

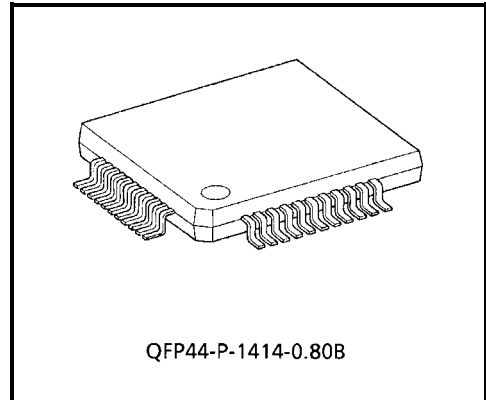
TA8479F

3 PHASE FULL WAVE BRUSHLESS DC MOTOR DRIVER IC FOR VIDEO CAMERA

TA8479F is a capstan / cylinder motor 1-chip driver IC for video camera. Enclosing the capstan and cylinder sections in one package saves space and makes patterning the set board easier.

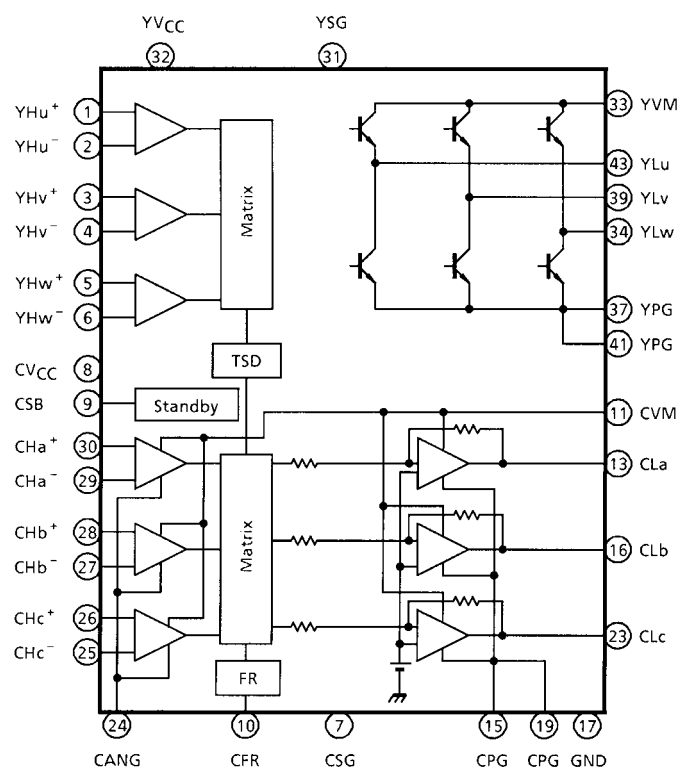
FEATURES

- Capstan / Cylinder Motor Driver in 1 Chip
 - 3 Phase Full Wave Drive~Voltage Control / Voltage Drive Mode
 - Package: QFP44
 - Built-in Thermal Shutdown Circuit
- <Capstan section>
- Soft switching drive
 - Bi-direction drive
 - Built-in standby circuit
- <Cylinder section>
- Hard switching drive
 - One direction drive



Weight : 1.15 g (Typ.)

BLOCK DIAGRAM



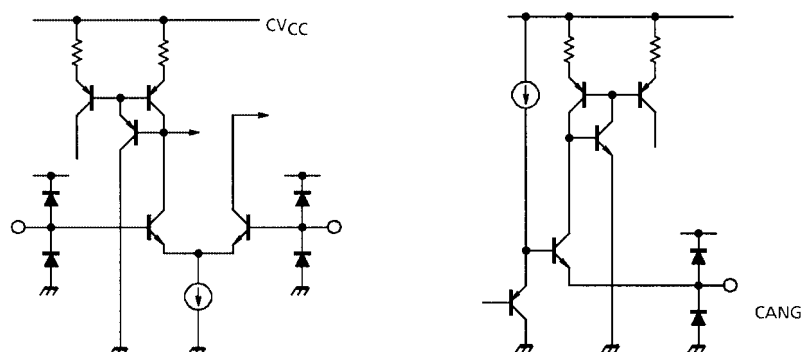
PIN FUNCTION

PIN No.	SYMBOL	FUNCTION	PIN No.	SYMBOL	FUNCTION
1	YHu ⁺	u-phase Hall amp positive input pin	23	CLc	c-phase drive output pin
2	YHu ⁻	u-phase Hall amp negative input pin	24	CANG	Hall amp gain control pin
3	YHv ⁺	v-phase Hall amp positive input pin	25	CHc ⁻	c-phase Hall amp negative input pin
4	YHv ⁻	v-phase Hall amp negative input pin	26	CHc ⁺	c-phase Hall amp positive input pin
5	YHw ⁺	w-phase Hall amp positive input pin	27	CHb ⁻	b-phase Hall amp negative input pin
6	YHw ⁻	w-phase Hall amp negative input pin	28	CHb ⁺	b-phase Hall amp positive input pin
7	CSG	Small signal section GND	29	CHa ⁻	a-phase Hall amp negative input pin
8	CV _{CC}	Small signal supply voltage input pin	30	CHa ⁺	a-phase Hall amp positive input pin
9	CSB	Standby pin	31	YSG	Small signal section GND
10	CFR	Forward / reverse switching pin	32	YV _{CC}	Small signal section supply voltage input pin
11	CV _M	Output section drive voltage input pin	33	YV _M	Output section drive voltage input pin
12	NC		34	YLw	w-phase drive output pin
13	CLa	a-phase drive output pin	35	NC	
14	NC		36	NC	
15	CPG	Output section GND	37	YPG	Output section GND
16	CLb	b-phase drive output pin	38	NC	
17	GND	GND pin	39	YLv	v-phase drive output pin
18	NC		40	NC	
19	CPG	Output section GND	41	YPG	Output section GND
20	NC		42	NC	
21	NC		43	YLu	u-phase drive output pin
22	NC		44	NC	

EXPLANATION OF SECTIONS

<Capstan section>

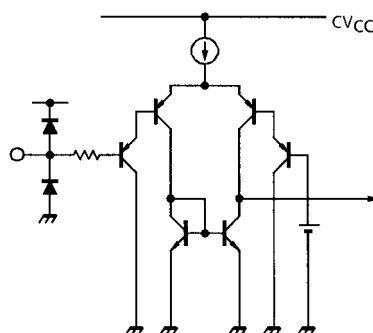
- Hall amp circuit



The Hall amp is a differential amp, and the common-phase input voltage range is $CV_{CMR} = 1.4 \sim 2.8$ [V]. For signals from Hall elements, input sinusoidal waves. Noise, etc. which causes malfunctions when found in signals, must be prevented by a condenser.

