National Semiconductor

LM119JAN

OBSOLETE
September 24, 2010

High Speed Dual Comparator

General Description

The LM119 is a precision high speed dual comparator fabricated on a single monolithic chip. It is designed to operate over a wide range of supply voltages down to a single 5V logic supply and ground. Further, it has higher gain and lower input currents than devices such as the LM710. The uncommitted collector of the output stage makes the LM119 compatible with RTL, DTL and TTL as well as capable of driving lamps and relays at currents up to 25 mA.

Although designed primarily for applications requiring operation from digital logic supplies, the LM119 is fully specified for power supplies up to ±15V. It features faster response than the LM111 at the expense of higher power dissipation. However, the high speed, wide operating voltage range and low package count make the LM119 much more versatile than older devices such as the LM711.

Features

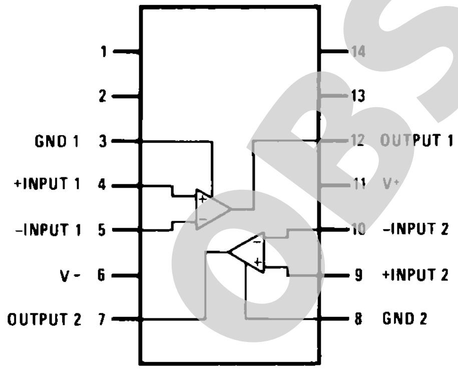
- Two independent comparators
- Operates from a single 5V supply
- Typically 80 ns response time at ±15V
- Minimum fan-out of 2 each side
- Maximum input current of 1 μA over temperature
- Inputs and outputs can be isolated from system ground
- High common mode slew rate

Ordering Information

NS Part Number	JAN Part Number	NS Package Number	Package Description
JL119BIA	JM38510/10306BIA	H10C	10LD T0-100 Metal Can
JL119BCA	JM38510/10306BCA	J14A	14LD CERDIP

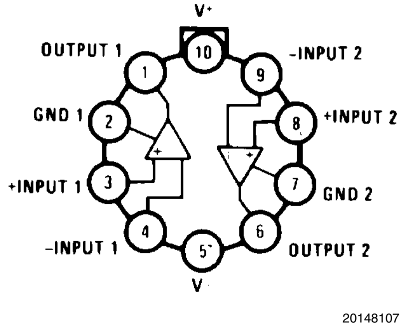
Connection Diagrams

Dual-In-Line Package



Top View
See NS Package Number J14A

Metal Can Package



Case is connected to pin 5 (V−)

