GENERAL DESCRIPTION

The EM83049 microcontroller is dedicated to a keyboard encoder ,specially designed for IBM PC AT,XT and all compatible machines. The EM83049 controll all scan codes, three LEDs status, scan timing and communications between the keyboard and PC. It is easy to implement a high performance, low cost keyboard with the minimal external components.

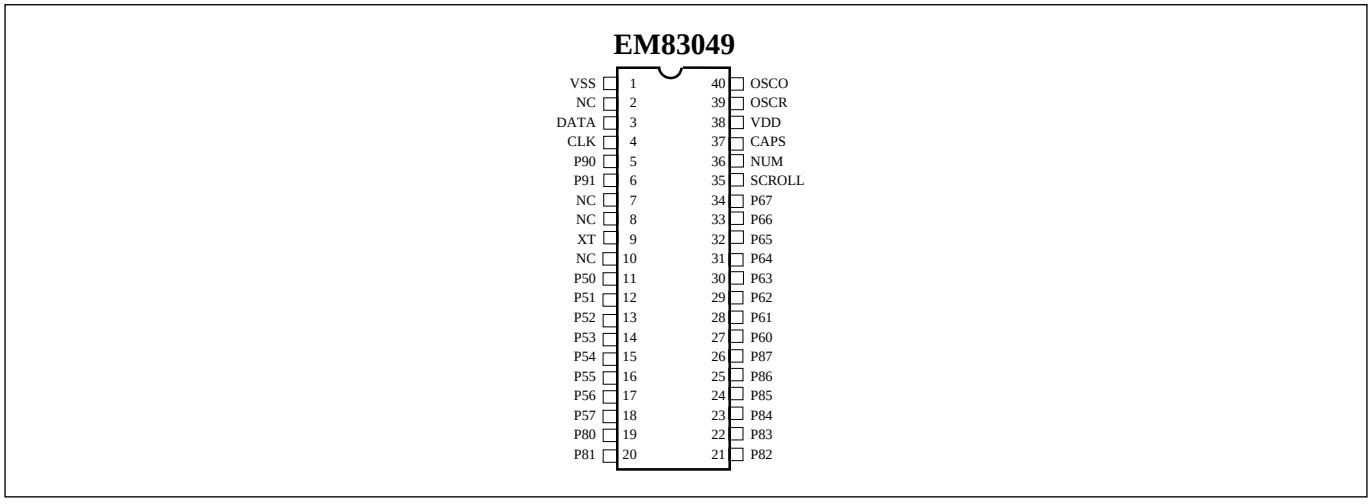
FEATURES

- Low cost - eliminate need external components.
- Phantom key detects.
- RC oscillator (1.8432MHz).
- Support scan code set 1 ,2 and 3.
- Support PC AT,XT and PS/2 keyboard .
- Low power CMOS device technology.
- Internal pull-up resistor.
- Tri-state outputs for easy board application.
- 40 Pin DIP package.
- Built-in 4K ROM.
- Support WINDOWS™ keys.
- 101/102/104 keys or other special application keyboard encoder.
- WINDOWS is registered trademarks of Microsoft corperation.

APPLICATION

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

PIN ASSIGNMENTS



PIN DESCRIPTIONS

Symbol	I/O	Function
P50	O	Column 0 Low output scan line, 3-state
P51	O	Column 1 Low output scan line, 3-state
P52	O	Column 2 Low output scan line, 3-state
P53	O	Column 3 Low output scan line, 3-state
P54	O	Column 4 Low output scan line, 3-state
P55	O	Column 5 Low output scan line, 3-state
P56	O	Column 6 Low output scan line, 3-state
P57	O	Column 7 Low output scan line, 3-state
P80	O	Column 8 Low output scan line, 3-state
P81	O	Column 9 Low output scan line, 3-state
P82	O	Column 10 Low output scan line, 3-state
P83	O	Column 11 Low output scan line, 3-state
P84	O	Column 12 Low output scan line, 3-state
P85	O	Column 13 Low output scan line, 3-state
P86	O	Column 14 Low output scan line, 3-state
P87	O	Column 15 Low output scan line, 3-state
P90	O	Column 16 Low output scan line, 3-state
P91	O	Column 17 Low output scan line, 3-state
VSS	I	Ground
SCROLL	O	Scroll Lock Indicator
NUM	O	NUM Lock Indicator
CAPS	O	Caps Lock Indicator
P60	I	Row 0 Input scan line, internal pull high (10KΩ)
P61	I	Row 1 Input scan line, internal pull high (10KΩ)
P62	I	Row 2 Input scan line, internal pull high (10KΩ)
P63	I	Row 3 Input scan line, internal pull high (10KΩ)
P64	I	Row 4 Input scan line, internal pull high (10KΩ)
P65	I	Row 5 Input scan line, internal pull high (10KΩ)
P66	I	Row 6 Input scan line, internal pull high (10KΩ)
P67	I	Row 7 Input scan line, internal pull high (10KΩ)
CLK	I/O	CLOCK line for IBM communication , internal pull high (2.2KΩ)
DATA	I/O	DATA line for IBM communication , internal pull high (2.2KΩ)
V_{DD}	I	+5V Power Supply
OSCO	O	CLOCK output
OSCR	I	Connect 51K OHM resistor for 1.8432 MHz oscillation
XT	I	"1" or Floating=AT, "0"=XT, internal pull high.

