

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

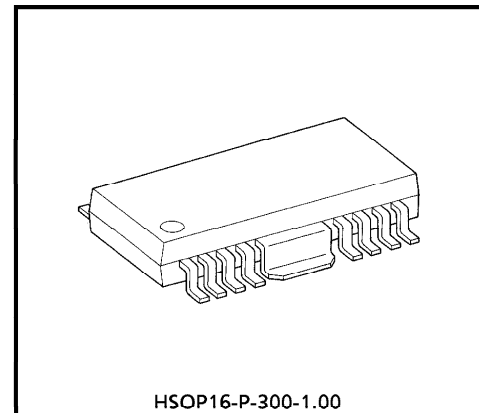
# TA8430AF

## STEPPING MOTOR DRIVER IC

The TA8430AF is 2 Phase Bipolar Stepping Motor Driver IC designed especially for low operating voltage use FDD and other portable equipments.

### FEATURES

- 2 Phase Bipolar Stepping Motor Driver
- Low Voltage Use :  $V_{CC\text{ opr}} = 4V$  (Min.)
- Power Save and Stand-by Mode available  
 $I_{CC\text{ stand-by}} \leq 100\mu A$
- Built-in Punch Through Current Restriction Circuit
- 1, 2 and 1-2 Phase Excitation Drive available
- C-MOS Compatible Inputs (INA, INB, PS, ST)
- Output Current up to 400mA (AVE) and 600mA (PEAK)
- Sealed in PFP 16 SM Package
- HEAT SINK is connected with GND with low impedance.



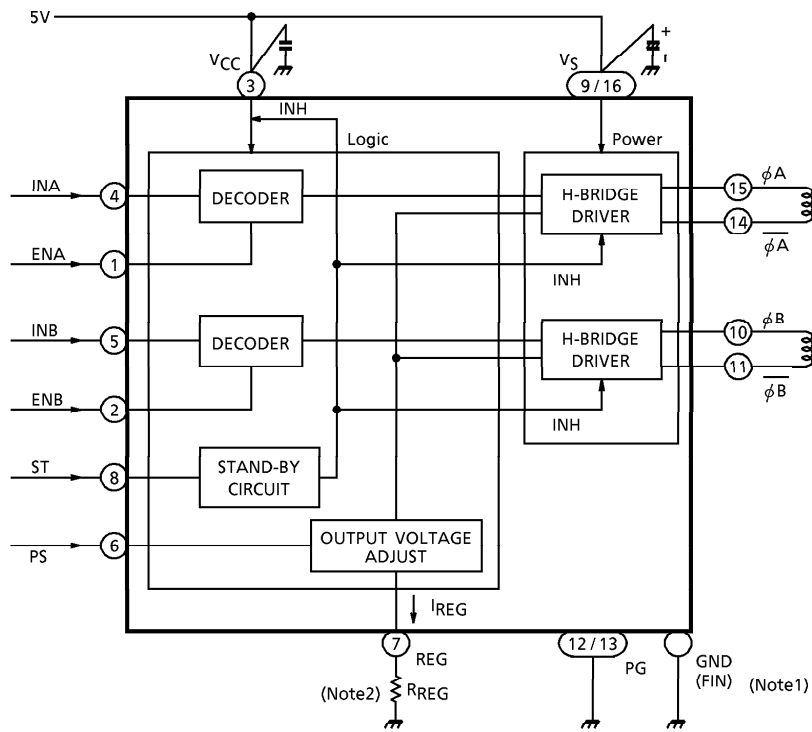
HSOP16-P-300-1.00

Weight : 0.50g (Typ.)

