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## **2-IN-1 PnP SERIAL MOUSE CONTROLLER WITH AUTO-REF.**

### **FEATURES**

- RS232C interface.
- 2-in-1 i.e. Microsoft System or Mouse System.
- CMOS technology.
- Low power dissipation.
- Seven button combinations.
- Wheel or Optical/Mechanical.
- Can work on optical mouse.
- Will send out PnP code after rising edge of RTS.
- Zener diode built in.
- Operating frequency: 32768Hz .
- Auto-Reference function

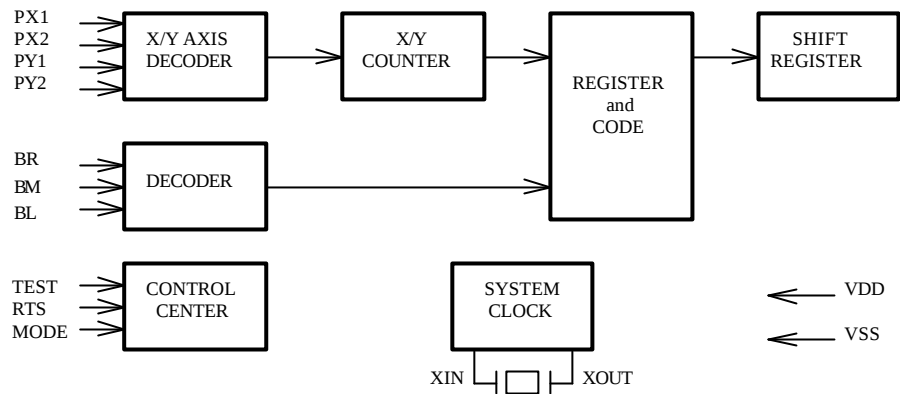
### **GENERAL DESCRIPTION**

EC3581 is a single chip 2-IN-1 Mouse Controller, designed and fabricated in CMOS ASIC technology.

**PAD DESCRIPTIONS**

| PAD NAME | I/O | FUNCTION                                                                                                                                                                                                                                                                                                                                              |
|----------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MODE     | I   | Mode selection input. If MODE pin is HIGH, EC3581 will operate in Microsoft System mode. If MODE pin is LOW, EC3581 will operate in Mouse System mode. If MODE pin is floating during the Power On Reset period and one of the buttons is pressed, the EC3581 will operate in Microsoft System mode. Otherwise, it will operate in Mouse System mode. |
| XIN      | I   | Crystal oscillator input.                                                                                                                                                                                                                                                                                                                             |
| XOUT     | O   | Crystal oscillator output.                                                                                                                                                                                                                                                                                                                            |
| RTS      | I   | Input from RTS (Request To Send) of RS232C. The RXD pin will send a 4D hexadecimal code in Microsoft System Mode after a LOW to HIGH transition of the RTS pin. After 4D code is received, the RTS pin will remain HIGH.                                                                                                                              |
| RXD      | O   | Serial data output to Receive Data of RS232C. Normally LOW.                                                                                                                                                                                                                                                                                           |
| VSS      | P   | Ground pin.                                                                                                                                                                                                                                                                                                                                           |
| BR       | I   | Right button selection. BR pin is HIGH when right button is pressed and becomes LOW when it is released. EC3581 will only report through RXD on a rising edge or falling edge of the input signal. The status of BR will be LOW on a falling edge and HIGH on a rising edge.                                                                          |
| BM       | I   | Middle button input.                                                                                                                                                                                                                                                                                                                                  |
| BL       | I   | Left button input.                                                                                                                                                                                                                                                                                                                                    |
| GND      | I   | Reference voltage for ZENER.                                                                                                                                                                                                                                                                                                                          |
| PX1      | I   | Input from the first X axis photo-encoder. In both Microsoft System and Mouse System, PX1 and PX2 constitute positive (negative) counts for rightward (leftward) movement on the screen.                                                                                                                                                              |
| PX2      | I   | Input from the second X axis photo-encoder.                                                                                                                                                                                                                                                                                                           |
| PY1      | I   | Input from the first Y axis photo-encoder. In Microsoft System, PY1 and PY2 constitute positive (negative) counts for downward (upward) movement on the screen. In Mouse System, PY1 and PY2 constitute positive (negative) counts for upward (downward) movement on the screen.                                                                      |
| PY2      | I   | Input from the second Y axis photo-encoder.                                                                                                                                                                                                                                                                                                           |
| VDD      | P   | +5V power supply.                                                                                                                                                                                                                                                                                                                                     |

