



TP8511HB- E01

PS/2 Keyboard controller

DataSheet

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General Specification

1. General Description

The TP8511KB is an 8-bits microcontroller that can operate in wide range of power supply. The TP8511KB contains four 8-bit bi-directional parallel ports, two 16-bit timer/counters, and three direct LED drivers. These peripherals are supported by a two-source, two-level interrupt capability. The internal memory includes 128 bytes of RAM for data memory and 4K bytes of ROM for program memory.

2. Feature

- 8-bit CMOS microcontroller
- Fully static design
- Wide supply voltage range: from 4.5V to 5.5V
- Wide operating frequency range: from DC to 6 MHz
- 128 bytes of on-chip RAM
- 4K bytes of on-chip ROM
- Build in clock source(need a resistor only)
- Four 8-bit bi-directional ports
- Two 16-bit timer
- Boolean processor
- Two-source, two-level interrupt capability
- Three direct LED drive outputs
- Power down mode with port wake up function
- 40 pin DIP plastic package

3. Applications

- IBM PC AT or compatible machine keyboard.
- IBM PS/2 model 30,50,60,80 or compatible machine keyboard.
- Japanese keyboard.
- Korean keyboard.



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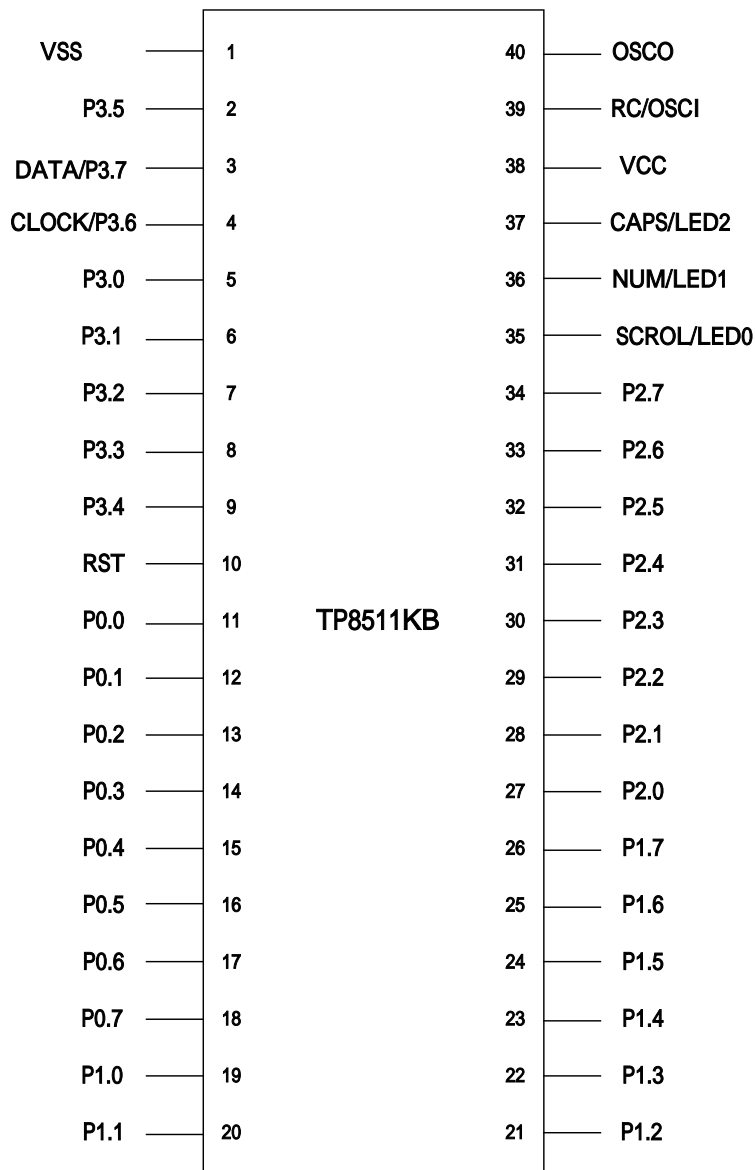
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Pin Configurations and Package Type

