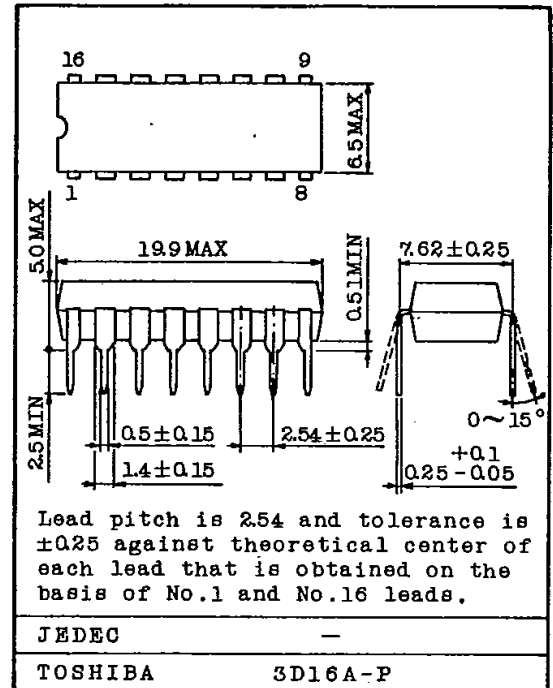


## TAPE RECORDED MUSIC AUTOMATIC SELECTING IC (9 MUSIC SELECTION)

Unit in mm

The TC9167P is an IC for automatic music selection for tape recorders. This IC has the built-in intermusic detecting circuit, and the displaying decoder and the driver circuits, and is capable of composing the automatic music selecting function with a few component parts.

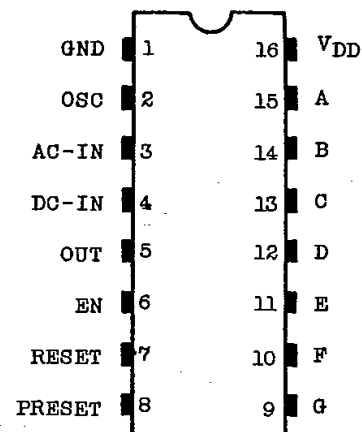
- Capable of CUE/MS of up to 9 preceding/succeeding musics.
- Desired musics are set by the step-up system by means of the UP key.
- Preset music number is displayed by 7-segment LED which is directly driven by the built-in decoder and driver.
- The built-in intermusic detection circuit allows direct input of AC signal.
- The auto-clear circuit prevents malfunction at time of power ON/OFF.
- Operating supply voltage : 3.0V ~ 6.0V



### MAXIMUM RATINGS (Ta=25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>DD</sub>	-0.3 ~ 7.0	V
Supply Current	I <sub>DD</sub>	200	mA
Input Voltage	V <sub>IN</sub>	-0.3 ~ V <sub>DD</sub> +0.3	V
Output Current	I <sub>OH</sub>	30	mA
Power Dissipation	P <sub>D</sub>	300	mW
Operating Temperature	T <sub>opr</sub>	-30 ~ 75	°C
Storage Temperature	T <sub>stg</sub>	-55 ~ 125	°C

