1. DESCRIPTION

The XB6104x is a high frequency boost converter designed for small to medium sized LCD bias supplies and white LED backlight supplies. The device is ideally suited for generating output voltages up to 28V using two NiMH/NiCd batteries or a single Li-ion battery. The device can also be used to achieve power conversion from standard 3.3V or 5V to 12V.

The XB6104x operates at switching frequencies up to 1MHz, which supports the use of small external components that use ceramic and tantalum output capacitors. the XB61040 device has an internal 400mA switching current limit, while the XB61041 device has a 250mA switching current limit, which provides lower output voltage ripple and allows for the use of smaller form factor inductors for low-power applications. The low quiescent current (28μA typical), combined with the optimised control scheme, allows the devices to operate at very high efficiency over the entire load current range.

2. FEATURES

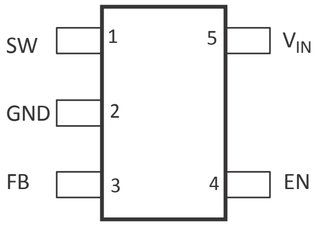
- 1.8V to 6V input voltage range
- Adjustable output voltage range up to 28V
- 400mA (XB61040) and 250mA (XB61041) internal switching current
- Up to 1MHz switching frequency
- 28μA typical no-load quiescent current
- 1μA typical shutdown current
- Internal soft-start
- Uses SOT23-5 packages

3. APPLICATIONS

- LCD Bias Power Supplies
- White LED power supply available for LCD backlighting
- Digital cameras
- PDAs, organizers and handheld devices PCs
- Cell phones
- Internet audio players
- Standard 3.3V or 5V to 12V conversion

4. PIN CONFIGURATIONS AND FUNCTIONS

XB61040
XB61041

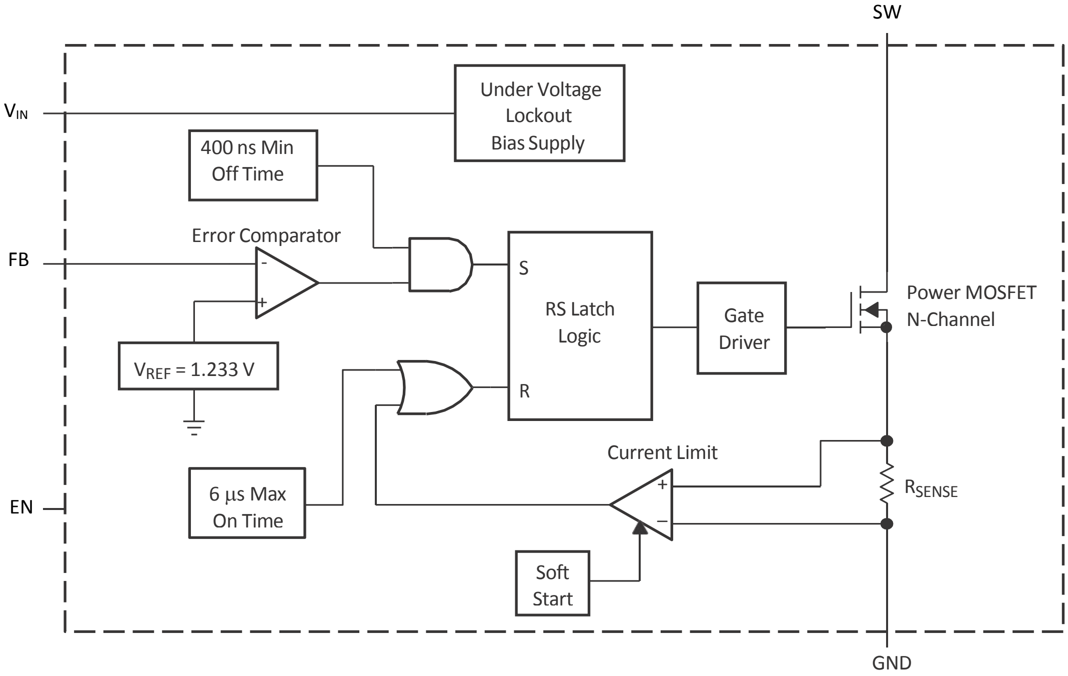


(Top View)

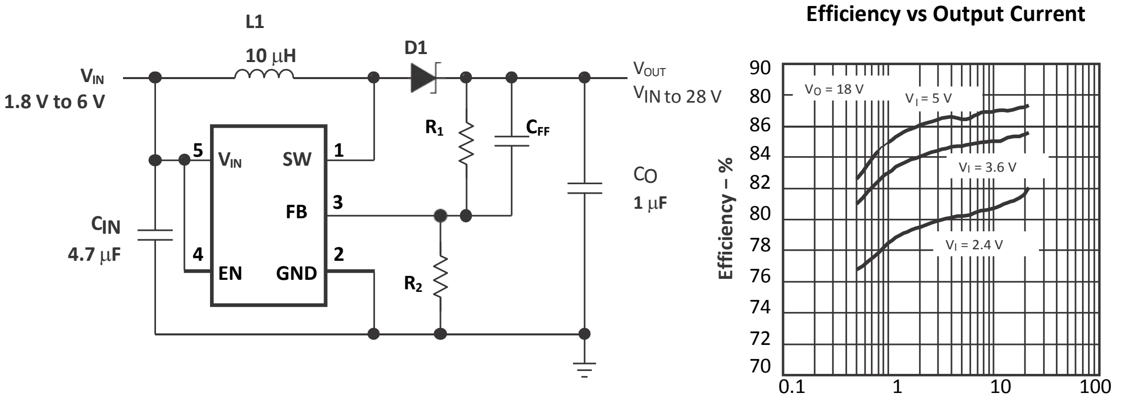
Pin Functions

PIN		I/O	DESCRIPTION
NAME	SOT23-5		
SW	1	I	Connect the inductor and Schottky diode to this pin. This is a switch pin and is connected to the drain of the internal power MOSFET
GND	2	–	Ground pin
FB	3	I	This is the component's feedback pin. Connecting this pin to an external voltage divider programs the desired output voltage.
EN	4	I	This is the enable pin for the device. Pulling the pin to ground puts the device into shutdown mode and reduces the supply current to less than 1μA. This pin must not be left open and needs to be terminated.
V_{IN}	5	I	Supply Voltage Pin

5. FUNCTIONAL BLOCK DIAGRAM



Block Diagram



Typical Application Schematic

6. SPECIFICATIONS

6.1. Absolute Maximum Ratings

Measured in the operating temperature range under naturally ventilated conditions (unless otherwise stated)

		MIN	MAX	UNIT
V_{IN}	Supply voltage on pin V_{IN}	-0.3	7	V
V_I	Voltage on pins EN, FB	-0.3	V_{IN} + 0.3	V
V_O	Voltage on pins SW	30	30	V
T_J	Operating junction temperature	-40	150	℃
T_{stg}	Storage temperature	-50	150	℃

[1] Stresses in excess of those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are pressure ratings only and do not indicate that the device will operate properly under these conditions or any other conditions other than the recommended operating conditions. Prolonged exposure to absolute maximum rating conditions may affect device reliability.

[2] All voltage values are based on network ground.

