ALPHA SEMICONDUCTOR
Excellence in Analog Power Products

AS34063

1.5A DC-to-DC Converter Control Circuits

(PRELIMINARY INFORMATION)

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 100Khz
- Precision 2% Reference
- Pin-To-Pin Compatible With MC34063/35063/33063

APPLICATIONS

- Battery Powered Applications
- Laptop/Notebook Computers
- Power Inverter (+ to -) or (- to +)
- Medical Instruments
- Interface Power Supplies
- Portable Instruments
- Cellular Phones/Radios

PRODUCT DESCRIPTION

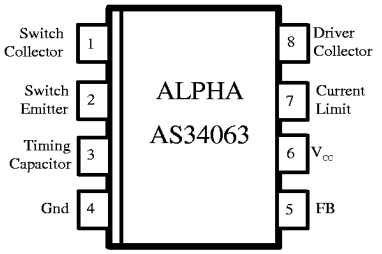
The AS34063 contains a monolithic control circuit containing the primary functions required for DC-to-DC converters. This device contains an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch. The AS34063 was specifically designed to operate with a minimum number of external components to provide Step-Down and Step-Up and Voltage-Inverting applications.

The AS34063 is available in commercial temperatures of 0° to +70°C, in SO-8 and 8 PDIP packages.

ORDERING INFORMATION

Part Number	Oper. Temp. Range	Package Type
AS34063S	T_A = 0°C to +70°C	SO-8
AS34063P	T_A = 0°C to +70°C	Plastic DIP

PIN CONNECTIONS



Top View

Alpha Semiconductor Inc. 1031 Serpentine Lane. Pleasanton, CA 94566 Tel: (925) 417-1391 Fax: (925) 417-1390

Rev.2/25/99

ABSOLUTE MAXIMUM RATINGS

Power Supply Voltage (V_{CC}) .....40 Vdc
Comparator Input Voltage Range (V_{IR}).....-0.3 to +40 Vdc
Switch Collector Voltage (V_C) .....40 Vdc
Switch Emitter Voltage ($V_{PIN\ 1}$ = 40 V) (V_E).....40 Vdc
Switch Collector to Emitter Voltage (V_{CE}) .....40 Vdc
Driver Collector Voltage (V_C).....40 Vdc
Driver Collector Current (Note 1) (I_C)..... 100 mA
Switch Current Peak (I_{SW}) ..... 1.5 A

Power Dissipation and Thermal Characteristics
Plastic Package (P Suffix) T_A = 25°C.....1.25 W
Thermal Resistance.....100°C/W
SOIC Package (D Suffix) T_A = 25°C.....625 mW
Thermal Resistance.....160°C/W
Operating Junction Temperature (T_J).....+150° C
Operating Ambient Temperature Range (T_A).....0 to +70° C
Storage Temperature Range (T_{STG}).....-65 to +150° C

ELECTRICAL CHARACTERISTICS (V_{CC} = 5.0 V, T_A =[0° to +70])

Parameter	Conditions	AS34063 Min	Typ	Max	Units
OSCILLATOR					
Frequency (f_{OSC})	$V_{PIN\ 5}$ = 0 V, C_T = 1.0 nF, T_A = 25°C	24	33	42	kHz
Charge Current (I_{CHG})	V_{CC} = 5.0 V to 40 V, T_A = 25°C	24	35	42	µA
Discharge Current (I_{DISCHG})	V_{CC} = 5.0 V to 40 V, T_A = 25°C	140	220	260	µA
Discharge to Charge Current Ratio (I_{DISCHG}/I_{CHG})	Pin 7 to V_{CC} , T_A = 25°C	5.2	6.5	7.5	
Current Limit Sense Voltage (V_{IPK}(sense))	$I_{DISCHG} = I_{CHG}$, T_A = 25°C	250	300	350	mV
OUTPUT SWITCH (Note 2)					
Saturation Voltage, Darlington Connection (V_{CE}(sat)) (Note 3)	I_{SW} = 1.0 A, Pins 1, 8 connected		1.0	1.3	V
Saturation Voltage, Darlington Connection (V_{CE}(sat))	I_{SW} = 1.0 A, Rpin 8 = 82 Ω to VCC, Forced β ≈ 20		0.45	0.7	V
DC Current Gain (h_{FE})	I_{SW} = 1.0 A, V_{CE} = 5.0 V, T_A = 25°C	50	75		
Collector Off-State Current (I_C (off))	V_{CE} = 40 V		0.01	100	µA
COMPARATOR					
Threshold Voltage (V_{TH})	(T_A = 25°C) (T_A = 0°C to 70°C)	1.225 1.21	1.25 —	1.275 1.29	V
Threshold Voltage Line Regulation (Reg_{LINE})	(V_{CC} = 3.0 V to 40 V	—	1.4	5.0	mV
Input Bias Current (I_{IB})	(V_{IN} = 0 V)	—	-20	-400	nA
TOTAL DEVICE					
Supply Current (I_{CC})	(V_{CC} = 5.0 V to 40 V, C_T = 1.0 nF, Pin 7 = V_{CC}, $V_{PIN\ 5}$ > V_{TH}, Pin 2 = Gnd, remaining pins open)			4.0	mA

