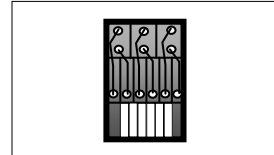


Earl J. Lum
+1-650-430-2221
elum@ejlwireless.com



**Ericsson W-CDMA/LTE 2100MHz Remote Radio Unit
80W (2 x 40W)
KRC 161 254/2 R1H
Model RRUS11 B4
November 2013**



Entire contents © 2013 EJL Wireless Research LLC. All Rights Reserved. Reproduction of this publication in any form without prior written permission is strictly forbidden and will be prosecuted to the fully extent of US and International laws. The transfer of this publication in either paper or electronic form to unlicensed third parties is strictly forbidden. The information contained herein has been obtained from sources EJL Wireless Research LLC deems reliable. EJL Wireless Research disclaims all warranties as to the accuracy, completeness or adequacy of such information. EJL Wireless Research LLC shall have no liability for errors, omissions or inadequacies in the information contained herein or for the interpretation thereof. The reader assumes sole responsibility for the selection of these materials to achieve its intended results. The opinions expressed herein are subject to change without notice.

TABLE OF CONTENTS

| | |
|--|-----|
| EXECUTIVE SUMMARY | 6 |
| Active/Passive Component Summary | 6 |
| Important Note: | 6 |
| CHAPTER 1: ERICSSON RBS6000 BTS SYSTEM | 7 |
| Overview of RBS6601 Product Offering | 7 |
| CHAPTER 2: RRUS 11 MECHANICAL ANALYSIS | 11 |
| Mechanical Analysis..... | 11 |
| RRUS 11 TRx Housing..... | 18 |
| RRUS 11 DC and RF Cables | 23 |
| CHAPTER 3: RRUS 11 INTERFACE SUBSYSTEM | 26 |
| CHAPTER 4: RRUS 11 POWER SURGE PROTECTION DEVICE (SPD) PCB | 29 |
| CHAPTER 5: RRUS 11 TRX SUBSYSTEM..... | 31 |
| Digital Processor and TRx PCB | 31 |
| Area A: Baseband Signal Processing | 35 |
| Area B: Main TRx Power Supply | 38 |
| Area C: RRUS Transmitters | 42 |
| Area C1 and C2 | 42 |
| Area C3..... | 44 |
| Area D: RF Power Amplifier Tx Sampling Circuit | 50 |
| Area E: RRUS 11 System Timing | 53 |
| Area F: Receiver RF Downconversion | 55 |
| Areas F1 and F2: RRUS 11 Receiver Low Noise Amplifier | 56 |
| Area F3: RRUS 11 Receiver RF/IF Downconverters..... | 60 |
| Area G: Dual Receiver A/D Converters | 63 |
| ROR 101 0007 1 R2B (e1)..... | 66 |
| Area H: Secondary Receiver/Analog Cross Connect..... | 71 |
| PA9F34 Frequency Synthesizer Module..... | 74 |
| PA9F41 Frequency Synthesizer Module..... | 76 |
| E-H04A Frequency Synthesizer Module..... | 78 |
| E-E42A Frequency Synthesizer Module | 80 |
| CHAPTER 6: RRUS 11 RF AMPLIFIER SUBSYSTEM | 82 |
| Area A: Power Amplifier | 86 |
| Area B: Power Supply..... | 88 |
| RRUS 11 RF Power Amplifier Shield | 95 |
| RRUS 11 RF Power Amplifier Heat Sink | 97 |
| CHAPTER 7: RRUS 11 DUPLEXER CAVITY FILTER RF SUBSYSTEM | 102 |
| VSWR PCB | 110 |
| RRUS 11 Duplexer Filter Waveguide/Resonator Analysis | 121 |
| APPENDIX A - PASSIVE COMPONENT MARKET SHARE/CASE SIZE ANALYSIS | 125 |
| APPENDIX B - ACTIVE COMPONENT MARKET SHARE ANALYSIS | 129 |

