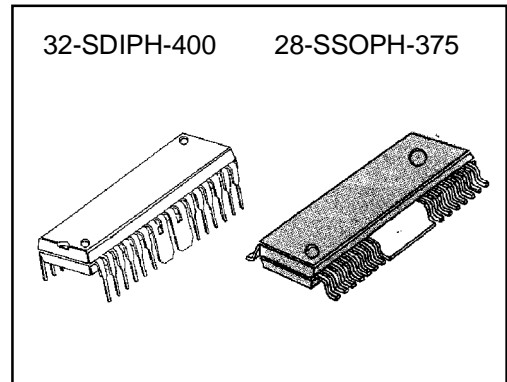


3-PHASE CAPSTAN MOTOR DRIVER

The KA3080 And KA3080D are a monolithic integrated circuit, and suitable for 3-phase capstan motor driver for VCR system.

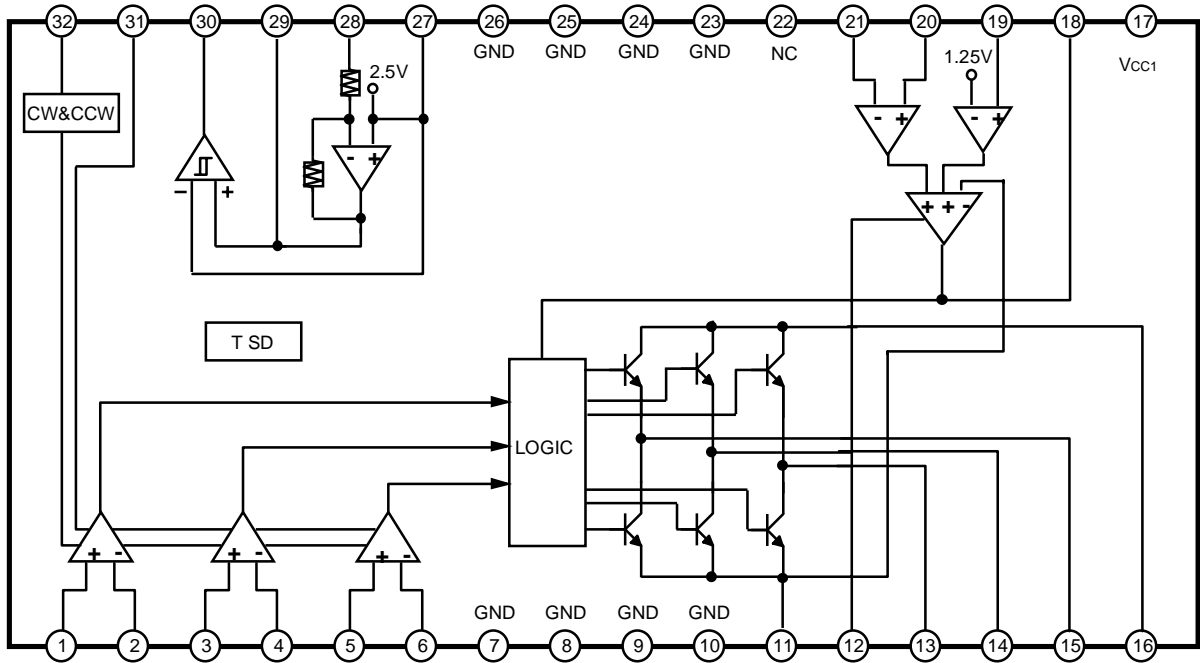
**FEATURES**

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

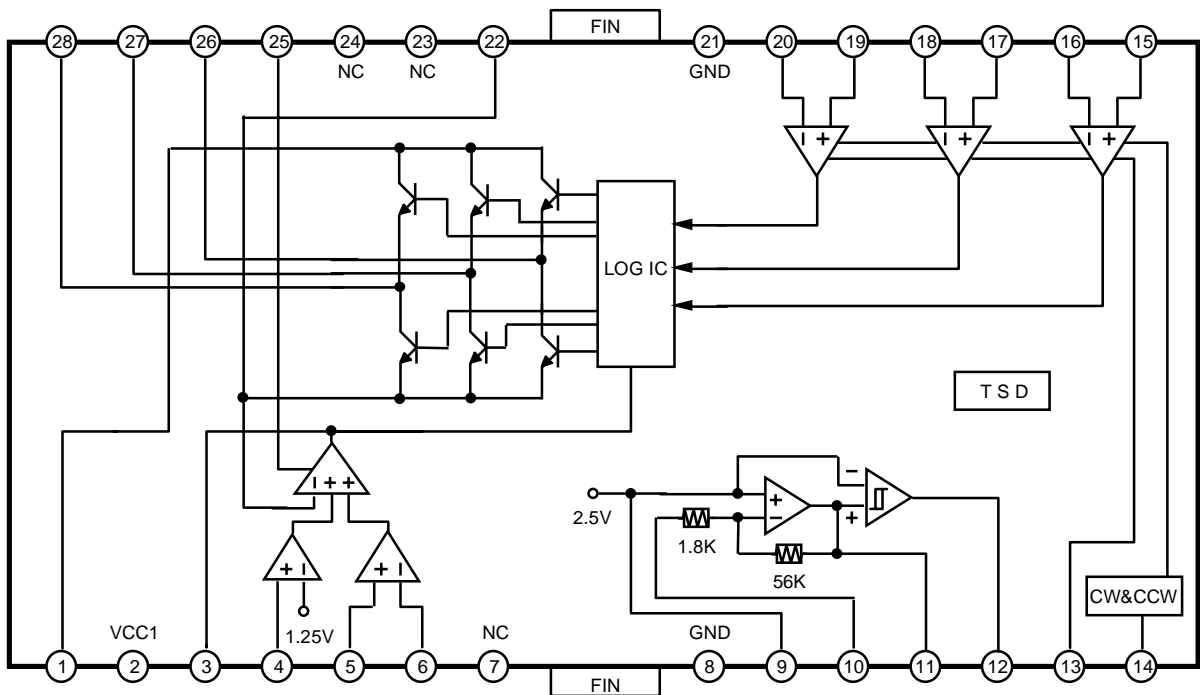
ORDERING INFORMATION

Device	Package	Operating Temperature
KA3080	32-SDIPH-400	- 20°C ~ + 75°C
KA3080D	28-SSOPH-375	

