

## General Specifications

### GENERAL DESCRIPTION

With increased requirements from the automotive industry for additional component robustness, AVX recognized the need to produce a MLCC with enhanced mechanical strength. It was noted that many components may be subject to severe flexing and vibration when used in various under the hood automotive and other harsh environment applications.

To satisfy the requirement for enhanced mechanical strength, AVX had to find a way of ensuring electrical integrity is maintained whilst external forces are being applied to the component. It was found that the structure of the termination needed to be flexible and after much research and development, AVX launched FLEXITERM®. FLEXITERM® is designed to enhance the mechanical flexure and temperature cycling performance of a standard ceramic capacitor with an X7R dielectric. **The industry standard for flexure is 2mm minimum. Using FLEXITERM®, AVX provides up to 5mm of flexure without internal cracks. Beyond 5mm, the capacitor will generally fail “open”.**

As well as for automotive applications FLEXITERM® will provide Design Engineers with a satisfactory solution when designing PCB's which may be subject to high levels of board flexure.

### PRODUCT ADVANTAGES

- High mechanical performance able to withstand, 5mm bend test guaranteed.
- Increased temperature cycling performance, 3000 cycles and beyond.
- Flexible termination system.
- Reduction in circuit board flex failures.
- Base metal electrode system.
- Automotive or commercial grade products available.



### APPLICATIONS

#### High Flexure Stress Circuit Boards

- e.g. Depanelization: Components near edges of board.

#### Variable Temperature Applications

- Soft termination offers improved reliability performance in applications where there is temperature variation.
- e.g. All kind of engine sensors: Direct connection to battery rail.

#### Automotive Applications

- Improved reliability.
- Excellent mechanical performance and thermo mechanical performance.

### HOW TO ORDER

| 0805                                         | 5                                                                            | C                  | 104                                                    | K                                                  | A                              | Z                                                                                     | 2                           | A                |
|----------------------------------------------|------------------------------------------------------------------------------|--------------------|--------------------------------------------------------|----------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------|-----------------------------|------------------|
| Style                                        | Voltage                                                                      | Dielectric         | Capacitance Code (In pF)                               | Capacitance Tolerance                              | Failure Rate                   | Terminations                                                                          | Packaging                   | Special Code     |
| 0603<br>0805<br>1206<br>1210<br>1812<br>2220 | 6 = 6.3V<br>Z = 10V<br>Y = 16V<br>3 = 25V<br>5 = 50V<br>1 = 100V<br>2 = 200V | C = X7R<br>F = X8R | 2 Sig Digits +<br>Number of Zeros<br>e.g., 104 = 100nF | J = ±5%*<br>K = ±10%<br>M = ±20%<br><br>*≤1µF only | A=Commercial<br>4 = Automotive | Z = FLEXITERM®<br>For FLEXITERM®<br>with Tin/Lead<br>termination see<br>AVX LD Series | 2 = 7" reel<br>4 = 13" reel | A = Std. Product |

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.



## Specifications and Test Methods

### PERFORMANCE TESTING

#### AEC-Q200 Qualification:

- Created by the Automotive Electronics Council
- Specification defining stress test qualification for passive components

#### Testing:

Key tests used to compare soft termination to AEC-Q200 qualification:

- Bend Test
- Temperature Cycle Test



### BOARD BEND TEST PROCEDURE

According to AEC-Q200

Test Procedure as per AEC-Q200:

Sample size: 20 components  
Span: 90mm Minimum deflection spec: 2 mm

- Components soldered onto FR4 PCB (Figure 1)
- Board connected electrically to the test equipment (Figure 2)



Fig 1 - PCB layout with electrical connections



Fig 2 - Board Bend test equipment

### BOARD BEND TEST RESULTS

AEC-Q200 Vrs AVX FLEXITERM® Bend Test



### TABLE SUMMARY

Typical bend test results are shown below:

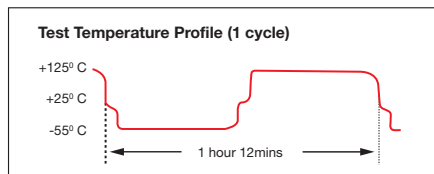
| Style | Conventional Termination | FLEXITERM® |
|-------|--------------------------|------------|
| 0603  | >2mm                     | >5mm       |
| 0805  | >2mm                     | >5mm       |
| 1206  | >2mm                     | >5mm       |

### TEMPERATURE CYCLE TEST PROCEDURE

#### Test Procedure as per AEC-Q200:

The test is conducted to determine the resistance of the component when it is exposed to extremes of alternating high and low temperatures.

