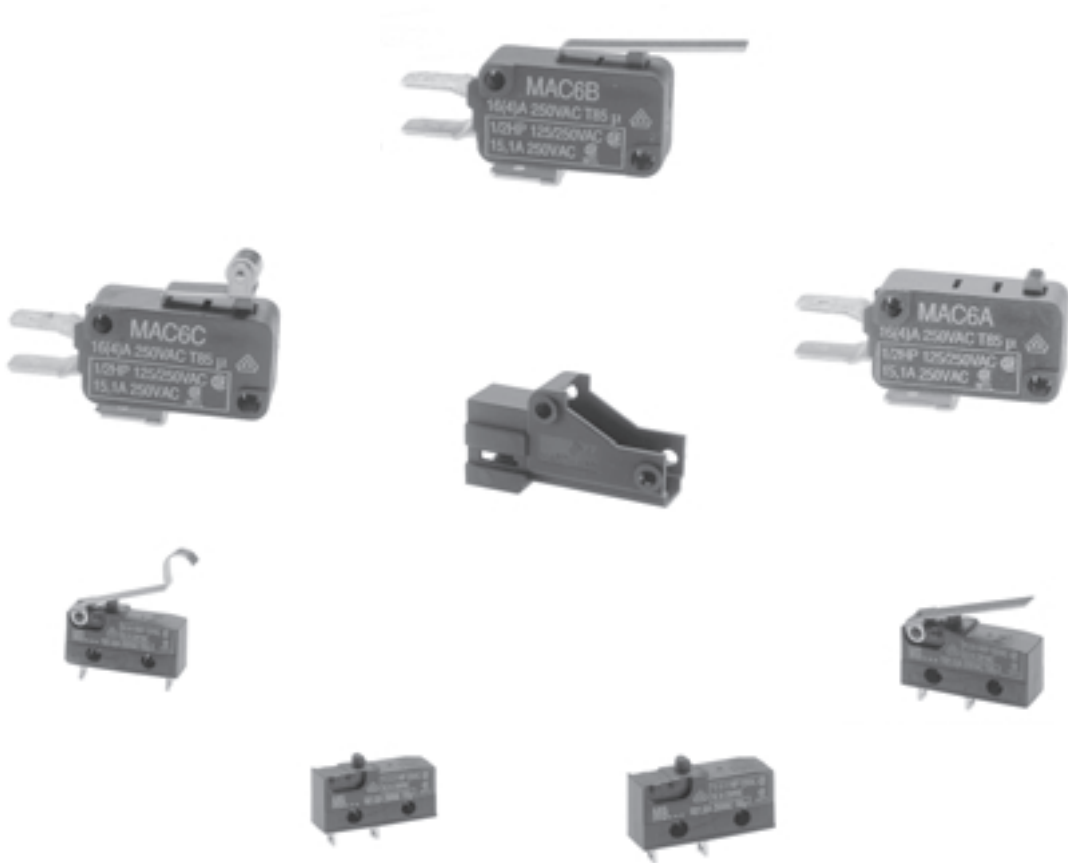


# MICRO-LIMIT SWITCHES

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE



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# MICRO-LIMIT SWITCHES

**Micro-limit pushbutton switches** are used in many applications including microwave ovens, vending machines, copy and fax machines, medical and security equipment, computer peripherals and many others. They are characterized by close tolerance precision switching positions and long service life. APEM micro-limit switches are 100% electronic tested prior to shipment to insure proper operation and conformance with specifications.

## DEFINITIONS OF TERMS

### Free position

Position of the switch actuator when no force is applied.

### Operating position

The position of the actuator when the contact snaps.

### Overtravel position

The final position of the actuator.

### Release position

The position of the actuator when the contact snaps back from the operating position to original position.

### Contact opening gap

The distance between the open contact pair.

### Pretravel

The distance between free and operating positions.

### Overtravel

The distance the actuator travels after the contact actuates.

### Movement differential

The distance from the operating to release position of the actuator.

### Free travel

The distance between the release and free positions.

### Back travel

The distance between the overtravel and release positions.

### Total travel

The sum of pretravel and overtravel.

### Operating force

The force required to cause snap action of contact.

