LTC4218
Hot Swap Controller

DESCRIPTION

Demonstration circuit DC1052A includes two separate circuits for performance evaluation of the LTC®4218 Hot Swap™ controller. The standard version of the controller (LTC4218) is intended to operate with 2.9V to 26.5V rails, while the LTC4218-12 has internal adjustment for 12V applications.

One circuit of DC1052A located on the upper board area is assembled with the LTC4218 configured for operation with a 24V rail. The circuit on the lower board area includes the LTC4218-12. Circuit breaker thresholds in both cases are adjusted to 7.5A.

The LTC4218 features accurate current limiting with foldback and a ground-referred current monitor. The current monitor sources a current that is proportional to the sense voltage, and it may be converted into a voltage signal with an appropriate resistor.

The current limit may be reduced by placing an external resistor between GND and the ISET pin.

The LTC4218 protects the load from overvoltage and undervoltage conditions.

The DC1052A schematic allows the LTC4218 to operate in turn-on and turn-off modes as well as in the steady-state mode with different loads, and in the fault state.

Design files for this circuit board are available at http://www.linear.com/demo

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
24V Circuit						
V_{DD}	Input Supply Range	Typical Value	19.89	24	26.34	V
$V_{DD(UVL)}$	Input Supply Undervoltage Range	V_{DD} Rising	19.32	19.89	20.68	V
$V_{DD(OVH)}$	Input Supply Overvoltage Range	V_{DD} Rising	25.56	26.34	27.39	V
$V_{OUT(PG)}$	Output Voltage Defined as Power Good	V_{SOURCE} Rising	20.00	20.75	21.57	V
t_{TIMER}	Timer Period		0.9	1.235	1.76	ms
I_{LIMIT}	Current Limit	V_{FB} = 1.23V (V_{OUT} in the Range 20.33V to 21.16V) V_{FB} = 0V to 0.15V (V_{OUT} in the Range 0V to 2.6V)	7.05 1.38	7.5 1.88	7.95 2.37	A A
C_{MAX24}	Maximal Load Capacitance	Successful Power-Up Mode		600		µF
C_{MIN24}	Minimal Load Capacitance	Unsuccessful Power-Up Mode		1800		µF
12V Circuit						
V_{DD}	Input Supply Range	Typical Value	9.88	12	15.05	V
$V_{DD(UVL)}$	Input Supply Undervoltage Range	V_{DD} Rising	9.6	9.88	10.2	V
$V_{DD(OVH)}$	Input Supply Overvoltage Range	V_{DD} Rising	14.7	15.05	15.4	V
$V_{OUT(PG)}$	Output Voltage Defined as Power Good	V_{SOURCE} Rising	10.2	10.5	10.8	V
t_{TIMER}	Timer Period		0.9	1.235	1.76	ms
I_{LIMIT}	Current Limit	V_{FB} = 1.23V (V_{OUT} in the Range 10.3V to 10.4V) V_{FB} = 0V to 0.15V (V_{OUT} in the Range 0V to 1.27V)	7.05 1.38	7.5 1.88	7.95 2.37	A A
C_{MAX12}	Maximal Load Capacitance	Successful Power-Up Mode		900		µF
C_{MIN12}	Minimal Load Capacitance	Unsuccessful Power-Up Mode		1800		µF

OPERATING PRINCIPLES

The LTC4218 is suited for low voltage power control in applications for hot board insertion or removal with electronic circuit breaker function, foldback current limit and load current monitoring. The LTC4218 has a rich set of features to support Hot Swap applications, including:

- 2% accurate undervoltage and overvoltage protection
- Adjustable 5% accurate current limit
- Adjustable inrush current control
- Load current monitoring
- Adjustable current limit timer before power is turned off
- Power good and fault signaling

QUICK START PROCEDURE

Demonstration circuit 1052A is easy to set up to evaluate the performance of the LTC4218 and LTC4218-12. Refer to Figure 1 for the proper measurement equipment setup and follow the procedure below.