Grounding the CANG pin with a resistor makes it possible to change the input / output gains in the Hall amp. Determine the resistance value within 1 k Ω ~several k Ω .

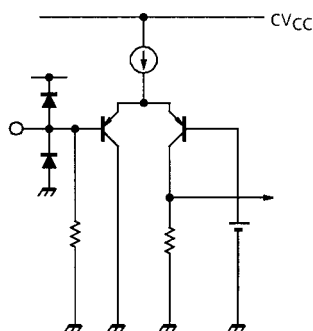
- Standby circuit



A standby state turns off all circuits in the capstan section except for the standby circuit.

H: Start
L: Standby

- FR circuit



H: Reverse rotation
L: Forward rotation

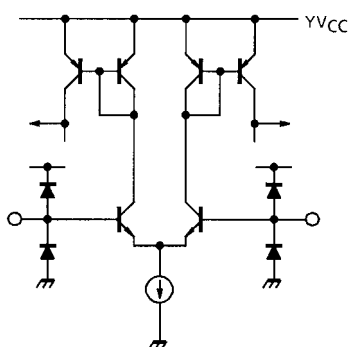
In an open state, the circuit causes the motor to rotate forward.

- Output circuit

This IC uses an amplitude control mode to control output currents by changing output amplitude.

<Cylinder section>

- Hall amp circuit



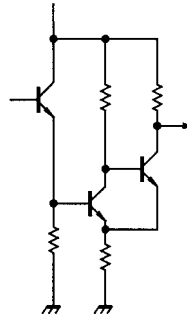
The Hall amp is a differential amp, and the common-phase input voltage range is $V_{CMR} = 1.3 \sim V_{CC} - 1.3$ [V]. For signals from Hall elements, input sinusoidal waves. Noise, etc., which causes malfunction when found in signals, must be prevented by a condenser.

This circuit has a high gain amp at the latter stage, making the input sensitivity as high as about 20 mV_{p-p} (Typ.).

- Output circuit

This circuit uses a hard switching drive mode and controls output currents by changing the emitter-collector voltage of the Pw Tr.

- Thermal shutdown circuit

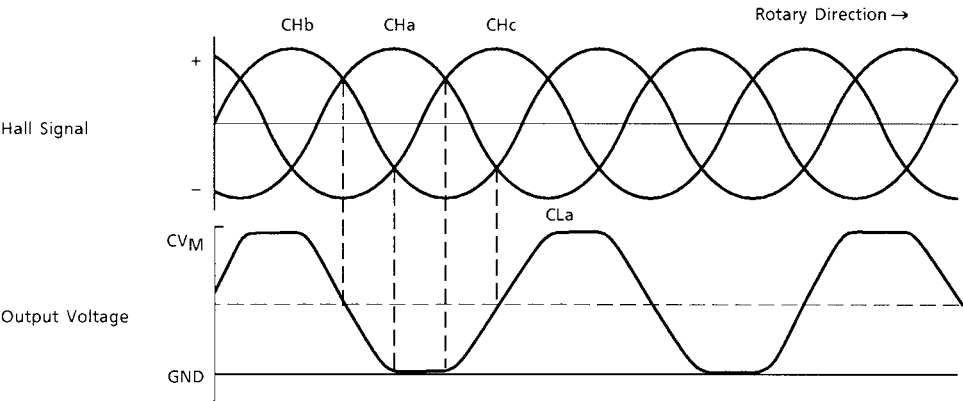


When the temperature exceeds $T_j = 170^{\circ}\text{C}$ (Typ.) (design target value), the output circuits in the capstan and cylinder sections are turned off. This circuit has an approximately 30°C Hysteresis, and the recovery temperature is $T_j = 140^{\circ}\text{C}$ (Typ.) (design target value).

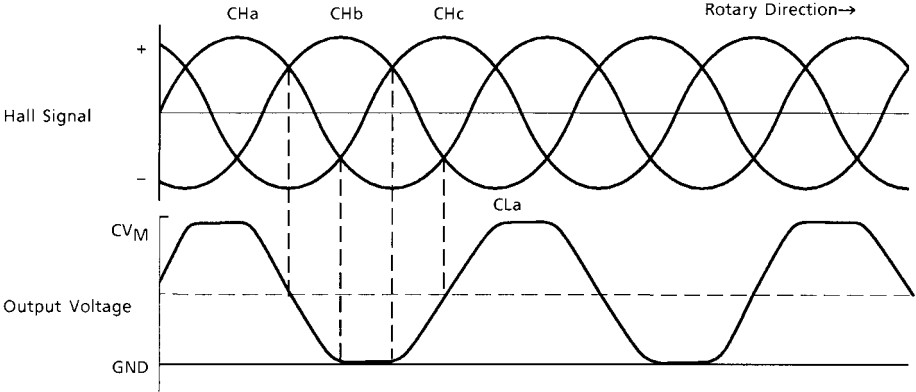
TRUTH TABLE / TIMING CHART
<Capstan section>

CHa	CHb	CHc	CLa	CLb	CLc	
L	H	L	H	L	M	(Forward Rotation) CLa = -(CHa - CHb) CLb = -(CHb - CHc) CLc = -(CHc - CHa) CFR = " L "
H	H	L	M	L	H	
H	L	L	L	M	H	
H	L	H	L	H	M	
L	L	H	M	H	L	
L	H	H	H	M	L	
H	L	L	H	M	L	(Reverse Rotation) CLa = CHa - CHb CLb = CHb - CHc CLc = CHc - CHa CFR = " H "
H	H	L	M	H	L	
L	H	L	L	H	M	
L	H	H	L	M	H	
L	L	H	M	L	H	
H	L	H	H	L	M	

(Forward rotation)

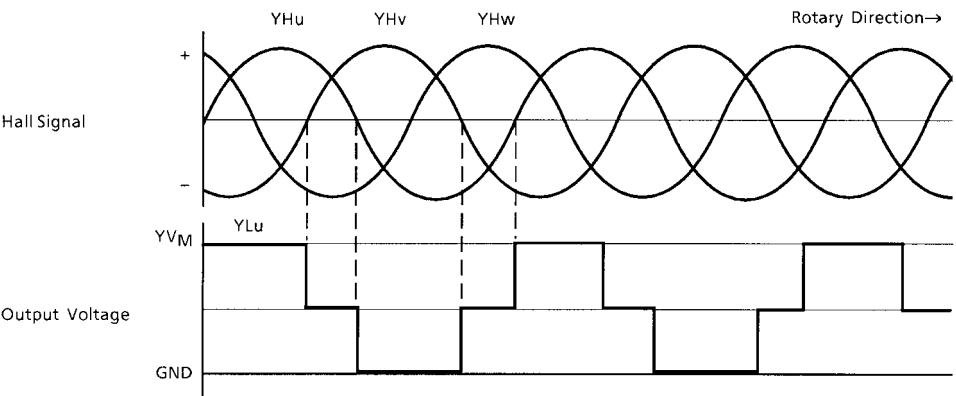


(Reverse rotation)



