

DC-to-DC Converter Control Circuit

MC34063AQ8

Description

The MC34063AQ8 is a monolithic control circuit containing the primary functions required for DC-to-DC converters. This device consists of an internal temperature compensated reference, comparator, control- led duty cycle oscillator with an active current limit circuit, driver and high current output switch.

Features

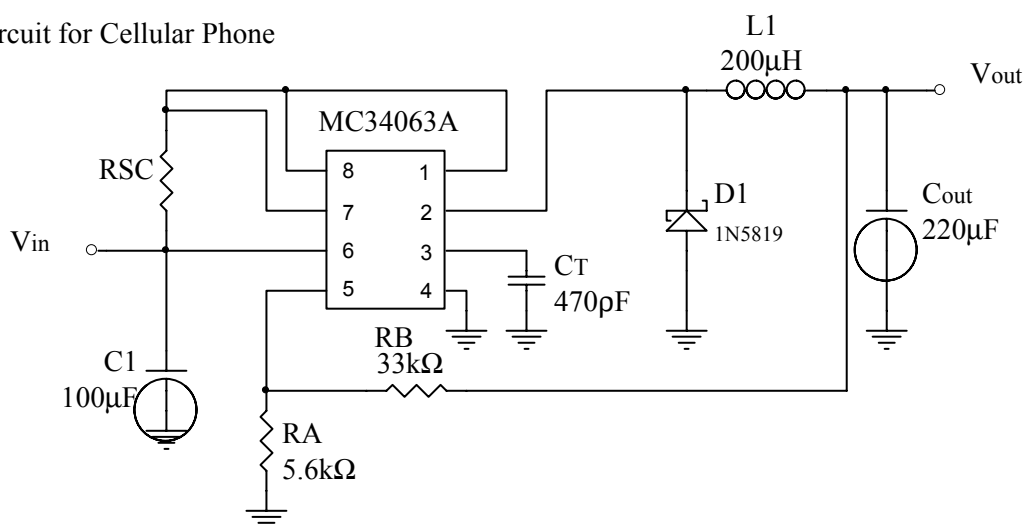
- 3V to 40V Input Voltage Operation
- Internal 1.6A Peak Current Switch
- Internal $\pm 1.8\%$ Reference
- Low Quiescent Current at 1.6mA
- Frequency Operation from 100Hz~100KHz
- Current Limiting

Applications

- Saver for Cellular Phone
- DC-DC Converter Module

Typical Application Circuit

Fig1.Saver Circuit for Cellular Phone





Pin Connections

	Pin1:Switch Collector	Pin5:Comparator Inverting Input
	Pin2:Switch Emitter	Pin6:Vcc
	Pin3:Timing Capacitor	Pin7:Ipk Sense
	Pin4:Gnd	Pin8:Driver Collector

