

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

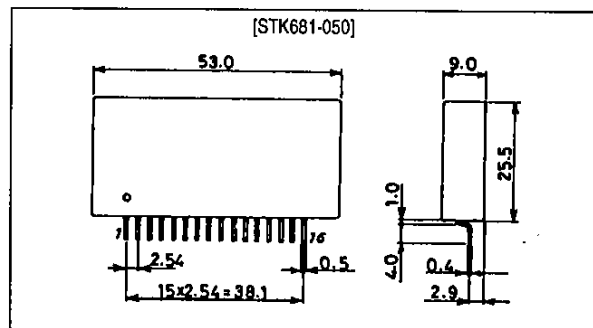
Features

- 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 $T_a = 25^\circ\text{C}$

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	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	θ_{j-c}	per MOSFET	5	$^\circ\text{C}/\text{W}$
Junction temperature	T_J max	per MOSFET	150	$^\circ\text{C}$
Operating substrate temperature	T_c max		105	$^\circ\text{C}$
Storage temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

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Allowable Operating Ranges at Ta = 25°C

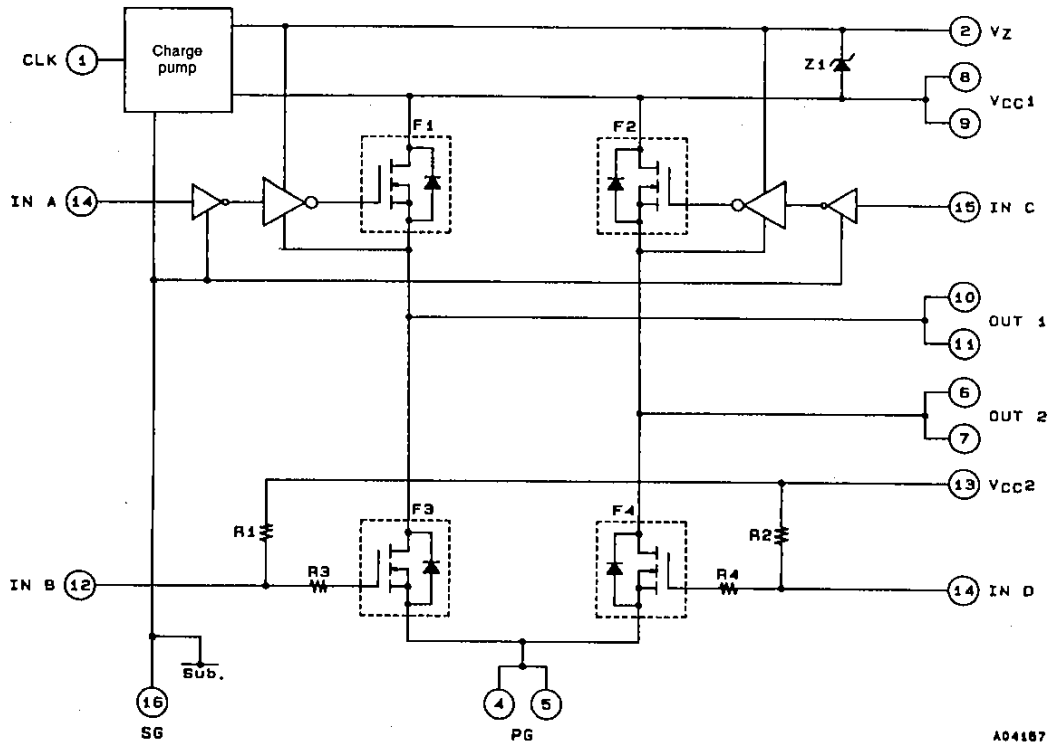
Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage 1	V _{CC1}	With signal	18 to 42	V
Supply voltage 2	V _{CC2}	With signal	4.75 to 7.00	V
Input voltage	V _{in}	Pins 1, 3, 12, 14, 15	-7 to +7	V
Motor output current	I _O	PWM frequency f _p = 25kHz	5	A
Motor starting current	I _{OD}	1 pulse, t = 200ms	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 Tc = 25°C, V_{CC1} = 24V, V_{CC2} = 5.0V, f_{CLK} = 25kHz

Parameter	Symbol	Conditions	min	typ	max	Unit
Output saturation voltage 1	V _{st1}	I _O = 5A, F1, F2	-	0.75	1.05	V
Output saturation voltage 2	V _{st2}	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 _{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} = 2.7V)	-	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-ON1}	F1, F2 (I _O = 5A)	-	0.6	-	μs
Turn OFF delay time 1	t _{d-OFF1}	F1, F2 (I _O = 5A)	-	3.9	-	μs
Turn ON delay time 2	t _{d-ON2}	F3, F4 (I _O = 5A)	-	0.2	-	μs
Turn OFF delay time 2	t _{d-OFF2}	F3, F4 (I _O = 5A)	-	0.6	-	μs

