DC - DC Converter Control Circuit

DESCRIPTION

The GP34063 is designed for the applications which require DC - DC converters. It can be operated in a wide input range from 3.0V to 40V and has the controlled duty cycle oscillator, driver and high current output switch. Also, With the internal temperature compensation circuit, the GP34063 provides an internally trimmed precision 2% reference voltage of 1.25V. These features make the GP34063 suitable for step-down, step-up and voltage inverting applications.

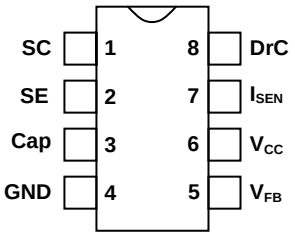
FEATURES

- **Wide Input Operating Range: 3.0V to 40V**
- **Output Switch Current up to 1.5A**
- **100KHz operational Frequency**
- **Low Standby Current**
- **Internally trimmed 2% 1.25V Reference Voltage**
- Adjustable Output Voltage
- Available in 8 Pin Plastic DIP and 8 Pin S.O Packages

APPLICATIONS

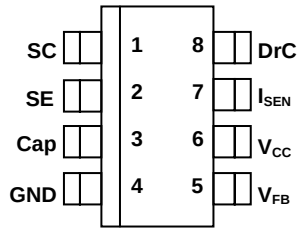
- Car Chargers
- Adaptors
- DC-DC converter
- Modem Power

PACKAGE PIN OUT



M

(TOP VIEW)



DM

(TOP VIEW)

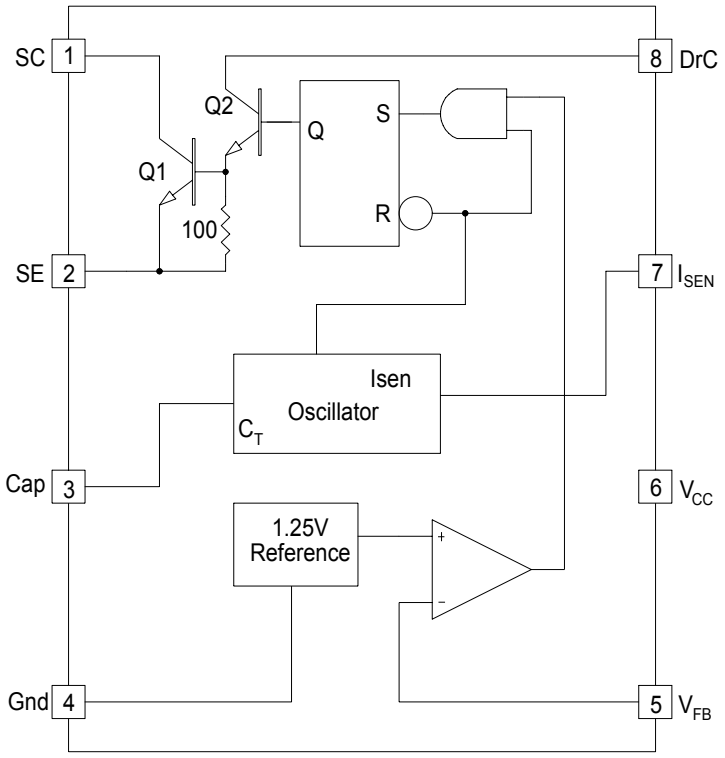
ORDER INFORMATION				
T_A (°C)	**M**	Plastic DIP 8-pin	**DM**	Plastic SO-8 8-pin
	GP34063M (Pb-Free)		GP34063DM (Pb-Free)	

Note: All surface-mount packages are available in Tape & Reel. Append the letter "T" to part number (i.e. GP34063DMT).

