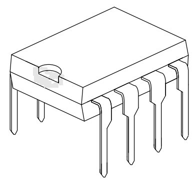
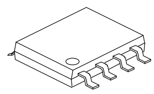
PC POWER SUPPLY SUPERVISORS



DIP-8



SOP-8

■ DESCRIPTION

The UTC 3563 is a monolithic control circuit containing the primary functions required for DC to DC converters and highside-sensed constant current source. The device consists of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current sense circuit, bootstrapped driver, and high current output switch. This device is specifically designed to construct a constant current source for battery chargers with a minimum number of external components. Bootstrapped driver can drive the NPN output switch to saturation for higher efficiency and less heat dissipation. The UTC 3563 can deliver 1.5A continuous current without requiring a heat sink.

■ APPLICATIONS

*Constant current source for battery chargers.
*Saver for cellular phones.
*Step-Down DC-DC converter module.

■ FEATURES

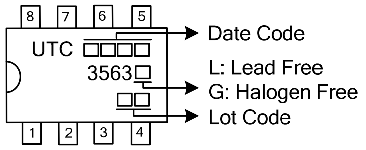
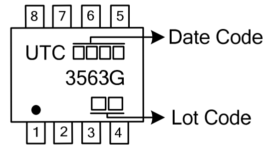
* 3V to 30V input voltage operation.
* Internal 2A peak current switch.
* 1.5A continuous output current.
* Bootstrapped driver.
* High side current sense capability.
* High efficiency (up to 90%)
* Internal ±2% reference.
* Low quiescent current at 1.6mA.
* Frequency operation from 100Hz to 100KHz

■ ORDERING INFORMATION

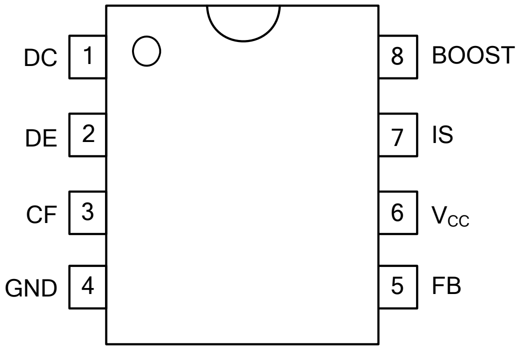
Ordering Number		Package	Packing
Lead Free	Halogen Free		
3563L-D08-T	3563G-D08-T	DIP-8	Tube
-	3563G-S08-R	SOP-8	Tape Reel

3563L-D08-T	
(1)Packing Type	(1) T: Tube, R: Tape Reel
(2)Package Type	(2) D08: DIP-8, S08: SOP-8
(3)Green Package	(3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING

DIP-8	SOP-8
	

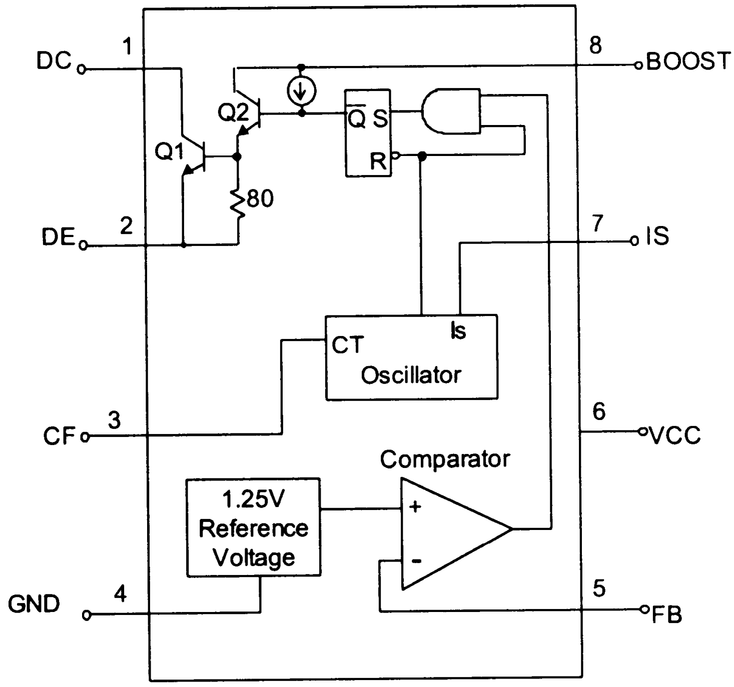
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	DC	2A switch collector
2	DE	Darlington switch emitter
3	CF	Oscillator timing capacitor
4	GND	Power ground
5	FB	Feedback comparator inverting input
6	V_{CC}	Power supply input
7	IS	Highside current sense input (V_{CC}-VIS=300mV)
8	BOOST	Bootstrapped driver collector

