Bay Linear

Inspire the Linear Power

1.5Amp DC-to-DC Converter Control Circuit

B34063A

Description

The Bay Linear B34063A series is monolithic control circuit containing the primary functions required for DC-to-DC converters. These devices consist of an internal temperature compensated reference, comparator, controlled, duty cycle oscillator with an active current limit circuit, driver and high current output switch.

This series was specially designed to be incorporated in Step-Down and Step-Up and voltage-inverting applications with a minimum number of external component.

The B34063A is offer in 8-pin DIP or Surface mount package.

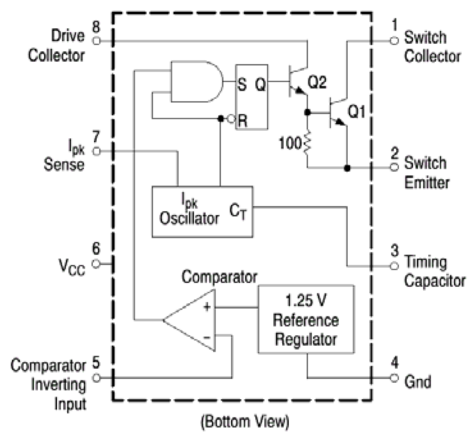
Features

- **Operation from 3.0V to 40V input**
- **Low Standby Current**
- **Current Limiting**
- **Output Switch Current to 1.5A**
- **Output voltage Adjustable**
- **Frequency Operation to 100 kHz**
- **Precision 2% Reference**
- **Step-Up-Step Down or inverting Switching regulator**
- **Direct Replacement for MC34063**

Applications

- **CD ROM**
- **Mother Board**
- **SMPS Power Supply**

Pin Connection



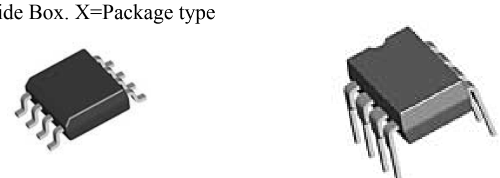
This device contains 51 active transistors.

Figure 1. Representative Schematic Diagram

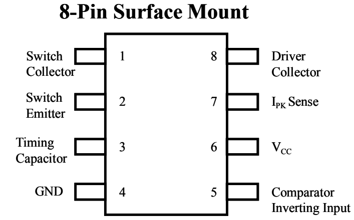
Ordering Information

SO-8 8-pin	P-DIP 8-pin	Operating Temp. Range
B34063AM	B34063AP	0°C to 70°C
B34063AIM	B34063AIP	-40°C to 85°C
B34063AEM	B34063AEP	-40°C to 125°C

All Marking will be B34063X. The Temperature will be specified in out side Box. X=Package type



8-Pin Surface Mount



Top View

Absolute Maximum Rating

Parameter	Symbol	Value	Unit
Supply Voltage	V_{CC}	40	V
Comparator Input Voltage Range	$V_{I(COMP)}$	-0.3 ~ + 40	V
Switch Collector Voltage	$V_{C(SW)}$	40	V
Switch Emitter Voltage	$V_{E(SW)}$	40	V
Switch Collector to Emitter Voltage	$V_{CE(SW)}$	40	V
Driver Collector Voltage	$V_{C(DR)}$	40	V
Switch Current	I_{SW}	1.5	I

Electrical Characteristics

(V_{CC} = 5.0V, $T_A = T_{LOW}$ to T_{HIGH} (Note 3), unless otherwise specified)

