



STK681-050

Bidirectional DC Brush-Type Motor Driver (I_O=5A)

Overview

The STK681-050 is a bidirectional DC brush-type motor driver IC with brake function that incorporates MOSFET power elements.

Applications

- PPC drum and scanner motor drivers
- LBP drum motor drivers
- Printer head and carriage motor drivers
- General DC motor applications

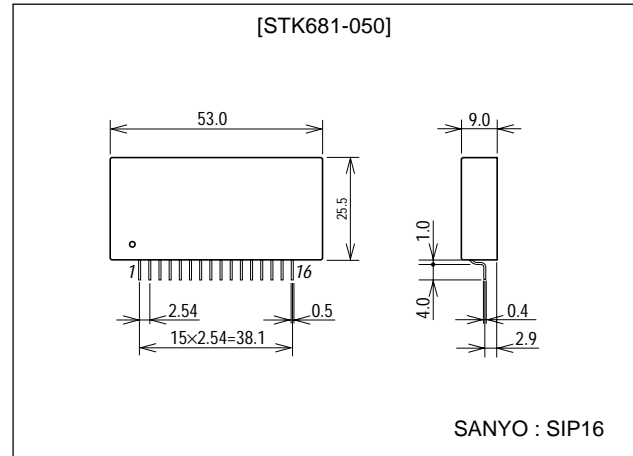
Features

- H-bridge output stage configuration employing 4 MOSFETs
- Independent TTL/CMOS level control for each MOSFET (4-pin control)
- External signal control of forward, reverse and brake operation
- MOSFETs supporting 12A peak starting current and 13.5A peak brake current (F3 and F4 ON)
- DC input supporting saturation operation
- Only 1 charge pump electrolytic capacitor required, compared with the STK6875 which requires 2

Package Dimensions

unit:mm

4163



Specifications

Maximum Ratings at T_a = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage 1	V _{CC1} max	No signal	50	V
Maximum supply voltage 2	V _{CC2} max	No signal	10	V
Maximum input voltage	V _{in} max	Pins 1, 3, 12, 14, 15	±10	V
Maximum motor starting current	I _O peak	1 pulse, pulse width=70ms	12	A
Maximum motor brake current 1 (F1 and F2 ON)	I _{OB1} peak	1 pulse, pulse width=70ms	12	A
Maximum motor brake current 2 (F3 and F4 ON)	I _{OB2} peak	1 pulse, pulse width=25ms 1 pulse, pulse width=100ms	16 13.5	A A
Allowable power dissipation 1	Pd1 max	No heatsink, total loss	5.2	W
Allowable power dissipation 2	Pd2 max	Arbitrary large heatsink, per MOSFET	25	W

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Parameter	Symbol	Conditions	Ratings	Unit
Thermal resistance	θ_{j-c}	Per MOSFET	5	$^{\circ}\text{C}/\text{W}$
Junction temperature	$T_j \text{ max}$	Per MOSFET	150	$^{\circ}\text{C}$
Operating substrate temperature	$T_c \text{ max}$		105	$^{\circ}\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^{\circ}\text{C}$

Allowable Operating Ranges at $T_a = 25^{\circ}\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage 1	V_{CC1}	With signal	18 to 42	V
Supply voltage 2	V_{CC2}	With signal	4.75 to 7.00	V
Input voltage	V_{in}	Pins 1, 3, 12, 14, 15	-7 to +7	V
Motor output current	I_O	PWM frequency $f_p=25\text{kHz}$	5	A
Motor starting current	I_{OD}	1 pulse, $t=200\text{ms}$	8	A
Motor brake current 1 (F1 and F2 ON)	I_{OB1}	Triangle wave, 1 pulse, pulse width=100ms	11	A
Motor brake current 2 (F3 and F4 ON)	I_{OB2}	Triangle wave, 1 pulse, pulse width=100ms	13.5	A
PWM frequency	f_p		0 to 30	kHz
CLK input frequency	f_{CLK}	40 to 60% duty	10 to 30	kHz
Sensing voltage	V_S	Between pins 4/5 and ground	0 to 0.6	V
Gate input voltage	V_{IG}	Between pins 3/12 and SG	V_{CC2}	V
MOSFET withstand voltage	V_{DSS}	F1, F2, F3, F4	60	V

