



Step-Up DC/DC Controller

■ FEATURES

- Adjustable Output Voltage with Two Resistors (AIC1630A).
- Power-Saving Shutdown Mode (7 μ A typical).
- 120KHz Switching Rate.
- On-Chip Low Battery Detector.

■ APPLICATIONS

- Palmtop & Notebook Computers.
- Battery Charger Supply.
- Cellular Telephone.
- LCD Contrast Supply.
- Flash Memory Programmer.
- Battery Backup Supplies.
- Portable Instruments.

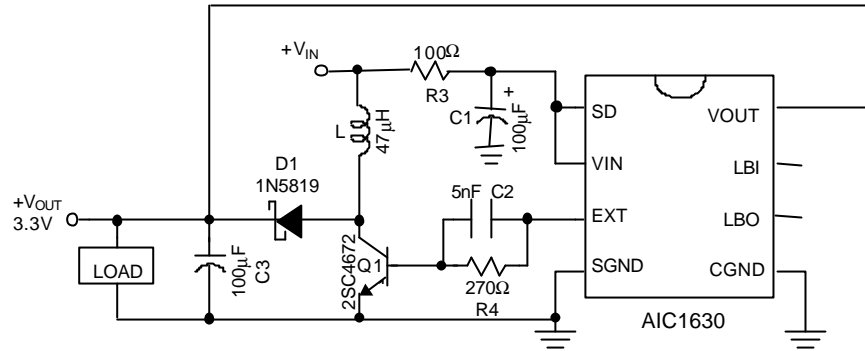
■ DESCRIPTION

The AIC1630 is a DC-DC controller designed to drive an external power switch for more flexibility, especially in higher voltage and larger power applications. Typically six components are required to set up a step-up configuration easily achieving efficiency beyond 80%. A few more components are required to set up a step-down configuration delivering 4A load current with 83% typical efficiency, 86% at 2A load, and 300 μ A quiescent current.

The output voltage is internally set to 3V, 3.3V, 5V or externally set to an arbitrary value below breakdown voltage of the power switch. Logic-controlled shutdown mode is provided for power saving. The low battery detector can be also configured as a linear regulator.

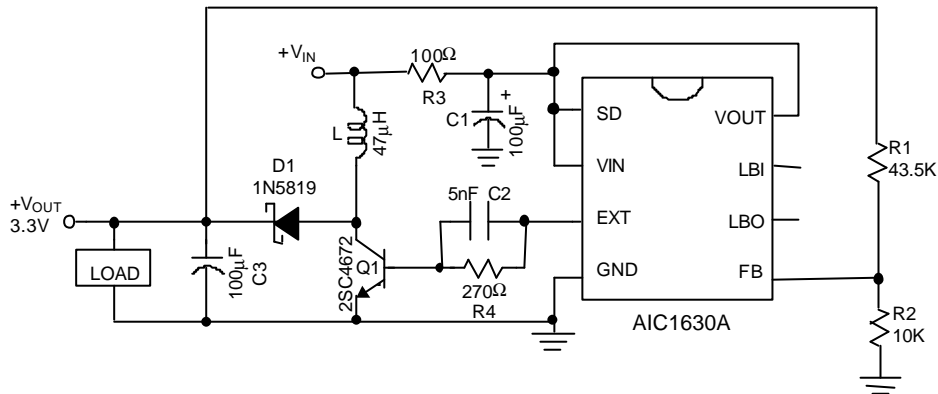
120KHz switching rate reduces the inductor size. Inductors of 22 μ H to 47 μ H inductance are recommended for most applications.

TYPICAL APPLICATION CIRCUIT



Note : $V_{IN} \geq 1.8V$, $V_{OUT} \leq 7V$

High Efficiency Step-Up DC/DC Converter

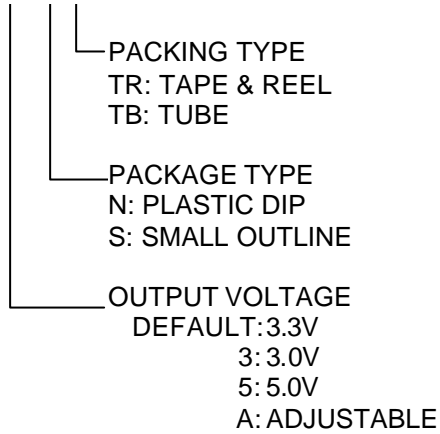


Note : $V_{IN} \geq 2.2V$

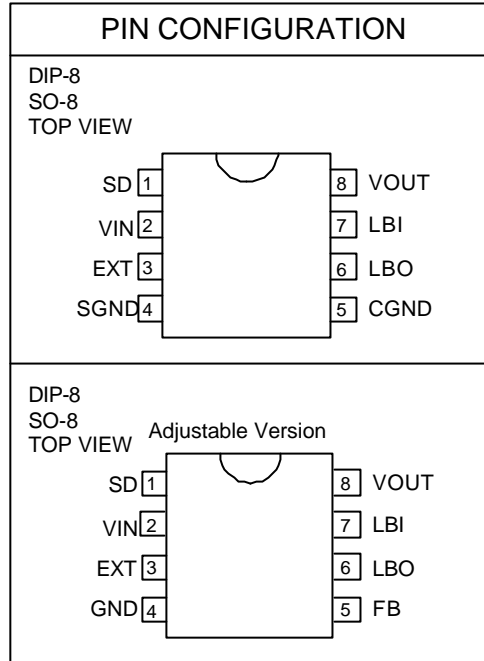
High Efficiency Step-Up DC/DC Converter

ORDERING INFORMATION

AIC1630-XCXXX



EX: AIC1630-3CSTR
 → 3.0V Version, in SO8 Package & Tape & Reel Packing Type



ABSOLUTE MAXIMUM RATINGS

Supply Voltage	7.0V
DC Voltage Applied On All Other Pins	7.0V
Operating Temperature Range	-20°C~80°C
Storage Temperature Range	-65°C ~150°C

TEST CIRCUIT

Refer to Typical Application Circuit.

