CM494

ADVANCED REGULATING PULSE WIDTH MODULATOR

GENERAL DESCRIPTION

This of PWM modulator provides a complete pulse width modulation system in a single monolithic integrated circuit. This device includes a 5V reference accurate to ±1%, two independent amplifiers usable for both voltage and current sensing, an externally synchronizable oscillator with its linear ramp generator, and two-uncommitted transistor output switches. These two outputs may be operated either in parallel for single-ended operation or alternating for push-pull applications with an externally controlled dead-band. This unit is internally protected against double-pulsing of a single output or from extraneous output signals when the input supply voltage is below minimum.

The CM494 contains an on-chip 39V zener diode for high-voltage applications where Vcc would be greater than 40V, and a buffered output steering control that overrides the internal control of the pulse steering flip-flop.

FEATURES

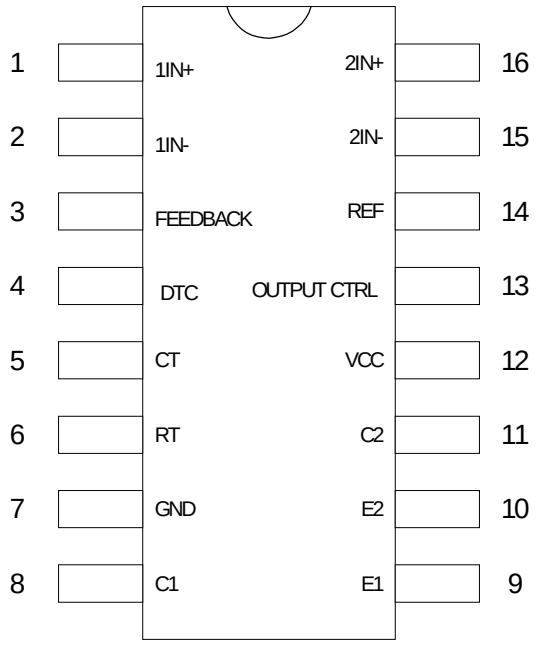
- Dual uncommitted 40V, 200mA output transistors.
- 1% accurate 5V reference.
- Dual error amplifiers.
- Wide range, variable dead time.
- Single-ended or push-pull operation.
- Under-voltage lockout with hysteresis.
- Double pulse protection.
- Master or slave oscillator operation.

APPLICATIONS

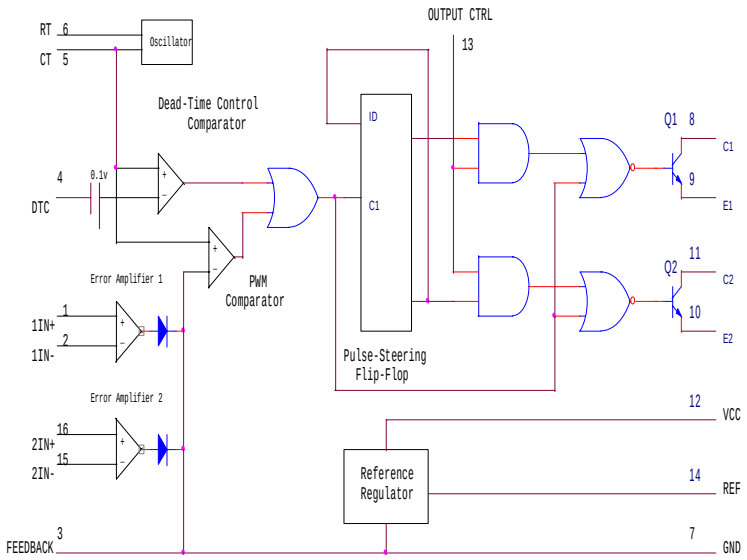
- Linear Regulators
- Adjustable Supplies
- Switching Power Supplies
- Battery Operated Computers
- Instrumentation
- Computer Disk Drives

