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MC56F8300DBUM/D  
Rev. 0, 08/11/2003

*56F8300  
Demonstration  
Board*

*User Manual*

MC56F8300DBUM/D  
Rev. 1.0, 8/20/03

*56F8300  
Hybrid Controller*

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# Preface

This reference manual describes in detail the hardware on the 56F8300 Demonstration Board.

## Audience

This document is intended for application developers who are creating software for devices using the Motorola 56F8300 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 56F8300 Demonstration Board in detail.

## Suggested Reading

Related documentation for the 56F800E family of hybrid controllers may be found at:

**<http://www.motorola.com/semiconductors>**

# Notation Conventions

This manual uses the following notational conventions:

Typeface, Symbol or Term	Meaning	Examples	Typeface, Symbol or Term
Courier Monospaced Type	Code examples	//Process command for line flash	Courier Monospaced Type
<i>Italic</i>	Directory names, project names, calls, functions, statements, procedures, routines, arguments, file names, applications, variables, directives, code snippets APIs in text	...and contains these core directories: <i>applications</i> contains applications software...  ...CodeWarrior project, <i>3des.mcp</i> is...  ...the <i>pConfig</i> argument...  ...defined in the C header file, <i>aec.h</i> ...	<i>Italic</i>
<b>Bold</b>	Reference sources, paths, emphasis	...refer to the <b>Targeting MC56F80x Platform manual</b> ...  ...see: <b>C:\Program Files\Motorola\help\ tutorials</b>	<b>Bold</b>
<a href="#">Blue Text</a>	Linkable	...refer to <a href="#">Chapter 7</a> , License...	<a href="#">Blue Text</a>
Number	Any number is considered a positive value, unless preceded by a minus symbol to signify a negative value	3V  -10  DES <sup>-1</sup>	Number
ALL CAPITAL LETTERS	# defines/ defined constants	# define INCLUDE_STACK_CHECK	ALL CAPITAL LETTERS
Brackets [...]	Function keys	...by pressing function key [F7]	Brackets [...]

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## Cautionary Notes

1. Electrostatic Discharge (ESD) prevention measures should be applied whenever handling this product. ESD damage is not a warranty repair item.
2. Axiom Manufacturing reserves the right to make changes without further notice to any products to improve reliability, function or design. Axiom Manufacturing does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under patent rights or the rights of others.
3. EMC information on the 56F8300 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 product's operation from the factory default (as shipped) may affect its performance and also cause interference with other apparatus in the immediate vicinity. If such interference is detected, take suitable mitigating measures.

## Terminology

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

- Jumper on, in, or installed = A jumper is a plastic shunt that fits across two pins; the shunt is installed so that the two pins are connected with the shunt.
- Jumper off, out, or idle = A jumper or shunt is installed so that only one pin holds the shunt, two pins are not connected, or the jumper is removed. It is recommended that the jumpers be idled by installing on one 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 of 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 may be cut with a razor blade or knife between the component pads to isolate the default connection provided. Reconnection of the cut-away-type pads can be made by

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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>CAN</b>	Controller Area Network
<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>EOnCE</b>	Enhanced On-Chip Emulation, a debug bus and port created by Motorola to enable designers to create a low-cost hardware interface for a professional quality debug environment.
<b>PC</b>	Personal Computer
<b>PWM</b>	Pulse Width Modulation
<b>RTS</b>	Request To Send
<b>SCI</b>	Serial Communications Interface

## References

The following sources were used to produce this manual:

*DSP56800E Reference Manual*, Motorola, DSP56800ERM/D

*56F8300 Peripheral User Manual*, Motorola, MC56F8300UM/D

*Technical Data 56F8323 16-bit Hybrid Controller*, Motorola, MC56F8323/D

*Semiconductor Technical Data / Product Preview, Electric Field Imaging Device, 33794*; Motorola, MC33794

# Chapter 1

## Introduction

The 56F8300 Demonstration Board is used to demonstrate the abilities of the 56F8300 series of devices and to provide a hardware tool allowing the development of applications that use the 56F8300 devices.

### 1.1 56F8300 Demonstration Board Features

- MC56F8323 CPU
- MC33794 Electric Field Imaging Device (E-Sensor) peripheral
- RESET Switch
- IRQ Switch
- SW1 user switch
- GPIO / SERIAL Port (16 pin)\*
- TIMER / PWM Port (16 Pin)\*
- ADC Port (10 Pin)\*
- JTAG / EOnCE Port (14 pin)
- Host JTAG Port (P1- DB25P)
- COM1 Port - SCI to RS-232 (DB9S)\*
- CAN Port - 1M baud transceiver
- PWR Jack supply connector
- Power Port\*
- Power Indicator
- 10 User Indicators
- Microphone with amplifier
- Stereo Audio output with filters and AMP 3.5mm Stereo jack, Speaker

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

The 56F8300 Demonstration Board is detailed in [Figure 1-1](#).

