ROHM Stepper Motor Drivers (SMDs) offer designers a selection of products with the performance features required for printers and copiers, scanners, security cameras, robotics, sewing machines, factory automation and other applications requiring precision motor control.

Five product series are offered providing the ability to optimize the combination of function, performance, power and package size.

Reliable operation is the hallmark of ROHM Stepper Motor Drivers. A built-in voltage regulator in most models eliminates the need for control sequencing during power ON/OFF to prevent circuit malfunctions. ROHM SMDs also incorporate voltage, current and thermal protection circuits not typically found in this class of device.

Plus, ROHM’s exclusive Ghost Supply Prevention function prevents aberrant operation in OFF mode.

Finally, ROHM’s fabrication process yields products that exhibit exceptional ESD withstand, low ON resistance and low heat generation. The small package sizes are further enhanced by the reduction in external components.

**Built-in translator**
- CLK IN models simplify circuit design and drive the motor using only one clock signal.

**Built-in regulator**
-Eliminates power supply sequence control and simplifies circuit layout.

**Multiple protection circuits**
- Built in TSD, UVLO and OCP for greater reliability and safety.

**Logic input with Ghost Supply Prevention**
-Prevents control signals from passing through during OFF, eliminating IC malfunctions due to inadvertent power ON.

**Constant current control tuning function**
-Variable chopping frequency, combined with current decay switching, increases torque while reducing vibration.

**DMOS output**
-For low ON-resistance, low heat generation and high ESD resistance.

**Adjacent pin short protection**
-One failure mode typical of ICs is adjacent pin shorts. ROHM prevents this by utilizing a symmetrical pin configuration.
Important Performance Benefits of ROHM SMDs

- **PWM constant current drive significantly increases efficiency**
  ROHM's stepping motor drivers utilize PWM constant current drive for increased efficiency and eliminate the need for additional circuitry (i.e., snubber circuit), resulting in lower power consumption.

- **No charge pump required, eliminating the need for external capacitors**
  With no charge pump, there is no need for external capacitors, contributing to greater miniaturization while eliminating capacitor shorts, resulting in greater reliability.

- **Only one power supply needed due to built-in regulator**
  All ROHM stepper motor drivers (except the low voltage line) feature an integrated voltage regulator that eliminates the need for an additional power supply, simplifying design.

- **High ESD resistance (HBM)**
  An electrostatic discharge resistance of 8kV has been achieved through optimization of processes and circuitry, ensuring high reliability in all environments.

- **Thin, high power package**
  ROHM's stepping motor drivers employ a thin package with a bottom side metal heat sink, significantly increasing allowable loss while simplifying thermal design.
# Stepper Motor Drivers

## Product Lineup

### High Performance - High Reliability 36V Stepping Motor Driver Series

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Feature</th>
<th>Function</th>
<th>Package Type</th>
<th>Pin Compatible</th>
<th>Clock IN/Parallel IN type control signal input</th>
<th>Excitation mode (No. of steps)</th>
<th>Max. Output Current</th>
<th>Standby Current</th>
<th>ESD Resistance</th>
<th>Switching Function</th>
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<tbody>
<tr>
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<th>Package Type</th>
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<th>Clock IN/Parallel IN type control signal input</th>
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### Microstep 36V Stepping Motor Driver Series

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<th>Package Type</th>
<th>Pin Compatible</th>
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### Low Voltage Stepping Motor Driver Series

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<th>Package Type</th>
<th>Pin Compatible</th>
<th>Clock IN/Parallel IN type control signal input</th>
<th>Excitation mode (No. of steps)</th>
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<th>ESD Resistance</th>
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<th>Package Type</th>
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</table>

### Key

- **Max. output current**
- **Package type**
- **Inverse mounting protection**
- **ESD resistance**
- **Function compatible**
- **Pin compatible**
- **Built-in overvoltage lock out circuit**
- **Built-in undervoltage lock out circuit**
- **Built-in overcurrent protection circuit**
- **One power supply system due to built-in regulator**
- **Adjacent pin short protection**
- **SLOW/FAST/MIX DECAY Switching function**
- **Built-in thermal shutdown circuit**
- **Built-in current PWM**
- **Function compatible**
Stepper Motor Drivers
from ROHM Semiconductor

High Performance - High Reliability - 36V Series

- Pin compatibility simplifies replacement

ROHM offers 3 motor drivers (Iomin= 1.0A, 1.5A, 2.0A) that are pin-compatible, allowing different motors to be used without changing the board pattern, reducing both development time and costs.

- Ultra-thin, compact size and high heat dissipation characteristics simplify thermal design — even with large currents

The ultra-thin, compact package (HTSSOP-Bxx) dissipates heat to the substrate through the metal backside, resulting in large power dissipation. Compared with conventional HSOP packages that radiate heat through the leads, the HTSSOP-Bxx can handle large currents while reducing mounting area significantly.

