



THE DATASHEET OF
02016D105MAT2A



X5R Dielectric

General Specifications



GENERAL DESCRIPTION

- General Purpose Dielectric for Ceramic Capacitors
- EIA Class II Dielectric
- Temperature variation of capacitance is within $\pm 15\%$ from -55°C to $+85^{\circ}\text{C}$
- Well suited for decoupling and filtering applications
- Available in High Capacitance values (up to $100\mu\text{F}$)

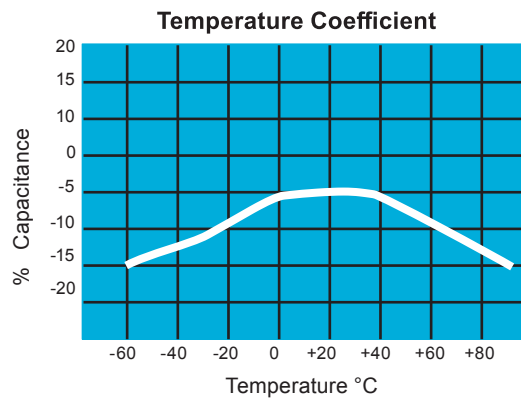
PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

| 1210 | 4 | D | 107 | M | A | T | 2 | A |
|--------------------------|----------------|-------------------|---------------------------------|----------------------------------|---------------------|----------------------|-----------------------------|---------------------|
| Size (L" x W") | Voltage | Dielectric | Capacitance Code (In pF) | Capacitance Tolerance | Failure Rate | Terminations | Packaging | Special Code |
| 0101** | 4 = 4V | D = X5R | 2 Sig. Digits + Number of Zeros | K = $\pm 10\%$ M = $\pm 20\%$ | A = N/A | T = Plated Ni and Sn | 2 = 7" Reel 4 = 13" Reel | A = Std. |
| 0201 | Z = 10V | | | | | | | |
| 0402 | Y = 16V | | | | | | | |
| 0603 | 3 = 25V | | | | | | | |
| 0805 | D = 35V | | | | | | | |
| 1206 | 5 = 50V | | | | | | | |
| 1210 | 1 = 100V | | | | | | | |
| 1812 | | | | | | | | |
| **EIA 01005 | | | | | | | | |



NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.

TYPICAL ELECTRICAL CHARACTERISTICS



X5R Dielectric

Specifications and Test Methods

| Parameter/Test | | X5R Specification Limits | Measuring Conditions | |
|--------------------------------|-----------------------|---|---|--------------------|
| Operating Temperature Range | | -55°C to +85°C | Temperature Cycle Chamber | |
| Capacitance | | Within specified tolerance | | |
| Dissipation Factor | | $\leq 2.5\%$ for $\geq 50V$ DC rating $\leq 12.5\%$ for 25V, 35V DC rating $\leq 12.5\%$ Max. for 16V DC rating and lower Contact Factory for DF by PN | Freq.: 1.0 kHz $\pm 10\%$ Voltage: 1.0Vrms $\pm .2V$ For Cap > 10 μF , 0.5Vrms @ 120Hz | |
| Insulation Resistance | | 10,000M Ω or 500M Ω - μF , whichever is less | Charge device with rated voltage for 120 ± 5 secs @ room temp/humidity | |
| Dielectric Strength | | No breakdown or visual defects | Charge device with 250% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) | |
| Resistance to Flexure Stresses | Appearance | No defects | Deflection: 2mm Test Time: 30 seconds  | |
| | Capacitance Variation | $\leq \pm 12\%$ | | |
| | Dissipation Factor | Meets Initial Values (As Above) | | |
| | Insulation Resistance | \geq Initial Value x 0.3 | | |
| Solderability | | $\geq 95\%$ of each terminal should be covered with fresh solder | Dip device in eutectic solder at 230 $\pm 5^\circ C$ for 5.0 ± 0.5 seconds | |
| Resistance to Solder Heat | Appearance | No defects, <25% leaching of either end terminal | Dip device in eutectic solder at 260°C for 60seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties. | |
| | Capacitance Variation | $\leq \pm 7.5\%$ | | |
| | Dissipation Factor | Meets Initial Values (As Above) | | |
| | Insulation Resistance | Meets Initial Values (As Above) | | |
| | Dielectric Strength | Meets Initial Values (As Above) | | |
| Thermal Shock | Appearance | No visual defects | Step 1: -55°C $\pm 2^\circ$ | 30 ± 3 minutes |
| | Capacitance Variation | $\leq \pm 7.5\%$ | Step 2: Room Temp | ≤ 3 minutes |
| | Dissipation Factor | Meets Initial Values (As Above) | Step 3: +85°C $\pm 2^\circ$ | 30 ± 3 minutes |
| | Insulation Resistance | Meets Initial Values (As Above) | Step 4: Room Temp | ≤ 3 minutes |
| | Dielectric Strength | Meets Initial Values (As Above) | Repeat for 5 cycles and measure after 24 ± 2 hours at room temperature | |
| Load Life | Appearance | No visual defects | Charge device with 1.5X rated voltage in test chamber set at 85°C $\pm 2^\circ C$ for 1000 hours (+48, -0). Note: Contact factory for *optional specification part numbers that are tested at < 1.5X rated voltage. Remove from test chamber and stabilize at room temperature for 24 ± 2 hours | |
| | Capacitance Variation | $\leq \pm 12.5\%$ | | |
| | Dissipation Factor | \leq Initial Value x 2.0 (See Above) | | |
| | Insulation Resistance | \geq Initial Value x 0.3 (See Above) | | |
| | Dielectric Strength | Meets Initial Values (As Above) | | |
| Load Humidity | Appearance | No visual defects | Store in a test chamber set at 85°C $\pm 2^\circ C$ / 85% $\pm 5\%$ relative humidity for 1000 hours (+48, -0) with rated voltage applied. Remove from chamber and stabilize at room temperature and humidity for 24 ± 2 hours before measuring. | |
| | Capacitance Variation | $\leq \pm 12.5\%$ | | |
| | Dissipation Factor | \leq Initial Value x 2.0 (See Above) | | |
| | Insulation Resistance | \geq Initial Value x 0.3 (See Above) | | |
| | Dielectric Strength | Meets Initial Values (As Above) | | |

