EM359x Reference Design Ceramic Balun, USB Enabled, 4-Layer, Revised March 25, 2015
EM359x-REF-DES-CER-USB Revision A0

Bill of Materials
Initial Release March 25, 2015

Item #	QTY	RefDes	Description	Manufacturer	Part Number
1	1	BLN1	BALUN, CHIP MULTILAYER CERAMIC, 2.4 GHZ. 50/100 OHM, -40C TO 85C, 0805 (2012 METRIC)	WURTH ELEKTRONIC JOHANSON TECHNOLOGY MURATA TDK	748421245 2450BL15B100E LDB212G4010C-001 HHM1520
2	2	C1, C2	CAPACITOR, CERAMIC, 33PF, +/-5%, 50V, -55C TO 125C, C0G, NP0, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	CL05C330JB5NNNC
3	2	C3, C38	CAPACITOR, CERAMIC, 1.0UF, +/-10%, 10V, -55C TO 125C, X7R, 0603 (1608 METRIC)	TAIYO YUDEN LTD	LMK107B7105KA-T
4	4	C5, C6, C10, C22	CAPACITOR, CERAMIC, 0.1UF, +/-10%, 6.3V, -55C TO 125C, X7R, 0402 (1005 METRIC)	MURATA	GRM155R70J104KA01D
5	1	C7	CAPACITOR, CERAMIC, 2.2UF, +/-10%, 6.3V, -55C TO 125C, X7R, 0603 (1608 METRIC)	MURATA	CL10B225KQ8NNNC
6[1]	1	C8	CAPACITOR, CERAMIC, 22PF, (DNI), +/-5%, 50V, -55C TO 125C, 0402 (1005 METRIC)	MURATA	GRM1555C1H220JA01D
7[1]	1	C9	CAPACITOR, CERAMIC, 33PF, (DNI), +/-5%, 50V, -55C TO 125C, C0G, NP0, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	CL05C330JB5NNNC
8	4	C12, C18, C19, C24	CAPACITOR, CERAMIC, 10NF, +/-10%, 6.3V, -55C TO 125C, X7R, 0402 (1005 METRIC)	MURATA	GRM155R70J103KA01D
9	2	C14, C25	CAPACITOR, CERAMIC, 10PF, +/-5%, 50V, -55C TO 125C, 0402 (1005 METRIC)	MURATA	GRM1555C1H100JA01D
10	2	C15, C17	CAPACITOR, CERAMIC, 1PF, +/-0.25PF, 50V, -55C TO 125C, C0G, NP0, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	CL05C010CB5NNNC
11	1	C16	CAPACITOR, CERAMIC, 1.8PF, +/-0.25PF, 50V, -55C TO 125C, C0G, NP0, 0402 (1005 METRIC)	MURATA	GRM1555C1H1R8CA01D
12	2	C21, C26	CAPACITOR, 6.8PF, +/-0.25PF, 50V, NP0, 0402	MURATA	GRM1555C1H6R8CA01D
13	1	C27	CAPACITOR, CERAMIC, 0.47UF, +/- 10%, 6.3V, -55C TO 85C, X5R, 0402 (1005 METRIC)	MURATA	GRM155R60J474KE19D
14[2]	1	C28	CAPACITOR, CERAMIC, 10NF, (DNI), +/-10%, 6.3V, -55C TO 125C, X7R, 0402 (1005 METRIC)	MURATA	GRM155R70J103KA01D
15	1	C39	CAPACITOR, CERAMIC, 4.7UF, -20%_+80%, 10V, -30C TO 85C, Y5V, 0603 (1608 METRIC)	MURATA	GRM188F51A475ZE20D
16	1	C40	CAPACITOR, CERAMIC, 330PF, +/- 10%, 50V, -55C TO 125C, X7R, 0402 (1005 METRIC)	YAGEO	CC0402KRX7R9BB331
17[3]	2	C43, C45	CAPACITOR, CERAMIC, 1.0UF, (DNI), +/-10%, 10V, -55C TO 125C, X7R, 0603 (1608 METRIC)	TAIYO YUDEN LTD	LMK107B7105KA-T
18[3]	1	C44	CAPACITOR, CERAMIC, 10NF, (DNI), +/-10%, 10V, -55C TO 125C, X7R, 0402 (1005 METRIC)	KEMET	C0402C103K8RACTU
19	3	D1, D2, D3	DIODE, TVS, 45W, 5V, SOD-882	VISHAY	VBUS051BD-HD1-GS08
20	1	FB1	FERRITE BEAD, 60 OHM, 500MA, 0603 SMD	MURATA	BLM18PG600SN1D
21[4]	2	J1, J3	CONNECTOR, HEADER, FEMALE, 26 POSITION, .1" DUAL, GOLD, THROUGH HOLE	SULLINS ELECTRONICS	PPPC132LFBN-RC
22[4]	1	J2	CONNECTOR, HEADER, FEMALE, 18 POSITION, .1" DUAL, GOLD, THROUGH HOLE	SULLINS ELECTRONICS	PPPC092LFBN-RC
23[5]	1	J4	CONNECTOR, HEADER, FTSH-105-01-F-DV-K, (DNI), 10 POSITION, DUAL ROW, VERTICAL, 0.050IN	SAMTEC	FTSH-105-01-L-DV-K
24	1	J5	CONNECTOR, USB, 10118192-0001LF, MICRO B, SMD	FCI	10118192-0001LF
25[6]	1	J6	CONNECTOR, JACK, END LAUNCH-WIDE, PCB, GOLD, SMA	Emerson Network Power	142-0701-851
