HT6547A
Keyboard Encoder

Features

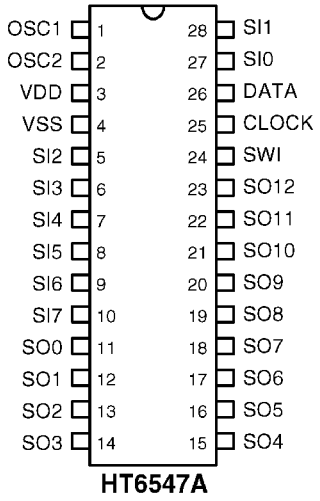
- 28 Pin dual-in-line package
- Supports code set 1, for PC/XT keyboard
- Supports code set 1, for PS/2 model 30 keyboard
- Support code set 2, for PC/AT, PS/2 model 50,60 keyboards
- Supports code set 3, for PS/2 model 80 keyboard
- LC or crystal oscillator
- Minimal external components
- Phantom key detection
- 101-key or 102-key application

General Description

The HT6547A is a keyboard encoder specially designed for IBM PC/XT, IBM PC/AT, IBM PS/2 and all compatible machines.

The HT6547A accepts keyboard inputs and provides a 16-character first-in-first-out buffer where data is stored. An inexpensive LC oscillator can be used for the system clock. It is easy to implement in high performance and low cost keyboards.

Pin Assignment



HT6547A

Pin Description

Pin No.	Pin Name	I/O	Function
1,2	OSC1,OSC2	I	System clock input
3	VDD	—	Positive power supply.
4	VSS	—	Negative power supply (GND).
27,28 5~10	SI0,SI1 SI2~SI7	I	Keyboard matrix scanning input pins.
11~23	SO0~SO12	O	Keyboard matrix scanning output pins.
24	SWI	I/O	This pin is an input pin when power on, XT/AT mode can be read in at this moment. And it is an output pin controls indicators (LEDs).
25	CLOCK	I/O	Synchronous clock signal. Used to clock the transmission data.
26	DATA	I/O	Bidirection data transmission line.

Absolute Maximum Ratings

Supply Voltage ..... 4.75V to 5.25V

Input Voltage..... V_{SS}–0.3V to V_{DD}+0.3V

Operating Temperature..... 0°C to 70°C

Storage Temperature..... –55°C to 125°C

Electrical Characteristics

(Ta=25°C)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{DD}	Operating voltage	—	4.75	5.0	5.25	V
I_{DD}	Operation current	—	—	1.0	2.2	mA
V_{IL}	Input low voltage (SI0~SI7)	—	0	—	1.5	V
	Input low voltage (DATA, CLOCK, SWI)	—	0	—	1.2	V
V_{IH}	Input high voltage	—	4	—	V_{DD}	V
V_{OH}	Output high voltage SWI	I_{OH}=24mA	4.5	—	—	V
V_{OL}	Output low voltage (SO0~SO12, SWI)	I_{OL}=10mA	—	—	0.5	V
	Output low voltage (DATA,CLOCK)	I_{OL}=15mA	—	—	0.5	V
R_{ph}	Internal pull high resistance (SI0~SI7)	—	7	10	20	KΩ
	Internal pull high resistance (CLOCK, DATA)	—	6	8	15	KΩ
F_{sys}	System clock	—	—	2.0	—	MHz

Functional Description

The basic function of the HT6547A is to detect when a keyboaord key has been pressed and released and to transmit the according scan code, including make code and break codes, to the system.

The device also accepts commands from the system and responds to the system if necessary. All communication between the keyboard and the system are managed through the CLOCK and DATA pins.

The keyboard begins to scan for pressed or released keys and commands from the system after the BAT (Basic Assurance Test) has been run.

Working Modes

Four working modes are supported by the HT6547A . These are setup by either a DIP switch or by the alternate scan code command F0. The various modes are described as follows.

Mode 0

- Supports code set 1 for PC/XT keyboards.
- Only one way to enter mode 0, that is to set the DIP switch to XT before power on.
- 9 bit data stream, including one start bit (always one) and eight data bits.
- All keys are typematic/make/break.

Note:

The keyboard will stay in mode 1 with the power connected, there is no way to change to other working modes.

Mode 1

- Supports code set 1 for PS/2 model 30 keyboards.
- Set DIP switch to AT/PS2 before power on, supply power, then issue an F0 command followed by a "1".
- 11 bit data stream, including one start bit (always zero) eight data bits, one parity bit (odd parity) and one stop bit (always one).
- All keys are typematic/make/break as default.
- The working mode can be changed again in this mode, by issuing an F0 command followed by an option. See the F0 command for more detail.

