INTEGRATED CIRCUIT

TECHNICAL DATA

TA7606P

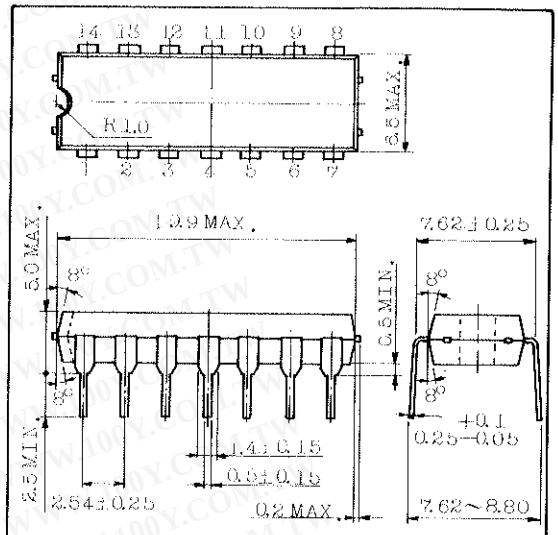
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT

SILICON MONOLITHIC

ZERO VOLTAGE SWITCH

- Temperature Control for Heaters and so Forth
- AC Line Operation at 50Hz or 60Hz
- High Peak Output Current (Pulse)···90mA Min.
- Built-in Protection Circuit for Opened or Shorted Sensor

Unit in mm



Lead pitch is 2.54 and tolerance is ±0.25 against theoretical center of each lead that is obtained on the basis of No.1 and No.14 leads.

JEDEC	—
TOSHIBA	5-21D

MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage (2-7Pin)	V_{CC}	14	V
DC Supply Voltage (2-8Pin)	V_{CC}	14	V
Peak Supply Current (5-7Pin)	I_{CC}(peak)	±50	mA
Peak Supply Current (12-7Pin)	I_{CC}(peak)	±50	mA
Input Voltage (9Pin, 13Pin)	V_9,V_{13}	V_S	V
Differential Input Voltage (9-13Pin)	V_{IN}	14	V
Protection Input Voltage (14Pin)	V_{14}	V_S	V
Protection Input Current (1Pin)	I_1	10	mA
Power Dissipation	P_D	625	mW
Operating Temperature	T_{opr}	-30 ~ 75	°C
Storage Temperature	T_{stg}	-55 ~ 150	°C

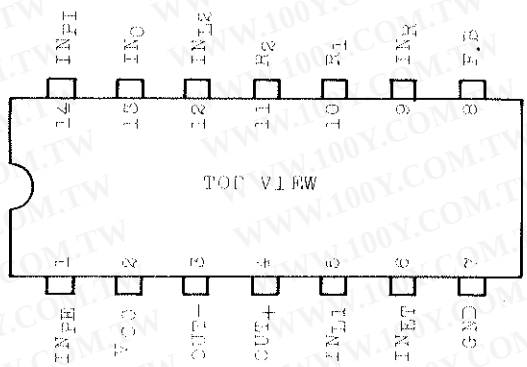
ELECTRICAL CHARACTERISTICS

($Ta=25^{o}C$, AC Line Voltage=$100V_{rms}$, 50-60Hz)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	Inhibit Mode	V_{CC}	1	$R_S=6.8k\Omega$	5.8	6.3	6.8	V
	Pulse Mode				5.5	6.1	-	V
Gate Trigger Current		$I_{GT}(4)$	2	Term. 3 and 2 Connected $V_{GT}=1V$	-	105	-	mA
Peak Output Current (Pulsed)	Internal Power Supply	$I_{OP}(4)$	2	Term. 3 Open $V_{GT}=0V$	50	85	-	mA
				Term. 3 and 2 Connected $V_{GT}=0V$	90	130	-	mA
	External Power Supply	$I_{OP}(4)$	3	Term. 3 Open $V_{GT}=0V$, $V_S=12V$	130	170	-	mA
				Term. 3 and 2 Connected $V_{GT}=0V$ $V_{CC}=12V$	190	250	-	mA
Total Gate Pulse Duration	Positive dv/dt	t_P	4	$R_S=6.8k\Omega$, $C_{(EXT.)}=0$	110	135	165	μs
	Negative dv/dt	t_N			110	135	165	μs
Gate Pulse Duration (After Zero Crossing)	Positive dv/dt	t_{P1}			-	50	-	μs
	Negative dv/dt	t_{N1}			-	85	-	μs
Output Leakage Current		I_4	-	-	-	-	5	μA
Input Bias Current		I_B	5	$V_{CC}=6V$	-	-	5.6	μA
Protection Threshold Voltage	High Level	V_{TH}"H"	6	$V_{CC}=6V$	4.80	5.05	5.30	V
	Low Level	V_{TH}"L"			0.75	1.10	1.34	V

