

ARGO Frequency Controlled Products Part Numbering Guide

AGX-20.000M-30-T49S-3rd-F-Y-O

AGX	20.000M	3.3V	30	T49S	3rd	F	Y	O	TR
Product Code	Frequency (Total 5 Digits)	Voltage (for Oscillator, TCXO only)	Load Capacitance (Crystal Only)		Value Added Services	Frequency Tolerance @+25°C	Operating Temperature	Frequency Tolerance Over Temperature	
AGX:Xtal Units AGXO:Xtal Oscillators AGTCO: TCXO AGVCO: VCXO AGVCTCO: VC-TCXO AGOCXO: OCXO AGMCF: Xtal Filter AGCF: Ceramic Filters AGCR: Ceramic Resonators AGSD: Saw Devices	20.000M = 20.00MHz 32.768k = 32.768kHz	5V=5V 3.3V=3.3V 2.5V=2.5V 1.8V=1.8V	30 = 30PF S = Series		3rd [□] = 3rd Overtone 5rd = 5rd Overtone 7rd = 7rd Overtone SL = Sleeved TL = TTL CS = CMOS HCS = HCMOS TC = =TTL/CMOS LVP = =LVPECL LVD = =LVDS HCL = =HCSL SIN = =Sine Wave CSIN = =Clipped Sine Wave	Blank : STD Crystal: ±30 ppm Oscillator: ±100 ppm A = ±100 ppm H = ±5 ppm B = ±75 ppm I = ±2.5 ppm C = ±50 ppm J = ±2 ppm D = ±25 ppm K = ±2.5 ppm E = ±20 ppm L = ±1 ppm F = ±15 ppm M = ±0.5 ppm G = ±10 ppm a = ±30 ppm e = ±18 ppm h = ±45 ppm y = ±4.6 ppm	Blank =STD Crystal: (-10°C ~ +70°C) Oscillator: (-10°C ~ +70 °C) W= +10°C ~ +70 °C u= +40°C ~ +145 °C X= -20°C ~ +70 °C Y= -30°C ~ +75 °C Z= -40°C ~ +85 °C f= -20°C ~ +80 °C t= -40°C ~ +105 °C r= -20°C ~ +85 °C n= -40°C ~ +125 °C m= -20°C ~ +105 °C j= 0°C ~ +60 °C i= 0°C ~ +85 °C g= -30°C ~ +85 °C	Blank : STD Crystal: ±30 ppm Oscillator: ±100 ppm O = ±50 ppm S = ±5 ppm P = ±30 ppm T = ±2.5 ppm Q = ±15 ppm U = ±2 ppm R = ±10 ppm V = ±0.5 ppm b = ±20 ppm d = ±25 ppm	Blank = Bulk TR =Tape and Reel TB =Tube PT =Plate I = Insulator 3L =Third Lead

PACKAGE											
THROUGH HOLE (T)				SMD(S)							
Crystal Units		VCTCXO		Crystal Units		Saw Devices		MCF			
-T49U	HC-49U	-TVT1	VTO-001A	-S49UG	HC-49UGull-wing	-SSTC2520	2520 (4 pads)	--SFUG	UM Series Gull Wing		
-T49S	HC-49/S (3.5mm)	-TVT3	VTO-003A	-S49S	HC-49/S (4.2mm)	-SSR11	F-11 SMD	--SF9G	49U Series Gull Wing		
-T49SS	HC-49/SS(2.5mm)	-TVT4	VTO-004	-S49SS	HC-49/SS(3.2mm)	-SSR8C	5x5 (8 pads)	--SF7S	SF-S7050		
-T49S+	HC-49/S+(2.0mm)	-TVT0	VTO-010	-S49S+	HC-49/S+(2.8mm)	-SSR4A	5x5 (4 pads)	Ceramic Resonator			
-TU1	UM-1	OCXO		-S49S++	HC-49/S++(2.5mm)	-SSR8B	3.8x3.8 (8 pads)				
-TU4	UM-4	-T14	14 pin	-SU1	UM1	-SSRC6	3.8x3.8 (6 pads)				-SZTA/-SZTT CCMG
-TU5	UM-5	MCF		-SM1G	UM1 Gull-wing	-SSRC8D	3x3 (8 pads)				-SZTA/-SZTT CRMG
-T15	1.5x5mm			-SM4G	UM4 Gull-wing	-SSRC6C	3x3 (6 pads)				-SZTA/-SZTT CSMT
-T26/M	φ2x6mm	-TFUT	49T	-SM5G	UM5 Gull-wing	-SSF11	F-11 SMD	-SZTA/-SZTT CVMT	For example: AGX – 20.000M – 30 – T49S – 3rd – F – Y – O		
-T38	φ3x8mm	-TFU1	UM1	-SM315	M315	-SSF8C	5x5 (8 pads)	-SZTA/-SZTT CSMX			
-T39/M	φ3x9mm	-TFU4	UM4	-SM415	M415	-SSF4A	5x5 (4 pads)	-SZTA/-SZTT CVMX			
-T310M	φ3x10mm	-TFU5	UM5	-SM519	M519	-SSF8B	3.8x3.8 (8 pads)	-SZTA/-SZTT CWMX			
T26F	蛙腳	-TF6	6 Poles Metal	-SM136	M136	-SSFC6	3.8x3.8 (6 pads)				
T26C	彎腳	-TF8	8 Poles Metal	-SM200S	M200S	-SSFC8D	3x3 (8 pads)				
		-TF10	10 Poles Metal	-S26R	φ2x6mm, 蛙腳	-SSFC6C	3x3 (6 pads)				
Oscillators		Ceramic Filters		TCXO							
-T14	14 Pin	-TCF2U	3 Pin Rectangle	-S7050	7050						
-T8	8 Pin	-TCFW	5 Pin Rectangle	-S7050A	7050 (2 pad)	-ST7050	7050				
TCXO		-TCFD	5 Pins Disc	-S6035	6035	-ST5032	5032				
-TT01	TCO-001A	Ceramic Resonators		-S6035A	6035 (2 pad)	-ST3225	3225				
-TT03	TCO-003A	-TZTA MHz 2 Pin Disc -TZTB kHz 2 Pin -TZTT MHz 3 Pin Disc		-S5032	5032	VCXO					
-TT04	TCO-004			-S5032A	5032 (2 pad)						
-TT14	TCO-014			-S4025	4025						
VCXO				-S3225	3225	-SV70506	7050(6 pads)				
				-S2520	2520	-SV5032	5032				
-TV14	14 Pin	Saw Devices		-S2016	2016	-SV3225	3225				
-TV8	8 Pin	-TSR39	TO-39	Oscillators		VCTCXO					
		-TSR11	F-11	-S7050	7050	-SVT7050	7050				
		-TSRD11	D-11	-S6035	6035	-SVT5032	5032				
				-S5032	5032	-SVT3225	3225				
				-S4025	4025						
				-S3225	3225						
				-S2520	2520						

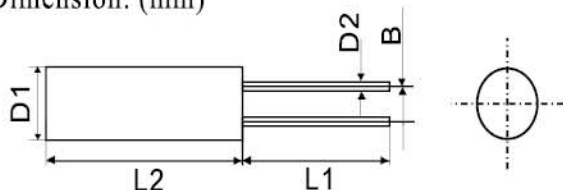
kHz DIP Crystal	AGX-T38 / T26 / T15	1
MHz Cylinder DIP Crystal	AGX-T26M / T38M / T39M / T310M	2
MHz DIP Crystal	AGX-T49U / T49S / T49SS / T49S+ / TU1 / TU5	3
SMD Crystal	AGX-S49S / S49SS / S49S+ / S7050 / S6035 / AGX-S5032 / S4025 / S3225 / S2520 / S2016	5
Oscillators DIP	AGXO-T14 / AGXO-T8	8
Oscillators SMD	AGXO-S7050 / S5032 / AGXO-S3225 / S2520 / S2016	9
VCXO DIP	AGVCO-T14 / T8	12
VCXO SMD	AGVCO-SV7050 / SV7050B	13
TCXO/VCTCO	AGTCO / AGVCTCO-ST5035 / SVT5032	14
TCO/VCTCO	AGTCO / AGVCTCO-ST7050 / SVT7050	15
OCXO DIP	AGOCXO-T14	16
Crystal MCF DIP	AGMCF-TFUT / TFU1 / TFU5	17
Crystal MCF SMD	AGMCF-SF7050	18
SAW Devices DIP	AGSD-TSF11	19
SAW Devices SMD	AGSD-SSTC2520 (for GPS)	20
MHz Ceramic Resonators DIP	AGCR-TZTA / TZTT	21
Ceramic Resonators SMD	AGCR-SZTA / SZTT	22
Fox Products		24
EPSON Products		25

Model	AGX-T38	AGX-T26	AGX-T15
Frequency Range	30~200kHz		
Frequency Tolerance at 25 °C	± 20 ppm or 100 ppm		
Shunt Capacitance (Co)	1.8 pF (Typical)	1.5 pF (Typical)	1.2 pF (Typical)
Load Capacitance (Cl)	12.5 pF (Typical)		
Operating Temperature Range	-10 to + 70°C		
Storage Temperature Range	- 40 to + 85°C		
Drive Level	1.0 μ W max.		
Shock Resistance	± 5 ppm max.		
Aging	± 3 ppm max. per year		

Equivalent Series Resistance (ESR)

Mode	Frequency	ESR
AGX-T15	32.768 kHz	50 K Ω Max.
AGX-T26	32.768 kHz	50 K Ω Max.
AGX-T38	32.768 kHz	35 K Ω Max.

Dimension: (mm)



Mode	L1	L2	D1	D2	B
AGX-T15	5.9±0.2	5.0 Max	φ 1.5±0.2	φ 0.18±0.02	0.5±0.2
AGX-T26	7.5±0.2	6.3 Max	φ 2.0±0.2	φ 0.25±0.02	0.7±0.2
AGX-T38	10.0±0.2	8.0 Max	φ 3.0±0.2	φ 0.32±0.02	0.8±0.2

Model	AGX-T26M	AGX-T38M / T39M / T310M
Frequency Range	12~27.0 MHz	4.0~50.0 MHz
Mode of Oscillation	AT- cut / Fundamental (4.0 ~ 30.0 MHz) AT- cut / 3 rd Overtone (30.1 ~ 50.0 MHz)	
Frequency Tolerance at +25°C	AT- cut: ± 30ppm at 25°C	
Frequency Stability	AT- cut: ± 50 ppm over -10 ~ + 70°C	
Shunt Capacitance (Co)	5pF Max.	
Load Capacitance (Cl)	16 pF Typ.(Please specify)	
Drive Level	10 ~ 100 μ W	
Operating Temperature Range	-10 ~ +70°C	
Storage Temperature Range	-40 ~ +85°C	
Aging	Less than ±3 ppm / year. (At 25±5°C)	

Euqivalent Series Resistance (ESR)

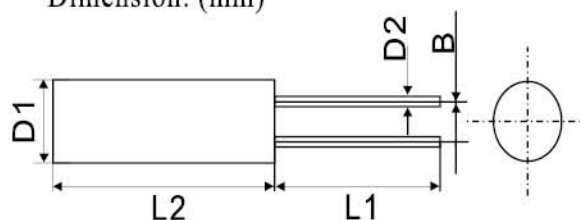
AGX-T26M

Frequency	ESR	Oscillation Mode
12~27.0 MHz	60 Ω Max.	Fundamental

AGX-T38M / T39M / T310M

Frequency	ESR	Oscillation Mode
4.0~5.9 MHz	150 Ω Max.	Fundamental
6.0~9.9 MHz	100 Ω Max.	Fundamental
10.0~30.0 MHz	60 Ω Max.	Fundamental
30.1~50.0 MHz	100 Ω Max.	3 rd Overtone

Dimension: (mm)



Mode	L1	L2	D1	D2	B
AGX-T26M	7.5 Max.	6.4±0.2	φ 2.0±0.2	φ 0.19±0.02	0.8±0.2
AGX-T38M	10 Max.	8.2±0.2	φ 3.0±0.2	φ 0.32±0.02	0.8±0.2
AGX-T39M	10 Max.	9.0±0.2	φ 3.0±0.2	φ 0.32±0.02	1.1±0.2
AGX-T310M	10 Max.	10.0±0.2	φ 3.0±0.2	φ 0.32±0.02	1.1±0.2

Model	AGX-T49U	AGX-T49S / T49SS / T49S+	AGX-TU1, AGX-TU5
Frequency Range	1.0 ~ 200 MHz	3.2 ~ 70 MHz	1.0~200MHz
Mode of Oscillation	2.01~45.0MHz:AT-cut Fund. 24.0~100MHz: AT-cut 3 rd Overtone 80.0~160MHz: AT-cut 5 th Overtone 110~200 MHz: AT-cut 7 th Overtone	3.2~30.0 MHz: AT - cut Fund. 27.0~70 MHz: AT- cut 3 rd Overtone 24.0~48.0 MHz: BT - cut Fund.	3.2~30.0 MHz: AT - cut Fund. 27.0~70 MHz: AT-cut 3 rd Overtone 24.0~48.0 MHz: BT - cut Fund.
Frequency Tolerance	SL-cut: ± 50 ppm at 25 $^{\circ}$ C AT-cut: ± 30 ppm at 25 $^{\circ}$ C	AT-cut: ± 30 ppm at 25 $^{\circ}$ C BT-cut: ± 50 ppm at 25 $^{\circ}$ C	SL-cut: ± 50 ppm at 25 $^{\circ}$ C AT-cut: ± 30 ppm at 25 $^{\circ}$ C
Frequency Stability	SL-cut: ± 100 ppm over -10~+70 $^{\circ}$ C AT-cut: ± 50 ppm over -10~+70 $^{\circ}$ C	AT-cut: ± 30 ppm over -10~+70 $^{\circ}$ C BT-cut: ± 100 ppm over -10~+70 $^{\circ}$ C	SL-cut: ± 100 ppm over -10~+70 $^{\circ}$ C AT-cut: ± 50 ppm over -10~+70 $^{\circ}$ C
Shunt Capacitance (C ₀)	7pF Max.		
Load Capacitance (C _L)	8 pF ~ 32 pF for Series		
Drive Level	100 μ W Typical		
Operating Temperature Range	-10 ~ +70 $^{\circ}$ C		
Storage Temperature Range	-40 ~ +85 $^{\circ}$ C		
Aging	Less than ± 3 ppm / year. (At 25 $\pm 5^{\circ}$ C)		

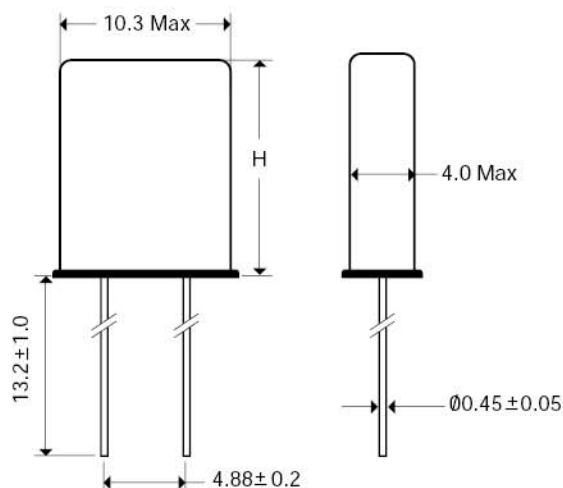
Equivalent Series Resistance (ESR)

Model	Freq. MHz	Oscillation Mode	ESR Max.	Freq. MHz	Oscillation Mode	ESR Max.
AGX-T49U	1.0~1.3	SL cut	5000 Ω	7.01~10.0	AT cut Fund.	35 Ω
	2.01~3.0	AT cut Fund.	400 Ω	10.0~30.0	AT cut Fund.	25 Ω
	3.01~3.2	AT cut Fund.	200 Ω	30.01~45.0	AT cut Fund.	20 Ω
	3.21~3.5	AT cut Fund.	150 Ω	24.0~100.0	AT cut 3 rd O/T	40 Ω
	3.51~3.9	AT cut Fund.	120 Ω	80.0~160.0	AT cut 5 th O/T	70 Ω
	3.91~5.0	AT cut Fund.	100 Ω	110.0~200.0	AT cut 7 th O/T	120 Ω
	5.01~7.0	AT cut Fund.	50 Ω			
AGX-T49S / T49SS / T49S+	3.2~3.4	AT cut Fund.	300 Ω	13.0~30.0	AT cut Fund.	40 Ω
	3.5~4.0	AT cut Fund.	150 Ω	24.0~40.0	BT cut Fund.	40 Ω
	4.1~4.9	AT cut Fund.	120 Ω	40.1~48.0	BT cut Fund.	30 Ω
	5.0~5.9	AT cut Fund.	100 Ω	27.0~30.0	AT cut 3 rd O/T	150 Ω
	6.0~8.9	AT cut Fund.	80 Ω	30.1~50.0	AT cut 3 rd O/T	100 Ω
	9.0~9.9	AT cut Fund.	60 Ω	50.1~70.0	AT cut 3 rd O/T	80 Ω
	10.0~12.9	AT cut Fund.	50 Ω			
AGX-TU1	1.0~1.2	SL cut Fund.	5K Ω	1.0~10.99	AT cut Fund.	60 Ω
	4.0~4.9	AT cut Fund.	150 Ω	11.0~12.9	AT cut Fund.	40 Ω
	5.0~5.9	AT cut Fund.	120 Ω	13.0~45.0	AT cut Fund.	25 Ω
	6.0~6.9	AT cut Fund.	100 Ω	30.0~50.0	AT cut 3 rd O/T	40 Ω
	7.0~7.9	AT cut Fund.	90 Ω	50.0~100.0	AT cut 3 rd O/T	50 Ω
	8.0~9.9	AT cut Fund.	80 Ω	80.0~200.0	AT cut 5 th O/T	80 Ω
AGX-TU5	10.0~11.99	AT cut Fund.	60 Ω	90.0~135.0	AT cut 3 rd O/T	40 Ω
	12.0~14.99	AT cut Fund.	50 Ω	90.0~159.9	AT cut 5 th O/T	100 Ω
	15.0~35.0	AT cut Fund.	30 Ω	160.0~200.0	AT cut 5 th O/T	80 Ω
	35.0~89.99	AT cut 3 rd O/T	60 Ω			

