**XRD9827TREF**
**USER MANUAL**

**TOSHIBA CIS 36-BIT COLOR**
**SINGLE LINE SCANNER**

## EVALUATION KIT PART LIST

- XRD9827TREF CIS 36-Bit Color Single Line Scanner
- XRD9827TREF User Manual
- SenseIt 1.0 Software Installation Diskettes (3)
- XRD9827 Data Sheet
- Scan Targets (Black, White, Color)

## FEATURES

- One line scanning functionality of XRD9827 with TOSHIBA 600DPI CIS (Contact Image Sensor)
- Easy to use with most personal computers through Parallel Port Interface
- Simple way of loading the Serial Port of XRD9827 to adjust gain and offset
- Software SenseIt 1.0 to view single line scan
- Optimized PCB Layout with Four Layers

## SYSTEM REQUIREMENTS

- Intel 486 compatible computer with Windows 95 operating system
- 8 MBytes system memory
- 25-pin D-shape parallel port receptacles
- 3 1/2" floppy disk drive

## INTRODUCTION

The XRD9827TREF is a demo system which includes a PCB design with a TOSHIBA CIPS218MC600 600DPI Color Contact Image Sensor (CIS). It demonstrates how to interface a CIS with EXAR's XRD9827, a 12-bit Linear CIS/CCD Sensor Signal Processor to output a single line scan and display the offset and gain corrected amplitude of each of the three colors. The XRD9827TREF is designed to provide a signal path for the CIS output signals to be processed, digitized by the XRD9827 and transmitted to a personal computer. There are no software algorithms or hardware implementations to adjust for color response.

The XRD9827TREF board is loaded with the XRD9827, an Altera MAX7128SLC84 FPGA, two FIFO SRAMs and peripheral circuits for the CIS. The MAX7128, which is a Field-Programmable Gate Arrays (FPGA) provides timing signals to the XRD9827, the SRAMs and the CIS. It also programs the XRD9827 to operate in the correct mode and adjust for gain and offset values. The XRD9827 processes the analog output from the CIS sensor, level-shifts and converts the signal into 12-bit digital codes. The SRAMs gate the digitized data from the XRD9827 and store the data temporarily. Controlled by the software, the SRAMs send the data through a parallel port connection to the PC and histograms of raw data are displayed on the monitor using the SenseIt software. A block diagram of the XRD9827TREF is shown below in Figure 1.
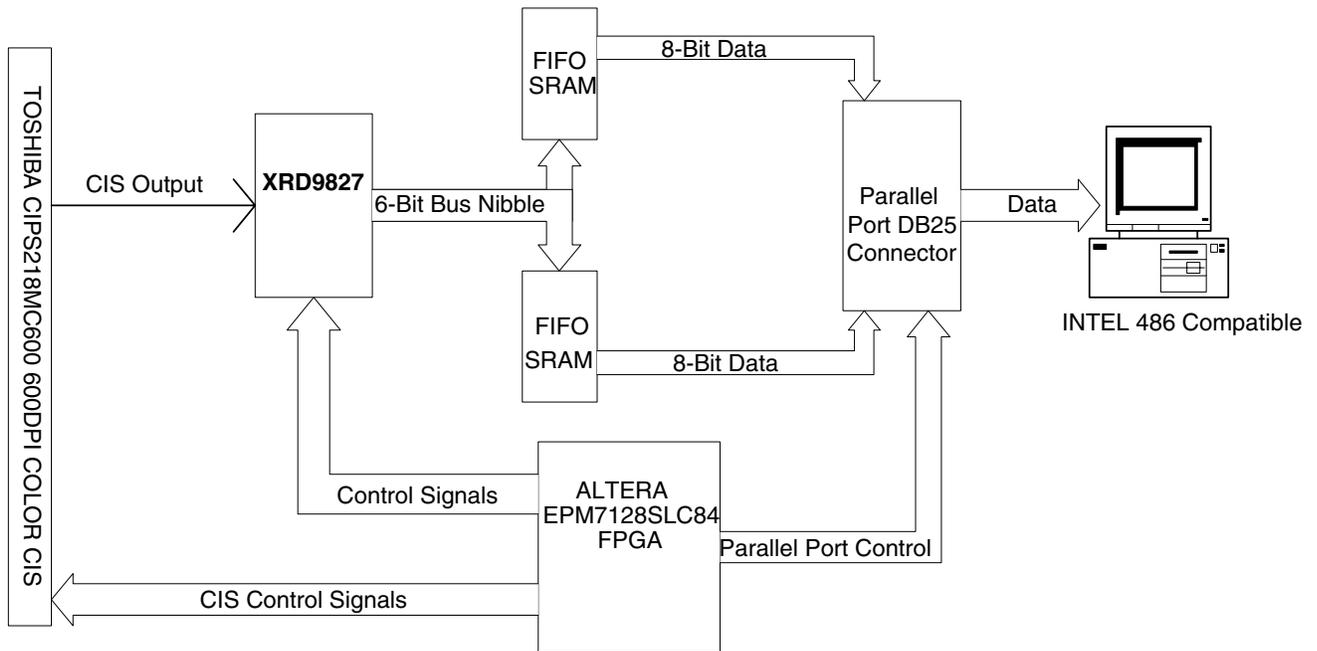
**EXAR**



**Figure 1. Block Diagram of XRD9827TREF**

The XRD9827 is a complete linear CIS or CCD sensor signal processor on a single monolithic chip. The XRD9827 includes a high speed 12-Bit ADC, a 6-Bit Programmable Gain Amplifier with gain adjustment of 1 to 10 and an 8-Bit programmable input referred offset calibration range of 800 mV. Please see the XRD9827EVAL User Manual / PCB board for evaluating the XRD9827 CIS / CCD signal processor chip. A simplified functional block diagram of XRD9827 is shown below for your reference.

Biasing Circuit for CANON
CIS



**Figure 2.  Simplified Functional Block Diagram of XRD9827**

## OPERATIONAL PROCEDURE

The routine listed below will first calibrate the photo response of the CIS using the XRD9827 by optimizing its offset and gain. After calibration, the XRD9827TREF can be used to scan any color target to show CIS non-color corrected response.  (Color correction is typically done in the digital ASIC.)

