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National Semiconductor

November 1994

LM747
Dual Operational Amplifier

General Description

The LM747 is a general purpose dual operational amplifier. The two amplifiers share a common bias network and power supply leads. Otherwise, their operation is completely independent.

Additional features of the LM747 are: no latch-up when input common mode range is exceeded, freedom from oscillations, and package flexibility.

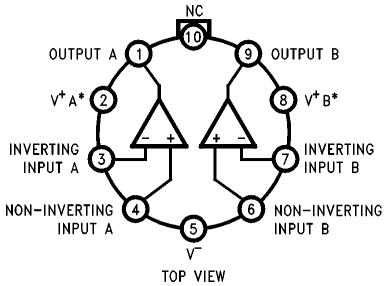
The LM747C/LM747E is identical to the LM747/LM747A except that the LM747C/LM747E has its specifications guaranteed over the temperature range from 0°C to +70°C instead of −55°C to +125°C.

Features

- No frequency compensation required
- Short-circuit protection
- Wide common-mode and differential voltage ranges
- Low power consumption
- No latch-up
- Balanced offset null

Connection Diagrams

Metal Can Package

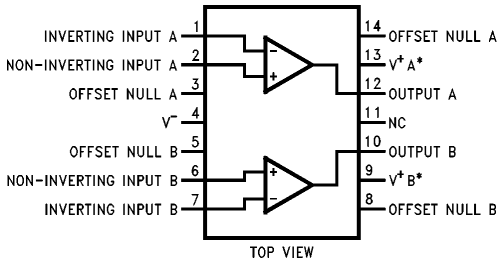


TL/H/11479–4

Order Number LM747H
See NS Package Number H10C

*V+A and V+B are internally connected.

Dual-In-Line Package



TL/H/11479–5

Order Number LM747CN or LM747EN
See NS Package Number N14A

  RRD-B30M115/Printed in U. S. A.

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	
LM747/LM747A	±22V
LM747C/LM747E	±18V
Power Dissipation (Note 1)	800 mW
Differential Input Voltage	±30V
Input Voltage (Note 2)	±15V
Output Short-Circuit Duration	Indefinite
Operating Temperature Range	
LM747/LM747A	−55°C to +125°C
LM747C/LM747E	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 10 sec.)	300°C

Electrical Characteristics (Note 3)

Parameter	Conditions	LM747A/LM747E			LM747			LM747C			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Input Offset Voltage	$T_A = 25°C$ $R_S \le 10\ k\Omega$ $R_S \le 50\Omega$		0.8	3.0		1.0	5.0		2.0	6.0	mV
	$R_S \le 50\Omega$ $R_S \le 10\ k\Omega$			4.0			6.0			7.5	mV
Average Input Offset Voltage Drift				15							$\mu V/°C$
Input Offset Voltage Adjustment Range	$T_A = 25°C$, $V_S = \pm 20V$	±10				±15			±15		mV
Input Offset Current	$T_A = 25°C$		3.0	30		20	200		20	200	nA
				70		85	500			300	
Average Input Offset Current Drift				0.5							nA/°C
Input Bias Current	$T_A = 25°C$ $T_{AMIN} \le T_A \le T_{AMAX}$		30	80 0.210		80	500 1.5		80	500 0.8	nA μA
Input Resistance	$T_A = 25°C$, $V_S = \pm 20V$	1.0	6.0		0.3	2.0		0.3	2.0		MΩ
	$V_S = \pm 20V$	0.5									
Input Voltage Range	$T_A = 25°C$							±12	±13		V
		±12	±13		±12	±13					
Large Signal Voltage Gain	$T_A = 25°C$, $R_L \ge 2\ k\Omega$ $V_S = \pm 20V$, $V_O = \pm 15V$	50									V/mV
	$V_S = \pm 15V$, $V_O = \pm 10V$ $R_L \ge 2\ k\Omega$				50	200		20	200		V/mV
	$V_S = \pm 20V$, $V_O = \pm 15V$	32									V/mV
	$V_S = \pm 15V$, $V_O = \pm 10V$				25			15			V/mV
	$V_S = \pm 5V$, $V_O = \pm 2V$	10									V/mV
Output Voltage Swing	$V_S = \pm 20V$ $R_L \ge 10\ k\Omega$ $R_L \ge 2\ k\Omega$	±16 ±15									V
	$V_S = \pm 15V$ $R_L \ge 10\ k\Omega$ $R_L \ge 2\ k\Omega$				±12 ±10	±14 ±13		±12 ±10	±14 ±13		V
Output Short Circuit Current	$T_A = 25°C$	10 10	25	35 40		25			25		mA
Common-Mode Rejection Ratio	$R_S \le 10\ k\Omega$, $V_{CM} = \pm 12V$				70	90		70	90		dB
	$R_S \le 50\ k\Omega$, $V_{CM} = \pm 12V$	80	95								

