

## FEATURES

- STACKED METALLIZED POLYETHYLENE NAPHTHALATE (PEN) FILM
- STANDARD EIA 1206, 1210, 1913, 2416, 2820, 3022 AND 3925 SIZES
- WIDE TEMPERATURE RANGE UP TO +105°C (16Vdc & 50Vdc)
- HIGH HEAT AND MOISTURE RESISTANT
- VERY STABLE TEMPERATURE, FREQUENCY, VOLTAGE, BIAS AND DIELECTRIC ABSORPTION CHARACTERISTICS
- REFLOW SOLDERING ONLY
- TAPE AND REEL PACKAGING

**NSWC IS  
RECOMMENDED  
FOR NEW DESIGNS**



**RoHS  
Compliant**

includes all homogeneous materials

\*See Part Number System for Details

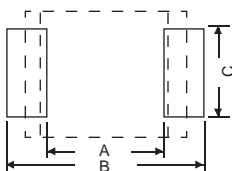
| SPECIFICATIONS                  | Case Sizes                                                                                                                    |                  |                |              |               |               |              |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|--------------|---------------|---------------|--------------|
|                                 | 1206                                                                                                                          | 1210             | 1913           | 2416         | 2820          | 3022          | 3925         |
| Capacitance Range               | 0.001 ~ 0.0047μF                                                                                                              | 0.00561 ~ 0.01μF | 0.012 ~ 0.22μF | 0.1 ~ 0.47μF | 0.18 ~ 0.33μF | 0.39 ~ 0.47μF | 0.56 ~ 1.0μF |
| Voltage Ratings                 | 16Vdc, 50Vdc, 100Vdc                                                                                                          |                  |                |              |               |               |              |
| Capacitance Tolerance           | 16V and 50V ±5% (J), 100V 0.001 ~ 0.01μF 5% (J) only, 0.012 ~ 0.15μF 5% (J) or 10% (K), 0.18 ~ 1.0μF 10% (K) only             |                  |                |              |               |               |              |
| Temperature Range               | -55°C ~ +105°C (16Vdc, 50Vdc and 100V 0.012μF ~ 0.01μF)<br>-55°C ~ +125°C (100Vdc, 0.012μF ~ 1.0μF with derating above +85°C) |                  |                |              |               |               |              |
| Dissipation factor (20°C)       | 1.0% max. @ 1KHz                                                                                                              |                  |                |              |               |               |              |
| Insulation resistance (20°C)    | 3 Gigohms or 1000Ω/F whichever is lower (16Vdc parts measured at 10Vdc)                                                       |                  |                |              |               |               |              |
| Dielectric Withstanding Voltage | 150% of Rated Voltage 60 Seconds<br>175% of Rated Voltage for 5 Seconds (except 100Vdc parts)                                 |                  |                |              |               |               |              |
| Temperature Characteristic      | ±3% ΔC Maximum Over Temperature Range                                                                                         |                  |                |              |               |               |              |
| Dielectric Absorption           | 0.05 ~ 0.10% Typical                                                                                                          |                  |                |              |               |               |              |

