Ultra-small SAW Duplexer for W-CDMA and Ultra-small SAW Filter for GSM

High-reliability, high-performance SAW Duplexer for W-CDMA and SAW Filter for GSM utilizing the hermetic sealing structure (MSL1-compatible) have newly been added in our lineup in the world's smallest size.

Overview

Due to the strong demand from BRICs and a generation change to 3G, the cellular phone market is expected to continue to grow in the future. Cellular phones have been expanded to multiple bands and mode to enable wider coverage areas. As multi-functions are also being added to cellular phones, miniaturization of the RF block is expected to advance further.

We launched the mass production of the world's first SAW Duplexer to replace the conventional dielectrics in 1998. It was initially utilized to AMPS in the 800MHz band, and then SAW technology began to be used in duplexers for various frequency bands. Since then, miniaturization has progressed and both pass band and attenuation characteristics have been improved. At present, the mainstream size is 3.0mm×2.5mm. The 2.5mm×2.0mm size is also in mass production for some systems and frequency bands. Transceiver ICs for W-CDMA are also evolving. To reduce the number of interstage filters, balanced interface is essential for the input terminal for the reception signal. It is expected that such ICs will become mainstream in the future.

The world's smallest SAW Duplexers for W-CDMA

FUJITSU has now developed the smallest SAW Duplexer in the world using a hermetic sealing structure for Bands I, II, IV, V, and VIII, which are the main bands used in W-CDMA. The SAW Duplexers for Bands I, II, IV, and VIII are 2.5mm×

Photo 1 External View of SAW Duplexers

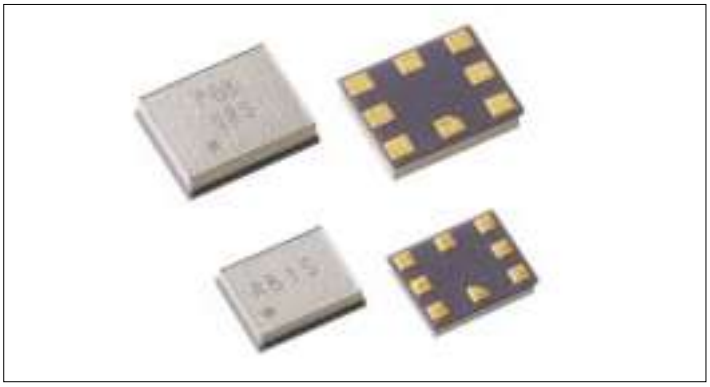


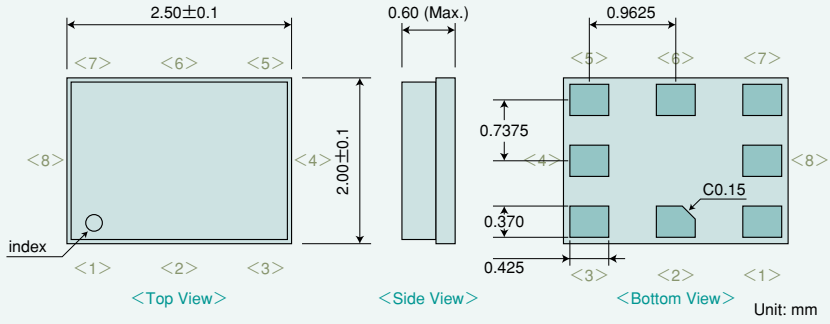
Photo 2 External View of SAW Filters

2.0mm (maximum height 0.6mm) in size. Its antenna and transmitter terminals have 50Ω unbalanced interface and reciever terminal has 100Ω balanced interface. For Band V, the size has been further miniaturized to 2.0mm×1.6mm (maximum height 0.5mm) and the same interface as Bands I, II, IV, and VIII. In the miniaturization, we have realized MSL1 by adopting our proprietary technology, a hermetic sealing structure that has a good track results in our RF filters, and have lined up high-reliability and high-performance SAW Duplexers.