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| PARAMETER                         | SYMBOL | MIN | MAX | UNIT |
|-----------------------------------|--------|-----|-----|------|
| Supply Voltage                    | Vdd    | 0   | 6.5 | V    |
| Ambient Temperature               | Tamb   | 0   | 70  |      |
| Storage Temperature               | Tstg   | -40 | 125 |      |
| Power Dissipation<br>(Tamb = 70 ) | Pd     | --- | 100 | mW   |

Note: This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

## DC ELECTRICAL CHARACTERISTICS

(Note: Vdd = 5 V, unless otherwise specified)

| PARAMETER                                                                     | SYMBOL | MIN | TYP | MAX | UNIT       |
|-------------------------------------------------------------------------------|--------|-----|-----|-----|------------|
| Operating Voltage                                                             | Vdd    | 4.5 | 5   | 5.5 | V          |
| Operating Current (No load)                                                   | Iop    | --- | --- | 2.0 | mA         |
| PX1/PX2/PY1/PY2 Input Range                                                   | Vir    | 0.1 | --- | 3.2 | V          |
| PX1/PX2/PY1/PY2 Input Amplitude                                               | Via    | 0.6 | --- | --- | V          |
| PX1/PX2/PY1/PY2 Input Resistance                                              | ---    | --- | --- | --- | K $\Omega$ |
| BL/BM/BR/MODE/RTS                                                             | Vih    | 3.2 | --- | --- | V          |
| BL/BM/BR/MODE/RTS                                                             | Vil    | --- | --- | 1.3 | V          |
| BL/BM/BR Internal Pull-down Resistor                                          | Rbut   | 125 | 200 | 270 | K $\Omega$ |
| RXD Output Current (sourcing)<br>Voh=(RTS-1)V                                 | Ioh    | 1.0 | --- | --- | mA         |
| RXD Output Current (sinking)<br>(Vol = 0.5V)                                  | Iol    | 1.0 | --- | --- | mA         |
| PX1/PX2/PY1/PY2/BL/BM/BR/<br>MODE//XIN<br>Input Leakage Current<br>(Vih = 5V) | Iih    | --- | --- | 2   | $\mu$ A    |
| Zener Diode Voltage<br>(Iz =4mA)                                              | Vz     | 5.0 | 5.2 | 5.4 | V          |

## AC ELECTRICAL CHARACTERISTICS

| PARAMETER                                             | SYMBOL | MIN  | TYP            | MAX | UNIT |
|-------------------------------------------------------|--------|------|----------------|-----|------|
| Oscillator Frequency                                  | Fosc   | ---  | 32.768         | --- | KHz  |
| BR/BL/BM Button Debounce Time                         | Tbd    | 40   | ---            | --- | ms   |
| Tracking Speed (200 DPI wheel; Microsoft System Mode) | Vts    | ---  | 64.5           | --- | CM/S |
| RXD Transmission Rate                                 | Fmx    | ---  | 1213           | --- | Hz   |
| Transmission Time (Mouse System)                      | Tms    | ---  | 41.2           | --- | ms   |
| Transmission Time (Microsoft)                         | Tm     | ---  | 24.72<br>32.95 | --- | ms   |
| Start Bit Time                                        | Ts     | ---  | 0.824          | --- | ms   |
| Data Bit Time                                         | Td     | ---  | 0.824          | --- | ms   |
| Stop Bit Time                                         | Tp     | ---  | 0.824          | --- | ms   |
| Mode Code Delay Time                                  | T1     | ---  | 13.7           | --- | ms   |
| Pattern In Pulse Width                                | Tpi    | 0.12 | ---            | --- | ms   |

Note: 1. After the power on, the mouse will send PnP code automatically.

2.The mouse will send PnP code at 15ms after RTS goes from low to high.

