

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

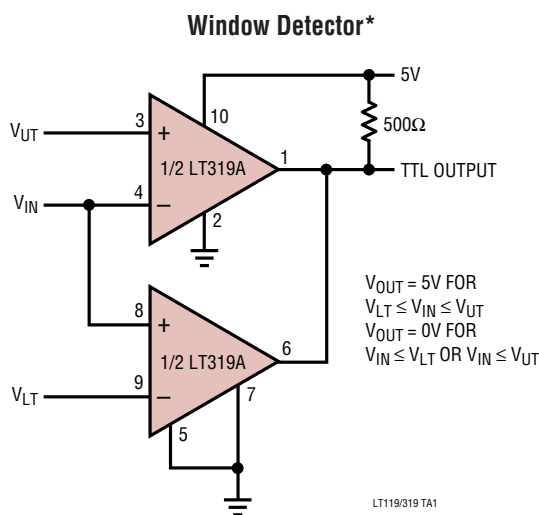
The LT[®]119A is an improved version of the LM119 dual comparator. It features lower input offset voltage and offset current, higher voltage gain, guaranteed common mode rejection and input protection diodes.

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.

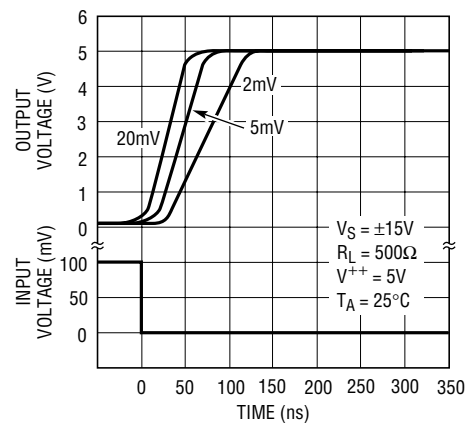
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TYPICAL APPLICATION



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

Response Time for Various Input Overdrives



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 OBSOLETE	–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

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

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	$V_{\text{IN}} \leq -5\text{mV}$, $I_O = 25\text{mA}$, $V^+ \geq 4.5\text{V}$, $V^- = 0\text{V}$		0.75	1.5		0.75	1.5	V
		$V_{\text{IN}} \leq -6\text{mA}$, $I_{\text{SINK}} \leq 3.2\text{mA}$ $T_A \geq 0^\circ\text{C}$ $T_A \leq 0^\circ\text{C}$		0.23	0.4 0.6		0.23	0.4 0.6	V V
	Output Leakage Current	$V_{\text{IN}} \geq 5\text{mV}$, V_{OUT} to $V^- = 35\text{V}$		0.2 1	2 10		0.2 1	2 10	μA μA
	Input Voltage Range	$V_S = \pm 15\text{V}$ $V^+ = 5\text{V}$, $V^- = 0\text{V}$	●	-12 1	± 13 3	●	-12 1	± 13 3	V 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	$V_S = \pm 15\text{V}$, $V_{\text{CM}} = 0\text{V}$		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	$V_{\text{IN}} \leq -10\text{mV}$, $I_{\text{SINK}} = 25\text{mA}$		0.75	1.5		0.75	1.5	V
		$V^+ \geq 4.5\text{V}$, $V^- = 0\text{V}$, $V_{\text{IN}} \leq -10\text{mV}$, $I_{\text{SINK}} \leq 3.2\text{mA}$	●	0.3	0.4		0.3	0.4	V
	Output Leakage Current	$V_{\text{IN}} \geq 10\text{mV}$, V_{OUT} to $V^- = 35\text{V}$		0.2	10		0.2	10	μA
	Input Voltage Range	$V_S = \pm 15\text{V}$ $V^+ = 5\text{V}$, $V^- = 0\text{V}$	●	1	± 13 3	●	1	± 13 3	V 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	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 $V_{\text{CM}} = 0\text{V}$, $T_A = 25^\circ\text{C}$. 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 $\pm 9\text{V}$. The offset voltage, offset current and bias current specifications apply for all supply voltages between $\pm 15\text{V}$ and 5V unless otherwise specified.

