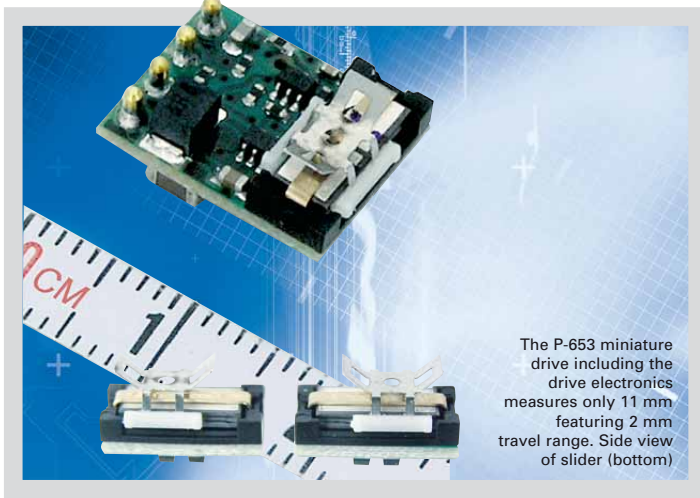


## P-653 PLine® Miniature Linear Motor / Slide OEM Drive for High Volume Applications



The P-653 miniature drive including the drive electronics measures only 11 mm featuring 2 mm travel range. Side view of slider (bottom)

- True Linear Motor Slide / No Rotary Conversion Losses
- Cost-Effective OEM Drive for High Quantity-Applications
- Preassembled and Mounted on a PCB Board
- Very Compact: Piezomotor Drive is Only 8 mm Long
- Fast Response: Full Stroke in <50 ms
- Force Generation to 0.15 N
- Self Locking at Rest
- Travel Range 2 mm, Velocity up to 200 mm/s

P-653 PLine® OEM piezomotor drives are ideal for OEM applications where space is limited and moved masses are small. These tiny linear positioners can be used to replace classical drive elements like miniaturized motor/spindle systems or other linear motors, which P-653 outclasses with its speed of up to 200 mm/s. PLine® piezo linear motors offer a number of advantages over classical drives:

- High velocities
- Compact design
- High push/pull and holding forces relative to the drive size

Integration of the P-653 in an application is simple because the moving slider and the piezo actuator are delivered assembled as a unit and already mounted on a PCB board. Drive electronics is included on the same board and requires a supply voltage of only 5 VDC.

Mechanical mounting is thus facilitated as well: All that remains is to affix the payload to the slider.

The motors are designed for moving small objects such as optical fibers, optics, micro- or electro-mechanical elements fast and precisely.

### Working Principle

P-653 drives employ a new, patented, ultrasonic piezomotor drive developed by PI. The highly compact, integrated piezomotor can attain velocities of up to 200 mm/s together with high position resolution and—considering its length of only 8 mm—a high holding force. Because the ceramic stator is pressed against the slider, piezomotor drives resist motion with an intrinsic holding force when the unit is at rest. The result is very high position stability, without the heat dissipation common with conventional linear motors. During operation, the oscillating piezoceramic propels the slider over the length of the motor. There are no gears, leadscrews or other mechanical components to contribute to play or backlash.

### Simple Control

The high-frequency, nanometer level oscillations (~500 kHz) needed by the PLine® motors are created by driver electronics, which self-adjusts to the resonant frequency of the motor ceramic, meaning that no individual tuning is necessary. The driver electronics can in turn be controlled by short voltage pulses.

