

FEATURES

- Trimmed Output $\pm 0.3\%$
- Low Drift— $5\text{ppm}/^{\circ}\text{C}$ Typ
- Low Noise— $3\text{ppm}_{(\text{p-p})}$
- High Line Rejection
- Temperature Output—REF-02
- Low Supply Current 1.4mA Max

APPLICATIONS

- A/D and D/A Converters
- Precision Regulators
- Constant Current Sources
- V/F Converters
- Bridge Excitation

DESCRIPTION

The REF-01/REF-02 are precision 10V and 5V bandgap references which provide stable output voltages over a wide range of operating conditions. Output voltage is accurate to $\pm 0.3\%$ with a low $5\text{ppm}/^{\circ}\text{C}$ typical temperature coefficient. The REF-01 and REF-02 are excellent choices for applications where low drift, moderate accuracy, low power consumption and low cost are considerations.

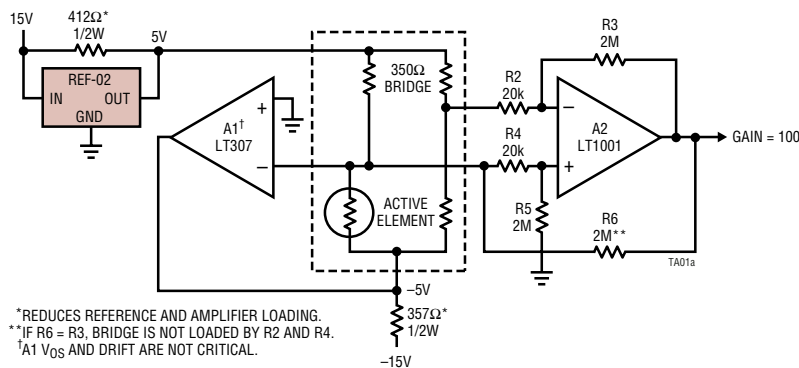
The REF-02 includes a temperature output pin which provides a linear voltage proportional to absolute temperature.

For lower drift and higher accuracy references, please see the LT1019 and LT1021 data sheets.

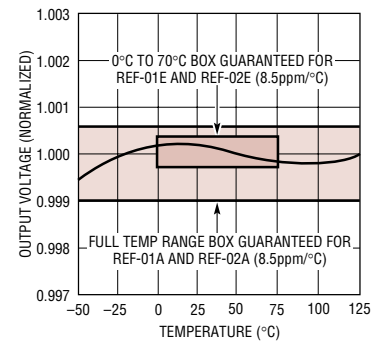
LT, LTC and LT are registered trademarks of Linear Technology Corporation.

TYPICAL APPLICATION

Ultra Linear Strain Gauge Amplifier



Output Voltage Temperature Drift



REF-01/REF-02

ABSOLUTE MAXIMUM RATINGS (Note 1)

REF-01/REF-02 A, E, H	40V	Storage Temperature Range	-65°C to 150°C
REF-01C/REF-02C	30V	Operating Temperature	
Power Dissipation	500mW	REF-01/REF-02, REF-01A/REF-02A ...	-55°C to 125°C
Output Short-Circuit Duration		REF-01E/REF-02E, REF-01H/REF-02H,	
To Ground	Indefinite	REF-01C/REF-02C, REF-01D/REF-02D	0°C to 70°C
To $V_{IN} \leq 16V$	Indefinite	Lead Temperature (Soldering, 10 sec)	300°C
To $V_{IN} > 16V$	Not Allowed		

