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# DIRECT

## Electronics Tech.

### (TSR)

# Saw Resonators

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## Product Introduction

### Saw Resonators (TSR) Can Replace LC Elements and Quartz Crystals.

Direct Saw Resonator employs surface acoustic wave, and is able to be applied to high frequency circuit where conventional crystal, ceramic resonators are not available, as resonator oscillates stably with its fundamental mode over frequency range from 200 MHz to around 1 GHz.

The resonator uses arrays of metal strips, with pitch  $\lambda/2$ , as reflectors of the waves. These arrays can give strong Saw reflections, and two arrays can be used to form a Saw cavity with high Q. Such resonators are often used for high-stability oscillators.



(TSR) can be applied to many types of high frequency devices including RF remote controls, CATV FSK demodulators and CATV 2nd local oscillators. (TSR) resonator is ideal for applications such as automotive keyless entry, tire pressure monitoring, gate and door openers, personal and home security, and automated meter readers, wireless point of sale terminals, identification tags, bar code readers, and computer peripherals.

Direct offers 2 type Resonators in terms of 1-port and 2-port.

#### 1-Port Type:

- One-port, typically one-pole, resonators are used in oscillator applications.
- Most of the application circuit is Colpitts or similar type that can be made with low cost.
- 1-port resonator is basically a 2 terminal device and its application is similar to that of quartz bulk wave resonator or ceramic resonator.
- Also, it is also applicable to VCO (Voltage Controlled Oscillator) application.

#### 2-Port Type:

- 2-port resonator is a kind of very narrow, low loss band-pass filter.
- Oscillation circuit is mostly like a RF amplifier with feedback loop.
- There are many varieties of two-port (multi-pole) resonator structures in production.

The (TSR) Resonator series has high stability; good temperature characteristics provided by quartz crystal substrate and are developed with Saw technology accumulated for Saw filters through Direct's experience. In addition, (TSR) Resonator can be customized designs and other frequency requirements available on request. Contact us with your specific needs. For more information, please link to Direct official website "[Saw Resonators](http://www.direct-token.com)".



## ▶ One Port Resonators

### for Automotive Electronics & Remote Control (TSR) One Port Type

Part Number	Center Freq. (MHz)	IL(dB)	Package	
			SMD Type	DIP Type
TSR224D50-D2	224.5	1.2		F-11
TSR224D70-D1	224.7	1.4		TO-39
TSR265D00-D1	265	1.8		TO-39
TSR288D00-D1	288	1.5		TO-39
TSR293D125-S5	293.125	1.6	QCC4A	
TSR295D00-D1	295	1.5		TO-39
TSR300D00A-D1	300	1.3		TO-39
TSR300D00B-S4	300	1.3	QCC8C	
TSR300D00C-S4	300	1.5	QCC8C	
TSR300D3625-S4	300.3625	1.3	QCC8C	
TSR303D75-D1	303.75	1.5		TO-39
TSR303D825A-S5	303.825	1.2	QCC4A	
TSR303D825B-D1	303.825	1.5		TO-39
TSR303D825C-D2	303.825	1.3		F-11
TSR303D825D-S4	303.825	1.4	QCC8C	
TSR303D875A-D1	303.875	1.5		TO-39
TSR303D875B-D2	303.875	1.3		F-11
TSR303D875C-S5	303.875	1.6	QCC4A	
TSR303D875D-S4	303.875	1.4	QCC8C	
TSR303D948A-S5	303.948	1.5	QCC4A	
TSR303D948B-S4	303.948	1.3	QCC8C	
TSR304D00-D1	304	1.2		TO-39
TSR304D30A-D1	304.3	1.4		TO-39
TSR304D30B-S11	304.3	1.5	F11SMD	
TSR304D30C-S5	304.3	1.5	QCC4A	
TSR305D675-D1	305.675	1.8		TO-39
TSR306D00-D2	306	1.2		F-11
TSR308D50-D1	308.5	1.2		TO-39
TSR309D00-D1	309	1.3		TO-39
TSR310D00A-D1	310	1.4		TO-39
TSR310D00B-S5	310	1.1	QCC4A	
TSR310D00C-S4	310	1.3	QCC8C	
TSR311D00A-D1	311	1.5		TO-39
TSR311D00B-S4	311	1.5	QCC8C	
TSR311D063A-S5	311.063	1.3	QCC4A	
TSR311D063B-S4	311.063	1.3	QCC8C	
TSR312D00A-D1	312	1.3		TO-39
TSR312D00B-S5	312	1.3	QCC4A	
TSR312D00C-S4	312	1.2	QCC8C	
TSR314D50A-D1	314.5	1.5		TO-39
TSR314D50B-D2	314.5	1.5		F-11