## DATA FORMAT

**Baud rate: 1200 bps asynchronous**

**Output data:**

| Microsoft System        | Mouse System       |
|-------------------------|--------------------|
| 3 or 4 bytes per packet | 5 bytes per packet |
| 1 Start bit             | 1 Start bit        |
| 7 Data bits             | 8 Data bits        |
| 2 Stop bits             | 2 Stop bits        |

**Byte format:**

**MICROSOFT SYSTEM**

| Data Bit | 6 | 5  | 4  | 3  | 2  | 1  | 0  |
|----------|---|----|----|----|----|----|----|
| 1st byte | 1 | BL | BR | Y7 | Y6 | X7 | X6 |
| 2nd byte | 0 | X5 | X4 | X3 | X2 | X1 | X0 |
| 3rd byte | 0 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |
| 4th byte | 0 | BM | 0  | 0  | 0  | 0  | 0  |

**MOUSE SYSTEM**

| Data Bit | 7  | 6  | 5  | 4  | 3  | 2  | 1  | 0  |
|----------|----|----|----|----|----|----|----|----|
| 1st byte | 1  | 0  | 0  | 0  | 0  | BL | BM | BR |
| 2nd byte | X7 | X6 | X5 | X4 | X3 | X2 | X1 | X0 |
| 3rd byte | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |
| 4th byte | X7 | X6 | X5 | X4 | X3 | X2 | X1 | X0 |
| 5th byte | Y7 | Y6 | Y5 | Y4 | Y3 | Y2 | Y1 | Y0 |

**Transmit sequence of each byte:**

|          | Microsoft System | Mouse System |
|----------|------------------|--------------|
| 1st bit  | start bit        | start bit    |
|          | data bit 0       | data bit 0   |
|          |                  |              |
|          | data bit 6       | data bit 6   |
|          |                  | data bit 7   |
| last bit | stop bit         | stop bit     |

**BR/BM/BL Data format:**

| Microsoft System | Mouse System  |
|------------------|---------------|
| 1 = Depressed    | 1 = Released  |
| 0 = Released     | 0 = Depressed |

**In Microsoft system:**

X7 - X0 = X axis movement in 2's complement, positive for rightward.

Y7 - Y0 = Y axis movement in 2's complement, positive for downward.

**In Mouse System:**

X7 - X0 = X axis movement in 2's complement, positive for rightward.

Y7 - Y0 = Y axis movement in 2's complement, positive for upward.

**TIMING DIAGRAM**
**DATE TYPE:**
**A. Plug and play code:**

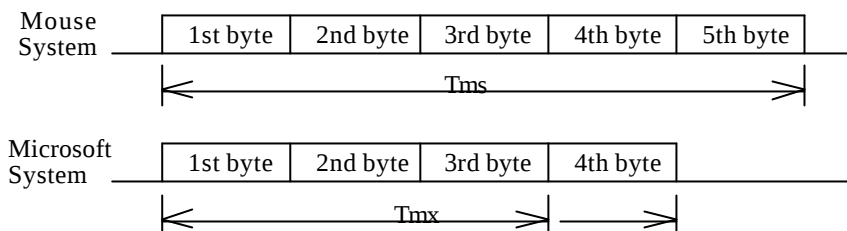
PnP code will be determined by each customer. Otherwise, this code will be E-CMOS' s code.

**E-CMOS PnP code**

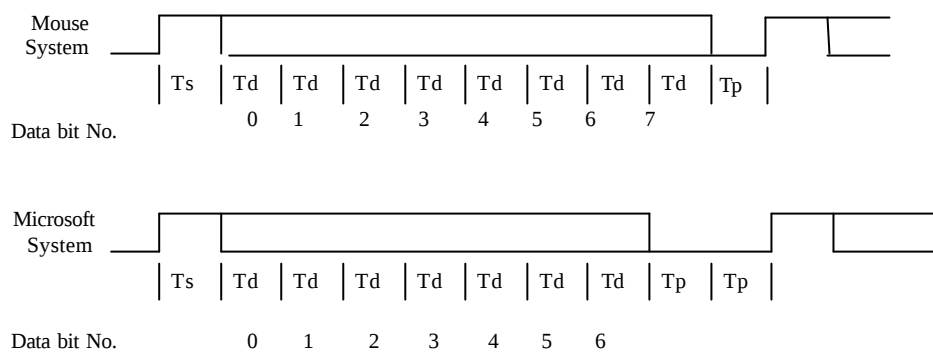
|                   |           |                      |
|-------------------|-----------|----------------------|
| <b>Non-PnP ID</b> | "m", "3"  | 4D,33                |
| <b>Begin PnP</b>  | 08h       | 08                   |
| <b>PnP Rev</b>    | 1.0       | 01,24                |
| <b>EISA ID</b>    | "ECM"     | 25,23,2D             |
| <b>Product ID</b> | 0001      | 10,10,10,11          |
| <b>Extend</b>     | "\"       | 3C                   |
| <b>Extend</b>     | "\"       | 3C                   |
| <b>Class Name</b> | "MOUSE"   | 2D,2F,35,33,25       |
| <b>Extend</b>     | "\"       | 3C                   |
| <b>Driver ID</b>  | "PNP0F0C" | 30,2E,30,10,26,10,23 |
| <b>Checksum</b>   | 380       | 18,10                |
| <b>End PnP</b>    | 09h       | 09                   |

