# General Specifications

## Electrical Capacity (Resistive Load)

**Power Level (silver):** 6A @ 125V AC & 3A @ 250V AC
4A @ 30V DC for On-None-On & On-None-Off; 3A @ 30V DC for all other circuits
**Logic Level (gold):** 0.4VA maximum @ 28V AC/DC maximum (Applicable Range 0.1mA ~ 0.1A @ 20mV ~ 28V)
**Logic/Power Level (gold over silver):** Combines silver & gold ratings
Note: Find additional explanation of dual rating & operating range in Supplement section.

## Other Ratings

**Contact Resistance:** 10 milliohms maximum for silver; 20 milliohms maximum for gold
**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 and case for 1 minute minimum
**Mechanical Life:** 100,000 operations minimum; 50,000 operations minimum for flat, locking & splashproof devices
**Electrical Life:** 25,000 operations minimum for silver; 50,000 operations minimum for gold;
50,000 operations minimum for silver at 3A @ 125V AC
**Angle of Throw:** 25°

## Materials & Finishes

**Toggle:** Brass with chrome plating
**Bushing:** Brass with nickel plating
**Case:** Diallyl phthalate resin (UL94V–0)
**Movable Contactor:** Phosphor bronze with silver or gold plating
**Movable Contacts:** Silver alloy (code W); copper with gold plating (code G); or silver alloy with gold plating (code A)
**Stationary Contacts:** Silver with silver plating (code W); copper or brass with gold plating (code G);
or silver with gold plating (code A)
**Terminals:** Copper or brass with silver plating; or copper or brass with gold plating
**Frame:** Stainless steel
**Support Bracket:** Brass with tin plating

## Environmental Data

**Operating Temp Range:** –30°C through +85°C (–22°F through +185°F)
**Humidity:** 90 ~ 95% humidity for 96 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$^2$) acceleration (tested in 6 right angled directions, with 5 shocks in each direction)
**Sealing:** Splashproof bushing options B3, D3, D8, L3, & L8, which have o-rings inside & outside the bushing, meet IP67 of IEC60529 Standards.

## Installation

**Mounting Torque:** 3.0Nm (26.55 lb•in) double nut for large bushing;
1.5Nm (13 lb•in) double nut & 0.7Nm (6 lb•in) single nut for all other bushings

## Processing

**Soldering:** Wave Soldering (PC version) for Gold: See Profile A in Supplement section.
Manual Soldering for Gold: See Profile A in Supplement section.
Wave Soldering (PC version) for Silver: See Profile B in Supplement section.
Manual Soldering for Silver: See Profile B in Supplement section.
Note: Lever must be in OFF (center) position while soldering.
**Cleaning:** These devices are not process sealed. Hand clean locally using alcohol based solution.

## Standards & Certifications

**Flammability Standards:** UL94V–0 for case
**UL:** **File No. E44145 - Recognized only when ordered with marking on switch.**
Add "/U" or "/CUL" before dash in part number to order UL recognized switch.
All models recognized at 6A @ 125V AC, 3A @ 250V AC or 0.4VA maximum @ 28V DC maximum.
**CSA:** **File No. 023535_0_000 - Certified only when ordered with marking on switch.**
Add "/C" before dash in part number to order CSA certified switch.
All models certified at 6A @ 125V AC or 3A @ 250V AC or 0.4VA maximum @ 28V maximum.

# Distinctive Characteristics

Antirotation design, standard on noncylindrical levers, mates toggle and bushing; bottom of toggle has two flatted sides which fit into a complementary opening inside bushing.

Antijamming design protects contacts from damage due to excessive downward force on actuator.

High torque bushing construction prevents rotation or separation from frame during installation.

High insulating barriers increase isolation of circuits in multipole devices and provide added protection to contact points.

