Ordering number: EN 5167

Thick Film Hybrid IC

SANYO No. 5167

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

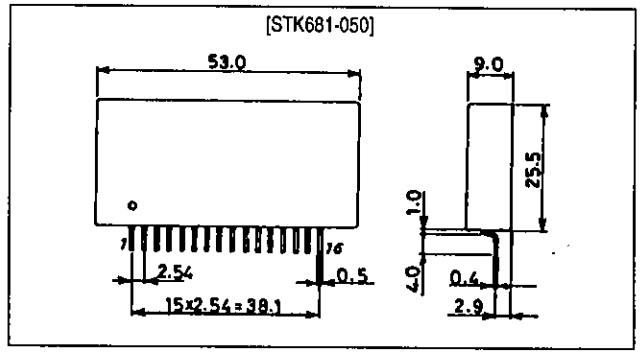
Features

- H-bridge output stage configuration employing 4 MOS-FETs
- Independent TTL/CMOS-level control for each MOS-FET (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 Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage 1	$V_{CC}1$ max	No signal	50	V
Maximum supply voltage 2	$V_{CC}2$ max	No signal	10	V
Maximum input voltage	Vin 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)	$I_{OB}1$ peak	1 pulse, pulse width = 70ms	12	A
Maximum motor brake current 2 (F3 and F4 ON)	$I_{OB}2$ peak	1 pulse, pulse width = 25ms	16	A
		1 pulse, pulse width = 100ms	13.5	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
Thermal resistance	θj-c	per MOSFET	5	°C/W
Junction temperature	Tj max	per MOSFET	150	°C
Operating substrate temperature	Tc max		105	°C
Storage temperature	Tstg		–40 to +125	°C

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Allowable Operating Ranges at Ta = 25°C

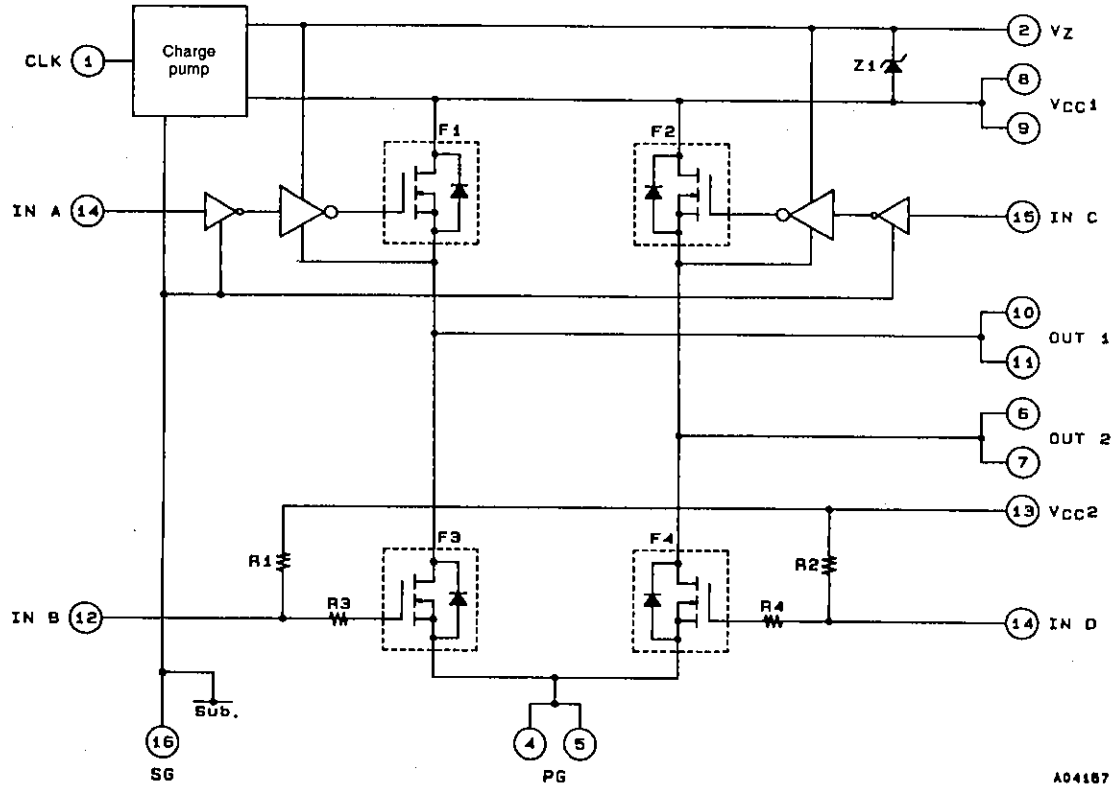
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage 1	$V_{CC}1$	With signal	18 to 42	V
Supply voltage 2	$V_{CC}2$	With signal	4.75 to 7.00	V
Input voltage	Vin	Pins 1, 3, 12, 14, 15	–7 to +7	V
Motor output current	I_O	PWM frequency fp = 25kHz	5	A
Motor starting current	I_{OD}	1 pulse, t = 200ms	8	A
Motor brake current 1 (F1 and F2 ON)	$I_{OB}1$	Triangle wave, 1 pulse, pulse width = 100ms	11	A
Motor brake current 2 (F3 and F4 ON)	$I_{OB}2$	Triangle wave, 1 pulse, pulse width = 100ms	13.5	A
PWM frequency	fp		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	$V_{CC}2$	V
MOSFET withstand voltage	V_{DSS}	F1, F2, F3, F4	60	V

