

HRPG Series

Miniature Panel Mount Optical Encoders



Data Sheet

Description

The HRPG series is a family of miniature panel mount optical encoders, also known as Rotary Pulse Generators (RPG) and digital potentiometers. The HRPG is designed to be mounted on a front panel and used as a rotary, data-entry device. The HRPG is very flexible for numerous applications due to the many configuration options available. These options include detents or smooth, multiple terminations, versatile mounting capabilities, and different shaft configurations.

The HRPG uses optical reflective technology providing accuracy and reliability to the encoder. An LED emits a beam of light onto the specular codewheel surface. When the light strikes the surface, it projects the image of the codewheel back on the photodetector, causing the output to change. The entire detector circuit is on one IC, thus the part is less sensitive to temperature and other environmental variations.

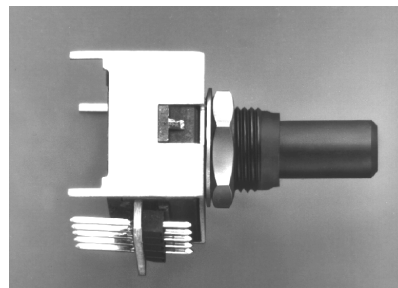
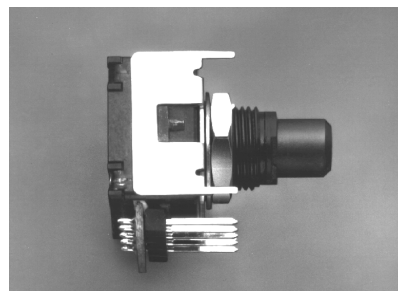
Applications

Typical applications for the Rotary Pulse Generator include front panel instruments, audio/visual boards, and other devices requiring digital output from a turning knob.

Note: Avago Technologies encoders are not recommended for use in safety critical applications. Eg. ABS braking systems, power steering, life support systems and critical care medical equipment. Please contact sales representative if more clarification is needed.

Features

- Miniature size
- Smooth turning and detented options
- Multiple mounting bracket options
- Uses optical reflective technology
- Quadrature digital output
- Small footprint for versatile mounting
- TTL compatible



Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Units | Notes |
|----------------------------|----------|--------|----------|-------|--------------------|
| Storage Temperature | T_S | -40 | +85 | °C | |
| Operating Temperature | T_A | 0 | +70 | °C | |
| Vibration | | | 20 | g | 20 Hz to 2 kHz |
| Supply Voltage | V_{CC} | -0.5 | 7 | V | |
| Output Voltage | V_O | -0.5 | V_{CC} | V | |
| Output Current Per Channel | I_O | -1 | 5 | mA | |
| Shaft Load – Axial | | | 4.0 | N | 10^6 Revolutions |
| Shaft Load – Radial | | | 0.1 | Nm | 10^6 Revolutions |
| Revolution Life | | 10^6 | | Rev | At Maximum Loads |

Recommended Operating Conditions

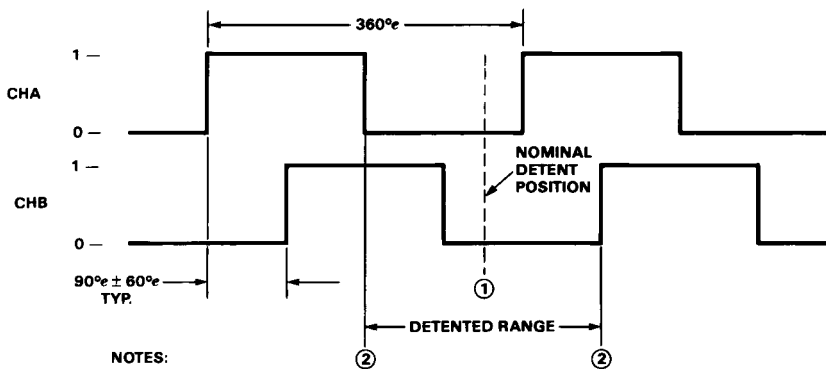
| Parameter | Symbol | Min. | Max. | Units | Notes |
|---------------------------|----------|------|------|-------|--------------------------------|
| Temperature | T | 0 | +70 | °C | Noncondensing Atmosphere |
| Supply Voltage | V_{CC} | 4.5 | 5.5 | V | Ripple < 100 mV _{p-p} |
| Rotation Speed – Detented | | | 200 | RPM | |
| – Smooth | | | 300 | RPM | |

