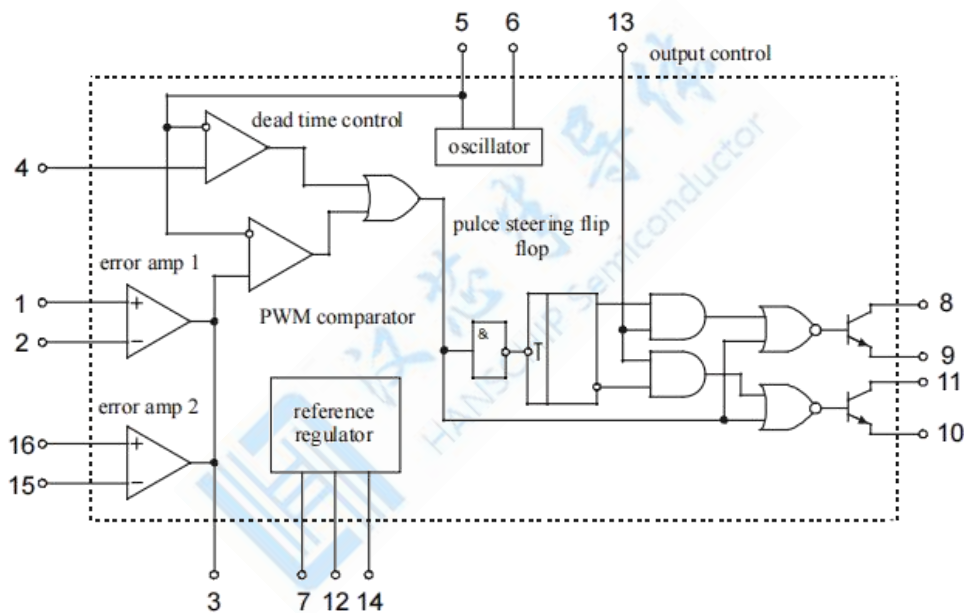


## SWITCHMODE Pulse Width Modulation Control Circuit

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

- 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

### LOGIC DIAGRAM



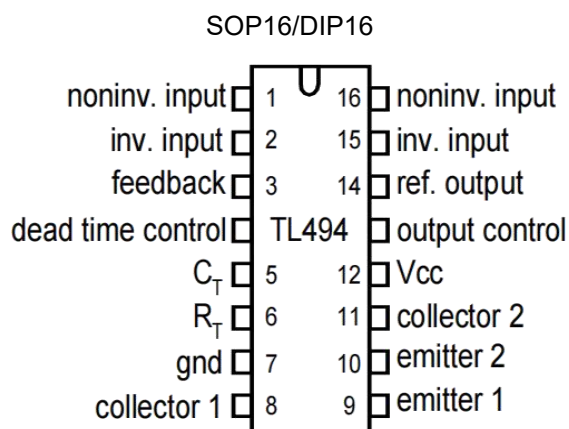
Pin 7 = GND

Pin 12 = Vcc

### ORDERING INFORMATION

| DEVICE    | Package Type | MARKING | Packing | Packing Qty  |
|-----------|--------------|---------|---------|--------------|
| TL494IPG  | DIP16        | TL494   | TUBE    | 1000pcs/reel |
| TL494IDRG | SOP16        | TL494   | REEL    | 2500pcs/reel |

## PIN ASSIGNMENT



## MAXIMUM AND RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter                                 | Recommended operating conditions |            | Maximum ratings |              | Unit |
|--------|---|----------------------------------|------------|-----------------|--------------|------|
|        |   | Min                              | Max        | Min             | Max          |      |
| VCC    | Supply Voltage                            | 7                                | 40         |                 | 41           | V    |
| $V_i$  | Amplifier Input Voltage                   | -0.3                             | $V_{CC}-2$ |                 | $V_{CC}+0.3$ | V    |
| $V_o$  | Collector Output Voltage                  |                                  | 40         |                 | 41           | V    |
| IOC    | Collector Output Current(Each Transistor) |                                  | 200        |                 | 250          | mA   |
| STR    | Storage Temperature Range                 |                                  |            | -65             | 150          | °C   |
| Ta     | Operating Free-Air Temperature Range      | -40                              | 85         |                 |              | °C   |

