

SAW and BAW Filters for sub-1 GHz, Wi-Fi and GNSS connections in Industrial-IoT, and consumer applications

Qualcomm Technologies, Inc. acquired the SAW and BAW filter business from EPCOS/TDK

In 2016 EPCOS/TDK carved-out the SAW business unit and formed a joint venture with Qualcomm Technologies, Inc. (QTI), called RF360 Holdings Singapore Pte. Ltd. Target was the value creation for customers in the complex RF environment by offering the entire RF component chain from the antenna to the transceiver. In 2018 QTI took over TDK’s share and is holding 100% of RF360 Holdings.

Qualcomm Technologies – a leader in SAW and BAW filters

Qualcomm Technologies provides the industries widest SAW (Surface Acoustic Wave) and BAW (Bulk Acoustic Wave) filters product portfolio, from single filters through diplexer and duplexers to double hump filters, extractors and band stop filters. The center frequency range starts at 169 MHz and ends in the 7 GHz range.

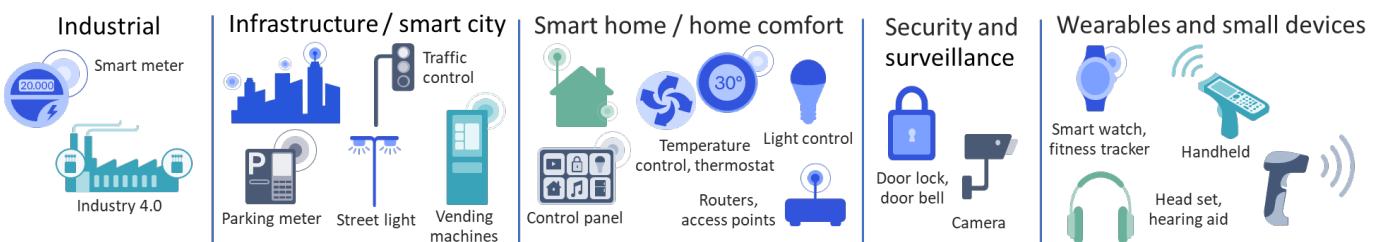
SAW and BAW filters are in all wireless applications

You find SAW and BAW filters in all wireless applications, such as mobile phones, wearables (e.g. smart watches, fitness trackers, headsets and handhelds) but also in smart home applications, infrastructure and industrial applications (e.g. smart meters, vending machines, street lights) and wireless access points and routers. These devices require high-end filter technology for seamless operation. Qualcomm® ultraSAW™ and ultraBAW™ filters represent superior filter technology for reliable connectivity.

Here we present our SAW and Qualcomm ultraBAW filters for sub-1 GHz, Wi-Fi (2.4 GHz and 5 to 7 GHz) and GNSS connections in IoT, industrial and consumer applications operating with various standards and protocols.



Application examples

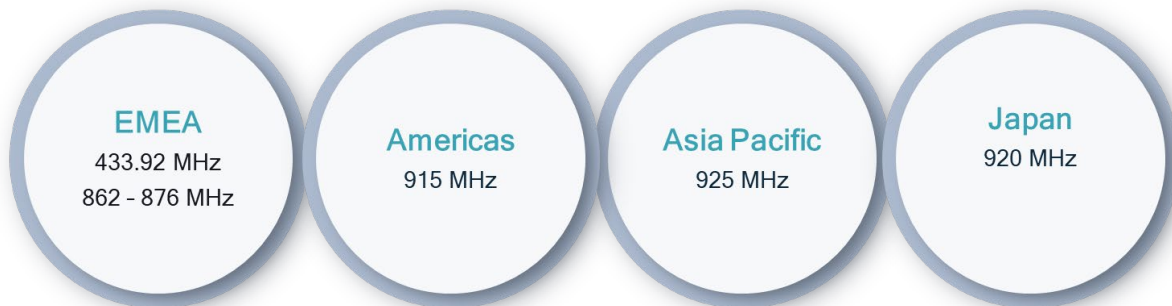


Reference designs

You find our filters in many of our and other IC makers transceiver/receiver reference designs.

SAW filters for sub-1 GHz

We provide a wide product range for all global regional specific frequency bands.



