

**SANYO**

No.1343D

**LA2010**

AUDIO LEVEL SENSOR

The LA2010 is an IC for detecting interprogram spaces to pick out the starting point of a program immediately preceding or following a musical program recorded on tape.

**Applicable Sets**

- Radio-cassette recorders
- Cassette decks
- Car stereos

**Application**

- Detection of spaces between programs recorded on tape

**Features**

- Built-in transistor capable of driving plunger with 600 mA max. and protective diode to prevent induced reverse voltage
- Capable of desired timing setting by using external C, R
- Detects unrecorded areas of tape and drives plunger.
- Built-in preventer to prevent plunger from malfunctioning at the time of application of power
- Built-in detector to detect recorded area

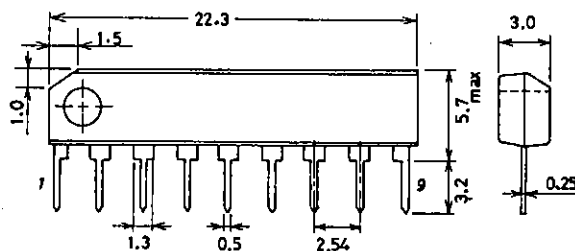
**Maximum Ratings/ $T_a = 25^\circ\text{C}$** 

Maximum supply voltage	$V_{CC}$ max	15	unit
Flow-in current	$I_g$ max	600	V
Allowable power dissipation	$P_d$ max	540	mA
Operating temperature	$T_{opr}$	$-20 \sim +75$	mW
Storage temperature	$T_{stg}$	$-40 \sim +125$	$^\circ\text{C}$
			$^\circ\text{C}$

- Note) • The voltage on pin 1 must not exceed the voltage on pin 9.  
 • The current flowing into pin 2 and pin 4 must not exceed  $\pm 0.5$  mA continuously.  
 • The voltage on pin 8 is 2.5 V max. and must not exceed the voltage on pin 7.

**Operating Conditions/ $T_a = 25^\circ\text{C}$** 

Recommended supply voltage	$V_{CC}$	9	unit
Operating voltage range	$V_{CC\ op}$	$3.5 \sim 14$	V

**Package Dimensions 3017B-S9IC**  
(unit: mm)

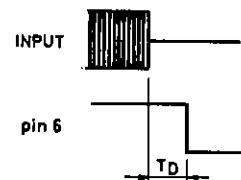
**Operating Characteristics/ $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 9.0\text{ V}$ ,  $f = 1\text{ kHz}$** 

			min	typ	max	unit
Circuit current	$I_{CC}$	$f = 1\text{ kHz}$ , $V_{IN} = -30\text{ dB}$		11	22	mA
Output transistor saturation voltage	$V_{CE}(\text{sat})$	$I_b = 600\text{ mA}$		1.1	1.6	V
Output diode forward voltage	$V_F$	$I_F = 600\text{ mA}$		1.5	2.0	V
Input check level	$V_{IN}$	$f = 1\text{ kHz}$ , Pin 6 L $\rightarrow$ H	-47	-50	-53	dB
Comparator (1) ON level	$V_{TH1-H}$	Pin 6 inverted	3.0	3.5	4.0	V
Comparator (1) OFF level	$V_{TH1-L}$	Pin 6 inverted	1.8	2.2	2.6	V
Comparator (2) ON level	$V_{TH2-H}$	Pin 6 inverted	4.7	5.5	6.3	V
Comparator (2) OFF level	$V_{TH2-L}$	Pin 6 inverted	3.6	4.0	4.6	V
Pin 4 reset level	$V_{4R}$	$f = 1\text{ kHz}$ , $V_{IN} = -30\text{ dB}$ , pin 8 = 1.0 V		0.02	0.1	V
Pin 8 reset voltage-1	$V_{8R-1}$	Pin 1 inverted, $R_g = 0$	0.6	0.7	0.8	V
Pin 8 reset voltage-2	$V_{8R-2}$	$f = 1\text{ kHz}$ , $V_{IN} = -30\text{ dB}$ , pin 4 inverted	1.1	1.3	1.5	V

**1. Description of external parts**

- **C1:** Input coupling capacitor  
Capacitor used for coupling with preceding preamp. Characteristics at the time of application of power considered, the capacitance value of C1 must not exceed that of C3 on pin 3. 0.047  $\mu\text{F}$  (polyester film capacitor) is recommended. R1, R2 are used to adjust the input level. Pin 1 is high impedance; in order to be free from external effect, R2 must not exceed 10 kohm and must be grounded.

