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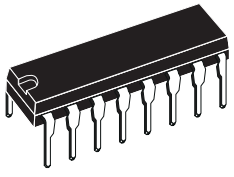
Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

PROGRAMMABLE QUAD BIPOLAR OPERATIONAL AMPLIFIER

- PROGRAMMABLE ELECTRICAL CHARACTERISTICS
- LOW SUPPLY CURRENT (250µA/amplifier)
- GAIN-BANDWITH PRODUCT : 1MHz
- LARGE DC VOLTAGE GAIN : 120dB
- LOW NOISE VOLTAGE : 28nV/√Hz
- WIDE POWER SUPPLY RANGE / ±1.5V to ±22V
- CLASSE AB OUTPUT STAGE. NO CROSS-OVER DISTORTION
- OVERLOAD PROTECTION FOR INPUTS AND OUTPUTS



N
DIP16
(Plastic Package)

DESCRIPTION

The LM346 consists of four independent, high gain, internally compensated, low power programmable amplifiers. Two external resistors (R_{set}) allow the user to program the gain-bandwith product, slew rate, supply current, input bias current, input offset current and input noise. For example the user can trade-off supply current for bandwith or optimize noise figure for a given source resistance. In a similar way other amplifier characteristics can be tailored to the application.

Except for the two programming pins at the end of the package the LM346 pin out is the same as the LM324 and LM348.

PROGRAMMING EQUATIONS :

Total supply current = 1mA (I_{set} = 10µA)

Gain bandwith product = 1MHz (I_{set} = 10µA)

Slew rate = 0.5V/µs (I_{set} = 10µA)

Input bias current ≈30nA (I_{set} = 10µA)

I_{set} = current into pin 8 and pin 9 (see schematic diagram)

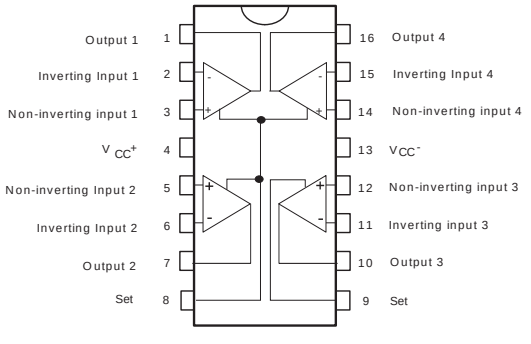
$$I_{set} = \frac{Vcc+ - Vcc- - 0.6V}{R_{set}}$$

ORDER CODE

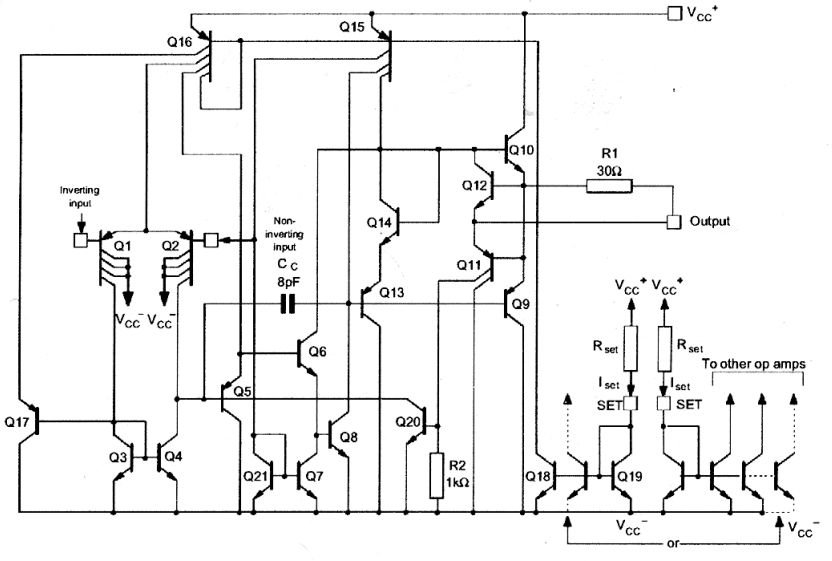
Part Number	Temperature Range	Package
		N
LM146	-55°C, +125°C	•
LM246	-40°C, +105°C	•
LM346	0°C, +70°C	•
Example : LM246N		

N = Dual in Line Package (DIP))

PIN CONNECTIONS (top view)



SCHEMATIC DIAGRAM (1/4 LM146)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	±22	V
V_i	I Input Voltage [1]	±15	V
V_{id}	Differential Input Voltage	±30	V
	Output Short-circuit Duration [2]	Infinite	
P_{tot}	Power Dissipation	500	mW
T_{oper}	Opearting Free-air Temperature Range LM146 LM246 LM346	 -55 to +125 40 to +105 0 to +70-	°C
T_{stg}	Storage Temperature Range	-65 to +150	°C

1. For supply voltage less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
2. Any of the amplifier outputs can be shorted to ground indefinitly; however more than one should not be simultaneously shorted as the maximum junction will be exceeded.

