

## Features

- 1000W peak pulse power capability at 10/1000μs waveform, repetition rate (duty cycles):0.01%
- Excellent clamping capability
- Typical failure mode is a short circuit condition for current events exceeding component rating
- Plastic package is flammability rated V-0 per UL-94
- Meet MSL level1, per J-STD-020, lead-frame maximum peak of 260°C
- High reliability application and automotive grade AEC-Q101 qualified

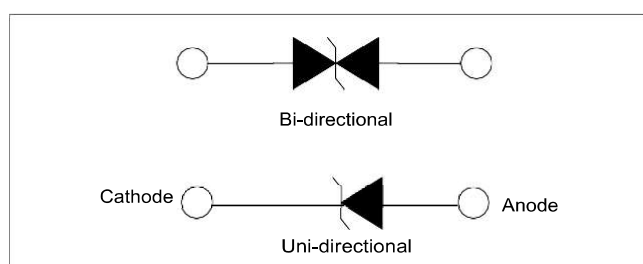
**RoHS**  
Compliant



## Applications

TVS devices are ideal for the transient voltage clamp protection of I/O Interfaces, DC power line bus and other circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

## Function Diagram



| Maximum Ratings and Thermal Characteristics<br>(T <sub>A</sub> =25°C unless otherwise noted) |                  |            |      |
|----------------------------------------------------------------------------------------------|------------------|------------|------|
| Parameter                                                                                    | Symbol           | Value      | Unit |
| Peak Pulse Power Dissipation at T <sub>A</sub> =25°C by 10/1000μs Waveform (Fig.3)           | P <sub>PPM</sub> | 1000       | W    |
| Power Dissipation on Infinite Heat Sink at T <sub>L</sub> =50°C                              | P <sub>D</sub>   | 5          | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 1)                             | I <sub>FSM</sub> | 120        | A    |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only(Note 2)                 | V <sub>F</sub>   | 3.5        | V    |
| Operating Temperature Range                                                                  | T <sub>J</sub>   | -55 to 150 | °C   |
| Storage Temperature Range                                                                    | T <sub>STG</sub> | -55 to 150 | °C   |

| AGENCY                                                                              | AGENCY FILE NUMBER |
|-------------------------------------------------------------------------------------|--------------------|
|  | Pending            |

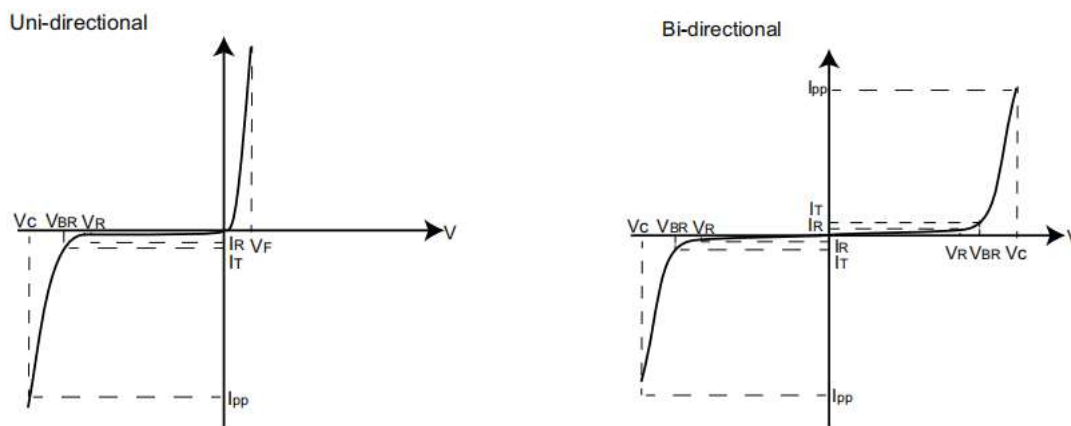
### Notes:

1. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.