Top View
See NS Package Number H10C

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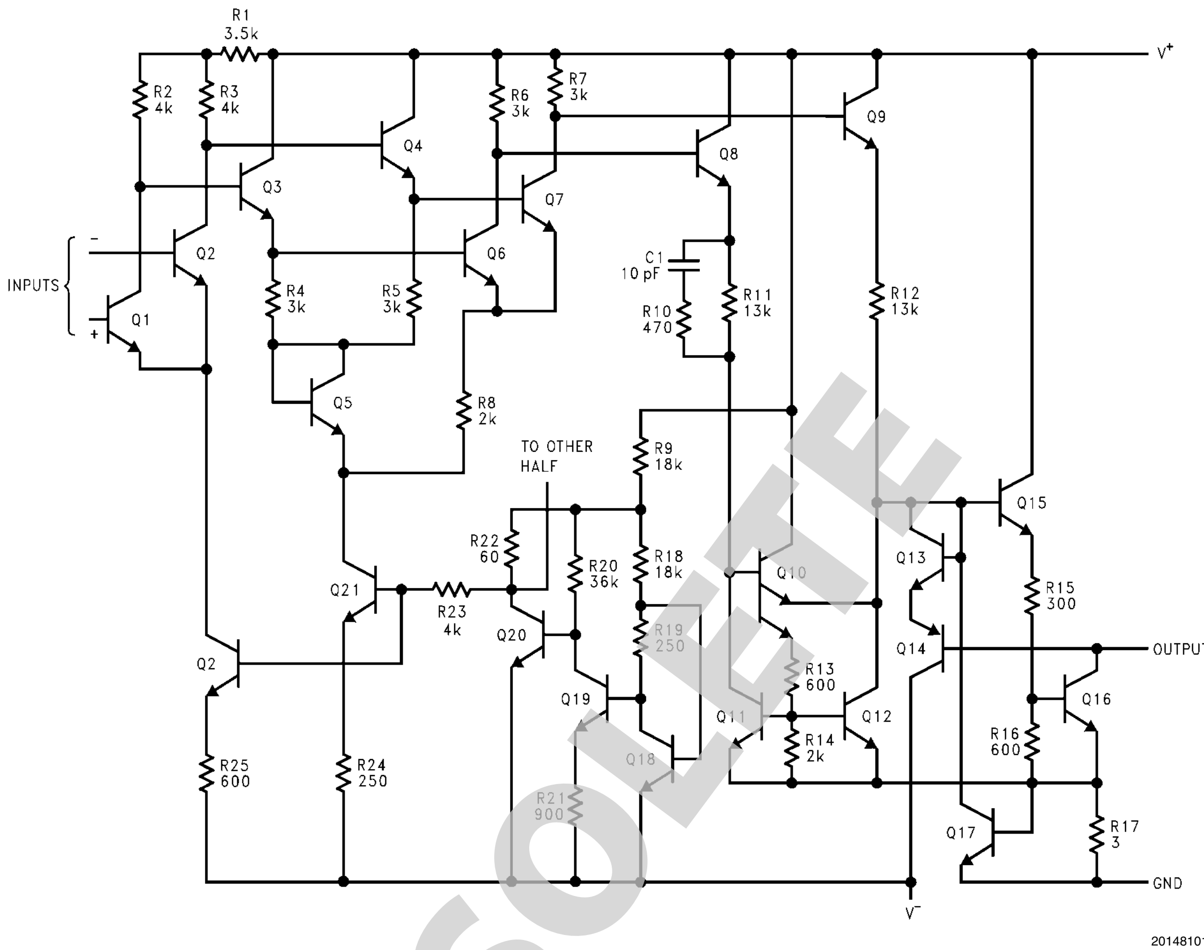
Schematic Diagram



*Do not operate the LM119 with more than 16V between GND and V+

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Absolute Maximum Ratings (Note 1)

Total Supply Voltage	36V
Output to Negative Supply Voltage	36V
Ground to Negative Supply Voltage	25V
Ground to Positive Supply Voltage	18V
Differential Input Voltage	±5V
Input Voltage (Note 3)	±15V
Power Dissipation (Note 2)	500 mW
Output Short Circuit Duration	10 sec
Storage Temperature Range	$-65°C \le T_A \le 150°C$
Operating Ambient Temperature Range	$-55°C \le T_A \le 125°C$
Maximum Junction Temperature (T_J)	150°C
Lead Temperature (Soldering, 10 sec.)	260°C
Thermal Resistance	
θ_{JA}	
H Package (Still Air)	162°C/W
H Package (500LF/Min Air flow)	88°C/W
J Package (Still Air)	94°C/W
J Package (500LF/Min Air flow)	52°C/W
θ_{JC}	
H Package	31°C/W
J Package	11°C/W
Package Weight	
H Package	TBD
J Package	TBD
ESD rating (Note 4)	800V

Quality Conformance Inspection

Mil-Std-883, Method 5005 - Group A

Subgroup	Description	Temp °C
1	Static tests at	25
2	Static tests at	125
3	Static tests at	-55
4	Dynamic tests at	25
5	Dynamic tests at	125
6	Dynamic tests at	-55
7	Functional tests at	25
8A	Functional tests at	125
8B	Functional tests at	-55
9	Switching tests at	25
10	Switching tests at	125
11	Switching tests at	-55
12	Settling time at	25
13	Settling time at	125
14	Settling time at	-55

