

BM34063

DC-DC CONVERTER

Features

- 3V to 40V Input Voltage Operation
- Internal 1.6A Peak Current Switch
- Internal $\pm 1.8\%$ Reference
- Low Quiescent Current at 1.6mA
- Frequency Operation from 100Hz~100KHz
- Output Voltage Adjustable
- Active Current Limiting
- Step-Up, Step-Down or Inverting Switching Regulators

Description

The BM34063 Series is a monolithic control circuit containing the primary functions required for DC-to-DC converters. These devices consist of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch.

Pin Assignment

DIP/SOP-8				Pin1: Switch Collector (SWC)	Pin5: Comparator Inverting Input (FB)
1	SWC	DRC	8	Pin2: Switch Emitter (SWE)	Pin6: Voltage Supply (Vcc)
2	SWE	IpK	7	Pin3: Timing Capacitor (TC)	Pin7: IpK Sense (IpK)
3	TC	VCC	6	Pin4: Ground (GND)	Pin8: Voltage Driver Collector (DRC)
4	GND	FB	5		

Ordering Information

Part Number	Package
BM34063HP	DIP-8
BM34063HS	SOP-8

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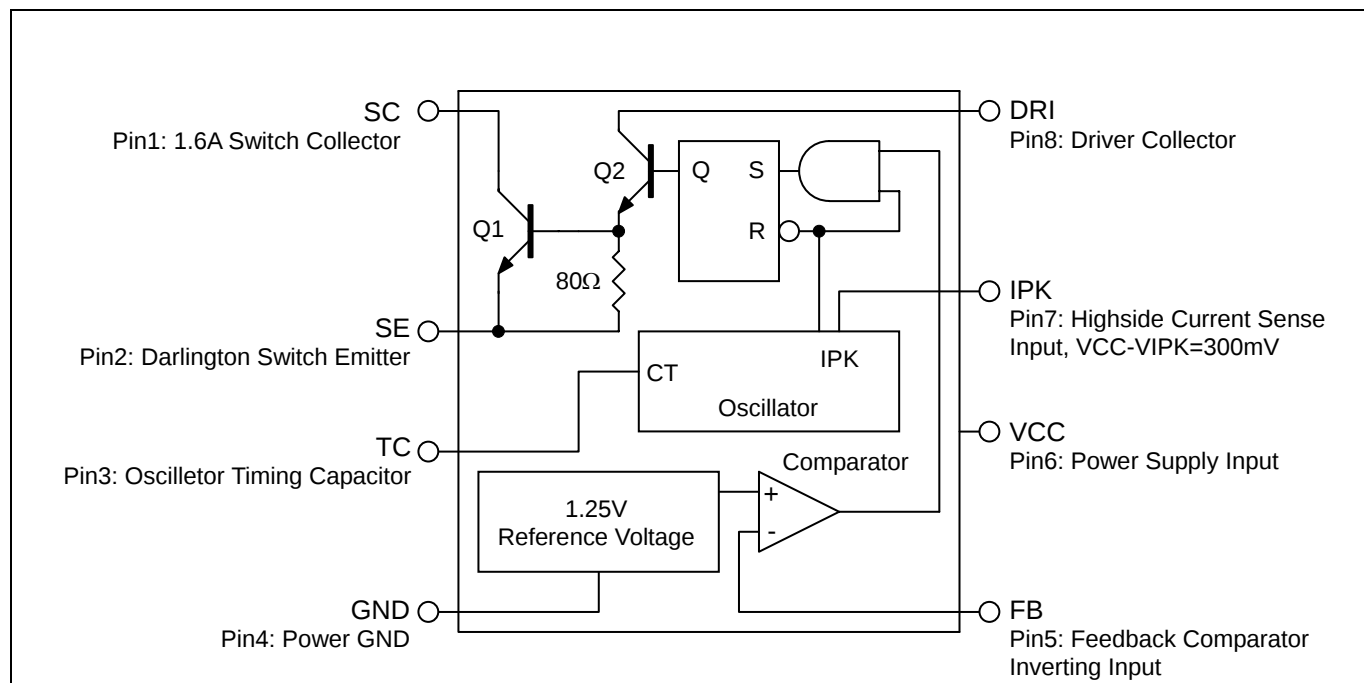
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Absolute Maximum Ratings

