

DESCRIPTION

Demonstration circuit DC1259A is a single-battery battery-backup controller featuring the LTC4110. The LTC4110 controller provides all the features and functions to offer a complete standalone battery-backup system. The LTC4110 is scalable with other LTC4110s to allow a larger battery array for increased capacity and/or redundancy.

A SMBus interface is offered to allow host communications in control and status and/or support Smart Batteries. However, no host is required to use the LTC4110. An on-board LTC1694 SMBus accelerator is used to provide 3.3V pull-up power and fast rise times of the bus for maximum speed and reliability.

From the factory, the DC1259A is configured for a 12.6V Li-ion Smart Battery in charge and discharge. The battery is connected to the BAT terminal. However, the Demoboard can be easily configured for a Standard Battery as well. Set JP1 to INT to allow batteries without a thermistor pin to be charged.

Note: If you use a standard battery, it is strongly recommended you have the final production version of the battery provide an extra pin to support the NTC/thermistor pin. This will allow the LTC4110 to:

- 1) Detect the physical presence of the battery and optionally report it to a host.
- 2) Start a complete charge cycle from the beginning including safe recovery of an over-discharged battery.
- 3) Allow the battery terminals to be 0V when no battery is present.

All the pin does inside the battery is connect a 300 ohm resistor (Li-ion) or a 10K NTC to Battery (B-) per the Smart Battery Standards. For more information, contact the factory.

Smart Batteries offer an integrated, high-accuracy gas gauge report allowing the host system to know exactly the state of charge of the battery at all times. Smart Batteries are the battery packs found on all mainstream notebooks made today. If you wish to try an industry

standard Smart Battery that plugs-and-plays with the Demoboard, we recommend you contact Inspired Energy: <http://www.inspired-energy.com/>

If the battery you're using is not 12.6V Li-ion, the Demoboard provides jumper options to support other chemistries and cell stack voltages. Consult the Schematic and Datasheet for more information.

Power input is connected to the DCIN terminal. The recommended input power is $12V \pm 5\%$ at 1.4A minimum up to 7A maximum as required to power the load. To successfully perform a calibration test, a 1.7A load on the VSYS or DCOUT terminals must be connected and turned on.

The battery backed load is to be connected to the DCOUT terminal. The VSYS terminal is optional and intended for loads that are NOT battery backed up. Why a VSYS connection? R1 exist as part of the Calibration protection system that looks for insufficient load current to support calibration safely. See datasheet for more information.

The Calibration feature of the LTC4110 allows one to test load the battery without generating any heat. The Fly-back converter is used in reverse as a current source dumping current back into the DCIN supply. The DCIN supply simply sees a reduction in load current.

The 3 GPIO pins are initially defined to be STATUS pins on power up. JP4 can be used to change them to be Hi-Z state on power up until programmed by the host.

The optional DC1223A-B SMBUS to USB port adapter along with the associated "QuickEval" software is used to automatically download IDs over the internet to program the LTC4110. The software will allow one to control, monitor and data-log the system and battery status for demonstration purposes only. You DO NOT need this software to run the DC1259A. Contact your LT representative for ordering a DC1223A-B.

Design files for this circuit board are available. Call the LTC factory.