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BLOCK DIAGRAM



- (Note 1) GND terminal of 12/13 connect to FIN.
- (Note 2) Output Voltages, appeared at φA, φ̄A, φB and φ̄B, are adjusted by R<sub>reg</sub> when Power Save function is selected.
- (Note 3) Utmost care is necessary in the design of the output line, V<sub>CC</sub>, V<sub>S</sub> and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

PIN FUNCTION

PIN No.	SYMBOL	FUNCTION
1	ENA	A channel enable
2	ENB	B channel enable
3	V <sub>CC</sub>	Supply voltage
4	INA	A channel reciprocal switching
5	INB	B channel reciprocal switching
6	PS	Energy-saving signal input
7	REG	Output voltage setting
8	ST	Stand-by signal input
9	V <sub>S</sub>	Supply voltage
10	φB	B output
11	φ̄B	B̄ output
12	PG	Power supply GND connection
13	PG	Power supply GND connection
14	φ̄A	Ā output
15	φA	A output
16	V <sub>S</sub>	Supply voltage
FIN	GND	GND connection

FUNCTION

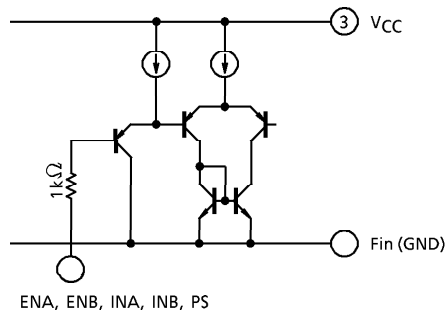
INPUT				OUTPUT		
ST	EN	PS	IN	$\phi$	$\overline{\phi}$	UPPER SIDE SATURATION VOLTAGE
H	H	L	L	L	H	$V_S - V_{CE(SAT)} U$
H	H	L	H	H	L	$V_S - V_{CE(SAT)} U$
H	H	H	L	L	H	$V_{REG}$ (Note)
H	H	H	H	H	L	$V_{REG}$ (Note)

(Note)  $V_{REG}$  is a voltage appeared at PIN⑦ and its value becomes approximately equal to  $V_{OUT}$  in power operation period.

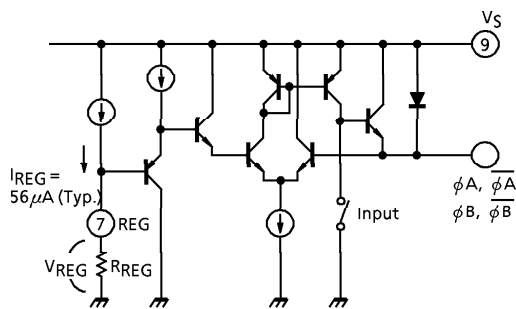
ST	ENA	ENB	$\phi A, \overline{\phi A}$	$\phi B, \overline{\phi B}$	MODE
H	L	H	$\infty$	ENABLE	OPERATION
H	H	L	ENABLE	$\infty$	OPERATION
H	H	H	ENABLE	ENABLE	OPERATION
L	X	X	$\infty$	$\infty$	STAND-BY

X : Don't Care  
 $\infty$  : High Impedance

INPUT STEP CIRCUIT DIAGRAM



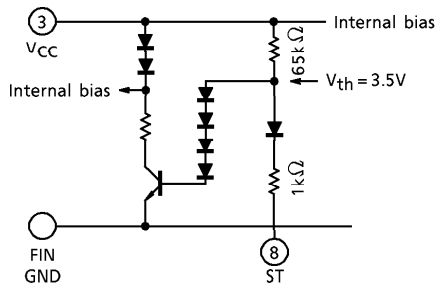
$V_{REG}$  OUTPUT CIRCUIT DIAGRAM



$V_{REG}$  output voltage can be selected with  $R_{REG}$  exterior resistance.  
 If  $V_{REG}$  is not used (as in the case of double-phase magnetization), use pin⑦ in the open position.  
 (Do not connect to  $V_{CC}$  or GND pins.)  
 Use the following formula to obtain the output voltage.

