DESCRIPTION

The A7463 series is a monolithic control circuit containing the primary functions required for DC-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. This series was specifically designed to be incorporated in step-down and step-up and voltage-inverting applications with a minimum number of external components.

The A7463 is available in SOP8 and DIP8 packages.

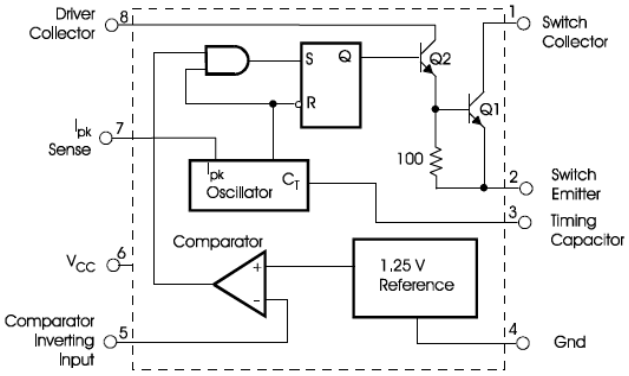
FEATURES

- Operation from 3.0V to 40V input
- Low standby current
- Current limiting
- Output switch current up to 1.5 A
- Adjustable output voltage
- Operation at frequencies up to 100kHz
- Precision Reference (2%)
- Available in SOP8 and DIP8 Packages

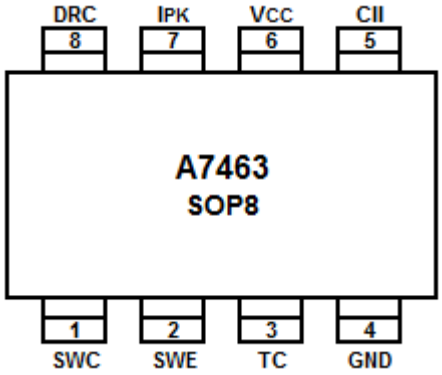
ORDERING INFORMATION

Package Type	Part Number	
SOP8	M8	A7463M8R
		A7463M8VR
DIP8	P8	A7463P8U
		A7463P8VU
Note	V: Halogen free Package R: Tape & Reel U: Tube	
AiT provides all RoHS products Suffix " V " means Halogen free Package		

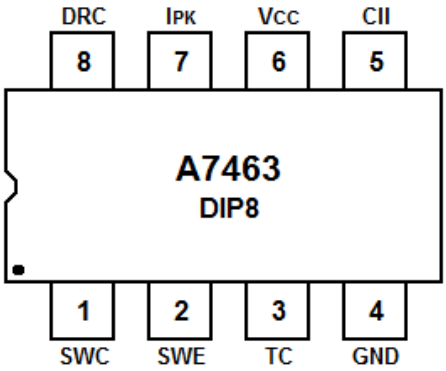
TYPICAL APPLICATION



PIN DESCRIPTION



Top View



Top View

Pin #	Symbol	Function
1	SWC	Switch Collector
2	SWE	Switch Emitter
3	TC	Timing Capacitor
4	GND	GND
5	CII	Comparator Inverting Input
6	Vcc	V_{CC}
7	IPK	I_{PK} Sense
8	DRC	Driver Collector

ABSOLUTE MAXIMUM RATINGS

V_{CC}, Power Supply Voltage	40V_{DC}
V_{IR}, Comparator Input Voltage Range	-0.3 to +40V_{DC}
$V_{C(Switch)}$, Switch Collector Voltage	40V_{DC}
$V_{E(Switch)}$, Switch Emitter Voltage (V_{Pin1}=40V)	40V_{DC}
$V_{CE(Switch)}$, Switch Collector-to-Emitter Voltage	40V_{DC}
$V_{C(Driver)}$, Driver Collector Voltage	40V_{DC}
$I_{C(Driver)}$, Driver Collector Current[NOTE1]	100mA
I_{Sw}, Switch Current	1.5A
T_J, Operating Junction Temperature	+150°C
T_A, Operating Ambient Temperature Range	-40°C ~ +85°C
T_{STG}, Storage Temperature Range	-65°C ~ + 150°C
ESD	2500V

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

NOTE1: Maximum package power dissipation limits must be observed.

