



DC-to-DC Converter Control Circuits

MC34063A

GENERAL DESCRIPTION

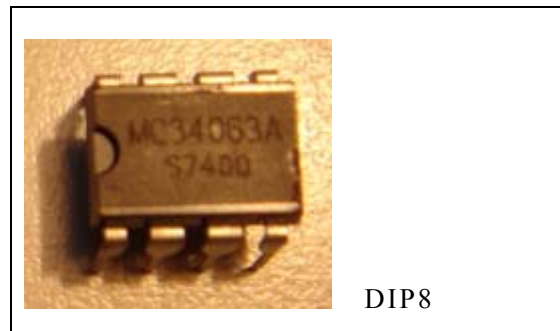
The MC34063A is a monolithic control circuit containing the primary functions required for DC-to-DC converters. These devices consist of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high

current output switch. This series was specifically designed to be incorporated in Step-Down and Step-Up and voltage- Inverting applications with a minimum number of external components.

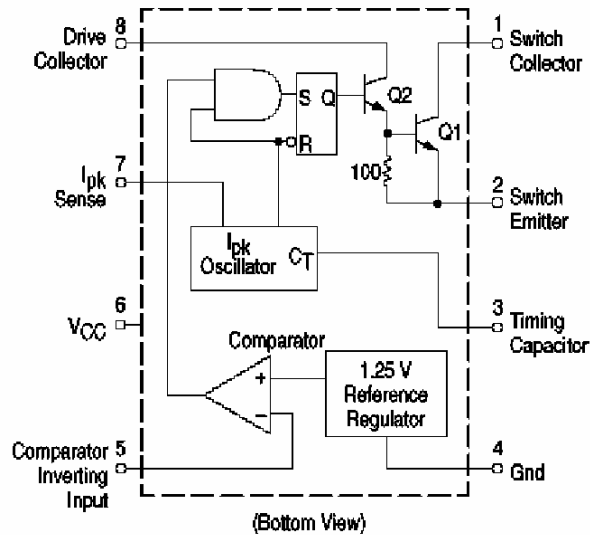
FEATURES

- Operation from 3.0V to 40V Input
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.2A
- Output Voltage Adjustable
- Frequency Operation to 100kHz
- Precision 2% Reference

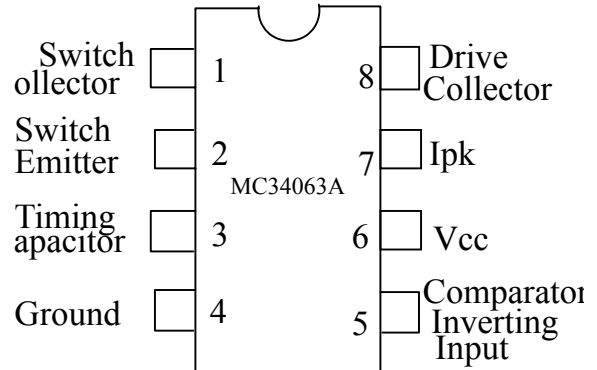
Outline Drawing



BLOCK DIAGRAM



PIN CONNECTION



MAXIMUM RATINGS (Ta=25°C)

Rating		Symbol	Value	Unit
Power Supply Voltage		V _{cc}	40	V
Comparator Input Voltage Range		V _{IR}	0.3~40	V
Switch Collector Voltage		V _c (switch)	40	V
Switch Emitter Voltage (V _{pin1} =40V)		V _E (switch)	40	V
Switch Collector to Emitter Voltage		V _{CE} (switch)	40	V
Driver Collector Voltage		V _c (drive)	40	V
Driver Collector Current (Note 1)		I _c (drive)	100	mA
Switch Current		I _{sw}	1.2	A
Power Dissipation	DIP8	P _D	1.25	W
	SOP8		625	mW
Operating Ambient Temperature Range		T _a	0~70	°C
Storage Temperature Range		T _{stg}	-65~150	°C

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

2.ESD data available upon request

ELECTRICAL CHARACTERISTICS(Unless otherwise specified: $V_{CC}=5.0V$, $T_a=0\sim 70^{\circ}C$)