Pin Configurations



Bonding Diagram

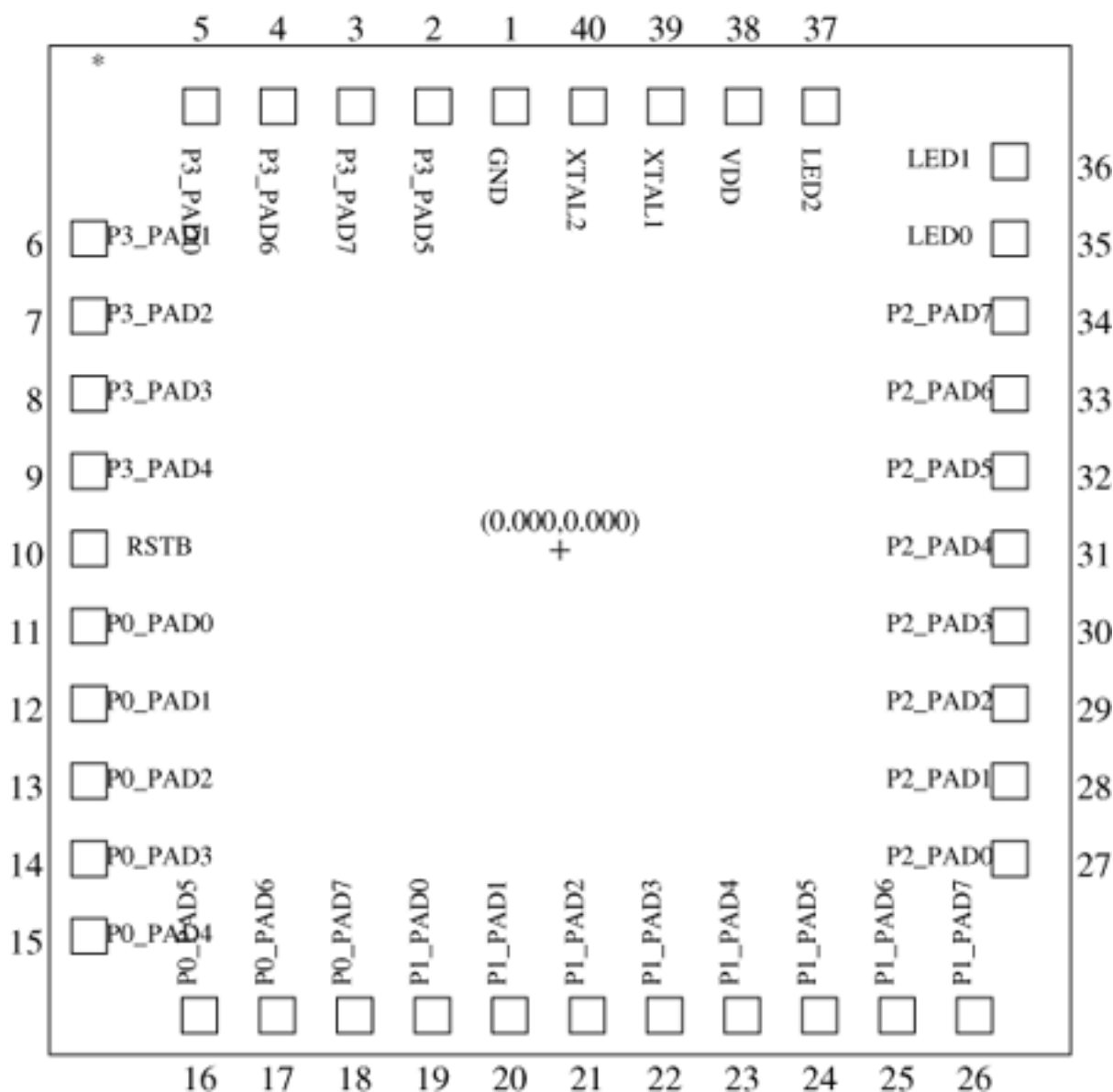


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- (1) TP NO: TP8511
 TR NO: TS1E011A
 Chip Size: 1450.000*1432.000
- (2) Pad Configuration

Date: Fri Mar 30 12:25:05 2001
 First Pin: GND
 Logo location show as '*'
 Package type: 40 COB



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Pin NO.	X	Y	Pin NO.	X	Y
Pin1: GND	-55.000,	645.000	Pin21: P1_PAD2	53.550,	-645.000
Pin2: P3_PAD5	-164.950,	645.000	Pin22: P1_PAD3	163.550,	-645.000
Pin3: P3_PAD7	-274.950,	645.000	Pin23: P1_PAD4	273.550,	-645.000
Pin4: P3_PAD6	-384.950,	645.000	Pin24: P1_PAD5	383.550,	-645.000
Pin5: P3_PAD0	-494.950,	645.000	Pin25: P1_PAD6	493.550,	-645.000
Pin6: P3_PAD1	-653.700,	457.300	Pin26: P1_PAD7	603.550,	-645.000
Pin7: P3_PAD2	-653.700,	347.300	Pin27: P2_PAD0	653.700,	-422.700
Pin8: P3_PAD3	-653.700,	237.300	Pin28: P2_PAD1	653.700,	-312.700
Pin9: P3_PAD4	-653.700,	127.300	Pin29: P2_PAD2	653.700,	-202.700
Pin10: RESET	-653.700,	17.250	Pin30: P2_PAD3	653.700,	-92.700
Pin11: P0_PAD0	-653.700,	-92.700	Pin31: P2_PAD4	653.700,	17.300
Pin12: P0_PAD1	-653.700,	-202.700	Pin32: P2_PAD5	653.700,	127.300
Pin13: P0_PAD2	-653.700,	-312.700	Pin33: P2_PAD6	653.700,	237.300
Pin14: P0_PAD3	-653.700,	-422.700	Pin34: P2_PAD7	653.700,	347.300
Pin15: P0_PAD4	-653.700,	-532.700	Pin35: LED0	653.700,	457.300
Pin16: P0_PAD5	-496.450,	-645.000	Pin36: LED1	653.700,	567.200
Pin17: P0_PAD6	-386.450,	-645.000	Pin37: LED2	385.050,	645.000
Pin18: P0_PAD7	-276.450,	-645.000	Pin38: VDD	275.000,	645.000
Pin19: P1_PAD0	-166.450,	-645.000	Pin39: XTAL1	165.000,	645.000
Pin20: P1_PAD1	-56.450,	-645.000	Pin40: XTAL2	55.000,	645.000

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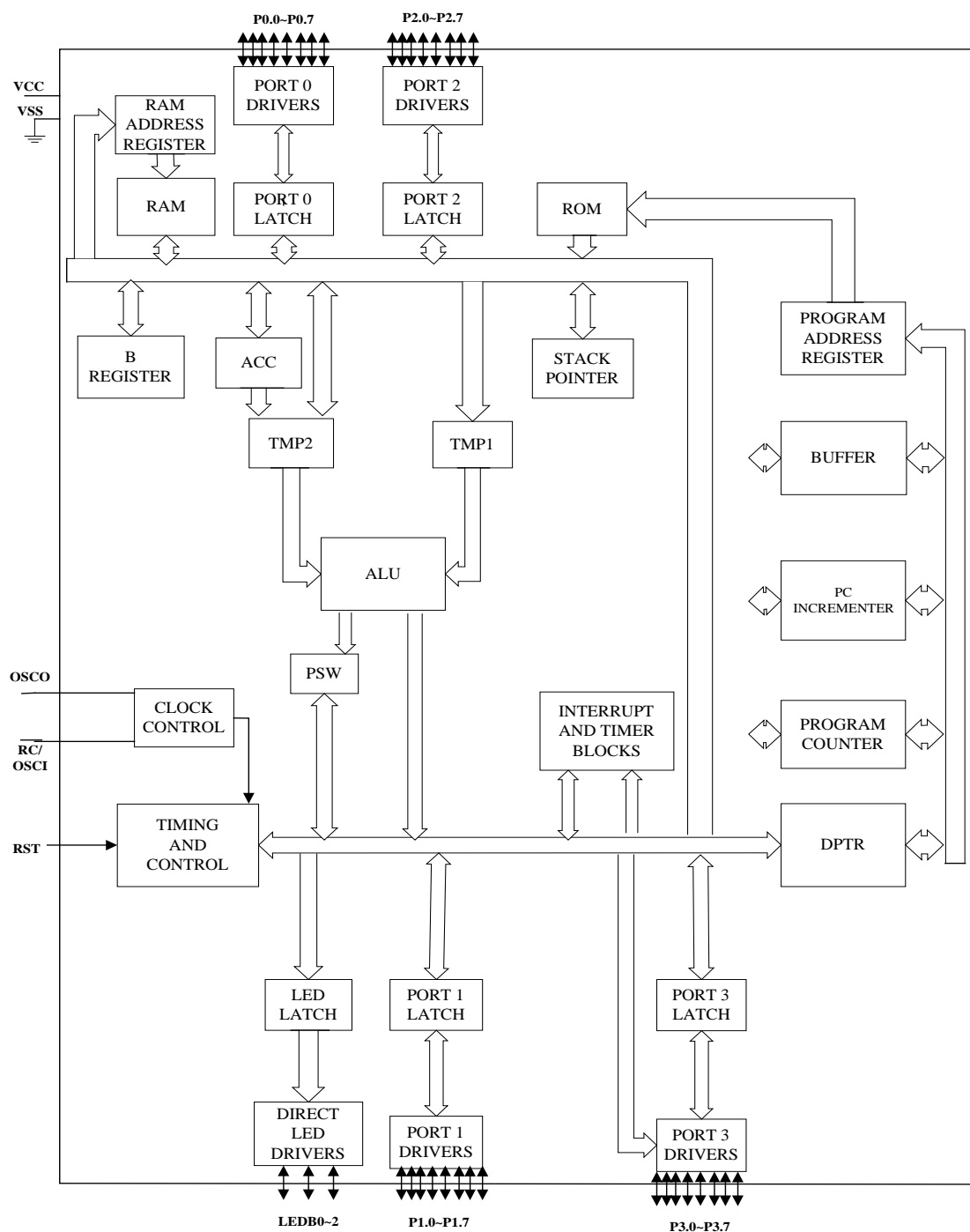
Pin Descriptions

