

# UTC MC34063 LINEAR INTEGRATED CIRCUIT

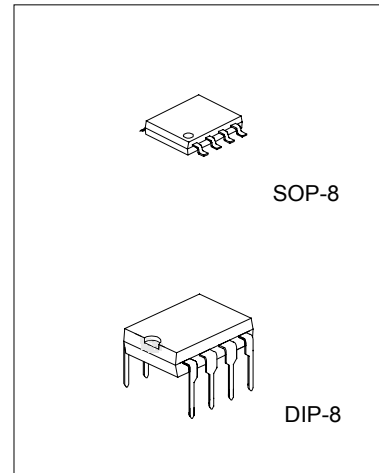
## DC TO DC CONVERTER CONTROLLER

### DESCRIPTION

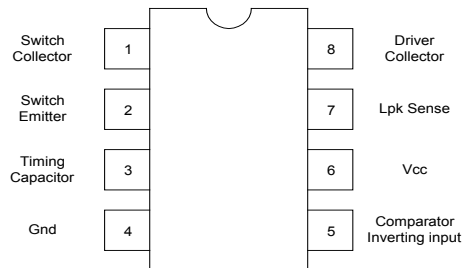
The UTC MC34063 is a monolithic regulator subsystem, intended for use as DC to DC converter. This device contains a temperature compensated band gap reference, a duty-cycle control oscillator, driver and high current output switch. It can be used for step down, step-up or inverting switching regulators as well as for series pass regulators.

### FEATURES

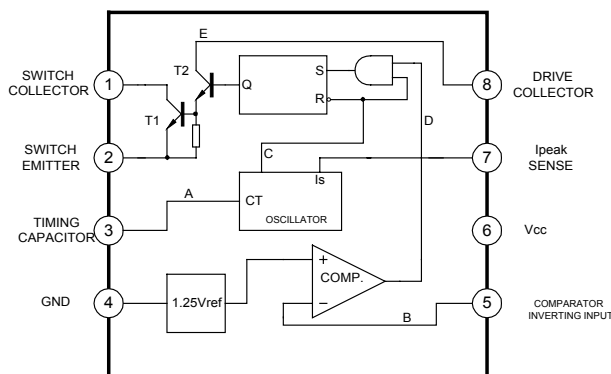
- \*Operation from 3.0V to 40V.
- \*Short circuit current limiting.
- \*Low standby current.
- \*Output switch current of 1.5A without external transistors.
- \*Frequency of operation from 100Hz to 100kHz.
- \*Step-up, step-down or inverting switch regulators.



### PIN CONFIGURATION



### BLOCK DIAGRAM



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## ABSOLUTE MAXIMUM RATINGS(Ta=25°C )

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	Vcc	40	V
Comparator input voltage range	Vi(comp)	-0.3~+40	V
Switch collector voltage	Vc(sw)	40	V
Switch Emitter Voltage	Ve(sw)	40	V
Switch collector to emitter voltage	Vce(sw)	40	V
Driver collector Voltage	Vc(dr)	40	V
Switch current	Isw	1.5	A
Power Dissipation (Ta=25°C)	Pd		
DIP		1250	mW
SOP		625	mW
Thermal Characteristics			
DIP		100	°C/W
SOP		160	°C/W
Operating junction temperature	Tj	150	°C
Operating ambient temperature range	Ta	0~70	°C
Storage temperature range	Tstg	-65~150	°C