- Sample lot size quantity 77 pieces
- TC chamber cycle from -55°C to +125°C for 1000 cycles
- Interim electrical measurements at 250, 500, 1000 cycles
- Measure parameter capacitance dissipation factor, insulation resistance



### AVX ENHANCED SOFT TERMINATION BEND TEST PROCEDURE

#### Bend Test

The capacitor is soldered to the printed circuit board as shown and is bent up to 10mm at 1mm per second:

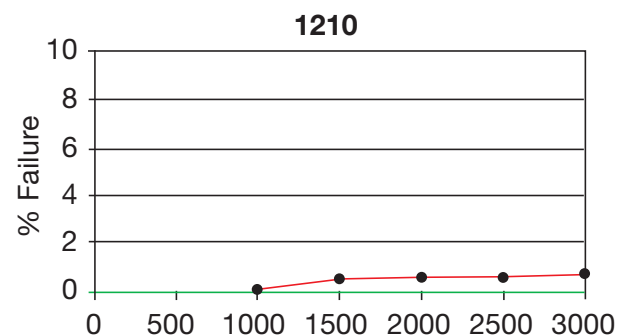
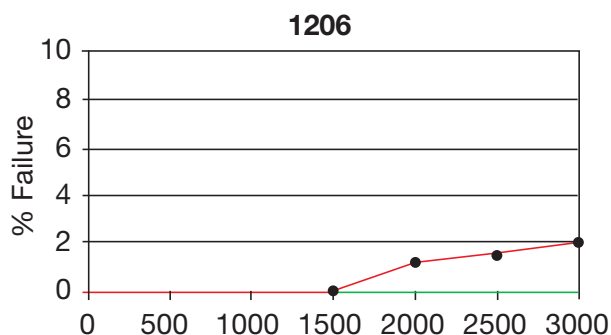
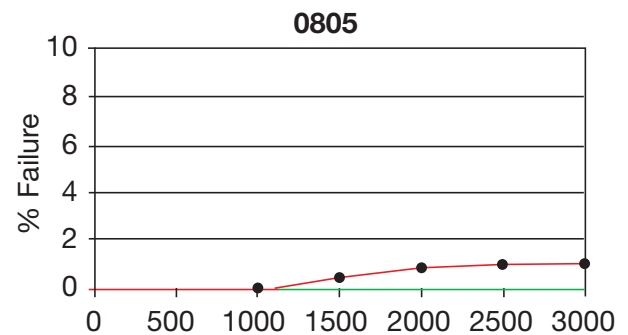
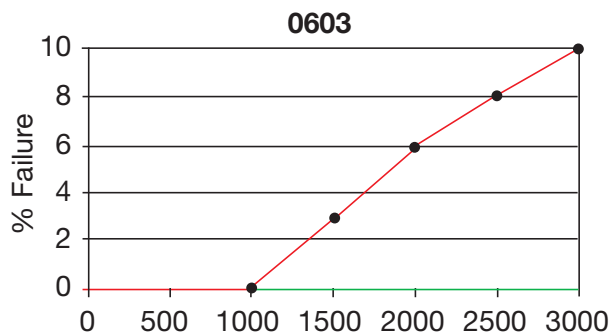


- The board is placed on 2 supports 90mm apart (capacitor side down)
- The row of capacitors is aligned with the load stressing knife



- The load is applied and the deflection where the part starts to crack is recorded (Note: Equipment detects the start of the crack using a highly sensitive current detection circuit)
- The maximum deflection capability is 10mm

### BEYOND 1000 CYCLES: TEMPERATURE CYCLE TEST RESULTS



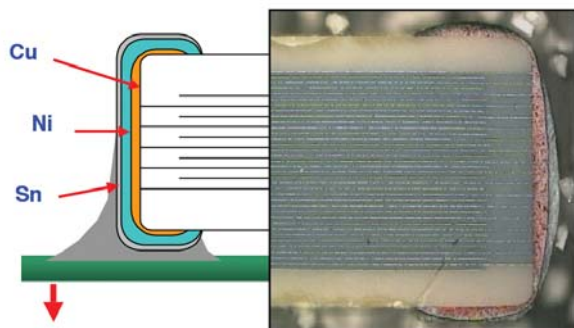
**Soft Term - No Defects up to 3000 cycles**

