SERIES 60A
Joystick

FEATURES
• Optical Encoder, Pushbutton, and Joystick in One Shaft
• Long Life, High Reliability
• Compatible with CMOS, HCMOS, and TTL Logic
• Choices of Cable Length and Termination
• Customized Solutions Available

APPLICATIONS
• Global Positioning/Driver Information Systems
• Medical Equipment Control
• Radio Control
• Robotics
• Commercial Appliances

DIMENSIONS in inches (and millimeters)

CIRCUITRY AND JOYSTICK OPERATION
Standard Quadrature 2-Bit Code

*EXTERNAL PULL-UP RESISTORS REQUIRED FOR OPERATION (2.2kΩ).
* DEFINED BY LOCATING PIN ON TOP OF HOUSING
WAVEFORM AND TRUTH TABLE  Standard Quadrature 2-Bit Code

SPECIFICATIONS
Rotary Electrical and Mechanical
Ratings
Operating Voltage: 5.00 ± 0.25 Vdc
Supply Current: 20 mA maximum at 5 Vdc
Output: Open collector phototransistor. External pull up resistors are required
Output Code: 2-Bit quadrature, channel A leads channel B by 90° electrically during clockwise rotation of the shaft
Logic Output Characteristics:
High: No less than 3.5 Vdc
Low: No greater than 1.0 Vdc
Minimum Sink Current: 1.0 mA at 5 Vdc
Power Consumption: 100 mW maximum
Mechanical Life: 1 million rotational cycles of operation (1 cycle is a rotation through all positions and a full return)
Average Rotational Torque: 2.0 ± 1.0 in.-oz initially, torque shall be within 50% of initial value throughout life
Mounting Torque: 15 in.-lbs. maximum
Shaft Push-Out Force: 45 lbs minimum
Shaft Pull-Out Force: 45 lbs minimum
Shaft Side-Load Force: 20 lbs max.
Terminal Strength: 15 lbs terminal pull-out force minimum for cabled and header termination
Solderability: 95% free of pin holes and voids

Pushbutton Electrical and Mechanical
Ratings
Rating: 10 mA at 5 Vdc resistive
Contact Resistance: less than 10 ohms
Life: 1 million actuations minimum
Contact Bounce: < 4 ms make, 10 ms break

Actuation Force: 400 ± 150 grams force
Shaft Travel: 0.020 ± 0.010 inches

Joystick Electrical and Mechanical
Ratings
Supply Current: 5 mA maximum
Output Code: 2-Bit
Logic Output Characteristics:
Neutral: 2.5 ± 0.5 Vdc
High: > 4.5 Vdc
Low: < 0.5 Vdc
Angle of Throw: 8° ± 2° in all directions
Life: 500,000 actuations in each direction

Environmental Ratings
Operating Temperature Range: -40°C to 85°C
Storage Temperature Range: -55°C to 100°C
Relative Humidity: 96 hours at 90-85% humidity at 40°C
Vibration: Harmonic motion with amplitude of 15g, within a varied 10 to 2000 Hz frequency for 12 hours
Mechanical Shock:
Test 1: 100g for 6ms half-sine wave with a velocity change of 12.3 ft/s
Test 2: 100g for 6ms sawtooth wave with a velocity change of 9.7 ft/s

Materials and Finishes
Assembly Studs: 305 Stainless steel
Detent Housing: Polyamide polymer (nylon 6/10 alloy)
Printed Circuit Boards: Glass cloth epoxy double clad with copper gold over nickel plated

Infrared Emitting Diode Chips: Gallium aluminum arsenide
Silicon Phototransistor Chips: Gold and aluminum alloys
Resistors: Metal oxide on ceramic substrate
Solder Pins: Brass, Plated with tin
Shaft: Polyamide polymer (nylon 6/10 alloy) with stainless steel insert
Detent Balls: Carbon steel plated with nickel
Detent Springs: Music wire plated with tin
Code Rotor: 33% Glass reinforced nylon 66
Pushbutton Dome: Stainless steel
Pushbutton Dome Retainer: Polycarbonate
Joystick Housing: Polyamide polymer (nylon 6/10 alloy)

OPTIONS
Contact Grayhill for custom terminations, rotational torque, number of positions, shaft configurations, and resolutions. Control knobs are also available.

ORDERING INFORMATION

Available from your local Grayhill Component Distributor.
For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.