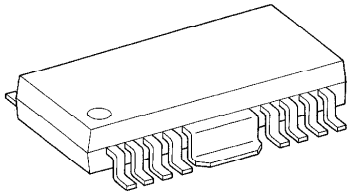
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

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.



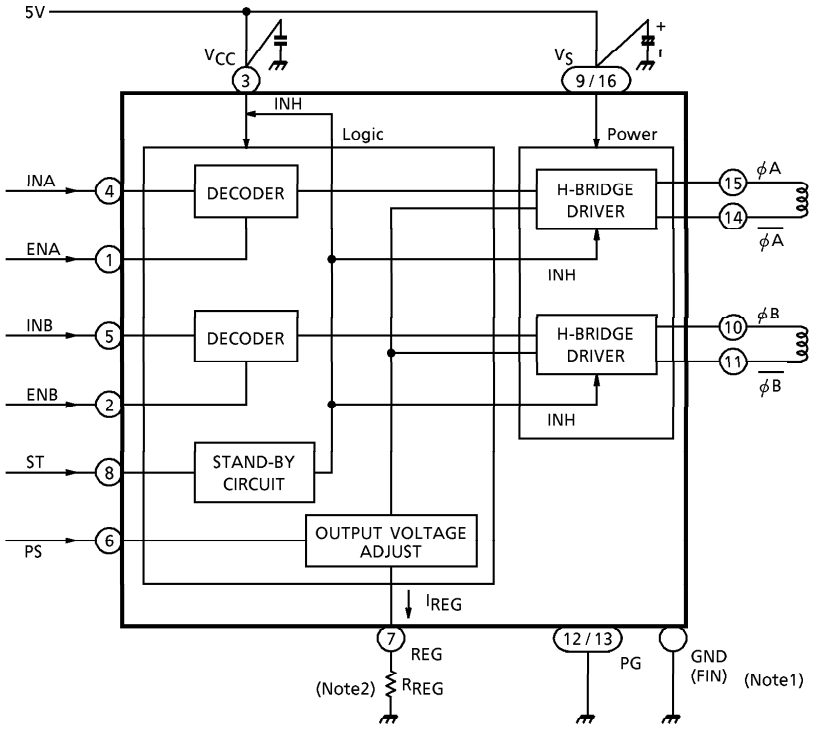
HSOP16-P-300-1.00

Weight : 0.50g (Typ.)

FEATURES

- 2 Phase Bipolar Stepping Motor Driver
- Low Voltage Use : $V_{CC\ opr} = 4V$ (Min.)
- Power Save and Stand-by Mode available
  I_{CC} stand-by $\leqq 100\mu A$
- 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.

BLOCK DIAGRAM



(Note 1) GND terminal of 12 / 13 connect to FIN.
(Note 2) Output Voltages, appeared at ϕA, $\overline{\phi}$A, ϕB and $\overline{\phi}$B, are adjusted by R_{reg} when Power Save function is selected.
(Note 3) Utmost care is necessary in the design of the output line, V_{CC}, V_S 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_{CC}	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_S	Supply voltage
10	ϕB	B output
11	$\overline{\phi}$B	$\overline{B}$ output
12	PG	Power supply GND connection
13	PG	Power supply GND connection
14	$\overline{\phi}$A	$\overline{A}$ output
15	ϕA	A output
16	V_S	Supply voltage
FIN	GND	GND connection

FUNCTION

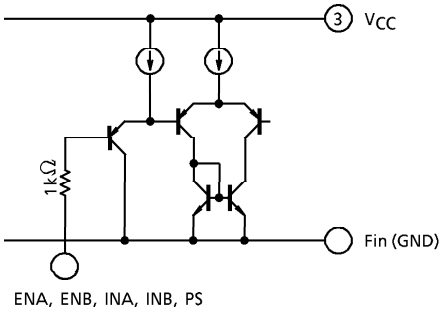
INPUT				OUTPUT		
ST	EN	PS	IN	ϕ	$\overline{\phi}$	UPPER SIDE SATURATION VOLTAGE
H	H	L	L	L	H	$V_S - V_{CE}$ (SAT) U
H	H	L	H	H	L	$V_S - V_{CE}$ (SAT) U
H	H	H	L	L	H	V_{REG} (Note)
H	H	H	H	H	L	V_{REG} (Note)