Our product range covers customer individual requirements such as for

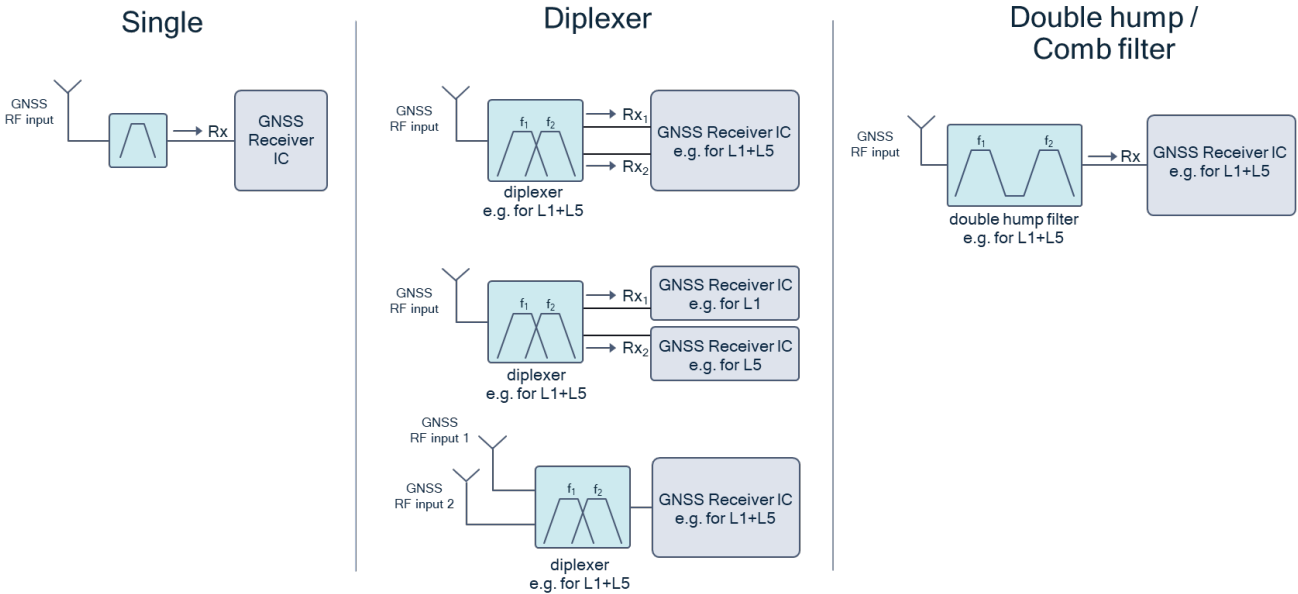
- LTE coexistence, e.g. B20 Tx
- 2-in-1 filter for multi region use, e.g. in EMEA and Americas
- best performance at specific temperature range, e.g. at 25 °C

The filters in the below fulfil most applications requirement for seamless operation.

