

M66261FP

6 × 5 CROSSPOINT SWITCH with MIXING FUNCTION

DESCRIPTION

The M66261 is an integrated circuit consisting of a 6 × 5 cross point switch capable of selecting 30 analog switches with mixing resistance respectively by serial control inputs. Using the M66261 with an external standard Op-Amp, 6 analog input signals can be mixed and output to any of 5 outputs freely by serial control inputs.

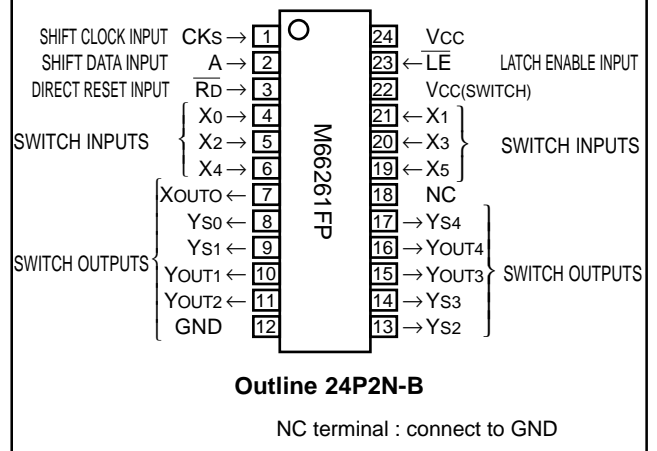
FEATURES

- High noise margin
..... Schmidt trigger circuit built in CKs and LE
- Switching and mixing function possible with standard Op-Amp.
- Excellent crosstalk characteristic
..... -90dB [$f_{IN} = 3\text{kHz}$, $V_{IN} = -10\text{dBV}$] (typ.)
- Line backup function provided in case of a power failure
..... (Effective when RD is "L.")
- Power supply pins for control circuit (Vcc) and for crosspoint switch circuit (Vcc(switch)) are provided separately.

