



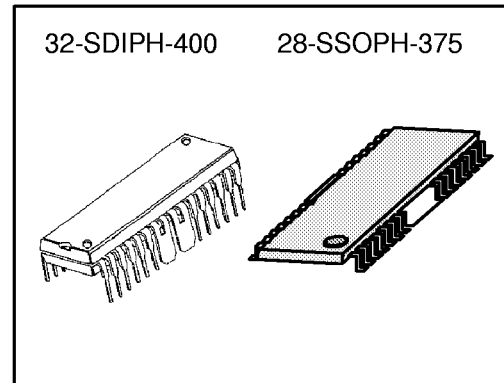
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*PRELIMINARY*

**KA3080**  
**DATA SHEET**  
**&**  
**APPLICATION NOTES**

**3-PHASE CAPSTAN MOTOR DRIVER**

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

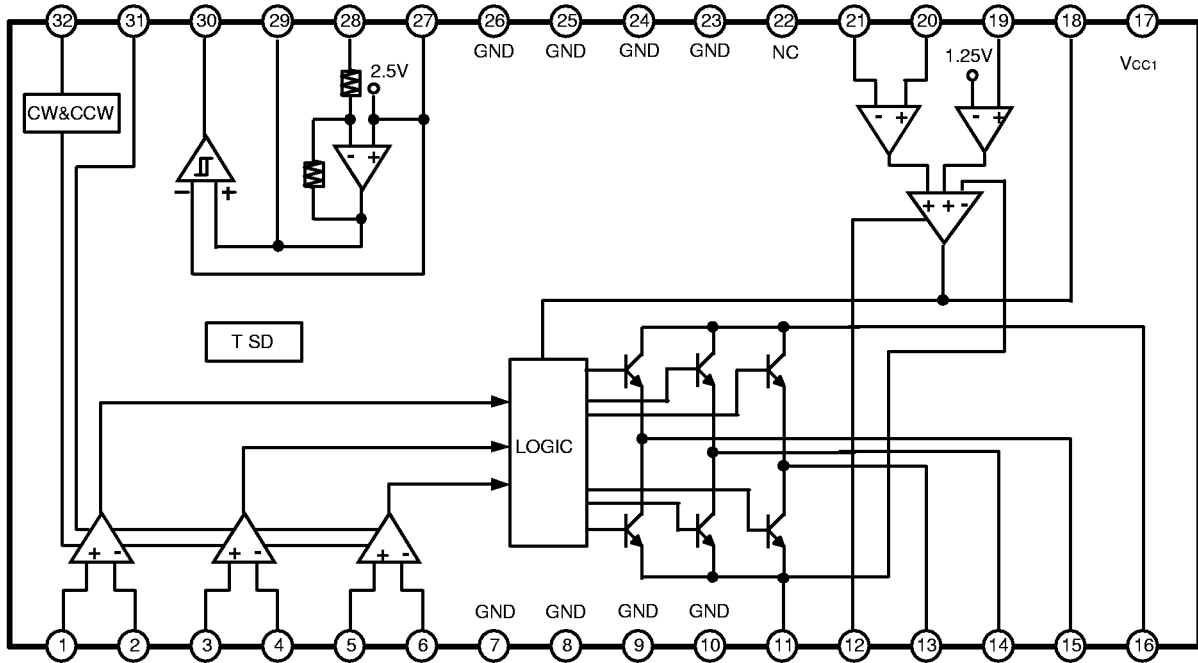
**FEATURES**

- 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

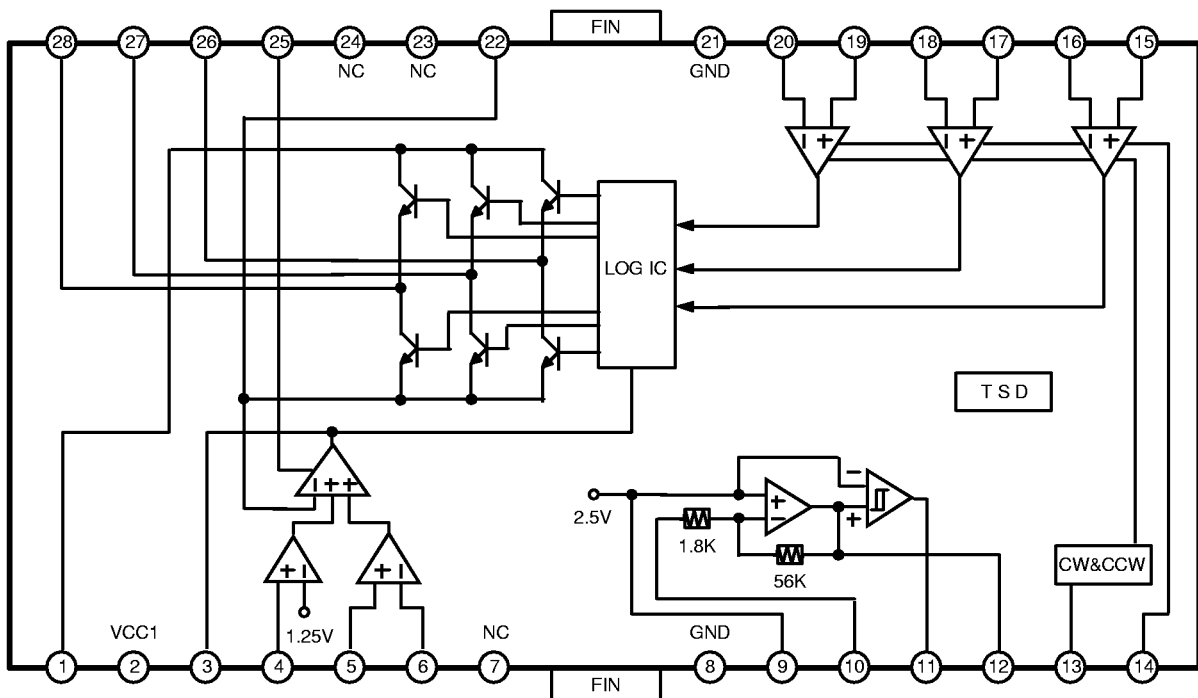
**ORDERING INFORMATION**

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

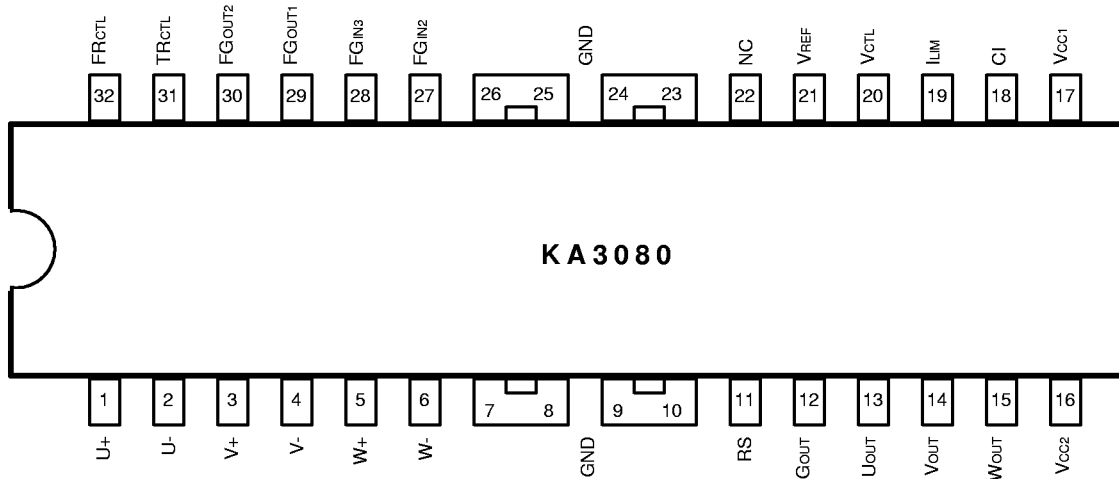
BLOCK DIAGRAM( 32SDIPH )



BLOCK DIAGRAM( 28SSOPH )



