

TL071, TL071A, TL071B, TL072 TL072A, TL072B, TL074, TL074A, TL074B LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080J – SEPTEMBER 1978 – REVISED MARCH 2005

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic Distortion . . . 0.003% Typ
- Low Noise
 $V_n = 18 \text{ nV}/\sqrt{\text{Hz}}$ Typ at $f = 1 \text{ kHz}$
- High Input Impedance . . . JFET Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation
- High Slew Rate . . . $13 \text{ V}/\mu\text{s}$ Typ
- Common-Mode Input Voltage Range Includes V_{CC+}

description/ordering information

The JFET-input operational amplifiers in the TL07x series are similar to the TL08x series, with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL07x series ideally suited for high-fidelity and audio preamplifier applications. Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip.

The C-suffix devices are characterized for operation from 0°C to 70°C . The I-suffix devices are characterized for operation from -40°C to 85°C . The M-suffix devices are characterized for operation over the full military temperature range of -55°C to 125°C .

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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080J – SEPTEMBER 1978 – REVISED MARCH 2005

description/ordering information (continued)

ORDERING INFORMATION

| T_A | V_{IOMax} AT 25°C | PACKAGE† | ORDERABLE PART NUMBER | TOP-SIDE MARKING | | |
|--------------|------------------------|--------------|--------------------------|---------------------|-----------|----------|
| 0°C to 70°C | 10 mV | PDIP (P) | Tube of 50 | TL071CP | TL071CP | |
| | | | Tube of 50 | TL072CP | TL072CP | |
| | | PDIP (N) | Tube of 25 | TL074CN | TL074CN | |
| | | SOIC (D) | Tube of 75 | TL071CD | TL071C | |
| | | | | Reel of 2500 | | TL071CDR |
| | | | Tube of 75 | TL072CD | TL072C | |
| | | | | Reel of 2500 | | TL072CDR |
| | | | Tube of 50 | TL074CD | TL074C | |
| | | | | Reel of 2500 | | TL074CDR |
| | | SOP (NS) | Reel of 2000 | TL074CNSR | TL074 | |
| | | SOP (PS) | Reel of 2000 | TL071CPSR | TL071 | |
| | | | Reel of 2000 | TL072CPSR | T072 | |
| | | TSSOP (PW) | Reel of 2000 | TL072CPWR | T072 | |
| | | | Tube of 90 | TL074CPW | T074 | |
| | | | Reel of 2000 | TL074CPWR | | |
| | 6 mV | PDIP (P) | Tube of 50 | TL071ACP | TL071ACP | |
| | | | Tube of 50 | TL072ACP | TL072ACP | |
| | | PDIP (N) | Tube of 25 | TL074ACN | TL074ACN | |
| | | | SOIC (D) | Tube of 75 | TL071ACD | 071AC |
| | | Reel of 2500 | | TL071ACDR | | |
| | | Tube of 75 | | TL072ACD | 072AC | |
| | | Reel of 2500 | TL072ACDR | | | |
| | | Tube of 50 | TL074ACD | TL074AC | | |
| | | | Reel of 2500 | | TL074ACDR | |
| | | SOP (PS) | Reel of 2000 | TL072ACPSR | T072A | |
| | | SOP (NS) | Reel of 2000 | TL074ACNSR | TL074A | |
| | | 3 mV | PDIP (P) | Tube of 50 | TL071BCP | TL071BCP |
| | | | | Tube of 50 | TL072BCP | TL072BCP |
| | | | PDIP (N) | Tube of 25 | TL074BCN | TL074BCN |
| | | | SOIC (D) | Tube of 75 | TL071BCD | 071BC |
| Reel of 2500 | TL071BCDR | | | | | |
| Tube of 75 | TL072BCD | | | 072BC | | |
| | Reel of 2500 | | | | TL072BCDR | |
| Tube of 50 | TL074BCD | | TL074BC | | | |
| | Reel of 2500 | | | TL074BCDR | | |
| SOP (NS) | Reel of 2000 | | TL074BCNSR | TL074B | | |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

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SLOS080J – SEPTEMBER 1978 – REVISED MARCH 2005

description/ordering information (continued)

ORDERING INFORMATION

| T_A | V_{IOmax} AT 25°C | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------------------|-----------|--------------|--------------------------|---------------------|
| -40°C to 85°C | 6 mV | PDIP (P) | Tube of 50 | TL071IP | TL071IP |
| | | | Tube of 50 | TL072IP | TL072IP |
| | | PDIP (N) | Tube of 25 | TL074IN | TL074IN |
| | | SOIC (D) | Tube of 75 | TL071ID | TL071I |
| | | | Reel of 2500 | TL071IDR | |
| | | | Tube of 75 | TL072ID | TL072I |
| | | | Reel of 2500 | TL072IDR | |
| | | | Tube of 50 | TL074ID | TL074I |
| Reel of 2500 | TL074IDR | | | | |
| -55°C to 125°C | 6 mV | CDIP (JG) | Tube of 50 | TL072MJGB | TL072MJGB |
| | | CFP (U) | Tube of 150 | TL072MUB | TL072MUB |
| | | LCCC (FK) | Tube of 55 | TL072MFKB | TL072MFKB |
| | 9 mV | CDIP (J) | Tube of 25 | TL074MJB | TL074MJB |
| | | CFP (W) | Tube of 25 | TL074MWB | TL074MWB |
| | | LCCC (FK) | Tube of 55 | TL074MFKB | TL074MFKB |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

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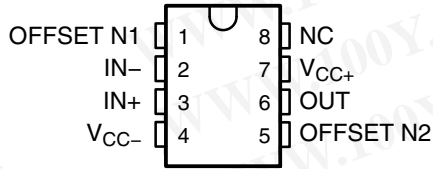