### End operating force

The force to be applied to keep the actuator in the allowed final position.

### Release force

The force applied to the actuator at the moment the contact snaps back from the operating position.

### Differential force

The difference between the operating force and the release force.

### Mechanical life

The minimum number of actuations with no load on the switch.

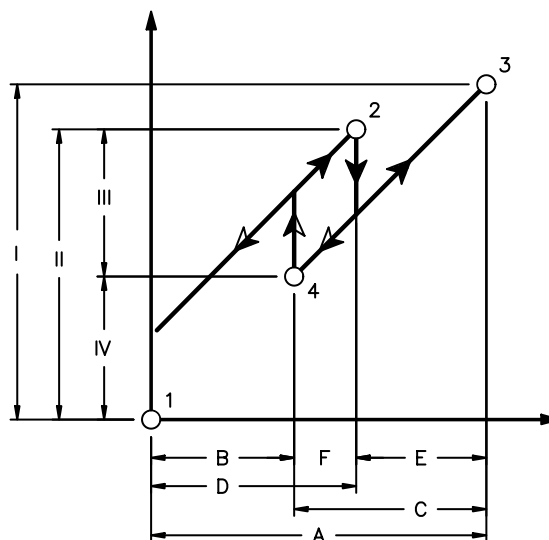
### Electrical life

The minimum number of actuations at rated voltage, rated current and resistive load at 20°C ambient temperature.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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- |     |                       |
|-----|-----------------------|
| 1   | free position         |
| 2   | operating position    |
| 3   | overtravel position   |
| 4   | release position      |
| A   | total travel          |
| B   | free travel           |
| C   | back travel           |
| D   | pretravel             |
| E   | overtravel            |
| F   | movement differential |
| I   | total force           |
| II  | operating force       |
| III | differential force    |
| IV  | release force         |



**FORCE vs.  
TRAVEL  
DIAGRAM**

## MA SERIES - MICRO-LIMIT SWITCHES



### FEATURES

- **Ratings:** 16 Amps 250 VAC (resistive load). 4 Amps 250 VAC (motor load) or 3 Amps 250 VAC (resistive load). 0.1 Amps 250 VAC (motor load).
- **Single pole CO (change-over or alternate action), NC (normally closed momentary) and NO (normally open momentary) configurations.**
- **Close tolerance switching action with long life (10,000,000 mechanical cycles min.).**
- **Pin plunger, hinge lever or roller lever actuator options.**

### MATERIALS

|                          |                                                         |
|--------------------------|---------------------------------------------------------|
| <b>Contacts:</b>         | Stationary: Nicker silver    Shorting: Beryllium copper |
| <b>Actuator:</b>         | FS 161 (UL94V-O)                                        |
| <b>Case &amp; cover:</b> | PBT (UL94V-O)                                           |
| <b>Terminals:</b>        | Silver plated copper/zinc                               |

### AGENCY RECOGNITION



Approval pending.

### SPECIFICATIONS

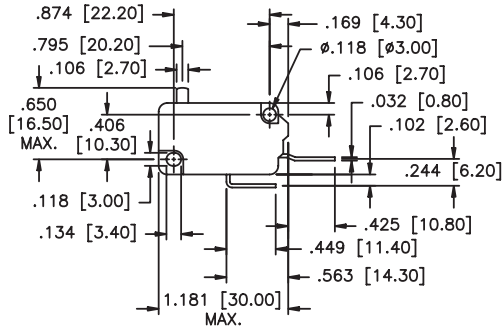
|                        |                                                                                                               |
|------------------------|---------------------------------------------------------------------------------------------------------------|
| Operating force:       | $\leq 12.59$ oz. (343 grams) approx. for 16 Amp models<br>$\leq 0.72$ oz. (20 grams) approx. for 3 Amp models |
| Pretravel:             | $\leq .047$ " (1.2mm)                                                                                         |
| Overtravel:            | $\geq .059$ " (1.5mm) min.                                                                                    |
| Movement differential: | $\leq .016$ " (0.4mm)                                                                                         |
| Free position:         | $\leq .649$ " (16.5mm)                                                                                        |
| Operating position:    | $.578 \pm .020$ " (14.7mm $\pm$ 0.5mm)                                                                        |
| Operating temperature: | -40°C to +85°C                                                                                                |
| Contact gap:           | less than .118" (3mm)                                                                                         |
| Tracking resistance:   | > PTI 175                                                                                                     |



