



## **KEYBOARD CONTROLLER**

### **GENERAL DESCRIPTION**

The W83C43 is a keyboard controller designed to provide the functions needed to interface a CPU to a keyboard or to a PS/2 mouse. The W83C43 can be used with IBM®-compatible personal computers or PS/2-based systems. The controller receives serial data from the keyboard or PS/2 mouse, checks the parity of the data, and presents the data to the system as a byte of data in its output buffer. The controller will interrupt the system when data are placed in its output buffer. The keyboard and PS/2 mouse are required to acknowledge all data transmissions. No transmission should be sent to the keyboard or PS/2 mouse until acknowledge is received for the previous byte sent.

This fast keyboard controller can improve the performance of IBM PC/AT® 386™ DX/SX and 486™ DX/SX machines and their compatibles. Hardwire methodology is used in this controller instead of software implementation, as in the traditional 8042 keyboard BIOS. With full hardware implementation, this enables the keyboard controller to respond instantly to all commands sent from the keyboard and PS/2 mouse to the CPU BIOS.

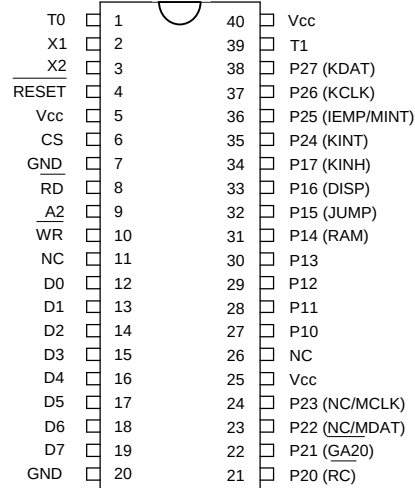
The keyboard controller enables popular programs such as AutoCAD®, Microsoft® Windows™ 3.1, NOVELL®, and other programs to run much faster.

### **FEATURES**

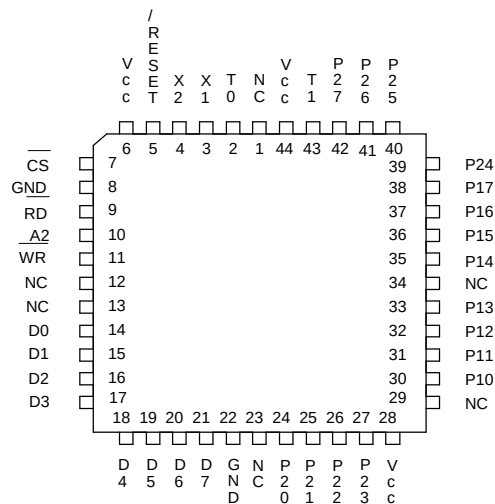
- Supports IBM PC/AT 386 DX/SX and 486 DX/SX system designs
- Full hardwire design based on advanced VLSI CMOS technology
- Supports PS/2 Mouse
- 6 MHz to 12 MHz operating frequency
- Supports AT mode and PS/2 mode for different hardware configurations
- Automatically detects PS/2 mode or AT mode
- Much faster than traditional keyboard controller
- Packaged in 40-pin DIP or 44-pin PLCC

## PIN CONFIGURATIONS

### 40-pin DIP



### 44-pin PLCC



## PIN DESCRIPTION

| PIN NO.                        |                                | I/O | NAME                      | FUNCTION                                                   |                                                            |
|--------------------------------|--------------------------------|-----|---------------------------|------------------------------------------------------------|------------------------------------------------------------|
| (40-pin DIP)                   | (44-pin PLCC)                  |     |                           | AT MODE                                                    | PS/2 MODE                                                  |
| 1                              | 2                              | I   | T0                        | K/B Clock Input                                            | K/B Clock Input                                            |
| 2                              | 3                              | I   | X1                        | Crystal Clock I/P                                          | Crystal Clock I/P                                          |
| 3                              | 4                              | I   | X2                        | Crystal Clock I/P                                          | Crystal Clock I/P                                          |
| 4                              | 5                              | I   | $\overline{\text{RESET}}$ | Chip Reset                                                 | Chip Reset                                                 |
| 5                              | 6                              | -   | Vcc                       | Optional +5V Power Supply                                  | Optional + 5V Power Supply                                 |
| 6                              | 7                              | I   | $\overline{\text{CS}}$    | Chip Select                                                | Chip Select                                                |
| 7                              | 8                              | -   | GND                       | Optional Ground Power                                      | Optional Ground Power                                      |
| 8                              | 9                              | I   | $\overline{\text{RD}}$    | I/O Read                                                   | I/O Read                                                   |
| 9                              | 10                             | I   | A2                        | Connect to Address A2                                      | Connect to Address A2                                      |
| 10                             | 11                             | I   | $\overline{\text{WR}}$    | I/O Write                                                  | I/O Write                                                  |
| 11, 26                         | 1, 12, 13, 23, 29, 34          | -   | NC                        | Reserved                                                   | Reserved                                                   |
| 12, 13, 14, 15, 16, 17, 18, 19 | 14, 15, 16, 17, 18, 19, 20, 21 | I/O | D0–D7                     | Data Bus D0–D7                                             | Data Bus D0–D7                                             |
| 20                             | 22                             | -   | GND                       | Ground Power Supply                                        | Ground Power Supply                                        |
| 21                             | 24                             | O   | P20                       | Bit 0 of Port2<br>( $\overline{\text{RC}}$ : System Reset) | Bit 0 of Port2<br>( $\overline{\text{RC}}$ : System Reset) |
| 22                             | 25                             | O   | P21                       | Bit 1 of Port2<br>( $\overline{\text{GA20}}$ : GATE A20)   | Bit 1 of Port2<br>( $\overline{\text{GA20}}$ : GATE A20)   |
| 23                             | 26                             | I/O | P22                       | Bit 2 of Port2<br>(NC: User-defined I/O)                   | Bit 2 of Port2<br>(MDAT: Mouse Data Output)                |
| 24                             | 27                             | I/O | P23                       | Bit 3 of Port2<br>(NC: User-defined I/O)                   | Bit 3 of Port2<br>(MCLK: Mouse Clock Output)               |
| 25                             | 28                             | -   | Vcc                       | Optional +5V Power Supply                                  | Optional + 5V Power Supply                                 |