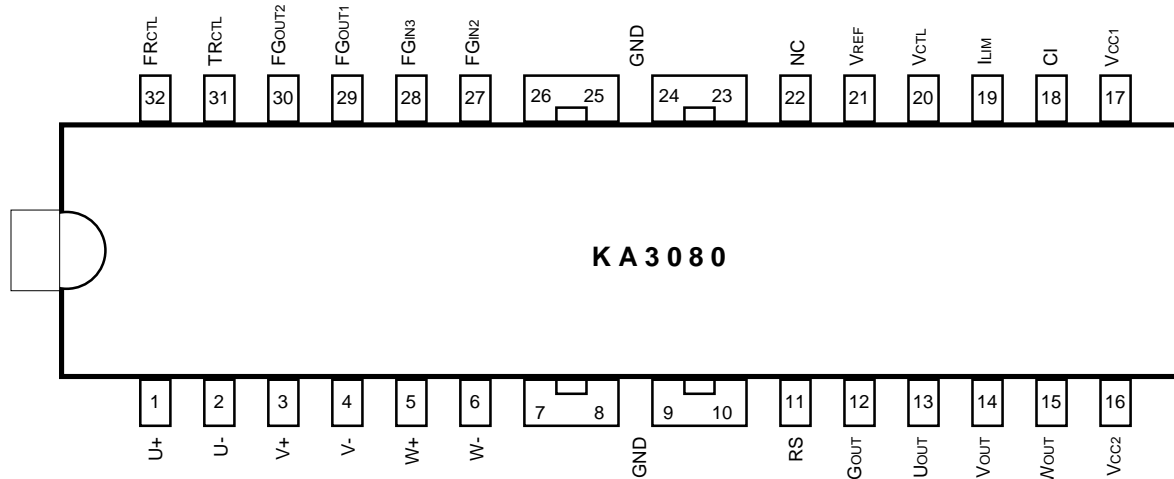
BLOCK DIAGRAM(32SDIPH)



BLOCK DIAGRAM(28SSOPH)



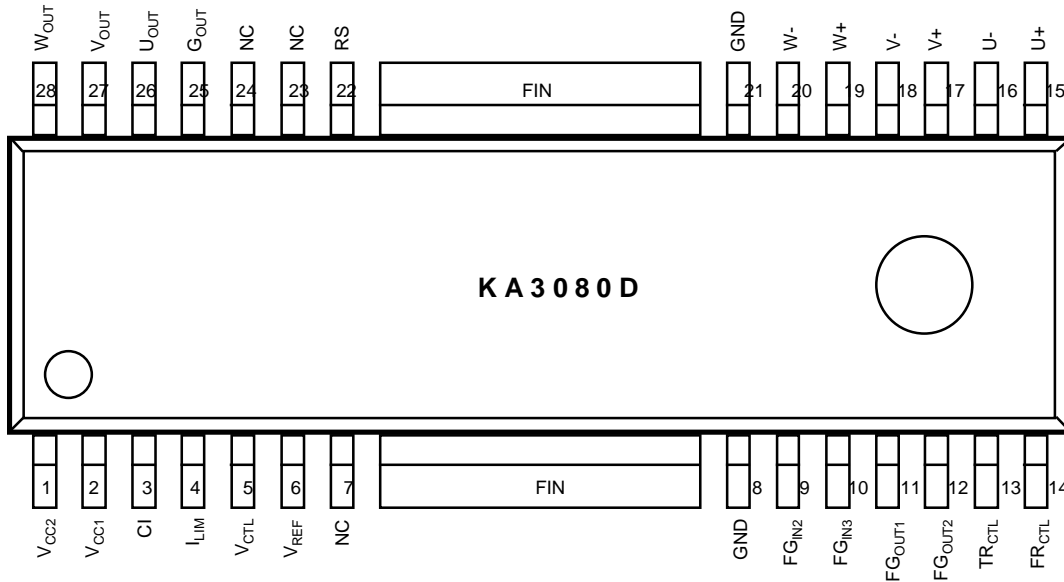
PIN CONFIGURATIONS(32SDIPH)



PIN DESCRIPTIONS(32SDIPH)

Pin no.	Symbol	I/O	Description	Pin no.	Symbol	I/O	Description
1	U +	I	U + hall signal input	17	VCC1	-	Supply voltsge(signal)
2	U –	I	U – hall signal input	18	CI	-	Phase stabilization
3	V +	I	V + hall signal input	19	ILIM	I	Current limitation
4	V –	I	V – hall signal input	20	VCTL	I	Voltage control
5	W +	I	W + hall signal input	21	VREF	I	Voltage control reference
6	W –	I	W – hall signal input	22	NC	-	No Connection
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	FGIN2	I	FG AMP input1
12	GOUT	-	Ground(power)	28	FGIN3	I	FG AMP input2
13	UOUT	O	U out	29	FGOUT1	O	FG AMP output
14	VOUT	O	V out	30	FGOUT2	O	FG COMP output
15	WOUT	O	W out	31	TRCTL	I	Torque ripple control
16	VCC2	-	Supply voltsge(power)	32	FRCTL	I	Forward & reverse control

PIN CONFIGURATIONS(28SSOPH)



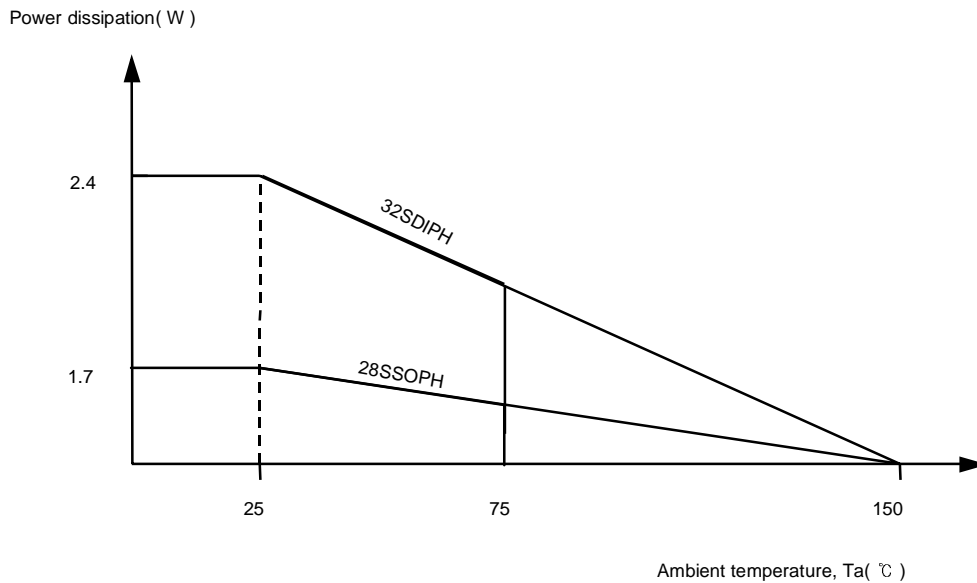
PIN DESCRIPTIONS(28SSOPH)