6.2. Thermal Resistance Characteristics

THERMAL METRIC(1)		XB61040	XB61041	UNIT
		SOT23-5	SOT23-5	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	205.2	205.2	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	118.3	118.3	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	34.8	34.8	°C/W
ψ_{JT}	Junction-to-top characterization parameter	12.2	12.2	°C/W
ψ_{JB}	Junction-to-board characterization parameter	33.9	33.9	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	—	—	°C/W

6.3. ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	±2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	±750	

[1] JEDEC document JEP155 states that 500 V HBM can be produced safely under standard ESD control procedures. Production at less than 500 V HBM is possible if the necessary precautions are taken. Pins listed as ±XXXV may actually have higher performance.

[2] JEDEC document JEP157 states that production is safe at 250 V CDM with standard ESD control procedures. Production at less than 250 V CDM is possible if the necessary precautions are taken. Pins listed as ±YYYV may actually have higher performance.

6.4. Recommended Operating Conditions

		MIN	NOM	MAX	UNIT
V_{IN}	Input Voltage Range	1.8		6	V
V_{OUT}	Output Voltage Range			28	V
L	inductors	2.2	10		μH
f	switching frequency			1	MHz
C_{IN}	input capacitor		4.7		μF
C_{OUT}	output capacitor	1			μF
T_A	working environment temperature	-40		85	℃
T_J	operating temperature	-40		125	℃

6.5. Electrical Characteristics

V_{IN} = 2.4V, EN = V_{IN}, T_A = -40°C to 85°C, typical values measured at TA = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current						
V_{IN}	Input Voltage Range		1.8		6	V
I_Q	Operating quiescent current	I_{OUT} = 0mA，no switch，V_{FB} = 1.3V		35	80	μA
I_{SD}	Shutdown current	EN = GND		1	5	μA
V_{UVLO}	Undervoltage blocking threshold			1.5	1.7	V
enable						
V_{IH}	High Level Input Voltage			1.3		V
V_{IL}	Low Level Input Voltage			0.4		V
I_I	EN Input leakage current	EN = GND or V_{IN}			1	μA
Power switching and current limiting						
Vsw	Maximum switching voltage			30		V
t_{off}	Minimum Off Time		250	400	550	ns
t_{on}	Maximum on-time		4	6	7.5	μs
$R_{DS}(on)$	MOSFET On-resistance	V_{IN} = 2.4V；I_{SW} = 200mA；XB61040		600	1000	mΩ
$R_{DS}(on)$	MOSFET On-resistance	V_{IN} = 2.4V；I_{SW} = 200mA；XB61041		750	1250	mΩ
	MOSFET Leakage Current	V_{SW} = 28V		1	10	μA
I_{LIM}	MOSFET Current Limit	XB61040	350	400	450	mA
I_{LIM}	MOSFET Current Limit	XB61041	215	250	285	mA
output						
V_{OUT}	Adjustable output voltage range		V_{IN}		28	V
V_{ref}	Internal Voltage Reference			1.233		V
I_{FB}	Feedback input bias current	V_{FB} = 1.3V		1		μA
V_{FB}	Feedback trip point voltage	1.8V ≤V_{IN} ≤6V	1.208	1.233	1.258	V
	Line conditioning (1)	1.8V ≤V_{IN} ≤6V；V_{OUT} = 18V；I_{load} = 10mA；C_{FF} = Not Connected		0.05		%/V
	Load regulation(1)	V_{IN} = 2.4V；V_{OUT} = 18V；0mA ≤I_{OUT} ≤30mA		0.15		%/mA

[1] Line and load regulation depends on the external components selected. Refer to the Applications section for more information.

6.6. Typical characteristics

Table 6-1

			FIGURE
η	efficiency	Relationship with load current	Figure 6-1、 figure 6-2、 figure 6-3
		Relationship to Input Voltage	figure 6-4
I_Q	quiescent current	Relationship to Input Voltage and Temperature	figure 6-5
V_{FB}	Feedback Voltage	Relationship with temperature	figure 6-6
I_{SW}	Switching current limit	Relationship with temperature	Figure 6-7
I_{CL}	Switching current limit	Relationship to supply voltage，XB61041	figure 6-8
		Relationship to supply voltage，XB61040	figure 6-9
$R_{DS(on)}$	$R_{DS(on)}$	Relationship with temperature	Figure 6-10
		Relationship to supply voltage	Figure 6-11
Line Transient Response			figure 8-2
Load Transient Response			figure 8-3
priming behavior			figure 8-4

