



EVB-USB3613
Evaluation Board
User's Guide

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Derek Carlson

VP Development Tools



Date

NOTES:

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NOTES:

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a “DS” number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is “DSXXXXA”, where “XXXX” is the document number and “A” is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the EVB-USB3613 Evaluation Board. Items discussed in this chapter include:

- [Document Layout](#)
- [Conventions Used in this Guide](#)
- [The Microchip Web Site](#)
- [Development Systems Customer Change Notification Service](#)
- [Customer Support](#)
- [Document Revision History](#)

DOCUMENT LAYOUT

This document describes how to use the EVB-USB3613 Evaluation Board as a demonstration platform optimized for portable applications. The manual layout is as follows:

- **Chapter 1. “Overview”** – Shows a brief description of the EVB-USB3613 Evaluation Board.
- **Chapter 2. “Hardware Configuration”** – Includes information about the hardware configuration of the EVB-USB3613 Evaluation Board.
- **Chapter 3. “Battery Charging Support”** – Provides information about the EVB-USB3613 Evaluation Board battery charging features.
- **Appendix A. “EVB-USB3613 Evaluation Board”** – This appendix shows the EVB-USB3613 Evaluation Board.
- **Appendix B. “EVB-USB3613 Evaluation Board Schematic”** – This appendix shows the EVB-USB3613 Evaluation Board schematic.
- **Appendix C. “Bill of Materials (BOM)”** – This appendix includes the EVB-USB3613 Evaluation Board Bill of Materials (BOM).

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	<i>MPLAB® IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	<u><i>File>Save</i></u>
Bold characters	A dialog button	Click OK
	A tab	Click the Power tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	#define START
	Filenames	autoexec.bat
	File paths	c:\mcc18\h
	Keywords	_asm, _endasm, static
	Command-line options	-Opa+, -Opa-
	Bit values	0, 1
	Constants	0xFF, 'A'
Italic Courier New	A variable argument	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [options]
Curly brackets and pipe character: { }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}
Ellipses...	Replaces repeated text	var_name [, var_name...]
	Represents code supplied by user	void main (void) { ... }

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- **Emulators** – The latest information on Microchip in-circuit emulators. This includes the MPLAB REAL ICE and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICKit 3 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART Plus and PICKit 2 and 3.

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- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

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Technical support is available through the web site at:
<http://www.microchip.com/support>

DOCUMENT REVISION HISTORY

Revision A (September 2013)

- Initial Release of this Document.

Chapter 1. Overview

1.1 INTRODUCTION

The USB3613 is a low-power, full-featured and OEM configurable Multi-Transaction Translator (MTT) USB 2.0 hub controller with three downstream ports optimized for portable applications. The USB3613 is fully compliant with the USB 2.0 Specification, USB 2.0 Link Power Management (LPM) Addendum, High-Speed Inter-Chip (HSIC) USB Electrical Specification Revision 1.0 and attaches to an upstream port as a high-speed hub. The 3-port hub supports low-speed, full-speed and high-speed downstream devices on all of the enabled (non-HSIC) downstream ports. HSIC ports support only high-speed operation. The USB3613 supports both upstream and downstream battery charging (BC1.2) detection. The EVB-USB3613BC Evaluation Board demonstrates a stand-alone application for the USB3613 device with advanced power saving options and configurable port assignments. See [Section 1.2 “Features”](#) for more information.

1.2 FEATURES

- USB3613 in a 30-pin WLCSP RoHS compliant package
- Two USB 2.0 downstream ports with ganged port power and overcurrent sense (OCS)
- One downstream HSIC port (downstream port 3)
- High-Speed (480 Mbps), Full-Speed (12 Mbps) and Low-Speed (1.5 Mbps) compatible
- USB Battery Charging is supported on all downstream USB ports up to 2A (BC1.2 CDP, SDP and DCP)
- Multi-Transaction Translator is enabled
- Supports internal default hub configuration. Optionally supports configuration from external SPI or EEPROM
- SMBus interface header available
- Low-Cost, 4-Layer space saving design with two outer signal layers, a power inner layer and a ground inner layer
- Self-Powered operation
- Operates from one single voltage (+5.0 VDC, 4 Amp regulated) external DC power supply
- On Board MCP1725 +3.3 VDC. 0.5 Amp regulator
- +5V, Reset, Hub Connect and port power LED indicators
- ESD/EMI component footprints provided (optional)
- Single 12 MHz crystal clock source
- External GPIO pin headers
- Schematics, layout and bill of materials are available to minimize new product development time

1.3 GENERAL DESCRIPTION

The EVB-USB3613BC is an evaluation and demonstration platform featuring the USB3613 Ultra Fast USB 2.0 Hub on a 4-layer RoHS compliant Printed Circuit Board (PCB).

The EVB-USB3613 is designed to demonstrate the unique features of this device using a low-cost PCB implementation with ganged port power control for the two downstream USB 2.0 ports. Both downstream USB 2.0 ports include a high current port power controller to fully support USB battery charging as a high current walk-up port.

Note: Do not exceed 4A total current consumption from 5 VDC.

The EVB-USB3613 is designed to support internal default configuration settings and an external I²C™ EEPROM (optional) for custom configured functionality. A location is provided for an external I²C EEPROM device for configuration at U8. Alternatively, a firmware can be downloaded onto a dual-output SPI Flash device located at U17.

