Ordering number: EN 5165

Thick Film Hybrid IC

SANYO No. 5165

STK6711AMK4

4-Phase Stepping Motor Driver Unipolar Self-Excitation Type (I_O = 1.5A)

Overview

The STK6711AMK4 is a unipolar fixed-current chopper-type self-excitation 4-phase stepping motor driver hybrid IC which uses MOSFET power devices. The excitation sequence signal is active-high.

Applications

- Serial printer, line printer, and laser beam printer (LBP) paper feed and carriage motor drivers
- PPC scanner and LBP feed drivers

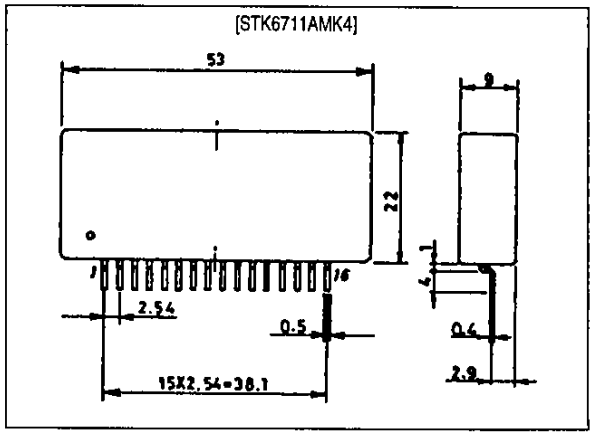
Features

- Simultaneous ON prevention circuit built-in to prevent driver breakdown due to simultaneous ON control signals from the control system's microcontroller, etc.
- Self-excitation design means chopping frequency is determined by motor L and R. Supports chopping at 20kHz or higher.
- Two 0.33Ω current detection resistors built-in for fixed-current chopping operation
- Wide operating supply voltage range (18 to 42V for motor drive)
- Unipolar design enables use as a driver for hybrid, PM, or VR-type stepping motors
- Supports W1-2 phase operation, with dual Vref pins

Package Dimensions

unit: mm

4129



Series Organization

The following devices form a series with differing excitation signal active level and output capacity. Some of the following devices are under development. Contact your Sanyo sales representative if you require more detailed information.

Type No.	Excitation signal	Output current (per phase)	Type
STK6711AMK4	Active-high	1.5A	Self-excitation
STK6711BMK4	Active-low		
STK6712AMK4	Active-high	1.7A	
STK6712BMK4	Active-low		
STK6713AMK4	Active-high	3.0A	
STK6713BMK4	Active-low		
STK6714AMK4	Active-high	4.0A	Fixed excitation
STK6714BMK4	Active-low		

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Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage 1	$V_{CC}1$ max	No input signal	52	V
Maximum supply voltage 2	$V_{CC}2$ max	No input signal	7	V
Maximum phase current	I_{OH} max	R = 5Ω, L = 10mH, 1 × 0.5s pulse, V_{CC} applied	2.2	A
Repeated avalanche handling capability	Ear max		38	mJ
Junction temperature	Tj max		150	°C
Operating substrate temperature	Tc max		105	°C
Storage temperature	Tstg		–40 to +125	°C

Allowable Operating Ranges at Ta = 25°C

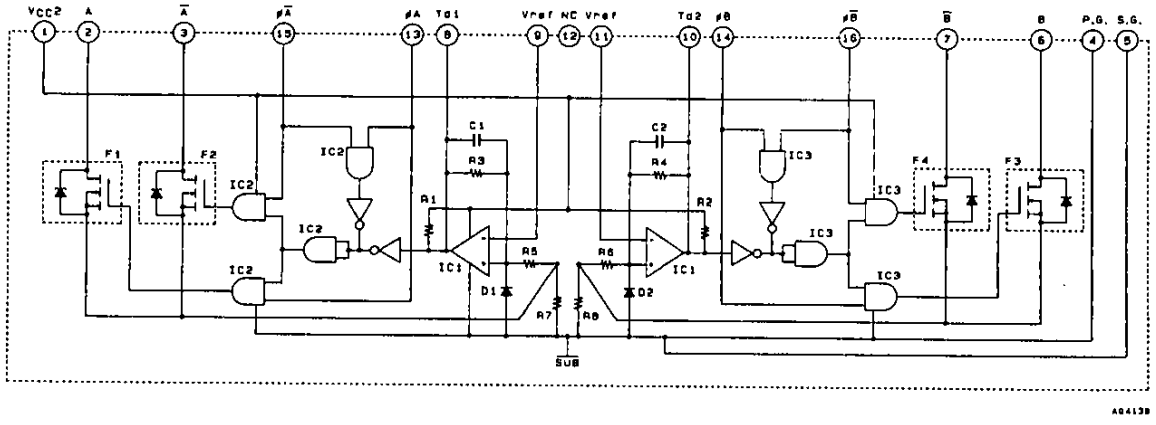
Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage 1	$V_{CC}1$	With input signal	18	–	42	V
Supply voltage 2	$V_{CC}2$	With input signal	4.75	5.00	5.25	V
Phase driver withstand voltage	V_{DSS}		100	–	–	V
Phase current	I_{OH} max	50% duty	–	–	1.5	A

