



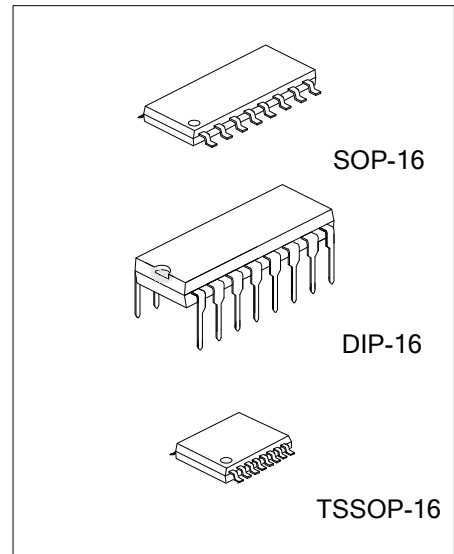
TL1451

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 UTC **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

ORDERING INFORMATION

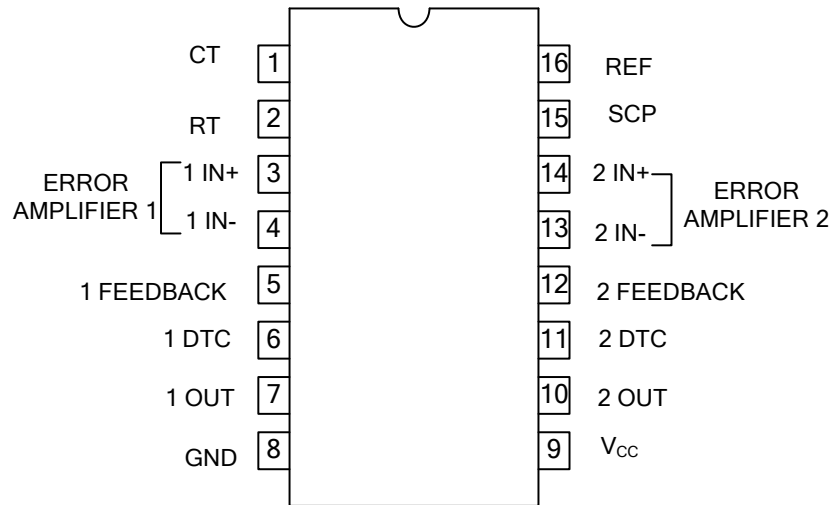
Ordering Number		Package	Packing
Lead Free	Halogen Free		
TL1451L-D16-T	TL1451G-D16-T	DIP-16	Tube
-	TL1451G-P16-R	TSSOP-16	Tape Reel
-	TL1451G-S16-R	SOP-16	Tape Reel

<p>TL1451L-D16-T</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel, T: Tube</p> <p>(2) D16: DIP-16, P16: TSSOP-16, S16: SOP-16</p> <p>(3) L: Lead Free, G: Halogen Free and Lead Free</p>
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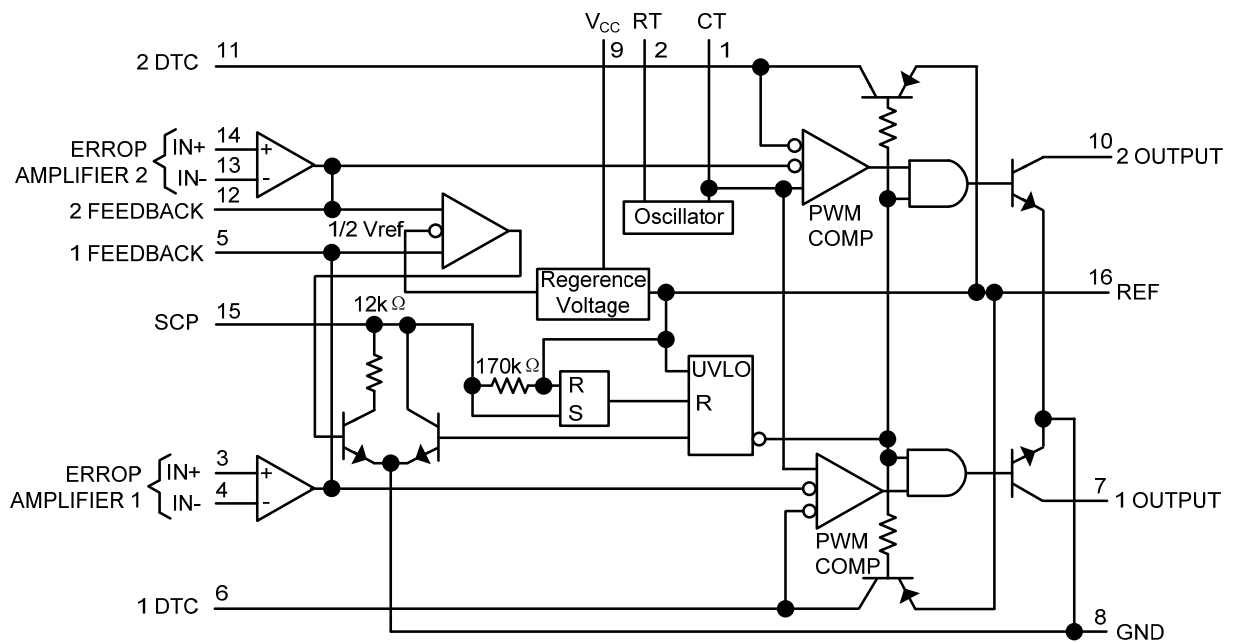
MARKING

