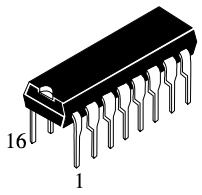
TL494AP Switchmode Pulse - Width - Modulation Control Circuit

The TL494AP 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

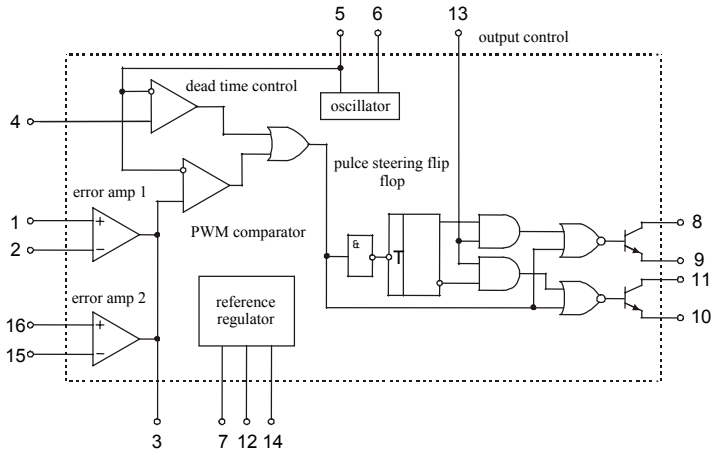


ORDERING INFORMATION

	Plastic
TL494	Chip

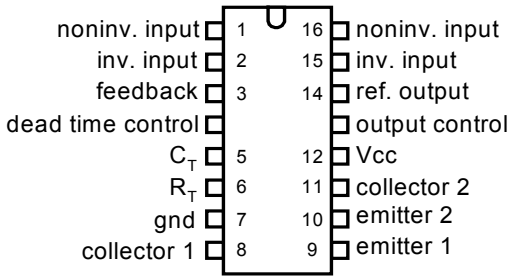
T_A = - 20° ÷ 85° C

LOGIC DIAGRAM



Pin 7 = GND
Pin 12 = V_{CC}

PIN ASSIGNMEN



MAXIMUM AND RECOMMENDED OPERATING CONDITIONS

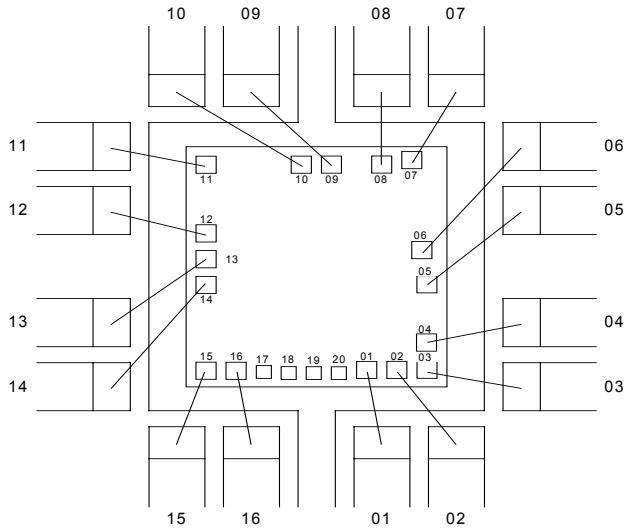
Symbol	Parameter	Recommended operating conditions		Maximum ratings		Unit
		Min	Max	Min	Max	
V_{CC}	Supply Voltage	7	40		41	V
V_I	Amplifier Input Voltage	-0.3	V_{CC}-2		V_{CC}+0.3	V
V_O	Collector Output Voltage		40		41	V
I_{OC}	Collector Output Current (Each Transistor)		200		250	mA
T	Storage Temperature Range			-55	125	°C
T	Operating Free-Air Temperature Range	-20	85			°C

ELECTRICAL CHARACTERISTICS (T_A= -25 ÷ +85°C, f =10kHz)

