

FEATURES

- Maximum Offset Voltage: 1mV
- Maximum Bias Current: 15nA
- Typical Output Drive: 70mA
- Operates from 1.1V to 40V
- Internal Pull-Up Current
- Output Can Drive Loads Above V^+
- 30 μ A Supply Current (LT1017)
- 110 μ A Supply Current (LT1018)

APPLICATIONS

- Power Supply Monitors
- Relay Driving
- Oscillators

DESCRIPTION

The LT[®]1017/LT1018 are general purpose micropower comparators. The LT1017 is optimized for lowest operating power while the LT1018 operates at higher power and higher speed. Both devices can operate from a single 1.1V cell up to 40V. The output stage includes a class “B” pull-up current source, eliminating the need for an external resistive pull-up and saving power. The output stage is also designed to allow driving loads connected to a supply more positive than the device, as can comparators with open-collector output stages.

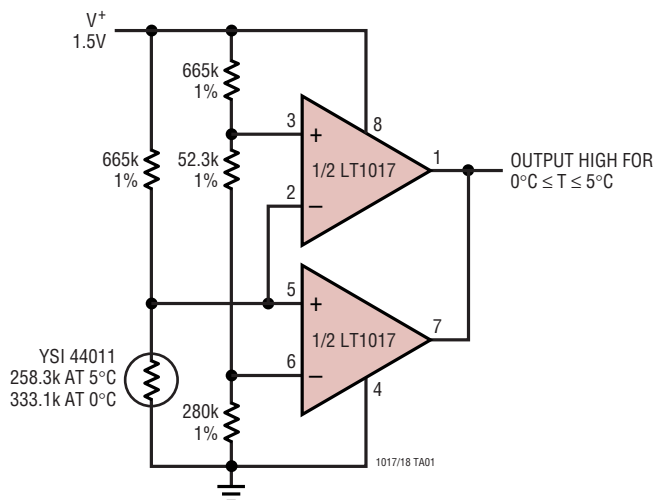
Input specifications are also excellent. On-chip trimming minimizes offset voltage, while high gain and common mode rejection ratio keep other input referred errors low. Common mode voltage range includes ground. Special circuitry prevents false output states even if the input is overdriven.

The LT1017/LT1018 are pin compatible with older dual comparators such as 393 type devices.

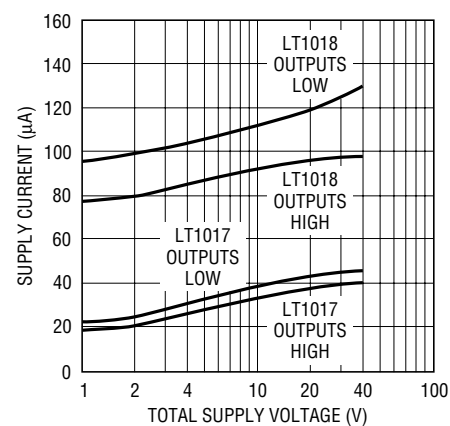
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TYPICAL APPLICATION

1.5V Powered Refrigerator Alarm



Supply Current

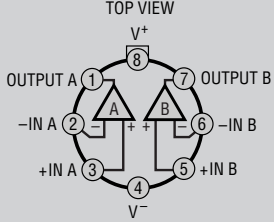
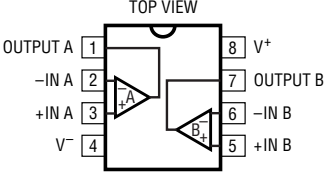
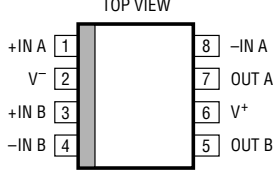
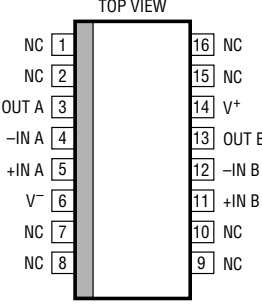


LT1017/LT1018

ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage	40V	Operating Temperature Range	
Differential Input Voltage	40V	LT1017M/LT1018M	-55°C to 125°C
Input Voltage	-0.3V to 40V	LT1017C/LT1018C	0°C to 70°C
Short-Circuit Duration	Indefinite	LT1017I	-40°C to 85°C
Storage Temperature Range	-65°C to 150°C	Lead Temperature (Soldering, 10 sec)	300°C

PACKAGE/ORDER INFORMATION

 <p>H PACKAGE 8-LEAD TO-5 METAL CAN $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 150^{\circ}\text{C/W}$, $\theta_{JC} = 45^{\circ}\text{C/W}$</p> <p>OBSOLETE PACKAGE Consider the 8-Lead Plastic Dip Package for Alternate Source</p>	<p>ORDER PART NUMBER</p> <p>LT1017MH LT1017CH LT1018MH LT1018CH</p>	 <p>N8 PACKAGE 8-LEAD PDIP $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 130^{\circ}\text{C/W}$</p>	<p>ORDER PART NUMBER</p> <p>LT1017CN8 LT1017IN8 LT1018CN8</p>
 <p>S8 PACKAGE 8-LEAD PLASTIC SO $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 190^{\circ}\text{C/W}$</p>	<p>ORDER PART NUMBER</p> <p>LT1017CS8 LT1017IS8 LT1018CS8</p> <p>S8 PART MARKING</p> <p>1017 1017I 1018</p>	 <p>SW PACKAGE 16-LEAD PLASTIC SO $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 130^{\circ}\text{C/W}$</p>	<p>ORDER PART NUMBER</p> <p>LT1017CSW LT1018CSW</p>

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

ELECTRICAL CHARACTERISTICS

The ● denotes specifications which apply over the operating temperature range of -55°C to 85°C for M grade parts, -40°C to 85°C for I grade parts and 0°C to 70°C for C grade parts.

