1. General Description

This 8-bit Micro-controller with built-in carrier generator uses a fully static CMOS technology to achieve high speed, small size, low power and high noise immunity.

On chip memory includes 512 words of ROM, and 28 bytes of static RAM.

2. Features

- Fully COMS static design
- 8-bit data bus
- On chip ROM size : 512 words
- Internal RAM size : 28 bytes (24general purpose registers, 4 special registers)
- 34 single word instructions
- 14-bit instructions
- 2-level stacks
- Operating voltage : 2.0V ~ 6 V
- Addressing modes include direct, indirect and relative addressing modes
- Power-on Reset
- System clock : 455KHz crystal (OSC1 cap 50P; OSC2 cap 100P)
- PA0-7 : 8 input only pins with pull-high resistor and input low wakeup detect circuit.
- PB0 : CMOS output.
- PB1~7 : Seven open drain output pins.
- Built in remote control carrier synthesizer Fosc/8 (56.9K) or Fosc/12 (37.9K) by firmware setting.
- 2048 clocks for oscillator start up time.

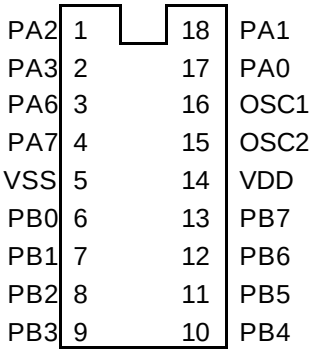
3. Applications

- Remote controller

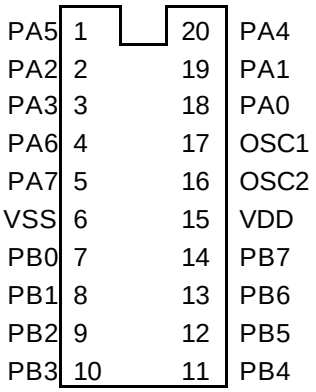
4. Pin Assignment

※ P – PDIP, S - PSOP

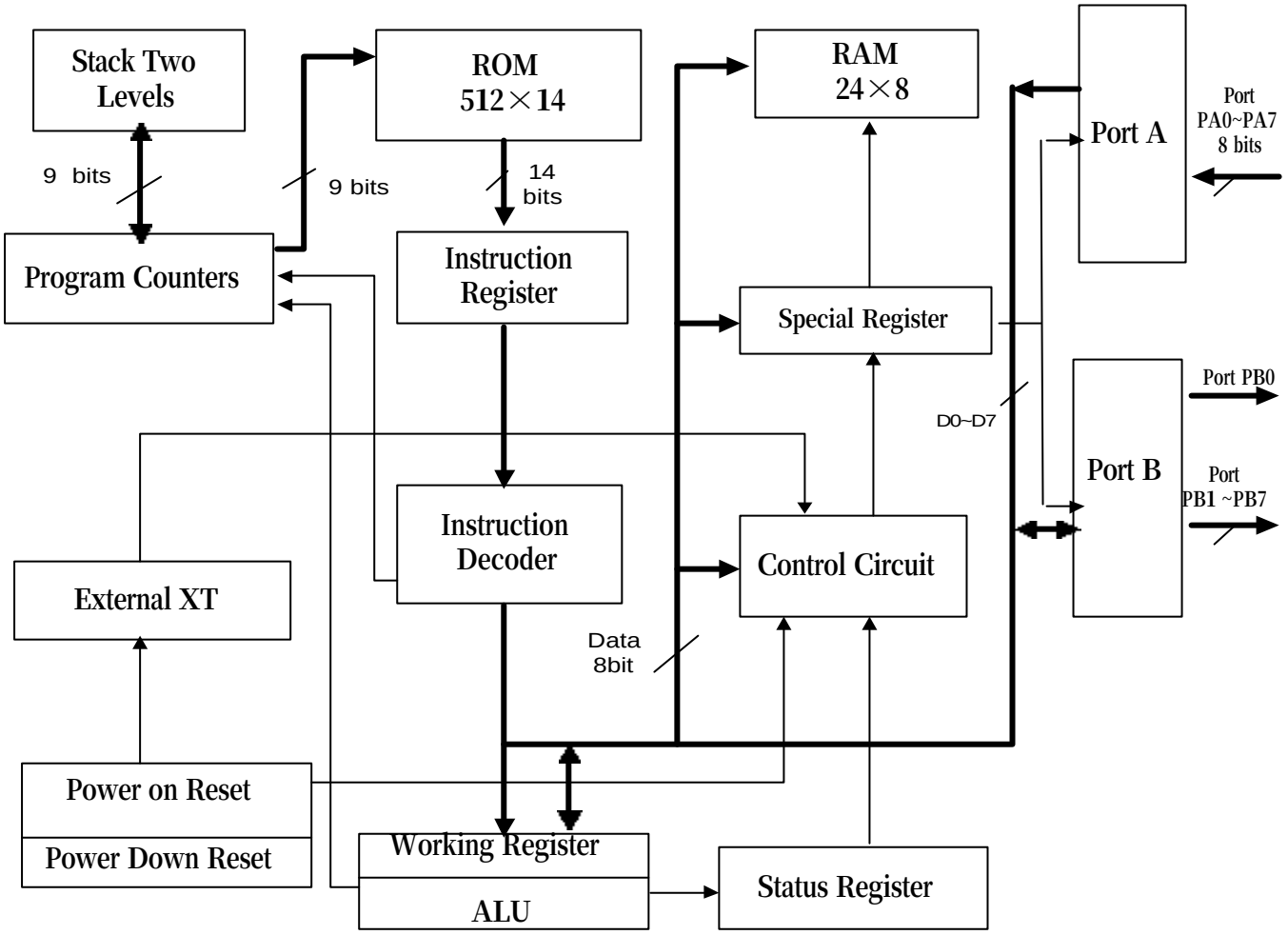
MDT10P43P11, MDT10P43S11



MDT10P43P21, MDT10P43S21



