UM3758 Series

Tri-State Programmable Encoder/Decoder

Features

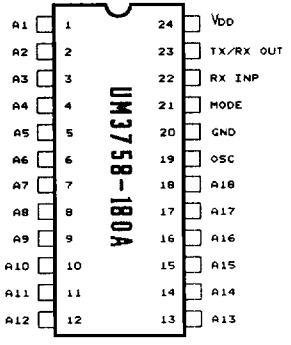
- Single-chip CMOS construction
- Single-chip Encoder/Decoder selected by jump wire
- Wide operating voltage range: V_{DD} = 3 to 12 Volts
- Built-in RC oscillator (can use 5 % resistor)
- Easy interface with RF, Infrared(IR) and Ultrasonic transmission media
- Tri-state(0, 1, open) address codes, some of address codes used as data codes or as internal addresses by mask option
- Internal address code is 18-bit, ie 3^{18} = 387,420,489 different codes at most
- Decoder has 8-bit latch data
- Series IC for various applications
- UM3758-120A pin out compatible with UM3750

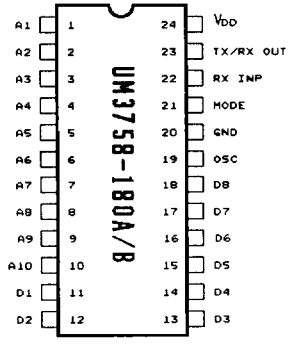
General Description

The UM3758 Series are single-chip programmable encoder /decoder ICs, fabricated in CMOS structure for low power consumption. They are enhanced for new stage encoder/decoder ICs to provide many more combinations for higher security.

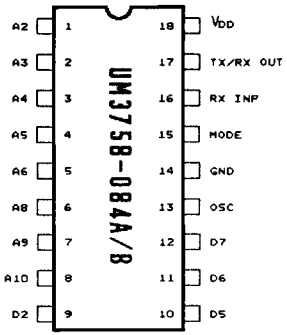
Most combinations are achieved by UM3758-180A, providing 3^{18} = 387,420,489 combinations. Some ICs of this series provide 4 to 8 data bits for controlling. According to the following information, the internal address bits, 18 bits/24-pin and 12 bits/18-pin package, can be assigned by customer in advance for much higher security and confidentiality. Whenever the address codes of transmitter transmits, the receiver will check the address codes with his own and the successive two matched address codes will generate a low pulse. If there were any data bits, the receiver will latch these data bits at the corresponding pins for controlling.

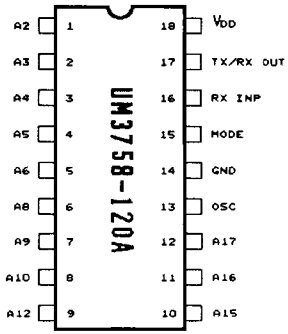
Pin Configurations

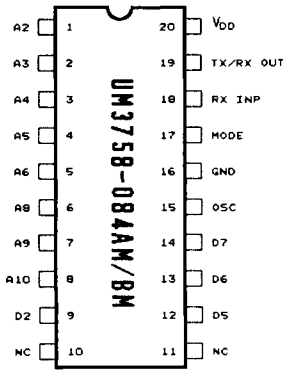


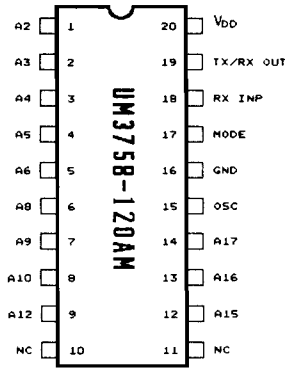


Pin Configurations (continued)









Absolute Maximum Ratings*

Power Supply Voltage . . . . . -0.3V to 11V
Operating Temperature . . . . . -40°C to 85°C
Storage Temperature (T_{stg}) . . . . . -55°C to 150°C
Applied Voltage on any Pin . . . . . .
. . . . . GND – 0.3 < V_{IN} < V_{DD} + 0.3

