Solid-state Timer

H3FA

DIP Model Timer for PC Board Use Provides Contact and Solid-state Output

- Four time ranges are selectable.
  - Models suffixed -A: 1 s, 10 s, 1 min, 10 min.
  - Models suffixed -B: 6 s, 60 s, 6 min, 60 min.
- Timer operation may also be controlled through an external variable resistor.
- Timer can be cleaned while mounted on a PC Board with the sealing tape affixed.
- Twenty-four-pin IC socket can be used for mounting the Timer.
- Mountable on a 1-inch pitch rack.
  
  (H 19.5 × W 36.9 × D 17.75 mm)

Model Number Structure

Note: This model number legend includes combinations that are not available. Before ordering, please check the List of Models on page 2 for availability.

<table>
<thead>
<tr>
<th>H3FA- □ □ □ □</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Time-limit contact</td>
<td>None: Contact outputs (SPST-NO + SPST-NC)</td>
<td>S: Solid-state outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Time range</td>
<td>A: 1 s to 10 min</td>
<td>B: 6 s to 60 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Operation/resetting system</td>
<td>None: Time-limit operation/power-OFF resetting and external resetting, Integrating operation/power-OFF resetting and external resetting</td>
<td>U: Instantaneous operation, time-limit resetting/external resetting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Supply voltage</td>
<td>For contact output models</td>
<td>6DC: 5 V DC</td>
<td>12DC: 12 V DC</td>
<td>24DC: 24 V DC</td>
</tr>
<tr>
<td>For solid-state output models</td>
<td>5/6DC: 5/6 V DC</td>
<td>12/24DC: 12/24 V DC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please read and understand this catalog before purchasing the products. Please consult OMRON representative if you have any questions or comments. Refer to Safety Precautions on page 9.
Ordering Information

■ List of Models

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>H3FA-A</th>
<th>H3FA-B</th>
<th>H3FA-SA</th>
<th>H3FA-SB</th>
<th>H3FA-AU</th>
<th>H3FA-BU</th>
<th>H3FA-SAU</th>
<th>H3FA-SBU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation/resetting</td>
<td>system</td>
<td>Time-lim</td>
<td>operation/power-OFF resetting and external</td>
<td>resettin</td>
<td>g</td>
<td>Integration operation/power-OFF resetting and external resetting</td>
<td>Time-lim</td>
<td>operation, time-lim</td>
<td>resetting/external</td>
</tr>
<tr>
<td>Time-limit contact</td>
<td>Contact output</td>
<td>(SPST-NO + SPST-NC)</td>
<td>Solid-state output</td>
<td>Contact output</td>
<td>(SPST-NO + SPST-NC)</td>
<td>Solid-state output</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instantaneous contact</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Mounting method</td>
<td>Surface mounting</td>
<td>(with IC socket or direct mounting on PC Board)</td>
<td>Surface mounting</td>
<td>(with IC socket or direct mounting on PC Board)</td>
<td>Surface mounting</td>
<td>(with IC socket or direct mounting on PC Board)</td>
<td>Surface mounting</td>
<td>(with IC socket or direct mounting on PC Board)</td>
<td>Surface mounting</td>
</tr>
<tr>
<td>Time range</td>
<td>1 s to 10 min</td>
<td>1 s to 10 min</td>
<td>6 s to 60 min</td>
<td>6 s to 60 min</td>
<td>1 s to 10 min</td>
<td>6 s to 60 min</td>
<td>1 s to 10 min</td>
<td>6 s to 60 min</td>
<td>1 s to 10 min</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>5 V DC</td>
<td>H3FA-A</td>
<td>5DC</td>
<td>H3FA-B</td>
<td>5DC</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>6 V DC</td>
<td>H3FA-A</td>
<td>6DC</td>
<td>H3FA-B</td>
<td>6DC</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>12 V DC</td>
<td>H3FA-A</td>
<td>12DC</td>
<td>H3FA-B</td>
<td>12DC</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>24 V DC</td>
<td>H3FA-A</td>
<td>24DC</td>
<td>H3FA-B</td>
<td>24DC</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>5/6 V DC</td>
<td>---</td>
<td>---</td>
<td>H3FA-SA</td>
<td>5/6DC</td>
<td>---</td>
<td>---</td>
<td>H3FA-SA</td>
<td>5/6DC</td>
</tr>
<tr>
<td></td>
<td>12/24 V DC</td>
<td>---</td>
<td>---</td>
<td>H3FA-SA</td>
<td>12/24DC</td>
<td>---</td>
<td>---</td>
<td>H3FA-SA</td>
<td>12/24DC</td>
</tr>
</tbody>
</table>