CHARACTERISTICS	SYMBOL	MIN	TYP	MAX	UNIT
OSCILLATOR					
Frequency ($V_{pin5}=0V$, $V_{CC}=5.0V$)	fosc	24	33	42	kHz
Charge current ($V_{CC}=5.0\sim 40V$, $V_{pin3}=L$)	Ichg	24	31	42	μA
Discharge current ($V_{CC}=5.0\sim 40V$, $V_{pin3}=H$)	Idischg	140	199	260	μA
Discharge to charge current ratio ($V_{PIN7}=V_{CC}$, $T_a=25^{\circ}C$)	Idischg/Ichg	5.2	6.2	7.5	
Current limit sense voltage (Ichg=Idischg, $T_a=25^{\circ}C$)	Vipk(sense)	250	300	350	mV
OUTPUT SWITCH (Note 3)					
Saturation voltage, Darlington connection(Note 4) ($I_{sw}=0.8A$, pins 1,8 connected)	$V_{CE(sat)}$		0.9	1.3	V
Saturation voltage, Darlington connection ($I_{sw}=0.8A$, $R_{pin\ 8}=82\Omega$ to V_{CC})	$V_{CE(sat)}$		0.45	0.7	V
DC current gain ($I_{sw}=0.8A$, $V_{CE}=5.0V$, $T_a=25^{\circ}C$)	h_{FE}	50	120		
Collector off-state current ($V_{CE}=40V$)	$I_c(off)$		2	100	μA
COMPARATOR					
Threshold voltage ($T_a=25^{\circ}C$, $V_{CC}=5.0V$)	V_{th}	1.23	1.25	1.27	V
Threshold voltage line regulation ($V_{CC}=5.0\sim 40V$)	Regline		4.0	5.0	mV
Input bias current($V_{in}=0V$)	I_{IB}		-40	-400	nA
TOTAL DEVICE					
Supply current ($V_{CC}=5.0\sim 40V$, $V_{pin5}=H$)	I_{CC}		2.36	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.

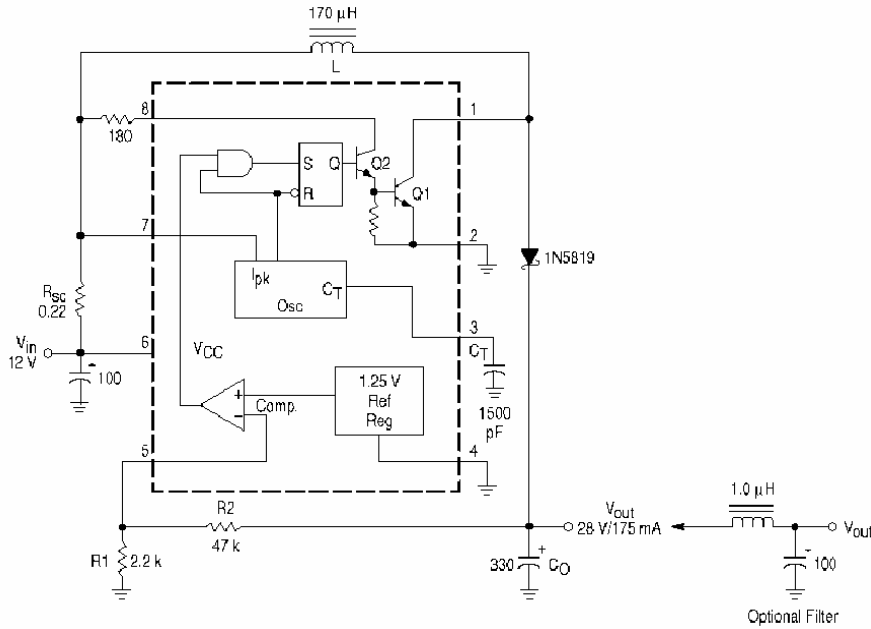
4. If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents (≤ 300 mA) and high driver currents (≥ 30 mA), it may take up to 2.0 μs for it to come out of saturation. This condition will shorten the off time at frequencies ≥ 30 kHz, and is magnified at 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:

$$\text{Forced } \beta \text{ of output switch : } I_c \text{ output} / (I_c \text{ drive} - 7.0\text{mA})^* \geq 10$$

