TWR-S08GW64 User Guide

1 Overview

The MC9S08GW64 Tower MCU Module (TWR-S08GW64) is a low-cost evaluation, demonstration and development board. The TWR-S08GW64 can operate stand-alone or as the main control board in a Tower System with peripheral modules.

The following list summarizes the features of the TWR-S08GW64:

- Tower compatible microcontroller module
- MC9S08GW64 in an 80 LQFP package
- MC9S08JM60 based Open Source Debug (OSBDM) circuit
- 3 user controlled LEDs
- 3 push buttons and two unpopulated headers for user input
- 3 pin header for PCNT based sensors
- Potentiometer

Contents

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- MC9S08QE8 based sine wave generator for ADC test and energy meter simulation
- 29 pin 3V LCD Glass GD4972P
- Optical IR communication
- RS232 transceiver and 2x5 pin header
- Push button and jumper selection for tamper inputs
- Optional battery for powering up the board
- Expansion via Primary Elevator connector

A block diagram for the TWR-S08GW64 is shown in the figure below.

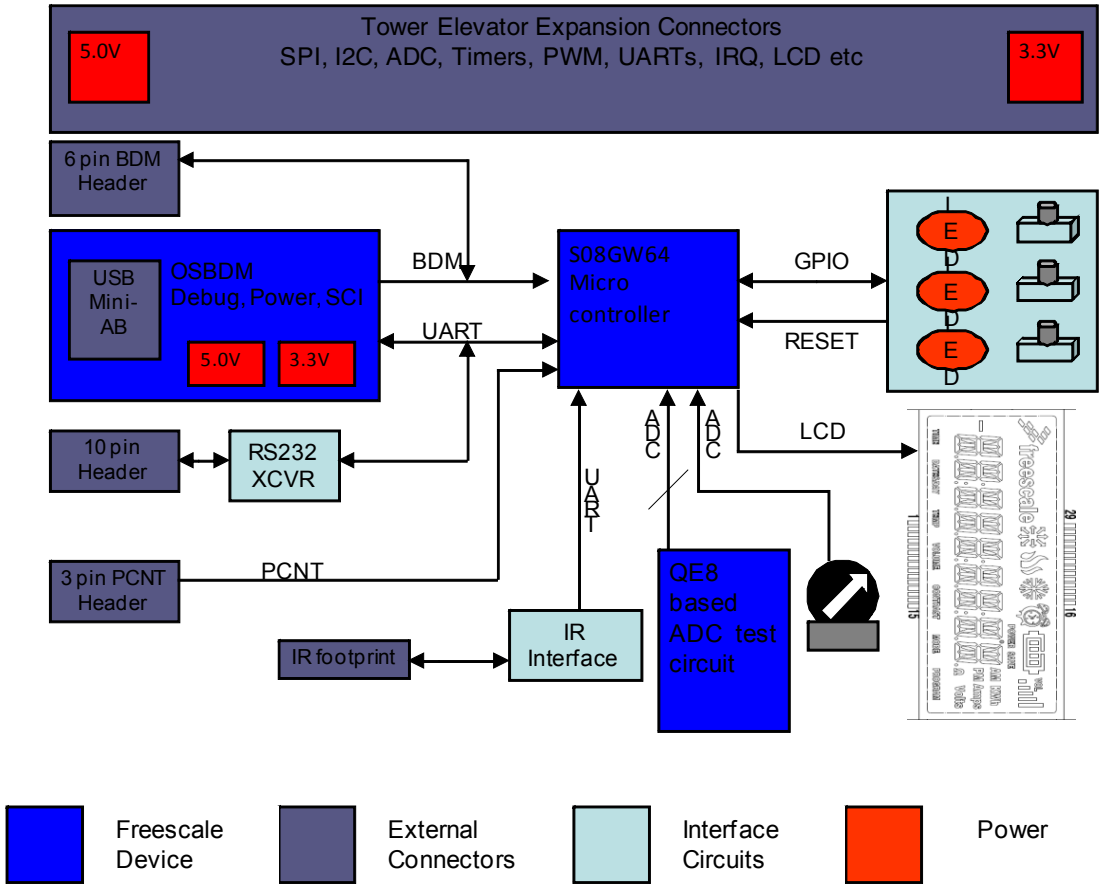


Figure 1. TWR-S08GW64 Block Diagram

2 Reference Documents

The documents listed below can be referenced for more information on the Freescale Tower system and the TWR-S08GW64. Refer to http://www.freesale.com/tower for the latest revision of all Tower documentation.

- TWR-S08GW64 Schematics
- TWR-S08GW64 Quick Start Guide

- TWR-S08GW64-KIT Lab Tutorial
- MC9S08GW64 Reference Manual
- MC9S08GW64 Data Sheet

3 Hardware Features

This section provides more details about the features and functionality of the TWR-S08GW64.