<Cylinder section>

YHu	YHv	YHw	YLu	YLv	YLw	
H	L	L	H	M	L	$YLu = YHu - YHv$ $YLv = YHv - YHw$ $YLw = YHw - YHu$
H	H	L	M	H	L	
L	H	L	L	H	M	
L	H	H	L	M	H	
L	L	H	M	L	H	
H	L	H	H	L	M	



MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING		UNIT
		CAPSTAN SECTION	CYLINDER SECTION	
Small Signal Section Supply Voltage	V _{CC}	10	10	V
Output Section Supply Voltage	V _M	10	10	V
Output Current	I _O	1.5	1.5	A
Power Dissipation	P _D	1 (Note 1)		W
Operating Temperature	T _{opr}	-20~75		°C
Storage Temperature	T _{stg}	-55~150		°C

Note 1: When mounted on board (100 × 100 × 1.6 mm Cu 24%)

OPERATING SUPPLY VOLTAGE RANGE (Ta = 25°C)
CAPSTAN SECTION

CHARACTERISTIC	SYMBOL	OPERATING RANGE	UNIT
Small Signal Section Supply Voltage	CV _{CC}	4.2~6.0	V
Output Section Supply Voltage	CV _M	2.8~8.0	V

CYLINDER SECTION

CHARACTERISTIC	SYMBOL	OPERATING RANGE	UNIT
Small Signal Section Supply Voltage	YV _{CC}	4.2~6.0	V
Output Section Supply Voltage	YV _M	1.5~8.0	V

ELECTRICAL CHARACTERISTICS
CAPSTAN SECTION ($CV_{CC} = 5.0\text{ V}$, $CV_M = 3\text{ V}$, $T_a = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Supply Current		CI_{CC1}	1	Output open, standby	—	60	80	μA
		CI_{CC2}	1	Output open, start	—	5	8	mA
		CI_{M1}	2	Output open, standby	—	2	5	mA
		CI_{M2}	2	Output open, start	—	7	12	mA
Hall Amp Circuit	Input Current	CI_H	3	$CV_{CMR} = 2.5\text{ V}$	—	—	5	μA
	Common-Phase Voltage Range	CV_{CMR}	4		1.4	—	2.8	V
	Input Sensitivity	CV_H	5	(Note)	20	—	—	mV_{p-p}
	Hall Input Output Voltage Gain	CG_{VHO}	5	$R_{ANGLE} = 6.8\text{ k}\Omega$	20	23	26	dB
Output Circuit	Saturation Voltage (Upper Side+Lower side)	$CV_{sat}(H+L)$	6	$I_O = 0.1\text{ A}$, $CV_M = 3\text{ V}$, $CV_H = 50\text{ mV}_{p-p}$	—	1.3	1.8	V
				$I_O = 1.0\text{ A}$, $CV_M = 5\text{ V}$, $CV_H = 50\text{ mV}_{p-p}$	—	2.3	2.8	
	Quiescent Voltage	CV_{OS}	8		1.05	1.25	1.45	V
	Quiescent Voltage Difference	ΔCV_{OS}	8		—	—	80	mV
Standby Circuit	Input Voltage (H)	CV_{SH}	11	(Start)	3.0	—	CV_{CC}	V
	Input Voltage (L)	CV_{SL}	11	(Stop)	0	—	1.2	V
	Input Current	CI_{INS}	11	$CV_S = 0\text{ V}$	—	—	5	μA
FR Circuit	Input Voltage (H)	CV_{FH}	12	(Reverse rotation)	3.0	—	CV_{CC}	V
	Input Voltage (L)	CV_{FL}	12	(Forward rotation)	0	—	1.2	V
	Input Current	CI_{INF}	12	$CV_F = 5.0\text{ V}$	—	—	70	μA
Thermal Shutdown Circuit Operating Temperature		T_{SD}	—	(Junction temperature)	—	170	—	$^\circ\text{C}$

Note: Defined by output functioning

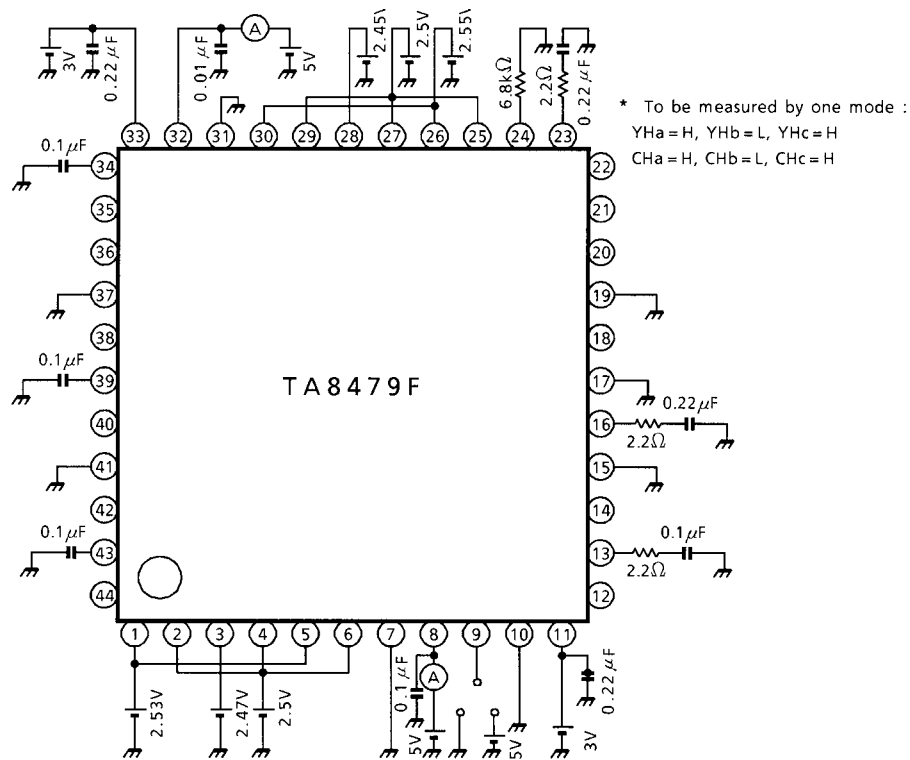
CYLINDER SECTION ($YV_{CC} = 5.0 \text{ V}$, $YV_M = 3 \text{ V}$, $T_a = 25^\circ\text{C}$)

