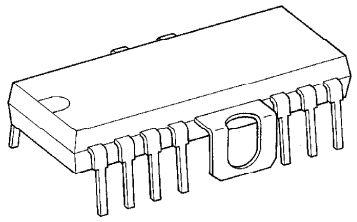
TENTATIVE TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8483AP

THREE-PHASE ALL WAVE DRIVER IC

The TA8483AP is a three-phase all wave driver IC that makes possible PWM sensorless driving.



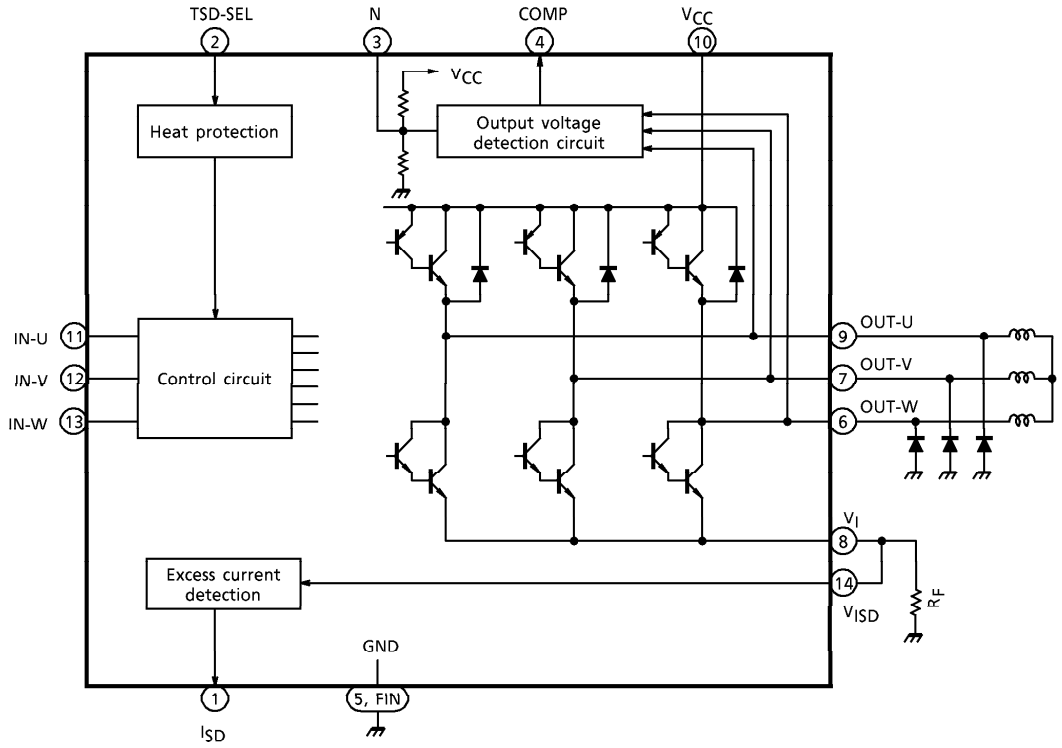
HDIP14-P-500-2.54A

Weight : 3.0g (Typ.)