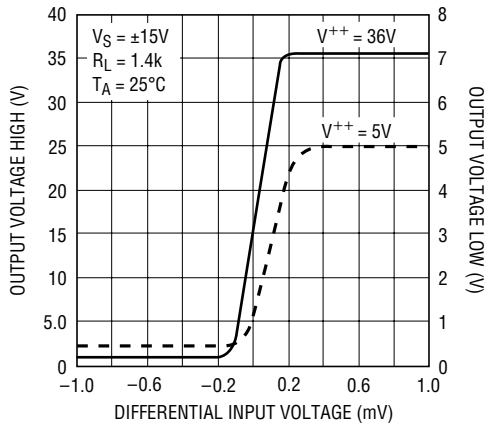
Note 4: The offset voltages and currents given are the maximum values required to drive the output within 1V of either supply with a 1mA load, thus these parameters define an error band and take into account the worst case effects of voltage gain and input impedance.

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.

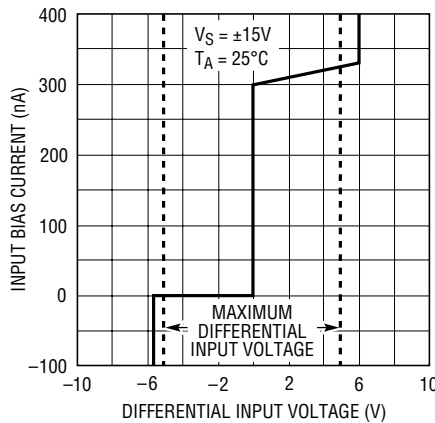
