

# 56F800 Demonstration Board

User Manual

**56F800**  
**16-bit Digital Signal Controllers**

DSP56F800DBUM  
Rev. 0  
09/2005

[freescale.com](http://freescale.com)





# TABLE OF CONTENTS

## Preface

### Chapter 1 Introduction

|     |                                               |     |
|-----|-----------------------------------------------|-----|
| 1.1 | 56F800 Demonstration Board Features . . . . . | 1-1 |
| 1.2 | SPECIFICATIONS . . . . .                      | 1-3 |

### Chapter 2 Technical Summary

|       |                                    |     |
|-------|------------------------------------|-----|
| 2.1   | OPTIONS . . . . .                  | 2-1 |
| 2.1.1 | HOST_ENABLE . . . . .              | 2-1 |
| 2.1.2 | CUT_AWAY Options. . . . .          | 2-1 |
| 2.2   | PORTS AND CONNECTORS . . . . .     | 2-2 |
| 2.2.1 | PWR Jack . . . . .                 | 2-2 |
| 2.2.2 | POWER PORT . . . . .               | 2-2 |
| 2.2.3 | GPIO / SERIAL . . . . .            | 2-2 |
| 2.2.4 | TIMER / PWM . . . . .              | 2-3 |
| 2.2.5 | ADC Port. . . . .                  | 2-3 |
| 2.2.6 | COM1 . . . . .                     | 2-3 |
| 2.2.7 | JTAG / OnCE . . . . .              | 2-3 |
| 2.2.8 | P1 - HOST JTAG . . . . .           | 2-4 |
| 2.3   | USER FEATURES . . . . .            | 2-4 |
| 2.3.1 | MICROPHONE . . . . .               | 2-4 |
| 2.3.2 | POTENTIOMETER (POT) - R12. . . . . | 2-5 |
| 2.4   | Indicators . . . . .               | 2-5 |

### Appendix A 56F800 Demonstration Board Schematics



# LIST OF FIGURES

|     |                                      |     |
|-----|--------------------------------------|-----|
| 1-1 | 56F800 Demonstration Board . . . . . | 1-2 |
| 2-1 | Power Port . . . . .                 | 2-2 |
| A-1 | 56F800 Demonstration Board . . . . . | A-2 |



---

# TABLE OF CONTENTS

|     |                        |     |
|-----|------------------------|-----|
| 2-1 | CUT_AWAY Options ..... | 2-1 |
| 2-2 | Indicators .....       | 2-5 |



# Preface

This reference manual describes in detail the hardware on the 56F800 Demonstration Board.

## Audience

This document is intended for application developers who are creating software for devices using the Freescale 56F800 Demonstration Board.

## Organization

This manual is organized into two chapters and one appendix.

- **Chapter 1, Introduction** - provides an overview of the Demonstration Board and its features.
- **Chapter 2, Technical Summary** - describes the 56F800 Demonstration Board in detail.
- **Appendix A, 56F800 Demonstration Board Schematics** - contains the schematics of the 56F800 Demonstration Board.

## Suggested Reading

Related documentation for the 56F800 family of digital signal controllers may be found at:

**<http://www.freescale.com/dsc>**

# Notation Conventions

This manual uses the following notational conventions:

| Typeface, Symbol or Term   | Meaning                                                                                                                                                                                                              | Examples                                                                                                                                                                                                                                                              | Typeface, Symbol or Term   |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| Courier<br>Monospaced Type | Code examples                                                                                                                                                                                                        | //Process command<br>for line flash                                                                                                                                                                                                                                   | Courier<br>Monospaced Type |
| <i>Italic</i>              | Directory names,<br>project names,<br>calls,<br>functions,<br>statements,<br>procedures,<br>routines,<br>arguments,<br>file names,<br>applications,<br>variables,<br>directives,<br>code snippets<br>APIs<br>in text | ...and contains these core<br>directories:<br><i>applications</i> contains<br>applications software...<br><br>...CodeWarrior project,<br><i>3des.mcp</i> is...<br><br>...the <i>pConfig</i> argument....<br><br>...defined in the C header<br>file, <i>aec.h</i> .... | <i>Italic</i>              |
| <b>Bold</b>                | Reference sources,<br>paths,<br>emphasis                                                                                                                                                                             | ...refer to the <b>Target-<br/>ing DSP56F80x Plat-<br/>form</b><br>manual....<br>...see: <b>C:\Program<br/>Files\Embedded<br/>SDK\help\tutorials</b>                                                                                                                  | <b>Bold</b>                |
| Blue Text                  | Linkable                                                                                                                                                                                                             | ...refer to <a href="#">Chapter 7</a> ,<br>License....                                                                                                                                                                                                                | Blue Text                  |
| Number                     | Any number is consid-<br>ered a positive value,<br>unless preceded by a<br>minus symbol to sig-<br>nify a negative value                                                                                             | 3V<br>-10<br>DES <sup>-1</sup>                                                                                                                                                                                                                                        | Number                     |
| ALL CAPITAL LET-<br>TERS   | # defines/<br>defined constants                                                                                                                                                                                      | # define<br>INCLUDE_STACK_CH<br>ECK                                                                                                                                                                                                                                   | ALL CAPITAL LETTERS        |
| Brackets [...]             | Function keys                                                                                                                                                                                                        | ...by pressing function<br>key [F7]                                                                                                                                                                                                                                   | Brackets [...]             |

## Cautionary Notes

1. Electrostatic Discharge (ESD) prevention measures should be applied whenever handling this product. ESD damage is not a warranty repair item.
2. EMC Information on the 56F800 Demonstration Board:
  - a. This product as shipped from the factory with associated power supplies and cables, has been tested and meets with requirements of CE and the FCC as a CLASS A product.
  - b. This product is designed and intended for use as a development platform for hardware or software in an educational or professional laboratory.
  - c. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate prevention measures.
  - d. Attaching additional wiring to this product or modifying the products operation from the factory default as shipped may effect its performance and also cause interference with other apparatus in the immediate vicinity. If such interference is detected, suitable mitigating measures should be taken.

## Terminology

This development board applies option selection jumpers. Terminology for application of the option jumpers is as follows:

Jumper on, in, or installed = jumper is a plastic shunt that fits across 2 pins and the shunt is installed so that the 2 pins are connected with the shunt.

Jumper off, out, or idle = jumper or shunt is installed so that only 1 pin holds the shunt, no 2 pins are connected, or jumper is removed. It is recommended that the jumpers be idled by installing on 1 pin so they will not be lost.

This development board applies CUT\_AWAY option selections. These option selections apply surface mount resistor locations with a printed circuit board trace connecting both component pads. This type connection places an equivalent 0-ohm type resistor in series with the I/O signal and the user component or I/O connector on the board. These connections maybe cut with a razor blade or similar type knife between the component pads to isolate the default connection provided. Reconnection of the cut-away type pads can be made by either installing a 0 ohm 0805 size surface mount resistor or a small wire jumper on the component pads.

## Definitions, Acronyms, and Abbreviations

Definitions, acronyms and abbreviations for terms used in this document are defined below for reference.

|              |                                                                                                                                                                        |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ADC</b>   | Analog-to-Digital Converter                                                                                                                                            |
| <b>CTS</b>   | Clear To Send                                                                                                                                                          |
| <b>ESD</b>   | Electrostatic Discharge                                                                                                                                                |
| <b>GPIO</b>  | General Purpose Input and Output Port                                                                                                                                  |
| <b>JTAG</b>  | Joint Test Action Group. A bus protocol/interface used for test and debug.                                                                                             |
| <b>OnCE™</b> | On-Chip Emulation, a debug bus and port created by Freescale to enable designers to create a low-cost hardware interface for a professional quality debug environment. |
| <b>PC</b>    | Personal Computer                                                                                                                                                      |
| <b>POT</b>   | Potentiometer                                                                                                                                                          |
| <b>PWM</b>   | Pulse Width Modulation                                                                                                                                                 |
| <b>RTS</b>   | Request To Send                                                                                                                                                        |

