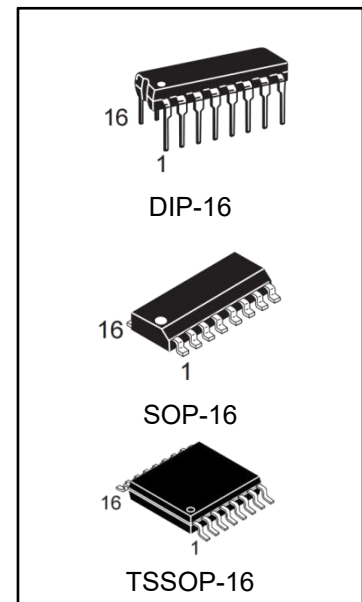


## SWITCHMODE PULSE WIDTH MODULATION CONTROL CIRCUIT

### Features

- Complete Pulse Width Modulation Control Circuitry
- On– Chip Oscillator with Master or Slave Operation
- On– Chip Error Amplifiers
- On– Chip 5.0 V Reference
- Adjustable Deadtime Control
- Uncommitted Output Transistors Rated to 500 mA Source or Sink
- Output Control for Push– Pull or Single– Ended Operation
- Undervoltage Lockout



### Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
TL494CN	DIP-16	TL494C	TUBE	1000pcs/box
TL494CM/TR	SOP-16	TL494C	REEL	2500pcs/reel
TL494CMT/TR	TSSOP-16	TL494C	REEL	2500pcs/reel
TL494IN	DIP-16	TL494I	TUBE	1000pcs/box
TL494IM/TR	SOP-16	TL494I	REEL	2500pcs/reel
TL494IMT/TR	TSSOP-16	TL494I	REEL	2500pcs/reel

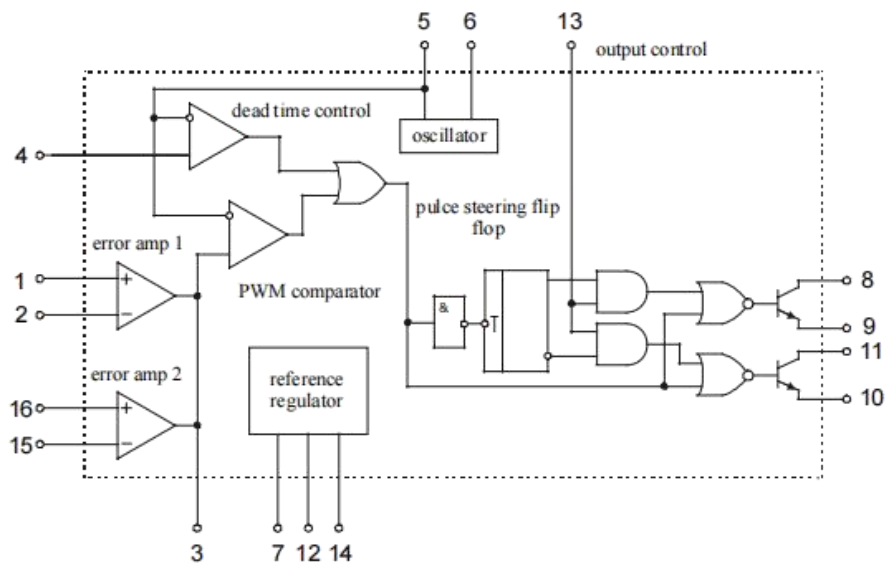
## DESCRIPTION

The TL494 is a fixed frequency, pulse width modulation control circuit designed primarily for SWITCHMODE power supply control.

## PIN ASSIGNMENT

noninv. input	1	16	noninv. input
inv. input	2	15	inv. input
feedback	3	14	ref. output
dead time control	4	13	output control
$C_T$	5	12	V <sub>CC</sub>
$R_T$	6	11	collector 2
gnd	7	10	emitter 2
collector 1	8	9	emitter 1

## LOGIC DIAGRAM



Pin 7 = GND  
Pin 12 = V<sub>CC</sub>

**MAXIMUM AND RECOMMENDED OPERATING CONDITIONS**

Symbol	Parameter		Recommended operating conditions		Maximum ratings		Unit
			Min	Max	Min	Max	
V <sub>CC</sub>	Supply Voltage		7	40		41	V
V <sub>I</sub>	Amplifier Input Voltage		-0.3	V <sub>CC</sub> -2		V <sub>CC</sub> +0.3	V
V <sub>O</sub>	Collector Output Voltage			40		41	V
I <sub>OC</sub>	Collector Output Current(Each Transistor)			200		250	mA
T <sub>STG</sub>	Storage Temperature Range				-65	150	°C
T <sub>A</sub>	Operating Free-Air Temperature Range	TL494C	0	70			°C
		TL494I	-40	85			°C

