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 (2.2k Ω).
* DEFINED BY LOCATING PIN ON TOP OF HOUSING
WAVEFORM AND TRUTH TABLE  Standard Quadrature 2-Bit Code

<table>
<thead>
<tr>
<th>Clockwise Rotation</th>
<th>Position</th>
<th>Output A</th>
<th>Output B</th>
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- Indicates logic high; blank indicates logic low. Code repeats every 4 positions.

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: > 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 90-95% 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 12.3 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)
Joystick Contact: Stainless steel, silicon rubber, brass with silver cladding, high-temp thermoplastic, phosphor bronze with silver cladding
Cable: Copper stranded with plating in PVC insulation
Connector: PA 4.6 with tin over nickel plated phosphor bronze
Lockwashers: Stainless steel with passivate finish
Hex Nuts: 303 Stainless steel
Label: TT406 Thermal transfer cast film
Solder: Sn/Ag/Cu, Lead-Free, No Clean
Mounting Nut: Polyurethane
Lubricating Grease: Nye nyogel 774L

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

ORDERING INFORMATION
Series
Angle of Throw: Detent: 18° = 20 positions; Non-detent: 08 = 18° or 20 positions;
Non-Turn: 00 = Joystick and Pushbutton only
Joystick Contacts: 2 = 2 Discrete Contacts
4 = 4 Discrete Contacts
8 = 4 Contacts in 8 possible directions
Termination: S = 4.0in Stripped cable: .050" centers;
C = 4.0in Cable with Amp Connector P/N 215003-8: .050" centers;
(See Amp Mateability Guide for mating connector details)
P = Pins: .050" centers
RAC = Right Angle Connector: JST SM08B-GHS-TB(LF)(SN): .050" centers
(See JST Connector Guide for mating connector details)
Cable Length: 020 = 2in. 030 = 3in. 040 = 4in. 050 = 5in. 060 = 6in. 080 = 8in. 100 = 10in. 120 = 12.5in.
*Eliminate cable length if ordering “P” or “RAC” termination option

*60A18-4-RAC available as standard P/N, for additional options, please contact Grayhill