# Chipsmall

Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

**Avago**
T E C H N O L O G I E S

## 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**
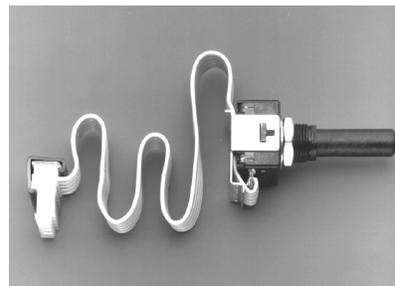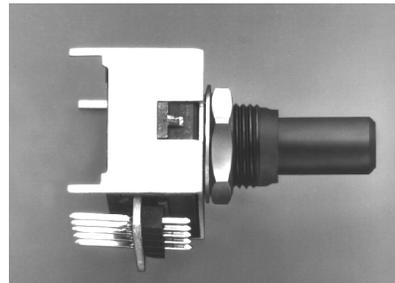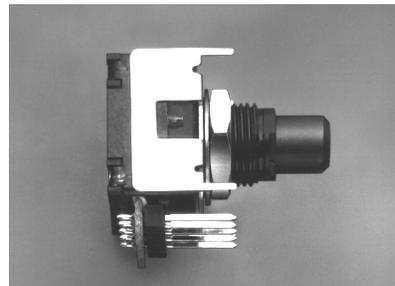
## Absolute Maximum Ratings

| 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 m$V_{P-P}$ |
| 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 µA Max. |
| Low Level Output Voltage | $V_{OL}$ | | 0.4 | V | $I_{OL}$ = 3.2 mA |

## Output Waveforms
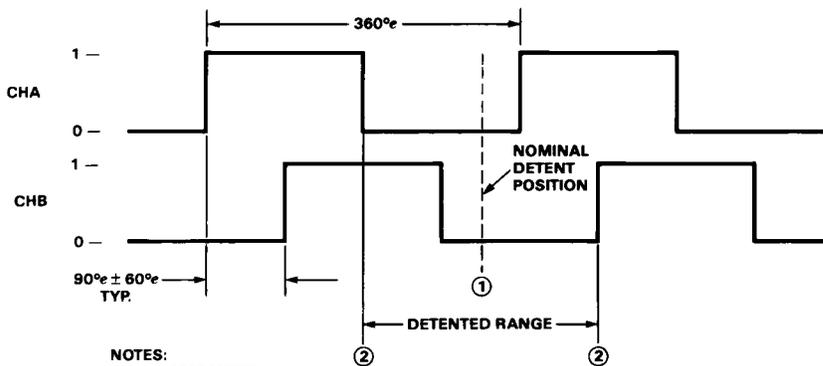


NOTES:
$$360°e = \frac{360° \text{ MECH.}}{\text{CPR}}$$

CHANNEL A LEADS CHANNEL B FOR CLOCKWISE ROTATION
CHANNEL B LEADS CHANNEL A FOR COUNTERCLOCKWISE ROTATION
1. FOR HRPG-ADXX #XXX THE NOMINAL DETENT POSITION IS CENTERED AROUND LOW-LOW STATE
    (CHA = 0, CHB = 0).
2. 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

SUGGESTED CONFIGURATION

PCB MOUNTING DIMENSIONS

$\frac{15.11}{0.595}$

$\frac{9.96}{0.392}$ REF.

$\frac{2.40}{0.095}$

$\frac{2.54}{0.100}$ TYP.

$\frac{8.31}{0.327}$

$\frac{16.61}{0.654}$

$\phi \frac{1.24 \pm 0.08}{0.049 \pm 0.003}$, 9 PLACES

SHAFT CENTER

NUT AND WASHER MUST BE
USED TO SECURE MOUNTING
PLATE TO THE HOUSING.

