# ePH1100

## Handwriting Recognition Microcontroller

# Product Specification

**DOC. VERSION 2.4**

**ELAN MICROELECTRONICS CORP.**

February 2006

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# Contents

# Specification Revision History

| Doc. Version | Revision Description | Date |
|---|---|---|
| 2.0 | ePH1100 initial specification | 2005/03/11 |
| 2.1 | Added new info and waveform diagram on ePH1100 response signal | 2005/03/21 |
| 2.2 | Added new commands on the “A/D Resolution” & Touch Panel Rotation” | 2005/06/07 |
| 2.3 | Modifed the Application Circuits | 2005/10/14 |
| 2.4 | Added accurate CSP size and modifed the CSP tape reel spec. | 2006/02/16 |

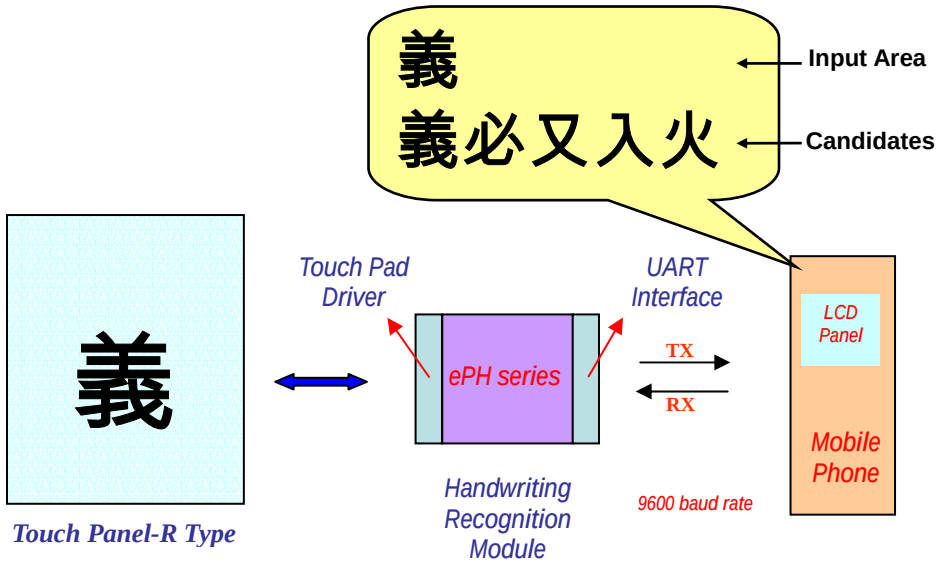
# 1 Introduction

The ePH1100 chip is an 8 bit RISC microcontroller embedded with recognition core. When connected to an external resistance type touch panel, the chip becomes suitable for handwriting recognition application products, such as SMS, Stylus Remote Controller, mobile phones, handwriting input device, etc. The ePH1100 has low power consumption, low cost, and yet is capable of providing high performance rate of recognition. These quality features are vital for shorter lead-time in developing new handwriting recognition related products or pressure-sensitive screen input devices.

# 2 Features

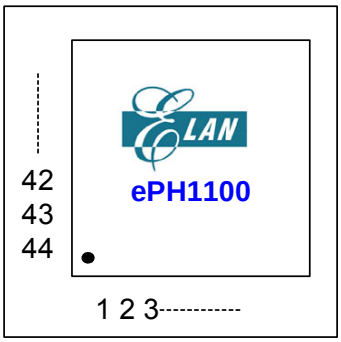
| Product No. | Package | Input | Output | Interface | Remarks |
|---|---|---|---|---|---|
| **ePH1100** | CSP/ LQFP44 | 1. Traditional Chinese<br>2. Simplified Chinese<br>3. ASCII<br>4. Gesture<br>5. Hiragana / Katakana | Unicode | UART | What you input (Traditional or Simplified Chinese) is what you get as output.<br>Can recognize 13,053 (Big 5) Traditional Chinese characters, and 6,763 (GB2312) Simplified Chinese characters. |

# 3 Block Diagram



# 4 Pin Assignment

## 4.1 LQFP 44 Pin

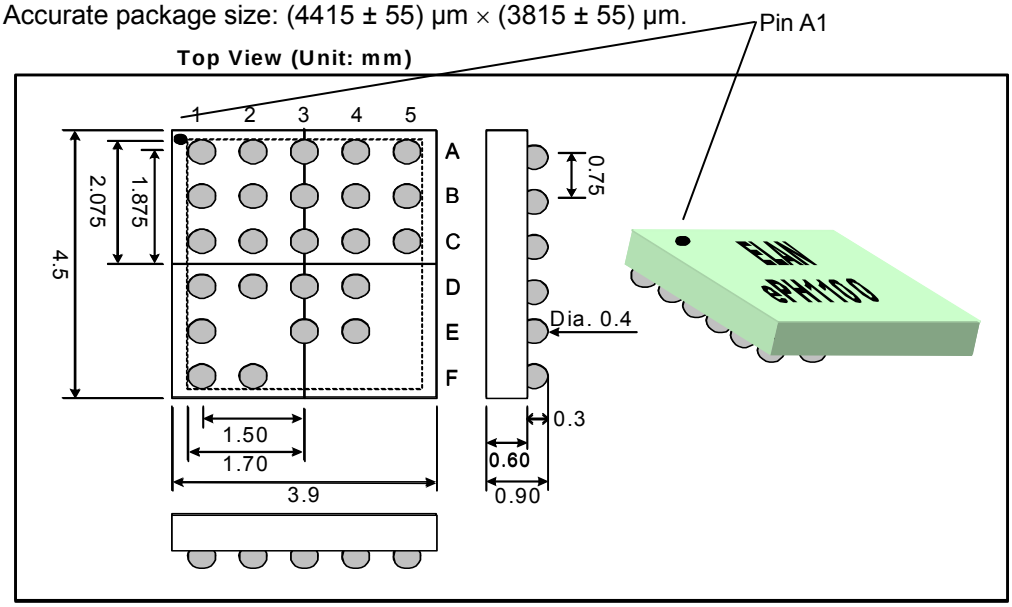



| No. | Pin Name | No. | Pin Name | No. | Pin Name | No. | Pin Name |
|---|---|---|---|---|---|---|---|
| 1 | NC | 12 | YP | 23 | CE | 34 | NC |
| 2 | NC | 13 | XP | 24 | NC | 35 | NC |
| 3 | HTEST | 14 | YN (WKO) | 25 | NC | 36 | NC |
| 4 | PLLC | 15 | XN | 26 | NC | 37 | NC |
| 5 | OSCI | 16 | VREX | 27 | NC | 38 | NC |
| 6 | OSCO | 17 | VDD | 28 | NC | 39 | NC |
| 7 | RESETB | 18 | STEST | 29 | NC | 40 | NC |
| 8 | VDDA | 19 | NC | 30 | NC | 41 | NC |
| 9 | VSS | 20 | NC | 31 | NC | 42 | NC |
| 10 | TX | 21 | WKI | 32 | NC | 43 | NC |
| 11 | RX | 22 | NC | 33 | NC | 44 | NC |

## 4.2 CSP (Chip Size Package) 24 Pin

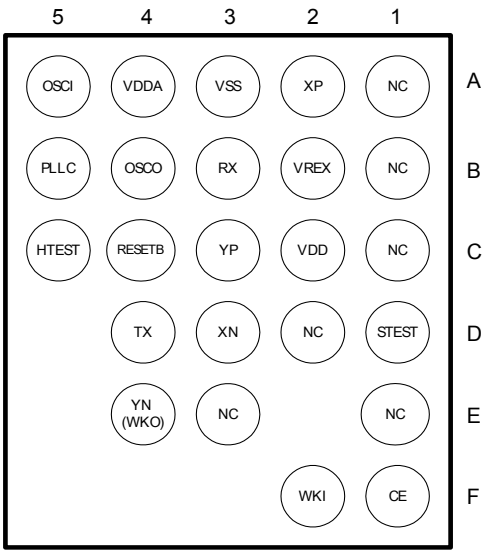
Perspective view of the pin locations viewed from the top surface of the chip.

Accurate package size: (4415 ± 55) μm × (3815 ± 55) μm.




| Perspective View from the Top Side | | | | | | |
|---|---|---|---|---|---|---|
| Y Coordinate \ X Coordinate | | –1.500 | –0.750 | 0.000 | 0.750 | 1.500 |
| | | 1 | 2 | 3 | 4 | 5 |
| 1.875 | A | NC | XP | VSS | VDDA | OSCI |
| 1.125 | B | NC | VREX | RX | OSCO | PLLC |
| 0.375 | C | NC | VDD | YP | RESETB | HTEST |
| –0.375 | D | STEST | NC | XN | TX | – |
| –1.125 | E | NC | – | NC | YN (WKO) | – |
| –1.875 | F | CE | WKI | – | – | – |

Pin location and assignment viewed from the actual pin (bottom) side of the chip.