Pin no.	Symbol	I/O	Description	Pin no.	Symbol	I/O	Description
1	VCC2	-	Supply voltsge(power)	15	U+	I	U + hall signal input
2	VCC1	-	Supply voltsge(signal)	16	U-	I	U – hall signal input
3	CI	-	Phase stabilization	17	V+	I	V + hall signal input
4	ILIM	I	Current limitation	18	V-	I	V – hall signal input
5	VCTL	I	Voltage control	19	W+	I	W + hall signal input
6	VREF	I	Voltage control reference	20	W-	I	W – hall signal input
7	NC	-	No Connection	21	GND	-	Ground(signal)
8	GND	-	Ground(signal)	22	RS	O	Output current detection
9	FGIN2	I	FG AMP input1	23	NC	-	No Connection
10	FGIN3	I	FG AMP input2	24	NC	-	No Connection
11	FGOUT1	O	FG AMP output	25	GOUT	-	Ground(power)
12	FGOUT2	O	FG COMP output	26	UOUT	O	U out
13	TRCTL	I	Torque ripple control	27	VOUT	O	V out
14	FRCTL	I	Forward & reverse control	28	WOUT	O	W out

ABSOLUTE MAXIMUM RATINGS(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	V _{CC1} = 5V, V _{CC2} = 16V
Power dissipation	P _D	2.4	W	32SDIPH
		1.7	W	28SSOPH
Junction temperature	T _J	150	℃	V _{CC1} = 5V, V _{CC2} = 16V
Operating temperature	T _{OPR}	- 20 ~ + 75	℃	
Storage temperature	T _{STG}	- 40 ~ + 125	℃	

POWER DISSIPATION CURVE



ELECTRICAL CHARACTERISTICS

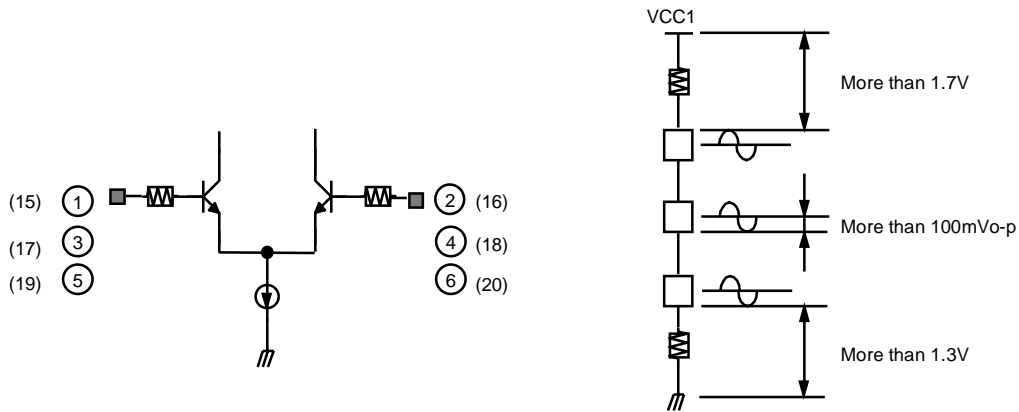
(VCC1=5V, VCC2=16V, RS=0.5ohm , Ta = 25°C , unless otherwisw specified)

Block	Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit	
TOTAL	Quiescent Input Current(1)	Icc1	VCC1=5V, VFR=5V	5.0	8.5	12.0	mA	
	Quiescent Input Current(3)	Icc3	VCC1=7V, VFR=5V	6.0	10.0	15.0	mA	
	Quiescent Input Current	Io1	VCC2=16V, VLIM=0V	--	1.5	5.0	mA	
	Quiescent Input Current(MAX.)	Io1	VCC2=27V, VLIM=VREF	--	2.7	7.0	mA	
OUTPUT	Current Limit Level	GML1	RS=0.5Ω	32SDIPH	0.61	0.67	0.73	A/V
			28SSOPH	0.46	0.52	0.58		
	Control Gain	GM1	VIN=0V	32SDIPH	0.9	1.0	1.1	A/V
				28SSOPH	0.7	0.8	0.9	
	Output AMP. Saturation Voltage4 (Outflow Current)	Vsu4	IOUT=0.8A/phase	--	1.8	2.0	V	
	Output AMP. Saturation Voltage4 (Inflow Current)	VSD4	IOUT=0.8A/phase	--	1.8	2.0	V	
	Limit Current Gap of Phases	LD1	LIVU2-LIWU2	-5	0	5	mA	
	Current Gap of Phases	D1	IVU1-IWU1	-5	0	5	mA	
Phase Output Wave Frequency(1)	PF1	15KHz, 5Vp-p	2.45	2.5	2.55	KHz		
Phase Output Wave Frequency(4)	PF4	10KHz, 5Vp-p	1.62	1.67	1.72	KHz		
CONTROL	Current Limit Input Current	I19	--	--	350	2000	nA	
	Control Input Current	I20	--	--	350	2000	nA	
	Input Offset Voltage U	V02U	--	-50	0	50	mV	
ROTATION CONTROL	CW Voltage Range	VFRU	--	1.0	1.3	1.6	V	
FG. AMP. & COMP.	FG. AMP. Input DC Voltage	V28(10)	32SDIPH(28SSOPH)	2.2	2.5	2.8	V	
	FG. AMP. Reference Voltage	V27(9)	32SDIPH(28SSOPH)	2.2	2.5	2.8	V	
	FG. AMP. Voltage Gain	FGAV1	FGIN3=10KHz, 60mVp-p	28	31	34	Times	
	FG. COMP. Output Frequency	FCOMP	FGAMPo=3Vp-p(1KHz)	0.9	1	1.1	KHz	
	FG. COMP. Downward Input Threshold Voltage	VTHDW	FGAMPo=3→2 Sweep	2.40	2.45	2.50	V	
	FG. COMP. Upware Input Threshold Voltage	VTHUP	FGAMPo=2→3 Sweep	2.50	2.55	2.60	V	
	FG. COMP. Hysteresis	VHYS	--	20	100	180	mV	
	FG. Output High Voltage	FGHI	FGIN3=3V	4.2	--	--	V	
	FG. Output Low Voltage	FGLO	FGIN3=2V	--	--	0.4	V	