Electrical Characteristics (Note 3) (Continued)

Parameter	Conditions	LM747A/LM747E			LM747			LM747C			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Supply Voltage Rejection Ratio	$V_S = \pm 20V$ to $V_S = \pm 5V$ $R_S \leq 50\Omega$ $R_S \leq 10\ k\Omega$	86	96		77	96		77	96		dB
Transient Response Rise Time Overshoot	$T_A = 25°C$, Unity Gain		0.25 6.0	0.8 20		0.3 5			0.3 5		μs %
Bandwidth (Note 4)	$T_A = 25°C$	0.437	1.5								MHz
Slew Rate	$T_A = 25°C$, Unity Gain	0.3	0.7			0.5			0.5		V/μs
Supply Current/Amp	$T_A = 25°C$			2.5		1.7	2.8		1.7	2.8	mA
Power Consumption/Amp	$T_A = 25°C$ $V_S = \pm 20V$ $V_S = \pm 15V$		80	150		50	85		50	85	mW
LM747A	$V_S = \pm 20V$ $T_A = T_{AMIN}$ $T_A = T_{AMAX}$			165 135							mW
LM747E	$V_S = \pm 20V$ $T_A = T_{AMIN}$ $T_A = T_{AMAX}$			150 150 150							mW
LM747	$V_S = \pm 15V$ $T_A = T_{AMIN}$ $T_A = T_{AMAX}$					60 45	100 75				mW

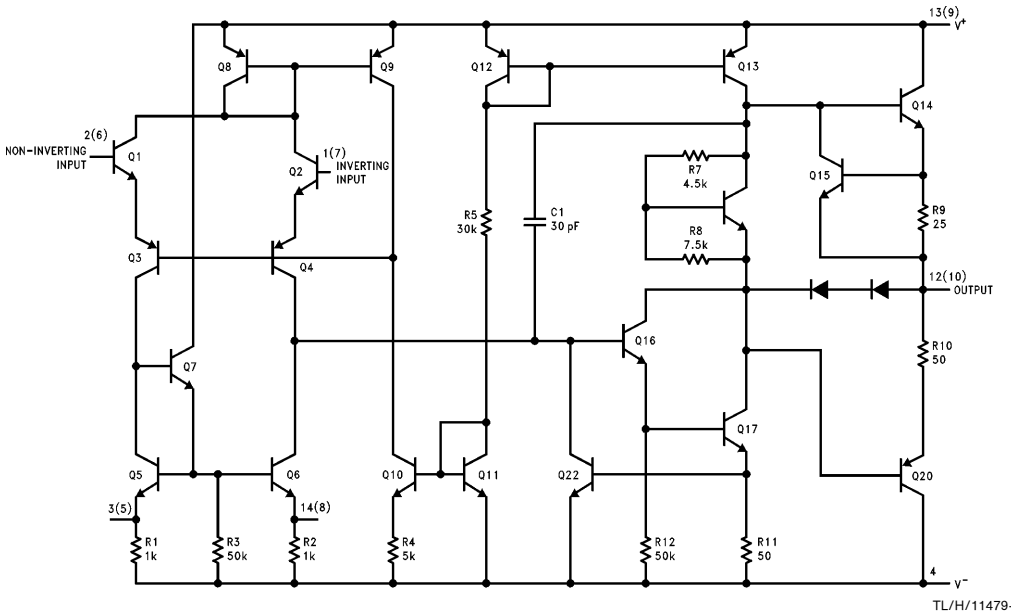
Note 1: The maximum junction temperature of the LM747C/LM747E is 100°C. For operating at elevated temperatures, devies in the TO-5 package must be derated based on a thermal resistance of 150°C/W, junction to ambient, or 45°C/W, junction to case. The thermal resistance of the dual-in-line package is 100°C/W, junction to ambient.