## 4.3 Ordering Information

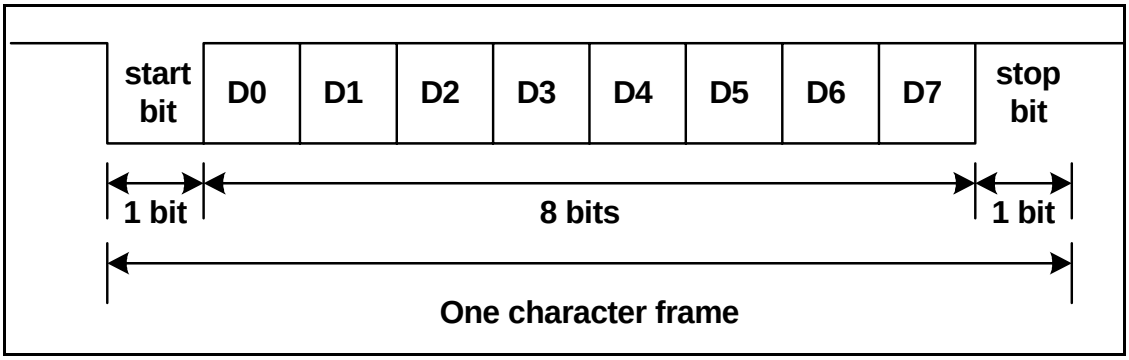
| Orderable Part Number | Package Type | |
|---|---|---|
| ePH1100SH | CSP | Tray of 72 |
| ePH1100KSH | | Tape reel of 2000 |
| ePH1100AQ | LQFP44 10x10mm | |

# 5 Pin Description

| CSP | LQFP44 | Name | I/O/P Type | Description |
|---|---|---|---|---|
| C2 | 17 | VDD | P | Digital power supply, ranging from 2.8V to 3.6V.<br>Should be connected to VSS through a 0.1μF capacitor. |
| A3 | 9 | VSS | P | Negative power supply |
| A4 | 8 | VDDA | P | Analog power supply, ranging from 2.8V to 3.6V.<br>Should be connected to VSS through a 0.1μF capacitor. |
| C4 | 7 | RESETB | I | System reset input pin with built-in pull up resistor (typical value = 100KΩ).<br>Should be connected to one GPIO pin. |
| C5 | 3 | HTEST | I | Hardware testing. Normally connected to VSS |
| A5 | 5 | OSCI | I | Crystal or External Clock Source connector pin:<br>• Crystal: Connect a 32.768 kHz crystal and connect to VSS through a 20pF capacitor<br>• External Clock Source: Connect a 32.768 kHz (± 20ppm) clock signal through a 0.1μF capacitor (Clock $V_{PP}$>0.3$V_{DD}$) |
| B4 | 6 | OSCO | O | Crystal or External Clock Source connector pin:<br>• Crystal: Connect a 32.768 kHz crystal and connect to VSS through a 20pF capacitor.<br>• External Clock Source: Keep the pin floating. |
| B5 | 4 | PLLC | I | PLL capacitor connector pin. Should be connected to VSS through a 0.047μF capacitor. |
| B2 | 16 | VREX | I/O | Internal reference voltage for A/D converter. Should be connected to VSS through a 0.1μF capacitor. |
| F1 | 23 | CE | I | "Floating": Chip Enable.<br>"L": Chip power down. UART interface pin will change to High-Z status. |
| D1 | 18 | STEST | I | Software testing. Normally floating or connected to VDD. |
| D4 | 10 | TX | O | UART Interface Tx pin |
| B3 | 11 | RX | I | UART Interface Rx pin |
| C3 | 12 | YP | I | Touch screen Y direction positive pin |
| A2 | 13 | XP | I | Touch screen X direction positive pin |
| E4 | 14 | YN (WKO) | O | Touch screen Y direction negative pin.<br>This pin should be connected to an input pin of the Host. Such Host input pin must be set as "non-pull-up" resistor type and provides a wake-up function. |
| D3 | 15 | XN | O | Touch screen X direction negative pin |
| F2 | 21 | WKI | I | Wake-up input pin.<br>Host wakes up the ePH1100 from power saving mode through this pin. |

# 6 Interface Control Timing Description

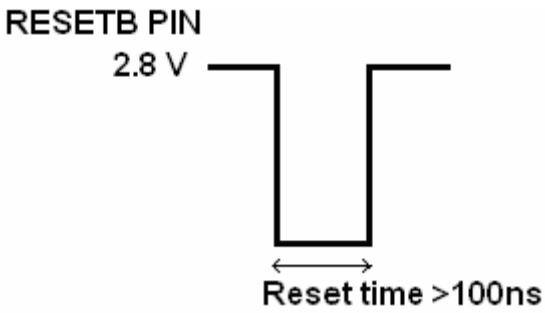
## 6.1 UART Interface Control (9600, N, 8, 1)




# 7 Pin Option Description

- **CE Pin Option**


- **RESETB Pin Timing**



# 8 Electrical Characteristic

## 8.1 Absolute Maximum Ratings

| Items | Symbol | Condition | Limits | Unit |
|---|---|---|---|---|
| Supply Voltage | VDD | | –0.3 to +3.6 | V |
| Input Voltage (General Input Port) | VIN | | –0.5 to VDD +0.5 | V |
| Operating Temperature Range | TOPR | | –20 to +80 | °C |
| Storage Temperature Range | TSTR | | –55 to +125 | °C |

## 8.2 Recommended Operating Conditions

| Items | Symbol | Condition | Limits | Unit |
|---|---|---|---|---|
| Supply Voltage | VDD | | 2.8 to 3.6 | V |
| | VDDA | | 2.8 to 3.6 | |
| Input Voltage | VIH | | VDD x 0.9 to VDD | V |
| | VIL | | 0 to VDD x 0.1 | V |
| A/D Full-Scale Input Span | ADRG | Positive input– negative input | 0 to VREX | V |
| Operating Temperature | TOPR | | –20 to +80 | °C |

## 8.3 DC Electrical Characteristics (Condition: Ta=25° C, VDD= 3.0 ± 0.3V)

| Parameter | Symbol | Condition | | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|---|
| CLOCK | Fmain | Main-clock frequency | | – | 9.83 | – | MHz |
| | Fsub | Sub-clock frequency | X'tal OSC | – | 32.768 | – | KHz |
| Supply Current | Idd2 | IDLE mode | VDD=3V, X'tal OSC. | – | 5 | 8 | μA |
| | Idd3 | FAST mode | VDD=3V, Fmain=9.83MHz without touch panel load | – | 2000 | 3000 | |
| Input Voltage | VIH1 | Input pin | | VDD×0.7 | – | VDD | V |
| | VIL1 | | | 0 | – | VDD×0.3 | |
| Input Threshold Voltage (Schmitt) | VT+ | RESETB pin | | 0.5×VDD | – | 0.75×VDD | V |
| | VT– | | | 0.2×VDD | – | 0.4×VDD | |
| Output Current | IOH1 | Output pin | VDD=3V, VOH=2.4V | –1.1 | –2.2 | –3.3 | mA |
| | IOL1 | | VDD=3V, VOL=0.2V | +1.1 | +2.2 | +3.3 | |
| Input Leakage Current | IIL | ALL Input port (without pull up/down resistor) Vin=VDD or GND | | – | – | ±1 | μA |
| Touch Panel Pull Down Resistance | RPD3 | DET=1, Xn pin | Vin=VDD, VDD=3V | 25 | 50 | 100 | KΩ |
| Data Retention Voltage | Vret | | | 1.6 | – | – | V |
| Power on Reset Voltage | Vpor | | | 1.4 | 1.5 | 1.6 | V |

