

1. DESCRIPTION

XL494 and XD494 are switching pulse width control circuit, mainly used for switching power supply control.

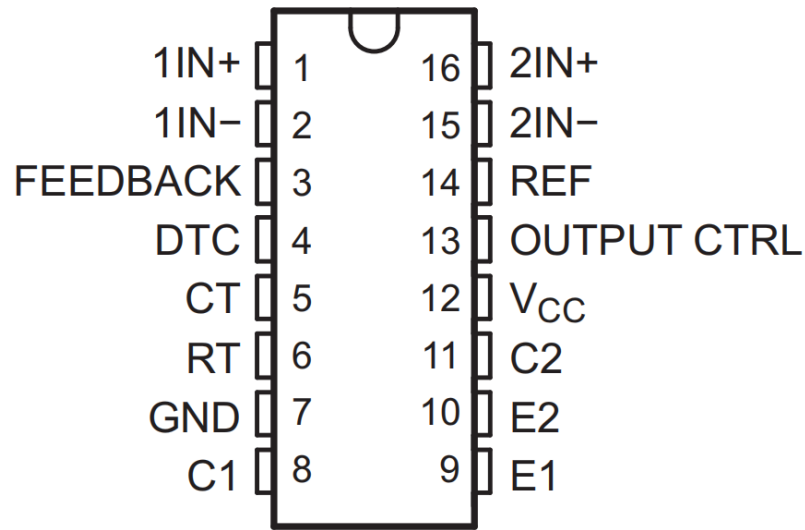
Adopts DIP16, SOP16 encapsulation form.

2. FEATURES

- Perfect pulse width control circuit.
- Includes an active or driven oscillator.
- Includes double error amplifier.
- Includes 5V reference power supply.
- The dead zone control is adjustable.
- Independent output transistor (source or trap 200mA).
- The output control mode is push-pull or single-ended.
- Package option: XL494 (SOP16), XD494 (DIP16)

3. PIN CONFIGURATIONS AND FUNCTIONS

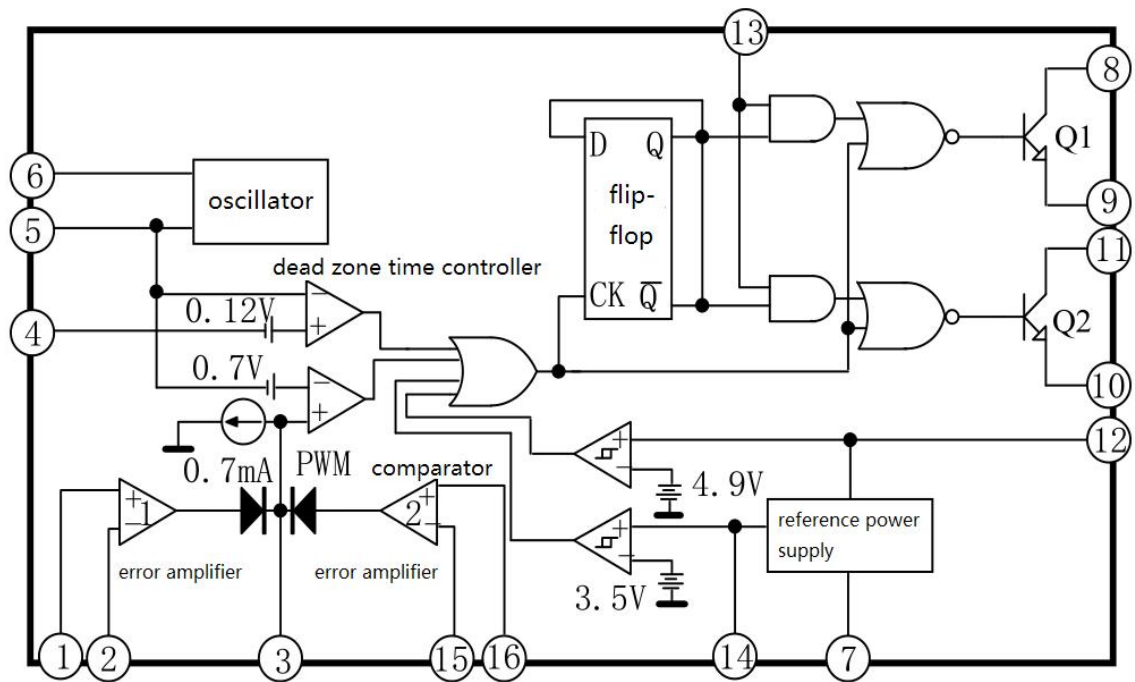
(Top View)



Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
1IN+	1	I	Noninverting input to error amplifier 1
1IN-	2	I	Inverting input to error amplifier 1
2IN+	16	I	Noninverting input to error amplifier 2
2IN-	15	I	Inverting input to error amplifier 2
C1	8	O	Collector terminal of BJT output 1
C2	11	O	Collector terminal of BJT output 2
CT	5	—	Capacitor terminal used to set oscillator frequency
DTC	4	I	Dead-time control comparator input
E1	9	O	Emitter terminal of BJT output 1
E2	10	O	Emitter terminal of BJT output 2
FEEDBACK	3	I	Input pin for feedback
GND	7	—	Ground
OUTPUT CTRL	13	I	Selects single-ended/parallel output or push-pull operation
REF	14	O	5-V reference regulator output
RT	6	—	Resistor terminal used to set oscillator frequency
V _{CC}	12	—	Positive Supply

4. BLOCK DIAGRAM



5. LIMITING VALUE(Absolute maximum rating, if no other provisions, Tamb=25℃)

Parameter	Symbol	Value		Unit
		Min	Max	
Supply voltage	Vcc	7	40	V
Collector output voltage	Vc1;Vc2	–	40	V
Collector output current (single transistor)	Ic1;Ic2	–	200	mA
Amplifier input voltage	Vin	-0.3	Vcc-2	V
Power consumption (Tamb≤45℃)	PD	–	500	mW
Operating ambient temperature	Tamb	-25	80	℃
Storage temperature	Tstg	-55	150	℃

6. RECOMMENDED WORKING CONDITIONS

Parameter	Symbol	Value			Unit
		Min	Typ.	Max	
Supply voltage	Vcc	7.0	15	40	V
Collector output voltage	Vc1; Vc2	–	30	40	V
Collector output current (single transistor)	Ic1; Ic2	–	–	200	mA
Amplifier input voltage	Vin	-0.3	–	Vcc-2.0	V
Feedback current	I _{fb}	–	–	0.3	mA
Output current of the reference terminal	I _{ref}	–	–	10	mA
Timing resistance	RT	1.8	30	500	k
Timing capacitance	CT	0.00047	0.001	10	F
Oscillation frequency	fosc	1.0	40	200	kHz

7. ELECTRICAL CHARACTERISTIC(If no other provisions, $V_{CC}=15V$, $f_{osc}=10kHz$, for typical values $T_{amb}=25^{\circ}C$, for minimum and maximum T_{amb} is the working environment temperature.)

Parameter	Conditions	Symbol	Value			Unit
			Min	Typ.	Max	
Reference part						
Reference voltage	Io=1.0mA	Vref	4.75	5.0	5.25	V
The reference voltage changes with temperature	ΔTambFrom MIN to MAX	ΔVref/ΔT	–	1.3	2.6	%
Voltage linearity	Vcc=7.0V~40V	Reg line	–	2.0	25	mV
Load adjustment rate	Io=1.0mA~10mA	Reg load	–	2.0	15	mV
Short-circuit output current	Vref=0V, Tamb=25℃	Isc	–	32		mA