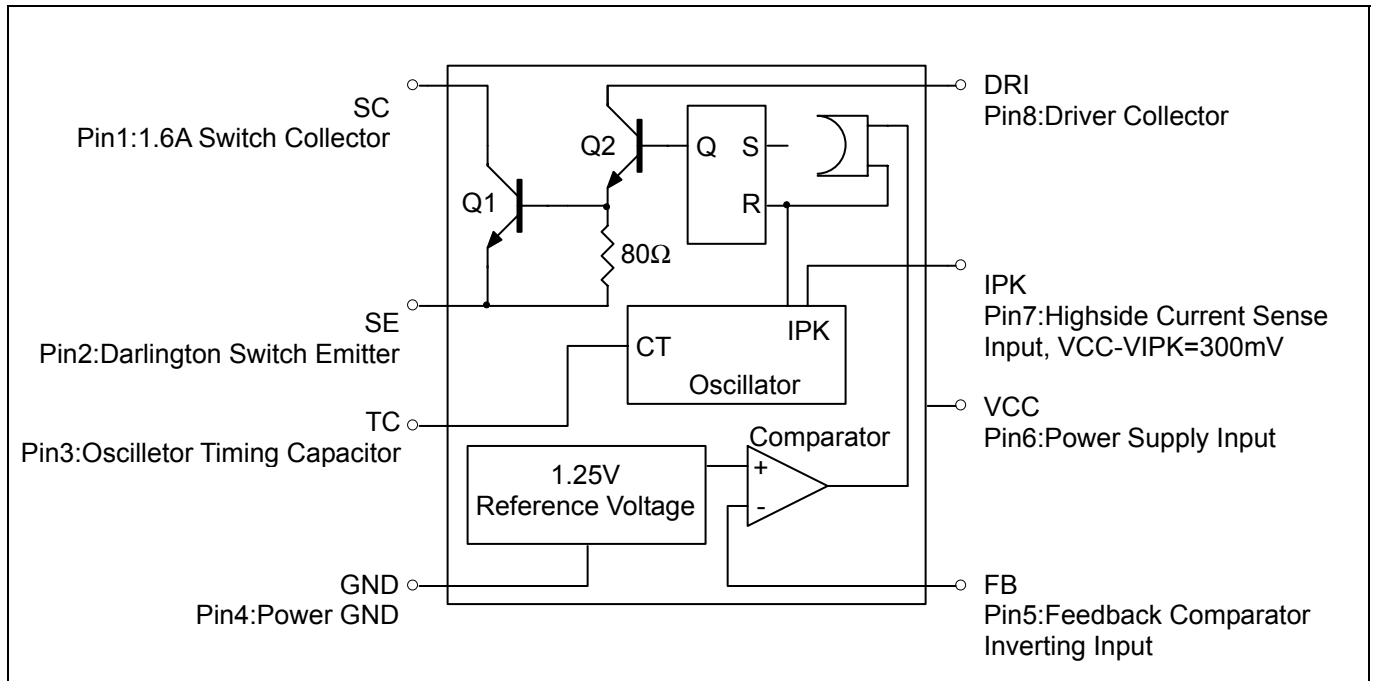
Absolute Maxium Rating

Supply Voltage	40 V
Comparator Input Voltage Range	-0.3 V ~ 40 V
Switch Collector Voltage	40 V
Switch Emitter Voltage	40 V
Switch Collector to Emitter Voltage	40 V
Driver Collector Voltage	40 V
Switch Current	1.6A
Power Dissipation DIP Package Ta=25°C.....	625 mW
Thermal Resistance Junction to Air	160 °C / W
Operating Junction Temperature.....	125 °C
Operating Ambient Temperature Range	0 ~ 70 °C
Storage Temperature Range.....	-40 °C ~ 125 °C

Electrical Characteristics (Vcc=5V,Ta=25°C, unless otherwise specified)

Parameter	Test Condition	Symbol	Min.	Typ.	Max.	Unit
Oscillator						
Charging Current	5.0V≤VCC≤40V	I _{chg}	24	35	42	uA
Discharge Current	5.0V≤VCC≤40V	I _{dischg}	140	220	260	uA
Voltage Amplitude	Pin3	V _{OSC}	-	0.6	-	V
Discharge to Charge Current Ratio	V _{IPK} (Sense) =VCC	I _{Dischg} /I _{chg}	5.2	6.5	7.5	
Current Limit Sense Voltage	I _{chg} =I _{dischg}	V _{IPK} (Sence)	250	300	350	mV
Output Switch						
Saturation Voltage, Darlington Connection	I _{SW} =1.0A, V _C (Driver)=V _C (Switch)	V _{CE} (Sat)	-	1.0	1.3	V
Saturation Voltage	I _{SW} =1.0A, I _C (Driver)=50mA (Forced β ≈ 20)	V _{CE} (Sat)	-	0.4	0.7	V
DC Current Gain	I _{SW} =1.0A, V _{CE} =5.0V	h _{FE}	50	75	-	V
Collector Off-State Current	V _{CE} =40V	I _{CC} (Off)	-	0.01	100	uA
Comparator						
Threshold Voltage	0°C≤Ta≤70°C	V _{FB}	1.227	1.250	1.273	V
Threshold Voltage			1.210	-	1.29	
Threshold Voltage Line Regulation	3.0V≤VCC≤40V	Regline	-	1.5	6	mV
Input Bias Current	V _{IN} =0V	I _{IB}	-	-20	-400	nA
Supply Current	V _{IPK} (Sence)=VCC V _{Pin5} >V _{FB} , 5.0V≤VCC≤40V C _T =0.0001uF,Pin2=Gnd Remaining pins open	I _{CC}	-	1.6	3	mA

