

# SMD Aluminum Solid Capacitors with Conductive Polymer



## FEATURES

- New OS-CON 94SVDP series provides improved characteristics with up to 125 °C temperature capability and 35 V maximum voltage rating in a SMD package
- Improved damp heat (steady state) 85 °C x 85 % RH performance
- Suitable for use in smoothing circuits of vehicle-mounted equipment, industrial equipment, etc.
- This product can support lead (Pb)-free reflow <sup>(2)</sup>
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
 COMPLIANT

| QUICK REFERENCE DATA   |  |  |  |
|--|--|--|--|
| DESCRIPTION  | CONDITIONS   | VALUE  |  |
| Operating temperature range                                    | -  | - 55 °C to + 125 °C  |  |
| Capacitance tolerance  | 120 Hz   | M: ± 20 %  |  |
| Tangent of loss angle (tan δ)                                  | 120 Hz   | ≤ values in Electrical Data and Ordering Information table |  |
| Leakage current (µA/2 min) (or less) <sup>(1)</sup>            | After 2 min  | ≤ values in Electrical Data and Ordering Information table |  |
| ESR  | -  | ≤ values in Electrical Data and Ordering Information table |  |
| Characteristics of impedance ratio at high and low temperature | 100 kHz, + 20 °C                                       | - 55 °C  | Z/Z <sub>20 °C</sub> 0.75 to 1.25                    |
|  |  | + 125 °C   | Z/Z <sub>20 °C</sub> 0.75 to 1.0                     |
| Endurance  | + 125 °C, 2000 h rated voltage applied                 | ΔC/C   | Within ± 20 %  |
|  |  | tan δ  | 2 x or < than an initial standard                    |
|  |  | ESR  | 2 x or < than an initial standard                    |
|  |  | Leakage current  | Below an initial standard                            |
| Damp heat (steady state)                                       | + 85 °C, 85 % to 90 % RH, 1000 h rated voltage applied | ΔC/C   | Within ± 20 %  |
|  |  | tan δ  | 2 x or < than an initial standard                    |
|  |  | ESR  | 2 x or < than an initial standard                    |
|  |  | Leakage current  | Below an initial standard                            |
| Solder heat resistance <sup>(2)</sup>                          | (VPS)<br>(230 °C x 75 s)                               | ΔC/C   | Within ± 10 %  |
|  |  | tan δ  | 1.3 x or < than an initial standard                  |
|  |  | ESR  | 1.3 x or < than an initial standard                  |
|  |  | Leakage current  | Below an initial standard (after voltage processing) |

### Notes

- (1) If any doubt arises, measure the current after applying voltage (voltage treatment). Voltage treatment: The rated voltage is applied (10 V to 35 V) for 120 min at 125 °C.
- (2) Refer to "Recommended Reflow Profile" for maximum temperatures.

| DIMENSIONS in millimeters |           |               |         |         |         |            |         |
|---------------------------|-----------|---------------|---------|---------|---------|------------|---------|
|                           |           |               |         |         |         |            |         |
| SIZE CODE                 | Ø D ± 0.5 | L + 0.1/- 0.4 | W ± 0.2 | H ± 0.2 | C ± 0.2 | R          | P ± 0.2 |
| C6                        | 6.3       | 5.9           | 6.6     | 6.6     | 7.3     | 0.6 to 0.8 | 2.1     |
| E7                        | 8.0       | 6.9           | 8.3     | 8.3     | 9.0     | 0.6 to 0.8 | 3.2     |
| F8                        | 10.0      | 7.9           | 10.3    | 10.3    | 11.0    | 0.6 to 0.8 | 4.6     |
| E12                       | 8.0       | 11.9          | 8.3     | 8.3     | 9.0     | 0.8 to 1.1 | 3.2     |
| F12                       | 10.0      | 12.6          | 10.3    | 10.3    | 11.0    | 0.8 to 1.1 | 4.6     |

| CASE CODE LIST                   |                                 |                |                |                |
|----------------------------------|---------------------------------|----------------|----------------|----------------|
| CAPACITANCE<br>( $\mu\text{F}$ ) | RATED VOLTAGE (SURGE AT 125 °C) |                |                |                |
|                                  | 10.0<br>(11.5)                  | 16.0<br>(18.4) | 25.0<br>(29.0) | 35.0<br>(40.0) |
| 8.2                              |                                 |                |                | E7             |
| 10                               |                                 |                | C6             |                |
| 18                               |                                 |                |                | F8             |
| 22                               |                                 |                | E7             | E12            |
| 39                               |                                 |                | F8             |                |
| 47                               |                                 |                | E12            | F12            |
| 56                               | C6                              |                |                |                |
| 82                               |                                 | E7             | F12            |                |

| RECOMMENDED LAND PATTERN DIMENSIONS (in millimeters) |           |     |      |     |
|--|-----------|-----|------|-----|
|  | SIZE CODE | a   | b    | c   |
|  | C6        | 2.1 | 9.1  | 1.6 |
|  | E7        | 2.8 | 11.1 | 1.9 |
|  | F8        | 4.3 | 13.1 | 1.9 |
|  | E12       | 2.8 | 11.1 | 1.9 |
|  | F12       | 4.3 | 13.1 | 1.9 |

| FREQUENCY COEFFICIENT FOR RIPPLE CURRENT |                         |                         |                           |                            |
|--|-------------------------|-------------------------|---------------------------|----------------------------|
| FREQUENCY                                | 120 Hz $\leq$ f < 1 kHz | 1 kHz $\leq$ f < 10 kHz | 10 kHz $\leq$ f < 100 kHz | 100 kHz $\leq$ f < 500 kHz |
| COEFFICIENT                              | 0.05                    | 0.3                     | 0.7                       | 1                          |

