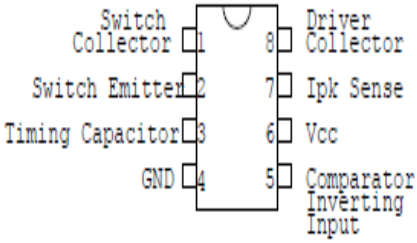
GENERAL DESCRIPTION

The EST MC34063 is a monolithic control circuit containing the primary functions required for Dc-to-Dc converters. This device consists of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch. This device was specifically designed to be incorporated in Step-Down and Step-Up and Voltage-inverting applications with a minimum number of external components.

FEATURES

- Operation from 3.0V to 40V Input
- Low Standby Current
- Output Switch Current to 1.5A
- Output Voltage Adjustable
- Frequency of Operation from 100Hz to 100kHz **DIP-8**
- Precision 2% Reference
- Current Limiting

PIN ARRANGEMENT



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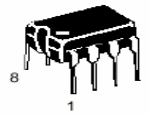

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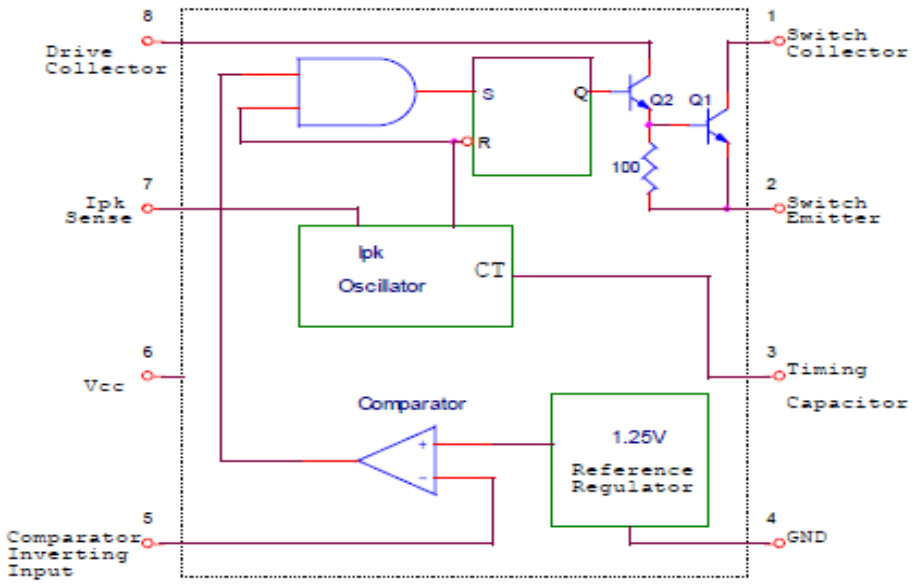
ORDERING INFORMATION

Device	Operating Temperature Range	Package
MC34063	TA=0℃~+70℃	**DIP-8**
MC34063S	TA=0℃~+70℃	**SOP-8**

BLOCK DIAGRAM



This device contains 51 active transistors

ABSOLUTE MAXIMUM RATING

Characteristic	SYMBOL	Value	Unit
Power Supply Voltage	V_{CC}	40	Vdc
Comparator Input Voltage Range	V_{IR}	-0.3 to +40	Vdc
Switch Collector Voltage	$V_{C(switch)}$	40	Vdc
Switch Emitter Voltage (VPin 1=40V)	$V_{E(switch)}$	40	Vdc
Switch Collector to Emitter Voltage	$V_{CE(switch)}$	40	Vdc
Driver Collector Voltage	$V_{C(driver)}$	40	Vdc
Driver Collector Current (Note 1)	$I_{C(driver)}$	100	mA
Switch Current	I_{SW}	1.5	A
Power Dissipation and Thermal Characteristics			
Plastic Package			
T_A=25℃	P_D	1.25	W
Thermal Resistance	$R_{\theta JA}$	100	℃/W
SOIC Package			
T_A=25℃	P_D	0.625	W
Thermal Resistance	$R_{\theta JA}$	100	℃/W
Operating Junction Temperature	T_J	+150	℃
Operating Ambient Temperature Range	T_A	0 to +70	℃
Storage Temperature Range	T_{stg}	-65 to +150	℃

NOTES: 1. Maximum package power dissipation limits must be observed.

2. ESD data available upon request.

ELECTRICAL CHARACTETRISTICS

(V_{CC}=5.0V, T_A=Tlow to Thigh [Note 3], unless otherwise specified.)

