No.1039C

LC7815

2-Pole 4-Position Analog Function Switch

The LC7815 is a 2-pole 4-position analog function switch with 2 built-in C-MOS analog switches (LC4066 type). A soft touch of a button enables switchover of the input signal source of an audio amplifier.

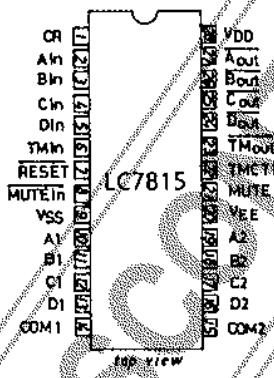
Use

Function switchover of amplifier, receiver, etc. (2 poles 4 positions)

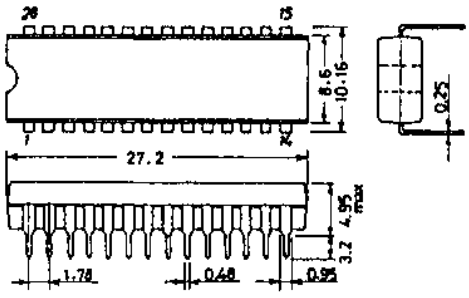
Features

1. Good distortion characteristic because of built-in analog switches of LC4066 type: Distortion 0.01 % max./ Vin = 1Vrms, V_{DD} = 15 to 18V
2. Capable of outputting audio muting control signal to minimize noise to be generated at the time of switchover
3. Built-in controller for tape monitor switchover (using LC4066B together)
4. Built-in driver for LED which displays function mode, tape monitor mode
5. Since control input can be operated from + supply alone when using dual supplies, interface with other circuits can be achieved easily.
6. Since audio muting control signal can be triggered independently from external pin ($\overline{MUTE}_{in}$); audio muting at the time of return from backup can be achieved easily.
7. Control input pin ($\overline{RESET}$) to be used for turning OFF all analog switches
8. Backup can be performed easily because of C-MOS structure. (Backup voltage: 3 V min.)
9. Operating voltage: 4.5 to 18.0 V/single supply, ±4.5 to ±9.0 V/dual supplies
10. Package: DIP-28 (Shrink type)

Pin Assignment



Case Outline 3029A-D28SIC
(unit: mm)