PARAMETER	CONDITIONS		LT1017			LT1018			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
Offset Voltage (Note 2)	$\pm 0.75\text{V} \leq V_S \leq \pm 20\text{V}$	25°C		0.4	1	0.4	1	mV	
		●		0.5	1.4	0.5	1.4	mV	
		125°C			5	0.7	1.5	mV	
Bias Current	$\pm 0.75\text{V} \leq V_S \leq \pm 20\text{V}$	25°C		5	15	15	75	nA	
		●		7	25	18	100	nA	
		125°C		10	60		110	nA	
Offset Current	$\pm 0.75\text{V} \leq V_S \leq \pm 20\text{V}$	25°C		0.4	2	1	8	nA	
		●		0.5	3	1.6	12	nA	
		125°C			20		20	nA	
Common Mode Rejection Ratio	$V_S = \pm 20\text{V}$, $-20\text{V} \leq V_{CM} \leq 19.1\text{V}$	25°C	105	115		105	115	dB	
		●	100	115		100	115	dB	
		125°C	82	100		95	110	dB	

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ELECTRICAL CHARACTERISTICS The ● denotes specifications which apply over the operating temperature range of -55°C to 85°C for M grade parts, -40°C to 85°C for I grade parts and 0°C to 70°C for C grade parts.

PARAMETER	CONDITIONS		LT1017			LT1018			UNITS	
			MIN	TYP	MAX	MIN	TYP	MAX		
Power Supply Rejection Ratio	$\pm 0.75\text{V} \leq V_S \leq \pm 20\text{V}$	25°C	96	110		96	110		dB	
		●	95	105		95	105		dB	
		125°C	82			86	100		dB	
Gain	No Load, $V_{OUT} = \pm 19.9\text{V}$ (Note 3)	25°C	110	115		110	125		dB	
		●	105	115		105	120		dB	
	125°C	100			100			dB		
	$R_L = 4\text{k}$, $V_{OUT} = \pm 19\text{V}$	25°C	100	110		100	110		dB	
●	94			94				dB		
Output Sink Current	$V^+ = 4.5\text{V}$, $V^- = 0\text{V}$ Overdrive > 30mV	25°C	30	65		35	70		mA	
		●	25	50		25	50		mA	
		125°C	10	20		10	30		mA	
Output Source Current	$V^+ = 40\text{V}$, $V^- = 0\text{V}$ $V_{IN} = 5\text{mV}$, $V_{OUT} = 0.4\text{V}$	25°C	30	75		75	250		μA	
		●	25	70		50	220		μA	
		125°C	25	75		50	200		μA	
	$V^+ = 1.2\text{V}$, $V^- = 0\text{V}$ $V_{IN} = 5\text{mV}$, $V_{OUT} = 0.4\text{V}$	25°C	25	35		70	140		μA	
		●	15	20		45	120		μA	
		125°C	25	40		40	110		μA	
Negative Output Saturation	$I_{OUT} = 0\text{mA}$ $= 0.1\text{mA}$ $= 1\text{mA}$ $= 10\text{mA}$ $= 30\text{mA}$	$V^+ = 4.5\text{V}$, $V^- = 0\text{V}$ $V_{IN} = -10\text{mV}$	25°C		5	20		5	15	mV
			25°C		35	60		35	60	mV
			25°C		60	120		60	120	mV
			25°C		120	200		120	250	mV
			25°C		350	600		350	700	mV
			●		5	20		8	20	mV
	$I_{OUT} = 0\text{mA}$ $= 0.1\text{mA}$ $= 1\text{mA}$ $= 10\text{mA}$ $= 30\text{mA}$	$V^+ = 4.5\text{V}$, $V^- = 0\text{V}$ $V_{IN} = -10\text{mV}$	●		40	75		35	70	mV
			●		75	150		70	150	mV
			●		150	300		150	300	mV
			●		600	900		500	900	mV
			125°C		25	50		10	40	mV
			125°C		60	100		60	100	mV
Positive Output Saturation	$I_{OUT} = 0\mu\text{A}$ $= 10\mu\text{A}$ $= 0\mu\text{A}$ $= 10\mu\text{A}$ $= 0\mu\text{A}$ $= 10\mu\text{A}$	$V^+ = 4.5\text{V}$, $V^- = 0\text{V}$ $V_{IN} = -10\text{mV}$	25°C		40	80		35	80	mV
			25°C		175	250		175	250	mV
			●		45	90		45	90	mV
			●		190	300		190	300	mV
			125°C		50	100		50	100	mV
			125°C			300			300	mV
Leakage Current	$V_S = 5\text{V}$, $V_{OUT} = 40\text{V}$ $V_{IN} \geq 100\text{mV}$	25°C		0.5	3		1	8	μA	
		●		0.6	3		1.8	10	μA	
		125°C			5			15	μA	
Supply Current	$V_S = 5\text{V}$	25°C		30	60		110	250	μA	
		●		40	80		110	250	μA	
	125°C			80			300	μA		
	$V_S = 40\text{V}$	25°C		40	90		130	250	μA	
●			55	100		140	270	μA		
125°C			100			300	μA			
Minimum Operating Voltage	$I_{OUT} = 1\text{mA}$	25°C			1.15			1.2	V	
		●			1.15			1.2	V	
		125°C			1.15			1.2	V	

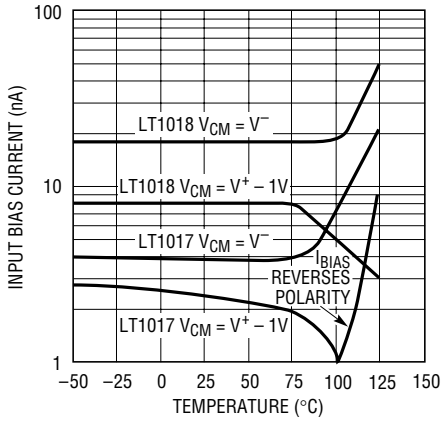
Note 1: Absolute Maximum Ratings are those values beyond which the life of the device may be impaired.

Note 2: Offset voltage is guaranteed over a common mode voltage range of $V^- \leq V_{IN} \leq (V^+ - 0.9\text{V})$.

Note 3: No load gain is guaranteed but not tested (LT1017 only).