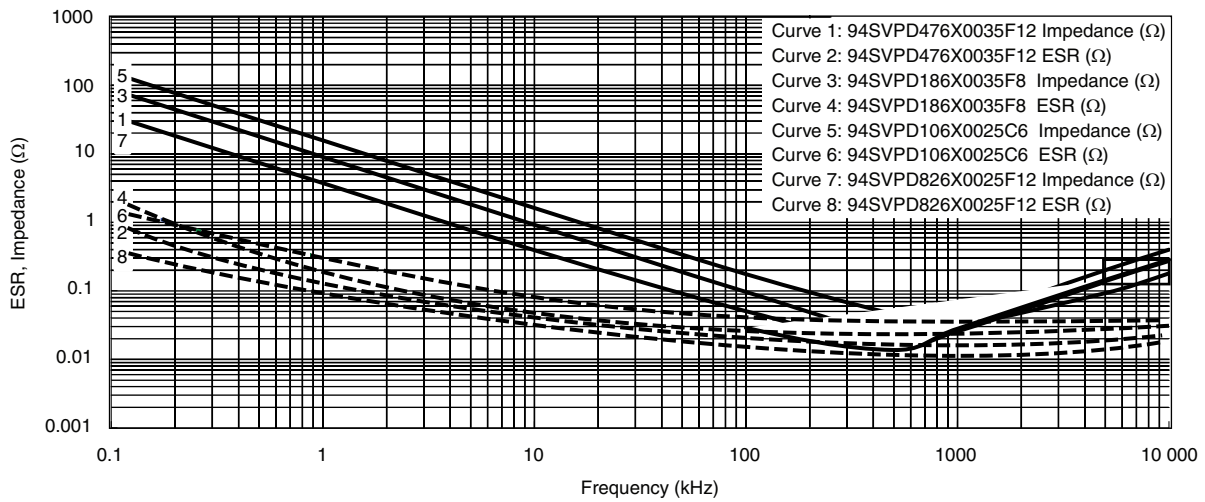
| ELECTRICAL DATA AND ORDERING INFORMATION |                            |           |  |                             |                          |                            |   |                            |
|--|----------------------------|-----------|--|-----------------------------|--------------------------|----------------------------|---|----------------------------|
| $U_R$<br>(V)                             | $C_R$<br>( $\mu\text{F}$ ) | CASE CODE | MAX. ESR<br>(100 kHz TO<br>300 kHz)<br>(m $\Omega$ ) | RATED RIPPLE CURRENT        | ALLOWABLE RIPPLE CURRENT | MAX. TANGENT OF LOSS ANGLE | MAX. LEAKAGE CURRENT ( $\mu\text{A}$ ) <sup>(2)</sup> | PART NUMBER <sup>(1)</sup> |
|  |                            |           |  | 100 kHz (mA) <sup>(3)</sup> |                          |                            |   |                            |
|  |                            |           |  | 105 °C < Tx $\leq$ 125 °C   | Tx $\leq$ 105 °C         |                            |   |                            |
| 10                                       | 56                         | C6        | 45   | 538                         | 1700                     | 0.12                       | 112   | 94SVPD566X0010C6           |
| 16                                       | 82                         | E7        | 40   | 670                         | 2120                     | 0.12                       | 262   | 94SVPD826X0016E7           |
| 25                                       | 10                         | C6        | 65   | 474                         | 1500                     | 0.10                       | 50  | 94SVPD106X0025C6           |
|  | 22                         | E7        | 48   | 580                         | 1835                     | 0.10                       | 110   | 94SVPD226X0025E7           |
|  | 39                         | F8        | 45   | 664                         | 2100                     | 0.10                       | 195   | 94SVPD396X0025F8           |
|  | 47                         | E12       | 30   | 943                         | 2980                     | 0.12                       | 235   | 94SVPD476X0025E12          |
|  | 82                         | F12       | 28   | 1202                        | 3800                     | 0.12                       | 410   | 94SVPD826X0025F12          |
| 35                                       | 8.2                        | E7        | 70   | 400                         | 1300                     | 0.10                       | 57  | 94SVPD825X0035E7           |
|  | 18                         | F8        | 60   | 550                         | 1800                     | 0.10                       | 126   | 94SVPD186X0035F8           |
|  | 22                         | E12       | 50   | 700                         | 2300                     | 0.12                       | 154   | 94SVPD226X0035E12          |
|  | 47                         | F12       | 30   | 1150                        | 3650                     | 0.12                       | 329   | 94SVPD476X0035F12          |

**Notes**

- (1) Capacitance tolerance: M  $\pm$  20 %  
 (2) After 2 min  
 (3) Tx: Ambient temperature



**FREQUENCY CHARACTERISTICS**

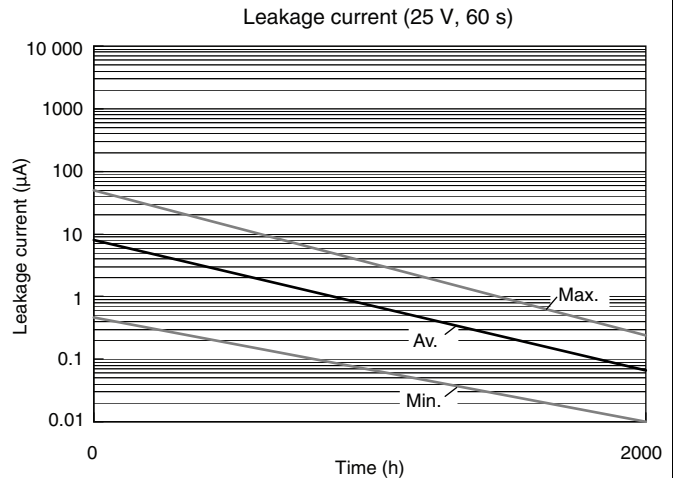
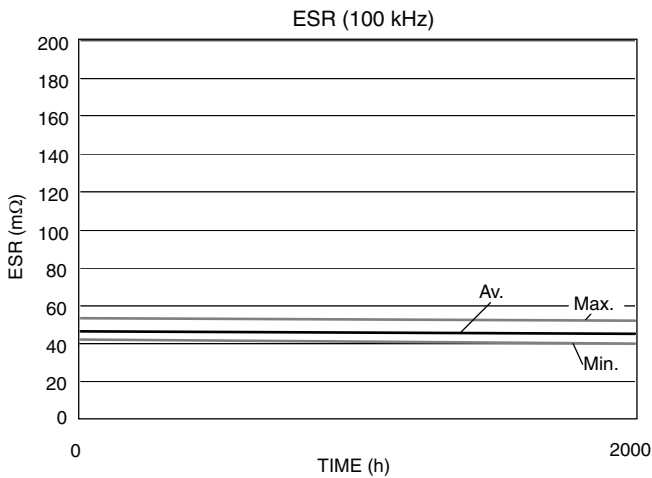
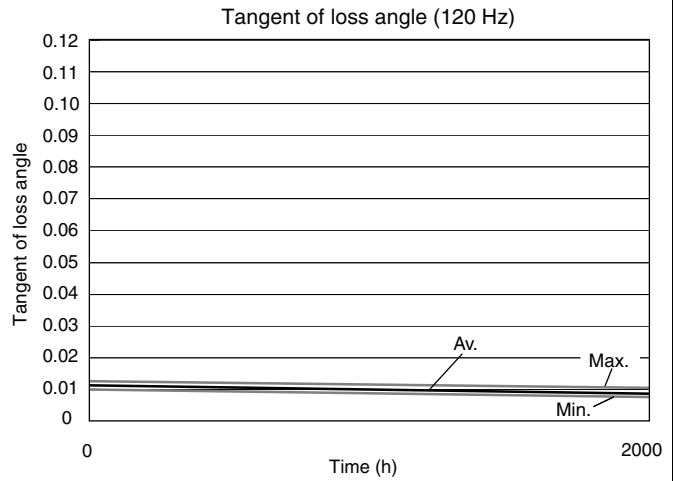
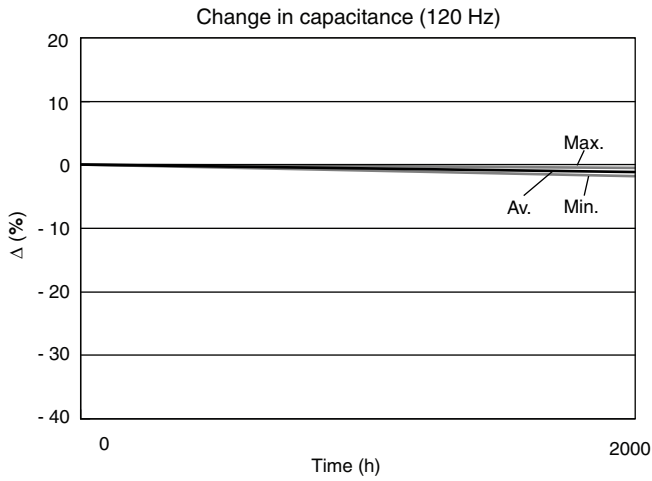


