0.8A STEP-DOWN/STEP-UP/INVERTING DC-DC CONVERTER AZ34063C

General Description

The AZ34063C is a monolithic switching regulator control circuit which contains the primary functions required for DC-DC converters. This device consists of internal temperature compensated reference, voltage comparator, controlled duty cycle oscillator with active current limit circuit, driver and high current output switch.

The AZ34063C is specifically designed as a general DC-DC converter to be used in Step-Down, Step-Up and Voltage-Inverting applications with a minimum number of external components.

The AZ34063C is available in 2 packages: SOIC-8 and DIP-8.

Features

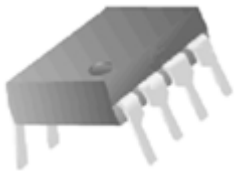
- Operation from 3.0V to 36V Input
- Low Standby Current
- Current Limiting
- Output Switch Current to 0.8A
- Output Voltage Adjustable
- Operation Frequency up to 180KHz (C_T=100pF)
- Precision 2% Reference

Applications

- Battery Chargers
- ADSL Modems
- Hubs
- Negative Voltage Power Supplies



SOIC-8

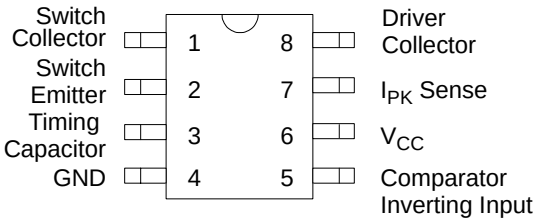


DIP-8

Figure 1. Package Types of AZ34063C

Pin Configuration

P/M Package
(DIP-8/SOIC-8)



Top View

Figure 2. Pin Configuration of AZ34063C

Functional Block Diagram

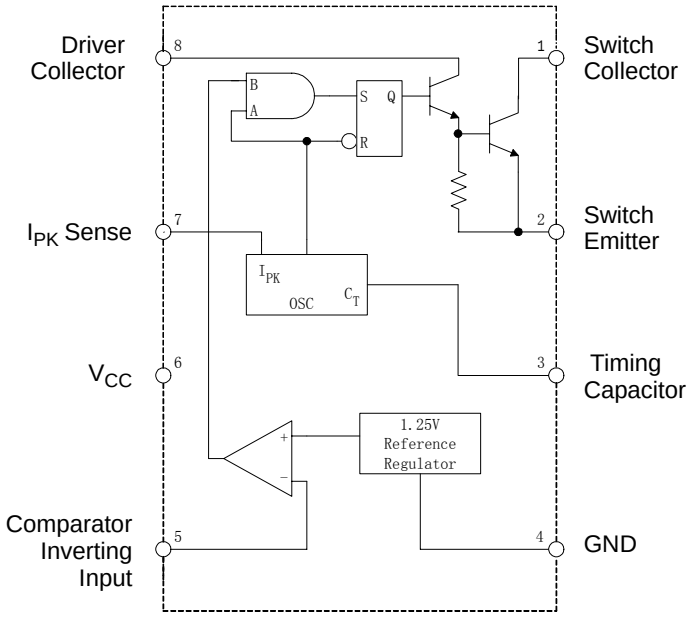
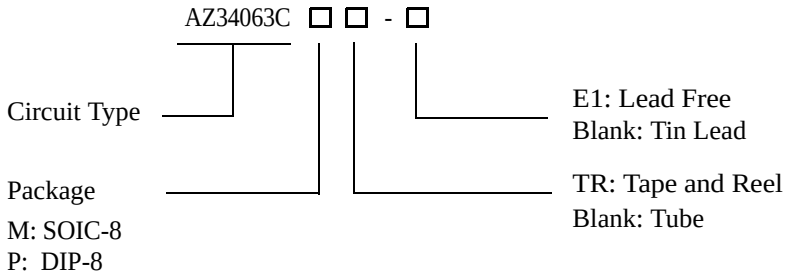


Figure 3. Functional Block Diagram of AZ34063C

Pin Description

Pin Number	Pin Name	Function
1	Switch Collector	Internal switch transistor collector
2	Switch Emitter	Internal switch transistor emitter
3	Timing Capacitor	Timing Capacitor to control the switching frequency
4	GND	Ground pin for all internal circuits
5	Comparator Inverting Input	Inverting input pin for internal comparator
6	V_{CC}	Voltage supply
7	I_{PK} Sense	Peak Current Sense Input by monitoring the voltage drop across an external current sense resistor to limit the peak current through the switch
8	Driver Collector	Voltage driver collector

