

DESCRIPTION

The MP6501AGF demo board is a customized evaluation board for a stepper motor driver with a built-in micro-stepping translator.

The MP6501AGF demo board operates from a supply voltage of up to 35V and delivers motor current up to 2.5A. It operates a bipolar stepper motor in full-, half-, quarter-, eighth-, and sixteenth- step modes by setting the MS3, MS2, and MS1. The input control signals and reference voltage are applied through the connector or generated on the board.

ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Value	Units
Input Voltage	V_{IN}	8-35	V
Output Current	I_{OUT}	2.5	A

FEATURES

- Wide 8V to 35V Input Voltage Range
- Up to 2.5A Programmable Output Current
- Full-, Half-, Quarter-, Eighth- and Sixteenth- Step modes
- Adjustable Mixed Decay Ratio or Automatic Decay
- OCP, OVP, and OTP
- Control Signals Generated by On-Board USB Microcontroller or Supplied Externally

APPLICATIONS

- Printers
- General Bipolar Stepper Drivers

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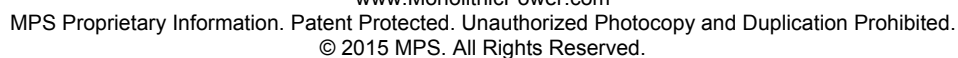
EV6501AGF-00B EVALUATION BOARD

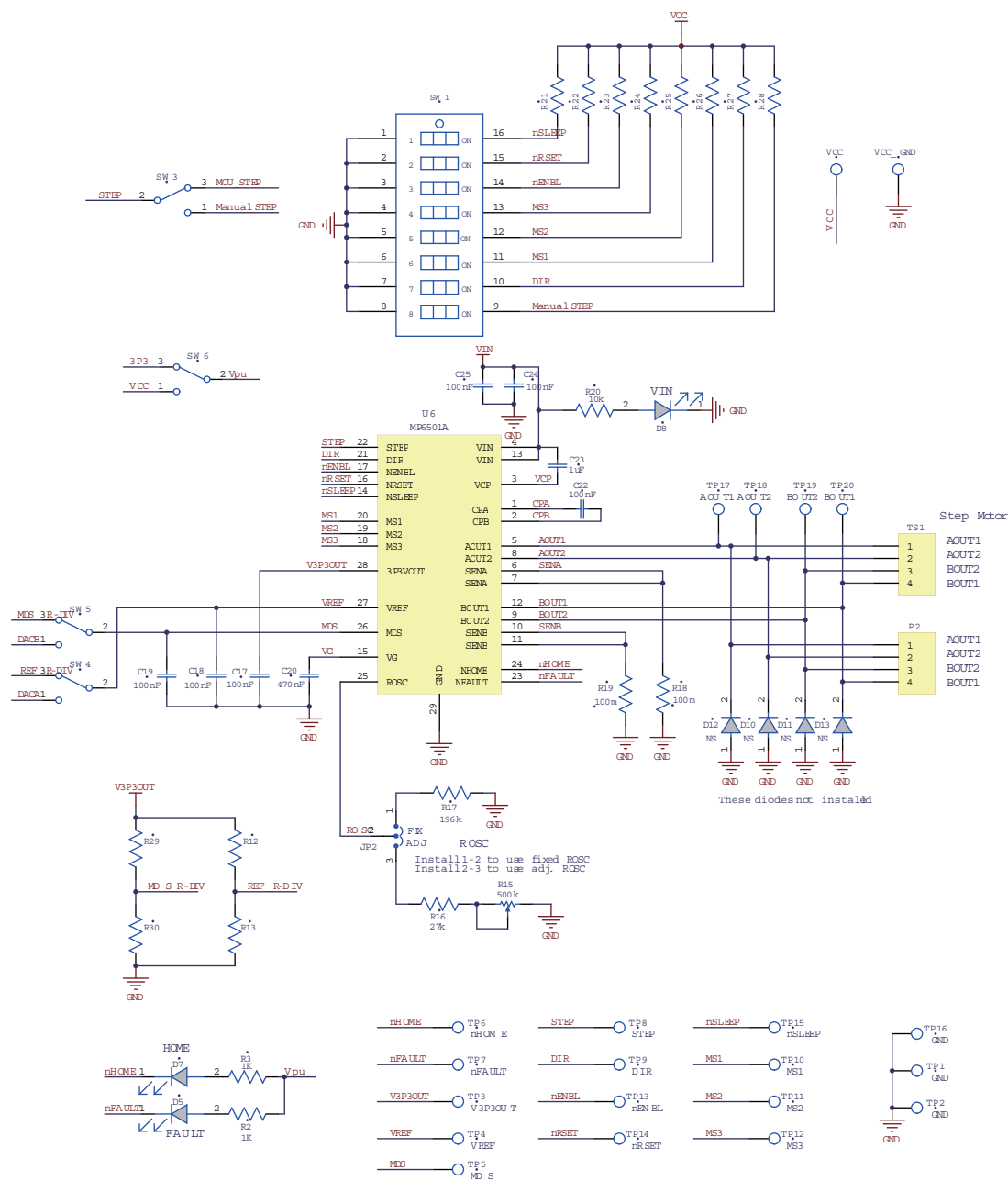


(L x W x H) 4" x 3.4" x 1" (10cm x 8.5cm x 2.5cm)