Note: The desired operation/resetting system is selected by short-circuiting and opening the specified terminals.

Specifications

■ Time Ranges

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated time</th>
<th>Time setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3FA-A</td>
<td>1 s</td>
<td>0.1 to 1 s</td>
</tr>
<tr>
<td>H3FA-AU</td>
<td>10 s</td>
<td>1 to 10 s</td>
</tr>
<tr>
<td>H3FA-SA</td>
<td>1 min</td>
<td>0.1 to 1 min</td>
</tr>
<tr>
<td>H3FA-SAU</td>
<td>10 min</td>
<td>1 to 10 min</td>
</tr>
<tr>
<td>H3FA-B</td>
<td>6 s</td>
<td>0.6 to 6 s</td>
</tr>
<tr>
<td>H3FA-BU</td>
<td>60 s</td>
<td>6 to 60 s</td>
</tr>
<tr>
<td>H3FA-SB</td>
<td>6 min</td>
<td>0.6 to 6 min</td>
</tr>
<tr>
<td>H3FA-SBU</td>
<td>60 min</td>
<td>6 to 60 min</td>
</tr>
</tbody>
</table>

Note: 1. The above timing ranges apply when the internal variable resistor of H3FA is used.
2. The external variable resistor may also be used by opening the terminal connected to the internal variable resistor.
3. Wire the appropriate terminal to select a time setting range. Refer to *Rated Time and Terminal Connections* on page 4 for details.
### Ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>H3FA-A/ H3FA-B</th>
<th>H3FA-AU/ H3FA-BU</th>
<th>H3FA-SA/ H3FA-SB</th>
<th>H3FA-SAU/ H3FA-SBU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated supply voltage</td>
<td>5 V DC, 6 V DC, 12 V DC, 24 V DC (See note 1.)</td>
<td>5/6 V DC (See note 1.)</td>
<td>12/24 V DC (See notes 1 and 2.)</td>
<td></td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>5 V DC: 90% to 110% of rated supply voltage 6, 12, 24 V DC: 85% to 110% of rated supply voltage</td>
<td>5/6 V DC: 90% to 110% of rated supply voltage</td>
<td>12/24 V DC: 85% to 110% of rated supply voltage</td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>5, 6 V DC: approx. 230 mW 12 V DC: approx. 270 mW 24 V DC: approx. 330 mW</td>
<td>5/6 V DC: approx. 80 mW</td>
<td>12 V DC: approx. 100 mW 24 V DC: approx. 240 mW</td>
<td></td>
</tr>
<tr>
<td>Control outputs</td>
<td>Contact output: SPST-NO + SPST-NC, 3 A at 250 V AC with resistive load, Minimum applied load: 10 mA at 5 V DC (Failure level: P, reference value)</td>
<td>Solid-state output: 150 mA max. at 30 V DC Residual voltage: 1.0 V max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>Operating: −10°C to 55°C (with no icing) Storage: −25°C to 65°C (with no icing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35% to 85%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**
1. Permissible ripple: 20% max. (3% max. at 5, 6 V DC-operated models)
2. Supply voltage can be selected by short-circuiting (12 V DC) or opening (24 V DC) the specified terminals.