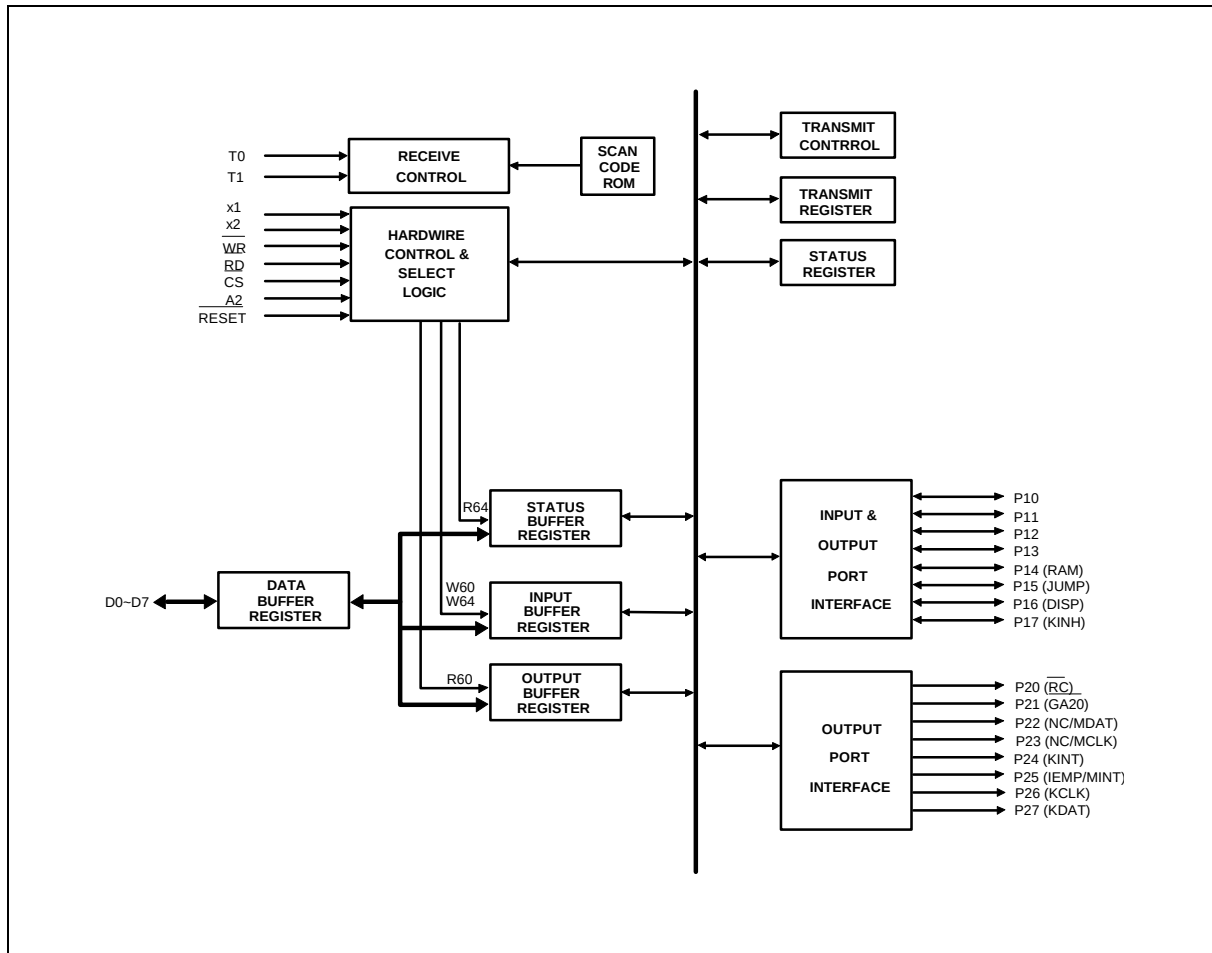


Pin Description, continued

| PIN NO.      |               | I/O        | NAME | FUNCTION                                        |                                                   |
|--------------|---------------|------------|------|-------------------------------------------------|---------------------------------------------------|
| (40-pin DIP) | (44-pin PLCC) |            |      | AT MODE                                         | PS/2 MODE                                         |
| 27           | 30            | I/O<br>PU* | P10  | Bit 0 of Port1<br>(User-defined I/O)            | Bit 0 of Port1<br>(K/B Data Input)                |
| 28           | 31            | I/O<br>PU* | P11  | Bit 1 of Port1<br>(User-defined I/O)            | Bit 1 of Port1<br>(Mouse Data Input)              |
| 29           | 32            | I/O        | P12  | Bit 2 of Port2<br>(User-defined I/O)            | Bit 2 of Port2<br>(User-defined I/O)              |
| 30           | 33            | I/O        | P13  | Bit 3 of Port1<br>(User-defined I/O)            | Bit 3 of Port1<br>(User-defined I/O)              |
| 31           | 35            | I<br>PU*   | P14  | Bit 4 of Port1<br>(RAM: RAM Jumper Select)      | Bit 4 of Port1<br>(RAM: RAM Jumper Select)        |
| 32           | 36            | I<br>PU*   | P15  | Bit 5 of Port1<br>(JUMP: Jumper)                | Bit 5 of Port1<br>(JUMP: Jumper)                  |
| 33           | 37            | I<br>PU*   | P16  | Bit 6 of Port1<br>(DISP: Display Select)        | Bit 6 of Port1<br>(DISP: Display Select)          |
| 34           | 38            | I<br>PU*   | P17  | Bit 7 of Port1<br>(KINH: K/B Inhibit Switch)    | Bit 7 of Port1<br>(KINH: K/B Inhibit Switch)      |
| 35           | 39            | O          | P24  | Bit 4 of Port2<br>(KINT: K/B OBF O/P Interrupt) | Bit 4 of Port2<br>(KINT: K/B OBF O/P Interrupt)   |
| 36           | 40            | O          | P25  | Bit 5 of Port2<br>(IEMP: I/P Buffer Empty)      | Bit 5 of Port2<br>(MINT: Mouse OBF O/P Interrupt) |
| 37           | 41            | O          | P26  | Bit 6 of Port2<br>(KCLK: K/B Clock Output)      | Bit 6 of Port2<br>(KCLK: K/B Clock Output)        |
| 38           | 42            | O          | P27  | Bit 7 of Port2<br>(KDAT: K/B Data Output)       | Bit 7 of Port2<br>(KDAT: K/B Data Output)         |
| 39           | 43            | I          | T1   | K/B Data Input                                  | Mouse Clock Input                                 |
| 40           | 44            | -          | Vcc  | +5V Power Supply                                | +5V Power Supply                                  |

\* Internal pull-up resistor

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                          | RATING        | UNIT |
|------------------------------------|---------------|------|
| Ambient Operating Temperature      | -0 to + 85    | °C   |
| Storage Temperature                | -65 to + 150  | °C   |
| Supply Voltage to Ground Potential | -0.3 to + 7.0 | V    |
| Applied Input/Output Voltage       | -0.3 to + 7.0 | V    |
| Power Dissipation                  | 50            | mW   |

Note: Exposure to conditions beyond those listed under Absolute Maximum Ratings may adversely affect the life and reliability of the device.

## ELECTRICAL CHARACTERISTICS & CAPACITANCE

(Ta = 0° C to + 70° C, VDD = +5V ± 5%)

| SYMBOL | DESCRIPTION                                               | MIN. | TYP. | MAX. | UNIT | NOTE                  |
|--------|-----------------------------------------------------------|------|------|------|------|-----------------------|
| VDD    | Power Supply                                              | 4.75 | 5.0  | 5.25 | V    |                       |
| VIL    | Input Low Voltage (except RESET, T0, T1)                  |      |      | 0.8  | V    |                       |
| VIL1   | Input Low Voltage (RESET, T0, T1)                         |      |      | 0.6  | V    |                       |
| VIH1   | Input High Voltage (except RESET, T0, T1, P10, P11)       | 2.0  |      |      | V    |                       |
| VIH2   | Input High Voltage (P10, P11)                             | 3.0  |      |      | V    |                       |
| VIH3   | Input High Voltage (T0, T1, RESET)                        | 3.5  |      |      | V    |                       |
| VOH1   | Output High Voltage (P10–P13, P20–P27)                    |      |      | 2.4  | V    | IOH = -2 mA           |
| VOH2   | Output High Voltage (D0–D7)                               |      |      | 2.4  | V    | IOH = -4 mA           |
| VOL1   | Output Low Voltage (P10–P13, P20–P27)                     | 0.4  |      |      | V    | IOL = 2 mA            |
| VOL2   | Output Low Voltage (D0–D7)                                | 0.4  |      |      | V    | IOL = 4 mA            |
| RIP    | Min. I/P Resist                                           | 10K  |      |      | Ω    |                       |
| IOFL   | O/P Leakage Current (D0–D7, High Z State)                 | -10  |      | 10   | μA   |                       |
| IiH    | I/P Leakage Current                                       | -10  |      | 10   | μA   | VDD = 5.5V, VIN = VDD |
| IiL    | I/P Leakage Current (Except P10, P11, P14, P15, P16, P17) | -10  |      | 10   | μA   | VDD = 5.5V, VIN = VSS |
| IiL1   | I/P Leakage Current (P10, P11, P14, P15, P16, P17)        | -10  |      | 550  | μA   | VDD = 5.5V, VIN = VSS |
| CL     | O/P Load Capacity                                         | 15   |      | 50   | pF   |                       |

## STATUS REGISTER (AT MODE)

The status register is an 8-bit read-only register at I/O address hex 64 that holds information about the status of the keyboard controller and interface. It may be read at any time.

| BIT | BIT FUNCTION       | DESCRIPTION                                     |
|-----|--------------------|-------------------------------------------------|
| 0   | Output Buffer Full | 0: Output buffer empty<br>1: Output buffer full |
| 1   | Input Buffer Full  | 0: Input buffer empty<br>1: Input buffer full   |



Status Register (AT Mode), continued

| BIT | BIT FUNCTION      | DESCRIPTION                                                                                                                                           |
|-----|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2   | System Flag       | This bit may be set to 0 or 1 by writing to the system flag bit in the command byte of the keyboard controller. It is set to 0 after a power-on reset |
| 3   | Command/data      | 0: Data byte<br>1: Command byte                                                                                                                       |
| 4   | Inhibit Switch    | 0: Keyboard is inhibited<br>1: Keyboard is not inhibited                                                                                              |
| 5   | Transmit Time-out | 0: No transmit time-out error<br>1: Transmit time-out error                                                                                           |
| 6   | Receive Time-out  | 0: No receive time-out error<br>1: Receive time-out error                                                                                             |
| 7   | Parity Error      | 0: Odd parity (no error)<br>1: Even parity (error)                                                                                                    |

## OUTPUT BUFFER

The output buffer is an 8-bit read-only register at I/O address hex 60. The keyboard controller uses the output buffer to send the scan code received from the keyboard and data bytes required by commands to the system. The output buffer should be read only when the output buffer full bit in the register is 1.