QUICK START GUIDE FOR DEMONSTRATION CIRCUIT DC1259A

BATTERY BACKUP MANAGER BOARD

Table 1. Performance Summary

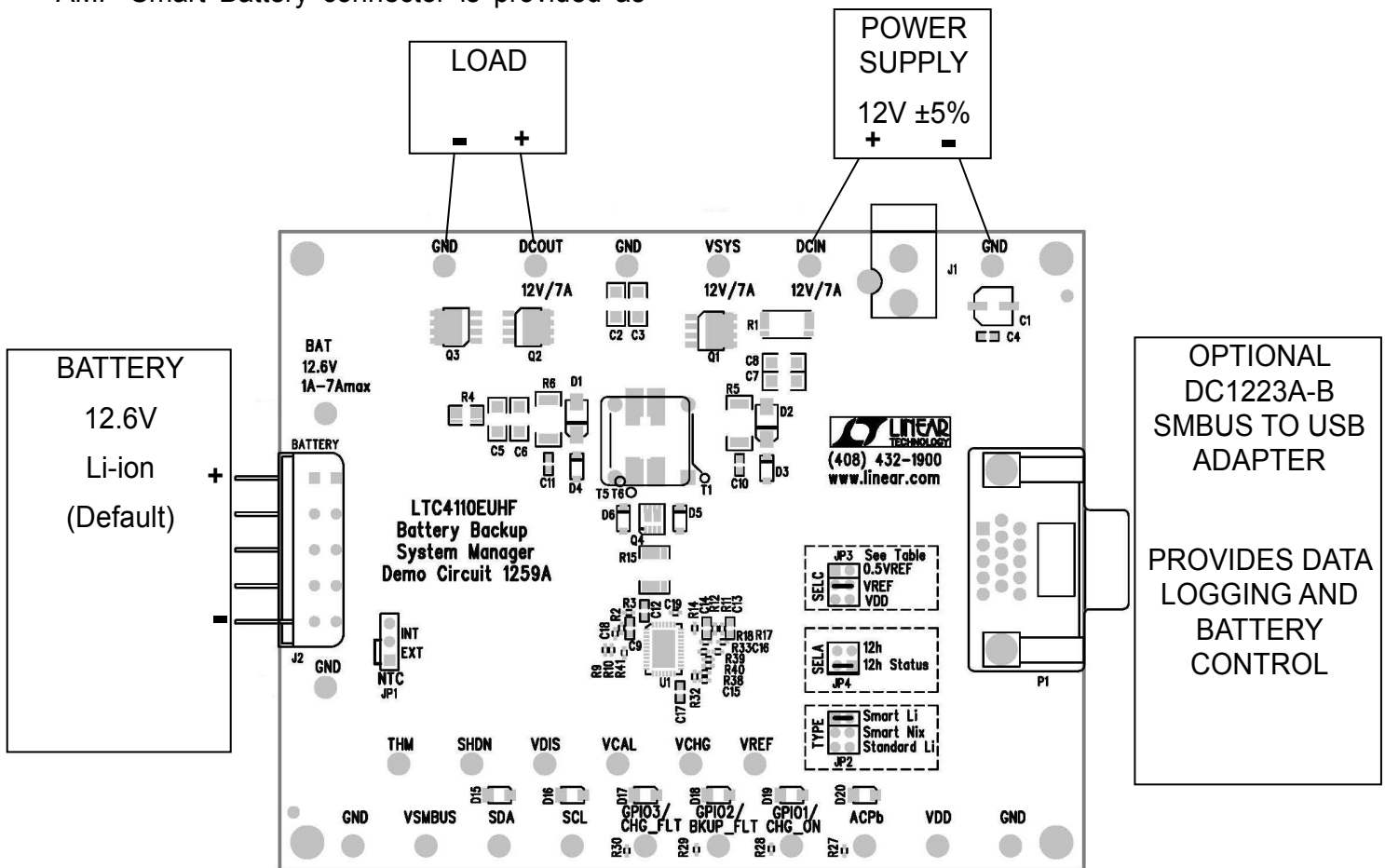
Parameter	Conditions/Notes	Value
DCIN Input Voltage Range	19V Abs Max.	12V± 5%
DCIN Trip voltage (Falling)		10.2V± 2.5%
DCIN Trip voltage (Rising)		11.2V± 2.5%
DCIN Hysteresis (Rising)	Set by R73. C29 used as a low pass filter for noise rejection.	+1V
DCIN minimum Current for Chg Only		1.4A
DCIN Minimum Current	Current needed for charge and calibration test.	3.1 A
Maximum Load Current	VSYS + DCOUT	7A
Minimum Load Current for Calibration	VSYS + DCOUT Load current > 0.65A (DCIN min) + 1A Cal Current.	1.7A
Battery Chemistry Select/Type	Preset for Smart Li-ion per JP2	Smart Li-ion
Battery Charge Voltage	Preset for 3 cells per JP3: Vchg = GND	12.6V±0.5%
Battery Charge Current	Full-scale Current as set by Ichg and R4	1A± 3.3%
Battery Discharge Cutoff Voltage	Set by Vdis pin. 2.9V/Cell.	8.7V± 2%
Calibration Discharge Cutoff Voltage	Set by Vcal pin. 2.9V/Cell.	8.7V± 2%
Calibration Discharge Current	Full-Scale Current as set by Ical and R4	1A ± 3.3%
Calibration DCIN Min load current Shdn	Cal Fault Min DCIN Current Shutdown. (Detected by R1)	0.5A ± 30%
Calibration DCIN OVP Shutdown Rising	Cal Fault OVP Shutdown voltage. (Detected by DCDIV)	13.2V
SMBus Address	Smart Battery Default. Adjustable.	12h
Power Up GPIO Mode	Preset per JP4	Status
SMBus voltage (internal)	Removing R62 allows external power of VSMBUS terminal.	3.3V
ACPb Delay on power up.	Delay in ACPb being asserted after DCDIV detection. Set by C18.	21ms
Max Bulk Charge Time allowed.	Set by Vref load current and C17. See datasheet.	6.7Hours
NTC/Battery Detection	Set per JP1 to detect the presence of a Smart Battery when plugged in.	EXT

