Ordering number:ENN1343D

Monolithic Linear IC

LA2010

Audio Level Sensor

Overview

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

Applicable Sets

- Radio-cassette recorders.
- Cassette decks.
- Car stereos.

Application

- Detection of spaces between programs recorded on tape.

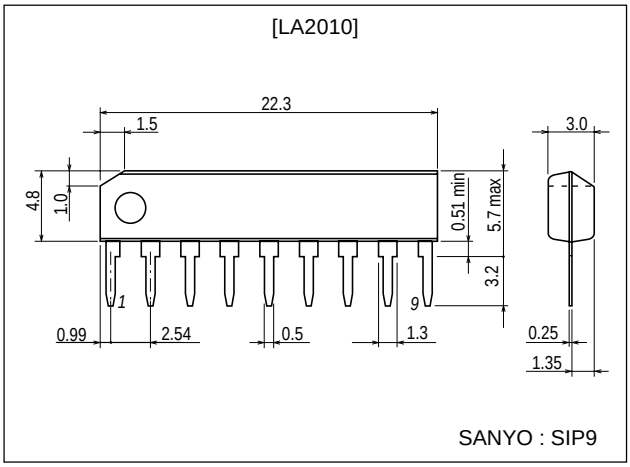
Features

- Built-in transistor capable of driving plunger with 600mA 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.

Package Dimensions

unit:mm

3017C-SIP9



Specifications

Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		15	V
Flow-in current	I_6 max		600	mA
Allowable power dissipation	Pd max		540	mW
Operating temperature	Topr		–20 to +75	˚C
Storage temperature	Tstg		–40 to +125	˚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 ±0.5mA continuously.
· The voltage on pin 8 is 2.5V max. and must not exceed the voltage on pin 7.

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Recommended Operating Conditions at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		9	V
Operating voltage range	V_{CC} op		3.5 to 14	V

Operating Characteristics at Ta = 25˚C, V_{CC}=9.0V, f=1kHz

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	I_{CC}	f=1kHz, V_{IN}=–30dB		11	22	mA
Output transistor saturation voltage	V_{CE}(Sat)	I_6=600mA		1.1	1.6	V
Output diode forward voltage	V_F	I_F=600mA		1.5	2.0	V
Input check kevel	V_{IN}	f=1kHz, Pin 6 L → 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=1kHz, V_{IN}=–30dB, pin 8=1.0V		0.02	0.1	V
Pin 8 reset voltage-1	V_{8R-1}	Pin 1 inverted, Rg=0	0.6	0.7	0.8	V
Pin 8 reset voltage-2	V8R-2	f=1kHz, V_{IN}=–30dB, pin 4 inverted	1.1	1.3	1.5	V

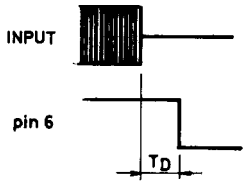
1. Description of external parts

· 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. 0.047µF (polyester film capacitor) is recommended. R1, R2 are used to adjust the input level. Pin 1 is high in input imedance ; in order to be free from external effect, R2 must not exceed 10kΩ and must be grounded.

· C2, R3 : For setting interprogram space detect time (TD)

By selecting proper C2 and R3, your desired TD can be obtained.
TD=1.34×C2 · R3 (s)
It is recommended to use R3 of 150kΩ to 500kΩ.
It is recommended to use C2 of 0.22µF (polyester film capacitor).



· C3 : NF capacitor

Lower cut-off frequency f_L depends on this capacitor.

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

Assuming C3=0.47µF, f_L=2.2kHz 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 0.47µF.

