muRata
Innovator in Electronics

SAF Series

FEATURES

- Standard part frequency range (80MHz – 2.0GHz)
- Low passband ripple
- Linear phase
- High selectivity

APPLICATIONS

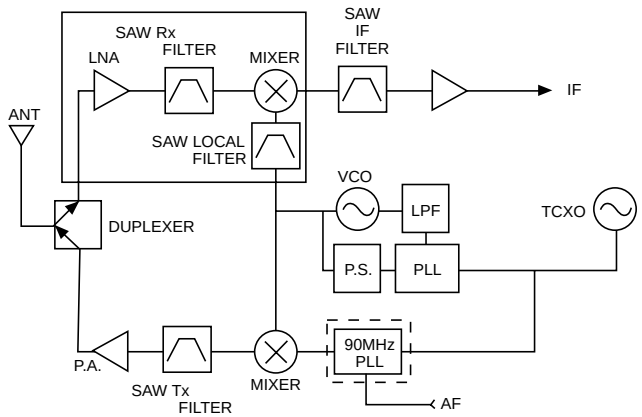
- Cellular Phone: E-AMPS, PCS and GSM, PDC
- Cordless Phone: CT-1, ISM, DECT
- Land Mobile Radio (LMR)
- 915 MHz ISM
- Pager
- RKE
- GPS

PART NUMBERING SYSTEM

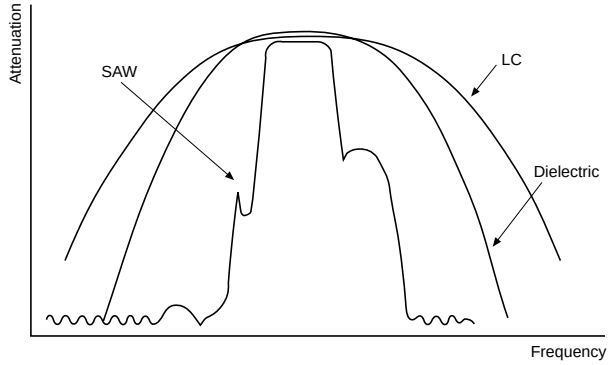
SAF	C	860.5M	A*	7*	0*	N	–	TC
Designates Saw Filters	C – Surface Mount Multi-Layered Ceramic U – Surface Mount Single Layer Ceramic	Center Frequency in MHz	Alpha Character for Design Characteristics	Numeric Package Style Code	Numeric Performance Code	Substrate: T – Lithium Tantalate N – Lithium Niobate X – Crystal S – Sapphire		180mm dia reels: TC = 500/Reel TC11 = 1,000/Reel TC12 = 2,000/Reel 330mm dia reels: TC00 = 10,000/Reel TC05 = 5,000/Reel TC04 = 4,000/Reel TC02 = 2,000/Reel

*Consult Microwave Group for details by part number.