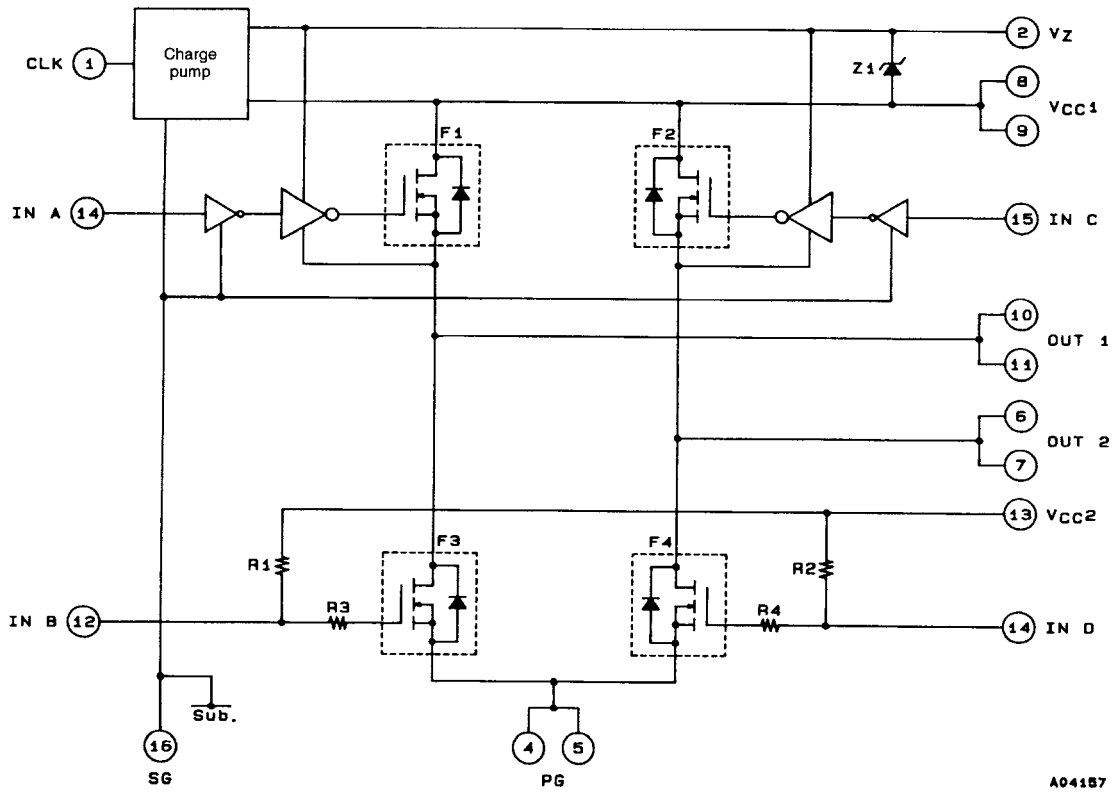
Electrical Characteristics at $T_a = 25^{\circ}\text{C}$, $V_{CC1}=24\text{V}$, $V_{CC2}=5.0\text{V}$, $f_{CLK}=25\text{kHz}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output saturation voltage 1	V_{st1}	$I_O=5\text{A}$, F1, F2		0.75	1.05	V
Output saturation voltage 2	V_{st2}	$I_O=5\text{A}$, F3, F4		0.43	0.65	V
Output leakage current	I_L	Pins 12, 14, 15=0.8V, pin 3 open Pins 3, 14, 15=0.8V, pin 12 open			100	μA
Supply current	I_{CCO}	Pins 3, 12, 14, 15=0.8V	2.0	2.7	4.0	mA
Input ON voltage	V_{IH}	Pins 1, 14, 15	2.0		V_{CC2}	V
Input OFF voltage	V_{IL}	Pins 1, 3, 12, 14, 15			0.80	V
Input ON current	I_{IH}	Pins 1, 14, 15 ($V_{IH}=2.7\text{V}$)		0.21	0.42	mA
Input OFF current	I_{IL}	Pins 3, 12 ($V_{IL}=0.4\text{V}$)		1.0	1.2	mA
Diode forward-bias voltage	V_F	$I_F=5\text{A}$		1.0	1.4	V
Turn ON delay time 1	t_{d-ON1}	F1, F2 ($I_O=5\text{A}$)		0.6		μs
Turn OFF delay time 1	t_{d-OFF1}	F1, F2 ($I_O=5\text{A}$)		3.9		μs
Turn ON delay time 2	t_{d-ON2}	F3, F4 ($I_O=5\text{A}$)		0.2		μs
Turn OFF delay time 2	t_{d-OFF2}	F3, F4 ($I_O=5\text{A}$)		0.6		μs