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

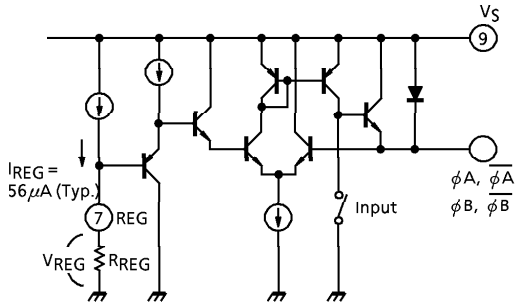
ST	ENA	ENB	ϕA, $\overline{\phi A}$	ϕB, $\overline{\phi B}$	MODE
H	L	H	∞	ENABLE	OPERATION
H	H	L	ENABLE	∞	OPERATION
H	H	H	ENABLE	ENABLE	OPERATION
L	X	X	∞	∞	STAND-BY

X : Don't Care
∞ : High Impedance

INPUT STEP CIRCUIT DIAGRAM



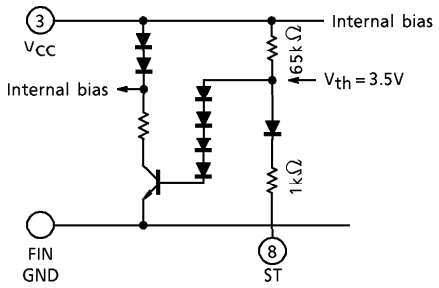
V_{REG} OUTPUT CIRCUIT DIAGRAM



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.

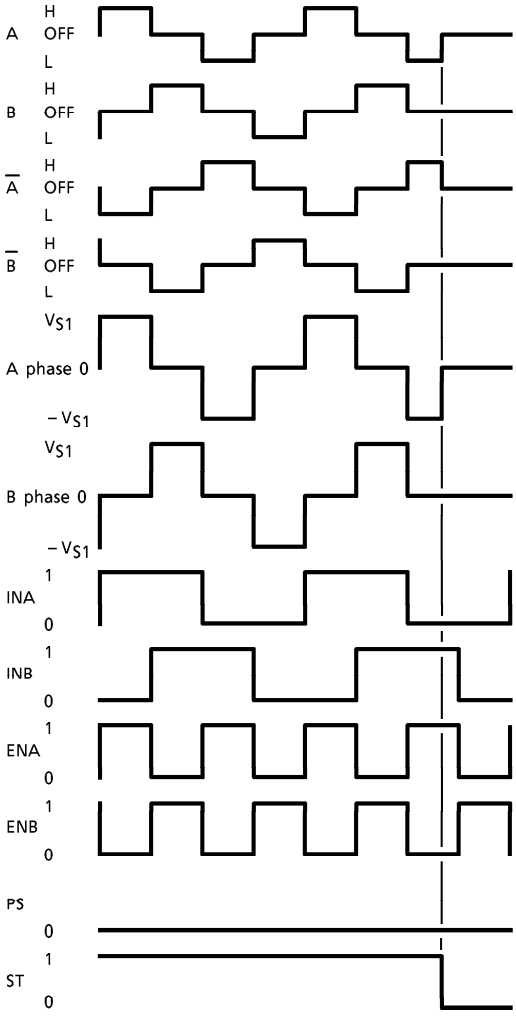
$$V_{OUT} \fallingdotseq V_{REG} \fallingdotseq R_{REG} \times 56 \times 10^{-6}$$