DIP-16	SOP-16 / TSSOP-16

PIN CONFIGURATION



BLOCK DIAGRAM



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

PARAMETER		SYMBOL	VALUE	UNIT
Supply Voltage		V _{CC}	51	V
Amplifier Input Voltage		V _{IN}	20	V
Collector Output Voltage		V _{OUT}	51	V
Collector Output Current		I _{OUT}	21	mA
Power Dissipation	DIP-16	P _D	1000	mW
	SOP-16		500	
	TSSOP-16		700	
Junction Temperature		T _J	+125	°C
Operating Temperature		T _{OPR}	-20 ~ +85	°C
Storage Temperature		T _{STG}	-40 ~ +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.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage	V _{CC}	3.6		50	V
Amplifier Input Voltage	V _{IN}	1.05		1.45	V
Collector Output Voltage	V _{OUT}			50	V
Collector Output Current(each Transistor)	I _{OUT}			20	mA
Current into Feedback Terminal	I _{FB}			45	μA
Feedback Resistor	R _F	100			kΩ
Timing Capacitor	C _T	150		15000	pF
Timing Resistor	R _T	8		100	kΩ
Oscillator frequency	F _{OSC}	1		350	kHz
Operating Temperature	T _{OPR}	-20		85	°C

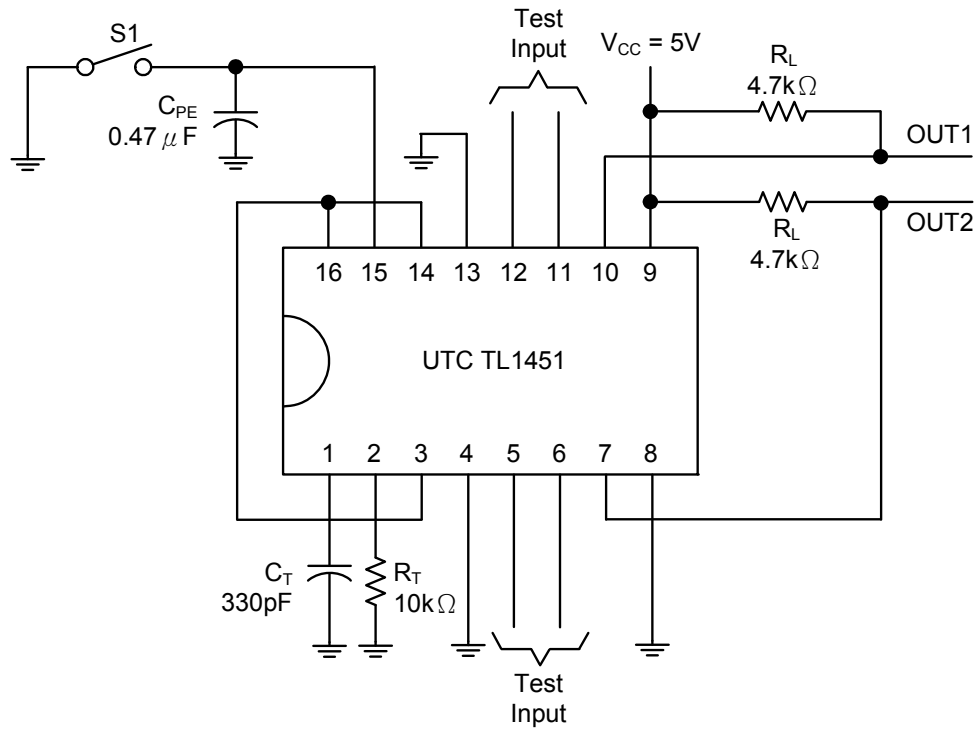
■ ELECTRICAL CHARACTERISTICS (V_{CC}=6V, f=200kHz, T_a=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Reference Section							
Output Voltage	V _{OUT}	I _{OUT} =1mA	2.4	2.5	2.6	V	
Output Voltage Change with Temperature		T _a = -20°C ~ 25°C		-0.1	±1	%	
		T _a = 25°C ~ 85°C		-0.2	±1		
Input Voltage Regulation	ΔV _{IN}	V _{CC} =3.6V ~ 40V		2	12.5	mV	
Output Voltage Regulation	ΔV _{OUT}	I _{OUT} =0.1mA ~ 1mA		1	7.5	mV	
Short-Circuit Output Current	I _{OUT}	V _{OUT} =0	3	10	30	mA	
Undervoltage Lockout Section							
Threshold Voltage (V _{CC})	Upper	V _{THR}	I _{OUT(REF)} =0.1mA		2.72	V	
	Lower				2.6	V	
Hysteresis (V _{CC})				V _{HYS}		120	mV
Reset Threshold voltage (V _{CC})					1.5	1.9	V
Short-Circuit Protection Control Section							
Input Threshold Voltage(SCP)	V _{IN(THR)}		0.60	0.67	0.75	V	
Standby Voltage(SCP)	V _{STN-BY}	No pullup	140	185	230	mV	
Latched Input Voltage (SCP)	V _{IN(LAT)}	No pullup		60	120	mV	
Input (source) Current	I _{IN(SOURCE)}	V _{IN} =0.7V	-10	-15	-20	μA	
Comparator Threshold Voltage (FEEDBACK)	V _{THR}			1.18		V	