- Current decay mode switching function reduces vibration, even during high rotation speeds

Generally, Slow Decay mode alone causes deformation of the current waveform during high speed rotation, resulting in motor vibration. ROHM stepping motor drivers feature an MTH terminal that allows selection of FAST/SLOW/MIX DECAY modes, ensuring low vibration driving — even during high speed rotation. In addition, the FAST/SLOW ratio can be linearly set during MIX DECAY, allowing optimization of the current decay.

- No failures due to adjacent pin shorts or inverse insertion

The carefully designed terminal configuration prevents failures due to reverse orientation or adjacent pin shorts caused by incorrect mounting or poor soldering, eliminating two major failure modes of the assembly process.

- High heat dissipation in a compact size

The compact, ultra-thin HTSSOP-B28 package dissipates heat to the substrate through the metal backside, resulting in large power dissipation. Compared with conventional HSOP packages that radiate heat through the leads, the HTSSOP-Bxx can handle large currents while reducing mounting area significantly.

---

### Linearly Variable SLOW/FAST Ratio

- Low vibration, even during high speed rotation

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Supply voltage(V)</th>
<th>Output current (A)</th>
<th>Circuit current (mA)</th>
<th>Input threshold voltage</th>
<th>Output ON resistance (Ω)</th>
<th>Package</th>
</tr>
</thead>
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<td>Vcc</td>
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<td>H level voltage(V)</td>
<td>L level voltage(V)</td>
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<td>2.0</td>
<td>0.8</td>
<td>0.65</td>
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<tr>
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<td>19 to 28</td>
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<td>2.5</td>
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<td>0.8</td>
<td>1.00</td>
</tr>
<tr>
<td>BD63873EFV</td>
<td>19 to 28</td>
<td>1.0</td>
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<tr>
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<td>2.0</td>
<td>0.8</td>
<td>0.65</td>
</tr>
<tr>
<td>BD63874EFV</td>
<td>19 to 28</td>
<td>1.5</td>
<td>2.5</td>
<td>2.0</td>
<td>0.8</td>
<td>1.00</td>
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<tr>
<td>BD63872EFV</td>
<td>19 to 28</td>
<td>1.0</td>
<td>2.5</td>
<td>2.0</td>
<td>0.8</td>
<td>1.90</td>
</tr>
</tbody>
</table>
Stepper Motor Drivers from ROHM Semiconductor

High Performance - High Reliability - 36V Series

CLK Interface

Important Features

- Single supply voltage (Vcc = 36V) with internal voltage regulator
- 1.0A, 1.5A and 2.0A output current models
  - Pin-compatible line-up
  - Small, thin power package (HTSSP-B28)
- CLK-IN with built-in translator
  - Full-step/ half-step/ quarter-step
- Constant current PWM driver
  - Variable frequency by external CR
  - FAST / SLOW / MIX DECAY modes
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection
- Ghost supply prevention function

- Easy board layout with simple CLK-IN control

  Compared with PARALLEL IN devices that require drive signals from the CPU, ROHM’s CLK-IN stepper motor drivers feature a built-in translator circuit making it possible to drive stepper motors using a single CLK signal. This cuts down both the amount of software processing as well as the number of signals significantly reducing the development time, simplifying board layout and decreasing costs.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Supply voltage (V)</th>
<th>Output current (A)</th>
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<th>Input threshold voltage</th>
<th>Output ON resistance (Ω)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD63877EFV</td>
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<td>2.0</td>
<td>2.5</td>
<td>H level voltage (V)</td>
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<tr>
<td>BD63875EFV</td>
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<td>2.5</td>
<td>L level voltage (V)</td>
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<td>1.00</td>
</tr>
<tr>
<td>BD63873EFV</td>
<td>19 to 28</td>
<td>1.0</td>
<td>2.5</td>
<td>H level voltage (V)</td>
<td>2.0</td>
<td>1.90</td>
</tr>
</tbody>
</table>

Clock Interface

Conventional

Simple CLK-IN control

Easy board layout with simple CLK-IN control

Compared with PARALLEL IN devices that require drive signals from the CPU, ROHM’s CLK-IN stepper motor drivers feature a built-in translator circuit making it possible to drive stepper motors using a single CLK signal. This cuts down both the amount of software processing as well as the number of signals significantly reducing the development time, simplifying board layout and decreasing costs.
Stepper Motor Drivers
from ROHM Semiconductor

High Performance - High Reliability - 36V Series
PARALLEL Interface

Important Features
- Single supply voltage (Vcc, max = 36V) with internal voltage regulator
- 1.0A, 1.5A and 2.0A output current models
  - Pin-compatible line-up
  - Small, thin power package (HTSSP-B28)
- Parallel IN
  - Full-step/ half-step/ quarter-step
- Constant current PWM driver
  - Variable frequency by external CR
  - FAST / SLOW / MIX DECAY modes
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection
- Ghost supply prevention function