Note 2: For supply voltages less than $\pm 15V$, the absolute maximum input voltage is equal to the supply voltage.

Note 3: These specifications apply for $\pm 5V \leq V_S \leq \pm 20V$ and $-55°C \leq T_A \leq 125°C$ for the LM747A and $0°C \leq T_A \leq 70°C$ for the LM747E unless otherwise specified. The LM747 and LM747C are specified for $V_S = \pm 15V$ and $-55°C \leq T_A \leq 125°C$ and $0°C \leq T_A \leq 70°C$, respectively, unless otherwise specified.

Note 4: Calculated value from: 0.35/Rise Time (μs).

Schematic Diagram (Each Amplifier)



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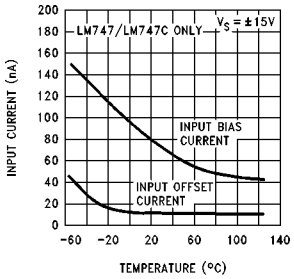
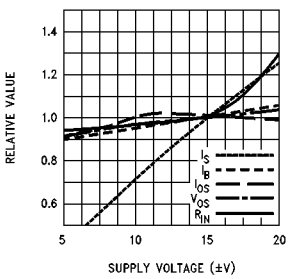
Note: Numbers in parentheses are pin numbers for amplifier B. DIP only.

Typical Performance Characteristics

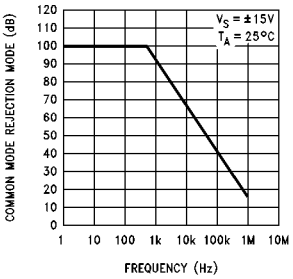
Input Bias and Offset Currents vs Ambient Temperature



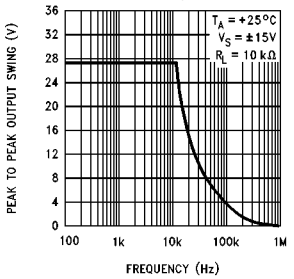
DC Parameters vs Supply Voltage



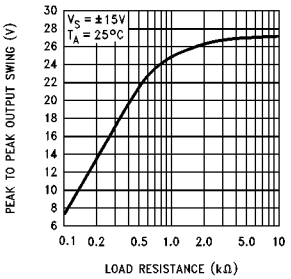
Common Mode Rejection Ratio vs Frequency



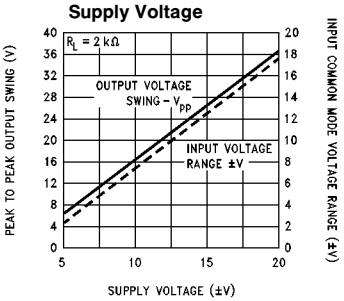
Output Voltage Swing vs Frequency



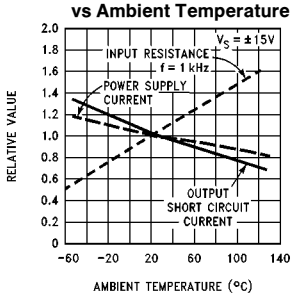
Output Voltage Swing vs Load Resistance



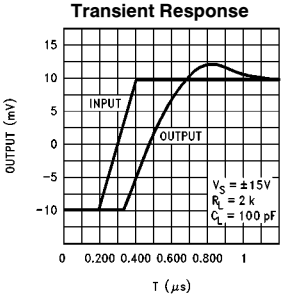
Output Swing and Input Range vs Supply Voltage