PIN CONFIGURATION

16-PIN PDIP/SOP
(Top View)



BLOCK DIAGRAM



FUNCTION TABLE	
Output Control Connected to :	Output Function
Ground	Single-Ended or Parallel Operation Push-Pull Alternating Output
V_{REF}	

UM495A

Steering Control （Output Control at V_{REF}）	Output Function
Vs < 0.4V	PWM Output at Q1
Vs > 2.4V	PWM Output at Q2

ORDERING INFORMATION

Part Number	Temperature Range	Package
CM494CP	0℃ to 70℃	16-PIN DPIP (P16)
CM494CS	0℃ to 70℃	16-PIN SOP (S16)

ABSOULTE MAXIMUM RATINGS

Supply voltage, Vcc(Note 2)…… 45V
Amplifier input voltages…… Vcc + 0.3V
Collector output voltage…… 41V
Collector output current…… 250mA
Continuous total dissipation…… 1000mW
@ (or below) 25℃ free air temperature range (Note 3)
Storage temperature range……-65℃ to + 150℃
Lead temperature 1 / 16"(1.6mm) from case for 60 seconds,
J package……300℃
Lead temperature 1 / 16"(1.6mm) from case for 10 seconds,
N package…… 260℃
Note 1: Over operating free air temperature range unless otherwise noted.
Note 2: All voltage values are with respect to network ground terminal 3.
Note 3: Consult package section of data book regarding thermal specification and limitation of package.

RECOMMENDED OPERATING CONDITION

Supply voltage Vcc…… 7V to 40V
Error amplifier input voltages……-0.3 to Vcc-2V
Collector output voltage…… .40V
Collector output current (each transistor)… 200mA
Current into feedback terminal……..0.3mA
Timing capacitor, C_T… 0.47nF to 10,000nF
Timing resistor, R_T……..1.8kΩ to 500kΩ
Oscillator Frequency……1kHz to 300kHz
Operating free air temperature
UC494A, UC495A……-55℃ to + 125℃
UC494AC, UC495AC……0℃ to +70℃

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, over recommended operating free-air temperature range. Vcc = 15V, f = 10Khz, T_A=T_J.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Reference Section					
Output voltage V_{REF}	Io = 1mA, T_A= 25℃	4.75	5	5.25	V
Input regulation	Vcc = 7V to 40V		2	25	mV
Output regulation	Io = 1mA to 10mA		1	15	mV
Output voltage over temperature	△T_A= Min. to Max	4.90		5.10	V
Short circuit output current	V_{REF} = 0, T_A= 25℃	10	35	50	mA
Oscillator Section					
Frequency (Note 2)	C_T = 0.01μF, R_T = 12Ω		10		kHz
Standard deviation of frequency (Note 3)	All values of Vcc, C_T, R_T, T_A		10		%
Frequency change with voltage	Vcc = 7V to 40V, T_A= 25℃		0.1		%
Frequency change with temperature	C_T = 0.01μF, R_T = 12kΩ, △T_A= Min. to Max			2	%
Deadtime Control Section (Output control connected to V_{REF})					
Input bias current (Pin 4)	V ($_{PIN\ 4}$) = 0V to 5.25V		-2	-10	μA
Maximum duty-cycle (each output)	V ($_{PIN\ 4}$) = 0V	45			%
Deadtime control Section (cont.) （Output control connected to V_{REF}）					
Input threshold voltage (Pin 4)	Zero duty-cycle		3	3.3	V
	Maximum duty-cycle	0			V
Amplifier Section					
Input offset voltage	Vo $_{(PIN\ 3)}$ = 2.5V		2	10	mV
Input offset current	Vo $_{(PIN\ 3)}$ = 2.5V		25	250	nA
Input bias current	Vo $_{(PIN\ 3)}$ = 2.5V		-0.2	-1	μA
Common-mode input voltage range	Vcc = 7V to 40V	.03 to Vcc -2			V
Open loop voltage gain	△Vo = 3V, Vo = 0.5V to 3.5V	70	95		dB
Unity gain bandwidth			800		kHz
Common-mode rejection ratio	Vcc = 40V, T_A = 25℃	65	80		dB
Output sink current (Pin 3)	V_{ID} = -15mV to –5V, V $_{(Pin\ 3)}$ = 3.5V	0.3	0.7		mA
Output Source current (Pin 3)	V_{ID} = -15mV to 5V, V $_{(Pin\ 3)}$ = 3.5V	-2			mA