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<th>Output ON resistance (Ω)</th>
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<td>2.5</td>
<td>2.0</td>
<td>0.65</td>
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<td>BD63874EFV</td>
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<td>BD63872EFV</td>
<td>19 to 28</td>
<td>1.0</td>
<td>2.5</td>
<td>2.0</td>
<td>1.90</td>
<td>HTSSOP-B28</td>
</tr>
</tbody>
</table>
High Performance - High Reliability - 36V Series
Standard / PARALLEL IN

Important Features

- Single supply voltage (Vcc, max = 36V) with internal voltage regulator
- 0.8A output current
- Parallel-In
  - Full-step/ half-step/ quarter-step
- Constant current PWM driver
  - SLOW decay mode
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection
- Ghost supply prevention function

<table>
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<tr>
<th>Part No.</th>
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<th>Input threshold voltage</th>
<th>Output ON resistance (Ω)</th>
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High Performance - High Reliability - 36V Series
Standard / CLK IN

Important Features

- Single supply voltage (Vcc, max = 36V) with internal voltage regulator
- 0.8A output current
- Clock-In
  - Full-step/ half-step
- Constant current PWM driver
  - SLOW decay mode
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection
- Ghost supply prevention function

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<tr>
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Single supply voltage (Vcc, max = 36V) with internal voltage regulator
0.8A output current
Clock-In
  - Full-step/ half-step
Constant current PWM driver
  - SLOW decay mode
DMOS output (Pch+Nch)
  - No charge pump
Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection
Ghost supply prevention function
High Performance - High Reliability - 36V Series

Microstep

Important Features

- Single supply voltage (Vcc = 36V, max) with internal voltage regulator
- 1.0A and 2.0A output current models
  - Pin-compatible line-up
  - Small, thin power package (HTSSOP-B28)
- CLK-IN with built-in translator
  - Full-step/ half-step/ eighth-step / sixteenth-step
- Constant current PWM driver
  - Variable frequency by external CR
  - FAST / SLOW / MIX DECAY modes
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection

- 4 mode settings possible from full step to sixteenth step via 4-bit logic input

Select between Full-Step, Half-Step, Eighth-Step or Sixteenth-Step operation based on the control input terminal settings. Full-step mode is ideal for sets requiring large current for high torque, while sixteenth-step mode features a smooth output waveform for lower noise and vibration.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Supply voltage(V)</th>
<th>Output current (A)</th>
<th>Circuit current (mA)</th>
<th>Input threshold voltage</th>
<th>Output ON resistance (Ω)</th>
<th>Package</th>
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<td>H level voltage(V)</td>
<td>L level voltage(V)</td>
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</table>
Stepping Motor Drivers
from ROHM Semiconductor

High Performance - High Reliability - 36V

Microstep

Important Features

- Single supply voltage (Vcc = 36V) with internal voltage regulator
- 2.5 output current
  - Small, thin power package (HTSSP-B28)
- CLK-IN with built-in translator
  - Full-step/ half-step/ quarter-step / eighth-step
- Constant current PWM driver
  - Variable frequency by external CR
    - FAST / SLOW / Mix DECAY modes
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
- Ghost supply prevention function

- 4 mode settings possible from full step to eighth step via 3-bit logic input

Select between Full-Step, Half-Step, Quarter-Step or Eighth-Step operation based on the control input terminal settings. Full-step mode is ideal for sets requiring large current for high torque, while eighth-step mode features a smoother output waveform for lower noise and vibration.

<table>
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<th>Part No.</th>
<th>Supply voltage(V)</th>
<th>Output current (A)</th>
<th>Circuit current (mA)</th>
<th>Input threshold voltage (V)</th>
<th>Output ON resistance (Ω)</th>
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<td>0.8</td>
<td>HTSSOP-B28</td>
</tr>
</tbody>
</table>
Stepper Motor Drivers from ROHM Semiconductor

High Performance - High Reliability - 36V Series

Low Voltage Series Parallel-in (Vcc 2.5V-5.5V)

Important Features

- 0.8A, and 1.2A output current models
  - Pin-compatible line-up
  - Small, thin power package (HTSSP-B24)
- Parallel-In
  - Full-step/ half-step
- Constant current PWM driver
  - SLOW decay mode
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection
- Ghost supply prevention function

- Compatible with low voltage (Vcc=2.5V) operation
  Operation is possible from a voltage as low as Vcc=2.5V, enabling compatibility with a wide range of battery-driven applications.