## ELECTRICAL CHARACTERISTICS (Ta=25°C )

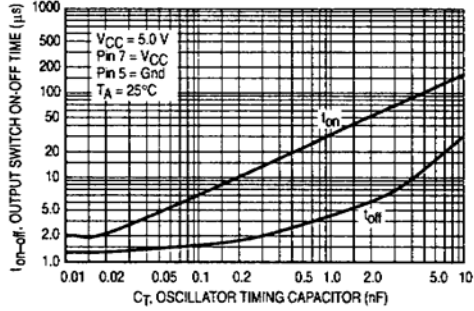
(Vcc=5.0V, Ta=0~70°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
<b>Oscillator</b>						
Charging Current	Ichg	Vcc=5 to 40V, Ta=25°C	22	31	42	μA
Discharging Current	Idischg	Vcc=5 to 40V, Ta=25°C	140	190	260	μA
Oscillator Amplitude	Vosc	Ta=25°C		0.5		V
Discharge to Charge Current Ratio	K	V7=Vcc, Ta=25°C	5.2	6.1	7.5	
Current limit Sense Voltage	Vsense	Ichg=Idischg Ta=25°C	250	300	350	mV
<b>Output Switch</b>						
Saturation Voltage 1(note)	Vce(sat)1	Isw=1.0A Vc(driver)=Vc(sw)		0.95	1.3	V
Saturation Voltage 2(note)	Vce(sat)2	Isw=1.0A Vc(driver)=50mA		0.45	0.7	V
DC Current Gain (note)	Gi(DC)	Isw=1.0A Vce=5.0V, Ta=25°C	50	180		
Collector Off State Current (note)	C(off)	Vce=40.0V, Ta=25°C		0.01	100	μA
<b>Comparator</b>						
Threshold Voltage	Vth		1.21	1.24	1.29	V
Threshold Voltage Line Regulation	Vth	Vcc=3~40V		2.0	5.0	mV
Input Bias Current	Ibias	Vi=0V		50	400	nA
<b>Total Device</b>						
Supply Current	Icc	Vcc=5~40V Ct=0.001 V7=Vcc Vc>Vth Pin2=GND		2.7	4.0	mA

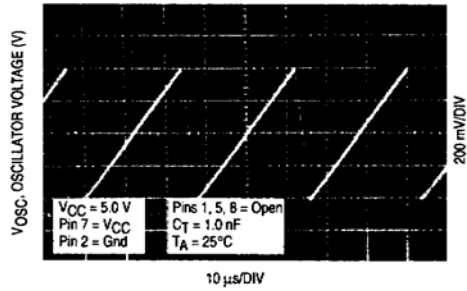
NOTE: Output switch tests are performed under pulsed conditions to minimize power dissipation.

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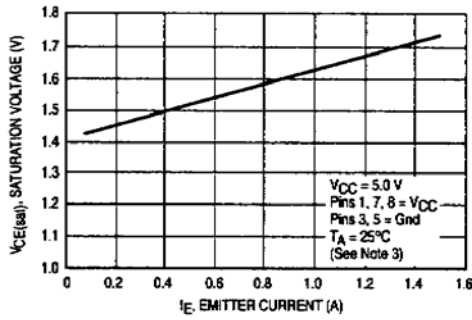
**Figure 1. Output Switch On-Off Time versus Oscillator Timing Capacitor**



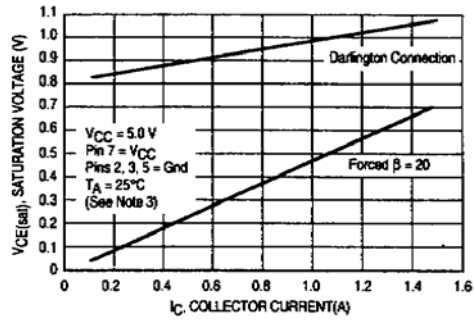
**Figure 2. Timing Capacitor Waveform**



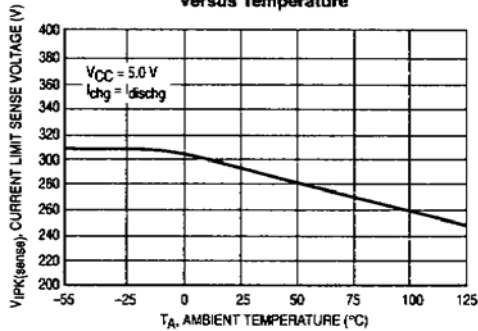
**Figure 3. Emitter Follower Configuration Output Saturation Voltage versus Emitter Current**