26	2	L1, L2	INDUCTOR, WIRE WOUND, 2.7NH, +/-0.2NH, 850MA, -55C TO 125C, 0402 (1005 METRIC)	MURATA	LQW15AN2N7C00D
27	1	L3	INDUCTOR, METAL FILM, 3.3NH, +/-0.3NH, 500MA, -40C TO 85C, 0603 (1608 METRIC)	MURATA	LQG18HN3N3S00D
28	1	PCB1	MECHANICAL, PCB, EM359X CERAMIC BALUN 4 LAYER REFERENCE DESIGN W/USB, SMA CONNECTOR, CORPORATE LOGO		
29	1	Q1	MOSFET, 2N7002, (DNI), 300MA, 830MW, 60V, TO-236-3, SC-59, SOT-23-3	NXP SEMI	2N7002,215
30[7]	1	R1	RESISTOR, THICK FILM, 100K, +/-5%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2GEJ104X
31[7]	1	R2	RESISTOR, THICK FILM, 150K, +/-1%, 1/16W, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	RC1005J154CS
32	2	R4, R5	RESISTOR, CHIP, 33 OHM, +/-1%, 0.1W, 1/10W, 0402	PANASONIC ECG	ERJ-2RKF33R0X
33	1	R6	RESISTOR, 1.5K OHM, 1%, 1/16W, 0402	PANASONIC ECG	ERJ-2RKF1501X
34[2]	5	R7, R8, R9, R10, R26	RESISTOR, 0402, DO NOT INSTALL		
35	1	R13	RESISTOR, THICK FILM, 1 OHM, +/-5%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2GEJ1R0X
36	2	R14, R15	RESISTOR, THICK FILM, 0_OHM, JUMPER, 1/10W, 0402 (1005 METRIC)	SAMSUNG ELECTRONICS	RC1005J000CS
37	1	R17	RESISTOR, THICK FILM, 10 OHM, +/-1%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2RKF10R0X
38[2]	4	R19, R20, R22, R27	RESISTOR, THICK FILM, 100K, (DNI), +/-5%, 0.1W, 1/10W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2GEJ104X
39	1	R38	RESISTOR, THICK FILM, 0.51 OHM, +/-1%, 0.167W, 1/6W, 0402 (1005 METRIC)	PANASONIC ECG	ERJ-2BQFR51X
40	1	U1	IC, COMMUNICATIONS, EM359X, -40C TO 85C, SOC, ZIGBEE/802.15.4 RF TRANSCEIVER, ARM CORTEX-M3, TO 12 - 64K RAM, 128 - 512K FLASH, 56-QFN	SILICON LABS	
41[2]	1	U2	IC - PROGRAMMABLE MEMORY - BLANK, SERIAL FLASH, 8M (256K X 32), (DNI), 2.7 V - 3.6 V, -40C 85C, 8-SOIC (0.154", 3.90MM WIDTH)	Winbond	W25Q80BVSNIG
42[3]	1	U3	IC, LDO, (DNI), 3.3V, 150MA, -40C TO 85C, SC59	SKYWORKS INC	AAT3220IGY-3.3-T1
43	1	Y1	OSCILLATOR, CRYSTAL, 24MHZ, 10PF, 60 0HMS, +/-40PPM OVERALL, 3.2 MM X 2.5 MM X 0.7 MM, ABM8, -40C +125C	ABRACON	ABM8X-101-24.000MHz-T
44[1]	1	Y2	OSCILLATOR, CRYSTAL, 32.768KHZ, 12.5PF, (DNI), +/-20PPM, -40C TO 85C, 2-SMD	ABRACON FOX CRYSTALS ILSI AMERICA ILSI AMERICA	ABS07-32.768KHz-T FX135A-327 IL3X-HX5-12.5-32.768KHz IL3X-BX5-12.5-32.768KHz

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] C8, C9 and Y2 can be omitted when using the internal 10 KHz RC oscillator for a sleep timer.

[2] C28, Q1, R18-R24, R26-R27, and U2 which make up the external Serial Flash circuit are not needed with larger memory EM359x variants. R26 is installed as 0 ohm only if external Serial Flash is implemented without Hardware shutdown control.

[3] C43, C44, C45 and U3 are not needed for applications not intended to be USB VBUS powered.

[5] The J4 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.

[4] J1, J2 and J3 are intended for use with internal EM359x Characterization Hardware and should be replaced with a different board to board interface arrangement, or removed entirely to facilitate a merger into an already existing PCB layout design.

[6] J6 is an RF characterization port and should be replaced with an antenna circuit in production modules.

[7] C40, R1 and R2 are not installed for USB VBUS powered applications