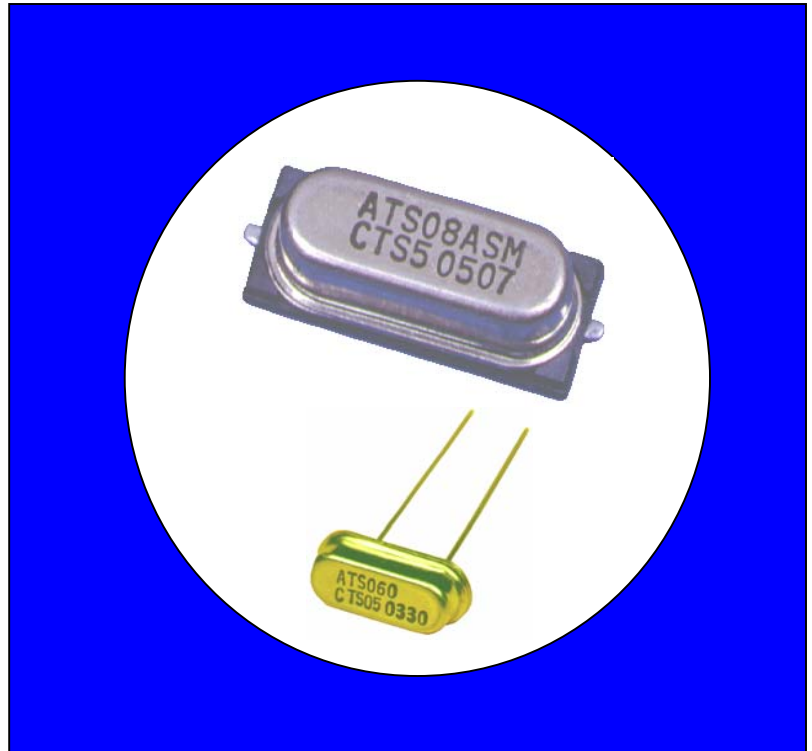


### FEATURES

- Standard HC-49/US or HC-49/US SM Low Profile Package Options
- Stable Frequency Over Temperature and Drive Level
- Fundamental and 3<sup>rd</sup> Overtone Crystals
- Frequency Range 3.5 – 60 MHz
- Frequency Tolerance,  $\pm 30$  ppm Standard
- Frequency Stability,  $\pm 50$  ppm Standard
- Operating Temperature,  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$
- Tape & Reel Packaging Available
- **RoHS/Green Compliant**

### DESCRIPTION

The ATS/ATS-SM crystal series offers excellent long-term stability and reliability in a proven resistance-weld metal package. The excellent shock performance makes it suitable for microprocessor, telecommunication, consumer electronic and networking applications.



### STANDARD PART NUMBERS AVAILABLE @ CTS DISTRIBUTORS

#### ATS

PART NUMBER	FREQUENCY (MHz)	LOAD CAPACITANCE	OPERATING MODE
ATS036	3.579545	18 pF	Fundamental
ATS037	3.686400	20 pF	Fundamental
ATS040	4.000000	20 pF	Fundamental
ATS042	4.915200	20 pF	Fundamental
ATS050	5.068800	20 pF	Fundamental
ATS060	6.000000	20 pF	Fundamental
ATS08A	8.000000	20 pF	Fundamental
ATS098	9.830400	20 pF	Fundamental
ATS100	10.000000	Series	Fundamental
ATS111	11.059200	20 pF	Fundamental
ATS120	12.000000	Series	Fundamental
ATS122	12.288000	20 pF	Fundamental
ATS143	14.318180	Series	Fundamental
ATS15A	15.360000	20 pF	Fundamental
ATS160	16.000000	Series	Fundamental
ATS16A	16.000000	20 pF	Fundamental
ATS200	20.000000	Series	Fundamental
ATS204	20.480000	20 pF	Fundamental
ATS245	24.576000	Series	Fundamental
ATS250	25.000000	Series	Fundamental
ATS25A	25.000000	20 pF	Fundamental

