No.1520B

LC7816

CMOS IC

2-Pole 4-Position Analog Function Switch

The LC7816 is a 2-pole 4-position analog function switch with 2 built-in CMOS analog switches (LC4966 type). A soft touch of a button enables switchover of the input signal source of an audio amplifier.

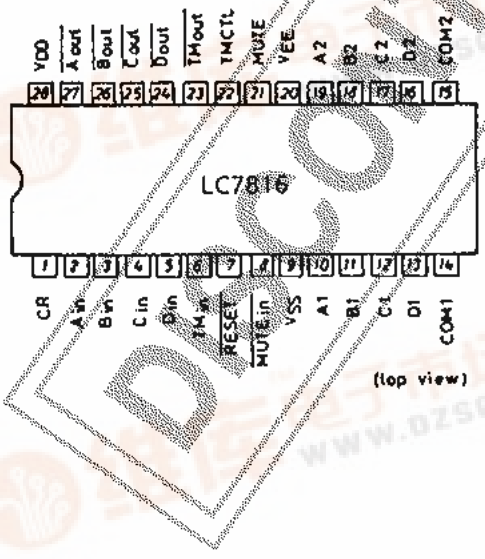
Use :

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

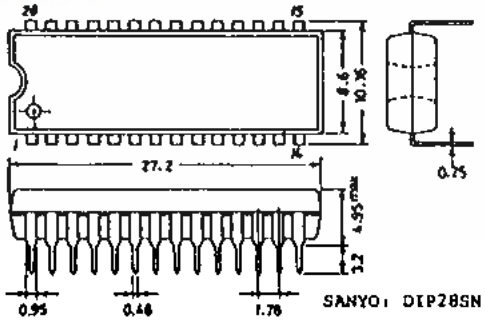
Features :

1. Good distortion characterisitc because of built-in analog switches of LC4966 type : Distortion 0.01% max./ Vi=1Vrms , V_{DD}-V_{EE}=15 to 37V.
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 LC4966 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 ($\overline{\text{MUTEin}}$), audio muting at the time of return from backup can be achieved easily.
7. Control input pin ($\overline{\text{RESET}}$) to be used for turning OFF all analog switches.
8. Backup can be performed easily because of C MOS structure. (Backup voltage: 3V min.)
9. Operating voltage : ±18V/dual supplies.
10. Package : DIP-28S (Shrink type).

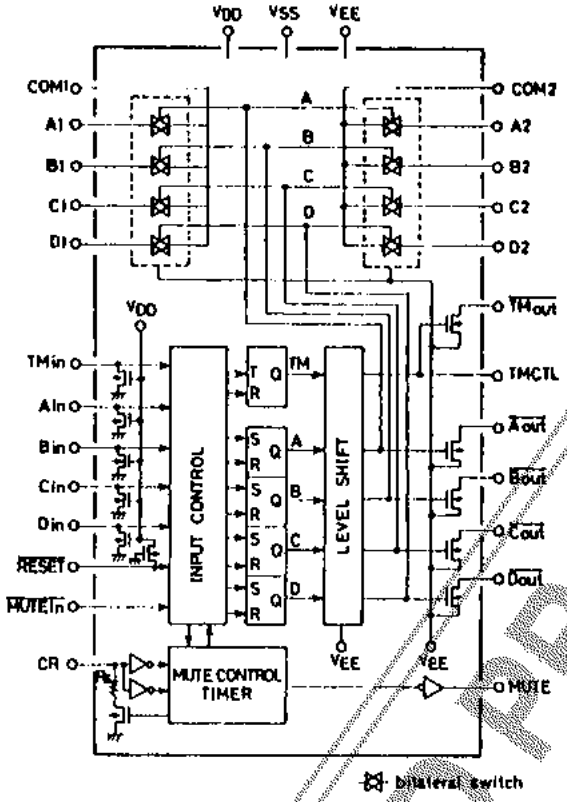
Pin Assignment



Case Outline 3063-D28SNIC
(unit:mm)