(Ta=25°C, Unless Otherwise Specified)

Parameter	Symbol	Value		Unit
Power Supply Voltage	V_{CC}	40		V
Comparator Input Voltage Range	V_{ir}	-0.3~+40		V
Switch Collector Voltage	$V_{C(SW)}$	40		V
Switch Emitter Voltage	V_{SWE}	40		V
Switch Emitter to Collector Voltage	V_{CE}	40		V
Driver Collector Voltage	$V_{C(DR)}$	40		V
Switch Current	I_{SW}	1.5		A
Power Dissipation at Ta=25°C	P_D	DIP-8	1	W
		SO-8	0.625	
Operating Ambient Temperature Range	T_{opr}	0~+70		°C
Storage Temperature Range	T_{stg}	-65~+150		°C
Operating Junction Temperature	T_{opj}	120		°C
Thermal Resistance Junction-ambient	θ_{JA}	125		°C/W

Block Diagram



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Electrical Characteristics (V_{CC}=5V, Ta=0~70°C, unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<i>Oscillator</i>						
Charging Current	I _{chg}	V _{CC} =5~40V, Ta=25°C	10	25	40	uA
Discharge Current	I _{dischg}	V _{CC} =5~40V, Ta=25°C	140	190	240	uA
Frequency	f _{OSC}	V _{PIN5} =0, C _T =1nF, Ta=25°C	28	33	40	KHz
Discharge to Charge Current Ratio	I _{dischg} /I _{chg}	V _{PIN7} =V _{CC} , Ta=25°C	5.2	6	7.5	
Current Limit Sense Voltage	V _{IPK}	I _{dischg} =I _{chg} , Ta=25°C	250	300	350	mV
<i>Output Switch</i>						
Saturation Voltage, Darlington Connection	V _{CE(sat)} 1	I _{SW} =1A, V _{C(SW)} =V _{C(DR)}	-	1	1.3	V
Saturation Voltage	V _{CE(sat)} 2	I _{SW} =1A, I _{C(DR)} =50mA	-	0.4	0.7	V
DC Current Gain	h _{FE}	I _{SW} =1A, V _{CE} =5V	35	120	-	
Collector Off-State Current	I _{CC(off)}	V _{CE} =40V, Ta=25°C	-	10	100	uA
<i>Comparator</i>						
Threshold Voltage	V _{FB}		1.23	1.25	1.27	V
Threshold Voltage Line Regulation	ΔV _{FB}	V _{CC} =5~40V	-	1.5	6	mV
Input Bias Current	I _{IB}	V _{IN} =0V	-	40	400	nA
<i>Total Device</i>						
Supply Current	I _{CC}	V _{CC} =5~40V, V _{PIN7} =V _{CC} , V _{PIN5} >V _{FB} , C _T =0.001uF, Pin7=GND, Remaining pins open	-	1.6	3	mA

