1. DESCRIPTION

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

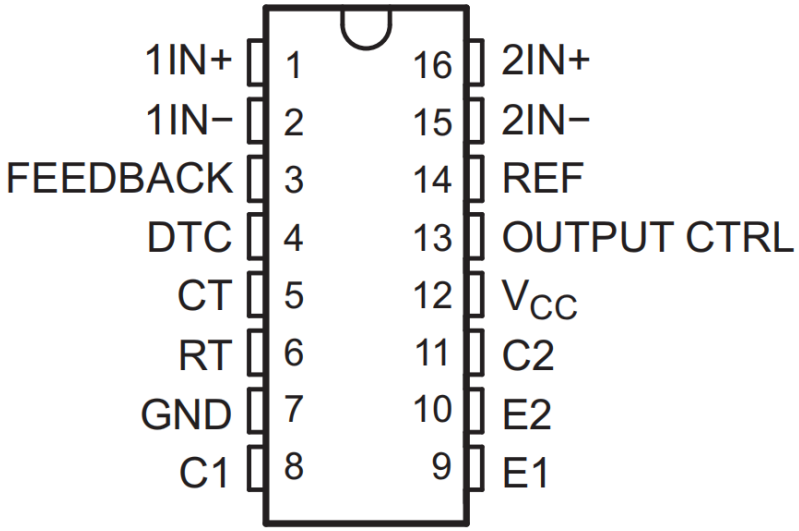
Adopts DIP16, SOP16 encapsulation form.

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

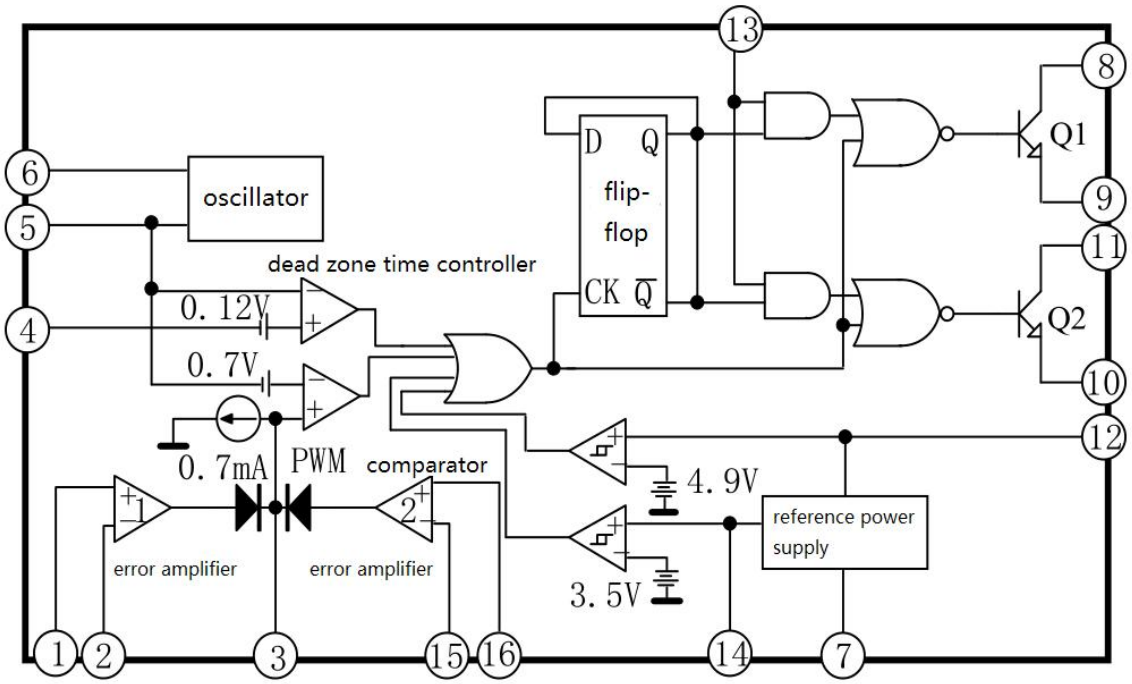
(Top View)



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	Ifb	-	-	0.3	mA
Output current of the reference terminal	Iref	-	-	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, Vcc=15V, fosc=10kHz, for typical values Tamb=25℃, for minimum and maximum Tamb 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	ΔTamb From 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

