

FEATURES

- *Guaranteed* Maximum 0.5mV Input Offset Voltage
- Input Protection Diodes
- Operates From Single 5V Supply
- 25mA Drive Capability
- 80ns Response Time

APPLICATIONS

- Window Detectors
- High Speed One Shot
- Relay/Lamp Drivers
- Voltage Controlled Oscillators

DESCRIPTION

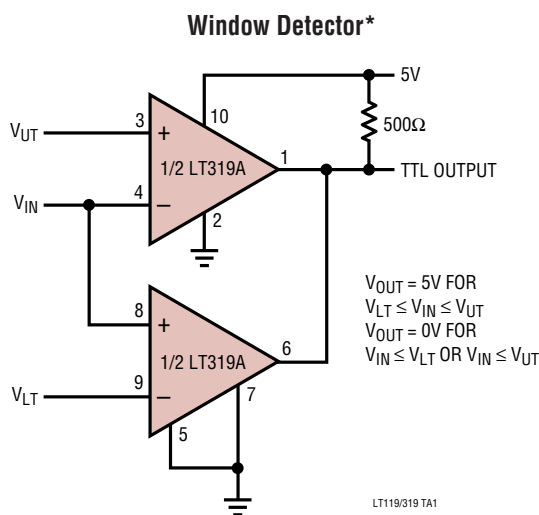
The LT[®]119A is an improved version of the LM119 dual comparator. It features lower input offset voltage and offset current, higher voltage gain, guaranteed common mode rejection and input protection diodes.

The LT119A is capable of operation over a supply range from 5V to ± 15 V and can drive 25mA loads from each open collector output. A separate ground pin allows the LT119A to isolate system grounds.

Linear Technology Corporation's advanced processing, design techniques and reliability make the LT119A/LT319A an ideal choice over previous devices in most comparator applications.

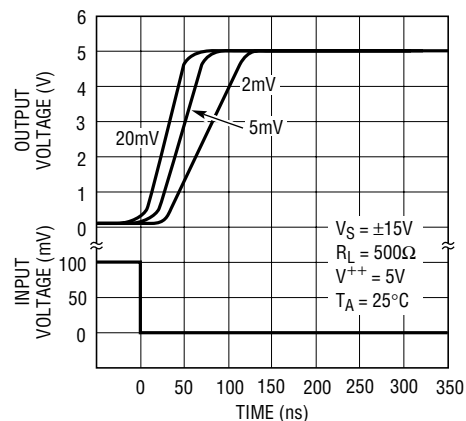
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TYPICAL APPLICATION



*ALLOWED WINDOW FOR SINGLE 5V SUPPLY IS 1.2V TO 3.8V

Response Time for Various Input Overdrives



LT119/319 TA2

LT119A/LT319A LM119/LM319

ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage	36V	Output Short-Circuit Duration	10s
Output to Negative Supply Voltage	36V	Operating Temperature Range	
Ground to Negative Supply Voltage	25V	LT119A, LM119 OBSELETE	-55°C to 125°C
Ground to Positive Supply Voltage	18V	LT319A, LM319	0°C to 70°C
Differential Input Voltage (Note 6)	±5V	Storage Temperature Range	-65°C to 150°C
Differential Input Current (Note 6)	±5mA	Lead Temperature (Soldering, 10 sec)	300°C
Input Voltage (Note 2)			

PACKAGE/ORDER INFORMATION

<p>H PACKAGE 10-LEAD TO-5 METAL CAN $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 150^{\circ}\text{C}/\text{W}$, $\theta_{JC} = 45^{\circ}\text{C}/\text{W}$</p>	ORDER PART NUMBER	<p>N PACKAGE 14-LEAD PLASTIC DIP $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 100^{\circ}\text{C}/\text{W}$</p> <p>J PACKAGE 14-LEAD CERAMIC DIP $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 100^{\circ}\text{C}/\text{W}$</p>	ORDER PART NUMBER
	<p>LT119AH LM119H LT319AH LM319H</p> <p>OBSELETE PACKAGE</p>		<p>LT319AN LM319N</p> <p>LT119AJ LM119J LT319AJ LM319J</p> <p>OBSELETE PACKAGE</p>

Consult LTC Marketing for parts specified with wider operating temperature ranges.