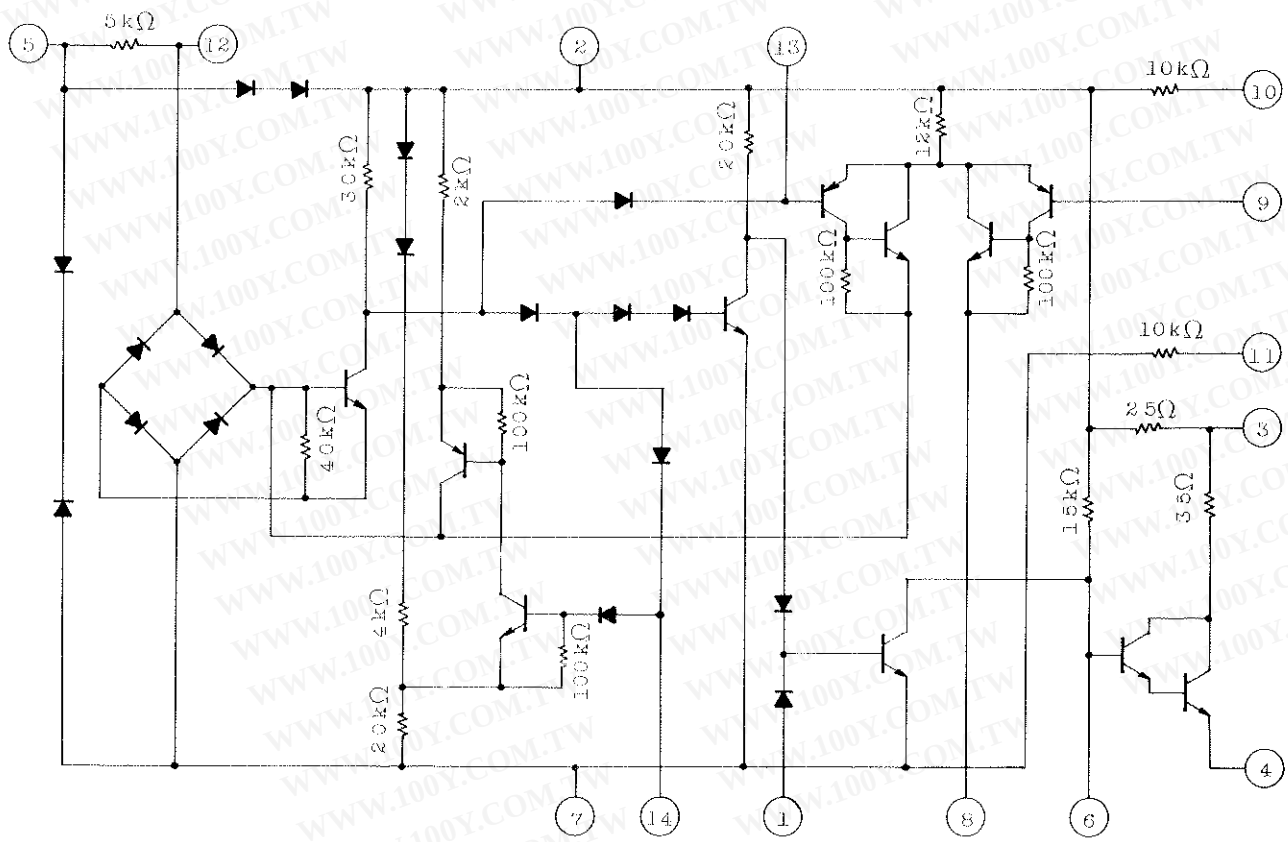
※ Gate pulse duration in 60Hz applications is approximately 15% shorter than shown in the above.

PIN CONNECTION



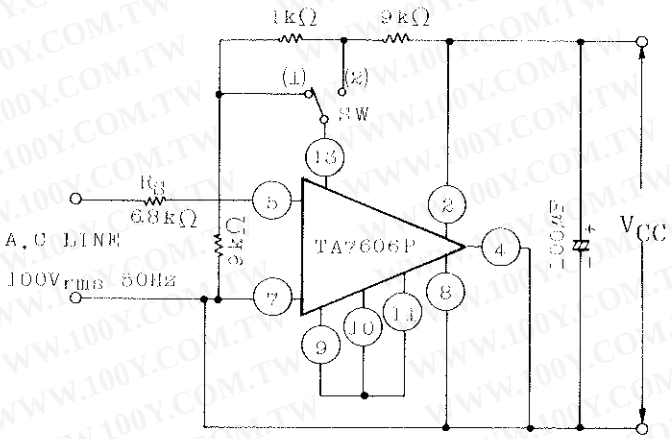
1. IN_{PE} : EXTERNAL PROTECTION INPUT
2. V_{CC} : DC SUPPLY
3. OUT- : -TRIGGER PULSE OUTPUT
4. OUT+ : +TRIGGER PULSE OUTPUT
5. IN_{L1} : AC LINE INPUT
6. IN_{ET} : EXTERNAL TRIGGER INPUT
7. GND : GROUND
8. F.B : FEEDBACK
9. IN_R : REFERENCE INPUT
10. R_1 : REFERENCE RESISTER
11. R_2 : REFERENCE RESISTER
12. IN_{L2} : AC LINE INPUT
13. IN_C : CONTROL SIGNAL INPUT
14. IN_{P1} : INTERNAL PROTECTION INPUT