Electrical Characteristics

Over Recommended Operating Range

| Parameter | Symbol | Min. | Max. | Units | Notes |
|---------------------------|----------|------|------|-------|---------------------------|
| Supply Current | I_{CC} | | 40 | mA | |
| High Level Output Voltage | V_{OH} | 2.4 | | V | $I_{OH} = -40 \mu A$ Max. |
| Low Level Output Voltage | V_{OL} | | 0.4 | V | $I_{OL} = 3.2$ mA |

Output Waveforms



NOTES:

$$360^\circ_e = \frac{360^\circ \text{ MECH.}}{\text{CPR}}$$

CHANNEL A LEADS CHANNEL B FOR CLOCKWISE ROTATION
CHANNEL B LEADS CHANNEL A FOR COUNTERCLOCKWISE ROTATION

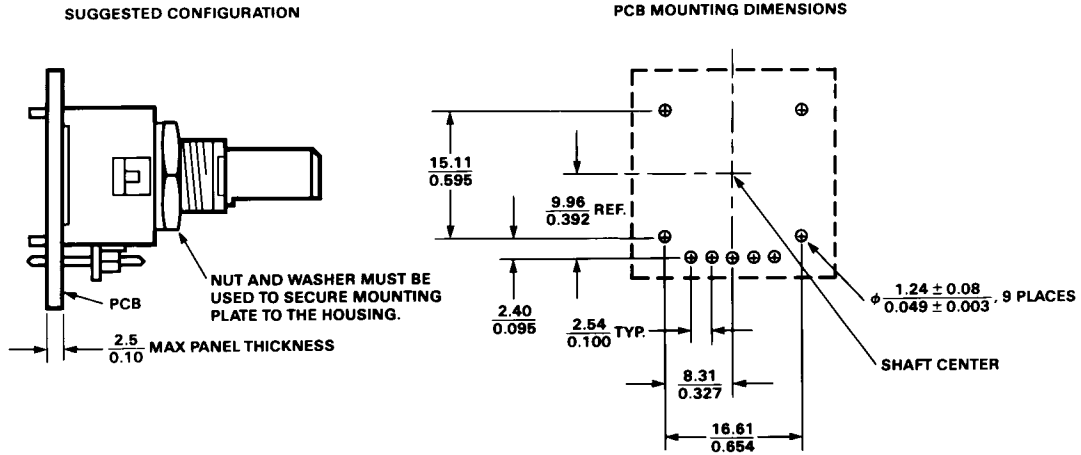
- FOR HRPG-ADXX #XXX THE NOMINAL DETENT POSITION IS CENTERED AROUND LOW-LOW STATE (CHA = 0, CHB = 0).
- DETENT POSITION WILL LIE WITHIN THESE BOUNDARIES, NEVER IN HIGH-HIGH STATE (CHA = 1, CHB = 1).

Mechanical Configurations

Termination Options

Option R – Pins Rear with Bracket

HRPG-AXXX#XXR



NOTES:
 DIMENSIONS ARE: $\frac{\text{mm}}{\text{INCHES}}$
 TOLERANCES ARE: $X \pm 0.25 \text{ mm}$
 $\text{XX} \pm 0.01''$
 $\text{XX} \pm 0.13 \text{ mm}$
 $\text{XXX} \pm 0.005''$

