QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 620
HIGH CURRENT QUAD OUTPUT SWITCHING REGULATORS FOR TFT-LCD PANELS

LT1943

DESCRIPTION

Demonstration circuit 620 is a quad output power supply intended for use in large TFT-LCD panels. The circuit features the LT®1943 high current quad-output switching regulator and generates a 3.3V logic supply along with the triple output supply required for the TFT-LCD panels. With an input voltage range of 8V to 20V, a step down regulator provides 3.3V V_{LOGIC} with up to 2A current; a high power SEPIC converter, a lower power boost converter and an inverting converter provide three independent output voltages AV_{DD}, V_{ON} and V_{OFF} required by the LCD panels. A high side PNP provides delayed turn on of the V_{ON} signal and can source up to 30mA at 30V.

All four switchers are synchronized to the internal 1.2MHz clock, allowing the use of low profile inductors and ceramic capacitors. They all have soft-start to limit start-up inrush current.

Long wires run from input sources (such as wall adaptors) can cause large voltage spikes during initial plug-in. C17 is installed on DC620 to damp the possible voltage spikes. C17 is not required for applications when input source is close to the regulator. Please refer to Application Note 88 for details.

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

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Table 1. Performance Summary (T_A = 25°C unless otherwise noted)

PARAMETER	CONDITION	VALUE
Minimum Input Voltage	-40°C to 85°C	8V
Maximum Input Voltage	-40°C to 85°C	20V
Output Voltage V_{LOGIC}	V_{IN} = 8V to 20V, I_{OUT} = 0A to 2A	3.3V ±3%
Maximum Output Current at V_{LOGIC}	V_{IN} = 8V to 20V (Note 1)	2A
Typical Output Ripple V_{LOGIC}	V_{IN} = 12V, load at V_{LOGIC} = 2A (20MHz BW)	23mV_{P-P}
Typical Output Ripple AV_{DD}	V_{IN} = 12V, load at AV_{DD} = 500mA (20MHz BW)	64mV_{P-P}
Typical Switching Frequency		1.2MHz
On/Off Control	Logic Low Voltage-Off, -40°C to 85°C	0.4V MAX
	Logic High Voltage-On	2.4V MIN

Note 1: 2A maximum output current is guaranteed when V_{OFF} is unloaded. Since V_{OFF} is supplied from V_{LOGIC}, the load at V_{OFF} reduces the available current at V_{LOGIC}. More output current is available at higher input voltage. Please refer to the LT1943 data sheet for output current vs. input voltage curve.

QUICK START PROCEDURE

Demonstration circuit 620 is easy to set up to evaluate the performance of the LT1943. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

NOTE: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the

probe tip directly across the V_{IN} or V_{OUT} and GND terminals. See Figure 2 for proper scope probe technique.

1. Make sure the input voltage does not exceed 20V. With power off, connect the input power supply to V_{IN} and GND.
2. Turn on the power at the input.
3. Check for the proper output voltages. If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
4. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

