LTC4211
Hot Swap Controller with Multifunction Current Control

DESCRIPTION

Demonstration circuit 536B is a hot swap controller with multifunction current control featuring the LTC®4211. The DC536B-A is configured to operate with up to 7A load and DC536B-B up to 20A load.

The DC536B permits evaluating the LTC4211 during turn-on and turn-off transients as well as during steady-state conditions.

The DC536B updates obsoleted components (Q1, D1) in DC536A.

Design files for this circuit board are available at http://www.linear.com/demo/DC536B

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{CC}	V_{CC} Supply Voltage Range		2.5		16.5	V
V_{LKO}	Internal V_{CC} Undervoltage Lockout	V_{CC} Low-To-High Transition	2.13	2.3	2.47	V
V_{ONHI}	ON Threshold High		1.23	1.316	1.39	V
V_{ONLO}	ON Threshold Low		1.20	1.236	1.26	V
I_{GATEUP}	Gate Pull-Up Current	Charge Pump On, $V_{GATE} \leq 0.2V$	–12.5	–10	–7.5	µA
$I_{GATEDOWN}$	Normal Gate Pull-Down Current Fast Gate Pull-Down Current	ON Low FAULT Latched and Circuit Breaker Tripped or in UVLO	130	200 50	270	µA mA
$V_{CB(FAST)}$	SENSE Trip Voltage ($V_{CC} – V_{SENSE}$)	Fast Comparator Trip	130	150	170	mV
$V_{CB(SLOW)}$	SENSE Trip Voltage ($V_{CC} – V_{SENSE}$)	Slow Comparator Trip	40	50	60	mV
ΔV_{GATE}	External N-Channel Gate Drive	$V_{GATE} – V_{CC}$ (For V_{CC} = 2.5V) $V_{GATE} – V_{CC}$ (For V_{CC} = 2.7V) $V_{GATE} – V_{CC}$ (For V_{CC} = 3.3V) $V_{GATE} – V_{CC}$ (For V_{CC} = 5V) $V_{GATE} – V_{CC}$ (For V_{CC} = 12V) $V_{GATE} – V_{CC}$ (For V_{CC} = 15V)	2.5 4.5 5.0 10 10 8		8 8 10 16 18 18	V V V V V V
I_{CB}	Circuit Breaker Threshold	DC536B-A DC536B-B	5.7 16	7 20	8.5 24	A A

OPERATING PRINCIPLES

The LTC4211 is a low voltage hot swap controller that has a 2.5V to 16.5V operating range and a 17V absolute maximum operating voltage for the V_{CC} pin. DC536B is populated for 5V operation, but it can easily be re-adjusted for any voltage between 2.5V to 16.5V by replacing R3 and R1 (top resistors in the FB divider and the ON pin voltage divider). There are two assembly options for load current.

The DC536B-A is populated with an Si4134 MOSFET in an SO-8 package and a 7mΩ current sense resistor providing a minimum 5A load current. The DC536B-B has an FDB8030L MOSFET in the DD package which when used with a 2.5mΩ sense resistor provides a minimum 16A load current.

QUICK START PROCEDURE

DC536B is easy to set up to evaluate the performance of the LTC4211. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. The DC536B is set up to operate in a 5V system. If the LTC4211 is to be evaluated at a different operating condition, follow steps 2 to 5 below, otherwise skip to step 6.
2. If evaluating at a voltage other than 5V, R3 must be adjusted for proper $\overline{\text{RESET}}$ response. Select R3 = V_{MIN} • 15k/1.223 – 15k, where V_{MIN} is the minimum output voltage expected for normal operation.
3. The ON pin operates as an input of a precision comparator and can accurately provide an adjustable undervoltage lockout. The DC536B is initially configured to turn on at 4.15V_{MIN}. If 3.3V logic will drive this pin, R1 can be replaced with a short. If the ON pin will be used to provide undervoltage lockout, then select R1 such that R1 = V_{UVLO} • 10k/1.39 – 10k, where V_{UVLO} is the minimum turn on voltage. Refer to the data sheet Figure 3 for common configurations.
4. For evaluating a circuit with up to 20A load, use DC536B-B board.
5. The soft start and power good ($\overline{\text{RESET}}$ release) delay is factory set to 2.9ms. This delay can be adjusted by changing C_{TIMER}; refer to the data sheet Table 1 for common values and the System Timing section for more detailed information.
6. After any necessary component changes have been made, connect a suitable load between VOUT and GND. This may be a passive resistive load or an active electronic load box.
7. Connect a power supply capable of supplying 1.5 • I_{LOAD} between the VIN and GND turrets. The minimum current capability of the supply must accommodate the tolerance of the circuit breaker threshold of ±20%. With the 7mΩ factory installed sense resistor, the overload circuit breaker will trip at between 5.7A to 8.5A (7A nominal). Connect the ON/$\overline{\text{OFF}}$ turret to the VIN turret to enable power to the load. A function generator can be used to generate a single event and trigger a scope. The DC536B provides convenient turrets for observing the $\overline{\text{FAULT}}$, $\overline{\text{RESET}}$ and VOUT signals.
8. The following experiments can be run:
   - Turn on into a nominal load;
   - Turn on into an overload;
   - Turn on into a short circuit;
   - Turn on into a nominal load and increase the load until the LTC4211 trips off.