## References

The following sources were referenced to produce this manual:

*DSP56800 Family Manual*

*DSP56F80x User's Manual*

*Technical Data, 56F801 16-Bit Digital Signal Controller*

# Chapter 1

## Introduction

The 56F800 Demonstration Board is used to demonstrate the abilities of the 56F800 family and to provide a hardware tool allowing the development of applications that use the 56F800 devices.

### 1.1 56F800 Demonstration Board Features

- 56F801FA60 (60 MHz version)
- RESET Switch
- IRQ Switch
- GPIO / SERIAL Port (10 pin) \*
- TIMER / PWM Port (10 Pin) \*
- ADC Port (10 Pin) \*
- JTAG / OnCE Port (14 pin) \*
- Host JTAG Port (P1- DB25P)
- COM1 Port - SCI to RS232 (DB9S) \*
- PWR Jack supply connector
- Power Port \*
- Power Indicator
- 10 User Indicators
- User Potentiometer (R12)
- Microphone with amplifier
- Crystal Reference (Y1) \*

\* All components may not be installed at the factory. The user may install the components to apply associated feature.

The 56F800 Demonstration Board is detailed in [Figure 1-1](#).

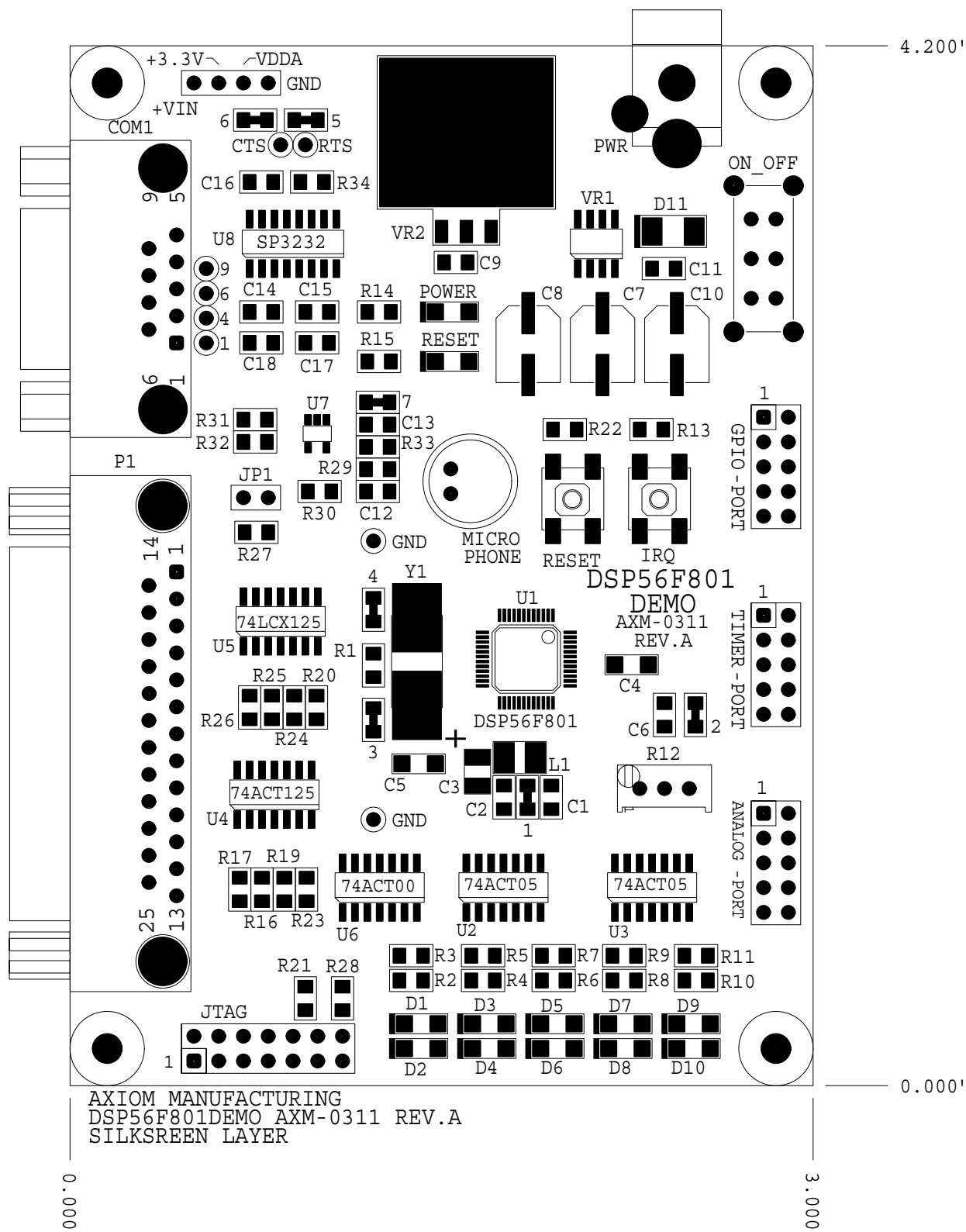


Figure 1-1. 56F800 Demonstration Board

## 1.2 SPECIFICATIONS

- +9V DC input voltage typical, 200ma
- Input voltage range: +7 to +15V DC
- On board regulated +5V DC and +3.3V DC supplies
- Board size: 3 x 4.2 inches



# Chapter 2

## Technical Summary

This chapter describes the 56F800 Demonstration Board's available options.

### 2.1 OPTIONS

#### 2.1.1 HOST\_ENABLE

The HOST\_ENABLE option jumper is installed by default and enables the Host JTAG interface on the board. With the option jumper installed, the 56F801 device will reset into Debug mode and await Host commands on the Host JTAG port (P1). Removing the HOST\_ENABLE option jumper will allow the 56F801 device to reset normally and execute program code contained in the device's Flash memory.