EQUIVALENT CIRCUIT

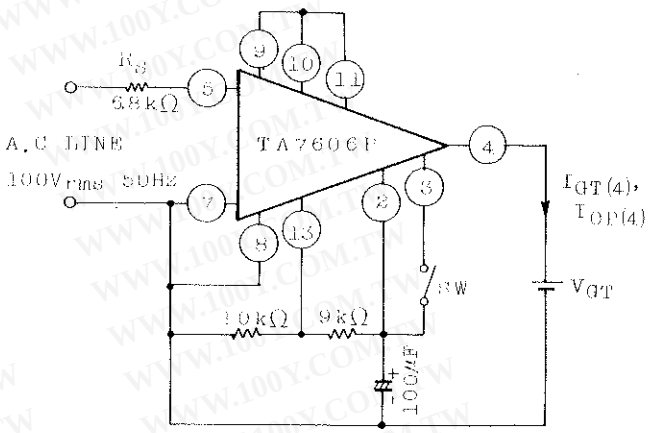


TEST CIRCUIT

1. V_{CC}



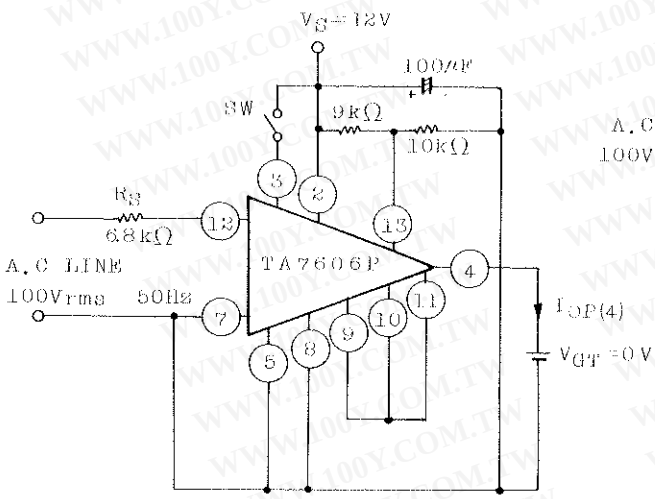
2. $I_{GT(4)}$, $I_{OP(4)}$, INTERNAL POWER SUPPLY



