ANALOG DEVICES

Evaluation Board for Color TFT Panel Charge Pump Regulator

Preliminary Technical Data
EVAL-ADM8830

FEATURES
3 Output Voltages (5.1V,15.3V,-10.2V) from one 3V input Supply
Power Efficiency optimised for use with TFT in mobile phones
Low Quiescent Current
Low Shutdown Current (<1uA)
Fast Transient Response
Shutdown Function
Power Saving during Blanking Period
Option to use external LDO

APPLICATIONS
Handheld Instruments
TFT LCD Panels
Cellular Phones

INTRODUCTION
The ADM8830 Evaluation Board allows the ADM8830 TFT Color Panel Charge Pump Regulator to be quickly and easily evaluated.

The evaluation board allows all of the input and output functions to be exercised without the need for external components.

THE ADM8830
The following gives a brief description of the ADM8830 and the evaluation board hardware overview. Further information can be found in the data sheet for the device.

The ADM8830 is a charge pump regulator, used for color TFT (Thin Film Transistor) LCDs (Liquid Crystal Displays). The device can be used to generate 3 output voltages (+5.1V ±2%, +15.3V, -10.2V) from a single 3V input supply, using charge pump technology. These outputs are then used to provide supplies for the LCD controller (5.1V ±2%), and the gate drives for the transistors in the panel (+15.3V and –10.2V). Only a few external capacitors are needed for the charge pumps. An efficient low dropout voltage regulator also ensures that the power efficiency is high and provides a low ripple 5.1V output. This LDO can be shutdown and an external LDO used to drive the input to the charge pump section which generates the +15.3V and -10.2V outputs if so required by the user.

The ADM8830 has an internal 100KHz oscillator for use in scanning mode but must be clocked by an external

clock source in blanking (low current) mode. The internal oscillator is used to clock the charge pumps during scanning mode where the current is highest. During blanking periods, the ADM8830 switches to use an external, lower frequency clock. This allows the user to vary the frequency and maximise power efficiency during blanking periods. The tolerances on the output voltages are seamlessly maintained when switching from Scanning Mode to Blanking Mode or vice versa.

The ADM8830 has a number of power save features, including low power Shutdown and reduced quiescent current consumption during the blanking periods mentioned above. The 5.1V output consumes the most power, so Power Efficiency is also maximised on this output with an oscillator enabling scheme (Green Idle™). This effectively senses the load current that is flowing and turns on the charge pump only when charge needs to be delivered to the 5V pump doubler output.

EVALUATION SYSTEM PACKAGE CONTENTS
The evaluation system package contains the following items

- This application note
- ADM8830 evaluation board

EVALUATION BOARD HARDWARE
The ADM8830 evaluation board contains the following main components, which can be identified from the block diagram,the schematic diagram and the printed circuit board silkscreen of figures 1,3 and 4 overleaf.

- 20ld LFCSP socket to hold ADM8831 IC

- 9 Jumper points to facilitate the connection of external LDO's, Clock Sources, external loads etc.