5. Block Diagram



6. Pin Function Description

Pin Name	I/O	Function Description
PA0~PA7	I	Port A, TTL input level. Built in 50K ohm pull-high resistor. In sleep mode, a high-to-low change on any pin will cause chip reset.
PB0	O	CMOS output pin
PB1~PB7	O	Port B open drain output pins, 50K ohm pull-high resistor.
OSC1	I	Crystal oscillation input pin
OSC2	O	Crystal oscillation output pin
Vdd		Power supply
Vss		Ground

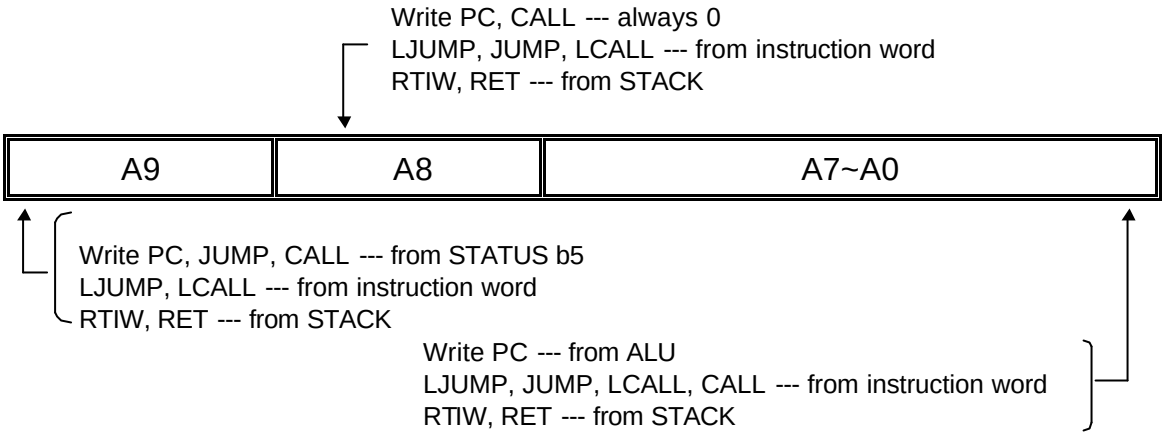
7. Memory Map

(A) Register Map

Address	Description
00	Indirect Addressing Register
01	Unimplemented
02	PC
03	STATUS
04	MSR
05	Port A (Input Only)
06	Port B output register (Using “CPIO PB“ Instruction change to PB Output data only)
07	Unimplemented
08~1F	Internal RAM, General Purpose Register

(1) IAR (Indirect Address Register) : R0

(2) PC (Program Counter) : R2



(3) STATUS (Status register) : R3

Bit	Symbol	Function
0	C	Carry bit
1	HC	Half Carry bit
2	Z	Zero bit
3	PF	Power loss Flag bit
4	LPT	Low power detect
		=0 : Vdd is lower than 2.3 ~ 2.5V
		=1 : Vdd is higher than 2.3 ~ 2.5V
5	——	General purpose bit
6—7	——	Carrier frequency control bits
		=00 No carrier (default)
		=01 Fosc/8, 1/2 duty
		=10 Fosc/12, 1/2 duty
		=11 Fosc/12, 1/3 duty (1/3 – Hi ; 2/3 - Low)