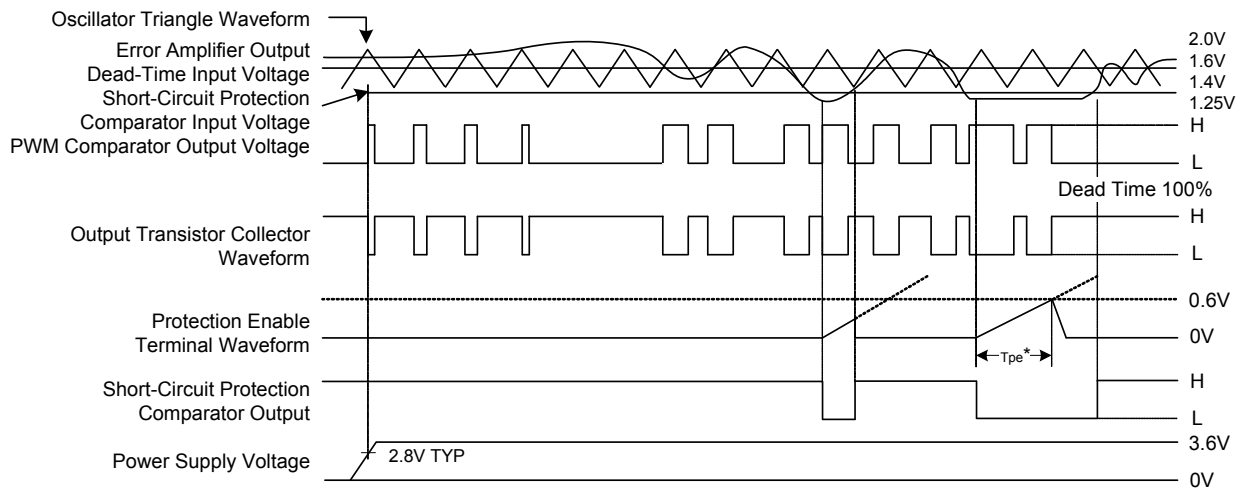
■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Oscillator Section						
Frequency	F	$C_T=330\text{pF}$, $R_T=10\text{k}\Omega$		200		kHz
Standard deviation of frequency		$C_T=330\text{pF}$, $R_T=10\text{k}\Omega$		10%		
Frequency Change with Voltage		$V_{CC}=3.6\text{V} \sim 40\text{V}$		1%		
Frequency Change with Temperature		$T_A=-20^\circ\text{C} \sim 25^\circ\text{C}$		-0.4	± 2	%
		$T_A=25^\circ\text{C} \sim 85^\circ\text{C}$		-0.2	± 2	
Dead-Time Control Section						
Input bias Current (DTC)	$I_{IN(BIAS)}$				1	μA
Latch mode (source) Current (DTC)			-80	-145		μA
Latched Input Voltage (DTC)	V_{IN}	$I_{OUT}=40\mu\text{A}$	2.3			V
Input threshold Voltage at $f=10\text{kHz}$ (DTC)	$V_{IN(THR)}$	Zero duty cycle		2.05	2.25	V
		Maximum duty cycle	1.2	1.45		
Error-Amplifier Section						
Input Offset Voltage	$V_{IN(OFF)}$	$V_{OUT}(\text{FEEDBACK})=1.25\text{V}$			± 6	mV
Input Offset Current	$I_{IN(OFF)}$	$V_{OUT}(\text{FEEDBACK})=1.25\text{V}$			± 100	nA
Input Bias current	$I_{IN(BIAS)}$	$V_{OUT}(\text{FEEDBACK})=1.25\text{V}$		160	500	nA
Common-Mode Input Voltage Range	$V_{IN(CM)}$	$V_{CC}=3.6\text{V} \sim 40\text{V}$	1.05~ 1.45			V
Open-loop Voltage Amplification		$R_F=200\text{k}\Omega$	70	80		dB
Unity-gain Bandwidth	B_G			1.5		MHz
Common-mode Rejection Ratio	RR		60	80		dB
Positive Output Voltage Swing	V_{OUT}		$V_{ref}-0.1$			V
Negative Output Voltage Swing	V_{OUT}				1	V
Output (sink) Current (FEEDBACK)	$I_{OUT(SIN)}$	$V_{ID}=-0.1\text{V}$, $V_{OUT}=1.25\text{V}$	0.5	1.6		mA
Output (source) Current (FEEDBACK)	$I_{OUT(SOU)}$	$V_{ID}=0.1\text{V}$, $V_{OUT}=1.25\text{V}$	-30	-40		μA
Output Section						
Collector off-state Current	I_{OFF}	$V_{OUT}=50\text{V}$			10	μA
Output Saturation Voltage	$V_{OUT(SAT)}$	$I_{OUT}=10\text{mA}$		1.2	2	V
Short-Circuit Output Current	$I_{OUT(SHT)}$	$V_{OUT}=6\text{V}$		90		mA
PWM Comparator Section						
Input Threshold Voltage at $f=10\text{kHz}$ (FEEDBACK)	$V_{I(THR)}$	Zero duty cycle		2.05	2.25	V
		Maximum duty cycle	1.2	1.45		
TOTAL DEVICE						
Standby Supply Current	I_{STN-BY}	Off-state		1.3	1.8	mA
Average Supply Current		$R_T=10\text{k}\Omega$		1.7	2.4	mA