Ordering Information



Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
SOIC-8	-40 to 85°C	AZ34063CM	AZ34063CM-E1	34063CM	34063CM-E1	Tube
		AZ34063CMTR	AZ34063CMTR-E1	34063CM	34063CM-E1	Tape & Reel
DIP-8	-40 to 85°C	AZ34063CP	AZ34063CP-E1	AZ34063CP	AZ34063CP-E1	Tube

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

Absolute Maximum Ratings (Note 1)

Parameter		Symbol	Value	Unit
Power Supply Voltage		V_{CC}	40	V
Comparator Input Voltage Range		V_{IR}	-0.3 to 40	V
Switch Collector Voltage		V_C(switch)	40	V
Switch Emitter Voltage ($V_{PIN\ 1}$=40V)		V_E(switch)	40	V
Switch Collector to Emitter Voltage		V_{CE}(switch)	40	V
Driver Collector Voltage		V_C(driver)	40	V
Driver Collector Current (Note 2)		I_C(driver)	100	mA
Switch Current		I_{SW}	0.8	A
Power Dissipation (T_A=25℃)	DIP-8	P_D	1.25	W
	SOIC-8		780	mW
Thermal Resistance	DIP-8	$R_{\theta JA}$	100	℃/W
	SOIC-8		160	
Operating Junction Temperature		T_J	150	℃
Lead Temperature (Soldering, 10s)		T_{LEAD}	260	℃
Storage Temperature Range		T_{STG}	-65 to 150	℃
ESD (Human body model)			2000	V

Note 1: 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.
Note 2: Maximum package power dissipation limits must be observed.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	3	36	V
Ambient Temperature	T_A	-40	85	^oC

Electrical Characteristics

(V_{CC}=5.0 V, T_A=-40 to 85°C, unless otherwise specified.)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
OSCILLATOR							
Frequency	f_{OSC}	V_{PIN5}=0V, T_A=25°C	C_T=1.0nF	30	38	45	KHz
			C_T=330pF	75	88	100	KHz
Charge Current	I_{CHG}	V_{CC}=5.0V to 36 V, T_A=25°C		30	38	45	μA
Discharge Current	I_{DISCHG}	V_{CC}=5.0V to 36V, T_A=25°C		180	240	290	μA
Discharge to Charge Current Ratio	I_{DISCHG}/I_{CHG}	Pin 7 to V_{CC}, T_A=25°C		5.2	6.5	7.5	
Current Limit Sense Voltage	V_{IPK}(sense)	I_{CHG}=I_{DISCHG}, T_A=25°C		250	300	350	mV
OUTPUT SWITCH (Note 3)							
Saturation Voltage, Dalington Connection	V_{CE}(sat)	I_{SW}=0.8A, Pins 1, 8 connected, Common Emitter			1.0	1.3	V
Saturation Voltage (Note 4)	V_{CE}(sat)	I_{SW}=0.8 A, R_{PIN8}=82 Ω to V_{CC}, Forced β=20, Common Emitter			0.45	0.8	V
DC Current Gain	h_{FE}	I_{SW}=0.8A, V_{CE}=5.0V, T_A=25°C		50	75		
Collector Off-State Current	I_C(off)	V_{CE}=36V			0.01	100	μA
COMPARATOR							
Threshold Voltage	V_{TH}	T_A=25°C		1.225	1.250	1.275	V
		T_A=-40 to 85°C		1.21	1.250	1.29	
Threshold Voltage Line Regulation	R_{EGLINE}	V_{CC}=3.0V to 36V			1.4	5	mV
Input Bias Current	I_{IB}	V_{IN}=0V			-20	-400	nA
TOTAL DEVICE							
Supply Current	I_{CC}	V_{CC}=5.0V to 36V, C_T=1.0 nF, V_{PIN7}=V_{CC}, V_{PIN5} > V_{TH}, V_{PIN2}=GND, other pins open				4	mA

Note 3: Low duty cycle pulse technique are used during test to maintain junction temperature as close to ambient temperature as possible.