ELECTRICAL CHARACTERISTICS

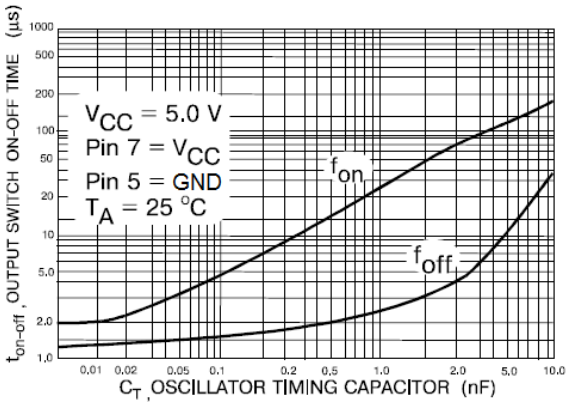
V_{CC}=5.0V, T_A=T_{Low} to T_{High}, unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
OSCILLATOR						
Frequency	f_{osc}	V_{Pin5}=0V, C_T=1.0nF, T_A=25°C	24	33	42	KHz
Charge current	I_{chg}	V_{CC}=5.0V to 40V, T_A=25°C	24	35	42	μA
Discharge current	I_{dischg}	V_{CC}=5.0V to 40V, T_A=25°C	140	220	260	μA
Discharge-to-charge current ratio	I_{dischg}/I_{chg}	Pin7 to V_{CC}, T_A=25°C	5.2	6.5	7.5	
Current limit sense voltage	$V_{Ipk(sense)}$	I_{chg}=I_{dischg}, T_A=25°C	250	300	350	mV
OUTPUT SWITCH NOTE 2						
Saturation voltage, Darlington connection	$V_{CE(sat)}$	I_{Sw}=1.0A, Pins1, 8 connected		1.0	1.3	V
Saturation voltage, Darlington connection	$V_{CE(sat)}$	I_{Sw}=1.0A, R_{Pin8}=82Ω to V_{CC}, Forced β =20		0.45	0.7	V
DC current gain	h_{FE}	I_{Sw}=1.0A, V_{CE}=5.0, T_A=25°C	50	75		
Collector off-state current	$I_{C(off)}$	V_{CE}=40V		40	100	μA
COMPARATOR						
Threshold voltage	V_{th}		1.225 1.21	1.25 -	1.275 1.29	V
Threshold voltage line regulation	Reg_{line}			1.4	5.0	mV
Input bias current	I_{IB}			-20	-400	nA
TOTAL DEVICE						
Supply current	I_{CC}	V_{CC}=5.0V to 40V, C_T=1.0nF, Pin7=V_{CC}, V_{Pin5}>V_{th}, Pin2 =GND, remaining pins - open			4.0	mA

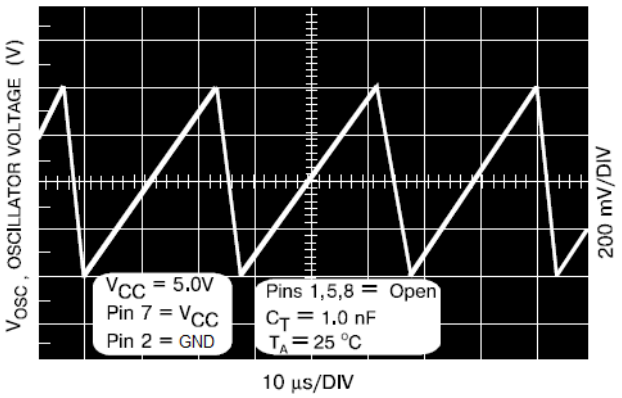
NOTE2: Low duty cycle pulse techniques are used during the test to maintain junction temperature as close to ambient temperature as possible.

