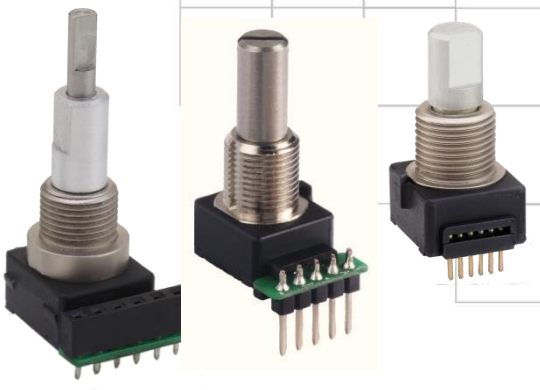
Series 291

Precision, Long-life 12mm Optical Encoder

- Available with 4, 6, 8, 24,32, 64 Pulses per Revolution
- Optional Momentary Switch
- Multiple options for terminations, resolution, cable lengths, and operating voltage



Description

The 291 Series allows versatility in design applications by providing highly reliable, precise digital output and long rotational life with our non-contacting design. This product provides flexibility in resolution, power consumption, and operating temperatures. The options of Schmitt trigger, detents, momentary switch, shaft & bushing length, dual shaft, termination styles, torque, operating voltage, and IP ratings provide flexibility to meet your exacting design requirements.

Ordering Information

Series	Termination	Bushing Length	Shaft Length	Shaft Trim	Output Combination	Operating Voltage	Switch	Schmitt Trigger & Locating Lug
291	V1	0	22	F	832	A	B	A

Code	Termination
V1	.050” pitch pins Rear facing .132” length(not for 64 PPR)
P1	.10” pitch pins Rear facing .236” length
*C4	4” ribbon cable With .050” pitch connector terminals (not for 64 PPR)
*C5	5” ribbon cable With .050” pitch connector terminals (not for 64 PPR)
*C6	6” ribbon cable With .050” pitch connector terminals (not for 64 PPR)

Code	Shaft Length “L”
Single shaft structure	
22	.687”
24	.875”
Dual shaft structure	
DD	Outer shaft: .685” Inner shaft: 1.059” (Not available with locating lug, 32 and 64 PPR, see page 8 for additional details)

Code	Spec.
F	Flat
S	Slotted

Output	Combination
832	8 PPR, 32 Detents
624	6 PPR, 24 Detents
416	4 PPR, 16 Detents
800	8 PPR, No Detents
600	6 PPR, No Detents
400	4 PPR, No Detents
X00	24 PPR, No Detents (only available with Schmitt trigger)
X24	24 PPR, 24 Detents (only available with Schmitt trigger)
Y00	32 PPR, No Detents (only available with Schmitt trigger)
Z00	64 PPR, No Detents (only available with Schmitt trigger)

Code	Spec.
A	None
B	Momentary (not for 64 P

Code	Spec.
BLANK	Without Schmitt trigger, With locating lug (not for 32, 64 PPR)
A	Without Schmitt trigger, Without locating lug (not for 32, 64 PPR)
S	With Schmitt trigger, Without locating lug
B	With Schmitt trigger, With locating lug

Code	Spec.
A	5.0V
B	3.3V (not for 64 PPR)

Code	Bushing Length “B”
0	.312” For single shaft construction
D	.256” For dual shaft construction (not for 32, 64 PPR)

Note: * Cable connector for C4, C5, C6 is AMP P/N 215083-6 or Equivalent

Electrical Specifications

Encoder Function

Parameter	Conditions & Remarks	Min	Nominal	Max	Unit
Voltage (4, 6, 8, 24, 32 PPR)		4.75 3.175	5.0 3.3	5.25 3.425	VDC
Voltage (64 PPR)		4.5	5.0	5.5	VDC
Output Code	2-Bit Quadrature Channel A leads Channel B by 90° during clockwise rotation				
Sink Current	5.0 VDC 3.3 VDC	2.0mA 1.0mA			
Power Consumption	5.0 VDC 3.3 VDC			150 80	mW mW
Resolution	4, 6, 8, 24, 32, 64				Pulses per Revolution

Mechanical and Environmental

Manual Soldering	Maximum temperature of 350°C for 5 seconds	
RoHS	Lead-Free. Fully compliant to RoHS Directive	
Shock :	Per MIL-STD-883F (100G's)	
Vibration :	Per MIL-STD-883F (15G's)	
IP Rating (4, 6, 8, 24, 32 PPR):	IP 50	
IP Rating (64 PPR):	IP 40	
Packaging :	Standard anti-static tray packaging	
Operating Temperature:	-40°C to +85°C	
Storage Temperature:	-55°C to +100°C	
Storage Temperature: (32, 64 PPR)	-40°C to +100°C	
Rotational Life	No detent @ 30 RPM With detent @ 30 RPM	3 Million Cycles 1 Million Cycles
Push-Pull Strength of Shaft **(4,6,8,24, 32 PPR)** **(64 PPR)**	 10 seconds 10 seconds	 20 kg 13.6 kg
Terminal Pull-out Strength	10 seconds	6 kg
Rotational Torque		
(4, 6, 8, 24 PPR)	Running	10 to 30 gf-cm
(32 PPR)	Running	30 gf-cm Max.
(64 PPR)	Running	100 gf-cm Max.
Rotational Torque	24 Detents	90 to 190 gf-cm
	16, 32 Detents	50 to 150 gf-cm
Detent Options	0, 16, 24, 32	

Optional Momentary Switch Function:

Parameter	Conditions & Remarks	Min.	Nominal	Max	Unit
Switch contact resistance				10	ohms
Switch rating	5 VDC @10 mA				
Switch travel		0.25	0.5	0.75	mm
Actuation Force		400	510	620	grams
Switch Life	Standard	1 Million			Actuations
Switch Life		Consult CTS for custom life requirements			

Mechanical Specifications

Figure 1 – 291V1… – Without Schmitt Trigger, With Left Locating Lug, .050” Pitch Pins Facing Rear

