



## ■ FEATURE

- Low cost - eliminate need external components.
- Phantom key detects.
- Support scan code set 1 ,2 and 3.
- Support PC AT and PS/2 keyboard .
- Low power CMOS device technology.
- Internal pull-up resistor.
- Tri-state outputs for easy board application.
- Built-in 8-bit's CPU.
- 5K bytes of ROM.
- 128 bytes of RAM.
- Support WINDOWS TM 95, 98, 2000, ME, XP keys.
- Normal operation frequency is 4 MHz.
- Built-in RC type oscillator with external resister
- On chip general 8 bit preload timer

## ■ DESCRIPTION

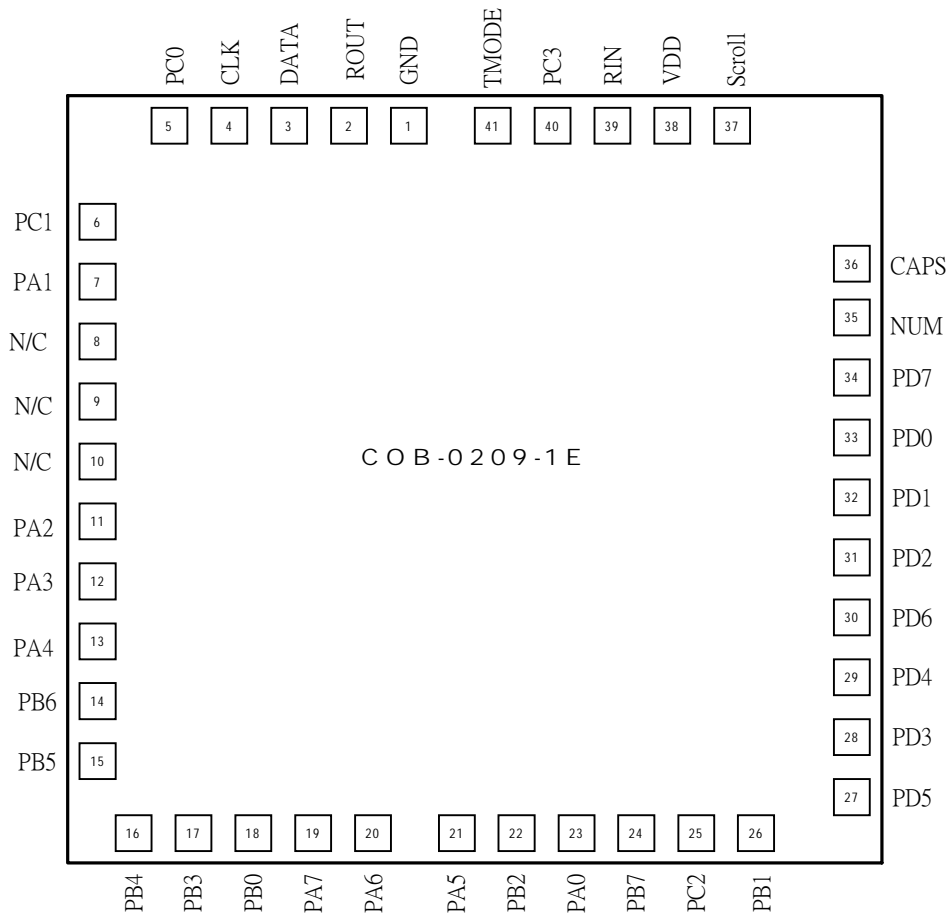
The EC3648 is a single chip CMOS micro-controller for keyboard application, specially for IBM PC AT and all compatible machines. It incorporate a 8-bit's CPU core, 5K bytes of ROM, and 128 bytes of RAM used as working RAM and stack area. The EC3648 control all scan codes, scan timing and communications between the keyboard and PC. It is easy to implement a high performance, low cost keyboard with the minimal external components.