Mode 2

- Supports code set 2 for PC/AT, PS/2 model 50,60 keyboards.
- Set the DIP switch to AT/PS2 before power on for the keyboard to power up in mode 2. The working mode can be changed by an F0 command followed by an option byte 1, 2 or 3 see the F0 command for more details.
- 11 bit data stream, including one start bit (always zero) eight data bits, one parity bit (odd parity) and one stop bit (always one)
- All keys are typematic/make/break as default.

Mode 3

- Supports code set 3, for PS/2 model 80 keyboards.
- Set the DIP switch to AT/PS2 before power on, supply power, then issue an F0 command followed by a "3".
- 11 bit data stream, including one start bit (always zero) eight data bits, one parity bit (odd parity) and one stop bit (always one).

  * All keys are make as default.

Buffers

The buffers support the following functions:

- 16-byte FIFO buffer: stores 16 keystoke scan codes.
- Additional keystokes will be ignored.
- Response codes, i.e FA/FE... do not occupy buffer positions.

Basic Assurance Test - BAT

The following functions are offered by the Basic Assurance Test:

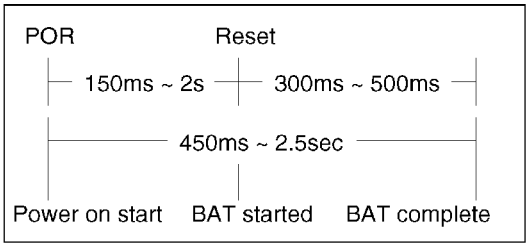
- Turns on LED status indicators.
- Keyboard processor test.
- RAM test.
- Turn off LED status indicators, i.e. the LEDs.
- Reports the BAT result to the system.

Notes

During the BAT, activity on the "clock" and "data" line is ignored. The LEDs are turned on at the beginning and off at the end of the BAT. The BAT takes a minimum of 300ms and a maximum of 500ms. The response to a satisfactory BAT completion is AA-completion and response to BAT failure is an FC-error. The reset keyboard command FF, will also cause the keyboard to execute the BAT. Completion codes are sent between 300 and 500ms after a reset command is acknowledged. After the BAT, the keyboard sets the keys to typematic and make/break, and sets the default typematic rate and delay.

Power-on

Two important activities take place when power is first applied to the keyboard. The first is the H/W signal POR (Power-On-Reset) resets the keyboard processor. The second is that the software BAT (Basic Assurance Test) runs a self test routine.



PC-type/Mode/Code Set

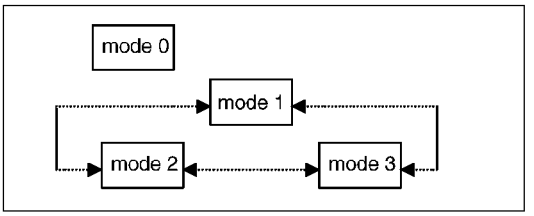
The following table describes the relationship between different computers types, the working mode and the code sets.

PC-XT	mode 0	code set 1
PS/2 30	mode 1	code set 1
PC-AT	mode 2	code set 2
PS/2 50	mode 2	code set 2
PS/2 60	mode 2	code set 2
PS/2 80	mode 3	code set 3

The mode can be changed between mode 2 and 3 but not to/from mode 0.

Keys

All keys except the PAUSE key have a make and break code. The PAUSE key has a make code only.



The defaults except for PAUSE are make/break/typematic. In mode 1,2 and 3 the key type may be changed to be one of the following:

- Typematic
- Make/break
- Make
- Typematic/make/break

All keys except PAUSE are typematic. Typematic means that the KB keeps sending make codes if the key is held down.

The data report is according the typematic rate/delay:

Default values are: delay 500ms ± 20%
10.9 char/sec ± 20%

The typematic rate and delay can be modified with the F3 command.

- If two or more keys are held down, only the last key pressed repeats at the typematic rate.
-

Typematic operation stops when the last key pressed is released even if other keys are still held down.

If a key is pressed and held down while keyboard transmission is inhibited, only the first make code is stored in the buffer overflow as a result of typematic action.

Four key types are suported as shown:

Key type	press	hold	release
Typematic	make1	make2	X
Make/break	make1	X	break
Make	make1	X	X
Typematic/ make/break	make1	make2	break

Note:

- make1 : send out only one make code.
- make2 : continue sending out make codes until key is released.
- x : nothing sent out.