#### ATS-SM

PART NUMBER	FREQUENCY (MHz)	LOAD CAPACITANCE	OPERATING MODE
ATS036SM	3.579545	18 pF	Fundamental
ATS037SM	3.686400	20 pF	Fundamental
ATS040SM	4.000000	20 pF	Fundamental
ATS042SM	4.915200	20 pF	Fundamental
ATS050SM	5.068800	20 pF	Fundamental
ATS060SM	6.000000	20 pF	Fundamental
ATS08ASM	8.000000	20 pF	Fundamental
ATS098SM	9.830400	20 pF	Fundamental
ATS100SM	10.000000	Series	Fundamental
ATS10ASM	10.000000	20 pF	Fundamental
ATS111SM	11.059200	20 pF	Fundamental
ATS120SM	12.000000	Series	Fundamental
ATS122SM	12.288000	20 pF	Fundamental
ATS143SM	14.318180	Series	Fundamental
ATS15ASM	15.360000	20 pF	Fundamental
ATS160SM	16.000000	Series	Fundamental
ATS200SM	20.000000	Series	Fundamental
ATS204SM	20.480000	20 pF	Fundamental
ATS245SM	24.576000	Series	Fundamental

Contact your authorized CTS distributor for availability.

**ADDITIONAL PART NUMBERS AVAILABLE FROM CTS**

**ATS**

PART NUMBER	FREQUENCY (MHz)	LOAD CAPACITANCE	OPERATING MODE
ATS04A	4.000000	Series	Fundamental
ATS061	6.144000	20 pF	Fundamental
ATS073	7.372800	20 pF	Fundamental
ATS080	8.000000	Series	Fundamental
ATS10A	10.000000	20 pF	Fundamental
ATS099	9.830400	Series	Fundamental
ATS12A	12.000000	20 pF	Fundamental
ATS125	12.288000	Series	Fundamental
ATS123	12.296000	20 pF	Fundamental
ATS124	12.296000	Series	Fundamental
ATS127	12.352000	20 pF	Fundamental
ATS126	12.352000	Series	Fundamental
ATS135	13.500000	20 pF	Fundamental
ATS14A	14.318180	20 pF	Fundamental
ATS16A	16.000000	20 pF	Fundamental
ATS169	16.934400	20 pF	Fundamental
ATS184	18.432000	Series	Fundamental
ATS18A	18.432000	20 pF	Fundamental
ATS196	19.660800	Series	Fundamental
ATS19A	19.660800	20 pF	Fundamental
ATS20A	20.000000	20 pF	Fundamental
ATS20B	20.000000	50 pF	Fundamental
ATS22A	22.118400	20 pF	Fundamental
ATS240	24.000000	Series	Fundamental
ATS24A	24.000000	20 pF	Fundamental
ATS24B	24.579000	20 pF	Fundamental
ATS320	32.000000	Series	3 <sup>RD</sup> Overtone
ATS32A	32.000000	20 pF	3 <sup>RD</sup> Overtone
ATS400	40.000000	Series	3 <sup>RD</sup> Overtone
ATS40A	40.000000	20 pF	3 <sup>RD</sup> Overtone