ABSOLUTE MAXIMUM RATINGS
Power Supply Voltage (V_{CC}) ……40V
Operating Junction temperature (M, DM Packages) …… 150 °C
Storage Temperature Range …… -65°C to 150°C
Lead temperature (Soldering, 10 seconds) ……300°C
Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

THERMAL DATA	
M PACKAGE:	
Power dissipation (P_D), T_A = 25 °C	1.31W
Thermal Resistance-Junction to Ambient, θ_{JA}	95°C /W
DM PACKAGE:	
Power dissipation (P_D), T_A = 25 °C	757mW
Thermal Resistance-Junction to Ambient, θ_{JA}	165°C /W

BLOCK DIAGRAM



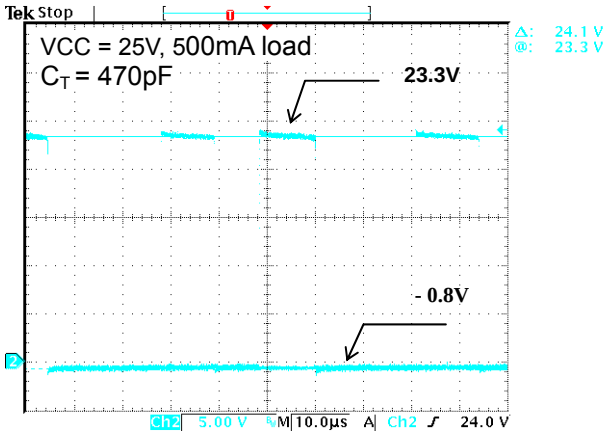
Pin Assignment Descriptions

Pin 1 : SC - Switch Collector	Pin 8 : DrC - Driver Collector
Pin 2 : SE - Switch Emitter	Pin 7 : I_{SEN} - I Peak Sense
Pin 3 : Cap - Oscillator Timing Capacitor	Pin 6 : V_{CC} - Power Supply
Pin 4 : GND - Ground	Pin 5 : V_{FB} - Comparator inverting input

RECOMMENDED OPERATING CONDITIONS					
Parameter	Symbol	Recommended			Units
		Min.	Typ.	Max.	
Comparator Input Voltage	V_{FB}	-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	$I_{C(driver)}$			100	mA
Switch Current	I_{SW}			1.5	A
Timing Capacitor (connected to Cap pin)	C_T		1		nF
Operating Ambient Temperature Range	T_A	0 to +70			°C

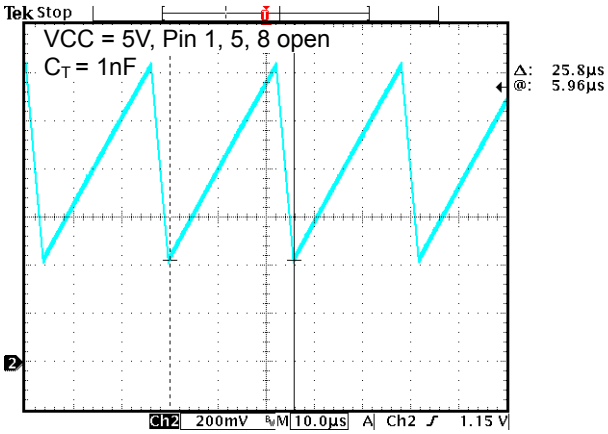
ELECTRICAL CHARACTERISTICS						
V_{CC}=5.0 V, T_A=0°C to 70°C, unless otherwise specified.						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
OSCILLATOR						
Frequency	f_{osc}	$V_{Pin\ 5}$ = 0V, C_T = 1.0nF, T_A = 25°C	24	33	42	KHz
Charge Current	I_{chg}	V_{CC} = 5.0 V to 40 V, T_A = 25°C	24	35	42	µA
Discharge Current	I_{dischg}	V_{CC} = 5.0 V to 40 V, T_A = 25°C	140	220	260	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_{sense}	I_{chg} = I_{dischg}, T_A = 25°C	250	300	350	mV
OUTPUT SWITCH						
Saturation Voltage, Darlington Connection	$V_{CE(sat)}$	I_{SW} = 1.0 A, Pins 1, 8 connected	-	1.0	1.3	V
Saturation Voltage	$V_{CE(sat)}$	I_{SW} = 1.0 A, $R_{pin\ 8}$ =82 Ω to V_{CC}, Forced β = 20	-	0.45	0.7	V
DC Current Gain	h_{FE}	I_{SW} = 1.0 A, V_{CE} = 5.0 V, T_A = 25°C	50	75	-	-
Collector Off–State Current	$I_{C(off)}$	V_{CE} = 40 V	-	0.01	100	µA
COMPARATOR						
Threshold Voltage	V_{th}	T_A = 25°C	1.225	1.25	1.275	V
		T_A =0°C to 70°C	1.21	-	1.29	
Threshold Voltage Line Regulation	Reg_{line}	V_{CC} = 3.0 V to 40 V	-	1.4	5.0	mV
Input Bias Current	I_{IB}	V_{FB} = 0 V	-	-20	-400	nA
TOTAL DEVICE						
Supply current	I_{CC}	V_{CC} = 5.0 V to 40 V, C_T = 1.0nF, Pin 7 = V_{CC}, V_{FB} > V_{th}, Pin 2= GND, remaining pins open	-	-	4.0	mA