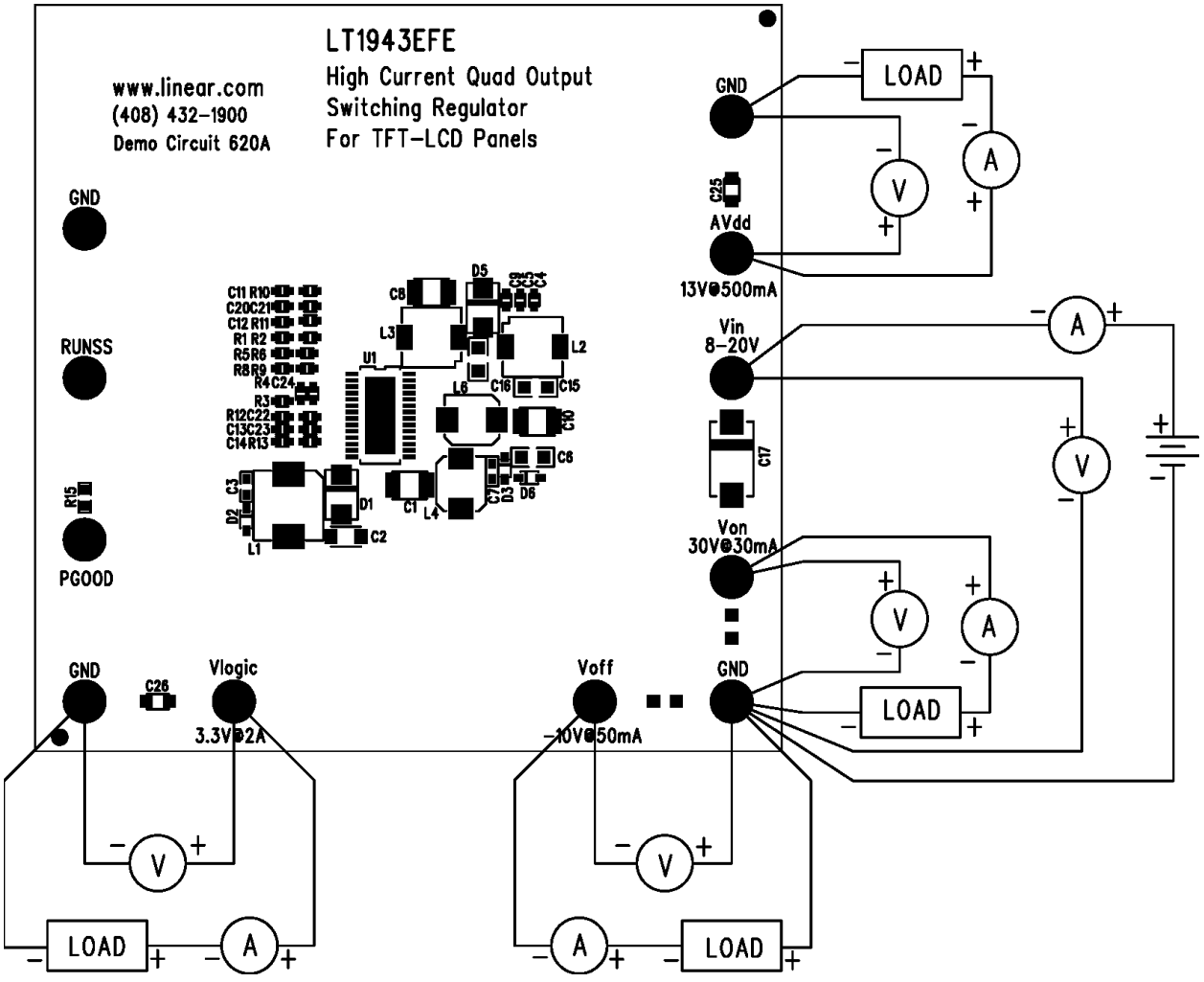


Figure 1. Proper Measurement Equipment Setup