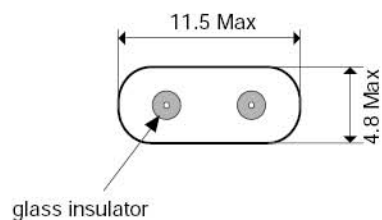


Dimension: (mm)

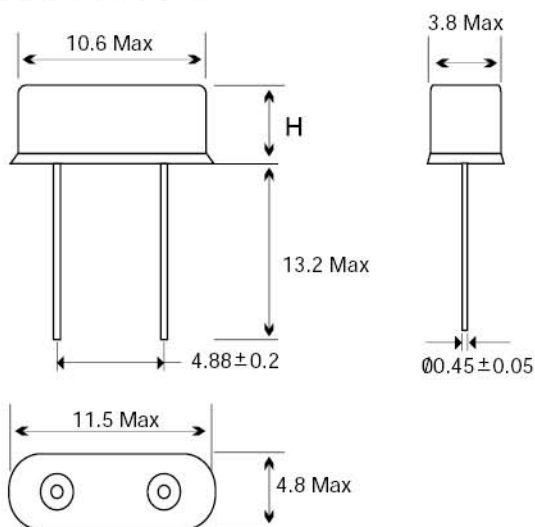
AGX-T49U / T49T



Type	H
T49U	13.6 ± 0.3
T49T	11.2 ± 0.3

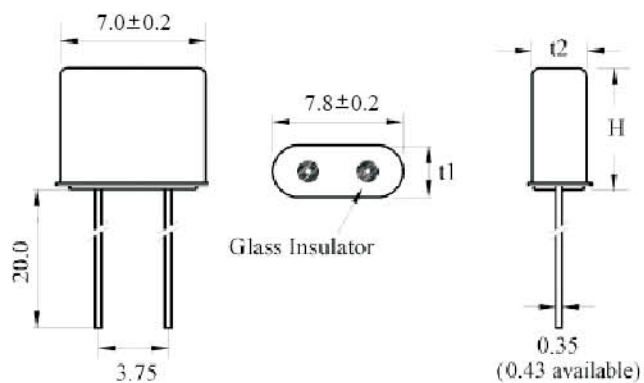


AGX-T49S / T49SS / T49S+



Type	H
T49S	3.5 ± 0.2
T49SS	2.5 ± 0.2
T49S+	2.0 ± 0.2

AGX-TU1 / TU5



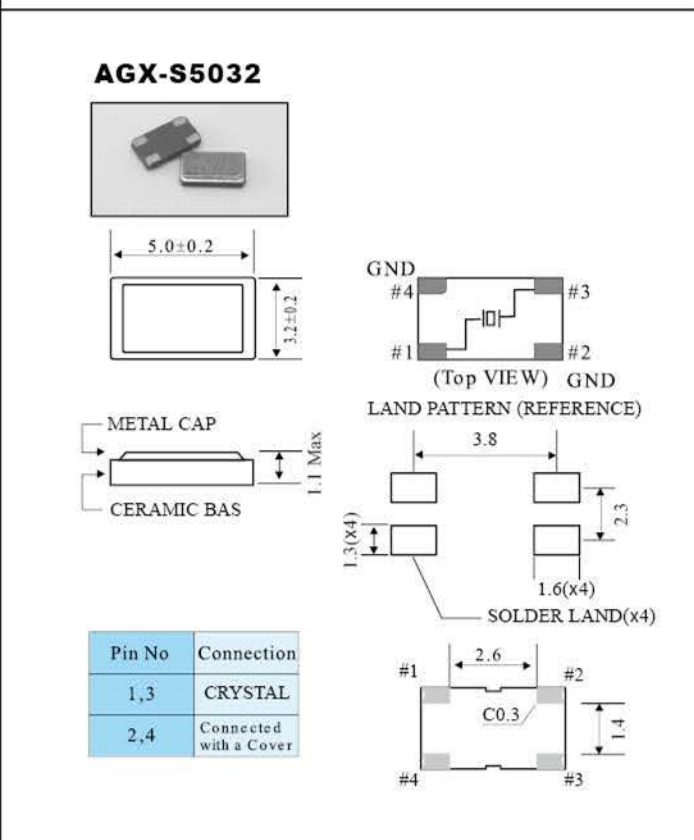
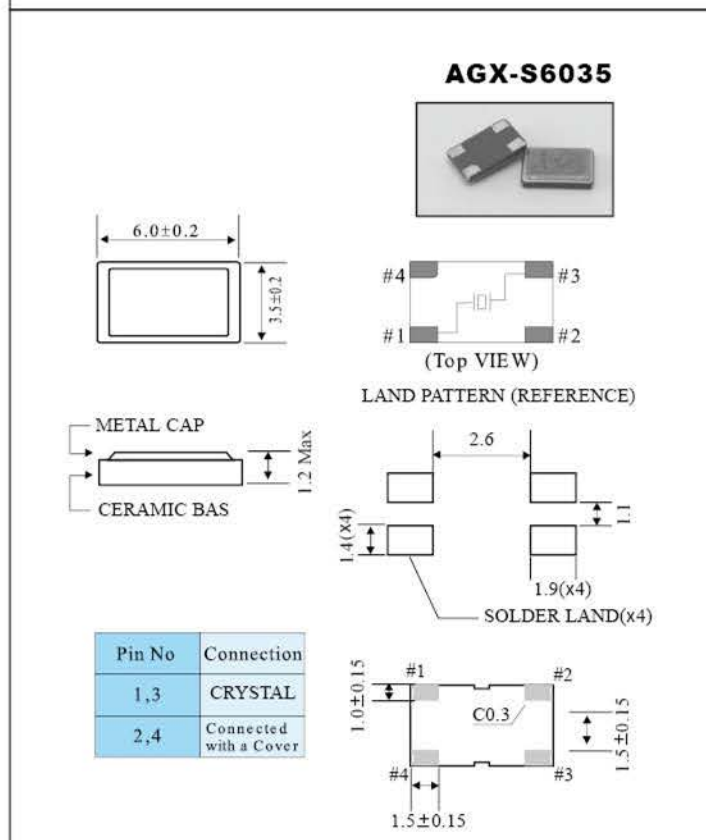
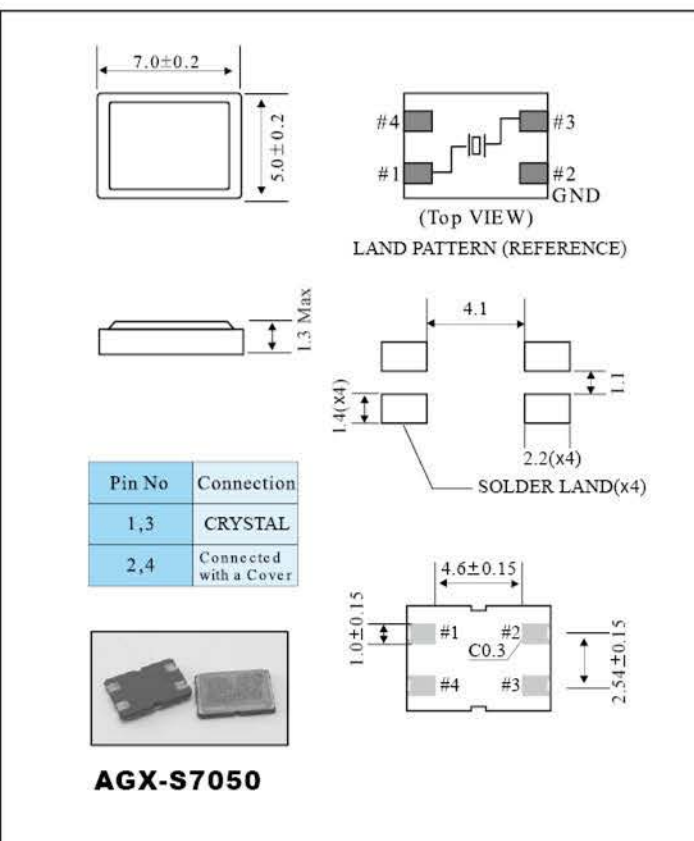
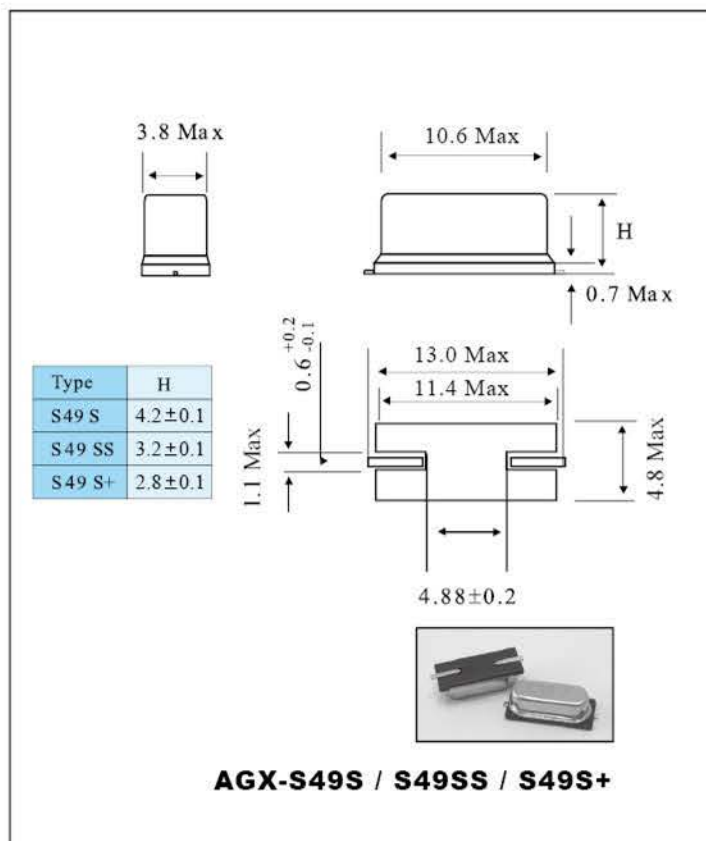
Type	H	t1	t2
TU1	8.0Max	3.2Max	2.3Max
TU5	6.0Max	3.2Max	2.3Max

Model	AGX-S49S / S49SS / S49S+	AGX-S7050	AGX-S6035	AGX-S5032	AGX-S4025	AGX-S3225	AGX-S2520	AGX-S2016
Frequency Range MHz (Fundamental)	3.2~30	6~40	8~50	8~40	12~40	12~40	12~50	24~50
Frequency Range MHz (3 rd Overtone)	27~80	30~130	40~125	40~125	16~50	20~52		
Frequency Tolerance	AT-cut: ± 30 ppm at 25°C							
Frequency Stability	AT-cut: ± 30 ppm over -10 ~ +70°C							
Shunt Capacitance (C ₀)	7pF Max.							
Load Capacitance (C _L)	8 pF ~ 32 pF or Series							8pF or 16pF
Drive Level	100μW Typ.							
Operating Temperature Range	-10 ~ +70°C							
Storage Temperature Range	-40 ~ +85°C							
Aging	Less than ± 3 ppm / year. (At 25±5°C)							

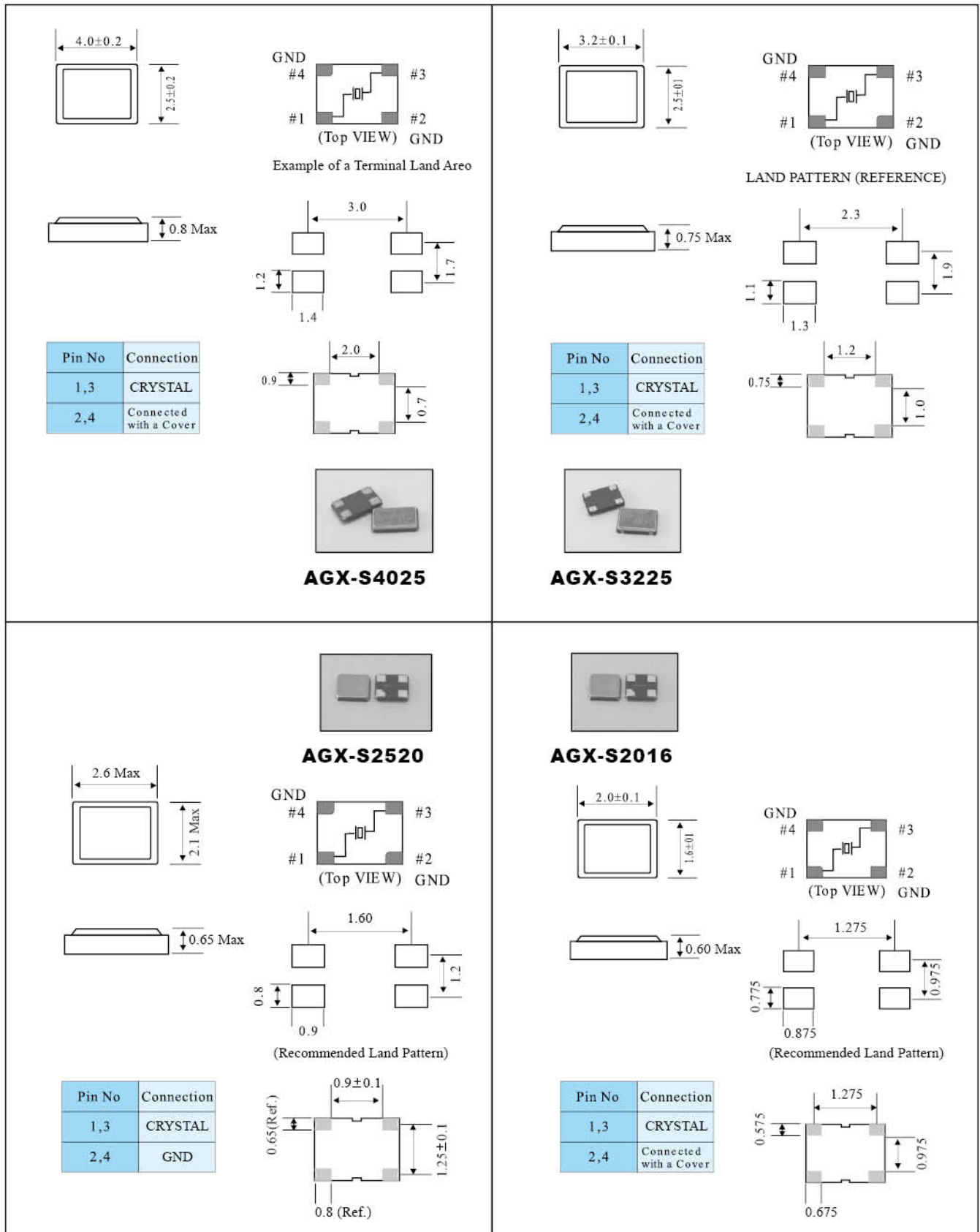
Equivalent Series Resistance (ESR)

Model	Freq. MHz	Oscillation Mode	ESR Max.	Model	Freq. MHz	Oscillation Mode	ESR Max.
AGX-S49S S49SS S49S+	3.200~3.999	Fundamental	150 Ω	AGX-S6035	40.000~67.000	3 rd Overtone	70 Ω
	4.000~4.999	Fundamental	120 Ω		67.100~125.000	3 rd Overtone	90 Ω
	5.000~5.999	Fundamental	100 Ω	AGX-S5032	8.000~40.000	Fundamental	50 Ω
	6.000~8.999	Fundamental	80 Ω		40.000~125.000	3 rd Overtone	60 Ω
	9.000~9.999	Fundamental	60 Ω	AGX-S4025	12.000~15.000	Fundamental	60 Ω
	10.000~12.999	Fundamental	50 Ω		16.000~20.000	Fundamental	40 Ω
	13.000~18.999	Fundamental	40 Ω		21.000~50.000	Fundamental	30 Ω
	19.000~50.000	Fundamental	35 Ω	AGX-S3225	12.000~15.000	Fundamental	100 Ω
	30.000~44.999	3 rd Overtone	80 Ω		16.000~20.900	Fundamental	70 Ω
	45.000~59.999	3 rd Overtone	70 Ω		21.000~29.900	Fundamental	60 Ω
	60.000~79.999	3 rd Overtone	60 Ω		30.000~52.000	Fundamental	50 Ω
AGX-S7050	6.000~9.999	Fundamental	60 Ω	AGX-S2520	12.000~20.900	Fundamental	80 Ω
	10.000~11.999	Fundamental	50 Ω		21.000~50.900	Fundamental	60 Ω
	12.000~14.999	Fundamental	40 Ω	AGX-S2016	24.000~25.000	Fundamental	100 Ω
	15.000~40.000	Fundamental	30 Ω		25.000~36.000	Fundamental	80 Ω
	30.000~130.000	3 rd Overtone	80 Ω		36.000~50.000	Fundamental	60 Ω
AGX-S6035	8.000~16.000	Fundamental	80 Ω				
	16.000~40.000	Fundamental	40 Ω				