## INPUT BUFFER

The input buffer is an 8-bit write-only register at I/O address hex 60 or 64. Writing to address hex 60 sets a flag that indicates a data write; writing to address hex 64 sets a flag that indicates a command write. Data written to I/O address hex 60 are sent to the keyboard (unless the keyboard controller is expecting a data byte) following the controller's input buffer only if the input buffer full bit in the status register is set to 0.

### (A) Input Port Definition (AT Mode)

| BIT | FUNCTION                                                                                                           |
|-----|--------------------------------------------------------------------------------------------------------------------|
| 0   | Undefined                                                                                                          |
| 1   | Undefined                                                                                                          |
| 2   | Undefined                                                                                                          |
| 3   | Undefined                                                                                                          |
| 4   | RAM on System Board<br>0: Disable second 256 KB of system board RAM<br>1: Enable second 256 KB of system board RAM |



(A) Input Port Definition (AT Mode), continued

| BIT | FUNCTION                                                                                                          |
|-----|-------------------------------------------------------------------------------------------------------------------|
| 5   | Manufacturing Jumper Installed<br>0: Manufacturing jumper<br>1: Jumper not installed                              |
| 6   | Display Type Switch<br>0: Primary display attached to color/graphics<br>1: Primary display attached to monochrome |
| 7   | Keyboard Inhibit Switch<br>0: Keyboard inhibited<br>1: Keyboard not inhibited                                     |

(B) Output Port Definition (AT Mode)

| BIT | FUNCTION                |
|-----|-------------------------|
| 0   | System Reset            |
| 1   | Gate A20                |
| 2   | Undefined               |
| 3   | Undefined               |
| 4   | Output Buffer Full      |
| 5   | Input Buffer Empty      |
| 6   | Keyboard Clock (Output) |
| 7   | Keyboard Data (Output)  |

(C) Test-input Port Definition (AT Mode)

| BIT | FUNCTION               |
|-----|------------------------|
| 0   | Keyboard Clock (Input) |
| 1   | Keyboard Data (Input)  |

Status Register (PS/2 Mode)

| BIT | BIT FUNCTION       | DESCRIPTION                                                                                                                                            |
|-----|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0   | Output Buffer Full | 0: Output buffer empty<br>1: Output buffer full                                                                                                        |
| 1   | Input Buffer Full  | 0: Input buffer empty<br>1: Input buffer full                                                                                                          |
| 2   | System Flag        | This bit may be set to 0 or 1 by writing to the system flag bit in the command byte of the keyboard controller. It is set to 0 after a power-on reset. |





Status Register (PS/2 Mode), continued

| BIT | BIT FUNCTION                   | DESCRIPTION                                                                       |
|-----|--------------------------------|-----------------------------------------------------------------------------------|
| 3   | Command/Data                   | 0: Data byte<br>1: Command byte                                                   |
| 4   | Inhinit Switch                 | 0: Keyboard is inhibited<br>1: Keyboard is not inhibited                          |
| 5   | Auxiliary Device Output Buffer | 0: Auxiliary device output buffer empty<br>1: Auxiliary device output buffer full |
| 6   | General Purpose Time-out       | 0: No time-out error<br>1: Time-out error                                         |
| 7   | Parity Error                   | 0: Odd parity<br>1: Even parity (error)                                           |

## Input Port Definition

| BIT | FUNCTION                                                                                                           |
|-----|--------------------------------------------------------------------------------------------------------------------|
| 0   | Keyboard Data Input                                                                                                |
| 1   | Mouse Data Input                                                                                                   |
| 2   | Undefined                                                                                                          |
| 3   | Undefined                                                                                                          |
| 4   | RAM on System Board<br>0: Disable second 256 KB of system board RAM<br>1: Enable second 256 KB of system board RAM |
| 5   | Manufacturing Jumper<br>0: Manufacturing jumper<br>1: Jumper not installed                                         |
| 6   | Display Type Switch<br>0: Primary display attached to color/graphics<br>1: Primary display attached to monochrome  |
| 7   | Keyboard Input Switch<br>0: Keyboard inhibited<br>1: Keyboard not inhibited                                        |

## Output Port Definition

| BIT | FUNCTION           |
|-----|--------------------|
| 0   | System Reset       |
| 1   | Gate A20           |
| 2   | Mouse Data Output  |
| 3   | Mouse Clock Output |



Output Port Definition, continued

| BIT | FUNCTION                              |
|-----|---------------------------------------|
| 4   | Keyboard Output Buffer Full Interrupt |
| 5   | Mouse Output Buffer Full Interrupt    |
| 6   | Keyboard Clock Output                 |
| 7   | Keyboard Data Output                  |

## Test-input Port Definition

| BIT | FUNCTION             |
|-----|----------------------|
| 0   | Keyboard Clock Input |
| 1   | Mouse Clock Input    |

## Commands (I/O Address HEX 64) (AT Mode)

| COMMAND | FUNCTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------|----|-------------------|----|-----------------------------|----|------------------------------|----|----------------------------|----|-----------------------------|---|-------------|---|----------|---|-------------------------------------|
| 20      | Read Command Byte of Keyboard Controller                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 60      | Write Command Byte of Keyboard Controller <table border="1"> <tr> <th>BIT</th><th>BIT DEFINITION</th></tr> <tr> <td>7</td><td>Reserved</td></tr> <tr> <td>6</td><td>IBM PC Compatible Mode</td></tr> <tr> <td>5</td><td>IBM PC Mode</td></tr> <tr> <td>4</td><td>Disable Keyboard</td></tr> <tr> <td>3</td><td>Inhibit Override</td></tr> <tr> <td>2</td><td>System Flag</td></tr> <tr> <td>1</td><td>Reserved</td></tr> <tr> <td>0</td><td>Enable Output Buffer Full Interrupt</td></tr> </table> | BIT | BIT DEFINITION | 7  | Reserved          | 6  | IBM PC Compatible Mode      | 5  | IBM PC Mode                  | 4  | Disable Keyboard           | 3  | Inhibit Override            | 2 | System Flag | 1 | Reserved | 0 | Enable Output Buffer Full Interrupt |
| BIT     | BIT DEFINITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 7       | Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 6       | IBM PC Compatible Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 5       | IBM PC Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 4       | Disable Keyboard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 3       | Inhibit Override                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 2       | System Flag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 1       | Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 0       | Enable Output Buffer Full Interrupt                                                                                                                                                                                                                                                                                                                                                                                                                                                                |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| AA      | Self-test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| AB      | Interface Test <table border="1"> <tr> <th>BIT</th><th>BIT DEFINITION</th></tr> <tr> <td>00</td><td>No Error Detected</td></tr> <tr> <td>01</td><td>K/B Clock Line is Stuck Low</td></tr> <tr> <td>02</td><td>K/B Clock Line is Stuck High</td></tr> <tr> <td>03</td><td>K/B Data Line is Stuck Low</td></tr> <tr> <td>04</td><td>K/B Data Line is Stuck High</td></tr> </table>                                                                                                                   | BIT | BIT DEFINITION | 00 | No Error Detected | 01 | K/B Clock Line is Stuck Low | 02 | K/B Clock Line is Stuck High | 03 | K/B Data Line is Stuck Low | 04 | K/B Data Line is Stuck High |   |             |   |          |   |                                     |
| BIT     | BIT DEFINITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 00      | No Error Detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 01      | K/B Clock Line is Stuck Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 02      | K/B Clock Line is Stuck High                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 03      | K/B Data Line is Stuck Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| 04      | K/B Data Line is Stuck High                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| AD      | Disable Keyboard Feature                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |
| AE      | Enable Keyboard Interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |                |    |                   |    |                             |    |                              |    |                            |    |                             |   |             |   |          |   |                                     |



