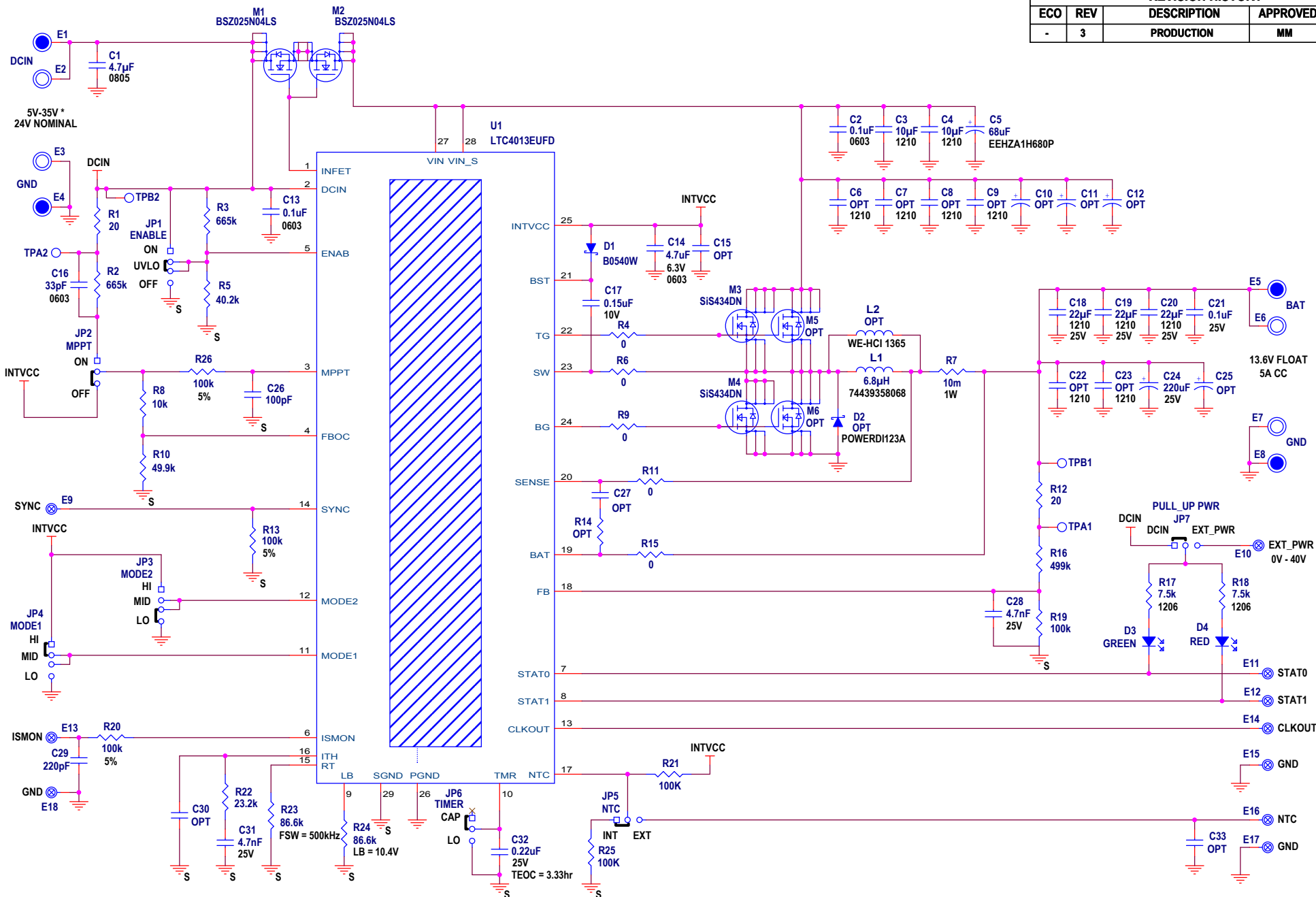



REVISION HISTORY				
ECO	REV	DESCRIPTION	APPROVED	DATE
-	3	PRODUCTION	MM	06-06-16



* 21.5V - 35V JP1, ENABLE = UVLO
 5V-35V JP1, ENABLE AND JP2, MPPT = ON
 NOTES: UNLESS OTHERWISE SPECIFIED
 1. RESISTORS: OHMS, 0402, 1%, 1/16W
 2. CAPACITORS: 0402, 10%, 50V
 S DESIGNATES SGND NODE

CUSTOMER NOTICE		APPROVALS		 1630 McCarthy Blvd. Milpitas, CA 95035 Phone: (408)432-1900 www.linear.com Fax: (408)434-0507 LTC Confidential-For Customer Use Only	
LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-SUPPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY PROPER AND RELIABLE OPERATION IN THE ACTUAL APPLICATION. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE OR RELIABILITY. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERING FOR ASSISTANCE.		PCB DES.	NC		
THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.		APP ENG.	MM	TITLE: SCHEMATIC	
				60V SYNCHRONOUS BUCK MULTI-CHEMISTRY BATTERY CHARGER	
				SIZE	IC NO.
				N/A	LTC4013EUFD
					DEMO CIRCUIT 2374A
				DATE:	06-06-16
				SCALE = NONE	
					SHEET 1 OF 1

Linear Technology Corporation

LTC4013EUF

ENGR: M. Merchant (011-087)

BILL OF MATERIALS

DEMO BD. #2374A-3

QTY- 225

9/8/2016

Item	Qty	Reference	Part Description	Manufacturer / Part #	Kit Qty	Pkg Qty	Balance	Parts/Purch.	
				NUMBER OF BOARDS =	225				
1	1	C1	CAP, CHIP, X5R, 4.7µF, ±10%, 50V, 0805	TDK, C2012X5R1H475K					
2	2	C2, C13	CAP, CHIP, X7R, 0.1µF, ±10%, 50V, 0603	MURATA GRM188R71H104KA93D					
3	2	C3, C4	CAP, CHIP, X5R, 10µF, ±10%, 50V, 1210	MURATA, GRM32ER61H106KA12					
4	1	C5	CAP, 68µF, 50V, Alum. Electro, 20%, 8mm x 10.2mm	PANASONIC, EEHZA1H680P					
5	0	C6-C9, C22, C23 (OPT)	CAP, CHIP, 1210						
6	0	C10-C12 (OPT)	CAP, 10mm X 10.2mm						
7	1	C14	CAP, CHIP, X5R, 4.7µF, ±10%, 6.3V, 0603	TDK, C1608X5R0J475K					
8	0	C15, C27, C30, C33 (OPT)	CAP, CHIP, 0402						
9	1	C16	CAP, CHIP, COG, 33pF, ±5%, 50V, 0603	MURATA, GRM1885C1H330JA01					
10	1	C17	CAP, CHIP, X5R, 0.15µF, ±10%, 10V, 0402	MURATA, GRM155R61A154KE19J					
11	3	C18-C20	CAP, CHIP, X5R, 22µF, ±10%, 25V, 1210	AVX, 12103D226KAT1A					
12	1	C21	CAP, CHIP, X5R, 0.1µF, ±10%, 25V, 0402	TDK, C1005X5R1E104K050BC					
13	1	C24	CAP, 220µF, 25V, Alum. Electro, 20%, 8mm X 10.2mm	PANASONIC, EEHZA1E221P					
14	0	C25 (OPT)	CAP, 8mm X 10.2mm						
15	1	C26	CAP, CHIP, COG, 100pF, ±5%, 50V, 0402	WURTH ELEK, 885012005061					
16	2	C28, C31	CAP, CHIP, X7R, 4.7nF, ±10%, 25V, 0402	MURATA, GRM155R71E472KA01D					
17	1	C29	CAP, CHIP, COG, 220pF, ±5%, 50V, 0402	WURTH ELEK, 885012005063					
18	1	C32	CAP, CHIP, X5R, 0.22µF, ±10%, 25V, 0402	MURATA GRM155R61E224KE01D					
19	1	D1	DIODE SWITCH, 40V, 500mA, SOD-123	DIODES INC, B0540W-7-F					
20	0	D2 (OPT)	DIODE, SCHOTTKY, POWERDI 123						
21	1	D3	DIODE, GREEN, 0603	LITE-ON, LTST-C190KGKT					
22	1	D4	DIODE, LED, RED, 0603	LUMEX, SML-LX0603SRW-TR					
23	4	E1, E4, E5, E8	TURRET, 0.09 DIA	MILL-MAX, 2501-2-00-80-00-00-07-0					
24	4	E2, E3, E6, E7	BANANA JACK, NON-INSULATED	KEYSTONE, 575-4					
25	10	E9 - E18	TURRET, 0.061 DIA	MILL-MAX, 2308-2-00-80-00-00-07-0					
26	3	JP1, JP3, JP4	HEADER, 4PINS, 2mm	WURTH, 62000411121					
27	4	JP2, JP5-JP7	HEADER, 3PINS, 2mm	WURTH, 62000311121					
28	7	JP1-JP7 (SHUNT)	SHUNT 2mm 1X3	WURTH, 60800213421					
29	1	L1	IND, SMT, 6.8µH, ±20%	WURTH, 74439358068					
30	0	L2 (OPT)	IND, SMT, WE-HCI 1365	WURTH, WE-HCI 1365					
31	2	M1, M2	MOSFET, N-CH 40V, 22A, 3.3x3.3 MLP	INFINEON, BSZ025N04LS					
32	2	M3, M4	MOSFET, N-CH 40V, 35A, POWERPACK 1212-8	VISHAY SILICONIX, SiS434DN					
33	0	M5, M6 (OPT)	MOSFET, N-CH, POWERPACK 1212-8						
34	2	R1, R12	RES, CHIP, 20Ω, ±1%, 1/16W, 0402	VISHAY, CRCW040220R0FKED					
35	2	R2, R3	RES, CHIP, 665kΩ, ±1%, 0.1W, 0402	VISHAY, CRCW0402665KFKED					
36	5	R4, R6, R9, R11, R15	RES, CHIP, 0Ω JUMPER, 1/16W, 0402	VISHAY, CRCW04020000Z0ED					
37	1	R5	RES, CHIP, 40.2KΩ, ±1%, 0.1W, 0402	VISHAY, CRCW040240K2FKED					
38	1	R7	RES, CHIP, 10mΩ, ±1%, 1W, 1632 LONG SIDE TERM	SUSUMU, PRL1632-R010-F-T1					