Dimension: (mm)



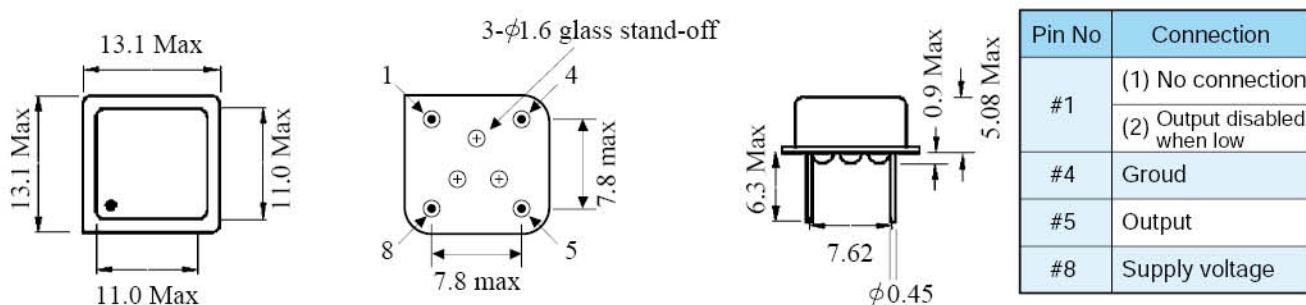
Dimension: (mm)



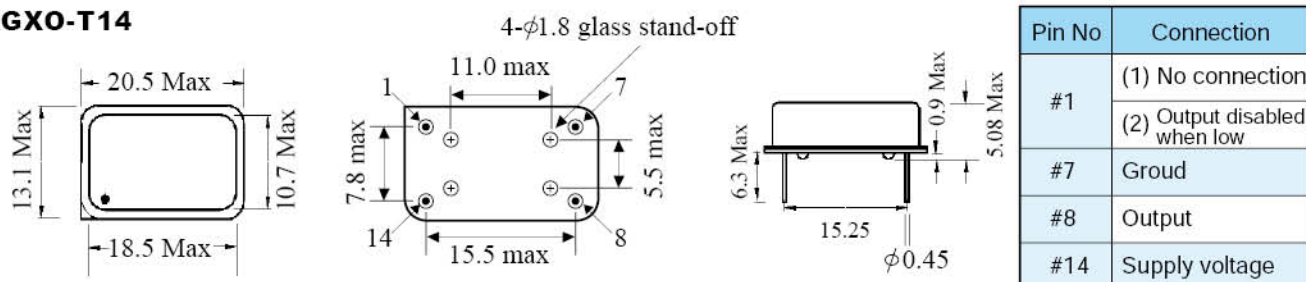
Model		AGXO-T14, AGXO-T8	
Frequency Range		20kHz~125MHz	
Frequency Tolerance		$\pm 20\text{ppm}$, $\pm 50\text{ppm}$, $\pm 100\text{ppm}$	
Output Logic		TTL / CMOS	
Power Supply Voltage		VDC 3V~5V or 2.8V	
Input Voltage (V_{DD})		V_{DD} 3.3V DC	V_{DD} 5.0V DC
Output Voltage HIGH"1"	TTL	2.4V min.	2.4V min.
	CMOS	2.97V min.	4.5V min.
Output Voltage LOW"0"	TTL	0.4V min.	0.4V max.
	CMOS	0.33V min.	0.5V max.
Current Consumption		15~45mA(frequency dependent)	
Operating Temperature Range		0 to $+70^{\circ}\text{C}$	
Storage Temperature Range		-40 to $+85^{\circ}\text{C}$	
Aging		Less than ± 5 ppm/year. (At $25\pm 5^{\circ}\text{C}$)	

Dimension: (mm)

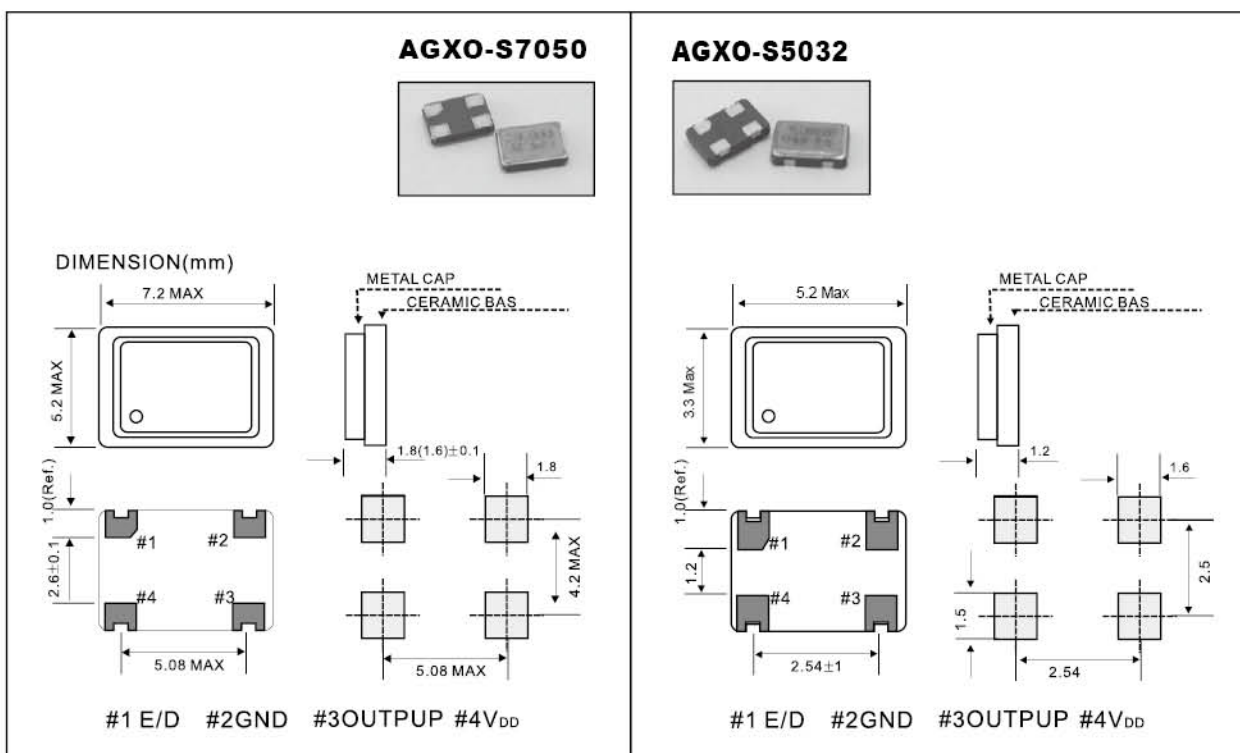
AGXO-T8



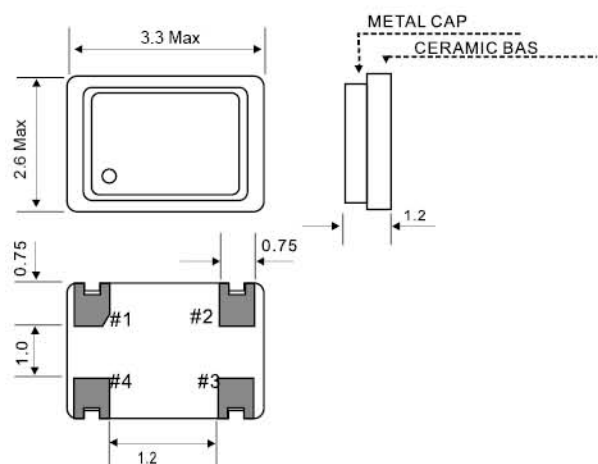
AGXO-T14



Model		AGXO-S7050 / S5032 / S3225 / S2520 / S2016	
Frequency Range		1MHz~150MHz	
Frequency Tolerance		$\pm 20\text{ppm}$, $\pm 50\text{ppm}$, $\pm 100\text{ppm}(\pm 5\text{ppm})$	
Output Logic		TTL / CMOS	
Power Supply Voltage		VDC 3V~5V or 2.8V	
Input Voltage (V _{DD})		V _{DD} 3.3V DC	V _{DD} 5.0V DC
Output Voltage HIGH"1"	TTL	2.4V min.	2.4V min.
	CMOS	2.97V min.	4.5V min.
Output Voltage LOW"0"	TTL	0.4V min.	0.4V max.
	CMOS	0.33V min.	0.5V max.
Current Consumption		15~45mA(frequency dependent)	
Operating Temperature Range		0 to +70°C	
Storage Temperature Range		-40 to +85°C	
Aging		Less than ± 5 ppm/year. (At 25 $\pm 5^\circ\text{C}$)	



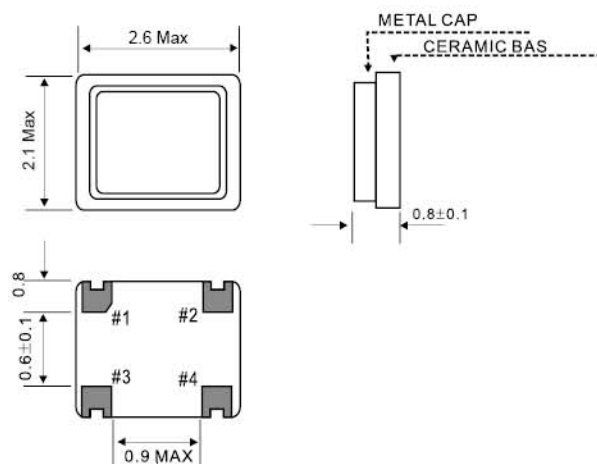
Dimension: (mm)



#1 E/D #2GND #3OUTPUP #4V_{DD}



AGXO-S3225

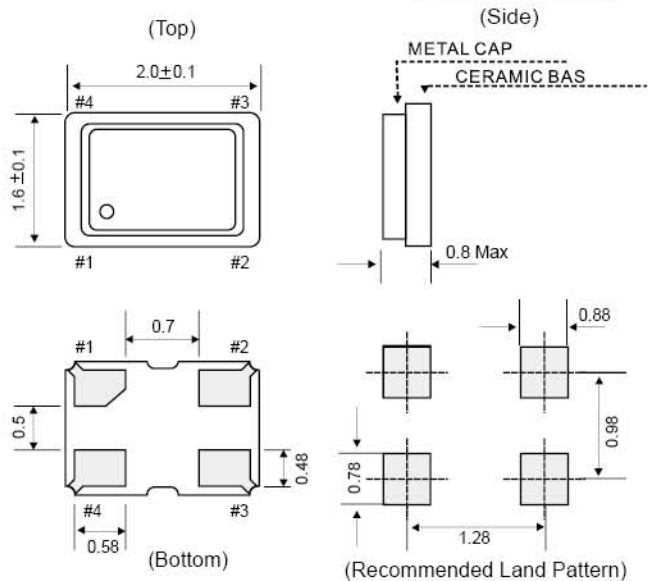


#1 E/D #2GND #3OUTPUP #4V_{DD}



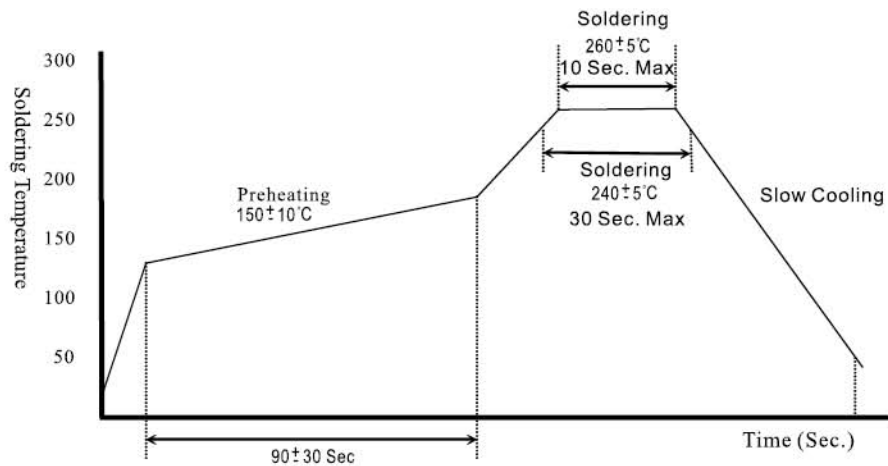
AGXO-S2520

AGXO-S2016



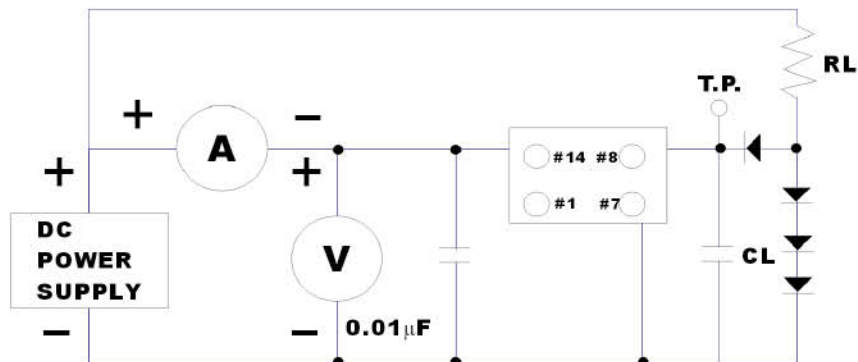
#1 E/D #2GND #3OUTPUP #4V_{DD}

Reflow:



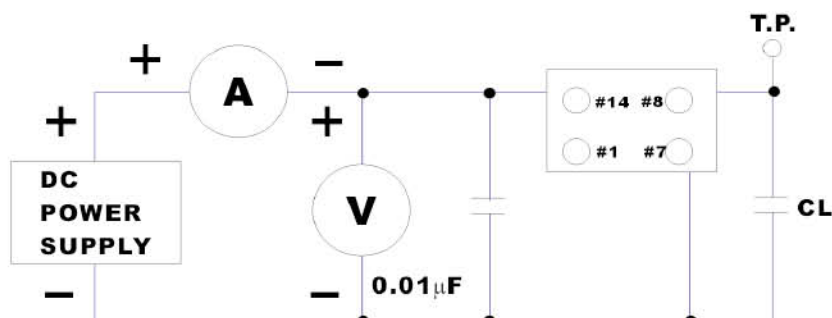
Test Circuit:

TTL



We recommend our customer to use capacit0.01uF in join Vcc and GND

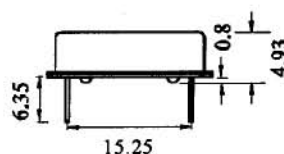
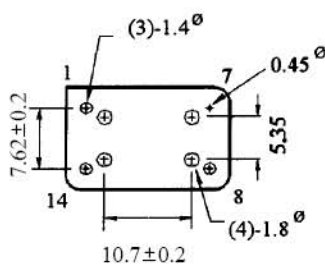
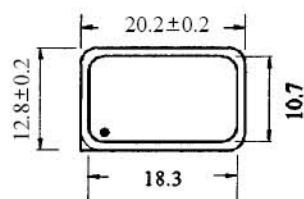
CMOS



Model		AGVCO-T14, AGVCO-T8	
Frequency Range		500kHz~125MHz	
Frequency Tolerance		$\pm 20\text{ppm}$, $\pm 50\text{ppm}$, $\pm 100\text{ppm}$	
Output Logic		TTL / CMOS	
Power Supply Voltage		VDC 3V~5V	
Input Voltage(V _{DD})		V _{DD} 3.3V DC	V _{DD} 5.0V DC
Output Voltage HIGH"1"	TTL	2.4V min.	2.4V min.
	CMOS	2.97V min.	4.5V min.
Output Voltage LOW"0"	TTL	0.4V min.	0.4V max.
	CMOS	0.33V min.	0.5V max.
Frequency Pulling Range		From $\pm 30\text{ppm}$ to $\pm 150\text{ppm}$ Control Voltage:0.3 to 3.0	From $\pm 80\text{ppm}$ to $\pm 200\text{ppm}$ Control Voltage:0.5 to 4.5
Current Consumption		15~45mA(frequency dependent)	
Operating Temperature Range		0 to +70°C	
Storage Temperature Range		-40 to +85°C	
Aging		Less than $\pm 5\text{ ppm/year}$. (At 25 $\pm 5^\circ\text{C}$)	

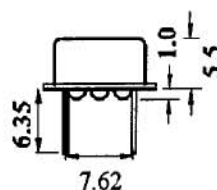
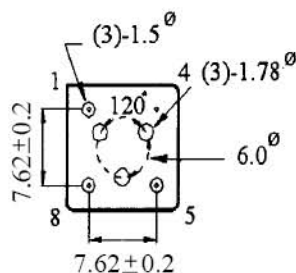
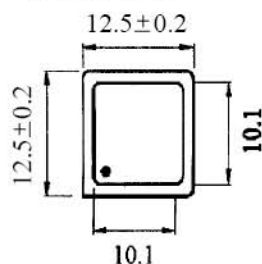
Dimension: (mm)