### Characteristics (T = 25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Key Marking |      | Reverse Stand off Voltage V <sub>R</sub> (Volts) | Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub> |       | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @ I <sub>DD</sub> (V) | Maximum Peak Pulse Current I <sub>PP</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (μA) | Agency Approval  |
|-------------------|------------------|-------------|------|--------------------------------------------------|------------------------------------------------------------|-------|----------------------------------|---------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|                   |                  | UNI         | BI   |                                                  | MIN                                                        | MAX   |                                  |                                                               |                                                |                                                              |                                                                                                     |
| TP1KSMB10A-VR     | TP1KSMB10CA-VR   | 010A        | 010C | 10                                               | 11.10                                                      | 12.30 | 1                                | 17.0                                                          | 58.9                                           | 5                                                            |                                                                                                     |
| TP1KSMB11A-VR     | TP1KSMB11CA-VR   | 011A        | 011C | 11                                               | 12.20                                                      | 13.50 | 1                                | 18.2                                                          | 55.0                                           | 3                                                            |                                                                                                     |
| TP1KSMB12A-VR     | TP1KSMB12CA-VR   | 012A        | 012C | 12                                               | 13.30                                                      | 14.70 | 1                                | 19.9                                                          | 50.3                                           | 3                                                            |                                                                                                     |
| TP1KSMB13A-VR     | TP1KSMB13CA-VR   | 013A        | 013C | 13                                               | 14.40                                                      | 15.90 | 1                                | 21.5                                                          | 46.6                                           | 1                                                            |                                                                                                     |
| TP1KSMB14A-VR     | TP1KSMB14CA-VR   | 014A        | 014C | 14                                               | 15.60                                                      | 17.20 | 1                                | 23.2                                                          | 43.1                                           | 1                                                            |                                                                                                     |
| TP1KSMB15A-VR     | TP1KSMB15CA-VR   | 015A        | 015C | 15                                               | 16.70                                                      | 18.50 | 1                                | 24.4                                                          | 41.0                                           | 1                                                            |                                                                                                     |
| TP1KSMB16A-VR     | TP1KSMB16CA-VR   | 016A        | 016C | 16                                               | 17.80                                                      | 19.70 | 1                                | 26.0                                                          | 38.5                                           | 1                                                            |                                                                                                     |
| TP1KSMB17A-VR     | TP1KSMB17CA-VR   | 017A        | 017C | 17                                               | 18.90                                                      | 20.90 | 1                                | 27.6                                                          | 36.3                                           | 1                                                            |                                                                                                     |
| TP1KSMB18A-VR     | TP1KSMB18CA-VR   | 018A        | 018C | 18                                               | 20.00                                                      | 22.10 | 1                                | 29.2                                                          | 34.3                                           | 1                                                            |                                                                                                     |
| TP1KSMB20A-VR     | TP1KSMB20CA-VR   | 020A        | 020C | 20                                               | 22.20                                                      | 24.50 | 1                                | 32.4                                                          | 30.9                                           | 1                                                            |                                                                                                     |
| TP1KSMB22A-VR     | TP1KSMB22CA-VR   | 022A        | 022C | 22                                               | 24.40                                                      | 26.90 | 1                                | 35.5                                                          | 28.2                                           | 1                                                            |                                                                                                     |