### Characteristics

| Accuracy of operating time        | ±0.5% FS max. (See note 1.) |
| Setting error                     | 0 to 30% FS max. (at 20°C, at rated voltage) |
| Reset time                        | 10 ms max. |
| Influence of voltage              | ±1% FS max. (2% FS max. for 5, 6, 5/6 V DC-operated models) |
| Influence of temperature          | ±5% FS max. (See note 1.) |
| Insulation resistance             | 100 MΩ min. (at 500 V DC) |
| Dielectric strength               | 1,500 V AC, 50/60 Hz for 1 min (between control output and operating circuit) (See note 2.) 1,000 V AC, 50/60 Hz for 1 min (between contacts not located next to each other) (See note 2.) |
| Vibration resistance              | Destruction: 10 to 55 Hz with 0.375-mm single amplitude in 3 directions for 1 hour each Malfunction: 10 to 55 Hz with 0.25-mm single amplitude in 3 directions for 10 minutes each |
| Shock resistance                  | Destruction: 1,000 m/s² 3 times each in 6 directions Malfunction: 100 m/s² 3 times each in 6 directions |
| Life expectancy                   | Mechanical: 10,000,000 operations min. (under no load at 1,800 operations/h) Electrical: 100,000 operations min. (3 A at 250 V AC, resistive load at 1,800 operations/h) |
| Approved safety standards         | UL508, CSA C22.2 No.14 |
| Weight                            | Contact output models: approx. 15 g Solid-state output models: approx. 10 g |

**Note:**
1. Add or subtract 10 ms to the ratings when using a timer with a rated time of 1 s.
2. Applicable to contact output models.

### Life-test Curve (Reference Values)
Connections

Block Diagrams

Note: All diagrams are views from the top.

### H3FA-A, H3FA-B, H3FA-SA, H3FA-SB

When the input voltage is applied, the CR oscillator circuit in the Timer starts to oscillate via the power supply circuit, the counter circuit counts up to the preset setting, and an output signal is produced. A transistor amplifies this signal to drive the load.

The voltage across the H3FA-SA and -SB (solid-state output loads) is the load input voltage minus the residual voltage when the transistor turns ON.

### H3FA-AU, H3FA-BU, H3FA-SAU, H3FA-SBU

Contact Output

Solid-state Output

### Rated Time and Terminal Connections

<table>
<thead>
<tr>
<th>Model</th>
<th>Terminal connection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>H3FA-A/-SA/AU-SAU</td>
<td>1 s</td>
</tr>
<tr>
<td>H3FA-B/-SB/BU-SBU</td>
<td>6 s</td>
</tr>
</tbody>
</table>

Note: 1. Short-circuit terminals 21 and 22 when using the internal variable resistor of H3FA.
2. An external resistor can also be used by opening terminals 21 and 22. When using an external resistor (1 MΩ for H3FA-A/-SA, 3 MΩ for H3FA-B/-SB), connect it between terminals 21 and 23.
### Operation

#### Timing Charts and External Connections

**Note:** Do not apply voltage to any terminals other than the power supply terminals. Otherwise, the internal circuits may be damaged.

**H3FA-A, H3FA-B, H3FA-SA, H3FA-SB**

**Standard Operation (ON-delay operation)**

When the power is turned ON and the set time has elapsed, an output is produced. (Power turns ON when power terminals 1 and 24 are shorted or when terminals 13 and 15 are shorted when using a 12/24 V DC-operated model with a 12 V DC power supply.) When connecting an external resistor to the Timer, connect it between terminals 21 and 23, and open terminals 21 and 22. Refer to **External Resistors and Operating Time (Reference Value)** on page 7. When operating with an external reset input, short terminals 1 and 4. The Timer will start operating even if reset terminals 1 and 4 are open when the power is turned ON.

In this case, the current flow is approximately 0.1 mA. If a contact is used for control, use a contact with high contact reliability. If a transistor is used for control, use an $I_{C\text{ED}}$ of 10 μA and a $V_{CE}$ (sat) of 0.5 V or less.

