

# General Specifications

## Electrical Capacity (Resistive Load)

**Logic Level:** 0.4VA maximum @ 48V AC/DC maximum  
(Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 48V)  
Note: Find additional explanation of operating range in Supplement section.

## Other Ratings

**Contact Resistance:** 50 milliohms maximum  
**Insulation Resistance:** 1,000 megohms minimum @ 500V DC  
**Dielectric Strength:** 1,000V AC minimum between contacts for 1 minute minimum;  
1,500V AC minimum between contacts & case for 1 minute minimum  
**Mechanical Life:** 100,000 operations minimum for bat lever models  
50,000 operations minimum for locking lever models  
**Electrical Life:** 50,000 operations minimum  
**Contact Timing:** Nonshorting (break-before-make)  
**Angle of Throw:** 24°

## Materials & Finishes

**Toggle/Lever:** Brass with chrome plating  
**Bushing:** Brass with nickel plating  
**Support Bracket:** Straight PC: phosphor bronze with tin plating; right angle & vertical: brass with tin plating  
**Housing:** Polybutylene terephthalate (PBT) (UL94V-0)  
**Base:** 1- and 2-pole GFR polyamide (UL94V-0); 4-pole liquid crystal polymer (LCP) (UL94V-0)  
**Movable Contacts:** Phosphor bronze with gold plating  
**Stationary Contacts:** Brass with gold plating  
**Terminals:** Brass with gold plating

## Environmental Data

**Operating Temp Range:** -10°C through +70°C (+14°F through +158°F)  
**Humidity:** 90 ~ 95% humidity for 240 hours @ 40°C (104°F)  
**Vibration:** 10 ~ 55Hz with peak-to-peak amplitude of 1.5mm traversing the frequency range & returning in 1 minute; 3 right angled directions for 2 hours  
**Shock:** 50G (490m/s<sup>2</sup>) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)

## PCB Processing

**Soldering:** Wave Soldering recommended. See Profile A in Supplement section.  
Manual Soldering: 1- & 2-pole: 3 seconds maximum @ 350°C maximum;  
4-pole: 4 seconds maximum @ 410°C maximum  
**Cleaning:** Hand clean locally using alcohol based solution.  
See Cleaning specifications in Supplement section.

## Standards & Certifications

**Flammability Standards:** UL94V-0 rated housing & base  
The D2 Series toggles have not been tested for UL recognition or CSA certification.  
These switches are designed for use in a low-current, logic level circuit.  
When used as intended in a logic level circuit, the results do not produce hazardous energy.

# Distinctive Characteristics

Base of heat resistant resin meets UL94V-0 flammability rating.

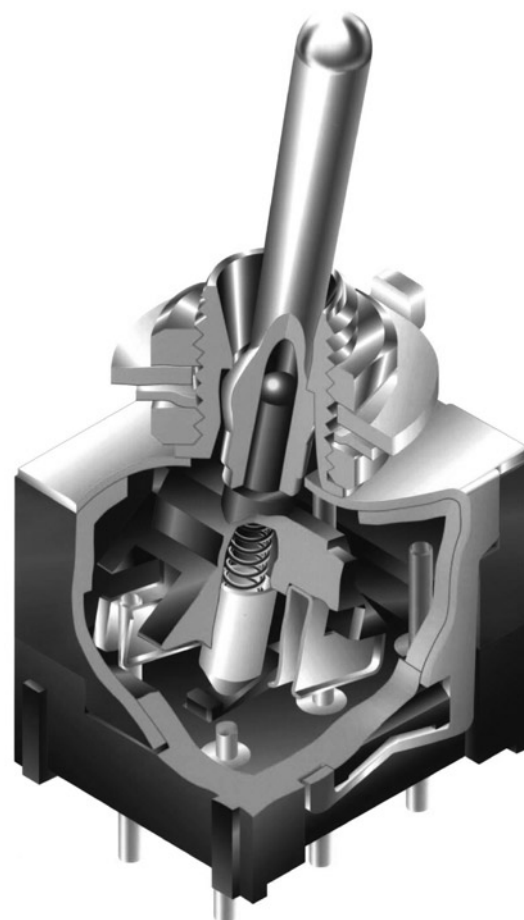
Maximized voltage capability of 48V allows use in medium source applications and increases operating life.

Award-winning STC contact mechanism with benefits unavailable in conventional mechanisms: smoother positive detent actuation, increased contact stability, and unparalleled reliability. (Additional STC details under Terms and Acronyms in the Supplement section.)

