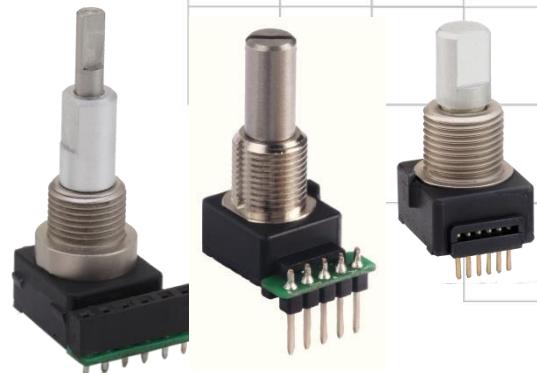


# Series 291

## Precision, Long-life 12mm Optical Encoder

- Available with 4, 6, 8, 24, 32 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							
P1	.10" pitch pins Rear facing .236" length							
*C4	4" ribbon cable With .050" pitch connector terminals							
*C5	5" ribbon cable With .050" pitch connector terminals							
*C6	6" ribbon cable With .050" pitch connector terminals							
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, see page 8 for additional details)							
Code	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)						
Code	Spec.							
BLANK	Without Schmitt trigger, With locating lug (not for 32)							
A	Without Schmitt trigger, Without locating lug (not for 32)							
S	With Schmitt trigger, Without locating lug							
B	With Schmitt trigger, With locating lug							
Code	Spec.							
A	5.0V							
B	3.3V							
Code	Bushing Length "B"							
0	.312" For single shaft construction							
D	.256" For dual shaft construction (not for 32)							

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
<b>Voltage (4, 6, 8, 24, 32 PPR)</b>		4.75 3.175	5.0 3.3	5.25 3.425	VDC
<b>Output Code</b>	2-Bit Quadrature Channel A leads Channel B by 90° during clockwise rotation				
<b>Sink Current</b>	5.0 VDC 3.3 VDC	2.0mA 1.0mA			
<b>Power Consumption</b>	5.0 VDC 3.3 VDC			150 80	mW mW
<b>Resolution</b>	4, 6, 8, 24, 32				Pulses per Revolution

## Mechanical and Environmental

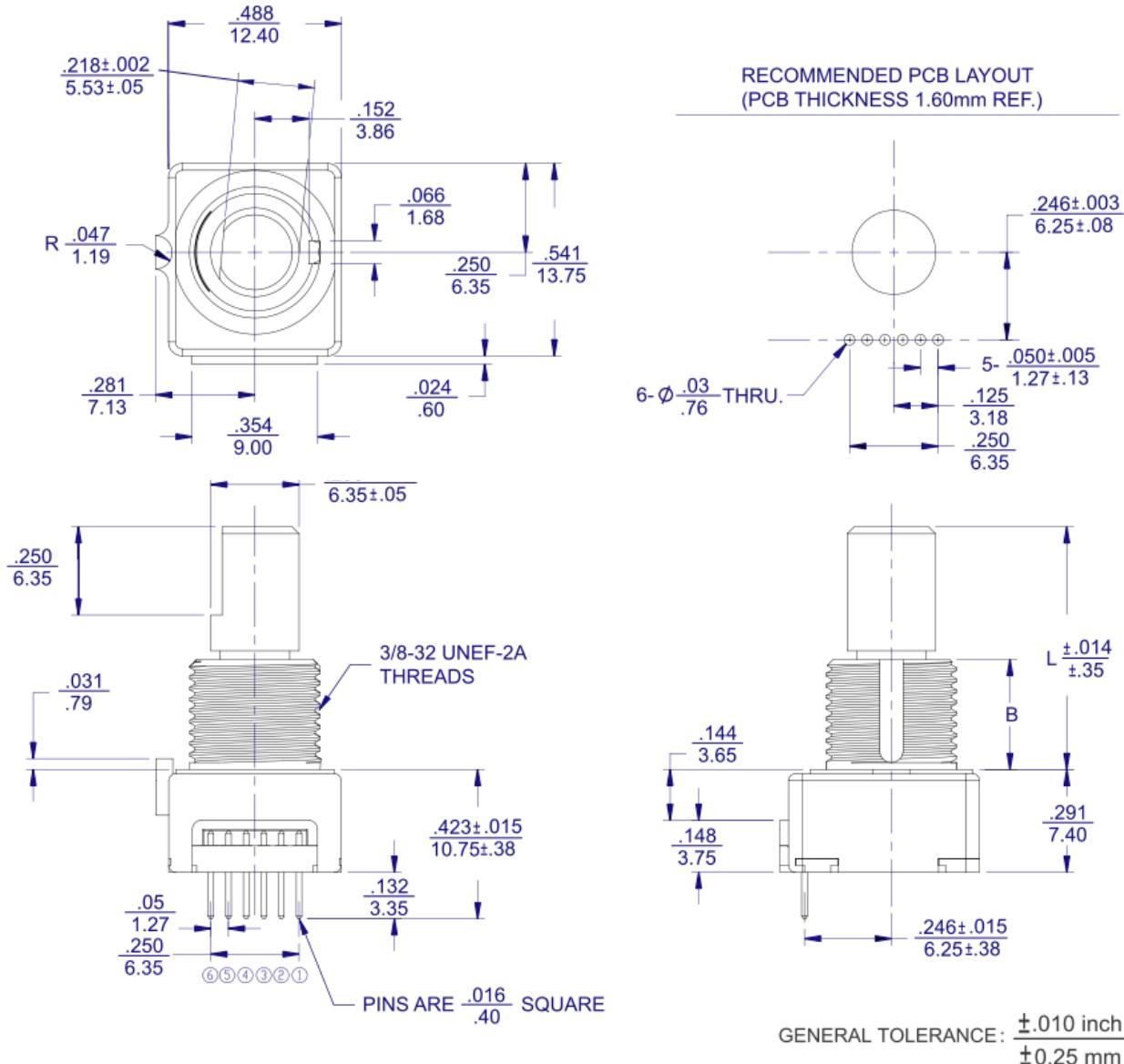
<b>Manual Soldering</b>	Maximum temperature of 350°C for 5 seconds		
<b>RoHS</b>	Lead-Free. Fully compliant to RoHS Directive		
<b>Shock :</b>	Per MIL-STD-883F ( 100G's)		
<b>Vibration :</b>	Per MIL-STD-883F ( 15G's)		
<b>IP Rating (4, 6, 8, 24, 32 PPR):</b>	IP 50		
<b>Packaging:</b>	Standard anti-static tray packaging		
<b>Operating Temperature:</b>	-40°C to +85°C		
<b>Storage Temperature:</b>	-55°C to +100°C		
<b>Storage Temperature: (32 PPR)</b>	-40°C to +100°C		
<b>Rotational Life</b>	No detent @ 30 RPM	3 Million Cycles	
	With detent @ 30 RPM	1 Million Cycles	
<b>Push-Pull Strength of Shaft</b>	10 seconds	20 kg	
<b>Terminal Pull-out Strength</b>	10 seconds	6 kg	
<b>Rotational Torque (4, 6, 8, 24 PPR) (32 PPR)</b>	Running Running	10 to 30 gf-cm 60 gf-cm Max.	
<b>Rotational Torque</b>	24 Detents 16, 32 Detents	90 to 190 gf-cm 50 to 150 gf-cm	
<b>Detent Options</b>	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			