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Electrical Characteristics

DC Parameters

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
V_{IO}	Input Offset Voltage	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V, V_{CM} = 0V, R_S = 50Ω		-4.0	4.0	mV	1
				-7.0	7.0	mV	2, 3
		$+V_{CC}$ = 27V, $-V_{CC}$ = -3V, V_{CM} = -12V, R_S = 50Ω		-4.0	4.0	mV	1
				-7.0	7.0	mV	2, 3
		$+V_{CC}$ = 3V, $-V_{CC}$ = -27V, V_{CM} = 12V, R_S = 50Ω		-4.0	4.0	mV	1
				-7.0	7.0	mV	2, 3
		$+V_{CC}$ = 2.5V, $-V_{CC}$ = -2.5V, V_{CM} = 2.5V, R_S = 50Ω		-4.0	4.0	mV	1
				-7.0	7.0	mV	2, 3
I_{IO}	Input Offset Current	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V, V_{CM} = 0V		-75	+75	nA	1, 2
				-100	+100	nA	3
		$+V_{CC}$ = 27V, $-V_{CC}$ = -3V, V_{CM} = -12V		-75	+75	nA	1, 2
				-100	+100	nA	3
		$+V_{CC}$ = 3V, $-V_{CC}$ = -27V, V_{CM} = 12V		-75	+75	nA	1, 2
				-100	+100	nA	3
$+I_{CC}$	Power Supply Current	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V			10	mA	1, 2
					11.5	mA	3
$-I_{CC}$	Power Supply Current	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V		-5.0		mA	1
				-4.5		mA	2
				-6.0		mA	3
$\pm I_{IB}$	Input Bias Current	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V, V_{CM} = 0V		-0.1	500	nA	1, 2
				-0.1	1000	nA	3
		$+V_{CC}$ = 27V, $-V_{CC}$ = -3V, V_{CM} = -12V		-0.1	750	nA	1, 2
				-0.1	1000	nA	3
		$+V_{CC}$ = 3V, $-V_{CC}$ = -27V, V_{CM} = 12V		-0.1	750	nA	1, 2
				-0.1	1000	nA	3
CMRR	Common Mode Rejection	-12V ≤ V_{CM} ≤ +12V, -27V ≤ $-V_{CC}$ ≤ -3V, 3V ≤ $+V_{CC}$ ≤ 27V, R_S = 50Ω		90		dB	1, 2, 3
V_{OL}	Low Level Output Voltage	$+V_{CC}$ = 3.5V, $-V_{CC}$ = -1V, V_{CM} = 1V, V_{IO} = 7mV, I_O = 3.2mA			0.4	V	1, 2
					0.6	V	3
		$+V_{CC}$ = 2.25V, $-V_{CC}$ = -2.25V, V_{CM}=2.25V, V_{IO} = 7mV, I_O = 3.2mA			0.4	V	1, 2
					0.6	V	3
		$+V_{CC}$ = 27V, $-V_{CC}$ = -3V, V_{CM} = -12V, V_{IO} = 7mV, I_O = 25mA			1.5	V	1, 2, 3
		$+V_{CC}$ = 3V, $-V_{CC}$ = -27V, V_{CM} = 12V, V_{IO} = 7mV, I_O = 25mA			1.5	V	1, 2, 3
I_{CEX}	Output Leakage Current	$+V_{CC}$ = 18V, $-V_{CC}$ = -18V, V_O = 18V		-1.0	2.0	µA	1
				-1.0	10	µA	2
A_V	Voltage Gain (Collector)	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V, V_O = 1.5V to 11.5V	(Note 5)	10		K	4
			(Note 5)	5.0		K	5, 6

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AC Parameters

The following conditions apply to all the following parameters, unless otherwise specified.

AC: ±15V, C_L = 50pF

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
tR_{LHC}	Response Time (Collector Output)	V_{OD} (overdrive) = +5mV, V_I = 100mV			125	nS	9
tR_{HLC}	Response Time (Collector Output)	V_{OD} (overdrive) = -5mV, V_I = 100mV			160	nS	9

DC Drift Parameters

Delta calculations performed at Group B-5

Symbol	Parameter	Conditions	Notes	Min	Max	Unit	Sub-groups
V_{IO}	Input Offset Voltage	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V, V_{CM} = 0V, R_S = 50Ω		-1.0	1.0	mV	1
		$+V_{CC}$ = 27V, $-V_{CC}$ = -3V, V_{CM} = -12V, R_S = 50Ω		-1.0	1.0	mV	1
		$+V_{CC}$ = 3V, $-V_{CC}$ = -27V, V_{CM} = 12V, R_S = 50Ω		-1.0	1.0	mV	1
$\pm I_{IB}$	Input Bias Current	$+V_{CC}$ = 15V, $-V_{CC}$ = -15V, V_{CM} = 0V		-50	50	nA	1
		$+V_{CC}$ = 27V, $-V_{CC}$ = -3V, V_{CM} = -12V		-50	50	nA	1
		$+V_{CC}$ = 3V, $-V_{CC}$ = -27V, V_{CM} = 12V		-50	50	nA	1

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.