- **HOST\_ENABLE = INSTALLED:** Debug Mode; host JTAG port is active
- **HOST\_ENABLE = OPEN or IDLE:** Normal Mode; executes user code in Flash

#### 2.1.2 CUT\_AWAY Options

CUT\_AWAY options allow the user to disconnect dedicated 56F801 I/O port resources from development board connectors or peripherals. The CUT\_AWAY options also allow for re-establishing the connection by installing surface-mount 0805-size 0 ohm resistors or mod wire with the use of a soldering iron. Normal operation of the 56F800 Demonstration Board generally does not require any manipulation of the CUT\_AWAY options.

**Table 2-1. CUT\_AWAY Options**

| CUT_AWAY # | Description                  | 56F801 Signal    | Connection Signal   |
|------------|------------------------------|------------------|---------------------|
| 1          | ADC reference supply         | V <sub>REF</sub> | V <sub>DDA</sub>    |
| 2          | User POT (R12) to ADC        | ANA6             | R12 wiper           |
| 3          | Crystal oscillator isolation | XTAL / GPIOB3    | GPIO / SERIAL pin 4 |

**Table 2-1. CUT\_AWAY Options (Continued)**

| CUT_AWAY # | Description                  | 56F801 Signal  | Connection Signal            |
|------------|------------------------------|----------------|------------------------------|
| 4          | Crystal oscillator isolation | EXTAL / GPIOB2 | GPIO / SERIAL pin 3          |
| 5          | COM1 serial port             | TXD0 / GPIO0   | U8 pin 11 (COM1 TXD)         |
| 6          | COM1 serial port             | RXD0 / GPIOB1  | U8 pin 12 (COM1 RXD)         |
| 7          | Microphone to ADC            | ANA2           | U7 pin 4 (Microphone output) |

