

LM747

LM747 Dual Operational Amplifier



Literature Number: SNOS661

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.

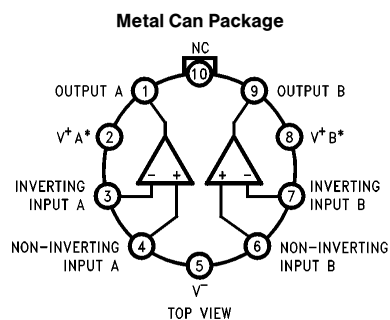
Additional features of the LM747 are: no latch-up when input common mode range is exceeded, freedom from oscillations, and package flexibility.

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

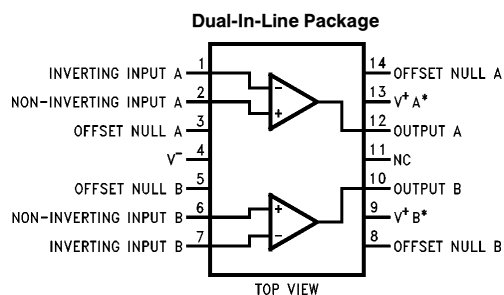
Connection Diagrams



TL/H/11479-4

Order Number LM747H
See NS Package Number H10C

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



TL/H/11479-5

Order Number LM747CN or LM747EN
See NS Package Number N14A

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	$T_A = 25^\circ\text{C}$ $R_S \leq 10\text{ k}\Omega$ $R_S \leq 50\Omega$		0.8	3.0	1.0	5.0		2.0	6.0		mV
	$R_S \leq 50\Omega$ $R_S \leq 10\text{ k}\Omega$			4.0		6.0			7.5		mV
Average Input Offset Voltage Drift				15							$\mu\text{V}/^\circ\text{C}$
Input Offset Voltage Adjustment Range	$T_A = 25^\circ\text{C}$, $V_S = \pm 20\text{V}$	±10			±15			±15			mV
Input Offset Current	$T_A = 25^\circ\text{C}$	3.0	30		20	200		20	200		nA
			70		85	500			300		
Average Input Offset Current Drift				0.5							nA/ $^\circ\text{C}$
Input Bias Current	$T_A = 25^\circ\text{C}$	30	80		80	500		80	500		nA
	$T_{\text{AMIN}} \leq T_A \leq T_{\text{AMAX}}$		0.210			1.5			0.8		μA
Input Resistance	$T_A = 25^\circ\text{C}$, $V_S = \pm 20\text{V}$	1.0	6.0		0.3	2.0		0.3	2.0		M Ω
	$V_S = \pm 20\text{V}$	0.5									
Input Voltage Range	$T_A = 25^\circ\text{C}$							±12	±13		V
		±12	±13		±12	±13					
Large Signal Voltage Gain	$T_A = 25^\circ\text{C}$, $R_L \geq 2\text{ k}\Omega$ $V_S = \pm 20\text{V}$, $V_O = \pm 15\text{V}$	50									V/mV
	$V_S = \pm 15\text{V}$, $V_O = \pm 10\text{V}$ $R_L \geq 2\text{ k}\Omega$				50	200		20	200		V/mV
	$V_S = \pm 20\text{V}$, $V_O = \pm 15\text{V}$	32									V/mV
	$V_S = \pm 15\text{V}$, $V_O = \pm 10\text{V}$				25			15			V/mV
	$V_S = \pm 5\text{V}$, $V_O = \pm 2\text{V}$	10									V/mV
Output Voltage Swing	$V_S = \pm 20\text{V}$ $R_L \geq 10\text{ k}\Omega$ $R_L \geq 2\text{ k}\Omega$	±16 ±15									V
	$V_S = \pm 15\text{V}$ $R_L \geq 10\text{ k}\Omega$ $R_L \geq 2\text{ k}\Omega$				±12 ±10	±14 ±13		±12 ±10	±14 ±13		V
Output Short Circuit Current	$T_A = 25^\circ\text{C}$	10 10	25	35 40	25			25			mA
Common-Mode Rejection Ratio	$R_S \leq 10\text{ k}\Omega$, $V_{\text{CM}} = \pm 12\text{V}$				70	90		70	90		dB
	$R_S \leq 50\text{ k}\Omega$, $V_{\text{CM}} = \pm 12\text{V}$	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 $V_S = \pm 5V$ $R_S \leq 50\Omega$ $R_S \leq 10k\Omega$	86	96		77	96		77	96		dB
Transient Response	$T_A = 25^\circ C$, Unity Gain		0.25	0.8		0.3			0.3		μs
Rise Time			6.0	20		5			5		%
Overshoot											
Bandwidth (Note 4)	$T_A = 25^\circ C$	0.437	1.5								MHz
Slew Rate	$T_A = 25^\circ C$, Unity Gain	0.3	0.7		0.5			0.5			V/ μs
Supply Current/Amp	$T_A = 25^\circ C$			2.5	1.7	2.8		1.7	2.8		mA
Power Consumption/Amp	$T_A = 25^\circ C$ $V_S = \pm 20V$ $V_S = \pm 15V$		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

