0.8A DC to DC CONVERTER Control Circuit CL34063

■ General Description

The CL34063 series 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 IC was specifically designed to be incorporated in Step–Down and Step–Up and Voltage–Inverting applications with a minimum number of external components.

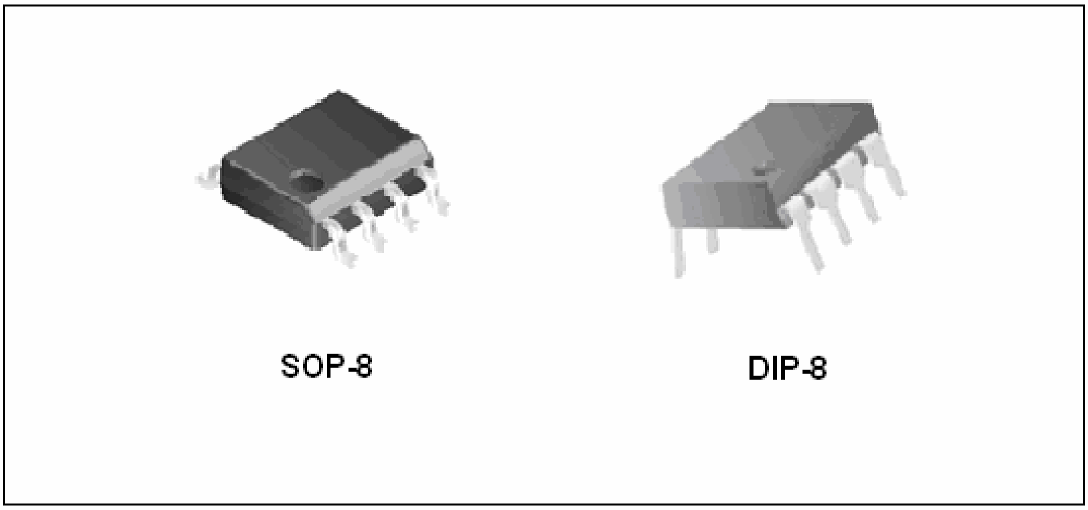
The CL34063 is available in 2 packages: DIP-8 and SOP-8.

■ Features

- Output switch current to 0.8A
- Reference precision 2%
- Low quiescent current: 2.5mA (TYP.)
- Operating from 3V to 18V
- Frequency operation to 100 kHz
- Active current limiting

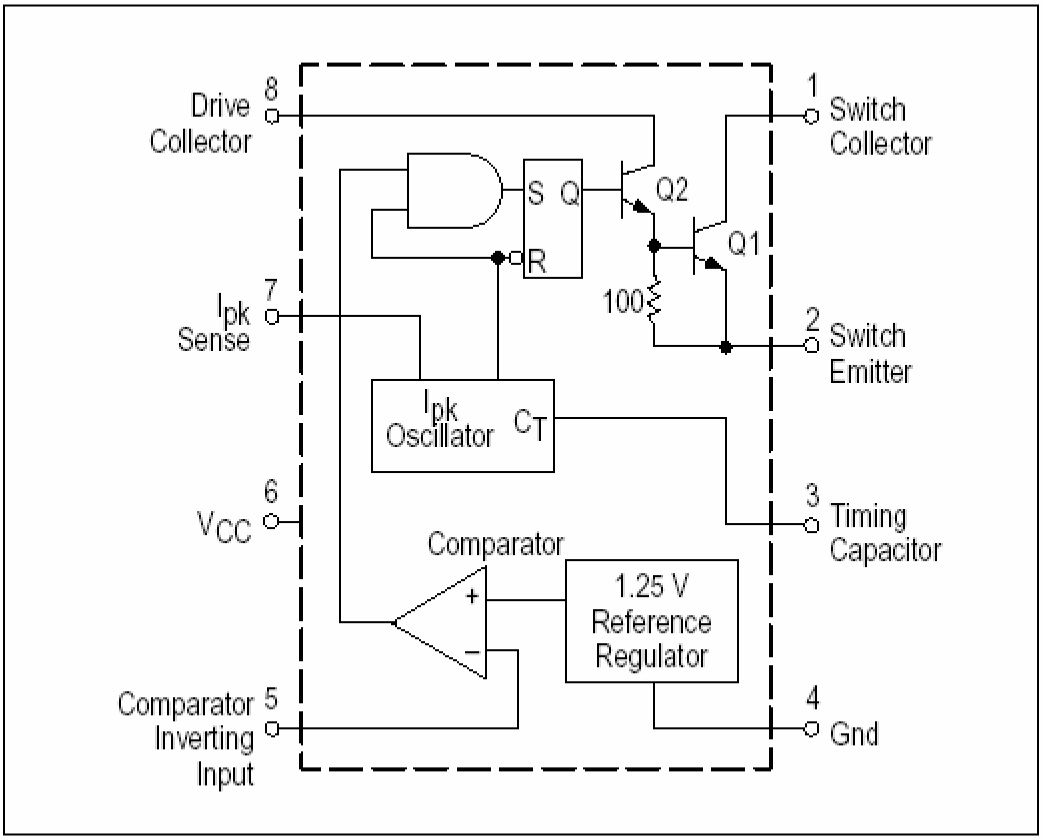
■ Applications

- Battery Charger
- ADSL Modems
- NICs/Switches/Hubs
- Negative Voltage Power Supplies