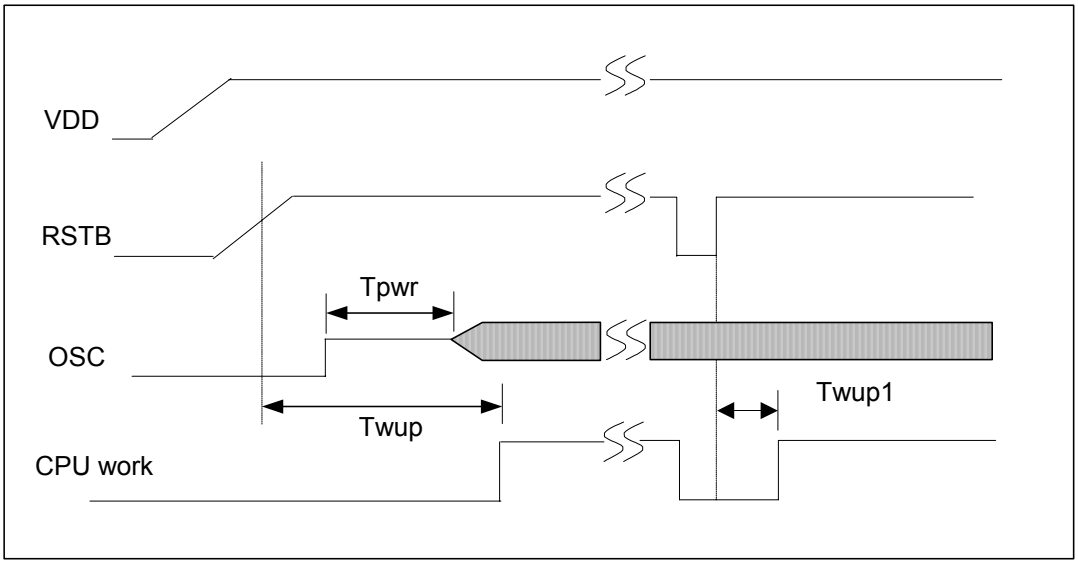
## 8.4 A/D Conversion (VDD=3.0V, VDDA=3.0V, Ta=25° C, Fclk=12*Fsample)

| Parameter | Symbol | Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| **Analog Input** | | | | | | |
| Mux Leakage Current | Imux | On/off leakage current, Vin=0 or VDD | – | 0.1 | 1 | μA |
| **System Perfomance** | | | | | | |
| Resolution | | | – | 10 | - | Bits |
| Integral Non-Linearity | INL | | –2 | – | +2 | LSB |
| Differential Non-linearity | DNL | | –2 | – | +2 | LSB |
| Offset Error | OErr | | –4 | – | +4 | LSB |
| Gain Error | GErr | | –4 | – | +4 | LSB |
| Missing Code | MC | | | | | Bit |
| VDDA Supply Current | Ivdd3 | VDD=3.0V, VDDA=3.0V, Fsample=20kHz, ADEN=1, VRS=1 | – | 0.5 | 0.7 | mA |
| | Ivdd4 | ADEN=0,VRS=1 | – | – | 1 | uA |
| Driver Current | IOH | Xp,Yp (VDD= 2.9 ± 0.3V) (Voh=VDD-0.2V) | –20 | –30 | –45 | mA |
| Sink Current | IOL | Xn,Yn (VDD= 2.9 ± 0.3V)(Vol=0.2V) | +20 | +30 | +45 | mA |

## 8.5 AC Electrical Characteristics (Condition: Ta=25°C, VDD=3.0 ± 0.3V)

| Parameter | Symbol | Condition | Min | Type | Max | Unit |
|---|---|---|---|---|---|---|
| A/D Conversion (VDD=3.0V, VDDA=3.0V, Ta=-10~+60 °C) | | | | | | |
| Throughput Rate | | VDD=3.0V, VDDA=3.0V | – | – | 80 | ksps |
| | | VDD=2.4V, VDDA=2.4V | – | – | 60 | |
| Power Supply Rejection Ratio | PSRR1+ | Power noise: 1kHz, 100mV | 37 | 40 | – | dB |
| | PSRR1– | Power noise: 1kHz, 100mV | 43 | 46 | – | |
| Signal to Noise Ratio | SNR | | 51 | 54 | – | dB |

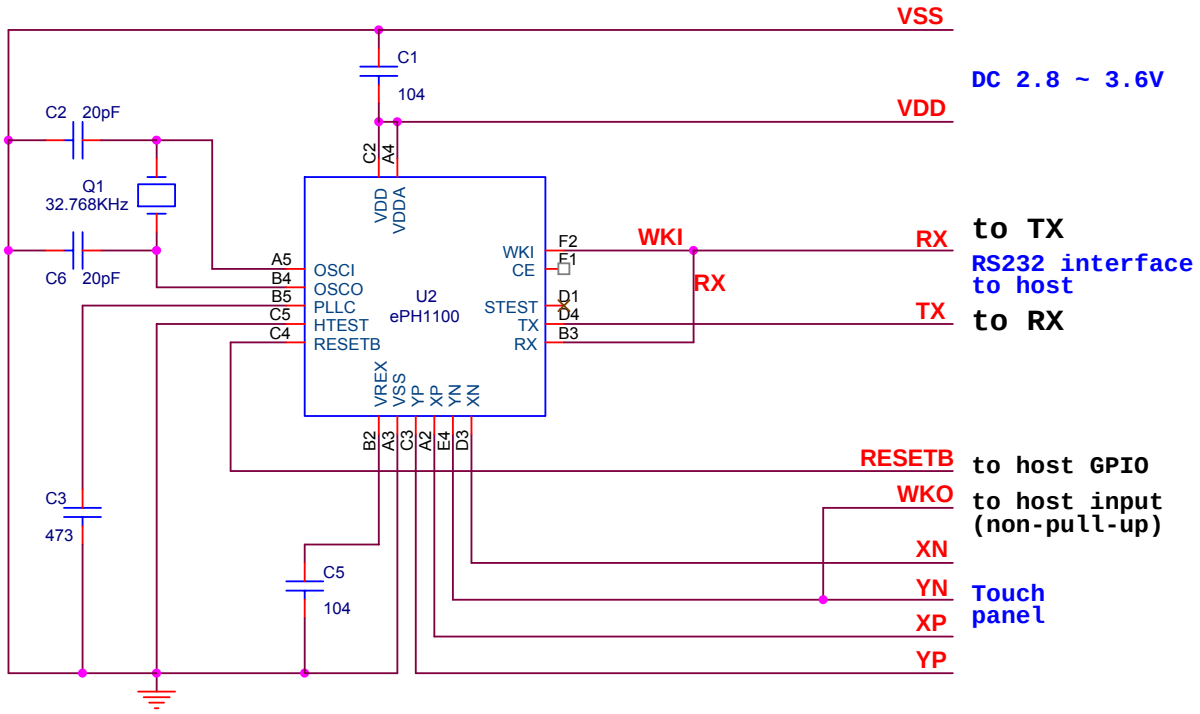
# 9 Power–up and Reset Timing




| Symbol | Characteristics | Min. | Type | Max. | Unit |
|---|---|---|---|---|---|
| Tpwr | Oscillator start up time | 100 | 226 | 300 | ms |
| Twup | CPU warm up time | 260 | 340 | 550 | ms |
| Twup1 | CPU reset time | 18 | 22 | 44 | ms |

# 10 Application Circuit

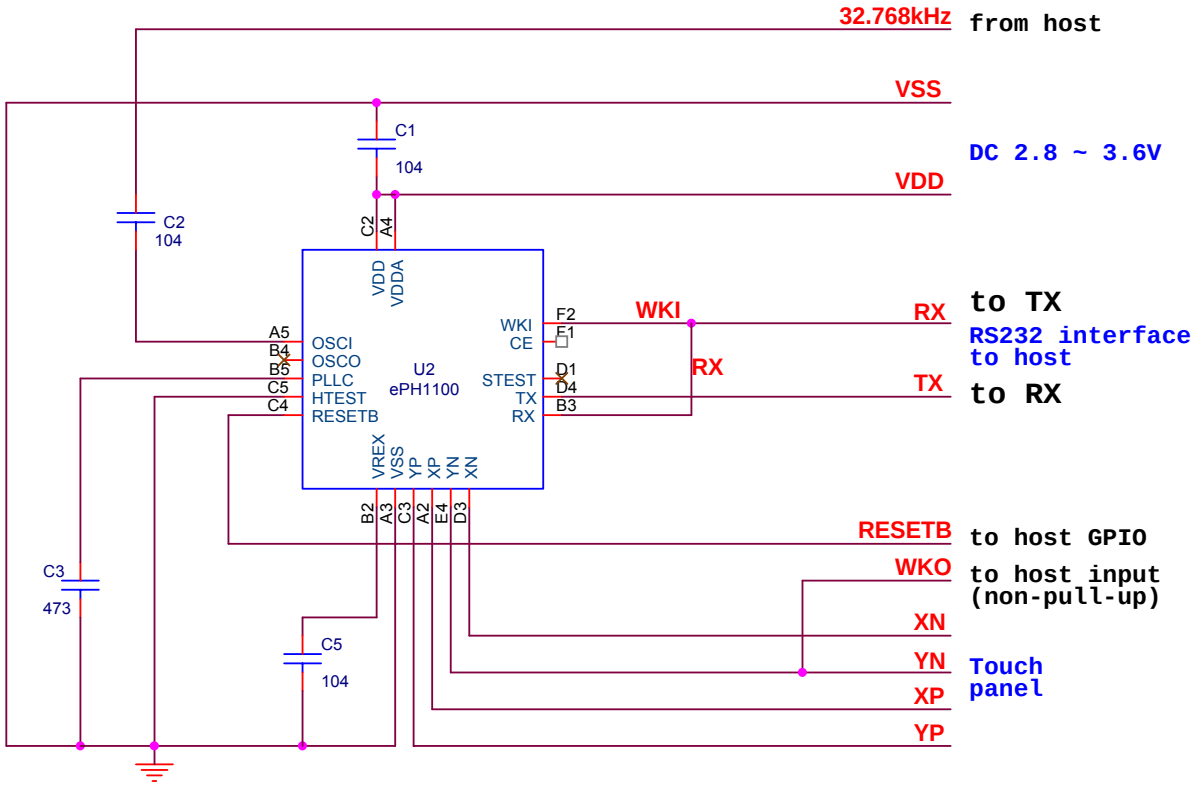
## 10.1 UART Interface Application Circuit (with 32.768kHz Crystal)