ELECTRICAL CHARACTERISTICS ($V_{IN}=3.0V$, $T_A=25^\circ C$, unless otherwise specified.)

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage		1.8		7	V
Output Voltage	$I_L=200mA$				
	AIC1630	3.16	3.3	3.44	V
	AIC1630-3	2.88	3.0	3.12	
	AIC1630-5	4.80	5.0	5.20	
Switch Off Current			105	140	μA
Shutdown Mode Current			7	15	μA
Recovery Time from Shutdown	$V_{IN}=2.5V$, $I_L=200mA$		0.4		mS
Efficiency	$I_L=300mA$ Fig. 1 in Appl. Examples		85		%
Line Regulation	$V_{IN}=2.2\sim 3.3V$ $V_{OUT}=5V$, $I_L=100mA$		0.6		$\%V_{OUT}$
Load Regulation	$I_L=10mA\sim 500mA$ $V_{OUT}=5V$		2.5		$\%V_{OUT}$
Oscillator Frequency		90	120	150	KHz
LBI Pin Trip Point		1.17	1.22	1.27	V
FB Threshold Voltage	AIC1630A	0.598	0.617	0.636	V
EXT Pin Driving Capability	Pin 8=5V				
	Sourcing, Pin 3= 0.85V Sinking, Pin 3= 4.15V		80 50		mA mA
LBO "ON Resistance"	$V_{IN}=2V$		45		Ω
Input Pin Bias Current				10	nA/Pin
Output Pin Leakage				10	nA/Pin

