SAW Components

SAW RF filter

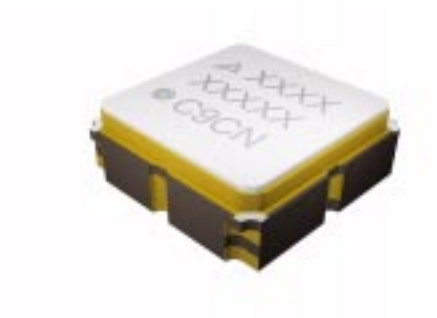
Digital radio

Series/type:	**B1644**
Ordering code:	**B39232B1644U510**
Date:	May 29, 2013
Version:	2.7

EPCOS AG is a TDK Group Company.

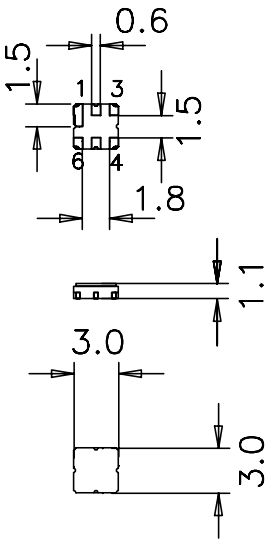
Application

- Low-loss RF filter for digital radio
- Impedance transformation from 50 Ω to 100 Ω
- Unbalanced to balanced operation
- Very low insertion attenuation
- Low amplitude ripple
- Usable passband 12.5 MHz



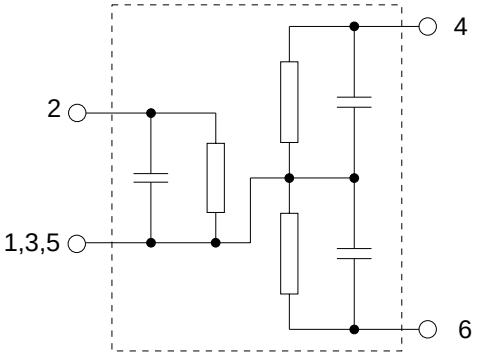
Features

- Package size 3.0 x3.0 x 1.1 mm³
- Package code DCC6D
- RoHS compatible
- Approximate weight 0.037 g
- Package for **S**urface **M**ount **T**echnology (**SMT**)
- Ni, gold-plated terminals
- Lead free soldering compatible with J - STD20C
- AEC-Q200 qualified component family
- **E**lectrostatic **S**ensitive **D**evice (**ESD**)



Pin configuration

- 2 Input
- 4,6 Output, balanced
- 1,3,5 To be grounded



Data sheet SMD

Characteristics

Temperature range for specification: T = –20 ˚C to +85 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 100 Ω (balanced)

		min.	typ. @ 25 ˚C	max.	
Nominal frequency	f_N	—	2338.75	—	MHz
Maximum insertion attenuation	α_{max}				
2332.5 ... 2345.0 MHz		—	2.4	3.5	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
2332.5 ... 2345.0 MHz		—	0.4	1.6	dB
Output amplitude balance ($\lvert S_{31}/S_{21}\rvert$)					
2332.5 ... 2345.0 MHz		–1.2	-0.7/0.0	1.5	dB
Output phase balance ($\phi(S_{31}) - \phi(S_{21})+180^\circ$)					
2332.5 ... 2345.0 MHz		–9.0	-7.0/-1.8	1.0	°
Return loss		10.0	15.0	—	dB
Attenuation	α				
88.0 ... 108.0 MHz		50	65	—	dB
880.0 ... 960.0 MHz		40	56	—	dB
1710.0 ... 1910.0 MHz		38	43	—	dB
2305.0 MHz		—	11	—	dB
2310.0 MHz		—	9	—	dB
2315.0 MHz		—	9	—	dB
2320.0 MHz		—	6	—	dB
2450.0 MHz		20	25	—	dB
3060.0 MHz		35	50	—	dB
Group delay ripple (p-p)					
2332.5 ... 2345.0 MHz		—	3	15	ns