- **C2, R3:** For setting interprogram space detect time ( $T_D$ )  
By selecting proper C2 and R3, your desired  $T_D$  can be obtained.  
 $T_D = 1.34 \times C2 \cdot R3$  (sec)  
It is recommended to use R3 of 150 kohm to 500 kohm.  
It is recommended to use C2 of 0.22  $\mu\text{F}$  (polyester film capacitor).



- **C3:** NF capacitor  
Lower cut-off frequency  $f_L$  depends on this capacitor.

$$f_L = \frac{1}{0.3\pi C3 (\mu\text{F})} \dots \dots \dots (\text{kHz})$$

Assuming  $C3 = 0.47\text{ }\mu\text{F}$ ,  $f_L = 2.2\text{ kHz}$  is obtained. If the capacitance value of C3 is increased,  $f_L$  lowers, thereby being subjected to the effect of the variations in preamp. Further, since the time that elapses between the moment  $V_{CC}$  is applied and the moment the circuit is stabilized becomes longer, the reset time must be made longer accordingly. Therefore, it is recommended to use C3 of 0.47  $\mu\text{F}$ .

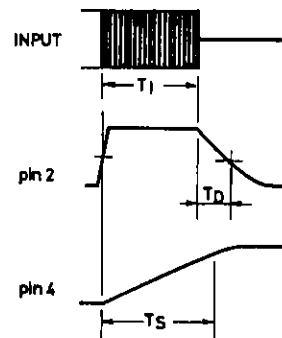
- **C4, R4:** For setting recorded area detect time ( $T_S$ )  
The presence or absence of a program (input signal) is checked by the time setting determined by C4, R4 as follows:

- For recorded area  $T_S < T_I + T_D$
- For unrecorded area  $T_S > T_I + T_D$

The recorded area detect time is set by:

$$T_S = C4 (\mu\text{F}) R4 (\text{k}\Omega) (\text{msec})$$

Therefore, if the recorded area detect time ( $T_S$ ) is longer than the input signal time ( $T_I$ ) + the unrecorded area detect time ( $T_D$ ), no program is present. The resistance value of R4 must be 50 kohm to 200 kohm; it is recommended to use R4 of 100 kohm. The capacitance value of C4 must not exceed 4.7  $\mu\text{F}$ ; it is recommended to use C4 of 1  $\mu\text{F}$  to 3.3  $\mu\text{F}$ .



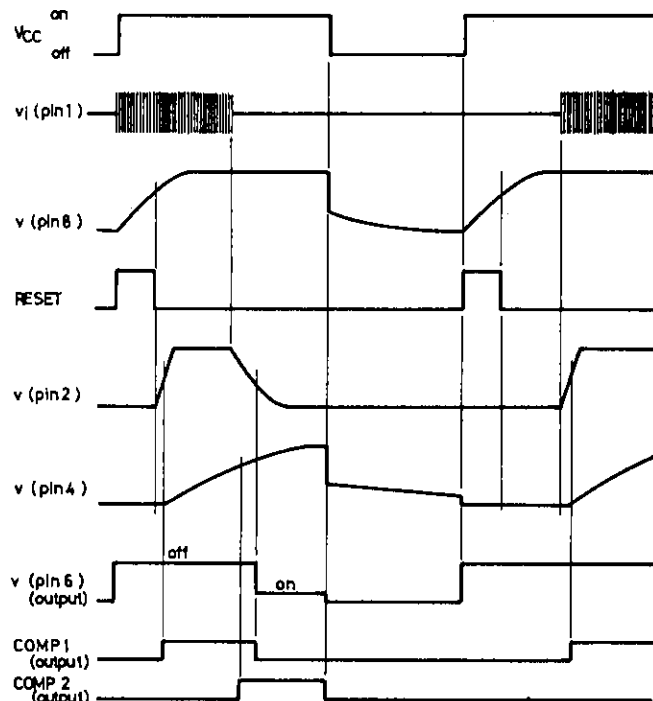
- C5: For setting reset time  
Capacitor used to set the time for initializing the circuit at the time of application of power. The reset pulse is generated for a certain period of time [  $TR = 14.4 \cdot C5 (\mu F) (ms)$  ] that is set each time power is applied.
- C6, R5: For power ripple filter

