

# General Specifications

## Electrical Capacity (Resistive Load)

**Logic Level:** 0.4VA maximum @ 48V AC/DC maximum  
(Applicable Range 0.1 mA ~ 0.1 A @ 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.

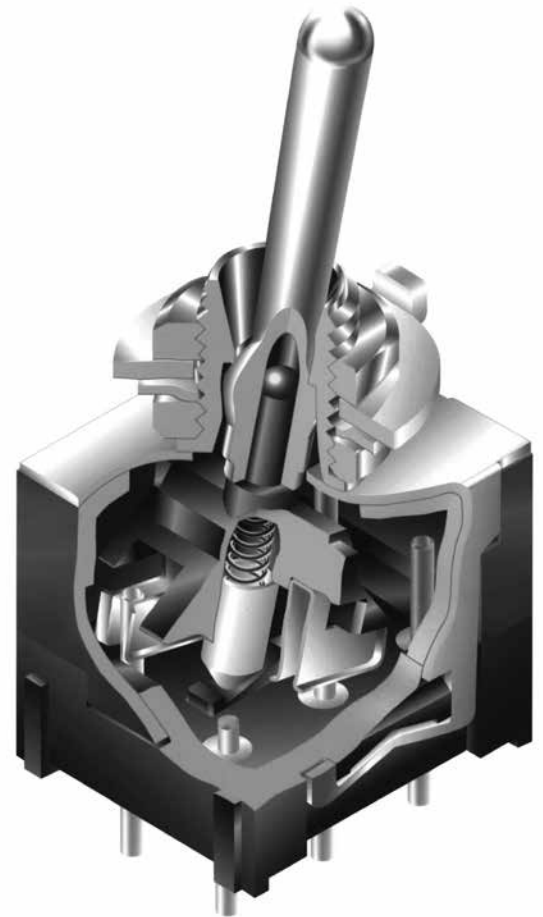
Maximized voltage capability of 48V allows use in medium source applications and increases operating life.

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.)

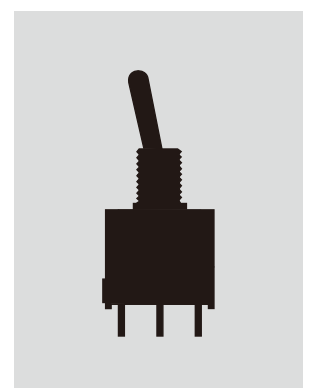
Round .031" (0.8mm) diameter PC terminals for easy PCB assembly.

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

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

### TYPICAL SWITCH ORDERING EXAMPLE

# D220

# 1

# 2

# P

Poles	
1	SPDT
2	DPDT
*4	4PDT

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

Actuators	
No Code	.413" (10.5mm) Bat Lever
L	.200" (5.1mm) Diameter Locking Lever

Circuits			
2	ON	NONE	ON
3	ON	OFF	ON
5	ON	NONE	(ON)
8	(ON)	OFF	(ON)
9	ON	OFF	(ON)

( ) = Momentary

PC Terminals	
P	Straight
B	Straight with Bracket
H	Right Angle w/Bracket
V	Vertical with Bracket

### DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

## D22012P

.413" (10.5mm)  
Bat Lever



SPDT  
ON-NONE-ON Circuit

Straight PC Terminals

POLES & CIRCUITS

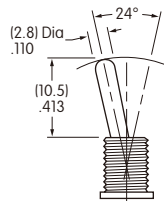
Pole	Model	Toggle Position ( ) = Momentary			Connected Terminals			Throw & Schematics
		Down Keyway	Center	Up	Down Keyway	Center	Up	
SP	D22012	ON	NONE	ON				SPDT Note: Terminal numbers are not actually on the switch. 
	D22013	ON	OFF	ON				
	D22015	ON	NONE	(ON)	2-3	OPEN	2-1	
	D22018	(ON)	OFF	(ON)				
	D22019	ON	OFF	(ON)				
DP	D22022	ON	NONE	ON				DPDT 
	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 8-9 11-12	OPEN	2-1 5-4 8-7 11-10	4PDT 