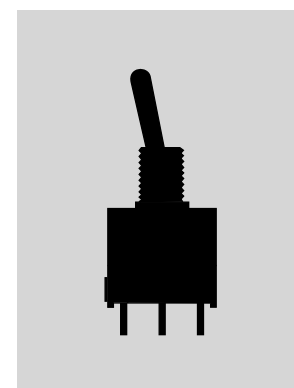
Round .031" (0.8mm) diameter PC terminals for easy PCB assembly.

Terminal spacing conforms to standard .100" (2.54mm) PC board grid spacing.

Molded-in terminals prevent entry of flux, solvents, and other contaminants.



Actual Size



|   |                |
|---|----------------|
| A | Toggles        |
|   | Rockers        |
|   | Pushbuttons    |
|   | Illuminated PB |
|   | Programmable   |
|   | Keylocks       |
|   | Rotaries       |
|   | Slides         |
|   | Tactiles       |
|   | Tilt           |
|   | Touch          |
|   | Indicators     |
|   | Accessories    |
|   | Supplement     |

### TYPICAL SWITCH ORDERING EXAMPLE

**D220**

**1**

**2**

**P**

#### Poles

|           |      |
|-----------|------|
| <b>1</b>  | SPDT |
| <b>2</b>  | DPDT |
| <b>*4</b> | 4PDT |

\* Combines with ON-NONE-ON circuit only & not available with Right Angle

#### Actuators

|                |                                         |
|----------------|-----------------------------------------|
| <b>No Code</b> | .413" (10.5mm)<br>Bat Lever             |
| <b>L</b>       | .200" (5.1mm) Diameter<br>Locking Lever |

#### Circuits

|          |      |      |      |
|----------|------|------|------|
| <b>2</b> | ON   | NONE | ON   |
| <b>3</b> | ON   | OFF  | ON   |
| <b>5</b> | ON   | NONE | (ON) |
| <b>8</b> | (ON) | OFF  | (ON) |
| <b>9</b> | ON   | OFF  | (ON) |

( ) = Momentary

#### PC Terminals

|          |                       |
|----------|-----------------------|
| <b>P</b> | Straight              |
| <b>B</b> | Straight with Bracket |
| <b>H</b> | Right Angle w/Bracket |
| <b>V</b> | Vertical with Bracket |

### DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

**D22012P**

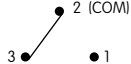
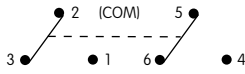
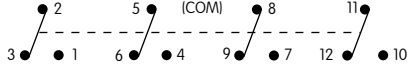
.413" (10.5mm)  
Bat Lever



SPDT  
ON-NONE-ON Circuit

Straight PC Terminals

## POLES & CIRCUITS

| Pole | Model  | Toggle Position<br>( ) = Momentary                                                        |                                                                                             |                                                                                         | Connected Terminals                                                                       |                                                                                             |                                                                                         | Throw & Schematics                                                                          |
|------|--------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|      |        | Down<br> | Center<br> | Up<br> | Down<br> | Center<br> | Up<br> |                                                                                             |
| SP   | D22012 | ON                                                                                        | NONE                                                                                        | ON                                                                                      |                                                                                           |                                                                                             |                                                                                         | SPDT<br> |
|      | D22013 | ON                                                                                        | OFF                                                                                         | ON                                                                                      |                                                                                           |                                                                                             |                                                                                         |                                                                                             |
|      | D22015 | ON                                                                                        | NONE                                                                                        | (ON)                                                                                    | 2-3                                                                                       | OPEN                                                                                        | 2-1                                                                                     |                                                                                             |
|      | D22018 | (ON)                                                                                      | OFF                                                                                         | (ON)                                                                                    |                                                                                           |                                                                                             |                                                                                         |                                                                                             |
|      | D22019 | ON                                                                                        | OFF                                                                                         | (ON)                                                                                    |                                                                                           |                                                                                             |                                                                                         |                                                                                             |
| DP   | D22022 | ON                                                                                        | NONE                                                                                        | ON                                                                                      |                                                                                           |                                                                                             |                                                                                         | DPDT<br> |
|      | D22023 | ON                                                                                        | OFF                                                                                         | ON                                                                                      |                                                                                           |                                                                                             |                                                                                         |                                                                                             |
|      | D22025 | ON                                                                                        | NONE                                                                                        | (ON)                                                                                    | 2-3 5-6                                                                                   | OPEN                                                                                        | 2-1 5-4                                                                                 |                                                                                             |
|      | D22028 | (ON)                                                                                      | OFF                                                                                         | (ON)                                                                                    |                                                                                           |                                                                                             |                                                                                         |                                                                                             |
|      | D22029 | ON                                                                                        | OFF                                                                                         | (ON)                                                                                    |                                                                                           |                                                                                             |                                                                                         |                                                                                             |
| 4P   | D22042 | ON                                                                                        | NONE                                                                                        | ON                                                                                      | 2-3 5-6<br>8-9 11-12                                                                      | OPEN                                                                                        | 2-1 5-4<br>8-7 11-10                                                                    | 4PDT<br> |

