Step-Down/Step-Up/Inverting DC-DC Converter

Description

The PD34063A 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 PD34063A 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 PD34063A is available in 2 packages: SOIC-8 and DIP-8.

Feature

- Operation from 3.0V to 36V Input
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.5A
- Output Voltage Adjustable
- Operation Frequency up to 100kHz
- Precision 2% Reference

Application

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

SOIC-8 DIP-8

Figure 1. Package Types of PD34063A

Pin Configuration

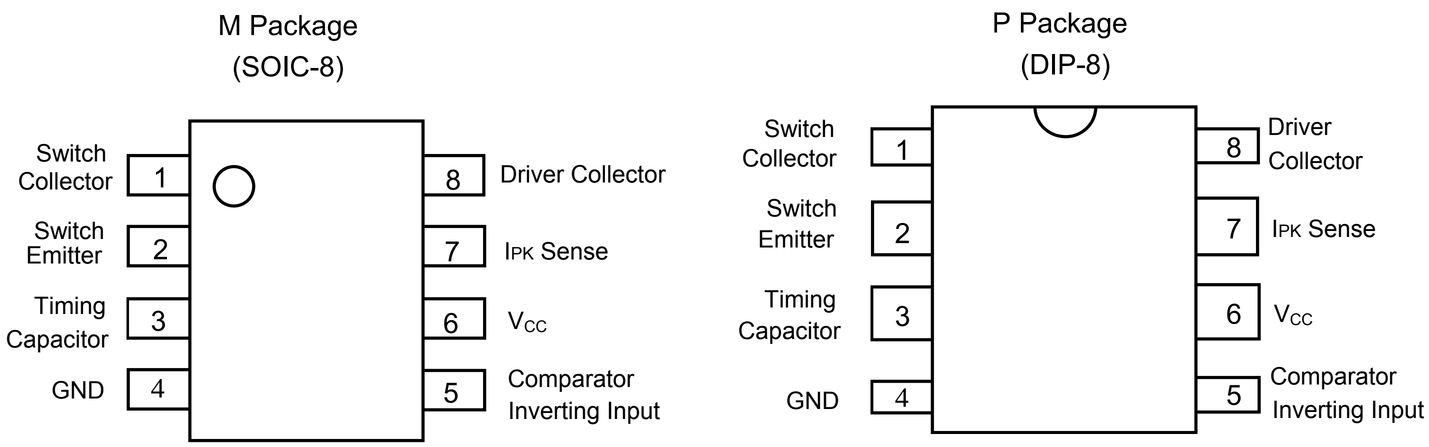


Figure 2. Pin Configuration of PD34063A (Top View)

Functional Block Diagram

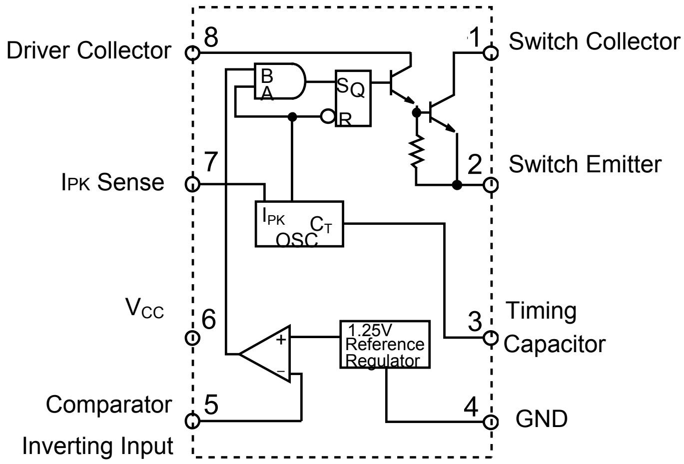


Figure 3. Functional Block Diagram of PD34063A

Absolute maximum rating(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_{PIN1}=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}	1.5	A
Power Dissipation(T_A=25℃)	DIP-8	P_D	1.25	W
	SOIC-8		780	mW
Thermal Resistance	DIP-8	$θ_{JA}$	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	℃