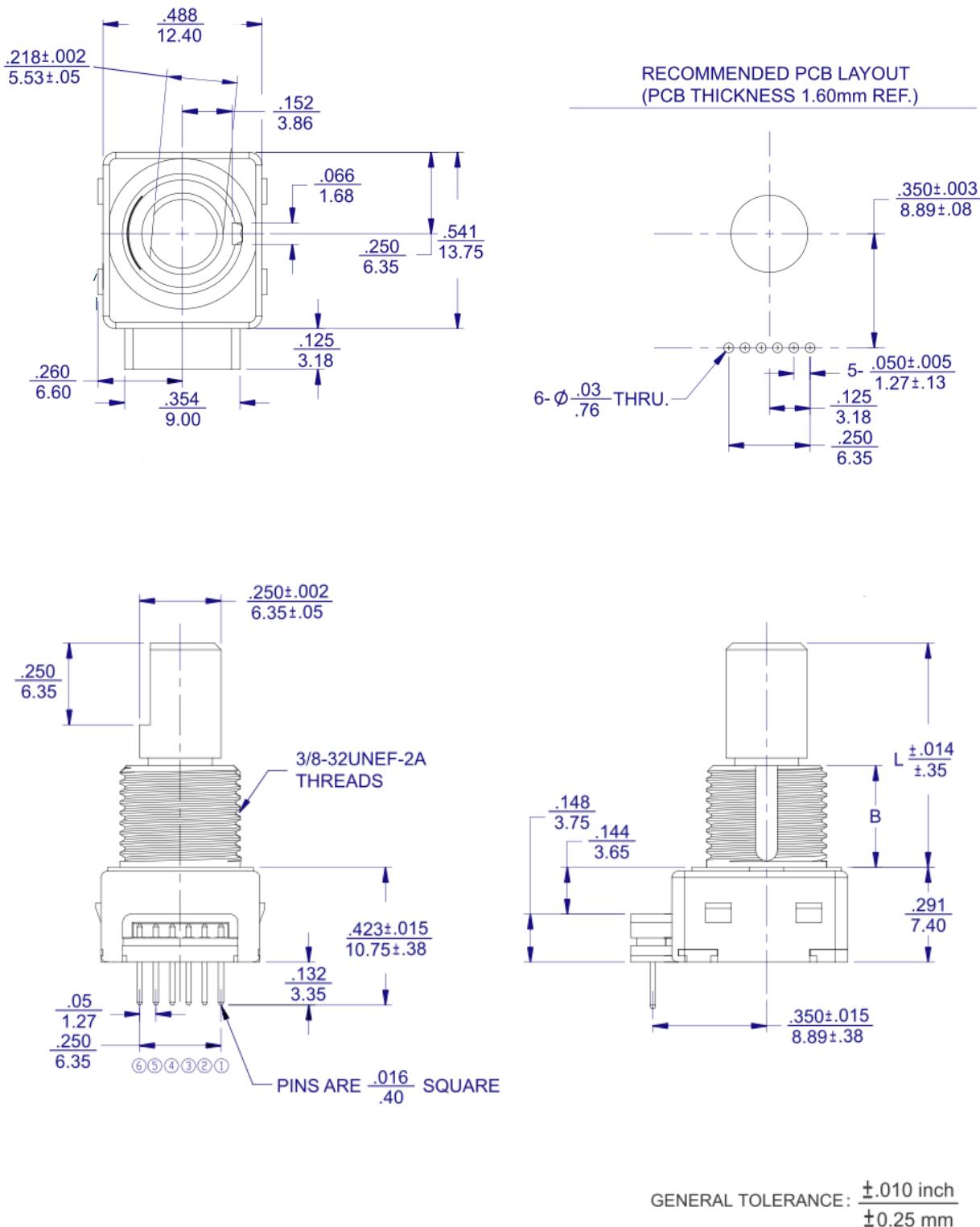
**Mechanical Specifications**

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



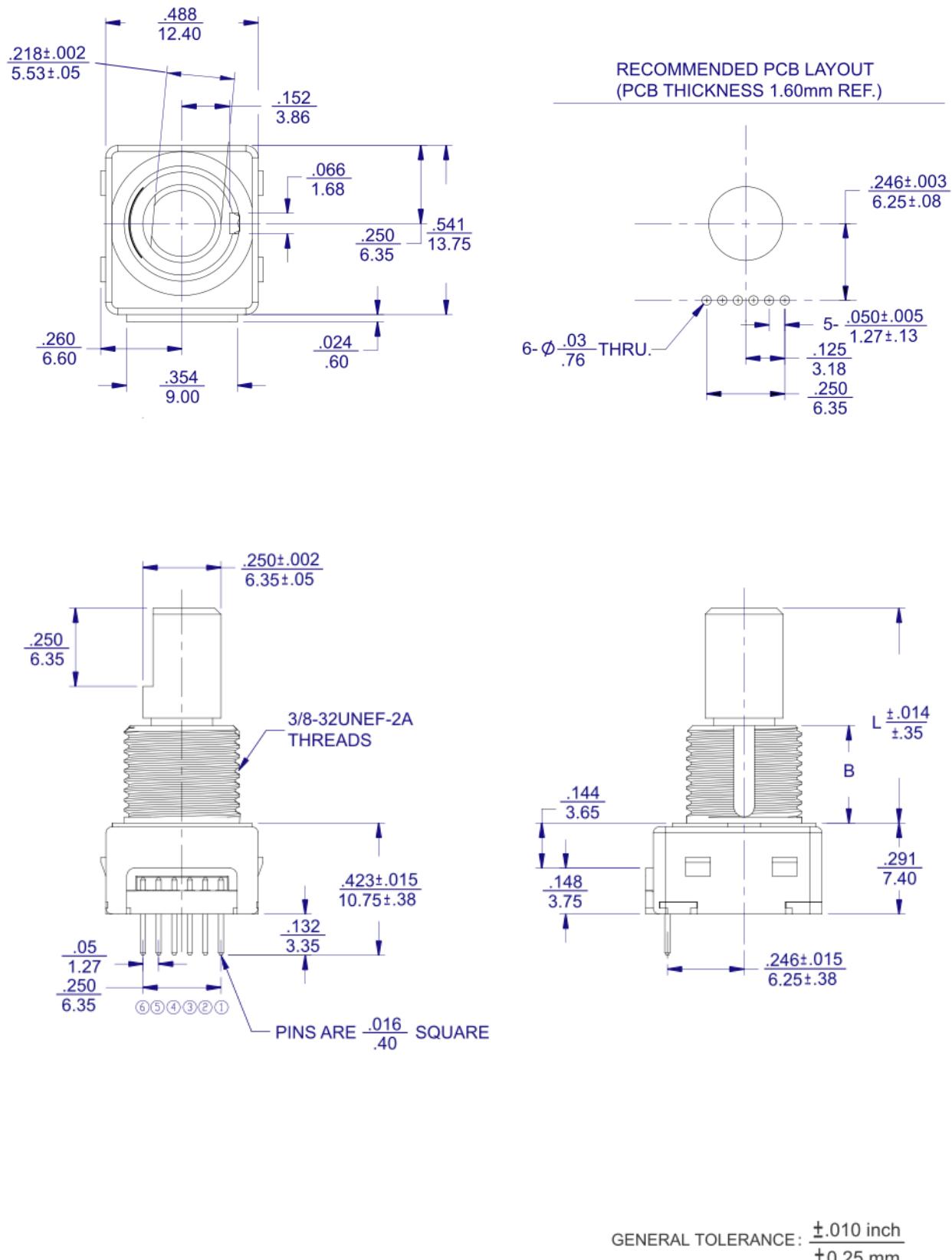
Series 291  
Compact Optical Encoder

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



Series 291  
Compact Optical Encoder

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