TYPICAL CELLULAR SYSTEM AND SAW POSSIBILITIES



ATTENUATION VS. FREQUENCY – GENERAL COMPARISON OF FILTER CHARACTERISTICS



SAW FILTERS SPECIFICATIONS

SAF Series

App.	Part Number	Function	Center Freq. (MHz)	I.L. (dB) max.*	Bandwidth (MHz)	Attenuation (dB)	Ripple (dB) max.	VSWR	Max. GDT (μs)	Input/Output Impedance	Pkg. Style	Tape Code‡
E-AMPS /ADC	SAFC836.5MC90T	RF (TX)	836.5	3.8	824 to 849	3.8	1.8	2	N/S	50 ohm // 0pF	SC33	TC00, TC05, TC11,TC12
					869 to 894	25						
					920 to 2000	32						
	SAFC881.5MC90T	RF (RX)	881.5	3.5	869 to 894	3.5	1.5	2.0	—	50 ohm // 0pF	SC33	TC00, TC05, TC11,TC12
					824 to 849	30						
					1100 to 2000	32						
	SAFC881.5MD90T	RF (RX)	881.5	2.5	869 to 894	2.5	1.5	2.5	—	50 ohm // 0pF	SC33	TC00, TC05, TC11,TC12
					824 to 849	20						
					1100 to 2000	2.3						
	SAFC881.5MWC90T	RF (RX) differential	881.5	3.5	869 to 894	3.5	1.5	2.0	—	50 ohm // 0pF	SC33	TC00, TC05, TC11,TC12
					824 to 849	30						
					1100 to 2000	28						
	SAFC83.160MA40X	1st IF	83.160	5.0	fo ± 15kHZ	3.0	1.5	N/S	10.0	850 ohm // –2.0pF	SC511	TC, TC11
					83.04 to 83.10	20 min.						
					83.22 to 83.28	20 min.						
	SAFC83.160MC40X	1st IF	83.160	5.0	fo ± 15kHZ	3.0	1.5	N/S	8.0	850 ohm // –2.0pF	SC511	TC, TC11
					83.04 to 83.10	20 min.						
					83.22 to 83.28	20 min.						
	SAFC85.380ME35X	1st IF	85.38	5.5	fo ± 13kHz	3	1.5	N/S	10	870 ohm // –1.7pF	SC59	TC, TC11, TC04
					85.26 to 85.32	25						
					85.44 to 85.50	25						
	SAFC130.4MSC10T	1st IF	130.38	5.5	fo ± 630kHz	3	N/S	N/S	0.8	435 ohm // 0.8uH	SC57	TC, TC11, TC04
					135.33	40						
					139.65 to 140.91	45						
PCS	SAFC1960ML1C0T	RF (RX)	1960	4.5	1930 to 1990	4.5	3.0	2.5	—	50 ohm // 0pF	SC33 low profile	TC00, TC05, TC12
					1850 to 1910	15						
					1719 to 1780	23						
	SAFC1880ML1C0T	RF (TX)	1880	4.5	1850 to 1910	4.5	3.0	2.5	—	50 ohm // 0pF	SC33 low profile	TC00, TC05, TC12
					1930 to 1990	9						
					3860 to 3980	14						
	SAFC1867.5T1897.5ML80T	RF split TX	1867.5	2.8	1850 to 1885	2.8	1.8	1.8	—	50 ohm // 0pF	SC44 dual type	TC, TC04 TC11
					1930 to 1965	30						
					3700 to 3770	20						
			1897.5	2.8	1885 to 1910	2.8						
					1965 to 1990	30						
