

Low-saturation, Low-voltage 1 channels Bi-directional Motor Driver (Micro-actuator Driver)

Description

FP5502 is a micro-actuator driver IC with miniature package (STDFN6). It is one channel low voltage bi-directional motor driver IC. The design is optimal for driving different type micro-actuator, such as voice coil motor, piezo-actuator, or other dc motor actuators. It is suitable for camera module application or other portable device.

Features

- Low voltage operation ($V_{DD\ min} = 1.8V$)
- Low saturation voltage(Upper transistor + low transistor residual voltage; 0.46V typ. at 400mA)
- Low input current
- Low operating current, sleep mode with zero current drain
- Crossover-current protection
- High output sinking and driving capability
- Small, thin, highly reliable package (STDFN-6)
- Thermal shutdown protection
- RoHS compliant

Applications

- Voice Coil Motor
- Piezo-actuator
- Camera Module
- Other DC Motor Actuators

Pin Assignments

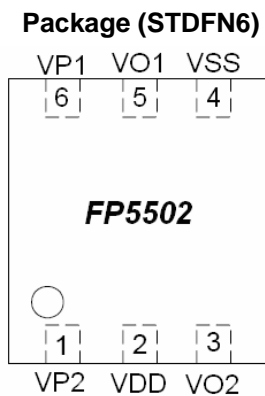
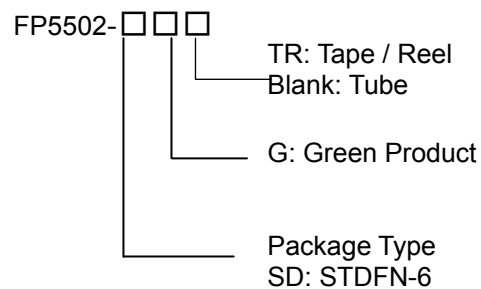


Figure 1. Pin Assignment of FP5502 (Top View)

Ordering Information



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Block Diagram & Application Circuit

Shutter application:

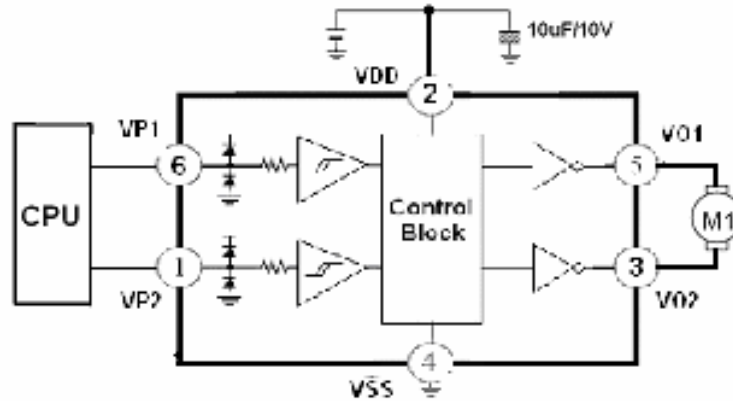


Figure. 2 The Block Diagram and Application Circuit of the FP5502

Functional Pin Description

Pin Num.	Pin Name	Pin Function
1	VP2	Input pin that determines driving mode.
2	VDD	Power supply pin.
3	VO2	Output sinking / driving pin.
4	VSS	Ground pin.
5	VO1	Output sinking / driving pin.
6	VP1	Input pin that determines driving mode.