CHARACTERIZATION CURVES

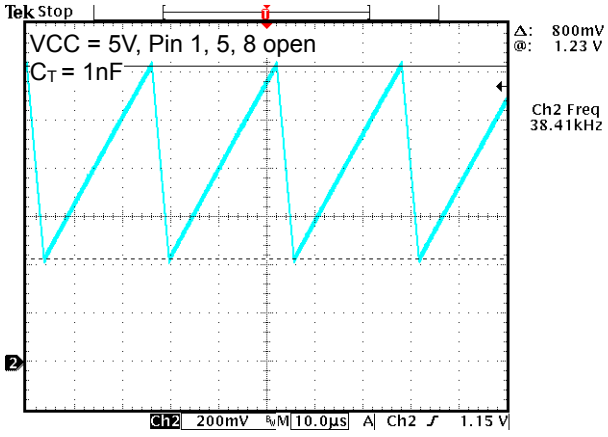


SE pin (PIN#2) waveform

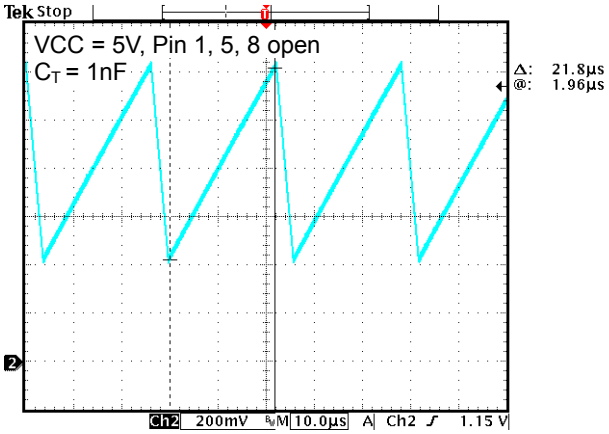
on 5V step down converter



Cap pin (PIN#3) waveform



Cap pin (PIN#3) waveform



Cap pin (PIN#3) waveform

Figure 1 – Step-Up Converter Application Circuits

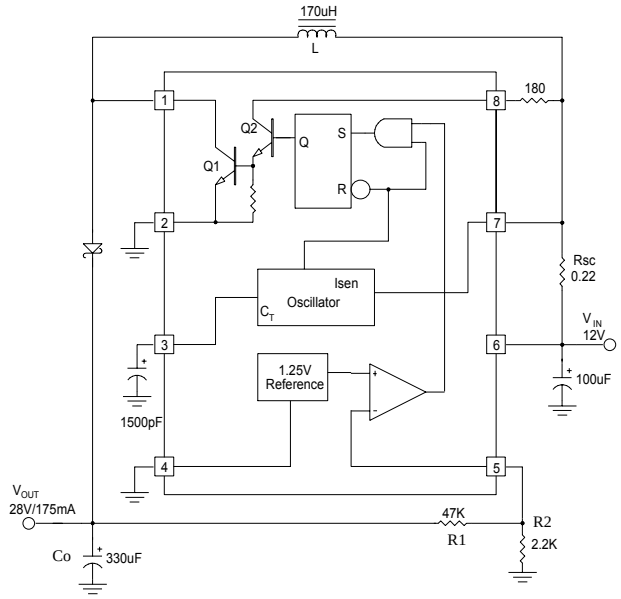


Figure 2 – Step-Down Converter Application Circuit

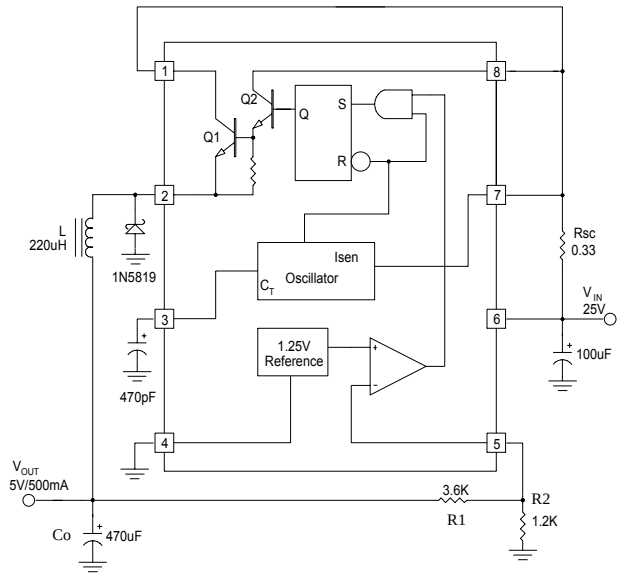
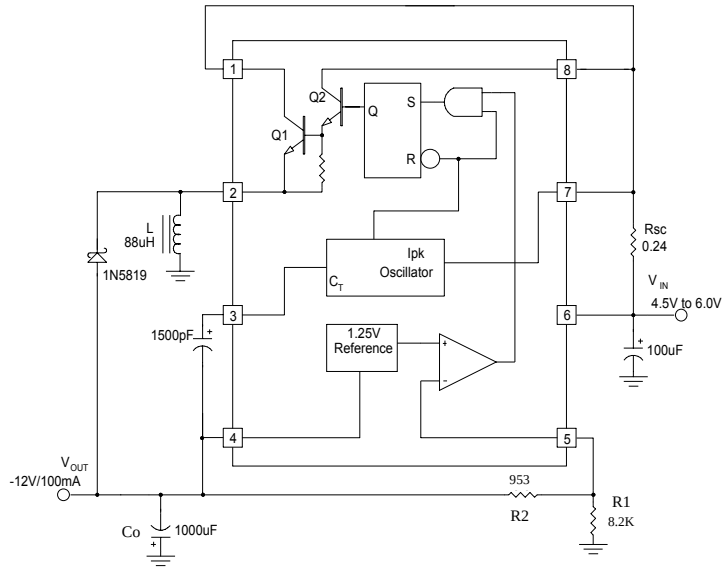


Figure 3 – Voltage Inverting Converters



Note: For step-down, step-up or voltage inverting applications requiring peak current greater than 1.5A, external boost current circuitry by NPN or PNP transistors can be used.

Typical Design Reference Table:

Calculation	Step-Down	Step-Up	Voltage-Inverting
t_{on}/t_{off}	$\frac{V_{out} + V_F}{V_{in(min)} - V_{sat} - V_{out}}$	$\frac{V_{out} + V_F - V_{in(min)}}{V_{in(min)} - V_{sat}}$	$\frac{V_{out} + V_F}{V_{in} - V_{sat}}$
