



## Stepper Motor Driver (For four motors)

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# STEPPER MOTOR DRIVER VID66-06

## GENERAL DESCRIPTION

The quad stepping motor driver VID66-06 is a monolithic CMOS device intended to be used as an interface circuit to ease the use of the stepper motor VID29-XX. It is specifically designed for applications in the car dashboard. The chip allows the user to drive four motors as it contains four identical drivers on the same chip.

The driver circuit converts a pulse train  $f(scx)$  into a current level sequence sent to the motor coils. This sequence is used to produce the micro stepping movement of the motor. Each inner driver in the chip generates 2 sequent logic pulse signals and provides shaft stepping angle resolution  $1/12^\circ$ .

## FEATURES

- Generates micro steps
- Glitch filters on all inputs
- $V_{DD} = 4.5$  to  $5.5V$
- Low EMI emission

## APPLICATIONS

- Car dashboard Nautical instrumentation
- Nautical instrumentation
- Aeronautical instrumentation
- Appliance controls
- Devices for medical analysis

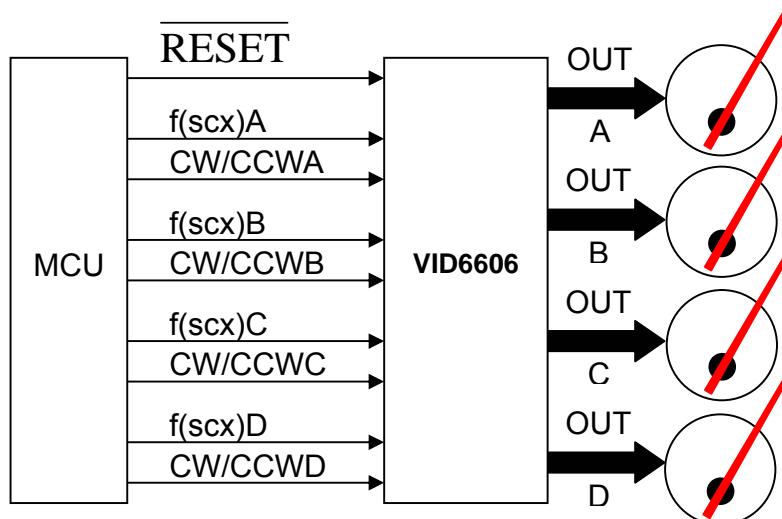




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### TYPICAL OPERATING CONFIGURATION



### PIN CONFIGURATION

1	VDD	F(SCX)A	28
2	CW/CCWB	CW/CCWA	27
3	F(SCX)B	RESET	26
4	OUT3A	OUT3B	25
5	OUT4A	OUT4B	24
6	OUT2A	OUT2B	23
7	OUT1A	OUT1B	22
8	OUT1D	OUT1C	21
9	OUT2D	OUT2C	20
10	OUT4D	OUT4C	19
11	OUT3D	OUT3C	18
12	VSS	F(SCX)D	17
13	CW/CCWC	CW/CCWD	16
14	F(SCX)C	VDD	15

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## PIN DESCRIPTION

Unused inputs must always be tied to a defined logic voltage level .

Pin Number SOP - 28	Name	I/O	Function
1/15	V <sub>DD</sub>	V	Positive supply voltage
12	V <sub>SS</sub>	V	Negative supply voltage
28/3/14/17	f(scx) A/B/C/D	I	Stepping frequency; Driver A / B / C / D
27/2/13/16	CW/CCW A/B/C/D	I	Direction of rotation; Driver A / B / C / D
26	RESET	I	Reset for the four drivers
4/5/6/7	OUT 3A/4A/2A/1A	O	Output driver A
8/9/10/11	OUT 1D/2D/4D/3D	O	Output driver D
18/19/20/21	OUT 3C/4C/2C/1C	O	Output driver C
22/23/24/25	OUT 1B/2B/4B/3B	O	Output driver B