Small SAW Filters compatible for 4 GSM bands

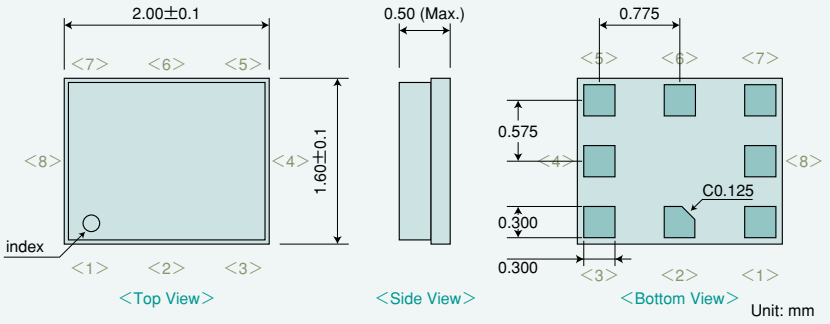
GSM system is built into most W-CDMA cellular phones. At the same time we developed the lineup of duplexers, we also developed small SAW Filters for 4 bands in GSM. Ever since we launched the mass production of 5.0mm×5.0mm–size products in 1990, miniaturization and performance improvement have been advanced with SAW Filters for cellular phones in a similar fashion to duplexers. The current mainstream dual filter is 1.8mm×1.4mm in size and the single filter is 1.4mm×1.0mm in size. We have now achieved the world's smallest sizes of 1.5mm×1.1mm (maximum height 0.5mm) for the dual filter and 1.1mm×0.9mm (maximum height 0.5mm) for the single filter while maintaining our proprietary hermetic sealing structure. We have in our lineup GSM850&900 and GSM1800&1900 combinations as dual filters and GSM850 and 900 as single filters. This enables a dramatic reduction in the size of the RF block in W-CDMA cellular phones that include the GSM portion. In the case of 3 W-CDMA bands and 4 GSM bands, approximately 33% of the chip area can be reduced.

Figure 1 External Dimensions (SAW Duplexer: 2.5mm×2.0mm)



No.	Code	Function
1	Rx	Receiver Pin (Balanced)
2	GND	Ground Pin
3	Tx	Transmitter Pin
4	GND	Ground Pin
5	GND	Ground Pin
6	ANT	Antenna Pin
7	GND	Ground Pin
8	Rx	Receiver Pin (Balanced)

Figure 2 External Dimensions (SAW Duplexer: 2.0mm×1.6mm)



No.	Code	Function
1	Rx	Receiver Pin (Balanced)
2	GND	Ground Pin
3	Tx	Transmitter Pin
4	GND	Ground Pin
5	GND	Ground Pin
6	ANT	Antenna Pin
7	GND	Ground Pin
8	Rx	Receiver Pin (Balanced)

Product Features

- The world's smallest size with a hermetic sealing structure
- W-CDMA-compatible bands: I, II, IV, V, and VIII
  Bands I, II, IV, and VIII: 2.5mm×2.0mm (maximum height 0.6mm)
  Band V: 2.0mm×1.6mm (maximum height 0.5mm)
- GSM-compatible bands: GSM850, 900, 1800, and 1900
  GSM850, 900 single filters: 1.1mm×0.9mm (maximum height 0.5mm)
  GSM850&900 dual filter: 1.5mm×1.1mm (maximum height 0.5mm)
  GSM1800&1900 dual filter: 1.5mm×1.1mm (maximum height 0.5mm)
- High reliability and performance

Figures 1 and **2** present the external dimensions of SAW Duplexers and **Figures 3** and **4** show the external dimensions of SAW Filters, and examples of typical characteristics are shown in **Figure 5** through **16**.

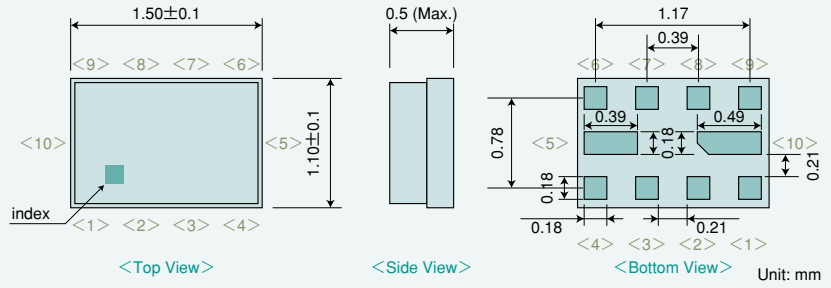
Applications

Duplexers for W-CDMA cellular phones and filters for GSM cellular phones.