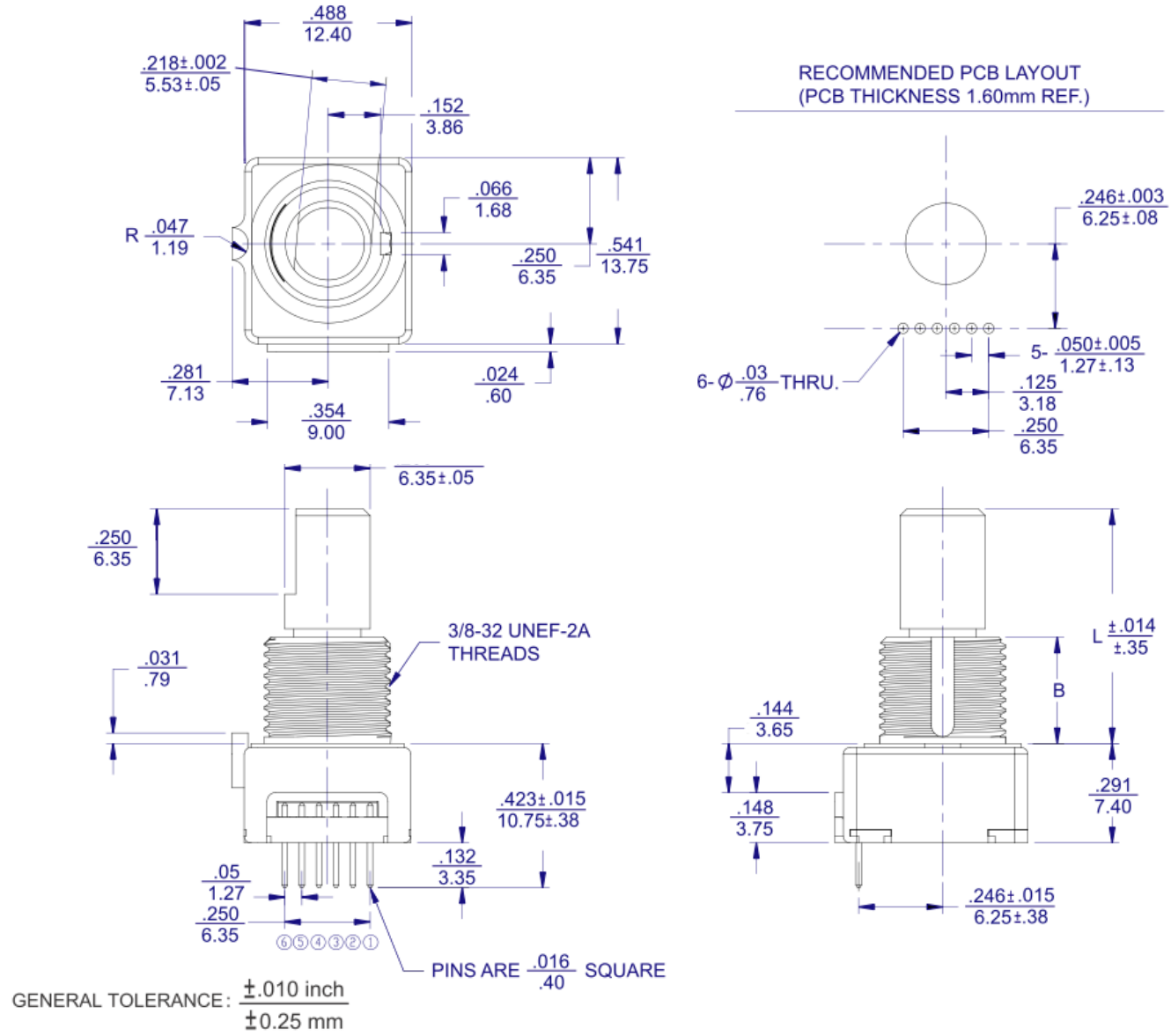


Figure 2 – 291V1…S – With Schmitt Trigger, Without Locating Lug, .050” Pitch Pins Facing Rear