### PIN CONNECTION

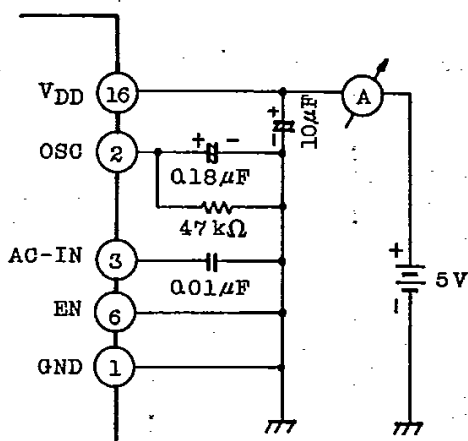


## ELECTRICAL CHARACTERISTICS (Unless otherwise specified, $V_{DD}=5.0V$ , $T_a=25^\circ C$ )

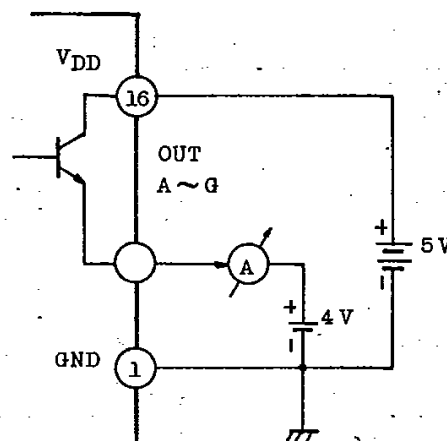
CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Operating Supply Voltage	$V_{DD}$	-		3.0	5.0	6.0	V	
Operating Supply Current	$I_{DD}$	1	No Load $f_{OSC}=200Hz$	-	0.8	1.5	mA	
Input Voltage	"L" Level	$V_{IL}(1)$	RESET, PRESET	0	-	$V_{DD} \times 0.3$	V	
	"H" Level	$V_{IH}(1)$		$V_{DD} \times 0.7$	-	$V_{DD}$		
	"L" Level	$V_{IL}(2)$	DC-IN (Schmitt Input)	0	-	$V_{DD} \times 0.1$		
	"H" Level	$V_{IH}(2)$		$V_{DD} \times 0.9$	-	$V_{DD}$		
Output Current	"L" Level	$I_{IL}$	EN	$V_{IL}=0V$	-	-	1.0	$\mu A$
	"H" Level	$I_{IH}$		$V_{IH}=5V$	-	-	1.0	
Output Current	$I_{OH}$	2	OUT, A,B,C,D,E,F, G $V_{OH}=4.0V$	10	15	-	mA	
Pull Up Resistance	$R_{UP}$	-	RESET, PRESET	-	47	-	$k\Omega$	
Oscillation Frequency	$f_{OSC}$	-		DC	-	100k	Hz	
Input Sensitivity	$V_{IN}$	4	$f_{IN}=10kHz$	50	100	200	$mV_{rms}$	
Input Resistance	$R_{IN}$	-	AC-IN	-	470	-	$k\Omega$	
Output Resistance	$R_O$	-	DC-IN	-	10	-	$k\Omega$	
Auto Clear Voltage	$V_{CL}$	-		-	2.4	2.6	V	

### TEST CIRCUIT

1.  $I_{DD}$



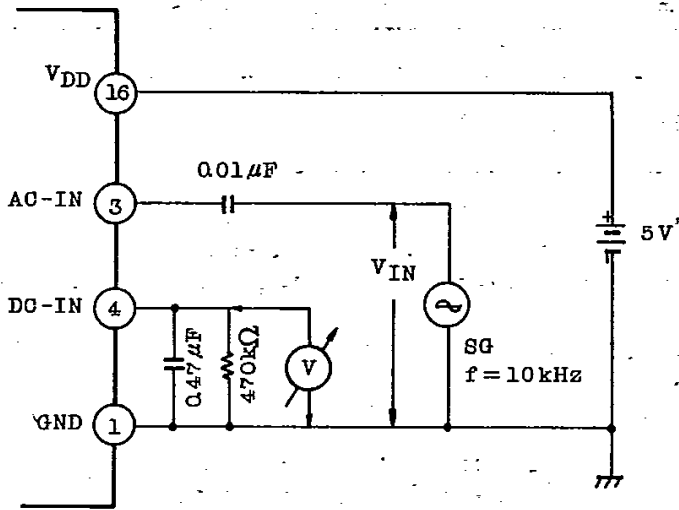
2.  $I_{OH}$



\* Other pins than the above are all open.