X5R Dielectric Capacitance Range



PREFERRED SIZES ARE SHADED

| Case Size | 0101* | | 0201 | | | | | 0402 | | | | | 0603 | | | | | | 0805 | | | | | | | | | |
|---------------|---------------------------------------|-------|--------------------------------------|------|-----|----|----|--------------------------------------|------|-----|----|----|--------------------------------------|------|-----|-----|----|----|--------------------------------------|------|----|-----|-----|----|----|----|----|----|
| Soldering | Reflow Only | | Reflow Only | | | | | Reflow/Wave | | | | | Reflow/Wave | | | | | | Reflow/Wave | | | | | | | | | |
| Packaging | Paper/Embossed | | All Paper | | | | | All Paper | | | | | All Paper | | | | | | Paper/Embossed | | | | | | | | | |
| (L) Length | mm 0.40 ± 0.02 (0.016 ± 0.0008) | | mm 0.60 ± 0.09 (0.024 ± 0.004) | | | | | mm 1.00 ± 0.20 (0.040 ± 0.008) | | | | | mm 1.60 ± 0.20 (0.063 ± 0.008) | | | | | | mm 2.01 ± 0.20 (0.079 ± 0.008) | | | | | | | | | |
| (W) Width | mm 0.20 ± 0.02 (0.008 ± 0.0008) | | mm 0.30 ± 0.09 (0.011 ± 0.004) | | | | | mm 0.50 ± 0.20 (0.020 ± 0.008) | | | | | mm 0.80 ± 0.20 (0.031 ± 0.008) | | | | | | mm 1.25 ± 0.20 (0.049 ± 0.008) | | | | | | | | | |
| (t) Terminal | mm 0.10 ± 0.04 (0.004 ± 0.0016) | | mm 0.15 ± 0.05 (0.006 ± 0.002) | | | | | mm 0.25 ± 0.10 (0.010 ± 0.004) | | | | | mm 0.35 ± 0.15 (0.014 ± 0.006) | | | | | | mm 0.50 ± 0.25 (0.020 ± 0.010) | | | | | | | | | |
| Voltage: | 6.3 | 10 | 4 | 6.3 | 10 | 16 | 25 | 4 | 6.3 | 10 | 16 | 25 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | |
| Cap (pF) 100 | 101 | B | | | | | A | | | | | | | | | | | | | | | | | | | | | |
| 150 | 151 | B | | | | | A | | | | | | | | | | | | | | | | | | | | | |
| 220 | 221 | B | | | | | A | | | | | | C | | | | | | | | | | | | | | | |
| 330 | 331 | B | | | | | A | | | | | | C | | | | | | | | | | | | | | | |
| 470 | 471 | B | | | | | A | | | | | | C | | | | | | | | | | | | | | | |
| 680 | 681 | B | | | | | A | | | | | | C | | | | | | | | | | | | | | | |
| 1000 | 102 | B | | | | | A | A | | | | | C | | | | | | | | | | | | | | | |
| 1500 | 152 | B | B | | | | A | A | A | | | | C | | | | | | | | | | | | | | | |
| 2200 | 222 | B | B | | | | A | A | A | | | | C | | | | | | | | | | | | | | | |
| 3300 | 332 | B | B | | | | A | A | A | | | | C | | | | | | | | | | | | | | | |
| 4700 | 472 | B | B | | | | A | A | A | | | | C | | | | | | | | | | | | | | | |
