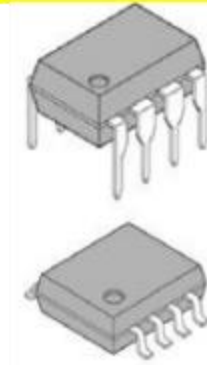


## General Description

The MC34063A is a monolithic control circuit containing the primary functions required for DC-to-DC converters. This device consists of an internal temperature compensated reference ( 1.25V ), comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch. The IC is specifically designed to be used in Step-Down and Step-Up and Voltage-Inverting applications with a minimum number of external components.

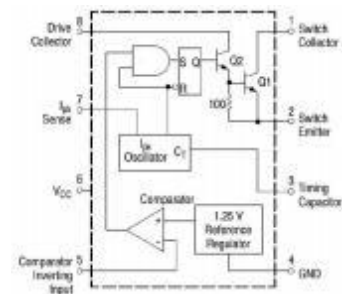
The MC34063A is available in DIP8 and SOP8 package.



## Features

- Operation from 3.0V to 40V Input
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.5A
- Output Voltage Adjustable
- Frequency Operation to 100kHz
- Precision 2% Reference

## Functional Block Diagram



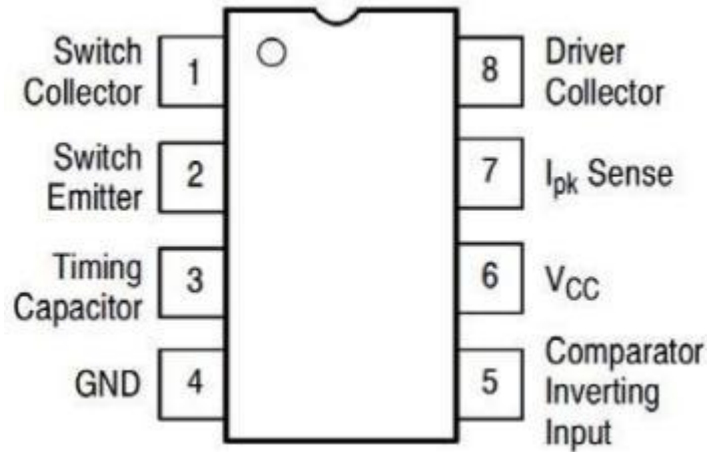
## Applications

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

## Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing QTY
XBLW MC34063AN	DIP-8	MC34063AN	Tube	2000/Box
XBLW MC34063ADTR	SOP-8	MC34063A	Tape	2500/Reel

## Pin Configuration



## Pin Description

Pin Number	Pin Name	Function Description	Pin Number	Pin Name	Function Description
1	SC	Switch collector	5	FB	Comparator inverting input
2	SE	Switch emitter	6	V <sub>CC</sub>	Input voltage
3	CT	Timing capacitor	7	I <sub>pk</sub>	I <sub>pk</sub> sense
4	GND	Ground	8	DC	Drive collector

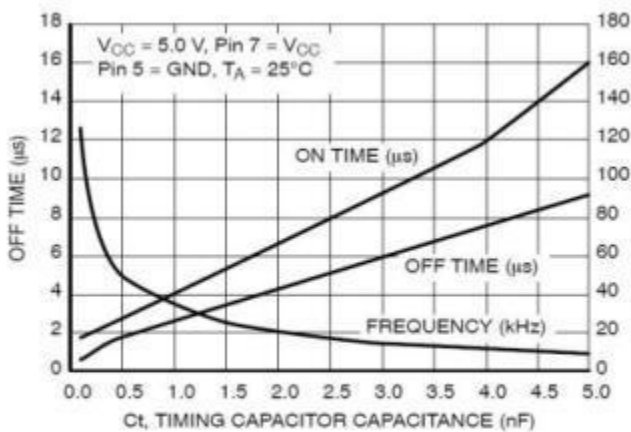
## Absolute Maximum Ratings (Ta= 25 °C)