· C4, R4 : For setting recorded area detect time (TS)

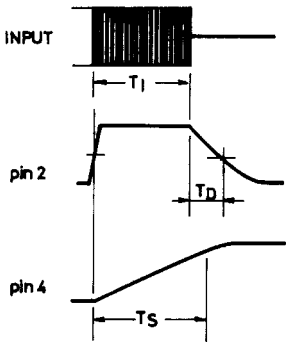
The presence or absence of a program (input signal) is checked by the time setting determined by C4, R4 as follows :

· 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 (µF) R4 (kΩ) (ms)

Therefore, if the recorded area detect time (TS) is longer than the input signal time (TI) + the unrecorded area detect time (TD), no program is present. The resistance value of R4 must be 50kΩ to 200kΩ ; it is recommended to use R4 of 100kΩ. The capacitance value of C4 must not exceed 4.7µF ; it is recommended to use C4 of 1µF to 3.3µF.

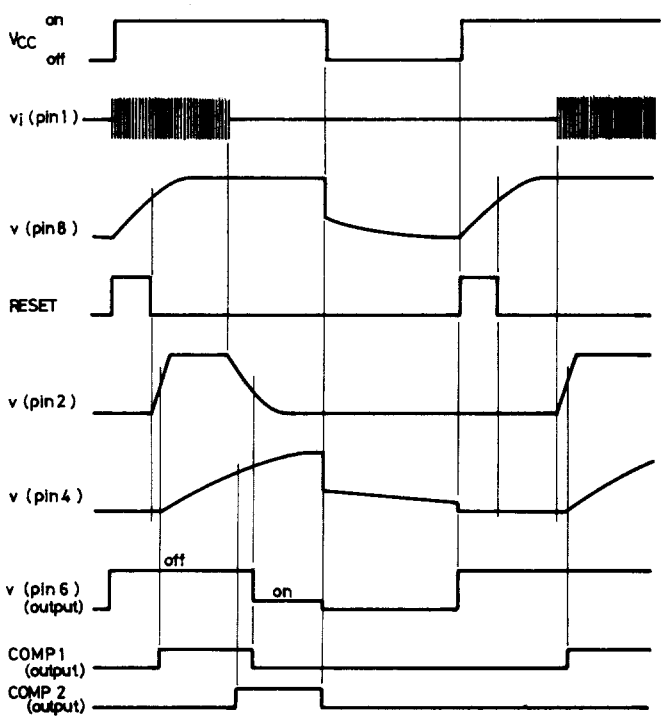


· C5 : For setting reset time
Capacitor used to set the time for initializing the circuit at the time of application of power. The reset pulse is generated for a certain period of time [TR=14.4 · C5 (μF) (ms)] that is set each time power is applied.
· C6, R5 : For power ripple filter.

Description of Operatin (See Timing Chart.)

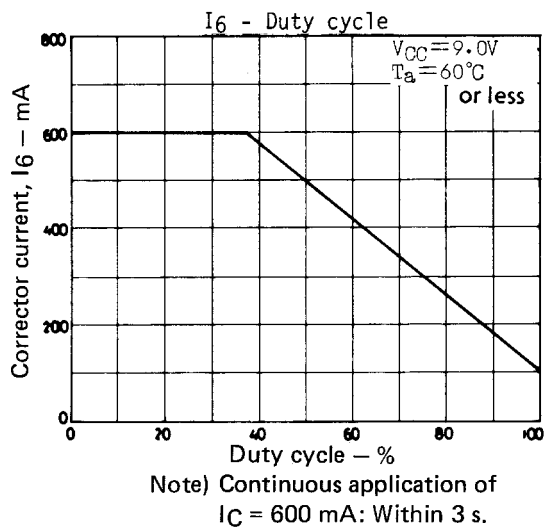
When power is applied, the reset circuit operates to initialize the circuit. The reset time depends on the capacitance value of C5 on pin 8 and no input signal is accepted while the reset circuit is operating. When the reset mode is released and the input signal exceeds the input check level, C, R on pin 2 are charged and the pontential 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.