**Integration Operation**

By opening the terminals connected to the internal variable resistor, Timer operation can be interrupted to enable the Timer to perform time integration operations. Interrupt Timer operation by opening terminals 21 and 22 when using the internal variable resistor or terminals 21 and 23 when using the external resistor. Timer operation can be resumed by reconnecting the terminals.

**Note:**
1. Control output is provided when the set time has elapsed ($T_1 + T_2$ or $T_3 + T_4$).
2. When using a 12/24 V DC-operated model with a 12 V DC power supply, short terminals 13 and 15.

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**Contact Output (Top View)**

When using the 12/24 V DC-operated model with a 12 V DC power supply, short terminals 13 and 15.

**Solid-state Output (Top View)**

When using the 12/24 V DC-operated model with a 24 V DC power supply, open terminals 13 and 15.
**H3FA-AU, H3FA-BU, H3FA-SAU, H3FA-SBU**

### One-shot Output Operation

Turn ON the power and apply a start input (short terminals 6 and 1). (Power turns ON when power terminals 1 and 24 are shorted or when terminals 13 and 15 are shorted when using a 12/24 V DC-operated model with a 12 V DC power supply.) An output is produced immediately and is reset when the set time has elapsed.

If the reset input is applied (short terminals 4 and 1) with no start input (open terminals 6 and 1) while the Timer is operating, the Timer stops operating and the output is reset.

When operating with an external start or reset input, the current flow from terminal 6 to terminal 1 (start input) or from terminal 4 to terminal 1 (reset input) is approximately 0.1 mA. A highly reliable contact is therefore recommended for the start and reset inputs.

Use an \( I_{CEO} \) of 10 \( \mu A \) and a \( V_{CE} \) (sat) of 0.5 V or less for transistor control. When connecting an external resistor to the Timer, connect it between terminals 21 and 23, and open terminals 21 and 22.

#### Contact Output (Top view)

- Power supply (terminals 1 and 24) (See note 1.)
- Start input (terminals 1 and 6)
- Reset input (terminals 1 and 4)
- SPST-NO contact output (terminals 13 and 16)
- Solid-state output (terminals 1 and 10)
- SPST-NC contact output (terminals 9 and 12)

#### Note:
1. When using a 12/24 V DC-operated model with a 12 V DC power supply, short terminals 13 and 15.
2. The start input is disabled during the time limit.
3. \( T \) denotes the set time. \( t_1 < T \)

#### Solid-state Output (Top View)

When using the 12/24 V DC-operated model with a 24 V DC power supply, open terminals 13 and 15.

### OFF-delay Operation

Turn ON the power and apply a start input (short terminals 6 and 1). (Power turns ON when power terminals 1 and 24 are shorted or when terminals 13 and 15 are shorted when using a 12/24 V DC-operated model with a 12 V DC power supply.) An output is produced immediately. If the start input is applied constantly, however, the reset input can be applied until the set time elapses to stop time-limit operation. (An output is produced when the start input is applied even when the constant reset input is ON prior to the start input.)

The time-limit operation starts when the reset input terminals are opened, and the output is reset when the set time has elapsed.

When operating with an external start or reset input, the current flow is approximately 0.1 mA. A highly reliable contact is therefore recommended for the start and reset inputs. Use an \( I_{CEO} \) of 10 \( \mu A \) and a \( V_{CE} \) (sat) of 0.5 V or less for transistor control.

#### Contact Output (Top view)

- Power supply (terminals 1 and 24) (See note 1.)
- Start input (terminals 1 and 6)
- Reset input (terminals 1 and 4)
- SPST-NO contact output (terminals 13 and 16)
- Solid-state output (terminals 1 and 10)
- SPST-NC contact output (terminals 9 and 12)

#### Note:
1. When using a 12/24 V DC-operated model with a 12 V DC power supply, short terminals 13 and 15.
2. \( T \) denotes the set time. \( t_1, t_2, \) and \( t_3 < T \)

#### Solid-state Output (Top View)

When using the 12/24 V DC-operated model with a 24 V DC power supply, open terminals 13 and 15.
External Resistors and Operating Time (Reference Value)

Refer to the following characteristics diagrams when using an external resistor.