| FREQUENCY (kHz)                 | 0.12    | 0.5    | 1      | 10    | 100   | 500   | 1000  | 5000  | 10 000 |
|---------------------------------|---------|--------|--------|-------|-------|-------|-------|-------|--------|
| 94SVPD106X0025C6 IMPEDANCE (Ω)  | 127.769 | 31.001 | 15.608 | 1.612 | 0.176 | 0.046 | 0.032 | 0.093 | 0.179  |
| 94SVPD106X0025C6 ESR (Ω)        | 1.303   | 0.482  | 0.306  | 0.081 | 0.044 | 0.035 | 0.032 | 0.033 | 0.040  |
| 94SVPD186X0035F8 IMPEDANCE (Ω)  | 72.87   | 17.781 | 8.955  | 0.918 | 0.096 | 0.023 | 0.037 | 0.200 | 0.397  |
| 94SVPD186X0035F8 ESR (Ω)        | 1.681   | 0.333  | 0.179  | 0.043 | 0.027 | 0.023 | 0.023 | 0.026 | 0.034  |
| 94SVPD476X0035F12 IMPEDANCE (Ω) | 30.178  | 7.389  | 3.725  | 0.392 | 0.05  | 0.016 | 0.025 | 0.134 | 0.266  |
| 94SVPD476X0035F12 ESR (Ω)       | 0.852   | 0.206  | 0.121  | 0.045 | 0.023 | 0.016 | 0.014 | 0.017 | 0.023  |
| 94SVPD826X0025F12 IMPEDANCE (Ω) | 16.736  | 4.096  | 2.074  | 0.229 | 0.029 | 0.014 | 0.028 | 0.144 | 0.285  |
| 94SVPD826X0025F12 ESR (Ω)       | 0.339   | 0.135  | 0.094  | 0.033 | 0.015 | 0.011 | 0.011 | 0.014 | 0.019  |



**TYPICAL PARAMETERS**

| MODEL            | TEST ITEM                        | TEST TEMPERATURE | APPLIED VOLTAGE | LOT. NUMBER |
|------------------|----------------------------------|------------------|-----------------|-------------|
| 94SVPD106X0025C6 | Endurance<br>(after V.P.S. test) | 125 °C           | 25 V            | 7130A2714   |



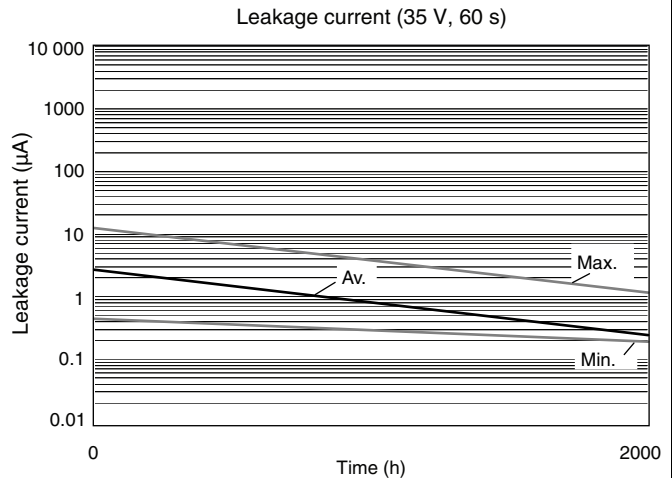
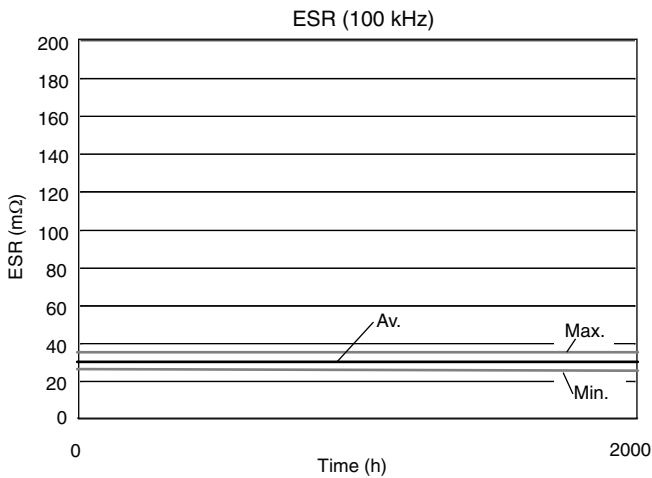
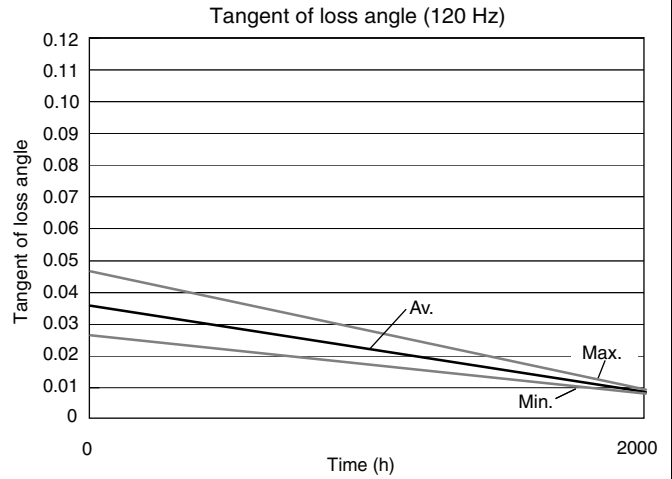
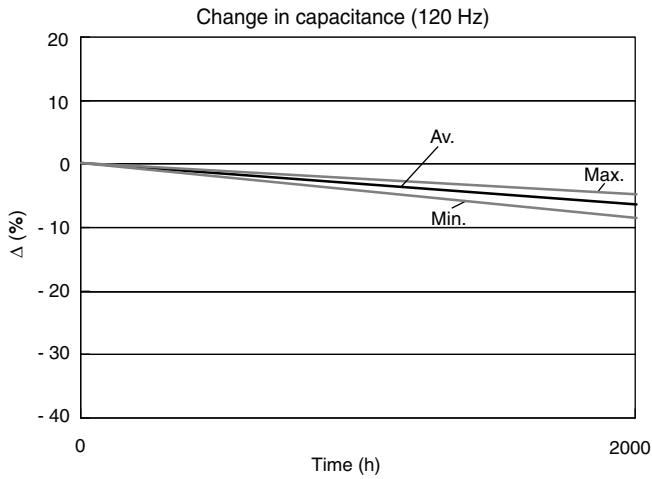
**Notes**