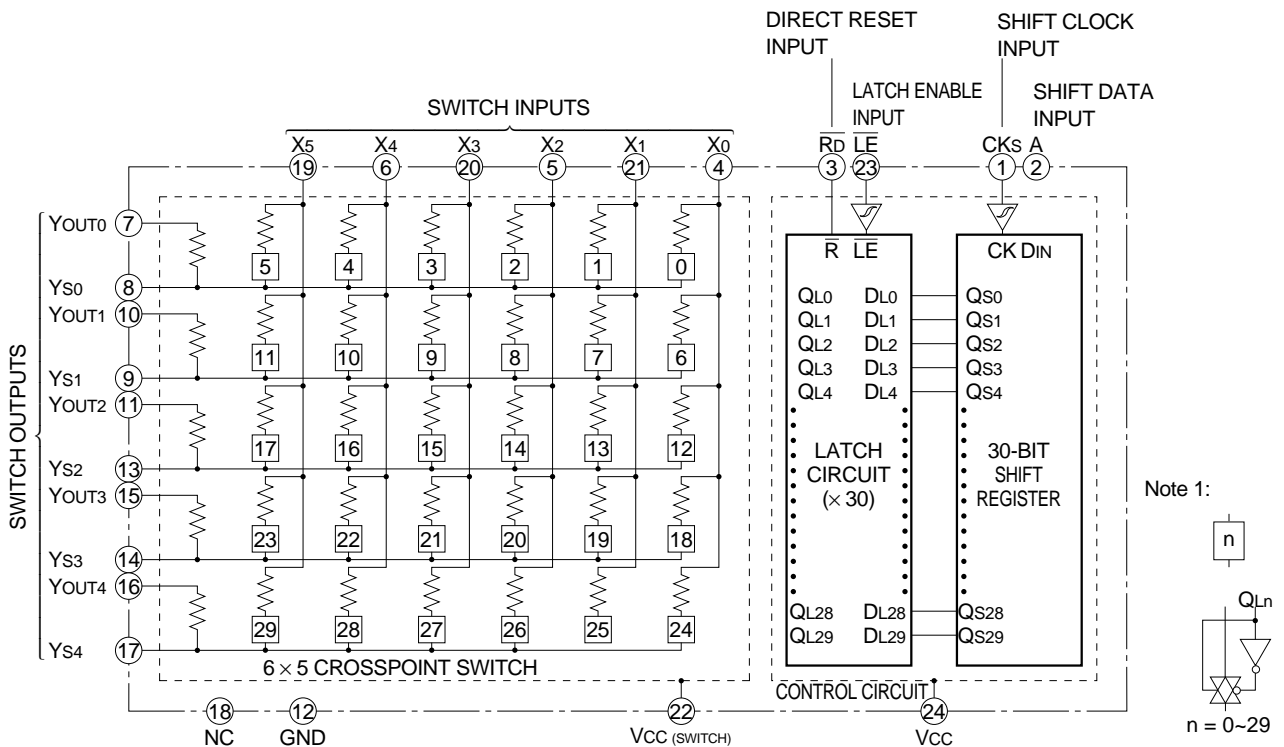
APPLICATION

Line switching with mixing function of telephone and communication equipments.

PIN CONFIGURATION (TOP VIEW)



BLOCK DIAGRAM



FUNCTION

Serial data input A is the data input of the first step of 30 BIT SHIFT REGISTER and when latch enable input \overline{LE} is "L", the signal of A shifts shifting registers one by one when shift clock input CKs changes from "L" to "H", in units of 32 bits. The first 2 bits of shifting data are ignored and the other 30 bits are stored into LATCH CIRCUIT in parallel when latch enable LE changes from "L" to "H".

Analog switches come on in a low-impedance state when the output of the corresponding latch circuit is "H." They come off in a high-impedance stage when the output of the corresponding circuit is "L."

When direct reset input \overline{RD} changes to "L," switches 0 and 29 only come on, and others come off. This function backs up the line if a power failure occurs.

FUNCTION TABLES

(1) 30-bit shift register (Note 3)

Operation mode	Inputs				Internal outputs							
	\overline{RD}	A	CKs	\overline{LE}	QS0	QS1	QS2	QS3	.....	QS27	QS28	QS29
Shift	x	L	↑	L	L	Q ⁰ S0	Q ⁰ S1	Q ⁰ S2	.....	Q ⁰ S26	Q ⁰ S27	Q ⁰ S28
	x	H	↑	L	H	Q ⁰ S0	Q ⁰ S1	Q ⁰ S2	.....	Q ⁰ S26	Q ⁰ S27	Q ⁰ S28

(2) Latch circuit [× 30] (Note 3)

Operation mode	Inputs				Internal outputs							
	\overline{RD}	A	CKs	\overline{LE}	QL0	QL1	QL2	QL3	.....	QL27	QL28	QL29
Reset	L	x	x	x	H	L	L	L	.....	L	L	H
Shift	H	x	x	H	QS0	QS1	QS2	QS3	.....	QS27	QS28	QS29
	H	x	x	L	Q ⁰ L0	Q ⁰ L1	Q ⁰ L2	Q ⁰ L3	.....	Q ⁰ L27	Q ⁰ L28	Q ⁰ L29

(3) 6 × 5 cross point switch

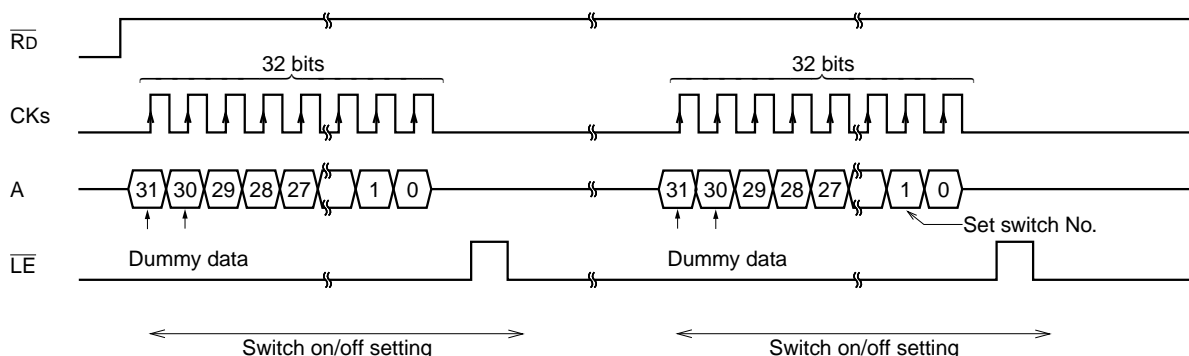
QLn	Status of switch No. [n]
L	OFF
H	ON

Table 1. Latch Output (QLN) and Corresponding Switch No. [n]