FUNCTION DESCRIPTIONS

Keyboard buffer

The keyboard will buffer 16 bytes in a first-in-first-out order when the system is able to receive scan codes from the keyboard. The response codes and repeated 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-overrun condition occurs.

Power-on Reset and self test

The duration of the keyboard Power-on-Reset(POR) should be within 150 milliseconds and 2 seconds after the 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 milliseconds and a maximum 500 milliseconds. 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, and error code is sent, the keyboard is disabled and waits for a command from the system. The completion codes are sent between 450 milliseconds and 2.5 seconds after POR, and between 300 and 500 milliseconds after a RESET command is acknowledged.

Keyboard data output

When the keyboard is ready to send data to the system, it first checks clock and data lines. If either one is in the low state, data is stored in the keyboard buffer. If both are in the high state, keyboard starts clocking data out. Data will be valid before the trailing edge and after the leading edge of the clock pulse. During the transmission the keyboard checks the clock line at least every 60 microseconds . If the system lowers the clock lines before the leading edge of the 10th clock, the keyboard should stop sending, then buffer the data and return clock and data lines to high state.

Keyboard data input

When the system is ready to send data to the keyboard, it first checks clock line to see if keyboard is sending data. If keyboard is not sending data or it is sending data but has not reached the 10th clock, the system can inhibit the interface by forcing the clock line low for more than 60 microseconds and prepares to send data. The keyboard checks clock line status at least every 5 milliseconds. If a system Request to Send(RTS) is detected, the keyboard clocks 11 bits in. After the 10th bit, the keyboard checks for a high state in data line then pulls it low and clocks one more bit to signal the system that data has been received. If data is low after the 10th bit, it indicates a frame error. The keyboard should continue to count until data line goes high, then pulls it low and issues a RESEND to the system.

Command from the system

The system can send commands to the keyboard at any time. The keyboard needs to respond within 20 milliseconds, unless the system prevents keyboard output, when doing self test or executing a RESET. The following are the keyboard input commands and the actions that keyboard needs to take.

Set /Reset Status indicators (Hex ED)

- Responds ACK.
- Receives option byte.

- Responds ACK.
- Updates status indicators.
- Returns to previous scanning state.

Echo (Hex EEH)

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

Invalid commands (Hex EF and F1)

- Returns a RESEND command.
- Returns to previous scanning state.

Select Alternate Scan Codes (Hex F0)

- Responds ACK.
- Clears output buffer.
- Sets the default typematic rate/delay.
- Clears last typematic key.
- Receives option byte.
- Responds ACK.
- Option byte =
  01 : selects scan code set 1
  02 : selects scan code set 2
  03 : selects scan code set 3
- Returns to previous scanning rate.

Read ID (F2)

- Responds with ACK.
- Discontinues scanning.
- Sends two ID bytes. The second byte 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 (* Note 1)
- Returns to previous scanning state.