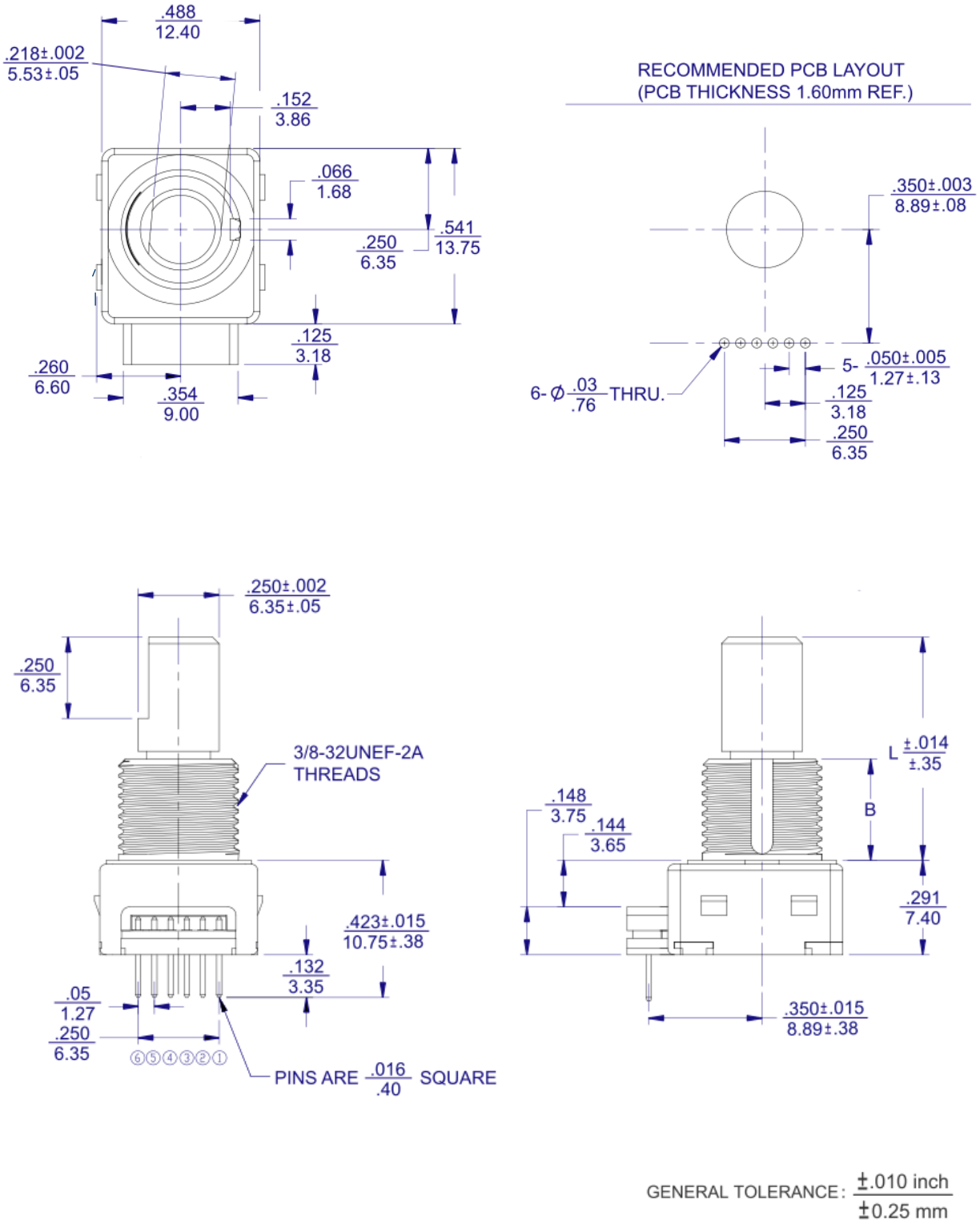


Figure 3 – 291V1…A – Without Schmitt Trigger, Without Locating