

DATA SHEET

ANTI SURGE AND ANTI SULFURATION AUTOMOTIVE GRADE CHIP RESISTORS

AS series

0.5%, 1%, 5%, 10%, 20%

sizes 0402/0603/0805/1206/1210/2512

RoHS compliant & Halogen free



SCOPE

This specification describes AS0402 to AS1210 and AS2512 chip resistors with lead-free terminations made by thick film process.

APPLICATIONS

- Telecommunications
- Power supplies
- Car electronics

FEATURES

- AEC-Q200 qualified
- Superior to AF series in pulse withstanding voltage and surge withstanding voltage.
- MSL class: MSL 1
- Halogen free epoxy
- RoHS compliant
- Reduce environmentally hazardous waste
- High component and equipment reliability

ORDERING INFORMATION - GLOBAL PART NUMBER

Part number is identified by the series name, size, tolerance, packaging type, temperature coefficient, taping reel and resistance value.

GLOBAL PART NUMBER

AS XXXX X X X XX XXXX L
(1) (2) (3) (4) (5) (6) (7)

(1) SIZE

0402 / 0603 / 0805 / 1206 / 1210 / 2512

(2) TOLERANCE

D = ±0.5%
 F = ±1%
 J = ±5%
 K = ±10%
 M = ±20%

(3) PACKAGING TYPE

R = Paper taping reel

(4) TEMPERATURE COEFFICIENT OF RESISTANCE

- = Based on spec.

(5) TAPING REEL & POWER

07 = 7 inch dia. Reel 7W = 7 inch dia. Reel & 2 x standard power
 7T = 7 inch dia. Reel & 3 x standard power
 47 = 7 inch dia. Reel & 4 x standard power

(6) RESISTANCE VALUE

1 Ω ≤ R ≤ 4M Ω
 There are 2~4 digits indicated the resistance value. Letter R/K/M is decimal point, no need to mention the last zero after R/K/M, e.g.1K2, not 1K20.
 Detailed coding rules of resistance are shown in the table of "Resistance rule of global part number".

(7) DEFAULT CODE

Letter L is the system default code for ordering only. ^(Note)

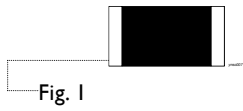
| Resistance rule of global part number | |
|---------------------------------------|--|
| Resistance coding rule | Example |
| XRXX (1 to 9.76 Ω) | 1R = 1 Ω 1R5 = 1.5 Ω 9R76 = 9.76 Ω |
| XXRX (10 to 97.6 Ω) | 10R = 10 Ω 97R6 = 97.6 Ω |
| XXXR (100 to 976 Ω) | 100R = 100 Ω |
| XKXX (1 to 9.76 KΩ) | 1K = 1,000 Ω 9K76 = 9760 Ω |
| XXKX (10 to 97.6 KΩ) | 10K = 10,000 Ω 97K6 = 976,000 Ω |
| XXXK (100 KΩ) | 100K = 100,000 Ω |

ORDERING EXAMPLE

The ordering code for an AS0805 chip resistor, value 10 KΩ with ±5% tolerance, supplied in 7-inch tape reel is: AS0805JR-0710KL.

MARKING

AS0402

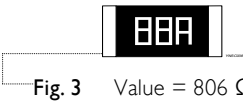


No Marking

AS0603

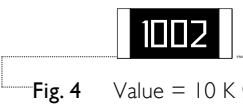


1%, 0.5%, E24 exception values 10/11/13/15/20/75 of E24 series



1%, 0.5%, E96 refer to EIA-96 marking method, including values 10/11/13/15/20/75 of E24 series

AS0805 / 1206 / 1210 / 2512



Both E-24 and E-96 series: 4 digits, ±0.5% & ±1%
 First three digits for significant figure and 4th digit for number of zeros

NOTE

For further marking information, please refer to data sheet “Chip resistors marking”.

