SAW Components

SAW IF filter

Satellite Radio

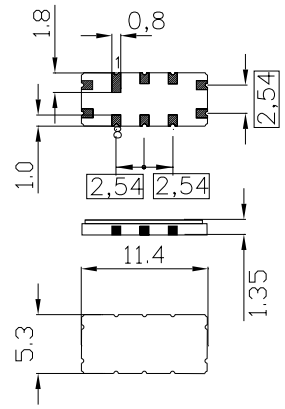
Series/type:	**X3402**
Ordering code:	**B39800-X3402-U910**
Date:	June 26, 2008
Version:	2.1

Application

- IF filter for Sirius Digital Satellite Radio
- Diplexing of TDM1 and TDM2 satellite signal
- One balanced input and two balanced outputs
- Constant group delay
- Usable bandwidths of 3.7 MHz in TDM1 and TDM2
- Low voltage loss

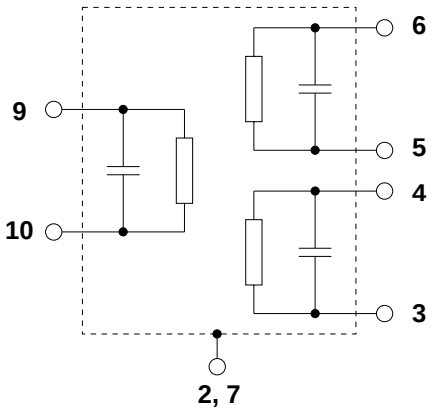
Features

- Package size 11.4 x 5.3 x 1.35 mm^3
- Maximum package height 1.5 mm
- Package code QCC10C
- RoHS compliant
- Approximate weight 0.24 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals



Pin configuration

- 9,10 Input, balanced
- 5,6 Output TDM1, balanced
- 3,4 Output TDM2, balanced
- 1,8 To be grounded
- 2,7 Case–grounds



Characteristics of TDM1 channel

Temperature range for specification: T = –10 °C to +85 °C
Terminating source impedance: Z_S = 27 Ω and matching network
Terminating load impedance: Z_L = 1 kΩ and matching network

		min.	typ. @ 25 °C	max.	
Nominal frequency	f_N	—	72.54	—	MHz
Minimum insertion attenuation (including losses in the matching network)	α_{min}	—	18.3	19.8	dB
Maximum voltage gain source – load (V_L/V_S)	α_{vgsl}	–7.0	–5.0	—	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
$f_N \pm 1.85$ MHz		—	0.8	1.5	dB
Pass bandwidth					
$\alpha_{rel} \leq 1.5$ dB	$B_{1.5dB}$	—	4.1	—	MHz
$\alpha_{rel} \leq 3$ dB	B_{3dB}	—	4.5	—	MHz
$\alpha_{rel} \leq 15$ dB	B_{15dB}	—	5.6	6.1	MHz
$\alpha_{rel} \leq 30$ dB	B_{30dB}	—	6.2	6.7	MHz
Mean attenuation (relative to α_{min})	α_{rel}				
Upper sidelobe 86.47 ... 91.53 MHz		52.0	57.0	—	dB
Relative attenuation (relative to α_{min})	α_{rel}				
Lower sidelobe 50.00 ... 65.00 MHz		40.0	45.0	—	dB
65.00 ... 66.48 MHz		39.0	44.0	—	dB
66.48 ... 68.08 MHz		37.0	42.0	—	dB
Upper sidelobe 77.30 ... 78.60 MHz		40.0	45.0	—	dB
78.60 ... 86.47 MHz		42.0	46.0	—	dB
86.47 ... 91.53 MHz		46.0	52.0	—	dB
91.53 ... 95.21 MHz		48.0	54.0	—	dB
95.21 ... 100.00 MHz		50.0	54.0	—	dB
Group delay ripple (p–p)	$\Delta\tau$				
$f_N \pm 1.85$ MHz		—	70	—	ns
Temperature coefficient of frequency	TC_f	—	– 18	—	ppm/K

Characteristics of TDM1 channel

Temperature range for specification: T = –40 ˚C to +105 ˚C
Terminating source impedance: Z_S = 27 Ω and matching network
Terminating load impedance: Z_L = 1 kΩ and matching network

		min.	typ. @ 25 ˚C	max.	
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95.21 ... 100.00 MHz		50.0	54.0	—	dB
Group delay ripple (p–p)	$\Delta\tau$				
$f_N \pm 1.85$ MHz		—	70	—	ns
Temperature coefficient of frequency	TC_f	—	– 18	—	ppm/K

