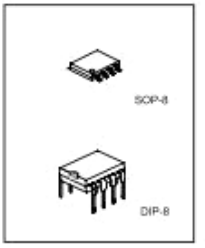
UTC MC34063 LINEAR INTEGRATED CIRCUIT

DC TO DC CONVERTER CONTROLLER



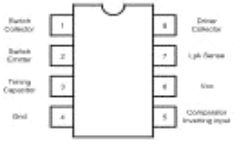
DESCRIPTION

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.

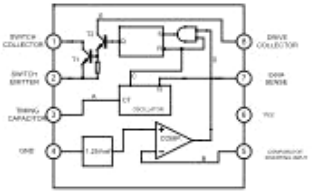
FEATURES

*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



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) DIP SOP	Pd	 1250 625	 mW mW
Thermal Characteristics DIP SOP		 100 160	 °C/W °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,Tamb=-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)	Ic(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	Vin=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.

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

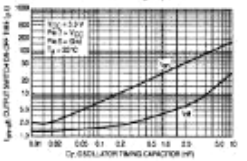


Figure 2. Timing Capacitor Waveform

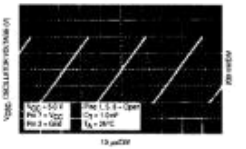


Figure 3. Emitter Follower Configuration Output Saturation Voltage versus Emitter Current

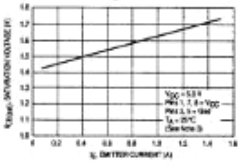


Figure 4. Common Emitter Configuration Output Switch Saturation Voltage versus Collector Current

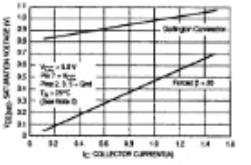


Figure 5. Current Limit Sense Voltage versus Temperature

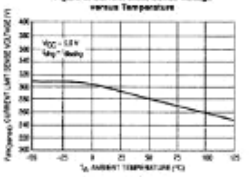


Figure 6. Standby Supply Current versus Supply Voltage

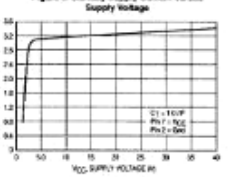
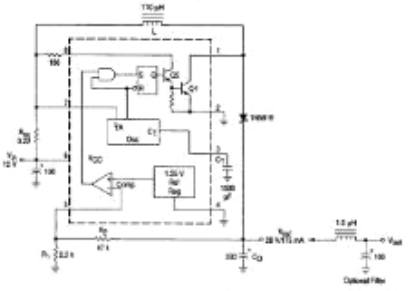


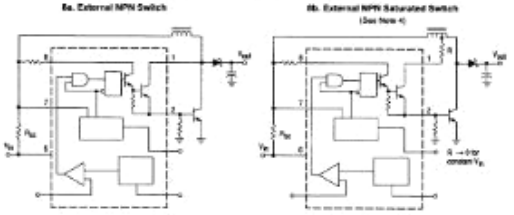
Figure 7. Step-Up Converter



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 = ± 0.01%
Output Ripple	V_{in} = 12 V, I_O = 175 mA	400 mVp-p
Efficiency	V_{in} = 12 V, I_O = 175 mA	87.7%
Output Ripple With Optional Filter	V_{in} = 12 V, I_O = 175 mA	40 mVp-p

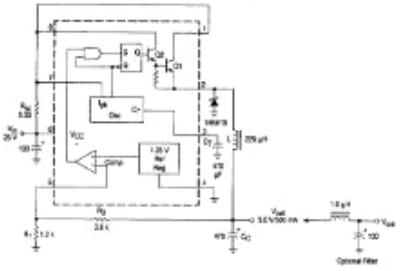
Figure 8. External Current Boost Connections for I_C Peak Greater than 1.5 A

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 (≤ 300 mA) and high drive currents (≥ 30 mA), it may take up to 2.0 µs 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. Unless the output switch cannot saturate, it is non-Darlington configuration is used, the following output drive condition is recommended:

Figure 9. 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	125 mVp-p
Short Circuit Current	V_{in} = 25 V, R_L = 0.1 Ω	1.1 A
Efficiency	V_{in} = 25 V, I_O = 500 mA	80.7%
Output Ripple With Optional Filter	V_{in} = 25 V, I_O = 500 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**

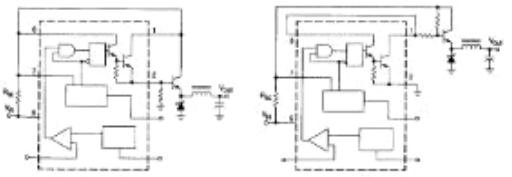
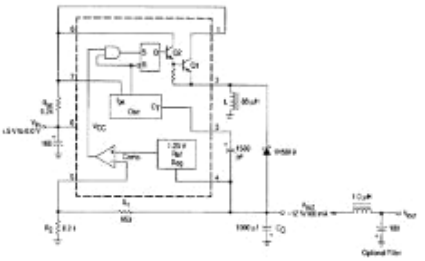


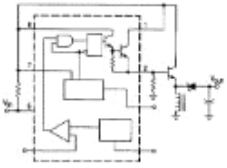
Figure 11. Voltage Inverting Converter



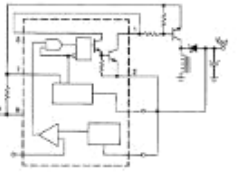
Test	Conditions	Results
Line Regulation	V_{in} = 4.5 V to 6.0 V, I_O = 100 mA	3.0 mV = ±0.6%/%
Load Regulation	V_{in} = 5.0 V, I_O = 10 mA to 100 mA	0.002 V = ±0.08%
Output Ripple	V_{in} = 5.0 V, I_O = 100 mA	500 mVp-p
Short Circuit Current	V_{in} = 5.0 V, R_L = 0.1 Ω	910 mA
Efficiency	V_{in} = 5.0 V, I_O = 100 mA	62.5%
Output Ripple With Optional Filter	V_{in} = 5.0 V, I_O = 100 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



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