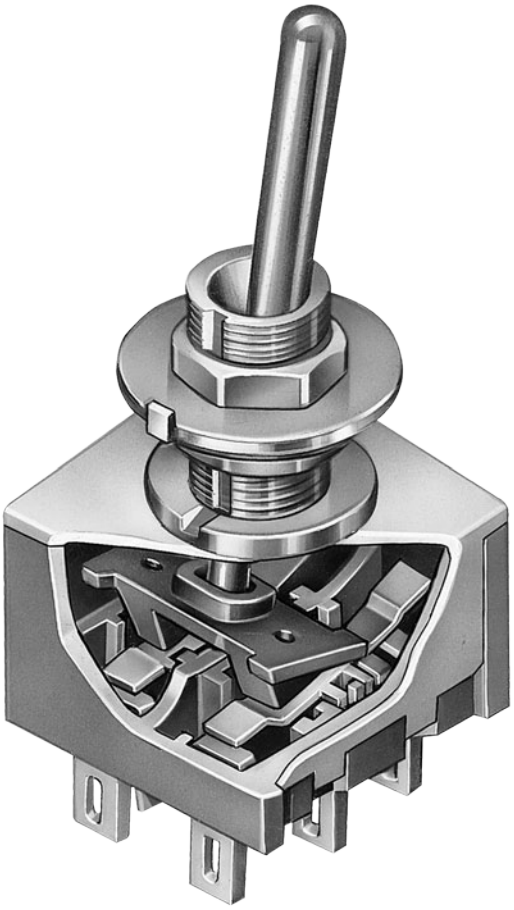
Molded diallyl phthalate case has a UL flammability rating of 94V-0.

Epoxy sealed terminals prevent entry of solder flux and other contaminants.

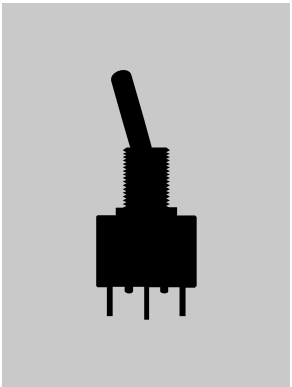
Prominent external insulating barriers increase insulation resistance and dielectric strength.

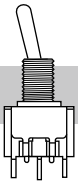
Interlocked actuator block, lever, and interior guide prevent switch failure due to biased lever movement.

Clinching of frame to case well above base and terminals provides 1,500V dielectric strength.

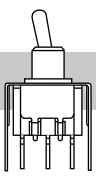


Actual Size

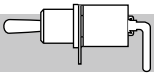




Bushing Mount Page A48



Bracket PC Mount Page A60



Angle PC Mount Page A66

## TYPICAL SWITCH ORDERING EXAMPLE

M20 | 1 | 2 | S2 | A2 | G | 40 | — | □ | □

### Poles

| | |
|---|---|
| 1 | SPDT |
| 2 | DPDT<br>SP3T |
| 3 | 3PDT |
| *4 | 4PDT<br>DP3T |

*4-pole available on vertical models only.

### Small Toggles

| | |
|---|---|
| S | .413″ (10.5mm) Bat |
| S2 | .200″ (5.08mm) Bat |
| S3 | .256″ (6.5mm) Bat |
| E | .450″ (11.4mm) Flatted |
| E2 | .256″ (6.5mm) Flatted |

Toggle dimensions are based on use with a .350″ (8.9mm) bushing; add .070″ (1.78mm) to toggle length when combining with a .280″ (7.1mm) bushing.

### Small Bushings

| | |
|---|---|
| A2 | .280″ (7.1mm) Smooth with Keyway |
| S2 | .350″ (8.9mm) Smooth with Keyway |
| A1 | .280″ (7.1mm) Threaded with Keyway |
| S1 | .350″ (8.9mm) Threaded with Keyway |

### Contact Materials & Ratings

| | |
|---|---|
| W | Silver; Rated<br>6A @ 125V AC & 3A @ 250V AC |
| G | Gold; Rated<br>0.4VA max @ 28V AC/DC max |
| A | Gold over Silver; Rated<br>6A @ 125V AC & 0.4VA max @ 28V AC/DC max |

### Optional Caps

| | |
|---|---|
| B | For S Bat Toggle |
| C | Conical Cap for S Bat Toggle |

### Cap Colors

| | |
|---|---|
| A | Black |
| B | White |
| C | Red |
| E | Yellow |
| F | Green |
| G | Blue |

### Cap for Locking Lever

| | |
|---|---|
| No Code | Nickel Plated Supplied with Switch |
| A | Black |
| C | Red |
| G | Blue |

### Circuits

| | | | |
|---|---|---|---|
| 2 | ON | NONE | ON |
| 3 | ON | OFF | ON |
| 5 | ON | NONE | (ON) |
| 8 | (ON) | OFF | (ON) |
| 9 | ON | OFF | (ON) |
| *4 | ON | ON | ON |
| *6 | (ON) | ON | (ON) |
| *7 | ON | ON | (ON) |