STAND-BY CIRCUIT DIAGRAM



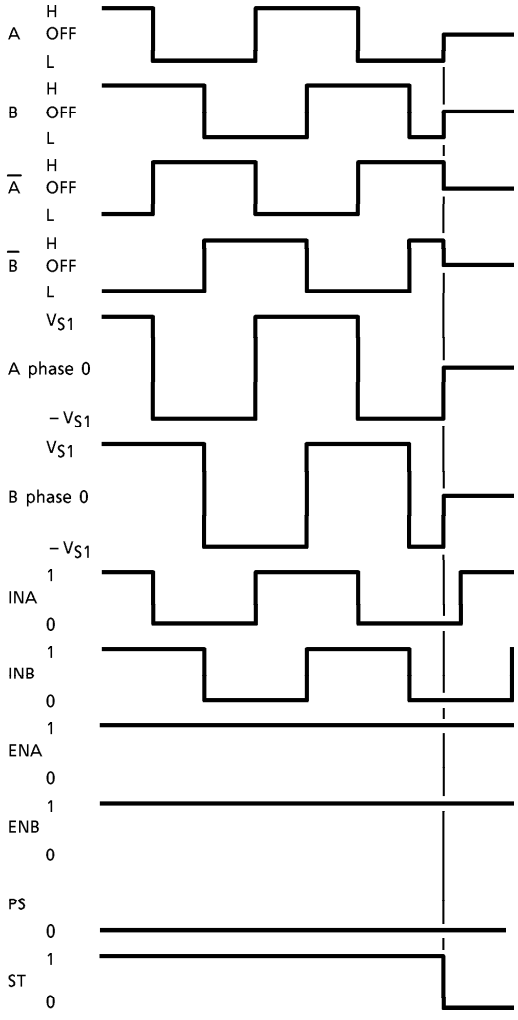
TIMING CHART

Single-phase magnetization



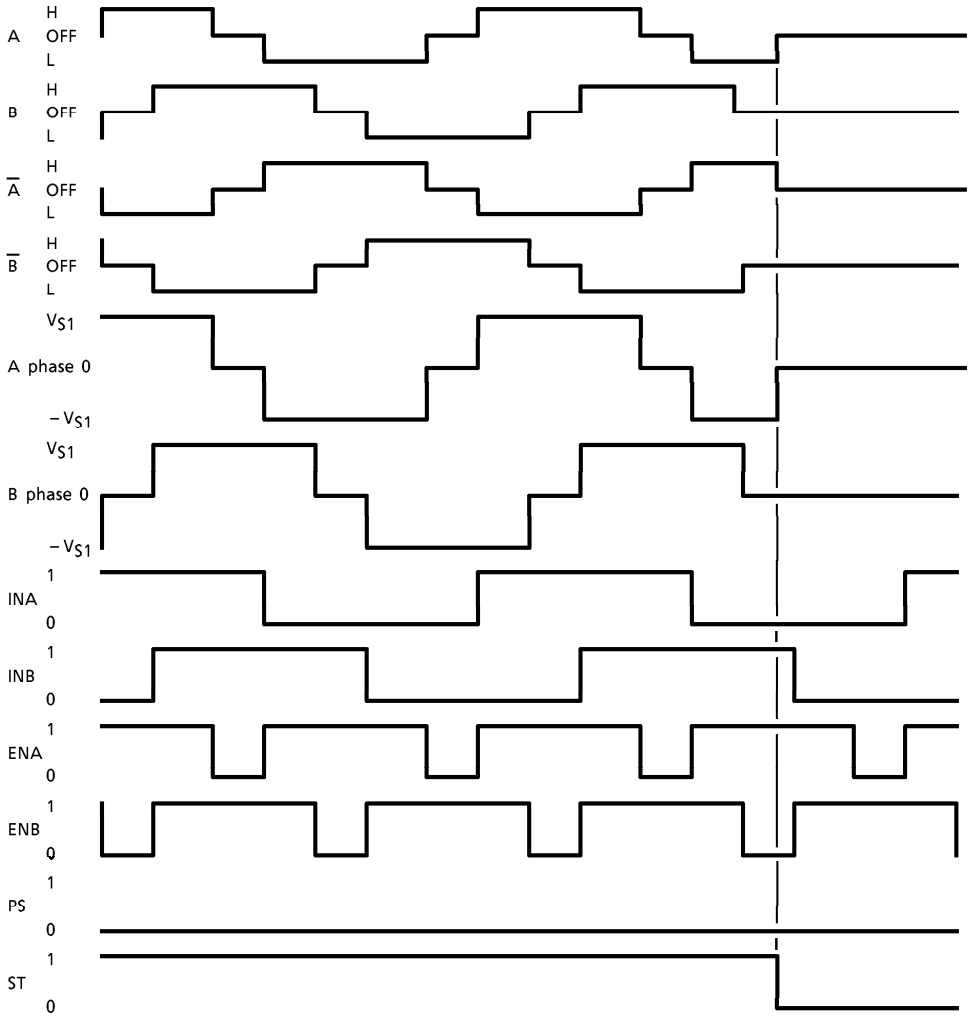
* $V_{S1} = V_S - (V_{SAT\ U} + V_{SAT\ L})$

