



FEATURES

- Standard HC-49/US (thru hole) and HC-49/US-SM (surface mount) Packages
- Stable Frequency Over Temperature and Drive Level
- **Fundamental and 3rd Overtone Crystals**
- Frequency Range 3.2 – 64 MHz
- Frequency Tolerance, ±30 ppm Standard
- Frequency Stability, ±50 ppm Standard
- Operating Temperature, -20°C to +70°C Standard, -40°C to +85°C Available
- Tape & Reel Packaging Available
- **RoHS/Green Compliant (6/6)**

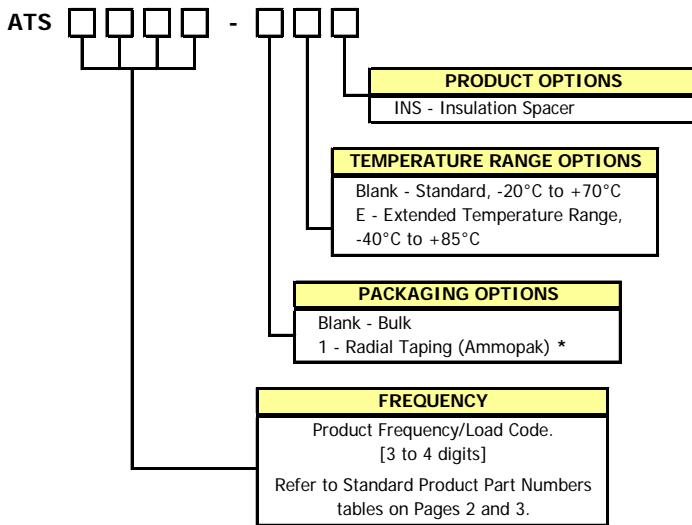


APPLICATIONS

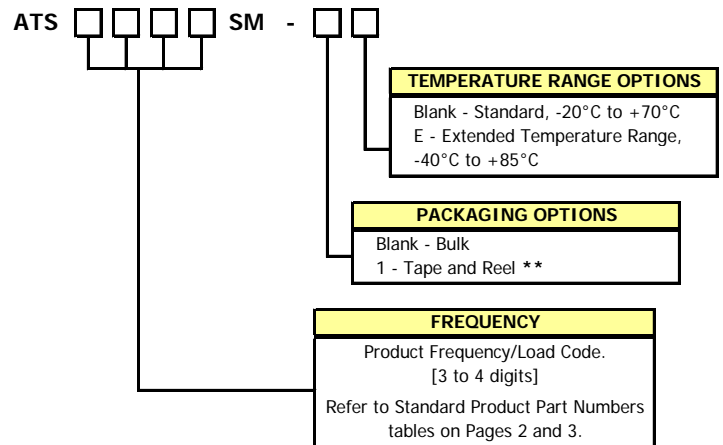
The ATS/ATS-SM crystal series offers excellent long-term stability and reliability in a proven resistance-weld metal package. The excellent shock performance makes it suitable for microprocessor, telecommunication, industrial, consumer electronics and networking applications.

ORDERING INFORMATION

ATS



ATS-SM



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

* Standard packaging is bulk in a bag.

Non-Standard Ordering Options

- Custom requirements may be available upon request. Use form C052 to detail non-standard parameters. (http://www.ctscorp.com/components/CTS_Crystal_Specifying_Form.xls)
- Contact your local CTS Representative or CTS Customer Service for assistance.

STANDARD PRODUCT PART NUMBERS - ATS

Part numbers in **BOLD** are common stock items through CTS authorized distributors. Non-bold part numbers may be stocked or are available for order.

Contact your CTS Distributor or local CTS Representative for availability.

