Super-compact size, Slim-package, Surface-mounting type available

DESCRIPTION
NEC TOKIN’s UA2/UB2 relay is a new generation miniature signal relay of super-compact size and slim-package.

FEATURES
- Small mounting size of slim package for dense mounting.
- Telcordia (2500 V) and FCC (1500 V) surge capability.
- IEC60950/UL1950/EN60950 spacing and high breakdown voltage.
  (Basic insulation class on 200 V working voltage)
- Low power consumption 140 mW

APPLICATIONS
Electronic switching systems, PBX, terminal equipment, telephone system.

For Correct Use of Miniature Relays

DO NOT EXCEED MAXIMUM RATINGS.
Do not use relays under exceeding conditions such as over ambient temperature, over voltage and over current. Incorrect use could result in abnormal heating, damage to related parts or cause burning.

READ CAUTIONS IN THE SELECTION GUIDE.
Read the cautions described in NEC/TOKIN’s “Miniature Relays” when you choose relays for your application.

The information in this document is subject to change without notice.
DIMENSIONS AND PAD LAYOUTS (Unit : mm [inch])

**UA2 SERIES**

- **STANDARD**

![UA2 STANDARD Diagram](image)

Tolerance of lead pitch is ±0.15 mm [0.006 inch]
Another tolerance is ±0.3 mm [0.012 inch]
( ) is reference.

* Value of trimmed lead type (NJ type)

- **MINIMUM FOOTPRINT TYPE**

![UA2 MINIMUM FOOTPRINT TYPE Diagram](image)

Tolerance of lead pitch is ±0.15 mm [0.006 inch]
Another tolerance is ±0.3 mm [0.012 inch]
( ) is reference.

**UB2 SERIES**

- **STANDARD**

![UB2 STANDARD Diagram](image)

Tolerance of lead pitch is ±0.15 mm [0.006 inch]
Another tolerance is ±0.3 mm [0.012 inch]
( ) is reference.

![UB2 MINIMUM FOOTPRINT TYPE Diagram](image)

Tolerance of lead pitch is ±0.15 mm [0.006 inch]
Another tolerance is ±0.3 mm [0.012 inch]
( ) is reference.

Note. General tolerance : ±0.1
PIN CONFIGURATIONS (bottom view)

**UA2 SERIES**

- **Non-latch type (not energized position)**
- **Single coil latch type (reset position)**

**UB2 SERIES**

- **Non-latch type (not energized position)**
- **Single coil latch type (reset position)**

MARKINGS (top view)

1. Part number
2. Manufacturer
3. Country of origin
4. Date code
5. Index mark of relay direction (pin No. 1, 8)
PERFORMANCE CHARACTERISTICS (Community)