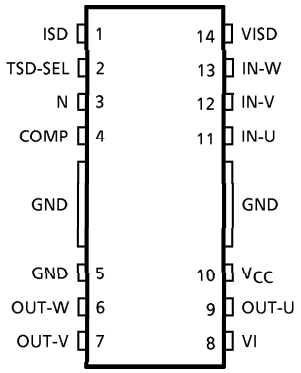
FEATURES

- Built-in excess current detection function
- Built-in heat protection function

BLOCK DIAGRAM



PIN CONNECTION



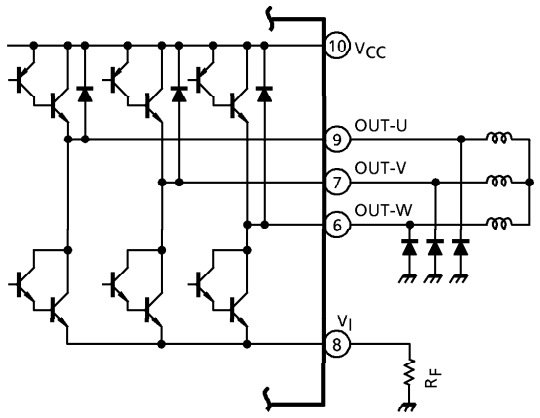
PIN FUNCTION

PIN No.	SYMBOL	I / O	FUNCTIONAL DESCRIPTION
1	I_{SD}	O	Excess current detection signal output
2	TSD-SEL	I	Heat protection circuit selecting pin
3	N	—	Mid-point voltage pin
4	COMP	O	Pin voltage detection circuit (majority logical sum output)
5	GND	—	GND
6	OUT-W	O	W-phase output pin
7	OUT-V	O	V-phase output pin
8	V_I	O	Current detection resistance connecting pin
9	OUT-U	O	U-phase output pin
10	V_{CC}	I	Supply voltage pin
11	IN-U	I	U-phase input pin
12	IN-V	I	V-phase input pin
13	IN-W	I	W-phase input pin
14	V_{ISD}	I	Excess current detection input pin

FUNCTIONAL DESCRIPTION

1. Output section (OUT-U, OUT-V, OUT-W)

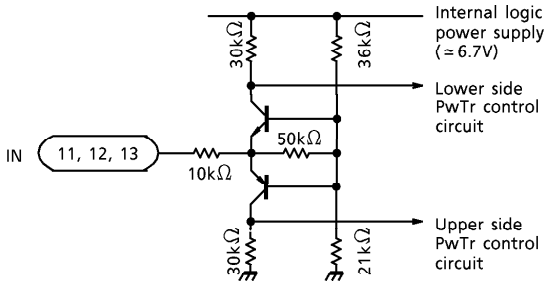
   - The configuration of the output stage is shown in the chart to the right.
   - The PWM operation takes OFF-ON control of the upper side transistor.
   - Be sure to set the schottky barrier diode outside, because the current flows to the lower-side diode when PWM is off.



<Output circuit>

2. Input circuit (IN-U, IN-V, IN-W)

   - The three-phase input receives three-state impedance (high. low, high impedance) from the controller side.



<Input circuit>

3. Overheat protection circuit

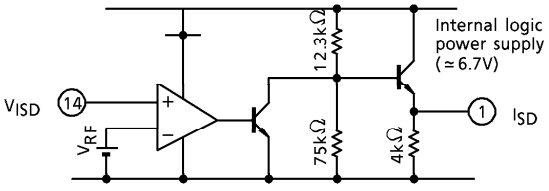
   - When junction temperature Tj is Tj≧TSD (ON) (overheat protection operation temperature) when TSD-SEL = "LOW", the entire output maintains an OFF state.

     To cancel this state,
     ① Reapply the supply voltage.
     ② Apply "⌐¬" signal to the TSD-SEL pin.

   - When TSD-SEL = "HIGH", an automatic return mode takes place.

4. Excess current detection circuit (V_{ISD}, I_{SD})

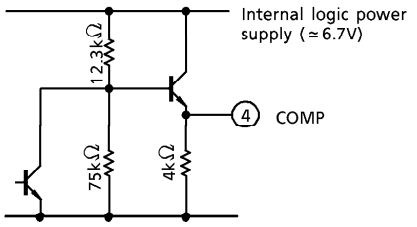
   - The voltage in current detection resistor RF outside V_I pin is input to the V_{ISD} pin.
   - When V_{ISD} voltage rises above internal reference voltage V_{RF} (≃0.5V), excess current detection circuit I_{SD} becomes "HIGH".



<Excess current detection circuit>

5. Output voltage detection circuit (COMP)

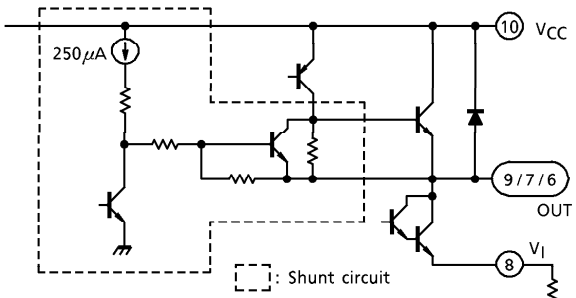
- Brings about majority logical sum output. (When two-phase output or higher out of three-phase output is larger than mid-point voltage $V_{CC}/2$, "HIGH" is output; when it is smaller, "LOW" is output.)



<Output voltage detection circuit>

6. Upper side output B-E shunt circuit

- A Base-Emitter shunt circuit is incorporated to turn off the upper side power transistor.