Parameter Name	Symbol	Value	Unit
Power Supply Voltage	V <sub>CC</sub>	40	V
Comparator Input Voltage Range	V <sub>IR</sub>	-0.3~40	V
Switch Collector Voltage	V <sub>C</sub> (switch)	40	V
Switch Emitter Voltage (VPin1=40V)	V <sub>E</sub> (switch)	40	V
Switch Collector to Emitter Voltage	V <sub>CE</sub> (switch)	40	V
Driver Collector Voltage	V <sub>C</sub> (drive)	40	V
Driver Collector Current	I <sub>C</sub> (drive)	100	mA
Switch Current	I <sub>SW</sub>	1.5	A
Power Dissipation	DIP8	1.25	W
	SOP8	625	mW
Operating Ambient Temperature Range	T <sub>a</sub>	0~70	°C
Storage Temperature Range	T <sub>stg</sub>	-65~ 150	°C

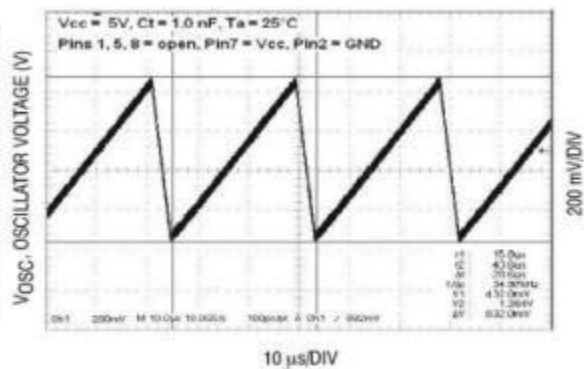
**Electrical Characteristics (Unless otherwise noted, V<sub>CC</sub>=5.0V, T<sub>a</sub>=0~70°C)**

Parameter Name	Symbol	Min	Typ	Max	Unit
<b>OSCILLATOR</b>					
Frequency (V <sub>pin5</sub> =0V, CT=1.0nF, T <sub>a</sub> =25°C)	fosc	24	33	42	kHz
Charge Current (V <sub>CC</sub> =5.0~40V, T <sub>a</sub> =25°C)	I <sub>chg</sub>	24	35	42	µA
Discharge Current (V <sub>CC</sub> =5.0~40V, T <sub>a</sub> =25°C)	I <sub>dischg</sub>	140	220	260	µA
Discharge to Charge Current Ratio (Pin7 to V <sub>CC</sub> , T <sub>a</sub> =25°C)	I <sub>dischg</sub> /I <sub>chg</sub>	5.2	6.5	7.5	
Current limit Sense Voltage (I <sub>chg</sub> =I <sub>dischg</sub> , T <sub>a</sub> =25°C)	V <sub>ipk(sense)</sub>	250	300	350	mV
<b>OUTPUT SWITCH</b>					
Saturation Voltage, Darlington Connection (I <sub>SW</sub> =1.0A, Pins 1,8 Connected)	V <sub>CE(sat)</sub>		1.0	1.3	V
Saturation Voltage, Darlington Connection (I <sub>SW</sub> =1.0A, R <sub>pin 8</sub> =82Ω to V <sub>CC</sub> , Forced β ≈ 20)	V <sub>CE(sat)</sub>		0.45	0.7	V
DC Current Gain (I <sub>SW</sub> =1.0A, V <sub>CE</sub> =5.0V, T <sub>a</sub> =25°C)	hFE	50	75		
Collector Off-State Current (V <sub>CE</sub> =40V)	I <sub>c(off)</sub>		0.01	100	µA
<b>COMPARATOR</b>					
Threshold Voltage (T <sub>a</sub> =25°C)	V <sub>th</sub>	1.225	1.25	1.275	V
Threshold Voltage (T <sub>a</sub> =0~70°C)		1.21		1.29	
Threshold Voltage Line Regulation (V <sub>CC</sub> =3.0~40V)	Regline		1.4	5.0	mV
Input Bias Current (V <sub>in</sub> =0V)	I <sub>B</sub>		-20	-400	nA
<b>TOTAL DEVICE</b>					
Supply Current (V <sub>CC</sub> =5.0~40V, CT=1.0nF, Pin7=V <sub>CC</sub> , V <sub>pin5</sub> >V <sub>th</sub> , pin2=Gnd, Remaining Pins Open)	I <sub>CC</sub>			4.0	µA