Future Development

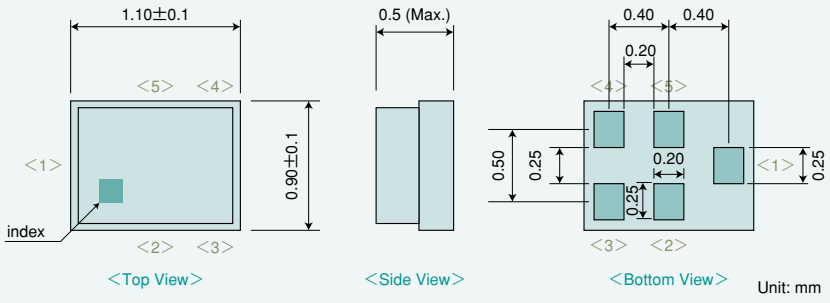
For duplexers, we will try to expand to LTE (3.9G), which will be the next-generation cellular phone method. In addition, we will continue with further miniaturization and will concurrently develop a WLP (Wafer Level Package) for filters. ✱

Figure 3 External Dimensions (SAW Filter: 1.5mm×1.1mm)



No.	Code	Function	No.	Code	Function
1	IN	Filter1 input Pin	6	OUT	Filter2 balanced output Pin
2	GND	Ground Pin	7	OUT	Filter2 balanced output Pin
3	GND	Ground Pin	8	OUT	Filter1 balanced output Pin
4	IN	Filter2 input Pin	9	OUT	Filter1 balanced output Pin
5	GND	Ground Pin	10	GND	Ground Pin

Figure 4 External Dimensions (SAW Filter: 1.1mm×0.9mm)



No.	Code	Function
1	IN	Input Pin
2	GND	Ground Pin
3	OUT	Output Pin
4	OUT	Output Pin
5	GND	Ground Pin

Figure 5 Example of Typical Characteristic of SAW Duplexer (Band V) (1)

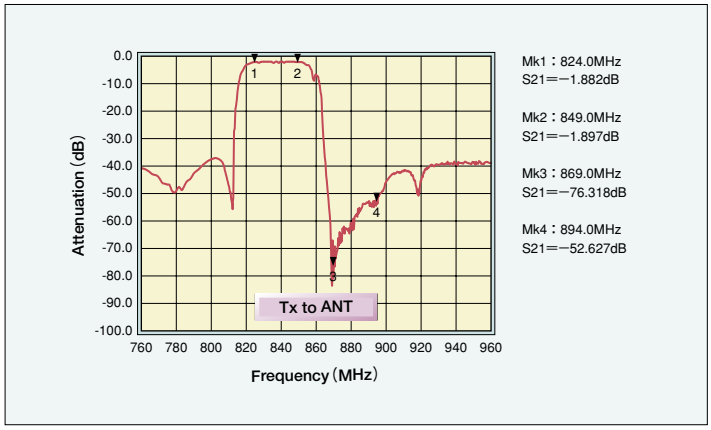


Figure 6 Example of Typical Characteristic of SAW Duplexer (Band V) (2)

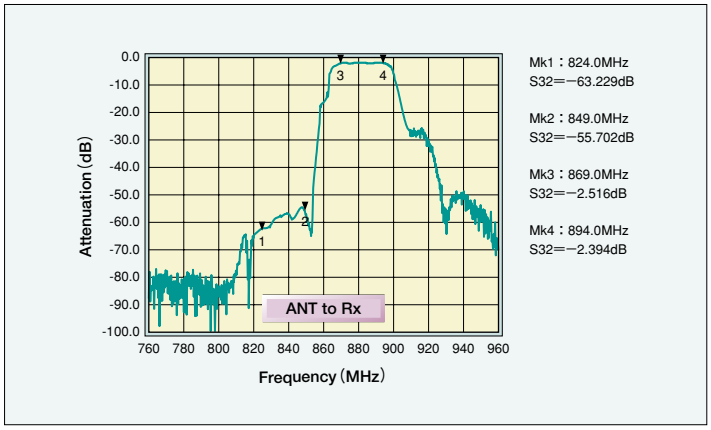


Figure 7 Example of Typical Characteristic of SAW Duplexer (Band V) (3)

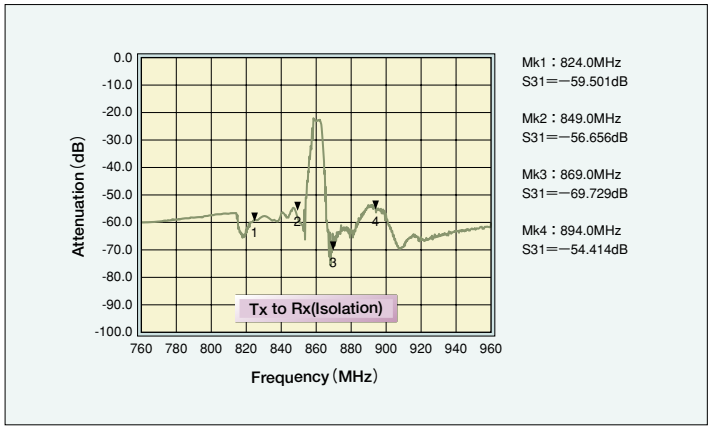


Figure 8 Example of Typical Characteristic of SAW Duplexer (Band V) (4)