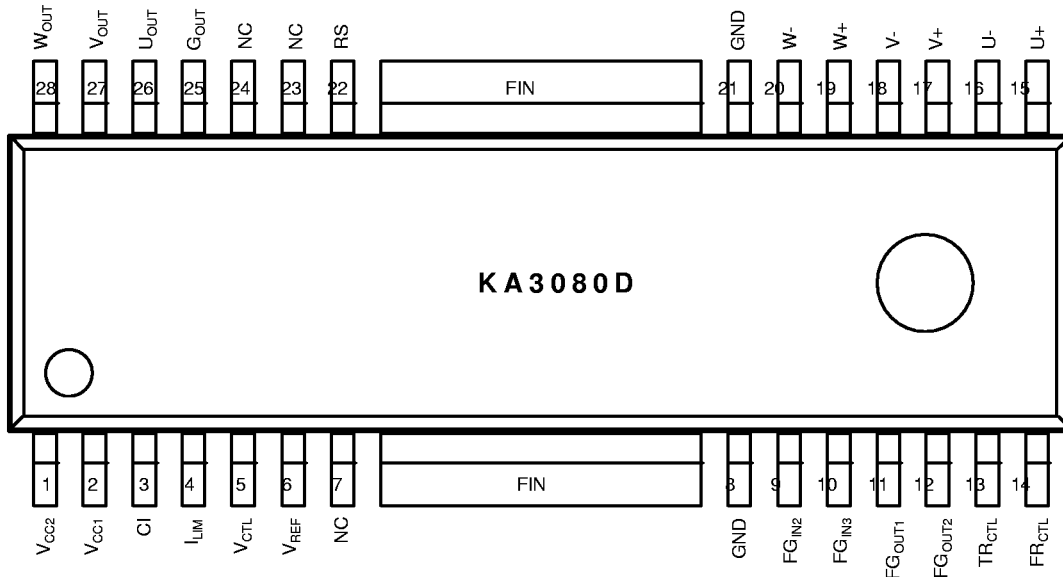
**PIN CONFIGURATIONS( 32SDIPH )**



**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 )**



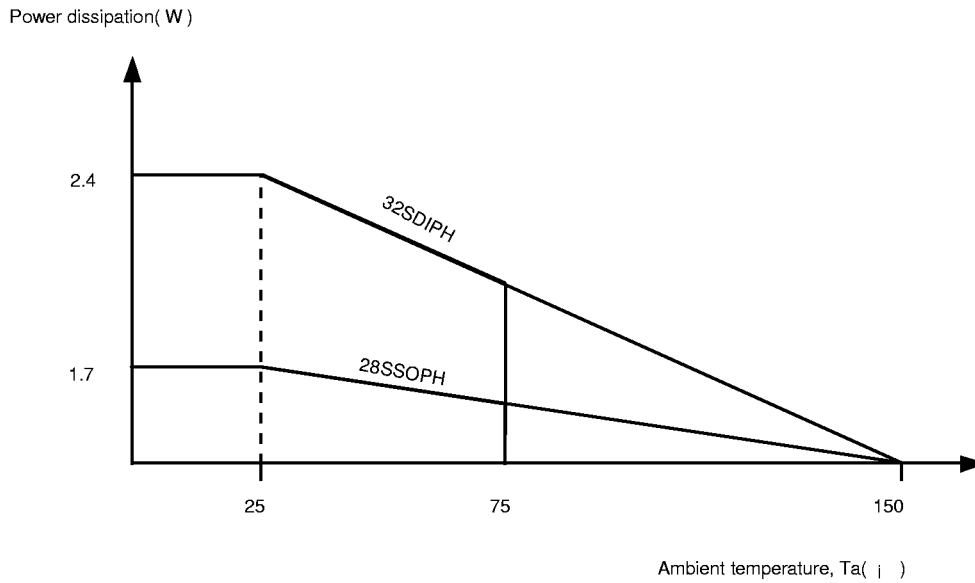
**PIN DESCRIPTIONS( 28SSOPH )**

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 = 25j )

Characteristics	Symbol	Value	Unit	Remark
Supply voltage( Signal )	V <sub>CC1</sub>	7	V	
Supply voltage( Power )	V <sub>CC2</sub>	28	V	
Output current	I <sub>OUT</sub>	1.5	A/phase	V <sub>CC1</sub> = 5V, V <sub>CC2</sub> = 16V
Power dissipation	P <sub>D</sub>	2.4	W	32SDIPH
		1.7	W	28SSOPH
Junction temperature	T <sub>J</sub>	150	j	V <sub>CC1</sub> = 5V, V <sub>CC2</sub> = 16V
Operating temperature	T <sub>OPR</sub>	- 20 ~ + 175	j	
Storage temperature	T <sub>STG</sub>	- 40 ~ + 125	j	

**POWER DISSIPATION CURVE**



**ELECTRICAL CHARACTERISTICS**

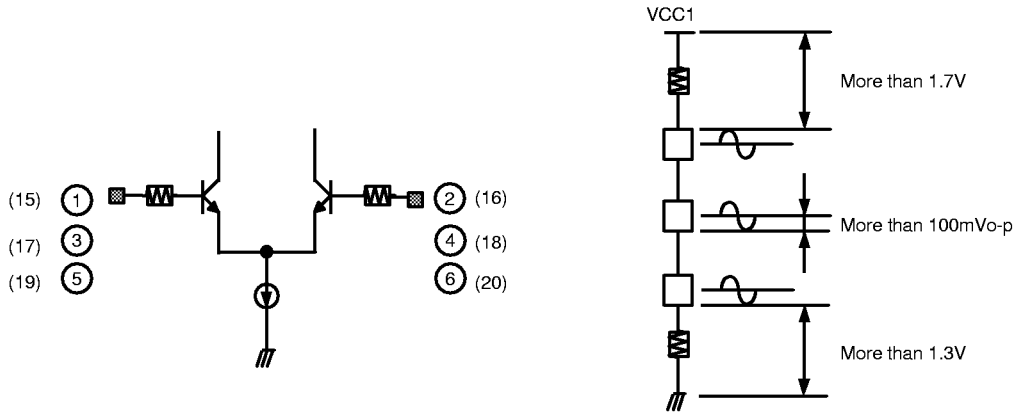
( Vcc1=5V, Vcc2=16V, Rs=0.5ohm , Ta = 25j , unless otherwisw specified )