( ) = Momentary

*3-ON circuits available with double and four pole bases only

### Locking Lever

| | |
|---|---|
| L | .201″ (5.1mm) Dia. Locking Lever |

### Bushing For Locking Levers

| | |
|---|---|
| L2 | Smooth with Keyway for Lever Lock |

### Terminals

| | |
|---|---|
| 30 | .150″ (3.81mm)<br>Right Angle PC (1-3 Pole) |
| 32 | Right Angle PCB<br>(1 Pole & 0.4VA Rating Only) |
| 40 | .150″ (3.81mm)<br>Vertical PC (1-4 Pole) |
| 45 | .100″ (2.54mm)<br>Vertical PC (1-4 Pole) |

**Standard Toggle, Bushing, & Terminal Combinations:**

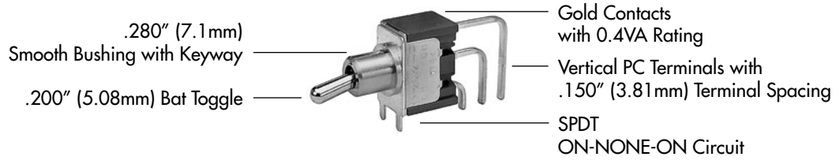
**S2A2G30, S2A2G40, SS2G30, SS2G40, LL2G30, & LL2G40**

### IMPORTANT:

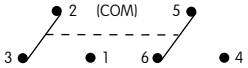
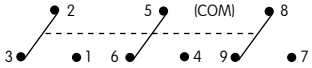
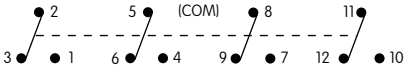
Switches are supplied without UL, cULus & CSA marking unless specified. **UL, cULus & CSA recognized only when ordered with marking on the switch.** Specific models, ratings, & ordering instructions are noted on General Specifications page.

### DESCRIPTION FOR TYPICAL ORDERING EXAMPLE

M2012S2A2G40

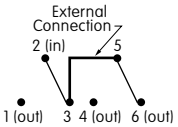
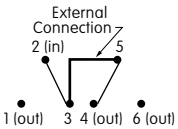
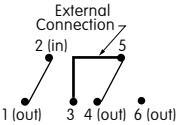
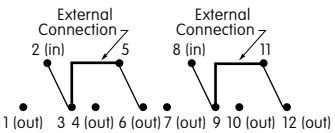
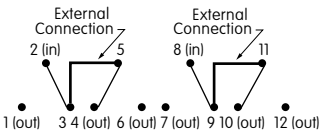
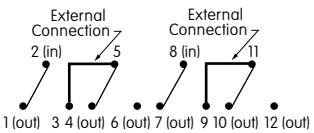


## POLES & CIRCUITS

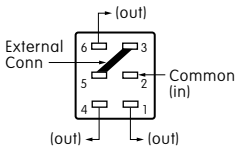
| Pole | Model | Toggle Position ( ) = Momentary: Down (Keyway) | Center | Up | Connected Terminals: Down (Keyway) | Center | Up | Throw & Schematics |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Note: Terminal numbers are not actually on the switch. * Reverse circuits available for vertical mount SP & DP upon request. |
| SP | *M2012 | ON | NONE | ON | 2-3 | OPEN | 2-1 | SPDT |
| | M2013 | ON | OFF | ON | | | | |
| | *M2015 | ON | NONE | (ON) | | | | |
| | M2018 | (ON) | OFF | (ON) | | | | |
| | M2019 | ON | OFF | (ON) | | | | |
| DP | *M2022 | ON | NONE | ON | 2-3 5-6 | OPEN | 2-1 5-4 | DPDT  |
| | M2023 | ON | OFF | ON | | | | |
| | *M2025 | ON | NONE | (ON) | | | | |
| | *M2028 | (ON) | OFF | (ON) | | | | |
| | M2029 | ON | OFF | (ON) | | | | |
| 3P | M2032 | ON | NONE | ON | 2-3 5-6 8-9 | OPEN | 2-1 5-4 8-7 | 3PDT  |
| | M2033 | ON | OFF | ON | | | | |
| | M2035 | ON | NONE | (ON) | | | | |
| | M2038 | (ON) | OFF | (ON) | | | | |
| | M2039 | ON | OFF | (ON) | | | | |
| 4P | M2042 | ON | NONE | ON | 2-3 5-6 8-9 11-12 | OPEN | 2-1 5-4 8-7 11-10 | 4PDT  |
| | M2043 | ON | OFF | ON | | | | |
| | M2045 | ON | NONE | (ON) | | | | |
| | M2048 | (ON) | OFF | (ON) | | | | |
| | M2049 | ON | OFF | (ON) | | | | |