| TP1KSMB24A-VR     | TP1KSMB24CA-VR   | 024A        | 024C | 24                                               | 26.70                                                      | 29.50 | 1                                | 38.9                                                          | 25.7                                           | 1                                                            |                                                                                                     |
| TP1KSMB26A-VR     | TP1KSMB26CA-VR   | 026A        | 026C | 26                                               | 28.90                                                      | 31.90 | 1                                | 42.1                                                          | 23.8                                           | 1                                                            |                                                                                                     |
| TP1KSMB28A-VR     | TP1KSMB28CA-VR   | 028A        | 028C | 28                                               | 31.10                                                      | 34.40 | 1                                | 45.4                                                          | 22.1                                           | 1                                                            |                                                                                                     |
| TP1KSMB30A-VR     | TP1KSMB30CA-VR   | 030A        | 030C | 30                                               | 33.30                                                      | 36.80 | 1                                | 48.4                                                          | 20.7                                           | 1                                                            |                                                                                                     |
| TP1KSMB33A-VR     | TP1KSMB33CA-VR   | 033A        | 033C | 33                                               | 36.70                                                      | 40.60 | 1                                | 53.3                                                          | 18.8                                           | 1                                                            |                                                                                                     |
| TP1KSMB36A-VR     | TP1KSMB36CA-VR   | 036A        | 036C | 36                                               | 40.00                                                      | 44.20 | 1                                | 58.1                                                          | 17.2                                           | 1                                                            |                                                                                                     |
| TP1KSMB40A-VR     | TP1KSMB40CA-VR   | 040A        | 040C | 40                                               | 44.40                                                      | 49.10 | 1                                | 64.5                                                          | 15.5                                           | 1                                                            |                                                                                                     |
| TP1KSMB43A-VR     | TP1KSMB43CA-VR   | 043A        | 043C | 43                                               | 47.80                                                      | 52.80 | 1                                | 69.4                                                          | 14.4                                           | 1                                                            |                                                                                                     |
| TP1KSMB45A-VR     | TP1KSMB45CA-VR   | 045A        | 045C | 45                                               | 50.00                                                      | 55.30 | 1                                | 72.7                                                          | 13.8                                           | 1                                                            |                                                                                                     |
| TP1KSMB48A-VR     | TP1KSMB48CA-VR   | 048A        | 048C | 48                                               | 53.30                                                      | 58.90 | 1                                | 77.4                                                          | 13.0                                           | 1                                                            |                                                                                                     |
| TP1KSMB51A-VR     | TP1KSMB51CA-VR   | 051A        | 051C | 51                                               | 56.70                                                      | 62.70 | 1                                | 82.4                                                          | 12.2                                           | 1                                                            |                                                                                                     |
| TP1KSMB54A-VR     | TP1KSMB54CA-VR   | 054A        | 054C | 54                                               | 60.00                                                      | 66.30 | 1                                | 87.1                                                          | 11.5                                           | 1                                                            |                                                                                                     |
| TP1KSMB58A-VR     | TP1KSMB58CA-VR   | 058A        | 058C | 58                                               | 64.40                                                      | 71.20 | 1                                | 93.6                                                          | 10.7                                           | 1                                                            |                                                                                                     |
| TP1KSMB60A-VR     | TP1KSMB60CA-VR   | 060A        | 060C | 60                                               | 66.70                                                      | 73.70 | 1                                | 96.8                                                          | 10.3                                           | 1                                                            |                                                                                                     |

