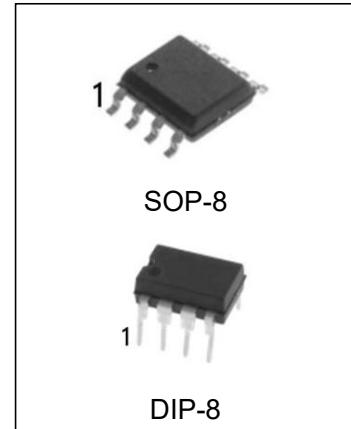


## FEATURES

- Operation from 3V to 40V
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.2A
- Output Voltage Adjustable
- Operation Frequency up to 180 kHz (CT = 100pF)
- Precision 2% Reference
- Continuous Load Current up to 0.75A

(Vin =12 to 24V, Rcs $\geq$ 0.2 $\Omega$ , DIP-8 package, see Note for  
Step-Down Application)



## ORDERING INFORMATION

DEVICE	Package Type	MARKING	Packing	Packing Qty
MC34063PG	DIP-8	MC34063	TUBE	2000pcs/Box
MC34063DRG	SOP-8	MC34063	REEL	2500pcs/Reel
MC34063DRG4	SOP-8	MC34063	REEL	4000pcs/Reel

## DESCRIPTION

The MC34063 is a monolithic switching regulator control circuit containing 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 device is specifically designed to be used in Step-Down, Step-Up and Voltage-Inverting applications with a minimum number of external components.

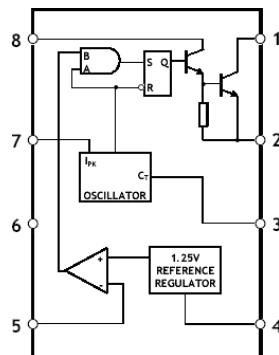
The MC34063 is the enhanced version of MC34063A with the ability to work in higher frequency.

The MC34063 is available in 2 packages: SOP- 8 and DIP-8.

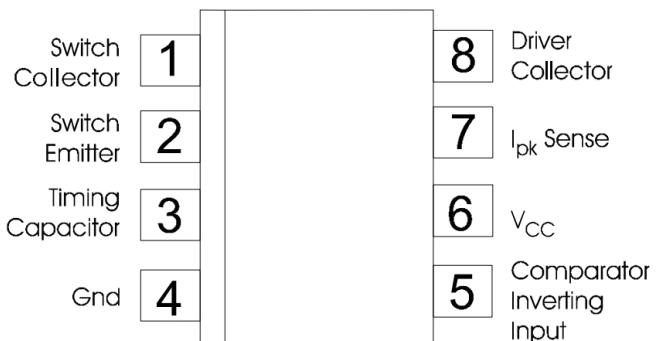
## APPLICATIONS

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

## SCHEMATIC DIAGRAM



## PIN CONNECTIONS



## PIN FUNCTIONS

PIN 1	Switch Collector	Internal switch transistor collector
PIN 2	Switch Emitter	Internal switch transistor emitter
PIN 3	Timing Capacitor	Timing Capacitor to control the switching frequency
PIN 4	GND	Ground pin for all internal circuits
PIN 5	Comparator Inverting Input	Inverting input pin for internal comparator
PIN 6	VCC	Voltage supply
PIN 7	IPK Sense	Peak Current Sense Input by monitoring the voltage drop across an external $I$ sense resistor to limit the peak current through the switch
PIN 8	Driver Collector	Voltage driver collector

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
$V_{CC}$	Supply Voltage	3	40	V
$T_A$	Ambient Temperature	-40	85	°C

**ABSOLUTE MAXIMUM RATINGS (NOTE 1)**

SYMBOL	PARAMETER	VALUE	UNIT
$V_{CC}$	Power Supply Voltage	40	V
$V_{IR}$	Comparator Input Voltage Range	-0.3 to 40	V
$V_C$ (SWITCH)	Switch Collector Voltage	40	V
$V_E$ (SWITCH)	Switch Emitter Voltage ( $V_{pin1} = 40V$ )	40	V
$V_{CE}$ (SWITCH)	Switch Collector to Emitter Voltage	40	V
$V_C$ (DRIVER)	Driver Collector Voltage	40	V
$I_C$ (DRIVER)	Driver Collector Current (NOTE 2)	100	mA
$I_{SW}$	Switch Current	1.2	A