APPLICATION INFORMATION (32SDIPH : (#) , 28SSOPH : (#))

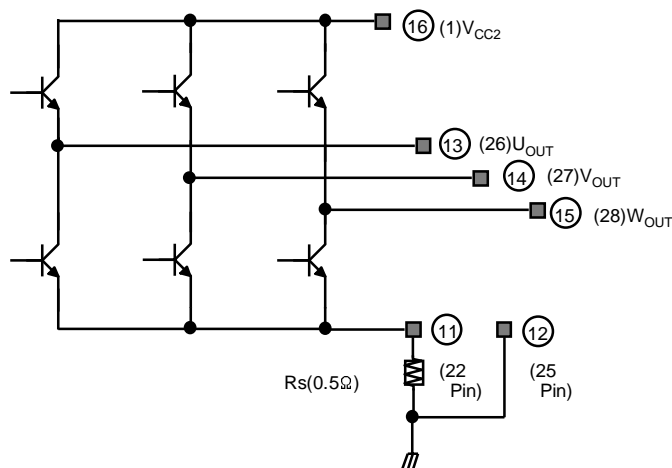
1. HALL INPUT

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~VCC1-0.8V.



2. OUTPUT CURRENT DETECTION

The Rs(Output Current Sencing) 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. The GOUT(Power Ground) is connected to the circuit with the ground side or Rs.

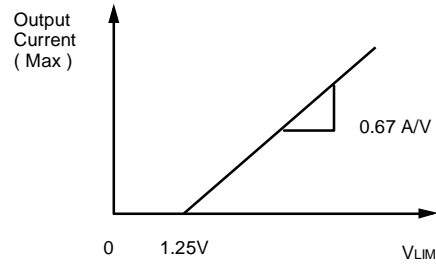
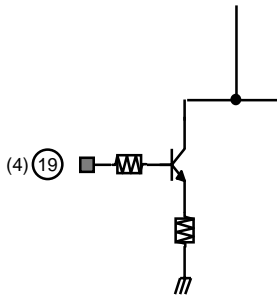


3. MOTOR SPEED CONTROL (INPUT CURRENT LIMITATION)

The maximum output current is limited by the LIM(Current Limiting) 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 VCC1.

$$GM = \Delta I_o / \Delta V_{LIM} = (I_{o2} - I_{o1}) / (V_{LIM2} - V_{LIM1}), \text{ where } V_{LIM1} = 1.45V \Rightarrow \text{Output current} = I_{o1}$$

$$V_{LIM2} = 1.55V \Rightarrow \text{Output current} = I_{o2}$$

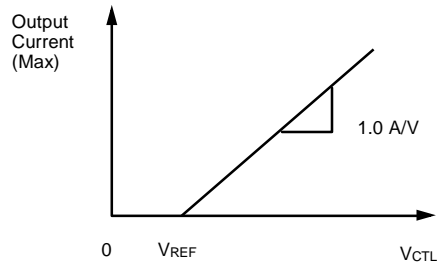
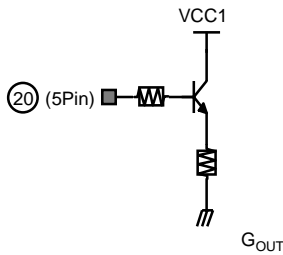


4. MOTOR SPEED CONTROL (INPUT VOLTAGE CONTROL)

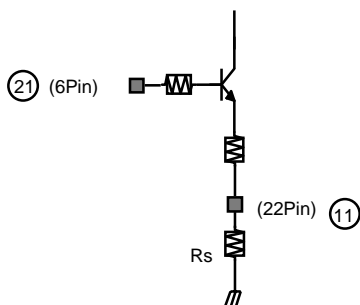
The control of motor speed is possible on the conditions of $V_{CTL} \geq V_{REF}$.
 The control gain is approx. 1.0 A/V as follows.

$$GM = \Delta I_o / \Delta V_{CTL} = (I_{o2} - I_{o1}) / (V_{CTL2} - V_{CTL1}), \text{ where } V_{REF} = 2.5V, V_{CTL1} = 2.6V \Rightarrow \text{Output current} = I_{o1}$$

$$V_{REF} = 2.5V, V_{CTL2} = 2.7V \Rightarrow \text{Output current} = I_{o2}$$

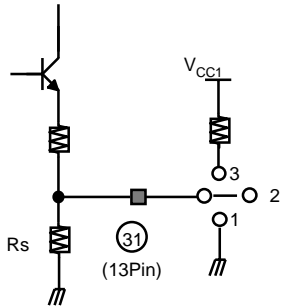


5. VOLTAGE CONTROL REFERENCE



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

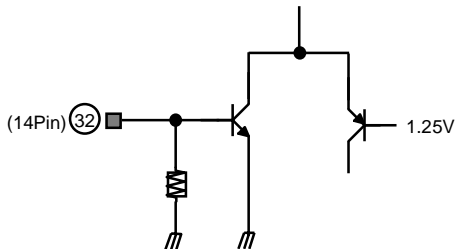
6. TORQUE RIPPLE CONTROL



The motor torque ripple is controlled by the TRCTL (Torque Ripple Control) voltage as follows.