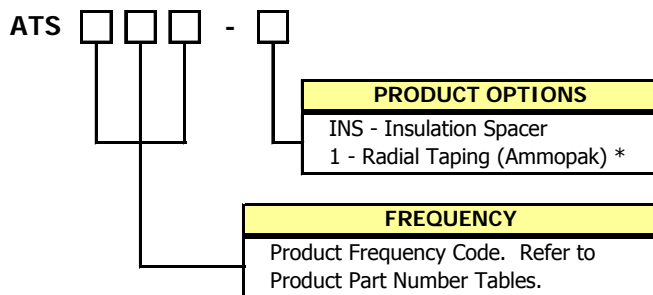
**ATS-SM**

PART NUMBER	FREQUENCY (MHz)	LOAD CAPACITANCE	OPERATING MODE
ATS04ASM	4.000000	Series	Fundamental
ATS061SM	6.144000	20 pF	Fundamental
ATS073SM	7.372800	20 pF	Fundamental
ATS080SM	8.000000	Series	Fundamental
ATS099SM	9.830400	Series	Fundamental
ATS12ASM	12.000000	20 pF	Fundamental
ATS125SM	12.288000	Series	Fundamental
ATS123SM	12.296000	20 pF	Fundamental
ATS124SM	12.296000	Series	Fundamental
ATS127SM	12.352000	20 pF	Fundamental
ATS126SM	12.352000	Series	Fundamental
ATS135SM	13.500000	20 pF	Fundamental
ATS14ASM	14.318180	20 pF	Fundamental
ATS16ASM	16.000000	20 pF	Fundamental
ATS16BSM	16.000000	18 pF	Fundamental
ATS169SM	16.934400	20 pF	Fundamental
ATS184SM	18.432000	Series	Fundamental
ATS18ASM	18.432000	20 pF	Fundamental
ATS196SM	19.660800	Series	Fundamental
ATS19ASM	19.660800	20 pF	Fundamental
ATS20ASM	20.000000	20 pF	Fundamental
ATS20BSM	20.000000	50 pF	Fundamental
ATS22ASM	22.118400	20 pF	Fundamental
ATS240SM	24.000000	Series	Fundamental
ATS24ASM	24.000000	20 pF	Fundamental
ATS24BSM	24.576000	20 pF	Fundamental
ATS250SM	25.000000	Series	Fundamental
ATS25ASM	25.000000	20 pF	Fundamental
ATS320SM	32.000000	Series	3 <sup>RD</sup> Overtone
ATS32ASM	32.000000	20 pF	3 <sup>RD</sup> Overtone
ATS400SM	40.000000	Series	3 <sup>RD</sup> Overtone
ATS40ASM	40.000000	20 pF	3 <sup>RD</sup> Overtone

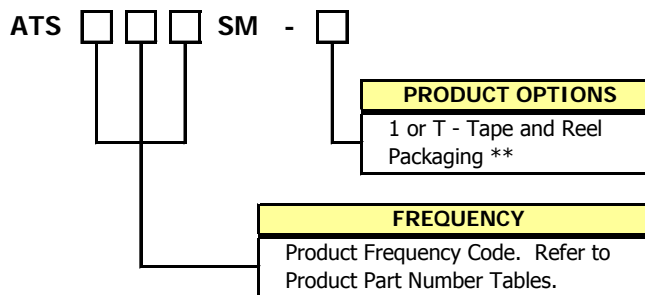
Contact your local CTS Representative or CTS Customer Service for availability.

**ADDITIONAL ORDERING INFORMATION**

**Available Standard Product Options**



\* Standard packaging is bulk in a bag.



\*\* Standard packaging is tape and reel. CTS Distributors may use -T for Tape and Reel indicator.

**NON-Standard Ordering Options**

Custom performance characteristics and lead trim requirements available upon request. Use form C052 to detail non-standard parameters. Contact your local CTS Representative or CTS Customer Service for assistance.

### ELECTRICAL CHARACTERISTICS

	PARAMETER	VALUE
Electrical Parameters	Operating Mode	Fundamental or 3 <sup>rd</sup> Overtone
	Crystal Cut	AT-Cut
	Frequency Range	3.5 MHz to 60.0 MHz
	Frequency Tolerance @ 25°C	± 30 ppm Standard *
	Frequency Stability Tolerance (Operating Temperature Range, Referenced to 25°C Reading)	± 50 ppm Standard *
	Operating Temperature Range	-20°C to +70°C *
	Storage Temperature Range	-55°C to +125°C
	Equivalent Series Resistance	See ESR Table
	Load Capacitance or Resonance Mode	See Standard Part Number Tables *
	Shunt Capacitance (C <sub>0</sub> )	7.0 pF Maximum
	Drive Level	10 μW Typical, 100 μW Maximum
	Reflow Condition, per JEDEC J-STD-020	+255°C ± 5°C, 10 Seconds Maximum