<Upper side output b-e shunt circuit>

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_S	35	V
Output Current	$I_{OUT\ (PEAK)}$	2.0	A
Power Dissipation	P_D	2.3 (Note)	W
Operating Temperature	T_{opr}	−30~85	°C
Storage Temperature	T_{stg}	−55~150	°C
Input Voltage	V_{IN}	6.0	V

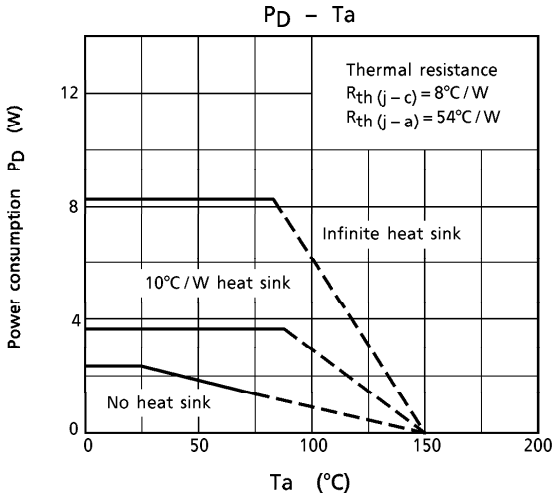
(Note) No heat sink

RECOMMENDED OPERATING CONDITIONS (Ta = −30 to 85°C)

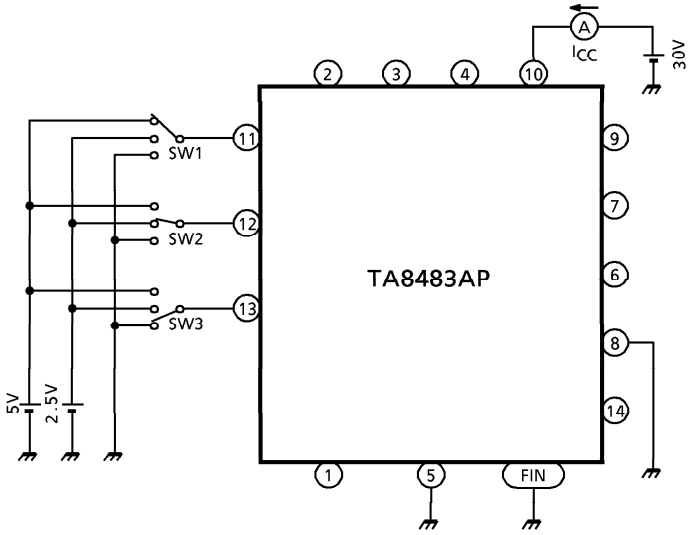
CHARACTERISTIC	SYMBOL	MIN	TYP.	MAX	UNIT
Supply Voltage	V_S	20	—	30	V
Output Current	I_{OUT}	—	—	1.5	A
Chopping Frequency	f_{PWM}	—	20	40	kHz

ELECTRICAL CHARACTERISTICS (Ta = 25°C, V_{CC} = 30V)