## ENVIRONMENTAL CHARACTERISTICS

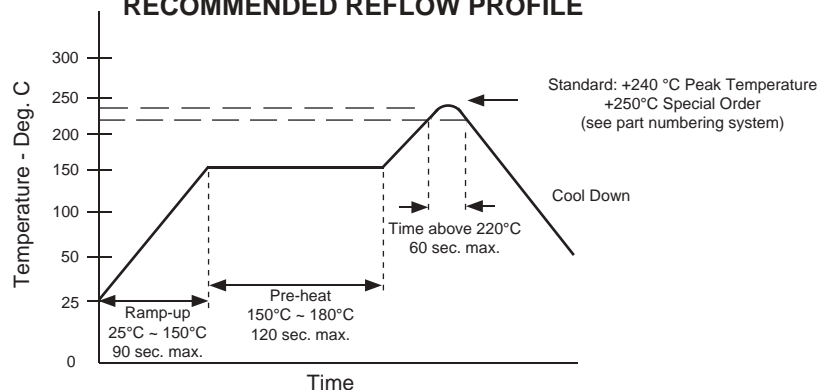
|                                                                                                                                |                                                                 |                                                                                  |                           |
|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------|
| Life Test At +105°C<br>1,000 Hours at 125% of Rated Voltage<br>(125°C for 100Vdc, 0.012μF ~ 1.0μF)                             | Capacitance Change                                              | Within +1%/-6% of Initial Value                                                  |                           |
|                                                                                                                                | Dissipation Factor                                              | 1.1% Maximum                                                                     |                           |
|                                                                                                                                | Insulation Resistance                                           | 1 Gigohm Minimum or 300Ω/F whichever is lower                                    |                           |
| Resistance to Soldering Heat:<br>+240°C Peak                                                                                   | Capacitance Change                                              | Within ±5% of Initial Value                                                      |                           |
|                                                                                                                                | Dissipation Factor                                              | 1.1% Maximum                                                                     |                           |
|                                                                                                                                | Insulation Resistance                                           | 1 Gigohm Minimum or 300Ω/F whichever is lower                                    |                           |
| Humidity Load Life (90% ~ 95% RH)<br>(1) 1,000 Hours, +40°C<br>(500 Hours for 100Vdc, 0.012μF ~ 1.0μF)<br>(2) 500 Hours, +60°C | Capacitance Change                                              | (1) +8%/-5%                                                                      | (2) ±10% of Initial Value |
|                                                                                                                                | Dissipation Factor                                              | (1) 1.5% Max.                                                                    | (2) 2.0% Max.             |
|                                                                                                                                | Insulation Resistance                                           | (1) 100 Megohm Min. or 30Ω/F<br>(2) 10 Megohm Min. or 3Ω/F<br>whichever is lower |                           |
| Solderability with<br>25% Wt Rosin-Methanol Flux                                                                               | 90% Minimum Coverage After 2.5 Second Dip Into 245°C Solder Pot |                                                                                  |                           |

## RECOMMENDED LAND PATTERN (mm)

| EIA Size | A   | B    | C   |
|----------|-----|------|-----|
| 1206     | 1.8 | 3.6  | 1.4 |
| 1210     | 1.8 | 3.6  | 2.3 |
| 1913     | 2.6 | 6.6  | 3.0 |
| 2416     | 3.8 | 7.8  | 3.8 |
| 2820     | 4.5 | 9.0  | 4.6 |
| 3022     | 5.1 | 9.7  | 5.0 |
| 3925     | 7.2 | 11.9 | 5.7 |



## RECOMMENDED REFLOW PROFILE



## PART NUMBER SYSTEM

NSWC 104 J 50 TR D4 N E

- NSWC: Series
- 104: Capacitance in pF, 1st two digits are significant, 3rd digit is no. of zeros
- J: Tolerance Code: J=±5%
- 50: Voltage
- TR: Tape & Reel
- D4: Size Code
- N: Optional High Temp. Reflow (+250°C)\*
- E: RoHS Compliant

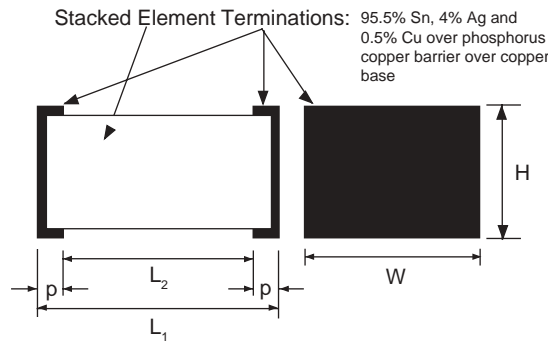
\*Special packaging and handling required.