TYPICAL PERFORMANCE CHARACTERISTICS

Transfer Function



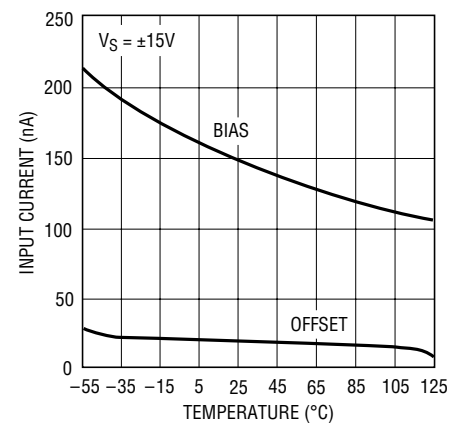
LT119/319 G1

Input Characteristics



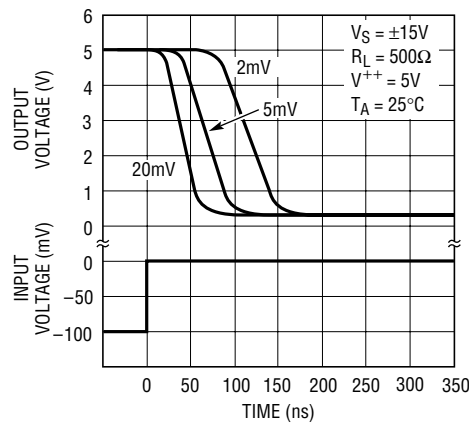
LT119/319 G2

Input Currents



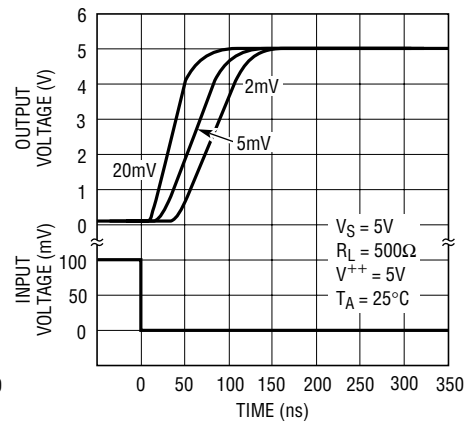
LT119/319 G3

Response Time for Various Input Overdrives



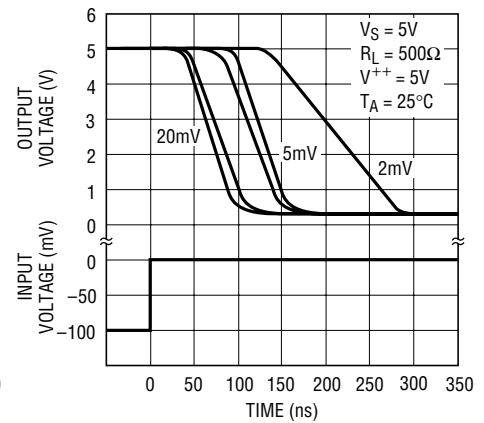
LT119/319 G4

Response Time for Various Input Overdrives



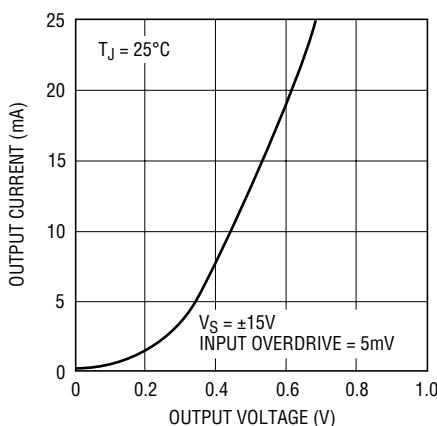