ACTUATORS

No Code

.413" (10.5mm)  
Bat Lever

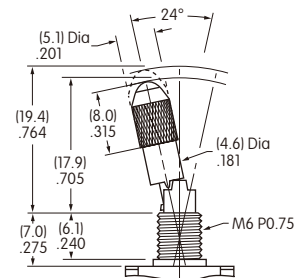
Material:  
Chrome over brass



L

.413" (5.1mm) Diameter  
Locking Lever

Material:  
Chrome over brass



PC TERMINALS

P

Straight



B

Straight with  
Bracket



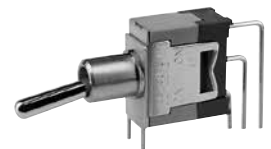
H

Right Angle  
with Bracket



V

Vertical  
with Bracket

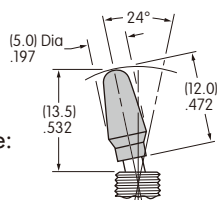


OPTIONAL CAPS & CAP COLORS

AT415  
Bat Lever Cap

Material:  
Polyethylene

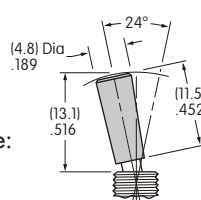
Colors Available:  
A B C E F G



AT444 Bat Lever  
Conical Cap

Material:  
Polyethylene

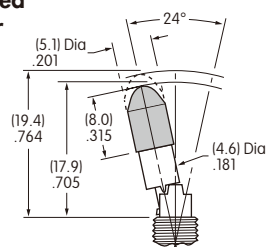
Colors Available:  
A B C E F G



AT427 Cap Supplied  
with Locking Lever

Material:  
Anodized  
Aluminum

Colors Available:  
A C G



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

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

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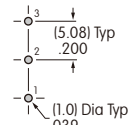
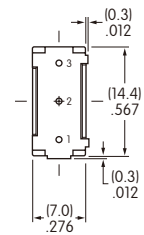
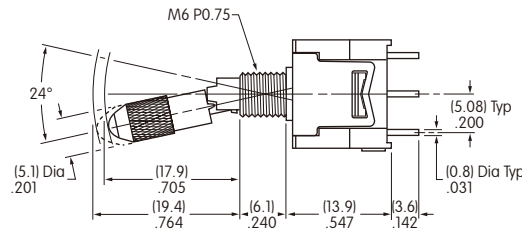
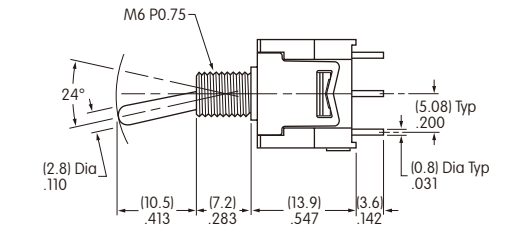
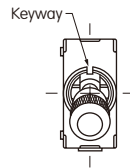
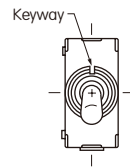
## TYPICAL SWITCH DIMENSIONS

### Straight PC • Single Pole



**D22012P**

**D22012LP**



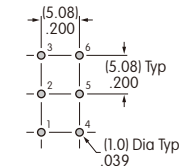
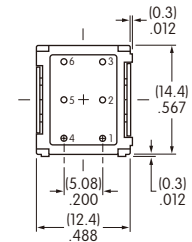
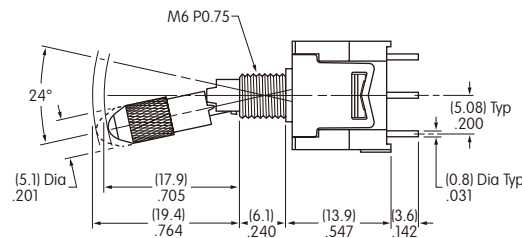
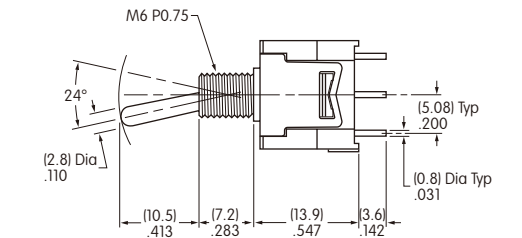
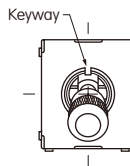
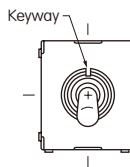
Actuator in Down Position