AGVCO-T14



Pin No	Connection
#14	Supply Control
#8	Output
#7	GND
#1	Voltage Control

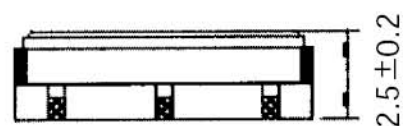
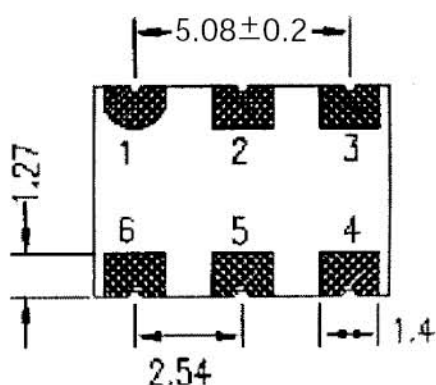
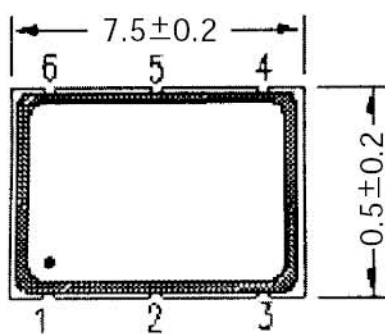
AGVCO-T8



Pin No	Connection
#8	Supply Control
#5	Output
#4	GND
#1	Voltage Control

Model		AGVCO-SV7050	AGVCO-SV7050B
Frequency Range		500kHz~125MHz	
Frequency Tolerance		±20ppm, ±50ppm, ±100ppm	
Output Logic		TTL / CMOS	
Power Supply Voltage		VDC 3V~5V	
Input Voltage(V _{DD})		V _{DD} 3.3V DC	V _{DD} 5.0V DC
Output Voltage HIGH"1"	TTL	2.4V min.	2.4V min.
	CMOS	2.97V min.	4.5V min.
Output Voltage LOW"0"	TTL	0.4V min.	0.4V max.
	CMOS	0.33V min.	0.5V max.
Frequency Pulling Range		From ± 30ppm to ±150ppm Control Voltage:0.3 to 3.0	From ± 80ppm to ±200ppm Control Voltage:0.5 to 4.5
Current Consumption		15~45mA(frequency dependent)	
Operating Temperature Range		0 to +70°C	
Storage Temperature Range		-40 to +85°C	
Aging		Less than ±5 ppm/year. (At 25±5°C)	

Dimension: (mm)



Pin No	Connection
1	Voltage Control
2	Tri-State
3	Ground
4	Output
5	No-Connection
6	Supply Control

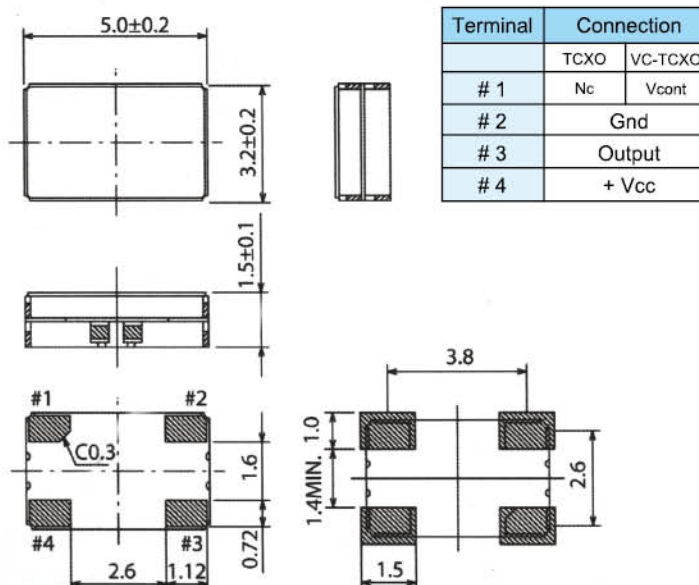
Model		ST5032	SVT5032
Nominal Frequency Range		10.000-36.000 MHz	
Standard Frequency		13.000, 14.400, 19.200 , 19.680, 26,00 MHz	
Frequency Stability	Tolerance (@25°C)	± 0.5ppm Max.	
	Temperature	±1.0 ppm (0°C ~ +50°C), ±2.5 ppm (-30°C ~ +85°C)	
	Supply Voltage	±0.2ppm (Vcc ± 5%)	
	Aging(+25°C)	±1.0 ppm / year Max.	
Temperature Range	Operating	0°C ~ +50°C, -30°C ~ +85°C	
	Storage	- 40°C ~ + 85°C	
Power Supply Voltage(VDC)		+2.7V ~ +5.0V(±5%)	
Current Consumption		2mA Max.(Load)	
Output	Load	10KΩ/10pF	
	Level	0.8Vp-p Min.	
	Waveform	Clipped Sine Wave	
	Phase Noise (@ 1.0 kHz) [dBc/Hz]**	-130 dBc / Hz Typ. (@ 1.0KHz)**	
External Control Function	Freq. Tuning Range	-	±8.0ppm Min.((Positive)
	Ext. Control Voltage		+1.5V ±1.0V

Please consult with our sales department for other parameters.

*Do not clean this TCXO by ultra sonic-wave or liquid.

**Performances vary based on different specification.

Dimension: (mm)



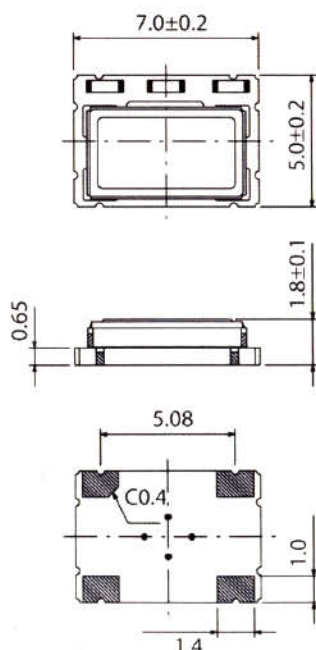
Model		ST7050	SVT7050
Nominal Frequency Range		10.000-26.000 MHz	
Standard Frequency		12.8, 13.0, 14.4, 15.36, 19.20, 19.68, 26.0MHz	
Frequency Stability	Tolerance (@25°C)	±0.5ppm Max.	
	Temperature	±1.0 ppm (0°C ~ +50°C), ±2.5 ppm (-30°C ~ +85°C)	
	Supply Voltage	±0.2ppm (Vcc ±5%)	
	Aging(+25°C)	±1.0 ppm / year Max.	
Temperature Range	Operating	0°C ~ +50°C, -30°C ~ +85°C	
	Storage	-40°C ~ +85°C	
Power Supply Voltage(VDC)		+2.8V ~ +5.0V (±5%)	
Current Consumption		2mA Max.(Load)	
Output	Load	10KΩ / 10pF	
	Level	0.8Vp-p Min.	
	Waveform	Clipped Sine Wave	
	Phase Noise (@ 1.0 kHz) [dBc/Hz]**	-130 dBc / Hz Typ. (@ 1.0KHz)**	
External Control Function	Freq. Tuning Range	-	±8.0ppm Min.((Positive))
	Ext. Control Voltage		+1.5V ±1.0V

Please consult with our sales department for other parameters.

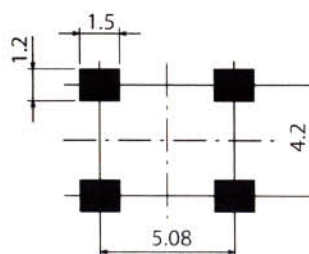
*Do not clean this TCXO by ultra sonic-wave or liquid.

**Performances vary based on different specification.

Dimension: (mm)

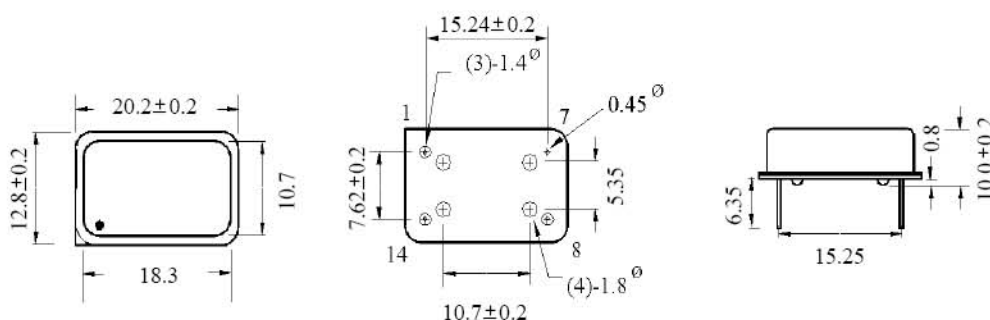


Terminal	Connection	
	TCXO	VC-TCXO
# 1	Nc	Vcont
# 2	Gnd	
# 3	Output	
# 4	+ Vcc	



Frequency Range		1.0 MHz ~ 60.0 MHz	
Standard Frequency (partial list)		5, 10.0, 10.245, 3.000, 16.384 MHz	
Supply Voltage (Vcc)		+5.0 V D.C. $\pm 5\%$ (voltage code "5") or +12.0 V D.C. $\pm 5\%$ (voltage code "12") +15.0 V D.C. $\pm 5\%$ (voltage code "15")	
Type of Crystal Cut		AT -cut. Use "A" for crystal code.	SC -cut. Use "S" for crystal code.
Frequency Stability	vs Operating Temperature Range (referenced to +25°C)	$\pm 1E-7$ over -30 to +70°C. Custom spec on request	$\pm 1E-8$ over -30 to +70°C. custom spec on request
	vs Aging /1 day	$\pm 3E-9$ max. after 72 hours of operation	$\pm 3E-9$ max. after 72 hours of operation
	vs Aging /first year	$\pm 5E-7$ max. after 72 hours of operation	$\pm 5E-7$ max. after 72 hours of operation
	vs short term	$\pm 5E-11$ max.	$\pm 1E-11$ max.
	vs 5% Supply Voltage Change	± 10 ppb max.	
	vs 5% Load Change	± 10 ppb max.	
Electronic Frequency Tuning (EFC)	Tuning Range	$\pm 3.6E-6$ min.	$\pm 8.8E-7$ min.
	Control Voltage Range	0 to +5.0V or 0 to +10V D.C. (please specify)	
	Linearity	$\pm 20\%$	
	Transfer Function	Positive	
	Input Impedance	20 K Ω typical	
Initial Frequency Accuracy(at+25°C)		± 2 .ppm at time of shipment. With EFC at +2.5V ± 0.5 V	
Power Dissipation		5 watts at steady-state at +25°C. 1.7 watts at turn-on.	
Warm-up time(at +25°C)		10 minutes max. (to $\pm 2E-8$ of the nominal freq.)	7 minutes max. (to $\pm 2E-8$ of the nominal freq.)
HCMOS Square Wave	V _{OH} :Logic High "1"	4.5V D.C. min. for Vcc=+12V or +5.0V, 15pF load	
	V _{OL} :Logic High "0"	0.5V D.C. min. for Vcc=+12V or +5.0V, 15pF load	
	Duty Cycle	45% ~55% measured at (V _{OH} - V _{OL})/2	
	Rise Time and Fall Time	10n sec. max. (90% 10% Vcc)	
	Load	15pF	
Sine Wave	Output	0 to +17dBm min. Please specify.	
	Load	50 Ω	
	Harmonics	-20 dBc	
	Spurious	-80 dBc	

Dimension:(mm)



Pin No	Connection
#1	Voltage Control
#7	GND
#8	Output
#14	Supply Voltage

- Feature:
 - Small size, light weight.
 - Wide frequency range.
 - Resistance weld hermetic seal.
- 12.5 kHz Channel Spacing

Model	Freq	Poles	Pass Band Width		Stop Band Width		Ripple	Loss	Holder
			dB	KHz	dB	KHz			
10R08A	10.7 MHz	2	3	±3.75 KHz	20	±18 KHz	2	2	TFUT
21R08A	21.4 MHz	2	3	±3.75 KHz	20	±18 KHz	0.5	1.5	TFU1
21R08B	21.4 MHz	4	3	±3.75 KHz	40	±14 KHz	1.0	2.5	TFU1*2
45R08A	45.0MHz	2	3	±3.75 KHz	10	±12.5 KHz	1.0	2.5	TFU1
45R08B	45.0MHz	4	3	±3.75 KHz	30	±12.5 KHz	1.0	4.0	TFU1*2

- 2.50 kHz Channel Spacing

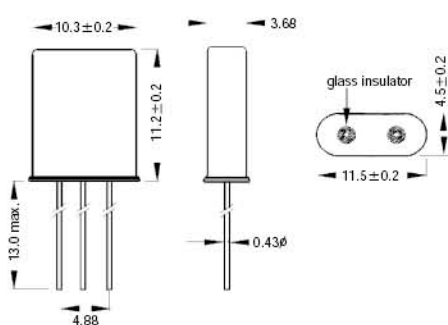
Model	Freq	Poles	Pass Band Width		Stop Band Width		Ripple	Loss	Holder
			dB	KHz	dB	KHz			
21R15A	21.4 MHz	2	3	±7.5 KHz	18	±25 KHz	0.5	1.5	TFU1
21R15B	21.4 MHz	4	3	±7.5 KHz	40	±25 KHz	1.0	2.5	TFU1*2
45R15A	45.0 MHz	2	3	±7.5 KHz	15	±25 KHz	1.0	2.0	TFU1
45R15B	45.0MHz	4	3	±7.5 KHz	30	±25 KHz	1.0	3.0	TFU1*2

- 50.0 kHz Channel Spacing

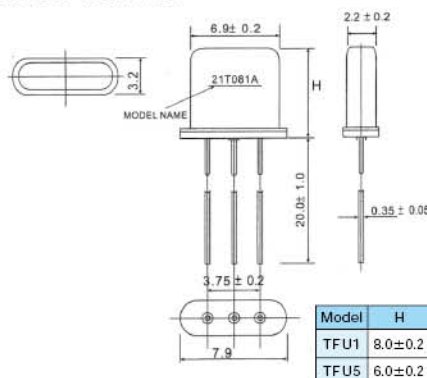
Model	Freq	Poles	Pass Band Width		Stop Band Width		Ripple	Loss	Holder
			dB	KHz	dB	KHz			
21R30A	21.4 MHz	2	3	±15 KHz	15	±45 KHz	0.5	1.5	TFU1
21R30B	21.4 MHz	4	3	±15 KHz	40	±50 KHz	1.0	2.5	TFU1*2
45R30A	45.0 MHz	2	3	±15 KHz	15	±50 KHz	1.0	2.0	TFU1
45R30B	45.0MHz	4	3	±15 KHz	40	±60 KHz	1.0	3.0	TFU1*2

Dimension:(mm)

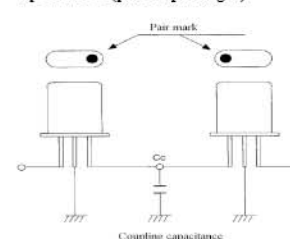
AGMCF-TFUT



AGMCF-TFU1 / TFU5



4 pole MCF (paired packages)



Feature:

- Small size, light weight.
- Wide frequency range.
- Seam type.

12.5 kHz Channel Spacing

Model	Freq	Poles	Pass Band Width		Stop Band Width		Ripple	Loss
			dB	kHz	dB	kHz		
21R08A	21.4 MHz	2	3	±3.75 kHz	20	±18 kHz	0.5	1.5
45R08A	45.0MHz	2	3	±3.75 kHz	10	±12.5 kHz	1.0	2.5

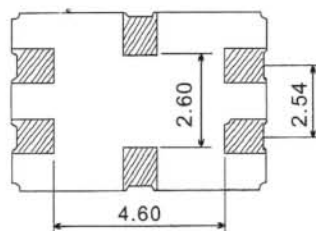
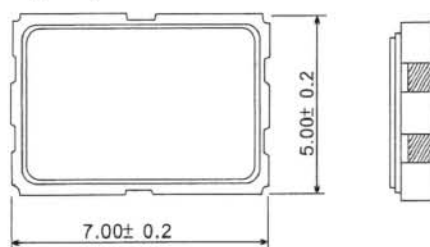
25.0 kHz Channel Spacing

Model	Freq	Poles	Pass Band Width		Stop Band Width		Ripple	Loss
			dB	kHz	dB	kHz		
21R15A	21.4 MHz	2	3	±7.5 kHz	18	±25 kHz	0.5	1.5
45R15A	45.0 MHz	2	3	±7.5 kHz	15	±25 kHz	1.0	2.0

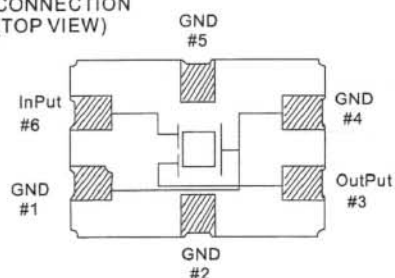
50.0 kHz Channel Spacing

Model	Freq	Poles	Pass Band Width		Stop Band Width		Ripple	Loss
			dB	kHz	dB	kHz		
21R30A	21.4 MHz	2	3	±15 kHz	15	±45 kHz	0.5	1.5
45R30A	45.0 MHz	2	3	±15 kHz	15	±50 kHz	1.0	2.0

Dimension:(mm)



CONNECTION
(TOP VIEW)



SAW Filter 433.92 MHz AGSD-TSF11

Maximum Rating:

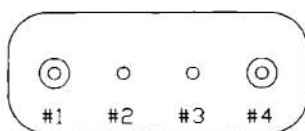
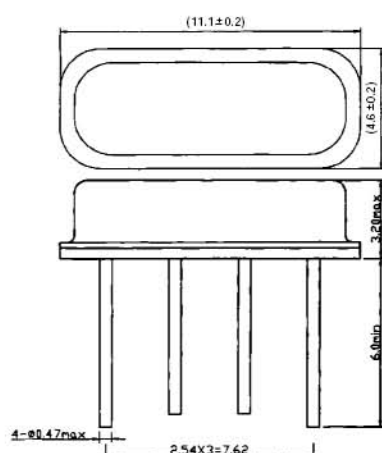
1. Input Power Level: 0 dBm
2. DC voltage: 0V
3. Operating Temperature: -15°C to +60°C
4. Storage Temperature: -40°C to +85°C

Electrical Characteristics:

Item	Unit	Min.	Type.	Max.
Center frequency F_c	MHz	-	433.92	-
Insertion Loss IL_{min} (reference level)	dB	-	2.3	3.5
3dB Bandwidth BW_{3dB}	MHz	4	7.7	-
Attenuation: (Reference level from IL_{min})				
$F_c - 100$ to $F_c - 200$ MHz	dB	56	64	-
$F_c - 25$ to $F_c - 100$ MHz	dB	40	55	-
$F_c - 10.7$ MHz	dB	42	59	-
$F_c + 25$ to $F_c + 100$ MHz	dB	40	60	-
$F_c + 100$ to $F_c + 200$ MHz	dB	40	52	-
Source impedance Z_s	Ω	-	50	-
Load impedance Z_L	Ω	-	50	-

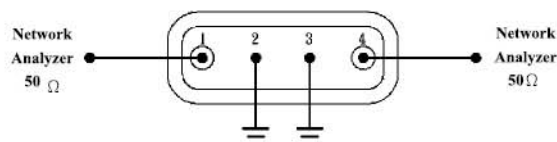
Note: IL_{min} is the minimum of the pass band attenuation. The center frequency F_c is the mean value of the upper and lower frequencies at the 3dB filter attenuation level relative to the IL_{min} .