LT119/319 G5

Response Time for Various Input Overdrives



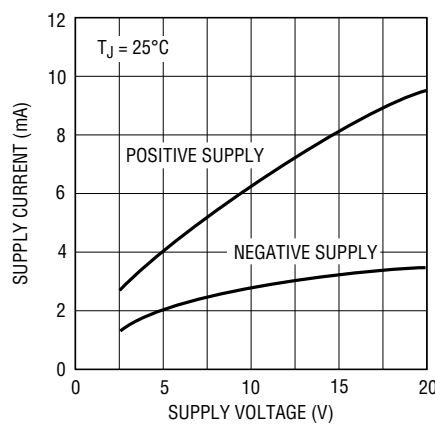
LT119/319 G6

Output Saturation Voltage



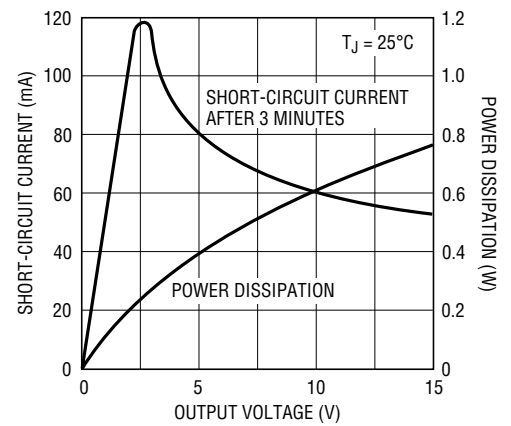
LT119/319 G7

Supply Current



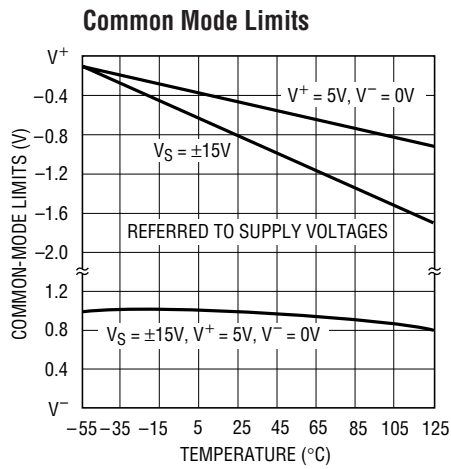
LT119/319 G8

Output Limiting Characteristics

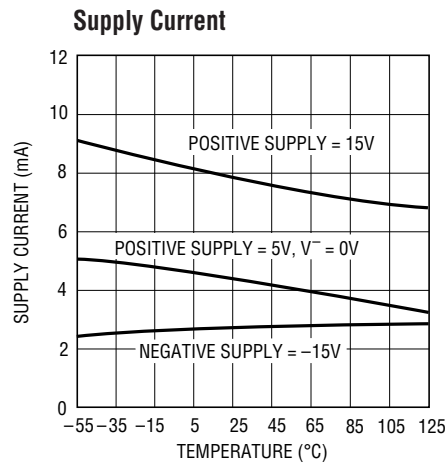


LT119/319 G9

TYPICAL PERFORMANCE CHARACTERISTICS



