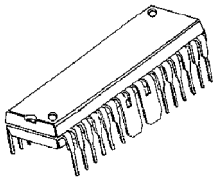
3-PHASE CAPSTAN MOTOR DRIVER

The KA8329B is a monolithic integrated circuit, and suitable for 3-phase capstan motor driver of VCR system.

32-SDIPH-400



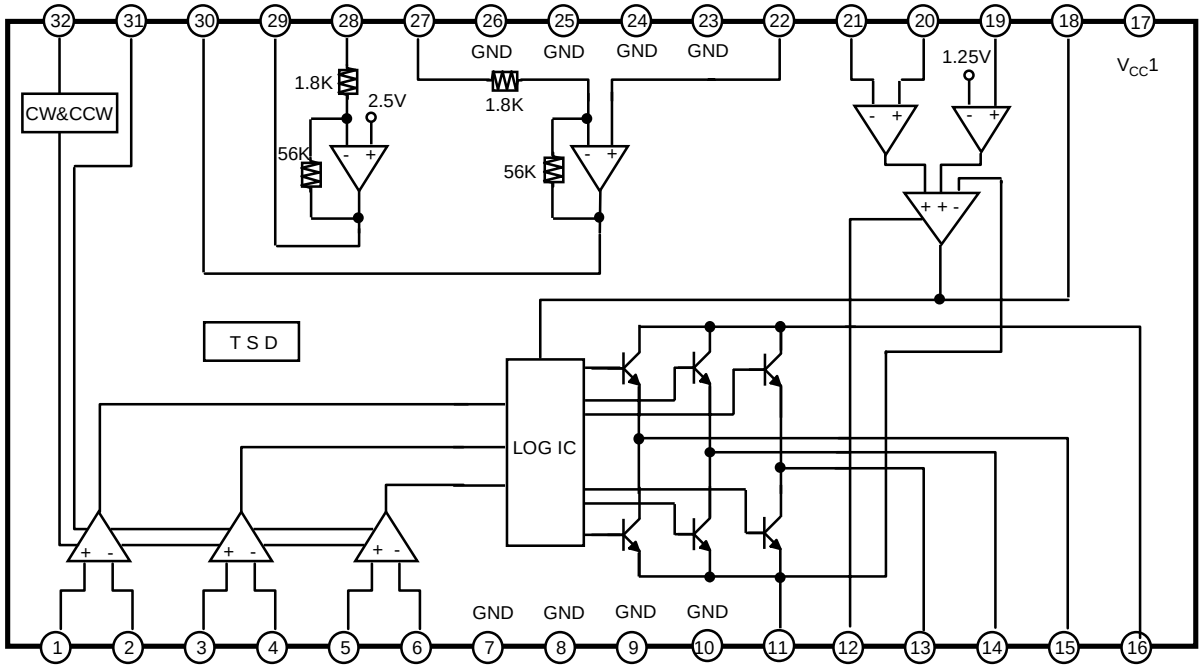
FEATURES

- 3-phase, full-wave, linear BLDC motor driver with 3 hall sensors
- Built-in TSD(Thermal Shutdown) circuit
- Built-in torque ripple control circuit
- Built-in output current limiter
- Motor speed control
- High output current
- Built-in FG amplifier with sinusoidal waveforms
- Built-in hall amplifier
- Built-in CW and CCW circuit