* Note 1
1. Repeat period = (8+A) x (2B) x 0.00417 seconds
   A : binary value of bits 2, 1, and 0.
   B : binary value of bits 4 and 3.
2. Delay = (C +1) x 250 milliseconds
   C : binary value of bits 6 and 5. Bit 7 is always 0.

bit 4~ bit 0	typematic rate ± 20%	bit 4~ bit 0	typematic rate ± 20%
00000	30.0	10000	7.5
00001	26.7	10001	6.7
00010	24.0	10010	6.0
00011	21.8	10011	5.5
00100	20.0	10100	5.0
00101	18.5	10101	4.6
00110	17.1	10110	4.3
00111	16.0	10111	4.0
01000	15.0	11000	3.7
01001	13.3	11001	3.3
01010	12.0	11010	3.0
01011	10.9	11011	2.7
01100	10.0	11100	2.5
01101	9.2	11101	2.3
01110	8.6	11110	2.1
01111	8.0	11111	2.0

3. Default rate = 10.9 chars/sec + 20%
   Default delay = 500 mS ± 20%

Enable (Hex F4)

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

Default Disable (Hex F5)

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

Set Default (Hex F6)

- Responds with ACK.
- Resets all conditions to power-on state.
- Clears output buffer.
- Sets the default key type (scan code set 3 only).
- Set the default typematic rate/delay.
- Clears last typematic key.
- 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 operation).
  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 operation).
  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.
- Checks clock and data lines - Reset in the high state for at least 500 microseconds or receives another command.
- Default to scan code set 2.

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.

BAT Completion Code (Hex AA)

This command is issued 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)

The 2 byte ID is issued 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 keyboard buffer overflows, the overrun code will replace the last byte in the buffer. If the keyboard is using scan code set 1 , the code is hex FF. For sets 2 and 3, the code is hex 00.

Resend (Hex FE)

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

Keyboard Scan Code Table

The keyboard contains 3 scan code sets. The system defaults to scan code set 2, but can be switched to set 1 or set 3 . The following tables show the key numbers and three scan code sets in hexadecimal values. All the keys are typematics except for the pause key. When a key is pressed down, the make scan code is sent to the system. 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.

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

scan code set 1

Key Number	Make code	Break code	Key Number	Make code	Break code
1	29	A9	47	2D	AD
2	02	82	48	2E	AE
3	03	83	49	2F	AF
4	04	84	50	30	B0
5	05	85	51	31	B1
6	06	86	52	32	B2
7	07	87	53	33	B3
8	08	88	54	34	B4
9	09	89	55	35	B5
10	0A	8A	57	36	B6
11	0B	8B	58	1D	9D
12	0C	8C	60	38	B8
13	0D	8D	61	39	B9
15	0E	8E	62	E0 38	E0 B8
16	0F	8F	64	E0 1D	E0 9D
17	10	90	90	45	C5
18	11	91	91	47	C7
19	12	92	92	4B	CB
20	13	93	93	4F	CF
21	14	94	96	48	C8
22	15	95	97	4C	CC

Key Number	Make code	Break code	Key Number	Make code	Break code
23	16	96	98	50	D0
24	17	97	99	52	D2
25	18	98	100	37	B7
26	19	99	101	49	C9
27	1A	9A	102	4D	CD
28	1B	9B	103	51	D1
29 @1	2B	AB	104	53	D3
30	3A	BA	105	4A	CA
31	1E	9E	106	4E	CE
32	1F	9F	108	E0 1C	E0 9C
33	20	A0	110	01	81
34	21	A1	112	3B	BB
35	22	A2	113	3C	BC
36	23	A3	114	3D	BD
37	24	A4	115	3E	BE
38	25	A5	116	3F	BF
39	26	A6	117	40	C0
40	27	A7	118	41	C1
41	28	A8	119	42	C2
42 @2	2B	AB	120	43	C3
43	1C	9C	121	44	C4
44	2A	AA	122	57	D7
45 @2	56	D6	123	58	D8
46	2C	AC	125	46	C6