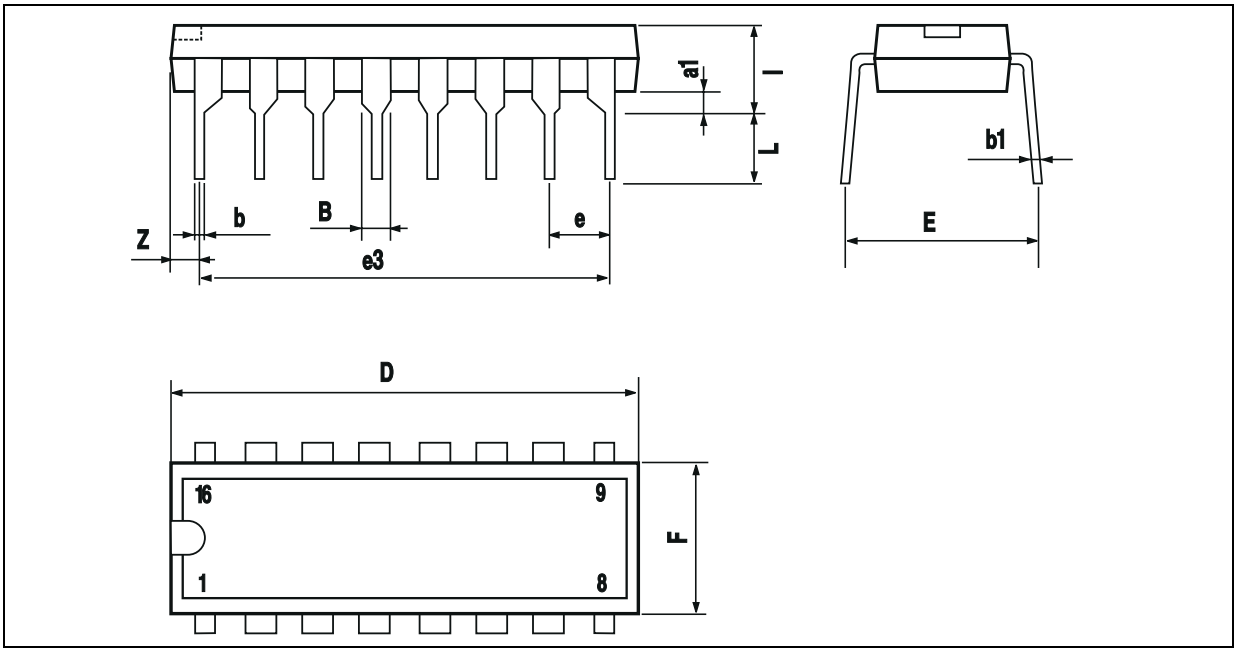
ELECTRICAL CHARACTERISTICS

$V_{CC}^+ = \pm 15V$, $I_{set} = 10\mu A$, $T_{amb} = +25°C$ (unless otherwise specified)

Symbol	Parameter	LM146			LM246 - LM346			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage ($R_S \le 10k\Omega$) $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$		0.5	3 5		0.5	5 6	mV
I_{io}	Input Offset Current $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$		2	20 25		2	100 100	nA
I_{ib}	Input Bias Current $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$		30	100 100		30	250 250	nA
A_{vd}	Large Signal Voltage Gain ($V_o = \pm 10V$, $R_L = 10k\Omega$) $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$	100 50	1000		50 25	1000		V/mV
SVR	Supply Voltage Rejection Ratio ($R_S \le 10k\Omega$) $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$	80 80	110		80 80	110		dB
I_{cc}	Supply Current, all Amp, no load $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$		1	2 2		1	2 2	mA
V_{icm}	Input Common Mode Voltage Range $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$	±13.5 ±13.5			±13.5 ±13.5			
CMR	Common Mode Rejection Ratio ($R_S \le 10k\Omega$) $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$	80 70	110		80 70	110		dB
I_{os}	Output Short-circuit Current $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$	10 4	20	30 35	10 4	20	30 35	mA
$\pm V_{opp}$	Output Voltage Swing ($R_L \le 10k\Omega$) $T_{amb} = 25°C$ $T_{min} \le T_{amb} \le T_{max}$	12 12	14		12 12	14		V
SR	Slew Rate ($V_I = \pm 10V$, $R_L = 10k\Omega$, $C_L = 100pF$, unity Gain)	0.3	0.5		0.3	0.5		V/µs
R_I	Input Resistance		1			1		MΩ
C_I	Input Capacitance		2			2		pF
V_{o1}/V_{o2}	Channel Separation ($R_L = 10k\Omega$, $Vo = 12V_{pp}$)		120			120		dB
GBP	Gain Bandwith Product ($V_I = 10$ mV, $R_L = 10k\Omega$, $C_L = 100pF$ f =100kHz)	0.8	1		0.5	1		MHz
THD	Total Harmonic Distortion (f = 1kHz, $A_v = 20dB$, $R_L = 10k\Omega$ $C_L = 100pF$, $V_o = 2V_{pp}$)		0.015			0.015		%
e_n	Equivalent Input Noise Voltage (f = 1kHz, $R_S = 100\Omega$		28			28		$\frac{nV}{\sqrt{Hz}}$

PACKAGE MECHANICAL DATA

16 PINS - PLASTIC PACKAGE



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050