

UTC MC34063 LINEAR INTEGRATED CIRCUIT

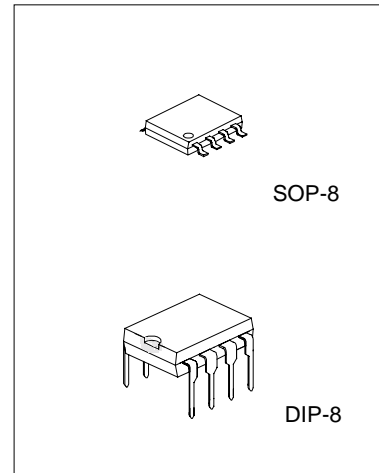
DC TO DC CONVERTER CONTROLLER

DESCRIPTION

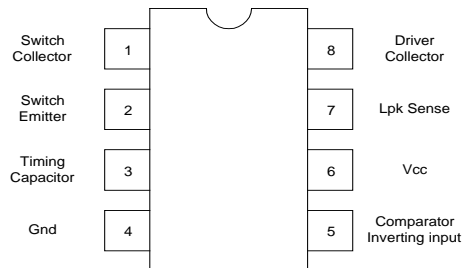
The UTC MC34063 is a monolithic regulator subsystem, intended for use as DC to DC converter. This device contains a temperature compensated band gap reference, a duty-cycle control oscillator, driver and high current output switch. It can be used for step down, step-up or inverting switching regulators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

FEATURES

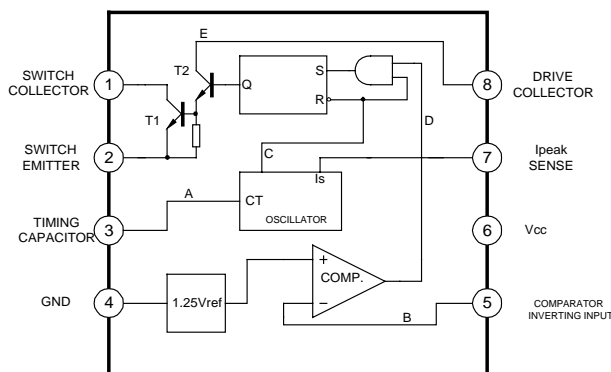
- *Operation from 3.0V to 40V.
- *Short circuit current limiting.
- *Low standby current.
- *Output switch current of 1.5A without external transistors.
- *Frequency of operation from 100Hz to 100kHz.
- *Step-up, step-down or inverting switch regulators.



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
Oscillator						
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
Output Switch						
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
Comparator						
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
Total Device						
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

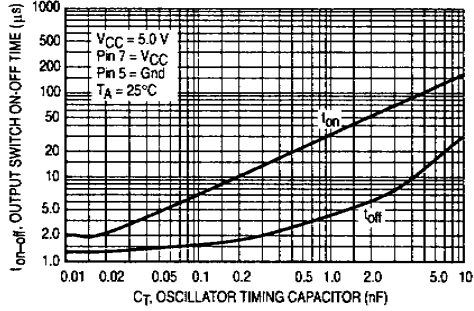


Figure 2. Timing Capacitor Waveform

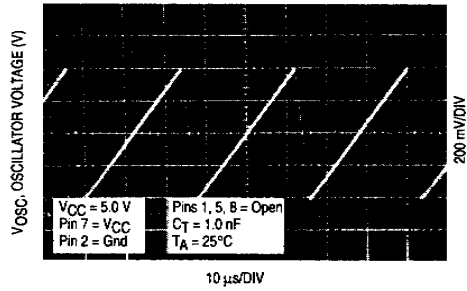


Figure 3. Emitter Follower Configuration Output Saturation Voltage versus Emitter Current

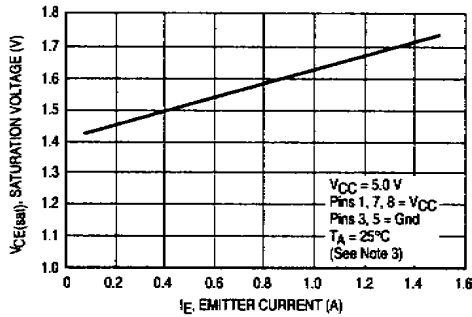


Figure 4. Common Emitter Configuration Output Switch Saturation Voltage versus Collector Current