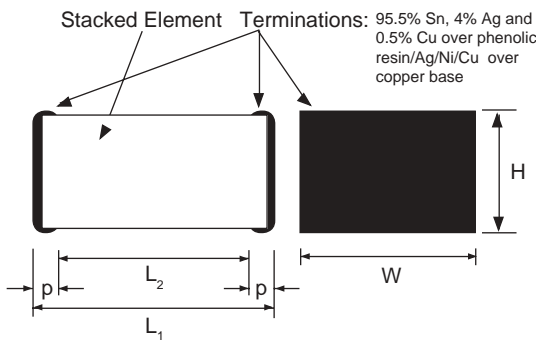
## STANDARD PRODUCTS AND SIZE CODE

| Cap.   | Code | Working Voltage (Vdc) |    |     | EIA Code |
|--------|------|-----------------------|----|-----|----------|
|        |      | 16                    | 50 | 100 |          |
| 0.001  | 102  |                       |    | B2  |          |
| 0.0012 | 122  |                       |    | B2  |          |
| 0.0015 | 152  |                       |    | B2  |          |
| 0.0018 | 182  |                       |    | B2  |          |
| 0.0022 | 222  |                       |    | B2  |          |
| 0.0027 | 272  |                       |    | B2  |          |
| 0.0033 | 332  |                       |    | B3  |          |
| 0.0039 | 392  |                       |    | B3  |          |
| 0.0047 | 472  |                       |    | B3  |          |
| 0.0056 | 562  |                       |    | C2  |          |
| 0.0068 | 682  |                       |    | C2  |          |
| 0.0082 | 822  |                       |    | C3  |          |
| 0.010  | 103  |                       |    | C3  |          |
| 0.012  | 123  |                       |    | D1  |          |
| 0.015  | 153  |                       |    | D1  |          |
| 0.018  | 183  |                       |    | D1  |          |
| 0.022  | 223  |                       |    | D1  |          |
| 0.027  | 273  |                       |    | D1  |          |
| 0.033  | 333  |                       |    | D1  |          |
| 0.039  | 393  |                       |    | D1  |          |
| 0.047  | 473  |                       |    | D2  |          |
| 0.056  | 563  |                       | D2 | D2  |          |
| 0.068  | 683  |                       | D2 | D3  |          |
| 0.082  | 823  |                       | D3 | D4  |          |
| 0.1    | 104  |                       | D4 | E1  |          |
| 0.12   | 124  | D1                    | E1 | E3  |          |
| 0.15   | 154  | D2                    | E2 | E4  |          |
| 0.18   | 184  | D2                    | E3 | G1  |          |
| 0.22   | 224  | D3                    | E4 | G2  |          |
| 0.27   | 274  | E1                    |    | G3  |          |
| 0.33   | 334  | E2                    |    | G5  |          |
| 0.39   | 394  | E3                    |    | Q1  |          |
| 0.47   | 474  | E4                    |    | Q2  |          |
| 0.56   | 564  |                       |    | R1  |          |
| 0.68   | 684  |                       |    | R3  |          |
| 0.82   | 824  |                       |    | R6  |          |
| 1.0    | 105  |                       |    | R8  |          |