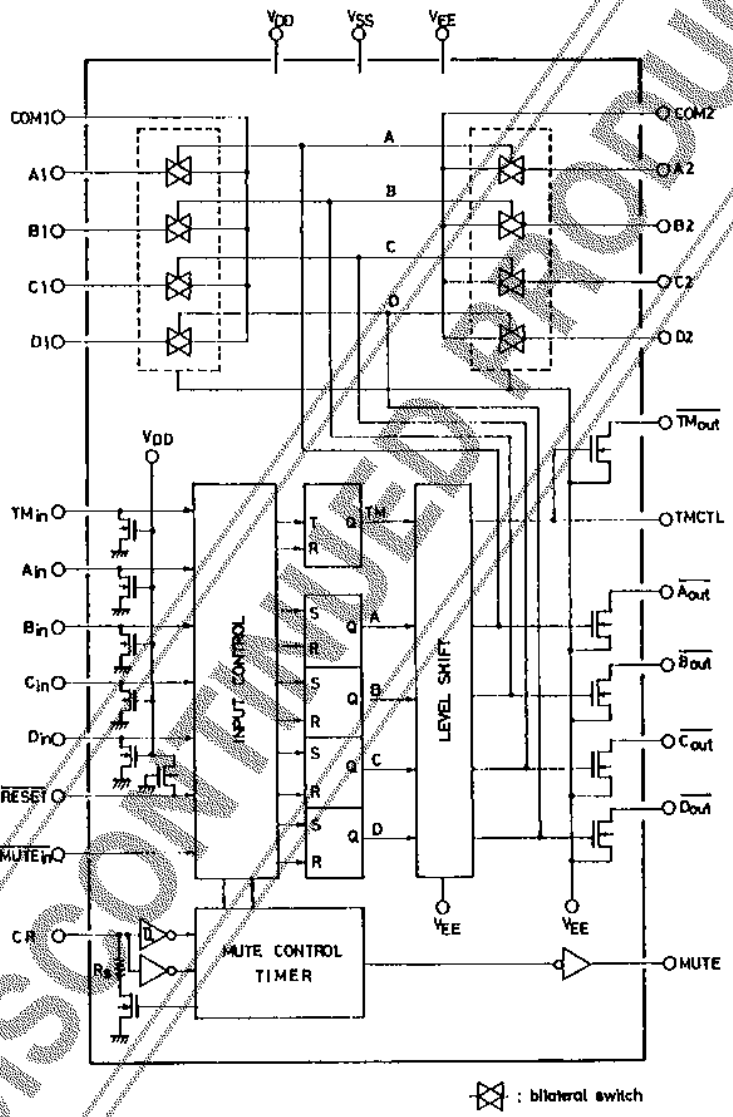


SANYO: DIP28S

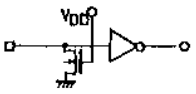
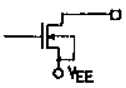
Specifications and information herein are subject to change without notice.

SANYO Electric Co.,Ltd. Semiconductor Overseas Marketing Div.
Natsume Bldg., 18-6, 2-chome, Yushima, Bunkyo-ku, TOKYO 113 JAPAN

Equivalent Circuit Block Diagram



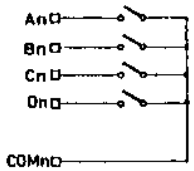
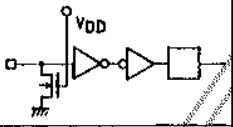
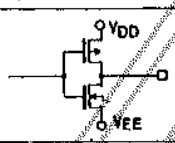
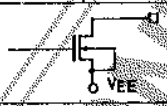
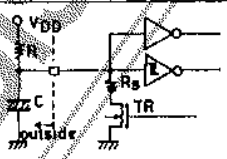
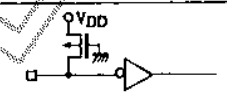
Pin Description

<table>
<tr><th>Pin Name</th><th>Pin No.</th><th>Type of Input/Output</th><th>Pin Functions</th></tr>
<tr><td>V_{DD}
V_{SS}
V_{EE}</td><td>28
9
20</td><td></td><td>• Power supply pins
Single supply (+): V_{SS}=V_{EE}=GND
Dual supplies (+−): V_{SS}=GND, V_{EE}=(−)V</td></tr>
<tr><td>A_{in}, B_{in},
C_{in}, D_{in}</td><td>2, 3,
4, 5</td><td>  </td><td>• Specified input pins for turning ON individual analog switches
• Priority order of simultaneous push (A_{in} > B_{in} > C_{in} > D_{in})
• Prevention of malfunction attributable to pulse noise (Pulse width is discriminated by muting delay time.)</td></tr>
<tr><td>$\overline{A_{out}}$,
$\overline{B_{out}}$,
$\overline{C_{out}}$,
$\overline{D_{out}}$</td><td>27,
26,
25,
24</td><td>  </td><td>• Output of driver for LED which displays ON state corresponding to individual analog switches
• N channel open drain (Source is connected to V_{EE}.)</td></tr>
<tr><td>A_1, B_1,
C_1, D_1

