# LT3081
# 1.5A Single Resistor Rugged Linear Regulator with Monitors

## DESCRIPTION

DC1870A is a 1.5A low dropout linear regulator featuring LT®3081. The device is designed for rugged industrial applications and can be paralleled for higher output current or heat spreading. Besides paralleling, the LT3081 also presents other features including adjustability to zero $V_{OUT}$, reverse protection for input and output-to-input voltages, temperature monitor, output current monitor, etc.

A key feature of the LT3081 is the extended safe operating area (SOA). With the precision zero TC 50µA reference current source, a single resistor programs the output voltage to any level between zero and 34.5V.

Internal protection circuitry includes reverse-battery and reverse-current protection, current limiting and thermal limiting.

The LT3081 is offered in the packages of 16-lead TSSOP, 7-lead TO-220, 7-lead DD-Pak, and a 12-lead 4mm × 4mm DFN.

The LT3081 data sheet gives a complete description of the device, operation and application information. The data sheet should be read in conjunction with this quick start guide for working on or modifying the DC1870A.

**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 |
|---|---|---|---|---|---|---|
| $V_{IN}$ | Input Supply Range | $V_{OUT}$ = 1.2V, $I_{OUT1}$ = 1mA | 2.8 | | 36 | V |
| $V_{OUT}$ | Output Voltage | Shunt at 1, 2 for JP1 | 1.164 | 1.2 | 1.248 | V |
| | | Shunt at 3, 4 for JP1 | 1.455 | 1.5 | 1.56 | V |
| | | Shunt at 5, 6 for JP1 | 1.746 | 1.8 | 1.872 | V |
| | | Shunt at 7, 8 for JP1 | 2.425 | 2.5 | 2.6 | V |
| | | Shunt at 9, 10 for JP1 | 3.201 | 3.3 | 3.432 | V |
| | | Shunt at 11, 12 for JP1 | 4.85 | 5 | 5.2 | V |
| | | Shunt at 13, 14 for JP1 and R7 Stuffed as 243kΩ | 11.64 | 12 | 12.48 | V |

## QUICK START PROCEDURE

DC1870A is easy to set up to evaluate the performance of the LT3081. 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 terminals of the input or output capacitors. See Figure 2 for proper scope probe technique.

1. Use JP1 to set the desired output voltage.
2. With power off, connect the input power supply to $V_{IN}$ and GND.
3. Turn on the power at the $V_{IN}$.

   NOTE: Make sure that the $V_{IN}$ voltage does not exceed 36V.
4. Check for the proper output voltages:

   NOTE: If there is no output, temporarily disconnect the load to make sure that the load is not set too high or is shorted.
5. Once the proper output voltages are established, adjust the loads within the operating range and observe the output voltage regulation, efficiency and other parameters.

   NOTE: Make sure that the power dissipation is limited below the thermal limit.