## OPERATING CONDITIONS

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating temperature	T <sub>A</sub>		-40		+105	°C
Thermal impedance	R <sub>th</sub>	SOP		80		°C/W
Supply voltage	V <sub>DD</sub>		4.5	5	5.5	V
Input voltage at any pin	V <sub>IN</sub>		V <sub>SS</sub>		V <sub>DD</sub>	V

## ELECTRICAL CHARACTERISTICS

V<sub>DD</sub> = 4.5~5.5V, T<sub>A</sub> = -40~105°C, unless otherwise specified

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Typical supply current	I <sub>C</sub>	V <sub>DD</sub> =5V, ω=200° /S, T <sub>A</sub> =25°C, R <sub>B25</sub> =280 Ω		76		mA
Worst case supply current	I <sub>CMAX</sub>	V <sub>DD</sub> =5.5V, RESET=V <sub>SS</sub> , T <sub>A</sub> =-40°C, R <sub>B-40</sub> =190 Ω			200	mA
Quiescent supply current	I <sub>CC</sub>	All inputs at V <sub>DD</sub> or V <sub>SS</sub> , no load			300	μ A
Low level input voltage	V <sub>IL</sub>	V <sub>DD</sub> =4.5~5.5V	V <sub>SS</sub>		1.35	V
High level input voltage	V <sub>IH</sub>	V <sub>DD</sub> =4.5~5.5V	3.15		V <sub>DD</sub>	V
Input leakage	I <sub>IN</sub>	V <sub>IN</sub> =V <sub>SS</sub> or V <sub>DD</sub>	-10		10	μ A



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### LOAD CHARACTERISTICS

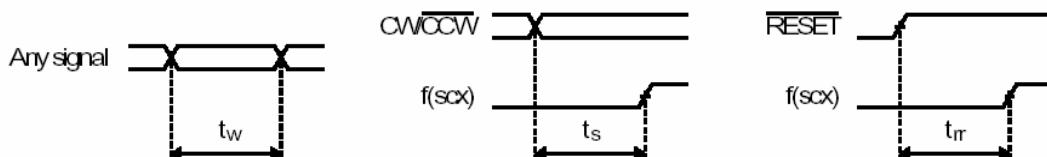
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Coil resistance	$R_{B25}$	VID29-XX, $T_A=25^\circ C$	260	280	300	$\Omega$
	$R_{B-40}$	VID29-XX, $T_A=-40^\circ C$	190			$\Omega$
	$R_{B105}$	VID29-XX, $T_A=105^\circ C$	350			$\Omega$
Phase inductance	$L_{25}$	VID29-XX, $T_A=25^\circ C$		0.4		H

### TIMING CHARACTERISTICS

$V_{DD} = 4.5\sim 5.5V$ ,  $T_A = -40\sim 105^\circ C$ ,  $t_{rise}$  and  $t_{fall} \leq 20ns$ , input signal swing  $V_{SS}$  to  $V_{DD}$

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Signal pulse width	$t_w$	high or low	450			ns
Input frequency	$f(scx)$	Driver input limit 1.1 MHz Motor speed limit (= $600^\circ/s$ )			1.1 7.2	MHz kHz
Setup time to $f(scx)$	$t_s$	high or low	100			ns
RESET release time to $f(scx)$	$t_{rr}$		100			ns

### DELAY TIMING WAVEFORMS



### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions
Voltage $V_{DD}$ to $V_{SS}$	$V_{DD}$	-0.3~+6V
Voltage at any pin to $V_{DD}$	$V_{MAX}$	+0.3V
Voltage at any pin to $V_{SS}$	$V_{MIN}$	-0.3V
Current at OUTs 1-4	$I_{OUTMAX}$	$\pm 35mA$
Max. junction temperature	$T_j$	150°C



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Operating temp. range	T <sub>A</sub>	-40~+105°C
Storage temp. range	T <sub>STO</sub>	-65~+125°C

## HANDING PROCEDURES

Stresses beyond these listed maximum ratings may cause permanent damage to the device. Exposure to conditions beyond specified operating conditions may affect device reliability or cause malfunction.