TAPING REEL & POWER

Table I

| TYPE | POWER, W (P70) | | | |
|------|----------------|-----|-----|-----|
| | CODING | | | |
| | 07 | 7W | 7T | 47 |
| 0402 | 1/16 | 1/8 | 1/5 | 1/4 |
| 0603 | 1/10 | 1/5 | 1/4 | 1/3 |
| 0805 | 1/8 | 1/4 | 1/3 | 1/2 |
| 1206 | 1/4 | 1/2 | 3/4 | 1 |
| 1210 | 1/2 | 1 | - | - |
| 2512 | 1 | 2 | 3 | - |

CONSTRUCTION

The resistor is constructed on top of a high-grade ceramic body. Internal metal electrodes are added at each end and connected by a resistive glaze. The resistive glaze is covered by a lead-free glass. The composition of the glaze is adjusted to give the approximately required resistance value. The whole element is covered by a protective overcoat. The top of overcoat is marked with the resistance value. Finally, the two external terminations (Ni/matte tin) are added, as shown in Fig. 5.

OUTLINES

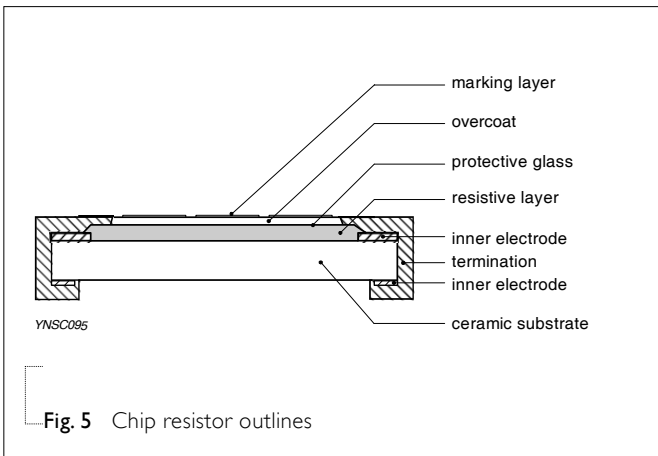


Fig. 5 Chip resistor outlines

DIMENSIONS

Table 2

| TYPE | L (mm) | W (mm) | H (mm) | l ₁ (mm) | l ₂ (mm) |
|--------|-----------|-----------|-----------|---------------------|---------------------|
| AS0402 | 1.00±0.05 | 0.50±0.05 | 0.35±0.05 | 0.20±0.10 | 0.25±0.10 |
| AS0603 | 1.60±0.10 | 0.80±0.10 | 0.45±0.10 | 0.25±0.15 | 0.25±0.15 |
| AS0805 | 2.00±0.10 | 1.25±0.10 | 0.50±0.10 | 0.35±0.20 | 0.35±0.20 |
| AS1206 | 3.10±0.10 | 1.60±0.10 | 0.55±0.10 | 0.45±0.20 | 0.45±0.20 |
| AS1210 | 3.10±0.10 | 2.60±0.15 | 0.55±0.10 | 0.45±0.15 | 0.50±0.20 |
| AS2512 | 6.35±0.10 | 3.10±0.15 | 0.57±0.10 | 0.60±0.20 | 2.50±0.25 |