Electrical Characteristics

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Oscillator						
Frequency	f_{osc}	V_{PIN5}=0V,C_T=1.0nF T_A=25℃	24	33	42	KHz
Charge Current	I_{CHG}	V_{CC}=5.0V to 36V,T_A=25℃	24	35	42	μA
Discharge Current	I_{DISCHG}	V_{CC}=5.0V to 36V,T_A=25℃	140	220	260	μA
Discharge to Charge Current Ratio	I_{DISCHG}/I_{CHG}	Pin7 to V_{CC},T_A=25℃	5.2	6.5	7.5	
Current Limit Sense Voltage	V_{IPK}(sense)	I_{CHG}=I_{DISCHG},T_A=25℃	250	300	350	mV
Output Switch(Note 3)						
Saturation Voltage, Darlington Connection	V_{CE}(sat)	I_{SW}=1.0A, Pin1 and Pin8 connected, Common Emitter		1.0	1.3	V
Saturation Voltage(Note 4.)	V_{CE}(sat)	I_{SW}=1.0A,R_{PIN8}=82Ω to V_{CC}, Forced β=20,Common Emitter		0.45	0.7	V
DC Current Gain	h_{FE}	I_{SW}=1.0A,V_{CE}=5.0V,T_A=25℃	50	75		
Collector Off-State Current	I_C(off)	V_{CE}=36V		0.01	100	μA
Comparator						
Threshold Voltage	V_{TH}	T_A=25℃	1.225	1.250	1.275	V
		T_A=-40 to 85℃	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=1.0nF, 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 2.0μs 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:

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

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

Typical Performance Characteristics

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

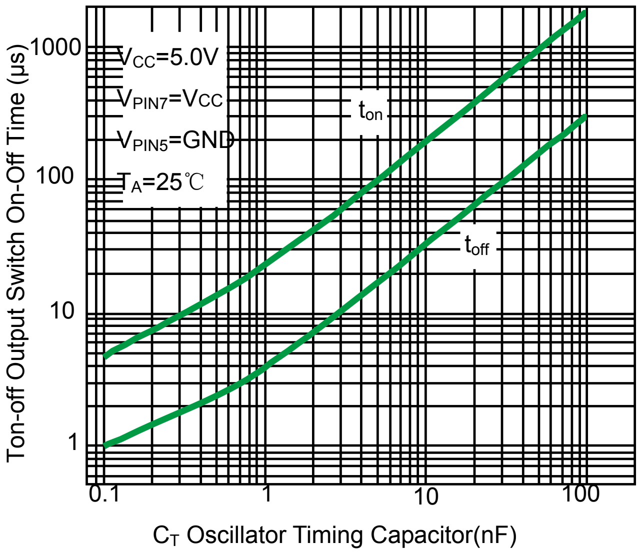


Figure 4.Output Switch On-Off Time vs. Oscillator Timing Capacitor

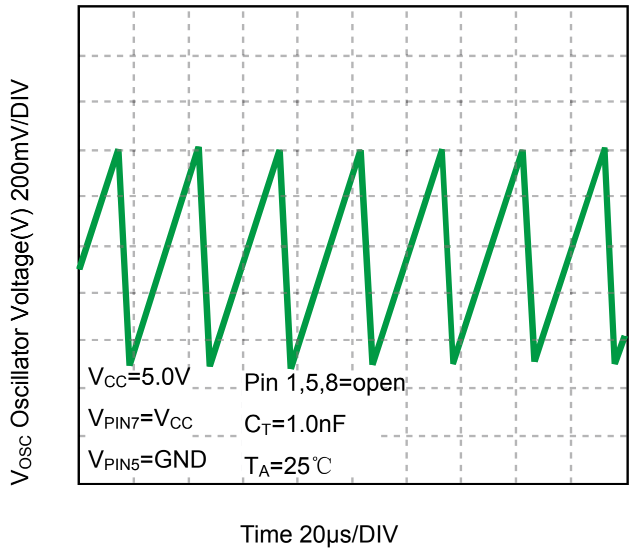


Figure 5.Timing Capacitor Waveform

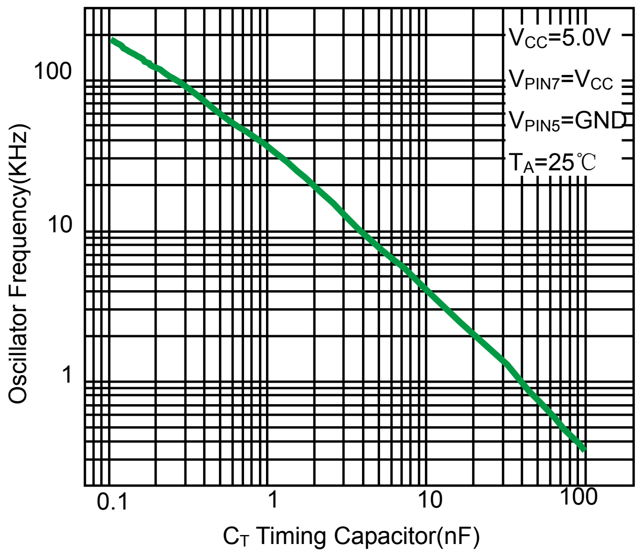


Figure 6.Oscillator Frequency vs. Timing Capacitor

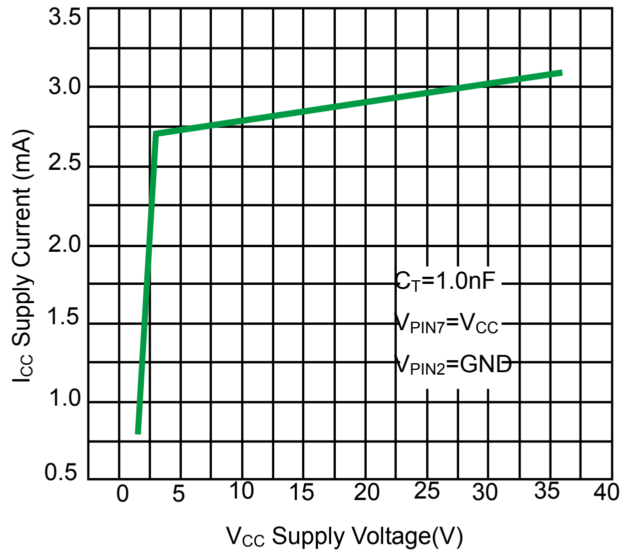


Figure 7.Standard Supply Current vs. Supply Voltage

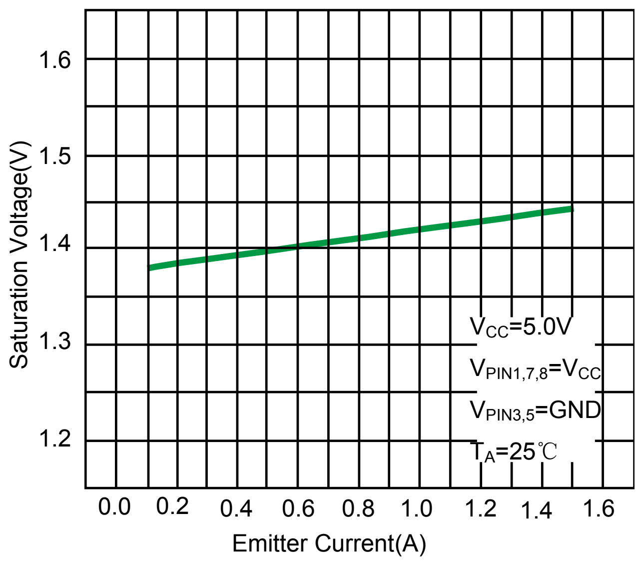


Figure 8.Emitter Follower Configuration Output Saturation Voltage vs. Emitter current

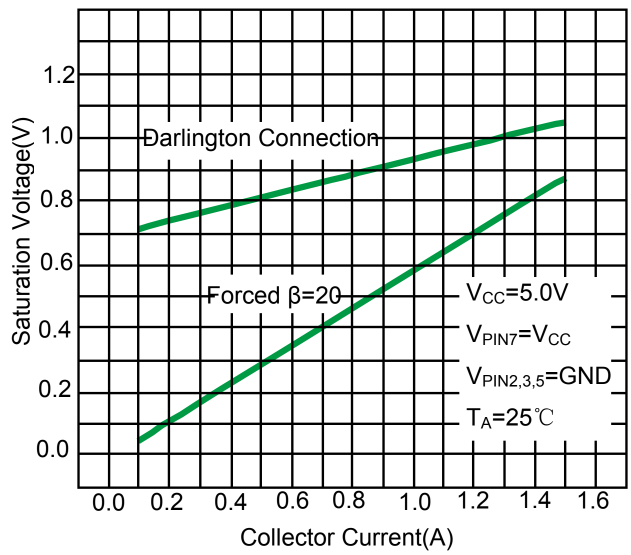


Figure 9.Common Emitter Configuration Output Switch Saturation Voltage vs. Collector Current

