DESCRIPTION

Demonstration circuit 568 is a Dual Synchronous, 600mA, 1.5MHz Step-Down DC/DC Regulator featuring the LTC®3407. The DC568 has an input voltage range of 2.5V to 5.5V, and either output is capable of delivering up to 600mA of output current. In Burst Mode™ operation, the LTC3407 requires only 40 uA of quiescent current, and the DC568 provides higher efficiency at light load currents. In Pulse Skip mode, the DC568 provides lower output ripple voltage at light load currents. In either mode, the DC568 can provide up to 96% efficiency on either channel and consumes less than 1uA in shutdown. The LTC3407 comes in a small 10-Pin MS10E package, which has an exposed pad on the bottom-side of the IC for better thermal performance. These features, plus the nominal operating frequency of 1.5MHz (allowing the exclusive use of low profile surface mount components), make the DC568 demo board an ideal circuit for use in battery-powered, hand-held applications.

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

LTC and Burst Mode is registered trademark of Linear Technology Corporation.

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

PARAMETER	CONDITION	VALUE
Minimum Input Voltage		2.5V
Maximum Input Voltage		5.5V
Output Voltage V_{OUT1}	V_{IN} = 2.5V to 5.5V, I_{OUT1} = 0A to 600 mA	1.2V ±2% 1.5V ±2% 1.8V ±2%
Typical Output Ripple V_{OUT1}	V_{IN} = 5V, I_{OUT1} = 600 mA (20 MHz BW)	20mV_{P-P}
Output Regulation	Line	±1%
	Load	±1%
Output Voltage V_{OUT2}	V_{IN} = 2.5V to 5.5V, I_{OUT2} = 0A to 600 mA	2.5V ±2%
Typical Output Ripple V_{OUT2}	V_{IN} = 5V, I_{OUT2} = 600 mA (20 MHz BW)	20mV_{P-P}
Output Regulation	Line	±1%
	Load	±1%
Nominal Switching Frequency		1.5 MHz

QUICK START PROCEDURE

Demonstration circuit 568 is easy to set up to evaluate the performance of the LTC3407. 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. Connect the input power supply to the V_{IN} and GND terminals on the left-side of the board. Do not hot-plug V_{IN} or increase V_{IN} over the rated maximum supply voltage of 5.5V, or the part may be damaged. Connect the loads between the V_{OUT} and GND terminals on the right-side of the board. Refer to figure 1 for the proper measurement equipment setup.
2. Before proceeding to operation, insert jumpers JP1 and JP2 into the OFF positions, jumper JP3 into the $V_{OUT}1$ voltage position of choice (1.2V, 1.5V, and 1.8V), and jumper JP4 into the desired mode of operation: Pulse Skip or Burst Mode.
3. Apply 3.3V at V_{IN}. Measure both V_{OUT}s; they should read 0V. If desired, one can measure the shutdown supply current at this point. The supply current will be approximately 33 uA in shutdown, with roughly 32 uA due to the optional 100k• pull-up resistor of the Power-On Reset (POR) feature. This resistor can be removed, and the actual shutdown supply current can be measured, if the POR feature is not required.
4. Turn on $V_{OUT}1$ and $V_{OUT}2$ by changing jumpers JP1 and JP2 from the OFF position(s) to the ON position(s). Vary the input voltage from 2.5V to 5.5V and adjust each load current from 0 to 600mA. Both output voltages should be regulating.
5. Set the load current of both outputs between 200 mA and 600 mA, and measure both output ripple voltages; they should measure less than 20 mVAC each. Also, observe the voltage waveform at the switch node (pin 3) of each regulator. The switching frequencies should be between 1.2 MHz and 1.8 MHz (T = 0.833 us and 0.555 us), and each switch node waveform should be rectangular in shape.
6. To change the mode of operation, change jumpers JP1 and JP2 from the ON position(s) to the OFF position(s). Then change jumper JP4 to the alternative position. Re-insert jumpers JP1 and JP2 into the ON position(s). Observe the voltage waveform at both switch nodes.

When finished, insert jumpers JP1 and JP2 to the OFF position(s) and disconnect the power.