Part Number	Center Freq. (MHz)	IL(dB)	Package	
			SMD Type	DIP Type
TSR314D50C-S5	314.5	1.3	QCC4A	
TSR314D50D-S4	314.5	1.2	QCC8C	
TSR314D50E-S11	314.5	1.6	F11SMD	
TSR315D00A-D1	315	1.5		TO-39
TSR315D00B-D2	315	1.5		F-11
TSR315D00C-D3	315	1.0		D-11
TSR315D00D-S5	315	1.3	QCC4A	
TSR315D00E-S4	315	1.4	QCC8C	
TSR315D00F-S9	315	1.5	DCC6C	
TSR315D00G-S7	315	1.3	DCC6	
TSR315D00H-S11	315	1.6	F11SMD	
TSR315D50A-D1	315.5	1.2		TO-39
TSR315D50B-D2	315.5	1.3		F-11
TSR315D50C-D3	315.5	1.3		D-11
TSR315D50D-S5	315.5	1.5	QCC4A	
TSR315D50E-S5	315.5	1.6	QCC4A	
TSR315D50F-S4	315.5	1.5	QCC8C	
TSR315D50G-S7	315.5	1.5	DCC6	
TSR315D50H-S9	315.5	1.3	DCC6C	
TSR316D025-D1	316.025	1.2		TO-39
TSR316D65-D1	316.65	1.3		TO-39
TSR316D80A-D1	316.8	1.3		TO-39
TSR316D80B-D2	316.8	1.3		F-11
TSR316D80C-S5	316.8	1.2	QCC4A	
TSR317D50-S5	317.5	1.2	QCC4A	
TSR318D00A-D1	318	1.0		TO-39
TSR318D00B-D2	318	1.0		F-11
TSR318D00C-S5	318	1.2	QCC4A	
TSR318D00D-S4	318	1.5	QCC8C	
TSR319D00-S4	319	1.0	QCC8C	
TSR319D50A-S5	319.5	1.3	QCC4A	
TSR319D50B-S4	319.5	1.3	QCC8C	
TSR320D00-D1	320	1.5		TO-39
TSR324D00-S4	324	1.5	QCC8C	
TSR325D00A-D1	325	1.6		TO-39
TSR325D00B-D2	325	1.6		F-11
TSR330D00A-D1	330	1.2		TO-39
TSR330D00B-D2	330	1.0		F-11
TSR333D00A-D1	333	1.3		TO-39
TSR333D00B-D2	333	1.3		F-11
TSR334D50-D2	334.5	1.8		F-11
TSR336D00-D3	336	1.5		D-11
TSR340D00A-D1	340	1.0		TO-39
TSR340D00B-S4	340	1.3	QCC8C	
TSR345D00A-D1	345	1.4		TO-39