ELECTRICAL CHARACTERISTICS The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^{\circ}\text{C}$. (Note 3)

SYMBOL	PARAMETER	CONDITIONS	LT119A			LM119			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage	$V_S = \pm 15\text{V}$, $V_{CM} = 0$		0.3	0.5			4	mV
		(Note 4)		0.5	1.0	0.7	4	mV	
			●	1.2	2.0	7	mV		
CMRR	Common Mode Rejection Ratio		90	106				dB	
I_{OS}	Input Offset Current	(Note 4)		20	40	30	75	nA	
		●			75	100	nA		
I_B	Input Bias Current	(Note 4)		150	500	150	500	nA	
		●			1000	1000	nA		
A_V	Voltage Gain		20	40	10	40		V/mV	
	Response Time	(Note 5)		80		80		ns	

ELECTRICAL CHARACTERISTICS The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^\circ\text{C}$. (Note 3)

SYMBOL	PARAMETER	CONDITIONS	LT119A			LM119			UNITS	
			MIN	TYP	MAX	MIN	TYP	MAX		
V_{SAT}	Saturation Voltage	$V_{IN} \leq -5\text{mV}$, $I_O = 25\text{mA}$, $V^+ \geq 4.5\text{V}$, $V^- = 0\text{V}$		0.75	1.5		0.75	1.5	V	
		$V_{IN} \leq -6\text{mA}$, $I_{SINK} \leq 3.2\text{mA}$ $T_A \geq 0^\circ\text{C}$		0.23	0.4		0.23	0.4	V	
		$T_A \leq 0^\circ\text{C}$			0.6		0.6		V	
	Output Leakage Current	$V_{IN} \geq 5\text{mV}$, V_{OUT} to $V^- = 35\text{V}$		0.2 1	2 10		0.2 1	2 10	μA μA	
	Input Voltage Range	$V_S = \pm 15\text{V}$	●	-12	± 13	12	-12	± 13	12	V
		$V^+ = 5\text{V}$, $V^- = 0\text{V}$	●	1		3	1		3	V
	Differential Input Voltage		●		± 5			± 5	V	
I_S	Supply Current	$V^+ = 5\text{V}$, $V^- = 0\text{V}$		4.3			4.3		mA	
	Positive Supply Current	$V_S = \pm 15\text{V}$		8	11.5		8	11.5	mA	
	Negative Supply Current	$V_S = \pm 15\text{V}$		3	4.5		3	4.5	mA	

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^\circ\text{C}$. (Note 3)

SYMBOL	PARAMETER	CONDITIONS	LT319A			LM319			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{OS}	Input Offset Voltage	$V_S = \pm 15\text{V}$, $V_{CM} = 0\text{V}$		0.3	0.5			8	mV
		$R_S \leq 5\text{k}$ (Note 4)	●	0.5	1 2		2	8 10	mV mV
CMRR	Common Mode Rejection Ratio			90	106				dB
I_{OS}	Input Offset Current	(Note 4)		30	40 60		80	200 300	nA nA
I_B	Input Bias Current	(Note 4)		150	500 1000		250	1000 1200	nA nA
A_V	Voltage Gain			20	40		8	40	V/mV
	Response Time	(Note 5)		80			80		ns
V_{SAT}	Saturation Voltage	$V_{IN} \leq -10\text{mV}$, $I_{SINK} = 25\text{mA}$		0.75	1.5		0.75	1.5	V
		$V^+ \geq 4.5\text{V}$, $V^- = 0\text{V}$, $V_{IN} \leq -10\text{mV}$, $I_{SINK} \leq 3.2\text{mA}$	●	0.3	0.4		0.3	0.4	V
	Output Leakage Current	$V_{IN} \geq 10\text{mV}$, V_{OUT} to $V^- = 35\text{V}$		0.2	10		0.2	10	μA
	Input Voltage Range	$V_S = \pm 15\text{V}$	●		± 13			± 13	V
		$V^+ = 5\text{V}$, $V^- = 0\text{V}$	●	1		3	1		3
	Differential Input Voltage		●		± 5			± 5	V
I_S	Supply Current	$V^+ = 5\text{V}$, $V^- = 0\text{V}$		4.3			4.3		mA
	Positive Supply Current	$V_S = \pm 15\text{V}$		8	12.5		8	12.5	mA
	Negative Supply Current	$V_S = \pm 15\text{V}$		3	5		3	5	mA