3.1 Clocking

Internal Clock can be configured using the ICS block for the microcontroller to run at up to 20 MHz bus clock. Also there is a provision of 32.768 kHz external crystal.

3.2 System Power

The TWR-S08GW64 can be powered by the OSBDM circuit via the Mini-B USB connector, J8, or from a source in an assembled Tower System. A standard USB A male to Mini-B male cable (provided) can be used to supply power from a USB Host or powered USB Hub. Optionally, an AC to DC adapter with a USB A female receptacle (not provided) can be used as the power source.

Power will automatically be sourced from the Elevator connector if power is available on both the Elevator and the OSBDM.

A jumper, J7, can be used to isolate the 3.3V supply from the microcontroller. This connection can be used to measure the power usage of the MC9S08GW64 microcontroller.

Alternatively the board can be powered up from battery. The jumper J6 selects the source between 3V battery and USB or elevator power.

3.3 Debug Interface

An on-board, MC9S08JM60 based Open Source BDM (OSBDM) circuit provides a debug interface to the MC9S08GW64 and MC9S08QE8. The OSBDM circuit provides a USB-to-debug interface that allows run-control and debugging of the

MC9S08GW64 target device. The USB drivers required to communicate with the OSBDM are provided in development tools such as Freescale CodeWarrior. This single USB connection can also be used to power the TWR-S08GW64 stand-alone or in a fully assembled Tower System. A standard USB A male to Mini-B male cable (provided) can be used for debugging via the USB connector, J8.

Alternatively the header J2 can be used to program via P&E USB multilink debugger. The jumpers J1 and J3 select between the devices MC9S08GW64 and MC9S08QE8 while programming using both OSBDM and P&E USB multilink.

3.4 RS232 Interface

An RS232 transceiver on the TWR-S08GW64 connects to a standard 2x5 pin header (refer to Figure 2).

Selection jumper pins on J14 allow UART0 signals to be routed to either the RS232 transceiver or the OSBDM circuit. Refer to Table 1 for more details.

Table 1. RS232 2X5 Pin Header Connections

MC9S08GW64 Signal	PIN		MC9S08GW64 Signal
No Connect	1	2	No Connect
TXD	3	4	CTS
RXD	5	6	RTS
No Connect	7	8	No Connect
GND	9	10	3.3V

3.5 Elevator Connections

The TWR-S08GW64 features two expansion card-edge connectors that interface to Elevator boards in a Tower system: the Primary and Secondary Elevator connectors. The Primary Elevator connector, comprised of sides A and B, is utilized by the TWR-S08GW64, while the Secondary Elevator connector makes connections to LCD signals from TWR-S08GW64 and ground (GND).

3.6 Mechanical Form Factor

The TWR-S08GW64 is designed for the Freescale Tower System and complies with the electrical and mechanical specification as described in Freescale Tower Electromechanical Specification.

4 Jumper Settings

There are several jumpers provided for isolation, configuration, and feature selection. Refer to the following table for details. The default installed jumper settings are shown in **bold**.

Table 2. TWR-S08GW64 Jumper Connections

Jumper	Option	Setting	Description
J1	Reset selection	1-2	Connect MC9S08QE8 Reset to Debugger
		2-3	Connect MC9S08GW64 Reset to Debugger
J2	6 pin BDM header for MC9S08QE8 and MC9S08GW64		
J3	BKGD selection for Debugger	1-2	Connect MC9S08QE8 BKGD to Debugger
		2-3	Connect MC9S08GW64 BKGD to Debugger
J4	IRQ (DNP) header for JM60		

Table 2. TWR-S08GW64 Jumper Connections

Jumper	Option	Setting	Description
J5	6 pin BDM header for JM60		
J6	Supply Selection	1-2	Battery power
		2-3	Regulated Output Voltage
J7	MCU power	ON	Supply 3.3V to MCU
		OFF	Isolate MCU from Power (connect an ammeter to measure current)
J9	KBI7 switch header (DNP)		
J10	Tamper Selection	1-2	Tamper 1
		2-3	Tamper 0
J11	KBI6 switch header (DNP)		
J12	PCNT Sensor Header(DNP)		
J13	UART header 10 pin		
J14		1-3 & 2-4	Connect TXD0 and RXD0 to OSBDM debugger circuit
		3-5 & 4-6	Connect TXD0 and RXD0 to RS232
J15	ADC1 Input	1-2	Simulated sine wave from QE8
		2-3	GND
J16	ADC2 Input	1-2	Simulated sine wave from QE8
		2-3	GND
J17	Primary Elevator		
J18	Secondary Elevator		