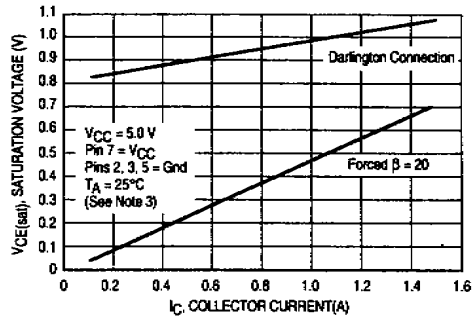


Figure 5. Current Limit Sense Voltage versus Temperature

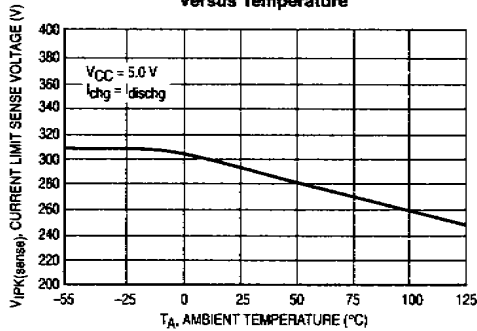
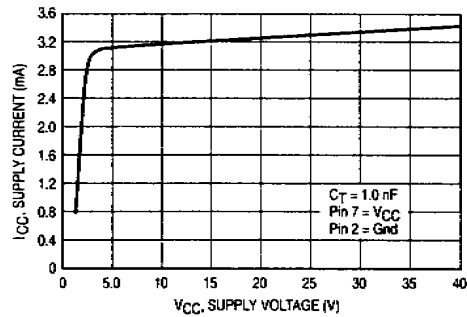
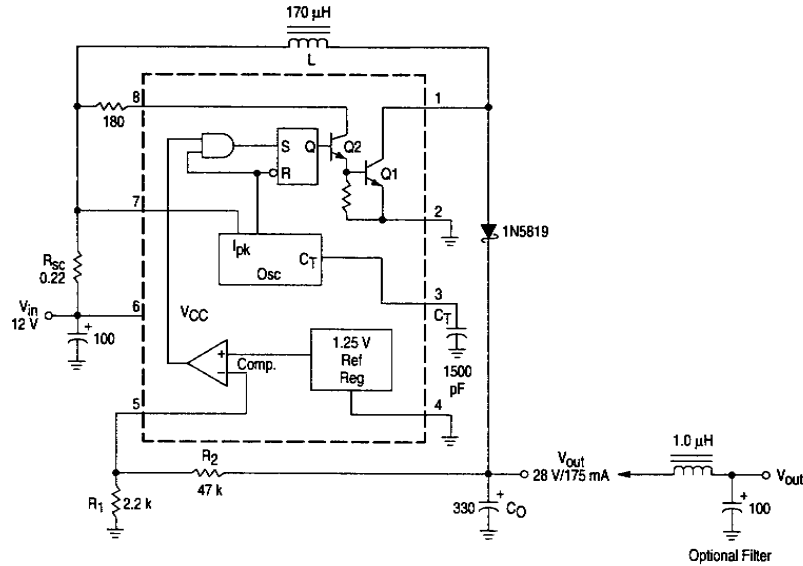


Figure 6. Standby Supply Current versus Supply Voltage



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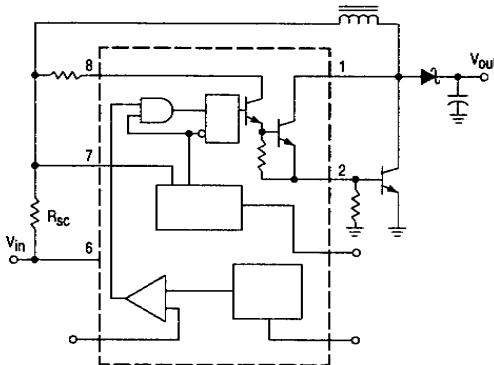
Figure 7. Step-Up Converter



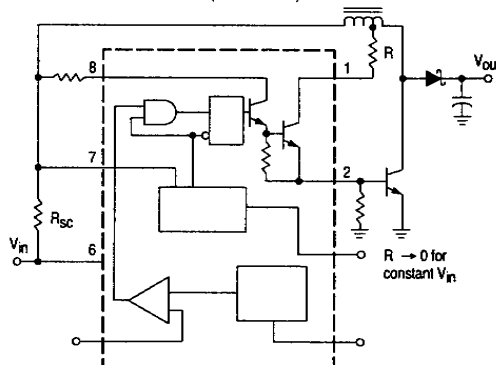
Test	Conditions	Results
Line Regulation	$V_{in} = 8.0 \text{ V to } 16 \text{ V}, I_O = 175 \text{ mA}$	$30 \text{ mV} \pm 0.05\%$
Load Regulation	$V_{in} = 12 \text{ V}, I_O = 75 \text{ mA to } 175 \text{ mA}$	$10 \text{ mV} \pm 0.017\%$
Output Ripple	$V_{in} = 12 \text{ V}, I_O = 175 \text{ mA}$	400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