PCB

$\frac{2.5}{0.10}$ MAX PANEL THICKNESS

3/8"-32 UNEF THREAD

$\frac{5.8}{0.23}$ MIN. TO LAST COMPLETE THREAD

TABS $\frac{0.79}{0.031}$, 4 PLACES

$\frac{15.11}{0.595}$

$\frac{9.96}{0.392}$

$\frac{7.1}{0.28}$

$\frac{3.6}{0.14}$

$\frac{11.4}{0.45}$

STAR WASHER

HEX NUT, 7/16"
(11.1 mm)
FLAT TO FLAT

PINS 0.64 mm/0.025" SQR. 5 PLACES
ON 2.54 mm/0.100" CENTERS

$\frac{8.1}{0.32}$

$\frac{12.7}{0.50}$ MAX.

$\frac{17.3}{0.68}$

NOTES:
DIMENSIONS ARE: $\frac{mm}{INCHES}$

TOLERANCES ARE: $\frac{X \pm 0.25\,mm}{.XX \pm 0.01"}$

$\frac{.XX \pm 0.13\,mm}{.XXX \pm 0.005"}$

SHIELD IS FOR HOUSING ESD PATH ONLY

TABS $\frac{0.51}{0.020}$

$\frac{16.1}{0.63}$

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

## Option F – Pins Front with Bracket

## HRPG-AXXX# XXF

SUGGESTED CONFIGURATION
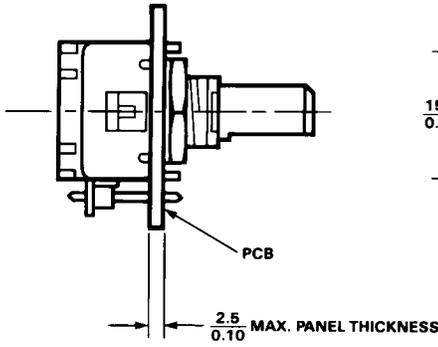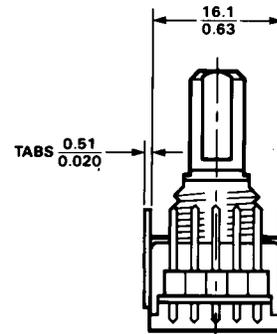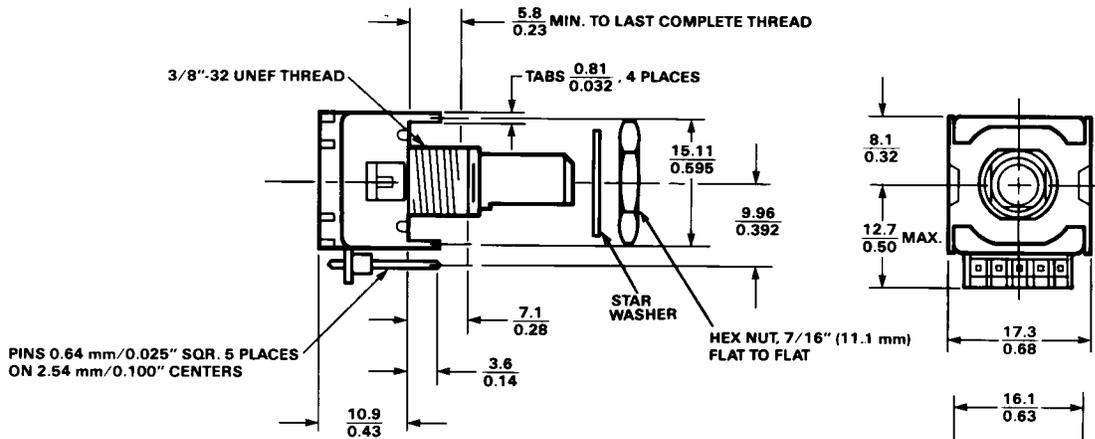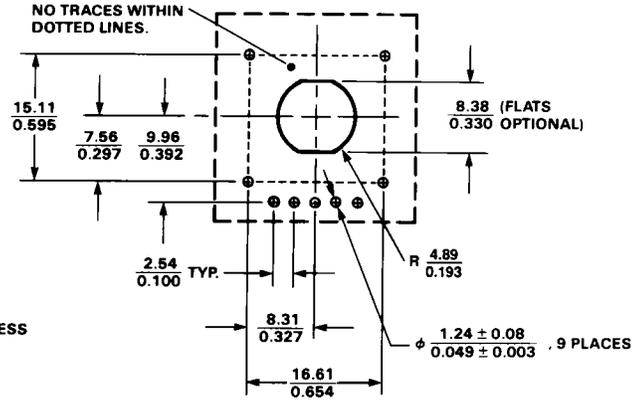
PCB MOUNTING DIMENSIONS

NO TRACES WITHIN
DOTTED LINES.