Linear Technology Corporation

LTC4013EUFD

ENGR: M. Merchant (011-087)

BILL OF MATERIALS

DEMO BD. #2374A-3

QTY- 225

9/8/2016

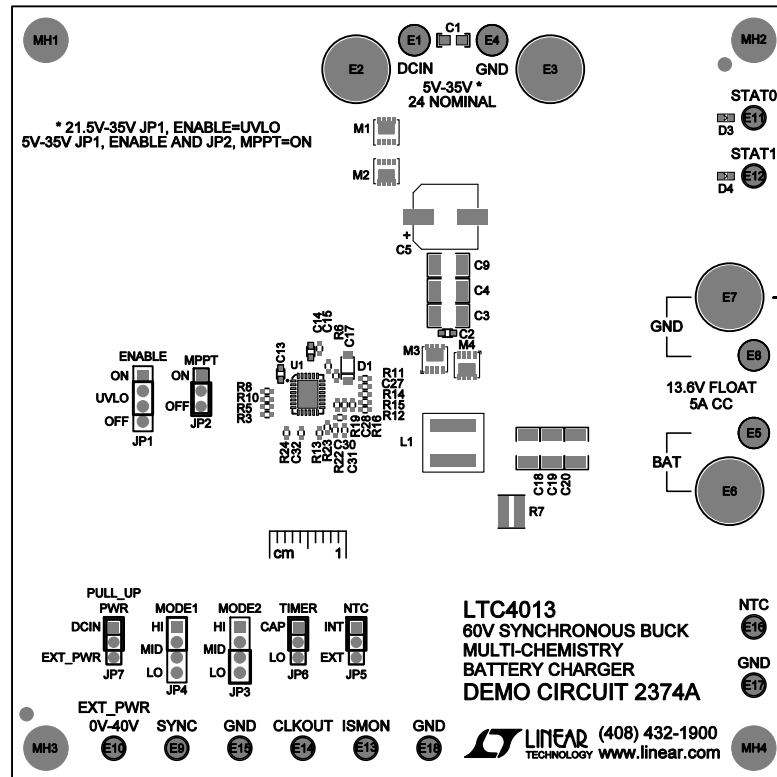
Item	Qty	Reference	Part Description	Manufacturer / Part #	Kit Qty	Pkg Qty	Balance	Parts/Purch.
				NUMBER OF BOARDS =	225			
39	1	R8	RES, CHIP, 10KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040210K0FKED				
40	1	R10	RES, CHIP, 49.9KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040249K9FKED				
41	3	R13, R20, R26	RES, CHIP, 100KΩ, ±5%, 1/16W, 0402	VISHAY, CRCW0402100KJNED				
42	0	R14 (OPT)	RES, CHIP, 0402					
43	1	R16	RES, CHIP, 499KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW0402499KFKED				
44	2	R17, R18	RES, CHIP, 7.5KΩ, ±5%, 1/4W, 1206	VISHAY, CRCW12067K50JNED				
45	3	R19, R21, R25	RES, CHIP, 100KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW0402100KFKED				
46	1	R22	RES, CHIP, 23.2kΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040223K2FKED				
47	2	R23, R24	RES, CHIP, 86.6KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040286K6FKED				
48	1	U1	60V SYNC. BUCK MULTI-CHEMISTRY BATTERY CHARGER	LINEAR TECH., LTC4013EUFD#PBF				
49	4	MH1-MH4	STANDOFF, NYLON 0.5"	KEYSTONE, 8833 (SNAP ON)				
50	1		FAB,PRINTED CIRCUIT BOARD	DEMO CIRCUIT 2374A-3				
51	2		TOP & BOTTOM STENCILS	STENCIL, DC2374A-3				
							TOTAL \$	-

Item	Qty	Reference	Part Description	Manufacturer / Part #
REQUIRED CIRCUIT COMPONENTS:				
1	1	C1	CAP, CHIP, X5R, 4.7µF, ±10%, 50V, 0805	TDK, C2012X5R1H475K
2	2	C2, C13	CAP, CHIP, X7R, 0.1µF, ±10%, 50V, 0603	MURATA GRM188R71H104KA93D
3	2	C3, C4	CAP, CHIP, X5R, 10µF, ±10%, 50V, 1210	MURATA, GRM32ER61H106KA12
4	1	C5	CAP, 68µF, 50V, Alum. Electro, 20%, 8mm x 10.2mm	PANASONIC, EEHZA1H680P
5	1	C14	CAP, CHIP, X5R, 4.7µF, ±10%, 6.3V, 0603	TDK, C1608X5R0J475K
6	1	C17	CAP, CHIP, X5R, 0.15µF, ±10%, 10V, 0402	MURATA, GRM155R61A154KE19J
7	3	C18-C20	CAP, CHIP, X5R, 22µF, ±10%, 25V, 1210	AVX, 12103D226KAT1A
8	1	C21	CAP, CHIP, X5R, 0.1µF, ±10%, 25V, 0402	TDK, C1005X5R1E104K050BC
9	1	C24	CAP, 220µF, 25V, Alum. Electro, 20%, 8mm X 10.2mm	PANASONIC, EEHZA1E221P
10	2	C28, C31	CAP, CHIP, X7R, 4.7nF, ±10%, 25V, 0402	MURATA, GRM155R71E472KA01D
11	1	C32	CAP, CHIP, X5R, 0.22µF, ±10%, 25V, 0402	MURATA GRM155R61E224KE01D
12	1	D1	DIODE SWITCH, 40V, 500mA, SOD-123	DIODES INC, B0540W-7-F
13	1	L1	IND, SMT, 6.8µH, ±20%	WURTH, 74439358068
14	2	M1, M2	MOSFET, N-CH 40V, 22A, 3.3x3.3 MLP	INFINEON, BSZ025N04LS
15	2	M3, M4	MOSFET, N-CH 40V, 35A, POWERPACK 1212-8	VISHAY SILICONIX, SiS434DN
16	2	R2, R3	RES, CHIP, 665kΩ, ±1%, 0.1W, 0402	VISHAY, CRCW0402665KFKED
17	1	R5	RES, CHIP, 40.2KΩ, ±1%, 0.1W, 0402	VISHAY, CRCW040240K2FKED
18	1	R7	RES, CHIP, 10mΩ, ±1%, 1W, 1632 LONG SIDE TERM	SUSUMU, PRL1632-R010-F-T1
19	1	R8	RES, CHIP, 10KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040210K0FKED
20	1	R10	RES, CHIP, 49.9KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040249K9FKED
21	1	R16	RES, CHIP, 499KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW0402499KFKED
22	2	R17, R18	RES, CHIP, 7.5KΩ, ±5%, 1/4W, 1206	VISHAY, CRCW12067K50JNED
23	3	R19, R21, R25	RES, CHIP, 100KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW0402100KFKED
24	1	R22	RES, CHIP, 23.2kΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040223K2FKED
25	2	R23, R24	RES, CHIP, 86.6KΩ, ±1%, 1/16W, 0402	VISHAY, CRCW040286K6FKED
26	1	U1	60V SYNC. BUCK MULTI-CHEMISTRY BATTERY CHARGER	LINEAR TECH., LTC4013EUFD#PBF
ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:				
27	0	C6-C9, C22, C23 (OPT)	CAP, CHIP, 1210	
28	0	C10-C12 (OPT)	CAP, 10mm X 10.2mm	
29	0	C15, C27, C30, C33 (OPT)	CAP, CHIP, 0402	
30	1	C16	CAP, CHIP, COG, 33pF, ±5%, 50V, 0603	MURATA, GRM1885C2A330JA01
31	0	C25 (OPT)	CAP, 8mm X 10.2mm	
32	1	C26	CAP, CHIP, COG, 100pF, ±5%, 50V, 0402	WURTH ELEK, 885012005061
33	1	C29	CAP, CHIP, COG, 220pF, ±5%, 50V, 0402	WURTH ELEK, 885012005063
34	0	D2 (OPT)	DIODE, SCHOTTKY, POWERDI 123	
35	1	D3	DIODE, GREEN, 0603	LITE-ON, LTST-C190KGKT
36	1	D4	DIODE, LED, RED, 0603	LUMEX, SML-LX0603SRW-TR
37	0	L2 (OPT)	IND, SMT, WE-HCI 1365	WURTH, WE-HCI 1365
38	0	M5, M6 (OPT)	MOSFET, N-CH, POWERPACK 1212-8	
39	2	R1, R12	RES, CHIP, 20Ω, ±1%, 1/16W, 0402	VISHAY, CRCW040220R0FKED
40	5	R4, R6, R9, R11, R15	RES, CHIP, 0Ω JUMPER, 1/16W, 0402	VISHAY, CRCW04020000Z0ED
41	3	R13, R20, R26	RES, CHIP, 100KΩ, ±5%, 1/16W, 0402	VISHAY, CRCW0402100KJNED
42	0	R14 (OPT)	RES, CHIP, 0402	
HARDWARE-FOR DEMO BOARD ONLY:				
43	4	E1, E4, E5, E8	TURRET, 0.09 DIA	MILL-MAX, 2501-2-00-80-00-00-07-0
44	4	E2, E3, E6, E7	BANANA JACK, NON-INSULATED	KEYSTONE, 575-4
45	10	E9 - E18	TURRET, 0.061 DIA	MILL-MAX, 2308-2-00-80-00-00-07-0
46	3	JP1, JP3, JP4	HEADER, 4PINS, 2mm	WURTH, 62000411121
47	4	JP2, JP5-JP7	HEADER, 3PINS, 2mm	WURTH, 62000311121
48	7	JP1-JP7 (SHUNT)	SHUNT 2mm 1X3	WURTH, 60800213421