TL071, TL071A, TL071B, TL072 TL072A, TL072B, TL074, TL074A, TL074B

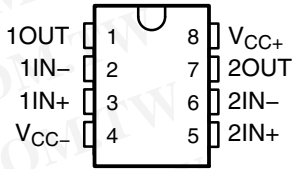
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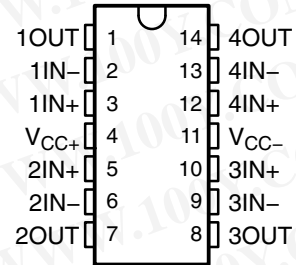
TL071, TL071A, TL071B
D, P, OR PS PACKAGE
(TOP VIEW)



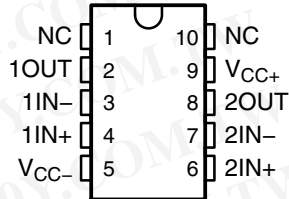
TL072, TL072A, TL072B
D, JG, P, PS, OR PW PACKAGE
(TOP VIEW)



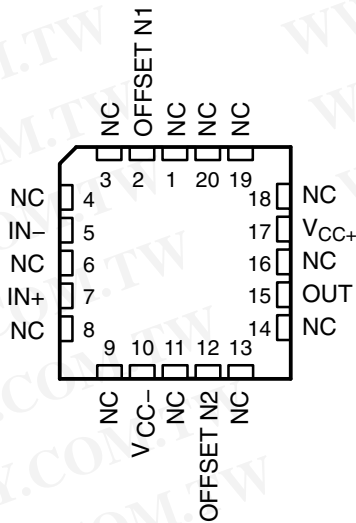
TL074A, TL074B
D, J, N, NS, OR PW PACKAGE
TL074 . . . D, J, N, NS, PW,
OR W PACKAGE
(TOP VIEW)



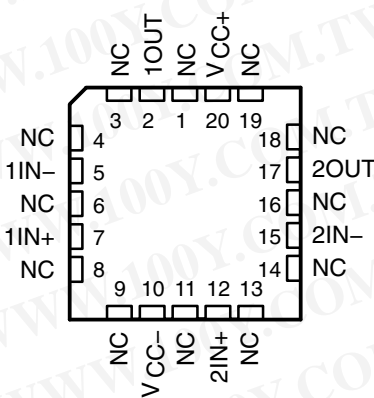
TL072
U PACKAGE
(TOP VIEW)



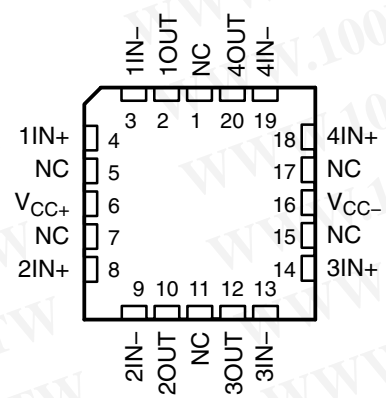
TL071
FK PACKAGE
(TOP VIEW)



TL072
FK PACKAGE
(TOP VIEW)

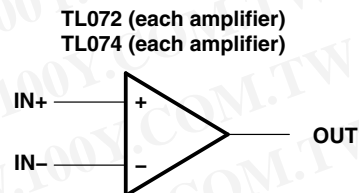
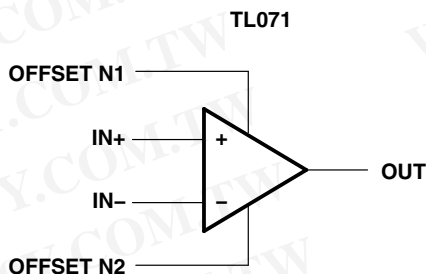


TL074
FK PACKAGE
(TOP VIEW)



