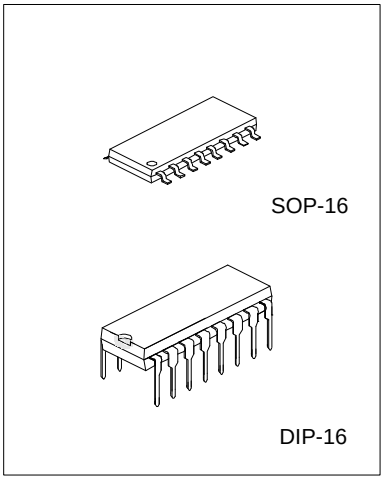
UTC TL1451 LINEAR INTEGRATED CIRCUIT

DUAL PULSE-WIDTH-MODULATION CONTROL CIRCUITS



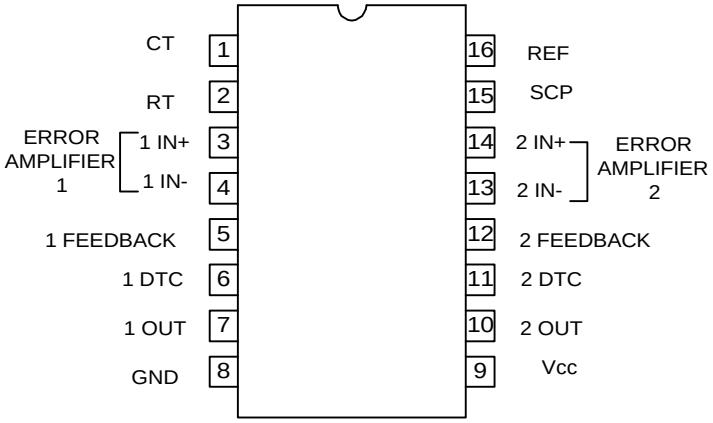
DESCRIPTION

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.

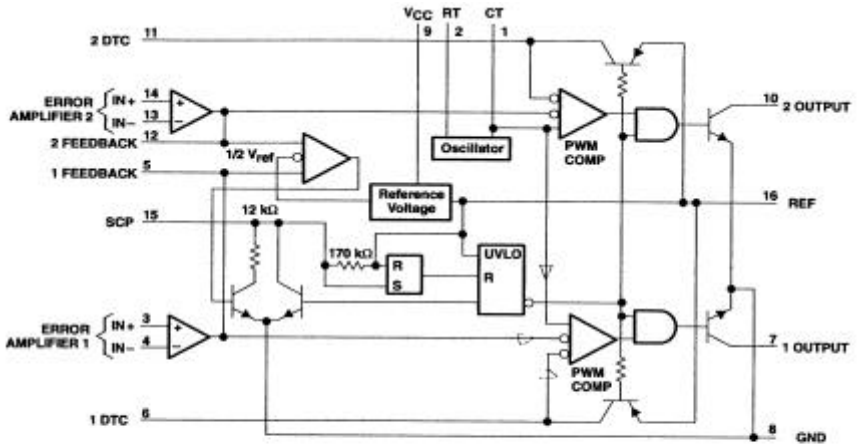
FEATURES

*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



BLOCK DIAGRAM



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 : TA≤25°C DIP SOP		 1000 500	mW
Operating free-air Temperature Range	TA	-20 TO 85	°C
Storage Temperature Range	Tstg	-65 TO 150	°C
Lead Temperature 1.6mm from Case for 10 Sec.	Tcase	260	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE		UNIT
		MIN	MAX	
Supply Voltage	Vcc	3.6	50	V
Amplifier Input Voltage	Vi	1.05	1.45	V
Collector Output Voltage	Vo		50	V
Collector Output Current(each Transistor)	Io		20	mA
Current into Feedback Terminal			45	μA
Feedback Resistor	RF	100		kΩ
Timing Capacitor	CT	150	15000	pF
Timing Resistor	RT	5.1	100	kΩ
Oscillator frequency		1	500	kHz
Operating Free-Air Temperature	TA	-20	85	°C