5 Input/Output Pin Usage Table

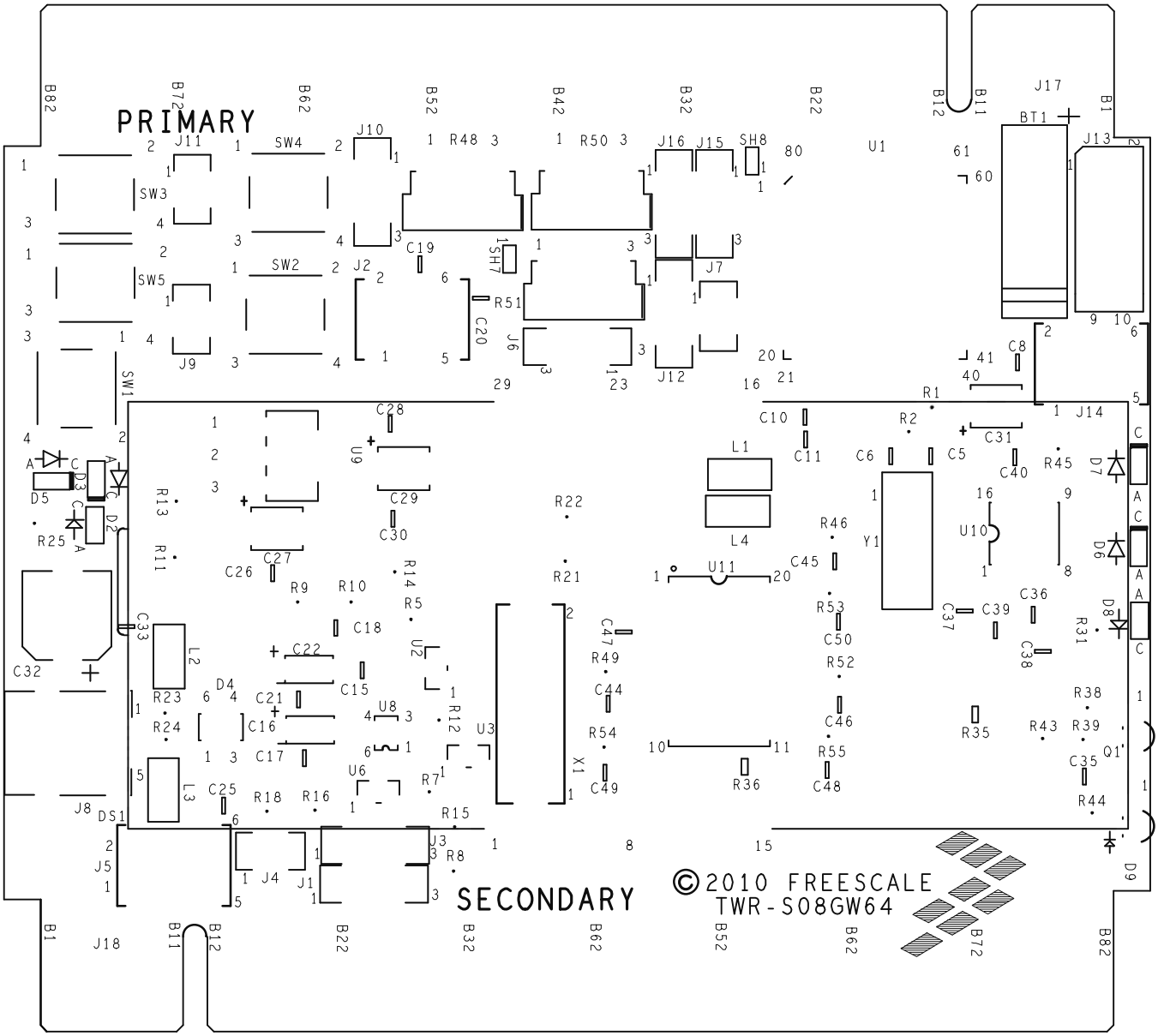
Pin No	MC9S08GW64 Pins	Application
1	PTE6/LCD24	LCD Glass pin 15
2	PTE7/LCD25	LCD Glass pin 16
3	PTF0/LCD26	LCD Glass pin 17
4	PTF1/LCD27	LCD Glass pin 18
5	PTF2/LCD28	LCD Glass pin 19
6	PTF3/LCD29	LCD Glass pin 20
7	PTF4/LCD30	LCD Glass pin 21
8	PTF5/LCD31	LCD Glass pin 22
9	PTF6/MTIMCLK/AD4/LCD32	LCD Glass pin 23
10	PTF7/FTMCLK/AD5/LCD33	LCD Glass pin 24