Dimension:(mm)



Pin No	Connection
#1	Input
#2.#3	GND
#4	Output

Measurement Circuit



● **SAW Filter 1575.42 MHz for GPS AGSD-SSTC2520**

● **Maximum Rating:**

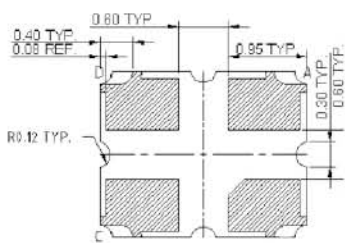
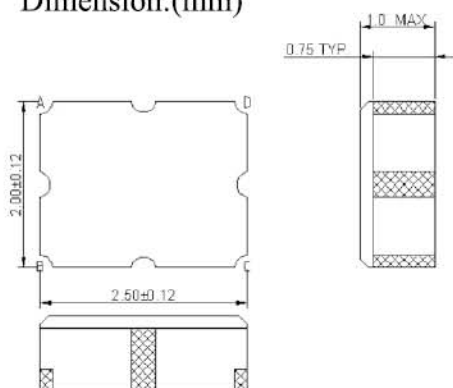
1. Maximum Input Signal Level: +10 dBm
2. Maximum DC Voltage: 5 V
3. Operating Temperature: -40°C ~ +85°C
4. Storage Temperature: -50°C ~ +100°C

● **Electrical Characteristics:**

Item	Unit	Min.	Type.	Max.
Center frequency Fc	(dB)	-	1575.42	-
Insertion loss within Fc ± 1 MHz IL	(dB)	-	2.7	3.5
Amplitude ripple (p-p) within Fc ± 1 MHz	(dB)	-	0.07	1.0
Attenuation (Reference level from 0 dB)				
1475.42 MHz	(dB)	35.0	40	-
1535.42 MHz	(dB)	30.0	37	-
1615.42 MHz	(dB)	30.0	60	-
1675.42 MHz	(dB)	40.0	62	-
VSWR within Fc ± 1 MHz		-	1.3	2.0
Source impedance Z _s	Ω	-	50	-
Load impedance Z _L	Ω	-	50	-

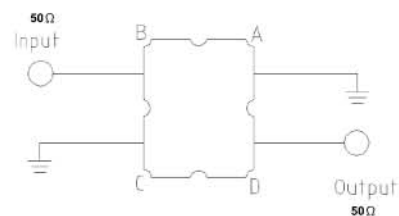
Note1. No matching network required for operation at 50 Ω

Dimension:(mm)



#B : Input
#B : Output
#A, C : Ground
△ : Year code
□ : Date code

Measurement Circuit

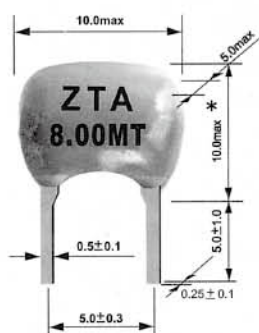


● TZTA WS Series of Ceramic Resonator

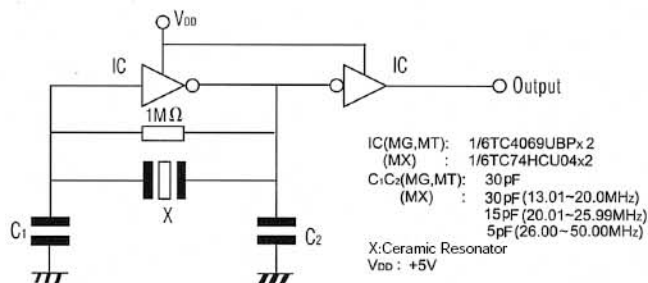
1.80-50.00MHz

● Technical Characteristics:

Part Number	Frequency Range (MHz)	Frequency Accuracy (25°C)(%)	Stability in Temperature (-20~+80°C)(%)	Operating Temperature (°C)	Aging For Ten Years (%)
ZTA□MG	1.79~6.00	±0.5	±0.3	-25~85	±0.3
ZTAWS□MG	1.79~6.00	±0.5	±0.3	-25~85	±0.3
ZTALS□MG	3.00~8.00	±0.5	±0.3	-25~85	±0.3
ZTA□MT	6.00~13.00	±0.5	±0.3	-25~85	±0.3
ZTA□MX	12.00~60.00	±0.5	±0.3	-25~85	±0.3



Test Circuit For MOS IC



*MG: 7.5max;
*MT: 10.0 max;
MX: 12.00~23.99MHz, 10.0 max
24.00~31.99MHz, 7.5 max
32.00~60.00MHz, 6.5 max

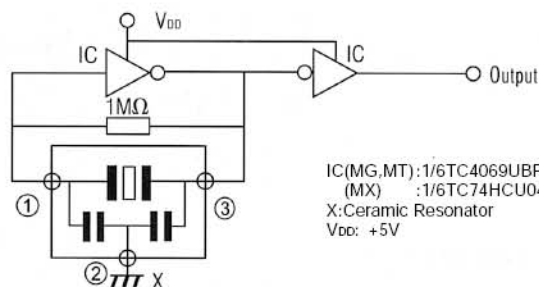
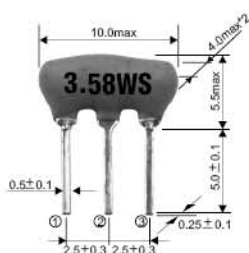
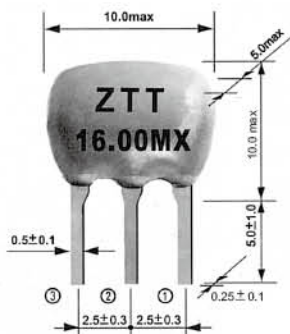
*1 LS/WS : 5.5max
*2 LS/WS□MG : 4.0 max

● TZTT Series of Ceramic Resonator With Built-in Capacitor

1.80-50.00MHz

● Technical Characteristics:

Part Number	Frequency Range (MHz)	Frequency Accuracy (25°C)(%)	Stability in Temperature (-20~+80°C)(%)	Operating Temperature (°C)	Aging For Ten Years (%)
ZTT□MG	1.79~6.00	±0.5	±0.3	-25~85	±0.3
ZTTWS□MG	1.79~6.00	±0.5	±0.3	-25~85	±0.3
ZTTLS□MG	3.00~8.00	±0.5	±0.3	-25~85	±0.3
ZTT□MT	6.00~13.00	±0.5	±0.3	-25~85	±0.3
ZTT□MX	12.00~60.00	±0.5	±0.3	-25~85	±0.3



*MG: 8.0max;
*MT: 10.0 max;
MX: 12.00~13.00MHz, 12.0 max
13.01~60.00MHz, 10.0 max

*1 LS/WS : 5.5max
*2 LS/WS□MG : 4.0 max

SZTACC/CS/CV □ MG/MT/MX
SZTTCC/CS/CV □ MG/MT/MX
SZTACC/CS/CV □ MG/MT/MX
SZTTCC/CS/CV □ MG/MT/MX

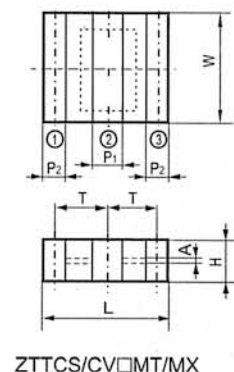
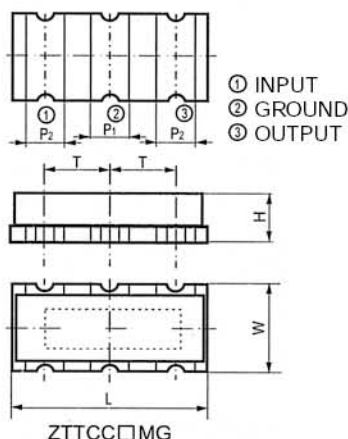
Series of Ceramic Resonator

2.00-50.0 MHz

Electrical Characteristics:

Model	Frequency Range (MHz)	Frequency Accuracy (%)	Stability in Temperature (-20~+80 °c)(%)	Aging For Ten Years (%)
SZTACC □ MG SZTTCC □ MG	2.00-8.00	±0.5	±0.3	±0.3
SZTACS/CV □ MT SZTTCS/CV □ MT	7.00-13.00	±0.5	±0.4	±0.3
SZTACS □ MG SZTTCS □ MG	13.01-50.00	±0.5	±0.3	±0.3
SZTACV □ MG SZTACV □ MG	16.00-50.00	±0.5	±0.3	±0.3

Figure And Dimensions



ZTTCS/CV □ MT/MX

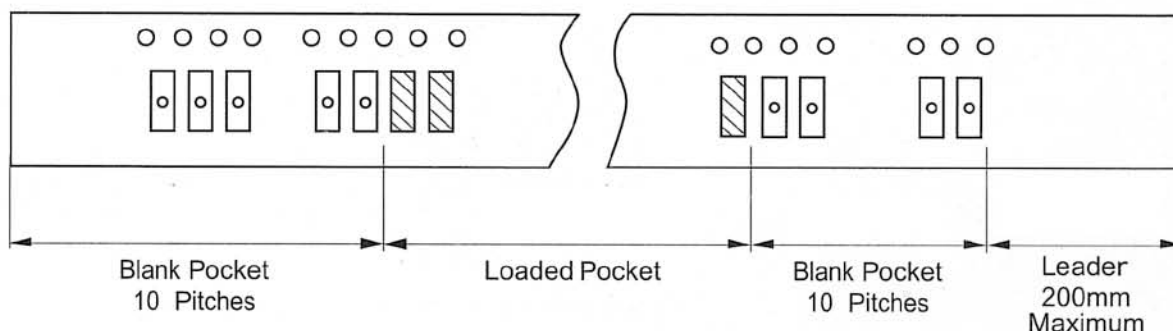
ZTTCC □ MG

Model	Code	L	W	H	P ₁	P ₂	T
SZTA/ZTTCC MG		7.4±0.2	3.4±0.2	1.8±0.2	1.2±0.2	1.2±0.2	2.5±0.2
SZTA/ZTTCS MT/MX		4.7±0.2	4.1±0.2	(1.2+A)±0.2	1.0±0.2	0.8±0.2	1.95±0.2
SZTA/ZTTCV MT/MX		3.7±0.2	3.1±0.2	(1.0+A)±0.2	0.9±0.2	0.7±0.2	1.6±0.2

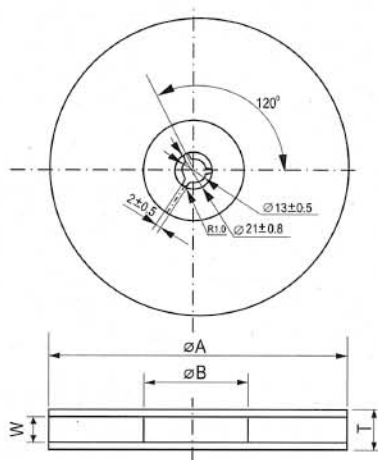
Note :A stands for thickness of the ceramic element ,which varies with the frequency.The range of the thickness is 0.1 to 0.7mm.

No middle terminal for ZTA series

Packing Method

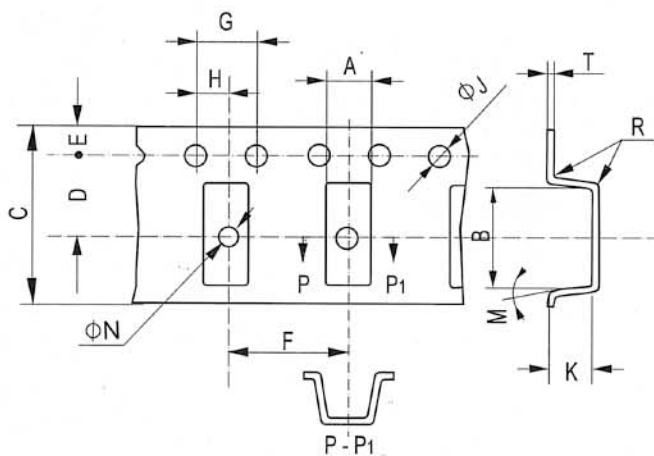


Reel



Type Dimensions (mm)

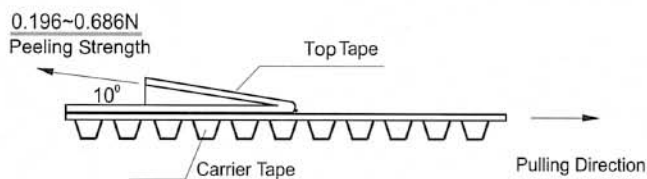
Code Tolerance	A	B	C	D	E	F	G	H	φJ	φN	M	R	K	T
Part Number	±0.2	±0.2	±0.3	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	Max	Max	±0.2	±0.1
SZTACC□MG SZTTCC□MG	3.8	7.8	16.0	7.5									2.1	
SZTACSCMT/MX SZTTCSMT/MX	5.0	4.4	12.0	5.5	1.75	8.0	4.0	2.0	1.5	1.6	10°	0.3	1.8	0.3
SZTACVMT/MX SZTTCVMT/MX	3.4	4.0	12.0	5.5									1.3	



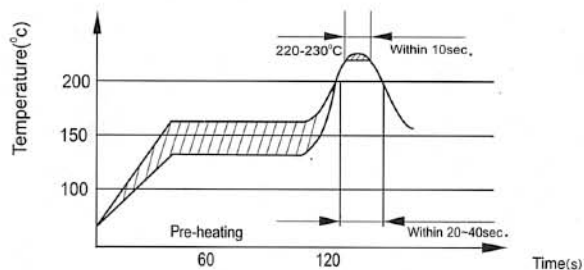
Dimensions (mm)

φA	φB	W	T	Pieces Per Reel	Carrier Tape Size
179±2	60 typ	12.4 min	19.4 max	1000 typ.	12
179±2	60 typ	16.4 min	22.4 max	1000 typ.	16
330±3	80 min	12.4 min	19.4 max	4000 typ.	12
330±3	80 min	16.4 min	22.4 max	4000 typ.	16

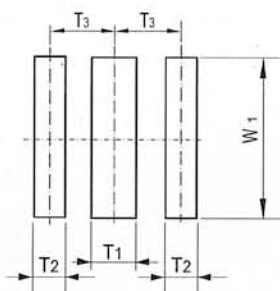
Test Condition of Peeling Strength



Recommended Reflow Soldering Standard Conditions



Recommended Land Pattern



Code	Dimension (mm)			
Part Number	T1	T2	T3	W1
SZTA/SZTTCC (MG)	1.5±0.3	1.7±0.3	2.5±0.3	4.0±0.3
SZTA/SZTTCS (MT/MX)	1.3±0.2	0.8±0.2	1.95±0.2	5.1±0.2
SZTA/SZTTCV (MT/MX)	1.0±0.2	0.7±0.2	1.5±0.2	4.1±0.2

APPLICATION SPECIFIC



designed specifically for

ETHERNET -GbE
FIBRE CHANNEL - FC

SONET - OC
SCSI, SATA, SAS - ST



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Welcome to the world of Application Specific XpressOs available through Fox Electronics' patented XpressO technology. Fox has designed, manufactured and delivered more than 12 million XpressO oscillators. This has given us all the expertise and experience needed to configure and characterize XpressOs that match your application's most precise and demanding needs exactly...and at cost points well below what you'd expect for such advanced, application-specific technology. If you're designing for Gigabit Ethernet, Telecom, Video, PCI, PCI Express, SCSI, SAS, SATA or SDI, Fox has the perfect XpressO oscillator for you!