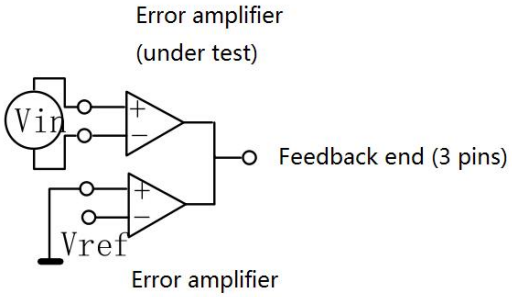
Parameter	Conditions	Symbol	Value			Unit
			Min	Typ.	Max	
Output part						
Collector leakage current	Vcc=40V；Vce=40V	Ic(off)	-	2.0	100	μA
Emitter leakage current	Vcc=40V；Vc=40V；Ve=0V	Ie(off)	-	-	-100	μA
Collector-emitter saturation pressure drop	Common emitter：Ve=0V；Ic=200mA	Vc(sat)	-	1.1	1.3	V
	Emitter 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	Iio	–	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	%

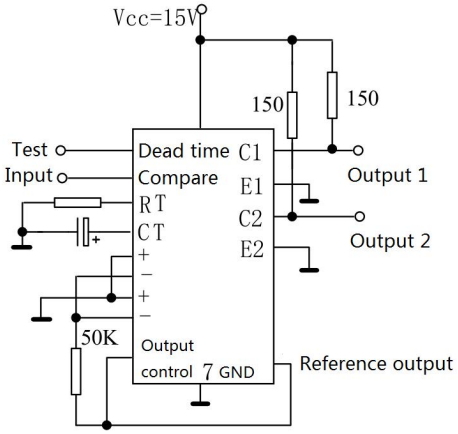
Parameter	Conditions	Symbol	Value			Unit
			Min	Typ.	Max	
Initiation control						
Low current input	V (pin3) =0.4V	ISTL	–	-25	-200	μA
High current input	V (pin13) =2.4V	ISTH	–	25	200	μA
	V (pin13) =Vref		–	75	–	
Integral part						
Standby current (pin 6 is the reference voltage, other input and output 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

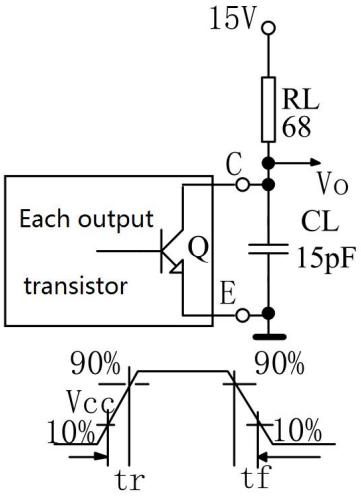
1.Error amplifier characteristic



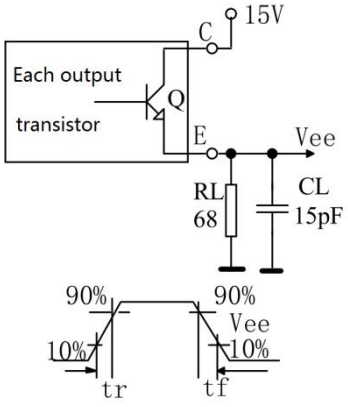
2.Dead time and feedback control test circuit



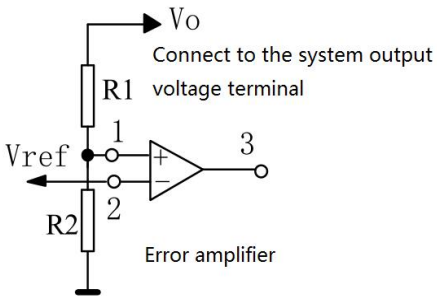
3.Common emitter connection test circuit and waveform