FREQUENCY (MHz)	PART NUMBER -20/70°C	PART NUMBER -40/85°C	LOAD CAPACITANCE	OPERATING MODE	FREQUENCY (MHz)	PART NUMBER -20/70°C	PART NUMBER -40/85°C	LOAD CAPACITANCE	OPERATING MODE
3.579545	ATS036B	ATS036B-E	Series	Fundamental	12.352000	ATS126	ATS126-E	Series	Fundamental
3.579545	ATS036	ATS036-E	18 pF	Fundamental	12.352000	ATS127	ATS127-E	20 pF	Fundamental
3.686400	ATS037A	ATS037A-E	Series	Fundamental	13.500000	ATS135	ATS135-E	20 pF	Fundamental
3.686400	ATS037	ATS037-E	20 pF	Fundamental	14.318180	ATS143	ATS143-E	Series	Fundamental
3.686400	ATS037B	ATS037B-E	18 pF	Fundamental	14.318180	ATS14A	ATS14A-E	20 pF	Fundamental
4.000000	ATS04A	ATS04A-E	Series	Fundamental	14.318180	ATS143B	ATS143B-E	18 pF	Fundamental
4.000000	ATS040	ATS040-E	20 pF	Fundamental	14.745600	ATS147	ATS147-E	Series	Fundamental
4.000000	ATS040B	ATS040B-E	18 pF	Fundamental	14.745600	ATS147A	ATS147A-E	20 pF	Fundamental
4.096000	ATS042A	ATS042A-E	20 pF	Fundamental	14.745600	ATS147B	ATS147B-E	18 pF	Fundamental
4.096000	ATS042B	ATS042B-E	18 pF	Fundamental	15.000000	ATS150	ATS150-E	Series	Fundamental
4.194304	ATS041C	ATS041C-E	12 pF	Fundamental	15.360000	ATS15A	ATS15A-E	20 pF	Fundamental
4.915200	ATS049A	ATS049A-E	Series	Fundamental	16.000000	ATS160	ATS160-E	Series	Fundamental
4.915200	ATS042	ATS042-E	20 pF	Fundamental	16.000000	ATS16A	ATS16A-E	20 pF	Fundamental
4.915200	ATS049B	ATS049B-E	18 pF	Fundamental	16.000000	ATS16B	ATS16B-E	18 pF	Fundamental
5.000000	ATS050C	ATS050C-E	Series	Fundamental	16.384000	ATS164B	ATS164B-E	18 pF	Fundamental
5.000000	ATS050A	ATS050A-E	20 pF	Fundamental	16.934400	ATS169	ATS169-E	20 pF	Fundamental
5.000000	ATS050B	ATS050B-E	18 pF	Fundamental	18.432000	ATS184	ATS184-E	Series	Fundamental
5.068000	ATS051	ATS051-E	Series	Fundamental	18.432000	ATS18A	ATS18A-E	20 pF	Fundamental
5.068000	ATS050	ATS050-E	20 pF	Fundamental	18.432000	ATS184B	ATS184B-E	18 pF	Fundamental
6.000000	ATS060A	ATS060A-E	Series	Fundamental	19.660800	ATS196	ATS196-E	Series	Fundamental
6.000000	ATS060	ATS060-E	20 pF	Fundamental	19.660800	ATS19A	ATS19A-E	20 pF	Fundamental
6.000000	ATS060B	ATS060B-E	18 pF	Fundamental	19.660800	ATS196B	ATS196B-E	18 pF	Fundamental
6.000000	ATS060C	ATS060C-E	32 pF	Fundamental	20.000000	ATS200	ATS200-E	Series	Fundamental
6.144000	ATS061	ATS061-E	20 pF	Fundamental	20.000000	ATS20A	ATS20A-E	20 pF	Fundamental
6.144000	ATS061B	ATS061B-E	18 pF	Fundamental	20.000000	ATS200C	ATS200C-E	18 pF	Fundamental
6.144000	ATS061C	ATS061C-E	32 pF	Fundamental	20.000000	ATS20B	ATS20B-E	50 pF	Fundamental
