IC Sử Dụng Trong Mạch Khảo Sát

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO.** | **IC NAME** | **AMOUNT** | **FUNCTION** | **LINK** |
| 1 | 133TM5  # | 10 | Vi mạch đại diện cho 4 D-triggers  (D-Triger) | https://russian-electronics.com/products/ics-unf-modules-microassemblies/:133tm5 |
| 2 | 134PM1  # | 6 | Vi mạch 134PM1 là 4 phần tử lưu trữ (D-Triger) | https://zapadpribor.com/134rm1/ |
| 3 | 133ЛA3  \* | 7 | Microassemblies 133LА3 là 4 phần tử logic 2I-NЕ. | https://russian-electronics.com/products/ics-unf-modules-microassemblies/:133la3 |
| 4 | 136ЛА3  \* | 5 | Chip 136LA3 là 4 phần tử logic 2I-NOT. | https://eandc.ru/catalog/detail.php?ID=245 |
| 5 | 106ЛА8A  \* | 19 | Vi mạch 106LA8 là bốn phần tử logic 2I-NOT với đầu ra bộ góp hở | https://eandc.ru/catalog/detail.php?ID=18821 |
| 6 | 133ЛA8  \* | 1 | Vi mạch 133LA8 là bốn mạch hai đầu vào AND-NOT với đầu ra cực góp hở | https://russian-electronics.com/products/ics-unf-modules-microassemblies/:133la8 |
| 7 | 136ЛН1 | 15 | Mạch tích hợp cấu trúc cổng logic 6 NOT. | https://russian-electronics.com/products/ics-unf-modules-microassemblies/:136ln1 |
| 8 | 136ЛР3 | 8 | Chip 136LR3 là phần tử logic 2-2-2-3I-4OR-NOT với khả năng mở rộng bằng OR. | https://eandc.ru/catalog/detail.php?ID=249 |
| 9 | 133ЛA4 | 1 | Vi mạch đại diện cho ba phần tử logic 3AND-NOT. | https://russian-electronics.com/products/ics-unf-modules-microassemblies/:133la4 |
| 10 | 133ЛA1 | 1 | Vi mạch đại diện cho hai phần tử logic 4AND-NOT, một trong số chúng có thể mở rộng bằng phần tử OR. | https://russian-electronics.com/products/ics-unf-modules-microassemblies/:133la1 |
| 11 | 134КП10 | 20 | Vi mạch 134KP10 ghép 8 kênh trong ra 1 | https://eandc.ru/catalog/detail.php?ID=220 |
| 12 | 136ЛР1 | 12 | Chip 136LR1 là 2 phần tử logic 2-2I-2OR-NOT, một phần tử có thể mở rộng bằng OR. | https://eandc.ru/catalog/detail.php?ID=248 |
| 13 | B18 | 22 | Tụ thanh |  |
| 14 | K56J | 6 | Trở thanh |  |
| 15 | СНП-135  135 PIN  (45\*3) |  | | |
| 16 | X160P-A | 160 PIN (80\*2) | | |

*\*, # : Linh kiện có cùng chức năng.*

CHÂN GIAO TIẾP

- СНП-135 : Cấu tạo 3 hàng chân (X2A, X2B, X2C); mỗi hàng chứa 45 PIN; tổng 135 PIN.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ROW** | **IN** | **OUT** | **I/O** | **VCC** | **GND** | **NC** |
| X2A |  |  | 43 | 0 | 0 | 2 |
| X2B |  |  | 27 | 6 | 6 | 6 |