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

APPLICATION CIRCUITS

1.Step-Up Converter

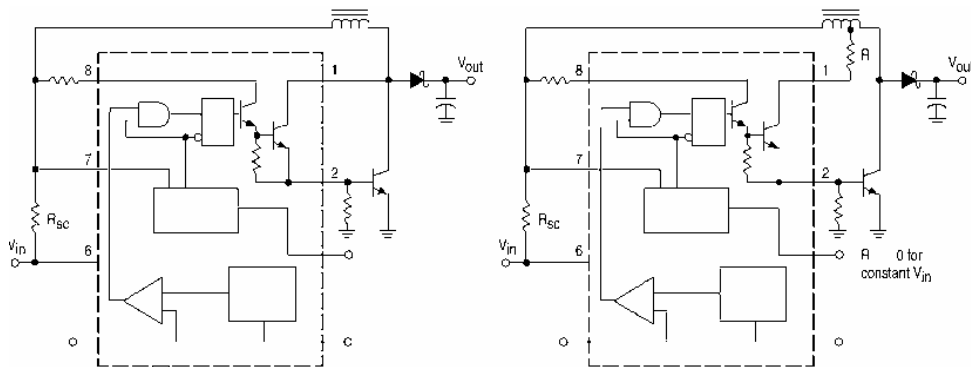


test	conditions	Results
Line Regulation	$V_{in}=8.0\sim 16V, I_o=175mA$	$30mV=\pm 0.05\%$
Load Regulation	$V_{in}=12V, I_o=75\sim 175mA$	$10mV=\pm 0.017\%$
Output Ripple	$V_{in}=12V, I_o=175mA$	$400mV_{pp}$
Efficiency	$V_{in}=12V, I_o=175mA$	87.7%
Output Ripple With Optional Filter	$V_{in}=12V, I_o=175mA$	$40mV_{pp}$

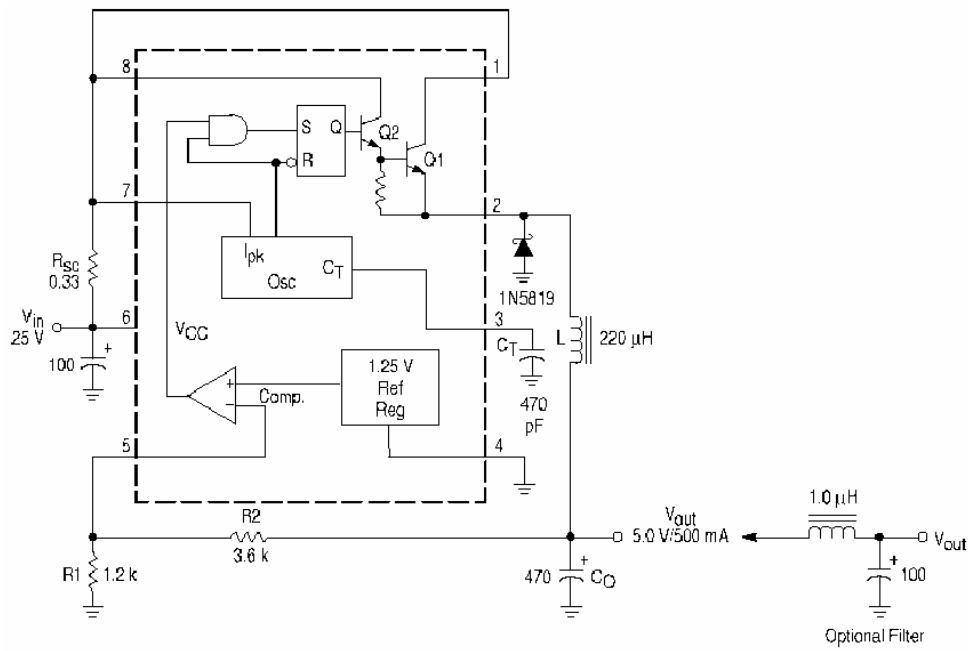
2.External Current Boost Connections for I_c Peak Greater than 1.5A