*Comments

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Electrical Characteristics

(T_A = 25°C, V_{DD} = 9 Volts, GND = 0V, unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Operating voltage	V_{DD}	3.0	–	12	V	
Operating current	Iop	–	–	1.2	mA	
Schmitt Trigger input level	Vsh Vsl	6 –	– –	– 2	V V	HIGH LOW
Other pins input level	Vih Vil	8.5 0	– –	9 0.5	V V	HIGH LOW
Output pin logic level	Voh Vol	8.5 0	– –	9 1	V V	HIGH LOW
DATA output current HIGH level LOW level	 Iohd Iold	 9 9	 – –	 – –	 mA mA	V_{DD} = 12V Voh = 6V Vol = 6V
TX/RX output current HIGH level LOW level	 Ioht Iolt	 35 15	 – –	 – –	 mA mA	V_{DD} = 12V Voh = 6V Vol = 6V
Operating frequency	F	–	160	–	KHz	+15% exclusive of external part

Pin Descriptions

1. UM3758-180A/AM, UM3758-120A and UM3758-120AM

Pin Number			Designation	Description
UM3758 -180A /AM	UM3758 -120A	UM3758 -120AM		
1	–	–	A1	Address select line 1 is tri-state indicated as 0, 1 and open
2	1	1	A2	Address select line 2 is tri-state indicated as 0, 1 and open
3	2	2	A3	Address select line 3 is tri-state indicated as 0, 1 and open
4	3	3	A4	Address select line 4 is tri-state indicated as 0, 1 and open
5	4	4	A5	Address select line 5 is tri-state indicated as 0, 1 and open
6	5	5	A6	Address select line 6 is tri-state indicated as 0, 1 and open
7	–	–	A7	Address select line 7 is tri-state indicated as 0, 1 and open
8	6	6	A8	Address select line 8 is tri-state indicated as 0, 1 and open
9	7	7	A9	Address select line 9 is tri-state indicated as 0, 1 and open
10	8	8	A10	Address select line 10 is tri-state indicated as 0, 1 and open
11	–	–	A11	Address select line 11 is tri-state indicated as 0, 1 and open
12	9	9	A12	Address select line 12 is tri-state indicated as 0, 1 and open

Pin Descriptions (continued)

Pin Number			Designation	Description
UM3758 -180A /AM	UM3758 -120A	UM3758 -120AM		
–	–	10	NC	No Connection
–	–	11	NC	No Connection
13	–	–	A13	Address select line 13 is tri-state indicated as 0, 1 and open
14	–	–	A14	Address select line 14 is tri-state indicated as 0, 1 and open
15	10	12	A15	Address select line 15 is tri-state indicated as 0, 1 and open
16	11	13	A16	Address select line 16 is tri-state indicated as 0, 1 and open
17	12	14	A17	Address select line 17 is tri-state indicated as 0, 1 and open
18	–	–	A18	Address select line 18 is tri-state indicated as 0, 1 and open
19	13	15	OSC	R.C. input pin for single pin oscillator. A resistor is connected from this pin to V_{DD} and a capacitor to GND
20	14	16	GND	Ground pin
21	15	17	MODE	This pin is used to select transmit or receive mode MODE — V_{DD} : Encoder mode MODE — GND : Decoder mode
22	16	18	RX INP	Receiver input pin. Receives waveform from the detect circuit
23	17	19	TX/RX OUT	In encoder mode, this pin will transmit waveform; in decoder mode, this pin will switch to LOW if comparison is OK
24	18	20	V_{DD}	Positive power supply