**AEC-Q200 specification states 1000 cycles compared to AVX 3000 temperature cycles.**

### FLEXITERM® TEST SUMMARY

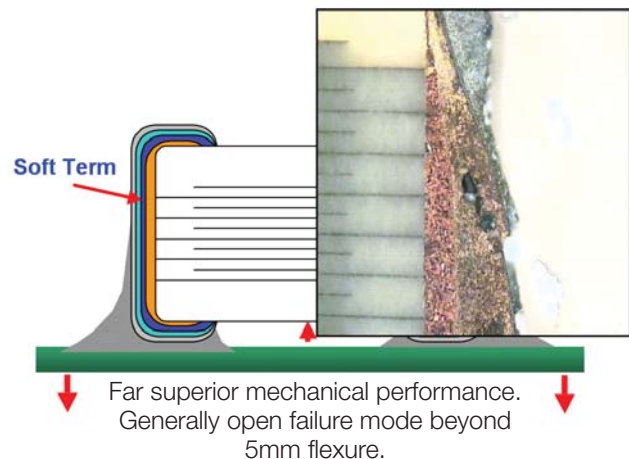
- Qualified to AEC-Q200 test/specification with the exception of using AVX 3000 temperature cycles (up to +150°C bend test guaranteed greater than 5mm).
- FLEXITERM® provides improved performance compared to standard termination systems.
- Board bend test improvement by a factor of 2 to 4 times.
- Temperature Cycling:
  - 0% Failure up to 3000 cycles
  - No ESR change up to 3000 cycles

### WITHOUT SOFT TERMINATION



Major fear is of latent board flex failures.

### WITH SOFT TERMINATION



Far superior mechanical performance. Generally open failure mode beyond 5mm flexure.

# MLCC with FLEXITERM®



## X8R Dielectric Capacitance Range

| SIZE           |                 |                 |                 | 0603            |                 |                 |                 | 0805            |                 |                 |                 | 1206            |                 |  |  |
|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|--|--|
|                | WVDC            |                 |                 | 25V             | 50V             | 25V             | 50V             | 25V             | 50V             | 25V             | 50V             |                 |                 |  |  |
| 271            | Cap             | 270             |                 | G               | G               |                 |                 |                 |                 |                 |                 |                 |                 |  |  |
| 331            | (pF)            | 330             |                 | G               | G               | J               | J               |                 |                 |                 |                 |                 |                 |  |  |
| 471            |                 | 470             |                 | G               | G               | J               | J               |                 |                 |                 |                 |                 |                 |  |  |
| 681            |                 | 680             |                 | G               | G               | J               | J               |                 |                 |                 |                 |                 |                 |  |  |
| 102            |                 | 1000            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 152            |                 | 1500            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 182            |                 | 1800            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 222            |                 | 2200            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 272            |                 | 2700            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 332            |                 | 3300            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 392            |                 | 3900            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 472            |                 | 4700            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 562            |                 | 5600            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 682            |                 | 6800            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 822            |                 | 8200            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 103            | Cap             | 0.01            |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 123            | (µF)            | 0.012           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 153            |                 | 0.015           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 183            |                 | 0.018           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 223            |                 | 0.022           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 273            |                 | 0.027           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 333            |                 | 0.033           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 393            |                 | 0.039           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 473            |                 | 0.047           |                 | G               | G               | J               | J               |                 |                 | J               |                 | J               |                 |  |  |
| 563            |                 | 0.056           |                 | G               |                 | N               | N               |                 |                 | M               |                 | M               |                 |  |  |
| 683            |                 | 0.068           |                 | G               |                 | N               | N               |                 |                 | M               |                 | M               |                 |  |  |
| 823            |                 | 0.082           |                 |                 |                 | N               | N               |                 |                 | M               |                 | M               |                 |  |  |
| 104            |                 | 0.1             |                 |                 |                 | N               | N               |                 |                 | M               |                 | M               |                 |  |  |
| 124            |                 | 0.12            |                 |                 |                 | N               | N               |                 |                 | M               |                 | M               |                 |  |  |
| 154            |                 | 0.15            |                 |                 |                 | N               | N               |                 |                 | M               |                 | M               |                 |  |  |
| 184            |                 | 0.18            |                 |                 |                 | N               |                 |                 |                 | M               |                 | M               |                 |  |  |
| 224            |                 | 0.22            |                 |                 |                 | N               |                 |                 |                 | M               |                 | M               |                 |  |  |
| 274            |                 | 0.27            |                 |                 |                 |                 |                 |                 |                 | M               |                 | M               |                 |  |  |
| 334            |                 | 0.33            |                 |                 |                 |                 |                 |                 |                 | M               |                 | M               |                 |  |  |
| 394            |                 | 0.39            |                 |                 |                 |                 |                 |                 |                 | M               |                 |                 |                 |  |  |
| 474            |                 | 0.47            |                 |                 |                 |                 |                 |                 |                 | M               |                 |                 |                 |  |  |
| 684            |                 | 0.68            |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |  |  |
| 824            |                 | 0.82            |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |  |  |
| 105            |                 | 1               |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |  |  |
|                | WVDC            |                 |                 | 25V             | 50V             | 25V             | 50V             | 25V             | 50V             | 25V             | 50V             |                 |                 |  |  |
| SIZE           |                 |                 |                 | 0603            |                 |                 |                 | 0805            |                 |                 |                 | 1206            |                 |  |  |
| Letter         | A               | C               | E               | G               | J               | K               | M               | N               | P               | Q               | X               | Y               | Z               |  |  |
| Max. Thickness | 0.33<br>(0.013) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.90<br>(0.035) | 0.94<br>(0.037) | 1.02<br>(0.040) | 1.27<br>(0.050) | 1.40<br>(0.055) | 1.52<br>(0.060) | 1.78<br>(0.070) | 2.29<br>(0.090) | 2.54<br>(0.100) | 2.79<br>(0.110) |  |  |
|                | PAPER           |                 |                 |                 |                 | EMBOSS          |                 |                 |                 |                 |                 |                 |                 |  |  |

