LT3086
40V, 2.1A Low Dropout Adjustable Linear Regulator with Monitoring and Cable Drop Compensation

DESCRIPTION

Demonstration circuit 1729A is a 2.1A low dropout adjustable linear regulator featuring the LT®3086. The device is designed with multiple features and operates over a wide 1.4V to 40V input supply range. The LT3086 requires only one resistor to set the output voltage from 0.4V to 32V and it is stable with ceramic output capacitors requiring a minimum of 10µF.

The key features of the LT3086 include programmable cable drop compensation, master/slave configuration for paralleling of multiple devices for higher load current and heat spreading, output current and temperature monitoring, and programmable power good flag.

The LT3086 is offered in the packages of 16-lead DFN, 16-lead TSSOP, 7-lead DD-PAK, and a 7-lead TO-220.

The LT3086 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 demo circuit 1729A.

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} = 1V, I_{OUT1} = 1mA	1.55		40	V
V_{OUT}	Output Voltage	Shunt at 1, 2 for JP1	0.97	1	1.03	V
		Shunt at 3, 4 for JP1	1.164	1.2	1.236	V
		Shunt at 5, 6 for JP1	1.455	1.5	1.545	V
		Shunt at 7, 8 for JP1	3.201	3.3	3.399	V
		Shunt at 9, 10 for JP1	4.85	5	5.15	V
		Shunt at 11, 12 for JP1 and R10 Stuffed as 232k	11.64	12	12.36	V
I_{OUT}	Maximum Output Current	(Note 1)	2.1			A

Note 1: The maximum output current 2.1A is when the internal current limit is active and when V_{IN}-V_{OUT} is smaller than 9V. For the maximum output current under other conditions, please refer to the data sheet.

QUICK START PROCEDURE

Demonstration circuit 1729A is easy to set up to evaluate the performance of the LT3086. 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 VIN and GND.
3. Turn on the power at the VIN.

Note: Make sure that the VIN voltage does not exceed 40V.

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.

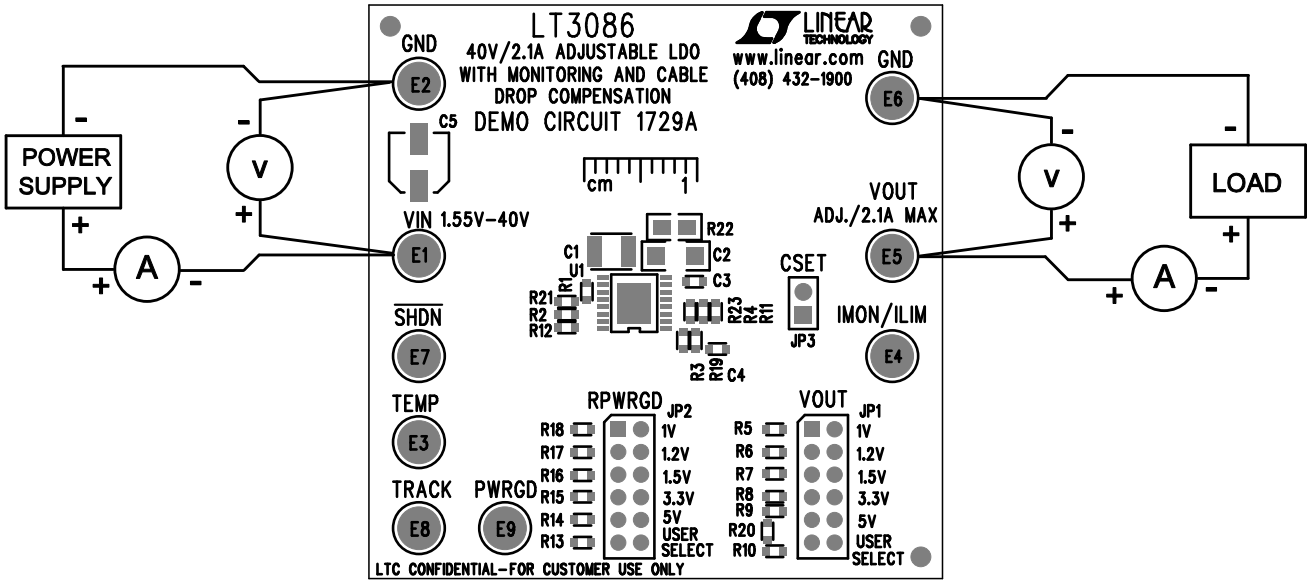


Figure 1. DC1729A Proper Equipment Setup

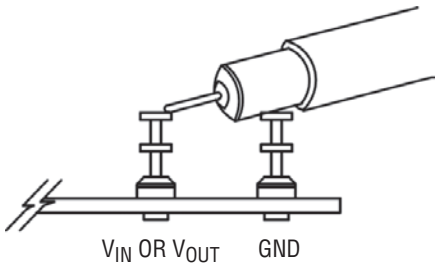


Figure 2. Measuring Input or Output Ripple

THERMAL IMAGE

An example thermal image shows the temperature distribution on the board. The test is done in still air at room temperature with 2.2W power dissipation in the LT3086. This gives the IC case-to-ambient thermal resistance θ_{JA} = 23°C/W on the demo board.

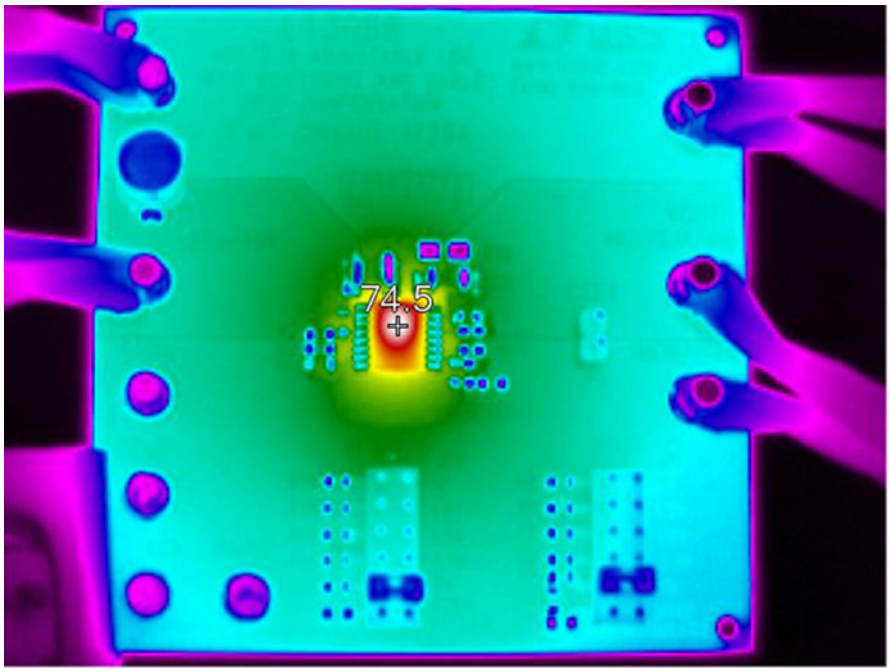


Figure 3. Temperature Rise at 2.2W Dissipation

CABLE DROP COMPENSATION

The power good setting jumper JP2 on the DC1729A is used for setting the power good threshold for the corresponding output voltages. JP2 needs to be configured at the same position as JP1 for any specific output voltages. For example, when JP1 is configured on 7 and 8 for $3.3V_{OUT}$, JP2 also needs to be configured on 7 and 8 for the correct power good setting for $3.3V_{OUT}$.

POWER GOOD SETTING

The cable drop compensation on the DC1729A can be turned on by placing R4 (R_{CDC}) with a value which is governed by the following equation provided in the data sheet:

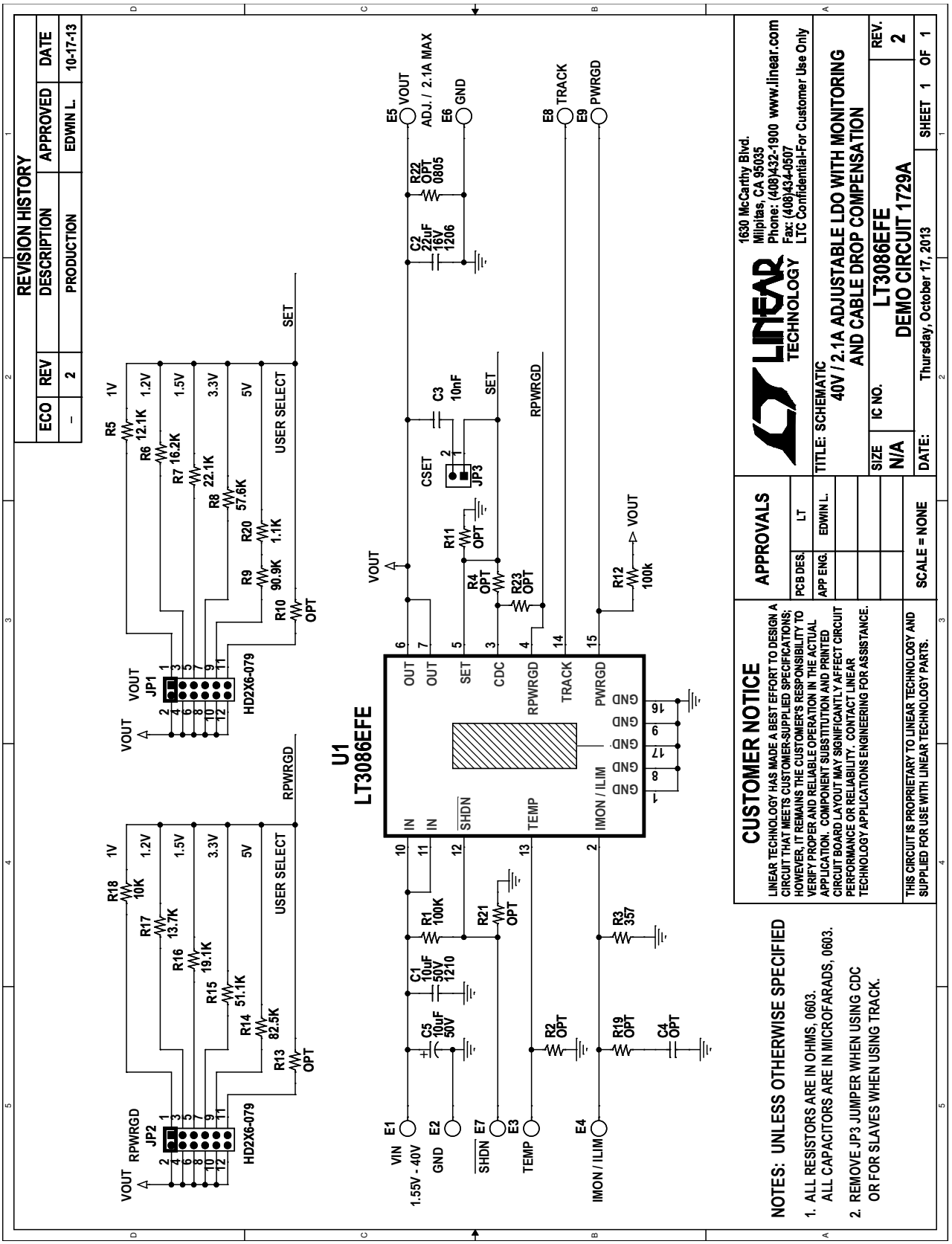
$$R_{CDC} = \frac{R_{MON} \bullet R_{SET}}{3000 \bullet R_{WIRE}}$$