| X2C |  |  | 35 | 0 | 0 | 10 |
| **TOTAL** |  |  | 105 | 6 | 6 | 18 |
|  | |

Tổng số chân GPIO của FPGA cần dùng (không bao gồm VCC và GND)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NO.** | **PIN USE** | **COMMUNICATE** | **LEVEL** | **NOTE** |
|  | 105 | СНП-135 | 5V | Bảng mạch khảo sát |
|  | 4 | W25Q32 | 3.3V | ROM 32kbit (4kbyte) |
|  | 2 | CH340C | 3.3V | USB - TTL |
| **TOTAL** | **111 PIN (FPGA) cho thiết kế mạch giao tiếp** | | | |

Bảng kết nối của СНП-135.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PIN NO.** | **PIN NAME** | **NET LABLE** | **ROW** | **I/O** | **NOTE** |
|  |  | e4-14 | X2A |  | O(F8, E7); X1A(43); I(E4, F5) |
|  |  | d1-14 | X2A |  | O(F8, E7); X1B(133); I(D1, F3) |
|  |  | e7-8 | X2A |  | O(E7, F8); X1B(119); I(F4, H4) |
|  |  | e7-14 | X2A |  | O(E7, F8); X1B(132); I(F2, K3) |
|  |  | b3-14 | X2A |  | X1B(134); I(B3, E3) |
|  |  | b2-14 | X2A |  | X1B(147); I(B2, E2) |
|  |  | e4-3 | X2A |  | O(H8); X1A(50); I(E4, F5) |
|  |  | d1-3 | X2A |  | O(H8); X1B(126); I(D1, F3) |
|  |  | f4-3 | X2A |  | O(H8); X1B(111); I(F4, H4) |
|  |  | f2-3 | X2A |  | O(H8); X1B(129); I(F2, K3) |
|  |  | b3-3 | X2A |  | X1B(125); I(B3, E3) |
|  |  | b2-3 | X2A |  | X1B(143); I(B2, E2) |
|  |  | e4-13 | X2A |  | O(H7); X1A(65); I(E4, F5) |
|  |  | d1-13 | X2A |  | O(H7); X1B(128);I (D1, F3) |
|  |  | f4-13 | X2A |  | O(H7); X1B(115); I(F4, H4) |
|  |  | f2-13 | X2A |  | O(H7); X1B(130); I(F2, K3) |
|  |  | b3-13 | X2A |  | X1B(131); I(B3, E3) |
|  |  | b2-13 | X2A |  | X1B(146); I(B2, E2) |
|  |  | e4-2 | X2A |  | O(K5); X1B(93); I(E4, F5) |
|  |  | d1-2 | X2A |  | O(K5); X1B(89); I(D1, F3) |
|  |  | f4-2 | X2A |  | O(K5); X1B(88); I(F4, H4) |
|  |  | f2-2 | X2A |  | O(K5); X1B(99); I(F2, K3) |
|  |  | b3-2 | X2A |  | X1B(127); I(B3, E3) |
|  |  | b2-2 | X2A |  | X1B(145); I(B2, E2) |
|  |  | e4-1 | X2A |  | O(K4); X1B(112); I(E4, F5) |
|  |  | d1-1 | X2A |  | O(K4); X1B(109); I(D1, F3) |
|  |  | f4-1 | X2A |  | O(K4); X1(B106); I(F4, H4) |
|  |  | f2-1 | X2A |  | O(K4); X1B(117); I(F2, K3) |
|  |  | b3-1 | X2A |  | X1(B135); I(B3, E3) |
|  |  | b2-1 | X2A |  | X1B(149); I(B2, E2) |
|  |  | e8-1 | X2A |  | X1A(48); I(E8) |
|  |  | e8-12 | X2A |  | X1A(40); I(E8) |
|  |  | b6-3 | X2A |  | I(B6) |
|  |  | f9-8 | X2A |  | I(H10, K7, K9, F9) |
|  |  | f9-9 | X2A |  | I(F9, H10, K7, K9) |