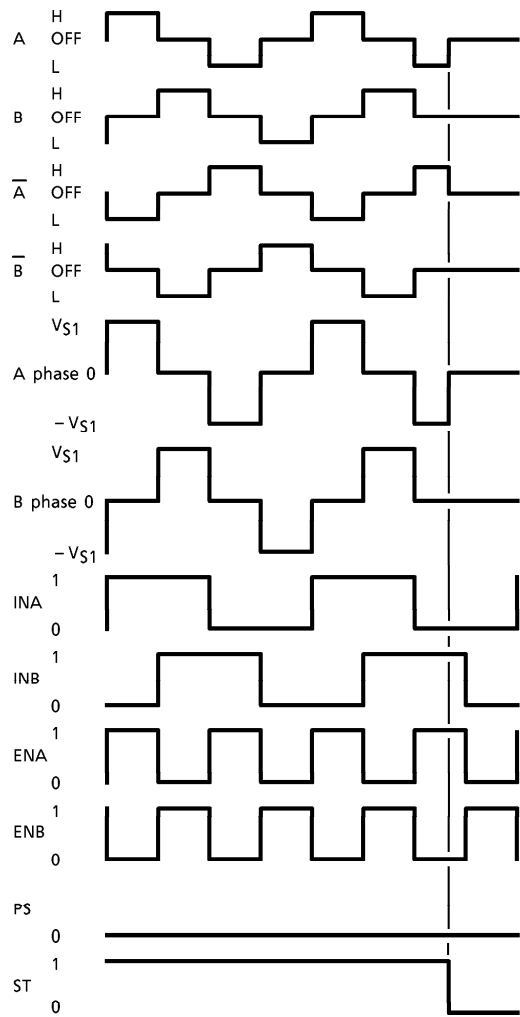
$$V_{OUT} \cong V_{REG} \cong R_{REG} \times 56 \times 10^{-6}$$