Electrical Characteristics at Tc = 25°C, $V_{CC}1$ = 24V, $V_{CC}2$ = 5.0V, f_{CLK} = 25kHz

Parameter	Symbol	Conditions	min	typ	max	Unit
Output saturation voltage 1	Vst1	I_O = 5A, F1, F2	–	0.75	1.05	V
Output saturation voltage 2	Vst2	I_O = 5A, F3, F4	–	0.43	0.65	V
Output leakage current	I_L	Pins 12, 14, 15 = 0.8V, pin 3 open	–	–	100	µA
		Pins 3, 14, 15 = 0.8V, pin 12 open				
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	–	$V_{CC}2$	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} = 2.7V)	–	0.21	0.42	mA
Input OFF current	I_{IL}	Pins 3, 12 (V_{IL} = 0.4V)	–	1.0	1.2	mA
Diode forward-bias voltage	V_F	I_F = 5A	–	1.0	1.4	V
Turn ON delay time 1	$t_{d\text{-}ON}1$	F1, F2 (I_O = 5A)	–	0.6	–	µs
Turn OFF delay time 1	$t_{d\text{-}OFF}1$	F1, F2 (I_O = 5A)	–	3.9	–	µs
Turn ON delay time 2	$t_{d\text{-}ON}2$	F3, F4 (I_O = 5A)	–	0.2	–	µs
Turn OFF delay time 2	$t_{d\text{-}OFF}2$	F3, F4 (I_O = 5A)	–	0.6	–	µs

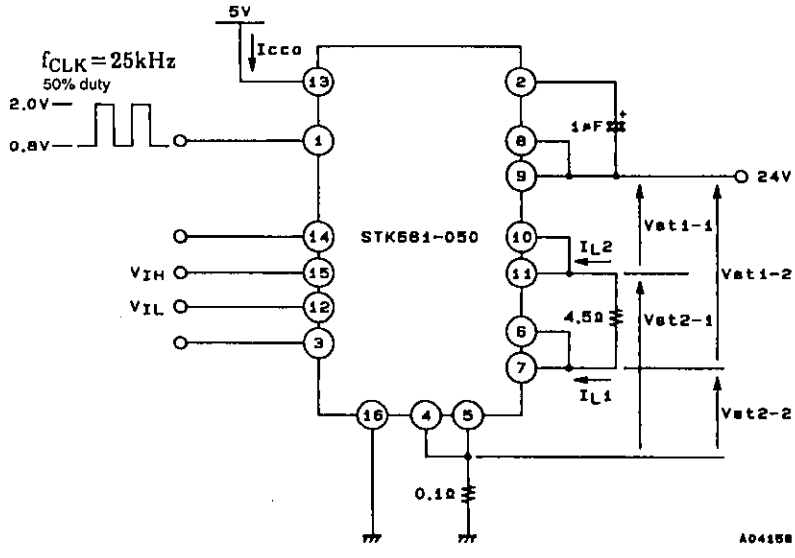
Note: All tests made using a constant-voltage supply.