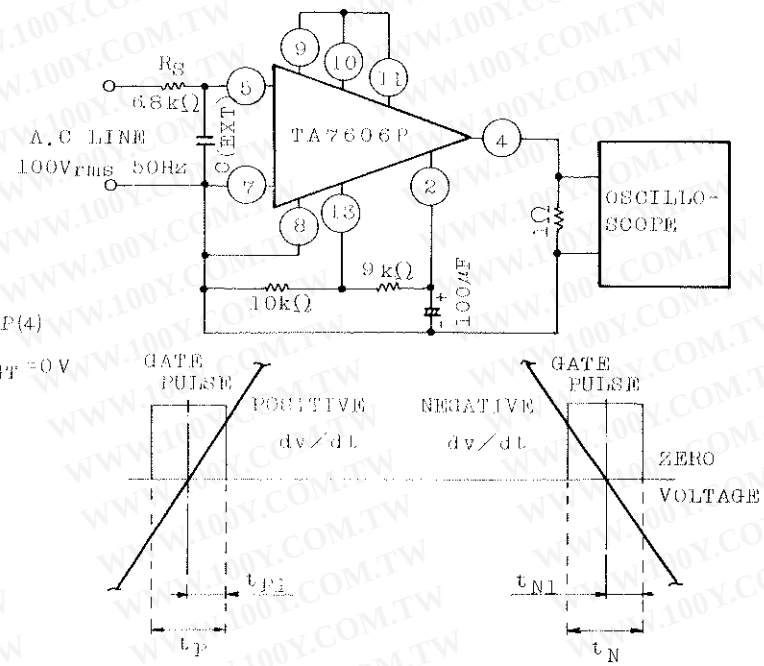
SW → (1) : INHIBIT MODE

SW → (2) : PULSE MODE

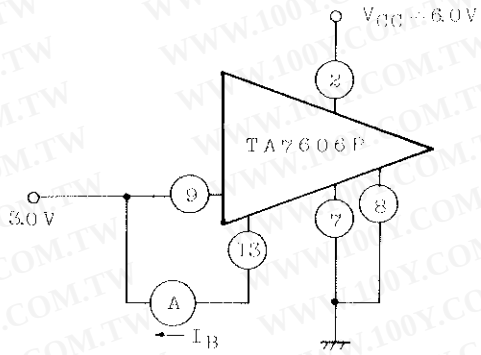
3. $I_{OP(4)}$ EXTERNAL POWER SUPPLY



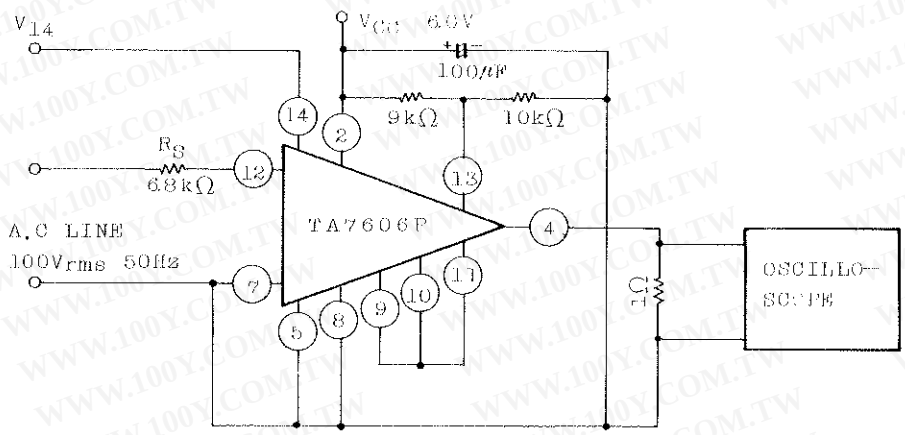
4. t_P, t_N, t_{P1}, t_{N1}



5. I_B

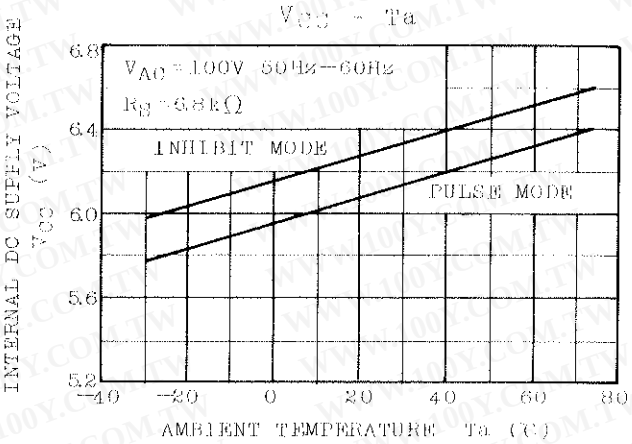


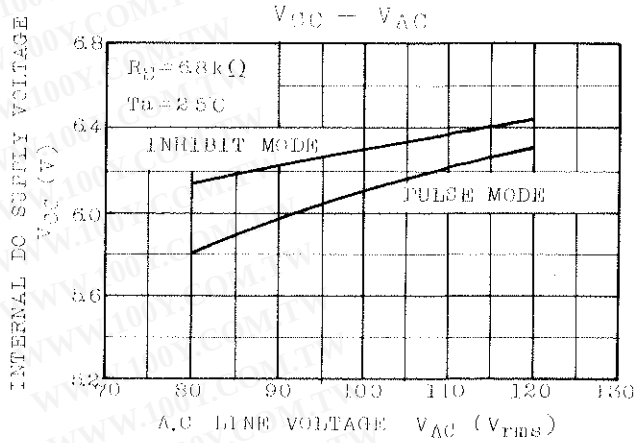
6. V_{TH}"H", V_{TH}"L"

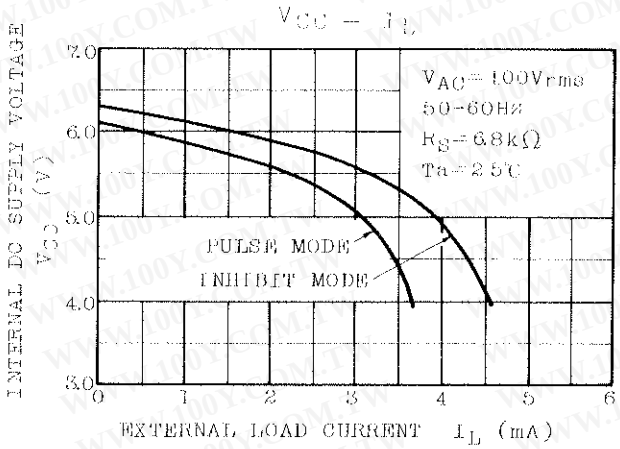


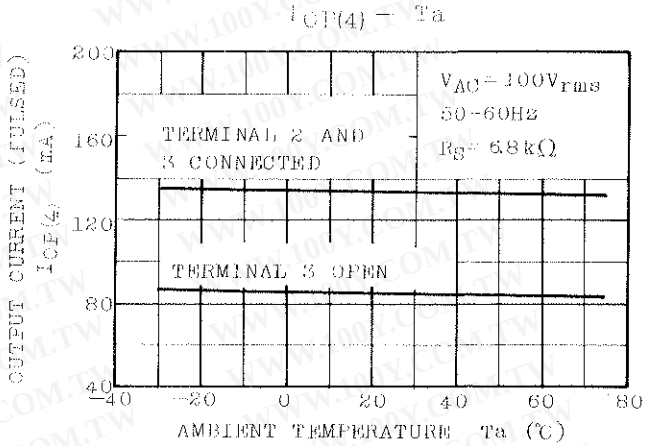
V_{TH}"H" : The high level of V_{14} at the output off.

