## Options Overview:

CPU can be Quad or Single ITemp

U22 and U24 (RAM) not pop on Single core

K1 (WiFi module) is on the WIFI models

Mini-Card Connector (J3) has a USB interface & is on CP models

mSATA support on this connector with Quad only

SIM Card connector not included in standard options

PEM Mounts provided with Mini-Card Connector

No I2C on this interface

2nd Ethernet (U32 & T2) is on the CPU's PCIe port on CP Models

Audio (U30 & J7) is on the CP Models

Gyro (U17) is not populated for any model

Standard SATA Connector is not populated for any model

---

### Resistor Strapping Table

<table>
<thead>
<tr>
<th>R39</th>
<th>R37</th>
<th>R36</th>
<th>R34</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>TS-7970-1G-4GF-SBS-RTC-I</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>TS-7970-2G-4GF-Q10S-RTC-E</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>TS-7970-1G-4GF-SBS-RTC-CP-WIFI-I</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>TS-7970-2G-4GF-Q10S-RTC-CP-WIFI-E</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

0=DNP, 1=POP

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**Heat Sink for CPU**

Excel Cell Electronic # A1404036

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**All 4 iMX6 UARTs MUXed thru FPGA**

Features that require UART:

- 2 RS-232 Ports
- 2 RS-485 Ports
- 1 TTL UART to HD1
- 1 UART for BlueTooth

---

Web Schematic: Some proprietary information has been withheld.
Rev. C was never built

Rev. B to D Changes

- Changed Eth Phy to Marvell
- Changed Magjack (T1) to one with separate CT
- Added Q17 to improve PHY reset
- Added two lane MIPI connector (CN1)
- Change RTC battery holder to smaller one
- When Console Jumper off, pull USB_5V_DETECT low
- Added PUSH_SW# signal to HD1 to allow SiLab wake-up via header
- Improved CN99 (Factory Programming Interface)
- Removed 1.2V Reg (used by Micrel PHY)
- Added optional Xtal Osc (X1) for PHYs

Rev. E Changes:

- Added TVS10-13 for RS-485
- Updated Factory Programming Interface
RAM Data bits 32-63

Not populated for Single Core CPU
SD, GPIO, NAND

WiFi (1.8V)

SD Card (3.3V)

eMMC (3.3V)

Ethernet 1.8V

Bias Res.

4 PWM total

PWM on SD4_DAT 1 or 2
GPIO_1 and GPIO_9
Allows MX6 to program FPGA
10/100/1000 Marvell PHY

CPU ETH1

Strapped for PHY address = 1
PCIe 100 MHz

Clock Generator

Level Shifter

Gyro-Accelerometer

Option not populated on any standard models
Micro SD Card Socket

At system power up, FET is off

RTC and Temp. Sensor

Precision

eMMC 4GB
TS-7970 WiFi, SATA, SPI Flash

64 bytes of OTP

SATA

WiFi Radio

Technologic Systems Date Dec. 27, 2016
Title: TS-7970 WiFi, SATA, SPI Flash
Rev: E Designer Sheet 17 of 27
HDMI PHY