**Fig. 1 16V & 50V, 100V D1~R8**



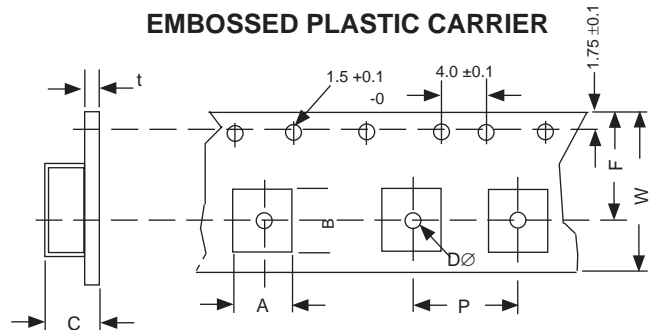
**Fig. 2 (100V B2~C3)**



## DIMENSION (mm) AND CASE CODE

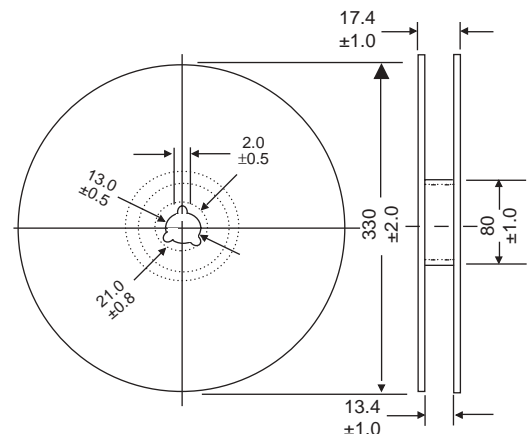
| Case Code | Length L ±0.2 | Width W   | Height H ±0.3 | P                  | EIA Code |                    |      |                    |      |
|-----------|---------------|-----------|---------------|--------------------|----------|--------------------|------|--------------------|------|
| B2        | 3.2           | 1.6 ± 0.2 | 1.1           | 0.65 ±0.3 (Fig. 1) | 1206     |                    |      |                    |      |
| B3        |               |           | 1.5           |                    |          |                    |      |                    |      |
| C2        |               |           | 1.5           |                    |          |                    |      |                    |      |
| C3        |               |           | 2.1           |                    |          |                    |      |                    |      |
| D1        | 4.8           | 3.3 ± 0.3 | 1.4           | 0.35 ±0.2 (Fig. 2) | 1913     |                    |      |                    |      |
| D2        |               |           | 2.0           |                    |          |                    |      |                    |      |
| D3        |               |           | 2.4           |                    |          |                    |      |                    |      |
| D4        |               |           | 2.8           |                    |          |                    |      |                    |      |
| E1        | 6.0           | 4.1 ± 0.3 | 1.8           |                    |          | 0.35 ±0.2 (Fig. 2) | 2416 |                    |      |
| E2        |               |           | 2.0           |                    |          |                    |      |                    |      |
| E3        |               |           | 2.4           |                    |          |                    |      |                    |      |
| E4        |               |           | 2.8           |                    |          |                    |      |                    |      |
| G1        | 7.1           | 5.0 ± 0.4 | 2.0           | 0.35 ±0.2 (Fig. 2) | 2820     |                    |      |                    |      |
| G2        |               |           | 2.4           |                    |          |                    |      |                    |      |
| G3        |               |           | 2.9           |                    |          |                    |      |                    |      |
| G5        |               |           | 3.5           |                    |          |                    |      |                    |      |
| Q1        | 7.7           | 5.5 ± 0.4 | 3.4           |                    |          | 0.35 ±0.2 (Fig. 2) | 3022 |                    |      |
| Q2        |               |           | 4.0           |                    |          |                    |      |                    |      |
| R1        | 9.8           | 6.3 ± 0.4 | 3.0           |                    |          |                    |      | 0.35 ±0.2 (Fig. 2) | 3925 |
| R3        |               |           | 3.6           |                    |          |                    |      |                    |      |
| R6        |               |           | 4.3           |                    |          |                    |      |                    |      |
| R8        |               |           | 5.1           |                    |          |                    |      |                    |      |

## EMBOSED PLASTIC CARRIER



## TAPE DIMENSIONS (mm)

| Case Code | A±0.1 | B±0.1 | C±0.2 | t         | W±0.3 | F         | P±0.1 | D±0.2/-0     | Qty/Reel |          |      |     |       |
|-----------|-------|-------|-------|-----------|-------|-----------|-------|--------------|----------|----------|------|-----|-------|
| B2        | 1.9   | 3.5   | 1.5   | 0.25      | 8.0   | 3.5       | 4.0   | 1.0          | 3,000    |          |      |     |       |
| B3        |       |       | 1.9   |           |       |           |       |              | 2,000    |          |      |     |       |
| C2        |       |       | 1.9   |           |       |           |       |              | 2,000    |          |      |     |       |
| C3        | 2.5   | 2,000 |       |           |       |           |       |              |          |          |      |     |       |
| D1        | 3.8   | 5.1   | 2.0   | 0.3 ±0.05 | 12.0  | 5.5 ±0.05 | 8.0   | 1.5          | 3,000    |          |      |     |       |
| D2        |       |       | 2.6   |           |       |           |       |              | 3,000    |          |      |     |       |
| D3, D4    |       |       | 3.4   |           |       |           |       |              | 2,000    |          |      |     |       |
| E1, E2    |       |       | 2.7   |           |       |           |       |              | 3,000    |          |      |     |       |
| E3, E4    | 3.5   | 2,000 |       |           |       |           |       |              |          |          |      |     |       |
| G1 ~ G5   | 5.5   | 7.4   | 4.7   |           |       |           |       | 0.343 ±0.013 | 16.0     | 7.5 ±0.1 | 12.0 | 1.5 | 1,500 |
| Q1, Q2    | 6.91  | 8.43  | 5.685 |           |       |           |       |              |          |          |      |     | 1,000 |
| R1 ~ R8   | 8.94  | 10.54 | 5.795 |           |       |           |       |              |          |          |      |     | 1,000 |



# Stacked Film Capacitor Chips

NSWC Series  
(High Voltage)

## FEATURES

- STACKED METALLIZED POLYETHYLENE NAPHTHALATE (PEN) FILM
- STANDARD EIA 1913, 2416 and 2420 SIZES
- HIGH HEAT AND MOISTURE RESISTANT
- VERY STABLE TEMPERATURE, FREQUENCY, VOLTAGE, BIAS AND DIELECTRIC ABSORPTION CHARACTERISTICS
- REFLOW SOLDERING ONLY
- TAPE AND REEL PACKAGING