**How to Run the XRD9827TREF Demonstration**

1. Make sure the computer is powered off and the AC power adapter is disconnected from a wall outlet
2. Connect the parallel port cable to the printer port of the computer
3. Connect the AC power adapter into a wall outlet
4. Turn on the computer and activate Windows 95

**Loading EXAR Software**

5. Load the diskette labeled SenseIt 1.0 Disk # 1 into the floppy drive
6. Select the Start menu in the program manager and choose RUN
7. Inside the small pop-up window, type:  A:\setup
8. Follow the instructions to finish software installation

**Parallel Port Configurations**

1. Confirm the parallel port address as follows:
   a. Select the Start Menu, choose Settings, then choose Control Panel
   b. From the Control Panel window which pops up, double-click on System
   c. In the System Properties window, select Device Manager
   d. From the Device Manager window, double-click on Ports (COM & LPT)
   e. Double-click on Printer Port (LPT1). If you can not find it, please goto Step 2
   f. From the pop-up window, select Resources
   g. Verify the Input/Output Range is set to 0378 - 037F
   h. If the range is not correct, clear the Use Automatic Settings check box by clicking it
   i. Choose correct address which is 0378 by default and click OK
   j. Re-start the computer as advised

2. If you do not have a Printer Port configured on your computer, please follow the steps listed below:
   a. From the Control Panel window which pops up, double-click on Add New Hardware
   b. From the pop-up window, click the Next > button
   c. Select 'No' when prompted for 'Do you want Windows to search for your new hardware?', then click the Next > button
   d. Choose Ports (COM & LPT), then click the Next > button
   e. Choose Printer Port, then click the Next > button
   f. Make a note of the Input/Output Range of Printer Port of your computer and click OK. You will use these values later when configure the SenseIt software
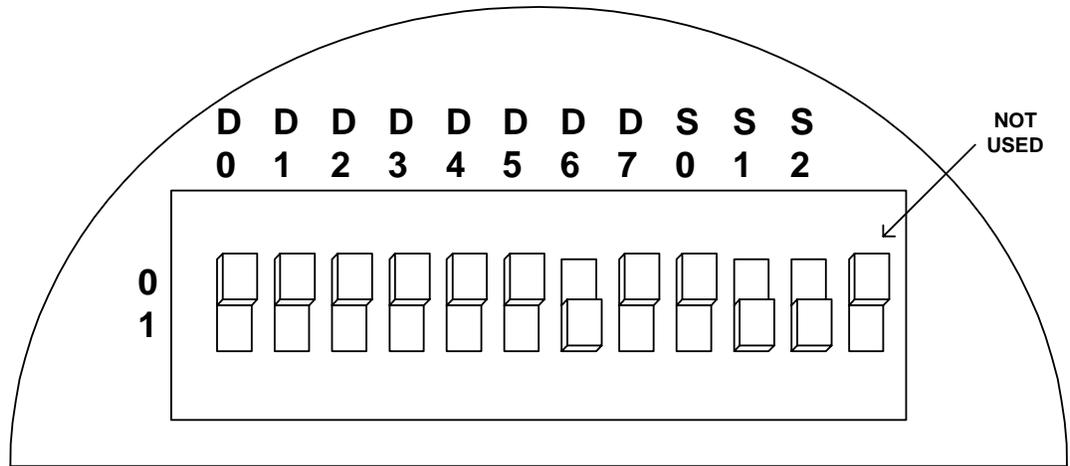   g. Re-start the computer as advised

**Figure 3. Dip Switches Set to Value [110 01000000] to Reset XRD9827**

**Offset Adjustment With a Black Target**

1. Set the dip switches located on the side panel of the scanner to [110 01000000] as shown in Figure 3 and push the Serial Port button which is located on the front panel of the demo system. This will reset the XRD9827.

2. Select the Start Menu, choose Programs, then choose SenseIt icon

3. A window will pop up as shown below. The upper window shows the plot of captured data and the lower window shows the histogram of data. Figure 4 shows the pop-up window when SenseIt is first started.

4. Select SETUP from the pull-down menu and choose I/O ADDRESS. In the window that pops up, type in the Input/Output Range of Printer Port of your computer. The default setting is 378H.

5. Select SETUP again from the pull-down menu and choose PIXEL NUMBER. In the pop-up window, type in 5148 which is the number of pixels of one line.