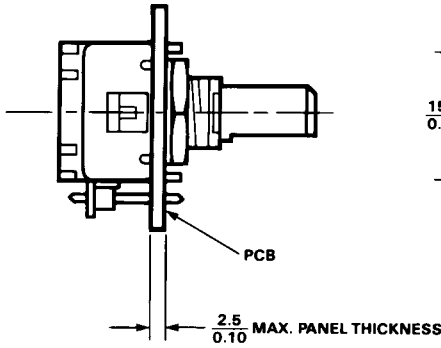
SHIELD IS FOR HOUSING ESD PATH ONLY



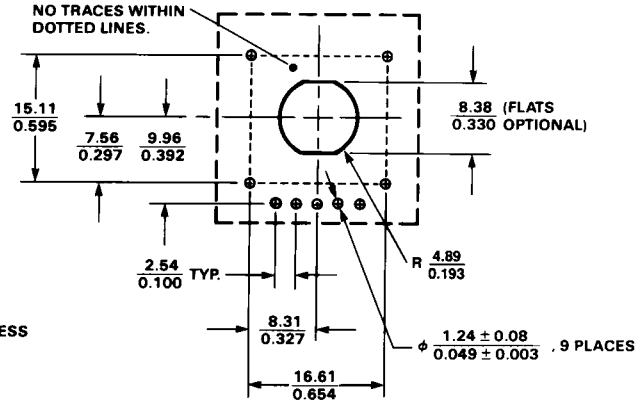
Option F – Pins Front with Bracket

HRPG-AXXX#XXF

SUGGESTED CONFIGURATION



PCB MOUNTING DIMENSIONS



1. GROUND (DOT ON BOTTOM)
2. CHANNEL B
3. V_{CC} (+5 VOLTS)
4. CHANNEL A
5. SHIELD (HOUSING GROUND)

NOTES:
 DIMENSIONS ARE: $\frac{\text{mm}}{\text{INCHES}}$
 TOLERANCES ARE: $X \pm 0.25 \text{ mm}$
 $\text{.XX} \pm 0.01 \text{''}$
 $\text{.XX} \pm 0.13 \text{ mm}$
 $\text{.XXX} \pm 0.005 \text{''}$

SHIELD IS FOR HOUSING ESD PATH ONLY

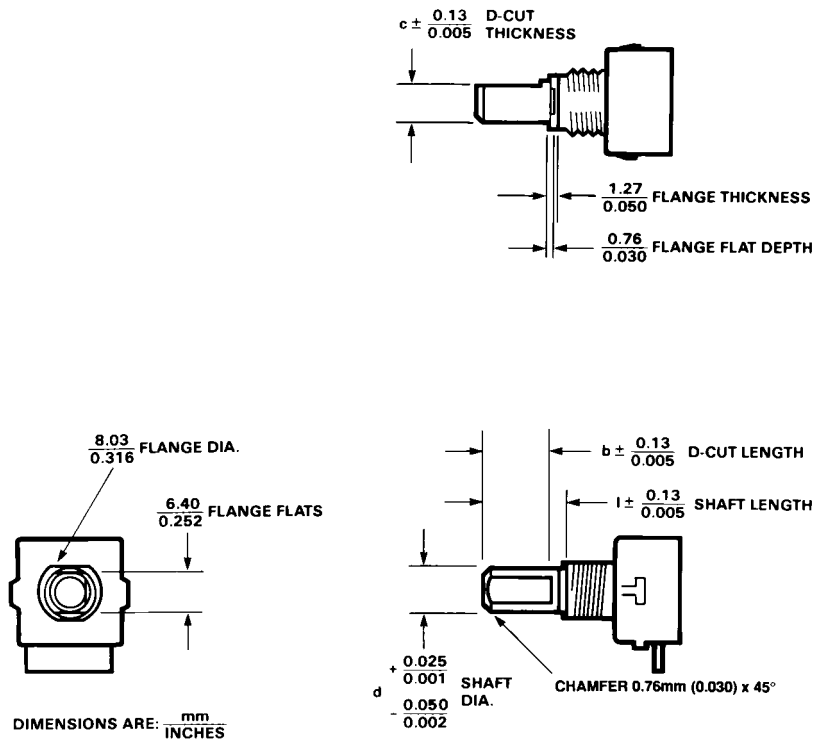
Option C – Cable Connector with Strain Relief

HRPG-AXXX#XXC




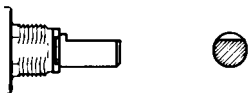

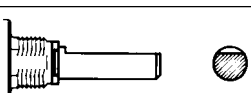

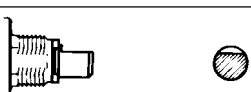
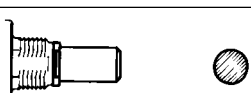
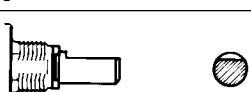
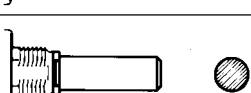
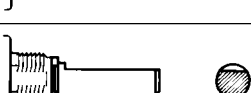