## Series 291

## Compact Optical Encoder

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

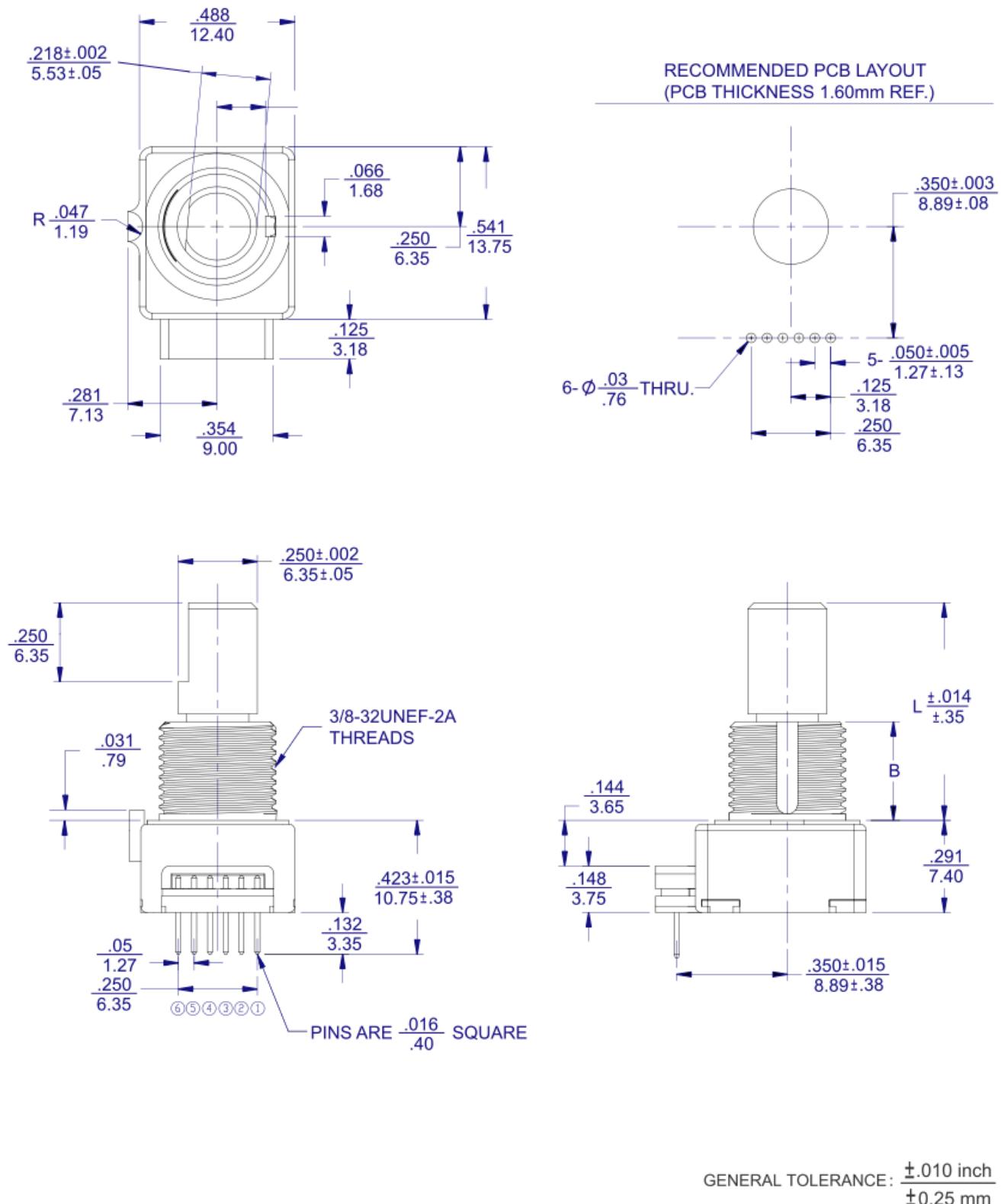


Figure 5 – 291P1...A – Without Schmitt Trigger, Without Locating Lug, .100" Pitch Pins Facing Rear  
 291P1...S – With Schmitt Trigger, Without Locating Lug, .100" Pitch Pins Facing Rear

