DESCRIPTION

The Demonstration circuit DC1357 is intended to evaluate the performance of the LTC1422 Hot Swap Controller. The board allows demonstrating all possible operation modes: power up and power down, when power rail is turned on or turned off, a steady state with a constant load and overload conditions.

The board contains the LTC1422 Controller, a power MOSFET, a current sense resistor, a resistive feedback divider, an ON pin circuit and three LEDs to indicate input and output voltages, and $\overline{RESET}$ output signal.

The DC1357 is configured to operate in 12V rail with up to 7.3A circuit breaker threshold.

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

PERFORMANCE SUMMARY Specifications are at $T_A = 25°C$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{CC}	Operating range		2.7		12.0	V
V_{LKO}	V_{CC} Undervoltage Lockout		2.4	2.47	2.55	V
V_{LKH}	V_{CC} Undervoltage Lockout Hysteresis			120		mV
V_{FB}	FB Pin Voltage Threshold		1.220	1.232	1.244	V
ΔV_{FB}	FB Pin Voltage Threshold Line Regulation	$3V \leq V_{CC} \leq 12V$		0.5	2.5	mV
V_{FBHST}	FB Pin Voltage Threshold Hysteresis			2		mV
V_{TMO}	TIMER Pin Voltage Threshold		1.208	1.232	1.256	V
ΔV_{TM}	TIMER Pin Voltage Threshold Line Regulation	$3V \leq V_{CC} \leq 12V$		2	15	mV
R_{ON}	TIMER Pin Voltage Threshold Hysteresis			45		mV
I_{TM}	Timer Pin Current	Timer On, $GND \leq V_{TIMER} \leq 1.5V$	−2.5	−2.0	−1.5	µA
		Timer Off, $V_{TIER} = 1.5V$		10		mA
V_{CB}	Circuit Breaker Trip Voltage	$V_{CB} = (V_{CC} − V_{SENSE})$	44	50	64	mV
I_{CP}	Gate Pin Output Current	Charge Pump On, $V_{GATE} = GND$	−12	−10	−8	µA
		Charge Pump Off, $V_{GATE} = V_{CC}$		10		mA
ΔV_{GATE}	External N–Channel Gate Drive	$V_{GATE} − V_{CC}$	10	12	14	V
V_{ONHI}	ON Pin Threshold High		1.25	1.30	1.35	V
V_{ONLO}	ON Pin Threshold Low		1.20	1.23	1.26	V
V_{ONHYST}	ON Pin Threshold Hysteresis			80		mV
V_{OL}	Output Low Voltage	$\overline{RESET}$, $I_O = 3mA$		0.14	0.4	V
I_{PU}	Logic Output Pull–Up Current	$\overline{RESET} = GND$		−12		µA
t_{RST}	Soft Reset Time		22	30	48	µs

OPERATING PRINCIPLES

The LTC1422 is a low voltage hot swap controller that has a 2.7V to 12V operating range and 13.2V absolute maximum operating voltage for the Vcc pin. This demo circuit is populated for +12V operation, but it can easily be readjusted for any voltage in the operating voltage range by replacing R4 and R6 (top resistor in the feedback divider and top resistor in the ON pin signal divider).

MOSFET gate capacitor C2 defines the output voltage slew rate. Initially, the board is populated for a nominal 1040V/s slew rate.

The external ON control signal should be higher than 1.35V

QUICK START PROCEDURE

Demonstration circuit 1357 is easy to set up to evaluate the performance of the LTC1422. Refer to **Error! Reference source not found.** for proper measurement equipment setup and follow the procedure below:

1. Place jumper **JP1** in the OFF position.

2. With +12V power on and switch SW1 open, connect the power supply output to V_{IN} and GND.

3. With switch SW2 open connect ON Signal Source to ON and GND.

4. Close the switch SW2 and observe Controller output voltage at the V_{OUT} and GND pins. The output voltage slew rate should be between 800V/s and 1250V/s. All three LEDs should light.