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,V LIM=0V	--	1.5	5.0	mA
	Quiescent Input Current( MAX. )	Io1	VCC2=27V,V LIM=VREF	--	2.7	7.0	mA
OUTPUT	Current Limit Level	GML1	Rs=0.5 $\Omega$	0.61	0.67	0.73	A/V
	Control Gain	GM1	VIN=0V	0.9	1.0	1.1	A/V
	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	--	2.2	2.5	2.8	V
	FG. AMP. Reference Voltage	V27	--	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=3j 2 Sweep	2.35	2.45	2.50	V
	FG. COMP. Upware Input Threshold Voltage	VTHUP	FGAMPO=2j 3 Sweep	2.50	2.55	2.55	V
	FG. COMP. Hysteresis	VHYS	--	20	100	180	mV
	FG. Output High Voltage	FGHI	FGIN3=2V	4.2	--	--	V
	FG. Output Low Voltage	FGLO	FGIN3=3V	--	--	0.4	V

APPLICATION INFORMATION ( 32SDIPH :  $\odot$ , 28SSOPH : ( # ) )

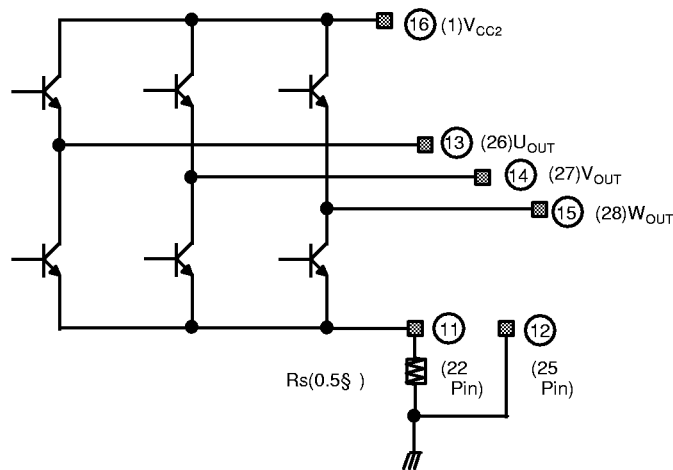
1. HALL INPUT

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~V<sub>CC1</sub>-0.8V.