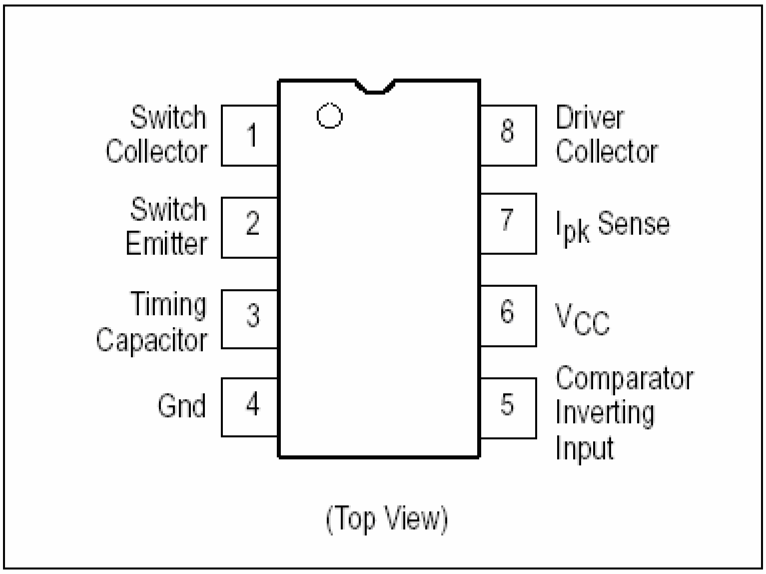


0.8A DC to DC CONVERTER Control Circuit CL34063

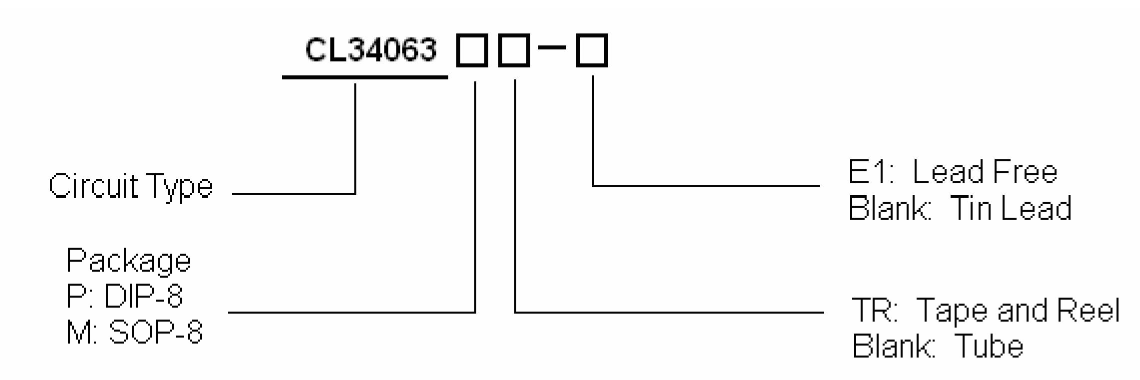
■ Function Block



■ Pin Configuration



■ Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
DIP-8	-40℃~ +85℃	CL34063P-E1	CL34063	Tube
SOP-8	-40℃~ +85℃	CL34063M-E1	CL34063	Tube
	-40℃~ +85℃	CL34063MTR-E1	CL34063	Tape & Reel

■ Absolute Maximum Ratings (Note1)

Rating	Symbol	Value	Unit
Power Supply Voltage	VCC	20	V
Comparator Input Voltage Range	VIR	-0.3 to +20	V
Switch Collector Voltage	VC(switch)	20	V
Switch Emitter Voltage (VPin1 = 18 V)	VE(switch)	20	V
Switch Collector to Emitter Voltage	VCE(switch)	20	V
Driver Collector Voltage	VC(driver)	20	V
Driver Collector Current (Note2)	IC(driver)	100	mA
Switch Current	ISW	0.8	A
Power Dissipation and Thermal Characteristics DIP-8 TA = 25°C Thermal Resistance SOP-8 TA = 25°C Thermal Resistance	 PD RθJA PD RθJA	 1250 100 625 160	 mW °C/W mW °C/W
Operating Junction Temperature	TJ	150	℃
Operating Ambient Temperature Range	TA	-40~ +85	℃
Storage Temperature Range	TSTG	-65~ +150	℃

Note1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Note2: Maximum package power dissipation limits must be observed.

■ Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	VCC	3	18	V
Ambient Operating Temperature	TA	-40	+85	℃

■ Electrical Characteristics

VCC = 5V, GND = 0V, TA = -40℃ to +85℃ unless otherwise specified.

Parameter	Symbol	Condition	Min	Type	Max	Unit
Oscillator						
Frequency	fosc	Vpin5=0V,Ta=25℃ CT=1.0nF	20	33	42	kHz
Charge Current	Ichg	Vcc=5V to 18V,Ta=25℃	20	30	42	uA
Discharge Current	Idischg	Vcc=5V to 18V,Ta=25℃	120	180	260	uA
Discharge to charge current ratio	Idischg/Ichg	Pin7 to Vcc,Ta=25℃	5.0	6.2	7.5	
Current limit sense	Vipk(sense)	Idischg=Ichg, Ta=25℃	250	300	350	mV
Output Switch (Note1)						
Saturation Voltage, Darlington Connection	VCE(sat)	Isw=0.6A Pin1, 8 connected		1.0	1.5	V
Saturation Voltage (Note2)	VCE(sat)	Isw=0.6A Rpin8=82Ω to VCC, Forced β ≈20		0.5	0.95	V
DC Current Gain	hFE	Isw=0.6 A, VCE=5 V	50	75		
Collector Off-State Current	Ic(off)	VCE =18V		0.01	100	uA
Comparator						
Threshold Voltage	Vth	TA=25℃ TA=-40℃ to +85℃	1.225 1.21	1.25	1.275 1.29	V
Threshold Voltage Line Regulation	Reg(line)	Vcc=3 to 18V		1.5	5	mV
Input Bias Current	Iib	Vin= 0V		-20	-400	nA
Total Device						
Supply Current	Icc	Vcc=5 to 18V,CT=1nF Pin7=Vcc, Vpin5>Vth Pin2=GND Other pins open		2.5	4.5	mA

Note1: Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.
Note2: 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 us 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 can't saturate. If a non–Darlington configuration is used, the following output drive condition is recommended: Forced of output switch: IC output / (IC driver – 7.0 mA*) ≥10
* The 100Ω resistor in the emitter of the driver device requires about 7.0 mA before the output switch conducts.