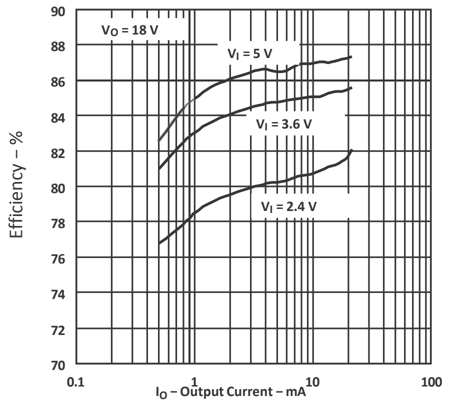


Figure 6-1. Efficiency versus Output Current

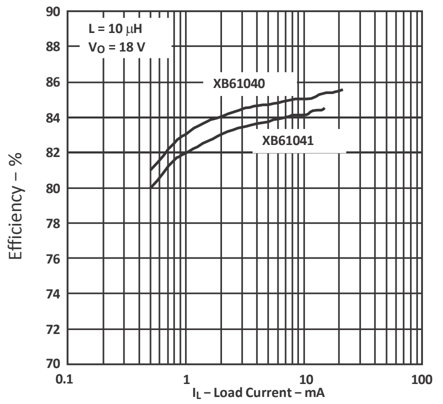


Figure 6-2. Efficiency versus Load Current

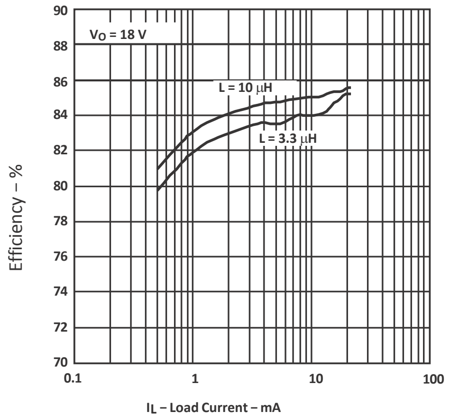


Figure 6-3. Efficiency versus Load Current

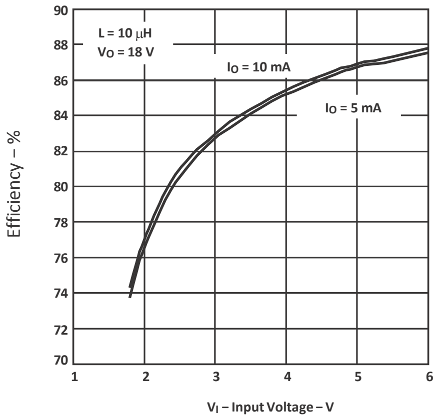


Figure 6-4. Efficiency vs. Input Voltage

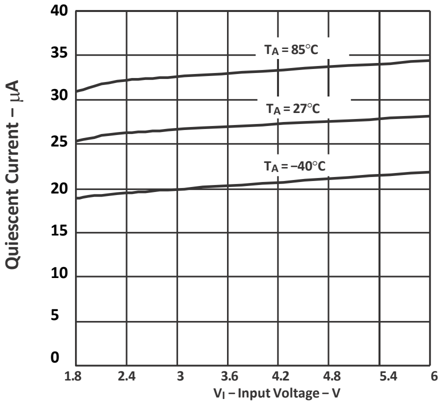


Figure 6-5. XB61040 Quiescent Current vs. Input Voltage

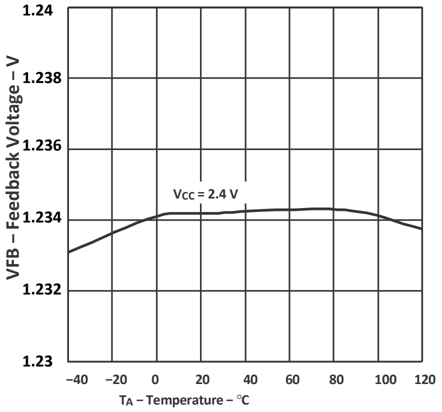


Figure 6-6. Relationship between Feedback Voltage and Temperature under Natural Ventilation Conditions

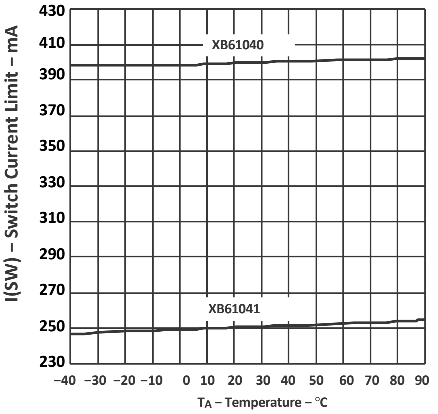


Figure 6-7. XB6104x Switching Current Limit vs. Temperature under Natural Ventilation Conditions

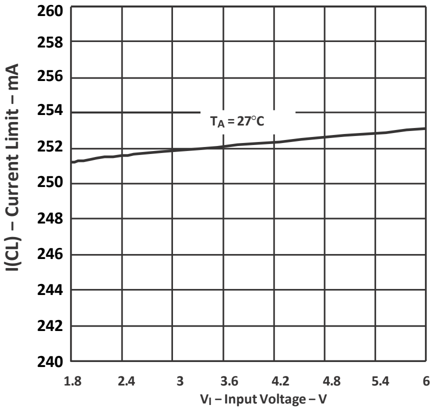


Figure 6-8. XB61041 Current Limit vs. Supply Voltage

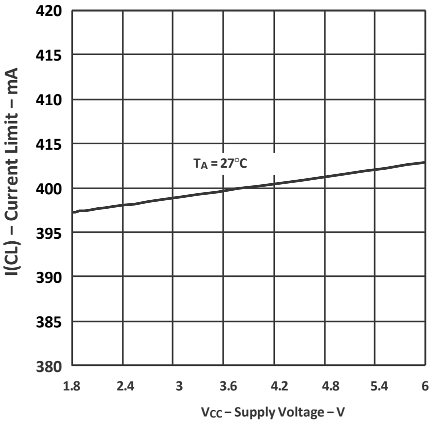


Figure 6-9. XB61040 Current Limit vs. Supply Voltage

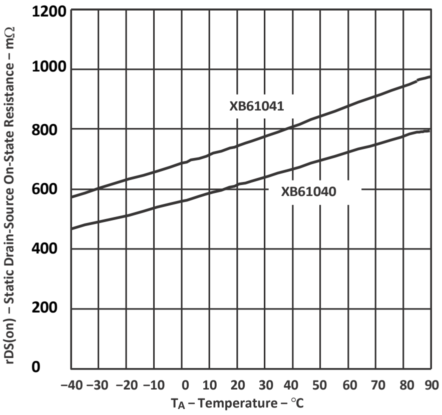


Figure 6-10. XB6104x Static Drain-On State Resistance vs. Temperature under Natural Ventilation Conditions

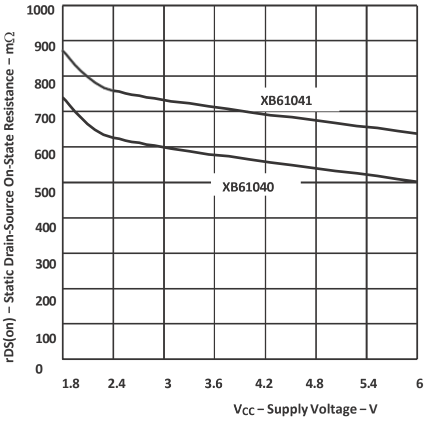


Figure 6-11. XB6104x Static Drain Source Turn-On State Resistance vs. Voltage

7. Detailed description

7.1. Overview

The XB6104x is a high frequency boost converter designed for small to medium sized LCD bias supplies and white LED backlight supplies. The device is ideal for generating output voltages up to 28V using two NiMH/NiCd batteries or a single Li-ion battery.

7.2. Characterization

7.2.1. Peak Current Control

The internal switch will remain on until the inductor current reaches the typical DC current limit (ILIM) of 400mA (XB61040) or 250mA (XB61041). Since the typical value of the internal propagation delay is 100ns, the actual current will exceed the DC current limit threshold by a small amount. Typical peak current limits can be calculated:

$$I_{peak(typ)} = I_{LIM} + \frac{V_{IN}}{L} \times 100ns$$

$$I_{peak(typ)} = 400mA + \frac{V_{IN}}{L} \times 100ns \text{ for the XB61040 - Q1}$$

$$I_{peak(typ)} = 250mA + \frac{V_{IN}}{L} \times 100ns \text{ for the XB61041 - Q1} \quad (1)$$

The higher the input voltage and the lower the inductor value, the higher the peak value.

Selecting the XB6104x allows the design to be customized to meet specific application current limit requirements. The lower current limit supports applications that require lower output power and allows the use of smaller form factor inductors with lower current ratings. Lower current limits also generally mean lower output voltage ripple.

7.2.2. Soft Start

All inductive boost converters will experience large inrush currents during startup if special precautions are not taken. This will result in a voltage drop at the input rails during startup and may cause the system to shut down unexpectedly or prematurely.

The XB6104x limits this inrush current by increasing the current limit, which is performed in two steps, from $\frac{I_{LIM}}{4}$ for 256 cycles to $\frac{I_{LIM}}{2}$ for the next 256 cycles and then to full current limit (see Figure 8-4).

7.2.3. Enable

Pulling the enable terminal (EN) to ground shuts down the device, which reduces the shutdown current to 1 µA (typical). Because there is a conductive path between the input and output through the inductor and Schottky diode, the output voltage is equal to the input voltage during shutdown. The enable pin must be terminated and must not be left dangling. Use a small external transistor to disconnect the input from the output during shutdown as shown in Figure 6-6.

7.2.4. Undervoltage Lockout

Undervoltage lockout prevents the device from misoperation at input voltages below the typical 1.5V. The main switch will turn off when the input voltage falls below the undervoltage threshold.

7.2.5. Thermal Shutdown

Internal thermal shutdown is achieved and shuts down the internal MOSFET if the typical junction temperature is exceeded at 168°C. The thermal shutdown hysteresis is typically 25°C. This data is based on a statistical methodology and has not been tested during regular mass production of the IC.