Characteristics of TDM2 channel

Temperature range for specification: T = –10 °C to +85 °C
Terminating source impedance: Z_S = 27 Ω and matching network
Terminating load impedance: Z_L = 1 kΩ and matching network

		min.	typ. @ 25 °C	max.	
Nominal frequency	f_N	—	80.46	—	MHz
Minimum insertion attenuation (including losses in the matching network)	α_{min}	—	18.1	19.6	dB
Maximum voltage gain source – load (V_L/V_S)	α_{vgsl}	–9.6	–7.6	—	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
$f_N \pm 1.84$ MHz		—	0.8	1.5	dB
Pass bandwidth					
$\alpha_{rel} \le 1.5$ dB	$B_{1.5dB}$	—	4.2	—	MHz
$\alpha_{rel} \le 3$ dB	B_{3dB}	—	4.5	—	MHz
$\alpha_{rel} \le 15$ dB	B_{15dB}	—	5.6	6.1	MHz
$\alpha_{rel} \le 30$ dB	B_{30dB}	—	6.2	6.7	MHz
Mean attenuation (relative to α_{min})	α_{rel}				
Upper sidelobe 86.47 ... 91.53 MHz		52.0	55.0	—	dB
Relative attenuation (relative to α_{min})	α_{rel}				
Lower sidelobe 55.00 ... 67.00 MHz		50.0	58.0	—	dB
67.00 ... 75.99 MHz		43.0	47.0	—	dB
Upper sidelobe 85.21 ... 86.47 MHz		40.0	48.0	—	dB
86.47 ... 91.53 MHz		46.0	53.0	—	dB
91.53 ... 95.21 MHz		50.0	58.0	—	dB
95.21 ... 105.00 MHz		52.0	60.0	—	dB
Group delay ripple (p–p)	$\Delta\tau$				
$f_N \pm 1.84$ MHz		—	80	—	ns
Temperature coefficient of frequency	TC_f	—	– 18	—	ppm/K

Characteristics of TDM2 channel

Temperature range for specification: T = –40 ˚C to +105 ˚C
Terminating source impedance: Z_S = 27 Ω and matching network
Terminating load impedance: Z_L = 1 kΩ and matching network

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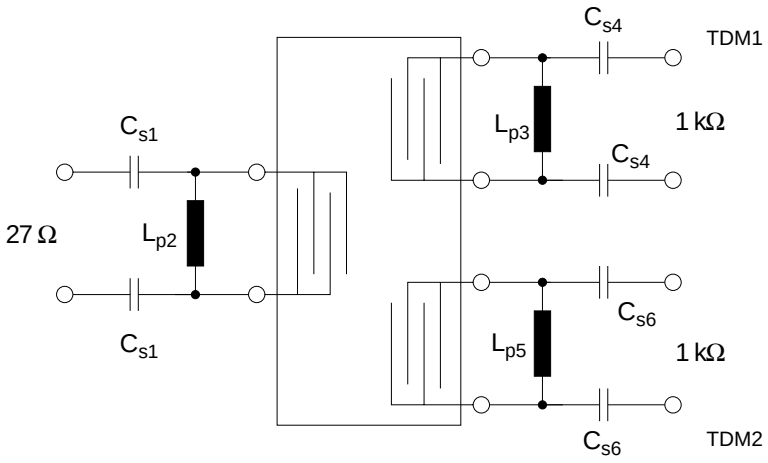
95.21 ... 105.00 MHz		52.0	60.0	—	dB
Group delay ripple (p–p)	$\Delta\tau$				
$f_N \pm 1.84$ MHz		—	80	—	ns
Temperature coefficient of frequency	TC_f	—	– 18	—	ppm/K

Maximum ratings

Operable temperature range	T	–40/+105	˚C	
Storage temperature range	T_{stg}	–40/+105	˚C	
DC voltage	V_{DC}	0	V	
Source power	P_S	10	dBm	source impedance 50 Ω