Double-phase magnetization



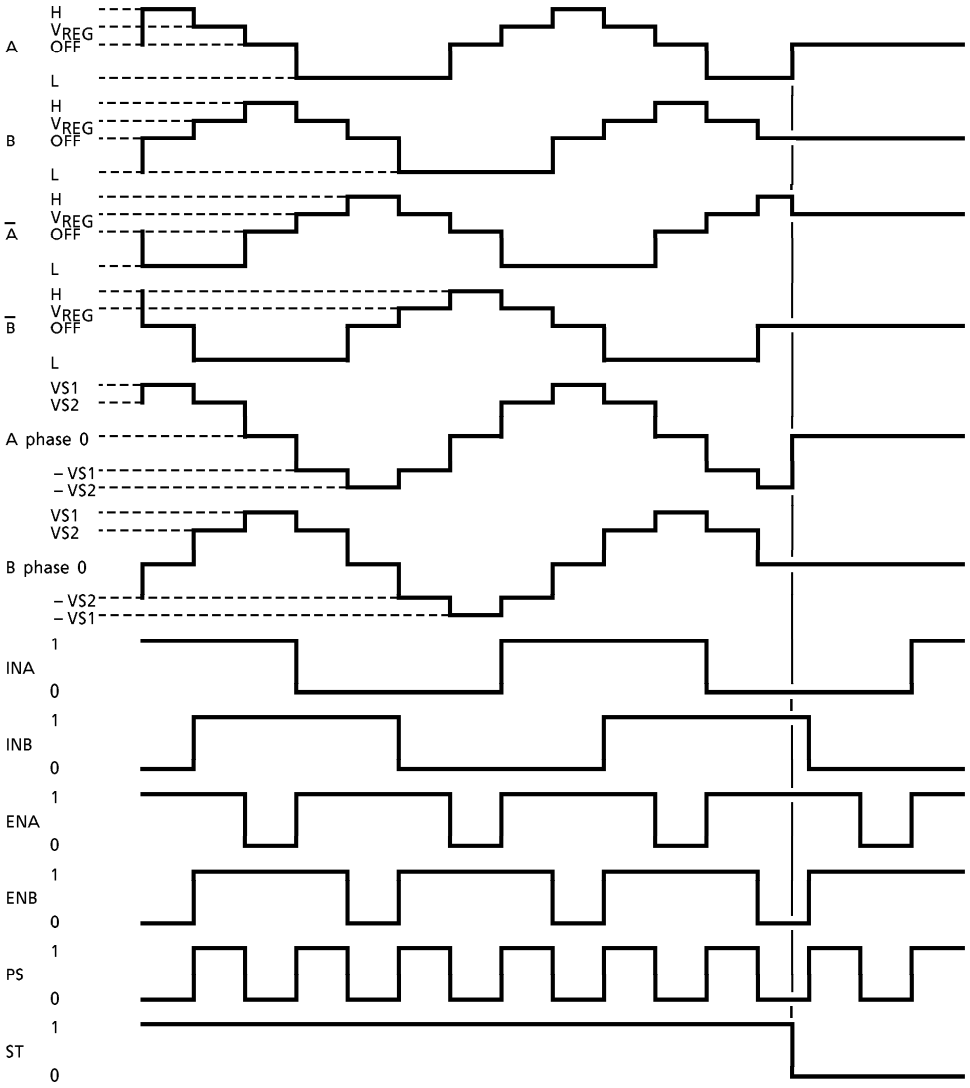
* $V_{S1} = V_S - (V_{SAT\ U} + V_{SAT\ L})$