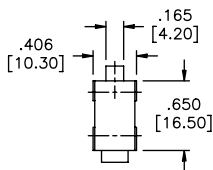
# MA SERIES - MICRO-LIMIT SWITCHES

## MECHANICAL OUTLINES

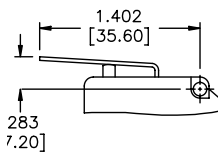
Models with quick-connect terminal .031x.248" (0.8x6.3mm)



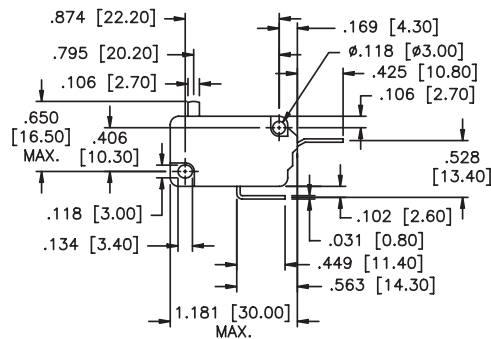
Normally open



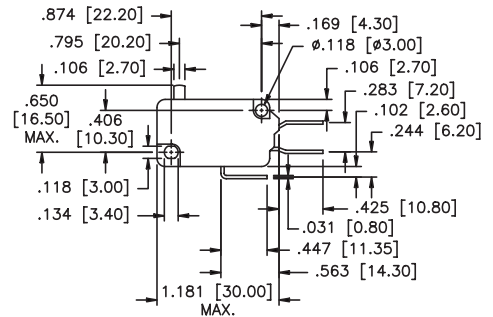
Side view



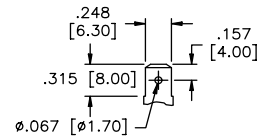
Hinge lever



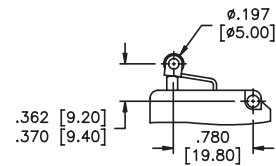
Normally closed



Change-over



Quick-connect terminal



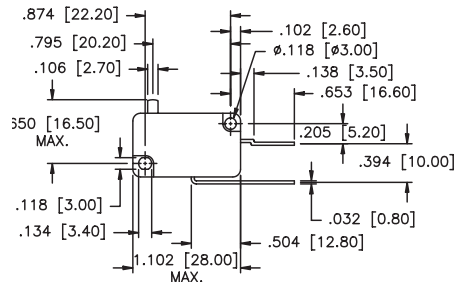
Roller lever

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

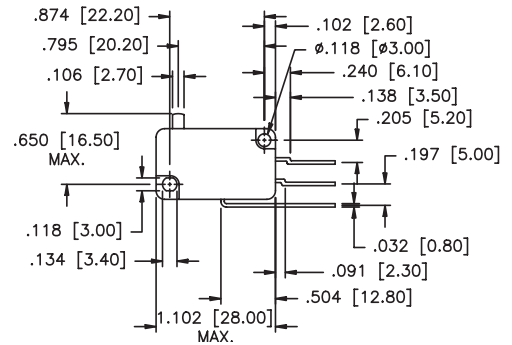
# MA SERIES - MICRO-LIMIT SWITCHES

## MECHANICAL OUTLINES

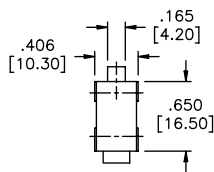
Models with quick-connect terminal .031x.248" (0.8x6.3mm) & pin spacing .197" (5mm)