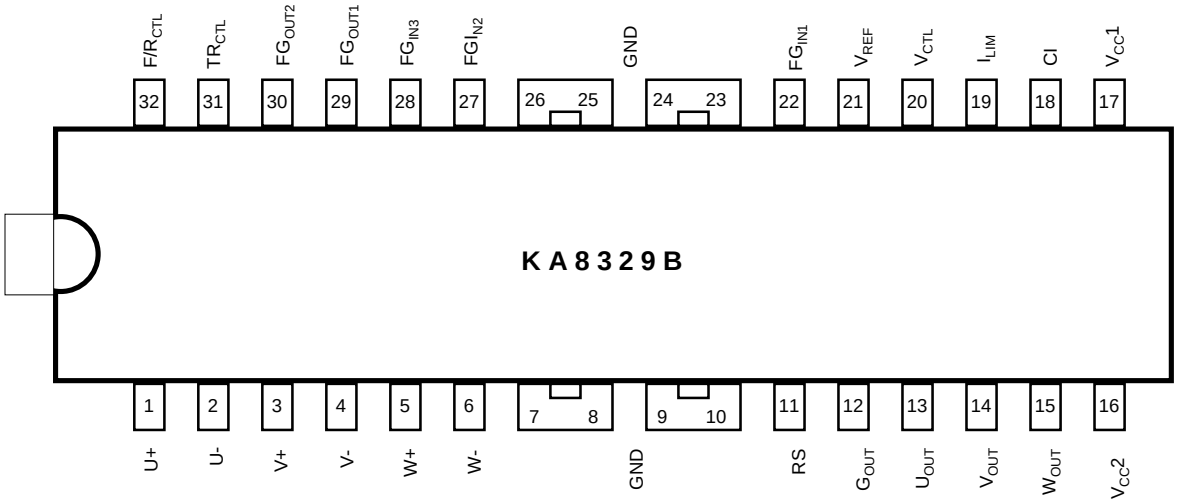
ORDERING INFORMATION

Device	Package	Operating Temperature
KA8329B	32-SDIPH-400	- 20 ~ + 75℃

BLOCK DIAGRAM



PIN CONFIGURATION



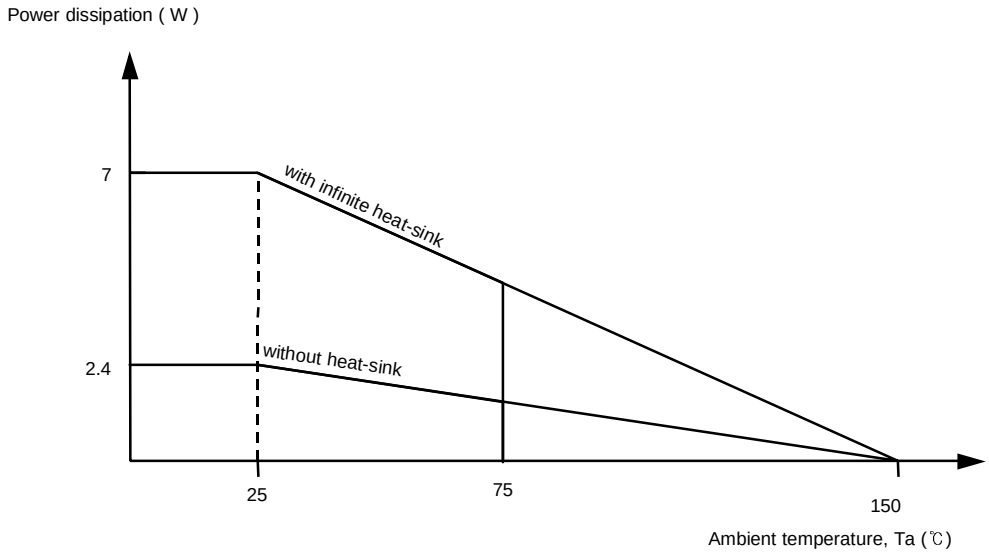
PIN DESCRIPTION

Pin No.	Symbol	I/O	Description	Pin No.	Symbol	I/O	Description
1	U +	I	U + Hall Signal Input	17	V_{CC1}	-	Supply voltage(signal)
2	U –	I	U – Hall Signal Input	18	CI	-	Phase stabilization
3	V +	I	V + Hall Signal Input	19	I_{LIM}	I	Current limitation
4	V –	I	V – Hall Signal Input	20	V_{CTL}	I	Voltage control
5	W +	I	W + Hall Signal Input	21	V_{REF}	I	Voltage control reference
6	W –	I	W – Hall Signal Input	22	FG_{IN1}	I	FG AMP1 input1
7	GND	-	Ground(Signal)	23	GND	-	Ground(signal)
8	GND	-	Ground(Signal)	24	GND	-	Ground(signal)
9	GND	-	Ground(Signal)	25	GND	-	Ground(signal)
10	GND	-	Ground(Signal)	26	GND	-	Ground(signal)
11	RS	O	Output Current Detection	27	FG_{IN2}	I	FG AMP1 input2
12	G_{OUT}	-	Ground(Power)	28	FG_{IN3}	I	FG AMP2 input1
13	U_{OUT}	O	U - Phase Output	29	FG_{OUT1}	O	FG AMP2 output
14	V_{OUT}	O	V - Phase Output	30	FG_{OUT2}	O	FG AMP1 output
15	W_{OUT}	O	W - Phase Output	31	TR_{CTL}	I	Torque ripple control
16	V_{CC2}	-	Supply Voltage(Power)	32	F/R_{CTL}	I	Forward & reverse control

ABSOLUTE MAXIMUM RATING (Ta = 25℃)

Characteristics	Symbol	Value	Unit	Remark
Supply Voltage(Signal)	V_{CC1}	7	V	
Supply Voltage(Power)	V_{CC2}	28	V	
Output Current	I_{OUT}	1.5	A/phase	
Power Dissipation	P_D	2.4	W	No Heat Sink
Thermal Resistance	R_T	60.2	mw/℃	No Heat Sink
Junction Temperature	T_J	150	℃	
Operating Temperature	T_{OPR}	- 20 ~ + 75	℃	
Storage Temperature	T_{STG}	- 40 ~ + 125	℃	

POWER DISSIPATION CURVE



ELECTRICAL CHARACTERISTICS