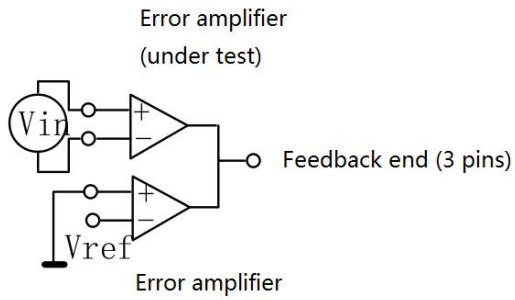
Parameter	Conditions	Symbol	Value			Unit
			Min	Typ.	Max	
Output part						
Collector leakage current	Vcc=40V; Vce=40V	Ic(off)	–	2.0	100	μA
Emitter leakage current	Vcc=40V; Vc=40V; Ve=0V	Ie(off)	–	–	-100	μA
Collector-emitter saturation pressure drop	Common emitter: Ve=0V; Ic=200mA	Vc(sat)	–	1.1	1.3	V
	Emitter following: Vc=15V; Ie=-200mA	Ve(sat)	–	1.5	2.5	V
Output control pin current	Voc=Vref	IOCH	–	0.2	3.5	mA
Output voltage rise time	Common emitter: Test Figure 3	Tr	–	100	200	ns
	Emitter following: Test Figure 4		–	100	200	ns
Output voltage drop time	Common emitter: Test Figure 3	Tf	–	25	100	ns
	Emitter following: Test Figure 4		–	40	100	ns
Error amplifier section						
Input offset	Vo (pin3) =2.5V	Vio	–	2.0	10	mV

voltage						
Input offset current	Vo (pin3) =2.5V	lio	–	5.0	250	nA
Input bias current	Vo (pin3) =2.5V	IIB	–	0.1	1.0	μA
Input common-mode voltage range	Vcc=7.0V~40V	VICR	-0.3	–	Vcc-2.0	V
Open-loop voltage gain	Vo=0.5V~3.5V; RL=2.0kΩ; ΔVo=3.0V	GVOL	70	95	–	dB
Unit-gain bandwidth	Vo=0.5V~3.5V; RL=2.0kΩ	fc	–	800	–	kHz
Common mode rejection ratio	Vcc=40V	CMRR	65	90	–	dB
Output absorbing current	Vo (pin3) =0.7V	Io-	0.3	0.7	–	mA
Output source current	Vo (pin3) =3.5V	Io+	-2.0	-4.0	–	mA
PWM Comparator part (test circuit diagram 2)						
Input threshold voltage	Zero duty cycle	VTH	–	4	4.5	V
Input suction current	V (pin3) =0.7V	II-	0.3	0.7	–	mA
Dead zone control section (see 2 for test circuit diagram)						
Input bias current	Vin=0V~5.25V	IIB(DT)	–	-2.0	-10	μA
Maximum duty cycle (per output)	Vin=0V; RT=12kΩ; CT=0.1μF	DCmax	–	45	–	%
Input Threshold voltage (pin4)	Zero duty cycle	VTH	–	3	3.3	V
	Maximum duty cycle		0	–	–	
Oscillator section						
Frequency	RT=12kΩ; CT=0.01μF	fosc	–	10	–	kHz
Standard frequency offset	RT=30kΩ; CT=0.001μF	Δfosc	–	3.0	–	%
Frequency variation with voltage	Vcc=7.0V~40V	Δfosc/ΔV	–	0.1	–	%
The change in frequency with temperature	RT=12kΩ; CT=0.01μF; Tamb=Tlow~Thigh	Δfosc/ΔT	–	–	12	%