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise specified)

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC}	30	V
Comparator input voltage range		V_I	-0.3~+30	V
Switch collector voltage		$V_{C(switch)}$	30	V
Switch emitter Voltage		$V_{E(switch)}$	30	V
Switch collector to emitter voltage		$V_{CE(switch)}$	30	V
Driver collector Voltage		$V_{C(driver)}$	30	V
Switch current		I_{SW}	2	A
Power dissipation	DIP-8	P_D	1000	mW
	SOP-8		625	mW
Operating junction temperature		Tj	125	°C
Operating ambient temperature range		T_A	-20~+85	°C
Storage temperature range		T_{STG}	-65~+150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

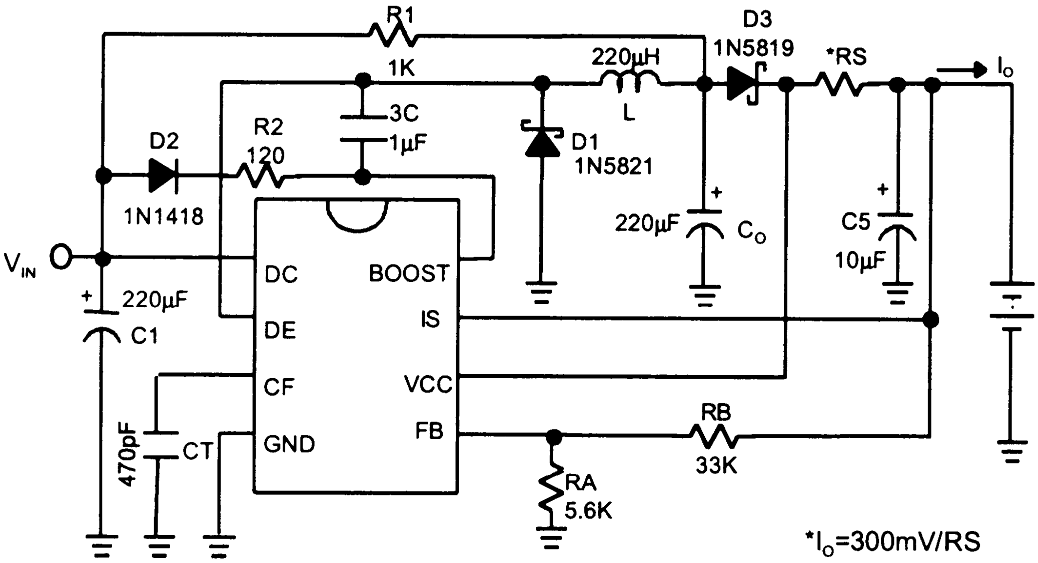
■ THERMAL RESISTANCES CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	100	°C/W
Junction to Case	θ_{JC}	160	°C/W

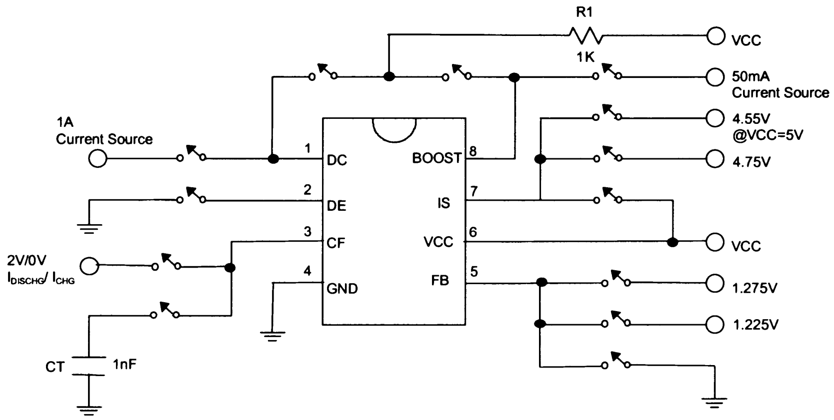
■ ELECTRICAL CHARACTERISTICS (V_{CC}=5.0V, T_A=25°C, unless otherwise specified)

