

# UTC TL1451 LINEAR INTEGRATED CIRCUIT

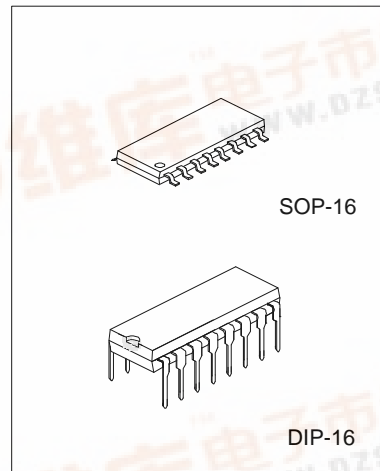
## DUAL PULSE-WIDTH-MODULATION CONTROL CIRCUITS

### DESCRIPTION

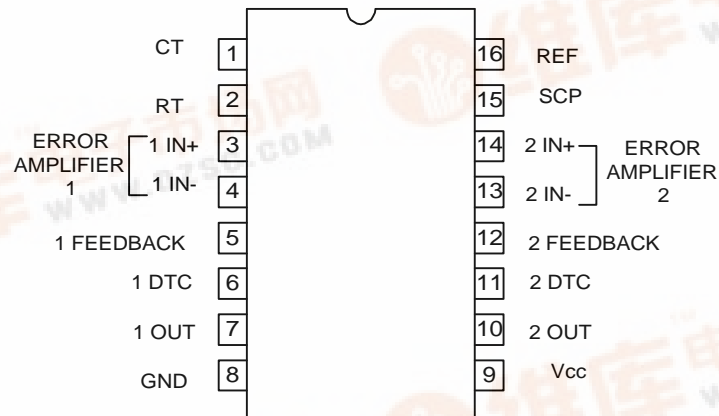
The UTC TL1451 incorporates on a single monolithic chip all the functions required in the construction of two pulse-width-modulation (PWM) control circuits. Designed primarily for power supply control, the TL1451 contains an on-chip 2.5V regulator, two error amplifiers, an adjustable oscillator, two dead-time comparators, undervoltage lockout circuitry, and dual common-emitter output transistor circuits.

### FEATURES

- \*Complete PWM Power control Circuitry
- \*Completely Synchronized Operation
- \*Internal Undervoltage Lockout Protection
- \*Wide Supply Voltage Range
- \*Internal Short-Circuit Protection
- \*Oscillator Frequency .500kHz Max
- \*Variable Dead Time Provides Control Over Total Range
- \*Internal Regulator Provides a Stable 2.5V Reference Supply

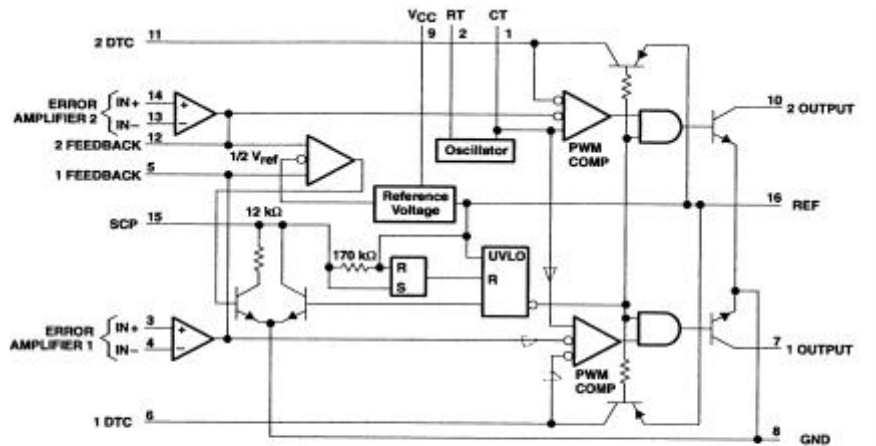


### PIN CONFIGURATIONS



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## BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS (Unless otherwise noted all is over operating free air temperature range)