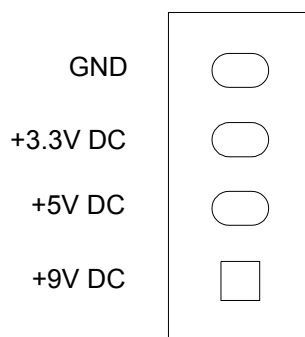
## 2.2 PORTS AND CONNECTORS

### 2.2.1 PWR Jack

This connector provides power input to the board by default. The PWR jack accepts a standard 2.0 ~ 2.1mm center-barrel plug connector (positive voltage center) to provide the +VIN supply of +9V DC at 200ma.

### 2.2.2 POWER PORT

Provides access to the +9V DC input, GND (power ground), +5V DC and +3.3V DC power supplies. The +9V DC input should only be applied by PWR jack or Power Port, but not both, or a supply conflict may occur and the 56F800 Demonstration Board could be damaged. Power Port accepts a 3.5mm pin space terminal block.



**Figure 2-1. Power Port**

### 2.2.3 GPIO / SERIAL

|               |   |    |               |
|---------------|---|----|---------------|
| TXD0 / GPIOB0 | 1 | 2  | GPIOB1 / RXD0 |
| GPIOB2        | 3 | 4  | GPIOB3        |
| SCLK / GPIOB4 | 5 | 6  | GPIOB5 / MOSI |
| MISO / GPIOB6 | 7 | 7  | GPIOB7 / SS*  |
| IREQA*        | 9 | 10 | RESET*        |

GPIO B port provides alternate functions as SCI (COM1 and indications) and SPI ports. IREQ and RESET signals are also provided on this connector.

### 2.2.4 TIMER / PWM

|              |   |    |              |
|--------------|---|----|--------------|
| TD0 / GPIOA0 | 1 | 2  | GPIOA1 / TD1 |
| TD2 / GPIOA2 | 3 | 4  | FAULTA0      |
| PWMA4        | 5 | 6  | PWMA5        |
| PWMA2        | 7 | 7  | PWMA3        |
| PWMA0        | 9 | 10 | PWMA1        |

GPIOA0 - 2 port provides alternate functions of Timer TD0 - 2 I/O. Note that most of these ports provide a user indication.

### 2.2.5 ADC Port

|      |   |    |      |
|------|---|----|------|
| ANA6 | 1 | 2  | ANA7 |
| ANA4 | 3 | 4  | ANA5 |
| ANA2 | 5 | 6  | ANA3 |
| ANA0 | 7 | 7  | ANA1 |
| VREF | 9 | 10 | GND  |

Analog inputs. Note that ANA2 and ANA6 provide Microphone and User POT R12 input, respectively.

### 2.2.6 COM1

|      |   |   |     |
|------|---|---|-----|
| 1    | 1 |   |     |
| TXD0 | 2 | 6 | 6   |
| RXD0 | 3 | 7 | CTS |
| 4    | 4 | 8 | RTS |
| GND  | 5 | 9 | 9   |

The **COM1** port has a female DB9 connector that interfaces to the 56F801 internal SCI0 serial port via the U8 RS-232 transceiver. It uses a simple 2-wire asynchronous serial interface and is translated to RS-232 signaling levels.

**1,4,6 connected (host null)**

**RTS and CTS** flow control connection pads are provided on the 56F800 Demonstration Board to apply unassigned 56F801 I/O to support flow control on COM1. The RTS pad provides RS-232 level output conversion to COM1 port pin 8. The CTS pad provides RS-232-converted input from COM1 pin 7.

The 1, 4, 6, and 9 pins provide RS-232 status. The 1, 4, and 6 pins are connected on the bottom of the development board to provide NULL status to the host. The user may isolate pins and provide the status connections to the host by applying I/O signals and RS-232 level conversion.