Block Diagram



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}-V_{sat}$
$(t_{on} + t_{off})_{max}$	$1/F_{min}$	$1/F_{min}$	$1/F_{min}$
CT	$4*10^{-5}t_{on}$	$4*10^{-5}t_{on}$	$4*10^{-5}t_{on}$
IC(switch)	$2*I_{out(max)}$	$2*I_{out(max)}(t_{on}+t_{off}/t_{off})$	$2*I_{out(max)}(t_{on}+t_{off}/t_{off})$
RS	$0.3 / IC(switch)$	$0.3 / IC(switch)$	$0.3 / IC(switch)$
L(min)	$(V_{in(min)}-V_{sat}-V_{out} / IC(switch)) * t_{on(max)}$	$(V_{in(min)}-V_{sat} / IC(switch)) * t_{on(max)}$	$(V_{in(min)}-V_{sat} / IC(switch)) * t_{on(max)}$
Co	$IC(switch)*(t_{on}+t_{off}) / 8V_{Ripple(P-P)}$	$I_{out}*t_{on} / V_{Ripple(P-P)}$	$I_{out}*t_{on} / V_{Ripple(P-P)}$

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. $|V_{out}|=1.25*(1+R_B/R_A)$

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.

Application Information (Continued)

Fig.2 Step-Up Converter

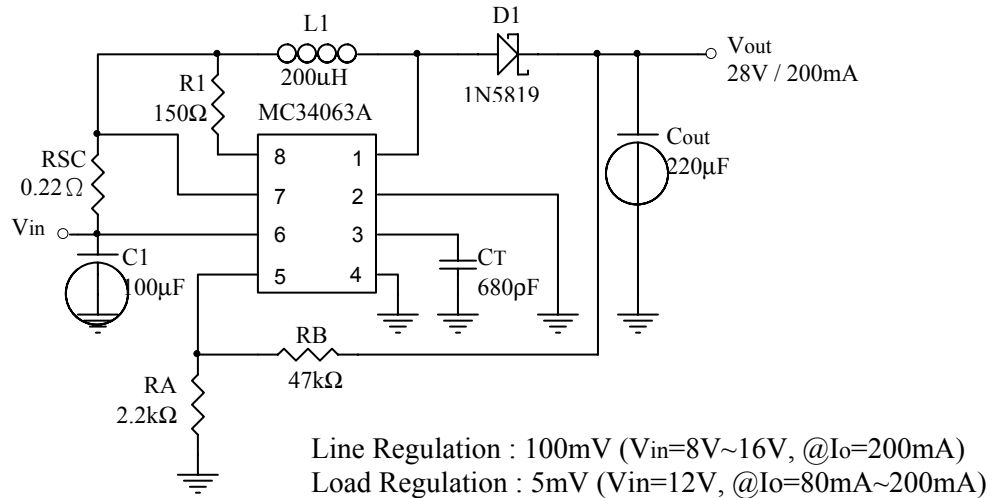


Fig.3 Step-Up Converter With External NPN Switch

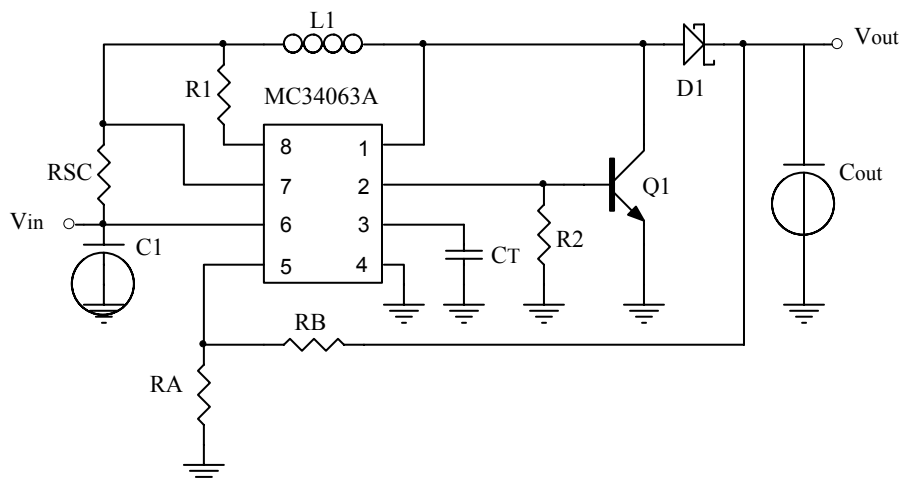
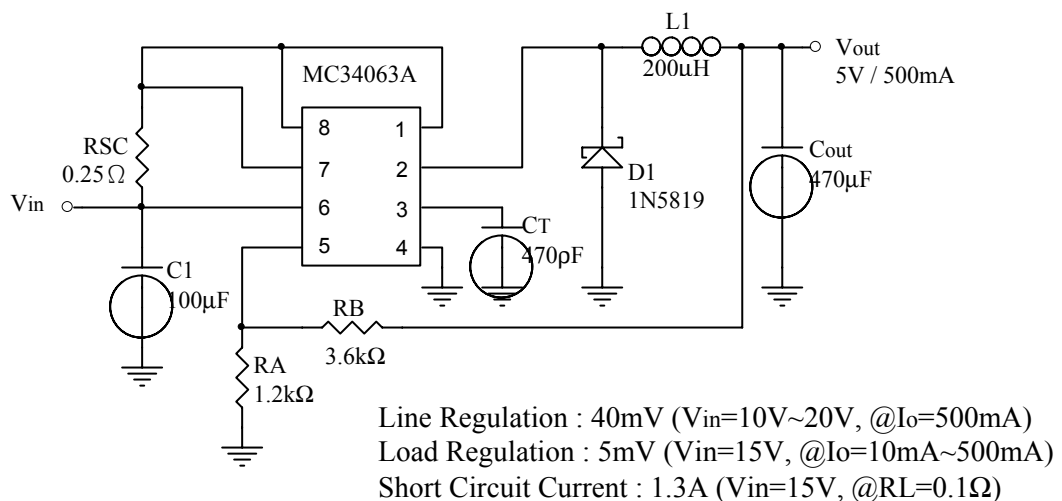


Fig.4 Step-Down Converter



Application Information (Continued)