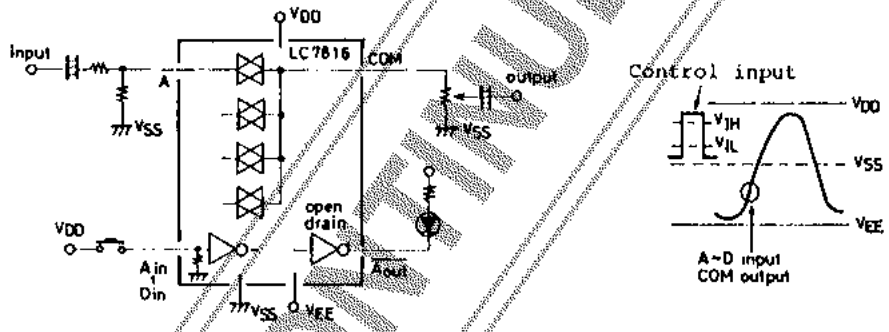


Equivalent Circuit Block Diagram

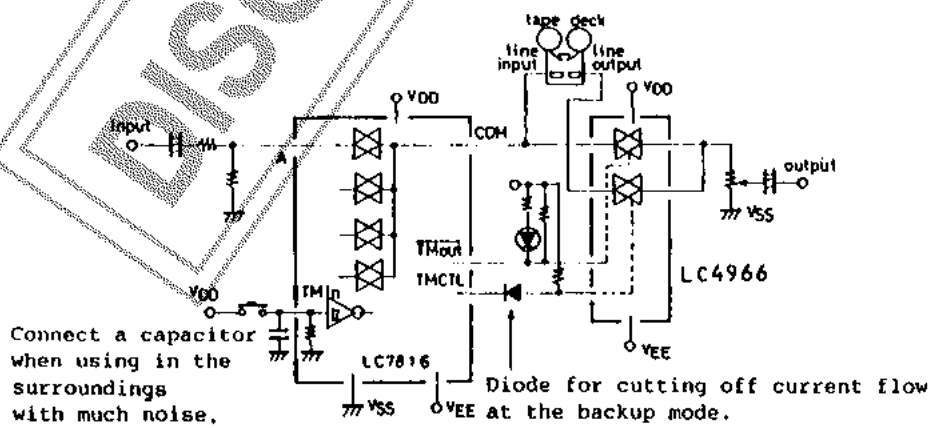


Sample Application Circuits

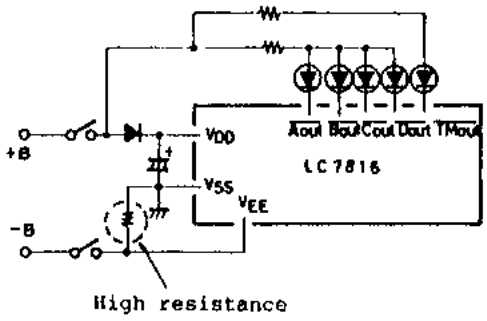
1. Without tape monitor function



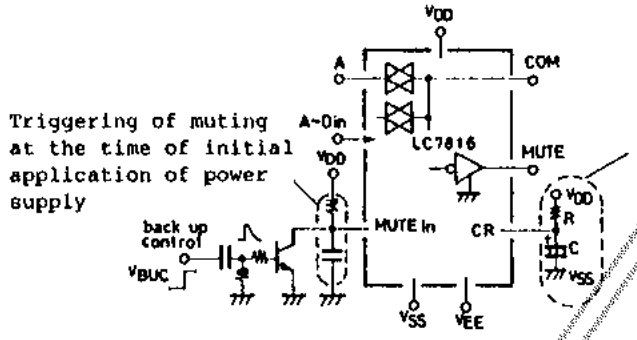
2. With tape monitor function



3. Backup



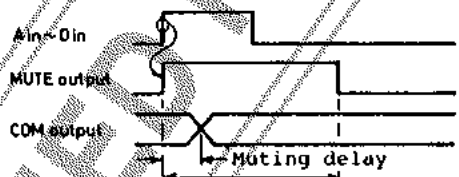
4. Muting



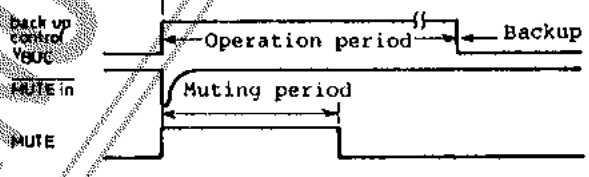
Triggering of muting at the time of initial application of power supply

Muting period depends on CR time constant. CR parallel connection is also usable.