<table>
<thead>
<tr>
<th>Contact Form</th>
<th>2 Form c</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Ratings</td>
<td>Maximum Switching Power 30 W (resistive) 37.5 VA (resistive)</td>
</tr>
<tr>
<td></td>
<td>Maximum Switching Voltage 220 Vdc 250 Vac</td>
</tr>
<tr>
<td></td>
<td>Maximum Switching Current 1 A</td>
</tr>
<tr>
<td></td>
<td>Maximum Carrying Current 1 A</td>
</tr>
<tr>
<td>Minimum Contact Ratings</td>
<td>10 mVdc, 10 μA *4</td>
</tr>
<tr>
<td>Initial Contact Resistance</td>
<td>100 mΩ Max. (Initial)</td>
</tr>
<tr>
<td>Contact Material</td>
<td>Silver alloy with gold alloy overlay</td>
</tr>
<tr>
<td>Nominal Operating Power</td>
<td>Non-Latch Type 140 to 230 mW</td>
</tr>
<tr>
<td></td>
<td>Single Coil Latch Type 100 to 120 mW</td>
</tr>
<tr>
<td>Operate Time (Excluding Bounce)</td>
<td>Approximately 2 ms</td>
</tr>
<tr>
<td>Release Time (Excluding Bounce)</td>
<td>Approximately 1 ms without diode</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>1000 MΩ at 500 Vdc</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>Between Open Contacts 1000 Vac for one minute (1500 V surge, 10 × 160 μs *1)</td>
</tr>
<tr>
<td></td>
<td>Between Adjacent Contacts</td>
</tr>
<tr>
<td></td>
<td>Between Coil and Contact 1500 Vac for one minute (2500 V surge, 2 × 10 μs *2)</td>
</tr>
<tr>
<td>Shock Resistance</td>
<td>735 m/s² (misoperating) 980 m/s² (destructive failure)</td>
</tr>
<tr>
<td>Vibration Resistance</td>
<td>10 to 55 Hz at double amplitude of 3 mm (misoperating) 10 to 55 Hz, double amplitude of 5 mm (Destructive failure)</td>
</tr>
<tr>
<td>Ambient Temperature</td>
<td>-40 to +85°C</td>
</tr>
<tr>
<td>Coil Temperature Rise</td>
<td>18 degrees at nominal coil voltage (140 mW)</td>
</tr>
<tr>
<td>Running specifications</td>
<td>No-load 5 × 10⁷ *3 operations (Non-latch type) 1 × 10⁷ operations (Latch type)</td>
</tr>
<tr>
<td></td>
<td>Load 30 Vdc 1 A (resistive), 1 × 10⁷ operations at 20°C 125 Vac 0.3 A (resistive), 1 × 10⁷ operations at 20°C</td>
</tr>
<tr>
<td>Weight</td>
<td>Approximately 1 grams</td>
</tr>
</tbody>
</table>

*1 rise time : 10 μs, decay time to half crest : 160 μs
*2 rise time : 2 μs, decay time to half crest : 10 μs
*3 This shows a number of operation where it can be running by which a fatal is not caused, and number of operation by which a steady characteristic is maintained is 1 × 10⁷ operations.
*4 This value is a reference value in the resistive load.
Minimum capacity changes depending on switching frequency and environment temperature and the load.

SAFETY STANDARD AND RATING

<table>
<thead>
<tr>
<th>UL Recognized (UL508)*</th>
<th>CSA Certificated (CSA C22.2 No14)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>File No E73266</td>
<td>File No LR46266</td>
</tr>
<tr>
<td>30 Vdc, 1 A (Resistive)</td>
<td></td>
</tr>
<tr>
<td>110 Vdc, 0.3 A (Resistive)</td>
<td></td>
</tr>
<tr>
<td>125 Vac, 0.3 A (Resistive)</td>
<td></td>
</tr>
<tr>
<td>TUV Certified (EN61810)</td>
<td></td>
</tr>
<tr>
<td>No.2050596</td>
<td></td>
</tr>
<tr>
<td>Creepage and clearance of coil to contact is over than 2 mm (According EN60950)</td>
<td></td>
</tr>
<tr>
<td>Basic insulation class</td>
<td></td>
</tr>
</tbody>
</table>

* Spacing : UL840
† Spacing : CSAstd950

RECOMMENDED RELAY DRIVE CONDITIONS

Drive under conditions. If it is impossible, please inquire to NEC/TOKIN

<table>
<thead>
<tr>
<th>Nonlatch type</th>
<th>Voltage : with ±5% at nominal voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single coil latch type</td>
<td>Square pulse (rise and fall time is rapidly) pulse height : within ±5% at nominal voltage pulse width : more than 10 ms</td>
</tr>
<tr>
<td></td>
<td>Ambient temperature -40 to +85°C</td>
</tr>
</tbody>
</table>
### PART NUMBER SYSTEM

**UA2 – 3 S N U**

- **Option**
  - NU: Standard
  - NR: Silver-Nickel alloy contact (with Gold alloy overlay)
  - NJ: Trimmed lead type
  - NRJ: Trimmed lead type with Silver-Nickel alloy contact

- **Latch type**
  - Nil: Nonlatch type
  - S: Single coil latch type

- **Nominal coil voltage**
  - A numerical value of coil voltage (See the following lineup)