### *10.1.1 BOM Table*

| Component | Component P/N | Pin Location | Packaging | Qty |
|---|---|---|---|---|
| MCU | ePH1100 | U2 | CSP | 1 |
| Oscillator | 32768HZ Crystal | Q1 | D | 1 |
| Capacitor | 20pF | C2, C6 | S | 2 |
| Capacitor | 0.1μF (104) | C1, C4, C5 | S | 3 |
| Capacitor | 0.047μF (473) | C3 | S | 1 |

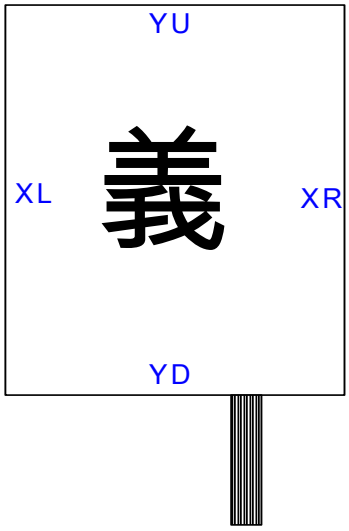
## 10.2 UART Interface Application Circuit (with 32.768kHz External Clock)



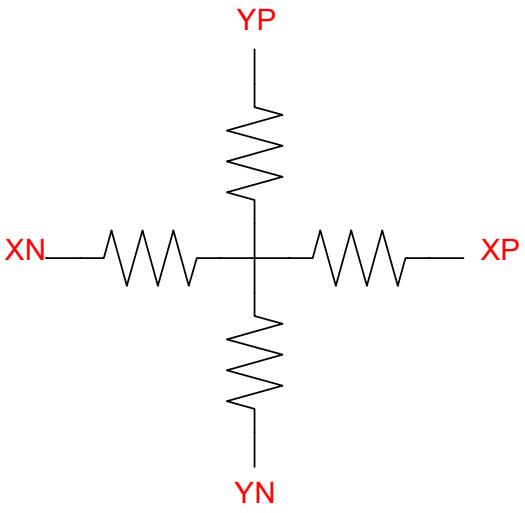

### *10.2.1 BOM Table*

| Component | Component P/N | Pin Location | Packaging | Qty |
|---|---|---|---|---|
| MCU | ePH1100 | U2 | CSP | 1 |
| Capacitor | 0.1μF (104) | C1, C2, C4, C5 | S | 4 |
| Capacitor | 0.047μF (473) | C3 | S | 1 |

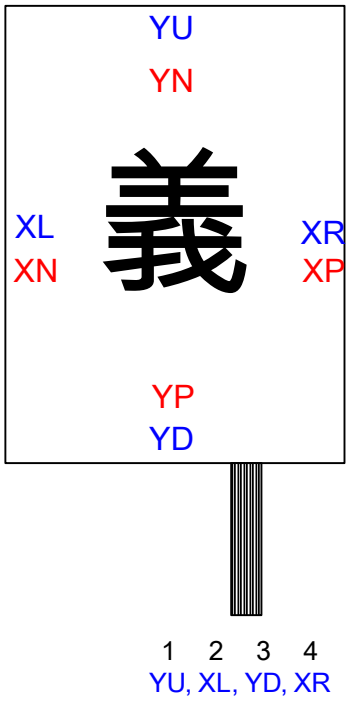
## 10.3 Touch Panel and YP, XP, YN, & XN Layout Format

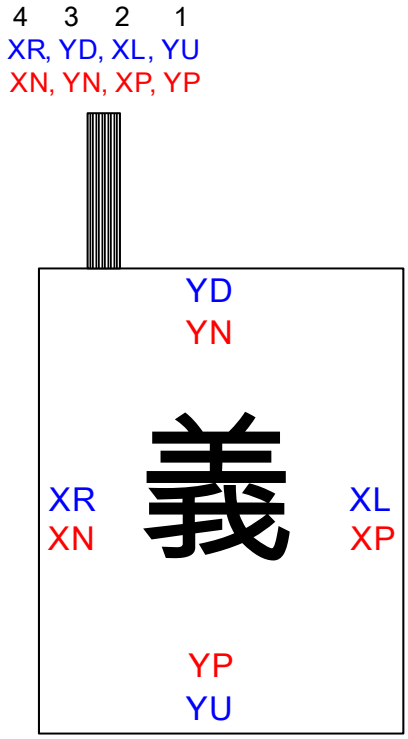


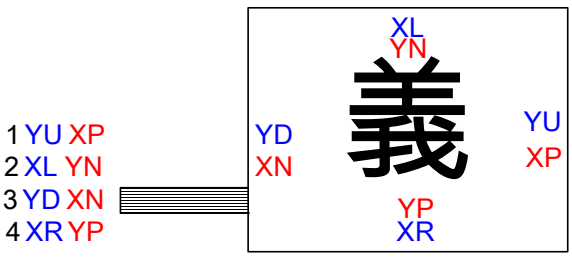

Touch Panel

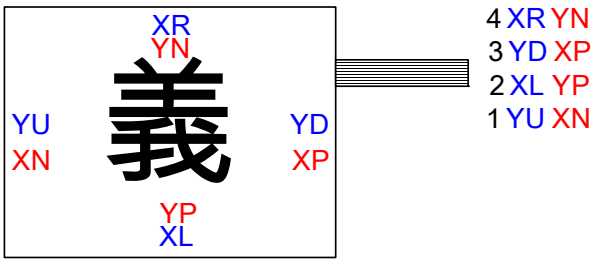



ePH1100 Pin Setting



# 11 HWRE Software Specification

## 11.1 HWRE Software Description

- The ePH1100 provides nine free-hand input recognition proficiencies; including Chinese character Set I (for both Traditional & Simplified Chinese), Chinese character Set II (for both Traditional & Simplified Chinese), etc.
- You can choose to access the input as you write (inking) with recognized characters feedback, or access the recognized characters only without accessing the inking (input).
- The ePH1100 transmits both hand-written characters and hand-drawn graphics. Graphics inking are transmitted without recognition.
- The ePH1100 can only transmit data to the Host through a defined touch panel button area coordinates (located at a designated area of the touch panel). When you tap and drag on the panel, only the tapping is transmitted. Dragging is ignored.

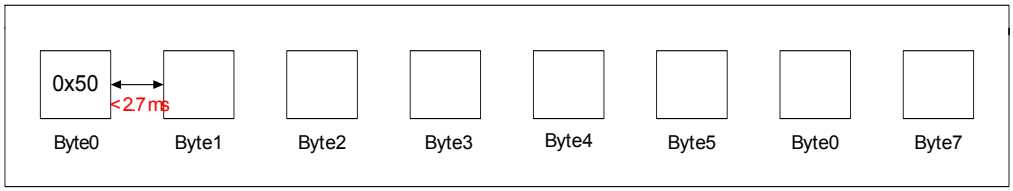
## 11.2 Communication Protocol and Command List

### *11.2.1 Communication Interface: UART*

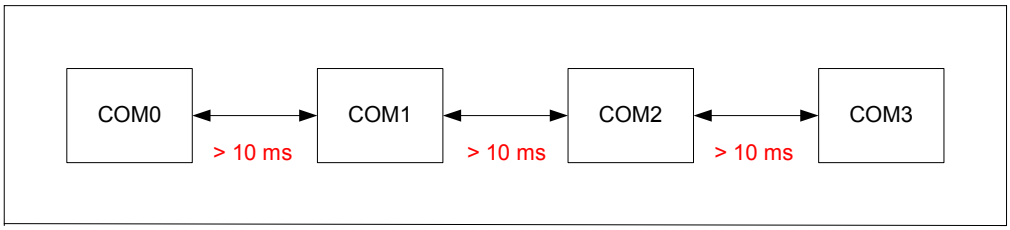
UART parameter**:** baud rate 9600; no parity check; 8 bits data length.

### *11.2.2 Command Timing Request*

When the Host sends command to the ePH1100, the time between two bytes must be less than 2.7ms. Otherwise, the ePH1100 will not accept the command and accesses the “ACK error” message.




When the Host transmits command to the ePH1100, the time between two consecutive commands must be longer than 10 ms.