Key No.	Base Case,or Shift + Nun Lock Make/Break	Shift Case @3 Make/Break	Num Lock Make/Break
75	E0 52 / E0 D2	E0 AA E0 52 / E0 D2 E0 2A	E0 2A E0 52 / E0 D2 E0 AA
76	E0 53 / E0 D3	E0 AA E0 53 / E0 D3 E0 2A	E0 2A E0 53 / E0 D3 E0 AA
79	E0 4B / E0 CB	E0 AA E0 4B / E0 CB E0 2A	E0 2A E0 4B / E0 CB E0 AA
80	E0 47 / E0 C7	E0 AA E0 47 / E0 C7 E0 2A	E0 2A E0 47 / E0 C7 E0 AA
81	E0 4F / E0 CF	E0 AA E0 4F / E0 CF E0 2A	E0 2A E0 4F / E0 CF E0 AA
83	E0 48 / E0 C8	E0 AA E0 48 / E0 C8 E0 2A	E0 2A E0 48 / E0 C8 E0 AA
84	E0 50 / E0 D0	E0 AA E0 50 / E0 D0 E0 2A	E0 2A E0 50 / E0 D0 E0 AA
85	E0 49 / E0 C9	E0 AA E0 49 / E0 C9 E0 2A	E0 2A E0 49 / E0 C9 E0 AA
86	E0 51 / E0 D1	E0 AA E0 51 / E0 D1 E0 2A	E0 2A E0 51 / E0 D1 E0 AA
89	E0 4D / ED CD	E0 AA E0 4D / E0 CD E0 2A	E0 2A E0 4D / E0 CD E0 AA

Key No.	Scan Code Make/Break	Shift Case Make/Break @3
95	E0 35 / E0 B5	E0 AA E0 35 / E0 B5 E0 2A

Key No.	Scan Code Make/Break	Ctrl Case, Shift Case Make/ Break	Alt Case Make/Break
124	E0 2A E0 37 / E0 B7 E0 AA	E0 37 / E0 B7	54 / D4

Key No.	Make Code	Ctrl Key Pressed
126 @4	E1 1D 45 E1 9D C5	E0 46 E0 C6

Note .

@1 : 101-key keyboard only.
@2 : 102-key keyboard only.
@3 : If the left Shift key is held down, the AA/2A shift make and break is sent with the other scan codes. If the right Shift key is held down, B6/36 is sent. If both Shift keys are down, both sets of codes are sent with the other scan code.
@4 : This key is not typematic. All associated scan codes occur on the make of the key.

scan code set 2

Key Number	Make code	Break code	Key Number	Make code	Break code
1	0E	F0 0E	47	22	F0 22
2	16	F0 16	48	21	F0 21
3	1E	F0 1E	49	2A	F0 2A
4	26	F0 26	50	32	F0 32
5	25	F0 25	51	31	F0 31
6	2E	F0 2E	52	3A	F0 3A
7	36	F0 36	53	41	F0 41
8	3D	F0 3D	54	49	F0 49
9	3E	F0 3E	55	4A	F0 4A
10	46	F0 46	57	59	F0 59
11	45	F0 45	58	14	F0 14
12	4E	F0 4E	60	11	F0 11
13	55	F0 55	61	29	F0 29
15	66	F0 66	62	E0 11	E0 F0 11
16	0D	F0 0D	64	E0 14	E0 F0 14
17	15	F0 15	90	77	F0 77
18	1D	F0 1D	91	6C	F0 6C
19	24	F0 24	92	6B	F0 6B
20	2D	F0 2D	93	69	F0 69
21	2C	F0 2C	96	75	F0 75
22	35	F0 35	97	73	F0 73
23	3C	F0 3C	98	72	F0 72
24	43	F0 43	99	70	F0 70
25	44	F0 44	100	7C	F0 7C
26	4D	F0 4D	101	7D	F0 7D
27	54	F0 54	102	74	F0 74
28	5B	F0 5B	103	7A	F0 7A
29 @5	5D	F0 5D	104	71	F0 71

Key Number	Make code	Break code	Key Number	Make code	Break code
30	58	F0 58	105	7B	F0 7B
31	1C	F0 1C	106	79	F0 79
32	1B	F0 1B	108	E0 5A	E0 F0 5A
33	23	F0 23	110	76	F0 76
34	2B	F0 2B	112	05	F0 05
35	34	F0 34	113	06	F0 06
36	33	F0 33	114	04	F0 04
37	3B	F0 3B	115	0C	F0 0C
38	42	F0 42	116	03	F0 03
39	4B	F0 4B	117	0B	F0 0B
40	4C	F0 4C	118	83	F0 83
41	52	F0 52	119	0A	F0 0A
42 @6	5D	F0 5D	120	01	F0 01
43	5A	F0 5A	121	09	F0 09
44	12	F0 12	122	78	F0 78
45 @6	61	F0 61	123	07	F0 07
46	1A	F0 1A	125	7E	F0 7E