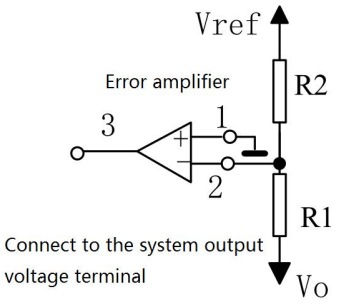


4.The E pole follows the connected test circuit and waveform



5.Error amplifier sensing technology

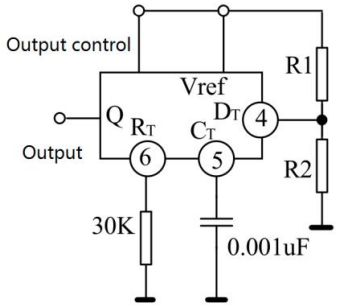




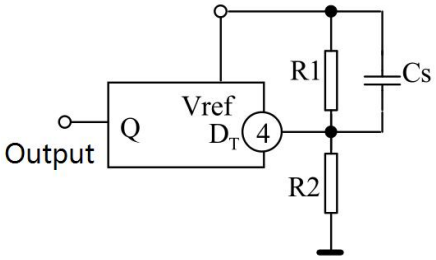
Positive output voltage
Vo=Vref（1+R1/R2）