TABLES

| | |
|---|-----|
| Table 1: RRUS 11 Cables/Connectors Bill of Materials | 23 |
| Table 2: Interface PCB Top, Bill of Materials | 27 |
| Table 3: Interface PCB Bottom, Bill of Materials | 28 |
| Table 4: Power SPD PCB Top, Bill of Materials..... | 30 |
| Table 5: Area A Bill of Materials | 36 |
| Table 6: Area B Bill of Materials | 39 |
| Table 7: Area C1 Bill of Materials | 47 |
| Table 8: Area C2 Bill of Materials | 48 |
| Table 9: Area C3 Bill of Materials | 49 |
| Table 10: Area D Bill of Materials | 52 |
| Table 11: Area E1 Bill of Materials..... | 54 |
| Table 12: Area E2 Bill of Materials..... | 54 |
| Table 13: Area F1 Bill of Materials..... | 58 |
| Table 14: Area F2 Bill of Materials..... | 59 |
| Table 15: Area F3 Bill of Materials..... | 62 |
| Table 16: Area G Bill of Materials | 65 |
| Table 17: ROR 101 0007 1 R2B (e1) Bill of Materials | 70 |
| Table 18: Area H1 Bill of Materials | 73 |
| Table 19: Area H2 Bill of Materials | 73 |
| Table 20: PA9F34 Module Bill of Materials | 75 |
| Table 21: PA9F41 Module Bill of Materials | 77 |
| Table 22: E-H04A Module Bill of Materials | 79 |
| Table 23: E-E42A Module Bill of Materials..... | 81 |
| Table 24: RRUS 11 RF Power Amplifier Area A Bill of Materials..... | 92 |
| Table 25: RRUS 11 RF Power Amplifier Area B Bill of Materials..... | 93 |
| Table 26: VSWR RFA PCB Bill of Materials | 117 |
| Table 27: VSWR RFB PCB Bill of Materials | 119 |
| Table 28: Passive Component Case Size Distribution by System Subsection | 126 |
| Table 29: Identified Passive Component Supplier Distribution by System Subsection..... | 127 |
| Table 30: Active/Passive Component Distribution by System Subsection..... | 128 |
| Table 31: Active Semiconductor/Component Vendor Distribution by System Subsection | 130 |