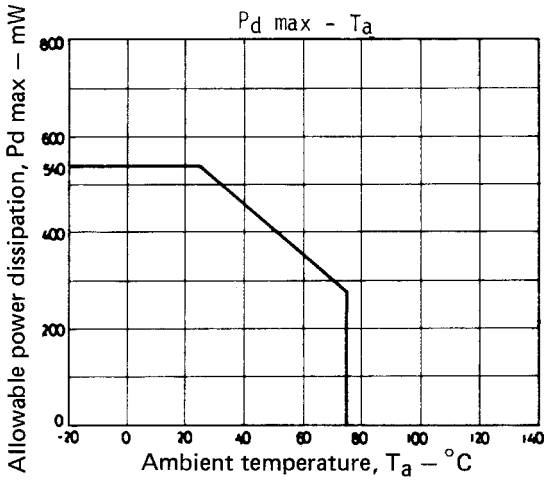
Timing Chart



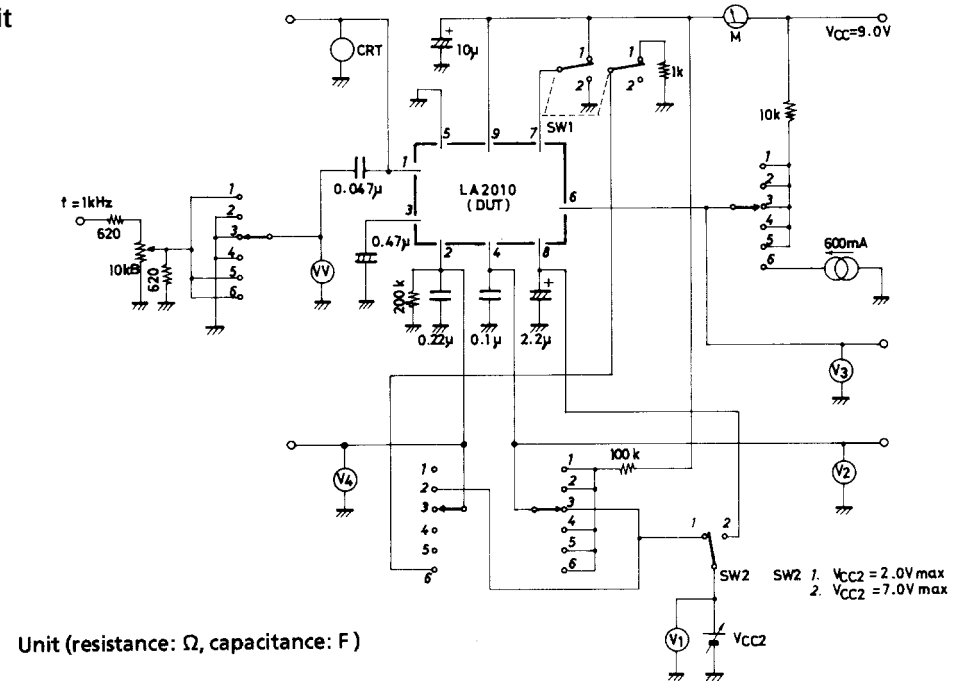
Proper Cares in Using IC

· Maximum Ratings
If the maximum ratings are exceeded, breakdown or deteroration 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 ±0.5mA continuously.
· The voltage on pin 8 is 2.5V 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 catalon values of such capacitors. For polyester film capacitor and tantalum electrolytic capacitor, the calculated values hold to a fairly good approximation.