## ■ APPLICATION

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



## ■ PIN ASSIGNMENT



**■ PIN DESCRIPTION**

Pin Name	Pad No.	I/O	FUNCTION
<b>KEYBOARD MATRIX DRIVE AND SENSE INTERFACE</b>			
PA0	23	O	Column 1 Low output scan line
PA1	7	O	Column 2 Low output scan line
PA2	11	O	Column 3 Low output scan line
PA3	12	O	Column 4 Low output scan line
PA4	13	O	Column 5 Low output scan line
PA5	21	O	Column 6 Low output scan line
PA6	20	O	Column 7 Low output scan line
PA7	19	O	Column 8 Low output scan line
PB0	18	O	Column 9 Low output scan line
PB1	26	O	Column 10 Low output scan line
PB2	22	O	Column 11 Low output scan line
PB3	17	O	Column 12 Low output scan line
PB4	16	O	Column 13 Low output scan line
PB5	15	O	Column 14 Low output scan line
PB6	14	O	Column 15 Low output scan line
PB7	24	O	Column 16 Low output scan line
PC0	5	O	Column 17 Low output scan line
PC1	6	O	Column 18 Low output scan line
PC2	25	O	Column 19 Low output scan line
PC3	40	O	Reserved for Column 20 Low output scan line
PD0	33	I	Row 0 Input scan line, internal pull high (18K)
PD1	32	I	Row 1 Input scan line, internal pull high (18K)
PD2	31	I	Row 2 Input scan line, internal pull high (18K)
PD3	28	I	Row 3 Input scan line, internal pull high (18K)
PD4	29	I	Row 4 Input scan line, internal pull high (18K)
PD5	27	I	Row 5 Input scan line, internal pull high (18K)
PD6	30	I	Row 6 Input scan line, internal pull high (18K)
PD7	34	I	Row 7 Input scan line, internal pull high (18K)
<b>KEYBOARD PS2 INTERFACE (2 PINS)</b>			
CLK	4	I/O	CLOCK line for IBM communication, internal pull high (5K)
DATA	3	I/O	DATA line for IBM communication, internal pull high (5K)
<b>KEYBOARD LED INTERFACE( 3 PINS )</b>			
SCROLL	37	O	Scroll Lock Indicator
NUM	35	O	NUM Lock Indicator
CAPS	36	O	Caps Lock Indicator
<b>SYSTEM CLOCK AND POWER SUPPLY( 4 PINS )</b>			
VDD	38	I	+5V Power Supply
VSS	1	I	Ground
Rout	2	O	CLOCK output
Rin	39	I	Connect 47K OHM resistor for 4 MHz oscillation

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## ■ FUNCTION DESCRIPTION

### Command from the system

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

### Set/Reset Status indicators (Hex ED)

- Responds ACK.
- Receives option byte.
- Responds ACK.
- Updates status indicators.
- Return to previous scanning state.

### Echo (Hex EE)

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

### Invalid commands (Hex EF and F1)

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

### Select Alternate Scan Code (Hex F0)

- Responds ACK.
- Clears output buffer.
- Sets the default typematic rate/delay.
- Clears last typematic key.
- Receives options key.
- 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 state.

### Read ID (Hex F2)

- Responds with ACK.
- Discontinues scanning.
- Sends two ID Bytes. The second byte will be sent within 500  $\mu$ S after first byte.
- Resumes scanning.

### Set Typematic Rate/Delay (Hex F3)

- Responds ACK.
- Receives rate/delay value byte.
- Responds ACK.
- Set rate/delay (\* Note1)
- Returns to previous scanning state.

\*Note 1

1. Repeat period =  $(8+A) \times (2B) \times 0.00417$  seconds  
A: binary value of bits 2, 1, and 0.  
B: binary value of bits 4 and 3.
2. Delay =  $(C+1) \times 250$  milliseconds



C: binary value of bits 6 and 5. Bit 7 is always 0.

Bit 4 ~ bit 0	Typematic rate $\pm$ 20%	bit 4 ~ bit 0	Typematic rate $\pm$ 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  $\pm$  20%

Default delay = 500 mS  $\pm$  20%

**Enable (Hex F4)**

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

**Default Disable ( Hex F5)**

- Responds with ACK.
- Reset 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.
- Clear output buffer.
- Set all key type (affect only 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 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.

**BAT Failure Code ( Hex FC )**

If a BAT failure occurs, the keyboard sends this code , discontinues scanning, and waits for a system response or reset.

**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.

■ FUNCTION DESCRIPTION

**Keyboard Scan Code Table**

The keyboard contains 3 scan code sets. The system defaults to scan set 2. It's can be switched to set 1 or set 3 . The following tables show the key and three scan code sets in hexadecimal values. All the keys are typematics except for the pause key. When a controller receive the make key frame from RF receiver, the make scan code is sent to the system. When receive the break key frame, its break code is sent. If receives two or more keys frame, only the last key pressed repeats at the typematic rate. Typematic operation stops when receives the break frame, 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 And Symbol			Make/Break code	Key Number and Symbol		Make/Break code
1	~	`	29/A9	47	X	2D/AD
2	!	1	02/82	48	C	2E/AE
3	@	2	03/83	49	V	2F/AF
4	#	3	04/84	50	B	30/B0
5	\$	4	05/85	51	N	31/B1
6	%	5	06/86	52	M	32/B2
7	^	6	07/87	53	< ,	33/B3
8	&	7	08/88	54	> .	34/B4
9	*	8	09/89	55	? /	35/B5
10	(	9	0A/8A	57	Shift(R)	36/B6
11	)	0	0B/8B	58	Ctrl(L)	1D/9D
12	_	-	0C/8C	60	Alt(L)	38/B8
13	+	=	0D/8D	61	Space	39/B9
14			56 7D/D6 FD	62	Alt(R)	E0 38/E0 B8
15	Back Space		0E/8E	64	Ctrl(R)	E0 1D/E0 9D
16	Tab		0F/8F	90	Num Lock	45/C5
17	Q		10/90	91	7 Home	47/C7
18	W		11/91	92	4 ←	4B/CB
19	E		12/92	93	1 End	4F/CF
20	R		13/93	96	8 ↑	48/C8
21	T		14/94	97	5	4C/CC
22	Y		15/95	98	2 ↓	50/D0
23	U		16/96	99	0 Ins	52/D2
24	I		17/97	100	*	37/B7
25	O		18/98	101	9 PgUp	49/C9
26	P		19/99	102	6 →	4D/CD
27	{	[	1A/9A	103	3 PgDn	51/D1
28	}	]	1B/9B	104	. Del	53/D3
*29		\	2B/AB	105	-	4A/CA
30	Caps Lock		3A/BA	106	+	4E/CE
31	A		1E/9E	107		7E/FE
32	S		1F/9F	108	Enter	E0 1C/E0 9C
33	D		20/A0	110	ESC	01/81
34	F		21/A1	112	F1	3B/BB
35	G		22/A2	113	F2	3C/BC
36	H		23/A3	114	F3	3D/BD
37	J		24/A4	115	F4	3E/BE
38	K		25/A5	116	F5	3F/BF
39	L		26/A6	117	F6	40/C0