6. Pick the black target out from the kit and put it on a flat area. Place the XRD9827TREF on top of the black target with the CIS sensor facing downwards. Set the dip switches to [110 00001100] and then push the Serial Port button. This configures the XRD9827 to operate in a AC Coupled CCD mode since output signal of TOSHIBA CIS is similar to CCD waveform. From the CAPTURE menu select SNAP SHOT (or simply press CTRL and B buttons simultaneously) for a single line scan of the black target. A typical result of a black target scan is shown in Figure 5.
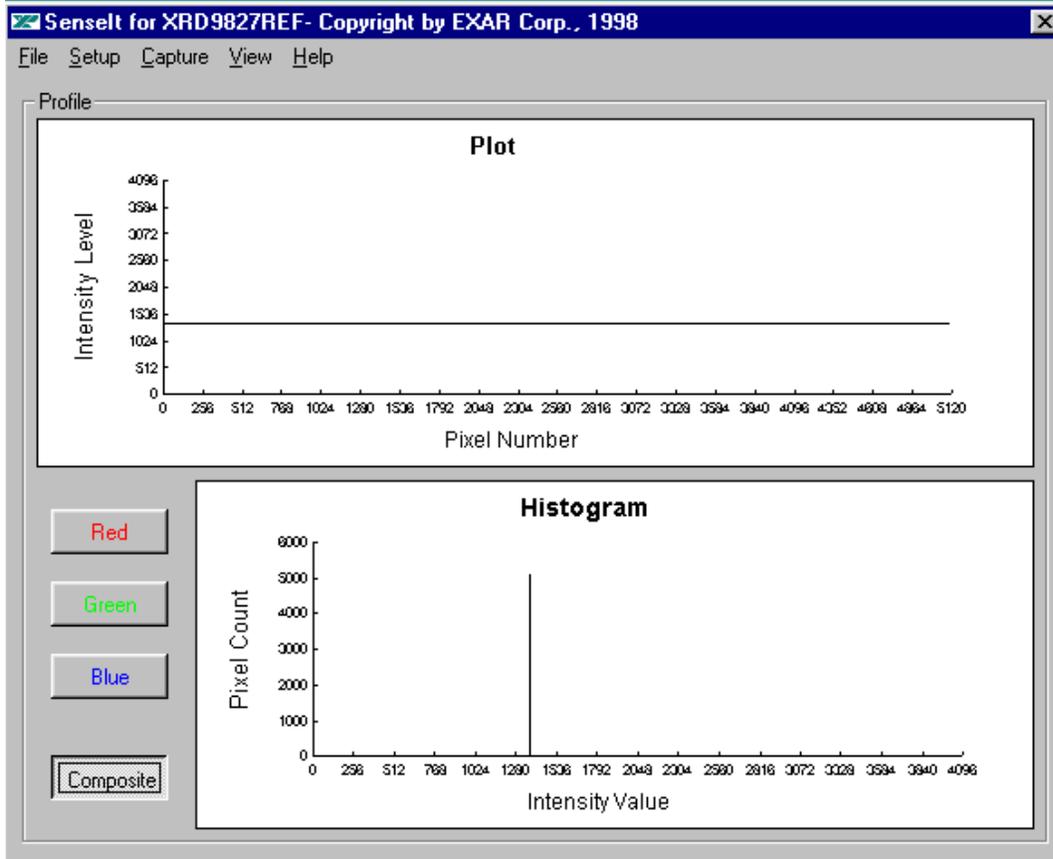
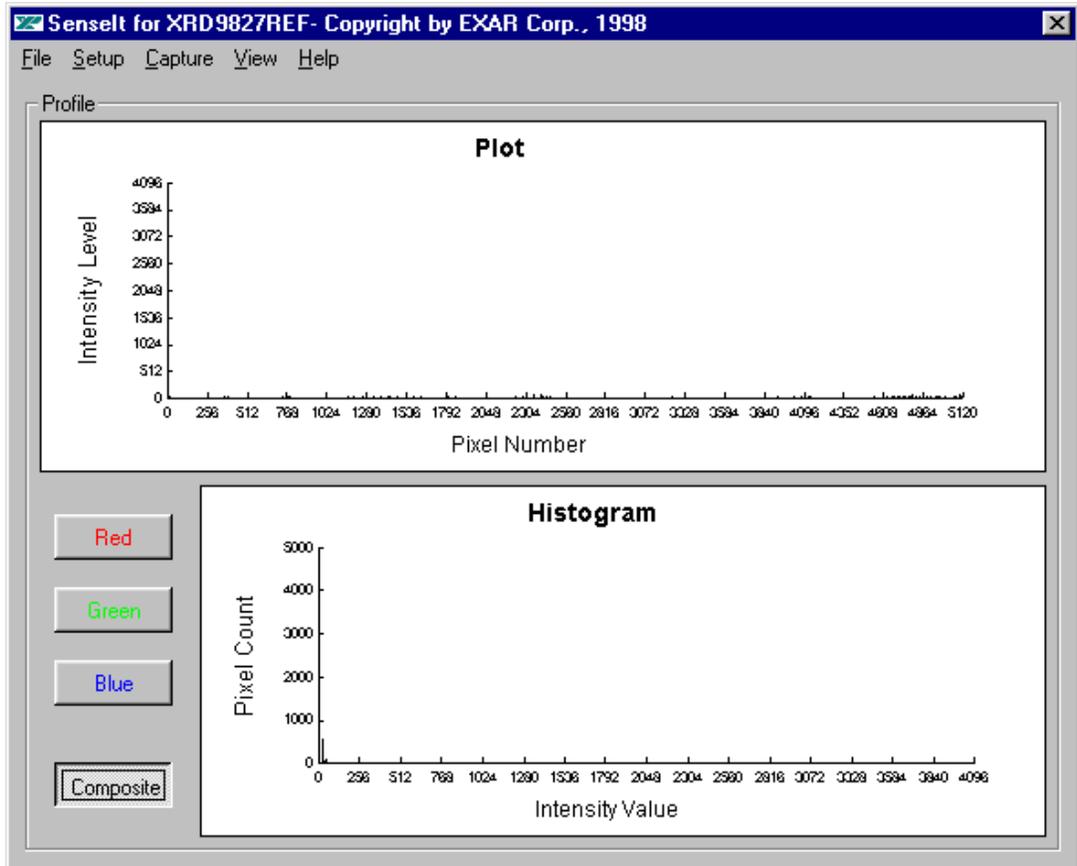**Figure 4.  Senselt Software Window Before Scanning**

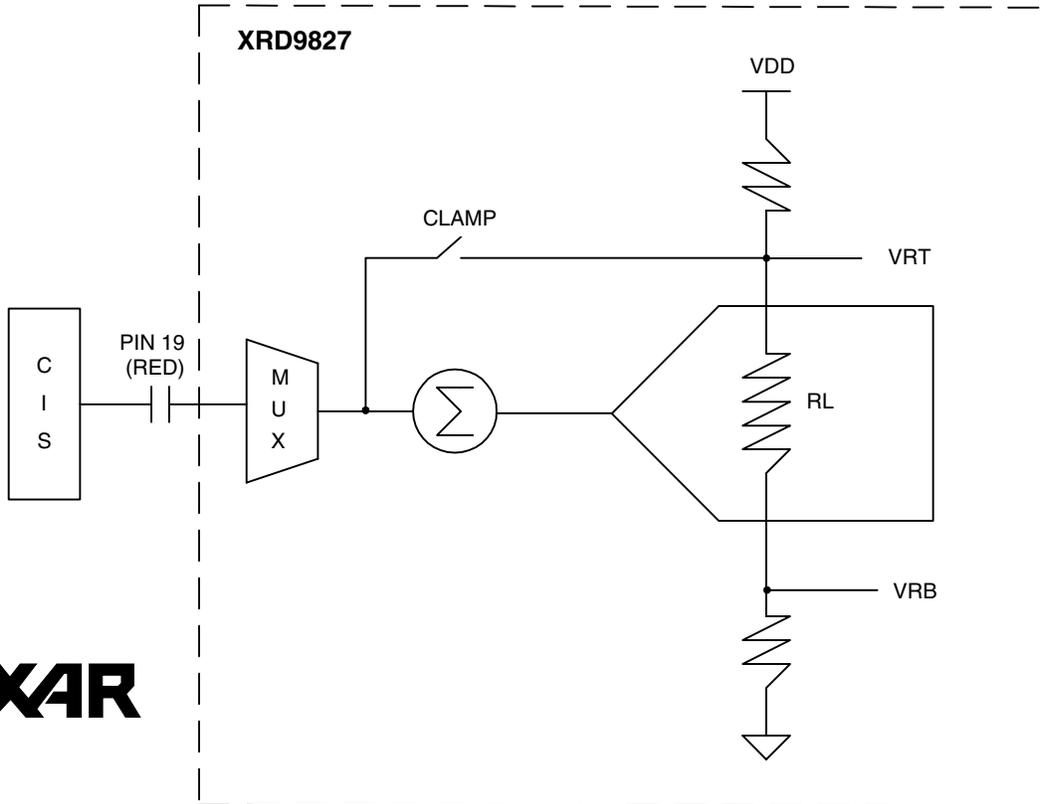**Figure 5.   Non-calibrated Black Target Scan (Output Codes Are Below Zero)**