(1).External NPN Switch

(2) External NPN Saturated Switch (Note 4)



3. Step-Down Converter

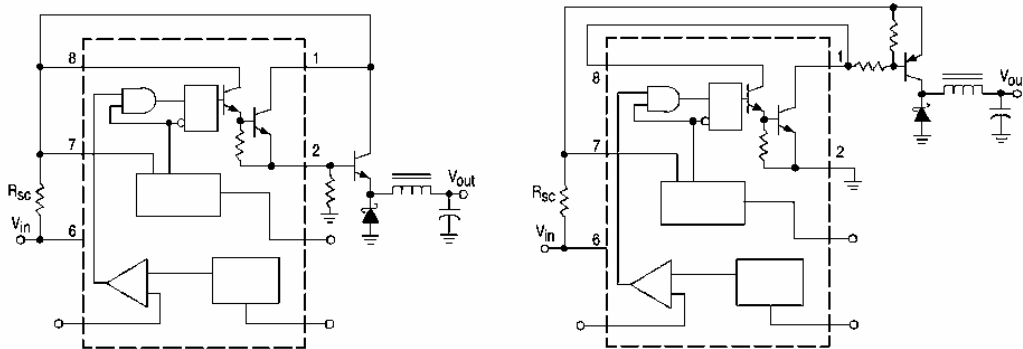


test	conditions	Results
Line Regulation	$V_{in}=15\sim 25V, I_o=500mA$	$12mV\pm 0.12\%$
Load Regulation	$V_{in}=25V, I_o=50\sim 500mA$	$3.0mV\pm 0.03\%$
Output Ripple	$V_{in}=25V, I_o=500mA$	$120mV_{pp}$
Short Circuit Current	$V_{in}=25V, R_L=0.1\Omega$	1.1 A
Efficiency	$V_{in}=25V, I_o=500mA$	83.7%
Output Ripple With Optional Filter	$V_{in}=25V, I_o=500mA$	$40mV_{pp}$

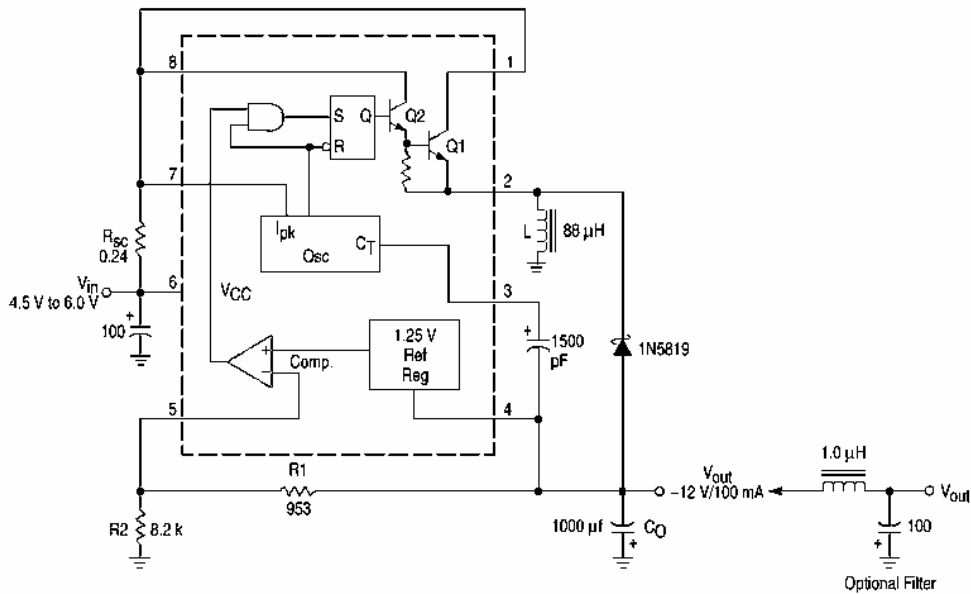
4. External Current Boost Connections for I_c Peak Greater than 1.5A