(4) MSR (Memory Select Register) : R4

(5) PORT A : R5

Bit 7-0 : Port A data input

(6) CPIO PB : R6

Bit 7-1 : PB7-PB1 output register (open drain output)

Bit 0 : PB0 output register (CMOS output)

8. Reset Condition for all Registers

Register	Address	Power-On Reset
IAR	00h	—
PC	02h	1111 1111
STATUS	03h	0001 1xxx
MSR	04h	111x xxxx
PB Output data	06h	1111 1110

Note : " x "=unknown, " – "=unimplemented, read as "0"

10. Instruction Set

Instruction Code	Mnemonic Operands	Function	Operating	Status
010000 00000000	NOP	No operation	None	
010000 00000010	SLEEP	Sleep mode	0→WT, stop OSC	TF, PF
010000 00000100	RET	Return	Stack→PC	None
010000 00000rrr	CPIO R	Control I/O port register	W→CPIO r	None
010001 1rrrrrrr	STWR R	Store W to register	W→R	None
011000 trrrrrrr	LDR R, t	Load register	R→t	Z
111010 iiiiiiii	LDWI I	Load immediate to W	I→W	None
010111 trrrrrrr	SWAPR R, t	Swap halves register	[R(0~3) ↔ R(4~7)]→t	None
011001 trrrrrrr	INCR R, t	Increment register	R + 1→t	Z
011010 trrrrrrr	INCRSZ R, t	Increment register, skip if zero	R + 1→t	None
011011 trrrrrrr	ADDWR R, t	Add W and register	W + R→t	C, HC, Z
011100 trrrrrrr	SUBWR R, t	Subtract W from register	R – W→t (R+/W+1→t)	C, HC, Z
011101 trrrrrrr	DECR R, t	Decrement register	R – 1→t	Z
011110 trrrrrrr	DECRSZ R, t	Decrement register, skip if zero	R – 1→t	None
010010 trrrrrrr	ANDWR R, t	AND W and register	R ∩ W→t	Z
110100 iiiiiiii	ANDWI i	AND W and immediate	i ∩ W→W	Z
010011 trrrrrrr	IORWR R, t	Inclu. OR W and register	R ∪ W→t	Z
110101 iiiiiiii	IORWI i	Inclu. OR W and immediate	i ∪ W→W	Z
010100 trrrrrrr	XORWR R, t	Exclu. OR W and register	R ⊕ W→t	Z

Instruction Code	Mnemonic Operands	Function	Operating	Status
110110 iiiiiiii	XORWI i	Exclu. OR W and immediate	i ⊕ W→W	Z
011111 trrrrrrr	COMR R, t	Complement register	/R→t	Z
010110 trrrrrrr	RRR R, t	Rotate right register	R(n) →R(n-1), C →R(7), R(0)→C	C
010101 trrrrrrr	RLR R, t	Rotate left register	R(n)→r(n+1), C→R(0), R(7)→C	C
010000 1xxxxxxx	CLRW	Clear working register	0→W	Z
010001 0rrrrrrr	CLRR R	Clear register	0→R	Z
0000bb brrrrrrr	BCR R, b	Bit clear	0→R(b)	None
0010bb brrrrrrr	BSR R, b	Bit set	1→R(b)	None
0001bb brrrrrrr	BTSC R, b	Bit Test, skip if clear	Skip if R(b)=0	None
0011bb brrrrrrr	BTSS R, b	Bit Test, skip if set	Skip if R(b)=1	None
1000nn nnnnnnnn	LCALL n	Long CALL subroutine	n→PC, PC+1→Stack	None
1010nn nnnnnnnn	LJUMP n	Long JUMP to address	n→PC	None
110000 nnnnnnnn	CALL n	Call subroutine	n→PC, PC+1→Stack	None
110001 iiiiiiii	RTIW i	Return, place immediate to W	Stack→PC, i→W	None
11001n nnnnnnnn	JUMP n	JUMP to address	n→PC	None

Note :