A_2, B_2,
C_2, D_2

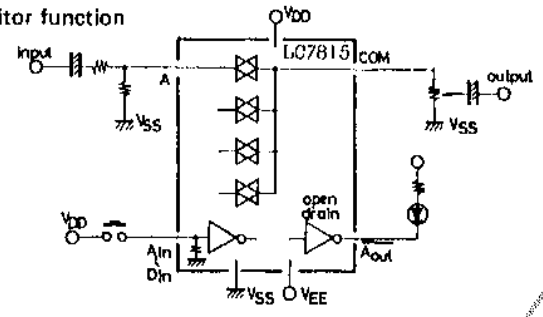
COM 1
COM 2</td><td>10, 11,
12, 13

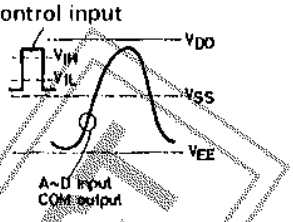
19, 18,
17, 16

14
15</td><td>  </td><td>• A to D: Audio signal input pins
• COM: Audio signal output pins
• Signal inputs (A to D) conduct according to signal inputs (A_{in} to D_{in}) as follows:
<table>
<tr><th colspan="2">COM output</th><th>A_n</th><th>B_n</th><th>C_n</th><th>D_n</th></tr>
<tr><td rowspan="4">Specified input</td><td>A_{in}</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>B_{in}</td><td>*</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>C_{in}</td><td>*</td><td>*</td><td>1</td><td>0</td></tr>
<tr><td>D_{in}</td><td>*</td><td>*</td><td>*</td><td>1</td></tr>
</table>
*: Don't care.</td></tr>
<tr><td>TM_{in}</td><td>6</td><td>  </td><td>• Input pin for specifying tape monitor mode ON/OFF
• Rise of input signal is detected; monitor mode ON/OFF are inverted to monitor mode OFF/ON respectively.</td></tr>
<tr><td>TMCTL</td><td>22</td><td>  </td><td>• Output pin for controlling external analog switch (LC4066B) for tape monitor
• Source of N channel transistor of complementary buffer output is connected to V_{EE}.</td></tr>
<tr><td>$\overline{TM_{out}}$</td><td>23</td><td>  </td><td>• Output pin for driver for LED which displays tape monitor state as well as external analog switch (LC4066B) for tape monitor
• $\overline{TM_{out}}$ is opposite in polarity to TMCTL.</td></tr>
<tr><td>$\overline{MUTE_{in}}$</td><td>8</td><td>  </td><td>• Input pin for forcing audio muting control signal (MUTE) to be triggered externally
• If fixed at 'L' level, MUTE output becomes 'H' level.</td></tr>
<tr><td>MUTE</td><td>21</td><td>  </td><td>• Output pin for audio muting control signal
• Signal with pulse width to be determined by external constant at CR pin is output at the time of function switchover or $\overline{MUTE_{in}}$ input.</td></tr>
<tr><td>CR</td><td>1</td><td>  </td><td>• CR time constant pin for determining time interval of audio muting control signal
• Time lag (muting delay) between muting signal rise and analog switch switchover depends on C·RS time constant at the time of transistor ON.</td></tr>
<tr><td>$\overline{RESET}$</td><td>7</td><td>  </td><td>• Input pin for turning OFF all analog switches and resetting tape monitor flip-flop ('L' level active)</td></tr>
</table>

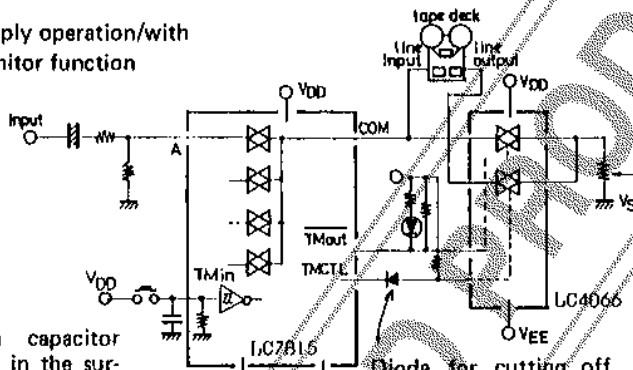
■ Sample Application Circuits

1. Dual-supply operation/without tape monitor function





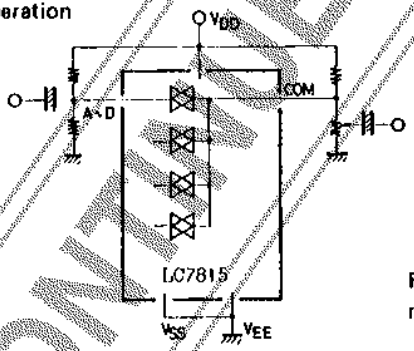
2. Dual-supply operation/with tape monitor function

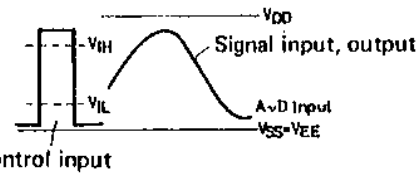


Connect a capacitor when using in the surroundings with much noise.

Diode for cutting off current flow at the backup mode.

3. Single-supply operation

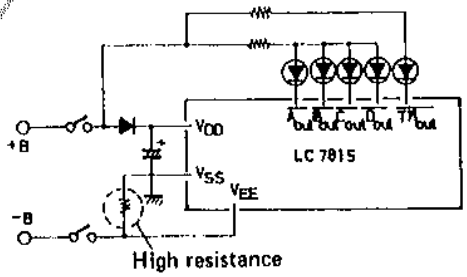




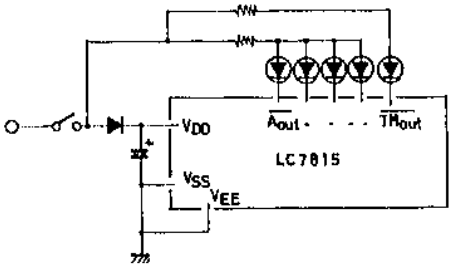
For using tape monitor function, make connection as shown in 2 above.