Electrical Characteristics at Tc = 25°C, $V_{CC}1$ = 36V, $V_{CC}2$ = 5V

Parameter	Symbol	Conditions	min	typ	max	Unit
Output saturation voltage	Vst	R_L = 23Ω, Vin = 2.4V	–	1.4	1.9	V
Average output current	Ioave	Load: R = 3.5Ω, L = 3.8mH, Vin = 2.4V, per phase	0.45	0.50	0.55	A
Pin current drain	$I_{CC}2$	Load: R = 3.5Ω, L = 3.8mH, Vin = 2.4V, per phase	–	15	25	mA
FET diode forward voltage	Vdf	If = 1.0A	–	1.2	1.8	V
TTL-input high level voltage	V_{IH}	Input voltage when F1, F2, F3, F4 ON	2.0	–	–	V
TTL-input low level voltage	V_{IL}	Input voltage when F1, F2, F3, F4 OFF	–	–	0.8	V
Switching time	t_{ON}	R_L = 24Ω, Vin = 2.4V	–	50	–	ns
	t_{OFF}	R_L = 24Ω, Vin = 2.4V	–	0.1	–	µs

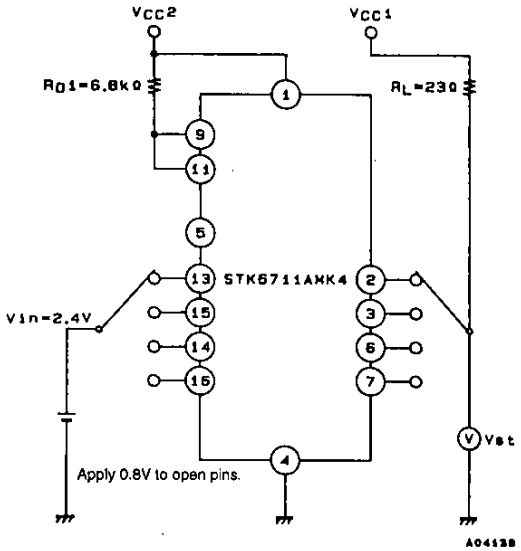
Note: All tests are made using a constant-voltage supply.