CHARACTERISTICS	SYMBOL	MIN	Typ	MAX	Unit
OSCILLATOR					
Frequency(VPin 5=0V, CT=1.0nF, T_A=25℃)	f_{osc}	24	33	42	kHz
Oscillator Amplitude (V_{CC}=5.0V , T_A=25℃)	$V_{(osc)}$		0.4		V
Charge Current (V_{CC}=5.0V to 40V, T_A=25℃)	I_{chg}	22	35	42	μA
Discharge Current (V_{CC}=5.0V to 40V, T_A=25℃)	I_{dischg}	140	220	260	μA
Discharge to Charge Current Ratio (Pin 7 to V_{CC}, T_A=25℃)	I_{dischg}/ I_{chg}	5.2	6.5	7.5	-
Current Limit Sense Voltage (I_{chg}==I_{dischg}, T_A=25℃)	$V_{ipk(sence)}$	250	300	350	mV
OUTPUT SWITCH (NOTE 4)					
Saturation Voltage, Darlington Connection (Note 5) (I_{SW}=1.0A, Pins 1, 8 connected)	$V_{CE(sat)}$	-	1.0	1.3	V
Saturation Voltage, Darlington Connection (I_{SW}=1.0A, R_{Pin} 8=82Ω to V_{CC}, Forced β □ 20)	$V_{CE(sat)}$	-	0.45	0.7	V

DC Current Gain (ISW=1.0A, V_{CE}=5.0V, T_A=25℃)	h_{FE}	50	95	-	-
Collector Off-State Current(V_{CE}=40V)	$I_{C(off)}$	-	0.01	100	μA

ELECTRICAL CHARACTETRISTICS

(V_{CC}=5.0V, T_A=Tlow to Thigh [Note 3], unless otherwise specified.)

CHARACTERISTICS	SYMBOL	MIN	Typ	MAX	Unit
COMPARATOR					
Threshold Voltage (T_A=25℃) (T_A=Tlow to Thigh)	V_{th}	1.225 1.225	1.25 -	1.275 1.275	V
Threshold Voltage Line Regulation (V_{CC}=3.0V to 40V)	Reg_{line}	-	1.4	5.0	mV
Input Bias Current (V_{in}=0V)	I_{IB}	-	-20	-400	nA
TOTAL DEVICE					
Supply Current (V_{CC}=5.0V to 40V, CT=1.0nF, Pin 7=V_{CC}, VPin 5>Vth, Pin 2=Gnd, remaining pins open)	I_{CC}	-	2.75	4.0	mA

NOTES:

3. Tlow=0℃ for MC34063A Thigh=+70℃ for MC34063A
4. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.
5. If the output switch is driven into hard saturation (non-Darlington) at low switch currents (≤ 300mA) and high driver currents (≥ 30mA), it may take up to 2.0μs for it to come out of saturation. This condition will shorten the off time at frequencies ≥ 30kHz, and is magnified at high temperature. 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: $\frac{I\,output}{Ic\,driver - 7.0mA\,*} \geq 10$