STAND-BY CIRCUIT DIAGRAM



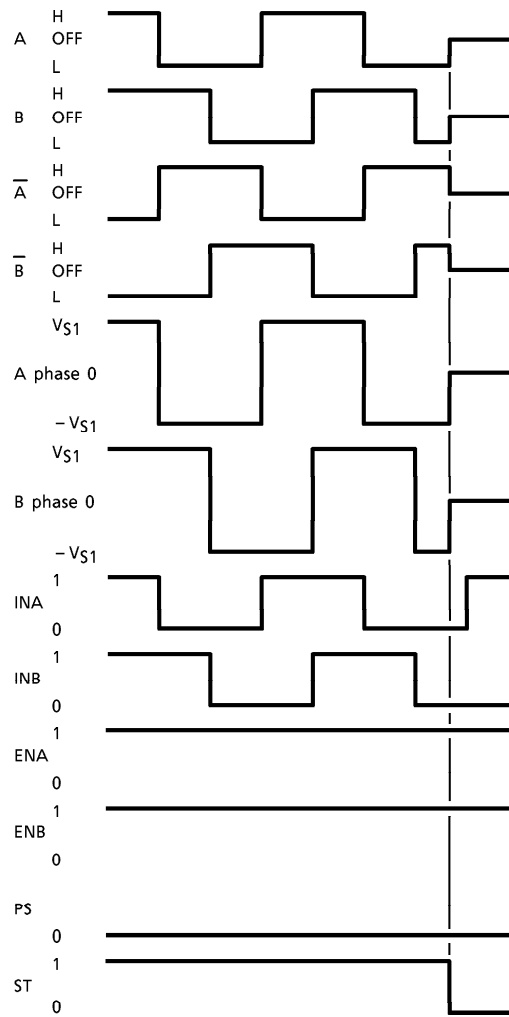
TIMING CHART

Single-phase magnetization



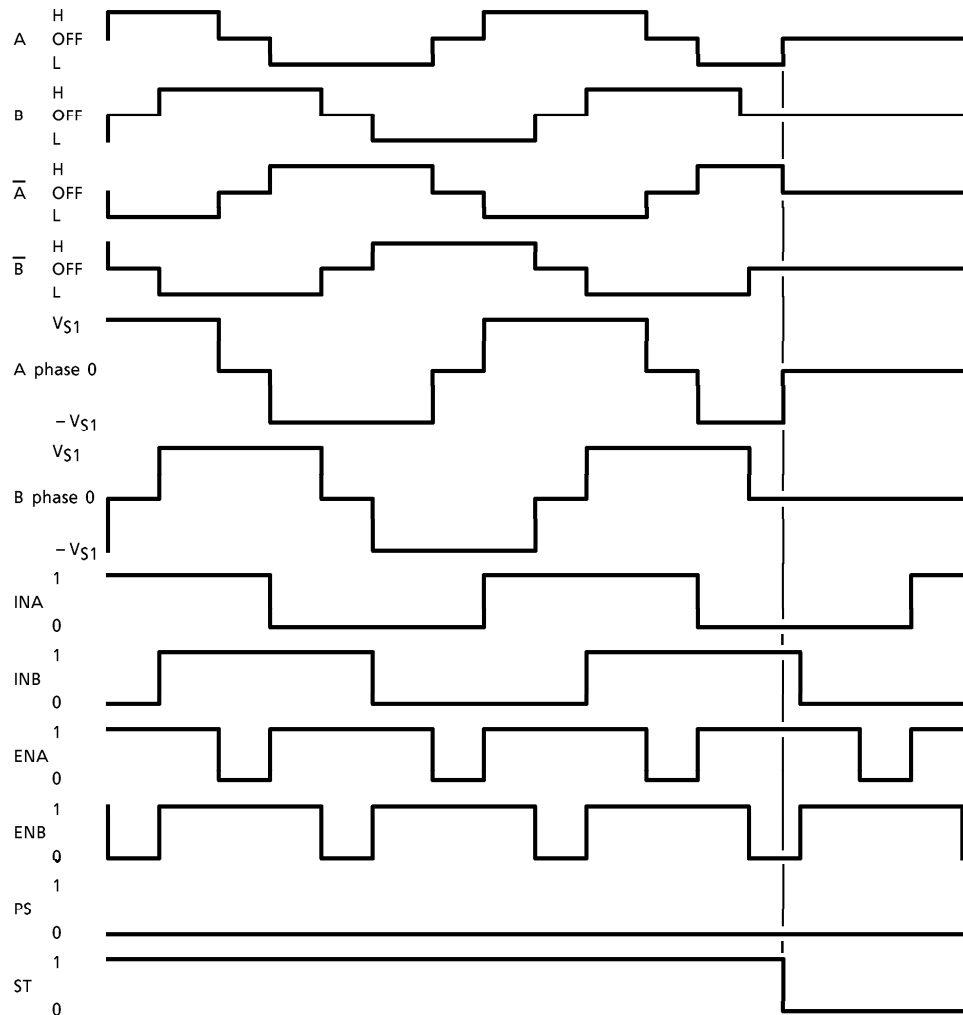
\*  $V_{S1} = V_S - (V_{SAT U} + V_{SAT L})$