7.3. Device Functional Modes

7.3.1. Operation

The XB6104x operates over an input voltage range of 1.8V to 6V and can generate output voltages up to 28V. The device operates with a Pulse Frequency Modulation (PFM) scheme and has constant peak current control. The control scheme maintains high efficiency over the entire load current range and has a switching frequency of up to 1MHz, allowing the device to use very small external components.

The converter monitors the output voltage, and when the feedback voltage falls below the reference voltage, which is typically 1.233V, the internal switches will turn on and the current will gradually increase. When the inductor current reaches the internally set peak current, typically 400mA (XB61040) or 250mA (XB61041), the switch will turn off. The second condition to turn the switch off is a maximum on-time of 6μs (typical). This is to limit the maximum on-time of the converter to cover extreme conditions. When the switch is turned off, the external Schottky diode will be forward biased to provide current to the output. The switch remains off for a minimum of 400ns (typical) or until the feedback voltage drops below the reference voltage again. With this PFM peak current control scheme, the converter operates in discontinuous conduction mode (DCM), where the switching frequency is dependent on the output current, providing extremely high efficiency over the entire load current range. The inherent stability of this regulation scheme allows for a wider selection of inductors and output capacitors.

8. Applications and Realizations

8.1. Application Information

The XB6104x is designed for output voltages up to 28V, with an input voltage range of 1.8V to 6V and a peak switching current limit of 400mA (250mA for the XB61041). (250mA for the XB61041). The device operates with a pulse frequency modulation (PFM) scheme and features constant peak current control. The control scheme maintains high efficiency over the entire load current range and the switching frequency is up to 1MHz, allowing the device to use very small external components. The following section provides a step-by-step design approach for configuring the XB61040 as a voltage regulated boost converter with an LCD bias supply, as shown in Figure 8-1.

8.2. Typical Applications

The following section provides a step-by-step design approach for configuring the XB61040 as a voltage regulated boost converter with an LCD bias supply, as shown in Figure 8-1.

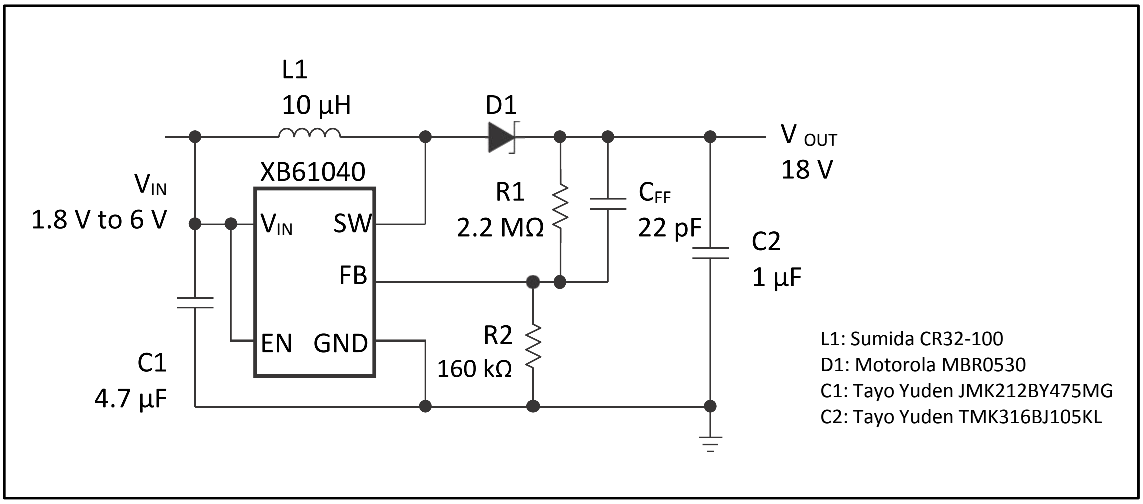


Figure 8-1. LCD Bias Power

8.2.1. Design Requirements

Table 8-1. Design Parameters

Design parameters	value
Input Voltage	1.8 V to 6 V
output voltage	18V
Output Current	10mA

8.2.2. Detailed design process

8.2.2.1 Inductor Selection, Maximum Load Current

The PFM peak current control scheme is inherently stable, so the inductor value will not affect the stability of the regulator. The inductor and the choice of nominal load current, input and output voltages for the application will determine the switching frequency of the converter. Depending on the application, inductance values between 2.2μH and 47μH are recommended. The maximum inductance value is determined by the maximum on-time of the switch, which is typically 6 µs. To ensure proper operation, a peak current limit of 400 mA/250 mA (typical) should be achieved during this 6 µs period.

The maximum switching frequency of the converter is determined by the inductance value. Therefore, the inductance value should be selected so that the maximum switching frequency at the converter's maximum load current is not exceeded. The maximum switching frequency is calculated using the following formula:

$$f_{s(\max)} = \frac{VIN(\min) \times (V_{OUT} - V_{IN})}{I_P \times L \times V_{OUT}}$$

IN WHICH

- IP = peak current, as described in Peak Current Control
- L = selected inductance value
- $V_{IN(min)}$ = maximum switching frequency generated at minimum input voltage

If the selected inductance value does not exceed the maximum switching frequency of the converter, the next step is to calculate the switching frequency at nominal load current using the following equation:

$$f_{s(Iload)} = \frac{2 \times I_{load} \times (V_{OUT} - V_{IN} + V_d)}{Ip^2 \times L}$$

IN WHICH

- IP = peak current, as described in Peak Current Control
- L = selected inductance value
- Iload = nominal load current
- Vd = rectifier diode forward voltage (typically 0.3V)

A smaller inductance value will produce a higher converter switching frequency, but will reduce efficiency.

The inductance value has a small effect on the maximum available load current and is only a minor factor. The ideal way to calculate the maximum available load current for a given operating condition is to estimate the expected converter efficiency at maximum load current. This can be obtained from the efficiency graphs shown in Figure 6-1 through Figure 6-4. The maximum load current can then be estimated as shown below:

$$I_{load} = \eta \frac{Ip^2 \times L \times f_{s(\max)}}{2 \times (V_{OUT} - V_{IN})}$$

IN WHICH

- IP = peak current, as described in Peak current control
- L = selected inductance value
- fS max = previously calculated maximum switching frequency
- η = expected converter efficiency. Typically 70% to 85%.

The maximum load current of the converter is the current at the operating point (when the converter starts to enter continuous on mode). Typically, the converter should always operate in discontinuous conduction mode.

Finally, the selected inductor should have a saturation current that matches the converter's maximum peak current (calculated in Peak Current Control). Use the maximum value for I LIM

maximum value is used in this calculation.

Another important inductor parameter is the DC resistance. The lower the DC resistance, the higher the converter efficiency. Refer to Table 8-2 and typical applications for inductor selection.

Table 8-2. Inductors Recommended for Typical LCD Bias Power Supplies (See Figure 10-1)

Devices	Inductance	Devices Supplier	Remarks
XB61040	10µH	Sumida CR32-100	efficient
	10µH	Sumida CDRH3D16-100	efficient
	10µH	Murata LQH4C100K04	efficient
	4.7µH	Sumida CDRH3D16-4R7	Small Form Factor Solutions
	4.7µH	Murata LQH3C4R7M24	Small Form Factor Solutions
	10µH	Murata LQH3C100K24	Efficient Small Form Factor Solutions

8.2.2.2 Setting the output voltage

The output voltage is calculated as follows:

$$VOUT = 1.233V \times (1 + \frac{R1}{R2})$$

For battery-powered applications, a high impedance voltage divider should be used, with typical values of ≤200 kΩ for R2 and 2.2 MΩ maximum for R1. Smaller values can be used to reduce the noise sensitivity of the feedback pin.