Parameter	Symbol	Conditions	MIN	TYP	MAX	UNIT
OSCILATOR						
Charging Current	I_{CHG}	V_{VV}=5 to 40V, T_A = 25 °C	24	35	42	µA
Discharging Current	I_{DISHG}	V_{CC} = 5 to 40V, T_A = 25 °C	140	220	260	µA
Frequesncy	f_{OSC}	T_A = 25 °C	24	33	42	kHz
Discharge in To Charge Current Ratio	K	$V_7 = V_{CC}$ T_A = 25 °C	5.2	6.5	7.5	-
Current Limit Sense Voltage	$V_{SENSE(C.L)}$	$I_{CHG} = I_{DISCHG,}$ T_A = 25 °C	250	300	350	mV
OUTPUT SWITCH (Note 4)						
Saturation Voltage Darlington Connection	$V_{CE(SAT)}$[1]	I_{SW} = 1.0A, Pins 1, 8 connected $V_{C(drive)} = V_{C(SW)}$	-	1.0	1.3	V
Saturation Voltage (Note 5)	$V_{CE(SAT)}$[2]	I_{SW} = 1.0A, $V_{C(drive)}$ = 50mA	-	0.45	0.7	V
DC Current Gain	$G_{I(DC)}$	I_{SW} = 1.0A, V_{CE} = 5.0V, T_A = 25 °C	50	75	-	-
Collector off Sate Current	$I_{C(OFF)}$	V_{CE} = 40V	-	40	100	µA
COMPARATOR						
Threshold Voltage	V_{TH}	T_A = 25 °C $T_A = T_{LOW}$ to T_{high}	1.225 1.21	1.25	1.275 1.29	V
Threshold Voltage Line Reg. B34063A, B34063AI B34063AE	ΔV_{TH}	V_{CC} = 3V to 40V	- -	1.4 1.4	5.0 6.0	mV
Input Bias Current	I_{BIAS}	V_I = 0V		-20	-400	nA
TOTAL DEVICE						
Supply Current	I_{CC}	V_{CC} = 5V to 40V, C_T = 0.001µF, Pin7=V_{CC} , $V_5 > V_{TH}$ pin2=Gnd, Remaining pins open	-	-	4.0	mA

Note3: T_{low} = 0 °C for B34063A, - 40 °C for B34063AI, AE, T_{high} = +70°C for the B34063A, T_{high} = +85°C for the B34063AI, +125°C for the B34063AE
Note4: Low Duty cycle pulse techniques are used during test to maintain junction temp. as close to ambient temp. as possible.
Note5: If the output switch is driven into hard saturation (non-Darlington configuration) at low switch current (≤300mA) and high driver currents (≥30mA). It may take up to 2.0 µs for it to come out of saturation. This condition will shorten the off time at frequencies ≥ 30 kHz. And is magnified at high temperatures. This condition does not occur with a Darlington configuration. Since the output switch can not saturate. If a non-Darlington configuration is used the following output drive condition is recommended:

Forces β of output switch : Ic output/Ic driver – 7.0mA ≥10

The 100Ω resistor is the emitter of the driver device requires about 7.0 mA before the output switch conducts