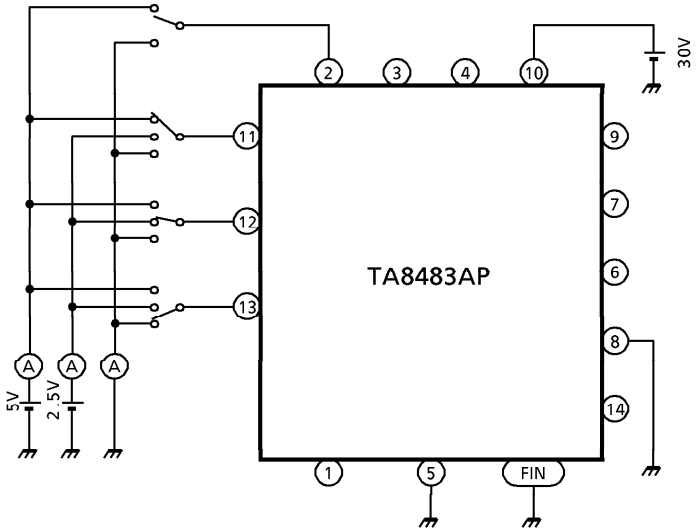
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Current consumption	I_{CC} (1)	1	CHOP ON	—	34.8	51	mA
	I_{CC} (2)		CHOP OFF	—	21.3	30	
	I_{CC} (3)		OFF	—	20.3	28	
Input Current	I_{IN1} (L)	2	V_{IN} = 0V, IN-U, IN-V, IN-W	− 350	—	− 100	μA
	I_{IN1} (OFF)		V_{IN} = 2.5V, IN-U, IN-V, IN-W	—	0	—	
	I_{IN1} (H)		V_{IN} = 5V, IN-U, IN-V, IN-W	100	—	350	
	I_{IN2} (L)		V_{IN} = 0V, TSD-SEL, T_j = 150°C	—	0	—	
	I_{IN2} (H)		V_{IN} = 5V, TSD-SEL, T_j = 150°C	—	5.5	100	
Input Voltage	V_{IN1} (L)	3	V_{CC} = 20V, IN-U, IN-V, IN-W	0	—	0.7	V
	V_{IN1} (OFF)		V_{CC} = 20V, IN-U, IN-V, IN-W	1.9	—	3.0	
	V_{IN1} (H)		V_{CC} = 20V, IN-U, IN-V, IN-W	4	—	5.5	
	V_{IN2} (L)		TSD-SEL, T_j = 150°C	0	—	0.5	
	V_{IN2} (H)		TSD-SEL, T_j = 150°C	1.1	—	5.5	
Mid-point Potential	V_N	4		0.95 × VS / 2	VS / 2	1.05 × VS / 2	V
Pin Voltage Detection Level	V_{CMP}	5		0.95 × VS / 2	VS / 2	1.05 × VS / 2	V
Pin Voltage Detection Output Voltage	V_{OV}	5	I_O = 50μA	4.3	—	5.15	V
Excess Current Detection Level	V_{RF}	6		0.43	0.50	0.52	V
Excess Current Detection Output Voltage	V_{OC}	6	I_O = 50μA	4.3	—	5.15	V
Output Saturation Voltage	V_{SAT} (H)	7	V_{CC} = 20V, I_O = 1A	—	1.3	1.7	V
			V_{CC} = 20V, I_O = 1.5A	—	1.6	2.1	
	V_{SAT} (L)	8	V_{CC} = 20V, I_O = 1A	—	1.3	1.7	
			V_{CC} = 20V, I_O = 1.5A	—	1.5	2.0	
Upper Side Diode Forward Voltage	V_F (H)	9	I_O = 1A	—	1.8	2.5	V
Output Leakage Voltage	I_L (L)	10	V_L = 35V	—	0	50	
Upper Side Output B-E Shunt Circuit Current	I_S	11	V_{CC} = 35V	—	250	400	
Heat Protection Operative Temperature	TSD (ON)	—	T_j	—	175	—	°C
	TSD (OFF)			—	150	—	
	TSD (HYS)			—	25	—	
Output Transmission Time	ton	—		—	0.2	—	μs
	toff			—	6.1	—	
Comparator Output Transmitting Duration	t_{pLH}	—		—	0.5	—	μs
	t_{pHL}			—	1.5	—	
Excess Current Detection Duration	t_r	—		—	1	—	μs
	t_f			—	7	—	


P_D – Ta
Thermal resistance
$R_{th\ (j-c)}$ = 8°C / W
$R_{th\ (j-a)}$ = 54°C / W
Infinite heat sink
10°C / W heat sink
No heat sink
Power consumption P_D (W)
0
4
8
12
0
50
100
150
200
Ta (°C)