Note 1: Maximum package power dissipation limits must be observed.
Note 2: Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.
Note 3: If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents (≤ 300 mA) and high driver currents (≥ 30 mA), 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 cannot saturate. If a non-Darlington configuration is used, the following output drive condition is recommended:

Forced β of output switch : $I_{C,\ OUTPUT}/(I_{C,\ DRIVER}$ -7.0 mA*) ≥ 10

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

Output Voltage: $|Vo| = 1.25\left(\frac{R1 + R2}{R1}\right)V$

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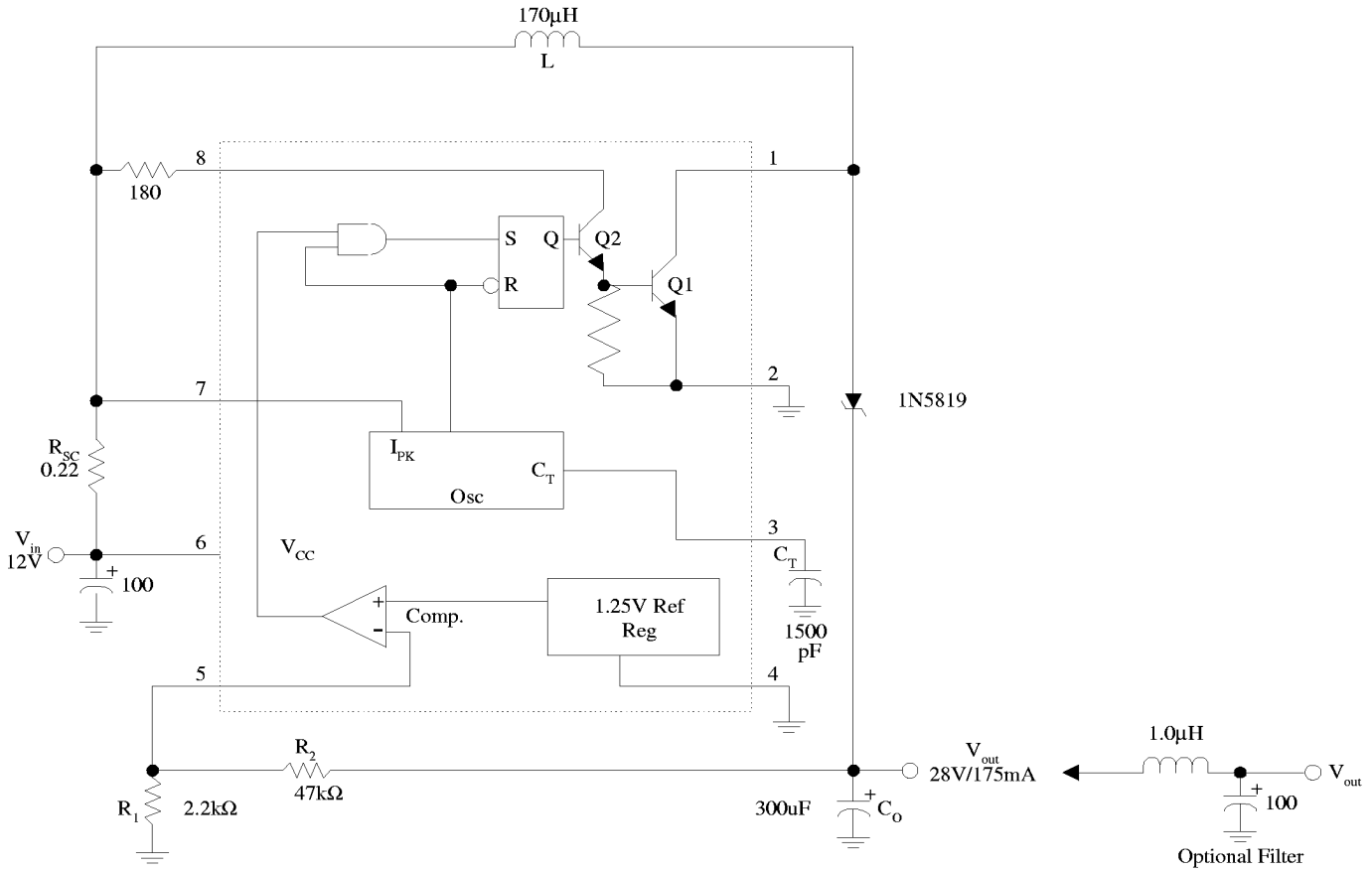
TYPICAL APPLICATIONS