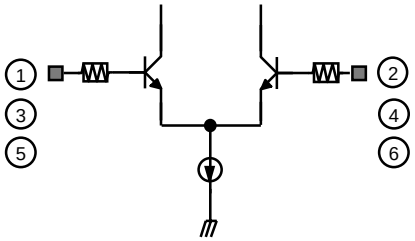
(Ta=25℃, V_{CC1}=5V, V_{CC2}=16V, R_S=0.5Ω,unless otherwise specified)

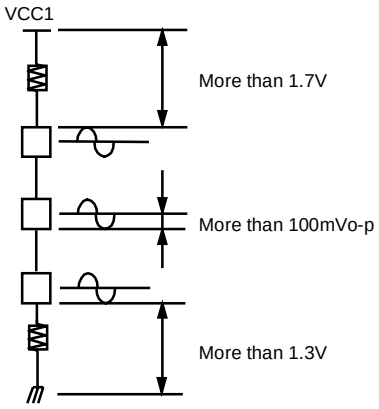
Characteristics	Symbol	Pin No.	Test Conditions	Min	Typ	Max	Unit
Quiescent Input Current	I_{CC1}	17	VF/R=0V or 5V	5	8.5	12	mA
Hall AMP Input Voltage Range	V_{INS}	1 ~ 6	mVo-p	100	-	-	mV
Power TR Saturation Voltage (Outflow Current)	V_{SAT1}	16 – 13,14,15	V_{CC2}=13V, Iout=0.8A/Phase	-	1.8	2.0	V
Power TR Saturation Voltage (Inflow Current)	V_{SAT2}	11-13,14,15	V_{CC2}=13V, Iout=0.8A/Phase	-	1.8	2.0	V
I_{LIM} Input Voltage Range	V_{LIM}	19		0	-	V_{CC}1	V
I_{LIM} Input Current	I_{19}	19	V_{CTL}=3.5V,V_{LIM}=3V	-	350	2,000	nA
I_{LIM} Current Limit Level	GML	19 – 13,14,15	V_{CTL}=3.5V,V_{LIM}=Adjustable	0.61	0.67	0.73	A/V
I_{LIM} Quiescent Output Current	I_{O1}	19	V_{LIM}=0V	-	1.5	5.0	mA
I_{LIM} Limit Offset Voltage	V_{O1}	19	V_{REF}=2.5V	1.17	1.25	1.33	V
V_{CTL} Input Voltage Range	V_{CTL}	20		0	-	V_{CC}1	V
V_{CTL} Input Current	I_{20}	20	V_{CTL}=3V,V_{LIM}=5V	-	350	2,000	nA
V_{CTL} Control Gain	GM	20 – 13,14,15	V_{LIM}=5V,V_{CTL}=Adjustable	0.9	1.0	1.1	A/V
V_{CTL} Quiescent Output Current	I_{O2}	20	V_{CTL}=0V	-	1.5	5.0	mA
V_{CTL} Input off-Set Voltage	V_{O2}	20	V_{CTL}= Adjustable	-50	0	50	mV
Foward Rotation Mode	V_F	32		1.0	1.3	1.6	V
Reverse Rotation Mode	V_R	32		0	-	0.8	V
V_{REF} Input Voltage Range	V_{REF}	21		2.0	-	V_{CC}1-2.0	V
FG_{AMP} Internal Reference Voltage	V_{28}	28		2.2	2.5 -	2.8	V V
FG_{AMP} Input Voltage Range	FG_{IN}	27,28	Pin 28=10kHz,60mVp-p,	1		4	
FG_{AMP1} Gain	FG_{AV1}	28-29	Sinusoidal Waveforms Pin 27=10kHz,60mVp-p,	28	31	34	Times
FG_{AMP2} Gain	FG_{AV2}	27-30	Sinusoidal Waveforms Pin 22=2.5V	28	31	34	Times