## B. DATAOUT DIAGRAM

### (1) BYTES STRUCTURE:



### (2) BITS STRUCTURE :



## LAYOUT DESIGN GUIDELINES

### Mounting of Die and Layout for Wire Bond Pads

1. A ground potential is required for the die, area for the PCB die pad should be .010" larger than the die, on all sides.
2. For wire bonding manufacturability, the PCB pads should be placed in line with die pads.
  - A. Normal distance between die pad and PCB bond pads: .020" to .100"
  - B. Typical PCB pad size: .005" to .010" square
3. Usual Length of a wire bond: .020" to .100"

### 儲存環境注意事項

1. Dies 應存放於 Tray 盤內以真空包裝及置於恆溫箱中以常溫 25 儲存，以避免氧化。

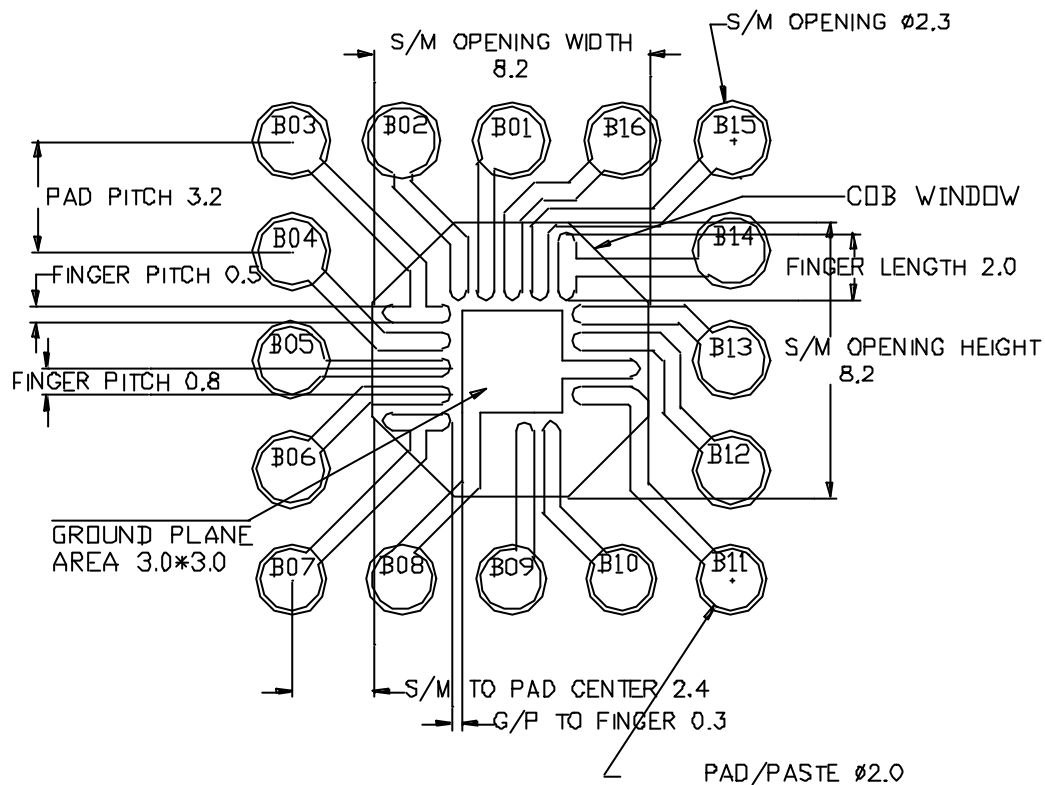
E-CMOS CORPORATION

Dev. : EC3581-D

TYPICAL COB LAYOUT DRAWING

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unit : mm



Note :