NC – No internal connection

symbols

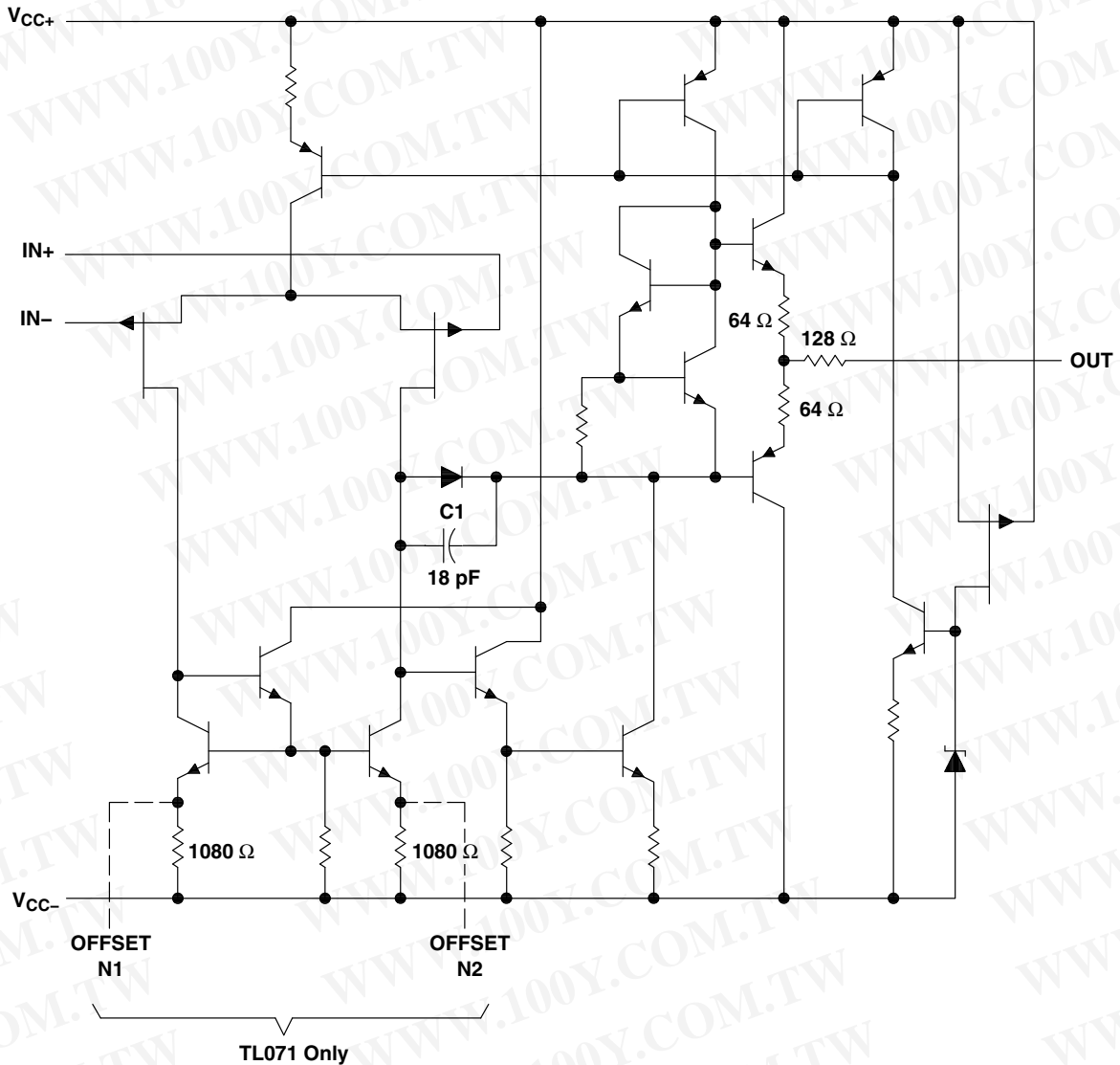


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 LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080J – SEPTEMBER 1978 – REVISED MARCH 2005

schematic (each amplifier)



All component values shown are nominal.

| COMPONENT COUNT† | | | |
|------------------|-------|-------|-------|
| COMPONENT TYPE | TL071 | TL072 | TL074 |
| Resistors | 11 | 22 | 44 |
| Transistors | 14 | 28 | 56 |
| JFET | 2 | 4 | 6 |
| Diodes | 1 | 2 | 4 |
| Capacitors | 1 | 2 | 4 |
| epi-FET | 1 | 2 | 4 |

† Includes bias and trim circuitry

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

| | |
|---|----------------|
| Supply voltage (see Note 1): V_{CC+} | 18 V |
| V_{CC-} | -18 V |
| Differential input voltage, V_{ID} (see Note 2) | ± 30 V |
| Input voltage, V_I (see Notes 1 and 3) | ± 15 V |
| Duration of output short circuit (see Note 4) | Unlimited |
| Package thermal impedance, θ_{JA} (see Notes 5 and 6): | |
| D package (8 pin) | 97°C/W |
| D package (14 pin) | 86°C/W |
| N package | 80°C/W |
| NS package | 76°C/W |
| P package | 85°C/W |
| PS package | 95°C/W |
| PW package (8 pin) | 149°C/W |
| PW package (14 pin) | 113°C/W |
| U package | 185°C/W |
| Package thermal impedance, θ_{JC} (see Notes 7 and 8): | |
| FK package | 5.61°C/W |
| J package | 15.05°C/W |
| JG package | 14.5°C/W |
| W package | 14.65°C/W |
| Operating virtual junction temperature, T_J | 150°C |
| Case temperature for 60 seconds: FK package | 260°C |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: J, JG, or W package | 300°C |
| Storage temperature range, T_{stg} | -65°C to 150°C |

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES:
1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC-} .
 2. Differential voltages are at $IN+$, with respect to $IN-$.
 3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
 4. The output may be shorted to ground or to either supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.
 5. Maximum power dissipation is a function of $T_J(\max)$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\max) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 6. The package thermal impedance is calculated in accordance with JESD 51-7.
 7. Maximum power dissipation is a function of $T_J(\max)$, θ_{JC} , and T_C . The maximum allowable power dissipation at any allowable case temperature is $P_D = (T_J(\max) - T_C)/\theta_{JC}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
 8. The package thermal impedance is calculated in accordance with MIL-STD-883.