Note 2: The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{Jmax} (maximum junction temperature), θ_{JA} (package junction to ambient thermal resistance), and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is $P_{Dmax} = (T_{Jmax} - T_A)/\theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower.

Note 3: For supply voltages less than ±15V the absolute maximum input voltage is equal to the supply voltage.

Note 4: Human Body model, 1.5KΩ in series with 100pF.

Note 5: K = V/mV.

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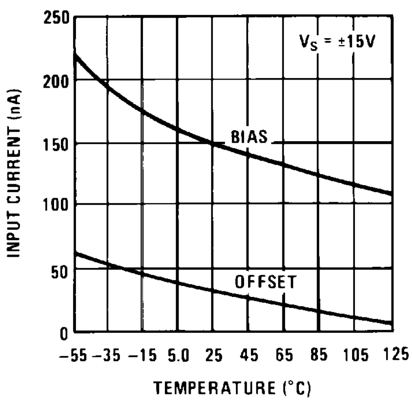
Typical Performance Characteristics

Input Currents



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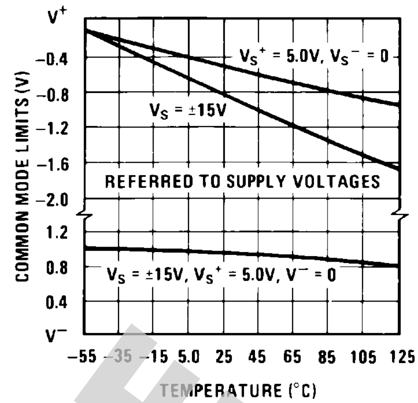
Common Mode Limits



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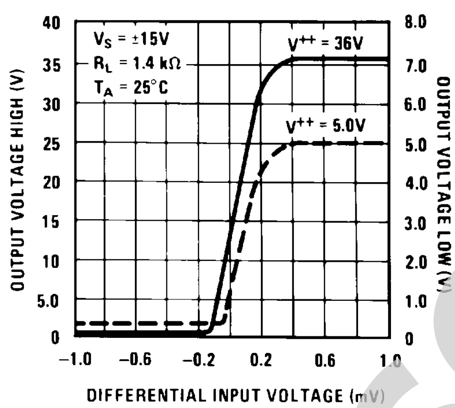
Transfer Function



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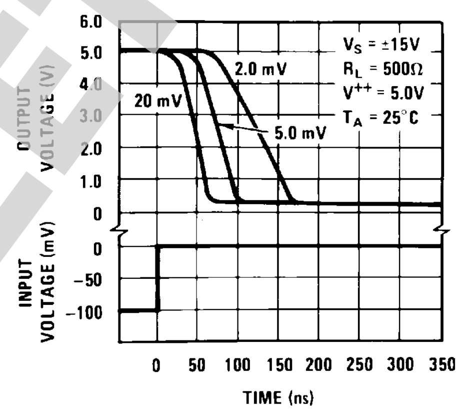
Response Time for Various Input Overdrives



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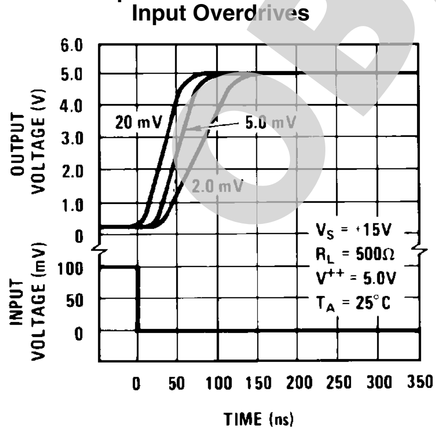
Response Time for Various Input Overdrives



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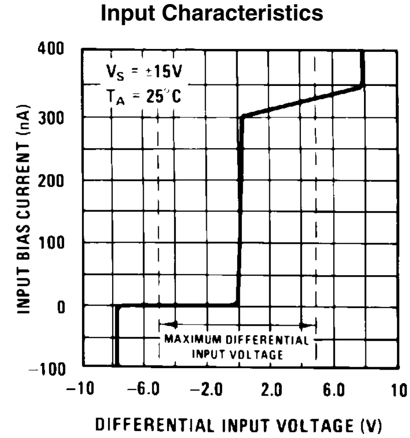
Input Characteristics