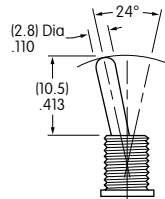
Note: Terminal numbers are not actually on the switch.

## ACTUATORS

**No Code**

**.413" (10.5mm)  
Bat Lever**

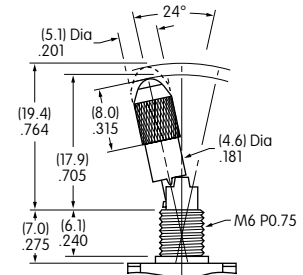
Material:  
Chrome over brass



**L**

**.413" (5.1mm) Diameter  
Locking Lever**

Material:  
Chrome over brass



## PC TERMINALS

**P**

**Straight**



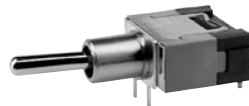
**B**

**Straight with  
Bracket**



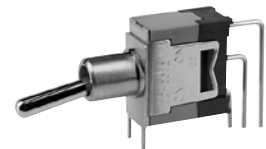
**H**

**Right Angle  
with Bracket**



**V**

**Vertical  
with Bracket**

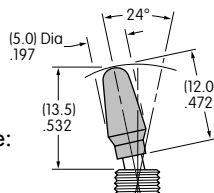


## OPTIONAL CAPS & CAP COLORS

**AT415  
Bat Lever Cap**

Material:  
Polyethylene

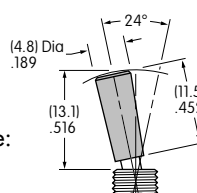
Colors Available:  
A B C E F G



**AT444 Bat Lever  
Conical Cap**

Material:  
Polyethylene

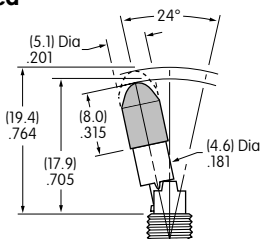
Colors Available:  
A B C E F G



**AT427 Cap Supplied  
with Locking Lever**

Material:  
Anodized  
Aluminum

Colors Available:  
A C G



Colors Codes: A Black B White C Red E Yellow F Green G Blue

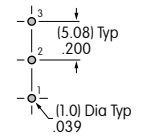
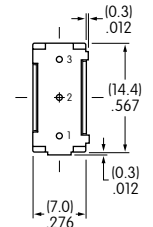
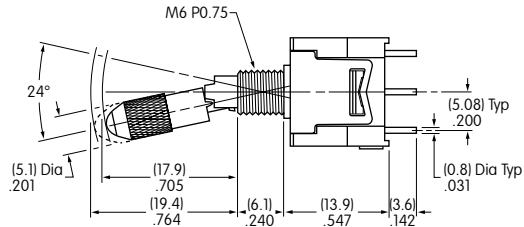
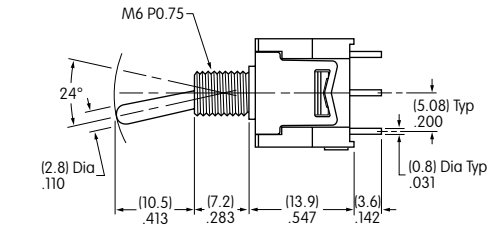
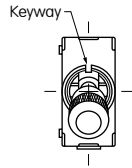
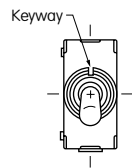
### TYPICAL SWITCH DIMENSIONS