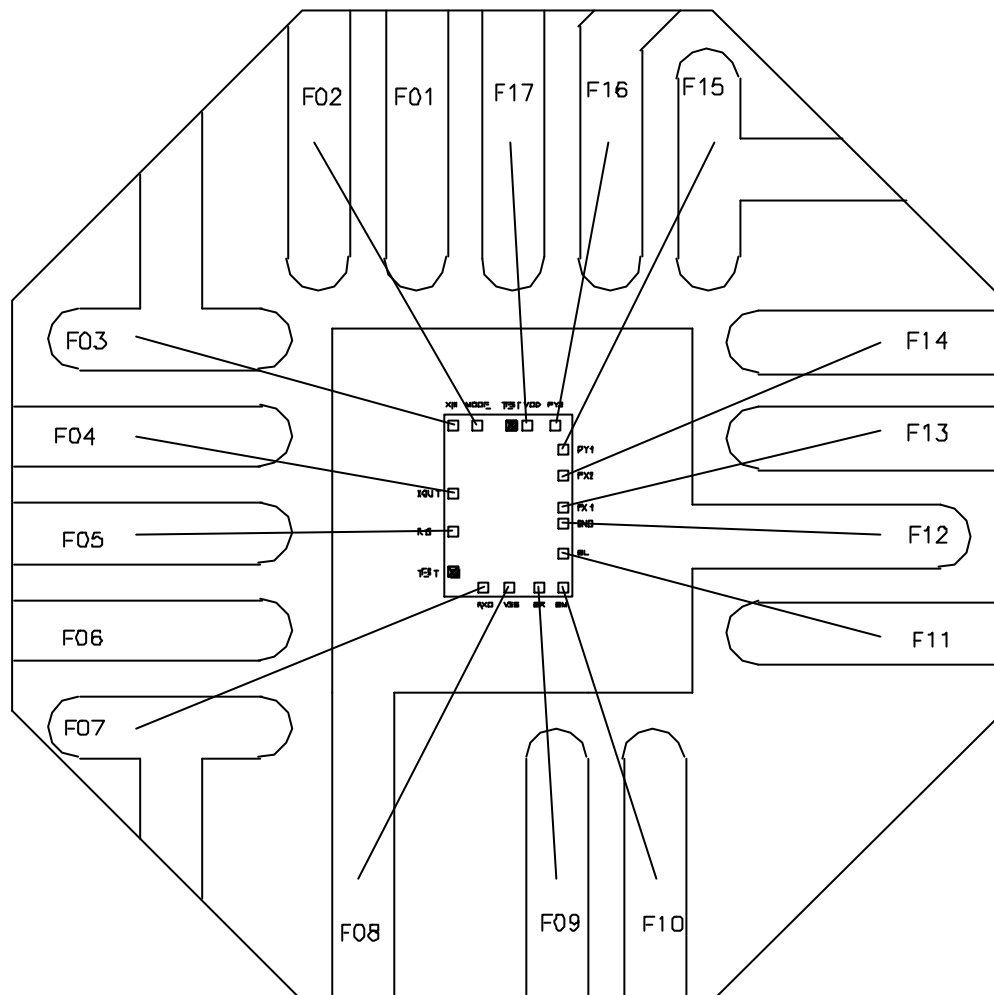
1. S/M = Solder Mask
2. G/P = Ground Plane
3. The PAD area should be fully opened up by the defined solder mask layer.
4. No.12 of pad connects to the ground plane.
5. The S/M opening area must be plated with gold for wire bonding.