Data sheet SMD

Characteristics

Temperature range for specification: T = –40 ˚C to+105 ˚C
Terminating source impedance: Z_S = 50 Ω
Terminating load impedance: Z_L = 100 Ω (balanced)

		min.	typ. @ 25 ˚C	max.	
Nominal frequency	f_N	—	2338.75	—	MHz
Maximum insertion attenuation	α_{max}				
2332.5 ... 2345.0 MHz		—	2.4	4.8	dB
Amplitude ripple (p-p)	$\Delta\alpha$				
2332.5 ... 2345.0 MHz		—	0.4	2.9	dB
Output amplitude balance ($\lvert S_{31}/S_{21}\rvert$)					
2332.5 ... 2345.0 MHz		–5.0	-0.7/0.0	3.5	dB
Output phase balance ($\phi(S_{31}) - \phi(S_{21})+180^\circ$)					
2332.5 ... 2345.0 MHz		–12.0	-7.0/-1.8	8.0	°
Return loss		10.0	15.0	—	dB
Attenuation	α				
88.0 ... 108.0 MHz		50	65	—	dB
880.0 ... 960.0 MHz		40	56	—	dB
1710.0 ... 1910.0 MHz		38	43	—	dB
2305.0 MHz		—	11	—	dB
2310.0 MHz		—	9	—	dB
2315.0 MHz		—	9	—	dB
2320.0 MHz		—	6	—	dB
2450.0 MHz		20	25	—	dB
3060.0 MHz		35	50	—	dB
Group delay ripple (p-p)					
2332.5 ... 2345.0 MHz		—	3	20	ns

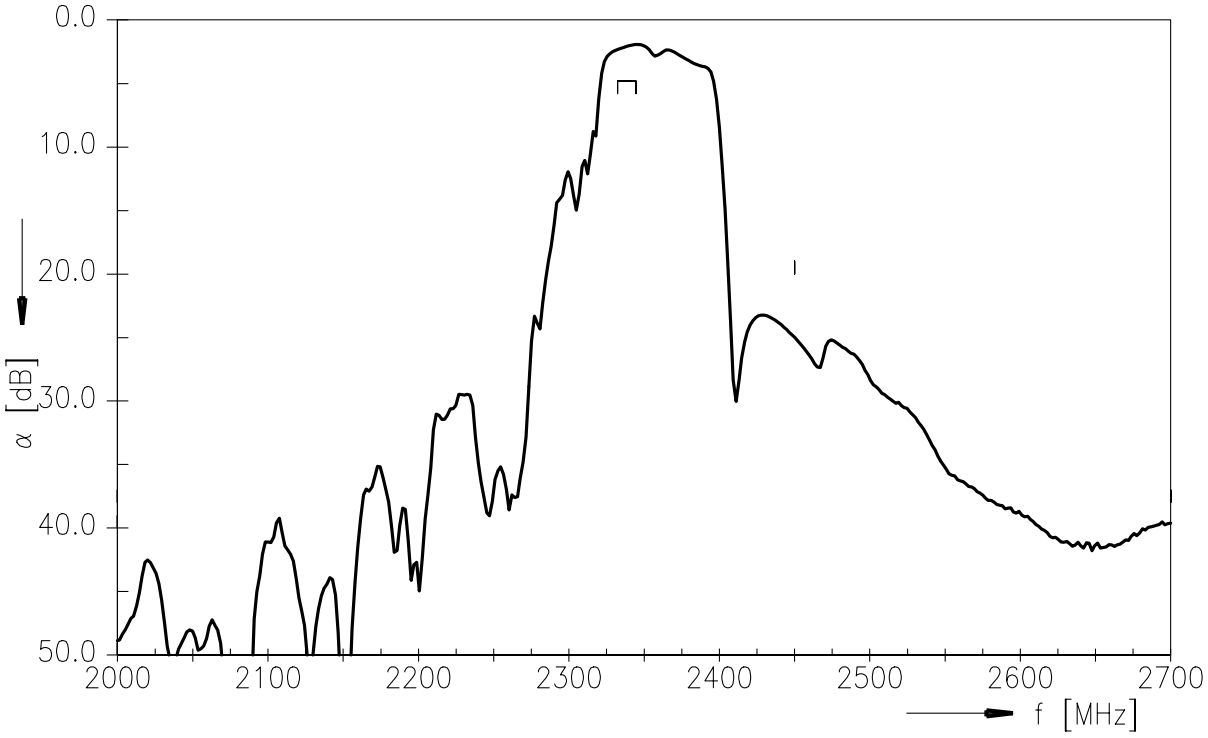
Maximum ratings

Operable temperature range	T	–45/+125	˚C	
Storage temperature range	T_{stg}	–45/+125	˚C	
DC voltage	V_{DC}	6	V	
ESD voltage	V_{ESD}	50[1)]	V	machine model, 10 pulses
	V_{ESD}	200[2)]	V	human body model, 1 pulse
Input power at				
2332.5 MHz...2345.0 MHz	P_{IN}	0	dBm	source impedance 50 Ω