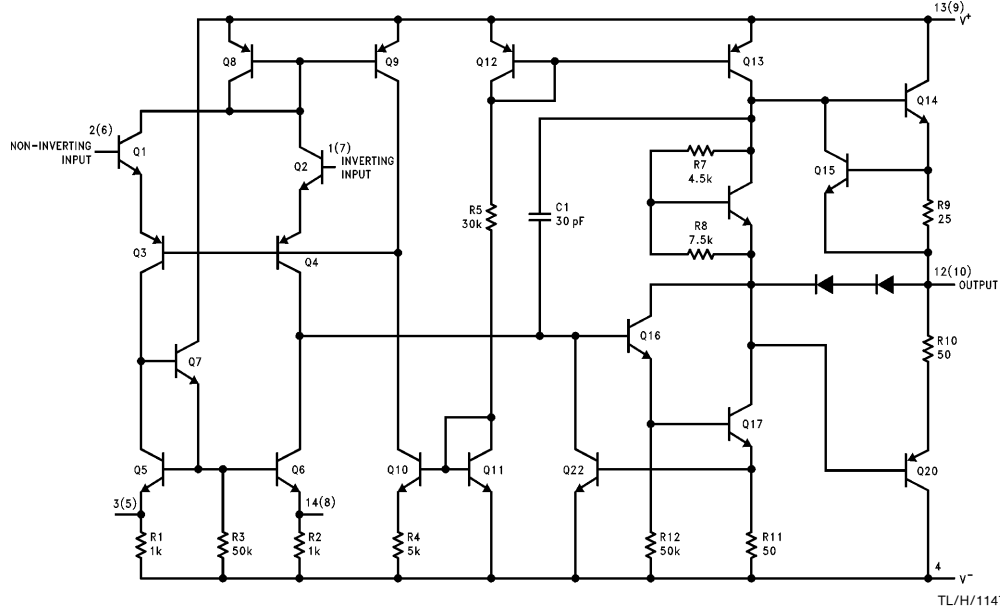
Note 1: The maximum junction temperature of the LM747C/LM747E is $100^\circ C$. For operating at elevated temperatures, devices in the TO-5 package must be derated based on a thermal resistance of $150^\circ C/W$, junction to ambient, or $45^\circ C/W$, junction to case. The thermal resistance of the dual-in-line package is $100^\circ C/W$, 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 $-55^\circ C \leq T_A \leq 125^\circ C$ for the LM747A and $0^\circ C \leq T_A \leq 70^\circ C$ for the LM747E unless otherwise specified. The LM747 and LM747C are specified for $V_S = \pm 15V$ and $-55^\circ C \leq T_A \leq 125^\circ C$ and $0^\circ C \leq T_A \leq 70^\circ C$, respectively, unless otherwise specified.

