

Version:  
January 13, 2017



(TSF)

**Saw Filters**

**Token Electronics Industry Co., Ltd.**

**Taiwan:** No.137, Sec. 1, Zhongxing Rd., Wugu District,  
New Taipei City, Taiwan, R.O.C. 24872  
Tel: +886 2981 0109 Fax: +886 2988 7487

**China:** 12F, Zhong Xing Industry Bld., Chuang Ye Road,  
Nan Shan District, Shen Zhen City,  
Guang Dong, China 518054  
Tel: +86 755 26055363; Fax: +86 755 26055365

[Web: www.token.com.tw](http://www.token.com.tw)

[Email: rfq@token.com.tw](mailto:rfq@token.com.tw)



**▶ Product Introduction****Token Saw Filters (TSF)****Make New Waves in The Wireless World.**

With the growth of wireless communications, surface acoustic wave technology filters have become a critical component for electronics manufacturers. Token develops and manufactures a complete line of our frequency control products utilizing industry standard packages in both Surface Mount and Through Hole designs.



Token provides innovative low-cost, space-saving and energy-efficient designs with high volume off-shore manufacturing, leading technology and superior engineering resources in design and process manufacturing.

Token's saw filters support all the major standards: EGSM, DCS, AMPS/CDMA/GSM850, PCS, WCDMA, WLAN, GPS, within the standard range of devices, offering a cost-effective solution for all applications.

A new compact range of Saw RF filters uses chip-scale packaging specifically to address the demanding miniaturization and performance requirements for new generations of mobile phones. Key features of the range include compatibility with lead-free (high-temperature) solder reflow while achieving high reliability against moisture, temperature, mechanical vibrations and shocks.

In modern remote control applications, Saw resonators and front end filters are key components which transmit in the USA typically at 315 or 915 MHz and in Europe at 433.92 MHz or 868-870 MHz. These remote controls are used in systems for Remote Keyless Entry (RKE, wireless operation of a car's central locking system), security alarms and garage door openers, electronic toll, RFID, short range data transmission, wireless Tire Pressure Monitoring (TPMS).

Token saw components provide stable frequencies for the RF carrier signal to transmit data over a range for the local oscillators of superhet receivers. The front-end filter in the receiver eliminates interference from the incoming RF signal, thus increasing selectivity and sensitivity in short-range devices.

Our experienced engineering team can support your Saw application from the initial design through production. Custom designs are available utilizing high technology mask designs, wafer fabrication, assembly and complete reliability testing.

For marketing discontinuations or second sourcing activities concerning RF Filter and IF Filter products, you are encouraged to contact our Sales Department so the request can be properly directed within Token.

Contact us with your specific needs. For more information, please link to Token official website "[Saw Filters](http://www.token.com.tw)".