Application Information

Design Formula Table

Calculation	Step-Down	Step-Up	Voltage-Inverting
t _{on} /t _{off}	(V _{out} +V _F)/(V _{in(min)} -V _{sat} -V _{out})	(V _{out} +V _F -V _{in(min)})/(V _{in(min)} -V _{sat})	(V _{out} +V _F)/(V _{in(max)} -V _{sat})
(t _{on} +t _{off}) max	1/F _{min}	1/F _{min}	1/F _{min}
C _T	4*10 ⁻⁵ t _{on}	4*10 ⁻⁵ t _{on}	4*10 ⁻⁵ t _{on}
I _{C(sw)}	2*I _{out(max)}	2*I _{out(max)} (t _{on} +t _{off} /t _{off})	2*I _{out(max)} (t _{on} +t _{off} /t _{off})
R _S	0.3/I _{C(sw)}	0.3/I _{C(sw)}	0.3/I _{C(sw)}
L _(min)	(V _{in(min)} -V _{sat} /I _{pk(sw)})*t _{on(max)}	(V _{in(min)} -V _{sat} /I _{pk(sw)})*t _{on(max)}	(V _{in(min)} -V _{sat} /I _{pk(sw)})*t _{on(max)}
C _O	(I _{pk(sw)} *(t _{on} +t _{off}))/(8*V _{ripple(P-P)})	I _{out} *t _{on} /V _{ripple(P-P)}	I _{out} *t _{on} /V _{ripple(P-P)}

V_{sat}: Saturation voltage of the output switch.

V_F: Forward voltage drop of the ringback rectifier.

The following power supply characteristics must be chosen:

V_{in}: Nominal input voltage.

V_{out}: Desired output voltage. |V_{out}|=1.25*(1+RB/RA)

I_{out}: Desired output current

F_{min}: Minimum desired output switching frequency at the selected values for V_{in} and I_{out}.

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

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Application Information (Continued)