### For 3 Throw (3-On)

### Connected Terminals & Schematics

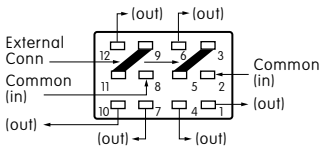
| Pole | Model | Down | Center | Up | Down | Center | Up |
|---|---|---|---|---|---|---|---|
| SP | M2024 | ON | ON | ON |  2-3 5-6 |  2-3 5-4 |  2-1 5-4 |
| | M2026 | (ON) | ON | (ON) | | | |
| | M2027 | ON | ON | (ON) | | | |
| DP | M2044 | ON | ON | ON |  2-3 5-6 8-9 11-12 |  2-3 5-4 8-9 11-10 |  2-1 5-4 8-7 11-10 |
| | M2046 | (ON) | ON | (ON) | | | |
| | M2047 | ON | ON | (ON) | | | |

**The SP3T model utilizes a double pole base.**




External connection must be made during field installation.

**The DP3T model utilizes a four pole base.**

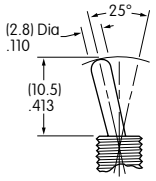



External connection must be made during field installation.

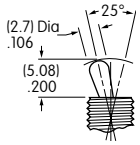
## SMALL TOGGLES

**Important:**
Toggle length changes based on bushing selected. All illustrations are shown with .350" (8.9mm) long bushing. When using a .280" (7.1mm) long bushing, toggle length increases .070" (1.78mm).

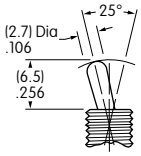
**S** **.413" (10.5mm)**
**Bat**



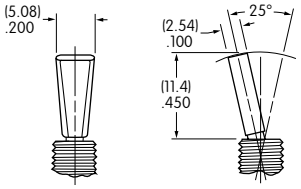

**S2** **.200" (5.08mm)**
**Bat**



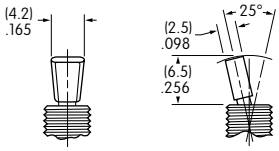

**S3** **.256" (6.5mm)**
**Bat**




**E** **.450" (11.4mm)**
**Flatted**



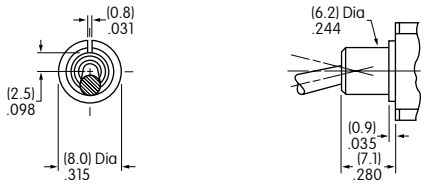

**E2** **.256" (6.5mm)**
**Flatted**




**Standard Material & Finish:** Brass with Bright Chrome
Contact factory for optional finishes.

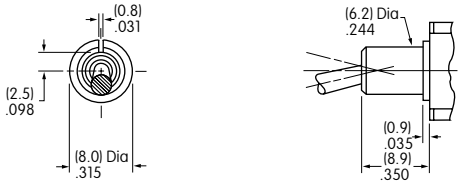
## SMALL BUSHINGS

**A2** **.280" (7.1mm)**
**Smooth with Keyway**

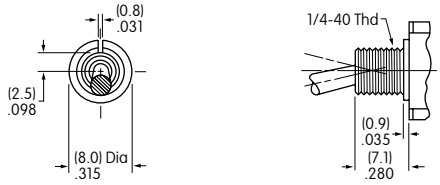



When using this bushing, toggle length is increased by .070" (1.78mm).

**S2** **.350" (8.9mm)**
**Smooth with Keyway**

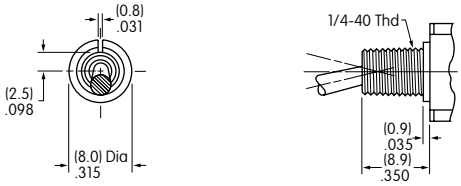



**A1** **.280" (7.1mm)**
**Threaded with Keyway**




When using this bushing, toggle length is increased by .070" (1.78mm). Maximum Panel Thickness with Standard Hardware: .031" (0.8mm)

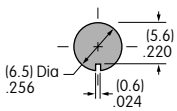
**S1** **.350" (8.9mm)**
**Threaded with Keyway**



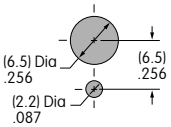

Maximum Panel Thickness with Standard Hardware: .102" (2.6mm)