## ▶ for Automotive Electronics & Remote Control

### Front End Filter Typical Specification (TSF)

| Part Number    | Center Freq. (MHz) | IL(dB) | 3dB BW(MHz) | Package  |          |
|----------------|--------------------|--------|-------------|----------|----------|
|                |                    |        |             | SMD Type | DIP Type |
| TSF295D00-D1   | 295                | 3.0    | 0.6         |          | TO-39    |
| TSF302D00A-S4  | 302                | 2.5    | 0.75        | QCC8C    |          |
| TSF302D00B-S7  | 302                | 2.5    | 0.75        | DCC6     |          |
| TSF303D825A-D1 | 303.825            | 3.0    | 0.6         |          | TO-39    |
| TSF303D825B-S4 | 303.825            | 3.0    | 0.6         | QCC8C    |          |
| TSF303D875A-D1 | 303.875            | 3.0    | 0.6         |          | TO-39    |
| TSF303D875B-S4 | 303.875            | 3.0    | 0.6         | QCC8C    |          |
| TSF310D00-S4   | 310                | 3.0    | 0.8         | QCC8C    |          |
| TSF315D00A-D1  | 315                | 3.0    | 0.6         |          | TO-39    |
| TSF315D00B-D2  | 315                | 3.0    | 0.6         |          | F-11     |
| TSF315D00C-S4  | 315                | 3.0    | 0.6         | QCC8C    |          |
| TSF315D00D-S4  | 315                | 2.5    | 1.3         | QCC8C    |          |
| TSF315D00E-S6  | 315                | 2.5    | 1.3         | QCC8B    |          |
| TSF315D50-D1   | 315.5              | 3.0    | 0.6         |          | TO-39    |
| TSF318D00-D1   | 318                | 3.0    | 0.6         |          | TO-39    |
| TSF319D50-D1   | 319.5              | 2.5    | 0.7         |          | TO-39    |
| TSF345D00A-S6  | 345                | 2.5    | 4.5         | QCC8B    |          |
| TSF345D00B-S4  | 345                | 3.0    | 0.9         | QCC8C    |          |
| TSF372D50-D1   | 372.5              | 3.0    | 0.6         |          | TO-39    |
| TSF390D00-S4   | 390                | 3.0    | 1.0         | QCC8C    |          |
| TSF391D25-D1   | 391.25             | 2.5    | 0.6         |          | TO-39    |
| TSF395D00-S4   | 395                | 3.0    | 1.0         | QCC8C    |          |
| TSF401D65-S4   | 401.65             | 3.0    | 0.6         | QCC8C    |          |
| TSF401D90-D1   | 401.9              | 3.0    | 0.6         |          | TO-39    |
| TSF418D00A-D1  | 418                | 3.0    | 0.6         |          | TO-39    |
| TSF418D00B-S4  | 418                | 3.0    | 0.6         | QCC8C    |          |
| TSF419D20-S4   | 419.2              | 3.0    | 1.2         | QCC8C    |          |
| TSF430D50A-D1  | 430.5              | 3.0    | 0.6         |          | TO-39    |
| TSF430D50B-D2  | 430.5              | 3.0    | 0.6         |          | F-11     |
| TSF431D50A-D2  | 431.5              | 2.5    | 0.58        |          | F-11     |
| TSF431D50B-S4  | 431.5              | 2.5    | 0.58        | QCC8C    |          |
| TSF433D42A-S4  | 433.42             | 3.5    | 0.6         | QCC8C    |          |
| TSF433D42B-S7  | 433.42             | 3.0    | 0.9         | DCC6     |          |
| TSF433D92A-D1  | 433.92             | 3.0    | 0.6         |          | TO-39    |
| TSF433D92B-D1  | 433.92             | 2.0    | 0.73        |          | TO-39    |
| TSF433D92C-D2  | 433.92             | 3.0    | 0.6         |          | F-11     |
| TSF433D92D-S4  | 433.92             | 3.0    | 0.6         | QCC8C    |          |
| TSF433D92E-S4  | 433.92             | 2.0    | 0.73        | QCC8C    |          |
| TSF433D92F-S4  | 433.92             | 2.5    | 0.6         | QCC8C    |          |
| TSF433D92G-S4  | 433.92             | 2.5    | 0.95        | QCC8C    |          |
| TSF433D92H-S4  | 433.92             | 2.2    | 0.7         | QCC8C    |          |