## 2.2.7 JTAG / OnCE

The JTAG 14-pin connector is compatible with the Freescale OnCE development port. This connector allows the connection of a OnCE-style background debug cable for software development, programming and debugging in real time.

|          |    |    |          |
|----------|----|----|----------|
| TDI      | 1  | 2  | GND      |
| TDO      | 3  | 4  | GND      |
| TCK      | 5  | 6  | GND      |
|          | 7  | 7  | (key)    |
| RESET in | 9  | 10 | TMS      |
| +3.3V DC | 11 | 12 |          |
| DE*      | 13 | 14 | TRST* in |

JTAG / OnCE BDM connection.

Note: HOST\_ENABLE option must be open or idle to apply this connector.

## 2.2.8 P1 - HOST JTAG

The P1 - Host JTAG connector provides development port interface to a hosting Personal Computer's LPT or Printer port. The HOST\_ENABLE option jumper must be installed for this port to operate.

|                |    |    |           |
|----------------|----|----|-----------|
|                | 1  | 14 |           |
| Reset in       | 2  | 15 | Pin 8 tie |
| TMS            | 3  | 16 | GND       |
| TCK            | 4  | 17 |           |
| TDI            | 5  | 18 | GND       |
| TRST*          | 6  | 19 | GND       |
| DE* (Note R23) | 7  | 20 | GND       |
| Pin 15 tie     | 8  | 21 | GND       |
|                | 9  | 22 | GND       |
|                | 10 | 23 | GND       |
| TDO            | 11 | 24 | GND       |
|                | 12 | 25 | GND       |
| P-CON          | 13 |    |           |

P1 - HOST JTAG connector is a DB25 pin connector. Signals are organized for direct connection to an IBM-compatible PC with a straight-through DB25 cable.

Pin 7 / DE\* signal, if supported, can be enabled by installing R23 (51 ohms)

Note: HOST\_ENABLE option must be installed to apply this connector.

## 2.3 USER FEATURES

Several circuits are provided for demonstration of 56F800 applications.

### 2.3.1 MICROPHONE

A microphone with audio amplifier is provided on the 56F800 Demonstration Board for user applications. The amplifier provides low-pass filtering starting at ~4000Hz for speech input. The audio signal from the microphone amplifier is provided to the ADC ANA2 input channel via CUT\_AWAY option #7.

### 2.3.2 POTENTIOMETER (POT) - R12

The user POT R12 provides a 0 to +3.3V adjustable analog input to the 56F801's ADC ANA6 channel. R12 can be removed from the ANA6 channel by CUT\_AWAY option #2.

## 2.4 Indicators

User indications are provided that are active with a high level on the associated 56F801 device's I/O port. [Table 2-2](#) details the indicators.

**Table 2-2. Indicators**

| Indicator | 56F800 Signal | Color  |
|-----------|---------------|--------|
| D1        | PWMA0         | Green  |
| D2        | PWMA1         | Green  |
| D3        | PWMA2         | Green  |
| D4        | PWMA3         | Green  |
| D5        | PWMA4         | Yellow |
| D6        | PWMA5         | Yellow |
| D7        | GPIOB1 / RXD0 | Yellow |
| D8        | GPIOB0 / TXD0 | Yellow |
| D9        | GPIOA1 / TD1  | Red    |
| D10       | GPIOA2 / TD2  | Red    |