- 1 : GND
- 2 : Normal mode
- 3 : Control mode

7. FORWARD & REVERSE ROTATION CONTROL

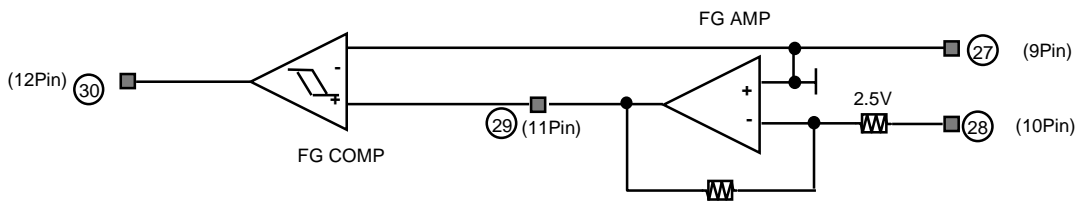


Forward mode : $V_{FRCTL} \geq 1.8V$

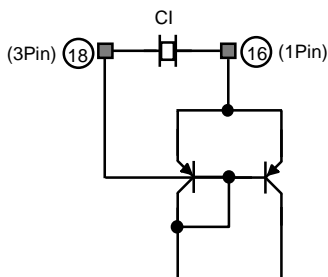
Reverse mode : $V_{FRCTL} \leq 0.8V$

8. FG AMP

FG AMP is the inversion type. FG AMP is built in both the reference voltage(approx. 2.5V) and the gain setting resistors. The FG COMP generates a square waveforms.