Key No.	Base Case,or Shift + Nun Lock Make/Break	Shift Case @7 Make/Break	Num Lock Make/Break
75	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
76	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
79	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
80	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
81	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
83	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
84	E0 72 / E0 F0 72	E0 F0 12 E0 72 / E0 F0 72 E0 12	E0 12 E0 72 / E0 F0 72 E0 F0 12
85	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
86	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
89	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 No.	Scan Code Make/Break	Shift Case Make/Break @7
95	E0 4A / E0 F0 4A	E0 F0 12 E0 4A / E0 F0 4A E0 12

Key No.	Scan Code Make/Break	Ctrl Case, Shift Case Make/ Break	Alt Case Make/Break
124	E0 12 E0 7C / E0 F0 7C E0 F0 12	E0 7C / E0 F0 7C	84 / F0 84

Key No.	Make Code	Ctrl Key Pressed
126 @8	E1 14 77 E1 F0 14 F0 77	E0 7E E0 F0 7E

Note .

@5 : 101-key keyboard only.

@6 : 102-key keyboard only.

@7 : If the left Shift key is held down, the F0 12/12 shift make and break is sent with the other scan codes. If the right Shift key is held down, F0 59/59 is sent. If both Shift keys are down, both sets of codes are sent with the other scan code.

@8 : This key is not typematic. All associated scan codes occur on the make of the key.

scan code set 3

Key number	Make Code	Break Code	Default Key State
1	0E	F0 0E	Typematic
2	16	F0 16	Typematic
3	1E	F0 1E	Typematic
4	26	F0 26	Typematic
5	25	F0 25	Typematic
6	2E	F0 2E	Typematic
7	36	F0 36	Typematic
8	3D	F0 3D	Typematic
9	3E	F0 3E	Typematic
10	46	F0 46	Typematic
11	45	F0 45	Typematic
12	4E	F0 4E	Typematic
13	55	F0 55	Typematic
15	66	F0 66	Typematic
16	0D	F0 0D	Typematic
17	15	F0 15	Typematic
18	1D	F0 1D	Typematic
19	24	F0 24	Typematic
20	2D	F0 2D	Typematic
21	2C	F0 2C	Typematic
22	35	F0 35	Typematic
23	3C	F0 3C	Typematic
24	43	F0 43	Typematic
25	44	F0 44	Typematic
26	4D	F0 4D	Typematic
27	54	F0 54	Typematic
28	5B	F0 5B	Typematic
29 @9	5C	F0 5C	Typematic
30	14	F0 14	Make/Break
31	1C	F0 1C	Typematic
32	1B	F0 1B	Typematic
33	23	F0 23	Typematic
34	2B	F0 2B	Typematic
35	34	F0 34	Typematic
36	33	F0 33	Typematic

Key number	Make Code	Break Code	Default Key State
37	3B	F0 3B	Typematic
38	42	F0 42	Typematic
39	4B	F0 4B	Typematic
40	4C	F0 4C	Typematic
41	52	F0 52	Typematic
42 @10	53	F0 53	Typematic
43	5A	F0 5A	Typematic
44	12	F0 12	Make/Break
45 @10	13	F0 13	Typematic
46	1A	F0 1A	Typematic
47	22	F0 22	Typematic
48	21	F0 21	Typematic
49	2A	F0 2A	Typematic
50	32	F0 32	Typematic
51	31	F0 31	Typematic
52	3A	F0 3A	Typematic
53	41	F0 41	Typematic
54	49	F0 49	Typematic
55	4A	F0 4A	Typematic
57	59	F0 59	Make/Break
58	11	F0 11	Make/Break
60	19	F0 19	Make/Break
61	29	F0 29	Typematic
62	39	F0 39	Make only
64	58	F0 58	Make only
75	67	F0 67	Make only
76	64	F0 64	Typematic
79	61	F0 61	Typematic
80	6E	F0 6E	Make only
81	65	F0 65	Make only
83	63	F0 63	Typematic
84	60	F0 60	Typematic
85	6F	F0 6F	Make only
86	6D	F0 6D	Make only
89	6A	F0 6A	Typematic
90	76	F0 76	Make only
91	6C	F0 6C	Make only
92	6B	F0 6B	Make only
93	69	F0 69	Make only
95	77	F0 77	Make only
96	75	F0 75	Make only
97	73	F0 73	Make only
98	72	F0 72	Make only
99	70	F0 70	Make only
100	7E	F0 7E	Make only
101	7D	F0 7D	Make only
102	74	F0 74	Make only
103	7A	F0 7A	Make only