# TC9167P

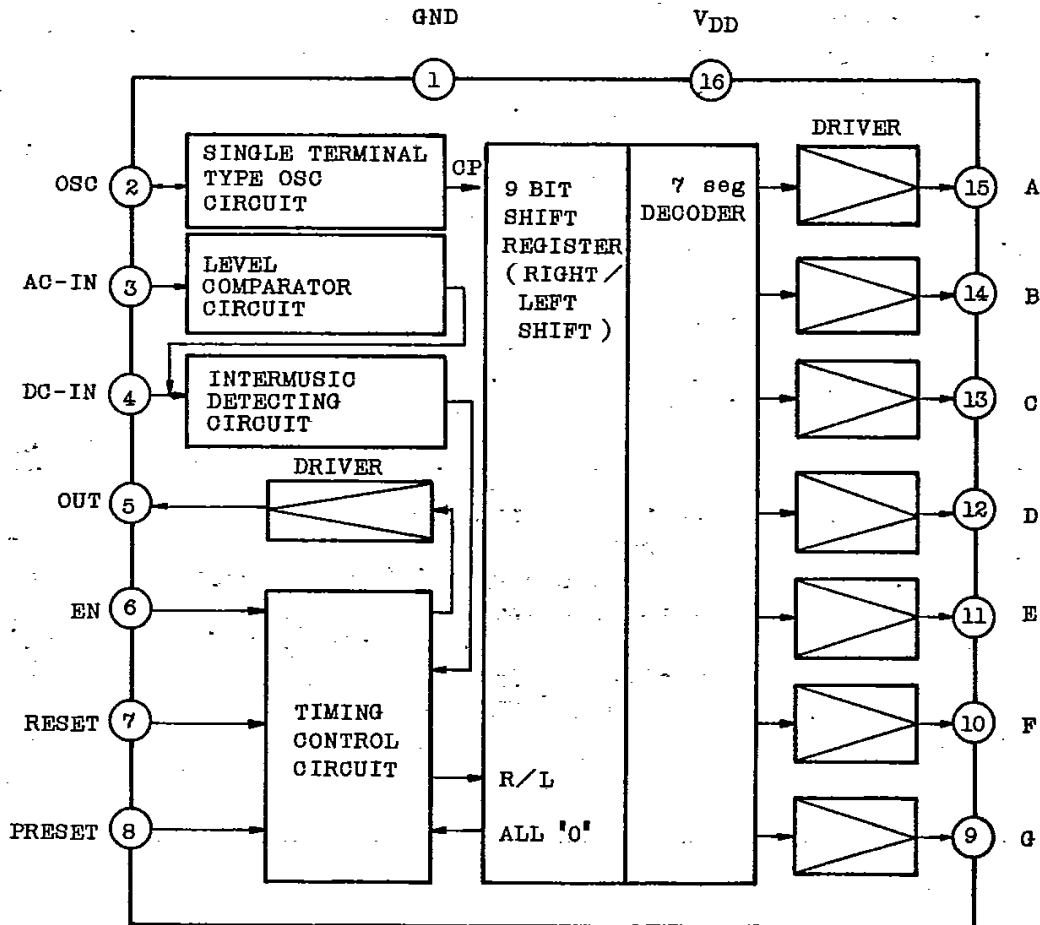
## 3. $V_{IN}$

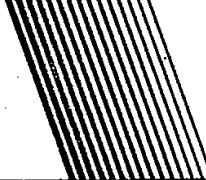


\* An output value of SG when 4.5V is generated at DC-IN is denoted by  $V_{IN}$ .

\* Other pins than the above are all open.

## BLOCK DIAGRAM





## FUNCTIONAL DESCRIPTION OF EACH TERMINAL

PIN No.	SYMBOL	FUNCTION	I/O FORM
1, 16	GND, V <sub>DD</sub>	Supply voltage applying terminal	
2	OSC	<p>The single-terminal type oscillator terminal. Frequency is set by externally connected C and R. By this frequency, the following time and pulse width are decided.</p> <ol style="list-style-type: none"> <li>1. Preset input chattering preventing time.</li> <li>2. OUT-2 output pulse width.</li> </ol>	
3	AC-IN	<p>The audio signal input terminal. An inverter type amplifier and a level comparator are built in, and when coupled with a capacitor, AC signal is directly inputted.</p>	
4	DC-IN	<p>The intermusic time setting terminal. An intermusic time can be set as desired by externally connected C and R. When an external rectifier circuit is used, a set time is input by DC signal from this terminal.</p>	
5	OUT	<p>The mechanical control output terminal. (Bipolar output) When the cue operation ends, pulse output ("H" level) is generated. The cue operation is stopped by this output, and the mechanism is changed over to the playing operation.</p>	
6	EN	<p>The intermusic detecting operation inhibiting input terminal. (C-MOS input) When this terminal is placed at "L" level, input from DC-IN (4-Pin) is made invalid. Malfunction can be prevented by inputting a "L" level signal externally at time of the mechanical changeover. When not used, "H" level signals are applied.</p>	

# TC9167P

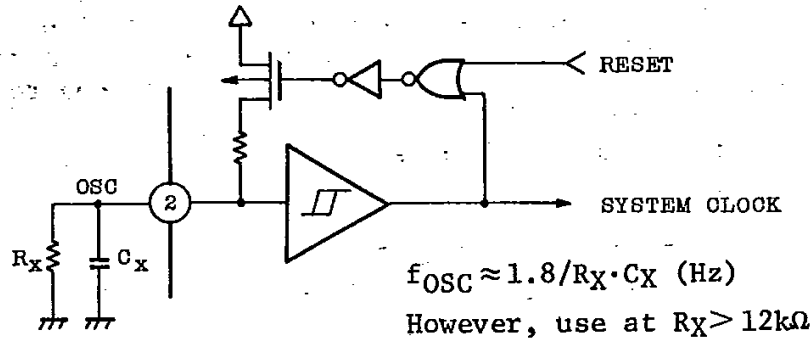


PIN No.	SYMBOL	FUNCTION	I/O FORM
7	RESET	<p>The internal reset input terminal (with a pull-up resistor).</p> <p>When this terminal is placed at "L" level, the reset is made and all the 7-segment outputs (A to G) go to "L" levels. When this terminal goes to "H" level from "L" level, "0" is displayed.</p> <p>This terminal can also be used a preset music cancelling input.</p>	
8	PRESET	<p>The desired music preset terminal (with a pull-up resistor).</p> <p>This terminals is an input to preset a desired cue music and one music is picked up by one push. After nine pushes set the ninth music another push sets the first one and so on.</p> <p>(The chattering preventing circuit is built in).</p> <p>0 → 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 9 → 0</p>	
9	G	7-segment LED driver output terminals (Bipolar outputs)	
10	F	The outputs A to G, are capable of directly driving the cathode common LEDs. The displaying forms of characters are as follows:	
11	E		
12	D		
13	C		
14	B		
15	A		