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electrical characteristics, $V_{CC\pm} = \pm 15\text{ V}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS† | T_A ‡ | TL071C TL072C TL074C | | | TL071AC TL072AC TL074AC | | | TL071BC TL072BC TL074BC | | | TL0711 TL0721 TL0741 | | | UNIT |
|---|--|------------|----------------------------|------------|-----|-------------------------------|------------|-----|-------------------------------|------------|-----|----------------------------|------------|------|------------------------------|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_{IO} Input offset voltage | $V_O = 0, R_S = 50\ \Omega$ | 25°C | 3 10 | | | 3 6 | | | 2 3 | | | 3 6 | | | mV |
| | | Full range | 13 | | | 7.5 | | | 5 | | | 8 | | | |
| αV_{IO} Temperature coefficient of input offset voltage | $V_O = 0, R_S = 50\ \Omega$ | Full range | 18 | | | 18 | | | 18 | | | 18 | | | $\mu\text{V}/^\circ\text{C}$ |
| I_{IO} Input offset current | $V_O = 0$ | 25°C | 5 100 | | | 5 100 | | | 5 100 | | | 5 100 | | | pA |
| | | Full range | 10 | | | 2 | | | 2 | | | 2 | | | nA |
| I_{IB} Input bias currents§ | $V_O = 0$ | 25°C | 65 200 | | | 65 200 | | | 65 200 | | | 65 200 | | | pA |
| | | Full range | 7 | | | 7 | | | 7 | | | 20 | | | nA |
| V_{ICR} Common-mode input voltage range | | 25°C | ± 11 | -12 to 15 | | ± 11 | -12 to 15 | | ± 11 | -12 to 15 | | ± 11 | -12 to 15 | V | |
| V_{OM} Maximum peak output voltage swing | $R_L = 10\ \text{k}\Omega$ | 25°C | ± 12 | ± 13.5 | | ± 12 | ± 13.5 | | ± 12 | ± 13.5 | | ± 12 | ± 13.5 | V | |
| | $R_L \geq 10\ \text{k}\Omega$ | Full range | ± 12 | | | ± 12 | | | ± 12 | | | ± 12 | | | |
| | $R_L \geq 2\ \text{k}\Omega$ | | ± 10 | | | ± 10 | | | ± 10 | | | ± 10 | | | |
| A_{VD} Large-signal differential voltage amplification | $V_O = \pm 10\ \text{V}, R_L \geq 2\ \text{k}\Omega$ | 25°C | 25 | 200 | | 50 | 200 | | 50 | 200 | | 50 | 200 | V/mV | |
| | | Full range | 15 | | | 25 | | | 25 | | | 25 | | | |
| B_1 Unity-gain bandwidth | | 25°C | 3 | | | 3 | | | 3 | | | 3 | | | MHz |
| r_i Input resistance | | 25°C | 10^{12} | | | 10^{12} | | | 10^{12} | | | 10^{12} | | | Ω |
| CMRR Common-mode rejection ratio | $V_{IC} = V_{ICR\min}, V_O = 0, R_S = 50\ \Omega$ | 25°C | 70 | 100 | | 75 | 100 | | 75 | 100 | | 75 | 100 | dB | |
| k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC} = \pm 9\ \text{V to } \pm 15\ \text{V}, V_O = 0, R_S = 50\ \Omega$ | 25°C | 70 | 100 | | 80 | 100 | | 80 | 100 | | 80 | 100 | dB | |
| I_{CC} Supply current (each amplifier) | $V_O = 0, \text{ No load}$ | 25°C | 1.4 | 2.5 | | 1.4 | 2.5 | | 1.4 | 2.5 | | 1.4 | 2.5 | mA | |
| V_{O1}/V_{O2} Crosstalk attenuation | $A_{VD} = 100$ | 25°C | 120 | | | 120 | | | 120 | | | 120 | | | dB |

† All characteristics are measured under open-loop conditions with zero common-mode voltage, unless otherwise specified.

‡ Full range is $T_A = 0^\circ\text{C to } 70^\circ\text{C}$ for TL07_C, TL07_AC, TL07_BC and is $T_A = -40^\circ\text{C to } 85^\circ\text{C}$ for TL07_I.

§ Input bias currents of an FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive, as shown in Figure 4. Pulse techniques must be used that maintain the junction temperature as close to the ambient temperature as possible.

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TL072A, TL072B, TL074, TL074A, TL074B
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SLOS080J – SEPTEMBER 1978 – REVISED MARCH 2005

electrical characteristics, $V_{CC\pm} = \pm 15\text{ V}$ (unless otherwise noted)

| PARAMETER | TEST CONDITIONS† | T_A ‡ | TL071M TL072M | | | TL074M | | | UNIT |
|---|--|------------|------------------|------------|-----|-----------|------------|------------------------------|------|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_{IO} Input offset voltage | $V_O = 0, R_S = 50\ \Omega$ | 25°C | 3 | 6 | | 3 | 9 | mV | |
| | | Full range | | | 9 | | 15 | | |
| $\alpha_{V_{IO}}$ Temperature coefficient of input offset voltage | $V_O = 0, R_S = 50\ \Omega$ | Full range | 18 | | | 18 | | $\mu\text{V}/^\circ\text{C}$ | |
| I_{IO} Input offset current | $V_O = 0$ | 25°C | 5 | 100 | | 5 | 100 | pA | |
| | | Full range | | | 20 | | 20 | nA | |
| I_{IB} Input bias current‡ | $V_O = 0$ | 25°C | 65 | 200 | | 65 | 200 | pA | |
| | | Full range | | | 50 | | 50 | nA | |
| V_{ICR} Common-mode input voltage range | | 25°C | ± 11 | -12 to 15 | | ± 11 | -12 to 15 | V | |
| V_{OM} Maximum peak output voltage swing | $R_L = 10\ \text{k}\Omega$ | 25°C | ± 12 | ± 13.5 | | ± 12 | ± 13.5 | V | |
| | $R_L \geq 10\ \text{k}\Omega$ | Full range | ± 12 | | | ± 12 | | | |
| | $R_L \geq 2\ \text{k}\Omega$ | Full range | ± 10 | | | ± 10 | | | |
| A_{VD} Large-signal differential voltage amplification | $V_O = \pm 10\ \text{V}, R_L \geq 2\ \text{k}\Omega$ | 25°C | 35 | 200 | | 35 | 200 | V/mV | |
| | | Full range | 15 | | | 15 | | | |
| B_1 Unity-gain bandwidth | $T_A = 25^\circ\text{C}$ | | 3 | | | 3 | | MHz | |
| r_i Input resistance | $T_A = 25^\circ\text{C}$ | | 10^{12} | | | 10^{12} | | Ω | |
| CMRR Common-mode rejection ratio | $V_{IC} = V_{ICR\text{min}}, V_O = 0, R_S = 50\ \Omega$ | 25°C | 80 | 86 | | 80 | 86 | dB | |
| k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$) | $V_{CC} = \pm 9\ \text{V to } \pm 15\ \text{V}, V_O = 0, R_S = 50\ \Omega$ | 25°C | 80 | 86 | | 80 | 86 | dB | |
| I_{CC} Supply current (each amplifier) | $V_O = 0, \text{ No load}$ | 25°C | 1.4 | 2.5 | | 1.4 | 2.5 | mA | |
| V_{O1}/V_{O2} Crosstalk attenuation | $A_{VD} = 100$ | 25°C | 120 | | | 120 | | dB | |

† Input bias currents of an FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive, as shown in Figure 4. Pulse techniques must be used that will maintain the junction temperature as close to the ambient temperature as possible.