TYPICAL PERFORMANCE CHARACTERISTICS

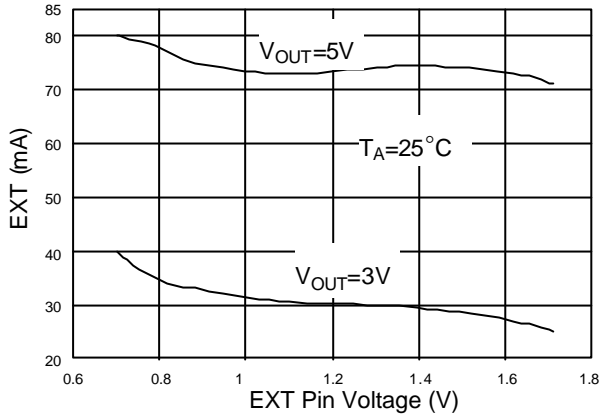


Fig. 1 Ext Pin Sourcing Capability

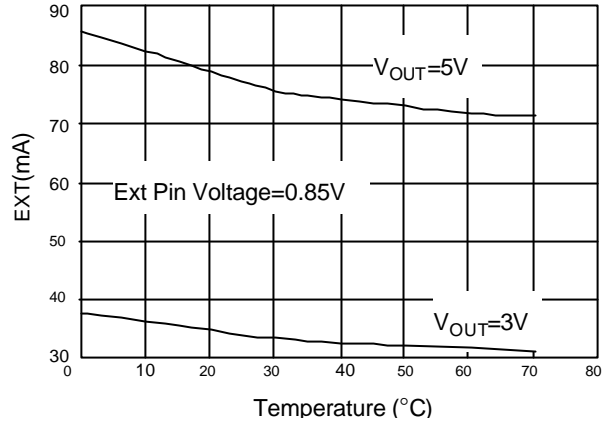


Fig. 2 Ext Pin Sourcing Capability vs. Temperature

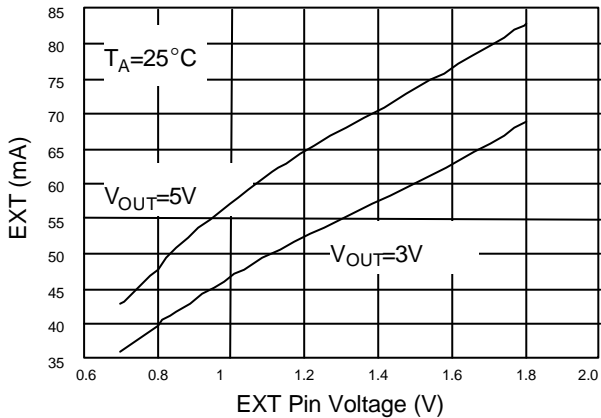


Fig. 3 Ext Pin Sinking Capability

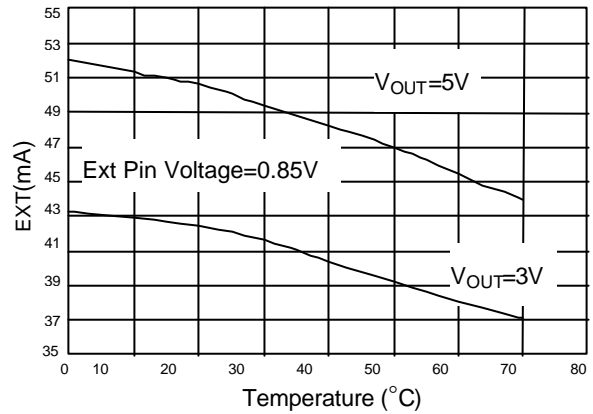


Fig. 4 Ext Pin Sinking Capability vs. Temperature

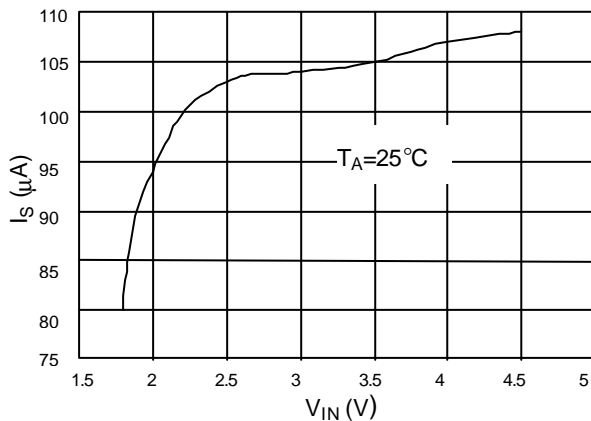


Fig. 5 Switch off Supply Current vs. Input Voltage

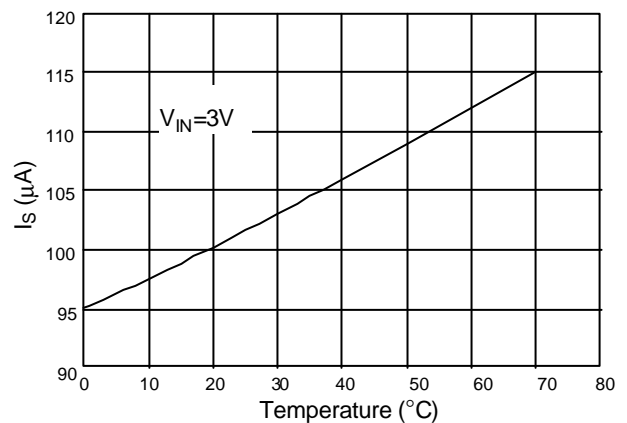


Fig. 6 Switch Off Supply Current vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

