**				34,95 ± 0,175	MHz
1,5 dB - band width at ambient temperature T_A .	34,850	MHz			
3 dB - band width at ambient temperature T_A .	34,960	MHz		34,95 ± 0,050	MHz
22 dB - band width at ambient temperature T_A .	35,620	MHz			
24 dB - band width at ambient temperature T_A .	35,660	MHz			
Relative attenuation in O.T.R. : a_{rel}					
f_{3dB-} + 0,1 MHz ... f_{3dB+} - 0,1 MHz	1,2	dB	max.	1,5	dB
f_{3dB+} + 0,4 MHz ... f_{3dB+} + 0,6 MHz	25	dB	min.	22	dB
f_{3dB-} - 0,6 MHz ... f_{3dB-} - 0,4 MHz	25	dB	min.	22	dB
f_{3dB+} + 0,6 MHz ... f_{3dB+} + 1,0 MHz	27	dB	min.	24	dB
f_{3dB-} - 1,0 MHz ... f_{3dB-} - 0,6 MHz	27	dB	min.	24	dB
f_{3dB+} + 1,0 MHz ... f_{3dB+} + 1,3 MHz	33	dB	min.	30	dB
f_{3dB-} - 1,3 MHz ... f_{3dB-} - 1,0 MHz	33	dB	min.	30	dB
f_{3dB+} + 1,3 MHz ... f_{3dB+} + 5,0 MHz	40	dB	min.	35	dB
f_{3dB-} - 5,0 MHz ... f_{3dB-} - 1,3 MHz	40	dB	min.	35	dB
f_{3dB+} + 5,0 MHz ... f_{3dB+} + 100 MHz	50...55	dB	min.	45	dB
f_{3dB-} - 100 MHz ... f_{3dB-} - 5,0 MHz	50...60	dB	min.	45	dB
Group delay (mean value in PB):	2,15	µs	max.	3	µs
Group delay ripple in PB (p-p):	50	ns	max.	120	ns
Deviation from linear phase in PB :	12° p-p...(2° r.m.s.)				
Triple transit attenuation compared to main signal	60	dB			
Crosstalk	60	dB			
Temperature coefficient of frequency (Tc_f) [$LiNbO_3$]	- 87	ppm/K		- 94	ppm/K
Frequency deviation of f_C over temperature	$\Delta f_C(Hz) = Tc_f(ppm/K) \times (T - T_A) \times f_{CTA}$ (MHz)				
Operating temperature range (O.T.R.)			- 10 °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.

Generated: **Dunzow W.**

Checked/Approved: **Dr. Bert Wall**

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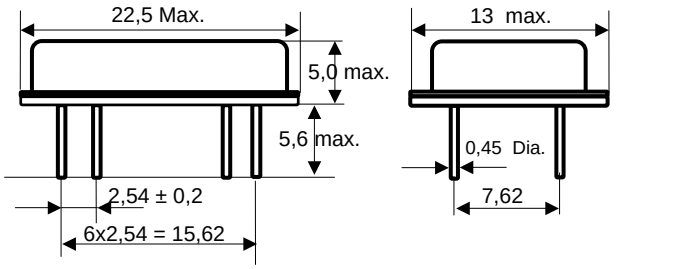
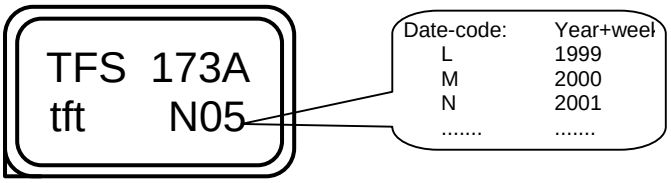
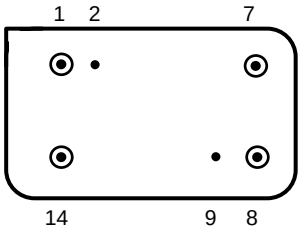
3. Package and pin connection : (All dimensions in mm)

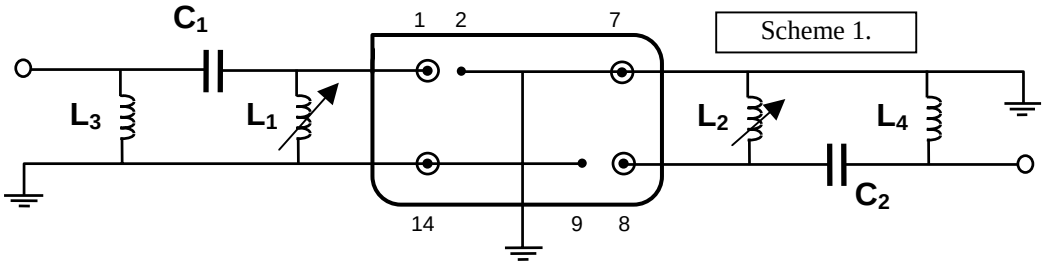






Pin **1**	**Input**
Pin 14	Input RF Return
Pin **8**	**Output**
Pin 7	Output RF Return
Pin 2, 9	Package Ground

4. 50 Ω - Matching network (about matching element values see Application Note):



For final test we use scheme 1 (with variable coils L_1 and L_2.)