**Panel Cutouts**

**For A2, S2, A1 or S1 Bushing with Keyway**




**For A1 or S1 Bushing with Locking Ring**



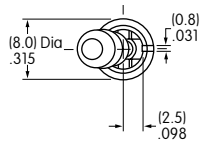

**Standard Hardware:**

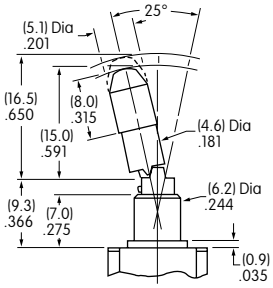
2 Hex Nuts (AT513H)
1 Lockwasher (AT509)
1 Locking Ring (AT507H)

For dimensions, see Accessories & Hardware section.

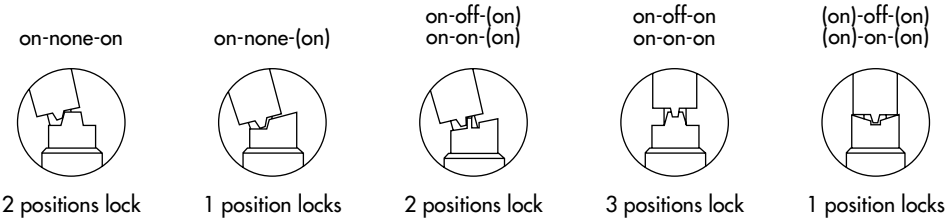
## LOCKING LEVER & BUSHING

**LL2** **Smooth with Keyway**

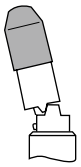



**Locking Mechanism**




**No Code**



**Cap for Locking Lever**

**Supplied with Cap AT427**
**Material & Finish:**
Brass with Nickel Plating

**Lever Material & Finish:**
Brass with Chrome Plating

**Color Codes for Optional Anodized Aluminum Caps**

**A** Black
**C** Red
**G** Blue

## CONTACT MATERIALS & RATINGS

| | | | |
|---|---|---|---|
| **W** | **Silver over Silver** | **Power Level** | **6A @ 125V AC & 3A @ 250V AC** |
| **G** | **Gold over Brass or Copper** | **Logic Level** | **0.4VA maximum @ 28V AC/DC maximum** |

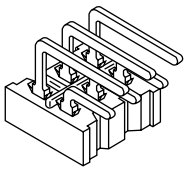
Note: See Supplement section to find complete explanation of operating range.

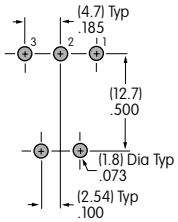
| | | | |
|---|---|---|---|
| **A** | **Gold over Silver** | **Power Level or Logic Level** | **6A @ 125V AC or 0.4VA maximum @ 28V AC/DC maximum** |

Note: This dual rated option is suitable when two or more identical switches are used in logic and in power circuits within the same application. See Supplement section to find complete explanation of dual rating and operating range.

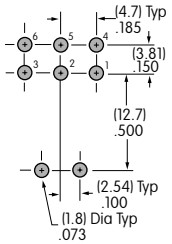
## TERMINALS

**30** **.150" (3.81mm) Right Angle PC (1-3 Pole)**

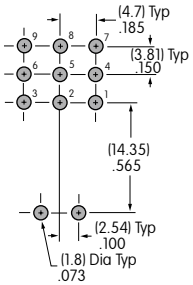





Single Pole

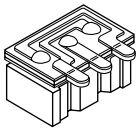


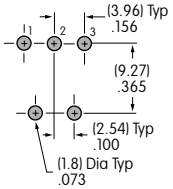

Double Pole




Three Pole

**32** **Right Angle PCB with Reverse Circuit (1 Pole & 0.4VA Rating Only)**

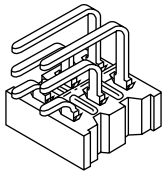


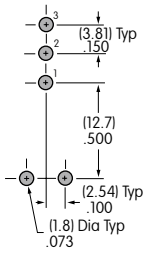



Terminal dimensions are shown on the Typical Switch Dimensions pages which follow.