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

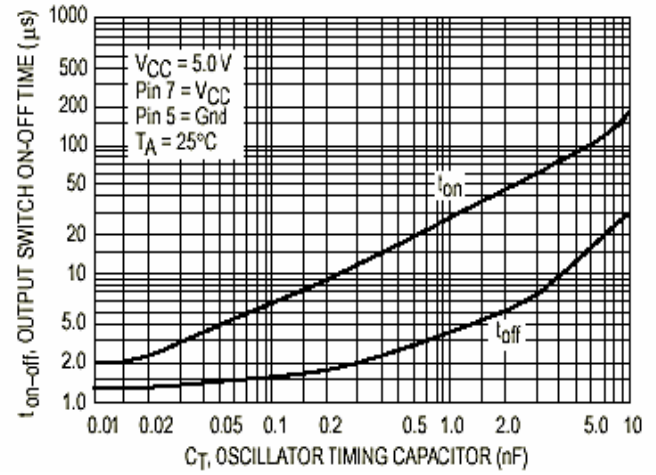


Fig 1.Output Switch On-Off Time versusOscillator Timing Capacitor

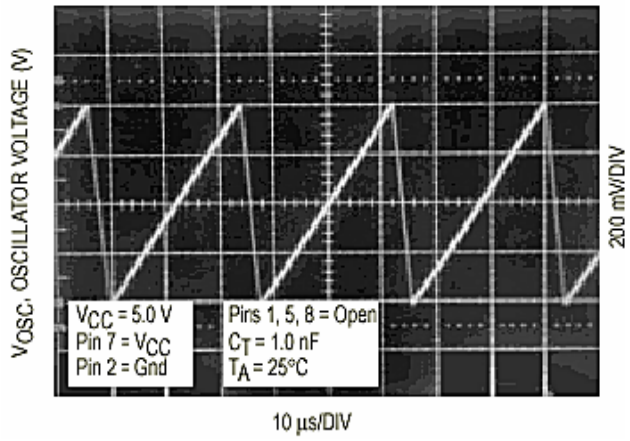


Fig 2. Timing Capacitor Waveform

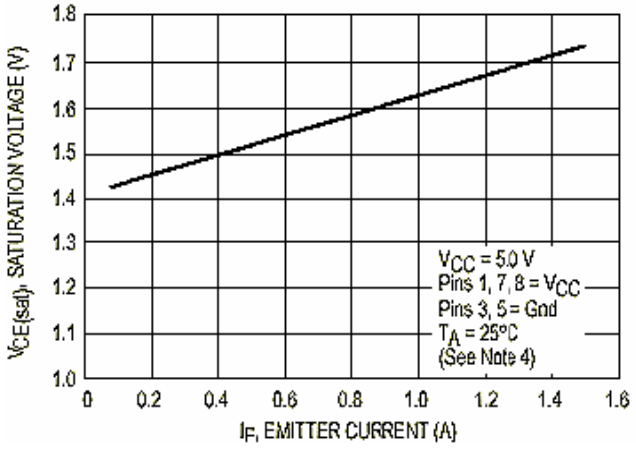


Fig 3.Emitter Follower Configuration Output Saturation Voltage versus Emitter Current