■ Typical Performance Characteristics

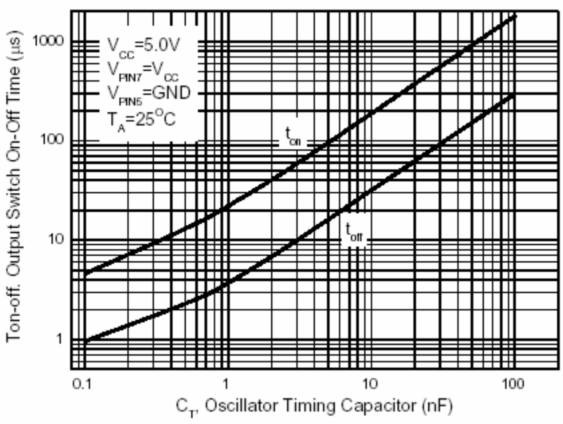


Figure 1. Output Switch On-Off Time vs. Oscillator Timing Capacitor

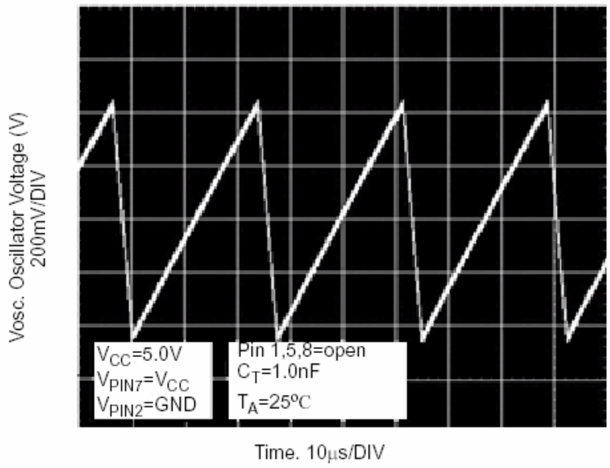


Figure 2. Timing Capacitor Waveform

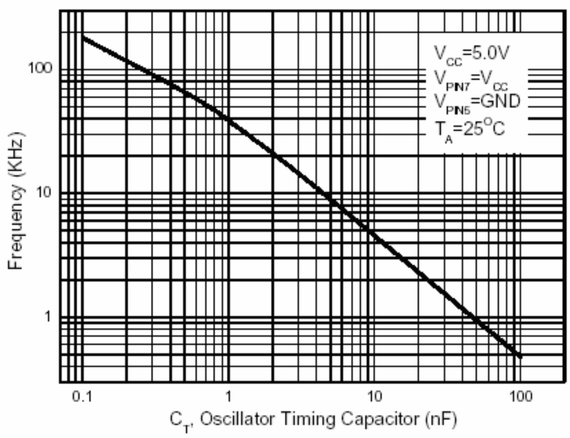


Figure 3. Oscillator Frequency vs. Timing Capacitor

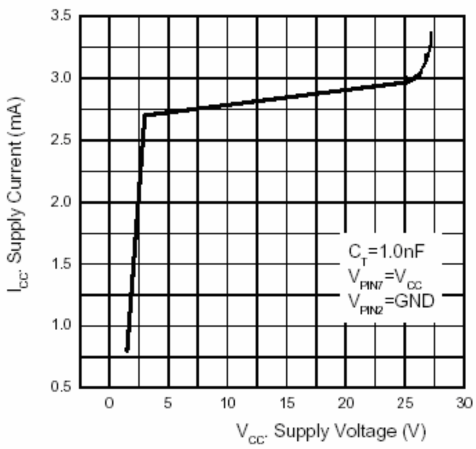


Figure 4. Standby Supply Current vs. Supply Voltage

■ Typical Performance Characteristics (Continued)

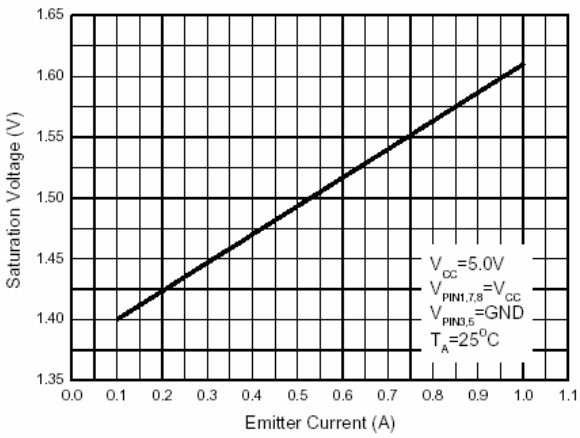


Figure 5. Emitter Follower Configuration Output Saturation Voltage vs. Emitter Current

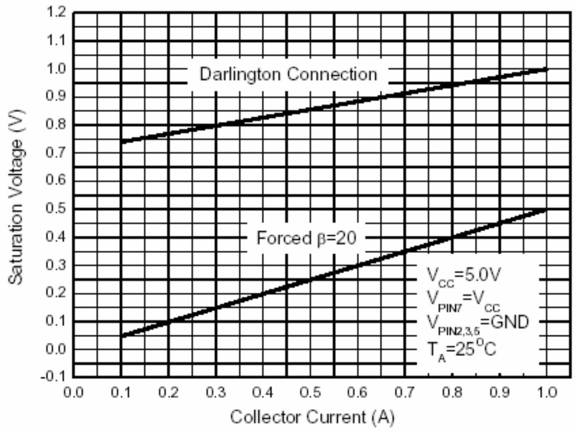


Figure 6. Common Emitter Configuration Output Switch Saturation Voltage vs. Collector Current