| Part Number    | Center Freq.<br>(MHz) | IL(dB) | 3dB BW(MHz) | Package  |          |
|----------------|-----------------------|--------|-------------|----------|----------|
|                |                       |        |             | SMD Type | DIP Type |
| TSF433D92I-S6  | 433.92                | 2.8    | 6.0         | QCC8B    |          |
| TSF433D92J-S6  | 433.92                | 2.3    | 0.56        | QCC8B    |          |
| TSF433D92K-S6  | 433.92                | 2.3    | 0.56        | QCC8B    |          |
| TSF433D92L-S9  | 433.92                | 2.8    | 1.0         | DCC6C    |          |
| TSF433D92M-S7  | 433.92                | 2.3    | 0.56        | DCC6     |          |
| TSF434D42A-D1  | 434.42                | 3.0    | 0.7         |          | TO-39    |
| TSF434D42B-S4  | 434.42                | 3.0    | 0.6         | QCC8C    |          |
| TSF439D25-D1   | 439.25                | 3.0    | 0.6         |          | TO-39    |
| TSF451D25-D1   | 451.25                | 2.5    | 0.48        |          | TO-39    |
| TSF463D912-S4  | 463.912               | 2.5    | 1.2         | QCC8C    |          |
| TSF499D25-D1   | 499.25                | 3.0    | 0.54        |          | TO-39    |
| TSF801D125A-S7 | 801.125               | 5.8    | 0.56        | DCC6     |          |
| TSF801D125B-S6 | 801.125               | 5.0    | 0.58        | QCC8B    |          |
| TSF859D15-D2   | 859.15                | 4.0    | 1.0         |          | F-11     |
| TSF868D00-S4   | 868                   | 3.5    | 1.2         | QCC8C    |          |
| TSF868D30-S4   | 868.3                 | 4.0    | 1.2         | QCC8C    |          |
| TSF868D35A-D2  | 868.35                | 4.0    | 1.2         |          | F-11     |
| TSF868D35B-S4  | 868.35                | 4.0    | 1.2         | QCC8C    |          |
| TSF868D35C-S6  | 868.35                | 3.5    | 1.8         | QCC8B    |          |
| TSF868D69-S4   | 868.69                | 3.8    | 1.9         | QCC8C    |          |
| TSF868D95-S4   | 868.95                | 3.5    | 1.2         | QCC8C    |          |
| TSF869D69-S4   | 869.69                | 3.8    | 1.8         | QCC8C    |          |
| TSF902D30-S4   | 902.3                 | 3.5    | 1.2         | QCC8C    |          |
| TSF908D00-S6   | 908                   | 3.0    | 2.0         | QCC8B    |          |
| TSF914D50-D2   | 914.5                 | 3.8    | 1.2         |          | F-11     |
| TSF915D00A-D1  | 915                   | 3.5    | 1.2         |          | TO-39    |
| TSF915D00B-S4  | 915                   | 4.0    | 1.2         | QCC8C    |          |
| TSF915D00C-S7  | 915                   | 3.8    | 1.8         | DCC6     |          |
| TSF916D50A-D1  | 916.5                 | 4.0    | 1.2         |          | TO-39    |
| TSF916D50B-D2  | 916.5                 | 3.5    | 1.2         |          | F-11     |
| TSF916D50C-S4  | 916.5                 | 4.0    | 1.2         | QCC8C    |          |
| TSF916D50E-S4  | 916.5                 | 4.0    | 1.2         | QCC8C    |          |
| TSF916D50F-S6  | 916.5                 | 4.8    | 1.35        | QCC8B    |          |
| TSF921D60-S6   | 921.6                 | 2.6    | 1.9         | QCC8B    |          |
| TSF927D20-S7   | 927.2                 | 3.0    | 1.45        | DCC6     |          |
| TSF931D00-S4   | 931                   | 3.5    | 1.8         | QCC8C    |          |

- **Front end filters for Automotive Electronics and Remote Control:**  
 433.92 MHz in Europe.  
 315 MHz or 915 MHz in the USA.  
 868-870 MHz In modern remote control applications.

## ► for Satellite Receiver

### Satellite Receiver Typical Specification (TSF)

| Part Number   | Center Freq. (MHz) | IL(dB)      | 3dB BW(MHz) | Application                    | Package  |          |
|---------------|--------------------|-------------|-------------|--------------------------------|----------|----------|
|               |                    |             |             |                                | SMD Type | DIP Type |
| TSF480D00A-D5 | 480                | 21          | 18          | One-channel, Satellite Filters |          | TO39-2   |
| TSF480D00B-S4 | 480                | 21          | 18          | One-channel, Satellite Filters | QCC8C    |          |
| TSF480D00C-D5 | 480                | 22.5        | 27          | One-channel, Satellite Filters |          | TO39-2   |
| TSF480D00D-S4 | 480                | 22.5        | 27          | One-channel, Satellite Filters | QCC8C    |          |
| TSF480D00E-D5 | 480                | 20          | 27          | One-channel, Satellite Filters |          | TO39-2   |
| TSF480D00F-D5 | 480                | 21          | 36          | One-channel, Satellite Filters |          | TO39-2   |
| TSF480D00G-S4 | 480                | 21          | 36          | One-channel, Satellite Filters | QCC8C    |          |
| TSF480D00H-D1 | 480                | 15          | 16          | One-channel, Satellite Filters |          | TO-39    |
| TSF480D00I-S4 | 480                | 12.5        | 15.3        | One-channel, Satellite Filters | QCC8C    |          |
| TSF480D00J-D5 | 480                | 22          | 38.6        | One-channel, Satellite Filters |          | TO39-2   |
| TSF479D50A-D5 | 479.5              | 21.5        | 8           | One-channel, Satellite Filters |          | TO39-2   |
| TSF479D50B-S4 | 479.5              | 21.5        | 8           | One-channel, Satellite Filters | QCC8C    |          |
| TSF479D50C-D5 | 479.5              | 18          | 6.5         | One-channel, Satellite Filters |          | TO39-2   |
| TSF479D50D-D2 | 479.5              | 22          | 16 (5.5 dB) | One-channel, Satellite Filters |          | F-11     |
| TSF479D50E-S4 | 479.5              | 22          | 16 (5.5 dB) | One-channel, Satellite Filters | QCC8C    |          |
| TSF402D78B-S4 | 402.78             | 20.5 / 20.0 | 15.5 / 28.0 | Two-channel, Satellite Filters | QCC8C    |          |