#### Straight PC • Single Pole



D22012P

D22012LP



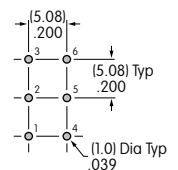
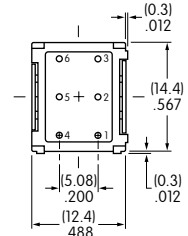
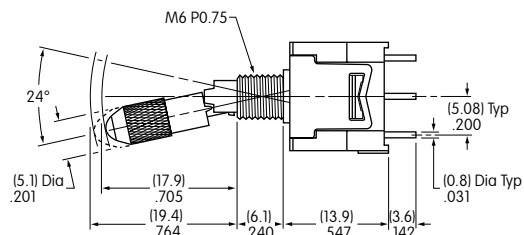
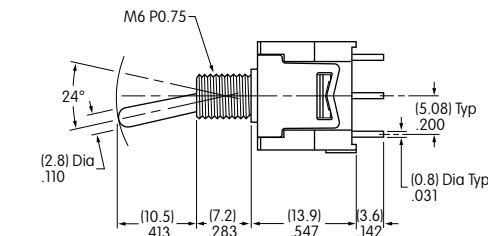
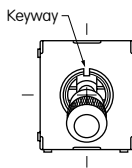
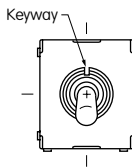
Actuator in Down Position

#### Straight PC • Double Pole



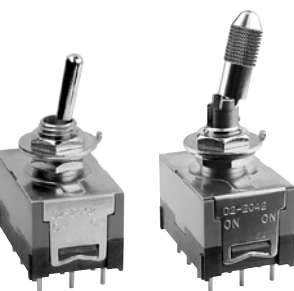
D22022P

D22022LP



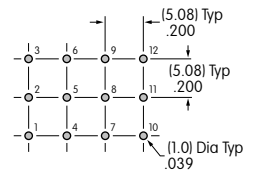
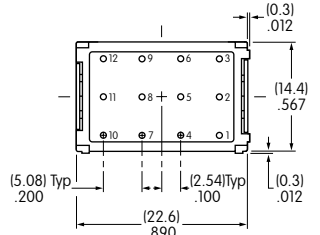
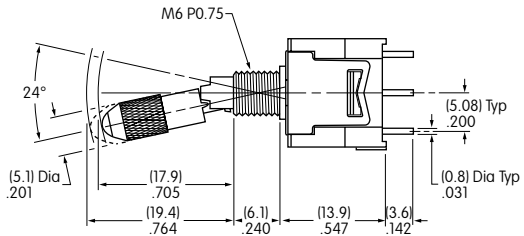
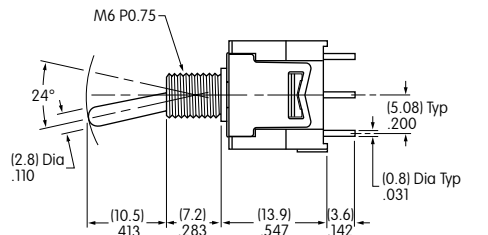
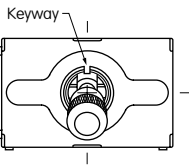
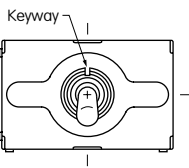
Actuator in Down Position

#### Straight PC • Four Pole



D22042P

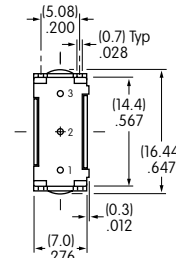
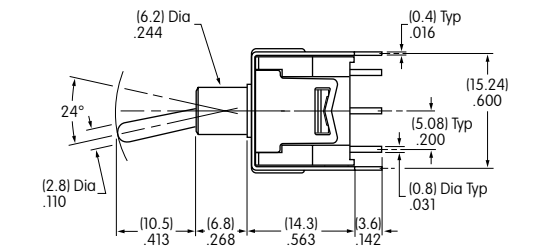
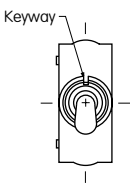
D22042LP



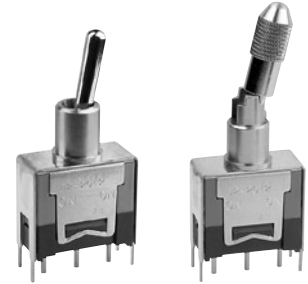
Actuator in Down Position

## TYPICAL SWITCH DIMENSIONS

**A** Toggles

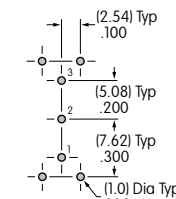
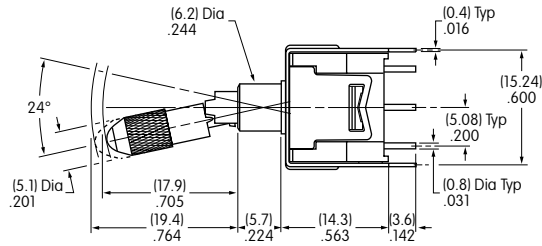
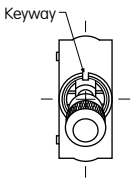