REVISION HISTORY				
ECO	REV	DESCRIPTION	APPR	DATE
-	3	PRODUCTION	MM	06-06-16

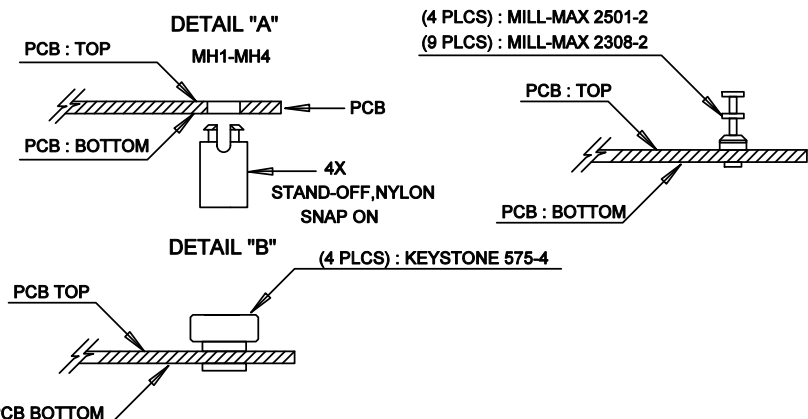
NOTES: UNLESS OTHERWISE SPECIFIED

1. WORKMANSHIP SHALL BE IN ACCORDANCE WITH IPC-A-610.
2. ASSEMBLY PROCESS SHALL INCLUDE: REFLOW SOLDER TOP SIDE SMD.
MAXIMUM SOLDER TEMPERATURE IS 240 DEGREES CELCIUS.
3. PARTS TO OMIT WILL BE SPECIFIED ON THE BILL OF MATERIALS
LOCATIONS OF OMITTED PARTS SHALL BE FREE OF SOLDER.
MASK THE SOLDER STENCIL WHERE SMT PARTS ARE OMITTED.
4. INSTALL SHUNTS AS SHOWN ON ASSY DRAWING.
5. DEPANELIZE BOARDS AFTER ASSEMBLY AND ROUTE-OUT THE BREAKOUT TABS ON FOUR SIDES OF THE BOARD EDGE.
6. APPLY ASSEMBLY STAMP OR QA STAMP TO BOTTOM OF BOARD (UNSHOWY AREA).
7. INSTALL TURRETS AND 4 STAND-OFFS AT FOUR CORNERS AS SHOWN BELOW:

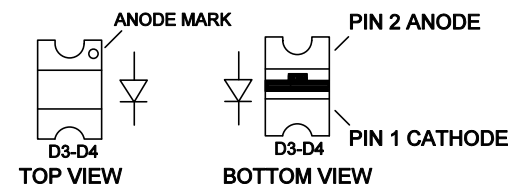


DETAIL "A"

DETAIL "B"

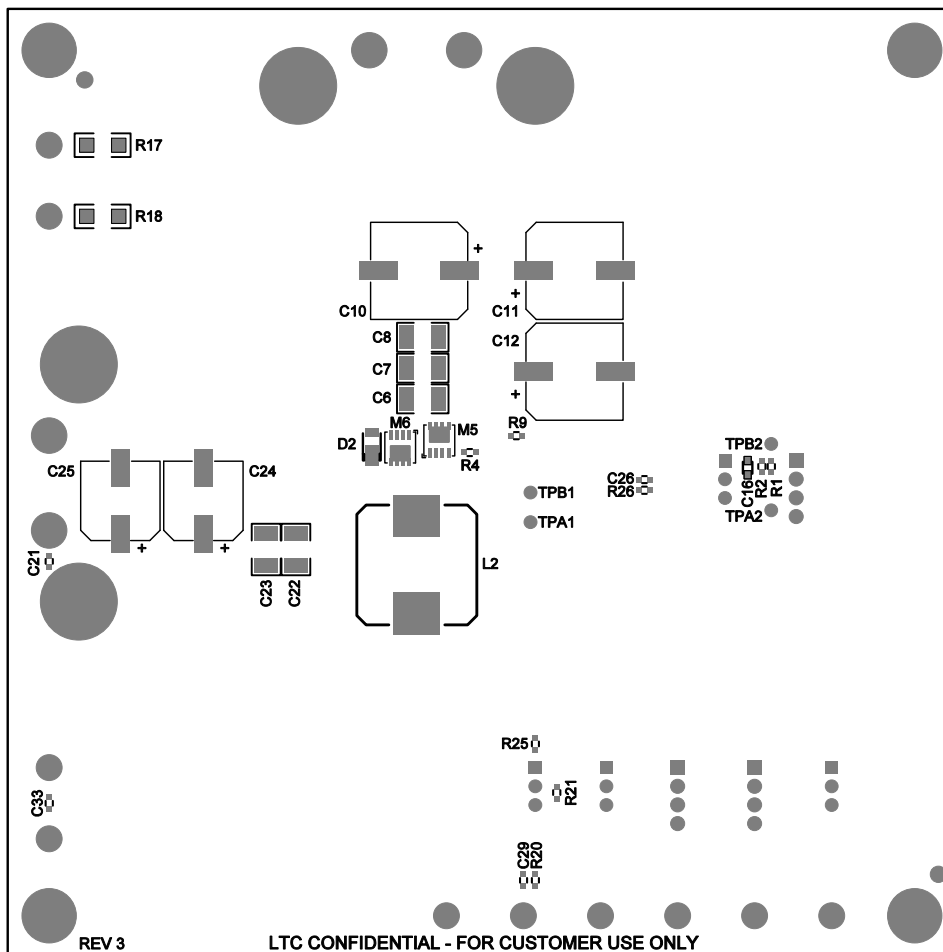



8. INSTALL LED's D3 AND D4 AS SHOWN:



APPROVALS		LINEAR TECHNOLOGY		
PCB DES. NC	APP ENG. MM	TITLE: TOP ASSEMBLY DRAWING: 60V SYNCHRONOUS BUCK MULTI-CHEMISTRY BATTERY CHARGER		
		SIZE N/A	IC NO. LTC4013EUF DEMO CIRCUIT 2374A	REV. 3
SCALE = NONE		SHT 1 of 2		

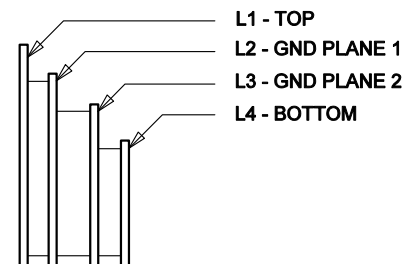
1630 MCCARTHY BLVD
MILPITAS, CA 95035
PH: (408)432-1900
www.linear.com
LTC CONFIDENTIAL-
FOR CUSTOMER USE ONLY