#### Description of Operation (See Timing Chart.)

When power is applied, the reset circuit operates to initialize the circuit. The reset time depends on the capacitance value of C5 on pin 8 and no input signal is accepted while the reset circuit is operating. When the reset mode is released and the input signal exceeds the input check level, C, R on pin 2 are charged and the potential on pin 2 rises, thereby causing the comparator (1) to be inverted. When the comparator (1) is inverted, pin 4 (C4) is charged and the potential on pin 4 begins rising. When this potential exceeds the threshold voltage, the comparator (2) is inverted and the program presence mode is memorized; thus the potential on pin 4 is held at High level. During this period of time, the output (pin 6) is held at High level. When the signal disappears and the comparator (1) is inverted, the output (pin 6) turns to Low level, thereby causing the plunger to be driven.

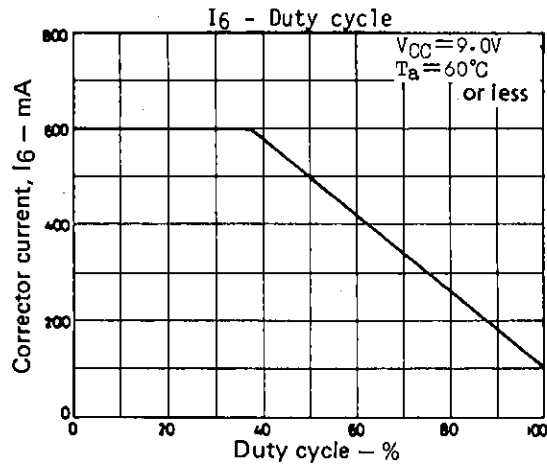
The reset pulse is generated for a certain period of time each time power is applied, thereby causing the circuit to be initialized.