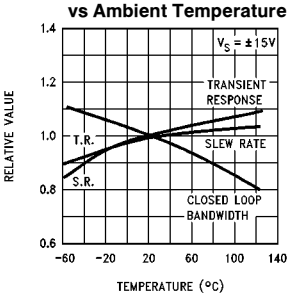
Normalized DC Parameters vs Ambient Temperature



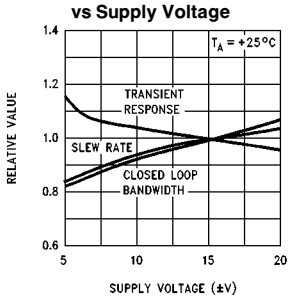
Transient Response



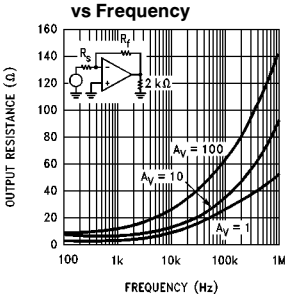
Frequency Characteristics vs Ambient Temperature



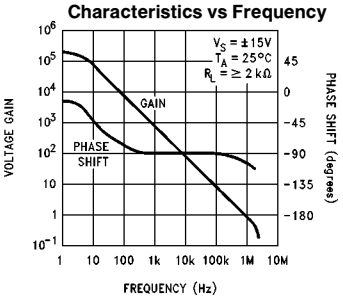
Frequency Characteristics vs Supply Voltage



Output Resistance vs Frequency



Open Loop Transfer Characteristics vs Frequency



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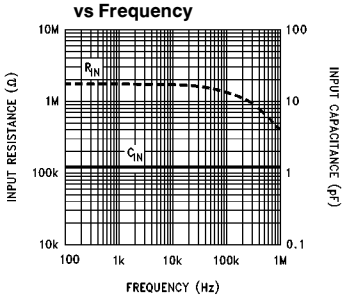
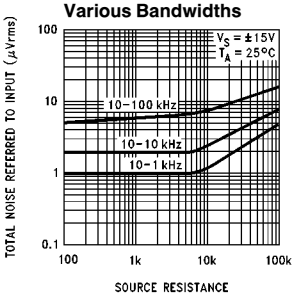
Typical Performance Characteristics (Continued)

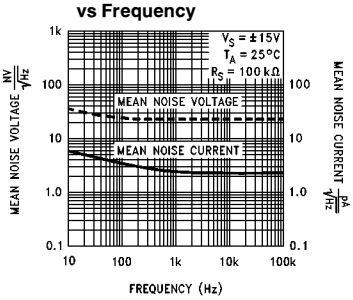
Input Resistance and Input Capacitance vs Frequency