# PS2 KEYBOARD CONTROLLER

**EC3648**

Preliminary

40	:	;	27/A7	118	F7	41/C1
41	“	’	28/A8	119	F8	42/C2
**42		\	2B/AB	120	F9	43/C3
43	Enter		1C/9C	121	F10	44/C4
44	Shift(L)		2A/AA	122	F11	57/D7
**45	Macro		56/D6	123	F12	58/D8
46	Z		2C/AC	125	Scroll Lock	46/C6
*101-Key Keyboard Only						
**102-Key Keyboard Only						

Key Number And Symbol		Base case Shift+Num	Left-Shift	Right-Shift	Num Lock
75	Insert	E0 52 /E0 D2	E0 AA E0 52 /E0 D2 E0 2A	E0 B6 E0 52 /E0 D2 E0 36	E0 2A E0 52 /E0 D2 E0 AA
76	Delete	E0 53 /E0 D3	E0 AA E0 53 /E0 D3 E0 2A	E0 B6 E0 53 /E0 D3 E0 36	E0 2A E0 53 /E0 D3 E0 AA
79	←	E0 4B /E0 CB	E0 AA E0 4B /E0 CB E0 2A	E0 B6 E0 4B /E0 CB E0 36	E0 2A E0 4B /E0 CB E0 AA
80	Home	E0 47 /E0 C7	E0 AA E0 47 /E0 C7 E0 2A	E0 B6 E0 47 /E0 C7 E0 36	E0 2A E0 47 /E0 C7 E0 AA
81	End	E0 4F /E0 CF	E0 AA E0 4F /E0 CF E0 2A	E0 B6 E0 4F /E0 CF E0 36	E0 2A E0 4F /E0 CF E0 AA
83	↑	E0 48 /E0 C8	E0 AA E0 48 /E0 C8 E0 2A	E0 B6 E0 48 /E0 C8 E0 36	E0 2A E0 48 /E0 C8 E0 AA
84	↓	E0 50 /E0 D0	E0 AA E0 50 /E0 D0 E0 2A	E0 B6 E0 50 /E0 D0 E0 36	E0 2A E0 50 /E0 D0 E0 AA
85	PgUp	E0 49 /E0 C9	E0 AA E0 49 /E0 C9 E0 2A	E0 B6 E0 49 /E0 C9 E0 36	E0 2A E0 49 /E0 C9 E0 AA
86	PgDn	E0 51 /E0 D1	E0 AA E0 51 /E0 D1 E0 2A	E0 B6 E0 51 /E0 D1 E0 36	E0 2A E0 51 /E0 D1 E0 AA
89	→	E0 4D /E0 CD	E0 AA E0 4D /E0 CD E0 2A	E0 B6 E0 4D /E0 CD E0 36	E0 2A E0 4D /E0 CD E0 AA
59	L-WIN	E0 5B /E0 DB	E0 AA E0 5B /E0 DB E0 2A	E0 B6 E0 5B /E0 DB E0 36	E0 2A E0 5B /E0 DB E0 AA
63	R-WIN	E0 5C /E0 DC	E0 AA E0 5C /E0 DC E0 2A	E0 B6 E0 5C /E0 DC E0 36	E0 2A E0 5C /E0 DC E0 AA
127	APP	E0 5D /E0 DD	E0 AA E0 5D /E0 DD E0 2A	E0 B6 E0 5D /E0 DD E0 36	E0 2A E0 5D /E0 DD E0 AA
When both shift keys are held down Key number : 75			Both Shift E0 AA E0 B6 E0 52 /E0 D2 E0 2A E0 36		



Key Number And Symbol		Base	Left-Shift	Right-Shift
95	/	E0 35 /E0 B5	E0 AA E0 35 /E0 B5 E0 2A	E0 B6 E0 35 /E0 B5 E0 36
When both shift keys are held down Key number: 95			Both Shift E0 AA E0 B6 E0 35 /E0 B5 E0 2A E0 36	

Key Number And Symbol		Base	Shift/Ctrl	Alt
124	Print Screen	E0 2A E0 37 /E0 B7 E0 AA	E0 37 /E0 B7	54 /D4

Key Number And Symbol		Base	Ctrl
126	Pause	E1 1D 45 E1 9D C5	E0 46 E0 C6
This key is not typematic, all associated scan codes occur on the make code.			