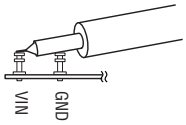
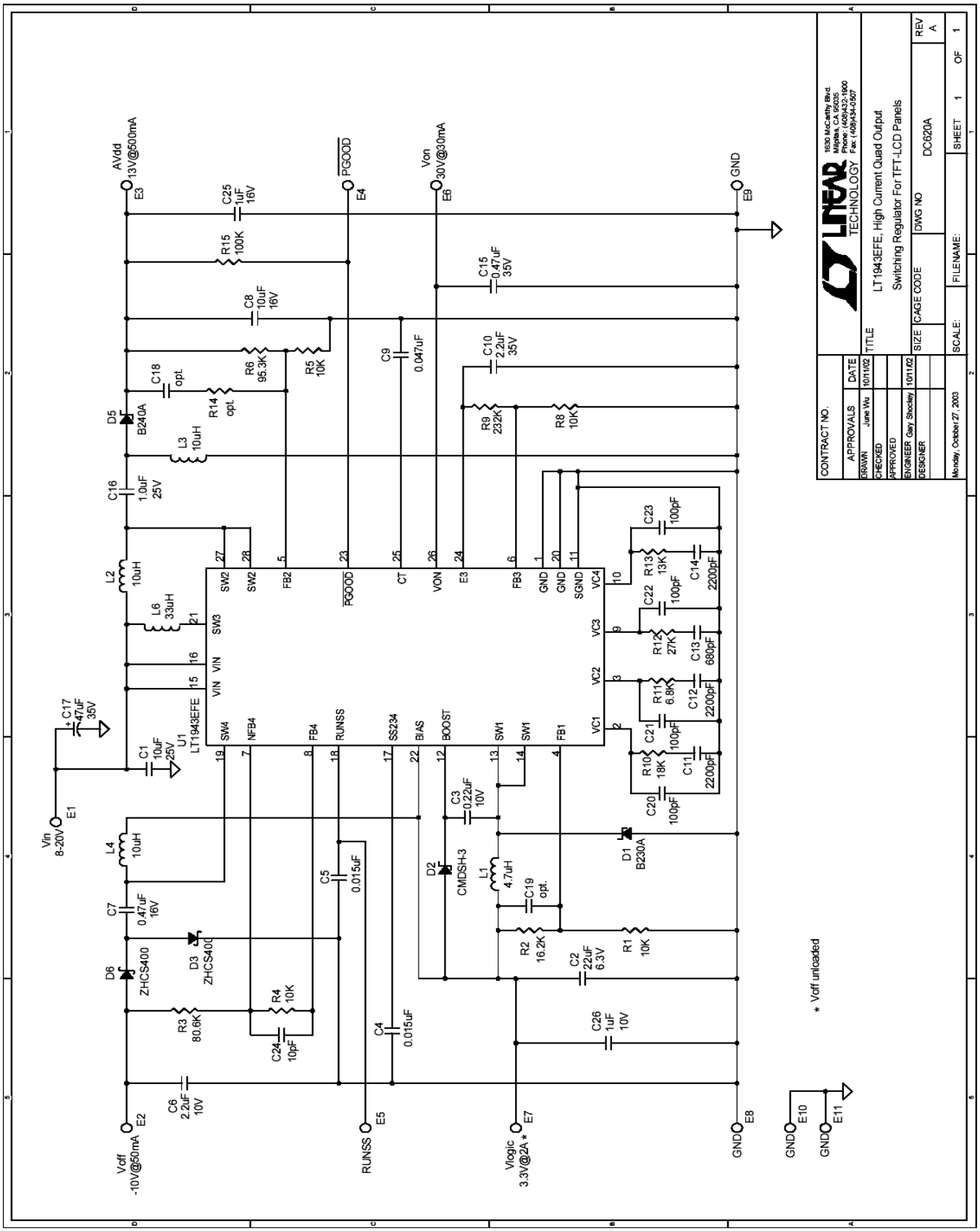
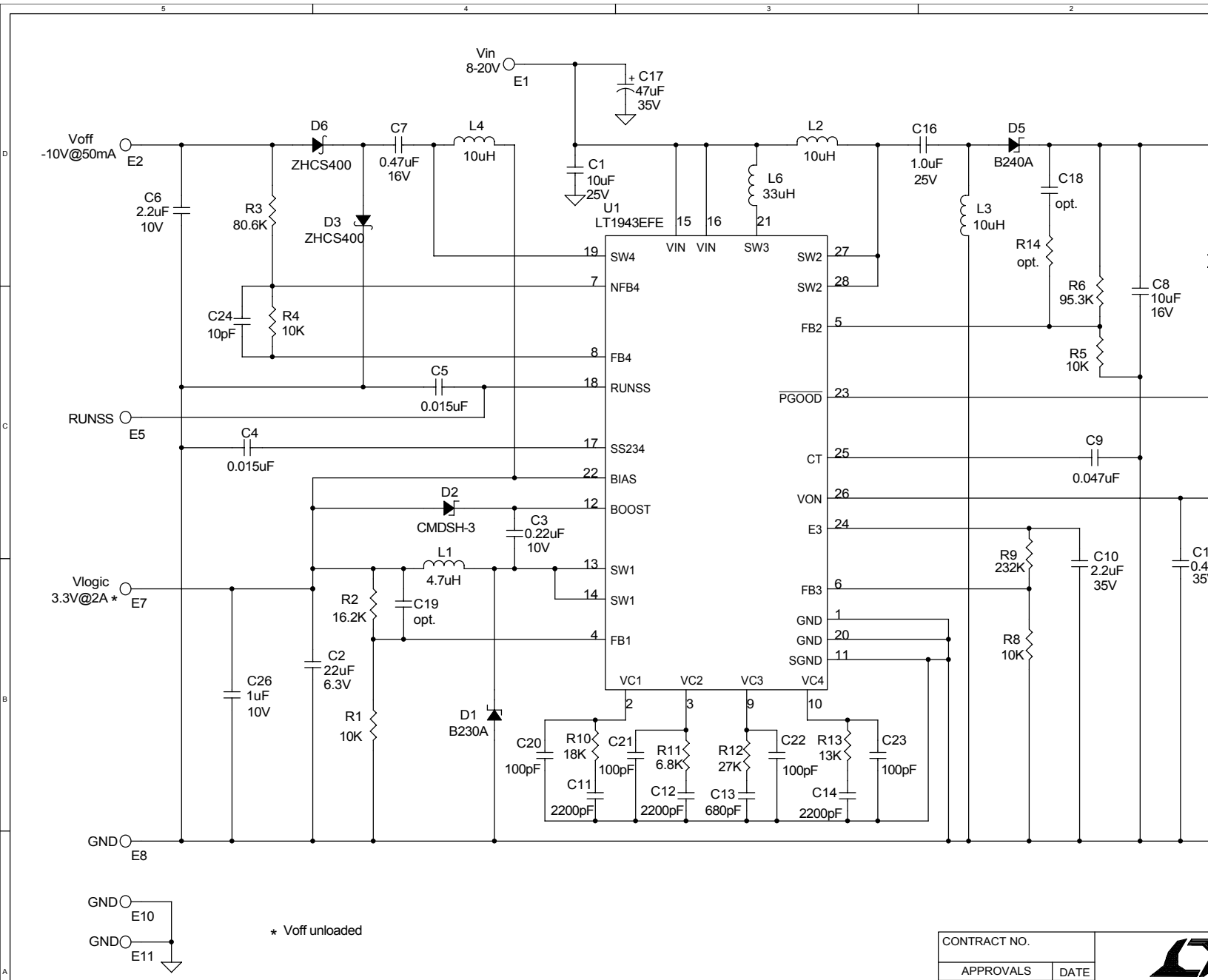