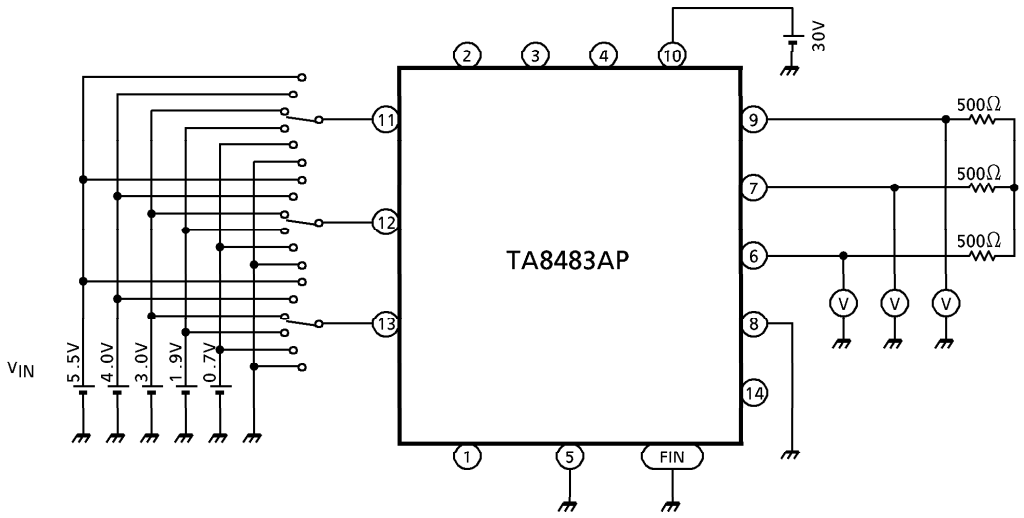
TEST CIRCUIT 1 : 1_{CC}



TEST CIRCUIT 2 : I_{IN}

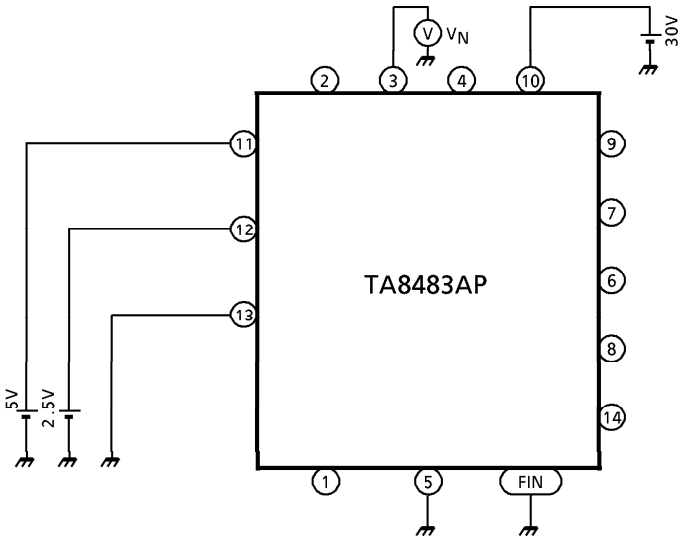


TEST CIRCUIT 3 : V_{IN}

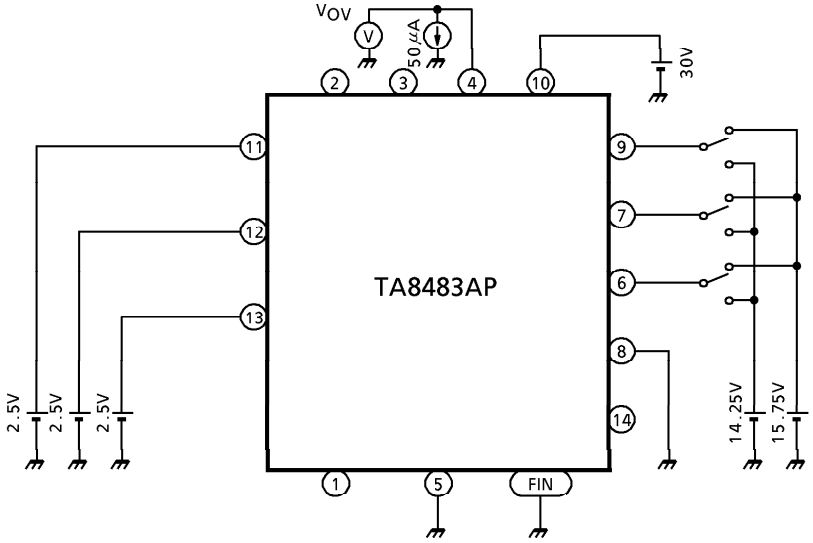


(Note) Confirm output voltage by inputting regular V_{IN}.