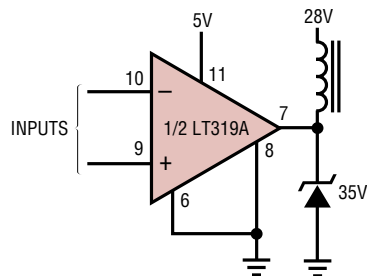
LT119/319 G10



LT119/319 G11

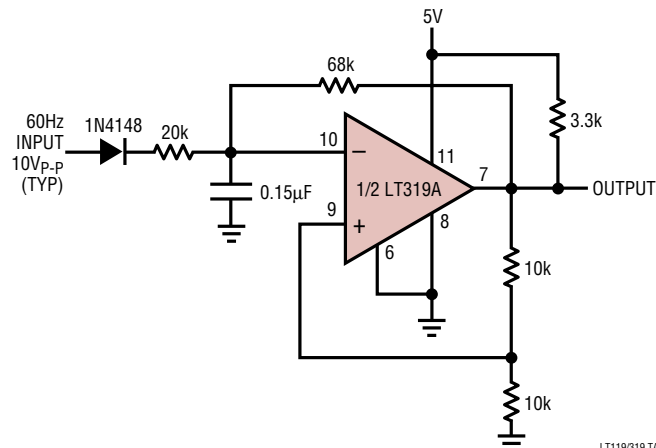
TYPICAL APPLICATIONS

Relay Driver



LT119/319 TA3

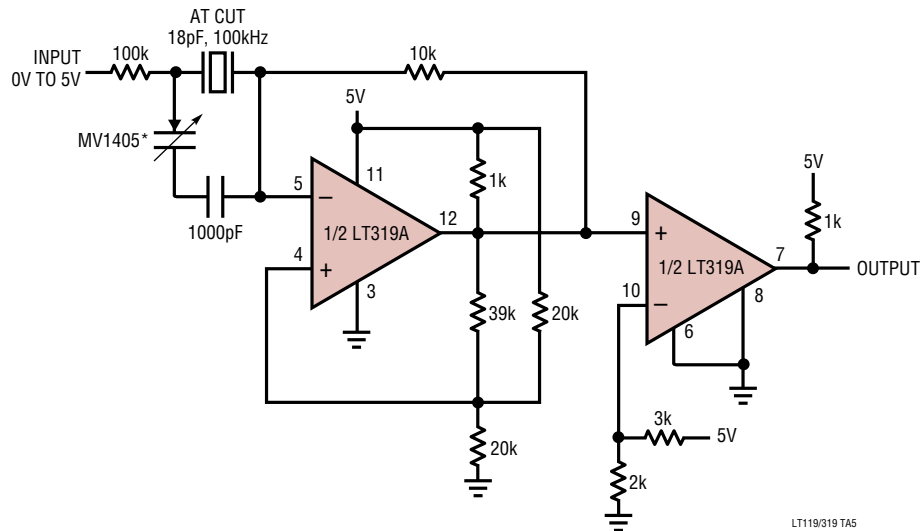
High Noise Immunity 60Hz Sync Circuit



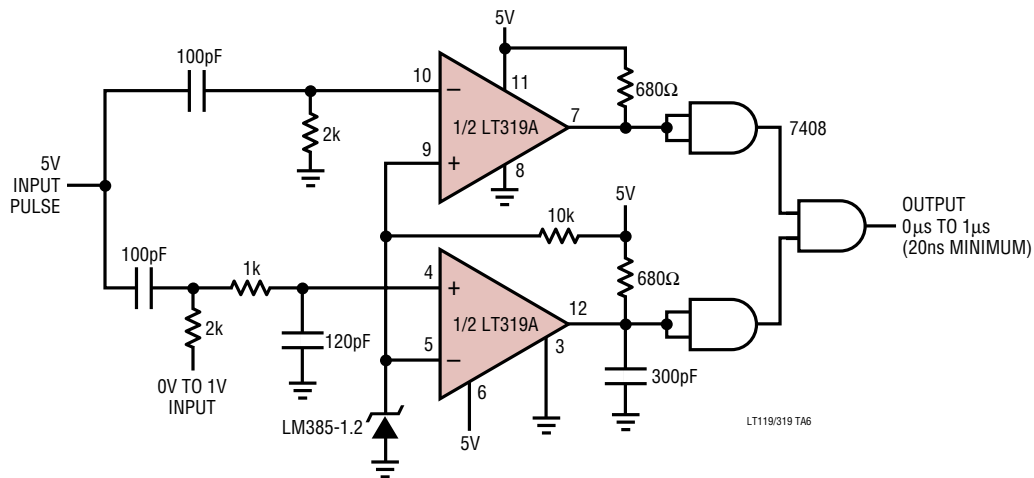
LT119/319 TA4

TYPICAL APPLICATIONS

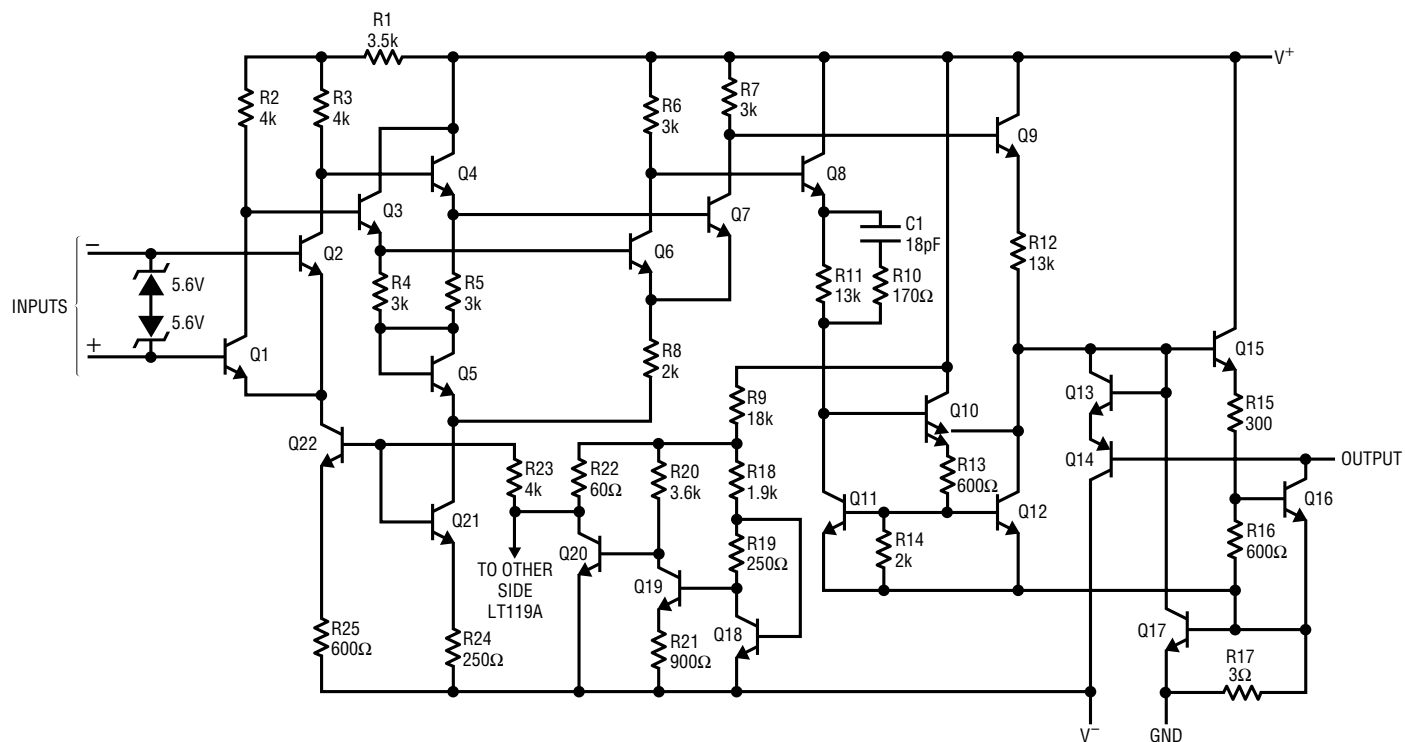
Voltage Controlled Crystal Oscillator
With 100ppm Trim Range