| 6800 | 682 | B | B | | | | A | A | A | | | | C | | | | | | | | | | | | | | | |
| Cap (µF) 0.01 | 103 | B | B | | | | A | A | A | | | | C | | | | | | | | | | | | | | | |
| 0.015 | 153 | B | | | | | | | | | | | C | | | | | | | | | | | | | | | |
| 0.022 | 223 | B | | | | | A | A | A | | | | C | C | | | | | | | | | | | | | N | |
| 0.033 | 333 | B | | | | | | | | | | | C | | | | | | | | | | | | | | N | |
| 0.047 | 473 | B | | | | | A | A | A | | | | C | C | | | | | | | | | | | | | N | |
| 0.068 | 689 | B | | | | | | | | | | | C | | | | | | | | | | | | | | N | |
| 0.1 | 104 | B | | | | | A | A | A | A | | | C | C | C | C | | | | | | | | | | | N | |
| 0.15 | 154 | | | | | | | | | | | | | | | | | | | | | | | | | | N | |
| 0.22 | 224 | B | | | | | A | A | A | | | | C | C | C | C | C | | | | | | | | | | N | |
| 0.33 | 334 | | | | | | | | | | | | | | | | | | | | | | | | | | N | |
| 0.47 | 474 | B | | | | | A | A | | | | | C | C | C | C | C | E | | | | | | | | | N | |
| 0.68 | 684 | | | | | | | | | | | | | | | | | | | | | | | | | | N | |
| 1.0 | 105 | | | | | | A | A | C | C | | | C | C | C | C | C | | | | | | | | | | N | |
| 1.5 | 155 | | | | | | | | | | | | | | | | | | | | | | | | | | N | |
| 2.2 | 225 | | | | | | C | C | C | | | | C | C | C | C | C | | | | | | | | | | N | |
| 3.3 | 335 | | | | | | | | | | | | | | | | | | | | | | | | | | N | |
| 4.7 | 475 | | | | | | C | C | | | | | E | E | E | E | | | | | | | | | | | N | |
| 10 | 106 | | | | | | | | | | | | E | E | E | | | | | | | | | | | | N | |
| 22 | 226 | | | | | | | | | | | | E | G | | | | | | | | | | | | | N | |
| 47 | 476 | | | | | | | | | | | | | | | | | | | | | | | | | | N | |
| 100 | 107 | | | | | | | | | | | | | | | | | | | | | | | | | | N | |
| Voltage: | | 6.3 | 10 | 4 | 6.3 | 10 | 16 | 25 | 4 | 6.3 | 10 | 16 | 25 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 |
| Case Size | | 0101* | | 0201 | | | | | 0402 | | | | | 0603 | | | | | | 0805 | | | | | | | | |

| Letter | A | B | C | E | G | J | K | M | N | P | Q | X | Y | Z |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Max. Thickness | 0.33 (0.013) | 0.22 (0.009) | 0.56 (0.022) | 0.71 (0.028) | 0.90 (0.035) | 0.94 (0.037) | 1.02 (0.040) | 1.27 (0.050) | 1.40 (0.055) | 1.52 (0.060) | 1.78 (0.070) | 2.29 (0.090) | 2.54 (0.100) | 2.79 (0.110) |
| | PAPER | | | | | | EMBOSSSED | | | | | | | |

PAPER and EMBOSSSED available for 01005
 NOTE: Contact factory for non-specified capacitance values
 *EIA 01005