APPROVALS		 1830 MCCARTHY BLVD MILPITAS, CA 95035 PH: (408)432-1900 www.Linear.com LTC CONFIDENTIAL- FOR CUSTOMER USE ONLY	
PCB DES.	NC		
APP ENG.	MM	TITLE: BOTTOM ASSEMBLY DRAWING: 60V SYNCHRONOUS BUCK MULTI-CHEMISTRY BATTERY CHARGER	
SIZE	IC NO.	LTC4013EUFD	REV.
N/A		DEMO CIRCUIT 2374A	3
SCALE = NONE		SHT 2 of 2	

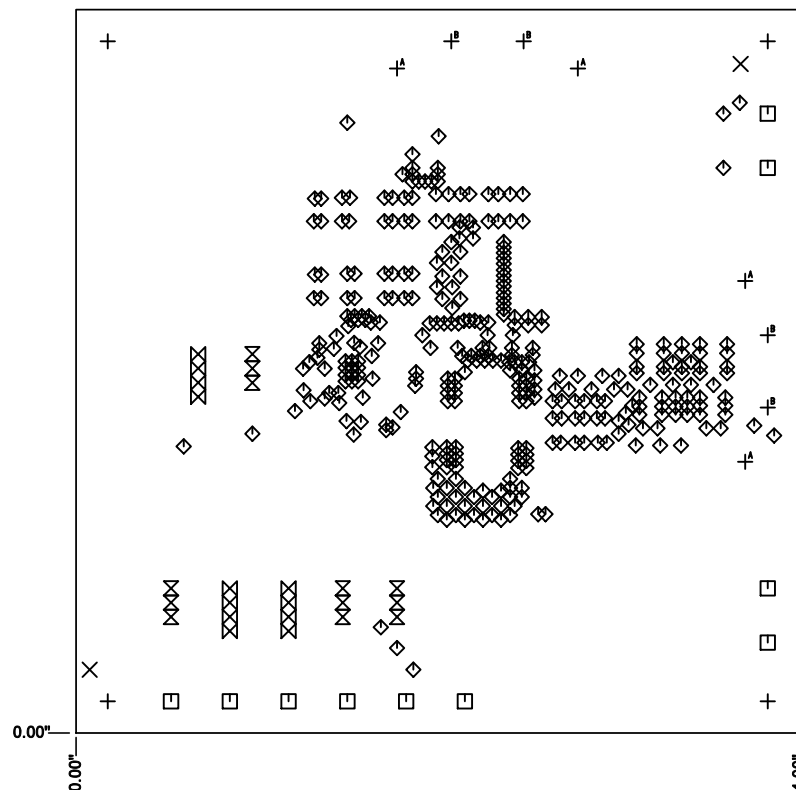
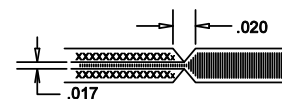
REVISION HISTORY				
ECO	REV	DESCRIPTION	APPR	DATE
-	3	PRODUCTION	MM	06-06-16

LAYER STRUCTURE




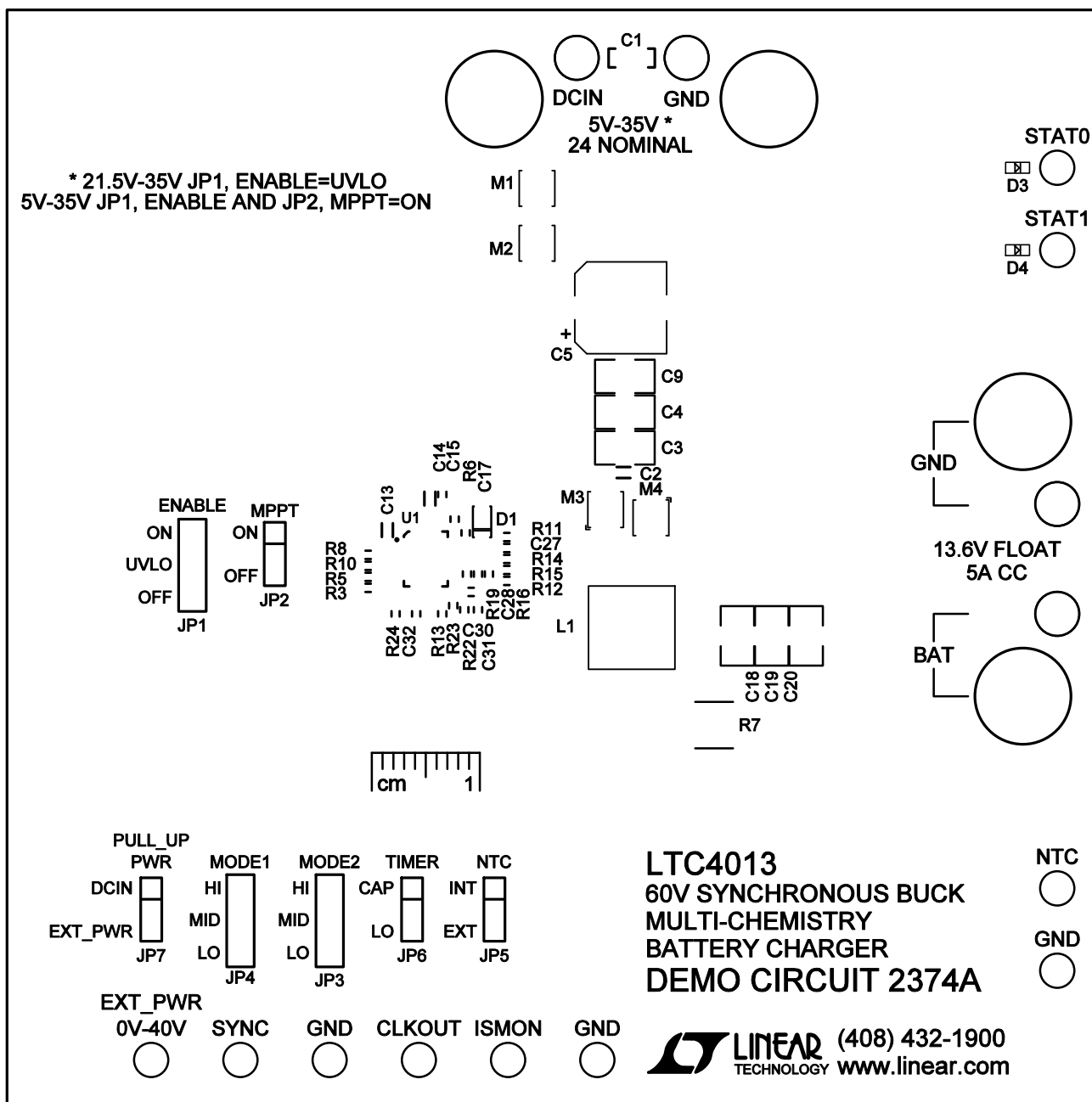
NOTES: UNLESS OTHERWISE SPECIFIED

- FAB PER IPC-A-600.
- MATERIAL: -LEAD FREE ASSEMBLY COMPLIANT, ISOLA FR-370HR OR EQUIVALENT.
-FINISHED THICKNESS TO BE 0.062" +/- .005"
-TOTAL OF 4 LAYERS WITH 2 OZ. CU ON THE OUTER LAYERS
AND 2 OZ. CU ON THE INNER LAYERS.
-FLAMMABILITY RATING: 94 V-O MINIMUM.
- SIZE: CUT TO DIMENSIONS AND TOLERANCES SHOWN.
0.00 ARE PRIMARY DATUMS.
- DRILLING: -DRILL HOLES PER SCHEDULE. PLATE THROUGH
HOLES WITH COPPER, 0.001" THICK MIN.
-ALL HOLE SIZES ARE SPECIFIED AFTER PLATING.
-HOLE LOCATION TOLERANCES ARE +/-0.003"
IN RELATION TO CENTER
- FINISH: -SMOBC USING LPI BOTH SIDES, COLOR GREEN. TENT BOTH SIDES.
-GOLD IMMERSION BOTH SIDES.
-FOR SILKSCREEN: BOTH SIDES USE WHITE NON-CONDUCTIVE INK.
- DO NOT ALTER ARTWORK e.g. TO ADD LOGO OR DATE CODE.
PAD SIZE CAN BE MODIFIED TO MEET END FINISH.
- PCBS ARE TO BE RoHS COMPLIANT.
- DO NOT ALTER SOLDER MASK MAINTAIN .003" OVERSIZE
ON SMT PADS. A .003" WEBBING IS REQUIRED BETWEEN SMD PADS.
- SCORING FOR PANELIZED PCB: "PRODUCTION FAB ONLY"