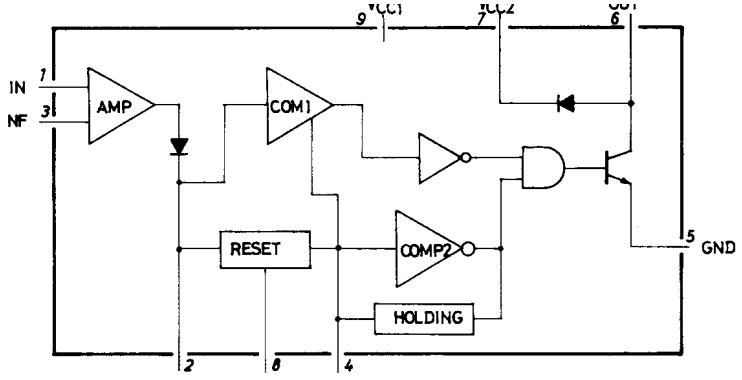
Test Circuit



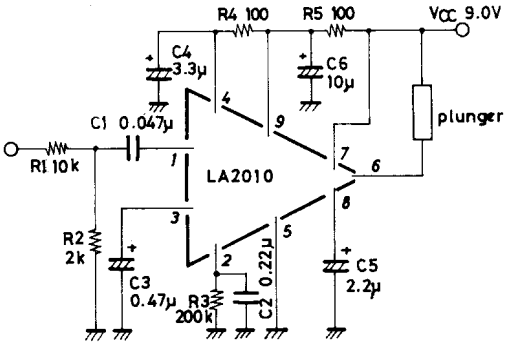
Unit (resistance: Ω, capacitance: F)

Test Item	Symbol	Rotary SW	SW-1	SW-2	Conditions
Input check level	V_{IN}	1	1	1	Measure AC input level VV at pin 6 L →H inversion mode.
Comparator (1) ON level	V_{TH1-H}	2	1	1	Measure pin 2 V_4 at pin 6 L →H inversion mode.
Comparator (1) OFF level	V_{TH1-L}	2	1	1	Measure pin 2 V_4 at pin 6 H →L inversion mode.
Comparator (2) ON level	V_{TH2-H}	3	1	1	Measure pin 4 V_2 at pin 6 H →L inversion mode.
Comparator (2) OFF level	V_{TH2-L}	3	1	1	Measure pin 4 V_2 at pin 6 L →H inversion mode.
Pin 8 reset voltage 1	V_{8R-1}	4	1	2	Measure V_1 voltage at pin 1 inversion mode.
Pin 8 reset voltage 2	V_{8R-2}	5	1	2	Measure V_1 voltage at pin 4 inversion mode.
Pin 4 reset level	V_{4R}	5	1	2	Measure pin 4 voltage V_2 at V_1=1V.
Circuit current	I_{CC}	5	1	1	Measure supply current.
Output transistor saturation voltage	V_{CE}(sat)	6	1	1	Measure pin 6 voltage V_3 at 600mA.
Output diode saturation voltage	V_F	6	2	1	Measure pin 6 voltage V_3 at 600mA.