2. OUTPUT CURRENT DETECTION

The R<sub>s</sub>( Output Current Sensing ) is usually connected with R<sub>s</sub>( approx. 0.5 $\Omega$  ), and the motor current is converted to a voltage by the R<sub>s</sub> and provided to a feedback amplifier. The G<sub>OUT</sub>( Power Ground ) is connected to the circuit with the ground side or R<sub>s</sub>.



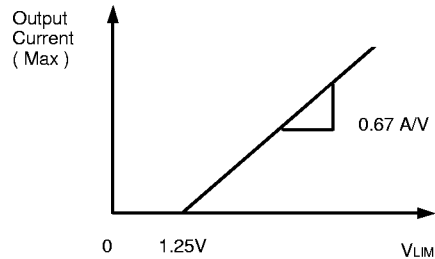
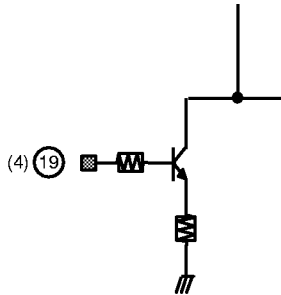


3. MOTOR SPEED CONTROL ( INPUT CURRENT LIMITATION )

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.

$$GM_L = i_{o1} / i_{o2} \quad V_{LIM} = ( i_{o2} - i_{o1} ) / ( V_{LIM2} - V_{LIM1} ), \text{ where } V_{LIM1} = 1.45V \Rightarrow \text{Output current} = i_{o1}$$

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

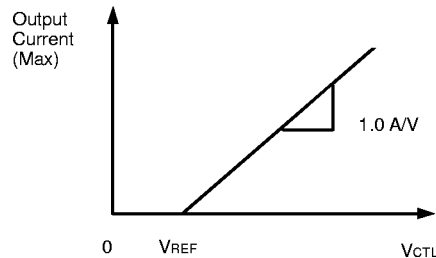
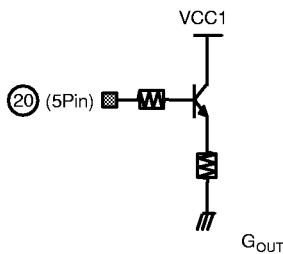


4. MOTOR SPEED CONTROL (INPUT VOLTAGE CONTROL)

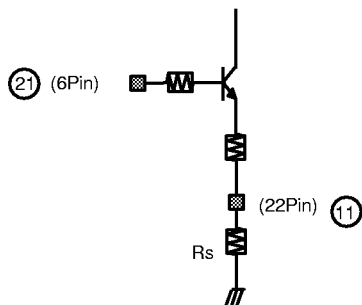
The control of motor speed is possible on the conditions of  $V_{CTLj} \setminus V_{REF}$ .  
The control gain is approx. 1.0 A/V as follows.

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

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

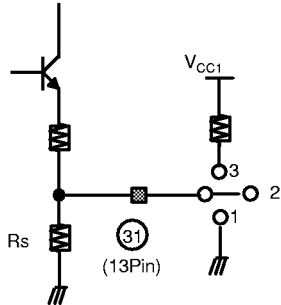


5. VOLTAGE CONTROL REFERENCE



The input voltage range is  $2V_j \setminus V_{REFj} \setminus ( V_{CC1} - 2V )$ .

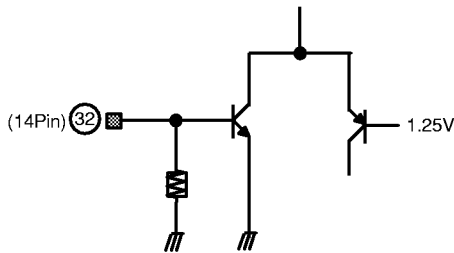
6. TORQUE RIPPLE CONTROL



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

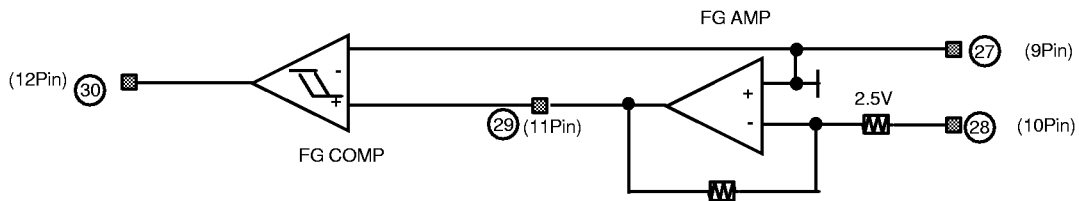


Forward mode :  $V_{FRCTLj} \sim 1.8V$

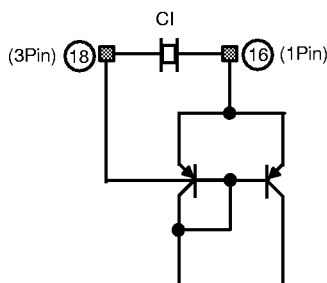
Reverse mode :  $V_{FRCTLj} \sim 0.8V$

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.

