

M66260FP

8 × 4 CROSSPOINT SWITCH with MIXING FUNCTION

DESCRIPTION

The M66260 is an integrated circuit consisting of a 8 × 4 cross point switch capable of selecting 32 analog switches with mixing resistance respectively by serial control inputs. Using the M66260 with an external standard Op-Amp, 8 analog input signals can be mixed and output to any of 4 outputs freely by serial control inputs.

FEATURES

- Serial data input type
- Switching and mixing function possible with standard Op-Amp.
- Switch matrix can be extended to 8 × 8 or 8 × 12 by combining 2 or 3 ICs in parallel.
- Excellent crosstalk characteristic
..... -90 dB [f = 3 kHz, V_{IN} = -10dBV] (typ.)

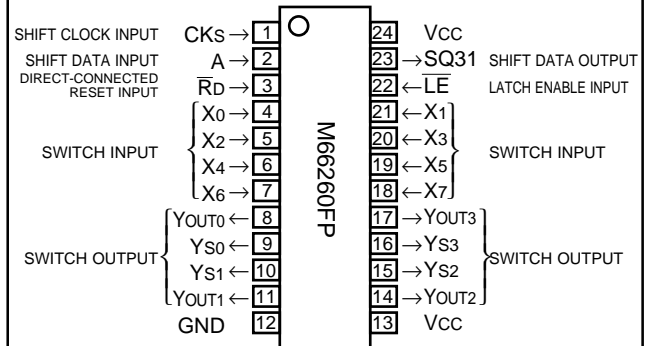
APPLICATION

Line switching with mixing function of telephone and communication equipments.

FUNCTION

Serial data input A is the data input of the first step of 32 BIT SHIFT REGISTER and when latch enable input 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.

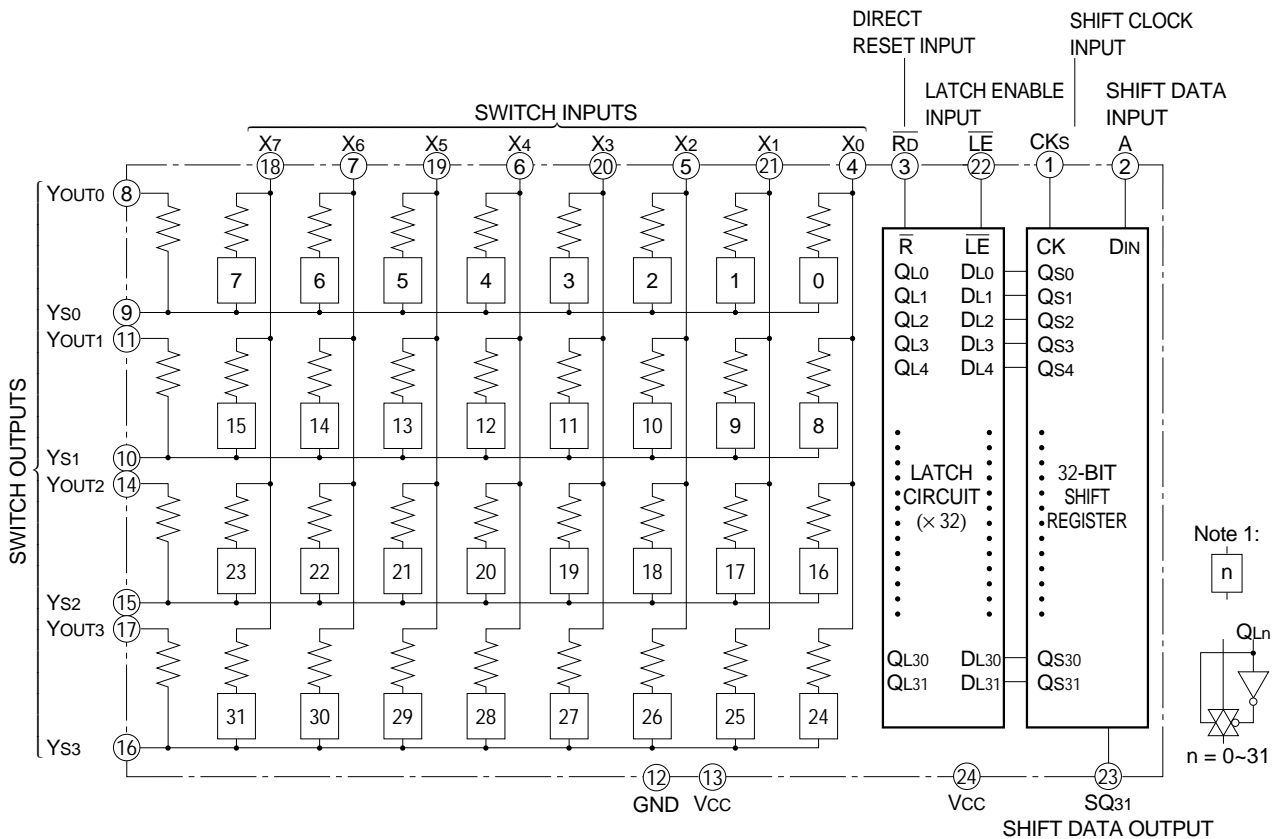
PIN CONFIGURATION (TOP VIEW)