$t_{on} + t_{off}$	$\frac{1}{f}$	$\frac{1}{f}$	$\frac{1}{f}$
t_{off}	$\frac{t_{on} + t_{off}}{t_{on}/t_{off} + 1}$	$\frac{t_{on} + t_{off}}{t_{on}/t_{off} + 1}$	$\frac{t_{on} + t_{off}}{t_{on}/t_{off} + 1}$
t_{on}	$(t_{on} + t_{off}) - t_{off}$	$(t_{on} + t_{off}) - t_{off}$	$(t_{on} + t_{off}) - t_{off}$
C_T	$4.0 \times 10^{-5}\ t_{on}$	$4.0 \times 10^{-5}\ t_{on}$	$4.0 \times 10^{-5}\ t_{on}$
$I_{pk(switch)}$	$2I_{out(max)}$	$2I_{out(max)}\ (t_{on}/t_{off} + 1)$	$2I_{out(max)}\ (t_{on}/t_{off} + 1)$
R_{SC}	$0.3/I_{pk(switch)}$	$0.3/I_{pk(switch)}$	$0.3/I_{pk(switch)}$
$L_{(min)}$	$\left(\frac{(V_{in(min)} - V_{sat} - V_{out})}{I_{pk(switch)}}\right) t_{on(max)}$	$\left(\frac{(V_{in(min)} - V_{sat})}{I_{pk(switch)}}\right) t_{on(max)}$	$\left(\frac{(V_{in(min)} - V_{sat})}{I_{pk(switch)}}\right) t_{on(max)}$
C_O	$\frac{I_{pk(switch)}(t_{on} + t_{off})}{8V_{ripple(pp)}}$	$9\frac{I_{out}\ t_{on}}{V_{ripple(pp)}}$	$9\ \frac{I_{out}\ t_{on}}{V_{ripple(pp)}}$