Part number	Package size [mm]	fc [MHz]	BW [MHz]	IL, typ [dB]	IL, max [dB]	Highlight
B39171B3942U310	5.0 x 5.0	169,5	0,2	1,3	2,4	narrow band filter
B39871B3746H110	3.0 x 3.0	868,6	1,2	2	2,8	narrow band filter
B39431B3710U410	3.0 x 3.0	433,92	1,7	2,0	2,7	Top, max=125 °C
B39871B4377P810	1.4 x 1.1	866,50	7,0	2,3	3,5	Top, max=125 °C
B39871B2600P810	1.4 x 1.1	869,00	14,0	1,6	3,0	wide band filter; Top, max=125 °C
B39871B2674P810	1.4 x 1.1	869,00	2,0	1,8	2,8	optimized for low insertion attenuation
B39871B2636P810	1.4 x 1.1	869,00	2,0	2,7	3,1	optimized for best performance at 25 °C, high attenuation at 862 MHz (LTE B20 Tx) and B8 Tx
B39871B4365P810	1.4 x 1.1	869,00	2,0	2,5	3,3	combines high attenuation at 862 MHz (LTE B20 Tx) and B8 Tx with low insertion loss @ -40 to +85 °C; Top, max=125 °C
B39921B4301F210	1.4 x 1.1	915,00	26,0	1,5	2,5	optimized for high out-of-band attenuation
B39921B2671P810	1.1 x 0.9	915,00	26,0	1,5	1,9	optimized for low insertion loss
B39921B4379P810	1.1 x 0.9	915,00	26,0	1,9	2,3	optimized for high out-of-band attenuation
B39921B2625P810	1.4 x 1.1	915,00	26,0	1,7	2,3	Top, max=125 °C
B39921B4344P810	1.4 x 1.1	915,00	26,0	2,8	4,0	optimized for high attenuation at 894 MHz (LTE B5/25 Rx)
B39921B2672P810	1.4 x 1.1	915,00	26,0	1,1	1,5	optimized for low insertion loss
B39921B9972P810	1.5 x 1.1	866,50	7,0	2,6	3,3	duplexer; covers all typical sub-1 GHz frequencies, 2 output lines can be combined into 1 output line
		915,00	26	1,9	3,0	
B39921B2615P810	1.4 x 1.1	921,50	13	1,4	2,0	Top, max=125 °C
B39921B2619P810	1.4 x 1.1	922,50	5	1,4	1,9	Top, max=125 °C
B39921B2616P810	1.4 x 1.1	924,50	5	2,1	3,4	Top, max=125 °C
B39931B4336P810	1.4 x 1.1	925,15	5,9	1,7	3,0	optimized for high out of band attenuation, incl. B8 Tx
B39931B8331P810	1.4 x 1.1	925,15	5,9	1,8	2,7	optimized for high out of band attenuation, incl. B8 Tx
B39931B2645P810	1.4 x 1.1	925,20	5,8	1,3	1,8	optimized for low insertion loss; Top, max=125 °C

SAW filters for GNSS

We provide a wide product range of single filters, diplexers and double hump filters for all GNSS frequency bands.



Package Size [mm x mm]	Part number	Pass Band [MHz]						Comment
		fstart [MHz]	fcenter [MHz]	fstop [MHz]	Bandwidth [MHz]	IL, typ [dB]	IL, max [dB]	
Single filters L1 band								
0.9 x 0.7	B7504	1559	1583	1606	47	0.9 - 1.2	1.4 - 2.0	low insertion attenuation + high attenuation
1.1 x 0.9	B8813	1559	1583	1606	47	0.85 - 1.2	1.4 - 1.9	low insertion attenuation
1.1 x 0.9	B7527	1574	1583	1606	32	0.95 - 1.7	-	B24 suppression between 1526-1536 & 1627-1680 MHz
1.4 x 1.1	B8313	1559	1583	1606	47	0.8 - 1.3	1.3 - 2.0	low insertion attenuation
1.4 x 1.1	B9621	1559	1583	1606	47	1.0 - 1.4	1.4 - 2.4	industrial grade
Single filters for L2 and L5 band								
0.9 x 0.7	B7505	1166	1176	1186	20	0.9	1.3	low insertion attenuation; L5, E5a
1.1 x 0.9	B8884	1166	1176	1186	20	1.0	1.6	low insertion attenuation; L5, E5a
1.1 x 0.9	B8889	1166	1197	1228	62	0.9 - 1.4	1.3 - 2.6	L5, E5a, E5b, G3, B2-1, L2
1.4 x 1.1	B2642	1166	1225	1284	118	1.1 - 2.2	1.5 - 2.4	ultra wide band; L5, E5a, E5b, G3, B2-1, L2, G2, B3-1, E6
Diplexers and double hump filter for L1, L2 and L5 band								
1.5 x 1.1	B1267	1166	1176	1186	20	1.2	2.2	diplexer; L5, E5a
		1559	1583	1606	47	1.2 - 1.5	1.5 - 2.2	
1.5 x 1.1	B9973	1166	1197	1228	62	1.2 - 1.7	2.0 - 2.1	diplexer; L5, E5a, E5b, G3, B2-1, L2
		1559	1583	1606	47	1.3 - 1.6	1.7 - 2.0	
1.5 x 1.1	B8389	1166	1177	1187	21	1.4 - 1.6	2.0 - 2.3	double hump; L5, E5a; low GDR
		1559	1583	1606	47	1.9	2.3	

SAW filters for Wi-Fi 2.4 GHz and Qualcomm ultraBAW filters for Wi-Fi 5 to 7 GHz

More and more devices in homes and public and industrial areas are connected for seamless operation, almost all of them using Wi-Fi. Wi-Fi uses two major carrier frequency areas at 2.4 GHz and 5 to 7 GHz. While Wi-Fi at 2.4 GHz and 5 GHz has been well established for years, the bands between 6 and 7 GHz are in use as of recently, with release of Wi-Fi 6/6E and now Wi-Fi 7.