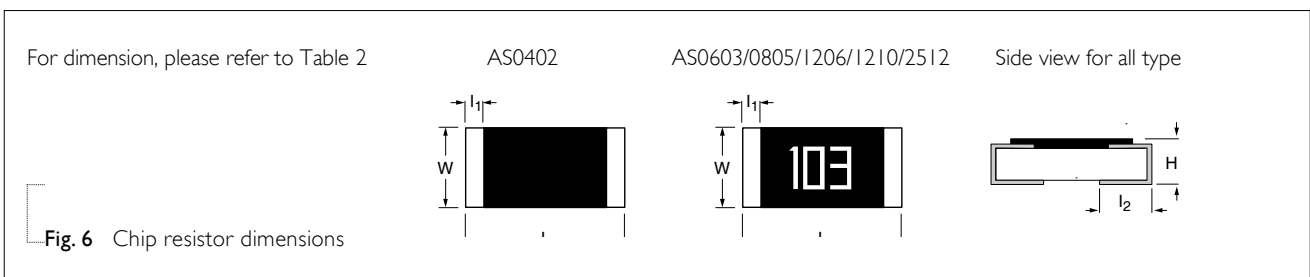


Fig. 6 Chip resistor dimensions

ELECTRICAL CHARACTERISTICS

Table 3

| TYPE | POWER | RESISTANCE RANGE | CHARACTERISTICS | | | | | |
|--------|-------|--------------------------------------|-----------------------------|----------------------|-----------------------|---------------------------------|---------------------------------------|---|
| | | | Operating Temperature Range | Max. Working Voltage | Max. Overload Voltage | Dielectric Withstanding Voltage | Temperature Coefficient of Resistance | |
| AS0402 | 1/16W | | | | 75V | 100V | 100V | |
| | 1/8W | | | | | | | |
| | 1/5W | | | | | | | |
| | 1/4W | | | | | | | |
| AS0603 | 1/10W | | | | 150V | 300V | 300V | |
| | 1/5W | | | | | | | |
| | 1/4W | | | | | | | |
| | 1/3W | | | | | | | |
| AS0805 | 1/8W | E24 5%, 10%, 20% E24/E96 0.5%, 1% | -55 °C to +155 °C | | 500V | 1000V | 1000V | 1Ω ≤ R ≤ 10Ω ±200 ppm°C 10Ω < R ≤ 4MΩ ±100 ppm°C |
| | 1/4W | | | | | | | |
| | 1/3W | | | | | | | |
| | 1/2W | | | | | | | |
| AS1206 | 1/4W | 1Ω ≤ R ≤ 4MΩ for 2512 | | | 500V | 1000V | 1000V | |
| | 1/2W | | | | | | | |
| | 3/4W | | | | | | | |
| | 1W | | | | | | | |
| AS1210 | 1/2W | | | | 500V | 1000V | 1000V | |
| | 1W | | | | | | | |
| | 1W | | | | | | | |
| AS2512 | 1W | | | | 500V | 1000V | 1000V | |
| | 2W | | | | | | | |
| | 3W | | | | | | | |

FOOTPRINT AND SOLDERING PROFILES

Recommended footprint and soldering profiles, please refer to data sheet “Chip resistors mounting”.

PACKING STYLE AND PACKAGING QUANTITY

Table 4 Packing style and packaging quantity

| PACKING STYLE | REEL DIMENSION | AS0402 | AS0603/0805/1206/1210 | AS2512 |
|--------------------------|----------------|--------|-----------------------|--------|
| Paper taping reel (R) | 7" (178 mm) | 10,000 | 5,000 | - |
| Embossed taping reel (K) | 7" (178 mm) | - | - | 4,000 |

NOTE

1. For paper/embossed tape and reel specification/dimensions, please refer to data sheet “Chip resistors packing”.

FUNCTIONAL DESCRIPTION**OPERATING TEMPERATURE RANGE**

Range: -55 °C to +155 °C

POWER RATING

Each type rated power at 70 °C:

AS0402: 1/16W, 1/8W, 1/5W, 1/4W

AS0603: 1/10W, 1/5W, 1/4W, 1/3W

AS0805: 1/8W, 1/4W, 1/3W, 1/2W

AS1206: 1/4W, 1/2W, 3/4W, 1W

AS1210: 1/2W, 1W

AS2512: 1W, 2W, 3W

RATED VOLTAGE

The DC or AC (rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$V = \sqrt{(P \times R)}$$

or max. working voltage whichever is less

Where

V = Continuous rated DC or AC (rms) working voltage (V)

P = Rated power (W)

R = Resistance value (Ω)