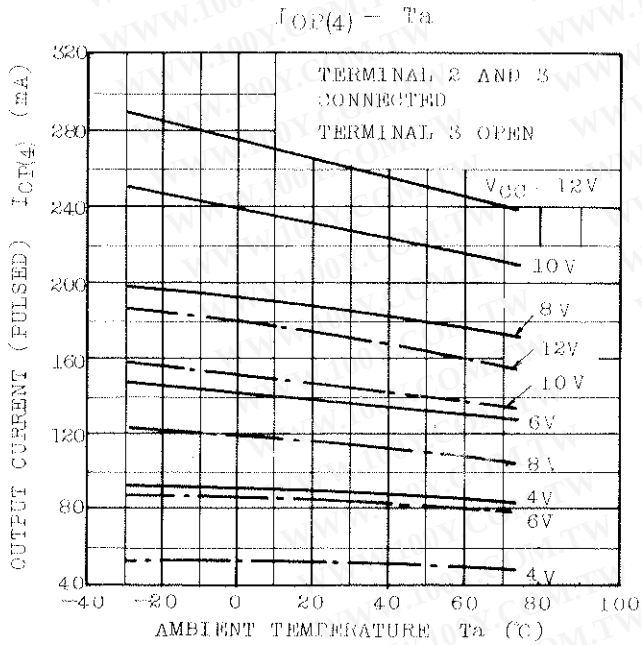
V_{TH}"L" : The low level of V_{14} at the output off.

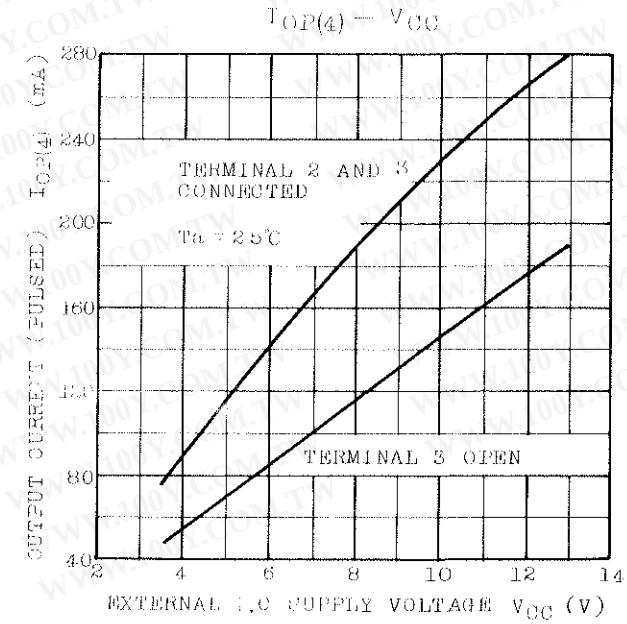

VCC - Ta
VAC = 100V 50Hz~60Hz
RS = 6.8kΩ
INHIBIT MODE
PULSE MODE
INTERNAL DC SUPPLY VOLTAGE VCC (V)
AMBIENT TEMPERATURE Ta (℃)


VCC - VAC
RS = 6.8kΩ
Ta = 25℃
INHIBIT MODE
PULSE MODE
INTERNAL DC SUPPLY VOLTAGE VCC (V)
A.C LINE VOLTAGE VAC (Vrms)

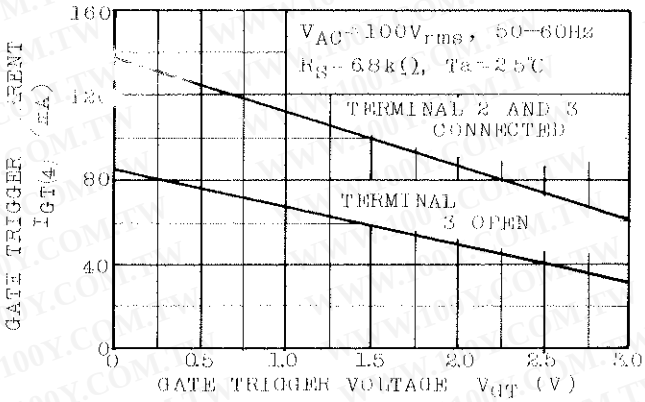

VCC - IL
VAC = 100Vrms
50~60Hz
RS = 6.8kΩ
Ta = 25℃
PULSE MODE
INHIBIT MODE
INTERNAL DC SUPPLY VOLTAGE VCC (V)
EXTERNAL LOAD CURRENT IL (mA)