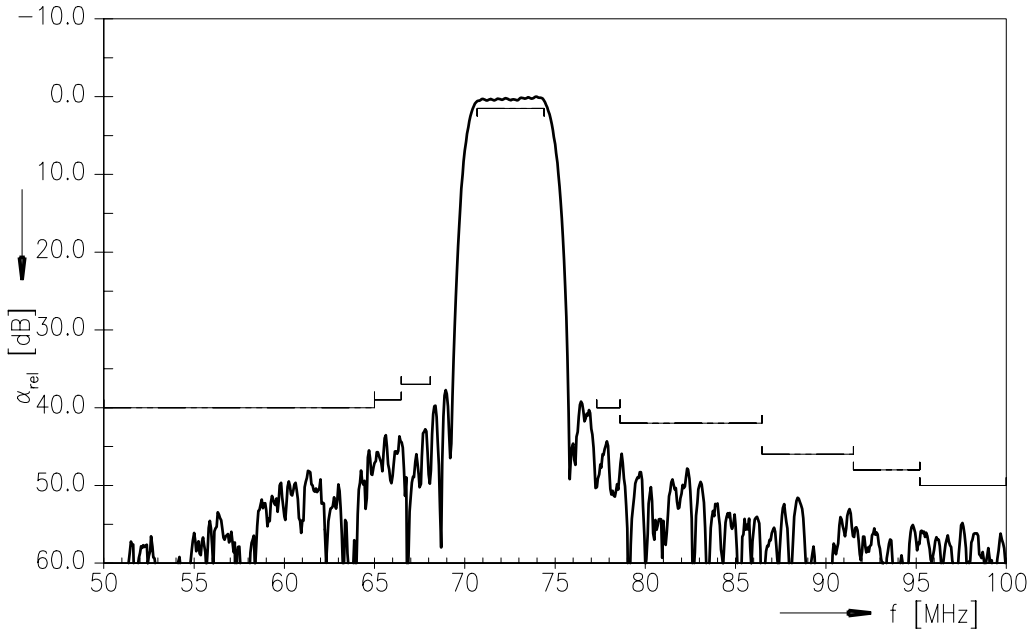
Matching network[1] (based on four port measurement, quality factors Q_L = 40, Q_C = 90)



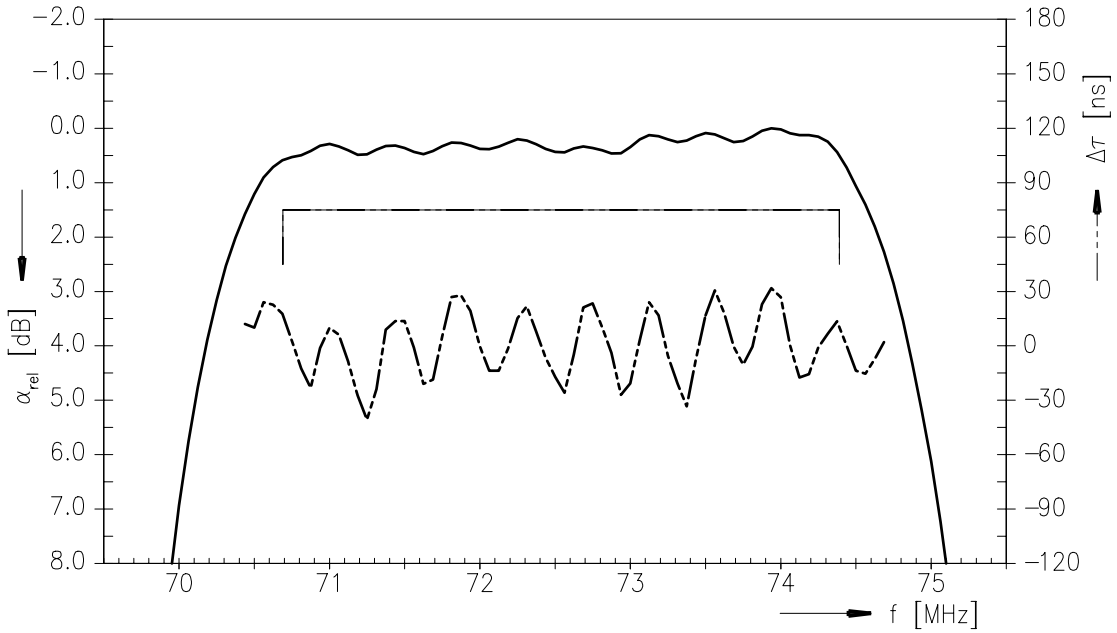
C_{s1} = 68 pF
L_{p2} = 82 nH
L_{p3} = 680 nH
C_{s4} = 5.6 pF
L_{p5} = 520 nH
C_{s6} = 4.7 pF

1) The input matching circuit has been designed as a power match of the filter's input port to 175 Ω. In a second step it has been optimized in a narrow range in order to operate at 27 Ω input termination with optimum filter performance.