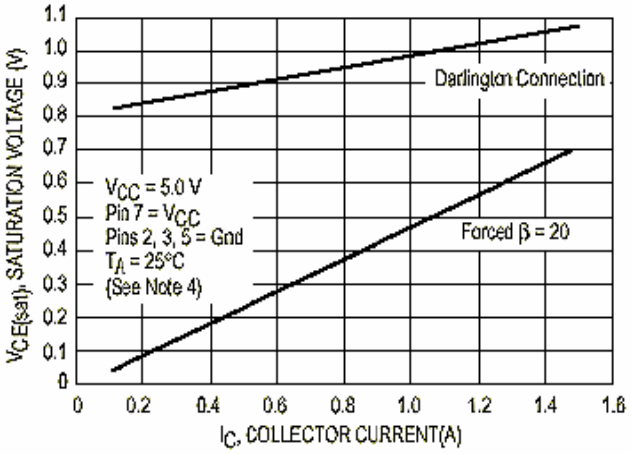


Fig 4.Common Emitter Configuration Output Switch Saturation Voltage versus Collector Current

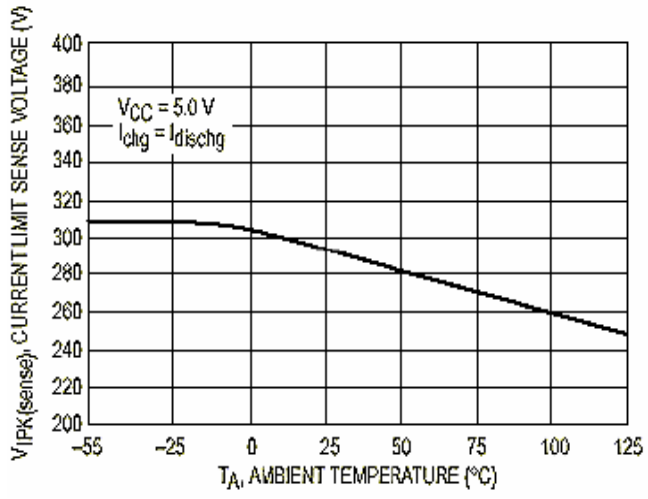


Fig 5.Current Limit Sense Voltage versus Temperature

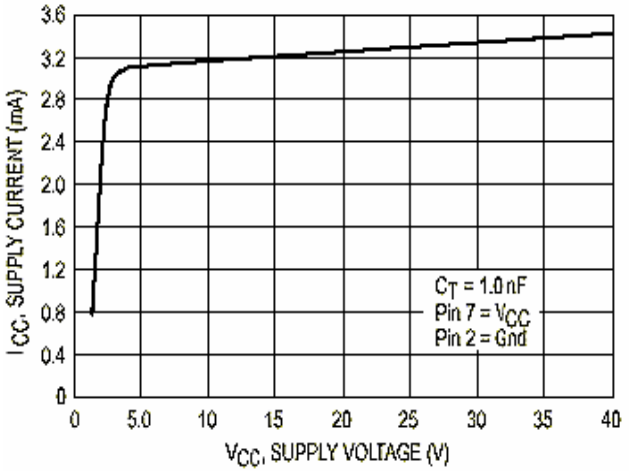


Fig 6.Standby Supply Current versus Supply Voltage

NOTE: 4. Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.