Lug, .050” Pitch Pins Facing Rear

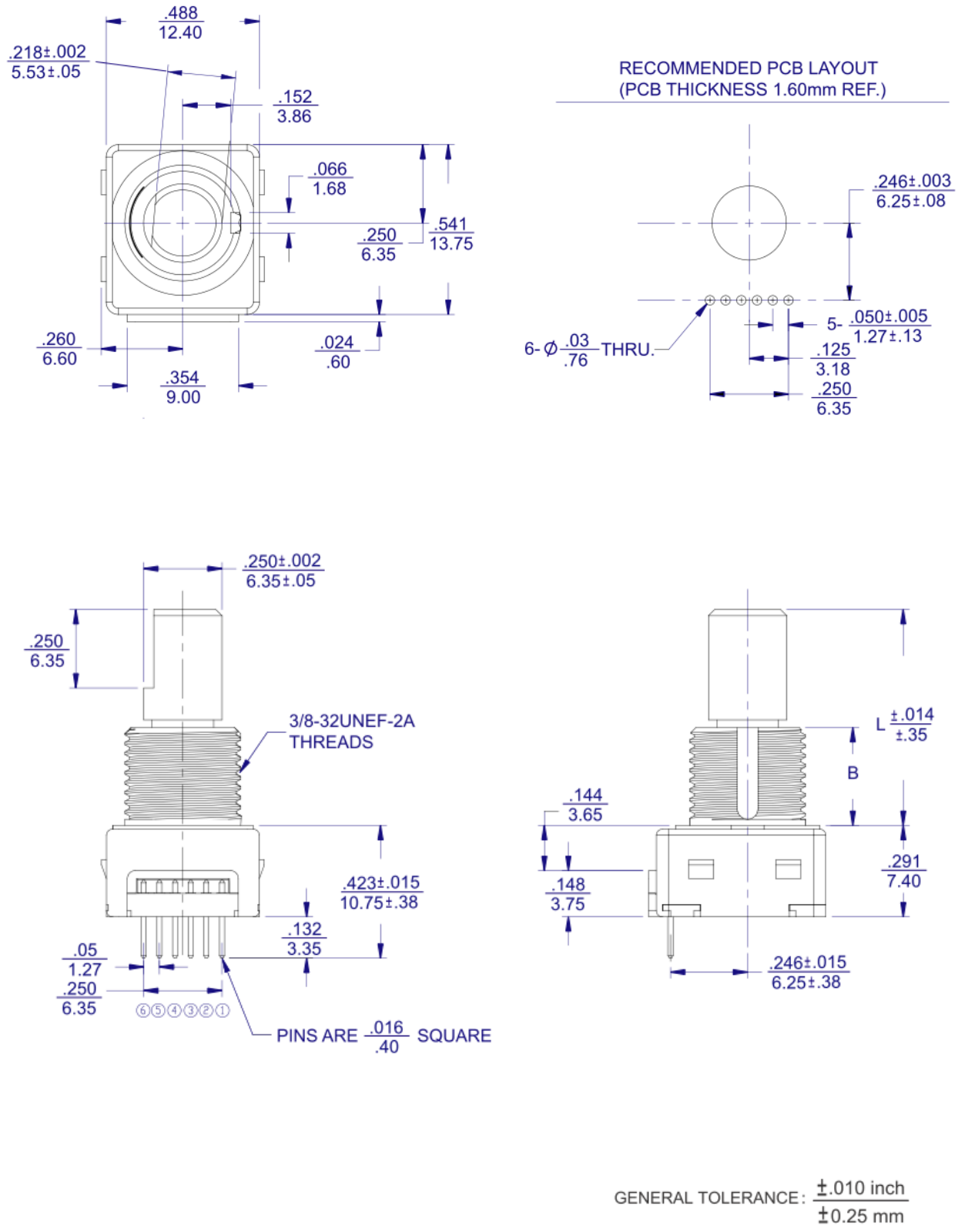
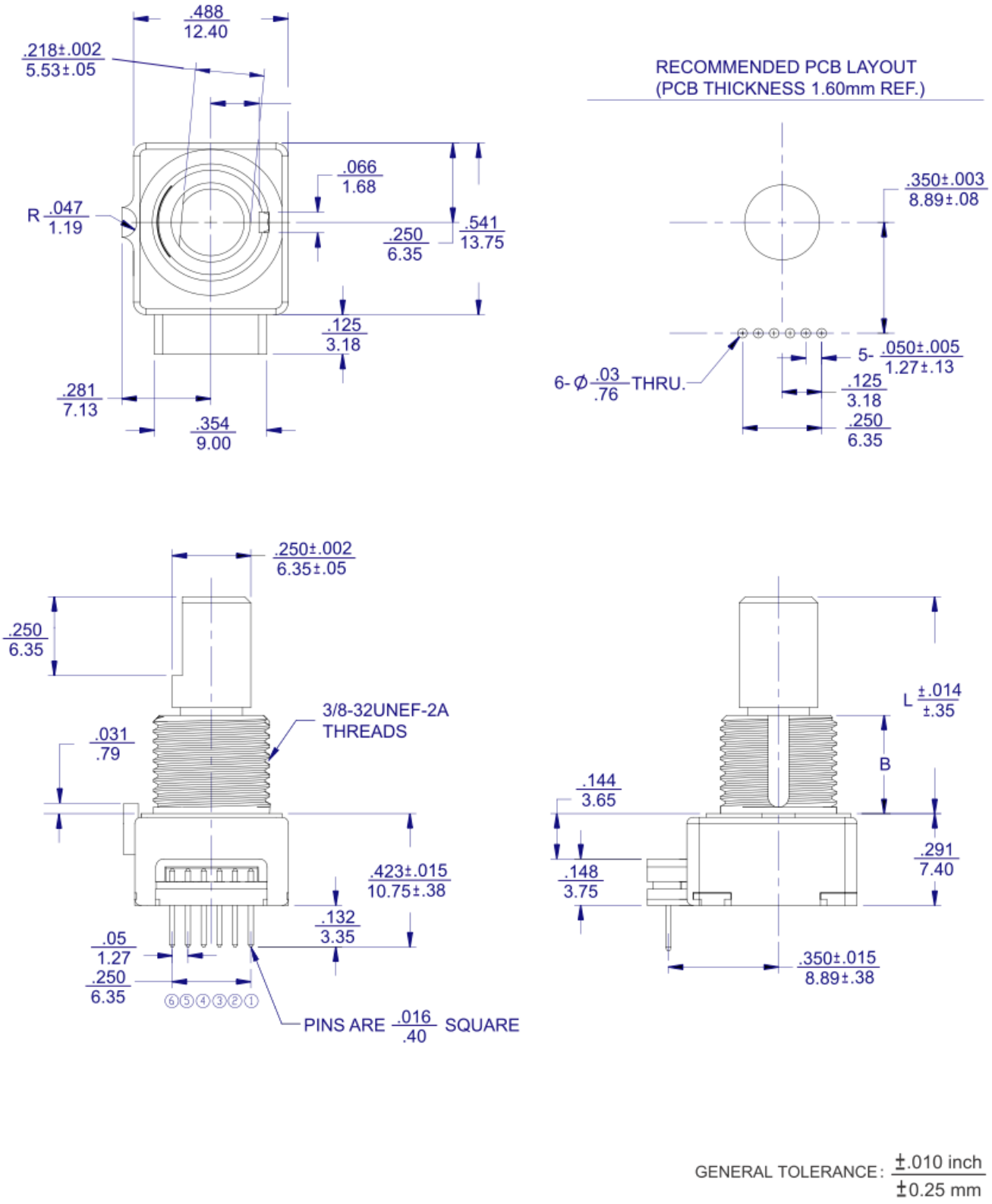