[Figure 2-2](#) shows the top and bottom level silk screen and copper layers. A block diagram of the EVB-USB3613 is shown in [Figure 2-3](#).

Chapter 2. Hardware Configuration

2.1 HARDWARE DESCRIPTION

The EVB-USB3613 has one on board regulator. The MCP1725 (U6) generates +3.3 VDC for the hub device circuitry and performs voltage supervisor and RESETn functions. The USB3613 generates its own +1.2 VDC for internal use with on-chip +1.2 VDC regulators. The internal +1.2 VDC regulator tied to the oscillator and Phase-Locked Loop (PLL) is turned off during suspend to minimize suspend current. Downstream port power is distributed by two independent power switches at up to 2A per port via U1 and U2.

Note: Do not exceed 4A total current consumption from +5 VDC.

Downstream port 1 and port 2 have USB 2.0 connectors with USB 2.0 compliant decoupling and separate shield grounds. Downstream port 3 has U.FL connectors (J20 and J21) to support Data and Strobe HSIC signals.

2.1.1 Port Assignment

The downstream ports are numbered 1 through 3. Downstream port 1 and port 2 are the USB 2.0 ports. Downstream port 3 is an HSIC port. The USB3613 allows downstream port 1 and/or port 2 to be configured for high current battery USB charging. Power to downstream port 1 and port 2 is controlled through the AP2111 devices U1 and U2. Each device provides up to 2A to the corresponding downstream port. Both of these port power controllers are enabled via a shared PRTPWR pin on the USB3613. Overcurrent sensing of both port power controllers is also monitored on the same PRTPWR pin.

Note: There is only a maximum of 4A provided across the entire evaluation board.

The EVB-USB3613 must be connected to an HSIC upstream host via the Data0 (J14) and Strobe0 (J15) connectors using the provided U.FL coaxial cables. When removing these cables from the evaluation board for any reason, the provided HSIC Extraction tool must be used. [Figure 2-1](#) shows the recommended usage of the HSIC extraction tool per the Hirose U.FL data sheet on proper use of the plugs.

FIGURE 2-1: U.FL COAXIAL CABLE EXTRACTION GUIDELINES

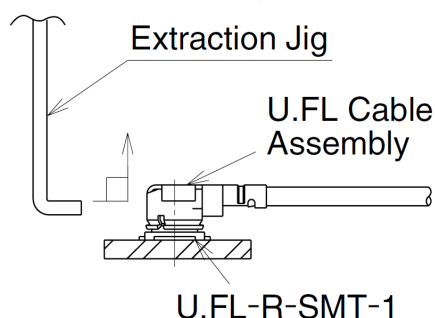
Usage Precautions

1. Plugs

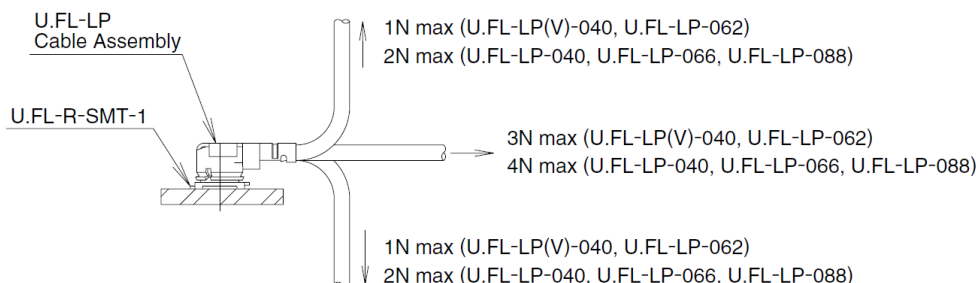
(1) Mating/Unmating

- 1) To disconnect the connectors, insert the end portion of U.FL-LP-N-2 under the connector flanges and pull off vertically, in the direction of the connector mating axis.
- 2) To mate the connectors, the mating axes of both connectors must be aligned. The “click” confirms a fully-mated connection. Do not attempt to insert on an extreme angle.

U.FL-LP-N-2 Plug Extraction Tool



- (2) Pull forces on the cable after the connectors are mated. Do not apply a load to the cable in excess of the values indicated in the diagram below.



(3) Precautions

Do NOT forcefully twist or deform wires.

An external HUB_CONN port control signal from the host must be wired to the “HubConn” pin on the J23 header. This signal lets the USB3613 know when an HSIC upstream host is ready to attach. Once a host has been attached and detected, the green “HubConn” LED D18 lights up.

The EVB-USB3613 is designed to allow flexible configuration options. It can be configured with default internal register settings through an SMBus or through a downloadable external firmware to an SPI Flash. It supports “Quad-Page” configuration OTP flash (four consecutive 200-byte configuration pages). The following sections detail the various configuration methods and features.

2.1.2 USB3613 Configuration

Default: Upon power-up, the USB3613 searches for an external SPI Flash device that contains a valid signature. If an SPI device is not present, the firmware checks to see whether SMBus is enabled. If the SMBus is disabled, the USB3613 attempts to load the configuration from an external I²C EEPROM. If no external options are detected, the USB3613 will operate using the internal default register settings. It also sets the vendor ID, product ID, language ID, device ID and additional settings from internal ROM code.