Please note that when cable drop compensation is activated, it also changes the power good threshold. R23 needs to be the same value as R4 in order to keep the same output voltage power good threshold at the load.

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP., X7R, 10µF 50V, 10%, 1210	MURATA, GRM32ER71H106KA12L
2	1	C2	CAP., X5R, 22µF 16V, 10%, 1206	AVX, 1206YD226KAT2A
3	1	C3	CAP., X7R, 10nF 25V, 10%, 0603	AVX, 06033C103KAT2A
4	2	R1, R12	RES., CHIP, 100k, 1/16W, 1% 0603	VISHAY, CRCW0603100KFKEA
5	1	R3	RES., CHIP, 357Ω, 1/16W, 1% 0603	VISHAY, CRCW0603357RFKEA
6	1	R5	RES., CHIP, 12.1k, 1/16W, 1% 0603	VISHAY, CRCW060312K1FKEA
7	1	R6	RES., CHIP, 16.2k, 1/16W, 1% 0603	VISHAY, CRCW060316K2FKEA
8	1	R7	RES., CHIP, 22.1k, 1/16W, 1% 0603	VISHAY, CRCW060322K1FKEA
9	1	R8	RES., CHIP, 57.6k, 1/16W, 1% 0603	VISHAY, CRCW060357K6FKEA
10	1	R9	RES., CHIP, 90.9k, 1/16W, 1% 0603	VISHAY, CRCW060390K9FKEA
11	1	R14	RES., CHIP, 82.5k, 1/16W, 1% 0603	VISHAY, CRCW060382K5FKEA
12	1	R15	RES., CHIP, 51.1k, 1/16W, 1% 0603	VISHAY, CRCW060351K1FKEA
13	1	R16	RES., CHIP, 19.1k, 1/16W, 1% 0603	VISHAY, CRCW060319K1FKEA
14	1	R17	RES., CHIP, 13.7k, 1/16W, 1% 0603	VISHAY, CRCW060313K7FKEA
15	1	R18	RES., CHIP, 10k, 1/16W, 1% 0603	NIC, NRC06F1002TRF
16	1	R20	RES., CHIP, 1.1k, 1/16W, 1% 0603	VISHAY, CRCW06031K10FKEA
17	1	U1	I.C., LT3086EFE, TSSOP16EFE-BB	LINEAR TECH., LT3086EFE
Additional Demo Board Circuit Components				
1	0	C4	CAP., OPT 0603	
2	1	C5	CAP., SMT, 10µF 50V, 50CE10BSS	SANYO, 50CE10BSS
3	0	R2, R4, R10, R11, R13, R19, R21, R23	RES., CHIP, OPT 0603	OPT
4	0	R22	RES., CHIP, OPT 0805	OPT
Hardware-For Demo Board Only				
1	9	E1, E2, E3, E4, E5, E6, E7, E8, E9	TP, TURRET, 0.094"	MILL-MAX, 2501-2-00-80-00-00-07-0
2	2	JP1, JP2	JMP, 2X6, 0.079"	SULLINS, NRPN062PAEN-RC
3	1	JP3	JMP, 1X2, 0.079"	SULLINS, NRPN021PAEN-RC
4	2	XJP1, XJP2	SHUNT, 0.079" CENTER	SAMTEC, 2SN-BK-G

SCHEMATIC DIAGRAM



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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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