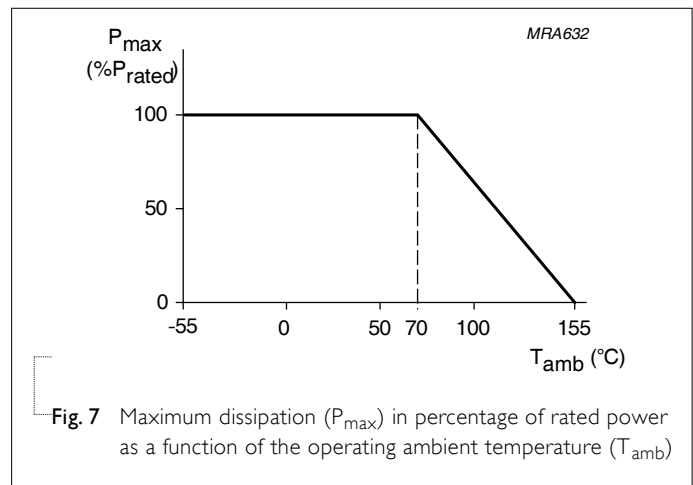
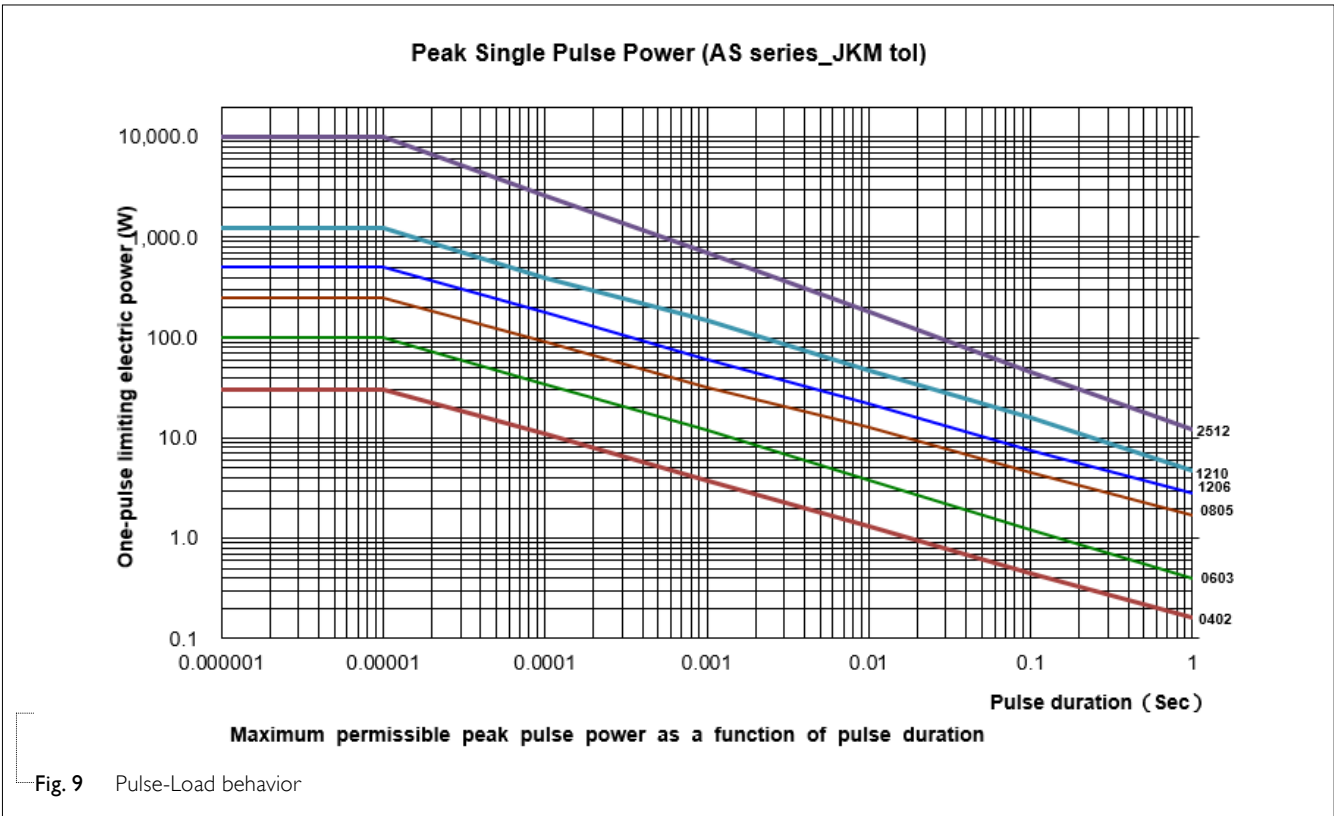