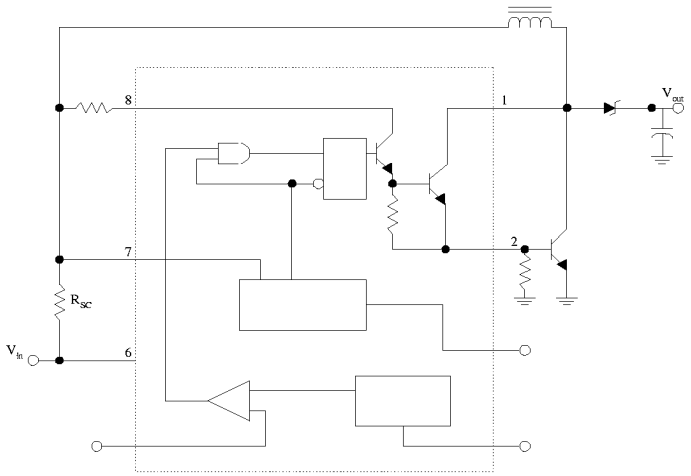
Figure 1. Step-Up Converter



Test	Conditions	Results
Line Regulation	V_{IN} = 8.0 V to 16 V, I_O = 175 mA	30 mV = ± 0.05%
Load Regulation	V_{IN} = 12 V, I_O = 75 mA to 175 mA	10 mV = ± 0.02%
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 2. Boost Converter: External Current Boost Connections for $I_{SW\ PEAK}$ Greater than 1.5A

2a. External NPN Switch



2b. External NPN Saturated Switch
(Refer to Note 3)

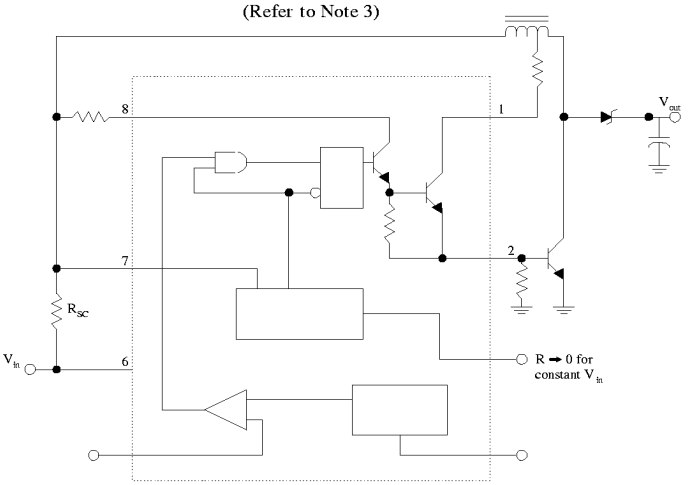
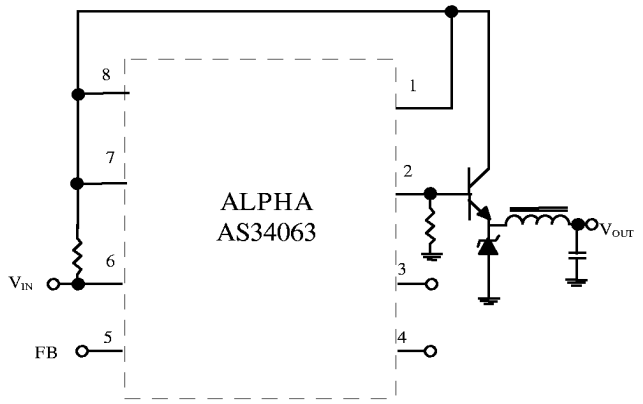
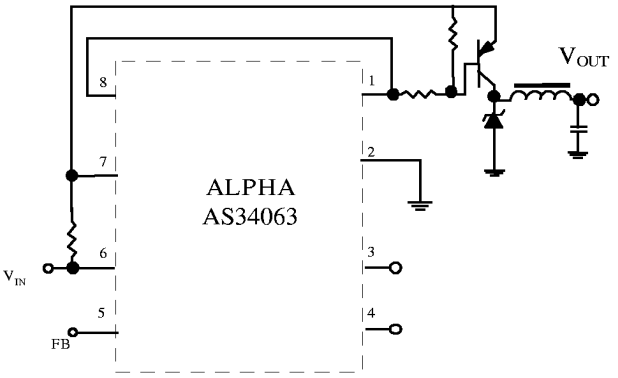