Note : All tests made using a constant-voltage supply.

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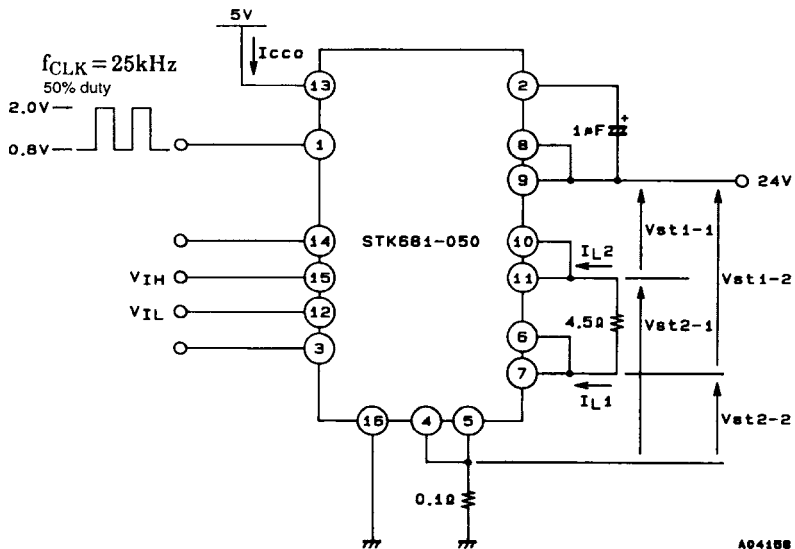
Block Diagram



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Test Circuit

Vst1, Vst2, I_{CCO}, I_L



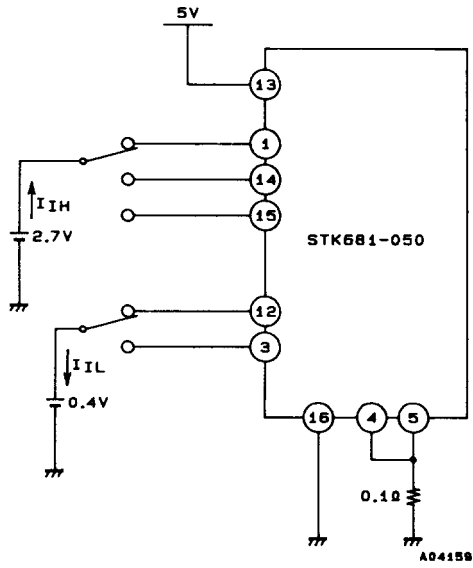
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Test parameter	Input conditions			
	Pin 14	Pin 15	Pin 12	Pin 13
Vst1-1	High	Low	Low	Open
Vst1-2	Low	High	Open	Low
Vst2-1	Low	High	Open	Low
Vst2-2	High	Low	Low	Open
I _{CCO}	Low	Low	Low	Low
I _{L1}	Low	Low	Low	Open
I _{L2}	Low	Low	Open	Low