Outline 24P2N-B

The 32 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".

BLOCK DIAGRAM



FUNCTION TABLES

(1) 32-bit shift register (Note 2)

| Operation mode | Inputs | | | | Internal outputs | | | | | | | | | Output |
|----------------|-----------------|---|-----|-----------------|------------------|-------------------|-------------------|-------------------|-----|--------------------|--------------------|--------------------|--------------------|--------|
| | \overline{RD} | A | CKs | \overline{LE} | QS0 | QS1 | QS2 | QS3 | ... | QS29 | QS30 | QS31 | SQ31 | |
| Shift | x | L | ↑ | L | L | Q ⁰ S0 | Q ⁰ S1 | Q ⁰ S2 | ... | Q ⁰ S28 | Q ⁰ S29 | Q ⁰ S30 | qs ⁰ 30 | |
| | x | H | ↑ | L | H | Q ⁰ S0 | Q ⁰ S1 | Q ⁰ S2 | ... | Q ⁰ S28 | Q ⁰ S29 | Q ⁰ S30 | qs ⁰ 30 | |

(2) Latch circuit [× 32] (Note 2)

| Operation mode | Inputs | | | | Internal outputs | | | | | | | | |
|----------------|-----------------|---|-----|-----------------|-------------------|-------------------|-------------------|-------------------|-----|--------------------|--------------------|--------------------|--|
| | \overline{RD} | A | CKs | \overline{LE} | QL0 | QL1 | QL2 | QL3 | ... | QL29 | QL30 | QL31 | |
| Reset | L | x | x | x | L | L | L | L | ... | L | L | L | |
| Shift | H | x | L | H | QS0 | QS1 | QS2 | QS3 | ... | QS29 | QS30 | QS31 | |
| | H | x | x | L | Q ⁰ L0 | Q ⁰ L1 | Q ⁰ L2 | Q ⁰ L3 | ... | Q ⁰ L29 | Q ⁰ L30 | Q ⁰ L31 | |