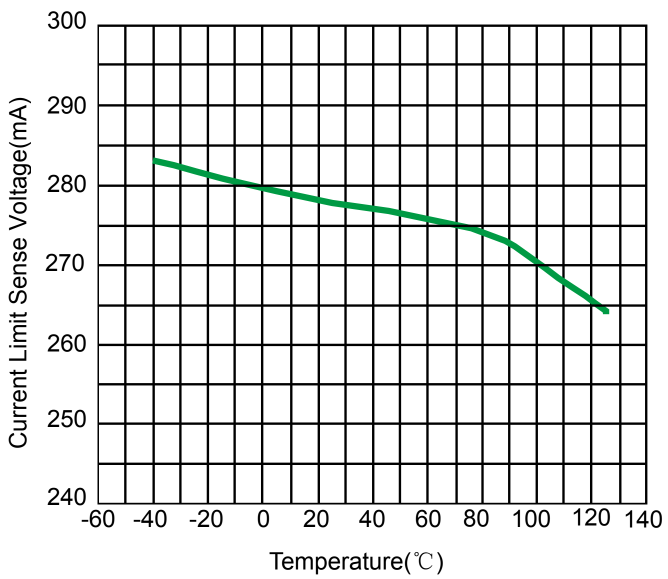


Figure 10.Current Limit Sense Voltage vs. Temperature

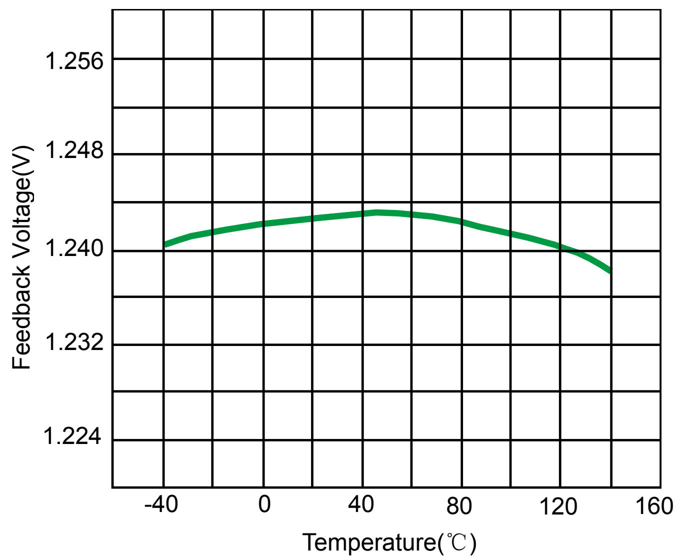


Figure 11.Feedback Voltage vs. Temperature

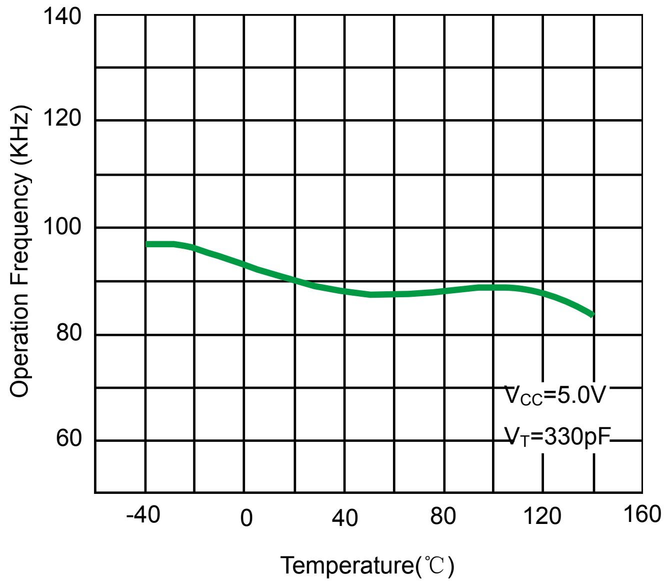


Figure 12.Operation Frequency vs. Temperature

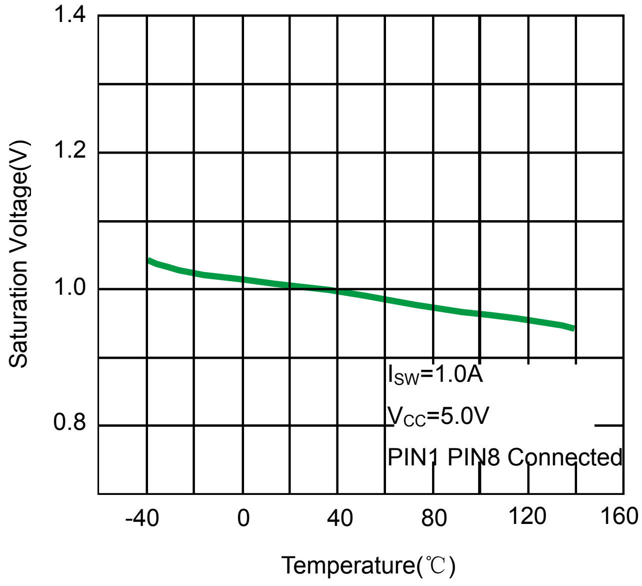


Figure 13.Saturation Voltage vs. Temperature