■ TEST CIRCUIT



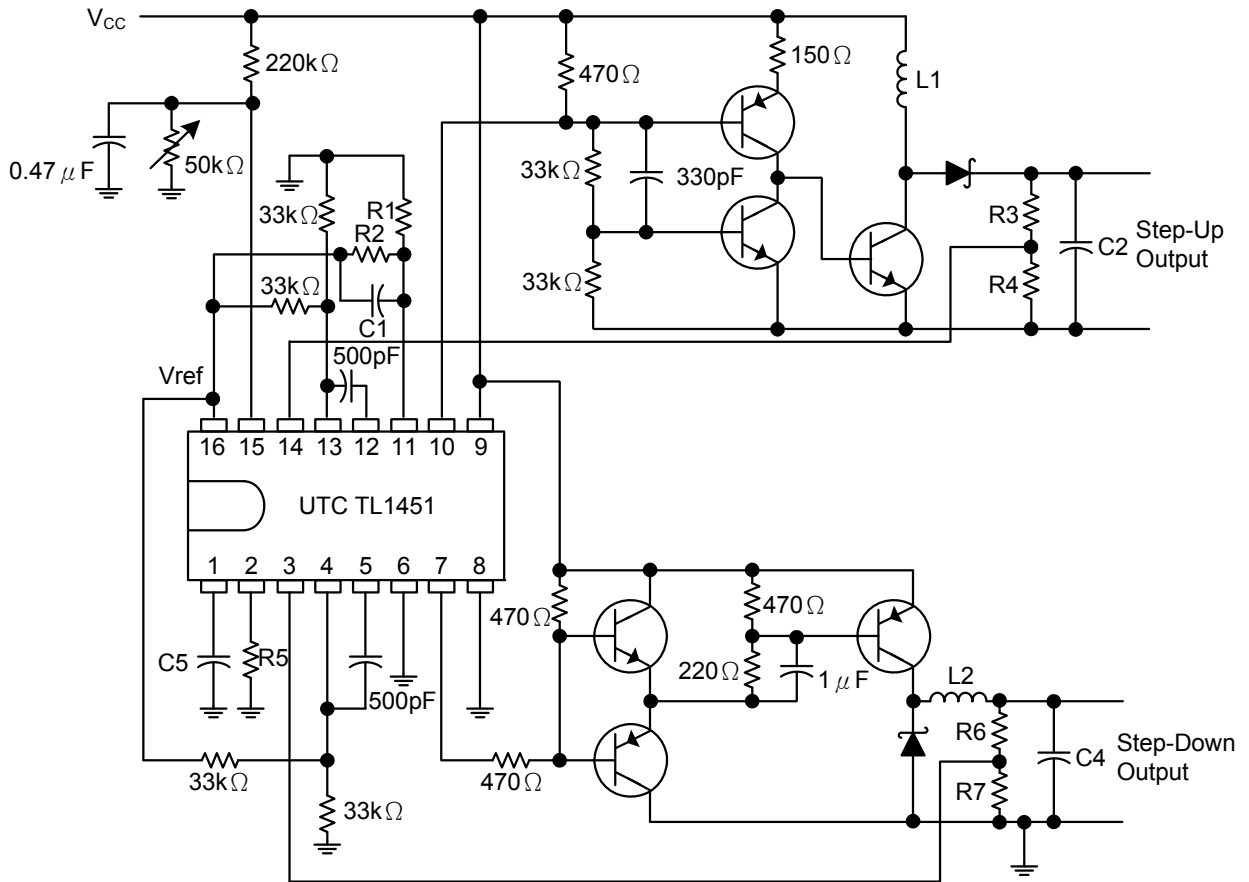
■ TIMING DIAGRAM



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

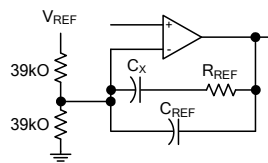
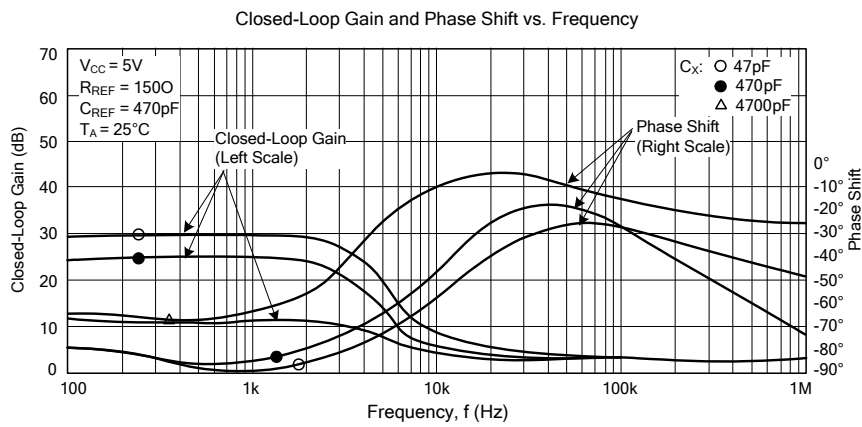
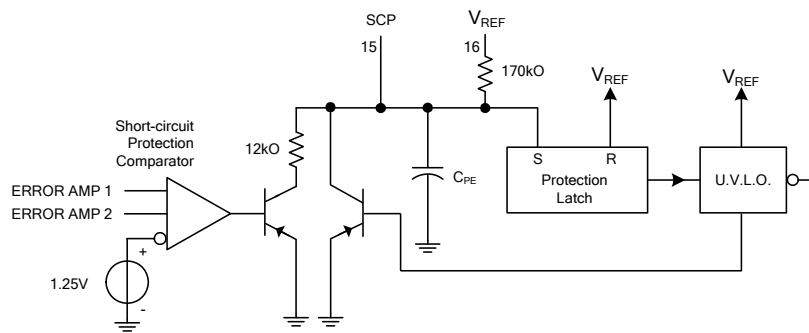
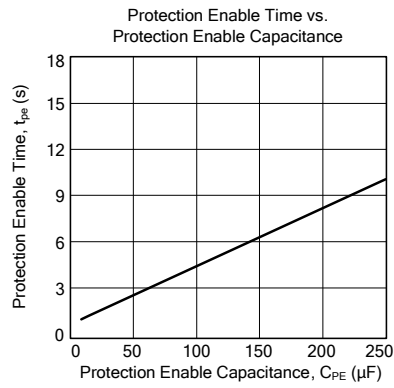
APPLICATION INFORMATION