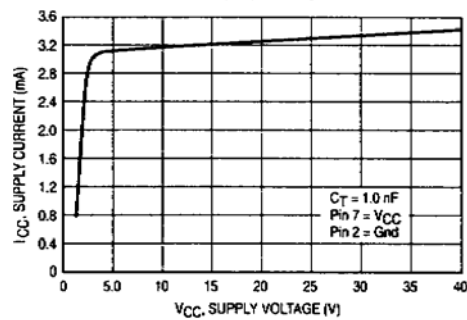
**Figure 4. Common Emitter Configuration Output Switch Saturation Voltage versus Collector Current**



**Figure 5. Current Limit Sense Voltage versus Temperature**

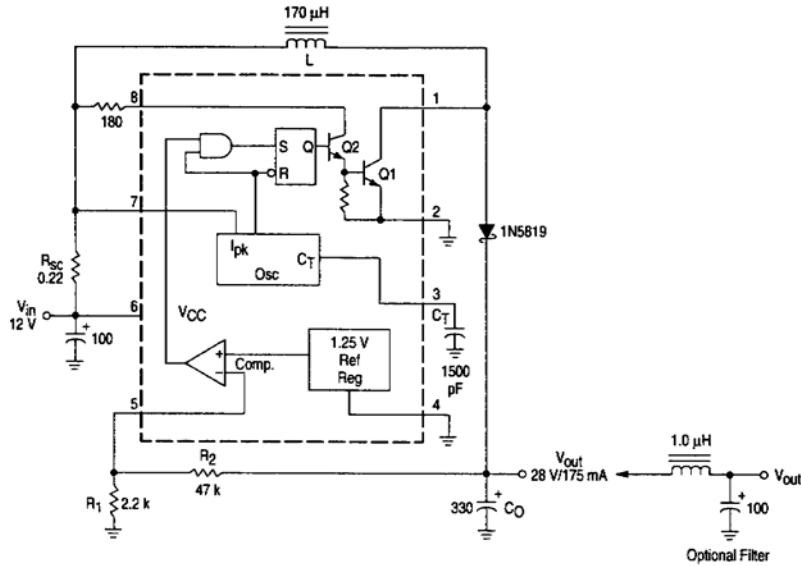


**Figure 6. Standby Supply Current versus Supply Voltage**



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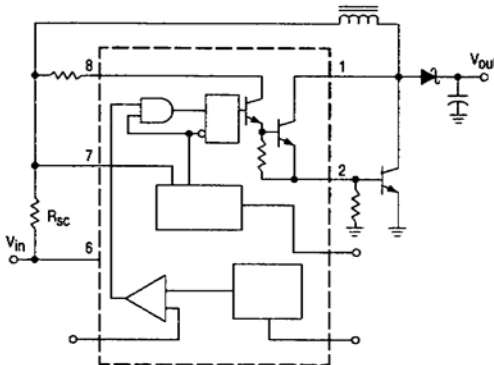
Figure 7. Step-Up Converter



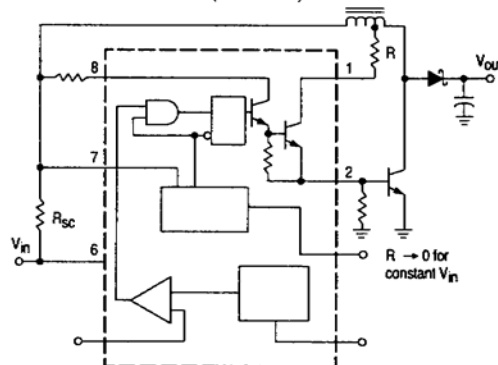
Test	Conditions	Results
Line Regulation	$V_{in} = 8.0 \text{ V to } 16 \text{ V}, I_O = 175 \text{ mA}$	$30 \text{ mV} = \pm 0.05\%$
Load Regulation	$V_{in} = 12 \text{ V}, I_O = 75 \text{ mA to } 175 \text{ mA}$	$10 \text{ mV} = \pm 0.017\%$
Output Ripple	$V_{in} = 12 \text{ V}, I_O = 175 \text{ mA}$	$400 \text{ mVp-p}$
Efficiency	$V_{in} = 12 \text{ V}, I_O = 175 \text{ mA}$	$87.7\%$
Output Ripple With Optional Filter	$V_{in} = 12 \text{ V}, I_O = 175 \text{ mA}$	$40 \text{ mVp-p}$