- n = 30 pieces
- V.P.S. test conditions: 230 °C x 75 s x 2 (V.P.S. = Vapor Phase Soldering method)



**TYPICAL PARAMETERS**

| MODEL            | TEST ITEM                        | TEST TEMPERATURE | APPLIED VOLTAGE | LOT. NUMBER |
|------------------|----------------------------------|------------------|-----------------|-------------|
| 94SVPD186X0035F8 | Endurance<br>(after V.P.S. test) | 125 °C           | 35 V            | 6517A3254   |



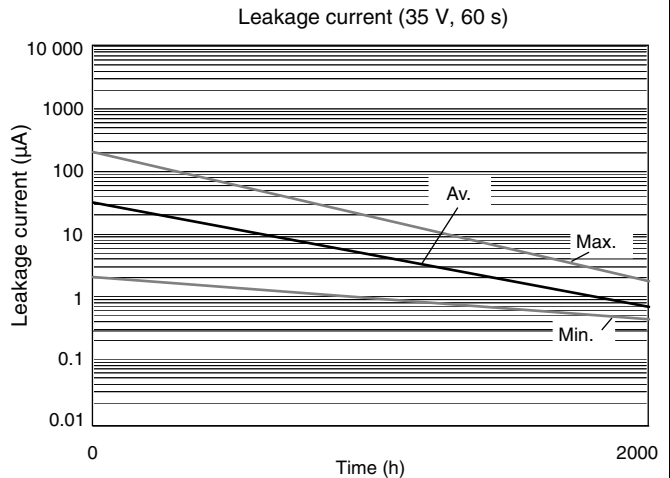
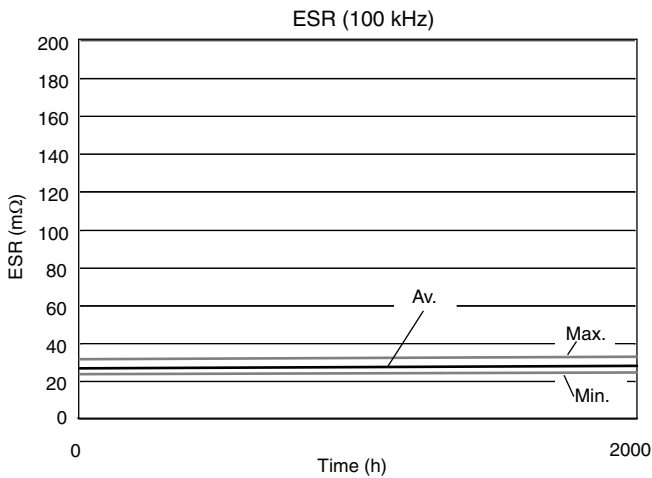
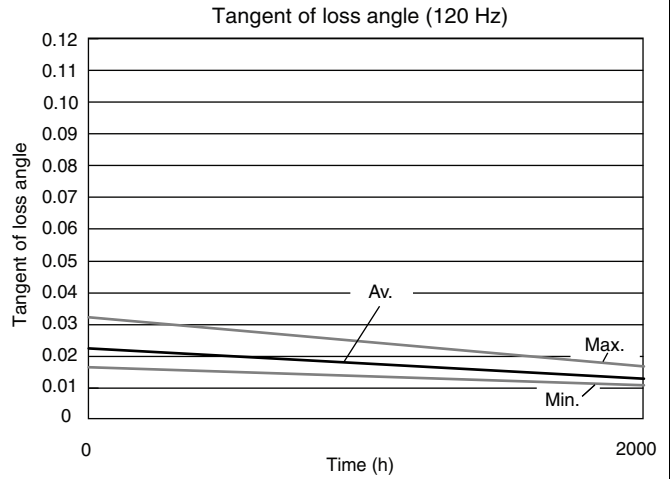
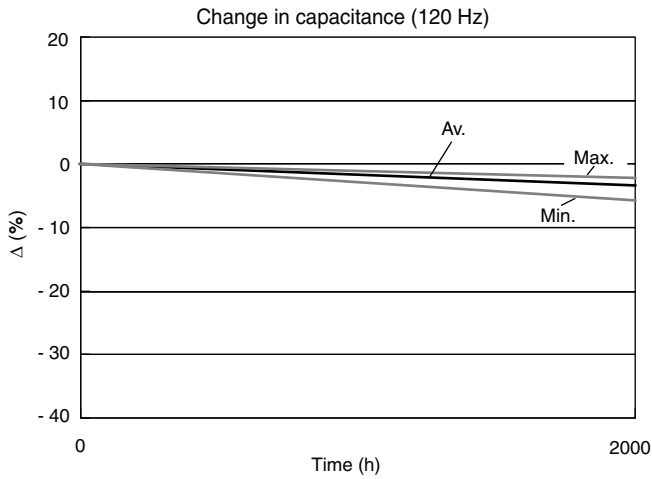
**Notes**