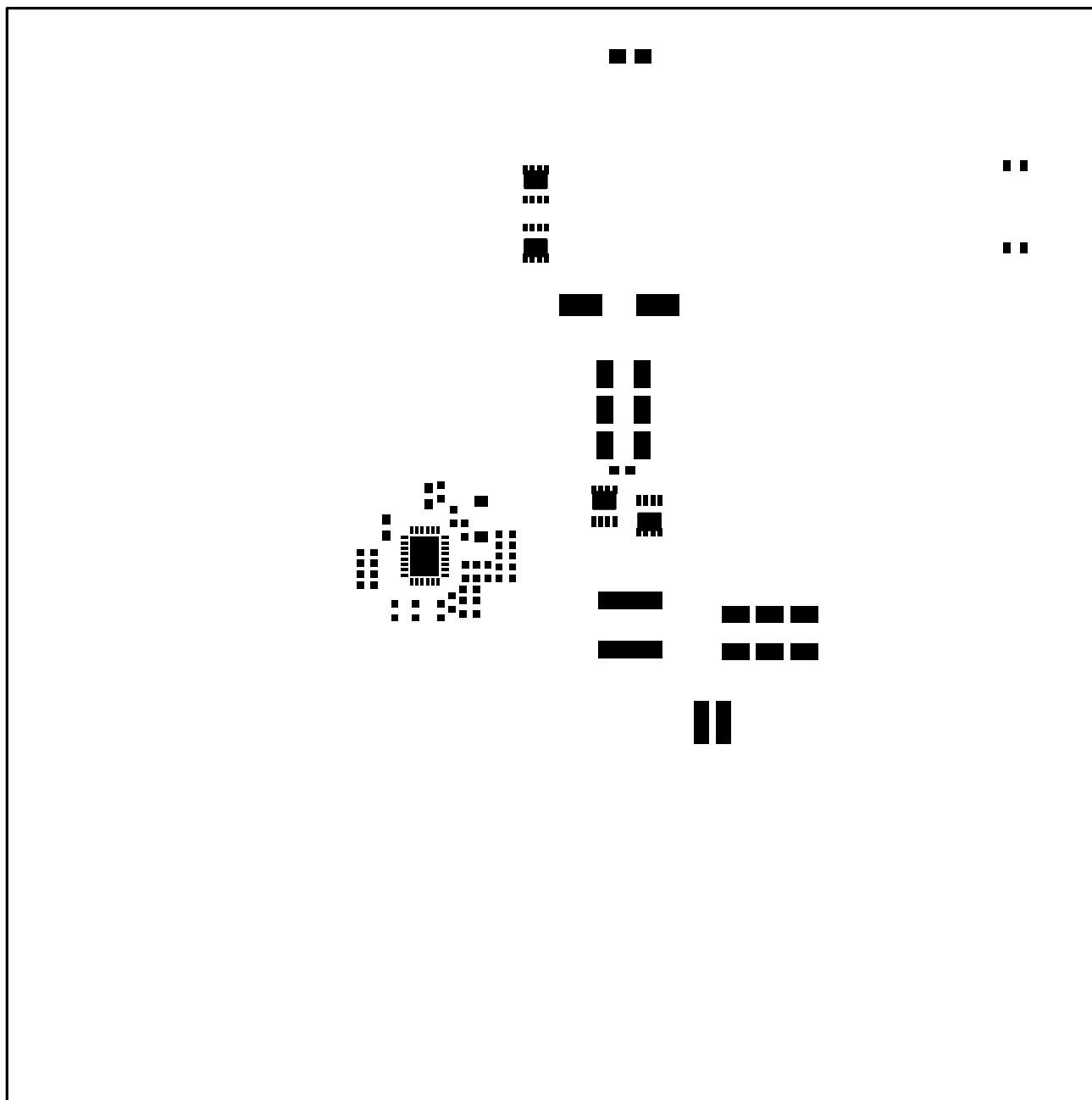


SIZE	QTY	SYM	PLATED	TOL
0.01	352	◇	YES	+/-0.003
0.031	12	⊗	YES	+/-0.003
0.037	12	⊗	YES	+/-0.003
0.063	10	□	YES	+/-0.003
0.07	2	×	NO	+/-0.003
0.094	4	⊕	YES	+/-0.003
0.19	4	⊕	YES	+/-0.003
0.205	4	⊕	YES	+/-0.003

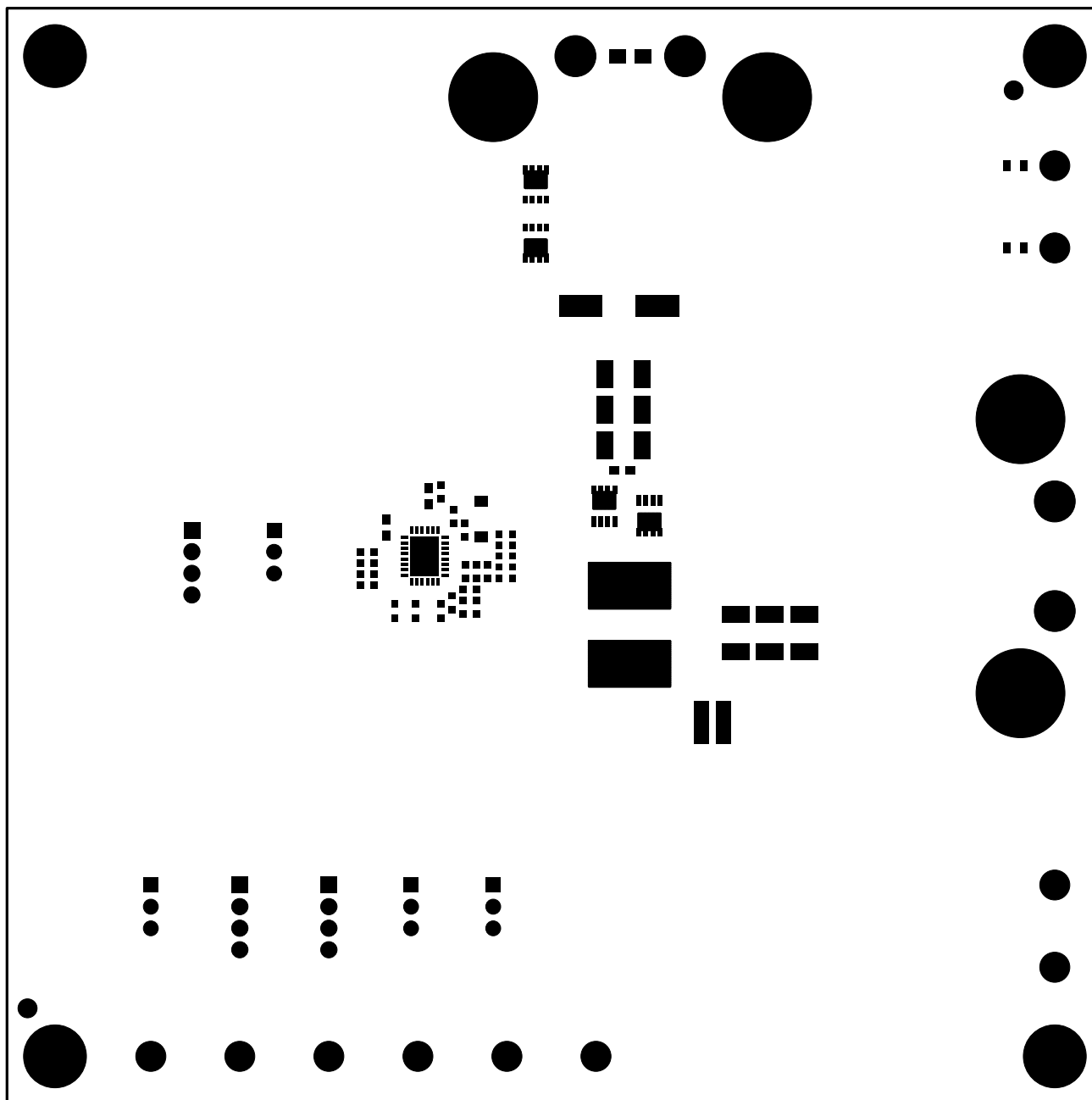
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON ANGLE 1° 0.300° = 0.011° 0.300° = 0.005° INTERPRET DIM AND TOL PER ASME Y14.5M-1994	APPROVALS		TECHNOLOGY 1630 MCCARTHY BLVD MILPTAS, CA 95035 PH: (408)432-1900 www.Lthwr.com LTC CONFIDENTIAL- FOR CUSTOMER USE ONLY		
	PCB DES.	NC			
	APP ENG.	MM			
THIRD ANGLE PROJECTION			TITLE: FABRICATION DRAWING: 60V SYNCHRONOUS BUCK MULTI-CHEMISTRY BATTERY CHARGER		
			SIZE	IC NO. LTC4013EUF	REV.
			N/A	DEMO CIRCUIT 2374A	3
DO NOT SCALE DRAWING	SCALE: NONE				SHT 1 of 1