**POWER DISSIPATION AND THERMAL CHARACTERISTICS**

$P_D$	DIP Package	Power Dissipation ( $TA = 25^\circ C$ )	1.25	W
$R_{\theta JA}$		Thermal Resistance	100	°C/W
$P_D$	SOP Package	Power Dissipation ( $TA = 25^\circ C$ )	625	mW
$R_{\theta JA}$		Thermal Resistance	160	°C/W
$T_J$	Operating Junction Temperature	150	°C	
$T_{STG}$	Storage Temperature Range	-65 to 150	°C	
ESD for MC34063		3000	V	
$T_L$	Lead Temperature (Soldering, 10 seconds)	245	°C	

**ELECTRICAL CHARACTERISTICS**

V<sub>CC</sub> = 5V, TA = -40 TO 85°C, UNLESS OTHERWISE SPECIFIED

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>OSCILLATOR</b>						
F <sub>OSC</sub>	Frequency	V <sub>pin5</sub> = 0V; T <sub>A</sub> = 25°C; C <sub>T</sub> = 1 nF	30	38	45	kHz
I <sub>CHG</sub>	Charge Current	V <sub>CC</sub> = 5.0V to 40V; T <sub>A</sub> = 25°C	30	38	45	µA
I <sub>DISCHG</sub>	Discharge Current	V <sub>CC</sub> = 5.0V to 40V; T <sub>A</sub> = 25°C	180	240	290	µA
I <sub>DISCHG/ICHG</sub>	Discharge to Charge Current Ratio	Pin 7 to V <sub>CC</sub> ; T <sub>A</sub> = 25°C	5.2	6.5	7.5	-
V <sub>IPK(SENSE)</sub>	Current Limit Sense Voltage	I <sub>CHG</sub> = I <sub>DISCHG</sub> ; T <sub>A</sub> = 25°C	250	300	350	mV
<b>OUTPUT SWITCH (NOTE 3)</b>						
V <sub>CE(SAT)</sub>	Saturation Voltage, Darlington connection	I <sub>SW</sub> = 0.8A; Pins 1,8 connected	-	1.0	1.3	V
V <sub>CE(SAT)</sub>	Saturation Voltage (see NOTE 4)	I <sub>SW</sub> = 0.8 A; R <sub>pin 8</sub> = 82 to V <sub>CC</sub> ; Forced $\beta$ = 20	-	0.45	0.8	V
$h_{FE}$	DC Current Gain	I <sub>SW</sub> = 0.8 A; V <sub>CE</sub> = 5.0V T <sub>A</sub> = 25°C	50	75	-	-
I <sub>C(OFF)</sub>	Collector Off-State Current	V <sub>CE</sub> = 40 V	-	0.01	100	µA
<b>COMPARATOR</b>						
V <sub>TH</sub>	Threshold Voltage	T <sub>A</sub> = 25°C	1.225	1.25	1.275	V
		T <sub>A</sub> = -40°C to +85°C	1.210		1.290	
REG <sub>LINE</sub>	Threshold Voltage Line Regulation	V <sub>CC</sub> = 3V to 40V	-	1.4	5	mV
I <sub>IB</sub>	Input Bias Current	V <sub>IN</sub> = 0V	-	-20	-400	nA
<b>TOTAL DEVICE</b>						
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = 5.0V to 40V; C <sub>T</sub> = 1.0 nF; Pin 7 = V <sub>CC</sub> ; V <sub>pin 5</sub> > V <sub>th</sub> ; Pin 2 = GND; other pins open	-	-	4	mA

## ELECTRICAL CHARACTERISTICS (CONTINUED)

### NOTES

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.
2. Maximum package power dissipation limits must be observed.
3. Low duty cycle pulse technique 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 ( $\leq 300\text{mA}$ ) and high driver currents ( $\geq 30\text{mA}$ ), it may take up to  $2.0\mu\text{s}$  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:

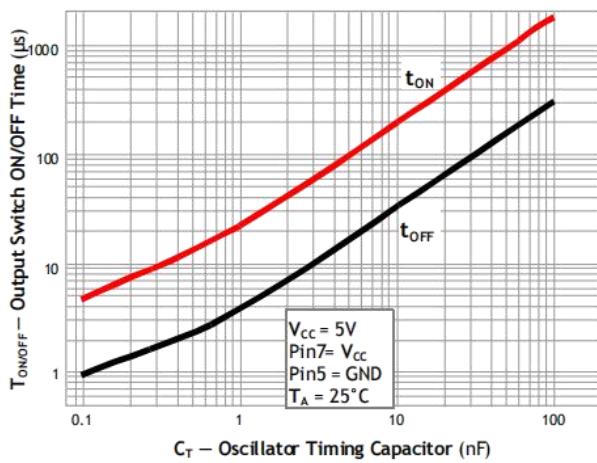
Forced  $\beta$  of output switch:

$$\frac{I_{C(OUTPUT)}}{I_{C(DRIVER)} - 7.0\text{mA}^*} \geq 10$$

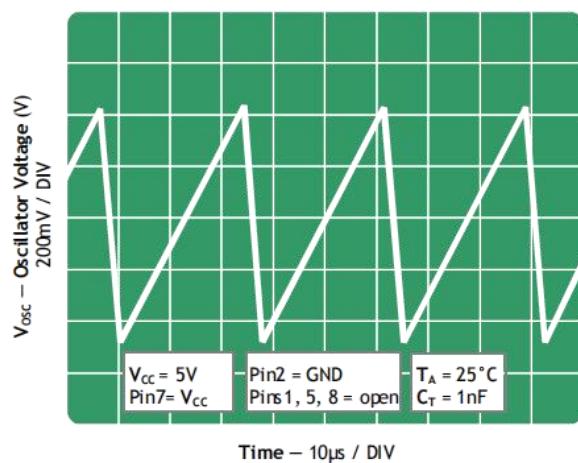
\* The  $100\Omega$  resistor in the emitter of the driver device requires about 7 mA before the output switch conducts.

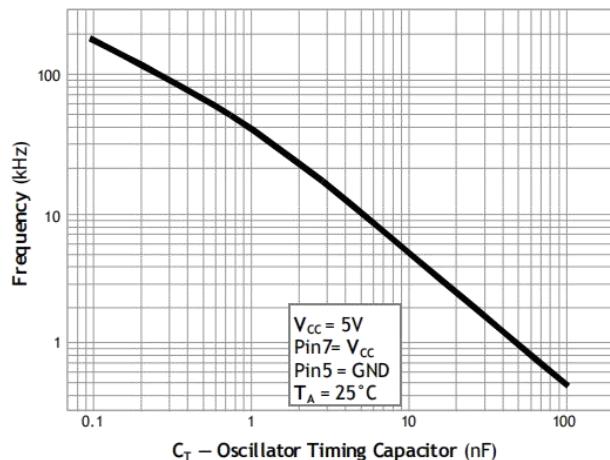
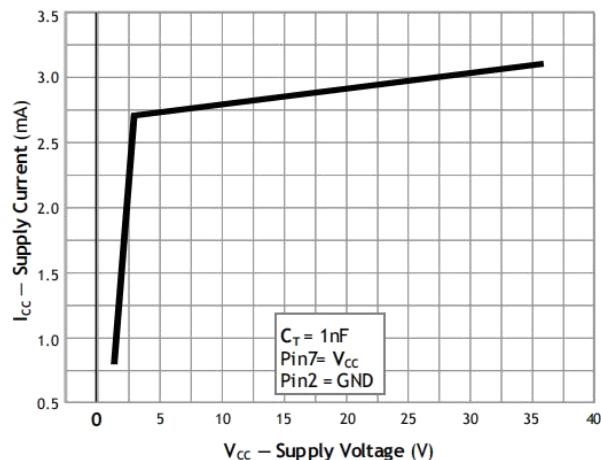
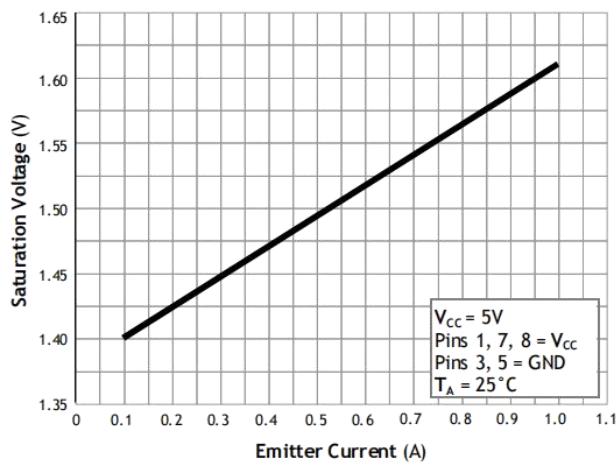
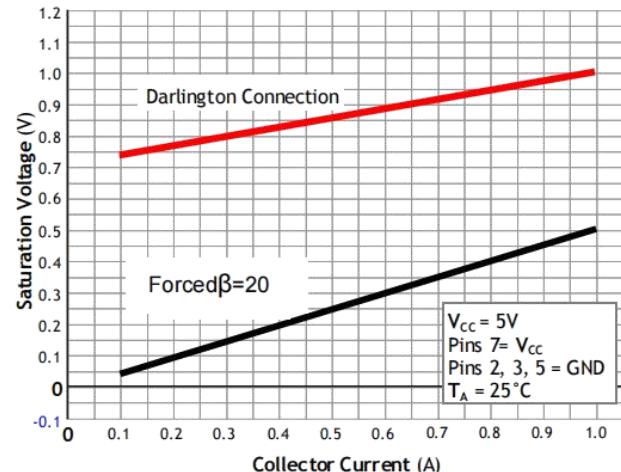
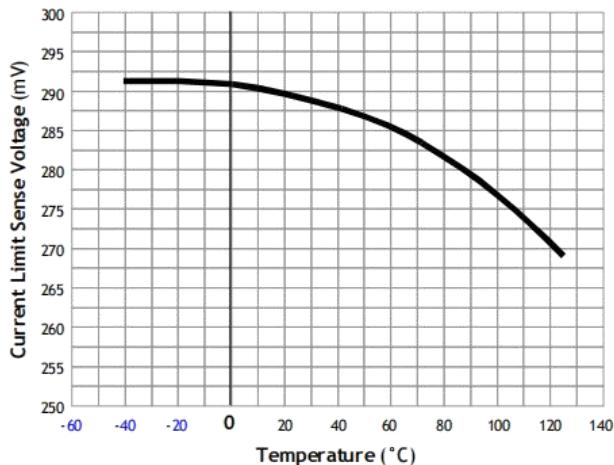
## TYPICAL PERFORMANCE CHARACTERISTICS