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

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

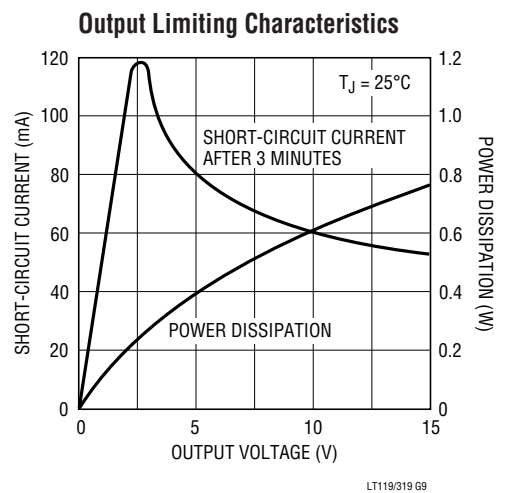
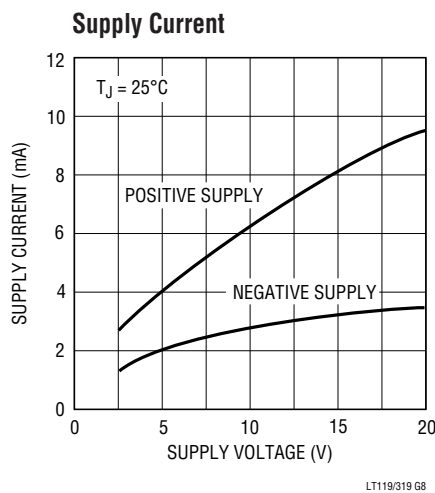
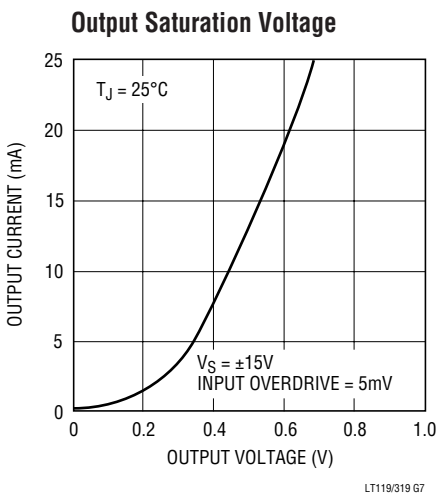
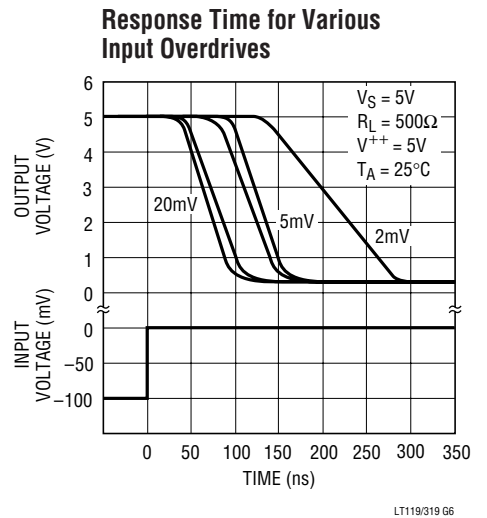
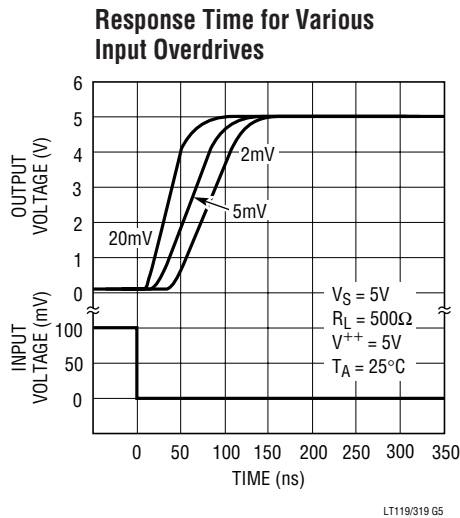
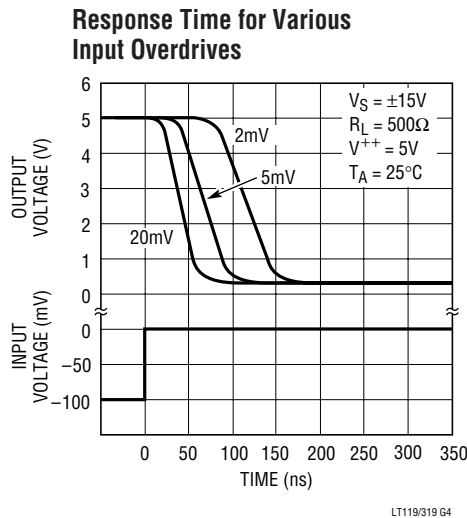
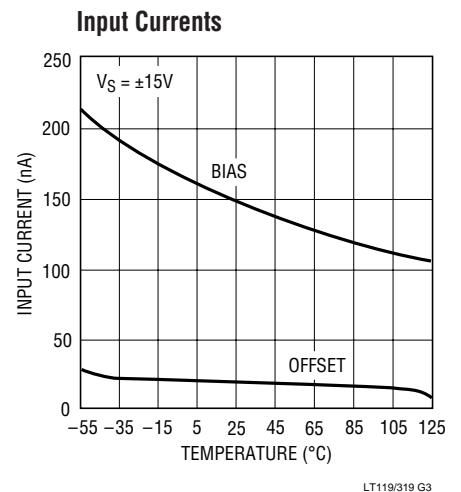
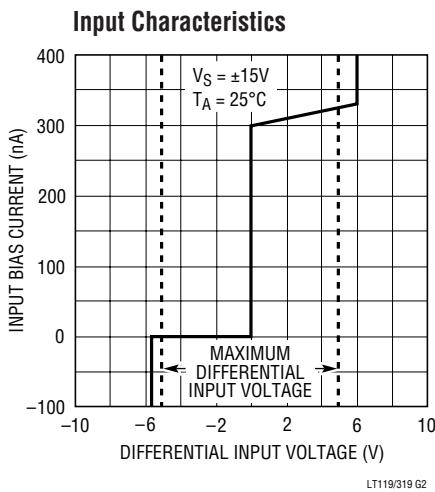
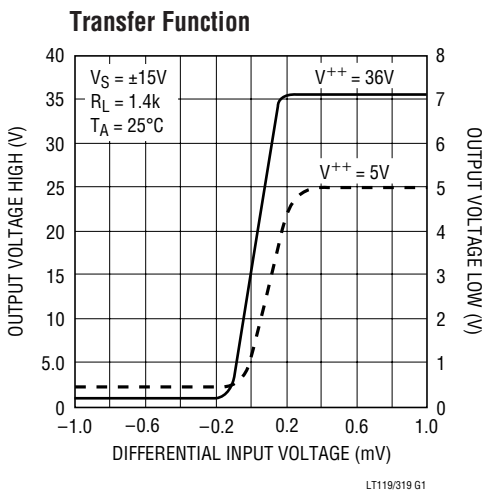
Note 3: Unless otherwise noted, supply voltage equals $\pm 15\text{V}$ and $V_{CM} = 0\text{V}$, $T_A = 25^\circ\text{C}$. The ground pin is grounded. Note that the maximum voltage allowed between the ground pin and V^+ is 18V . Do not tie the ground pin to V^- when the power supply voltage exceeds 9V . The offset voltage, offset current and bias current specifications apply for all supply voltages between $\pm 15\text{V}$ and 5V unless otherwise specified.