(3) 8 × 4 cross point switch

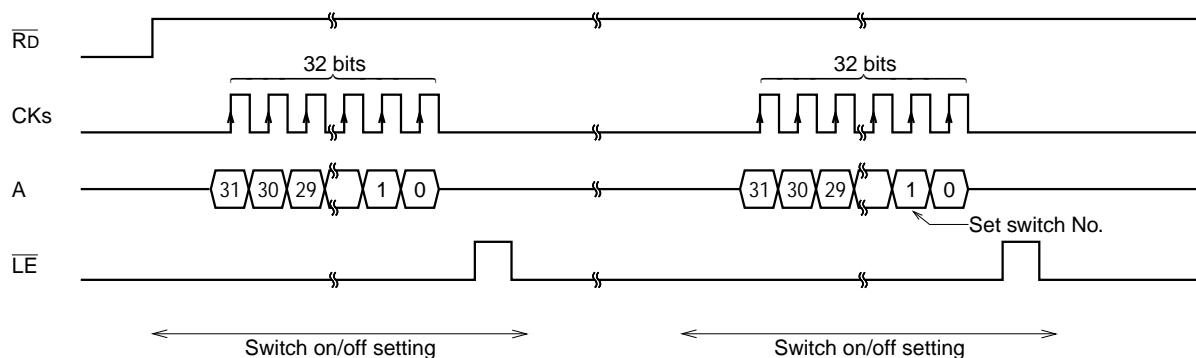
| QLn | Status of switch No. [n] |
|-----|--------------------------|
| L | OFF |
| H | ON |

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

| Latch output | QL0 | QL1 | QL2 | QL3 | ... | QL29 | QL30 | QL31 |
|--------------|-----|-----|-----|-----|-----|------|------|------|
| Switch No. | 0 | 1 | 2 | 3 | ... | 29 | 30 | 31 |

Note 2: ↑ : 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 \overline{LE} changed from "H" to "L"

OPERATION TIMING CHART



8 × 4 CROSSPOINT SWITCH with MIXING FUNCTION

ABSOLUTE MAXIMUM RATINGS (Ta = -20°C to 75°C 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 ~ X7 | -0.5 ~ Vcc+0.5 | |
| Vo | Output voltage | YS0 ~ YS3, YOUT0 ~ YOUT3 | -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 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 ~ X7 | 0 | Vcc | |
| Vo | Output voltage | YS0 ~ YS3, YOUT0 ~ YOUT3 | 0 | Vcc | V |
| Topr | Operating temperature | -20 | | 75 | °C |

ELECTRICAL CHARACTERISTICS (Ta = -20°C to 75°C, Vcc = 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, CKs, \overline{LE} | 0.8 × Vcc | | | V | |
| VIL | "L" Input voltage | | | | 0.2 × Vcc | V | |
| VOL | "L" output voltage | SQ31 | IOH = +100μA | | 0.55 | V | |
| VOH | "H" output voltage | | IOH = -100μA | Vcc - 0.8 | | V | |
| Ri | Input resistance | Xn → YSm n = 0 ~ 7 m = 0 ~ 3 | 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 | 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 | | | 400 | μA |
| IiH | "H" input current | | Vi* = Vcc | | | +1.0 | μA |
| IiL | "L" input current | | Vi* = GND | | | -1.0 | μA |
| CI | Input capacitance | | f = 1MHz | | | 10 | pF |

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

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

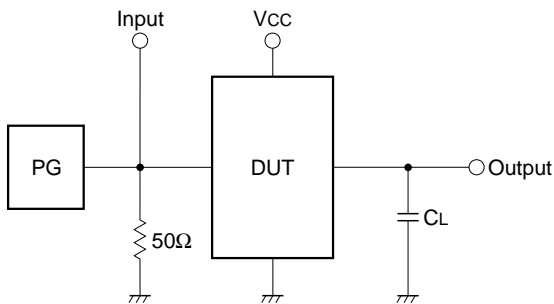
| Symbol | Parameter | conditions | Limits | | | Unit |
|-----------------|----------------------------|------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| tC | Clock cycle | (Note 4) | 1000 | | | ns |
| tw± (CKs) | Clock pulse width | | 400 | | | ns |
| tw (LE) | Latch enable 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 (CKs - LE) | LE recovery time after CKs | | 1000 | | | ns |

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

| Symbol | Parameter | | conditions | Limits | | | Unit |
|--------|-------------------------------|----------|--------------------|--------|------|------|------|
| | | | | Min. | Typ. | Max. | |
| tPLH | Output "L-H" propagation time | CKs-SQ31 | CL = 10pF (Note 4) | | | 600 | ns |
| tPHL | Output "H-L" propagation time | | | | | 600 | ns |
| — | Crosstalk frequency | | (Note 3) | | -90 | | dB |