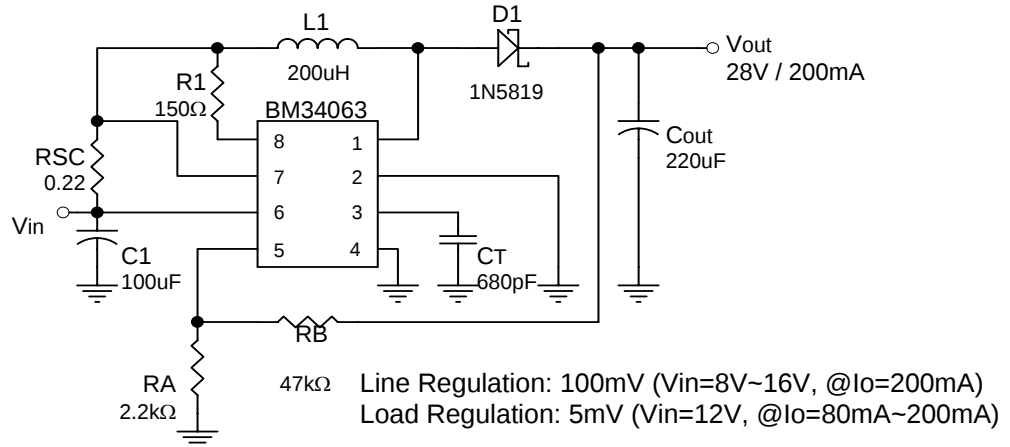


Fig.2 Step-Up Converter

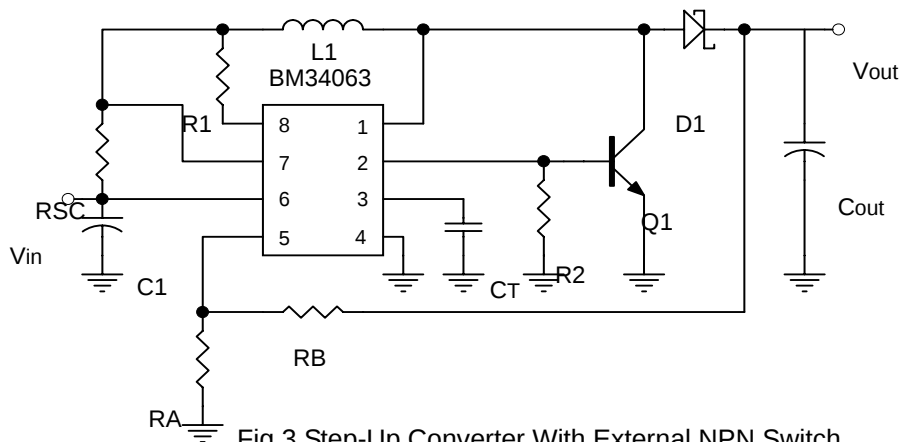


Fig.3 Step-Up Converter With External NPN Switch

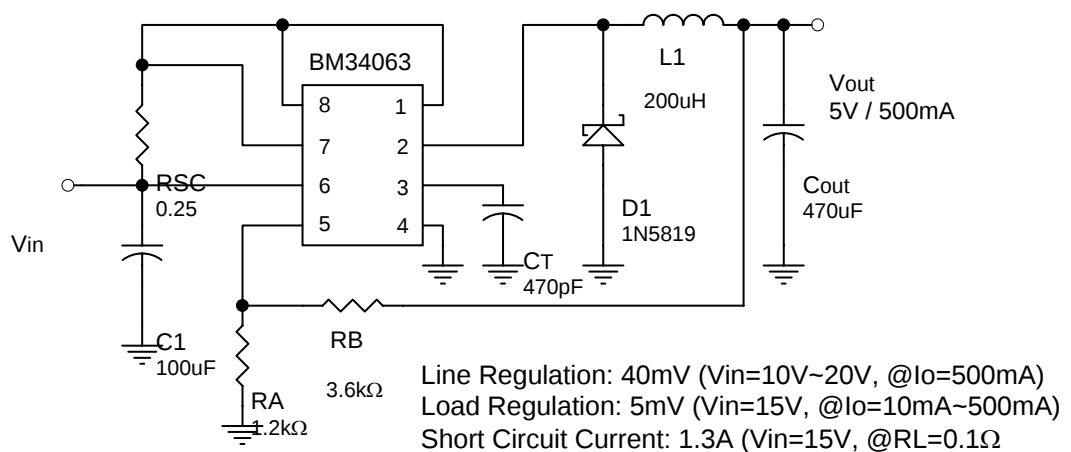


Fig.4 Step-Down Converter

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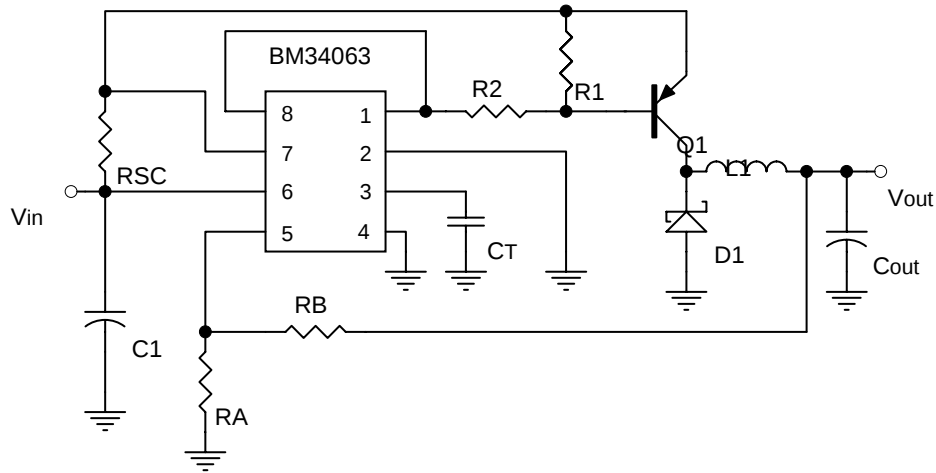