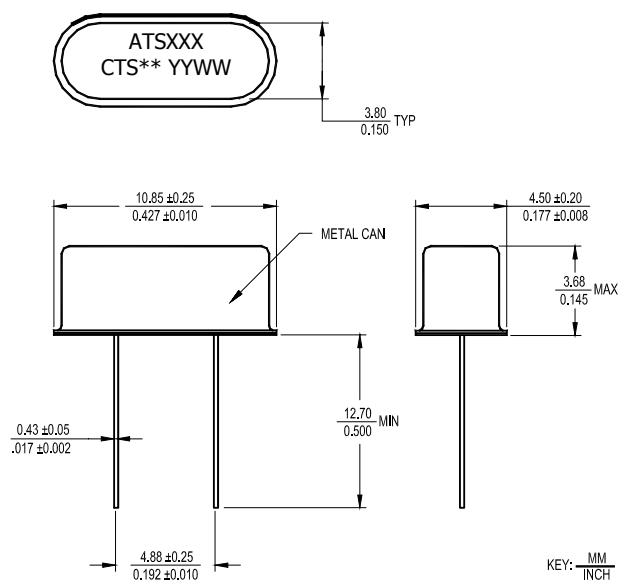
\* Custom requirements are available upon request. Use form C052 to communicate crystal parameters. Contact your local CTS Representative or CTS Customer Service for assistance.

### EQUIVALENT SERIES RESISTANCE TABLE

FREQUENCY RANGE	MODE of OSCILLATION	ESR Maximum
3.50 MHz - < 4.00 MHz	Fundamental	150 Ohms
4.00 MHz - < 5.00 MHz	Fundamental	120 Ohms
5.00 MHz - < 8.00 MHz	Fundamental	80 Ohms
8.00 MHz - < 12.00 MHz	Fundamental	60 Ohms
12.00 MHz - < 20.00 MHz	Fundamental	40 Ohms
20.00 MHz - < 30.00 MHz	Fundamental	30 Ohms
27.00 MHz - 60.00 MHz	3 <sup>RD</sup> Overtone	80 Ohms

### MECHANICAL SPECIFICATIONS

#### ATS PACKAGE DRAWING



#### MARKING INFORMATION

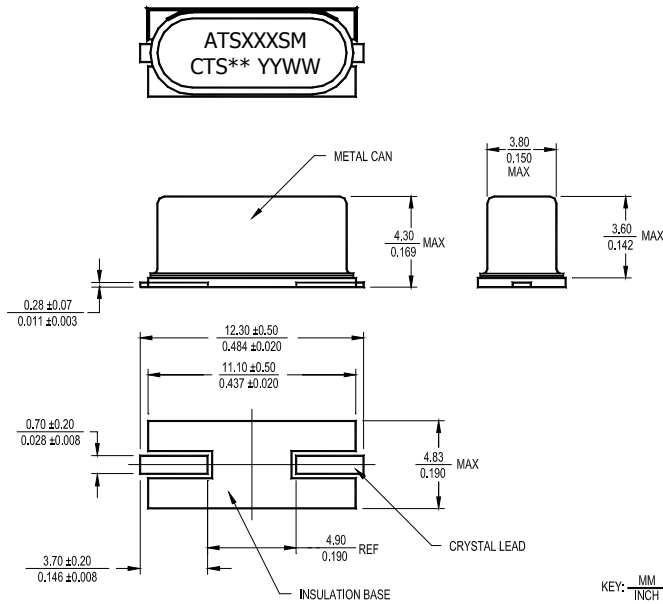
1. CTS Part Number.
2. \*\* - Manufacturing Site Code.
3. YYWW – Date Code, YY – year, WW – week.
4. Complete CTS part number, frequency value and date code information must appear on bag and box labels.