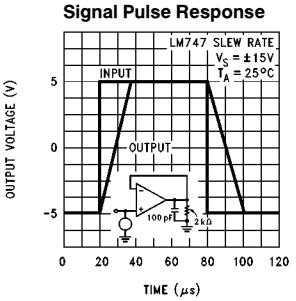
Broadband Noise for Various Bandwidths



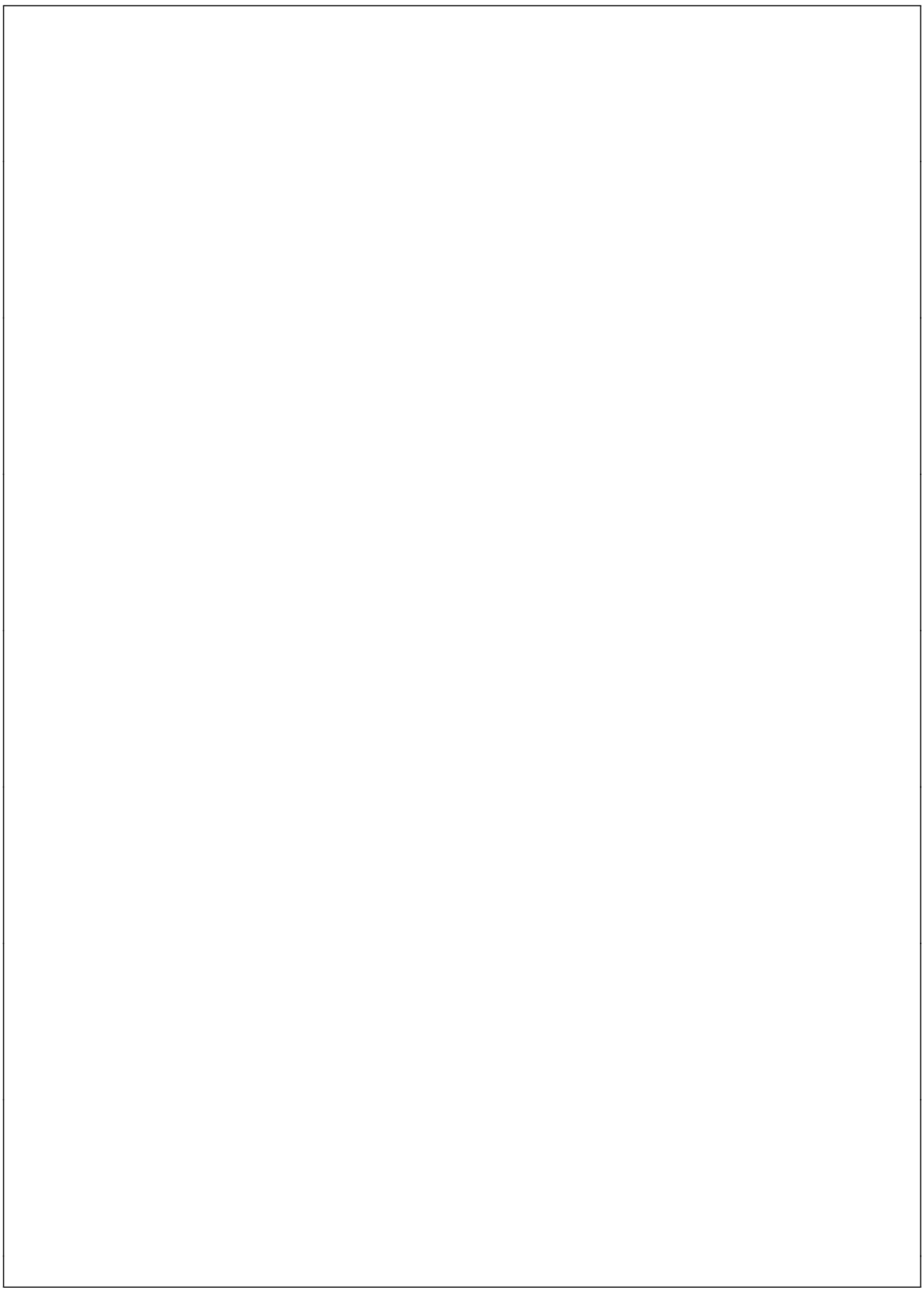
Input Noise Voltage and Current vs Frequency