Timing Chart

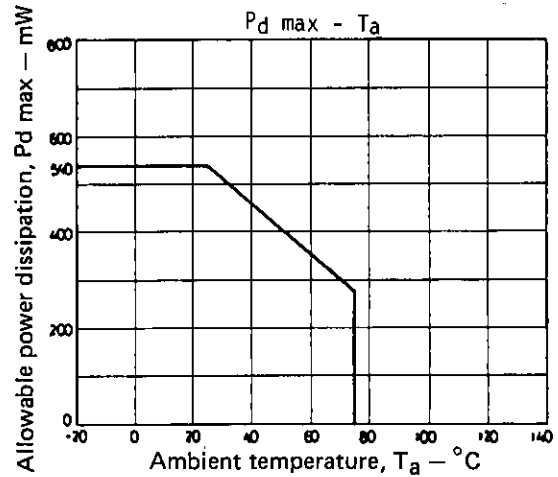


#### Proper Cares in Using IC

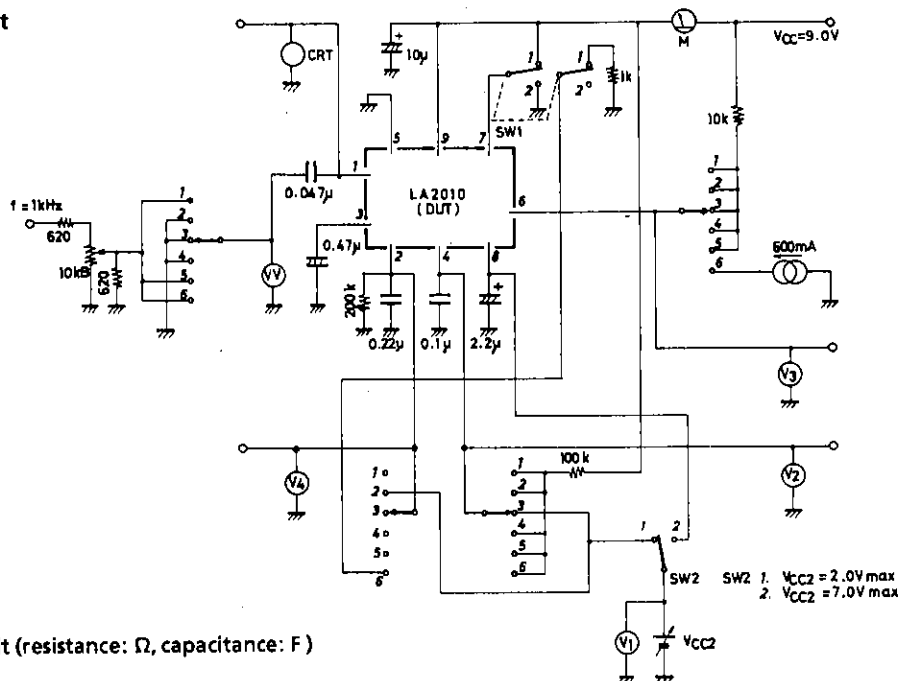
- Maximum Ratings  
If the maximum ratings are exceeded, breakdown or deterioration may result. Use the IC in the range where the maximum ratings are not exceeded.
- Pin-to-pin Short and Inverted Insertion  
These may cause breakdown or deterioration to occur. Be extremely careful when mounting the IC on the board.
- The voltage on pin 1 must not exceed that on pin 9.
- The current flowing into pin 2 and pin 4 must not exceed  $\pm 0.5$  mA continuously.
- The voltage on pin 8 is 2.5 V max. and must not exceed that on pin 7.
- Electrolytic capacitors are used to set the recorded area detect time and reset time. The actual time constants are 15 to 20 % larger than the calculated values obtained by using the catalog values of such capacitors. For polyester film capacitor and tantalum electrolytic capacitor, the calculated values hold to a fairly good approximation.



Note) Continuous application of  
I<sub>C</sub> = 600 mA: Within 3 sec.

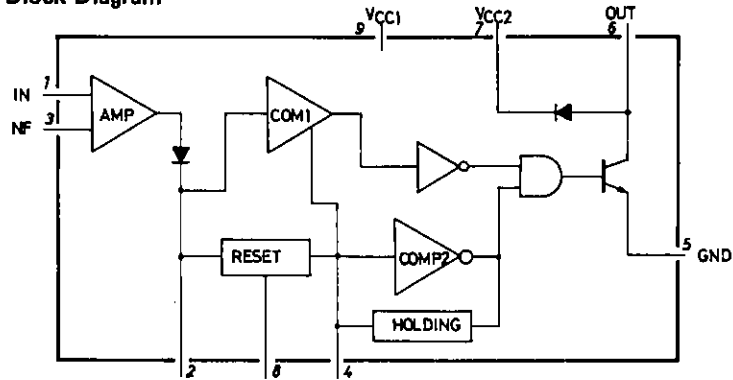


### Test Circuit

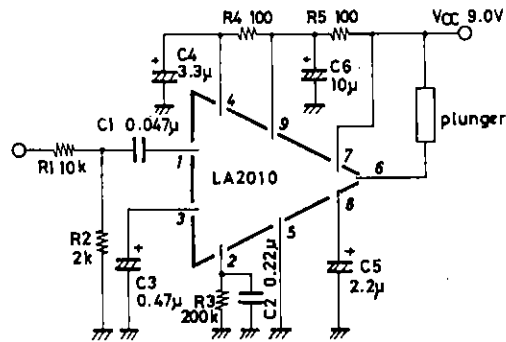


