POLOLU TB67H420FTG DUAL/SINGLE MOTOR DRIVER CARRIER

USER'S GUIDE

USING THE MOTOR DRIVER

Motor and power connections are made on one side of the board and control connections are made on the other. The driver requires an operating voltage between 10 V and 47 V to be supplied to the power input, VIN. This input is reverse-protected up to 40 V, and the VM pin provides convenient access to the reverse-protected supply voltage.

In a typical application, three connections are used to control each motor driver channel: INx1 and INx2 to set the motor direction and PWMx to set the speed, resulting in drive-brake operation. The following simplified truth table shows how the driver operates with this control method:

TB67H420FTG simplified truth table

Inputs			Outputs		Operation
INx1	**INx2**	**PWMx**	**x+**	**x−**	
1	0	PWM	PWM (H/L)	L	forward/brake at speed *PWM %*
0	1		L	PWM (H/L)	reverse/brake at speed *PWM %*
1	0	0	L	L	brake low (outputs shorted to ground)
0	1				
1	1	X			
0	0	X	Z	Z	coast (outputs floating/disconnected) (standby if all IN and PWM inputs are low)

Note the special case when all six control inputs (INA1, INA2, PWMA, INB1, INB2, and PWMB) are low: this puts the driver into a lower-power standby mode and clears any active errors.

Alternatively, the control lines can be reduced to two pins per channel if PWM signals are applied directly to INx1 and INx2 with PWMx held high; this allows either drive/brake or drive/coast operation, depending on whether the non-PWMed input is held high or low, respectively. (Note that achieving drive/brake operation with this method requires inverted PWM signals; that is, with one IN pin PWMed and the other held high, the motor will drive while the PWM signal is low and brake while it is high.) The complete truth table below shows all possible combinations of the inputs and the driver outputs they produce:

TB67H420FTG complete truth table

Inputs			Outputs		Operation
PWMx	INx1	INx2	x+	x−	
0	0	0	Z	Z	coast (standby if all IN and PWM inputs are low)
	1	0	L	L	brake low
	0	1			
	1	1			
1	0	0	Z	Z	coast
	1	0	H	L	forward
	0	1	L	H	reverse
	1	1	L	L	brake low

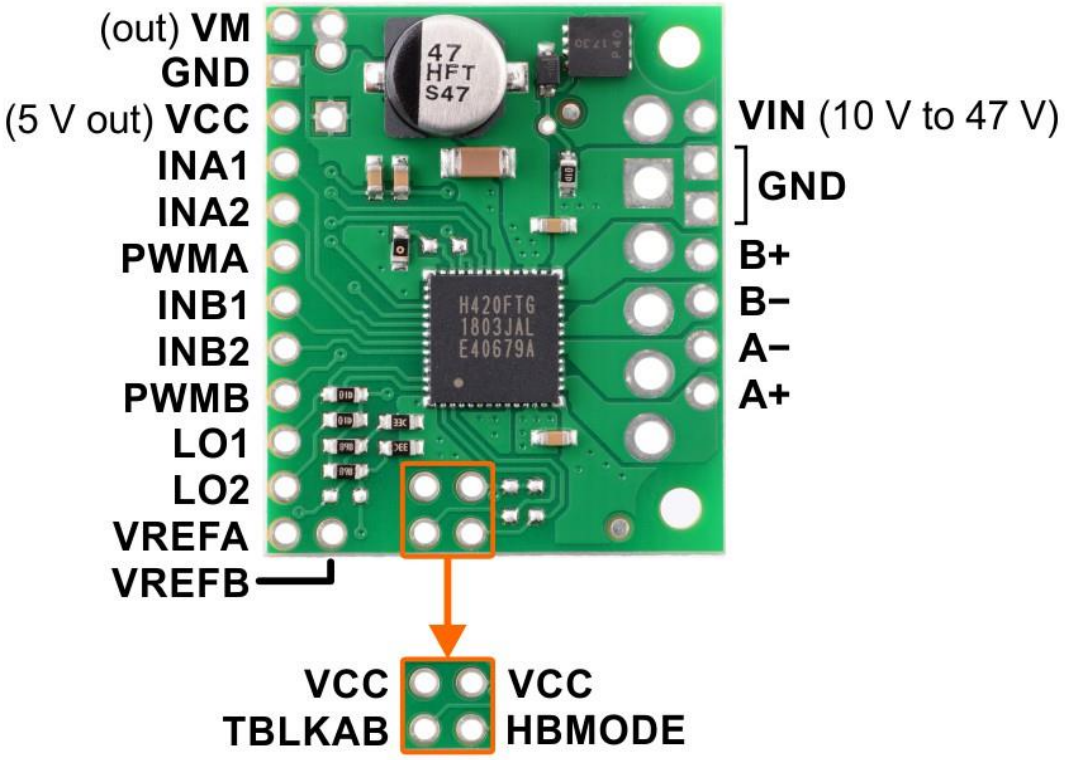
By default, the TB67H420FTG runs in dual-channel mode and drives two motors independently, but it can optionally be configured to run in a paralleled single-channel mode, in which it can deliver about twice the current to a single motor. To select single-channel mode, connect the HBMODE pin to a logic high voltage; the adjacent VCC pin

