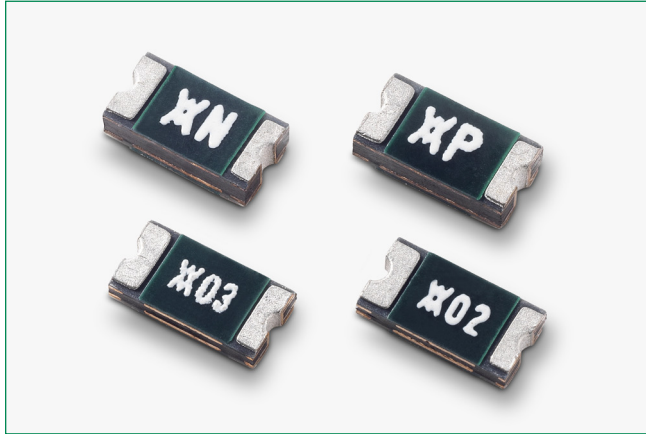


# Automotive nanoASMDC Series

## Surface Mount



### Additional Information



Resources



Accessories



Samples

### Description

The nanoASMDC is small-sized 1206 PPTC series, helping to reduce weight of wire harnesses. PPTC devices distributed in a circuit can allow the use of smaller wire sizes with the resulting harnesses. Forego looping back and forth around a fuse box and place your protection wherever you see fit. The solid state composition of PPTC devices helps provide reliability.

### Features & Benefits

- Products meet applicable automotive industry standards
- Compatible with high-volume electronics assembly
- Small footprint – 1206 size
- Resettable solution against overcurrent and short-circuit
- AEC-Q200 qualified, RoHS compliant, and ISO/TS16949 certified
- Surface-mount form factor
- Automotive and industrial transportation
- Actuators and medium motors
- Trace protection
- Harness/junction box protection
- Powered outputs
- Electronic control modules
- Telematics/Infotainment

### Applications

- Automotive and industrial transportation
- Actuators and medium motors
- Trace protection
- Harness/junction box protection
- Powered outputs
- Electronic control modules
- Telematics/Infotainment

### Electrical Characteristics

| Part Number           | Ordering Part Number | $I_H(A)@$<br>( $R_{1MAX}$ ) | $I_H(A)@$<br>( $R_{aMAX}$ ) | $I_T$<br>(A) | $V_{MAX}$<br>( $V_{DC}$ ) | $I_{MAX}$<br>(A) | $P_{D Typ}$<br>(W) | Max Time-to-trip<br>(A) | (s)  | $R_{MIN}$<br>( $\Omega$ ) | $R_{1MAX}$<br>( $\Omega$ ) | $R_{aMAX}$<br>( $\Omega$ ) |
|-----------------------|----------------------|-----------------------------|-----------------------------|--------------|---------------------------|------------------|--------------------|-------------------------|------|---------------------------|----------------------------|----------------------------|
| nanoASMDC – 13.2- 60V |                      |                             |                             |              |                           |                  |                    |                         |      |                           |                            |                            |
| nanoASMDC010F         | RF4563-000           | 0.10                        | 0.10                        | 0.25         | 60                        | 10               | 0.80               | 0.50                    | 1.00 | 1.60                      | 15.00                      | 15.00                      |
| nanoASMDC012F         | RF2145-000           | 0.12                        | 0.12                        | 0.39         | 48                        | 10               | 0.50               | 1.00                    | 0.20 | 1.40                      | 6.50                       | 6.50                       |
| nanoASMDC016F         | RF2146-000           | 0.16                        | 0.16                        | 0.45         | 48                        | 10               | 0.50               | 1.00                    | 0.30 | 1.10                      | 5.00                       | 5.00                       |
| nanoASMDC020F         | RF2147-000           | 0.20                        | 0.20                        | 0.42         | 24                        | 100              | 0.60               | 8.00                    | 0.10 | 0.65                      | 3.10                       | 3.10                       |
| nanoASMDC025F         | RF4525-000           | 0.25                        | 0.25                        | 0.58         | 16                        | 100              | 0.60               | 8.00                    | 0.01 | 0.40                      | 2.10                       | 2.10                       |
| nanoASMDC035F         | RF2148-000           | 0.35                        | 0.35                        | 0.75         | 16                        | 20               | 0.60               | 3.50                    | 0.10 | 0.45                      | 1.35                       | 1.35                       |
| nanoASMDC050F/13.2    | RF4564-000           | 0.50                        | 0.50                        | 1.10         | 13.2                      | 70               | 0.80               | 8.00                    | 0.10 | 0.20                      | 0.75                       | 0.75                       |