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_{CC}	8.0	V
	V_S	8.0	
Output Current	I_O (MAX.)	±600	mA
	I_O (AVE.)	±400	
Input Voltage	V_{IN}, V_{PS} V_{ST}, V_{EN}	GND − 0.4~V_{CC} + 0.4	V
Power Dissipation	P_D (Note)	1.4	W
Operating Temperature	T_{opr}	−40~85	°C
Storage Temperature	T_{stg}	−55~150	°C

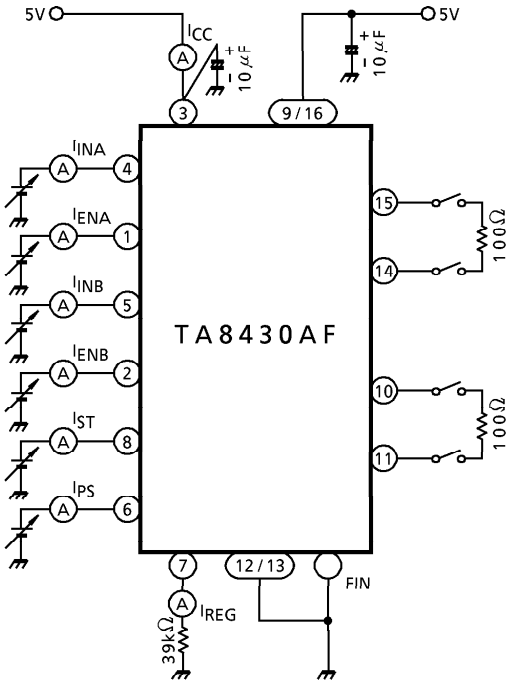
(Note) 60 × 30 × 1.6mm PCB occupied in excess of 50% of copper area, mounting.

ELECTRICAL CHARACTERISTICS (Ta = 25°C, V_{CC} = 5V, V_S = 5V, ST = 5V, PS = 0V, EN = 5V)

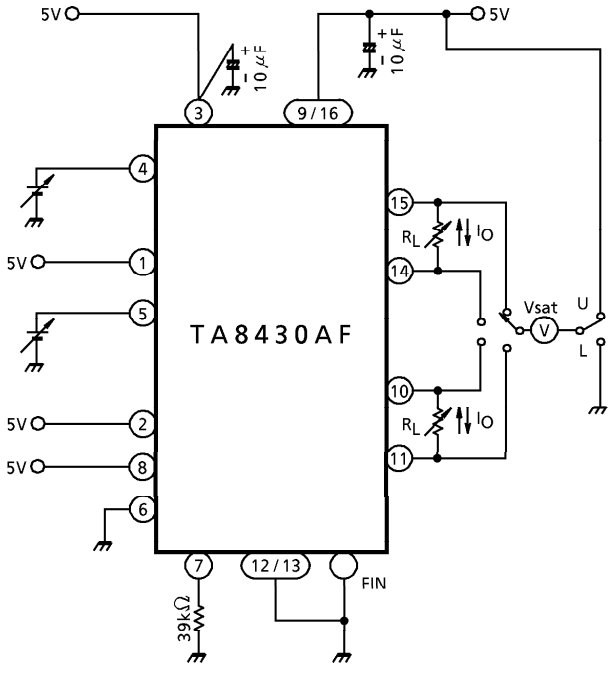
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC1}	1	Output open		—	14	20	mA
	I_{CC2}		Output open, PS = 5V		—	14	20	
	I_{CC3}		Output open	ENA = 0V, ENB = 5V	—	9	15	
				ENA = 5V, ENB = 0V				
	I_{CC4}		Output open, PS = 5V	ENA = 0V, ENB = 5V	—	9	15	
				ENA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