OUTPUT SWITCH ON-OFF TIME versus  
OSCILLATOR TIMING CAPACITOR



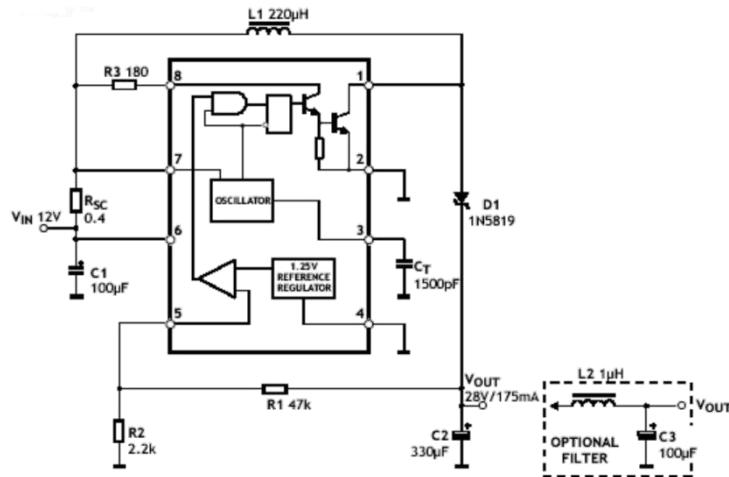
TIMING CAPACITOR WAVEFORM



**OSCILLATOR FREQUENCY versus TIMING CAPACITOR**

**STANDBY SUPPLY CURRENT versus SUPPLY VOLTAGE**

**EMITTER FOLLOWER CONFIGURATION  
OUTPUT SATURATION VOLTAGE vs.  
EMITTER CURRENT**

**COMMON Emitter Configuration Output  
Switch Saturation Voltage vs. COLLECTOR  
CURRENT**

**CURRENT LIMIT SENSE VOLTAGE  
versus TEMPERATURE**


## TYPICAL APPLICATIONS

### STEP-UP CONVERTER



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.

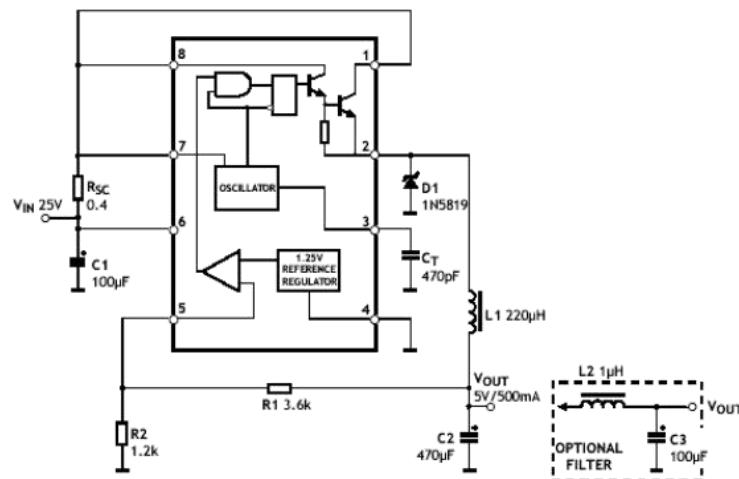
Then the output of the comparator will go high, the output switch will be allowed to conduct. Since

$$V_{pin5} = V_{OUT} * R2 / (R1 + R2) = 1.25(V),$$

the output voltage can be decided by

$$V_{OUT} = 1.25 * (R1 + R2) / R2 (V).$$

### STEP-DOWN CONVERTER



Note: It is recommended to use  $L=165\mu H$ ,  $C_t=1nF$ ,  $R_{CS}=0.2$  Ohm for Load Current 0.75A.