2. UM3758-108A/B/AM/BM, UM3758-084A/B and UM3758-084AM/BM

Pin Number			Designation	Description
UM3758 -108A/B /AM/BM	UM3758 -084 A/B	UM3758 -084AM /BM		
1	–	–	A1	Address select line 1 is tri-state indicated as 0, 1 and open
2	1	1	A2	Address select line 2 is tri-state indicated as 0, 1 and open
3	2	2	A3	Address select line 3 is tri-state indicated as 0, 1 and open
4	3	3	A4	Address select line 4 is tri-state indicated as 0, 1 and open
5	4	4	A5	Address select line 5 is tri-state indicated as 0, 1 and open
6	5	5	A6	Address select line 6 is tri-state indicated as 0, 1 and open
7	–	–	A7	Address select line 7 is tri-state indicated as 0, 1 and open
8	6	6	A8	Address select line 8 is tri-state indicated as 0, 1 and open
9	7	7	A9	Address select line 9 is tri-state indicated as 0, 1 and open
10	8	8	A10	Address select line 10 is tri-state indicated as 0,1 and open
11	–	–	D1	Data output pin 1, states are either HIGH (1 or open) or LOW (0)
12	9	9	D2	Data output pin 2, states are either HIGH (1 or open) or LOW (0)

Pin Descriptions (continued)

Pin Number			Designation	Description
UM3758 -108A/B /AM/BM	UM3758 -084 A/B	UM3758 -084AM /BM		
–	–	10	NC	No Connection
–	–	11	NC	No Connection
13	–	–	D3	Data output pin 3, states are either HIGH (1 or open) or LOW (0)
14	–	–	D4	Data output pin 4, states are either HIGH (1 or open) or LOW (0)
15	10	12	D5	Data output pin 5, states are either HIGH (1 or open) or LOW (0)
16	11	13	D6	Data output pin 6, states are either HIGH (1 or open) or LOW (0)
17	12	14	D7	Data output pin 7, states are either HIGH (1 or open) or LOW (0)
18	–	–	D8	Data output pin 8, states are either HIGH (1 or open) or LOW (0)
19	13	15	OSC	R.C. input pin for single pin oscillator. A resistor is connected from this pin to V_{DD} and a capacitor to GND
20	14	16	GND	Ground pin
21	15	17	MODE	This pin is used to select transmit or receive modes MODE — V_{DD} : Encoder mode MODE — GND : Decoder mode
22	16	18	RXINP	Receiver input pin. Receives waveform from the detect circuit
23	17	19	TX/RX OUT	In encoder mode, this pin will transmit waveform; in decoder mode, this pin will switch to LOW if comparison is OK
24	18	20	V_{DD}	Positive power supply

Functional Description

General

The operating mode of the UM3758 series is controlled by the "MODE" pin. When the "MODE" pin is connected to VDD the circuit will automatically switch to encoder mode, then "TX/RX OUT" pin acts as data out pin and "RX INP" pin acts as an idle pin. When "MODE" pin is connected to GND the circuit will switch to decoder mode, then "TX/RX OUT" pin will switch to LOW if comparison is OK, otherwise this pin will remain HIGH, and "RX/INP" receives waveform from detect circuit.

Encoder Mode

The encoder mode is selected by connecting "MODE" pin to VDD.
The transmit sequence is initiated by the power connection and continuously transmits till power down. Each transmitted address bit is encoded into address pulses (see Fig. 1). A logic zero is encoded as two consecutive long pulses, a logic one as two consecutive short pulses and an open as a long pulse followed by a short pulse. Each transmitted data bit is encoded into logic zero or one and the data pulse is the same as the address pulse (see Fig. 1), ie., the state of data pin is either one or zero. The data is one when connected to VDD or open and zero when connected to GND.

The UM3758-180A samples the 18 bit tri-state address and encodes this parallel address data for transmitting. These 18 address pins may be in either of three states (0, 1, open) allowing 3^{18} = 387,420,489 possible combinations. The UM3758-120A provides 12-bit address and allows 3^{12} = 531,441 possible combinations.

The UM3758-108A/B and UM3758-084A/B provide address bits and data bits, as described in Table 1.

Part Number	Address Bits	Address Combinations	Data Bits	Data Combinations
UM3758-108A/ B/AM/BM	10	59,049	8	256
UM3758-084A/ B/AM/BM	8	6,561	4	16

Table 1

Decoder Mode

The decoder mode is selected by connecting "MODE" pin to GND.
The decoder receives the serial data from the detect circuit and outputs the comparison result or data, if it is valid. The received data may include two types — without data and with data.