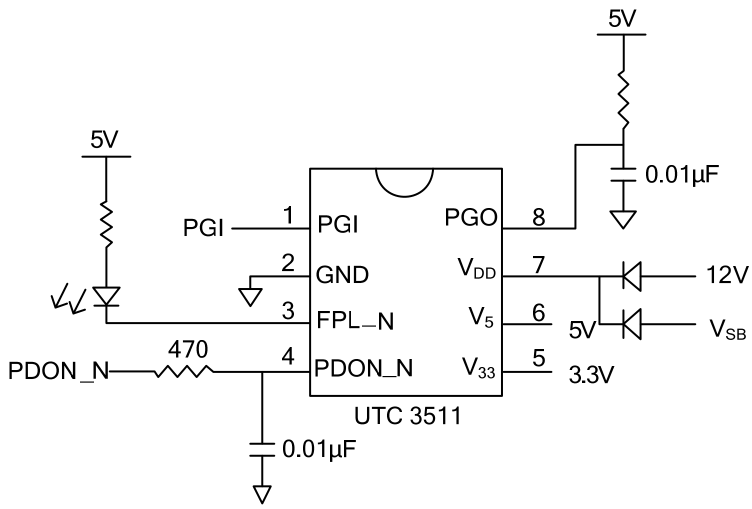
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Oscillator						
Charging Current	I_{CHG}	5V≤V_{CC}≤30V	10	25	40	μA
Discharging Current	I_{DISCHG}	5V≤V_{CC}≤30V	100	150	200	μA
Voltage Swing	V_{OSC}	PIN 3		0.6		V
Discharge to Charge Current Ratio	I_{DISCHG} / I_{CHG}	V_{IS}=V_{CC}		6.0		
Current limit Sense Voltage	$V_{CC\text{ -}VIS}$	I_{CHG}=I_{DISCHG}	250	300	350	mV
Output Switch						
Saturation Voltage, Emitter Follower Connection	$V_{CE(SAT)}$	I_{DE}=1.0A, V_{BOOST}=V_{DC}=V_{CC}		1.5	1.8	V
Saturation Voltage	$V_{CE(SAT)}$	I_{DC}=1.0A, I_{BOOST}=50mA, (Forced β≈20)		0.4	0.7	V
DC Current Gain	h_{FE}	I_{SC}=1.0A, V_{CE}=5.0V	35	120		
Collector Off State Current	$I_{C(OFF)}$	V_{CE}=30V		10		nA
Comparator						
Threshold Voltage	V_{FB}	T_A=25°C	1.225	1.250	1.275	V
		0°C≤T_A≤70°C	1.210	1.250	1.290	V
Threshold voltage Line Regulation	R_{EGLINE}	3V≤V_{CC}≤30V		0.1	0.3	mV/V
Input Bias Current	I_{IB}	V_{IN}=0V		0.4	1.0	μA
Supply Current	I_{CC}	V_{IS}=V_{CC}, PIN 5>V_{FB}, 5.0V≤V_{CC}≤30V, C_T=1nF, PIN 2=GND, Remaining pins open		1.6	3.0	mA