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

Electrical Characteristics (Continued)

Forced β of output switch: $\frac{I_C \text{ output}}{I_C \text{ driver - } 7.0\text{mA}^*} \geq 10$

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

Typical Performance Characteristics

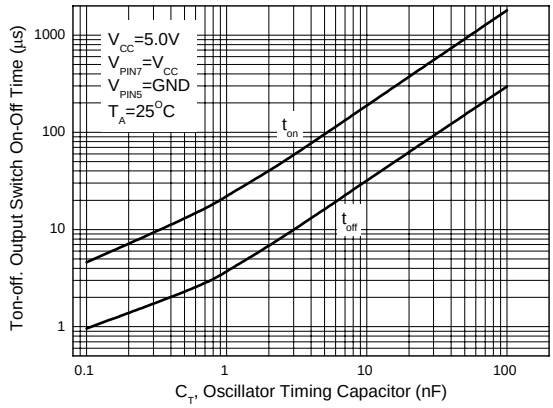


Figure 4. Output Switch On-Off Time vs. Oscillator Timing Capacitor

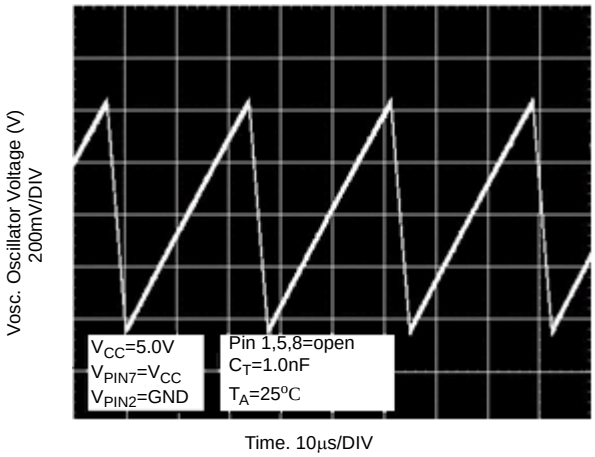


Figure 5. Timing Capacitor Waveform

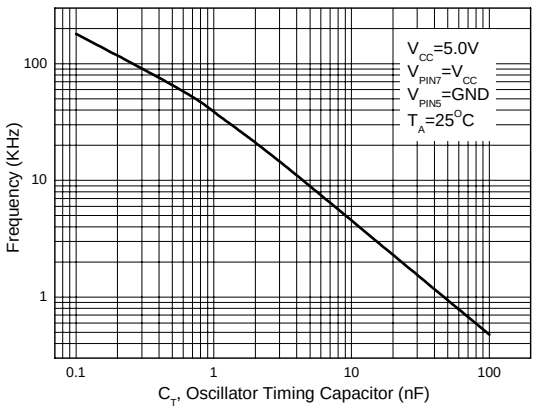


Figure 6. Oscillator Frequency vs.Timing Capacitor

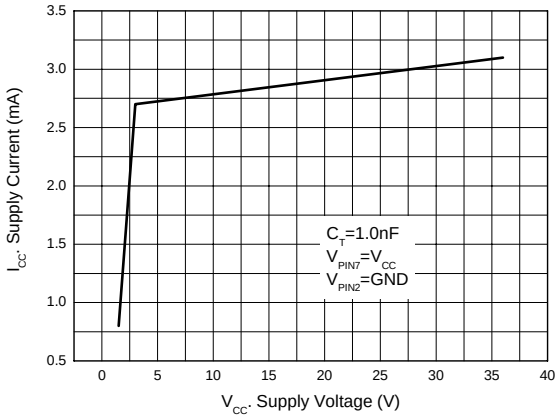


Figure 7. Standby Supply Current vs. Supply Voltage

Typical Performance Characteristics (Continued)

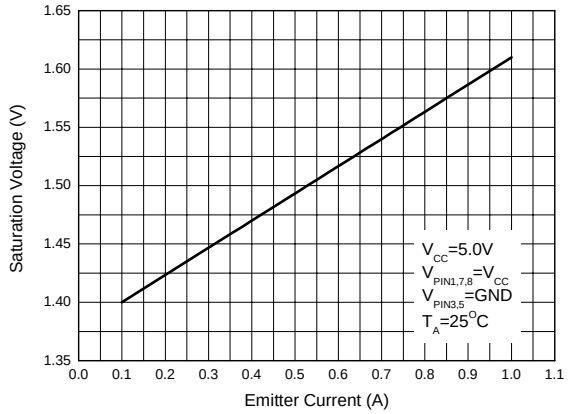


Figure 8. Emitter Follower Configuration Output Saturation Voltage vs. Emitter Current