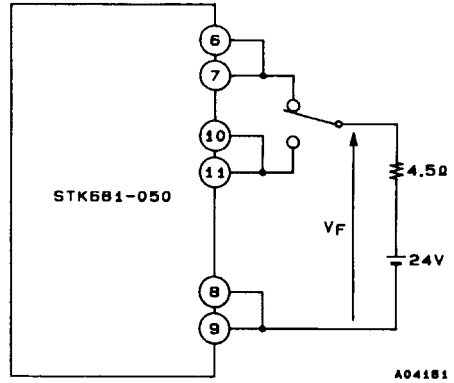
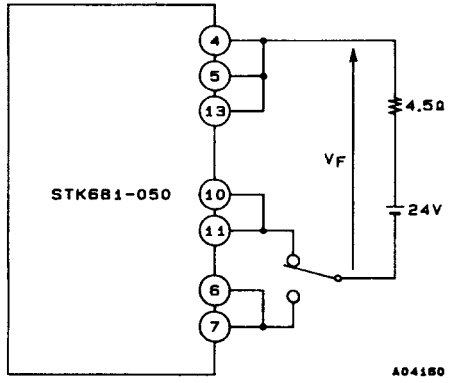
High : V_{IH}=2.0V
Low : V_{IL}=0.8V

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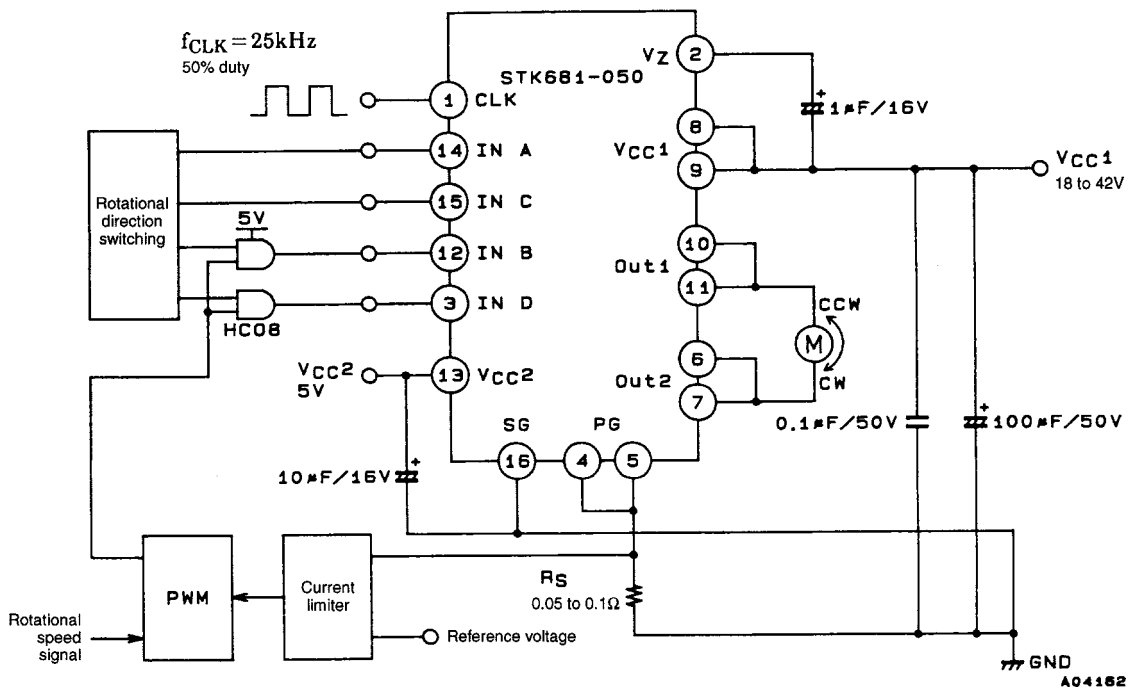
I_{IH}, I_{IL}



V_F



Sample Application Circuit



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Mode	IN A	IN C	IN B	IN D
Standby (before drive)	Low	Low	Low	Low
CW	High	Low	Low	PWM
CCW	Low	High	PWM	Low
Brake	Low	Low	V _{CC2}	V _{CC2}
Inhibit mode	High	×	High	×
	×	High	×	High

High : V_{IH} ≥ 2.7V

Low : V_{IL} ≤ 0.4V

High level during PWM operation = V_{CC2}

× = don't care

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