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

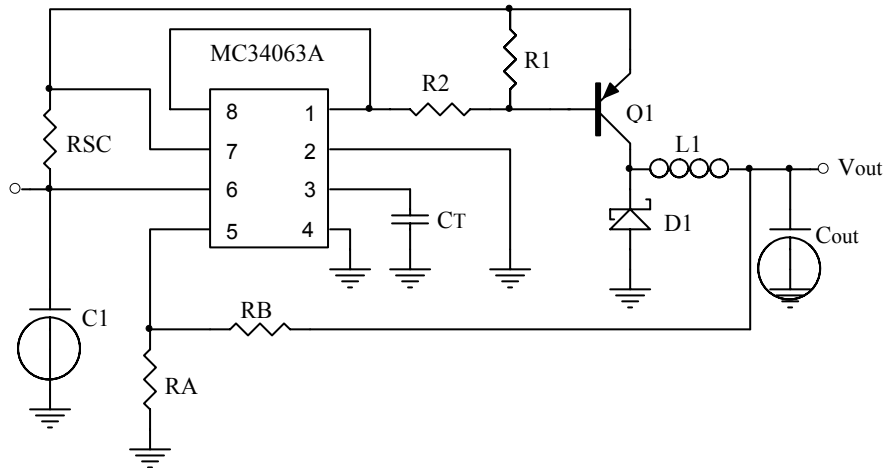


Fig.6 Voltage Inverting Converter

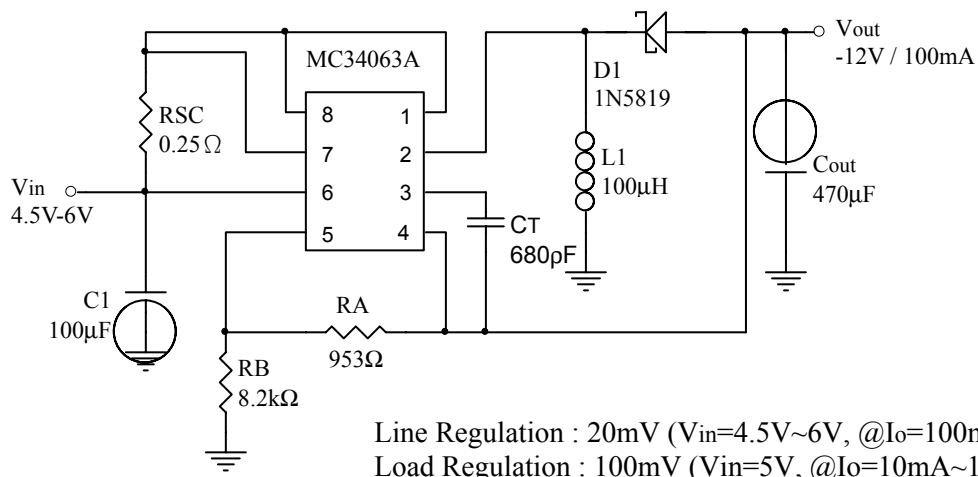
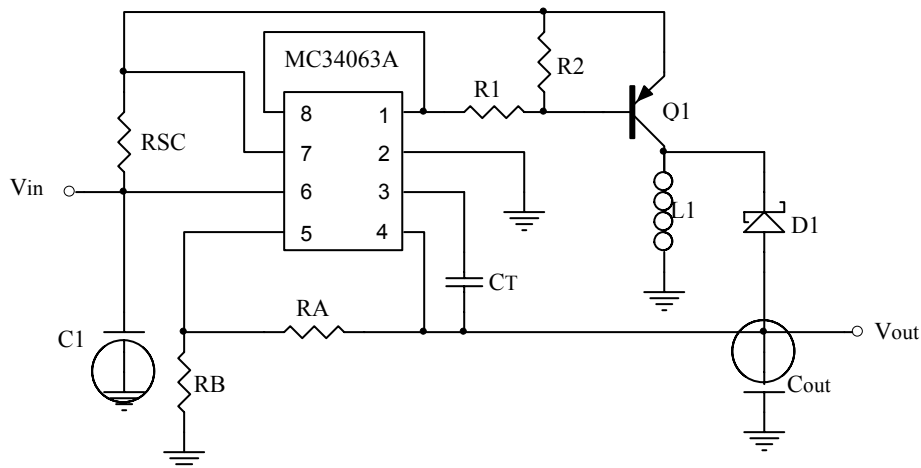


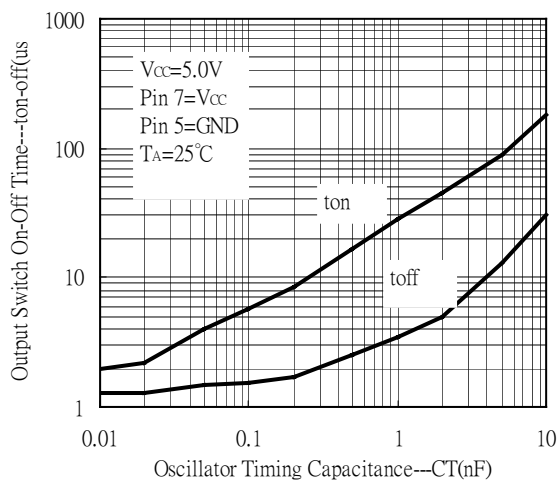
Fig.7 Voltage Inverting Converter With External PNP Saturation Switch