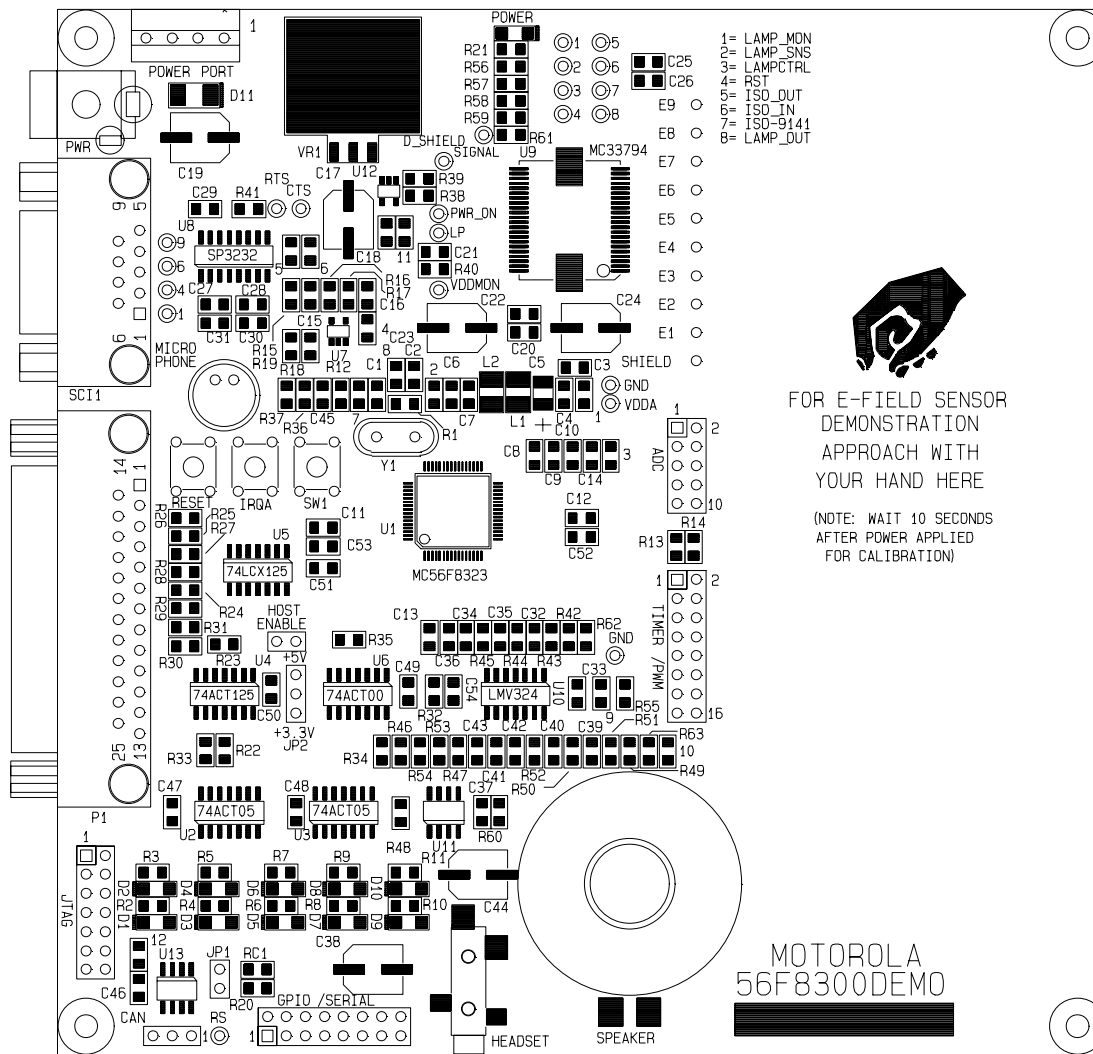


Figure 1-1. 56F8300 Demonstration Board

## 1.2 SPECIFICATIONS

- +9V DC input voltage typical, 300ma
- Input voltage range: +7 to +15V DC
- On-board regulated +5V DC and +3.3V DC supplies
- Board size: 5.5 x 5.5 inches

# Chapter 2

## Technical Summary

This chapter describes the 56F8300 Demonstration Board's available options.