TYPICAL PERFORMANCE CHARACTERISTICS

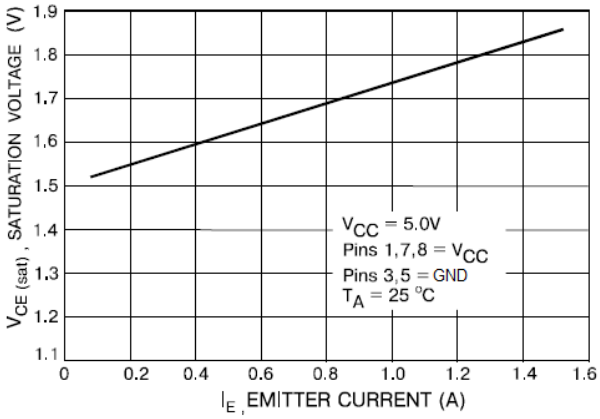
1. Output Switch on-off time versus Oscillator timing capacitor



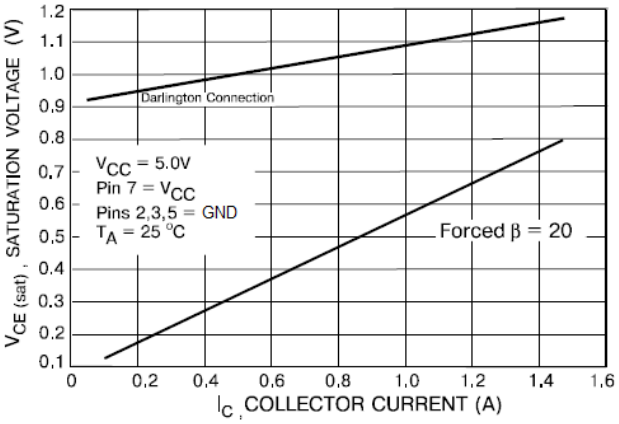
2. Timing capacitor waveform



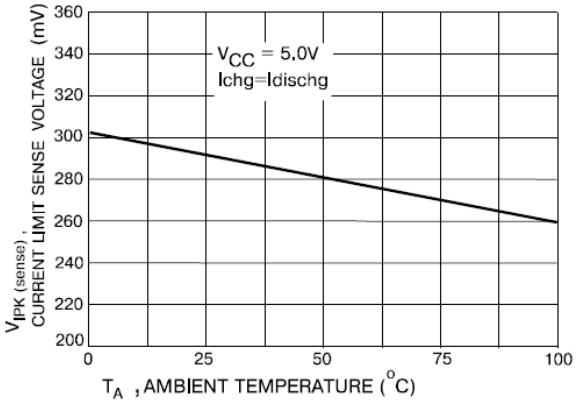
3. Emitter follower configuration output saturation voltage versus Emitter current



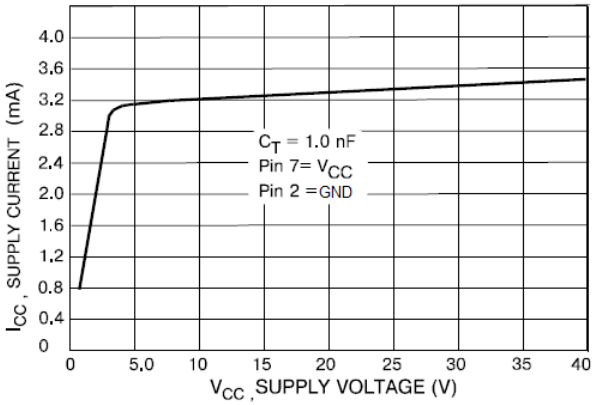
4. Common emitter configuration output saturation voltage versus Collector current