Latch output	QL0	QL1	QL2	QL3	.....	QL27	QL28	QL29
Switch No.	0	1	2	3	.....	27	28	29

Note 3. ↑ : Change from "L" to "H"
 x : "H" or "L"
 Q⁰S : The content of shift register before CKs changed
 Q⁰L : The content of latch circuit before LE changed from "H" to "L"

OPERATION TIMING CHART



6 × 5 CROSSPOINT SWITCH with MIXING FUNCTION

ABSOLUTE MAXIMUM RATINGS (Ta = -20°C to 75°C, VCC = VCC (switch) unless otherwise noted)

Symbol	Parameter	Conditions	Rating	Unit
VCC	Supply voltage		-0.5 ~ +7.0	V
Vi	Input voltage	\overline{RD} , A, CKs, \overline{LE}	-0.5 ~ VCC+0.5	V
		X0 ~ X5	-0.5 ~ VCC+0.5	
Vo	Output voltage	YS0 ~ YS4, YOUT0 ~ YOUT4	-0.5 ~ VCC+0.5	V
Pd	Power dissipation		500	mW
Tstg	Storage temperature		-65 ~ 150	°C

RECOMMENDED OPERATIONAL CONDITIONS (Ta = -20°C to 75°C, VCC = VCC (switch) unless otherwise noted)

Symbol	Parameter	Limits			Unit
		Min.	Typ.	Max.	
VCC	Supply voltage	2.8		5.5	V
Vi	Input voltage	\overline{RD} , A, CKs, \overline{LE}	0	VCC	V
		X0 ~ X5	0	VCC	V
Vo	Output voltage	YS0 ~ YS4, YOUT0 ~ YOUT4	0	VCC	V
Topr	Operating temperature	-20		75	°C

ELECTRICAL CHARACTERISTICS (Ta = -20°C to 75°C, VCC = VCC (switch) 2.8V ~ 5.5V and GND = 0V unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit	
			Min.	Typ.	Max.		
VIH	"H" Input voltage	\overline{RD} , A	0.8 × VCC			V	
VIL	"L" Input voltage				0.2 × VCC	V	
VT+	Positive-going threshold voltage	CKs, \overline{LE}	0.35 × VCC		0.8 × VCC	V	
VT-	Negative-going threshold voltage		0.2 × VCC		0.65 × VCC	V	
Ri	Input resistance	Xn → YSm n = 0 ~ 5 m = 0 ~ 4	VI (Xn) = 0.5 × VCC (For any one of switches)	15	25	40	kΩ
Rf	Feedback resistance	YOUTm → YSm	VI (YOUTm) = 0.5 × VCC (For any one of switches)	15	25	40	kΩ
ΔR	On resistance difference (Rf and Ri)	(1 block)		0.9	1	1.1	—
IOFF	Off-state leakage current	Switches off; VI* = VIH or VIL (for each of Xn, Ysm and YOUTm)				1.0	μA
ICC	Quiescent supply current	VI* = VCC or GND	VCC = 2.8V			200	μA
			VCC = 5.5V			400	
IiH	"H" input current	VI* = VCC				1.0	μA
IiL	"L" input current	VI* = GND				-1.0	μA

VI* = VI (\overline{RD} , A, CKs, \overline{LE})

6 × 5 CROSSPOINT SWITCH with MIXING FUNCTION

TIMING CONDITIONS (Ta = -20°C to 75°C, VCC = VCC (switch) = 2.8V ~ 5.5V and GND = 0V unless otherwise noted)