Input/Output Pin Usage Table

Pin No	MC9S08GW64 Pins	Application
11	PTG0/MOSI1/AD6/LCD34	LCD Glass pin 25
12	PTG1/MISO1/AD7/LCD35	LCD Glass pin 26
13	PTG2/SCLK1/AD8/LCD36	LCD Glass pin 27
14	PTG3/SS1/AD9/LCD37	LCD Glass pin 28
15	PTG4/CMPOUT1/RXD3/AD10/LCD38	LCD Glass pin 29
16	PTG5/CMPOUT2/TXD3/AD11/LCD39	IR communication
17	PTG6/PCNT0/CMPP3/AD12/LCD40	PCNT Sensor Input/sine wave Input from QE8
18	PTG7/PCNT1/CMPP4/AD13/LCD41	PCNT Sensor Input
19	PTH0/PCNT2/CMPP5/AD14/LCD42	PCNT Sensor Input/sine wave Input from QE8
20	PTH1/RTCCLKOUT/AD15/LCD43	ADC Potentiometer
21	VDDA	Analog Power
22	VREFH	Analog Reference Voltage High
23	VSSA	Analog Ground
24	VREFL	Analog Reference Voltage Low
25	DADP0	sine wave Input from QE8
26	DADM0	sine wave Input from QE8
27	VREFO	Reference Output Voltage from MCU
28	DADP1	sine wave Input from QE8
29	DADM1	sine wave Input from QE8
30	VBAT	3 V battery for RTC
31	EXTAL1	RTC EXTAL of 32.768 kHz
32	XTAL1	RTC XTAL of 32.768 kHz
33	TAMPER0	Tamper from SW4 using J10
34	TAMPER1	Tamper from SW4 using J10
35	PTA0/MOSI2/PCNTCH0/SCL/AD2	
36	PTA1/MISO2/PCNTCH1/SDA/AD3	
37	PTA2/SCLK2/FTMCH0/PCNT0/CMPP0	User LED
38	PTA3/SS2/FTMCH1/PCNT1/CMPP1	User LED
39	PTA4/MTIMCLK/RXD2/PCNT2/CMPP2	User LED
40	PTA5/FTMCLK/TXD2/EXTRIG/IRQ	User Push Button
41	PTA6/CMPOUT0/CLKOUT/BKGD/MS	BKGD
42	VDD	Digital Power
43	VSS1	Digital Ground
44	PTB0/KBIP0/TXD1/EXTAL2	MCU EXTAL of 32.768 kHz
45	PTB1/KBIP1/RXD1/CMPP6/XTAL2	MCU XTAL of 32.768 kHz
46	RESET	MCU Reset

Pin No	MC9S08GW64 Pins	Application
47	PTB2/KBIP2/MOSI0/MISO0/RXD0	UART Receiver
48	PTB3/KBIP3/MISO0/MOSI0/TXD0	UART Transmitter
49	PTB4/KBIP4/SCLK0/SCL	
50	PTB5/KBIP5/SS0/SDA	
51	PTB6/KBIP6/RXD2/LCD0	IR communication Receiver
52	PTB7/KBIP7/TXD2/LCD1	IR communication Transmitter
53	PTC0/MOSI1/LCD2	LCD Glass pin 1
54	PTC1/MISO1/LCD3	LCD Glass pin 2
55	PTC2/SCLK1/LCD4	LCD Glass pin 3
56	PTC3/SS1/LCD5	LCD Glass pin 4
57	PTC4/FTMCH0/RXD1/LCD6	LCD Glass pin 5
58	PTC5/FTMCH1/TXD1/LCD7	LCD Glass pin 6
59	PTC6/PCNTCH0/RXD3/LCD8	LCD Glass pin 7
60	PTC7/PCNTCH1/TXD3/LCD9	LCD Glass pin 8
61	PTD0/KBIP0/MOSI2/LCD10	
62	PTD1/KBIP1/MISO2/LCD11	
63	PTD2/KBIP2/SCLK2/LCD12	
64	PTD3/KBIP3/SS2/LCD13	
65	PTD4/KBIP4/LCD14	User Push Button
66	PTD5/KBIP5/CLKOUT/LCD15	User Push Button
67	PTD6/KBIP6/LCD16	User 2 pin Header
68	PTD7/KBIP7/LCD17	User 2 pin Header
69	PTE0/LCD18	LCD Glass pin 9
70	PTE1/LCD19	LCD Glass pin 10
71	PTE2/LCD20	LCD Glass pin 11
72	PTE3/LCD21	LCD Glass pin 12
73	PTE4/LCD22	LCD Glass pin 13
74	PTE5/LCD23	LCD Glass pin 14
75	VSS2	Digital GND
76	VLL3	LCD voltage
77	VLL2	LCD voltage
78	VLL1	LCD voltage
79	VCAP2	Charge Pump capacitor
80	VCAP1	Charge Pump capacitor

Appendix A Silk Screen



Appendix B Schematic Drawings

Table of Contents

Revisions

Rev	Description	Date	Approved
X1	Original Release	Nov 21, 2009	Sunaina Srivastava
A	Release to Production	Dec 4, 2009	Sunaina Srivastava
B	swapped PTG5 with PTG6	Sep 1, 2010	Sunaina Srivastava