Block Diagram



Test Circuit

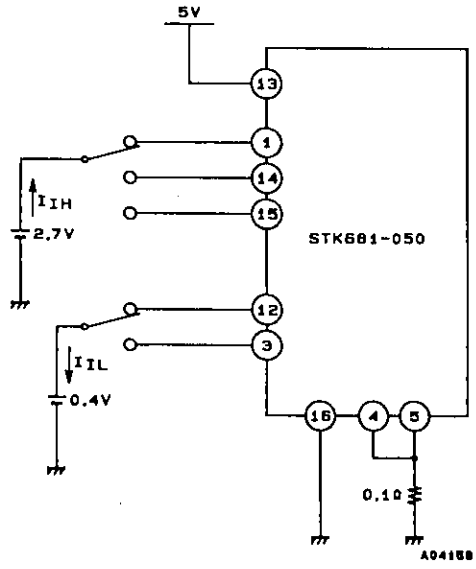
Vst1, Vst2, I_{CCO}, I_L



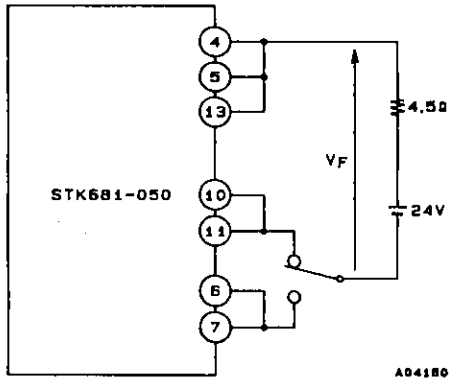
Test parameter	Input conditions			
	Pin 14	Pin 15	Pin 12	Pin 3
Vst1-1	High	Low	Low	Open
Vst1-2	Low	High	Open	Low
Vst2-1	Low	High	Open	Low
Vst2-2	High	Low	Low	Open
I_{CCO}	Low	Low	Low	Low
I_L1	Low	Low	Low	Open
I_L2	Low	Low	Open	Low

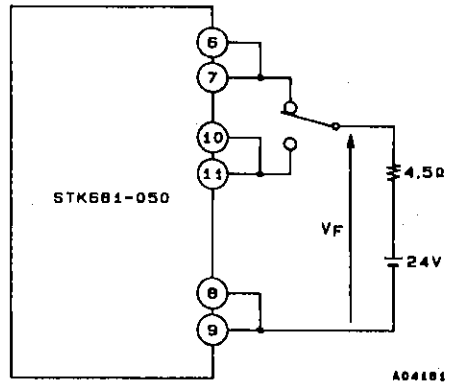
High: V_{IH} = 2.0V
Low: V_{IL} = 0.8V

I_{IH}, I_{IL}

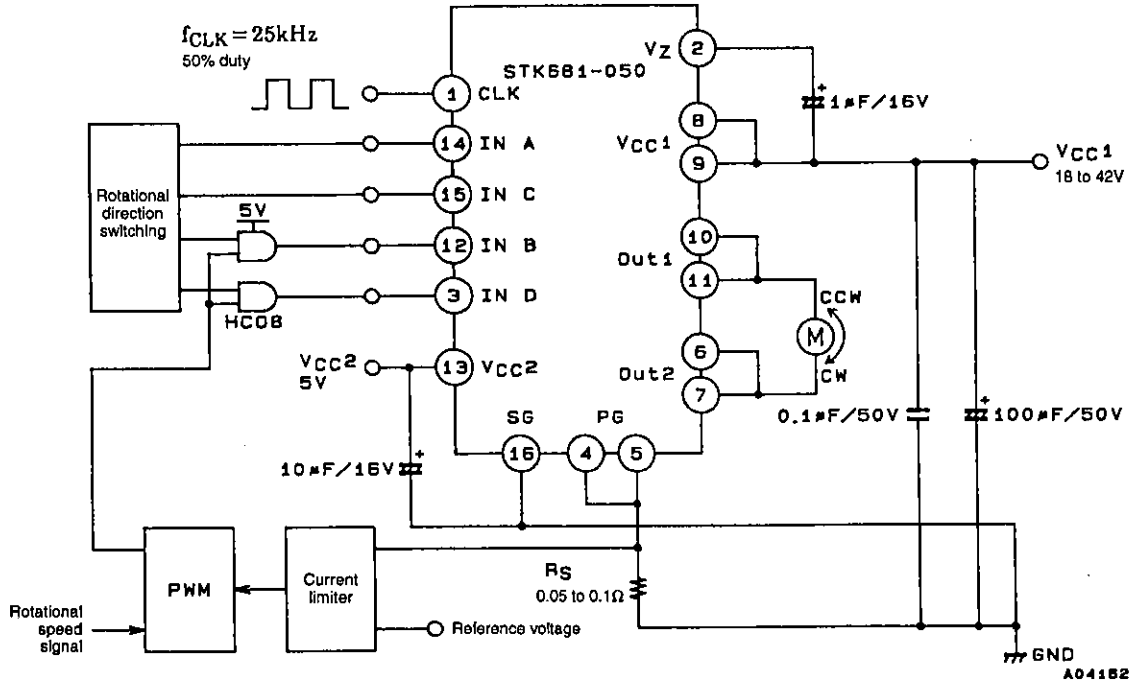


V_F





Sample Application Circuit



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	$V_{CC}2$	$V_{CC}2$
Inhibit mode	High	×	High	×
	×	High	×	High

High: $V_{IH} \geq 2.7V$
Low: $V_{IL} \leq 0.4V$
High level during PWM operation = $V_{CC}2$
× = don't care