A feedforward capacitor in the upper feedback resistor R1 is required to provide sufficient overdrive for the error comparator. If the feedforward capacitor is not present or is too small, the XB6104x will exhibit a double pulse or pulse burst at the switch node (SW) instead of a single pulse, which will increase the output voltage ripple. If this higher output voltage ripple is acceptable, the feedforward capacitor can be left out.

The lower the switching frequency of the converter, the higher the capacitance of the feedforward capacitor required. A 10pF feed-forward capacitor can be used as a starting point. For a first estimate, the following formula can also be used to calculate the required feedforward capacitor value at the operating point:

$$C_{FF} = \frac{1}{2 \times u \times \frac{fs}{20} \times R1}$$

IN WHICH

- R_1 = upper resistance of the voltage divider
- f_S = switching frequency of the converter at nominal load current (see Inductor Selection, Maximum Load Current to Calculate Switching Frequency)
- C_{FF} = choose the value closest to the calculated result

The higher the capacitance of the feedforward capacitor, the worse the line regulation of the device. Therefore, when line regulation is critical, the feedforward capacitor should be selected with the smallest possible capacitance. Refer to the following sections for more information on line and load regulation.

8.2.2.3 Line and Load Regulation

The line regulation of the XB6104x depends on the voltage ripple on the feedback pin. Typically, a 50mV peak-to-peak voltage ripple on the feedback pin FB provides good results.

Some applications require very small line regulation rates, allowing only small output voltage variations over a specific input voltage range. Without the feed-forward capacitor CFF in the upper resistor of the voltage feedback divider, the device will have good line regulation. Without the feed-forward capacitor, the output voltage ripple will be higher because the XB6104x exhibits output voltage bursts on the switching pins (SW) instead of a single pulse, which increases the output voltage ripple. Increasing the output capacitance value will reduce the output voltage ripple.

If it is not possible to increase the output capacitance value, the feedforward capacitor CFF can be used as shown in the previous section. using the feedforward capacitor will increase the amount of voltage ripple present on the feedback pin (FB). The greater the voltage ripple on the feedback pin (≥50mV), the worse the line regulation will be. Line regulation can be further improved in two ways:

1. Increase the switching frequency by using a smaller inductance value, which will reduce the output voltage ripple as well as the voltage ripple on the feedback pin.

2. Adding a smaller capacitor between the feedback pin (FB) and ground will reduce the voltage ripple on the feedback pin to 50mV again.

The same capacitance value selected for the feedforward capacitor CFF can be used first.

8.2.2.4 Output Capacitor Selection

Low ESR output capacitors are recommended for excellent output voltage filtering. Ceramic capacitors have low ESR values, but tantalum capacitors can also be used, depending on the application.

Assuming that the converter does not exhibit double pulses or pulse bursts at the switching node (SW), the output voltage ripple is calculated as follows:

$$V_{out} = \frac{I_{out}}{C_{out}} \times \left(\frac{1}{f_{s(Iout)}} - \frac{IP \times L}{V_{out} + Vd - V_{in}}\right) + I_P \times ESR$$

IN WHICH

- IP = peak current, as described in Peak current control
- L = selected inductance value
- I out = nominal load current
- fS(out) = previously calculated switching frequency at nominal load current
- Vd = rectifier diode forward voltage (typically 0.3V)
- C out = selected output capacitor
- ESR = Output capacitor ESR value

Refer to Table 8-3 and typical applications for output capacitor selection.

Table 8-3. Recommended Input and Output Capacitors

Devices	Capacitors	Voltage rating	Devices Supplier	Remarks
XB6104x	4.7μF/X5R/0805	6.3V	Tayo Yuden JMK212BY475MG	C_{IN}/C_{OUT}
	10μF/X5R/0805	6.3V	Tayo Yuden JMK212BJ106MG	C_{IN}/C_{OUT}
	1μF/X7R/1206	25V	Tayo Yuden TMK316BJ105KL	C_{OUT}
	1μF/X5R/1206	35V	Tayo Yuden GMK316BJ105KL	C_{OUT}
	4.7μF/X5R/1210	25V	Tayo Yuden TMK325BJ475MG	C_{OUT}

8.2.2.5 Input Capacitor Selection

For excellent input voltage filtering, low ESR ceramic capacitors are recommended. 4.7μF ceramic input capacitors are sufficient for most applications. This value can be increased for improved input voltage filtering. Refer to Table 7-3 and typical applications for input capacitor recommendations.

8.2.2.6 Diode Selection

For high efficiency, a Schottky diode should be used. The current rating of this diode should match the converter peak current rating calculated in Peak Current Control. Use the maximum value for ILIM in this calculation. Refer to Table 8-4 and typical applications for Schottky diode selection.

Table 8-4. Recommended Schottky Diodes for Typical LCD Bias Supplies (see Figure 10-1)

Devices	Reverse Voltage	Devices Supplier	Remarks
XB6104x	30V	ON Semiconductor MBR0530	
	20V	ON Semiconductor MBR0520	
	20V	ON Semiconductor MBRM120L	**efficient**
	30V	Toshiba CRS02	