NSWC IS  
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RoHS  
Compliant

includes all homogeneous materials

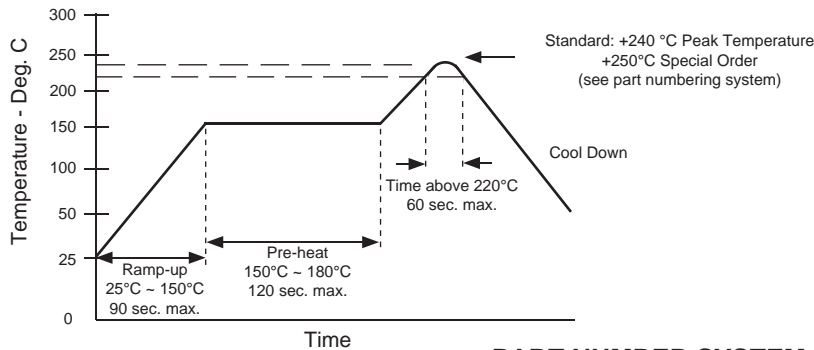
\*See Part Number System for Details

| SPECIFICATIONS                                          | Case Sizes                                         |                       |                      |
|---------------------------------------------------------|----------------------------------------------------|-----------------------|----------------------|
|                                                         | 1913                                               | 2416                  | 2420                 |
| Capacitance Range                                       | 0.001 ~ 0.015 $\mu$ F                              | 0.012 ~ 0.068 $\mu$ F | 0.027 ~ 0.12 $\mu$ F |
| Voltage Ratings                                         | 250Vdc                                             |                       |                      |
| Capacitance Tolerance                                   | $\pm$ 5%(J)                                        |                       |                      |
| Temperature Range                                       | -55°C ~ +85°C                                      |                       |                      |
| Dissipation Factor                                      | 1.0% max. @ 1KHz                                   |                       |                      |
| Insulation Resistance (20°C)<br>Through 2K Ohm Resistor | 3 Gigohms @ 100Vdc                                 |                       |                      |
| Dielectric Withstanding Voltage                         | 150% of Rated Voltage                              |                       |                      |
| Temperature Characteristic                              | $\pm$ 3% $\Delta$ C Maximum Over Temperature Range |                       |                      |
| Dielectric Absorption                                   | 0.05 ~ 0.10% Typical                               |                       |                      |

## ENVIRONMENTAL CHARACTERISTICS

|                                                            |                                                                 |                                                              |
|------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------|
| Life Test At +85°C<br>1,000 Hours at 125% of Rated Voltage | Capacitance Change                                              | Within $\pm$ 1%/-6% of Initial Value                         |
|                                                            | Dissipation Factor                                              | 1.1% Maximum                                                 |
|                                                            | Insulation Resistance                                           | 1 Gig $\Omega$ Minimum                                       |
| Resistance to Soldering Heat:<br>+240°C Peak               | Capacitance Change                                              | Within $\pm$ 5% of Initial Value                             |
|                                                            | Dissipation Factor                                              | 1.1% Maximum                                                 |
|                                                            | Insulation Resistance                                           | 1 Gig $\Omega$ Minimum or 300 $\Omega$ /F whichever is lower |
| Humidity Load Life (90 ~ 95% RH)<br>1,000 Hours, +40°C     | Capacitance Change                                              | (1) +8%/-5%                                                  |
|                                                            | Dissipation Factor                                              | (1) $\pm$ 1.5%                                               |
|                                                            | Insulation Resistance                                           | (1) 100Meg $\Omega$                                          |
| Resistance to Soldering Heat<br>240°C for 5 seconds        | Capacitance Change                                              | Within $\pm$ 5%                                              |
|                                                            | Dissipation Factor                                              | Maximum 1.1%                                                 |
|                                                            | Insulation Resistance                                           | 1Gig $\Omega$                                                |
| Solderability with<br>25% Wt Rosin-Methanol Flux           | 95% Minimum Coverage After 2.5 Second Dip into 245°C Solder Pot |                                                              |

## RECOMMENDED REFLOW PROFILE



## RECOMMENDED LAND PATTERN (mm)

| EIA Size | A   | B   | C   |
|----------|-----|-----|-----|
| 1913     | 2.6 | 6.6 | 3.0 |
| 2416     | 3.8 | 7.8 | 3.8 |
| 2420     | 3.8 | 7.8 | 4.6 |

## PART NUMBER SYSTEM

NSWC 822 J 250 TR D1 N E

- Series
- Capacitance in pF, 1st two digits are significant, 3rd digit is no. of zeros
- Tolerance Code: J= $\pm$ 5%
- Voltage
- Tape & Reel
- Size Code
- Optional High Temp. Reflow (+250°C)\*
- RoHS Compliant

\*Special packaging and handling required.