Note 4: The offset voltages and currents given are the maximum values required to drive the output within 1V of either supply with a 1mA load, thus these parameters define an error band and take into account the worst case effects of voltage gain and input impedance.

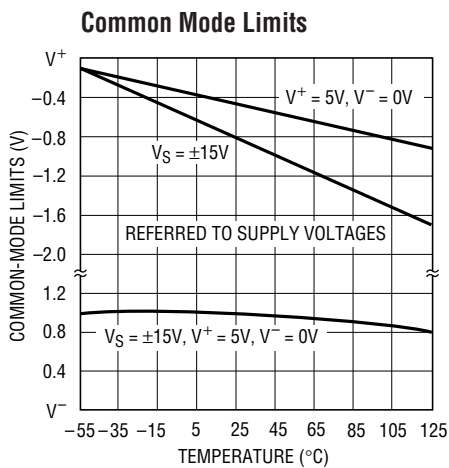
Note 5: Response time specified is for a 100mV input step with 5mV overdrive.

Note 6: Inputs are protected with back-to-back 5.6V zener diodes. This limits maximum differential input voltage to $\pm 5\text{V}$ if current is unlimited. Larger differential input drive is allowed if input current is limited to $\pm 5\text{mA}$ with external resistance.

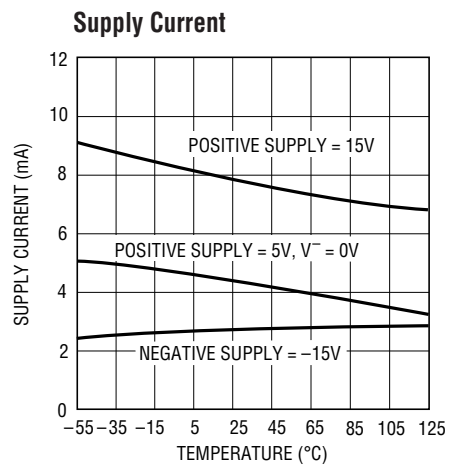
TYPICAL PERFORMANCE CHARACTERISTICS



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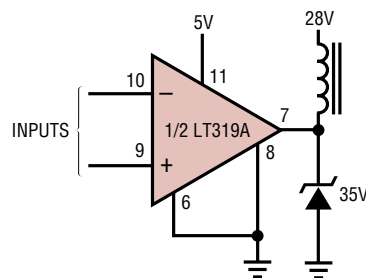
LT119/319 G10