|  |  | f9-10 | X2A |  | I(F9, H10, K7, K9) |
|  |  | a37 | X2A |  | X1B(91) |
|  |  | a38 | X2A |  | X1B(94) |
|  |  | a39 | X2A |  | X1B(98) |
|  |  | a40 | X2A |  | X1(B101) |
|  |  | a41 | X2A |  | X1B(104) |
|  |  | a42 | X2A |  | X1B(121) |
|  |  | a43 | X2A |  | X1B(122) |
|  |  |  | X2A | NC |  |
|  |  |  | X2A | NC |  |
|  |  |  | X2B | GND |  |
|  |  | d5-14 | X2B |  | X1B(86); I(D5, E5) |
|  |  | b3 | X2B |  | X1A(16) |
|  |  |  | X2B | VCC |  |
|  |  | d2-14 | X2B |  | X1B(120); I(D4, D2) |
|  |  | b6 | X2B |  | X1A(23) |
|  |  | d5-3 | X2B |  | X1B(82); I(D5, E5) |
|  |  | b8 | X2B |  | X1A(31) |
|  |  | d2-3 | X2B |  | X1B(114); I(D2, D4) |
|  |  |  | X2B | VCC |  |
|  |  | b11 | X2B |  | X1A(53) |
|  |  | b12 | X2B |  | X1A(54) |
|  |  |  | X2B | GND |  |
|  |  | d5-13 | X2B |  | X1B(84); I(D5, E5) |
|  |  | b6-1 | X2B |  | O(B6) |
|  |  | d2-13 | X2B |  | X1B(116); I(D2, D4) |
|  |  | b6-4 | X2B |  | O(B6) |
|  |  |  | X2B | VCC |  |
|  |  | d5-2 | X2B |  | X1B(83); I(D5, E5) |
|  |  | b6-10 | X2B |  | O(B6) |
|  |  |  | X2B | GND |  |
|  |  | d2-2 | X2B |  | X1B(144); I(D2, D4) |
|  |  | b6-13 | X2B |  | O(B6) |
|  |  |  | X2B | NC |  |
|  |  |  | X2B | GND |  |
|  |  | d5-1 | X2B |  | X1B(85); I(D5, E5) |
|  |  | d2-1 | X2B |  | X1B(148); I(D2, D4) |
|  |  |  | X2B | VCC |  |
|  |  |  | X2B | NC |  |
|  |  |  | X2B | NC |  |
|  |  | b31 | X2B |  | X1A(80) |
|  |  | e8-9 | X2B |  | X1A(34); I(E8) |
|  |  |  | X2B | GND |  |
|  |  | e8-4 | X2B |  | X1A(38); I(E8) |
|  |  |  | X2B | NC |  |
|  |  |  | X2B | VCC |  |
|  |  | a4-3 | X2B |  | O(A4); I(A4) |
|  |  | b38 | X2B |  | X1B(95) |
|  |  | b39 | X2B |  | X1B(100) |
|  |  |  | X2B | NC |  |
|  |  |  | X2B | NC |  |
|  |  |  | X2B | VCC |  |
|  |  | f7-5 | X2B |  | O(F7); X1A(71) |
|  |  | f7-3 | X2B |  | O(F7); X1A(56) |
|  |  |  | X2B | GND |  |
|  |  | e7-1 | X2C |  | X1A(75); I(E7) |
|  |  | e7-6 | X2C |  | X1A(59); I(E7) |
|  |  | e7-9 | X2C |  | X1A(62); I(E7) |
|  |  | e7-12 | X2C |  | X1A(64); I(E7) |
|  |  | c5 | X2C |  | X1A(22) |
|  |  | c6 | X2C |  | X1A(28) |
|  |  | c7 | X2C |  | X1A(29) |
|  |  | c8 | X2C |  | X1A(30) |
|  |  | b2-8 | X2C |  | I(D1, D2, D5, B2, B3, E4, F2, F4) |
|  |  | b2-9 | X2C |  | I(D1, D2, D5, B2, B3, E4, F2, F4) |
|  |  | b2-10 | X2C |  | I(D1, D2, D5, B2, B3, E4, F2, F4) |
|  |  | d4-8 | X2C |  | I(D4, E2, E3, E5, F3, F5, H4, K3) |