SYMBOL	MODE	FUNCTION DESCRIPTION
V _{SS}	I	Circuit GND Potential.
V _{CC}	I	Main Power Supply(+4.5V~+5.5V)
RST ₋	I	A low level input resets the CPU. A small internal pullup resistor permits power-on reset using only a capacitor connected to GND.
PORT0 (P _{0.0} -P _{0.7})	I/O	Port0 is an 8-bit bi-directional I/O port with internal pull-ups. Port 0 can sink/source 8 LS TTL loads.
PORT1 (P _{1.0} -P _{1.7})	I/O	Port1 is an 8-bit quasi-bidirection I/O port with internal pull-ups. Port1 can sink/source 4 LS TTL loads.
PORT2 (P _{2.0} -P _{2.7})	I/O	Port2 is an 8-bit quasi-bidirection I/O port with internal pull-ups. Port2 can sink/source 4 LS TTL loads.
PORT3 (P _{3.0} -P _{3.7})	I/O	Port3 is an 8-bit quasi-bidirection I/O with internal pull-ups. <i>P3.6-P3.7: Connecting with a 2.2K ohm pull-up to VCC</i>
LED0	O	Direct LED drive output
LED1	O	Direct LED drive output
LED2	O	Direct LED drive output
XTAL1	I	Input to inverting oscillator amplifier or tie a resistor to VCC to control the frequency of internal clock source.
XTAL2	O	Provide a VDD reference voltage for built in clock source.

Note: “I” means INPUT function; “O” means OUTPUT function.

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Functional Block Diagram





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Function Descriptions

The TP8511KB architecture consists of a core controller and some special function registers. The special function registers contain two 16-bits timers/counters, four general purpose I/O ports, and two-sources, two-levels interrupt processor, and three direct LED drive output ports.

I/O ports

There are four general purpose I/O ports in the TP8511KB, and each port has 1 8-bits register to store its output value. These registers call P0, P1, P2, and P3, respectively. The addresses of the registers and the usage of the ports are the same as the industry standard 80C51 microcontroller.

PS2 keyboard function descriptions

16 bytes Keyboard buffer

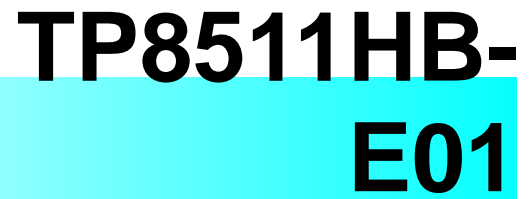
The keyboard will buffer 16 bytes in a FIFO order when the system is able to receive scan codes from the keyboard. The response codes will not be buffered. If keystrokes generate a multiple-byte sequence, the entire sequence must fit into the buffer or the keystroke is discarded and a buffer-overflow. The overflow code is '00' hex for set2 or set3, 'FF' hex for set1.

Power-on Reset and self test

The duration of the keyboard Power-on-Reset(POR) should be timed to occur a minimum of 150ms and 2s from the time power is applied to the keyboard. After executing POR, the keyboard executes a self test. The LEDs are turned on at the beginning and off at the end of the self test. The self test takes a minimum 300 ms and a maximum 500 ms. If the self test is successful, a completion code 'AA' hex is sent to the system and the keyboard starts scanning. If the self test fails, an error code 'FC' hex is sent. Then the keyboard is disabled and waits for a command from the system.

Command from the system

The system may send commands to the keyboard at any time. The keyboard will respond within 20 ms

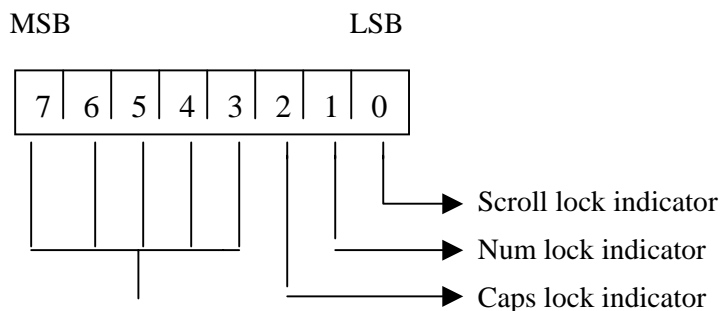


except when performing the BAT following POR or a ‘Reset’ command. The following are the keyboard input commands and the actions that keyboard needs to take.

Set /Reset Status indicators (Hex ED)

- Responds ACK(Hex FA).
- Receives option byte.
- Responds ACK.
- Updates status indicators.
- Returns to previous scanning state.

Option byte format:



Reserved bits must be '0'

Echo (Hex EEH)

- Responds with EE hex.
- Returns to previous scanning state.