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, over recommended operating free-air temperature range. Vcc = 15V, f = 10Khz, T_A=T_J

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNITS
Output Section							
Collector off-state current		V_{CE} = 40V, Vcc = 40V			2	100	μA
Emitter off-state current		Vcc = Vc = 40V, V_E = 0				-100	μA
Collector-Emitter Saturation voltage	Common-Emitter	V_E = 0, Ic = 200mA			1.1	1.3	V
	Emitter-follower	Vc =15 V, I_E = -200mA			1.5	2.5	V
Output control input current		V_I = V_{REF}				3.5	mA
PWM Comparator Section							
Input threshold voltage (Pin 3)		Zero duty-cycle			4	4.5	V
Input sink current (Pin 3)		$V_{(Pin\ 3)}$ = 0.7V		0.3	0.7		mA
Steering Control							
Input current		$V_{(Pin\ 13)}$ = 0.4V,$Q_{1\ ACTIVE}$				-200	μA
		$V_{(Pin\ 13)}$ = 2.4V,$Q_{2\ ACTIVE}$				300	μA
Deadband					500		mA
Zener Diode Circuit（UC495A）							
Breakdown voltage		Vcc = 45V, Iz = 2mA		36	39	.45	V
Sink current		$V_{(Pin\ 15)}$ = 1V		0.2	0.3	0.6	mA
Total Device							
Standby supply current		Pin 6 at V_{REF}, All other inputs and outputs open	Vcc = 15V		6	10	mA
			Vcc = 40V		9	15	mA
Under voltage lockout				3.5		6.5	V
Hysteresis					300		mV
Switching Characteristics（T_A = 25℃）							
Output voltage rise time		Common-emitter configuration			100	200	ns
Output voltage fall time		R_L = 68Ω, C_L= 15pF			25	100	ns
Output voltage rise time		Emitter-follower configuration			100	200	ns
Output voltage fall time		R_L= 68Ω, C_L= 15pF			40	100	ns

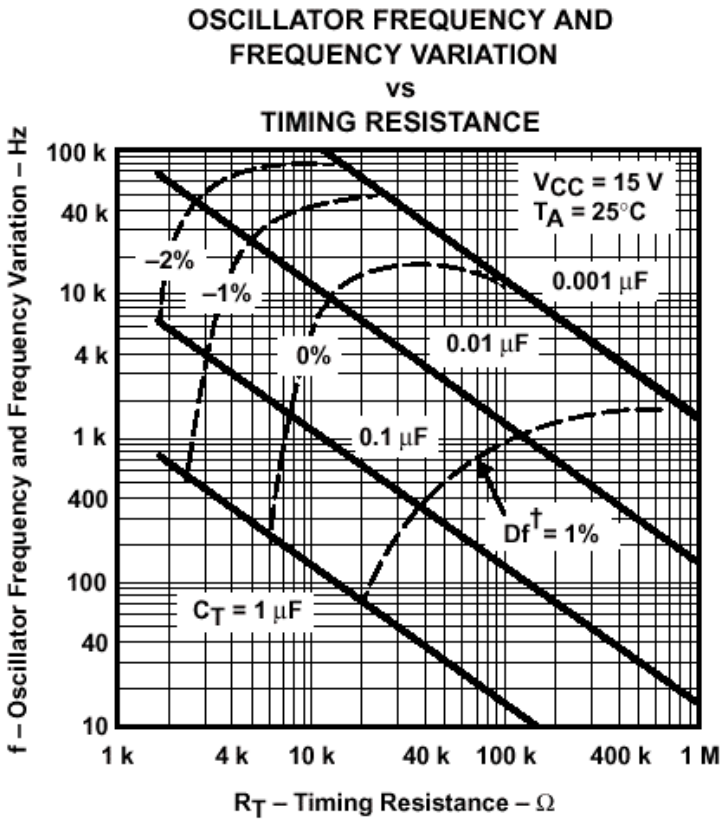
Note 1: Duration of the short circuit should not exceed one second.