Fig.5 Step-Down Converter With External PNP Saturation Switch

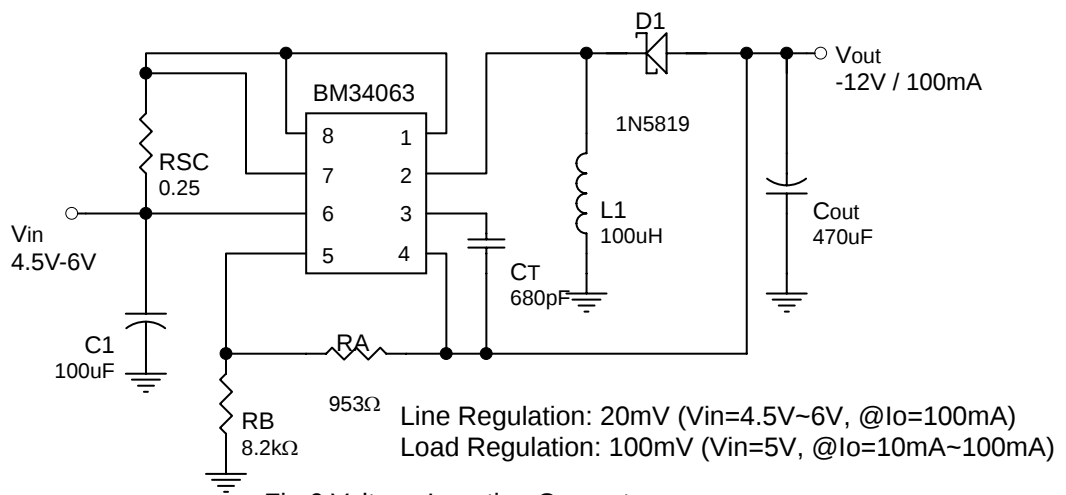


Fig.6 Voltage Inverting Converter

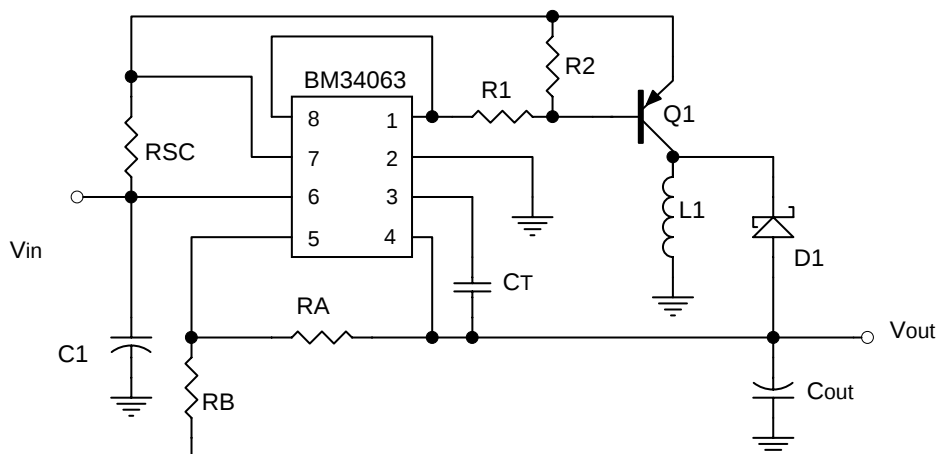
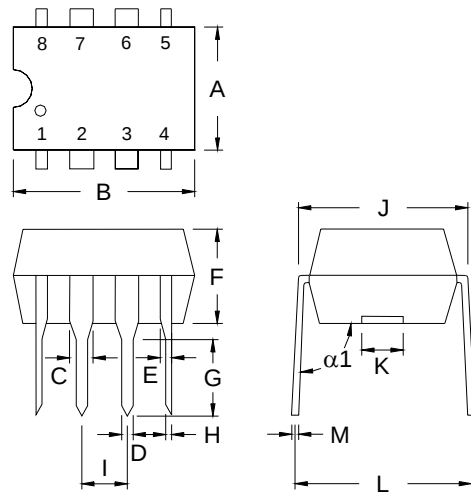