					3770 to 3820	20						
	SAFC210.38MWJSOX	IF differential	210.38	8.5	209.75 to 211.01	5.0	—	1.0	—	in 775 ohm // 68nH out 465 ohm // 54nH	SC513	TC02, TC11
					130 to 209.13	33						
					211.63 to 270	33						
GSM	SAFC902.5MA90N	RF (TX)	902.5	4	890 to 915	4	1.7	2.5	N/S	50 ohm // 0pF	SC33	TC00, TC05 TC11, TC12
					935 to 960	20						
	SAFC902.5MC90T	RF (TX)	902.5	3.5	890 to 915	3.5	1.5	2.1	N/S	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					935 to 960	25						
					1500 to 2000	40						
	SAFC902.5MWC90T	RF (TX) differential	902.5	3.5	890 to 915	3.5	1.5	2.3	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					935 to 960	25						
					1500 to 2000	25						
	SAFC947.5MC90T	RF (TX)	947.5	3.5	935 to 960	3.5	1.5	2.3	N/S	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					890 to 915	35						
					1500 to 2000	40						
	SAFC947.5MD90T	RF (TX)	947.5	3.5	935 to 960	3	1.5	2.2	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					890 to 915	20						
					1500 to 2000	23						
	SAFC947.5MWC90T	RF (TX) differential	947.5	3.8	935 to 960	3.8	1.5	2.3	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					890 to 915	35						
					1200 to 1500	35						
EGSM	SAFC942.5MD1C0T	RF (RX)	942.5	3.0	925 to 960	3.0	1.7	2.8	—	50 ohm // 0pF	SC33 low profile	TC00, TC05, TC12
					880 to 905	18						
					1850 to 2500	30						
	SAFC942.5MYJ1C0T	RF (RX)	942.5	4.3	925 to 960	4.3	2.2	2.8	—	50 ohm // 0pF	SC33 low profile	TC00, TC05, TC12
					980 to 1100	23						
					1600 to 2500	25						
GSM 1800	SAFC1842.5ML1C0T	RF (RX)	1842.5	4.5	1805 to 1880	4.5	3.0	2.5	—	50 ohm // 0pF	SC33 low profile	TC00, TC05, TC12
					1600 to 1710	35						
					1980 to 3000	20						
	SAFC942.5T1842.5ML80T	RF (RX) EGSM	942.5	3.7	925 to 960	3.7	2.5	2.7	—	50 ohm // 0pF	SC44 dual type	TC, TC04, TC11
					880 to 905	15						
					1600 to 2000	25						
		RF (RX) GSM1800	1842.5	4.2	1805 to 1880	4.2	2.5	2.7	—	50 ohm // 0pF	SC44 dual type	TC, TC04, TC11
					1705 to 1785	7						
					2800 to 4000	15						
	SAFC246.000MC30X	1st IF	246	5	fo ± 80kHz	3	1.0	N/S	2.5	420 ohm // –3.6pF	SC59	TC, TC04, TC11
					245.6 and 246.4	25						
					243 and 249	40						