The device has built-in protection against high static voltages or electric fields; however, anti-static precautions must be taken as for any other CMOS component. Unless otherwise specified, proper operation can only occur when all terminal voltages are kept within the supply voltage range. Unused inputs must always be tied to a defined logic voltage level unless otherwise specified.

## CIRCUIT PROTECTIONS

To filter fast voltage transients, it is highly recommended to connect two 100nF ceramic capacitors to the power supply pins, one on either side and as close as possible to the chip.

Moreover, to protect the chip against latch-up, a 5uF capacitor per motor connected should be added. Thus, for 4 motors, typically a 22uF capacitor must be used, either electrolytic or tantalum. Note this capacitor can be placed close to the voltage regulator.

## RECOMMENDED POWER UP

In order to power up the circuit in a defined manner, it is recommended to keep the RESET input low while the V<sub>DD</sub> voltage is raising. After a delay of about 1ms, the RESET can be released (i.e. set high). Depending on the micro controller used, an external pull-down resistor might be required to properly set the RESET state at low during the start-up.

## FUNCTIONAL DESCRIPTION

The rising edge of the f(scx) input signal moves the rotor by one micro step.

The input signal "CW/CCW" (clockwise / counterclockwise) controls the direction of

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rotation of the motor.

### **INPUT GLITCH FILTER & LEVEL SHIFTER**

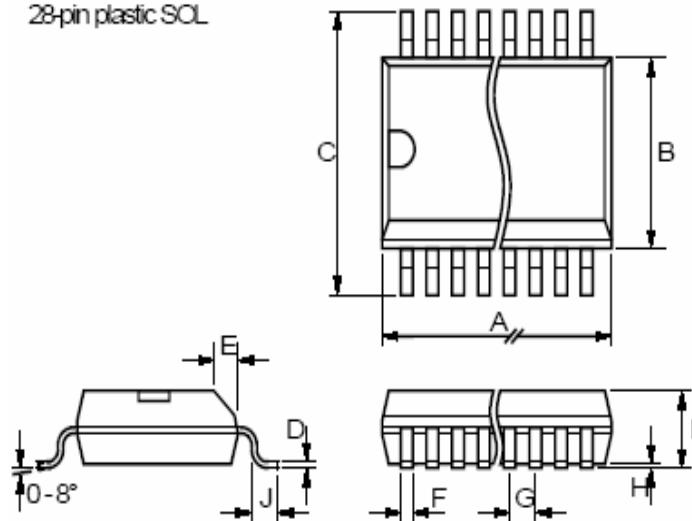
All logic inputs of this driver are armed with a glitch filter to avoid erroneous information due to spikes and glitches on the input signal lines. All negative or positive pulses of less than 20 ns width are ignored.

A minimum signal pulse width (positive or negative) of 450 ns guarantees correct function over the full temperature range.

All logic inputs also feature a level shifter, which allows for operation of the circuit at a higher supply voltage ( $V_{DD}$ ) than the circuits driving the inputs. This is in order to drive the VID motors at a higher torque level.

### **PACKAGE DIMENSIONS**

28-pin plastic SOIC



	Inches		mm	
	Mn	Max	Mn	Max
A	0.701	0.711	17.81	18.06
B	0.292	0.299	7.42	7.59
C	0.400	0.410	10.16	10.41
D	0.009	0.013	0.23	0.32
E	0.010	0.016	0.25	0.41
F	0.014	0.019	0.35	0.48
G	0.050 BSC		1.27 BSC	
H	0.005	0.012	0.12	0.29
I	0.097	0.104	2.46	2.64
J	0.024	0.040	0.61	1.02