HIGH-SPEED DUAL SWITCHING REGULATOR

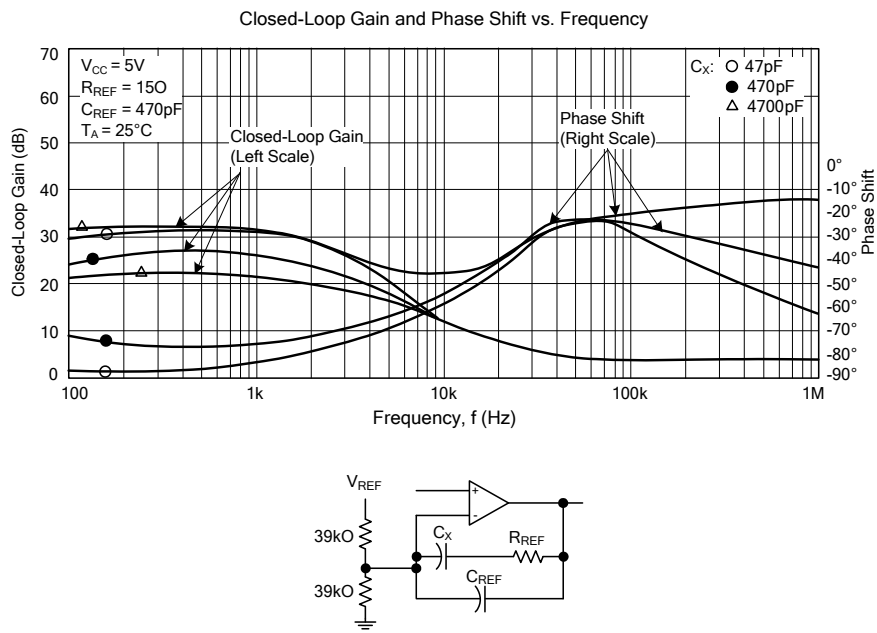
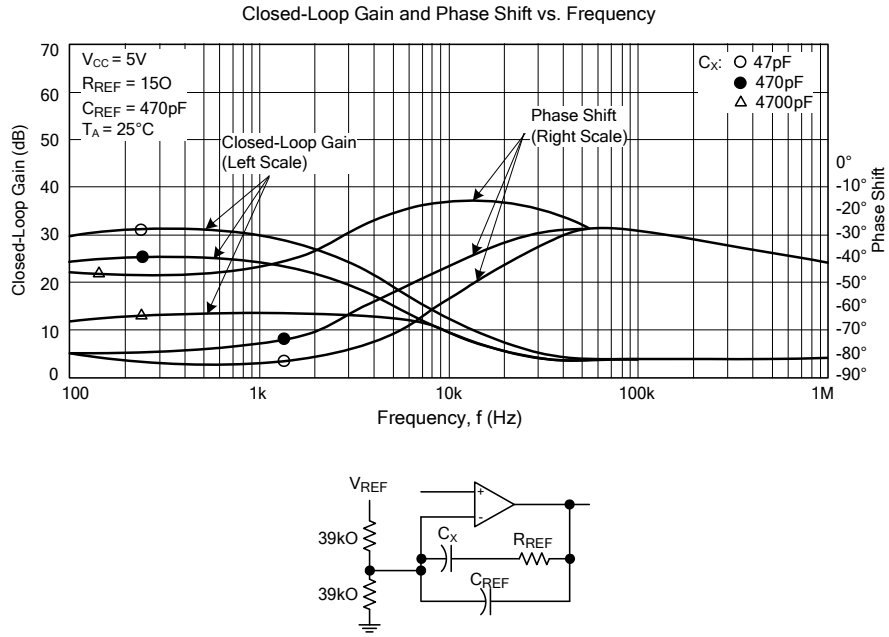


NOTE A: Values for R1 through R7, C1 through C4, and L1 and L2 depend upon individual application.

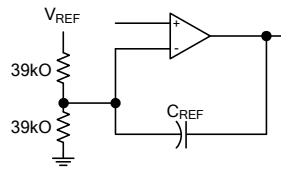
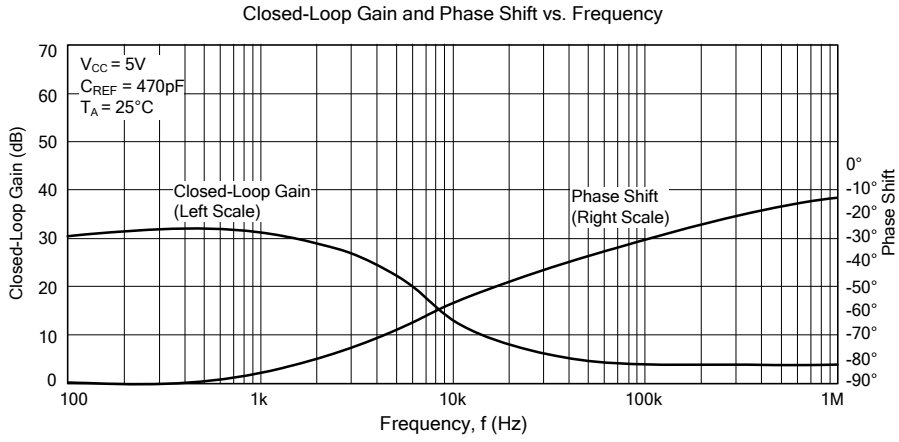
TYPICAL CHARACTERISTICS