Table of Commands from system

Note	Command	mode 0	mode 1	mode 2	mode 3
	FF – reset	x	y	y	y
	FE – resend	x	y	y	y
****	FD – set key type make	x	x	x	x
****	FC – set key type make/break	x	x	x	x
****	FB – set key type typematic	x	x	x	x
	FA – set all keys typematic/make/break	x	y	y	y
	F9 – set all keys make	x	y	y	y
	F8 – set all keys make/break	x	y	y	y
	F7 – set all keys typematic	x	y	y	y
	F6 – set default	x	y	y	y
	F5 – default disabled	x	y	y	y
	F4 – enable	x	y	y	y
	F3 – set typematic rate/delay	x	y	y	y
***	F2 – Read ID	x	y	y	y
**	F1 –	x	x	x	x
	F0 – select alternate scan codes	x	y	y	y
**	EF –	x	x	x	x
	EE – Echo	x	y	y	y
	ED – set/reset status indicators	x	y	y	y

Note:

**

F1 in the PC/AT standard is a NOP command, but it is an invalid command in the PS/2 standard. This is treated as an invalid command in every working mode

***

F2 in the PC/AT standard is a NOP command, but it is a Read ID command in the PS/2 standard. The HT6547A treats this command as a read ID command except in mode 0.

****

FB, FC, FD commands in the PS/2 standard are set key type commands. These commands are not supported.

The keyboard should respond within 20ms, except when performing the BAT or executing a reset command.

In mode 0 the HT6547A won't accept commands from the system. There are only two actions defined between the system and the HT6547A

- Clock Low: indicates the system is sequesting the HT6547A to execute a reset.
- Data Low: keyboard disabled.

Command Description

Default disable - F5

- send an acknowledge FA, to the system.
- clear it's output buffer, FIFO.
- sets the default key types.
- set typematic rate/delay as default value.
- clear the last typematic key.
- stop scanning and wait further instruction.

Echo - EE

- send an EE to the system
- continue scanning if the keyboard is enabled

  Note: this command does not need to feed back the ACK

Enable - F4

- send an ACK to the system
- clear output buffer
- clear the last typematic key
- start scanning

Invalid command

- send an FE to system
- no further activities.

  Note: no ACK

Read ID - F2

- send an ACK to system
- discontinue scanning
- 2 byte ID-AB, 83

  the 2nd byte must follow the completion of the first byte within 500ms
- resume scanning

Resend - FE

* send the last code to the system

Note: * no FA response.

Reset - FF

- disable keyboard
- send an ACK to the system, the keyboard acknowledges the command with an ACK and ensures the system accepts the ACK before executing the command
- the system sets CLK=DATA=high for 500ms: aceptance of ACK
- the system can issue any command to KB within the 500ms period mentioned above to override FF
- if no override, the system performs it's BAT and set to code 2 (even if it is set to be mode 3)

Select Alternate Scan Code - F0

- send an ACK to the system
- clears both output buffer and the typematic key
- accept option byte

Set all keys - F7, F8, F9, FA

- FA: set all keys to typematic/make/break
- F9: set all keys to make
- F8: set all keys to make/break
- F7: set all keys to typematic
- send an ACK to the system
- clear output buffer
- set all keys to the type indicated by the command

Set default - F6

- send an ACK to the system
- clear the output buffer
- set to default key states: default key type typematic rate/delay

Set LED - ED

- send ACK to the system
- discontinue scanning
- wait for the option from the system
- respond with ACK to the system
- set indicator
- if command comes from the system in place of option, discard the set LED function and then process the new command
- LED default after power on - all off

- set default disable - do not change the LEDs
- Set typematic rate/delay, F3
- send an ACK to the system
- stop scanning
- wait for the system typematic rate and delay
- send an ACK to the system
- set rate/delay
- bit 6,5 – delay
- bit 4,3,2,1,0 typematic rate
- bit 7=0 (always)

Delay= (1+bit6,bit5)×250ms

Typematic rate= 1/period

...where period= (8+A)×(2^B)×0.00417

...where A= binary value of bit 2, 1 and 0

...where B= binary value of bit 4 and 3

b4~b0	typematic rate	b4~b0	typematic rate
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

Default:

- delay: 500ms ± 20%
- typematic rate= 10.9 characters/sec ± 20%

Commands to the system

00: keyboard detect a error/overrun (set 2, set 3)

AB,83: keyboard ID

AA: BAT completion

FC: BAT failure

EE: Echo

FA: Acknowledge

FE: resend

FF: Keyboard detects a overrun (set 1)

- FA: acknowledge

  If KB (Keyboard) receives any valid input except EE (echo) and resend (FE) then send an FA to the system first.

