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NTE1729
Integrated Circuit
Pulse Width Modulator (PWM) Control Circuit

Description:

The NTE1729 is an inverter control unit in a 16–Lead DIP type package which provides all the control circuitry for PWM type switching regulators. Included in this device is the voltage reference, dual error amplifiers, oscillator, pulse width modulator, pulse steering flip flop, dual alternating output switches, and dead time control.

Features:

- Complete PWM Power Control Circuit
- Adjustable Dead Time: 0 to 100%
- No Double Pulsing of Same Output during Load Transient Condition
- Dual Error Amplifiers have Wide Common Mode Input Voltage Capability: –0.3V to V_{CC} –2V
- Circuit Architecture Provides Easy Synchronization
- Uncommitted Outputs for 250mA Sink or Source
- With Miss–Operation Prevention Circuit for Low Level Supply Voltage

Absolute Maximum Ratings: (T_A = +25°C unless otherwise specified)

Supply Voltage, V_{CC} 41V
Error Amplifier Input Voltage, V_{ICM} . . . . . V_{CC} +0.3V
Output Voltage, V_{CER} 41V
Total Power Dissipation (T_A = +25°C), P_T 1000mW
Operating Temperature Range, T_{opr} . . . . . –20° to +85°C
Storage Temperature Range, T_{stg} . . . . . –65° to +150°C

Recommended Operating Conditions:

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	7	–	40	V
Output Voltage	V_{CER}	–0.3	–	40	V
Output Current	I_C	–	–	200	mA
Error Amplifier Sink Current	I_{OAMP}	–	–	–0.3	mA
Timing Capacitor	C_T	0.47	–	10000	nF
Timing Resistance	R_T	1.8	–	500	kΩ
Oscillation Frequency	f_{osc}	1	–	300	kHz
Operating Temperature	T_{opt}	–20	–	+70	°C

Electrical Characteristics: (V_{CC} = +15V, f = 10kHz, –20° ≤ T_A ≤ +70°C, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Section							
Output Voltage		V_{ref}	I_{ref} = 1mA, T_A = +25°C	4.75	5.0	5.25	V
Line Regulation		REG_{IN}	7V ≤ V_{CC} ≤ 40V, I_{ref} = 1mA, T_A = +25°C	–	8	25	mV
Load Regulation		REG_L	1mA ≤ I_{ref} ≤ 10mA, T_A = +25°C	–	1	15	mV
Temperature Coefficient		V_{ref}	–20° ≤ T_A ≤ +85°C, I_{ref} = 1mA	–	0.01	0.03	%/°C
Short–Circuit Output Current		I_{short}	V_{ref} = 0, T_A = +25°C, Note 2	–	50	–	mA
Oscillator Section							
Frequency		f_{OSC}	C_T = 0.01µF, R_T = 12kΩ, T_A = +25°C	–	10	–	kHz
Standard Deviation of Frequency			7V ≤ V_{CC} ≤ 40V, C_T, R_T, Const., T_A = +25°C, Note 1	–	10	–	%
Frequency Change with Temperature			0° ≤ T_A ≤ +70°C, C_T = 0.01µF, R_T = 12kΩ	–	1	2	%
Frequency Change with Voltage			7V ≤ V_{CC} ≤ 40V, C_T = 0.01µF, R_T = 12kΩ, T_A = +25°C	–	–	1	%
Dead–Time Control Section							
Input Bias Current			0 ≤ V_I ≤ 5.25V	–	–2	–10	µA
Maximum Duty Cycle (Each Output)			V_I = 0	45	49	–	%
Input Threshold Voltage		V_{th}	Zero Duty Cycle	–	3.0	3.3	V
			Maximum Duty Cycle	0	–	–	V
Error Amplifier Section							
Input Offset Voltage		V_{IO}	V_{OAMP} = 2.5V	–	2	10	mV
Input Offset Current		I_{IO}	V_{OAMP} = 2.5V	–	25	250	nA
Input Bias Current			V_{OAMP} = 2.5V	–	0.2	1.0	mA
Common Mode Input Voltage	Low	V_{ICM}	7V ≤ V_{CC} ≤ 40V	–0.3	–	–	V
	High			V_{CC}–2	–	–	V
Open–Loop Voltage Amplification		A_V	V_{OAMP} = 0.5V to 3.5V, T_A = +25°C	60	80	–	dB
Unity Gain Bandwidth			T_A = +25°C	500	830	–	kHz
Common Mode Rejection Ratio		CMRR	V_{CC} = 40V, T_A = +25°C	65	80	–	dB
Output Sink Current			V_{OAMP} = 0.7V	0.3	0.7	–	mA
Output Source Current			V_{OAMP} = 3.5V	–2	–10	–	mA
PWM Section							
Input Threshold Voltage			Zero Duty Cycle	–	4.0	4.5	V
Input Sink Current			$V_{(Pin3)}$ = 0.7V	0.3	0.7	–	mA
Output Section							
Collector Cutoff Current		I_{CER}	V_{CE} = 40V, V_{CC} = 40V	–	2	100	µA
Emitter Cutoff Current			V_{CC} = V_C = 40V	–	–	–100	µA
Collector Saturation Voltage		$V_{CE(sat)}$	I_C = 200mA, V_E = 0, Common Emitter	0	0.95	1.3	V
		$V_{CE(on)}$	I_E = 200mA, V_C = 15V, Emitter Follower	–	1.6	2.5	V