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**TYPICAL PARAMETERS**

| MODEL             | TEST ITEM                        | TEST TEMPERATURE | APPLIED VOLTAGE | LOT. NUMBER |
|-------------------|----------------------------------|------------------|-----------------|-------------|
| 94SVPD476X0035F12 | Endurance<br>(after V.P.S. test) | 125 °C           | 35 V            | 7209A6544   |



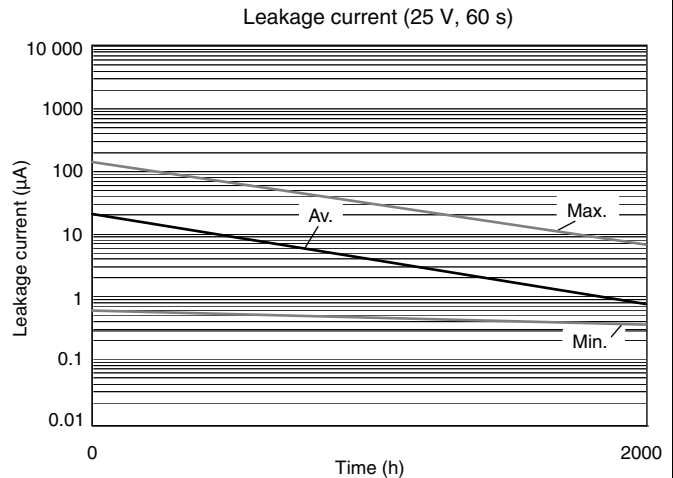
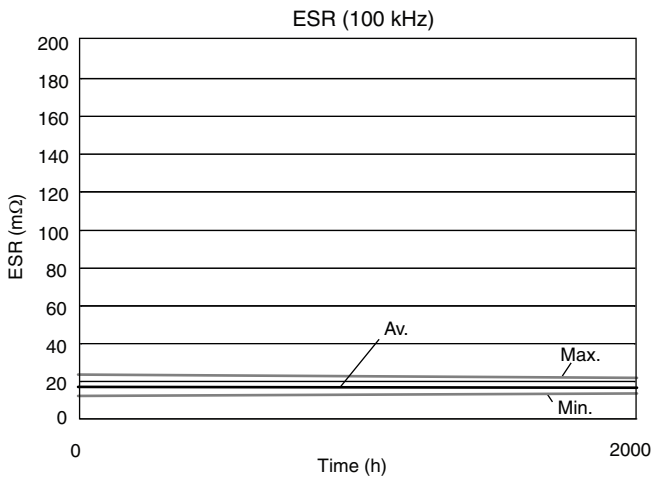
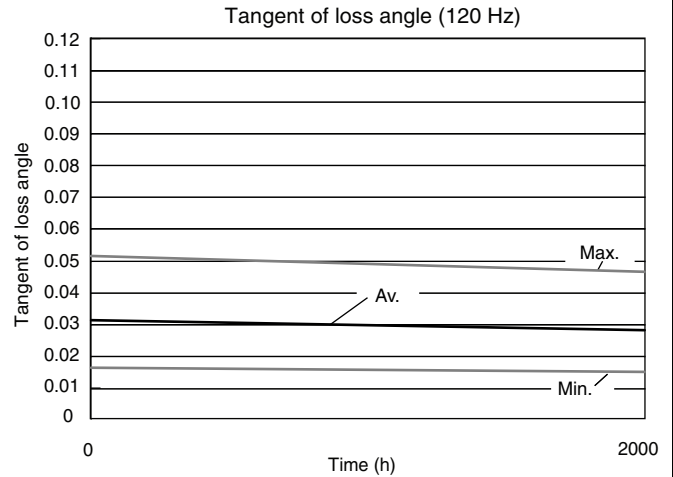
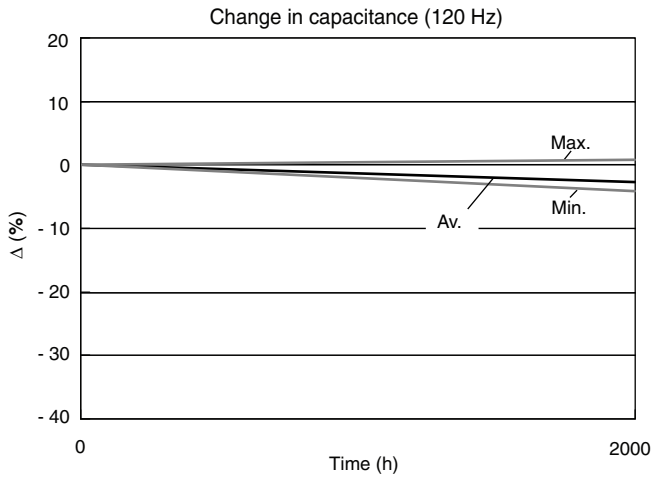
**Notes**

- n = 30 pieces
- V.P.S. test conditions: 230 °C x 75 s x 2 (V.P.S. = Vapor Phase Soldering method)