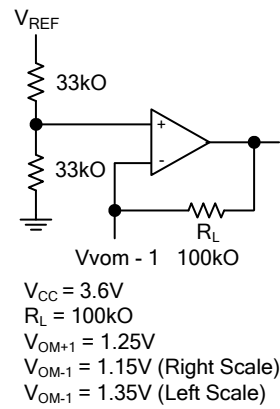
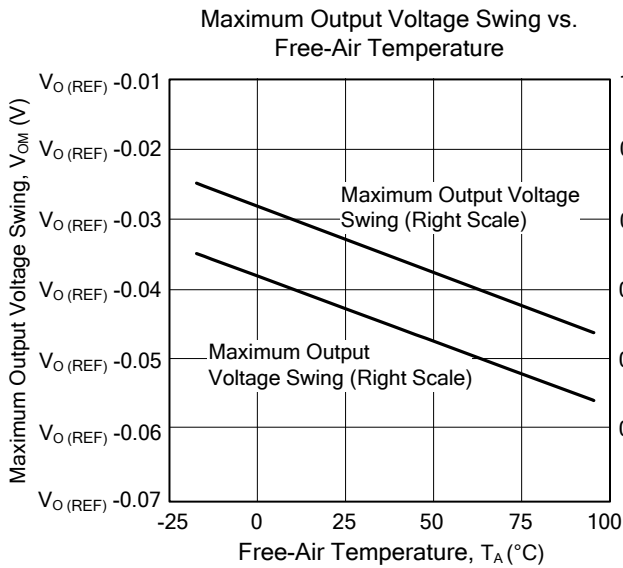
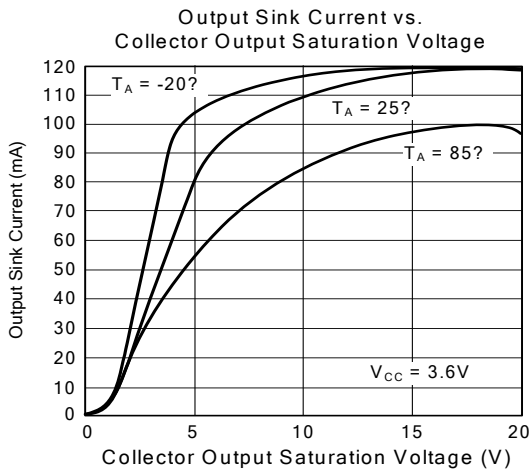
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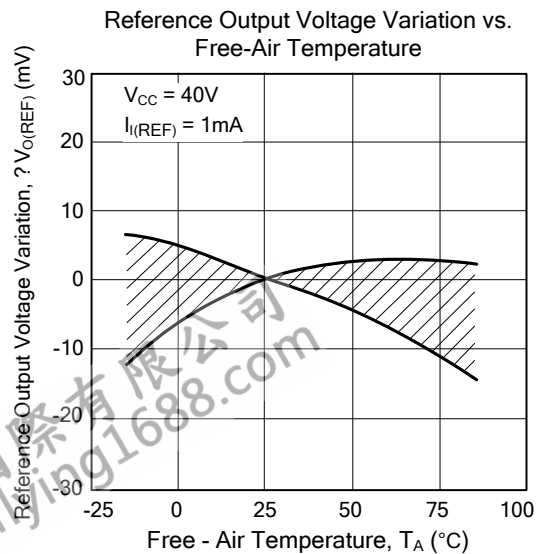
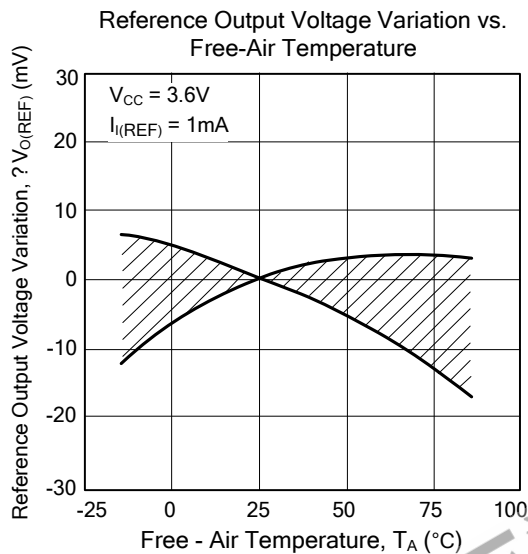
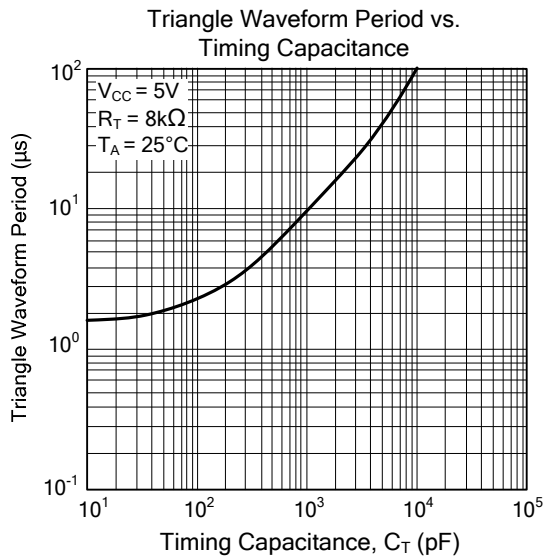
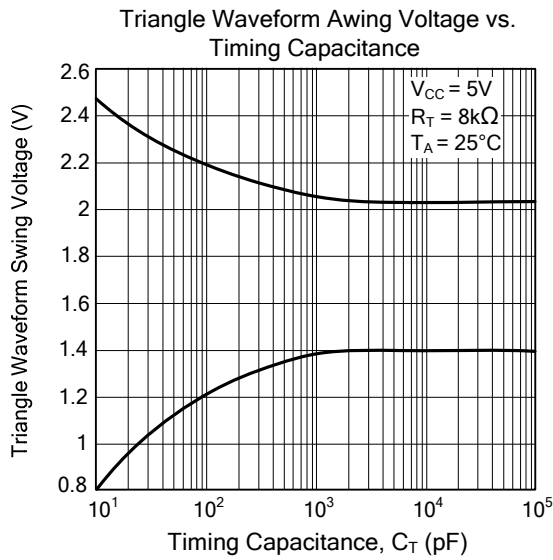
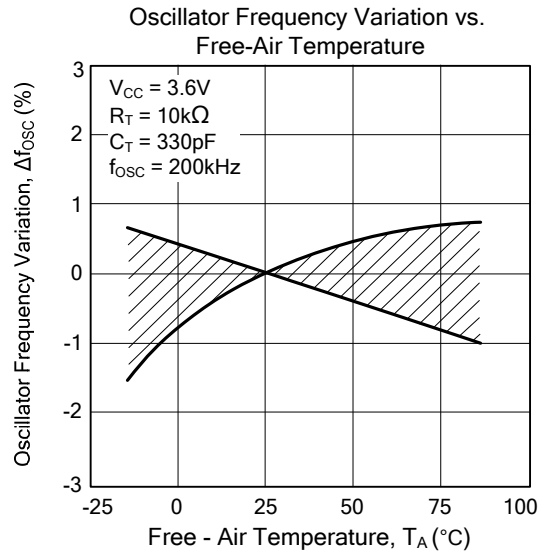