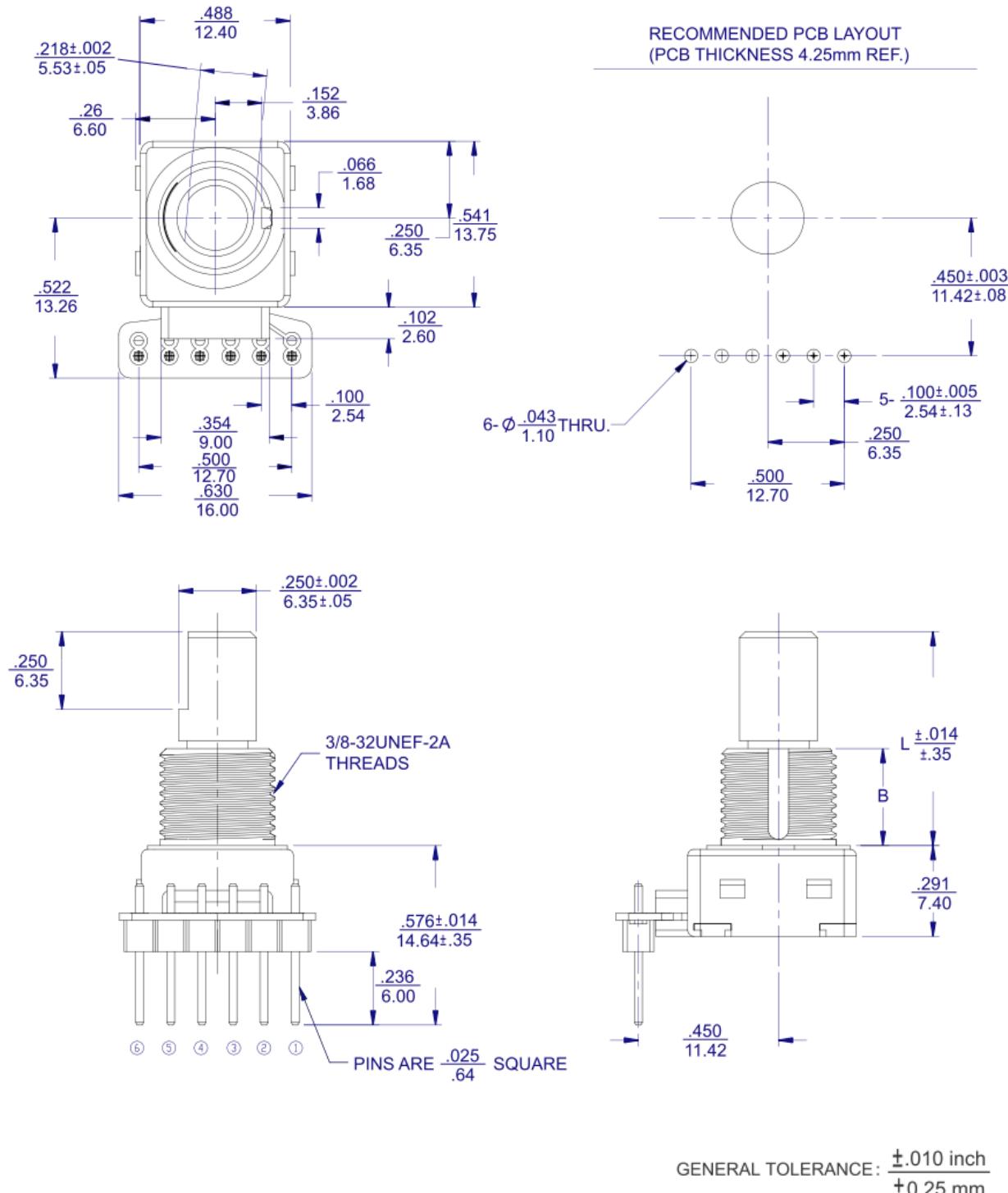


Figure 6 –291P1... – Without Schmitt Trigger, With Locating Lug, .100" Pitch Pins Facing Rear  
 291P1...B – With Schmitt Trigger, With Locating Lug, .100" Pitch Pins Facing Rear