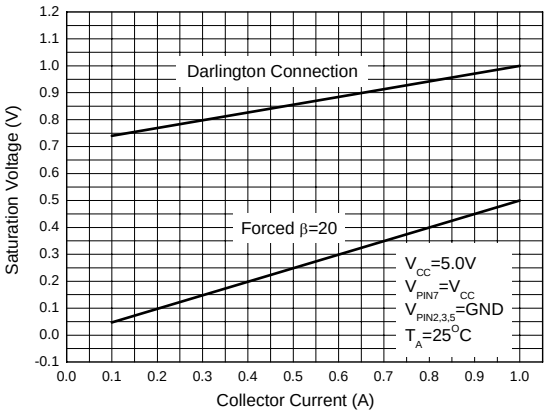


Figure 9. Common Emitter Configuration Output Switch Saturation Voltage vs. Collector Current

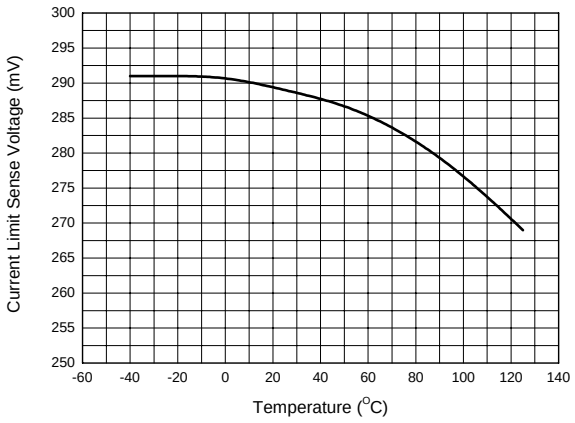


Figure 10. Current Limit Sense Voltage vs. Temperature

Typical Applications