**ELECTRICAL CHARACTERISTICS** (TA= -40~+85°C, f=10kHz)

Symbol	Parameter	Test Conditions	Value		Temperature, °C	Unit
			Min	Max		
Vref	Output voltage	I <sub>0</sub> =1.0mA, V <sub>CC</sub> =15V	4.75	5.25	-40~+85	V
U <sub>regin</sub>	Input regulation	V <sub>CC</sub> =7~40V, I <sub>0</sub> =1.0mA	-	25	25	mV
U <sub>regout</sub>	Output regulation	I <sub>0</sub> =1~10 mA, V <sub>CC</sub> =15V	-	15	25	mV
Vref	Output voltage change with temperature	I <sub>0</sub> =1mA, V <sub>CC</sub> =15V	-	1.0	-40~+85	%
ISC	Short circuit output current	V <sub>ref</sub> =0, t <sub>sc</sub> <1s V <sub>CC</sub> =15V	-	50		mA
f <sub>osc</sub>	Frequency	C=0.01uF, R=12k V <sub>CC</sub> =15V, V <sub>(03)</sub> =0.7V	6.0	14		kHz
f <sub>osc</sub>	Standard Deviation of Frequency *	V <sub>CC</sub> =15V, V <sub>(03)</sub> =0.7V	-	15		%
f <sub>osc</sub> (ΔV)	Frequency Change with Voltage	V <sub>CC</sub> =7~40V, V <sub>(03)</sub> =0.7V	-	10	25	%
f <sub>osc</sub> (ΔT)	Frequency Change with Temperature	C=0.01uF, R <sub>T</sub> =12k V <sub>CC</sub> =15V, V <sub>(03)</sub> =0.7V	-	2.0		%
I <sub>I</sub> (2T)	Input bias current (pin 4)	V <sub>I</sub> =0...5.25V, V <sub>CC</sub> =15V V <sub>(03)</sub> =0.7V	-	-10		A
DC <sub>max</sub>	Maximum duty cycle (each output)	V <sub>I</sub> (04)=0V, V <sub>CC</sub> =15V V <sub>(03)</sub> =0.7V	45	-	-40~+85	%
V <sub>THD1</sub>	Input threshold voltage (pin 4) (Zero Duty Cycle)	DC <sub>max</sub> =0, V <sub>CC</sub> =15V V <sub>(03)</sub> =0.7V	-	3,3		V
V <sub>THD2</sub>	Input threshold voltage (pin 4) (Maximum Duty Cycle)	DC <sub>max</sub> V <sub>CC</sub> =15V, V <sub>(03)</sub> =0.7V	0	-		V
t <sub>rc</sub>	Output voltage risetime (Common- Emitter)	V <sub>CC</sub> =15V, V <sub>(03)</sub> =2.0V	-	200	-40~+85	ns
t <sub>fc</sub>	Output voltage falltime (Common- Emitter)	V <sub>CC</sub> =15V, V <sub>(03)</sub> =2.0V	-	100		ns
t <sub>rf</sub>	Output voltage risetime (Emitter- Follower)	V <sub>CC</sub> =V <sub>C</sub> =15V, V <sub>(03)</sub> =2.0V	-	200		ns
t <sub>ff</sub>	Output voltage falltime (Emitter- Follower)	V <sub>CC</sub> =V <sub>C</sub> =15V, V <sub>(03)</sub> =2.0V	-	100		ns
V <sub>THP</sub>	Input threshold voltage (pin 3)	DC <sub>max</sub> =0, V <sub>CC</sub> =15V	-	4.5	-40~+85	V
I <sub>i</sub>	Input sink current (pin 3)	V <sub>CC</sub> =15V, V <sub>(03)</sub> =0.7V	0.3	-		mA
V <sub>IO</sub>	Input offset voltage	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =2.5V	-	10		mV

