

EM35x Reference Design Ceramic Balun, USB Enabled, Inverted F Antenna, Revised **March 27, 2014**
EM358X_REF_DES_CER_USB_INV-F Revision **A0**

Bill of Materials
Initial Release **March 27, 2014**

Item #	QTY	RefDes	Description	Manufacturer	Part Number
				WURTH ELEKTRONIC JOHANSON TECHNOLOGY MURATA TDK	748421245 2450BL15B100E LDB212G4010C-001 HMM1520
1	1	BLN1	BALUN, CHIP MULTILAYER CERAMIC, 2.4 GHZ, 50/100 OHM, -40C TO 85C, 0805 (2012 METRIC)		
2	4	C1,C14,C16,C20	CAPACITOR, CERAMIC, 10NF, +/-10%, 6.3V, -55C TO 125C, X7R, 0402 (1005 METRIC)	MURATA	GRM155R70J103KA01D
3	1	C2	CAPACITOR, CERAMIC, 0.47UF, +/- 10%, 6.3V, -55C TO 85C, X5R, 0402 (1005 METRIC)	MURATA	GRM155R60J474KE19D
4	4	C3-C5,C7	CAPACITOR, CERAMIC, 0.1UF, +/-10%, 6.3V, -55C TO 125C, X7R, 0402 (1005 METRIC)	MURATA	GRM155R70J104KA01D
5	2	C6,C38	CAPACITOR, CERAMIC, 1.0UF, +/-10%, 10V, -55C TO 125C, X7R, 0603 (1608 METRIC)	TAIYO YUDEN LTD	LMK107B7105KA-T
6	1	C8	CAPACITOR, CERAMIC, 2.2UF, +/-10%, 6.3V, -55C TO 125C, X7R, 0603 (1608 METRIC)	MURATA	CL10B225KQ8NNNC
7 ¹	1	C9	CAPACITOR, CERAMIC, 33PF, (DNI), +/-5%, 50V, -55C TO 125C, COG, NP0, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	CL05C330JB5NNNC
8 ¹	1	C10	CAPACITOR, CERAMIC, 22PF, (DNI), +/-5%, 50V, -55C TO 125C, 0402 (1005 METRIC)	MURATA	GRM1555C1H220JA01D
9	2	C11-C12	CAPACITOR, CERAMIC, 22PF, +/-5%, 50V, -55C TO 125C, 0402 (1005 METRIC)	MURATA	GRM1555C1H220JA01D
10	2	C13,C22	CAPACITOR, CERAMIC, 10PF, +/-5%, 50V, -55C TO 125C, 0402 (1005 METRIC)	MURATA	GRM1555C1H100JA01D
11	2	C17,C19	CAPACITOR, CERAMIC, 1PF, +/-0.25PF, 50V, -55C TO 125C, COG, NP0, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	CL05C010CB5NNNC
12	1	C18	CAPACITOR, CERAMIC, 1.8PF, +/-0.25PF, 50V, -55C TO 125C, COG, NP0, 0402 (1005 METRIC)	MURATA	GRM1555C1H18CA01D
13 ²	1	C37	CAPACITOR, CERAMIC, 10NF, (DNI), +/-10%, 6.3V, -55C TO 125C, X7R, 0402 (1005 METRIC)	MURATA	GRM155R70J103KA01D
14	1	C39	CAPACITOR, CERAMIC, 4.7UF, -20% +80%, 10V, -30C TO 85C, Y5V, 0603 (1608 METRIC)	MURATA	GRM188F51A475ZE20D
15 ³	1	C40	CAPACITOR, CERAMIC, 330PF, +/- 10%, 50V, -55C TO 125C, X7R, 0402 (1005 METRIC)	YAGEO	CC0402KRX7R9BB331
16	2	C41-C42	CAPACITOR, CERAMIC, 33PF, +/-5%, 50V, -55C TO 125C, COG, NP0, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	CL05C330JB5NNNC
17 ⁴	2	C43,C45	CAPACITOR, CERAMIC, 1.0UF, (DNI), +/-10%, 10V, -55C TO 125C, X7R, 0603 (1608 METRIC)	TAIYO YUDEN LTD	LMK107B7105KA-T