Part Number	Center Freq. (MHz)	IL(dB)	Package	
			SMD Type	DIP Type
TSR345D00B-S5	345	1.5	QCC4A	
TSR345D00C-S4	345	1.5	QCC8C	
TSR350D00A-D1	350	1.3		TO-39
TSR350D00B-D2	350	1.0		F-11
TSR350D00C-S4	350	1.5	QCC8C	
TSR360D00A-D1	360	1.5		TO-39
TSR360D00B-D2	360	1.2		F-11
TSR360D00C-S4	360	1.3	QCC8C	
TSR360D00D-S5	360	1.2	QCC4A	
TSR370D00-S4	370	1.2	QCC8C	
TSR372D00-S5	372	1.2	QCC4A	
TSR372D50A-D1	372.5	1.0		TO-39
TSR372D50B-S5	372.5	1.2	QCC4A	
TSR372D50C-S4	372.5	1.4	QCC8C	
TSR380D00-D2	380	1.2		F-11
TSR384D05-D2	384.05	1.3		F-11
TSR388D95-D2	388.95	1.2		F-11
TSR390D00A-D1	390	1.2		TO-39
TSR390D00B-D2	390	1.4		F-11
TSR390D00C-S4	390	1.2	QCC8C	
TSR390D00D-S4	390	1.3	QCC8C	
TSR392D85-S4	392.85	1.3	QCC8C	
TSR395D00A-D1	395	1.5		TO-39
TSR395D00B-D2	395	1.0		F-11
TSR395D00C-S5	395	1.5	QCC4A	
TSR395D50A-D1	395.5	1.2		TO-39
TSR395D50B-D2	395.5	1.3		F-11
TSR396D00-D1	396	1.3		TO-39
TSR403D55A-D1	403.55	1.2		TO-39
TSR403D55B-S5	403.55	1.3	QCC4A	
TSR403D55C-S4	403.55	1.3	QCC8C	
TSR403D966A-S5	403.966	1.3	QCC4A	
TSR403D966B-S4	403.966	1.5	QCC8C	
TSR407D30A-D1	407.3	1.3		TO-39
TSR407D30B-S4	407.3	1.3	QCC8C	
TSR417D50A-D1	417.5	1.4		TO-39
TSR417D50B-S4	417.5	1.5	QCC8C	
TSR418D00A-D1	418	1.5		TO-39
TSR418D00B-D2	418	1.6		F-11
TSR418D00A-S5	418	1.2	QCC4A	
TSR418D00B-S4	418	1.6	QCC8C	
TSR418D00C-S6	418	1.7	QCC8B	
TSR418D00D-S9	418	1.8	DCC6C	
TSR419D95-D2	419.95	1.4		F-11
TSR423D22A-D1	423.22	1.3		TO-39





Part Number	Center Freq. (MHz)	IL(dB)	Package	
			SMD Type	DIP Type
TSR423D22B-D2	423.22	1.5		F-11
TSR423D22C-S5	423.22	1.6	QCC4A	
TSR423D22D-S4	423.22	1.6	QCC8C	
TSR426D00-S4	426	1.5	QCC8C	
TSR426D55-S4	426.55	1.5	QCC8C	
TSR430D50A-D1	430.5	2.0		TO-39
TSR430D50B-D2	430.5	2.2		F-11
TSR430D50C-D3	430.5	1.6		D-11
TSR430D65-D1	430.65	2.0		TO-39
TSR432D00-D2	432	1.2		F-11
TSR432D92A-D1	432.92	1.3		TO-39
TSR432D92B-S4	432.92	1.3	QCC8C	
TSR433D00-D1	433	1.0		TO-39
TSR433D385-S4	433.385	1.3	QCC8C	
TSR433D42A-D1	433.42	1.8		TO-39
TSR433D42B-S5	433.42	1.3	QCC4A	
TSR433D42C-S4	433.42	1.5	QCC8C	
TSR433D42D-S9	433.42	1.6	DCC6C	
TSR433D62-S9	433.62	1.6	DCC6C	
TSR433D85-D2	433.85	1.6		F-11
TSR433D92A-D1	433.92	1.8		TO-39
TSR433D92B-D1	433.92	1.5		TO-39
TSR433D92C-D1	433.92	2.6		TO-39
TSR433D92D-D1	433.92	1.3		TO-39
TSR433D92E-D1	433.92	1.1		TO-39
TSR433D92F-D2	433.92	1.3		F-11
TSR433D92G-D2	433.92	1.5		F-11
TSR433D92H-D3	433.92	1.0		D-11
TSR433D92I-S5	433.92	1.5	QCC4A	
TSR433D92J-S4	433.92	1.2	QCC8C	
TSR433D92K-S4	433.92	1.6	QCC8C	
TSR433D92L-S4	433.92	2.0	QCC8C	
TSR433D92M-S4	433.92	2.0	QCC8C	
TSR433D92N-S4	433.92	1.8	QCC8C	
TSR433D92O-S9	433.92	1.6	DCC6C	
TSR433D92P-S7	433.92	1.5	DCC6	
TSR433D92Q-S6	433.92	1.5	QCC8B	
TSR433D92R-S11	433.92	1.8	F11SMD	
TSR433D97-D1	433.97	1.1		TO-39
TSR434D40-D1	434.4	1.3		TO-39
TSR434D42A-D1	434.42	1.3		TO-39
TSR434D42B-S5	434.42	1.8	QCC4A	
TSR434D42C-S4	434.42	2.0	QCC8C	
TSR435D00-D1	435	1.2		TO-39
TSR435D72A-S5	435.72	1.3	QCC4A	