Typical Applications

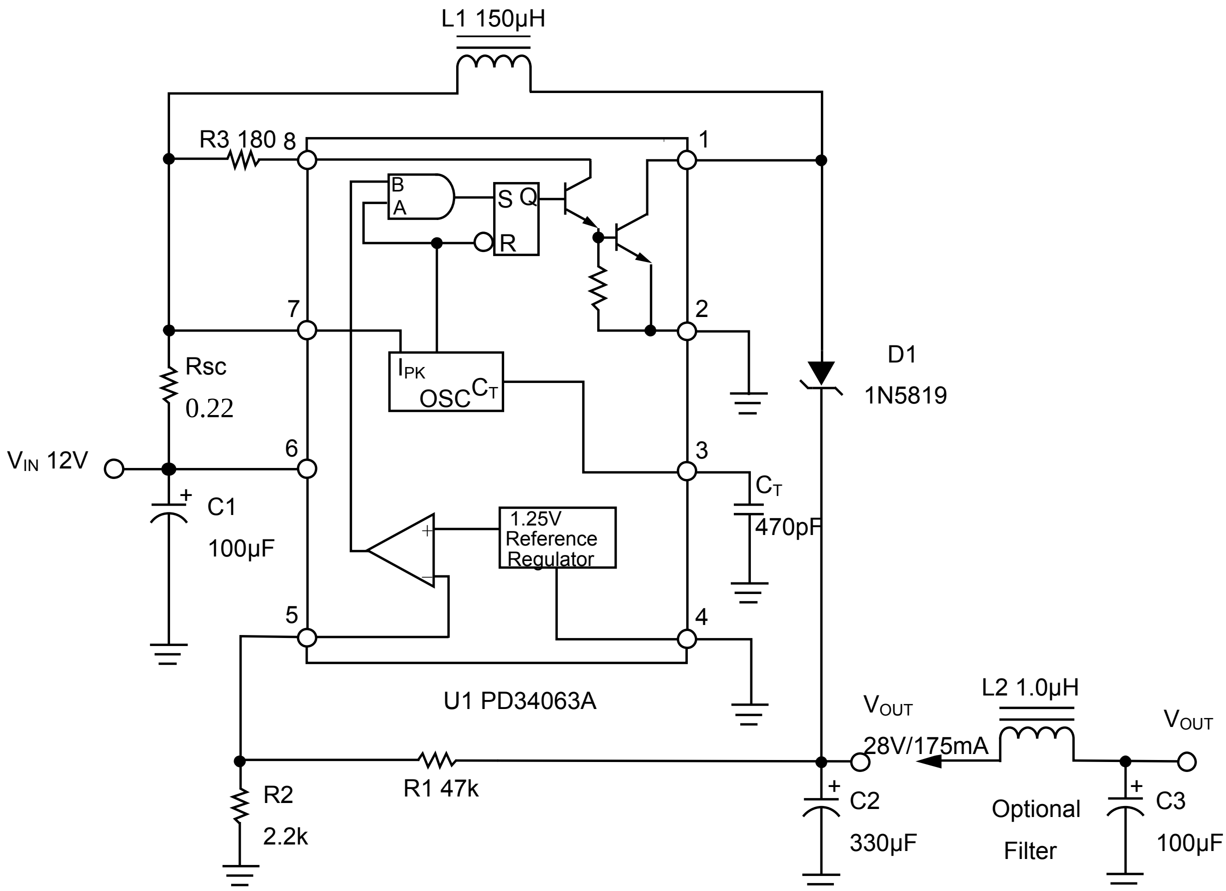


Figure 14.Step-Up Converter(Note 5)

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 switching 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 $V_{PIN5}=V_{OUT}*R_2/(R_1+R_2)=1.25(V)$, the output voltage can be decided by $V_{OUT}=1.25*(R_1+R_2)/R_2$ (V).