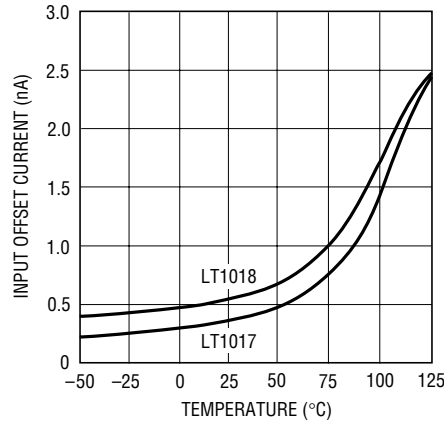
TYPICAL PERFORMANCE CHARACTERISTICS

Input Bias Current



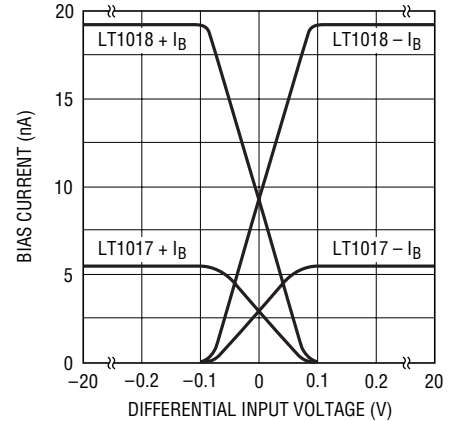
1017/18 G01

Input Offset Current



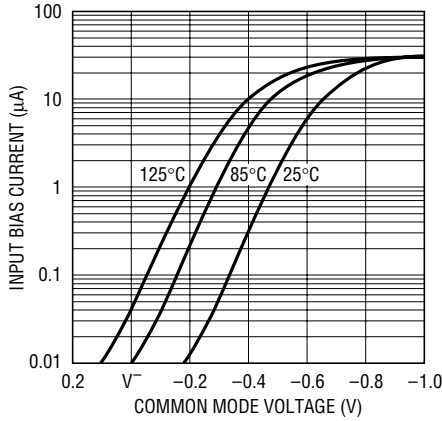
1017/18 G02

Bias Current vs Differential Input



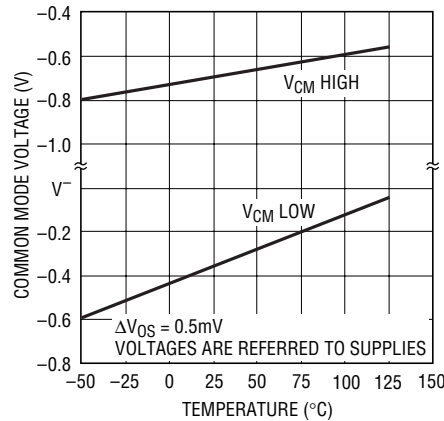
1017/18 G03

Input Bias Current with Inputs Driven Below the Supply



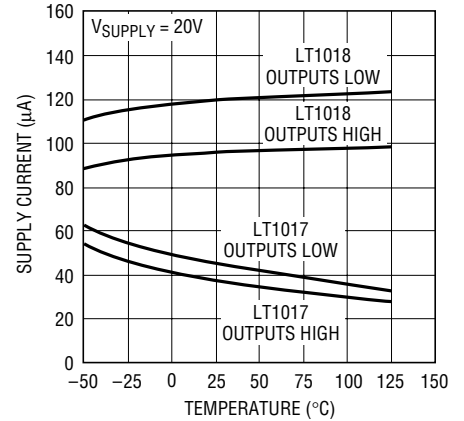
1017/18 G04

Common Mode Limits



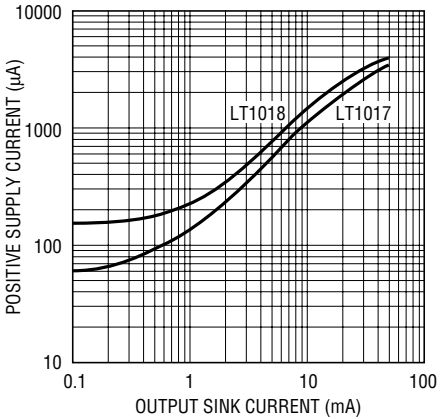
1017/18 G05

Supply Current



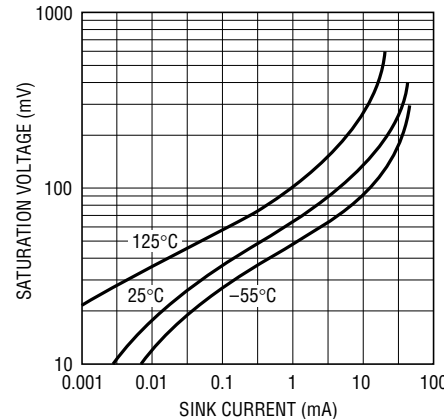
1017/18 G06

Positive Supply Current



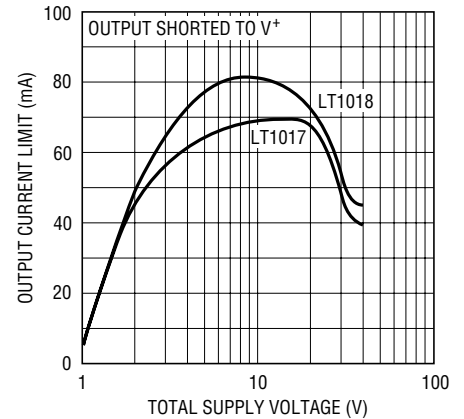
1017/18 G07

NPN Output Saturation Voltage



1017/18 G08

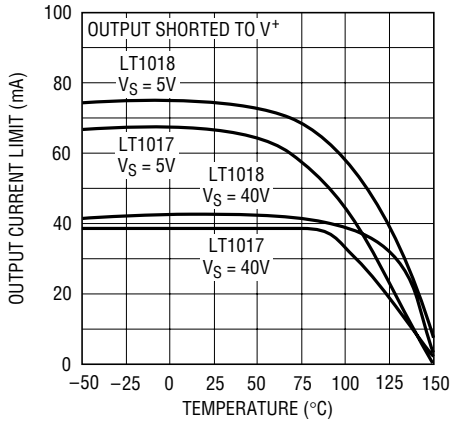
Output Sinking Current Limit



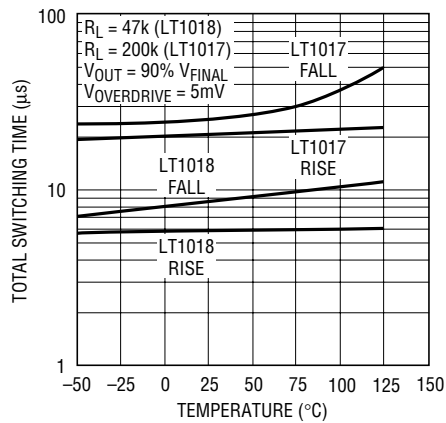
1017/18 G09

TYPICAL PERFORMANCE CHARACTERISTICS

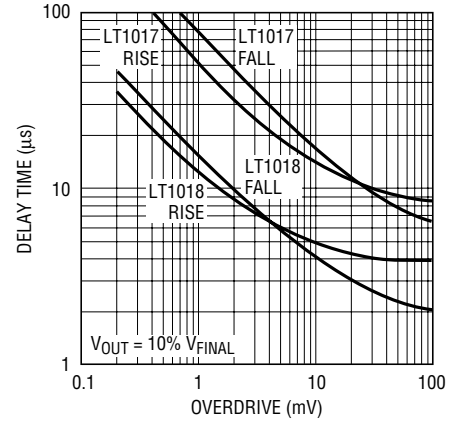
Output Sinking Current Limit