Invalid commands (Hex EF and F1)

- Returns a RESEND command (Hex FE).
- Returns to previous scanning state.

Select Alternate Scan Codes (Hex F0)

- Responds ACK.
- Clears output buffer.
- Sets the default typematic rate/delay.



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- Clears last typematic key.
- Receives option byte.
- If option byte is '00', responds the current keyboard set (Hex 01, 02 or 03), Otherwise responds ACK.
- Option byte =
 - 01 : set keyboard be scan code set 1
 - 02 : set keyboard be scan code set 2
 - 03 : set keyboard be scan code set 3
- Returns to previous scanning rate.

Read ID (F2)

- Responds with ACK.
- Discontinues scanning.
- Sends two ID bytes '83AB'. The low byte 'AB' first then the second byte '83' will be sent within 500 uS after first byte.
- Resumes scanning.

Set Typematic Rate/Delay (Hex F3)

- Responds ACK.
- Receives rate/delay value byte
- Responds ACK.
- Set rate/delay time.
- Returns to previous scanning state.

1. Repeat period = $(8+A) \times (2B) \times 0.00417 \text{ s}$

A = binary value of bits 2, 1, and 0(LSB).

B = binary value of bits 4 and 3.

2. Delay = $(C + 1) \times 250 \text{ ms}$

C = binary value of bits 6 and 5 and bit 7 is always 0.

3. Default rate = $10.9 \text{ cps}(\text{chars per second}) + 20\%$

Default delay = $500 \text{ ms} \pm 20\%$



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Bits 43210	Rate (CPS)	Bits 43210	Rate (CPS)	Bits 43210	Rate (CPS)	Bits 43210	Rate (CPS)
00000	30.0	01000	15.0	10000	7.5	11000	3.7
00001	26.6	01001	13.3	10001	6.7	11001	3.3
00010	24.0	01010	12.0	10010	6.0	11010	3.0
00011	21.8	01011	10.9	10011	5.5	11011	2.7
00100	20.0	01100	10.0	10100	5.0	11100	2.5
00101	18.4	01101	9.2	10101	4.6	11101	2.3
00110	17.1	01110	8.6	10110	4.3	11110	2.1
00111	16.0	01111	8.0	10111	4.0	11111	2.0

Enable (Hex F4)

- Responds with ACK.
- Clears the output buffer.
- Clears the last typematic key.
- Start scanning.

Default Disable (Hex F5)

- Responds with ACK.
- Resets all conditions to power-on reset state.
- Clears the output buffer.
- Clears last typematic key.
- Sets the default key type (for scan code set 3 only).
- Sets the default typematic rate/delay.
- Stops scanning,

Set Default (Hex F6)

- Responds with ACK.
- Resets all conditions to power-on reset state.
- Clears output buffer.
- Clears last typematic key.
- Sets the default key type (for scan code set 3 only).
- Sets the default typematic rate/delay.



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- Continues scanning,

Set All Keys (Hex F7,F8,F9,FA)

- Responds ACK.
- Clears output buffer.
- Sets all key type (affect only scan code set 3).

F7 : Typematic

F8 : Make/Break

F9 : Make

FA : Typematic/Make/Break

- Returns to previous scanning rate.

Set Key Type (Hex FB,FC,FD)

- Responds ACK.
- Clears output buffer.
- Receives key ID byte.
- Responds ACK.
- Sets key ID type (affect only scan code set 3).

FB : Typematic

FC : Make/Break

FD : Make

- Returns to previous scanning rate.

Resend (Hex FE)

- Sends the previous output again. If the previous byte is RESEND, the last byte before RESEND shall be sent.

Reset (Hex FF)

- Responds ACK.
- Default to scan code set 2.
- Checks clock and data lines in the high state for at least 500 ms or receives another command.



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- Responds BAT completion code (Hex AA).

Command to the system

The following are the keyboard output commands.

- Acknowledge (Hex FA)

The keyboard sends an acknowledge in response to any valid command from the system except for RESEND and ECHO command.

- BAT Completion Code (Hex AA)

This command is sent after successful completion of keyboard self test.

- Echo (Hex EE)

The keyboard sends this code in response to an ECHO command.

- Keyboards ID (Hex 83AB)

These two bytes ID is sent to respond to READ ID command. The low byte is sent first, followed by the high byte.

- Keyboard buffer Overrun (Hex 00 or FF)

If the keyboard buffer overflows, the overrun code will replace the last byte in the buffer. The code is hex FF for scan code set 1 and hex 00 for others.

- Resend (Hex FE)

When the keyboard receives an invalid input or any input with incorrect parity, the RESEND command should be sent.

Keyboard Scan Code Table

The keyboard contains three scan code sets. The system defaults to scan code set 2, but can be switched to set 1 or set 3 by 'F0' command. The following tables show the key numbers and three scan code sets in hexadecimal values. For scan code set 1 and 2 ,all the keys are typemantics except for the pause key which is make only. When a key is depressed, the keyboard will transmit the make code for that key at the typematic rate as long as the key is held down. When the key is released, its break code is sent. If two or more keys are held down, only the last key pressed repeats at the typematic rate. Typematic operation stops when the last pressed key is released, even if other keys are being released or some other keys are still held down.

For scan code set 3, all keys are individually programmable by system command to allow keyboard



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modification to system/user requirements. At power on, Reset or Default command, the keyboard is configured to a default keytypes.

There are all four key types for scan code set 3.

Make only keys

Keyboard data will be sent only on the depression of these keys.

Make/Break keys

The depression of a Make/Break key cause its scan code to be output. The release of a Make/Break key causes its scan code to be output preceded by a special break code prefix(Hex 'F0').

Typematic keys

A typematic key will output on depression and will begin to repeat after the 'typematic delay time' when held down.

Typematic Make/Break keys

A typematic Make/Break key will output on depression and repeat when held down similar to a typematic key. The release of a typematic Make/Break key causes its scan code to be output preceded by the break code just like Make/Break key.

The following table shows three scan code sets used in the keyboard.