## DESCRIPTION OF OPERATION

### 1. OSC CIRCUIT

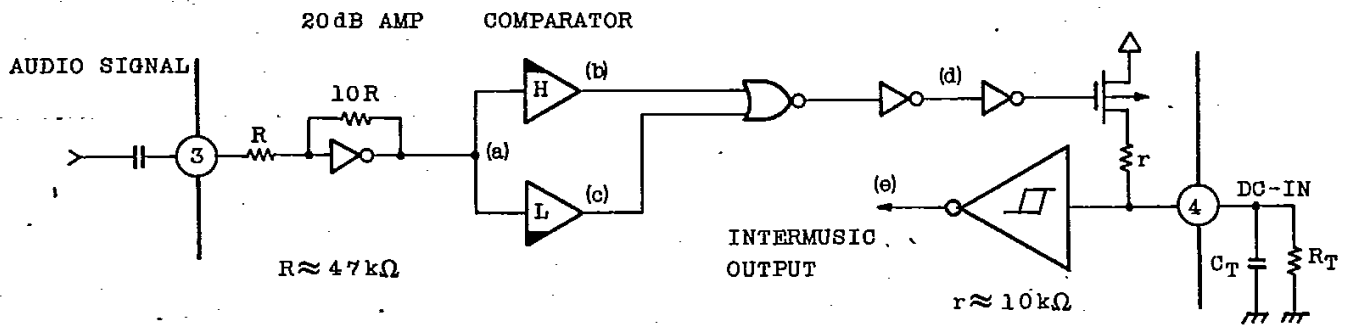
The OSC terminal (PIN 2) is a single-terminal type oscillation circuit which oscillates with externally connected C and R.