Figure 4 – 291V1…B – With Schmitt Trigger, With Locating Lug, .050” Pitch Pins Facing Rear



GENERAL TOLERANCE: ±.010 inch / ±0.25 mm

Figure 5 – 291P1…A – Without Schmitt Trigger, Without Locating Lug, .100” Pitch Pins Facing Rear
291P1…S – With Schmitt Trigger, Without Locating Lug, .100” Pitch Pins Facing Rear

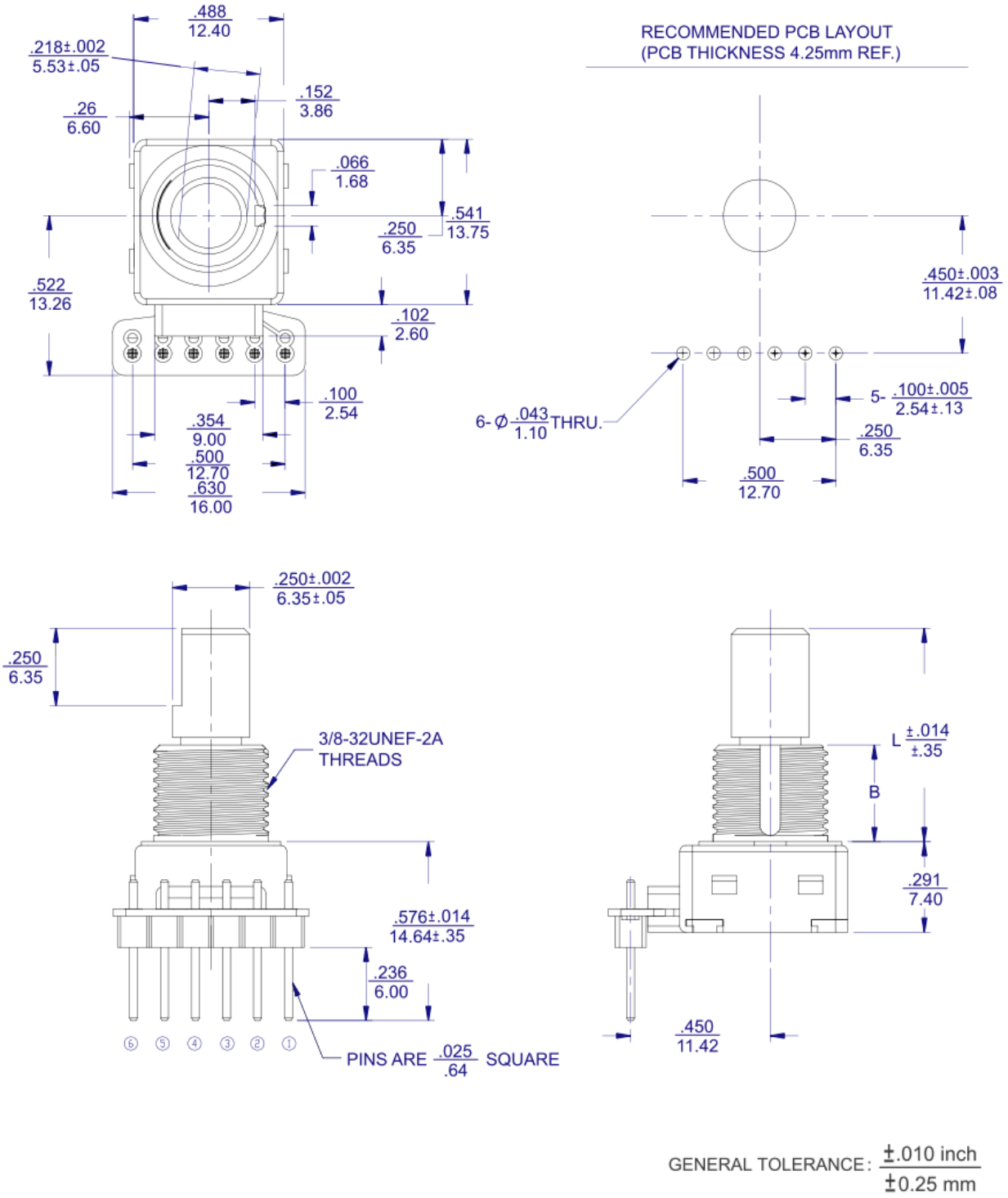


Figure 6 –291P1… – Without Schmitt Trigger, With Locating Lug, .100” Pitch Pins Facing Rear
291P1…B – With Schmitt Trigger, With Locating Lug, .100” Pitch Pins Facing Rear

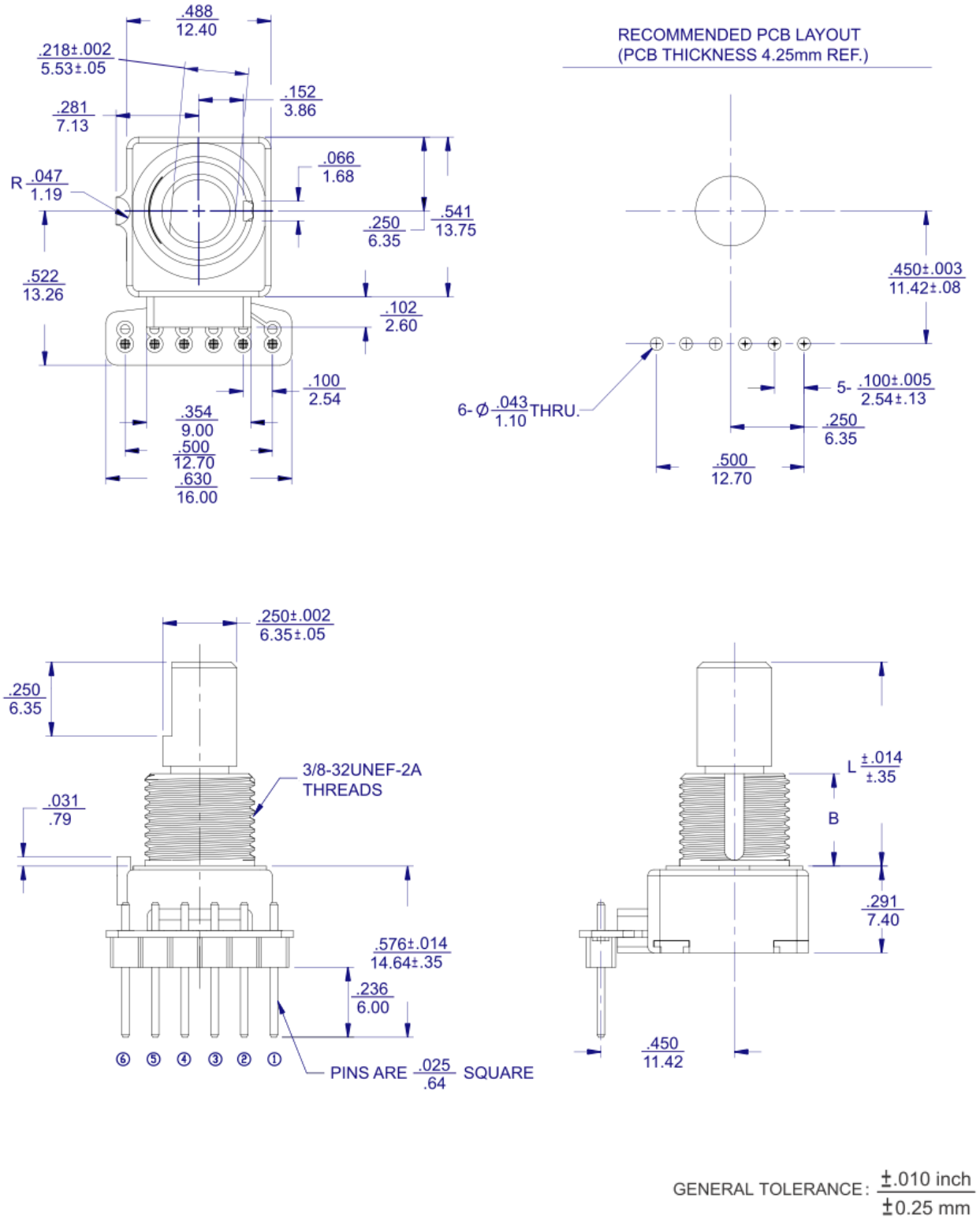


Figure 7 –291C… – Without Schmitt Trigger, With Locating Lug, With Ribbon Cable
291C…B – With Schmitt Trigger, With Locating Lug, With Ribbon Cable