4. Backup

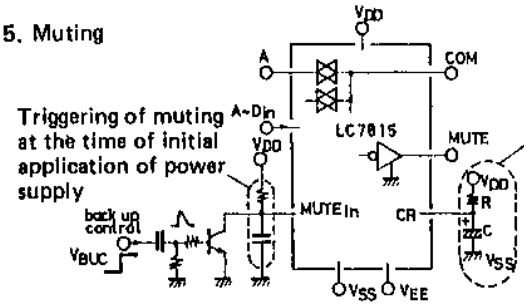
(1) Dual-supply operation

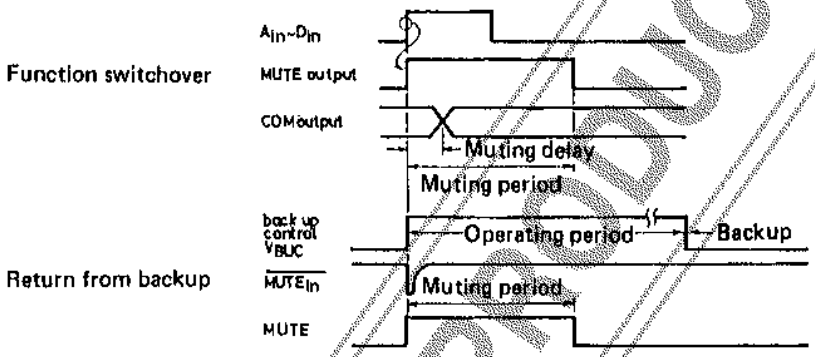


(2) Single-supply operation



5. Muting





Absolute Maximum Ratings/Ta=25 ±2°C

				unit
Maximum Supply Voltage	V_{DD} max		V_{SS}−0.3~V_{EE}+20	V
	V_{EE} max		V_{DD}−20~V_{SS}+0.3	V
Output Current	I_{OUT}	$\overline{A_{out}}$, $\overline{B_{out}}$, $\overline{C_{out}}$, $\overline{D_{out}}$, $\overline{TM_{out}}$	30	mA
Output Voltage	V_{OUT}	$\overline{A_{out}}$, $\overline{B_{out}}$, $\overline{C_{out}}$, $\overline{D_{out}}$, $\overline{TM_{out}}$	V_{EE}−0.3~V_{DD}+0.3	V
Voltage Difference at Analog Switch ON	ΔV_{on}	Switch ON	0.5	V
Allowable Power Dissipation	$P_d$max	Ta≦85°C	350	mW
Operating Temperature	Topg		−40~+85	°C
Storage Temperature	Tstg		−40~+125	°C

Allowable Operating Conditions/Ta = −40~+85°C

Characteristic	Symbol	Pin No.	Conditions	min	typ	max	unit
Supply Voltage	V_{DD1}	V_{DD}(28)	V_{EE}≦V_{SS}	V_{SS}+4.5		V_{EE}+18	V
	V_{EE}	V_{EE}(20)	V_{DD}≧V_{SS}+4.5	V_{DD}−18		V_{SS}	V
	V_{DD2}	V_{DD}(28)	Backup, V_{EE}≦V_{SS}	V_{SS}+3		V_{SS}+18	V
'H' Level Input Voltage	V_{IH1}	A_{in}(2)~D_{in}(5), $\overline{RESET}$(7), $\overline{MUTE_{in}}$(8)		0.75V_{DD}		V_{DD}	V
	V_{IH2}	TM_{in}(6)		0.8V_{DD}		V_{DD}	V
'L' Level Input Voltage	V_{IL1}	A_{in}(2)~D_{in}(5), $\overline{RESET}$(7), $\overline{MUTE_{in}}$(8)		V_{SS}		0.25V_{DD}	V
	V_{IL2}	TM_{in}(6)		V_{SS}		0.2V_{DD}	V
Analog Switch Input Voltage	V_{IN}	A_1(10)~D_1(13), A_2(19)~D_2(16)		V_{EE}		V_{DD}	V
External Capacitance for Muting Timer	C	CR(1)				10	μF
External Resistance for Muting Timer	R	CR(1)	V_{DD}−V_{SS}=4.5V	40		100	kΩ
			V_{DD}−V_{SS}≧9V	100		300	kΩ
Input Receiving Pulse Width	T_{IN}	A_{in}(2)~D_{in}(5), TM_{in}(6)	V_{DD}=9V, C=3.3μF, R=220kΩ	120			ms

