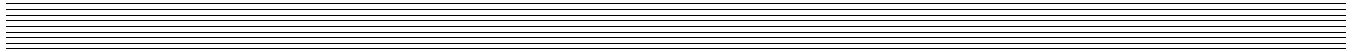




# g20 Developer's Kit



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**Developer's Guide**

98-08901C67-O





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## 1.1 SCOPE OF THIS MANUAL

This manual introduces the g20 Developer's Kit, and describes the technical details required by the data terminal equipment (DTE) team to successfully integrate the Motorola g20 cellular engine into an original equipment manufacturer (OEM) wireless host device. With the help of this manual, the DTE team can use the Developer's Kit to conduct a full series of test and evaluation procedures on the g20, as well as perform application development.

We at Motorola want to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

You can reach us by email: GSM support-BSH015@email.mot.com.

## 1.2 WHO SHOULD USE THIS MANUAL

This manual is intended for all members of the DTE OEM integration team who will use the g20 Developer's Kit, including representatives from hardware, software and RF engineering disciplines.

## 1.3 DISCLAIMER

This guide provides advice and guidelines to OEM teams. Responsibility regarding how the information is used lies entirely with the OEM. Statements indicating support provided by, or offered by, Motorola are subject to change at any time.

Motorola reserves the right to make any changes to this manual.

## 1.4 REGULATORY REQUIREMENTS

The Federal Communications Commission (FCC) requires application for certification of digital devices in accordance with CFR Title 47, Part 2 and Part 15. This includes Electromagnetic Energy Exposure (EME) testing. As the g20 modem is not a standalone transceiver but is an integrated module, the g20 cannot be tested by itself for EME certification. It is, however, the integrator's responsibility to have the completed device tested for EME certification.

## 1.5 REGULATORY STATEMENT

The following safety precautions must be observed during all phases of the operation, usage, service or repair of any cellular terminal or mobile incorporating the g20 module. Manufacturers of the cellular terminal are advised to convey the following safety information to users and operating personnel, and to incorporate these guidelines into all manuals supplied with the product. Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. Motorola assumes no liability for customer failure to comply with these precautions.

1. The g20 must be operated at the voltages described in the technical documentation.
2. The g20 must not be mechanically nor electrically changed. Use of connectors should follow the guidance of the technical documentation.
3. The g20 is designed to meet the EMC requirements of ETS 300 342.

## Preface

4. When integrating the g20 into a system, Motorola recommends testing the system to ETS300342-1.
5. The g20 meets the safety requirements of EN60950.
6. Systems using the g20 are subject to mandatory EMC testing under directive 89/336/EEC (see item 3 above). Other directives, such as the LVD directive 73/23/EE, may also apply to a system using the g20 module.

## 1.6 SAFETY

### 1.6.1 User Operation

Do not operate your telephone when a person is within eight inches (20 centimeters) of the antenna. A person or object within eight inches (20 centimeters) of the antenna could impair call quality and may cause the phone to operate at a higher power level than necessary, as well as expose that person to RF energy in excess of that established by the FCC RF Exposure Guidelines.

**IMPORTANT:** The telephone must be installed in a manner that provides a minimum separation distance of 20 cm or more between the antenna and persons in order to satisfy FCC RF exposure requirements for mobile transmitting devices.

**IMPORTANT:** To comply with the FCC RF exposure limits and satisfy the categorical exclusion requirements for mobile transmitters, the requirements described in the section that follows must be met.

### 1.6.2 Antenna Installation

- A minimum separation distance of 20 cm must be maintained between the antenna and all persons.
- The effective radiated power of the transmitter must be less than 1.5 Watts ERP (2.45 Watts or 33.9 dBm EIRP). This requires that the combination of antenna gain and feed line loss does not exceed 11 dBi.

## 1.7 APPLICABLE DOCUMENTS

g20 Cellular Engine Module Description: 9808901C66-O

g20 AT Commands: 9808901C68-O

## 1.8 HOW THIS MANUAL IS ORGANIZED

This manual contains the following chapters:

- **Chapter 1** contains this Preface.
- **Chapter 2** introduces the g20 Developer's Kit and provides important safety instructions.
- **Chapter 3** describes the Developer Board and its components in detail, including connectors, jumpers, DIP switches and LED indicators. It also includes a set of Quick Start procedures for first-time use.
- **Chapter 4** provides a mechanical description of the Developer Board.
- **Chapter 5** provides contact information for Motorola Service Support and Customer Assistance.
- **Chapter 6** includes schematic diagrams of the g20 Developer's Kit as well as a complete parts list.
- **Errata** provides a correction to the Developer Board.



# INTRODUCTION

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## 2.1 GENERAL DESCRIPTION

The g20 Developer’s Kit is intended for evaluating the g20 module, as well as for developing and testing software applications for it.

## 2.2 TERMS AND ABBREVIATIONS

This section provides definitions for terms and acronyms used in this document.

Table 1. Terms and Abbreviations

Acronym/Term	Definition/Description
ADC	Analog to Digital Converter
CMOS	Complementary Metal Oxide Semiconductor
CODEC	Coder-Decoder
DTE	Data Terminal Equipment (such as terminals, PCs and so on)
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
IGN	<b>WHAT DOES THIS STAND FOR?</b>
IRQ	Interrupt Request
LED	Light-Emitting Diode
MMCX	Multimedia Communications Exchange
PCM	Pulse Code Modulation
RF	Radio Frequency
SIM	Subscriber Identity Module
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
UUT	Unit Under Test

## 2.3 SAFETY PRECAUTIONS

Most Developer Board circuits are not shielded. Be sure to take appropriate precautionary measures in order to avoid ESD while handling the kit. ESD can damage the Developer Board and/or the g20 module attached to it.



# DEVELOPER BOARD AND INTERFACES DESCRIPTION

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## 3.1 GENERAL

The g20 Developer Board is designed to support the hardware and software development and validation of the g20 GSM/GPRS data module. The Developer Board provides a peripheral platform to operate the g20 as a standalone product, and to easily access the g20 interface connector signals.

The Developer Board has the following functions:

- Serves as a mounting platform for the g20 module
- Supplies the g20 module with supply voltage
- Provides standard communication interfaces (USB and RS232)

**Kit Number:** FTN8121A

**Board Number:** 8487653U01

**Revision:** P3

Figure 1 shows the Developer Board and some of its accessories with the g20 module attached to it: ***PLEASE PROVIDE GRAPHIC.***

Figure 1. Developer Board with Accessories

### **3.1.1 Developer Board Features**

The Developer Board provides the following features to facilitate software and hardware development:

- Output of all g20 connector signals to a large header connector for debugging
- Host-systems connector
- AC, battery and DC power supplies for board operation
- LED indicators for critical signals
- Display and keypad for phone operation
- USB and RS232 serial interfaces
- Secondary RS232 interface using the SPI bus
- Digital audio interface
- Analog audio interface for speaker, alert speaker, microphone and headset
- SIM card connector
- Switches and jumpers for controlling board operation

### 3.1.2 Developer Board Connectivity

Figure 2 shows the Developer Board and its components:

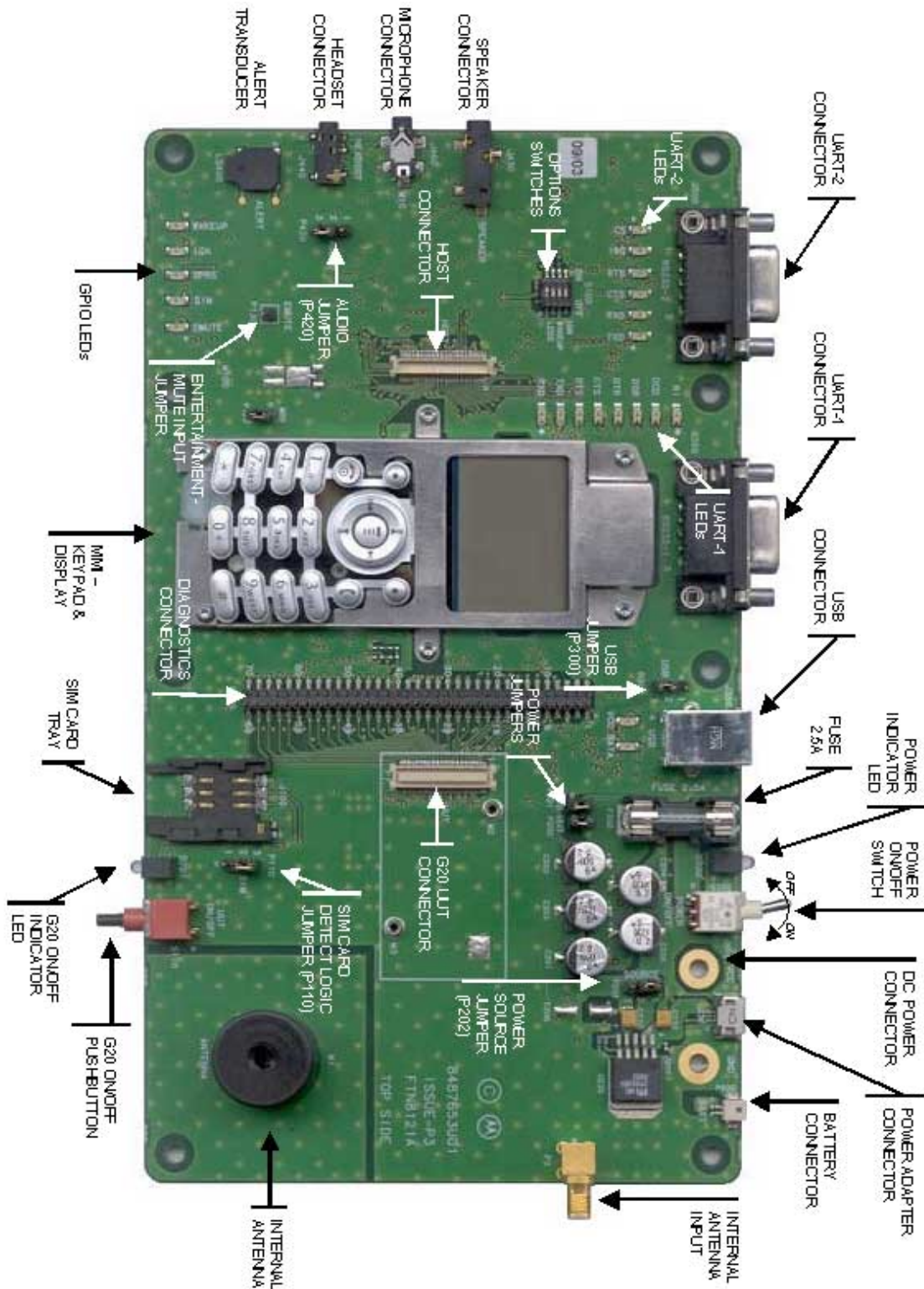


Figure 2. Developer Board Components

### 3.1.3 Quick Start

This section describes a series of Quick Start procedures for first-time use of the Developer Board.