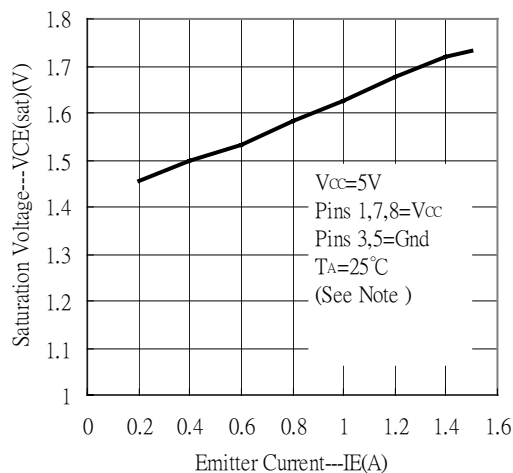


Characteristic Curves

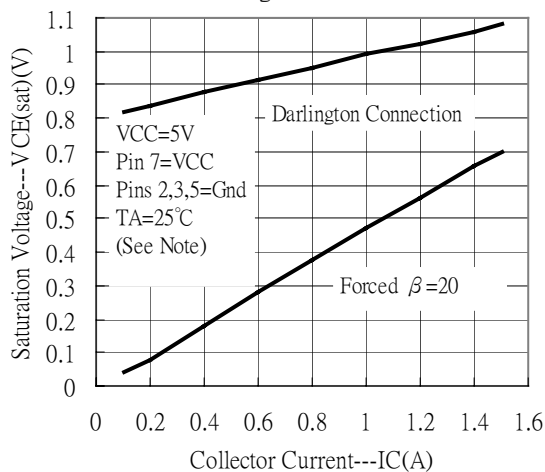
Output Switch On-Off Time vs Oscillator Timing Capacitance



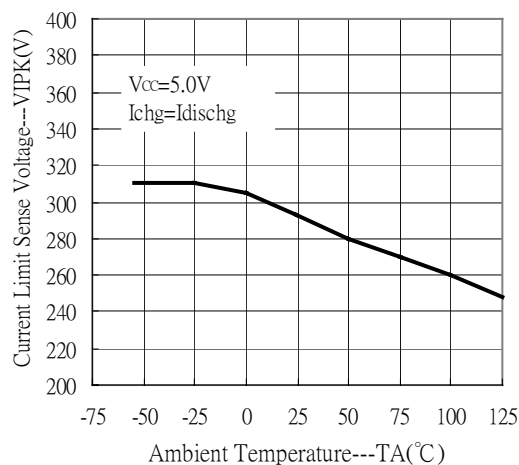
Emitter Follower Configuration Output Saturation Voltage vs Emitter Current



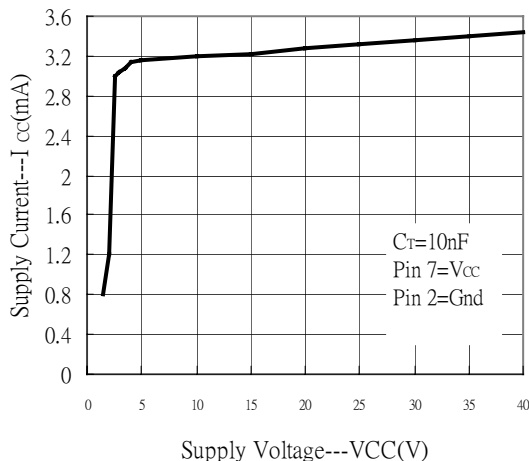
Common Emitter Configuration Output Switch Saturation Voltage vs Collector Current



