



# IM481H

ULTRA MINIATURE HIGH PERFORMANCE  
MICROSTEPPING DRIVE  
QUICK REFERENCE



## WARNINGS

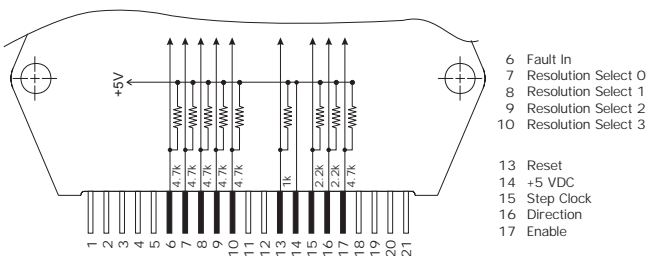
- The rear mounting surface of the driver contains various voltages and must be kept isolated when attached to conductive materials.
- The heat sink mounting surface must be a smooth, flat surface with no burrs, protrusions, cuttings or foreign objects.
- Although stepping motors will run hot when configured correctly, damage may occur if a higher than specified current is applied. Most specified motor currents are maximum values. Care must be taken when exceeding these values.
- When using an unregulated power supply, the output voltage must not exceed the maximum driver input voltage due to variations in line voltage. It is recommended that an input line filter be used on the power supply to limit voltage spikes to the driver.
- Do not connect or disconnect the motor leads or the power supply with power applied.
- When interfacing with the FAULT IN or RESET inputs, an open collector, tri-state output, or blocking diode is required or damage may occur to the internal circuits.

## ELECTRICAL SPECIFICATIONS

Input Voltage ..... +12 to +48 Volts (Includes Back EMF)  
 Output Current\* ..... 0.14 to 1.5 A RMS, 2.1 A Peak,  
 Step Frequency (Max) .. 10 MHz  
 Steps per Revolution  
 (1.8° Motor) ..... 400, 800, 1000, 1600, 2000, 3200,  
 5000, 6400, 10000, 12800, 25000,  
 25600, 50000, 51200  
 Protection ..... Thermal, Phase to Phase, V+ to Phase  
 Current Reduction\* ..... 0.5 Sec. After Last Step Input  
 \*Resistor Selectable

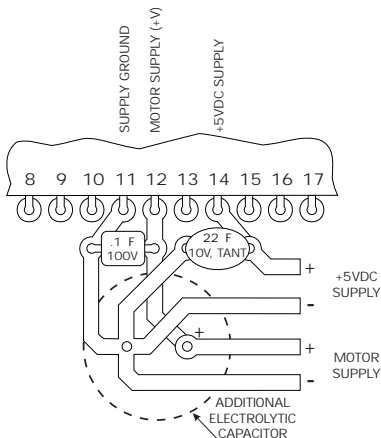
### Inputs

The inputs to the IM481H are internally pulled-up to the +5VDC internal supply.



### +5VDC Input

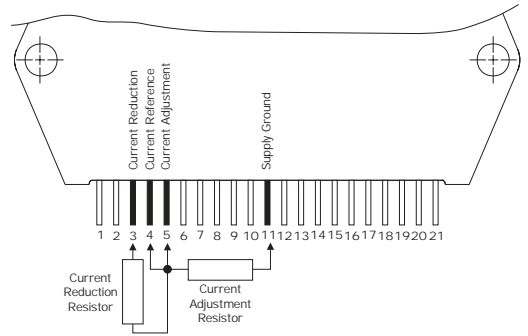
The IM481H requires an external regulated +5VDC power supply. The supply is connected between pin 11 (ground) and pin 14 (+5VDC.)



## Automatic Current Reduction

The IM481H has the ability to automatically reduce the current in the motor windings after completion of a move. The reduction occurs 0.5 seconds after the last positive going edge of the Step Clock Input. The IM481H will then revert to the original current setting upon the next positive going edge of the Step Clock Input. To utilize this feature, the current reference output must be used to adjust the reduced output current of the IM481H and a resistor must be connected between pin 3 and pin 4.