5. Use pure resistive loads R_{LOAD1} = 2Ω and R_{LOAD2} = 1Ω in the power-up transients.

In the first test with a 2Ω load Controller successfully completes power-up transient, and load current in the steady state should be in the range 7.3A and 10.6A.

In the second test with 1Ω load Controller must fail in the power-up.

6. Use pure capacitive loads C_{LOAD1} = 5600µF and C_{LOAD2} = 13500µF in the power-up transients.

With first load Controller successfully completes power-up transient.

With a second load Controller must fail in the power-up.

7. If DC1357 should be readjusted for the other transient parameters, please, pay special attention to the correspondence between MOSFET Safe Operating Area and transient parameters.
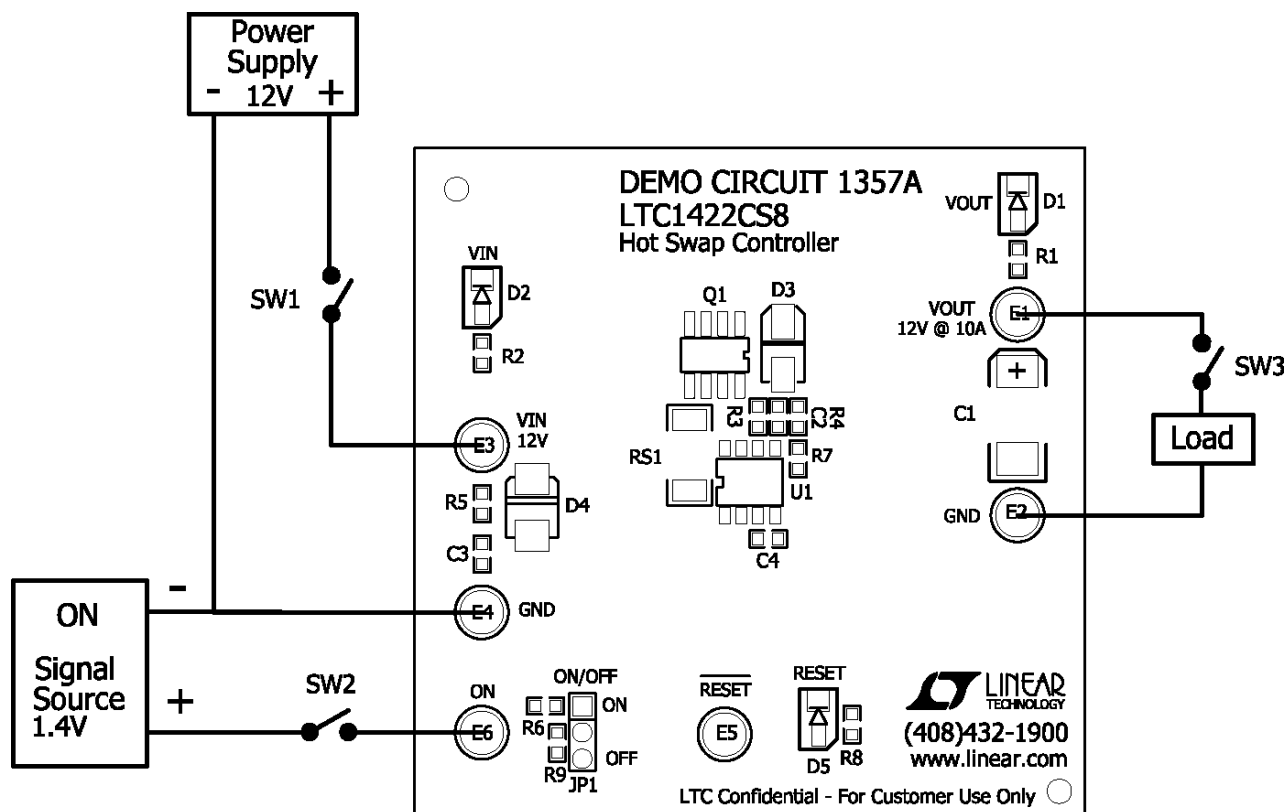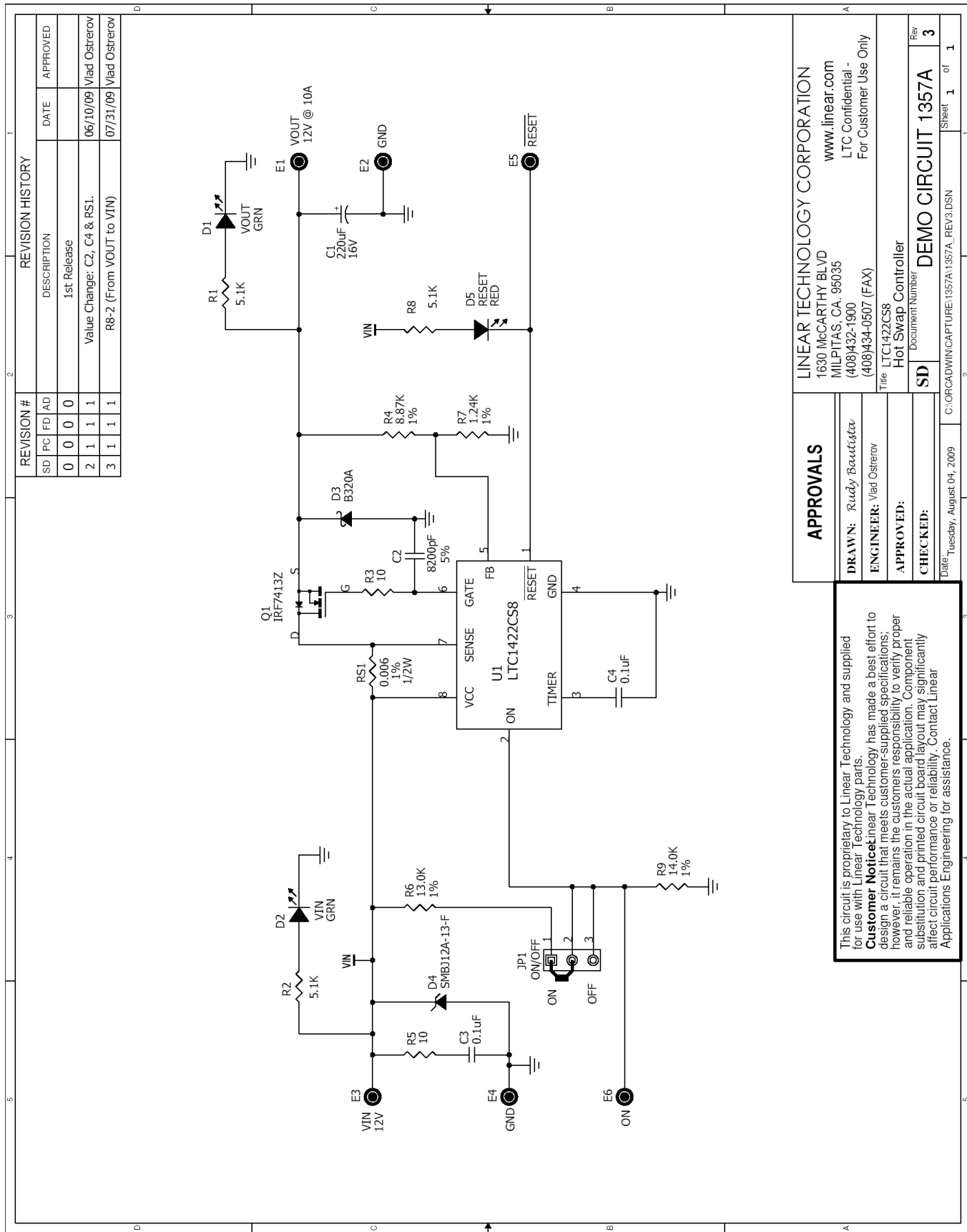
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Figure 1. Proper Measurement Equipment Setup