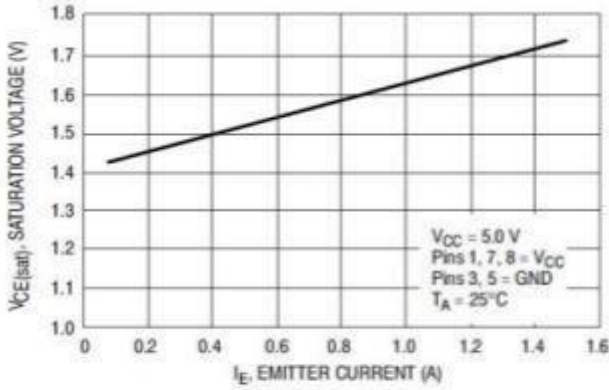
**Characteristics Curves**



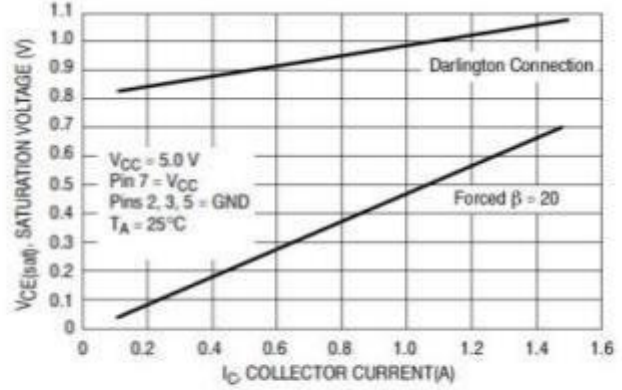
Oscillator Frequency



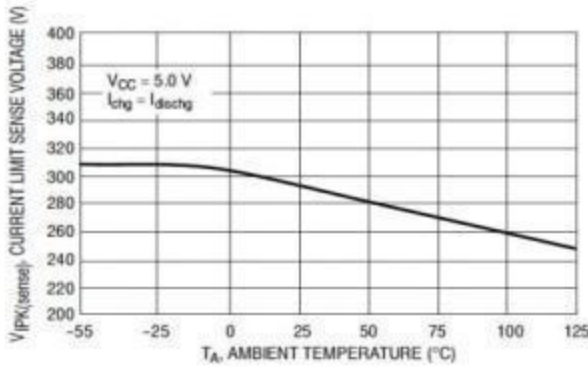
Timing Capacitor Waveform



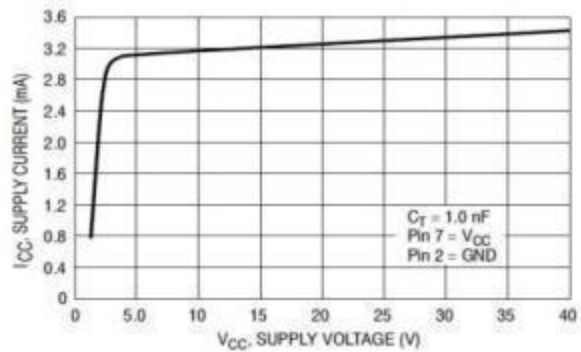
**Emitter Follower Configuration Output**  
Saturation Voltage Versus Emitter Current



