HT34063

DOS Electronics Pte Ltd

DC-to-DC Converter Control Circuits HT34063

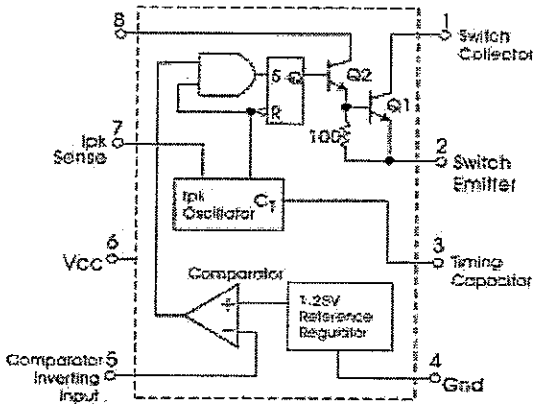
General Description

The HT34063 Series is a 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 specifically designed to be incorporated in Step-Down and Step-Up and voltage- DIP8 Inverting applications with a minimum number of external components.

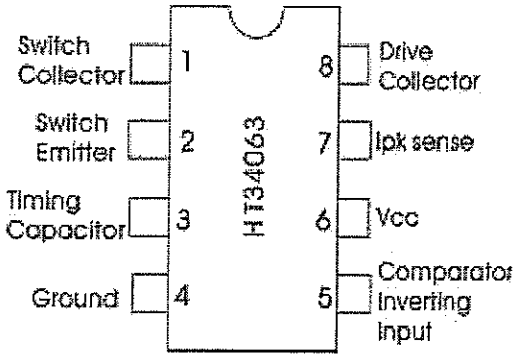
Features

- 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

Block Diagram



Pin Connection



Absolute Maximum Ratings (for IC in Package)

Rating		Symbol	Value	Unit
Power Supply Voltage		Vcc	40	V
Comparator Input Voltage Range		V_{IR}	-0.3 to +40	V
Switch Collector Voltage		V_C(switch)	40	V
Switch Emitter Voltage (V_{PIN1} = 40 V)		V_E(switch)	40	V
Switch Collector to Emitter Voltage		V_{CE}(switch)	40	V
Driver Collector Voltage		V_C(driver)	40	V
Driver Collector Current (Note 1)		I_C(driver)	100	mA
Switch Current		I_{SW}	1.5	A
Power Dissipation	DIP8	PD	1.25	W
	SOP8		625	mW
Operating Ambient Temperature Range		Ta	0~70	°C
Storage Temperature Range		Tstg	-65 to +150	°C

*Notes: 1.Maximum package power dissipation limits must be observed
2.ESD data available upon request

Electrical Characteristics (Unless otherwise specified: Vcc=5.0V, Ta=0~70°C)

Characteristics	Symbol	Min	Typ	Max	Unit
OSCILLATOR					
Frequency (V_{pin5} = 0V, C_T = 1.0 nF, T_A = 25°C)	f_{OSC}	24	33	42	kHz
Charge Current (V_{CC} = 5.0V to 40V, T_A = 25°C)	I_{chg}	24	35	42	µA
Discharge Current (V_{CC} = 5.0V to 40V, T_A = 25°C)	I_{dischg}	140	220	260	µA
Discharge to Charge Current Ratio(Pin 7 to V_{CC}, T_A=25°C)	I_{dischg}/ I_{chg}	5.2	6.5	7.5	–
Current Limit Sense Voltage (I_{chg} = I_{dischg}, T_A = 25°C)	Vipk(sence)	250	300	350	mV
OUTPUT SWITCH(Note 3)					
Saturation Voltage, Darlington Connection (I_{SW} = 1.0 A, Pins 1, 8 connected)	$V_{CE(sat)}$	–	1.0	1.3	V
Saturation Voltage, Darlington Connection (Note 4) (I_{SW} = 1.0 A, R_{pin} 8 = 82Ω to V_{CC}, Forced β ≒ 20)	$V_{CE(sat)}$	–	0.45	0.7	V
DC Current Gain (I_{SW} =1.0 A, V_{CE} =5.0 V, T_A = 25°C)	h_{FE}	50	75	–	–
Collector Off-State Current (V_{CE} = 40 V)	$I_{C(off)}$	–	0.01	100	µA
COMPARATOR					
Threshold Voltage (T_A=25°C) (T_A =T_{low} to T_{high})	Vth	1.225 1.21	1.25 –	1.275 1.29	V
Threshold Voltage Line Regulation (Vcc=3.0 to 40 V)	$Regl_{ine}$	1.4	-	5.0	mV
Input Bias Current (Vin=0 V)	I_{IB}	—	-20	-400	nA
TOTAL DEVICE					
Supply Current (Vcc = 5.0 V to 40 V, C_T = 1.0 nF, Pin 7 = V_{CC}, Vpin 5 > Vth, Pin 2 = Gnd, remaining pins open)	I_{CC}	–	–	4.0	mA