LT119/319 G11

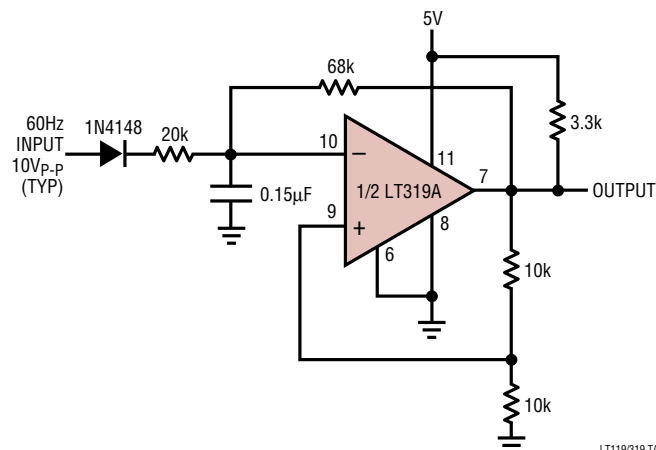
TYPICAL APPLICATIONS

Relay Driver



LT119/319 TA3

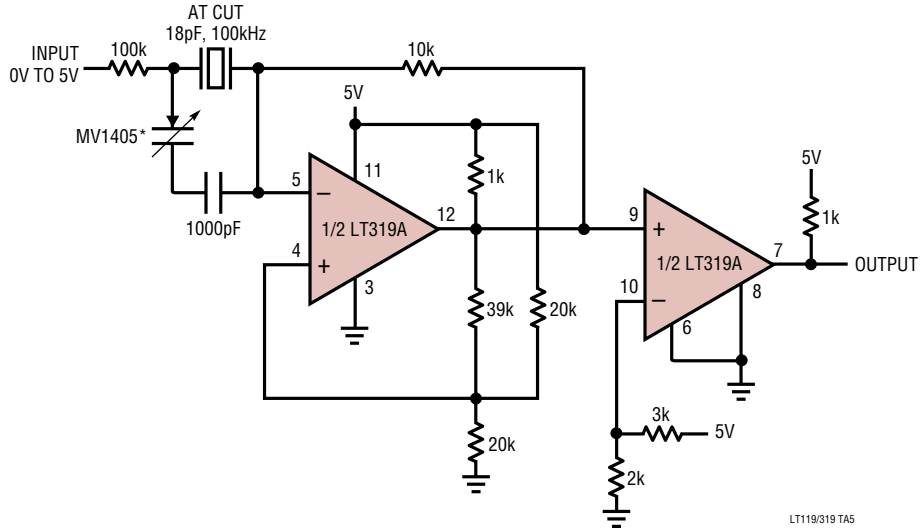
High Noise Immunity 60Hz Sync Circuit



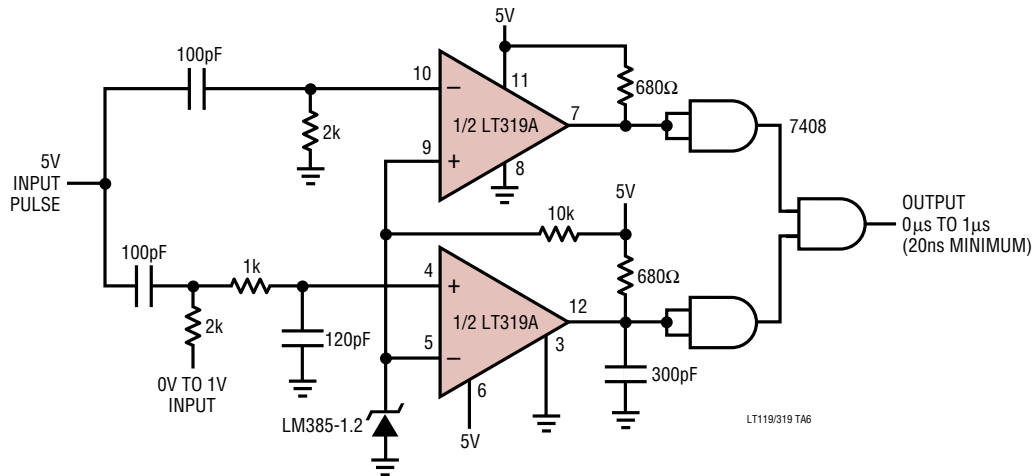
LT119/319 TA4

TYPICAL APPLICATIONS