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Saturation Voltage		$V_{SAT\ U1}$	2	—	I_{OUT} = 100mA	—	0.8	—	V
		$V_{SAT\ U2}$			I_{OUT} = 400mA	—	0.9	1.2	
		$V_{SAT\ L1}$			I_{OUT} = 100mA	—	0.1	—	
		$V_{SAT\ L2}$			I_{OUT} = 400mA	—	0.2	0.4	
Output Control Upper Voltage		$V_{REG}1$	—	R_{REG} = 39kΩ	I_{OUT} = 100mA	—	2.0	—	V
		$V_{REG}2$			I_{OUT} = 400mA	—	1.9	—	
Control Circuit Output Current		I_{REG}	1	—		41	56	71	μA
Diode Forward Voltage		V_{FU}	3	IF = 400mA		—	1.5	2.0	V
		V_{FL}				—	1.0	2.0	
Operating Supply Voltage Range		$V_{CC\ (opr.)}$	—	—		4.0	—	6.0	V
Propagation Delay Time	IN-φ	t_{pLH}	—	R_L = 8.2Ω C_L = 15pF		—	4.5	—	μs
	EN-φ					—	3	—	
	PS-φ					—	4.5	—	
	ST-φ					—	10	—	
	IN-φ	t_{pHL}				—	0.1	—	
	EN-φ					—	10	—	
	PS-φ					—	0.2	—	
	ST-φ					—	5	—	