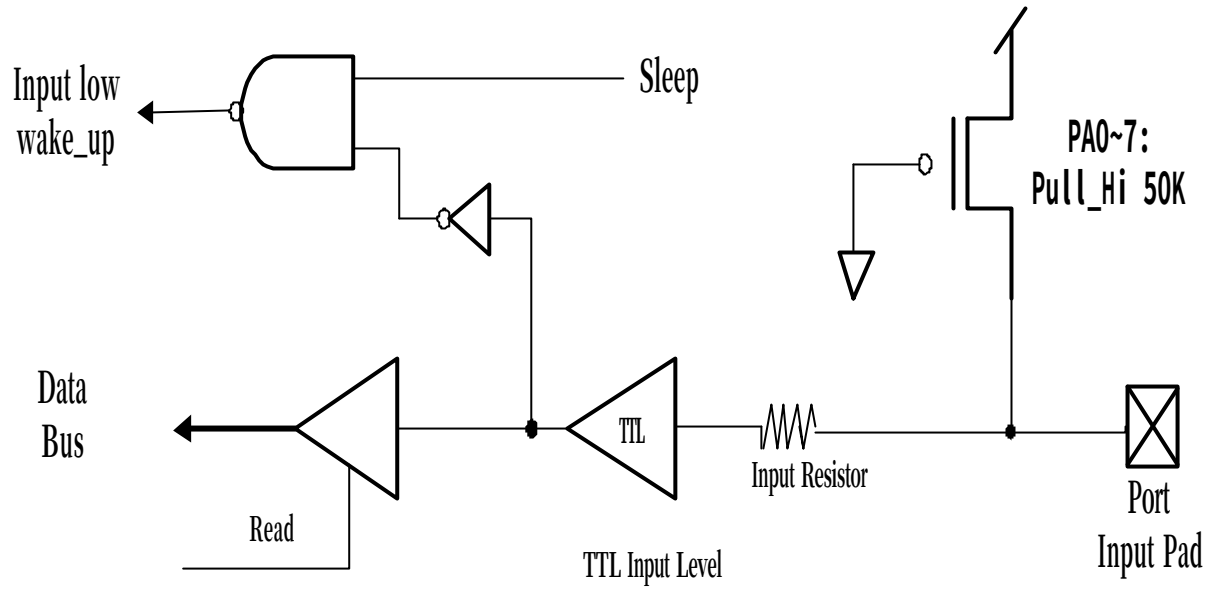
W	:	Working register	b	:	Bit position
CPIO	:	Control I/O port register	t	:	Target
HC	:	Half carry			0 : Working register
Z	:	Zero flag			1 : General register
C	:	Carry flag			
PF	:	Power loss flag	R	:	General register address
PC	:	Program Counter	i	:	Immediate data (8 bits)
OSC	:	Oscillator	n	:	Immediate address
Inclu.	:	Inclusive '∪'	/	:	Complement
Exclu.	:	Exclusive '⊕'	x	:	Don't care
AND	:	Logic AND '∩'			

11. Electrical Characteristics

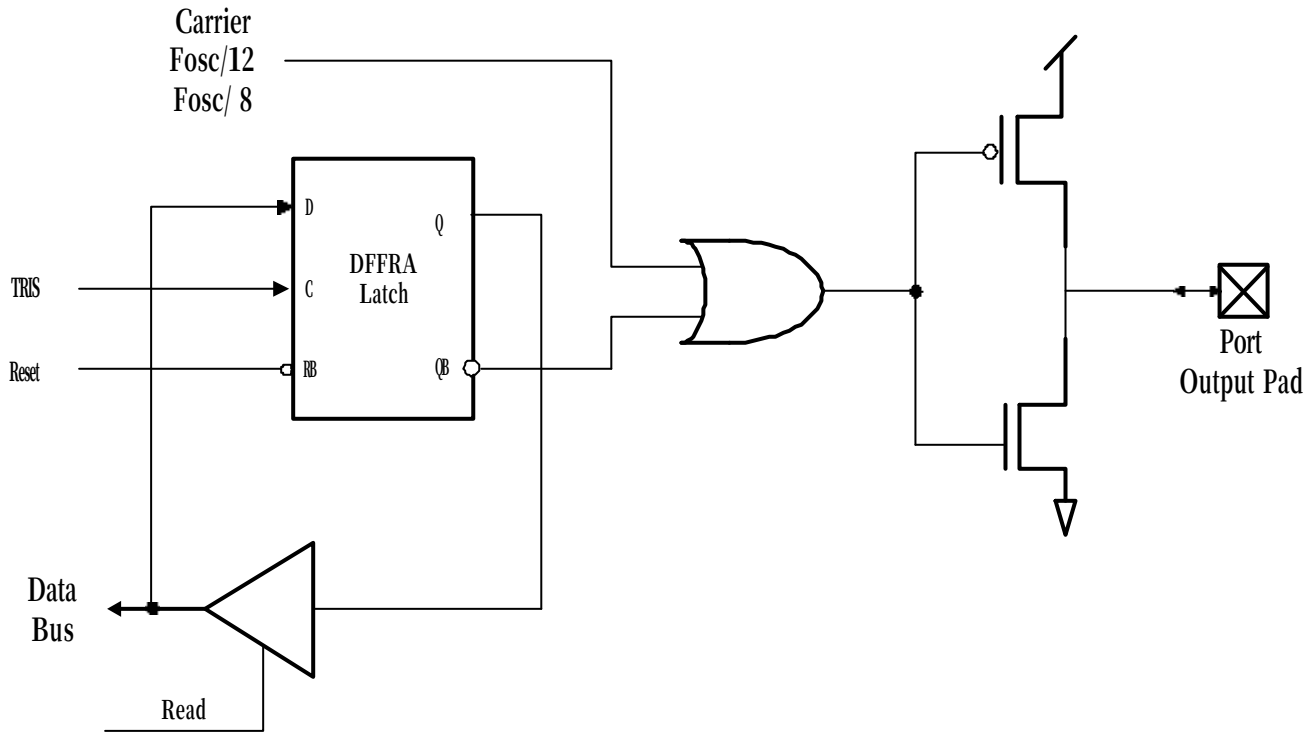
(Operating temperature at 25℃).