SPI Flash Option: If upon power-up an external SPI Flash device is present, the external ROM is enabled and code execution is initiated from the external SPI device. The SPI Flash device on the EVB-USB3613 is populated by default. To hold this device in reset, the J33 “SPI Hold” two-pin header can be shorted together, thereby tying the HOLD signal low.

SMBus Option: The SMBus interface is disabled by default via the 100 kOhm pull down resistor on SMBCLK. To enable SMBus, the SMBCLK pin must be pulled high to +3.3 VDC with a strong pull up resistor. This is often embedded within the external SMBus tool (not included) when inserted onto the J13 SMBus header. All device configuration must be performed via the Pro-Touch Programming Tool. For information on this tool, contact your local sales representative. When SMBus is enabled, the firmware configures the GPIOs to act as an SMBus slave. As an SMBus slave, the firmware waits indefinitely for the SMBus configuration.

EEPROM Option: If the USB3613 does not detect an SMBus interface, it will check for an I²C EEPROM (not populated by default). The EVB-USB3613 loads configuration from an external two-wire I²C EEPROM when present. The EEPROM must be installed either directly or through a DIP socket located at the U8 footprint and the “Manual I²C Enable” headers J11 and J12 must be set to enable this option. By default, J11 and J12 are left open so that the I²C interface are only enabled by pull ups in the external EEPROM device. When both J11 and J12 are jumpered, SDA and SCL on the I²C interface are pulled high to +3.3 VDC externally. The EEPROM must be pre-programmed before installation as the EVB-USB3613 is tied to an HSIC host. The EVB-USB3613BC is compatible with I²C EEPROMs from several manufacturers. The memory capacity must be at least 512 bytes.

2.1.3 Clock Source – 12 MHz Oscillator

By default, a 12 MHz oscillator OSC1 is populated on the evaluation board as the clock source for the USB3613. An alternative clock source can be injected into the J54 SMA “External Clock Input” connector if desired. The REFSEL[1:0] pins are both pulled high to +3.3 VDC by default to configure the USB3613 to have an input reference clock frequency of 12 MHz.

2.1.4 Power Source – Self-Powered

The EVB-USB3613 only supports self-powered operation and is powered by one +5 VDC regulated external DC power supply. The +5 VDC, 4A external DC power supply plugs into the on board 2.1 mm connector J8. The external power supply controls the on board +3.3 VDC MCP1725 voltage regulator. The evaluation board is setup so that the +5 VDC feeds VBAT on the USB3613 which feeds the internal +3.3 VDC regulator. The +3.3 VDC comes out on the VDD33 power pin which then feeds the internal +1.2 VDC regulator via the VDDCRREG pin. A +1.2 VDC is then output onto the VDDCR12 pin of the USB3613. Therefore, the USB3613 is powered completely by the +5 VDC output of the external power supply.

2.1.5 Powered State LED

The LED D5 indicates when +5 VDC power is present.

2.1.6 RESETn LED

The LED D6 indicates when the RESETn signal is driven low and the USB3613 is held in the Reset state.

2.1.7 Port Power LEDs

LEDs D1 and D2 indicate when +5 VDC port power is available to the associated downstream USB port(s).

2.1.8 Hub Connect LED

The LED D18 indicates when an upstream HSIC host is present.

2.1.9 Connector Description

The EVB-USB3613 has two USB connectors for downstream port 1 and port 2. The upstream port as well as downstream port 3 have U.FL connectors for HSIC data and strobe signals. Power is supplied via 2.1 mm power jack. See [Table 2-1](#) for the list of connectors. For more details, please see [Appendix A. "EVB-USB3613 Evaluation Board"](#).

TABLE 2-1: CONNECTOR DESCRIPTION

Connector	Type	Description
J1	USB uAB	Downstream USB Port 1
J2	USB A	Downstream USB Port 2
J7	1x2 header	External Reset Control
J8	Power Jack 2.1 mm	+5 VDC Regulated Power Supply
J11, J12	1x2 headers	I ² C™ External/Manual Enable
J13	2x5 header	SMBus I/F connection
J14	U.FL	Upstream HSIC Port 0 DATA
J15	U.FL	Upstream HSIC Port 0 STROBE
J18, J19	1x2 headers	Charge Detect [1:0]
J20	U.FL	Downstream HSIC Port 3 DATA
J21	U.FL	Downstream HSIC Port 3 STROBE
J22	1x2 header	Suspend/IRQ#/Interrupt
J33	1x2 header	SPI HOLD (to hold SPI in reset)
J54	SMA	External Clock Input

Component side top and bottom layers are shown in [Figure 2-2](#) with silk screen information to identify component locations.