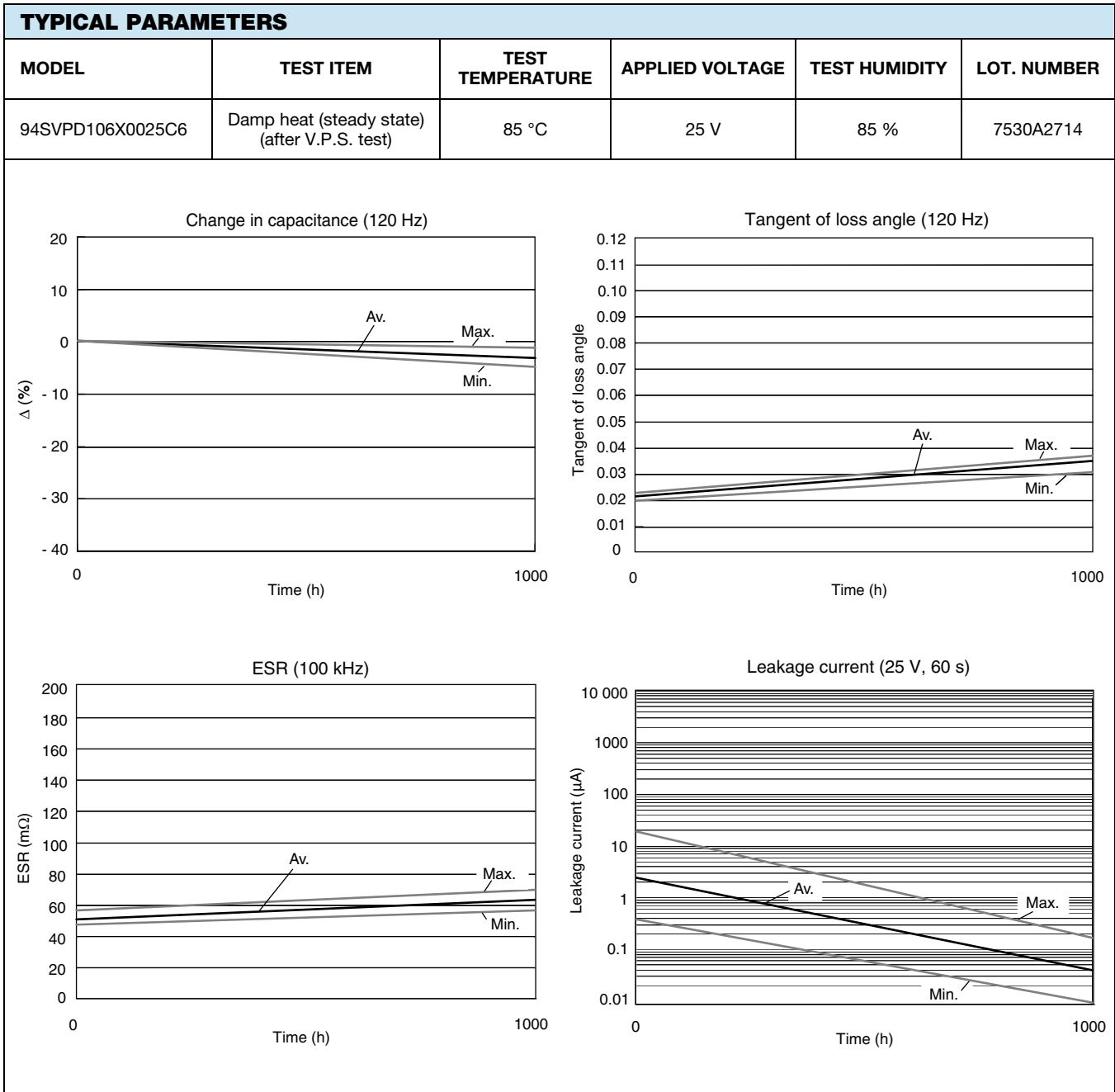
**TYPICAL PARAMETERS**

| MODEL             | TEST ITEM                        | TEST TEMPERATURE | APPLIED VOLTAGE | LOT. NUMBER |
|-------------------|----------------------------------|------------------|-----------------|-------------|
| 94SVPD826X0025F12 | Endurance<br>(after V.P.S. test) | 125 °C           | 25 V            | 7527A6544   |



**Notes**

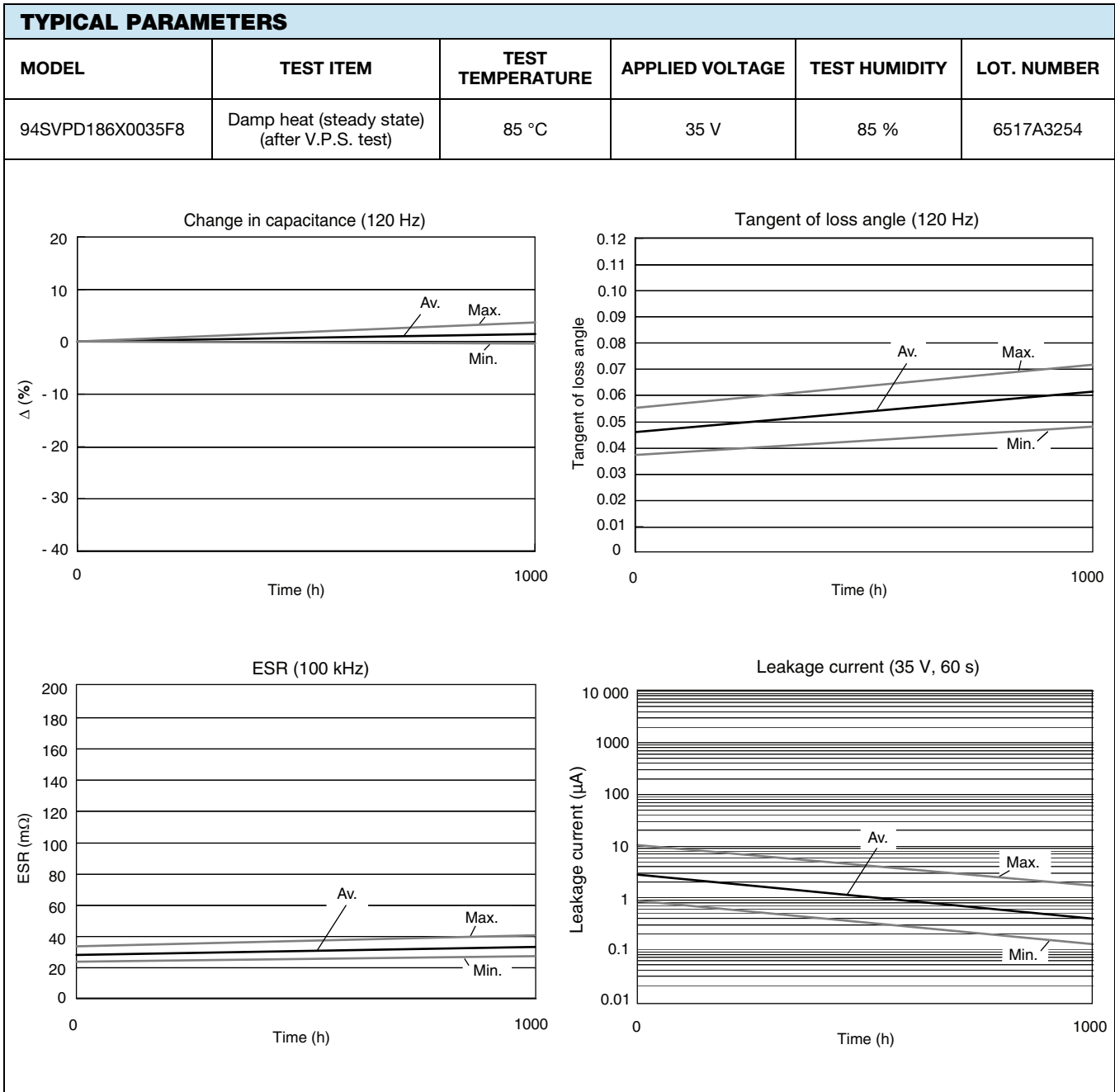
- n = 30 pieces
- V.P.S. test conditions: 230 °C x 75 s x 2 (V.P.S. = Vapor Phase Soldering method)