**Figure 6. Simplified Block Diagram Showing XRD9827
with AC Coupled CCD Configuration**

7. Set the dip switches to [001 01011000] to select the internal offset DAC for fine offset adjustment. Push the Serial Port button. From the CAPTURE menu select SNAP SHOT. A typical result of the fine offset adjustment is shown below. Please notice that the black code value has moved up to just above zero.
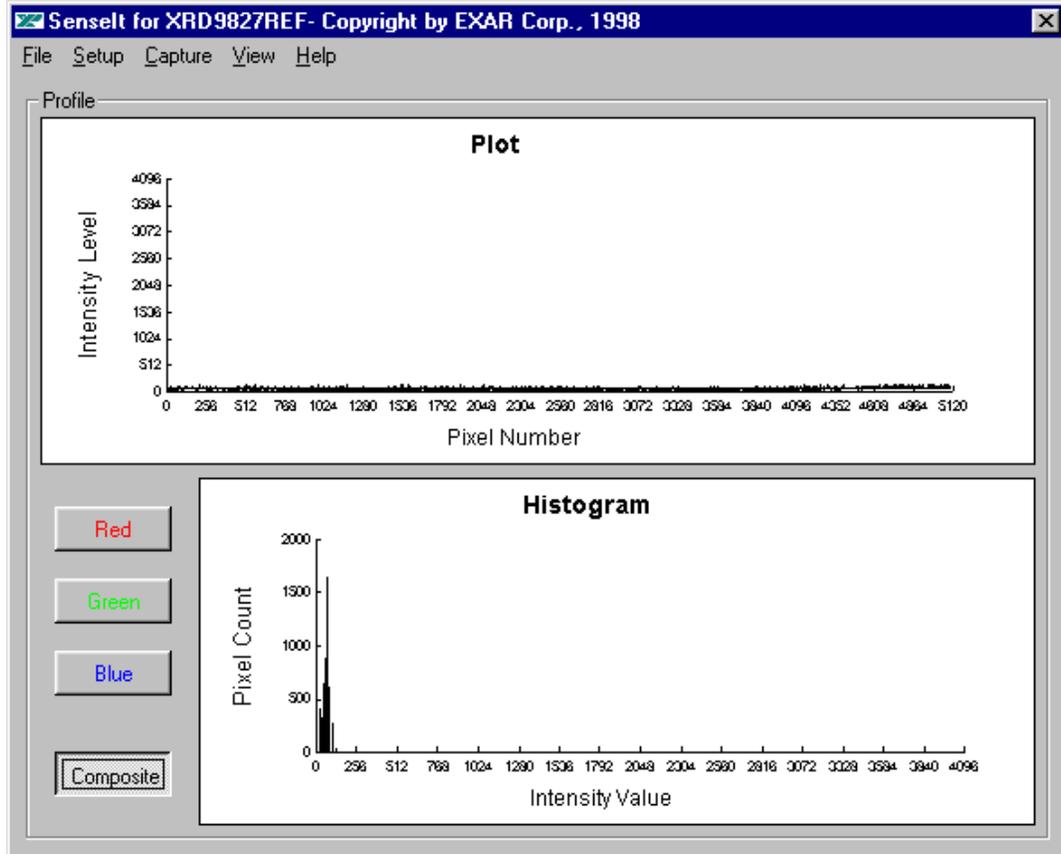
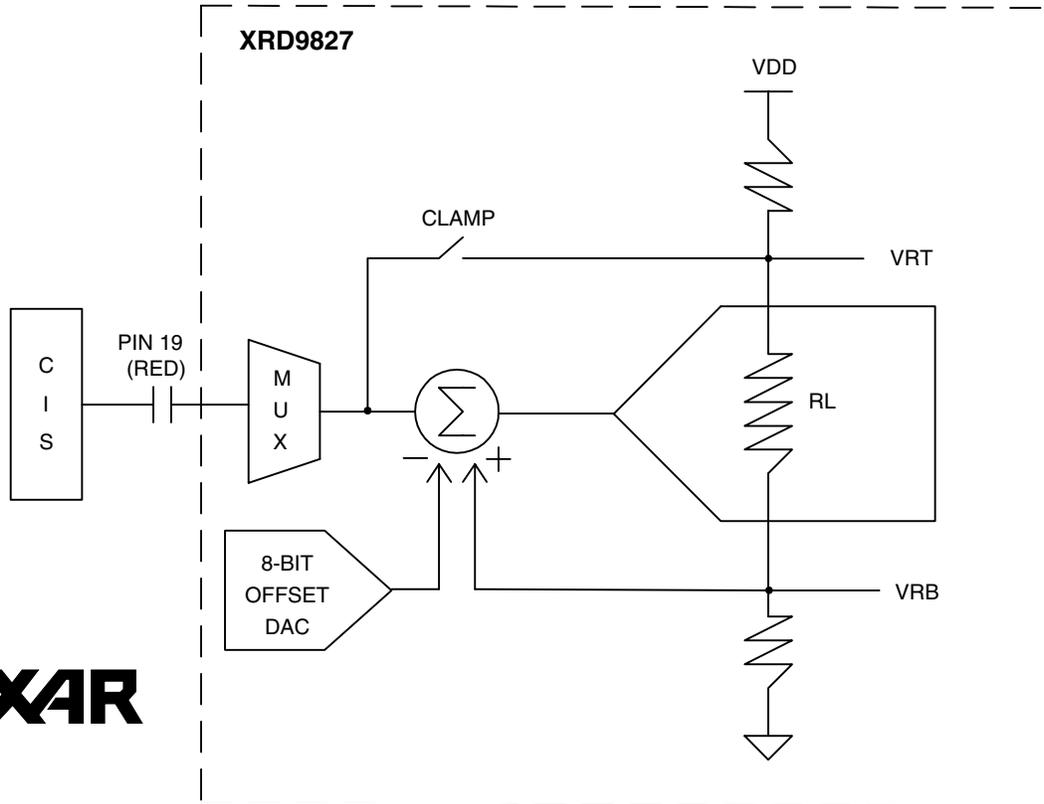**Figure 7.   Black Target Scan After Fine Offset Adjustment**