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Supply Current		YI_{CC}	1	Output open	—	5	8	mA
		YI_M	2	Output open	—	25	40	mA
Hall Amp Circuit	Input Current	YI_H	3	$YV_{CMR} = 2.5 \text{ V}$	—	—	5	μA
	Common-Phase Input Voltage Range	YV_{CMR}	4		1.3	—	$YV_{CC} - 1.3$	V
	Input Sensitivity	YV_H	5	(Note)	20	—	—	mV _{p-p}
Output Circuit	Saturation Voltage (Upper Side+Lower side)	$YV_{sat} (H + L)$	6	$I_O = 1.0 \text{ A}$, $YV_H = 30 \text{ mV}_{p-p}$	—	2.2	2.7	V
	Leakage Current (Upper Side)	$YV_{OL} (H)$	9	$YV_M = 10 \text{ V}$	—	—	10	μA
	Leakage Current (Lower Side)	$YV_{OL} (L)$	10	$YV_M = 10 \text{ V}$	—	—	10	μA
Thermal Shutdown Operating Temperature		T_{SD}	—		—	170	—	$^\circ\text{C}$

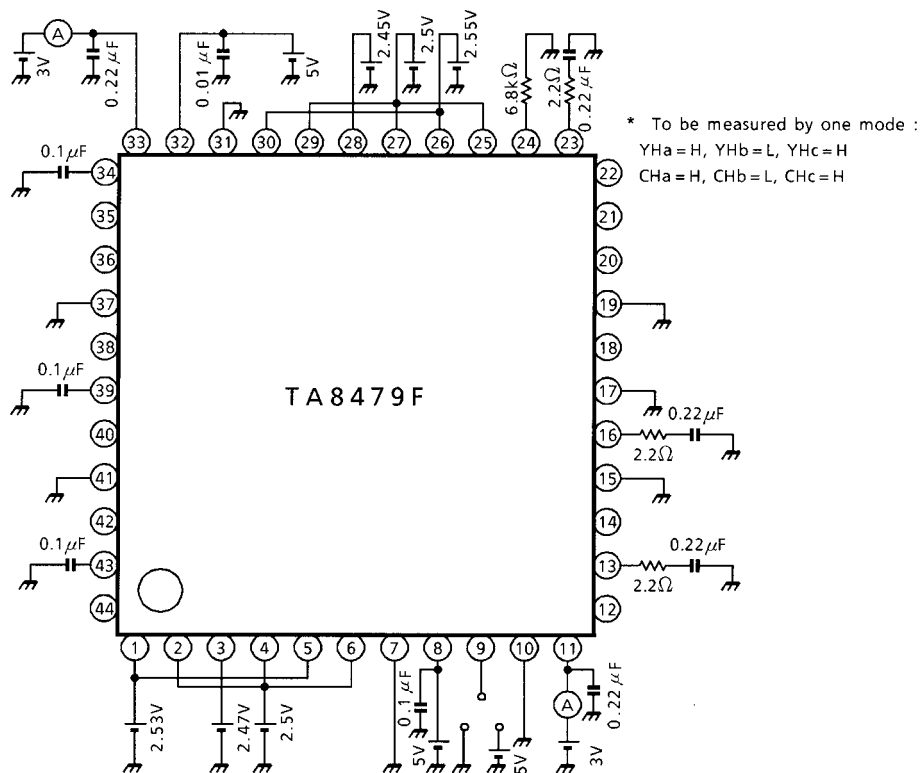
Note: Defined by output functioning

TEST CIRCUIT

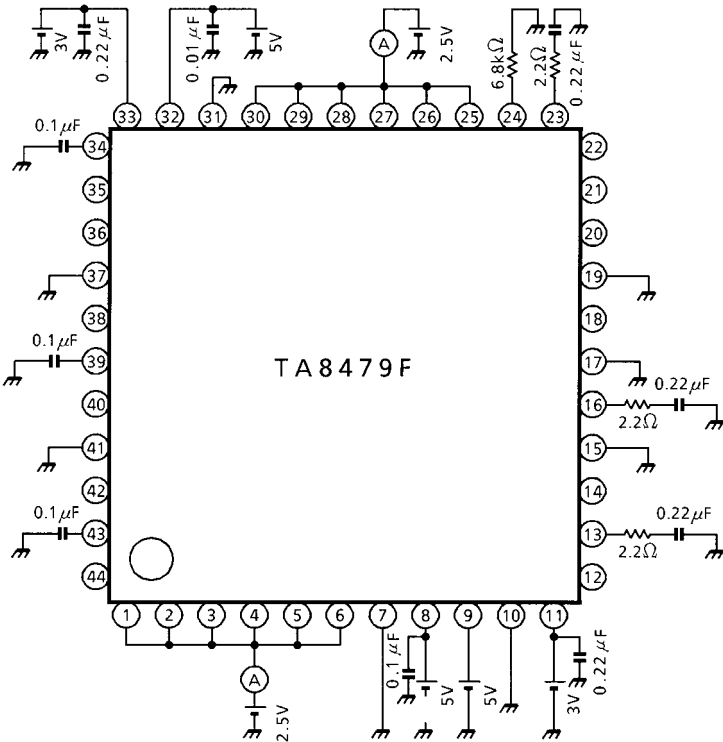
1. Ylcc, Clcc1, Clcc2



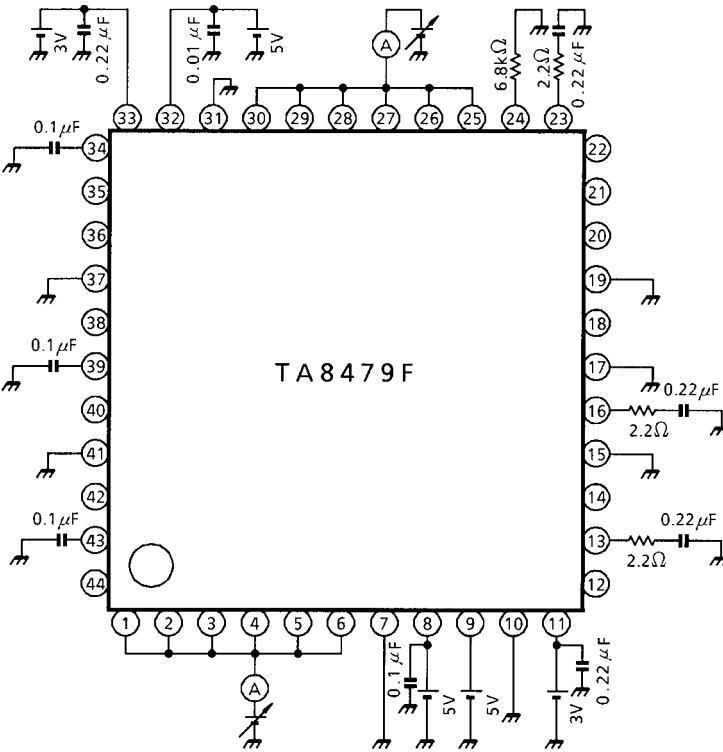
2. YlM, ClM1, ClM2



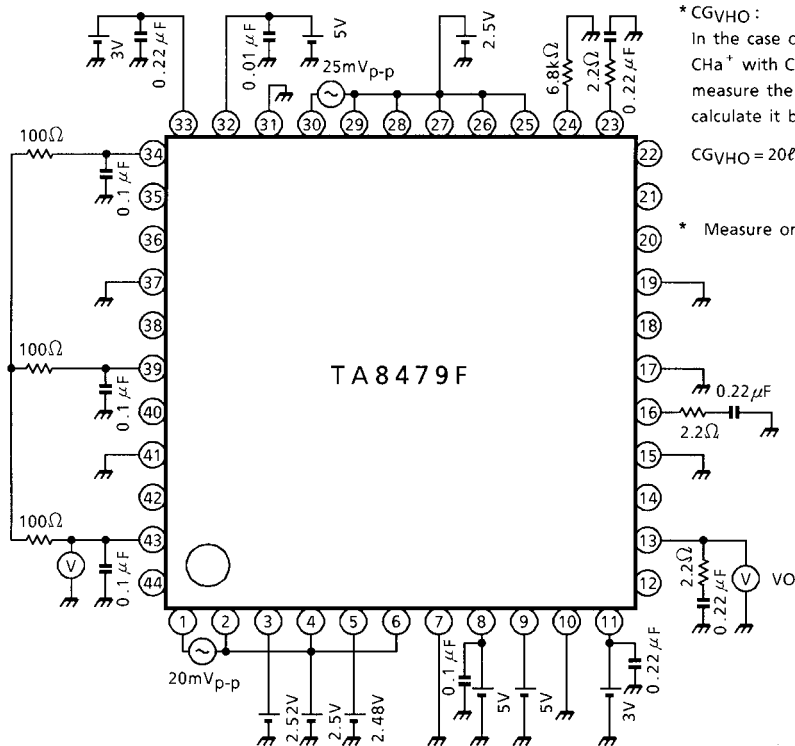
3. Y_{IH} , C_{IH}



4. Y_{VCMR} , C_{VCMR}



5. YV_H , CV_H , CG_{VHO}



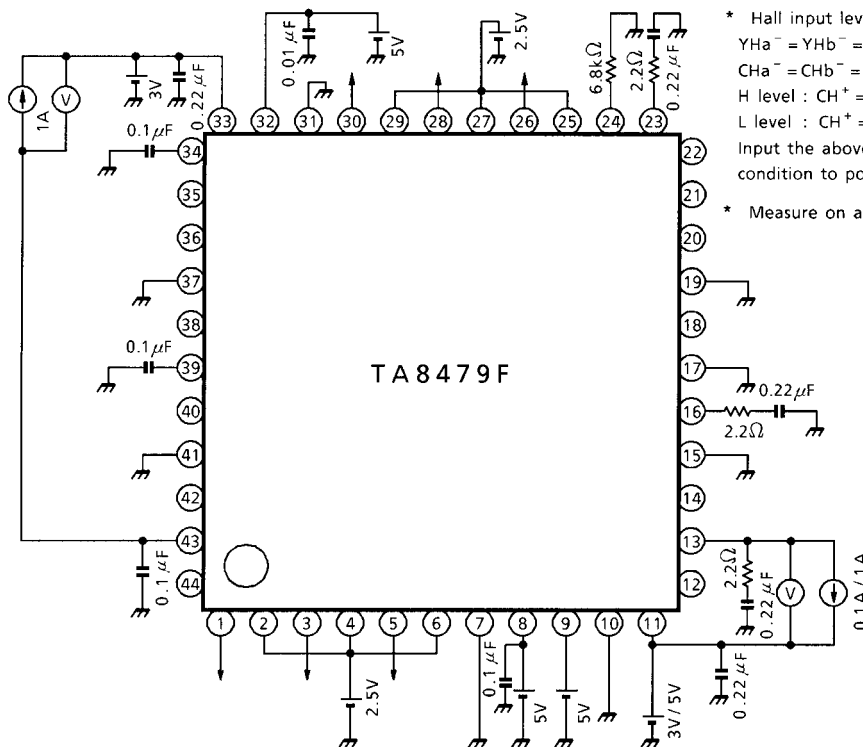
* CG_{VHO} :

In the case of a-phase CG_{VHO} , change CHa^+ with $CHa^- = CHb^- = CHc^- = 2.5V$, measure the voltage of CLa in that case, and calculate it by the following formula :

$$CG_{VHO} = 20 \log \frac{V_O(2.525) - V_O(2.475)}{2.525 - 2.475} \text{ (dB)}$$

* Measure on a, b, and c phases.