(1). External NPN Switch

(2) External NPN Saturated Switch



5. Voltage inverting converter

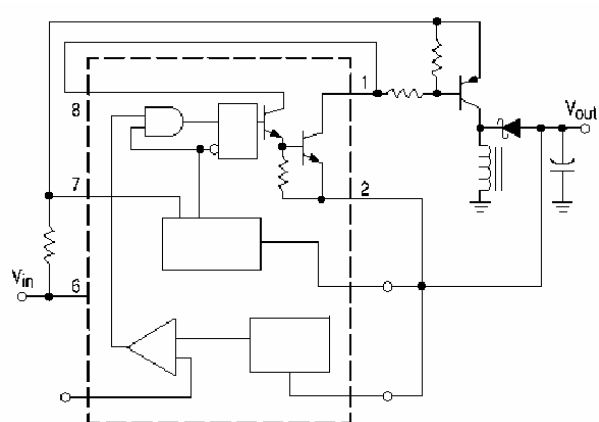
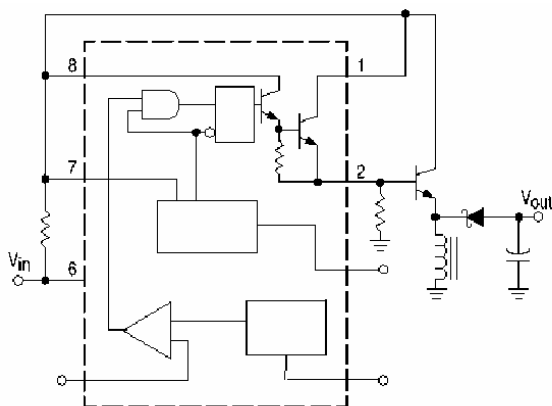


test	conditions	Results
Line Regulation	$V_{in}=4.5\sim 6.0V, I_o=100mA$	$3.0mV\pm 0.012\%$
Load Regulation	$V_{in}=5.0V, I_o=10\sim 100mA$	$3.0mV\pm 0.09\%$
Output Ripple	$V_{in}=5.0V, I_o=100mA$	$500mV_{pp}$
Short Circuit Current	$V_{in}=5.0V, R_L=0.1\Omega$	$910mA$
Efficiency	$V_{in}=5.0V, I_o=100mA$	62.2%
Output Ripple With Optional Filter	$V_{in}=5.0V, I_o=100mA$	$70mV_{pp}$