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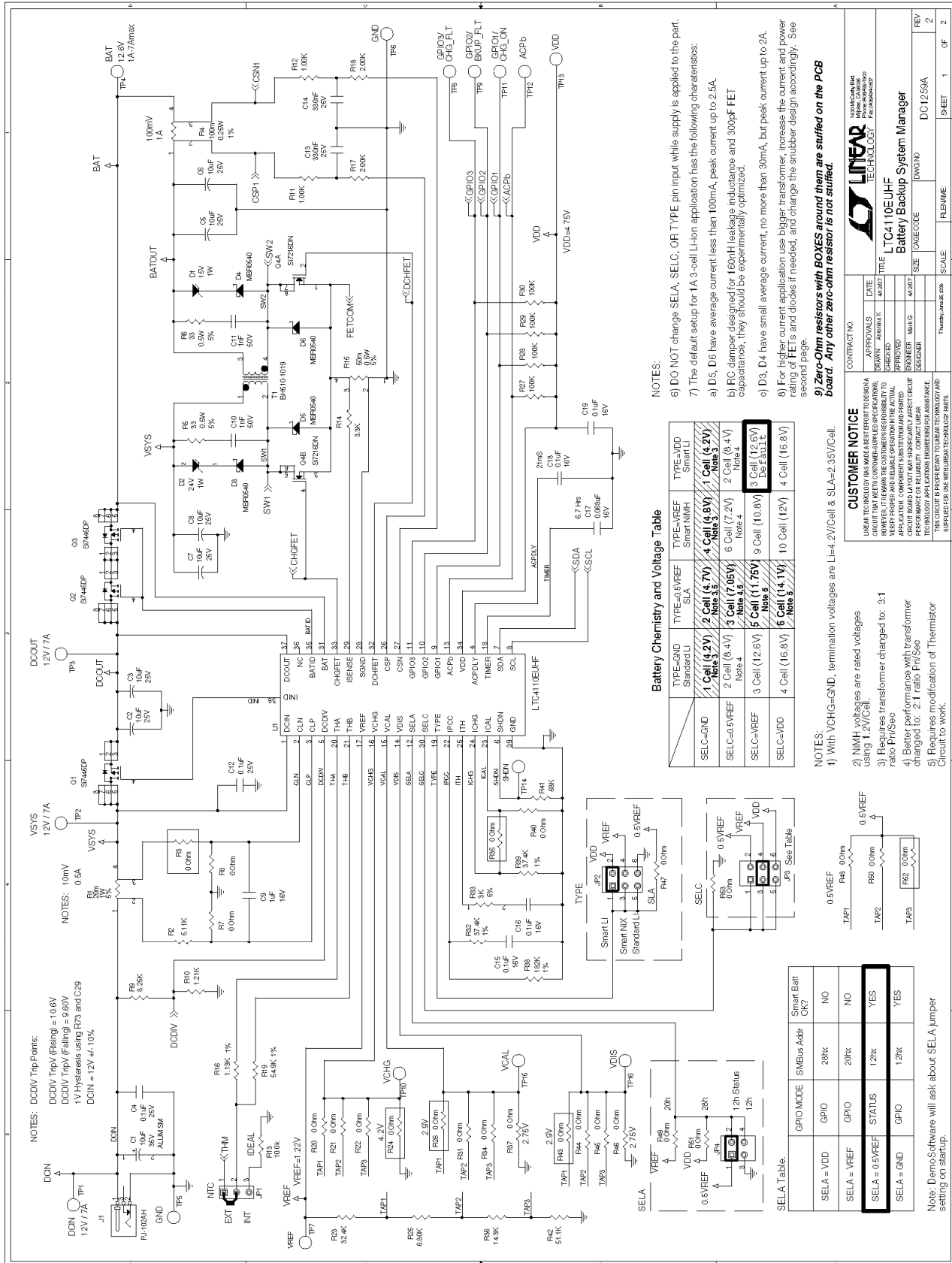
BATTERY BACKUP MANAGER BOARD