8.2.3. Application curves

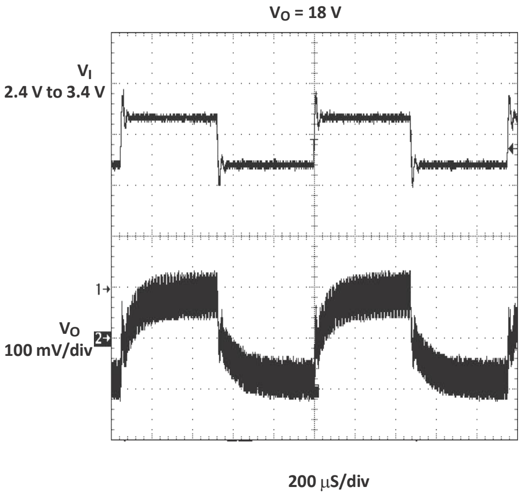


Figure 8-2. Line Transient Response

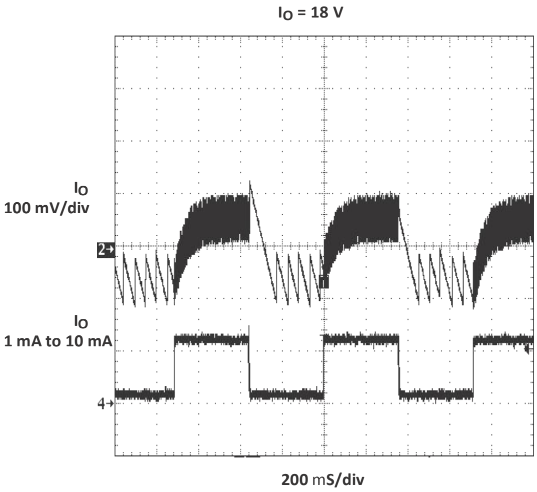


Figure 8-3. Load Transient Response

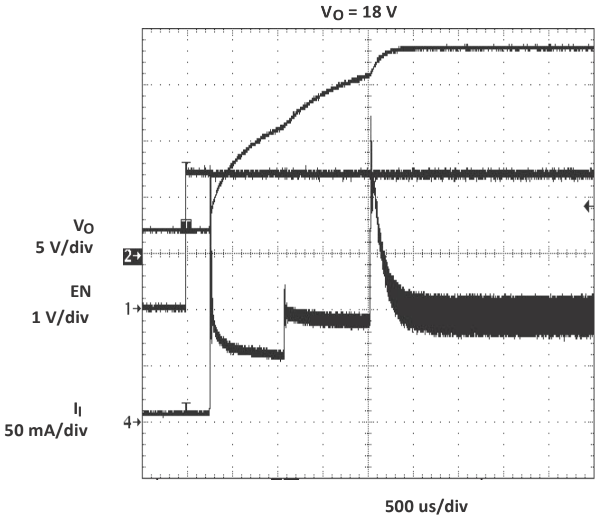
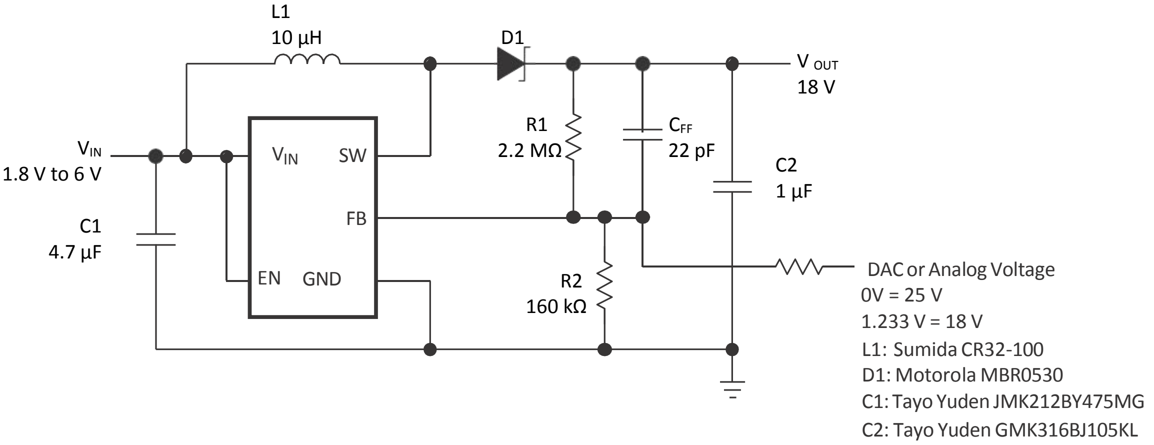


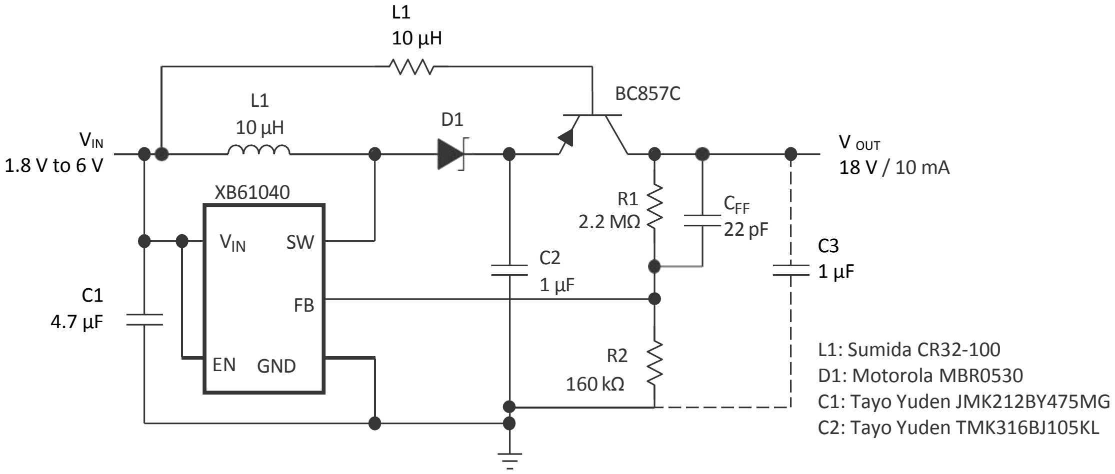
Figure 8-4. Start-up Behaviour

8.3. System Examples



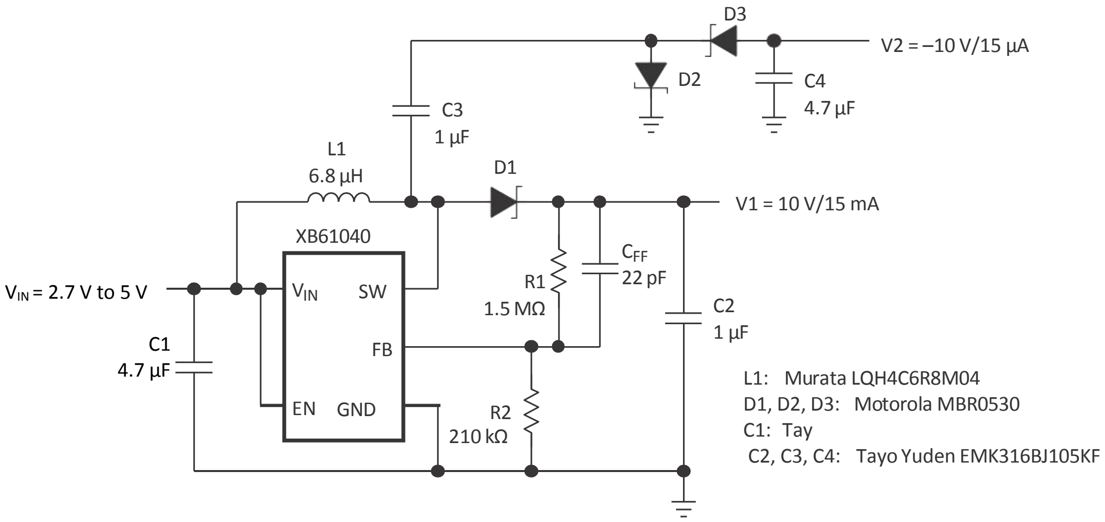
L1: Sumida CR32-100
D1: Motorola MBR0530
C1: Tayo Yuden JMK212BY475MG
C2: Tayo Yuden GMK316BJ105KL

Figure 8-5. LCD Bias Power Supply with Adjustable Output Voltage



L1: Sumida CR32-100
D1: Motorola MBR0530
C1: Tayo Yuden JMK212BY475MG
C2: Tayo Yuden TMK316BJ105KL

Figure 8-6. LCD Bias Power Supply with Load-Disconnect Function



L1: Murata LQH4C6R8M04
D1, D2, D3: Motorola MBR0530
C1: Tay
C2, C3, C4: Tayo Yuden EMK316BJ105KF