Commands (I/O Address HEX 64) (AT Mode), continued

| COMMAND | FUNCTION          |
|---------|-------------------|
| C0      | Read Input Port   |
| D0      | Read Output Port  |
| D1      | Write Output Port |
| E0      | Read Test Inputs  |
| F0-FF   | Pulse Output Port |

## Commands (I/O Address HEX 64) (PS/2 Mode)

| COMMAND | FUNCTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------|----|-------------------|----|--------------------------------------------|----|---------------------------------------------|----|-------------------------------------------|----|-------------------------------------------|---|-------------|---|----------------------------|---|---------------------------|
| 20      | Read Command Byte of Keyboard Controller                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 60      | Write Command Byte of Keyboard Controller <table border="1"> <thead> <tr> <th>BIT</th><th>BIT DEFINITION</th></tr> </thead> <tbody> <tr> <td>7</td><td>Reserved</td></tr> <tr> <td>6</td><td>IBM Keyboard Translate Mode</td></tr> <tr> <td>5</td><td>Disable Auxiliary Device</td></tr> <tr> <td>4</td><td>Disable Keyboard</td></tr> <tr> <td>3</td><td>Reserve</td></tr> <tr> <td>2</td><td>System Flag</td></tr> <tr> <td>1</td><td>Enable Auxiliary Interrupt</td></tr> <tr> <td>0</td><td>Enable Keyboard Interrupt</td></tr> </tbody> </table> | BIT | BIT DEFINITION | 7  | Reserved          | 6  | IBM Keyboard Translate Mode                | 5  | Disable Auxiliary Device                    | 4  | Disable Keyboard                          | 3  | Reserve                                   | 2 | System Flag | 1 | Enable Auxiliary Interrupt | 0 | Enable Keyboard Interrupt |
| BIT     | BIT DEFINITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 7       | Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 6       | IBM Keyboard Translate Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 5       | Disable Auxiliary Device                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 4       | Disable Keyboard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 3       | Reserve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 2       | System Flag                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 1       | Enable Auxiliary Interrupt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 0       | Enable Keyboard Interrupt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| A7      | Disable Auxiliary Device Interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| A8      | Enable Auxiliary Device Interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| A9      | Interface Test <table border="1"> <thead> <tr> <th>BIT</th><th>BIT DEFINITION</th></tr> </thead> <tbody> <tr> <td>00</td><td>No Error Detected</td></tr> <tr> <td>01</td><td>Auxiliary Device "Clock" line is stuck low</td></tr> <tr> <td>02</td><td>Auxiliary Device "Clock" line is stuck high</td></tr> <tr> <td>03</td><td>Auxiliary Device "Data" line is stuck low</td></tr> <tr> <td>04</td><td>Auxiliary Device "Data" line is stuck low</td></tr> </tbody> </table>                                                                         | BIT | BIT DEFINITION | 00 | No Error Detected | 01 | Auxiliary Device "Clock" line is stuck low | 02 | Auxiliary Device "Clock" line is stuck high | 03 | Auxiliary Device "Data" line is stuck low | 04 | Auxiliary Device "Data" line is stuck low |   |             |   |                            |   |                           |
| BIT     | BIT DEFINITION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 00      | No Error Detected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 01      | Auxiliary Device "Clock" line is stuck low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 02      | Auxiliary Device "Clock" line is stuck high                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 03      | Auxiliary Device "Data" line is stuck low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| 04      | Auxiliary Device "Data" line is stuck low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |
| AA      | Self-test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |     |                |    |                   |    |                                            |    |                                             |    |                                           |    |                                           |   |             |   |                            |   |                           |



Commands (I/O Address HEX 64) (PS/2 Mode), continued

| COMMAND | FUNCTION                                                                                                                                                                                                                                                                                                                                                                                                     |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------|----|-------------------|----|------------------------------------|----|-------------------------------------|----|-----------------------------------|----|------------------------------------|
| AB      | Interface Test <table border="1"> <tr> <th>BIT</th><th>BIT DEFINITION</th></tr> <tr> <td>00</td><td>No Error Detected</td></tr> <tr> <td>01</td><td>Keyboard "Clock" line is stuck low</td></tr> <tr> <td>02</td><td>Keyboard "Clock" line is stuck high</td></tr> <tr> <td>03</td><td>Keyboard "Data" line is stuck low</td></tr> <tr> <td>04</td><td>Keyboard "Data" line is stuck high</td></tr> </table> | BIT | BIT DEFINITION | 00 | No Error Detected | 01 | Keyboard "Clock" line is stuck low | 02 | Keyboard "Clock" line is stuck high | 03 | Keyboard "Data" line is stuck low | 04 | Keyboard "Data" line is stuck high |
| BIT     | BIT DEFINITION                                                                                                                                                                                                                                                                                                                                                                                               |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| 00      | No Error Detected                                                                                                                                                                                                                                                                                                                                                                                            |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| 01      | Keyboard "Clock" line is stuck low                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| 02      | Keyboard "Clock" line is stuck high                                                                                                                                                                                                                                                                                                                                                                          |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| 03      | Keyboard "Data" line is stuck low                                                                                                                                                                                                                                                                                                                                                                            |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| 04      | Keyboard "Data" line is stuck high                                                                                                                                                                                                                                                                                                                                                                           |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| AD      | Disable Keyboard Interface                                                                                                                                                                                                                                                                                                                                                                                   |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| AE      | Enable Keyboard Interface                                                                                                                                                                                                                                                                                                                                                                                    |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| C0      | Read Input Port                                                                                                                                                                                                                                                                                                                                                                                              |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| C1      | Poll Input Port Low                                                                                                                                                                                                                                                                                                                                                                                          |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| C2      | Poll Input Port High                                                                                                                                                                                                                                                                                                                                                                                         |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| D0      | Read Output Port                                                                                                                                                                                                                                                                                                                                                                                             |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| D1      | Write Output Port                                                                                                                                                                                                                                                                                                                                                                                            |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| D2      | Write Keyboard Output Buffer                                                                                                                                                                                                                                                                                                                                                                                 |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| D3      | Write Auxiliary Device Output Buffer                                                                                                                                                                                                                                                                                                                                                                         |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| D4      | Write to Auxiliary Device                                                                                                                                                                                                                                                                                                                                                                                    |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| E0      | Read Test Inputs                                                                                                                                                                                                                                                                                                                                                                                             |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |
| F0-FF   | Pulse Output Port                                                                                                                                                                                                                                                                                                                                                                                            |     |                |    |                   |    |                                    |    |                                     |    |                                   |    |                                    |

## AC TIMING

| NO. | DESCRIPTION                 | MIN. | MAX. | UNIT |
|-----|-----------------------------|------|------|------|
| T1  | Address Setup Time from WRB | 0    |      | nS   |
| T2  | Address Setup Time from RDB | 0    |      | nS   |
| T3  | WRB Strobe Width            | 20   |      | nS   |
| T4  | RDB Strobe Width            | 20   |      | nS   |
| T5  | Address Hold Time from WRB  | 0    |      | nS   |
| T6  | Address Hold Time from RDB  | 0    |      | nS   |
| T7  | Data Setup Time             | 50   |      | nS   |
| T8  | Data Hold Time              | 0    |      | nS   |
| T9  | Gate Delay Time from WRB    | 10   | 30   | nS   |