5. Current limit sense voltage versus Temperature



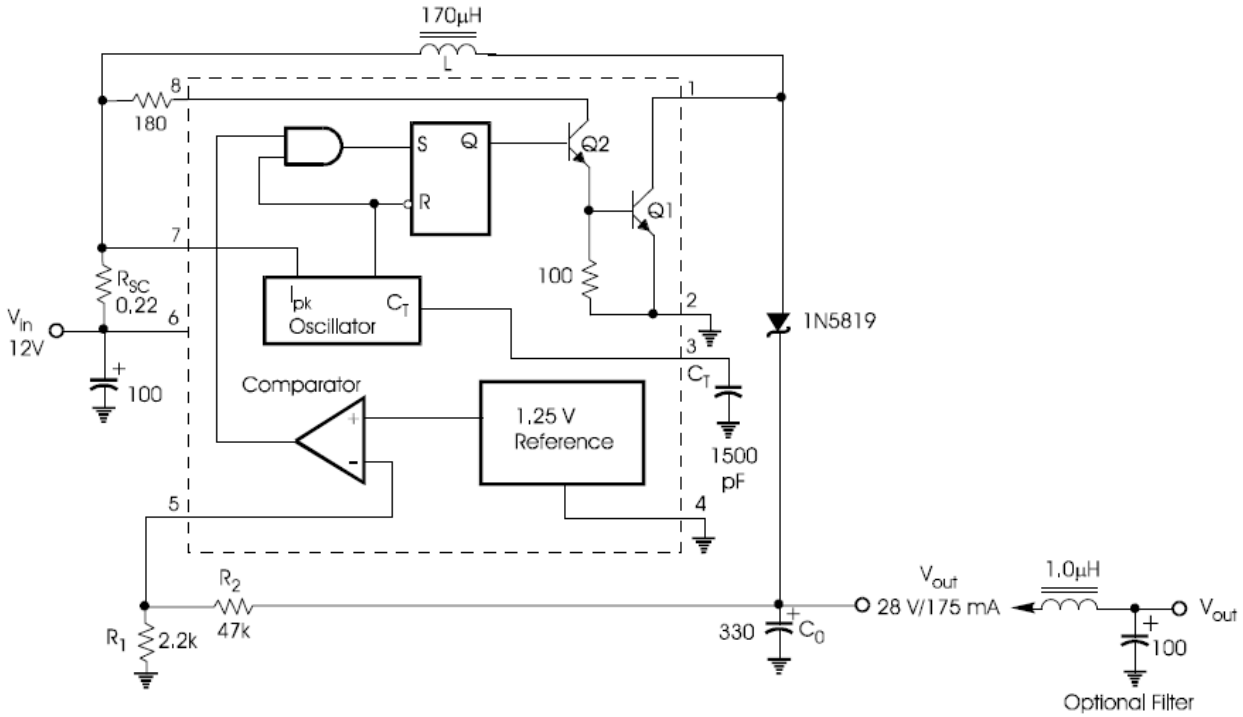
6. Standby supply current versus Supply voltage