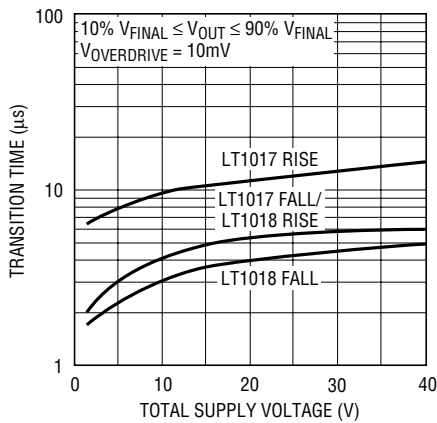
Total Switching Time



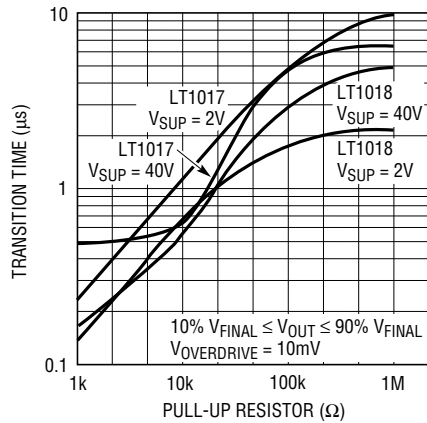
Output Delay



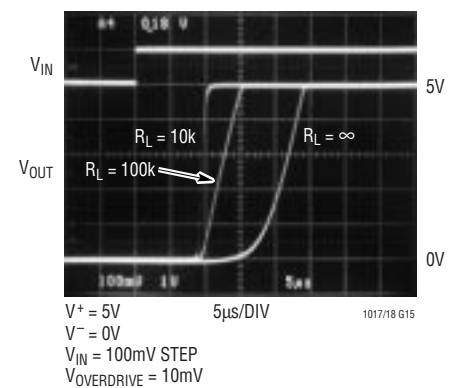
Transition Time



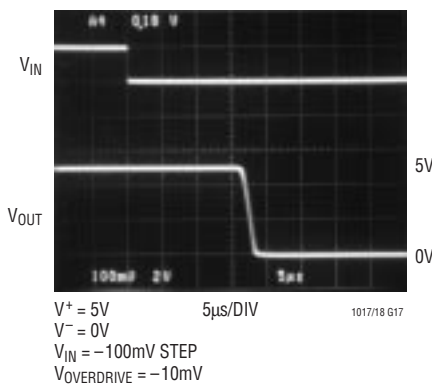
Positive Transition Time



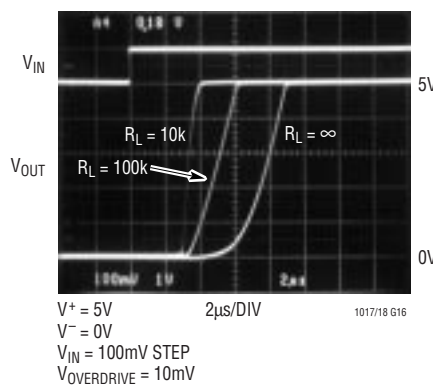
LT1017 Response Time



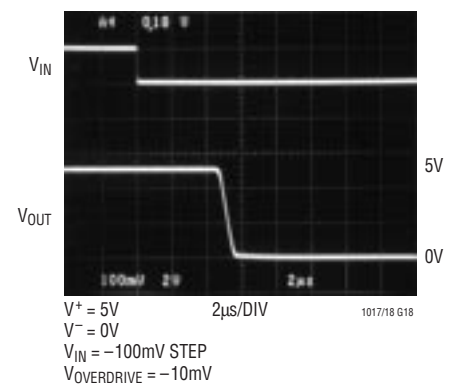
LT1017 Response Time



LT1018 Response Time

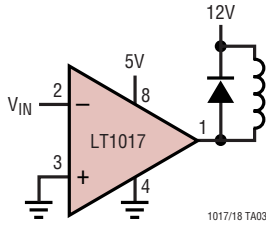


LT1018 Response Time



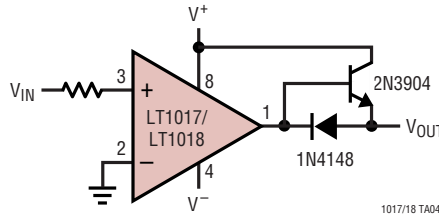
TYPICAL APPLICATIONS

Driving Relays



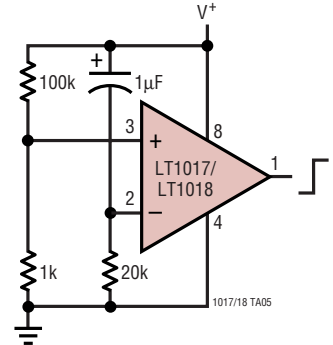
1017/18 TA03

Increasing Positive Output Current



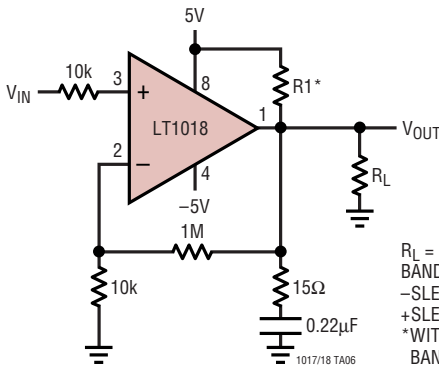
1017/18 TA04

Delay On Power Up



1017/18 TA05

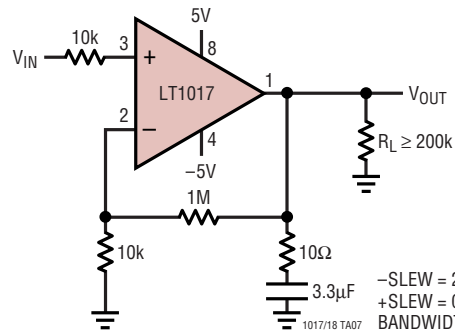
LT1018 Op Amp, $A_V = 100$



$R_L = 100k$
 BANDWIDTH = 30Hz
 -SLEW = 320V/ms
 +SLEW = 0.93V/ms
 *WITH $R_1 = 1k$
 BANDWIDTH $\approx 200Hz$