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	$V_{CC}$	51	V
Amplifier Input Voltage	$V_I$	20	V
Collector Output Voltage	$V_O$	51	V
Collector Output Current	$I_O$	21	mA
Power Dissipation : $T_A \leq 25^\circ\text{C}$ DIP SOP		1000 500	mW
Operating free-air Temperature Range	$T_A$	-20 TO 85	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 TO 150	$^\circ\text{C}$
Lead Temperature 1.6mm from Case for 10 Sec.	$T_{case}$	260	$^\circ\text{C}$

## RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE		UNIT
		MIN	MAX	
Supply Voltage	$V_{CC}$	3.6	50	V
Amplifier Input Voltage	$V_I$	1.05	1.45	V
Collector Output Voltage	$V_O$		50	V
Collector Output Current (each Transistor)	$I_O$		20	mA
Current into Feedback Terminal			45	$\mu\text{A}$
Feedback Resistor	$R_F$	100		$\text{k}\Omega$
Timing Capacitor	$C_T$	150	15000	pF
Timing Resistor	$R_T$	5.1	100	$\text{k}\Omega$
Oscillator frequency		1	500	kHz
Operating Free-Air Temperature	$T_A$	-20	85	$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range,  $V_{CC}=6\text{V}$ ,  $f=200\text{kHz}$ ,  $T_A=25^\circ\text{C}$ , Unless otherwise specified)

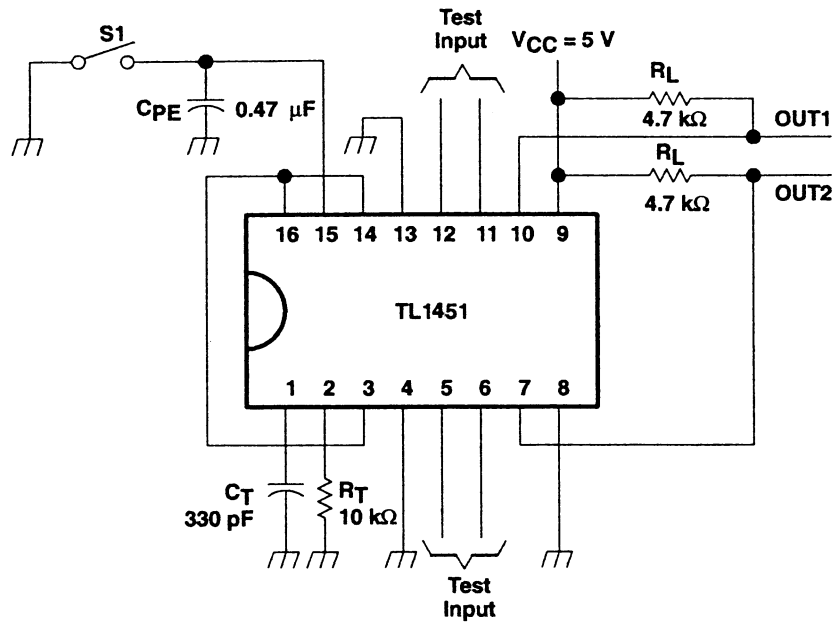
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Reference Section</b>					
Output Voltage	$I_O=1\text{mA}$	2.4	2.5	2.6	V
Output Voltage Change with Temperature	$T_A=-20^\circ\text{C}$ to $25^\circ\text{C}$		-0.1	$\pm 1\%$	
	$T_A=25^\circ\text{C}$ to $85^\circ\text{C}$		-0.2	$\pm 1\%$	
Input Voltage Regulation	$V_{CC}=3.6\text{V}$ to $40\text{V}$		2	12.5	mV
Output Voltage Regulation	$I_O=0.1\text{mA}$ to $1\text{mA}$		1	7.5	mV
Short-Circuit Output Current	$V_O=0$	3	10	30	mA
<b>Undervoltage Lockout Section</b>					
Upper Threshold Voltage ( $V_{CC}$ )	$I_O(\text{ref})=0.1\text{mA}$ , $T_A=25^\circ\text{C}$		2.72		V
Lower Threshold Voltage ( $V_{CC}$ )			2.6		V
Hysteresis ( $V_{CC}$ )		80	120		mV
Reset Threshold voltage ( $V_{CC}$ )		1.5	1.9		V
<b>Short-Circuit Protection Control Section</b>					
Input Threshold Voltage (SCP)	$T_A=25^\circ\text{C}$	0.65	0.7	0.75	V