Peak output current (AMPS x 1000 = Resistor Value (Ohms))



$$\text{Output Current Reduced (Amps)} = \frac{.001 \times R (\text{Current Adjust}) \times R (\text{Current Reduction})}{R (\text{Current Adjust}) + R (\text{Current Reduction})}$$

$$R (\text{Current Reduction}) = \frac{\text{Output Current Reduced} \times R (\text{Current Adjust})}{.001 \times R (\text{Current Adjust}) - \text{Output Current Reduced}}$$

### Test Values

TEST CONDITION	MIN	TYP	MAX	UNITS
Input Voltage	12	45	48*	V
Phase Output Current (RMS)	0.14		1.5	A
Phase Output Current (Peak)			2.3	A
Quiescent Current (+V, Pin 12) (Inputs/Outputs/Floating)		25		mA
Quiescent Current (+5 VDC, pin 14) (Inputs/Outputs/Floating)		40		mA
Active Power Dissipation (I <sub>OUT</sub> =1A RMS)		2.0		W
Low Level Input Voltage (All Inputs)			0.8	V
High Level Input Voltage (All Inputs Except Reset)		2.0		V
High Level Input Voltage (Reset)		2.3		V
Input Pull-Up Resistance (Fault In, Res Sel 0-3, Enable)	4.4	4.7	5.0	kΩ
Input Pull-Up Resistance (Step Clock Direction)	2.1	2.2	2.3	kΩ
Input Pull-Up Resistance (Reset)	0.9	1.0	1.1	kΩ
Low Level Output Current (Fault, Fullstep)		24		mA
High Level Output Current (Fault, Fullstep)		-2		mA
Low Level Output Voltage (I <sub>OL</sub> =24mA)			0.4	V
High Level Output Voltage (I <sub>OH</sub> =2mA)			4.5	V

\* Includes back EMF of motor.

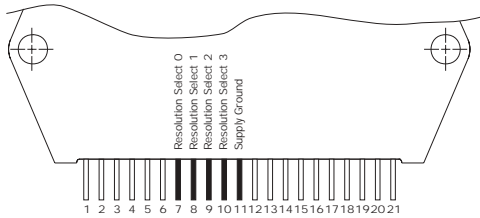
## Pin Assignment and Description

PIN#	PIN NAME	FUNCTION
1	Phase $\bar{A}$	Phase $\bar{A}$ connection.
2	Phase A	Phase A connection.
3	Current Reduction Adjust	A resistor connected between Pin 3 and Pin 4 will proportionately reduce the current in both windings approximately 0.5 seconds after the last positive edge of the step clock input.
4	Current Reference	A resistor is connected to Pin 4 (1mA current source output) and Pin 11 (ground) to generate voltage used to set the peak phase current in the motor.
5	Current Adjustment	A voltage applied to Pin 5 sets the peak phase current in the motor.
6	Fault Input	A low signal generates a latched fault.
7	Resolution Select 0	Microstep Resolution Select (See Microstep Sel. Chart)
8	Resolution Select 1	Microstep Resolution Select (See Microstep Sel. Chart)
9	Resolution Select 2	Microstep Resolution Select (See Microstep Sel. Chart)
10	Resolution Select 3	Microstep Resolution Select (See Microstep Sel. Chart)
11	Ground	Supply Ground
12	V+	+12 to 48VDC Supply
13	Reset Input	A low will reset the IM481H. A high will allow the driver to return to its initial state. (Phase A off/Phase B on)
14	+5VDC	A +5VDC supply for the internal logic. It is referenced to Pin 11 (ground).
15	Step Clock Input	A positive going edge advances the motor one increment.
16	Direction Input	Changes direction of the motor.
17	Enable Input	Used to enable the input/output circuits of the driver. A high enables the driver.
18	On-Full-Step Output	A totem-pole output used to indicate when the driver has positioned at a full step. Can be used as a counter for full steps.
19	Fault Output	A totem-pole output used to indicate a short circuit has occurred or the Fault Input is low.
20	Phase B	Phase B connection.
21	Phase $\bar{B}$	Phase $\bar{B}$ connection.