Figure 8-7. Positive and Negative LCD Bias Power Supplies

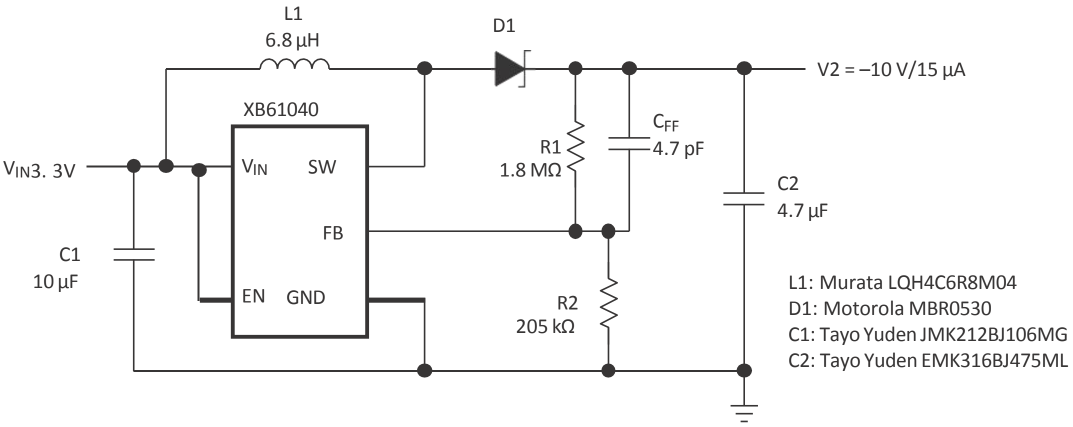


Figure 8-8. Standard 3.3V to 12V Power Supply

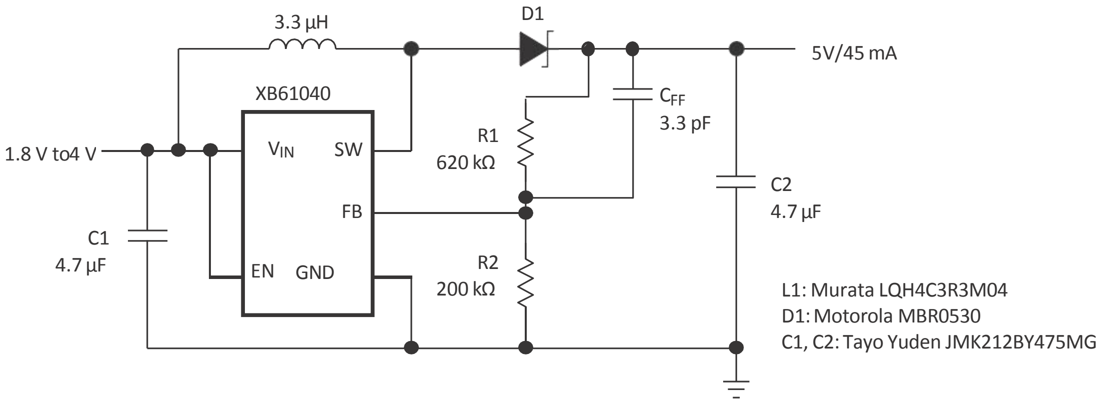


Figure 8-9. Battery-to-5V/50mA conversion efficiency equals approximately 84% at VIN = 2.4V and Vo = 5V/45mA.

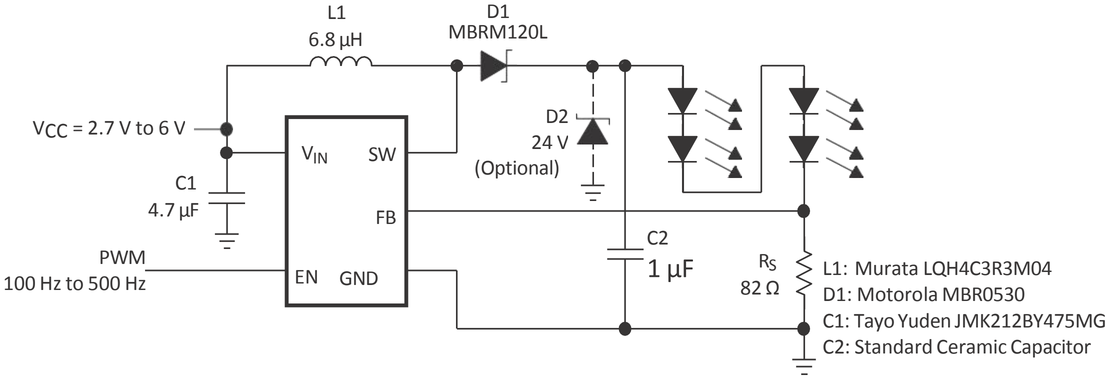
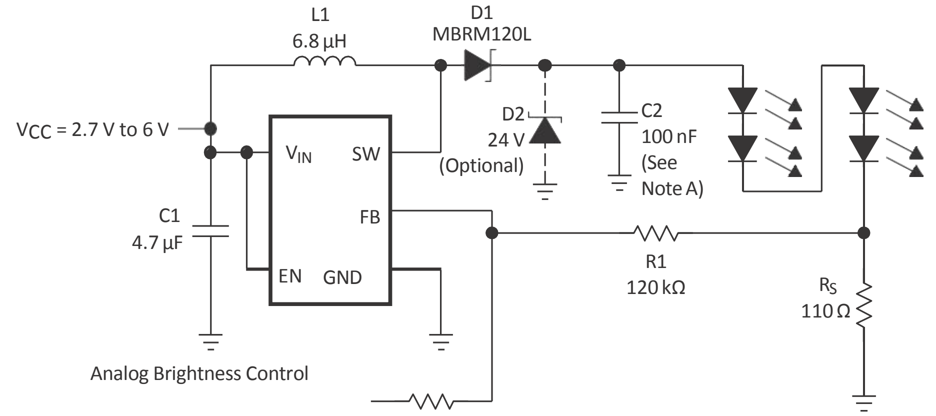


Figure 8-10. White LED Power Supply with Adjustable Brightness Control Using a PWM Signal on the Enable Pin at VIN = 3V, Efficiency Equals Approximately 86% at VIN = 3V, ILED = 15mA



Smaller output capacitance values for C2 result in increased LED ripple.

Figure 8-11. White LED Power Supply with Adjustable Brightness Control Using Analog Signals on Feedback Pins

9. Power Supply Related Recommendations

This device is designed to operate over an input supply voltage range of 1.8V to 6V. The output current of the input supply must be rated based on the supply voltage, output voltage, and output current of the XB6104x.

10. Layout

10.1. Layout Guidelines

Typically for all switching power supplies, layout is an important step in the design; especially with high peak currents and high switching frequencies. If the layout is not designed carefully enough, the regulator may suffer from noise problems and duty cycle jitter.

Input capacitors should be placed as close as possible to the input pins for good input voltage filtering. Inductors and diodes should be placed as close as possible to the switching pins to minimise noise coupled to other circuits. Feedback pins and networks are high impedance circuits, so feedback networks should be routed away from inductors. The feedback pins and feedback network should be shielded by a ground plane or trace to minimise noise coupled to this circuit.

For the bold connections shown in Figure 10-1, wide traces should be used. A star ground connection or ground plane minimises ground drift and noise.