### 11.2.3 *Commands from Host* (see Section 11.3 for details)

| Command | Brief Description | Command Response | Response at Tapping* |
|---|---|---|---|
| 0x33 | Wake-up ePH1100 | Not applicable | Not applicable |
| 0x10 | Execute the set character recognition mode | Instantaneous | Instantaneous |
| 0x14 | Execute the set inking transmit switch | Instantaneous | Instantaneous |
| 0x1A | Execute the set pen up (next tapping) waiting time | Instantaneous | As soon as pen is up |
| 0x1B | Recognition before timeout | Instantaneous | As soon as pen is up |
| 0x1C | Host Ready | Instantaneous | Instantaneous |
| 0x1D | Convert recognition & “tap to wake-up” data into even numbered package | Instantaneous | Instantaneous |
| 0x1E | Pen up timeout offset (shorten timeout) | Instantaneous | As soon as pen is up |
| 0x40 | Get handwriting firmware version | Instantaneous | Instantaneous |
| 0x41 | Output with different code table | Instantaneous | Instantaneous |
| 0x42 | Software reset | Instantaneous | Instantaneous |
| 0x43 | Abort the current inking | Instantaneous | Instantaneous |
| 0x44 | Calibration | Instantaneous | Instantaneous |
| 0x46 | Set writing area location | Instantaneous | Instantaneous |
| 0x49 | Set Recognition / Graphic mode | Instantaneous | Instantaneous |
| 0x4A | Set power saving mode | Instantaneous | Instantaneous |
| 0x4B | Set A/D resolution | Instantaneous | Instantaneous |
| 0x4C | Rotate touch panel | Instantaneous | Instantaneous |

* 1. Shows which command takes effect immediately when Host sends command to ePH1100 with the pen tapped and held on touch panel.

2. If there is inadequate time to receive the Host command, ePH1100 will initially access the “ACK error” message and wait for the Host to send the correct command within 1.5 sec. After receiving valid command or 1.5 sec timeout, ePH1100 continues to execute the original program.

### 11.2.4 *Responses from ePH1100* (see Section 11.4 for details)

| Command | Description |
|---|---|
| 0×00 | Ack error |
| 0×16 | Inking (written input) coordinates |
| 0×17 | Touch panel button area coordinates |
| 0×18 | Recognized characters array |
| 0×33 | Exit from power saving mode |
| 0×42 | Initial power ON |
| Host command dependent | Ack OK |

## 11.3 Commands from Host Specifications

### *11.3.1 Wake-up ePH1100 (0x33; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0x50 |
| 1 | Command | 1 | HEX | 0x33 |
| 2 | Parameter length | 1 | HEX | 0x04 |
| 3-6 | Stuff | 4 | HEX | 0×00; 0×00; 0×00; 0×00 |
| 7 | Checksum | 1 | HEX | 0xC7 |

**Description:** Host can use this command to wake up ePH1100.
Note that this command is applicable only when ePH1100 is in idle mode and it cannot ACK any response when in FAST mode.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| Command wake-up | 50 33 04 00 00 00 00 C7 | |
| Command wake-up response | | 50 33 04 FF FF FF FF 19 |

### *11.3.2 Set Character Recognition Mode (0x10; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×10 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-4 | Parameter | 2 | HEX | User define |
| 5-6 | Stuff | 2 | HEX | 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** Set recognition type

**Recognition Type Definition:** Total 10 bits (**Default value: 0×3F01**)

- **Byte 3**

| Bit No. | Recognition Type Description | Recognition Type Setting |
|---|---|---|
| 0 | Set Chinese character Set I | 0×0100 |
| 1 | Set Chinese character Set II | 0×0200 |
| 2 | Set capital letter | 0×0400 |
| 3 | Set numeral | 0×0800 |
| 4 | Set symbol | 0×1000 |
| 5 | Set default gesture | 0×2000 |
| 6 | Set hiragana | 0×4000 |
| 7 | Set katakana | 0×8000 |

■ **Byte 4**

| Bit No. | Recognition Type Description | Recognition Type Setting |
|---|---|---|
| 8 | Set small letter | 0×0001 |
| 9 | "Pu-Fu-Mo-Fo" Traditional Chinese phonetics | 0×0002 |

**Stroke (Gesture) Definition:**

| Default Stroke Description | Default Stroke Setting |
|---|---|
| BackSpace | 0×0008 |
| Return/Enter | 0×000D |
| Delete | 0×0010 |
| SPACE | 0×0020 |

The following graphs show the default writing stroke. Dot on each stroke shows where to begin. Then lift the pen (stylus) at the end of the stroke. You only need to lightly tap and drag on the touch panel.

BackSpace (0×0008)



Return/Enter (0×000D)

Delete (0×0010)

Space (0×0020)

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (set recognition type) | 50 10 04 FF 01 FF FF 19 | |
| ACK (set recognition type) | | 50 10 04 FF FF FF FF 59 |

### 11.3.3 Set Inking Transmit Switch (0x14; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×14 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | On :0×01/Off: 0×00 |
| 4-6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** Select whether to transmit or not the inking (written input). Default is to transmit (ON). During Graphic mode, inking transmit switch OFF command is ignored, but is carried out once you enter Recognition mode.

**Examples:**

1. Transmit inking coordinates (0×14)

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (Set inking transmit) | 50 14 04 01 FF FF FF 3A | |
| ACK (Set inking transmit) | | 50 14 04 FF FF FF FF FD |

2. Do not transmit inking coordinates (0×14)

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (Do not transmit inking) | 50 14 04 00 FF FF FF 2C | |
| ACK (Do not transmit inking) | | 50 14 04 FF FF FF FF FD |

### 11.3.4 Set Pen Up (Lifting of Stylus) Waiting Time (0x1A; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×1A |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | |
| 4-6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** Set pen up (lifting of stylus) waiting time.

**Pen Up Waiting Time Setting:**

1. The ePH1100 divides the pen up time into 10 steps. 1~10 are valid values, other values represent infinite waiting. Default is 600 ms.
2. Every step increases by an increment of 200ms. 1 represents 1x200 ms, and 10 represent 10x200 ms. If infinite pen up time is used, ePH1100 must initially receive the “Recognizing immediately (0x1B)” command before executing character recognition.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (set pen up waiting time) | 50 1A 04 03 FF FF FF AF | – |
| ACK (set pen up waiting time) | – | 50 1A 04 FF FF FF FF 44 |

### *11.3.5 Perform Recognition Immediately, i.e., Before Time-out (0x1B; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×1B |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×FF; 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | 0×6D |

**Description:** Proceed to character recognition immediately.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (recognize emmediately) | 50 1B 04 FF FF FF FF 6D | |
| ACK (can not recognize immediately) | | 50 1B 04 00 00 00 00 B3 |
| ACK (can Recognize immediately) | | 50 1B 04 FF FF FF FF 6D |

### *11.3.6 Host Ready (0x1C; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×1C |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×FF; 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | 0×B2 |

**Description:** With this command, the Host notifies the ePH1100, “I am ready.” You can then start transmitting data after wake-up occurs (by tapping the touch pad).

**Example:** The same as in Section 11.4.5, *Exit from Power Saving Mode*.

### 11.3.7 Set Even Numbered Package for Recognizing Characters and to Trigger Wake-Up by Tapping Touch Pad (0x1D; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×1D |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | Off: 0×00 / On: 0×01 |
| 4-6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** This command defines the data format (even numbered) for recognizing characters and for responding to touch pad tapping to wake-up ePH1100 (Add 0×00).

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (even package) | 50 1D 04 01 FF FF FF 5C | – |
| ACK (even package) | – | 50 1D 04 FF FF FF FF 9B |

### 11.3.8 Pen Up (Lifting of Stylus) Time-out Offset (0x1E; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×1E |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | On: 0×01 / Off: 0×00 |
| 4-6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** This command subtracts 100ms from original setup pen up time.

**Examples:**

- **Original Pen-up Time = 200ms**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM(Pen up time 200ms) | 50 1A 04 01 FF FF FF 83 | – |
| ACK(Pen up time 200ms) | 50 1A 04 FF FF FF FF 44 | – |
| COM (Pen up timeout offset) | 50 1E 04 01 FF FF FF 27 | – |
| ACK (Pen up timeout offset) 200-100=100ms | – | 50 1E 04 FF FF FF FF E0 |

■ **Original Pen-up Time = 400ms**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (Pen-up time 400ms) | 50 1A 04 02 FF FF FF B9 | – |
| ACK (Pen-up time 400ms) | 50 1A 04 FF FF FF FF 44 | – |
| COM (Pen-up time-out offset) | 50 1E 04 01 FF FF FF 27 | – |
| ACK (Pen-up time-out offset) 400-100=300ms | – | 50 1E 04 FF FF FF FF E0 |

### *11.3.9 Access the HWRE Firmware Version (0x40; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×40 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×FF; 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | 0×B1 |

**Description:** Access the Handwriting Recognition firmware version.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (access firmware version) | 50 40 04 FF FF FF FF B1 | |
| ACK (access firmware version) | | 50 40 04 02 23 51 11 D3<br>(V2.21 **:** 2005/1/11) |

### *11.3.10 Output with Different Code Table (0x41; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0x50 |
| 1 | Command | 1 | HEX | 0x41 |
| 2 | Parameter length | 1 | HEX | 0x04 |
| 3 | User defined | 1 | HEX | 0×00**:**Traditional / Simplified combo<br>0×01**:**Traditional only<br>0×02**:**Simplified only |
| 4-6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** ePH1100 offers three code tables for your selection. 0~2 are valid values. Any other invalid values are regarded as default value "0." The difference between the three code tables are as listed below.