NOTES

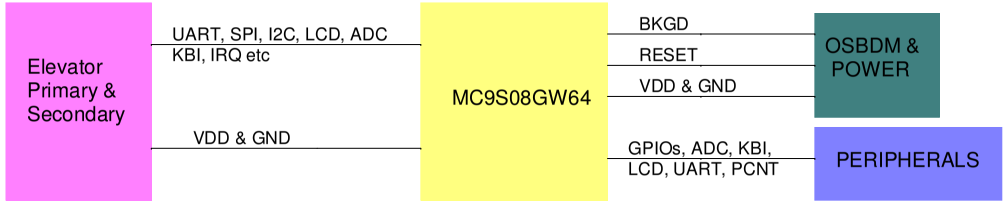
1. Unless Otherwise Specified:
   All resistors are in ohms, 5%, 1/8 Watt
   All capacitors are in uF, 20%, 50V
   All voltages are DC
   All polarized capacitors are aluminum electrolytic

2. Interrupted lines coded with the same letter or letter combinations are electrically connected.

3. Device type number is for reference only. The number varies with the manufacturer.

4. Special signal usage:
   _B Denotes - Active-Low Signal
   <> or [] Denotes - Vectored Signals

5. Interpret diagram in accordance with American National Standards Institute specifications, current revision, with the exception of logic block symbology.



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ICAP Classification: FCP: FIUO: X PUBI:

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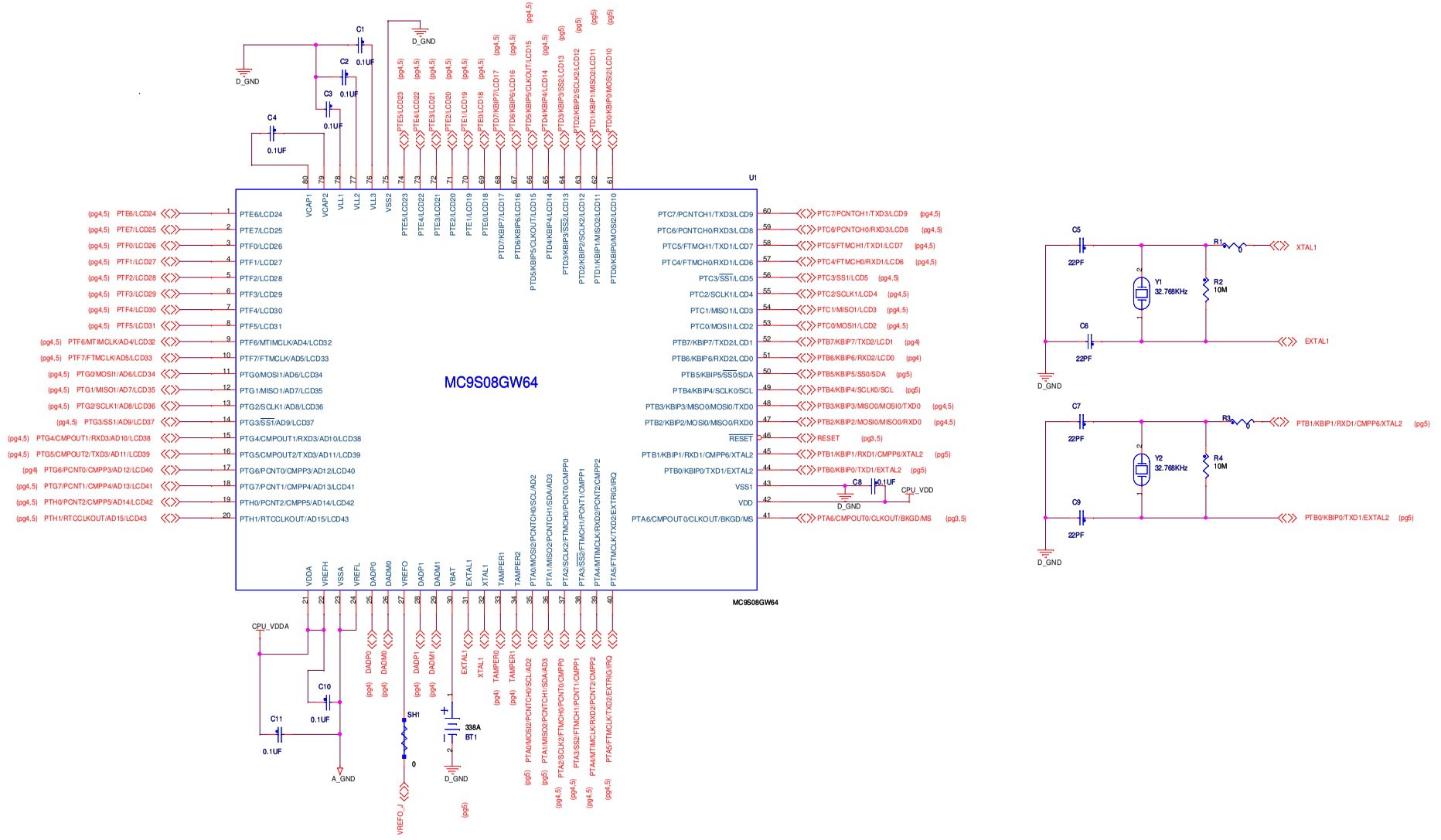
Drawn by: Sunaina Srivastava	Page Title: Cover Page	
Approved: Sunaina Srivastava	Size C / Document Number SCH-26361 PDF: SPF-26361	Rev B
	Date: Thursday, September 30, 2010	Sheet 1 of 5