6. $YV_{sat}(H)$, $CV_{sat}(H)$



* Hall input level

$YHa^- = YHb^- = YHc^- = 2.5V$

$CHa^- = CHb^- = CHc^- = 2.5V$

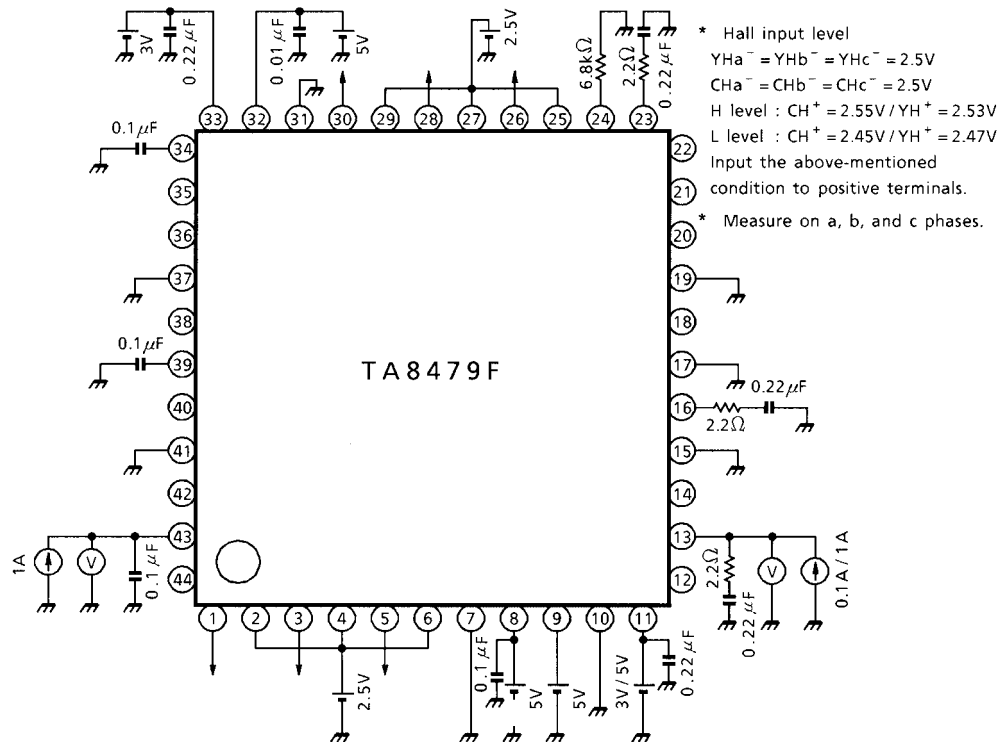
H level : $CH^+ = 2.55V / YH^+ = 2.53V$

L level : $CH^+ = 2.45V / YH^+ = 2.47V$

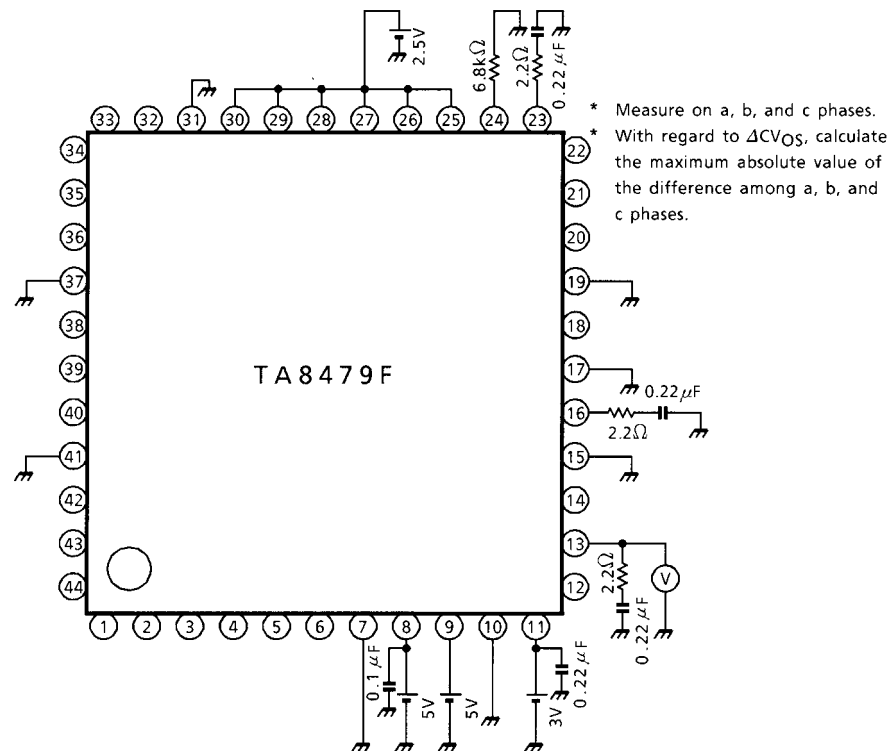
Input the above-mentioned condition to positive terminals.

* Measure on a, b, and c phases.

