

## GDTL494

### VOLTAGE MODE PWM CONTROL CIRCUIT

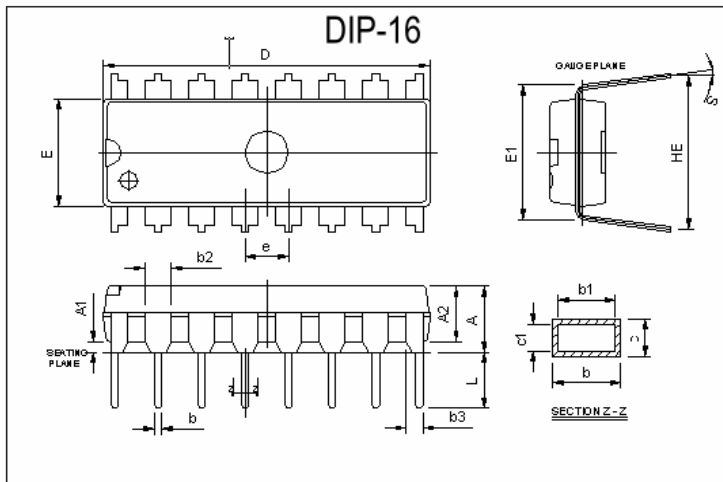
### Description

The GDTL494 incorporates all the functions required in the construction of a pulse-width modulation switching circuit. Designed Primarily for switching power supply control or DC-DC converters, it offers the systems engineer the flexibility to tailor control circuitry to its own application.

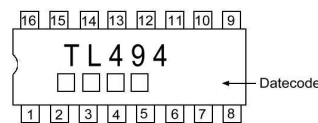
### Features

- \*Complete PWM power control circuitry
- \*Uncommitted outputs for 200 mA sink or source current
- \*Output control selects single ended or push pull operation
- \*Internal circuitry prohibits double pulses over total range.
- \*Easy synchronization.

### Package Dimensions



Marking:



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	-	5.334	c1	0.203	0.279
A1	0.381	-	D	18.92	19.69
A2	3.175	3.429	E	6.096	6.604
b	0.406	0.508	E1	7.493	8.001
b1	0.356	0.508	e	2.413	2.667
b2	1.270	1.778	HE	8.509	9.525
b3	0.762	1.143	L	3.175	3.683
c	0.203	0.356	S	0'	15'

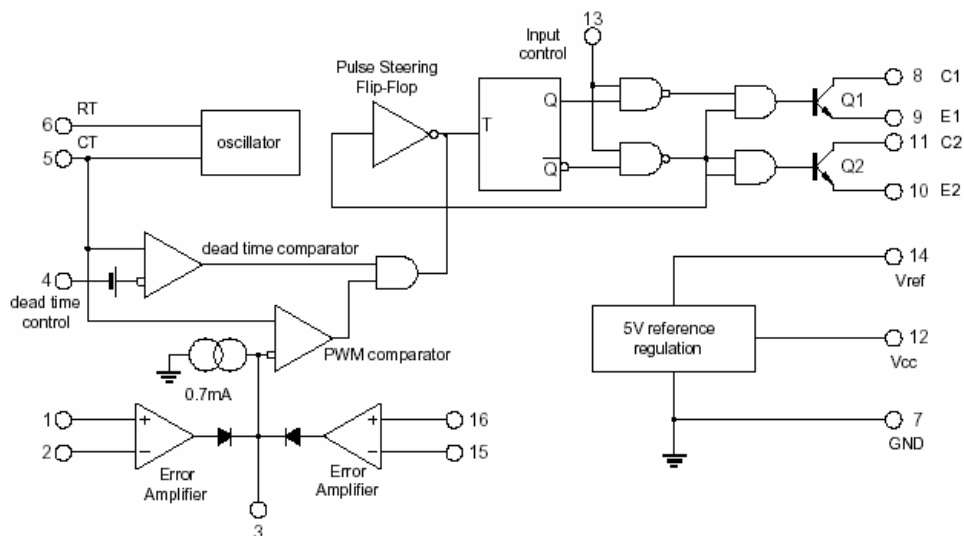
### Absolute Maximum Ratings (Unless otherwise noted all is over operating free air temperature range)