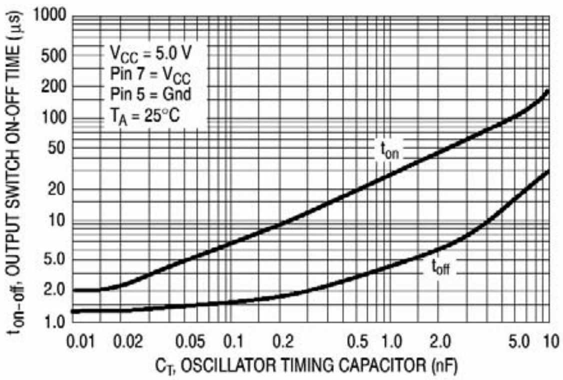


Figure 2. Output Switch On–Off Time versus Oscillator Timing Capacitor

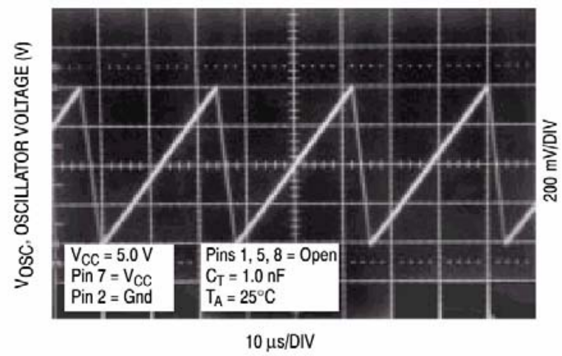


Figure 3. Timing Capacitor Waveform

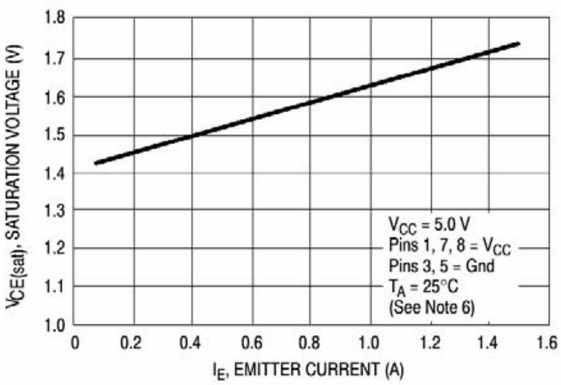


Figure 4. Emitter Follower Configuration Output Saturation Voltage versus Emitter Current

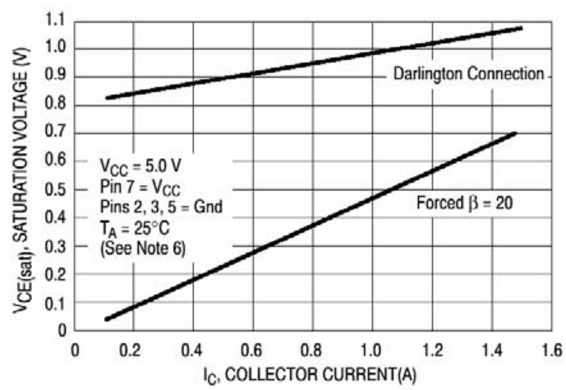


Figure 5. Common Emitter Configuration Output Switch Saturation Voltage versus Collector Current