E-CMOS CORPORATION

Dev. : EC3581-D

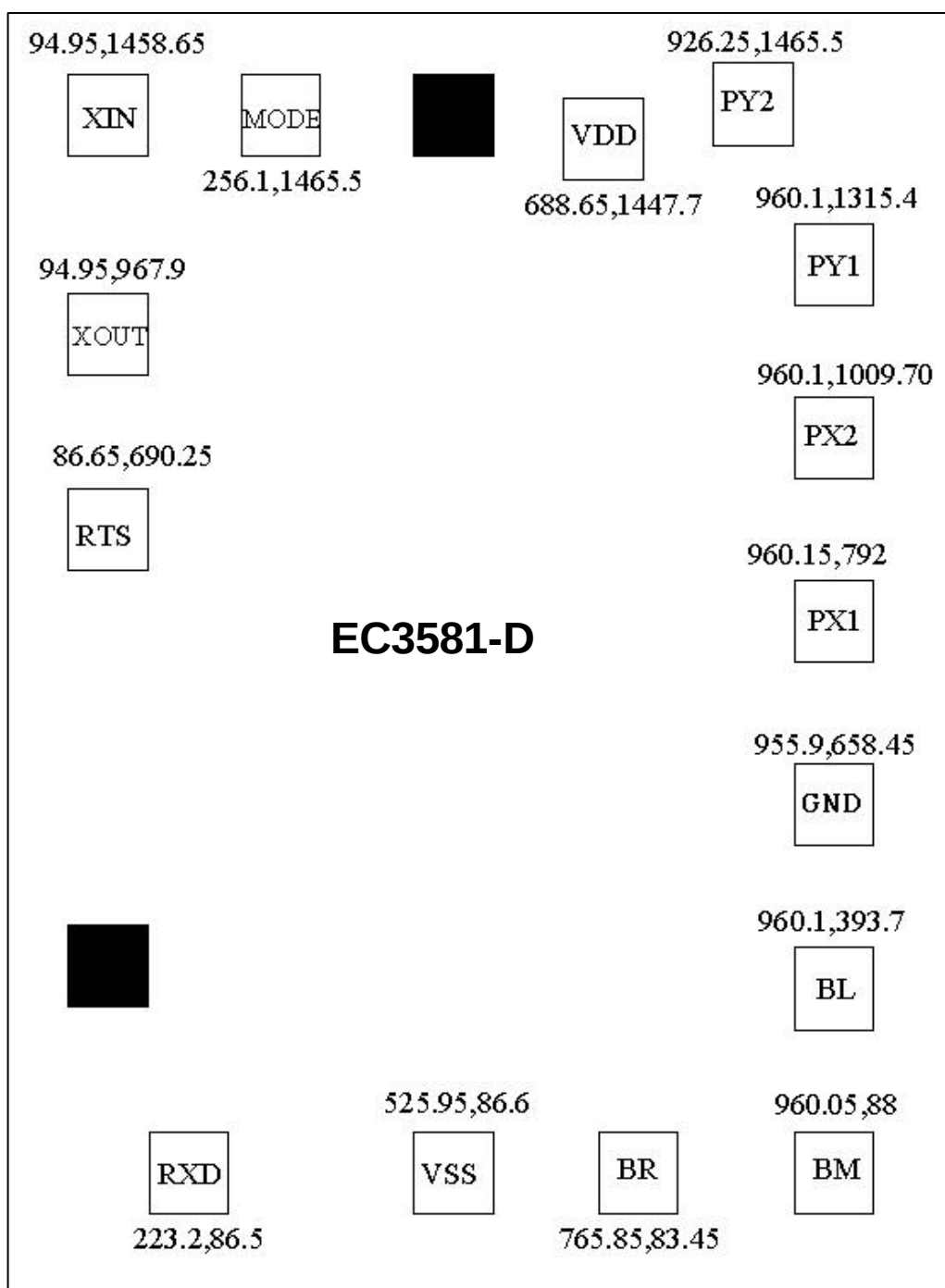
# COB BONDING DIAGRAM

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Die Size = 1.164 mm x 1.644 mm

# CHIP LOCATION



**FINGER AND PAD CONTRAST TABLE**

| Probe | Ball Number | Finger Number | Pad Name | Coordinate      |
|-------|-------------|---------------|----------|-----------------|
|       | B01         | F01           | NONE     | ---             |
|       | B02         | F02           | MODE     | 256.1,1465.5    |
|       | B03         | F03           | XIN      | 94.95 , 1458.65 |
|       | B04         | F04           | XOUT     | 94.95,967.9     |
|       | B05         | F05           | RTS      | 86.65,690.25    |
|       | B06         | F06           | NONE     | ---             |
|       | B07         | F07           | RXD      | 223.2,86.5      |
|       | B08         | F08           | VSS      | 525.95,86.6     |
|       | B09         | F09           | BR       | 765.85,83.45    |
|       | B10         | F10           | BM       | 960.05,88       |
|       | B11         | F11           | BL       | 960.1,393.7     |
|       | NONE        | F12           | GND      | 955.9,658.45    |
|       | B12         | F13           | PX1      | 960.15,792      |
|       | B13         | F14           | PX2      | 960.1,1009.7    |
|       | B14         | F15           | PY1      | 960.1,1315.4    |
|       | B15         | F16           | PY2      | 926.25,1465.5   |
|       | B16         | F17           | VDD      | 688.65,1447.7   |