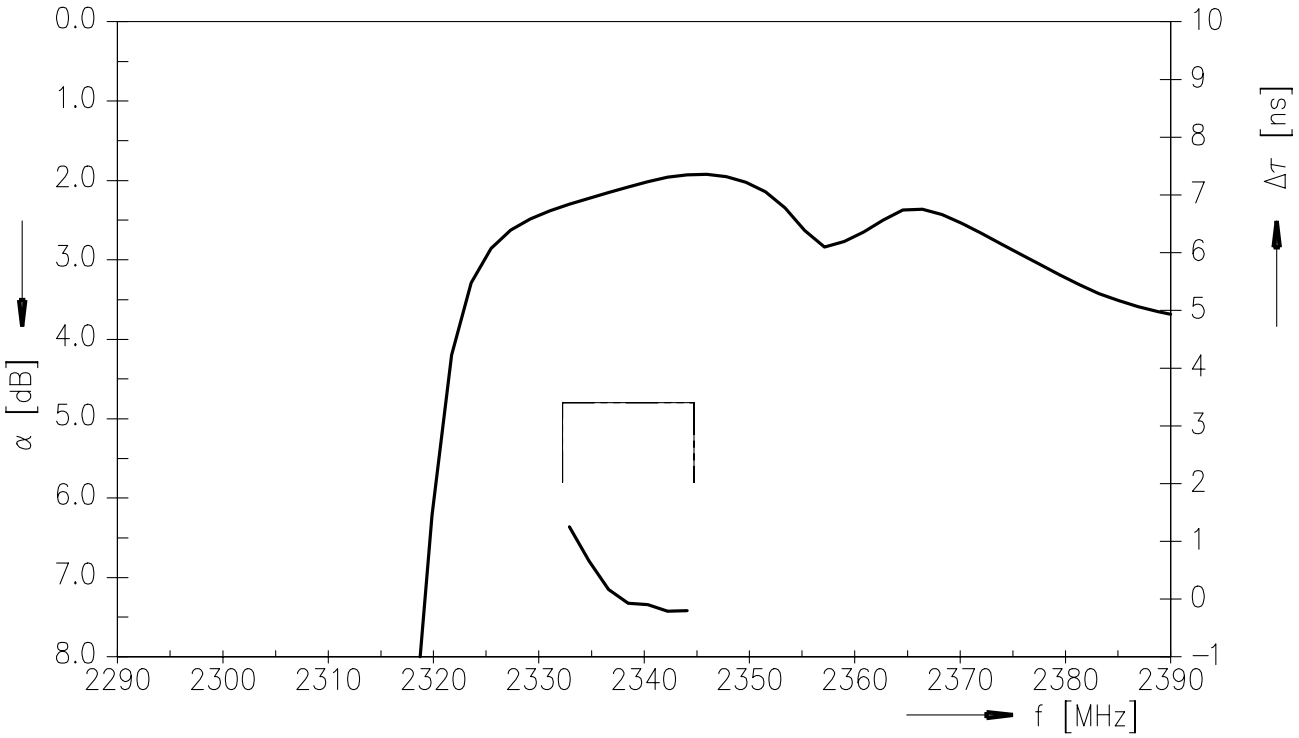
1) according to JESD22-A115B, 50V, Machine Model, 10 negative & 10 positive pulses.

2) acc. to JESD22-A114F (human body model), 1 negative & 1 positive pulse.