- "0" **:** Default code table; Traditional / Simplified Chinese combo
  (Traditional in – Traditional out; Simplified in – Simplified out)
  write "华" → recognized as "华" (0×534e)
  write "華" → recognized as "華" (0×83ef)
- "1" **:** Traditional Chinese only
  (Traditional or Simplified in – always Traditional out)
  write "华" → recognized as "華" (0×83ef)
  write "華" → recognized as "華" (0×83ef)
- "2" **:** Simplified Chinese only
  (Traditional or Simplified in – always Simplified out)
  write "华" → recognized as "华" (0×534e)
  write "華" → recognized as "华" (0×534e)

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (output with different code table) | 50 41 04 02 FF FF FF 65 | – |
| ACK (output with different code table) | – | 50 41 04 FF FF FF FF 98 |

### *11.3.11 Software Reset (0x42; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×42 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×FF; 0xFF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | 0×E3 |

**Description:** Host can use this command to reset the ePH1100. The ePH1100 will reset to initial power on when this command is executed and all settings will return to its default values.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (software reset) | 50 42 04 FF FF FF FF E3 | |
| ACK (software reset) | | 50 42 04 FF FF FF FF E3 |
| COM (initial power on) | | 50 42 04 00 00 00 00 3D |

### 11.3.12 Abort the Current Inking (0x43; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×43 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×FF; 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | 0×CA |

**Description:** Clear the current inking.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (clear current inking) | 50 43 04 FF FF FF FF CA | – |
| ACK (clear current inking) | – | 50 43 04 FF FF FF FF CA |

### 11.3.13 Calibration (0x44; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×44 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×FF; 0×FF; 0×FF; 0×FF; |
| 7 | Checksum | 1 | HEX | 0×15 |

**Description:** Use this command to request for ePH1100 calibration. The ePH1100 cannot determine whether the executed calibration command is successful or not. The Host should accommodate this function.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (calibration) | 50 44 04 FF FF FF FF 15 | – |
| ACK (calibration) | – | 50 44 04 FF FF FF FF 15 |
| COM (calibrate: top- left) | – | 50 44 04 25 36 FF FF F3 |
| COM (calibrate: bottom- right) | – | 50 44 04 FF FF D7 CE 84 |

### 11.3.14 Set Writing Area Location (0x46; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×46 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | Top-left X coordinate | 1 | HEX | 0×00—0×FE |
| 4 | Top-left Y coordinate | 1 | HEX | 0v00—0×FE |
| 5 | Bottom-right X coordinate | 1 | HEX | 0×00—0×FE |
| 6 | Bottom-right Y coordinate | 1 | HEX | 0×00—0×FE |
| 7 | Checksum | 1 | HEX | |

**Description:** Set the desired location of the writing area.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (set writing area location) | 50 46 04 10 10 F0 F0 96 | |
| ACK (set writing area location) | | 50 46 04 FF FF FF FF 47 |

### 11.3.15 Set Recognition Mode / Graphic Mode (0x49; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×49 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | Recognition:0x00 / Graphic:0×01 |
| 4-6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** Default is Recognition mode. Graphic mode transmission coordinates are similar to Recognition mode except recognition is not processed under Graphic mode.

**Example:**

1. Recognition Mode**:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (set recognition mode) | 50 49 04 00 FF FF FF 06 | – |
| ACK (set recognition mode) | – | 50 49 04 FF FF FF FF D7 |

2. Graphic Mode (0x49)**:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (set Graphic Mode) | 50 49 04 01 FF FF FF 10 | – |
| ACK (set Graphic Mode) | – | 50 49 04 FF FF FF FF D7 |

### 11.3.16 Set Power Saving Mode (0x4A; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×4A |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | Enable "Tap to wake-up": 0×01<br>Disable "Tap to wake-up": 0×00 |
| 4 | User defined | 1 | HEX | Idle time for idle mode<br>to take effect: 1~20 |
| 5-6 | Stuff | 2 | HEX | 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:**

1. Byte 3 represents the tap to wake-up switch
   0x01 → Enable "Tap to wake-up" function
   0x00 → Disable "Tap to wake-up" function
2. Byte 4 represents the idle (no input) time before power saving mode takes effect. The ePH1100 divides the time into 20 steps; i.e., 1~20 (valid values). Any other value above 20 is considered as "20." Every step increases by about 15 seconds. "1" represents 1×15 seconds and 20 represent 20×15 seconds. "0" value (default) is used to prevent ePH1100 from entering into power saving mode.
3. To instantly enter into power saving mode, add "0×80" to the defined idle time. Note that the instant power saving mode works only once and the defined idle time takes over.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (set power saving mode) | 50 4A 04 01 02 FF FF 96 | – |
| ACK (set power saving mode) | – | 50 4A 04 FF FF FF FF AC |

### 11.3.17 Set A/D Resolution (0x4B; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×4B |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | A/D 8 bit resolution : 0×01<br>A/D 10 bit resolution : 0×00 |
| 4~6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | |

**Description:** ePH1100 supports two A/D resolutions: 8-bit or 10-bit (default is 8-bit).

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (set A/D resolution:8 bit) | 50 4B 04 01 FF FF FF 42 | – |
| COM (set A/D resolution:10 bit) | 50 4B 04 00 FF FF FF 54 | – |
| ACK (set A/D resolution) | – | 50 4B 04 FF FF FF FF 85 |

### *11.3.18 Rotate Touch Panel (0x4C; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×4C |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3 | User defined | 1 | HEX | – |
| 4~6 | Stuff | 3 | HEX | 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | – |

**Description:** Exchange touch panel X/Y axis.

- **Byte 3**

| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|
| 0 | – | – | – | 0 | 0 | 0 | 0 |

Bit 6=1 represents XN/YN exchange, XP/YP exchange

Bit 5=1 represents XN/XP exchange, Y direction fixed

Bit 4=1 represents YN/YP exchange, X direction fixed

Bit 7, Bit0~3 must be fixed to 0.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| COM (rotate touch panel) | 50 4C 04 70 FF FF FF B9 | – |
| ACK (rotate touch panel) | – | 50 4C 04 FF FF FF FF 5A |

## 11.4 Responses from the ePH1100 Specifications

### *11.4.1 ACK_ERROR (0x00; 8 Bytes)*

| Bytes | Function | Length | Data format | Remark |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×00 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×00; 0×00; 0×00; 0×00; |
| 7 | Checksum | 1 | HEX | 0×19 |

**Description:** If Host sends an invalid command, the ePH1100 will respond with “ACK ERROR” to Host.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| Response (ACK error) | – | 50 00 04 00 00 00 00 19 |

### *11.4.2 Inking (Access to Written Input) Coordinates (0x16; 6 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0x50 |
| 1 | Command | 1 | HEX | 0x16 |
| 2 | Parameter length | 1 | HEX | 0x02 |
| 3 | X coordinate | 1 | HEX | 0x00—0xFE |
| 4 | Y coordinate | 1 | HEX | 0x00—0xFE |
| 5 | Checksum | 1 | HEX | – |

**Description:**

- Normal inking: when the stylus taps the touch panel, the coordinate is transmitted.
- Stroke over: when the stylus leaves the touch panel, "0×FF, 0×FF" is transmitted.
- Word over: when a word is completed, "0×FF, 0×00" is transmitted.

**Example:**

| ePH1100 Inking Response | Desciption |
|---|---|
| 50 16 02 60 60 ED | =>Normal inking |
| 50 16 02 65 61 AB 50 16 02 6A 61 68 50 16 02 6F 60 2E 50 16 02 74 5F 53 | |
| 50 16 02 FF FF 1B | =>Stroke over |
| 50 16 02 40 8D CE 50 16 02 45 8F 81 50 16 02 4A 8F 42 50 16 02 4F 8F 03 50 16 02 55 8E D1 50 16 02 5C 8E 6C 50 16 02 62 8D 4A 50 16 02 67 8D 0B 50 16 02 6F 8C A4 50 16 02 74 8B 71 50 16 02 79 8A 9F 50 16 02 7E 8A F4 50 16 02 83 89 00 50 16 02 89 89 82 50 16 02 8E 88 EE 50 16 02 93 87 7D 50 16 02 98 86 ED | |
| 50 16 02 FF FF 1B | =>Stroke over |
| 50 16 02 FF 00 E8 | =>Word over |
| 50 18 15 0A 8C 4E A0 4E AB 51 35 6C 09 4E 3D 00 3A 00 3B 00 69 00 21 00 F9 | |