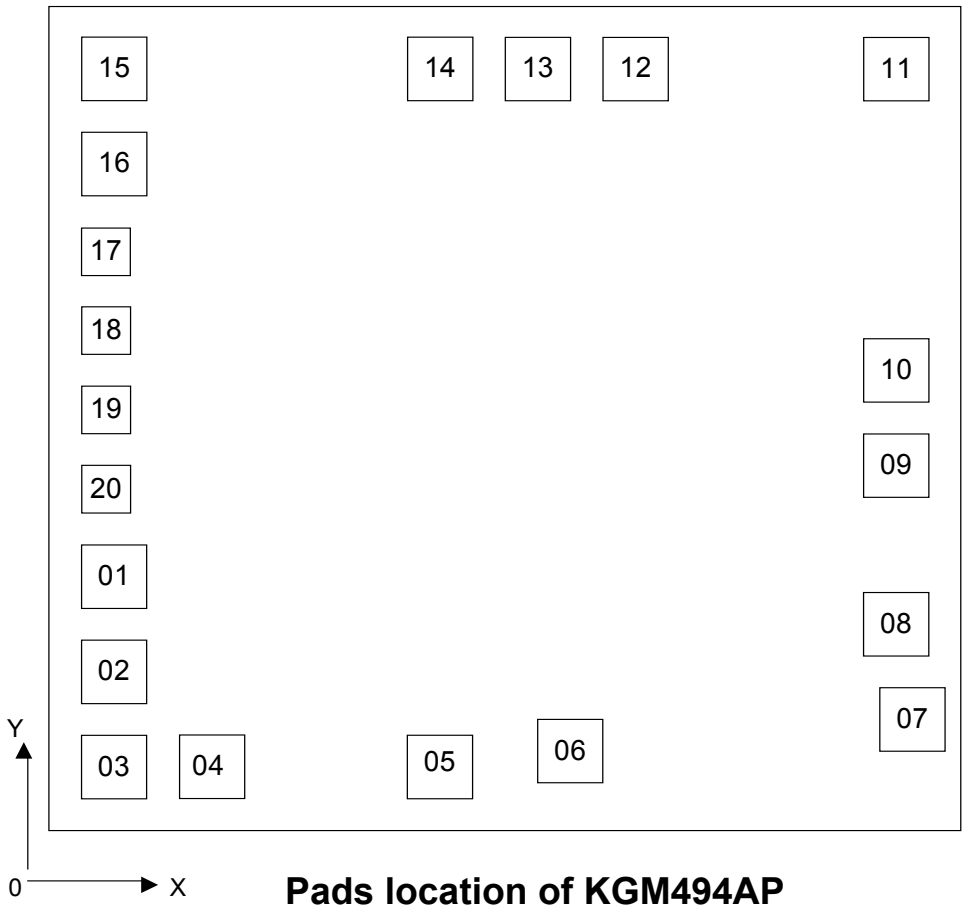
Symbol	Parameter	Test Conditions	Value			Temperature, ˚C	Unit
			Min	Typ	Max		
V_{ref}	Output voltage	I_0=1.0mA V_{CC}=15V	4.90	5.0	5.10	-20÷+85	V
U_{regin}	Input regulation	V_{CC}=7÷ 40V I_0=1.0mA	-	2	25	25	mV
U_{regout}	Output regulation	I_0=1÷ 10 mA V_{CC} =15 V	-	1	15	25	mV
ΔV_{ref}	Output voltage change with temperature	I_0=1 mA V_{CC} =15 V	-	0.2	1.0	-20÷+85	%
I_{SC}	Short circuit output current	V_{ref}=0, tsc< 1 s V_{CC}=15 V		35	50		mA
f_{osc}	Frequency	C=0.01µF, R=12kΩ V_{CC}=15 V $V_{(03)}$=0.7 V		10		25	kHz
σf_{osc}	Standard Deviation of Frequency *	V_{CC}=15 V $V_{(03)}$=0.7 V	-	3			%
$\sigma f_{osc(\Delta V)}$	Frequency Change with Voltage	V_{CC}=7÷40 V $V_{(03)}$=0.7 V	-	0.1	-	25	%
$\sigma f_{osc(\Delta T)}$	Frequency Change with Temperature	C=0.01µF, R_T=12 kΩ V_{CC}=15 V $V_{(03)}$=0.7 V	-	-	2	-20÷+85	%
$I_{IB(2T)}$	Input bias current (pin 4)	V_I=0÷5.25V V_{CC}=15 V $V_{(03)}$=0.7 V	-	-2	-10		µA
DCmax	Maximum duty cycle (each output)	$V_{I(04)}$=0V V_{CC}=15 V $V_{(03)}$=0.7 V	45	48	50		%
V_{THD1}	Input threshold voltage (pin 4) (Zero Duty Cycle)	DCmax=0 V_{CC}=15 V $V_{(03)}$=0.7 V	-	2.8	3.3		V
V_{THD2}	Input threshold voltage (pin 4) (Maximum Duty Cycle)	DCmax V_{CC}=15 V $V_{(03)}$=0.7 V	0	-	-		V
t_{rc}	Output voltage rise time (Common-Emitter)	V_{CC}=15 V $V_{(03)}$=2.0 V		100	200	-20÷+85	ns
t_{fc}	Output voltage fall time (Common-Emitter)	V_{CC}=15 V $V_{(03)}$=2.0 V		25	100		ns
t_{rf}	Output voltage rise time (Emitter-Follower)	V_{CC}=V_C=15 V $V_{(03)}$=2.0 V		100	200		ns
t_{ff}	Output voltage fall time (Emitter-Follower)	V_{CC}= V_C= 15 V $V_{(03)}$= 2.0 V	-	35	100	-20÷+85	ns