FIGURE 2-2: EVB-USB3613 TOP AND BOTTOM LEVEL SILK SCREEN AND COPPER LAYERS

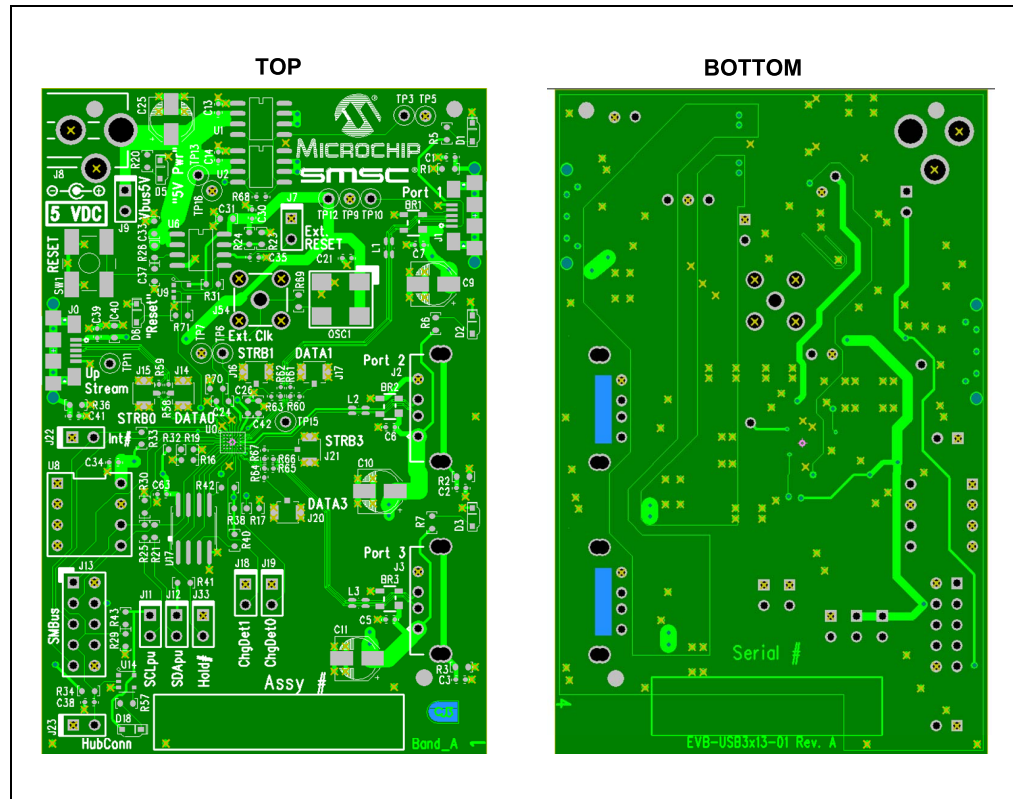
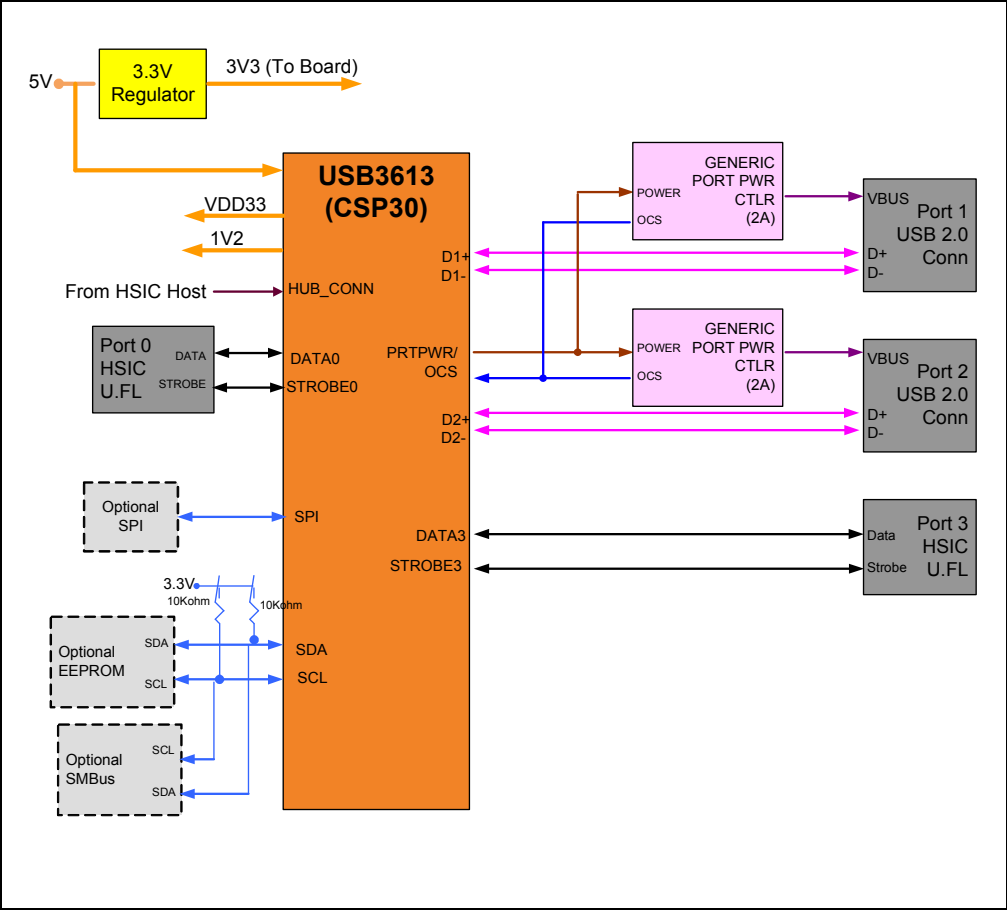


FIGURE 2-3: EVB-USB3613 BLOCK DIAGRAM



Chapter 3. Battery Charging Support

3.1 BATTERY CHARGING MODES

The EVB-USB3613 supports several different Battery Charging modes, providing an array of flexible configuration solutions. Both downstream port 1 and port 2 can be separately configured for battery charging via OTP, downloadable external firmware to an on board SPI Flash or through SMBus commands. Each port's configuration is independent of the other ports.