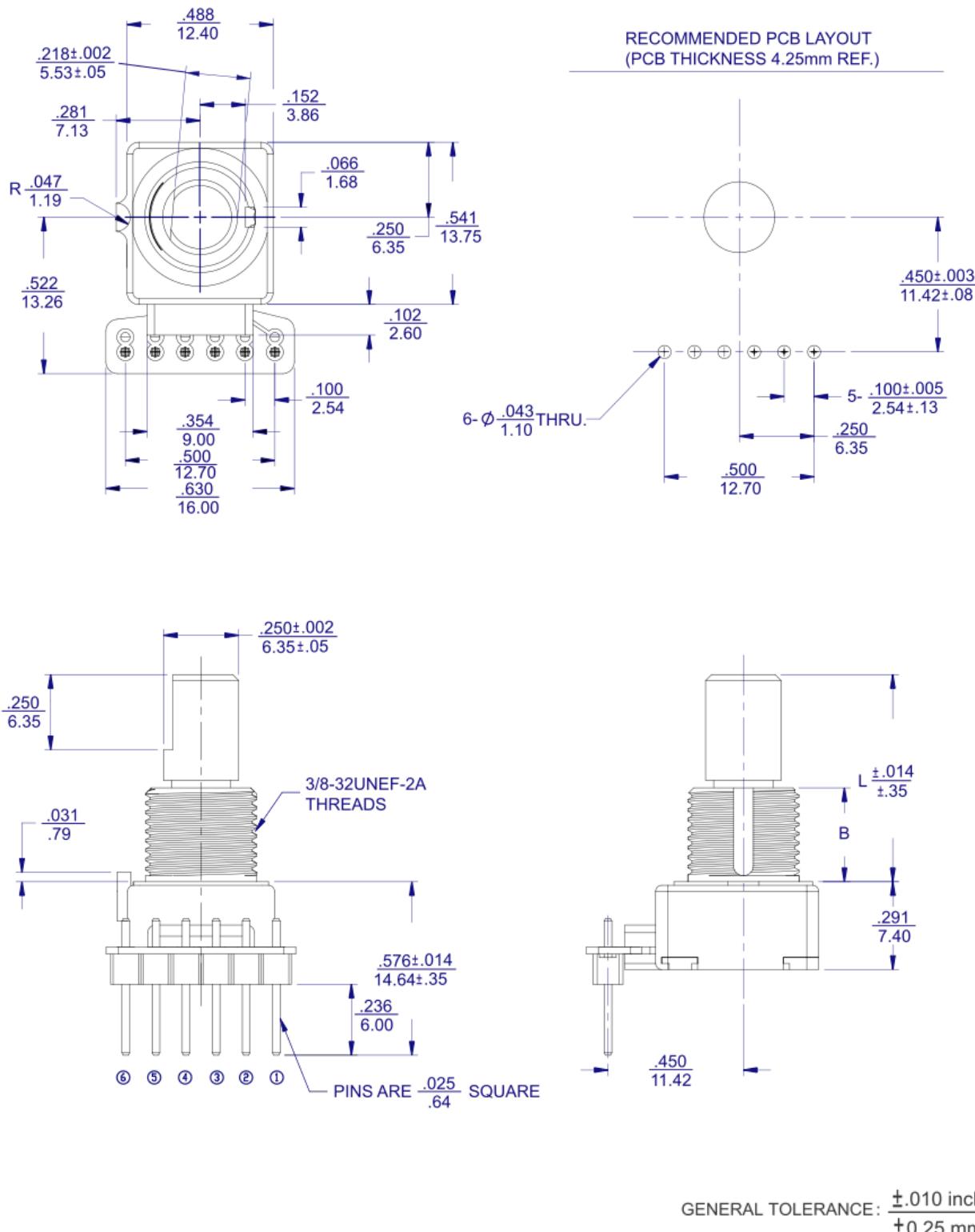


Figure 7 –291C... – Without Schmitt Trigger, With Locating Lug, With Ribbon Cable  
291C...B – With Schmitt Trigger, With Locating Lug, With Ribbon Cable