## Microstep Selection

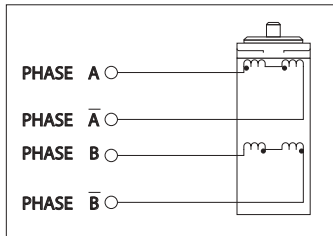
BINARY					
RESOLUTION (Microsteps/Step)	STEPS/REV (1.8° Step Motors)	RESOLUTION SELECT 0 (Pin 7)	RESOLUTION SELECT 1 (Pin 8)	RESOLUTION SELECT 2 (Pin 9)	RESOLUTION SELECT 3 (Pin 10)
2	400	LOW	LOW	LOW	LOW
4	800	HIGH	LOW	LOW	LOW
8	1600	LOW	HIGH	LOW	LOW
16	3200	HIGH	HIGH	LOW	LOW
32	6400	LOW	LOW	HIGH	LOW
64	12800	HIGH	LOW	HIGH	LOW
128	25600	LOW	HIGH	HIGH	LOW
256	51200	HIGH	HIGH	HIGH	LOW
DECIMAL					
5	1000	LOW	LOW	LOW	HIGH
10	2000	HIGH	LOW	LOW	HIGH
25	5000	LOW	HIGH	LOW	HIGH
50	10000	HIGH	HIGH	LOW	HIGH
125	25000	LOW	LOW	HIGH	HIGH
250	50000	HIGH	LOW	HIGH	HIGH
ILLEGAL SETTINGS: MAY CAUSE ERRATIC OPERATION					
		LOW	HIGH	HIGH	HIGH
		HIGH	HIGH	HIGH	HIGH

### Resolution Select Pins



## Connecting the Motor

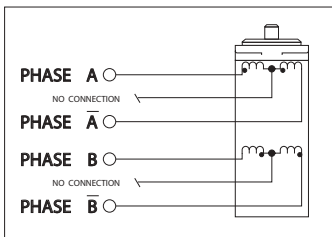
### 4 Lead Motors



Motor Peak Current =  
Rated Amps/Phase x 1.4

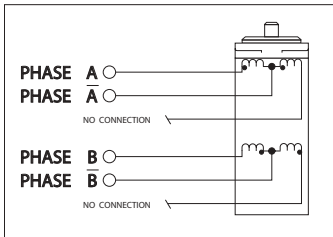
### 6 Lead Motors

#### Full Coil Configuration



Motor Peak Current =  
Rated Amps/Phase

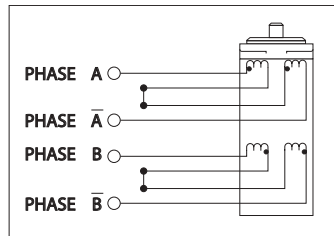
#### Half Coil Configuration



Motor Peak Current =  
Rated Amps/Phase x 1.4

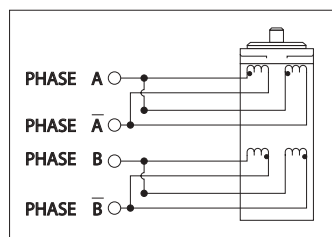
### 8 Lead Motors

#### Series Connection



Motor Peak Current =  
Rated Amps/Phase  
or  
Motor Peak Current =  
Bipolar Current Rating x 1.4

#### Parallel Connection



Motor Peak Current =  
Rated Amps/Phase x 2  
or  
Motor Peak Current =  
Bipolar Current Rating x 1.4

**MAXIMUM**  
Motor Inductance (mH/Phase) =  
0.2 x Minimum Supply Voltage

## Thermal Specifications

Storage ..... -40 to +125° C  
Rear Mounting  
Surface (Max)\* ..... 0 to +70° C

\*External heat sink may be required to maintain mounting surface below 70°C. Isolating thermal pad is required when using additional heat sink.

For More Information:  
See the complete IM481H Product Manual

## Timing

The Direction and Microstep Resolution Select Inputs are synchronized with the positive going edge of the Step Clock Input. When the Step Clock Input is high, the Direction and Microstep Select Inputs are latched and further changes to these inputs are ignored until the next rising edge of the Step Clock Input.

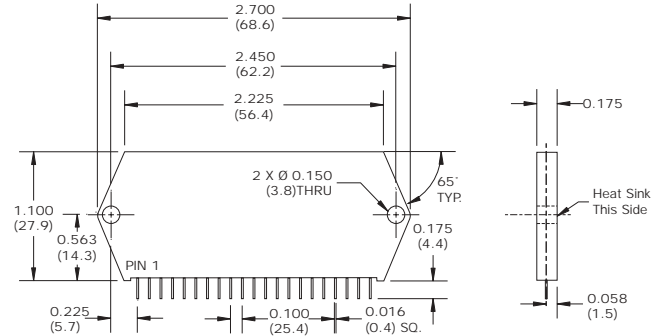
The minimum pulse width for the Step Clock Input is 75nS. The typical execution time for a Direction or Microstep Select change is 100nS. The typical execution time for a Step Input is 100nS.