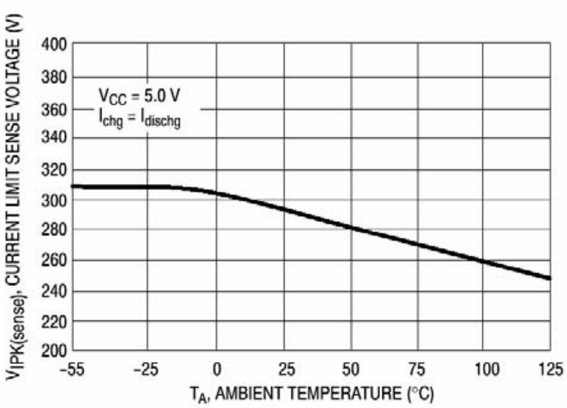


Figure 6. Current Limit Sense Voltage versus Temperature

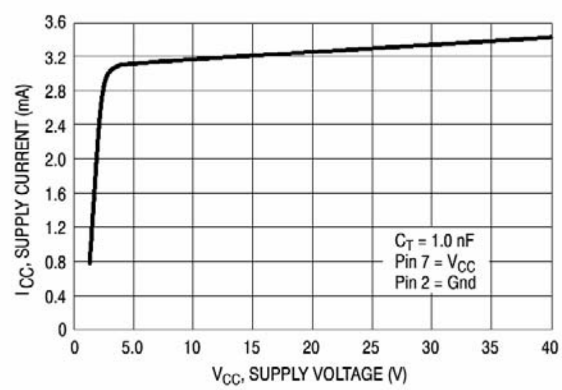
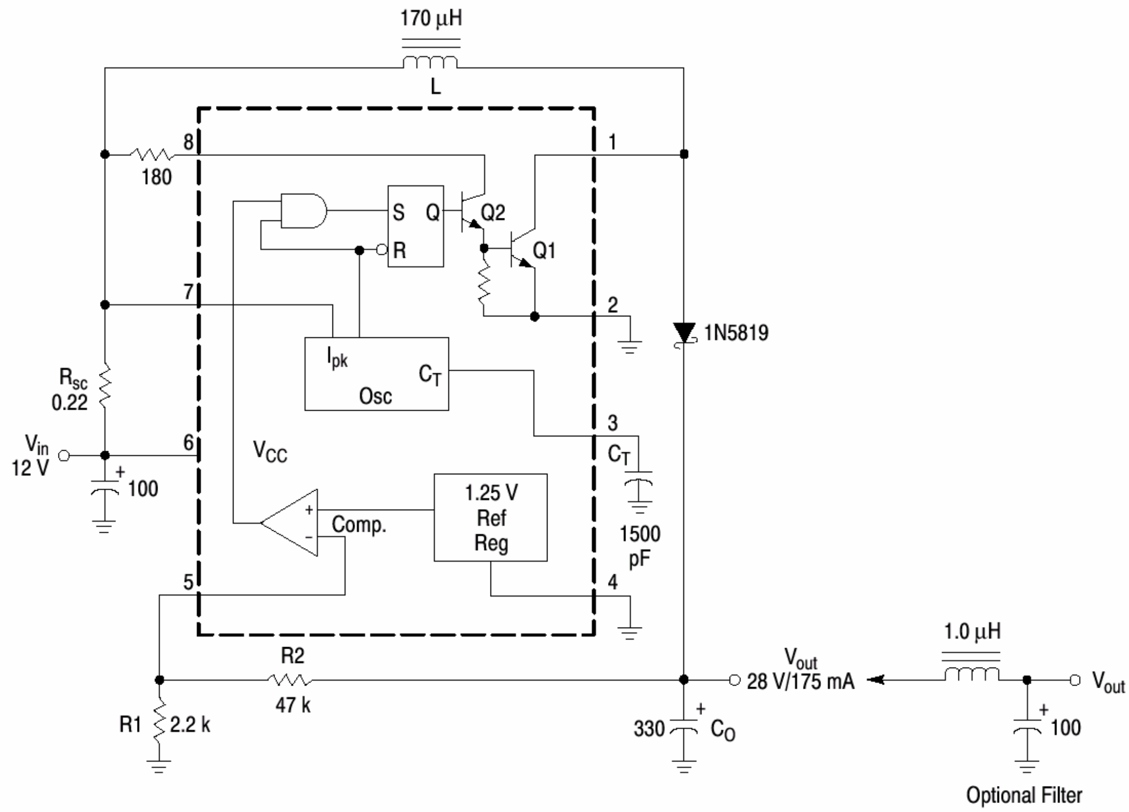


Figure 7. Standby Supply Current versus Supply Voltage

Figure 8. Step-Up Converter



Test	Conditions	Results
Line Regulation	V_{IN} = 8.0 V to 16 V, I_O = 175 mA	30 mV = $\pm$ 0.05%
Load Regulation	V_{IN} = 12 V, I_O = 75 mA to 175 mA	10 mV = $\pm$ 0.01%
Output Ripple	V_{IN} = 12 V, I_O = 175 mA	400 mVp-p
Efficiency	V_{IN} = 12 V, I_O = 175 mA	89.2%
Output Ripple With Optional Filter	V_{IN} = 12 V, I_O = 175 mA	40 mVp-p