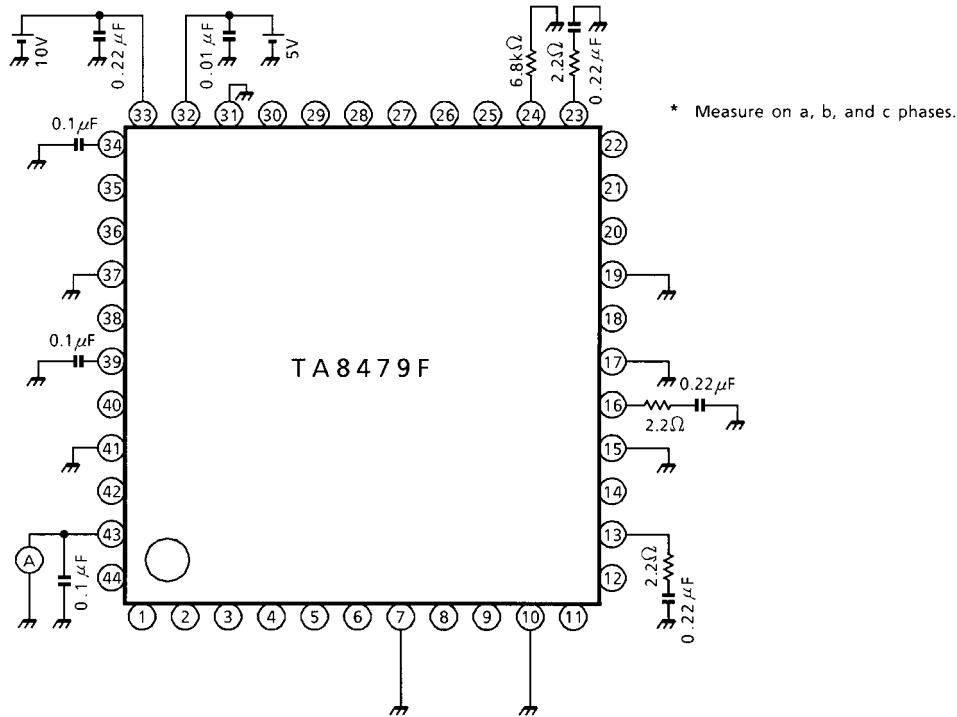
7. $YV_{sat(L)}$, $CV_{sat(L)}$



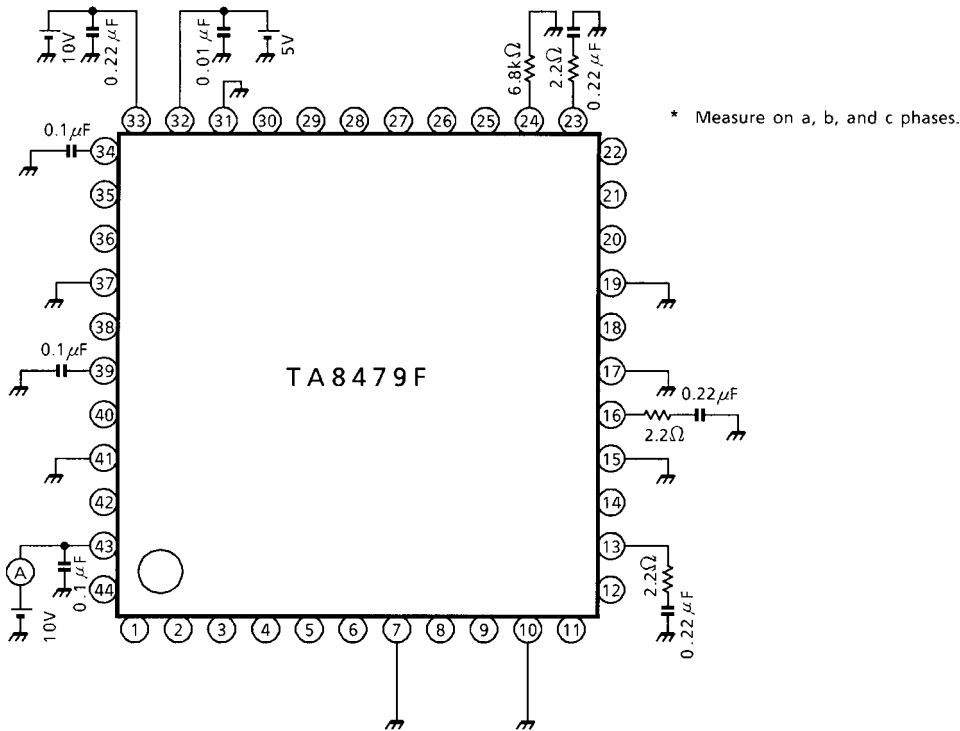
8. CV_{OS} , ΔCV_{OS}



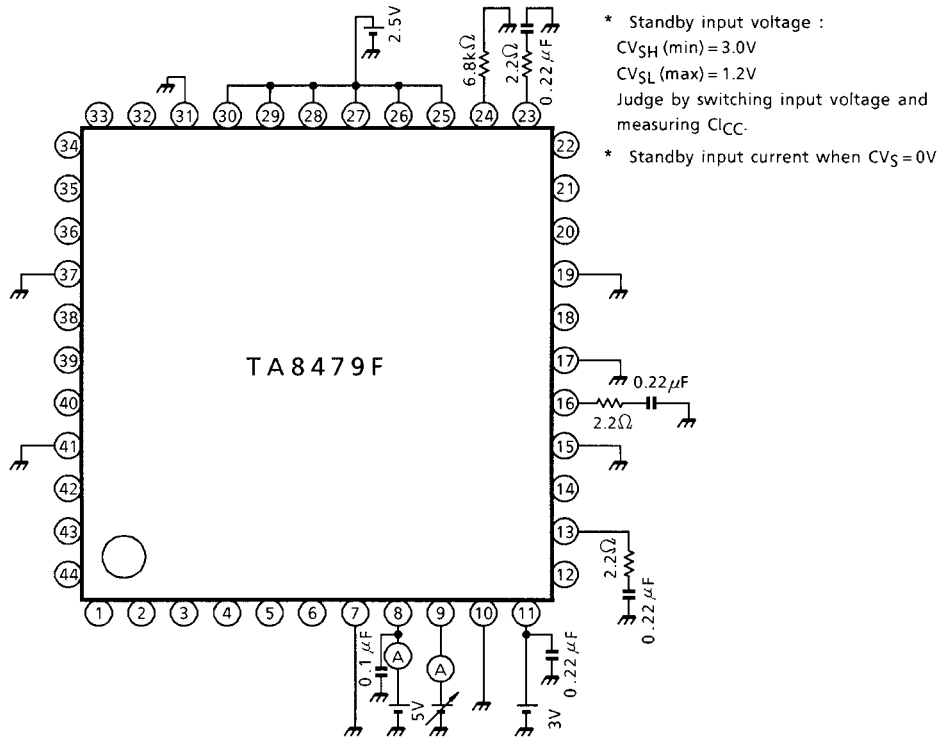
9. Y_{IOL} (H)



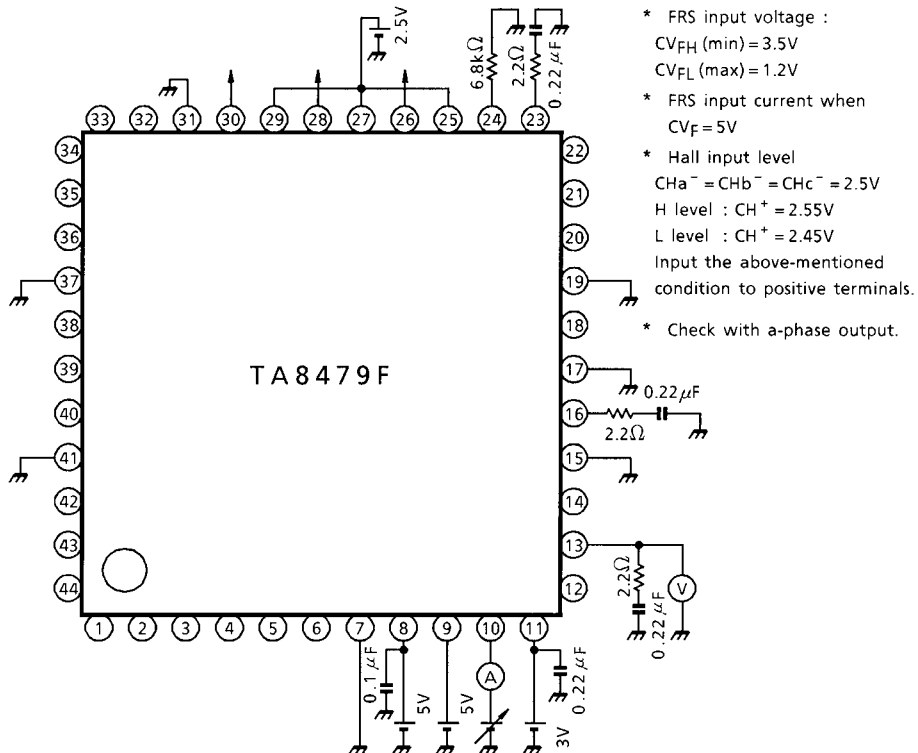
10. Y_{IOL} (L)