7.372800	ATS073A	ATS073A-E	Series	Fundamental	20.480000	ATS204	ATS204-E	20 pF	Fundamental
7.372800	ATS073	ATS073-E	20 pF	Fundamental	22.118400	ATS22A	ATS22A-E	20 pF	Fundamental
7.372800	ATS073B	ATS073B-E	18 pF	Fundamental	22.118400	ATS221B	ATS221B-E	18 pF	Fundamental
8.000000	ATS080	ATS080-E	Series	Fundamental	24.000000	ATS240	ATS240-E	Series	Fundamental
8.000000	ATS08A	ATS08A-E	20 pF	Fundamental	24.000000	ATS24A	ATS24A-E	20 pF	Fundamental
8.000000	ATS080B	ATS080B-E	18 pF	Fundamental	24.000000	ATS240B	ATS240B-E	18 pF	Fundamental
8.000000	ATS080C	ATS080C-E	32 pF	Fundamental	24.000000	ATS240C	ATS240C-E	12 pF	Fundamental
8.192000	ATS081B	ATS081B-E	18 pF	Fundamental	24.576000	ATS245	ATS245-E	Series	Fundamental
9.830400	ATS099	ATS099-E	Series	Fundamental	24.576000	ATS24B	ATS24B-E	20 pF	Fundamental
9.830400	ATS098	ATS098-E	20 pF	Fundamental	24.576000	ATS245A	ATS245A-E	18 pF	Fundamental
9.830400	ATS098B	ATS098B-E	18 pF	Fundamental	25.000000	ATS250	ATS250-E	Series	Fundamental
10.000000	ATS100	ATS100-E	Series	Fundamental	25.000000	ATS25A	ATS25A-E	20 pF	Fundamental
10.000000	ATS10A	ATS10A-E	20 pF	Fundamental	25.000000	ATS250B	ATS250B-E	18 pF	Fundamental
10.000000	ATS100B	ATS100B-E	18 pF	Fundamental	27.000000	ATS270A	ATS270A-E	20 pF	Fundamental
11.059200	ATS111A	ATS111A-E	Series	Fundamental	27.000000	ATS270B	ATS270B-E	18 pF	Fundamental
11.059200	ATS111	ATS111-E	20 pF	Fundamental	32.000000	ATS320	ATS320-E	Series	3rd Overtone
11.059200	ATS111B	ATS111B-E	18 pF	Fundamental	32.000000	ATS32A	ATS32A-E	20 pF	3rd Overtone
11.059200	ATS111C	ATS111C-E	32 pF	Fundamental	32.000000	ATS320B	ATS320B-E	18 pF	3rd Overtone
12.000000	ATS120	ATS120-E	Series	Fundamental	40.000000	ATS400	ATS400-E	Series	3rd Overtone
12.000000	ATS12A	ATS12A-E	20 pF	Fundamental	40.000000	ATS40A	ATS40A-E	20 pF	3rd Overtone
12.000000	ATS120B	ATS120B-E	18 pF	Fundamental	40.000000	ATS400B	ATS400B-E	18 pF	3rd Overtone
12.000000	ATS120C	ATS120C-E	32 pF	Fundamental	48.000000	ATS480A	ATS480A-E	20 pF	3rd Overtone
12.288000	ATS125	ATS125-E	Series	Fundamental	48.000000	ATS480B	ATS480B-E	18 pF	3rd Overtone
12.288000	ATS122	ATS122-E	20 pF	Fundamental	60.000000	ATS600A	ATS600A-E	20 pF	3rd Overtone
12.288000	ATS122B	ATS122B-E	18 pF	Fundamental	60.000000	ATS600B	ATS600B-E	18 pF	3rd Overtone
12.296000	ATS124	ATS124-E	Series	Fundamental	64.000000	ATS640A	ATS640A-E	20 pF	3rd Overtone
12.296000	ATS123	ATS123-E	20 pF	Fundamental	64.000000	ATS640B	ATS640B-E	18 pF	3rd Overtone
12.296000	ATS123B	ATS123B-E	18 pF	Fundamental					