N/S: Not Specified.

‡Tape codes and package quantities defined at the end of the SAW section of this catalog.

*IL for IF filters is guaranteed at center frequency relative to 0dB reference. I.L. for RF filters is guaranted across the pass band relative to 0dB reference level.

**Attenuation for IF filters is relative to center frequency loss. Attenuation for RF filters is relative to 0dB reference level.

Type	Part Number	Function	Center Freq. (MHz)	I.L. (dB) max.*	Bandwidth (MHz)	Attenuation (dB)	Ripple (dB) max.	VSWR	Max. GDT (μs)	Input/Output Impedance	Pkg. Style	Tape Code‡
ISM 915	SAFC903MF90T	TX or RX	903	4.5	902 to 904	4.5	1.5	—	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					926 to 928	35						
					944 to 948	40						
	SAFC927MF90T	TX or RX	927	4.5	926 to 928	4.5	1.5	—	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					902 to 904	35						
					968 to 972	40						
	SAFC915MA70N	RF	915.0	4.5	902 to 928	4.5 max.	2.0	N/S	N/S	50 ohm // 0pF	SC44	TC00, TC04, TC11
					790 to 860	30 min.						
					970 to 1040	20 min.						
DECT	SAFU110.6MSA40T	1st IF	110.592	4.5	fo ± 576MHz	3.0	N/S	N/S	0.7	300 ohm 1.2μH	SU511	TC, TC11
					fo ± 1.15MHz	10 min.						
					fo ± 1.728MHz	30 min.						
LMR	SAFC815.5MA70N	RF	815.5	4.0	806 to 825	4.0 max.	2.0	2.5	N/S	50 ohm // 0pF	SC44	TC, TC04, TC11
					761 to 780	20 min.						
					851 to 870	20 min.						
	SAFC860.5MA70N	RF	860.5	4.0	851 to 870	4.0 max.	2.0	2.5	N/S	50 ohm // 0pF	SC44	TC, TC04, TC11
					806 to 825	20 min.						
					896 to 915	15 min.						
RKE	SAFC315MF70T	RF (RX)	315	3.0	314.7 to 315.3	3.0	1.5	2.0	—	50 ohm // 0pF	SC44	TC, TC04, TC11
					293 to 293.9	50						
					357.5 to 358.7	50						
	SAFC869MF70T	RF (RX)	869	4.5	868 to 870	4.5	1.5	—	—	50 ohm // 0pF	SC44	TC, TC04, TC11
					825 to 828	40						
					910 to 913	40						
	SAFC864MF70T	RF (RX)	864	4.5	863 to 865	4.5	1.5	—	—	50 ohm // 0pF	SC44	TC, TC04, TC11
					820 to 823	40						
					905 to 908	40						
	SAFC434MC70T	RF (RX)	433.9	4.5	433.05 to 434.7	4.5	1.5	2.0	—	50 ohm // 0pF	SC44	TC, TC04, TC11
					389 to 392	50						
					475.5 to 478.5	50						
GPS	SAFC1575MB1C0S	RF (RX)	1575.5	2.8	1574 to 1577	2.8	1.3	3.0	N/S	50 ohm // 0pF	SC33 low profile	TC00, TC05, TC12
					1382 to 1397	35						
					1478 to 1487	25						
	SAFC90MA31N	IF	90	6.5	90 ± 1MHz	3.0	2.0	—	0.5	365 ohm // –0.7pF	SC59	TC, TC04, TC11
					84 to 85	25						
					95 to 96	25						
PDC 800	SAFC950MB90N	RF (TX) 800	950	4	940 to 960	4	2	N/S	2.5	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					810 to 830	45						
					1050 to 2000	35						
	SAFC950MC90T	RF (TX)	950	3.5	940 to 960	3.5	1.5	2.5	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					810 to 830	48						
					1050 to 2000	35						
	SAFC820ME90N	RF (RX) 800	820	2.5	810 to 830	2.5	1.5	N/S	2.5	50 ohm // 0pF	SC33	TC00 TC05 TC11. TC12
					940 to 960	32						
					1100 to 2000	22						
	SAFC820MD90T	RF (RX)	820	2.2	810 to 830	2.2	1.3	2.5	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					940 to 960	30						
					1100 to 2000	22						
PDC 1.5	SAFS1441MC1B0T	RF (TX)	1441	2.7	1429 to 1453	2.7	1.5	2.3	—	50 ohm // 0pF	SC22	TC00, TC05, TC12
					1477 to 1501	15						
					1783 to 1808	32						
	SAFC1489MC90S	RF (RX)	1489	2	1477 to 1501	2	1.2	N/S	2.7	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					1429 to 1453	15						
					1737 to 1761	35						
	SAFC1489MC1B0T	RX	1489	2.7	1477 to 1501	2.7	1.5	2.3	—	50 ohm // 0pF	SS22	TC00, TC05, TC12
					1429 to 1453	15						
					1735 to 1766	35						
PDC Multi-band	SAFC895.5T942.5MF1D0T	RF (TX) 895.5	895.5	4.0	893 to 898	4.0	2.1	2.5	—	50 ohm // 0pF	SC33 dual type	TC00, TC05, TC12
					810 to 830	22						
					1778 to 1796	20						
		RF(TX) 942.5	942.5	3.5	925 to 960	3.5	2.3	3.2	—	50 ohm // 0pF		
					870 to 885	18						
					1850 to 1920	10						
	SAFC826.5T877.5MF1D0T	RF (TX) 826.5	826.5	2.7	810 to 843	2.7	1.6	2.6	—	50 ohm // 0pF	SC33 dual type	TC00, TC05, TC12
					893 to 960	24						
					1300 to 2000	12						
		RF (TX) 877.5	877.5	2.7	870 to 885	2.7	1.3	2.6	—	50 ohm // 0pF		
					925 to 960	26						
					1300 to 2000	23						
PDC All	SAFC130.000MA1G0X	IF	130.0	5.5	130 ± 16kHz	3.0	0.5	—	5	740 ohm // –1.1pF	SC36	TC05, TC11
					130 ± 100kHz	22						
					130 ± 200kHz	40						

N/S: Not Specified.