APPLICATION INFORMATION

1. HALL INPUT

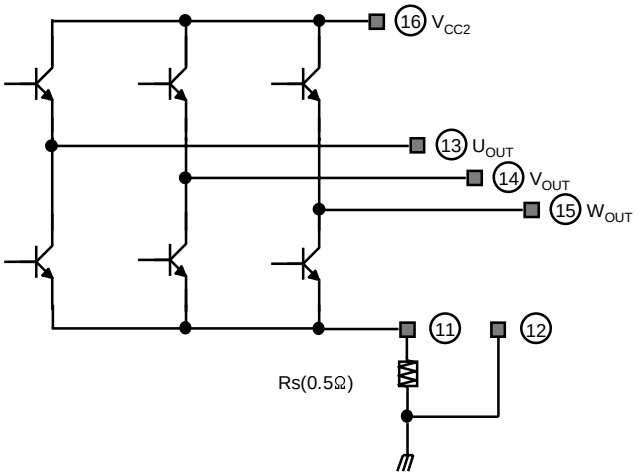
The input signal of the Hall Sensor requires more amplitude than 100mVo-p. and the operating voltage level of the Hall Sensor is from 1.2V~V_{CC1}-0.8V.





2. OUTPUT CURRENT DETECTION

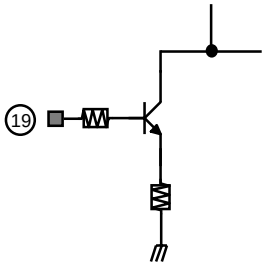
Pin 11 is usually connected with Rs(approx. 0.5Ω), and the motor current is converted to a voltage by the Rs and provided to a feedback amplifier. Pin 12 is connected to the circuit with the ground side or Rs.

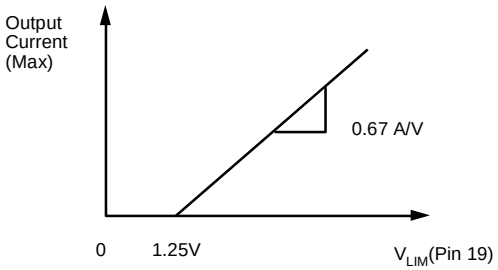


3. MOTOR SPEED CONTROL(INPUT CURRENT LIMITATION)

The maxmum output current is limitted by Pin 19 voltage as follows. So a motor speed is controlled by the output current. In case of no-use, it is to be short-circuit with V_{CC1}.