|  |  | d4-9 | X2C |  | I(D4, E2, E3, E5, F3, F5, H4, K3) |
|  |  | d4-10 | X2C |  | I(D4, E2, E3, E5, F3, F5, H4, K3) |
|  |  |  | X2C | NC |  |
|  |  | b4-8 | X2C |  | O(B4) |
|  |  | a10-1 | X2C |  | I(A10) |
|  |  | a10-4 | X2C |  | I(A10) |
|  |  | b10-13 | X2C |  | I(B10) |
|  |  |  | X2C | NC |  |
|  |  | a4-4 | X2C |  | I(A4) |
|  |  | a4-5 | X2C |  | I(A4) |
|  |  |  | X2C | NC |  |
|  |  |  | X2C | NC |  |
|  |  |  | X2C | NC |  |
|  |  |  | X2C | NC |  |
|  |  | f7-2 | X2C |  | X1A(66); I(F7) |
|  |  | c28 | X2C |  | X1A(78) |
|  |  | c29 | X2C |  | X1A(79) |
|  |  | k5-2 | X2C |  | X1B(92); I(K5) |
|  |  | k4-2 | X2C |  | X1B(110); I(K4) |
|  |  | c32 | X2C |  | X1B(154) |
|  |  | a2-3 | X2C |  | I(A2) |
|  |  | b5-12 | X2C |  | I(B5) |
|  |  | e9-3 | X2C |  | I(E9) |
|  |  | d8-3 | X2C |  | I(D8) |
|  |  | e7-2 | X2C |  | X1A(68); I(E7) |
|  |  | f7-10 | X2C |  | X1A(47); I(F7, H8) |
|  |  | f8-2 | X2C |  | X1A(41); I(F8) |
|  |  | h7-2 | X2C |  | X1A(63); I(H7) |
|  |  |  | X2C | NC |  |
|  |  |  | X2C | NC |  |
|  |  |  | X2C | NC |  |
|  |  |  | X2C | NC |  |
|  |  | b4-6 | X2C |  | O(B4) |

|  |  |
| --- | --- |
| *\* NC: No Connect.*  *\* VCC: 5V.*  *\* GND: Ground.* | *\* I: Input.*  *\* O: Output.* |

Bảng kết nối của X160P-A

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PIN NO.** | **PIN NAME** | **NET LABLE** | **ROW** | **I/O** | **NOTE** |
|  |  |  | X1A | VCC |  |
|  |  |  | X1A | GND |  |
|  |  | t2-2 | X1A |  | I(T2) |
|  |  | p2-1 | X1A |  | I(P2) |
|  |  |  | X1A | NC |  |
|  |  | p2-2 | X1A |  | I(P2) |
|  |  | t2-1 | X1A |  | I(T2) |
|  |  |  | X1A | NC |  |
|  |  |  | X1A | NC |  |
|  |  |  | X1A | NC |  |
|  |  | y4-2 | X1A |  | O(Y4) |
|  |  | t3-6 | X1A |  | O(T3) |
|  |  |  | X1A | NC |  |
|  |  | m5-6 | X1A |  | O(M5) |
|  |  | p4-1 | X1A |  | I(P4) |
|  |  | t6-2 | X1A |  | I(W4, T6 ) |
|  |  | t4-2 | X1A |  | I(T4) |
|  |  | u2-2 | X1A |  | O(U2) |
|  |  |  | X1A | NC |  |
|  |  | p4-2 | X1A |  | I(P4) |
|  |  | t4-1 | X1A |  | I(T4) |
|  |  | m6-2 | X1A |  | O(T2); I(M6) |
|  |  | u3-10 | X1A |  | I(U3, U4) |
|  |  | m5-2 | X1A |  | O(M5) |
|  |  | t3-10 | X1A |  | O(T3) |
|  |  | m5-10 | X1A |  | O(M5) |
|  |  | t3-2 | X1A |  | O(T3) |
|  |  | m6-7 | X1A |  | O(T1); I(M6) |
|  |  | m6-10 | X1A |  | O(T1); I(M6) |
|  |  | m6-13 | X1A |  | O(T1); I(M6) |