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage (note1)	V <sub>cc</sub>	41	V
Amplifier Input Voltage	V <sub>i</sub>	V <sub>cc</sub> +0.3	V
Collector output Voltage	V <sub>o</sub>	41	V
Collector output Current	I <sub>co</sub>	250	mA
Continuous Total Dissipation at (or for below) 25°C free air Temperature(note 2)	P <sub>D</sub>	1000	mW
Operating Temperature Range	T <sub>opr</sub>	0 TO 70	°C
Storage Temperature Range	T <sub>stg</sub>	-65 TO 150	°C
Lead Temperature 1.6mm from Case for 60 Sec.	T <sub>case</sub>	300	°C

Note1: All voltage values, except differential voltages are with respect to the network ground terminal.

Note2: For operation above 25°C free-air temperature, the dissipation derates with 9.2mW/°C.

## BLOCK DIAGRAM



## Recommended Operating Conditions

Parameter	Symbol	VALUE		Unit
		MIN	MAX	
Supply Voltage	V <sub>cc</sub>	7	40	V
Amplifier Input Voltage	V <sub>i</sub>	-0.3	V <sub>cc</sub> -2	V
Collector Output Voltage	V <sub>o</sub>		40	V
Collector Output Current(each Transistor)	I <sub>c</sub>		200	mA
Current into Feedback	I <sub>f</sub>		0.3	mA
Timing Capacitor	C <sub>T</sub>	0.47	10000	nF
Timing Resistor	R <sub>T</sub>	1.8	500	kΩ
Oscillator Frequency	f <sub>osc</sub>	1	300	kHz
Operating Free-Air Temperature	T <sub>a</sub>	0	70	°C

## Electrical Characteristics (Over recommended operating free-air temperature range, V<sub>cc</sub>=15V, f=1kHz, Unless otherwise specified)

Parameter	Test Conditions	Min	Typ.	Max.	Unit	
<b>Reference Section</b>						
Output Voltage	I <sub>o</sub> =1mA	4.75	5	5.25	V	
Input Regulation	V <sub>cc</sub> = 7to 40 V		2	25	mV	
Output Regulation	I <sub>o</sub> =1 to 10mA		1	15	mV	
Output Voltage Change with Temperature	ΔT <sub>A</sub> =MIN to MAX(note2)		0.2	1	%	
Short-Circuit Output Current	V <sub>ref</sub> =0		35		mA	
<b>Oscillator Section</b>						
Frequency	C <sub>T</sub> =0.01μf, R <sub>T</sub> =120kΩ		10		kHz	
Standard Deviation of Frequency	All Values of V <sub>cc</sub> C <sub>T</sub> , R <sub>T</sub> , T <sub>A</sub> constant		10		%	
Frequency Change with Voltage	V <sub>cc</sub> =7v to 40v, T <sub>a</sub> = 25°C		0.1		%	
Frequency Change with Temperature	C <sub>T</sub> =0.01μf, R <sub>T</sub> =12 kΩ, ΔT <sub>A</sub> =MIN to MAX			12	%	
<b>Amplifier Section</b>						
Input Offset Voltage	Error	V <sub>o</sub> (pin 3)=2.5v		2	10	mV
Input Offset Current		V <sub>o</sub> (pin 3)=2.5v		25	250	nA
Input Bias Current		V <sub>o</sub> (pin 3)=2.5v		0.2	1	μA
Common-Mode Input Voltage Range	Error	V <sub>cc</sub> =7V to 40V	-0.3 to V <sub>cc</sub> -2			V