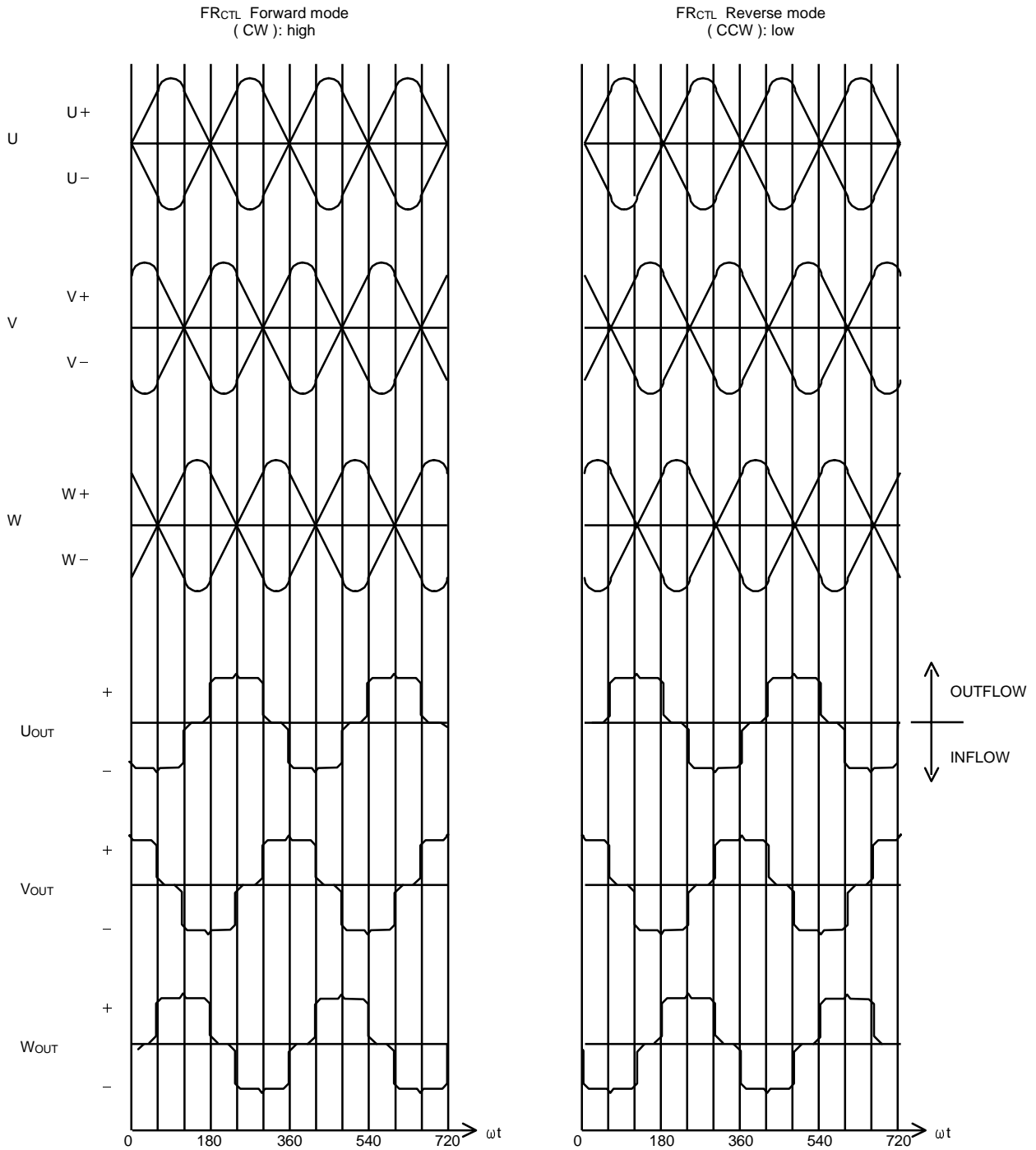


9. PHASE STABILIZATION

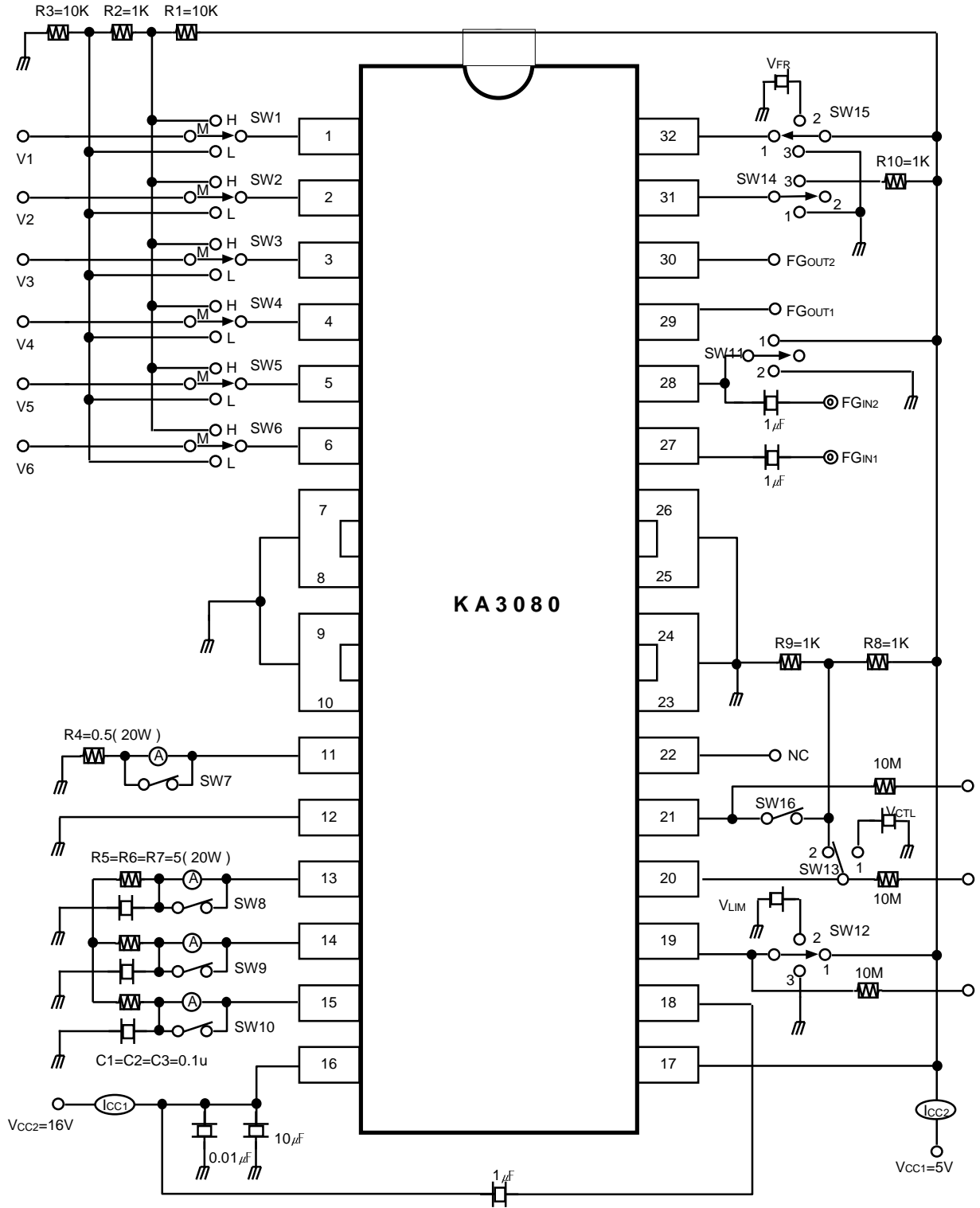


Be inserted a capacitor between Vcc2. This capacitor, approx. $0.1 \mu F$ is for the phase stabilization of the circuit.