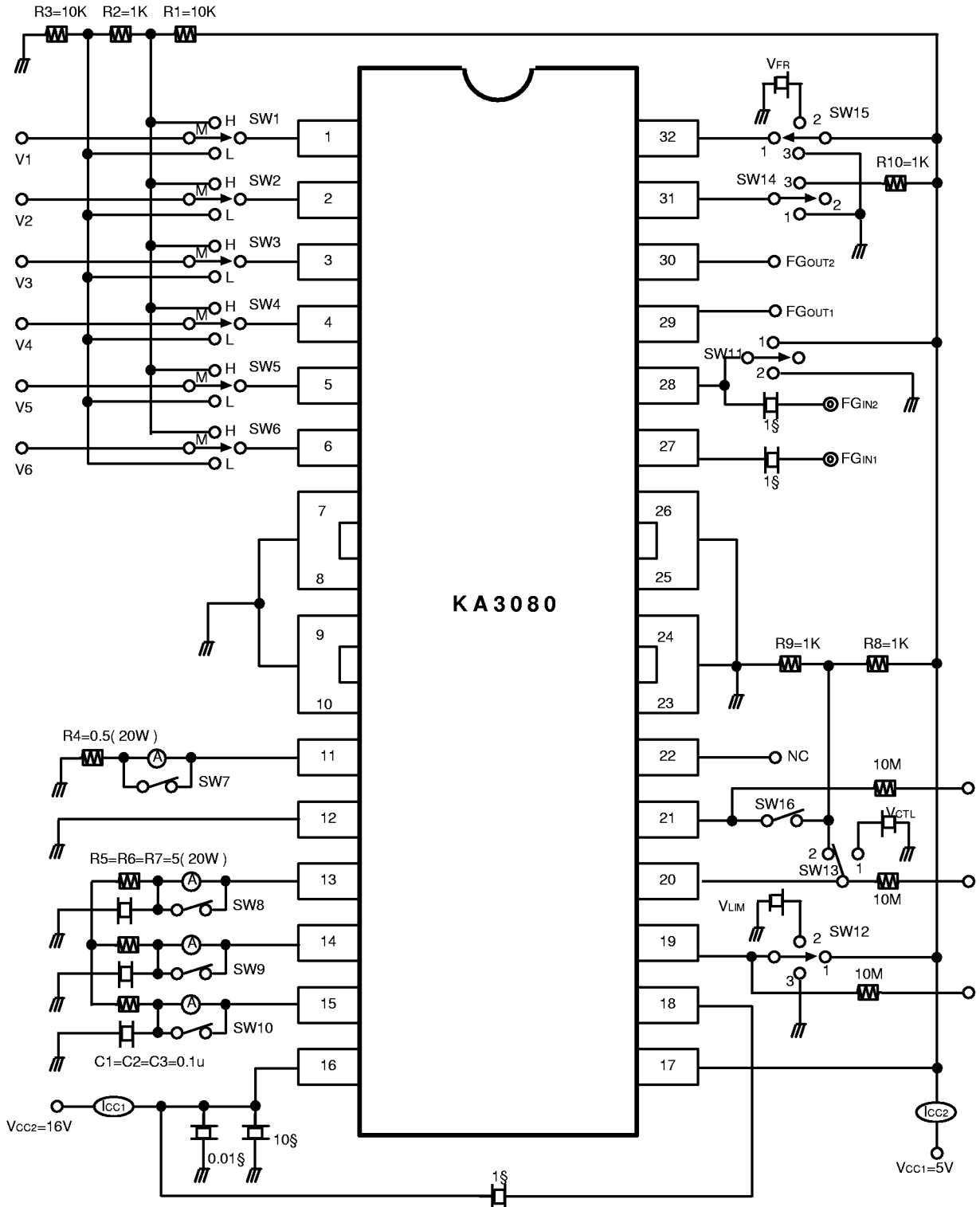


9. PHASE STABILIZATION

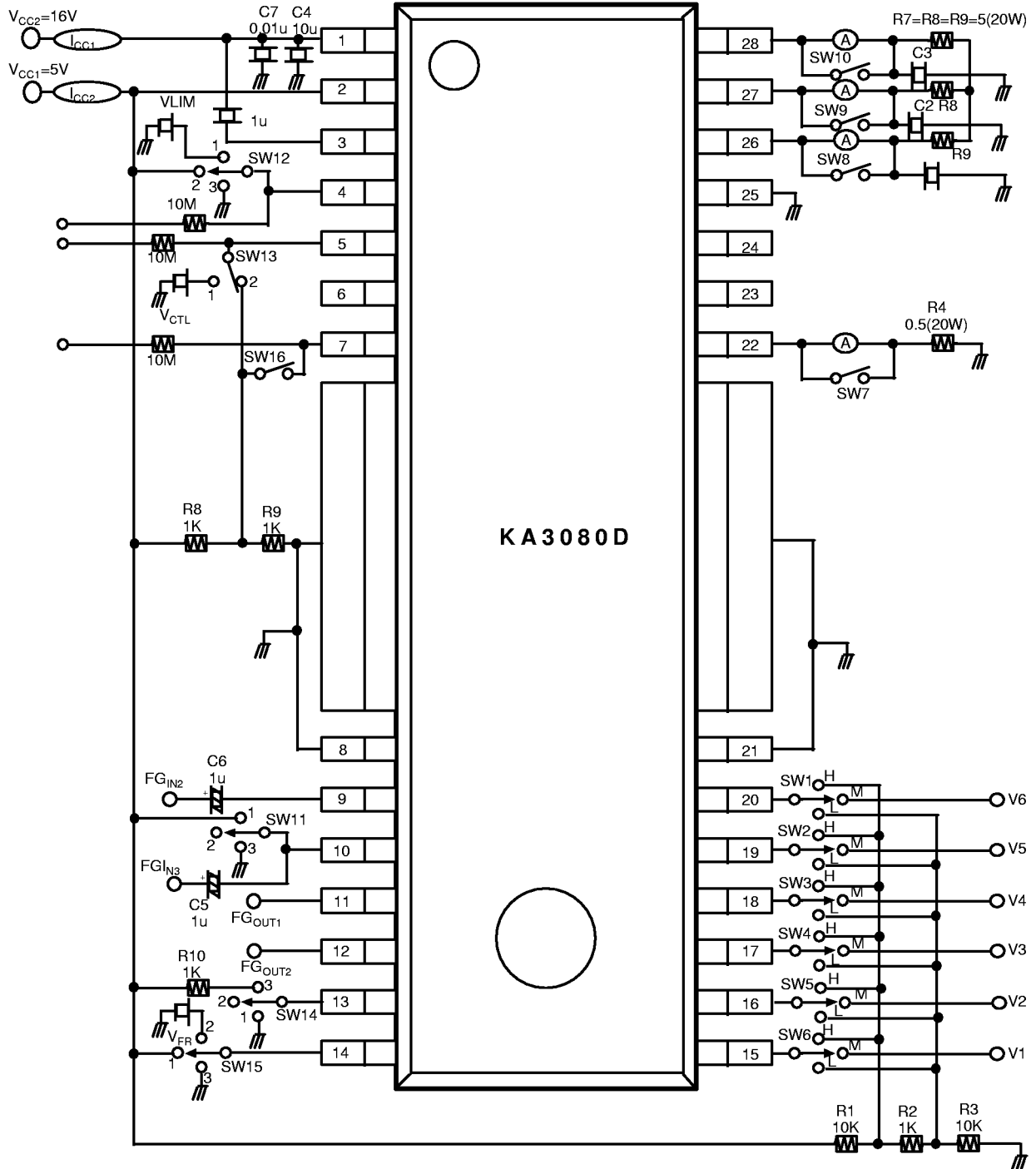


Be inserted a capacitor between Vcc2. This capacitor, approx. 