STANDARD PRODUCT PART NUMBERS -ATS-SM

Part numbers in **BOLD** are common stock items through CTS authorized distributors. Non-bold part numbers may be stocked or are available for order.

FREQUENCY (MHz)	PART NUMBER -20/70°C	PART NUMBER -40/85°C	LOAD CAPACITANCE	OPERATING MODE	FREQUENCY (MHz)	PART NUMBER -20/70°C	PART NUMBER -40/85°C	LOAD CAPACITANCE	OPERATING MODE
3.579545	ATS036BSM-1	ATS036BSM-1E	Series	Fundamental	14.745600	ATS147SM-1	ATS147SM-1E	Series	Fundamental
3.579545	ATS036SM-1	ATS036SM-1E	18 pF	Fundamental	14.745600	ATS147ASM-1	ATS147ASM-1E	20 pF	Fundamental
3.686400	ATS037ASM-1	ATS037ASM-1E	Series	Fundamental	14.745600	ATS147BSM-1	ATS147BSM-1E	18 pF	Fundamental
3.686400	ATS037SM-1	ATS037SM-1E	20 pF	Fundamental	15.000000	ATS150SM-1	ATS150SM-1E	Series	Fundamental
3.686400	ATS037BSM-1	ATS037BSM-1E	18 pF	Fundamental	15.000000	ATS150BSM-1	ATS150BSM-1E	18 pF	Fundamental
4.000000	ATS04ASM-1	ATS04ASM-1E	Series	Fundamental	15.360000	ATS15ASM-1	ATS15ASM-1E	20 pF	Fundamental
4.000000	ATS04OSM-1	ATS04OSM-1E	20 pF	Fundamental	16.000000	ATS16OSM-1	ATS16OSM-1E	Series	Fundamental
4.000000	ATS04OBSM-1	ATS04OBSM-1E	18 pF	Fundamental	16.000000	ATS16ASM-1	ATS16ASM-1E	20 pF	Fundamental
4.096000	ATS042ASM-1	ATS042ASM-1E	20 pF	Fundamental	16.000000	ATS16BSM-1	ATS16BSM-1E	18 pF	Fundamental
4.096000	ATS042BSM-1	ATS042BSM-1E	18 pF	Fundamental	16.384000	ATS164BSM-1	ATS164BSM-1E	18 pF	Fundamental
4.194304	ATS041CSM-1	ATS041CSM-1E	12 pF	Fundamental	16.934400	ATS169SM-1	ATS169SM-1E	20 pF	Fundamental
4.915200	ATS049ASM-1	ATS049ASM-1E	Series	Fundamental	18.432000	ATS184SM-1	ATS184SM-1E	Series	Fundamental
4.915200	ATS042SM-1	ATS042SM-1E	20 pF	Fundamental	18.432000	ATS18ASM-1	ATS18ASM-1E	20 pF	Fundamental
4.915200	ATS049BSM-1	ATS049BSM-1E	18 pF	Fundamental	18.432000	ATS184BSM-1	ATS184BSM-1E	18 pF	Fundamental
5.000000	ATS050CSM-1	ATS050CSM-1E	Series	Fundamental	19.660800	ATS196SM-1	ATS196SM-1E	Series	Fundamental
5.000000	ATS050ASM-1	ATS050ASM-1E	20 pF	Fundamental	19.660800	ATS196BSM-1	ATS196BSM-1E	18 pF	Fundamental
5.000000	ATS050BSM-1	ATS050BSM-1E	18 pF	Fundamental	20.000000	ATS200SM-1	ATS200SM-1E	Series	Fundamental
5.068000	ATS051SM-1	ATS051SM-1E	Series	Fundamental	20.000000	ATS20ASM-1	ATS20ASM-1E	20 pF	Fundamental
5.068000	ATS050SM-1	ATS050SM-1E	20 pF	Fundamental	20.000000	ATS200CSM-1	ATS200CSM-1E	18 pF	Fundamental
6.000000	ATS060ASM-1	ATS060ASM-1E	Series	Fundamental	20.000000	ATS20BSM-1	ATS20BSM-1E	50 pF	Fundamental
6.000000	ATS060SM-1	ATS060SM-1E	20 pF	Fundamental	20.000000	ATS204SM-1	ATS204SM-1E	20 pF	Fundamental
6.000000	ATS060BSM-1	ATS060BSM-1E	18 pF	Fundamental	20.480000	ATS204SM-1	ATS204SM-1E	20 pF	Fundamental
6.000000	ATS060CSM-1	ATS060CSM-1E	32 pF	Fundamental	22.118400	ATS22ASM-1	ATS22ASM-1E	20 pF	Fundamental
6.144000	ATS061SM-1	ATS061SM-1E	20 pF	Fundamental	22.118400	ATS221BSM-1	ATS221BSM-1E	18 pF	Fundamental
6.144000	ATS061BSM-1	ATS061BSM--1E	18 pF	Fundamental	24.000000	ATS24OSM-1	ATS24OSM-1E	Series	Fundamental
6.144000	ATS061CSM-1	ATS061CSM-1E	32 pF	Fundamental	24.000000	ATS24ASM-1	ATS24ASM-1E	20 pF	Fundamental
7.372800	ATS073ASM-1	ATS073ASM-1E	Series	Fundamental	24.000000	ATS240BSM-1	ATS240BSM-1E	18 pF	Fundamental