EXHIBITS

| | |
|--|----|
| Exhibit 1: Ericsson RBS6601 Main-Remote BTS System (L), RRUS 11 (R) | 8 |
| Exhibit 2: Ericsson RRUS 11 B4 System Block Diagram..... | 8 |
| Exhibit 3: RBS6601 Configurations (Star/Cascade)..... | 9 |
| Exhibit 4: RBS6601 Main Unit with DUL | 9 |
| Exhibit 5: RRUS 11 Connection Interfaces | 10 |
| Exhibit 6: RRUS 11 with Solar Shield (Front and Back) | 11 |
| Exhibit 7: RRUS 11 Front Solar Shield, (External (L) and Internal (R) | 12 |
| Exhibit 8: RRUS 11 Back Solar Shield, External (L) and Internal (R) | 12 |
| Exhibit 9: RRUS 11 Front View..... | 13 |
| Exhibit 10: RRUS 11 Back View | 14 |
| Exhibit 11: RRUS 11 Back View with Duplexer Filter Covers Removed..... | 15 |
| Exhibit 12: Duplexer Filter Cover Views, External (L) and Internal (R) | 16 |
| Exhibit 13: Duplexer Filter Cover Side View..... | 17 |
| Exhibit 14: RRUS 11 Housing, TRx (L) and Power Amplifier (R)..... | 17 |
| Exhibit 15: RRUS 11 TRX Housing | 18 |
| Exhibit 16: RRUS 11 TRX Housing with RF Duplexer Filters Removed..... | 19 |
| Exhibit 17: RRUS 11 TRX Housing with RF Duplexer Filters, SPD and Interface PCB Removed..... | 20 |
| Exhibit 18: RRUS 11 TRX Housing with RF Transceiver/Shield, RF Duplexer Filters, SPD and Interface PCB Removed | 21 |
| Exhibit 19: TRx RF Shield, External View..... | 22 |
| Exhibit 20: TRx RF Shield, Internal View | 22 |
| Exhibit 21: RF Coaxial Cables, RF Power Amplifier/RF Receiver-Duplexer Filter | 23 |
| Exhibit 22: RRUS 11 Cables/Connectors Location Diagram, Internal View..... | 24 |
| Exhibit 23: RRUS 11 Cables/Connectors Location Diagram, External View | 24 |
| Exhibit 24: RRUS 11 Cables/Connectors System Block Diagram | 25 |
| Exhibit 25: Interface PCB Component Diagram. Top | 26 |
| Exhibit 26: Interface PCB Component Diagram. Bottom | 28 |
| Exhibit 27: Power SPD PCB Component Diagram. Top | 29 |
| Exhibit 28: Power SPD PCB Component Diagram. Bottom | 29 |
| Exhibit 29: Power SPD PCB Component Diagram. Side..... | 30 |
| Exhibit 30: RRUS 11 TRx PCB, Top View | 32 |
| Exhibit 31: RRUS 11 TRx PCB, Bottom View | 33 |
| Exhibit 32: RRUS 11 TRx PCB with RF Connectors, Top View | 34 |
| Exhibit 33: Area A Component Diagram | 35 |
| Exhibit 34: Area B Component Diagram..... | 38 |
| Exhibit 35: Area B Component Diagram (con't)..... | 38 |
| Exhibit 36: Area C Diagram..... | 42 |
| Exhibit 37: Area C1 Component Diagram | 43 |
| Exhibit 38: Area C2 Component Diagram | 43 |
| Exhibit 39: Area C1, C2, and C3 Block Diagram | 44 |
| Exhibit 40: Area C3 Component Diagram | 45 |
| Exhibit 41: Area C3 MCX Connector Block Diagram | 45 |
| Exhibit 42: RF 3dB Coupler Component | 46 |
| Exhibit 43: RF Power Divider Component | 46 |
| Exhibit 44: Area D Component Diagram..... | 50 |
| Exhibit 45: Area D Block Diagram | 51 |
| Exhibit 46: Area E1 Component Diagram | 53 |
| Exhibit 47: Area E2 Component Diagram | 53 |
| Exhibit 48: Area F Diagram | 55 |
| Exhibit 49: Areas F & G Signal Diagram | 55 |
| Exhibit 50: Area F1 Component Diagram | 56 |
| Exhibit 51: Area F2 Component Diagram | 56 |
| Exhibit 52: Area F1 RXB Path Block Diagram | 57 |
| Exhibit 53: Area F2 RXA Path Block Diagram | 57 |
| Exhibit 54: Area F3 Component Diagram | 60 |
| Exhibit 55: Area F3 Block Diagram | 61 |
| Exhibit 56: Area G Component Diagram..... | 63 |
| Exhibit 57: Area G Block Diagram | 64 |
| Exhibit 58: ROR 101 0007 1 R2B (e1) Component Diagram..... | 67 |
| Exhibit 59: ROR 101 0007 1 R2B (e1) Block Diagram | 67 |