## I-V Curve Characteristics



$P_{PPM}$  Peak Pulse Power Dissipation -- Max power dissipation

$V_R$  Stand-off Voltage -- Maximum voltage that can be applied to the TVS without operation

$V_{BR}$  Breakdown Voltage -- Maximum voltage that flows though the TVS at a specified test current ( $I_T$ )

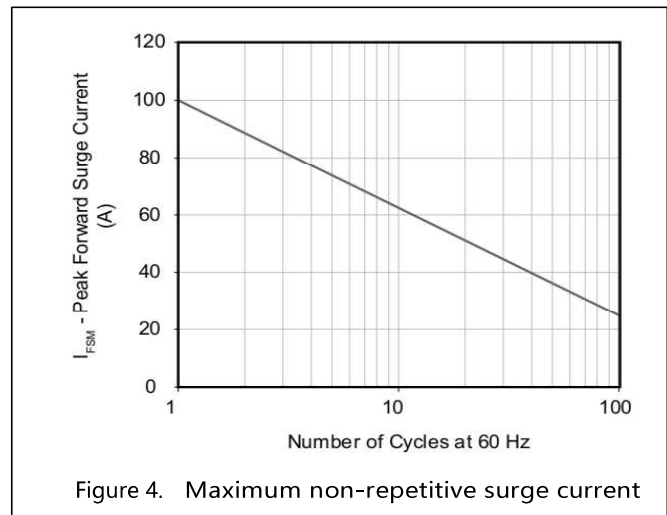
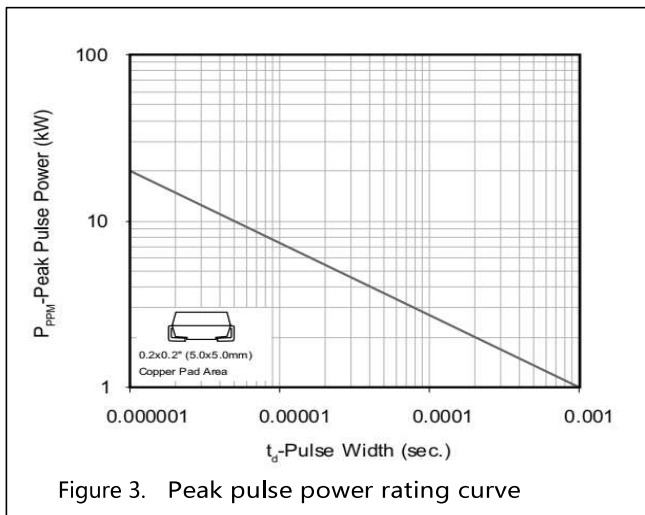
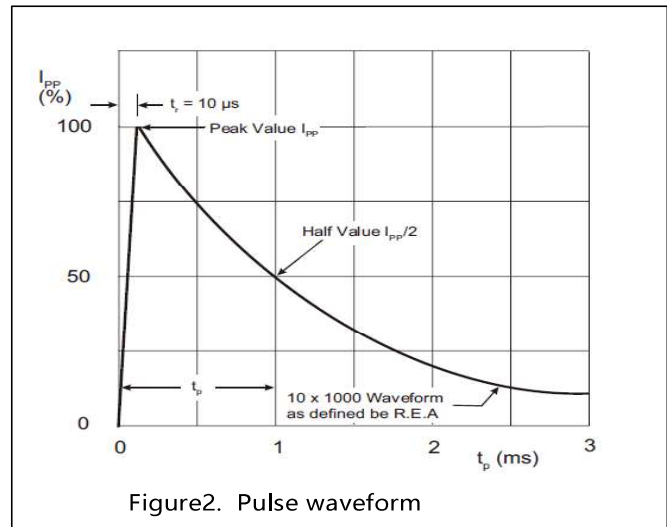
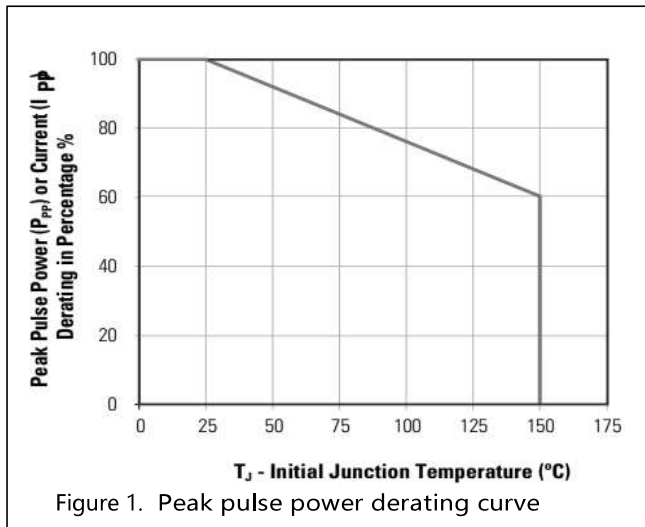
$V_C$  Clamping Voltage -- Peak voltage measured across the TVS at a specified  $I_{PPM}$  (peak impulse current)

$I_R$  Reverse Leakage Current -- Current measured at  $V_R$

$V_F$  Forward Voltage Drop for Uni-directional



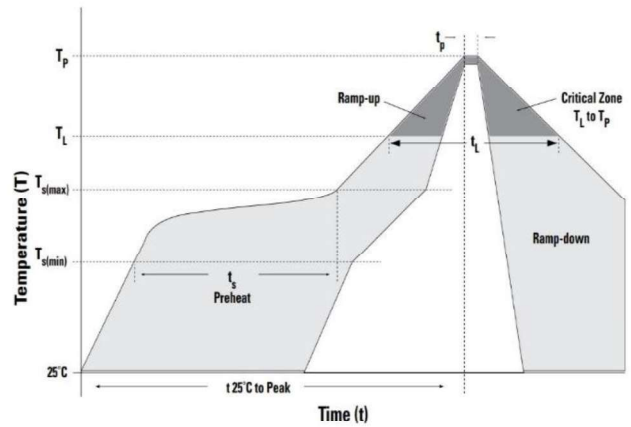
Ratings and Characteristic Curves (T = 25°C unless otherwise noted)