Figure 3. Buck Converter : External Current Boost Connections for $I_{SW\ PEAK}$ greater than 1.5A

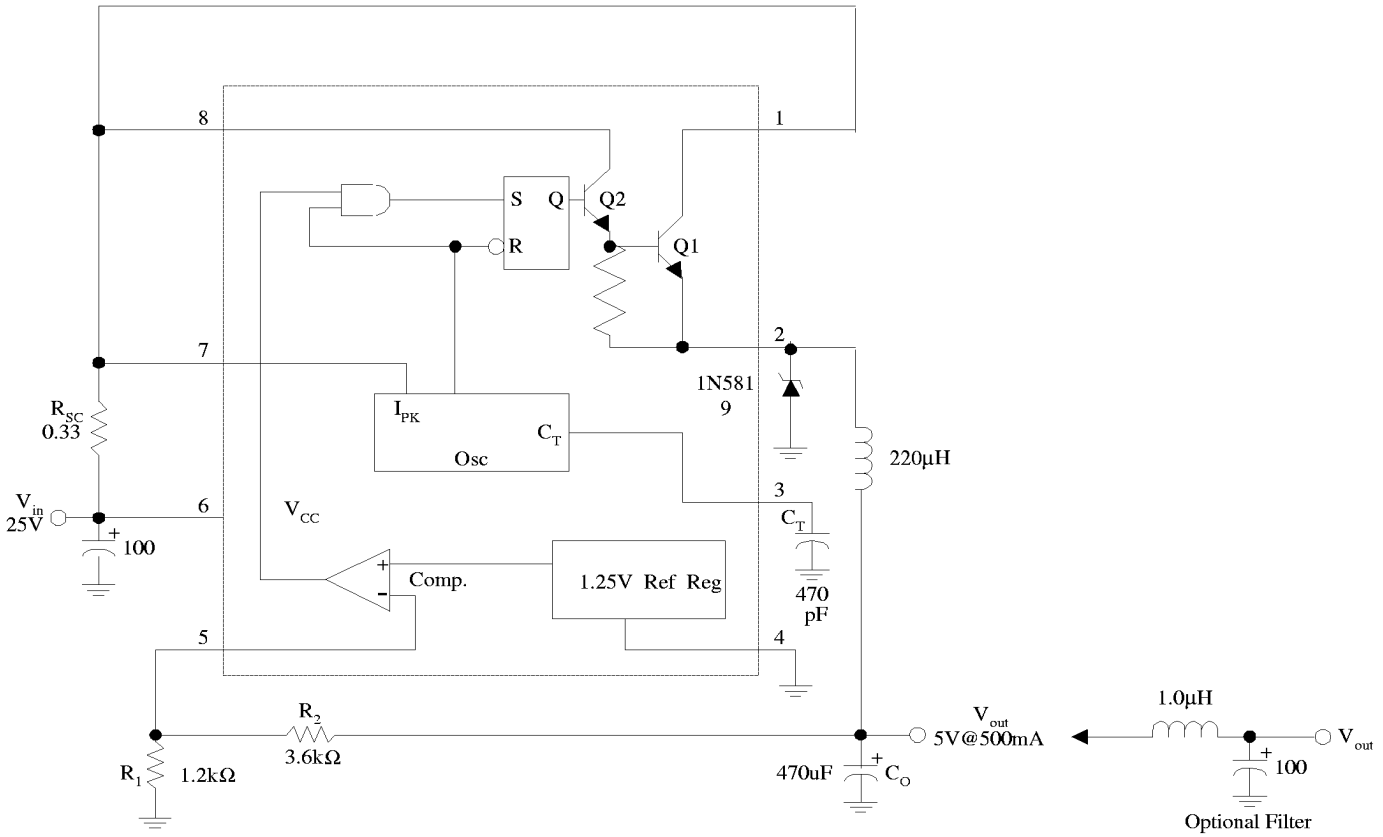


External NPN Switch



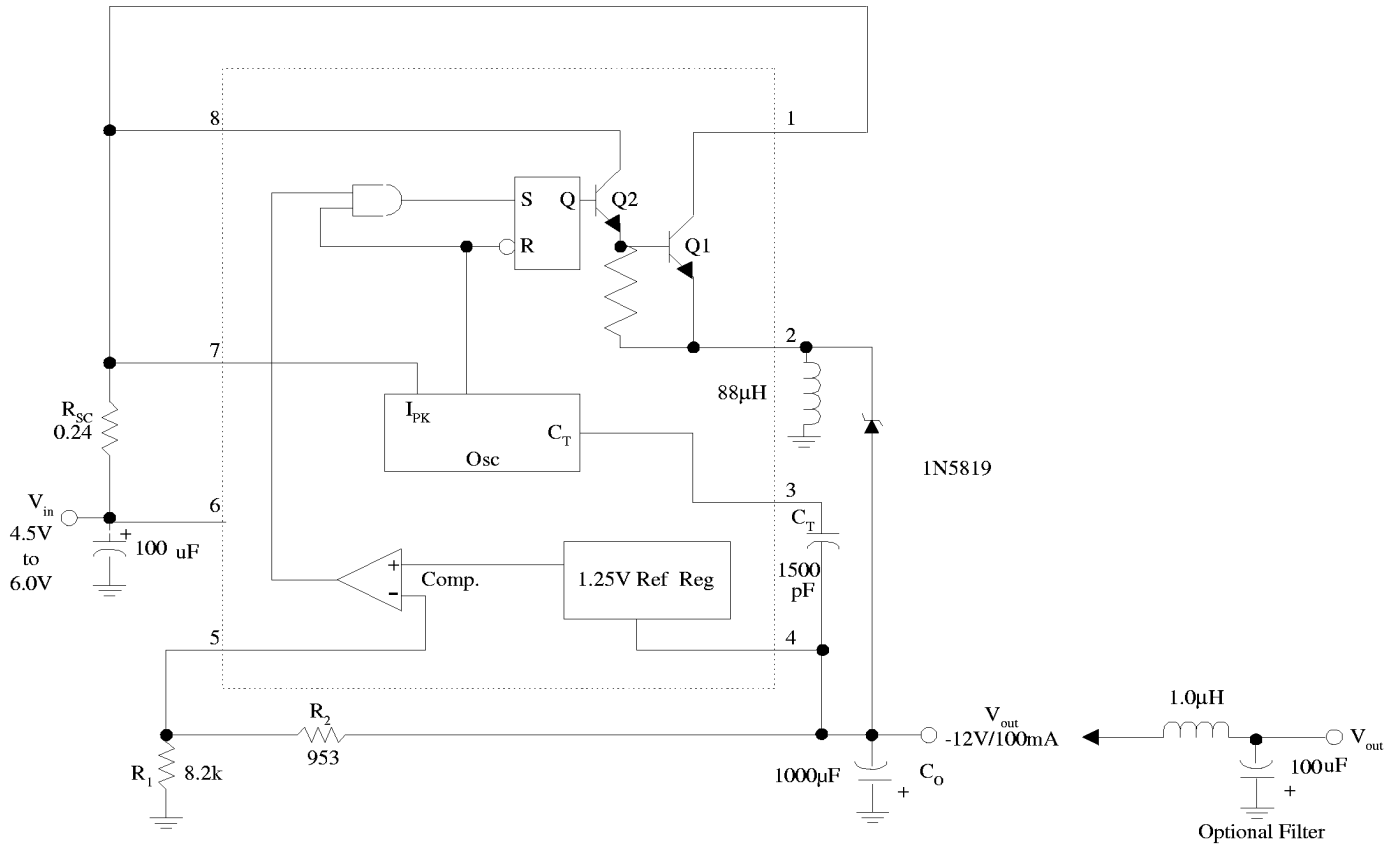
ExternalPNP Saturated Switch

Figure 4. Step-Down Converter



Test	Conditions	Results
Line Regulation	V_{IN} = 15 V to 25 V, I_O = 500 mA	12 mV = ± 0.12%
Load Regulation	V_{IN} = 25 V, I_O = 50 mA to 500 mA	3.0 mV = ± 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 5. 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