PACKAGE/ORDER INFORMATION

<p>TOP VIEW</p> <p>NC* 8</p> <p>NC* 1</p> <p>INPUT 2</p> <p>TEMP** 3</p> <p>GND 4</p> <p>TRIM 5</p> <p>OUTPUT 6</p> <p>NC* 7</p> <p>NC* 8</p> <p>GND (CASE)</p> <p>H PACKAGE</p> <p>8-LEAD TO-5 METAL CAN</p> <p>$T_{JMAX} = 150^{\circ}C$, $\theta_{JA} = 150^{\circ}C/W$, $\theta_{JC} = 45^{\circ}C/W$</p> <p>* INTERNALLY CONNECTED. DO NOT CONNECT EXTERNALLY.</p> <p>** DO NOT CONNECT ON REF-01</p>	ORDER PART NUMBER		<p>TOP VIEW</p> <p>NC* 1</p> <p>INPUT 2</p> <p>TEMP** 3</p> <p>GND 4</p> <p>TRIM 5</p> <p>OUTPUT 6</p> <p>NC* 7</p> <p>NC* 8</p> <p>N8 PACKAGE</p> <p>8-LEAD PDIP</p> <p>$T_{JMAX} = 100^{\circ}C$, $\theta_{JA} = 130^{\circ}C/W$</p> <p>* INTERNALLY CONNECTED. DO NOT CONNECT EXTERNALLY.</p> <p>** DO NOT CONNECT ON REF-01</p>	ORDER PART NUMBER	
	<p>REF01AH REF02AH</p> <p>REF01H REF02H</p> <p>REF01EH REF02EH</p> <p>REF01HH REF02HH</p> <p>REF01CH REF02CH</p> <p>REF02DH</p>	<p>REF01EN8 REF02EN8</p> <p>REF01HN8 REF02HN8</p> <p>REF01CN8 REF02CN8</p> <p>REF02DN8</p>		<p>REF01EJ8 REF02EJ8</p> <p>REF01HJ8 REF02HJ8</p> <p>REF01CJ8 REF02CJ8</p> <p>REF02DJ8</p>	
<p>OBSOLETE PACKAGE</p> <p>Consider the N Package for Alternate Source</p>		<p>OBSOLETE PACKAGE</p> <p>Consider the N Package for Alternate Source</p>			

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

ELECTRICAL CHARACTERISTICS $V_{IN} = 15V$, $T_A = 25^{\circ}C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	REF-01A/E, REF-02A/E			REF-01H, REF-02H			UNITS		
			MIN	TYP	MAX	MIN	TYP	MAX			
V_O	Output Voltage	$I_L = 0mA$	REF-01	9.97	10	10.03	REF-01H	9.95	10	10.05	V
			REF-02	4.985	5	5.015	REF-02H	4.975	5	5.025	V
	Output Adjustment Range	$R_P = 10k\Omega$	REF-01	± 3	5, -27		REF-02H	± 3	5, -27		%
		REF-02	± 3	5, -13		REF-02H	± 3	5, -13		%	
e_{nP-P}	Output Voltage Noise	0.1Hz to 10Hz (Note 7)	REF-01	20		REF-01H	20			μV_{P-P}	
			REF-02	10		REF-02H	10			μV_{P-P}	
V_{IN}	Input Voltage Range		REF-01	12		40	REF-01H	12		40	V
			REF-02	7		40	REF-02H	7		40	V
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation (Note 2)	$(V_{OUT} + 3V) \leq V_{IN} \leq 33V$		0.0001	0.010		0.0001	0.010		%/V	
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (Note 2)	$I_L = 0mA$ to 10mA	REF-01	0.0005	0.008		REF-01H	0.0005	0.010		%/mA
			REF-02	0.0010	0.010		REF-02H	0.001	0.010		%/mA
I_Q	Quiescent Supply Current	No Load		0.65	1.4		0.65	1.4		mA	
I_{OUT}	Load Current			10	20		10	20		mA	
	Sink Current			-0.3	-20		-0.3	-20		mA	
I_{SC}	Short-Circuit Current	$V_O = 0V$		25			25			mA	
V_T	Temperature Voltage Output	(Note 3)	REF-02 Only	620			620			mV	