Negative output voltage
Vo=Vref*R1/R2

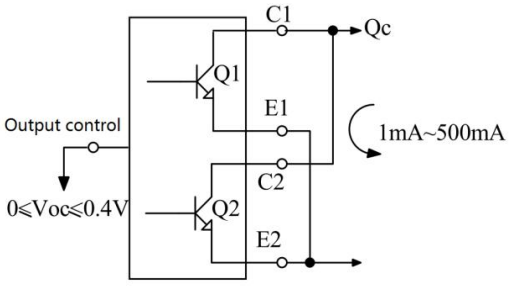
6.Dead-time control circuit

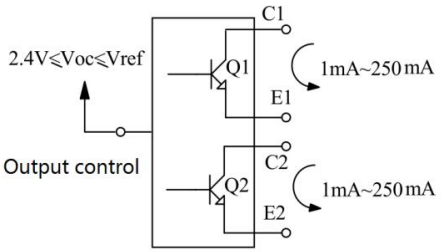


7.Soft starting circuit

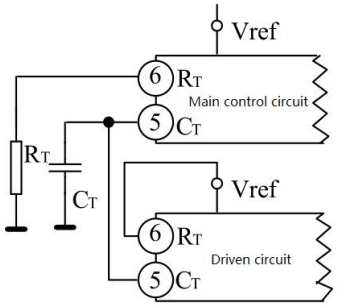


8.Single-ended and push-pull connections

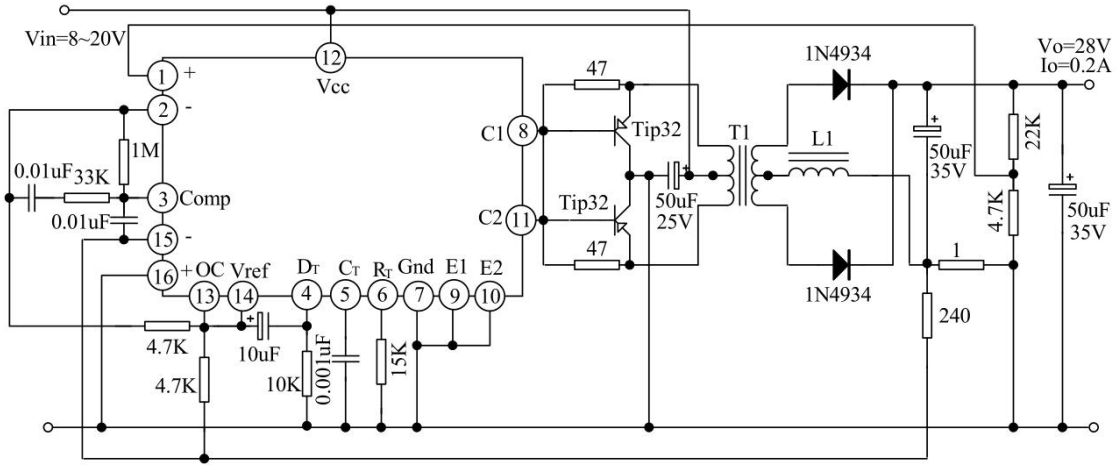




9.Two or more slave control circuits

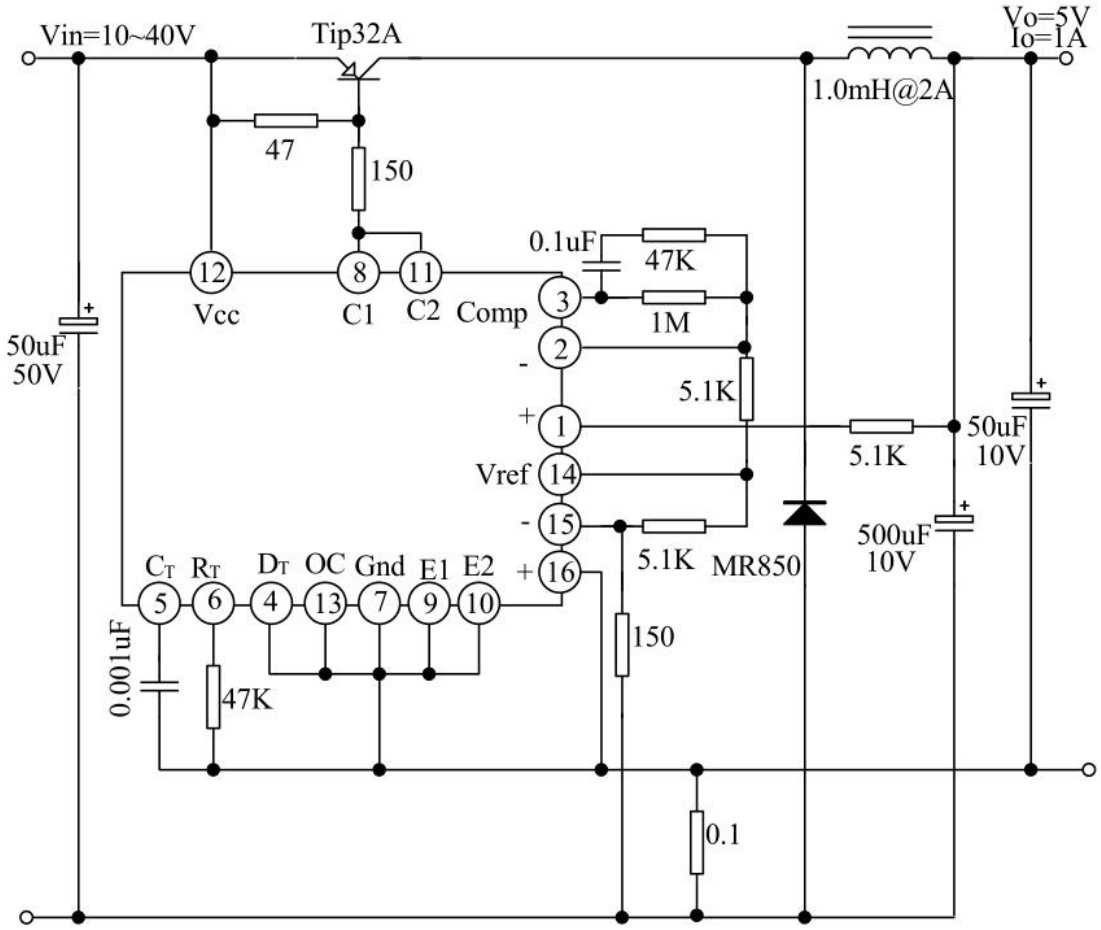


10.Pulse-width modulated push-pull converter



Test item	Conditions	Result
Line supply voltage	Vin=10V~40V	14mV 0.28%
Load adjustment rate	Vin=28V； Io=1.0mA~1.0A	3.0mV 0.06%
Output ripple voltage	Vin=28V； Io=1.0A	65mVpp P.A.R.D
Short-circuit current	Vin=28V； RL=0.1	1.6A
Efficiency	Vin=28V； Io=1.0A	71%

11.Pulse-width modulated step-down converter



Test item	Conditions	Result
Line supply voltage	Vin=8V~40V	3.0mV 0.01%
Load adjustment rate	Vin=12.6V； Io=0.2mA~200mA	5.0mV 0.02%
Output ripple voltage	Vin=12.6V； Io=200mA	40mVpp P.A.R.D
Short-circuit current	Vin=12.6V； RL=0.1Ω	250mA
Efficiency	Vin=12.6V； Io=200mA	71%