Electrical Characteristics (Cont'd): (V_{CC} = +15V, f = 10kHz, –20° ≤ T_A ≤ +70°C, unless otherwise specified)

Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Output Section (Cont'd)							
Output Voltage Rise Time	Common Emitter	t_r	V_{CC} = 15V, R_L = 150Ω, I_O = 100mA, T_A = +25°C	–	100	200	ns
	Emitter Follower			–	100	200	ns
Output Voltage Fall Time	Common Emitter	t_f		–	70	200	ns
	Emitter Follower			–	70	200	ns
Total Device							
Standby Current		$I_{CC(S.B.)}$	V_{CC} = 15V, all other inputs and outputs open	–	8.0	12.5	mA
Bias Current		$I_{CC(B.I.)}$	$V_{(Pin4)}$ = 2V	–	10	–	mA

Note 1. Standard deviation is a measure of the statistical distribution about the mean as derived from the formula:

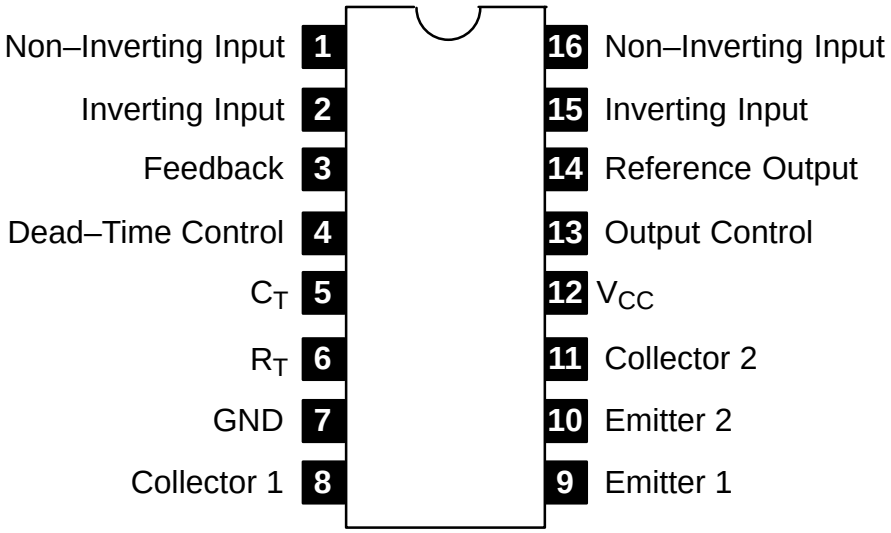
$$\alpha = \sqrt{\frac{\sum_{n=1}^{N} (X_n - \overline{X})^2}{N - 1}}$$

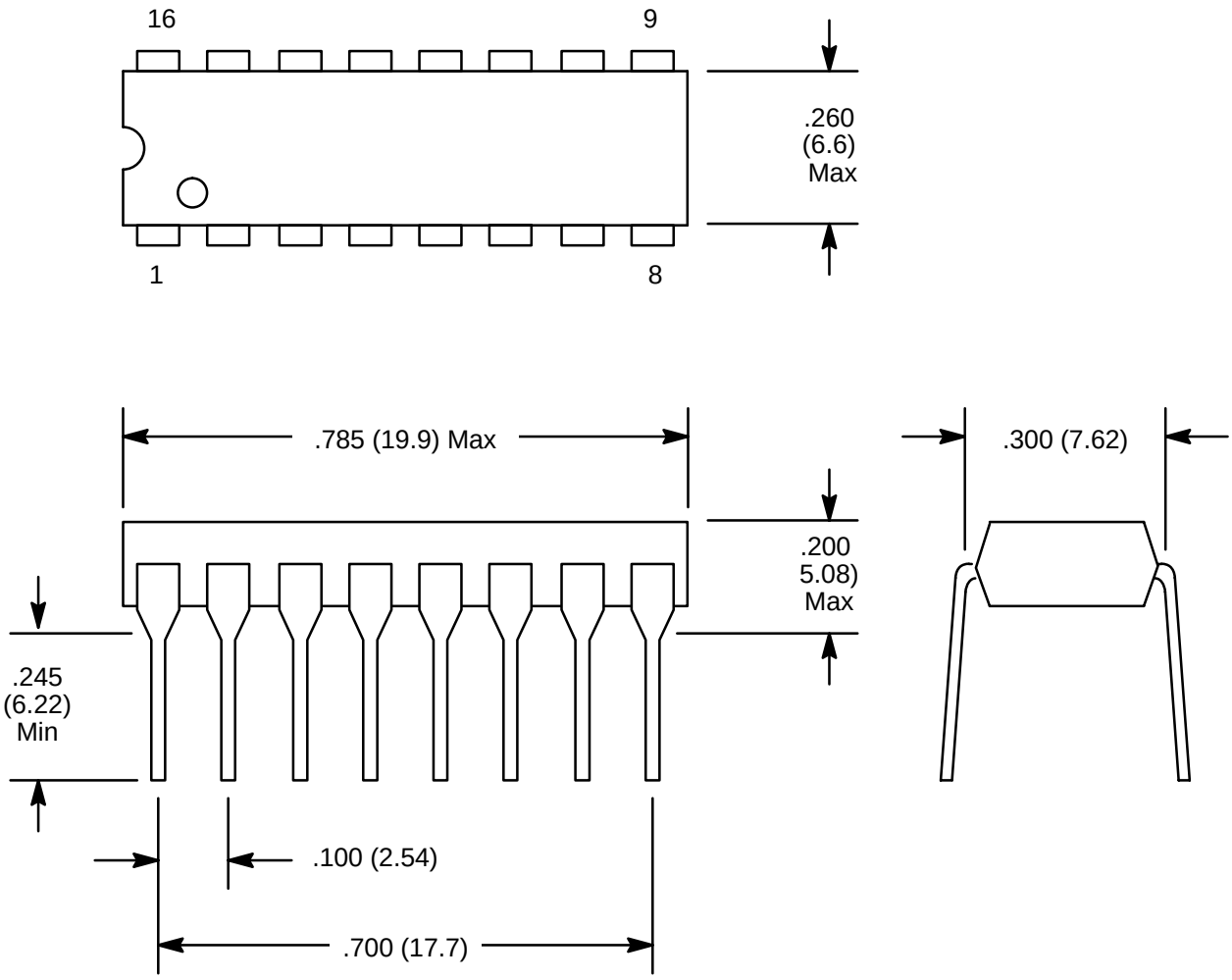
Calculation expression of frequency is as follows:

$$f_{OSC} = \frac{1}{0.817\ R_T \bullet C_T + 1.42 \bullet 10^{-6}}\ (Hz) \qquad [R_T] = \Omega,\ [C_T] = F$$

Note 2. Maximum duration of short–circuit condition is 1sec (non–repetitive).

Pin Connection Diagram




16
9
.260
(6.6)
Max
1
8
.785 (19.9) Max
.300 (7.62)
.200
5.08)
Max
.245
(6.22)
Min
.100 (2.54)
.700 (17.7)