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

| Symbol   | Parameter  | Test Conditions                             | Value |      | Temperature, °C | Unit |
|----------|--|---|-------|------|-----------------|------|
|          |  |   | Min   | Max  |                 |      |
| Vref     | Output voltage                                       | $I_o=1.0mA V_{CC}=15V$                      | 4.75  | 5.25 | -40...+85       | V    |
| Uregin   | Input regulation                                     | $V_{CC}=7...40V I_o=1.0mA$                  | -     | 25   | 25              | mV   |
| Uregout  | Output regulation                                    | $I_o=1...10mA V_{CC}=15V$                   | -     | 15   | 25              | mV   |
| Vref     | Output voltage change with temperature               | $I_o=1mA V_{CC}=15V$                        | -     | 1.0  | -40...+85       | %    |
| ISC      | Short circuit output current                         | $V_{ref}=0 t_{sc}<1s V_{CC}=15V$            | -     | 50   |                 | mA   |
| fosc     | Frequency  | $C=0.01F, R_T=12k V_{CC}=15V V_{(03)}=0.7V$ | 6.0   | 14   |                 | kHz  |
| fosc     | Standard Deviation of Frequency *                    | $V_{CC}=15V V_{(03)}=0.7V$                  | -     | 15   |                 | %    |
| fosc(ΔV) | Frequency Change with Voltage                        | $V_{CC}=7...40V V_{(03)}=0.7V$              | -     | 10   | 25              | %    |
| fosc(ΔT) | Frequency Change with Temperature                    | $C=0.01F, R_T=12k V_{CC}=15V V_{(03)}=0.7V$ | -     | 2.0  | -40...+85       | %    |
| IIB(2T)  | Input bias current (pin 4)                           | $V_i=0...5.25V V_{CC}=15V V_{(03)}=0.7V$    | -     | -10  |                 | μA   |
| DCmax    | Maximum duty cycle (each output)                     | $V_i(04)=0V V_{CC}=15V V_{(03)}=0.7V$       | 45    | -    |                 | %    |
| VTHD1    | Input threshold voltage (pin 4) (Zero Duty Cycle)    | $DC_{max}=0V V_{CC}=15V V_{(03)}=0.7V$      | -     | 3,3  |                 | V    |
| VTHD2    | Input threshold voltage (pin 4) (Maximum Duty Cycle) | $DC_{max} V_{CC}=15V V_{(03)}=0.7V$         | 0     | -    |                 | V    |

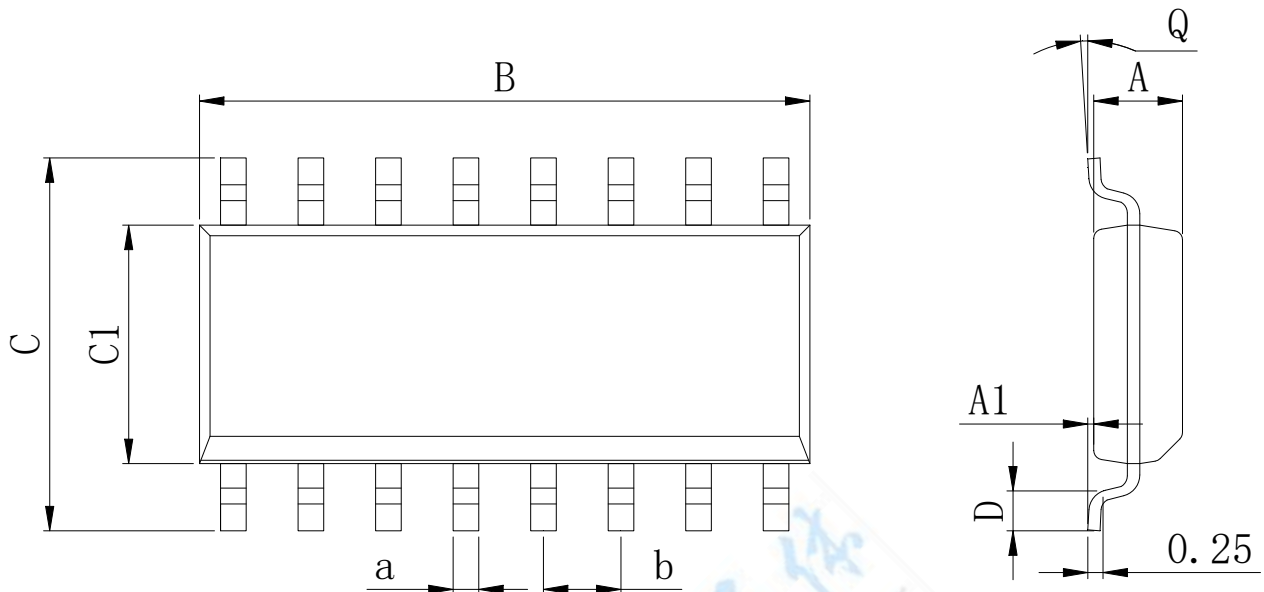
| Symbol              | Parameter   | Test Conditions   | Value              |      | Temperature, °C | Unit |
|---------------------|---|---|--------------------|------|-----------------|------|
|                     |   |   | Min                | Max  |                 |      |
| t <sub>rc</sub>     | Output voltage risetime (Common- Emitter)               | V <sub>CC</sub> =15V V <sub>0(03)</sub> =2.0V   | -                  | 200  | -40...+85       | ns   |
| t <sub>fc</sub>     | Output voltage falltime (Common- Emitter)               | V <sub>CC</sub> =15V V <sub>0(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>0(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>0(03)</sub> =2.0V                             | -                  | 100  | -40...+85       | ns   |
| V <sub>THP</sub>    | Input thresholdvoltage (pin 3)                          | DCmax=0V V <sub>CC</sub> =15V   | -                  | 4.5  |                 | V    |
| I <sub>I</sub>      | Input sink current(pin 3)                               | V <sub>CC</sub> =15V V <sub>0(03)</sub> =0.7V   | 0.3                | -    |                 | mA   |
| V <sub>IO</sub>     | Input offset voltage                                    | V <sub>CC</sub> =15V V <sub>0(03)</sub> =2.5V   | -                  | 10   |                 | mV   |
| I <sub>IO</sub>     | Input offset current                                    | V <sub>CC</sub> =15V V <sub>0(03)</sub> =2.5V   | -                  | 250  |                 | nA   |
| I <sub>IB</sub>     | Input bias current                                      | V <sub>CC</sub> =15V V <sub>0(03)</sub> =2.5V   | -                  | 1    |                 | μA   |
| V <sub>ICRL</sub>   | Low Input commonmode voltage range                      | V <sub>CC</sub> =7...40V  | -0.3               | -    |                 | V    |
| V <sub>ICRH</sub>   | High Input commonmode voltage range                     | V <sub>CC</sub> =7...40V  | V <sub>CC</sub> -2 | -    |                 | V    |
| A <sub>VOL</sub>    | Open loop voltage amplification                         | V <sub>0</sub> =3V<br>V <sub>CC</sub> =15V V <sub>0</sub> =0.5...3.5V                     | 70                 | -    |                 | dB   |
| f <sub>b</sub>      | Unity-gainbandwidth                                     | V <sub>CC</sub> =15V  | 100                | -    |                 | kHz  |
| CMRR                | Common moderejection 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>0(03)</sub> =0.7V   | 0.3                | -    | -40...+85       | mA   |
| I <sub>OH</sub>     | Output sourcecurrent (pin 3)                            | V <sub>CC</sub> =15V V <sub>0(03)</sub> =3.5V   | -2.0               |      |                 | mA   |
| I <sub>C(off)</sub> | Collector off-statecurrent                              | V <sub>CE</sub> =V <sub>CC</sub> =40V   | -                  | 100  |                 | μA   |
| I <sub>E(off)</sub> | Emitter off-statecurrent                                | V <sub>CC</sub> =V <sub>C</sub> =40V V <sub>E</sub> =0V                                   | -                  | -100 |                 | μA   |
| V <sub>SAT(C)</sub> | Collector - Emittersaturation voltage (Common-Emitter)  | V <sub>CC</sub> =15V V <sub>E</sub> =0V V <sub>0(03)</sub> =3.0V<br>I <sub>C</sub> =200mA | -                  | 1.3  |                 | V    |
| V <sub>SAT(E)</sub> | Collector - Emittersaturation voltage(Emitter-follower) | V <sub>CC</sub> =V <sub>C</sub> =15V I <sub>E</sub> = -200mA V <sub>0(03)</sub> =3.0V     | -                  | 2.5  | 25              | V    |
|                     |   |   | -                  | 2.9  | -40...+85       |      |
| I <sub>OCH</sub>    | Output control inputcurrent                             | V <sub>CC</sub> =15V V <sub>0(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   |