**Common Emitter Configuration Output**  
Switch Saturation Voltage Versus Collector Current



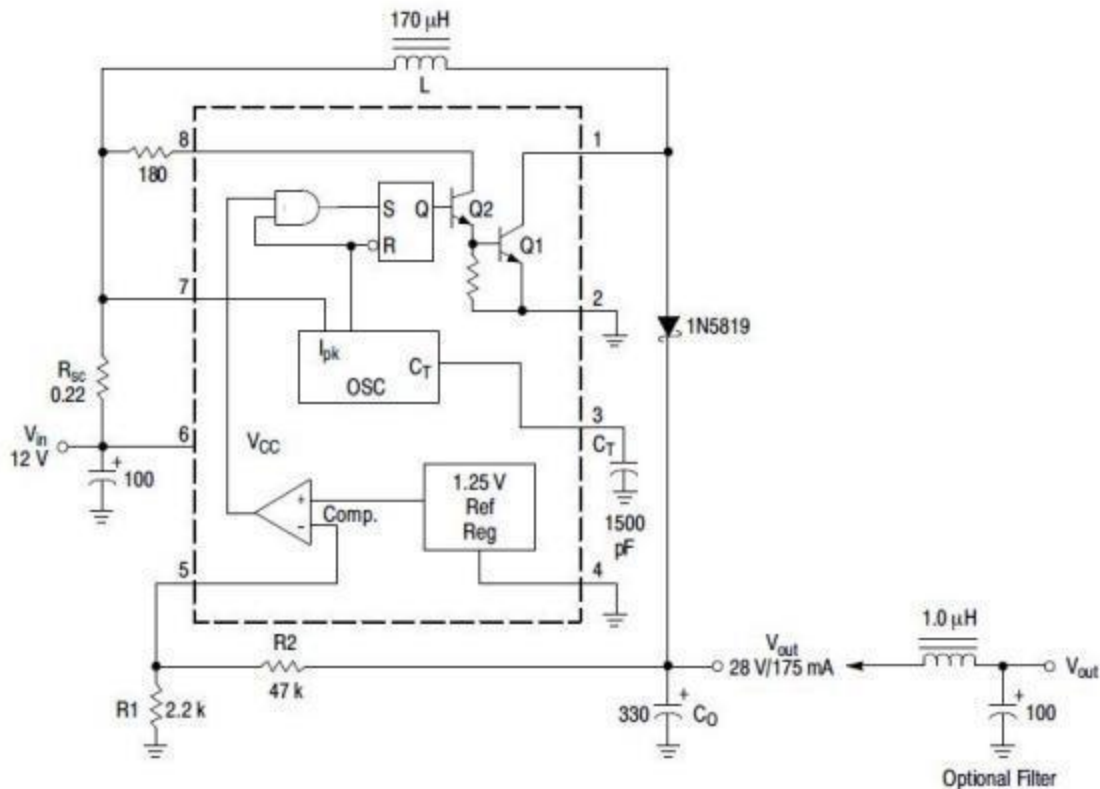
**Current Limit Sense Voltage Versus Temperature**