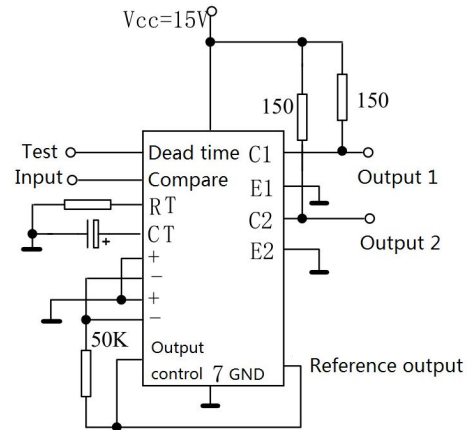
Parameter	Conditions	Symbol	Value			Unit
			Min	Typ.	Max	
Initiation control						
Low current input	V (pin3) =0.4V	ISTL	–	-25	-200	μA
High current input	V (pin13) =2.4V	ISTH	–	25	200	μA
	V (pin13) =Vref		–	75	–	
Integral part						
Standby current (pin 6 is the reference voltage, other input and output are open)	Vcc=15V	Icc	–	6	10	mA
	Vcc=40V		–	9	15	
Average power current (see 2 for test circuit diagram)	Vcc=15V; RT=12kΩ; CT=0.01μF; V (pin14) =2.0V	–	–	7.5	–	mA

8. TEST SCHEMATIC DIAGRAM

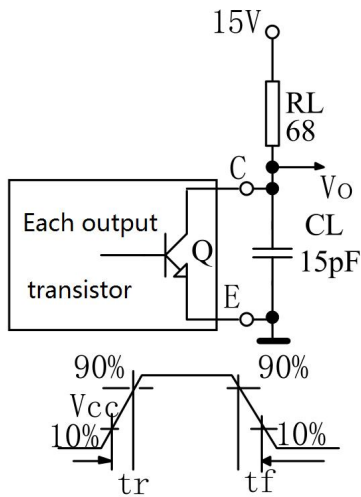
1. Error amplifier characteristic



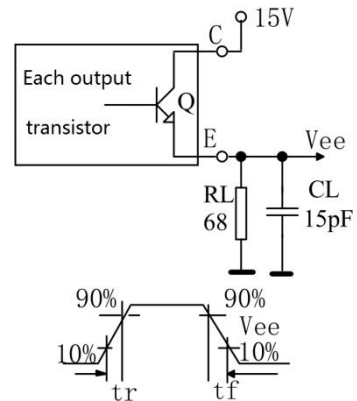
2. Dead time and feedback control test circuit



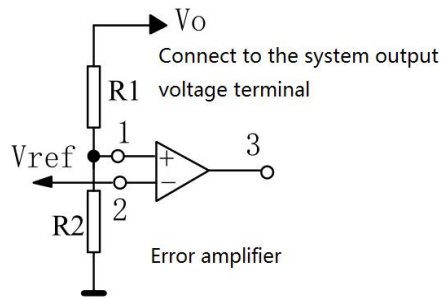
3. Common emitter connection test circuit and waveform



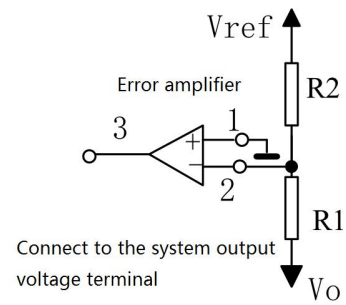
4. The E pole follows the connected test circuit and waveform