■ TYPICAL APPLICATION CIRCUIT



■ TEST CIRCUIT





■ APPLICATION INFORMATION

Tabel 1. DESIGN FORMULA TABLE

CALCULATION	STEP-DOWN	STEP-UP
t_{ON} / t_{OFF}	$\frac{V_{OUT}+V_F}{V_{IN(MIN)}-V_{SAT}-V_{OUT}}$	$\frac{V_{OUT}+V_F-V_{IN(MIN)}}{V_{IN(MIN)}-V_{SAT}}$
$(t_{ON}+t_{OFF})_{MAX}$	1 / F_{MIN}	1 / F_{MIN}
C_T	$4\times10^{-5}\ t_{ON}$	$4\times10^{-5}\ t_{ON}$
$I_{C(SWITCH)}$	$2I_{OUT(MAX)}$	$2I_{OUT(MAX)}\frac{t_{ON}+t_{OFF}}{t_{OFF}}$
RS	0.3 / $I_{C(SWITCH)}$	0.3 / $I_{C(SWITCH)}$
L(MIN)	$\frac{V_{IN(MIN)}-V_{SAT}-V_{OUT}}{I_{C(SWITCH)}}t_{ON(MAX)}$	$\frac{V_{IN(MIN)}-V_{SAT}}{I_{C(SWITCH)}}t_{ON(MAX)}$
Co	$\frac{I_{C(SWITCH)}(t_{ON}+t_{OFF})}{8V_{RIPPLE(P-P)}}$	$\frac{I_{OUT}t_{ON}}{V_{RIPPLE(P-P)}}$

V_{SAT} : Saturation voltage of the output switch
V_F : Forward voltage of the ringback rectifier
The following power supply characteristics must be chosen:
V_{IN} : Norminal input voltage
V_{OUT} : Desired output voltage, V_{OUT}=1.25(1+RB/RA)
I_{OUT} : Desired output current
F_{MIN} : Minimum desired switching frequency at 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 affect the line and load regulation.

