

Kunde / customer :
 Artikelnummer / part number : 820 512 511

Datum / Date : 2006-06-28

Bezeichnung :
 description : STANDARD VARISTOR DISC

DIAM: 10 MM

ROHS Compliant

A Elektrische Eigenschaften / electrical properties :

TECHNICAL DATA

| Part Number | Breakdown Voltage | Tolerance | Working Voltage | | Clamping Voltage | Current Clamp. Volt. | Peak Current Withstanding C. |
|-------------|-------------------|-----------|-----------------|-----|------------------|----------------------|------------------------------|
| | (V@mA) (*1) | | (%) | AC | | | |
| 820512511 | 390 | 10 | 250 | 320 | 650 | 25 | 2500 |

- * 1 The varistor voltage was measured at 0.1 mA current for 5 mm diameter and 1 mA current for other
- * 2 The Clamping voltage measured at "Current Clamping Voltage" see next column
- * 3 The Peak Current was tested at 8/20 us waveform for 1 time

| Part Number | Rated Wattage | Energy | Capacitance | UL | Certification | | Diameter |
|-------------|---------------|--------|-------------|-----|---------------|---------|----------|
| | (W) | | | | J (*4) | pF (*5) | |
| 820512511 | 0.4 | 60.0 | 210 | yes | yes | yes | 10 |

- * 4. The Energy measured at 10/1000 µs waveform for 1 time
- * 5. The capacitance value measured at standard frequency @ 1kHz
- * 6. Certification UL N° XUHT2.E244196
- * 7. Certification CSA N° XUHT8.E244196
- * 8. Certification VDE N° 40016998 & 40016986

SURGE LEVEL IEC61000-4-5

| Severity Level | (kV) |
|----------------|---------|
| 1 | 0,5 |
| 2 | 1 |
| 3 | 2 |
| 4 | 4 |
| X | Special |

Wave shape "Short circuit" (Current I_{sc})



| Wave during | T1 | T2 |
|-----------------|-------|---------|
| 8/20 µs | 10 µs | 1000 µs |
| 10/700 µs CCITT | 10 µs | 700 µs |
| 10/1000 µs | 10 µs | 1000 µs |

ORDER CODE

820

MARKING CODE

X X XXX X

S

Varistor Type

Serie

Diameter

Vrms Voltage

Tolerance

Other

Special Type

Disc Varistor

5 = Standard
4 = High Surge

5 = 5 mm
7 = 7 mm
1 = 10 mm
4 = 14 mm
2 = 20 mm

Example:
180 = 18 V
271 = 270 V
102 = 1 000 V

5 = 5%
1 = 10%
6 = 15%
2 = 20%
7 = 25%
3 = 30%

Lead Diameter See Table
Lead Pitch See Table
Lead Style Straight lead
Packing Ammopack with lead 20 mm

Kunde / customer :

Artikelnummer / part number : **820512511**

Bezeichnung :

description : **STANDARD VARISTOR DISC**

DIAM: **10** MM

B Mechanische Abmessungen / dimensions :

SIZE

| Diameter* | Ø 5 | Ø 7 | Ø 10 | Ø 14 | Ø 20 |
|-----------|-----|-----|---------|----------|----------|
| D max. | 7,5 | 9,0 | 12,5 | 16,5 | 23,0 |
| d +/-0,05 | 0,6 | 0,6 | 0,6/0,8 | 0,8/1,0 | 0,8/1,0 |
| F +/-1,0 | 5,0 | 5,0 | 5,0/7,5 | 7,5/10,0 | 7,5/10,0 |
| H max. | 11 | 13 | 18 | 22 | 28 |
| H1 max | 3,5 | 3,5 | 5,0 | 5,0 | 5,0 |
| L1 min. | 25 | 25 | 25 | 25 | 25 |
| L min. | 24 | 24 | 24 | 24 | 24 |