- **Filters for Digital Satellite Broadcasting (DSB Receiver):**  
 Superior sound and picture quality.  
 More available channels to choose from.  
 Progressively digitized worldwide of Television and radio broadcasting.

## ▶ for GPS

### RF Filters for GPS Typical Specification (TSF) Mobile Communications

| Part Number    | Center Freq. (MHz) | BW(MHz) | IL(dB) | Package  |          |
|----------------|--------------------|---------|--------|----------|----------|
|                |                    |         |        | SMD Type | DIP Type |
| TSF1542D50-S9  | 1542.50            | 40      | 3.5    | DCC6C    |          |
| TSF1575D42A-S9 | 1575.42            | 2.4     | 1.6    | DCC6C    |          |
| TSF1575D42B-S6 | 1575.42            | 2.4     | 1.6    | QCC8B    |          |

## ▶ for Wireless LAN

### IF Filters for Wireless LAN Typical Specification (TSF) Mobile Communications

| Part Number   | Center Freq. (MHz) | 3dB BW(MHz) | IL(dB) | Package  |          |
|---------------|--------------------|-------------|--------|----------|----------|
|               |                    |             |        | SMD Type | DIP Type |
| TSF280D00-S4  | 280                | 20          | 11     | QCC8C    |          |
| TSF374D00A-D1 | 374                | 22          | 9      |          | TO-39    |
| TSF374D00B-D1 | 374                | 22          | 8.5    |          | TO-39    |
| TSF374D00C-S4 | 374                | 22          | 9      | QCC8C    |          |
| TSF374D00D-S4 | 374                | 22          | 8.5    | QCC8C    |          |
| TSF374D00E-S4 | 374                | 19          | 9      | QCC8C    |          |
| TSF374D00F-S4 | 374                | 20.5        | 9      | QCC8C    |          |
| TSF374D00G-S6 | 374                | 23          | 9      | QCC8B    |          |
| TSF374D00H-S6 | 374                | 21          | 9      | QCC8B    |          |

## Applications

### RF & IF Filters Applications (TSF)

#### Saw RF Filters (Front End Filters)

- The main key factor of insertion loss on system performance criticizes the application of resonant design principles such as LCRF (Longitudinally-Coupled Resonator Filter), IEF (Impedance Element Filter), and IEF balanced bridge filters. With many year's experience in Saw applications, Token takes advantages of these design principles for the development of low loss filters for front end applications.
- A combination of two port resonators can be described as an LCRF design. Typically, a parallel connection of 4 two port resonators is used. This advantage allows very low loss by reducing resistive losses and avoided waveguide effects.
- IEF composes the basic design principle for RF filters with one port resonators used as impedance elements. Resonators are constituted in a ladder configuration. The difference between the acoustic impedance of resonance and anti-resonance is used to achieved a filter performance. The resonators may be designed to have different resonant frequencies.
- For wide-band, low-loss filters, Token takes advantage of different cuts of higher coupling substrate material (LiNbO3 / LiTaO3).