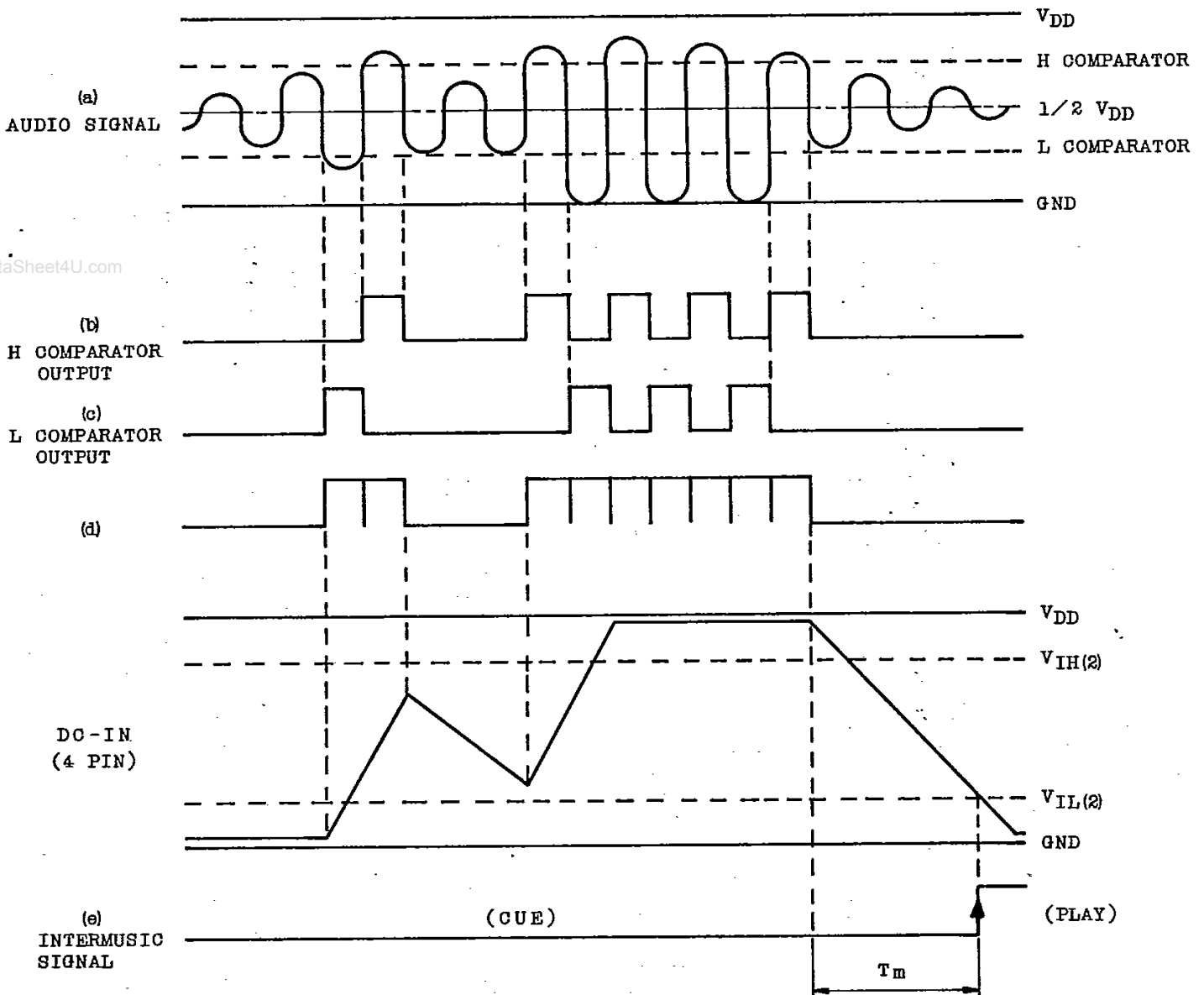


- . Oscillation frequency may vary depending upon fluctuation by IC and supply voltage. (See Graph-(1).)
- . Assuming that oscillation frequency is  $f_{OSC}$ , the following time and pulse width are decided.
  - a. PRESET input terminal chattering preventing time :  $t = 2 \sim 4 \times 1/f_{OSC}$   
 $= 10 \sim 20ms$  ( $f_{OSC} = 200Hz$ )
  - b. OUT output terminal pulse width :  $T = 8 \times 1/f_{OSC}$   
 $= 40ms$  ( $f_{OSC} = 200Hz$ )

### 2. INTERMUSIC DETECTING CIRCUIT

Audio signal from IN-1 terminal is amplified by the amplifier (20dB), and after full-wave rectification by the level comparator, transmitted through DC-IN. The intermusic time is decided by discharge time constants of C and R connected to DC-IN.



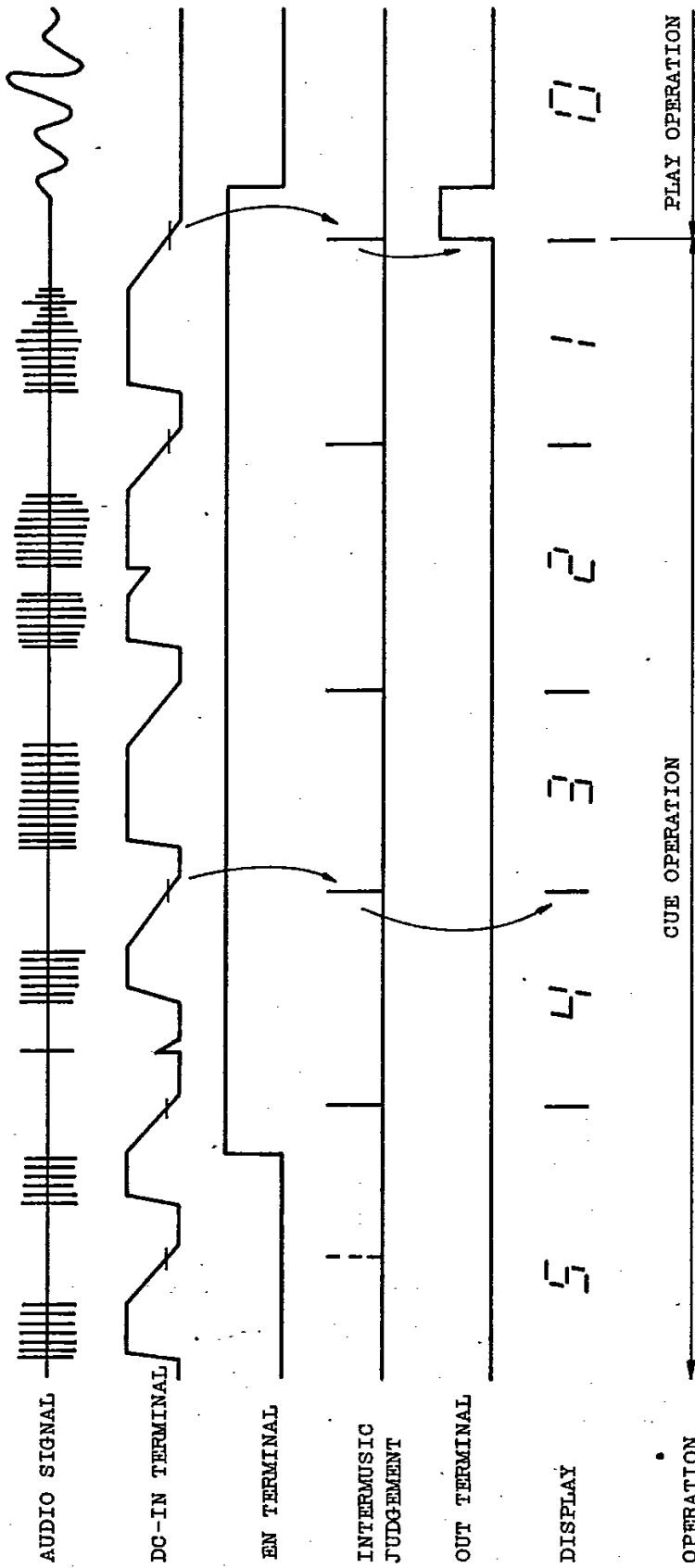


Note : H comparator level  $\approx 2/3 V_{DD}$   
 L comparator level  $\approx 1/3 V_{DD}$

- Intermusic time  $T_m \approx 1.5 CT \cdot RT$  (sec). However, use at  $RT > 150k\Omega$ .
- Intermusic time and input sensitivity may vary depending upon fluctuation by IC and supply voltage. (See Graph-(2) and (3).)
- Pulse noise between musics is prevented by output resistance (r) of DC-IN and charging time constant of CT.