  If the command is EE, then send an EE back to system.

  If the command is FE, then send the last key code to system.

  If there is an interrupt while sending FA, KB dircards the FA and accepts the command from the system and processes it.

- 00/FF: Key overrun

  If the keyboard detects an overrun error, KB sends a overrun error code to system.

  mode 0,1 : FF

  mode 2,3 : 00

- FE: resend

  KB issues an FE when there is a parity error in transmission.

Data Communications

Data output - AT/PS2 mode only

- If CLK=0, no transmission (keyboard inhibited).
- If CLK=1, DATA=0, no transmission (system request to send).
- If CLK=1, DATA=1, transmission permitted.
- Data will be valid before the trailing edge and beyond the leading edge of the clock.
- KB checks the clock line for an active level at least every 60ms.
- If line contention occurs (system brings the clock low before the tenth clock), set clock=data=high.

Data input - AT/PS2 only

- The system overrides the clock line for at least 60ms
- The keyboard checks the state of the "clock" line at intervals of no more than 10ms
- If a system Request-To-Send is detected, the keyboard counts 11 data bits.
- Data will be valid before the rising edge and beyond the falling edge Note it is not the same as data input.
- After the 10th bit, the keyboard checks for an active level on the "data" line. If the line is active it is forced to be inactive, and counts one more bit.

  Note:

  This action signals the system that the keyboard has received it's data. Upon reception of this signal, the system returns to the ready state, in which it can accept keyboard outputs or goes to the inhibit state until it is ready.
- If the keyboard "data" line is found to be at an inactive level following the 10th bit, a frame error has occurred, and the keyboard continues to count until the "data" line becomes active. The keyboard then makes the "data" line inactive and sends a Resend.

Data stream

Mode 0		Mode 1,2,3	
b1:	start bit allways 1	b1:	start bit allways 0
b2:	data bit 0	b2:	data bit 0
b3:	data bit 1	b3:	data bit 1
b4:	data bit 2	b4:	data bit 2
b5:	data bit 3	b5:	data bit 3
b6	data bit 4	b6	data bit 4
b7:	data bit 5	b7:	data bit 5
b8:	data bit 6	b8:	data bit 6
b9:	data bit 7	b9:	data bit 7
		b10:	parity bit (odd par)
		b11:	stop bit allways 1

Notes:

Mode 0 is a 9-bit data stream that does not have a parity bit or stop bit and whose start bit is always 1.

The parity bit is either 1 or 0, and the 8 data bits, plus the parity bit, always have an odd number of 1's.

Key Code Set 1

Key number	make/break code	Key number	make/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
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	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	2B / AB	120	43 / C3
43	1C / 9C	121	44 / C4
44	2A / AA	122	57 / D7
** 45	56 / D6	123	58 / D8
46	2C / AC	125	46 / C6

* 101–Key Keyboard Only
** 102–key Keyboard Only

Key Code Set 1

Key number	base case Shift+Num	Left-Shift	Right-Shift	Num Lock
75	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	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	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	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 80 /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	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	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
when both shift are keys held down: key number 75		Both Shift E0 AA E0 B6 E0 52 /E0 D2 E0 2A E0 36		

key number	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	base	+left-shift	+right-shift
124	E0 2A E0 37 /E0 B7 E0 AA	E0 37 /E0 B7	54/D4

key number	base	+Ctrl
126	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 Code Set 2

Key number	make/break code	Key number	make/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	5D / F0 5D	104	71 / F0 71
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	5D / F0 5D	120	01 / F0 01
43	5A / F0 5A	121	09 / F0 09
44	12 / F0 12	122	78 / F0 78
** 45	61 / F0 61	123	07 / F0 07
46	1A / F0 1A	125	7E / F0 7E

* 101–Key Keyboard Only
** 102–key Keyboard Only

Key Code Set 2

Key number	base case Shift+Num	Left-Shift	Right-Shift	Num Lock
75	E0 70 /E0 F0 72	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	E0 71 /E0 F0 71	E0 F0 12 E0 70 /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 70 /E0 F0 6B E0 12	E0 F0 59 E0 6B /E0 F0 6B E0 59	E0 12 E0 6B /E0 F0 6B E0 F0 12
80	E0 6C /E0 F0 6C	E0 F0 12 E0 70 /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	E0 69 /E0 F0 69	E0 F0 12 E0 70 /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 70 /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 70 /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	E0 7D /E0 F0 7D	E0 F0 12 E0 70 /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	E0 7A /E0 F0 7A	E0 F0 12 E0 70 /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 70 /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
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	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	base	+Shift / +Ctrl	+Alt
124	E0 12 E0 7C /E0 F0 7C E0 12	E0 7C /E0 F0 7C	84 / F0 84

key number	base	+Ctrl
126	E1 14 77 E1 F0 14 F0 77	E0 7E E0 F0 7E
Note: this key is not typematic, all associated scan codes occur on the make of the key.		