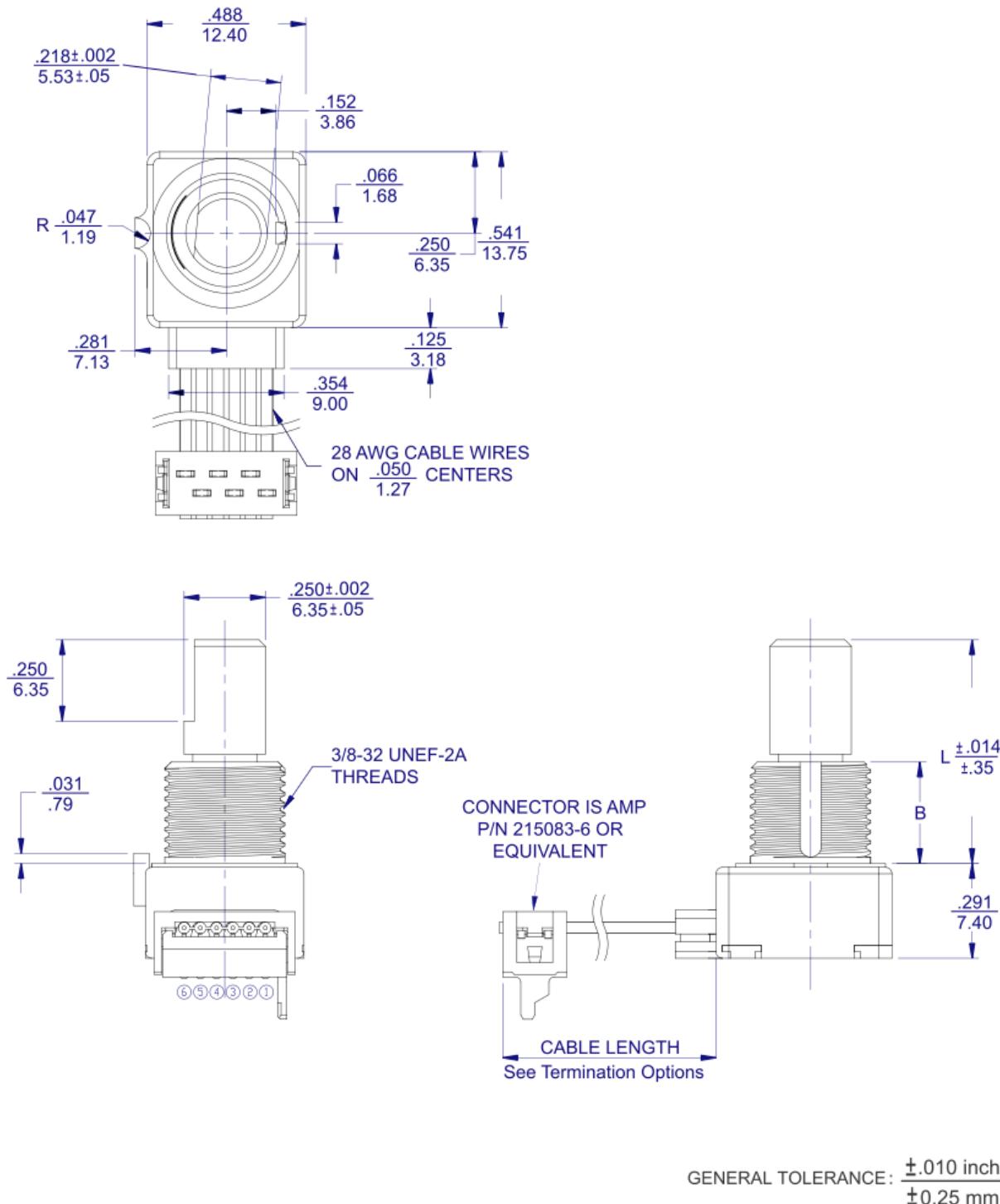
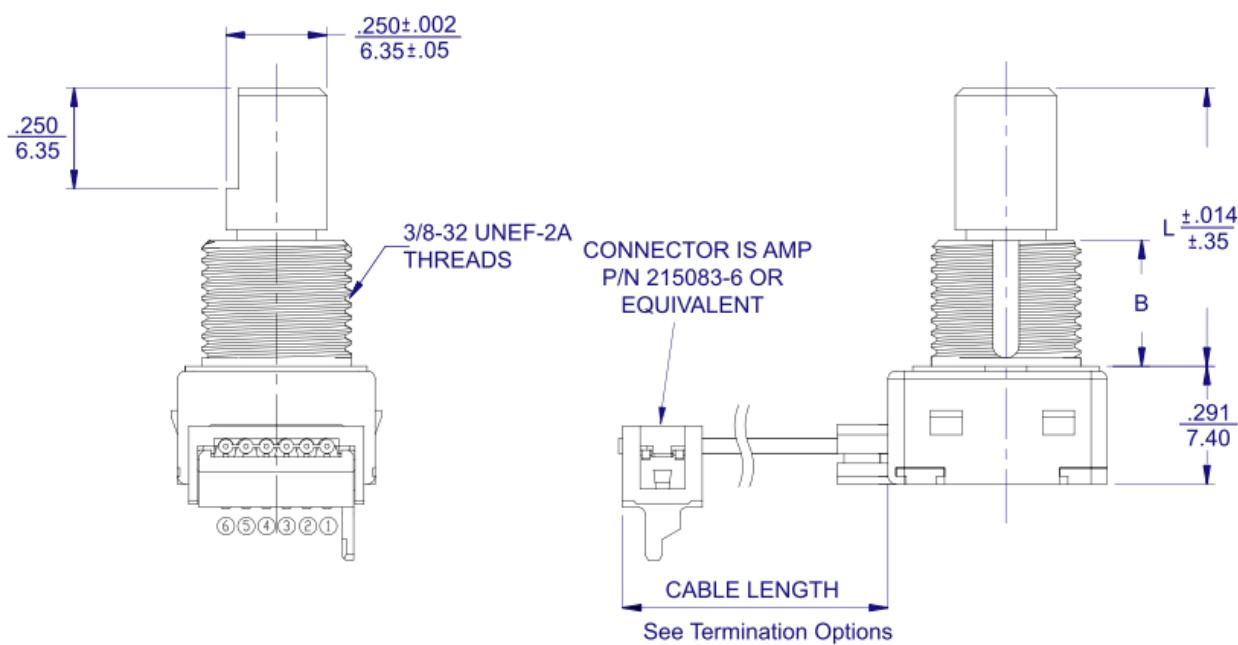