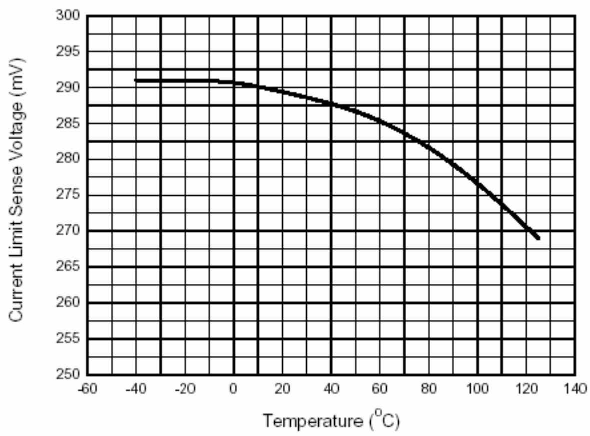


Figure 7. Current Limit Sense Voltage vs. Temperature

0.8A DC to DC CONVERTER Control Circuit CL34063

■ Typical Application

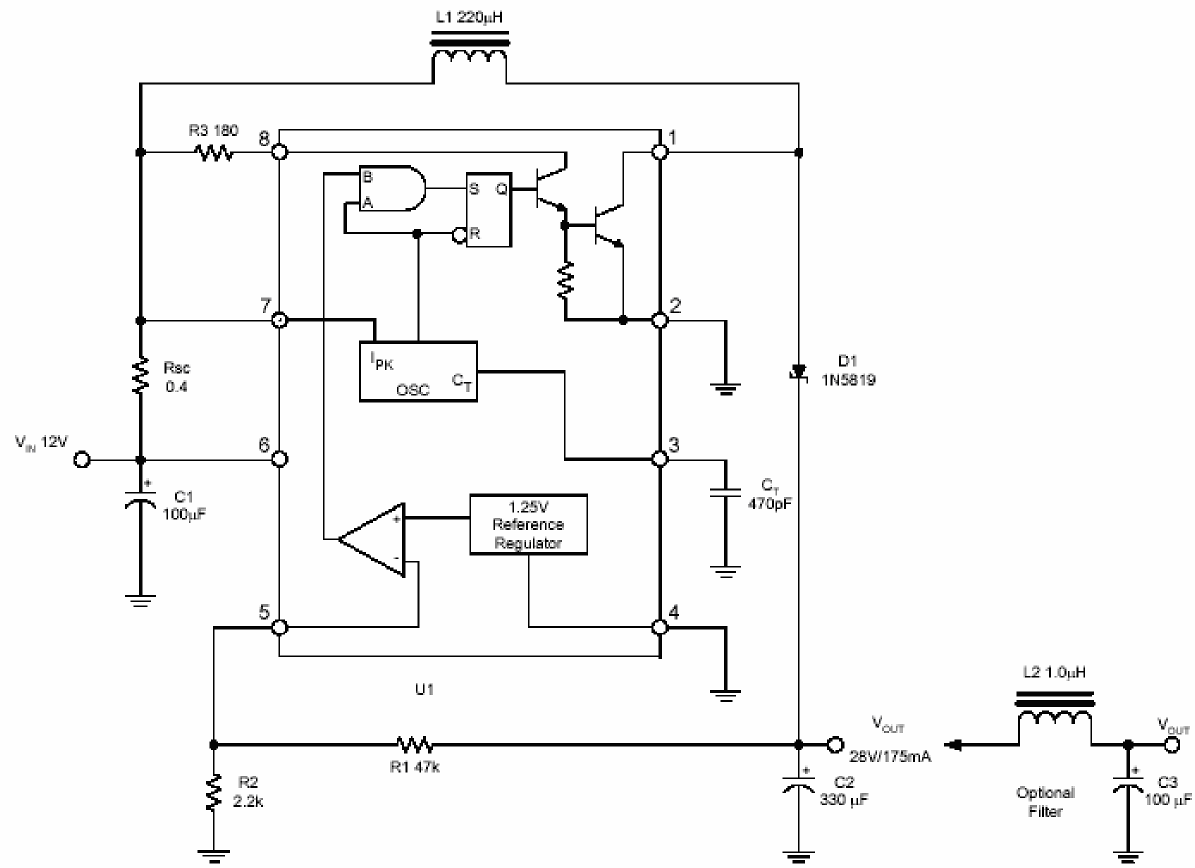


Figure 8. Step-Up Converter (Note 1)

Note 1: This is a typical step-up converter configuration. In the steady state, if the resistor divider voltage at pin 5 is greater than the voltage in the non-inverting input, which is 1.25V determined by the internal reference, the output of the comparator will go low. At the next swithching period, the output switch will not conduct and the output voltage will eventually drop below its nominal voltage until the divider voltage at pin 5 is lower than 1.25V. Then the output of the comparator will go high, the output switch will be allowed to conduct. Since $V_{PIN5}=V_{OUT}$ * R2/(R1+R2)=1.25(V), the output voltage can be decided by V_{OUT}=1.25 * (R1+R2)/R2 (V).

■ Typical Application (Continued)