The battery charging mechanism automatically switches ports between states that perform the BC1.2 CDP handshake (which allows full USB communication with a USB host while charging), and states that emulate the dedicated chargers from charging device vendors. This allows support for the BC1.2 CDP mode and emulation of dedicated chargers in DCP mode, without interfering with normal USB operation of any USB 2.0 device attached to the port. Battery charging is supported through the use of standard port power controllers.

Section 3.2 “Charging Port Roles” describes the modes of operation. For more information on battery charging, please refer to the Application Note 34.5 and the USB Battery Charging 1.2 specifications.

3.2 CHARGING PORT ROLES

The EVB-USB3613's battery charging enabled downstream ports automatically switch between various roles depending on the USB state of the EVB-USB3613. These roles are:

1. BC1.2 charging downstream port (CDP – 1.5A with data)
2. Standard downstream port (SDP – 0.5A with data)
3. Dedicated charger emulation port (DCP – power brick without data)
4. Custom profiles loaded via SMBus or OTP

When switching between roles, the EVB-USB3613 toggles power to the attached device if appropriate. The power toggle occurs if charger or USB renegotiation is necessary based on the following conditions:

1. If the port is in an SDP role while the hub is disconnected from the host, the port toggles power when switching to a DCP role to allow the downstream device to negotiate with the DCP mechanism.
2. If the port is in a DCP role and the port needs to switch to a CDP or an SDP role, the port toggles power to allow the device to renegotiate with a CDP handshake and/or USB attach.

When battery charging is disabled for a EVB-USB3613 port, the port acts as a normal USB hub port.

When a USB port is in a state in which device-host USB communication is not possible, a battery charging enabled port is not required to act as a USB hub port and is therefore free to enter states that emulate dedicated chargers. For the EVB-USB3613, there are two cases where this applies:

1. The EVB-USB3613 upstream port is not connected to a USB host (which on this

evaluation board, it is tied to an HSIC host).

2. The EVB-USB3613 is in USB suspend with remote wake on the USB 2.0 portion of the EVB-USB3613 disabled and no USB 2.0 device connected as a USB device on the downstream port. If USB 2.0 remote wake is disabled, the hub cannot generate resume signaling and does not need to detect a USB 2.0 attach.

In case 2, the EVB-USB3613's charging ports do not enter dedicated charging states when there is a USB 2.0 device attached as a USB device. There are two reasons for this behavior:

1. Entering dedicated charging states may involve changing the state of an attached device due to power toggling and/or USB linestate changing. Because the host system is unaware of the battery charging mechanism of the EVB-USB3613, the host could find the device in an unexpected state when exiting suspend.
2. The attached device will not be able to signal resume signaling to the host when the port is in a dedicated charging state. Hubs must propagate resume signaling from downstream devices even when remote wake generation is disabled for the hub.

If the EVB-USB3613 is in USB 2.0 suspend with USB 2.0 remote wake disabled and a USB-attached device is removed from a port, the port switches to the DCP role because possible resume propagation is no longer required.

3.2.1 BC1.2 Charging Downstream Port (CDP) Description

Devices that do not follow the BC1.2 CDP specification behave as they normally would when inserted into a standard USB port. The EVB-USB3613 ports in CDP mode allow normal USB operation or communication between normal devices and USB hosts by switching to the SDP role after downstream device detection and absence of a BC1.2 CDP handshake from the device. When a subsequent device detach is detected, the port switches back to the CDP role.

Devices that follow the BC1.2 CDP specification are also allowed to communicate normally with the USB host when inserted into the EVB-USB3613 ports in CDP mode. Additionally, prior to allowing the normal USB connection between the host and the BC1.2 device, the EVB-USB3613 port performs the BC1.2 CDP handshake to inform the BC1.2-compliant device that it may draw current exceeding the USB specified limits. When the handshake is complete, the port switches to the SDP role to allow USB functionality for the device. When a subsequent device detach is detected, the port switches back to the CDP role.

3.2.2 Standard Downstream Port (SDP) Description

When a port is in the SDP role, it behaves as a normal hub port and allow full USB functionality for an attached downstream device.

3.2.3 Dedicated Charger Emulation Port (DCP) Description

The advantage of the EVB-USB3613 dedicated charger emulation port over the BC1.2-specified DCP is that it supports BC1.2 compliant charging devices and many non-BC1.2 compliant charging devices. The following paragraphs describe the EVB-USB3613 modes of operation when its downstream ports are in dedicated charging states (when normal USB connection is not required as described in previous sections).