$\frac{15.11}{0.595}$

$\frac{7.56}{0.297}$    $\frac{9.96}{0.392}$

$\frac{8.38}{0.330}$ (FLATS OPTIONAL)

PCB

$\frac{2.54}{0.100}$ TYP.

R $\frac{4.89}{0.193}$

$\frac{2.5}{0.10}$ MAX. PANEL THICKNESS

$\frac{8.31}{0.327}$

$\phi \frac{1.24 \pm 0.08}{0.049 \pm 0.003}$ , 9 PLACES

$\frac{16.61}{0.654}$

$\frac{5.8}{0.23}$ MIN. TO LAST COMPLETE THREAD

3/8″-32 UNEF THREAD

TABS $\frac{0.81}{0.032}$ , 4 PLACES

$\frac{15.11}{0.595}$

$\frac{8.1}{0.32}$

$\frac{9.96}{0.392}$

$\frac{12.7}{0.50}$ MAX.

$\frac{7.1}{0.28}$

STAR
WASHER

$\frac{3.6}{0.14}$

HEX NUT, 7/16″ (11.1 mm)
FLAT TO FLAT

$\frac{17.3}{0.68}$

PINS 0.64 mm/0.025″ SQR. 5 PLACES
ON 2.54 mm/0.100″ CENTERS

$\frac{10.9}{0.43}$

$\frac{16.1}{0.63}$

TABS $\frac{0.51}{0.020}$

**NOTES:**

DIMENSIONS ARE: $\frac{mm}{INCHES}$

TOLERANCES ARE: $\frac{X \pm 0.25 \text{ mm}}{.XX \pm 0.01″}$

$\frac{.XX \pm 0.13 \text{ mm}}{.XXX \pm 0.005″}$

SHIELD IS FOR HOUSING ESD PATH ONLY

1. GROUND (DOT ON BOTTOM)
2. CHANNEL B
3. Vcc (+5 VOLTS)
4. CHANNEL A
5. SHIELD (HOUSING GROUND)

4

## Option C – Cable Connector with Strain Relief

### HRPG-AXXX# XXC

**SUGGESTED CONFIGURATION**

$\frac{3.8}{0.15}$ MAX. PANEL THICKNESS

**PANEL HOLE DIMENSIONS**

R $\frac{4.89}{0.193}$

$\frac{8.38}{0.330}$

3/8"-32 UNEF THREAD

$\frac{5.8}{0.23}$ MIN. TO LAST COMPLETE THREAD

$\frac{17.3}{0.68}$

$\frac{8.0}{0.32}$

$\frac{15.2}{0.60}$ MAX.

$\frac{7.6}{0.30}$

$\frac{14.0}{0.55}$ MAX.

$\frac{152 \pm 8.0}{6.0 \pm 0.31}$

STAR WASHER

HEX NUT, 7/16" (11.1 mm) FLAT TO FLAT

**CONNECTOR**
AMP 641239-5 MTA-100 CLOSED END HOUSING WITH DUST COVER, FEMALE CONNECTOR ON 0.100"(2.54 mm) CENTERS TO MATE WITH MALE 0.025" (0.54 mm) SQR. POSTS, 0.28 ± 0.04 (7.11 ± 1.00 mm) LONG.