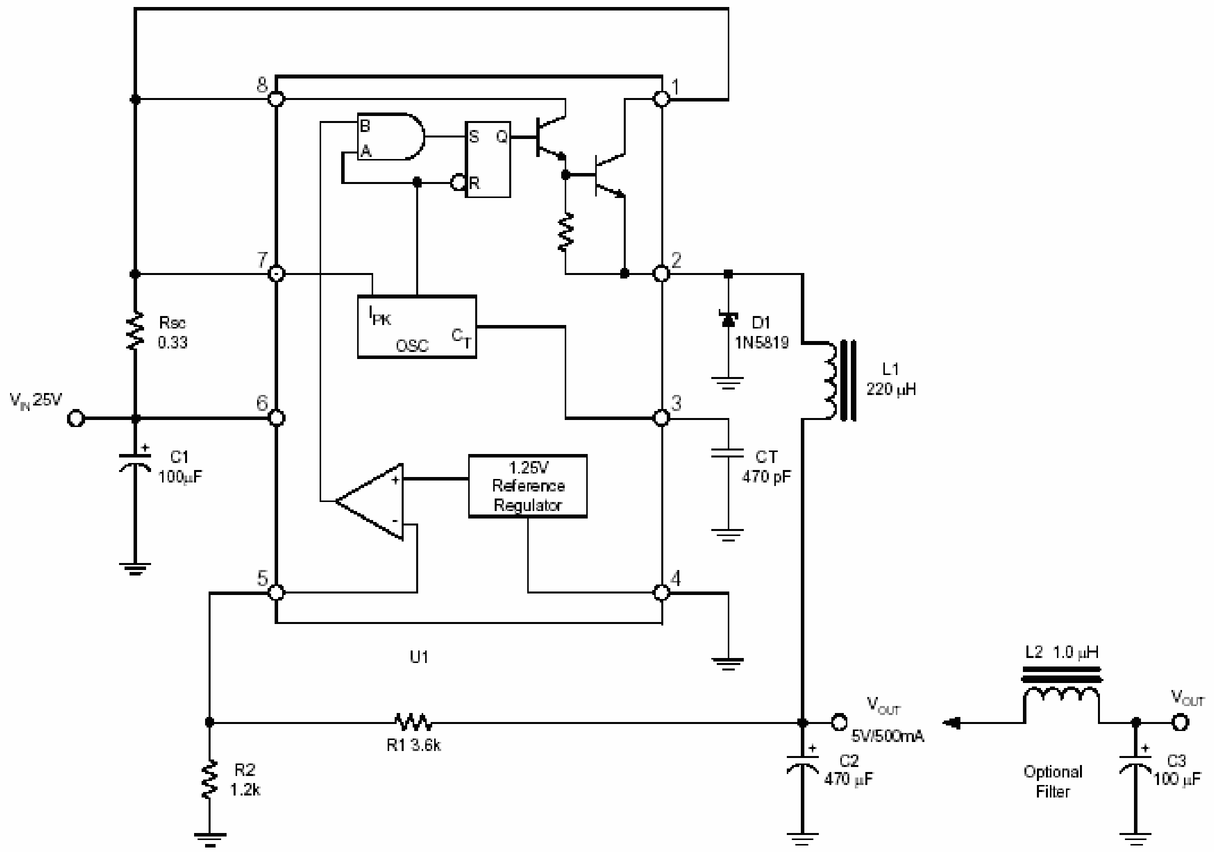


Figure 9. Step-Down converter (Note 2)

Note 2: This is a typical step-down converter configuration. The working process in the steady state is similar to step-up converter, $V_{PIN5}=V_{OUT}*R2/(R1+R2)=1.25$ (V), the output voltage can be decided by $V_{OUT}=1.25*(R1+R2)/R2$ (V).

■ Typical Application (Continued)