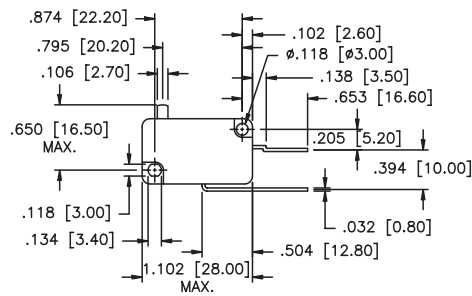
Normally open



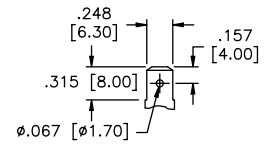
Change-over



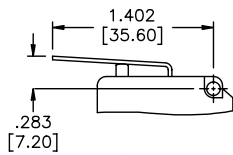
Side view



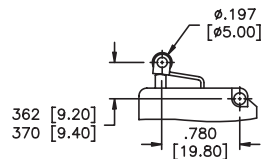
Normally closed



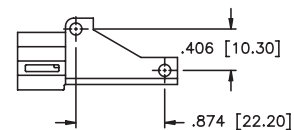
Quick-connect terminal



Hinge lever



Roller lever



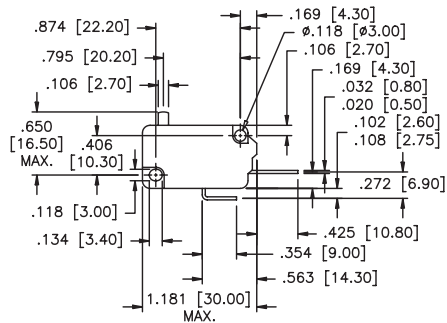
Adaptor element

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

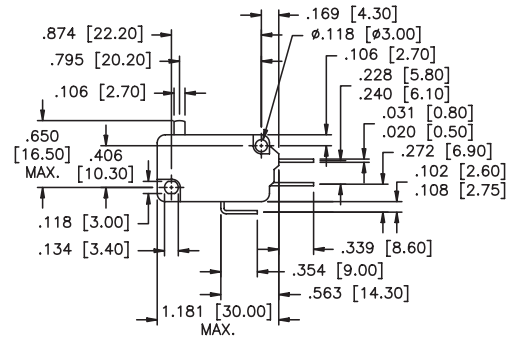
# MA SERIES - MICRO-LIMIT SWITCHES

## MECHANICAL OUTLINES

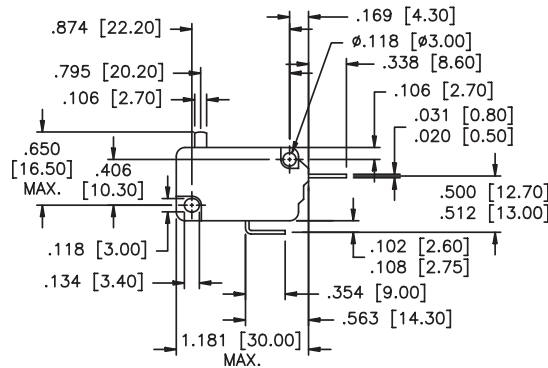
Models with quick-connect terminal .020 or .031x.248" (0.8 or 0.8x6.3mm)



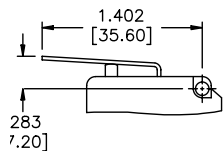
Normally open



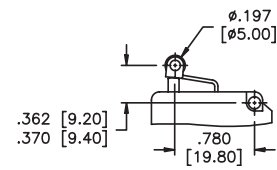
Change-over



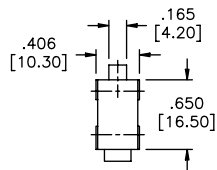
Normally closed



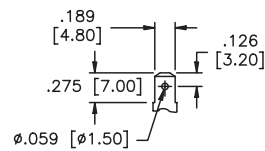
Hinge lever



Roller lever



Side view



Quick connect terminal

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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## MB SERIES - MICRO-LIMIT SWITCHES



### FEATURES

- Ratings: 10 Amps 250 VAC (resistive load). 1.5 Amps 250 VAC (motor load).
- Single pole CO (change-over or alternate action), NC (normally closed momentary) and NO (normally open momentary) configurations.
- Close tolerance switching action with long life (10,000,000 mechanical cycles min.).
- Pin plunger, hinge lever or roller lever actuator options.