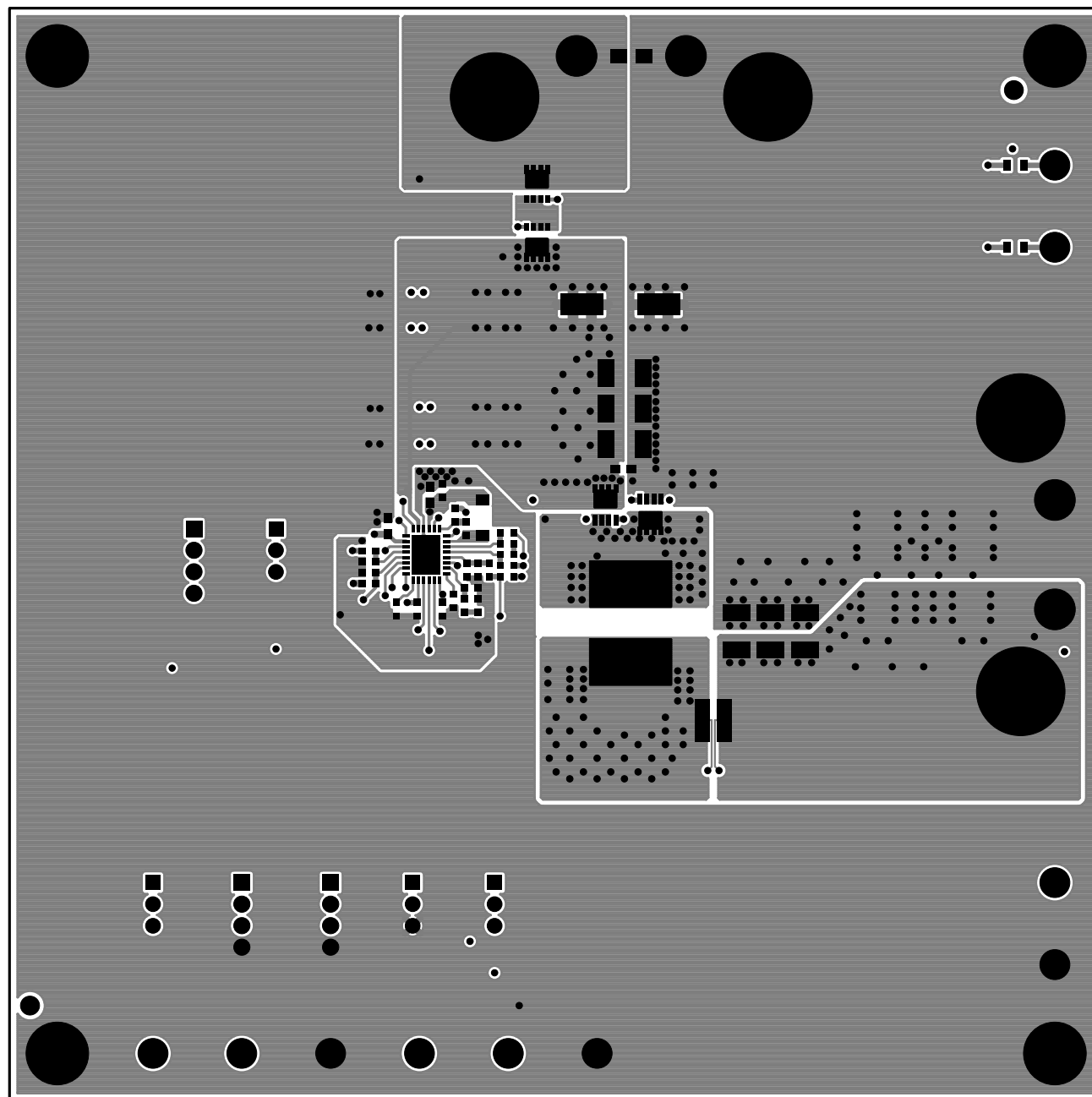
TOP SILKSCREEN
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



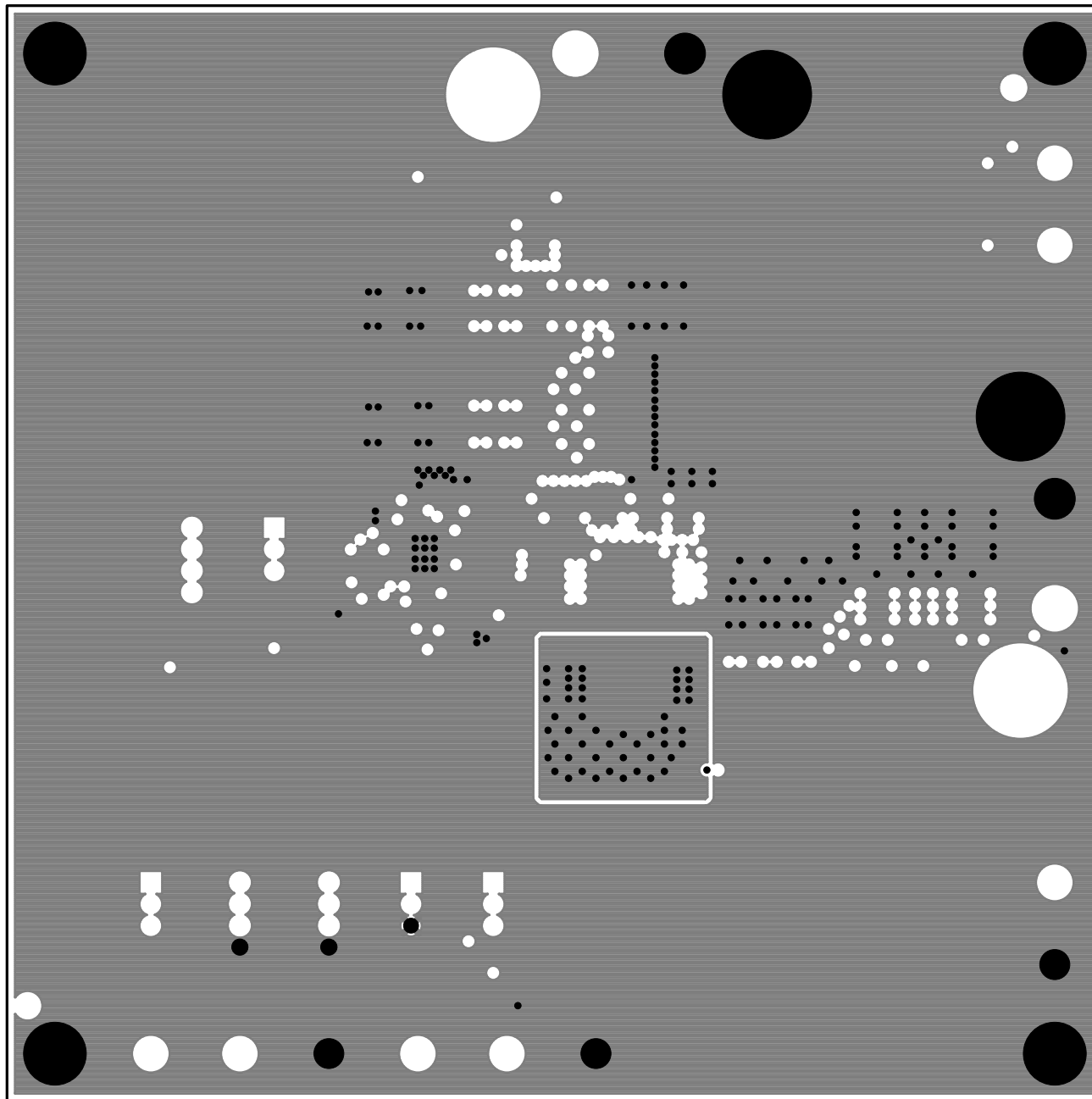
TOP SOLDER PASTE
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