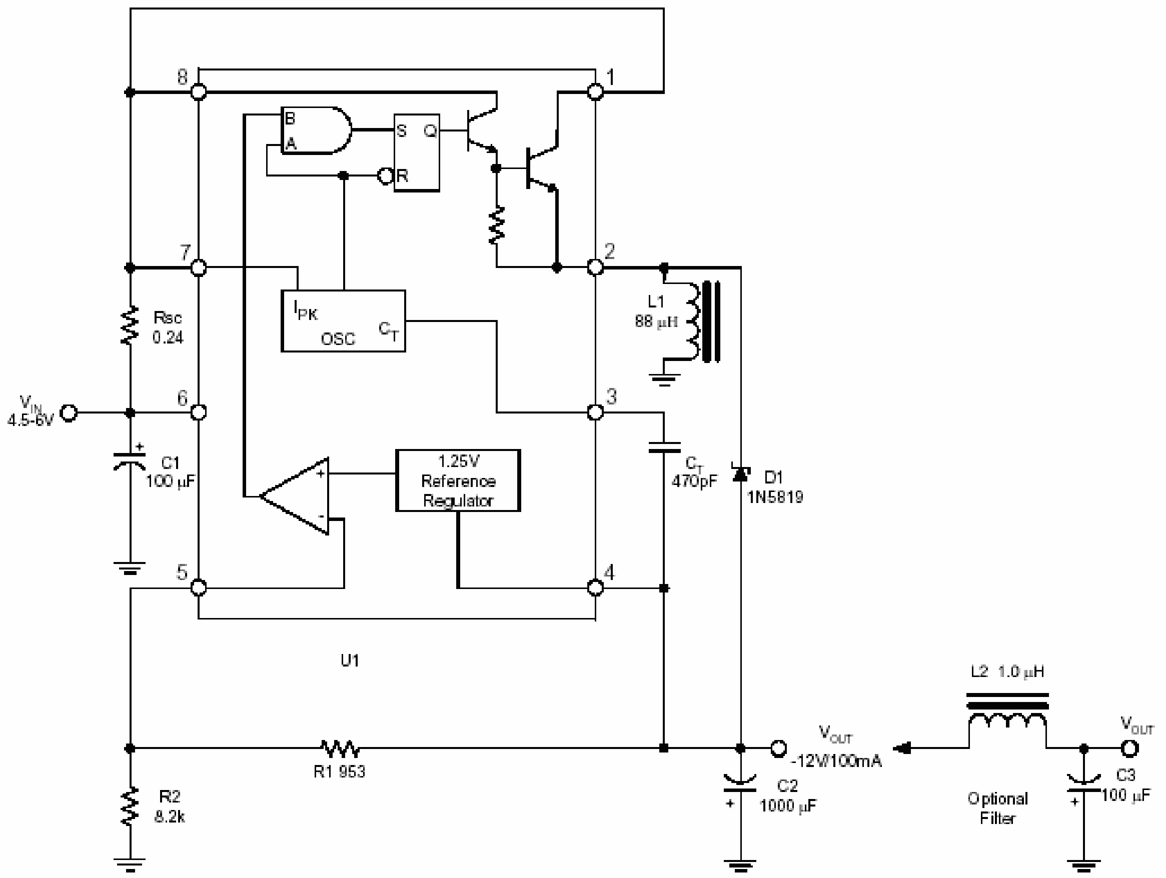
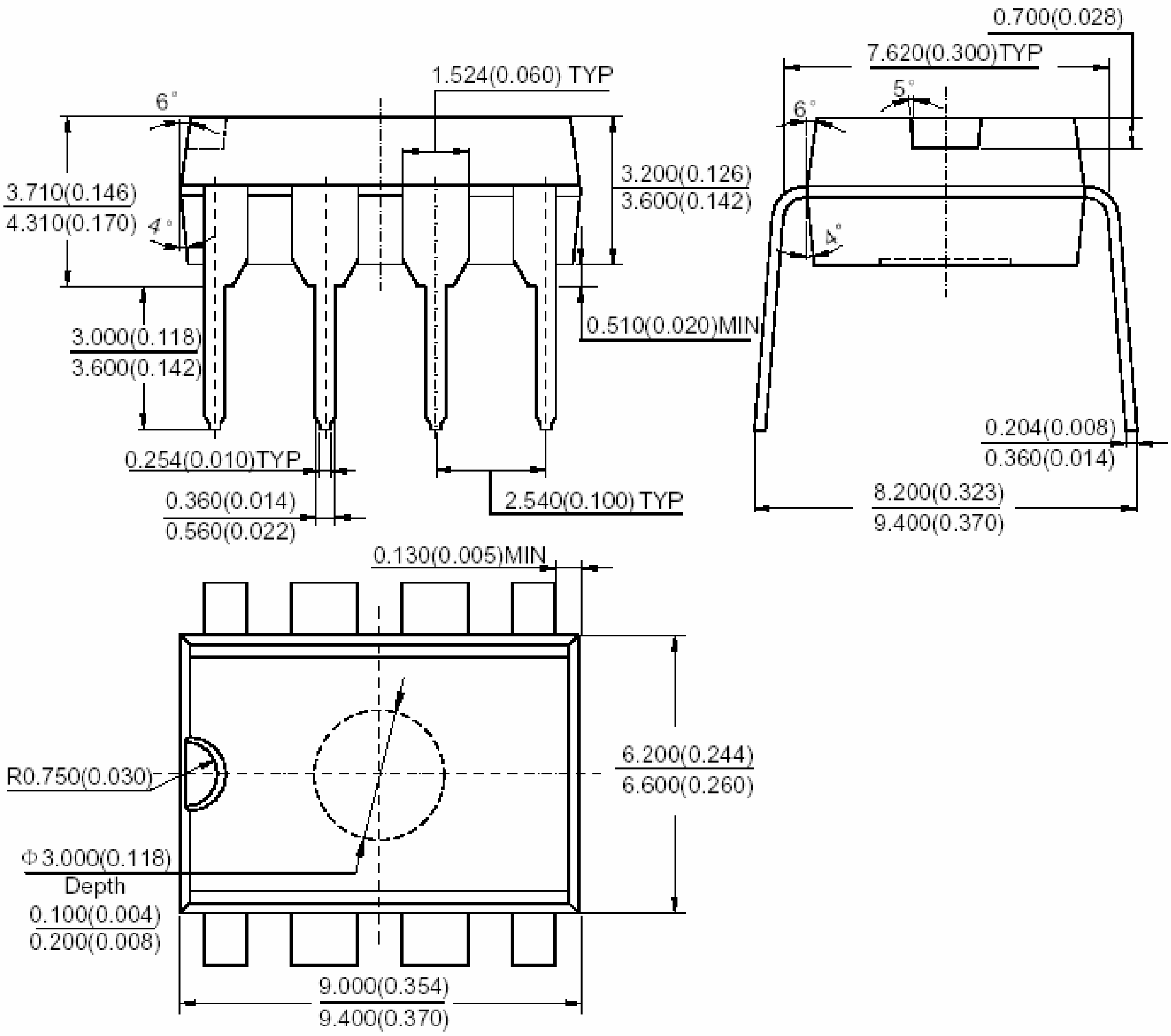