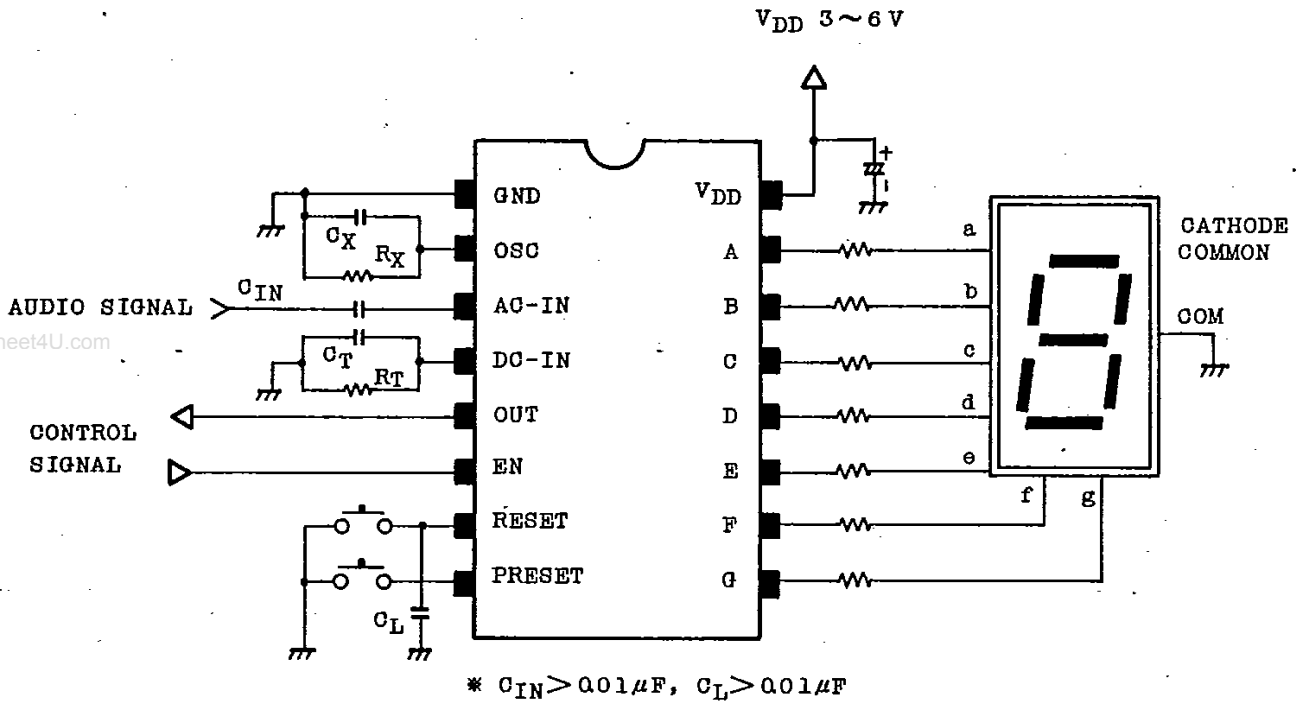
### 3. CUE OPERATION TIME (PRESET MUSIC 5)



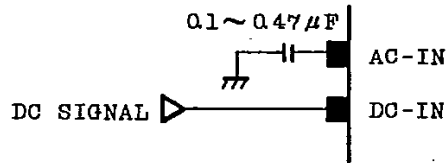
- Note 1. As long as the EN terminal is at "L" level, the intermusic judgement becomes invalid and downcount of preset musics is not taken place.
2. Even during the cue operation, a desired music can be changed by the PRESET input.