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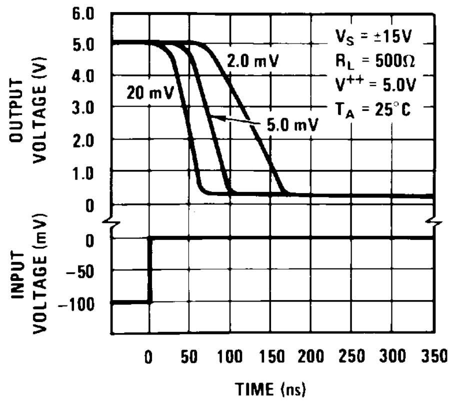
Response Time for Various Input Overdrives



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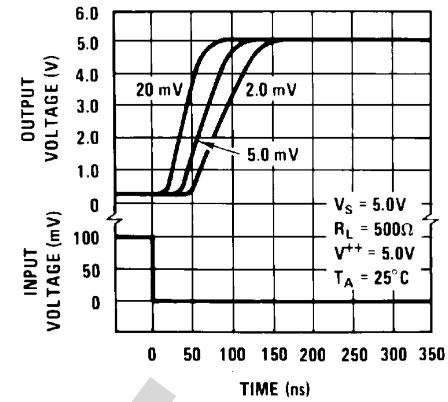
Response Time for Various Input Overdrives



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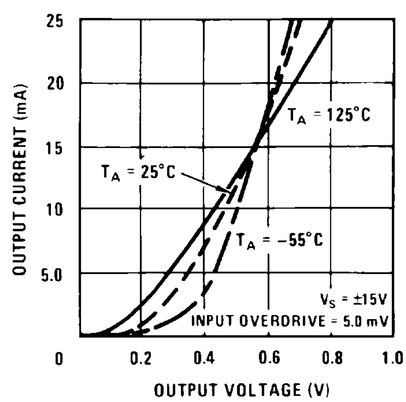
Output Saturation Voltage



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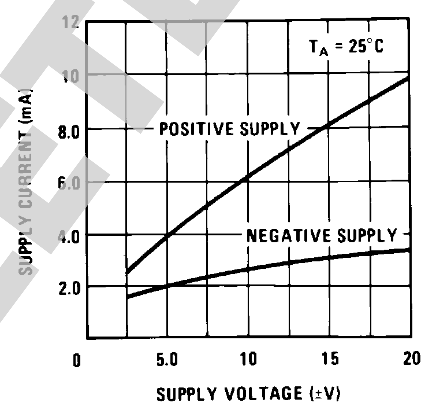
Supply Current



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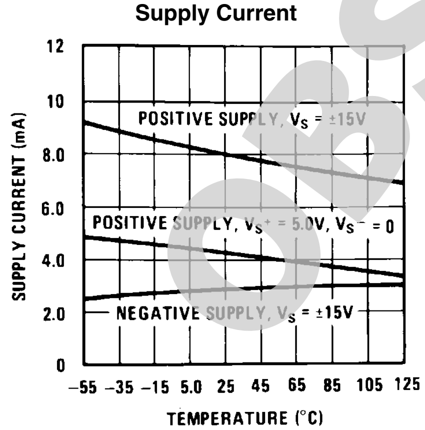
Supply Current



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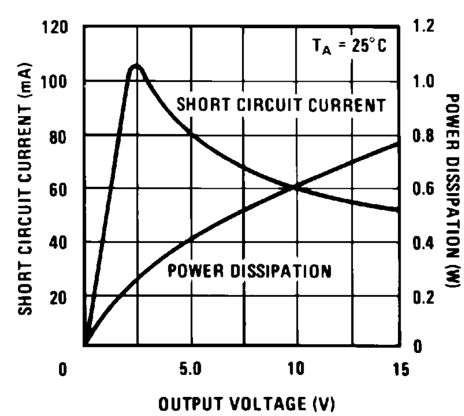
Output Limiting Characteristics



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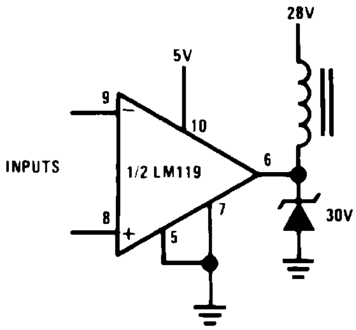
Typical Applications (*Note Pin numbers are for metal can package.*)