For decoders without data ICs, such as UM3758-180A and UM3758-120A, the address word is examined bit by bit as received; if two successive address words match the address bits of decoder, the "TX/RX OUT" pin will switch to LOW and two successive unmatched address words will cause "TX/RX OUT" pin to return to HIGH (see Fig. 3-1).

For decoders with data IC, such as UM3758-108A/B and UM3758-084A/B, the address word with data word are examined bit by bit as received. The first 10 bits (ex. UM3758-108A/B) are assumed to be address bits. If the address bits match the address bits from detect circuit, the next eight data bits are stored and matched to the last valid data stored. When the second word with data is received, the address bits must match again, and if they do, the data bits are checked against the previous stored data bits. If the two words (eight bits data each) of data match, the data is transferred to the output data pins (D1, D2 to D8). If the decoder is momentary type, the data pins will latch the data till the "TX/RX OUT" pin switches to HIGH; for latch decoder, the data pins will latch the data till the next valid data appears (see Fig. 3-2). Although the address bits are tri-state (0, 1, open), the data information must be either one or zero. An open state will be decoded as a logic one. The above table (Table 1) also describes these (decoder with data).

Timing Waveforms

Tri-State Encoded Pulses

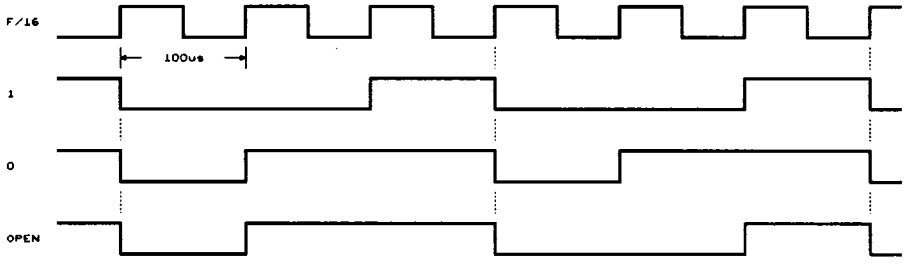


Fig. 1

Encoder Mode

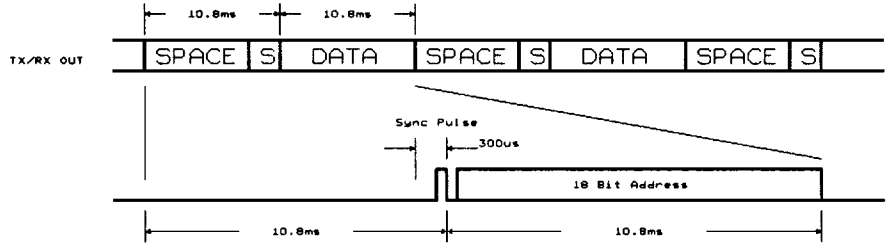


Fig. 2

Decoder Mode (without data) :

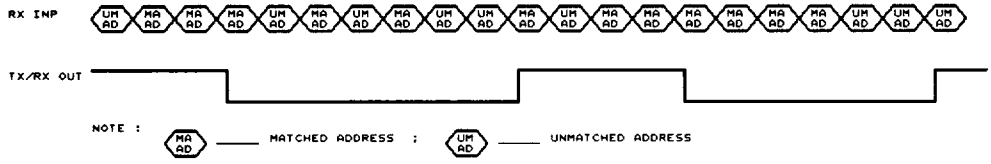


Fig. 3 -1

Timing Waveforms (continued)

Decoder Mode (with data):