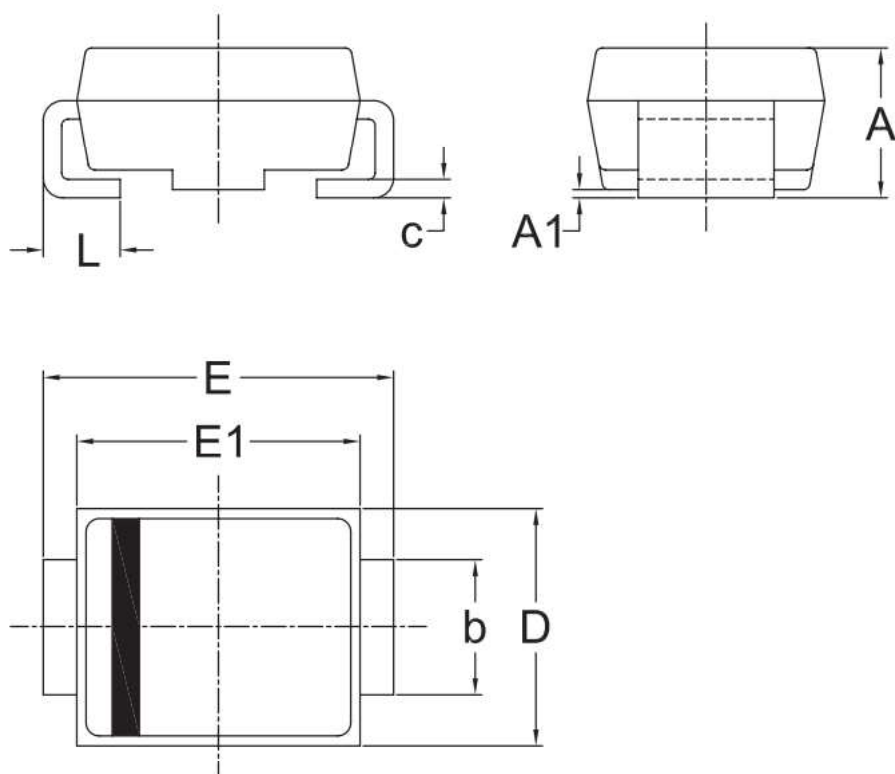
## Soldering Parameters

| Reflow Condition                                       |                                    | Lead-free assembly      |
|--------------------------------------------------------|------------------------------------|-------------------------|
| Pre Heat                                               | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                        | - Time (min to max) ( $t_s$ )      | 60 – 180 secs           |
| Average ramp up rate (Liquidus Temp ( $T_A$ ) to peak) |                                    | 3°C/second max          |
| $T_{s(max)}$ to $T_A$ - Ramp-up Rate                   |                                    | 3°C/second max          |
| Reflow                                                 | - Temperature ( $T_A$ ) (Liquidus) | 217°C                   |
|                                                        | - Time (min to max) ( $t_r$ )      | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 20 – 40 seconds         |
| Ramp-down Rate                                         |                                    | 6°C/second max          |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes Max.          |
| Do not exceed                                          |                                    | 260°C                   |