**Notes**

- n = 30 pieces
- V.P.S. test conditions: 230 °C x 75 s x 2 (V.P.S. = Vapor Phase Soldering method)





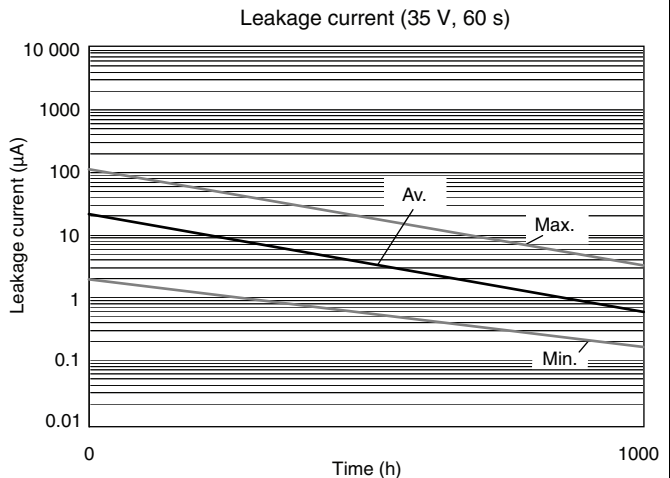
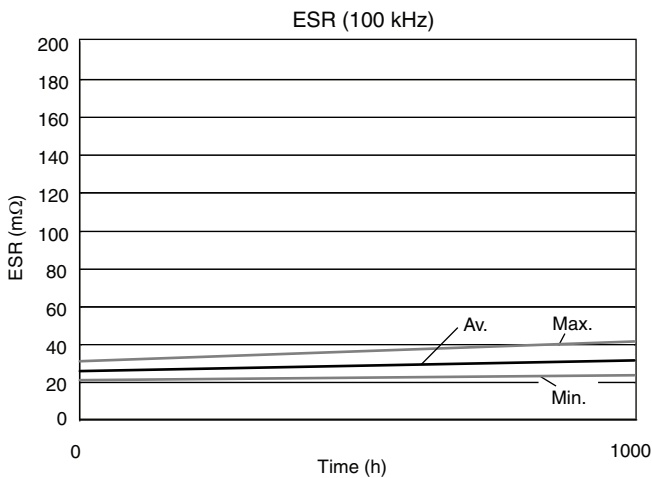
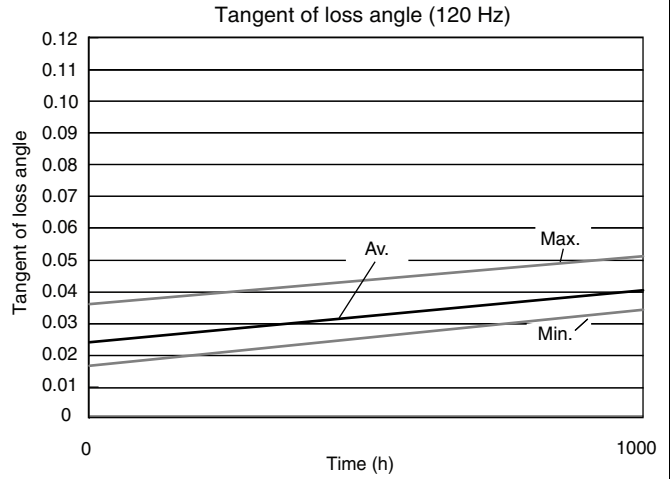
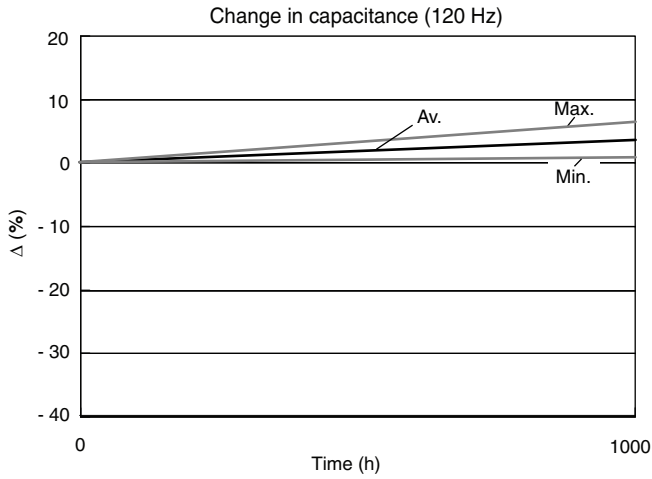
**Notes**

- n = 30 pieces
- V.P.S. test conditions: 230 °C x 75 s x 2 (V.P.S. = Vapor Phase Soldering method)