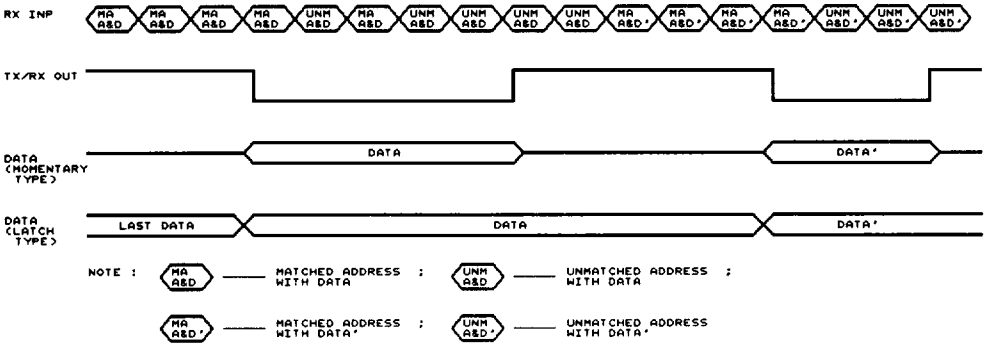
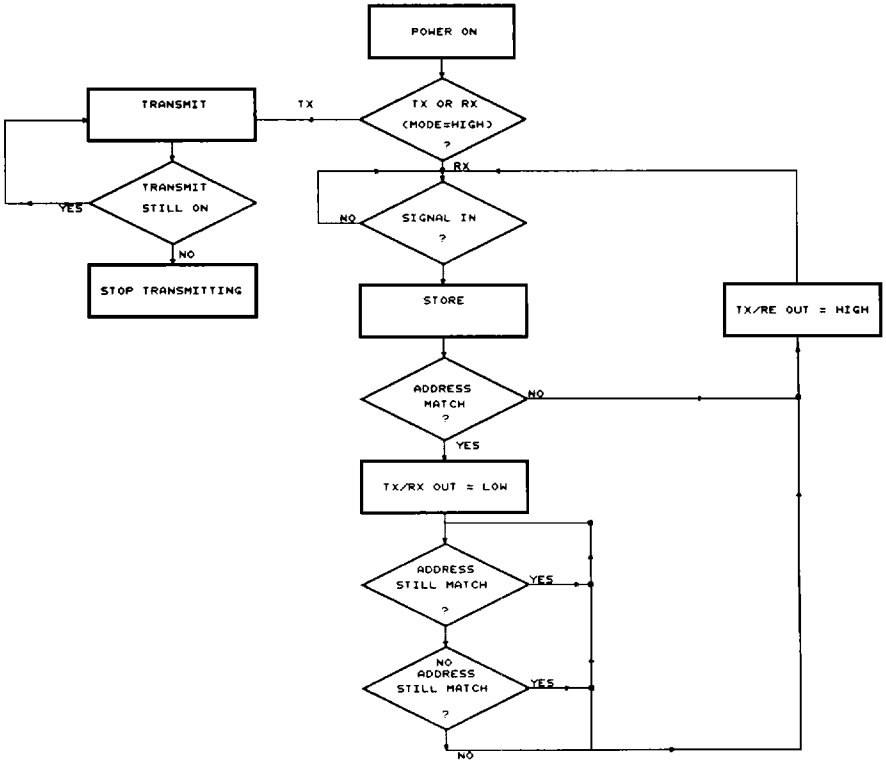
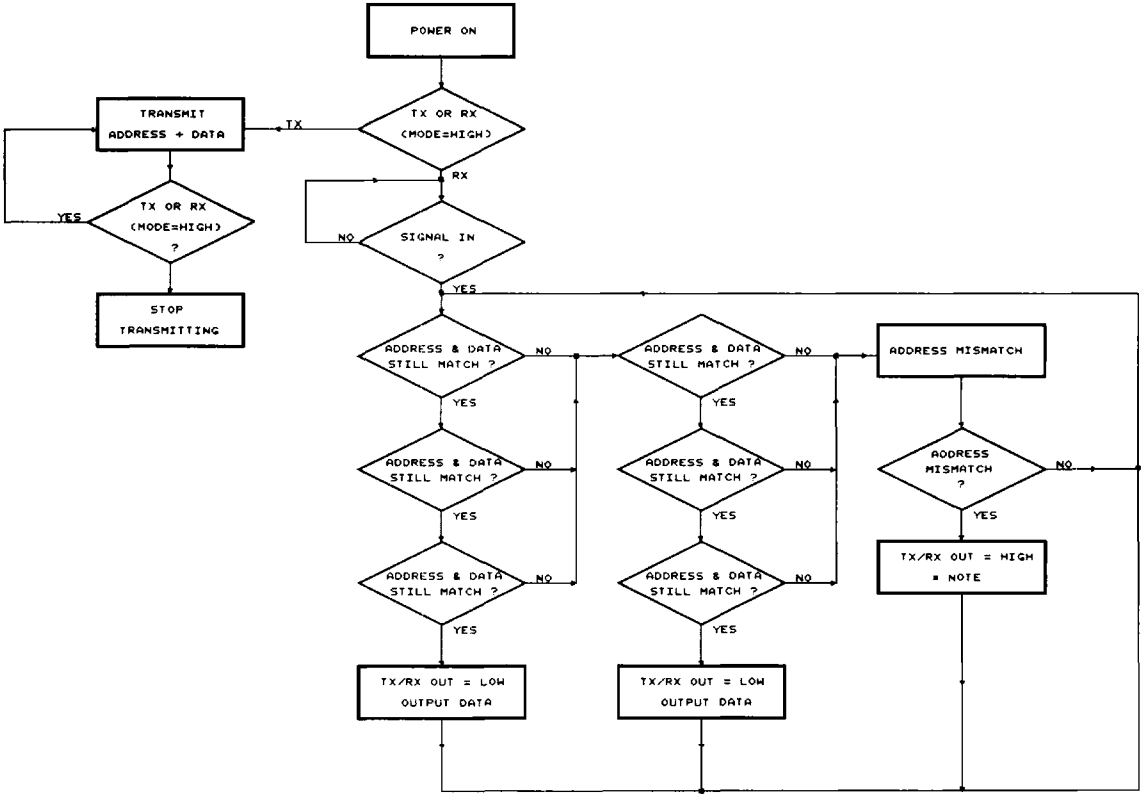