## Soldering profile



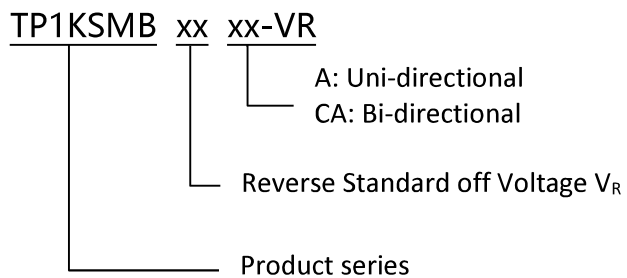
## Dimensions



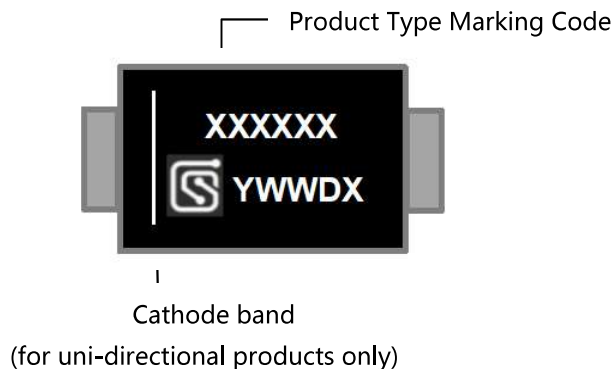
| UNIT | A   | A1   | b    | c    | D    | E    | E1   | L    |      |
|------|-----|------|------|------|------|------|------|------|------|
| mm   | Max | 2.50 | 0.30 | 2.15 | 0.25 | 3.75 | 5.54 | 4.65 | 1.50 |
|      | Min | 2.00 | 0.00 | 1.85 | 0.15 | 3.45 | 5.04 | 4.35 | 0.80 |

Remark: Dimensions D and E1 do not include mold flash & gate remain.

## Part Numbering



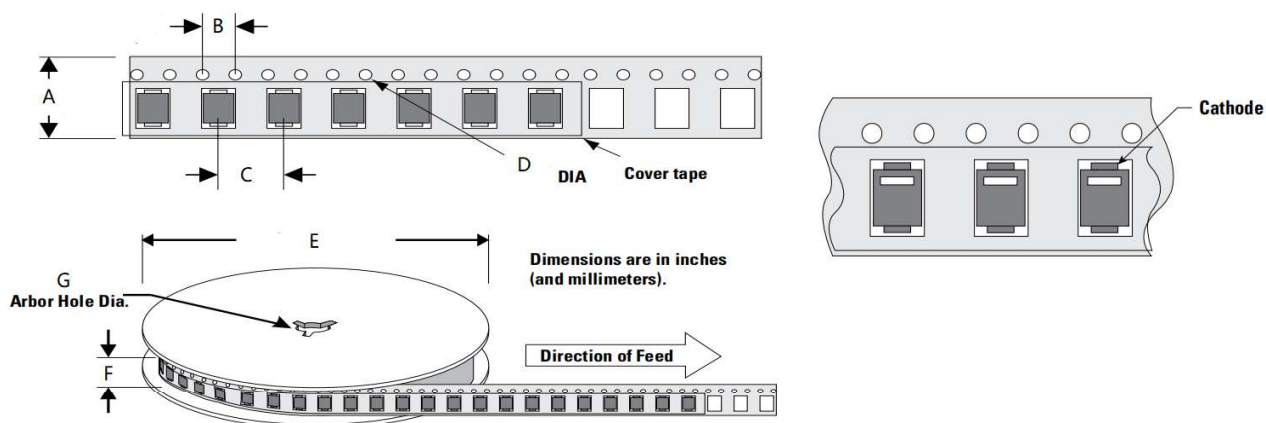
## Part Marking



## Packing

| Part number    | Package name | Small packing quantity | Packing method |
|----------------|--------------|------------------------|----------------|
| TP1KSMBXXXX-VR | DO-214AA     | 3000                   | Tape & Reel    |

## Tape and Reel Specification



| Symbol | Millimeter  |
|--------|-------------|
| A      | 12.00±0.10  |
| B      | 4.00±0.10   |
| C      | 8.00±0.10   |
| D      | 1.55±0.05   |
| E      | 330.20±2.00 |
| F      | 15.70±2.00  |
| G      | 13.30±0.30  |

## Revision history of Specification

| Version | Change Items    | Effective Date |
|---------|-----------------|----------------|
| 1.0     | Initial Release | 13-Aug-2021    |



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