7.372800	ATS073SM-1	ATS073SM-1E	20 pF	Fundamental	24.000000	ATS240CSM-1	ATS240CSM-1E	12 pF	Fundamental
7.372800	ATS073BSM-1	ATS073BSM-1E	18 pF	Fundamental	24.576000	ATS245SM-1	ATS245SM-1E	Series	Fundamental
8.000000	ATS080SM-1	ATS080SM-1E	Series	Fundamental	24.576000	ATS24BSM-1	ATS24BSM-1E	20 pF	Fundamental
8.000000	ATS08ASM-1	ATS08ASM-1E	20 pF	Fundamental	24.576000	ATS245ASM-1	ATS245ASM-1E	18 pF	Fundamental
8.000000	ATS080BSM-1	ATS080BSM-1E	18 pF	Fundamental	25.000000	ATS250SM-1	ATS250SM-1E	Series	Fundamental
8.000000	ATS080CSM-1	ATS080CSM-1E	32 pF	Fundamental	25.000000	ATS25ASM-1	ATS25ASM-1E	20 pF	Fundamental
8.192000	ATS081BSM-1	ATS081BSM-1E	18 pF	Fundamental	25.000000	ATS250BSM-1	ATS250BSM-1E	18 pF	Fundamental
9.830400	ATS099SM-1	ATS099SM-1E	Series	Fundamental	26.000000	ATS260ASM-1	ATS260ASM-1E	20 pF	Fundamental
9.830400	ATS098SM-1	ATS098SM-1E	20 pF	Fundamental	26.000000	ATS260BSM-1	ATS260BSM-1E	18 pF	Fundamental
9.830400	ATS098BSM-1	ATS098BSM-1E	18 pF	Fundamental	27.000000	ATS270ASM-1	ATS270ASM-1E	20 pF	Fundamental
10.000000	ATS100SM-1	ATS100SM-1E	Series	Fundamental	27.000000	ATS270BSM-1	ATS270BSM-1E	18 pF	Fundamental
10.000000	ATS10ASM-1	ATS10ASM-1E	20 pF	Fundamental	30.000000	ATS300ASM-1	ATS300ASM-1E	20 pF	Fundamental
10.000000	ATS100BSM-1	ATS100BSM-1E	18 pF	Fundamental	30.000000	ATS300BSM-1	ATS300BSM-1E	18 pF	Fundamental
11.059200	ATS111ASM-1	ATS111ASM-1E	Series	Fundamental	32.000000	ATS320SM-1	ATS320SM-1E	Series	3rd Overtone
11.059200	ATS111SM-1	ATS111SM-1E	20 pF	Fundamental	32.000000	ATS32ASM-1	ATS32ASM-1E	20 pF	3rd Overtone
11.059200	ATS111BSM-1	ATS111BSM-1E	18 pF	Fundamental	32.000000	ATS320BSM-1	ATS320BSM-1E	18 pF	3rd Overtone
11.059200	ATS111CSM-1	ATS111CSM-1E	32 pF	Fundamental	33.000000	ATS330ASM-1	ATS330ASM-1E	20 pF	3rd Overtone
12.000000	ATS120SM-1	ATS120SM-1E	Series	Fundamental	33.000000	ATS330BSM-1	ATS330BSM-1E	18 pF	3rd Overtone
12.000000	ATS12ASM-1	ATS12ASM-1E	20 pF	Fundamental	36.000000	ATS360ASM-1	ATS360ASM-1E	20 pF	3rd Overtone
12.000000	ATS120BSM-1	ATS120BSM-1E	18 pF	Fundamental	36.000000	ATS360BSM-1	ATS360BSM-1E	18 pF	3rd Overtone
12.000000	ATS120CSM-1	ATS120CSM-1E	32 pF	Fundamental	40.000000	ATS400SM-1	ATS400SM-1E	Series	3rd Overtone
12.288000	ATS125SM-1	ATS125SM-1E	Series	Fundamental	40.000000	ATS40ASM-1	ATS40ASM-1E	20 pF	3rd Overtone
12.288000	ATS122SM-1	ATS122SM-1E	20 pF	Fundamental	40.000000	ATS400BSM-1	ATS400BSM-1E	18 pF	3rd Overtone
12.288000	ATS122BSM-1	ATS122BSM-1E	18 pF	Fundamental	48.000000	ATS480ASM-1	ATS480ASM-1E	20 pF	3rd Overtone
12.296000	ATS123SM-1	ATS123SM-1E	Series	Fundamental	48.000000	ATS480BSM-1	ATS480BSM-1E	18 pF	3rd Overtone
12.296000	ATS124SM-1	ATS124SM-1E	20 pF	Fundamental	60.000000	ATS600ASM-1	ATS600ASM-1E	20 pF	3rd Overtone
12.352000	ATS127SM-1	ATS127SM-1E	Series	Fundamental	60.000000	ATS600BSM-1	ATS600BSM-1E	18 pF	3rd Overtone
12.352000	ATS126SM-1	ATS126SM-1E	20 pF	Fundamental	64.000000	ATS640ASM-1	ATS640ASM-1E	20 pF	3rd Overtone
13.500000	ATS135SM-1	ATS135SM-1E	20 pF	Fundamental	64.000000	ATS640BSM-1	ATS640BSM-1E	18 pF	3rd Overtone
14.318180	ATS143SM-1	ATS143SM-1E	Series	Fundamental					
14.318180	ATS14ASM-1	ATS14ASM-1E	20 pF	Fundamental					
14.318180	ATS143BSM-1	ATS143BSM-1E	18 pF	Fundamental					