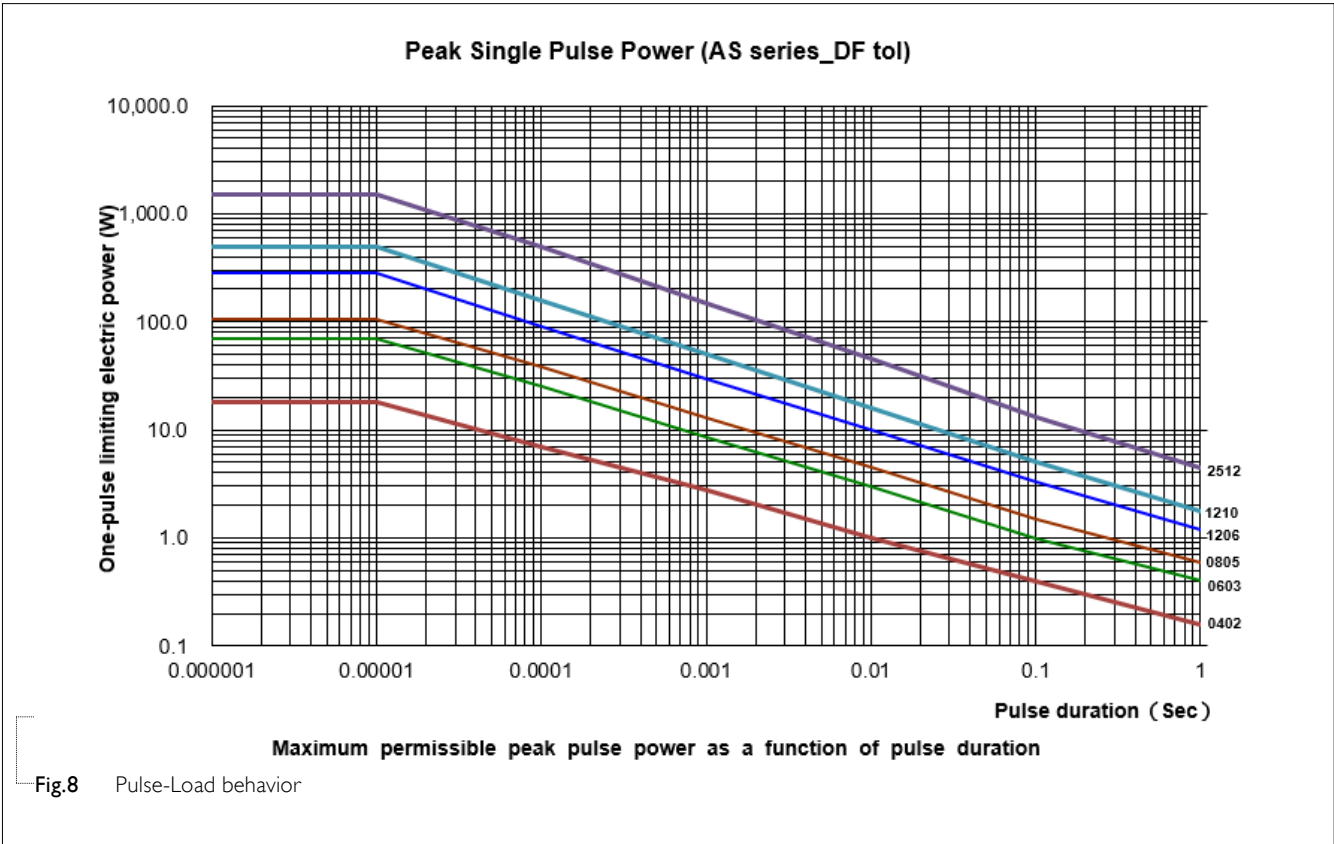