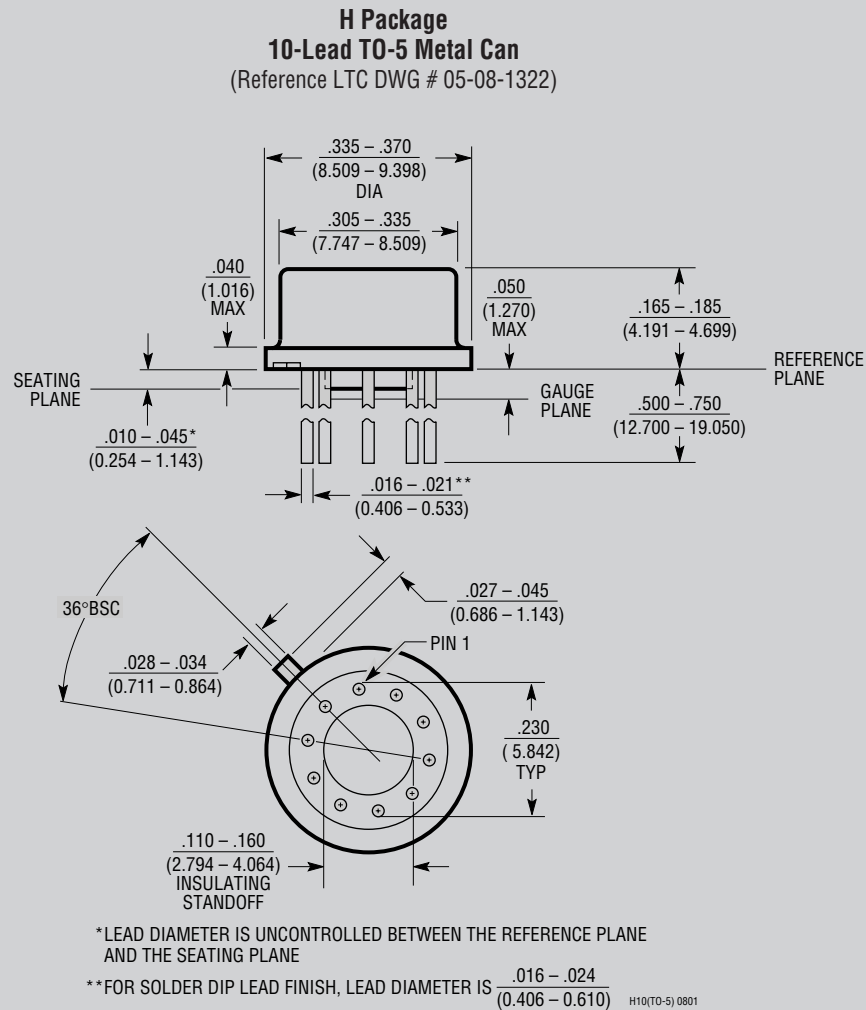
Voltage Controlled High Speed One Shot



SCHEMATIC DIAGRAM



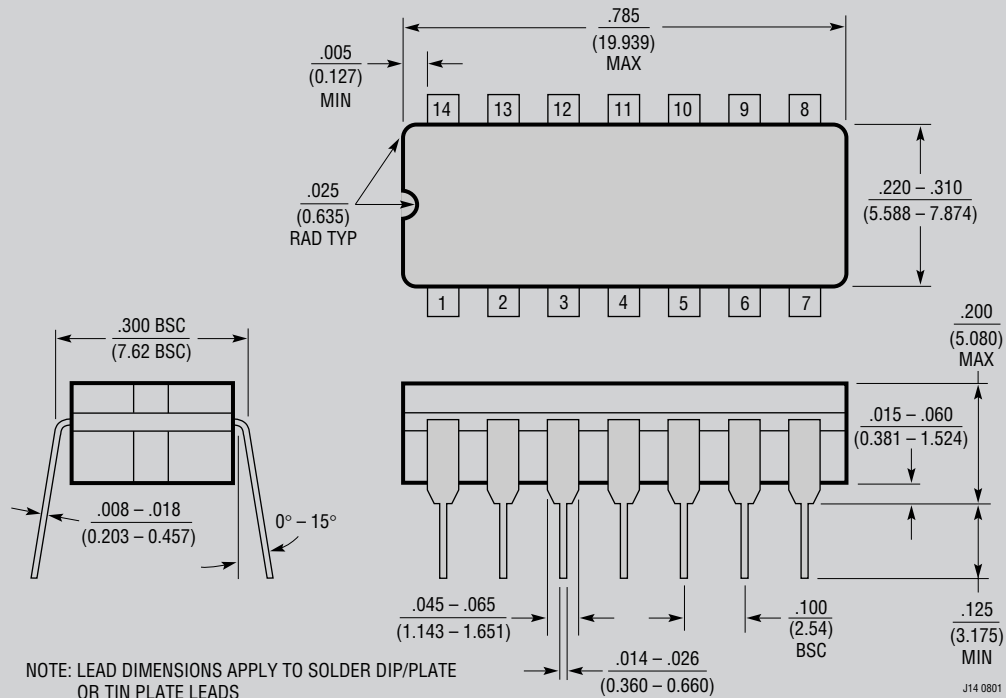
PACKAGE DESCRIPTION



OBsolete PACKAGE

PACKAGE DESCRIPTION

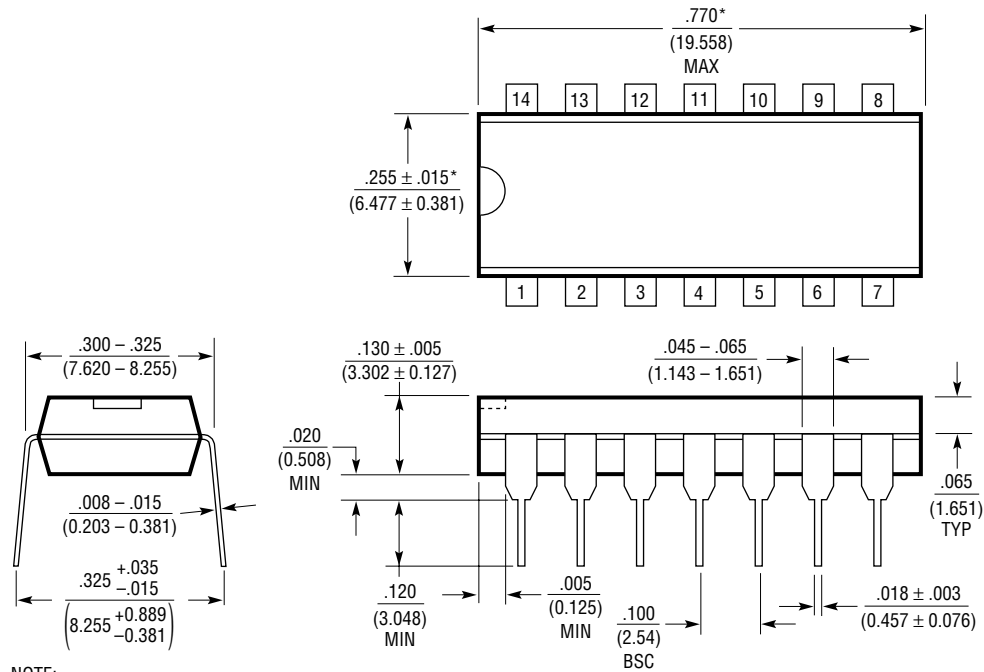
J Package
14-Lead Cerdip (Narrow .300 Inch, Hermetic)
(Reference LTC DWG # 05-08-1110)



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

The circuit diagram shows a precision rectifier. The input is labeled "0V TO 10V" and passes through a 2kΩ potentiometer (marked with a †). The signal is then split: one path goes through a 20kΩ resistor to the non-inverting input (pin 5) of the first LT119A op-amp, and the other path goes through a 3.3kΩ resistor to the inverting input (pin 12). The inverting input is also connected to a 50pF POLYSTYRENE capacitor and a 470Ω resistor. The non-inverting input is connected to ground through a 0.01μF capacitor and a 220Ω resistor. The output of the first op-amp (pin 12) is connected to the base of a 2N2369 transistor. The transistor's emitter is grounded, and its collector is connected to the inverting input of the second LT119A op-amp through a 10kΩ resistor. The inverting input of the second op-amp is also connected to a 5V supply through a 330Ω resistor. The non-inverting input (pin 9) of the second op-amp is connected to ground through a 3kΩ resistor. The output of the second op-amp (pin 11) is connected to the output of the first op-amp through a 10kΩ resistor. The output of the first op-amp is also connected to a 1MΩ resistor to ground. The output of the second op-amp is labeled "TTL OUT 5kHz TO 2MHz".

ALL DIODES 1N4148
 † SET SCALE FACTOR

LT119/319 TA9