Dynamic Mode:

The EVB-USB3613 can be configured to dynamically react to devices inserted into the downstream ports and emulate the appropriate type of charger for the inserted device. In this configuration, the port begins in Apple® charger emulation mode and switches to China Charging, Blackberry® or BC1.2 device charger emulation when such devices are detected by the port. When a device is detached, the port starts again in Apple charger emulation mode.

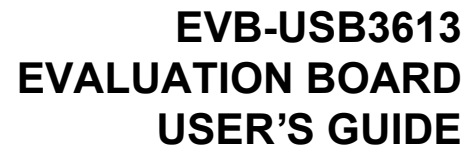
Configurable 1A and 2A Apple modes are available depending on the capabilities of each port's port power controller.

An EVB-USB3613 port with a standard port power controller also supports Samsung® Galaxy Tab™ charger emulation in addition to the above modes.

Static Mode:

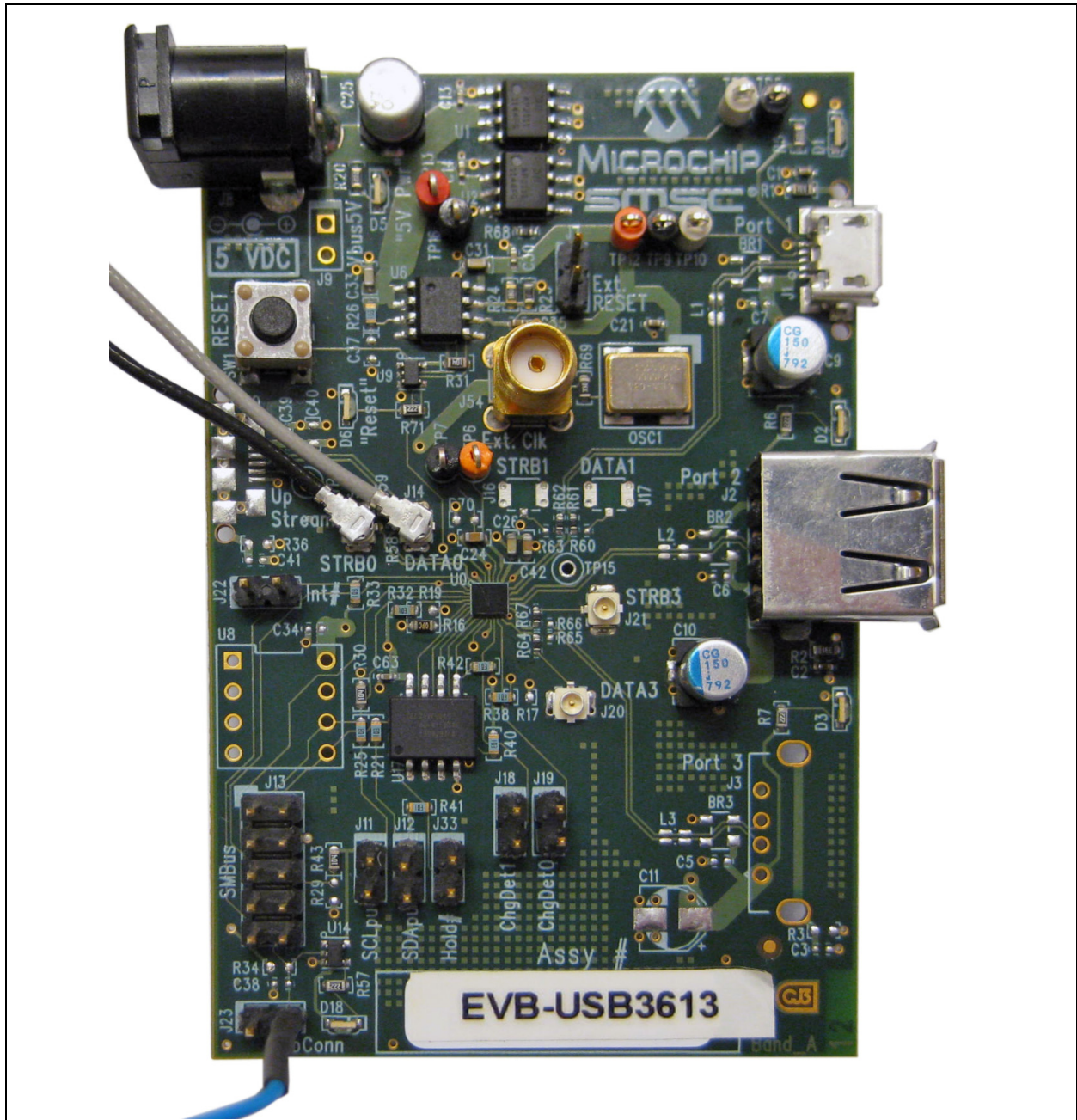
The EVB-USB3613 can be configured to keep the downstream ports in a fixed charger emulation state. Currently, Apple and Samsung Galaxy Tab or China Charging fixed charger emulation modes are available.

NOTES:



A.1 INTRODUCTION

FIGURE A-1: EVB-USB3613 EVALUATION BOARD



NOTES:



EVB-USB3613 EVALUATION BOARD USER'S GUIDE

Appendix B. EVB-USB3613 Evaluation Board Schematic

B.1 INTRODUCTION

This appendix shows the EVB-USB3613 Evaluation Board schematic.