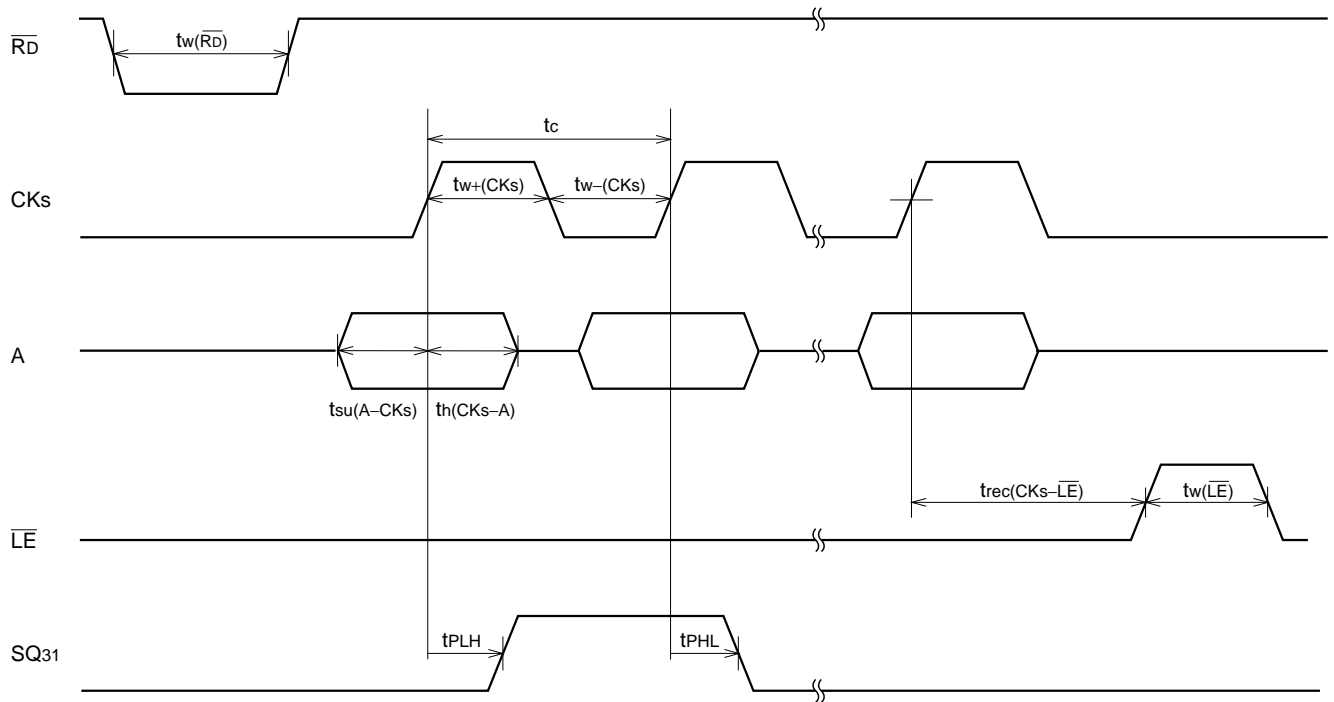
Note 3: VIN = 10dBV, fin = 3kHz
 Other inputs: 1kΩ at terminal
 Standard Op-Amp: M5228P (connected externally)
 RL = 10kΩ
 Crosstalk: $20 \log_{10} \frac{V_O}{V_I}$

Note 4: TEST CIRCUIT



- (1) Pulse generator (PG) characteristics
 tr = tf = 6ns (10% ~ 90%)
 VIN = 0 to VCC
- (2) CL includes stray wiring capacitance and probe input capacitance.
- (3) Reference voltage
 Input voltage: 0.5 × VCC
 Output voltage: 0.5 × VCC

TIMING CHART



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APPLICATION EXAMPLE

Cordless Telephone with Built-in Answering Machine (One host phone and two cordless extensions)