#### 3.1.3.1 g20 Connection

Open the top cover of the Developer Board and insert the g20 in its designated position. The g20 should connect to the 70-pin connector, labeled UUT (P1), and its holes should be aligned with the spacers on the Developer Board.

Fasten the g20 to the Developer Board spacers using two M2x0.4x6 mm screws provided with the kit. ***PLEASE PROVIDE GRAPHIC.***

Figure 3. Mounting the g20 Module

#### 3.1.3.2 Antenna Connection

Connect the on-board antenna cable to the g20 antenna connector. Connect the RF Out output to the Internal antenna input using the supplied cable. ***PLEASE PROVIDE GRAPHIC.***

Figure 4. Attaching the RF Cable



**Note**

While working, you can keep the box closed.

### 3.1.3.3 Power Connection

The Developer Board can be powered using either a wall-mounted adapter, a DC power supply or a battery cell.



**Note**

Only the adapter option is covered in this section. See “Power Connections” on page 15., when using other power methods.

Connect the adapter to the wall outlet and to the Developer Board adapter connector (J230) labeled Adapter.



**Note**

The power source selection jumper, labeled Source, must be in the correct position for adapter operation (pins 1-2 shorted).

### 3.1.3.4 Serial Connection

The USB and RS232 serial interfaces are available for PC communications. If a PC connection is required, connect either an RS232 cable with a male D-Type connector to the labeled UART1 connector, or a USB cable with a B-Type connector to the labeled USB connector.



**Note**

When using a USB interface, be sure the USB jumper (P300) position reflects the g20 version being used. See “USB” on page 11..

### 3.1.3.5 Audio Connection

The Developer Board has several available audio configurations:

- Hands-free audio using the speaker and microphone
- Digital PCM audio
- Personal headset audio



**Note**

Only the headset audio option is covered in this section. See “Audio Interface” on page 21. when using other audio options.

Connect the supplied headset to the headset connector (J440) labeled Headset.

### 3.1.3.6 SIM Card Connection

Insert a SIM card into the SIM tray (J100).



**Note**

When using a SIM card, be sure the SIM jumper (P110) position reflects the g20 version being used. See “SIM Card” on page 23. for more details.

### 3.1.3.7 Default Switches and Jumper Settings

The Developer Board jumpers and switches are initially configured to comply with this Quick Start operation mode. If different settings are necessary, refer to the relevant section for details about the required switch or jumper settings.

### 3.1.3.8 Operating the g20

After completing the initial setup, turn on the Developer Board power by switching the power switch (S200) to its on position, and turn on the g20 by depressing the on/off switch (S110) or by depressing the on/off button on the keypad.

## 3.2 COMMUNICATIONS INTERFACES

The g20 Developer Board includes three different serial interfaces:

- RS232
- USB
- SPI

The RS232 and USB ports are multiplexed within the g20, and therefore cannot be operated simultaneously. Their default connection is RS232. The SPI interface is used for debugging.

Each of these serial interfaces is described in the sections that follow.

### 3.2.1 RS232

The RS232 serial port is the primary interface to the g20 UUT via the J350 connector. This port is denoted by the RS232-1 marking beside the 9-pin, D-type connector.

The UUT RS232 signals are active-low CMOS-level signals (0-2.7 V), which are converted by the Developer Board to standard RS232 levels for PC communications.

Table 2. RS232-1 Connector Pinout (J350)

Pin #	Description	DTE I/O
1	DCD	In
2	RXD	In
3	TXD	Out
4	DTR	Out
5	Ground	
6	DSR	In
7	RTS	Out
8	CTS	In
9	RI	In



**Note**

The RS232 connector pin names are DTE-oriented.



### 3.2.2 USB

The USB interface operates according to the g20 UUT configuration. The Developer Board has a complete USB transceiver circuit to support USB communications for g20 units that do not include a USB driver of their own. The Developer Board USB interface can be overridden manually when using a g20 unit that does include its own USB driver interface.

Table 3. USB Connector Pinout (J3)

Pin #	Description
1	VCC
2	D-
3	D+
4	Ground

The USB jumper (P300) located next to the USB connector selects between the Developer Board USB interface and the UUT USB interface. By changing the jumper position, the USB\_VBUS signal is diverted to the selected driver (in the g20 or on the Developer Board) and operates it.

Table 4. USB Selection (P300 Jumper)

P300 Jumper Position			Selected Mode	USB Source
1	2	3		
•	•		g20	g20 driver
	•	•	EVB (Developer Board)	EVB driver
			USB disconnected	

### 3.2.3 SPI

The Developer Board includes a secondary 4-wire RS232 interface, which is connected to the g20 internal SPI bus through the J500 connector. This interface is used to debug applications. This port is denoted by the RS232-2 label next to the 9-pin D-type connector.

On the Developer Board, the g20 SPI interface is converted to standard RS232 signals for PC communications. The conversion process uses the RS232 interface as a second slave on the internal g20 SPI bus, and communicates with it as such. SPI read and write operations are performed normally, using the CS and IRQ signals provided by the conversion circuit. The IRQ signal is connected to a g20 IRQ pin.

Table 5. RS232-2 Connector Pinout (J500)

Pin #	Description	DTE I/O
1	Unused	
2	RXD	In
3	TXD	Out
4	Unused	
5	Ground	
6	Unused	
7	RTS	Out
8	CTS	In
9	Unused	



The RS232 connector pin names are DTE-oriented.

### 3.3 CONNECTORS DESCRIPTION

All the Developer Board connectors are marked by their reference number and by a pin-1 indicator. Table 6 describes the available connectors on the Developer Board.

Table 6. Connectors

Reference	Connector	Description
P1	g20 UUT	g20 UUT (unit under test) connector
J1	Host	Emulates the g20 connector for host systems
P100	Diagnostics	Debug header connector (70-pin)
J300	USB	USB B-type connector
J350	RS232-1	Primary RS232 to PC
J500	RS232-2	Secondary RS232 for debugging (SPI)

Table 6. Connectors (Continued)

Reference	Connector	Description
J430	Speaker	Hands-free system speaker jack
J460	Microphone	Hands-free system microphone jack
J440	Headset	Headset jack
J201	VCC	Developer Board DC power supply
J200	GND	Developer Board common ground
P600	Battery	Battery connector
J230	AC adapter/charger	Wall-mount adapter connector (CE bus compatible)
J100	SIM card	SIM card socket with detection
P2	Antenna connector	SMA connector for g20 antenna
M1	RF Antenna	RF antenna
DS800	Display	Display pads

### 3.3.1 UUT Interface Connector

Table 7 lists the pin names and functions available for g20 interface connectors. All pin numbers and functions are identical for the P1, J1 and P100 connectors on the Developer Board.

Table 7. g20 Connectors Pinout

Pin #	Pin Name	Pin #	Pin Name
1	GND	2	GND
3	GND	4	GND
5	VCC	6	VCC
7	VCC	8	VCC
9	RTS_N	10	USB_DET
11	RXD_N	12	Not connected
13	DSR_N	14	Not connected
15	CTS_N	16	WAKEUP_IN_N

Table 7. g20 Connectors Pinout (Continued)

Pin #	Pin Name	Pin #	Pin Name
17	DCD_N	18	PCM_DIN
19	DTR_N	20	PCM_DOUT
21	TXD_N	22	PCM_CLK
23	RI_N	24	PCM_FS
25	RESET_N	26	WAKEUP_OUT_N
27	BL_SINK	28	KBC1_N
29	CHRG_DIS	30	KBC0_N
31	CHRG_SW	32	KBR0_N
33	CHRG_STATE	34	KBR1_N
35	CHRG_DET_N	36	KBR2_N
37	ENT_MUTE	38	KBR3_N
39	TX_EN_N	40	KBR4_N
41	ANT_DET	42	KBR5_N
43	VIB_OUT	44	SIM_RST_N
45	CHRG_TYP	46	SIM_CLK
47	THERM	48	SIM_VCC
49	GPRS_DET_N	50	SIM_PD
51	IGN	52	SIM_DIO
53	ON_OFF_N	54	LCD_CS
55	HDST_INT_N	56	LCD_DATA
57	HDST_MIC	58	LCD_CLK
59	MIC_GND	60	LCD_RS
61	MIC	62	SPI_IRQ_N
63	ALRT_N	64	SPI_DIN

Table 7. g20 Connectors Pinout (Continued)

Pin #	Pin Name	Pin #	Pin Name
65	ALRT_P	66	SPI_CLK
67	SPKR_N	68	SPI_DOUT
69	SPKR_P	70	SPI_CS

### 3.4 POWER CONNECTIONS

Developer Board power can be supplied from a DC power source, an AC power adapter or a battery. The same power source is used for the UUT and the board peripherals.

The Developer Board includes three jumpers for controlling the power supply:

- **P202:** AC adapter or battery power source selection
- **P201:** Connects/disconnects the Developer Board peripherals from the power supply
- **P200:** Connects/disconnects the g20 from the power supply

Each power supply option is described in the sections that follow.

#### 3.4.1 DC Power Source Operation

When using a DC power supply, the power source is applied to connectors J201 (VCC) and J200 (Ground). The DC voltage applied through this connection should not exceed the recommended operational limits of 3V-4.2V. In all cases, the DC source input is protected from over voltage and reverse polarity, and includes a 2.5A protective fuse.

The supplied DC input connectors must be attached to the Developer Board in order to use the DC power source. The two connectors should be screwed into their appropriate positions (J201, labeled VCC, and J200, labeled GND). Use the red connector for VCC and the black one for GND. Connect the DC power source to these connectors using banana plugs, alligator clamps or wire.



It is recommended to remove jumper P202 when using the DC power source. In any case, the DC power source should not be used when other sources are connected.

### 3.4.2 AC Adapter Operation

When using an AC adapter, the adapter is connected to J230. The adapter supplies a constant 4.5 V, which is regulated to a nominal 4.1 V on the Developer Board.

Table 8. J230 Connector Pinout

Pin #	Pin Name
1	GND
2	Detection circuit
3	VCC

### 3.4.3 Battery Operation

The Developer Board supports a battery power supply. The battery used must be a 3.6V lithium-ion cell, corresponding to Motorola part number 0189727L01.

When using a battery as the main power source, the AC adapter input operates as a battery charger, which connects to an on-board battery charging circuit.

Table 9. P600 Connector Pinout

Pin #	Pin Name
1	VCC
2	GND

### 3.4.4 Power Source Selection

The Developer Board AC adapter and battery power inputs include a selection jumper (P202) that diverts either the regulated AC adapter power or the battery power to the board.