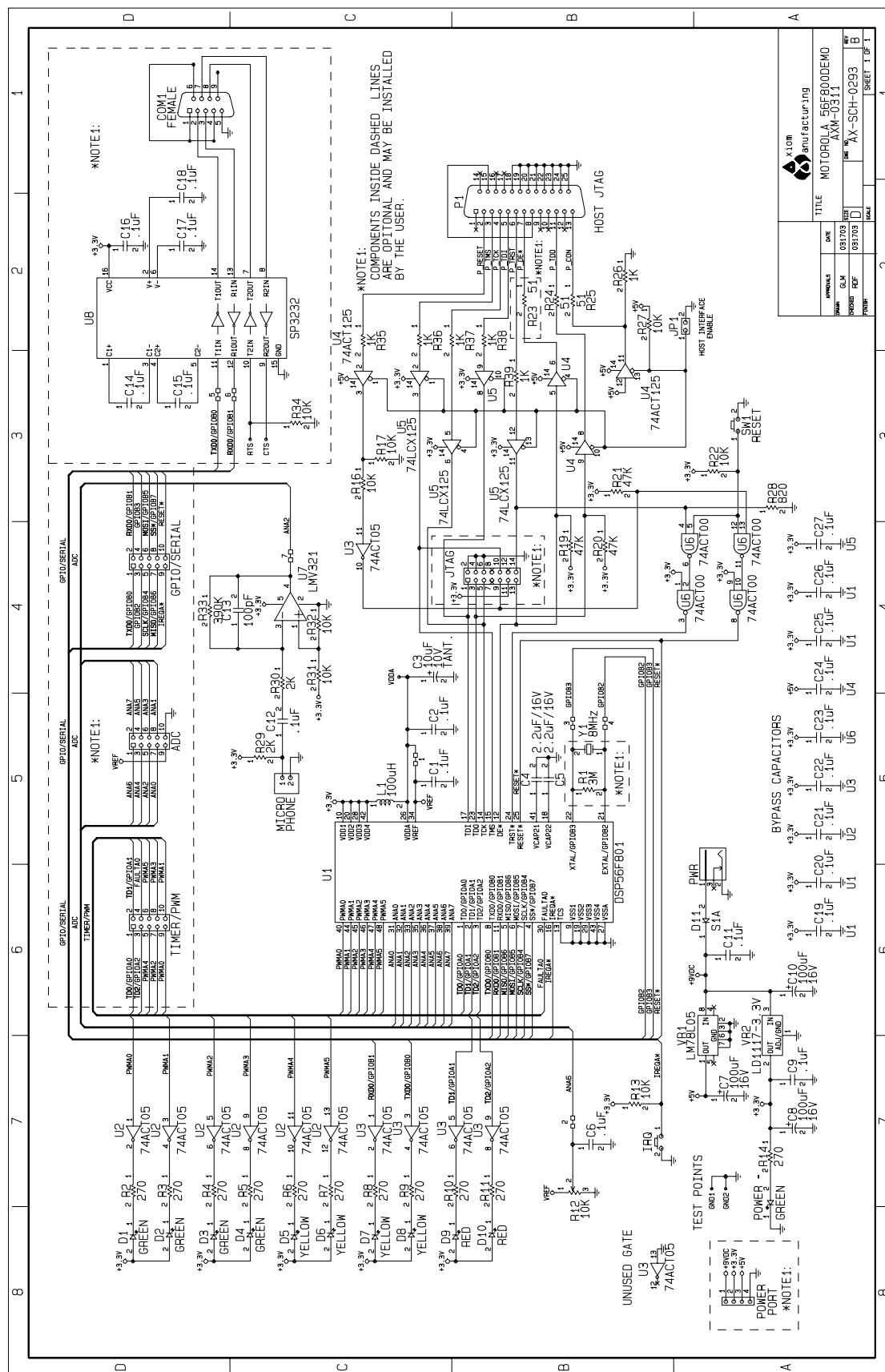




# **Appendix A**

## **56F800 Demonstration Board**

### **Schematics**



**Figure A-1. 56F800 Demonstration Board**

# INDEX

## A

ADC [vi](#), [2-1](#), [2-4](#)  
Analog-to-Digital Converter  
    ADC [vi](#)

## C

CE [v](#)  
Clear To Send  
    CTS [vi](#)  
COM1 serial port [2-1](#)  
Crystal oscillator isolation [2-1](#)  
CTS [vi](#), [2-3](#)  
CUT\_AWAY [v](#), [2-4](#), [2-5](#)