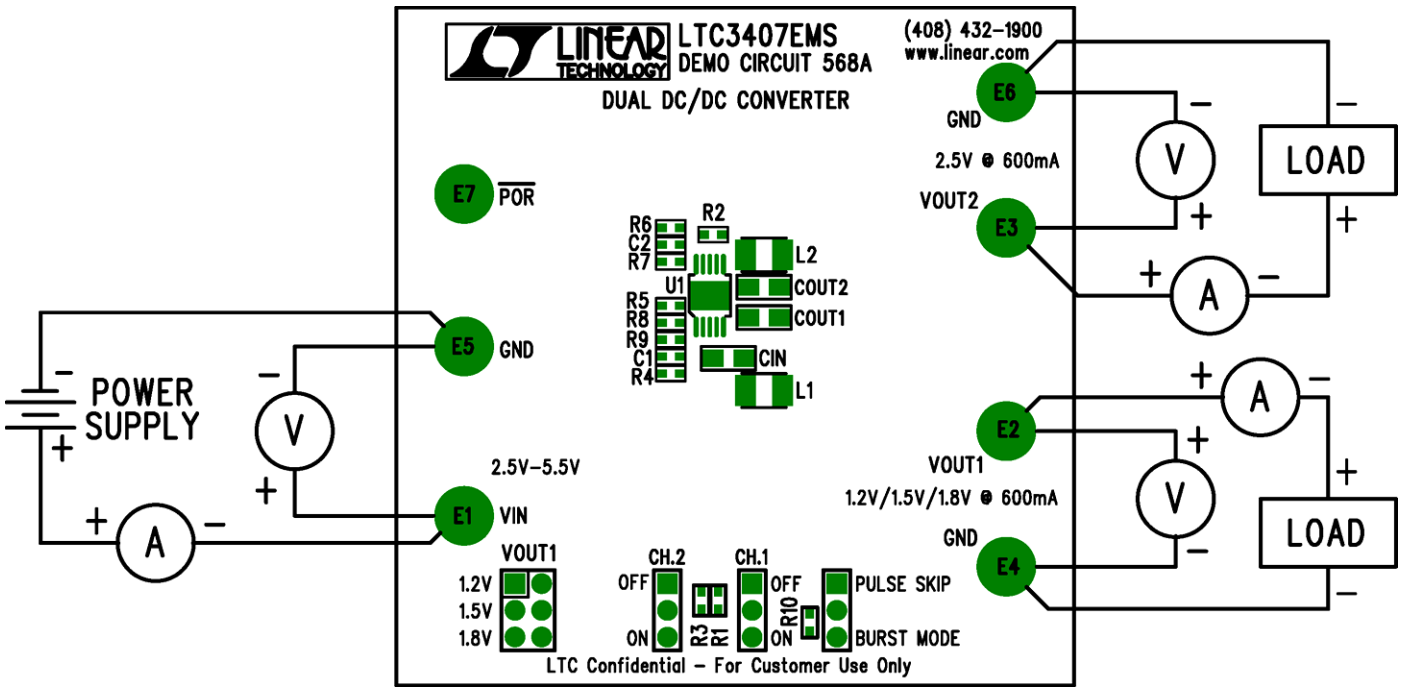


Figure 1. Proper Measurement Equipment Setup