**Straight PC • Bracket  
Single Pole**

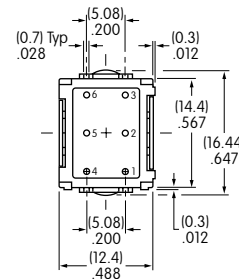
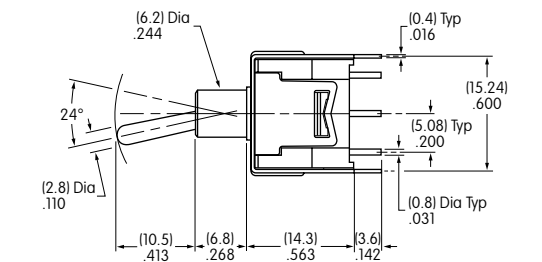
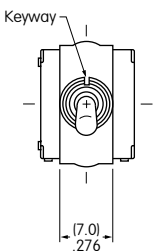


**D22012B**

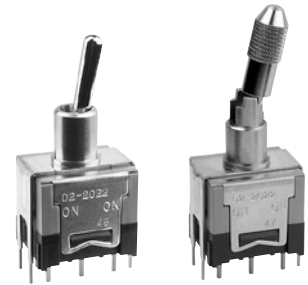
**D22012LB**



**Actuator in Down Position**

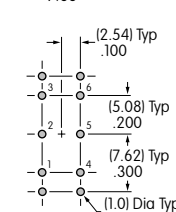
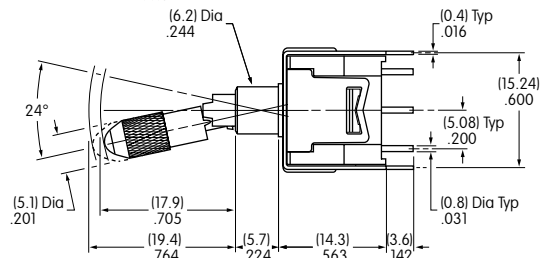
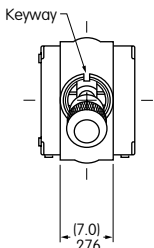


**Straight PC • Bracket  
Double Pole**

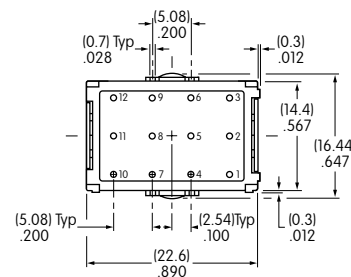
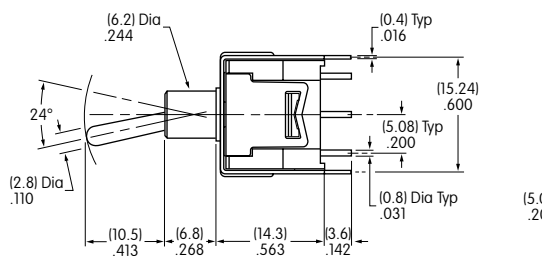
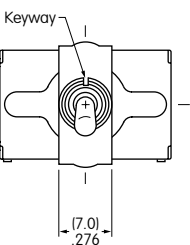


**D22022B**

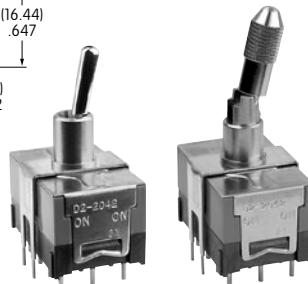
**D22022LB**



**Actuator in Down Position**

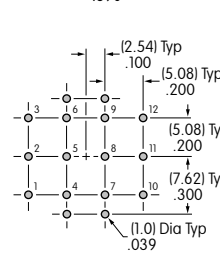
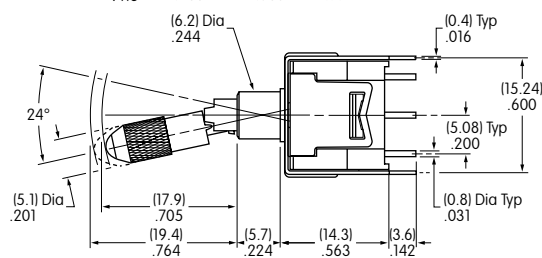
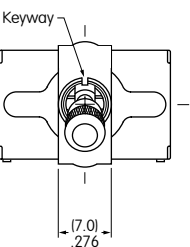