Key Number And Function		Make/Break code	Default
ACPI	Power	E0 5E/E0 DE	Make/Break
ACPI	Sleep	E0 5F/E0 DF	Make/Break
ACPI	Wake up	E0 63/E0 E3	Make/Break

Key Number	Make/Break code	Default
<b>Korea KOR0</b>	F1/-	MAKE
Korea KOR1	F0/-	MAKE
Brazil BA0	73/F3	TYPEMATIC
Brazil BA1	7E/FE	TYPEMATIC



# PS2 KEYBOARD CONTROLLER

**EC3648**

Preliminary

## scan code set 2

Key Number And Symbol			Make/Break code	Key Number and Symbol		Make/Break code
1	~	`	0E/F0 0E	47	X	22/F0 22
2	!	1	16/F0 16	48	C	21/F0 21
3	@	2	1E/F0 1E	49	V	2A/F0 2A
4	#	3	26/F0 26	50	B	32/F0 32
5	\$	4	25/F0 25	51	N	31/F0 31
6	%	5	2E/F0 2E	52	M	3A/F0 3A
7	^	6	36/F0 36	53	< ,	41/F0 41
8	&	7	3D/F0 3D	54	> .	49/F0 49
9	*	8	3E/F0 3E	55	? /	4A/F0 4A
10	(	9	46/F0 46	57	Shift(R)	59/F0 59
11	)	0	45/F0 45	58	Ctrl(L)	14/F0 14
12	_	-	4E/F0 4E	60	Alt(L)	11/F0 11
13	+	=	55/F0 55	61	Space	29/F0 29
14			6A/F0 6A	62	Alt(R)	E0 11/E0 F0 11
15	Back Space		66/F0 66	64	Ctrl(R)	E0 14/E0 F0 14
16	Tab		0D/F0 0D	90	Num Lock	77/F0 77
17	Q		15/F0 15	91	7 Home	6C/F0 6C
18	W		1D/F0 1D	92	4 ←	6B/F0 6B
19	E		24/F0 24	93	1 End	69/F0 69
20	R		2D/F0 2D	96	8 ↑	75/F0 75
21	T		2C/F0 2C	97	5	73/F0 73
22	Y		35/F0 35	98	2 ↓	72/F0 72
23	U		3C/F0 3C	99	0 Ins	70/F0 70
24	I		43/F0 43	100	*	7C/F0 7C
25	O		44/F0 44	101	9 PgUp	7D/F0 7D
26	P		4D/F0 4D	102	6 →	74/F0 74
27	{	[	54/F0 54	103	3 PgDn	7A/F0 7A
28	}	]	5B/F0 5B	104	. Del	71/F0 71
*29		\	5D/F0 5D	105	-	7B/F0 7B
30	Caps Lock		58/F0 58	106	+	79/F0 79
31	A		1C/F0 1C	107		6D/F0 6D
32	S		1B/F0 1B	108	Enter	E0 5A/E0 F0 5A
33	D		23/F0 23	110	ESC	76/F0 76
34	F		2B/F0 2B	112	F1	05/F0 05
35	G		34/F0 34	113	F2	06/F0 06
36	H		33/F0 33	114	F3	04/F0 04
37	J		3B/F0 3B	115	F4	0C/F0 0C
38	K		42/F0 42	116	F5	03/F0 03
39	L		4B/F0 4B	117	F6	0B/F0 0B
40	:	;	4C/F0 4C	118	F7	83/F0 83
41	“	’	52/F0 52	119	F8	0A/F0 0A
**42		\	5D/F0 5D	120	F9	01/F0 01



# PS2 KEYBOARD CONTROLLER

**EC3648**

Preliminary

43	Enter	5A/F0 5A	121	F10	09/F0 09
44	Shift(L)	12/F0 12	122	F11	78/F0 78
**45	Macro	61/F0 61	123	F12	07/F0 07
46	Z	1A/F0 1A	125	Scroll Lock	7E/F0 7E
*101-Key Keyboard Only					
**102-Key Keyboard Only					