Open-Loop Voltage Amplification		$\Delta V_o=3v, V_o=0.5V \text{ to } 3.5V$	70	95		dB
Unity-Gain Bandwidth				800		kHz
Common-Mode Rejection Ratio	Error	$V_{cc}=40V, T_A=25^\circ C$	65	80		dB
Output Sink Current(pin 3)		$V_{ID}=-15mV \text{ to } -5V \quad V(\text{pin } 3)=0.5V$	0.3	0.7		mA
Output source Current(pin 3)		$V_{ID}=15Mv \text{ to } -5V \quad V(\text{pin } 3)=3.5V$	-2			mA
<b>Output Section</b>						
Collector off-state current		$V_{CE}=40V, V_{cc}=40v$		2	100	$\mu A$
Emitter off-state current		$V_{cc}=V_c=40V, V_E=0$			-100	$\mu A$
Collector-Emitter saturation Voltage	Common-Emitter	$V_E=0, I_c=200mA$		1.1	1.3	V
	Emitter-Follower	$V_c=15V, I_E=-200mA$		1.5	2.5	
Output Control Input Current		$V_i=V_{ref}$			3.5	mA
<b>Dead Time Control Section</b>						
Input bias(pin 4)		$V_i=0 \text{ to } 5.25 \text{ V}$		-2	-10	$\mu A$
Maximum duty cycle, each output		$V_I(\text{pin } 4)=0$	45			%
Input threshold Voltage (pin 4)		Zero duty cycle		3	3.3	V
		Maximum duty cycle	0			
<b>PWM comparator Section</b>						
Input Threshold Voltage(pin 3)		Zero Duty cycle		4	4.5	V
Input Sink current (pin 3)		$V(\text{pin } 3)=0.7V$	0.3	0.7		mA
<b>Total Device</b>						
Standby supply current	$V_{cc}=15V$	Pin 6 at $V_{ref}$ , all other Input s and outputs open		6	10	mA
	$V_{cc}=40V$			9	15	
Average supply current		$V \text{ pin } 4 =2V$		7.5		mA
<b>Switching Characteristics, <math>T_a = 25^\circ C</math></b>						
Output Voltage Rise Time		Common-emitter configuration		100	200	ns
Output Voltage Fall Time				25	100	ns
Output Voltage Rise Time		Emitter-follower configuration		100	200	ns
Output Voltage Fall Time				40	100	ns

Note 1 : All typical values except for temperature coefficient are at  $T_a=25^\circ C$ .

Note 2 : For conditions shown as MIN or MAX, use appropriate value under recommended operating conditions.

Note 3 : Duration of the short -circuit should not exceed one second.

Note 4 : Standard deviation is a measure of the statistical distribution the mean as derived from the formula:

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

## TEST CIRCUIT

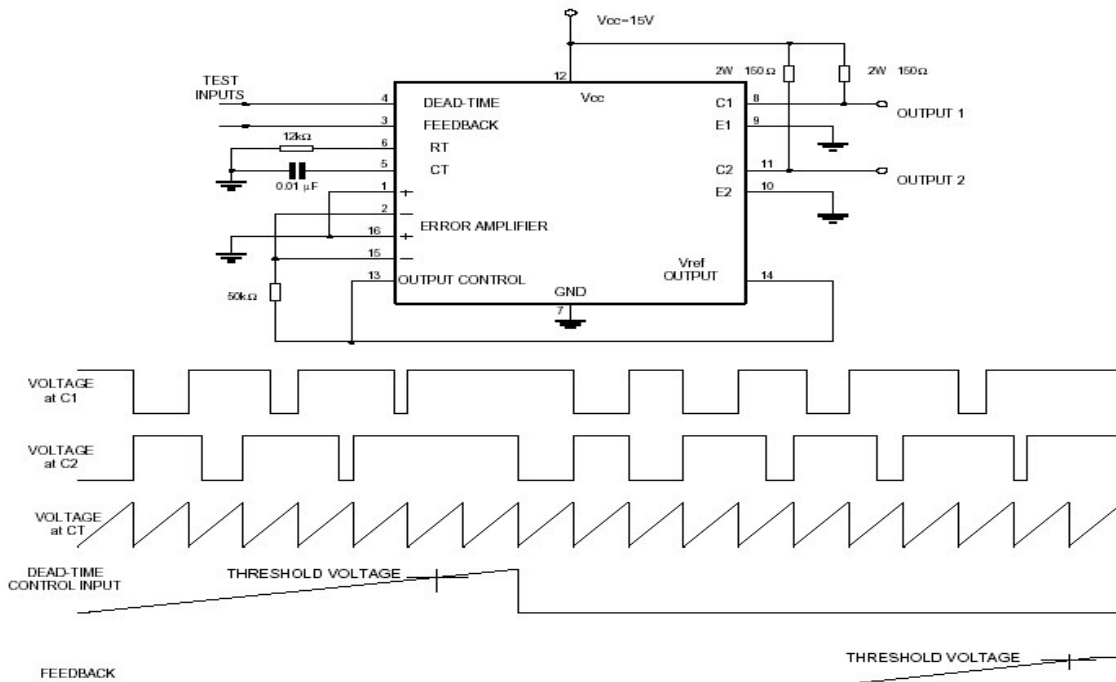


FIG 1. OPERATIONAL TEST CIRCUIT AND WAVEFORMS

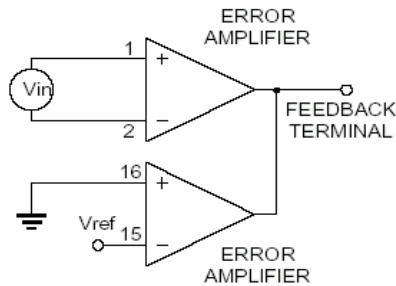


FIG 2. AMPLIFIER CHARACTERISTICS

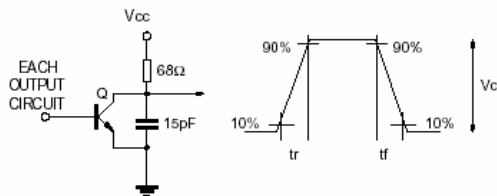


FIG. 3 COMMON-EMITTER CONFIGURATION

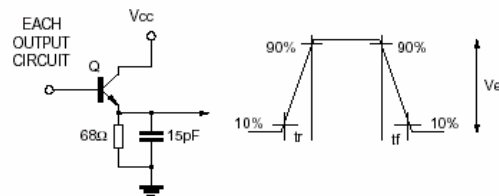
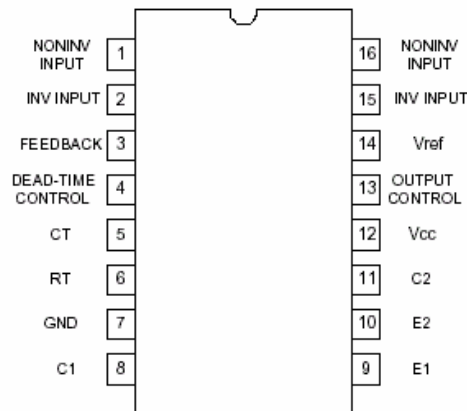


FIG. 4 EMITTER-FOLLOWER CONFIGURATION

## PIN CONFIGURATIONS



## TYPICAL PERFORMANCE CHARACTERISTICS

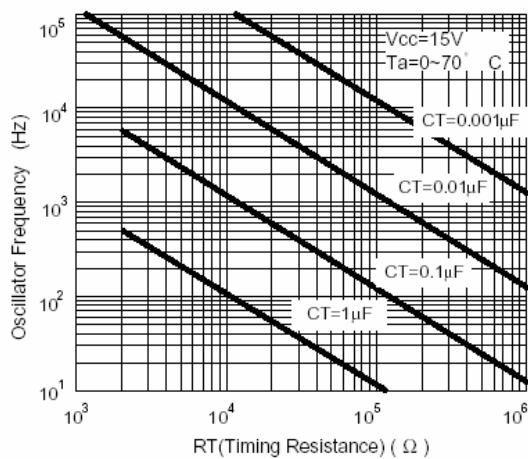


FIG 5. Oscillator Frequency and Frequency Variation  
Vs  
Timing Resistance

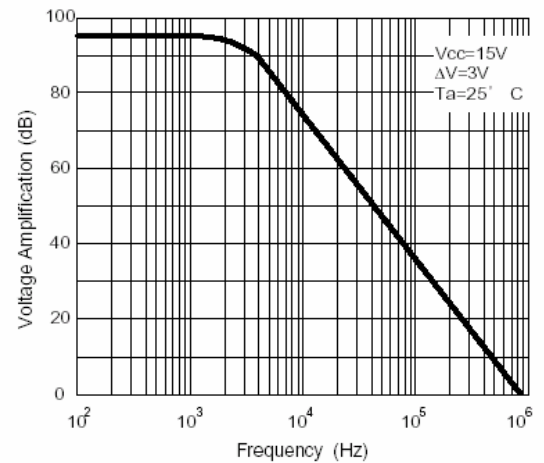


Fig.6 Amplifier Voltage Amplification

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