CPU HDMI

1. i.MX6Q - HDMI

2. 2.5V

3. HDMI_PHY

4. HDMI_CONN

5. HDMI

6. HDMI_PHY

7. HDMI_CONN

8. HDMI

9. HDMI_PHY

10. HDMI_CONN

11. HDMI

12. HDMI_PHY

13. HDMI_CONN

14. HDMI

15. HDMI_PHY

16. HDMI_CONN

17. HDMI

18. HDMI_PHY

19. HDMI_CONN

20. HDMI

21. HDMI_PHY

22. HDMI_CONN

23. HDMI

24. HDMI_PHY

25. HDMI_CONN

26. HDMI

27. HDMI_PHY

28. HDMI_CONN

29. HDMI

30. HDMI_PHY

31. HDMI_CONN

32. HDMI

33. HDMI_PHY

34. HDMI_CONN

35. HDMI

36. HDMI_PHY

37. HDMI_CONN

38. HDMI

39. HDMI_PHY

40. HDMI_CONN

41. HDMI

42. HDMI_PHY

43. HDMI_CONN

44. HDMI

45. HDMI_PHY

46. HDMI_CONN

47. HDMI

48. HDMI_PHY

49. HDMI_CONN

50. HDMI

51. HDMI_PHY

52. HDMI_CONN

53. HDMI

54. HDMI_PHY

55. HDMI_CONN

56. HDMI

57. HDMI_PHY

58. HDMI_CONN

59. HDMI

60. HDMI_PHY

61. HDMI_CONN

62. HDMI

63. HDMI_PHY

64. HDMI_CONN

65. HDMI

66. HDMI_PHY

67. HDMI_CONN

68. HDMI

69. HDMI_PHY

70. HDMI_CONN

71. HDMI

72. HDMI_PHY

73. HDMI_CONN

74. HDMI

75. HDMI_PHY

76. HDMI_CONN

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78. HDMI_PHY

79. HDMI_CONN

80. HDMI

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83. HDMI

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87. HDMI_PHY

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92. HDMI

93. HDMI_PHY

94. HDMI_CONN

95. HDMI

96. HDMI_PHY

97. HDMI_CONN

98. HDMI

99. HDMI_PHY

100. HDMI_CONN

11. HDMI

12. HDMI_PHY

13. HDMI_CONN

14. HDMI

15. HDMI_PHY

16. HDMI_CONN

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18. HDMI_PHY

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39. HDMI_PHY

40. HDMI_CONN

41. HDMI

42. HDMI_PHY

43. HDMI_CONN

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67. HDMI_CONN

68. HDMI

69. HDMI_PHY

70. HDMI_CONN

71. HDMI

72. HDMI_PHY

73. HDMI_CONN

74. HDMI

75. HDMI_PHY

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98. HDMI

99. HDMI_PHY

100. HDMI_CONN

101. HDMI

102. HDMI_PHY

103. HDMI_CONN

104. HDMI

105. HDMI_PHY

106. HDMI_CONN

107. HDMI

108. HDMI_PHY

109. HDMI_CONN

110. HDMI

111. HDMI_PHY

112. HDMI_CONN

113. HDMI

114. HDMI_PHY

115. HDMI_CONN

116. HDMI

117. HDMI_PHY

118. HDMI_CONN

119. HDMI

120. HDMI_PHY

121. HDMI_CONN

122. HDMI

123. HDMI_PHY

124. HDMI_CONN

125. HDMI

126. HDMI_PHY

127. HDMI_CONN

128. HDMI

129. HDMI_PHY

130. HDMI_CONN

131. HDMI
Mod Bus RS-485 and Edge Conn.

CN99
Factory Programmer
Edge Conn.

RS-485 Driver

Modbus Power Switch

Modbus RJ45

Technologic Systems
Date Dec. 27, 2016
Title: TS-7970 Modbus, Edge Conn.
Rev: E
Designer
Sheet 21 of 27
RS-232 Transceiver

3.3V --> 5V
Level shifter

CAN2 Transceiver

CAN1 Transceiver
FPGA required for:
- Provides serial port MUXing
- Auto-485 for two UARTs
- Adds a MAX3100 UART via SPI

Resistor Strapping Table

<table>
<thead>
<tr>
<th>R39</th>
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<th>R34</th>
</tr>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
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</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

PUSH_SWS# has no direct connect to CPU
send status to CPU via_FPGA_IRQ1 until disabled

HD1_SPI_CS# is driven by CPU
When true, FPGA "passes thru" SPI bus signals to HD1

Bank 5 1.8V

MACH XO2 FPGA
mSATA or USB only Mini-Cards

7mm Stack Height to center of bd.

SATA Port
Option not populated on any standard models
Two DIO

4 to 20 mA
Analog Inputs
Enable USB Console

Daughter Card Interface HD2

STC
RS-485 Driver

Daughter Card Interface HD1