Key number	Make Code	Break Code	Default Key State
104	71	F0 71	Make only
105	84	F0 84	Make only
106	7C	F0 7C	Typematic
108	79	F0 79	Make only
110	08	F0 08	Make only
112	07	F0 07	Make only
113	0F	F0 0F	Make only
114	17	F0 17	Make only
115	1F	F0 1F	Make only
116	27	F0 27	Make only
117	2F	F0 2F	Make only
118	37	F0 37	Make only
119	3F	F0 3F	Make only
120	47	F0 47	Make only
121	4F	F0 4F	Make only
122	56	F0 56	Make only
123	5E	F0 5E	Make only
124	57	F0 57	Make only
125	5F	F0 5F	Make only
126	62	F0 62	Make only

Note .

@9 : 101-key keyboard only
@10 : 102-key keyboard only

New key codes for scan set 1:

New key	Make	Break
LWIN	E0 5B	E0 DB
RWIN	E0 5C	E0 DC
APP	E0 5D	E0 DD
N-CHG (131)	7B	FB
CHG (132)	79	F9
ROMA (133)	70	F0
014	7D	FD
056	73	F3
107	7E	FE
KL	F1	X
KR	F0	X

New key codes for scan set 2:

New key	Make	Break
LWIN	E0 1F	E0 F0 1F
RWIN	E0 27	E0 F0 27
APP	E0 2F	E0 F0 2F
N-CHG (131)	67	F0 67
CHG (132)	64	F0 64
ROMA (133)	13	F0 13
014	6A	F0 6A
056	51	F0 51
107	6D	F0 6D
KL	F1	X
KR	F2	X

New key codes for scan set 3:

New key	Make	Break
LWIN	8B	F0 8B
RWIN	8C	F0 8C
APP	8D	F0 8D
N-CHG (131)	85	F0 85
CHG (132)	86	F0 86
ROMA (133)	87	F0 87
014	5D	F0 5D
056	51	F0 51
107	7B	F0 7B
KL	F1	X
KR	F2	X