Table 10. Power Source (P202 Jumper)

P202 Jumper Position			Selected Mode	Power Source
1	2	3		
•	•		Adapter	AC Adapter
	•	•	Battery	Lilon Battery
			Adapter and battery disconnected	DC power only

**Note**

The DC power source input is independent of the other power inputs, and does not pass through this selection jumper. Nevertheless, it is still recommended to disconnect the P202 jumper when using the DC source.

### 3.5 SWITCHES AND JUMPERS

Table 11 describes the available switches and jumpers on the Developer Board.

Table 11. Switches and Jumpers

Reference	Switch/Jumper	Description
S200	Board on/off	Developer Board on/off switch
S110	g20 on/off	g20 UUT on/off push button switch
S100	Options switch	Four switches for Developer Board options
P420	Audio	Analog/digital audio-selection jumper
P201	EVB	Peripheral power input jumper
P200	UUT	g20 UUT power input jumper
P202	Source	Power source selection jumper
P110	SIM	SIM card detect logic selection jumper
P300	USB	USB driver source selection jumper
P130	EMUTE	Entertainment mute connection point

### 3.6 LED INDICATORS

Table 12 describes the LED indicators available on the Developer Board. Each LED is marked on the board by the function it represents.

Table 12. LED Indicators

Group	LED	Reference	Description
GPIO	WAKEUP	D704	Wake-up in/out
	IGN	D702	Ignition input
	GPRS	D710	GPRS coverage indication
	SIM	D703	SIM card reset indication
	UUT	D701	g20 reset signal
	PWR	D200	Developer Board power indicator
	EMUTE	D708	Entertainment mute indicator
SPI	CS	D741	SPI chip-select output
	IRQ	D745	SPI IRQ input
USB	VCC	D760	USB VBUS
	DATA	D761	USB D+
RS232-1	RXD	D722	DTE receive data
	TXD	D721	DTE transmit data
	RTS	D724	Request to send
	CTS	D723	Clear to send
	DTR	D725	Data terminal ready
	DSR	D726	Data set ready
	DCD	D727	Carrier detect
	RI	D728	Ring indicator



Table 12. LED Indicators (Continued)

Group	LED	Reference	Description
RS232-2	RXD	D743	DTE receive data
	TXD	D742	DTE transmit data
	CTS	D744	Clear to send
	RTS	D745	Request to send

## 3.7 MMI

The Developer Board includes a man-machine interface (MMI), complete with display and keypad. The signals from the display and keypad are directly connected to the UUT interface.

### 3.7.1 Display

The grayscale display (DS800) is not a standalone component, and includes a complete assembly in which it is housed, along with other necessary parts.

Table 13. Display Connector Pinouts (DS800)

Pin #	Description
1	Chip select
2	Reset
3	Register select
4	Serial clock
5	Serial data
6	Supply
7	Supply
8	Ground
9	Vout

### 3.7.2 Keypad

Table 14 describes the Developer Board keypad layout.

Table 14. Keypad Functions

<b>Pad Reference</b>	<b>Function</b>	<b>Alternate</b>
S803	1	Punctuation
S802	2	ABC
S820	3	DEF
S801	4	GHI
S805	5	JKL
S804	6	MNO
S806	7	PQRS
S817	8	TUV
S811	9	WXYZ
S809	0	+
S810	Star (*)	
S815	Pound (#)	
S814	Send	
S813	End	On/Off
S819	Menu	
S822	Right	
S823	Left	
S818	Up	
S816	Down	
S812	Soft Right	
S808	Soft Left	

## 3.8 AUDIO INTERFACE

The Developer Board includes analog and digital audio interfaces. The audio interface contains a hands-free speaker and microphone, a headset, and an alert speaker.

### 3.8.1 Speaker

The differential speaker interface is designed as a car-kit hands-free speaker. The Developer Board uses an audio amplifier to amplify the speaker audio output to desired levels. The speaker connector (J430) is labeled SPEAKER. The speaker output is 8 ohms matched.

Table 15. Speaker Connector Pinout (J430)

Pin #	Description
1	Not connected
2	Speaker positive output
3	Speaker negative output
4	Not connected

### 3.8.2 Microphone

The microphone interface is designed as a car-kit hands-free microphone. The microphone connector (J460) is labeled MIC.

Table 16. Microphone Connector Pinout (J460)

Pin #	Description
1	Ground
2	Microphone audio-in
3	Ground
4	Ground
5	Ground

### 3.8.3 Audio Source Selection

Microphone and speaker audio can be routed through two different sources: the g20 audio amplifiers or the g20 digital audio interface. The Developer Board includes a CODEC that converts the g20 digital audio data to analog audio signals.

The P420 jumper selects the speaker and microphone source, as indicated in Table 17.

Table 17. Audio Source (P420 Jumper)

P420 Jumper Position			Selected Mode	Audio Source
1	2	3		
•	•		Digital audio	CODEC audio I/O
	•	•	Analog audio	G20 audio I/O
			Audio disconnected	

### 3.8.4 Headset

The headset interface is designed as a portable phone audio interface, and is similar to the headset interface. The headset connector (J440) includes a speaker, microphone and a detection signal. The speaker and microphone signals are directly connected to the g20 audio signals.

The purpose of the detection circuit is to switch the g20 headset audio paths on and off, whenever a headset connection is detected. Headset detection is made whenever a headset plug is inserted into the jack. This action disables the g20 microphone and speaker, and routes the audio signals to the headset.

Table 18. Headset Connector Pinout (J440)

Pin #	Description
1	Ground
2	Headset-detect switch
3	Speaker audio-out
4	Microphone audio-in
5	Ground

### 3.8.5 Alert Speaker

The Developer Board includes an on-board transducer for alert audio sounds (LS400), which is labeled ALERT. The transducer is connected directly to the g20 differential alert outputs. The alert transducer is similar to the alert speaker, which sounds the g20 MIDI signals.

Table 19. Alert Transducer Pinout (LS400)

Pin #	Description
1	Alert audio inverted output
2	Alert audio positive output
3	Alert audio inverted output
4	Alert audio inverted output

## 3.9 DEVELOPER BOARD PERIPHERALS

This section describes the connectors for peripheral devices that can be used with the Developer Board.

### 3.9.1 SIM Card

The SIM card connector (J100) is external to the UUT, but is connected directly to it, similar to an internal SIM. The UUT can accept 1.8V and 3V SIM cards.

Table 20. SIM Connector Pinouts (J100)

Pin	Description
1	Ground
2	Presence detect
3	Clock
4	Reset
5	VCC
6	Serial data I/O
7	VPP
8	Ground

The SIM card supports both active-high and active-low detection configurations. Jumper P110 is used to select between these configurations.

Table 21. SIM Detection Logic (P110 Jumper)

P110 Jumper Position			Selected Mode
1	2	3	
•	•		Active-low
	•	•	Active-high
			Not active

### 3.9.2 Entertainment Mute

The Developer Board includes an entertainment-mute logic circuit that is responsible for muting a car radio whenever the phone is in use (for example, incoming calls, dialing, and so on).

The entertainment-mute logic circuit includes an ENABLE input that is both a g20 signal and an open-collector MUTE output. This circuit is connected to jumper P130 for host systems.



**Note**

The entertainment-mute operation is not currently supported by the g20.

### 3.9.3 LEDs Logic and Control

The Developer Board includes LED indicators for critical signals. A 3.0V regulator powers the LEDs, and an on/off switch controls their operation. The switch is located in the S100 switch array, and is labeled LED. Turning the switch on and off enables or disables all LED activity, respectively.

The Developer Board power LED and the g20 on/off LED are always active and cannot be disabled.

### 3.9.4 ADC Test Logic

The g20 has two ADC pins. The g20 charger and temperature monitor currently occupy these pins. The Developer Board includes optional resistors for ADC testing. These resistors, two for each ADC signal, can be used to set a specific voltage across the ADC signal.

The G20 has a 47K-ohm internal pull-up resistor at each ADC input, as shown in Figure 5.

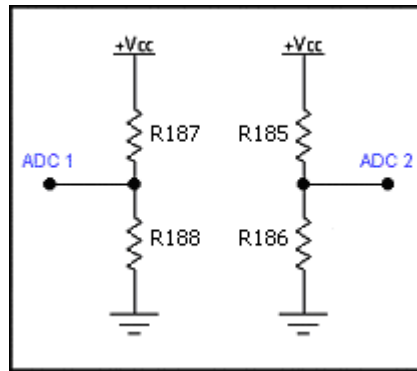


Figure 5. ADC Test Logic

### 3.9.5 Ignition

The Developer Board contains an on/off switch that is connected to the g20 UUT ignition circuit. The switch is located in the S100 switch array, and is labeled IGN. Turning the switch on applies the UUT supply on the Ignition input pin.

### 3.9.6 Wakeup

The Developer Board includes a wakeup switch that toggles the g20 WAKEUP\_IN\_N signal. The switch is located in the S100 switch array, and is labeled WAKEUP.

### 3.9.7 AC Adapter Detection Circuit

The g20 charger module includes a detection logic circuit for detecting charger presence and type. The detection circuit is internal to the g20 module. However, the Developer Board does contain the necessary routing from the g20 UUT to the AC adapter connector.

Two g20 signals are used for this detection:

- **AD1:** ADC signal for charger type detection
- **CHRG\_SW:** Charger rate control

These detection signals are present to provide compatibility with the phone. They may be removed in future versions.

## 3.10 ANTENNA CONFIGURATION

An antenna (internal or external) must be connected to the Developer Board for adequate GSM reception. You can connect the g20 to either the on-board internal antenna or to an external antenna. Two RF connectors on the Developer Board, labeled INT ANT and EXT ANT, are used for this purpose. The EXT ANT connector has an internal extension cable with MMCX termination, which must be connected to the g20 RF connector. The INT ANT connector is an on-board connection to the Developer Board internal antenna.

When using the internal antenna option, the additional RF cable supplied in the Developer's Kit must be connected between the EXT ANT and INT ANT connectors. When using the external antenna option, an external antenna or antenna application must be connected to the EXT OUT connector. (The connection cable is not included.)

### 3.11 TEST POINTS

Table 22 describes the available test points on the Developer Board.

Table 22. Test Points

Reference	Function
TP400	Alert speaker positive signal
TP401	Alert speaker inverted signal

### 3.12 ELECTRICAL SPECIFICATIONS

Table 23 describes the electrical specifications OF the Developer Board.

Table 23. Electrical Specifications

Parameter	Min	Typ	Max	Units
DC power supply	3.0	3.6	4.2	V
Adapter power supply	4.4	4.6	12	V
Battery power supply	3.0	3.6	4.2	V
Off current	---	36	46	uA
On current	8.1	8.33	8.45	mA
Active current peripherals off	12.7	13	---	mA
Active current peripherals on*	13.1	---	190	mA

\* Depends on the active peripherals (LEDs, UART, USB, and so on) in use.