■ APPLICATION EXAMPLES

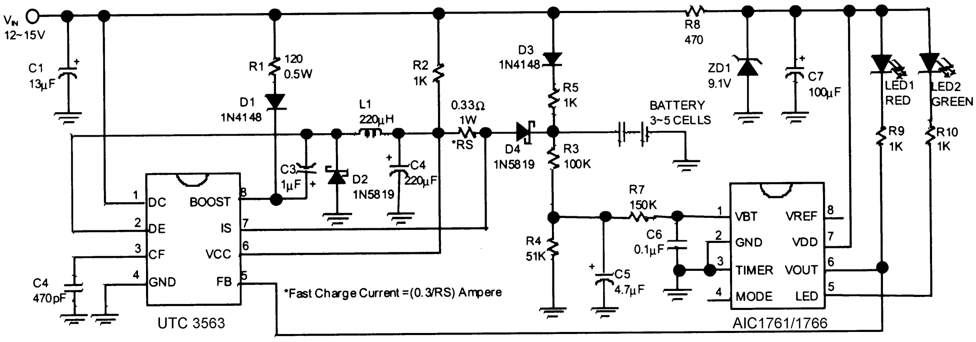


Fig. 1 Simplified Battery Charge Circuit for Ni-Cd/Ni-MH Battery

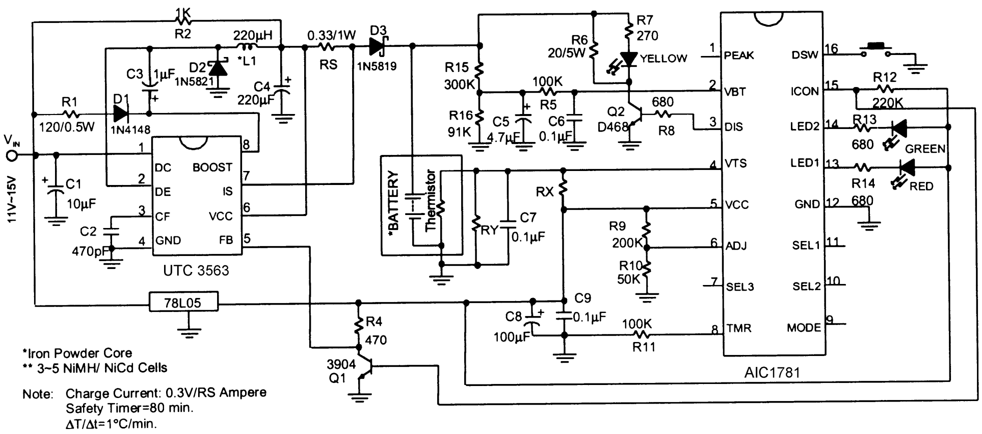
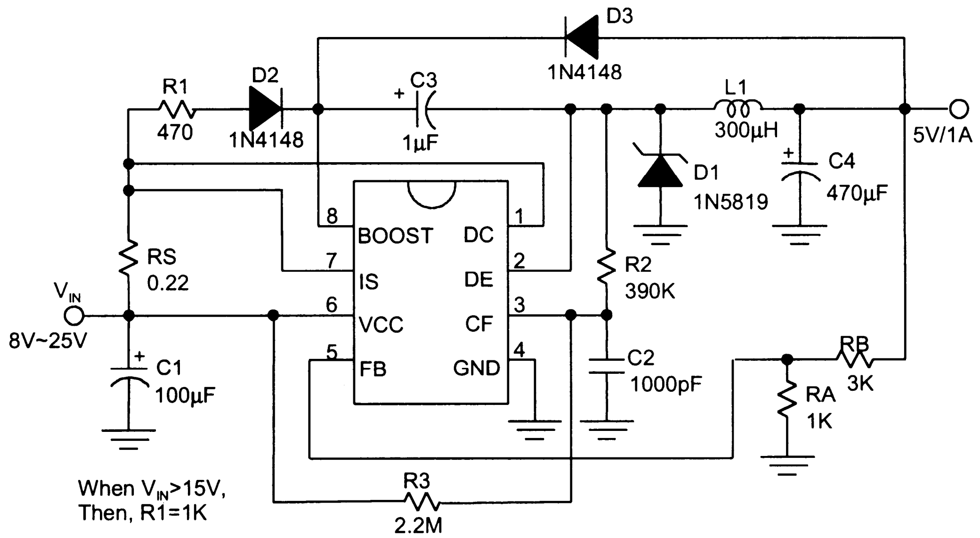


Fig.2 Battery Charge Circuit for Fluctuating Charging Current Applications

■ APPLICATION EXAMPLES (Cont.)



Line regulation: 40mV (V_{IN}=10V~20V, @ I_O=1A)
Load regulation: 20mV (V_{IN}=15V, @ I_O=100mA~1A)
Short circuit current: 1.3A (V_{IN}=15V, @ R_L=0.1Ω)

Fig. 3 Step-Down Converter

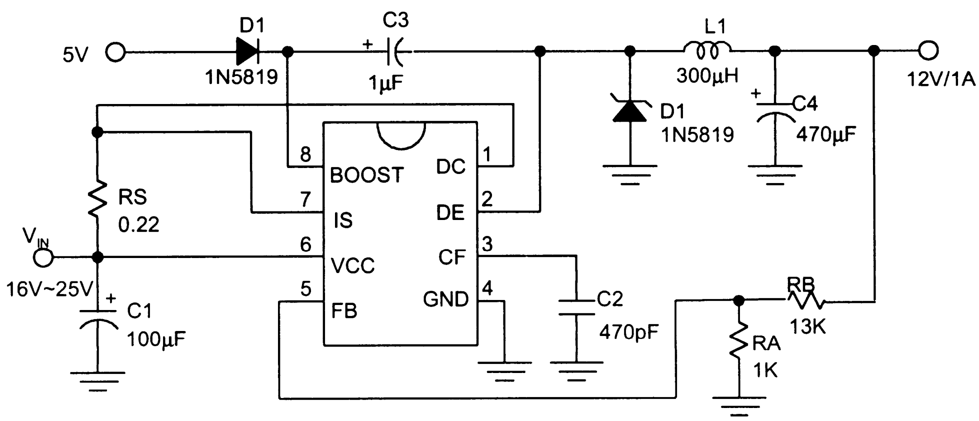
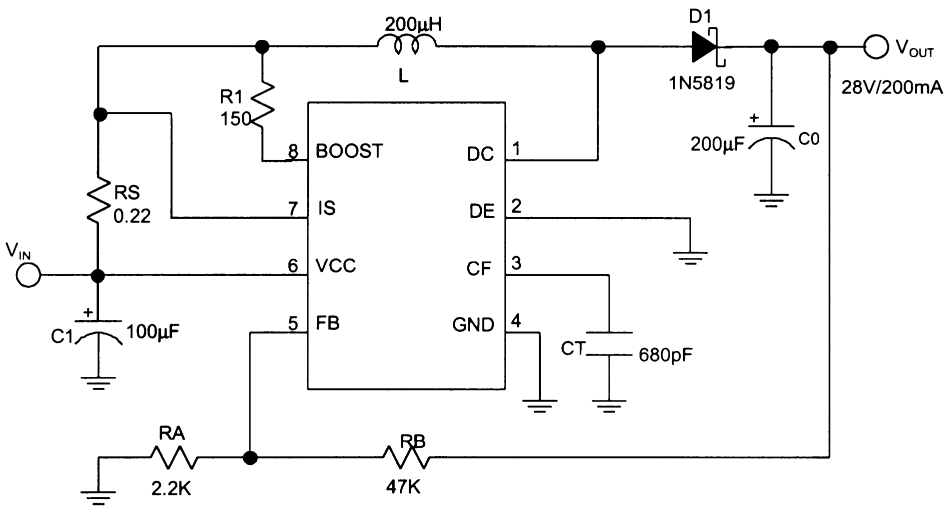