**UB2 – 3 S NU – L**

- **Package**
  - Nil: Tube
  - L: Embossed carrying tape (L type)
  - R: Embossed carrying tape (R type)
  - L6: Embossed carrying tape (L type) with MBB *
  - R6: Embossed carrying tape (R type) with MBB *

  (*MBB: Moisture Barrier bag)

- **Option**
  - NU: Standard
  - NR: Silver-Nickel alloy contact (with Gold alloy overlay)
  - NUN: Minimum footprint type
  - NRN: Minimum footprint type with Silver-Nickel alloy contact

- **Latch type**
  - Nil: Nonlatch type
  - S: Single coil latch type

- **Nominal coil voltage**
  - A numerical value of coil voltage (See the following lineup)

### NOMINAL LINEUP

#### Non-latch Type

<table>
<thead>
<tr>
<th>Nominal Coil Voltage (Vdc)</th>
<th>Coil Resistance (Ω ±10%)</th>
<th>Must Operate Voltage (Vdc)</th>
<th>Must Release Voltage (Vdc)</th>
<th>Nominal operate power (mW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>16</td>
<td>1.13</td>
<td>0.15</td>
<td>140</td>
</tr>
<tr>
<td>3</td>
<td>64.3</td>
<td>2.25</td>
<td>0.3</td>
<td>140</td>
</tr>
<tr>
<td>4.5</td>
<td>145</td>
<td>3.38</td>
<td>0.45</td>
<td>140</td>
</tr>
<tr>
<td>5</td>
<td>178</td>
<td>3.75</td>
<td>0.5</td>
<td>140</td>
</tr>
<tr>
<td>6</td>
<td>257</td>
<td>4.5</td>
<td>0.6</td>
<td>140</td>
</tr>
<tr>
<td>9</td>
<td>579</td>
<td>6.75</td>
<td>0.9</td>
<td>140</td>
</tr>
<tr>
<td>12</td>
<td>1028</td>
<td>9.0</td>
<td>1.2</td>
<td>140</td>
</tr>
<tr>
<td>24</td>
<td>2504</td>
<td>18.0</td>
<td>2.4</td>
<td>230</td>
</tr>
</tbody>
</table>

#### Single-Coil Latch Type

<table>
<thead>
<tr>
<th>Nominal Coil Voltage (Vdc)</th>
<th>Coil Resistance (Ω ±10%)</th>
<th>Must Operate Voltage (Vdc)</th>
<th>Must Release Voltage (Vdc)</th>
<th>Nominal operate power (mW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>22.5</td>
<td>1.13</td>
<td>1.13</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>90</td>
<td>2.25</td>
<td>2.25</td>
<td>100</td>
</tr>
<tr>
<td>4.5</td>
<td>202.5</td>
<td>3.38</td>
<td>3.38</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>250</td>
<td>3.75</td>
<td>3.75</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>360</td>
<td>4.5</td>
<td>4.5</td>
<td>100</td>
</tr>
<tr>
<td>9</td>
<td>810</td>
<td>6.75</td>
<td>6.75</td>
<td>100</td>
</tr>
<tr>
<td>12</td>
<td>1440</td>
<td>9.0</td>
<td>9.0</td>
<td>100</td>
</tr>
<tr>
<td>24</td>
<td>4800</td>
<td>18.0</td>
<td>18.0</td>
<td>120</td>
</tr>
</tbody>
</table>

*Ph (707) 996-5201  Fx (707) 996-3380*
*www.worldproducts.com*
e-mail: corpsales@worldproducts.com
PERFORMANCE DATA

- **COIL TEMPERATURE RISE**
  Temperature is measured by coil resistance.

- **SWITCHING CAPACITY**
  This is allowed maximum value.
  Inquiry for NEC/TOKIN under maximum value at continuous use.

- **MAXIMUM COIL VOLTAGE**
  This is a maximum value of permissible alteration.
  Inquiry for NEC/TOKIN at continuous use.