Figure 8. External Current Boost Connections for  $I_C$  Peak Greater than 1.5 A

8a. External NPN Switch



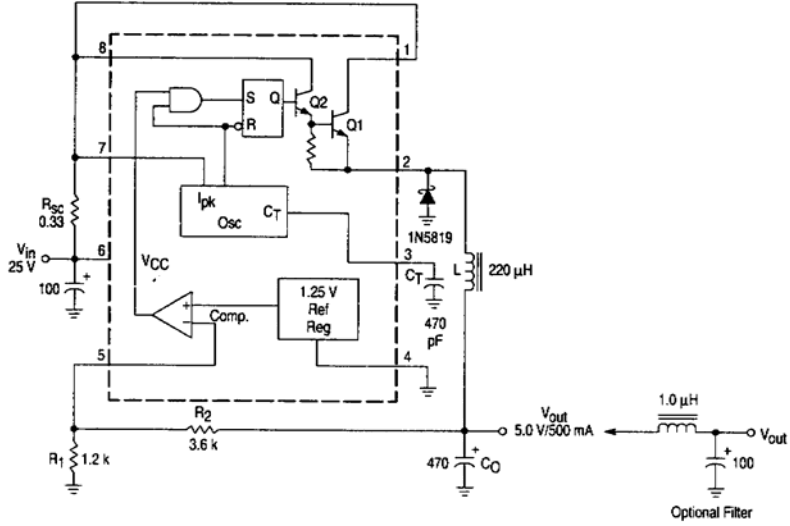
8b. External NPN Saturated Switch  
(See Note 4)



**NOTE:** 4. If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents ( $\leq 300 \text{ mA}$ ) and high driver currents ( $\geq 30 \text{ mA}$ ), it may take up to  $2.0 \mu\text{s}$  to come out of saturation. This condition will shorten the off time at frequencies  $\geq 30 \text{ kHz}$ , 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.

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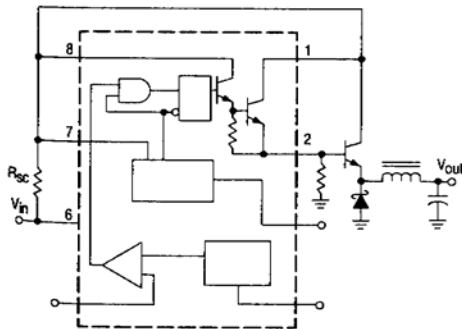
Figure 9. Step-Down Converter



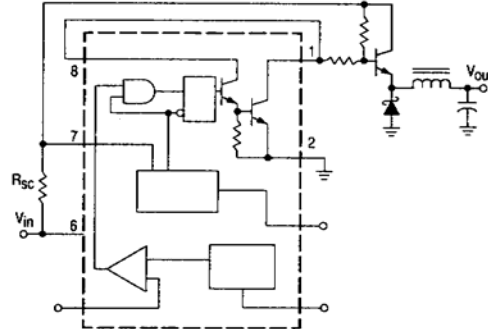
Test	Conditions	Results
Line Regulation	$V_{in} = 15 \text{ V to } 25 \text{ V}, I_O = 500 \text{ mA}$	$12 \text{ mV} = \pm 0.12\%$
Load Regulation	$V_{in} = 25 \text{ V}, I_O = 50 \text{ mA to } 500 \text{ mA}$	$3.0 \text{ mV} = \pm 0.03\%$
Output Ripple	$V_{in} = 25 \text{ V}, I_O = 500 \text{ mA}$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