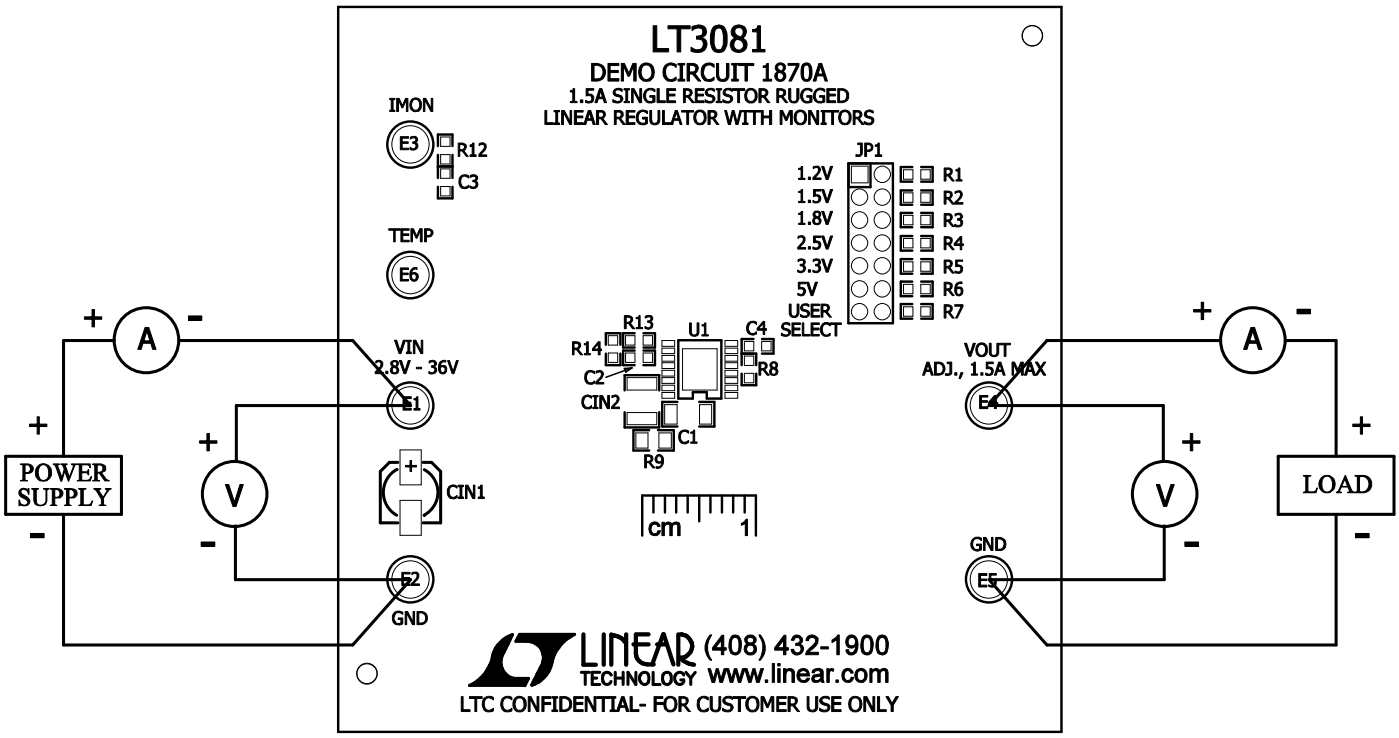



**Figure 1. DC1870A Proper Equipment Setup**

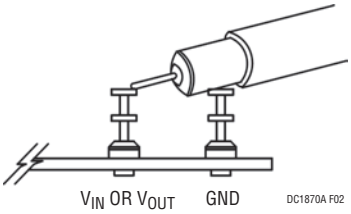



**Figure 2. Measuring Input or Output Ripple**

## THERMAL IMAGE

An example thermal image shows the temperature distribution on the PC board. The test is done in still air at room temperature with 2.3W power dissipation in the LT3081 IC. This gives an IC junction-to-ambient thermal resistance of $\theta_{JA}$ = 16°C/W on the demo board.

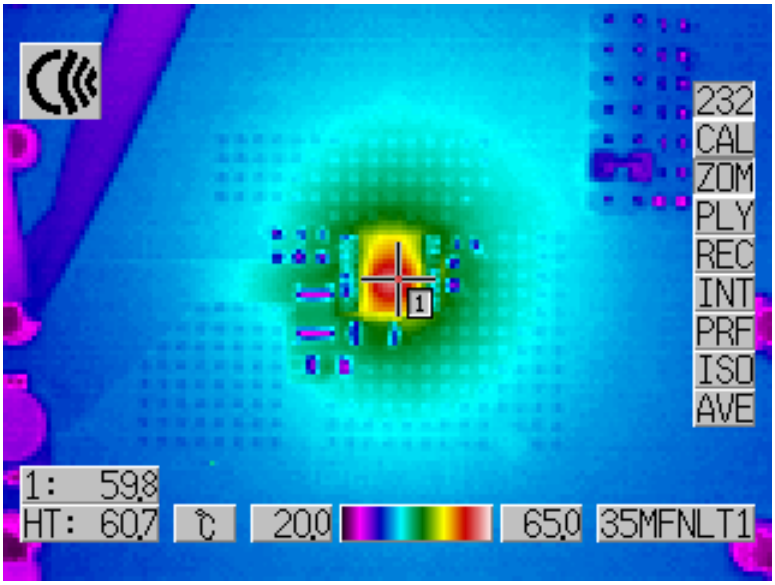
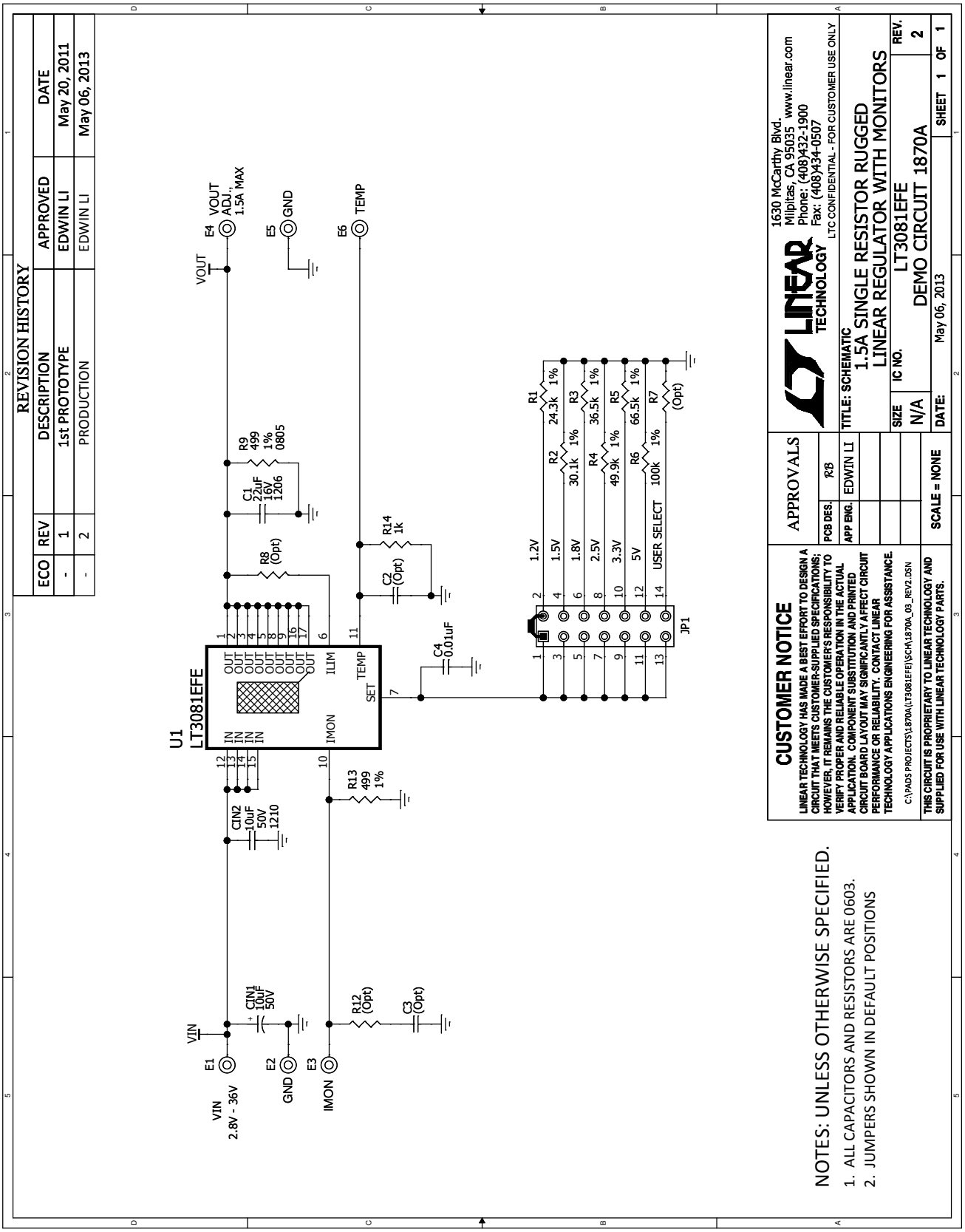