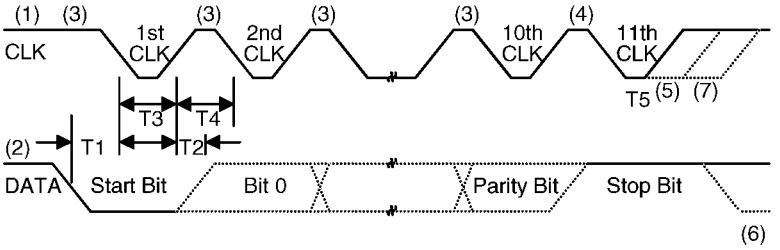
Key Code Set 3

Key #	make/break code	Note	Key #	make/break code	Note
1	0E / F0 0E		53	41 / F0 41	
2	16 / F0 16		54	49 / F0 49	
3	1E / F0 1E		55	4A / F0 4A	
4	26 / F0 26		57	59 / F0 59	
5	25 / F0 25		58	11 / F0 11	***
6	2E / F0 2E		60	19 / F0 19	***
7	36 / F0 36		61	29 / F0 29	
8	3D / F0 3D		62	39 / F0 39	***
9	3E / F0 3E		64	58 / E0 58	***
10	46 / F0 46		75	67 / F0 67	***
11	45 / F0 45		76	64 / F0 64	***
12	4E / F0 4E		79	61 / F0 61	***
13	55 / F0 55		80	6E / F0 6E	***
15	66 / F0 66		81	65 / F0 65	***
16	0D / F0 0D		83	63 / F0 63	***
17	15 / F0 15		84	60 / F0 60	***
18	1D / F0 1D		85	6F / F0 60	***
19	24 / F0 24		86	6D / F0 6D	***
20	2D / F0 2D		89	6A / F0 6A	***
21	2C / F0 2C		90	76 / F0 76	***
22	35 / F0 35		91	6C / F0 6C	
23	3C / F0 3C		92	6B / F0 6B	
24	43 / F0 43		93	69 / F0 69	
25	44 / F0 44		95	77 / F0 77	***
26	4D / F0 4D		96	75 / F0 75	
27	54 / F0 54		97	73 / F0 73	
28	5B / F0 5B		98	72 / F0 72	
* 29	5C / F0 5C	**	99	70 / F0 70	
30	14 / F0 14	**	100	7E / F0 7E	
31	1C / F0 1C		101	7D / F0 7D	
32	1B / F0 1B		102	74 / F0 74	
33	23 / F0 23		103	7A / F0 7A	
34	2B / F0 2B		104	71 / F0 71	
35	34 / F0 34		105	84 / F0 84	***
36	33 / F0 33		106	7C / F0 7C	***
37	3B / F0 3B		108	79 / F0 79	***
38	42 / F0 42		110	08 / F0 08	***
39	4B / F0 4B		112	07 / F0 07	***
40	4C / F0 4C		113	0F / F0 0F	***
41	52 / F0 52		114	17 / F0 17	***
** 42	5D / F0 5D	***	115	1F / F0 1F	***
43	5A / F0 5A		116	27 / F0 27	***
44	12 / F0 12		117	2F / F0 2F	***
** 45	13 / F0 13	***	118	37 / F0 /37	***
46	1A / F0 1A		119	3F / F0 3F	***
47	22 / F0 22		120	47 / F0 47	***
48	21 / F0 21		121	4F / F0 4F	***
49	2A / F0 2A		122	56 / F0 56	***
50	32 / F0 32		123	5E / F0 5E	***
51	31 / F0 31		124	57 / F0 57	***
52	3A / F0 3A		125	5F / F0 5F	***
			126	62 / F0 62	***