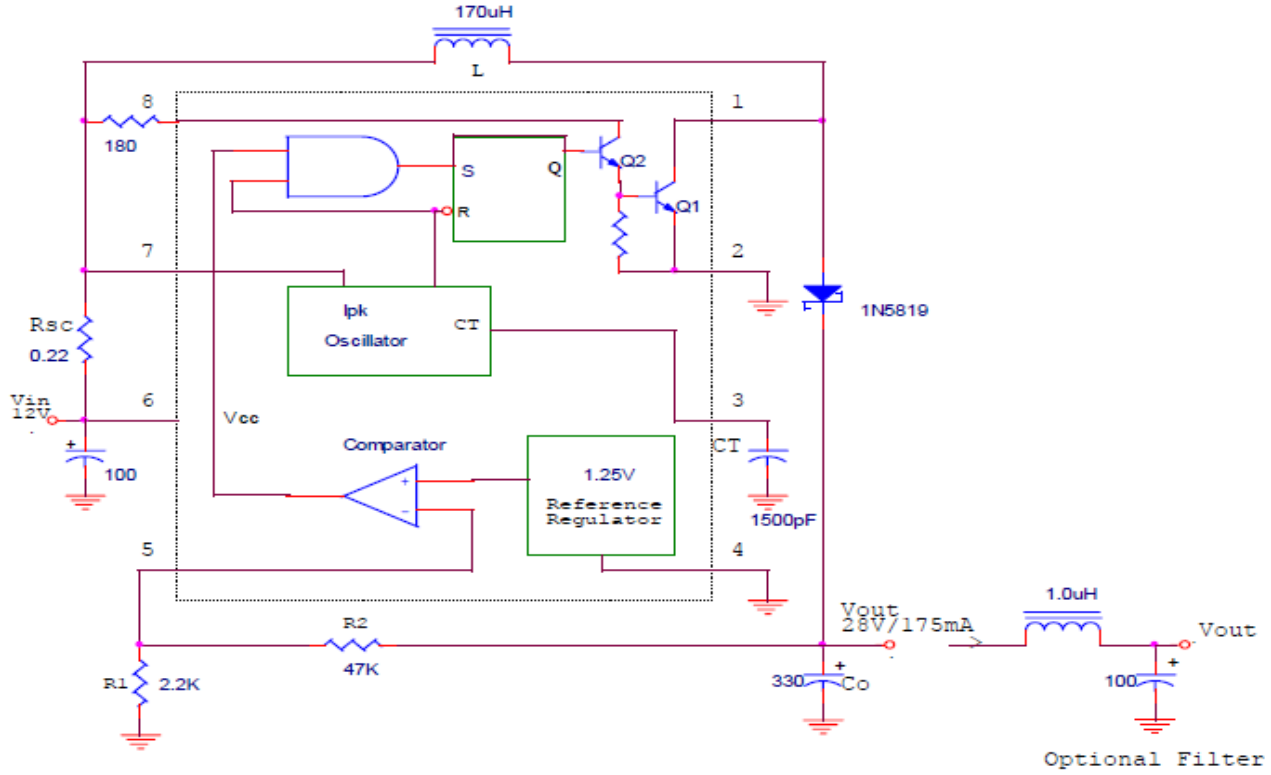
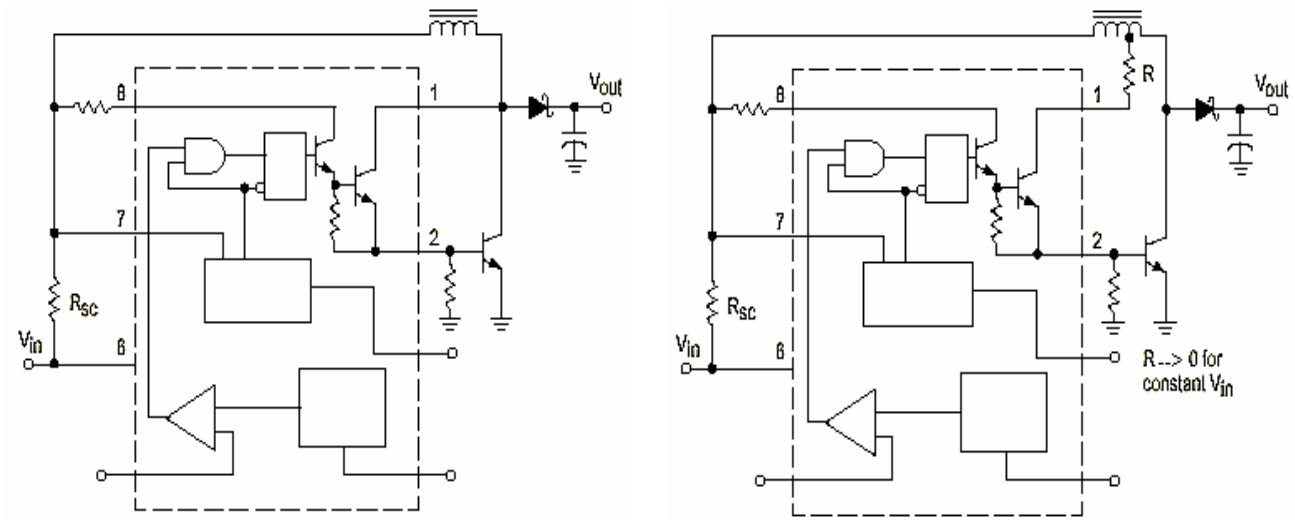