**Figure 3. Temperature Rise at 2.3W Dissipation**

## PARTS LIST

| ITEM | QTY | REFERENCE | PART DESCRIPTION | MANUFACTURER/PART NUMBER |
|---|---|---|---|---|
| **Required Circuit Components** | | | | |
| 1 | 1 | CIN2 | Cap., X5R 10µF 50V 20% 1210 | Taiyo Yuden UMK325BJ106MM-T |
| 2 | 1 | C1 | Cap., X5R 22µF 16V 20% 1206 | Taiyo Yuden EMK316BJ226ML-T |
| 3 | 1 | C4 | Cap., X7R 0.01µF 25V 10% 0603 | AVX 06033C103KAT2A |
| 4 | 1 | R1 | Res., Chip 24.3k 0.1W 1% 0603 | Vishay CRCW060324K3FKEA |
| 5 | 1 | R2 | Res., Chip 30.1k 0.1W 1% 0603 | Vishay CRCW060330K1FKEA |
| 6 | 1 | R3 | Res., Chip 36.5k 0.1W 1% 0603 | Vishay CRCW060336K5FKEA |
| 7 | 1 | R4 | Res., Chip 49.9k 0.1W 1% 0603 | Vishay CRCW060349K9FKEA |
| 8 | 1 | R5 | Res., Chip 66.5k 0.1W 1% 0603 | Vishay CRCW060366K5FKEA |
| 9 | 1 | R6 | Res., Chip 100k 0.1W 1% 0603 | Vishay CRCW0603100KFKEA |
| 10 | 1 | R9 | Res., Chip 499Ω 0.125W 1% 0805 | Vishay CRCW0805499RFKEA |
| 11 | 1 | R13 | Res., Chip 499Ω 0.1W 1% 0603 | Vishay CRCW0603499RFKEA |
| 12 | 1 | R14 | Res., Chip 1k 0.1W 5% 0603 | Vishay CRCW06031K00JNEA |
| 13 | 1 | U1 | I.C., Linear Regulator TSSOP16-FE/TSSOP16-BB | Linear Technology Corporation LT3081EFE#PBF |
| **Additional Demo Board Circuit Components** | | | | |
| 1 | 1 | CIN1 | Cap., Aluminum 10µF 50V 10% OSCON-CE-5 | Sun Electronics 50CE10BSS |
| 2 | 0 | C2, C3 (Opt) | Cap., 0603 | |
| 3 | 0 | R7, R8, R12 (Opt) | Res., 0603 | |
| **Hardware: For Demo Board Only** | | | | |
| 1 | 6 | E1, E2, E3, E4, E5, E6 | Turret, Testpoint | Mill Max 2501-2-00-80-00-00-07-0 |
| 2 | 1 | JP1 | Headers, 2 × 7 (2mm Ctrs.) | Samtec TMM-107-02-L-D |
| 3 | 1 | XJP1 | Shunt, 2mm Ctrs. | Samtec 2SN-BK-G |

## SCHEMATIC DIAGRAM



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