Note 2: Frequency for other values of C_T and R_T is approximately f = 1.1/RTCT

Note 3: Standard deviation is measure of the statistical distribution about the mean as derived from the formula:

$$\sigma = \sqrt{\frac{\sum_{n=1}^{n} (Xn - X)^2}{n-1}}$$

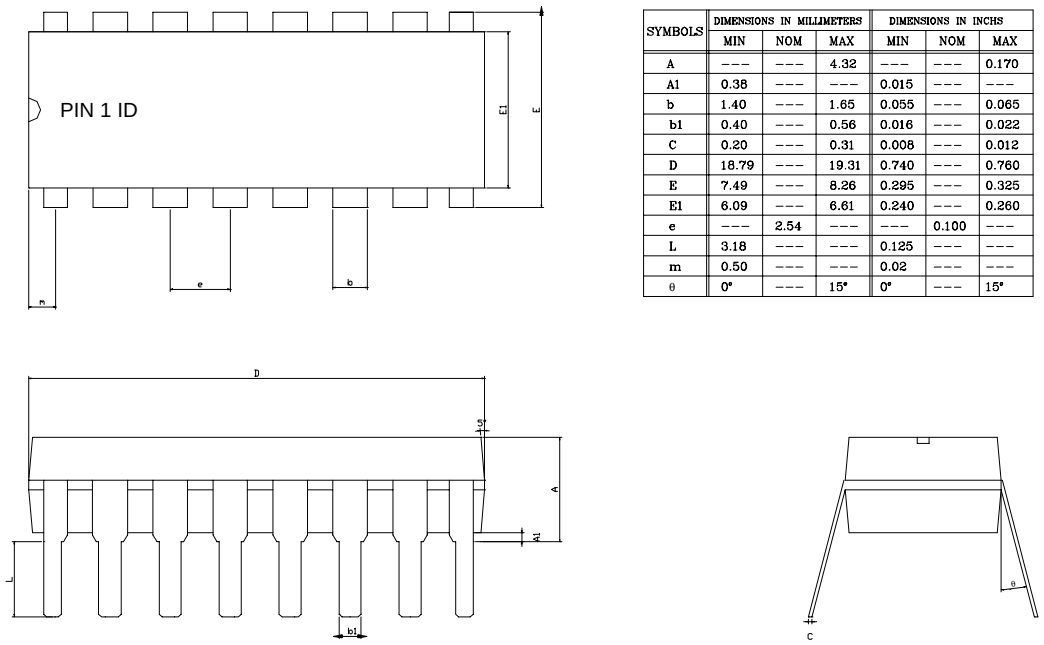
TYPICAL CHARACTERISTICS



Frequency variation (Δf) is the change in oscillator frequency that occurs over the full temperature range.