#### Saw IF Filters

- There are various different design principles which are suitable for the design of saw IF Filters. However, to meet the requirements perfectly is working on optimization.
- Precision filter design meets most of the requirements such as phase ripple, group delay and low amplitude in combination with high close-in rejection and fabulous selectivity. The disadvantage of precision filters is their high insertion loss. Token Saw Resonator design makes low insertion loss and miniaturized package size served better.
- SPUDT (Single Phase Unidirectional Transducer) filters combine transversal and resonant filter design principles to take advantage of optimization both. By optimizing the transduction and reflection of interdigital transducers, the filter performance can be improved while keeping the chip size the same. As a result of internal reflections, the signal length in the time domain is increased.
- Token utilizes SFIT(Slanted Finger Interdigital Transducer) filter to provide a low insertion loss with a wide bandwidth in Saw design. Token has developed a set of practical design tools to achieve low group delay ripple, and suppression of reflections including the triple transit signal.

## Order Codes

### Order Codes (TSF)

| TSF         | 302D00            |  | A          | S1      |
|-------------|-------------------|--|------------|---------|
| Part Number | Center Freq.(MHz) |  | Series No. | Package |
| 302D00      | 302 MHz           |  | None       | S1      |
| 310D00      | 310 MHz           |  | A          | S2      |
| 391D25      | 391.25 MHz        |  | B          | D1      |
|             |                   |  | C          | D2      |
|             |                   |  | D          | D3      |



## ▶ Saw Glossary

### Surface Acoustic Wave Glossary (TSF)

**RF Filters / IF Filters Technology for Wireless Communications - The Choice is yours**

#### What is SAW - Surface Acoustic Wave

- SAWs were first explained in 1885 by Lord Rayleigh, who described the surface acoustic mode of propagation and predicted its properties in his classic paper. Named after their discoverer, Rayleigh waves have a longitudinal and a vertical shear component that can couple with any media in contact with the surface. This coupling strongly affects the amplitude and velocity of the wave, allowing SAW sensors to directly sense mass and mechanical properties.

#### What is IDT - Interdigital Transducer

- The theory developed by Blotekjaer ET AL., (1973) is used to study a periodic system of conducting electrodes deposited upon the surface of a piezoelectric half space - a SAW IDT. It is assumed that some of the electrodes are fed by external voltage sources. Exact expressions are obtained for elements of the transmittance matrix, coupling currents and electrode potentials. Numerical and experimental results are presented.

#### Type of Saw devices

- Precision - Bidirectional, High Loss
- SPUDT - Single Phase Unidirectional Transducer
- TCRF - Transversely-Coupled Resonator filter
- LCRF - Longitudinally-Coupled Resonator Filter
- SFIT - Slanted Finger Interdigital Transducer
- IEF - Impedance Element Filter



#### Type of Saw Applications

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>● SONET - Synchronous Optical Network</li> <li>● DECT - Digital European Cordless Telephone</li> <li>● GSM - Global System for Mobile Communications</li> <li>● VCO - Voltage Controlled Oscillator</li> <li>● PCS - Personal Communication System</li> <li>● IF - Intermediate Frequency Filter</li> <li>● RF - Radio Frequency Filter</li> <li>● 3G - Third Generation Systems</li> <li>● PCN - Personal Communications Network</li> <li>● PHS - Personal Handyphone System</li> <li>● CDMA - Code Division Multiple Access</li> </ul> | <ul style="list-style-type: none"> <li>● SCDMA - Synchronous Code Division Multiple Access</li> <li>● VOFDM - Vector Orthogonal Frequency Division Multiplexing</li> <li>● TDMA - Time Division Multiple Access</li> <li>● EGSM - Extended Global System for Mobile</li> <li>● AMPS - Advanced Mobile Phone System</li> <li>● GSM - Global System for Mobile Communications</li> <li>● SDH - Synchronous Digital Hierarchy</li> <li>● DCS - Digital Communications System</li> <li>● PDC - Personal Digital Cellular</li> </ul> |
|---|---|