IOP(4) - Ta
VAC = 100Vrms
50~60Hz
RS = 6.8kΩ
TERMINAL 2 AND 3 CONNECTED
TERMINAL 3 OPEN
OUTPUT CURRENT (PULSED) IOP(4) (mA)
AMBIENT TEMPERATURE Ta (℃)

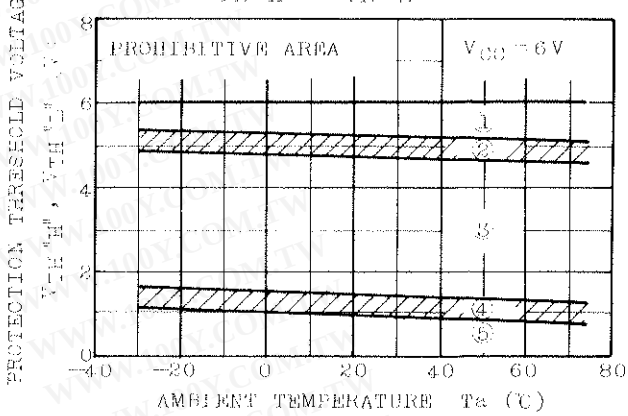

IOP(4) - Ta
TERMINAL 2 AND 3 CONNECTED
TERMINAL 3 OPEN
VCC = 12V
10V
8V
12V
10V
6V
8V
4V
6V
4V
OUTPUT CURRENT (PULSED) IOP(4) (mA)
AMBIENT TEMPERATURE Ta (℃)


IOP(4) - VCC
TERMINAL 2 AND 3 CONNECTED
Ta = 25℃
TERMINAL 3 OPEN
OUTPUT CURRENT (PULSED) IOP(4) (mA)
EXTERNAL D.C SUPPLY VOLTAGE VCC (V)