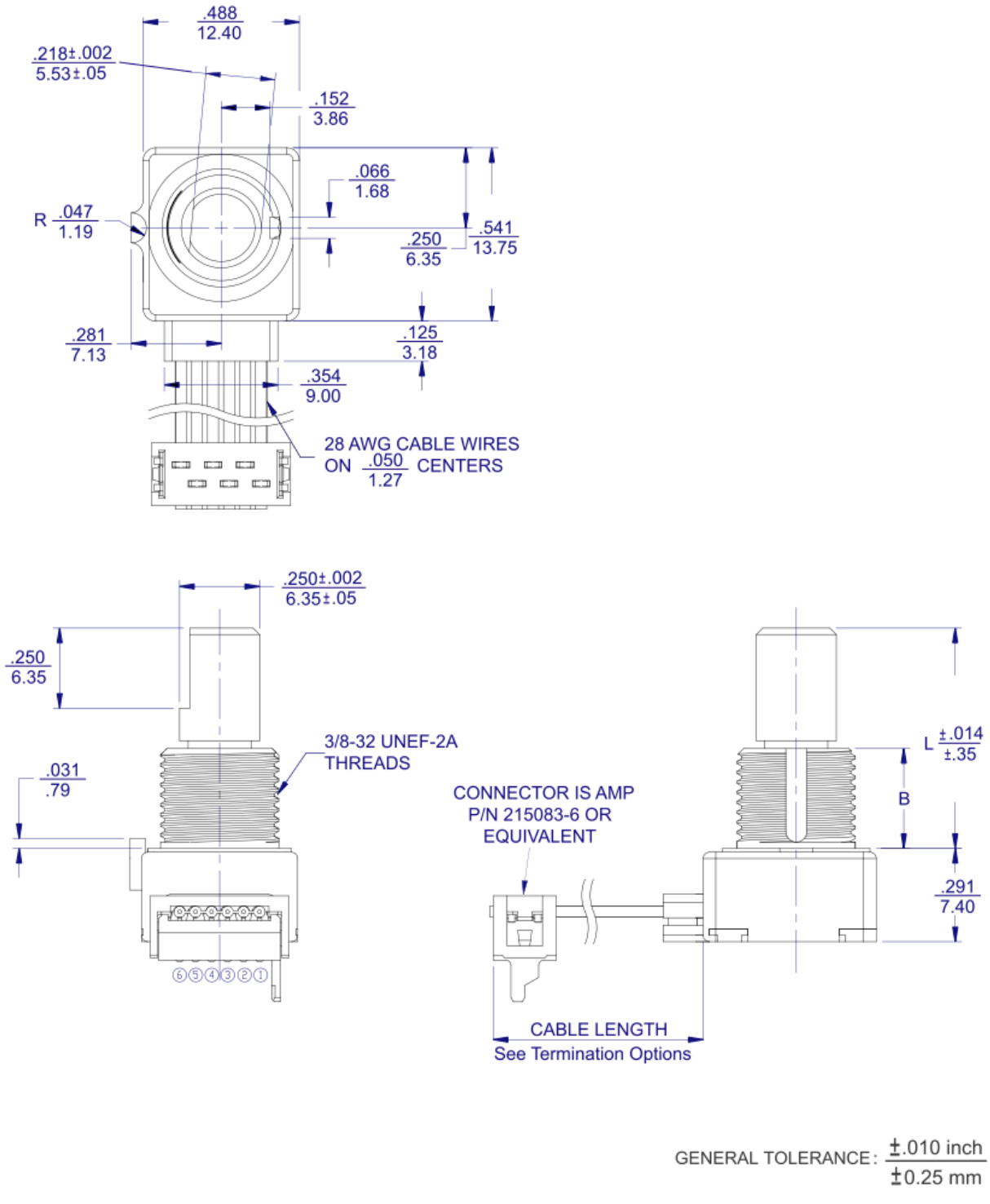


Figure 8 – 291C…A – Without Schmitt Trigger, Without Locating Lug, With Ribbon Cable
291C…S – With Schmitt Trigger, Without Locating Lug, With Ribbon Cable