(mm) - *Disc diameter before epoxy



Table of T max., A & P₁. Unit : (mm)

| Voltage Code | Ø 5 | | | Ø 7 | | | Ø 10 | | | Ø 14 | | | Ø 20 | | |
|--------------|-------|----------|----------------|-------|----------|----------------|-------|----------|----------------|-------|----------|----------------|-------|----------|----------------|
| | T max | A +/-0,8 | P ₁ | T max | A +/-0,8 | P ₁ | T max | A +/-0,8 | P ₁ | T max | A +/-0,8 | P ₁ | T max | A +/-0,8 | P ₁ |
| 180 | 4,5 | 1,4 | 3,0 | 4,5 | 1,4 | 3,0 | 4,9 | 1,4 | 3,0 | 5,0 | 1,5 | 3,0 | 5,2 | 1,5 | 3,0 |
| 220 | 4,5 | 1,5 | 3,0 | 4,5 | 1,5 | 3,0 | 4,9 | 1,5 | 3,0 | 5,0 | 1,6 | 3,0 | 5,3 | 1,6 | 3,0 |
| 270 | 4,7 | 1,5 | 3,0 | 4,7 | 1,5 | 3,0 | 5,1 | 1,5 | 3,0 | 5,2 | 1,7 | 3,0 | 5,4 | 1,7 | 3,0 |
| 330 | 4,7 | 1,6 | 3,0 | 4,7 | 1,6 | 3,0 | 5,1 | 1,6 | 3,0 | 5,2 | 1,8 | 3,0 | 5,4 | 1,8 | 3,0 |
| 390 | 4,7 | 1,8 | 3,0 | 4,7 | 1,8 | 3,0 | 5,1 | 1,8 | 3,0 | 5,2 | 2,0 | 3,0 | 5,4 | 2,0 | 3,0 |
| 470 | 5,0 | 1,8 | 3,0 | 5,0 | 1,8 | 3,0 | 5,5 | 1,8 | 3,0 | 5,6 | 2,0 | 3,0 | 5,6 | 2,0 | 3,0 |
| 560 | 5,0 | 2,0 | 3,0 | 5,0 | 2,0 | 3,0 | 5,5 | 2,0 | 3,0 | 5,6 | 2,2 | 3,0 | 5,6 | 2,2 | 3,0 |
| 680 | 5,5 | 2,3 | 3,0 | 5,5 | 2,3 | 3,0 | 6,0 | 2,3 | 3,0 | 6,1 | 2,5 | 3,0 | 6,1 | 2,5 | 3,0 |
| 820 | 3,8 | 1,4 | 3,0 | 3,8 | 1,4 | 3,0 | 4,3 | 1,4 | 3,0 | 4,4 | 1,6 | 3,0 | 4,9 | 1,8 | 3,0 |
| 101 | 3,9 | 1,4 | 3,0 | 3,9 | 1,4 | 3,0 | 4,4 | 1,4 | 3,0 | 4,5 | 1,6 | 3,0 | 5,1 | 1,8 | 3,0 |
| 121 | 4,1 | 1,5 | 3,0 | 4,1 | 1,5 | 3,0 | 4,5 | 1,5 | 3,0 | 4,6 | 1,7 | 3,0 | 5,3 | 1,9 | 3,0 |
| 151 | 4,5 | 1,8 | 3,0 | 4,5 | 1,8 | 3,0 | 4,9 | 1,8 | 3,0 | 5,1 | 2,0 | 3,0 | 5,6 | 2,2 | 3,0 |
| 181 | 4,1 | 1,6 | 3,0 | 4,1 | 1,6 | 3,0 | 4,5 | 1,6 | 3,0 | 4,7 | 1,8 | 3,0 | 5,2 | 2,0 | 3,0 |
| 201 | 4,2 | 1,6 | 3,0 | 4,2 | 1,6 | 3,0 | 4,6 | 1,6 | 3,0 | 4,8 | 1,8 | 3,0 | 5,3 | 2,0 | 3,0 |
