

## SPST MINIATURE POWER RELAY

### FEATURES

- 4 kV dielectric strength
- Proof tracking index (PTI/CTI) 250
- 5 Amp switching capability (version "T" 10 Amp)
- Epoxy sealed version available
- Class F insulation available
- UL, CUR file E365652
- TUV B0887930007
- CQC 14002105344



### CONTACTS

<b>Arrangement</b>	SPST-NO. (1 Form A)
<b>Ratings (max.)</b>	
switched power	(resistive load) 150W or 1250 VA
switched current	(Version "T": 300W or 2500VA ) 5 A (Version "T" : 10A )
continuous current	5 A (Version "T" : 10A )
switched voltage	30VDC* or 250VAC
<b>Approved ratings</b>	<b>UL/CUR</b>
	Standard Coil
	5A at 250VAC, resistive, 100k cycles 85°C
	5A at 30VDC, resistive, 100k cycles 85°C
	1/6HP at 125/250 VAC, 100k cycles 85°C
	Sensitive Coil
	3A at 250VAC, Res. 100k cycles 85°C
	3A at 30VDC, Res. 100k cycles 85°C
	High capacity version "T"
	Standard Coil
	10A at 250VAC, Res. 100k cycles 85°C
	10A at 30VDC, Res. 100k cycles 85°C
	1/6HP at 125/250 VAC, 100k cycles 85°C
	TV5 at 120VAC, 25k cycles 25°C Silver tin contacts only
	Sensitive Coil
	8A at 250VAC, 85°C, 100k cycles
	8A at 30VDC, Res. 100k cycles 85°C
	<b>TUV/CQC</b>
	Standard Coil
	5A at 250VAC/ 30VDC, Res., 100k cycles 85°C
	10A at 250VAC/ 30VDC, Res., 100k cycles 85°C( "T Ver.)
	Sensitive Coil
	3A at 250VAC/ 30VDC, Res. 100k cycles 85°C
	8A at 250VAC/ 30VDC, Res., 100k cycles 85°C( "T Ver.)
	(All TUV ratings 105°C Class F only)

#### Contact material

Silver cadmium oxide,  
Silver alloy (UL only),  
Silver tin oxide, gold plating available  
(UL/TUV only)

#### Initial contact resistance

≤ 100 mΩ (at 6V, 1A, voltage drop method )  
< 3 mΩ (typical)

### COIL

<b>Nominal coil DC voltages</b>	3,5,6, 9, 12, 18, 24
<b>Dropout voltage</b>	> 5% of nominal coil voltage
<b>Coil power</b>	(at 20 °C)
Nominal	0.45 W (standard coil) 0.2W (sensitive coil)
at pickup voltage	220mW (standard coil) 113 mW (sensitive coil)
<b>Temperature Rise</b>	standard 41°C (74°F) at nominal coil voltage, 85°C sensitive 22°C (40°F) at nominal coil voltage, 85°C
<b>Max. temperature</b>	Max. 105°C (221°F) Standard Max. 155°C (311°F) available

## GENERAL DATA

<b>Life Expectancy</b>	(minimum operations)
mechanical	1 x 10 <sup>7</sup>
electrical	see approved ratings
<b>Operate Time</b>	8 ms (max.) at nominal coil voltage
<b>Release Time</b>	4 ms (max.) at nominal coil voltage, (without coil suppression)
<b>Dielectric Strength</b>	(at sea level for 1 min.)
coil to load contacts	4000 V <sub>RMS</sub>
open load contacts	1000 V <sub>RMS</sub>
<b>Insulation Resistance</b>	1000 MΩ (min.) at 20°C, 500 VDC, 50% RH
<b>Temperature Range operating</b>	(at nominal coil voltage) -40°C (-40°F) to 85°C (185°F) -40°C (-40°F) to 105°C (221°F) Class F only
<b>Vibration resistance</b>	0.062" (1.5 mm) DA at 10–55 Hz
<b>Shock</b>	10 g
<b>Enclosure</b>	P.B.T. polyester
protection category	RT II, flux proof
material group	IIIa
flammability	UL94 V-0
<b>Terminals</b>	Tinned copper alloy, P. C.
<b>Soldering</b>	
max. temperature	270 °C
max. time	5 s
<b>Dimensions</b>	
length	18.4 mm (0.724")
width	10.2 mm (0.401")
height	15.5 mm (0.610")
<b>Weight</b>	6 grams (approx.)
<b>Compliance</b>	UL 508, IEC 61810-1, RoHS, REACH
<b>Packing unit in pcs</b>	100 per plastic tray / 1000 per carton box

## COIL VOLTAGE SPECIFICATIONS

### STANDARD COIL

Nominal Coil VDC	Must Operate VDC	Max. Cont. VDC	Resistance Ohm ± 10%
3	2.1	3.9	20
5	3.5	6.5	55
6	4.2	7.8	80
9	6.3	11.7	180
12	8.4	15.6	320
18	12.6	23.4	720
24	16.8	31.2	1280
48	33.6	62.4	5120

### SENSITIVE COIL

Nominal Coil VDC	Must Operate VDC	Max. Cont. VDC	Resistance Ohm ± 10%
3	2.25	3.9	45
5	3.75	6.5	125
6	4.5	7.8	180
9	6.75	11.7	400
12	9.0	15.6	720
18	13.5	23.4	1620
24	18.0	31.2	2800

Note: All values at 20°C (73°F), upright position, terminals downward.