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Scan Code:

Key	Set1		Set2		Set3		
	Make code	Break code	Make code	Break code	Make code	Break code	Default key type
`(~)	29	A9	0E	F0 0E	0E	F0 0E	Typematic
1	02	82	16	F0 16	16	F0 16	Typematic
2	03	83	1E	F0 1E	1E	F0 1E	Typematic
3	04	84	26	F0 26	26	F0 26	Typematic
4	05	85	25	F0 25	25	F0 25	Typematic
5	06	86	2E	F0 2E	2E	F0 2E	Typematic
6	07	87	36	F0 36	36	F0 36	Typematic
7	08	88	3D	F0 3D	3D	F0 3D	Typematic
8	09	89	3E	F0 3E	3E	F0 3E	Typematic
9	0A	8A	46	F0 46	46	F0 46	Typematic
0	0B	8B	45	F0 45	45	F0 45	Typematic
-(_)	0C	8C	4E	F0 4E	4E	F0 4E	Typematic
=(+)	0D	8D	55	F0 55	55	F0 55	Typematic
Back space	0E	8E	66	F0 66	66	F0 66	Typematic
Tab	0F	8F	0D	F0 0D	0D	F0 0D	Typematic
Q	10	90	15	F0 15	15	F0 15	Typematic
W	11	91	1D	F0 1D	1D	F0 1D	Typematic
E	12	92	24	F0 24	24	F0 24	Typematic
R	13	93	2D	F0 2D	2D	F0 2D	Typematic
T	14	94	2C	F0 2C	2C	F0 2C	Typematic
Y	15	95	35	F0 35	35	F0 35	Typematic
U	16	96	3C	F0 3C	3C	F0 3C	Typematic
I	17	97	43	F0 43	43	F0 43	Typematic
O	18	98	44	F0 44	44	F0 44	Typematic
P	19	99	4D	F0 4D	4D	F0 4D	Typematic
[({	1A	9A	54	F0 54	54	F0 54	Typematic
]})	1B	9B	5B	F0 5B	5B	F0 5B	Typematic
\()@1	2B	AB	5D	F0 5D	5C	F0 5C	Typematic
Caps	3A	BA	58	F0 58	14	F0 14	Make/Break
A	1E	9E	1C	F0 1C	1C	F0 1C	Typematic
S	1F	9F	1B	F0 1B	1B	F0 1B	Typematic
D	20	A0	23	F0 23	23	F0 23	Typematic
F	21	A1	2B	F0 2B	2B	F0 2B	Typematic
G	22	A2	34	F0 34	34	F0 34	Typematic
H	23	A3	33	F0 33	33	F0 33	Typematic

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J	24	A4	3B	F0 3B	3B	F0 3B	Typematic
K	25	A5	42	F0 42	42	F0 42	Typematic
L	26	A6	4B	F0 4B	4B	F0 4B	Typematic
;()	27	A7	4C	F0 4C	4C	F0 4C	Typematic
'()	28	A8	52	F0 52	52	F0 52	Typematic
K42 @2	2B	AB	5D	F0 5D	53	F0 53	Typematic
ENTER	1C	9C	5A	F0 5A	5A	F0 5A	Typematic
SHIFT_L	2A	AA	12	F0 12	12	F0 12	Make/Break
K45 @2	56	D6	61	F0 61	13	F0 13	Typematic
Z	2C	AC	1A	F0 1A	1A	F0 1A	Typematic
X	2D	AD	22	F0 22	22	F0 22	Typematic
C	2E	AE	21	F0 21	21	F0 21	Typematic
V	2F	AF	2A	F0 2A	2A	F0 2A	Typematic
B	30	B0	32	F0 32	32	F0 32	Typematic
N	31	B1	31	F0 31	31	F0 31	Typematic
M	32	B2	3A	F0 3A	3A	F0 3A	Typematic
,(<)	33	B3	41	F0 41	41	F0 41	Typematic
.(>)	34	B4	49	F0 49	49	F0 49	Typematic
/(&?)	35	B5	4A	F0 4A	4A	F0 4A	Typematic
SHIFT_R	36	B6	59	F0 59	59	F0 59	Make/Break
CTRL_L	1D	9D	14	F0 14	11	F0 11	Make/Break
ALT_L	38	B8	11	F0 11	19	F0 19	Make/Break
SPACE	39	B9	29	F0 29	29	F0 29	Typematic
ALT_R	E0 38	E0 B8	E0 11	E0 F0 11	39	F0 39	Make only
CTRL_R	E0 1D	E0 9D	E0 14	E0 F0 14	58	F0 58	Make only
NUM	45	C5	77	F0 77	76	F0 76	Make only
(7)	47	C7	6C	F0 6C	6C	F0 6C	Make only
(4)	4B	CB	6B	F0 6B	6B	F0 6B	Make only
(1)	4F	CF	69	F0 69	69	F0 69	Make only
(8)	48	C8	75	F0 75	75	F0 75	Make only
(5)	4C	CC	73	F0 73	73	F0 73	Make only
(2)	50	D0	72	F0 72	72	F0 72	Make only
(0)	52	D2	70	F0 70	70	F0 70	Make only
(*)	37	B7	7C	F0 7C	7E	F0 7E	Make only
(9)	49	C9	7D	F0 7D	7D	F0 7D	Make only
(6)	4D	CD	74	F0 74	74	F0 74	Make only
(3)	51	D1	7A	F0 7A	7A	F0 7A	Make only
(DEL)	53	D3	71	F0 71	71	F0 71	Make only
(-)	4A	CA	7B	F0 7B	84	F0 84	Make only
(+)	4E	CE	79	F0 79	7C	F0 7C	Typematic

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(ENTER)	E0 1C	E0 9C	E0 5A	E0 F0 5A	79	F0 79	Make only
ESC	01	81	76	F0 76	08	F0 08	Make only
F1	3B	BB	05	F0 V5	07	F0 07	Make only
F2	3C	BC	06	F0 06	0F	F0 0F	Make only
F3	3D	BD	04	F0 04	17	F0 17	Make only
F4	3E	BE	0C	F0 0C	1F	F0 1F	Make only
F5	3F	BF	03	F0 03	27	F0 27	Make only
F6	40	C0	0B	F0 0B	2F	F0 2F	Make only
F7	41	C1	83	F0 83	37	F0 37	Make only
F8	42	C2	0A	F0 0A	3F	F0 3F	Make only
F9	43	C3	01	F0 01	47	F0 47	Make only
F10	44	C4	09	F0 09	4F	F0 4F	Make only
F11	57	D7	78	F0 78	56	F0 56	Make only
F12	58	D8	07	F0 07	5E	F0 5E	Make only
SCROLL	46	C6	7E	F0 7E	5F	F0 5F	Make only
INS	See Scan Table 1	See Scan Table 2			67	F0 67	Make only
DEL					64	F0 64	Typematic
LEFT					61	F0 61	Typematic
HOME					6E	F0 6E	Make only
END					65	F0 65	Make only
UP					63	F0 63	Typematic
DOWN					60	F0 60	Typematic
PAGE UP					6F	F0 6F	Make only
PAGE DOWN					6D	F0 6D	Make only
RIGHT					6A	F0 6A	Typematic
(/)					77	F0 77	Make only
PRINT					57	F0 57	Make only
PAUSE					62	F0 62	Make only