V_F: Forward Voltage drop of the output rectifier
V_{sat}: Saturation voltage of the output switch transistor.

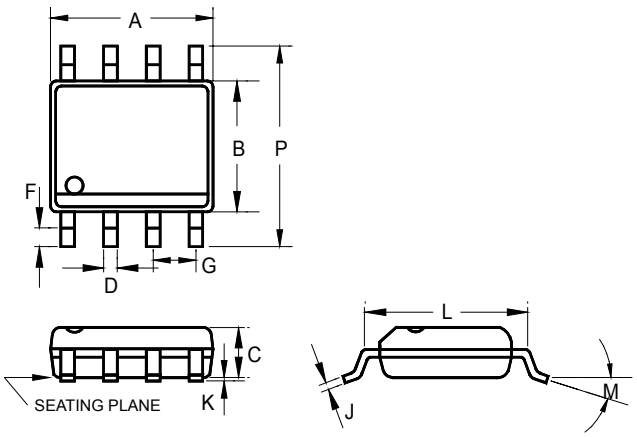
The following power supply characteristics should be chosen:

V_{in} - Nominal input voltage
V_{out} - Desired output voltage, $V_{out} = 1.25(1 + R1/R2)$
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.

Application concerns:

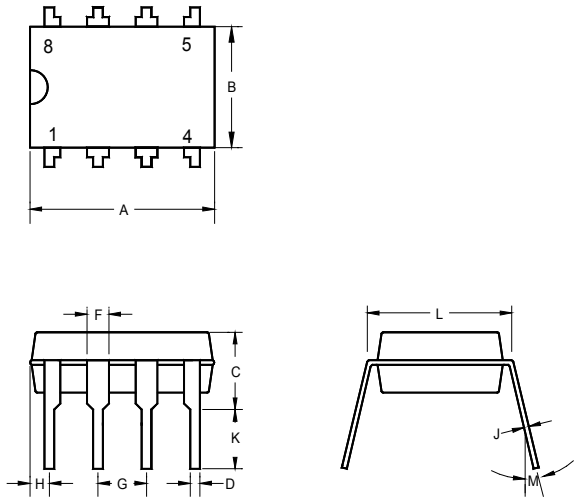
To get the best regulation performance, suggest select Low ESR capacitor at Vout node.

8-Pin Plastic SO



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.183	-	0.202	4.65	-	5.13
B	0.144	-	0.163	3.66	-	4.14
C	0.068	-	0.074	1.35	-	1.88
D	0.010	-	0.020	0.25	-	0.51
F	0.015	-	0.035	0.38	-	0.89
G	0.050 BSC			1.27 BSC		
J	0.007	-	0.010	0.19	-	0.25
K	0.005	-	0.010	0.13	-	0.25
L	0.189	-	0.205	4.80	-	5.21
M	-	-	8°	-	-	8°
P	0.228	-	0.244	5.79	-	6.20

8-Pin Plastic DIP



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.355	0.365	0.400	9.02	9.27	10.16
B	0.240	0.250	0.280	6.10	6.35	7.11
C	-	-	0.210	-	-	5.33
D	-	0.018	-	-	0.46	-
F	-	0.060	-	-	1.52	-
G	-	0.100	-	-	2.54	-
H	0.050	-	0.090	1.27	-	2.29
J	0.008	-	0.015	0.20	-	0.38
K	0.115	0.130	0.150	2.92	3.30	3.81
L	0.300 BSC.			7.62 BSC.		
M	-	7°	15°	-	7°	15°

Note: For 8-pin Plastic package, 60 units per tube

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