

LTC4213

Electronic Circuit Breaker

DESCRIPTION

Demonstration circuit DC872A features the LTC4213 NoRsense Electronic Circuit Breaker, which provides over-current protection without a sense resistor. The

Board allows evaluation of the LTC4213 over its full operating voltage range, at all three over-current protection levels and with ON and RESET functionality.

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

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PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{CC}	Supply Voltage Range		2.6		6.0	V
V_{SENSEP}	SENSEP Voltage Range	$V_{SENSEP} \leq V_{CC}$	0		6.0	V
$V_{CC(URLR)}$	V_{CC} Undervoltage Lockout Release	V_{CC} Rising	1.8	2.1	2.23	V
V_{CB}	Circuit Breaker Trip Voltage $V_{CB} = V_{SENSEP} - V_{SENSEN}$ at slow comparator Trips	$V_{SENSEP} = V_{CC}, I_{OSEL} = 0V$ $V_{SENSEP} = V_{CC}, I_{OSEL} = \text{Floated}$ $V_{SENSEP} = V_{CC}, I_{OSEL} = V_{CC}$	22.5 45 90	25 50 100	23 55 110	mV
$V_{CB(FAST)}$	Circuit Breaker Trip Voltage $V_{CB(FAST)} = V_{SENSEP} - V_{SENSEN}$ at fast comparator Trips	$V_{SENSEP} = V_{CC}, I_{OSEL} = 0V$ $V_{SENSEP} = V_{CC}, I_{OSEL} = \text{Floated}$ $V_{SENSEP} = V_{CC}, I_{OSEL} = V_{CC}$		100 175 325		mV mV mV
$I_{GATE(UP)}$	Gate Pin Pull Up Current	$V_{GATEN} = 0V,$	-50	-100	-150	μA
$I_{GATE(DN)}$	Gate Pin Pull Down Current	$V_{ON} = 1V, \Delta = V_{SENSEP} - V_{SENSEN} = 200\text{ mV},$ $V_{GATE} = 8V$	10	40	80	mA
$V_{ON(TH)}$	ON Pin High Threshold	ON Rising, Gate Pulls Down	0.76	0.8	0.84	V
$V_{ON(RST)}$	ON Pin Reset Threshold	ON Falling, Fault Reset, Gate Pulled Down	0.36	0.4	0.44	V

OPERATING PRINCIPLES

The LTC4213 is an Electronic Circuit Breaker that has a 0V to 6.0V operating range and a 10V absolute maximum operating voltage for the V_{CC} pin. In low voltage applications where the rail voltage is lower than 2.6V, the V_{CC} pin must have a separate supply.

The circuit Breaker function is based on sensing the voltage across the drain and source of an external N-channel MOSFET. The LTC4213 provides dual level over-current protection. The slow comparator has 15 μs response time while the fast comparator trips in 1 μs .

One of three Circuit Breaker thresholds, 25mV, 50mV, or 100mV is selected by connecting ISEL pin to GND, leaving it floating, or connecting to V_{CC} , respectively. The corresponding fast comparator thresholds are 100mV, 175mV, and 325mV.

When the ON pin signal increases above 0.8V, the device starts up and the GATE pulls up with a 100 μA current source. When the ON pin signal drops below 0.76V, the GATE pulls down. To reset a circuit breaker fault, the ON pin must go below 0.4V.

Customer Notice: Linear Technology has made a best effort to design a circuit that meets customer-supplied specifications; however, it remains the customers responsibility to verify proper and reliable operation in the actual application. Component substitution and printed circuit board layout may significantly affect circuit performance or reliability. Contact Linear Applications Engineering for assistance.

VCC

R5 10K

VCC

R4 1K

Q1

D1 RED

VOUT 0V-6V@3.5A

C3 100uF

READY

GND

THIRD ANGLE PROJECTION



The diagram illustrates the third angle projection of a cylinder. On the left is the front view, a circle with a smaller concentric circle inside, representing a hole. A vertical centerline passes through the center. To the right is the top view, a truncated cone. A horizontal centerline passes through the center of the cone. The two views are aligned horizontally, with the top view positioned directly above the front view, which is the standard convention for third angle projection.

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 LINEAR TECHNOLOGY		1630 McCarthy Blvd. Milpitas, CA 95035 Phone: (408) 432-1900 Fax: (408) 434-0507	
TITLE SCH, LTC4213CDDDB, FAST CIRCUIT BREAKER			
SIZE A	CAGE CODE	DWG NO DC872A	REV 2
SCALE: NONE	FILENAME: 872A-2.DSN	SHEET 1	OF 1

QUICK START PROCEDURE

1. Adjust electronic or passive load to 1A-1.2A current and connect it between the Vout and GND terminals.
2. Connect a signal source (power supply, pulse generator, etc.) between the ON and GND board terminals and disable its output.
3. Connect Power Supply output to VIN and GND. If the power supply voltage is between 2.6V and 6V, connect the Vcc terminal to Vin. If the power supply voltage is lower than 2.6V use an additional voltage source for Vcc.
4. Figure 1 illustrates DC872A connection with external equipment.
5. Install current level selection jumper in the 25mV position.
6. Activate ON signal source and observe output voltage transient.
7. Increase the load to 2.0-2.5A and observe circuit breaker performance.
8. Repeat 5 and 6 with current level selection jumper the 50mV and 100mV positions and corresponding loads of 3.8-4.2A and 7.0-7.5A.

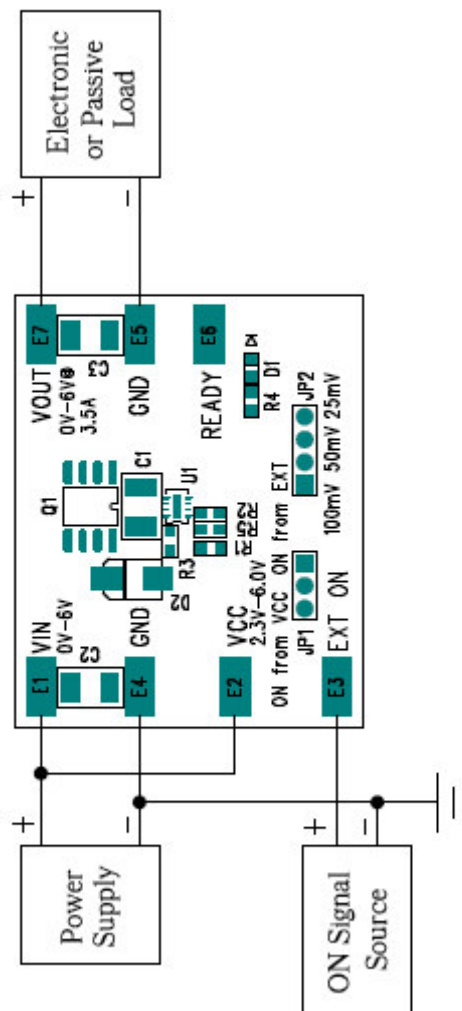


Fig. 1 DC872A Connection with External Equipment