Part Number	Center Freq. (MHz)	IL(dB)	Package	
			SMD Type	DIP Type
TSR435D72B-S4	435.72	2.8	QCC8C	
TSR435D80-D1	435.8	1.3		TO-39
TSR440D80-D1	440.8	2.5		TO-39
TSR441D20A-D1	441.2	2.7		TO-39
TSR441D20B-D2	441.2	2.8		F-11
TSR447D699A-S5	447.699	1.3	QCC4A	
TSR447D699B-S4	447.699	1.0	QCC8C	
TSR447D725A-D1	447.725	1.5		TO-39
TSR447D725B-S5	447.725	1.6	QCC4A	
TSR479D50A-D1	479.5	1.3		TO-39
TSR479D50B-D2	479.5	1.5		F-11
TSR499D50-S4	499.5	1.2	QCC8C	
TSR500D00-D2	500	1.1		F-11
TSR567D00-D1	567	5.0		TO-39
TSR585D00-D2	585	1.8		F-11
TSR622D08A-D1	622.08	1.5		TO-39
TSR622D08B-S7	622.08	1.5	DCC6	
TSR643D75-S4	643.75	1.5	QCC8C	
TSR680D00-D2	680	0.9		F-11
TSR755D00-S7	755	1.2	DCC6	
TSR801D125-S7	801.125	1.2	DCC6	
TSR809D00A-D1	809	1.2		TO-39
TSR809D00B-S4	809	1.3	QCC8C	
TSR820D00-S9	820	1.4	DCC6C	
TSR854D00-S7	854	1.2	DCC6	
TSR857D30-D1	857.3	1.0		TO-39
TSR857D65A-D1	857.65	2.8		TO-39
TSR857D65B-S5	857.65	1.2	QCC4A	
TSR858D00-S7	858	1.4	DCC6	
TSR863D00-D1	863	1.0		TO-39
TSR864D00-D1	864	1.0		TO-39
TSR868D00A-D1	868	1.2		TO-39
TSR868D00B-S4	868	1.5	QCC8C	
TSR868D00C-S9	868	1.3	DCC6C	
TSR868D30A-D1	868.3	1.2		TO-39
TSR868D30B-S4	868.3	1.5	QCC8C	
TSR868D30C-S9	868.3	1.5	DCC6C	
TSR868D35A-D1	868.35	1.2		TO-39
TSR868D35B-D2	868.35	1.3		F-11
TSR868D35C-D3	868.35	1.2		D-11
TSR868D35D-S4	868.35	1.6	QCC8C	
TSR868D35E-S6	868.35	1.0	QCC8B	
TSR868D35F-S9	868.35	1.5	DCC6C	
TSR868D35G-S5	868.35	1.7	QCC4A	
TSR868D75-S4	868.75	1.8	QCC8C	