ELECTRICAL CHARACTERISTICS $V_{IN} = 15V, T_A = 25^\circ C$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	REF-01C, REF-02C			REF-02D			UNITS	
			MIN	TYP	MAX	MIN	TYP	MAX		
V_O	Output Voltage	$I_L = 0mA$	REF-01 REF-02	9.9 4.95	10 5	10.1 5.05	4.9	5	5.1	V V
	Output Adjustment Range	$R_P = 10k\Omega$	REF-01 REF-02	± 2.7	5, -27 5, -13		± 2	5, -13		% %
e_{nP-P}	Output Voltage Noise	0.1Hz to 10Hz (Note 7)	REF-01 REF-02		30 12			12		μV_{P-P} μV_{P-P}
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation (Note 2)	$(V_{OUT} + 3V) \leq V_{IN} \leq 33V$			0.0001	0.015		0.0001	0.04	%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (Note 2)	$I_L = 0mA$ to 8mA $I_L = 0mA$ to 4mA			0.0005	0.015		0.001	0.04	%/mA %/mA
I_Q	Quiescent Supply Current	No Load			0.65	1.6		0.65	2	mA
I_{OUT}	Load Current			8	20		8	20		mA
	Sink Current			-0.2	20		-0.2	20		mA
I_{SC}	Short-Circuit Current	$V_O = 0V$			25			25		mA
V_T	Temperature Voltage Output	(Note 3)	REF-02 Only		620			620		mV

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^\circ C$. $V_{IN} = 15V, -55^\circ C \leq T_A \leq \pm 125^\circ C$ for REF-01A/REF-02A and REF-01/REF-02, $0^\circ C \leq T_A \leq 70^\circ C$ for REF-01E/REF-02E and REF-01H/REF-02H, $I_L = 0mA$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		REF-01A/E, REF-02A/E			REF-01H/REF-02H			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	
$\frac{\Delta V}{\Delta T}$	Output Voltage Change with Temperature (Notes 4, 5)	$0^\circ C \leq T_A \leq 70^\circ C$ $-55^\circ C \leq T_A \leq 125^\circ C$	● ●		0.02 0.09	0.06 0.15		0.035 0.144	0.17 0.45	% %
	TC	Output Voltage Temperature Coefficient (Note 6)	●		5	8.5		8	25	ppm/ $^\circ C$
	Change in V_O Temperature Coefficient with Output Adjustment	$R_P = 10k\Omega$	●		0.5			0.5		ppm/%
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation	$0^\circ C \leq T_A \leq 70^\circ C$	●		0.0001	0.012		0.0001	0.012	%/V
	$(V_{OUT} + 3V) \leq V_{IN} \leq 33V$ (Note 2)	$-55^\circ C \leq T_A \leq 125^\circ C$	●		0.0001	0.015		0.0001	0.015	%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation	$0^\circ C \leq T_A \leq 70^\circ C$	●		0.002	0.010		0.002	0.012	%/mA
	$(I_L = 0mA$ to 8mA) (Note 2)	$-55^\circ C \leq T_A \leq 125^\circ C$	●		0.002	0.012		0.002	0.015	%/mA
	Temperature Voltage Output Temperature Coefficient	(Note 3) REF-02	●		2.1			2.1		mV/ $^\circ C$

ELECTRICAL CHARACTERISTICS

The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at $T_A = 25^\circ\text{C}$. $V_{IN} = 15\text{V}$, $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ and $I_L = 0\text{mA}$ unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		REF-01C, REF-02C			REF-02D			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	
$\frac{\Delta V}{\Delta T}$	Output Voltage Change with Temperature	(Notes 4, 5)	●			0.45			1.7	%
TC	Output Voltage Temperature Coefficient	(Note 6)	●		8	65		8	250	ppm/ $^\circ\text{C}$
	Change in V_O Temperature Coefficient with Output Adjustment	$R_P = 10\text{k}\Omega$	●		0.5			0.5		ppm/%
$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	Line Regulation (Note 2)	$V_{IN} = 8\text{V to } 30\text{V}$	●		0.0001	0.018		0.0001	0.05	%/V
$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	Load Regulation (Note 2)	$I_L = 0\text{mA to } 5\text{mA}$	●		0.002	0.018		0.002	0.05	%/mA
	Temperature Voltage Output Temperature Coefficient	(Note 3) REF-02	●		2.1			2.1		mV/ $^\circ\text{C}$

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

Note 2: Line and load regulation specifications include the effect of self heating.