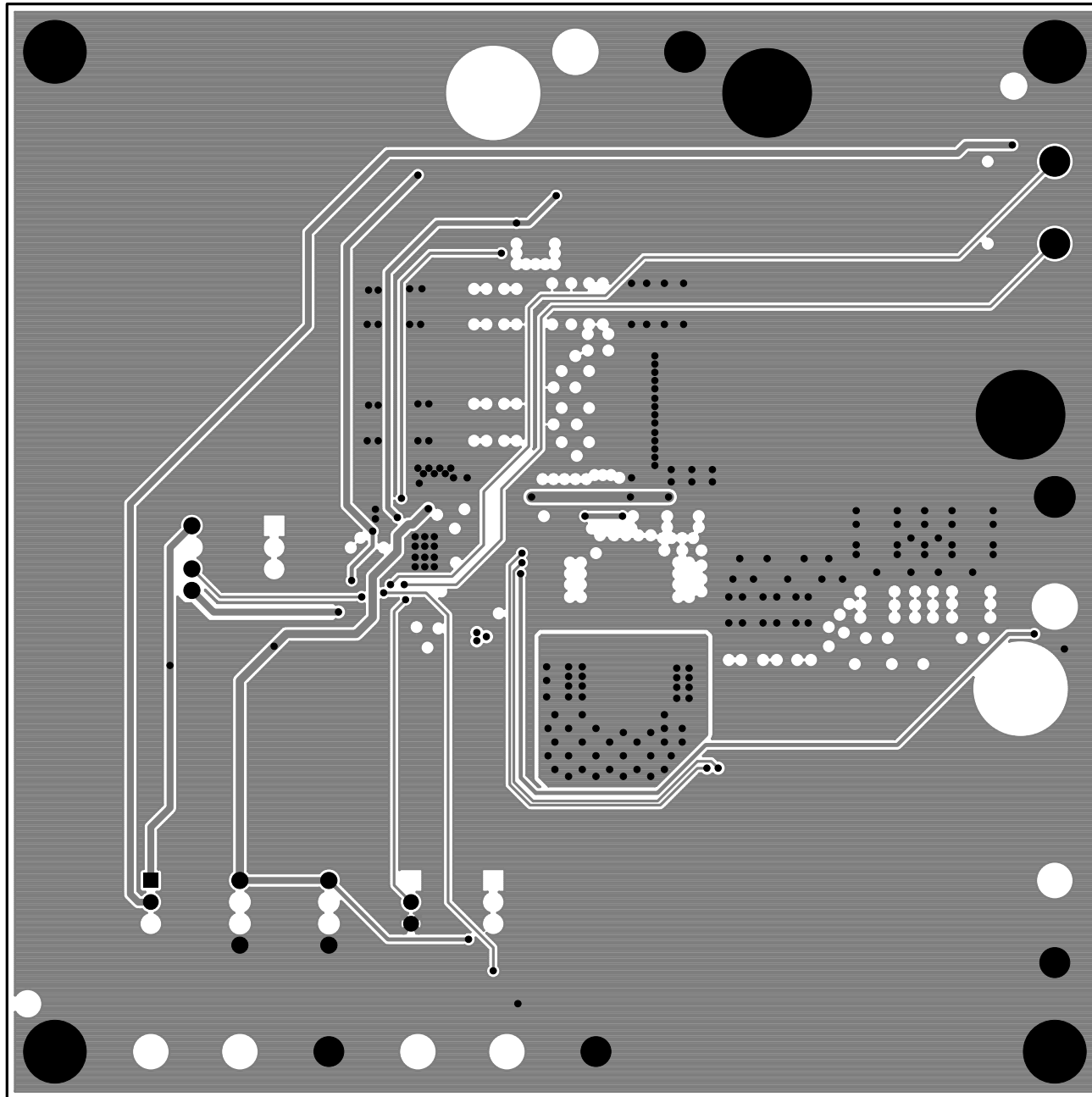
TOP SOLDER MASK
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



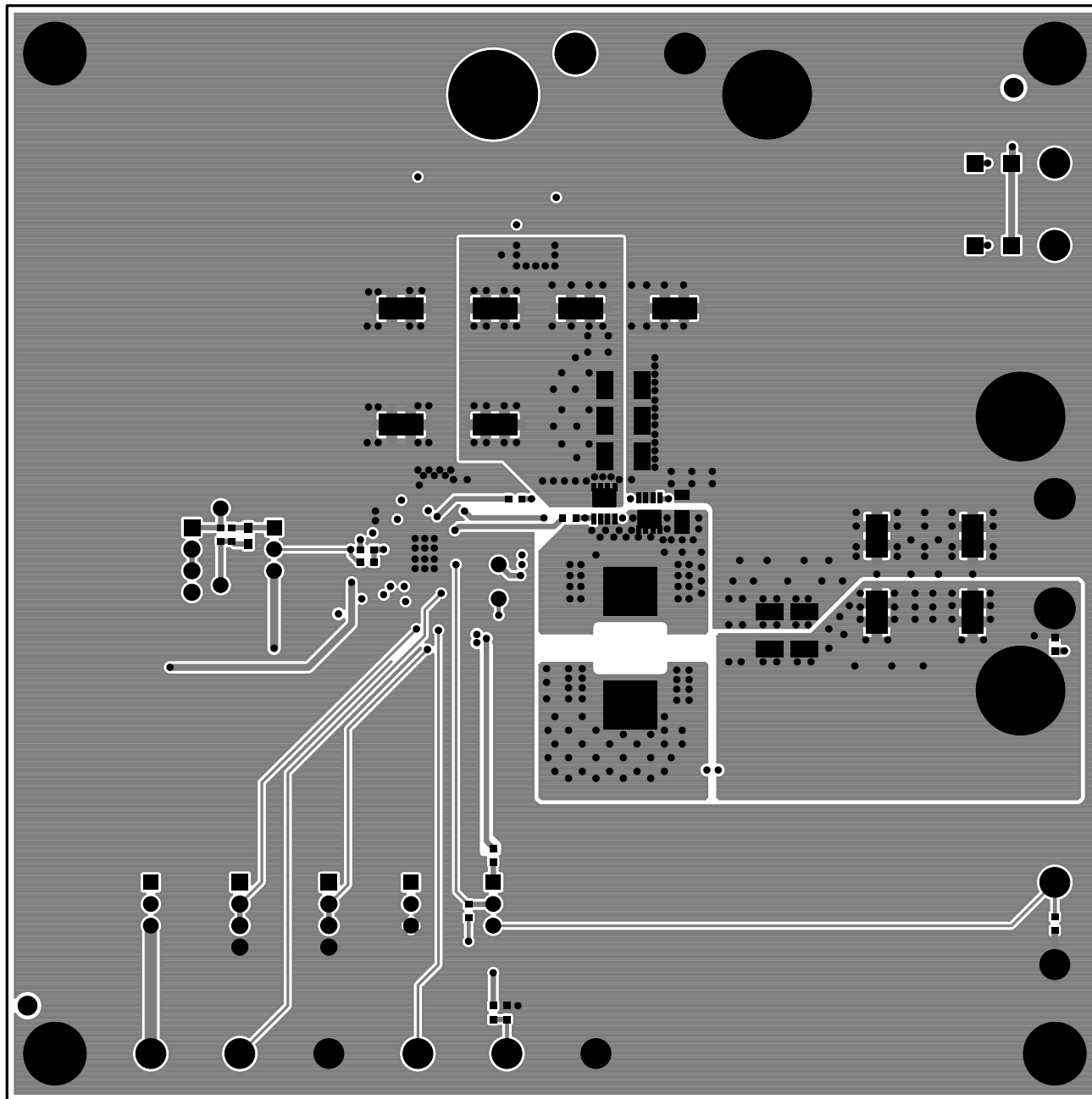
LAYER 1 - TOP SIDE
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



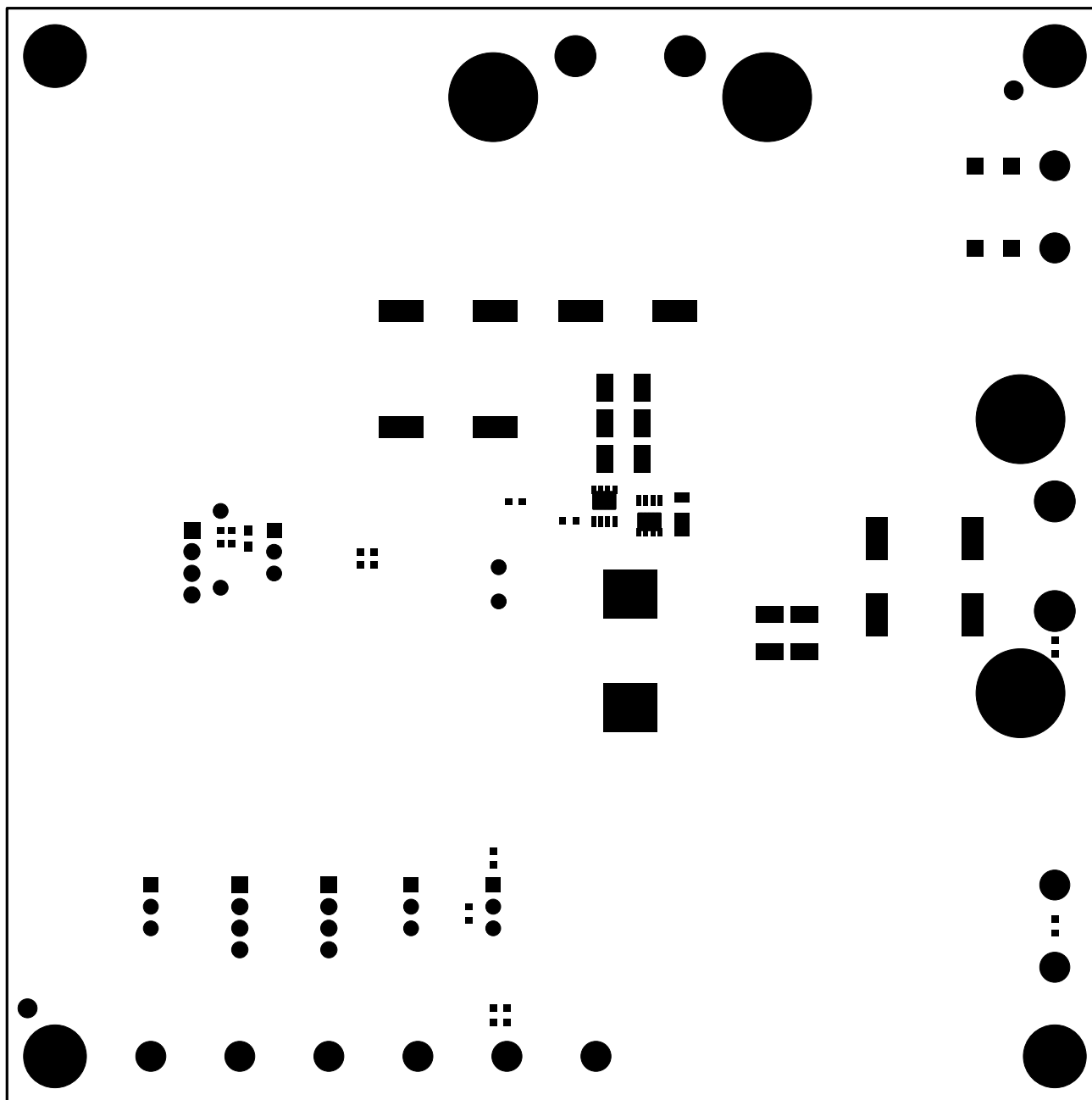
LAYER 2 - GND PLANE
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