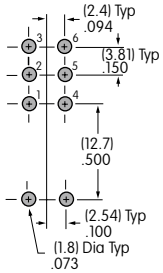
## TERMINALS (Continued)

**40** **.150" (3.81mm) Vertical PC (1-4 Pole)**

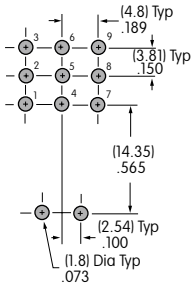




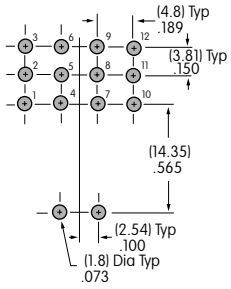

Single Pole




Double Pole

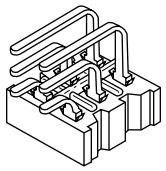


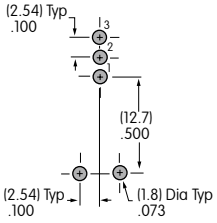

Three Pole



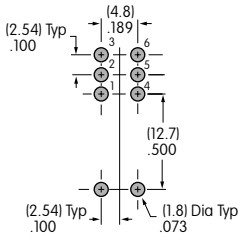

Four Pole

**45** **.100" (2.54mm) Vertical PC (1-4 Pole)**

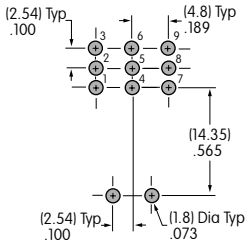




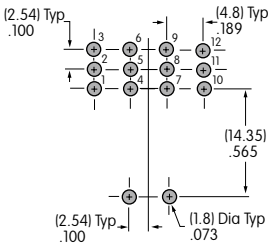

Single Pole




Double Pole




Three Pole



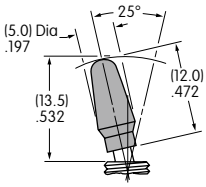

Four Pole

Terminal dimensions are shown on the Typical Switch Dimensions pages which follow.

## OPTIONAL CAPS & CAP COLORS

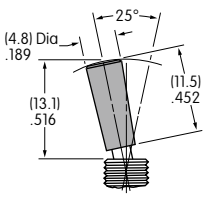
**B** **AT415 for S Bat Toggle**

Material: Polyethylene




**C** **AT444 Conical Cap for S Bat Toggle**

Material: Polyethylene

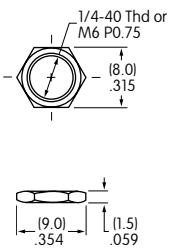



**Colors Available**

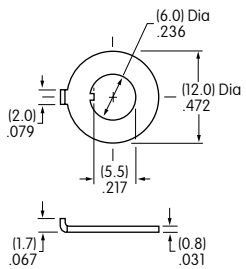
- **A** Black
- **B** White
- **C** Red
- **E** Yellow
- **F** Green
- **G** Blue

## STANDARD HARDWARE

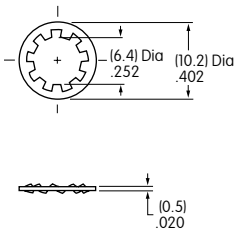
**AT513H for Inch**
**AT513M for Metric**
**Hex Nut** (2 per switch)
Brass/Nickel