Fig. 3 -2

UM3758 Operation Flowchart (without data bit)



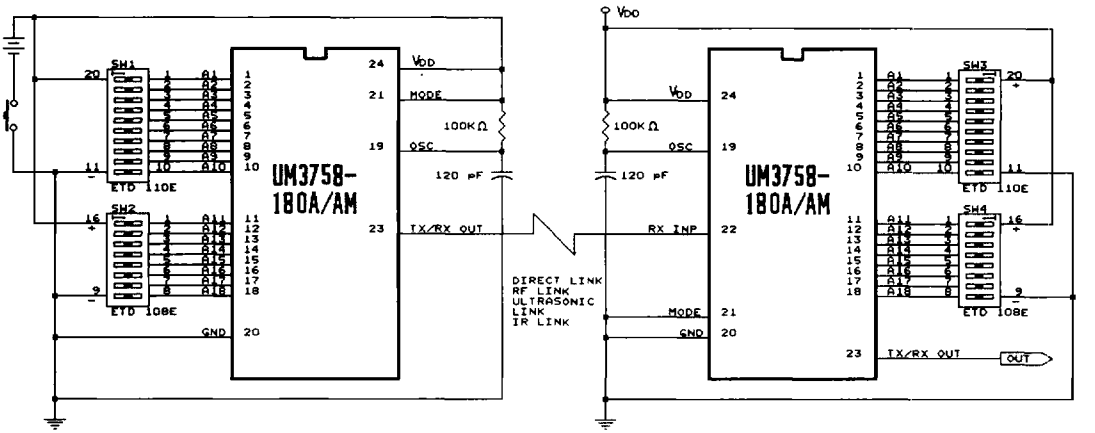
UM3758 Operation Flowchart (with data bit)



* Note : For LATCH Type ———— Keep current data
For MOMENTARY Type ———— All Data fall to LOW