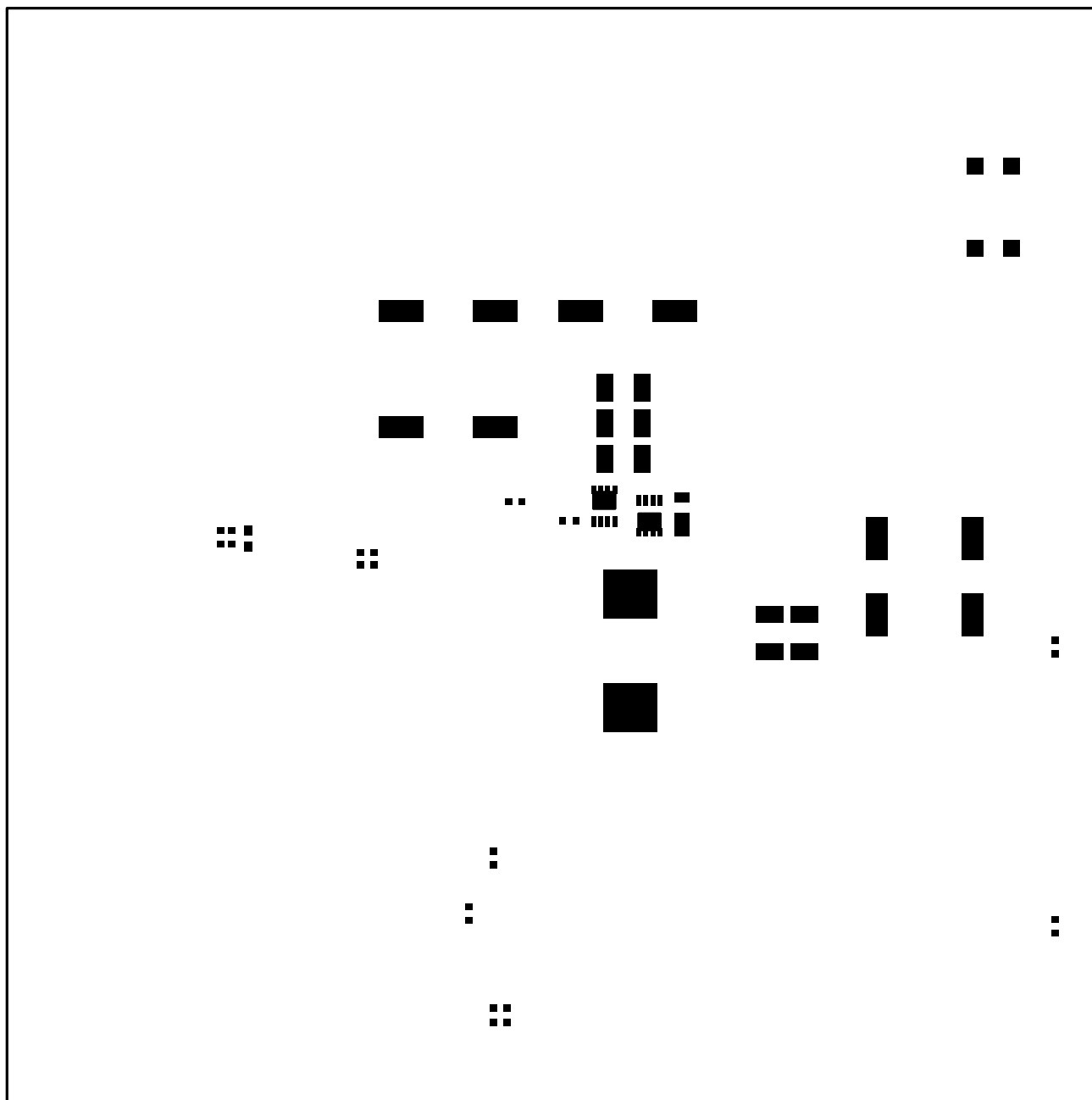
LAYER 3 - SIGNAL/PLANE
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



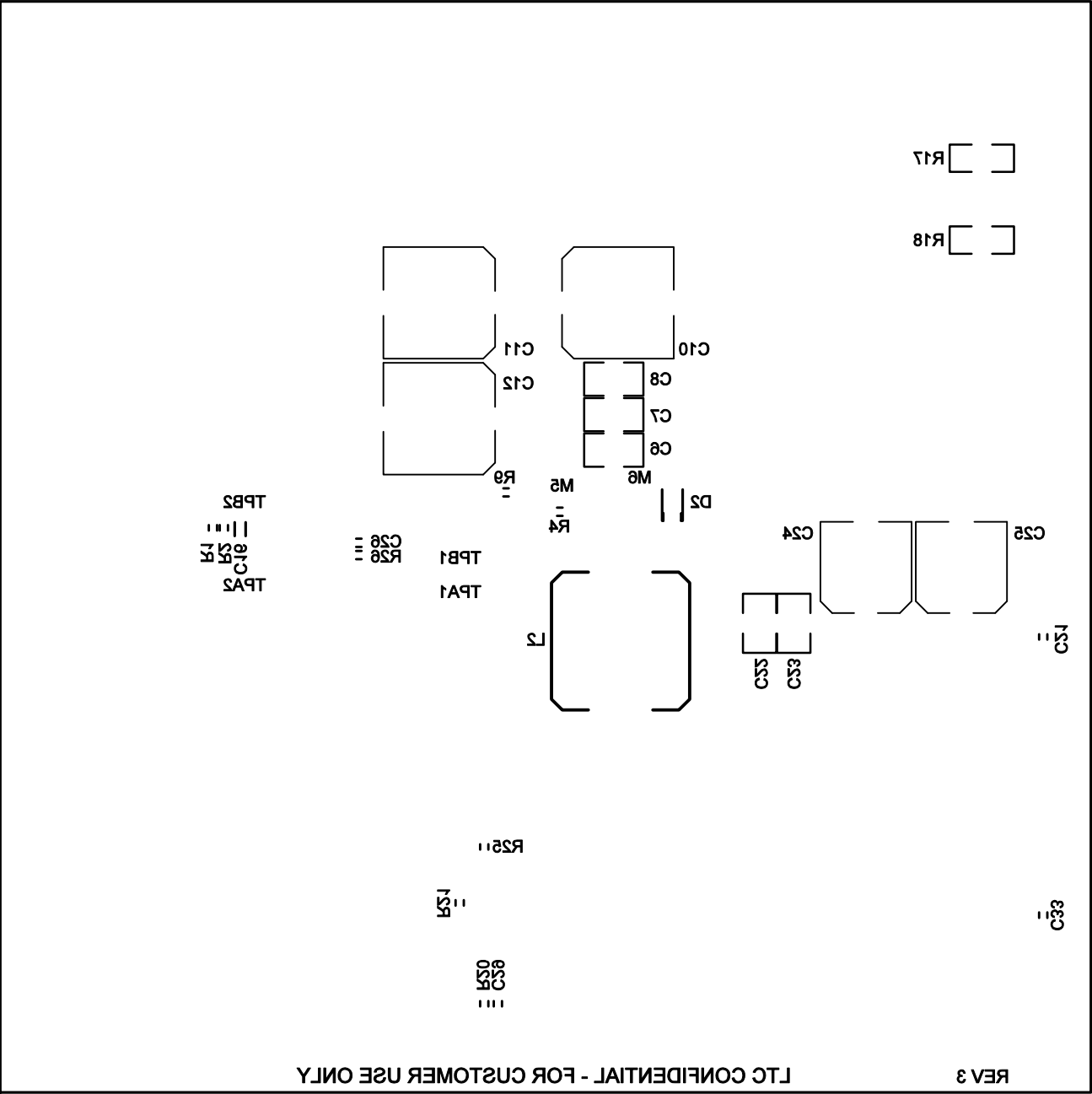
LAYER 4 - BOTTOM SIDE
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



BOTTOM SOLDER MASK
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



BOTTOM SOLDER PASTE
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
06-06-16



BOTTOM SILKSCREEN
LINEAR TECHNOLOGY
DEMO CIRCUIT 2374A-3 * LTC4013
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