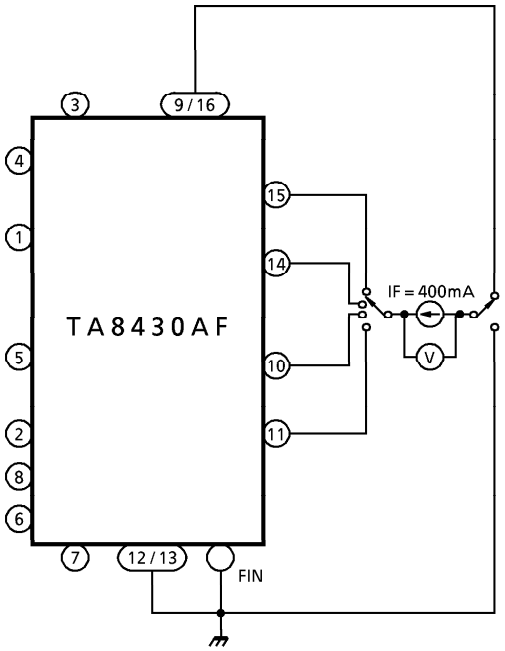
TEST CIRCUIT 1

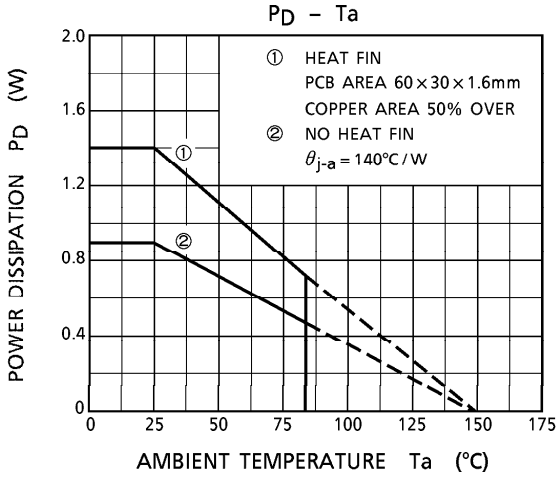


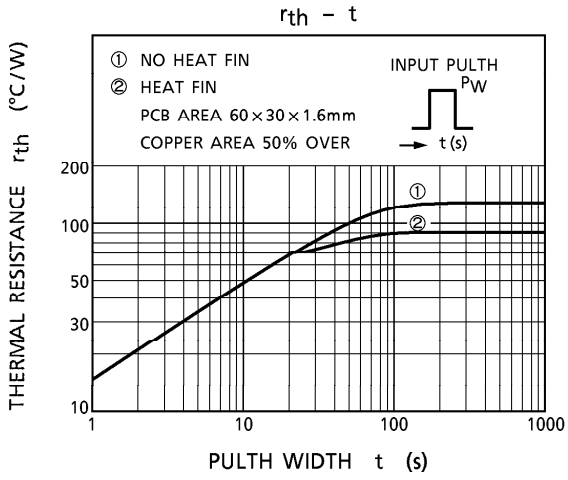
TEST CIRCUIT 2



TEST CIRCUIT 3

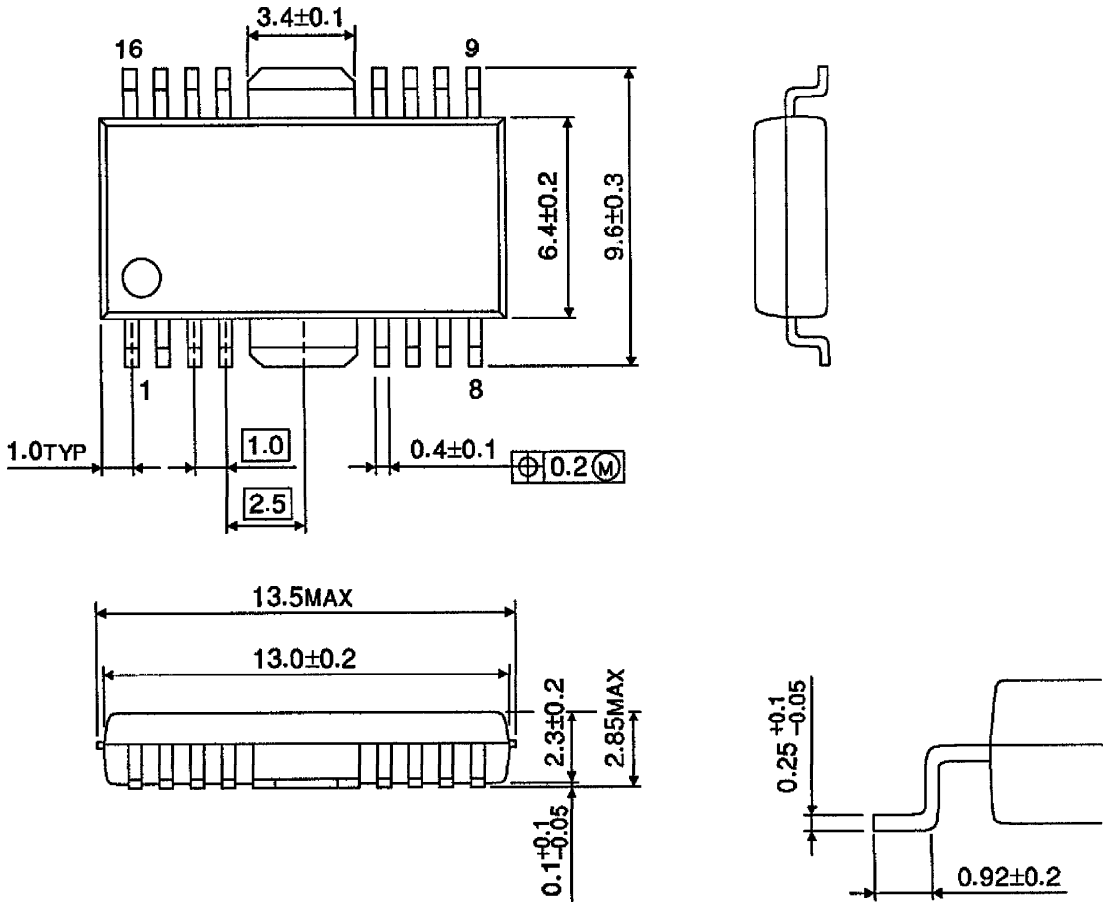






OUTLINE DRAWING

HSOP16-P-300-1.00 Unit : mm



Weight : 0.50g (Typ.)