

Vectron International**Filter specification****TFH70E****1/5****Measurement condition**

Ambient temperature:	23	°C
Input power level:	0	dBm
Terminating impedance: *		
Input:	1287 Ω -6.97 pF	
Output:	1227 Ω -7.18 pF	

Characteristics:

Remark: Reference level for the relative attenuation a_{rel} of the **TFH 70E** 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 nominal frequency f_N is fixed at **70.0 MHz** without tolerance. The temperature coefficient of frequency T_{cf} 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 included in the production tolerance scheme.

D a t a		typ. value		tolerance / limit		
Insertion loss (Reference level)	a_e	25	dB	max.	27	dB
Nominal frequency	f_N				70	MHz
Centre frequency at ambient temperature T_A : f_c		70.01	MHz		70.0 ± 0.09	MHz
Pass band at ambient temperature T_A :	PB				$f_N \dots f_N \pm 1.5$	MHz
Amplitude ripple in O.T.R. (p-p) in:	$f_N \dots f_N \pm 1.4$ MHz	0.5	dB	max.	0.8	dB
Bandwidth in O.T.R. :						
0,8 dB		3.19	MHz	min.	2.8	MHz
1 dB		3.22	MHz	min.	3.0	MHz
3 dB		3.61	MHz	min.	3.5	MHz
20 dB		4.66	MHz			
40 dB		5.21	MHz	max.	5.6	MHz
45 dB		5.31	MHz			
Relative attenuation	a_{rel}					
$f_N \dots f_N \pm 1,4$ MHz		0.5	dB	max.	0.8	dB
$f_N \pm 1,4$ MHz ... $f_N \pm 1,5$ MHz		0.7	dB	max.	1	dB
$f_N \pm 1,5$ MHz ... $f_N \pm 1,75$ MHz		2.5	dB	max.	3	dB
$f_N \pm 2,8$ MHz ... $f_N \pm 5,0$ MHz		44...53	dB	min.	40	dB
$f_N \pm 5,0$ MHz ... $f_N \pm 20$ MHz		53...65	dB	min.	50	dB
$f_N - 65$ MHz ... $f_N - 20$ MHz		75...65	dB		-	
$f_N + 35$ MHz ... $f_N + 63$ MHz		42...45	dB		-	
$f_N + 63$ MHz ... $f_N + 200$ MHz		65...70	dB		-	
Group delay (mean value in PB):		2.76	μ s		-	
Group delay ripple in PB (p-p):		45	ns	max.	100	ns
Deviation from linear phase in PB band (p-p):		2.6° (r.m.s. 0.6°)		max.	6	°
(S11) / (S22) in PB:		3 / 3	dB		-	
Triple transit attenuation compared to main signal		59	dB		-	
Crosstalk		52	dB		-	
Frequency inversion temperature (T_o)		30	°C		-	
Temperature coefficient of frequency (T_{cf})		-0.045	ppm/K ²		-	
Frequency deviation of f_c over temperature: **)	$\Delta f_c(\text{Hz}) = T_{cf}(\text{ppm/K}) \times (T - T_o)^2 \times f_{fo}(\text{MHz})$				-	
Operating temperature range (O.T.R.)		-			0 °C ... + 70 °C	
Storage temperature range		-			-40 °C ... + 85 °C	

*) The terminating impedances and insertion loss 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.

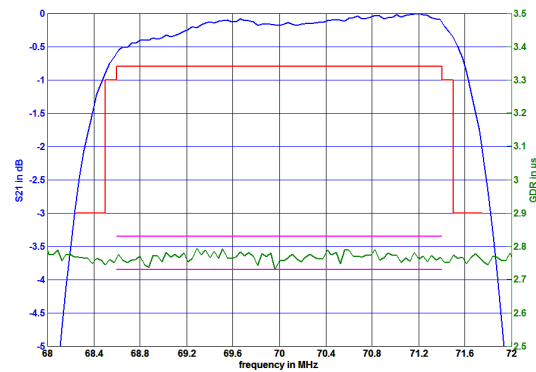
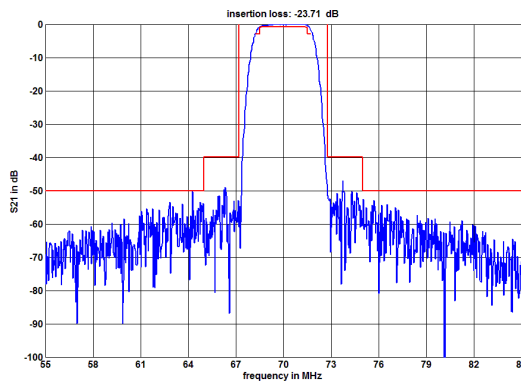
**) f_{fo} is reference frequency f_c at frequency inversion temperature (T_o)

Generated:**Checked / Approved:**

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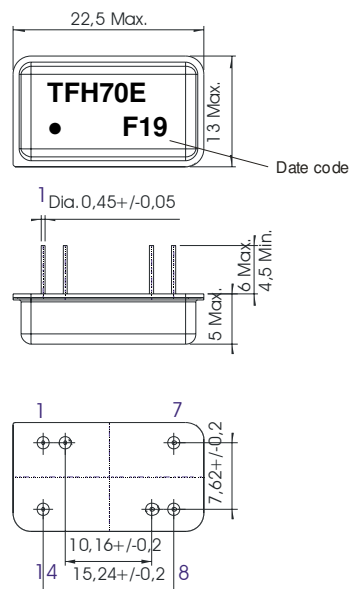
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Filter characteristic



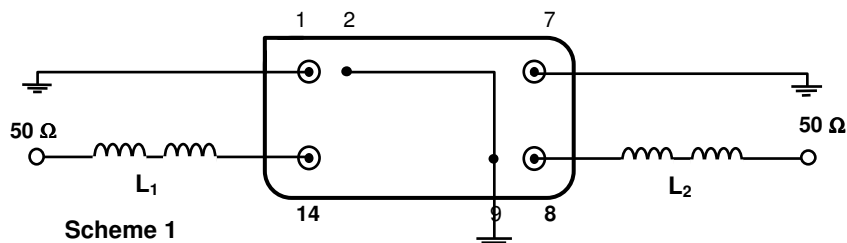
Construction and pin connection

(All dimensions in mm)



1	Input RF Return
2	Ground
7	Output RF Return
8	Output
9	Ground
14	Input

Date code:	Year + week
F	2015
G	2016
H	2017
...	