Block Diagram

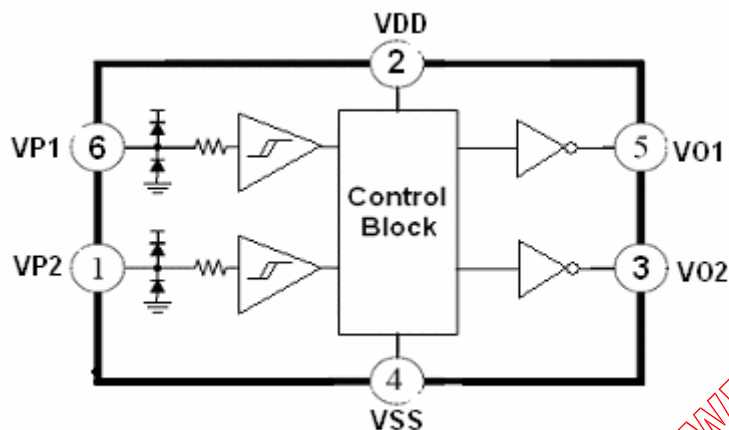


Figure. 3 The Block Diagram of the FP5502

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Absolute Maximum Ratings:

• VDD to GND -----	- 0.3V to + 5.5V
• VIN and VO to GND -----	- 0.3V to + (0.3V+ VDD)
• Output Current *1-----	0mA to 400mA
• Continuous Power Dissipation -----	300mW
• Junction Temperature -----	+ 150°C
• Storage Temperature Range-----	- 65°C to + 150°C
• Lead Temperature (Soldering, 10sec.) -----	260°C
• Operating Temperature Range -----	- 40°C to + 125°C
• ESD (Human Body Model) *2-----	4000V

*1: Output current rating may be limited by ambient temperature and heat sinking. Under any set of conditions, do not exceed the specified.

*2: ESD caution: ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

Electrical Characteristics

(Unless otherwise noted, $T_A = 25^\circ\text{C}$ & $V_{DD} = 3\text{V}$)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD}		1.8	3.0	5.5	V
Supply Current ($I_{DD} + I_S$)	I_{DD0}	$V_{VP1}, V_{VP2} = 0\text{V}$	-	0.1	3/2	μA
	I_{DD1}	$V_{VP1}, V_{VP2} \neq 0\text{V}$	-	0.10	0.25/0.2	mA
VP1 / VP2 Input Terminal ($T_J = 25^\circ\text{C}$)						
Input Voltage "H"	V_{IH}	-	$0.5 \cdot V_{DD}$	-	$V_{DD} + 0.3$	V
Input Voltage "L"	V_{IL}	-	-0.3	-	$0.2 \cdot V_{DD}$	V
Input Voltage Hysteresis	V_{Hsy}	-	-	0.42	-	V
Input Current "H"	I_{IH}	$V_{IN} = V_{DD}$	-	-	5/3	μA
Input Current "L"	I_{IL}	$V_{IN} = 0\text{V}$	-	-	3/3	μA
VO1 / VO2 Output Terminal ($T_J = 25^\circ\text{C}$)						
Output Voltage (upper + lower)	V_{OUT1}	$I_{OUT} = 200\text{mA}$	-	0.22	0.4	V
	V_{OUT2}	$I_{OUT} = 400\text{mA}$	-	0.46	0.7	V
	V_{OUT3}	$V_{DD} = 1.8\text{V}, I_{OUT} = 200\text{mA}$	-	0.55	1.0	V
Thermal Protection Circuit						
Protection Temperature	T_{TSD}	$V_{VP1}, V_{VP2} = H$	-	150	-	$^\circ\text{C}$
Temperature Hysteresis	T_{Hsy}	$V_{VP1}, V_{VP2} = H$	-	25	-	$^\circ\text{C}$

Typical Performance Curve:

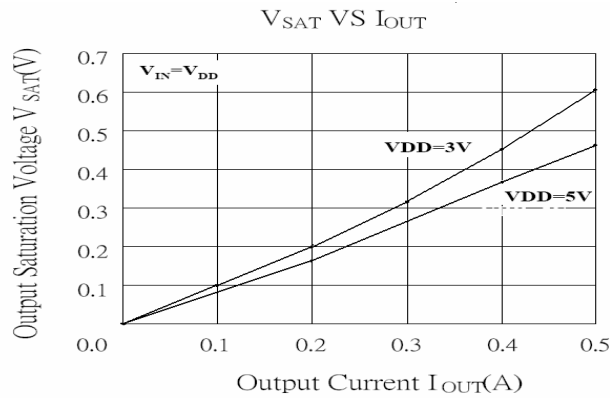


Figure 4a. V_{sat} VS I_{out}

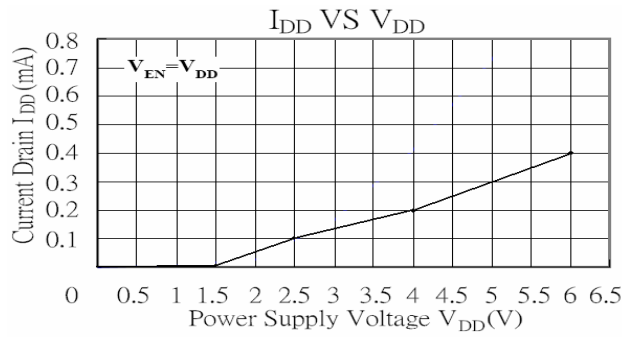


Figure 4b. I_{DD} VS V_{DD}

Truth Table

VP1	VP2	VO1	VO2	Mode
Low	Low	OFF	OFF	Standby
High	Low	High	Low	Forward
Low	High	Low	High	Reverse
High	High	---	---	Keep the previous mode(Forward / Reverse)

Truth Table test waves:

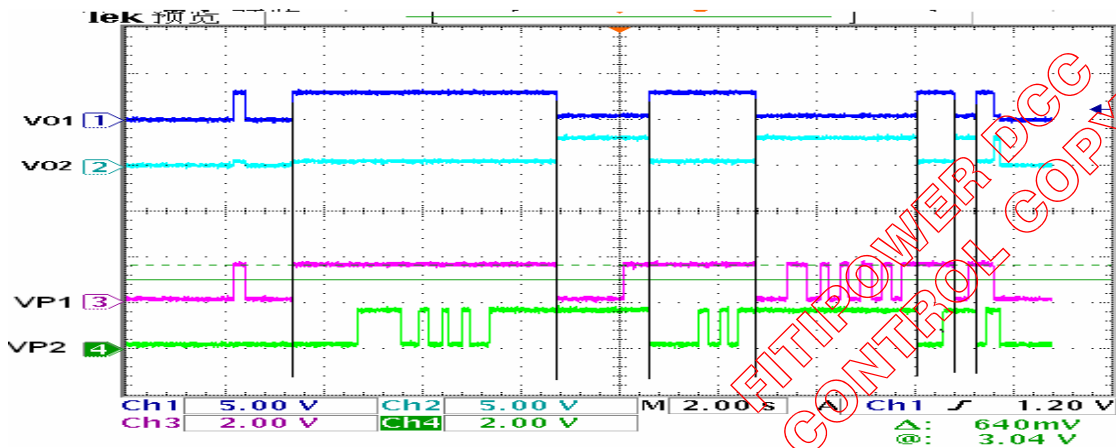


Figure. 5 Truth Table test waves

Function Description

Device Operation:

FP5502 is a micro-actuator driver IC with miniature package (STDFN6). It is one channel low voltage bi-directional motor driver IC. The design is optimal for driving different type micro-actuator, such as voice coil motor, piezo-actuator, or other dc motor actuators. It is suitable for camera module application or other portable device. MOSFET output stages substantially reduce the voltage drop and the power dissipation of the outputs of the FP5502 compared to typical drivers with bipolar transistors.

Internal circuit protection includes thermal shutdown with hysteresis and crossover current protection. The FP5502 is designed for portable applications with a power-off (sleep mode) current of 100nA typical, and an operating voltage of 1.8 to 5.5V. The FP5502 logic inputs are 3 to 5V logic compatible.