1017/18 TA06

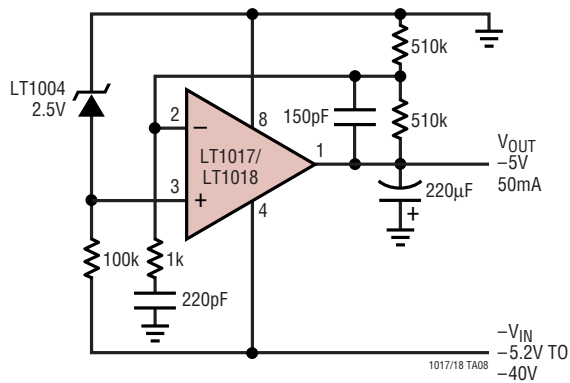
LT1017 Op Amp, $A_V = 100$



-SLEW = 23.5V/ms
 +SLEW = 0.017V/ms
 BANDWIDTH = 0.3Hz AT $R_L = 220k$

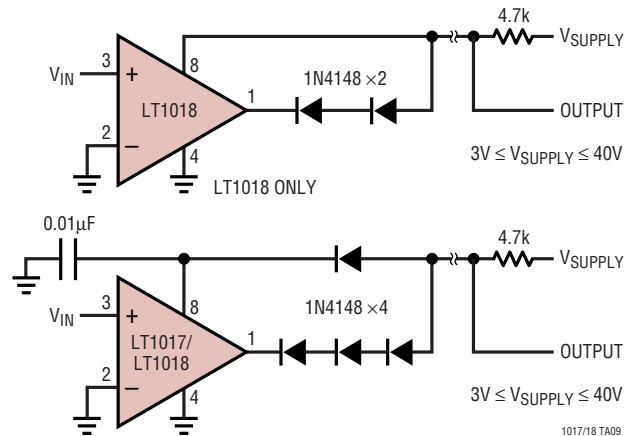
1017/18 TA07

Negative Voltage Regulator



1017/18 TA08

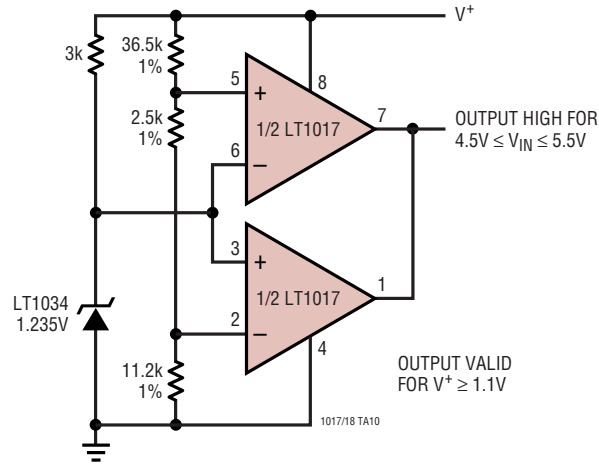
2-Wire Comparator