**Straight PC • Bracket  
Four Pole**



**D22042B**

**D22042LB**



**Actuator in Down Position**

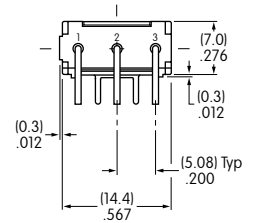
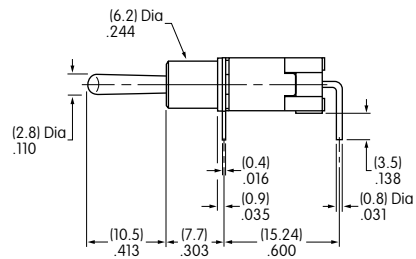
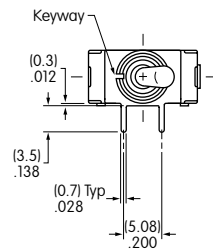
Rockers  
Pushbuttons  
Illuminated PB  
Programmable  
Keylocks  
Rotaries  
Slides  
Tactiles  
Tilt  
Touch  
Indicators  
Accessories  
Supplement

### TYPICAL SWITCH DIMENSIONS

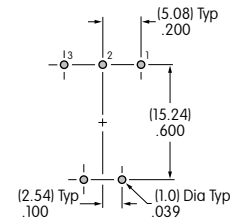
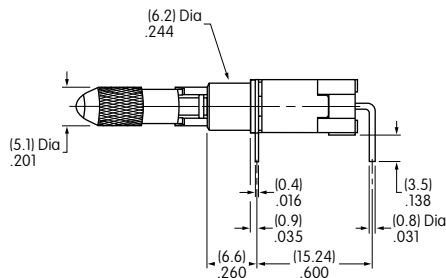
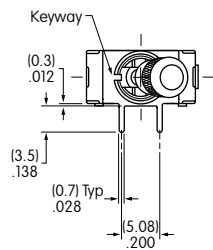
#### Right Angle PC • Single Pole



D22012H



D22012LH

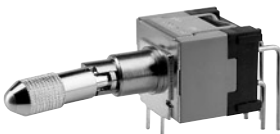
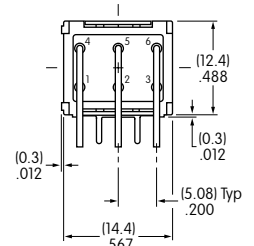
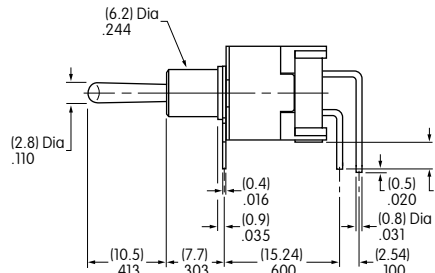
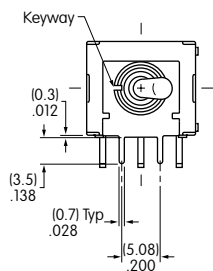


Actuator in Down Position

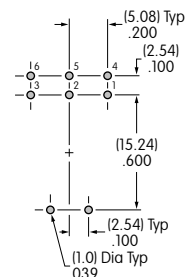
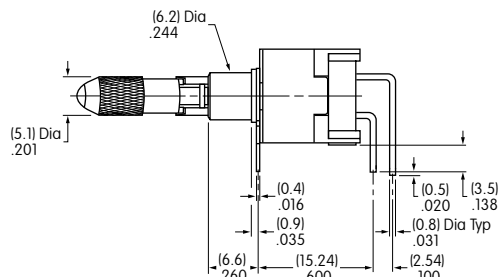
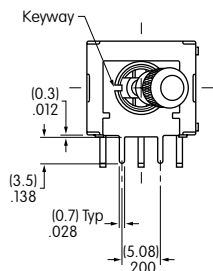
#### Right Angle PC • Double Pole



D22022H



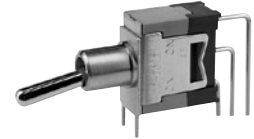
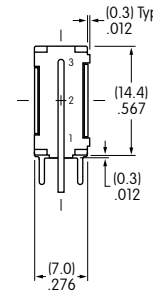
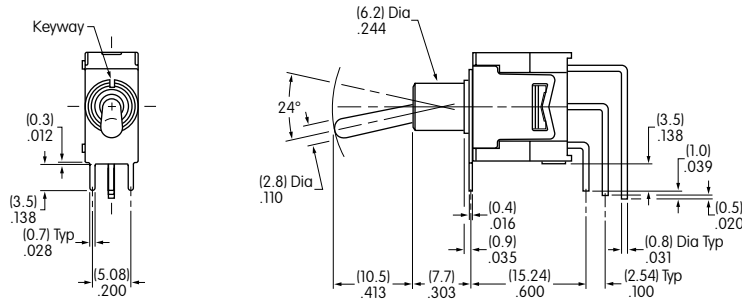
D22022LH