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

8a. External NPN Switch



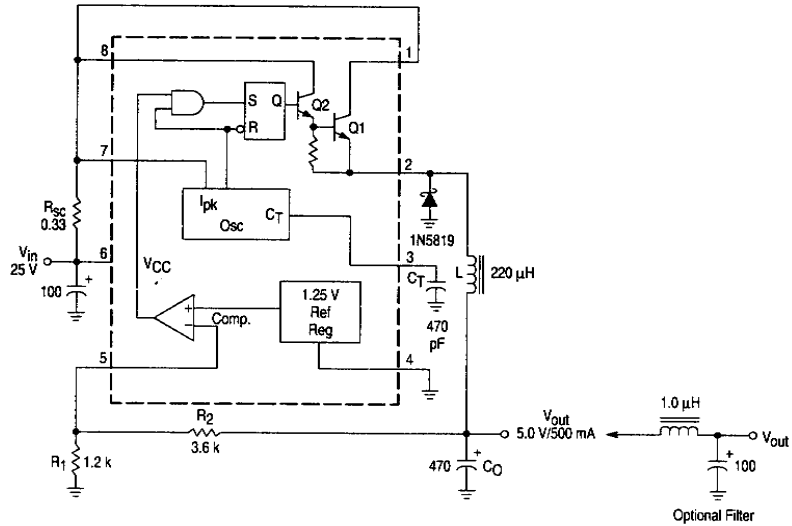
8b. External NPN Saturated Switch
(See Note 4)



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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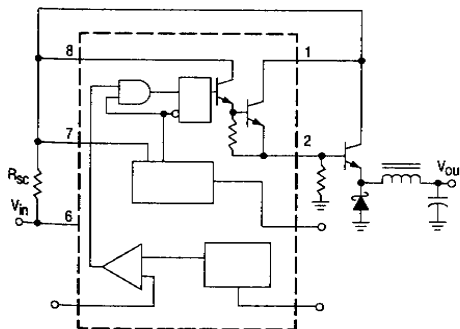
Figure 9. Step-Down Converter



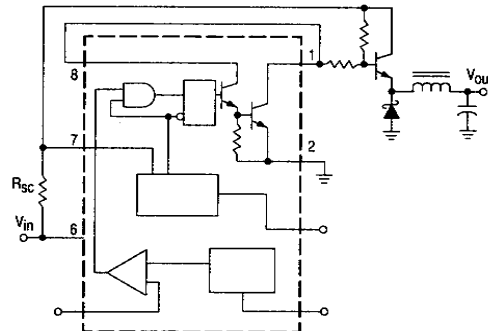
Test	Conditions	Results
Line Regulation	$V_{in} = 15 \text{ V to } 25 \text{ V}, I_O = 500 \text{ mA}$	$12 \text{ mV} = \pm 0.12\%$
Load Regulation	$V_{in} = 25 \text{ V}, I_O = 50 \text{ mA to } 500 \text{ mA}$	$3.0 \text{ mV} = \pm 0.03\%$
Output Ripple	$V_{in} = 25 \text{ V}, I_O = 500 \text{ mA}$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

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

10a. External NPN Switch

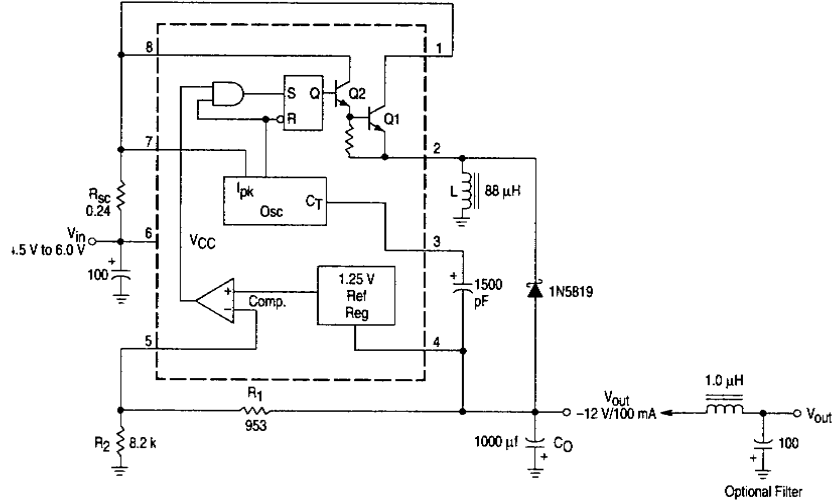


10b. External PNP Saturated Switch



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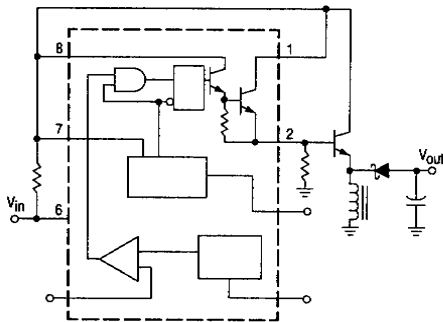
Figure 11. Voltage Inverting Converter



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 mVp-p
Short Circuit Current	$V_{in} = 5.0 \text{ V}, R_L = 0.1 \Omega$	910 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 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