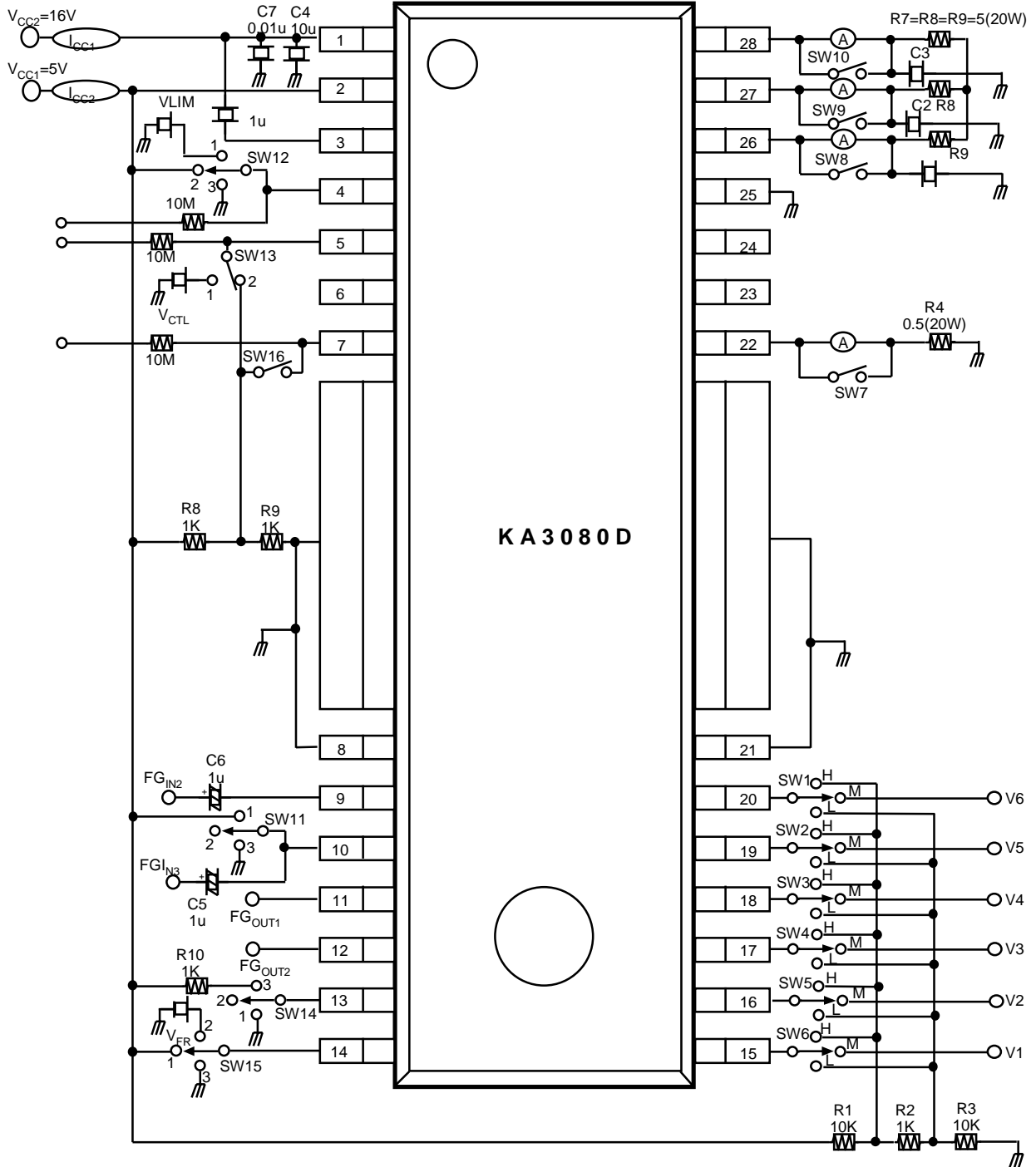
TIMMING CHART



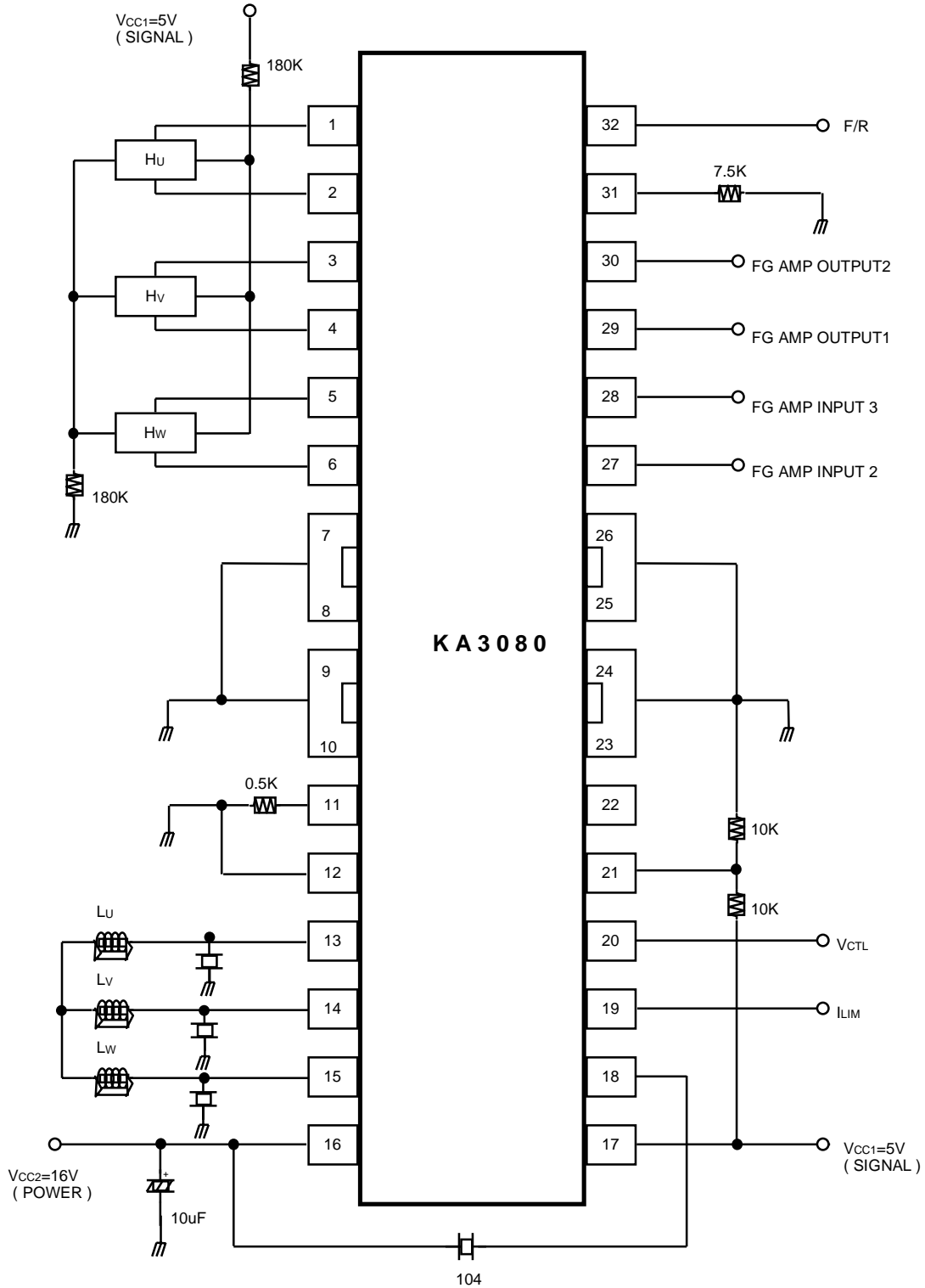
TEST CIRCUITS(32SDIPH)