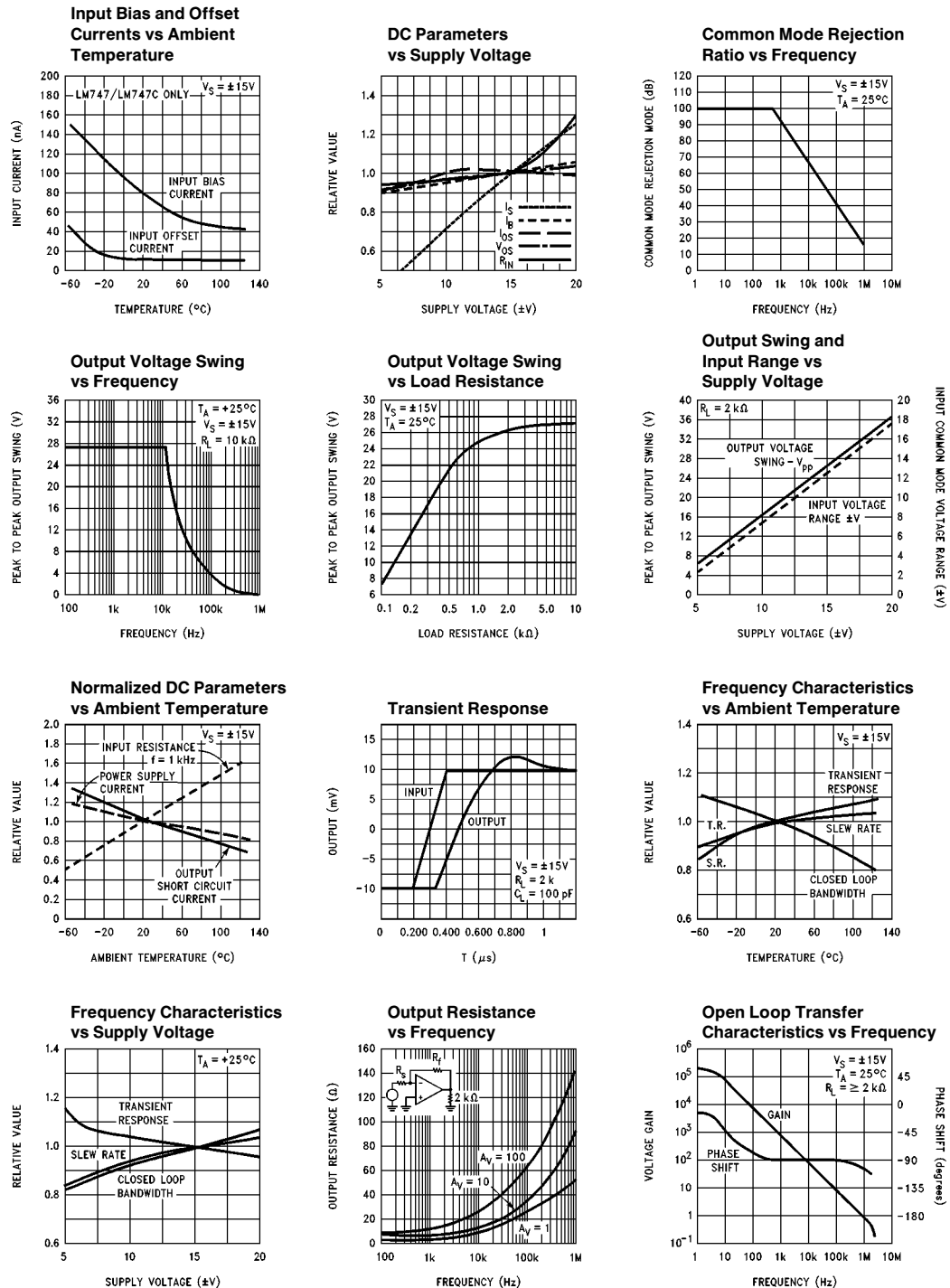
Note 4: Calculated value from: $0.35/\text{Rise Time } (\mu s)$.

Schematic Diagram (Each Amplifier)