Model Number	Get the reader	Output	Frequency Range	Dimension (mm)	Supply Voltage
FXO-HC32 Series		HCMOS	0.750 MHz - 180.000 MHz	3.2 x 2.5 x 1.0	2.5V
FXO-HC33 Series		HCMOS	0.750 MHz - 250.000 MHz	3.2 x 2.5 x 1.0	3.3V
FXO-HC52 Series		HCMOS	0.750 MHz - 180.000 MHz	5 x 3.2 x 1.4	2.5V
FXO-HC53 Series		HCMOS	0.750 MHz - 250.000 MHz	5 x 3.2 x 1.4	3.3V
FXO-PC52 Series		LVPECL	0.750 MHz - 1000 MHz	5 x 3.2 x 1.4	2.5V
FXO-PC53 Series		LVPECL	0.750 MHz - 1350 MHz	5 x 3.2 x 1.4	3.3V
FXO-LC32 Series		LVDS	0.750 MHz - 1000 MHz	3.2 x 2.5 x 1.0	2.5V
FXO-LC33 Series		LVDS	0.750 MHz - 1350 MHz	3.2 x 2.5 x 1.0	3.3V
FXO-LC52 Series		LVDS	0.750 MHz - 1000 MHz	5 x 3.2 x 1.4	2.5V
FXO-LC53 Series		LVDS	0.750 MHz - 1350 MHz	5 x 3.2 x 1.4	3.3V
FXO-HC72 Series		HCMOS	0.750 MHz - 180.000 MHz	7 x 5 x 1.4	2.5V
FXO-HC73 Series		HCMOS	0.750 MHz - 250.000 MHz	7 x 5 x 1.4	3.3V
FXO-PC72 Series		LVPECL	0.750 MHz - 1000 MHz	7 x 5 x 1.4	2.5V
FXO-PC73 Series		LVPECL	0.750 MHz - 1350 MHz	7 x 5 x 1.4	3.3V
FXO-LC72 Series		LVDS	0.750 MHz - 1000 MHz	7 x 5 x 1.4	2.5V
FXO-LC73 Series		LVDS	0.750 MHz - 1350 MHz	7 x 5 x 1.4	3.3V

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► kHz Range Crystal Unit (Tuning fork)

Model	External Dimensions (mm)	t Max.	Frequency	20 kHz	32 kHz	100 kHz	200 kHz	300 kHz
FC-12M		2.05×1.2×0.6		32 kHz		77.5 kHz		
FC-12D		2.05×1.25×0.35			● 32.768 kHz			
FC-13A		3.2×1.5×0.9			● 32.768 kHz			
FC-13F		3.2×1.5×0.6			● 32.768 kHz			
FC-135		3.2×1.5×0.9		32 kHz		77.5 kHz		
FC-255		4.9×1.8×0.9		32 kHz		100 kHz		
MC-146		7.0×1.5×1.4		32 kHz		100 kHz		
MC-156		7.1×3.3×1.5						
MC-306		8.0×3.8×2.54	20 kHz			165 kHz		
MC-405/406		10.41×4.06×3.6	20 kHz			165 kHz		
MC-405/406		8.0×3.8×2.54	20 kHz			165 kHz		
C-002RX		Φ2.0			● 32.768 kHz			
C-004R		Φ1.5						
C-005R		Φ1.2						
C-2-TYPE		Φ2.0	20 kHz			165 kHz		
C-4-TYPE		Φ1.5		32 kHz		120 kHz	● 192 kHz	

► MHz Range Crystal Unit (AT)

Model	External Dimensions (mm)	t Max.	Frequency	1 MHz	10 MHz	20 MHz	64 MHz
FA-118T		1.6×1.2×0.35			24 MHz		54 MHz
FA-128		2.0×1.6×0.5			16 MHz		54 MHz
FA-20H		2.5×2.0×0.55		12 MHz		48 MHz	
FA-238V		3.2×2.5×0.7		12 MHz		15.999 MHz	
FA-238		3.2×2.5×0.7			16 MHz		60 MHz
TSX-3225		3.2×2.5×0.6			16 MHz		48 MHz
MA-306		8.0×3.8×2.54			● 14.31818 MHz		
MA-406		11.7×4.8×3.7		4 MHz		64 MHz*	
MA-505/506		13.46×5.08×4.6					
CA-301		Φ3.1					

* 8.0 MHz < f_{nom} < 8.2 MHz : Unavailable.
 Available frequencies from 4 MHz to less than 5.5 MHz
 (4 MHz , 4.032 MHz , 4.096 MHz , 4.19 MHz , 4.194304 MHz ,
 4.433619 MHz , 4.5 MHz , 4.8 MHz , 4.9152 MHz)

► Resonator (SAW)

Model	External Dimensions (mm)	Frequency	200 MHz	500 MHz	700 MHz	1 GHz
NS-21R		300 MHz		500 MHz		
NS-32R		312 MHz			870 MHz	
FS-335		300 MHz			870 MHz	
FS-555		230 MHz		500 MHz		
FS-585		300 MHz		500 MHz		

► SPXO

Model	External dimensions (mm)	Frequency					
		1 Hz	1 MHz	50 MHz	100 MHz	500 MHz	800 MHz
SG-3030JC SG-3040JC	 10.5×5.8×2.7 (t: Max.)						
SG-3030JF	 7.1×5.1×1.5 (t: Max.)	● 32.768 kHz					
SG-3030LC SG-3040LC	 3.6×2.8×1.2 (t: Max.)						
SG-150 S*E	 2.1×1.7×0.75	3 MHz		54 MHz			
SG-211 S*E	 2.5×2.0×0.7	2.375 MHz		60 MHz			
SG-210 S*B	 2.5×2.0×0.8	2 MHz		60 MHz			
SG-210 S*D	 2.5×2.0×0.8		50 MHz	80 MHz			
SG-310 series	 3.2×2.5×1.05	2 MHz		80 MHz			
SG-550 series	 5.0×3.2×1.2 (t: Max.)	2 MHz		48 MHz			
TCO-710x series	 5.0×3.2×1.0	1.5 MHz		75 MHz			
SG-770 series	 7.0×5.0×1.6		50 MHz	230 MHz			
SG-771 PCD	 7.0×5.0×1.6		50 MHz	175 MHz			
TCO-708x series	 7.0×5.0×1.6	1.5 MHz		160 MHz			
HG-2150CA	 7.0×5.0×1.4	1 MHz		60 MHz			
SG-645 series	 7.1×5.1×1.5 (t: Max.)	32.001 MHz		135 MHz			
SG-636 series	 10.5×5.8×2.7 (t: Max.)	2.21675 MHz		135 MHz			
SG-615 series	 14.0×9.8×4.7 (t: Max.)	1.025 MHz		135 MHz			
SG-531 series	 DIP half size						
SG-51 series	 DIP full size	1.025 MHz		66.667 MHz			

► Programmable

Model	Package type	Frequency					
		1 Hz	1 MHz	50 MHz	100 MHz	500 MHz	800 MHz
SG-8003 series (1.8 / 2.5 / 3.3 V)	BA, CE, LB, JF, CA	1.0 MHz			166 MHz		
SG-8002 series (3.3 / 5.0 V)	CE, LB, JF, CA, JC, JA, DC, DB	1.0 MHz			125 MHz		

SG-8000 series Programming Tool

Package Type	BA	CE	LB	JF	CA	JC	JA	DC	DB
External dimensions (mm)	2.1×1.7×0.75 (t: Typ.)	3.2×2.5×1.05 (t: Typ.)	5.0×3.2×1.2 (t: Max.)	7.1×5.1×1.5 (t: Max.)	7.0×5.0×1.4 (t: Typ.)	10.5×5.8×2.7 (t: Max.)	14.0×9.8×4.7 (t: Max.)	DIP half size	DIP full size
									



► Spread Spectrum

Model	External dimensions (mm)	Frequency					
		1 Hz	1 MHz	50 MHz	100 MHz	500 MHz	800 MHz
SG-9001 LB (3.3 V)	 5.0×3.2×1.2 (t: Max.)	10 MHz			135 MHz		
SG-9001 CA (3.3 V)	 7.0×5.0×1.4	10 MHz			166 MHz		
SG-9001 JC (3.3 V)	 10.5×5.8×2.7 (t:Max.)	10 MHz			166 MHz		

► Low-jitter SAW

Model		External dimensions (mm)	Frequency					
			1 Hz	1 MHz	50 MHz	100 MHz	500 MHz	800 MHz
XG-1000CA (1.8/2.5/3.3V)	CMOS	 7.0×5.0×1.2			50 MHz	170 MHz		
XG-1000 CB (1.8/2.5/3.3V)	CMOS	 5.0×3.2×1.1			50 MHz	170 MHz		
EG-2021CA (2.5V)	CMOS	 7.0×5.0×1.2			62.5 MHz	250 MHz		
EG-2001CA (3.3V)	CMOS	 7.0×5.0×1.2			106.25 MHz	170 MHz		
EG-2002CA (3.3 V)	LV-TTL	 7.0×5.0×1.2			62.5 MHz	170 MHz		
EG-2121CB (2.5V)	Differential LV-PECL	 5.0×3.2×1.4			100 MHz	700 MHz		
EG-2102CB (3.3 V)	Differential LV-PECL							
	LVDS							
XG-2121CA (2.5V)	Differential LV-PECL	 7.0×5.0×1.2			100 MHz	700 MHz		
	LVDS							
XG-2102CA (3.3 V)	Differential LV-PECL	 7.0×5.0×1.2						
	LVDS							
EG-2121CA (2.5V)	Differential LV-PECL	 7.0×5.0×1.2		53.125 MHz		500 MHz		
	LVDS			53.125 MHz		700 MHz		
	HCSL				100 MHz	350 MHz		
EG-2102CA (3.3V)	Differential LV-PECL	 7.0×5.0×1.2			100 MHz	700 MHz		
	LVDS			53.125 MHz		700 MHz		
	HCSL				100 MHz	350 MHz		
EG-2101CA (3.3 V)	Differential LV-PECL	 7.0×5.0×1.2		62.5 MHz		99.999 MHz		
EG-4121CA (2.5V)	Differential LV-PECL	 7.0×5.0×1.2			100 MHz	700 MHz		
	LVDS				100 MHz	700 MHz		
	HCSL				100 MHz	350 MHz		
EG-4101CA (3.3V)	Differential LV-PECL	 7.0×5.0×1.2			100 MHz	700 MHz		
	LVDS				100 MHz	700 MHz		
	HCSL				100 MHz	350 MHz		
EA-2102CB (3.3 V)	Differential LV-PECL	 5.0×3.2×1.35				100 MHz		

► VCXO / VCSO

Model	External dimensions (mm)	Frequency					
		1 Hz	1 MHz	50 MHz	100 MHz	500 MHz	800 MHz
VG-4231CE (1.8 / 2.8 / 3.3 V)	 3.2×2.5×1.05	3 MHz		60 MHz			
VG-4231CB (3.3 V)	 5.0×3.2×1.2	1 MHz		81 MHz			
VG-4231CA (3.3 / 5.0 V)	 7.0×5.0×1.4	1 MHz		60 MHz			
VG-4232CA (3.3 V)	 7.0×5.0×1.4		60.0001 MHz	80 MHz			
VG-4501/4502CA (3.3 V)	 7.0×5.0×1.6			80 MHz	125 MHz		
VG-4512CA (3.3 V)	 7.0×5.0×1.6			80 MHz	200 MHz		
EV-9100JG (3.3 V)	 13.9×9.8×4.7					800 MHz	2500 MHz

► TCXO

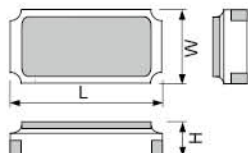
Model	External dimensions (mm)	Frequency			
		1 Hz	1 MHz	50 MHz	100 MHz
TG-3530SA (1.5 to 5.5 V)	 10.1×7.4×3.2	● 32.768 kHz			
TG-5031CJ (1.8 V)	 2.0×1.6×0.73		13 MHz	52 MHz	
TG-5035CJ (1.8 V)					
TG-5021CG (2.8 V)	 2.5×2.0×0.8		13 MHz	52 MHz	
TG-5035CG (1.8 V)					
TG-5021CE (2.8 V)	 3.2×2.5×0.9		10 MHz	40 MHz	
TG-5035CE (1.8 V)					

Category	Mode	Actual	size(mm)	Features
Serial 4-Wire	RX-4045SA		10.1x7.4x3.2 t(Typ)	High-Stability
	RX-4045NB		6.3x5.2x1.4 t(Max)	
	RX-4581NB		6.3x5.2x1.4 t(Max)	Built-in SRAM
	RX4565SA 		10.1x7.4x3.2 t(Typ)	For Automotivetemperature range(+125 °C)
	RX-4803SA		10.1x7.4x3.2 t(Typ)	Built-in DTCXO
	RX-4803LC		3.6x2.4x1.2 t(Max)	High Stability
	RX-5412SF		10.5x8.1x2.0 t(Max)	Built-in event recorderfunction
Serial 3-Wire	RTC-4701JE		7.3x6.2x1.5 t(Max)	Built-in Temperature Sensor
	RTC-4701NB		6.3x5.2x1.4 t(Max)	
	RTC-4574SA		10.1x7.4x3.2 t(Typ)	Simple Function
	RTC-4574JE		7.3x6.2x1.5 t(Max)	
	RTC-4574NB		6.3x5.2x1.4 t(Max)	
	RX-4574LC		3.6x2.8x1.2 t(Max)	
	RA-4574SA 		10.1x7.4x3.2 t(Typ)	For Automotive
	RTC-4543SA		10.1x7.4x3.2 t(Typ)	Simple Function
	RTC-4543SB		11.6x8.0x2.0 t(Max)	
	RX-4575LC		3.6x2.8x1.2 t(Max)	Built-in external event detection
	RX-4571LC		3.6x2.8x1.2 t(Max)	Low Backup Voltage
	RX-4571NB		6.3x5.2x1.4 t(Max)	
	RX-4571SA		10.1x7.4x3.2 t(Typ)	
I ² C Bus	RX-8025SA		10.1x7.4x3.2 t(Typ)	High-Stability
	RX-8025NB		6.3x5.2x1.4 t(Max)	
	RTC-8564JE		7.3x6.2x1.5 t(Max)	Low power consumption
	RTC-8564NB		6.3x5.2x1.4 t(Max)	
	RX-8564LC		3.6x2.8x1.2 t(Max)	
	RA-8565SA 		10.1x7.4x3.2 t(Typ)	For Automotivetemperature range(+125 °C)
	RX-8571SA		10.1x7.4x3.2 t(Typ)	Low powerconsumption
	RX-8571NB		6.3x5.2x1.4 t(Max)	128 bit user RAMLong-running timer (65000 hours)
	RX-8571LC		3.6x2.8x1.2 t(Max)	
	RX-8581SA		10.1x7.4x3.2 t(Typ)	Simple Function
	RX-8581JE		7.3x6.2x1.5 t(Max)	
	RX-8581NB 		6.3x5.2x1.4 t(Max)	For Automotive
	RA-8581SA		10.1x7.4x3.2 t(Typ)	Built-in EEPROM and unique ID-ROM
	RX-8731LC		3.6x2.8x1.2 t(Max)	Built-in DTCXO
	RX-8803SA		10.1x7.4x3.2 t(Typ)	
	RX-8803LC		3.6x2.4x1.2 t(Max)	
Parallel 4-bit	RTC-7301SF		10.5x8.1x2.0 t(Max)	Built-in Temperature
	RTC-7301DG		DIP 18 pin	Available Alarm and Timer
	RTC-72421		DIP 18 pin	4-bit simple Function
	RTC-72423		16.3x12.2x2.8 t(Max)	

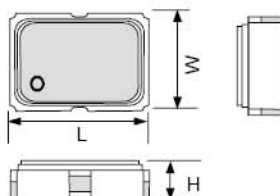
(Unit:mm)