Shaft Configurations

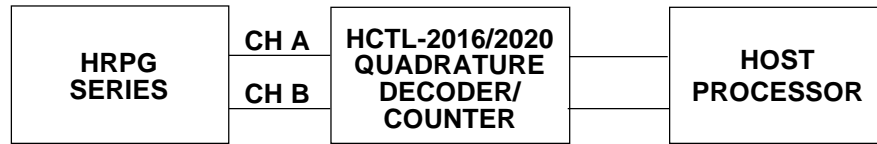
Shaft Dimensions (D-cut shown also)



Shaft Options Available

| Option # | Shaft Length (l) | Shaft Diameter (d) | D-Cut Thickness (c) | D-Cut Length (b) | Sketch (not to scale) |
|----------|------------------|--------------------|---------------------|------------------|---|
| 11 | 0.30" | 0.251" | - | - |  |
| 13 | 0.30" | 0.250" | 0.225" | 0.230" |  |
| 14 | 0.50" | 0.251" | - | - |  |
| 16 | 0.50" | 0.250" | 0.225" | 0.400" |  |
| 17 | 0.80" | 0.251" | - | - |  |
| 19 | 0.80" | 0.250" | 0.225" | 0.700" |  |
| 51 | 7.6 mm | 6.02 mm | - | - |  |
| 53 | 7.6 mm | 6.00 mm | 5.33 mm | 5.84 mm |  |
| 54 | 12.7 mm | 6.02 mm | - | - |  |
| 56 | 12.7 mm | 6.00 mm | 5.33 mm | 10.16 mm |  |
| 57 | 20.32 mm | 6.02 mm | - | - |  |
| 59 | 20.32 mm | 6.00 mm | 5.33 mm | 17.78 mm |  |

Typical Interface



Ordering Information

HRPG - A #

| Shaft / Resolution | Mechanical Configuration | Termination |
|---|--|---|
| S16 – Smooth 16CPR D16 – Detented 16CPR* S32 – Smooth 32CPR D32 – Detented 32CPR* SCA – Smooth 120CPR | 11 – 0.3" long, 0.25" dia. 13 – 0.3" long, 0.25" dia. D-cut 14 – 0.5" long, 0.25" dia. 16 – 0.5" long, 0.25" dia. D-cut 17 – 0.8" long, 0.25" dia. 19 – 0.8" long, 0.25" dia. D-cut 51 – 7.6 mm long, 6 mm dia. 53 – 7.6 mm long, 6 mm dia. D-cut 54 – 12.7 mm long, 6 mm dia. 56 – 12.7 mm long, 6 mm dia. D-cut | F – Pins Front with Bracket R – Pins Rear with Bracket C – Cable Connector with Strain Relief |

***Note:** When ordering detented versions, a D-cut shaft is recommended.

| HRPG Series | | 11 | 13 | 14 | 16 | 17 | 19 | 51 | 53 | 54 | 56 | 57 | 59 |
|-------------|---|----|----|----|----|----|----|----|----|----|----|----|----|
| AD16 | F | | | | * | | | | | * | * | | * |
| | R | | | | * | | | * | | * | | | |
| | C | | | | * | | | | | | * | | |
| | L | | | | | | | | | | | | |
| AD32 | F | | * | * | * | | * | * | * | | | * | * |
| | R | * | * | * | * | | * | | * | * | * | | * |
| | C | * | * | * | * | * | | * | * | * | * | | * |
| | L | | | | | | | | | | | | |
| AS16 | F | | | | | * | | | | * | | | |
| | R | * | | | | | | | * | | | | |
| | C | | | * | | | | * | | | | | |
| | L | | | | | | | | | | | | |
| AS32 | F | * | * | | | | | | | | * | | |
| | R | | * | * | | | | | * | | | | |
| | C | | | * | | | | | | | | | * |
| | L | | | | | | | | | | | | |
| ASCA | F | * | | * | * | * | * | | * | * | * | * | * |
| | R | * | * | * | * | * | * | | * | * | * | | |
| | C | * | * | * | * | * | * | | * | * | * | | * |
| | L | | | | | | | | | | | | |

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