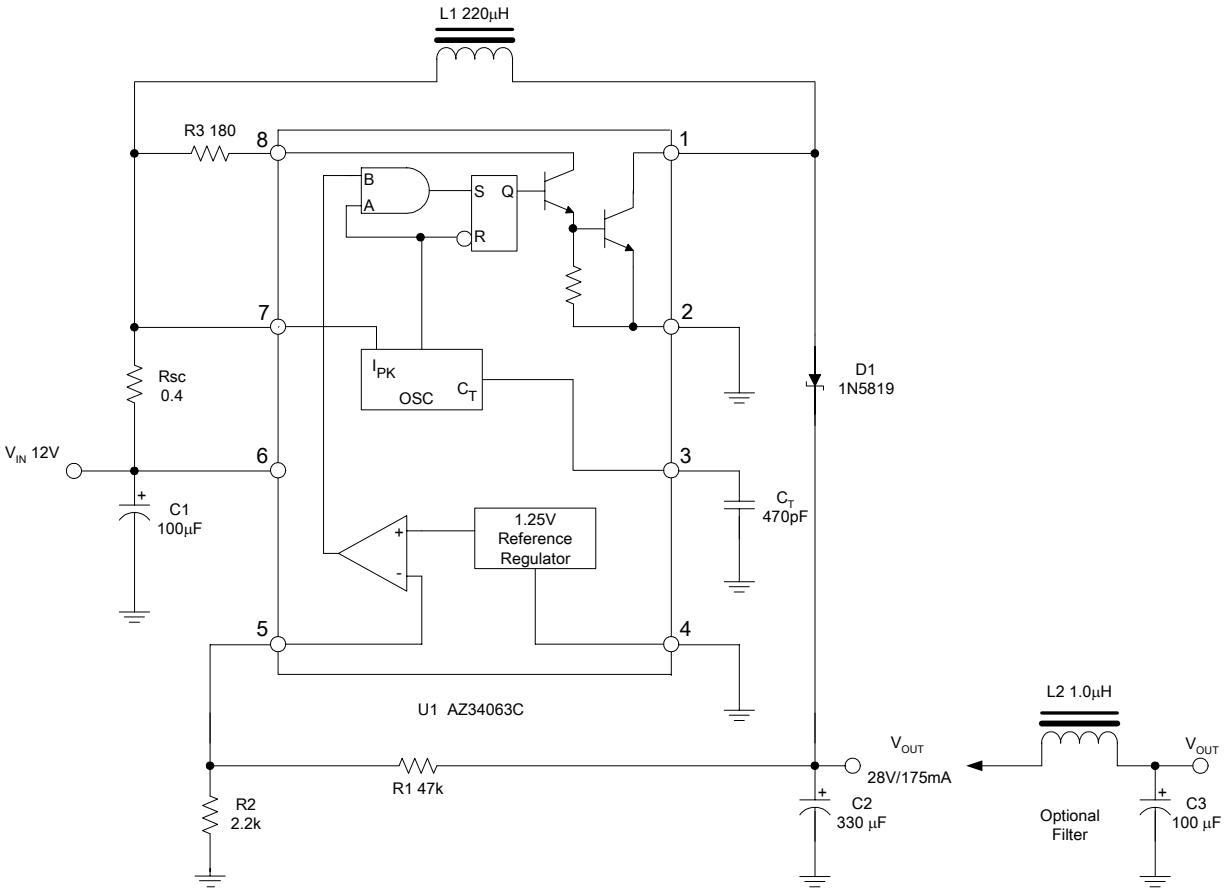


Figure 10. Step-Up Converter (Note 5)

Note 5: 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 Applications (Continued)

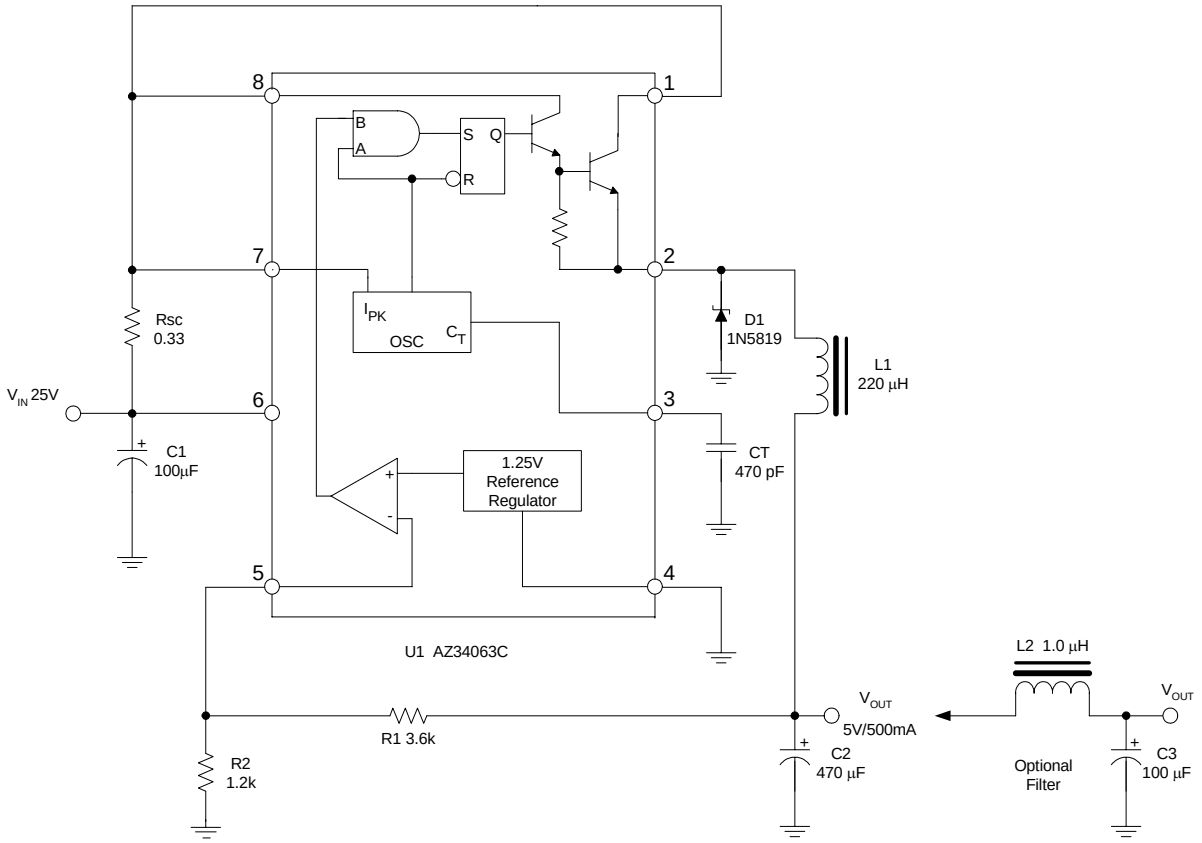


Figure 11. Step-Down converter (Note 6)