Figure 2. Measuring Input or Output Ripple


AVdd
13V@500mA
E3
C25
1uF
16V
PGOOD
E4
Von
30V@30mA
E6
GND
E9
R15
100K
C15
0.47uF
35V
C8
10uF
16V
C18
opt.
R14
opt.
R6
95.3K
R5
10K
C9
0.047uF
C10
2.2uF
35V
D5
B240A
L3
10uH
R9
232K
R8
10K
C16
1.0uF
25V
L2
10uH
L6
33uH
U1
LT1943EFE
SW4
NFB4
FB4
RUNSS
SS234
BIAS
BOOST
SW1
FB1
VC1
VC2
VC3
VC4
SGND
GND
FB3
VON
CT
PGOOD
FB2
SW2
SW3
VIN
C23
100pF
R13
13K
C14
2200pF
C22
100pF
R12
27K
C13
680pF
R11
6.8K
C12
2200pF
C21
100pF
R10
18K
C11
2200pF
C20
100pF
C17
47uF
35V
C1
10uF
25V
Vin
8-20V
E1
C3
0.22uF
10V
D1
B230A
L4
10uH
C7
0.47uF
16V
D2
CMDSH-3
L1
4.7uH
C19
opt.
C5
0.015uF
D6
ZHCS400
D3
ZHCS400
R4
10K
R3
80.6K
C24
10pF
R2
16.2K
R1
10K
C2
22uF
6.3V
C4
0.015uF
C26
1uF
10V
C6
2.2uF
10V
Voff
-10V@50mA
E2
RUNSS
E5
Vlogic
3.3V@2A *
E7
GND
E8
GND
E10
GND
E11
* Voff unloaded
CONTRACT NO.
APPROVALS
DRAWN June Wu 10/1/02
CHECKED
APPROVED
ENGINEER Gary Stockley 10/1/02
DESIGNER
Monday, October 27, 2003
DATE
TITLE
LT1943EFE, High Current Quad Output
Switching Regulator For TFT-LCD Panels
SIZE
CAGE CODE
DWG NO
DC620A
REV
A
SCALE:
FILENAME:
SHEET 1 OF 1
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
Fax: (408)434-0507



* Voff unloaded

CONTRACT NO.		
APPROVALS	DATE	
DRAWN June Wu	10/11/02	TITLE LT194 Switch
CHECKED		
APPROVED		
ENGINEER Gary Shockey	10/11/02	SIZE CAGE CODE
DESIGNER		
Friday, September 12, 2003		SCALE: FILE