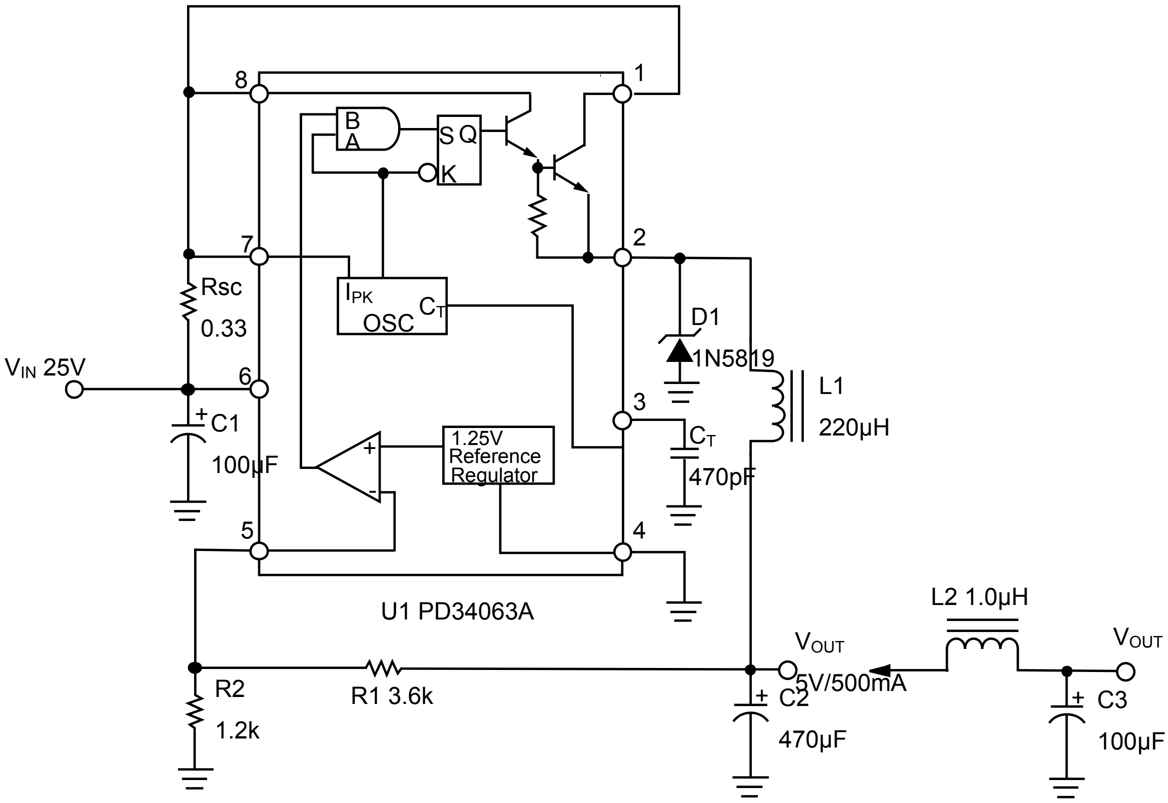


Figure 15.Step-Down Converter (Note 6)

Note 6: This is a typical step-down converter configuration. The working process in the steady state is similar to step-up converter, $V_{PIN5}=V_{OUT}*R_2/(R_1+R_2)=1.25$ (V), the output voltage can be decided by $V_{OUT}=1.25*(R_1+R_2)/R_2$ (V).