#### Notes:

- $I_H$  - Hold current: maximum current device will pass without interruption in 25°C, unless otherwise specified
- $I_T$  - Trip current: minimum current that will switch the device from low-resistance to high-resistance in 25°C still air, unless otherwise specified.
- $V_{MAX}$  - Maximum voltage device can withstand without damage at rated current.
- $I_{MAX}$  - Maximum fault current device can withstand without damage at rated voltage.

$P_D$   
 $R_{MIN}$   
 $R_{1MAX}$   
 $R_{aMAX}$

- Power dissipated from device when in the tripped state in 25°C still air, unless otherwise specified.
- Minimum resistance of device as supplied at 25°C, unless otherwise specified.
- Maximum resistance of device when measured one hour post reflow, unless otherwise specified.
- Maximum functional resistance of device after being subjected to the stresses described in PS400 at 5°C, unless otherwise specified.

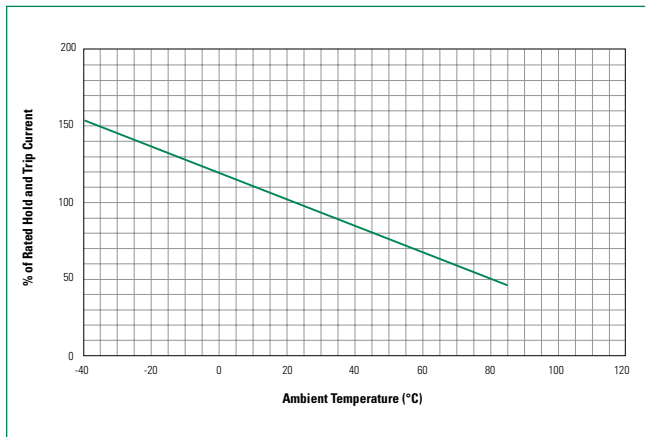
# Automotive nanoASMDC Series

## Surface Mount

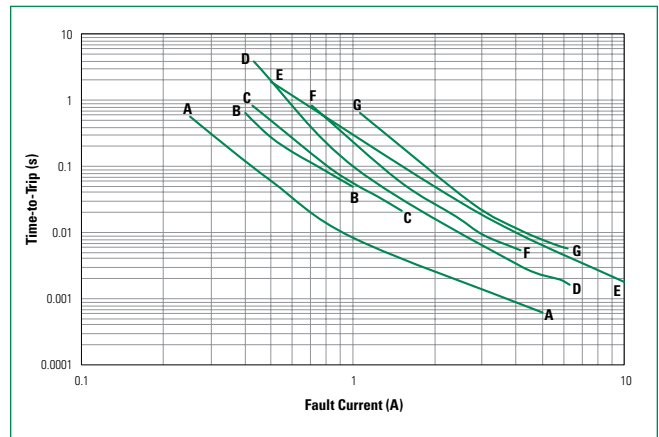
### Temperature Derating

| Part Number           | Maximum Ambient Temperature |       |      |      |      |      |      |      |      |      |
|-----------------------|-----------------------------|-------|------|------|------|------|------|------|------|------|
|                       | -40°C                       | -20°C | 0°C  | 20°C | 25°C | 40°C | 50°C | 60°C | 70°C | 85°C |
| Hold Current (A)      |                             |       |      |      |      |      |      |      |      |      |
| nanoASMDC – 13.2- 60V |                             |       |      |      |      |      |      |      |      |      |
| nanoASMDC010F         | 0.15                        | 0.14  | 0.12 | 0.10 | 0.10 | 0.09 | 0.08 | 0.07 | 0.06 | 0.05 |
| nanoASMDC012F         | 0.20                        | 0.17  | 0.15 | 0.13 | 0.12 | 0.11 | 0.10 | 0.09 | 0.08 | 0.07 |
| nanoASMDC016F         | 0.21                        | 0.20  | 0.18 | 0.16 | 0.16 | 0.14 | 0.13 | 0.12 | 0.11 | 0.09 |
| nanoASMDC020F         | 0.34                        | 0.30  | 0.26 | 0.22 | 0.20 | 0.17 | 0.15 | 0.13 | 0.11 | 0.08 |
| nanoASMDC025F         | 0.38                        | 0.33  | 0.30 | 0.26 | 0.25 | 0.22 | 0.20 | 0.19 | 0.16 | 0.11 |
| nanoASMDC035F         | 0.58                        | 0.51  | 0.44 | 0.38 | 0.35 | 0.31 | 0.28 | 0.24 | 0.21 | 0.16 |
| nanoASMDC050F/13.2    | 0.78                        | 0.69  | 0.61 | 0.52 | 0.50 | 0.44 | 0.39 | 0.35 | 0.30 | 0.24 |

### Temperature Derating Curve



### Typical Time-to-Trip Curves at 25°C



**Note:** The average time current curves and Temperature Derating curve performance is affected by a number of variables, and these curves provided as guidance only. Customer must verify the performance in their application.

### Physical Specifications

|                                       |                                                                                                 |