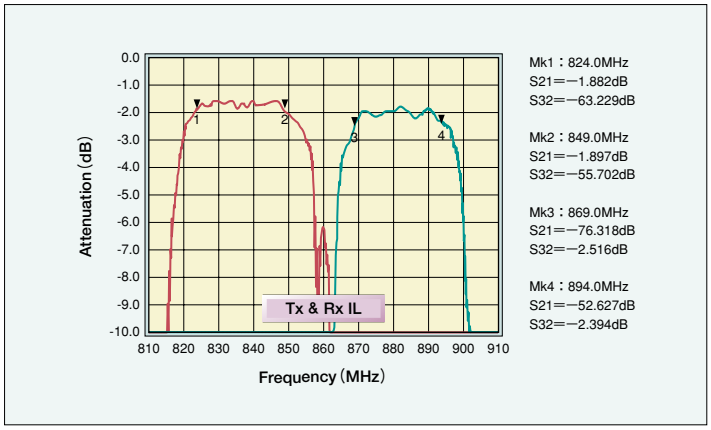


Figure 9 Example of Typical Characteristic of SAW Duplexer (Band VIII) (1)

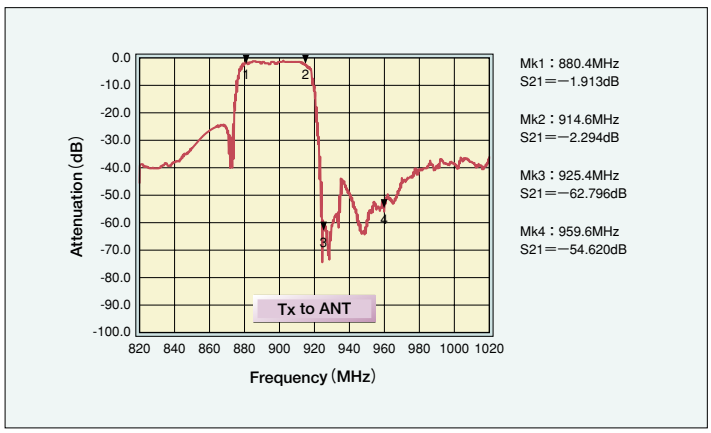


Figure 10 Example of Typical Characteristic of SAW Duplexer (Band VIII) (2)

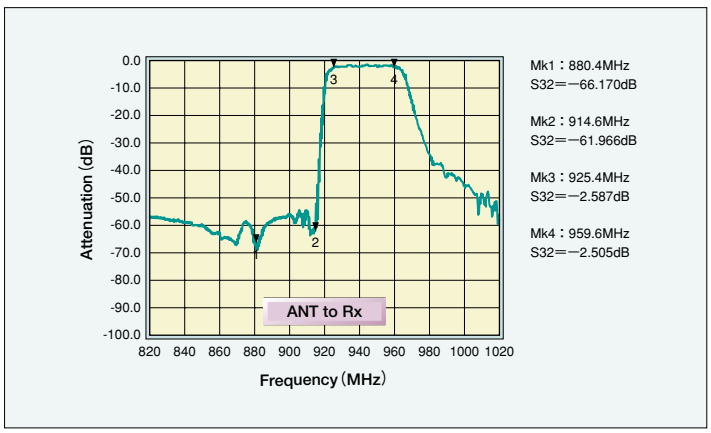


Figure 11 Example of Typical Characteristic of SAW Duplexer (Band VIII) (3)

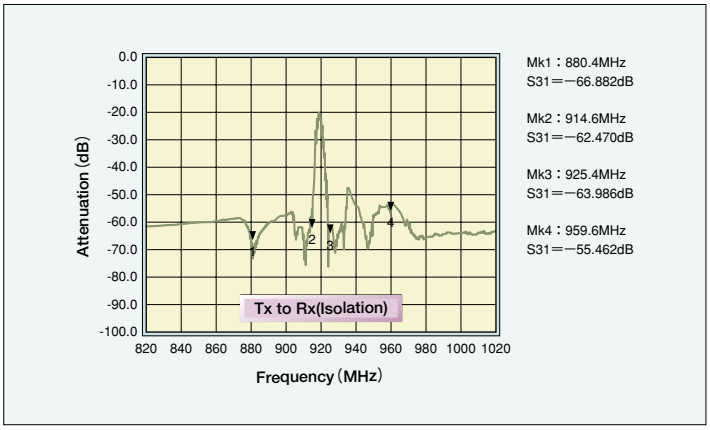


Figure 12 Example of Typical Characteristic of SAW Duplexer (Band VIII) (4)