Board Number	MPS IC Number
EV6501A-F-00B	MP6501AGF

EV6501A Rev.1.0
3/9/2015





EV6501AGF-00B BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	C1	47μF	Ceramic Capacitor, 6.3V, X6S	1206	muRata	GRM31CC80J476ME18L
15	C2, C3, C5, C6, C8, C11, C13, C14, C16, C17, C18, C19, C22, C24, C25	100nF	Ceramic Capacitor, 50V, X7R	0603	muRata	GRM188R71H104KA93D
2	C7, C12	12pF	Ceramic Capacitor, 50V, C0G	0603	muRata	GRM1885C1H120JA01
4	C9, C10, C15, C23	1μF	Ceramic Capacitor, 16V, X7R	0603	muRata	GRM188R71C105KA12D
1	C20	470nF	Ceramic Capacitor, 16V, X7R	0603	muRata	GRM188R71C474KA88D
1	C21	100μF	Electrolytic Capacitor, 50V, Electrolytic	DIP	Rubycon	50YXF100MEFC
1	R1	2kΩ	Film Resistor, 1%	0603	Yageo	RC0603FR-072KL
10	R2, R3, R21, R22, R23, R24, R25, R26, R27, R28	1kΩ	Film Resistor, 1%	0603	Yageo	RC0603FR-071KL
4	R4, R7, R11, R14	100kΩ	Film Resistor, 1%	0603	Yageo	RC0603FR-07100KL
8	R5, R6, R9, R10, R12, R13, R29, R30	4.7kΩ	Film Resistor, 1%	0603	Yageo	RC0603FR-074K7L
1	R8	NS				
1	R15	500kΩ	Square Trimming Potentiometer		Bourns	3266W-1-504LF
1	R16	27kΩ	Film Resistor, 1%	0603	Yageo	RC0603FR-0727KL
1	R17	196kΩ	Film Resistor, 1%	0603	Yageo	RC0603FR-07196KL
2	R18, R19	100mΩ	Sense Resistor, 1%, 2W	2512	CYNTEC	RL-3264-9-R100-FN
1	R20	10kΩ	Film Resistor, 1%	0603	Yageo	RC0603FR-0710KL
3	D1, D2, D3		TVS	SOD-923	On Semi	ESD9M5.0S
4	D4, D5, D7, D8		LED, Red	0805	BRIGHT LED	BL-HUF35A-TRB

EV6501AGF-00B BILL OF MATERIALS (*continued*)

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
1	D6		Schottky Diode, 75V, 0.15A	SOD-123	Diodes	1N4148W
5	D9, D10, D11, D12, D13	NS				
1	U1		USB Microcontroller	TSSOP56	Cypress	CY7C68013A-56PVXC
1	U2		Low-Power Linear Regulator	QFN8 (3X3mm)	MPS	MP2013GQ-33
1	U3		DAC	8-Lead TSOT-23	Linear Technology	LTC2632ACTS8
1	U4		64K-bit, 400kHz, 2.5V, I ² C Serial EEPROM	SO8	Microchip	24LC64-E/SN
1	U5		Octal Buffer and Line Driver with 3-State Outputs	TSSOP20	NXP	74LVC541APW,118
1	U6		Stepper Motor Driver	TSSOP-28 EP	MPS	MP6501AGF
1	Y1		Crystal Oscillator	DIP	Citizen	HC49US-24.000MABJ-UB
1	CN1		MICROUSB		Molex	10157-0001
1	JP2		3-Bits/2.54mm Connector			
1	JP3, P3		2-Bits/2.54mm Connector			
1	P1		5-Bits/2.54mm Connector			
1	P2		4-Bits/2.54mm Connector			
1	SW1		8-Bits Button	SMD	Würth	418121270808
4	SW3, SW4, SW5, SW6		Button	DIP	Würth	450301014042
1	TS1		Header, 4-Pin		Phoenix Contact	1729144
1	TS2		Header, 2-Pin		Phoenix Contact	1729128
9	VCC, VCC_GND, VIN, VIN_GND, AOUT1, AOUT2, BOUT1, BOUT2, GND		1.0 公针			
1	V3P3OUT		1-Bit/2.54mm Connector			
1	Other Test Points		31-Bits/2.54mm Connector			