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SAF Series

Type	Part Number	Function	Center Freq. (MHz)	I.L. (dB) max.*	Bandwidth (MHz)	Attenuation (dB)	Ripple (dB) max.	VSWR	Max. GDT (μs)	Input/Output Impedance	Pkg. Style	Tape Code‡
JAPAN CDMA	SAFC906ML90T	RF (TX)	906	4.5	887 to 925	4.5	2.8	2.8	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					832 to 870	30						
					2661 to 2775	20						
	SAFC851ML90T	RF (RX)	851	4.5	832 to 870	4.5	3.0	2.8	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					887 to 925	22						
					1000 to 2000	20						
KOREA PCS	SAFC1765MF90T	RF (TX)	1765	3.5	1750 to 1780	3.5	2.0	2.4	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					1840 to 1870	30						
					3500 to 3560	25						
	SAFC1855MF90T	RF (RX)	1885	3.5	1840 to 1870	3.5	2.0	2.4	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					1750 to 1780	23						
					2300 to 4000	20						
CT-1	SAFC886ME70T	RF	886.0	3.5	884 to 888	3.5 max.	1.5	N/S	N/S	50 ohm // 10nH	SC44	TC, TC04, TC11
					840 to 846	40 min.						
	SAFC931ME70T	RF	931.0	3.5	929 to 933	3.5 max.	1.5	N/S	N/S	50 ohm // 10nH	SC44	TC, TC04, TC11
					884 to 891	40 min.						
	SAFC914ME70T	RF	914.0	3.5	913 to 915	3.5 max.	1.5	N/S	N/S	50 ohm // 10nH	SC44	TC, TC04, TC11
					891 to 894	30 min.						
					934 to 937	15 min.						
	SAFC959ME70T	RF	959.0	3.5	958 to 960	3.5 max.	1.5	N/S	N/S	50 ohm // 10nH	SC44	TC, TC04, TC11
					936 to 939	30 min.						
					979 to 982	20 min.						
PAGER	SAFC139MC70N	RF (RX)	1575.5	2.8	1574 to 1577	2.8	1.3	3.0	N/S	50 ohm // 0pF	SC33 low profile	TC00, TC05, TC12
					1382 to 1397	35						
					1478 to 1487	25						
	SAFC146MC70N	IF	90	6.5	90 ± 1MHz	3.0	2.0	—	0.5	365 ohm // –0.7pF	SC59	TC, TC04, TC11
					84 to 85	25						
					95 to 96	25						
	SAFC154MC70N	RF (TX) 800	950	4	940 to 960	45	2	N/S	2.5	50 ohm // 0pF	SC33	TC12
					810 to 830	45						
					1050 to 2000	35						
	SAFC162MC70N	RF (TX)	950	3.5	940 to 960	3.5	1.5	2.5	—	50 ohm // 0pF	SC33	TC00, TC05, TC11, TC12
					810 to 830	48						
					1050 to 2000	35						
	SAFC171MC70N	RF (RX) 800	820	2.5	810 to 830	2.5	1.5	N/S	2.5	50 ohm // 0pF	SC33	TC12
					940 to 960	32						
					1100 to 2000	22						
	SAFC280ME70N	RF	280.0	4.5	275 to 285	4.5 max.	2.0	N/S	N/S	230 ohm // –.2pF	SC44	TC, TC04 TC11
					180 to 242.5	48 min.						
					317.5 to 380	40 min.						
	SAFC281ME70N	RF	281.0	4.5	276 to 286	4.5 max.	2.0	N/S	N/S	230 ohm // –.2pF	SC44	TC, TC04 TC11
					181 to 243.5	48 min.						
					318.5 to 381	40 min.						
	SAFC284ME75N	RF	284.0	4.5	280 to 288	4.5 max.	2.0	N/S	N/S	230 ohm // –.2pF	SC44	TC, TC04 TC11
					184 to 246.5	48 min.						
					321.5 to 384	40 min.						
	SAFC930.5ME70T	RF	930.5	4.5	928.8 to 932.2	4.5 max.	2.0	N/S	N/S	50 ohm // 10nH	SC44	TC, TC04 TC11
					884.8 to 890.2	45 min.						
					906.8 to 911.2	30 min.						