Test Item	Symbol	Rotary SW	SW-1	SW-2	Conditions
Input check level	V <sub>IN</sub>	1	1	1	Measure AC input level VV at pin 6 L → H inversion mode.
Comparator (1) ON level	V <sub>TH1-H</sub>	2	1	1	Measure pin 2 V <sub>4</sub> at pin 6 L → H inversion mode.
Comparator (1) OFF level	V <sub>TH1-L</sub>	2	1	1	Measure pin 2 V <sub>4</sub> at pin 6 H → L inversion mode.
Comparator (2) ON level	V <sub>TH2-H</sub>	3	1	1	Measure pin 4 V <sub>2</sub> at pin 6 H → L inversion mode.
Comparator (2) OFF level	V <sub>TH2-L</sub>	3	1	1	Measure p-n 4 V <sub>2</sub> at pin 6 L → H inversion mode.
Pin 8 reset voltage 1	V <sub>8R-1</sub>	4	1	2	Measure V <sub>1</sub> voltage at pin 1 inversion mode.
Pin 8 reset voltage 2	V <sub>8R-2</sub>	5	1	2	Measure V <sub>1</sub> voltage at pin 4 inversion mode.
Pin 4 reset level	V <sub>4R</sub>	5	1	2	Measure pin 4 voltage V <sub>2</sub> at V <sub>1</sub> = 1V.
Circuit current	I <sub>CC</sub>	5	1	1	Measure supply current.
Output transistor saturation voltage	V <sub>CE (sat)</sub>	6	1	1	Measure pin 6 voltage V <sub>3</sub> at 600 mA.
Output diode saturation voltage	V <sub>F</sub>	6	2	1	Measure pin 6 voltage V <sub>3</sub> at 600 mA.