* 101–Key Keyboard Only
** 102–key Keyboard Only
*** different from code set 2

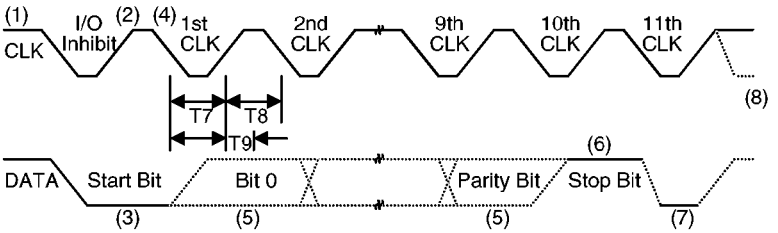
Timing Charts

Data output



	Timing Parameter	Min/Max
T1	DATA transition to the falling edge of CLK	5/25 μsec
T2	Rising edge of CLK to DATA transition	5/T4-5sec
T3	Duration of CLK inactive	30/50μsec
T4	Duration of CLK active	30/50μsec
T5	Time to auxiliary device inhibit after clock 11 to ensure the auxiliary device does not start another transmission	>0/50μsec

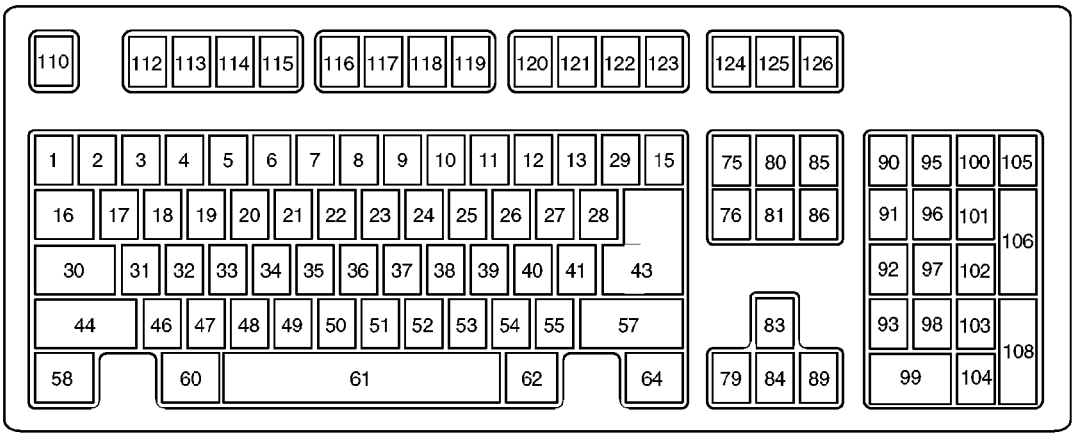
Keyboard data input



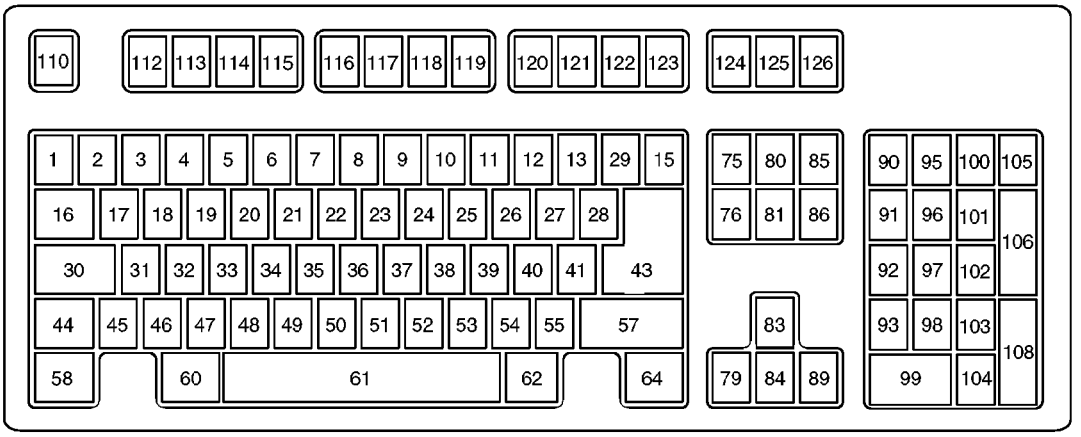
	Timing Parameter	Min/Max
T7	Duration of CLK inactive	30/50μsec
T8	Duration of CLK active	30/50μsec
T9	Time from inactive to active CLK transition, used to time when the auxiliary device samples DATA	5/25 μsec

The Keyboard Layout

1. The 101 key keyboard



2. The 102 key keyboard



Application Circuit