**Figure 8.   Simplified Block Diagram Showing Fine Offset Adjustment by XRD9827**

8.   Switch the black target to the enclosed white target. From the CAPTURE menu select SNAP SHOT for a single lline scan of the white target. A typical result of a white target is shown below.
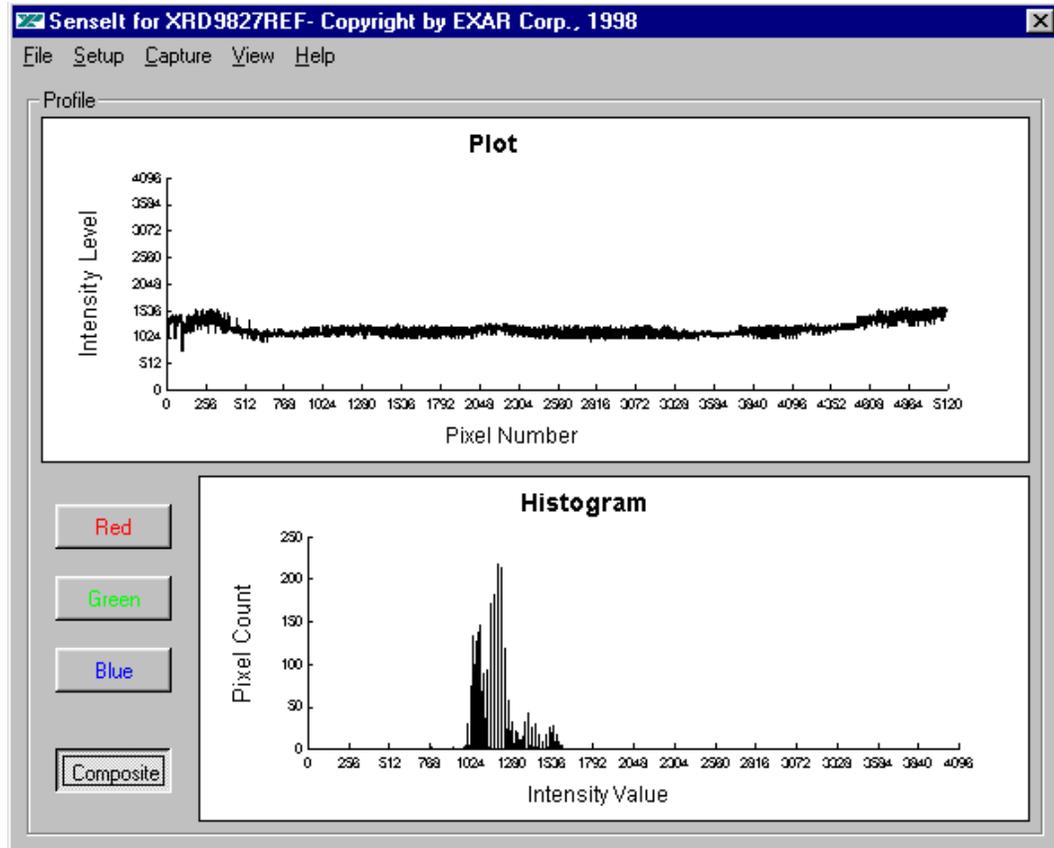
**Figure 9.   White Target Scan Without Gain Adjustment**