Double-phase magnetization



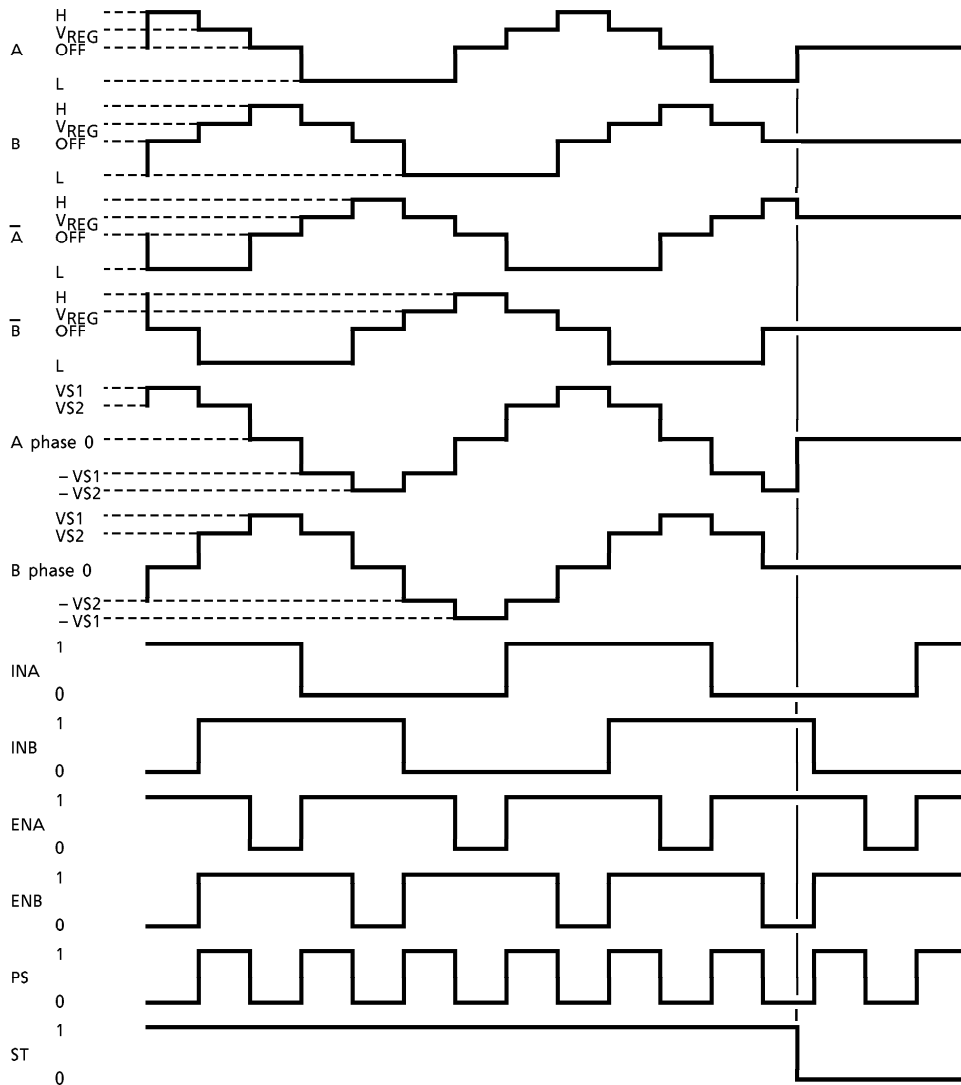
\*  $V_{S1} = V_S - (V_{SAT U} + V_{SAT L})$

Single- /double-phase magnetization



\*  $V_{S1} = V_S - (V_{SAT U} + V_{SAT L})$

Single- /double-phase magnetization (with energy-saving function)



$$V_{S1} = V_S - (V_{SAT U} + V_{SAT L})$$

$$V_{S2} = V_{REG} - V_{SAT L}$$

**MAXIMUM RATINGS** (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	8.0	V
	V <sub>S</sub>	8.0	
Output Current	I <sub>O</sub> (MAX.)	± 600	mA
	I <sub>O</sub> (AVE.)	± 400	
Input Voltage	V <sub>IN</sub> , V <sub>PS</sub> V <sub>ST</sub> , V <sub>EN</sub>	GND - 0.4~V <sub>CC</sub> + 0.4	V
Power Dissipation	P <sub>D</sub> (Note)	1.4	W
Operating Temperature	T <sub>opr</sub>	- 40~85	°C
Storage Temperature	T <sub>stg</sub>	- 55~150	°C

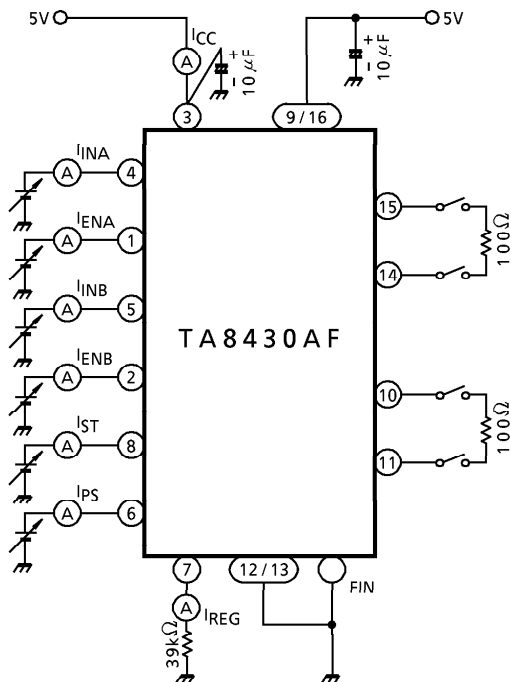
(Note) 60×30×1.6mm PCB occupied in excess of 50% of copper area, mounting.