#### NOTES

1. Lead finish (e1), SnAgCu.

### MECHANICAL SPECIFICATIONS

#### ATS-SM PACKAGE DRAWING



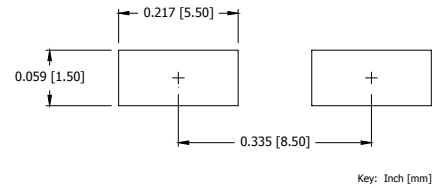
#### MARKING INFORMATION

1. CTS Part Number.
2. \*\* - Manufacturing Site Code.
3. YYWW – Date Code, YY – year, WW – week.
4. Complete CTS part number, frequency value and date code information must appear on reel and box labels.

#### NOTES

1. Lead finish (e1), SnAgCu.

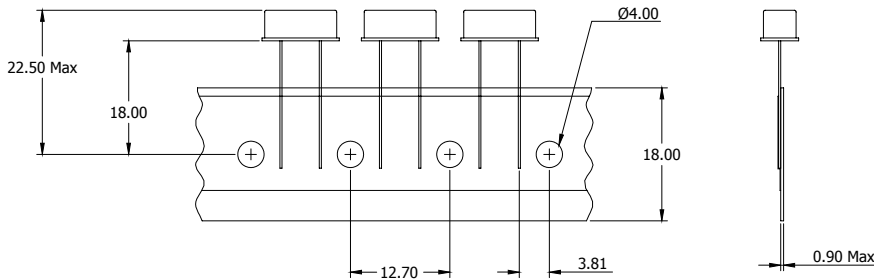
#### SUGGESTED SOLDER PAD GEOMETRY



### PACKAGING INFORMATION

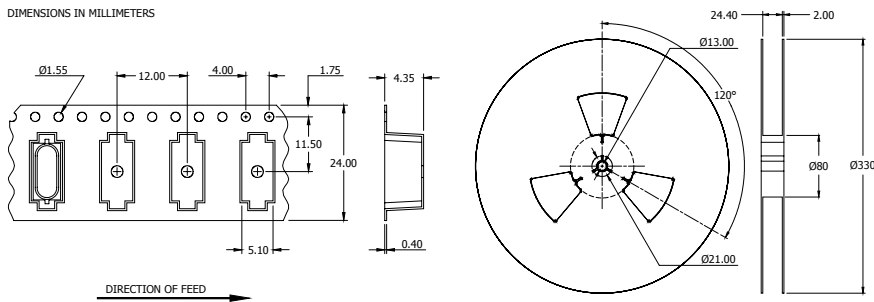
#### ATS Taping (Ammopak)

DIMENSIONS IN MILLIMETERS



#### ATS-SM Tape and Reel

DIMENSIONS IN MILLIMETERS



**ENVIRONMENTAL SPECIFICATIONS**

Temperature Cycle:	400 cycles from -55°C to +125°C, 10 minute dwell at each temperature, 1 minute transfer time between temperatures.
Mechanical Shock:	1,500g's, 0.5mS duration, ½ sinewave, 3 shocks each direction along 3 mutually perpendicular planes (18 total shocks).
Sinusoidal Vibration:	0.06 inches double amplitude, 10 to 55 Hz and 20g's, 55 to 2,000 Hz, 3 cycles each in 3 mutually perpendicular planes (9 times total).
Gross Leak:	No leak shall appear while immersed in an FC40 or equivalent liquid at +125°C for 20 seconds.
Fine Leak:	Mass spectrometer leak rates less than $2 \times 10^{-8}$ ATM cc/sec air equivalent.
Resistance to Solder Heat:	Product must survive 3 reflows of +260°C peak, 10 seconds maximum.
High Temperature Operating Bias:	2,000 hours at +125°C, disregarding frequency shift.
Frequency Aging:	1,000 hours at +85°C, maximum $\pm 5$ ppm shift.
Insulation Resistance:	500M Ohms @ $100V_{DC} \pm 15V_{DC}$ .
Moisture Sensitivity Level:	Level 1 per JEDEC J-STD-020.

**QUALITY AND RELIABILITY**

Quality systems meet or exceed the requirements of ISO 9000:2000 standards.