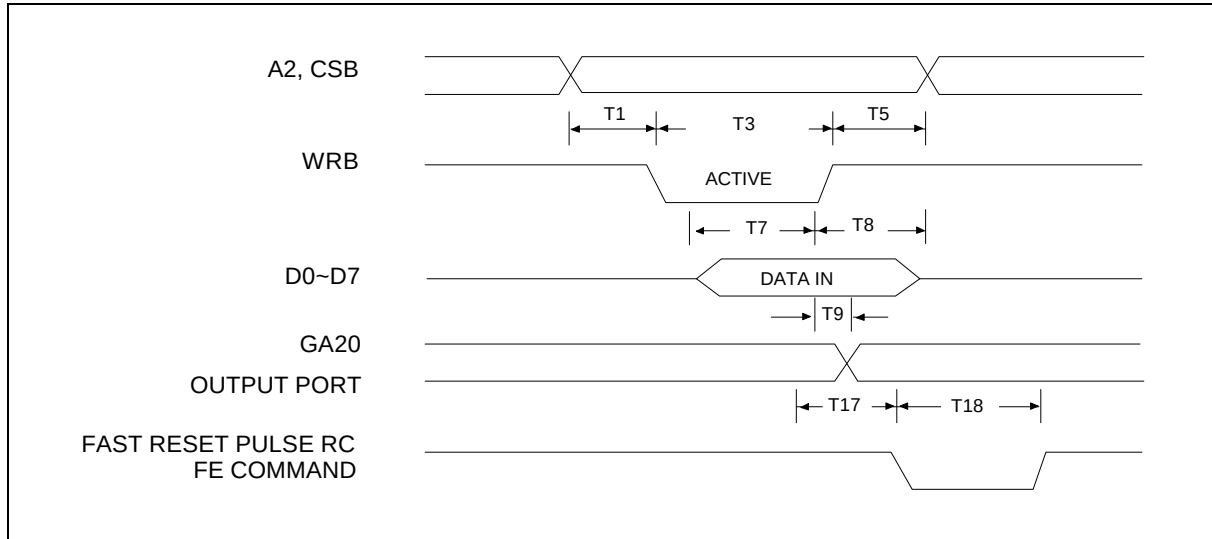


## AC Timing, continued

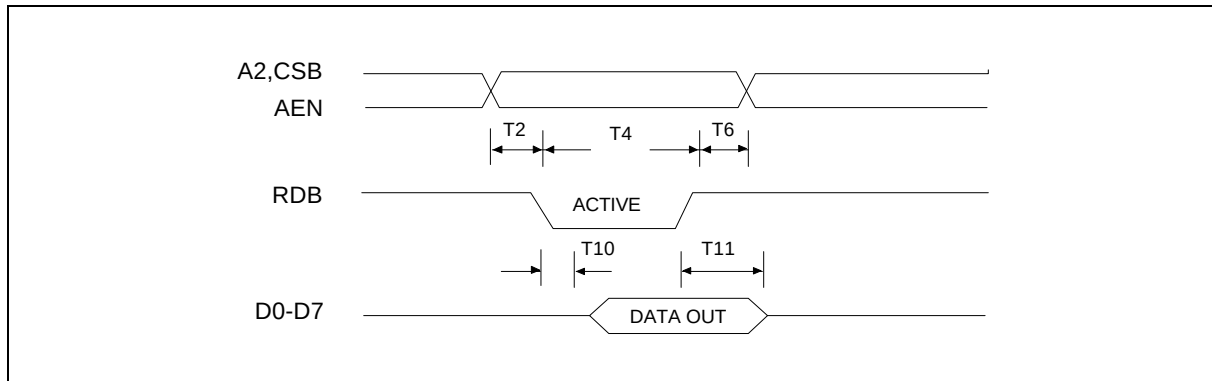
| NO. | DESCRIPTION                                                                           | MIN.           | MAX.  | UNIT |
|-----|---------------------------------------------------------------------------------------|----------------|-------|------|
| T10 | RDB to Drive Data Delay                                                               |                | 40    | nS   |
| T11 | RDB to Floating Data Delay                                                            | 0              | 20    | nS   |
| T12 | Data Valid After Clock Falling (SEND)                                                 |                | 4     | μS   |
| T13 | K/B Clock Period                                                                      | 20             |       | μS   |
| T14 | K/B Clock Pulse Width                                                                 | 10             |       | μS   |
| T15 | Data Valid Before Clock Falling (RECEIVE)                                             | 4              |       | μS   |
| T16 | K/B ACK After Finish Receiving                                                        | 20             |       | μS   |
| T17 | RC Fast Reset Pulse Delay (8 MHz)                                                     | 2              | 3     | μS   |
| T18 | RC Pulse Width (8 MHz)                                                                | 6              |       | μS   |
| T19 | Transmit Timeout                                                                      |                | 2     | mS   |
| T20 | Data Valid Hold Time                                                                  | 0              |       | μS   |
| T21 | X1/X2 Period (6–12 MHz)                                                               | 83             | 167   | nS   |
| T22 | Duration of CLK inactive                                                              | 30             | 50    | μS   |
| T23 | Duration of CLK active                                                                | 30             | 50    | μS   |
| T24 | Time from inactive CLK transition, used to time when the auxiliary device sample DATA | 5              | 25    | μS   |
| T25 | Time of inhibit mode                                                                  | 100            | 300   | μS   |
| T26 | Time from rising edge of CLK to DATA transition                                       | 5              | T28-5 | μS   |
| T27 | Duration of CLK inactive                                                              | 30             | 50    | μS   |
| T28 | Duration of CLK active                                                                | 30             | 50    | μS   |
| T29 | Time from DATA transition to falling edge of CLK                                      | 5              | 25    | μS   |
| T30 | Mode detect signal after P10 goes high                                                | Typical 1 mS   |       |      |
| T31 | High pulse of mode detect signal                                                      | Typical 220 μS |       |      |
| T32 | Low pulse of mode detect signal                                                       | Typical 220 μS |       |      |
| T33 | Mode detect signal after RESET goes high                                              | Typical 1 mS   |       |      |
| T34 | Time out of AT mode' s mode detect signal                                             | Typical 64 mS  |       |      |