Why Qualcomm ultraBAW filters for Wi-Fi 5 to 7 GHz

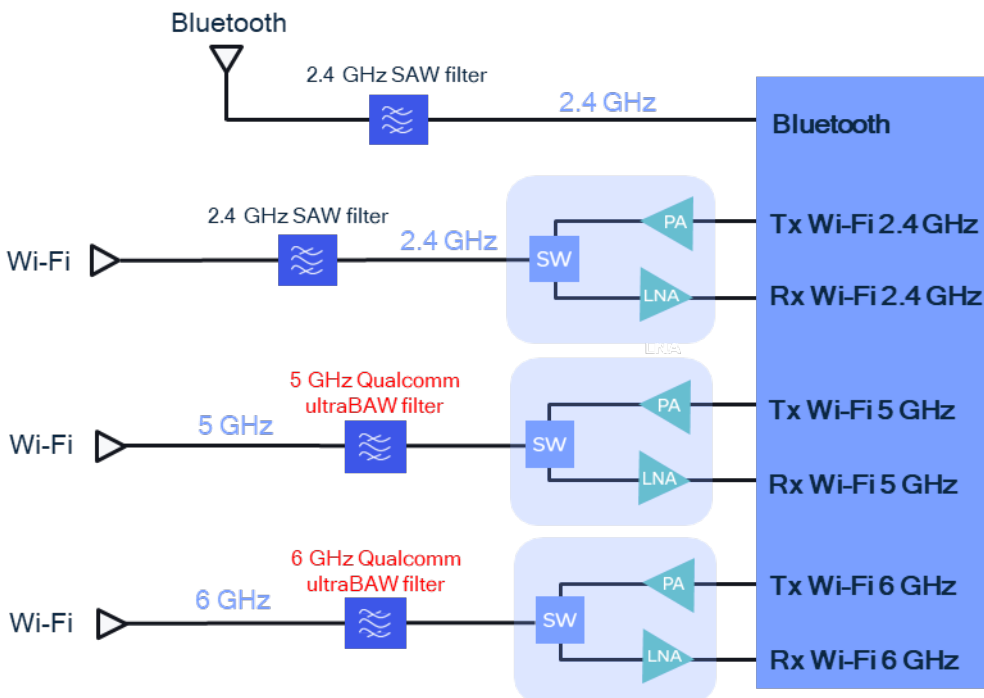
The emergence of Wi-Fi 5, then 6/6E and 7 is driven by the demand for increasing network capacity, increasing channel bandwidth, and enabling Multi-User MIMO.

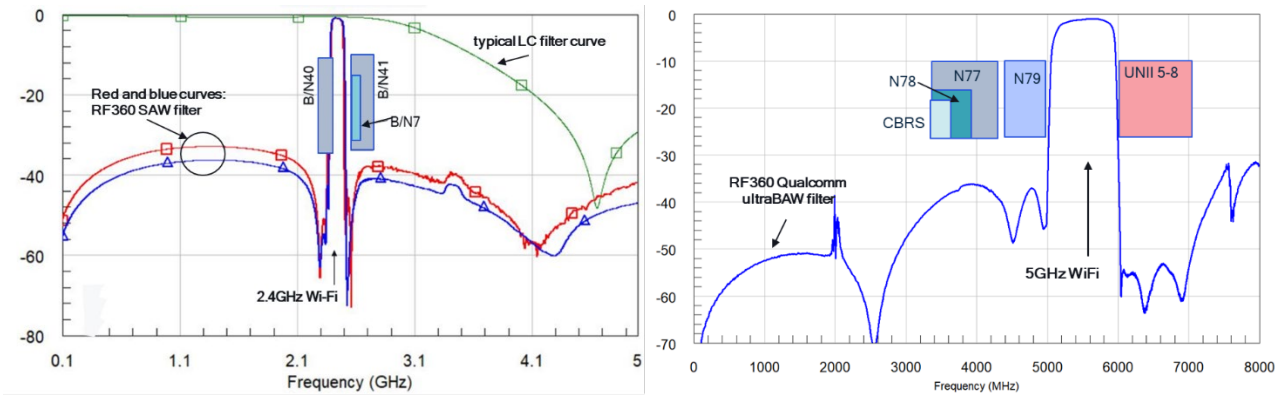
Qualcomm ultraBAW filters combine low insertion loss with high near-by selectivity. This performance enables a simultaneous operation at different bands which is a must for high data rates and takes the advantages Wi-Fi 6, 6E and 7 offers.