10.2. Layout Example

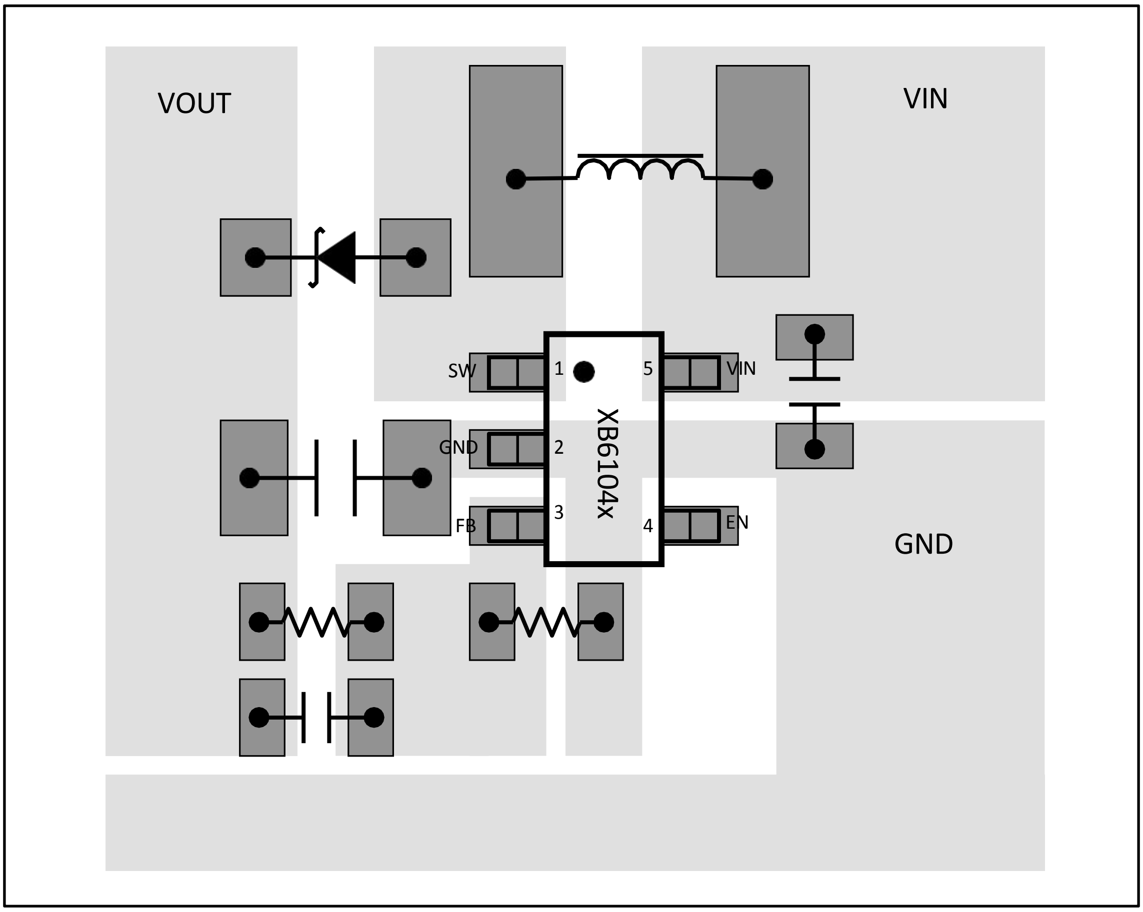


Figure 10-1.Layout

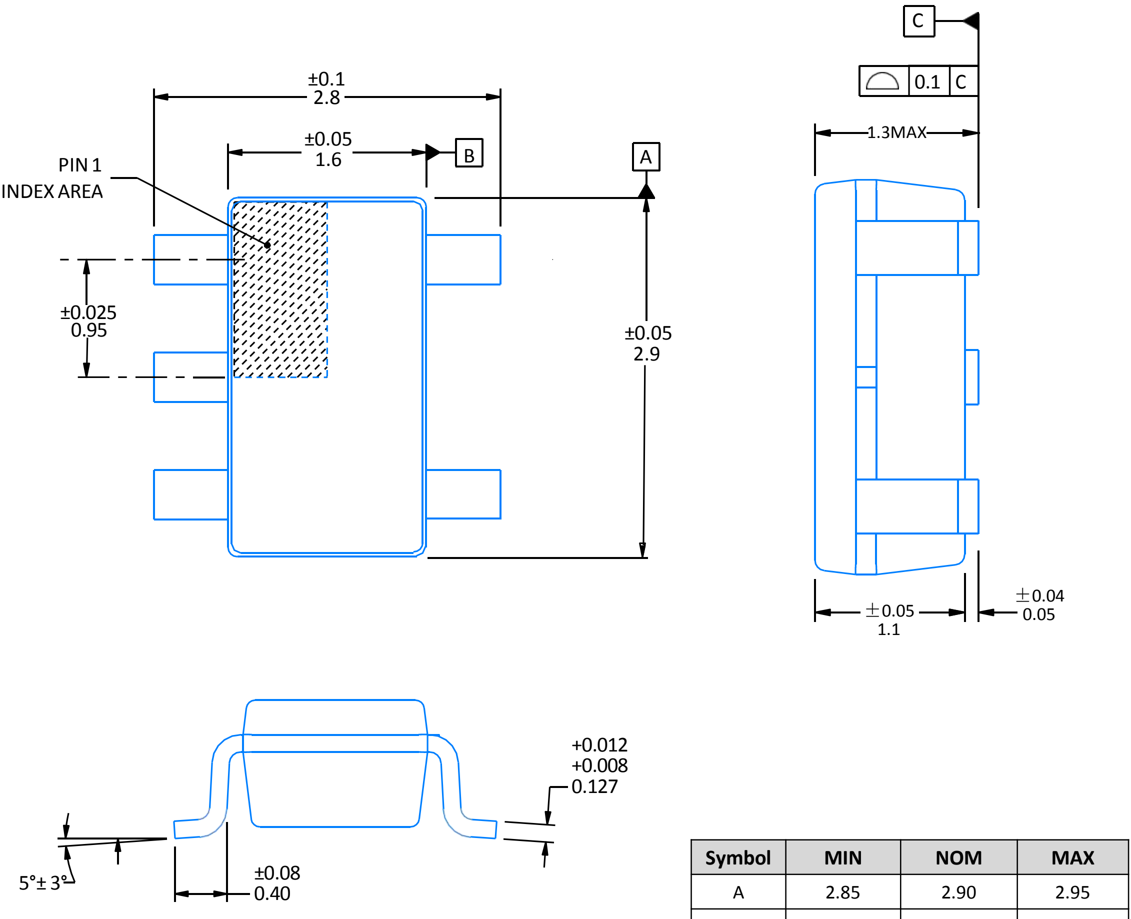
11. ORDERING INFORMATION

Ordering Information

Part Number	Device Marking	Package Type	Body size (mm)	Temperature (°C)	MSL	Transport Media	Package Quantity
XB61040	XB61040	SOT23-5	2.90 * 1.60	-40 to +85	MSL3	T&R	3000
XB61041	XB61041	SOT23-5	2.90 * 1.60	-40 to +85	MSL3	T&R	3000

12. DIMENSIONAL DRAWINGS

SOT23-5



Symbol	MIN	NOM	MAX
A	2.85	2.90	2.95
B	1.55	1.6	1.65
C			1.3