Fig 7. Step-Up Converter



8a. External NPN Switch **8b. External NPN Saturated Switch**(See Note 5)

Fig 8. External Current Boost Connections for IC Peak Greater than 1.5A

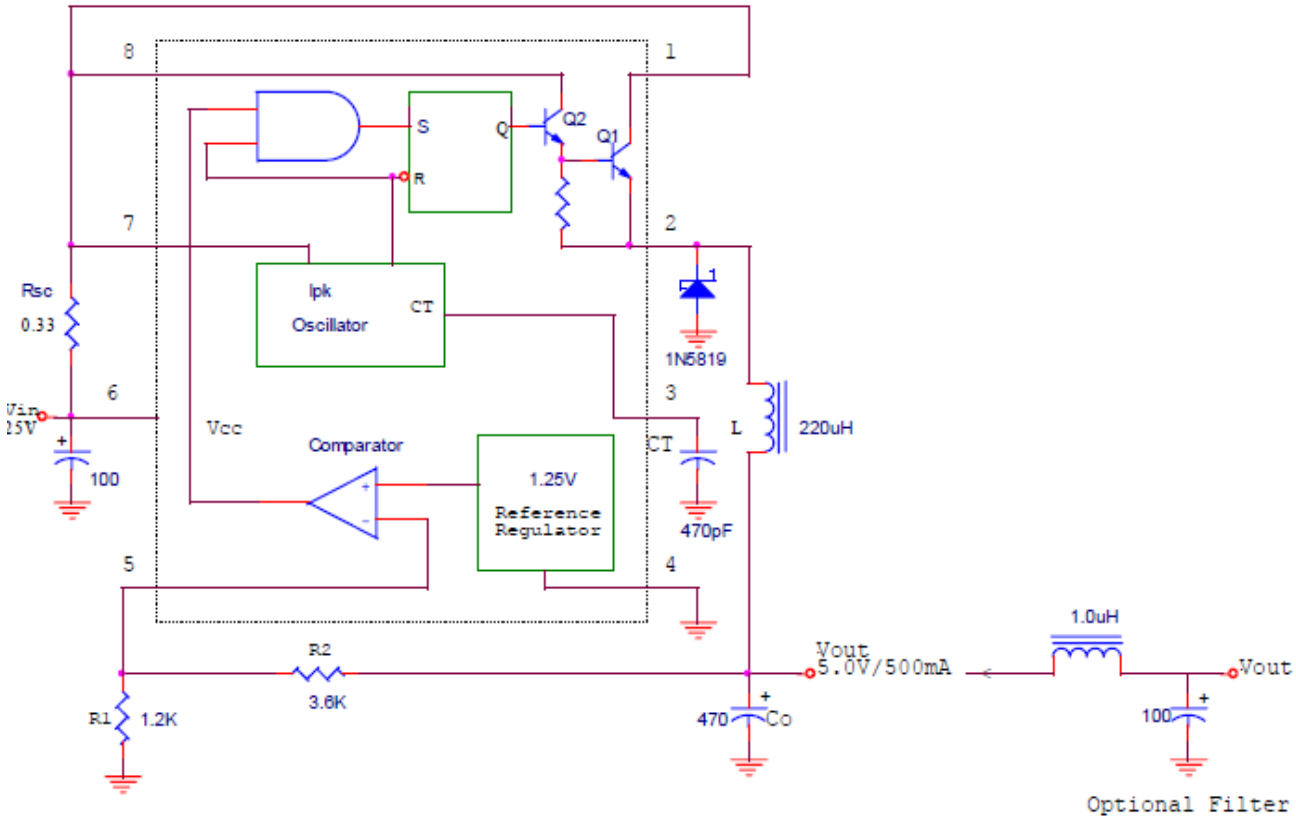
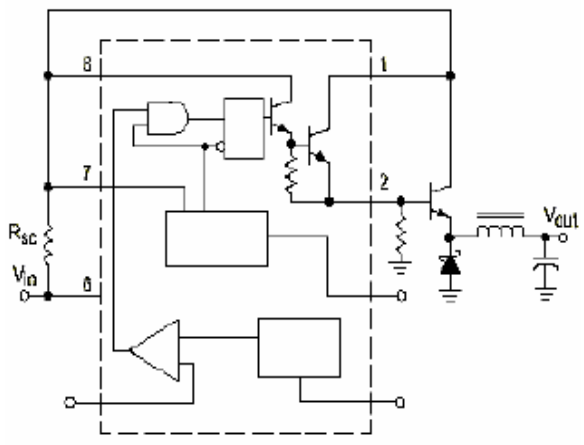
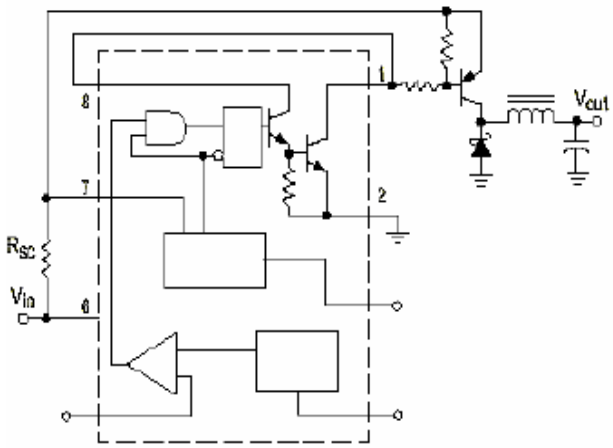


Fig 9. Step-Down Converter





10a. External NPN Switch

10b. External PNP Saturated Switch

Fig 10. External Current Boost Connections for IC Peak Greater than 1.5A

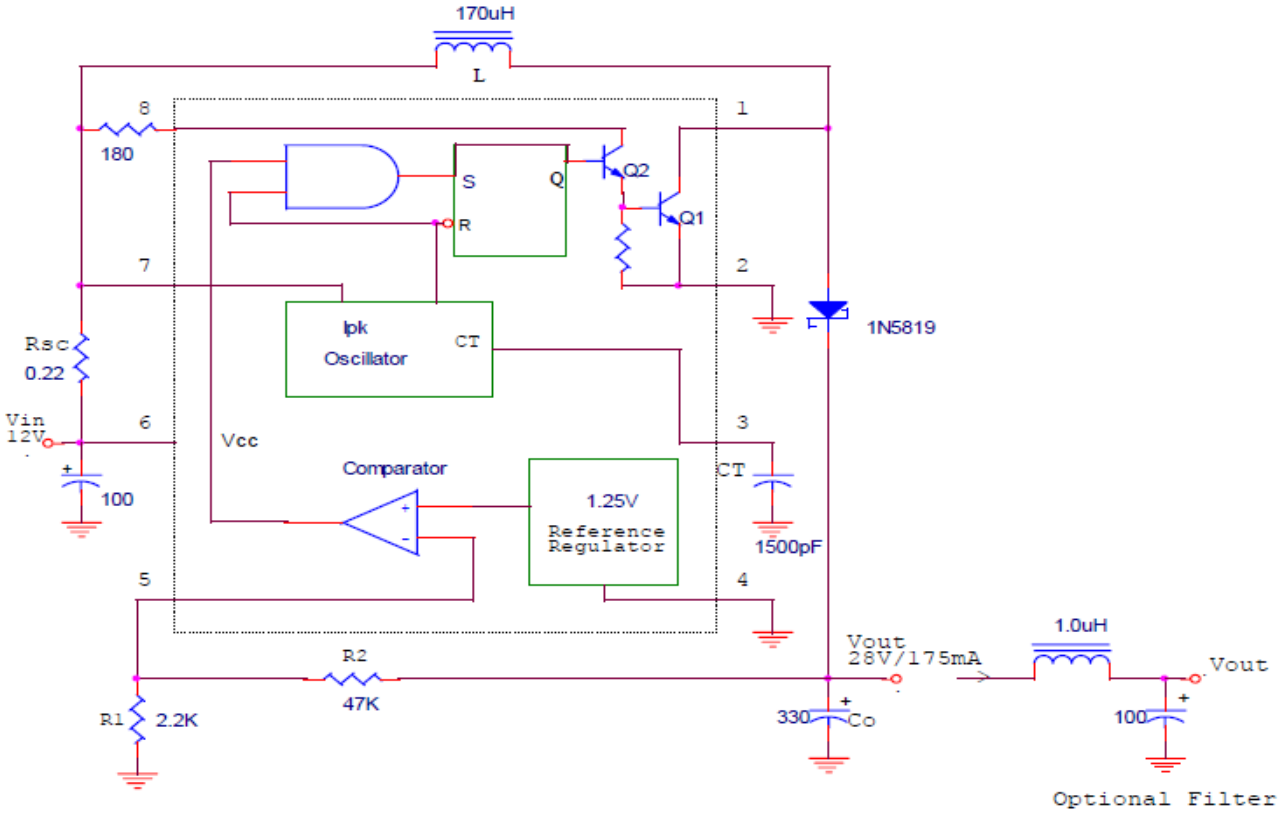
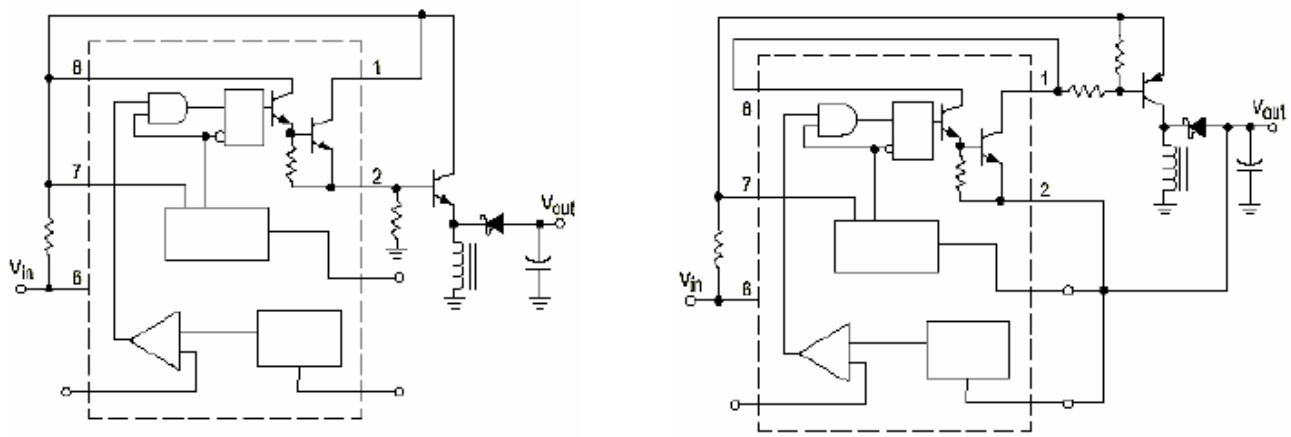


Fig 11. Voltage Inverting Converter



12a. External NPN Switch **12b. External PNP Saturated Switch**

Fig 12. External Current Boost Connections for IC Peak Greater than 1.5A

NOTE: 5. If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents (≤ 300mA) and high driver currents (≥ 30 mA), it may take up to 2.0 μs to come out of saturation. This condition willshorten the off time at frequencies ≥ 30 kHz, and is magnified at high temperatures. This condition does notoccur with a Darlington configuration, since the output switch cannot saturate. If a non-Darlington configuration is used, the following output drive condition is recommended