0.1 $\mu$  is for the phase stabilization of the circuit.

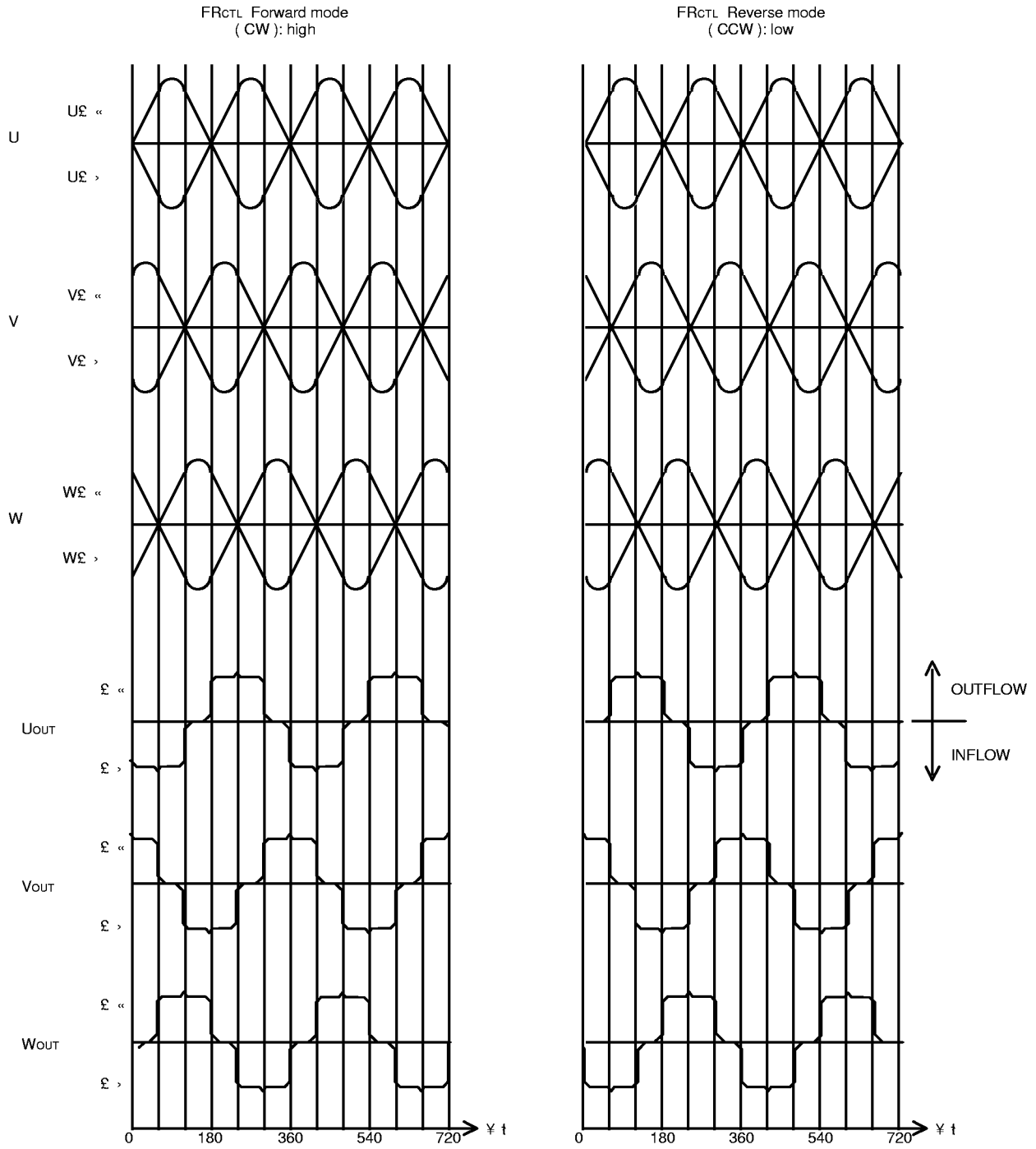
TEST CIRCUITS( 32SDIPH )