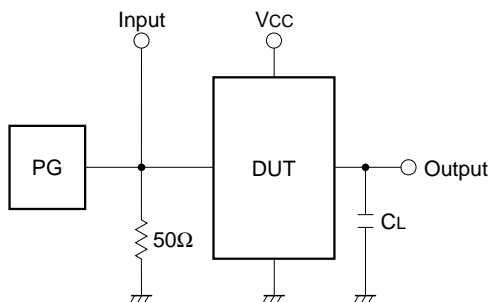
Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
tc	Clock cycle	(Note 4)	1000			ns
tw± (CKs)	Clock pulse width		400			ns
tw (LE)	Latch enable pulse width		1000			ns
tw (RD)	Reset pulse width		1000			ns
tsu (A-CKs)	A setup time before CKs		400			ns
th (CKs-A)	A hold time after CKs		200			ns
trec (RD-LE)	LE recovery time after RD		1000			ns
trec (CKs-LE)	LE recovery time after CKs		1000			ns

CROSSTALK CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
—	Crosstalk frequency	**		-90		dB

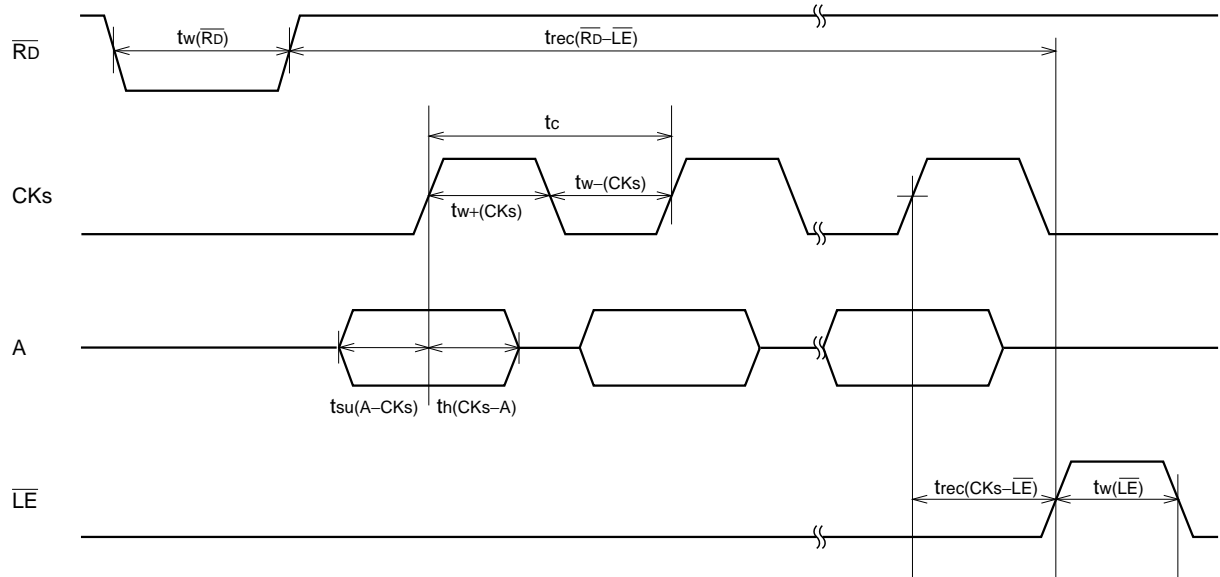
** : Vi = -10dBV, fin = 3kHz, Other input: 1kΩ at terminal
 Ta = 25°C, Vcc = +2.5V, GND = -2.5V
 VCC (switch) = +2.5V
 Standard Op-Amp: M5228P (connected externally)
 RL = 10kΩ
 Crosstalk: $20 \log_{10} \frac{V_o}{V_i}$

Note 4: TEST CIRCUIT



- (1) Pulse generator (PG) characteristics
 $t_r = t_f = 6\text{ns}$ (10%~90%)
 $V_{IN} = 0 \text{ to } V_{CC}$
- (2) CL includes stray wiring capacitance and probe input capacitance.
- (3) Reference voltage
 Input voltage: $0.5 \times V_{CC}$
 Output voltage : $0.5 \times V_{CC}$

TIMING CHART



APPLICATION EXAMPLE (Line backup function provided in case of a power failure)

When direct reset input \overline{RD} changes to "L", switches 0 and 29 only come on, and others come off.

In a power failure, using the following connection, communication can be maintained between Line and Host phone in case \overline{RD} is "L". In this time, the voltage 2.8 ~ 5.5V must be supplied on Vcc and Vcc (switch).