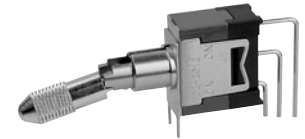
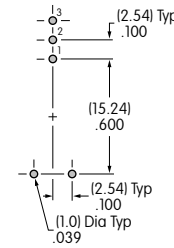
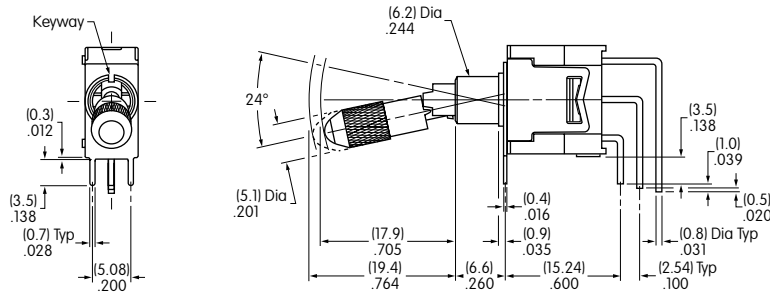
Actuator in Down Position

## TYPICAL SWITCH DIMENSIONS

### Vertical PC • Single Pole



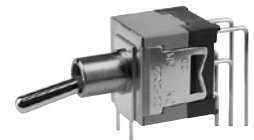
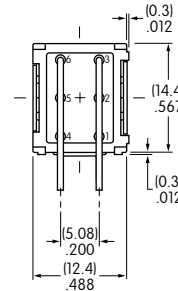
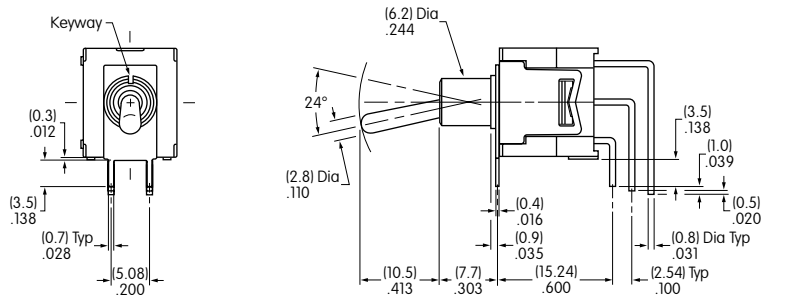
D22012V



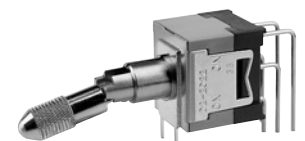
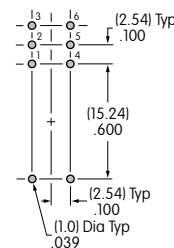
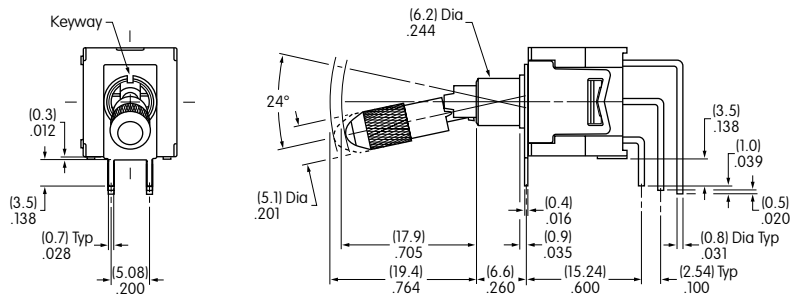
Actuator in Down Position