Key Number And Symbol		Base case Shift+Num	Left-Shift	Right-Shift	Num Lock
75	Insert	E0 70 /E0 F0 70	E0 F0 12 E0 70 /E0 F0 70 E0 12	E0 F0 59 E0 70 /E0 F0 70 E0 59	E0 12 E0 70 /E0 F0 70 E0 F0 12
76	Delete	E0 71 /E0 F0 71	E0 F0 12 E0 71 /E0 F0 71 E0 12	E0 F0 59 E0 71 /E0 F0 71 E0 59	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 F0 59 E0 6B /E0 F0 6B E0 59	E0 12 E0 6B /E0 F0 6B E0 F012
80	Home	E0 6C /E0 F0 6C	E0 F0 12 E0 6C /E0 F0 6C E0 12	E0 F0 59 E0 6C /E0 F0 6C E0 59	E0 12 E0 6C /E0 F0 6C E0 F0 12
81	End	E0 69 /E0 F0 69	E0 F0 12 E0 69 /E0 F0 69 E0 12	E0 F0 59 E0 69 /E0 F0 69 E0 59	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 F0 59 E0 75 /E0 F0 75 E0 59	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 F0 59 E0 72 /E0 F0 72 E0 59	E0 12 E0 72 /E0 F0 72 E0 F0 12
85	PgUp	E0 7D /E0 F0 7D	E0 F0 12 E0 7D /E0 F0 7D E0 12	E0 F0 59 E0 7D /E0 F0 7D E0 59	E0 12 E0 7D /E0 F0 7D E0 F0 12
86	PgDn	E0 7A /E0 F0 7A	E0 F0 12 E0 7A /E0 F0 7A E0 12	E0 F0 59 E0 7A /E0 F0 7A E0 59	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 F0 59 E0 74 /E0 F0 74 E0 59	E0 12 E0 74 /E0 F0 74 E0 F0 12
59	L-WIN	E0 1F /E0 F0 1F	E0 F0 12 E0 1F /E0 F0 1F E0 12	E0 F0 59 E0 1F /E0 F0 1F E0 59	E0 12 E0 1F /E0 F0 1F E0 F0 12
63	R-WIN	E0 27 /E0 F0 27	E0 F0 12 E0 27 /E0 F0 27 E0 12	E0 F0 59 E0 27 /E0 F0 27 E0 59	E0 12 E0 27 /E0 F0 27 E0 F0 12
127	APP	E0 2F /E0 F0 2F	E0 F0 12 E0 2F /E0 F0 2F E0 12	E0 F0 59 E0 2F /E0 F0 2F E0 59	E0 12 E0 2F /E0 F0 2F E0 F0 12
When both shift keys are held down key number :75			Both Shift E0 F0 12 E0 F0 59 E0 70 /E0 F0 70 E0 12 E0 59		



Key Number And Symbol		Base	Left-Shift	Right-Shift
95	/	E0 4A /E0 F0 4A	E0 F0 12 E0 4A /E0 F0 4A E0 12	E0 F0 59 E0 4A /E0 F0 4A E0 59
When both shift keys are held down Key number: 95			Both Shift E0 F0 12 E0 F0 59 E0 4A /E0 F0 4A E0 12 E0 59	

Key Number And Symbol		Base	Shift/Ctrl	Alt
124	Print Screen	E0 12 E0 7C /E0 F0 7C E0 F0 12	E0 7C /E0 F0 7C	84 /F0 84

Key Number And Symbol		Base	Ctrl
126	Pause	E1 14 77 E1 F0 14 F0 77	E0 7E E0 F0 7E
This key is not typematic , all associated scan codes occur on the make code.			

Key Number And Function		Make/Break code	Default
ACPI	Power	E0 37/E0 F0 37	Make/Break
ACPI	Sleep	E0 3F/E0 F0 3F	Make/Break
ACPI	Wake up	E0 5E/E0 F0 5E	Make/Break

Key Number	Make/Break code	Default
<b>Korea KOR0</b>	F1/-	MAKE
Korea KOR1	F2/-	MAKE
Brazil BA0	51/F0 51	TYPEMATIC
Brazil BA1	6D/F0 6D	TYPEMATIC



# PS2 KEYBOARD CONTROLLER

# EC3648

Preliminary

## scan code set 3

Key Number	Make /Break code	Default Key State	Key Number	Make /Break code	Default Key State
1	0E/F0 0E	Typematic	55	4A/F0 4A	Typematic
2	16/F0 16	Typematic	57	59/F0 59	Make/Break
3	1E/F0 1E	Typematic	58	11/F0 11	Make/Break
4	26/F0 26	Typematic	59	8B/F0 8B	Make/Break
5	25/F0 25	Typematic	60	19/F0 19	Make/Break
6	2E/F0 2E	Typematic	61	29/F0 29	Typematic
7	36/F0 36	Typematic	62	39/F0 39	Make Only
8	3D/F0 3D	Typematic	63	8C/F0 8C	Make/Break
9	3E/F0 3E	Typematic	64	58/F0 58	Make Only
10	46/F0 46	Typematic	75	67/F0 67	Make Only
11	45/F0 45	Typematic	76	64/F0 64	Typematic
12	4E/F0 4E	Typematic	79	61/F0 61	Typematic
13	55/F0 55	Typematic	80	6E/F0 6E	Make Only
14	5D/F0 5D	Typematic	81	65/F0 65	Make Only
15	66/F0 66	Typematic	83	63/F0 63	Typematic
16	0D/F0 0D	Typematic	84	60/F0 60	Typematic
17	15/F0 15	Typematic	85	6F/F0 6F	Make Only
18	1D/F0 1D	Typematic	86	6D/F0 6D	Make Only
19	24/F0 24	Typematic	89	6A/F0 6A	Typematic
20	2D/F0 2D	Typematic	90	76/F0 76	Make Only
21	2C/F0 2C	Typematic	91	6C/F0 6C	Make Only
22	35/F0 35	Typematic	92	6B/F0 6B	Make Only
23	3C/F0 3C	Typematic	93	69/F0 69	Make Only
24	43/F0 43	Typematic	95	77/F0 77	Make Only
25	44/F0 44	Typematic	96	75/F0 75	Make Only
26	4D/F0 4D	Typematic	97	73/F0 73	Make Only
27	54/F0 54	Typematic	98	72/F0 72	Make Only
28	5B/F0 5B	Typematic	99	70/F0 70	Make Only
*29	5C/F0 5C	Typematic	100	7E/F0 7E	Make Only
30	14/F0 14	Make/Break	101	7D/F0 7D	Make Only
31	1C/F0 1C	Typematic	102	74/F0 74	Make Only
32	1B/F0 1B	Typematic	103	7A/F0 7A	Make Only
33	23/F0 23	Typematic	104	71/F0 71	Make Only
34	2B/F0 2B	Typematic	105	84/F0 84	Make Only
35	34/F0 34	Typematic	106	7C/F0 7C	Typematic
36	33/F0 33	Typematic	107	7B/F0 7B	Make Only
37	3B/F0 3B	Typematic	108	79/F0 79	Make Only
38	42/F0 42	Typematic	110	08/F0 08	Make Only
39	4B/F0 4B	Typematic	112	07/F0 07	Make Only
40	4C/F0 4C	Typematic	113	0F/F0 0F	Make Only
41	52/F0 52	Typematic	114	17/F0 17	Make Only
**42	53/F0 53	Typematic	115	1F/F0 1F	Make Only
43	5A/F0 5A	Typematic	116	27/F0 27	Make Only