For the 24V circuit:

1. Place jumpers in the following positions:

   JP1 $\overline{\text{FAULT}}$ Signal

   JP2 AUX_UV ON

2. With power off, connect the 24V power supply terminals to the $24V_{IN}$ (E1) and GND (E4) turrets.
3. Turn on the 24V supply and verify the output voltage between the V_{OUT} (E2) and GND (E3) turrets. Green LEDs 24VIN (D2) and V_{OUT} (D4) should light up.
4. Check the current limit by providing an electronic or resistive load. It should be in the range of 7.05A to 7.95A. During this measurement, verify the current monitor performance. The monitor signal related to the current limit level should be 2.0V ± 0.17V. The monitor signal has a 3.75A/V scale.
5. Use an oscilloscope to check the output voltage slew rate without a load connected. It should be in the range of 1680V/s to 2300V/s. Use an 1800µF capacitive load to confirm that during power-up, the timer period expires and a current limit fault is indicated by the $\overline{\text{FAULT}}$ red LED (D5). The PG red LED (D6) indicates that the output voltage is lower than the power good level.

For the 12V circuit:

6. Place jumpers in the following positions:

   JP3 $\overline{\text{FAULT}}$ Signal

   JP4 AUX_UV ON

7. With power off, connect the 12V power supply terminals to the $12V_{IN}$ (E9) and GND (E12) turrets.
8. Turn on the 12V supply and verify the output voltage at the V_{OUT} (E10) and GND (E11) turrets. Green LEDs $12V_{IN}$ (D9) and V_{OUT} (D11) should light up.
9. Check the current limit by providing an electronic or resistive load. It should be in the range of 7.05A to 7.95A. During this measurement verify the current monitor performance. The monitor signal related to the current limit level should be 2.0V ± 0.17V. The monitor signal has a 3.75A/V scale.
10. Check the output voltage slew rate with an oscilloscope without a load connected. It should be in the range of 1680V/s to 2300V/s.
11. Use an 1800µF capacitive load to confirm that during power-up the timer period expires and a current limit fault is indicated by the $\overline{\text{FAULT}}$ red LED (D12) accompanied by the PG red LED (D13) to indicate that the output voltage is lower than the power good level.