Part Number	Center Freq. (MHz)	IL(dB)	Package	
			SMD Type	DIP Type
TSR868D95A-D1	868.95	1.3		TO-39
TSR868D95B-S4	868.95	1.8	QCC8C	
TSR868D95C-S9	868.95	1.6	DCC6C	
TSR902D30-S4	902.3	1.3	QCC8C	
TSR902D50-S4	902.5	1.3	QCC8C	
TSR904D30A-D1	904.3	2.8		TO-39
TSR904D30B-S5	904.3	3.4	QCC4A	
TSR905D80-S4	905.8	1.5	QCC8C	
TSR910D00-S4	910	1.2	QCC8C	
TSR912D00A-D1	912	1.3		TO-39
TSR912D00B-S4	912	1.5	QCC8C	
TSR912D00C-S7	912	1.0	DCC6	
TSR914D50A-S4	914.5	1.8	QCC8C	
TSR914D50B-S5	914.5	2.0	QCC4A	
TSR915D00A-D1	915	1.6		TO-39
TSR915D00B-S5	915	1.6	QCC4A	
TSR915D00C-S4	915	1.8	QCC8C	
TSR915D00D-S9	915	1.3	DCC6C	
TSR916D50A-D1	916.5	1.2		TO-39
TSR916D50B-S5	916.5	1.5	QCC4A	
TSR916D50C-S4	916.5	1.5	QCC8C	
TSR925D00-S4	925	2.4	QCC8C	
TSR927D00-S7	927	1.3	DCC6	
TSR927D20-S7	927.2	1.3	DCC6	
TSR930D50-D1	930.5	1.3		TO-39
TSR980D00A-D1	980	1.3		TO-39
TSR980D00B-S5	980	1.5	QCC4A	
TSR980D00C-S4	980	1.5	QCC8C	





## ▶ Two Port Resonators

### for Automotive Electronics & Remote Control (TSR) Two Port Type

Part Number	Center Freq. (MHz)	IL(dB)	Package	
			SMD Type	DIP Type
TSR217D25-D1	217.25	4.5		TO-39
TSR284D00-D1	284	5.0		TO-39
TSR310D00-D1	310	5.5		TO-39
TSR315D00A-D1	315	5.0		TO-39
TSR315D00B-D2	315	5.0		F-11
TSR315D00C-S4	315	5.0	QCC8C	
TSR380D00A-D1	380	6.0		TO-39
TSR380D00B-S11	380	5.5	F11SMD	
TSR384D05-D1	384.05	6.0		TO-39
TSR392D00-D1	392	5.5		TO-39
TSR403D55A-D1	403.55	6.0		TO-39
TSR403D55B-S4	403.55	5.0	QCC8C	
TSR418D00A-D1	418	6.0		TO-39
TSR418D00B-S4	418	6.0	QCC8C	
TSR423D22-D1	423.22	6.0		TO-39
TSR433D42-D1	433.42	6.0		TO-39
TSR433D92A-D1	433.92	6.0		TO-39
TSR433D92B-D2	433.92	6.0		F-11
TSR433D92C-S4	433.92	6.0	QCC8C	
TSR433D92D-S5	433.92	6.0	QCC4A	
TSR433D92E-S7	433.92	6.5	DCC6	
TSR780D00-S4	780	6.5	QCC8C	
TSR824D25-D1	824.25	6.5		TO-39
TSR865D00-D1	865	6.0		TO-39
TSR868D30-D1	868.3	6.0		TO-39
TSR868D30-S4	868.3	6.0	QCC8C	
TSR868D35-S4	868.35	6.5	QCC8C	
TSR873D00-S4	873	7.0	QCC8C	
TSR906D00-D1	906	6.5		TO-39
TSR915D00-S4	915	6.5	QCC8C	
TSR916D50-S4	916.5	6.5	QCC8C	
TSR934D00-D1	934	7.0		TO-39
TSR1090D00-D1	1090	6.5		TO-39



**Order Codes****Order Codes (TSR)**

TSR	224D50	A	S1
Part Number	Center Freq.(MHz)	Series No.	Package
224D50	224.5 MHz	None	S1
306D00	306 MHz	A	S2
384D05	384.05 MHz	B	D1
		C	D2
		D	D3



**▶ General Information****| Advantage of Direct Saw Devices**

Direct 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, Direct has diverse Engineering experience spanning hundreds of custom designed saw components, Band pass Filters, Low Loss Filters and saw based subsystems.

As Direct Company Spirit:

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

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