|---------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Terminal Pad Material</b>          | 100% Matte Tin with Nickel Underplate                                                           |
| <b>Soldering Characteristics</b>      | Solderability per ANSI-J-STD-002 Category 3                                                     |
| <b>Solder Heat Withstand</b>          | per IEC 60068-2-20, Test Tb, Section 5, Method 1a                                               |
| <b>Flammability</b>                   | per IEC 60695-11-5 Needle Flame Test for 20 seconds                                             |
| <b>Recommended Storage Conditions</b> | 40°C max, 70% RH max; Devices May Not Meet Specified Ratings if Storage Conditions are Exceeded |
| <b>Operation Temperature</b>          | -40°C to 85°C                                                                                   |

**Note:** See PS400 for other physical specifications.

#### nanoASMDC

|                          |                               |
|--------------------------|-------------------------------|
| <b>A</b> = nanoASMDC010F | <b>E</b> = nanoASMDC025F      |
| <b>B</b> = nanoASMDC012F | <b>F</b> = nanoASMDC035F      |
| <b>C</b> = nanoASMDC016F | <b>G</b> = nanoASMDC050F/13.2 |
| <b>D</b> = nanoASMDC020F |                               |

### Environmental Specifications

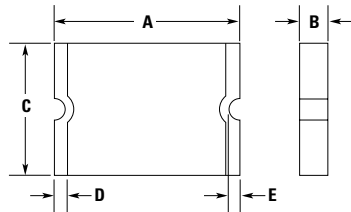
| Test                             | Conditions                                                                                                                                                        | Resistance Change                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>Passive Aging</b>             | 60°C, 1000 hrs<br>85°C, 1000 hrs                                                                                                                                  | ±3% Typical<br>±5% Typical          |
| <b>Humidity Aging</b>            | 85°C, 85% R.H., 100 hrs                                                                                                                                           | ±1.2% Typical                       |
| <b>Thermal Shock</b>             | 85°C, -40°C 20 times                                                                                                                                              | -33% Typical                        |
| <b>Solvent Resistance</b>        | Freon<br>Trichloroethane<br>Hydrocarbons                                                                                                                          | No change<br>No change<br>No change |
| <b>Moisture Resistance Level</b> | Level 2a, J-STD-020                                                                                                                                               |                                     |
| <b>Storage Conditions</b>        | 40°C max, 70% RH max; devices should remain in original sealed bags prior to use. Devices may not meet specified values if these storage conditions are exceeded. |                                     |