DETAILED INFORMATION

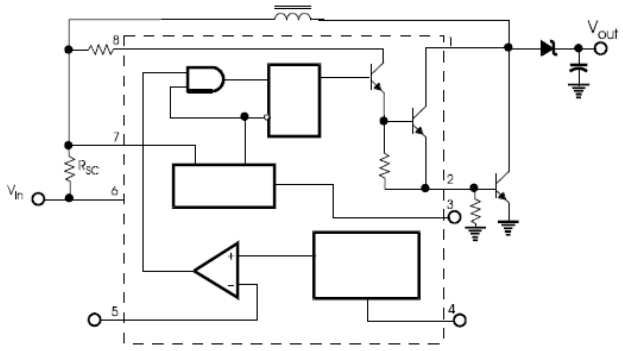
Application Information

1. Step–up converter

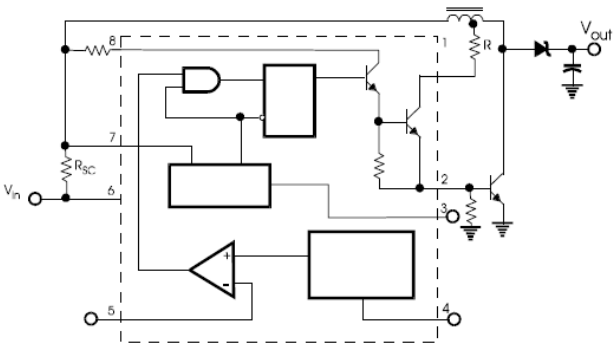


2. External current boost connections for $I_{C\ Peak}$ greater than 1.5A

External NPN switch☐

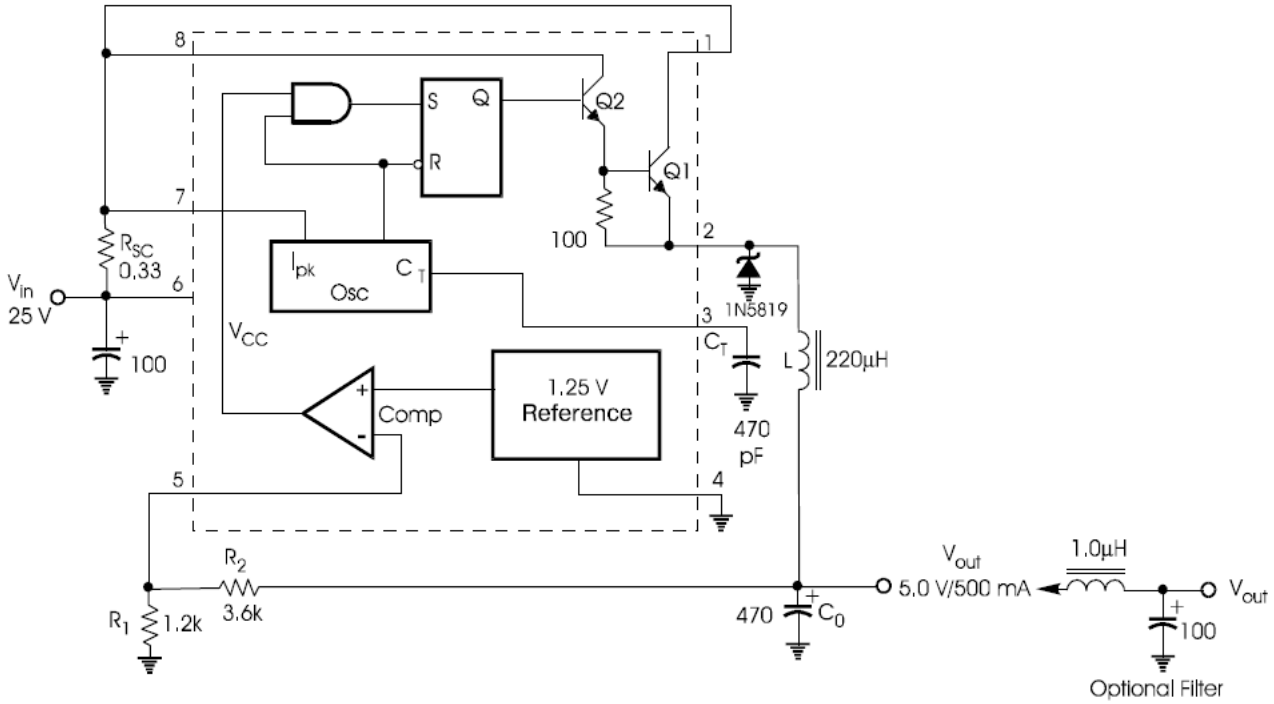


External NPN saturated switch



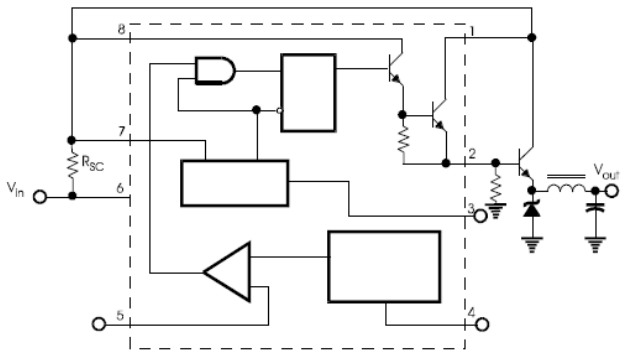
Note: R to 0 for constant V_{IN}

3. Step-down Converter

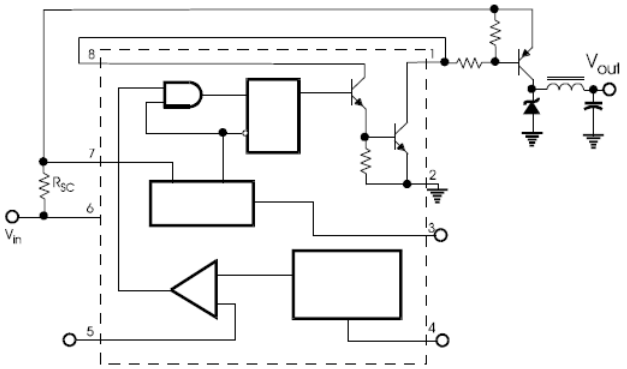


4. External current boost connections for $I_{C\ Peak}$ greater than 1.5A

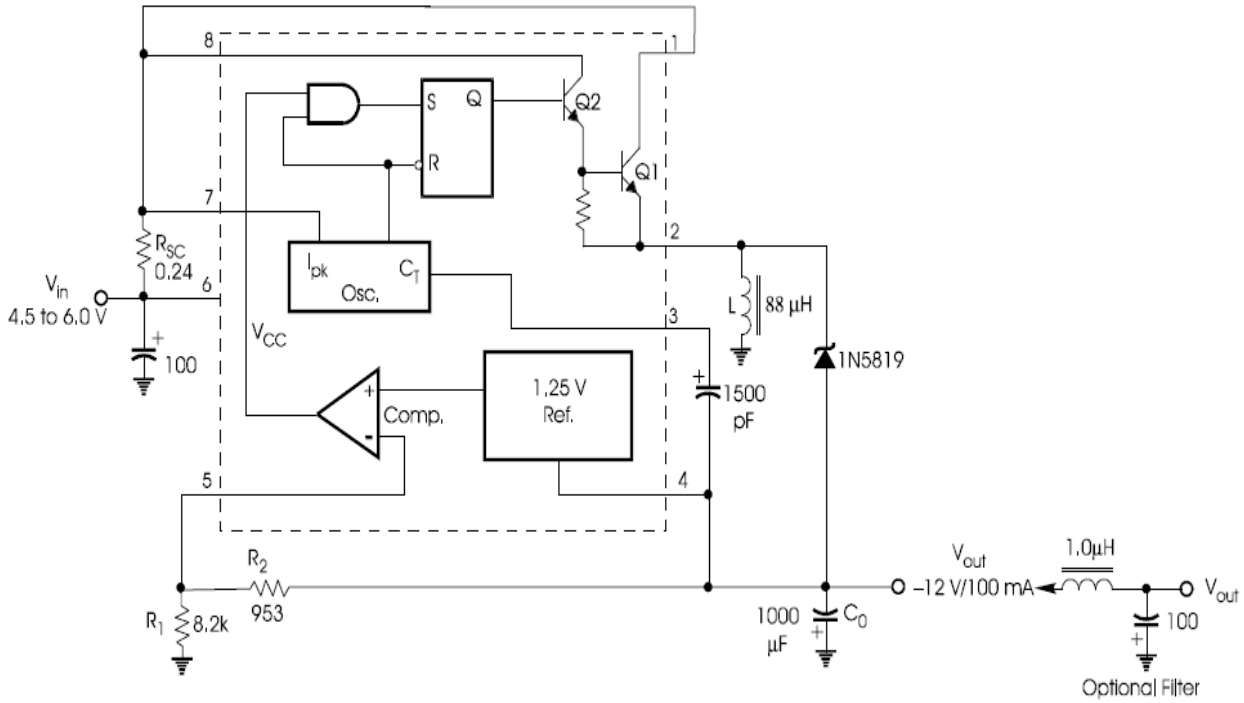
External NPN switch☐



External PNP saturated switch