Qualcomm ultraBAW filters also offer high out of band attenuations enabling RF systems to cope with demanding Coexistence requirements generated by proximity of Licensed spectrum.

The 2.4 GHz Wi-Fi channel is adjacent to LTE/5G Bands 41, 40, and 7, while 5-7 GHz Wi-Fi is adjacent to the 5G NR n79 and n77/n78. In addition, Qualcomm ultraBAW provide high isolation between the 5 GHz bands and 6 GHz bands enabling seamless SBS (Single Band Simultaneous) operation.

The schematic below shows an example of a Wi-Fi Triband front-end design (per antenna) for simultaneous operation at 2.4 GHz, 5 GHz and 6 GHz:



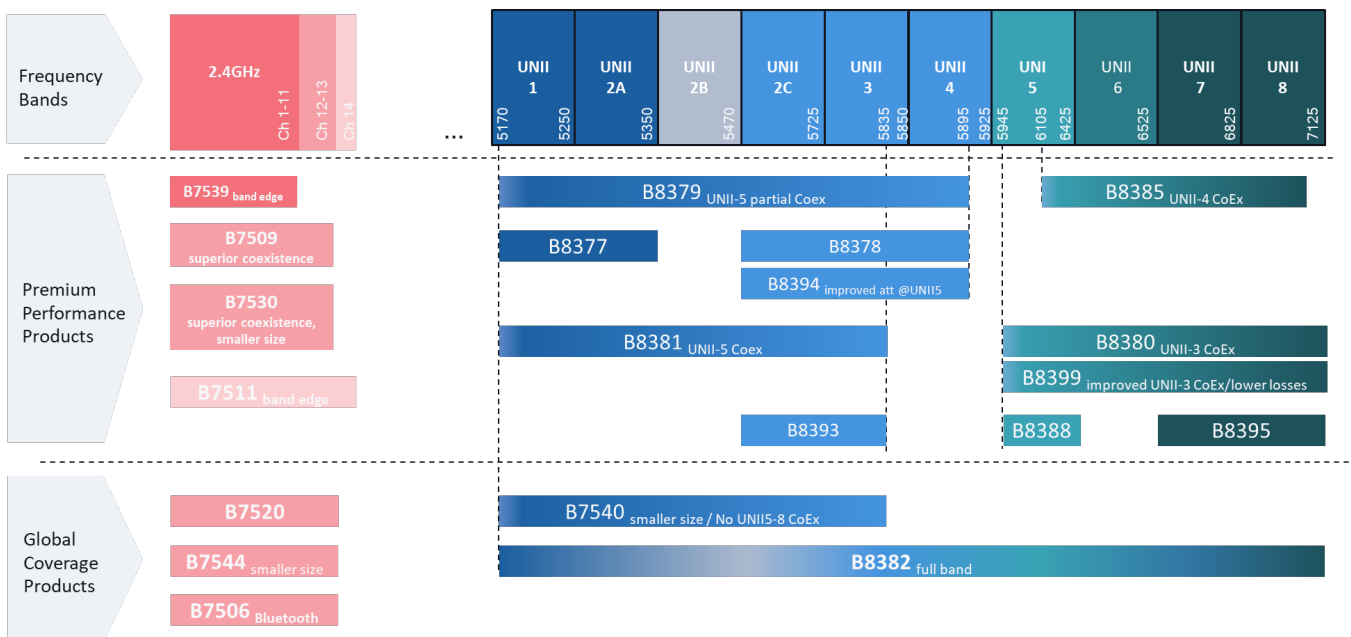


Beside the wide product range of Qualcomm ultraBAW filters for the Wi-Fi frequency bands from 5 to 7 GHz, Qualcomm Technologies provides superior SAW filters for 2.4 GHz.