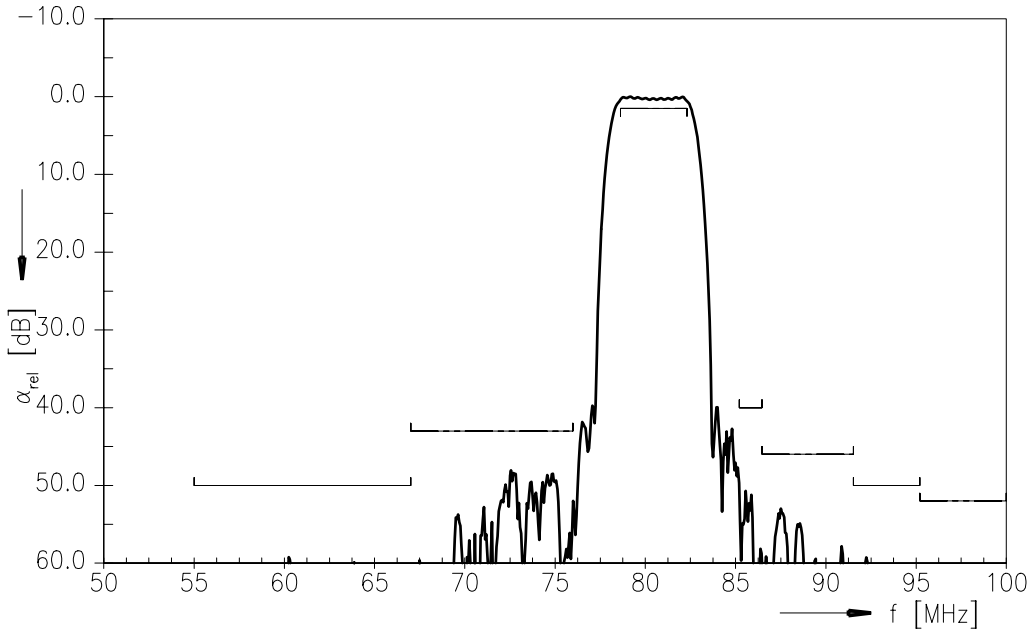
Transfer function TDM1 channel



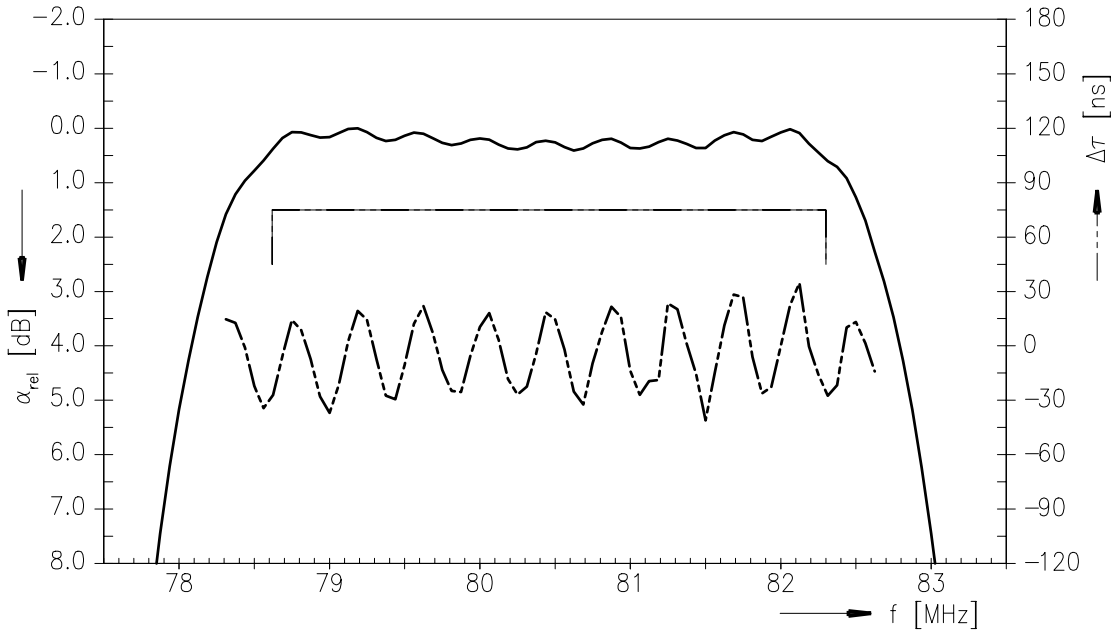
Transfer function TDM1 channel (pass band)



Transfer function TDM2 channel



Transfer function TDM2 channel (pass band)



References

Type	X3402
Ordering code	B39800-X3402-U910
Marking and package	C61157-A7-A73
Packaging	F61074-V8176-Z000
Date codes	L_1126
S-parameters	X3402_NB.s6p (matched), X3402_NB_UN.s6p (unmatched)
Soldering profile	S_6001
RoHS compatible	defined as compatible with the following documents: "DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. 2005/618/EC from April 18th, 2005, amending Directive 2002/95/EC of the European Parliament and of the Council for the purposes of establishing the maximum concentration values for certain hazardous substances in electrical and electronic equipment."

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