X5R Dielectric Capacitance Range



PREFERRED SIZES ARE SHADED

| Case Size | | | 1206 | | | | | | | 1210 | | | | | | | 1812 | | | | | | |
|--------------|-------|-------|--------------------------------|-----|----|----|----|----|----|--------------------------------|-----|----|----|----|----|----|--------------------------------|-----|----|----|----|----|----|
| Soldering | | | Reflow/Wave | | | | | | | Reflow Only | | | | | | | Reflow Only | | | | | | |
| Packaging | | | Paper/Embossed | | | | | | | Paper/Embossed | | | | | | | All Embossed | | | | | | |
| (L) Length | mm | (in.) | 3.20 ± 0.40 (0.126 ± 0.016) | | | | | | | 3.20 ± 0.40 (0.126 ± 0.016) | | | | | | | 4.50 ± 0.30 (0.177 ± 0.012) | | | | | | |
| W) Width | mm | (in.) | 1.60 ± 0.30 (0.063 ± 0.012) | | | | | | | 2.50 ± 0.30 (0.098 ± 0.012) | | | | | | | 3.20 ± 0.20 (0.126 ± 0.008) | | | | | | |
| (t) Terminal | mm | (in.) | 0.50 ± 0.25 (0.020 ± 0.010) | | | | | | | 0.50 ± 0.25 (0.020 ± 0.010) | | | | | | | 0.61 ± 0.36 (0.024 ± 0.014) | | | | | | |
| Voltage: | | | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 |
| Cap (pF) | 100 | 101 | | | | | | | | | | | | | | | | | | | | | |
| | 150 | 151 | | | | | | | | | | | | | | | | | | | | | |
| | 220 | 221 | | | | | | | | | | | | | | | | | | | | | |
| | 330 | 331 | | | | | | | | | | | | | | | | | | | | | |
| | 470 | 471 | | | | | | | | | | | | | | | | | | | | | |
| | 680 | 681 | | | | | | | | | | | | | | | | | | | | | |
| | 1000 | 102 | | | | | | | | | | | | | | | | | | | | | |
| | 1500 | 152 | | | | | | | | | | | | | | | | | | | | | |
| | 2200 | 222 | | | | | | | | | | | | | | | | | | | | | |
| | 3300 | 332 | | | | | | | | | | | | | | | | | | | | | |
| | 4700 | 472 | | | | | | | | | | | | | | | | | | | | | |
| | 6800 | 682 | | | | | | | | | | | | | | | | | | | | | |
| Cap (µF) | 0.01 | 103 | | | | | | | | | | | | | | | | | | | | | |
| | 0.015 | 150 | | | | | | | | | | | | | | | | | | | | | |
| | 0.022 | 223 | | | | | | | | | | | | | | | | | | | | | |
| | 0.033 | 333 | | | | | | | | | | | | | | | | | | | | | |
| | 0.047 | 473 | | | | | | | | | | | | | | | | | | | | | |
| | 0.068 | 689 | | | | | | | | | | | | | | | | | | | | | |
| | 0.1 | 104 | | | | | | | | | | | | | | | | | | | | | |
| | 0.15 | 154 | | | | | | | | | | | | | | | | | | | | | |
| | 0.22 | 224 | | | | | | | | | | | | | | | | | | | | | |
| | 0.33 | 334 | | | | | | | | | | | | | | | | | | | | | |
| | 0.47 | 474 | | | | | Q | Q | | | | | | X | X | | | | | | | | |
| | 0.68 | 684 | | | | | | | | | | | | | | | | | | | | | |
| | 1.0 | 105 | | | | | Q | Q | Q | | | | | X | X | X | | | | | | | |
| | 1.5 | 155 | | | | | | | | | | | | X | X | X | | | | | | | |
| | 2.2 | 225 | | | | Q | Q | Q | Q | Q | | | | X | Z | Z | | | | | | | |
| | 3.3 | 335 | | Q | Q | | | | | | | | | | | | | | | | | | |
| | 4.7 | 475 | X | X | X | X | X | X | X | | | Z | Z | Z | Z | Z | | | | | | | |
| | 10 | 106 | X | X | X | X | X | X | X | | X | X | Z | Z | Z | Z | | | | | Z | | |
| | 22 | 226 | X | X | X | X | X | | | | Z | Z | Z | Z | Z | | | Z | Z | Z | Z | | |
| | 47 | 476 | X | X | X | X | | | | | Z | Z | Z | Z | Z | | | | | | | | |
| | 100 | 107 | X | X | | | | | | | Z | Z | | | | | | | | | | | |
| Voltage: | | | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 | 4 | 6.3 | 10 | 16 | 25 | 35 | 50 |
| Case Size | | | 1206 | | | | | | | 1210 | | | | | | | 1812 | | | | | | |

| Letter | A | B | C | E | G | J | K | M | N | P | Q | X | Y | Z |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Max. Thickness | 0.33 (0.013) | 0.22 (0.009) | 0.56 (0.022) | 0.71 (0.028) | 0.90 (0.035) | 0.94 (0.037) | 1.02 (0.040) | 1.27 (0.050) | 1.40 (0.055) | 1.52 (0.060) | 1.78 (0.070) | 2.29 (0.090) | 2.54 (0.100) | 2.79 (0.110) |
| | PAPER | | | | | | EMBOSSSED | | | | | | | |

PAPER and EMBOSSSED available for 01005

NOTE: Contact factory for non-specified capacitance values
*EIA 01005

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View 02016D105MAT2A on WIN SOURCE](#)

 [AVX Corporation](#) Information

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