# Automotive nanoASMDC Series

## Surface Mount

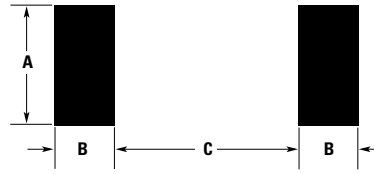
### Dimensions

Figure 1



### Recommended Pad Layout

Figure 2



| Part Number          | Dimensions in Millimeters (Inches) |                 |                 |                 |                 |                 |                 |                 | Figure           |     |
|----------------------|------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|-----|
|                      | A                                  |                 | B               |                 | C               |                 | D               |                 |                  | E   |
|                      | Min                                | Max             | Min             | Max             | Min             | Max             | Min             | Max             | Min              | Max |
| nanoASMDC – 13.2-60V |                                    |                 |                 |                 |                 |                 |                 |                 |                  |     |
| nanoASMDC010F        | 3.00<br>(0.118)                    | 3.40<br>(0.134) | 0.62<br>(0.024) | 1.00<br>(0.039) | 1.37<br>(0.054) | 1.80<br>(0.071) | 0.25<br>(0.010) | 0.75<br>(0.030) | 0.076<br>(0.003) | —   |
| nanoASMDC012F        |                                    |                 |                 |                 |                 |                 |                 |                 |                  | —   |
| nanoASMDC016F        |                                    |                 |                 |                 |                 |                 |                 |                 |                  | —   |
| nanoASMDC020F        |                                    |                 | —               |                 |                 |                 |                 |                 |                  |     |
| nanoASMDC025F        |                                    |                 | —               |                 |                 |                 |                 |                 |                  |     |
| nanoASMDC035F        |                                    |                 | —               |                 |                 |                 |                 |                 |                  |     |
| nanoASMDC050F/13.2   |                                    |                 | 0.50<br>(0.019) | 0.74<br>(0.029) |                 |                 |                 |                 |                  | —   |

### Packaging & Marking Information

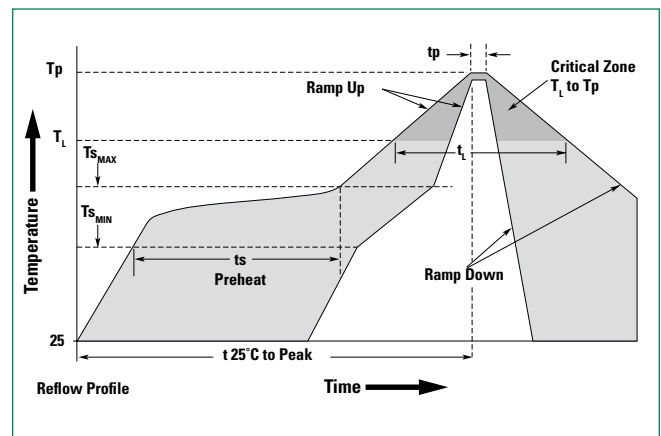
| Part Number                 | Tape & Reel Quantity | Standard Package | Part Marking | Dimension A (Min*/Nom) | Dimension B (Nom) | Dimension C (Nom) |
|-----------------------------|----------------------|------------------|--------------|------------------------|-------------------|-------------------|
| <b>nanoASMDC – 13.2-60V</b> |                      |                  |              |                        |                   |                   |
| nanoASMDC010F               | 3,000                | 15,000           | A            | 1.60 (0.063)           | 1.00 (0.039)      | 2.00 (0.079)      |
| nanoASMDC012F               | 3,000                | 15,000           | P            | 1.60 (0.063)           | 1.00 (0.039)      | 2.00 (0.079)      |
| nanoASMDC016F               | 3,000                | 15,000           | N            | 1.60 (0.063)           | 1.00 (0.039)      | 2.00 (0.079)      |
| nanoASMDC020F               | 3,000                | 15,000           | 02           | 1.60 (0.063)           | 1.00 (0.039)      | 2.00 (0.079)      |
| nanoASMDC025F               | 3,000                | 15,000           | C            | 1.60 (0.063)           | 1.00 (0.039)      | 2.00 (0.079)      |
| nanoASMDC035F               | 3,000                | 15,000           | 03           | 1.60 (0.063)           | 1.00 (0.039)      | 2.00 (0.079)      |
| nanoASMDC050F/13.2          | 3,000                | 15,000           | M            | 1.60 (0.063)           | 1.00 (0.039)      | 2.00 (0.079)      |

\* These devices are intended for use in automotive applications.