provides a convenient place to do so, either with a short piece of wire or with male header pins and a 0.1″ shorting block.

In single-channel mode, the A+ and A– pins should be connected to form one motor output, and B+ and B– should be connected to form the other. The A inputs control the motor and the B inputs are not used; the driver enters standby mode when all three A control inputs are low.

The TB67H420FTG can detect several fault (error) states that it reports by driving one or both of the LO pins low (the datasheet describes what each combination of LO1 and LO2 means). Otherwise, these pins are pulled up to VCC (5 V) by the board. Errors are latched, so the outputs will stay off and the error flag(s) will stay asserted until the error is cleared by toggling standby mode or disconnecting power to the driver.

PINOUT



Pinout diagram of the TB67H420FTG Dual/Single Motor Driver Carrier.

PIN	Default State	Description – dual channel mode (HBMODE = LOW)	Description – single channel mode (HBMODE = HIGH)
VIN		10 V to 47 V board power supply input (reverse-protected up to 40 V).	
GND		Ground connection points for the motor and logic supplies. The control source and the motor driver must share a common ground.	
VM		These pins give access to the motor power supply after the reverse-voltage protection MOSFET (see the board schematic below). They can be used to supply reverse-protected power to other components in the system. VM is generally intended as an output, but it can also be used to supply board power, and some of the VM and GND holes are spaced for the addition of an optional through-hole capacitor.	
A+		Motor A output +.	Motor output A *(connect together)*.
A−		Motor A output −.	
B+		Motor B output +.	Motor output B *(connect together)*.
B−		Motor B output −.	
VCC		Regulated 5 V **output**: this pin gives access to the voltage from the internal regulator of the TB67H420FTG. The regulator can only provide a few milliamps, so the VCC output should only be used for logic inputs on the board, not for powering external devices.	
INA1	LOW	Control input for A+. PWM can be applied to this pin (typically done with PWMA high).	Control input for A+ and A−. PWM can be applied to this pin (typically done with PWMA high).
INA2	LOW	Control input for A−. PWM can be applied to this pin (typically done with PWMA high).	Control input for B+ and B−. PWM can be applied to this pin (typically done with PWMA high).
PWMA	LOW	PWM input for channel A.	PWM input.
INB1	LOW	Control input for B+. PWM can be applied to this pin (typically done with PWMB high).	*Not used.*
INB2	LOW	Control input for B−. PWM can be applied to this pin (typically done with PWMB high).	*Not used.*
PWMB	LOW	PWM input for channel B.	*Not used.*
LO1	HIGH	Error output 1: drives low when an over-current or over-temperature fault occurs. Otherwise, the board pulls this pin up to VCC.	
LO2	HIGH	Error output 2: drives low when an open-load or over-temperature fault occurs. Otherwise, the board pulls this pin up to VCC.	
VREFA		Current chopping threshold reference for channel A.	Current chopping threshold reference.
VREFB		Current chopping threshold reference for channel B.	*Not used.*
TBLKAB	LOW	Blanking time configuration input (see datasheet). *This input should not be changed while the board is powered.*	
HBMODE	LOW	H-bridge drive mode configuration input: LOW selects dual-channel mode; HIGH selects single-channel mode. *This input should not be changed while the board is powered.*	

