BURR-BROWN®

OPA646

Low Power, Wide Bandwidth OPERATIONAL AMPLIFIER

FEATURES

- LOW POWER: 55mW
- UNITY-GAIN BANDWIDTH: 650MHz
- UNITY-GAIN STABLE
- FAST 12-BIT SETTLING: 15ns (0.01%)
- LOW INPUT BIAS CURRENT: 2μA
- LOW HARMONICS: –82dBc at 5MHz
- LOW DIFFERENTIAL GAIN/PHASE ERRORS: 0.025%/0.08°

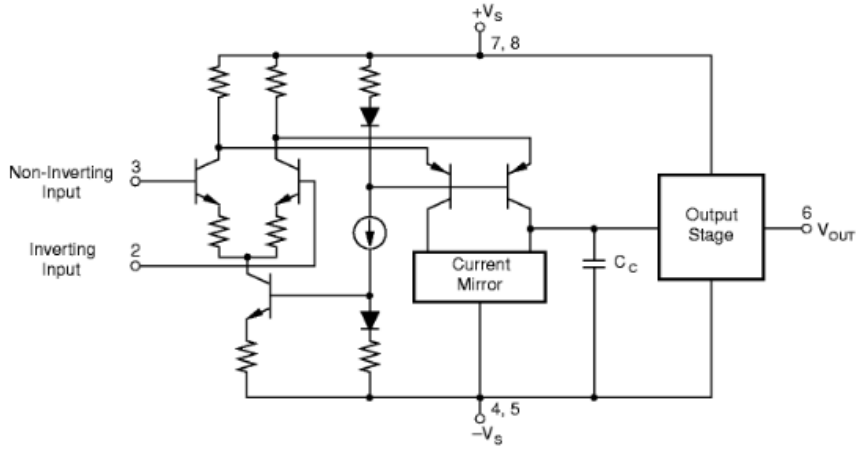
APPLICATIONS

- TELECOMMUNICATIONS
- MEDICAL IMAGING
- CCD IMAGING
- PORTABLE EQUIPMENT
- ACTIVE FILTERS
- VIDEO AMPLIFICATION
- ADC/DAC GAIN AMPLIFIER
- HIGH SPEED INTEGRATORS

DESCRIPTION

The OPA646 is a low power, wideband voltage feedback operational amplifier. It features a high bandwidth of 650MHz as well as a 12-bit settling time of only 15ns. Its low input bias current and wide bandwidth allows it to be used for high speed integrator and active filter designs. Its low distortion gives exceptional performance for telecommunications, medical imaging and video applications.

The OPA646 is internally compensated for unity-gain stability. This amplifier has a fully symmetrical differential input due to its "classical" operational amplifier circuit architecture. Its unusual combination of speed, accuracy and low power make it an ideal choice for many portable, multichannel and other high speed applications where power is at a premium.



International Airport Industrial Park • Mailing Address: PO Box 11400, Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd., Tucson, AZ 85706 • Tel: (520) 746-1111 • Twx: 910-952-1111
Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

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SPECIFICATIONS

ELECTRICAL

At T_A = +25°C, V_S = ±5V, R_L = 100Ω, C_L = 2pF, R_{FB} = 402Ω and all four power supply pins are used, unless otherwise noted. R_{FB} = 25Ω for a gain of +1.