### MATERIALS

|               |                                                         |
|---------------|---------------------------------------------------------|
| Contacts:     | Stationary: Nickel silver    Shorting: Beryllium copper |
| Actuator:     | POM (UL94HB)                                            |
| Case & cover: | PBT (UL94V-O)                                           |
| Terminals:    | Silver plated copper/zinc                               |

### AGENCY RECOGNITION



### SPECIFICATIONS

|                        |                                |
|------------------------|--------------------------------|
| Operating force:       | ≤ 10 oz. (274 grams) approx.   |
| Pretravel:             | ≤ .039" (1mm)                  |
| Overtravel:            | ≥ .024" (0.6mm)                |
| Movement differential: | ≤ .005" (0.13mm)               |
| Free position:         | ≤ .366" (9.3mm)                |
| Operating position:    | .331" ± .012" (8.4mm ± (0.3mm) |
| Operating temperature: | -40°C to +85°C                 |
| Contact gap:           | < .118" (3mm)                  |
| Tracking resistance:   | >PTI 175                       |

# MB SERIES - MICRO-LIMIT SWITCHES

## ORDER FORMAT

**M B D 5 B 1**

### Series

**MB**

### Circuit & quick-connect terminals

- D** Normally open (solder terminal)
- E** Normally closed (solder terminal)
- F** Change-over (solder terminal)
- G** Normally open (p.c. terminal)
- H** Normally closed (p.c. terminal)
- J** Change-over (p.c. terminal)

### Switch rating

**5** 10(1.5)A 250 VAC

### Actuator style

- A** Pin actuator
- B** Hinge actuator
- C** Roller actuator

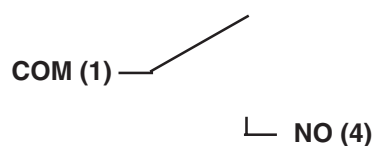
### Length

Actuator length and fixed position- (see table below)

## STANDARD MODELS

| Circuit                     |     |               | Normally open |               | Normally closed |               | Change-over   |               |
|-----------------------------|-----|---------------|---------------|---------------|-----------------|---------------|---------------|---------------|
| Terminals                   |     |               | Solder        | P.C.          | Solder          | P.C.          | Solder        | P.C.          |
| Pin plunger with radius     |     |               | <b>MBD5A</b>  | <b>MBG5A</b>  | <b>MBE5A</b>    | <b>MBH5A</b>  | <b>MBF5A</b>  | <b>MBJ5A</b>  |
| Pin plunger, spherical form |     |               | <b>MBD5D</b>  | <b>MBG5D</b>  | <b>MBE5D</b>    | <b>MBH5D</b>  | <b>MBF5D</b>  | <b>MBJ5D</b>  |
| Lever type                  | Fix | Act. length   |               |               |                 |               |               |               |
| Hinge lever                 | EH  | .189" (4.8mm) | <b>MBD5B</b>  | <b>MBG5B</b>  | <b>MBE5B</b>    | <b>MBH5B</b>  | <b>MBF5B</b>  | <b>MBJ5B</b>  |
|                             | EV  | .276" (7.0mm) | <b>MBD5B2</b> | <b>MBG5B2</b> | <b>MBE5B2</b>   | <b>MBH5B2</b> | <b>MBF5B2</b> | <b>MBJ5B2</b> |
|                             | EH  | .276" (7.0mm) | <b>MBD5B1</b> | <b>MBG5B1</b> | <b>MBE5B1</b>   | <b>MBH5B1</b> | <b>MBF5B1</b> | <b>MBJ5B1</b> |
|                             | EV  | .370" (9.4mm) | <b>MBD5B3</b> | <b>MBG5B3</b> | <b>MBE5B3</b>   | <b>MBH5B3</b> | <b>MBF5B3</b> | <b>MBJ5B3</b> |
| Roller lever                | EH  | .098" (2.5mm) | <b>MBD5C</b>  | <b>MBG5C</b>  | <b>MBE5C</b>    | <b>MBH5C</b>  | <b>MBF5C</b>  | <b>MBJ5C</b>  |
|                             | EV  | .185" (4.7mm) | <b>MBD5C2</b> | <b>MBG5C2</b> | <b>MBE5C2</b>   | <b>MBH5C2</b> | <b>MBF5C2</b> | <b>MBJ5C2</b> |
|                             | EH  | .185" (4.7mm) | <b>MBD5C1</b> | <b>MBG5C1</b> | <b>MBE5C1</b>   | <b>MBH5C1</b> | <b>MBF5C1</b> | <b>MBJ5C1</b> |
|                             | EV  | .280" (7.1mm) | <b>MBD5C3</b> | <b>MBG5C3</b> | <b>MBE5C3</b>   | <b>MBH5C3</b> | <b>MBF5C3</b> | <b>MBJ5C3</b> |
| Simulated roller lever      | EH  | .098" (2.5mm) | <b>MBD5E</b>  | <b>MBG5E</b>  | <b>MBE5E</b>    | <b>MBH5E</b>  | <b>MBF5E</b>  | <b>MBJ5E</b>  |
|                             | EV  | .185" (4.7mm) | <b>MBD5E2</b> | <b>MBG5E2</b> | <b>MBE5E2</b>   | <b>MBH5E2</b> | <b>MBF5E2</b> | <b>MBJ5E2</b> |
|                             | EH  | .185" (4.7mm) | <b>MBD5E1</b> | <b>MBG5E1</b> | <b>MBE5E1</b>   | <b>MBH5E1</b> | <b>MBF5E1</b> | <b>MBJ5E1</b> |
|                             | EV  | .280" (7.1mm) | <b>MBD5E3</b> | <b>MBG5E3</b> | <b>MBE5E3</b>   | <b>MBH5E3</b> | <b>MBF5E3</b> | <b>MBJ5E3</b> |