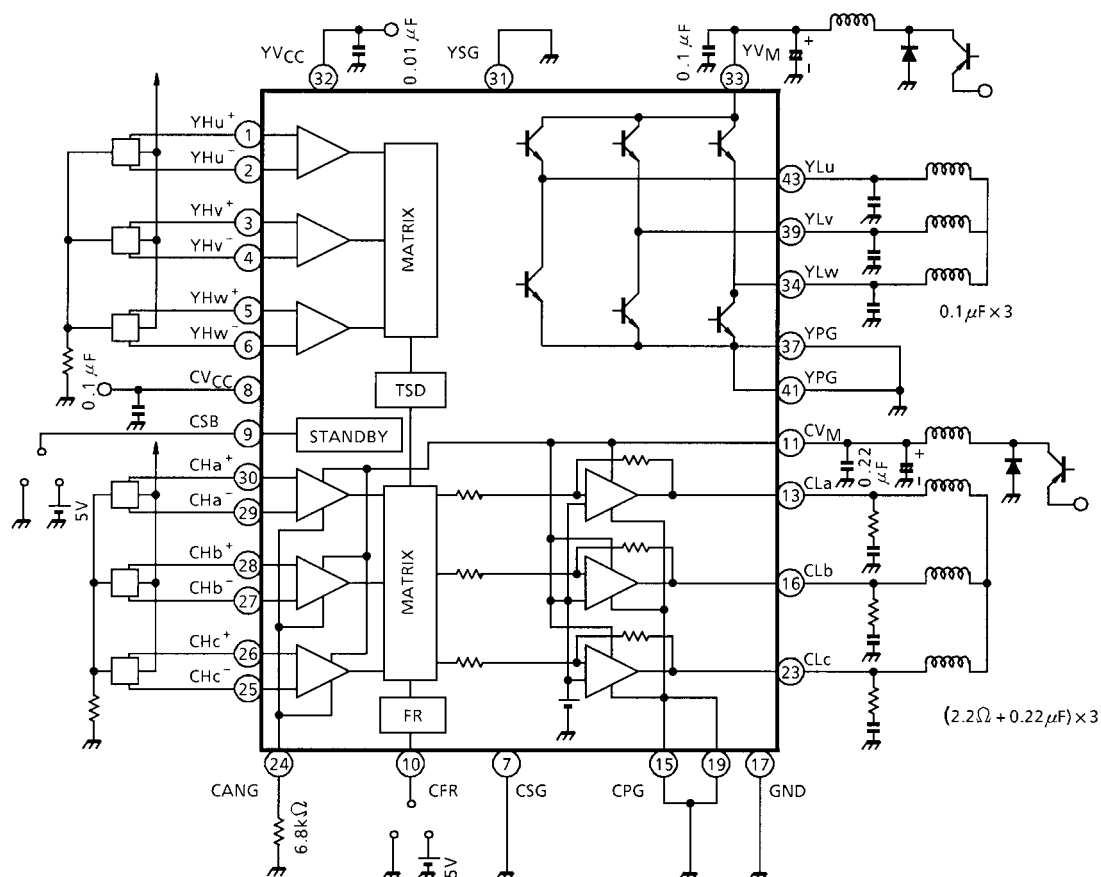
11. CV_{SH}, CV_{SL}, C_INS



12. CV_{FH}, CV_{FL}, C_INF



APPLICATION CIRCUIT

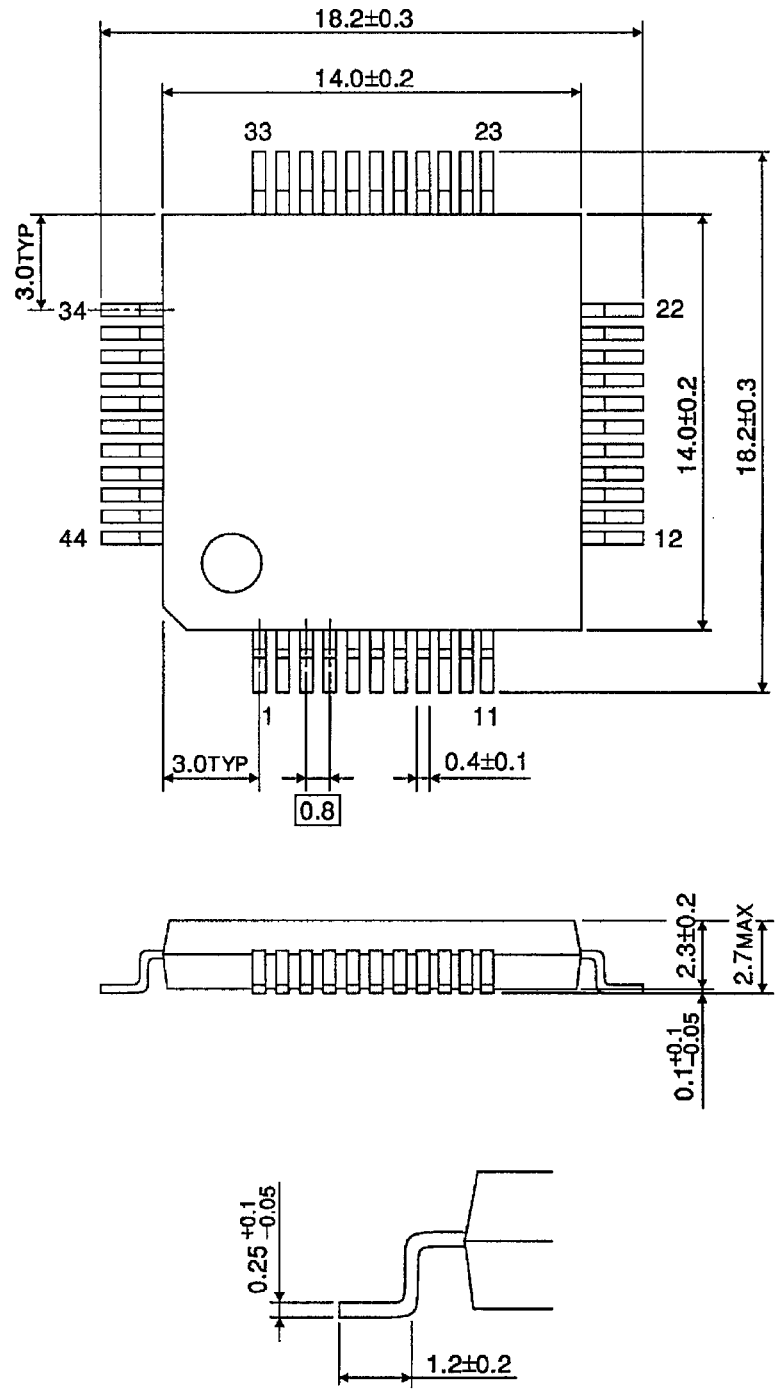


Note: Utmost care is necessary in the design of the output line, YVM, CVM and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

PACKAGE DIMENSIONS

QFP44-P-1414-0.80B

Unit : mm



Weight : 1.15 g (Typ.)

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000707EBA

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