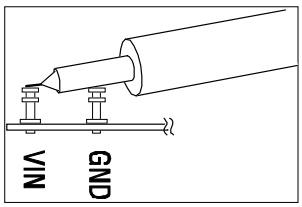
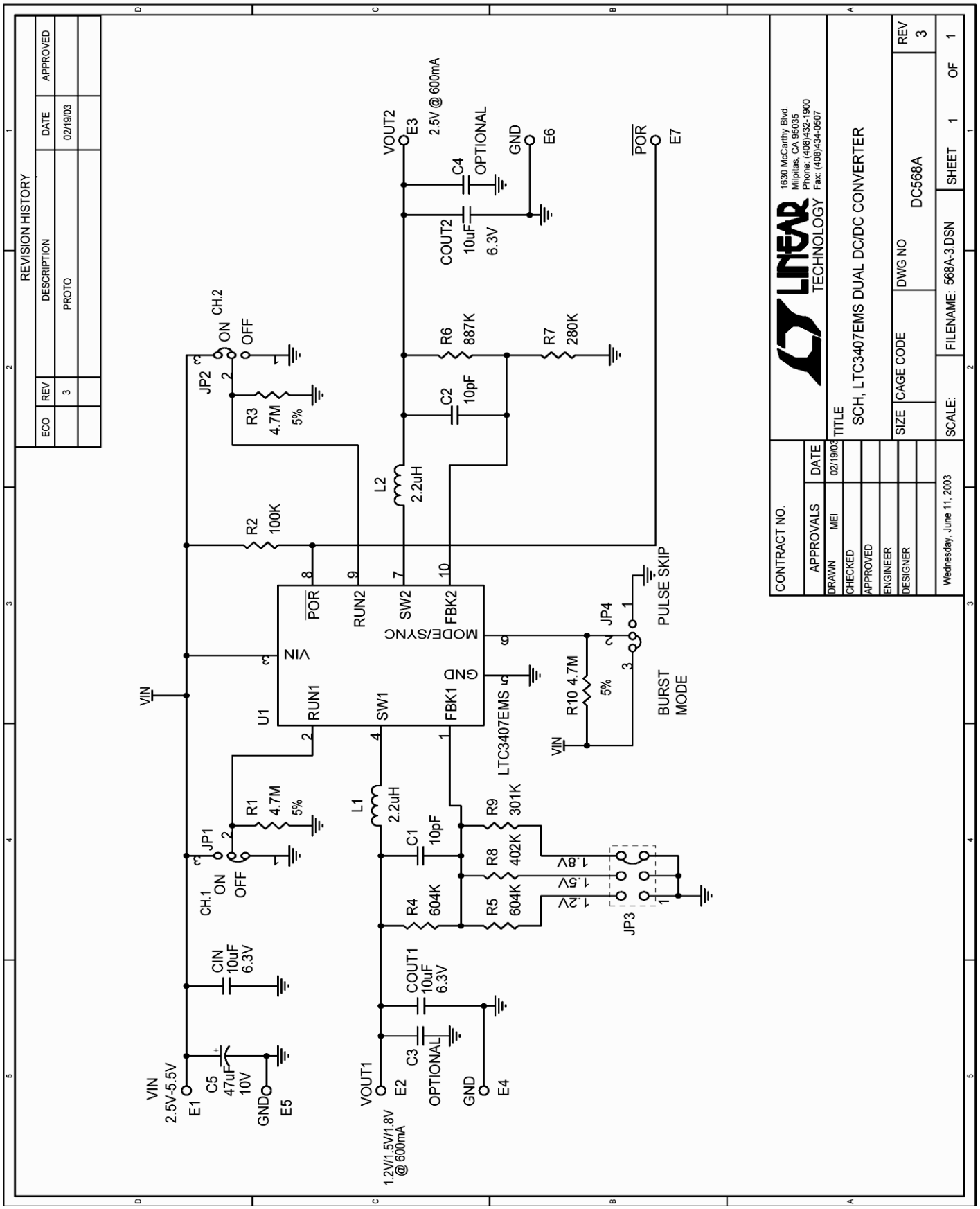
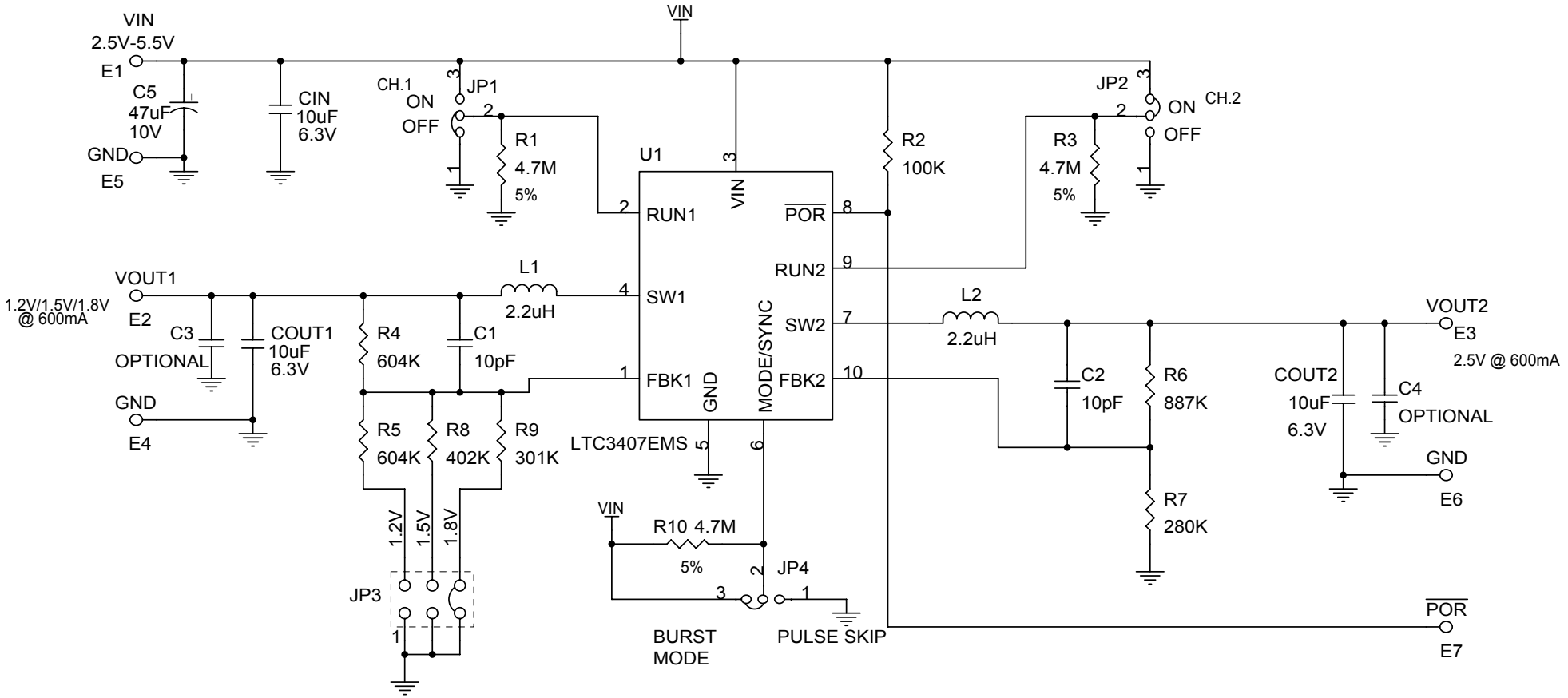