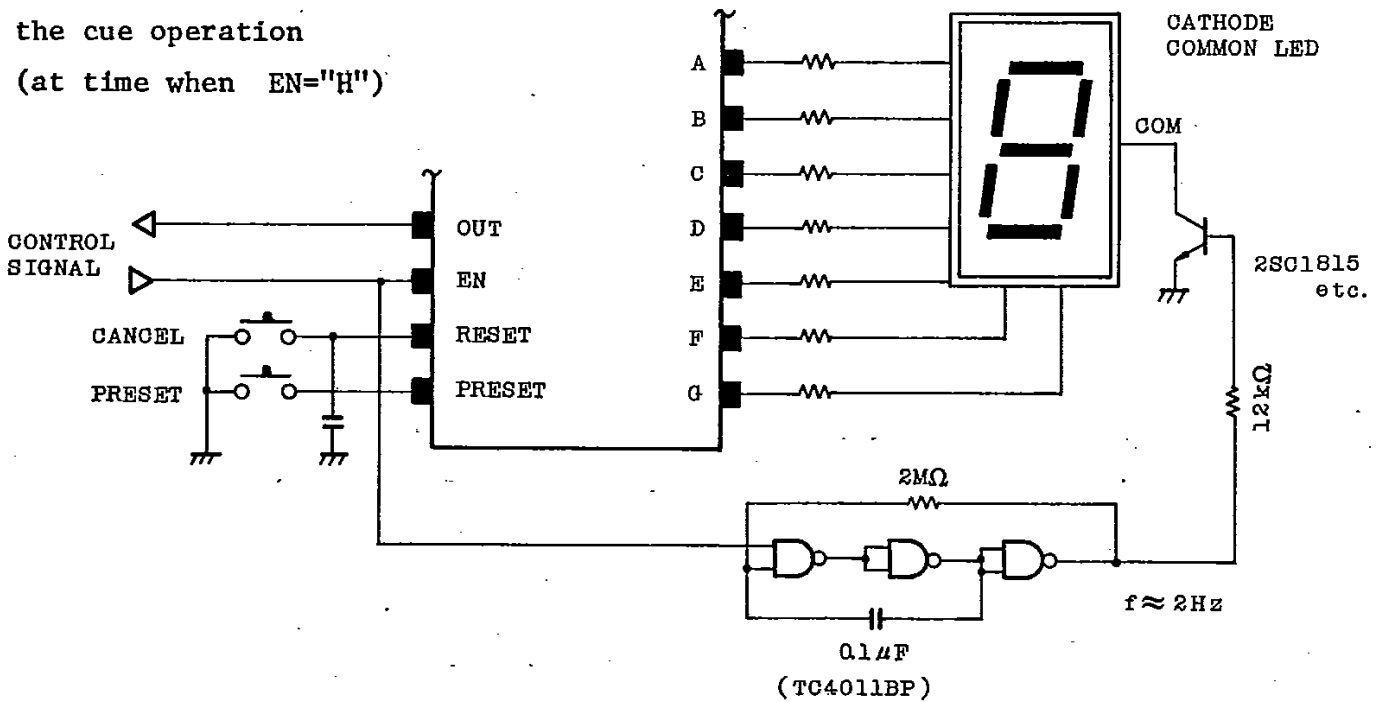
## APPLICATION CIRCUIT

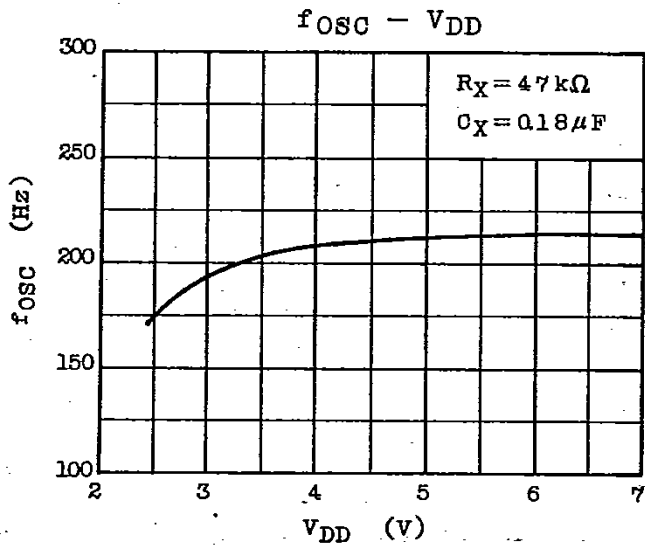
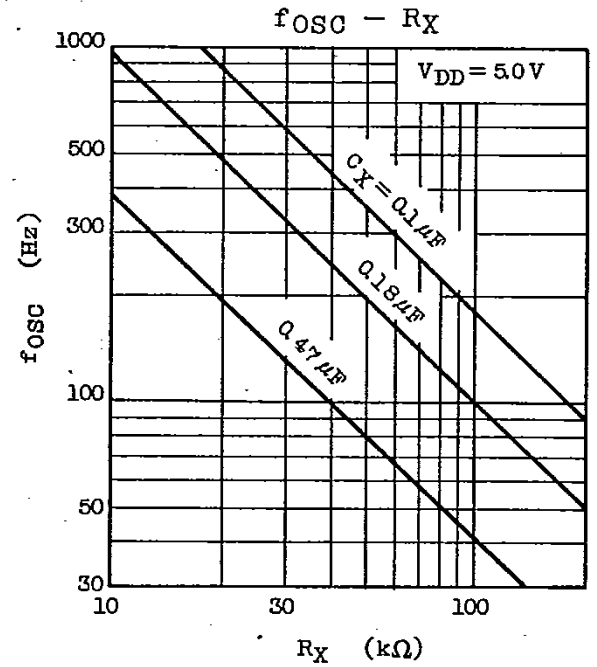
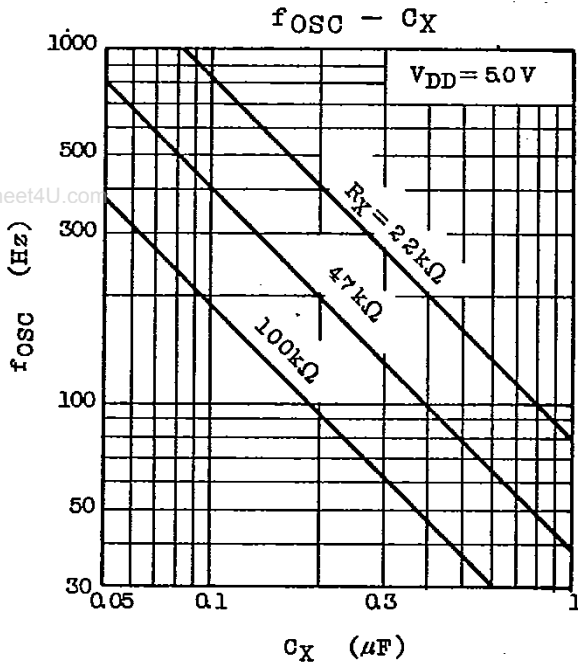