‡ All characteristics are measured under open-loop conditions with zero common-mode voltage, unless otherwise specified. Full range is $T_A = -55^\circ\text{C to } 125^\circ\text{C}$.

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SLOS080J – SEPTEMBER 1978 – REVISED MARCH 2005

operating characteristics, $V_{CC\pm} = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TL07xM | | | ALL OTHERS | | | UNIT |
|-----------|---|---------------------|-----|-----|------------|-----|-----|------------------------------|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| SR | Slew rate at unity gain $V_I = 10\text{ V}$, $C_L = 100\text{ pF}$, $R_L = 2\text{ k}\Omega$, See Figure 1 | 5 | 13 | | 8 | 13 | | $\text{V}/\mu\text{s}$ |
| t_r | Rise-time overshoot factor $V_I = 20\text{ mV}$, $C_L = 100\text{ pF}$, $R_L = 2\text{ k}\Omega$, See Figure 1 | 0.1 | | | 0.1 | | | μs |
| | | 20% | | | 20% | | | |
| V_n | Equivalent input noise voltage $R_S = 20\ \Omega$ | f = 1 kHz | | | 18 | | | $\text{nV}/\sqrt{\text{Hz}}$ |
| | | f = 10 Hz to 10 kHz | | | 4 | | | μV |
| I_n | Equivalent input noise current $R_S = 20\ \Omega$, f = 1 kHz | 0.01 | | | 0.01 | | | $\text{pA}/\sqrt{\text{Hz}}$ |
| THD | Total harmonic distortion $V_{\text{rms}} = 6\text{ V}$, $R_L \geq 2\text{ k}\Omega$, f = 1 kHz | 0.003 % | | | 0.003% | | | |

PARAMETER MEASUREMENT INFORMATION

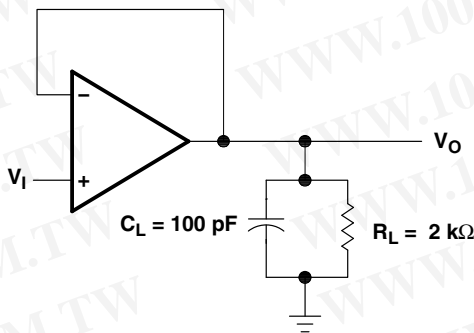


Figure 1. Unity-Gain Amplifier

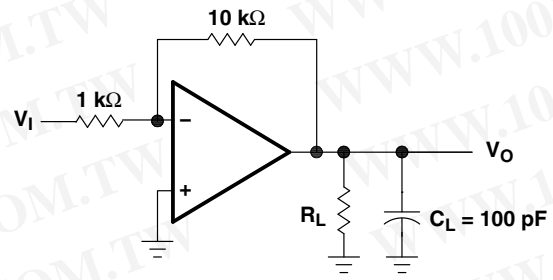


Figure 2. Gain-of-10 Inverting Amplifier

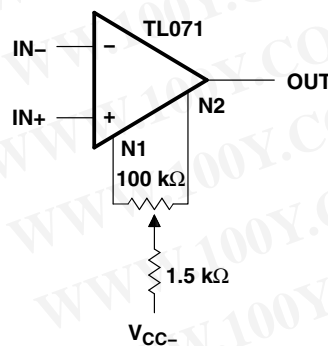


Figure 3. Input Offset-Voltage Null Circuit

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**TL071, TL071A, TL071B, TL072
TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS**

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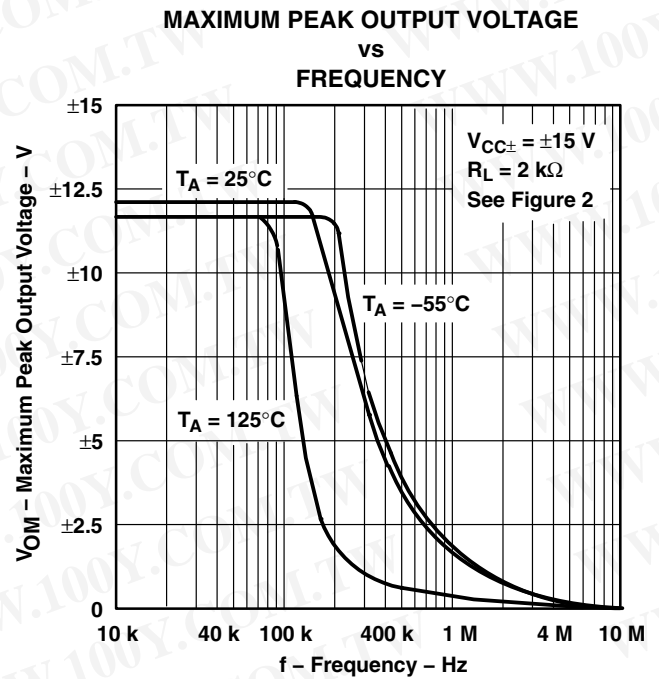
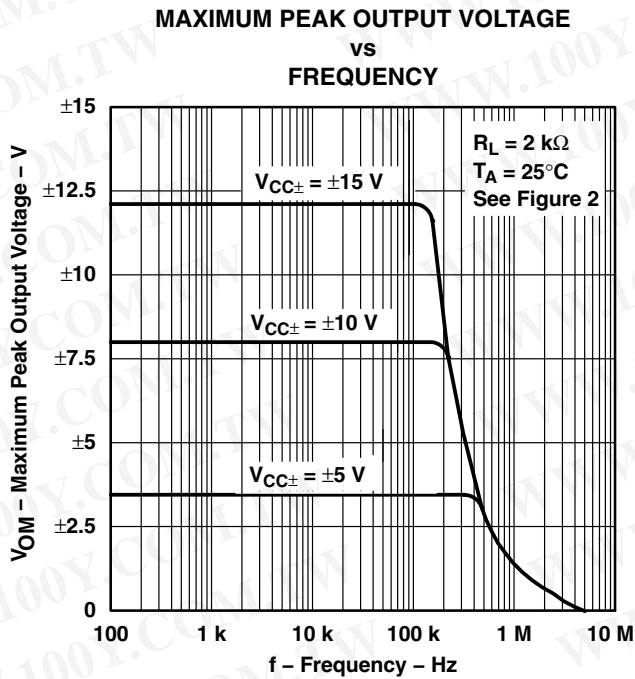
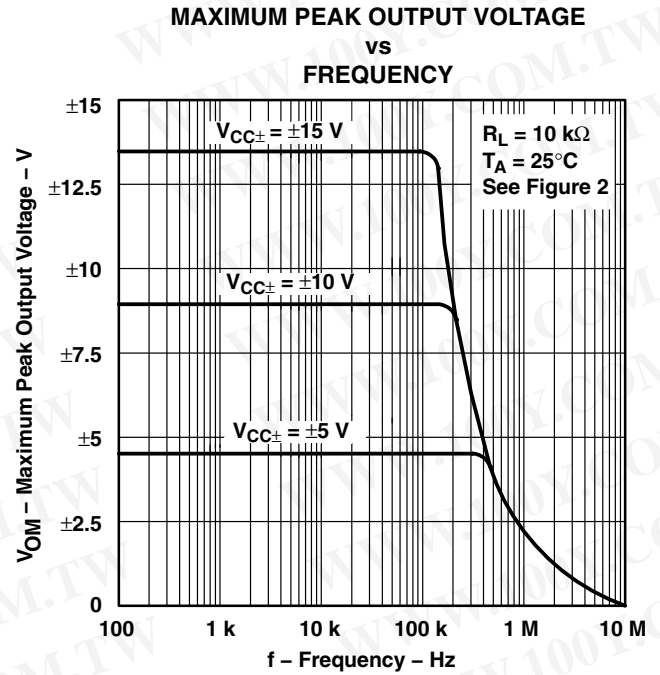
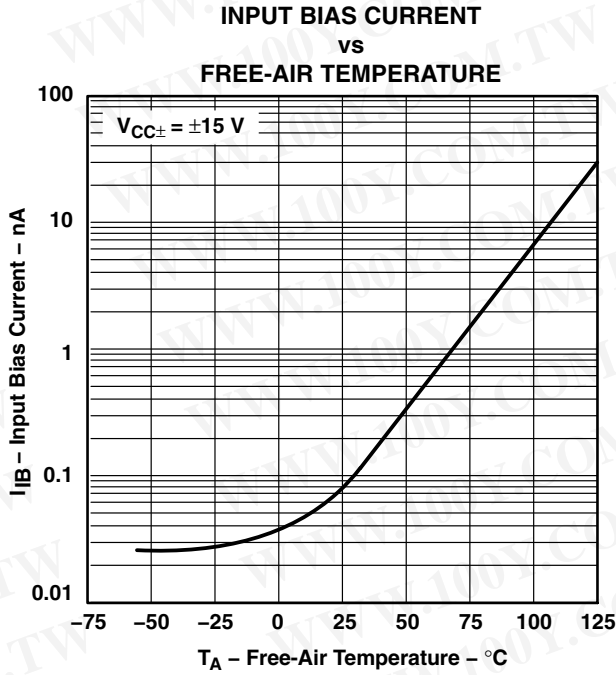
TYPICAL CHARACTERISTICS

Table of Graphs

| | | | FIGURE |
|----------|---|-----------------------------|-------------------------|
| I_{IB} | Input bias current | vs Free-air temperature | 4 |
| V_{OM} | Maximum output voltage | vs Frequency | 5, 6, 7 |
| | | vs Free-air temperature | 8 |
| | | vs Load resistance | 9 |
| | | vs Supply voltage | 10 |
| A_{VD} | Large-signal differential voltage amplification | vs Free-air temperature | 11 |
| | | vs Frequency | 12 |
| | Phase shift | vs Frequency | 12 |
| | Normalized unity-gain bandwidth | vs Free-air temperature | 13 |
| | Normalized phase shift | vs Free-air temperature | 13 |
| $CMRR$ | Common-mode rejection ratio | vs Free-air temperature | 14 |
| I_{CC} | Supply current | vs Supply voltage | 15 |
| | | vs Free-air temperature | 16 |
| P_D | Total power dissipation | vs Free-air temperature | 17 |
| | | Normalized slew rate | vs Free-air temperature |
| V_n | Equivalent input noise voltage | vs Frequency | 19 |
| THD | Total harmonic distortion | vs Frequency | 20 |
| | | Large-signal pulse response | vs Time |
| V_O | Output voltage | vs Elapsed time | 22 |

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TYPICAL CHARACTERISTICS†



† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TL071, TL071A, TL071B, TL072
 TL072A, TL072B, TL074, TL074A, TL074B
 LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

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TYPICAL CHARACTERISTICS†

MAXIMUM PEAK OUTPUT VOLTAGE
 vs
 FREE-AIR TEMPERATURE

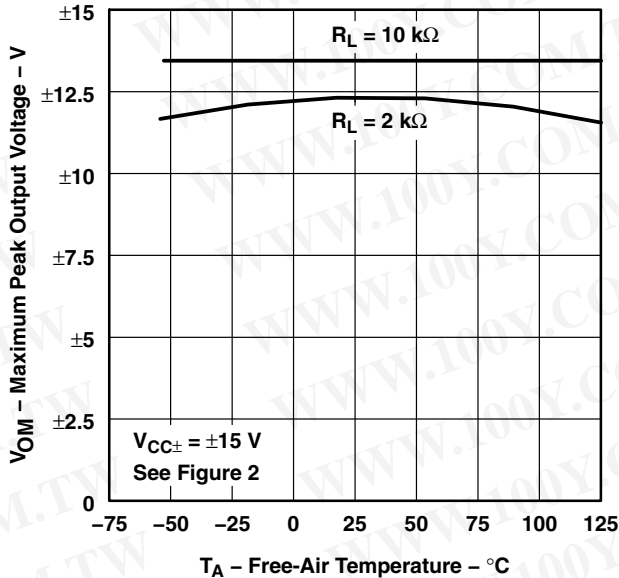


Figure 8

MAXIMUM PEAK OUTPUT VOLTAGE
 vs
 LOAD RESISTANCE

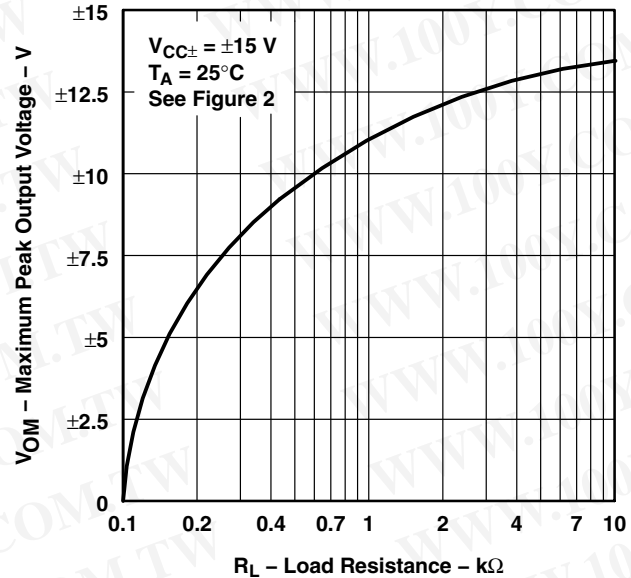


Figure 9

MAXIMUM PEAK OUTPUT VOLTAGE
 vs
 SUPPLY VOLTAGE

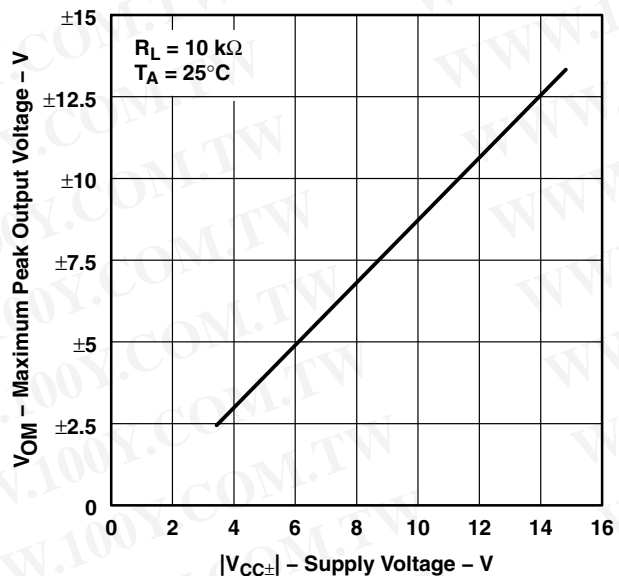


Figure 10

LARGE-SIGNAL
 DIFFERENTIAL VOLTAGE AMPLIFICATION
 vs
 FREE-AIR TEMPERATURE

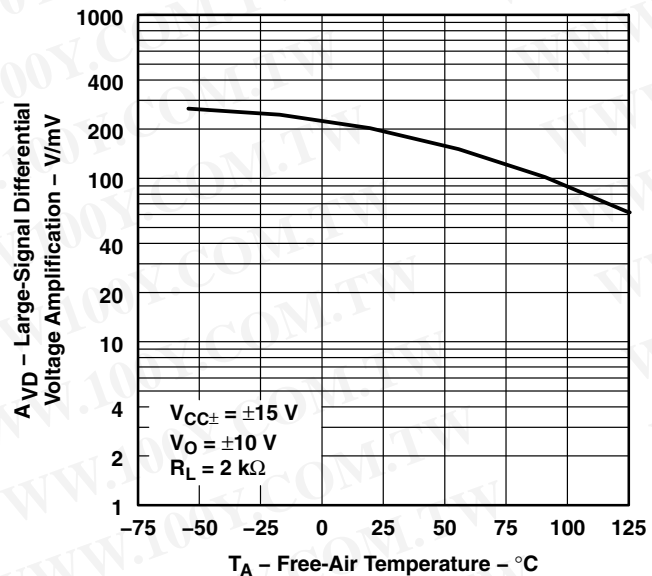


Figure 11

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



TL071, TL071A, TL071B, TL072
 TL072A, TL072B, TL074, TL074A, TL074B
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TYPICAL CHARACTERISTICS†
LARGE-SIGNAL
DIFFERENTIAL VOLTAGE AMPLIFICATION
AND PHASE SHIFT
VS
FREQUENCY