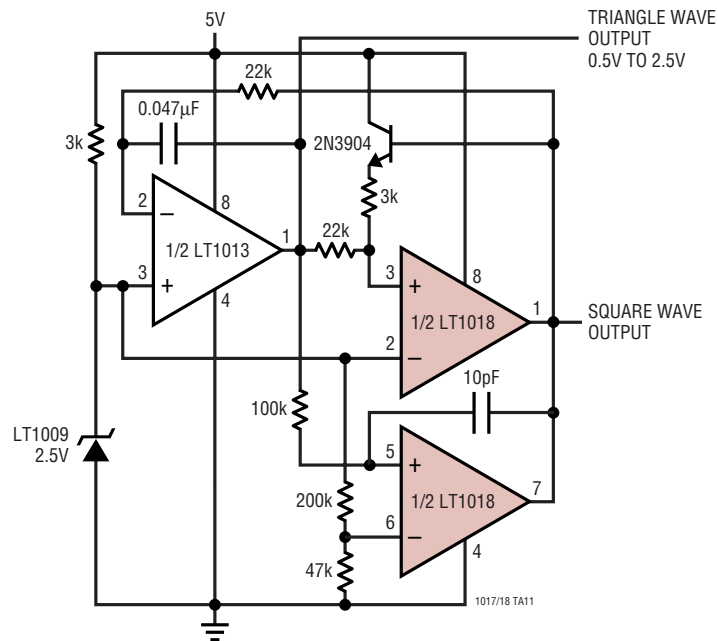
1017/18 TA09

TYPICAL APPLICATIONS

5V Power Supply Monitor

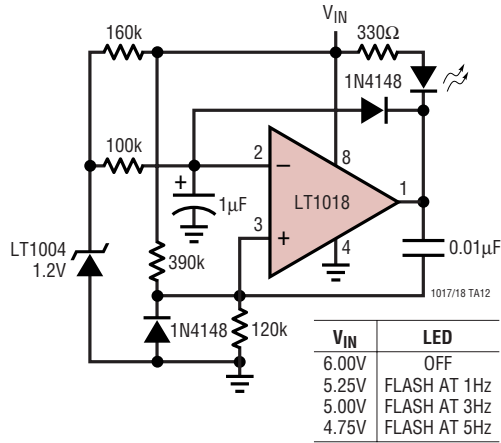


Precise Tri-Wave Generator

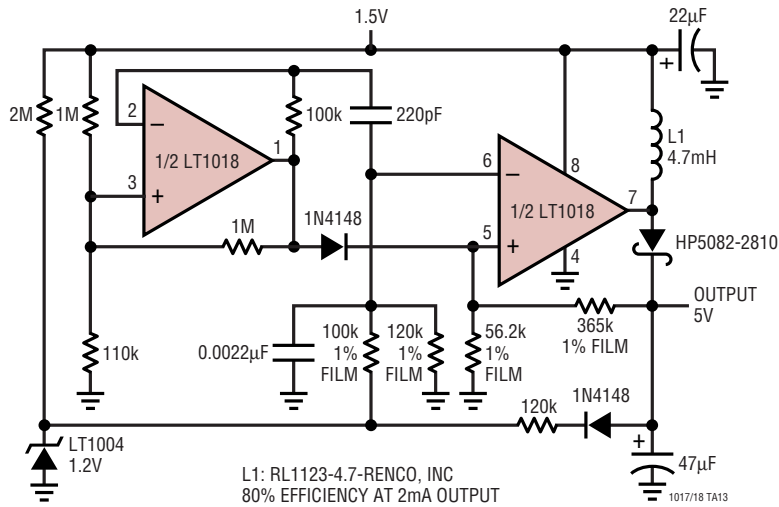


TYPICAL APPLICATIONS

Power Supply Monitor

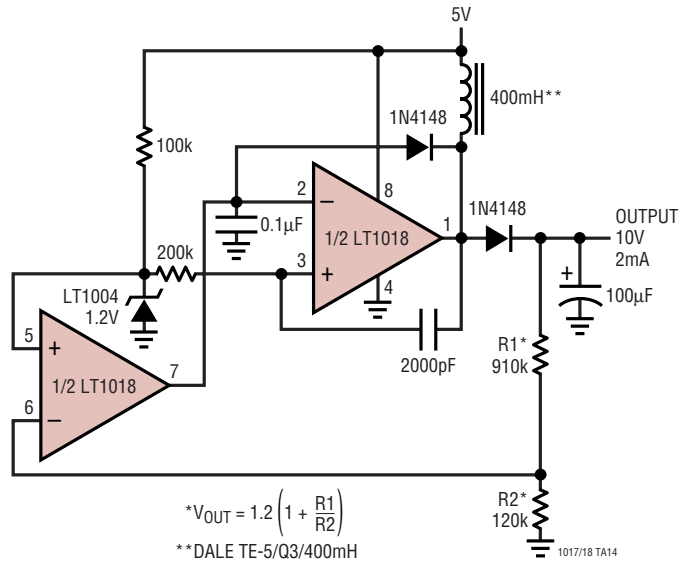


1.5V Input Flyback Regulator