Voltage Controlled Crystal Oscillator
With 100ppm Trim Range

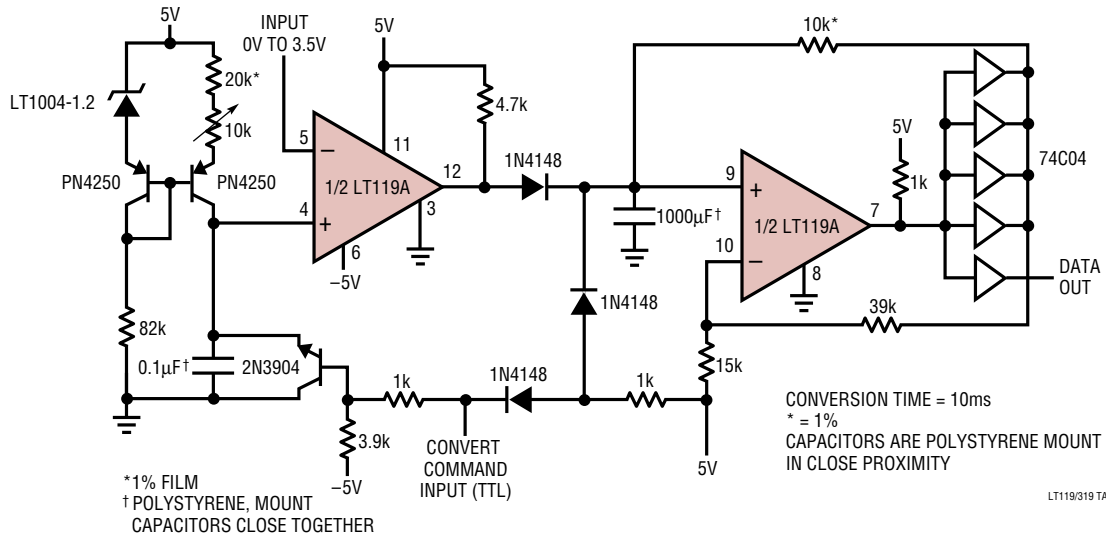


Voltage Controlled High Speed One Shot

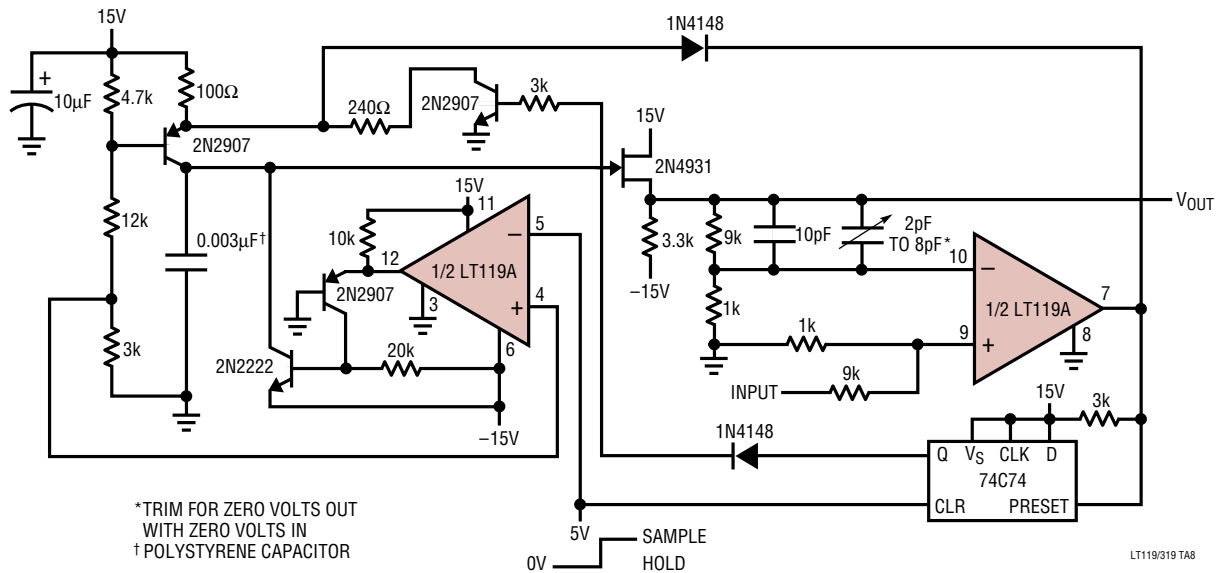


TYPICAL APPLICATIONS

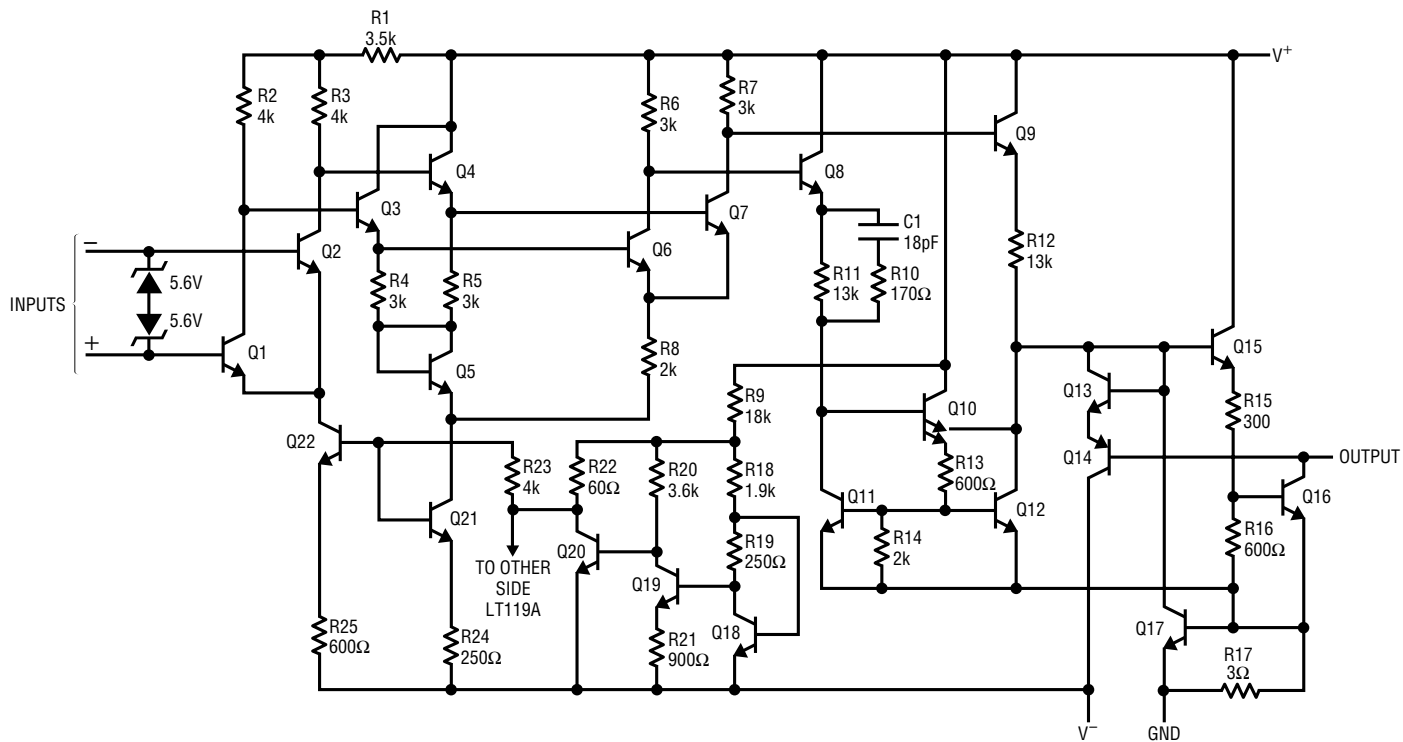