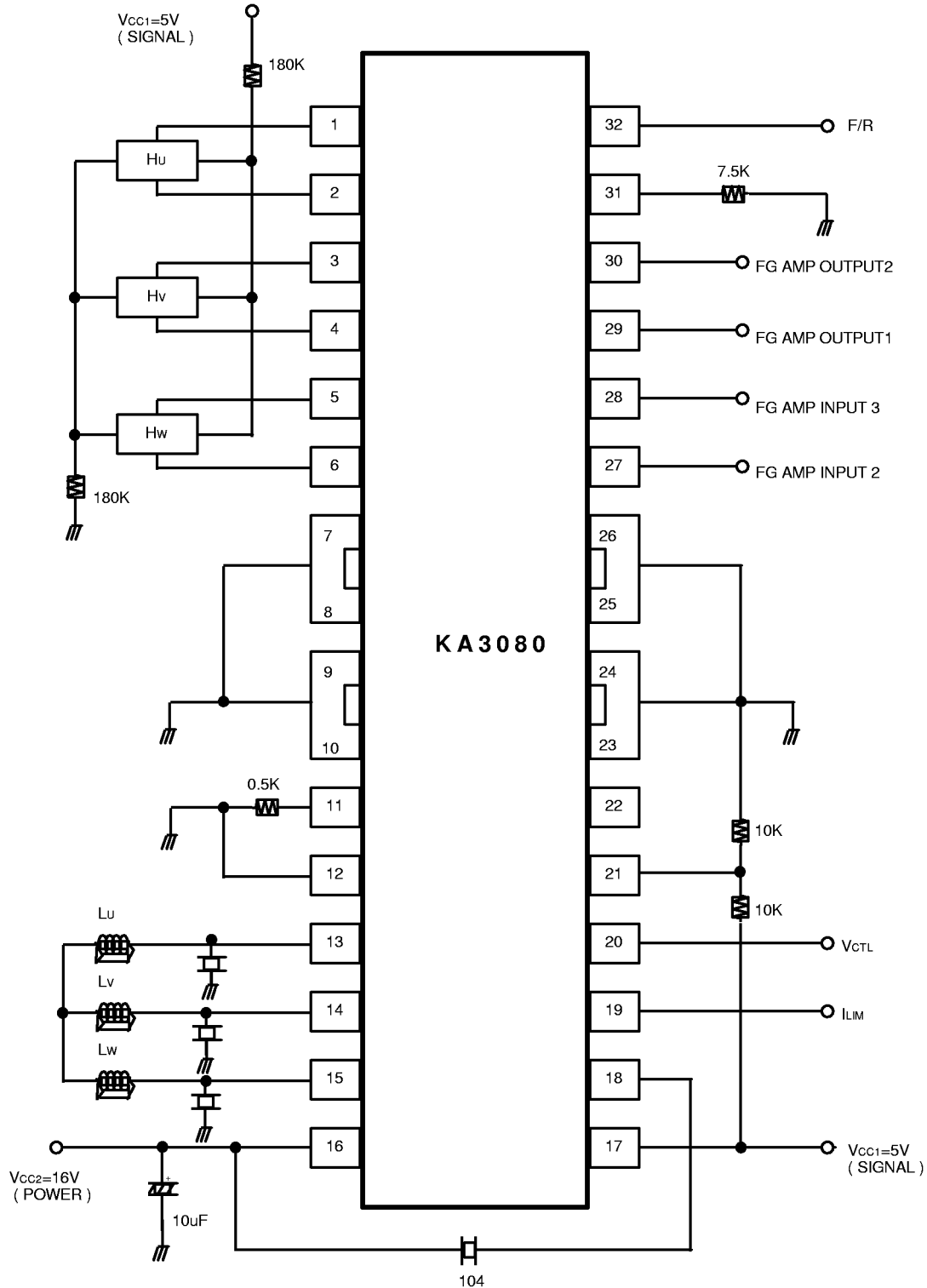
TEST CIRCUITS( 28SSOPH )