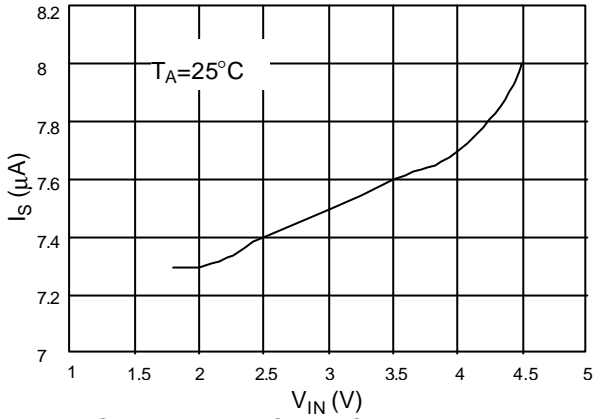


Fig. 7 Shutdown Mode Supply Current vs. Input Voltage

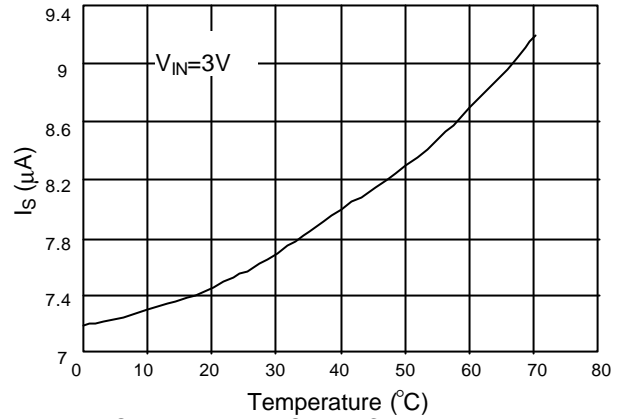


Fig. 8 Shutdown Mode Supply Current vs. Temperature

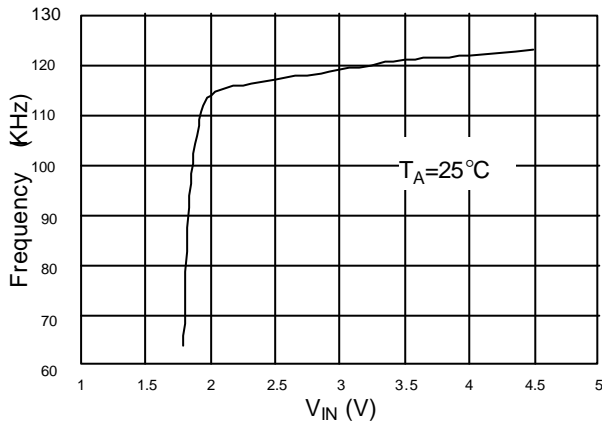


Fig. 9 Oscillator Frequency vs. Input Voltage

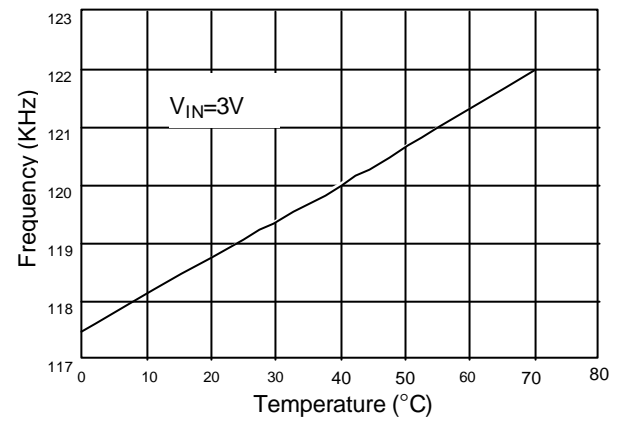
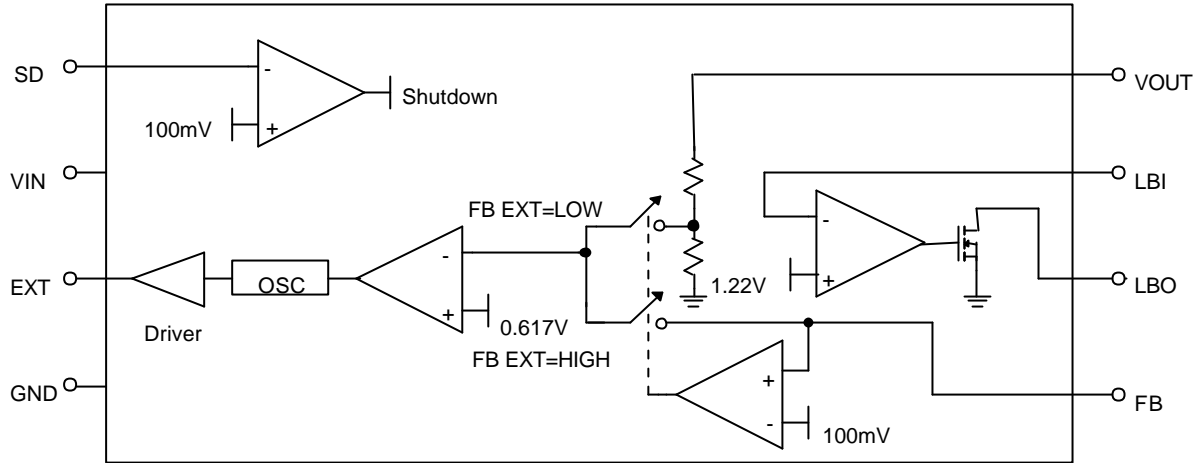


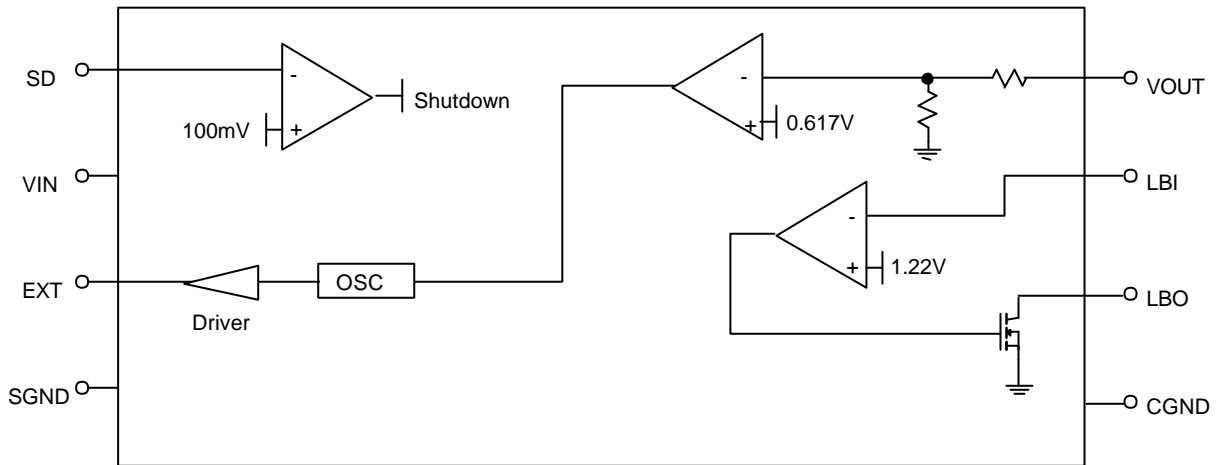
Fig. 10 Oscillator Frequency vs. Temperature

■ BLOCK DIAGRAM



The driver and reference (0.617V and 1.22V) are based on VOUT pin. And VOUT must be $\geq 2.2V$ then system can operate normally.

AIC1630A



AIC1630-3/AIC1630/AIC1630-5

PIN DESCRIPTIONS

AIC1630/ AIC1630-3/ AIC1630-5

- PIN 1: SD - The AIC1630 goes in shutdown mode and consumes less than 10 μ A when SD pin is pulled to ground and it goes in normal operating mode when the SD pin is pulled to a positive voltage above 100mV.
- PIN 2: VIN - Input supply.
- PIN 3: EXT - Push-pull drive output to drive external power switch.
- PIN 4: SGND - Ground connected to source of power switch.
- PIN 5: CGND - Ground for control circuits of the IC. It should be separated from SGND to avoid the interference.
- PIN 6: LBO - Open drain output of the battery low detector, with 45 Ω "ON resistance" at $V_{IN}=2V$. It is pulled low when the voltage on LBI pin is below 1.22V.
- PIN 7: LBI - The noninverting input of the battery low detector, of which the inverting input is internally connects to 1.22V voltage reference.
- PIN 8: VOUT - The output voltage feedbacks to the IC through this pin.