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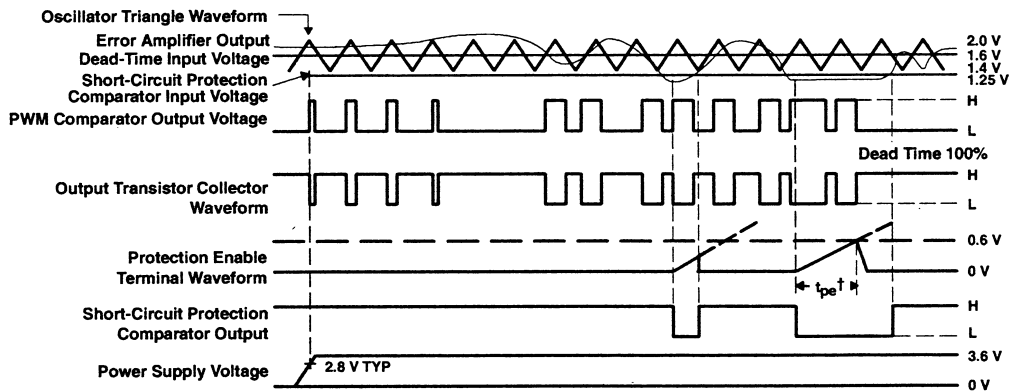
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Standby Voltage(SCP)	No pullup	140	185	230	mV
Latched Input Voltage (SCP)	No pullup		60	120	mV
Input (source) Current	VI=0.7V,TA=25°C	-10	-15	-20	μA
Comparator Threshold Voltage (FEEDBACK)			1.18		V
<b>Oscillator Section</b>					
Frequency	CT=330pF, RT=10kΩ		200		kHz
Standard deviation of frequency	CT=330pF, RT=10kΩ		10%		
Frequency Change with Voltage	Vcc=3.6V to 40V		1%		
Frequency Change with Temperature	TA=-20°C to 25°C TA=25°C to 85°C		-0.4% -0.2%	±2% ±2%	
<b>Dead-Time Control Section</b>					
Input bias Current (DTC)				1	μA
Latch mode (source) Current (DTC)	TA=25°C	-80	-145		μA
Latched Input Voltage (DTC)	Io=40μA	2.3			V
Input threshold Voltage at f=10kHz (DTC)	Zero duty cycle Maximum duty cycle	1.2	2.05 1.45	2.25	V
<b>Error-Amplifier Section</b>					
Input Offset Voltage	Vo (FEEDBACK)=1.25V			±6	mV
Input Offset Current	Vo (FEEDBACK)=1.25V			±100	nA
Input Bias current	Vo (FEEDBACK)=1.25V		160	500	nA
Common-Mode Input Voltage Range	Vcc=3.6V to 40V	1.05 to 1.45			V
Open-loop Voltage Amplification	RF=200kΩ	70	80		dB
Unity-gain Bandwidth			1.5		MHz
Common-mode Rejection Ratio		60	80		dB
Positive Output Voltage Swing		Vref- 0.1			V
Negative Output Voltage Swing				1	V
Output (sink) Current (FEEDBACK)	VID=-0.1V,Vo=1.25V	0.5	1.6		mA
Output (source) Current (FEEDBACK)	VID=-0.1V,Vo=1.25V	-45	-70		μA
<b>Output Section</b>					
Collector off-state Current	Vo=50V			10	μA
Output Saturation Voltage	Io=10mA		1.2	2	V
Short-Circuit Output Current	Vo=6V		90		mA
<b>PWM Comparator Section</b>					
Input Threshold Voltage at f=10kHz (FEEDBACK)	Zero duty cycle Maximum duty cycle	1.2	2.05 1.45	2.25	V
<b>TOTAL DEVICE</b>					
Standby Supply Current	Off-state		1.3	1.8	mA
Average Supply Current	RT=10kΩ		1.7	2.4	mA

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## TEST CIRCUIT



## TIMING DIAGRAM



† Protection Enable Time,  $t_{pe} = (0.051 \times 10^6 \times C_{pe})$  in seconds