**AT507H for Inch**
**AT507M for Metric**
**Locking Ring** (1 per switch)
Steel with Zinc/Chromate

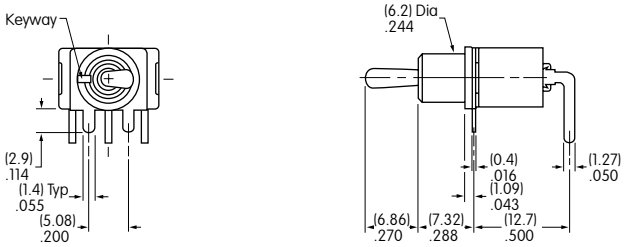



**AT509**
**Lockwasher** (1 per switch, none with splashproof)
Steel with Zinc/Chromate



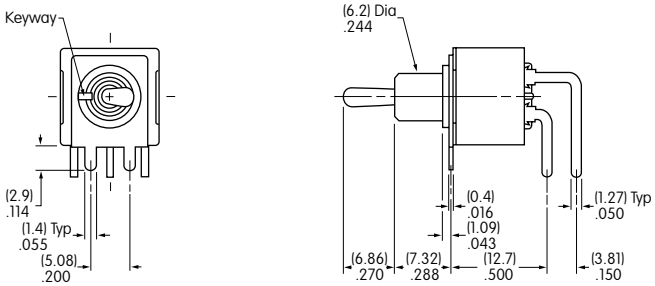
## TYPICAL SWITCH DIMENSIONS

### .150" (3.81mm) Right Angle PC — Single Pole



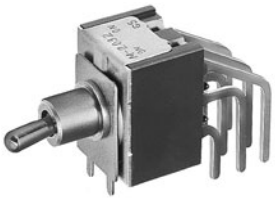

M2012S2A2G30

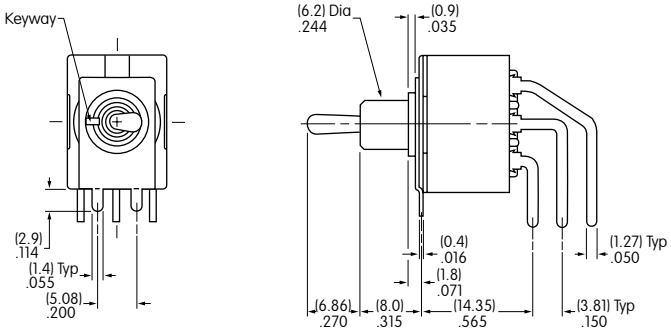
### .150" (3.81mm) Right Angle PC — Double Pole




M2022S2A2G30

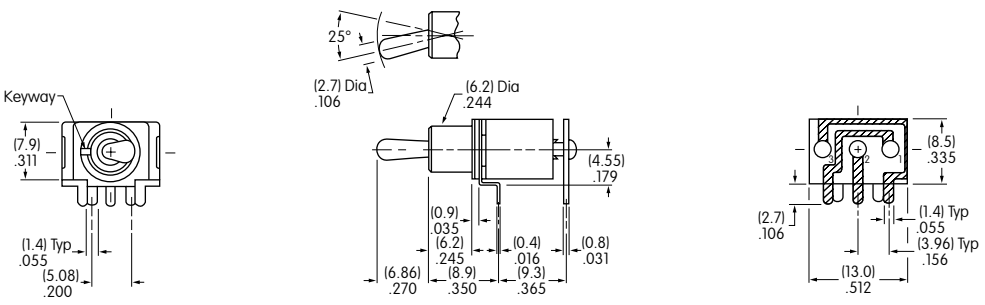
### .150" (3.81mm) Right Angle PC — Three Pole






M2032S2A2G30

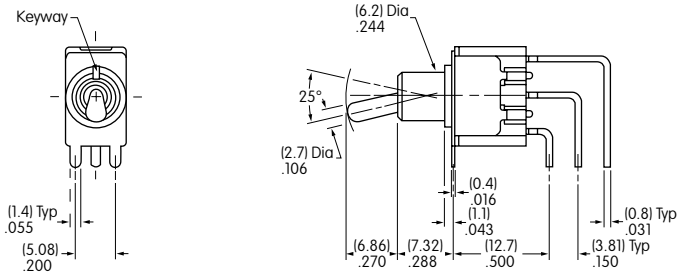
### Right Angle PCB — Single Pole • Reverse Circuit