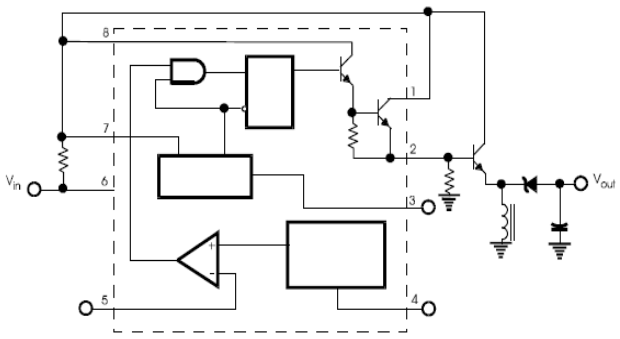


5. Voltage inverting converter

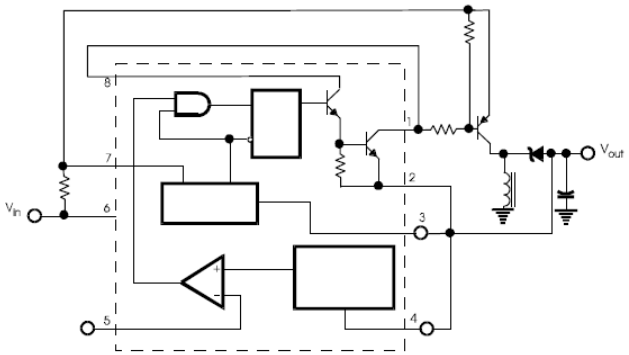


6. External current boost connections for $I_{C\ Peak}$ greater than 1.5A

External NPN switch



External PNP saturated switch



Design Formula

Calculation	Step-up	Step-down	Voltage-inverting
t_{on}	$\frac{V_{out}+V_F-V_{in(\min)}}{V_{in(\min)}-V_{sat}}$	$\frac{V_{out}+V_F}{V_{in(\min)}-V_{sat}-V_{out}}$	$\frac{\lvert V_{out}\rvert+V_F}{V_{in}+V_{sat}}$
$(t_{on}+t_{off})$ max	$\frac{1}{f_{min}}$	$\frac{1}{f_{min}}$	$\frac{1}{f_{min}}$