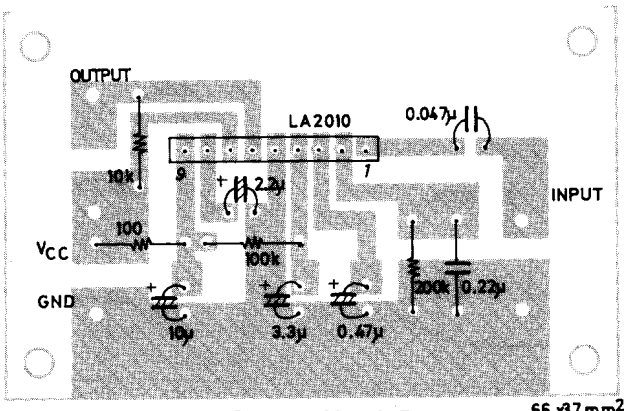
Equivalent Circuit Block Diagram



Sample Application Circuit

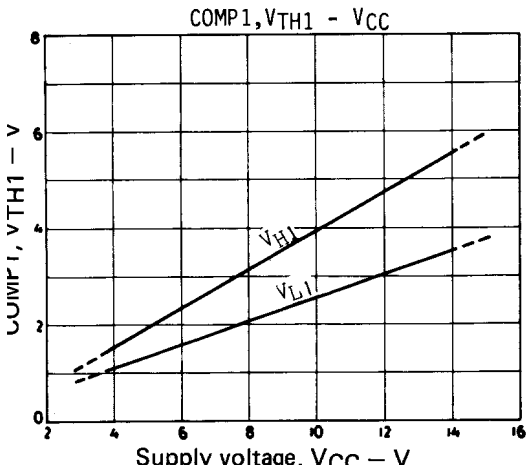


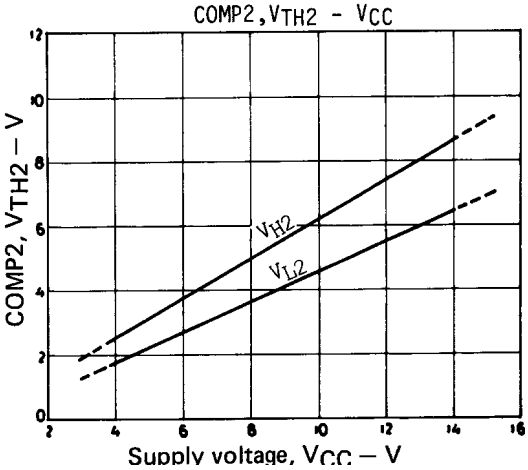
Unit (resistance: Ω, capacitance: F



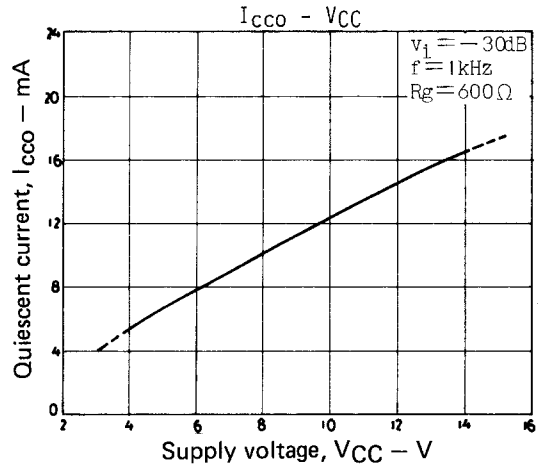
66 x37 mm²

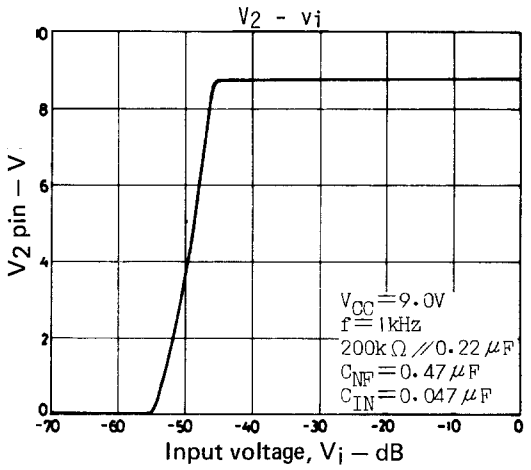
Sample Printed Circuit Pattern
(Cu-foiled area)