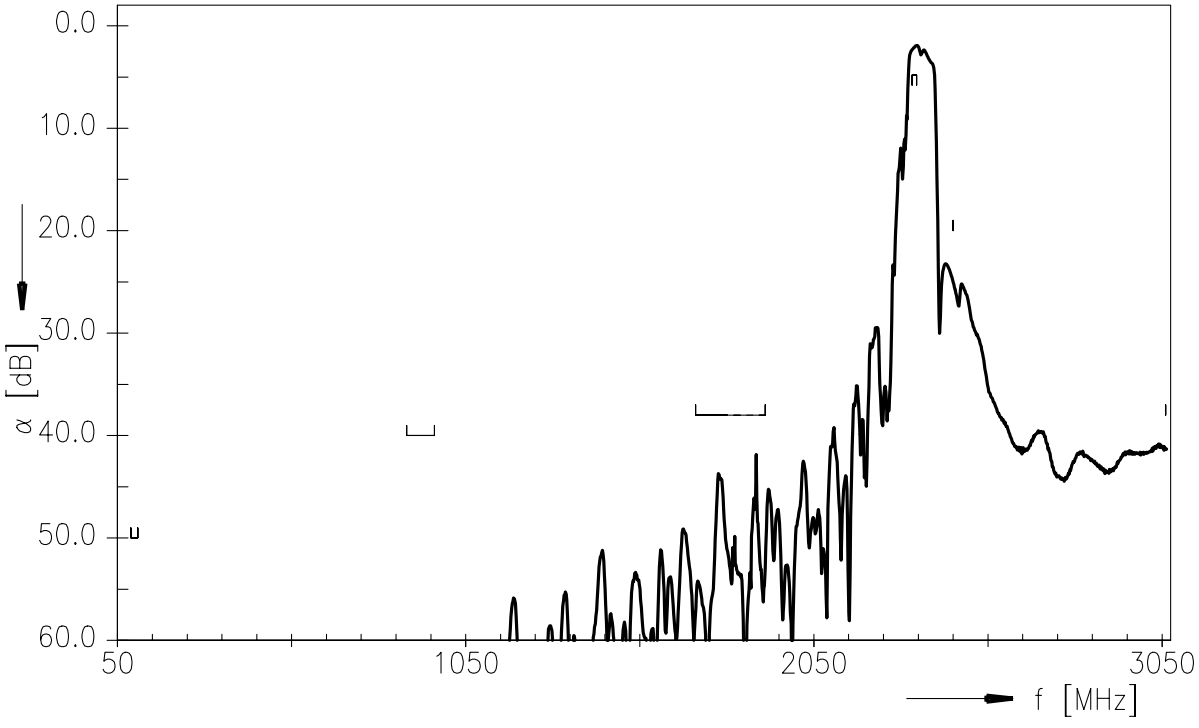
Transfer function



Transfer function (passband)



Transfer function (wideband)



ESD protection of SAW filters

SAW filters are **E**lectro **S**tatic **D**ischarge sensitive devices. To reduce the probability of damages caused by ESD, special matching topologies have to be applied.
In general, “ESD matching” has to be ensured at that filter port, where electrostatic discharge is expected.

Electrostatic discharges predominantly appear at the antenna input of RF receivers. Therefore only the input matching of the SAW filter has to be designed to short circuit or to block the ESD pulse.

Below three figures show recommended “ESD matching” topologies.

For wideband filters the high-pass ESD matching structure needs to be at least of 3rd order to ensure a proper matching for any impedance value of antenna and SAW filter input. The required component values have to be determined from case to case.

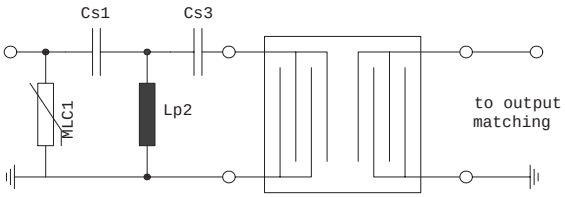


Fig. 1 MLC varistor plus ESD matching

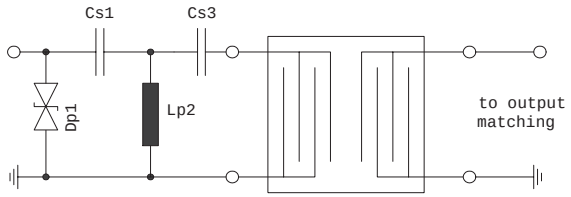


Fig. 2 Suppressor diode plus ESD matching

In cases where minor ESD occur, following simplified “ESD matching” topologies can be used alternatively.

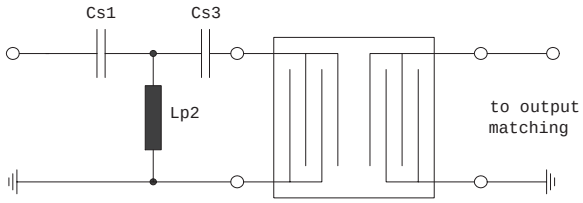


Fig. 3 3rd order high-pass structure for basic ESD protection

In all three figures the shunt inductor Lp2 could be replaced by a shorted microstrip with proper length and width. If this configuration is possible depends on the operating frequency and available pcb space.

Effectiveness of the applied ESD protection has to be checked according to relevant industry standards or customer specific requirements

For further information, please refer to EPCOS Application report:
“**ESD protection for SAW filters**”.
This report can be found under www.epcos.com/rke.Click on “Applications Notes”.

References

Type	B1644
Ordering code	B39232B1644U510
Marking and package	C61157-A7-A68
Packaging	F61074-V8168-Z000
Date codes	L_1126
S-parameters	B1644_NB.s3p See file header for port/pin assignment table.
Soldering profile	S_6001
RoHS compatible	RoHS-compatible means that products are compatible with the requirements according to Art. 4 (substance restrictions) of Directive 2011/65/EU of the European Parliament and of the Council of June 8th, 2011, on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("Directive") with due regard to the application of exemptions as per Annex III of the Directive in certain cases.
Matching coils	See Inductor pdf-catalog http://www.tdk.co.jp/tefe02/coil.htm#aname1 and Data Library for circuit simulation http://www.tdk.co.jp/etvcl/index.htm for a large variety of matching coils.

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