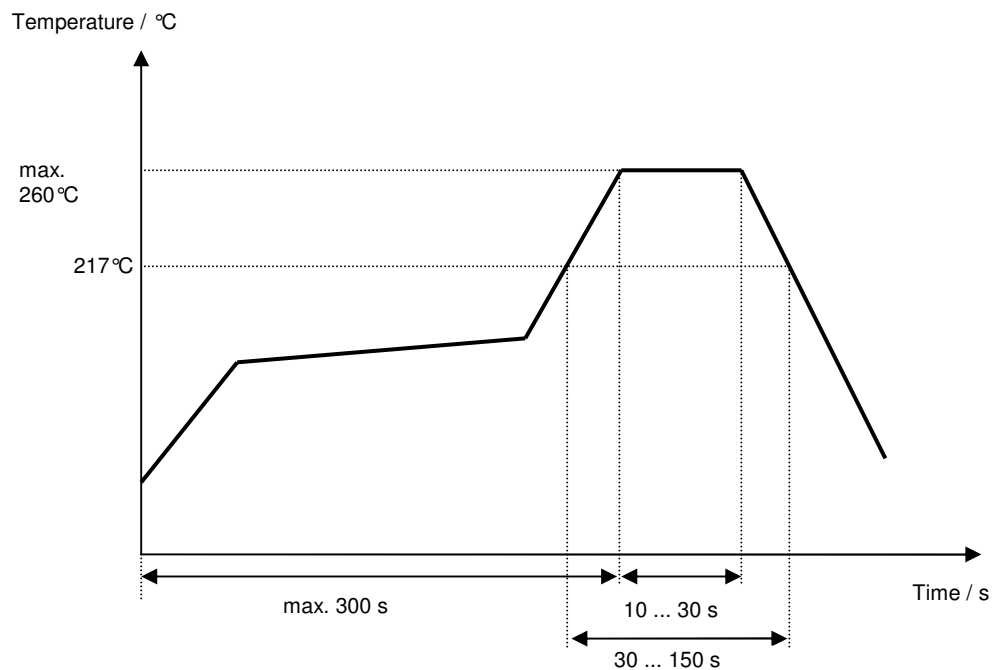
50 Ω matching network (for details about other schemes refer to application note):

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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

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.	

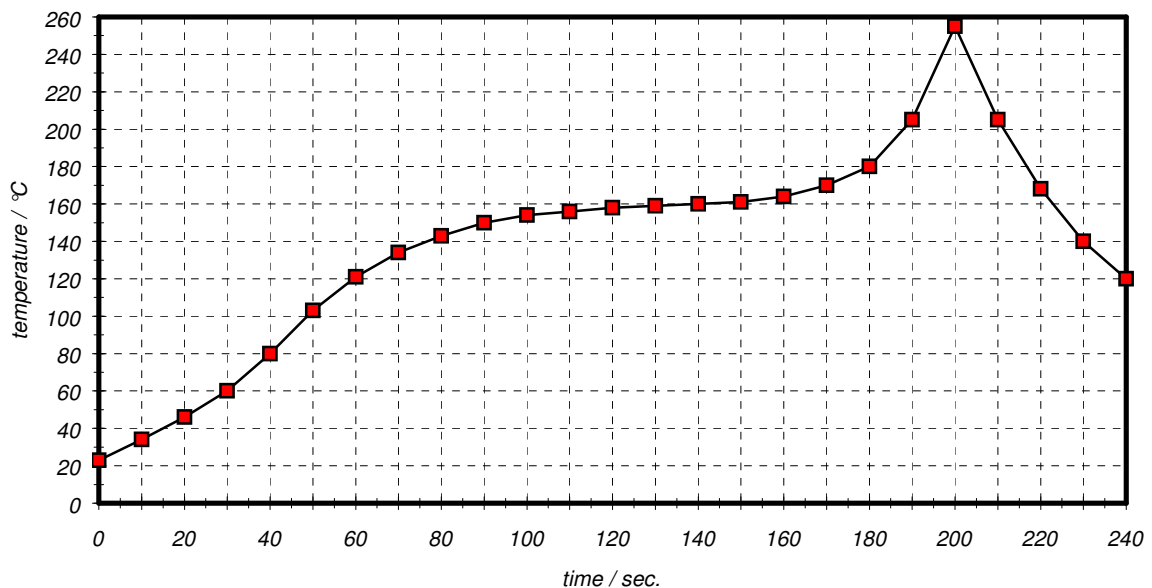
Air reflow profile

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 Filter Specification of TFS 70V	Dunzow W.	06.12.2000
1.1	- change name from TFS70V to TFH70E	Dunzow / Wall	08.03.2001
1.2	- correct definition of insertion loss - correct typical filter data - reduce max. pass band ripple from 1 db to 0.8 dB - correct termination impedances	Dunzow / Wall	09.03.2001
1.3	- change package drawing	Dunzow W.	29.11.2001
2.0	- change package drawing - update header and footer - update date code - add filter characteristics	Bonnen	07.05.2015