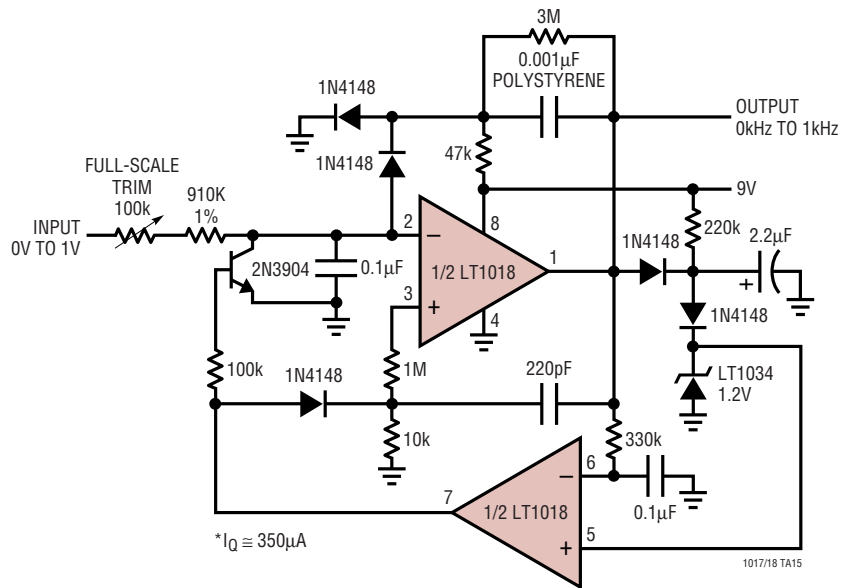


TYPICAL APPLICATIONS

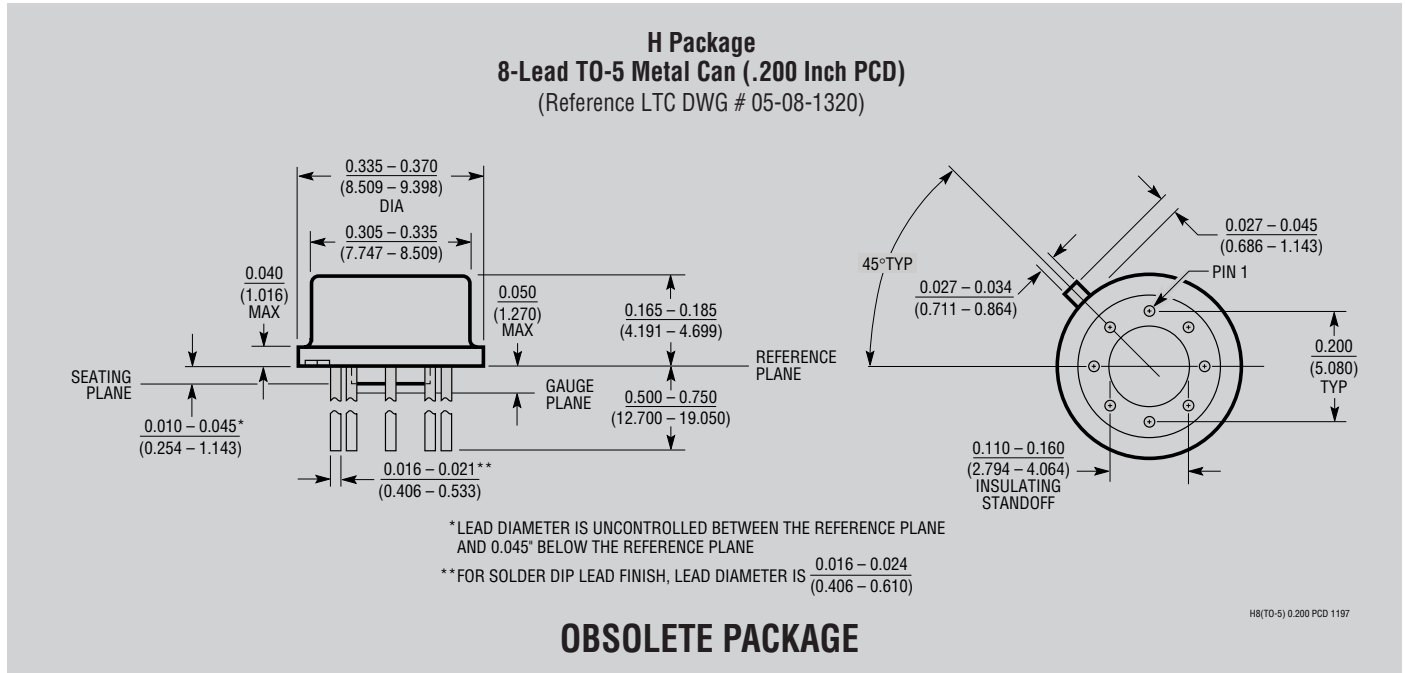
Regulated Step-Up Converter



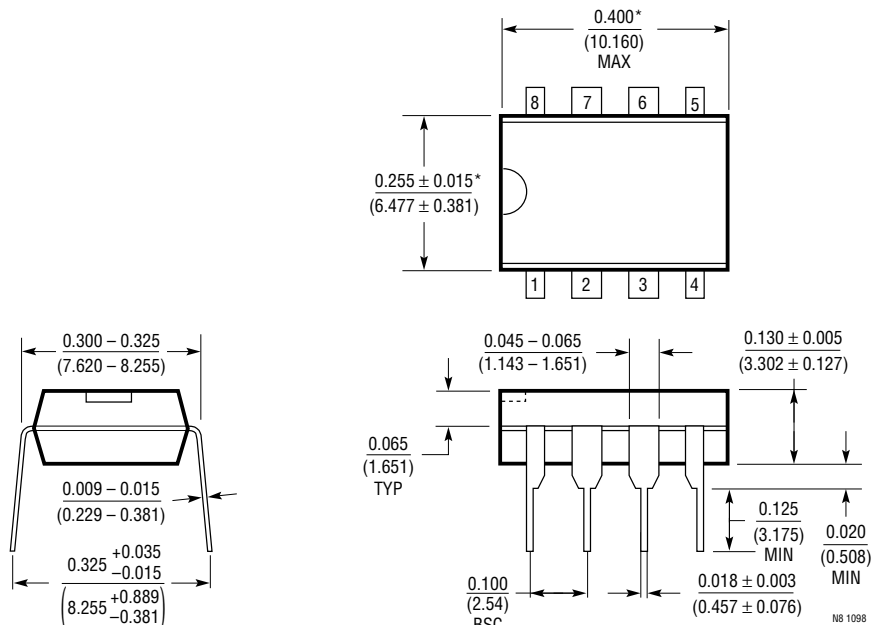
Low Power* V-to-F Converter



PACKAGE DESCRIPTION



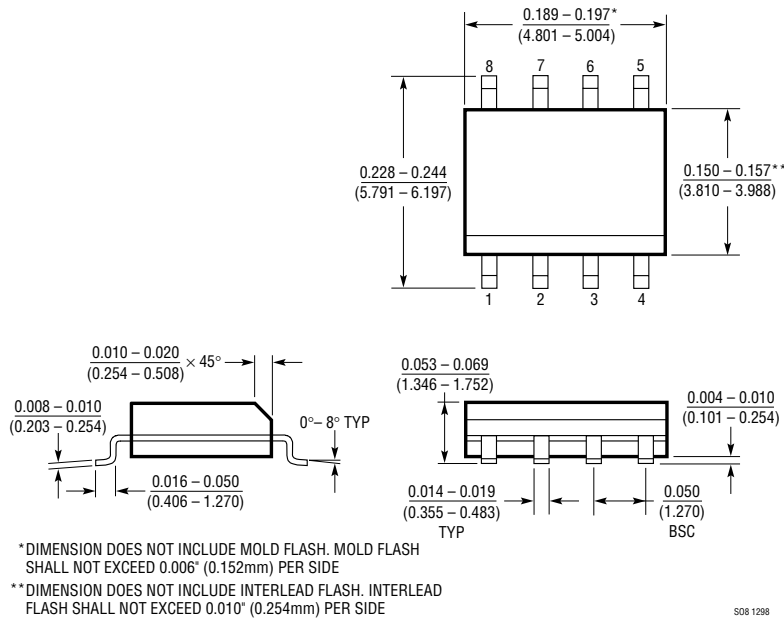
N8 Package
8-Lead PDIP (Narrow .300 Inch)
 (Reference LTC DWG # 05-08-1510)