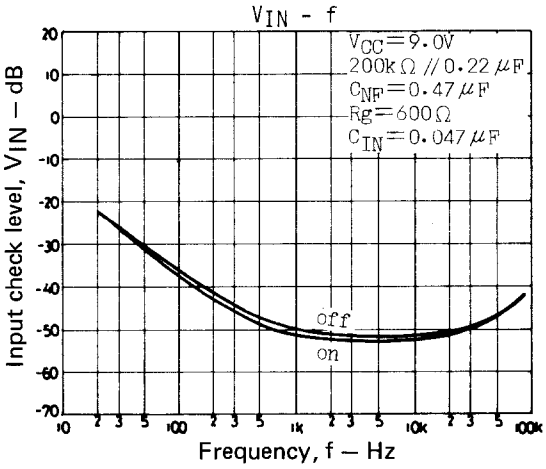


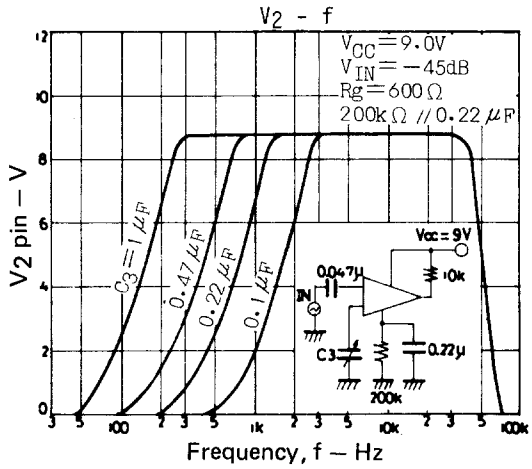


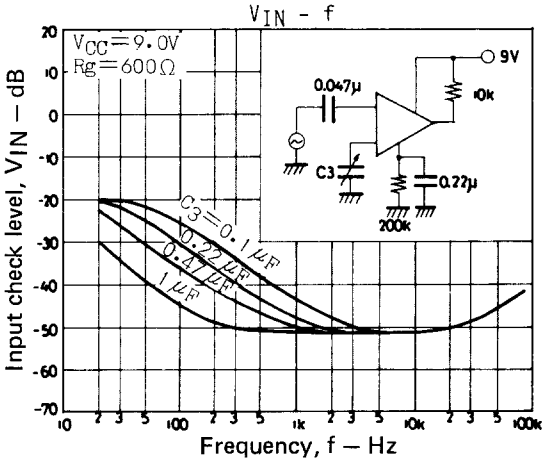
Unit (resistance: Ω, capacitance: F)

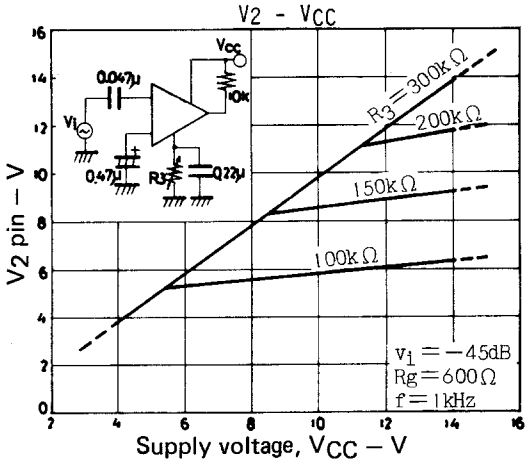


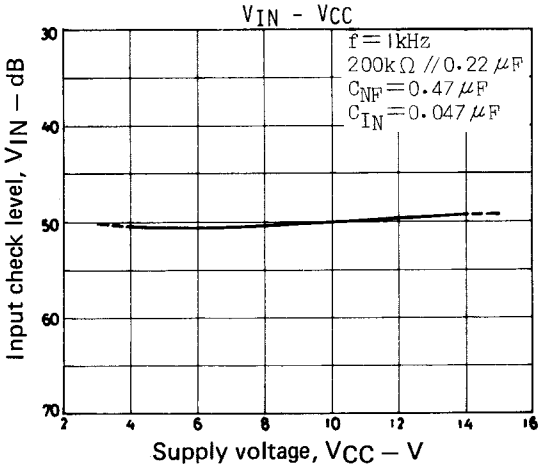


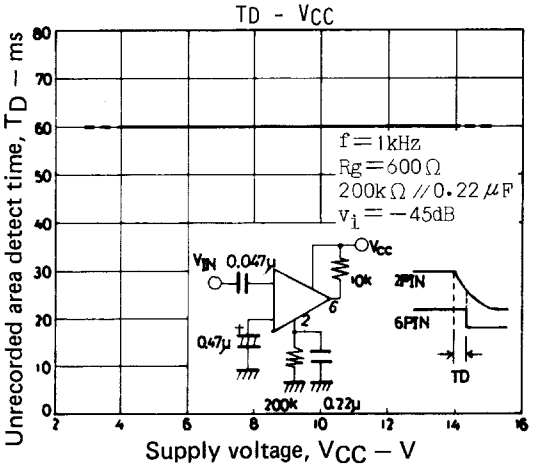












Unit (resistance: Ω, capacitance: F)