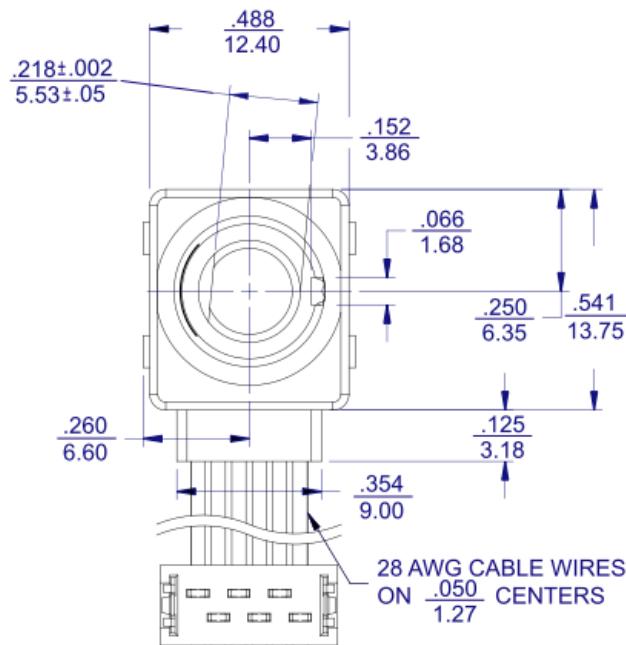