AIC1630A

- PIN 1: SD - The AIC1630A goes in shutdown mode and consumes less than 10 μ A when SD pin is pulled to ground and it goes in normal operating mode when the SD pin is pulled to a positive voltage above 100mV.
- PIN 2: VIN - Input supply.
- PIN 3: EXT - Push-pull drive output to drive external power switch.
- PIN 4: GND - Ground.
- PIN 5: FB - Output voltage can either be internally set to 5 volt by grounding FB pin, or be externally set to an arbitrary voltage by applying to FB pin the divider voltage of two divider resistors. V_{OUT} voltage is given by the following equation:

$$\frac{R1}{R2} = \frac{V_{OUT}}{0.617} - 1$$
, where
 R1 = Resistor connected between FB pin and VOUT pin.
 R2= Resistor connected between FB pin and ground.
 V_{OUT} =Output voltage to be set.
- PIN 6: LBO - Open drain output of the battery low detector, with 45 Ω "ON resistance" at $V_{IN}=2V$. It is pulled low when the voltage on LBI pin is below 1.22V.
- PIN 7: LBI - The noninverting input of the battery low detector, of which the inverting input is internally connects to 1.22V voltage reference.
- PIN 8: VOUT- The output voltage feedbacks to the IC through this pin. If output voltage was externally set, the VOUT pin can be tied to any low impedance node with voltage between the external power switch

threshold and 7V

APPLICATION EXAMPLES

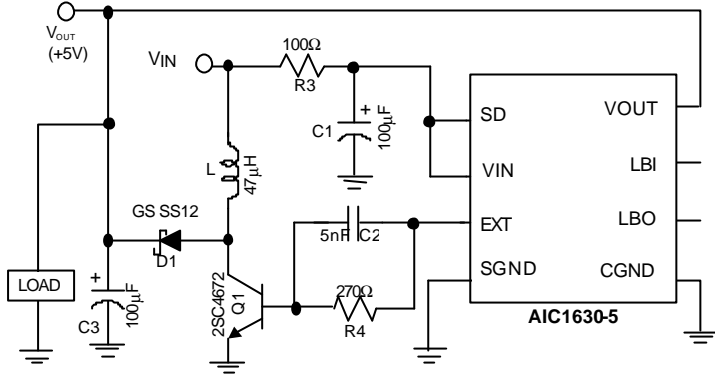


Fig. 11 5V Output Step-Up Converter

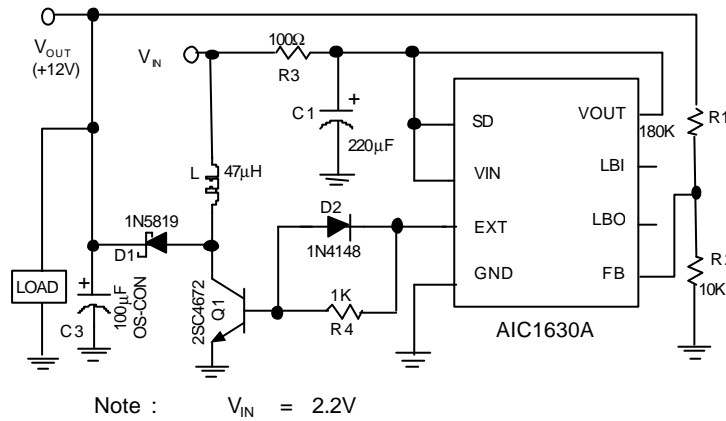
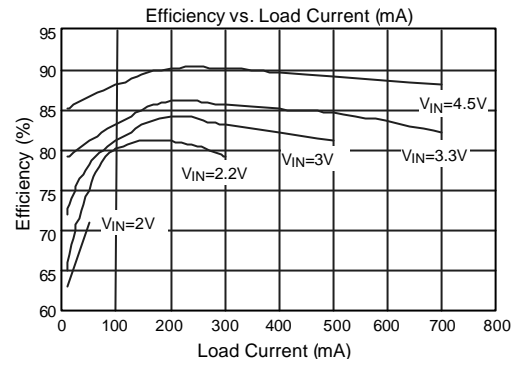


Fig. 12 12V Output Step-Up Converter for Flash Memory

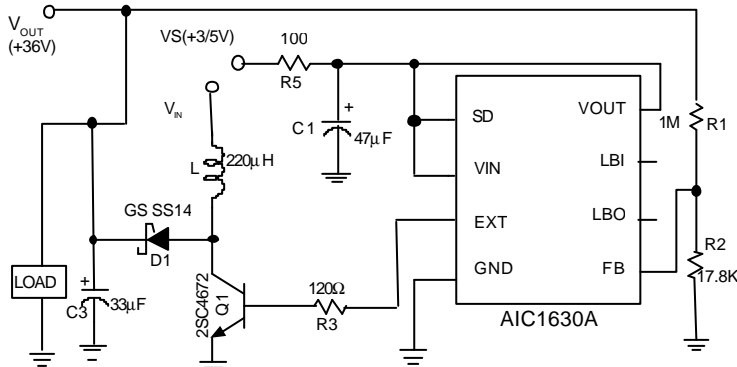
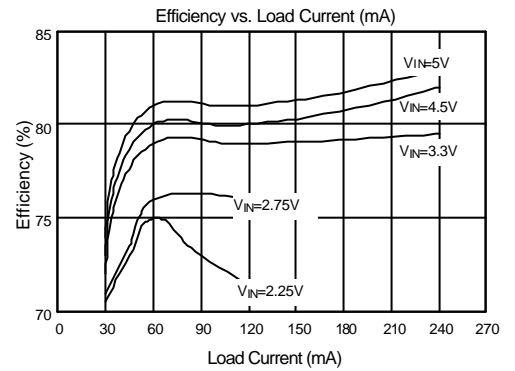
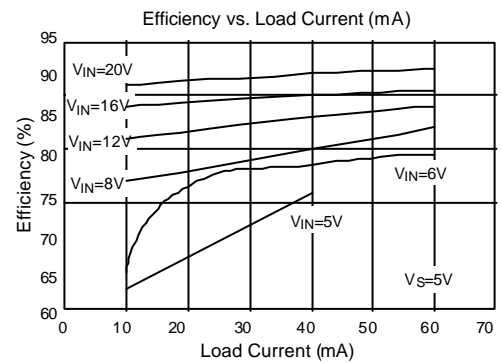


Fig. 13 36V Output Step-Up Converter for Color LCD



APPLICATION EXAMPLES (Continued)

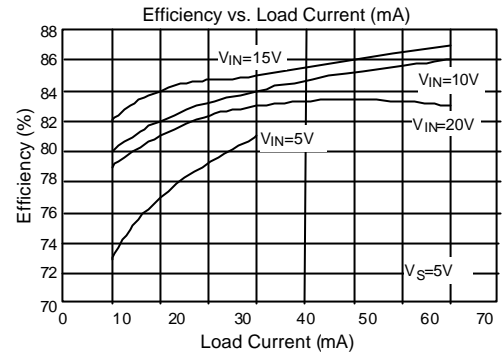
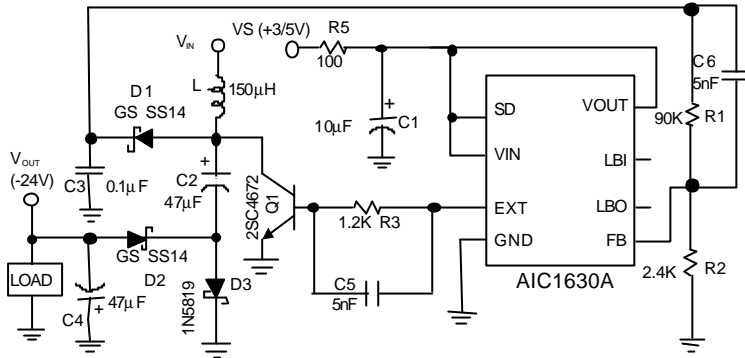


Fig. 14 -24V Output Inverting Converter for LCD

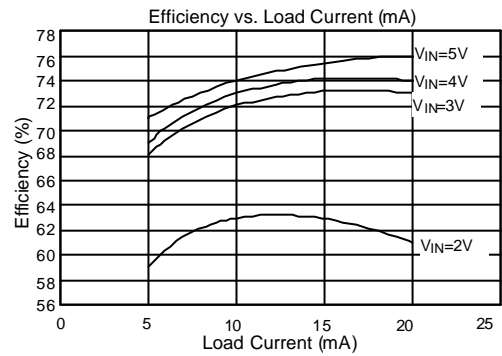
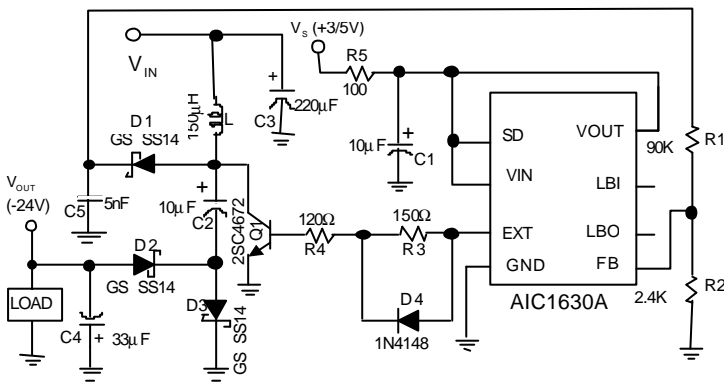


Fig. 15 2V Input 20mA Load -24V Output Inverting Converter for LCD

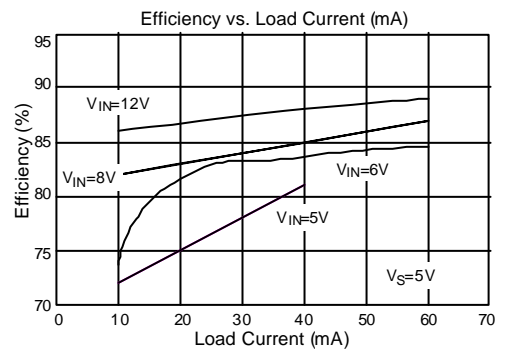
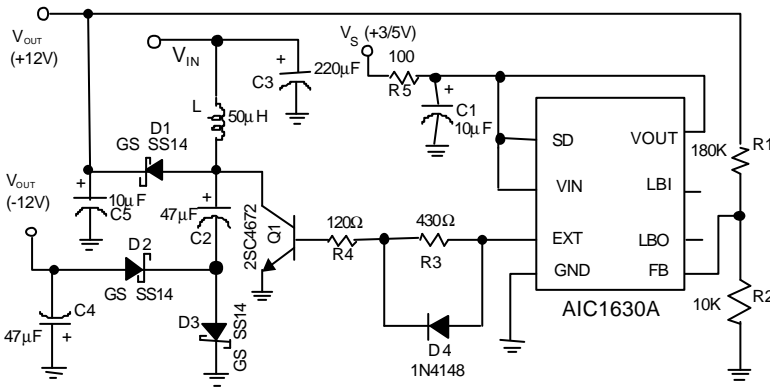


Fig. 16 12V Dual Output Converter for computer for computer Interfacing

APPLICATION EXAMPLES (Continued)