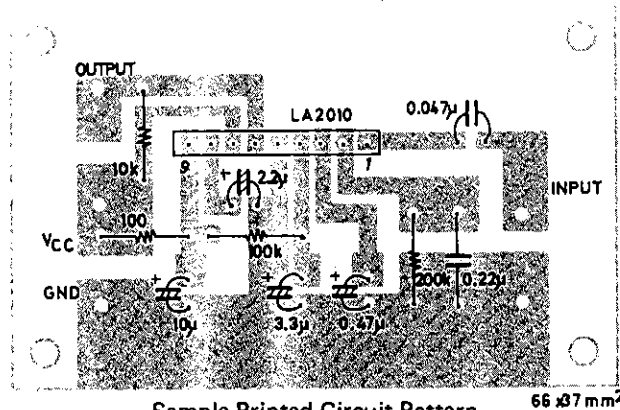
Equivalent Circuit Block Diagram



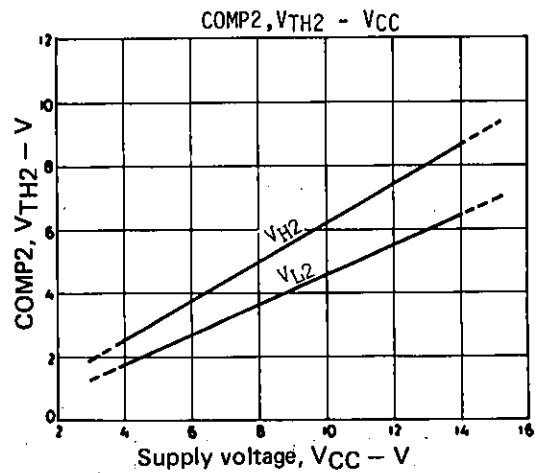
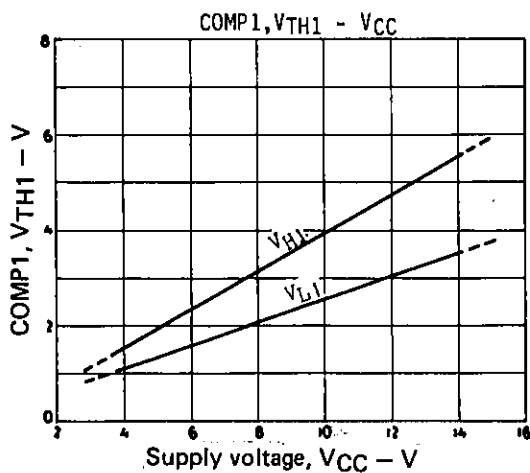
Sample Application Circuit