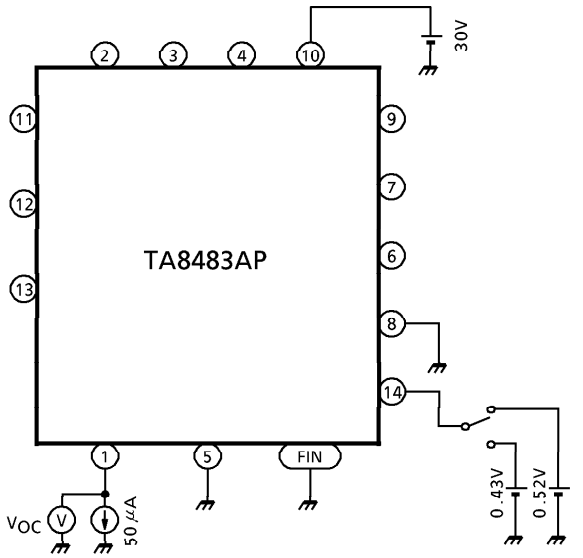
TEST CIRCUIT 4 : V_N



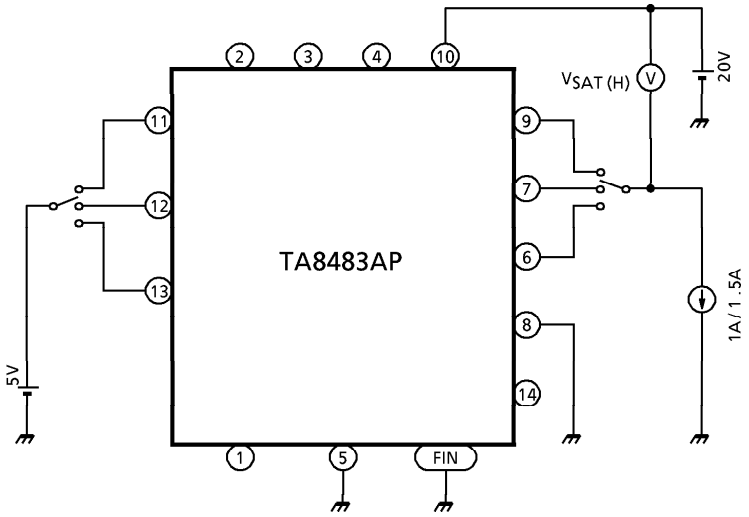
TEST CIRCUIT 5 : V_{CMP}, V_{OV}



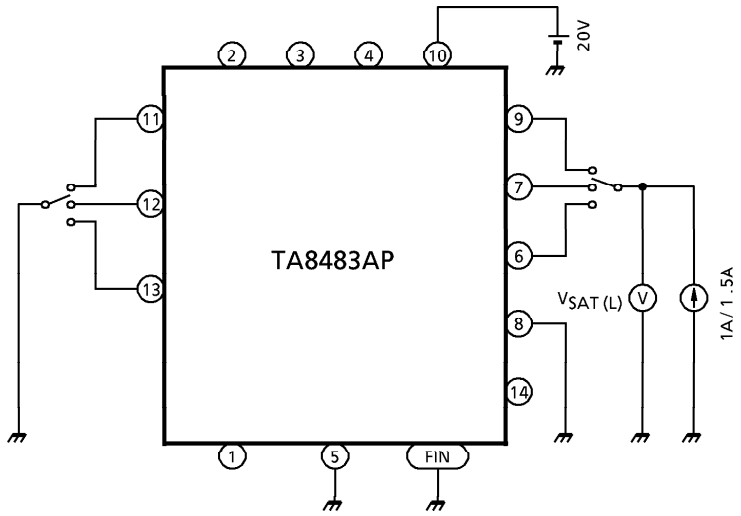
TEST CIRCUIT 6 : V_{RF}, V_{OC}



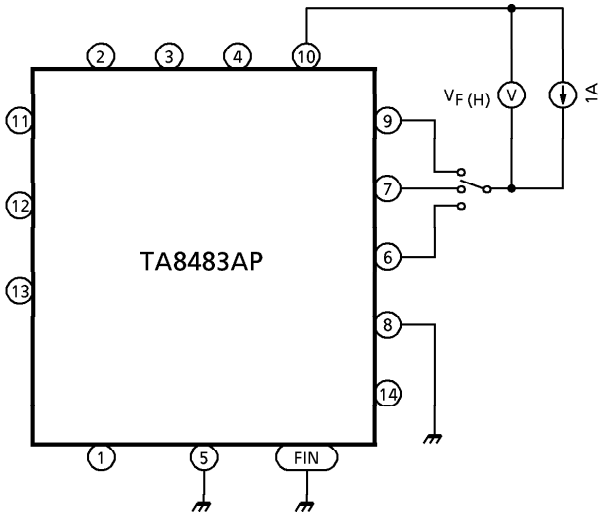