Current Limit Sense Voltage vs Temperature



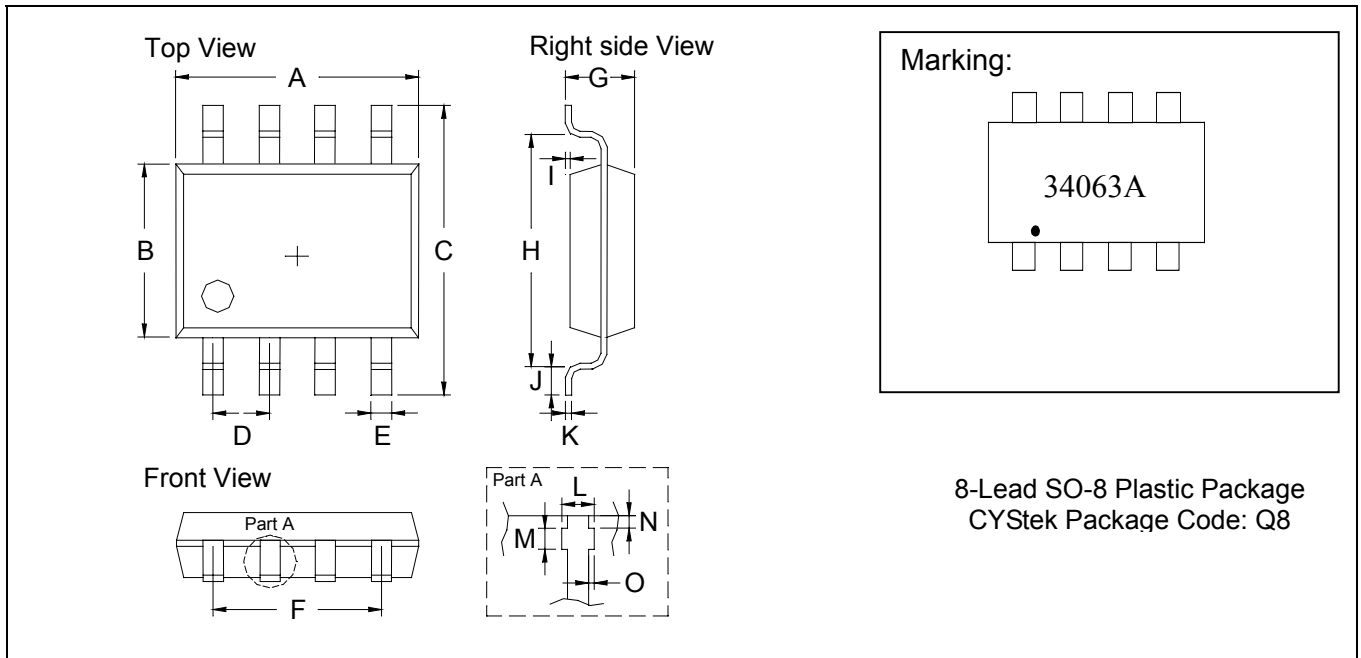
Standby Supply Current vs Supply Voltage



Note: Low duty cycle pulse techniques are used during test to maintain junction temperature as close to ambient temperature as possible.



SO-8 Dimension



*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1909	0.2007	4.85	5.10	I	0.0019	0.0078	0.05	0.20
B	0.1515	0.1555	3.85	3.95	J	0.0118	0.0275	0.30	0.70
C	0.2283	0.2441	5.80	6.20	K	0.0074	0.0098	0.19	0.25
D	0.0480	0.0519	1.22	1.32	L	0.0145	0.0204	0.37	0.52
E	0.0145	0.0185	0.37	0.47	M	0.0118	0.0197	0.30	0.50
F	0.1472	0.1527	3.74	3.88	N	0.0031	0.0051	0.08	0.13
G	0.0570	0.0649	1.45	1.65	O	0.0000	0.0059	0.00	0.15
H	0.1889	0.2007	4.80	5.10					

Notes: 1. Controlling dimension: millimeters.
2. Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3. If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: 42 Alloy; solder plating
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

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