Calculation	Step-Up	Step-Down	Voltage-inverting
t_{on}/t_{off}	$\frac{V_{out}+V_F-V_{in(min)}}{V_{in(min)}-V_{sat}}$	$\frac{V_{out}+V_F}{V_{in(min)}-V_{sat}-V_{out}}$	$\frac{\lvert V_{out}\rvert+V_F}{V_{in}-V_{sat}}$
$t_{on}+t_{off}$	$\frac{1}{f}$	$\frac{1}{f}$	$\frac{1}{f}$
t_{off}	$\frac{t_{on}+t_{off}}{\frac{t_{on}}{t_{off}}+1}$	$\frac{t_{on}+t_{off}}{\frac{t_{on}}{t_{off}}+1}$	$\frac{t_{on}+t_{off}}{\frac{t_{on}}{t_{off}}+1}$
t_{on}	$(t_{on}+t_{off})-t_{off}$	$(t_{on}+t_{off})-t_{off}$	$(t_{on}+t_{off})-t_{off}$
C_T	$4.0\times10^{-5}t_{on}$	$4.0\times10^{-5}t_{on}$	$4.0\times10^{-5}t_{on}$
$I_{pk(switch)}$	$2I_{out(max)}(\frac{t_{on}}{t_{off}}+1)$	$2I_{out(max)}$	$2I_{out(max)}(\frac{t_{on}}{t_{off}}+1)$
R_{sc}	$0.3/I_{pk(switch)}$	$0.3/I_{pk(switch)}$	$0.3/I_{pk(switch)}$
$L_{(min)}$	$(\frac{(V_{in(min)}-V_{sat})}{I_{pk(switch)}})t_{on(max)}$	$(\frac{(V_{in(min)}-V_{sat}-V_{out})}{I_{pk(switch)}})t_{on(max)}$	$(\frac{(V_{in(min)}-V_{sat})}{I_{pk(switch)}})t_{on(max)}$
C_O	$9\frac{I_{out}t_{on}}{V_{ripple(pp)}}$	$\frac{I_{pk(switch)}(t_{on}+t_{off})}{8V_{ripple(pp)}}$	$9\frac{I_{out}t_{on}}{V_{ripple(pp)}}$

Fig 13. Design Formula Tabl

V_{sat} = Saturation voltage of the output switch.

V_F = Forward voltage drop of the output rectifier.

The following power supply characteristics must be chosen:

V_{in} – Nominal input voltage.

V_{out} – Desired output voltage,

I_{out} –Desired output current.

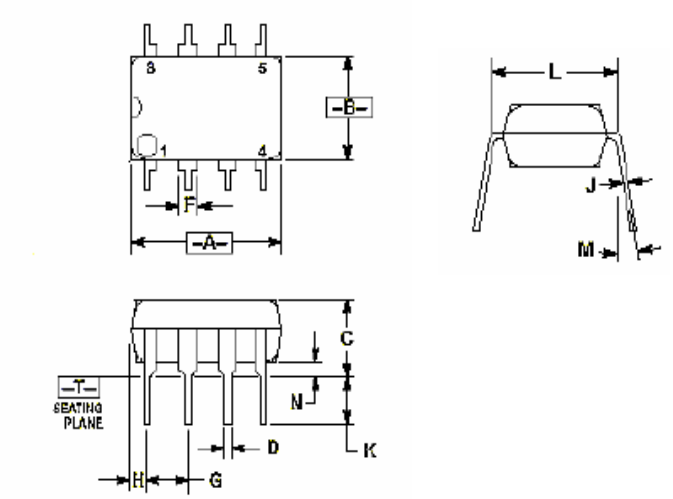
$$|Vout|=1.25(1+\frac{R2}{R1})$$

f_{min} – Minimum desired output switching frequency at the selected values of V_{in} and I_O.

$V_{ripple(p-p)}$ –Desired peak-to-peak output ripple voltage. In practice, the calculated capacitor value will need to be increased due to its equivalent series resistance and board layout. The ripple voltage should be kept to a low value since it will directly affect the line and load regulatio

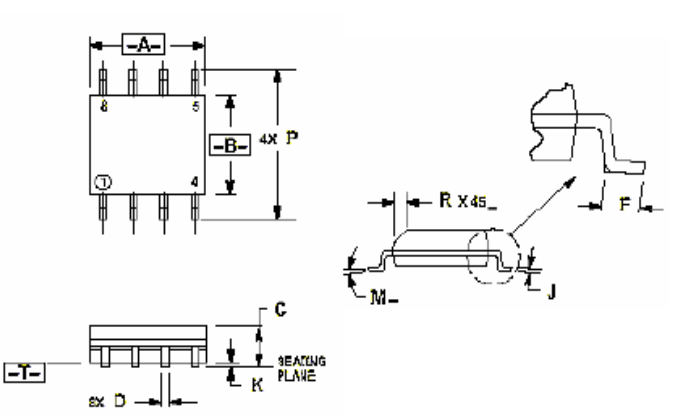
EXTERNAL DIMENSIONS

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	--	10°	--	10°
N	0.76	1.01	0.030	0.040



DIP-8

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.201
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.18	0.25	0.007	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019



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