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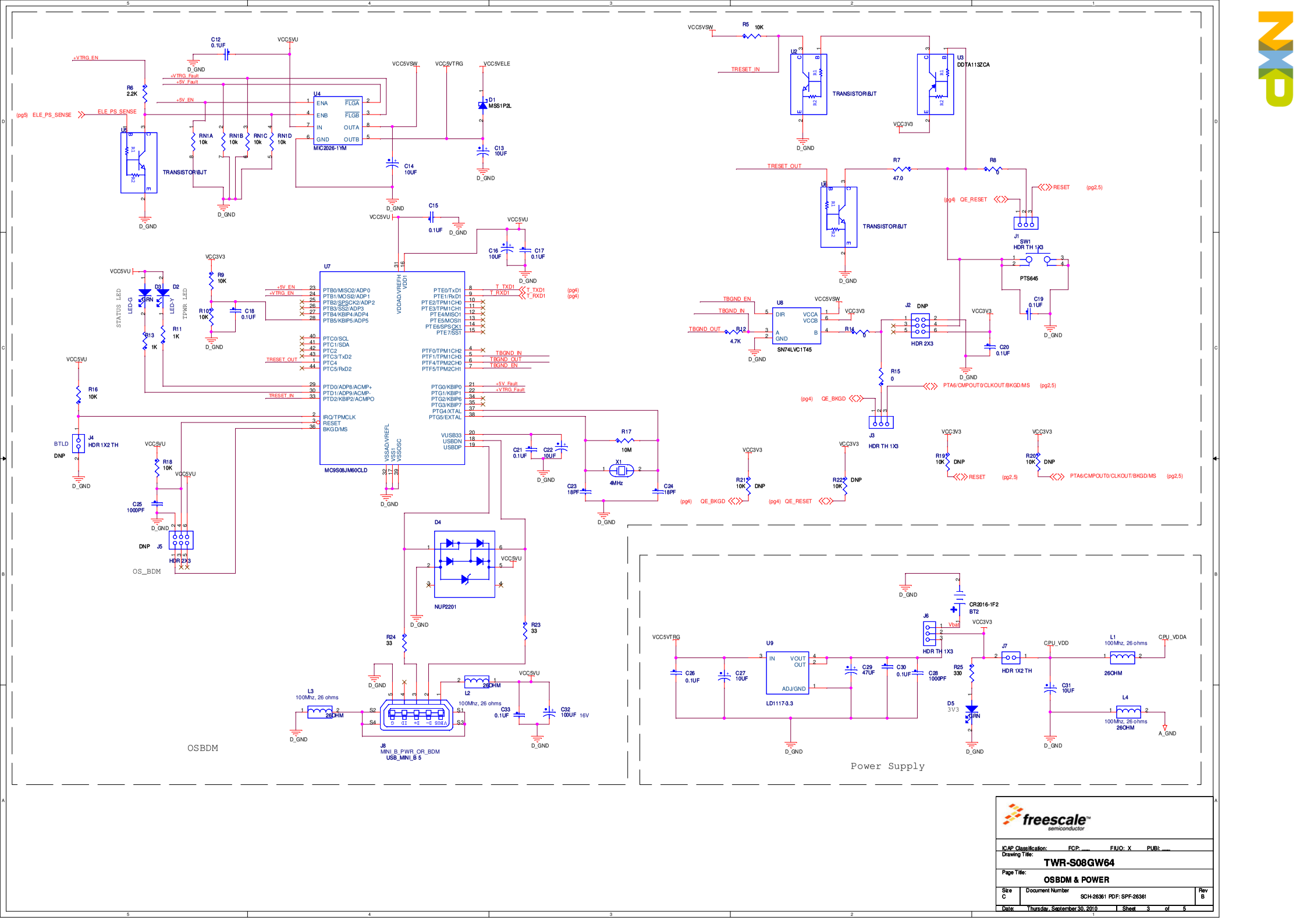
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MC9S08JM60CLD
MIC2026-1YM
SN74LVC1T45
LD1117-3.3
NUP2201
MINI_B_PWR_OR_BDM
USB_MINI_B 5
TRANSISTOR\BJT
HDR 2X3
HDR 1X3
HDR 1X2 TH