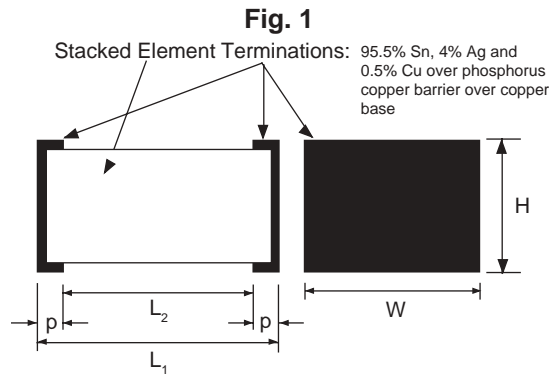


# Stacked Film Capacitor Chips

NSWC Series  
High Voltage

## STANDARD PRODUCTS AND SIZE CODE

| Cap.   | Code | Working Voltage (Vdc) |
|--------|------|-----------------------|
|        |      | 250                   |
| 0.001  | 102  | D1                    |
| 0.0012 | 122  | D1                    |
| 0.0015 | 152  | D1                    |
| 0.0022 | 222  | D1                    |
| 0.0027 | 272  | D1                    |
| 0.0033 | 332  | D1                    |
| 0.0039 | 392  | D1                    |
| 0.0047 | 472  | D1                    |
| 0.0056 | 562  | D1                    |
| 0.0068 | 682  | D1                    |
| 0.0082 | 822  | D1                    |
| 0.010  | 103  | D1                    |
| 0.012  | 123  | D1                    |
| 0.015  | 153  | D1                    |
| 0.018  | 183  | D2                    |
| 0.022  | 223  | D2                    |
| 0.027  | 273  | D3                    |
| 0.033  | 333  | D4                    |
| 0.039  | 393  | E2                    |
| 0.047  | 473  | E3                    |
| 0.056  | 563  | E4                    |
| 0.068  | 683  | E5                    |
| 0.082  | 823  | F2                    |
| 0.10   | 104  | F4                    |
| 0.12   | 124  | F5                    |



## DIMENSION (mm) AND CASE CODE

| Case Code | Length $L \pm 0.2$ | Width W       | Height $H \pm 0.3$ | p              | EIA Code |
|-----------|--------------------|---------------|--------------------|----------------|----------|
| D1        | 4.8                | $3.3 \pm 0.3$ | 1.4                | $0.35 \pm 0.2$ | 1913     |
| D2        |                    |               | 2.0                |                |          |
| D3        |                    |               | 2.4                |                |          |
| D4        |                    |               | 2.8                |                |          |
| E2        | 6.0                | $4.1 \pm 0.3$ | 2.0                |                | 2416     |
| E3        |                    |               | 2.4                |                |          |
| E4        |                    |               | 2.8                |                |          |
| E5        |                    |               | 3.2                |                |          |
| F1        | 6.0                | $5.0 \pm 0.4$ | 3.0                |                | 2420     |
| F2        |                    |               | 3.2                |                |          |
| F3        |                    |               | 3.6                |                |          |
| F4        |                    |               | 3.8                |                |          |
| F5        |                    |               | 4.5                |                |          |

## TAPE DIMENSIONS (mm)

| Case Code | A $\pm 0.1$ | B $\pm 0.1$ | C $\pm 0.2$ | t              | W $\pm 0.3$ | F              | P $\pm 0.1$ | D $\pm 0.2/-0$ | Qty/Reel |
|-----------|-------------|-------------|-------------|----------------|-------------|----------------|-------------|----------------|----------|
| D1        | 3.8         | 5.1         | 2.0         | $0.3 \pm 0.05$ | 12.0        | 5.5 $\pm 0.05$ | 8.0         | 1.5            | 3,000    |
| D2        |             |             | 2.6         |                |             |                |             |                | 3,000    |
| D3, D4    |             |             | 3.4         |                |             |                |             |                | 2,000    |
| E1, E2    | 2.7         | 3,000       |             |                |             |                |             |                |          |
| E3, E4    | 3.5         | 2,000       |             |                |             |                |             |                |          |
| F1 ~ F5   | 5.5         | 6.3         | 4.7         |                |             |                |             | -              | 1,500    |