PARAMETER	CONDITIONS	OPA646U			OPA646UB			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
OFFSET VOLTAGE								
Input Offset Voltage			±3	±8		±1	±2.5	mV
Average Drift			±20			±12		µV/°C
Power Supply Rejection (+V_S)	V_S = ±4.5 to ±5.5V	50	70		60	*		dB
(–V_S)		45	55		48	*		dB
INPUT BIAS CURRENT								
Input Bias Current	V_{CM} = 0V		2	5		*	3.5	µA
Over Specified Temperature			3	7		*	*	µA
Input Offset Current	V_{CM} = 0V		0.4	1.5		*	*	µA
Over Specified Temperature			0.9	3.0		*	*	µA
NOISE								
Input Voltage Noise								
Noise Density: f = 100Hz			23.2			*		nV/√Hz
f = 10kHz			7.5			*		nV/√Hz
f = 1MHz			7.1			*		nV/√Hz
f = 1MHz to 100MHz			7.2			*		nV/√Hz
Voltage Noise, BW = 100Hz to 100MHz			141			*		µVrms
Input Bias Current Noise								
Current Noise Density, f = 0.1Hz to 20kHz			1.1			*		pA/√Hz
Noise Figure (NF)								
R_S = 10kΩ			3.0			*		dB
R_S = 50Ω			19.1			*		dB
INPUT VOLTAGE RANGE								
Common-Mode Input Range		±2.5	±3.0		*	*		V
Over Specified Temperature		±2.5	±3.0		*	*		V
Common-Mode Rejection	V_{CM} = ±0.5V	60	80		75	90		dB
INPUT IMPEDANCE								
Differential			15 || 1			*		kΩ || pF
Common-Mode			1.6 || 1			*		MΩ || pF
OPEN-LOOP GAIN								
Open-Loop Voltage Gain	V_O = ±2V, R_L = 100Ω	45	51		47	55		dB
Over Specified Temperature		43	49		45	53		dB
FREQUENCY RESPONSE								
Closed-Loop Bandwidth	G = +1V/V		650			*		MHz
	G = +2V/V		160			*		MHz
	G = +5V/V		45			*		MHz
	G = +10V/V		22			*		MHz
Slew Rate[1]	G = +1, 2V Step		180			*		V/µs
At Minimum Specified Temperature			155			*		V/µs
Rise Time	1V Step		5.3			*		ns
Fall Time	1V Step		5.9			*		ns
Settling Time: 0.01%	G = +1, 2V Step		15			*		ns
0.1%	G = +1, 2V Step		11.5			*		ns
1%	G = +1, 2V Step		6			*		ns
Over-Voltage Recovery[2]			65					ns
Spurious Free Dynamic Range	G = +1, f = 5.0MHz, V_O = 2Vp-p, R_L = 402Ω		82			*		dBc
Differential Gain Error at 3.58MHz	G = +2V/V, V_O = 0 to 1.4V, R_L = 150Ω		0.025			*		%
Differential Phase Error at 3.58MHz	G = +2V/V, V_O = 0 to 1.4V, R_L = 150Ω		0.08			*		degrees
Gain Flatness to 0.1dB			100			*		MHz
OUTPUT								
Voltage Output	No Load							
Over Specified Temperature		±2.5	±2.75		*	*		V
Voltage Output	R_L = 250Ω							V
Over Specified Temperature		±2.5	±2.7		*	*		V
Voltage Output	R_L = 100Ω							
Over Specified Temperature		±2.0	±2.5		*	*		V
Current Output, +25°C to max Temp		±40	±52		*	*		mA
Over Specified Temperature		±30	±48		*	*		mA
Short Circuit Current			60			*		mA
Output Resistance	1MHz, G = +1V/V		0.2			*		Ω
POWER SUPPLY								
Specified Operating Voltage	T_{MIN} to T_{MAX}		±5			*		V
Operating Voltage Range	T_{MIN} to T_{MAX}	±4.5		±5.5	*		*	V
Quiescent Current			±5.25	±6.5		*	*	mA
Over Specified Temperature			±6.5	±7.5		*	*	mA
TEMPERATURE RANGE								
Specification: U, UB	Ambient	–40		+85	*		*	°C
Thermal Resistance	θ_{JA}, Junction to Ambient							
U, UB 8-Pin SO-8			125			*		°C/W

* Specification same as OPA646U.

NOTE: (1) Slew rate is rate of change from 10% to 90% of output voltage step. (2) Recovery time to linear operation from the input overdrive midpoint.