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}	$0.3/I_{pk(Switch)}$	$0.3/I_{pk(Switch)}$	$0.3/I_{pk(Switch)}$
$L_{(min)}$	$\left(\frac{V_{in(\min)}-V_{sat}}{I_{pk(switch)}}\right)\times t_{on(\max)}$	$\left(\frac{V_{in(\min)}-V_{sat}-V_{out}}{I_{pk(switch)}}\right)\times t_{on(\max)}$	$\left(\frac{V_{in(\min)}-V_{sat}}{I_{pk(switch)}}\right)\times t_{on(\max)}$
C_o	$9\frac{I_{out}t_{on}}{V_{ripple(pp)}}$	$\frac{I_{pk(switch)}(t_{on}+t_{off})}{8V_{ripple(pp)}}$	$9\frac{I_{out}t_{on}}{V_{ripple(pp)}}$

Terms and Definitions

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,

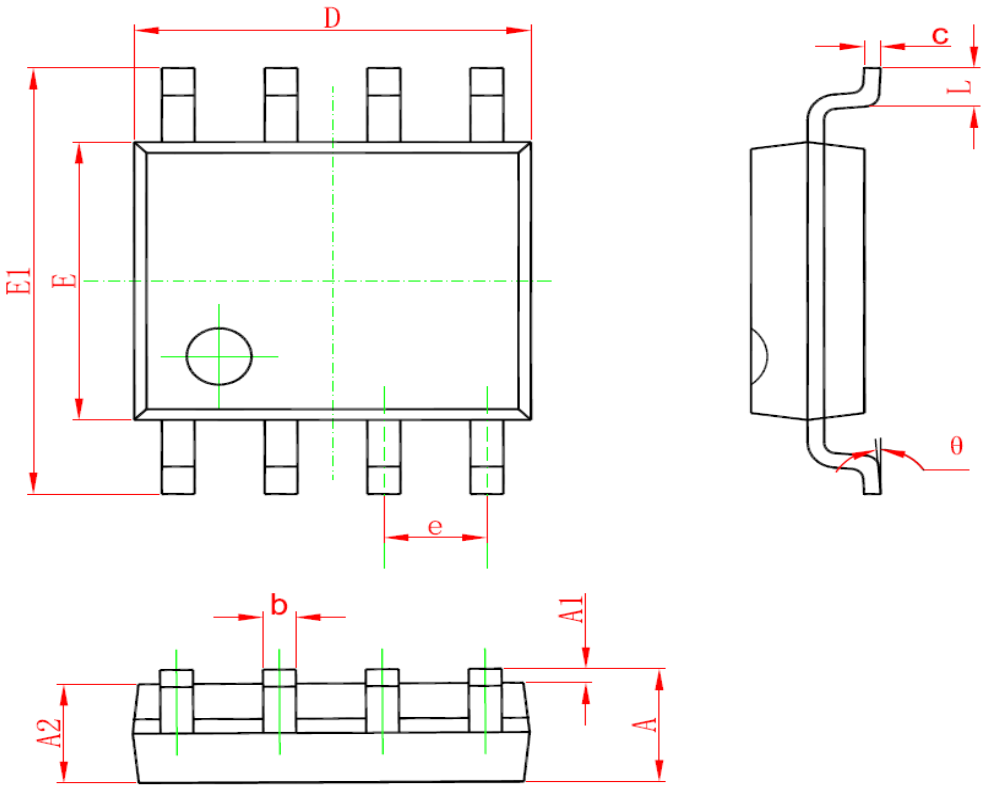
$$|V_{out}| = 1.25\left(1+\frac{R_2}{R_1}\right)$$