REVISION HISTORY

REVISION #					DESCRIPTION	DATE	APPROVED
SD	PC	FD	AD				
0	0	0	0	1st Release		
2	1	1	1	Value Change: C2, C4 & RS1.	06/10/09	Vlad Ostrerov
3	1	1	1	R8-2 (From VOUT to VIN)	07/31/09	Vlad Ostrerov

D1
VOUT
GRN

E1
VOUT
12V @ 10A

R1
5.1K

C1
220uF
16V

E2
GND

R8
5.1K

VIN

D5
RESET
RED

E5
RESET

R4
8.87K
1%

R7
1.24K
1%

D3
B320A

C2
8200pF
5%

Q1
IRF7413Z

R3
10

RS1
0.006
1%
1/2W

U1
LTC1422CS8

FB
GATE
SENSE
VCC
ON
TIMER
GND
RESET

C4
0.1uF

D2
VIN
GRN

R2
5.1K

R6
13.0K
1%

VIN

D4
SMBJ12A-13-F

JP1
ON/OFF
ON
OFF

R9
14.0K
1%

R5
10

C3
0.1uF

E3
VIN
12V

E4
GND

E6
ON

APPROVALS

DRAWN: *Rudy Bautista*

ENGINEER: Vlad Ostrerov

APPROVED:

CHECKED:

Date Tuesday, August 04, 2009

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Title LTC1422CS8
Hot Swap Controller

SD DEMO CIRCUIT 1357A

Document Number

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Rev 3

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Bill Of Material

Item	Qty	Reference	Part Description	Manufacturer / Part #
1	1	C1	Cap., Tant. 220uF 16V 20%	AVX TPSE227M016R0100
2	1	C2	Cap., X7R 8200pF 50V 5% 0603	AVX 06035C822JAT1A
3	1	C3	Cap., X7R(Flexterm) 0.1uF 25V 10% 0603	AVX 06033C104KAZ
4	1	C4	Cap., X7R 0.1uF 10V 20% 0603	AVX 0603ZC104MAT2A
5	2	D2,D1	LED, GRN	Panasonic LN1351CTR
6	1	D3	Schottky Diode, 20V/3Amp	Diodes Inc. B320A
7	1	D4	Voltage Supressor, 12V	Diodes Inc. SMBJ12A-13-F
8	1	D5	LED, RED	Panasonic LN1251CTR
9	6	E1,E2,E3,E4,E5,E6	Turret, Testpoint	Mill Max 2501-2-00-80-00-00-07-0
10	1	JP1	Headers, 3 Pins 2mm Ctrs.	Samtec TMM-103-02-L-S
11	1	Q1	N-Chan. Mosfet, 30V	International Rect. IRF7413Z
12	1	RS1	Res., 0.006 1/2W 1% 2010	Vishay WSL-2010-6L000-F-EA
13	3	R1,R2,R8	Res., Chip 5.1K 0.06W 5%	Vishay CRCW06035K10JNEA
14	2	R3,R5	Res., Chip 10 0.06W 5%	Vishay CRCW060310R0JNEA
15	1	R4	Res., Chip 8.87K 0.06W 1%	Vishay CRCW06038K87FKEA
16	1	R6	Res., Chip 13.0K 0.06W 1%	Vishay CRCW060313K0JNEA
17	1	R7	Res., Chip 1.24K 0.06W 1%	Vishay CRCW06031K24FKEA
18	1	R9	Res., Chip 14.0K 0.06W 1%	Vishay CRCW060314K0JNEA
19	1	U1	I.C., Hot Swap Controller	Linear Tech. Corp. LTC1422CS8
20	1	XJP1	Shunt, 2mm Ctrs.	Samtec 2SN-BK-G
21	1		FAB, 1357A_Rev1.pcb	DEMO CIRCUIT #1357A
22	1		STENCIL	STENCIL 1357A