| 221 | 4,3 | 1,7 | 3,0 | 4,3 | 1,7 | 3,0 | 4,7 | 1,7 | 3,0 | 4,9 | 1,9 | 3,0 | 5,4 | 2,1 | 3,0 |
| 241 | 4,4 | 1,7 | 3,0 | 4,4 | 1,9 | 3,0 | 4,8 | 1,9 | 3,0 | 5,0 | 2,1 | 3,0 | 5,5 | 2,3 | 3,0 |
| 271 | 4,6 | 1,9 | 3,0 | 4,6 | 2,0 | 3,0 | 5,0 | 2,0 | 3,0 | 5,2 | 2,1 | 3,0 | 5,7 | 2,5 | 3,0 |
| 301 | 4,8 | 1,9 | 3,0 | 4,8 | 2,1 | 3,0 | 5,2 | 2,2 | 3,0 | 5,4 | 2,3 | 3,0 | 5,9 | 2,7 | 3,0 |
| 331 | 4,9 | 1,9 | 3,0 | 4,9 | 2,1 | 3,0 | 5,3 | 2,2 | 3,0 | 5,5 | 2,3 | 3,0 | 6,0 | 2,7 | 3,0 |
| 361 | 5,1 | 2,4 | 3,0 | 5,1 | 2,5 | 3,0 | 5,5 | 2,5 | 3,0 | 5,7 | 2,7 | 3,0 | 6,2 | 2,9 | 3,0 |
| 391 | 5,3 | 2,6 | 3,5 | 5,3 | 2,6 | 3,5 | 5,7 | 2,8 | 3,5 | 5,9 | 2,8 | 3,5 | 6,4 | 3,0 | 3,5 |
| 431 | 6,1 | 2,7 | 3,5 | 6,1 | 2,9 | 3,5 | 6,5 | 3,1 | 3,5 | 6,7 | 3,1 | 3,5 | 7,2 | 3,3 | 3,5 |
| 471 | 6,4 | 2,8 | 3,5 | 6,4 | 2,9 | 3,5 | 6,8 | 3,2 | 3,5 | 7,0 | 3,3 | 3,5 | 7,5 | 3,5 | 4,0 |
| 511 | 6,6 | 3,1 | 4,0 | 6,6 | 3,1 | 4,0 | 7,0 | 3,7 | 4,0 | 7,2 | 3,7 | 4,0 | 7,7 | 3,9 | 4,0 |
| 561 | 6,9 | 3,4 | 4,0 | 6,9 | 3,4 | 4,0 | 7,3 | 4,0 | 4,0 | 7,5 | 4,0 | 4,0 | 8,0 | 4,2 | 4,0 |
| 621 | 7,2 | 3,7 | 4,0 | 7,2 | 3,7 | 4,0 | 7,6 | 4,6 | 4,0 | 7,8 | 4,4 | 4,0 | 8,3 | 4,7 | 4,0 |
| 681 | 7,5 | 4,0 | 4,0 | 7,5 | 4,0 | 4,0 | 8,0 | 5,0 | 4,0 | 8,2 | 4,7 | 4,0 | 8,7 | 5,0 | 4,0 |
| 751 | 7,9 | 4,3 | 4,0 | 7,9 | 4,3 | 4,0 | 8,4 | 5,0 | 4,0 | 8,6 | 4,9 | 4,0 | 9,1 | 5,1 | 4,0 |
| 781 | | | | 8,1 | 4,5 | 4,0 | 8,6 | 5,2 | 4,0 | 8,8 | 5,2 | 4,0 | 9,3 | 5,4 | 4,0 |
| 821 | | | | 8,3 | 4,7 | 4,0 | 8,8 | 5,2 | 4,0 | 9,0 | 5,2 | 4,0 | 9,5 | 5,4 | 4,0 |
| 911 | | | | | | | 9,4 | 6,0 | 4,0 | 9,6 | 6,0 | 4,0 | 10,1 | 6,3 | 4,0 |
| 102 | | | | | | | 9,9 | 6,0 | 4,0 | 10,1 | 6,2 | 4,0 | 10,7 | 6,4 | 4,0 |
| 112 | | | | | | | 10,5 | 6,3 | 4,0 | 10,7 | 6,7 | 4,0 | 11,2 | 6,9 | 4,0 |
| 182 | | | | | | | 12,6 | 9,8 | 6,0 | 12,8 | 10,2 | 6,0 | 13,5 | 10,4 | 6,0 |