## ▶ for Cellular Phone

### RF Filters for Cellular Phone (TSF) Mobile Communications

| Part Number   | Center Freq. (MHz) | BW(MHz) | IL(dB) | System         | Package  |          |
|---------------|--------------------|---------|--------|----------------|----------|----------|
|               |                    |         |        |                | SMD Type | DIP Type |
| TSF452D50-S7  | 452.5              | 5.0     | 2.1    | CDMA450 TX     | DCC6     |          |
| TSF462D50-S7  | 462.5              | 4.6     | 2.5    | CDMA450 RX     | DCC6     |          |
| TSF455D00-S7  | 455.0              | 5.0     | 2.1    | CDMA450 TX     | DCC6     |          |
| TSF465D00-S7  | 465.0              | 4.6     | 2.5    | CDMA450 RX     | DCC6     |          |
| TSF481D25-S7  | 481.25             | 4.5     | 1.8    | CDMA450 TX     | DCC6     |          |
| TSF491D25-S7  | 491.25             | 4.5     | 2.4    | CDMA450 RX     | DCC6     |          |
| TSF836D50-S9  | 836.5              | 25      | 2.7    | AMPS / CDMA TX | DCC6C    |          |
| TSF881D50-S9  | 881.5              | 25      | 2.7    | AMPS / CDMA RX | DCC6C    |          |
| TSF897D50A-S7 | 897.5              | 26      | 3.0    | EGSM TX        | DCC6     |          |
| TSF897D50B-S7 | 897.5              | 30      | 2.7    | EGSM TX        | DCC6     |          |
| TSF942D50-S7  | 942.5              | 30      | 2.7    | EGSM RX        | DCC6     |          |
| TSF900D00A-S7 | 900                | 30      | 2.7    | EGSM TX        | DCC6     |          |
| TSF900D00B-S9 | 900                | 30      | 2.7    | EGSM TX        | DCC6C    |          |
| TSF945D00A-S7 | 945                | 30      | 2.7    | EGSM RX        | DCC6     |          |
| TSF945D00B-S9 | 945                | 30      | 2.7    | EGSM RX        | DCC6C    |          |
| TSF902D50A-S9 | 902.5              | 30      | 2.7    | GSM TX         | DCC6C    |          |
| TSF902D50B-S7 | 902.5              | 25      | 3.0    | GSM TX         | DCC6     |          |
| TSF947D50A-S9 | 947.5              | 30      | 2.7    | GSM RX         | DCC6C    |          |
| TSF947D50B-S7 | 947.5              | 25      | 3.0    | GSM RX         | DCC6     |          |
| TSF1747D50-S9 | 1747.5             | 75      | 3.5    | PCN / DCS TX   | DCC6C    |          |
| TSF1842D50-S9 | 1842.5             | 75      | 3.5    | PCN / DCS RX   | DCC6C    |          |
| TSF1855D00-S9 | 1855.0             | 30      | 3.0    | K-PCS RX       | DCC6C    |          |

## ▶ for Cordless Phone

### RF Filters for ISM Band Cordless Phone (TSF) Mobile Communications

| Part Number   | Center Freq. (MHz) | BW(MHz) | IL(dB) | Package  |          |
|---------------|--------------------|---------|--------|----------|----------|
|               |                    |         |        | SMD Type | DIP Type |
| TSF903D65-S7  | 903.65             | +2      | 3.8    | DCC6     |          |
| TSF915D00A-S7 | 915                | 26      | 3.5    | DCC6     |          |
| TSF915D00B-S9 | 915                | 26      | 3.5    | DCC6C    |          |
| TSF915D00C-S9 | 915                | 26      | 3.5    | DCC6C    |          |
| TSF915D00D-S7 | 915                | 26      | 3.5    | DCC6     |          |
| TSF915D00E-S9 | 915                | 7       | 3.2    | DCC6C    |          |
| TSF915D00F-S7 | 915                | 7       | 3.0    | DCC6     |          |
| TSF926D25-S7  | 926.25             | +2      | 3.5    | DCC6     |          |

- 1dB Bandwidth : 6.75 MHz (CH1~CH5) ; 6.50 MHz
- Insertion Loss : 23.0 dB typical ; 6.50 dB typical (NDF25C)
- Passband Ripple :+ 0.6 dB ;+ 1.0 dB (NDF25C)