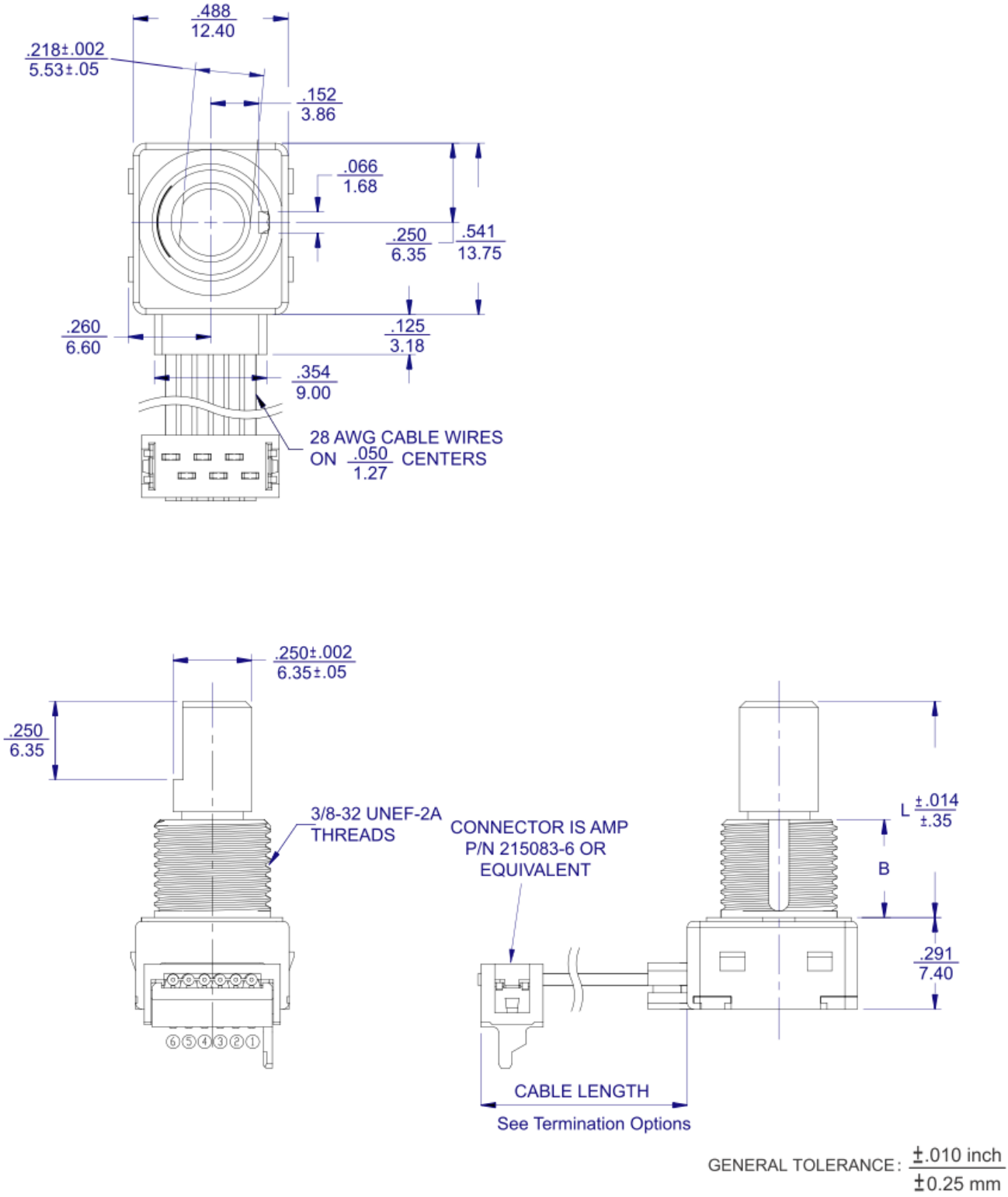
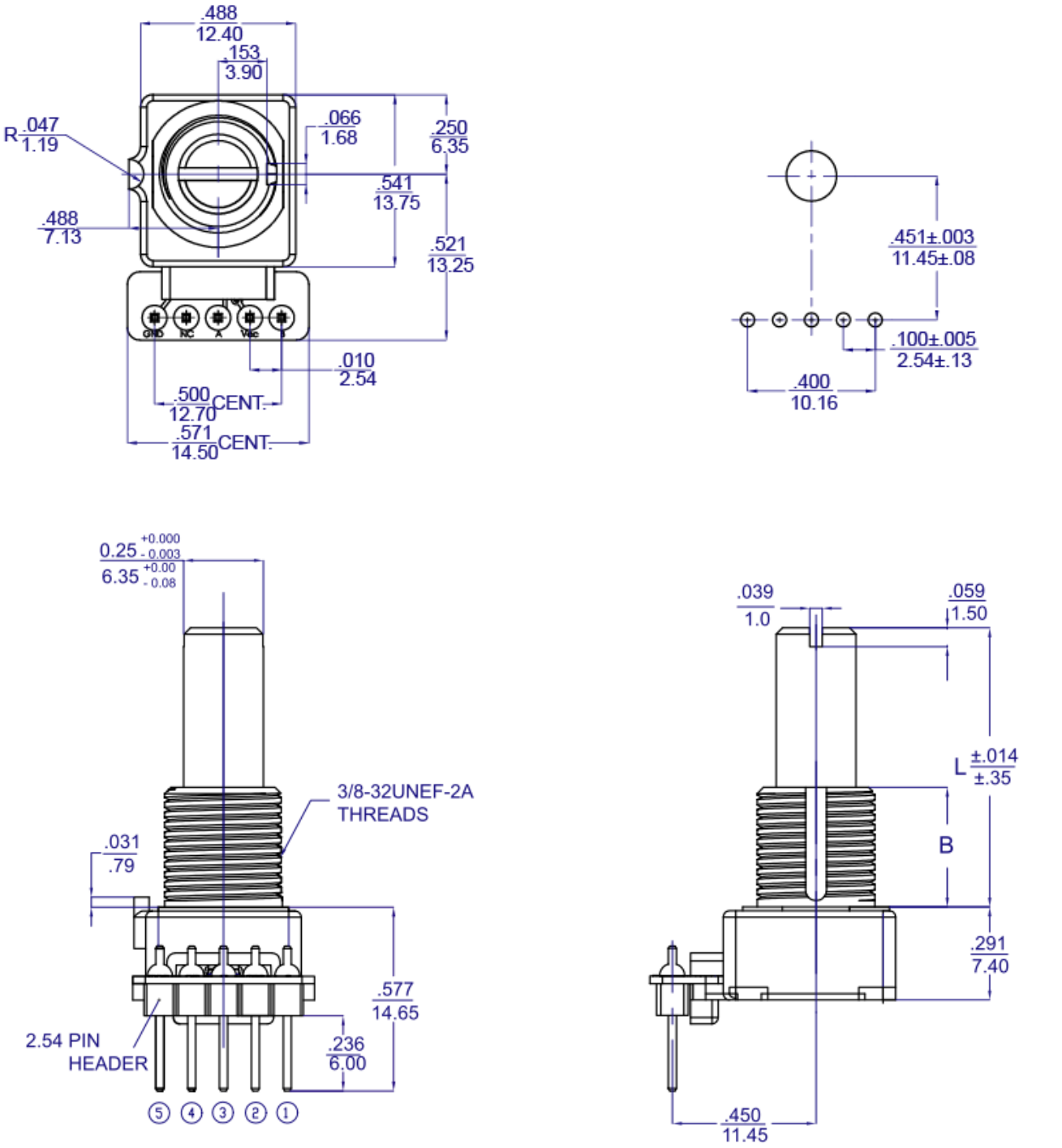


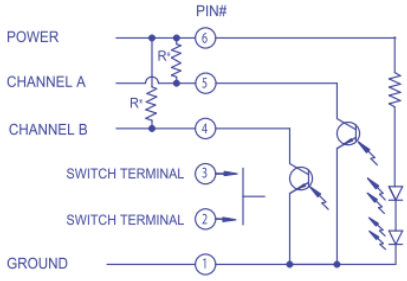
Figure 9 – 291P1…Z00AA – 64 PPR, With Schmitt Trigger, With Locating Lug, .100” Pitch Pins Facing Rear, Without Momentary Switch



GENERAL TOLERANCE: ±.010 inch / ±0.25 mm inch / mm

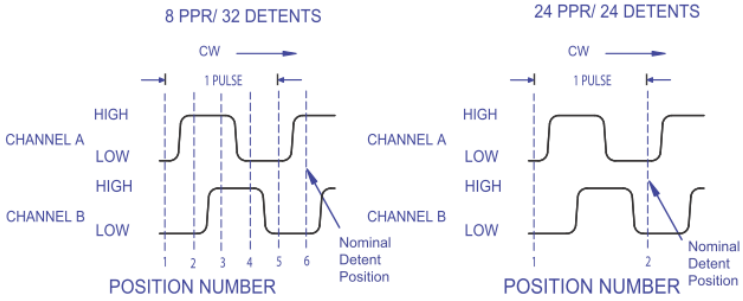
4, 6, 8, 24 PPR

Electric Circuit And Waveform (Without Schmitt Trigger Design)



*Product will function properly with external 2.2KΩ pull up resistors.