5. Error amplifier sensing technology

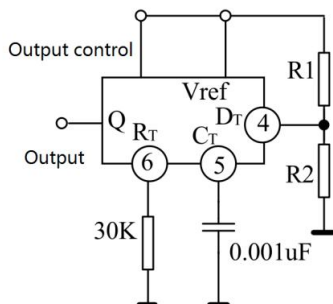


Positive output voltage
 $V_o = V_{ref} (1 + R_1/R_2)$

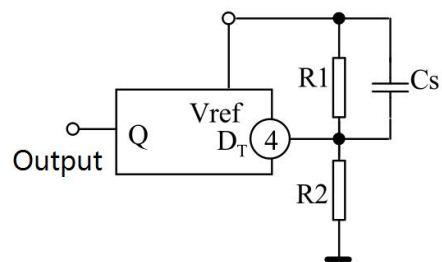


Negative output voltage
 $V_o = V_{ref} * R_1/R_2$

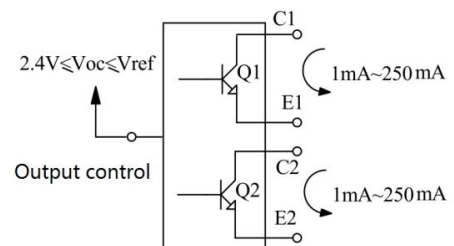
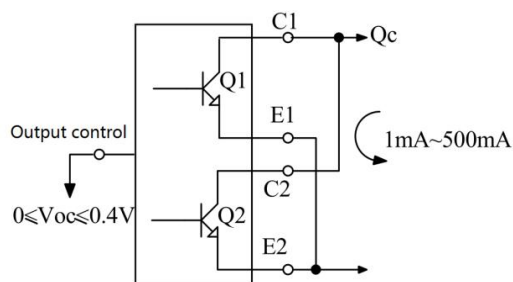
6. Dead-time control circuit



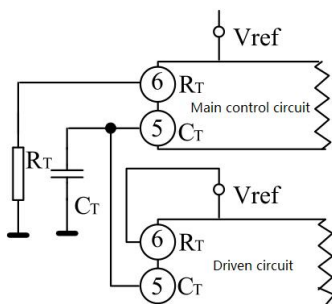
7. Soft starting circuit



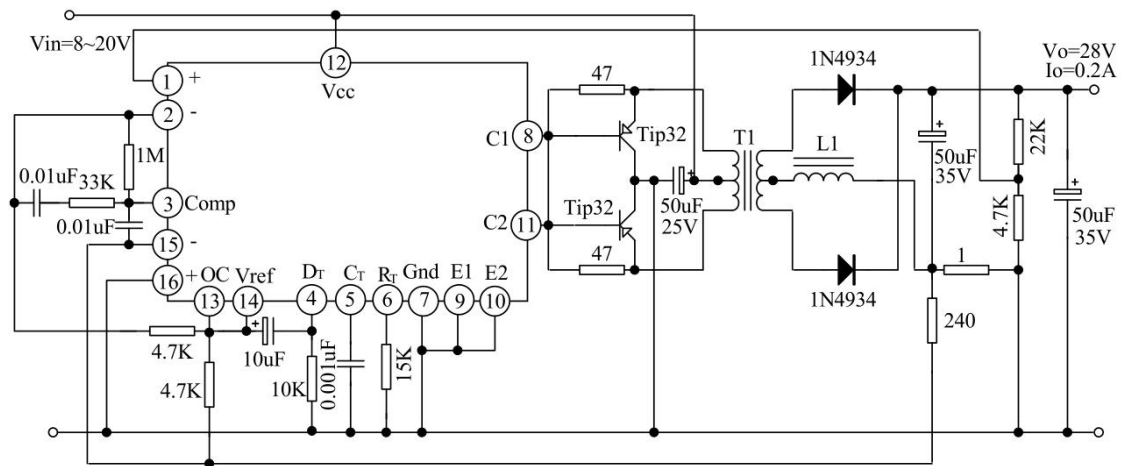
8. Single-ended and push-pull connections