Equivalent Circuit

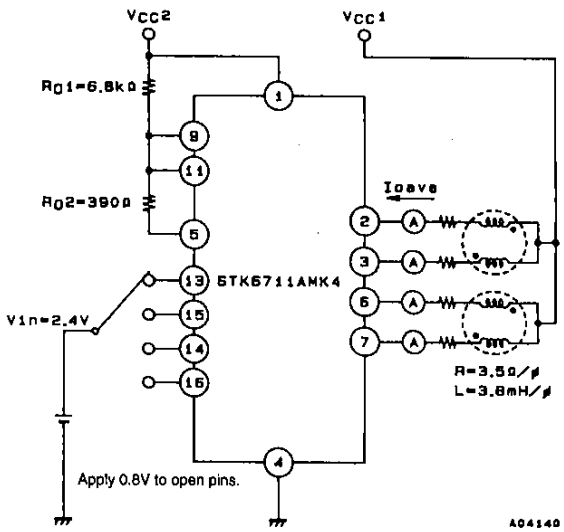


Test Circuits

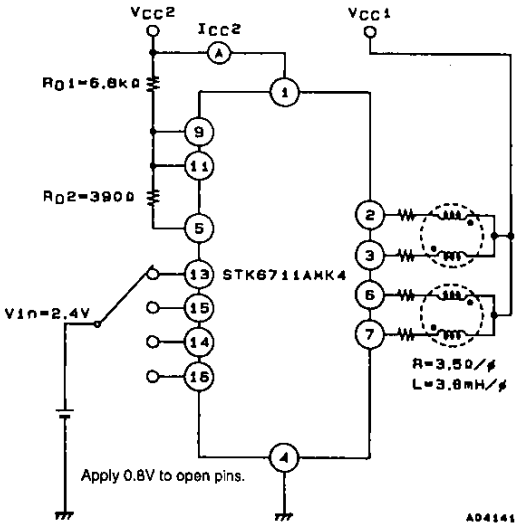
Vst



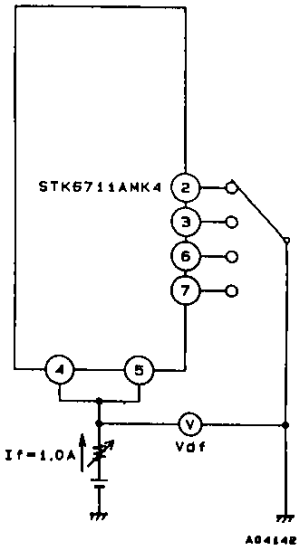
Ioave



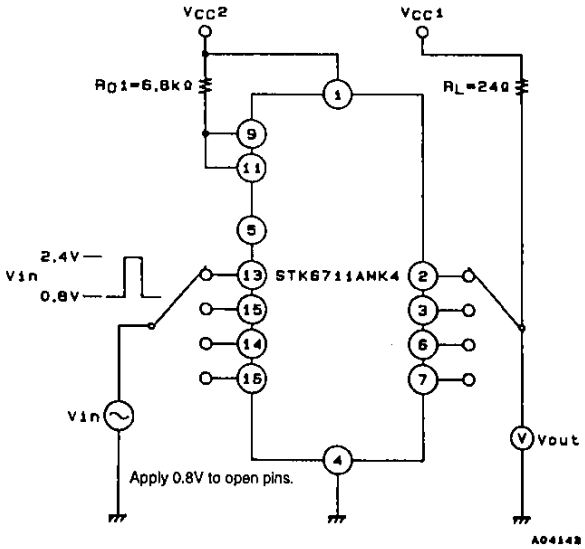
$I_{CC}2$

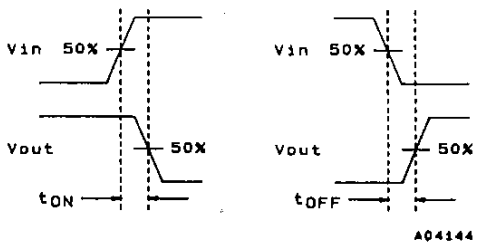


Vdf

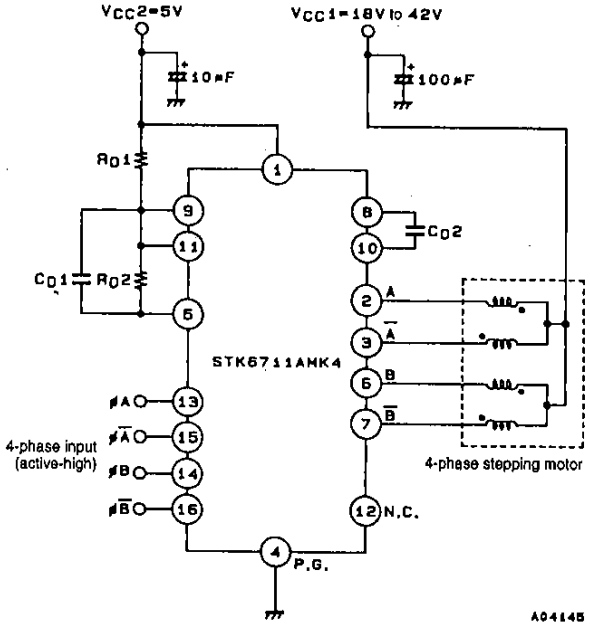


t_{ON}, t_{OFF}



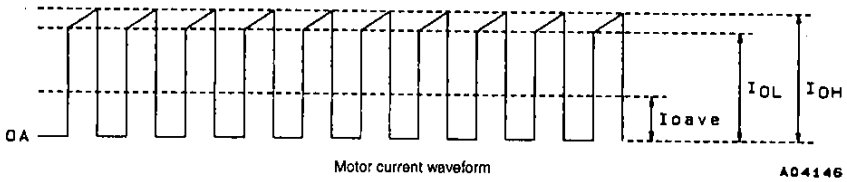


Sample Application Circuit



Motor Current

The following figure shows the motor current waveform when all 4-phase inputs are locked.



Motor current waveform

The motor current is set by the Vref voltage which is determined by the resistors R_O1 and R_O2 connected to pins 9 and 11. I_{OH} and Vref are related as shown in the following equations, where K is a correction coefficient for actual measurement.

$$I_{OH} = K \times \frac{R_O2}{R_O1 + R_O2} \times \frac{V_{CC}2}{R7}$$

$$Vref = \frac{R_O2}{R_O1 + R_O2} \times V_{CC}2$$

$K \approx 1.2$ and $R7 = R8 \approx 0.33\Omega \pm 3\%$

Reference values are such that $R_O1 = 6.8k\Omega$ and $R_O2 = 390\Omega$ at $I_{OH} \approx 1A$.

Motor Hold Noise Countermeasures (C_O1 and C_O2 Capacitors)

During motor hold, there may be cases where the motor generates audible noise. In this case, capacitors $C_O1 \approx 0.01\mu F$ and $C_O2 \approx 100$ to 200pF can be added to prevent this noise as shown in the Sample Application Circuit. During normal operation, however, these capacitors are not necessary.