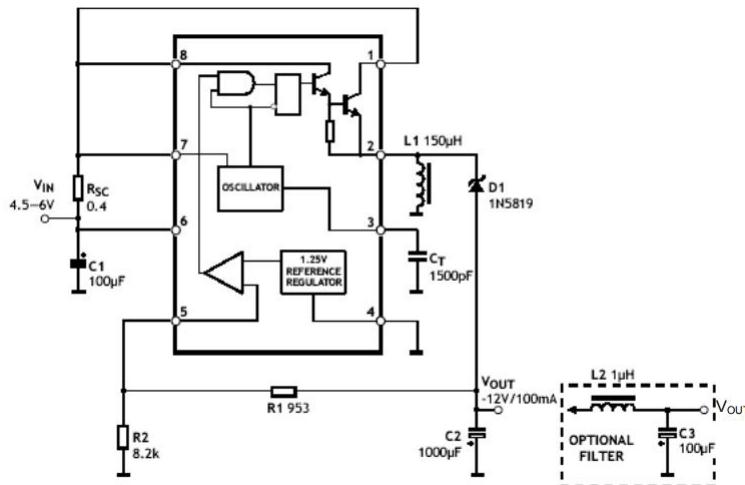
If  $R_{CS} \leq 0.2\Omega$  then the IC could be damaged (the short circuit of collector-emitter)

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

$$V_{OUT} = 1.25 * (R1 + R2) / R2 (V).$$

**VOLTAGE INVERTING CONVERTER**


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 noninverting pin of the comparator is equal to  $1.25V + V_{OUT}$ , then

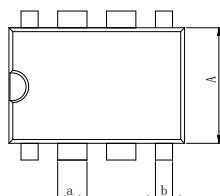
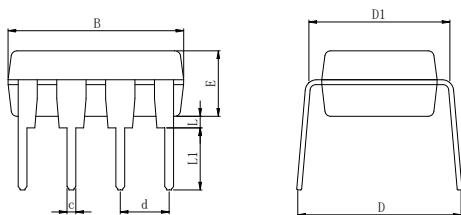
$$V_{pin5} = V_{OUT} * R2 / (R1 + R2) = 1.25V + V_{OUT},$$

so the output voltage can be decided by

$$V_{OUT} = -1.25 * (R1 + R2) / R1 (V).$$

## PHYSICAL DIMENSIONS

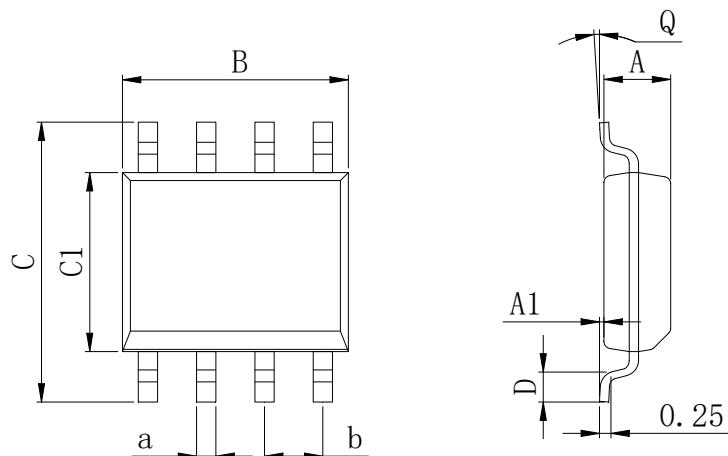
### DIP-8



Dimensions In Millimeters(DIP-8)

Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
<b>Min:</b>	6.10	9.00	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
<b>Max:</b>	6.68	9.50	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

### SOP-8



Dimensions In Millimeters(SOP-8)

Symbol:	A	A1	B	C	C1	D	Q	a	b
<b>Min:</b>	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
<b>Max:</b>	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

## REVISION HISTORY

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2012-9	New	1-12
V1.1	2023-8	Update encapsulation type、Update Lead Temperature	1、4

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