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

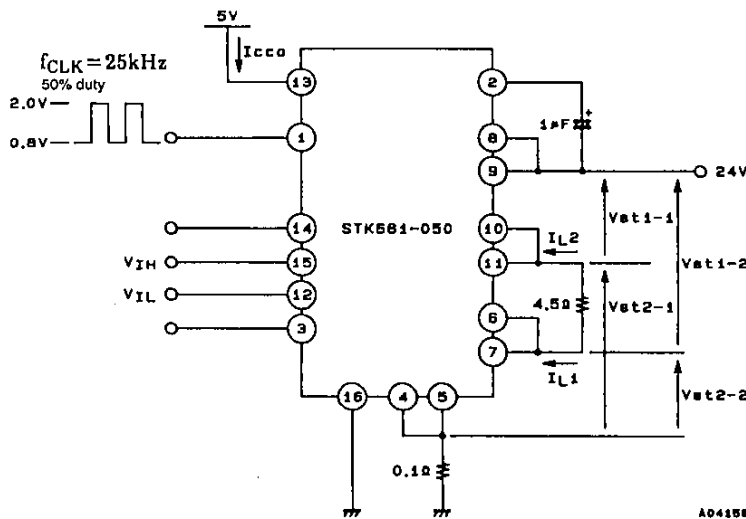
Block Diagram



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Test Circuit

Vst1, Vst2, I_{CCO}, I_L

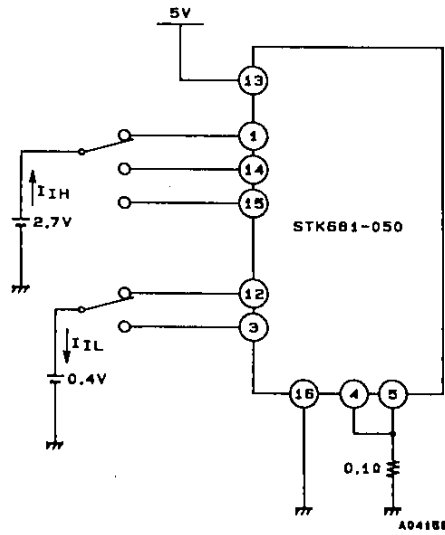


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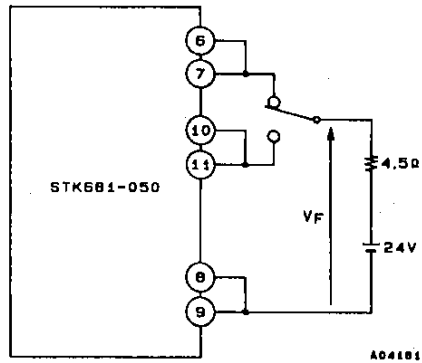
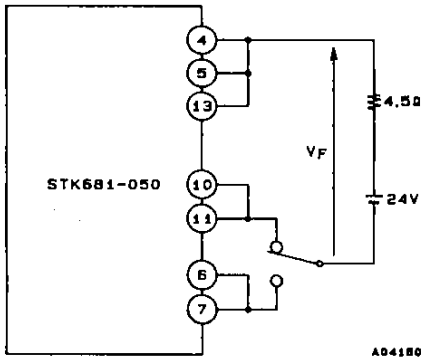
Test parameter	Input conditions			
	Pin 14	Pin 15	Pin 12	Pin 3
V _{st1-1}	High	Low	Low	Open
V _{st1-2}	Low	High	Open	Low
V _{st2-1}	Low	High	Open	Low
V _{st2-2}	High	Low	Low	Open
I _{CCO}	Low	Low	Low	Low
I _{L1}	Low	Low	Low	Open
I _{L2}	Low	Low	Open	Low

High: V_H = 2.0V
Low: V_L = 0.8V

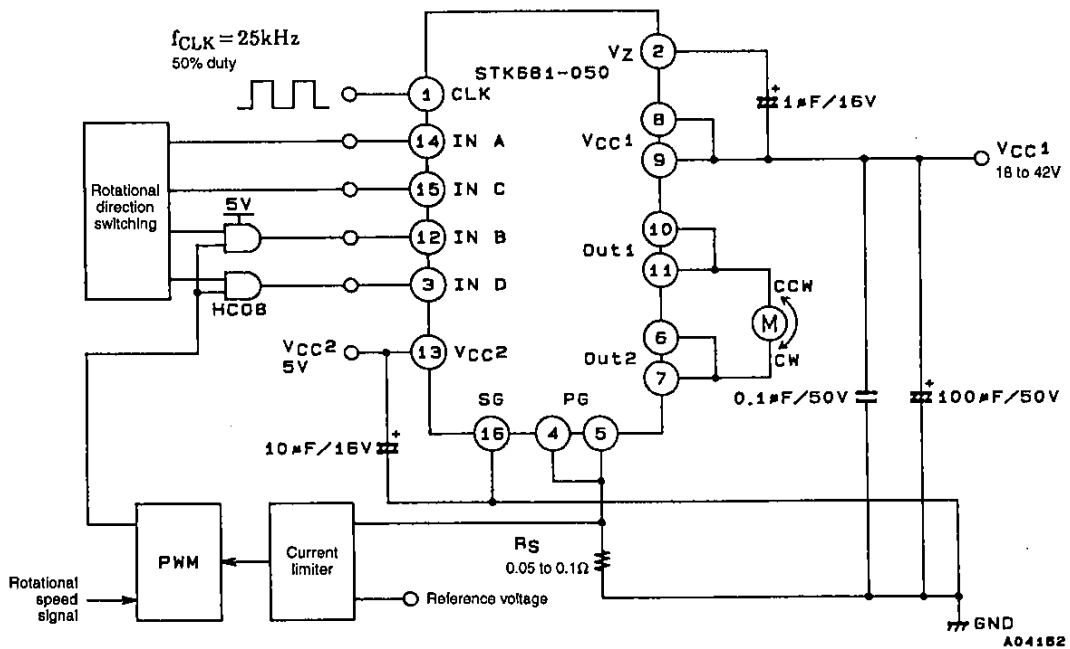
I_{IH} , I_{IL}



V_F



Sample Application Circuit



STK681-050

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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