External Supply 5V, 4A

5V
4A

J8 (2.1 mm)

TP16 BLACK
TP13 RED

5V
Br-Read RA
"5V Present"

R20 2.2K

D5

OSC1 12MHz
OSCILLATOR

3V3
C21 0.1uF

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

Warning:
Downstream VBUS is
5V @ 2A per channel to
support Battery Charging.



Appendix C. Bill of Materials (BOM)

C.1 INTRODUCTION

This appendix includes the EVB-USB3613 Evaluation Board Bill of Materials (BOM).

TABLE C-1: EVB-USB3613 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number	Notes
1	2	2	C9, C10	Capacitor, Low ESR, 150uF, 6.3 VDC, 20%, Aluminum, Radial-SMT, 5mm x 5.7mm	Lelon	VZS151M0JTR-0506	'3613
2	1	1	C1	Capacitor, 0.1uF, 25V, 10%, X5R, 0402	Murata Electronics®	GRM155R61E104KA7D	'3613
3	6	6	C2, C13, C14, C21, C30, C35	Capacitor, 0.1uF, 25V, 10%, X5R, 0402	Murata Electronics	GRM155R61E104KA7D	
4	1	1	C63	Capacitor, 0.1uF, 10V, 10%, X5R, 0402	Murata Electronics	GRM155R71A104KA01D	
5	2	2	C24, C42	Capacitor, 1.0uF, 16 VDC, 10%, X5R, 0603	Murata Electronics	GRM188R61C105KA93D	
6	3	3	C26, C31, C33	Capacitor, 4.7uF, 6.3 VDC, 20%, X5R, 0603	Murata Electronics	GRM188R60J475KE19D	
7	4	4	R61, R62, R64, R67	Resistor, ZERO, 0.1W, 0402	Panasonic®	ERJ-2GE0R00X	'3613
8	1	1	R68	Resistor, ZERO, 0.1W, 0402	Panasonic	ERJ-2GE0R00X	PCTL
9	1	1	R1	Resistor, 330, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ331V	'3613
10	1	1	R2	Resistor, 330, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ331V	
11	6	6	R5, R6, R7, R20, R57, R71	Resistor, 2.2K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ222V	
12	1	1	R16	Resistor, 12.0K, 1%, 1/16W, 0603	Panasonic	ERJ-3EKF1202V	
13	7	7	R26, R32, R33, R38, R40, R41, R42	Resistor, 10K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ103V	
14	2	2	R21, R25	Resistor, 10K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ103V	EEPROM
15	1	1	R23	Resistor, 21.0K, 1%, 1/16W, 0603	Yageo America	9C06031A2102FKHFT	
16	1	1	R24	Resistor, 150K, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF1503V	
17	1	1	R43	Resistor, 100K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ104V	'3613
18	2	2	R30, R31	Resistor, 100K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ104V	
19	1	1	R69	Resistor, 33, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ330V	
20	4	4	D1, D2, D3, D18	LED, Green, Bright (40 mcd), 0804, Right Angle	Stanley Electric	DG1113F	
21	2	2	D5, D6	LED, Bright Red, 0804, Right Angle	Stanley Electric	FR1113F	
22	1	1	J8	Connector, Power Jack, 2.1 mm x 5.5 mm, 12V, 4A, Right Angle, TH	Cui Stack	PJ-002AH	
23	1	1	J1	Receptacle, USB, Micro-AB, Right Angle, SMT	Hirose	ZX62-AB-5PA(11)	'3613
24	1	1	J2	Receptacle, USB, Style A, Right Angle, Through-hole	AMP	292303-1	
25	4	4	J14, J15, J20, J21	Receptacle, Coax, U.FL, SMT, Vertical	Hirose	U.FL-R-SMT-1	'3613
26	1	1	J54	Receptacle, SMA, Vertical	AMP	221789-1	
27	2	2	J7, J33	Header, 1x2, 0.1 Inch, Vertical (cut from 1x36)	Samtec	TSW-102-14-L-S	
28	1	1	J23	Header, 1x2, 0.1 Inch, Vertical	Samtec	TSW-102-14-L-S	'3613
29	5	5	J11, J12, J18, J19, J22	Header, 2x1, 0.1 Inch, Vertical (cut from 2x36)	Samtec	TSW-102-14-L-S	