Relay Driver



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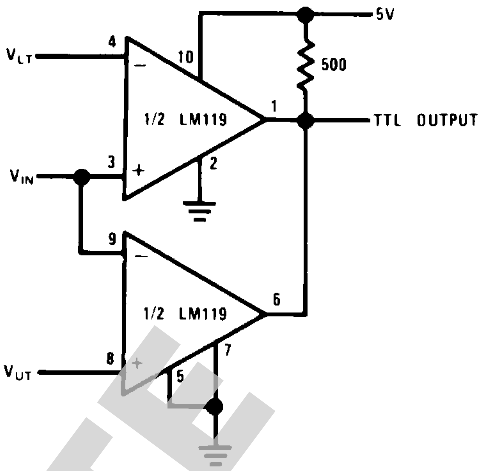
Note 6: Pin numbers are for metal can package.

Window Detector



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V_{OUT} = 5V for $V_{LT} \leq V_{IN} \leq V_{UT}$

V_{OUT} = 0 for $V_{IN} \leq V_{LT}$ or $V_{IN} \geq V_{UT}$

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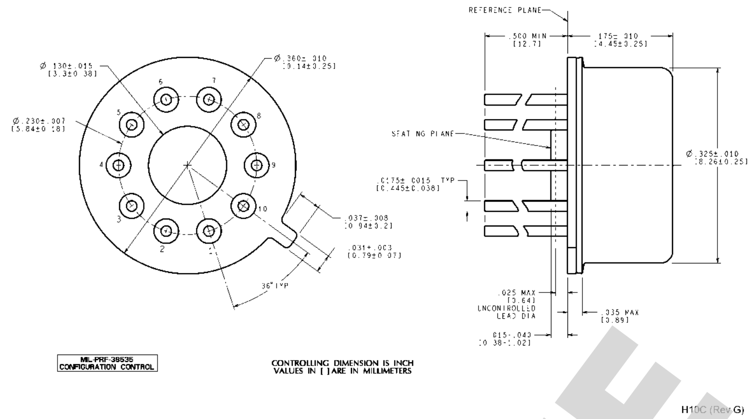
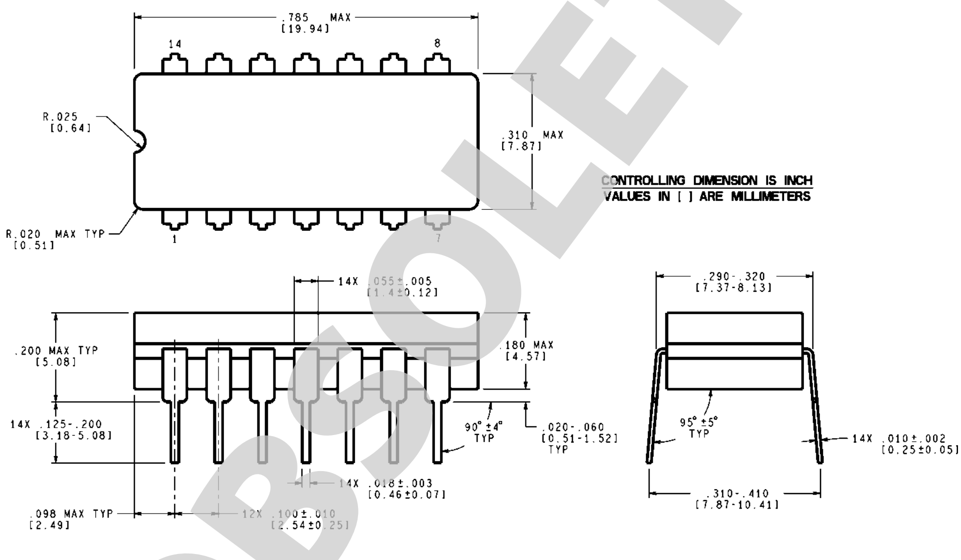
Revision History Section

Date Released	Revision	Section	Changes
7/0105	A	New release to corporate format	1 MDS datasheet converted into one corporate data sheet format MJLM119-X Rev. 0BL will be archived.
09/24/2010	B	Obsolete Data Sheet	Revision B, End of Life on Product/NSID Dec. 2009 Obsolete Data Sheet

Physical Dimensions inches (millimeters) unless otherwise noted



Metal Can Package (H)
NS Package Number H10C



Cavity Dual-In-Line Package (J)
NS Package Number J14A

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Notes

Notes

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