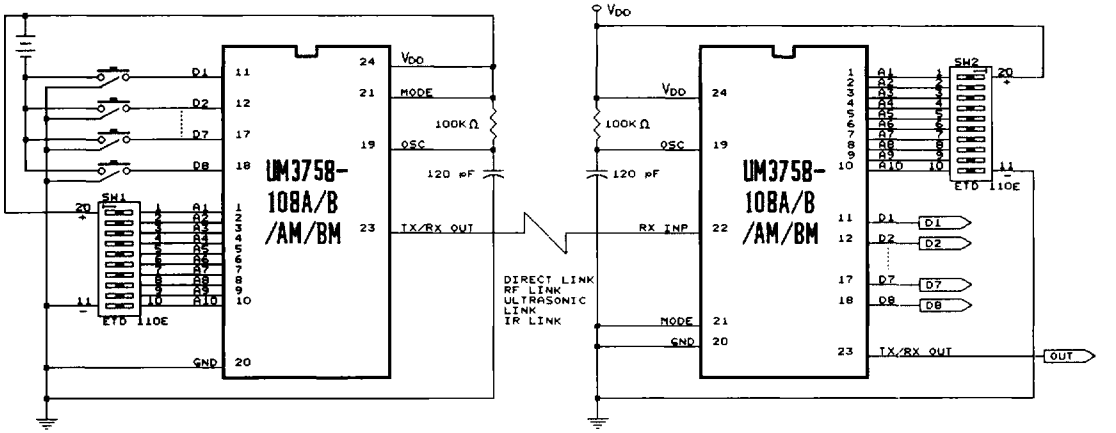
* Address MISMATCH INCLUDES " NO SIGNAL IN ".

Application Circuit (without data bit) (for reference only)



Application Circuits (with data bit) (for reference only)

(A) Use Three-Contact Pushbutton



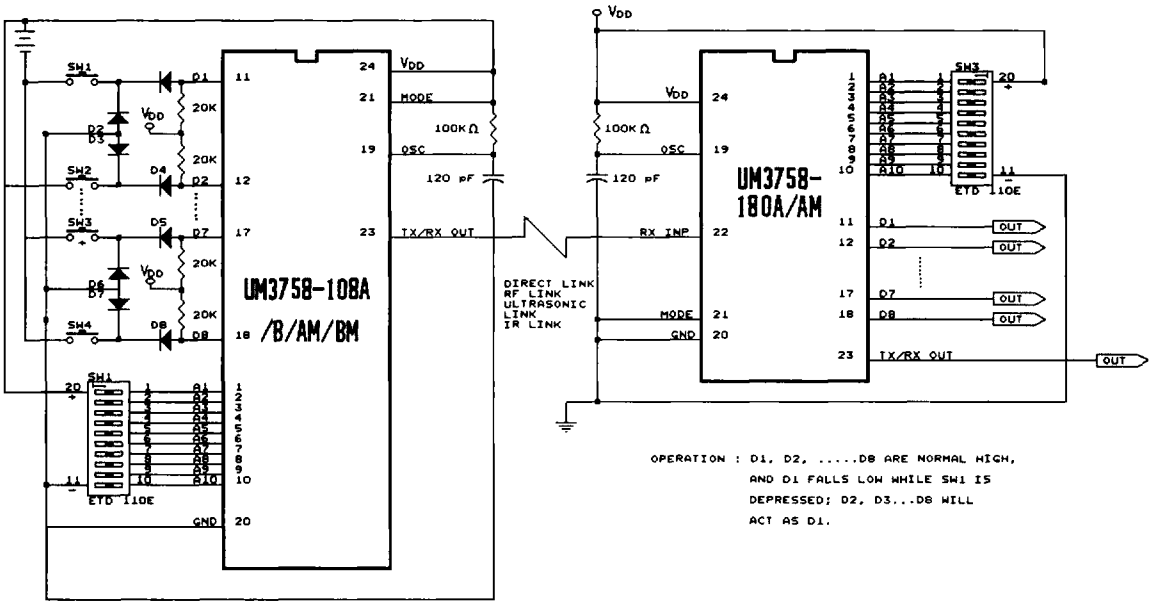
Note: ETD 108E — 8-Pin Tri-State DIP switch made by Excel Cell Electronic Co., Ltd.