In conditions where the logic supply voltage drops below 1.8V, both the sink and the source voltage drop will increase beyond the specified values. In extreme cases, no power will be delivered to the motors. However, the device will not be damaged.

Sleep Mode:

Pulling all inputs to 0.4V or less, sends the FP5502 to sleep mode, during which it draws 100nA typical.

Thermal Shutdown:

The FP5502 will disable the outputs if the junction temperature reaches 150 °C. When thermal shutdown is entered, after the junction temperature drops 15 °C, the outputs will be re-enabled.

Application Notes

The capacitor connected between the output nodes VO1/VO2 will reduce the noise generating by motor when the motor is switched to opposed direction.

The power dissipated by the IC varies widely with the supply voltage, the output current, and loading. It is important to ensure the application does not exceed the allowable power dissipation of the IC package.

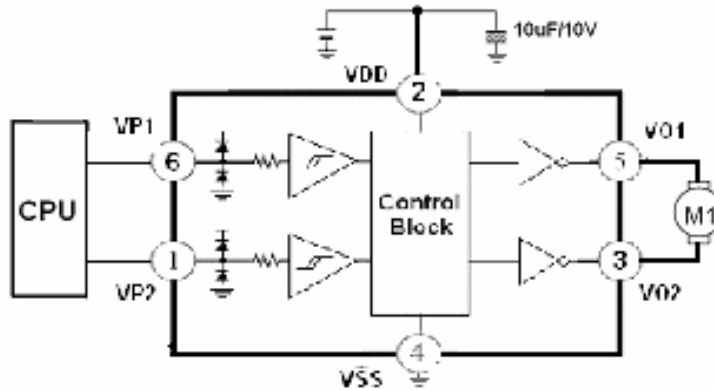


Figure 6. Typical DC Motor Application

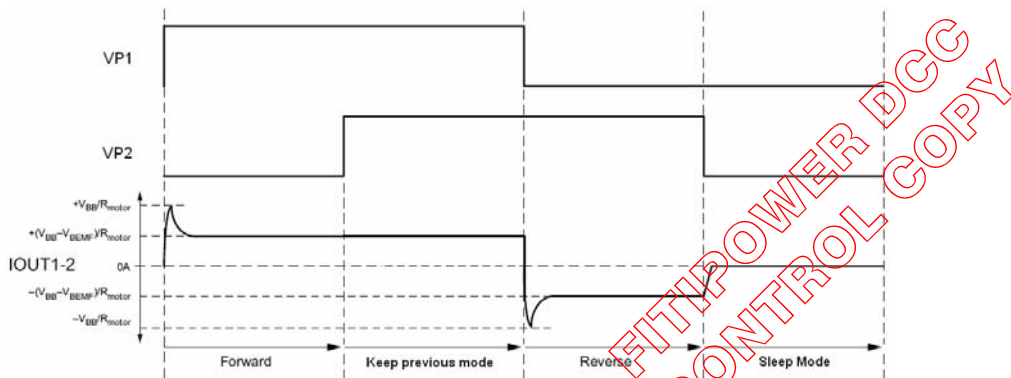
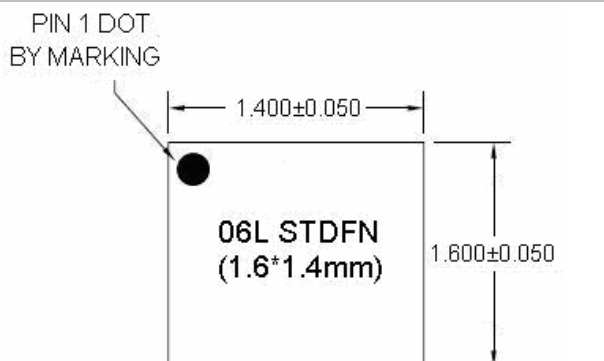