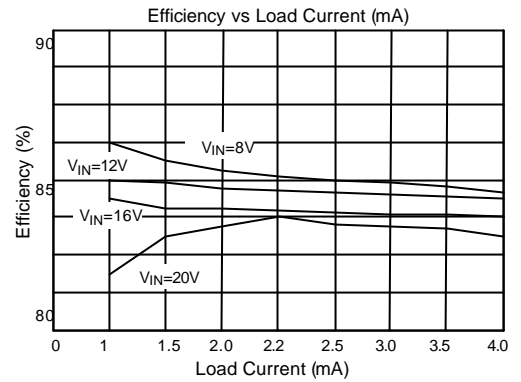
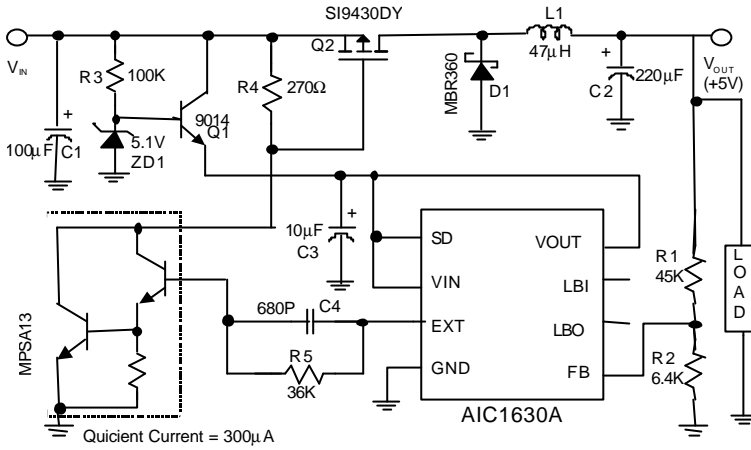


Fig. 17 5V Output Step-Down Converter -1

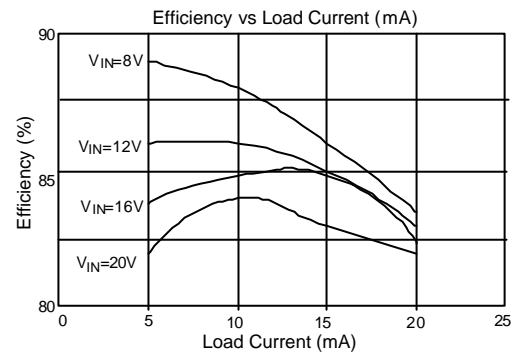
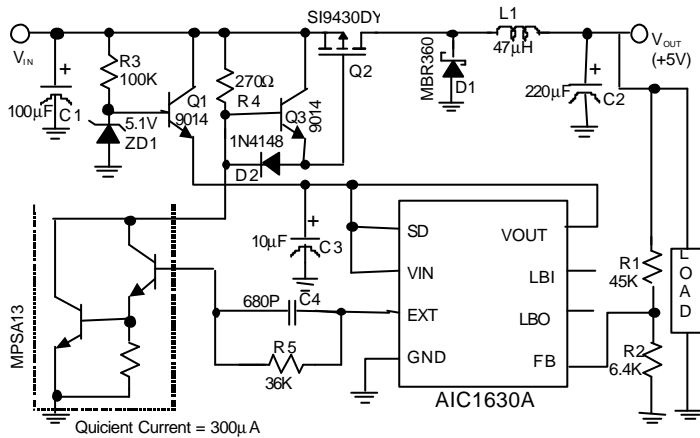
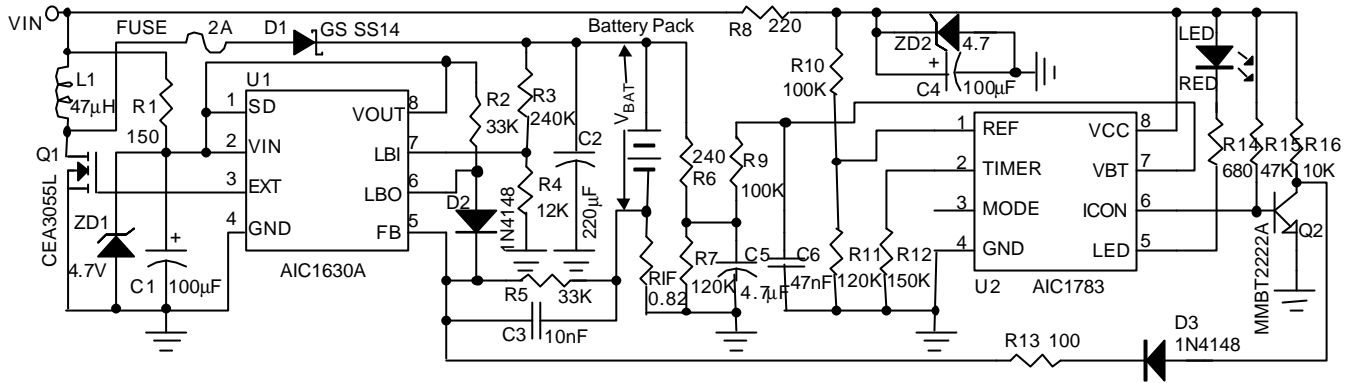


Fig. 18 5V Output Step-Down Converter -2

APPLICATION EXAMPLES (Continued)