D22012LV

### Vertical PC • Double Pole



D22022V

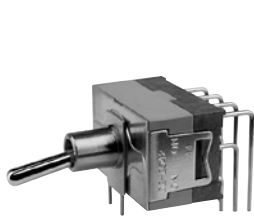


Actuator in Down Position

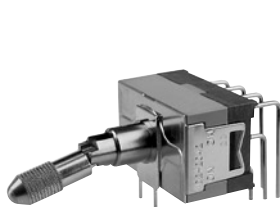
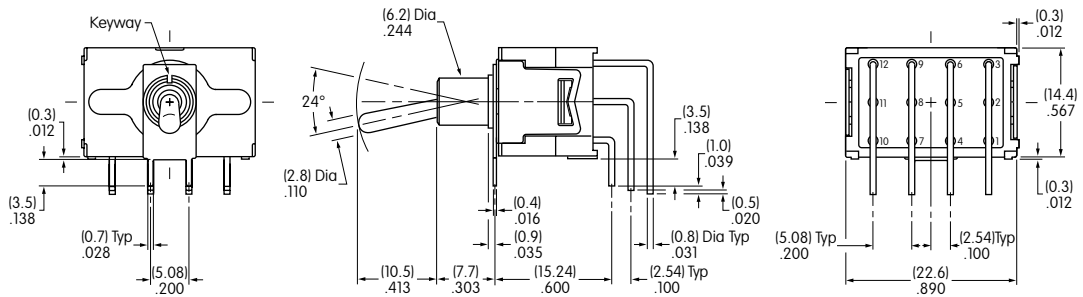
D22022LV

### TYPICAL SWITCH DIMENSIONS

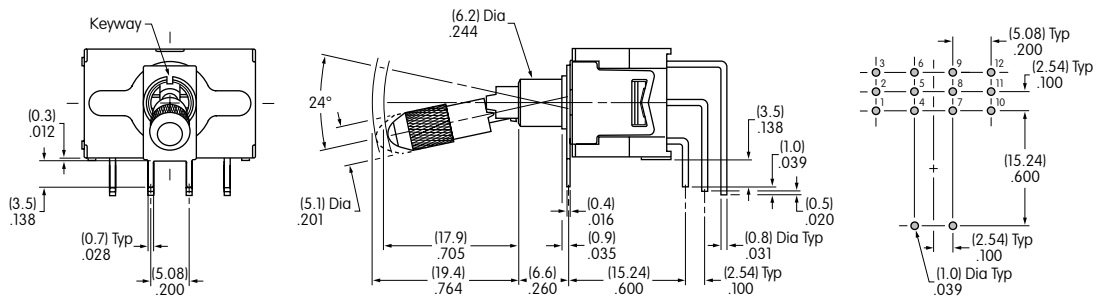
#### Vertical PC • Four Pole



D22042V



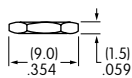
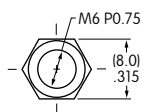
D22042LV



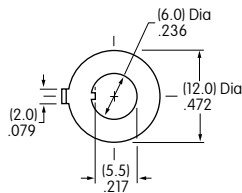
Actuator in Down Position

### STANDARD HARDWARE

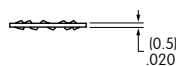
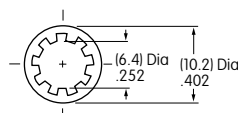
**AT513M**  
**Hex Nut**  
Brass with nickel plating  
2 supplied



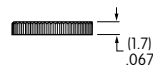
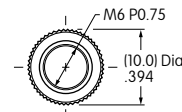
**AT507M**  
**Locking Ring**  
Steel with zinc/chromate  
1 supplied



**AT509**  
**Lockwasher**  
Steel with zinc/chromate  
1 supplied



**AT501M**  
**Knurled Face Nut**  
Brass with chrome plating



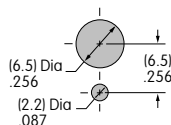
### OPTIONAL

### PANEL CUTOUTS & MAXIMUM PANEL THICKNESS

**With Standard Hardware**

.087" (2.2mm) for Standard Lever

.051" (1.3mm) for Locking Lever



**Without Bottom Hex Nut**

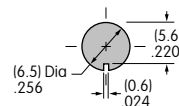
.154" (3.9mm) for Standard Lever

.110" (2.8mm) for Locking Lever

**Without Locking Ring**

.118" (3.0mm) for Standard Lever

.083" (2.1mm) for Locking Lever



**Without Locking Ring & Bottom Hex Nut**

.185" (4.7mm) for Standard Lever

.142" (3.6mm) for Locking Lever



# Mouser Electronics

Authorized Distributor

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## NKK Switches:

[D22012B](#) [D22029B](#) [D22029H](#) [D22029LB](#) [D22029LH](#) [D22029LP](#) [D22029LV](#) [D22029V](#) [D22042B](#) [D22042LB](#)  
[D22042LP](#) [D22042LV](#) [D22042P](#) [D22042V](#) [D22012LP](#) [D22013B](#)

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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