### Order Information

**P-653.01**  
Miniatur PLine® OEM Drive,  
2 mm Travel Range, 0.15 N,  
mounted on PCB board

**P-653.01D**  
Miniatur PLine® OEM Drive,  
2 mm Travel Range, 0.15 N,  
Demo Sample Kit with USB  
Interface

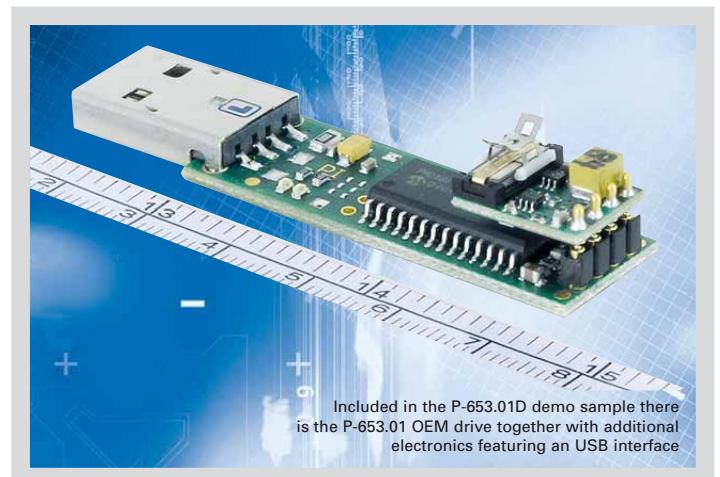
**Ask about custom designs**

### Note

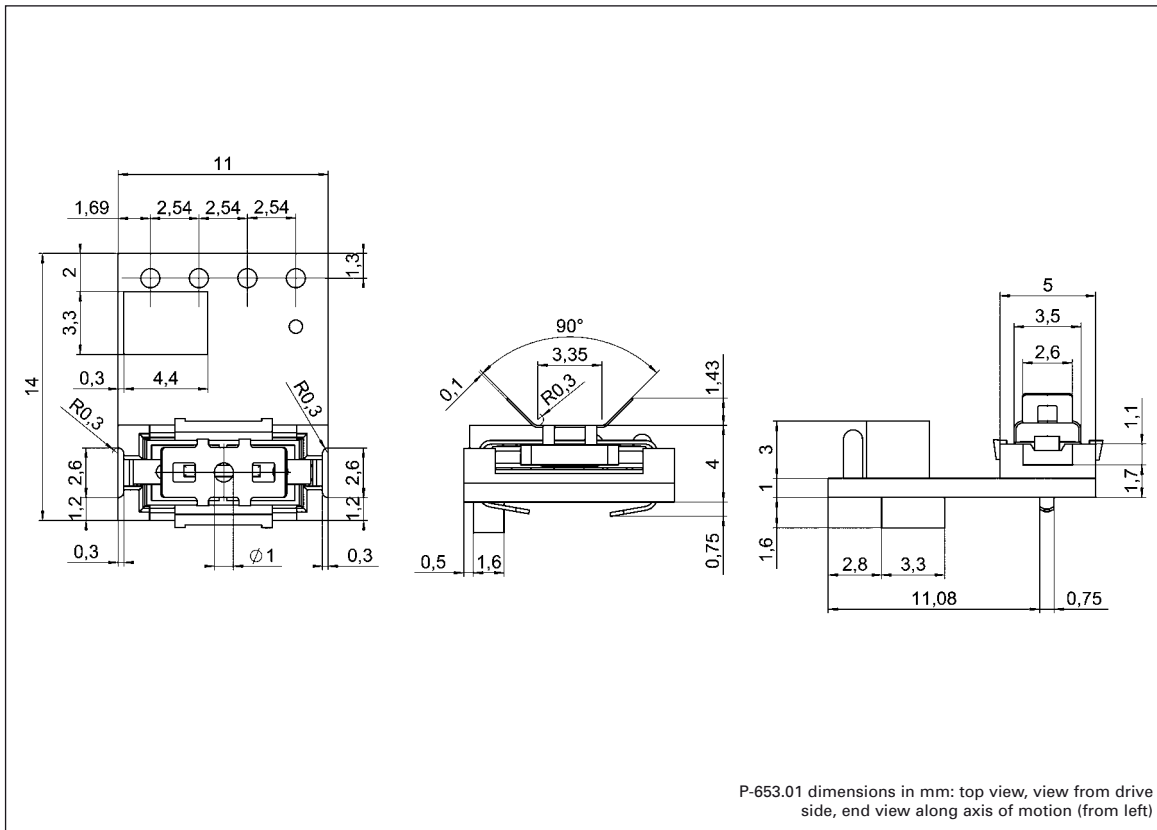
The products described in this document are in part protected by the following patents:  
German Patent  
No. 102004059429  
International Patent  
No. WO2006/027031A1

### Application Examples

- Consumer electronics
- Miniature mechatronics
- Micromanipulation
- Micropositioning
- Toys



Included in the P-653.01D demo sample there is the P-653.01 OEM drive together with additional electronics featuring an USB interface


**Linear Actuators & Motors**

PiezoWalk® Motors / Actuators

**PILine® Ultrasonic Motors**

DC-Servo &amp; Stepper Actuators

Piezo Actuators &amp; Components

Guided / Preloaded Actuators

Unpackaged Stack Actuators

Patches/Benders/Tubes/Shear..

**Nanopositioning / Piezoelectrics**

Nanometrology

Micropositioning

Index

**Technical Data**

<b>Model</b>	<b>P-653.01</b>
<b>Motion and positioning</b>	
Travel range	2 mm
Step size at 0.25 ms ON time	5 to 15 µm
Step size at 1.0 ms ON time	20 to 120 µm
Max. velocity*	100 to 200 mm/s
Typ. velocity**	50 to 90 mm/s
<b>Mechanical properties</b>	
Holding force when powered down	0.3 N
Max. push / pull force	0.15 N
<b>Drive properties</b>	
Resonant frequency (typ.)	515 kHz
Integrated piezo motor	PILine® P-653
Operating voltage (drive electronics)	5 VDC
Current consumption incl. drive electronics	0.1 A
Control voltage	5 V TTL
<b>Miscellaneous</b>	
Operating temperature range	-40 to 85 °C
Mass	1 g ±5%
Connectors	Header pin sockets
Recommended driver	Piezomotor drive electronics included
Dimensions	15 x 11 x 8 mm incl. drive electronics
Lifetime	>5,000,000 cycles

All data refer to 100% duty cycle.

\*without load. @ 5 g: 80 to 140 mm/s; @ 10 g: 50 to 100 mm/s

\*\*without load.