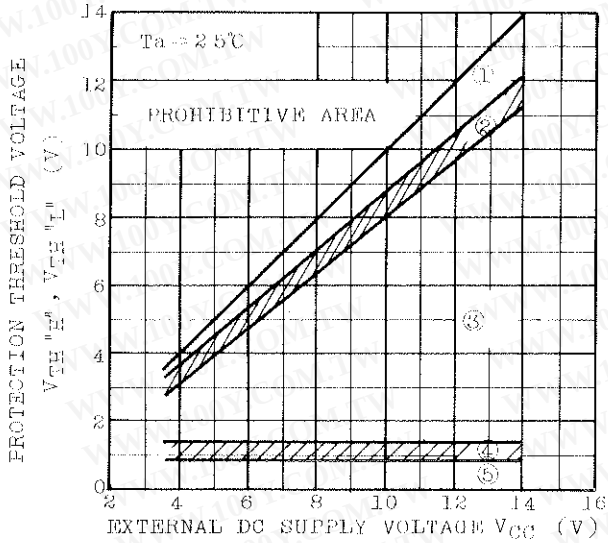
$I_{GT(4)}$ — V_{GT}



V_{TH}"H", V_{TH}"L" — Ta



V_{TH}"H", V_{TH}"L" — V_{CC}



① AREA OF OUTPUT OFF

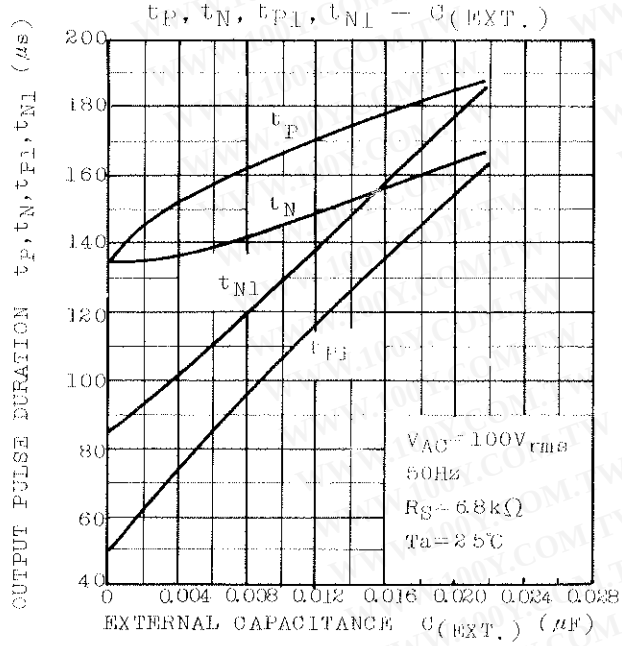
② AREA OF UNCERTAIN OPERATION

③ AREA OF NORMAL OPERATION

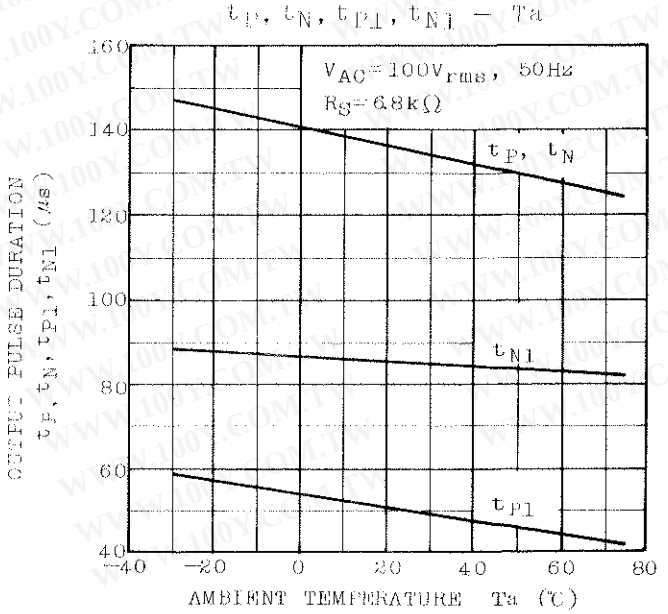
④ AREA OF UNCERTAIN OPERATION

⑤ AREA OF OUTPUT OFF

t_P, t_N, t_{P1}, t_{N1} — $C_{(EXT.)}$



t_P, t_N, t_{P1}, t_{N1} — Ta



APPLICATION

1. ON-OFF CONTROLLER (HEATER)

a. I^+, III^+ MODE TRIGGER

(STANDARD APPLICATION)

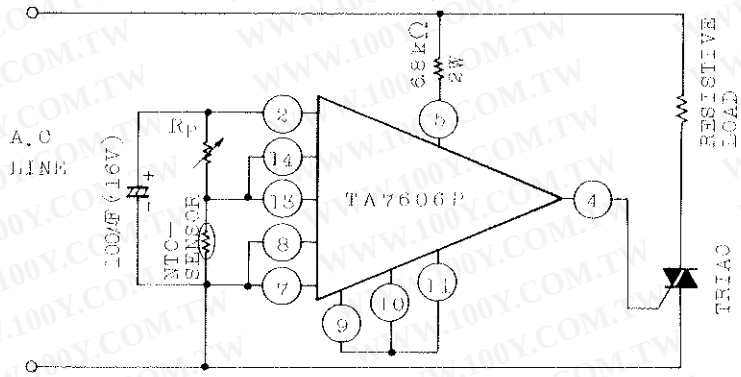


Fig. 1-a

- Mind the gate sensitivity (I^+ and III^+ modes) of a triac, because the TA7606P supplied positive gate pulses.
- The triac is turned off by the built-in protection circuit if the sensor opened or shorted.
- Open the terminal 14 if a built-in protection circuit is not necessary.
- Connect the terminal 2 and 3 if the output current is too low.
- Set the value of R_p and sensor resistance between 5kΩ and 50kΩ.
- If the output pulse duration is too short, it gives the longer effective gate pulse duration to connect a external capacitor between the terminal 5 and 7.

b. I^-, III^- MODE TRIGGER (HEATER)

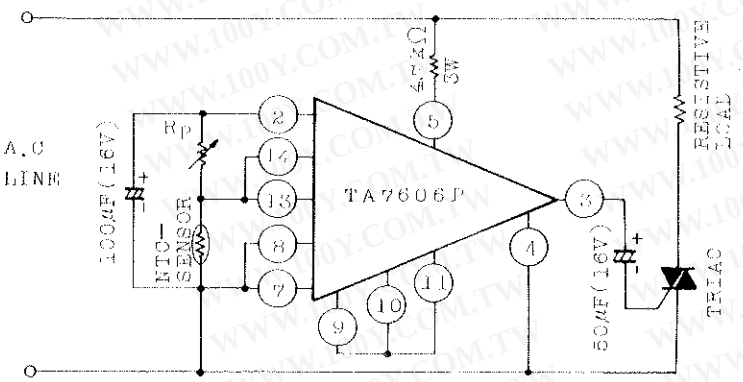


Fig.1-b(a)

- This circuit is used if I^+ and III^+ mode trigger is impossible.
  (Generally III^+ mode gate sensitivity is worst.)
- The curve in Fig.1-b(b) shows the approxmate gate current as a function of gate voltage.

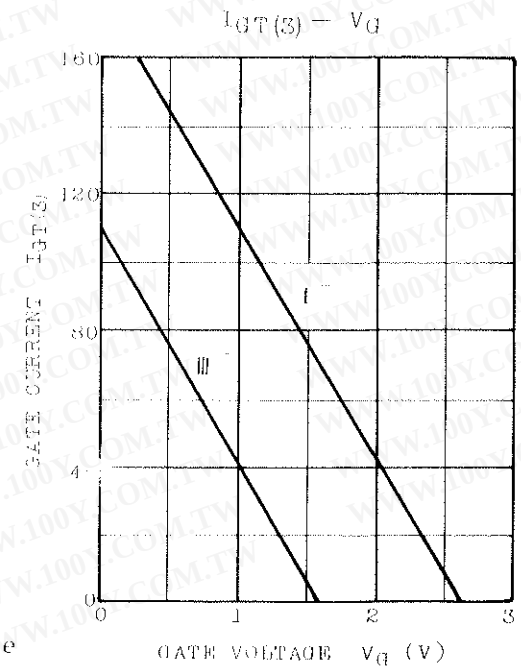


Fig. 1-b(b)