# PS2 KEYBOARD CONTROLLER

**EC3648**

Preliminary

44	12/F0 12	Make/Break	117	2F/F0 2F	Make Only
**45	13/F0 13	Typematic	118	37/F0 37	Make Only
46	1A/F0 1A	Typematic	119	3F/F0 3F	Make Only
47	22/F0 22	Typematic	120	47/F0 47	Make Only
48	21/F0 21	Typematic	121	4F/F0 4F	Make Only
49	2A/F0 2A	Typematic	122	56/F0 56	Make Only
50	32/F0 32	Typematic	123	5E/F0 5E	Make Only
51	31/F0 31	Typematic	124	57/F0 57	Make Only
52	3A/F0 3A	Typematic	125	5F/F0 5F	Make Only
53	41/F0 41	Typematic	126	62/F0 62	Make Only
54	49/F0 49	Typematic	127	8D/F0 8D	Make/Break
*101-Key Keyboard Only					
**102-Key Keyboard Only					

Key Number	Make/Break code	Default
<b>Korea KOR0</b>	F1/-	MAKE
Korea KOR1	F2/-	MAKE
Brazil BA0	51/F0 51	TYPEMATIC
Brazil BA1	7B/F0 7B	TYPEMATIC

## KEY CODE

Key mark and Key no	Code Set 1	Code Set 2	Code Set 3	DEFAULT
	Make/Break	Make/Break	Make/Break	
Japanese J14	56 7D/D6 FD	6A/F0 6A	5D/F0 5D	TYPEMATIC
Japanese J56	73/F3	51/F0 51	51/F0 51	TYPEMATIC
Japanese J131	7B/FB	67/F0 67	85/F0 85	MAKE
Japanese J132	79/F9	64/F0 64	86/F0 86	MAKE
Japanese J133	70/F0	13/F0 13	87/F0 87	MAKE



WIN 2K MEDIA CODES

Item	Extra Key Function Name	Set1		Set 2,3	
		MAKE	BREAK	MAKE	BREAK
1	BACK	E0 6A	E0 EA	E0 38	E0 F0 38
2	FORWARD	E0 69	E0 E9	E0 30	E0 F0 30
3	STOP	E0 68	E0 E8	E0 28	E0 F0 28
4	REFRESH	E0 67	E0 E7	E0 20	E0 F0 20
5	SEARCH	E0 65	E0 E5	E0 10	E0 F0 10
6	FAVORITES	E0 66	E0 E6	E0 18	E0 F0 18
7	HOME	E0 32	E0 B2	E0 3A	E0 F0 3A
8	MAIL	E0 6C	E0 EC	E0 48	E0 F0 48
9	MUTE	E0 20	E0 A0	E0 23	E0 F0 23
10	VOLUME-	E0 2E	E0 AE	E0 21	E0 F0 21
11	VOLUME+	E0 30	E0 B0	E0 32	E0 F0 32
12	PREVIOUS	E0 10	E0 90	E0 15	E0 F0 15
13	STOP	E0 24	E0 A4	E0 3B	E0 F0 3B
14	PLAY	E0 22	E0 A2	E0 34	E0 F0 34
15	NEXT	E0 19	E0 99	E0 4D	E0 F0 4D
16	MEDIA	E0 6D	E0 ED	E0 50	E0 F0 50
17	CALCULATOR	E0 21	E0 A1	E0 2B	E0 F0 2B
18	MY COMPUTOR	E0 6B	E0 EB	E0 40	E0 F0 40

New key codes for scan set 1

New Key	Make	Break
WIN L	E0 5B	E0 DB
WIN R	E0 5C	E0 DC
APP	E0 5D	E0 DD
N-CHG (131)	7B	FB
CHG (132)	79	F9
ROMA (133)	70	F0
K14	7D	FD
K56	73	F3
K107	7E	FE
KL	F1	X
KR	F0	X
POWER	E0 5E	E0 DE
SLEEP	E0 5F	E0 DF
WAKE UP	E0 63	E0 E3