# MECHANICAL DESCRIPTION

## 4.1 MECHANICAL REQUIREMENTS FOR MOUNTING THE G20 MODULE

The size of the g20 module is 45.2 x 24.4 x 6 mm. Two 2.4 mmØ holes are provided to accommodate M2 screws or #1-64 UNC 2A machine screws. Torque to 2 inches per pound. Refer to Figure 6 below for mounting requirements:

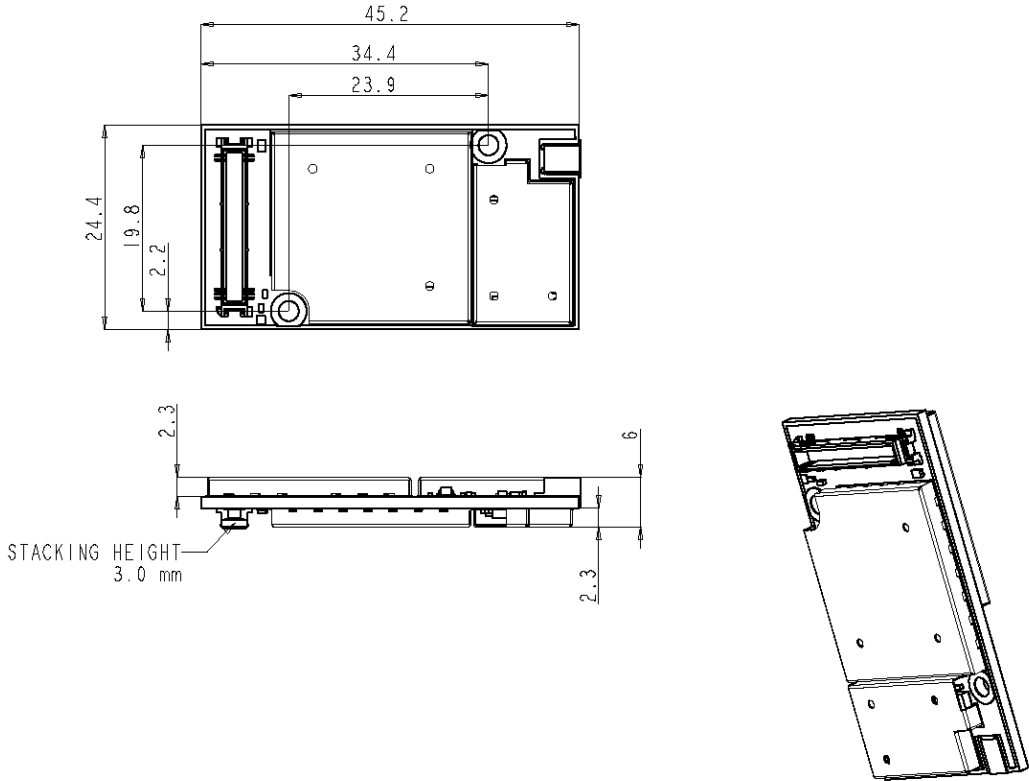


Figure 6. Mechanical Mounting Requirements



# SERVICE SUPPORT

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## 5.1 WEB PAGES

*PLEASE PROVIDE DETAILS FOR THIS SECTION.*

## 5.2 CUSTOMER ASSISTANCE

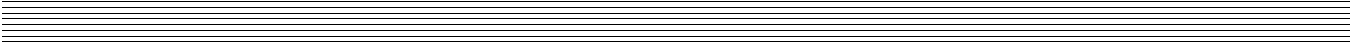
For customer assistance, contact us as directed below:

**Helpdesk email:** [n2cshd@motorola.com](mailto:n2cshd@motorola.com)

**Helpdesk telephone:** +972-3-568-4040



# SCHEMATICS, PLACEMENT AND PARTS LIST



## 6.1 SCHEMATICS

This section presents the schematics for the g20 Developer Board.

*PLEASE PROVIDE INFORMATION FOR FIGURE CAPTIONS.*

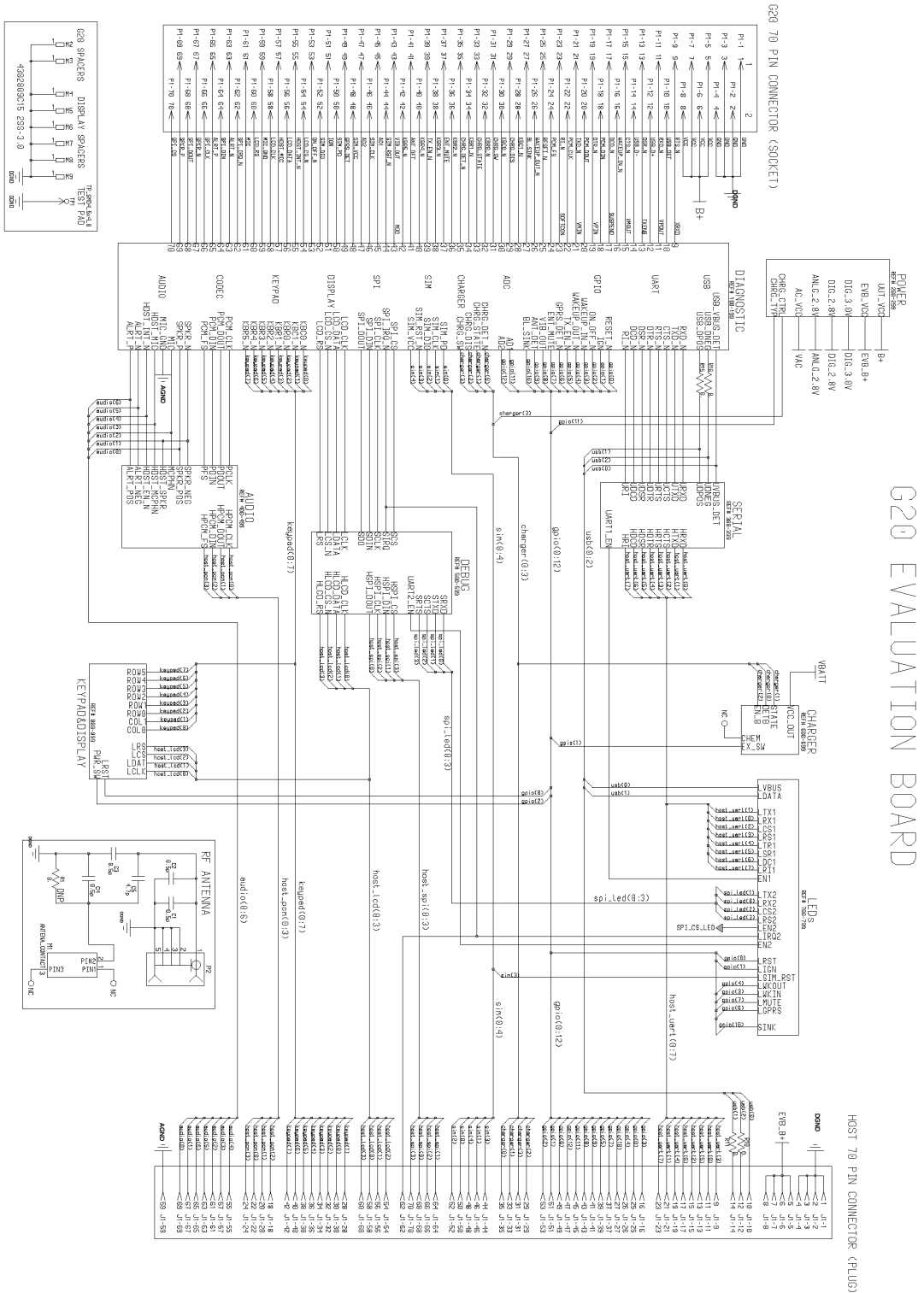


Figure 7.

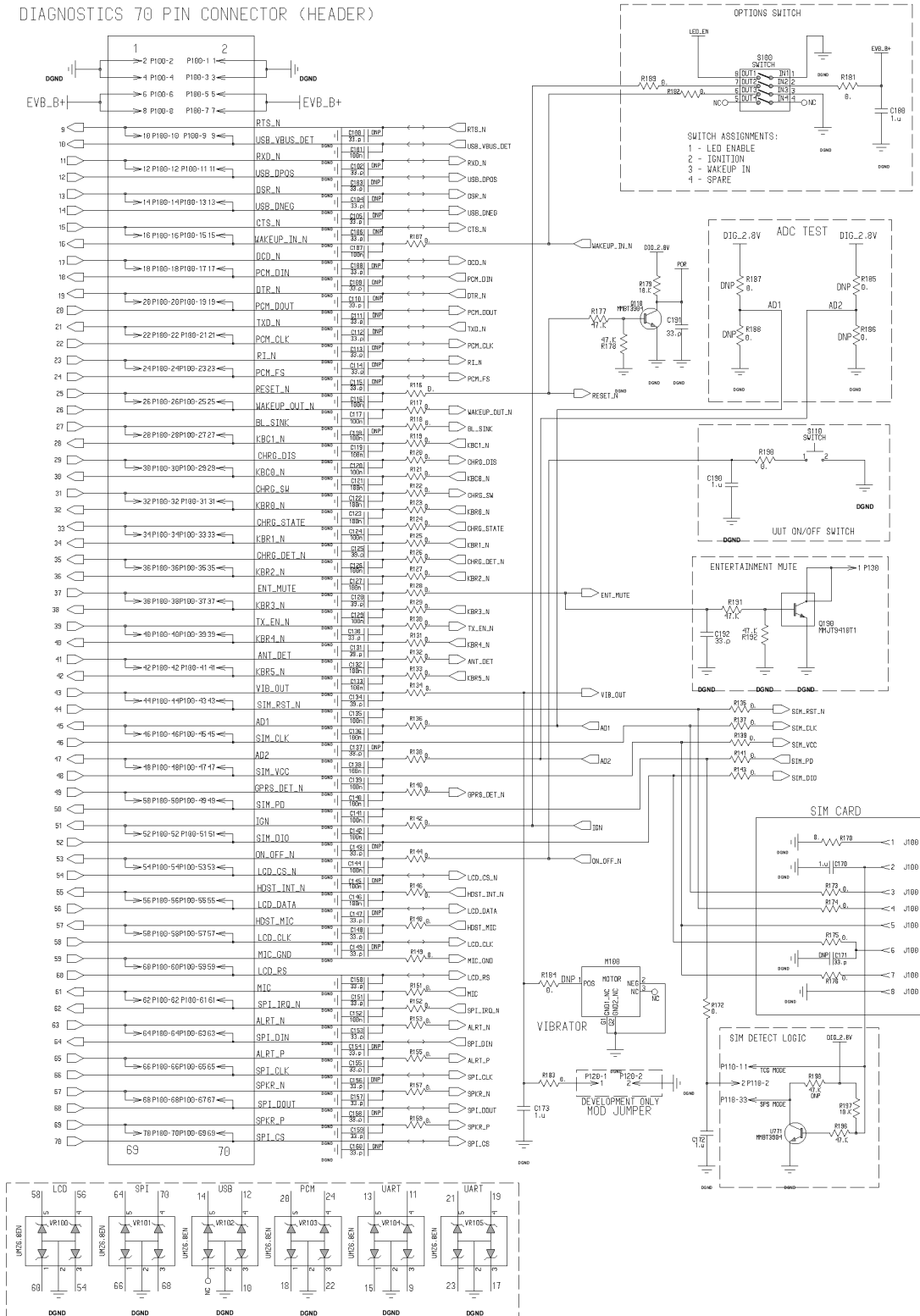


Figure 8.