### 11.4.3 Touch Panel Button Coordinates (0x17; 6 Bytes; 0XFF is Pen Up Signal)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×17 |
| 2 | Parameter length | 1 | HEX | 0×02 |
| 3 | X coordinate | 1 | HEX | 0×00—0×FE; 0×FF |
| 4 | Y coordinate | 1 | HEX | 0×00—0×FE; 0×FF |
| 5 | Checksum | 1 | HEX | |

**Description:** The default values of the touch panel writing area are (0×10, 0×10) and (0×F0, 0×F0). The ePH1100 will transmit coordinates through the touch panel button area (0×17) if the tapping occurs outside the writing area.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| Response (touch panel button) | | 50 17 02 01 01 3B |

### 11.4.4 Recognized Characters Array (0x18; Maximum 25 Bytes; Minimum 6 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×18 |
| 2 | Parameter length | 1 | HEX | – |
| 3 | Max. qty. of characters | 1 | HEX | – |
| 4 | Characters (low byte) | 1 | HEX | – |
| 5 | Characters (high byte) | 1 | HEX | – |
| …. | | | | |
| N | Checksum | 1 | HEX | – |

**Description:** Recognized characters array package. No character will utilize 6 bytes.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| Response (characters) | – | 50 18 03 01 08 00 3A |

### *11.4.5 Exit from Power Saving Mode (0x33; 8 Bytes)*

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×33 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×FF; 0×FF; 0×FF; 0×FF |
| 7 | Checksum | 1 | HEX | 0×19 |

**Description:**

***A. Wake-up Conditions***

When ePH1100 enters power saving mode, ePH1100 will wake-up when one of the following conditions occurs**:**

1. Touch panel wake-up ("tap to wake-up")**:**

   Tap the touch panel & ePH1100 wakes-up and sends 1 byte (0×00) to Host. Host must respond "Host ready" within 7.5 sec, else ePH1100 will enter power saving mode again. Note that ePH1100 must have the tap-to-wakeup function enabled in order to perform this function.

**Example:**

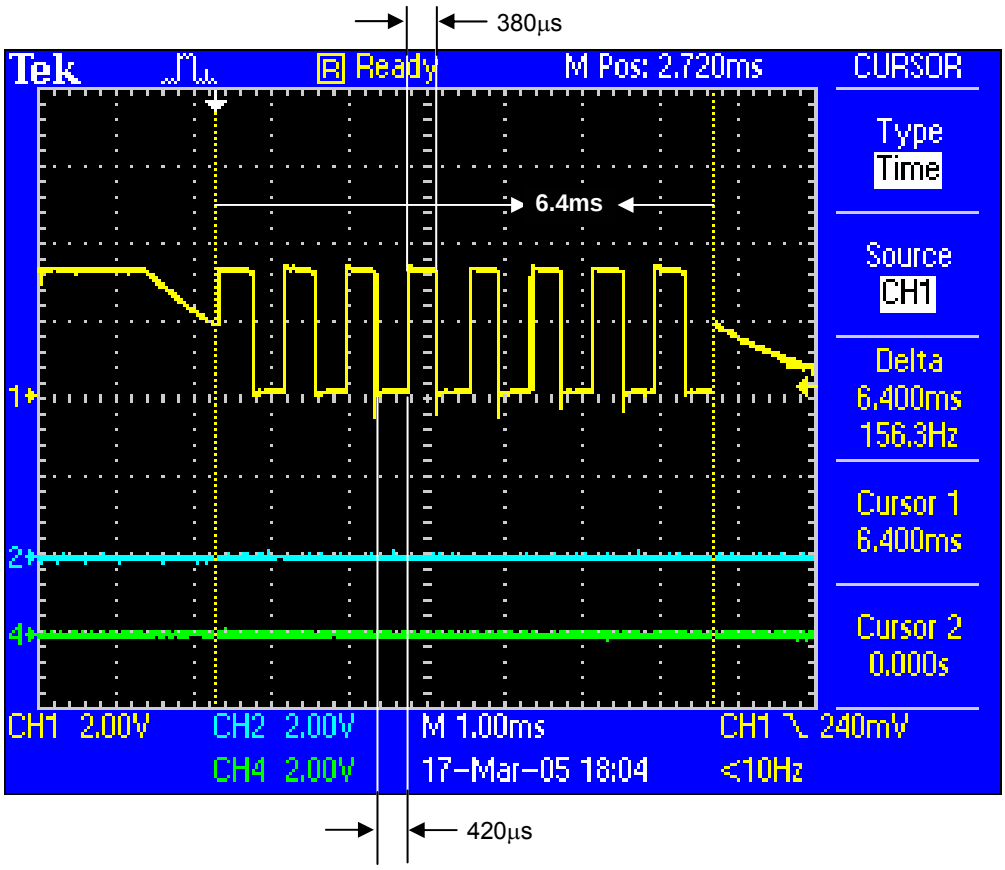
| Command / Response | Host | ePH1100 |
|---|---|---|
| Touch panel wakeup response | – | 00 |
| Com (Host ready) | 50 1C 04 FF FF FF FF B2 | – |
| ACK (Host ready) | – | 50 1C 04 FF FF FF FF B2 |
| Response | – | 50 33 04 FF FF FF FF 19 |

2. Command wake-up**:** Host executes command "50 33 04 00 00 00 00 C7" to wake up the ePH1100.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| Command wake-up | 50 33 04 00 00 00 00 C7 | – |
| Command wake-up response | – | 50 33 04 FF FF FF FF 19 |

### *B. ePH1100 Wake-up Response Signal Details*




The above waveform illustrates the characteristics of the signal which ePH1100 sends to Host after it wakes up from Idle mode. This signal is composed of 8 clocks with a total width of 6.4ms and is applicable only under “Tap to wake-up” condition.

### 11.4.6 Initial Power On (0x42; 8 Bytes)

| Bytes | Function | Length | Data Format | Remarks |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0×50 |
| 1 | Command | 1 | HEX | 0×42 |
| 2 | Parameter length | 1 | HEX | 0×04 |
| 3-6 | Stuff | 4 | HEX | 0×00; 0×00; 0×00; 0×00; |
| 7 | Checksum | 1 | HEX | 0×3D |

**Description:** When the ePH1100 is powered on, it will send “Initial power on” response to the Host.

**Example:**

| Command / Response | Host | ePH1100 |
|---|---|---|
| Response (initial power on) | – | 50 42 04 00 00 00 00 3D |

### 11.4.7 ACK_OK (Carry Out Host Command; 8 Bytes)

| Bytes | Function | Length | Data format | Remark |
|---|---|---|---|---|
| 0 | Header | 1 | HEX | 0x50 |
| 1 | Follow Host command | 1 | HEX | – |
| 2 | Parameter length | 1 | HEX | 0x04 |
| 3-6 | Stuff | 4 | HEX | 0xFF,0xFF,0xFF,0xFF |
| 7 | Checksum | 1 | HEX | – |

**Description:** After executing the Host command, the ePH1100 response with an ACK OK format which corresponds to the given command.