Note 3: Limit current in or out of Pin 3 to 50nA and capacitance on Pin 3 to 30pF.

Note 4: ΔV is defined as the absolute difference between the maximum output voltage and the minimum output voltage over the specified temperature range expressed as a percentage of nominal output.

$$\Delta V = \left| \frac{V_{MAX} - V_{MIN}}{V_{OUT}} \right| \cdot 100$$

Note 5: ΔV specification applies trimmed or untrimmed.

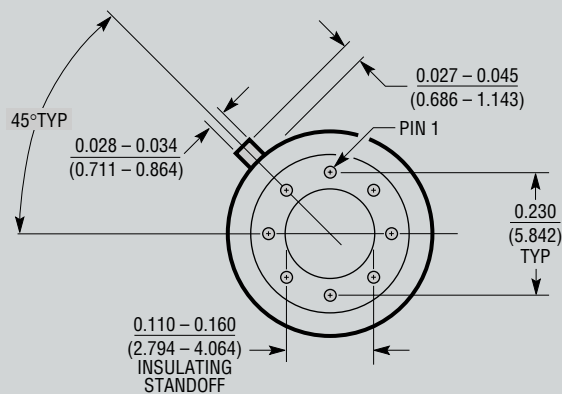
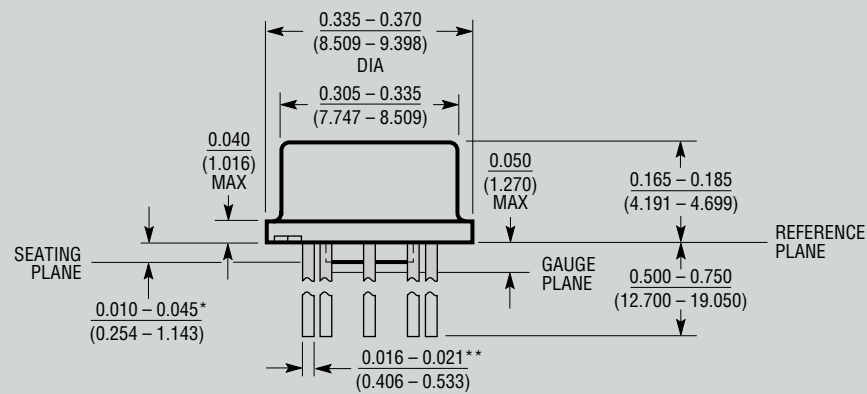
Note 6: TC is defined as ΔV divided by the temperature range, i.e.,

$$TC = \frac{\Delta V}{T_{MAX} - T_{MIN}}$$

Note 7: 0.1Hz to 10Hz noise cannot be 100% tested on modern high speed test equipment, so Linear Technology does not put a guaranteed maximum specification on this parameter for standard units. 100% bench testing of 0.1Hz to 10Hz noise is available on special request. To ensure low output noise, Linear Technology *does* 100% test 10Hz to 1kHz noise. Consult factory for details.