Linear Technology Corporation

LT1943EFE

Item	*Qty*	*Reference*	*Part Description*	*Manufacture / Pa*
1	1	C1	CAP., X5R, 10uF, 25V, 20% 1210	Taiyo Yuden, TMK325BJ10
2	1	C8	CAP., X5R, 10uF, 16V, 20% 1210	Taiyo Yuden, EMK325BJ10
3	1	C2	CAP., X5R, 22uF, 6.3V, 20% 1206	Taiyo Yuden, JMK316BJ22
4	1	C3	CAP., X7R, 0.22uF, 10V, 20% 0603	AVX, 0603ZC224MAT2A
5	2	C5,C4	CAP., X7R, 0.015uF, 16V, 20%, 0402	AVX, 0402YC153MAT2A
6	1	C6	CAP., X7R, 2.2uF, 10V, 10% 0805	MuRata, GRM21BR71A225
7	1	C7	CAP., X5R, 0.47uF, 16V, 20% 0603	AVX, 0603YD474MAT2A
8	1	C9	CAP., X5R, 0.047uF, 16V, 10% 0402	AVX, 0402YD473KAT2A
9	1	C10	CAP., X5R, 2.2uF, 35V, 20% 1210	Taiyo Yuden, GMK325BJ22
10	3	C11,C12,C14	CAP., X7R, 2200pF, 50V, 20% 0402	AVX, 04025C222MAT2A
11	1	C13	CAP., X7R, 680pF, 50V, 20% 0402	AVX, 04025C681MAT2A
12	1	C15	CAP., X5R, 0.47uF, 35V, 20% 0805	Taiyo Yuden, GMK212BJ47
13	1	C16	CAP., X5R, 1.0uF, 25V, 10% 0805	AVX, 08053D105KAT2A
14	1	C17	CAP., TANT, 47uF, 35V, 20% 7343	AVX, TAJE476M035R
15	4	C20-C23	CAP., X7R, 100pF, 50V, 20%, 0402	AVX, 04025C101MAT2A
16	0	C18,C19 (OPT.)	CAP., 0402	
17	1	C24	CAP., NPO, 10pF, 50V, 10% 0402	AVX, 04025A100KAT2A
18	1	C25	CAP., X5R, 1.0uF, 16V, 20% 0805	TAIYO YUDEN, EMK212BJ
19	1	C26	CAP., X7R, 1.0uF, 10V, 20% 0805	TAIYO YUDEN, LMK212BJ
20	1	D1	Schottky Barrier REC., B230A SMA	Diodes Inc., B230A
21	1	D2	Schottky Diode, CMDSH-3 SOD-323	CENTRAL SEMI., CMDSH-
22	2	D3,D6	Schottky Barries Dio., ZHCS400, SOD-323	ZETEX, ZHCS400
23	1	D5	Schottky Barrier REC., B240A SMA	Diodes Inc., B240A
24	11	E1-E11	TURRET,	MILL-MAX, 2501-2
25	1	L1	INDUCTOR, 4.7uH RLF7030	TDK, RLF7030T-4R7M3R4
26	2	L2,L3	INDUCTOR, 10uH SLF6028	TDK, SLF6028T-100M1R3
27	1	L4	INDUCTOR, 10uH RLF5018	TDK, RLF5018T-100MR94
28	1	L6	INDUCTOR, 33uH RLF5018	TDK, RLF5018T-330MR51
29	1	R10	RES., CHIP, 18K, 1/16W, 5% 0402	AAC, CR05-183JM
30	1	R11	RES., CHIP, 6.8K, 1/16W, 5% 0402	AAC, CR05-682JM
31	4	R1,R5,R8,R4	RES., CHIP, 10K, 1/16W, 1% 0402	AAC, CR05-1002FM
32	1	R12	RES., CHIP, 27K, 1/16W, 5% 0402	AAC, CR05-273JM
33	1	R13	RES., CHIP, 13K, 1/16W, 5% 0402	AAC, CR05-133JM
34	1	R2	RES., CHIP, 16.2K, 1/16W, 1% 0402	AAC, CR05-1622FM
35	1	R3	RES., CHIP, 80.6K, 1/16W, 1% 0402	AAC, CR05-8062FM
36	1	R6	RES., CHIP, 95.3K, 1/16W, 1% 0402	AAC, CR05-9532FM

Linear Technology Corporation

LT1943EFE

Item	*Qty*	*Reference*	*Part Description*	*Manufacture / Pa*
37	1	R9	RES., CHIP, 232K, 1/16W, 1% 0402	AAC, CR05-2323FM
38	1	R15	RES., CHIP, 100K, 1/16W, 5% 0603	AAC, CR16-104JM
39	0	R14 (OPT.)	RES., CHIP, 0402	
40	1	U1 (Tape & Reel)	I.C.LT1943EFE, TSSOP28FE	LINEAR., LT1943EFE
41	1		PRINTED CIRCUIT BOARD	DEMO CIRCUIT #620A

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