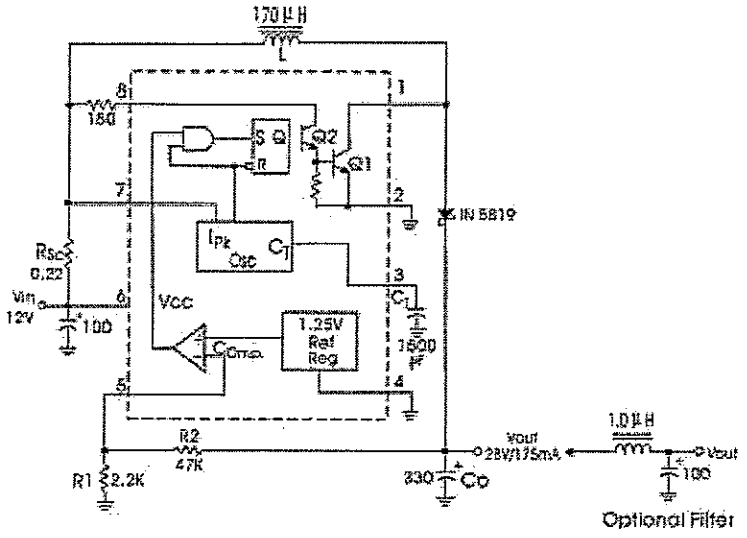
Notes: 3. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.

4. 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 : Ic output/ (Ic drive –7.0mA)* ≥ 10

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

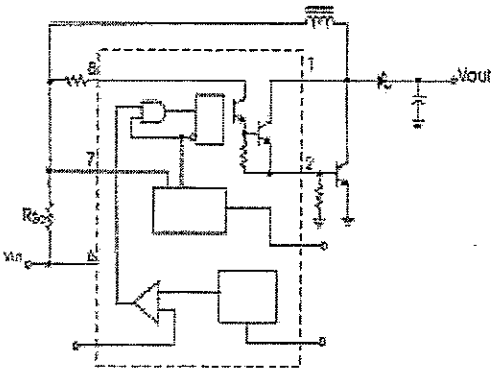
Figure 1. Step-Up Converter



test	conditions	Results
Line Regulation	Vin=8.0~16V, Io=175mA	30mV=±0.05%
Load Regulation	Vin=12V,Io=75~175mA	10mV=±0.017%
Output Ripple	Vin=12V, Io=175mA	400mVpp
Efficiency	Vin=12V, Io=175mA	87.7%
Output Ripple With Optional Filter	Vin=12V, Io=175mA	40mVpp

Figure2.External Current Boost Connections for Ic Peak Greater than 1.5A

(1).External NPN Switch



(2) External NPN Saturated Switch (Note 4)

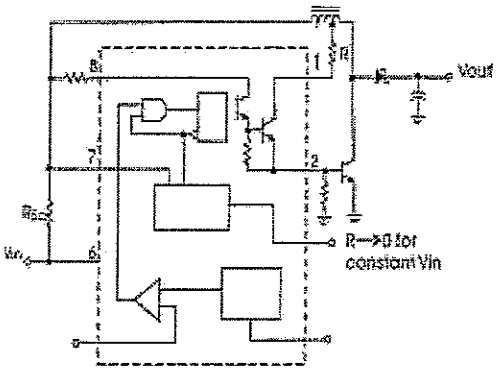
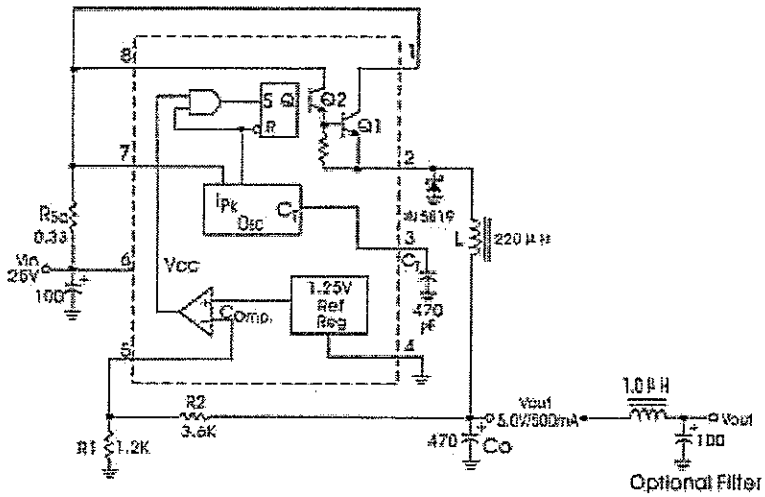