Scan Table 1:

Key	Base case, or Shift+Num lock Make/Break	Shift case @3 Make/Break	Num lock Make/Break
INS	E0 52/E0 D2	E0 AA E0 52 /E0 D2 E0 2A	E0 2A E0 52 /E0 D2 E0 AA
DEL	E0 53/E0 D3	E0 AA E0 53 /E0 D3 E0 2A	E0 2A E0 53 /E0 D3 E0 AA
LEFT	E0 4B/E0 CB	E0 AA E0 4B /E0 CB E0 2A	E0 2A E0 4B /E0 CB E0 AA

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HOME	E0 47/E0 C7	E0 AA E0 47 /E0 C7 E0 2A	E0 2A E0 47 /E0 C7 E0 AA
END	E0 4F/E0 CF	E0 AA E0 4F /E0 CF E0 2A	E0 2A E0 4F /E0 CF E0 AA
UP	E0 48/E0 C8	E0 AA E0 48 /E0 C8 E0 2A	E0 2A E0 48 /E0 C8 E0 AA
DOWN	E0 50/E0 D0	E0 AA E0 50 /E0 D0 E0 2A	E0 2A E0 50 /E0 D0 E0 AA
PAGE UP	E0 49/E0 C9	E0 AA E0 49 /E0 C9 E0 2A	E0 2A E0 49 /E0 C9 E0 AA
PAGE DOWN	E0 51/E0 D1	E0 AA E0 51 /E0 D1 E0 2A	E0 2A E0 51 /E0 D1 E0 AA
RIGHT	E0 4D/E0 CD	E0 AA E0 4D /E0 CD E0 2A	E0 2A E0 4D /E0 CD E0 AA
Key	Base case Make/Break		Shift case Make/Break @3
(/)	E0 35/E0 B5		E0 AA E0 35/E0 B5 E0 2A
Key	Base case Make/Break	Ctrl case, Shift case Make/Break	Alt case Make/Break
PRINT	E0 2A E0 37 /E0 B7 E0 AA	E0 37/E0 B7	54/D4
Key	Base case Make/Break		Ctrl case Make/Break
PAUSE @4	E1 1D 45 E1 9D C5		E0 46 E0 C6

Scan Table 2:

Key	Base case, or Shift+Num lock Make/Break	Shift case @5 Make/Break	Num lock Make/Break
INS	E0 70/E0 F0 70	E0 F0 12 E0 70 /E0 F0 70 E0 12	E0 12 E0 70 /E0 F0 70 E0 F0 12
DEL	E0 71/E0 F0 71	E0 F0 12 E0 71 /E0 F0 71 E0 12	E0 12 E0 71 /E0 F0 71 E0 F0 12
LEFT	E0 6B/E0 F0 6B	E0 F0 12 E0 6B /E0 F0 6B E0 12	E0 12 E0 6B /E0 F0 6B E0 F0 12
HOME	E0 6C/E0 F0 6C	E0 F0 12 E0 6C /E0 F0 6C E0 12	E0 12 E0 6C /E0 F0 6C E0 F0 12
END	E0 69/E0 F0 69	E0 F0 12 E0 69 /E0 F0 69 E0 12	E0 12 E0 69 /E0 F0 69 E0 F0 12
UP	E0 75/E0 F0 75	E0 F0 12 E0 75 /E0 F0 75 E0 12	E0 12 E0 75 /E0 F0 75 E0 F0 12
DOWN	E0 72/E0 F0 72	E0 F0 12 E0 72	E0 12 E0 72

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		/E0 F0 72 E0 12	/E0 F0 72 E0 F0 12
PAGE UP	E0 7D/E0 F0 7D	E0 F0 12 E0 7D /E0 F0 7D E0 12	E0 12 E0 7D /E0 F0 7D E0 F0 12
PAGE DOWN	E0 7A/E0 F0 7A	E0 F0 12 E0 7A /E0 F0 7A E0 12	E0 12 E0 7A /E0 F0 7A E0 F0 12
RIGHT	E0 74/E0 F0 74	E0 F0 12 E0 74 /E0 F0 74 E0 12	E0 12 E0 74 /E0 F0 74 E0 F0 12
Key	Base case Make/Break		Shift case Make/Break @5
(/)	E0 4A/E0 F0 4A		E0 F0 12 E0 4A/E0 F0 4A E0 12
Key	Base case Make/Break	Ctrl case,Shift case Make/Break	Alt case Make/Break
PRINT	E0 12 E0 7C /E0 F0 7C E0 F0 12	E0 7C/E0 F0 7C	84/F0 84
Key	Base case Make/Break		Ctrl case Make/Break
PAUSE @4	E1 14 77 E1 F0 14 F0 77		E0 7E E0 F0 7E

New key codes:

Key	Set1		Set2		Set3		Default key type
	Make code	Break code	Make code	Break code	Make code	Break code	
LWIN	E0 5B	E0 DB	E0 1F	E0 F0 1F	8B	F0 8B	Typematic
RWIN	E0 5C	E0 DC	E0 27	E0 F0 27	8C	F0 8C	Typematic
APP	E0 5D	E0 DD	E0 2F	E0 F0 2F	8D	F0 8D	Typematic
NCHG(131)	7B	FB	67	F0 67	85	F0 85	Make only
CHG(132)	79	F9	64	F0 64	86	F0 86	Make only
ROMA(133)	70	F0	13	F0 13	87	F0 87	Make only
K14	7D	FD	6A	F0 6A	5D	F0 5D	Typematic
K56	73	F3	51	F0 51	51	F0 51	Typematic
K107	7E	FE	6D	F0 6D	7B	F0 7B	Typematic
KL	F1	X	F1	X	F1	X	Make only
KR	F0	X	F2	X	F2	X	Make only
POWER	E0 5E	E0 DE	E0 37	E0 F0 37	X	X	X
SLEEP	E0 5F	E0 DF	E0 3F	E0 F0 3F	X	X	X
WAKE UP	E0 63	E0 E3	E0 5E	E0 F0 5E	X	X	X