PRINTED CIRCUIT BOARD LAYOUT

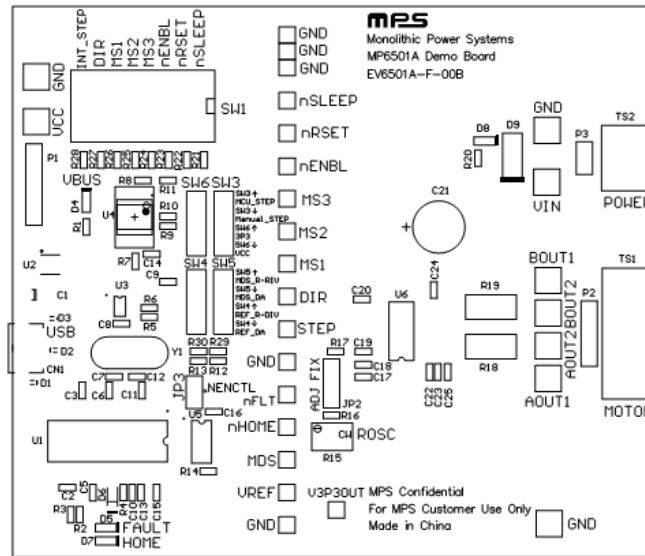


FIGURE 1. Top Silk Layer

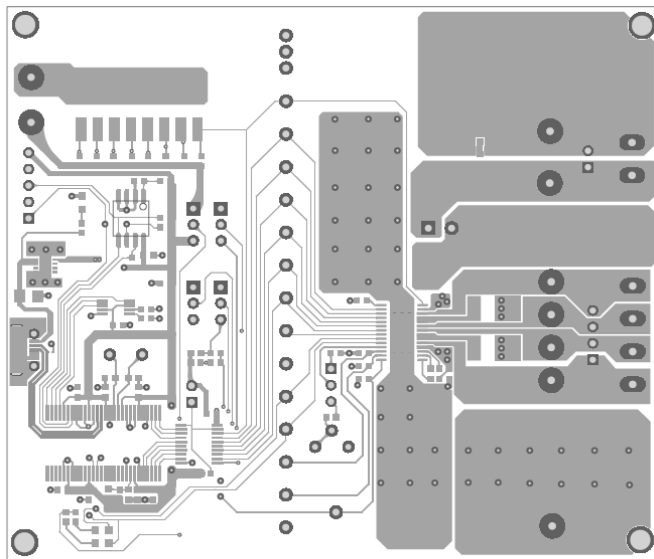


FIGURE 2. Top Layer

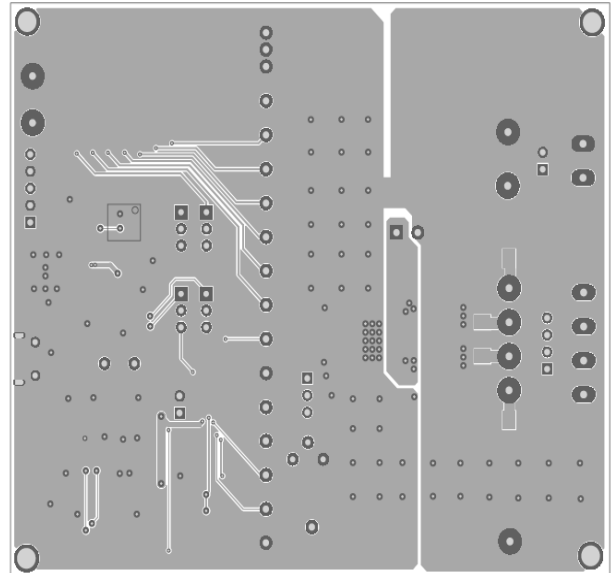


FIGURE 3. Bottom Layer

QUICK START GUIDE

- The power and control signals for the EV6501AGF-00B are applied through the terminal block TS2 or the header connector P3.
- Each pin in the connector is labeled on the EVB.
- The supplied voltage should be between 8V and 35V (12V or 24V nominal in most cases).
- The stepper motor is connected to terminal block TS1 or connector P2. Each pin is labeled.

Controlling the MP6501A using the On-Board USB Microcontroller and PCB GUI Program:

1. Place a jumper on JP3, nENCTRL.
2. Set all of the switches on the DIP switch SW1 to “off.”
3. To use the DIP switch or to drive signals externally to the test points, remove the jumper from JP3.
4. To use a fixed off time, set by R17 (196k), place a jumper across the pins labeled “FIX” on header JP2.
5. To use the trim pot to adjust the off time, place the jumper on the pins labeled “ADJ.”
 - SW3 selects either an internally generated STEP signal or an externally generated STEP signal.
 - SW4 selects either a fixed voltage for the VREF input or the on-board DAC, which is set by the GUI.
 - SW5 selects either a fixed voltage for the MDS input or the on-board DAC, which is set by the GUI.
 - SW6 selects between a 3.3V voltage for the pull-up resistors or an externally supplied voltage.