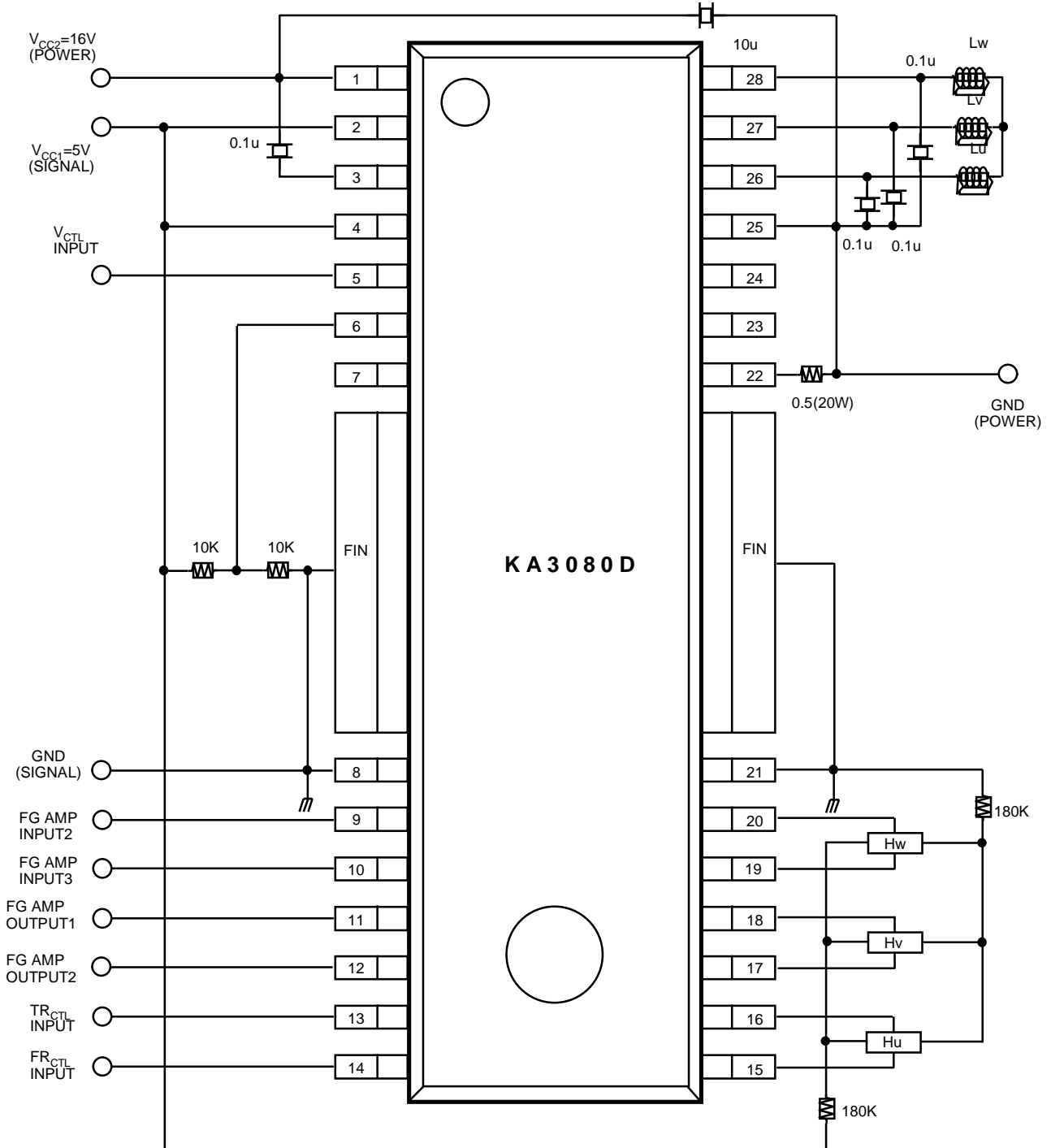
TEST CIRCUITS(28SSOPH)



TYPICAL APPLICATIONS(32SDIPH)

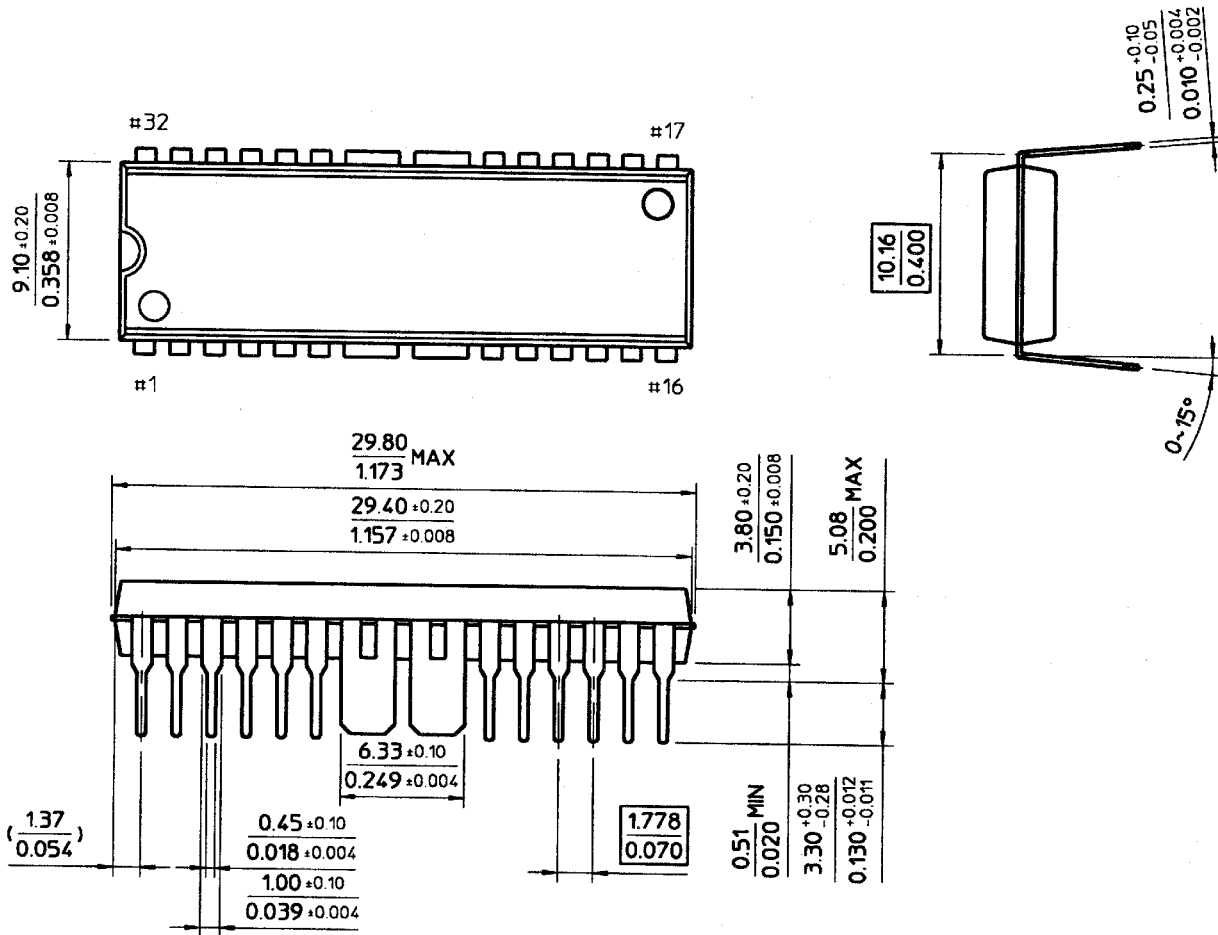


TYPICAL APPLICATIONS(28SSOPH)



PACKAGE DIMENSIONS (Unit : mm)

32-SDIPH-400



PACKAGE DIMENSIONS (Unit : mm)

28-SSOPH-375