Figure 10. External Current Boost Connections for  $I_C$  Peak Greater than 1.5 A

10a. External NPN Switch

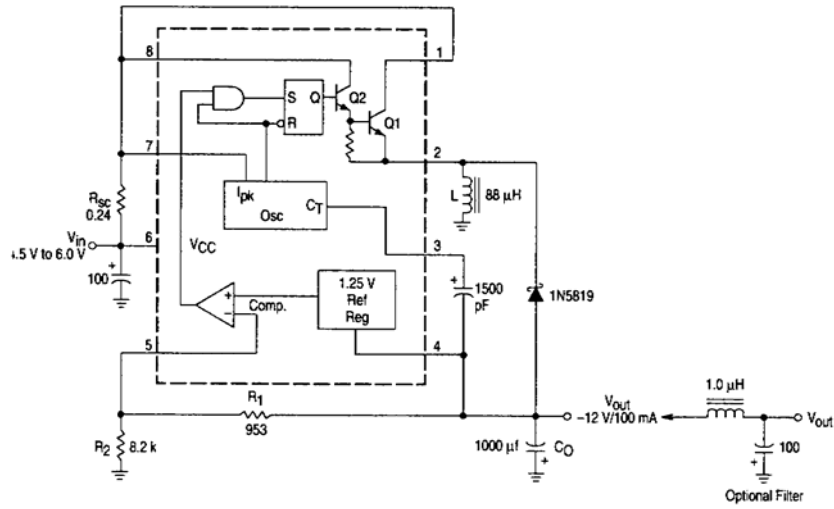


10b. External PNP Saturated Switch



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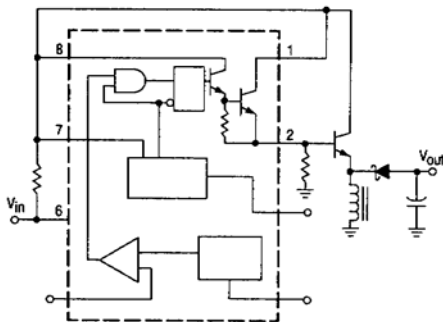
Figure 11. Voltage Inverting Converter



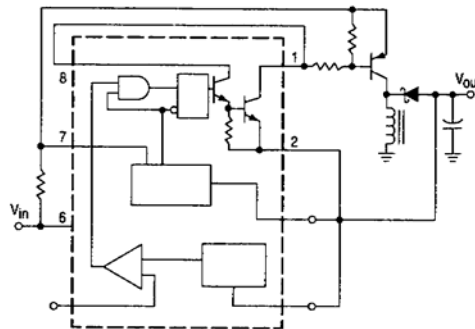
Test	Conditions	Results
Line Regulation	$V_{in} = 4.5 \text{ V to } 6.0 \text{ V}, I_O = 100 \text{ mA}$	$3.0 \text{ mV} \pm 0.012\%$
Load Regulation	$V_{in} = 5.0 \text{ V}, I_O = 10 \text{ mA to } 100 \text{ mA}$	$0.022 \text{ V} \pm 0.09\%$
Output Ripple	$V_{in} = 5.0 \text{ V}, I_O = 100 \text{ mA}$	$500 \text{ mVp-p}$
Short Circuit Current	$V_{in} = 5.0 \text{ V}, R_L = 0.1 \Omega$	$910 \text{ mA}$
Efficiency	$V_{in} = 5.0 \text{ V}, I_O = 100 \text{ mA}$	$62.2\%$
Output Ripple With Optional Filter	$V_{in} = 5.0 \text{ V}, I_O = 100 \text{ mA}$	$70 \text{ mVp-p}$

Figure 12. External Current Boost Connections for  $I_C$  Peak Greater than 1.5 A

12a. External NPN Switch



12b. External PNP Saturated Switch



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