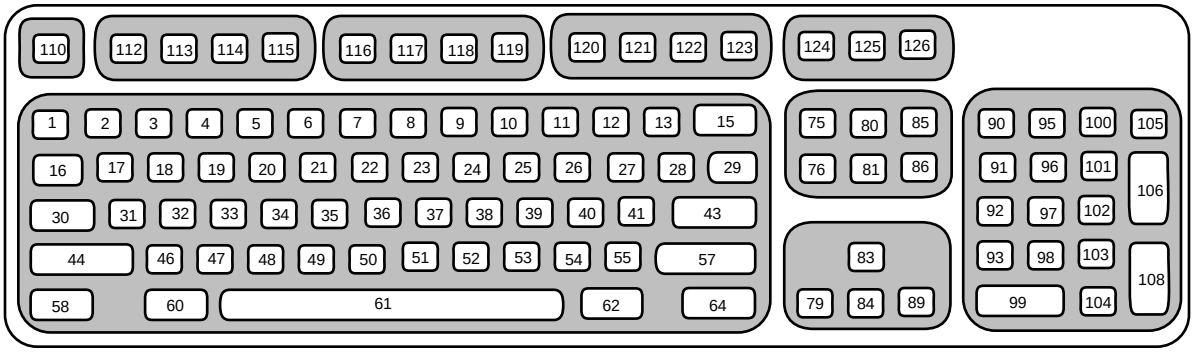


Fig 1. The 101-key keyboard layout

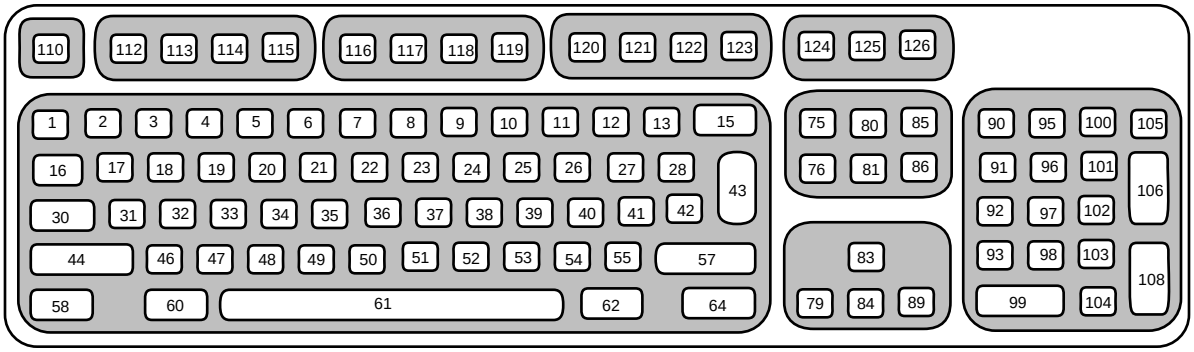


Fig 2. The 102-key keyboard layout

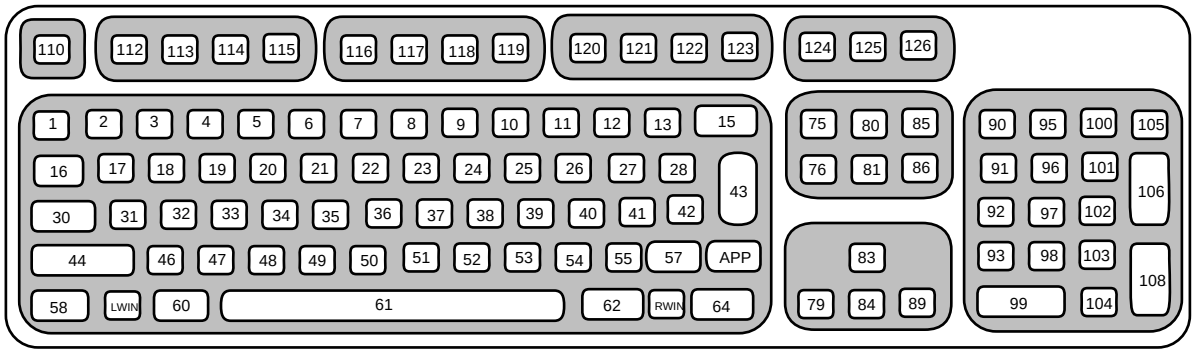


Fig 3. The 104-key keyboard layout

ABSOLUTE MAXIMUM RATINGS

Parameter	Sym.	Ratings
Supply Voltage	V_{CC}	-0.5V to +7V
Input Voltage	V_{IN}	-0.3V to +6V
Output Voltage	V_{OUT}	-0.3V to +6V
Temperature under bias	T_B	0°C to 70°C
Storage temperature	T_S	-65°C to 150°C

DC ELECTRICAL CHARACTERISTICS

Parameter	Sym.	Min.	Typ.	Max.	Unit	Condition
Operating voltage	V_{CC}	4.5	5	5.5	V	
Operating supply current	I_{CCI}			3	mA	Fosc=1.8432MHz
Input leakage	I_{IL}			±1	μA	V_{IN}=V_{CC} ,V_{SS}
Input high voltage	V_{IH}	2.0			V	
Input low voltage	V_{IL}			0.8	V	
Output high voltage	V_{OH1}	2.4			V	I_{OH} = - 6.0 mA
Output low voltage	V_{OL1}			0.4	V	I_{OL} = 3.0 mA
Output low voltage for LEDS	V_{OL3}			3.2	V	I_{OL} = 10 mA
Internal Pull-high resistance (port 6,9)	R_{PH1}	4.7		10	KΩ	
Internal Pull-high resistance for DATA, CLK	R_{PH2}	1.5	2.2	3	KΩ	

AC ELECTRICAL CHARACTERISTICS

Parameter	Sym.	Min.	Typ.	Max.	Unit
Time from DATA transition to falling edge of CLK	T1	5		25	μS
Time from rising edge of CLK to DATA transition	T2	5		T4 - 5	μS
Duration of CLK inactive	T3	30	40	50	μS
Duration of CLK active	T4	30	40	50	μS
Time to auxiliary device inhibit after clock 11 to ensure the auxiliary device does not start another transmission	T5			50	μS
Time from inactive to active CLK transition, used to time when auxiliary device samples DATA	T6	5		25	μS
System clock	FCLK		1.843		MHz