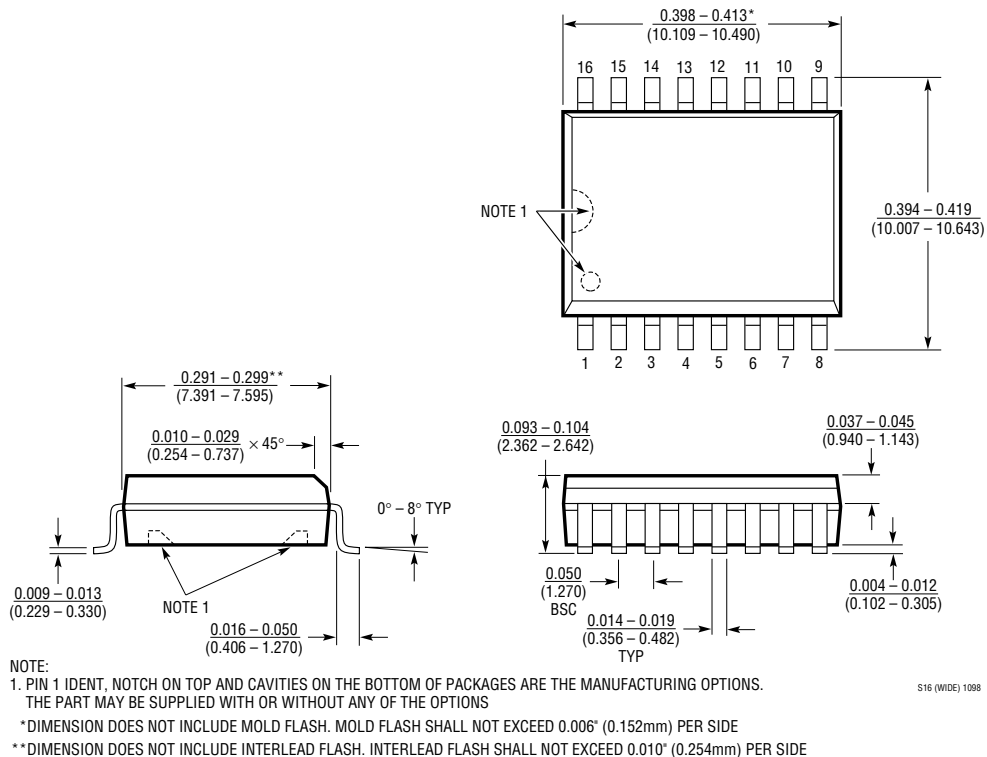
*THESE DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
 MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.010 INCH (0.254mm)

PACKAGE DESCRIPTION

S8 Package 8-Lead Plastic Small Outline (Narrow .150 Inch) (Reference LTC DWG # 05-08-1610)

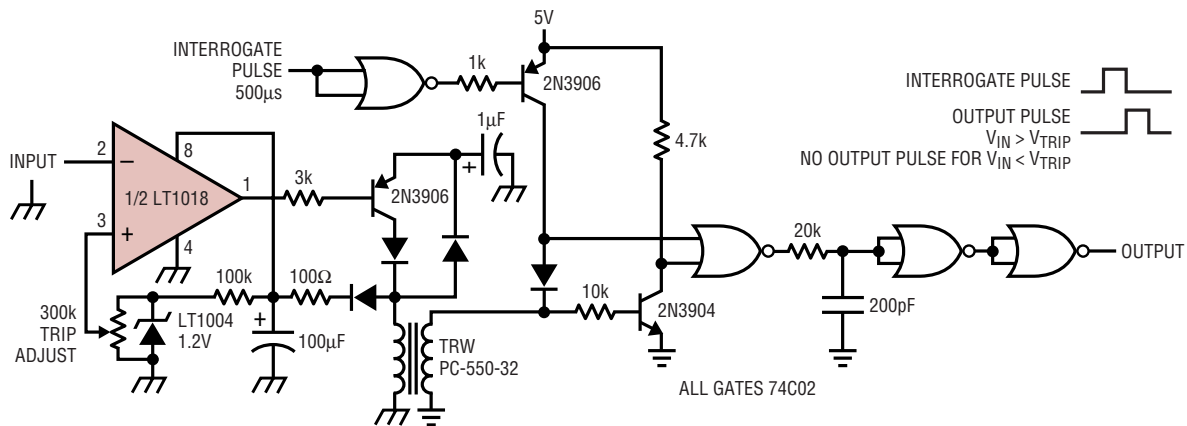


SW Package 16-Lead Plastic Small Outline (Wide .300 Inch) (Reference LTC DWG # 05-08-1620)



TYPICAL APPLICATION

Fully Isolated Limit Comparator



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1011/LT1011A	Voltage Comparators	Improved LT111A, 0.5mV $V_{OS(MAX)}$, 25nA $I_{B(MAX)}$, 3nA $I_{OS(MAX)}$, 250ns $t_{PD(MAX)}$
LT1020	Micropower Regulator and Comparator	40µA I_{SUPPLY} , 125mA I_{OUT} , 2.5V Reference Voltage
LTC1040	Dual Micropower Comparator	1.5µW (1Sample/Second), 0.5mV $V_{OS(MAX)}$, Rail-to-Rail Input
LT1120/LT1120A	Micropower Regulator with Comparator and Shutdown	20µA I_{SUPPLY} , 125mA I_{OUT} , 2.5V Reference Voltage
LT319A	Dual Comparators	0.5mV $V_{OS(MAX)}$, 25mA I_{OUT} , 80ns t_{PD}
LT1671	Single Supply Ground Sensing Comparator	450µA I_{SUPPLY} , 60ns t_{PD} , 0.8mV V_{OS}
LT1716	Micropower, 44V, SOT-23 Ground Sensing Comparator	Input Common Mode Range Extends from -5V to 44V from Negative Supply