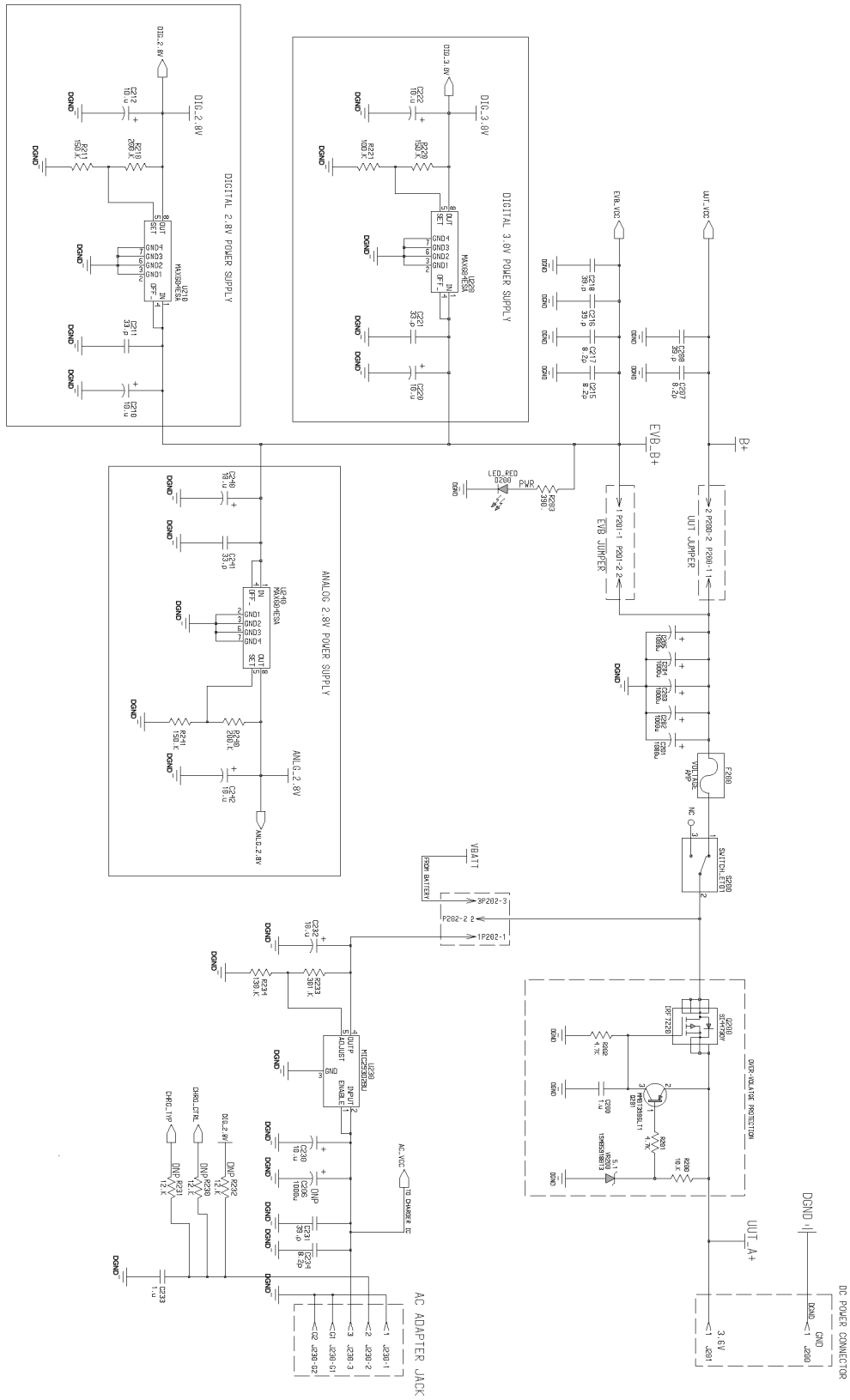


Figure 9.



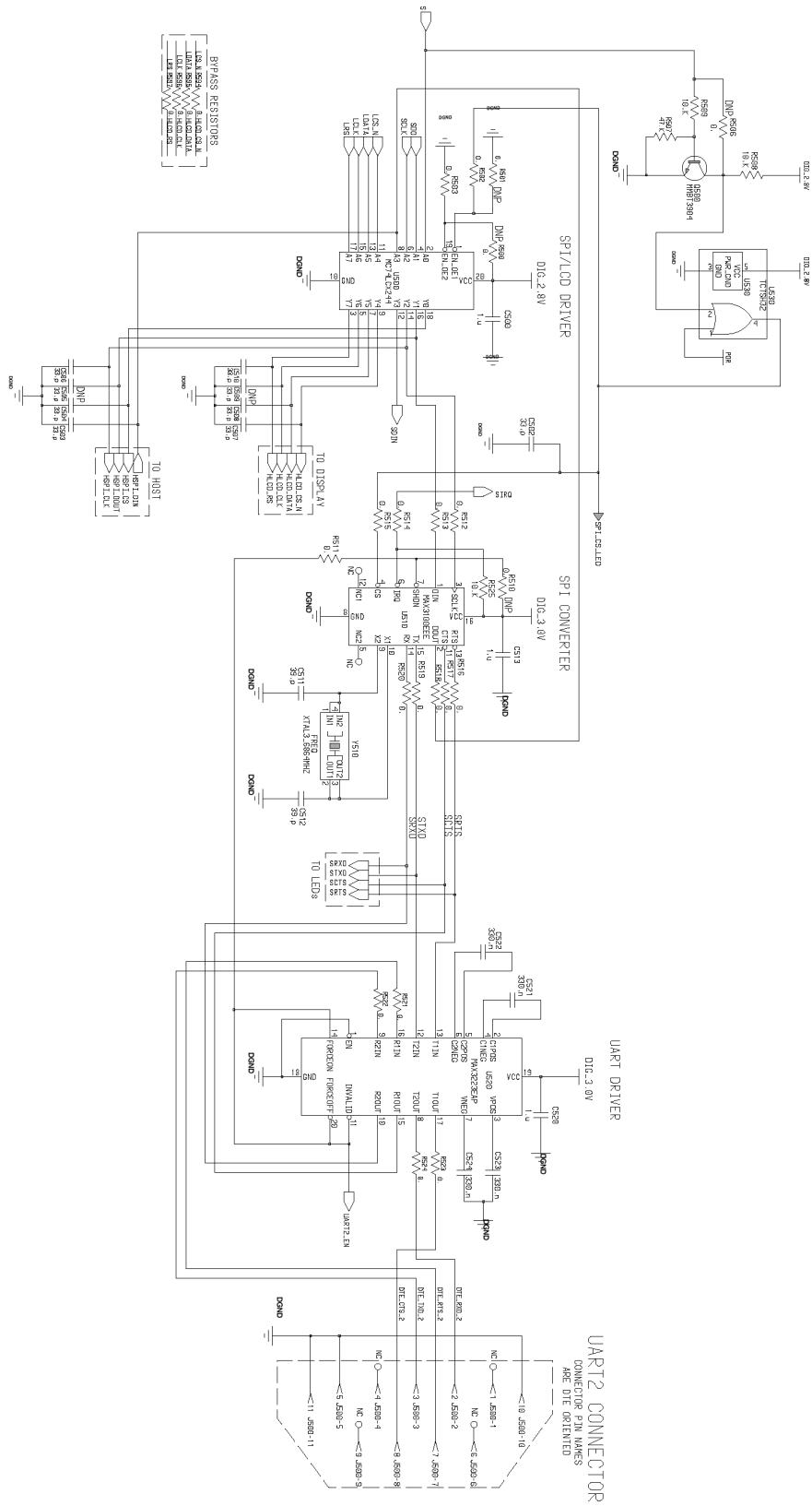


Figure 10.

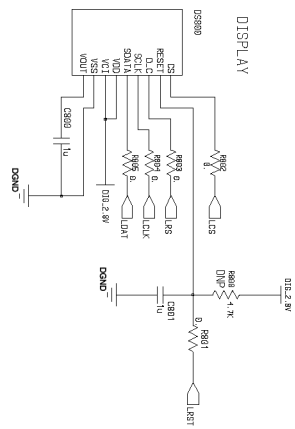
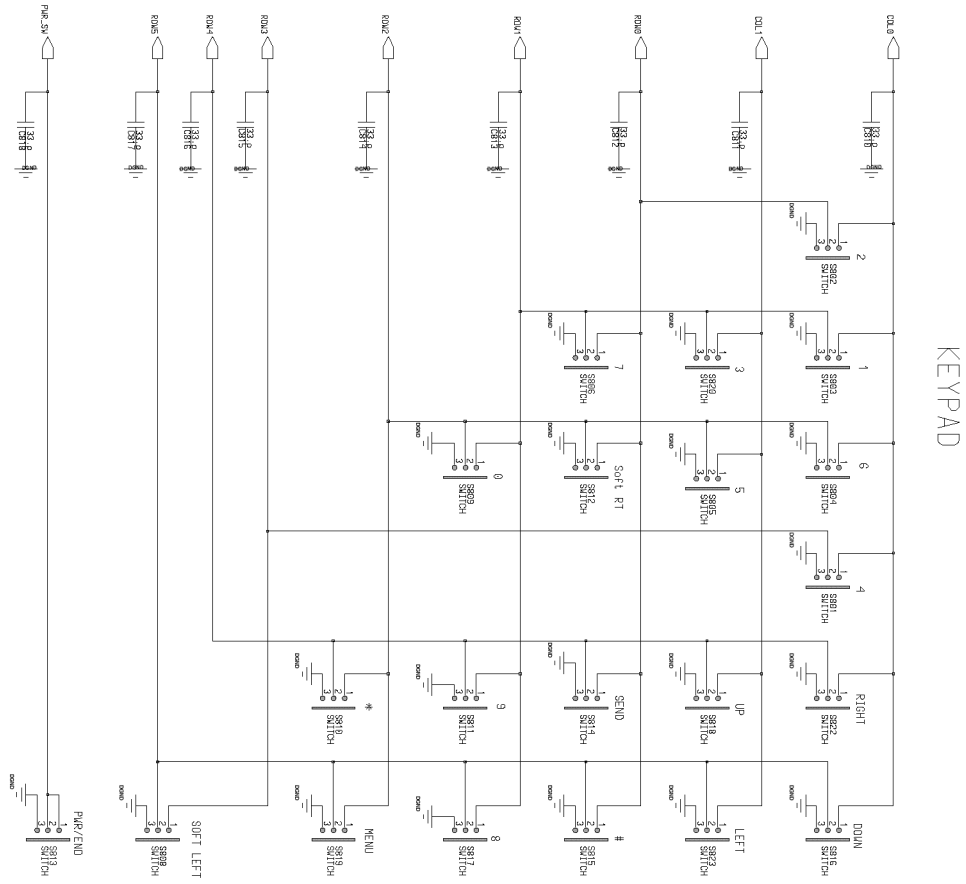


Figure 11.