- 1 SMA connectors for reliable logic signal connection

- 11 test points for signal connection and measurement

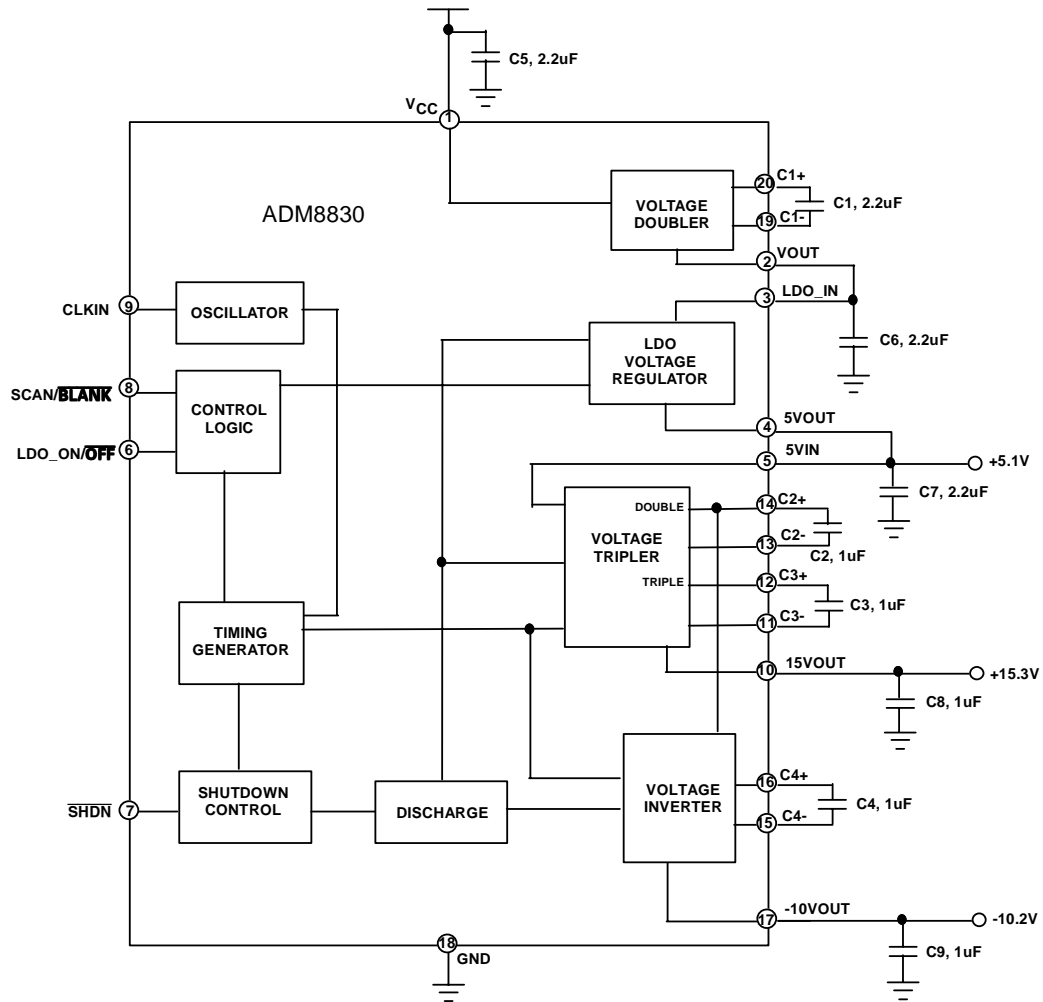- A large patchwork areas to facilitate the addition of extra components to the ADM8830 Eval board
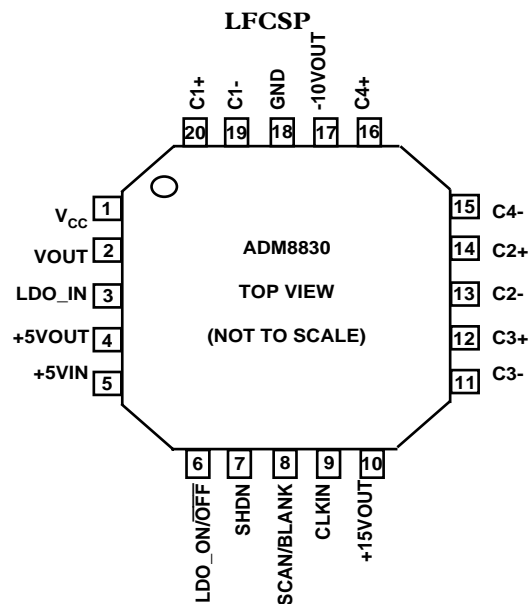
Figure 1. ADM8830 Functional Block Diagram