GML=$\triangle Io/\triangle V_{LIM}=(Io_2-Io_1)/(V_{LIM2}-V_{LIM1})$, where V_{LIM1}=1.45V => Output current=Io_1
V_{LIM2}=1.55V => Output current=Io_2

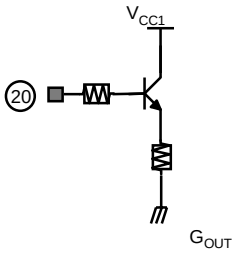


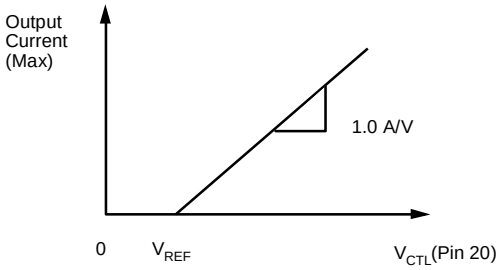


4. MOTOR SPEED CONTROL(INPUT VOLTAGE CONTROL)

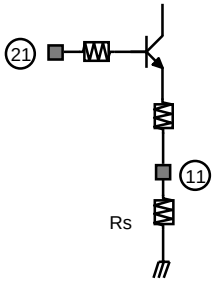
The control of motor speed is possible on the conditions of V_{CTL}(Pin 20)$\geq V_{REF}$.
The control gain is approx. 1.0 A/V as follows.

GM=$\triangle Io/\triangle V_{CTL}=(Io_2-Io_1)/(V_{CTL2}-V_{CTL1})$, where V_{REF}=2.5V, V_{CTL1}=2.6V => Output Current=Io_1
V_{REF}=2.5V, V_{CTL2}=2.7V => Output Current=Io_2



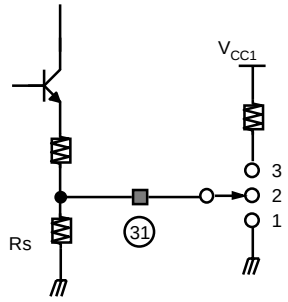


5. VOLTAGE CONTROL REFERENCE



The input voltage range is 2V$\leq V_{REF}\leq$(V_{CC1}-2V).

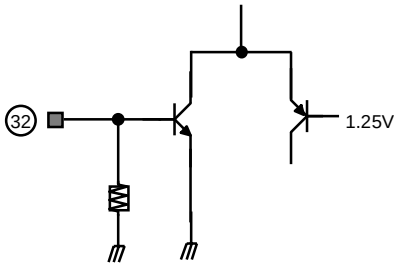
6. TORQUE RIPPLE CONTROL



The motor torque ripple is controlled by Pin 31 voltege as follows.

1 : GND
2 : Normal Mode
3 : Control Mode

7. FORWARD & REVERSE ROTATION CONTROL

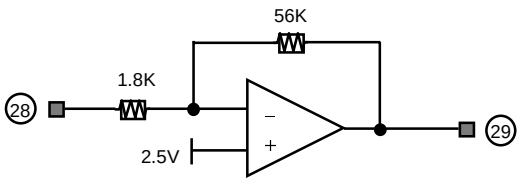


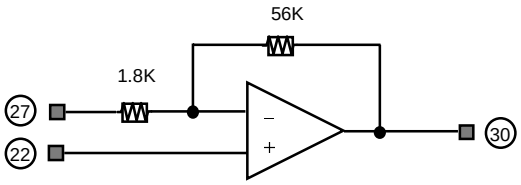
Forward mode : Pin 32 ≥1.8V

Reverse mode : Pin 32 ≤0.8V

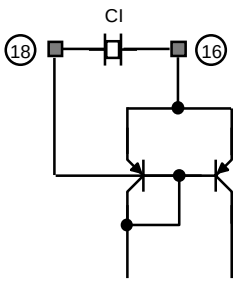
8. FG AMP

These amplifiers are the inversion type. One amplifier is built in both the reference voltage(approx. 2.5V) and the gain setting resistors. The voltage gain ia approx. 31 times.