9. Two or more slave control circuits

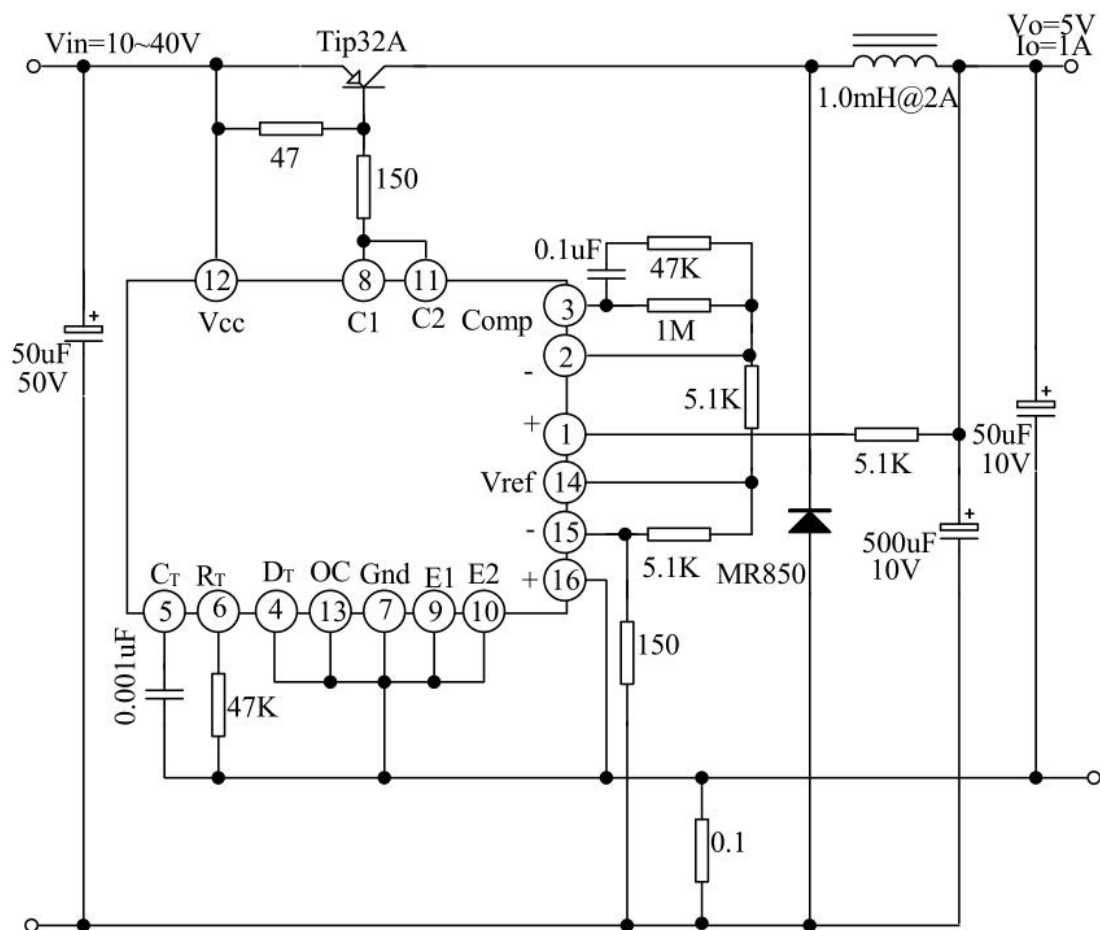


10. Pulse-width modulated push-pull converter



Test item	Conditions	Result
Line supply voltage	$V_{in}=10V\sim 40V$	14mV 0.28%
Load adjustment rate	$V_{in}=28V$; $I_o=1.0mA\sim 1.0A$	3.0mV 0.06%
Output ripple voltage	$V_{in}=28V$; $I_o=1.0A$	65mVpp P.A.R.D
Short-circuit current	$V_{in}=28V$; $R_L=0.1$	1.6A
Efficiency	$V_{in}=28V$; $I_o=1.0A$	71%

11. Pulse-width modulated step-down converter



Test item	Conditions	Result
Line supply voltage	$V_{in}=8V\sim40V$	3.0mV 0.01%
Load adjustment rate	$V_{in}=12.6V$; $I_o=0.2mA\sim200mA$	5.0mV 0.02%
Output ripple voltage	$V_{in}=12.6V$; $I_o=200mA$	40mVpp P.A.R.D
Short-circuit current	$V_{in}=12.6V$; $R_L=0.1\Omega$	250mA
Efficiency	$V_{in}=12.6V$; $I_o=200mA$	71%

9. ORDERING INFORMATION

Ordering Information

Part Number	Device Marking	Package Type	Body size (mm)	Temperature (°C)	MSL	Transport Media	Package Quantity
XL494	XL494	SOP16	10.00 * 3.95	- 2 5 to 80	MSL3	T&R	2500
XD494	XD494	DIP16	19.05 * 6.35	- 2 5 to 80	MSL3	Tube 2 5	1000

10. DIMENSIONAL DRAWINGS