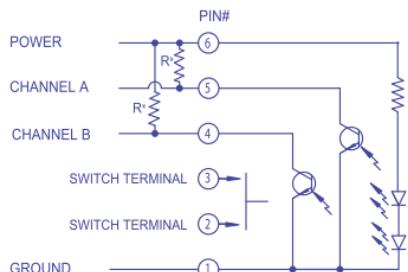
Figure 8 – 291C...A – Without Schmitt Trigger, Without Locating Lug, With Ribbon Cable  
291C...S – With Schmitt Trigger, Without Locating Lug, With Ribbon Cable



GENERAL TOLERANCE:  $\pm .010$  inch  
 $\pm 0.25$  mm

## 4, 6, 8, 24 PPR

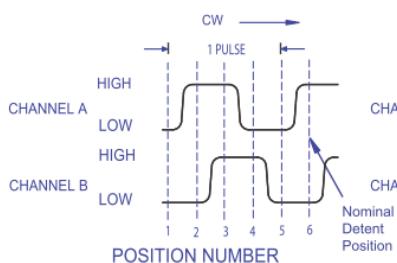
### Electric Circuit And Waveform (Without Schmitt Trigger Design)



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

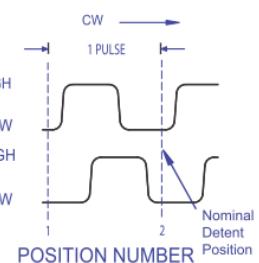
### Standard Quadrature 2-Bit Code

8 PPR/ 32 DETENTS



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

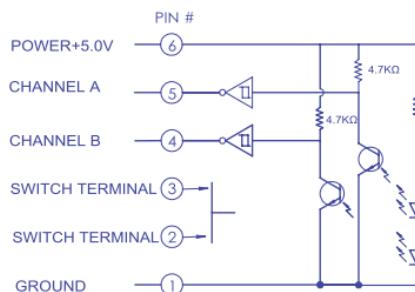
24 PPR/ 24 DETENTS



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

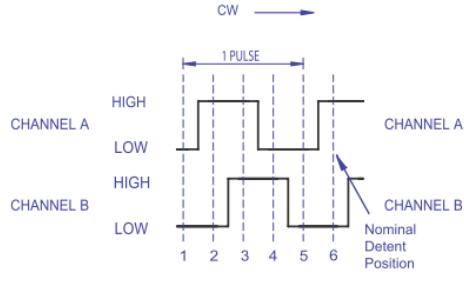
### Electric Circuit And Waveform (With Schmitt Trigger Design)



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

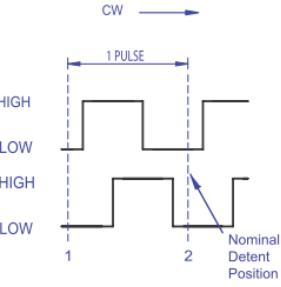
### Standard Quadrature 2-Bit Code

8 PPR/ 32 DETENTS



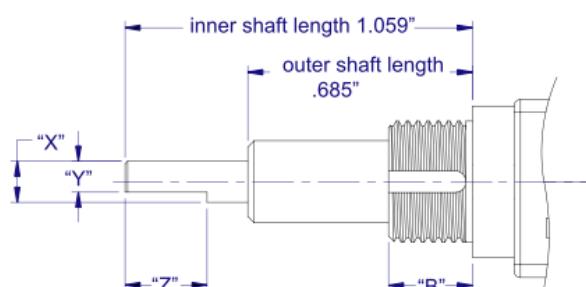
1. 8 PPR/32 detents is shown
2. Code repeats every 4 positions
3. Channel A Leads Channel B in CW direction and lags in CCW direction

24 PPR/ 24 DETENTS

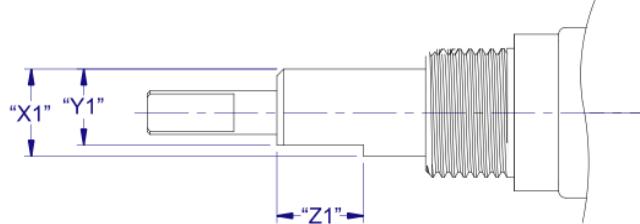


1. 24 PPR/24 detents is shown
2. The nominal detent position is located when both Channel A and B are low
3. Channel A Leads Channel B in CW direction and lags in CCW direction

## Dual Shaft Construction



### OUTER FLATTED SHAFT DIMENSION

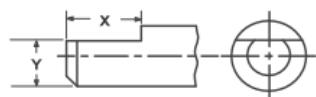


### D - DUAL

	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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