 = AEC-Q200 Qualified

## X7R Dielectric Capacitance Range

|                       | 0603                 |                      |                      |                      |                      | 0805                 |                      |                      |                      |                      | 1206                 |                      |                      |     |      | 1210 |     |     |     | 1812 |     |     |     | 2220 |     |     |      |   |   |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----|------|------|-----|-----|-----|------|-----|-----|-----|------|-----|-----|------|---|---|
|                       | 16V                  | 25V                  | 50V                  | 100V                 | 200V                 | 10V                  | 16V                  | 25V                  | 50V                  | 100V                 | 200V                 | 16V                  | 25V                  | 50V | 100V | 200V | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V | 25V | 50V | 100V |   |   |
| 101                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 121                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 151                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 181                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 221                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 271                   | J                    | J                    | J                    | J                    | J                    | J                    |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 331                   | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 391                   | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 471                   | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 561                   | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 681                   | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 821                   | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 102                   | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 122                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 152                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 182                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 222                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 272                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 332                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 392                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 472                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 562                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 682                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 822                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 103                   | J                    | J                    | J                    | J                    | J                    |                      | J                    | J                    | J                    | J                    | J                    | J                    | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 123                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 153                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 183                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | J    |     |     |     |      |     |     |     |      |     |     |      |   |   |
| 223                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | J    |     |     |     |      | K   |     |     |      |     |     |      |   |   |
| 273                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | J    |     |     |     |      | K   |     |     |      |     |     |      |   |   |
| 333                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | J    |     |     |     |      | K   |     |     |      |     |     |      |   |   |
| 393                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | M    | J   |     |     |      | K   |     |     |      |     |     |      |   |   |
| 473                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | M                    |                      | J                    | J   | J    | M    | J   |     |     |      | K   |     |     |      |     |     |      |   |   |
| 563                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | N                    |                      | J                    | J   | J    | M    | J   | K   | K   | K    | M   | K   | K   | K    | K   |     |      |   |   |
| 683                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | N                    |                      | J                    | J   | J    | M    | J   | K   | K   | K    | M   | K   | K   | K    | K   |     |      |   |   |
| 823                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | N                    |                      | J                    | J   | J    | P    | J   | K   | K   | K    | M   | K   | K   | K    | K   |     |      |   |   |
| 104                   | J                    | J                    | J                    |                      |                      |                      | J                    | J                    | J                    | J                    | N                    |                      | J                    | J   | J    | Q    | J   | K   | K   | K    | P   | K   | K   | K    | K   | X   | X    | X |   |
| 124                   |                      |                      |                      |                      |                      |                      | J                    | J                    | J                    | N                    | N                    |                      | J                    | J   | P    | Q    |     | K   | K   | K    | Q   | K   | K   | K    | K   |     |      |   |   |
