

February 28, 2003

**New Product**  
**CONTACT**

No.083b



revised on February 28,2003

# Illuminated Toggle Switches

## Series TL

### Fully Illuminated Toggles with Bright and Super Bright LED

#### Visible Status Indication

2 choices of illumination intensity:

Intensity Level 1 – Bright: Red, Green or Amber

Intensity Level 2 – Super Bright: White, Green or Blue

Plastic toggle provides high E.S.D. protection,  
withstands 20kV min. of Electrostatic Discharge.

#### Brilliant Front Panel Appearance

Non-glare black face nut contrasts with brilliant illumination.

#### Sealed Construction

Internal O-ring prevents entry of dust and liquids.

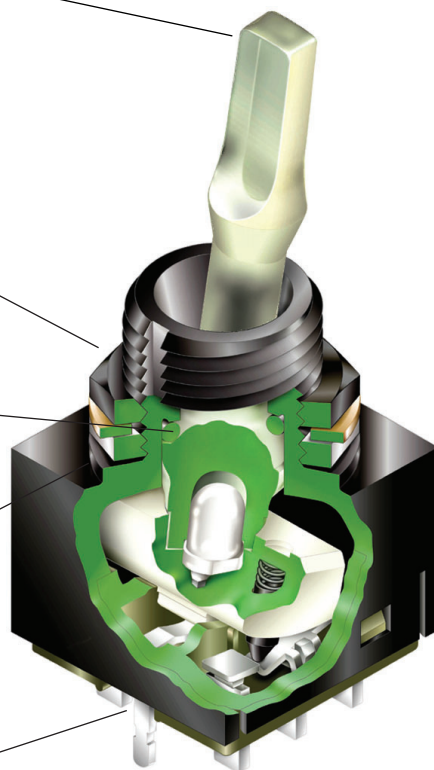
Design of outer housing and inner case also  
prevents contact contamination.

#### Panel Seal Option

O-ring AT401P provides splashproofing and  
qualifies switch to IP65 of IEC529 Standards.

#### Epoxy Sealed Terminals

Prevent entry of solder flux and other contaminants.



#### ► Applications

Audio & Visual Equipment, Theater Equipment, Control Panels, etc.

Automobile for specific purposes.(e.g. a wrecker, an ambulance)

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## ► Specifications

| 17.5mm Plastic Toggle        |   |
|------------------------------|---|
| Electrical Capacity          | 6A at 125V AC<br>3A at 250V AC  |
| Contact Resistance           | 10mΩ max.   |
| Insulation Resistance        | 1GΩ min. at 500V DC   |
| Dielectric Strength          | 1kV AC min. between contacts for 1 minute min.<br>1.5kV AC min. between contacts & panel for 1 minute min. (except LED terminals) |
| Mechanical Life              | 50,000 operations min.  |
| Electrical Life              | 25,000 operations min.  |
| Operating Temp. Range        | -10 through +55 °C  |
| Angle of Throw               | 25 ± 4°   |
| Actuation Force              | 25N   |
| Soldering Time & Temperature | 3 seconds at 350 °C max. for manual soldering   |

| 11.0mm Plastic Toggle        |   |
|------------------------------|---|
| Electrical Capacity (AC/DC)  | 0.4VA max. at 28V AC/DC max.<br>(Applicable Range : 0.1mA to 0.1A at 20mV to 28V)   |
| Contact Resistance           | 20mΩ max.   |
| Insulation Resistance        | 1GΩ min. at 500V DC   |
| Dielectric Strength          | 1kV AC min. between contacts for 1 minute min.<br>1.5kV AC min. between contacts & panel for 1 minute min. (except LED terminals) |
| Mechanical Life              | 50,000 operations min.  |
| Electrical Life              | 50,000 operations min.  |
| Operating Temp. Range        | -10 through +55 °C  |
| Angle of Throw               | 25 ± 4°   |
| Actuation Force              | 50N   |
| Soldering Time & Temperature | 3 seconds at 350 °C max. for manual soldering   |