| | |
|--|-----|
| Exhibit 60: ADL5562 Die Photo | 68 |
| Exhibit 61: ADSS493 Part Number Identification Die Photo..... | 68 |
| Exhibit 62: ADSS493 Die Photo..... | 69 |
| Exhibit 63: Area H1 Component Diagram..... | 71 |
| Exhibit 64: Area H2 Component Diagram..... | 72 |
| Exhibit 65: PA9F34 Module Component Diagram..... | 74 |
| Exhibit 66: PA9F41 Module Component Diagram..... | 76 |
| Exhibit 67: E-H04A Module Component Diagram..... | 78 |
| Exhibit 68: E-E42A Module Component Diagram..... | 80 |
| Exhibit 69: RRUS 11 RF Power Amplifier Housing..... | 82 |
| Exhibit 70: RRUS 11 RF Power Amplifier Housing DC/RF Connections..... | 83 |
| Exhibit 71: RRUS 11 RF Power Amplifier PCB..... | 84 |
| Exhibit 72: RRUS 11 RF Power Amplifier RF Connectors..... | 85 |
| Exhibit 73: RRUS 11 RF Power Amplifier Area A Component Diagram..... | 86 |
| Exhibit 74: RRUS 11 RF Power Amplifier TXA Path Block Diagram..... | 87 |
| Exhibit 75: RRUS 11 RF Power Amplifier TXB Path Block Diagram..... | 88 |
| Exhibit 76: RRUS 11 RF Power Amplifier Area B Component Diagram..... | 89 |
| Exhibit 77: RRUS 11 RF Power Amplifier Construction, Exploded Side View..... | 90 |
| Exhibit 78: RRUS 11 RF Power Amplifier Baseplate (x2)..... | 90 |
| Exhibit 79: RRUS 11 RF Power Amplifier PCB, Bottom View..... | 91 |
| Exhibit 80: RRUS 11 RF Power Amplifier Shield, External View..... | 95 |
| Exhibit 81: RRUS 11 RF Power Amplifier Shield, Internal View..... | 96 |
| Exhibit 82: RRUS 11 RF Power Amplifier Heat Sink..... | 97 |
| Exhibit 83: RRUS 11 RF Power Amplifier Heat Sink, Side View..... | 98 |
| Exhibit 84: RRUS 11 RF Power Amplifier Heat Sink, Bottom View..... | 98 |
| Exhibit 85: RRUS 11 RF Power Amplifier Heat Sink, Front View..... | 99 |
| Exhibit 86: RRUS 11 RF Power Amplifier Secondary Heat Sink..... | 100 |
| Exhibit 87: RRUS 11 RF Power Amplifier Secondary Heat Sink Outline..... | 101 |
| Exhibit 88: RRUS 11 Duplexer Filter RFA, Top View..... | 102 |
| Exhibit 89: RRUS 11 Duplexer Filter RFB, Top View..... | 103 |
| Exhibit 90: RRUS 11 Duplexer Filter RFA, Bottom View..... | 103 |
| Exhibit 91: RRUS 11 Duplexer Filter RFB, Bottom View..... | 104 |
| Exhibit 92: RRUS 11 Duplexer Filter, Front View..... | 104 |
| Exhibit 93: RRUS 11 Duplexer Filter, Rear View..... | 105 |
| Exhibit 94: RRUS 11 Duplexer Filter RF Shield, Top View..... | 106 |
| Exhibit 95: RRUS 11 Duplexer VSWR Shield..... | 107 |
| Exhibit 96: RRUS 11 Duplexer Cable Shield Location..... | 107 |
| Exhibit 97: RRUS 11 Duplexer Cable Shield, Top and Bottom Views..... | 108 |
| Exhibit 98: RRUS 11 Duplexer Filter Resonator Locations..... | 109 |
| Exhibit 99: RRUS 11 Duplexer Filter Tx/Rx Paths..... | 109 |
| Exhibit 100: VSWR PCB Component Diagram..... | 110 |
| Exhibit 101: RRUS 11 Duplexer Filter 7/16 DIN Connector Gasket/Washer/Nut..... | 111 |
| Exhibit 102: Metal Divider..... | 111 |
| Exhibit 103: VSWR PCB, Top View..... | 112 |
| Exhibit 104: VSWR PCB, Bottom View..... | 112 |
| Exhibit 105: AD8342 Part Number/Logo Identification Die Photo..... | 113 |
| Exhibit 106: AD8342 Die Photograph..... | 113 |
| Exhibit 107: AD8338 Logo Identification Die Photo..... | 114 |
| Exhibit 108: AD8338 Part Number Identification Die Photo..... | 114 |
| Exhibit 109: AD8338 Die Photo..... | 115 |
| Exhibit 110: VSWR Monitoring Circuit, RFA..... | 116 |
| Exhibit 111: VSWR Monitoring Circuit, RFB..... | 116 |
| Exhibit 112: RRUS11 Duplexer Filter Resonator Types..... | 121 |
| Exhibit 113: RRUS11 Duplexer Filter Resonator Type Locations..... | 121 |
| Exhibit 114: RRUS11 Duplexer Filter Resonator Stem Types..... | 122 |
| Exhibit 115: Duplexer Filter Path with Waveguide Coupler A..... | 122 |
| Exhibit 116: Duplexer Tx Filter Path with Waveguide Coupler A..... | 123 |
| Exhibit 117: Waveguide Coupler, Side View..... | 123 |
| Exhibit 118: Passive Component Case Size Distribution..... | 125 |
| Exhibit 119: Identified Passive Component Market Share by Vendor..... | 128 |
| Exhibit 120: Active Semiconductor Component Share..... | 129 |
| Exhibit 121: High Pin Count IC vs. Discretet..... | 132 |
| Exhibit 122: Active Semiconductor Market Share by Vendor..... | 133 |
| Exhibit 123: High Pin Count (64+) Active Semiconductor Market Share by Vendor..... | 134 |