New key codes for scan set 2

New Key	Make	Break
WIN_L	E0 1F	E0 F0 1F
WIN_R	E0 27	E0 F0 27
APP	E0 2F	E0 F0 2F
N-CHG (131)	67	E0 67
CHG (132)	64	E0 64
ROMA (133)	13	E0 13
K14	6A	E0 6A
K56	51	E0 51
K107	6D	E0 6D
KL	F1	X
KR	F2	X
POWER	E0 37	E0 F0 37
SLEEP	E0 3F	E0 F0 3F
WAKE UP	E0 5E	E0 F0 5E

New Key codes for scan set 3

New Key	Make	Break	Key Type
WIN_L	8B	F0 8B	Make/break
WIN_R	8C	F0 8C	Make/break
APP	8D	F0 8D	Make/break
N-CHG (131)	85	F0 85	Make
CHG (132)	86	F0 86	Make
ROMA (133)	87	F0 87	Make
K14	5D	F0 5D	Typematic
K56	51	F0 51	Typematic
K107	7B	F0 7B	Typematic
KL	F1	X	
KR	F2	X	
POWER	X	X	
SLEEP	X	X	
WAKE UP	X	X	

**■ ABSOLUTE MAXIMUM RATING**

Parameter	Sym.	Ratings
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	V	
Operating Supply current	$I_{CC1}$			2.2	mA	
Input Leakage Current	$I_{IN}$			±1	μA	$V_{IN}=V_{CC}, V_{SS}$
Input high voltage (Ports 6)	$V_{IH}$	2.0			V	
Input low voltage (Ports 6)	$V_{IL}$			0.8	V	
Output high voltage (Ports 5)	$V_{OH}$	2.4			V	$I_{OH}=-10.0mA$
Output low voltage (Ports 5)	$V_{OL1}$			0.4	V	$I_{OL1}=9.0mA$
Output low voltage for LEDs	$V_{OL2}$			0.4	V	$I_{OL2}=14.0mA$
Internal Pull-high resistance for DATA, CLK	$R_{PH}$	3.5	5	7	KΩ	$V_{PH}=0V$
Output low voltage for DATA CLK	$V_{OL3}$			0.4	V	$I_{OL}=5mA$

**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 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 sample DATA	T6	5		25	μS
System clock	$F_{CLK}$		4.00		MHz

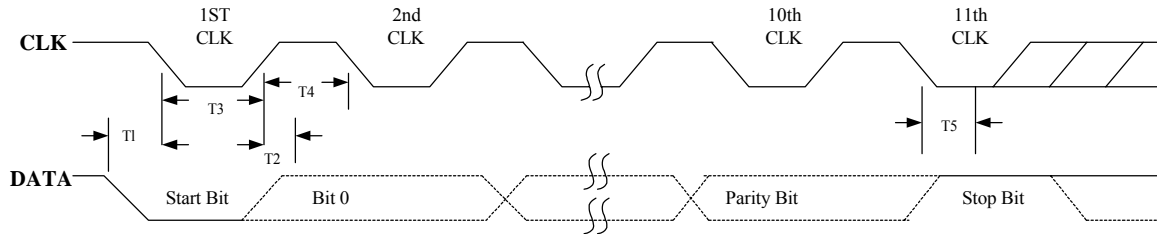


■ KEY MATRIX

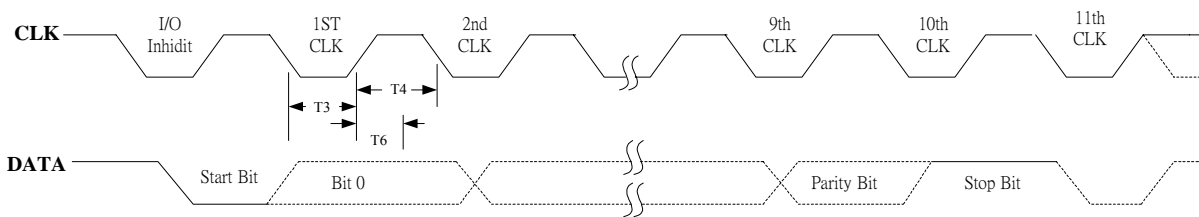
	R0	R1	R2	R3	R4	R5	R6	R7
S0	PAUSE				CTRL (R)		CTRL (L)	F5
S1	Q	TAB	A	ESC	Z	K131	~ ,	! 1
S2	W	CAPS	S	K45 ESC	X	K132	F1	@ 2
S3	E	F3	D	F4	C	K133	F2	# 3
S4	R	T	F	G	V	B	% 5	\$ 4
S5	U K92	Y	J K93	H	M K99	N	^ 6	& 7 K 91
S6	K97	} 	K K98	F6	< K107	BA0	+ =	* 8 K96
S7	O K102	F7	L K103		> K104	APP	F8	( 9 K101
S8	P K105	{ 	: ; K106	"	K42	? / K95	— -	) 0 K100
S9	SCROLL		<i>NEXT</i>	ALT(L)	<i>(WWW) SEARCH</i>	ALT(R)	<i>PREV</i>	PRINT
S10	K14	BACK SPACE	 \	F11	ENTER (L)	F12	F9	F10
S11	7 HOME	4 ←	1 END	SPACE	NUM LOCK	↓	Delete	KOR0
S12	8 ↑	5	2 ↑	0 Ins	/	→	Insert	KOR1
S13	9 PgUp	6 →	3 PgDn	. Del	*	—	Page Up	Page Down
S14	+	BA1	ENTER(R)	↑		←	Home	End
S15	<i>SLEEP</i>	SHIFT (L)	SHIFT (R)	<i>(WWW) BACK</i>	<i>(www) FAVORITE</i>		<i>(WWW) HOME</i>	<i>VOL+</i>
S16	<i>POWER</i>	WIN(L)	<i>PLAY</i>	<i>(WWW) STOP</i>			<i>(WWW) MAIL</i>	
S17	<i>CAL</i>		WIN(R)				<i>MEDIA</i>	<i>MY COM</i>
S18	<i>WAKE</i>		<i>STOP</i>	<i>(WWW) FORWARD</i>	<i>(WWW) REFRESH</i>		<i>MUTE</i>	<i>VOL-</i>