## TIMING WAVEFORMS

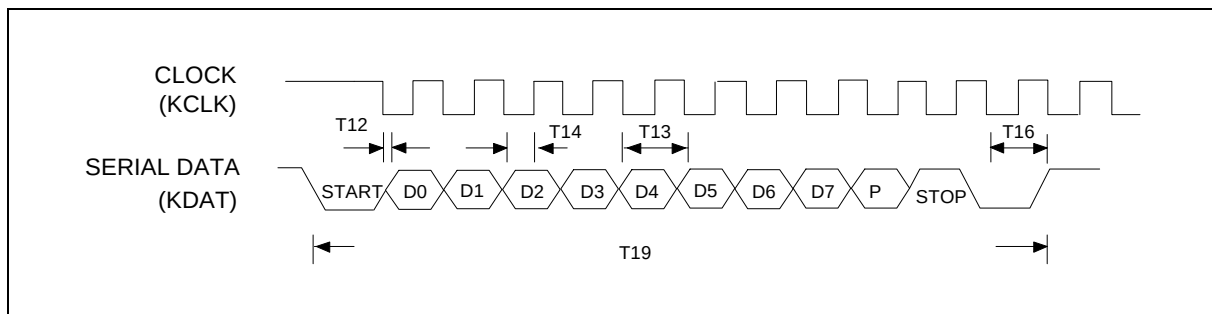
### Write Cycle Timing



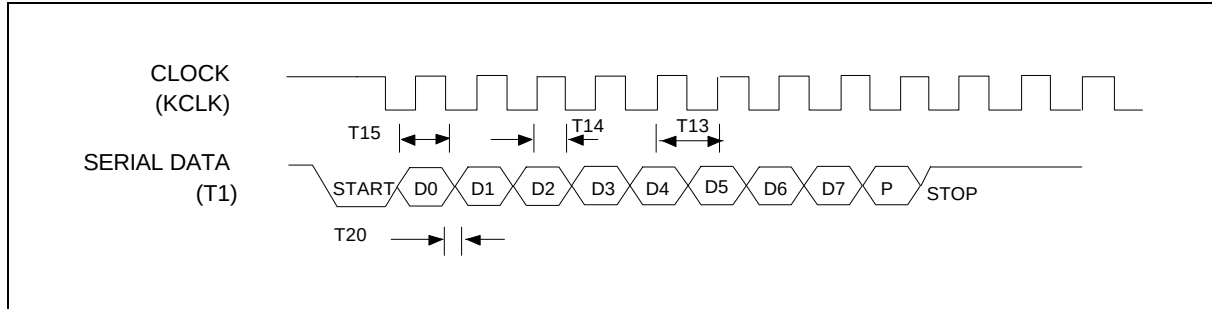
### Read Cycle Timing



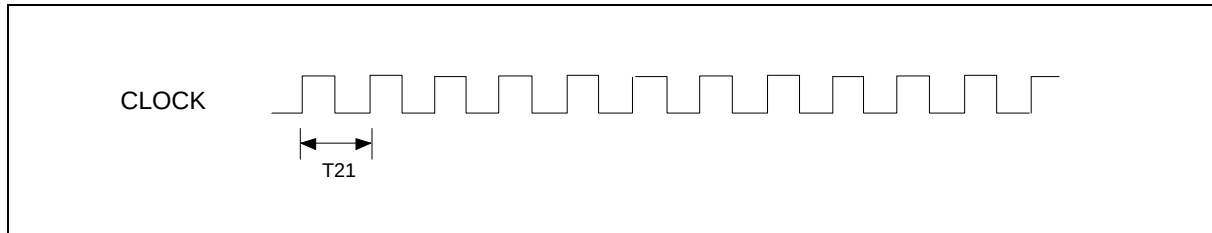
### Send Data to K/B



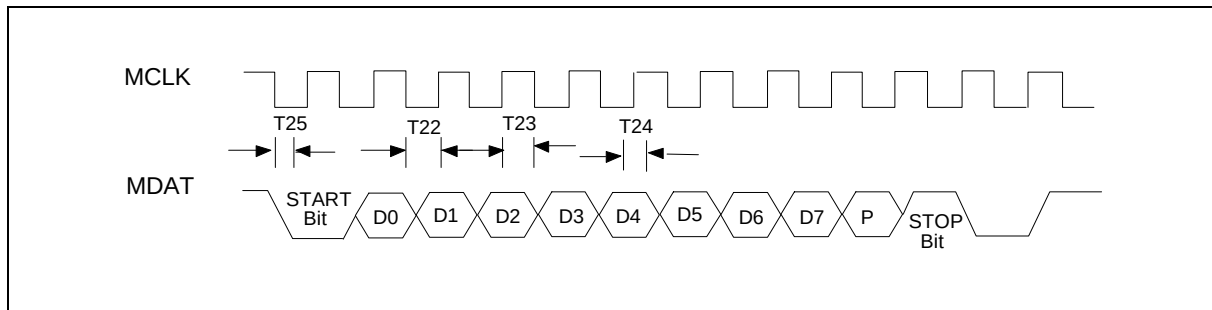
## Receive Data from K/B



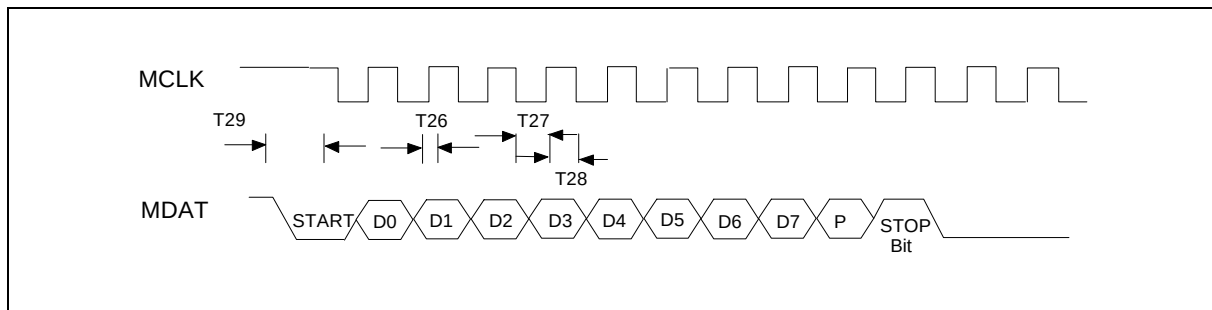
## X1/X2 Clock



## Send Data to Mouse

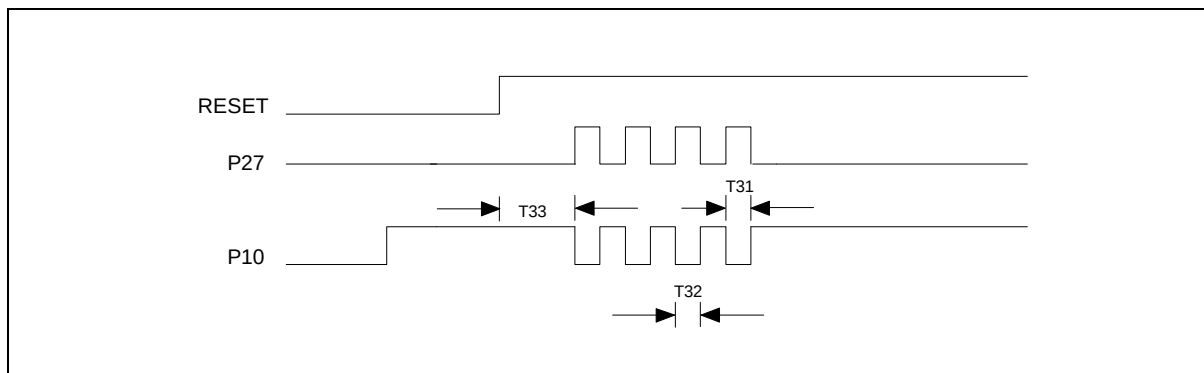


## Receive Data from Mouse



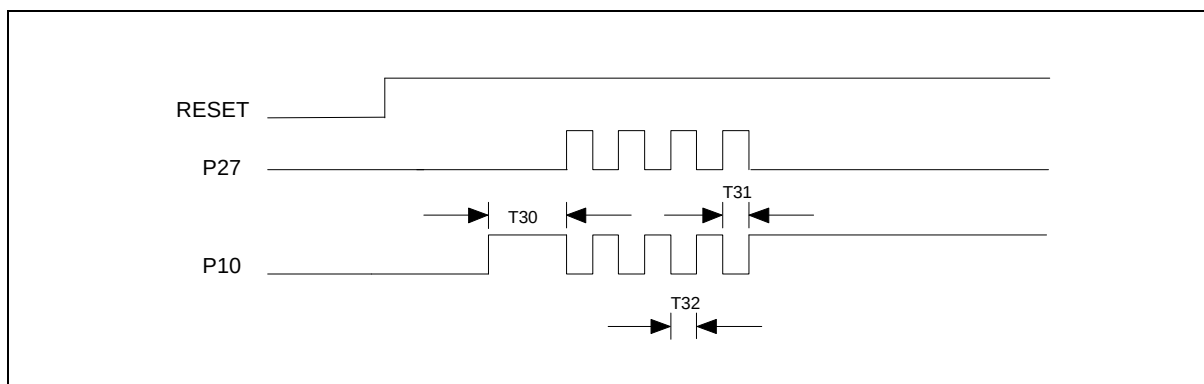
## PS2 Mode's Mode Detect

(P10 released to high by keyboard before RESET goes high)



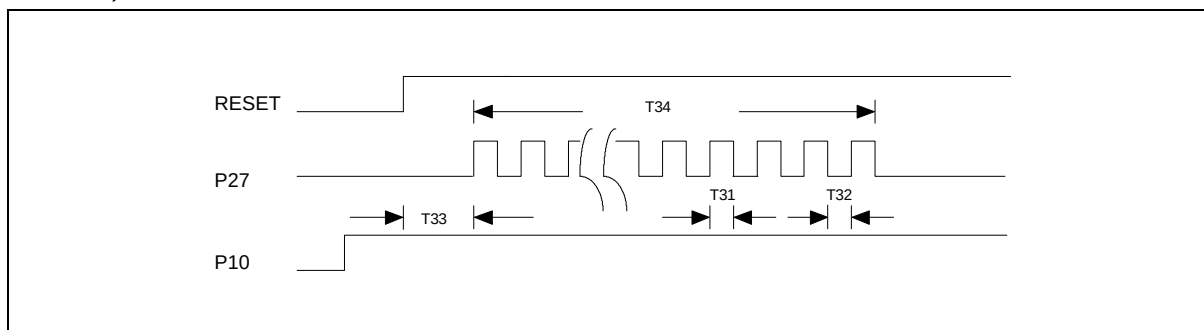
## PS2 Mode's Mode Detect

(P10 released to high by keyboard after RESET goes high)