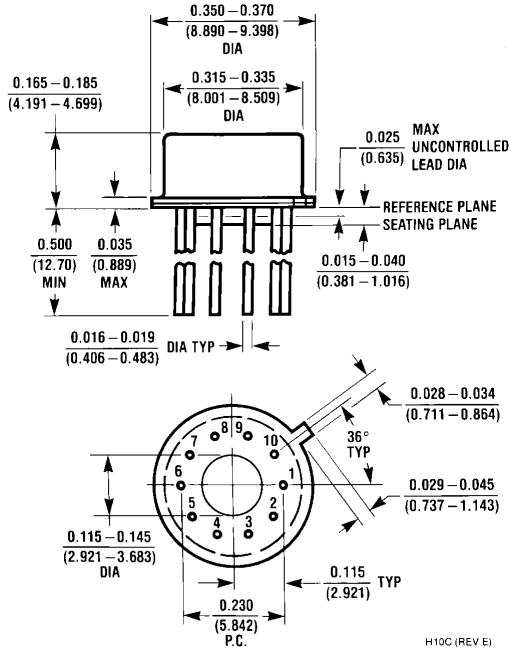
Voltage Follower Large Signal Pulse Response



TL/H/11479–3

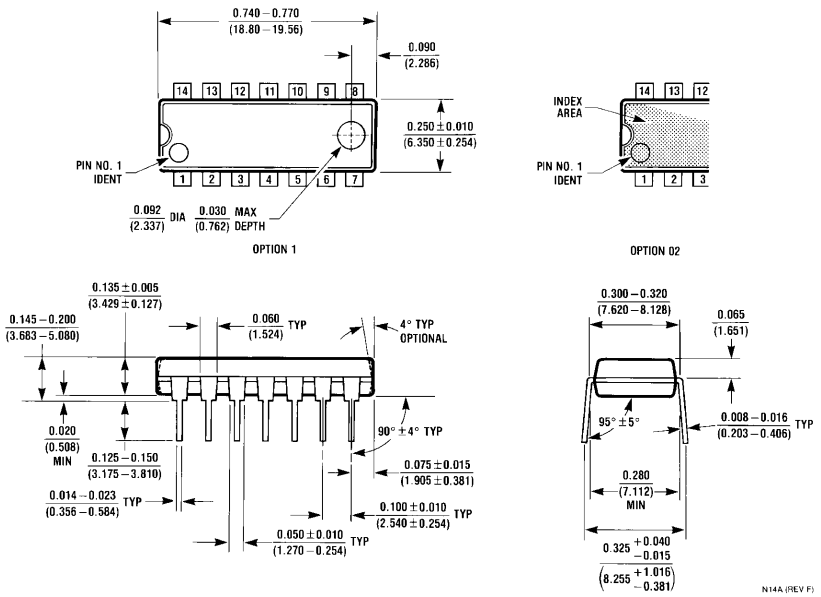


Physical Dimensions inches (millimeters)



Metal Can Package (H)
Order Number LM747H
NS Package Number H10C

Physical Dimensions inches (millimeters) (Continued)



Dual-In-Line Package (N)
Order Number LM747CN or LM747EN
NS Package Number N14A

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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LM747 Product Folder

Dual Operational Amplifier

See Also: LMC6061 - lower offset voltage

General Description | Features | Datasheet | Package & Models | Samples & Pricing | Design Tools | Application Notes

Parametric Table

Channels (Channels)	2
Input Output Type	Not Rail to Rail
Bandwidth, typ (MHz)	1.50
Slew Rate, typ (Volts/usec)	.50
Supply Current per Channel, typ (mA)	1.70
Minimum Supply Voltage (Volt)	10

Parametric Table

Maximum Supply Voltage (Volt)	44
Offset Voltage, Max (mV)	5
Input Bias Current, Temp Max (nA)	1500
Output Current, typ (mA)	25
Voltage Noise, typ (nV/Hz)	23
Shut down	No
Special Features	Vos Adj

Datasheet

Title	Size in Kbytes	Date	View Online	Download	Receive via Email
LM747 Dual Operational Amplifier	162 Kbytes	7-Jan-96	View Online	Download	Receive via Email
LM747 Mil-Aero (JAN) Datasheet MJLM747A-X	16 Kbytes		View Online	Download	Receive via Email
LM747 Mil-Aero Datasheet MNLM747-X	21 Kbytes		View Online	Download	Receive via Email
LM747 Mil-Aero Datasheet MNLM747A-X	13 Kbytes		View Online	Download	Receive via Email