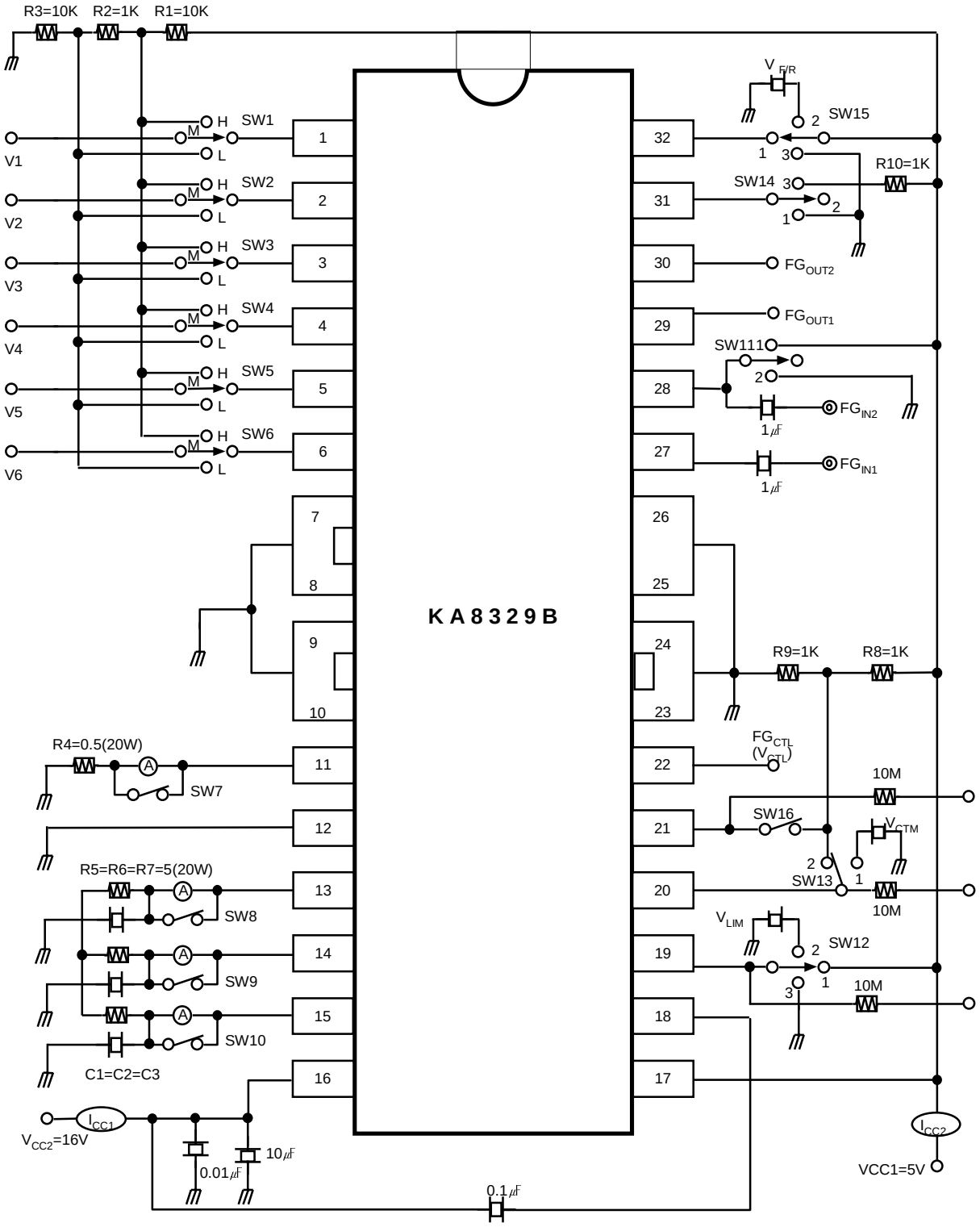


9. PHASE STABILIZATION

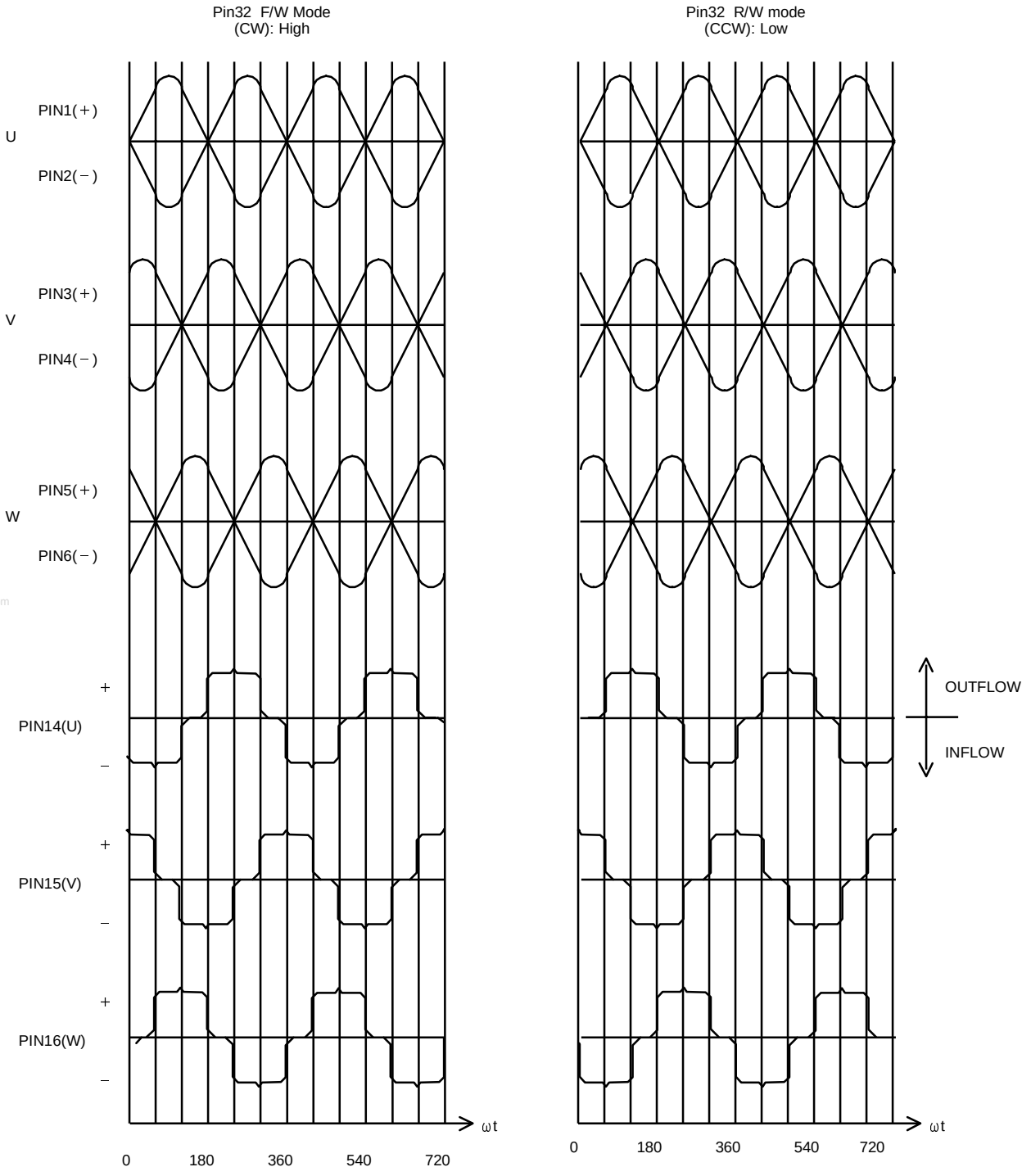


Be inserted a capacitor between Pin 16 and Pin 18. This capacitor, approx. 0.1μF is for the phase stabilization of the circuit.