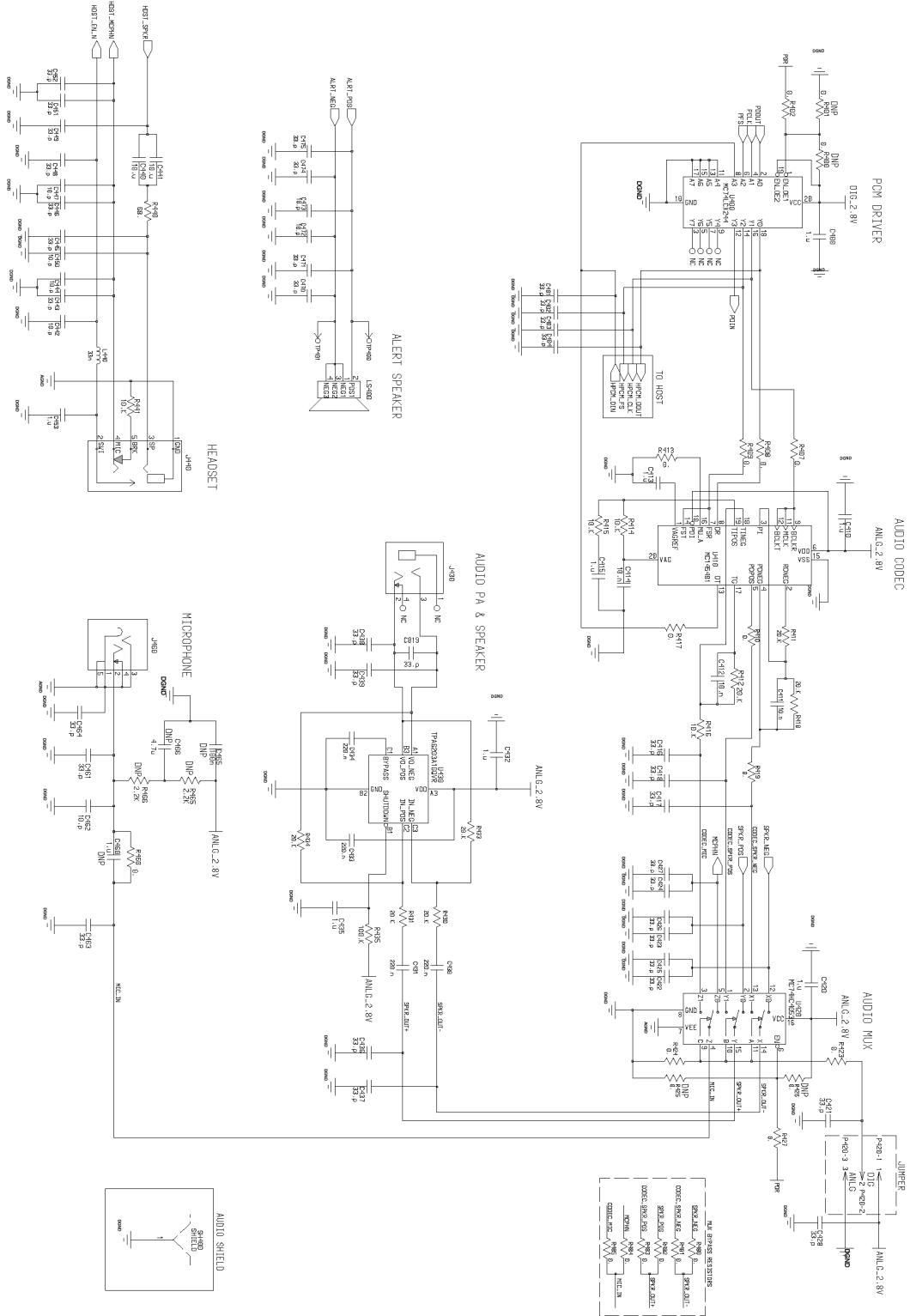


Figure 12.

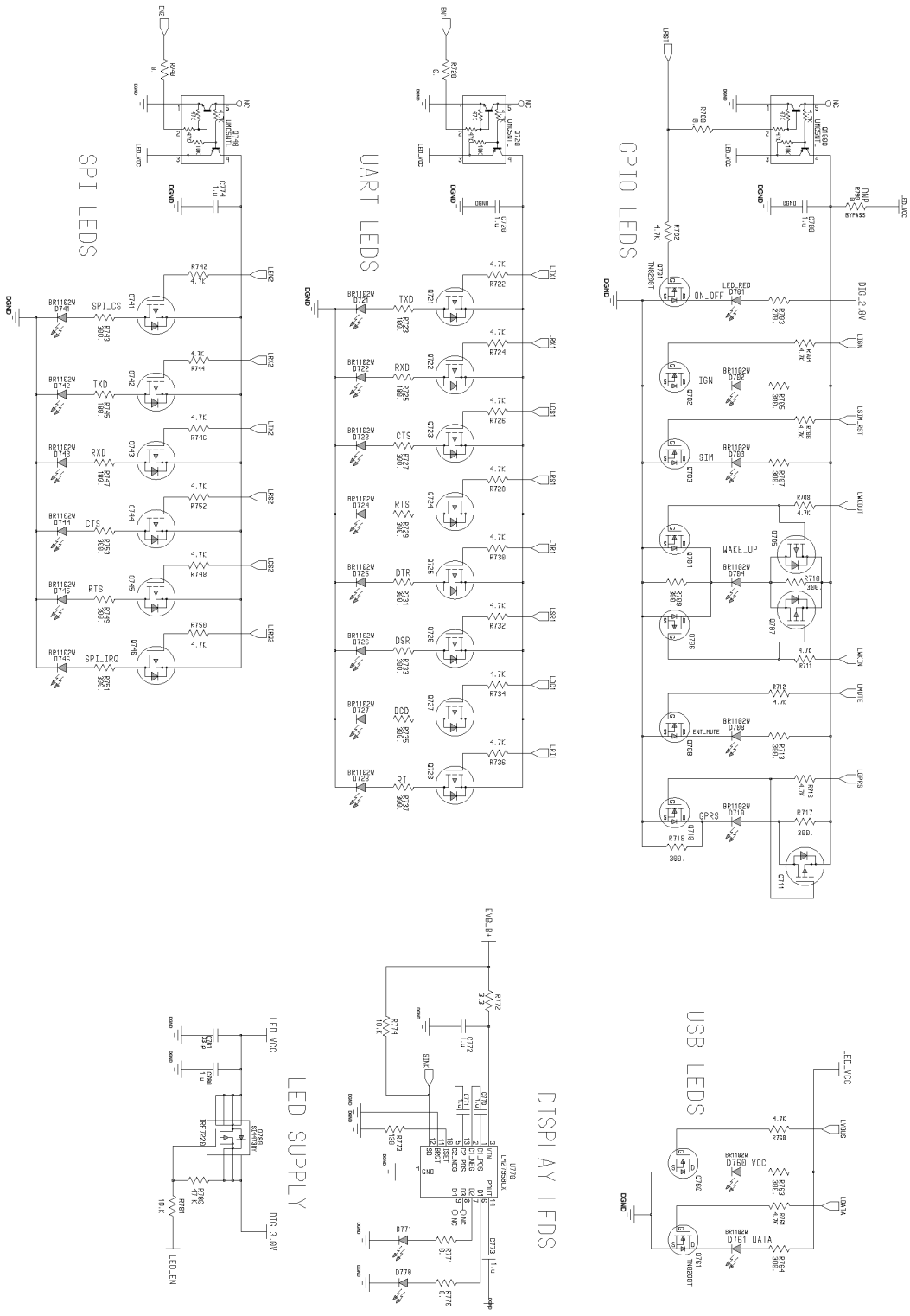


Figure 13.