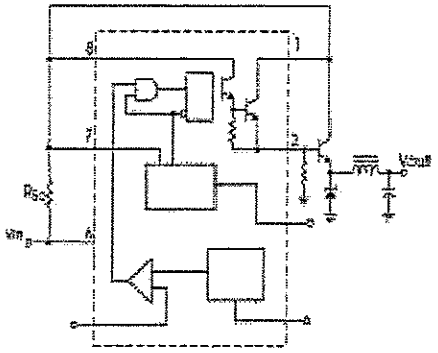
Figure 3. Step-Down Converter



test	conditions	Results
Line Regulation	Vin=15~25V, Io=500mA	12mV=±0.12%
Load Regulation	Vin=25V,Io=50~500mA	3.0mV=±0.03%
Output Ripple	Vin=25V, Io=500mA	120mVpp
Short Circuit Current	Vin=25V,RL=0.1 Ω	1.1A
Efficiency	Vin=25V, Io=500mA	83.7%
Output Ripple With Optional Filter	Vin=25V, Io=500mA	40mVpp

Figure4.External Current Boost Connections for Ic Peak Greater than 1.5A

(1).External NPN Switch



(2) External NPN Saturated Switch

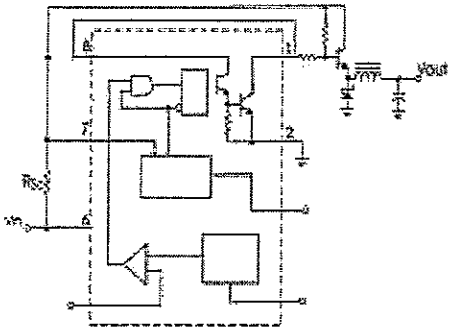
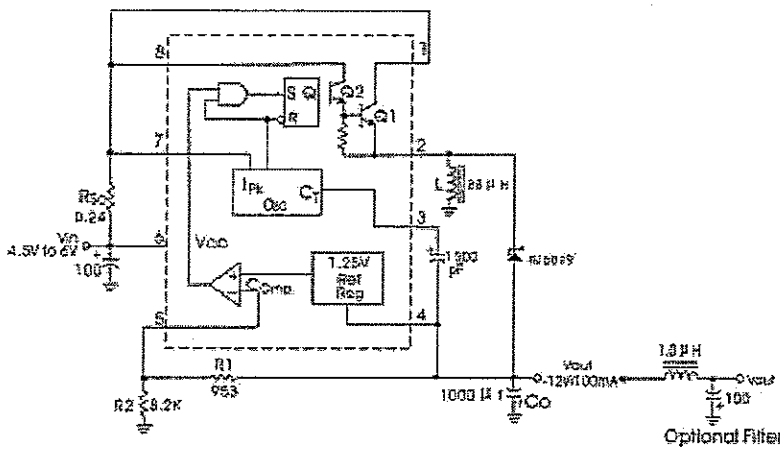