QUICK START PROCEDURE

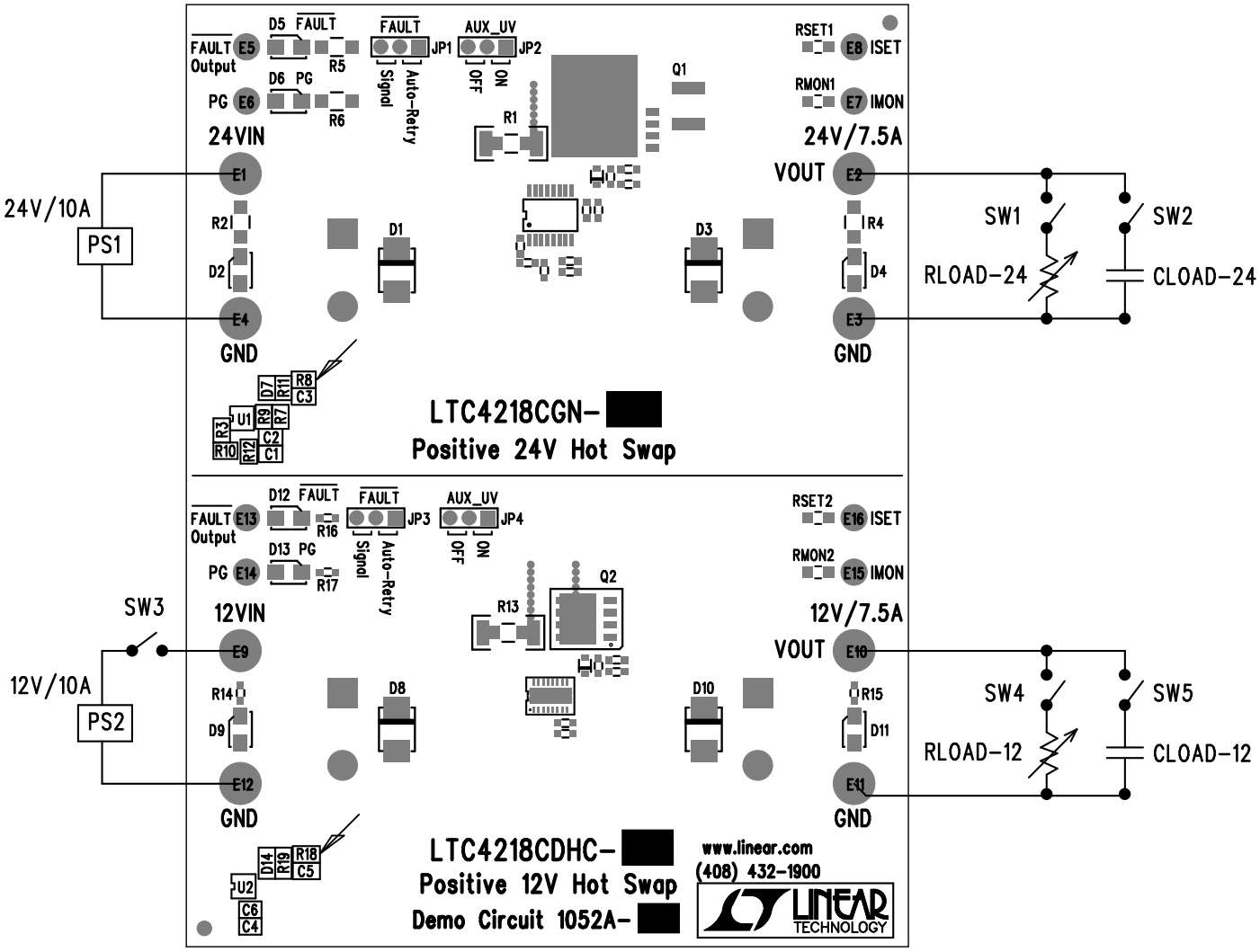
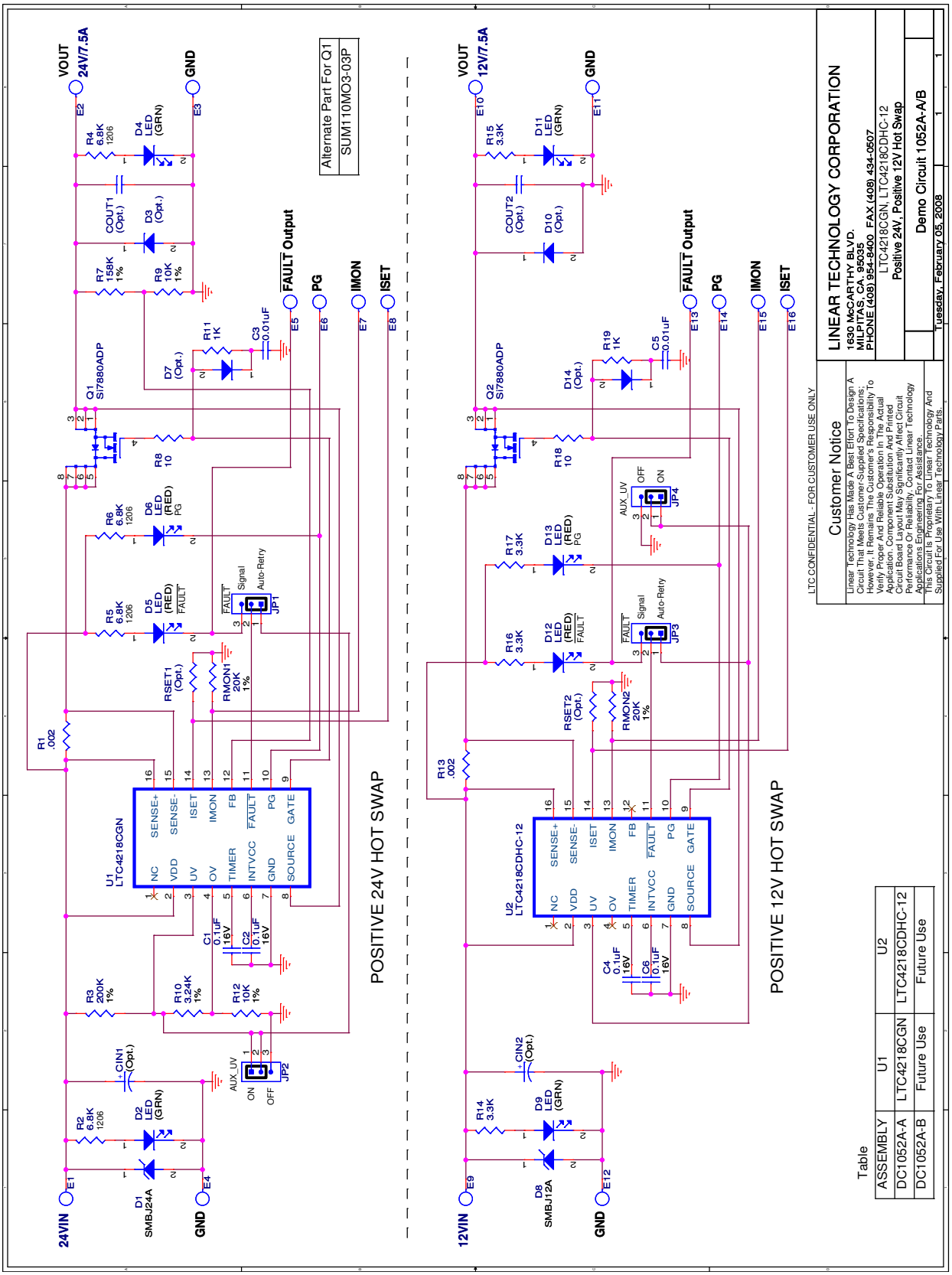