**Standby Supply Current Versus Supply Voltage**

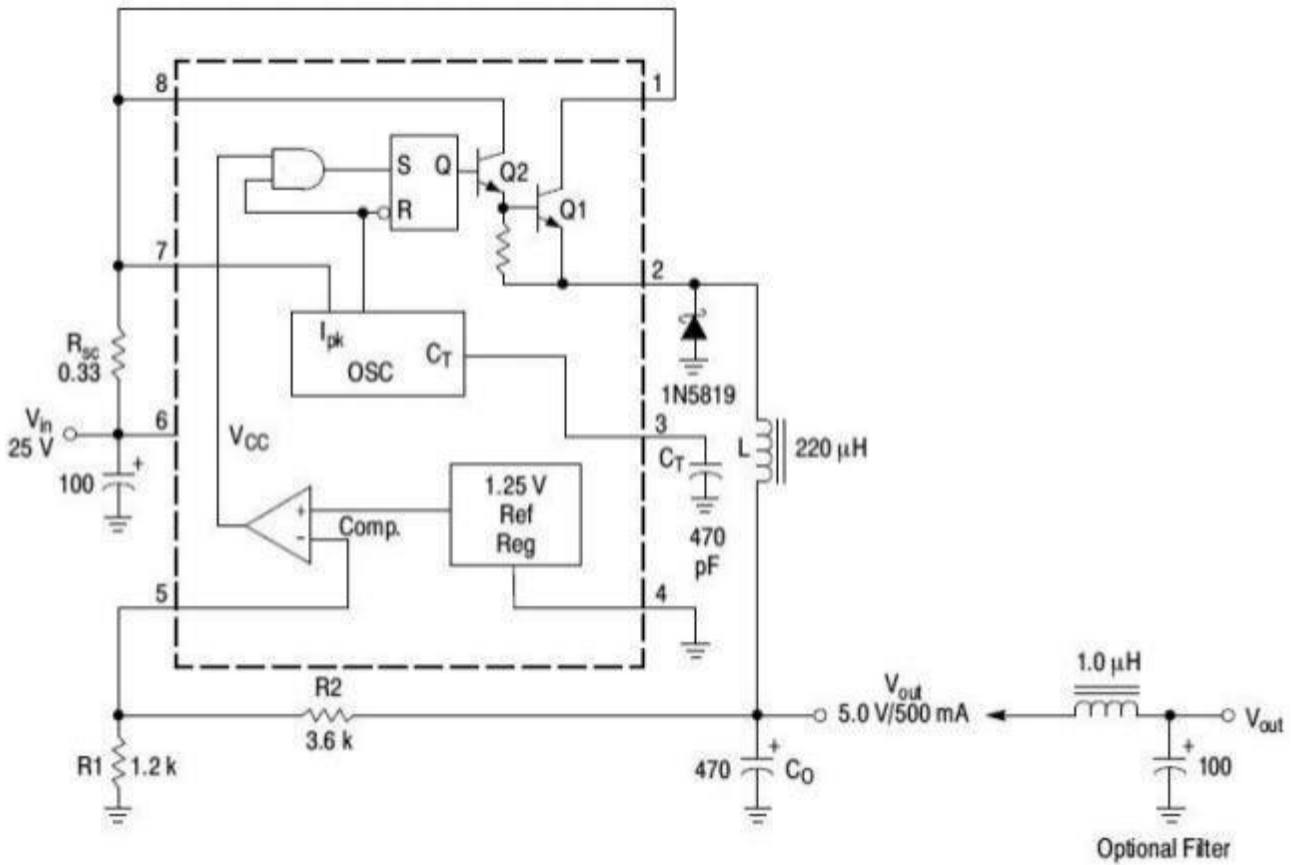
## Typical Application

### 1. Step-Up Converter



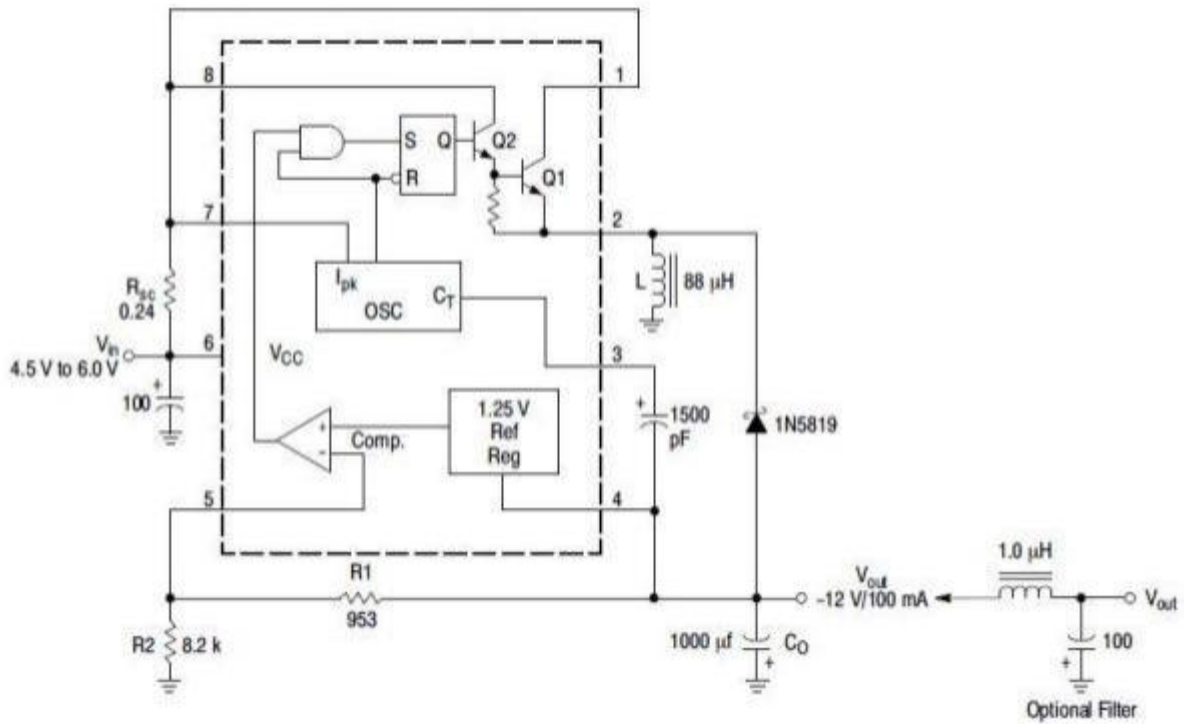
Test	Conditions	Results
Line Regulation	$V_{in}=8.0V\sim 16V, I_o=175mA$	$30mV=\pm 0.05\%$
Load Regulation	$V_{in}=12V, I_o=75mA\sim 175mA$	$10mV=\pm 0.017\%$
Output Ripple	$V_{in}=12V, I_o=175mA$	$400mV_{pp}$
Efficiency	$V_{in}=12V, I_o=175mA$	$87.7\%$
Output Ripple With Optional Filter	$V_{in}=12V,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

## 2. Step-Down Converter



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

### 3. Voltage Inverting Converter



Test	Conditions	Results
Line Regulation	$V_{in}=4.5V\sim 6.0V, I_o=100mA$	$3.0mV=\pm 0.012\%$
Load Regulation	$V_{in}=5.0V, I_o=10mA\sim 100mA$	$0.022V=\pm 0.09\%$
Output Ripple	$V_{in}=5.0V, I_o=100mA$	500mVpp
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	$V_{in}=5.0V, I_o=100mA$	70mVpp

**Application Information**

Calculation	Step-Up	Step-Down	Voltage-Inverting
$t_{on}/t_{off}$	$\frac{V_{out} + V_F - V_{in(min)}}{V_{in(min)} - V_{sat}}$	$\frac{V_{out} + V_F}{V_{in(min)} - V_{sat} - V_{out}}$	$\frac{ V_{out}  + V_F}{V_{in} - V_{sat}}$