Fig.7 Voltage Inverting Converter With External PNP Saturation Switch

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DIP-8 (P) Dimension

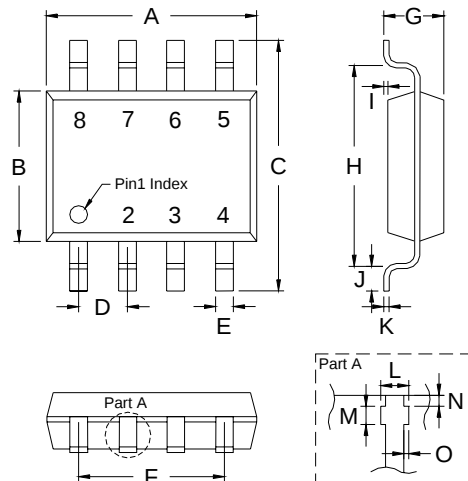


DIM	Min.	Max.
A	6.29	6.40
B	9.22	9.32
C	-	*1.52
D	-	*1.27
E	-	*0.99
F	3.25	3.35
G	3.17	3.55
H	0.38	0.53
I	2.28	2.79
J	7.49	7.74
K	-	*3.00
L	8.56	8.81
M	0.229	0.381
α1	94°	97°

*: Typical, Unit: mm

8-Lead DIP-8
Plastic Package

SOP-8 (S) Dimension



DIM	Min.	Max.
A	4.85	5.10
B	3.85	3.95
C	5.80	6.20
D	1.22	1.32
E	0.37	0.47
F	3.74	3.88
G	1.45	1.65
H	4.80	5.10
I	0.05	0.20
J	0.30	0.70
K	0.19	0.25
L	0.37	0.52
M	0.23	0.28
N	0.08	0.13
O	0.00	0.15

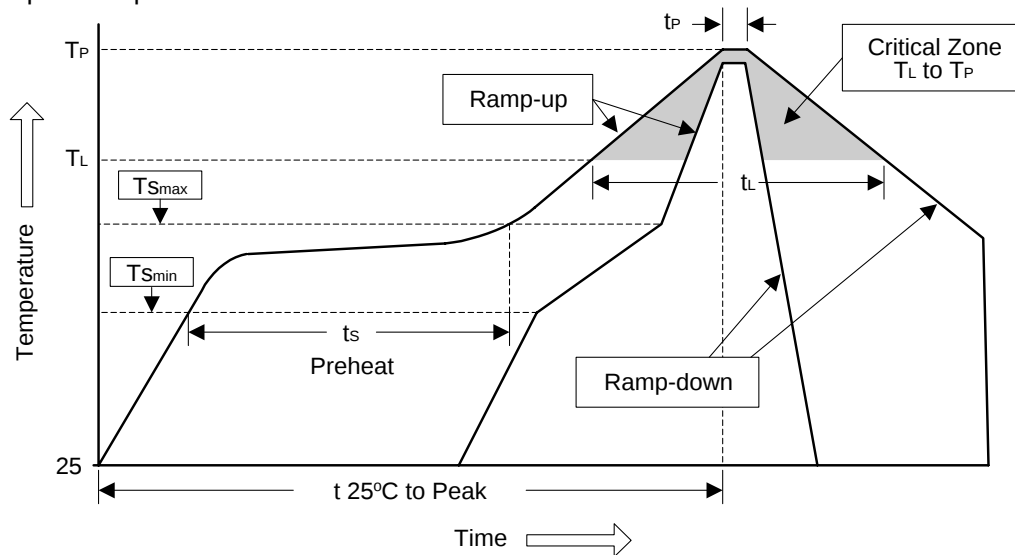
*: Typical, Unit: mm

8-Lead SO-8 Plastic
Surface Mounted Package

Soldering Methods

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T_{Smin})	100°C	150°C
- Temperature Max (T_{Smax})	150°C	200°C
- Time (min to max) (t_s)	60~120 sec	60~180 sec
T_{Smax} to T_L		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (T_L)	183°C	217°C
- Time (t_L)	60~150 sec	60~150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_p)	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec