

# SN54S124, SN74S124 DUAL VOLTAGE-CONTROLLED OSCILLATORS

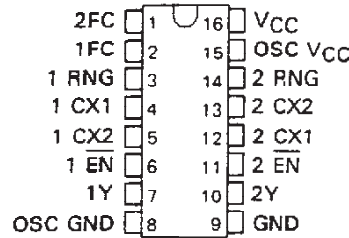
SDLS201A – DECEMBER 1983 – REVISED APRIL 2004

- Two independent VCOs in a 16-Pin Package
- Output Frequency Set by Single External Component:  
Capacitor for Fixed- or Variable-Frequency Operation
- Separate Supply Voltage Pins for Isolation of Frequency Control Inputs and Oscillators from Output Circuitry
- Highly Stable Operation over Specified Temperature and/or Supply Voltage Ranges
- Typical  $f_{max}$  ..... 85 MHz  
Typical Power Dissipation ..... 525 mW
- Frequency Spectrum ... 1 Hz to 60 MHz

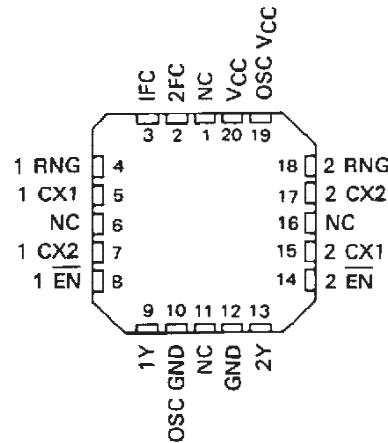
## description

The 'S124 features two independent voltage-controlled oscillators (VCO) in a single monolithic chip. The output frequency of each VCO is established by an external capacitor in combination with two voltage-sensitive inputs, one for frequency range and one for frequency control. These inputs can be used to vary the output frequency as shown under typical characteristics. These highly stable oscillators can be set to operate at any frequency typically between 0.12 hertz and 85 megahertz. <sup>1</sup>

SN54S124 ... J OR W PACKAGE  
SN74S124 ... D OR N PACKAGE  
(TOP VIEW)



SN54S124 ... FK PACKAGE  
(TOP VIEW)



NC – No internal connection

While the enable input is low, the output is enabled.  
While the enable input is high, the output is high.

These devices can operate from a single 5-volt supply. However, one set of supply-voltage and ground pins (V<sub>CC</sub> and GND) is provided for the enable, synchronization-gating, and output sections, and a separate set (⊖V<sub>CC</sub> and ⊖GND) is provided for the oscillator and associated frequency-control circuits so that effective isolation can be accomplished in the system.

The enable input of these devices starts or stops the output pulses when it is low or high, respectively. The internal oscillator of the 'S124 is started and stopped by the enable input. The enable input is one standard load; it and the buffered output operate at standard Schottky-clamped TTL levels.

The pulse synchronization-gating section ensures that the first output pulse is neither clipped nor extended. Duty cycle of the square-wave output is fixed at approximately 50 percent.

The SN54S124 is characterized for operation over the full military temperature range of –55°C to 125°C; the SN74S124 is characterized for operation from 0°C to 70°C.



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**TEXAS  
INSTRUMENTS**

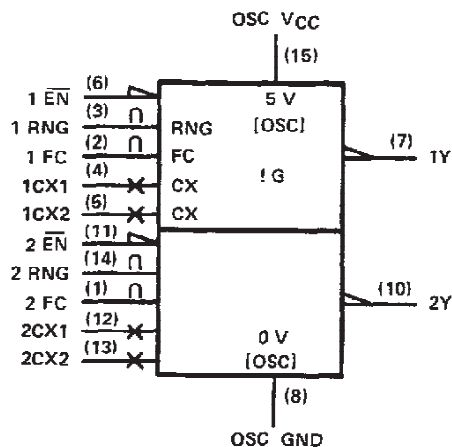
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# SN54S124, SN74S124 DUAL VOLTAGE-CONTROLLED OSCILLATORS

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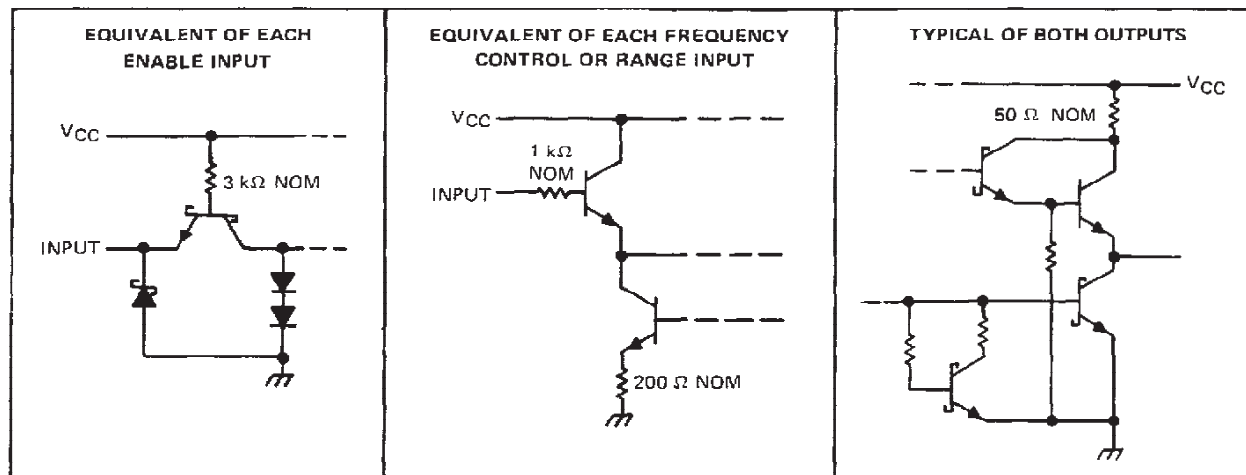
logic symbol<sup>†</sup>



<sup>†</sup>This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

|                                                |                |
|------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (See Notes 1 and 2)   | 7V             |
| Input voltage                                  | 5.5 V          |
| Operating free-air temperature range: SN54S124 | -55°C to 125°C |
| SN74S124                                       | 0°C to 70°C    |
| Storage temperature range                      | -65°C to 150°C |

NOTES: 1. Voltage values are with respect to the appropriate ground terminal.

2. Throughout this data sheet, the symbol  $V_{CC}$  is used for the voltage applied to both the  $V_{CC}$  and  $\ominus V_{CC}$  terminals, unless otherwise noted.

# SN54S124, SN74S124

## DUAL VOLTAGE-CONTROLLED OSCILLATORS

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### recommended operating conditions

|                                                                                  | SN54S124 |     |     | SN74S124 |     |      | UNIT |
|----------------------------------------------------------------------------------|----------|-----|-----|----------|-----|------|------|
|                                                                                  | MIN      | NOM | MAX | MIN      | NOM | MAX  |      |
| Supply voltage, $V_{CC}$ (see Note 1)                                            | 4.5      | 5   | 5.5 | 4.75     | 5   | 6.25 | V    |
| Input voltage at frequency control or range input, $V_{I(freq)}$ or $V_{I(rng)}$ | 1        |     | 5   | 1        |     | 5    | V    |
| High-level output current, $I_{OH}$                                              |          |     | -1  |          |     | -1   | mA   |
| Low-level output current, $I_{OL}$                                               |          |     | 20  |          |     | 20   | mA   |
| Output frequency (enabled), $f_o$                                                | 1        |     |     | 1        |     |      | Hz   |
|                                                                                  |          |     | 60  |          |     | 60   | MHz  |
| Operating free-air temperature, $T_A$                                            | -55      |     | 125 | 0        |     | 70   | °C   |

### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER |                                                        |                       | TEST CONDITIONS†                                                               |                     | MIN | TYP‡ | MAX  | UNIT          |
|-----------|--------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------|---------------------|-----|------|------|---------------|
| $V_{IH}$  | High-level input voltage at enable                     |                       |                                                                                |                     | 2   |      |      | V             |
| $V_{IL}$  | Low-level input voltage at enable                      |                       |                                                                                |                     |     |      | 0.8  | V             |
| $V_{IK}$  | Input clamp voltage at enable                          |                       | $V_{CC} = \text{MIN}$ , $I_I = -18 \text{ mA}$                                 |                     |     |      | -1.2 | V             |
| $V_{OH}$  | High-level output voltage                              |                       | $V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ ,<br>$I_{OH} = -1 \text{ mA}$   | SN54S*              | 2.6 | 3.4  |      | V             |
|           |                                                        |                       |                                                                                | SN74S*              | 2.7 | 3.4  |      |               |
| $V_{OL}$  | Low-level output voltage                               |                       | $V_{CC} = \text{MIN}$ , $V_{IL} = 0.8 \text{ V}$ ,<br>$I_{OL} = 20 \text{ mA}$ |                     |     |      | 0.5  | V             |
| $I_I$     | Input current                                          | Freq control or range | $V_{CC} = \text{MAX}$                                                          | $V_I = 5 \text{ V}$ |     | 10   | 50   | $\mu\text{A}$ |
|           |                                                        |                       |                                                                                | $V_I = 1 \text{ V}$ |     | 1    | 15   |               |
| $I_{II}$  | Input current at maximum input voltage                 | Enable                | $V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$                                  |                     |     |      | 1    | mA            |
| $I_{IH}$  | High-level input current                               | Enable                | $V_{CC} = \text{MAX}$ , $V_I = 2.7 \text{ V}$                                  |                     |     |      | 50   | $\mu\text{A}$ |
| $I_{IL}$  | Low-level input current                                | Enable                | $V_{CC} = \text{MAX}$ , $V_I = 0.5 \text{ V}$                                  |                     |     |      | -2   | mA            |
| $I_{OS}$  | Short-circuit output current §                         |                       | $V_{CC} = \text{MAX}$                                                          |                     | -40 |      | -100 | mA            |
| $I_{CC}$  | Supply current, total into $V_{CC}$ and $\odot V_{CC}$ |                       | $V_{CC} = \text{MAX}$ , See Note 3                                             |                     |     | 105  | 150  | mA            |
|           |                                                        |                       | $V_{CC} = \text{MAX}$ , $T_A = 125^\circ\text{C}$ ,<br>See Note 3              |                     |     |      | 110  |               |
|           |                                                        |                       | W package only                                                                 |                     |     |      |      |               |

†For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

§Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

NOTE 3:  $I_{CC}$  is measured with the outputs disabled and open.

### switching characteristics, $V_{CC} = 5 \text{ V}$ , $R_L = 280 \Omega$ , $C_L = 15 \text{ pF}$ , $T_A = 25^\circ\text{C}$ (see note 4)

| PARAMETER         |                                                                 | TEST CONDITIONS                     |                                                       | MIN | TYP                        | MAX | UNIT |
|-------------------|-----------------------------------------------------------------|-------------------------------------|-------------------------------------------------------|-----|----------------------------|-----|------|
| f <sub>O</sub>    | Output frequency                                                | C <sub>ext</sub> = 2 pF             | V <sub>I(freq)</sub> = 4 V, V <sub>I(rng)</sub> = 1 V | 60  | 85                         |     | MHz  |
|                   |                                                                 |                                     | V <sub>I(freq)</sub> = 1 V, V <sub>I(rng)</sub> = 5 V | 25  | 40                         |     |      |
| Output duty cycle |                                                                 | C <sub>ext</sub> = 8.3 pF to 500 μF |                                                       |     | 50%                        |     |      |
| t <sub>PHL</sub>  | Propagation delay time,<br>high-to-low-level output from enable | f <sub>O</sub> = 1 Hz to 20 MHz     |                                                       |     | 1.4<br>f <sub>O</sub> (Hz) |     | s    |
|                   |                                                                 | f <sub>O</sub> > 20 MHz             |                                                       |     | 70                         |     | ns   |

NOTE 4: Load circuits and voltage waveforms are shown in Section 1.

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## TYPICAL CHARACTERISTICS

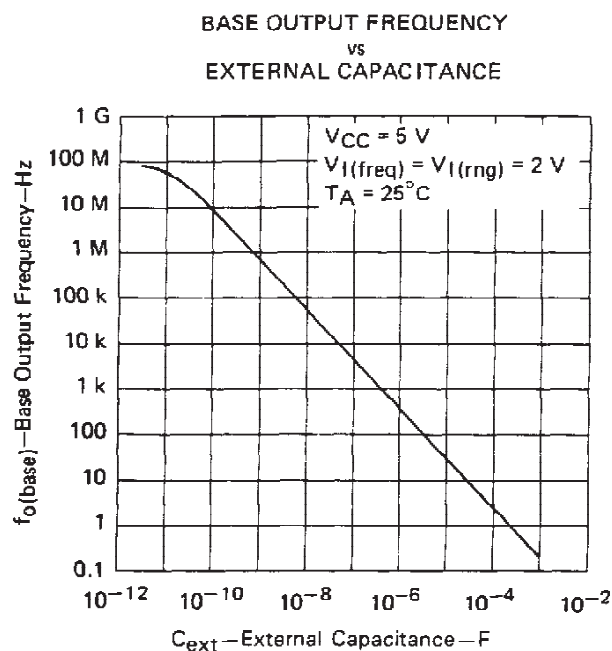


FIGURE 1

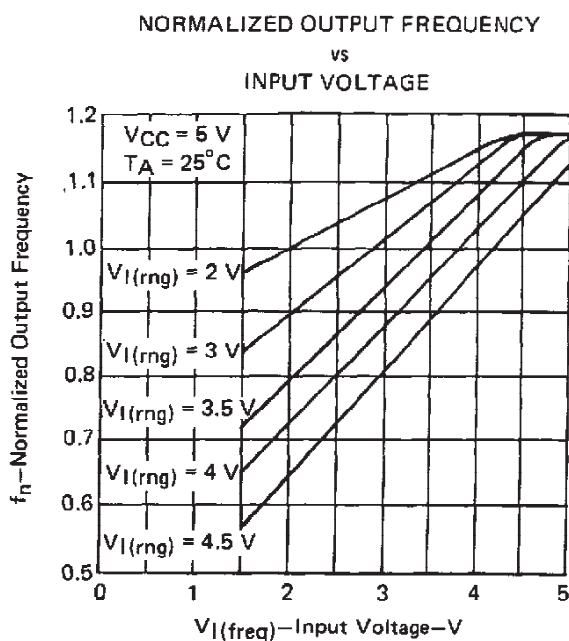


FIGURE 2

NOTE:  $f_o = f_n \times f_o(\text{base})$

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|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
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**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN54S124J        | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN74S124D        | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S124DE4      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S124DG4      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S124DR       | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S124DRE4     | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S124DRG4     | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S124N        | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74S124N3       | OBSOLETE              | PDIP         | N               | 16   |             | TBD                     | Call TI          | Call TI                      |
| SN74S124NE4      | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SNJ54S124J       | ACTIVE                | CDIP         | J               | 16   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54S124W       | ACTIVE                | CFP          | W               | 16   | 1           | TBD                     | A42              | N / A for Pkg Type           |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**TAPE AND REEL INFORMATION**



\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74S124DR | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device     | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74S124DR | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |

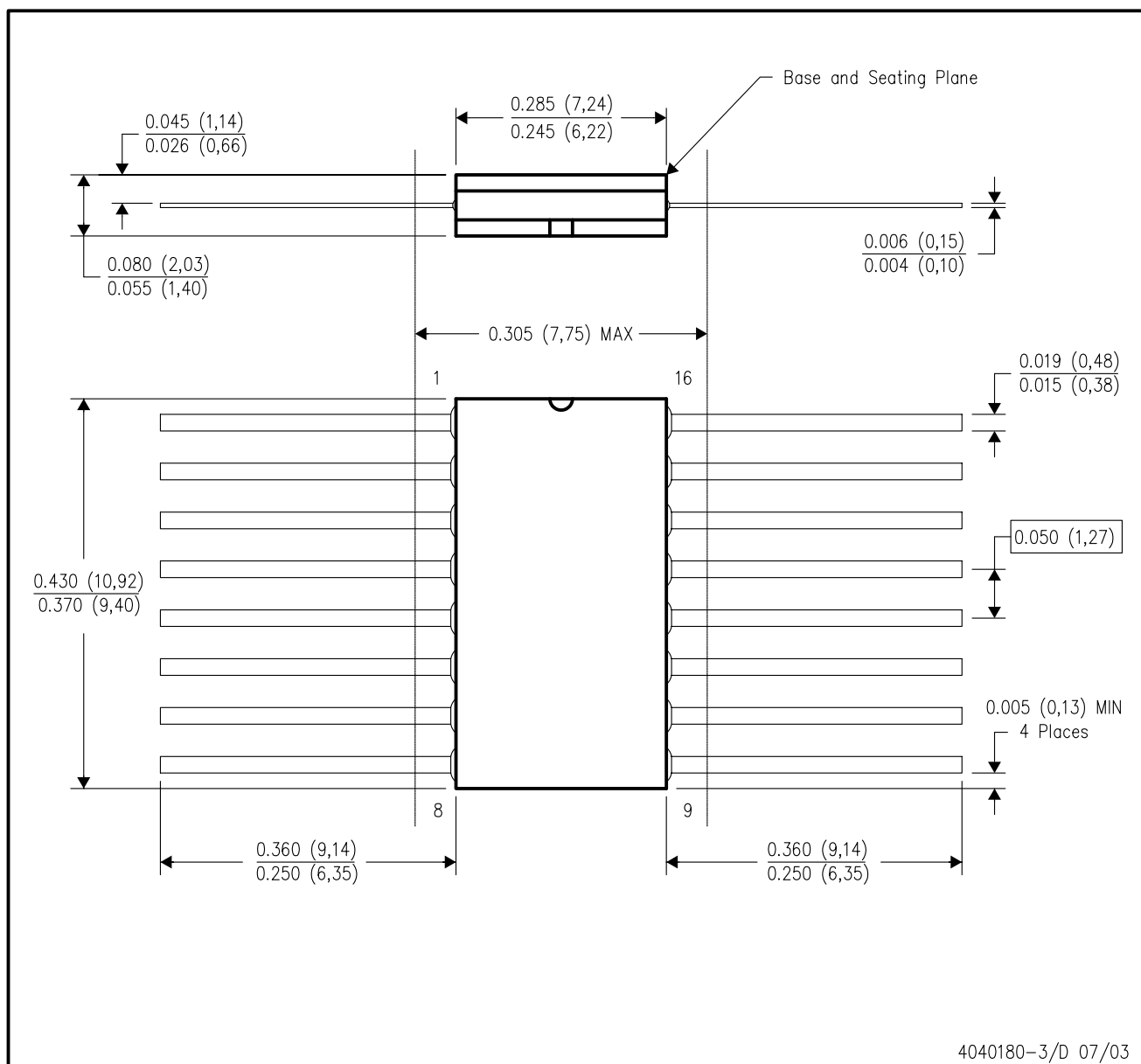


4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F16)