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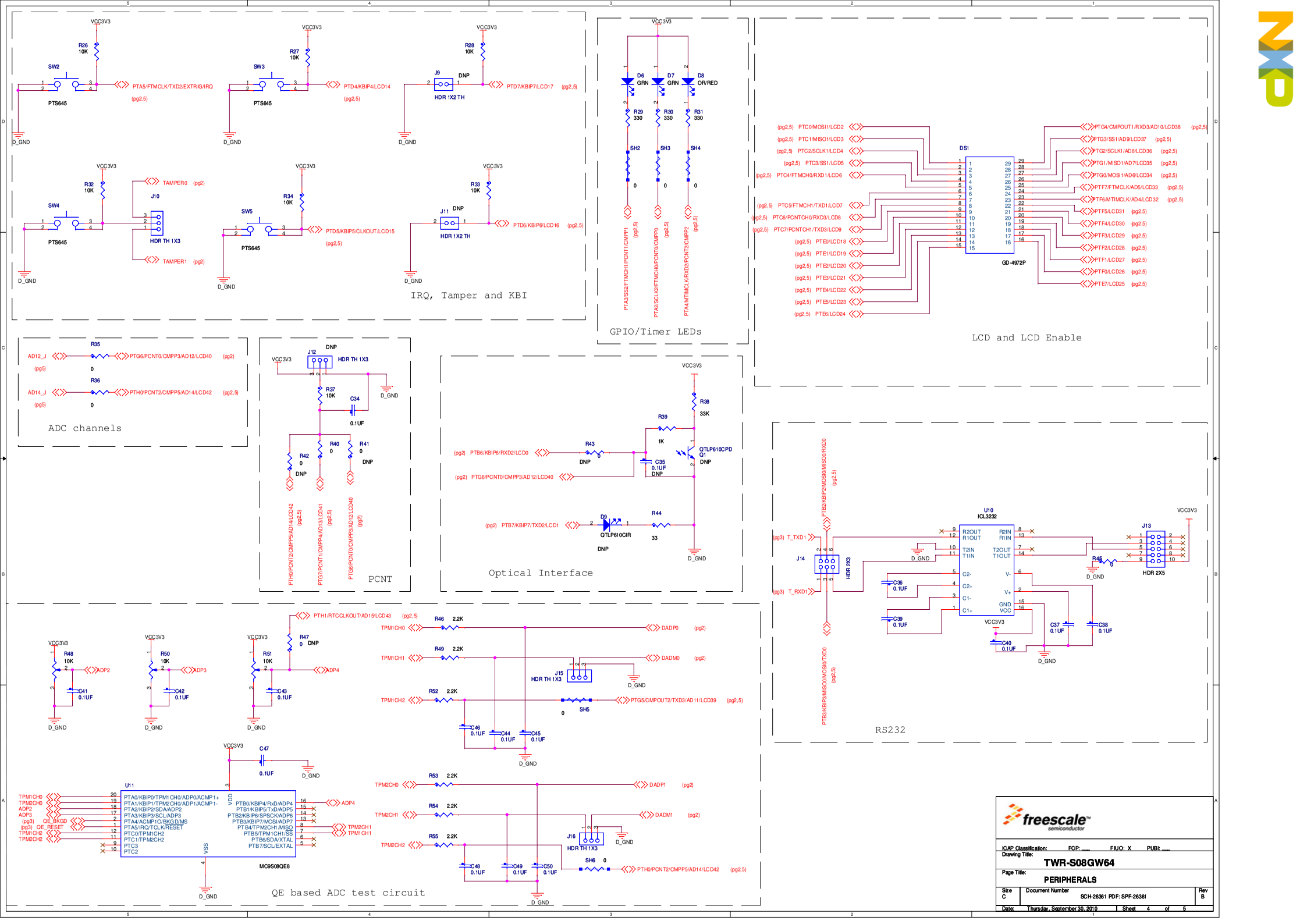
IRQ, Tamper and KBI
GPIO/Timer LEDs
LCD and LCD Enable
ADC channels
PCNT
Optical Interface
RS232
QE based ADC test circuit
MC9S08QE8
GD-4972P
ICL3232
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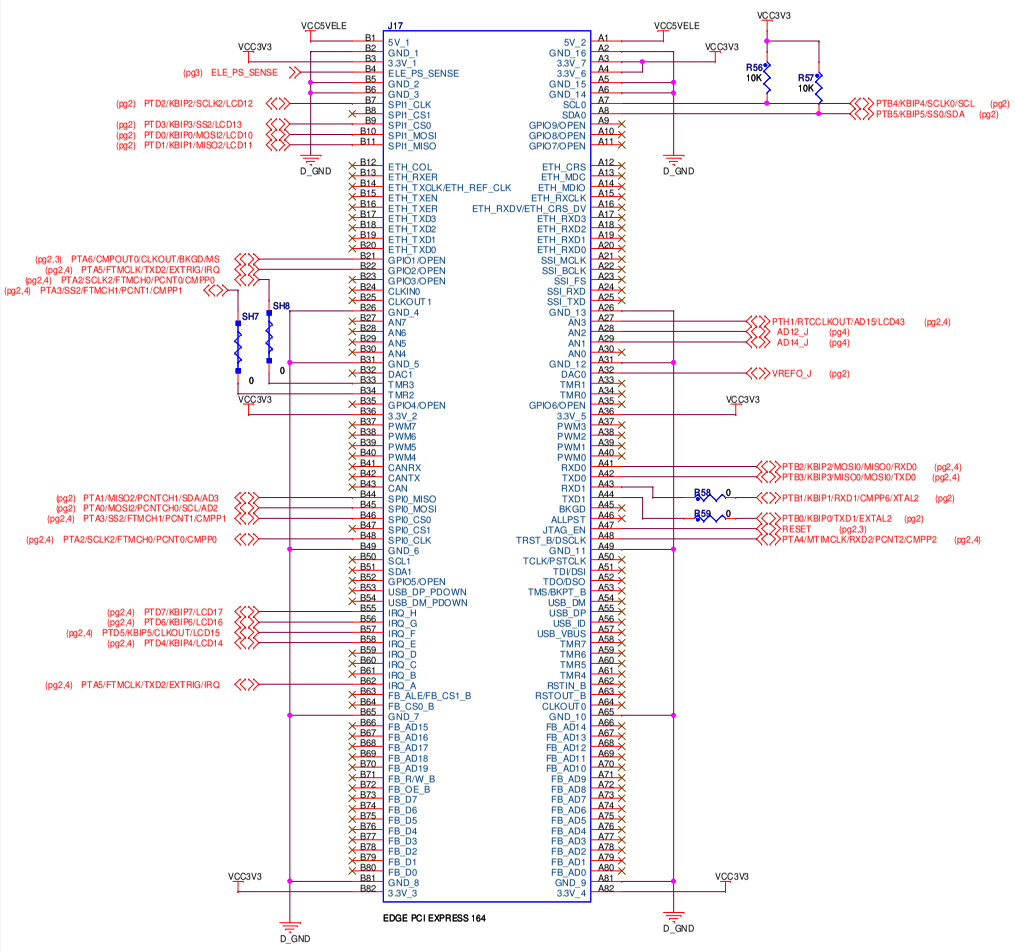