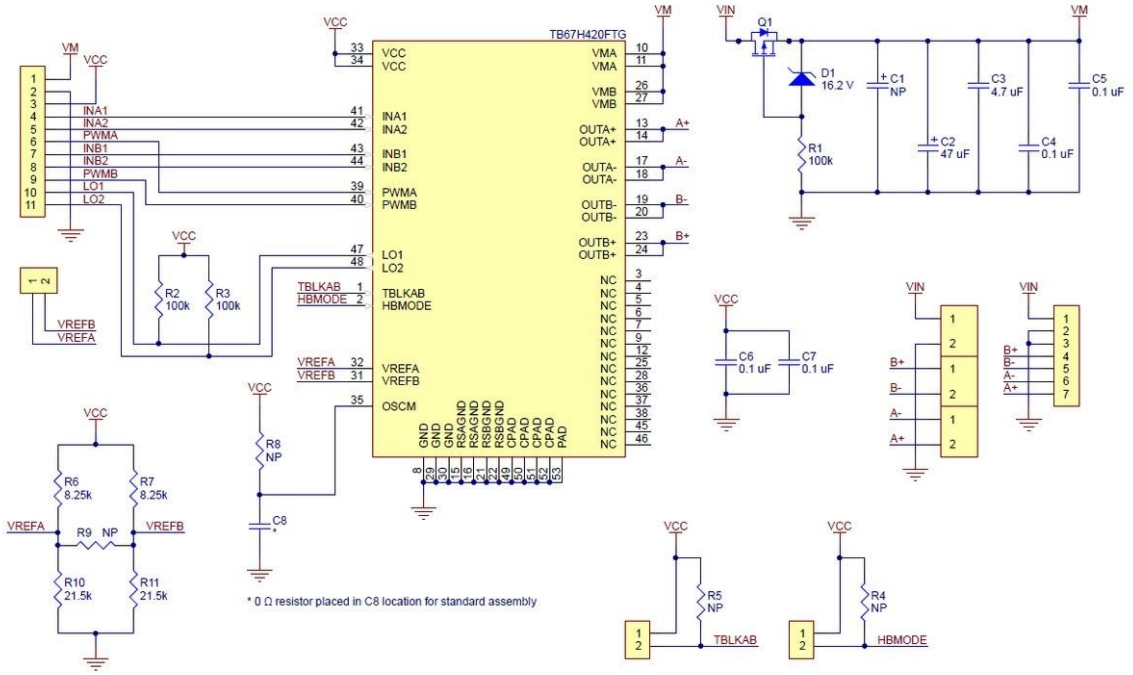
REAL-WORLD POWER DISSIPATION CONSIDERATIONS

The TB67H420FTG datasheet recommends a maximum continuous current of 4.5 A, and this carrier board limits the motor current to the same amount. However, the chip by itself will typically overheat at lower currents. In our tests, we found that the chip was able to deliver 4.5 A per channel for only a few seconds before the chip's thermal protection kicked in and disabled the motor outputs; a continuous current of about 1.7 A per channel was sustainable for many minutes without triggering a thermal shutdown. Driving only one channel at a time increases the sustainable current to almost 2.5 A per channel, and in single-channel mode, the driver can deliver about 3.4 A continuously without overheating.

The actual current you can deliver will depend on how well you can keep the motor driver cool. The carrier's printed circuit board is designed to help with this by drawing heat out of the motor driver chip. PWMing the motor will introduce additional heating proportional to the frequency.

This product can get hot enough to burn you long before the chip overheats. Take care when handling this product and other components connected to it..

SCHEMATIC



Schematic diagram of the TB67H420FTG Dual/Single Motor Driver Carrier.