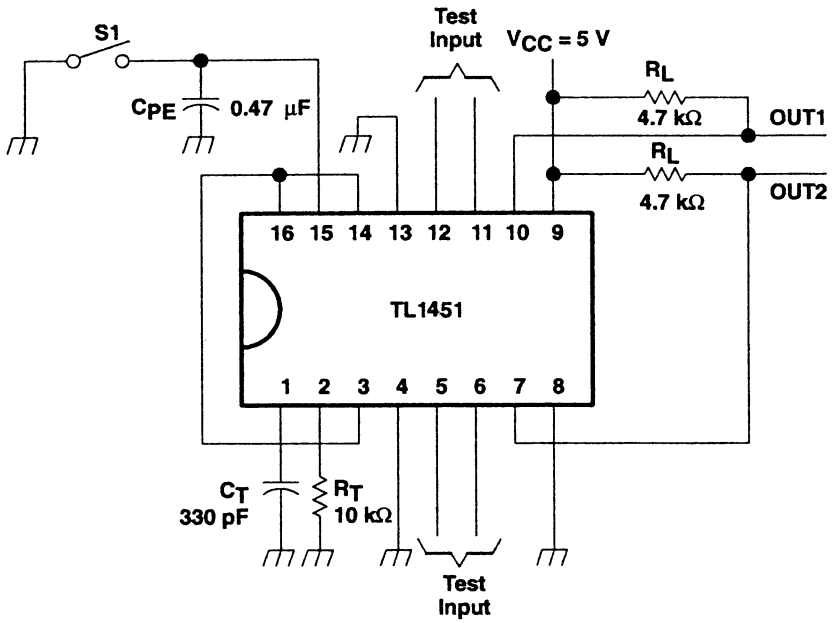
ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range,VCC=6V,f=200kHz,TA=25°C ,Unless otherwise specified)

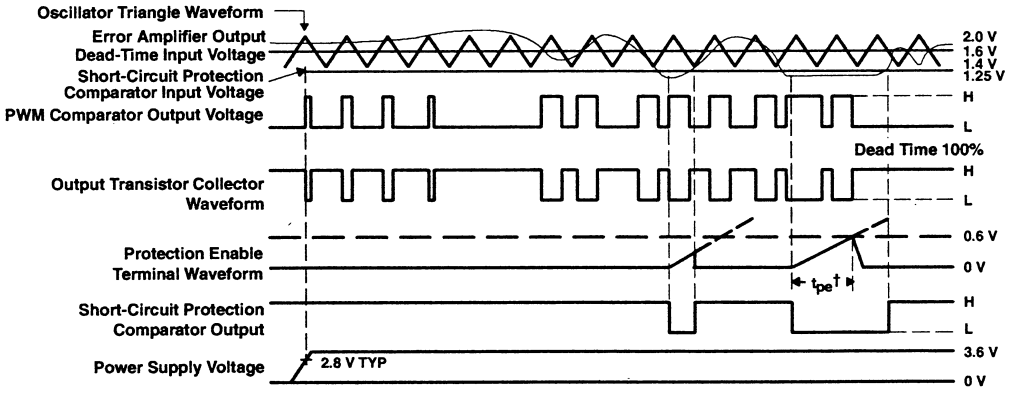
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Section					
Output Voltage	Io=1mA	2.4	2.5	2.6	V
Output Voltage Change with Temperature	TA=-20°C to 25°C TA=25°C to 85°C		-0.1 -0.2	±1% ±1%	
Input Voltage Regulation	Vcc=3.6V to 40V		2	12.5	mV
Output Voltage Regulation	Io=0.1mA to 1mA		1	7.5	mV
Short-Circuit Output Current	Vo=0	3	10	30	mA
Undervoltage Lockout Section					
Upper Threshold Voltage (Vcc)	Io(ref)=0.1mA, TA=25°C		2.72		V
Lower Threshold Voltage (Vcc)			2.6		V
Hysteresis (Vcc)		80	120		mV
Reset Threshold voltage (Vcc)		1.5	1.9		V
Short-Circuit Protection Control Section					
Input Threshold Voltage(SCP)	TA=25°C	0.65	0.7	0.75	V

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	V_I=0.7V,T_A=25°C	-10	-15	-20	μA
Comparator Threshold Voltage (FEEDBACK)			1.18		V
Oscillator Section					
Frequency	C_T=330pF, R_T=10kΩ		200		kHz
Standard deviation of frequency	C_T=330pF, R_T=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%	
Dead-Time Control Section					
Input bias Current (DTC)				1	μA
Latch mode (source) Current (DTC)	TA=25°C	-80	-145		μA
Latched Input Voltage (DTC)	I_O=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
Error-Amplifier Section					
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	R_F=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)	V_{ID}=-0.1V,Vo=1.25V	0.5	1.6		mA
Output (source) Current (FEEDBACK)	V_{ID}=-0.1V,Vo=1.25V	-45	-70		μA
Output Section					
Collector off-state Current	Vo=50V			10	μA
Output Saturation Voltage	I_O=10mA		1.2	2	V
Short-Circuit Output Current	Vo=6V		90		mA
PWM Comparator Section					
Input Threshold Voltage at f=10kHz (FEEDBACK)	Zero duty cycle Maximum duty cycle	 1.2	2.05 1.45	2.25	V
TOTAL DEVICE					
Standby Supply Current	Off-state		1.3	1.8	mA
Average Supply Current	R_T=10kΩ		1.7	2.4	mA

TEST CIRCUIT



TIMING DIAGRAM



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