TEST CIRCUIT 7 : $V_{SAT\,(H)}$



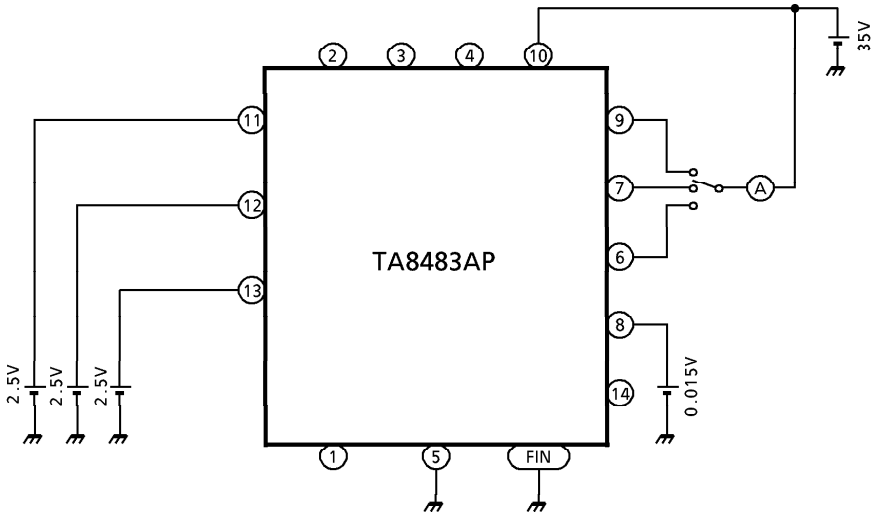
TEST CIRCUIT 8 : $V_{SAT\,(L)}$



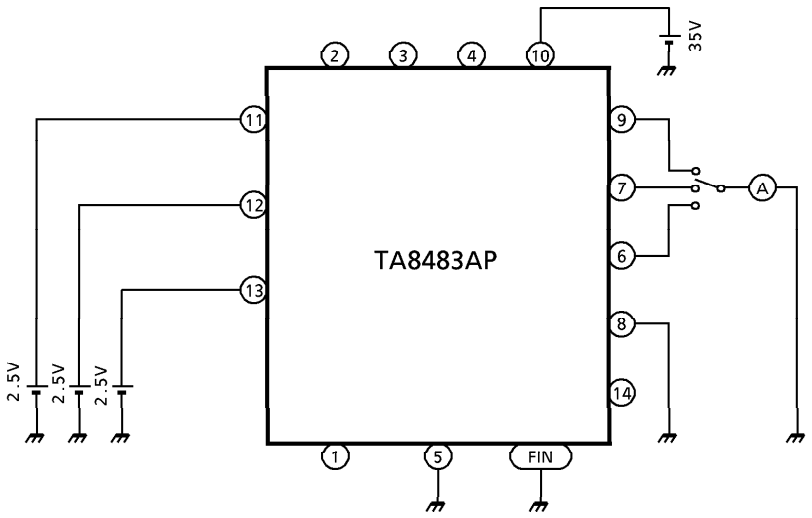
TEST CIRCUIT 9 : $V_{F\,(H)}$



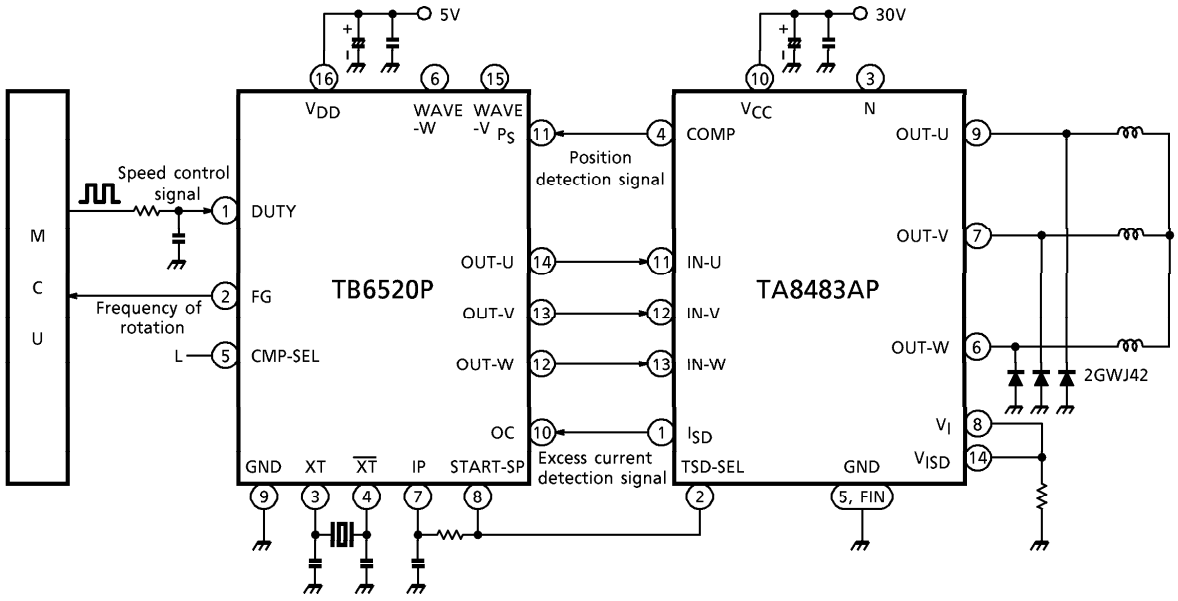
TEST CIRCUIT 10 : $I_{L\,(L)}$



TEST CIRCUIT 11 : I_S