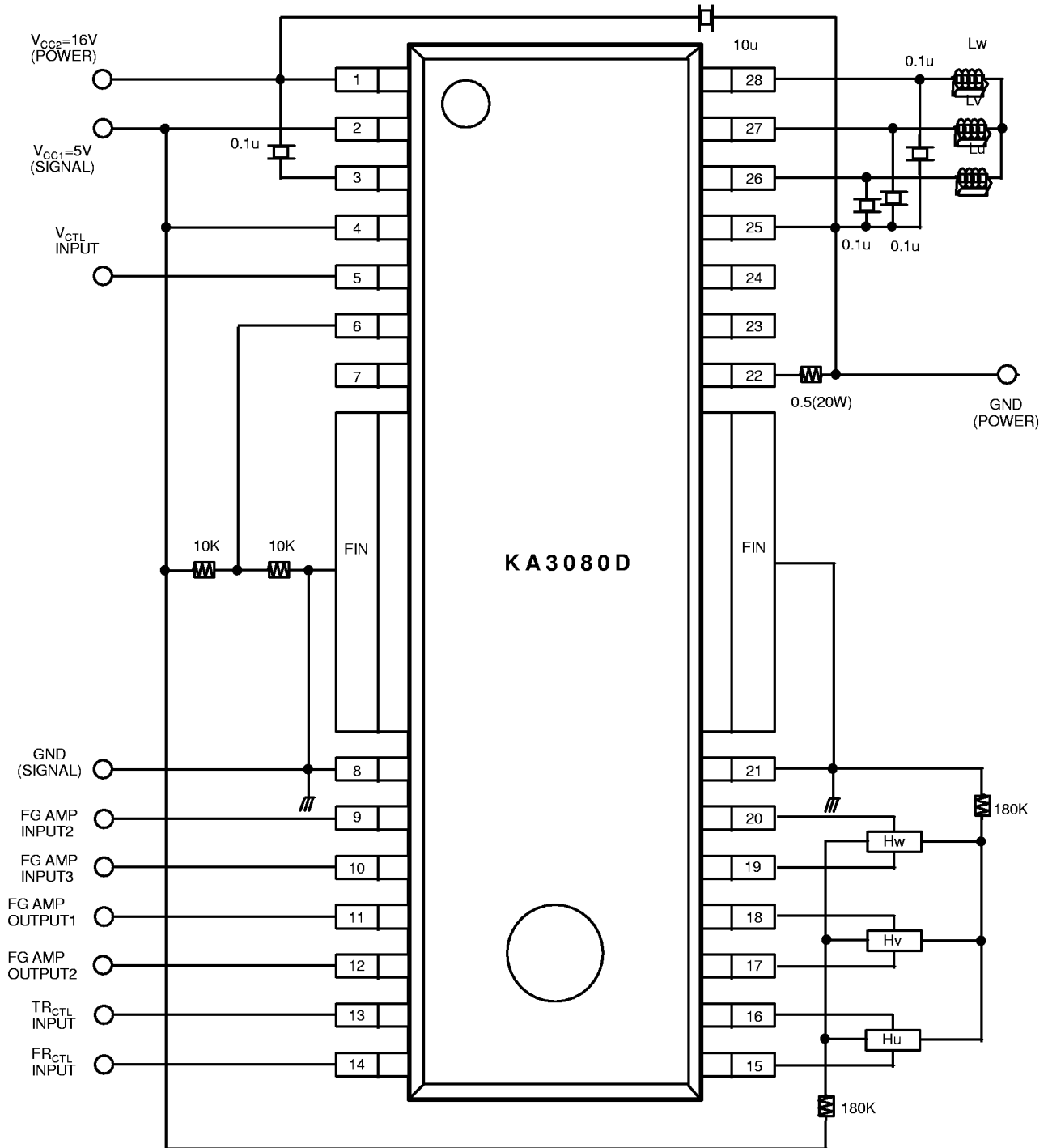
TIMMING CHART



TYPICAL APPLICATIONS( 32SDIPH )

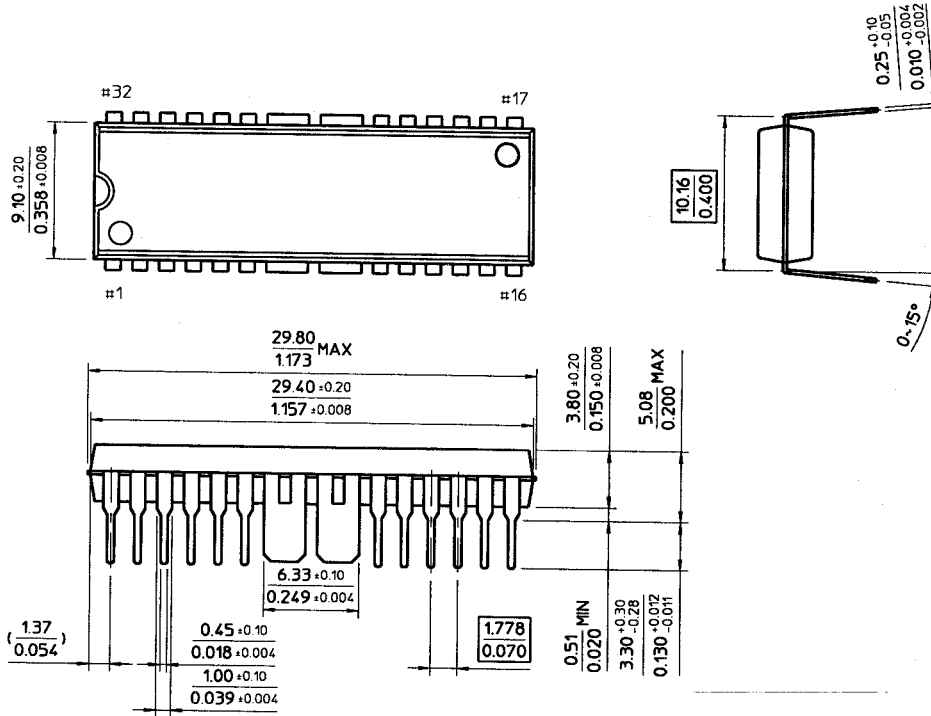


TYPICAL APPLICATIONS( 28SSOPH )



PACKAGE DIMENSIONS (Unit : mm)

(32SDIPH)





PACKAGE DIMENSIONS (Unit : mm)

(28SSOPH)