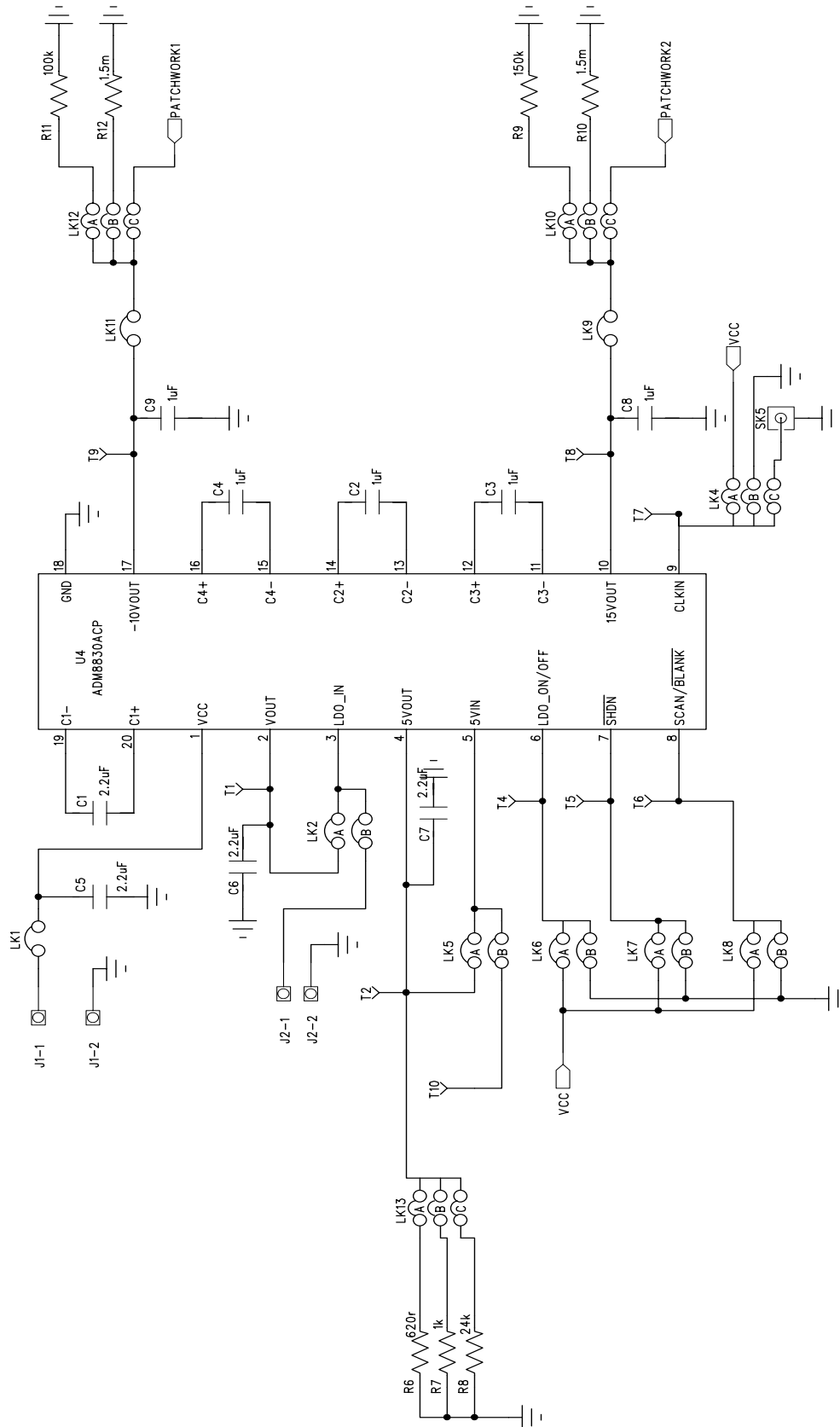*Figure 2. ADM8830 Pin Configurations*

Figure 3. ADM8830 Evaluation Board Schematic
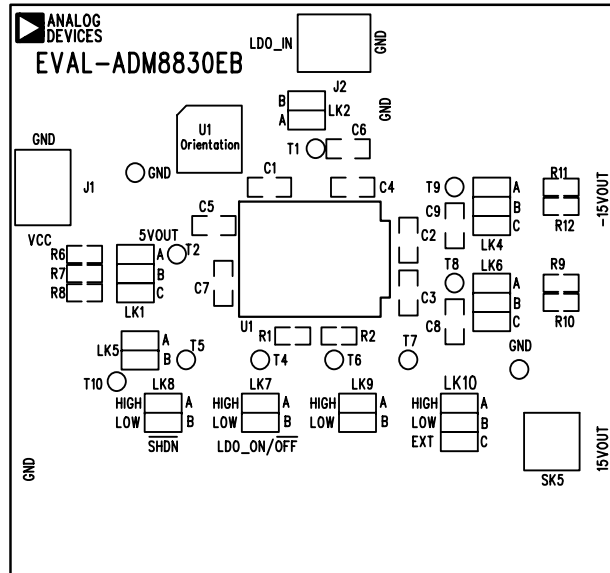
Figure 4. ADM8830 Evaluation Board Silkscreen

CONNECTORS AND JUMPERS

The function of the various connectors and jumpers on the evaluation board is explained below.