ELECTRICAL CHARACTERISTICS

	PARAMETER	VALUE
ELECTRICAL PARAMETERS	Frequency Range	3.2 MHz to 64.0 MHz
	Operating Mode	Fundamental or 3rd Overtone
	Crystal Cut	AT-Cut
	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 * -40°C to +85°C Available, See Ordering Information
	Equivalent Series Resistance	See ESR Table
	Load Capacitance or Resonance Mode	See Standard Part Numbers tables *
	Shunt Capacitance (C ₀)	7.0 pF Maximum
	Drive Level	100 µW Typical, 1,000 µW Maximum
	Aging @ +25°C	±3 ppm/yr Typical, ±5 ppm/yr Maximum
	Storage Temperature Range	-40°C to +85°C
	Reflow Condition, per JEDEC J-STD-020	+260°C Maximum, 10 Seconds Maximum

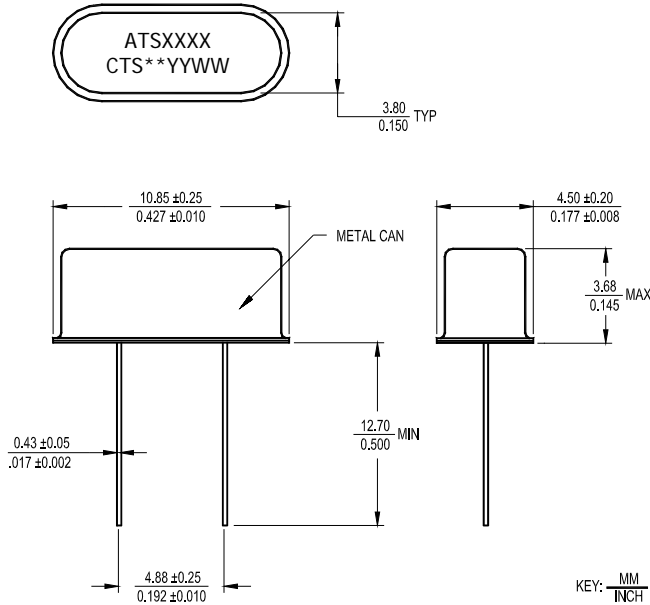
* Custom requirements may be available upon request. Use form C052 to detail non-standard parameters.

EQUIVALENT SERIES RESISTANCE TABLE

FREQUENCY RANGE	OSCILLATION MODE	ESR MAXIMUM
3.20 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 - 64.00 MHz	3rd Overtone	80 Ohms