Symbol	Parameter	Test Conditions	Value			Temperature, ˚C	Unit
			Min	Typ	Max		
V_{THP}	Input threshold voltage (pin 3)	DCmax=0 V_{CC}=15 V		4.0	4.5	-20÷+85	V
I_I	Input sink current (pin 3)	V_{CC}= 15 V $V_{(03)}$= 0.7 V	0.3	0.7			mA
V_{IO}	Input offset voltage	V_{CC}= 15 V $V_{O(03)}$= 2.5 V		2	10		mV
I_{IO}	Input offset current	V_{CC}= 15 V $V_{O(03)}$= 2.5 V		50	250		nA
I_{IB}	Input bias current	V_{CC}= 15 V $V_{O(03)}$= 2.5 V		-0.1	1		µA
V_{ICRL}	Low Input common mode voltage range	V_{CC}= 7÷40 V	--0.3				V
V_{ICRH}	High Input common mode voltage range	V_{CC}= 7÷40 V	Vcc				V
A_{VOL}	Open loop voltage amplification	ΔV_0=3 V V_{CC}= 15 V V_O= 0.5÷ 3.5 V	70	95			dB
f_b	Unity-gain bandwidth	V_{CC}= 15 V		350			kHz
CMRR	Common mode rejection ratio	Vcc=40 V	65	90		25	dB
I_{OL}	Output sink current (pin 3)	V_{CC}= 15 V $V_{0(03)}$= 0.7 V	0.3	1.5		-20÷+85	mA
I_{OH}	Output source current (pin 3)	V_{CC}= 15 V $V_{0(03)}$= 3.5 V	-2	-6.5			mA
$I_{C(off)}$	Collector off-state current	V_{CE}= V_{CC}= 40 V		2	100		µA
$I_{E(off)}$	Emitter off-state current	V_{CC}= V_C= 40 V V_E= 0 V		0.1	-100		µA
$V_{SAT(C)}$	Collector - Emitter saturation voltage (Common-Emitter)	V_{CC}= 15 V V_E= 0 V $V_{0(03)}$= 3.0 V I_C= 200 mA		1.1	1.5		V
$V_{SAT(E)}$	Collector - Emitter saturation voltage (Emitter-follower)	V_{CC}=V_C= 15 V I_E= - 200 mA $V_{0(03)}$= 3.0 V		1.5	2.5	25	V
					2.9	-20÷+85	
I_{OCH}	Output control input current	V_{CC}= 15 V $V_{0(03)}$= 0.7 V		0.2	3.5	25	mA
I_{CC15}	Standby Supply Current at V_{CC} 15V	V_{CC}= 15 V		5.5	10		mA
I_{CC40}	Standby Supply Current at V_{CC} 40V	V_{CC}= 40 V		7.5	15		mA
I_{CCA}	Average Supply Current	V_{CC}= 15 V $V_{0(03)}$= 0.7 V $V_{0(04)}$= 2.0 V		7.0	17	-20÷+85	mA