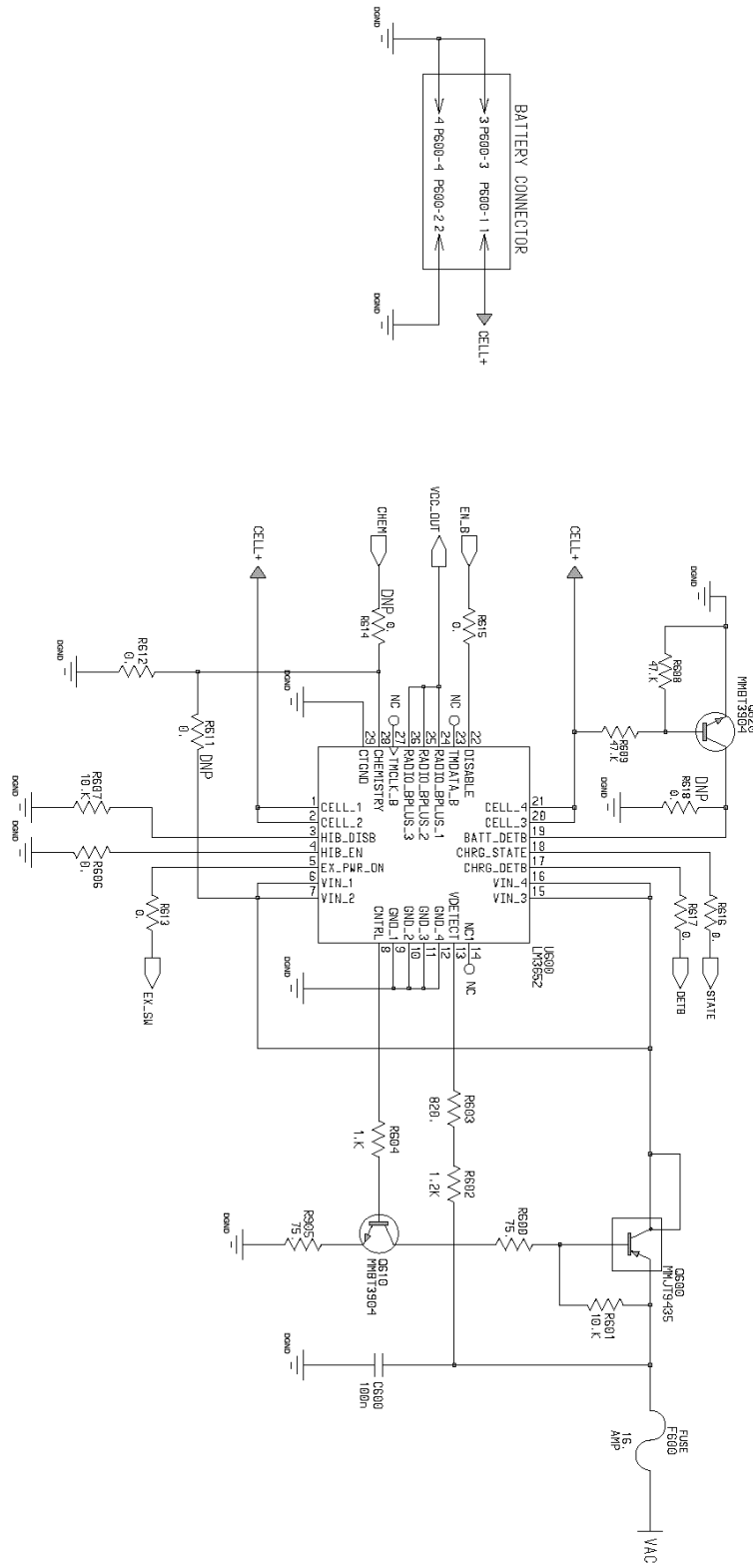


Figure 14.

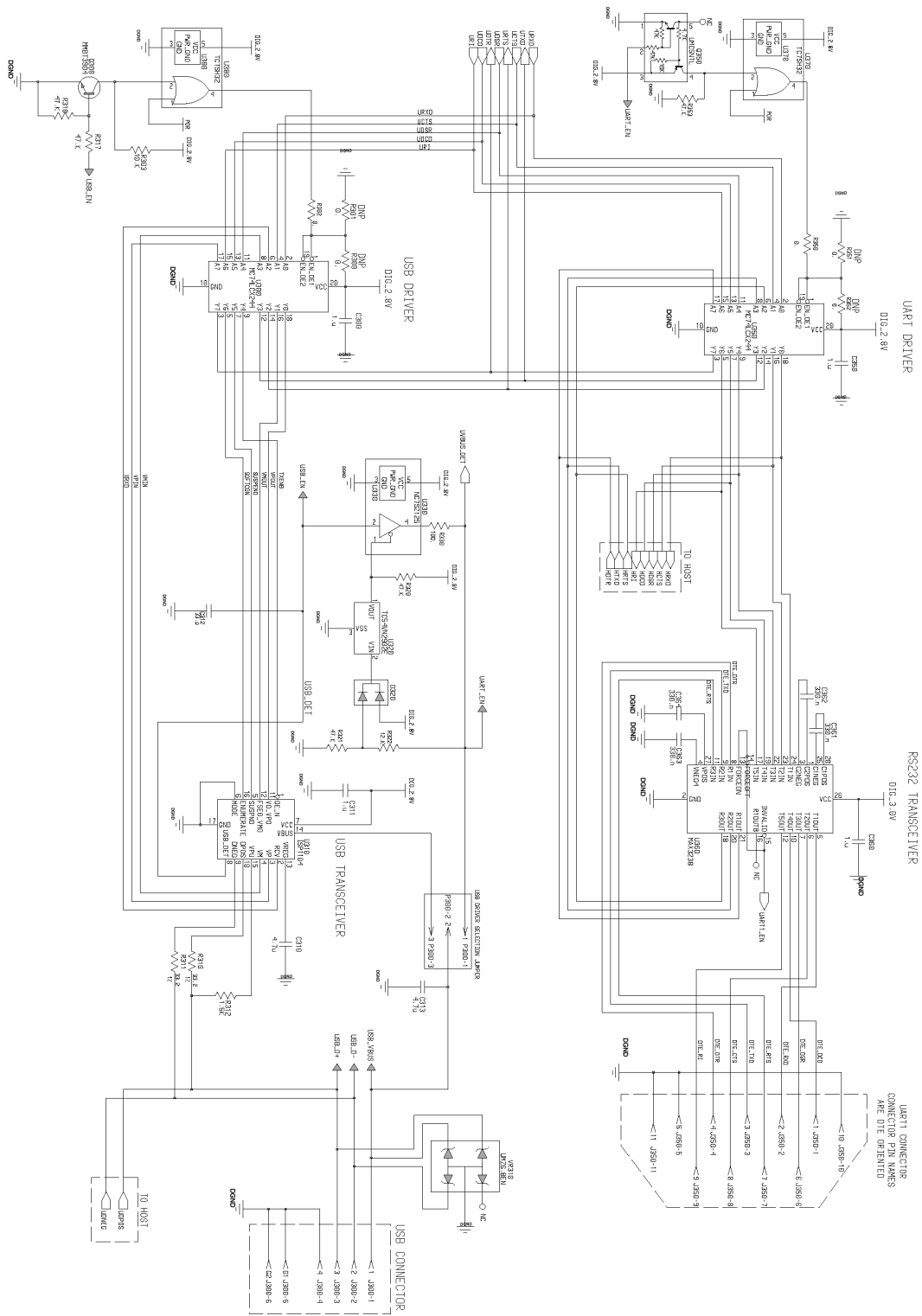


Figure 15.

## 6.2 DEVELOPERS BOARD PLACEMENT

Figure 16 shows the top layout of the Developer Board:

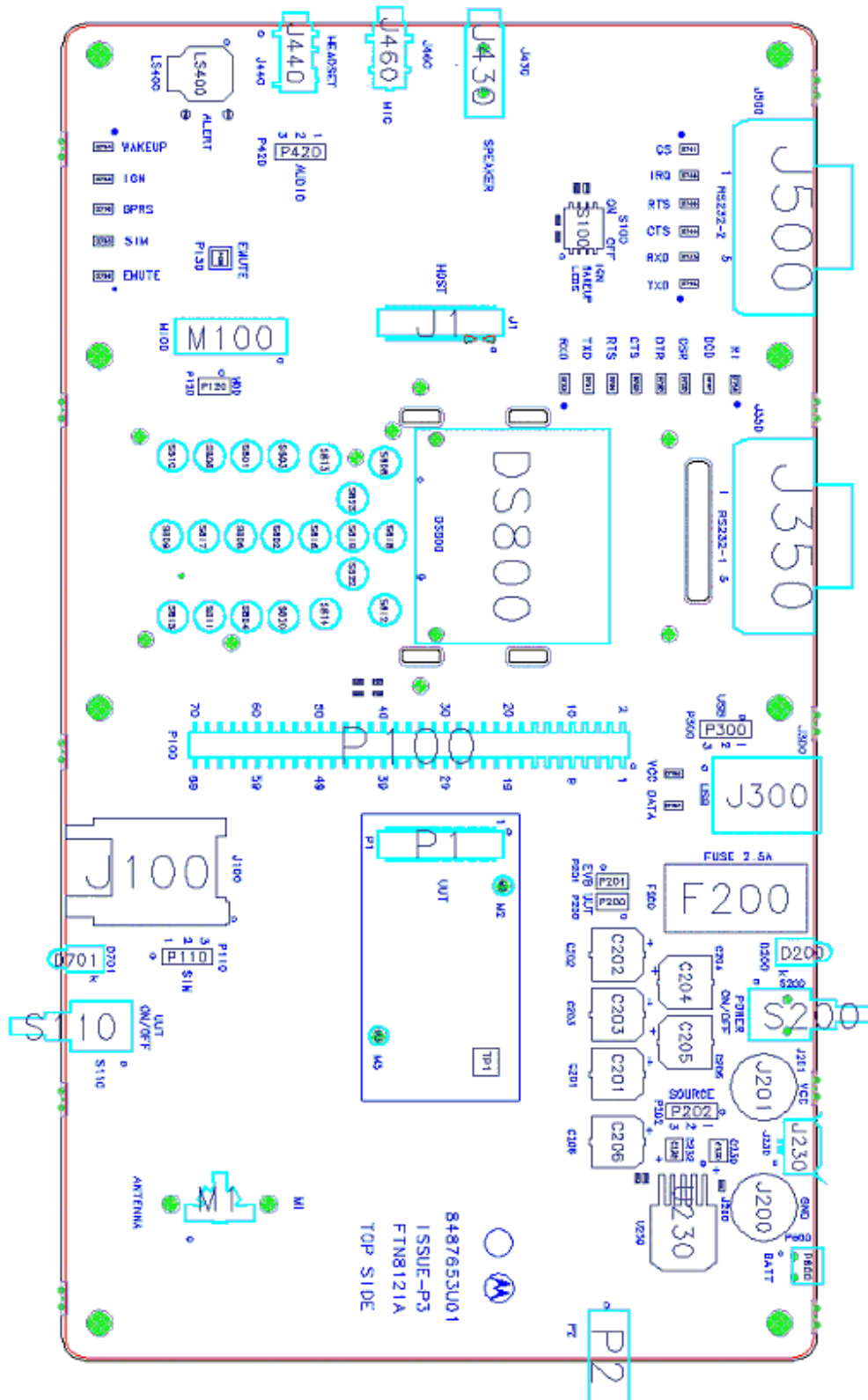


Figure 16. Developer Board Top Layout

Figure 17 shows the bottom layout of the Developer Board:

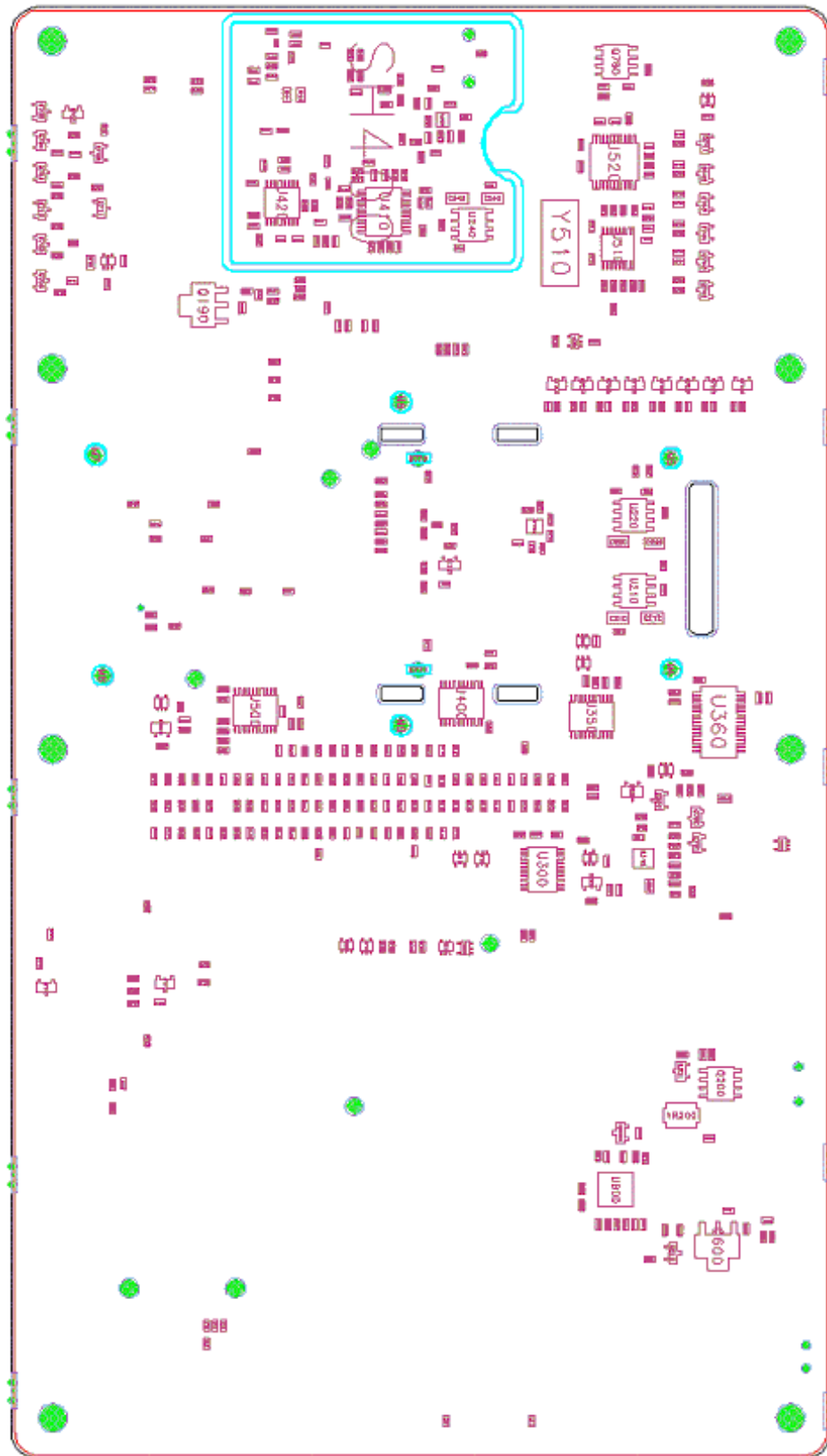


Figure 17. Developer Board Bottom Layout



### 6.3 DEVELOPER BOARD PARTS LIST

Table 24. Developer Board Parts List

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
<b>Resistors</b>		
R440	0662057A21	RES, 68
R600	0662057A22	RES, 75
R330	0662057A25	RES, 100
R773	0662057A28	RES, 130
R723, R725, R745, R747	0662057A31	RES, 180
R703	0662057A35	RES, 270
R705, R707, R709-10, R713, R717-18, R727, R729, R731, R733, R735, R737, R743, R749, R751, R753, R763, R764	0662057A36	RES, 300
R203	0662057A39	RES, 390
R603	0662057A47	RES, 820
R604	0662057A49	RES, 1K
R602	0662057A51	RES, 1.2K
R312	0662057A53	RES, 1.5K
R465-66	0662057A57	RES, 2.2K
R201-2, R702, R704, R706, R708, R711-12, R716, R722, R724, R726, R728, R730, R732, R734, R736, R742, R744, R746, R748, R750, R752, R760-61, R800	0662057A65	RES, 4.7K
R179, R197, R200, R303, R414-16, R441, R508-9, R525, R601, R607, R774, R781	0662057A73	RES, 10K
R230-32, R322	0662057A75	RES, 12K

Table 24. Developer Board Parts List (Continued)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R411-12, R418	0662057A80	RES, 20 K
R177-78, R191-92, R196, R198, R317-18, R320-21, R353, R507, R608-9, R780	0662057A89	RES, 47 K
R435	0662057A97	RES, 100 K
R1, R10-11, R15-16, R107, R116-144, R146, R148-49, R151-53, R155, R157, R159, R170, R172-76, R181-190, R300-302, R350-352, R400-402, R407-410, R413, R417, R419, R423-27, R460, R480-85, R500-503, R506, R510-524, R594-97, R606, R611-618, R700, R720, R740, R770-771, R801-805	0662057B47	RES, 0
R790	0662057C01	RES, 0
R430-31, R433-34	0662057P20	RES, 20K
R221	0662057P95	RES, 100K
R234	0662057P96	RES, 130K
R211, R220, R241	0662057P97	RES, 150K
R210, R240	0662057P99	RES, 200K
R233	0662057T17	RES, 301K
R310-11	0662057T43	RES, 33.2
R772	0662057W13	RES, 3.3

Table 24. Developer Board Parts List (Continued)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
<b>Fuses</b>		
F200	0904923K01	FUSE
F600	6586221J04	FUSE
<b>Connectors</b>		
J430	0909032K01	CONN_J
J460	0909399T09	CONN_J
J350, J500	0909672B03	CONN_J
P2	0909908P02	CONN_J
J1	0987547V01	CONN_J
J300	0987583U01	CONN_J
J440	0987837L02	CONN_J
J230	0989601K01	CONN_J
<b>Capacitors</b>		
C1, C2, C3, C4	2113740F01	CAP, 0.5p
C5	2113740F19	CAP, 4.7p
C207, C215, C217, C234	2113740F25	CAP, 8.2p
C442, C444, C447, C450, C462, C472-473	2113740F27	CAP, 10p
C100, C102-106, C108-115, C130, C137, C143, C147-151, C153-160, C171, C191-192, C211, C221, C241, C312, C401-404, C416-418, C421-428, C436-439, C443, C445-446, C448-449, C451-2, C461, C463-4, C470-471, C474-475, C502-510, C781, C810-819	2113740F39	CAP, 33p

Table 24. Developer Board Parts List (Continued)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C125, C128, C131, C134, C208, C216, C218, C231, C511-12	2113740F41	CAP, 39p
C411-412, C414	2113741F49	CAP, 10n
C101, C107, C116-124, C126-127, C129, C132-133, C135-136, C138-142, C144-146, C152, C465, C600	2113743E20	CAP, 100n
C430-431, C433-434	2113743K16	CAP, 220n
C361-364, C521-524	2113743K17	CAP, 330n
C310, C313, C466	2113928C04	CAP, 4.7u
C440-441	2113928C12	CAP, 10u
C170, C172-173, C180, C190, C200, C233, C300, C311, C350, C360, C400, C410, C413, C415, C420, C432, C435, C453, C460, C500, C513, C520, C700, C720, C770-774, C780, C800-801	2113928P04	CAP, 1u
C230, C232	2311049A57	CAPP, 10u
C210, C212, C220, C222, C240, C242	2311049A72	CAPP, 10u
C201-206	2387572V01	CAPP, 1000u
<b>Inductors</b>		
L440	2409154M42	IDCTR, 33n
<b>Shields</b>		
SH400	2604044K01	SHIELD

Table 24. Developer Board Parts List (Continued)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
<b>Connectors</b>		
P130	2880001R01	CONN_P
P120, P200-201	2880001R02	CONN_P
P110, P202, P300, P420	2880001R03	CONN_P
P600	2886290J07	CONN_P
P100	2886397J02	CONN_P
P1	2887548V01	CONN_P
J201	2987604U01	CONN_J
J200	2987604U02	CONN_J
<b>Contacts</b>		
M1	3903920K01	CONTACT
<b>Switches</b>		
S200	4008241G06	SWITCH_ET01
S110	4008242G05	SWITCH
J100	4009060S03	SWITCH_CONTACT_BLOCK
S100	4080564C02	SWITCH
<b>Spacers</b>		
M2, M3, M4, M5, M6, M7, M8, M9	4302809C15	SPACER
<b>LEDs</b>		
D702-704, D708, D710, D721-8, D741-746, D760-761	4805729G44	BR1102W
D770-771	4870370A25	CL-260S-WA
D200, D701	4880304L02	LED_RED
<b>Transistors</b>		
Q701-704, Q706, Q708, Q710, Q760-761	4809579E16	TN0200T
Q705, Q707, Q711, Q721-728, Q741-746	4809579E18	TP0101T
Q200, Q780	4809807C31	IRF7220
Q350, Q720, Q740, Q1000	4809939C05	UMC5NTL

Table 24. Developer Board Parts List (Continued)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q110, Q300, Q500, Q610, Q620, U771	4813824A10	MMBT3904
Q201	4813824A17	MMBT3906
Q600	4813824B11	MMJT9435
Q190	4813824B13	MMJT9410T1
<b>Diodes</b>		
VR200	4813831A14	SMB5918
D320	4813833C02	MMBD6100
VR100-105, VR310	4886182U05	UMZ6.8EN
<b>Integrated Circuits</b>		
U510	5102870C15	MAX3100EEE
U201, U220, U240	5104187K10	MAX604ESA
U230	5104187K89	MIC29302BU
U370, U380, U530	5105492X05	TC7SH32
U520	5108428S67	MAX3223EAP
U330	5109522E53	NC7SZ125
U360	5109781E76	MAX3238
U320	5109817F26	TC54VN2902E
U420	5113805B39	MC74HC4053
U410	5113811A56	MC145481
U300, U350, U400, U500	5113837A07	MC74LCX244
U430	5186214J87	TPA6203A1GQVR
U600	5187970L09	LM3652
U310	5187970L15	ISP1104
U770	5187970L20	LM2795BLX
<b>General</b>		
M100	5987772L02	MOTOR
Y510	4884450T02	XTAL3_6864MHZ
LS400	5087951K01	SPKR

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## 7.1 SWITCH ASSIGNMENTS CORRECTION

The S100 options switch on the Developer Board is labeled incorrectly. Figure 18 shows the correct function of each switch. ***PLEASE PROVIDE A PICTURE WITHOUT CALLOUTS.***

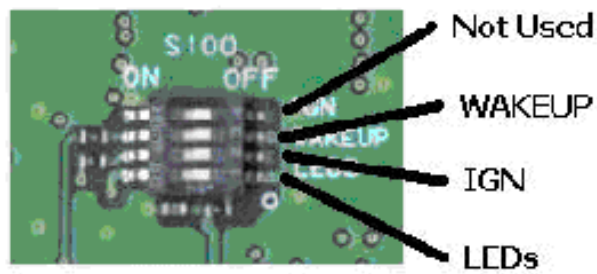


Figure 18. S100 Options Switch Functions