10.  Set the dip switches to [000 00111100] to select the desired gain.   Push the Serial Port button.  From the CAPTURE menu select SNAP SHOT.  The gain should move the output of the CIS to almost full scale.  Please refer to data sheet for further gain adjustment and optimal values of dip switches for your scanner.  A typical result of the white target with gain adjustment is shown below.
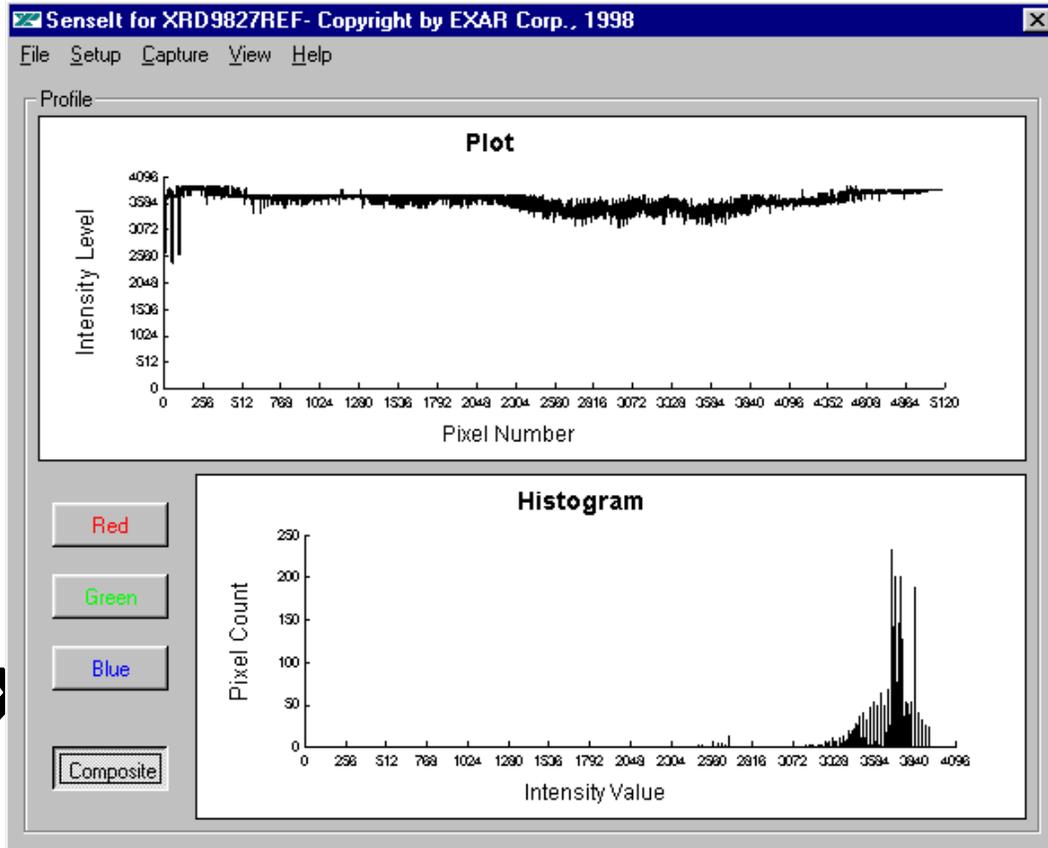
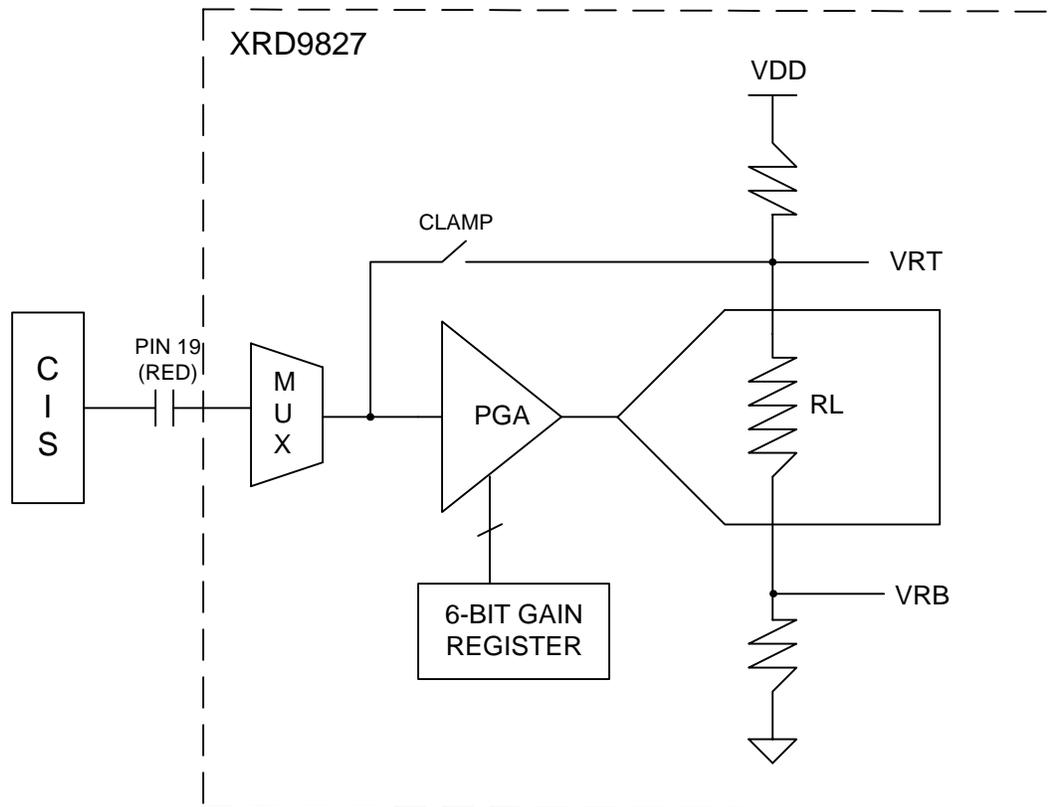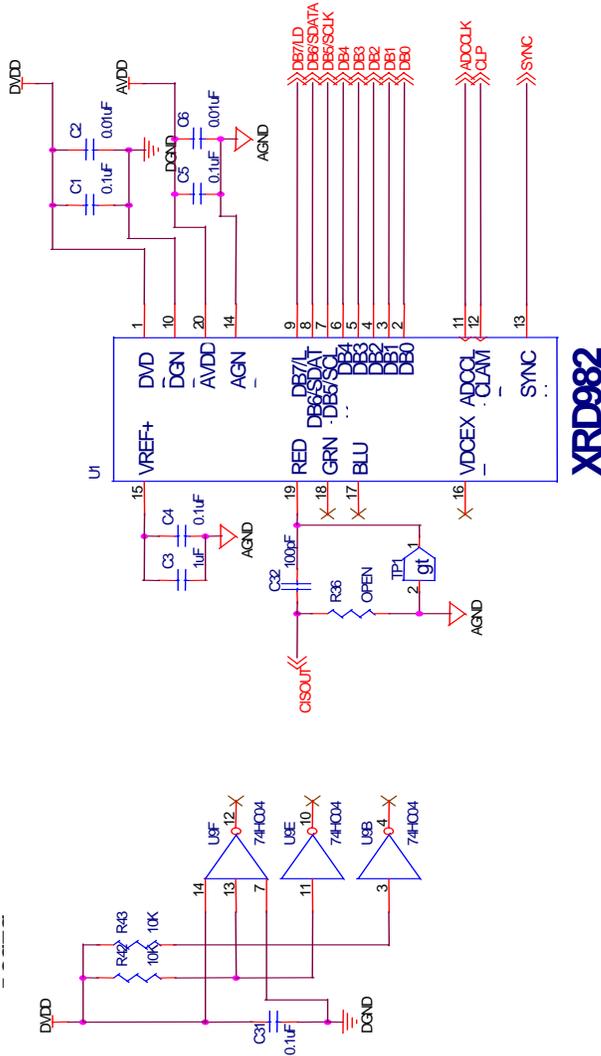**Figure 10. White Target Scan After Gain Adjustment**

**Figure 11.  Simplified Block Diagram Showing Gain Adjustment by XRD9827**

11. Once the XRD9827 has been fully calibrated, any target can be scanned.  For example: Scan a gray scale to demonstrate the stair step response or a color target for color responsitivity.