* - Standard deviation is a measure of the statistical distribution about the mean as derived from the formula $\sigma = \sqrt{\frac{\sum_{n=1}^{N} (Xn - \overline{X})^2}{N-1}}$



Bonding diagram KGM494AP

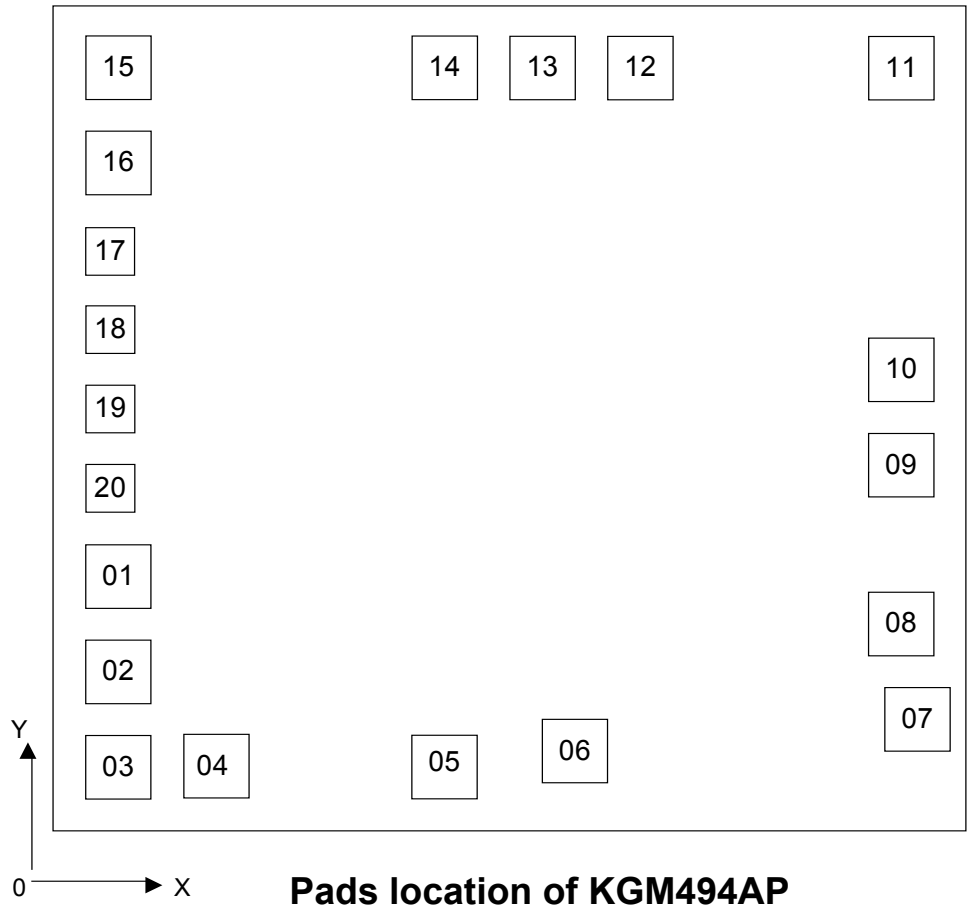


Pads location of KGM494AP

Die size Xr=1.9 mm, Yr=1.8 mm (pad size measured in “passivation” layer)
Coordinates of pads

No of pad (in layer “passivation”)	Coordinates left bottom, mm		pad size, mm
	X	Y	
01	0,138	0,510	0,100×0,100
02	0,138	0,324	0,100×0,100
03	0,138	0,138	0,100×0,100
04	0,324	0,138	0,100×0,100
05	0,793	0,138	0,100×0,100
06	1,061	0,154	0,100×0,100
07	1,682	0,223	0,100×0,100
08	1,661	0,416	0,100×0,100
09	1,661	0,812	0,100×0,100
10	1,661	0,994	0,100×0,100
11	1,661	1,562	0,100×0,100
12	1,158	1,562	0,100×0,100
13	0,982	1,562	0,100×0,100
14	0,799	1,562	0,100×0,100
15	0,158	1,542	0,100×0,100
16	0,158	1,356	0,100×0,100
17*	0,138	1,182	0,070×0,070
18*	0,138	1,020	0,070×0,070
19*	0,138	0,858	0,070×0,070
20*	0,138	0,696	0,070×0,070

* - not bonding



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