Figure 10. Voltage Inverting Converter (Note 3)

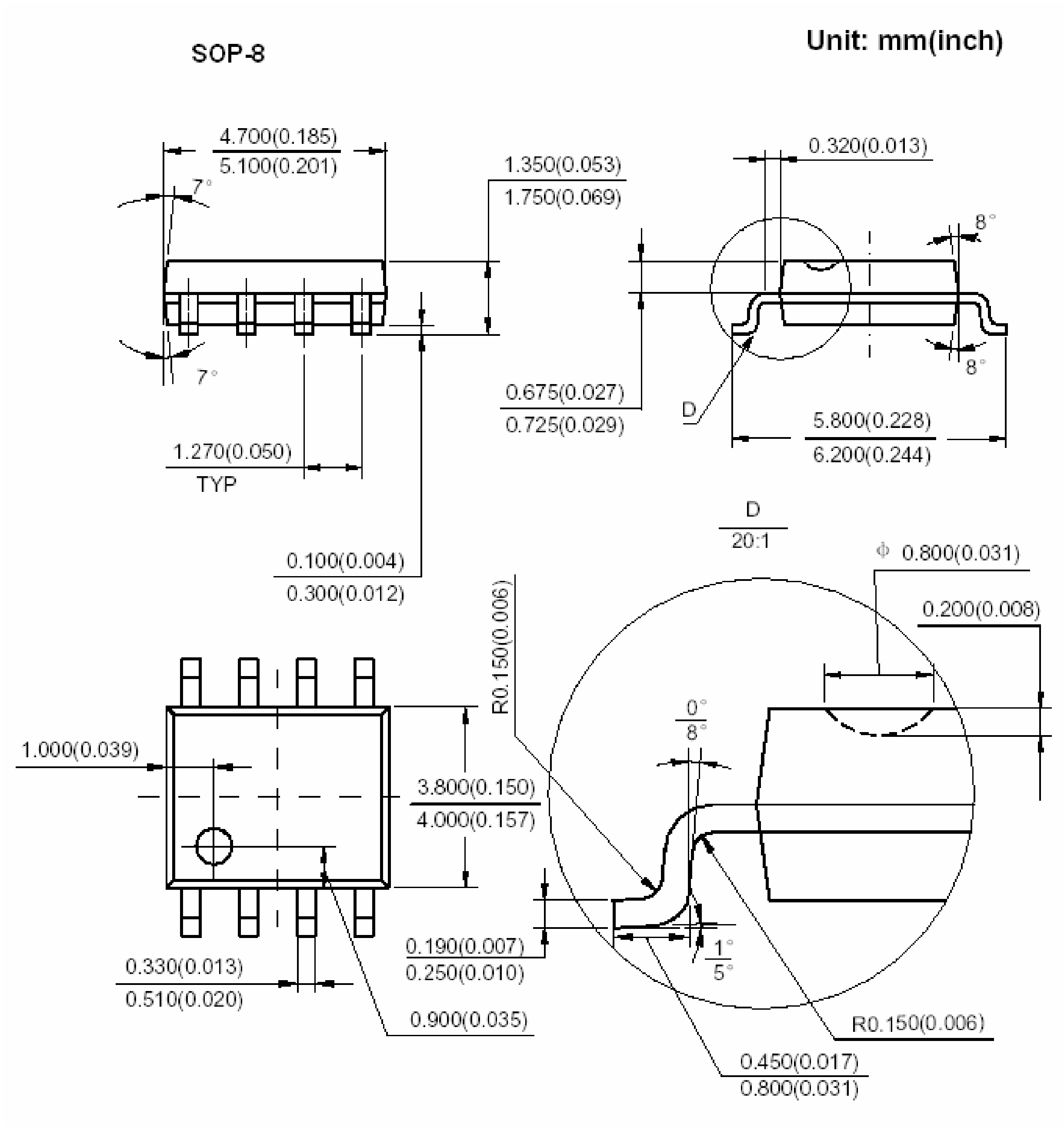
Note 3: This is a typical inverting converter configuration. The working process in the steady state is similar to step-up converter, the difference in this situation is that the voltage at the non-inverting pin of the comparator is equal to 1.25V+V_{OUT}, then V_{PIN5}=V_{OUT}*R2/(R1+R2)=1.25V+V_{OUT}, so the output voltage can be decided by V_{OUT}=-1.25*(R1+R2)/R1 (V).

■ Mechanical Dimensions

DIP-8 Unit: mm(inch)



■ Mechanical Dimensions (Continued)



IMPORTANT NOTICE