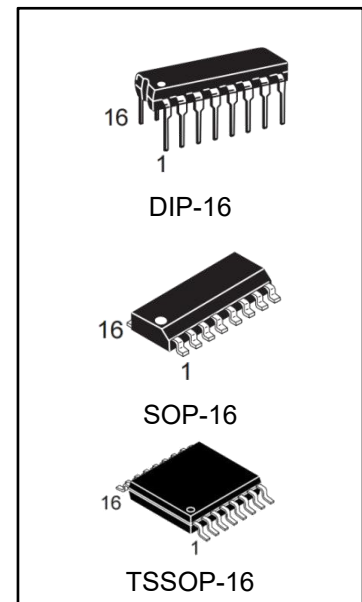


## SWITCHMODE PULSE WIDTH MODULATION CONTROL CIRCUIT

### 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

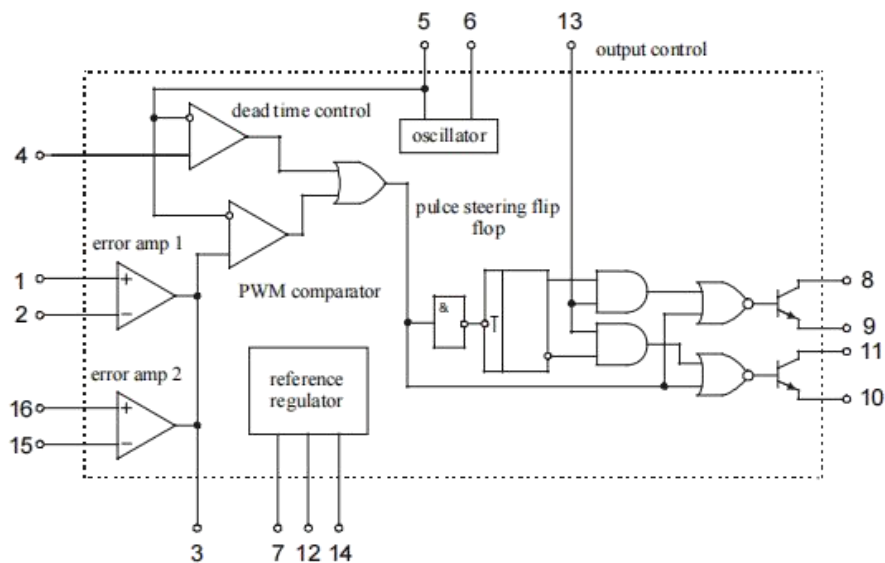
## DESCRIPTION

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	$V_{CC}$
$R_T$	6	11	collector 2
gnd	7	10	emitter 2
collector 1	8	9	emitter 1

## LOGIC DIAGRAM



Pin 7 = GND  
Pin 12 =  $V_{CC}$

**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
T <sub>L</sub>	Lead Temperature (Soldering, 10 seconds)				-	245	°C

**Note:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

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

Symbol	Parameter	Test Conditions	Value		Temperature, °C	Unit
			Min	Max		
V <sub>ref</sub>	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
V <sub>ref</sub>	Output voltage change with temperature	I <sub>0</sub> =1mA, V <sub>CC</sub> =15V	-	1.0	-40~+85	%
I <sub>SC</sub>	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>B</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		V
I <sub>i</sub>	Input sink current (pin 3)	V <sub>CC</sub> =15V, V <sub>(03)</sub> =0.7V	0.3	-	-40~+85	mA
V <sub>IO</sub>	Input offset voltage	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =2.5V	-	10		mV
I <sub>IO</sub>	Input offset current	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =2.5V	-	250		nA
I <sub>B</sub>	Input bias current	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =2.5V	-	1		A