The LED D5 indicates the status of FAULT. When over-temperature protection or over-current protection occurs, nFAULT is pulled down to a low level and lights up the LED.

R18 and R19 are the current-sense resistors connected directly to SENA and SENB, respectively. The other sides of these resistors are connected to GND. The resistors, in conjunction with the voltage applied to VREF, control the current through the MP6501A.

GUI OPERATION

A PC based GUI program is used to control the EV6501AGF-00B from a Windows PC. Connect the board to a USB port on the computer.

When launched, the GUI shows selection buttons for three pages as shown below:



When the “Monitor” button is clicked, the screen below is displayed:



From this screen, a reset pulse can be generated for the MP6501A by pressing “Reset.” You can enter or exit sleep mode by pressing “Sleep.” Pressing “Enable” will enable or disable the MP6501A.

***Note that the MP6501A must be enabled before trying to move the motor using the next screen.**

If a fault condition (over temperature, over current, etc.) is encountered, the “Fault” button will illuminate.

When the “Basic Input” button is clicked, the screen below is displayed:

The screenshot shows the 'Basic Input' screen of the EV6501A. It features three tabs at the top: 'Basic Input' (selected), 'Output Demo', and 'Monitor'. The screen is divided into several sections for parameter configuration:

- Step Mode:** A dropdown menu set to 'Full step'.
- Direction:** Two radio buttons, 'CW' (selected) and 'CCW'.
- Peak Current:** A text box containing '2.0' followed by 'A'. Below it, '(Rsense:100mΩ)' is displayed.
- Decay mode:** Two radio buttons, 'automatic decay mode' (selected) and 'mixed decay mode'. Below the 'mixed decay mode' option, there is a text box for T_{FD} set to '80' followed by '% x T_{OFF} '.
- Speed Control:** A diagram showing a trapezoidal speed profile with labels 'N1 (Steps for Speed up)', 'N (Total number of Steps)', 'T (Total Time)', and 'N2 (Steps for Speed down)'. Below the diagram are input fields:
 - N1(1-256):** 1
 - N2(1-256):** 1
 - N(1-65536):** 1
 - Target Frequency (10-20000)Hz:** 10
 - T1(S):** 0
 - T2(S):** 0
 - T(S):** 0
- Program:** A button at the bottom right.

Step mode (from 1/16-step to full-step) and the step direction are selectable.

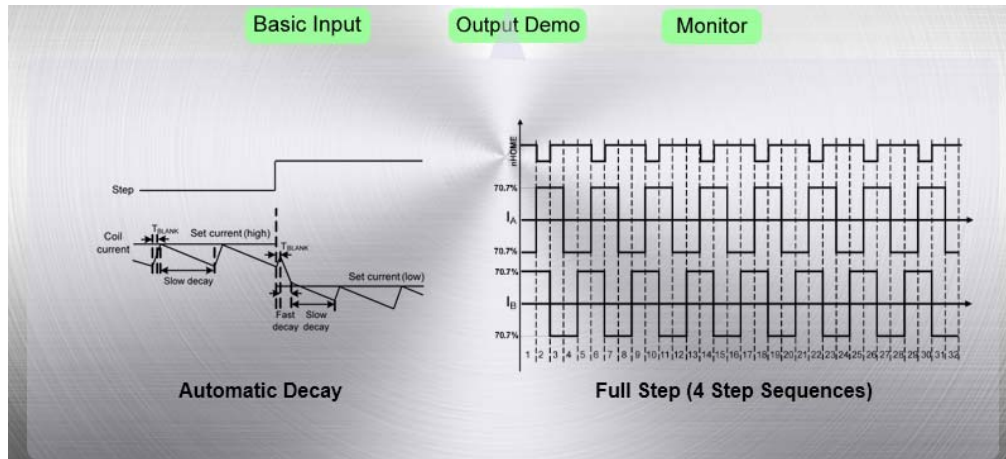
Entering a numeric value in the “Peak Current” box sets the peak winding current (the value assumes a 100mΩ sense resistor, which is normally installed on the EVB).

Decay mode can be selected. Select automatic decay mode or enter a numeric value for the fast decay portion of mixed decay (for slow decay enter “1,” for fast decay, enter “100”).

The “Speed Control” section allows you to set a number of steps for ramp up and ramp down, a number of steps to run at the target step rate, and the frequency (step rate) in Hz or PPS. The resulting ramp-up, run, and ramp-down times are displayed.

Once these parameters are set, press the “Program” button and the motor will move as programmed.

When the “Output Demo” button is clicked, the screen below is displayed:



This screen shows diagrammatically the winding currents for the selected decay and step modes.

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