### Straight PC • Double Pole



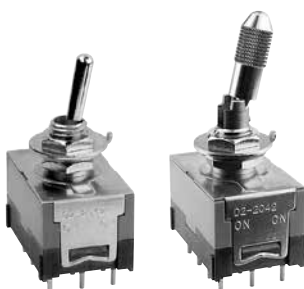
**D22022P**

**D22022LP**



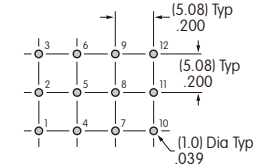
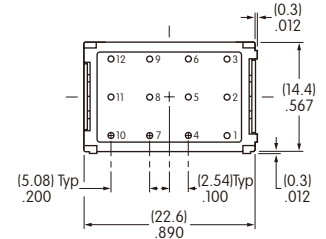
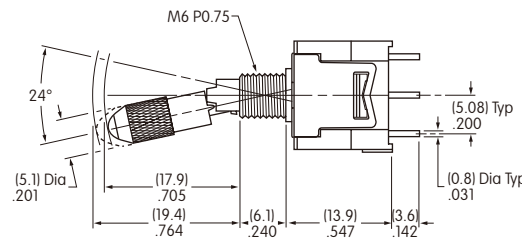
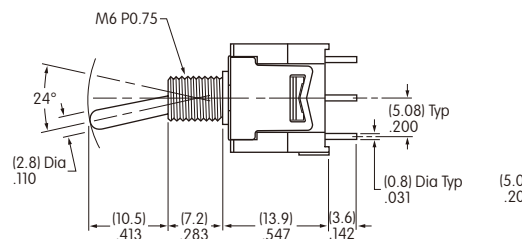
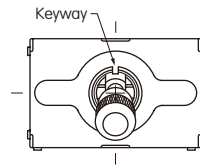
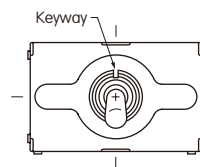
Actuator in Down Position

### Straight PC • Four Pole



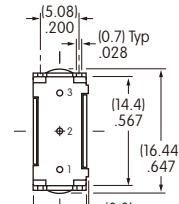
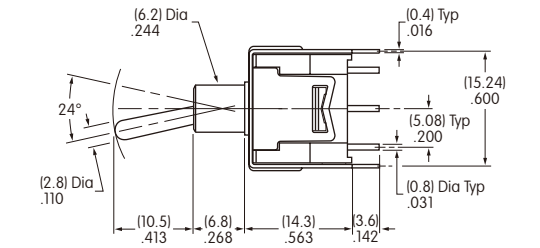
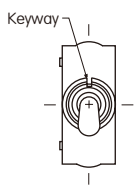
**D22042P**

**D22042LP**

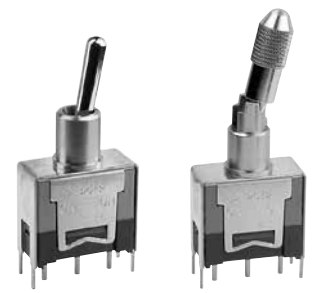


Actuator in Down Position

TYPICAL SWITCH DIMENSIONS

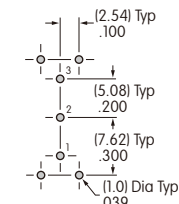
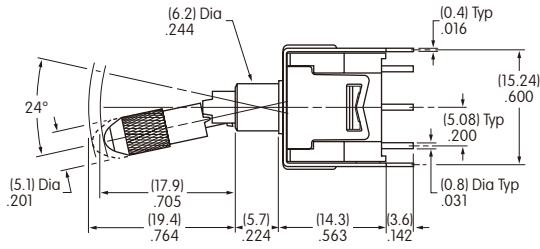
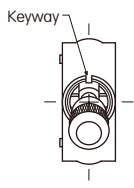