TIMING DIAGRAMS

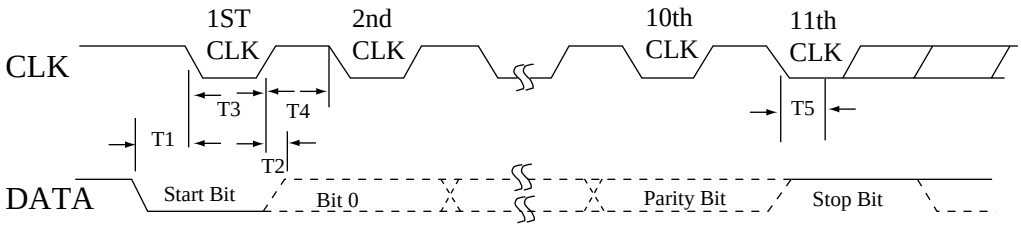


Fig 3. Keyboard output data timings

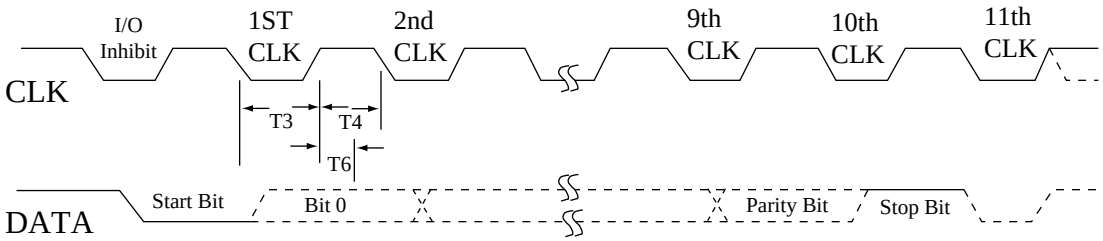
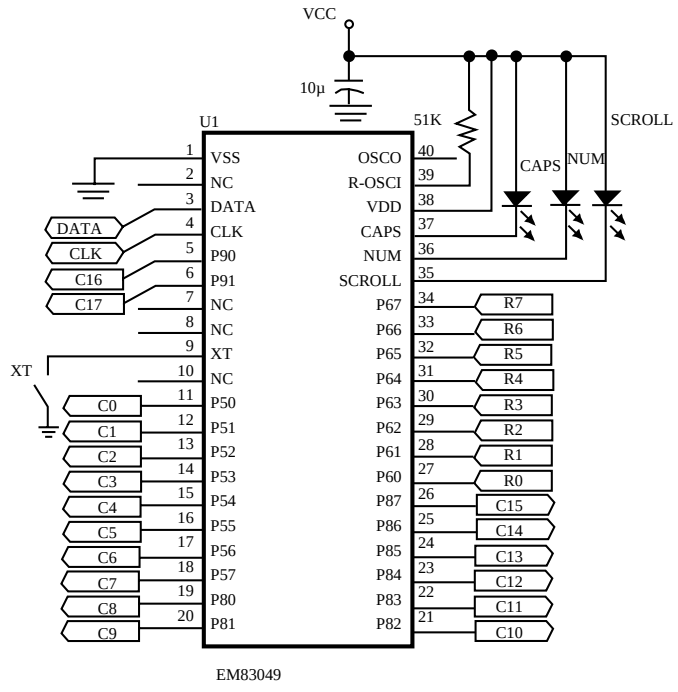


Fig 4. Keyboard input data timings

APPLICATION CIRCUIT



	R0	R1	R2	R3	R4	R5	R6	R7
C0	126				064		058	116
C1	017	016	031	110	046	131	001	002
C2	018	030	032	045	047	132	112	003
C3	019	114	033	115	048	133	113	004
C4	020	021	034	035	049	050	006	005
C5	023	022	037	036	052	051	007	008
C6	024	028	038	117	053	056	013	009
C7	025	118	039		054	APP	119	010
C8	026	027	040	041	042	055	012	011
C9	125			060		062		124
C10	014	015	029	122	043	123	120	121
C11	091	092	093	061	090	084	076	
C12	096	097	098	099	095	089	075	
C13	101	102	103	104	100	105	085	086
C14	106	107	108	083		079	080	081
C15		044	057					
C16		LWIN					KR	
C17	KL		RWIN					