- **APPLIED VOLTAGE VS. TIMING** (Sample: UA2-5NU)

Contact current (A)

- **APPLIED VOLTAGE VS. TIMING** (Sample: UA2-5NU) (Without coil diode)
OPERATE AND RELEASE VOLTAGE VS. AMBIENT TEMPERATURE

This shows a typical change of operate (release) voltage. Maximum value of operate estimated, so it must be applied more than this value for safety operation. In case of “hot start operation”, please inquiry for NEC/TOKIN.

RUNNING TEST (Nonload)

(Load: None, Driving: 5V.DC, 50 Hz, 50% duty, Ambient temperature: Room temperature, Sample: UA2-5NU 20 pieces)

RUNNING TEST (Load)

(Load: 50 V.DC 0.1 A resistive, Driving: 5V.DC, 5 Hz, 50% duty, Ambient temperature: 85 degree C, Sample: UA2-5NU 10 pieces)
**BREAKDOWN VOLTAGE**

Sample: UA2-5NU 10 pieces

(a) Between open contacts

(b) Between adjacent contacts

(c) Between coil to contact

**ALTERNATION OF VOLTAGE AT DENSELY MOUNTING (Magnet interference)**

Alternate of operate voltage

Alternate of release voltage

Device under test
TUBE PACKAGE (UA2, UB2)

Dimensions of Package (Unit : mm)

Outline of Package

TAPE PACKAGE (UB2)

APPEARANCE

TAPE DIMENSIONS mm

(inch)

Relay orientation mark and tape carrying direction.

Carrying tape type
Part number
Orientation mark
Tape carrying direction

Ph (707) 996-5201  Fx (707) 996-3380
www.worldproducts.com
e-mail: corpsales@worldproducts.com
SOLDERING TEMPERATURE CONDITION

Through–hole mounting type (UA2)

- Automatic soldering
  * Preheating: 100°C max. 1 minute max.
  * Solder temperature: 260°C max.
  * Solder time: 5 seconds max.

- Manual soldering
  * Solder temperature: 350°C max.
  * Solder time: 3 seconds max.

Surface mounting type (UB2)

IRS Method

Temperature (degree C)

Note:
1. Temperature profile shows printed circuit board surface temperature on the relay terminal portion.
2. Check the actual soldering condition to use other method except above mentioned temperature profiles.
NOTES ON CORRECT USE

1. Notes on contact load
   - Make sure that the contact load is within the specified range; otherwise, the lifetime of the contacts will be shortened considerably. Note that the running performance shown is an example, and that it varies depending on parameters such as the type of load, switching frequency, driver circuit, and ambient temperature under the actual operating conditions. Evaluate the performance by using the actual circuit before using the relay.

2. Driving relays
   - If the internal connection diagram of a relay shows + and - symbols on the coil, apply the rated voltage to the relay in the specified direction. If a rippled DC current source is used, abnormalities such as beat at the coil may occur.
   - The maximum voltage that can be applied to the coil of the relay varies depending on the ambient temperature. Generally, the higher the voltage applied to the coil, the shorter the operating time. Note, however, that a high voltage also increases the bounce of the contacts and the contact opening and closing frequency, which may shorten the lifetime of the relay. If a current is applied to the coil over a long period of time, the coil temperature rises, promoting generation of organic gas inside the relay, which may result in faulty contacts. In this case, use of a latching relay is recommended.
   - The operating time and release time indicate the time required for each contact to close after the voltage has been applied to or removed from the coil. However, because the relay has a mechanical structure, a bounce state exists at the end of the operating and release times. Furthermore, because additional time is required until the contact stabilizes after being in high-resistance state, care must be taken when using the relay at high speeds.