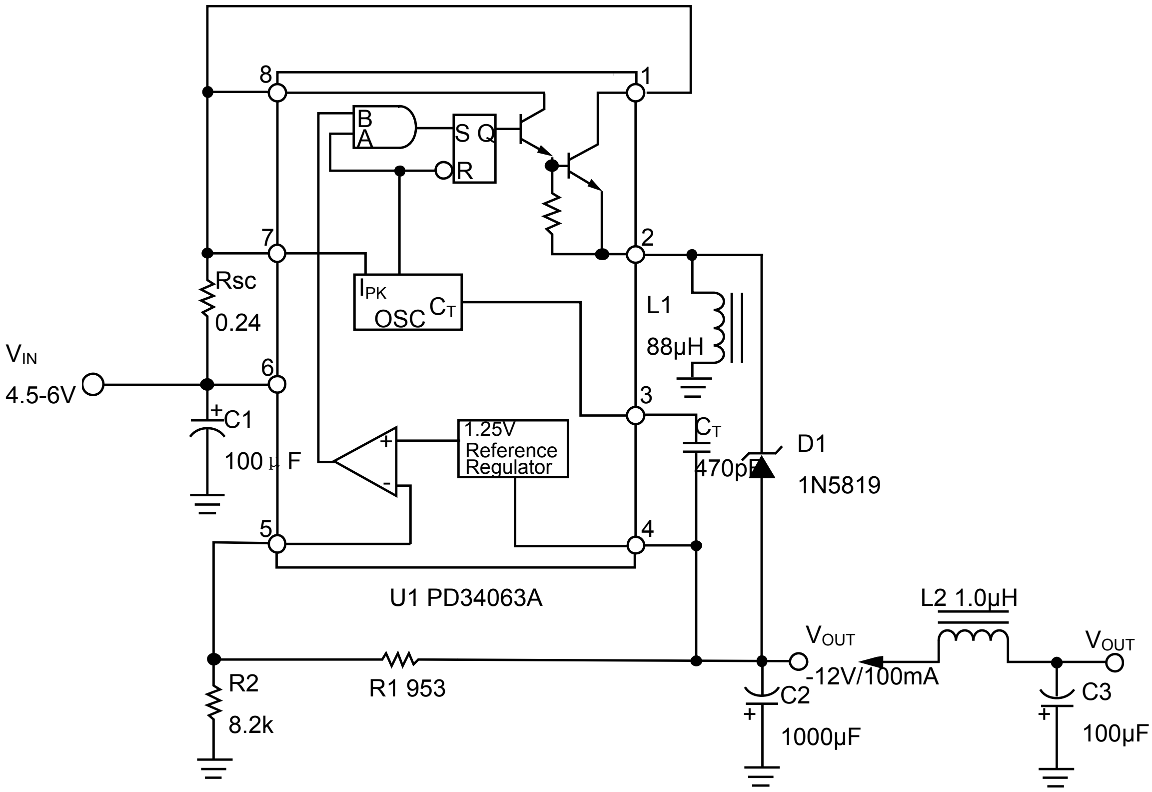
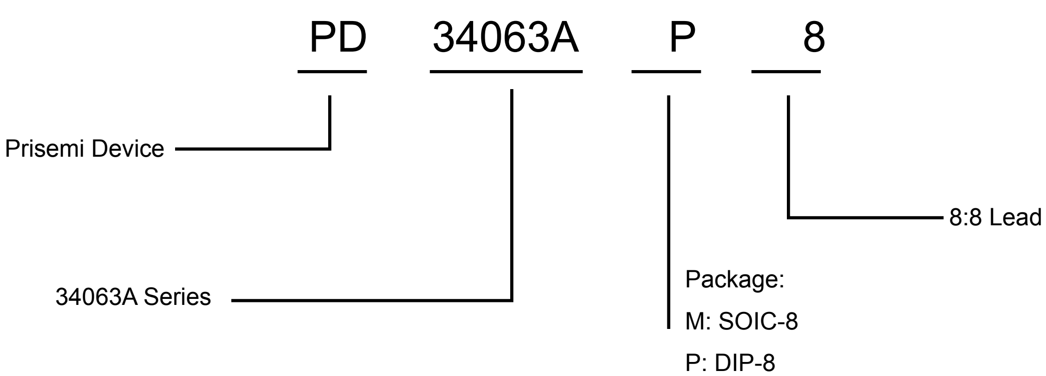


Figure 16.Voltage Inverting Converter(Note 7)

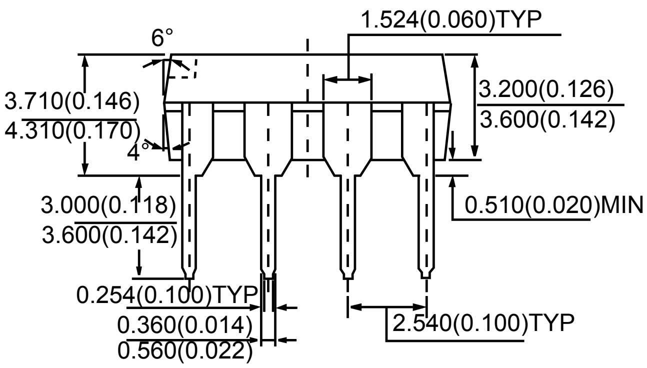
Note 7: This is a typical inverting converter configuration. The working process in the steady state is similar to step-up converter, the difference in this situation is that the voltage at the non-inverting pin of the comparator is equal to $1.25V+V_{OUT}$, then $V_{PIN5}=V_{OUT}*R_2/(R_1+R_2)=1.25V+V_{OUT}$, so the output voltage can be decided by $V_{OUT}=-1.25*(R_1+R_2)/R_1$ (V).

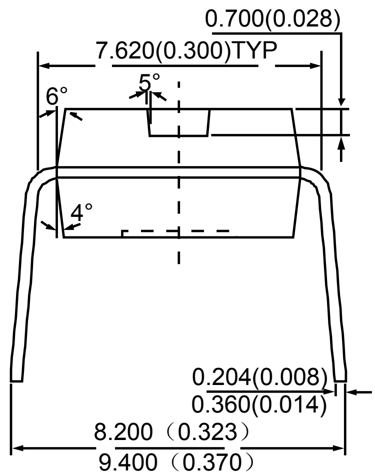
Naming Rule

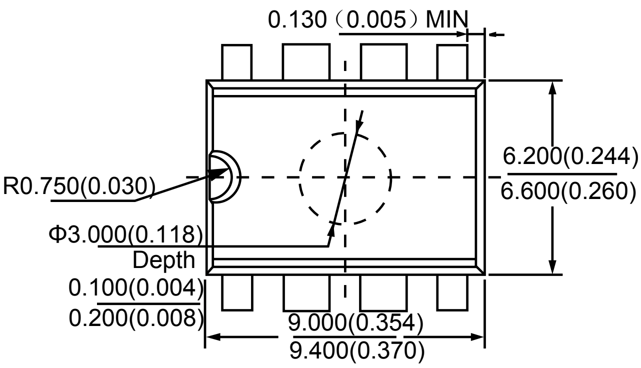


Product dimension (DIP-8)