***Important:***

1. If at any time an unexpected result is shown or the demo system seems to not working, please pull the AC adapter out from the wall outlet to cycle power. Start the procedures again from Step 11.

2. Keep the scanner away from other electrical equipment, power cords, light dimmers, etc., as stray electrical fields can end up in the digitized data.

3. Switch off all unnesscessary light sources and place the scanner flat on the image, this can prevent  stray light from entering the sensor and disrupt the scan.

POWER CIRCUIT

H:\PROJECTOR\CADWIN\9827\9827_TO\S9827T_RA.DS

Title: XRD9827TREF REFERENCE

Size: B

Document Number: XRD9827TREF_TOSHIBA

Rev: A

Date: Tuesday, December 15, 1998 | Sheet 1 of 3

XRD982

U1

UNUSED

EXAR

U4
NC  V+
GND  OUT
Oscillator
C12 0.1uF  C13 1uF
DGND
DVDD

JP2
HEADER 3
1
2
3
SPORTN
DGND
DVDD

S1
SW DIP-12
24
23  D10  R2  2.2K
22  D9   R3  2.2K
21  D8   R4  2.2K
20  D7   R5  2.2K
19  D6   R6  2.2K
18  D5   R7  2.2K
17  D4   R9  2.2K
16  D3   R10 2.2K
15  D2   R11 2.2K
14  D1   R12 2.2K
13  D0   R13 2.2K
DVDD
DGND

U9A
74HC04
SYNC  2  1  SPORTN
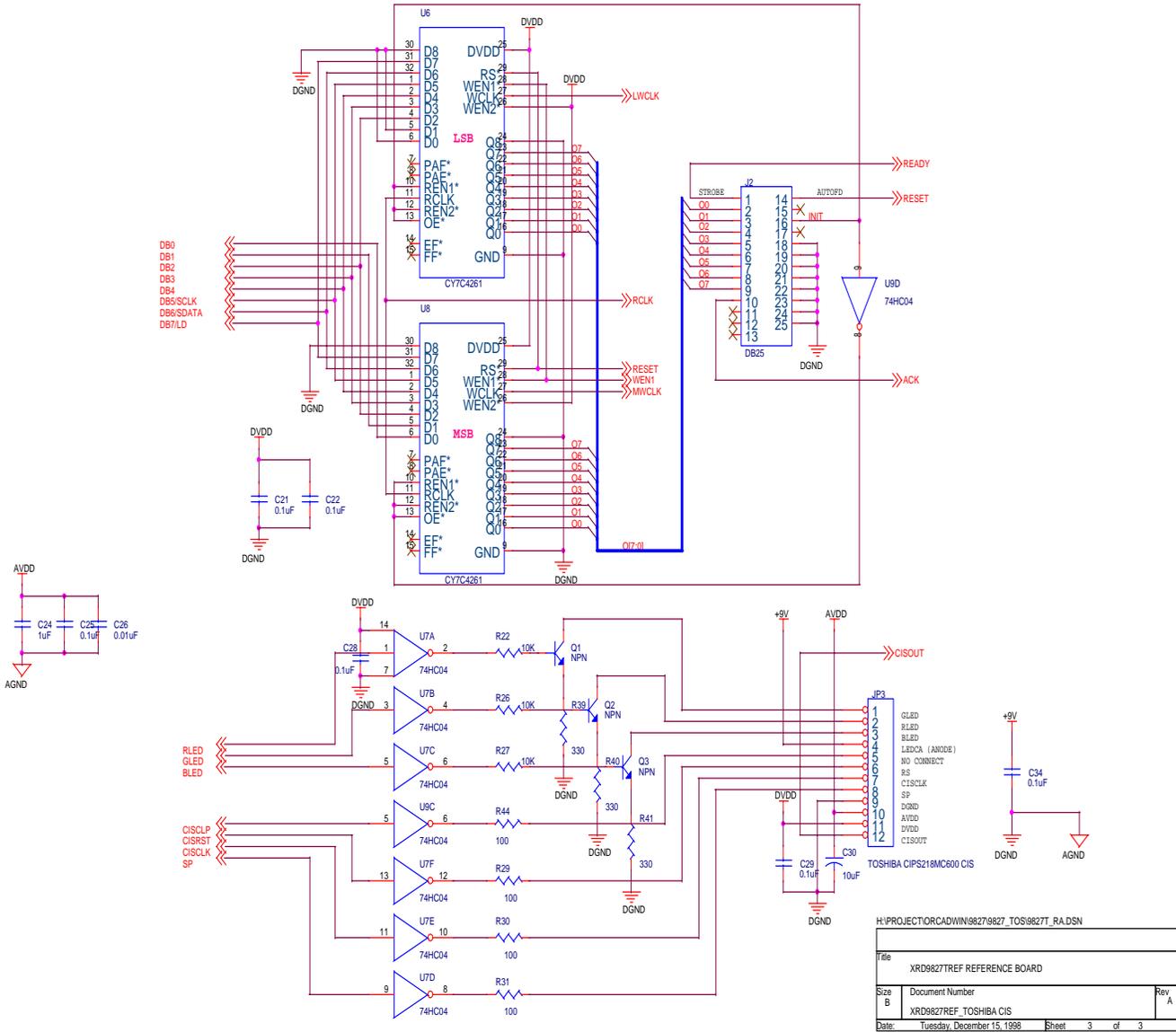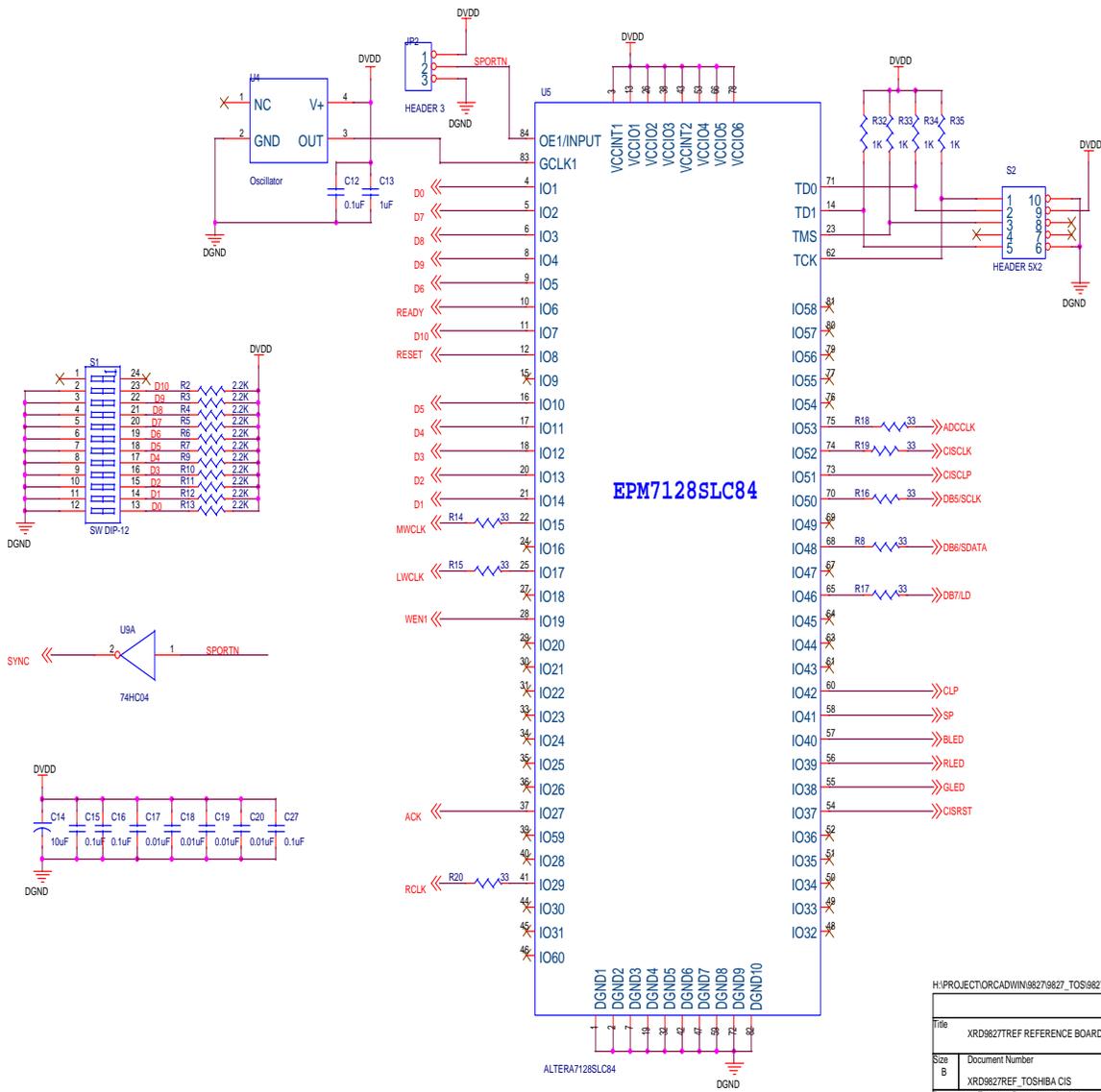
DVDD
C14 10uF  C15 0.1uF  C16 0.1uF  C17 0.01uF  C18 0.01uF  C19 0.01uF  C20 0.01uF  C27 0.1uF
DGND