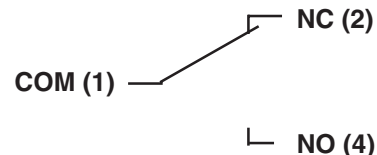
**NO =  
NORMALLY OPEN:**



**NC =  
NORMALLY CLOSED:**

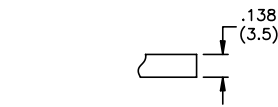


**CO =  
CHANGE-OVER:**

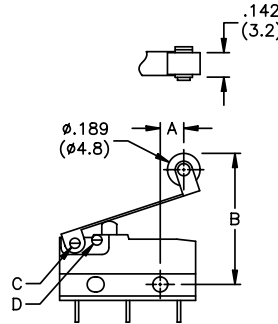


# MB SERIES - MICRO-LIMIT SWITCHES

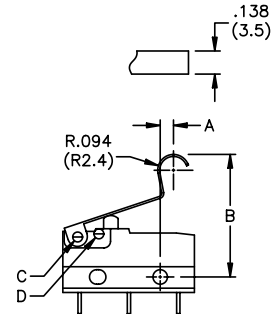
## ACTUATORS AND SPECIFICATIONS



**Hinge lever**



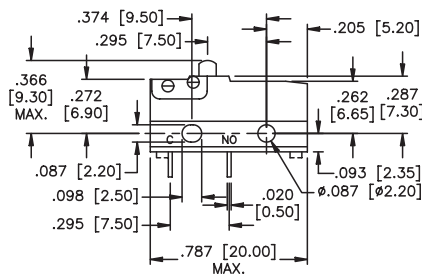
**Roller lever**



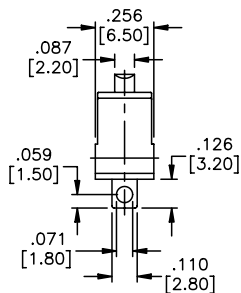
**Simulated roller lever**

| Actuator                                                  | Hinge lever  |              |              |              | Roller lever |              |              |              | Simulated roller lever |              |              |              |
|-----------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|------------------------|--------------|--------------|--------------|
| Actuator length, inches $\pm .031"$<br>$\pm 0.8\text{mm}$ | .189<br>4.8  | .276<br>7.0  | .276<br>7.0  | .370<br>9.4  | .098<br>2.5  | .185<br>4.7  | .185<br>4.7  | .280<br>7.1  | .098<br>2.5            | .185<br>4.7  | .185<br>4.7  | .280<br>7.1  |
| Fixed position, EH=rear EV=front                          | EH           | EV           | EH           | EV           | EH           | EV           | EH           | EV           | EH                     | EV           | EH           | EV           |
| Operating force, $\leq$ grams<br>$\leq ???$               | 100          | 45           | 85           | 40           | 110          | 50           | 95           | 40           | 115                    | 60           | 95           | 50           |
| Pre-travel, $\leq$ inches<br>$\leq$ mm                    | .177<br>4.5  | .354<br>9    | .197<br>5    | .394<br>10   | .177<br>4.5  | .354<br>9    | .197<br>5    | .394<br>10   | .177<br>4.5            | .354<br>9    | .197<br>5    | .394<br>10   |
| Overtravel, min. inches<br>min. mm                        | .030<br>0.75 | .049<br>1.25 | .030<br>0.75 | .059<br>1.5  | .030<br>0.75 | .049<br>1.25 | .030<br>0.75 | .059<br>1.5  | .030<br>0.75           | .049<br>1.25 | .030<br>0.75 | .059<br>1.5  |