Fig. 4 Step-Down Converter with External 5V Bootstrap

■ APPLICATION EXAMPLES (Cont.)



Line regulation: 100mV (V_{IN}=8V~16V, @ I_O=200mA)
Load regulation: 40mV (V_{IN}=12V, @ I_O=80mA~200mA)

Fig. 5 Step-Up Converter

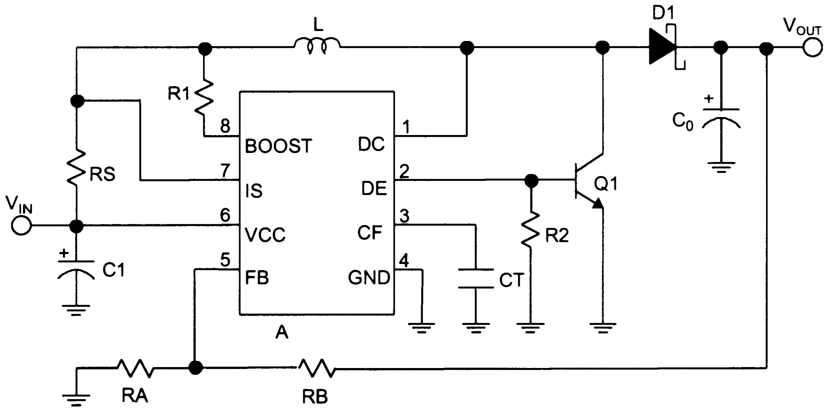
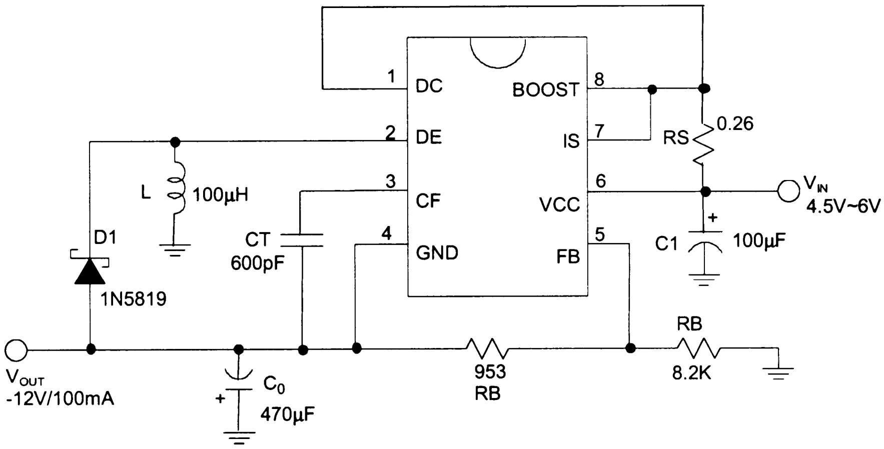


Fig. 6 Step-Up Converter with External NPN Switch

■ APPLICATION EXAMPLES (Cont.)