### 2.1 OPTIONS

#### 2.1.1 HOST\_ENABLE

The HOST\_ENABLE option jumper enables the Host JTAG interface on the board. With the option jumper installed, the 56F8323 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 56F8323 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 (default)

#### 2.1.2 JP1 - CAN PORT Termination Enable

JP1 provides connection of a 62 ohm termination resistor (RC1) between the CAN signals on the CAN port. This termination may or may not be required for the applied CAN network.

#### 2.1.3 JP2 - Host JTAG Interface Level

JP2 selects the interface level of the parallel Host JTAG port (P1). The default setting is +5V, but the +3.3V position can be selected if the host parallel port is known to use this level.

#### 2.1.4 CUT\_AWAY Options

CUT\_AWAY options allow the user to disconnect dedicated 56F8323 I/O port resources from development board connectors or peripherals. The CUT\_AWAY options also allow for establishing the connection again by installing surface-mount 0805-size 0 ohm resistors or mod wire with the use of a soldering iron. Normal operation of the 56F8300

Demonstration Board generally does not require manipulation of the CUT\_AWAY options. [Table 2-1](#) details 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	56F8323 On-chip Regulator control connection	OCR_DIS	Ground (enabled)
3	Temperature Sensor connection	TEMP_SENSE / ANA7	56F8323 TEMP SENSE output to ANA7 input
4	Microphone to ADC	ANA0	U7 pin 4 (Microphone output)
5	SCI1 serial port	$\overline{SS0}$ / TXD1	U8 pin 11 (SCI1 TXD)
6	SCI1 serial port	MISO0 / RXD1	U8 pin 12 (SCI1 RXD)
7	Crystal oscillator isolation	XTAL / PC1	GPIO / SERIAL port pin 14
8	Crystal oscillator isolation	EXTAL / PC0	GPIO / SERIAL port pin 13
9	Audio Output connection	TC0	Audio Out channel 2
10	Audio Output connection	TC1	Audio Out channel 1 and Speaker
11	E-Sensor connection	ANA4	E-Sensor level input
12	CAN Port input connection	CAN_RX	CAN transceiver output

## 2.2 PORTS AND CONNECTORS

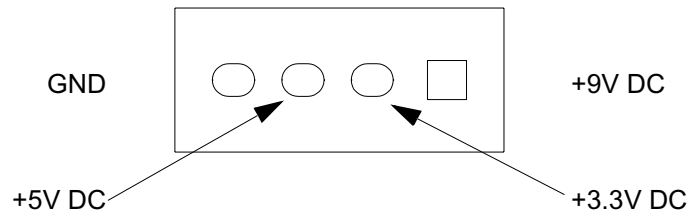
### 2.2.1 PWR Jack

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 300ma.

### 2.2.2 POWER PORT

The 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 the PWR jack or the Power Port, but not both, or a supply conflict may occur and the 56F8300 Demonstration Board could be damaged. The power port accepts a 3.5mm pin space terminal block. [Figure 2-1](#) illustrates the power port.





**Figure 2-1. Power Port**

### 2.2.3 ADC PORT

ANA6	1	2	ANA7
ANA4	3	4	ANA5
ANA2	5	6	ANA3
ANA0	7	8	ANA1
V <sub>REF</sub>	9	10	GND

Analog inputs. ANA0 provides MIC input. ANA4 provides E-Sensor input. ANA7 provides TEMP\_SENSE input.

### 2.2.4 GPIO / SERIAL

IRQA	1	2	MISO01 / RXD1 / PB1
$\overline{SS0}$ / TXDQ / PB0	3	4	MOSI0 / PB2
$\overline{RESET}$	5	6	SCLK0 / PB3
PHASEA0 / TA0 / PB7	7	7	INDEX0 / TA2 / PB5
PHASEB0 / TA1 / PB6	9	10	HOME0 / TA3 / PB4
CAN_RX / PC2	11	12	CAN_TX / PC3
EXTAL / PC0	13	14	XTAL / PC1
TEMP_SENSE	15	16	$\overline{RESET}$

Note: Most signals on this port have alternate connections on the development board.

### 2.2.5 TIMER / PWM

FAULT2 / PA8	1	2	ISA0 / PA9
FAULT1 / PA7	3	4	ISA1 / PA10
FAULT0 / PA6	5	6	ISA2 / PA11
TC0 / TXD0 / PC6	7	7	TC1 / RXD0 / PC5
TC3 / PC4	9	10	
PWMA4 / MOSI1 / PA4	11	12	PWMA5 / SCLK1 / PA5
PWMA2 / $\overline{SS1}$ / PA2	13	14	PWMA3 / MISO1 / PA3
PWMA0 / PA0	15	16	PWMA1 / PA1

Note: Most signals on this port have alternate connections on the development board.