MECHANICAL SPECIFICATIONS

ATS PACKAGE DRAWING



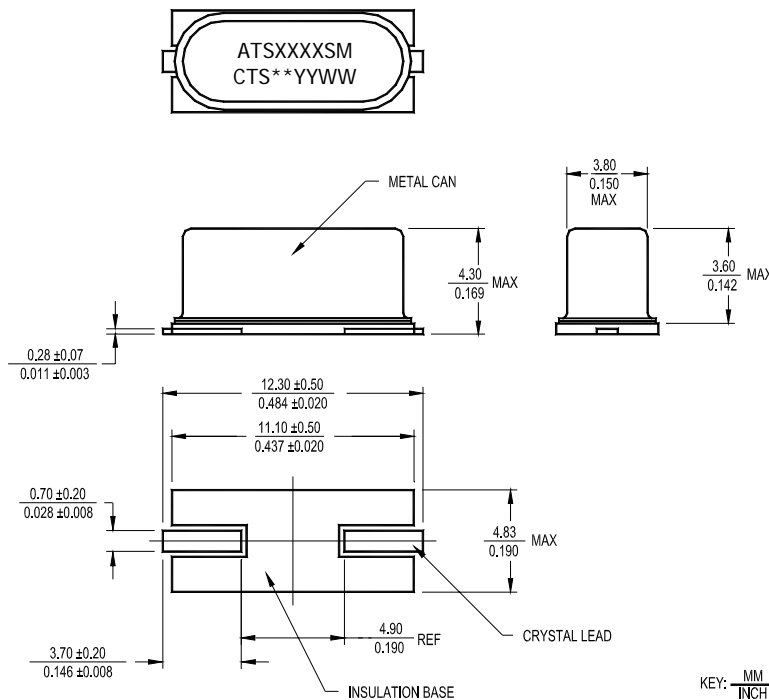
MARKING INFORMATION

1. ATSXXXX - CTS Part Number.
[See Standard Product Part Numbers tables.]
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.

ATS-SM PACKAGE DRAWING



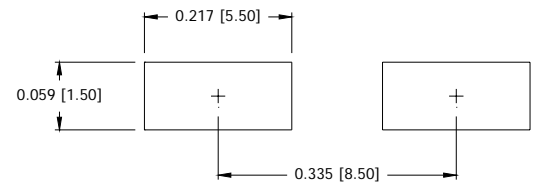
MARKING INFORMATION

1. ATSXXXXXSM - CTS Part Number.
[See Standard Product Part Numbers tables.]
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.

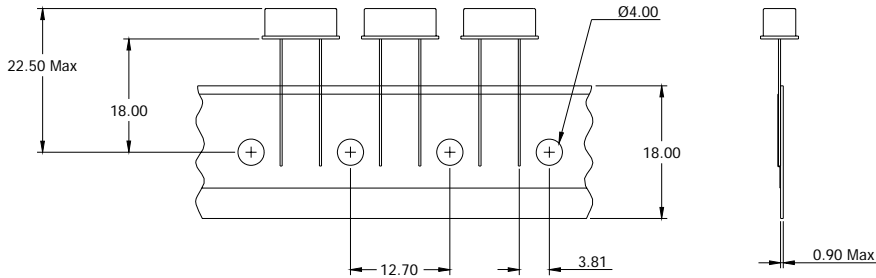
SUGGESTED SOLDER PAD GEOMETRY



PACKAGING INFORMATION

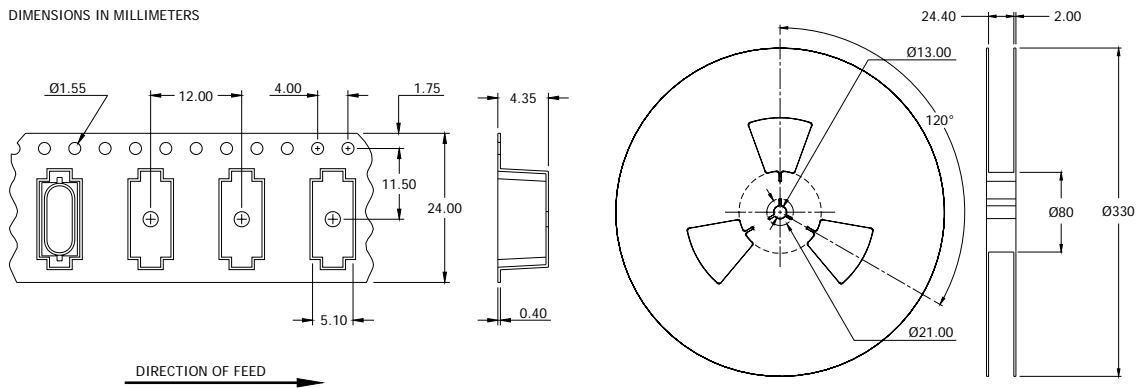
ATS Radial Taping (Ammopak)

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 2x10 ⁻⁸ ATM cc/sec air equivalent.
Resistance to Solder Heat:	Product must survive 3 reflows of +250°C maximum, 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 ±5 ppm shift.
Insulation Resistance:	500M Ohms @ 100V _{DC} ±15V _{DC} .
Moisture Sensitivity Level:	Level 1 per JEDEC J-STD-020.