●SON

Glass Lid type

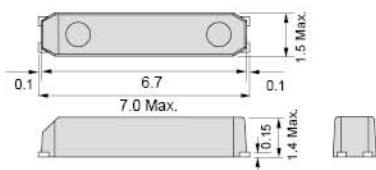


Metal Lid type

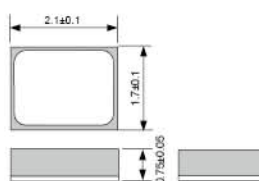


Category	Model	Dimension (mm)			Pin
		L	W	H	
Crystal Unit	FC-12D	2.05±0.1	1.25±0.1	0.35 Max.	4
	FC-12M	2.05±0.05	1.2±0.05	0.6 Max.	2
	FC-13A	3.2±0.1	1.5±0.1	0.9 Max.	2
	FC-13F	3.2±0.1	1.5±0.1	0.6 Max.	2
	FC-135	3.2±0.1	1.5±0.1	0.8±0.1	2
	FC-255	4.9±0.1	1.8±0.1	0.8±0.1	2
	FA-118T	1.6±0.1	1.2±0.1	0.35 Max.	4
	FA-128	2.0±0.1	1.6±0.1	0.5 Max.	4
	FA-20H	2.5±0.1	2.0±0.1	0.55 Max.	4
	TSX-3225	3.2±0.15	2.5±0.15	0.6 Max.	4
SAW Resonator	FA-238 / FA-238V	3.2±0.1	2.5±0.1	0.6±0.1	4
	NS-21R	2.5±0.1	2.0±0.1	0.86±0.9	4
	FS-335 / NS-32R	3.8±0.15	3.8±0.15	0.98±0.15	6
Crystal Oscillator	FS-555 / 585	4.8±0.2	5.2±0.2	1.5±0.2	8
	SG-211	2.5±0.15	2.0±0.15	0.7±0.1	4
	SG-210	2.5±0.15	2.0±0.15	0.8±0.1	4
	SG-310 / SG-8002CE / SG-8003CE	3.2±0.2	2.5±0.2	1.05±0.15	4
	TCO-710x series	5.0±0.2	3.2±0.2	1.0±0.2	4
	SG-770 / SG-771 series	7.0±0.2	5.0±0.2	1.6±0.2	6
	TCO-708x series	7.0±0.2	5.0±0.2	1.6±0.2	4
	SG-8002CA / SG-8003CA	7.0±0.2	5.0±0.2	1.5 Max.	4
	HG-2150CA	7.0±0.2	5.0±0.2	1.5 Max.	4
	SG-9001CA	7.0±0.2	5.0±0.2	1.4±0.1	6
	XG-1000CA	7.0±0.2	5.0±0.2	1.2±0.2	4
	XG-1000CB	5.0±0.2	3.2±0.2	1.1±0.15	4
	EA-2102CB	5.0±0.2	3.2±0.2	1.35±0.15	6
	EG-20** CA	7.0±0.2	5.0±0.2	1.2±0.2	4
	EG-2121CB / EG-2102CB	5.0±0.2	3.2±0.2	1.4±0.15	6
	XG-2121CA / XG-2102CA	7.0±0.2	5.0±0.2	1.2±0.2	6
	EG-21** CA / EG-41** CA	7.0±0.2	5.0±0.2	1.2±0.2	6
VCXO	VG-4231CE	3.2±0.2	2.5±0.2	1.05±0.15	4
	VG-4231CB	5.0±0.2	3.2±0.2	1.2±0.2	6
	VG-4231CA / VG-4232CA	7.0±0.2	5.0±0.2	1.4±0.1	6
	VG-4501CA / VG-4502CA / VG-4512CA	7.0±0.2	5.0±0.2	1.6±0.2	6
TCXO	TG-5031CJ / TG-5035CJ	2.0±0.15	1.6±0.15	0.73±0.07	4
	TG-5021CG / TG-5035CG	2.5±0.2	2.0±0.2	0.8±0.1	4
	TG-5021CE / TG-5035CE	3.2±0.2	2.5±0.2	0.9±0.1	4
SAW Filter	FF-32N	3.8±0.15	3.8±0.15	0.98±0.15	6
	FF-555	4.8±0.2	5.2±0.2	1.5±0.2	8
Gyro Sensor	XV-3500CB / XV-3700CB	5.0±0.2	3.2±0.2	1.3±0.2	8
	XV-8100CB / XV-8000CB				

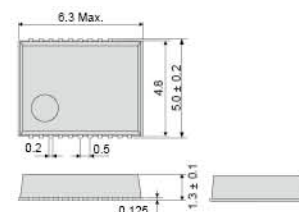
●SON (Crystal Unit)
MC-146



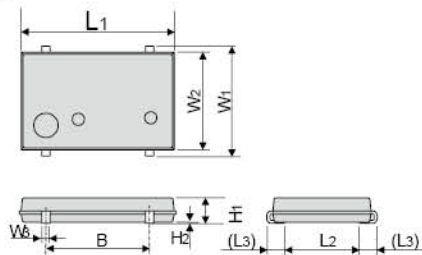
●SON (Crystal Oscillator)
SG-150 / SG-8003BA



●SON: RX-**** NB / RTC-**** NB

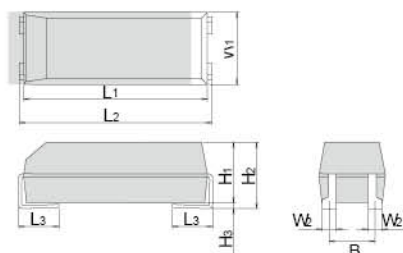


●SOJ / VSOJ



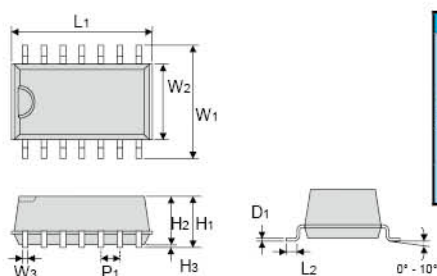
Category	Model	L ₁	L ₂	(L ₃)	W ₁	W ₂	W ₃	H ₁	H ₂	B	Pin
Crystal Unit	MC-156	7.1 Max.	1.6	(0.75)	3.3 Max.	2.5	0.4	1.5 Max.	—	5.08	4
	MC-306 / 30A	8.0 Max.	1.9	(0.9)	3.8 Max.	3.2	0.5	2.54 Max.	—	5.5	4
	MA-406	11.7 Max.	2.1	(1.2)	4.8 Max.	4.0	0.7	3.7 Max.	—	9.6	4
Crystal Oscillator	SG-** LB	5.0 ±0.2	2.5	(0.35)	3.2 ±0.2	2.8	1.0	1.2 Max.	0.0 Min.	2.54	4
	SG-645	7.1 ±0.2	3.8	(0.75)	5.1 ±0.2	4.6 ±0.2	0.4	1.5 Max.	0.0 Min.	5.08	4
	SG-636	10.5 Max.	3.6	(1.0)	5.8 Max.	5.0	0.51	2.7 Max.	0.05 Min.	5.08	4
	SG-615	14.0 Max.	7.62	—	9.8 Max.	8.65	0.51	4.7 Max.	0.25 Min.	5.08	4
	SG-** LC	3.6 ±0.2	2.0	(0.4)	2.8 ±0.2	2.4	0.22	1.2 Max.	0.0 Min.	0.5	12
	RX-** JE	7.0 ±0.3	4.5	(0.75)	6.0 ±0.2	5.4	0.22	1.5 Max.	0.0 Min.	0.65	20
Real time Clock Module	RTC-** JE										

●SOJ (Crystal Unit)



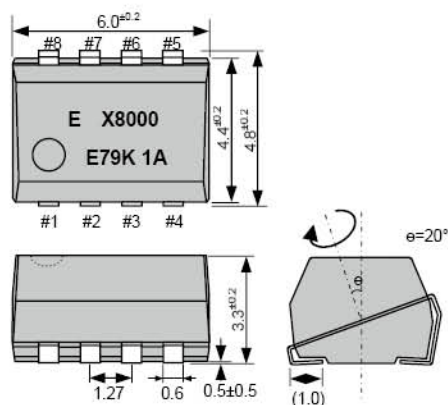
Category	Model	L ₁	L ₂	L ₃	W ₁	W ₂	B	H ₁	H ₂	H ₃
Crystal Unit	MC-405 / 406	9.6	10.41 Max.	2.54	4.06 Max.	0.51	2.29	3.15	3.6 Max.	0.2 Min.
	MA-505 / 506	12.7	13.46 Max.	2.54	5.08 Max.	1.09	3.3	4.19	4.6 Max.	0.2 Min.

●SOP / VSOP



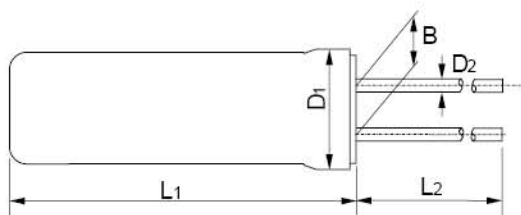
Category	Model	L ₁	L ₂	W ₁	W ₂	W ₃	H ₁	H ₂	H ₃	D ₁	P ₁	Pin
Real time Clock Module	RTC-****SA	10.1 ±0.2	0.6	7.4 ±0.2	5.0	0.35	3.2 ±0.1	3.1	0.05 Min.	0.15	1.27	14
	RX-****SA											
	RA-****SA											
	RTC-4543SB	11.4 ±0.2	0.6	7.8 ±0.2	5.4	0.4	2.0 Max.	1.8	0 Min.	0.15	1.27	18
	RTC-72423	16.3 Max.	1.0	12.2 Max.	7.9	0.35	2.8 Max.	—	0.1 Min.	0.2	1.27	24
	RX-5412SF	10.2 ±0.3	0.5	7.8 ±0.3	5.4	0.36	2.0 Max.	—	0 Min.	0.15	0.8	24
	RTC-7301SF											

●SOJ (Gyro sensor) XV-8000LK



(Unit:mm)

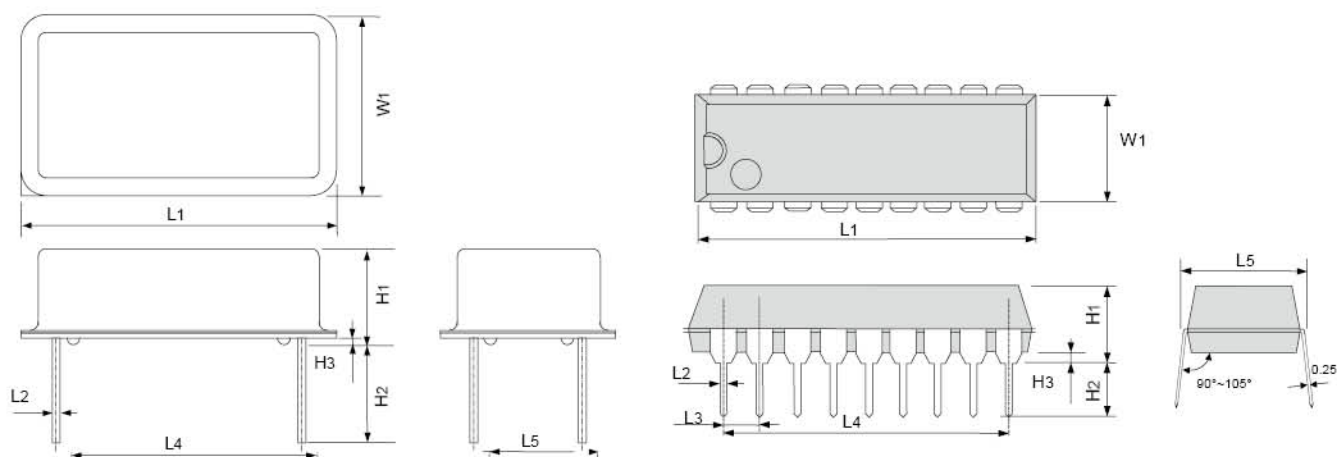
●Cylinder



Category	Model	L ₁	L ₂	D ₁	D ₂	B	
Crystal Unit	C-002RX / C-2-TYPE	6.0 Max.	4.0 Min.	Φ2.0 Max.	Φ0.2	0.7	
	C-004R / C-4-TYPE	5.0 Max.	4.0 Min.	Φ1.5 Max.	Φ0.18	0.5	
	C-005R	4.6 Max.	4.0 Min.	Φ1.2 Max.	Φ0.15	0.3	
	CA-301	Over 5.5 MHz	8.9 Max.	9.5 Min.	Φ3.1 Max.	Φ0.3	1.1
		Under 5.5 MHz	9.3 Max.	9.5 Min.	Φ3.1 Max.	Φ0.3	1.1

160 kHz to 165 kHz, 307.2 kHz: D1= ø 2.2 Max. (C-2-TYPE)

●DIP



Category	Model	L ₁	L ₂	L ₃	L ₄	L ₅	H ₁	H ₂	H ₃	W ₁	Pin
Crystal Oscillator	SG-51 SG-8002DB	19.8 Max.	0.51	—	15.24	7.62	5.3 Max.	2.54 Min.	0.2 Min.	6.36	4 Pin
	SG-531 SG-8002DC	13.7 Max.	0.51	—	7.62	7.62	5.3 Max.	2.54 Min.	0.2 Min.	6.6	4 Pin
Real time clock Module	RTC-7301DG	23.1 Max.	0.46	2.54	20.32	7.62	4.2 Max.	2.54 Min.	0.2 Min.	6.3	18 Pin
	RTC-72421	23.1 Max.	0.65	2.54	20.32	7.62	4.2 Max.	3.3 Min.	0.2 Min.	6.3	18 Pin

HANDLING PRECAUTIONS

When using Epson products, it is essential to observe the operating conditions specified in their respective specifications or catalogs.

Common points for all products

1. Shock resistance

Epson's crystal products are designed to resist physical shocks, but crystal products may be damaged under some conditions, such as dropping from desks or receiving shocks during mounting. Please be sure to re-check the characteristics if product has received any shocks.

2. Soldering heat resistance

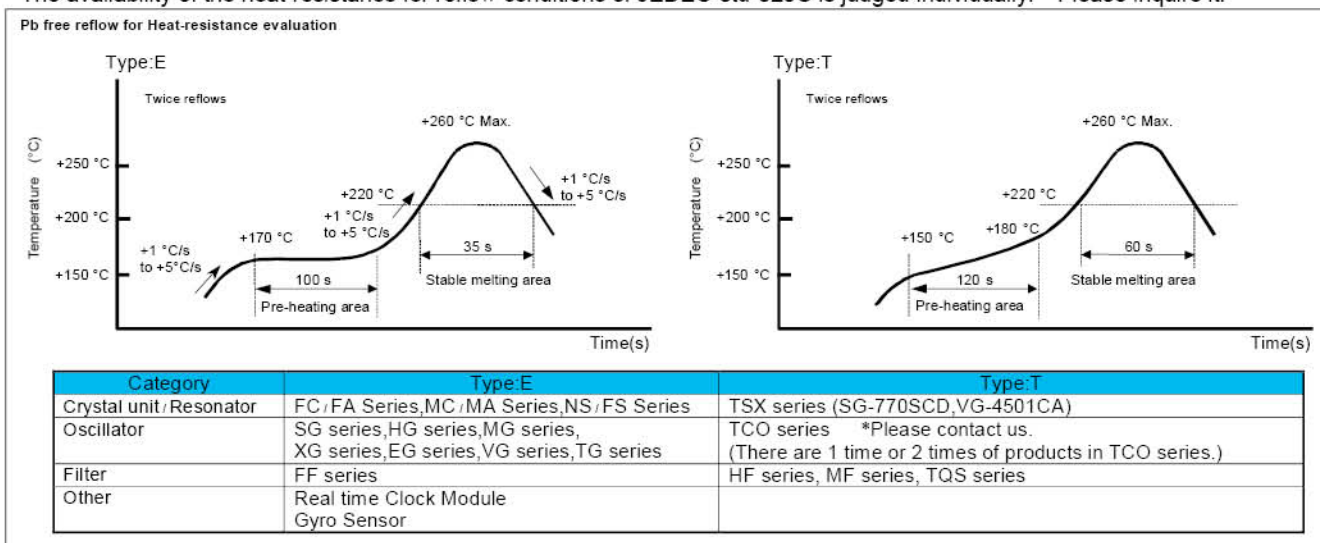
Epson's crystal products except SMD products use solder having a +180°C to +200°C melting point. Heating up the package more than +150°C may deteriorate the characteristics or damage the products. If the crystal products need to be soldered at temperature of more than +150°C, SMD products are recommended. Using higher temperatures over the following reflow conditions to crystal products, even SMD products, may cause the characteristics to deteriorate. The reflow conditions within following profile is recommended. Always check the soldering temperature and time before mounting these products. Also, please check them again when the mounting conditions are changed. Please contact us for inquiries about heat-resistance if crystal products need to be soldered over the following profile.

(1) Cylinder products and DIP products

Model	Soldering conditions
[Cylinder] C-TYPE, C-2-TYPE, C-4-TYPE, HTS-206	+280 °C or under @ Max. 5 s. Do not heat the package at more than +150 °C.
[Cylinder] CA-301 [DIP] SG-51 / 531, SG-8002DB / DC, RTC-62421 / 72421 / 7301DG	+260 °C or under @ Max. 10 s. Do not heat the package at more than +150 °C.

(2) SMD products Reflow profile (example)

The availability of the heat resistance for reflow conditions of JEDEC-std-020C is judged individually. Please inquire it.



Please make temperature rate as gentle a curve as possible. Also, if the package is cellular, the possibility of cracking is inevitable, so please store it for a short duration and take measures to protect product from dampness when you store it in high humidity.

3. Mounting precautions

Shocks by auto mounting

Shocks caused by auto mounting and vacuuming may deteriorate the characteristics and affect the products. Please set the mounting conditions to minimize the shocks as much as possible, and be sure that there is no affect on the characteristics before mounting. Please review the conditions after the conditions are changed. Also please be sure that crystal products don't hit machines or other electric boards, etc. before or after mounting.

(1) a) Ceramic package products and SON products

Bending the board after soldering ceramic package products and SON products (MC-146, RTC-****NB, RX-****NB) may cause peeling off portions of soldering or package cracks by mechanical stress. Particularly, in the case of cutting boards after soldering these products, please be sure to layout the crystal on a less stressed location and use less stressed cutting method.

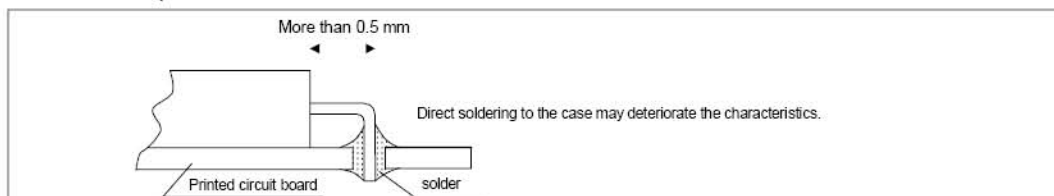
b) Ceramic package products

In the case of soldering ceramic package products on a different expansion-coefficient board (ex. Epoxy Glass), soldering crack at the foot pattern would be expected under repeated temperature changes for a long period. Under these conditions, be sure to check the solderability in advance.