**ELECTRICAL CHARACTERISTICS** (Ta = 25°C, V<sub>CC</sub> = 5V, V<sub>S</sub> = 5V, ST = 5V, PS = 0V, EN = 5V)

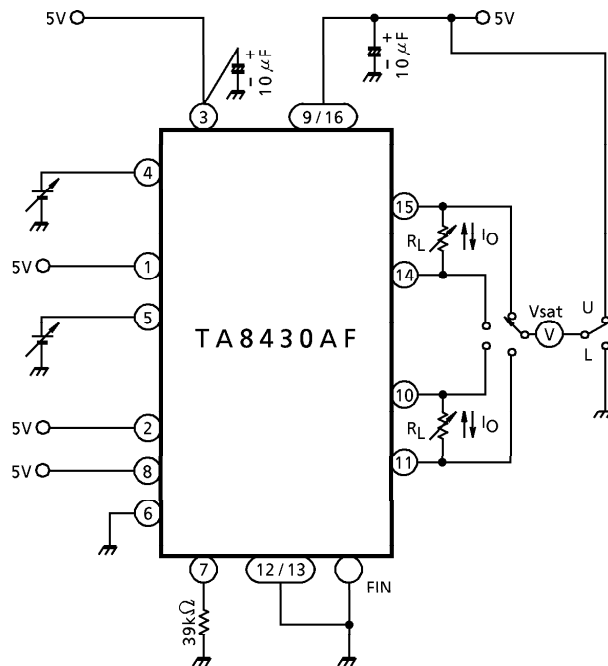
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Supply Current	I <sub>CC1</sub>	1	Output open	—	14	20	mA	
	I <sub>CC2</sub>		Output open, PS = 5V	—	14	20		
	I <sub>CC3</sub>		Output open	ENA = 0V, ENB = 5V	—	9		15
				ENA = 5V, ENB = 0V	—	9		15
	I <sub>CC4</sub>		Output open, PS = 5V	ENA = 0V, ENB = 5V ENA = 5V, ENB = 0V	—	9	15	
I <sub>CC5</sub>	ST = 0V		20	65	110	μA		
Input Voltage	V <sub>INH</sub>	1	④, ⑤ pin Source type	3.5	—	V <sub>CC</sub>	V	
	V <sub>INL</sub>			GND	—	1.7		
	V <sub>ENH</sub> , V <sub>PSH</sub>		①, ②, ⑥, ⑧ pin Source type	3.5	—	V <sub>CC</sub>		
	V <sub>STH</sub>			GND	—	1.7		
	V <sub>ENL</sub> , V <sub>PSL</sub>							
	V <sub>STL</sub>							
Input Current	I <sub>INH</sub>	1	V <sub>IN</sub> = 3.5V V <sub>IN</sub> = 0V	④, ⑤ pin	—	0	0.1	μA
	I <sub>INL</sub>				—	0.25	5.0	
	I <sub>ENH</sub> , I <sub>PSH</sub>		V <sub>EN</sub> = V <sub>PS</sub> = 3.5V V <sub>EN</sub> = V <sub>PS</sub> = 0V	①, ②, ⑥ pin	—	0	0.1	
					—	0.25	5.0	
	I <sub>STH</sub>		V <sub>ST</sub> = 3.5V V <sub>ST</sub> = 0V	⑧ pin	—	0	0.1	
					—	65	110	

