1. Measurement condition :

Ambient temperature T_A: 45 °C
Input power level: 0 dBm
Terminating impedances in f_C : for input: 50 Ω | 0 pF.
for output: 50 Ω | 0 pF.

2. Characteristics :

Remark: Reference level for the relative attenuation a_{rel} of the **TFS 140 M** 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 centre frequency f_C is the arithmetic mean value of the upper and lower frequencies at the 6 **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.

Data		**typ. value**	**tolerance / limit**
Insertion loss : (Reference level)	a_e	28,5 dB	max. 30,5 dB
Centre frequency at ambient temperature :	f_C	140,00 MHz	140,00 ± 0,25 MHz
Centre frequency at room temperature T=23°C:		140,23 MHz	140,23 ± 0,25 MHz
Pass band : (see theoretical [1] frequency response)	PB		
Pass band tilt :		0,0 dB	max. 0,01 dB/MHz
Deviation from theoretical frequency response [1] (p-p) :	$\Delta\alpha$		
f_C .... $f_C \pm f_Y$		± 0,15 dB	± max. 0,4 dB
Deviation from theoretical phase response [2] (p-p):	$\Delta\varphi$		
f_C .... $f_C \pm f_Y$		± 1 °	± max. 2 degree
Relative attenuation at ambient temperature :	a_{rel}		
$f_C \pm$ 18 MHz .... $f_C \pm$ 100 MHz		50 dB	min. 40 dB
Group delay at f_C :	τ_C	1,467 µs	
Reflected attenuation compared to main signal		60 dB	min. 45 dB
Crosstalk attenuation compared to main signal		60 dB	min. 45 dB
Nyquist frequency	f_Y	13,805 MHz	
Roll-off factor	a	0,25	
Partitioning factor	p	0,5	
Phase coefficients :	p_3 = 0,009987	p_5 = 0,6524	p_7 = - 0,6715
	p_9 = 0,3920	p_{11} = - 0,110	p_{13} = 0,01421 p_{15} = - 0,0006794
Input power level	-		max. 15 dBm
Temperature coefficient of frequency :	Tc_f	- 75 ppm / K	
Frequency deviation of f_C over temperature :		Δf_C(Hz) = Tc_f(ppm/K) x (T - T_A) x f_C (MHz)	
Operating temperature range (OgTR) :			+ 45 °C
Operable temperature range (OTR) :			- 40 °C ... + 85 °C
Storage temperature range (STR) :			- 40 °C ... + 85 °C

[1] Theoretical frequency response :

$$H(x) = (S(x))^p; \quad \text{where} \quad x = \frac{f - f_C}{f_Y}$$

$$S(x) = \begin{cases} 1, & \text{for} \quad |x| \le (1 - a) \\ \frac{1}{2} + \frac{1}{2}\cos\left(\frac{\pi\,(|x| - 1 + a)}{2a}\right), & \text{for} \quad (1 - a) \le |x| \le (1 + a), \\ 0 & \text{for} \quad (1 + a) \le |x| \end{cases}$$

[2] Theoretical phase response :

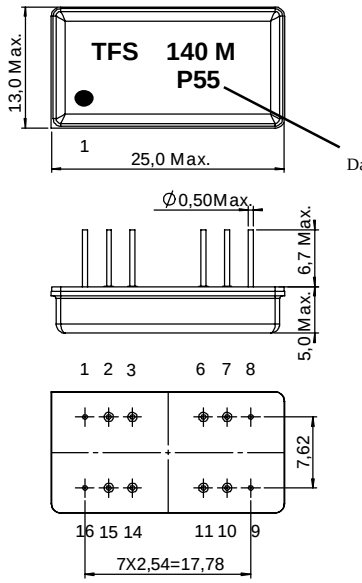
$$Ph(y) = [\,p_3 y^3 + p_5 y^5 + p_7 y^7 + p_9 y^9 + p_{11} y^{11} + p_{13} y^{13} + p_{15} y^{15}\,](\frac{180}{\pi})\ [\text{deg}] \qquad \text{where} \quad y = \frac{f - f_C}{10}[MHz\,]$$

Generated: **W. Dunzow**

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

VI TELEFILTER
Potsdamer Straße 18
D 14 513 TELTOW / Germany
Tel: (+49) 3328 4784-0 / Fax: (+49) 3328 4784-30
E-Mail: tft@telefilter.com

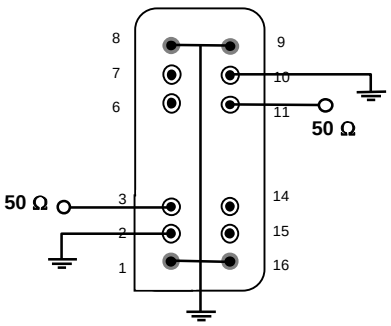
3. Construction and pin connection : (All dimensions in mm) pin grid 2,54 mm



Date-code:	Year+week
M	2000
N	2001
P	2002
...	...

Pin **3**	**input**
Pin 2	input RF Return
Pin **11**	**output**
Pin 10	output RF Return
Pin 1, 8, 9, 16	package ground
Pin 6, 7, 14, 15	not connected

4. 50 Ω - Matching network :



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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):	reflow possible: twice max.; for temperature conditions refer to the attached "Air reflow temperature conditions" on page 4;

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6. Soldering temperature conditions :

1st and 2nd soldering temperature 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.	

Soldering temperature profile

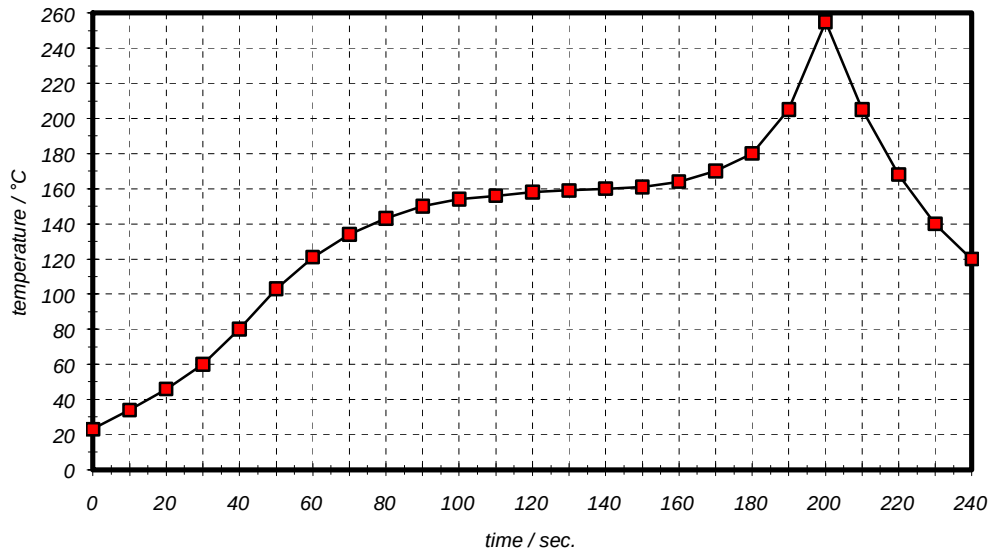

Table for temperature vs. time during the soldering process

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	Generation of development specification according to customer requirements.	Dunzow W.	06.11.2001
1.1	Correct theoretical phase response according to customer requirements.	Dunzow W.	13.11.2001
1.2	Generate filter specification. Add typical measured values.	Dunzow W.	28.05.2002
1.3	Package drawing correction.	Dunzow W.	28.06.2002

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