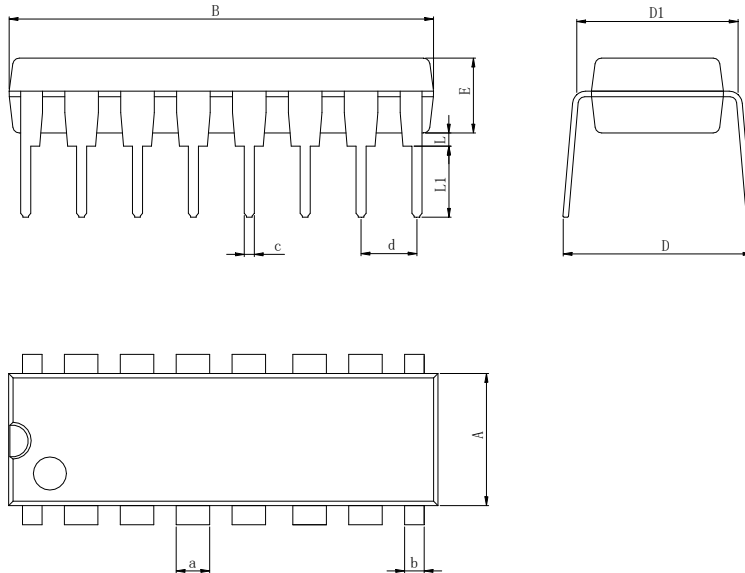
IIO	Input offset current	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =2.5V	-	250		nA
IIB	Input bias current	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =2.5V	-	1		A
VICRL	Low Input common mode voltage range	V <sub>CC</sub> =7~40V	-0.3	-		V
VICRH	High Input common mode voltage range	V <sub>CC</sub> =7~40V	V <sub>CC</sub> -2	-		V
AVOL	Open loop voltage amplification	V <sub>O</sub> =3V, V <sub>CC</sub> =15V V <sub>O</sub> =0.5~3.5V	70	-		dB
f <sub>b</sub>	Unity-gainbandwidth	V <sub>CC</sub> =15V	100	-		kHz
CMRR	Common mode rejection ratio	V <sub>CC</sub> =40V	65	-	25	dB
IOL	Output sink current(pin 3)	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =0.7V	0.3	-		mA
IOH	Output sourcecurrent (pin 3)	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =3.5V	-2.0		-40~+85	mA
IC(off)	Collector off-state current	V <sub>CE</sub> =V <sub>CC</sub> =40V	-	100		A
IE(off)	Emitter off-state current	V <sub>CC</sub> =V <sub>C</sub> =40V, V <sub>E</sub> =0V	-	-100		A
VSAT(C)	Collector - Emitter saturation voltage (Common-Emitter)	V <sub>CC</sub> =15V, V <sub>E</sub> =0V V <sub>O(03)</sub> =3.0V, I <sub>C</sub> =200mA	-	1.3		V
VSAT(E)	Collector - Emitter saturation voltage (Emitter-follower)	V <sub>CC</sub> =V <sub>C</sub> =15V I <sub>E</sub> = -200mA, V <sub>O(03)</sub> =3.0V			-20~+85	V
IOCH	Output control input current	V <sub>CC</sub> =15V V <sub>O(03)</sub> =0.7V	-	3.5		mA
ICC15	Standby Supply Current at VCC 15V	V <sub>CC</sub> =15V	-	10	25	mA
ICC40	Standby Supply Current at VCC 40V	V <sub>CC</sub> =40V	-	15	25	mA
ICCA	Average Supply Current	V <sub>CC</sub> =15V V <sub>O(03)</sub> =0.7V V <sub>O(04)</sub> =2.0V	-	15	-40~+85	mA

Standard deviation is a measure of the statistical distribution about the mean as derived from the formula

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

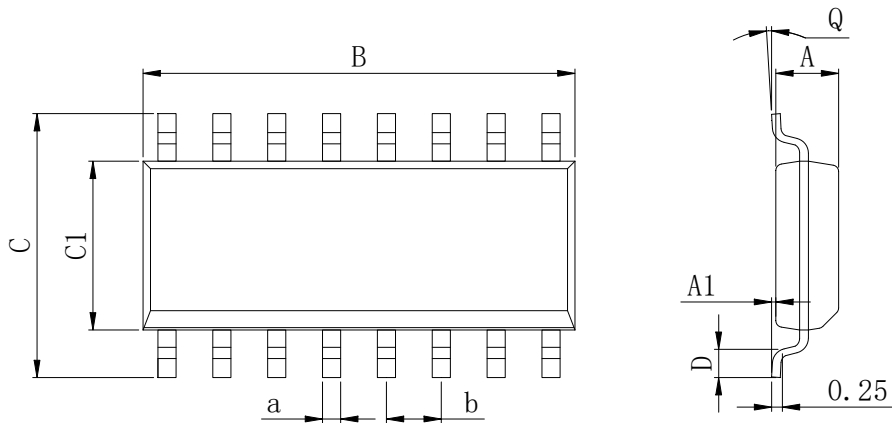
**PHYSICAL DIMENSIONS**

DIP16



Dimensions In Millimeters(DIP16)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	18.94	8.40	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	19.56	9.00	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

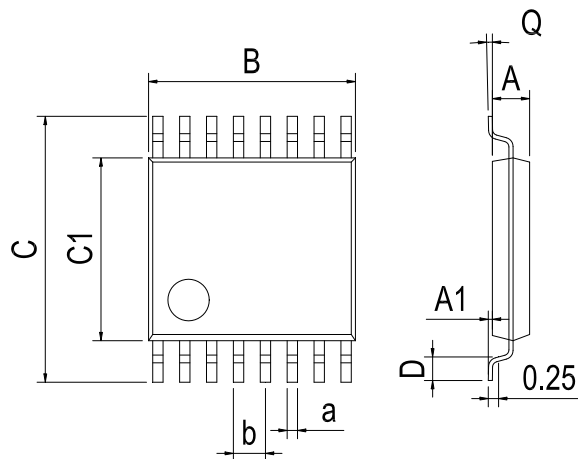
SOP16



Dimensions In Millimeters(SOP16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	9.80	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	10.0	6.20	4.00	0.80	8°	0.45	

**PHYSICAL DIMENSIONS**

TSSOP16



Dimensions In Millimeters(TSSOP16)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	4.90	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	0.95	0.20	5.10	6.60	4.50	0.80	8°	0.25	

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