2. ON-OFF CONTROLLER WITH HYSTERESIS (HEATER)

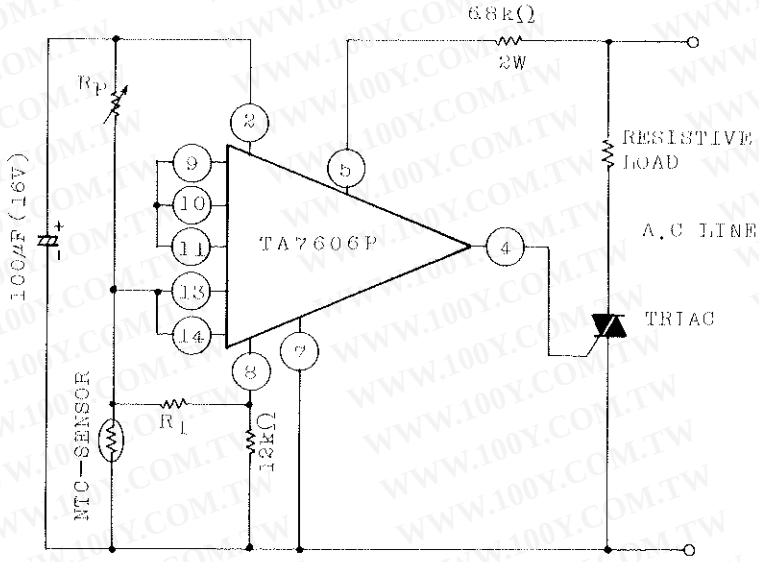


Fig.2 (a)

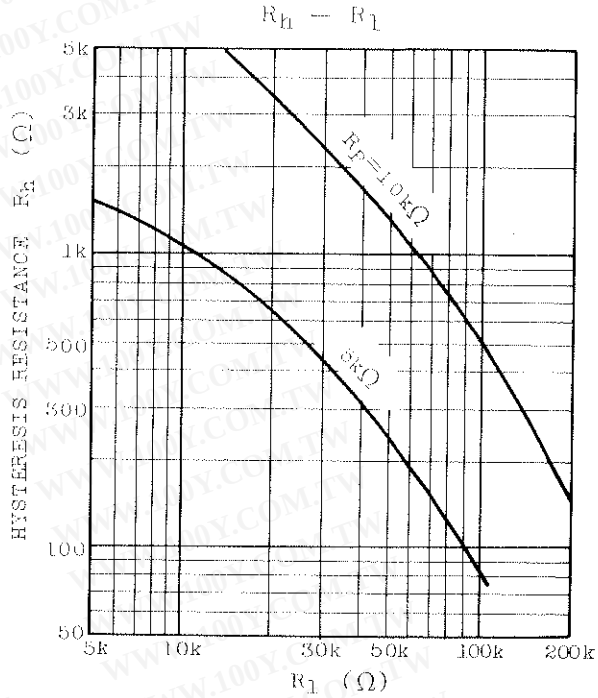


Fig.2 (b)

- The value of R_1 can change hysteresis shown in Fig.2 (b).
- The resistance between terminal 8 and GND can also change hysteresis.
- See application 1-a about a sensor and so forth.

3. ON-OFF CONTROLLER (EXTERNAL D.C SUPPLY)

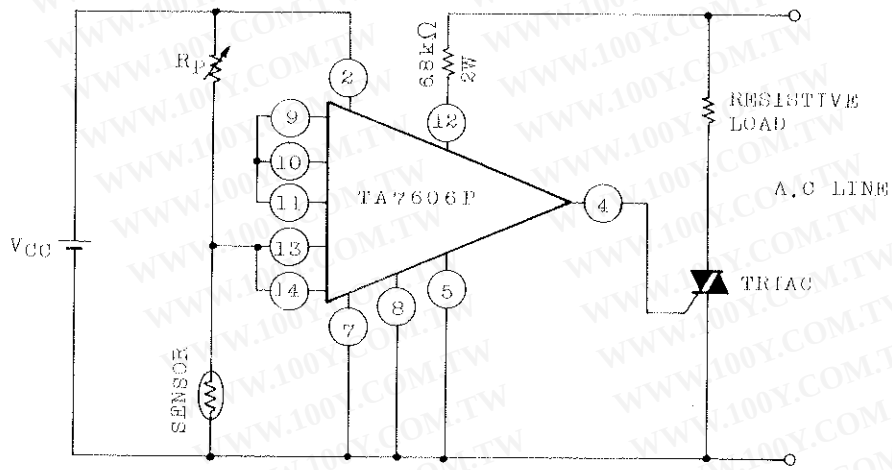


Fig.3

- See application 1-a about a sensor and so forth.