f_{min} – Minimum desired output switching frequency at the selected values of V_{IN} and I_{OUT}.

$V_{ripple(p-p)}$ – 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.

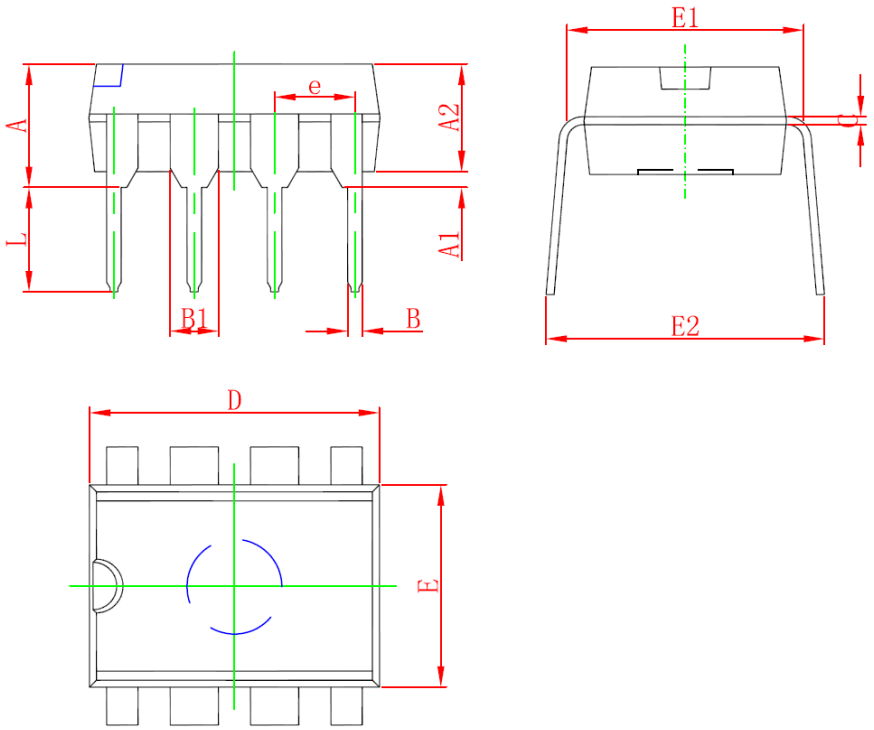
PACKAGE INFORMATION

Dimension in SOP8 (Unit: mm)



Symbol	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.350	1.550
b	0.330	0.510
c	0.170	0.250
D	4.700	5.100
E	3.800	4.000
E1	5.800	6.200
e	1.270(BSC)	
L	0.400	1.270
θ	0°	8°

Dimension in DIP8 (Unit: mm)



Symbol	Min	Max
A	3.710	4.310
A1	0.510	
A2	3.200	3.600
B	0.380	0.570
B1	1.524(BSC)	
C	0.204	0.360
D	9.000	9.400
E	6.200	6.600
E1	7.320	7.920
e	2.540(BSC)	
L	3.000	3.600
E2	8.400	9.000

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