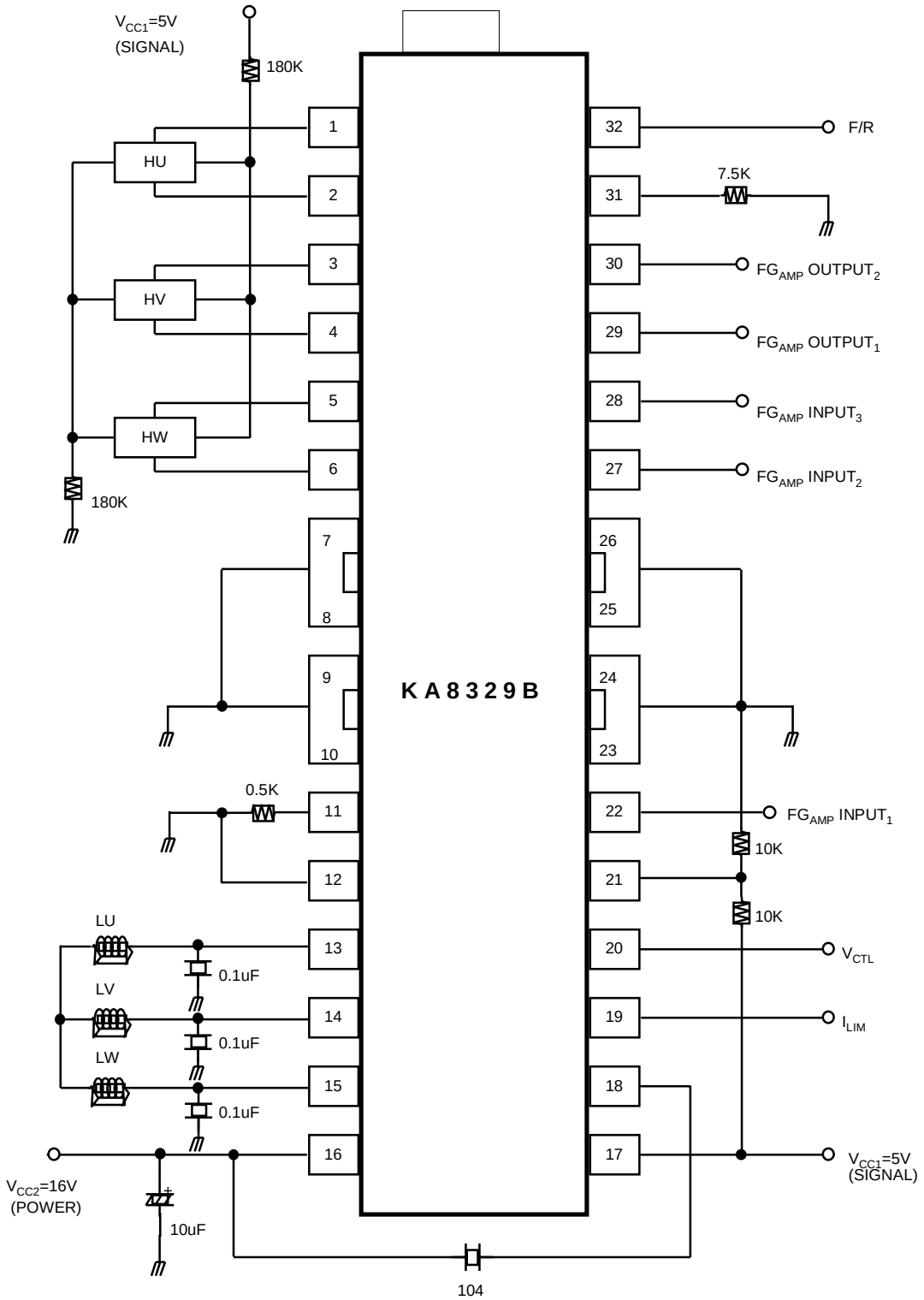
TEST CIRCUIT



TIMMING CHART



APPLICATION CIRCUIT



PACKAGE DIMENSIONS (Unit : mm)

32-SDIPH-400