9. ORDERING INFORMATION

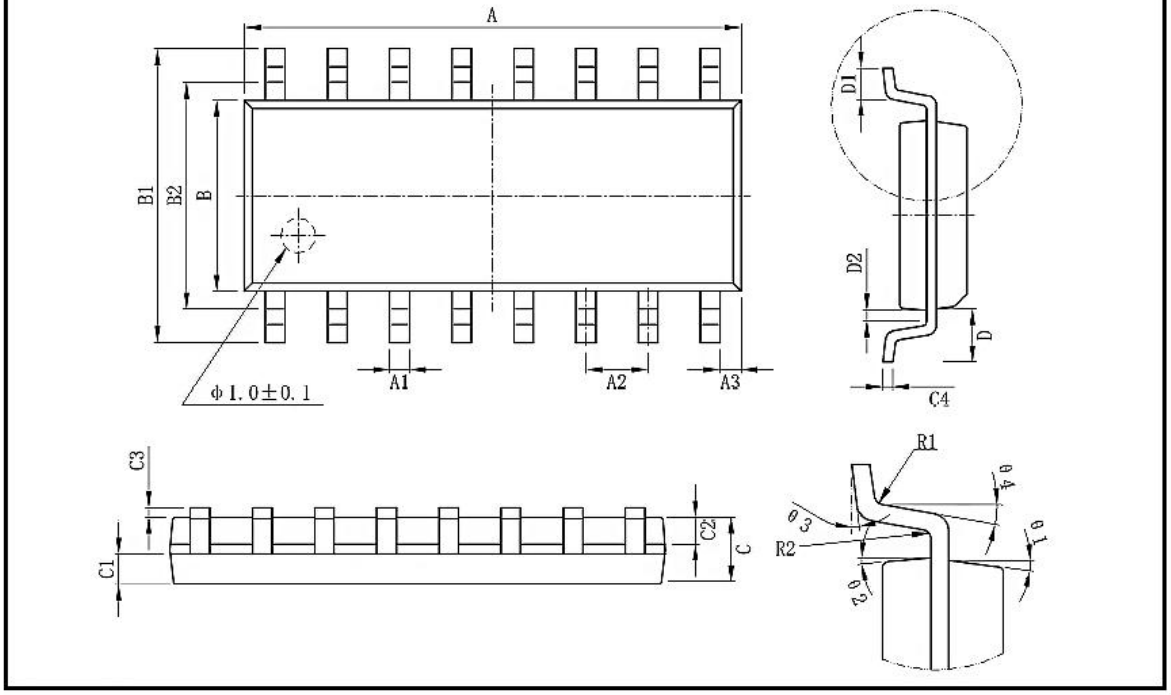
Ordering Information

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

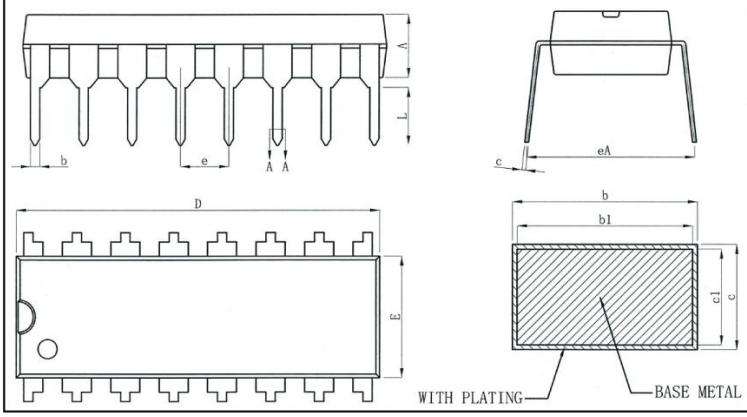
10. DIMENSIONAL DRAWINGS

SOP16

DIM / SYMBOL	MIN(mm)	MAX(mm)	DIM / SYMBOL	MIN(mm)	MAX(mm)
A	9.80	10.00	C4	0.203	0.233
A1	0.356	0.456	D	1.05TYP	
A2	1.27TYP		D1	0.40	0.70
A3	0.302TYP		D2	0.15	0.25
B	3.85	3.95	R1	0.20TYP	
B1	5.84	6.24	R2	0.20TYP	
B2	5.00TYP		θ1	8° ~ 12° TYP4	
C	1.40	1.60	θ2	8° ~ 12° TYP4	
C1	0.61	0.71	θ3	0° ~ 8°	
C2	0.54	0.64	θ4	4° ~ 12°	
C3	0.05	0.25			



DIP16



symbol	millimeter		
	Min	Nom	Max
A	3.20	3.30	3.40
b	0.44	---	0.53
b1	0.43	0.46	0.49
c	0.25	---	0.30
c1	0.24	0.25	0.26
D	18.95	19.05	19.15
E	6.25	6.35	6.45
e	2.54BSC		
eA	8.30	8.80	9.30
L	3.00	---	---