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MECHANICAL

TEST ITEM	PACKAGE	TEST CONDITIONS	TEST METHOD
Terminal Strength	SMD	Filter is soldered onto the center of PCB which is laid on two small supporters spaced 90mm apart. The PCB is deflected to 1mm below the horizontal level by the pressing stick for 1 second and repeated 5 times.	
	LEADED	A force of 1.0 Kg shall be applied to each terminal in the direction of the axis of terminal for 30 ± 5 seconds. A force of 250 gf is applied to each lead in axial direction. The lead shall be bent 90 degrees to one direction, then in opposite direction and returned to the original position.	
Solderability	BOTH	Lead terminals are immersed in methanol with 7 to 10% of rosin flux for about 5 seconds, then immersed in soldering bath at 230 ± 5°C for 5 ± 0.5 seconds.	MIL-STD-202E Method 208C
Random Drop	BOTH	Drop 3 times on concrete floor from 1.0 meter, (30cm for some products).	
Vibration	BOTH	Vibration amplitude of 1.5mm at 10-55Hz in each of three mutually perpendicular directions for 1 hour.	MIL-STD-201E Method 201A

ENVIRONMENTAL

TEST ITEM	PACKAGE	TEST CONDITIONS	TEST METHOD
Salt Spray	BOTH	Hold in chamber with 5% salt density at 35°C +1.1°/–1.7°C for 48 hours. Measure after exposure to room condition for 1 hour.	MIL-STD-202E Method 101D
Temperature Cycling	BOTH	Exposure to 5 cycles of –55°C (30 minutes) →+25°C (15 minutes), ±85°C (30 minutes) →+25°C (15 minutes). Test after 2 hours exposure to room conditions.	MIL-STD-202E Method 102A
Humidity	BOTH	Hold in chamber with 90 to 95% R.H. at 40 ± 2°C for 100 hours. Test after 2 hours exposure to room conditions.	MIL-STD-202E Method 103B
Operating Humidity	BOTH	Hold in chamber with 90 to 95% R.H. at 40 ± 2°C for 100 hours at 6VDC. Test after 2 hours exposure to room conditions.	MIL-STD-202E
Thermal Shock	BOTH	Expose to 5 cycles of –55°C (30 minutes) →+85°C (30 minutes). Test after 2 hours exposure to room conditions.	MIL-STD-202E Method 107D
Life Test (High)	BOTH	Hold in chamber at 85 ± 2°C for 100 hours. Test after exposure to room conditions for 2 hours.	MIL-STD-202E Method 108A
Life Test (Low)	BOTH	Hold in chamber at –30 ± 2°C for 100 hours. Test after exposure to room conditions for 2 hours.	MIL-STD-202E Method 108A
Operating Life Test	BOTH	Hold in chamber at 85 ± 2°C for 100 hours at 6VDC. Test after exposure to room conditions for 2 hours.	
Sulfuration	BOTH	Hold in chamber with 1000ppm sulfur density for 24 hours. Test after exposure to room conditions for 2 hours.	
Resistance to Soldering Heat	SMD	Filter shall be preheated at 150 ± 20°C for 60 seconds, immersed whole electrode in soldering bath at 240 ± 5°C for 3 ± 1 seconds, then measured after exposure to room conditions for 2 hours.	MIL-STD-202E Method 210A
	LEADED	Lead terminals are immersed up to 1.5mm from package base in soldering bath at 260 ± 5°C for 10 ± 1 seconds, then measured after exposure to room conditions for 2 hours.	

ELECTRICAL

TEST ITEM	PACKAGE	TEST CONDITIONS	TEST METHOD
Dielectric Withstanding Voltage	BOTH	Apply 100VDC between I/O terminals and ground terminal, for 1 minute.	MIL-STD-202E
Insulation Resistance	BOTH	Apply 100VDC between I/O terminals and ground terminal, for 1 minute.	MIL-STD-202E Method 302
Temperature Characteristics	SMD	Filter shall be measured between –10°C to +60°C temperature range.	
	LEADED	Filter shall be measured between –10°C to +50°C temperature range.	