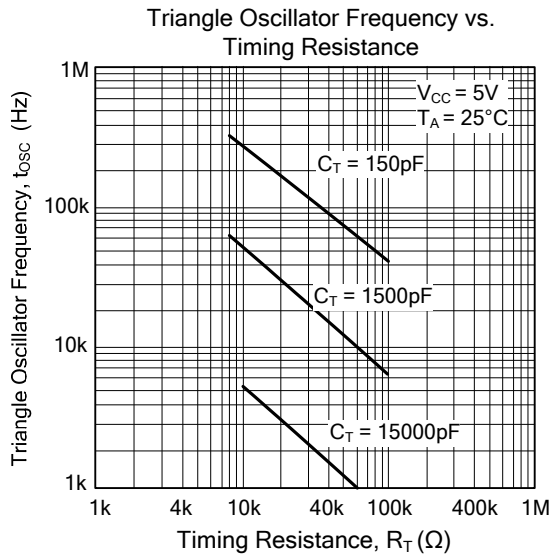
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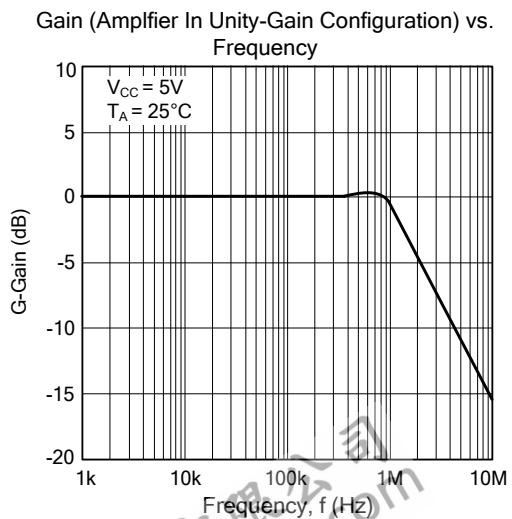
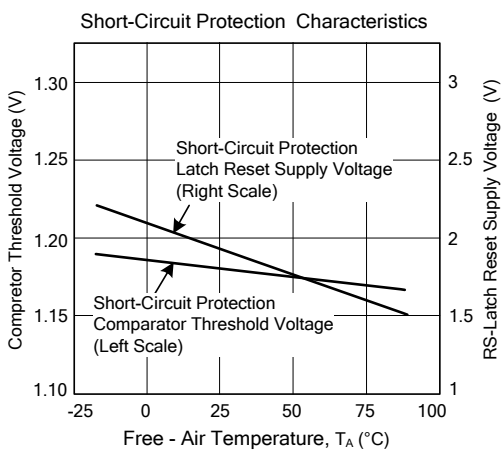
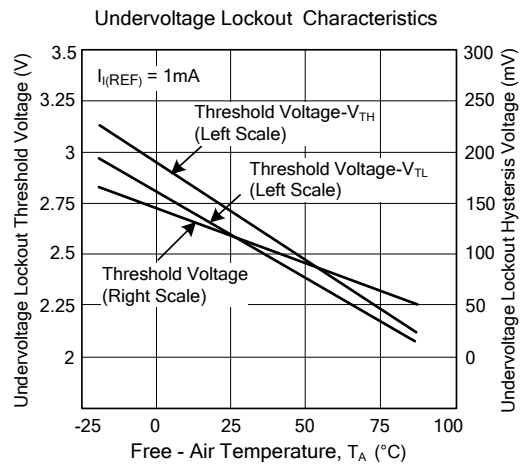
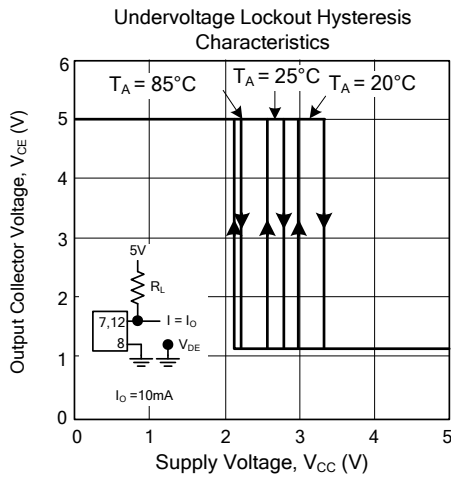
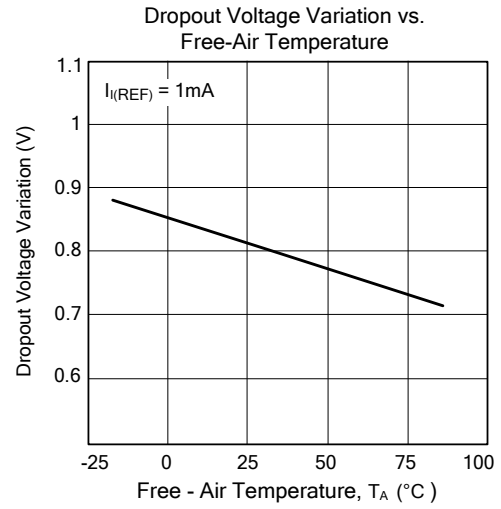
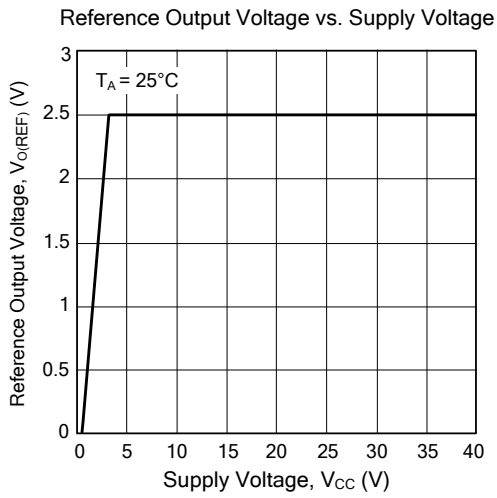
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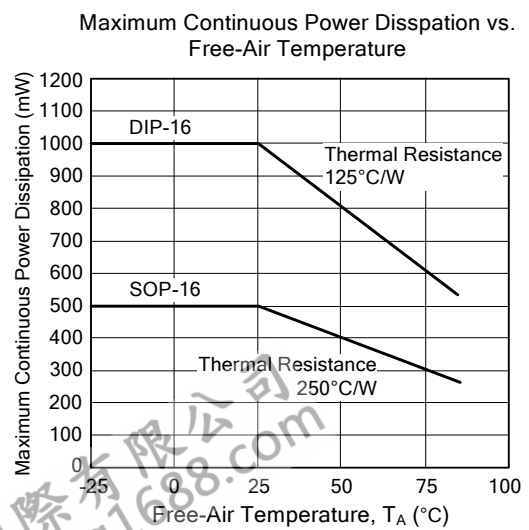