Electrical Characteristics/Ta=25 ±2°C, V_{SS}=0V

Characteristic	Symbol	Pin No.	Conditions	min	typ	max	unit
'H' Level Output Voltage	V_{OH1}	TMCTL(22)	I_{OH}=−0.1mA, V_{DD}=4.5~18V	0.8V_{DD}		V_{DD}	V
	V_{OH2}	MUTE(21)	I_{OH}=−0.4mA, V_{DD}=4.5V	V_{DD}−1.5		V_{DD}	V
			I_{OH}=−0.4mA, V_{DD}=9V	V_{DD}−0.5		V_{DD}	V
'L' Level Output Voltage	V_{OL1}	TMCTL(22)	I_{OL}=0.1mA	V_{EE}		0.2X (V_{DD}−V_{EE})	V
	V_{OL2}	MUTE(21)	I_{OL}=0.4mA, V_{DD}=4.5V	0		1.5	V
			I_{OL}=0.4mA, V_{DD}=9V	0		0.5	V
	VOL3	$\overline{A_{out}}$(27) to $\overline{D_{out}}$(24), $\overline{TM_{out}}$(23)	I_{OL}=7mA, V_{DD}−V_{EE}=4.5V	V_{EE}		V_{EE}+2	V
			I_{OL}=30mA, V_{DD}−V_{EE}=9V	V_{EE}		V_{EE}+4	V
			I_{OL}=30mA, V_{DD}−V_{EE}=18V	V_{EE}		V_{EE}+2	V
Analog Switch ON Resistance	R_{on}	A_1(10), B_1(11), C_1(12), D_1(13), COM1(14), A_2(19), B_2(18), C_2(17), D_2(16) COM2(15)	I=1mA, V_{DD}−V_{EE}=4.5V		400		Ω
			I=1mA, V_{DD}−V_{EE}=9V		120		Ω
			I=1mA, V_{DD}−V_{EE}=18V		80		Ω
'H' Level Input Current	I_{IL1}	A_{in}(2), B_{in}(3), C_{in}(4), D_{in}(5), TM_{in}(6)	V_{DD}=9V, V_{IN}=V_{DD}	20		90	μA
	I_{IH2}	$\overline{MUTE_{in}}$(8)	V_{IN}=V_{DD}=18V			10	μA
'L' Level Input Current	I_{IL1}	$\overline{RESET}$(7)	V_{DD}=9V, V_{IN}=V_{DD}	−90		−20	μA
	I_{IL2}	$\overline{MUTE_{in}}$(8)	V_{IN}=V_{SS}	−10			μA
Input/Output OFF Leak Current	I_{OFF1}	$\overline{A_{out}}$(27)~$\overline{D_{out}}$(24) $\overline{TM_{out}}$(23)	Output transistor OFF V_O=V_{EE}+18V			10	μA
	I_{OFF2}	CR(1)	Output transistor OFF V_O=V_{SS}+18V			3	μA
	I_{OFF3}	A_1(10),~D_1(13), COM1(14), A_2(19)~D_2(16), COM2(15)	Analog switch OFF V_{IN}=V_O=V_{EE} to 18V	−10		10	μA
Input Floating Voltage	V_{IF1}	A_{in}(2)~D_{in}(5), TM_{in}(6)	V_{DD}=4.5 to 18V			0.75	V
	V_{IF2}	$\overline{RESET}$(7)	V_{DD}=4.5 to 18V	V_{DD}−0.75			V
Total Harmonic Distortion	THD_1	COM1(14), COM2(15)	V_{IN}=1Vrms, f=1kHz, V_{DD}−V_{EE}=15 to 18V, Refer to Fig. 1.			0.01	%
	THD_2	COM1(14), COM2(15)	V_{IN}=0.1Vrms, f=1kHz, V_{DD}−V_{EE}=4.5V, Refer to Fig. 1.			0.05	%
Feedthrough (Switch OFF)	FTH	A_1(10), D_1(13) to COM1(14)	V_{DD}−V_{EE}=18V, f=10kHz, V_{in}=0.77Vrms, Refer to Fig. 2. R_L=47kΩ	55			dB
		A_2(19), D_2(16) to COM2(15)					
Crosstalk	CT	A_1(10), D_1(13) to COM2(15)	V_{DD}−V_{EE}=18V, f=10kHz V_{in}=0.77Vrms, Refer to Fig. 3. R_L=47kΩ	75			dB
		A_2(19), D_2(16) to COM1(14)					
Muting period	T_{M1}	MUTE(21)	V_{DD}=9V, Refer to Fig. 4. C=3.3μF ±20%, R=220kΩ ±5%	350	580	1000	ms
	T_{M2}	MUTE(21)	V_{DD}=9V, C=3.3μF ±0%, R=220kΩ ±0%	450	580	800	ms

Continued on next page.