PACKAGE DESCRIPTION

H Package
8-Lead TO-5 Metal Can (.230 Inch PCD)
 (Reference LTC DWG # 05-08-1321)



* LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND 0.045" BELOW THE REFERENCE PLANE

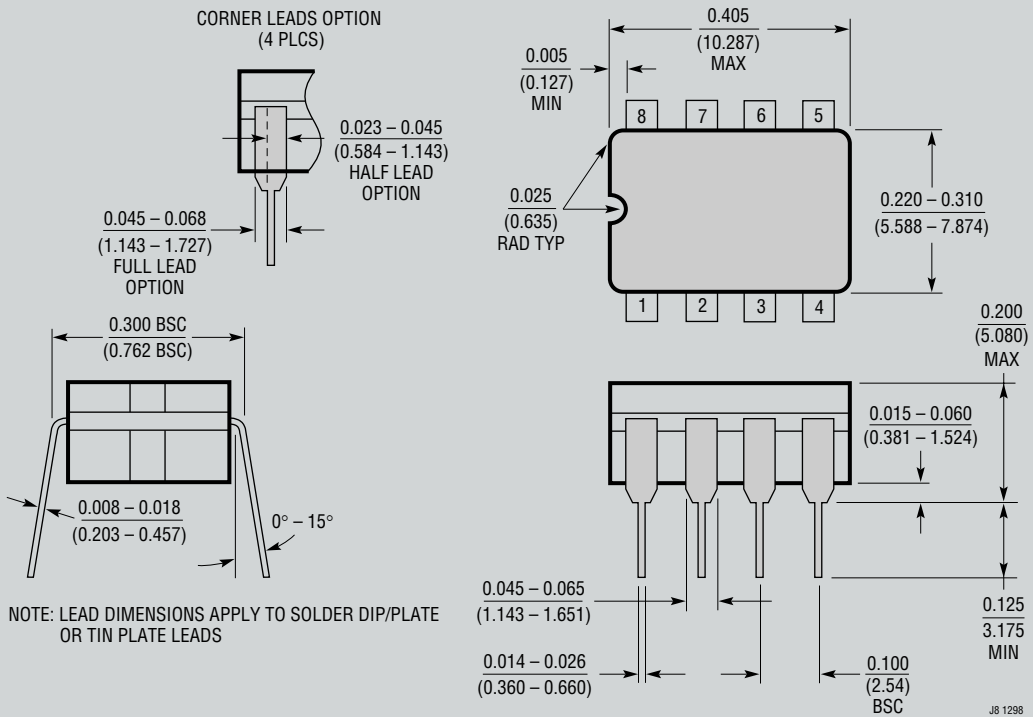
** FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS $0.016 - 0.024$ (0.406 - 0.610)

H8 (TO-5) 0.230 PCD 1197

OBSELETE PACKAGE

PACKAGE DESCRIPTION

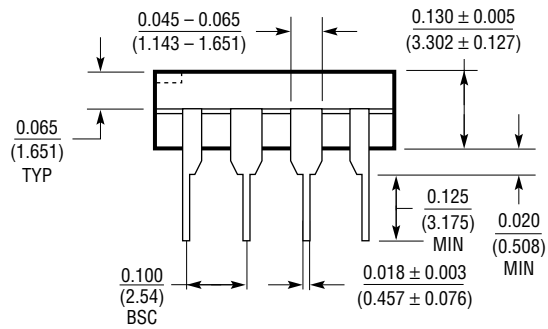
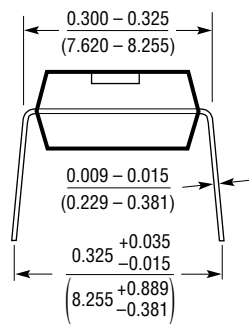
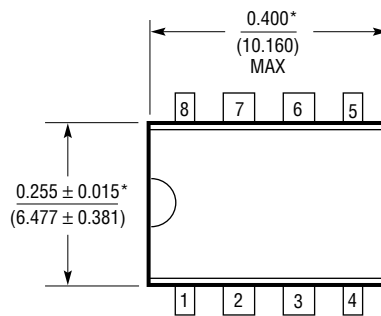
J8 Package
8-Lead CERDIP (Narrow .300 Inch, Hermetic)
 (Reference LTC DWG # 05-08-1110)



OBSOLETE PACKAGE

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)

N8 1098

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1019	0.05%, 5ppm/°C Precision Reference	Pin Compatible with the REF-01, REF-02, Improved Specs



Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331