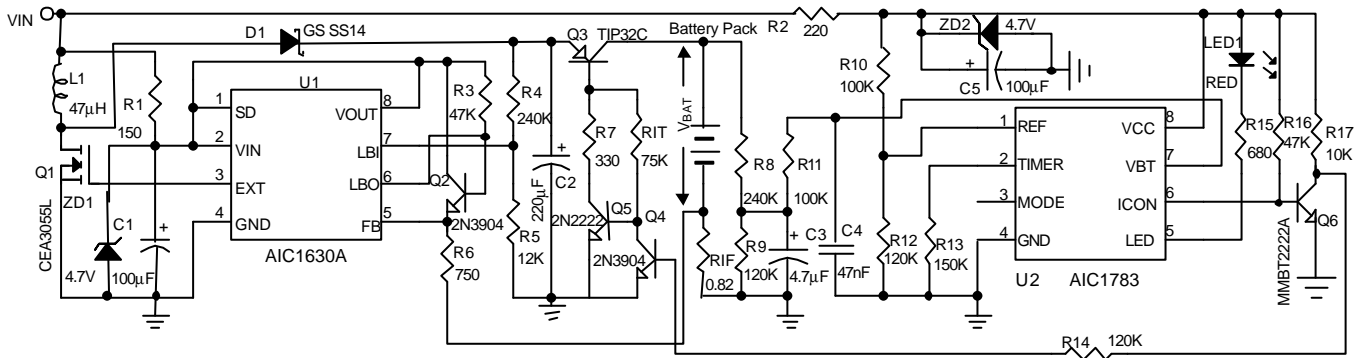


Note: V_{IN} must be lower than V_{BAT} .

R_{IF} sets the Charging Current, $I_{CHARGE} = 0.617V/R_{IF}$

Short Circuit Condition is protected with a 2A Fuse.

Fig. 19 Step-Up Rechargeable Battery Charger



Note: Fast Charge Current = $0.8A @ V_{IN} < V_{BAT}$

$= (V_{IN} - V_{BAT} - 0.5) / 0.82 @ V_{IN} > V_{BAT}$

Trickle charge Current = 30mA.

R_{IF} sets Fast Charge Current, R_{IT} sets Trickle Charge Current

Fig. 20 Step-Up/Down Rechargeable Battery Charger

APPLICATION EXAMPLES (Continued)

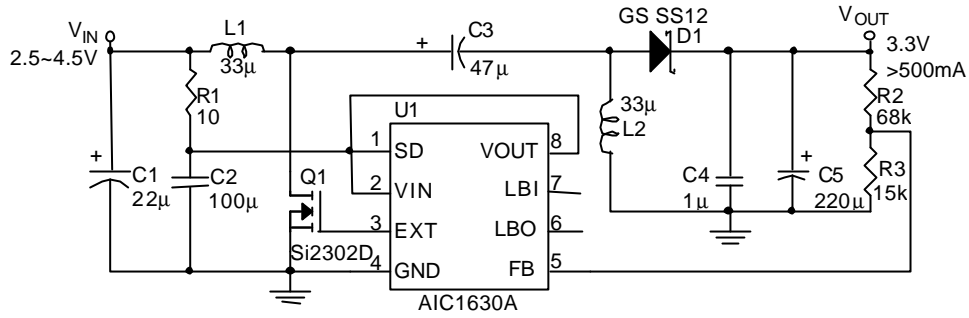


Fig. 21 SEPIC Circuit of the DC-DC Converter

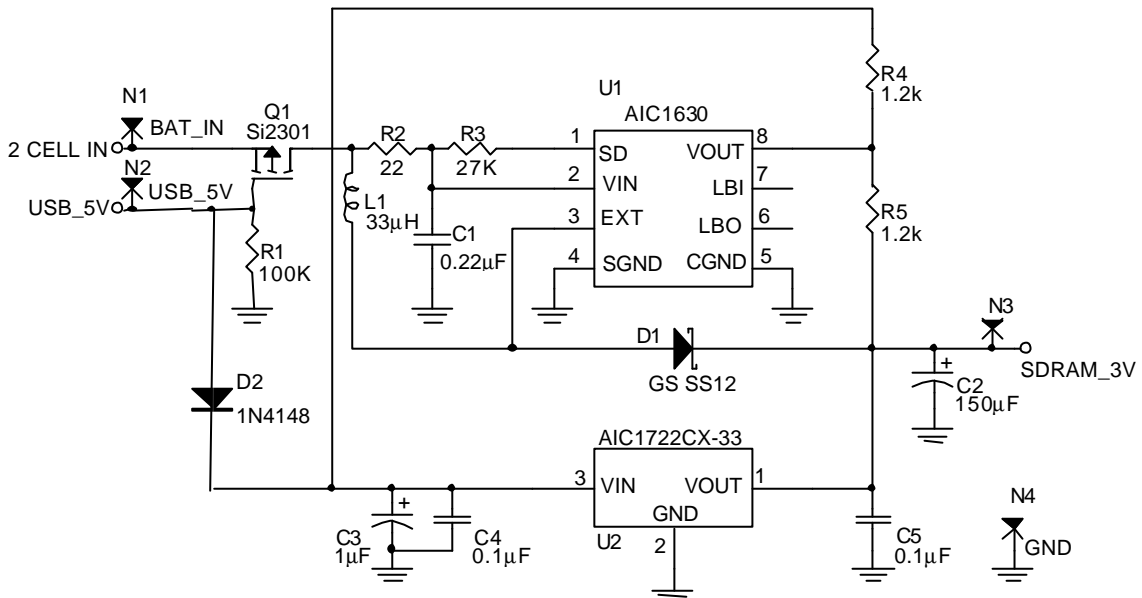


Fig. 22 USB dual Input Application of SDRAM