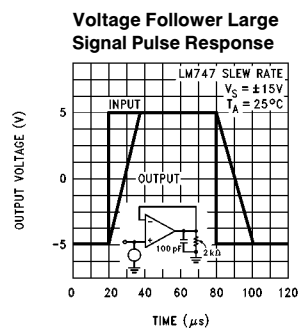
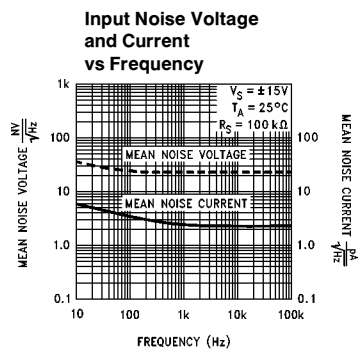
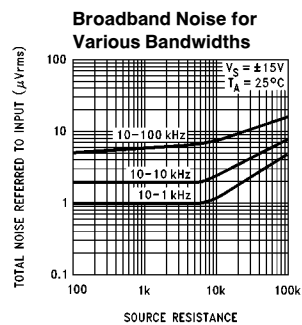
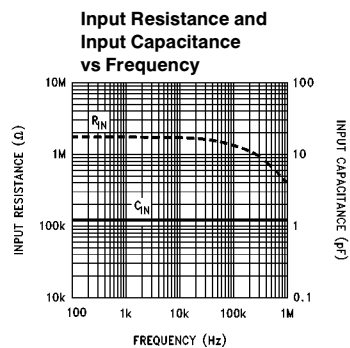
Note: Numbers in parentheses are pin numbers for amplifier B. DIP only.

Typical Performance Characteristics



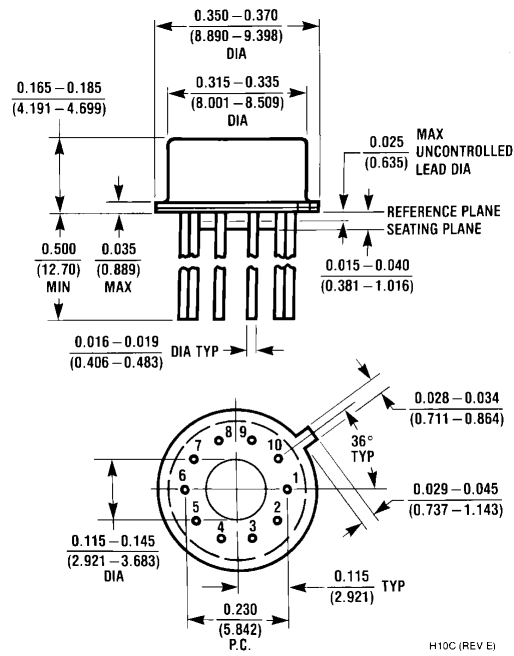
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Typical Performance Characteristics (Continued)



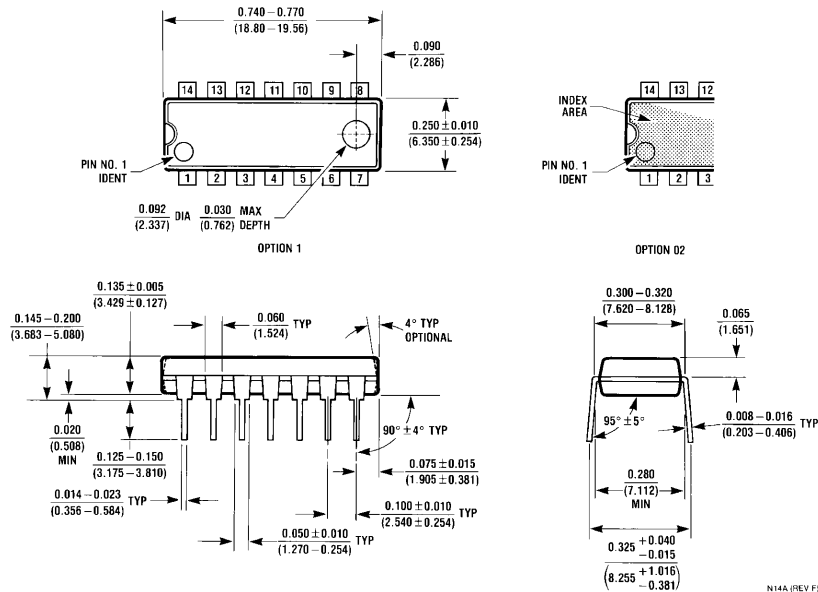
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Physical Dimensions inches (millimeters)



H10C (REV E)

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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PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LM747 MWC	Active	Production	WAFERSALE (YS) 0	1 NOT REQUIRED	-	Call TI	Level-1-NA-UNLIM	-40 to 85	

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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