10-Bit Serial Output A/D Converter



5 Microsecond Sample-and-Hold with Zero Hold Step

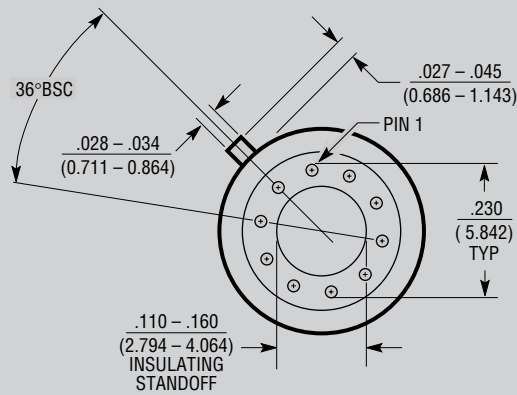
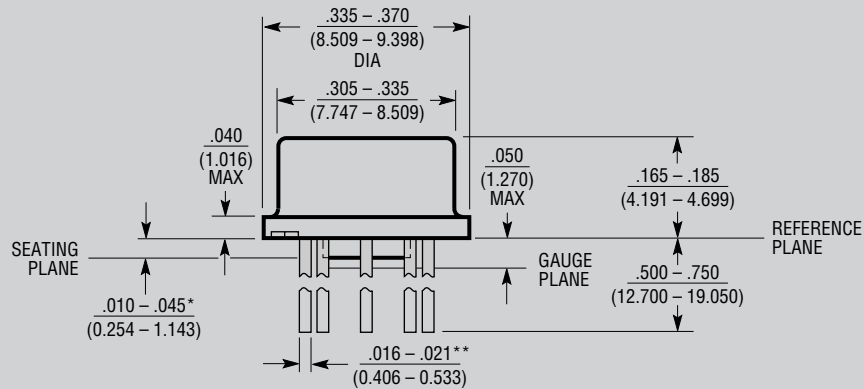


SCHEMATIC DIAGRAM



PACKAGE DESCRIPTION

H Package
10-Lead TO-5 Metal Can
(Reference LTC DWG # 05-08-1322)