18 ⁴	1	C44	CAPACITOR, CERAMIC, 10NF, (DNI), +/-10%, 10V, -55C TO 125C, X7R, 0402 (1005 METRIC)	KEMET	CC0402C103K8RACTU
19	3	D1-D3	DIODE, TVS, 45W, 5V, SOD-882	VISHAY	VBUS051BD-HD1-GS08
20	1	FB1	FERRITE BEAD, 60 OHM, 500MA, 0603 SMD	MURATA	BLM18P6G005N1D
21 ⁵	1	J1	CONNECTOR, HEADER, FTSH-105-01-F-DV-K, (DNI), 10 POSITION, DUAL ROW, VERTICAL, 0.050IN	SAMTEC	FTSH-105-01-L-DV-K
22 ⁶	1	J2	CONNECTOR, RECEPTACLE, BD075-19, (DNI), SURFACE MOUNT VERTICAL	GLOBAL CONNECTOR TECH	BD075-19-A-1-L-C
23 ⁶	1	J3	CONNECTOR, RECEPTACLE, BD075-14, (DNI), SURFACE MOUNT VERTICAL	GLOBAL CONNECTOR TECH	BD075-14-A-1-L-C
24 ⁷	1	J4	CONNECTOR, RECEPTACLE, U.FL, (DNI), RF COAXIAL, SMT	MOLEX-KOCH INDUSTRIES	73412-0110
25	1	J5	CONNECTOR, USB, 10118192-0001LF, MICRO B, SMD	FCI	10118192-0001LF
26 ⁸	1	L1	INDUCTOR, METAL FILM, 2.0NH, +/-0.1NH, 220MA, -40C TO 85C, 0402 (1005 METRIC)	MURATA	LQP15MN2N0B02
27 ⁸	1	L3	INDUCTOR, METAL FILM, 1.5NH, +/- 0.1NH, 280MA, -40C TO 85C, 0402 (1005 METRIC)	MURATA	LQP15MN1SN0B2D
28	1	L4	INDUCTOR, MULTI-LAYER FILM, 3.9NH, +/-0.3NH, 450MA, -40C TO 85C, 0603 (1608 METRIC)	MURATA	LQG18HN3N9S00D
29	2	L7-L8	INDUCTOR, WIRE WOUND, 2.7NH, +/-0.2NH, 850MA, -55C TO 125C, 0402 (1005 METRIC)	MURATA	LQW15AN2N7C00D
30	1	PCB1	MECHANICAL, PCB, EM35X CERAMIC BALUN 4 LAYER REFERENCE DESIGN W/USB, INVERTED F, CORPORATE LOGO		
31 ²	1	Q3	MOSFET, 2N7002, (DNI), 300MA, 830MW, 60V, TO-236-3, SC-59, SOT-23-3	NXP SEMI	2N7002,215
32	1	R1	RESISTOR, THICK FILM, 10 OHM, +/-1%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2RKF10R0X
33	1	R2	RESISTOR, THICK FILM, 1 OHM, +/-5%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2GEJ1R0X
34 ⁷	2	R3,R7	RESISTOR, THICK FILM, 0 OHM, (DNI), JUMPER, 1/10W, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	RC1005J000CS
35 ²	1	R5	RESISTOR, THICK FILM, 0 OHM, (DNI), JUMPER, 1/10W, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	RC1005J000CS
36	1	R8	RESISTOR, THICK FILM, 0 OHM, JUMPER, 1/10W, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	RC1005J000CS
37 ²	4	R10,R19,R24,R36	RESISTOR, THICK FILM, 100K, (DNI), +/-5%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2GEJ104X
38	1	R37	RESISTOR, THICK FILM, 100K, +/-5%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2GEJ104X
39 ³	1	R38	RESISTOR, THICK FILM, 0.51 OHM, +/-1%, 0.167W, 1/6W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2BQFR51X
40 ³	1	R39	RESISTOR, THICK FILM, 150K, +/-1%, 1/16W, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	RC1005J154CS
41	2	R40-R41	RESISTOR, CHIP, 33 OHM, +/-1%, 0.1W, 1/10W, 0402	PANASONIC ECG	ERJ-2RKF33R0X