Sym	Description	Condition	Min	Typ	Max	Unit
Vdd	Operating voltage		2.0		6.0	V
V_{IL}	Input Low Voltage PA	Vdd=5V	-0.6		1.0	V
V_{IH}	Input high Voltage PA	Vdd=5V	2.0		Vdd+0.6	V
I_{IL}	Input leakage current	Vdd=5V			+/-1	μA
V_{OL}	Output Low Voltage PB	Vdd=5V, I_{OL}=20mA Vdd=5V, I_{OL}=5mA		0.6 0.2		V V
V_{OH}	Output High Voltage PB0	Vdd=5V, I_{OH}= -20mA Vdd=5V, I_{OH}= -5mA		2.8 4.2		V V
V_{pr}	Power Edge-detector Reset Voltage			1.8		V

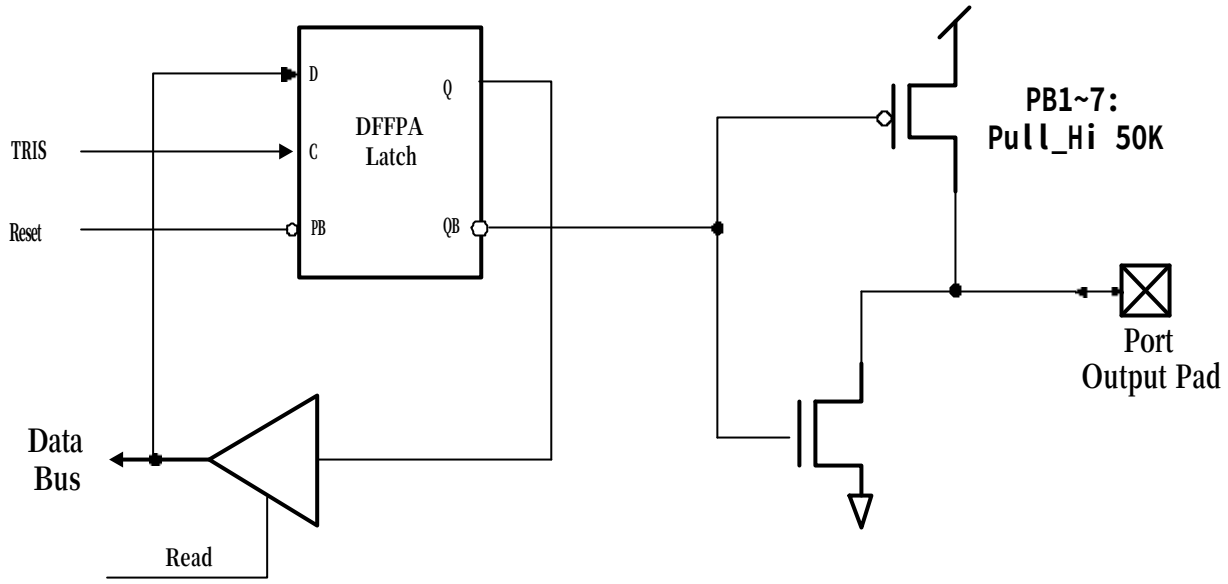
12. PA0 ~ PA7 Equivalent Circuit

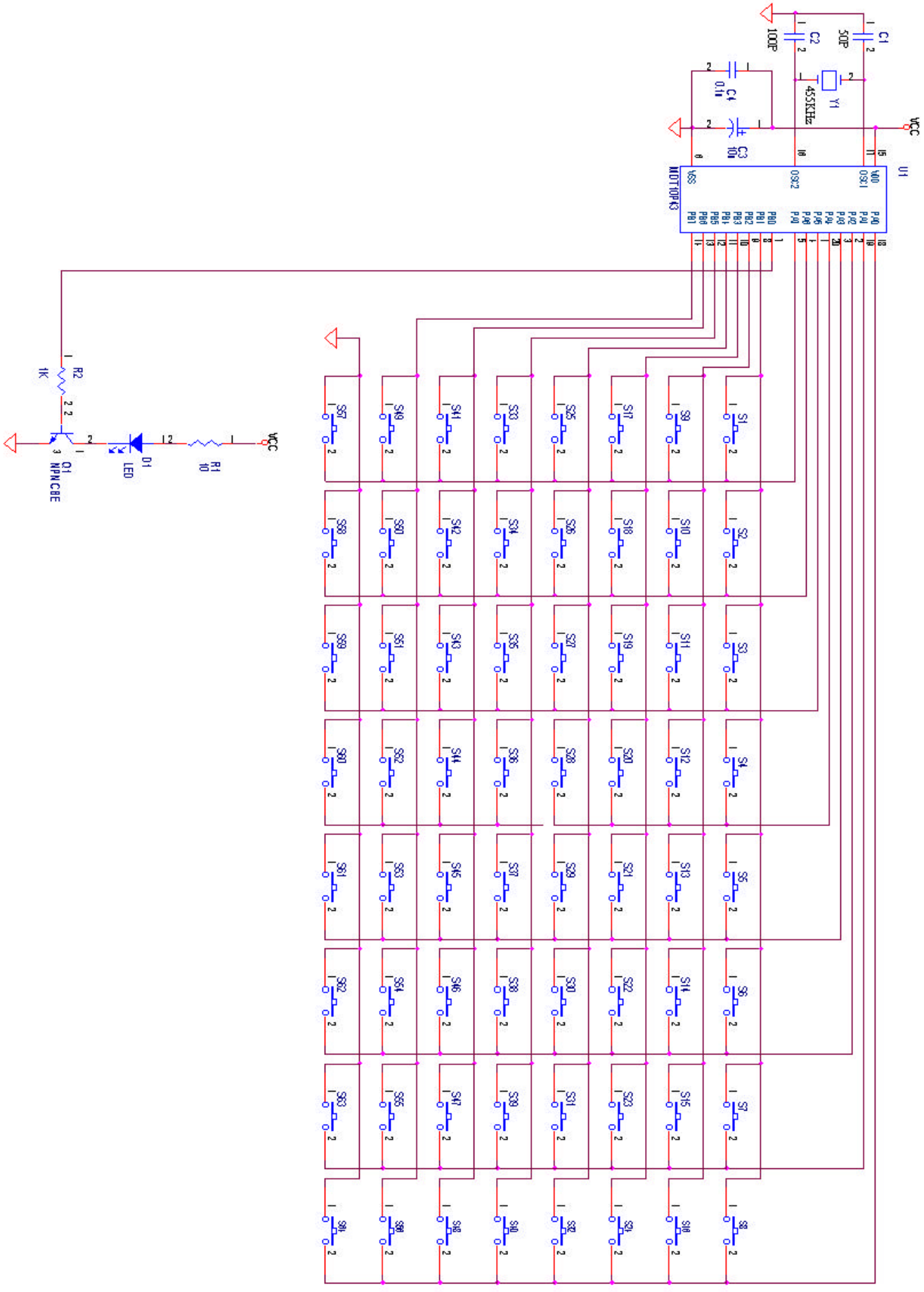


13. (A) PB0 Equivalent Circuit



(B) PB1~7 Equivalent Circuit




C1
50P
C2
100P
C4
0.1u
Y1
455KHz
C3
10u
VCC
U1
MDT10P43
OSC2
OSC1
VDD
VSS
R2
1K
Q1
NPN CBE
D1
LED
R1
10
VCC