Standard Quadrature 2-Bit Code

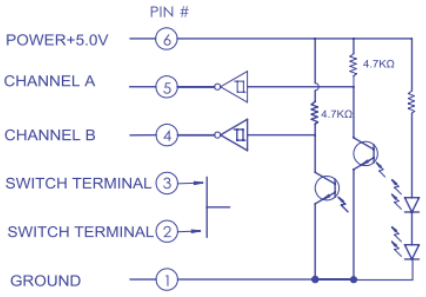


1. 8 PPR/32 detents is shown
2. Code repeats every 4 positions
3. Channel A Leads Channel B in CW direction and lags in CCW direction

1. 24 PPR/24 detents is shown
2. The nominal detent position is located when both Channel A and B are low
3. Channel A Leads Channel B in CW direction and lags in CCW direction

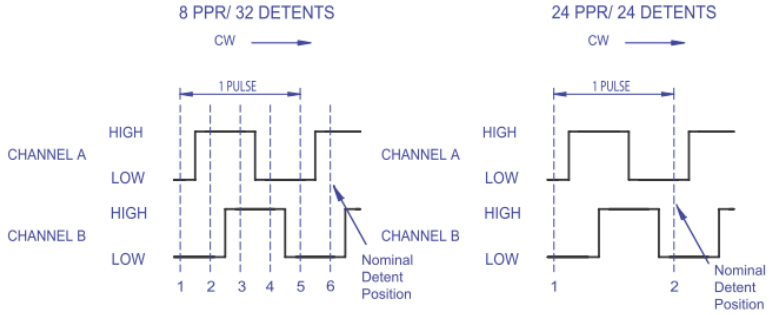
4, 6, 8, 24, 32 PPR

Electric Circuit And Waveform (With Schmitt Trigger Design)



*Schmitt trigger and pull-up resitor (4.7KΩ) are integrated inside CTS optical encoder, so it's not necessary to have external pull-up resistors for application circuit.

Standard Quadrature 2-Bit Code

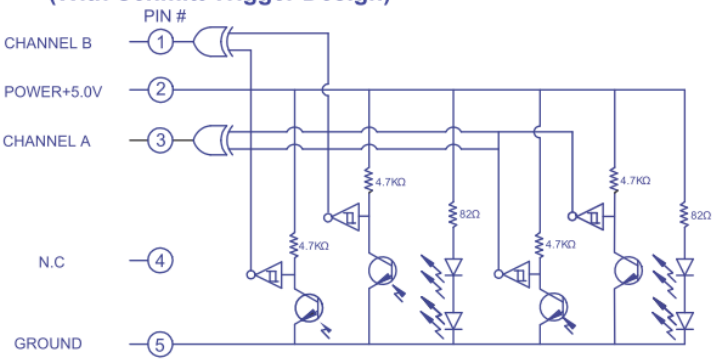


1. 8 PPR/32 detents is shown
2. Code repeats every 4 positions
3. Channel A Leads Channel B in CW direction and lags in CCW direction

1. 24 PPR/24 detents is shown
2. The nominal detent position is located when both Channel A and B are low
3. Channel A Leads Channel B in CW direction and lags in CCW direction

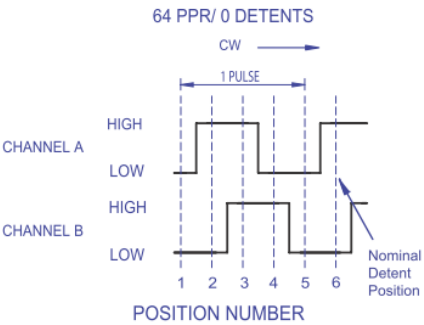
64 PPR

Electric Circuit And Waveform (With Schmitt Trigger Design)



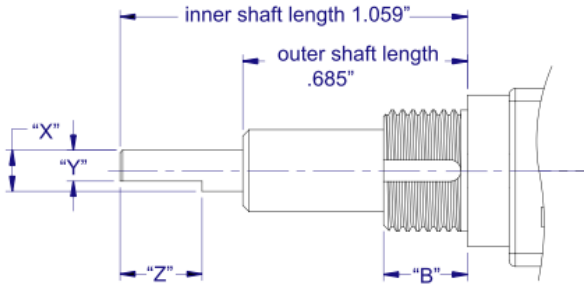
*Open collector with integrated XOR Gate, schmitt trigger and 4.7KΩ pull-up resistor are inside CTS optical encoder, so it's not necessary to have external pull-up resistors for application circuit.

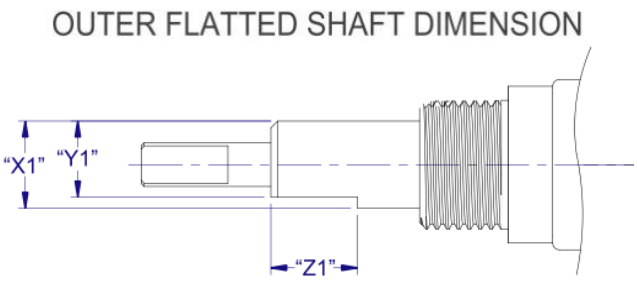
Standard Quadrature 2-Bit Code



1. 64 PPR/0 detents is shown
2. Code repeats every 4 positions
3. Channel A Leads Channel B in CW direction and lags in CCW direction

Dual Shaft Construction



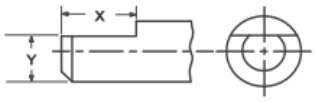


D - DUAL

	X	Y	Z	B
Imperial	.125"	.094"	.250"	.256"
Metric	3.18	2.40	6.35	6.50

Single Shaft Trim Options

FLATTED



Shaft Trim	Diameter	X	Y
F	.250" (6.35 mm)	.250" (6.35 mm)	.218" (5.53 mm)

SD SLOT

Shaft Trim	Diameter	X	Y
S	.250" (6.35 mm)	.059" (1.5mm)	.039" (1.0mm)

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Тел: +7 (812) 336 43 04 (многоканальный)
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www.lifeelectronics.ru