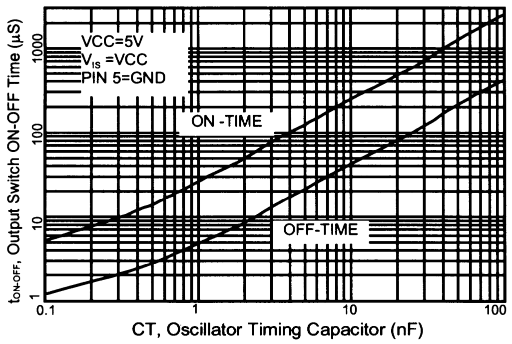


Line regulation: 20mV (V_{IN}=4.5V~6V, @ I_O=100mA)
Load regulation: 100mV (V_{IN}=5V, @ I_O=10mA~100mA)

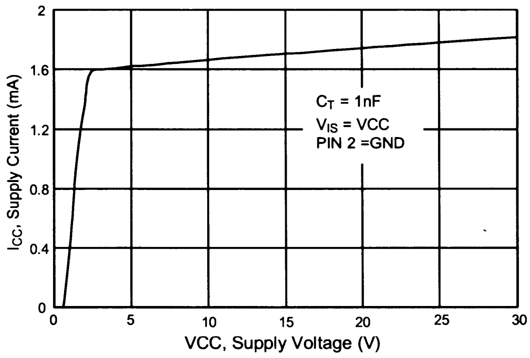
Fig. 7 Inverting Converter

■ TYPICAL CHARACTERISTICS

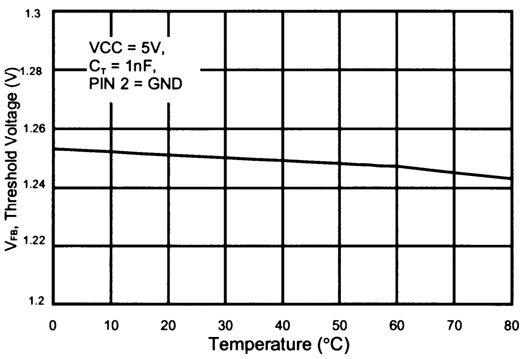
Output Switch ON-OFF Time vs Oscillator Timing Capacitor



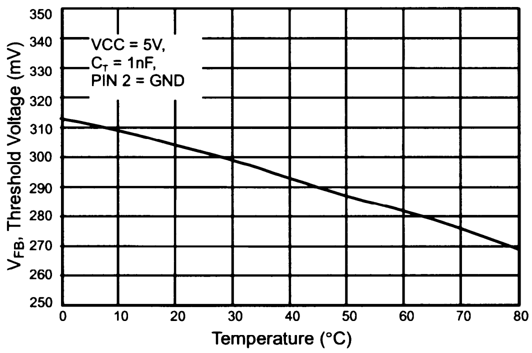
Standby Supply Current vs Supply Voltage



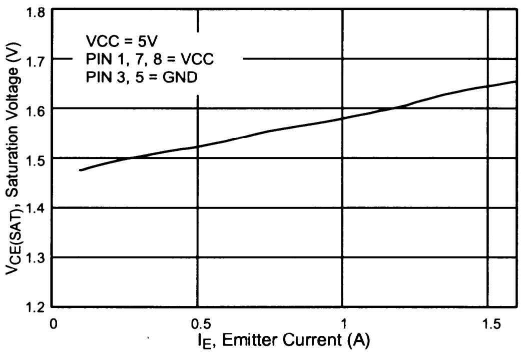
V_{FB}, Threshold Voltage vs Temperature



I_S Threshold Voltage vs Temperature



Emmiter Follower Configuration Output Switch Saturation Voltage vs Emmiter Current



Common Emitter Configuration Output Switch Saturation Voltage vs Collector Current