Figure 1. Proper Measurement Equipment Setup

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	4	C1, C2, C4, C6	CAP., CER X7R 0.1µF 16V 0603	AVX 0603YC104KAT2A
2	2	C3, C5	CAP., CER X7R 0.01µF 50V 0603	AVX 06035C103KAT2A
3	0	COUT1, COUT2	OPTIONAL	
4	0	CIN1, CIN2	OPTIONAL	
5	8	E5-E8, E13-E16	TURRET, TEST PIN, .061"	MILL-MAX 2308-2-00-44
6	8	E1-E4, E9-E12	TURRET, TEST PIN, .095"	MILL-MAX 2501-2
7	4	JP1-JP4	JUMPER, 0.079, 3 PIN	SAMTEC, TMM-103-02-L-S
8	4	JP1-JP4	SHUNT,	SAMTEC, 2SN-BK-G
9	4	D5, D6, D12, D13	LED, SMT RED	PANASONIC, LN1251C
10	4	D2, D4, D9, D11	LED, SMT GREEN	PANASONIC, LN1351C
11	1	D1	DIODE, 600W TRANSIENT VOLTAGE SUPPRESSOR	DIODES INC., SMBJ24A
12	1	D8	DIODE, 600W TRANSIENT VOLTAGE SUPPRESSOR	DIODES INC., SMBJ12A
13	0	D3, D10, D17, D14	OPTIONAL	SMA
14	2	Q1, Q2	MOSFET N-CHANNEL 30V, POWER PAK-SO-8	VISHAY, Si7880ADP
15	2	R1, R13	RES., CHIP, 0.002Ω 1/4W 1% 1206	VISHAY, WSL12062L000FEA
16	2	R8, R18	RES., CHIP, 10Ω 1/16W 5% 0603	VISHAY, CRCW060310R0JNEA
17	2	R11, R19	RES., CHIP, 1k 1/16W 5% 0603	VISHAY, CRCW06031K00JNEA
18	1	R10	RES., CHIP, 3.24k 1/16W 1% 0603	Vishay, CRCW06033K24FKEA
19	4	R14-R17	RES., CHIP, 3.30k 1/16W 5% 0603	VISHAY, CRCW06033K30JNEA
20	4	R2, R4, R5, R6	RES., CHIP, 6.80k 1/4W 5% 1206	VISHAY, CRCW12066K80JNEA
21	2	R9, R12	RES., CHIP, 10k 1/16W 1% 0603	VISHAY, CRCW060310K0FKEA
22	2	RMON1, RMON2	RES., CHIP, 20k 1/16W 5% 0805	VISHAY, CRCW080520K0JNEA
23	1	R7	RES., CHIP, 158k 1/16W 1% 0603	VISHAY, CRCW0603158KFKEA
24	1	R3	RES., CHIP, 200k 1/16W 1% 0603	VISHAY, CRCW0603200KFKEA
25	0	RSET1, RSET2	OPTIONAL	
26	1	U1	IC., HOT SWAP CONTROLLER	LINEAR, LTC4218CGN
27	1	U2	IC., HOT SWAP CONTROLLER	LINEAR, LTC4218CDHC-12

SCHEMATIC DIAGRAM



Table

ASSEMBLY	U1	U2
DC1052A-A	LTC4218CGN	LTC4218CDHC-12
DC1052A-B	Future Use	Future Use

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