TABLE 1. POWER CONNECTIONS

Connector Number	Function
J1	Supply (3 V nominal)
J2	External Source (can be regulated by on-board LDO)

TABLE 2. SMA CONNECTION

Connector	Name	Pin Function	Logic Level (High=3V, Low=0V)
SK5	CLKIN	Clk input pin for external clock which is required for blanking mode	

TABLE 3. JUMPERS (LINKS)

Jumper Name		Description	Default Status
LK1		Vcc Jumper	**Inserted**
LK2	A	Connects Vout (pin 4) to LDO_IN (pin 5)	**Inserted**
	B	Connects external source (J2) to LDO_IN (pin 5)	Removed
LK3	A	Connects to optional external 5V loads (R1,R2,R3)	Removed
	B	Connects 5VOut (pin 6) to 620Ohm resistor (R6) to GND (This generates max **scanning mode** load current of 8mA)	Removed
	C	Connects 5VOut (pin 6) to 1K resistor (R7) to GND (This generates load current of 5mA)	Removed
	D	Connects 5VOut (pin 6) to 1K resistor (R8) to GND (This generates max **blanking mode** load current of 200uA)	Removed
LK5	A	Connects ADM8830 regulated 5V output (pin 6) to 5VIN (pin 7) (Input to the +15V and -10V charge pump stage)	**Inserted**
	B	Connects externally regulated 5V output to 5VIN (pin 7) (Input to the +15V and -10V charge pump stage	Removed
LK6		Isolates externally regulated 5V supply	Removed
LK9		Connects/disconnects load resistors from the 15V output (pin 12)	Removed
LK10	A	Connects 15V output (pin 12) to 150K resistor (R9) to GND (This generates a max load current of 100uA)	**Inserted**
	B	Connects 15V output (pin 12) to 1M5 resistor (R10) to GND (This generates a min load current of 10uA)	**Inserted**
	C	Connects 15V output (pin 12) to patchwork area	**Inserted**
LK11		Connects/disconnects load resistors from the -10V output (pin 19)	Removed
LK12	A	Connects -10V output (pin 19) to 100K resistor (R11) to GND (This generates a max load current of 100uA)	**Inserted**
	B	Connects -10V output (pin 19) to 1M resistor (R12) to GND (This generates a min load current of 10uA)	**Inserted**
	C	Connects -10V output (pin 19) to patchwork area	**Inserted**

BOARD COMPONENTS

Item	Qty	Ref Des	Description
1	1	U1	ADM8830
2	1	SKT1	20 ld LFCSP Socket
3	2	J1,J2	Power Connector
4	1	SK1	SMA Connector
5	2	T1-T2,	Testpoint
6	7	T4-T11	Testpoint
7	6	C2-4,C8-9	CAP,1UF
8	5	C1,C5-7	CAP,2.2UF
9	1	R6	620OHM
10	1	R7	1KOHM
11	1	R8	25KOHM
12	1	R9	150KOHM
13	1	R10	1.5MOHM
14	1	R11	100KOHM
15	1	R12	1MOHM

SETTING UP THE ADM8830 EVAL BOARD (SCANNING MODE)

• Connect the scanning mode load resistors
- • 5VOut- connect R6 (Insert LK3B- Remove LK3A/C/D)
- • +15Vout- connect R9 (Insert LK9 and LK10A)
- • -10Vout- connect R11 (Insert LK11 and LK12A)

Note: All other load resistors should be disconnected by removing their links (see table 3)

• Connect Vout to ADM8830 LDO (Insert LK2A- Remove LK2B)

 • Connect the following jumpers
- • $\overline{SHDN}$- (Insert LK8a- Remove LK8B)
- • LDO_ON/$\overline{OFF}$-   (Insert LK7A- Remove LK7B)
- • SCAN/$\overline{BLANK}$- (Insert LK9A- Remove LK9B)

• Apply 3.3V logic signals to the logic input
- • CLKIN- SMA cable to SK5 or wire to T7

Note: An external clock is not required to be applied to CLKIN (pin 11) in this mode.

• Insert LK1. Apply a 3V supply to J1.

SETTING UP THE ADM8830 EVAL BOARD (BLANKING MODE)

• Connect the blanking mode load resistors
- • 5VOut- connect R8 (Insert LK3D- Remove LK3A/B/C)
- • +15Vout- connect R10 (Insert LK9 and LK10B)
- • -10Vout- connect R12 (Insert LK11 and LK12B)

Note: All other load resistors should be disconnected by removing their links (see table 3)

• Connect Vout to ADM8831 LDO (Insert LK2A- Remove LK2B)

• Connect the following jumpers
- • $\overline{SHDN}$- (Insert LK8a- Remove LK8B)
- • LDO_ON/$\overline{OFF}$-   (Insert LK7A- Remove LK7B)
- • SCAN/$\overline{BLANK}$- (Insert LK9B- Remove LK9A)
(Siganl must be LOW for Blanking Mode)

• Apply 3.3V logic signals to the logic input
- • CLKIN- SMA cable to SK5 or wire to T7

Note: An external clock MUST be applied to CLKIN (pin 11) in this mode. The frequency of this clock is nominally 1KHz (refer to the datasheet).

• Insert LK1. Apply a 3V supply to J1.