## AT Mode's Mode Detect

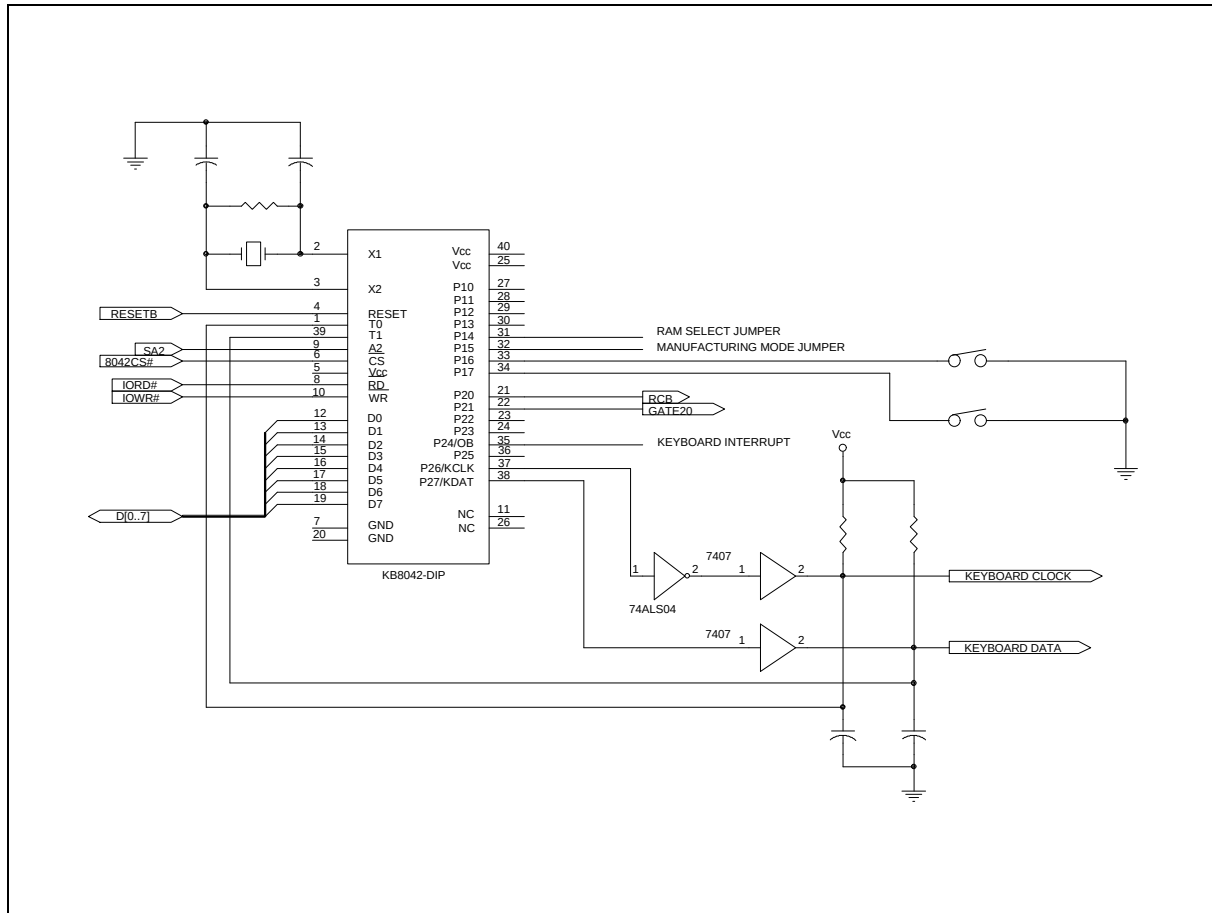
(P10 internal pull high. As there is no external loop between P27 and P10 so P27 issues pulse until time out )