The Reset and Enable inputs are asynchronous to any input and can be changed at any time. The Reset requires a minimum pulse width of 10µS.

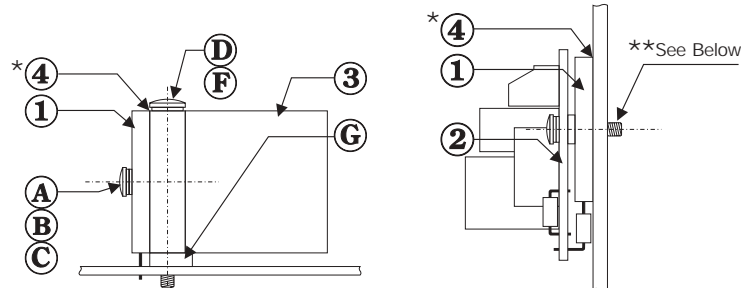
The Fullstep Output typically occurs 75nS after the positive edge of the Step Clock (excluding changes to the Direction or the Microstep Select Inputs).

## Mechanical Dimensions and Mounting

Dimensions in Inches (mm)

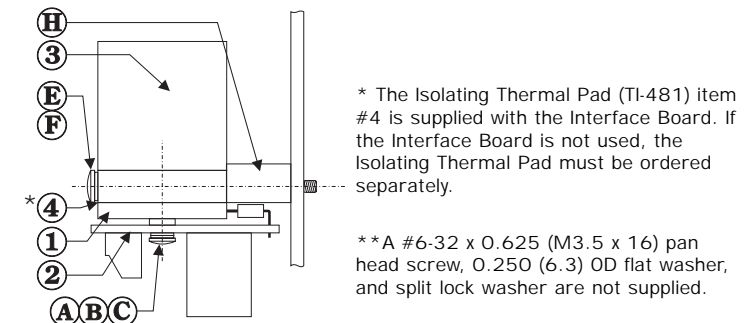


### Mounting Configurations



IM481H Driver and Interface  
Board Mounted with H-481 Heat Sink

IM481H Driver and Interface Board  
Panel Mounted without H-481 Heat Sink



IM481H Driver and Interface Board  
Panel Mounted with H-481 Heat Sink

\* The Isolating Thermal Pad (TI-481) item #4 is supplied with the Interface Board. If the Interface Board is not used, the Isolating Thermal Pad must be ordered separately.

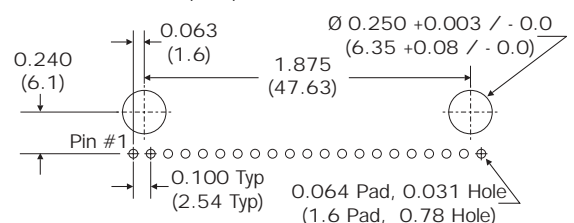
\*\* A #6-32 x 0.625 (M3.5 x 16) pan head screw, 0.250 (6.3) OD flat washer, and split lock washer are not supplied.

### Mounting Parts List

Item #	Description	Qty.
1	IM481H Microstepping Driver	1
2	INT-481 Interface Board	1
3	H-481 Heat Sink	1
4	TI-481 Isolating Thermal Pad	1
A	#6-32x0.625" Pan Head Screw	2
B	#6 Split Lock Washer	2
C	#6 Flat Washer, 0.250" OD, 0.145" ID, 0.030" Thick	2
D	#8-32x1.625" Pan Head Screw	2
E	#8-32x2" Pan Head Screw	2
F	#8 Split Lock Washer	2
G	#8-32 Internally Threaded Broaching Nut	2
H	Spacer, 0.312" OD, 0.171" ID, 0.500" L	2

### Recommended Hole Pattern

Dimensions in Inches (mm)



## IM481H Options and Accessories

Thermal Pad	TI-481
Interface Board	INT-481
Heat Sink (includes hardware)	H-481
21 Pin Right Angle Connector	HY481-CNO21
Small End Screwdriver	SD1