$(t_{on} + t_{off})$	$\frac{1}{f}$	$\frac{1}{f}$	$\frac{1}{f}$
$t_{off}$	$\frac{t_{on} + t_{off}}{\frac{t_{on}}{t_{off}} + 1}$	$\frac{t_{on} + t_{off}}{\frac{t_{on}}{t_{off}} + 1}$	$\frac{t_{on} + t_{off}}{\frac{t_{on}}{t_{off}} + 1}$
$t_{on}$	$(t_{on} + t_{off}) - t_{off}$	$(t_{on} + t_{off}) - t_{off}$	$(t_{on} + t_{off}) - t_{off}$
$C_T$	$4.0 \times 10^{-5} t_{on}$	$4.0 \times 10^{-5} t_{on}$	$4.0 \times 10^{-5} t_{on}$
$I_{pk( switch )}$	$2I_{out(max)} \left( \frac{t_{on}}{t_{off}} + 1 \right)$	$2I_{out(max)}$	$2I_{out(max)} \left( \frac{t_{on}}{t_{off}} + 1 \right)$
$R_{sc}$	$0.3/I_{pk( switch )}$	$0.3/I_{pk( switch )}$	$0.3/I_{pk( switch )}$
$L_{(min)}$	$\left( \frac{V_{in(min)} - V_{sat}}{I_{pk( switch )}} \right) t_{on(max)}$	$\left( \frac{V_{in(min)} - V_{sat} - V_{out}}{I_{pk( switch )}} \right) t_{on(max)}$	$\left( \frac{V_{in(min)} - V_{sat}}{I_{pk( switch )}} \right) t_{on(max)}$
$C_O$	$g \frac{I_{out} t_{on}}{V_{ripple(pp)}}$	$\frac{I_{pk( switch )} (t_{on} + t_{off})}{8V_{ripple(pp)}}$	$g \frac{I_{out} t_{on}}{V_{ripple(pp)}}$