Influence of inductors L_1 and L_2 on filter slope is stronger , as of L_3 and L_4 (please, refer to Application Note).
For this reason, it is possible to match the filter to minimum slope changing L_3 and L_4 using fixed E12 series inductor values (SMD-elements) for L_1 to L_4 .
If you use variable coils, then it is better to use scheme 1 with variable coils L_1 and L_2 ,

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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;

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6. 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

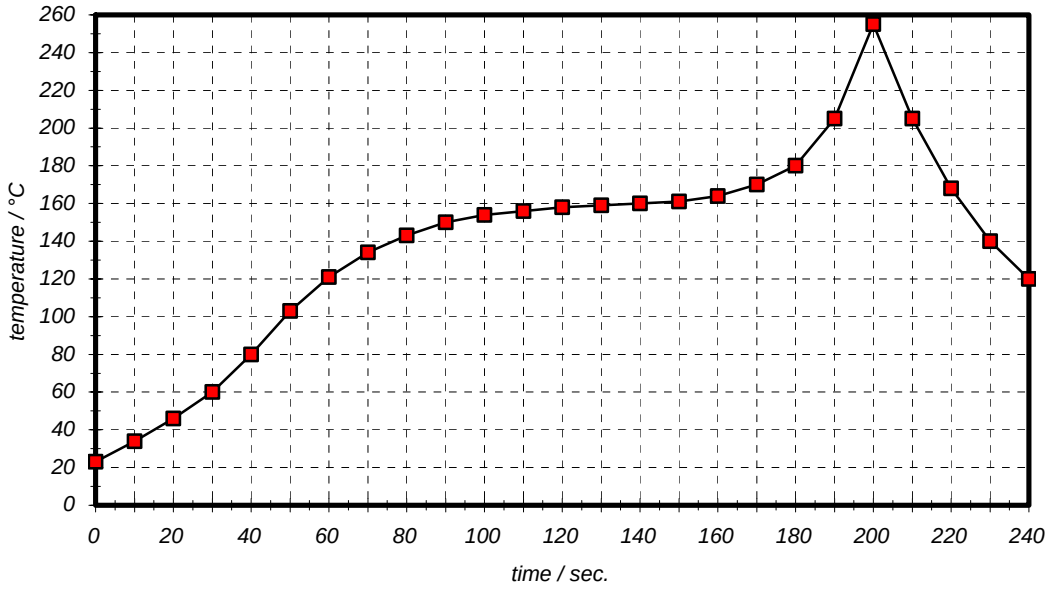

Table for temperature vs. time during the air reflow process

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

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7. History :

Version	Reason of Changes	Name	Date
1.0	Generate preliminary development specification according to customer requirements.	Dunzow W.	15.02.2001
1.1	- change band widths ; - change centre frequency ; - change definition of centre frequency ; - change filter name .	Dunzow W.	02.03.2001
1.2	- add amplitude ripple in PB (p-p) : max. 1 dB; - change frequencies of selection tolerances : from $\mathbf{f}_{3dB\pm}$ ± 1,325 MHz to $\mathbf{f}_{3dB\pm}$ ± 1,3 MHz and from $\mathbf{f}_{3dB\pm}$ ± 5,325 MHz to $\mathbf{f}_{3dB\pm}$ ± 5,0 MHz	Dunzow W.	05.03.2001
1.3	- change amplitude ripple in PB (p-p) : from max. 1 dB to max. 1,5 dB; - change configuration of matching network ; - add typical values of measured termination impedances; - add typical values of filter ; - change selection tolerances : in $\mathbf{f}_{3dB\pm}$ + 1,0 MHz ... $\mathbf{f}_{3dB\pm}$ + 1,3 MHz from min. 30 dB to min. 28 dB; in $\mathbf{f}_{3dB\pm}$ + 1,3 MHz ... $\mathbf{f}_{3dB\pm}$ + 2,0 MHz from min. 35 dB to min. 28 dB; in $\mathbf{f}_{3dB\pm}$ + 2,0 MHz ... $\mathbf{f}_{3dB\pm}$ + 5,0 MHz from min. 35 dB to min. 34 dB; in $\mathbf{f}_{3dB\pm}$ + 5,0 MHz ... $\mathbf{f}_{3dB\pm}$ +17,5 MHz from min. 45 dB to min. 35 dB; in $\mathbf{f}_{3dB\pm}$ - 17,5 MHz ... $\mathbf{f}_{3dB\pm}$ - 5,0 MHz from min. 45 dB to min. 42 dB; in $\mathbf{f}_{3dB\pm}$ - 5,0 MHz ... $\mathbf{f}_{3dB\pm}$ - 2,0 MHz from min. 35 dB to min. 34 dB; in $\mathbf{f}_{3dB\pm}$ - 2,0 MHz ... $\mathbf{f}_{3dB\pm}$ - 1,3 MHz from min. 35 dB to min. 29 dB; in $\mathbf{f}_{3dB\pm}$ - 1,3 MHz ... $\mathbf{f}_{3dB\pm}$ - 1,0 MHz from min. 30 dB to min. 29 dB;	Dunzow W.	06.06.2001
1.4	- add typical values of band widths at ambient temperature ; - add Stability characteristics ; - write limit lines as in Filter Spec. version 1.2 ; - change ILo : from max. 30 dB to max. 28 dB ; - change group delay ripple : from max. 180 ns to max. 120 ns ; - change tolerance for centre frequency at ambient temperature : from ± 100 kHz to ± 150 kHz.	Dunzow W.	18.07.2001
1.5	- correct typical values of band widths at ambient temperature ; - add commentary about matching networks. - change (reduce) tolerance for centre frequency : from 174,20 ± 0,15 MHz (174,05...174,35 MHz) to 174,05...174,30 MHz. - change point 3 in “Stability characteristics”.	Dunzow W.	01.08.2001

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