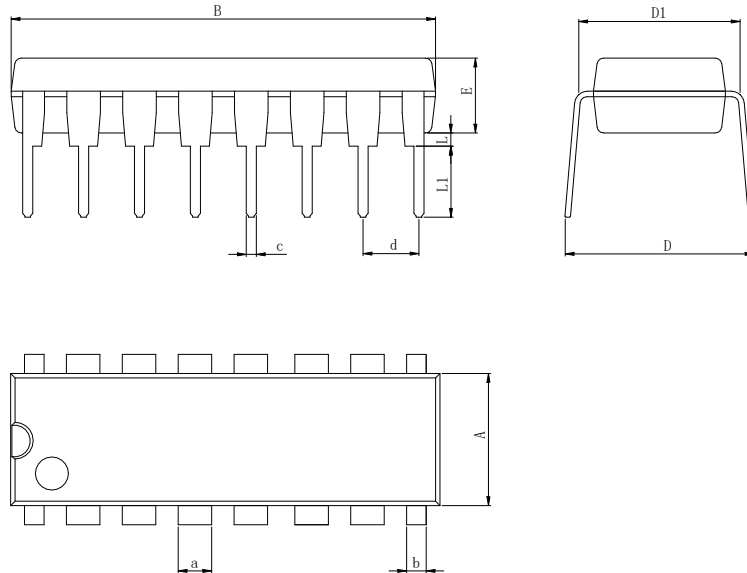
VICRL	Low Input common mode voltage range	V <sub>CC</sub> =7~40V	-0.3	-		V
VICRH	High Input common mode voltage range	V <sub>CC</sub> =7~40V	V <sub>CC</sub> -2	-		V
AVOL	Open loop voltage amplification	V <sub>O</sub> =3V, V <sub>CC</sub> =15V V <sub>O</sub> =0.5~3.5V	70	-		dB
f <sub>b</sub>	Unity-gainbandwidth	V <sub>CC</sub> =15V	100	-		KHz
CMRR	Common mode rejection ratio	V <sub>CC</sub> =40V	65	-	25	dB
I <sub>OL</sub>	Output sink current(pin 3)	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =0.7V	0.3	-	-40~+85	mA
I <sub>OH</sub>	Output sourcecurrent (pin 3)	V <sub>CC</sub> =15V, V <sub>O(03)</sub> =3.5V	-2.0			mA
I <sub>C(off)</sub>	Collector off-state current	V <sub>CE</sub> =V <sub>CC</sub> =40V	-	100		A
I <sub>E(off)</sub>	Emitter off-state current	V <sub>CC</sub> =V <sub>C</sub> =40V, V <sub>E</sub> =0V	-	-100		A
V <sub>SAT(C)</sub>	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
V <sub>SAT(E)</sub>	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
I <sub>OCH</sub>	Output control input current	V <sub>CC</sub> =15V V <sub>O(03)</sub> =0.7V	-	3.5	25	mA
I <sub>CC15</sub>	Standby Supply Current at V <sub>CC</sub> 15V	V <sub>CC</sub> =15V	-	10		mA
I <sub>CC40</sub>	Standby Supply Current at V <sub>CC</sub> 40V	V <sub>CC</sub> =40V	-	15	25	mA
I <sub>CCA</sub>	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

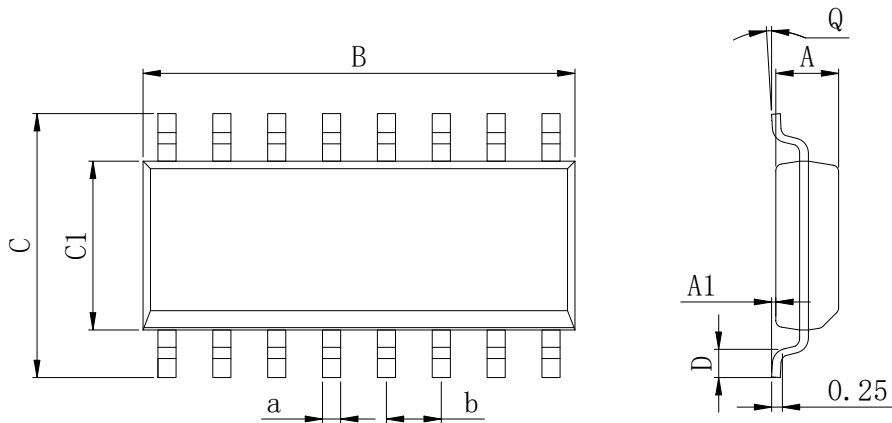
### DIP-16



Dimensions In Millimeters(DIP-16)

Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	18.94	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	19.56	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

### SOP-16

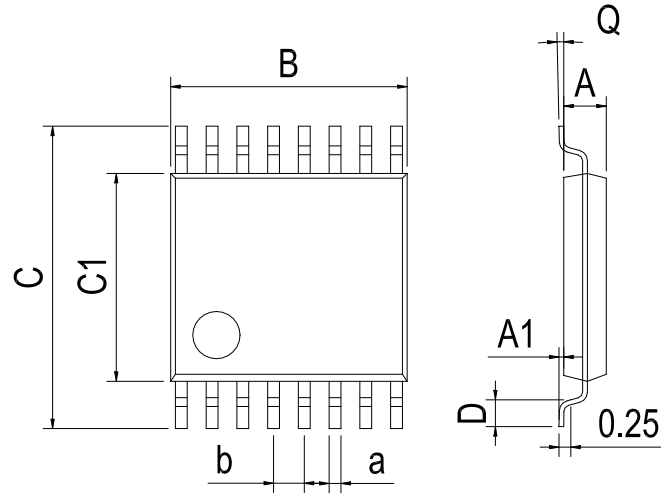


Dimensions In Millimeters(SOP-16)

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

TSSOP-16



Dimensions In Millimeters(TSSOP-16)									
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	

## Revision History

DATE	REVISION	PAGE
2019-12-8	New	1-9
2023-9-14	Modify the package dimension diagram TSSOP-16、 Update encapsulation type、 Update Lead Temperature、 Updated DIP-16 dimension、 Add annotation for Maximum Ratings.	1、 3、 6、 7



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