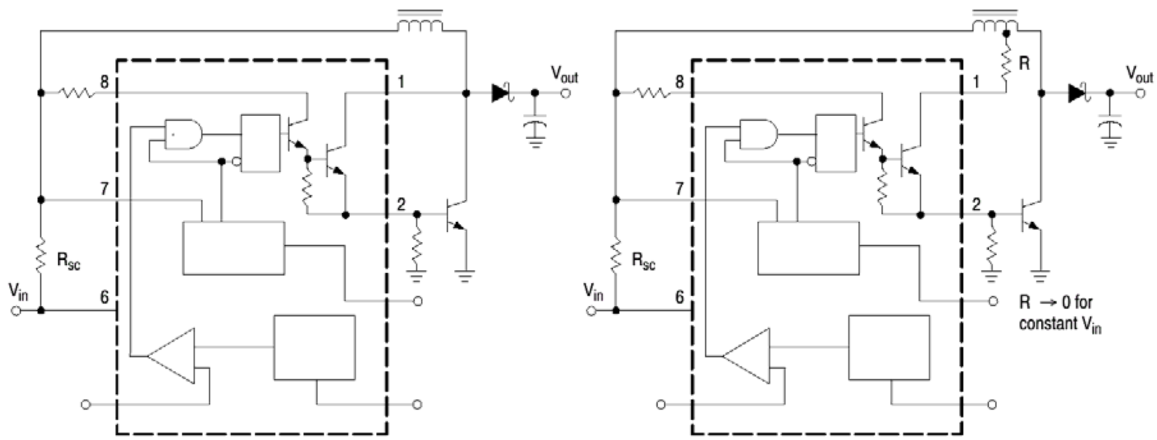


Figure 9. External Current Boost Connections for I_C Peak Greater than 1.5 A

9a. External NPN Switch

9b. External NPN Saturated Switch
(See Note 7)

Note 7: If the output switch is driven into hard saturation (non– Darlington configuration) at low switch currents (3 300 mA) and high driver currents (. 