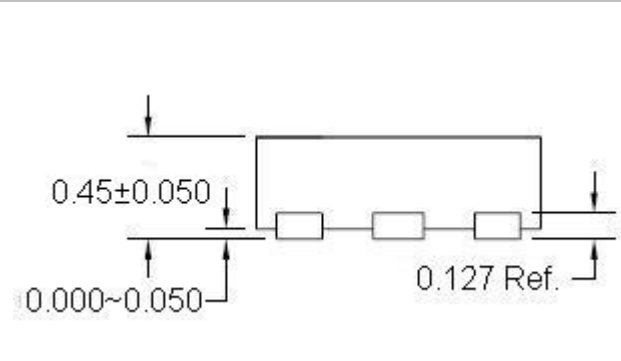
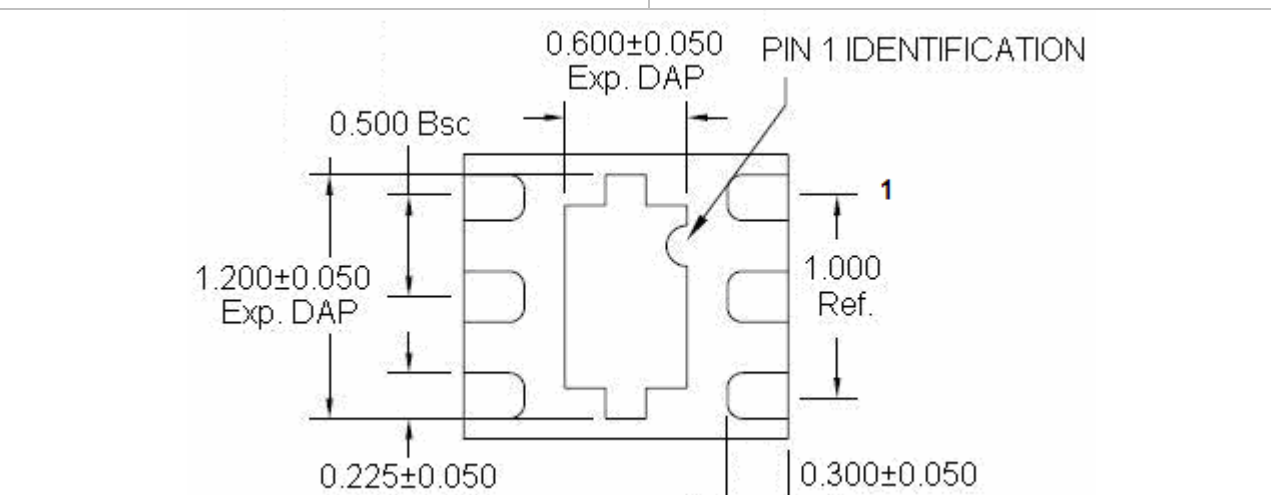


Figure 7. Typical dc motor control application (timing chart)

Outline Information:

STDFN-6 Package (Unit: mm)	
Top View	Side View
 <p>PIN 1 DOT BY MARKING</p> <p>1.400±0.050</p> <p>1.600±0.050</p> <p>06L STDFN (1.6*1.4mm)</p>	 <p>0.45±0.050</p> <p>0.000~0.050</p> <p>0.127 Ref.</p>
Bottom View	
 <p>0.600±0.050 Exp. DAP</p> <p>PIN 1 IDENTIFICATION</p> <p>0.500 Bsc</p> <p>1.200±0.050 Exp. DAP</p> <p>1.000 Ref.</p> <p>0.225±0.050</p> <p>0.300±0.050</p> <p>1</p>	

Note 1 : Design Following JEDEC MO-012.

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Life Support Policy

Fitipower's products are not authorized for use as critical components in life support devices or other medical systems.



Revision History

Revision	Content	Date
1.0	New Issue	2007-05-22
1.1	1, Add truth table waveform 2, Change the package specifications information.	2007-10-08
1.2	Add application note.	2007-10-27
1.3	Package standard change to Green mode product.	2008-2-28

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