6. External Current Boost Connections for I_c Peak Greater than 1.5A

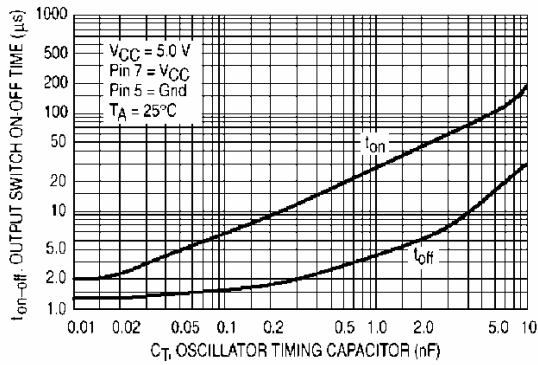
(1). External NPN Switch

(2) External NPN Saturated Switch

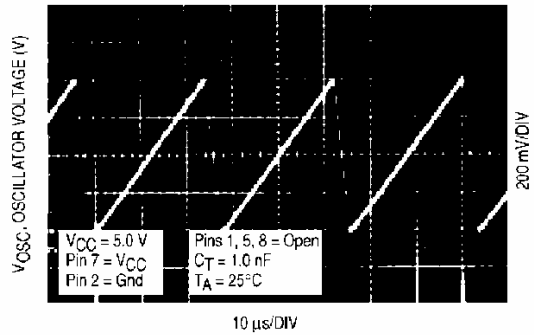


CHARACTERISTICS CURVES

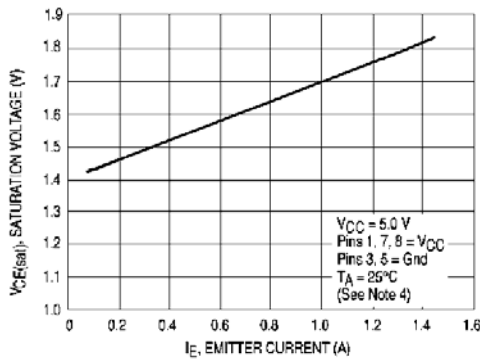
Output switch on-off time versus oscillator timing capacitor



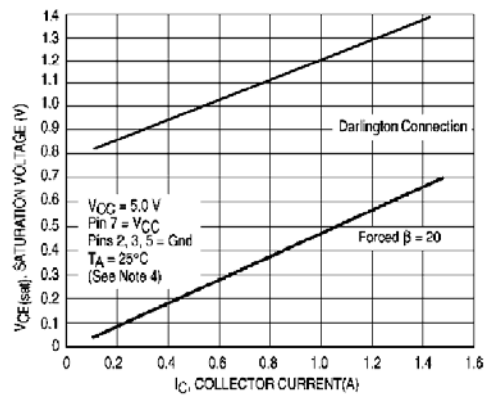
Timing capacitor waveform



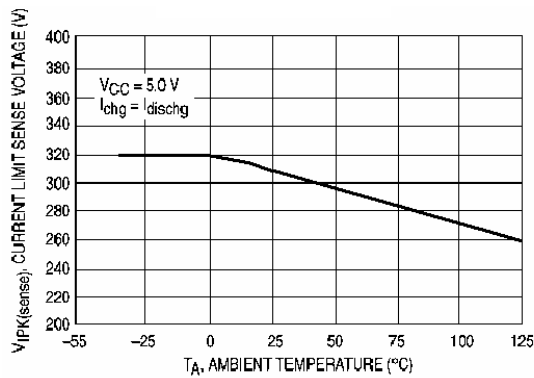
Emitter follower configuration output
Saturation voltage versus emitter current



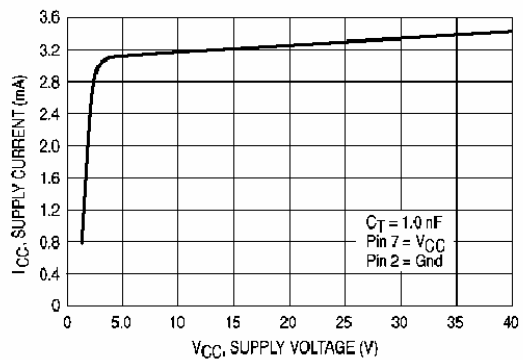
common emitter configuration output
switch saturation voltage versus collector current



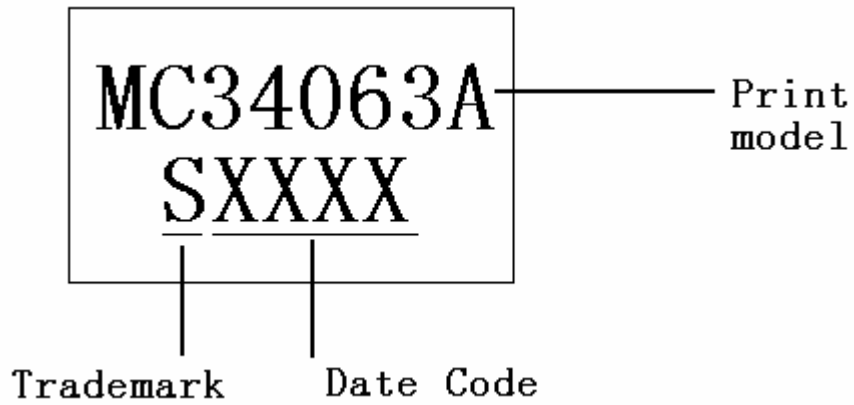
current limit sense voltage versus temperature