42	1	R42	RESISTOR, 1.5K OHM, 1%, 1/16W, 0402	PANASONIC ECG	ERJ-2RKF1501X
43	1	U1	IC, COMMUNICATIONS, EM358X, -40C TO 85C, SOC, ZIGBEE/802.15.4 RF TRANSCEIVER, ARM CORTEX-M3, TO 12 - 64K RAM, 128 - 512K FLASH, 48-QFN	SILICON LABS	540-0358-000
44 ⁴	1	U3	IC, LDO, (DNI), 3.3V, 150MA, -40C TO 85C, SC59	SKYWOKKS INC	AAT3220IGY-3.3-T1
				MACRONIX MACRONIX WINBOND WINBOND	MX25L8006EM11-12G MX25L8006EM1R-12G W25Q80BVSJNIG W25Q80BVSJNIG
45 ²	1	U11	IC - PROGRAMMABLE MEMORY - BLANK, SERIAL FLASH, DNI, (8M X 1, 4M X 2), 2.7 V - 3.6 V, -40C, 85C, 8-SOIC (0.154IN, 3.90MM WIDTH)		
				ABRACON ABRACON ABRACON ILSI AMERICA AEL CRYSTALS LTD	ABLS-24.000MHZ-D-R60-1-W-T ABLS-24.000MHZ-D1X-T ABLS-438-24.000MHZ-T HC49USM-24.000000M-2435 X24M000000S067
46	1	Y1	OSCILLATOR, CRYSTAL, 24.000MHZ, 18PF LOAD, +/-10PPM TOLERANCE, +/-25PPM STABILITY, -40C TO 85C, AT49		
				ABRACON FOX CRYSTALS ILSI AMERICA ILSI AMERICA	AB507-32.768KHz-T FX135A-327 IL3X-HX5-12.5-32.768KHz IL3X-BX5-12.5-32.768KHz
47 ¹	1	Y2	OSCILLATOR, CRYSTAL, 32.768KHZ, 12.5PF, (DNI), +/-20PPM, -40C TO 85C, 2-SMD		

Notes:
Parts highlighted are not required for the Reference Design. Substitutions of non-highlighted parts can be made for cost or availability reasons, but should be avoided as they may impact functionality and RF performance.
¹ C9, C10 and Y2 can be omitted when using the internal 10 KHz RC oscillator for a sleep timer.
² C37, Q3, R5, R10, R19, R24, R36 and U11 which make up the external Serial Flash circuit are not needed with larger memory EM358x variants. R5 is installed only if external Serial Flash is implemented without Hardware shutdown control.
³ C40, R38 and R39 are not installed for USB VBUS powered applications
⁴ C43, C44, C45 and U3 are not needed for applications not intended to be USB VBUS powered.
⁵ The J1 Packet Trace Port interface is required to make use of Ember Desktop software tools and enables a direct connection to an Ember Debug Adapter (ISA3). This part can be made 'Do Not Install' in production.
⁶ J2 and J3 are intended for use with the EM35x Development Kit and can be replaced with a different board to board interface arrangement, or removed entirely to facilitate a merger into an already existing PCB layout design.
⁷ J3, R3 and R7 make up an RF characterization port and are not installed in production modules.
⁸ The antenna port components AT1, L1 and L3, can be replaced with a preferred 50 ohm RF solution.