$V_{sat}$  = Saturation voltage of the output switch

$V_F$  = Forward voltage drop of the output rectifier

**The following power supply characteristics must be chosen:**

$V_{in}$  — Nominal input voltage

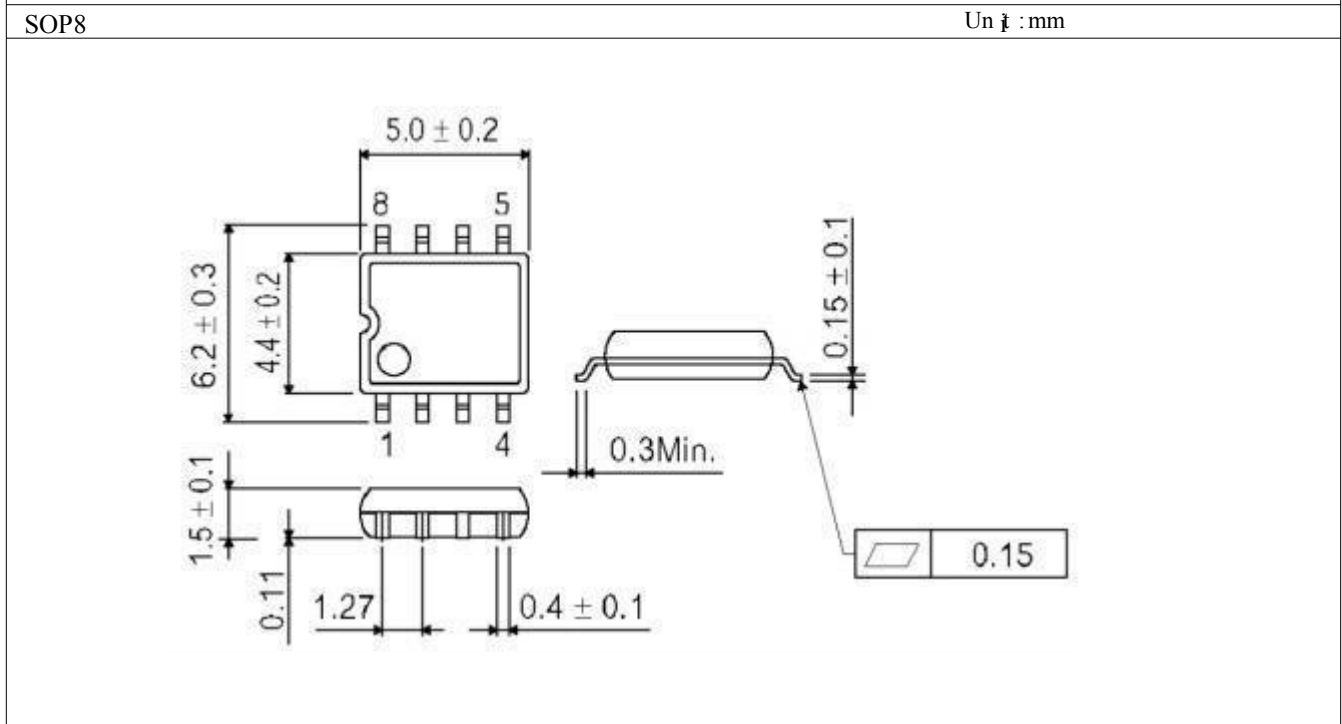
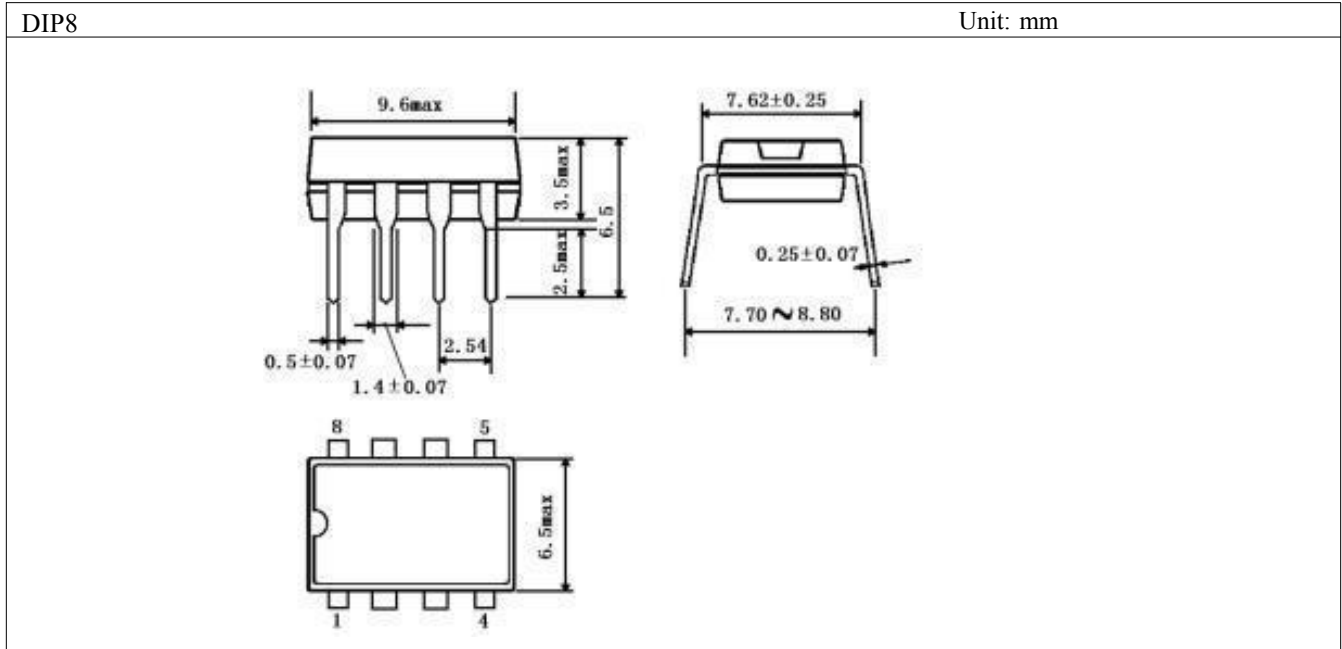
$V_{out}$  — Desired output voltage ,  $|V_{out}| = 1.25 \times ( 1 + R_2 )$

$R_1$

$I_{out}$  — Desired output current  $f_{min}$  — Minimum desired output switching frequency at the selected values of  $V_{in}$  and  $I_o$

$V_{ripple(pp)}$  — Desired peak-to-peak output ripple voltage. In practice, the calculated capacitor value will need to be increased due to its equivalent series resistance and board layout. The ripple voltage should be kept to a low value since it will directly affect the line and load regulation

**Outline Dimensions**





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