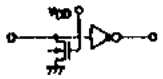
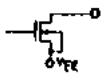
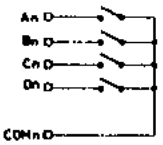
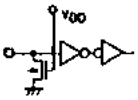
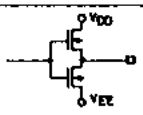
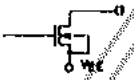
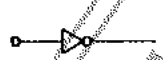
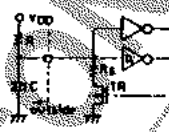
Function switchover



Return from backup



Pin Description

Pin Name	Pin No.	Type of Input/Output	Pin Functions
V_{DD} V_{SS} V_{EE}	28 9 20		·Power supply pins Dual supplies (+-): V_{SS}=GND, V_{EE}=(-)V
Ain,Bin, Cin,Din	2,3, 4,5		·Input pins for turning ON individual analog switches ·Priority order of simultaneous push(Ain>Bin>Cin>Din) ·Prevention of malfunction attributable to pulse noise (Pulse width is discriminated by muting delay time.)
$\overline{Aout}$ $\overline{Bout}$ $\overline{Cout}$ $\overline{Dout}$	27, 26, 25, 24		·Output of driver for LED which displays ON state corresponding to individual analog switches ·N channel open drain(Source is connected to V_{EE})
A1,B1, C1,D1 A2,B2, C2,D2 COM1 COM2	10,11, 12,13 19,18, 17,16 14 15		·A to D: Audio signal input pins ·COM: Audio signal output pins ·Signal inputs (A to D)conduct according to signal inputs(Ain to Din) as follows: *: Don't care
TMin	6		·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.
TMCTL	22		·Output pin for controlling external analog switch (LC4966) for tape monitor ·Source of N channel transistor of complementary buffer output is connected to V_{EE}.
$\overline{TMout}$	23		·Output pin for driver for LED which displays tape monitor state as well as for control of external switch (LC4966) for tape monitor. ·$\overline{TMout}$ is opposite in polarity to TMCTL.
$\overline{MUTEin}$	8		·Input pin for forcing audio muting control signal (MUTE) to be triggered externally ·If fixed at 'L' level,MUTE output becomes 'H' level.
MUTE	21		·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 $\overline{MUTEin}$ input.
CR	1		·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·R_S time constant at the time of transistor ON. CR parallel connection also usable.
$\overline{RESET}$	7		·Input pin for turning OFF all analog switches and resetting tape monitor flip-flop('L' level active)

COM output		An	Bn	Cn	Dn
Specified input	Ain	1	0	0	0
	Bin	*	1	0	0
	Cin	*	*	1	0
	Din	*	*	*	1

Absolute Maximum Ratings at Ta=25±2°C

				unit
Maximum Supply Voltage	V_{DD} max		V_{SS}-0.3 to V_{EE}+40	V
	V_{EE} max		V_{DD}-40 to V_{SS}+0.3	V
Output Current	I_{OUT}	$\overline{Aout}$, $\overline{Bout}$, $\overline{Cout}$, $\overline{Dout}$, TMout	30	mA
Output Voltage	V_{OUT}	" "	V_{EE}-0.3 to V_{DD}+0.3	V
Voltage Difference at Analog Switch ON	ΔV_{on}	Switch ON	0.5	V
Allowable Power Dissipation	Pd max	Ta≦85°C	350	mW
Operating Temperature	T_{opg}		-40 to +85	°C
Storage Temperature	T_{stg}		-40 to +125	°C