## ▶ for Cordless Phone

### Duplexers for Cordless Phone (TSF) Mobile Communications

| Part Number   | Lower Freq. (MHz) | Upper Freq. (MHz) | IL(dB)    | System   | Package  |          |
|---------------|-------------------|-------------------|-----------|----------|----------|----------|
|               |                   |                   |           |          | SMD Type | DIP Type |
| TSF908D50A-S4 | 886               | 931               | 3.5 / 3.5 | CT1+     | QCC8C    |          |
| TSF908D50B-S4 | 886               | 931               | 3.5 / 3.5 | CT1+     | QCC8C    |          |
| TSF908D50C-S6 | 886               | 931               | 3.5 / 3.5 | CT1+     | QCC8B    |          |
| TSF908D50D-S6 | 886               | 931               | 3.5 / 3.5 | CT1+     | QCC8B    |          |
| TSF915D00A-S6 | 903               | 927               | 3.5 / 3.5 | ISM band | QCC8B    |          |
| TSF915D00B-S6 | 903               | 927               | 3.5 / 3.5 | ISM band | QCC8B    |          |
| TSF914D95A-S6 | 903.45            | 926.45            | 3.5 / 3.5 | ISM band | QCC8B    |          |
| TSF914D95B-S6 | 903.45            | 926.45            | 3.5 / 3.5 | ISM band | QCC8B    |          |
| TSF914D95C-D1 | 903.75            | 926.25            | 3.5 / 3.5 | ISM band |          | TO-39    |
| TSF914D95D-D1 | 903.75            | 926.25            | 3.5 / 3.5 | ISM band |          | TO-39    |
| TSF914D95E-S4 | 903.75            | 926.25            | 3.5 / 3.5 | ISM band | QCC8C    |          |
| TSF914D95F-S4 | 903.75            | 926.25            | 3.5 / 3.5 | ISM band | QCC8C    |          |
| TSF914D95G-S6 | 903.75            | 926.25            | 3.5 / 3.5 | ISM band | QCC8B    |          |
| TSF914D95H-S6 | 903.75            | 926.25            | 3.5 / 3.5 | ISM band | QCC8B    |          |
| TSF937D00A-D1 | 914.5             | 959.5             | 3.5 / 3.5 | CT1      |          | TO-39    |
| TSF937D00B-D1 | 914.5             | 959.5             | 3.5 / 3.5 | CT1      |          | TO-39    |
| TSF937D00C-S4 | 914.5             | 959.5             | 3.5 / 3.5 | CT1      | QCC8C    |          |
| TSF937D00D-S4 | 914.5             | 959.5             | 3.5 / 3.5 | CT1      | QCC8C    |          |
| TSF937D00E-S6 | 914.5             | 959.5             | 3.5 / 3.5 | CT1      | QCC8B    |          |
| TSF937D00F-S6 | 914.5             | 959.5             | 3.5 / 3.5 | CT1      | QCC8B    |          |

▶ for Pager Appl.

for Pager Applications (TSF) Mobile Communications

| Part Number   | Center Freq.<br>(MHz) | BW(MHz) | IL(dB)   | Package  |          |
|---------------|-----------------------|---------|----------|----------|----------|
|               |                       |         |          | SMD Type | DIP Type |
| TSF139D00-D2  | 139                   | +4.0    | 6.5 max. |          | F-11     |
| TSF147D00A-D2 | 147                   | +4.0    | 6.5 max. |          | F-11     |
| TSF147D00B-S4 | 147                   | +4.0    | 6.5 max. | QCC8C    |          |
| TSF155D00A-D2 | 155                   | +4.0    | 6.5 max. |          | F-11     |
| TSF155D00B-S4 | 155                   | +4.0    | 6.5 max. | QCC8C    |          |
| TSF163D00A-D2 | 163                   | +4.0    | 6.5 max. |          | F-11     |
| TSF163D00B-S4 | 163                   | +4.0    | 6.5 max. | QCC8C    |          |
| TSF171D00A-D2 | 171                   | +4.0    | 6.5 max. |          | F-11     |
| TSF171D00B-S4 | 171                   | +4.0    | 6.5 max. | QCC8C    |          |
| TSF281D00A-D2 | 281                   | +3.1    | 4.5 max. |          | F-11     |
| TSF281D00B-S4 | 281                   | +4.0    | 4.5 max. | QCC8C    |          |
| TSF930D50A-D2 | 930.5                 | +2.0    | 4.5 max. |          | F-11     |
| TSF930D50B-S4 | 930.5                 | +2.0    | 4.5 max. | QCC8C    |          |
| TSF930D50C-S7 | 930.5                 | +2.0    | 4.5 max. | DCC6     |          |