Straight PC • Bracket Single Pole

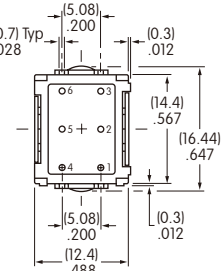
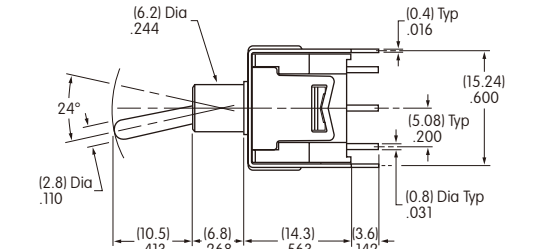
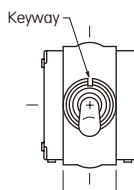


D22012B

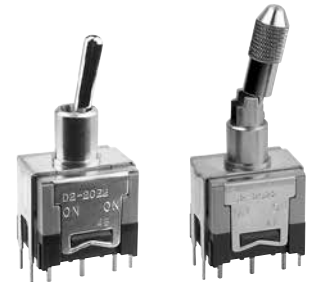
D22012LB



Actuator in Down Position

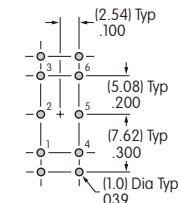
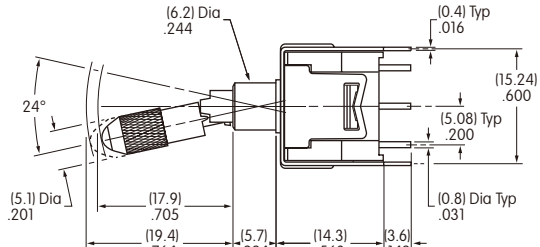
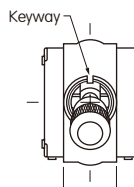


Straight PC • Bracket Double Pole



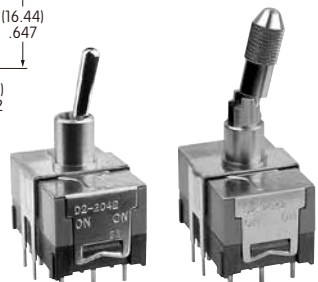
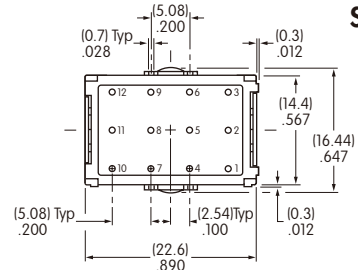
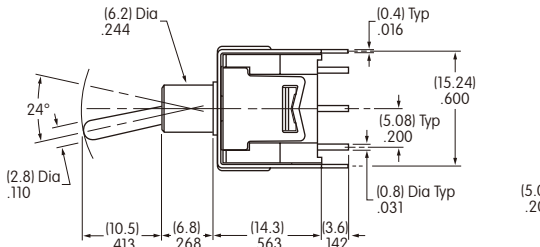
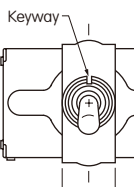
D22022B

D22022LB



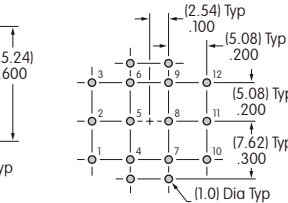
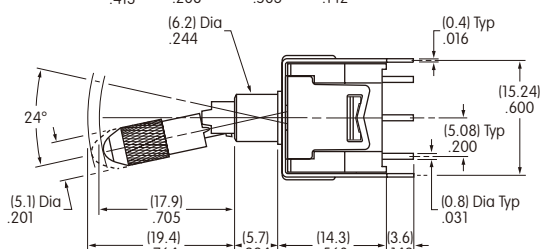
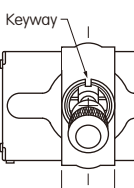
Actuator in Down Position