Allowable Operating Conditions at Ta=-40 to +85°C

		Pin No.	Conditions	min	typ	max	unit
Supply Voltage	V_{DD1}	V_{DD}(28)	V_{EE}≦V_{SS}-4.5	V_{SS}+4.5		V_{EE}+37	V
	V_{EE}	V_{EE}(20)	V_{DD}≧V_{SS}+4.5	V_{DD}-37		V_{SS}-4.5	V
	V_{DD2}	V_{DD}(28)	Backup V_{EE}≦V_{SS}	V_{SS}+3		V_{SS}+37	V
'H' Level Input Voltage	V_{IH1}	Ain(2) to Din(5), $\overline{RESET}$(7), $\overline{MUTE\ in}$(8)		0.75V_{DD}		V_{DD}	V
	V_{IH2}	TMin(6)		0.8V_{DD}		V_{DD}	V
'L' Level Input Voltage	V_{IL1}	Ain(2) to Din(5), $\overline{RESET}$(7), $\overline{MUTE\ in}$(8)		V_{SS}		0.25V_{DD}	V
	V_{IL2}	TMin(6)		V_{SS}		0.2V_{DD}	V
Analog Switch Input Voltage	V_{IN}	A1(10) to D1(13), A2(19) to D2(16)		V_{EE}		V_{DD}	V
External Capacitance for Muting Timer	C	CR(1)				10	uF
External Resistance for Muting Timer	R	CR(1)	V_{DD}-V_{SS}=4.5V	40		100	kohm
			14V>V_{DD}-V_{SS}≧9V	80		300	kohm
			18V>V_{DD}-V_{SS}≧14V	90		300	kohm
			37V>V_{DD}-V_{SS}≧18V	100		300	kohm
Input Receiving Pulse Width	T_{IN}	Ain(2) to Din(5) TMin(6)	V_{DD}=9V, C=3.3uF, R=220kohms	120			ms

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

		Pin NO.	Conditions	min	typ	max	unit
'H' Level Output Voltage	V_{OH1}	TMCTL(22)	IOH=-0.1mA, VDD=4.5 to 37V	0.8V_{DD}		V_{DD}	V
	V_{OH2}	MUTE(21)	IOH=-0.4mA, V_{DD}=4.5V	V_{DD}-1.5		V_{DD}	V
			" , 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
			" , V_{DD}≧9V	0		0.5	V
	V_{OL3}	$\overline{AOUT}$(27), $\overline{DOUT}$(24) $\overline{TMOUT}$(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
			" , V_{DD}-V_{EE}=18V	V_{EE}		V_{EE}+2	V
Analog Switch ON Resistance	Ron	A1(10), B1(11), C1(12), D1(13), COM1(14) A2(19), B2(18), C2(17), D2(16), COM2(15)	I=1mA, V_{DD}-V_{EE}=4.5V		400		ohm
			" , V_{DD}-V_{EE}=9V		120		ohm
			" , V_{DD}-V_{EE}=18V		80		ohm
			" , V_{DD}-V_{EE}=37V		70		ohm

Continued on next page.

Continued from preceding page.