0.100" (2.54 mm) CENTERS, ROUND CONDUCTOR FLAT CABLE GRAY PVC INSULATION

PIN 1 STRIPE

**NOTES:**
DIMENSIONS ARE: $\frac{mm}{INCHES}$

TOLERANCES ARE: $\frac{X \pm 0.25 \text{ mm}}{.XX \pm 0.01''}$

$\frac{.XX \pm 0.13 \text{ mm}}{.XXX \pm 0.005''}$

SHIELD IS FOR HOUSING ESD PATH ONLY

$\frac{12.7}{0.50}$ REF.

1. GROUND
2. CHANNEL B
3. Vcc (+5 VOLTS)
4. CHANNEL A
5. SHIELD (HOUSING GROUND)

5

## Shaft Configurations

## Shaft Dimensions (D-cut shown also)

$c \pm \dfrac{0.13}{0.005}$ D-CUT THICKNESS

$\dfrac{1.27}{0.050}$ FLANGE THICKNESS

$\dfrac{0.76}{0.030}$ FLANGE FLAT DEPTH

$\dfrac{8.03}{0.316}$ FLANGE DIA.

$\dfrac{6.40}{0.252}$ FLANGE FLATS

$b \pm \dfrac{0.13}{0.005}$ D-CUT LENGTH

$l \pm \dfrac{0.13}{0.005}$ SHAFT LENGTH

$d \; {}^{+}_{-} \; \dfrac{0.025}{0.001} \; \dfrac{0.050}{0.002}$ SHAFT DIA.

CHAMFER 0.76mm (0.030) x 45°

DIMENSIONS ARE: $\dfrac{mm}{INCHES}$

6
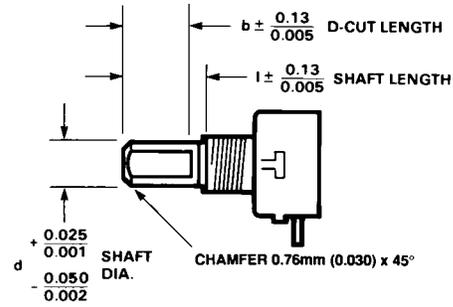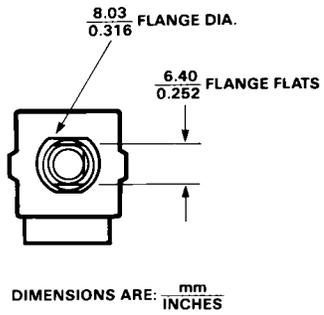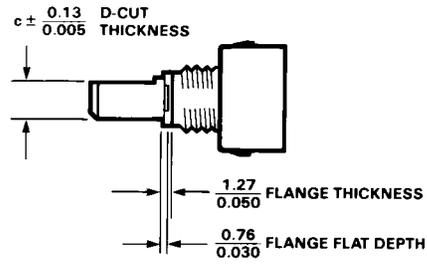
**Shaft Options Available**

| 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 | |
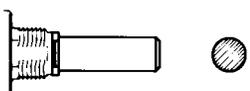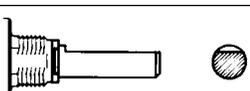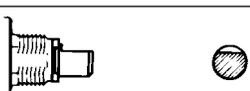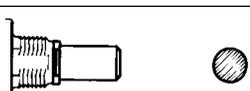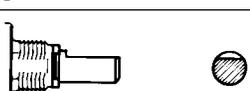
**Typical Interface**
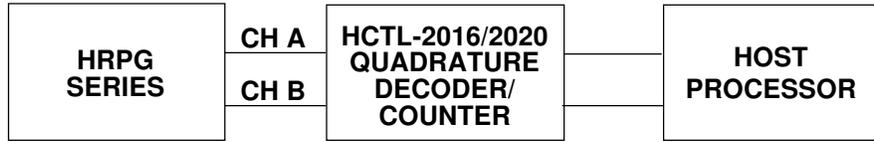


**Ordering Information**



| | Shaft / Resolution |
|---|---|
| S16 – Smooth 16CPR |
| D16 – Detented 16CPR* |
| S32 – Smooth 32CPR |
| D32 – Detented 32CPR* |
| SCA – Smooth 120CPR |

**Mechanical Configuration**

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

**Termination**

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 | | | | | | | | | | | | |