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Windows 2000 Multi-Media key code:

Key	Set1		Set2	
	Make code	Break code	Make code	Break code
WWW Back	E0 6A	E0 EA	E0 38	E0 F0 38
WWW Forward	E0 69	E0 E9	E0 30	E0 F0 30
WWW Stop	E0 68	E0 E8	E0 28	E0 F0 28
WWW Refresh	E0 67	E0 E7	E0 20	E0 F0 20
WWW Search	E0 65	E0 E5	E0 10	E0 F0 10
WWW Favorites	E0 66	E0 E6	E0 18	E0 F0 18
WWW Web/Home	E0 32	E0 B2	E0 3A	E0 F0 3A
Mail	E0 6C	E0 EC	E0 48	E0 F0 48
Mute	E0 20	E0 A0	E0 23	E0 F0 23
Volume-	E0 2E	E0 AE	E0 21	E0 F0 21
Volume+	E0 30	E0 B0	E0 32	E0 F0 32
Play/Pause	E0 22	E0 A2	E0 34	E0 F0 34
Stop	E0 24	E0 A4	E0 3B	E0 F0 3B
Previous Track	E0 10	E0 90	E0 15	E0 F0 15
Next Track	E0 19	E0 99	E0 4D	E0 F0 4D
Media Select	E0 6D	E0 ED	E0 50	E0 F0 50
My Computer	E0 6B	E0 EB	E0 40	E0 F0 40
Calculator	E0 21	E0 A1	E0 2B	E0 F0 2B

Note:

1. 101-key keyboard only
2. 102-key keyboard only
3. If the left shift key is pressed, the AA/2A shift make and break code is sent with the other scan codes. If the right shift key is pressed, B6/36 is sent. If both shift keys are pressed, both sets of codes are sent.
4. This key is not typematic.
5. If the left shift key is pressed, the F0 12/12 shift make and break code is sent with the other scan codes. If the right shift key is pressed, F0 59/59 is sent. If both shift keys are pressed, both sets of codes are sent.

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Absolute Maximum Ratings

Parameter	Rating	Unit
Operating Temperature	0 - +70	
Storage Temperature	-65 - +150	
Voltage on Any Pin	-0.5 - +7	V
Power Dissipation	0.2	W

Note: Stresses above those listed may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC Electrical Characteristic

($T_A=0^{\circ}\text{C}-70^{\circ}\text{C}$, $V_{CC}=5\pm 10\%$, $V_{SS}=0\text{V}$)

Parameter	Symbol	Limit			Unit	Test condition
		min	typ	max		
Input Low Voltage	V_{IL}	-0.5		$0.2V_{CC}-0.1$	V	
Input High Voltage(Except XTAL1,RST,P3.0~P3.2)	V_{IH}	$0.2V_{CC}+0.9$		$V_{CC}+0.5$	V	
Input High Voltage(XTAL1,RST)	V_{IH1}	$0.9V_{CC}$		$V_{CC}+0.5$	V	
Input High Voltage(P3.0~P3.2)	V_{IH2}	$0.2V_{CC}+2.5$		$V_{CC}+0.5$	V	
Output Low Voltage (Except P3.0~P3.2,LED0~2)	V_{OL}			0.45	V	$I_{OL}=1.6\text{mA}$
Output Low Voltage (P3.0~P3.2,LED0~2)	V_{OL1}			0.7	V	$I_{OL}=1.6\text{mA}$
Output High Voltage	V_{OH}	2.4			V	$I_{OH}=-60\mu\text{A}$
Input Leakage Current (Except P3.6,P3.7)	I_{IL}			-50	μA	$V_{in}=0.45\text{V}$
Input Leakage Current(Port0)	I_{IL1}			10	μA	$V_{in}=V_{CC}$
Input Leakage Current (P3.6,P3.7)	I_{IL2}			-350	μA	$V_{in}=0.45\text{V}$



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Power Supply Current	I _{CC}		15	30	mA	F _{OP} =20MHz
Idle Mode Supply Current	I _{ID}		1.7	5	mA	
Power Down Mode Supply Current	I _{PD}		5	50	μA	
Capacitance of I/O Buffer	C _{IO}			10	pF	F _{OP} =1MHz
Internal Reset Pull-Up Resistor	R _{RST}	50		150	K	
Build-in clock source frequency	F _{osc}	4.18		5.12	MHz	R _{osc} =47K

Notes: (1) All DC electrical characteristics are measured at 25°C.

(2) It is suggested that conventional precautions should be taken to avoid applying voltages greater than the absolute maximum ratings.

AC Electrical Characteristic

T_A=0°C to +70°C, or T_A=-40°C to +85°C / +125°C, V_{CC}=5V±10%, V_{SS}=0V¹

External Clock							
T _{CHCX}	5	High time ²	20		20	t _{CLCL} -t _{LOW}	ns
T _{CLCX}	5	Low time ²	20		20	t _{CLCL} -t _{HIGH}	ns
T _{CLCH}	5	Rise time ²		20		10	ns
T _{CHCL}	5	Fall time ²		20		10	ns

Notes: 1. Parameters are valid over operating temperature range unless otherwise specified.

2. These values are characterized but not 100% production tested.

EXPLANATION OF THE AC SYMBOLS

Each timing symbol has five characters. The first character is always "t" (=time). The other characters, depending on their positions, indicate the name of a signal or the logical status of that signal. The designations are:

C - Clock

H - Logic level high

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L - Logic level low

t - Time

X - No longer a valid logic level

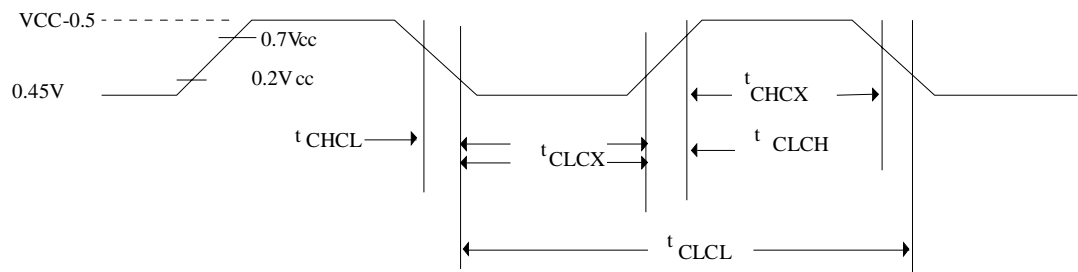
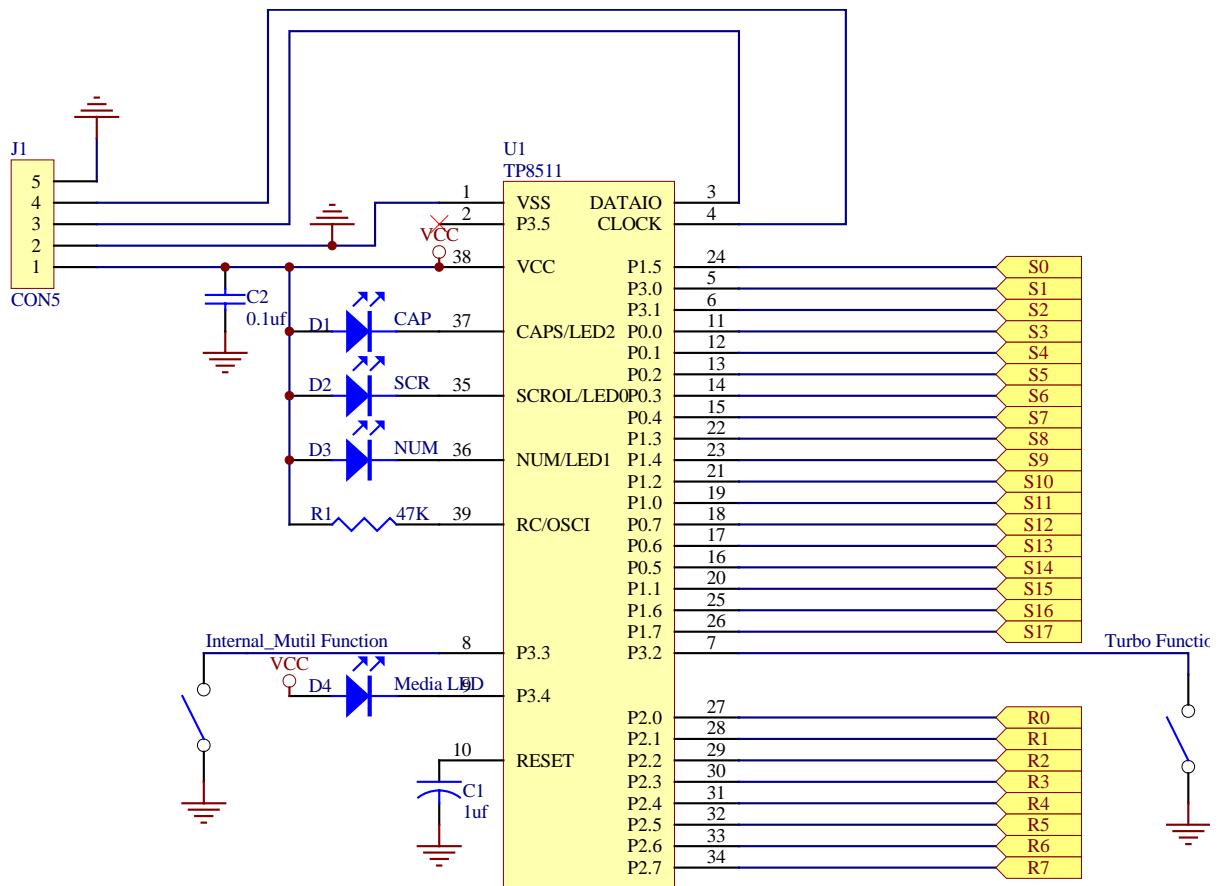


Figure 3. External Clock Drive

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Application Diagrams

(1) Application circuit



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(2)Key matrix definition for windows 2000 standard code

S0	Pause	Power	歐元	Sleep	R-Ctrl	Wake up	L-Ctrl	F5
S1	Q	Tab	A	Esc	Z	K131	`(~)	! 1
S2	W	Caps lock	S	K45	X	K132	F1	@ 2
S3	E	F3	D	F4	C	K133	F2	# 3
S4	R	T	F	G	V	B	% 5	\$ 4
S5	U	Y	J	H	M	N	^ 6	& 7
S6	I	}]	K	F6	< ,	K56	+ =	* 8
S7	O	F7	L		> .	App	F8	(9
S8	P	{ [: ;	“ ‘	K42	? /	_ -) 0
S9	Scroll Lock		Fn	L-Alt	M/Mode	R-Alt		Print Screen
S10	K14	Back Space	\	F11	Enter	F12	F9	F10
S11	7(Num)	4(Num)	1(Num)	Space	Num Lock		Delete	Power
S12	8(Num)	5(Num)	2(Num)	0(Num)	/ (Num)		Insert	Sleep
S13	9(Num)	6(Num)	3(Num)	.(Num)	*(Num)	-	Page Up	Page Down
S14	+(Num)	K107	Enter(Num)		Play/Pause		Home	End
S15	Wake Up	L-Shift	R-Shift	Volume-	Volume+	NextTrack	PrevTrack	Media Select
S16	Mail	L-Win	WWW Forward	WWW Stop	WWW Back	WWW Refresh	Mute	WWW Search
S17	Kor-L	WWW Favorite	R-Win	My Computer	Stop	Calculator	WWW/ Home	Kor-R
	R0	R1	R2	R3	R4	R5	R6	R7



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(3)Turbo Function:

Fn+	F1	2.1hz	F5	21hz
	F2	4.2hz	F6	30hz
	F3	7.2hz	F7	46hz
	F4	16.3hz	F11	KeyLock

Internal-Multikey Function:

Fn+ (M/Mode)	Multi-Media Function		Internal Function		O.S. Function	
	Pad_2	Volume-	Pad_Enter	WWW/Home	Pad_0	My Computer
	Pad_3	Play/Pause	Pad_+	Mail	Pad_1	Calculator
	Pad_4	PrevTrack	Pad_-	Favorite	E	Euro KEY
	Pad_5	Media	Pad_.	Search		
	Pad_6	NextTrack	Right Arrow	Forward		
	Pad_7	Mute	Left Arrow	Back		
	Pad_8	Volume+	Down Arrow	Stop		
	Pad_9	Stop	Up Arrow	Refresh		