## ▶ for Comm. Equipment

### for Communication Equipment (TSF) Mobile Communications

| Part Number           | Center Freq. (MHz) | BW(MHz)    | IL(dB)   | System                   | Package  |          |
|-----------------------|--------------------|------------|----------|--------------------------|----------|----------|
|                       |                    |            |          |                          | SMD Type | DIP Type |
| <b>TSF35D42-S2</b>    | 35.42              | 1.9 (1dB)  | 17.5     | GPS                      | SMP-53   |          |
| <b>TSF96D00B-S3</b>   | 96                 | 5 (1dB)    | 13.5     | 3G Base Station          | SMP-53-S |          |
| <b>TSF96D00C-S1</b>   | 96                 | +10        | 8.5      | 3G Base Station          | SMP-03   |          |
| <b>TSF110D00A-S4</b>  | 110                | 2.12 (3dB) | 3.5      | GPS                      | QCC8C    |          |
| <b>TSF110D00B-S1</b>  | 110                | 4.0 (3dB)  | 9.0      | Wireless LAN / Bluetooth | SMP-03   |          |
| <b>TSF110D00C-S1</b>  | 110                | 0.66 (1dB) | 12       | SCDMA                    | SMP-03   |          |
| <b>TSF110D592A-S4</b> | 110.592            | +0.576     | 3.5      | DECT                     | QCC8C    |          |
| <b>TSF110D592B-S1</b> | 110.592            | +0.576     | 3.5      | DECT                     | SMP-03   |          |
| <b>TSF130D38A-S6</b>  | 130.38             | +0.63 min. | 5.5 max. | AMPS / ADC               | QCC8B    |          |
| <b>TSF130D38B-S7</b>  | 130.38             | +0.63 min. | 5.5 max. | AMPS / ADC               | DCC6     |          |
| <b>TSF199D00-S3</b>   | 199                | +0.1       | 7.0 max. | GSM Base Station         | SMP-53-S |          |
| <b>TSF204D00-S1</b>   | 204                | 0.7 (1dB)  | 10       | SCDMA                    | SMP-03   |          |
| <b>TSF240D00-S4</b>   | 240                | +3.85      | 11       | Broadband                | QCC8C    |          |
| <b>TSF243D95A-S7</b>  | 243.95             | +0.11      | 2.0      | PHS                      | DCC6     |          |
| <b>TSF243D95B-S7</b>  | 243.95             | +0.11      | 2.2      | PHS                      | DCC6     |          |
| <b>TSF243D95C-S9</b>  | 243.95             | +0.11      | 2.0      | PHS                      | DCC6C    |          |
| <b>TSFD243D95D-S8</b> | 243.95             | +0.11      | 2.0      | PHS                      | QCC8D    |          |
| <b>TSF243D95E-S8</b>  | 243.95             | +0.11      | 2.2      | PHS                      | QCC8D    |          |
| <b>TSF265D55-S8</b>   | 265.55             | +0.11      | 2.3      | PHS                      | QCC8D    |          |
| <b>TSF426D00-S2</b>   | 426                | 6.5 (3dB)  | 22       | Broadband Access / VOFDM | SMP-53   |          |

## Order Codes

### Order Codes (TSF)

| TSF         | 302D00            | A          | S1      |
|-------------|-------------------|------------|---------|
| Part Number | Center Freq.(MHz) | Series No. | Package |
| 302D00      | 302 MHz           | None       | S1      |
| 310D00      | 310 MHz           | A          | S2      |
| 391D25      | 391.25 MHz        | B          | D1      |
|             |                   | C          | D2      |
|             |                   | D          | D3      |

## ▶ General Information

### | Advantage of Token Saw Devices

Token Electronics has gained a successful development of Saw components, due to our flexible design capabilities and cost-optimizing production facilities. In addition to our extensive offering of standard Saw devices, Token has diverse Engineering experience spanning hundreds of custom designed saw components, Band pass Filters, Low Loss Filters and saw based subsystems.

As Token Company Spirit:

- Honesty is our business policy.
- Perfection is our quality system.
- Sharing cost saving with customers is our business target.

Token reliably deliver high-quality components according to the each customer special needs with respect to performance, costs, and technology modifications.