■ **TIMING DIAGRAMS**

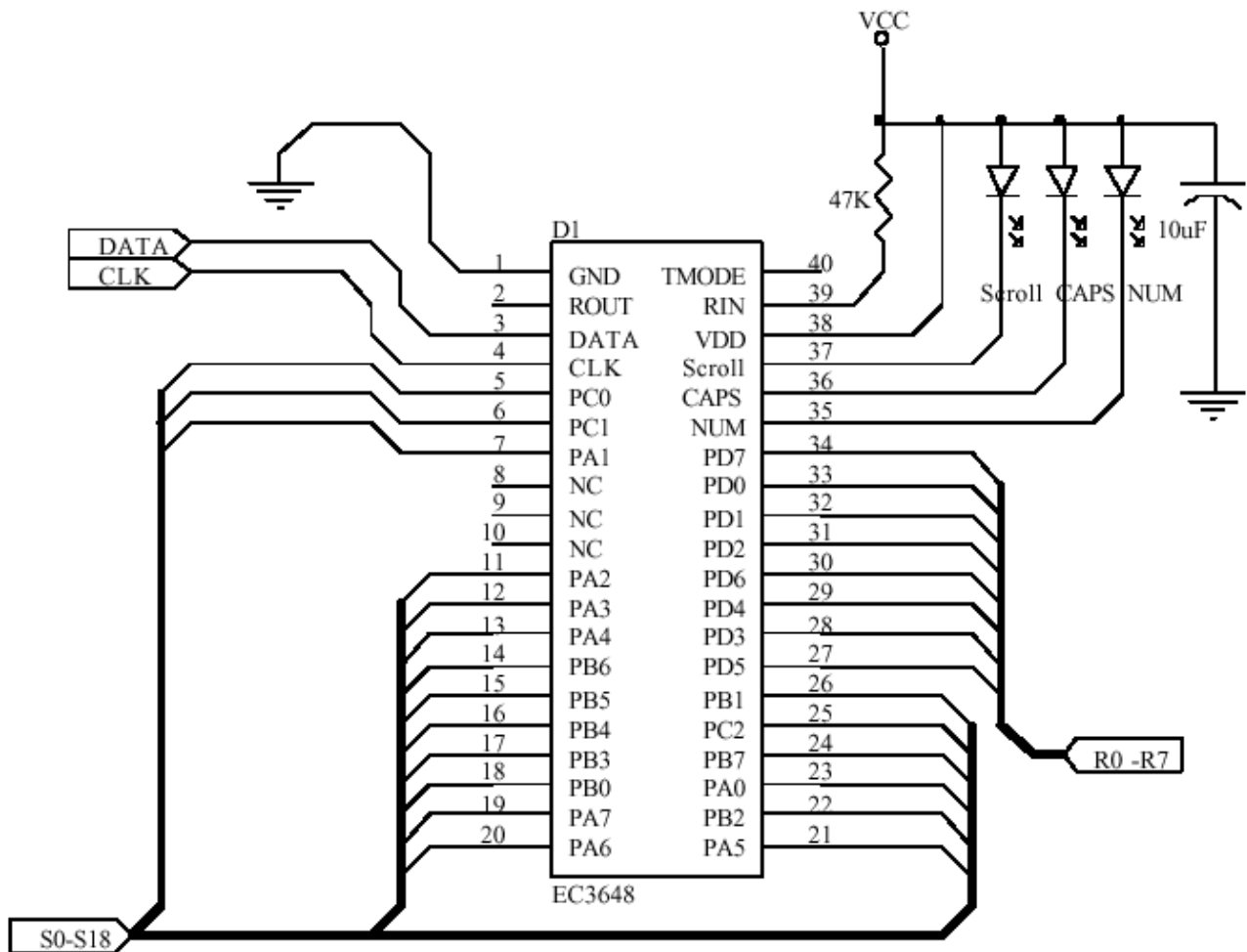
**Keyboard to Host**



**Host to Keyboard**



■ APPLICATION CIRCUIT



■ ORDERING INFORMATION

E-CMOS CORPORATION IC DATASHEET

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