(2)Cylinder products

Bending the lead on the glass or pulling the lead strongly may cause cracking of the hermetic seal glass at the root of the lead and may cause the airtightness and the characteristics to deteriorate. When the lead of crystal products need to be bent as in the figure below, leave more than 0.5mm of lead from the case and hold the lead to prevent the lead from cracks. When the lead needs to be repaired, do not pull it, and hold the bent part to correct it. Giving undue pressure on this portion of hermetic seal may cause the airtightness to deteriorate. Please avoid applying pressure. Gluing the case of products on the electric board is recommended to prevent the airtightness from deteriorating.

●Installation example



(3)DIP products

Deformed leads cannot be inserted into board holes. Avoid applying stress sufficient to deform leads.

(4)SOJ Products and SOP products

Please avoid applying stress sufficient to deform the leads.

Deformed leads may cause incorrect soldering.

Particularly SOP products need to be handled with the greatest care.

4. Ultrasonic cleaning

- Products using AT-cut crystal and SAW resonator/filter can be cleaned by ultrasonic. But under some conditions, the crystal characteristics may be affected and internal wiring may be damaged. Please be sure to check the suitability of your system in advance.
- Products using tuning-fork crystals and gyro sensor cannot be guaranteed if cleaned using ultrasonic methods, because crystal may be destroyed.
- Do not wash open-type products.
- With washable products, avoid the use of cleaners or solvents that may negatively affect the product.

5. The affect of mechanical vibration

While there is any given shock or mechanical vibration periodically to crystal products, such as, a piezo sounder, a piezo buzzer, and speaker, to crystal products, output frequency and amplitude can be changed. Especially the quality of telecommunication equipment could be affected by this phenomenon. Although Epson's crystal products are designed to minimize the effect of mechanical vibration, Epson recommends to check them in advance and then follow the Mounting guidelines as below.

●Mounting guidelines

- (1) Ideally, the mechanical buzzer source should be mounted on a separate PCB from the crystal device.
- (2) It is advisable to use cushion or cutting PCB, if you mount on same PCB.
- (3) Traveling mechanical vibration differs when applied to the PCB only vs. inside the body. Last of all, it is advisable to conform to inside body characteristics.

6. Storage

- (1) Storing the crystal products under higher or lower temperature or high humidity for a long period may affect frequency stability or solderability. Please store the crystal products at the normal temperature and humidity, avoid storing them for a long period and mount them as soon as possible after unpacking.

Normal temperature and humidity:

Temp, +15 °C to +35 °C, humidity 25 % RH to 85 % RH (refer to the standard conditions of test site JIS Z-8703)

- (2) Please carefully handle the inner and outer boxes and reel. External pressure may cause deformation of reel and tape.

7. Radiation

Exposure to radiation can cause deterioration in performance, so avoid irradiation.

8. Chemicals / pH

Do not use or store the product in a pH range that may cause corrosion or dissolution of the materials or packaging.

9. Adhesive

Do not use an adhesive that may cause corrosion of the packing materials, terminals, components, glass materials, and vapor deposited materials used in the products.

(For example, a chlorine-based adhesive may corrode the metal parts "lid" of a crystal unit to diminish the hermetic qualities, lowering the performance.)

10. Halogen Compound

Do not use products in halogen gas. Even a slight amount of halogen gas, such as that found in chlorine gas in the air or in metal parts used in the package, may corrode. Also, do not use any resin that emits halogen gas.

■Crystal unit / Resonator

1. Drive level

Applying excessive drive level to the crystal units may cause deterioration of characteristics or damage. Circuit design must be such as to maintain a proper drive level.(refer to "Drive level")

2. Negative resistance

Unless adequate negative resistance is allocated in the oscillation circuit, oscillation or oscillation start up time may increase (refer to "Allowance for Oscillation".)

3. Load capacitance

Differences in the load capacitance in the oscillation circuit may result in deviations in the oscillation frequency from the desired frequency. Attempting to tune by force may merely cause abnormal oscillation. Before use, please specify the load capacitance of the oscillation circuit.(refer to "Load capacitance")

■Crystal Oscillator and real time clock module

All crystal oscillators and real time clock modules are provided with a CMOS IC. Please pay attention to the following points.

1. Static electricity

Although an anti-static-electricity protection circuit is provided in the circuit, excessive levels of static electricity may damage the IC. Choose conductive materials for containers and packing material. Use a soldering gun and a measuring circuit free from high-voltage leakage and provide grounding connection when working with them.

2. Noise

Applying excessive level of extraneous noise to power source or input terminal may cause latch up or spurious phenomenon, which results in malfunction and breakdown.

To maintain stable operation, provide by-pass capacitor with more than 0.1 μ F at a location as near as possible to the power source terminal of the crystal products (between VCC - GND). Do not permit any objects which emit a high level of noise in a location near the crystal oscillator.

3. Power supply line

Line impedance of a power supply should be as low as possible.

4. Output Load

It is recommended that output load is installed as close as possible to an oscillator (within 20 mm).

5. Treatment of unused input terminals

Unused pins that are left open may collect noise, thereby resulting in malfunction. Also, power consumption may increase when both P-channel and N-channel are turned on, therefore connect unused input terminals to VCC or GND.

6. Heat impact

Repeated large changes in temperature may degrade the characteristics of a deteriorated crystal unit and cause breakage of wires inside the plastic mold. This must be avoided.

7. Mounting direction

Incorrect mounting of the oscillator may cause malfunction and breakdown, so please check the mounting direction when installing.

8. Power on

It is not recommended to power on from intermediate electric potential and / or extreme fast power on. Powering on under such conditions may cause no oscillation and / or malfunction.

■Optical device

1.Chemicals

Do not use chemicals that may negatively affect the glass materials,vapor deposited materials,or adhesives used in the product.

■ PRECAUTIONS IN DESIGNING OSCILLATION CIRCUITS

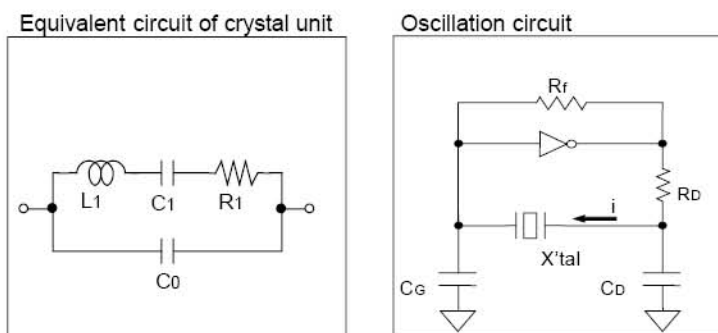
1. Drive level

Drive level denotes electric power required to oscillate a crystal unit, which can be calculated using the following formula.

$$\text{Drive level (P)} = i^2 \cdot R_e$$

Where i stands for current to pass in the crystal unit, R_e for effective resistance of crystal unit, and $R_e = R_1(1 + C_0/C_L)^2$.

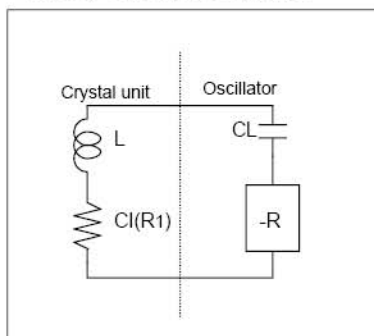
If the Drive level (P) exceeds the specified level, oscillation frequency will shift. This occurs because an excessive level of power causes stress for the crystal and, consequently, temperature rises. If excessive drive level of power is applied to the crystal unit, this may deteriorate or damage the characteristics.



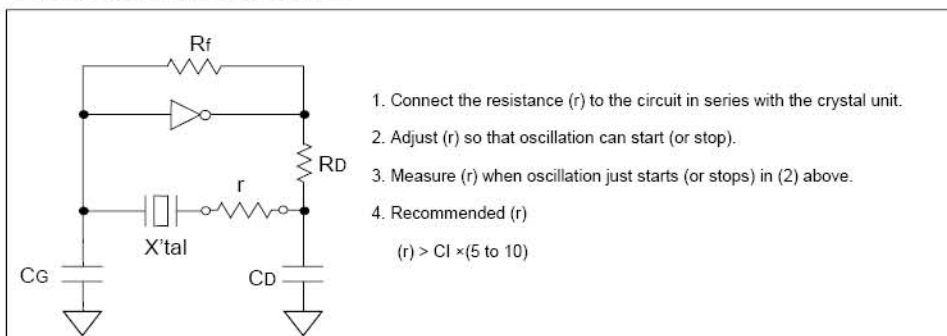
2. Allowance for oscillation

Unless adequate negative resistance is allocated in the oscillation circuit, oscillation start-up time may be increased, or No oscillation may occur. In order to avoid this, provide enough negative resistance in the circuitry design.

● Crystal unit and Oscillator



● Check of Negative resistance

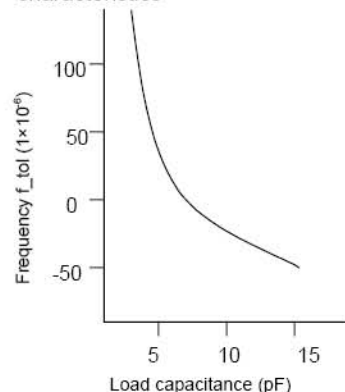


3. Load capacitance

Differences in the load capacitance of the oscillation circuit may result in a different oscillation frequency from the desired one, as shown in the figure below. Approximate expression of the load capacitance of the circuit $C_L \approx C_G \times C_D / (C_G + C_D) + C_S$.

Where C_S Stands for stray Capacity of the circuit.

● Frequency and load capacitance characteristics



● Reference for setting parameters of oscillation circuit

Symbol	R_f (M Ω)	R_D (k Ω)	C_G (pF)	C_D (pF)
Frequency range				
20 kHz to 60 kHz	20	500	10	10
60 kHz to 165 kHz	10	300	10	10
5.5 MHz to 30 MHz (Fundamental)	1	0.5	5~15	5~15
30 MHz~50 MHz (Fundamental)			5~10	5~10

IC: equivalent to TC74HCU04 (Unbuffer)
 IC: equivalent to TC74VHC04 (Unbuffer) (30 MHz to 50 MHz)
 (TC74HCU04 and TC74VHC04 are product number of Toshiba Corp.)

■ Terminal materials of Epson products complied with EU RoHS directive

- We will deliver the products complied with EU RoHS directive for new order.
Sn plating of terminals is our standard about the products that are two type plating.

	Model	Terminal Material	Terminal Plating	Complies with EU RoHS directive	Pb free	Remarks (Contains Pb in products exempted by RoHS directive.)
kHz range Crystal units	C-002RX / C-2-TYPE	Fe-Ni-Co	Sn-Cu	○	○	
	C-004R/C-4-TYPE	Fe-Ni-Co	Sn-Cu	○	○	
	C-005R	Fe-Ni-Co	Sn-Cu	○	○	
	FC-12D	Mo	Au	○	○	
	FC-12M	Mo	Au	○	○	
	FC-13A	Mo	Au	○	○	
	FC-13F	W	Au	○		Contains Pb in sealing glass exempted by RoHS directive.
	FC-135	W	Au	○		Contains Pb in sealing glass exempted by RoHS directive.
	FC-255	W	Au	○		Contains Pb in sealing glass exempted by RoHS directive.
	MC-146	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	MC-156	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	MC-306/MC-30A	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
MHz range Crystal units	CA-301	Fe-Ni-Co	Sn-Cu	○	○	
	FA-118T	Mo	Au	○	○	
	FA-128	W	Au	○	○	
	FA-20H	W	Au	○	○	
	FA-238 / FA-238V	W	Au	○	○	
	TSX-3225	W	Au	○	○	
	MA-306	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	MA-406	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	MA-505/MA-506	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
Resonator	NS-21R	W	Au	○	○	
	NS-32R	W	Au	○	○	
	FS-335	W	Au	○	○	
	FS-555	W	Au	○	○	
	FS-585	W	Au	○	○	
SPXO	SG-150 series	Cu	Au	○	○	
	SG-211 series	W	Au	○	○	
	SG-210 SxB / SxD	W	Au	○	○	
	SG-210 SxH	W	Au	○	○	
	SG-310 series	W	Au	○	○	
	SG-550 series	42 Alloy	Sn-Bi	○	○	
	TCO-710x series	W	Au	○	○	
	SG-770 series	W	Au	○	○	
	TCO-708x series	W	Au	○	○	
	SG-645 series	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-636 series	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-615 series	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-531 series	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-51 series	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-8003BA	Cu	Au	○	○	
	SG-8002CE/SG-8003CE	W	Au	○	○	
	SG-8002LB/SG-8003LB	42 Alloy	Sn-Bi	○	○	
	SG-8002JF	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-8002CA/SG-8003CA	W	Au	○	○	
	SG-8002JC	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-8002JA	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-8002DC	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-8002DB	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-8003JF	42 Alloy	Sn or Sn-Bi	○	○	
	SG-9001LB	42 Alloy	Sn-Bi	○	○	
	SG-9001CA	W	Au	○	○	
	SG-9001JC	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	XG-1000CA	W	Au	○	○	
	XG-1000CB	W	Au	○	○	
	EG-2021CA	W	Au	○	○	
	EG-2001CA	W	Au	○	○	
	EG-2002CA	W	Au	○	○	
	EG-2121CB / EG-2102CB	W	Au	○	○	
	EA-2102CB	W	Au	○	○	
	XG-2121CA / XG-2102CA	W	Au	○	○	
	EG-2121CA	W	Au	○	○	
	EG-2102CA	W	Au	○	○	
	EG-2101CA	W	Au	○	○	
	EG-4101CA	W	Au	○	○	
	EG-4121CA	W	Au	○	○	
	HG-2150CA	W	Au	○	○	
	SG-3030LC/3040LC	42 Alloy	Sn	○		Contains Pb in sealing glass exempted by RoHS directive.
	SG-3030JF	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)
	SG-3030JC/3040JC	42 Alloy	Sn or Sn-Bi	○		High melting temperature type solder. (Pb85%)

	Model	Terminal Material	Terminal Plating	Complies with EU RoHS directive	Pb free	Remarks (Contains Pb in products exempted by RoHS directive.)
VCXO / VCSO	VG-4231CE	W	Au	O	O	
	VG-4231CB	W	Au	O	O	
	VG-4231CA	W	Au	O	O	
	VG-4232CA	W	Au	O	O	
	VG-4501CA	W	Au	O		Contains Pb in sealing glass exempted by RoHS directive.
	VG-4502CA	W	Au	O		Contains Pb in sealing glass exempted by RoHS directive.
	VG-4512CA	W	Au	O	O	
TCXO	EV-9100JG	Sn-P-Cu	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	TG-3530SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	TG-5031CJ	Mo	Au	O	O	
	TG-5035CJ	Mo	Au	O	O	
	TG-5021CG	W	Au	O	O	
	TG-5035CG	W	Au	O	O	
	TG-5021CE	W	Au	O	O	
Real Time Clock Module	TG-5035CE	W	Au	O	O	
	RX-4045SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-4045NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-4581NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC4701JE	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-4701NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-4574SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-4574JE	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-4574NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-4574LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RA-4574SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-4543SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-4543SB	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-4575LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RX-4571LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RX-4571NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-4571SA	42 Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RA-4565SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-4803LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RX-4803SA	42 Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-5412SF	Cu Alloy	Sn	O		High melting temperature type solder. (Pb85%)
	RX-8025SA	42 Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-8025NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-8564JE	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-8564NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-8564LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RA-8565SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-8571LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RX-8571NB	Cu Alloy	Sn	O		High melting temperature type solder. (Pb85%)
	RX-8571SA	42 Alloy	Sn	O		High melting temperature type solder. (Pb85%)
	RX-8581SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-8581JE	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-8581NB	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RA-8581SA	42 Alloy	Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RX-8731LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RX-8803LC	42 Alloy	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	RX-8803SA	42 Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-7301SF	Cu Alloy	Sn or Sn-Ag	O		High melting temperature type solder. (Pb85%)
	RTC-7301DG	42 Alloy	Sn or Sn-Bi	O		High melting temperature type solder. (Pb85%)
	RTC-72423	42 Alloy	Sn or Sn-Bi	O		High melting temperature type solder. (Pb85%)
	RTC-72421	42 Alloy	Sn or Sn-Bi	O		High melting temperature type solder. (Pb85%)
SAW Filter	FF-32N	W	Au	O	O	
	FF-555	W	Au	O	O	
Sensor	AH-6120LR / AP-6110LR	Cu Alloy	Sn-Bi	O		Contains Pb in sealing glass exempted by RoHS directive.
	XV-8000LK	42 Alloy or Cu Alloy	Sn-Ag or Ni-Pd-Au	O	O	
	XV-3500CB	W	Au	O	O	
	XV-3700CB	W	Au	O	O	
	XV-8000CB	W	Au	O	O	
	XV-8100CB	W	Au	O	O	
	XP-7000 series	Cu	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	TSU-20G	Cu	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	TSU-70G	Cu	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.
	TSU-100G	Cu	Sn	O		Contains Pb in sealing glass exempted by RoHS directive.