Straight PC • Bracket Four Pole



D22042B

D22042LB



Actuator in Down Position

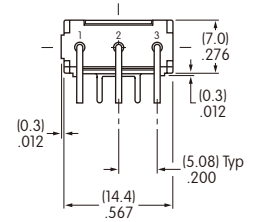
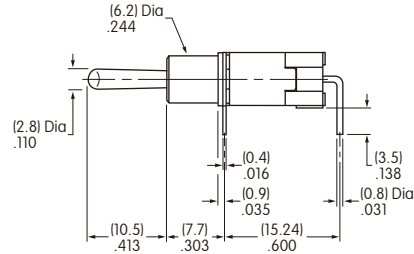
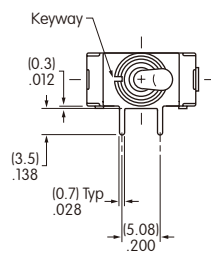
Toggles  
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 Accessories  
 Supplement

## TYPICAL SWITCH DIMENSIONS

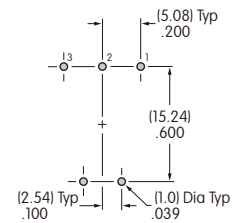
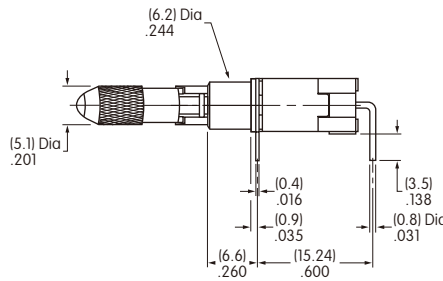
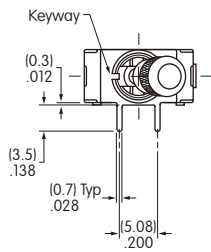
### Right Angle PC • Single Pole



**D22012H**



**D22012LH**

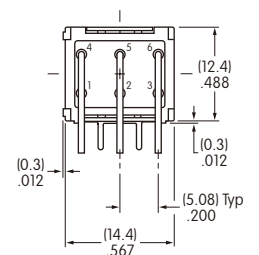
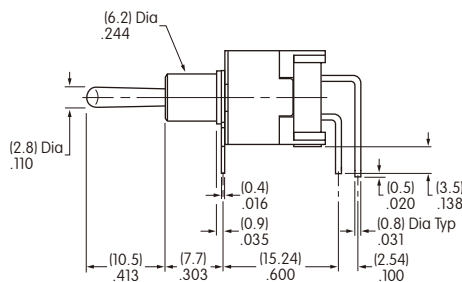
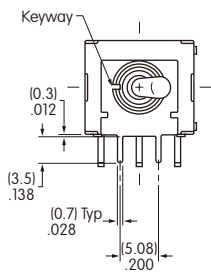


Actuator in Down Position

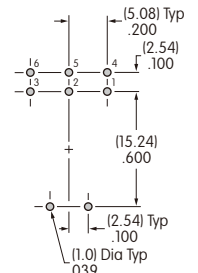
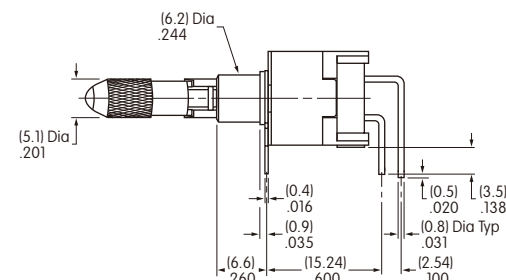
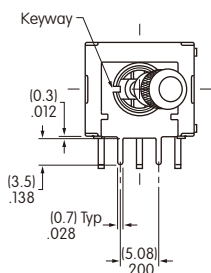
### Right Angle PC • Double Pole