- **Use an external resistor rated at about 0.1 W/1 MΩ for H3FA-A, -SA, -AU, and -SAU or 0.1 W/3 MΩ for H3FA-B, -SB, -BU, and -SBU.**
- **Do not run leads parallel to power lines and keep the leads shorter than 2 m to minimize the effects of external noise.**
- **The characteristics diagrams represent typical data. The factory set operating time may not always be uniform from one product to another. A variable resistor is recommended if more precise time adjustments are required. The operating time is slightly longer than the set time as the length of the lead increases.**

Extending the Reset Time

DIP Timers have a shorter reset time than that of conventional timers for use in solid-state circuit applications. To extend the reset time to that of conventional timers, i.e., about 100 ms, during operation, connect the Timer to a capacitor from the table as shown in the following diagram. The reset time after the set time has elapsed will vary with the load relay, so select an appropriate capacitor for the load relay.
Dimensions

Note: All units are in millimeters unless otherwise indicated.

**H3FA-A, H3FA-B, H3FA-SA, H3FA-SB**

**Applicable Connecting Socket**
Standard 24-pin IC socket can be used to mount the Timer.

**Mounting holes (Top view)**

**H3FA-A/B**
- Twelve, 1.0 dia. holes

**H3FA-SA/SB**
- Twelve, 1.0 dia. holes

**H3FA-AU/-BU, H3FA-SA/-SBU**

**Applicable Connecting Socket**
Standard 24-pin IC socket can be used for mounting the Timer.

**Mounting holes (Top View)**

**H3FA-AU/-BU**
- Thirteen, 1.0 dia. holes

**H3FA-SA/SBU**
- Thirteen, 1.0 dia. holes
Safety Precautions

■ Precautions for Safe Use
Observe the following items to ensure the safe use of this product.

Environmental Precautions
- Store the H3FA within the specified ratings. If the H3FA has been stored at a temperature of –10°C or lower, let it stand for 3 hours or longer at room temperature before turning ON the power supply.
- Use the H3FA within the specified ratings for operating temperature and humidity.
- Do not operate the H3FA in locations subject to sudden or extreme changes in temperature, or locations where high humidity may result in condensation.
- Do not use the H3FA in locations subject to vibrations or shock. Extended use in such locations may result in damage due to stress.
- Do not use the H3FA in locations subject to excessive dust, corrosive gas, or direct sunlight.

Usage Precautions
- Install a switch or circuit breaker that allows the operator to immediately turn OFF the power, and label it to clearly indicate its function.
- Be sure to wire the terminals correctly.
- Internal elements may be destroyed if a voltage outside the rated voltage is applied.
- Maintain voltage fluctuations in the power supply within the specified range.

■ Precautions for Correct Use
- Do not use excessive force to turn the time setting knob. Otherwise, it may be damaged.
- When more precise operating time settings are required, measure the operating time prior to use and adjust the time setting knob accordingly.
- Be very careful when handling terminal leads.
- Do not touch terminals with hands or objects that may be statically charged from mounting, transport, or other activities. Otherwise, the terminals may be damaged. Discharge static prior to handling the Timers by touching a grounded object or by using another method.
- Refer to the following diagram for the set values for various operating times.

When cleaning the timer, confirm that the sealing tape is securely in place. Do not clean without this sealing tape affixed. Use alcohol type (IPA, ethanol) solvent, which are less chemically reactive. Note that use of other solvents may damage the materials used for the Timer. Clean the Timer in less than 2 minutes. The cleaning solution must be 50°C or less. The tails of the connecting leads are solder-plated with consideration given to temperature at the time of soldering. When soldering the leads, keep the temperature at 260°C±5°C and complete soldering within 10 s. Do not use ultrasonic cleaning.

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