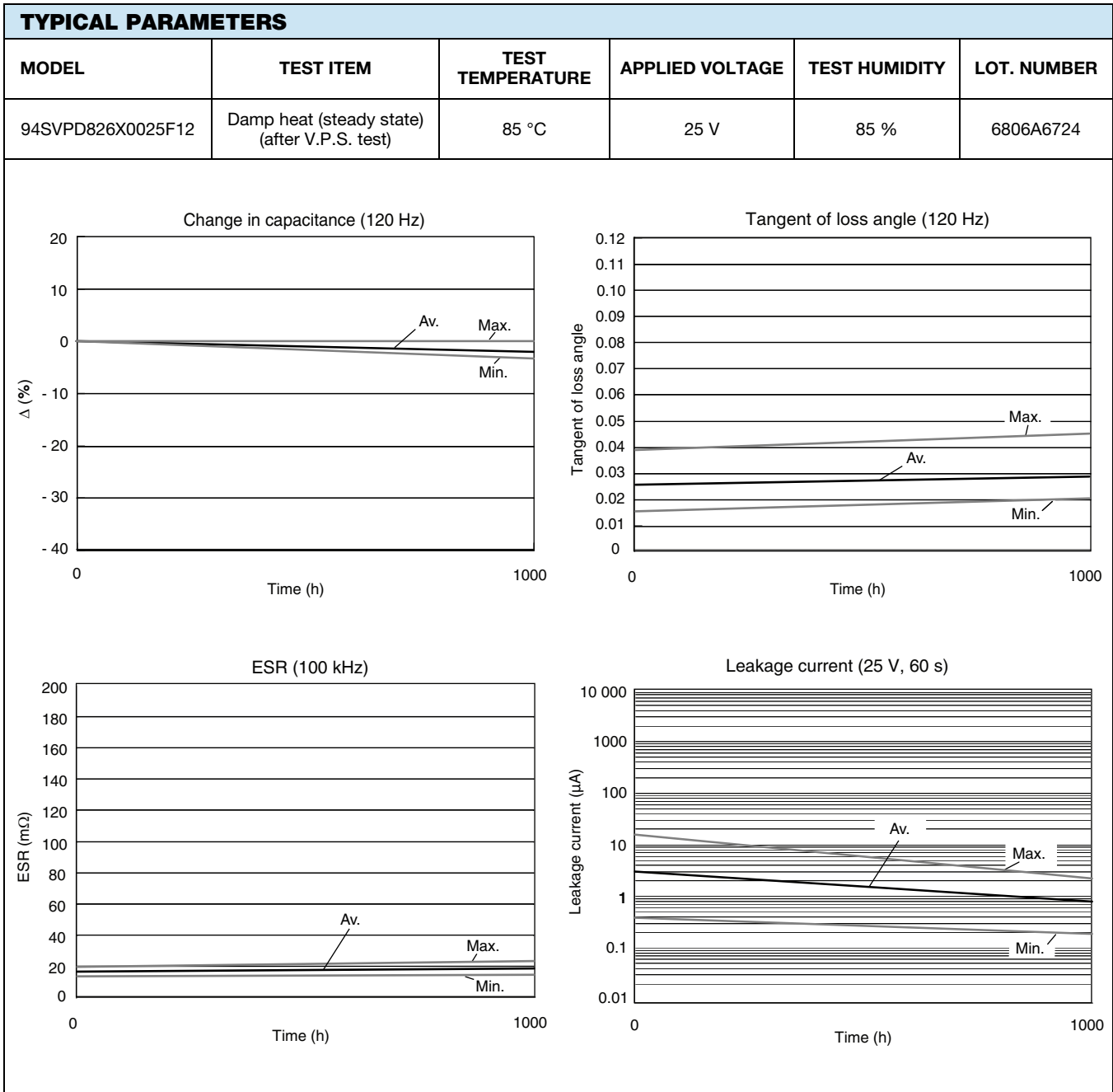
TYPICAL PARAMETERS

| MODEL             | TEST ITEM                                       | TEST TEMPERATURE | APPLIED VOLTAGE | TEST HUMIDITY | LOT. NUMBER |
|-------------------|---|------------------|-----------------|---------------|-------------|
| 94SVPD476X0035F12 | Damp heat (steady state)<br>(after V.P.S. test) | 85 °C            | 35 V            | 85 %          | 7209A6544   |



Notes

- n = 30 pieces
- V.P.S. test conditions: 230 °C x 75 s x 2 (V.P.S. = Vapor Phase Soldering method)

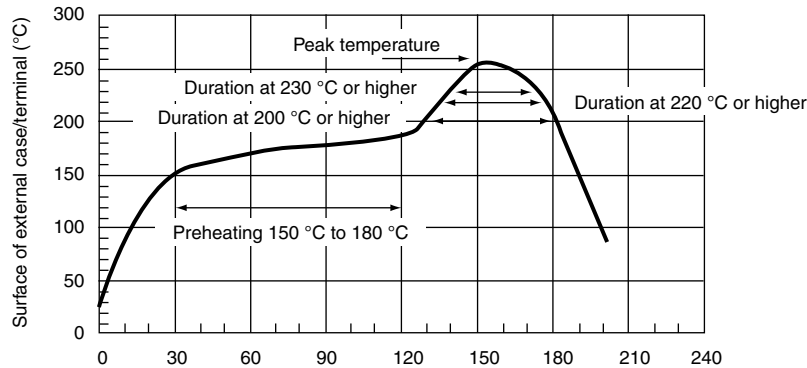


**Notes**

- n = 30 pieces
- V.P.S. test conditions: 230 °C x 75 s x 2 (V.P.S. = Vapor Phase Soldering method)



RECOMMENDED REFLOW PROFILE



Vishay OS-CON has different characteristics against soldering heat from conventional aluminum electrolytic capacitors or tantalum capacitors because of its unique materials and structure.

Please note the following points on soldering of Vishay OS-CON 94SVPD series to draw out the best performance.

| ITEM                    | 94SVPD SERIES              |             |
|-------------------------|----------------------------|-------------|
|                         | Peak temperature (max.)    | 250 °C      |
| Preheat                 | 150 °C to 180 °C 90 ± 30 s |             |
| 200 °C over time (max.) | 60 s                       | 60 s        |
| 220 °C over time (max.) | 50 s                       | 50 s        |
| 230 °C over time (max.) | 40 s                       | 40 s        |
| Reflow number           | Twice or less              | Only 1 time |

Note

- All temperatures are measured on the topside of the Al-can and terminal surface.

Attention:

Reflow soldering may reduce the capacitance of products before or after soldering even if soldering conditions stipulated in Recommended Reflow Condition are met. Though the actual reflow conditions are subject to change depending on the kind of reflow soldering method, please be aware that the peak temperature at the top of Al-case and electrode terminals should not exceed peak temperature. Particular notice should be given to the time that Vishay OS-CON is heated at 200 °C or higher during reflow. Be aware that soldering considerably deviating from these conditions will cause problems such as a 50 % reduction in capacitance, and a considerable increase in leakage current.

The leakage current value may increase (from a few µA to a few mA) even within the above conditions. When the Vishay OS-CON is used in a DC circuit, the leakage current will decrease gradually through self-recovery after voltage is applied. If your reflow profile (reflow temperature, number of reflows, etc.) deviates from the above conditions for mounting the 94SVPD series, please consult with Vishay OS-CON.



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