## D

DS25 [2-4](#)  
DSP56F801 Digital Signal Processor User's Manual [vi](#)

## E

Electrostatic Discharge  
    ESD [v](#), [vi](#)  
EMC [v](#)  
ESD [v](#), [vi](#)

## F

FCC [v](#)

## G

General Purpose Input/Output Port  
    GPIO [vi](#)  
GPIO [vi](#)

## H

HOST\_ENABLE [2-4](#)

## I

I/O connector [v](#)  
I/O signal [v](#)

## J

Joint Test Action Group  
    JTAG [vi](#)  
JTAG [vi](#)

## M

Microphone [2-2](#), [2-3](#)

## O

OnCE [vi](#)  
On-Chip Emulation  
    OnCE [vi](#)

## P

PC [vi](#)  
Personal Computer  
    PC [vi](#)  
POT [vi](#), [2-1](#), [2-3](#)  
Potentiometer  
    POT [vi](#)  
Pulse Width Modulation  
    PWM [vi](#)  
PWM [vi](#)

## R

R23 [2-4](#)  
RS-232 [2-3](#)  
RTS [2-3](#)

## T

Technical Data, 56F801 16-Bit Hybrid Controller [vi](#)

## **How to Reach Us:**

### **Home Page:**

[www.freescale.com](http://www.freescale.com)

### **E-mail:**

[support@freescale.com](mailto:support@freescale.com)

### **USA/Europe or Locations Not Listed:**

Freescale Semiconductor  
Technical Information Center, CH370  
1300 N. Alma School Road  
Chandler, Arizona 85224  
+1-800-521-6274 or +1-480-768-2130  
[support@freescale.com](mailto:support@freescale.com)

### **Europe, Middle East, and Africa:**

Freescale Halbleiter Deutschland GmbH  
Technical Information Center  
Schatzbogen 7  
81829 Muenchen, Germany  
+44 1296 380 456 (English)  
+46 8 52200080 (English)  
+49 89 92103 559 (German)  
+33 1 69 35 48 48 (French)  
[support@freescale.com](mailto:support@freescale.com)

### **Japan:**

Freescale Semiconductor Japan Ltd.  
Headquarters  
ARCO Tower 15F  
1-8-1, Shimo-Meguro, Meguro-ku,  
Tokyo 153-0064, Japan  
0120 191014 or +81 3 5437 9125  
[support.japan@freescale.com](mailto:support.japan@freescale.com)

### **Asia/Pacific:**

Freescale Semiconductor Hong Kong Ltd.  
Technical Information Center  
2 Dai King Street  
Tai Po Industrial Estate  
Tai Po, N.T., Hong Kong  
+800 2666 8080  
[support.asia@freescale.com](mailto:support.asia@freescale.com)

### **For Literature Requests Only:**

Freescale Semiconductor Literature Distribution Center  
P.O. Box 5405  
Denver, Colorado 80217  
1-800-441-2447 or 303-675-2140  
Fax: 303-675-2150  
[LDCForFreescaleSemiconductor@hibbertgroup.com](mailto:LDCForFreescaleSemiconductor@hibbertgroup.com)

Information in this document is provided solely to enable system and software implementers to use Freescale Semiconductor products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits or integrated circuits based on the information in this document.

Freescale Semiconductor reserves the right to make changes without further notice to any products herein. Freescale Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in Freescale Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals", must be validated for each customer application by customer's technical experts. Freescale Semiconductor does not convey any license under its patent rights nor the rights of others. Freescale Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescale Semiconductor product could create a situation where personal injury or death may occur. Should Buyer purchase or use Freescale Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold Freescale Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Freescale Semiconductor was negligent regarding the design or manufacture of the part.



Freescale™ and the Freescale logo are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.  
This product incorporates SuperFlash® technology licensed from SST.  
© Freescale Semiconductor, Inc. 2005. All rights reserved.