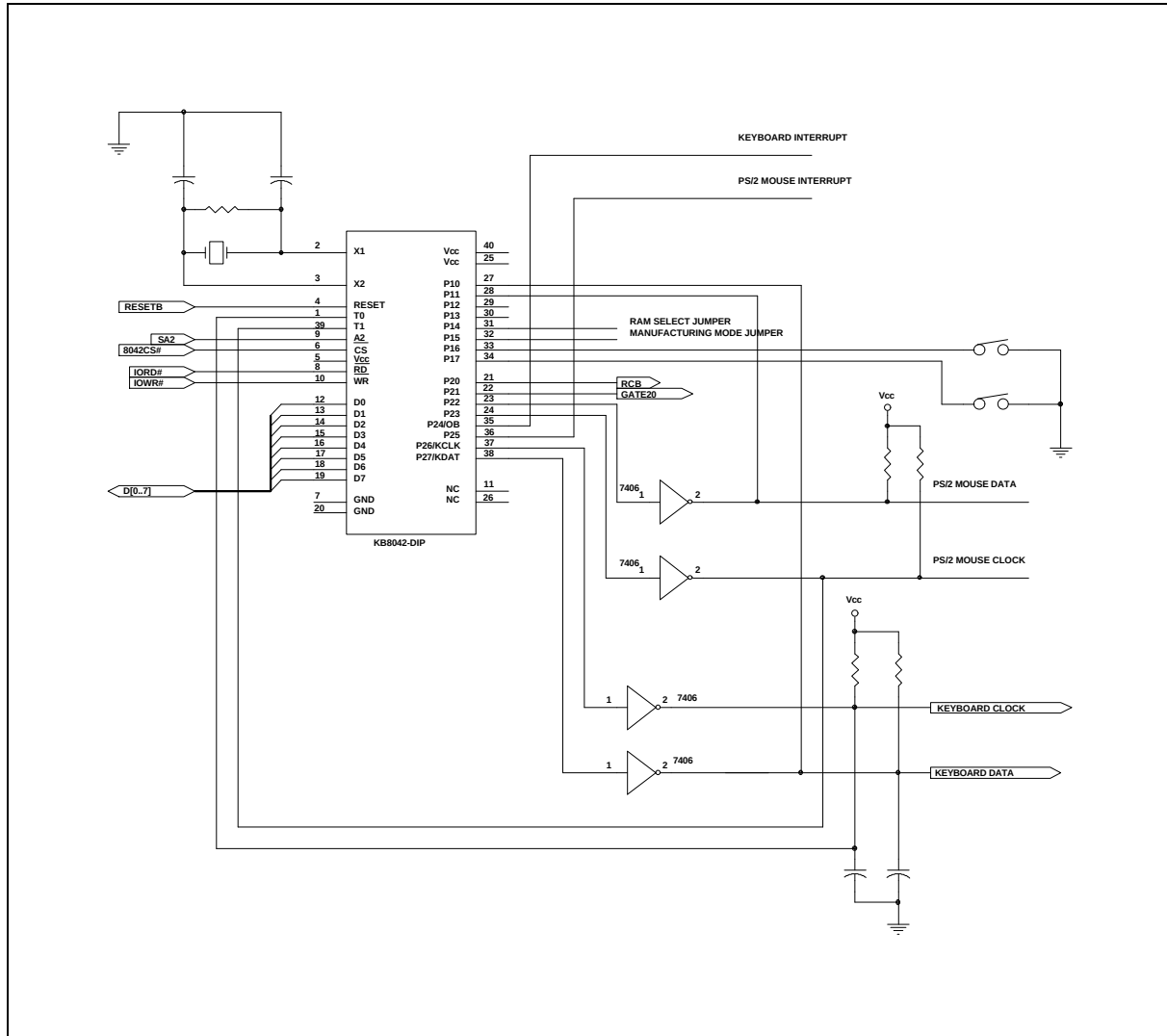


## TYPICAL APPLICATION CIRCUITS

### Application for AT Mode

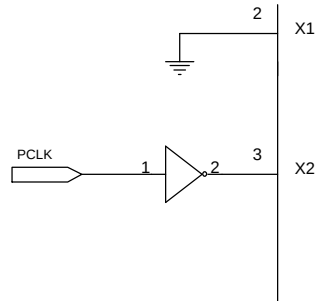


## Application for PS/2 Mode

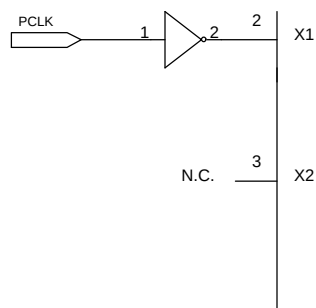


## Driving from External Source

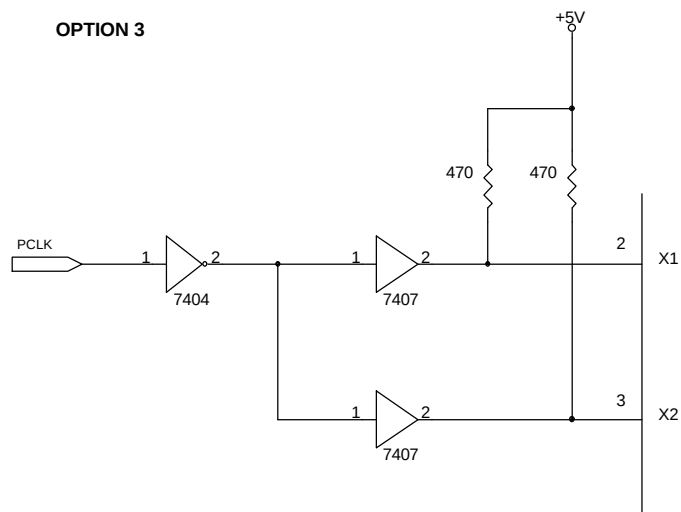
**OPTION 1**



**OPTION 2**

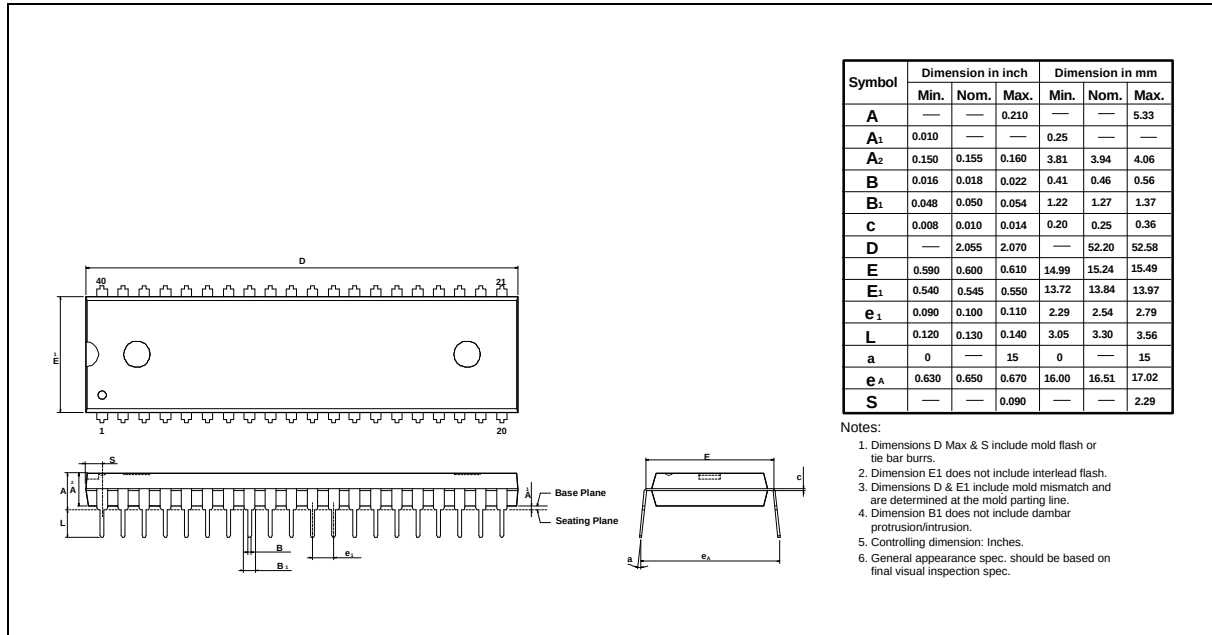


**OPTION 3**

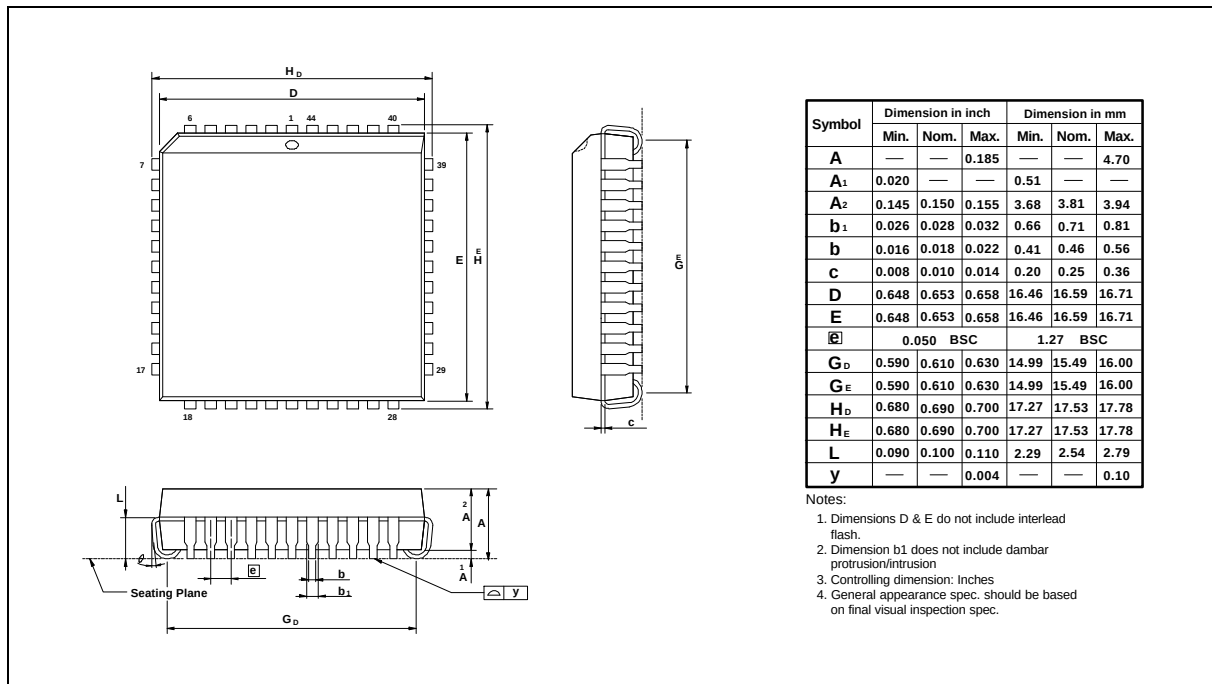


## PACKAGE DIMENSIONS

### 40-pin DIP



### 44-pin PLCC



**Headquarters**

No. 4, Creation Rd. III,  
Science-Based Industrial Park,  
Hsinchu, Taiwan  
TEL: 886-3-5770066  
FAX: 886-3-5792646  
<http://www.winbond.com.tw/>  
Voice & Fax-on-demand: 886-2-7197006

**Taipei Office**

11F, No. 115, Sec. 3, Min-Sheng East Rd.,  
Taipei, Taiwan  
TEL: 886-2-7190505  
FAX: 886-2-7197502

**Winbond Electronics (H.K.) Ltd.**

Rm. 803, World Trade Square, Tower II,  
123 Hoi Bun Rd., Kwun Tong,  
Kowloon, Hong Kong  
TEL: 852-27516023  
FAX: 852-27552064

**Winbond Electronics North America Corp.**

**Winbond Memory Lab.**  
**Winbond Microelectronics Corp.**  
**Winbond Systems Lab.**  
2730 Orchard Parkway, San Jose,  
CA 95134, U.S.A.  
TEL: 1-408-9436666  
FAX: 1-408-9436668

Note: All data and specifications are subject to change without notice.

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