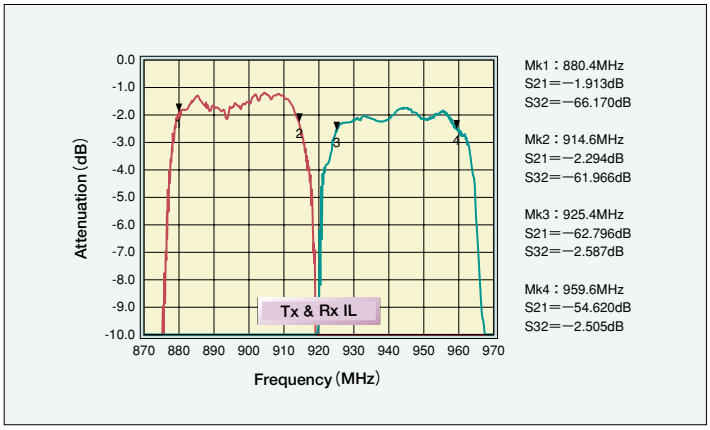


Figure 13 Example of Typical Characteristic of SAW Dual Filter (GSM850&900) (1)

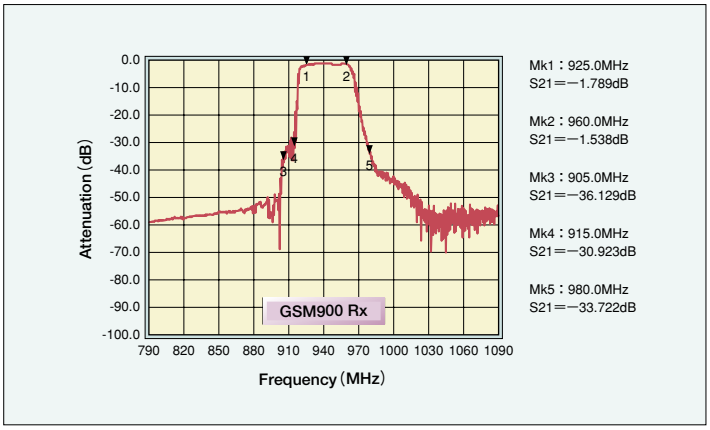


Figure 14 Example of Typical Characteristic of SAW Dual Filter (GSM850&900) (2)

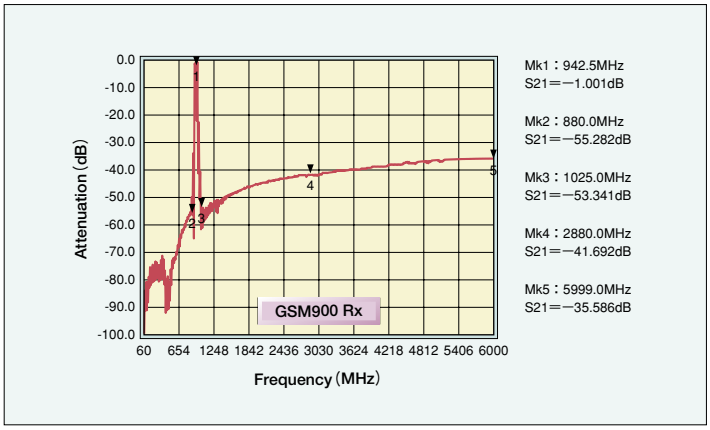


Figure 15 Example of Typical Characteristic of SAW Dual Filter (GSM850&900) (3)

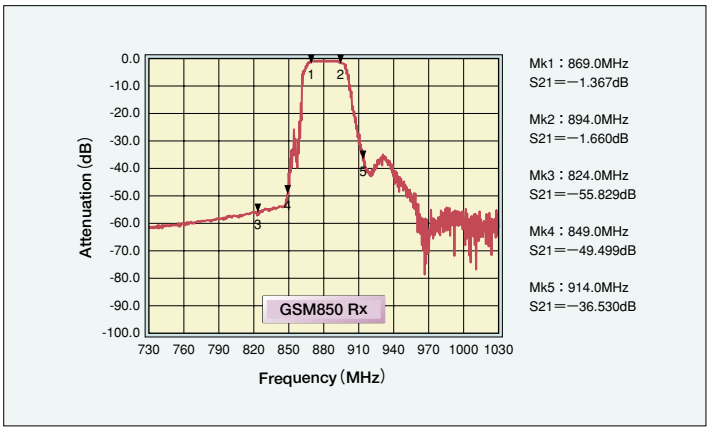


Figure 16 Example of Typical Characteristic of SAW Dual Filter (GSM850&900) (4)