- 0 μA standby current
  The built-in power save function features virtually no standby current, contributing to increased energy savings and longer battery life.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Supply voltage(V)</th>
<th>Output current (A)</th>
<th>Circuit current (mA)</th>
<th>Input threshold voltage</th>
<th>Output ON resistance (Ω)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>BD6381EFV</td>
<td>2.5 to 5.5</td>
<td>0.8</td>
<td>1.6</td>
<td>2.0</td>
<td>0.8</td>
<td>HTSSOP-B24</td>
</tr>
<tr>
<td></td>
<td>6.0 to 13.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BD6380EFV</td>
<td>2.5 to 5.5</td>
<td>1.2</td>
<td>1.6</td>
<td>2.0</td>
<td>0.8</td>
<td>HTSSOP-B24</td>
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<tr>
<td></td>
<td>4.0 to 13.5</td>
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</tr>
</tbody>
</table>
Stepper Motor Drivers from ROHM Semiconductor

High Performance - High Reliability - Low Voltage
Vcc 2.5 - 55

- High reference voltage output accuracy, even during battery driving
  The high accuracy (±3%) reference voltage is stable, even during voltage fluctuations. This allows arbitrary setting of the input at the constant current limit setting terminal via external resistor division. Dependable operation is ensured, even in battery driven applications with wide voltage variations. In addition, an external analog power supply is not required, reducing overall costs.

- SENSE terminal enables high accuracy constant current drive
  Motor current is detected by the SENSE terminal, eliminating any adverse effects due to the internal wiring resistance, ensuring precise control (i.e. during microstep driving via external DAC), resulting in lower noise and vibration.

- Drive two DC motors with the independent VM terminals
  Two independent motor power supply terminals (VM) allow for two different voltage settings, making it possible to drive two different DC motors (or one stepping motor). In addition, the PWM frequency can be set separately for each output.
Stepper Motor Drivers from ROHM Semiconductor

High Performance - High Reliability - High Voltage Series
Vcc up to 45V

Important Features

- Single supply voltage with internal voltage regulator
- 1.0A and 1.5A output current models
  - Small, thin power packages
    - 1.0A HTSSOP-B24
    - 1.5A HTSSOP-B28
- CLK-IN with built-in translator
  - Full-step/ half-step/ quarter-step
- Parallel-In (1.0A only)
  - Full-step/ half-step/ quarter-step
- Constant current PWM driver
  - Variable frequency by external CR
  - Four decay mode settings
- DMOS output (Pch+Nch)
  - No charge pump
- Built-in circuit protection
  - Undervoltage lockout
  - Overvoltage lockout
  - Thermal shutdown
  - Overcurrent protection
  - Adjacent pin short protection
- Ghost supply prevention function

- Low noise during motor hold with external PWM excitation

This series utilizes an external excitation (fixed frequency) PWM method for constant current control. Conventional self-excitation methods feature a timing lag between channels between regeneration and output ON, resulting in noise. Conversely, ROHM's high voltage stepping motor drivers utilize external excitation with synchronized timing, reducing noise significantly. 
Current decay mode switching possible via 2-bit logic input

Four decay mode settings (Slow Decay + 3 Mixed Decay modes) can be set via two 2-bit logic input terminals. Each mode features a different decay ratio between fast and slow, enabling optimization based on motor specs for lower distortion and vibration.

### DECAY MODE switching

- **SLOW DECAY**: Favorable for torque but not for high pulse rates
- **FAST DECAY**: Optimized for both torque and high pulse rates
- **MIX DECAY**: Adjustable FAST/SLOW ratio

<table>
<thead>
<tr>
<th>Current decay mode</th>
<th>Fast [%]</th>
<th>Slow [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow</td>
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<td>100</td>
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<tr>
<td>Mixed 1</td>
<td>15</td>
<td>85</td>
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<tr>
<td>Mixed 2</td>
<td>40</td>
<td>60</td>
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<tr>
<td>Mixed 3</td>
<td>75</td>
<td>25</td>
</tr>
</tbody>
</table>

### Logic H-bridge

Mixed DECAY Control

Set the Decay Mode based on 2-bit control signals

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Supply voltage(V)</th>
<th>Output current (A)</th>
<th>Circuit current (mA)</th>
<th>Input threshold voltage</th>
<th>Output ON resistance (Ω)</th>
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<tbody>
<tr>
<td>BD6425EFV</td>
<td>19 to 42</td>
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<tr>
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Stepper Motor Drivers
Package Dimensions

HTSSOP-B24

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<th>value</th>
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<td>7.8</td>
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<td>0.17</td>
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<td>0.65</td>
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HTSSOP-B28

<table>
<thead>
<tr>
<th>dimension</th>
<th>value</th>
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<tbody>
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<td>6.4</td>
<td>4.4</td>
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<td>9.7</td>
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<tr>
<td>1.0 Max.</td>
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<td>0.625</td>
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<tr>
<td>0.65</td>
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[Unit : mm]