## ORDERING DATA

AZ7709 - 1A E -12DS E F G (XXX)

I II III IV V VI VII VIII

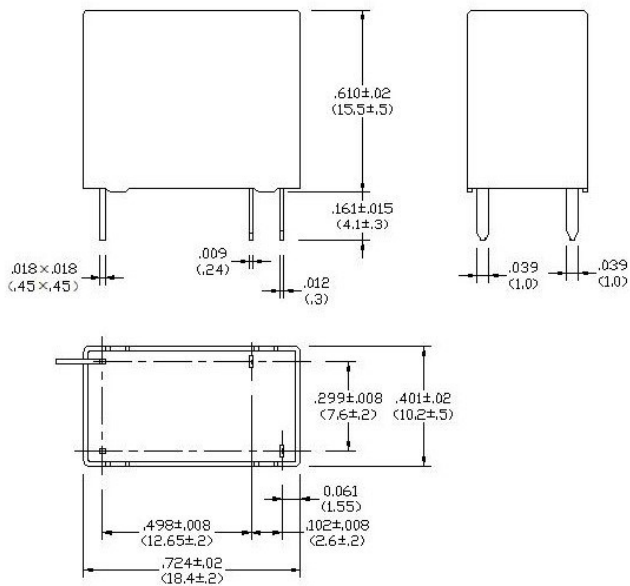
- I. Basic Series AZ7709 : standard contacts  
AZ7709T : High capacity version
- II. Contact Form 1A: 1 form A
- III. Contact Material Blank: Silver cadmium oxide  
E: Silver tin oxide  
B: Silver alloy (UL only)
- IV. Coil Voltage D (standard coil) 3,5,6, 9, 12, 18,24,48VDC.  
DS (sensitive coil) 3,5,6,9,12,18,24VDC.
- V. Construction Blank: no epoxy seal  
E: epoxy seal
- VI. Insulation System Blank: standard version  
F: Class F 155°C Version
- VII. Gold plated contacts Blank: no gold plated contacts  
G: gold plated contacts. (UL/TUV only)
- VIII. Special code Additional numbers or letters, which does not  
Designate construction features or ratings

### Example ordering data

AZ7709-1AE-12DF With  
AZ7709 standard series  
AgSnO<sub>2</sub> Contact Material  
12 VDC standard coil  
No epoxy seal  
Class F Insulation System  
No gold plated contacts

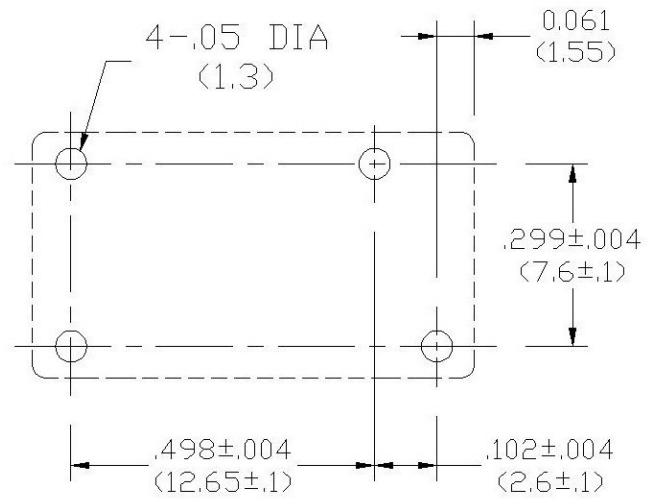
## MECHANICAL DATA

Dimensions in mm. Tolerance:  $\pm 0.3\text{mm}$



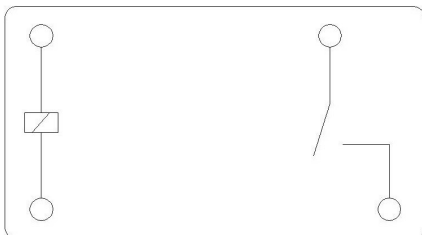
## PC BOARD LAYOUT

Viewed towards terminals. Dimensions in mm. Tolerance:  $\pm 0.3\text{mm}$



## WIRING DIAGRAMS

Viewed towards terminals



## NOTES

### General

1. All values in this datasheet are at reference temperature of 23°C (73°F) unless stated otherwise.
2. Evaluate the component's performance and operating conditions under the worst-case conditions of the actual application.
3. The datasheet and the component's specifications are subject to change without notice.