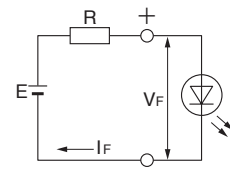
## ► LED Specifications

| Super Bright LED                  |                 | Intensity Level 2 |       |      | Ta = 25°C |  |
|-----------------------------------|-----------------|-------------------|-------|------|-----------|--|
| LED Type                          |                 | 6B                | 6F    | 6G   | Unit      |  |
| LED Color                         |                 | White             | Green | Blue |           |  |
| Forward Peak Current              | I <sub>FM</sub> | 30                |       |      | mA        |  |
| Forward Current                   | I <sub>F</sub>  | 20                |       |      | mA        |  |
| Forward Voltage                   | V <sub>F</sub>  | 3.6               | 3.3   | 3.4  | V         |  |
| Reverse Peak Voltage              | V <sub>RM</sub> | 5                 |       |      | V         |  |
| Current Reduction Rate Above 25°C | ΔI <sub>F</sub> | 0.50              | 0.40  | 0.40 | mA/°C     |  |
| Ambient Temp. Range               |                 | -10 to +55        |       |      | °C        |  |

| Bright LED                        |                 | Intensity Level 1 |       |       | Ta = 25°C |  |
|-----------------------------------|-----------------|-------------------|-------|-------|-----------|--|
| LED Type                          |                 | 5C                | 5D    | 5F    | Unit      |  |
| LED Color                         |                 | Red               | Amber | Green |           |  |
| Forward Peak Current              | I <sub>FM</sub> | 30                | 30    | 50    | mA        |  |
| Forward Current                   | I <sub>F</sub>  | 20                |       |       | mA        |  |
| Forward Voltage                   | V <sub>F</sub>  | 2.0               | 2.1   | 2.27  | V         |  |
| Reverse Peak Voltage              | V <sub>RM</sub> | 4                 |       |       | V         |  |
| Current Reduction Rate Above 25°C | ΔI <sub>F</sub> | 0.32              | 0.32  | 0.50  | mA/°C     |  |
| Ambient Temp. Range               |                 | -10 to +55        |       |       | °C        |  |

### Ballast Resistor Calculations

A ballast resistor must be connected in series with LED. The following circuit diagram and formula will assist in calculating the value of the ballast resistor.



R = Resistor Value (Ω)  
E = Source Voltage (V)  
V<sub>F</sub> = Forward Voltage (V)  
I<sub>F</sub> = Forward Current (mA)

$$R = \frac{E - V_F}{I_F}$$

**Poles & Circuit**

| Mode | Toggle Position |        | Connected Terminals |              | Throw & Schematics |
|------|-----------------|--------|---------------------|--------------|--------------------|
|      | Up              | Down   | Up                  | Down         |                    |
|      |                 |        |                     |              |                    |
|      | Keyway          | Keyway | Keyway              | Keyway       |                    |
| TL22 | ON              | ON     | 1-1b<br>2-2b        | 1-1a<br>2-2a |                    |

**▶ Switch Dimensions**

**17.5mm Toggle**

|                            |  |                                |
|----------------------------|--|--------------------------------|
| <p><b>TL22DNKW016G</b></p> |  | <p><b>Terminal Numbers</b></p> |
|----------------------------|--|--------------------------------|

**11.0mm Toggle**

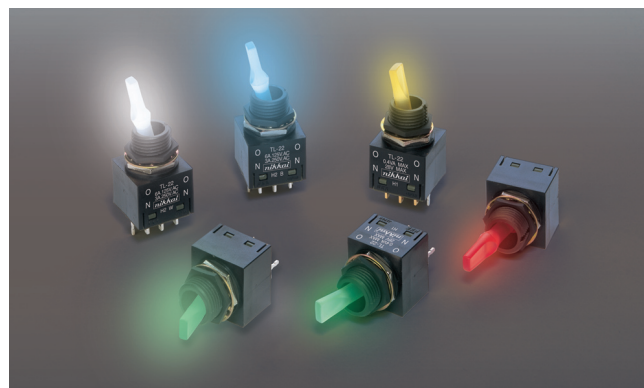
|                            |  |                                |
|----------------------------|--|--------------------------------|
| <p><b>TL22SCKG015C</b></p> |  | <p><b>Terminal Numbers</b></p> |
|----------------------------|--|--------------------------------|

| Standard Hardware      |                        |                                 | Optional Hardware  |
|------------------------|------------------------|---------------------------------|--|
| Hex Face Nut           | Hex Mounting Nut AT527 | Internal Tooth Lockwasher AT508 | Rubber Washer (AT401-P) for Panel Seal   |
| Black Chromate Plating | Nickel Plating         | Chromate Plating                | Black  |
|                        |                        |                                 |  |
|                        |                        |                                 | Insert switch from rear of the panel with rubber washer between panel and switch. Install hex face nut from the front of the panel. Mounting torque 981mN·m maximum. |