A digital storage scope provides a convenient means of observing the turn on and overload event. Observe the input or output current using a current probe. A current transformer can be used to observe the turn on current transients if a current probe is not available.

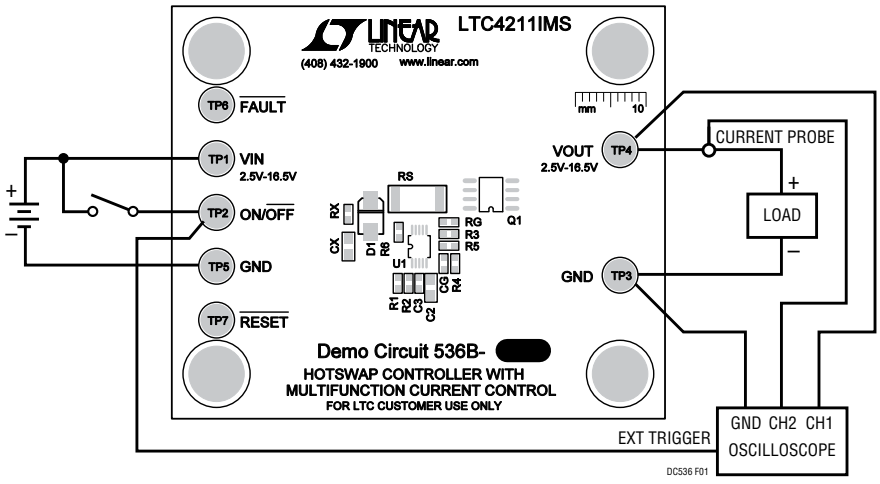
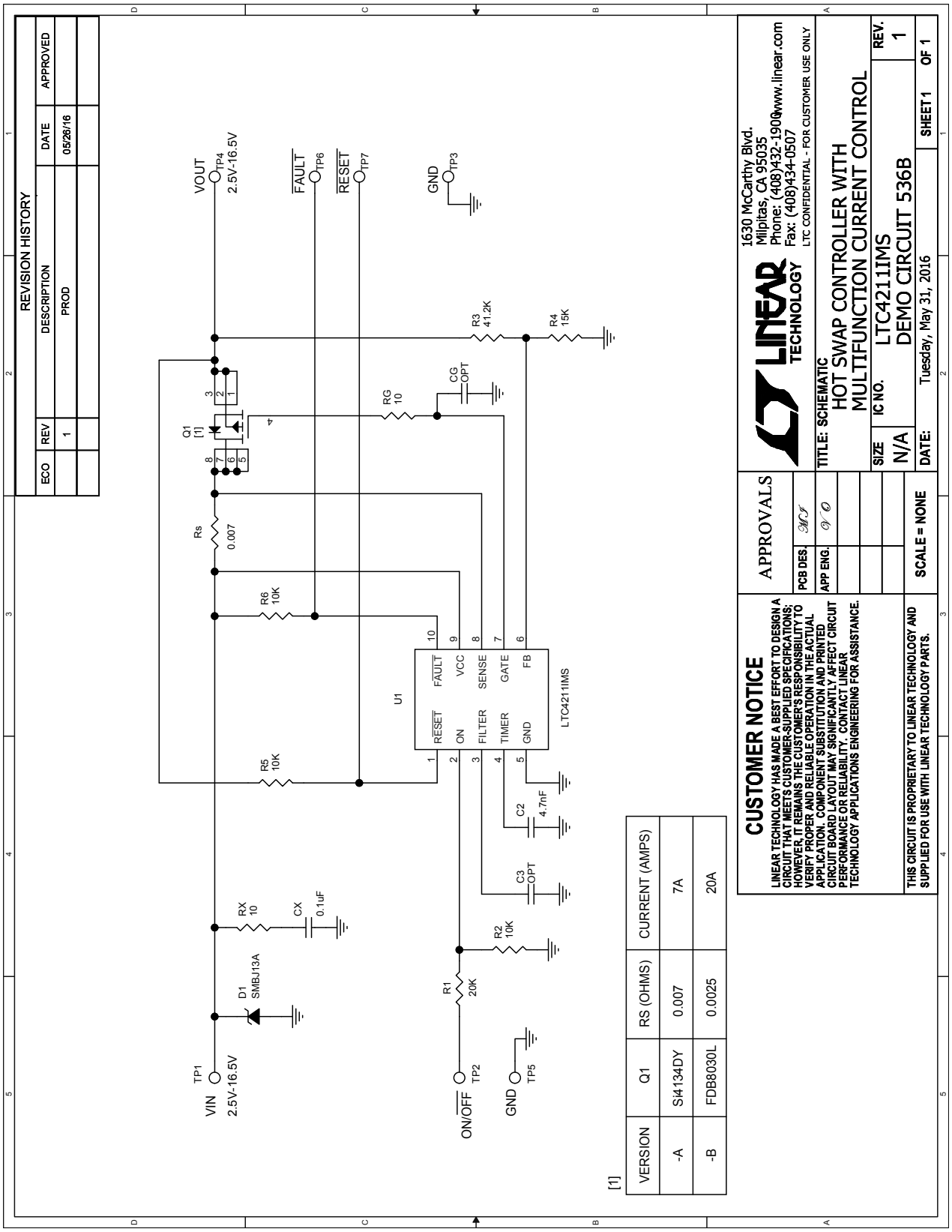


Figure 1. Proper Measurement Equipment Setup

SCHEMATIC DIAGRAM



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