| 154                   |                      |                      |                      |                      |                      |                      | M                    | M                    | N                    | N                    | N                    |                      | J                    | J   | P    | Q    |     | K   | K   | K    | Q   | K   | K   | K    | M   | X   | X    | X |   |
| 184                   |                      |                      |                      |                      |                      |                      | M                    | M                    | N                    | N                    | N                    |                      | J                    | M   | P    | Q    |     | M   | M   | M    | Q   | K   | K   | K    | M   |     |      |   |   |
| 224                   |                      |                      |                      |                      |                      |                      | M                    | M                    | N                    | N                    | N                    |                      | J                    | M   | P    | Q    |     | M   | M   | M    | Q   | M   | M   | M    | X   | X   | X    | X |   |
| 274                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    | N                    | N                    |                      | J                    | M   | P    | Q    |     | P   | P   | P    | Q   | M   | M   | M    | X   |     |      |   |   |
| 334                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    | N                    | N                    |                      | J                    | M   | P    | Q    |     | P   | P   | P    | Q   | M   | M   | M    | X   | X   | X    |   |   |
| 394                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    | N                    | N                    |                      | M                    | M   | P    | Q    |     | P   | P   | P    | Q   | X   | X   | X    | X   |     |      |   |   |
| 474                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    | N                    | N                    |                      | M                    | M   | P    | Q    |     | P   | P   | P    | Q   | X   | X   | X    | X   | X   | X    |   |   |
| 564                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    |                      |                      |                      | M                    | Q   | Q    | Q    |     | P   | Q   | Q    | Q   | X   | X   | X    | Z   |     |      |   |   |
| 684                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    |                      |                      |                      | M                    | Q   | Q    | Q    |     | P   | X   | X    | X   | X   | X   | X    | Z   | X   | X    | X |   |
| 824                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    |                      |                      |                      | M                    | Q   | Q    | Q    |     | P   | Z   | Z    | Z   | X   | X   | X    | Z   |     |      |   |   |
| 105                   |                      |                      |                      |                      |                      |                      | N                    | N                    | N                    |                      |                      |                      | M                    | Q   | Q    | Q    |     | P   | Z   | Z    | Z   | X   | X   | X    | Z   | X   | X    | X |   |
| 155                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      | Q                    | Q   |      |      |     | P   | Z   | Z    | Z   |     |     |      | Z   | Z   | X    | X | X |
| 185                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      | Q                    | Q   |      |      |     | Z   | Z   | Z    | Z   |     |     |      | Z   | Z   |      |   |   |
| 225                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      | Q                    | Q   |      |      |     | Z   | Z   | Z    | Z   |     |     |      | Z   | Z   | X    | X | X |
| 335                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     | Z   | Z   | Z    |     |     |     |      |     |     |      | Z |   |
| 475                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     | Z   | Z   | Z    |     |     |     |      |     |     |      | Z |   |
| 106                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     | Z   | Z    |   |   |
| 226                   |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      |     |      |      |     |     |     |      |     |     |     |      |     | Z   |      |   |   |
|                       | 16V                  | 25V                  | 50V                  | 100V                 | 200V                 | 10V                  | 16V                  | 25V                  | 50V                  | 100V                 | 200V                 | 16V                  | 25V                  | 50V | 100V | 200V | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V | 25V | 50V | 100V |   |   |
|                       | 0603                 |                      |                      |                      |                      | 0805                 |                      |                      |                      |                      | 1206                 |                      |                      |     |      | 1210 |     |     |     | 1812 |     |     |     | 2220 |     |     |      |   |   |
| Letter Max. Thickness | A<br>0.33<br>(0.013) | C<br>0.56<br>(0.022) | E<br>0.71<br>(0.028) | G<br>0.90<br>(0.035) | J<br>0.94<br>(0.037) | K<br>1.02<br>(0.040) | M<br>1.27<br>(0.050) | N<br>1.40<br>(0.055) | P<br>1.52<br>(0.060) | Q<br>1.78<br>(0.070) | X<br>2.29<br>(0.090) | Y<br>2.54<br>(0.100) | Z<br>2.79<br>(0.110) |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |
|                       | PAPER                |                      |                      |                      |                      |                      |                      |                      |                      |                      |                      | EMBOSSED             |                      |     |      |      |     |     |     |      |     |     |     |      |     |     |      |   |   |