				min	typ	max	unit
Input/Output OFF Leak Current	IOFF1	$\overline{AOUT}$(27) to $\overline{DOUT}$(24) $\overline{TMOUT}$(23)	Output transistor OFF $V_O=V_{EE}+18V$			10	uA
			Output transistor OFF $V_O=V_{EE}+37V$			20	uA
	IOFF2	CR(1)	Output transistor OFF $V_O=V_{SS}+18V$			3	uA
	IOFF3	A1(10) to D1(13), COM1(14), A2(19) to D2(16), COM2(15)	Analog switch OFF $V_{IN}=V_O=V_{EE}$ to $V_{EE}+37V$	-10		10	uA
Total Harmonic Distortion	THD1	COM1(14),COM2(15)	V_{IN}=1Vrms,f=1kHz, $V_{DD}-V_{EE}$=15 to 37V, Refer to Fig.1.			0.01	%
	THD2	" "	V_{IN}=0.1Vrms,f=1kHz, $V_{DD}-V_{EE}$=4.5V, Refer to Fig.1.			0.05	%
Feedthrough (Switch OFF)	FTH	A1(10), D1(13) to COM1(14)	$V_{DD}-V_{EE}$=37V,f=10kHz, V_{IN}=0.77Vrms, Refer to Fig.2. RL=47kohms		55		dB
		A2(19), D2(16) to COM2(15)					
Crosstalk	CT	A1(10), D1(13) to COM2(15)	$V_{DD}-V_{EE}$=37V,f=10kHz, V_{IN}=0.77Vrms, Refer to Fig.3. RL=47kohms		75		dB
		A2(19), D2(16) to COM1(14)					
Muting Time	TM1	MUTE(21)	V_{DD}=9V, Refer to Fig.4. C=3.3uF±20%, R=220kohms±5%	350	580	1000	ms
	TM2	MUTE(21)	V_{DD}=9V, C=3.3uF±0%, R=220kohms±0%	450	580	800	ms
Switch Switchover Delay Time	TSWD	Ain(2) to Din(5) TMin(6)	V_{DD}=9V, Refer to Fig.5. C=3.3uF,R=220kohms	30	50	120	ms
Supply Current	IDD1	VDD(28)	Operating, Refer to Fig.6. $V_{DD}-V_{EE}$=37V			1000	uA
Input Floating Voltage	VIF(1)	Ain(2) to Din(5) TMin(6)	V_{DD}=4.5 to 37V	V_{SS}		0.75	V
	VIF(2)	$\overline{RESET}$(7)	V_{DD}=4.5 to 37V	V_{DD}-0.75		V_{DD}	V

Fig. 1 Total harmanic distortion

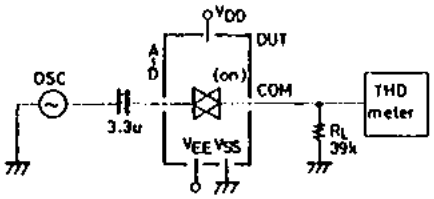
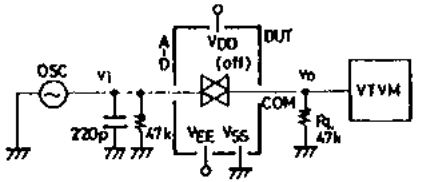


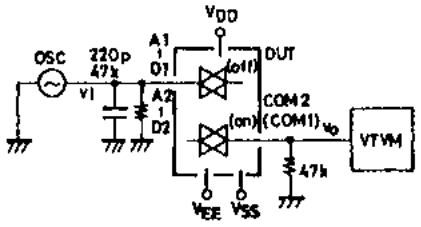
Fig. 2 Feedthrough



$$FTH=20\log\frac{Vo}{Vi}(dB)$$

Vi=770mVrms
VDD-VEE=37V

Fig. 3 Crosstalk



$CT = 20 \log \frac{Vo}{Vi}$ (dB)

Vi=770mVrms
VDD-VEE=37V

Fig. 4 Muting period

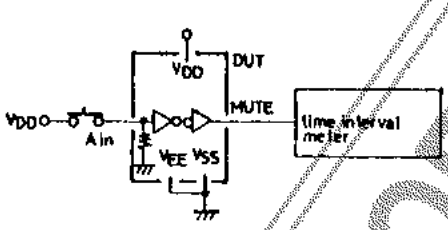
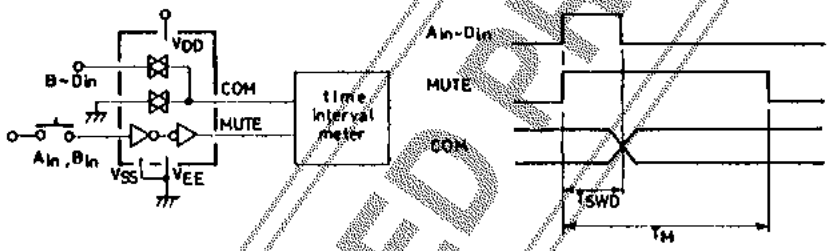


Fig. 5 Switch switchover delay time



TM: Muting period
TSWD: Switch switchover delay time

Fig. 6 Supply current