Fig. 7 Maximum dissipation (P_{max}) in percentage of rated power as a function of the operating ambient temperature (T_{amb})

PULSE LOAD BEHAVIOR



TESTS AND REQUIREMENTS

Table 5 Test condition, procedure and requirements

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|------------------------------|--|--|---|
| High Temperature Exposure | AEC-Q200 Test 3 MIL-STD-202 Method 108 | 1,000 hours at $T_A = 155\text{ °C}$, unpowered | $\pm(1.0\%+0.05\Omega)$ for D/F tol $\pm(2.0\%+0.05\Omega)$ for J tol |
| Moisture Resistance | MIL-STD-202 Method 106 | Each temperature / humidity cycle is defined at 8 hours, 3 cycles / 24 hours for 10d. with 25 °C / 65 °C 95% R.H, without steps 7a & 7b, unpowered | $\pm(0.5\%+0.05\Omega)$ for D/F tol $\pm(2.0\%+0.05\Omega)$ for J tol |
| Biased Humidity | AEC-Q200 Test 7 MIL-STD-202 Method 103 | 1,000 hours; 85 °C / 85% RH 10% of operating power Measurement at 24 ± 4 hours after test conclusion. | $\pm(1.0\%+0.05\Omega)$ for D/F tol $\pm(3.0\%+0.05\Omega)$ for J tol |
| Operational Life | AEC-Q200 Test 8 MIL-STD-202 Method 108 | 1,000 hours at 125 °C , derated voltage applied for 1.5 hours on, 0.5 hour off, still-air required | $\pm(1.0\%+0.05\Omega)$ for D/F tol $\pm(3.0\%+0.05\Omega)$ for J tol |
| Resistance to Soldering Heat | AEC-Q200 Test 15 MIL-STD-202 Method 210 | Condition B, no pre-heat of samples Lead-free solder, $260\pm 5\text{ °C}$, 10 ± 1 seconds immersion time Procedure 2 for SMD: devices fluxed and cleaned with isopropanol | $\pm(0.5\%+0.05\Omega)$ for D/F tol $\pm(1.0\%+0.05\Omega)$ for J tol No visible damage |
| Thermal Shock | MIL-STD-202 Method 107 | $-55/+125\text{ °C}$ Number of cycles is 300. Devices mounted Maximum transfer time is 20 seconds. Dwell time is 15 minutes. Air – Air | $\pm(0.5\%+0.05\Omega)$ for D/F tol $\pm(1.0\%+0.05\Omega)$ for J tol |
| ESD | AEC-Q200 Test 17 AEC-Q200-002 | Human Body Model, $I_{pos.} + I_{neg.}$ discharges 0201: 500V 0402/0603: 1KV 0805 and above: 2KV | $\pm(3.0\%+0.05\Omega)$ |

| TEST | TEST METHOD | PROCEDURE | REQUIREMENTS |
|--|----------------------------------|---|--|
| Solderability - Wetting | AEC-Q200 Test 18 J-STD-002 | Electrical Test not required Magnification 50X SMD conditions: (a) Method B, aging 4 hours at 155 °C dry heat, dipping at 235±3 °C for 5±0.5 seconds. (b) Method B, steam aging 8 hours, dipping at 215±3 °C for 5±0.5 seconds. (c) Method D, steam aging 8 hours, dipping at 260±3 °C for 30±0.5 seconds. | Well tinned (≥95% covered) No visible damage |
| Board Flex | AEC-Q200 Test 21 AEC-Q200-005 | Chips mounted on a 100mm x 40mm glass epoxy resin PCB (FR4) Bending for 0201/0402: 5 mm 0603/0805: 3 mm 1206 and above: 2 mm Holding time: minimum 60 seconds | ±(1.0%+0.05Ω) |
| Temperature Coefficient of Resistance (T.C.R.) | MIL-STD-202 Method 304 | At +25/-55 °C and +25/+125 °C Formula: $T.C.R = \frac{R_2 - R_1}{R_1(t_2 - t_1)} \times 10^6 \text{ (ppm/°C)}$ Where t ₁ =+25 °C or specified room temperature t ₂ =-55 °C or +125 °C test temperature R ₁ =resistance at reference temperature in ohms R ₂ =resistance at test temperature in ohms | Refer to table 3 |
| Short Time Overload | IEC60115-1 8.1 | 2.5 times of rated voltage or maximum overload voltage whichever is less for 5 sec at room temperature | ±(1.0%+0.05Ω) for D/F tol ±(2.0%+0.05Ω) for J tol |
| FOS | ASTM-B-809-95* * Modified | Sulfur 750 hours, 105 °C, unpowered | ± (4.0%+0.05Ω) |

REVISION HISTORY

| REVISION | DATE | CHANGE NOTIFICATION | DESCRIPTION |
|-----------|---------------|---------------------|---|
| Version 6 | Feb. 03, 2026 | - | - Add size 1210 |
| Version 5 | Jul. 10, 2025 | - | - Add 1W for 1206 |
| Version 4 | Jun. 10, 2025 | - | - Add 2512 |
| Version 3 | Nov. 06, 2024 | - | - Add 0402, - Upgrade the voltage to 150V of 0603 and add 1/3W - Upgrade the voltage to 500V of 0805 and 1206 |
| Version 2 | Aug. 03, 2022 | - | - l2 dimension updated, for size 1206. |
| Version 1 | Apr. 08, 2021 | - | - Upgrade to Automotive Grade |
| Version 0 | Nov. 30, 2020 | - | - New product datasheet |

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