1. When an external rectification circuit is used.

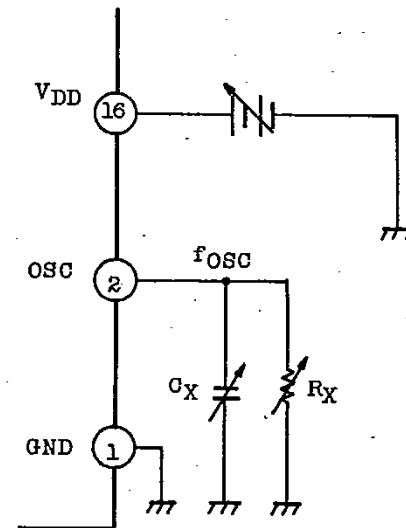


2. When display is flashed during the cue operation (at time when  $EN = "H"$ )

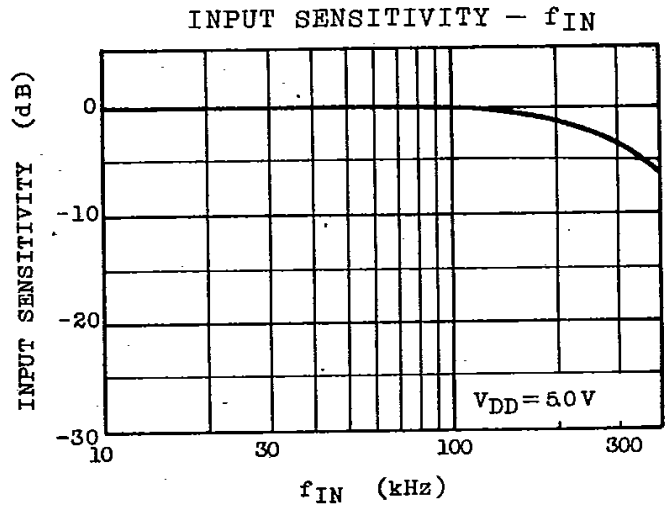
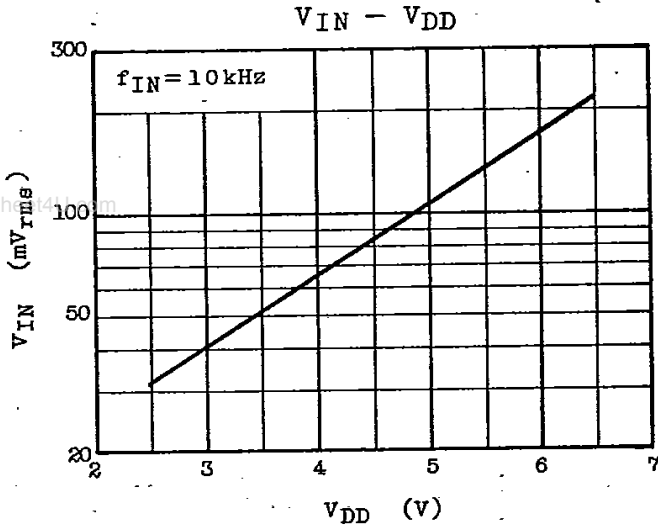




## TEST CIRCUIT



GRAPH (2) INPUT SENSITIVITY ( $V_{IN}$ ) CHARACTERISTICS (TEST CIRCUIT-3)



GRAPH (3) INTERMUSIC TIME CHARACTERISTICS