**D22022H**



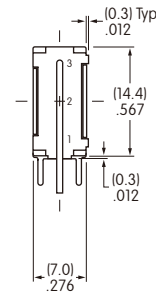
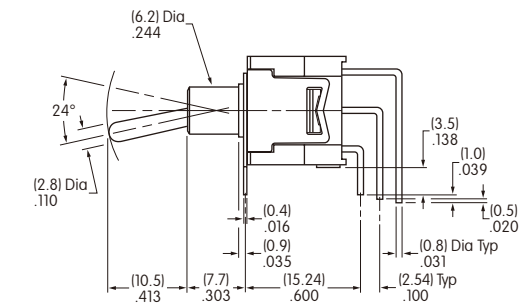
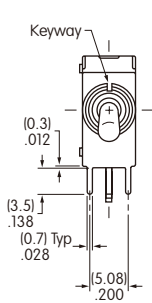
**D22022LH**



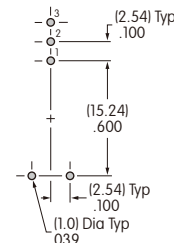
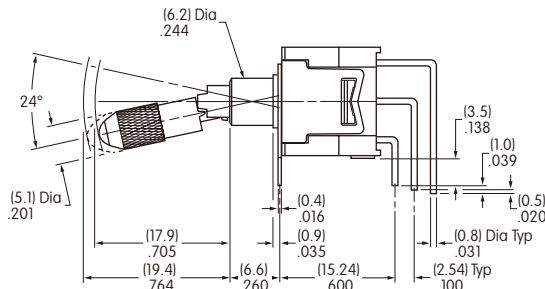
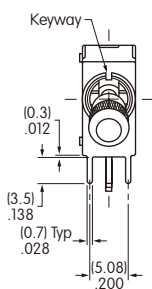
Actuator in Down Position

TYPICAL SWITCH DIMENSIONS

Vertical PC • Single Pole



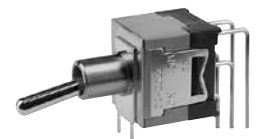
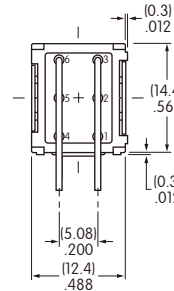
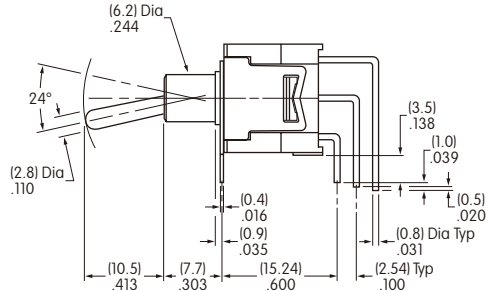
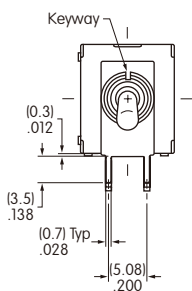
D22012V



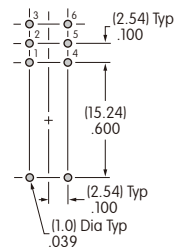
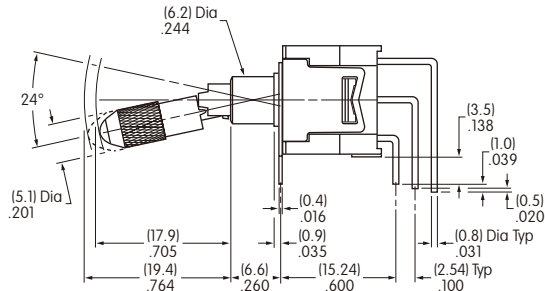
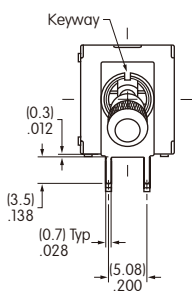
D22012LV