Kunde / customer :

Artikelnummer / part number : **820512511**

Bezeichnung :

description : **STANDARD VARISTOR DISC**DIAM: **10** MM**C Lötpad / soldering spec. :**

MARKING

Würth Elektronik

Characteristic

Certification

Date Code



GENERAL CHARACTERISTICS

| | |
|--------------------------------------|--------------------|
| Storage temperature : | -40 / +125°C |
| Max. reponse time : | 25 n sec |
| Max. operating temperature : | -40 / +125°C |
| Temp. Coefficient of voltage : | 0 - 0.05% / °C max |
| Max. working surface temperature : | +115°C |
| Insulation resistance (at DC 500V) : | Over 1000 Mohm |

LEAD FREE SOLDERING

| | |
|--------------------------|------------------|
| Solder | Tin 100% |
| Soldering temperature at | 255°C +/-5 °C |
| Profile soldering | 270°C during 10s |

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<http://www.we-online.com>

Kunde / customer :

Artikelnummer / part number : **820512511**

Bezeichnung :

description : **STANDARD VARISTOR DISC** DIAM: **10** MM

D Rollenspezifikation / tape and reel specification :

TAPE 1/2" pitch



1.0" pitch



| Item | Ø 5 / 7 | Ø 10 | Ø 10 / 14 / 20 | Ø 14 / 20 |
|-------------------------|----------------------|------------|-----------------------|----------------------|
| Taping pitch | 1/2" | | 1.0" | |
| l | 1,1 mm maxi. | | 1,1 mm maxi. | |
| H ₁ (type 2) | 3,5 mm maxi. | 5 mm maxi. | 5 mm maxi. | |
| H ₀ (type 2) | 16 +/-0,5 mm | | 16 +/-0,5 mm | |
| H ₀ (type 1) | 16 à 21 mm | | 16 à 21 mm | |
| h | +/-2 mm | | +/-2 mm | |
| W | 18 mm +1 / - 0,5 mm | | 18 mm +1 / - 0,5 mm | |
| W ₀ | 10 mm | | 12 mm | |
| W ₁ | 9 mm +0,75 / -0,5 mm | | 9 mm +0,75 / -0,5 mm | |
| W ₂ | 3 mm maxi. | | 3 mm maxi. | |
| F | 5 mm +0,8 / -0,2 mm | | 7,5 mm +0,8 / -0,2 mm | 10 mm +0,8 / -0,2 mm |
| P | 12,7 mm +/-1 mm | | 25,4 mm +/-1 mm | |
| P ₀ | 12,7 mm +/-0,3 mm | | 12,7 mm +/-0,3 mm | |
| P ₁ | 3,85 mm +/-0,7 mm | | 8,95 mm +/-0,7 mm | 7,7 mm +/-0,7 mm |
| P ₂ | 6,35 mm +/-1,3 mm | | 12,7 mm +/-1,3 mm | |
| D ₀ | 4 mm +/-0,2 mm | | 4 mm +/-0,2 mm | |
| d | 0,6 mm +/-0,05 mm | | 0,8 mm +/-0,05 mm | 1,0 mm +/-0,05 mm |
| T | See T max. table | | See T max. table | |
| t ₁ | 0,7 mm +/-0,05 mm | | 0,6 mm +/-0,05 mm | |
| t ₂ | 1,6 mm maxi. | | 1,8 mm maxi. | |

Kunde / customer :

Artikelnummer / part number : **820512511**

Bezeichnung :

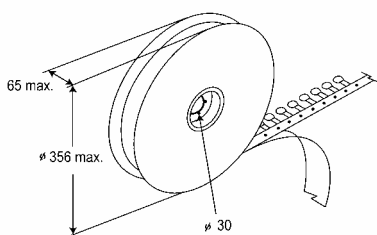
description : **STANDARD VARISTOR DISC**

DIAM: **10** MM

D Rollenspezifikation / tape and reel specification :

REEL DIMENSION

(Unit : mm)



Lead Free "LF" Marking

QUANTITY PER PACKING UNIT

| Diameter | Ø 5 | | | Ø 7 | | | Ø 10 | | | | Ø 14 | | | Ø 20 | | |
|---------------|-------|------|------|-------|------|------|-------|------|-------------------|------|-------|------|------|-------|------|------|
| | Bulk | Reel | Ammo | Bulk | Reel | Ammo | Bulk | Reel | Ammo | Ammo | Bulk | Reel | Ammo | Bulk | Reel | Ammo |
| Voltage Serie | (Box) | | | (Box) | | | (Box) | | Pitch 7,5 Pitch 5 | | (Box) | | | (Box) | | |
| 180 à 470 | 5000 | 1500 | 1500 | 5000 | 1500 | 1500 | 2500 | 1000 | 500 | 1000 | 1500 | 750 | 500 | 750 | 500 | 500 |
| 560 à 680 | 5000 | 1500 | 1500 | 5000 | 1500 | 1500 | 2500 | 1000 | 500 | 1000 | 1500 | 750 | 500 | 750 | 500 | 500 |
| 820 à 331 | 5000 | 1500 | 1500 | 5000 | 1500 | 1500 | 2500 | 1000 | 500 | 1000 | 1500 | 750 | 500 | 750 | 500 | 500 |
| 361 à 391 | 5000 | 1500 | 1000 | 5000 | 1500 | 1000 | 2500 | 1000 | 500 | 1000 | 1500 | 750 | 500 | 750 | 500 | 500 |
| 431 à 471 | 5000 | 1500 | 1000 | 5000 | 1000 | 1000 | 2500 | 750 | 500 | 750 | 1500 | 750 | 500 | 750 | 500 | 500 |
| 511 à 751 | 4000 | 1000 | 1000 | 4000 | 1000 | 1000 | 1500 | 500 | 500 | 500 | 750 | 500 | 500 | 450 | 500 | 500 |
| 781 à 182 | - | - | - | - | - | - | 1500 | 500 | 500 | 500 | 750 | 500 | 500 | 450 | 500 | 500 |