Continued from preceding page.

				min	typ	max	unit
Switch Switchover Delay Time	T_{SWD}	A_{in}(2) to D_{in}(5), TM_{in}(6)	V_{DD}=9V, Refer to Fig. 5. C=3.3μF, R=220kΩ	30	50	120	ms
Supply Current	I_{DD1}	V_{DD}(28)	Operating, Refer to Fig. 6. $V_{DD}-V_{EE}$=18V			1000	μA
	I_{DD2}	V_{DD}(28)	Backup, V_{DD}=5V, $V_{SS}=V_{EE}$			3	μA

Fig. 1 Total harmonic distortion

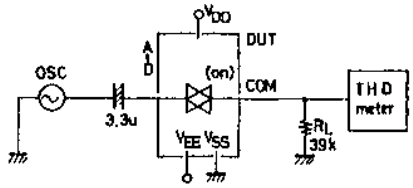
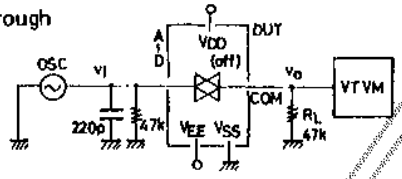


Fig. 2 Feedthrough

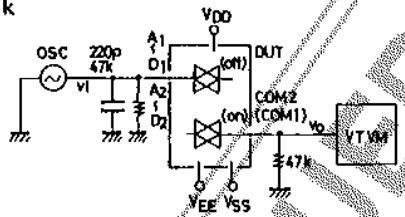


$$FTH = 20 \log \frac{V_O}{V_I} \quad (dB)$$

V_I = 770mVrms

$V_{DD} - V_{EE}$ = 18V

Fig. 3 Crosstalk



$$CT = 20 \log \frac{V_O}{V_I} \quad (dB)$$

V_I = 770mVrms

$V_{DD} - V_{EE}$ = 18V

Fig. 4 Muting period

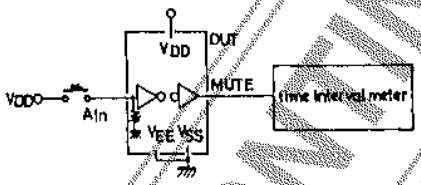


Fig. 6 Supply current

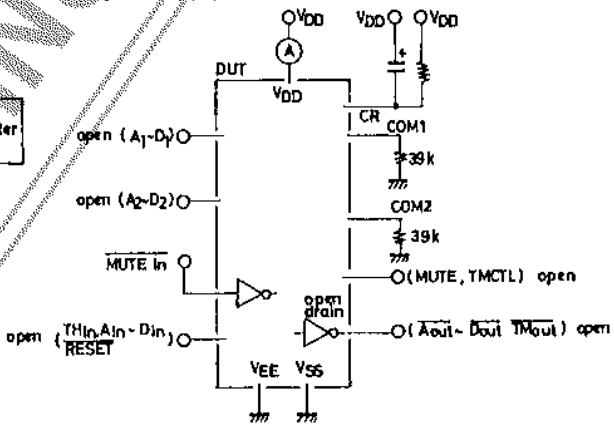
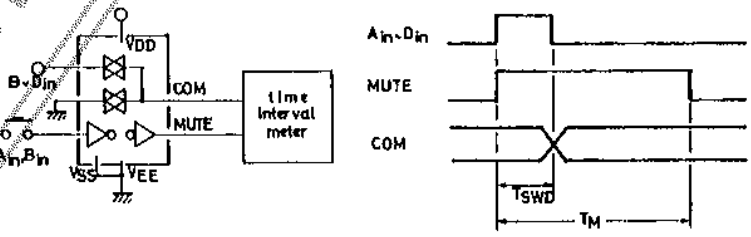


Fig. 5 Switch switchover delay time



T_M: Muting period

T_{SWD}: Switch switchover delay time