ETD 110E — 10-Pin Tri-State DIP switch made by Excel Cell Electronic Co., Ltd.

Application Circuits (continued)

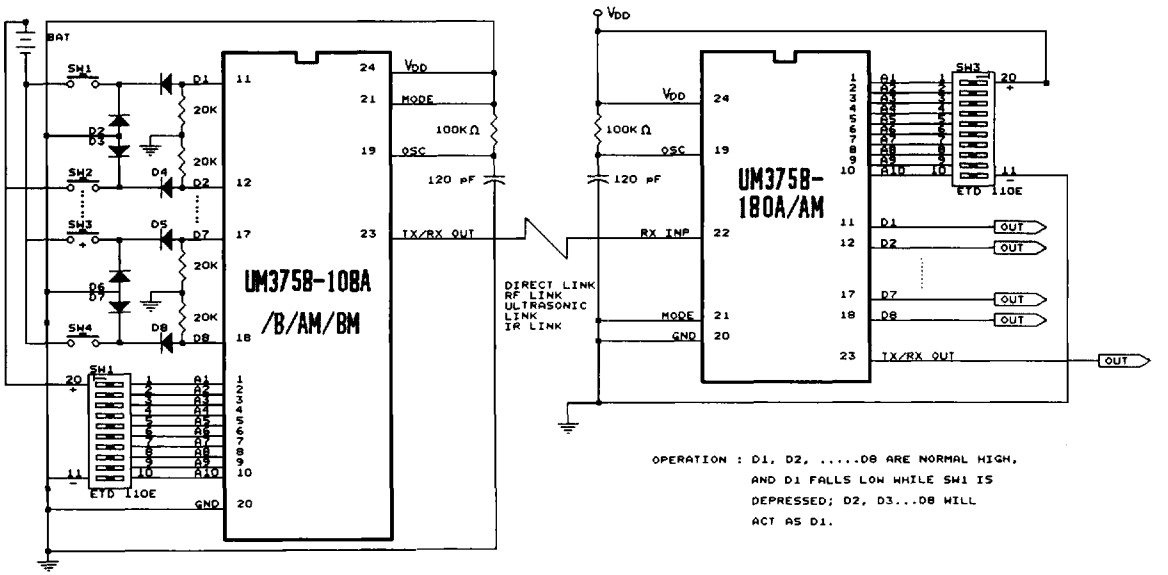
(B) Use Normal Two-Contact Pushbutton

(B) — 1 Application Circuit with Data Bit High to Low



OPERATION : D1, D2, ...D8 ARE NORMAL HIGH, AND D1 FALLS LOW WHILE SW1 IS DEPRESSED; D2, D3...D8 WILL ACT AS D1.

(B) — 2 Application Circuit with Data Bit Low to High



OPERATION : D1, D2, ...D8 ARE NORMAL HIGH, AND D1 FALLS LOW WHILE SW1 IS DEPRESSED; D2, D3...D8 WILL ACT AS D1.

Ordering Information

Part No.	Addresses	Data	Data Output Type	Package Type
UM3758-180A	18	0	—	24L DIP
UM3758-180AM	18	0	—	24L SOP
UM3758-108A	10	8	LATCHED	24L DIP
UM3758-108AM	10	8	LATCHED	24L SOP
UM3758-108B	10	8	MOMENTARY	24L DIP
UM3758-108BM	10	8	MOMENTARY	24L SOP
UM3758-120A	12	0	—	18L DIP
UM3758-120AM	12	0	—	20L SOP
UM3758-084A	8	4	LATCHED	18L DIP
UM3758-084AM	8	4	LATCHED	20L SOP
UM3758-084B	8	4	MOMENTARY	18L DIP
UM3758-084BM	8	4	MOMENTARY	20L SOP