QUANTITY PER CARTON UNIT

| Packaging | Bulk (Box) | Reel | Reel Ø 14 / 20 | Ammopack | Ammo Ø 14 / 20 |
|-----------------|-----------------|--------------------|-----------------|-----------------|-----------------|
| Box size | 290 x 155 x 110 | 350 x 350 x 108 | 350 x 350 x 74 | 330 x 240 x 45 | 350 x 260 x 65 |
| Carton size | 310 x 328 x 250 | 371 x 371 x 590 | 370 x 370 x 468 | 354 x 515 x 258 | 365 x 535 x 275 |
| One carton with | 4 boxes | 5 boxes (10 reels) | 6 boxes | 10 boxes | 8 boxes |
| Unit:(mm) | | | | | |

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Kunde / customer :
 Artikelnummer / part number : 820 512 511
 Bezeichnung :
 description : STANDARD VARISTOR DISC DIAM: 10 MM

E Testbedingungen / test conditions :

BASIC TEST AND ENVIRONMENTAL RELIABILITY TEST

| | | | | | | | | | | | | | | | |
|---|--|-------------------|----------------------------------|------------|-------------------------------|------------|---|-------------------|---------------------------------|----------------|--------------|-----------------|--------------|-----------------|--------------|
| <p>Humidity The specimen shall be subjected to 40+/-2°C, 90 to 95% R.H. For 1000 hours without load and then stored at room temperature and normal humidity for 1 to 2 hours. Thereafter, the change of Vn shall be measured and meet the requirement of: $\Delta Vn/Vn \leq \pm 5\%$</p> <p>Impulse life The impulse current listed on catalog is applied 1000 times continuously with the interval of 30 seconds at room temperature. The change of Vn shall be measured $\Delta Vn/Vn \leq \pm 10\%$</p> <p>Low temperature The specimen shall be subjected to 40 ±2°C without load for 1000 hours and then stored at room temperature and normal humidity for 1 to 2 hours. Thereafter, the change of Vn shall be measured and meet the requirement of $\Delta Vn/Vn \leq \pm 5\%$.</p> <p>High temperature load After being continuously applied the maximum allowable Voltage at 85 ±2°C for 1000 hours, the specimen shall be stored at room temperature and humidity for 1 to 2 hours. The change of Vn shall be measured and meet the requirement of $Vn/Vn \leq \pm 10\%$.</p> <p>High temperature storage The specimen shall be subjected to 125 ±1°C for 1000 hours. In a drying oven without load stored at room temperature and humidity for 1 to 2 hours. The change of Vn shall be measured and meet the requirement of $\Delta Vn/Vn \leq \pm 5\%$.</p> <p>Withstanding Voltage The specified voltage shall be applied between both terminals of the specimen connected together for 1 minute, with no remarkable mechanical damage.</p> <p>Withstanding Voltage (Body Insulation)</p> <table border="1"> <tr> <td>Classification (Nom. varistor voltage)</td> <td>Test Voltage (AC)</td> </tr> <tr> <td>$V_{0,1mA} - V_{1mA} \leq 330 V$</td> <td>1 000 Vrms</td> </tr> <tr> <td>$V_{0,1mA} - V_{1mA} > 330 V$</td> <td>1 500 Vrms</td> </tr> </table> | Classification (Nom. varistor voltage) | Test Voltage (AC) | $V_{0,1mA} - V_{1mA} \leq 330 V$ | 1 000 Vrms | $V_{0,1mA} - V_{1mA} > 330 V$ | 1 500 Vrms | <p>Terminal bending strength The unit shall be secured with its terminal kept vertical and the weight specified above shall be applied in the axial direction. The terminal shall gradually be bent 90° in one direction, then 90° in the opposite direction, and again back to the original position. A bend of lead wire shall be repeated 2 times, with no remarkable mechanical damage. Loading weight in bending strength 5N (0.51Kg) 5N (0.51Kg) 10N (1.02Kg)</p> <p>Vibration Subjected to simple harmonic motion of 0.75 mm amplitude 1.5 mm maximum total excursion between limits of 10-55 Hz. Frequency scan shall be traversed in one minute. This motion shall then be applied for period of 2 hours in each of three mutually perpendicular directions, with no remarkable mechanical damage.