30 mA), it may take up to 2.0 ms to come out of saturation. This condition will shorten the off time at frequencies . 30 kHz, and is magnified at high temperatures. This condition does not occur with a Darlington configuration, since the output switch cannot saturate. If a non– Darlington configuration is used, the following output drive condition is recommended.

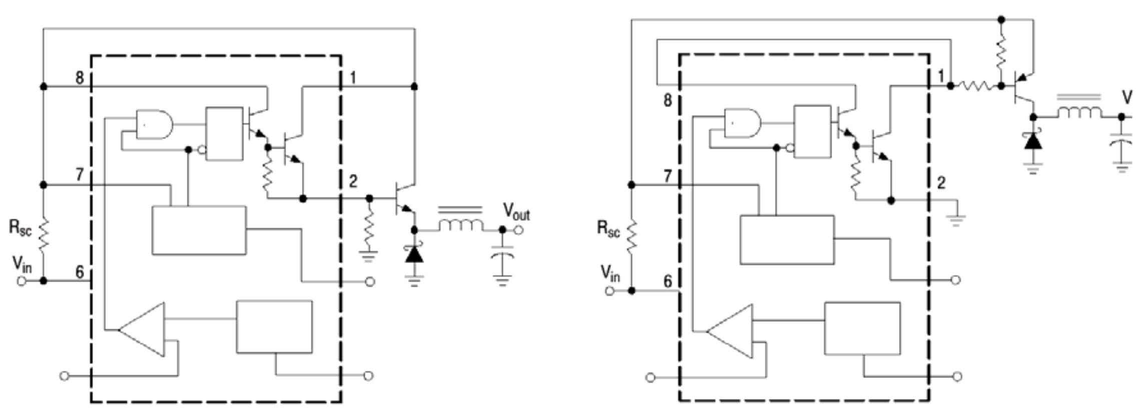
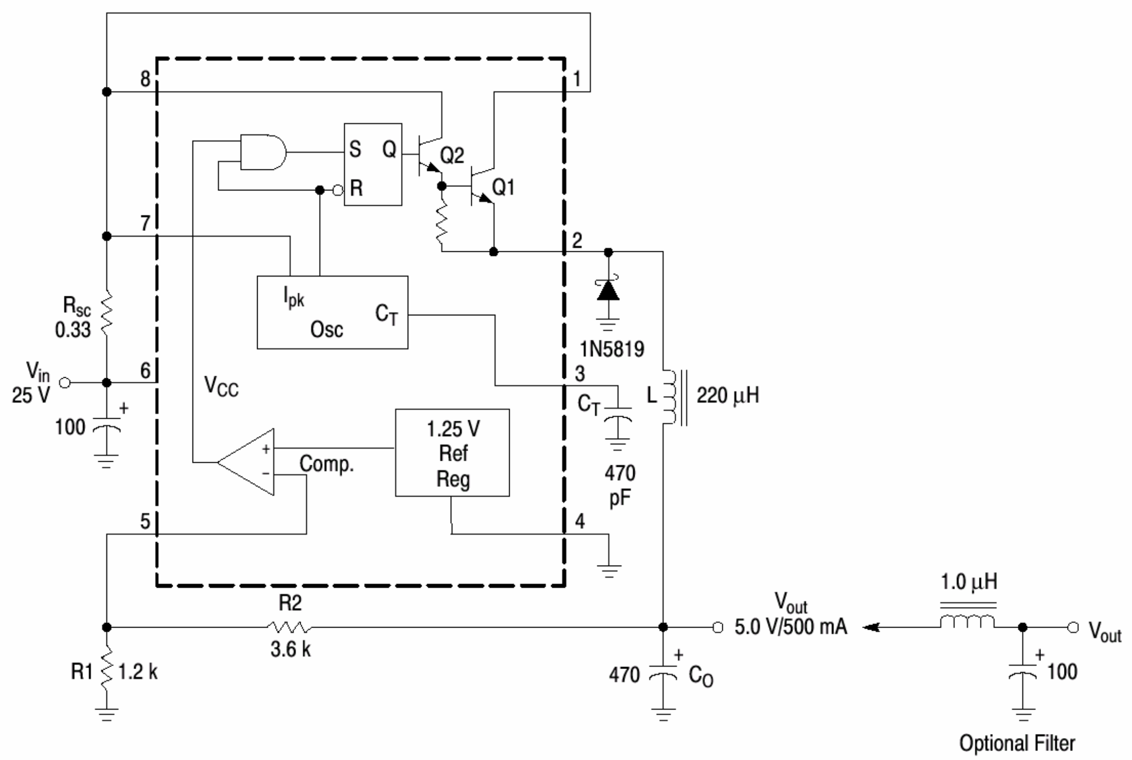