|  |  | w4-13 | X1A |  | I(W4) |
|  |  | m3-12 | X1A |  | O(M3) |
|  |  | m5-4 | X1A |  | O(M5) |
|  |  | m2-9 | X1A |  | I(M2, P1) |
|  |  | m7-2 | X1A |  | O(M7) |
|  |  | t3-12 | X1A |  | O(T3) |
|  |  | m5-12 | X1A |  | O(M5) |
|  |  | m2-4 | X1A |  | I(M2, P1) |
|  |  | t3-4 | X1A |  | O(T3) |
|  |  | m2-12 | X1A |  | I(M2) |
|  |  | u5-1 | X1A |  | I(U5) |
|  |  | m3-4 | X1A |  | O(M3) |
|  |  | m10-6 | X1A |  | O(T9); I(M10, U10) |
|  |  | m7-4 | X1A |  | O(M7) |
|  |  | m3-6 | X1A |  | O(M3) |
|  |  | m2-2 | X1A |  | O(T4, T6); I(M2, P1) |
|  |  | t5-1 | X1A |  | I(T5) |
|  |  | m2-1 | X1A |  | I(M2, P1) |
|  |  | m3-8 | X1A |  | O(M3) |
|  |  | m9-1 | X1A |  | O(P8); I(M9, P7) |
|  |  | m3-10 | X1A |  | O(M3) |
|  |  | m3-2 | X1A |  | O(M3) |
|  |  | u3-13 | X1A |  | I(U3) |
|  |  | p7-6 | X1A |  | I(P7, U10, W10, Y9, Z11, Z7) |
|  |  |  | X1A | NC |  |
|  |  | w11-7 | X1A |  | I(W11) |
|  |  | m3-5 | X1A |  | O(P7); I(M3) |
|  |  | m7-8 | X1A |  | O(M7) |
|  |  | p5-13 | X1A |  | O(P5) |
|  |  | t7-8 | X1A |  | O(T7, Y10); I(W5) |
|  |  | m7-10 | X1A |  | O(M7) |
|  |  | p5-9 | X1A |  | O(P5) |
|  |  | u8-1 | X1A |  | I(U8) |
|  |  | p5-8 | X1A |  | O(P5) |
|  |  | p10-3 | X1A |  | I(P10, W10) |
|  |  | p8-1 | X1A |  | I(P8) |
|  |  | m7-12 | X1A |  | O(P7) |
|  |  | m6-1 | X1A |  | I(M6) |
|  |  | m3-9 | X1A |  | O(P7); I(M3) |
|  |  | t3-8 | X1A |  | O(T3) |
|  |  | p10-7 | X1A |  | I(P10) |
|  |  | m5-8 | X1A |  | O(M5); |
|  |  | m7-6 | X1A |  | O(M7); |
|  |  | u2-4 | X1A |  | O(U2); |
|  |  | p5-14 | X1A |  | O(P5); |
|  |  | t7-6 | X1A |  | O(T7); I(W5) |
|  |  |  | X1A | NC |  |
|  |  | t9-1 | X1A |  | I(T9) |
|  |  | y10-1 | X1A |  | I(Y11) |
|  |  | m9-8 | X1A |  | O(M9, M11, W11, W1, P10, W2, Z3, Z1) |
|  |  | y4-4 | X1B |  | O(Y4) |
|  |  | m11-3 | X1B |  | O(T5, T8); I(M11, Y9) |
|  |  | m11-7 | X1B |  | O(T10); I(M11) |
|  |  | u8-8 | X1B |  | O(U8, Y11); I(W11, Z11) |
|  |  | p11-4 | X1B |  | O(T11); I(P11) |
|  |  | m6-8 | X1B |  | O(U5, M6); I(W11, Z7, W8) |
|  |  | u7-1 | X1B |  | O(Y7); I(U7, Y4, Z8) |
|  |  | m9-7 | X1B |  | I(M9) |
|  |  | m9-6 | X1B |  | I(M9) |
|  |  | m5-1 | X1B |  | O(Y7); I(M5, T7, U9) |
|  |  | t6-1 | X1B |  | I(T6, U4) |
|  |  | t10-1 | X1B |  | I(T10) |
|  |  | m9-5 | X1B |  | I(M9) |
|  |  | t7-3 | X1B |  | I(T7, U7, Y8, Z6) |
|  |  | t6-12 | X1B |  | O(); I(T6) |