M2012S2A2G32

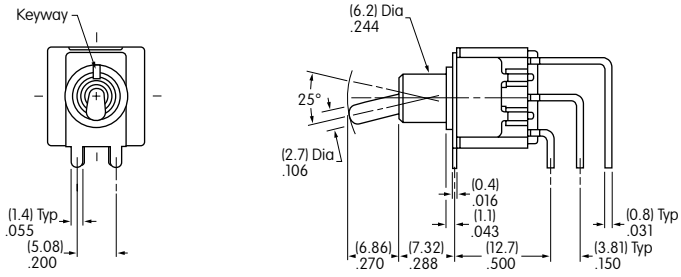
## TYPICAL SWITCH DIMENSIONS

### Single Pole — .150" (3.81mm) Vertical PC



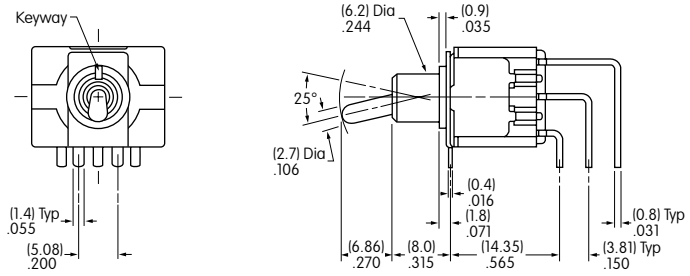
M2012S2A2G40

### Double Pole — .150" (3.81mm) Vertical PC



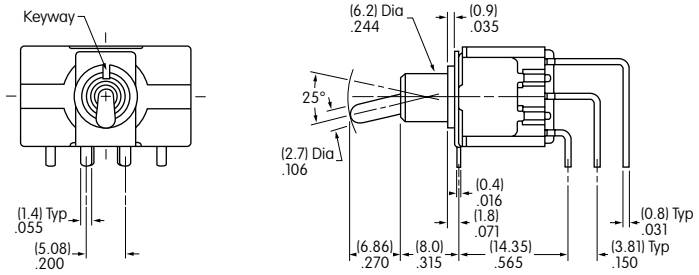
M2022S2A2G40

### Three Pole — .150" (3.81mm) Vertical PC



M2032S2A2G40

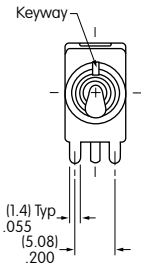
### Four Pole — .150" (3.81mm) Vertical PC

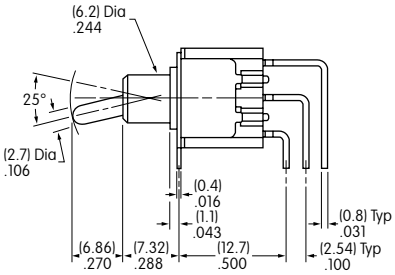


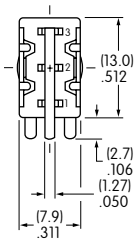
M2042S2A2G40

## TYPICAL SWITCH DIMENSIONS

### .100" (2.54mm) Vertical PC — Single Pole

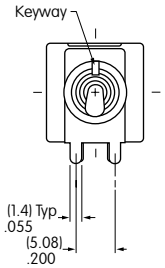


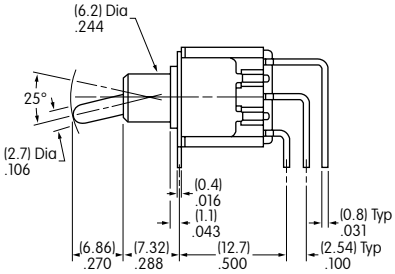



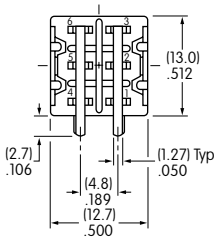




M2012S2A2G45

### .100" (2.54mm) Vertical PC — Double Pole

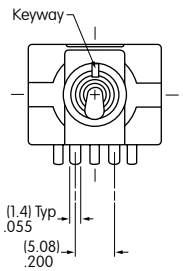


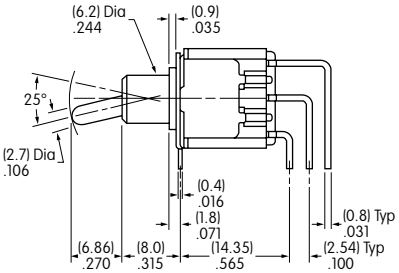



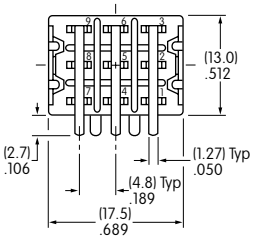




M2022S2A2G45

### .100" (2.54mm) Vertical PC — Three Pole

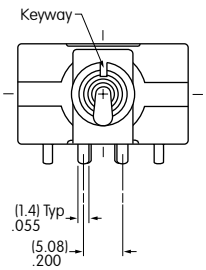


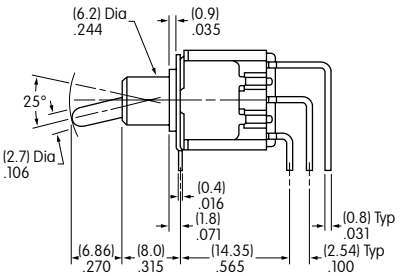



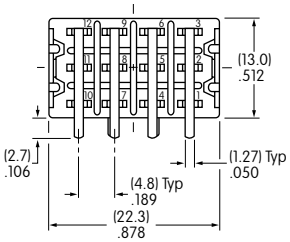




M2032S2A2G45

### .100" (2.54mm) Vertical PC — Four Pole




M2042S2A2G45

# OCEAN CHIPS
## Океан Электроники
## Поставка электронных компонентов

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**».

AVIC JONHON

**«JONHON»** (основан в 1970 г.)

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