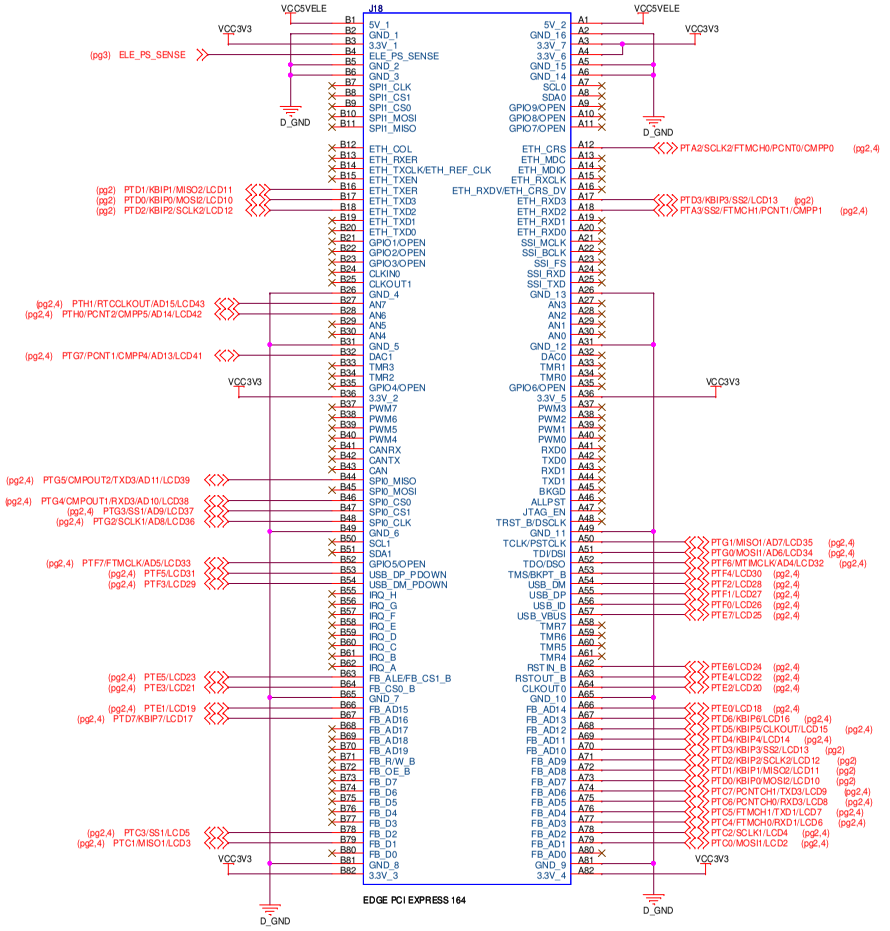
Sheet 4 of 5



Primary Elevator



Secondary Elevator

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Page Title:	ELEVATOR CONNECTIONS		
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10/2010

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