|  |  | m5-3 | X1B |  | O(Y7); I(M5, T7, U9) |
|  |  | u7-2 | X1B |  | O(Y7); I(U7, Y4, Z8) |
|  |  | t7-5 | X1B |  | I(T7, U7, Y8, Z6) |
|  |  | m10-1 | X1B |  | I(M10) |
|  |  | t6-13 | X1B |  | I(T6) |
|  |  | u9-5 | X1B |  | I(U9, Z10, Z9, Z8) |
|  |  |  | X1B | NC |  |
|  |  | t6-11 | X1B |  | O(T6) |
|  |  | u9-3 | X1B |  | O(); I(U9, Z10, Z9, Z8) |
|  |  |  | X1B | NC |  |
|  |  | m10-4 | X1B |  | I(M10) |
|  |  | m5-9 | X1B |  | O(W7); I(M5, P4, U7, Z8) |
|  |  | m5-11 | X1B |  | O(W7); I(M5, P4, U7, Z8) |
|  |  | m10-3 | X1B |  | I(M10) |
|  |  | t11-1 | X1B |  | I(T11) |
|  |  | m9-3 | X1B |  | O(P8); I(M9, P7) |
|  |  | m10-2 | X1B |  | I(M10) |
|  |  | m5-13 | X1B |  | O(W7); I(M5, T7, T4, U9) |
|  |  | m11-4 | X1B |  | O(T5, T9); I(M11, Y9) |
|  |  | p10-5 | X1B |  | O(Y10); I(P10, W10) |
|  |  | u8-14 | X1B |  | O(U8, U9); I(W11, Z11) |
|  |  | m10-5 | X1B |  | I(M10) |
|  |  | m5-5 | X1B |  | O(W7); I(M5, P4, U7, Z8) |
|  |  | p10-1 | X1B |  | O(T9); I(P10, U10) |
|  |  | m6-14 | X1B |  | O(U5, M6); I(W11, W8 , Z7) |
|  |  | p2-5 | X1B |  | I(P2, P4, T2, T4) |
|  |  | p2-3 | X1B |  | I(P2, P4 , T2 ,T4) |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  | m11-1 | X1B |  | O(T5, T8); I(M11, Y9) |
|  |  | m9-2 | X1B |  | O(P8); I(M9, P7) |
|  |  | m11-5 | X1B |  | O(T10); I(M11) |
|  |  | p10-4 | X1B |  | O(Y10); I(P10, W10) |
|  |  | m9-4 | X1B |  | O(P8); I(M9, P7) |
|  |  | p10-6 | X1B |  | O(Y10); I(P10, W10) |
|  |  | u8-3 | X1B |  | O(U8, Y11); I(W11, Z11) |
|  |  | p10-2 | X1B |  | O(T9); I(P10, U10) |
|  |  | m10-7 | X1B |  | O(T9); I(M10, U10) |
|  |  | m6-3 | X1B |  | O(U5, M6, W8); I(U5, Z7) |
|  |  | p11-2 | X1B |  | O(T11); IP11() |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  | m11-2 | X1B |  | O(T5, T8); I(M11, Y9) |
|  |  | p11-1 | X1B |  | O(T10); I(P11) |
|  |  | m11-6 | X1B |  | O(T10); I(M11) |
|  |  | u8-5 | X1B |  | O(U8, Y11); I(W11, Z11) |
|  |  | m6-5 | X1B |  | O(M6, U5, W8); I(P11, Z7) |
|  |  | p11-5 | X1B |  | O(T11); I(P11) |
|  |  | p11-3 | X1B |  | O(T11); I(P11) |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  | u3-9 | X1B |  | I(U3, W4) |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | NC |  |
|  |  |  | X1B | GND |  |
|  |  |  | X1B | VCC |  |

|  |  |
| --- | --- |
| *\* NC: No Connect.*  *\* VCC: 5V.*  *\* GND: Ground.* | *\* I: Input.*  *\* O: Output.* |