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Package Availability, Models, Samples & Pricing

Part Number	Package			Status	Models		Samples & Electronic Orders	Budgetary Pricing		Std Pack Size	Package Marking
	Type	Pins	MSL		SPICE	IBIS		Qty	$US each		
LM747H	TO-5	10	MSL	Full production	N/A	N/A	Buy Now	1K+	$1.7600	box of 500	[logo]¢Z¢2¢T LM747H

LM747AH-MIL	TO-5	10	MSL	Full production	N/A	N/A	Buy Now	50+	$3.5000	tray of 20	[logo] ¢Z¢S¢4¢A$E LM747AH-MIL
LM747H/883	TO-5	10	MSL	Full production	N/A	N/A	Buy Now	50+	$2.5600	tray of 20	[logo]¢Z¢S¢4¢A$E LM747H/883Q
LM747J/883	CERDIP	14	MSL	Full production	N/A	N/A	Buy Now	50+	$1.9400	rail of 25	[logo]¢Z¢S¢4¢A$E LM747J/883Q¢M
JM38510/10102BI	TO-5	10	MSL	Full production	N/A	N/A		50+	$10.3000	tray of 20	[logo] ¢Z¢S¢4¢A 27014 QS JM38510/10102BIA $E
JM38510/10102BC	CERDIP	14	MSL	Full production	N/A	N/A		50+	$12.2000	rail of 25	[logo] ¢Z¢S¢4¢A$E JM38510/10102BCA 27014 QS
JM38510/10102BD	CERPACK	14	MSL	Full production	N/A	N/A		50+	$18.3000	rail of 19	[logo]¢Z¢S¢4¢A$E JM38510/ 10102BDA 27014 QS
JM38510/10102SI	TO-5	10	MSL	Full production	N/A	N/A		50+	$213.0000	tray of 20	[logo] ¢Z¢S¢4¢A$E 27014 Q JM38510/10102SIA
JM38510/10102SC	CERDIP	14	MSL	Full production	N/A	N/A		50+	$195.0000	rail of 25	[logo] ¢Z¢S¢4¢A$E JM38510/10102SCA 27014 Q
LM747 MDC	Die			Full production	N/A	N/A	Samples			tray of N/A	-
LM747 MWC	Wafer			Full production	N/A	N/A				wafer jar of N/A	-
LM747L MD8	Die			Full production	N/A	N/A	Samples			tray of N/A	-
LM747L MW8	Wafer			Full production	N/A	N/A				wafer jar of N/A	-

General Description

The LM747 is a general purpose dual operational amplifier. The two amplifiers share a common bias network and power supply leads. Otherwise, their operation is completely independent.

Additional features of the LM747 are: no latch-up when input common mode range is exceeded, freedom from oscillations, and package flexibility.

The LM747C/LM747E is identical to the LM747/LM747A except that the LM747C/LM747E has its specifications guaranteed over the temperature range from 0°C to +70°C instead of -55°C to +125°C.

Features

- No frequency compensation required
- Short-circuit protection
- Wide common-mode and differential voltage ranges
- Low power consumption
- No latch-up
- Balanced offset null

Design Tools

Title	Size in Kbytes	Date	View Online	Download	Receive via Email
Amplifiers Selection Guide software for Windows	7 Kbytes	12-Jun-2002	View		

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Application Notes

Title	Size in Kbytes	Date	View Online	Download	Receive via Email
AN-509: Using the TP3401/2/3 ISDN PBX Transceivers	195 Kbytes	4-Nov-95	View Online	Download	Receive via Email
LB-44: Get More Power Out of Dual or Quad Op-Amps	71 Kbytes	28-Jun-96	View Online	Download	Receive via Email

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