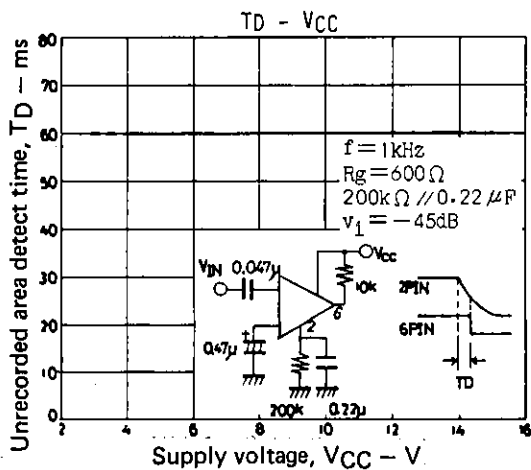
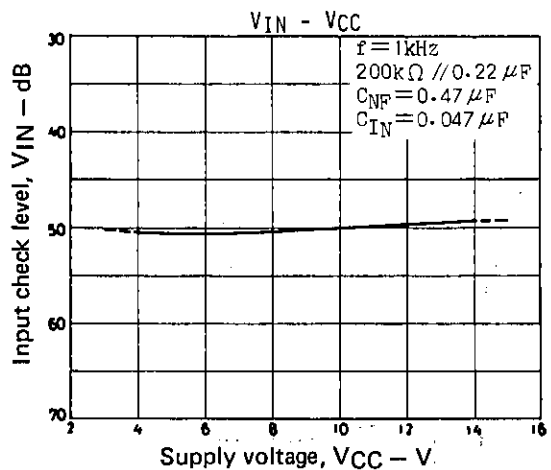
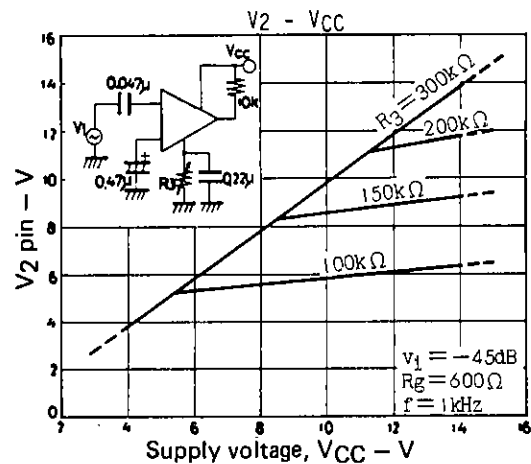
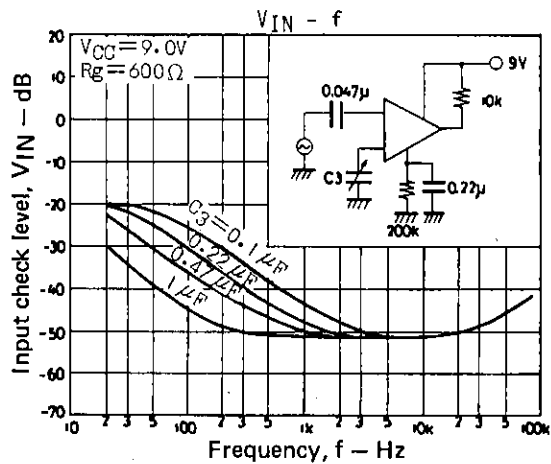
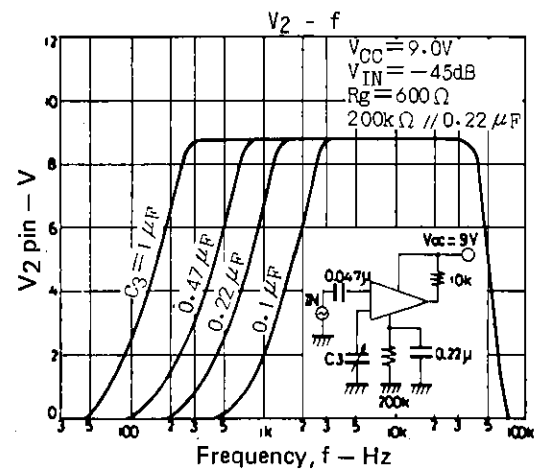
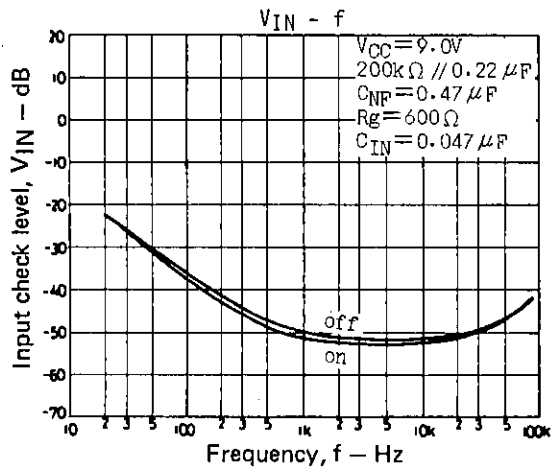
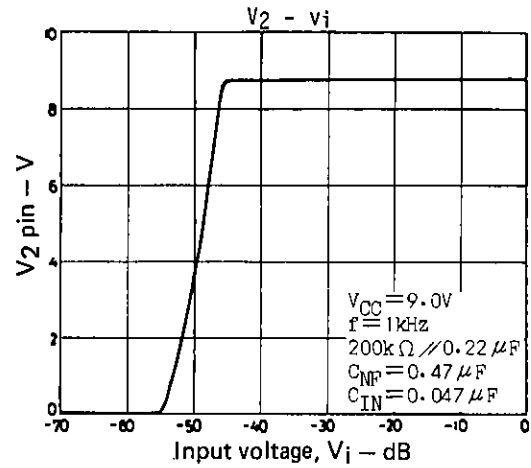
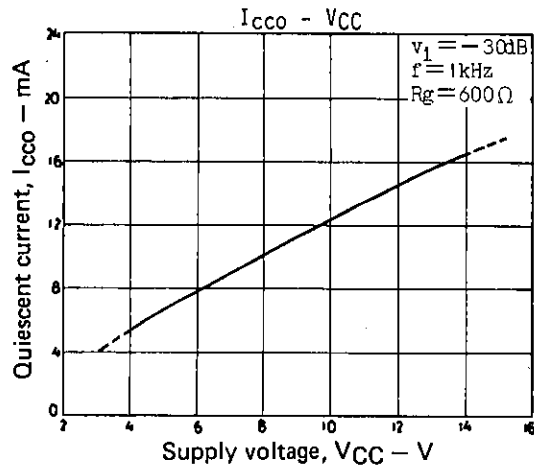