QUICK START PROCEDURE

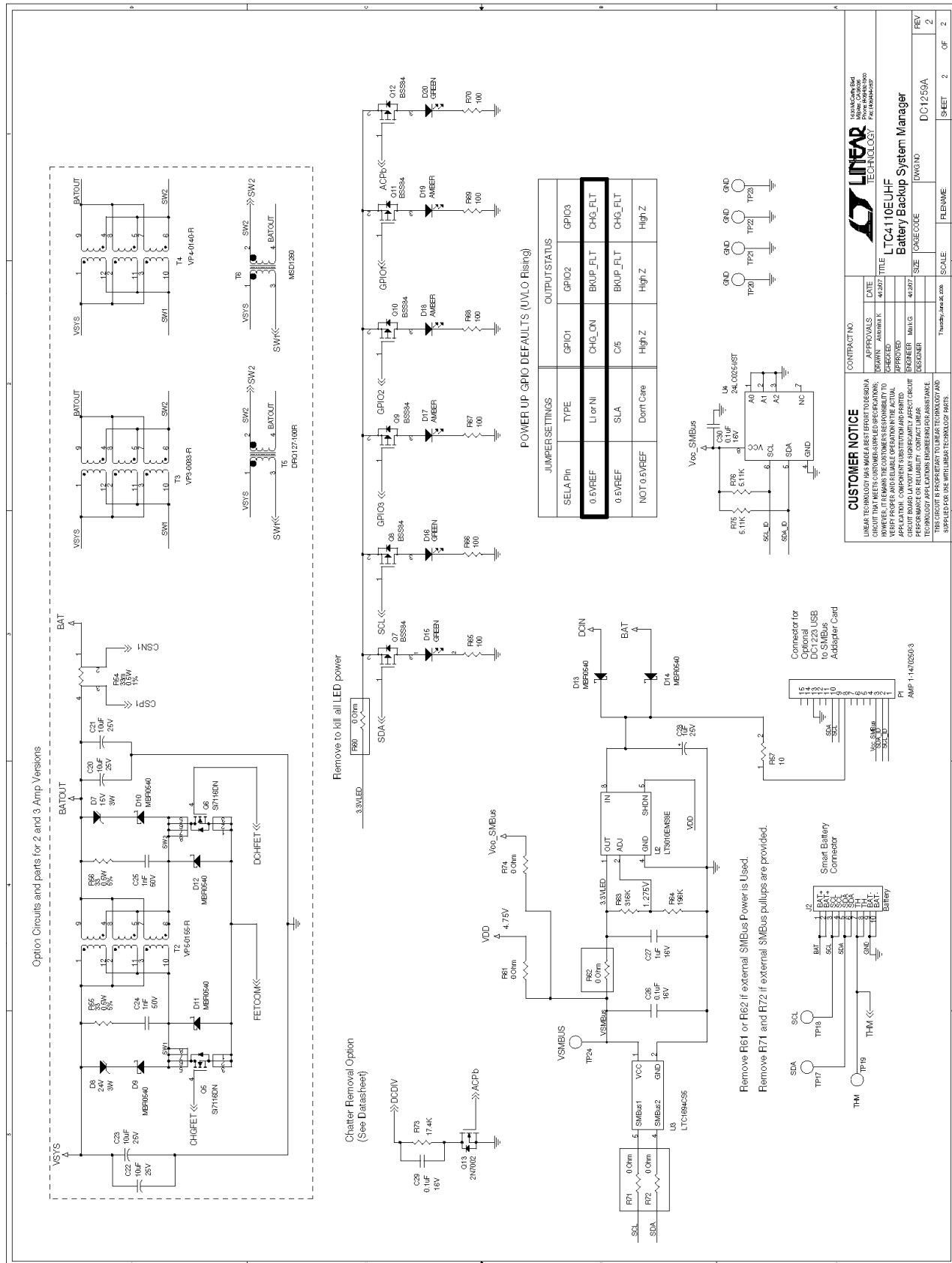
1. Connect a properly rated power source to DCIN terminals J1 or terminals labeled DCIN and GND.
2. Optionally connect a load to DCOUT and GND terminals.
3. Configure the jumpers for your specific battery.
4. Plug in the battery. Industry standard 5 Pin AMP Smart Battery connector is provided as well as generic soldering Test Points for hard-wire connections.
5. Turn on the input power supply.
6. Optionally use the provided DC1223A-B demonstration software to control and configure the DC1259A.