3. Operating environment
   - Make sure that the relay mounted in the application set is used within the specified temperature range. Use of a relay at a temperature outside this range may adversely affect insulation or contact performance.
   - If the relay is used for a long period of time in highly humid (RH 85% or higher) environment, moisture may be absorbed by the coil. This moisture may react with the NOx and SOx generated by glow discharges that occur when the contacts are opened or closed, producing nitric or sulfuric acid. If this happens, the acid produced may corrode the metallic parts of the relay, causing operational malfunction.
   - If the relay is used for a long period of time in high-speed environments, the relay absorbs moisture and is then heated during soldering. Prevent the relay from being frozen and avoid the generation of condensation.
   - The relay maintains constant sealability under normal atmospheric pressure (810 to 1,200 hpa). Its sealability may be degraded or the relay may be deformed and malfunction if it is used under barometric conditions exceeding the specified range.
   - The relay varies depending on temperature to which the relay is exposed after it is removed from the carton box to within 50°C.
   - If excessive vibration or shock is applied to the relay, it may malfunction and the contacts remain closed. Vibration or shock applied to the relay during operation may cause considerable damage to or wearing of the contacts. Note that operation of a snap switch mounted close to the relay or shock due to the operation of magnetic solenoid may also cause malfunctioning.

4. Notes on mounting relays
   - When mounting a relay onto a PCB board using an automatic chip mounter, if excessive force is applied to the cover of the relay when the relay is chucked or inserted, the cover may be damaged or the chip may be degraded. Keep the force applied to the relay to within 1 kg.
   - Avoid bending the pins to temporarily secure the relay to the PCB board. Bending the pins may degrade sealability or adversely affect the internal mechanism.
   - It is recommended to solder the relay onto a PCB board under the following conditions:
     - Reflow soldering: Refer to the recommended soldering temperature profile.
     - Flow soldering: Solder temperature: 260°C max., Time: 5 seconds max., Preheating: 100°C max./1 minute max.
   - Ventilation immediately after soldering is recommended. Avoid immersing the relay in cleaning solvent immediately after soldering due to the danger of thermal shock being applied to the relay.
   - Use an alcohol-based or water-based cleaning solvent. Never use thinner and benzene because they may damage the relay housing.
   - Do not use ultrasonic cleaning because the vibration energy generated by the ultrasonic waves may cause the contacts to remain closed.

5. Handling
   - Relays are packaged in magazine cases for shipment. If a space is created in the case after some relays have been removed, be sure to insert a stopper to secure the remaining relays in the case. If relays are not well secured, vibration during transportation may cause malfunctioning of the contacts.
   - Exercise caution in handling the relay so as to avoid dropping it or allowing it to fall. Do not use a relay that has been dropped. If a relay drops from a workbench to the floor, a shock of 9,800 m/s² (1,000 G) or more is applied to the relay, possibly damaging its functions. Even if a light shock has been applied to the relay, thoroughly evaluate its operation before using it.
   - Latching relays are factory-set to the reset state for shipment. A latching relay may be set, however, by vibration or shock applied while being transported. Be sure to forcibly reset the relay before using it in the application set. Also note that the relay may be set by unexpected vibration or shock when it is used in a portable set.
   - The sealability of a surface-mount relay may be lost if the relay absorbs moisture and is then heated during soldering. When storing relays, therefore, observe the following points:
     - Please use relays within 12 months after delivery. (Storage conditions: 30 degrees C / 60% RH)
     - Manual soldering: Please use relays within 2 years after delivery. (Storage conditions: 30 degrees C / 60% RH) After opening MBB packing, Please use within 3 months.
     - Please use relays within 2 years after delivery. (Storage conditions: 30 degrees C / 60% RH) After opening MBB packing, Please use within 3 months.

Permanent magnets are used in polarized relays. For this reason, when magnet, transformer, or speaker is located nearby, the relay characteristics may change and faulty operations may result.
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“Standard”, “Special”, and “Specific”. The Specific quality grade applies only to devices developed based on a customer designated “quality assurance program” for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

**Standard:** Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

**Special:** Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

**Specific:** Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC/TOKIN devices is "Standard" unless otherwise specified in NEC/TOKIN’s Data Sheets or Data Books. If customers intend to use NEC/TOKIN devices for applications other than those specified for Standard quality grade, they should contact an NEC/TOKIN sales representative in advance.

(Note)

(1) "NEC/TOKIN" as used in this statement means NEC/TOKIN Corporation and also includes its majority-owned subsidiaries.

(2) "NEC/TOKIN electronic component products" means any electronic component product developed or manufactured by or for NEC/TOKIN (as defined above).

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