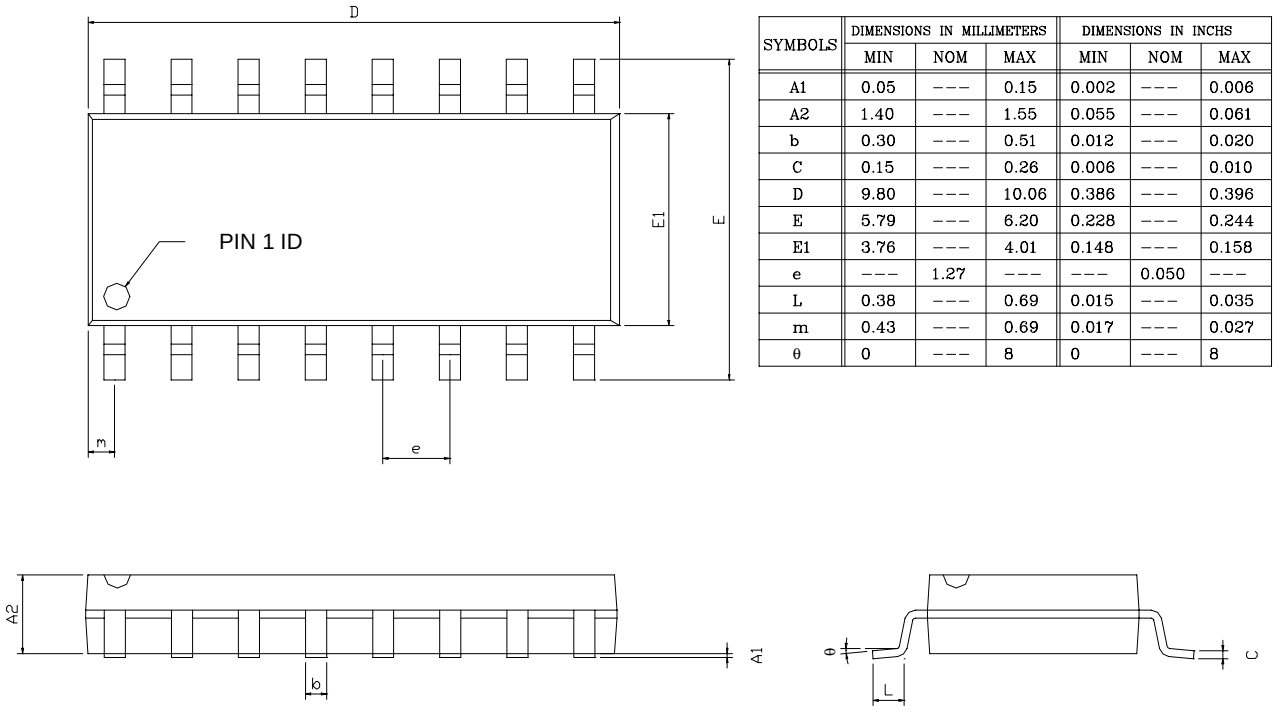
PACKAGE DIMENSION

16-PIN PDIP (P16)



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	4.32	---	---	0.170
A1	0.38	---	---	0.015	---	---
b	1.40	---	1.65	0.055	---	0.065
b1	0.40	---	0.56	0.016	---	0.022
C	0.20	---	0.31	0.008	---	0.012
D	18.79	---	19.31	0.740	---	0.760
E	7.49	---	8.26	0.295	---	0.325
E1	6.09	---	6.61	0.240	---	0.260
e	---	2.54	---	---	0.100	---
L	3.18	---	---	0.125	---	---
m	0.50	---	---	0.02	---	---
θ	0°	---	15°	0°	---	15°

16-PIN SOP (S16)



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHS		
	MIN	NOM	MAX	MIN	NOM	MAX
A1	0.05	---	0.15	0.002	---	0.006
A2	1.40	---	1.55	0.055	---	0.061
b	0.30	---	0.51	0.012	---	0.020
C	0.15	---	0.26	0.006	---	0.010
D	9.80	---	10.06	0.386	---	0.396
E	5.79	---	6.20	0.228	---	0.244
E1	3.76	---	4.01	0.148	---	0.158
e	---	1.27	---	---	0.050	---
L	0.38	---	0.69	0.015	---	0.035
m	0.43	---	0.69	0.017	---	0.027
θ	0	---	8	0	---	8

IMPORTANT NOTICE

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