| Overtravel, max. inches<br>max. mm                        | .059<br>1.5  | .098<br>2.5  | .059<br>1.5  | .118<br>3    | .059<br>1.5  | .098<br>2.5  | .059<br>1.5  | .118<br>3    | .059<br>1.5            | .098<br>2.5  | .059<br>1.5  | .118<br>3    |
| Movement diff. $\leq$ inches<br>$\leq$ mm                 | .035<br>0.9  | .059<br>1.5  | .047<br>1.2  | .071<br>1.8  | .028<br>0.7  | .059<br>1.5  | .039<br>1    | .071<br>1.8  | .028<br>0.7            | .059<br>1.5  | .039<br>1    | .071<br>1.8  |
| Free position, $\leq$ inches<br>$\leq$ mm                 | .551<br>14   | .709<br>18   | .591<br>15   | .787<br>20   | .748<br>19   | .866<br>22   | .787<br>20   | .945<br>24   | .748<br>19             | .866<br>22   | .787<br>20   | .945<br>24   |
| Operating position, inches<br>Tolerance inches $\pm$      | .421<br>.063 | .472<br>.118 | .437<br>.071 | .492<br>.138 | .622<br>.063 | .669<br>.118 | .638<br>.071 | .689<br>.138 | .630<br>.063           | .677<br>.118 | .646<br>.071 | .697<br>.138 |
| Operating position, mm<br>Tolerance mm $\pm$              | 10.7<br>1.6  | 12<br>3      | 11.1<br>1.8  | 12.5<br>3.5  | 15.8<br>1.6  | 17<br>3      | 16.2<br>1.8  | 17.5<br>3.5  | 16<br>1.6              | 17.2<br>3    | 16.4<br>1.8  | 17.7<br>3.5  |
| Order code                                                | B            | B2           | B1           | B3           | C            | C2           | C1           | C3           | E                      | E2           | E1           | E3           |

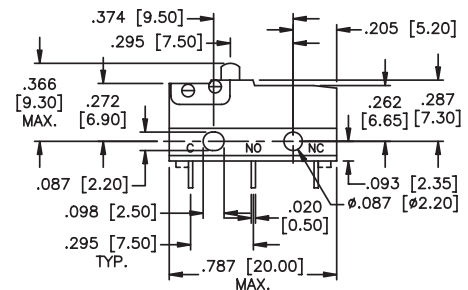
## MECHANICAL OUTLINES



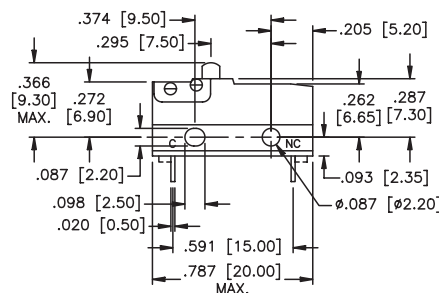
**Normally open**



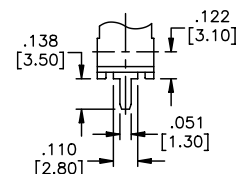
**Side view (w/solder terminal)**



**Change-over**



**Normally closed**



**P.C. terminal**

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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