Figure 2. Measuring Input or Output Ripple


REVISION HISTORY
ECO
REV
DESCRIPTION
DATE
APPROVED
3
PROTO
02/19/03
CONTRACT NO.
APPROVALS
DATE
DRAWN MEI
02/19/03
CHECKED
APPROVED
ENGINEER
DESIGNER
LINEAR TECHNOLOGY
1630 McCarthy Blvd.
Milpitas, CA 95035
Phone: (408)432-1900
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TITLE
SCH, LTC3407EMS DUAL DC/DC CONVERTER
SIZE
CAGE CODE
DWG NO
DC568A
REV
3
SCALE:
FILENAME: 568A-3.DSN
SHEET 1 OF 1
Wednesday, June 11, 2003
U1
LTC3407EMS
VIN
RUN1
SW1
FBK1
GND
MODE/SYNC
FBK2
SW2
RUN2
POR
VIN
2.5V-5.5V
E1
C5
47uF
10V
GND
E5
CIN
10uF
6.3V
CH.1
ON
OFF
JP1
R1
4.7M
5%
L1
2.2uH
C1
10pF
R4
604K
R5
604K
R8
402K
R9
301K
JP3
1.8V
1.5V
1.2V
VOUT1
1.2V/1.5V/1.8V
@ 600mA
E2
C3
OPTIONAL
COUT1
10uF
6.3V
GND
E4
R10 4.7M
5%
JP4
BURST
MODE
PULSE SKIP
L2
2.2uH
R2
100K
R3
4.7M
5%
JP2
CH.2
ON
OFF
C2
10pF
R6
887K
R7
280K
VOUT2
2.5V @ 600mA
E3
C4
OPTIONAL
COUT2
10uF
6.3V
GND
E6
POR
E7

REVISION HISTORY				
ECO	REV	DESCRIPTION	DATE	APPROVED
	3	PROTO	02/19/03	



CONTRACT NO.			
APPROVALS	DATE		
DRAWN MEI	02/19/03		
CHECKED			
APPROVED			
ENGINEER			
DESIGNER			
Wednesday, June 11, 2003			

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TITLE
SCH, LTC3407EMS DUAL DC/DC CONVERTER

SIZE	CAGE CODE	DWG NO	REV
		DC568A	3

SCALE:	FILENAME: 568A-3.DSN	SHEET 1 OF 1

Item	Qty	Ref	Desc	Part Number
1	3	COUT1,COUT2,CIN	CAP, X5R 10uF 6.3V 20% 0805	TAIYO YUDEN JMK212BJ106MG
2	2	C2,C1	CAP, NPO 10pF 50V 10% 0402	AVX 04025A100KAT
3	0	C3,C4	CAP, 0805	TBD
4	1	C5	CAP, TANT 47uF 10V 20% 6032	AVX TAJW476M010R
5	7	E1,E2,E3,E4,E5,E6,E7	TURRETS	MILL-MAX 2501-2
6	3	JP1,JP2,JP4	HEADER, 3P 2mm	COMM CON 2802S-03-G1
7	1	JP3	HEADER, 3X2 2mm	COMM CON 2202S-06G1
8	2	L1,L2	IND, 2.2uH	TAIYO YUDEN LQLBC25182R2M
10	3	R1,R3,R10	RES, 4.7M OHMS 5% 1/16W 0402	AAC CR05-475JM
11	1	R2	RES, 100K OHMS 1% 1/16W 0402	AAC CR05-1003FM
12	2	R4,R5	RES, 604K OHMS 1% 1/16W 0402	AAC CR05-6043FM
13	1	R6	RES, 887K OHMS 1% 1/16W 0402	AAC CR05-8873FM
14	1	R7	RES, 280K OHMS 1% 1/16W 0402	AAC CR05-2803FM
15	1	R8	RES, 402K OHMS 1% 1/16W 0402	AAC CR05-4023FM
16	1	R9	RES, 301K OHMS 1% 1/16W 0402	AAC CR05-3013FM
17	1	U1	IC, LTC3407EMS	LINEAR TECH. LTC3407EMS