### Packaging & Marking Information

| Profile Feature                                | Pb-Free Assembly |
|------------------------------------------------|------------------|
| Average ramp up rate ( $T_{s\_MAX}$ to $T_p$ ) | 3°C/s max        |
| Preheat:                                       | -                |
| • Temperature min ( $T_{s\_MIN}$ )             | 150°C            |
| • Temperature max ( $T_{s\_MAX}$ )             | 200°C            |
| • Time ( $t_{s\_MIN}$ to $t_{s\_MAX}$ )        | 60-120 s         |
| Time maintained above:                         | -                |
| • Temperature ( $T_L$ )                        | 217°C            |
| • Time ( $t_L$ )                               | 60-150 s         |
| Peak/Classification temperature ( $T_p$ )      | 260°C            |
| Time within 5°C of actual peak temperature:    | -                |
| Time ( $t_p$ )                                 | 30 s max         |
| Ramp down rate                                 | 3°C/s max        |
| Time 25°C to peak temperature                  | 8 min max        |

Note: All temperatures refer to top side of the package, measured on the package body surface.



# Automotive nanoASMDC Series

## Surface Mount

### Solder Reflow Recommendations

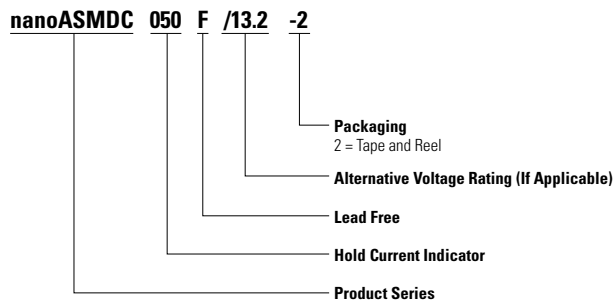
#### Solder Reflow

- Recommended reflow method: IR, hot air, nitrogen.
- Recommended maximum paste thickness: 0.25mm (0.010in)
- Devices can be cleaned using standard methods and aqueous solvents.
- Experience has shown the optimum conditions for forming acceptable solder fillets occur when a reasonable amount of solder paste is placed underneath each device's termination. As such, we request that customers comply with our recommended solder pad layouts.
- Customer should validate that the solder paste amount and reflow recommendations meet its application.
- We request that customer board layouts refrain from placing raised features (e.g. vias, nomenclature, traces, etc.) underneath PolySwitch devices. It is possible that raised features could negatively impact solderability performance of our devices.

#### Rework

- Standard industry practices. (Please also avoid direct contact to the device.)

### Part Ordering Number System



### Tape & Reel Specifications

| Description        | nanoASMDC<br>EIA 481-1 (mm)                     |                                                                       |
|--------------------|-------------------------------------------------|-----------------------------------------------------------------------|
|                    | nanoASMDC010F<br>nanoASMDC012F<br>nanoASMDC016F | nanoASMDC020F<br>nanoASMDC025F<br>nanoASMDC035F<br>nanoASMDC050F/13.2 |
| W                  | 8.0 ± 0.30                                      | 8.0 ± 0.30                                                            |
| P <sub>0</sub>     | 4.0 ± 0.10                                      | 4.0 ± 0.10                                                            |
| P <sub>1</sub>     | 4.0 ± 0.10                                      | 4.0 ± 0.10                                                            |
| P <sub>2</sub>     | 2.0 ± 0.05                                      | 2.0 ± 0.05                                                            |
| A <sub>0</sub>     | 1.95 ± 0.10                                     | 1.95 ± 0.10                                                           |
| B <sub>0</sub>     | 3.5 ± 0.1                                       | 3.50 +0.1/-0.08                                                       |
| B <sub>1 max</sub> | 4.35                                            | 4.35                                                                  |
| D <sub>0</sub>     | 1.55 ± .05                                      | 1.55 ± .05                                                            |
| F                  | 3.50 ± 0.05                                     | 3.50 ± 0.05                                                           |
| E <sub>1</sub>     | 1.75 ± 0.10                                     | 1.75 ± 0.10                                                           |
| E <sub>2 min</sub> | 6.25                                            | 6.25                                                                  |
| T max              | 0.3                                             | 0.3                                                                   |
| T <sub>1 max</sub> | 0.1                                             | 0.1                                                                   |
| K <sub>0</sub>     | 1.27 ± 0.1                                      | 0.89 ± 0.1                                                            |
| A max              | 185                                             | 185                                                                   |
| N min              | 50                                              | 50                                                                    |
| W <sub>1</sub>     | 8.4 + 1.5/-0.00                                 | 8.4 + 1.5/-0.00                                                       |
| W <sub>2 max</sub> | 14.4                                            | 14.4                                                                  |