U5
EPM7128SLC84

VCCINT1 VCCIO1 VCCIO2 VCCIO3 VCCINT2 VCCIO4 VCCIO5 VCCIO6
DVDD

84 OE1/INPUT
83 GCLK1
D0  4  IO1
D7  5  IO2
D8  6  IO3
D9  8  IO4
D6  9  IO5
READY 10 IO6
D10 11 IO7
RESET 12 IO8
15 IO9
D5  16 IO10
D4  17 IO11
D3  18 IO12
D2  20 IO13
D1  21 IO14
MWCLK R14 33  22 IO15
24 IO16
LWCLK R15 33  25 IO17
27 IO18
WEN1 28 IO19
29 IO20
30 IO21
31 IO22
33 IO23
34 IO24
35 IO25
36 IO26
ACK 37 IO27
39 IO59
40 IO28
RCLK R20 33  41 IO29
44 IO30
45 IO31
46 IO60

TD0 71
TD1 14
TMS 23
TCK 62

IO58 81
IO57 80
IO56 79
IO55 77
IO54 76
IO53 75 R18 33 ADCCLK
IO52 74 R19 33 CISCLK
IO51 73 CISCLP
IO50 70 R16 33 DB5/SCLK
IO49 69
IO48 68 R8 33 DB6/SDATA
IO47 67
IO46 65 R17 33 DB7/LD
IO45 64
IO44 63
IO43 61
IO42 60 CLP
IO41 58 SP
IO40 57 BLED
IO39 56 RLED
IO38 55 GLED
IO37 54 CISRST
IO36 52
IO35 51
IO34 50
IO33 49
IO32 48

DVDD
R32 1K  R33 1K  R34 1K  R35 1K
S2
HEADER 5X2
1 10
2 9
3 8
4 7
5 6
DVDD
DGND

DGND1 DGND2 DGND3 DGND4 DGND5 DGND6 DGND7 DGND8 DGND9 DGND10
ALTERA7128SLC84
DGND

H:\PROJECT\ORCADWIN\9827\9827_TOS\9827T_RA.DSN

Title: XRD9827TREF REFERENCE BOARD
Size: B
Document Number: XRD9827REF_TOSHIBA CIS
Rev: A
Date: Tuesday, December 15, 1998  Sheet 2 of 3

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