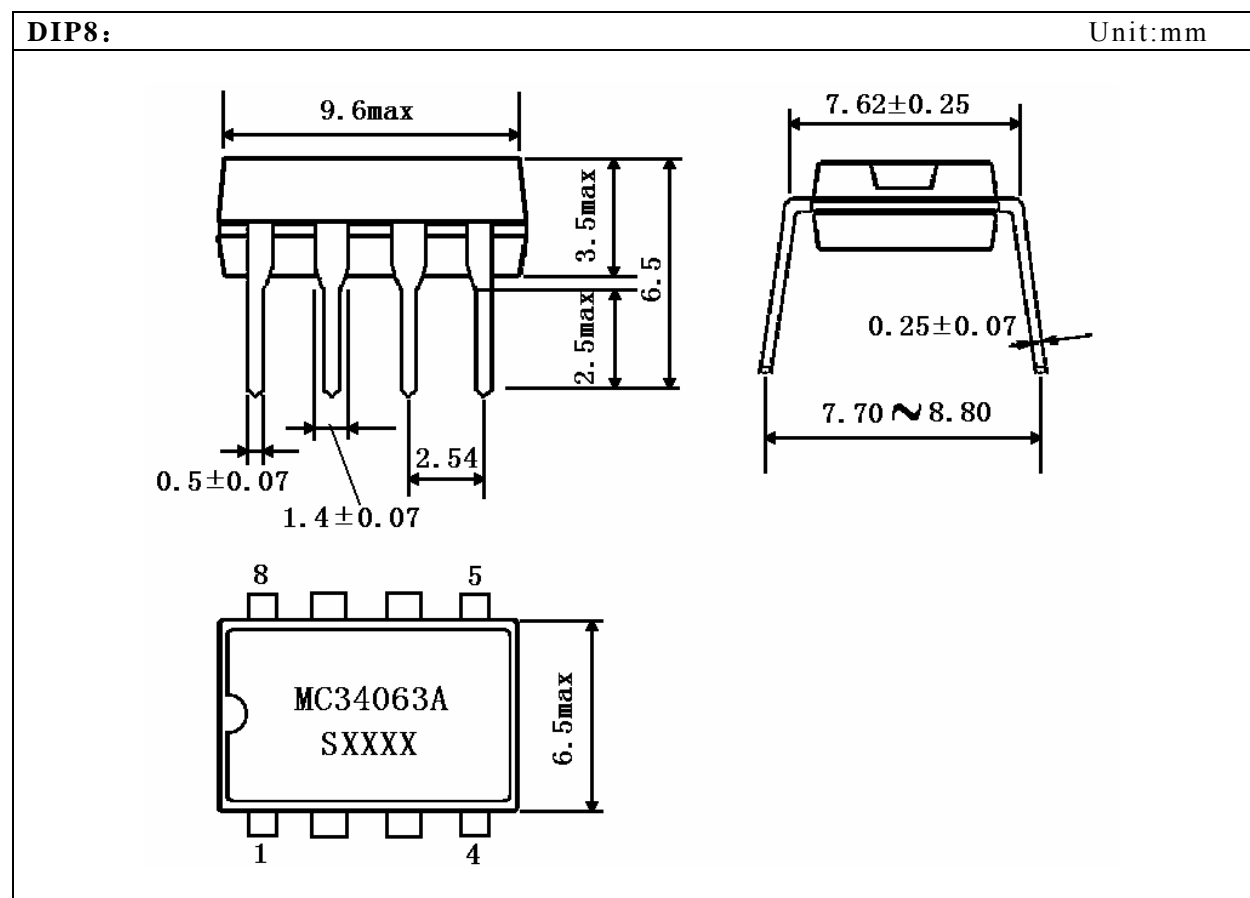
standby supply current versus supply voltage



MARKING INFORMATION:



OUTLINE DRAWING



SOP8:

Unit:mm