# Automotive nanoASMDC Series

## Surface Mount

### Tape & Reel Diagrams

Figure 2

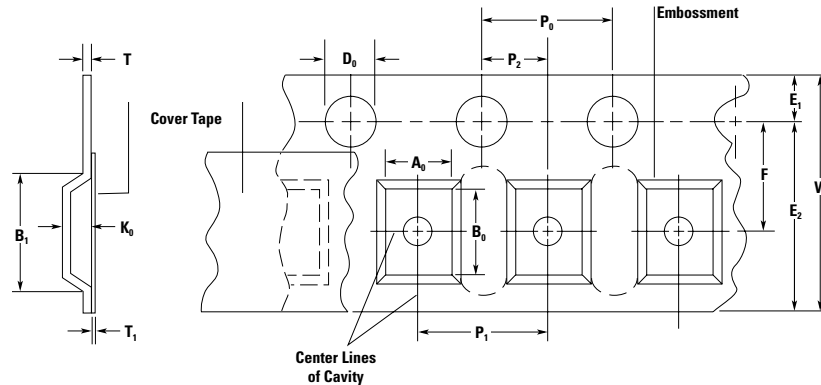
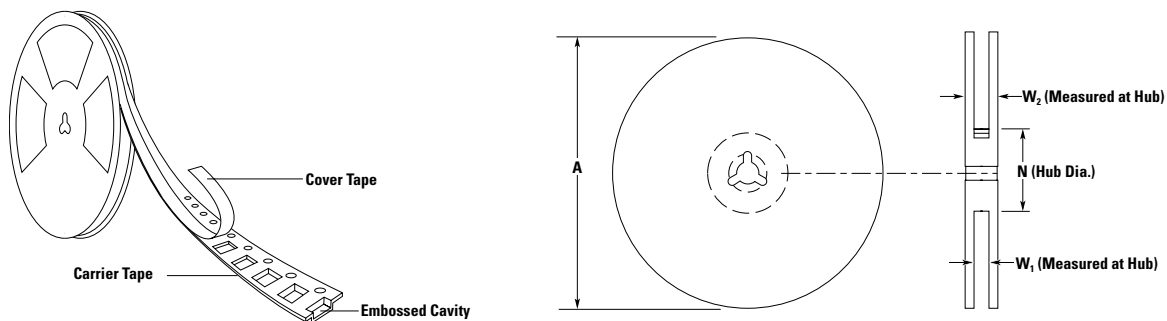


Figure 2



#### WARNING

- Users should independently evaluate the suitability of and test each product selected for their own application.
- Operation beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- These devices are intended for protection against damage caused by occasional overcurrent or overtemperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
- Contamination of the PPTC material with certain silicone-based oils or some aggressive solvents can adversely impact the performance of the devices.
- Device performance can be impacted negatively if devices are handled in a manner inconsistent with recommended electronic, thermal, and mechanical procedures for electronic components.
- PPTC devices are not recommended for installation in applications where the device is constrained such that its PTC properties are inhibited, for example in rigid potting materials or in rigid housings, which lack adequate clearance to accommodate device expansion.
- Operation in circuits with a large inductance can generate a circuit voltage ( $L di/dt$ ) above the rated voltage of the device.

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