</p> <p>Solderability After dipping the terminal to a depth of approximately 3mm from the body in a soldering bath of 235 ±5°C for 2 ±0.5 seconds, the terminal shall be visually examined. Approximately 95% of the terminals shall be covered with new solder uniformly.</p> <p>Resistance to soldering heat The terminal shall be dipped into a soldering bath with temperature of 260 ±5°C to a point of 2~2.5 mm from the body of the unit, be held there for 10 ±1 sec (5N series: 5 ±1 sec) and then be stored at room temperature and humidity for 1 to 2 hours. The change of Vn shall be measured and meet the requirement of $\Delta Vn/Vn \leq \pm 5\%$ with no remarkable mechanical damage.</p> <p>Damp heat load The specimen shall be subjected to 40 ±2°C, 90 to 95% R.H. and the maximum allowable voltage for 100 hours and then stored at room temperature and normally humidity for 1 to 2 hours. The change of Vn shall be measured and meet the requirement of $\Delta Vn/Vn \leq \pm 10\%$.</p> <p>Temperature cycle The temperature cycle is repeated five cycles with (1)-40 ±3°C keeping 30 ±3 minutes then (2) room temperature keeping 15 ±3 minutes then (3)125 ±2°C keeping 30 ±3 minutes then (4) room temperature keeping 15 ±3 minutes and then stored at room temperature and humidity for 1 to 2 hours. The change of Vn shall be measured and meet requirement $\Delta Vn/Vn \leq \pm 5\%$ with no remarkable mechanical damage.</p> <p>Terminal pull strength After gradually applying the load specified below and keeping the unit fixed for 10 ±1 seconds, with no remarkable mechanical damage.</p> <table border="1"> <tr> <td>Terminal diameter</td> <td>Loading weight in pull strength</td> </tr> <tr> <td>0.6mm (0.024")</td> <td>10N (1.02Kg)</td> </tr> <tr> <td>0.8 mm (0.031")</td> <td>10N (1.02Kg)</td> </tr> <tr> <td>1.0 mm (0.039")</td> <td>20N (2.04Kg)</td> </tr> </table> | Terminal diameter | Loading weight in pull strength | 0.6mm (0.024") | 10N (1.02Kg) | 0.8 mm (0.031") | 10N (1.02Kg) | 1.0 mm (0.039") | 20N (2.04Kg) |
| Classification (Nom. varistor voltage) | Test Voltage (AC) | | | | | | | | | | | | | | |
| $V_{0,1mA} - V_{1mA} \leq 330 V$ | 1 000 Vrms | | | | | | | | | | | | | | |
| $V_{0,1mA} - V_{1mA} > 330 V$ | 1 500 Vrms | | | | | | | | | | | | | | |
| Terminal diameter | Loading weight in pull strength | | | | | | | | | | | | | | |
| 0.6mm (0.024") | 10N (1.02Kg) | | | | | | | | | | | | | | |
| 0.8 mm (0.031") | 10N (1.02Kg) | | | | | | | | | | | | | | |
| 1.0 mm (0.039") | 20N (2.04Kg) | | | | | | | | | | | | | | |

| | | | | |
|--|--------------------------|-------------------------|-------------------------|--------------|
| Freigabe erteilt / general release: | Kunde / customer | | | |
| Datum / date | Unterschrift / signature | JP Penlou | New P/N | 2006-06-01 |
| | Würth Elektronik | JP Penlou | Customer Layout | 2006-05-11 |
| | | JP Penlou | Factory codes | 2005-11-16 |
| | | JP Penlou | Lead Free Marking | 2004-10-19 |
| Geprüft / checked | 2006-06-01 | Kontrolliert / approved | JP. Penlou | |
| | | Name | Änderung / modification | Datum / date |

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- Подбор аналогов.
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- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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