Actuator in Down Position

Vertical PC • Double Pole



D22022V



D22022LV

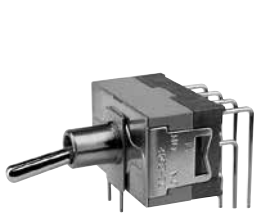
Actuator in Down Position

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

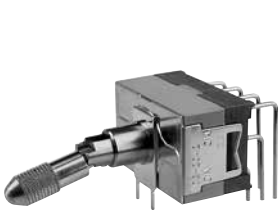
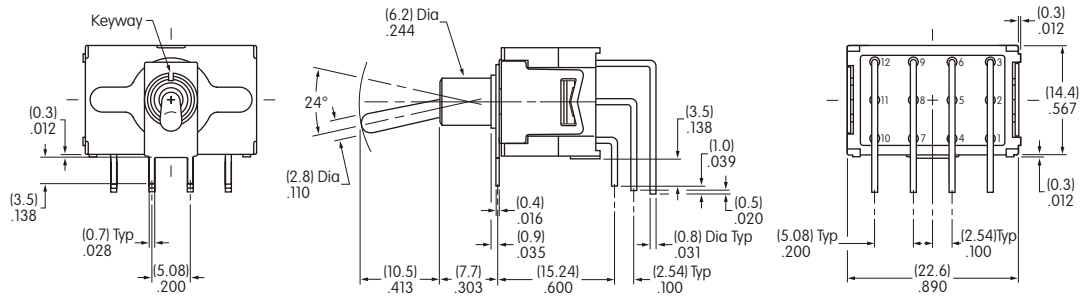


## TYPICAL SWITCH DIMENSIONS

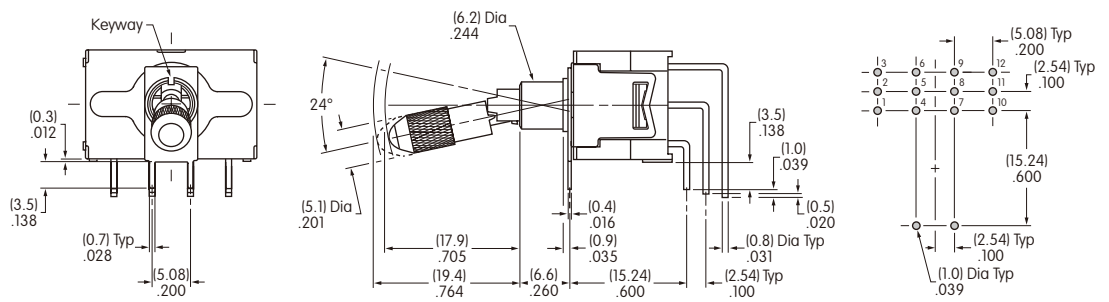
### Vertical PC • Four Pole



**D22042V**



**D22042LV**

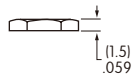
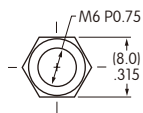


Actuator in Down Position

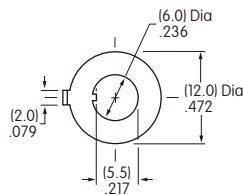
### STANDARD HARDWARE

### OPTIONAL

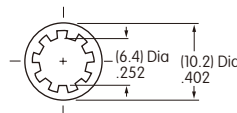
**AT513M**  
**Hex Nut**  
Brass with nickel plating  
2 supplied



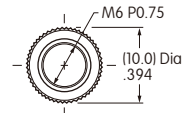
**AT507M**  
**Locking Ring**  
Steel with zinc/chromate  
1 supplied



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



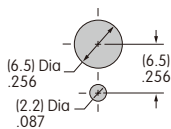
**AT501M**  
**Knurled Face Nut**  
Brass with chrome plating



### PANEL CUTOUTS & MAXIMUM PANEL THICKNESS

**With Standard Hardware**

.087" (2.2mm) for Standard Lever



.051" (1.3mm) for Locking Lever

**Without Bottom Hex Nut**

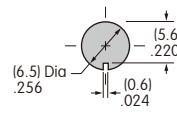
.154" (3.9mm) for Standard Lever

.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