APPLICATION CIRCUIT

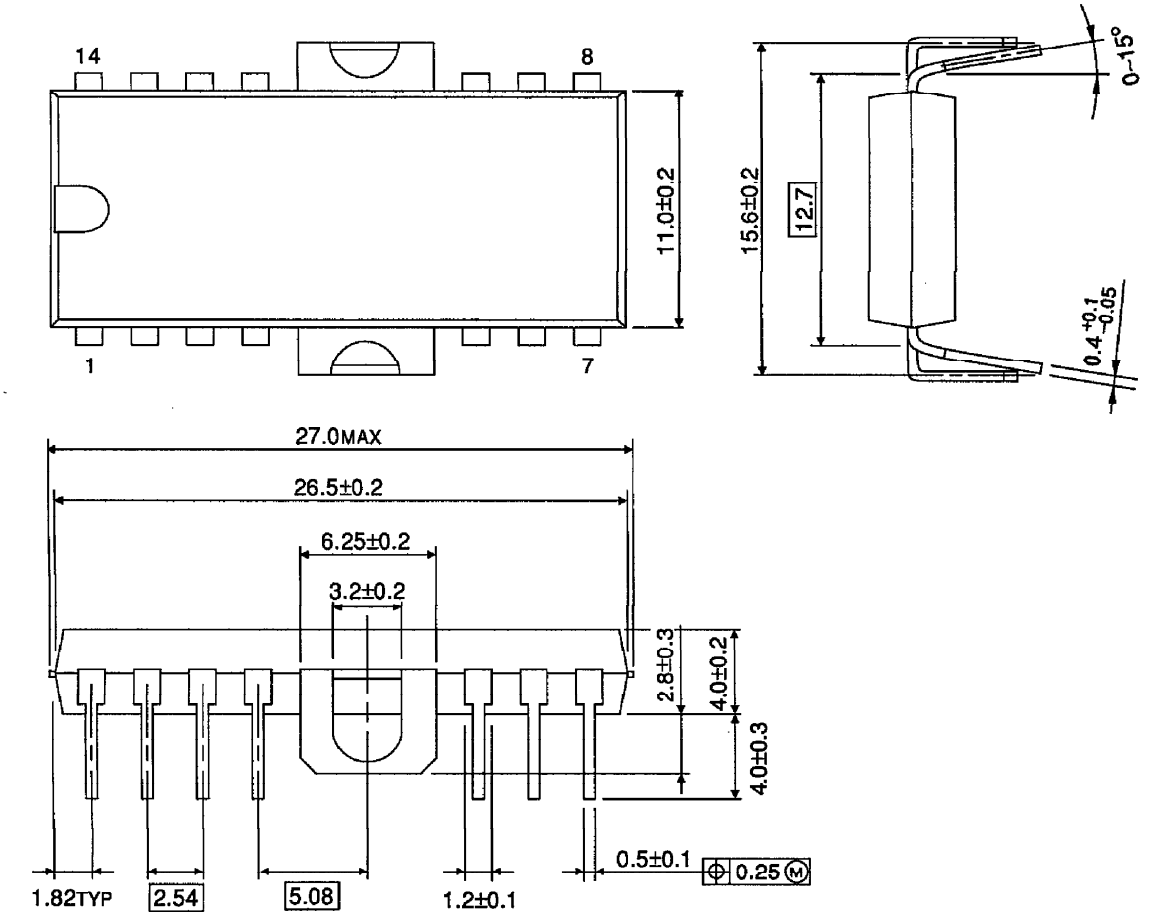


(Note) Utmost care is necessary in the design of the output line, V_{CC} and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

OUTLINE DRAWING

HDIP14-P-500-2.54A

Unit : mm



Weight : 3.0g (Typ.)