Application examples

<p>Routers and Access Points</p>	<p>Security and Surveillance</p>
<p>Infrastructure/Smart city</p>	<p>Smart home / Home comfort</p>

Product range



2.4 GHz Wi-Fi and Bluetooth

Part number	Package size [mm]	fstart [MHz]	fc [MHz]	fstop [MHz]	BW [MHz]	IL, typ [dB]	IL, max [dB]	Highlight
B39242B7544L210	0.9 x 0.7	2403.1	2442	2480.9	77.8	1.0-1.4	1.6-2.1	B7/B40/B41 coexistence, very low insertion loss
B39242B7530L210	0.9 x 0.7	2403.1	2442	2480.9	77.8	0.6-1.0	1.2-1.9	superior B7/B40/B41 coexistence
B39242B7520P810	1.1 x 0.9	2403.1	2442	2480.9	77.8	0.9-1.4	1.5-2.0	B7/B40/B41 coexistence, very low insertion loss
B39242B7509L210	1.1 x 0.9	2403.1	2442	2480.9	77.8	1.1-1.7	1.7-2.5	superior B7/B40/B41 coexistence
B39242B7506P810	1.1 x 0.9	2403.1	2442	2480.9	77.8	1.0-1.4	1.5-1.9	very low insertion loss
B39242B7539P810	1.1 x 0.9	2403.1	2437	2470.9	67	0.7 - 1.0	1.1 - 1.6	band edge filter CH1 to 11
B39242B7511P810	1.1 x 0.9	2402.5	2448	2493.5	91	1.0-1.2	1.3-1.8	band edge filter CH1 to 14

5 to 7 GHz Wi-Fi

Part number	Package size [mm]	UNII	fstart [MHz]	fstop [MHz]	Highlight
B39552B7540L210	1.1 x 0.9	UNII 1-3	5170	5835	low insertion loss, coexistence with 5G N77/78/79 and CBRS
B39522B8377L210	1.4 x 1.1	UNII 1-2a	5170	5330	low insertion loss, coexistence with 5G N77/78/79 and CBRS
B39572B8378L210	1.4 x 1.1	UNII 2c-4	5490	5835	coexistence with Wi-Fi 6E (6 GHz UNII 5-8) and 5G N77/78/79 and CBRS
B39552B8379L210	1.4 x 1.1	UNII 1-4	5170	5895	coexistence with Wi-Fi 6E (6 GHz UNII 5-8) and 5G N77/78/79 and CBRS
B39652B8380L210	1.8 x 1.4	UNII 5-8	5945	7125	covers entire Wi-Fi 6E frequency spectrum
B39552B8381L210	1.4 x 1.1	UNII 1-3	5170	5825	coexistence with Wi-Fi 6E (6 GHz UNII 5-8) and 5G N77/78/79 and CBRS
B39612B8382L210	1.4 x 1.1	UNII 1-8	5150	7125	covers all Wi-Fi bands from 5 to 7 GHz, coexistence with 5G N77/78/79 and CBRS
B39652B8385L210	1.8 x 1.4	UNII 5-8	6105	7125	coexistence with Wi-Fi 6 (5 GHz UNII 1-4)
B39622B8388L210	1.8 x 1.4	UNII 5	5945	6425	coexistence with Wi-Fi 6E (6 GHz UNII 6-8) and 5G N77/78/79 and CBRS
B39562B8393L210	1.4 x 1.1	UNII 2c-3	5490	5835	coexistence with Wi-Fi 6E (6 GHz UNII 5-8) and 5G N77/78/79 and CBRS
B39572B8394L210	1.4 x 1.1	UNII 2c-4	5490	5895	coexistence with Wi-Fi 6E (6 GHz UNII 5-8) and 5G N77/78/79 and CBRS
B38682B8395L210	1.8 x 1.4	UNII 7-8	6585	7125	coexistence with Wi-Fi 6E (5 GHz UNII 1-5) and 5G N77/N78/N79
B39652B8399L210	1.8 x 1.4	UNII 5-8	5945	7125	coexistence with UNII 1-3

Technical data subject to change. Filter specification must be taken from the respective product data sheet. Qualcomm ultraBAW is a product of Qualcomm Technologies, Inc. and/or its subsidiaries.