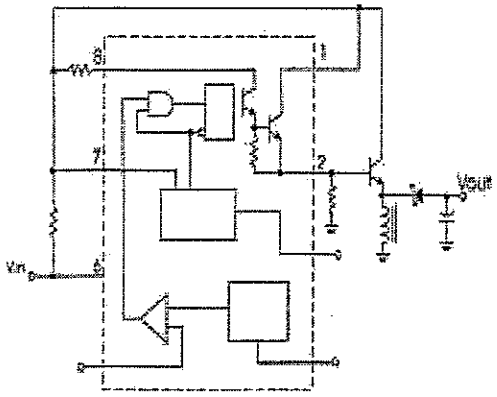
Figure5. Voltage Inverting Converter



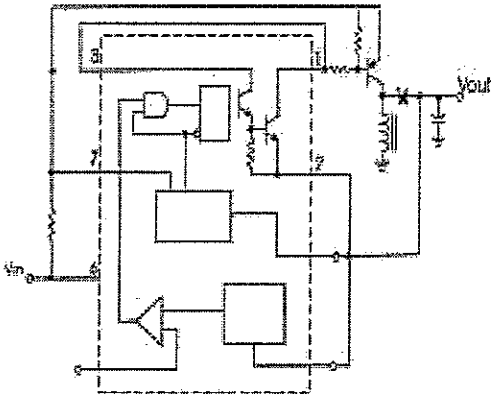
test	conditions	Results
Line Regulation	Vin=4.5~6.0V, Io=100mA	3.0mV=±0.012%
Load Regulation	Vin=5.0V,Io=10~100mA	3.0mV=±0.09%
Output Ripple	Vin=5.0V, Io=100mA	500mVpp
Short Circuit Current	Vin=5.0V,RL=0.1 Ω	910mA
Efficiency	Vin=5.0V, Io=100mA	62.2%
Output Ripple With Optional Filter	Vin=5.0V, Io=100mA	70mVpp

Figure6.External Current Boost Connections for Ic Peak Greater than 1.5A

(1).External NPN Switch

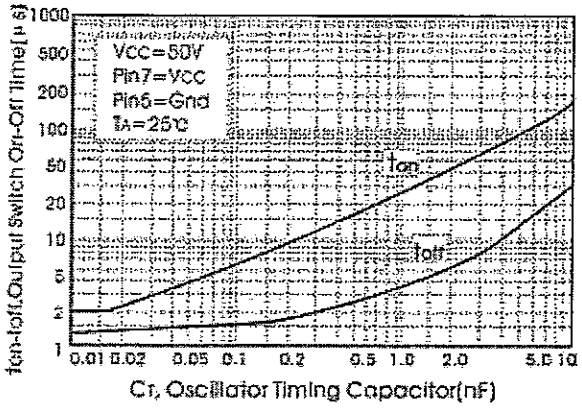


(2) External NPN Saturated Switch

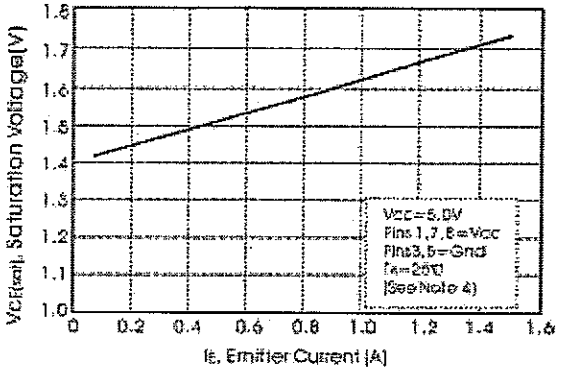


Characterstics Curves

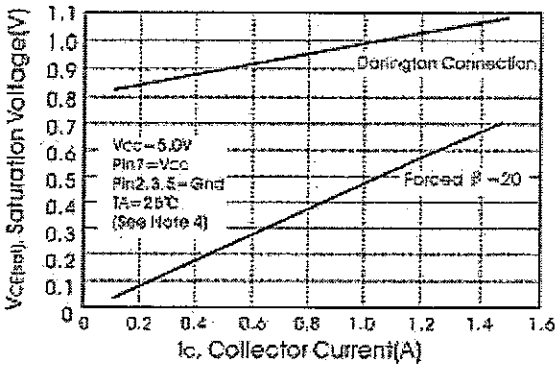
Output switch on-off time versus Timing capacitor



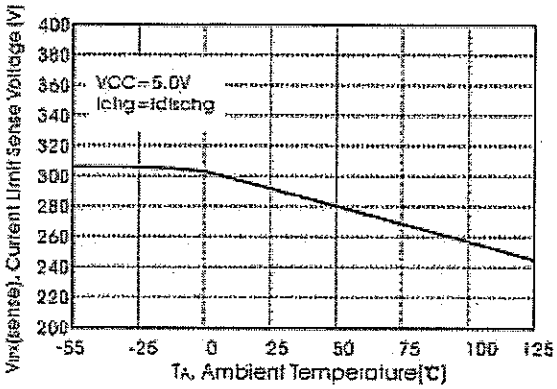
Emitter follower configuration output Saturation voltage versus emitter current



common emitter configuration output switch saturation voltage versus collector current



current limit sense voltage versus temperature



standby supply current versus supply voltage