TABLE C-1: EVB-USB3613 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number	Notes
30	1	1	J13	Header, 2x5, 0.1 Inch, Vertical	AMP	146256-5	SMBus
31	1	1	SW1	Switch, Momentary, SPST, 100mA, J-lead, NO	E-Switch	TL3301xF160QJor-RJ	
32	2	2	TP3, TP10	Test Point, White, Loop, Mini, 0.04 Inch ID	Keystone	5002	
33	4	4	TP5, TP7, TP9, TP16	Test Point, Black, Loop, Mini, 0.04 Inch ID	Keystone	5001	
34	2	2	TP6, TP12	Test Point, Orange, Loop, Mini, 0.04 Inch ID	Keystone	5003	
35	1	1	TP13	Test Point, Red, Loop, Mini, 0.04 Inch ID	Keystone	5000	
36	1	1	TP15	Test Point, Yellow, Loop, Mini, 0.04 Inch ID	Keystone	5004	
37	1	1	U0	IC, USB3613, 3-Port USB 2.0/HSIC Hub, WLCSP30	Standard Microsystems Corp	USB3613	
38	2	2	U1, U2	IC, AP2111SG-13, Power Distribution Switch, SOP-8	Diodes® Inc.	AP2111SG-13	
39	1	1	U6	IC, MCP1725-ADJE/SN, LDO Regulator, Adj., 500 mA, SOIC8	Microchip Technology	MCP1725(T)-ADJE/SN	
40	2	2	U9, U14	IC, 74LVC1G14, Inverter, Schottky, DCK	TI	SN74LVC1G14DCKR	
41	1	1	U17	IC, '25VF640C, 64Mb, (8M x 8) SPI Serial FLASH, 2.5V-3.6V, 75-80 MHz, Dual Read, SO8	Microchip	SST25VF064C-80-4I-S3AE	SPI
42	1	1	OSC1	Oscillator, 12.000 MHz, 50 ppm, 3.3V, SMT	CTS	CB3LV-3C-12M0000	
43	4	4		Foot, Silicone Rubber, Adhesive, Clear, Cylindrical .375" x .190"	Richco®	RBS-35	Place bottom side, one at each corner
44	1	1	Starting SN = Band-01	Serial Number Labels, 6 mm x 27 mm			Place bottom side in white S/N box
45	1	1		Assy Labels: "EVB-USB3613_A1", 6 mm x 27 mm		EVB-USB3x13	Place top side in Assy# box
46	1	1	PCB Fab	PCB, Band (EVB-USB3x13), Rev. A	ViaSystems/DDi	EVB-USB3x13	Supplied by SMSC
47	1	1	Assembly	Assembly, Band (EVB-USB3613), Rev. A1			
48	1	0	C25	Capacitor, Low ESR, 100uF, 6.3 VDC, 20%, Aluminum, Radial-SMT, 5 mm x 5.8 mm	United Chemi-Con	EMZA6R3ADA101ME61G	DNP
49	1	0	C11	Capacitor, Low ESR, 150uF, 6.3 VDC, 20%, Aluminum, Radial-SMT, 5 mm x 5.7 mm	Lelon	VZS151M0JTR-0506	'3813
50	2	0	C3, C41	Capacitor, 0.1uF, 25V, 10%, X5R, 0402	Murata Electronics	GRM155R61E104KA7D	'3813
51	3	0	C5, C6, C7	Capacitor, 0.1uF, 25V, 10%, X5R, 0402	Murata Electronics	GRM155R61E104KA7D	ESD
52	1	0	C34	Capacitor, 0.1uF, 25V, 10%, X5R, 0402	Murata Electronics	GRM155R61E104KA7D	EEPROM-DNP
53	2	0	C38, C39	Capacitor, 1000pF, 50V, 10%, X7R, 0402	Murata Electronics	GRM155R71H102KA01D	'3813

TABLE C-1: EVB-USB3613 EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number	Notes
54	1	0	C37	Capacitor, 1.0uF, 16VDC, 10%, X5R, 0603	Murata Electronics	GRM188R61C105KA93D	DNP
55	1	0	C40	Capacitor, 2.2uF, 6.3 VDC, 10%, X5R, 0603	Murata Electronics	GRM185R60J225KE26D	'3813
56	6	0	R58, R59, R60, R63, R65, R66	Resistor, ZERO, 0.1W, 0402	Panasonic	ERJ-2GE0R00X	'3813
57	2	0	R3, R36	Resistor, 330, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ331V	'3813
58	2	0	R17, R19	Resistor, 10K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ103V	DNP
59	1	0	R29	Resistor, 100K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEY104V	'3813
60	1	0	R34	Resistor, 82K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ823V	'3813
61	1	0	R70	Resistor, 33, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ330V	DNP
62	1	0	J0	Receptacle, USB, Micro-AB, Right Angle, SMT	Hirose	ZX62-AB-5PA	'3813
63	1	0	J3	Receptacle, USB, Style A, Right Angle, Through-hole	AMP	292303-1	'3813
64	2	0	J16, J17	Receptacle, Coax, U.F.L. SMT, Vertical	Hirose	U.F.L-R-SMT-1	'3813
65	1	0	J9	Header, 1x2, 0.1 Inch, Vertical	Samtec	TSW-102-14-L-S	'3813
66	3	0	BR1, BR2, BR3	Diode, Bridge, Switching, 50V, 140 mA, KCAC, SOT-143	Infineon Tech	BGX50A	ESD
67	3	0	L1, L2, L3	Inductor, Common Mode Choke, DLP11SN900SL2, 0504	Murata Electronics	DLP11SN900SL2	ESD
68	1	0	SKT1 (Place at U8)	Socket, IC, 8-Pin DIP, Leaf Contacts, Through-hole	Assmann	A08-LC-TT-R	EEPROM-DNP
69	1	0	TP11	Test Point, White, Loop, Mini, 0.04 Inch ID	Keystone	5002	'3813
70	1	0	U8	IC, 24C04, 2 Wire Serial EPROM, 4 Kb, 2.7V, DIP-8	Microchip Technology	24LC04B-I/P	EEPROM-DNP
71	1	0	SHUNT1	Shunt, Insulated, 0.1 Inch	AMP	881545-2	DNP

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