### Storage, handling, and environmental guidelines

4. Relays are electromechanical components that are sensitive to shock. The relay's adjustment can be affected if the relay is subjected to excessive shock or excessive pressure is applied to the relay case. Relays which have been dropped must no longer be used.
5. Substances containing silicone or phosphorus must be avoided in the vicinity to the relay. Outgassing from these substances can penetrate the relay and adhere on the contacts. Deposits of these substances may act as insulators and adversely affect the contact resistance. Silicone can be found e.g. in gaskets, lubricants or filling materials, phosphorus can be found e.g. as a flame retardant in plastics.
6. Protect relays from atmospheres containing corrosive gases, liquids, or solids such as water vapor, H<sub>2</sub>S, SO<sub>2</sub>, NO<sub>2</sub>, Cl, P, dust, and other harmful substances and elements. Corrosion of internal structures and contacts leads to malfunction and shortens the component's service life.
7. Prevent non-sealed relays and relays with opened vent hole from atmospheres subject to dust. Dust particles may enter the case and get stuck between the contacts, causing the contact circuits to fail.
8. Do not use these relays in environments with explosive or flammable gases. Electrical arcing at the contacts could ignite these gases and cause fire.
9. For automated dual wave soldering process we recommend preheating with 120°C (248°F) for max. 120 seconds and a soldering temperature of 260 ±5°C (500 ±9°F) for max. 10 seconds soldering time (max. 5 seconds per wave). For manual soldering we recommend 350°C (662°F) max. temperature for max. 5 seconds. During the soldering process, no force may be exerted on the relay terminals.
10. Non-sealed relays must not be washed, immersion cleaned or conformal coated as substances may enter the case and cause corrosion or seizure of mechanical parts.
11. With sealed versions of this relay type, the vent hole must be cut open after washing or conformal coating to achieve the specified performance and service life. Care must be taken to ensure no particles get into the relay as a result of the cutting process.
12. Avoid high frequency or ultrasonic vibrations on the relays as these can cause contact welding and misalignment or destruction of internal structures.
13. During operation, storage and transport, ambient temperature should be within the specified operating temperature range. Humidity should be in the range of 5% to 85% RH. Icing and condensation must be avoided. Relays stored for an extended period of time may show initially increased contact resistance values due to chemical effects such as oxidation.

### Design guidelines

14. The relay may pull in and operate with less than the specified *must operate* voltage value.
15. The coil's *must operate* and *min. holding* voltages, the coil's *ohmic resistance* and the relay's *operate time* depend on the temperature of the coil. The specified values are given for a coil temperature of 23°C and increase by approx. 0.39% per Kelvin of temperature rise. This circumstance must be considered, especially during operation with high load currents and elevated ambient temperature.
16. At elevated ambient temperatures, after applying the rated nominal coil voltage for ≥ 200 milliseconds, the coil energization must be reduced to a holding level in order to reduce thermal stress and prevent the coil from overheating.
17. Coil suppression circuits such as diodes, etc. in parallel to the coil will lengthen the release time. We recommend using suppression circuits with a breakdown voltage of approx. 2 times the nominal coil voltage in order to achieve a quick release time.
18. For short-circuit performance according IEC62955, IEC61008-1 or IEC62752, coil suppression circuits with a breakdown voltage of ≥ 2 times the nominal coil voltage must be used. Using rectifier diodes or similar in parallel to the coil is not appropriate.
19. When using PWM coil control, use a fast-switching recirculation diode in parallel with the coil to keep the coil current during pulse pauses. To achieve the IEC62955, IEC61008-1 or IEC 62752 required short-circuit performance, when de-energizing the coil, the recirculation diode must be eliminated from the circuit to get a fast decay of coil current and a short release time. As PWM frequency we recommend ≥ 15 kHz in order to avoid audible noise from magnetostriction. To reduce EMI effects, we recommend to apply the PWM to the coil's inner layer terminal and have the outer layer terminal connected to ground or the supply rail.
20. Contact resistance is a function of load current, dwell time and wear level of the contacts. Immediately after closing the contacts, or if tested with low current only, the contact resistance will show a relatively high value. A low level steady state contact resistance is reached at higher current after a certain time in thermal equilibrium.
21. The relay dissipates heat from power losses through its load terminals. Provide sufficient cross section and area of the PCB traces so that they can act as heat spreader.
22. For PCBs with multiple relays, do not place the components directly next to each other. We suggest providing a mounting distance of minimum 10 mm to allow for better cooling.
23. For load current greater than 50 Amps, the load contact sets must be connected in parallel to share the load current. See section *Wiring Diagram* for details.
24. A minimum load of 10 mA / 5 V / 50 mW is recommended for the gold plated monitor contact to ensure a reliable and stable electrical connection.
25. As with any contact mechanism, the relay's NC monitor contact bounces when switching. For evaluation of its signal, suitable debouncing measures must be taken to get a reliable signal.

# AZ7709

## DISCLAIMER

This product specification is to be used in conjunction with the application notes which can be downloaded from the regional ZETTLER relay websites. The specification provides an overview of the most significant part features. Any individual applications and operating conditions are not taken into consideration. It is recommended to test the product under application conditions. Responsibility for the application remains with the customer. Proper operation and service life cannot be guaranteed if the part is operated outside the specified limits.

## ZETTLER GROUP

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