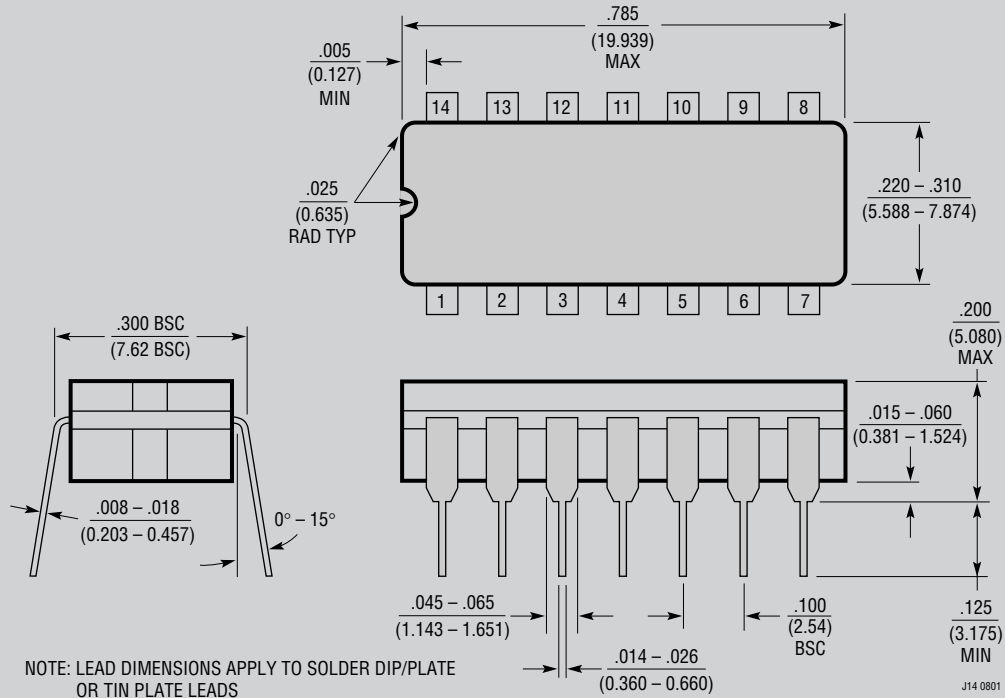
*LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND THE SEATING PLANE

**FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS $\frac{.016 - .024}{(0.406 - 0.610)}$ H10(TO-5) 0801

OBsolete PACKAGE

PACKAGE DESCRIPTION

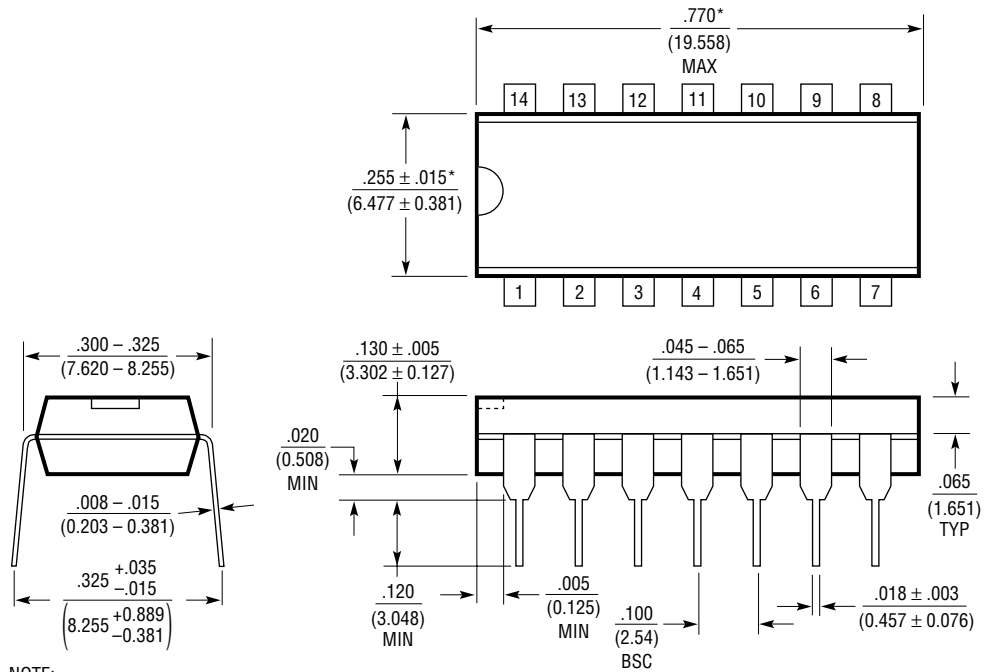
J Package
14-Lead CERDIP (Narrow .300 Inch, Hermetic)
(Reference LTC DWG # 05-08-1110)



OBsolete PACKAGE

PACKAGE DESCRIPTION

N Package
14-Lead PDIP (Narrow .300 Inch)
(Reference LTC DWG # 05-08-1510)



NOTE:
1. DIMENSIONS ARE $\frac{\text{INCHES}}{\text{MILLIMETERS}}$

*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH (0.254mm)

N14 1002

TYPICAL APPLICATION

5kHz to 2MHz V → F Converter