**Panel Cutouts**

**Recommended panel thickness:**  
4.0mm max.

**Recommended panel thickness with rubber washer for panel seal:**  
6.0mm max.



### ► Toggles & Terminals



color code on the body

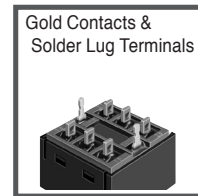
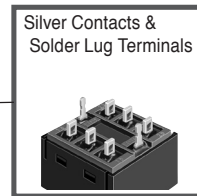
|   |       |
|---|-------|
| B | Blue  |
| M | Green |
| W | White |

(Note) H2 indicates super bright LED with intensity level 2.  
H1 indicates bright LED with intensity level 1.

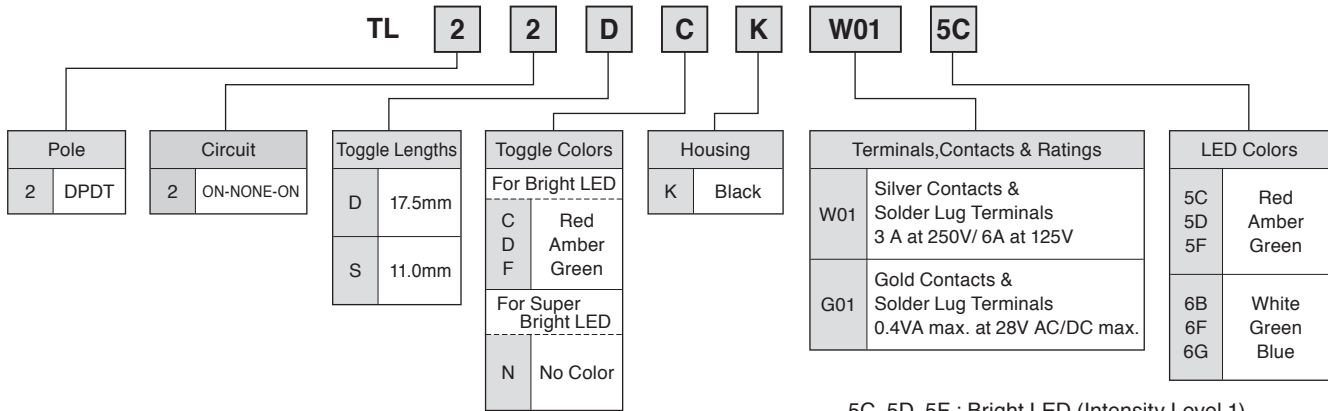
#### Toggles



#### Terminals



### ► Part Number Structure



5C, 5D, 5F : Bright LED (Intensity Level 1)  
6B, 6F, 6G : Super Bright LED (Intensity Level 2)

#### Part Number List

| Toggle Length | Contacts & Terminals                   | LED Brightness    | LED color | Part Number         |
|---------------|--|-------------------|-----------|---------------------|
| 17.5mm        | Silver Contacts & Solder Lug Terminals | Intensity Level 1 | 5C        | <b>TL22DCKW015C</b> |
|               |  |                   | 5D        | <b>TL22DDKW015D</b> |
|               |  |                   | 5F        | <b>TL22DFKW015F</b> |
|               |  | Intensity Level 2 | 6B        | <b>TL22DNKW016B</b> |
|               |  |                   | 6F        | <b>TL22DNKW016F</b> |
|               |  |                   | 6G        | <b>TL22DNKW016G</b> |
| 11.0mm        | Gold Contacts & Solder Lug Terminals   | Intensity Level 1 | 5C        | <b>TL22SCKG015C</b> |
|               |  |                   | 5D        | <b>TL22SDKG015D</b> |
|               |  |                   | 5F        | <b>TL22SFKG015F</b> |
|               |  | Intensity Level 2 | 6B        | <b>TL22SNKG016B</b> |
|               |  |                   | 6F        | <b>TL22SNKG016F</b> |
|               |  |                   | 6G        | <b>TL22SNKG016G</b> |

### ► Release

October 16, 2002