Unit:mm(inch)

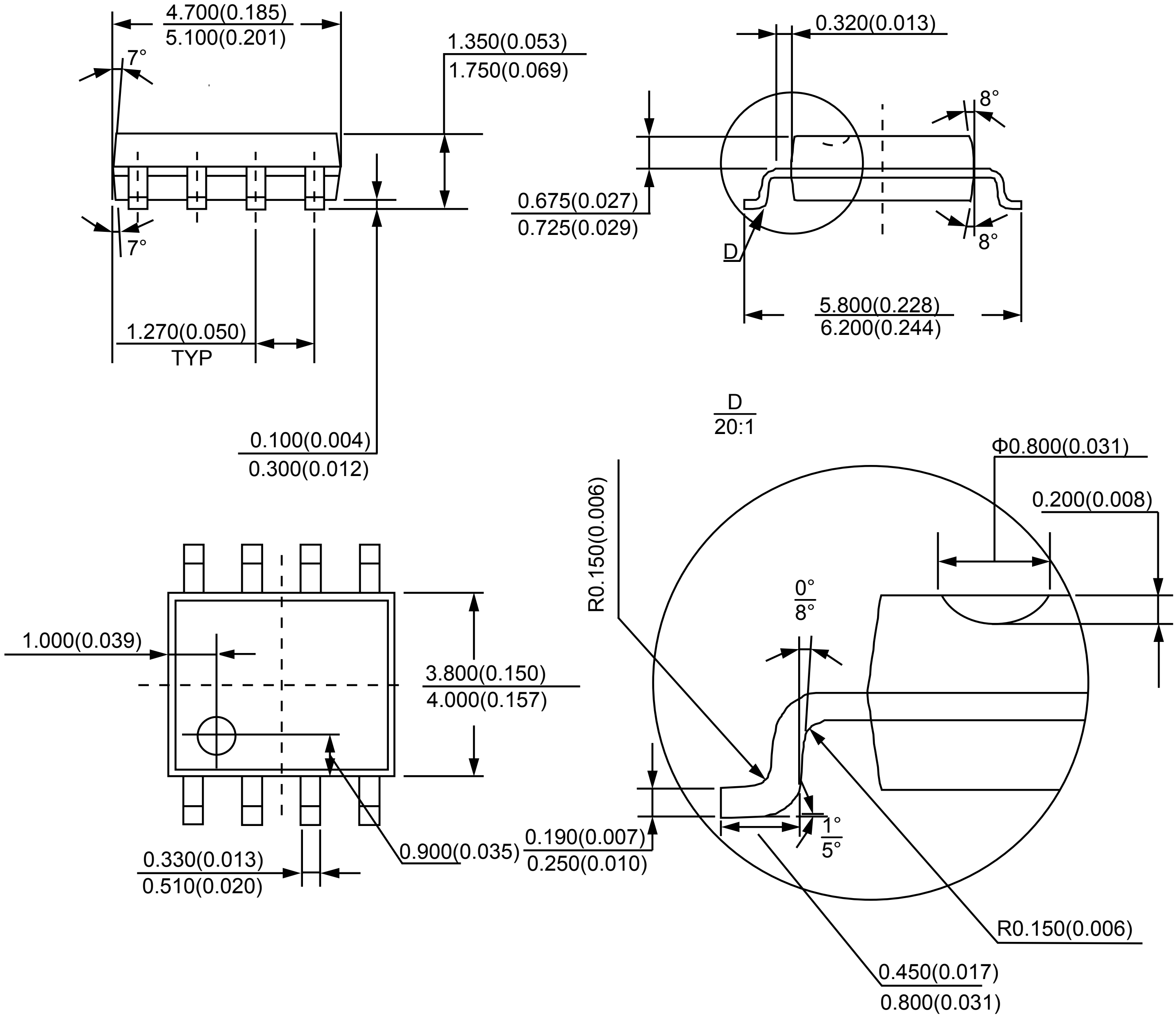






Product dimension (SOIC-8)

Unit:mm(inch)



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