Note 6: 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 Applications (Continued)

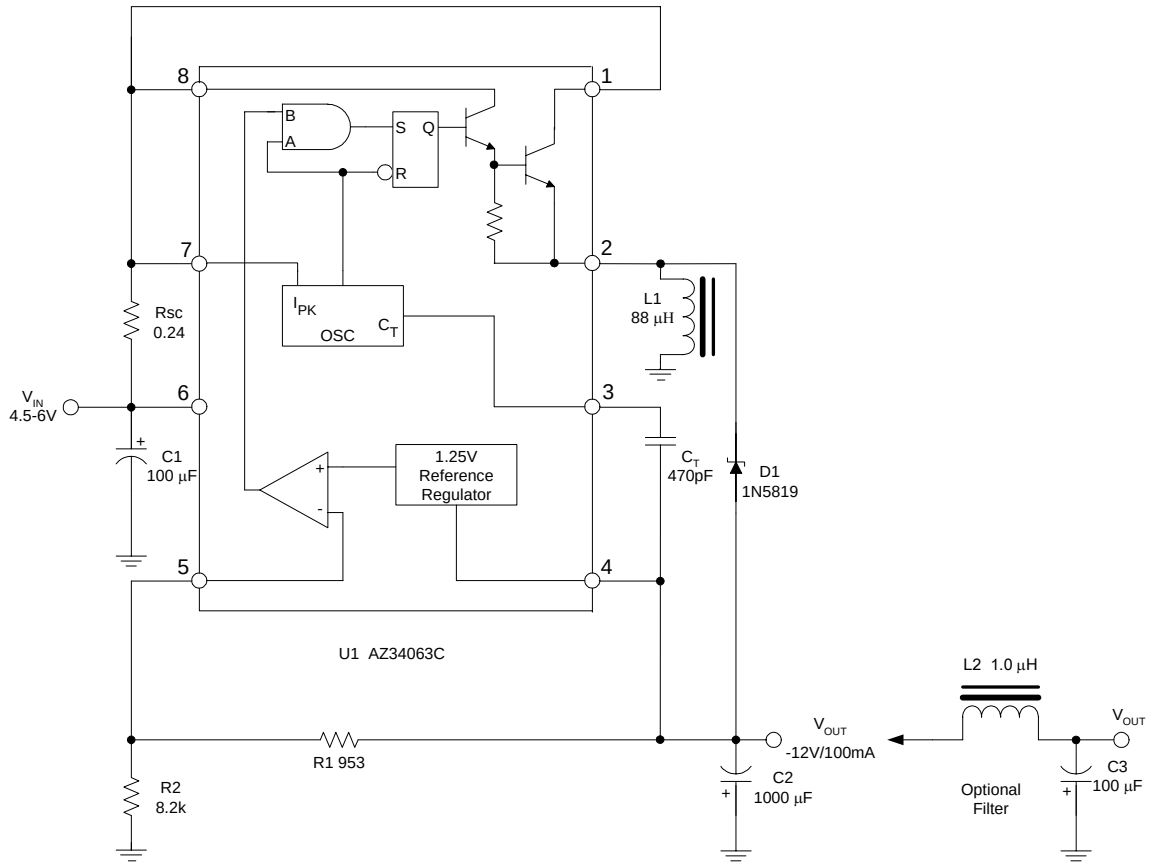
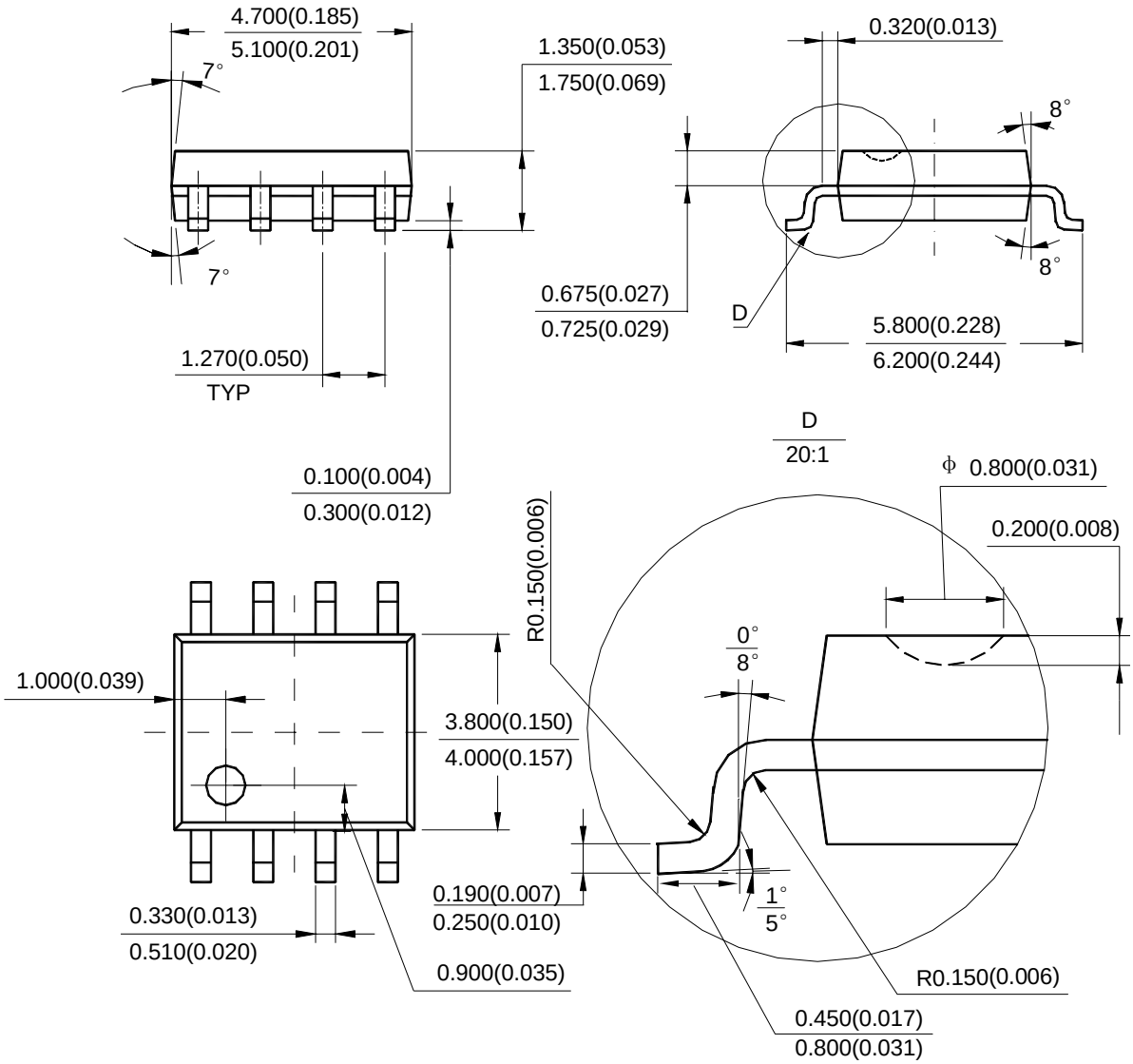