Figure 11. External Current Boost Connections for I_C Peak Greater than 1.5 A

11a. External NPN Switch

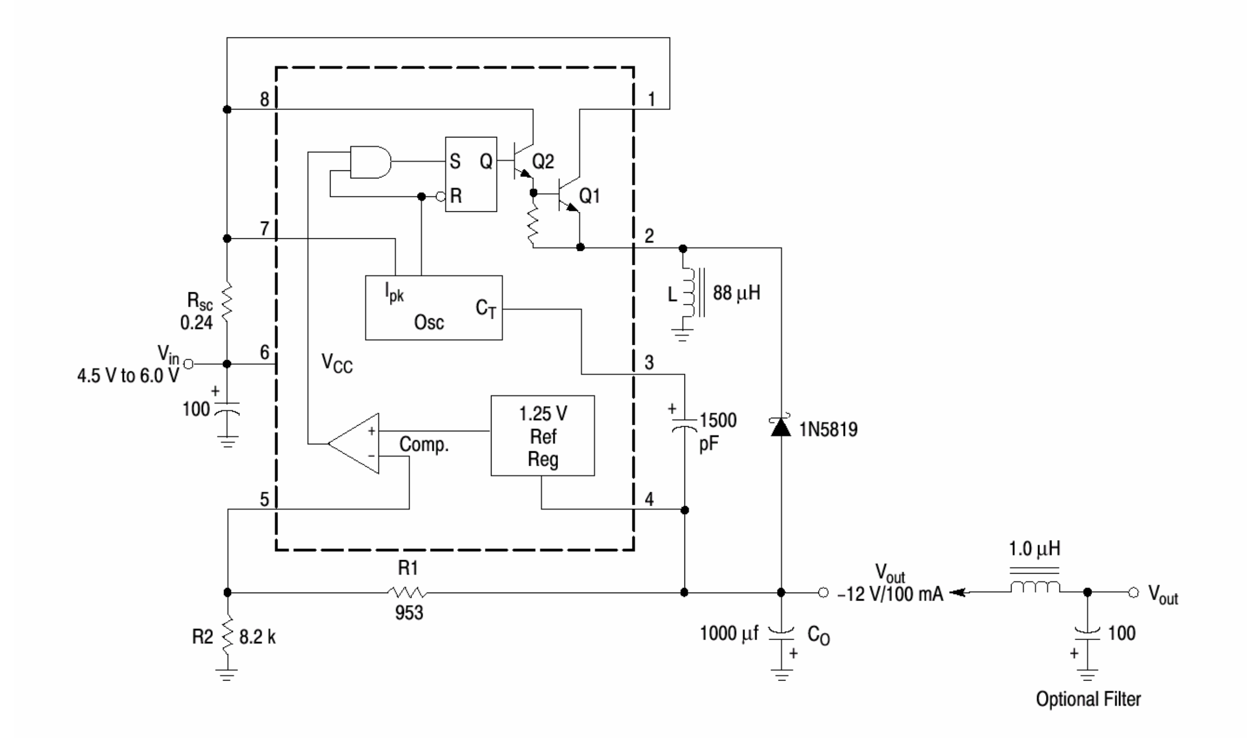
11b. External PNP Saturated Switch

Figure 10. Step-Down Converter



Test	Conditions	Results
Line Regulation	V_{IN} = 15 V to 25 V, I_O = 500 mA	12 mV = $\pm$ 0.12%
Load Regulation	V_{IN} = 25 V, I_O = 50 mA to 500 mA	3.0 mV = $\pm$ 0.03%
Output Ripple	V_{IN} = 25 V, I_O = 500 mA	120 mVp-p
Short Circuit Current	V_{IN} = 25 V, R_L = 0.1Ω	1.1A
Efficiency	V_{IN} = 25 V, I_O = 500 mA	83.7%
Output Ripple With Optional Filter	V_{IN} = 25 V, I_O = 500 mA	40 mVp-p

Figure 12. Voltage Inverting Converter



Test	Conditions	Results
Line Regulation	V_{IN} = 4.5 V to 6.0 V, I_O = 100 mA	3 mV = ± 0.12%
Load Regulation	V_{IN} = 5.0 V, I_O = 10 mA to 100 mA	0.022 mV = ± 0.09%
Output Ripple	V_{IN} = 5.0 V, I_O = 100 mA	500 mVp-p
Short Circuit Current	V_{IN} = 5.0 V, R_L = 0.1 Ω	910mA
Efficiency	V_{IN} = 5.0 V, I_O = 100 mA	62.2%
Output Ripple With Optional Filter	V_{IN} = 5.0 V, I_O = 100 mA	70 mVp-p