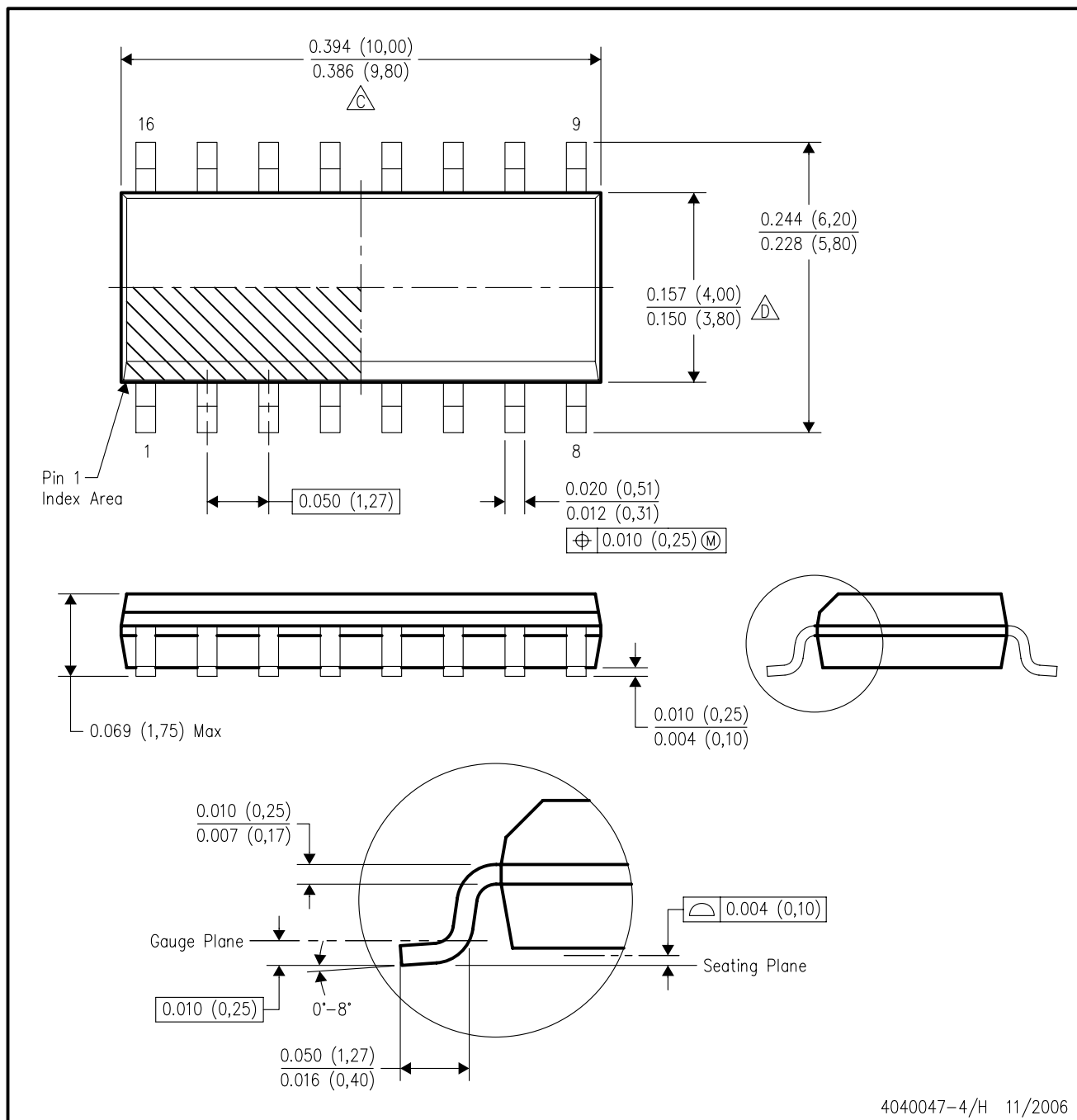
CERAMIC DUAL FLATPACK



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP1-F16 and JEDEC MO-092AC

## D (R-PDSO-G16)

## PLASTIC SMALL-OUTLINE PACKAGE



4040047-4/H 11/2006

## NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AC.

## D(R-PDSO-G16)



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

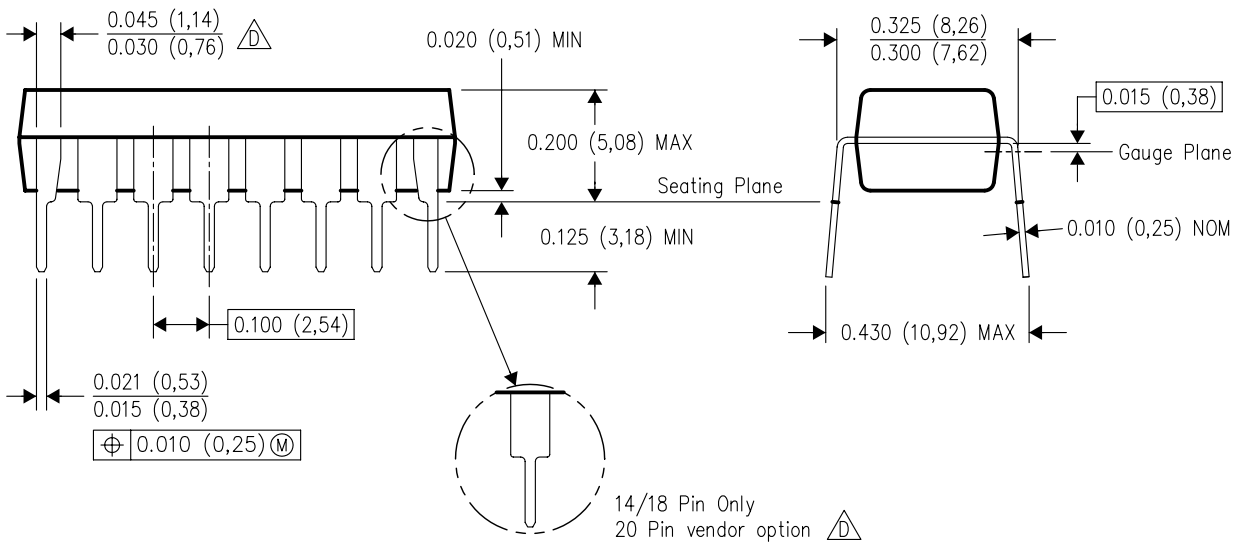
## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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