Figure 12. Voltage Inverting Converter (Note 7)

Note 7: 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).

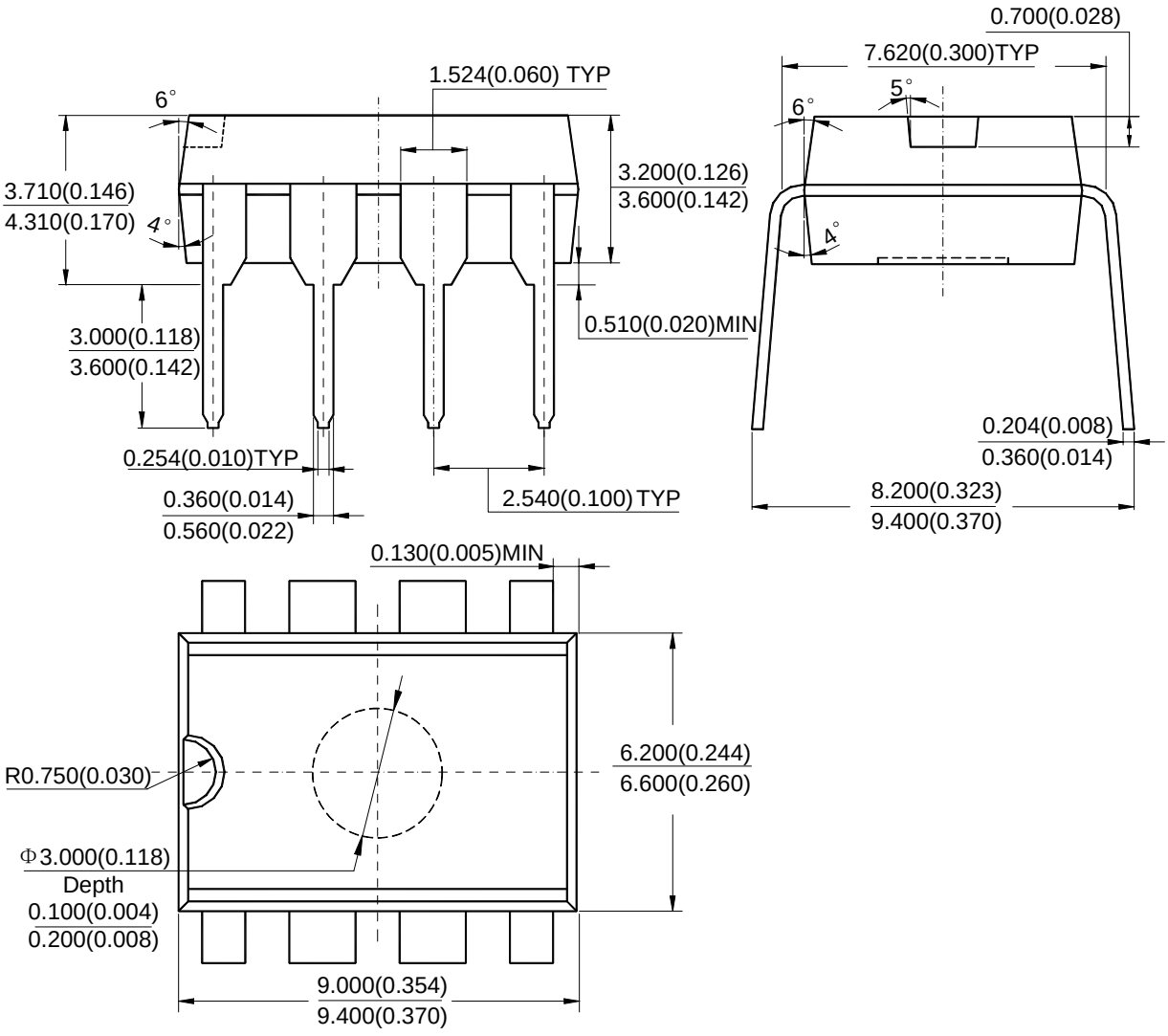
Mechanical Dimensions

SOIC-8 **Unit: mm(inch)**



Mechanical Dimensions (Continued)

DIP-8 **Unit: mm(inch)**





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MAIN SITE

BCD Semiconductor Manufacturing Limited
- Wafer Fab
Shanghai SIM-BCD Semiconductor Manufacturing Limited
800, Yi Shan Road, Shanghai 200233, China
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

BCD Semiconductor Manufacturing Limited
- IC Design Group
Advanced Analog Circuits (Shanghai) Corporation
8F, Zone B, 900, Yi Shan Road, Shanghai 200233, China
Tel: +86-21-6495 9539, Fax: +86-21-6485 9673

REGIONAL SALES OFFICE

Shenzhen Office
Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd. Shenzhen Office
Advanced Analog Circuits (Shanghai) Corporation Shenzhen Office
Room E, 5F, Noble Center, No.1006, 3rd Fuzhong Road, Futian District, Shenzhen 518026, China
Tel: +86-755-8826 7951, Fax: +86-755-8826 7865

Taiwan Office
BCD Semiconductor (Taiwan) Company Limited
4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei, Taiwan
Tel: +886-2-2656 2808, Fax: +886-2-2656 2806

USA Office
BCD Semiconductor Corporation
3170 De La Cruz Blvd., Suite 105, Santa Clara,
CA 95054-2411, U.S.A