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Parts List

Linear Technology Corporation
LTC4110EUHF

Item	Qty	Reference	Part Description	Manufacturer / Part #
REQUIRED CIRCUIT COMPONENTS				
6	C2,C3,C5-C8		CAP.,SM,X5R,10uF,25V,10%,1206	Murata, GRM31CR6C106KA88L
1	C12		CAP.,X7R,0.1uF,10%,25V,0603	AVX, 06033C104KAT2A
1	C9		CAP.,X7R,1uF,10%,16V,0603	Murata, GRM188R71C105KA12D
2	C10,C11		CAP.,X7R,1nF,10%,50V,0603	AVX, 06035C102KAT2A
2	C13,C14		CAP.,X5R,0.33uF,10%,25V,0603	Taiyo Yuden, TMK107Bj334KA-T
4	C15,C16,C18,C19		CAP.,X5R,0.1uF,10%,16V,0402	AVX, 0402YD104KAT2A
1	C17		CAP.,X7R,68nF,10%,16V,0603	AVX, 0603YC683KAT2A
1	C29		CAP.,X7R,0.1uF,10%,10V,0402	MURATA, GRM155R61A104KA01
1	D1		DIODE, zener, 15V, SMA	Diodes Inc., SMAZ15-13-F
1	D2		DIODE, zener, 24V, SMA	Diodes Inc., SMAZ24-13-F
4	D3-6		DIODE, schottky, MBR05401G, SOD123	ON Semi., MBR0540T1G
3	Q1,Q2,Q3		Mosfet,P-Chan, Si7445DP, PPAK, SO-8	Vishay, Si7445DP-T1-E3
1	Q4		Mosfet,N-Chan,Si7216DN,PPAK-1212-DUAL	Vishay, Si7216DN-T1-E3
1	Q13		Transistor, N-Chan, 2N7002, SOT-23	Fairchild, Semi., 2N7002
1	T1		Trans, L10-1019	BH Electronics, L10-1019
1	U1		I.C., LTC4110EUHF, QFN38	Linear Tech., LTC4110EUHF
1	R1		Res.,sense, 20m, 5%, 2512, KELVIN	Panasonic, ERJ-M1WSJ20MU
1	R2		Res.,chip, 5.11K, 1%, 1/10W, 0402	VISHAY, CRCW04025K11FKED
1	R4		Res.,sense 100m, 1%, 0.25W1206, KELVIN	Panasonic, ERJ-8RSFR10V
2	R5,R6		Res.,chip, 33, 0.5W, 5%, 2010	Panasonic, ERJ-12ZYJ330U
1	R9		Res.,chip, 8.87K, 1%, 1/16W, 0402	VISHAY, CRCW04028K87FKED
1	R10		Res.,chip, 1.21K, 1%, 1/16W, 0402	VISHAY, CRCW04021K21FKED
2	R11,R12		Res.,chip, 1.00K, 1%, 1/16W, 0402	VISHAY, CRCW04021K00FKED
1	R14		Res.,chip, 3.32K, 1%, 1/16W, 0402	VISHAY, CRCW04023K32FKED
1	R15		Res.,sense,50m, 1%, 0.5W, 1812, KELVIN	Panasonic, ERJ-L12KF50MU
1	R16		Res.,chip, 1.13K, 1%, 1/16W, 0402	VISHAY, CRCW04021K13FKED
2	R18,R17		Res.,chip, 2.00K, 1%, 1/16W, 0402	VISHAY, CRCW04022K00FKED
1	R19		Res.,chip, 54.9K, 1%, 1/16W, 0402	VISHAY, CRCW040254K9FKED
1	R23		Res.,chip, 32.4K, 1%, 1/16W, 0402	VISHAY, CRCW040232K4FKED
1	R25		Res.,chip, 6.80K, 1%, 1/16W, 0402	VISHAY, CRCW04026K80FKED
4	R27,R28,R29,R30		Res.,chip, 100K, 1%, 1/16W, 0402	VISHAY, CRCW0402100KFED
2	R32,R39		Res.,chip, 37.4K, 1%, 1/16W, 0402	VISHAY, CRCW040237K4FKED
1	R33		Res.,chip, 3K, 1%, 0402	VISHAY, CRCW04023K00FKED
1	R36		Res.,chip, 14.3K, 1%, 1/16W, 0402	VISHAY, CRCW040214K3FKED
1	R38		Res.,chip, 182K, 1%, 1/16W, 0402	VISHAY, CRCW0402182KFED
1	R41		Res.,chip, 68K, 1%, 0402	VISHAY, CRCW040268K0FKED
1	R42		Res.,chip, 51.1K, 1%, 1/16W, 0402	VISHAY, CRCW040251K1FKED
1	R73		Res.,chip, 19.6K, 1%, 0402	VISHAY, CRCW040219K6FKED

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Linear Technology Corporation
LTC4110EUHF

ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS			
1	C1	CAP., ALUM, 10uF, 35V, 20%, AECAP-C35V	SANYO., 35CE10AX
1	C4	CAP., X7R, 0.1uF, 10%, 25V, 0603	AVX, 06033C104KAT2A
1	C27	CAP., X7R, 1uF, 10%, 16V, 0603	Murata, GRM188R71C105KA12D
0	C24, C25	CAP., X7R, 1nF, 10%, 50V, 0603	AVX, 06035C102KAT2A
2	C26, C30	CAP., X5R, 0.1uF, 10%, 16V, 0402	AVX, 0402YD104KAT2A
1	C28	CAP., TANT, 1uF, 10%, 25V, size A	AVX, TAJA105K025R
0	C20-C23	CAP., SM, X5R, 10uF, 25V, 10%, 1206	Murata, GRM31CR6C106KA88L
0	D7	DIODE, zener, 15V, SMA	Diodes Inc., SMAZ15-13-F
0	D8	DIODE, zener, 24V, SMA	Diodes Inc., SMAZ24-13-F
0	D9-D12	DIODE, schottky, MBR05401G, SOD123	ON Semi., MBR0540T1G
2	D13-D14	DIODE, schottky, MBR05401G, SOD123	ON Semi., MBR0540T1G
3	D15, D16, D20	LED, GREEN, LN1351C, 4V, 15mA	Panasonic, LN1351CTR
3	D17, D18, D19	LED, AMBER, LN1451C, 4V, 15mA	Panasonic, LN1451CTR
1	JP1	0.079, single row header, 3PIN	SAMTEC, TMM103-02-L-S
2	JP2, JP3	0.079, dual row header, 3x2	SAMTEC, TMM103-02-L-D
1	JP4	0.079, dual row header, 2x2	SAMTEC, TMM102-02-L-D
4	JPX1-JPX4	Shunt, 0.079	SAMTEC, 2SN-BK-G
1	J1	CONN, DC POWER JACK, T/H, PJ-102AH	CUJ INC., CUJ-PJ-102AH (PBF)
1	J2	Right-Angle Header, Keyless, 787441-1	Tyco Electronics, 5787441-1 (PBF)
1	P1	15 position, right angle t/h con.,	Tyco Electronics, 1-1734530-3
0	Q6, Q5	Mosfet, N-Chan, SI7116DN, PPAK-1212-8	Vishay, SI7116DN-T1-E3
6	Q7, Q8, Q9, Q10, Q11, Q12	Transistor, P-Chan, BSS84, SOT-23	Diodes Inc., BSS84-F
0	T2	Trans, VP5-0155-R	Cooper Bussmann, VP5-0155-R
0	T3	Trans, VP3-0083-R	Cooper Bussmann, VP5-0083-R
0	T4	Trans, VP4-0140-R	Cooper Bussmann, VP4-0140-R
0	T5	Trans., DRQ127-100-R	Coiltronics, DRQ127-100-R
0	T6	Trans., MSD1260-183ML	CoilCraft, MSD1260-183ML
1	U2	I.C., LT3010EMS8E, MS8E	Linear Tech., LTC3010MS8E
1	U3	I.C., LTC1694CS5#TRPBF, TSOT23-5	Linear Tech., LTC1694CS5#TRPBF
1	U4	I.C., 24LC025-I/ST, TSSOP-8	Microchip, 24LC025-I/ST
2	R3, R35	Res., chip, 0 Ohm, 0402	VISHAY, CRCW04020000Z0ED
0	R7, R8, R40	DO NOT INSTALL 0402	
1	R13	Res., chip, 10.0k, 1%, 1/16W, 0603	VISHAY, CRCW060310K0FKED
0	R20, R21, R22, R31, R34, R37	DO NOT INSTALL 0603	
8	R24, R26, R43, R52	Res., chip, 0 Ohm, 0603	VISHAY, CRCW06030000Z0EA
	R60, R62, R71, R72,		
	R51, R53, R61, R74		

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ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS		
0	R54	Res., sense, 33m, 1%, 0.5W, 1206, KELVIN
0	R55,R56	Res., chip, 33, 0.5W, 5%, 2010
1	R57	Res., chip, 10, 1%, 0402
1	R63	Res., chip, 316K, 1%, 0603
1	R64	Res., chip, 196K, 1%, 0603
6	R65,R66,R67,R68,R69,R70	Res., chip, 100, 1%, 0603
2	R75,R76	Res., chip, 5.11K, 1%, 1/10W, 0402
HARDWARE FOR DEMO BOARD ONLY		
24	TP1-TP24	Testpoint, turret, 0.063"
4	MTGS AT 4 CORNERS	STANDOFF, NYLON .5 1/2"
		MILL MAX, 2308-2-00-80-00-00-07-0
		KEYSTONE, 8833 (SNAP-ON)