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Saturation Voltage	V <sub>SAT U1</sub>	2	—	I <sub>OUT</sub> = 100mA	—	0.8	—	V
	V <sub>SAT U2</sub>			I <sub>OUT</sub> = 400mA	—	0.9	1.2	
	V <sub>SAT L1</sub>			I <sub>OUT</sub> = 100mA	—	0.1	—	
	V <sub>SAT L2</sub>			I <sub>OUT</sub> = 400mA	—	0.2	0.4	
Output Control Upper Voltage	V <sub>REG1</sub>	—	R <sub>REG</sub> = 39kΩ	I <sub>OUT</sub> = 100mA	—	2.0	—	V
	V <sub>REG2</sub>			I <sub>OUT</sub> = 400mA	—	1.9	—	
Control Circuit Output Current	I <sub>REG</sub>	1	—	41	56	71	μA	
Diode Forward Voltage	V <sub>FU</sub>	3	IF = 400mA	—	1.5	2.0	V	
	V <sub>FL</sub>			—	1.0	2.0		
Operating Supply Voltage Range	V <sub>CC (opr.)</sub>	—	—	4.0	—	6.0	V	
Propagation Delay Time	IN-φ	t <sub>pLH</sub>	R <sub>L</sub> = 8.2Ω C <sub>L</sub> = 15pF	—	4.5	—	μs	
	EN-φ			—	3	—		
	PS-φ			—	4.5	—		
	ST-φ			—	10	—		
	IN-φ	t <sub>pHL</sub>		—	0.1	—		
	EN-φ			—	10	—		
	PS-φ			—	0.2	—		
	ST-φ			—	5	—		

TEST CIRCUIT 1

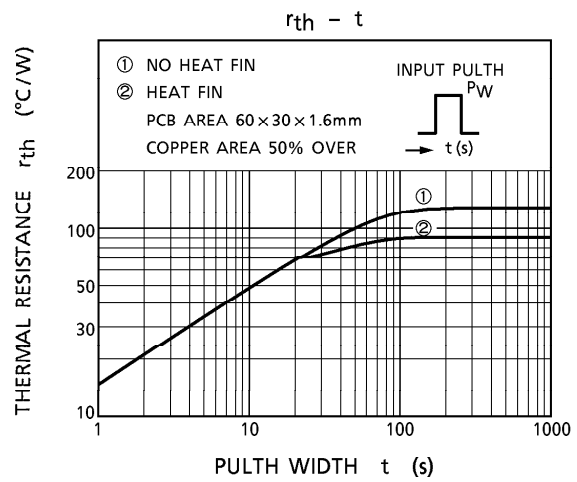
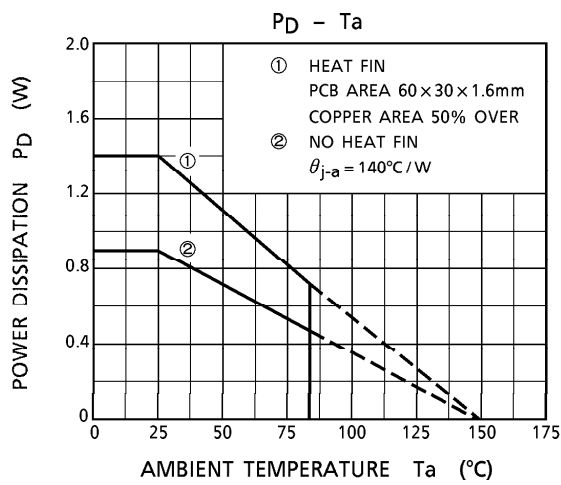
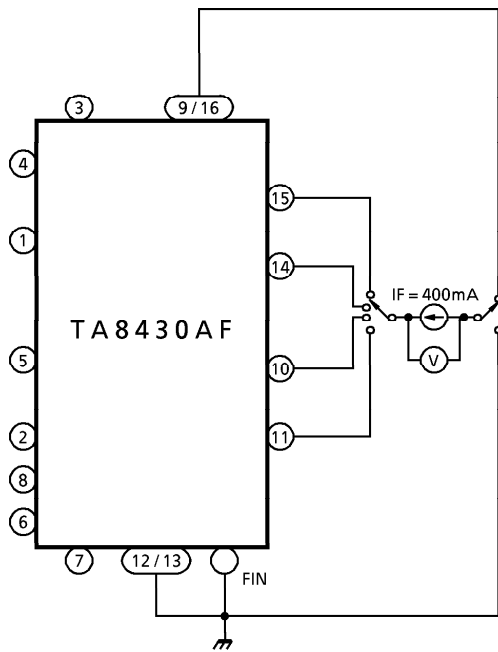