## 2.2.6 SCI1

1	1		
TXD0	2	6	6
RXD0	3	7	CTS
4ANA0	4	8	RTS
GND	5	9	9

The SCI1 port has a femaleDB9 connector that interfaces to the 56F8323 internal SCI1 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.

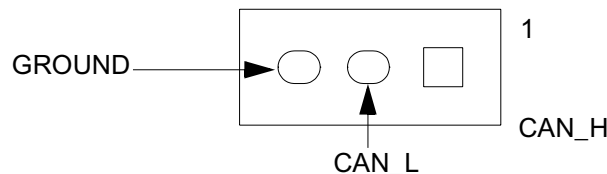
**1, 4, 6 connected (host null)**

**RTS and CTS** flow control connection pads are provided on the 56F8300 Demonstration Board to apply unassigned 56F8323 I/O to support flow control on the SCI1 port. The RTS pad provides RS-232 level output conversion to SCI1 port pin 8. The CTS pad provides RS-232 converted input from SCI1 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 CAN Port

The 56F8323 CAN provides a 1M baud CAN transceiver and CAN\_PORT I/O header. The CAN port CAN\_H and CAN\_L network signals are terminated with a 62 ohm resistor that is enabled or disabled with the JP1 option jumper. CUT\_AWAY option number 12 will isolate the 56F8323 CAN\_RX signal from the transceiver so the PC2 port can be used as a general purpose I/O. [Figure 2-2](#) illustrates the CAN port.



**Figure 2-2. CAN Port**

## 2.2.8 JTAG / EOnCE

The JTAG 14-pin connector is compatible with the Motorola EOnCE development port. This connector allows the connection of an EOnCE-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)
$\overline{\text{RESET}}$ in	9	10	TMS
+3.3V DC	11	12	
	13	14	$\overline{\text{TRST}}$ in

JTAG / EOnCE BDM connection.

Note: This connector is only active if the HOST\_ENABLE jumper is open or idle.

### 2.2.9 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	
$\overline{\text{RESET}}$ in	2	15	Pin 8 tie
TMS	3	16	
TCK	4	17	
TDI	5	18	GND
$\overline{\text{TRST}}$	6	19	GND
	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.

Note: This connector is only active if the HOST\_ENABLE jumper is installed.

## 2.3 USER FEATURES

Several circuits are provided for demonstration of 56F8323 applications.

### 2.3.1 Microphone

A microphone with audio amplifier is provided on the 56F8300 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 ANA0 input channel via CUT\_AWAY option #4.

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### 2.3.2 Audio Output, Headset / Speaker

Timer output channels TC0 and TC1 provide input to 4th order 4KHz low-pass filters with audio amplifier output to the headset jack or speaker. Channel TC1 is the speaker input channel. Amplifier gain is fixed by resistors R48 and R54 for channels TC0 and TC1, respectively. When using a headset, be careful to keep volume low. CUT\_AWAY pads 9 and 10 will isolate the TC0 and TC1 channels respectively from the audio output.

### 2.3.3 MC33794 E-Sensor

The E-Sensor device is provided as a user peripheral and allows detection of an object close to one of the sensor input channels, E1 - E9. Channel E1 is provided with a large sensor plane on the 56F8300 Demonstration Board. Refer to the **MC33794 data sheet** for more details.

Table 2-2 details connections between the E sensor and the 56F8323; any unapplied MC33794 connections are available to the user as test pad connections near the device.

**Table 2-2. Connections**

56F8323 I/O Port	MC33794 Signal
HOME0	Select A
INDEX0	Select B
PHASEB0	Select C
PHASEA0	Select D
ANA4	LEVEL

## 2.4 Indicators

The active user indicators provided have a high level on the associated 56F8323 device's I/O port. [Table 2-3](#) details the indicators.

**Table 2-3. Indicators**

Indicator	56F8323 Signal	Color
D1	PWMA1 / PA1	Green
D2	$\overline{SS0}$ / PB0	Green
D3	PWMA2 / PA2	Green
D4	MISO0 / PB1	Green
D5	PWMA3 / PA3	Yellow
D6	MOSI0 / PB2	Yellow
D7	PWMA4 / PA4	Yellow
D8	SCLK0 / PB3	Yellow
D9	PWMA5 / PA5	Red
D10	PWMA0 / PA0	Red

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