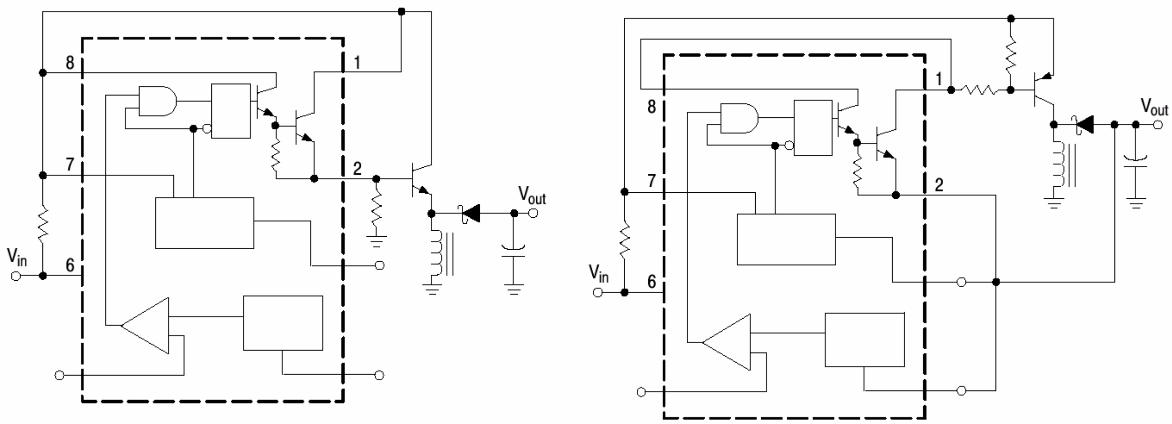
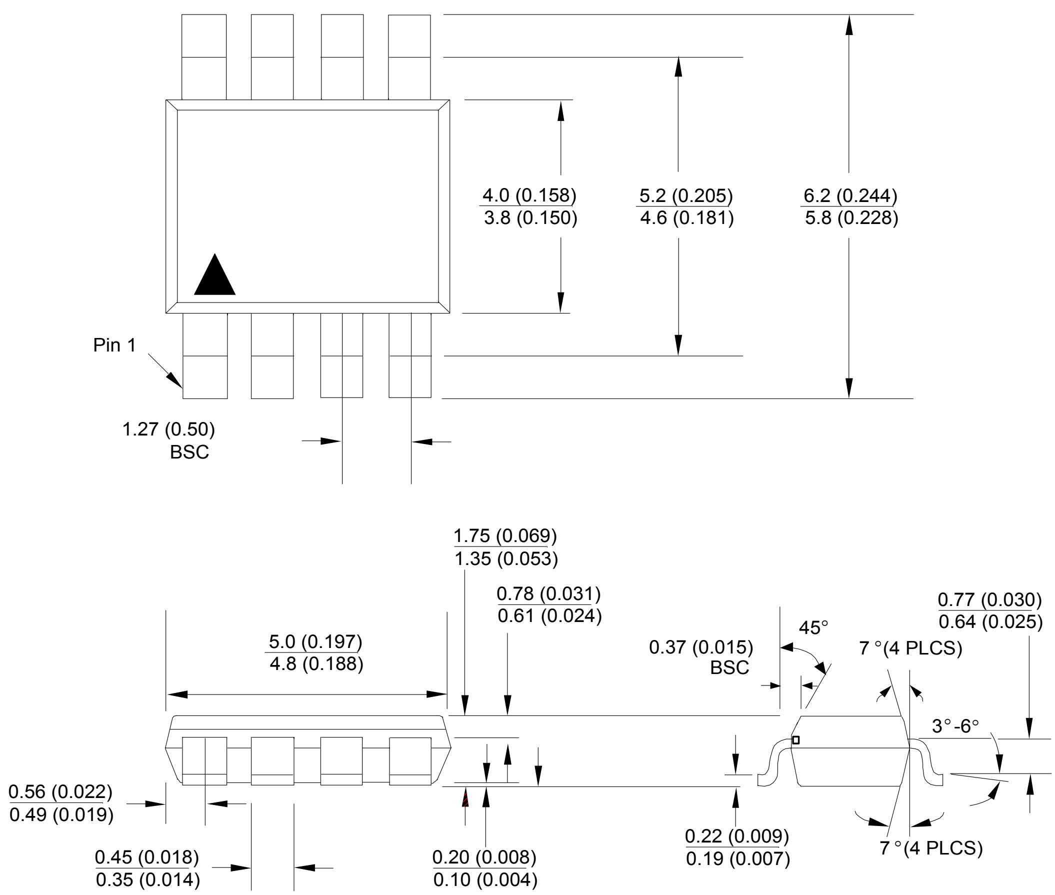


Figure 13. External Current Boost Connections for I_C Peak Greater than 1.5 A

13a. External NPN Switch **13b. External PNP Saturated Switch**



Advance Information- These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/ or initial prototype evaluation.

Preliminary Information- These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including " Typical" for each customer application.

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