**Example:** Refer to each command sample provided in this specification.

## 11.5 Checksum Program

**Reference :** www.6502.org:

**Source:** CRC Calculations

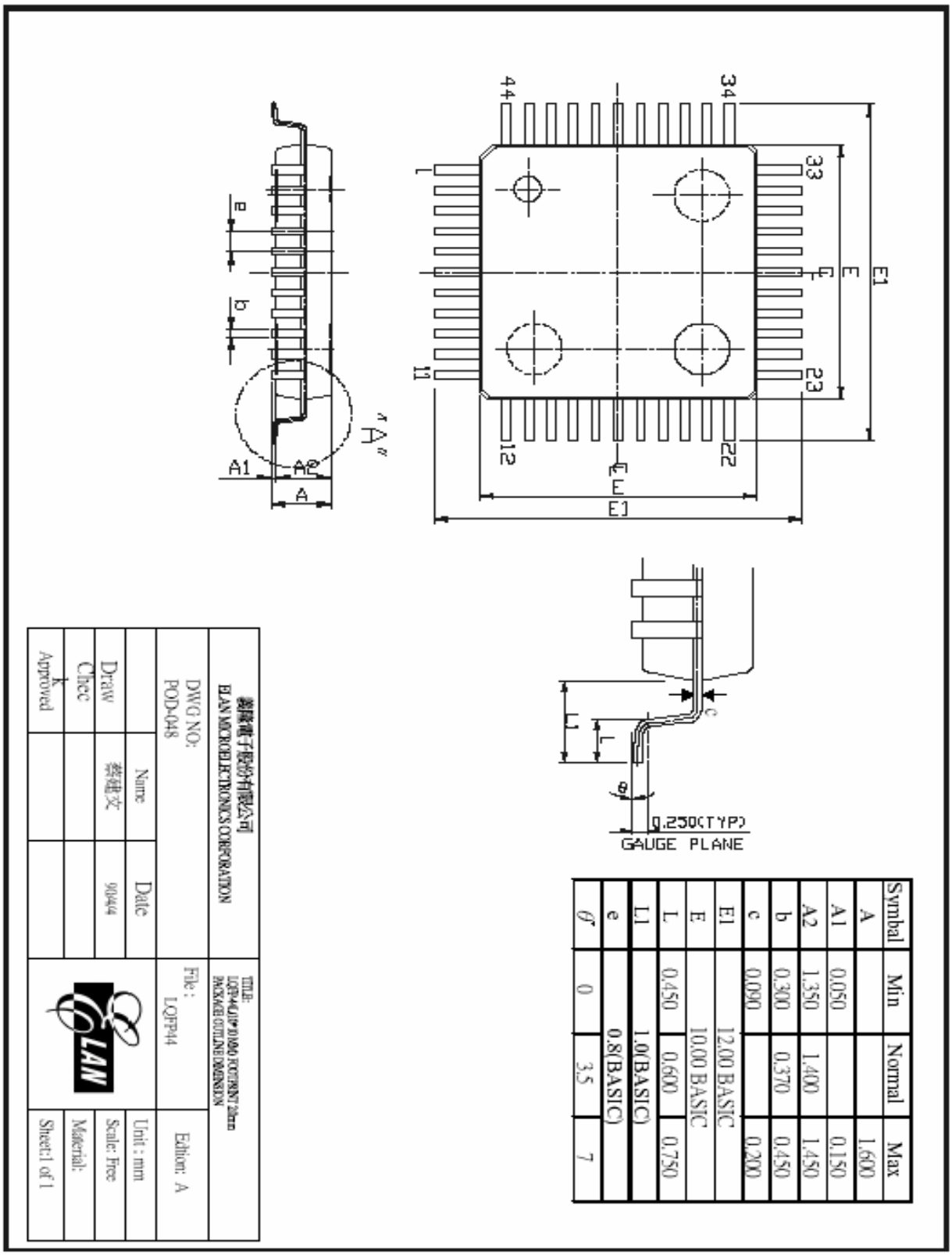
```
CRC-8 8bits checksum table
const BYTE CRCTable[256]={
0x00,0x07,0x0E,0x09,0x1C,0x1B,0x12,0x15,0x38,0x3F,0x36,0x31,
0x24,0x23,0x2A,0x2D,0x70,0x77,0x7E,0x79,0x6C,0x6B,0x62,0x65,
0x48,0x4F,0x46,0x41,0x54,0x53,0x5A,0x5D,0xE0,0xE7,0xEE,0xE9,
0xFC,0xFB,0xF2,0xF5,0xD8,0xDF,0xD6,0xD1,0xC4,0xC3,0xCA,0xCD,
0x90,0x97,0x9E,0x99,0x8C,0x8B,0x82,0x85,0xA8,0xAF,0xA6,0xA1,
0xB4,0xB3,0xBA,0xBD,0xC7,0xC0,0xC9,0xCE,0xDB,0xDC,0xD5,0xD2,
0xFF,0xF8,0xF1,0xF6,0xE3,0xE4,0xED,0xEA,0xB7,0xB0,0xB9,0xBE,
0xAB,0xAC,0xA5,0xA2,0x8F,0x88,0x81,0x86,0x93,0x94,0x9D,0x9A,
0x27,0x20,0x29,0x2E,0x3B,0x3C,0x35,0x32,0x1F,0x18,0x11,0x16,
0x03,0x04,0x0D,0x0A,0x57,0x50,0x59,0x5E,0x4B,0x4C,0x45,0x42,
0x6F,0x68,0x61,0x66,0x73,0x74,0x7D,0x7A,0x89,0x8E,0x87,0x80,
0x95,0x92,0x9B,0x9C,0xB1,0xB6,0xBF,0xB8,0xAD,0xAA,0xA3,0xA4,
0xF9,0xFE,0xF7,0xF0,0xE5,0xE2,0xEB,0xEC,0xC1,0xC6,0xCF,0xC8,
0xDD,0xDA,0xD3,0xD4,0x69,0x6E,0x67,0x60,0x75,0x72,0x7B,0x7C,
0x51,0x56,0x5F,0x58,0x4D,0x4A,0x43,0x44,0x19,0x1E,0x17,0x10,
0x05,0x02,0x0B,0x0C,0x21,0x26,0x2F,0x28,0x3D,0x3A,0x33,0x34,
0x4E,0x49,0x40,0x47,0x52,0x55,0x5C,0x5B,0x76,0x71,0x78,0x7F,
0x6A,0x6D,0x64,0x63,0x3E,0x39,0x30,0x37,0x22,0x25,0x2C,0x2B,
0x06,0x01,0x08,0x0F,0x1A,0x1D,0x14,0x13,0xAE,0xA9,0xA0,0xA7,
0xB2,0xB5,0xBC,0xBB,0x96,0x91,0x98,0x9F,0x8A,0x8D,0x84,0x83,
0xDE,0xD9,0xD0,0xD7,0xC2,0xC5,0xCC,0xCB,0xE6,0xE1,0xE8,0xEF,
0xFA,0xFD,0xF4,0xF3};

Code of produce and verify checksum :
unsigned char GenerateCRC(unsigned char *Packet,
 int size)
{
int i;
unsigned char value;
value=0;
for(i=0;i<size-1;i++){
  value ^= Packet[i];
  value=CRCTable[value];
}
return value;
}



void main(void)
{
  unsigned char Packet[8]; //produce checksum of 8bytes package
  int I;
  for(I=0;I<8;I++)Packet[I]=0;
  Packet[7]=GenerateCRC(Packet,sizeof(Packet)) //checksum place the eighth
                                                byte }
```

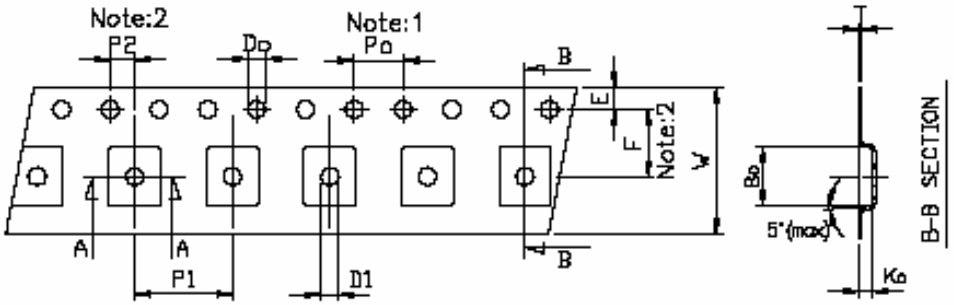
# 12 Package LQFP44

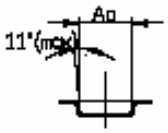



| Symbal | Min | Normal | Max |
|---|---|---|---|
| A | | | 1.600 |
| A1 | 0.050 | | 0.150 |
| A2 | 1.350 | 1.400 | 1.450 |
| b | 0.300 | 0.370 | 0.450 |
| c | 0.090 | | 0.200 |
| E1 | | 12.00 BASIC | |
| E | | 10.00 BASIC | |
| L | 0.450 | 0.600 | 0.750 |
| L1 | | 1.0(BASIC) | |
| e | | 0.8(BASIC) | |
| θ | 0 | 3.5 | 7 |

| | | | |
|---|---|---|---|
| 義隆電子股份有限公司 ELAN MICROELECTRONICS CORPORATION | | | |
| DWG NO: POD-048 | Name | Date | File: LQFP44 |
| | 蔡緯文 | 98/4/4 | Edition: A |
| Draw | | | Unit : mm |
| Chec | | | Scale: Free |
| k | | | Material: |
| Approved | | | Sheet:1 of 1 |

# 13 Tape Reel Specification




A–A SECTION

Ao= 4.20±0.10 mm

Bo= 4.80±0.10 mm

Ko= 1.15±0.10 mm

Unit: mm

| Symbol | Spec. |
|---|---|
| K1 | – |
| Po | 4.0±0.10 |
| P1 | 8.0±0.10 |
| P2 | 2.0±0.05 |
| Do | 1.55±0.05 |
| D1 | 1.50(MIN) |
| E | 1.75±0.10 |
| F | 5.50±0.05 |
| 10Po | 40.0±0.10 |
| W | 12.0±0.20 |
| T | 0.30±0.05 |

Notice:

1. 10 Sprocket hole pitch cumulative tolerance is ±0.1mm
2. Pocket position relative to sprocket hole measured as true position of pocket not pocket hole.
3. Ao & Bo measured on a place 0.3mm above the bottom of the pocket to top surface of the carrier.
4. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
5. Carrier camber shall be not than 1mm per 100mm through a length of 250mm.

| | | |
|---|---|---|
| SCALE: 2:1 | MATERIAL: | TITLE: 4.5x3.9x0.87 Carrier Tape |
| UNIT: MM | | |
| PROJ: | TREATMENT: | DWG NO: R1208-005401 |

| DESIGNED: | DRAWN: | APPROVED: | |
|---|---|---|---|
| DATE: | DATE: | DATE: | |