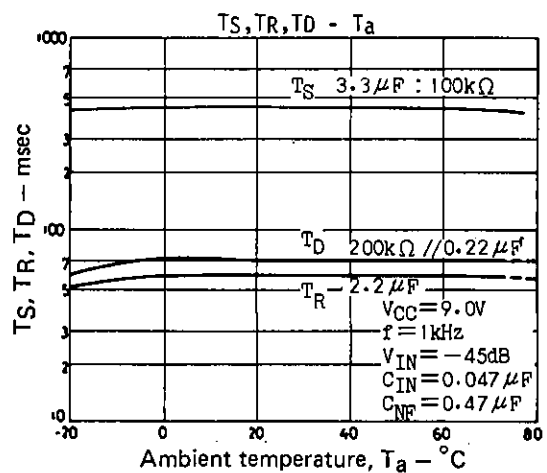
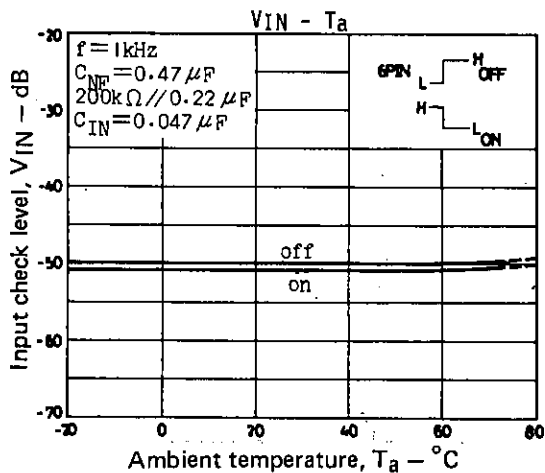
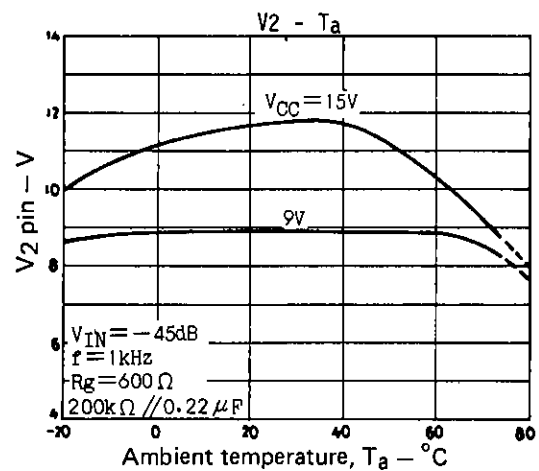
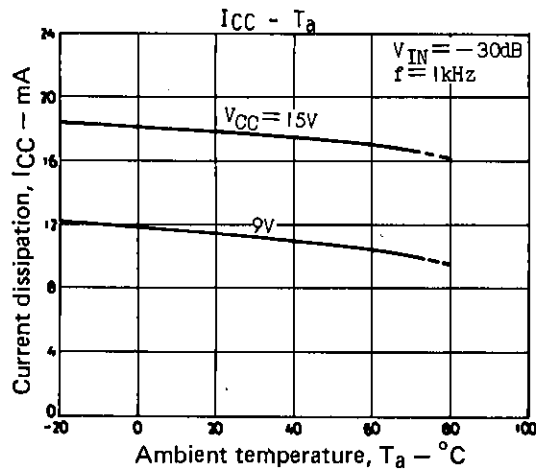
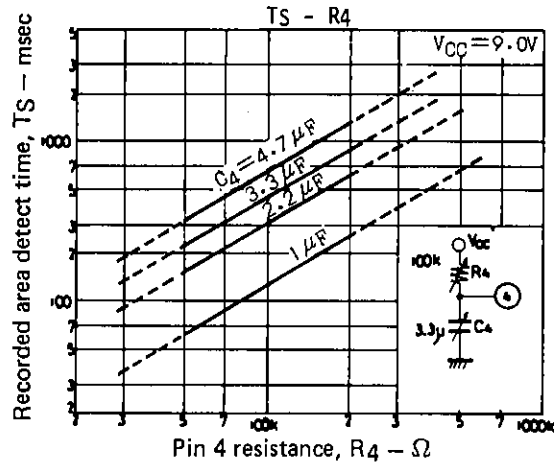
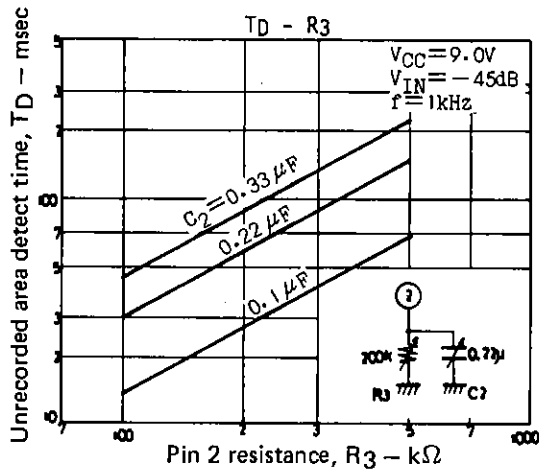
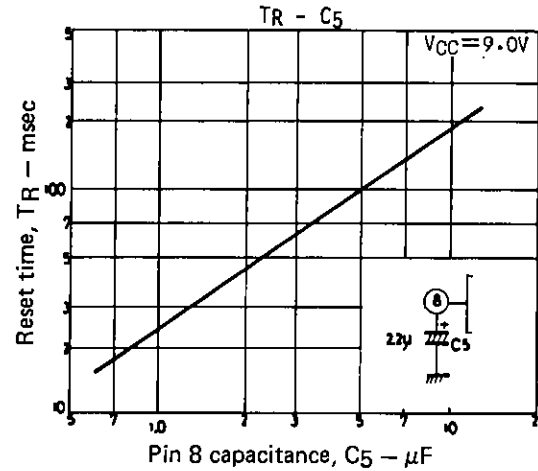
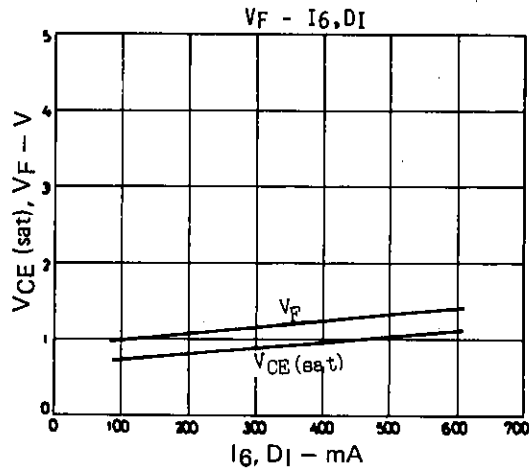
Unit (resistance:  $\Omega$ , capacitance: F)



Sample Printed Circuit Pattern  
(Cu-foiled area)







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