TEST CIRCUIT 2



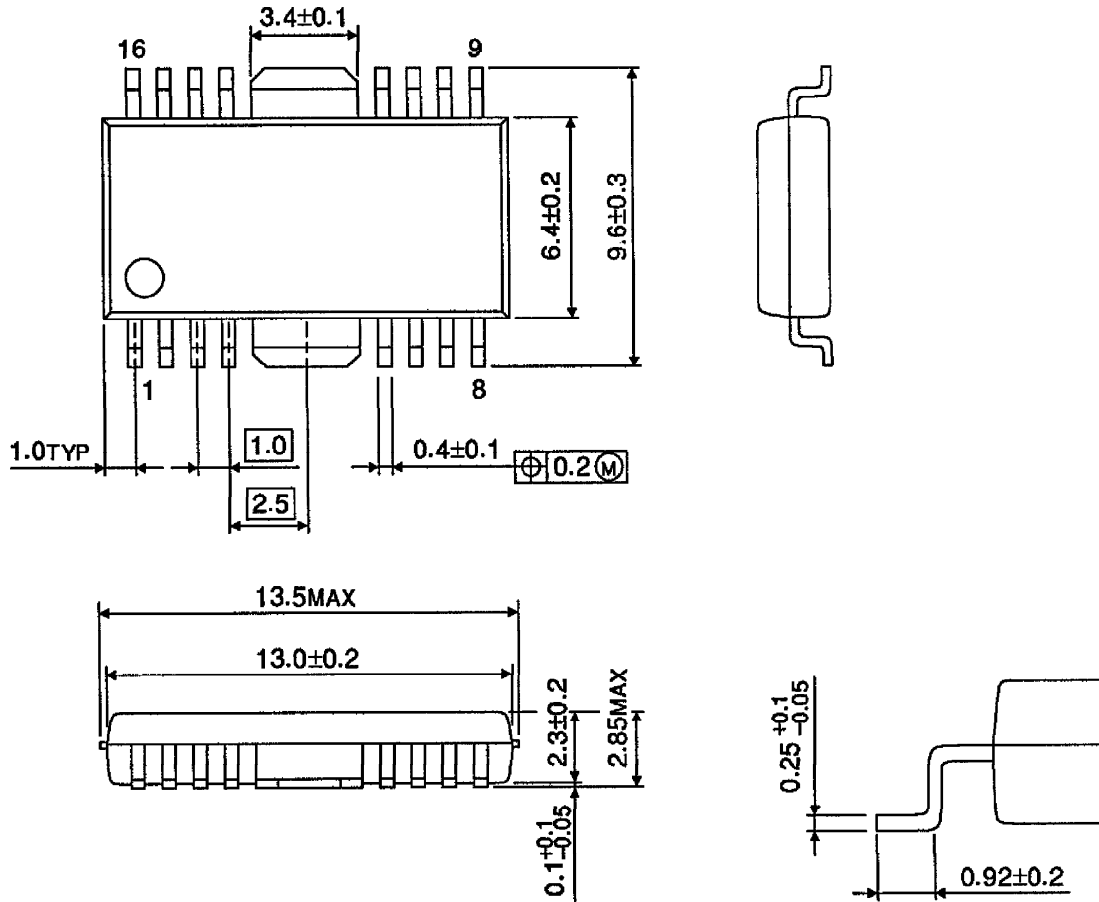


TEST CIRCUIT 3



OUTLINE DRAWING  
HSOP16-P-300-1.00

Unit : mm



Weight : 0.50g (Typ.)