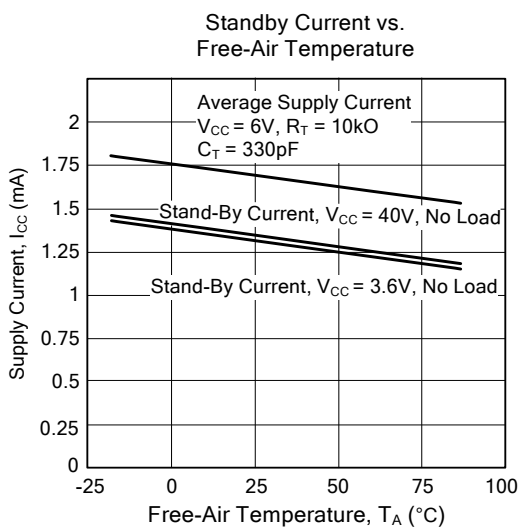
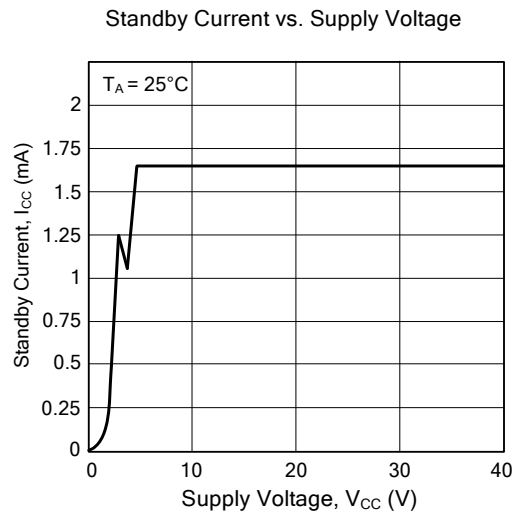
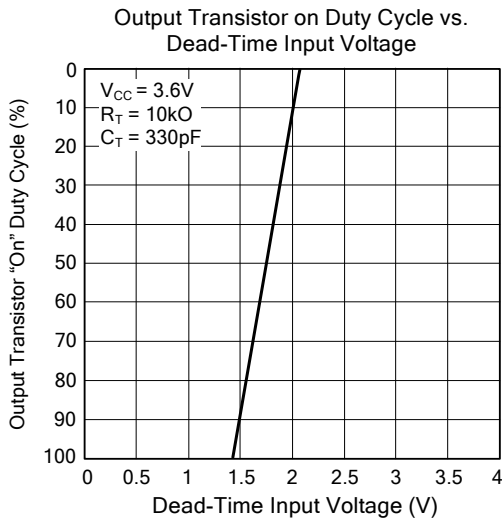
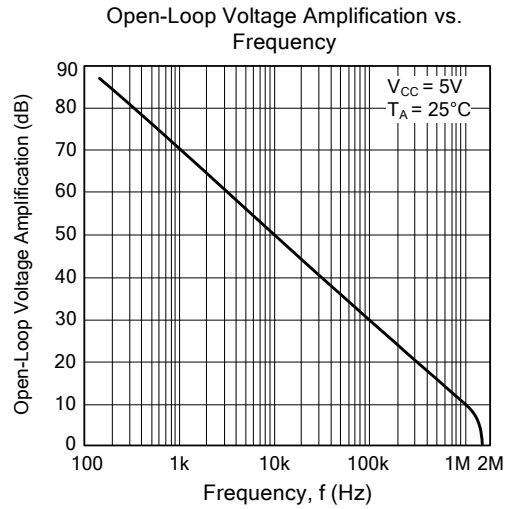
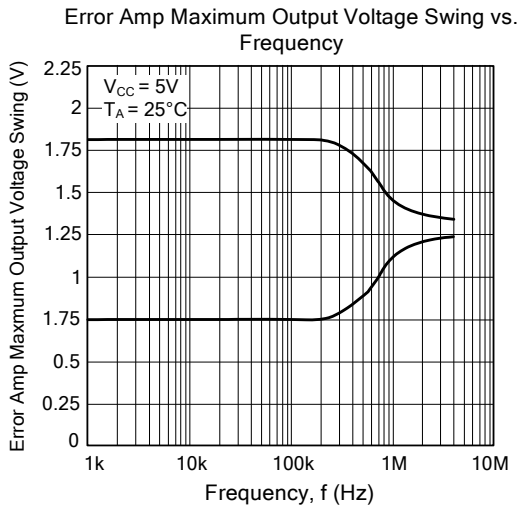
■ TYPICAL CHARACTERISTICS



■ TYPICAL CHARACTERISTICS(Cont.)



TYPICAL CHARACTERISTICS(Cont.)



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