| Symbol            | Parameter                                     | Test Conditions  | Value |     | Temperature, °C | Unit |
|-------------------|---|--|-------|-----|-----------------|------|
|                   |   |  | Min   | Max |                 |      |
| 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 SupplyCurrent                         | V <sub>CC</sub> =15V V <sub>0(03)</sub> =0.7V V <sub>0(04)</sub> =2.0V | -     | 17  | -40...+85       | mA   |

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

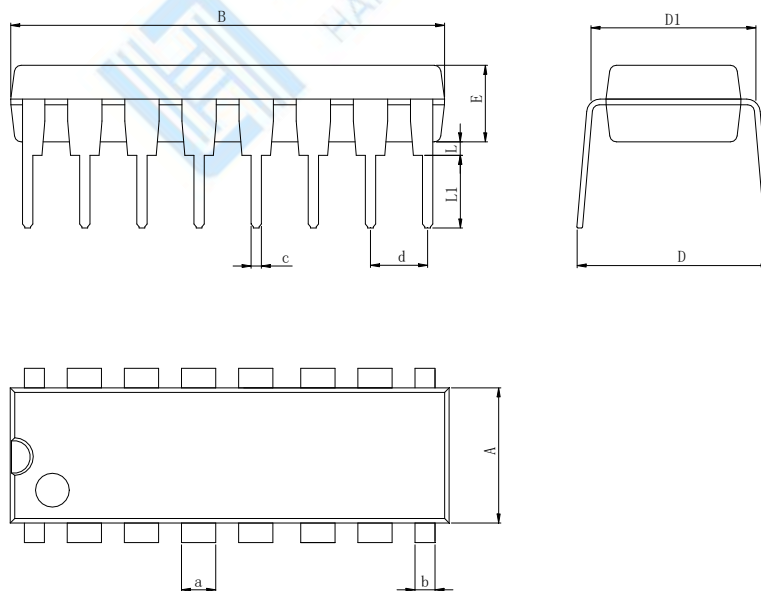
**Physical Dimensions**

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 |          |

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 | 300  | 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 |          |

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