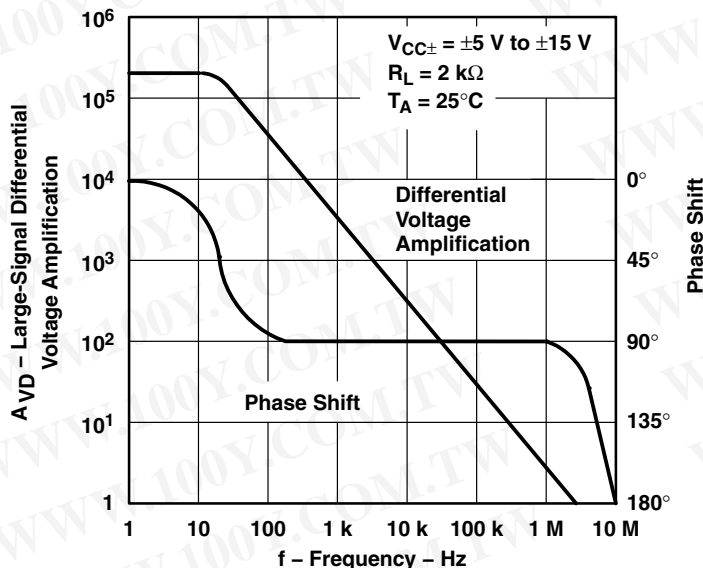


Figure 12

NORMALIZED UNITY-GAIN BANDWIDTH
AND PHASE SHIFT
VS
FREE-AIR TEMPERATURE

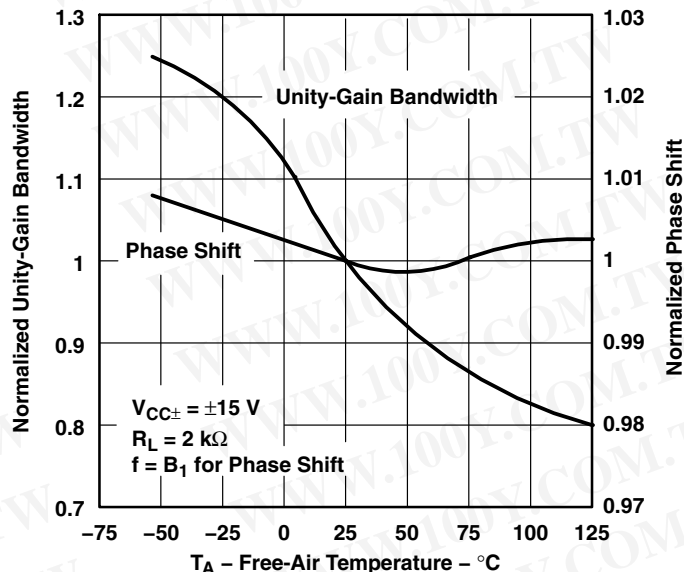


Figure 13

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

**TL071, TL071A, TL071B, TL072
TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS**

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TYPICAL CHARACTERISTICS†

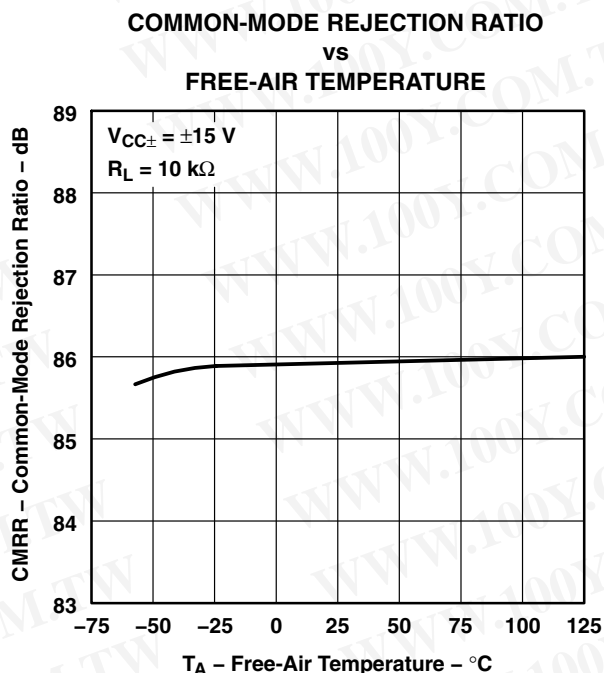


Figure 14

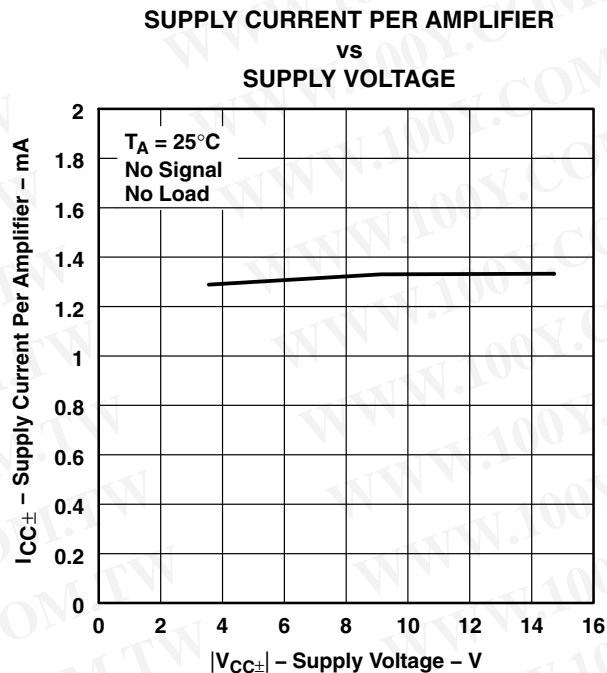


Figure 15

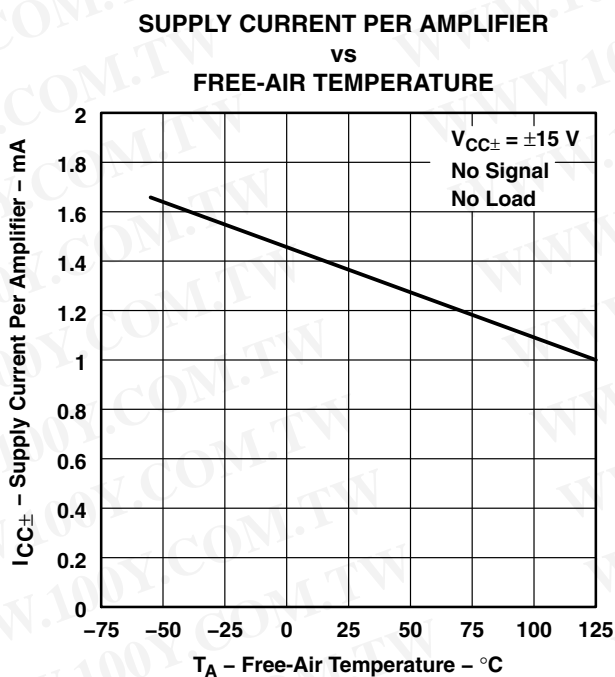


Figure 16

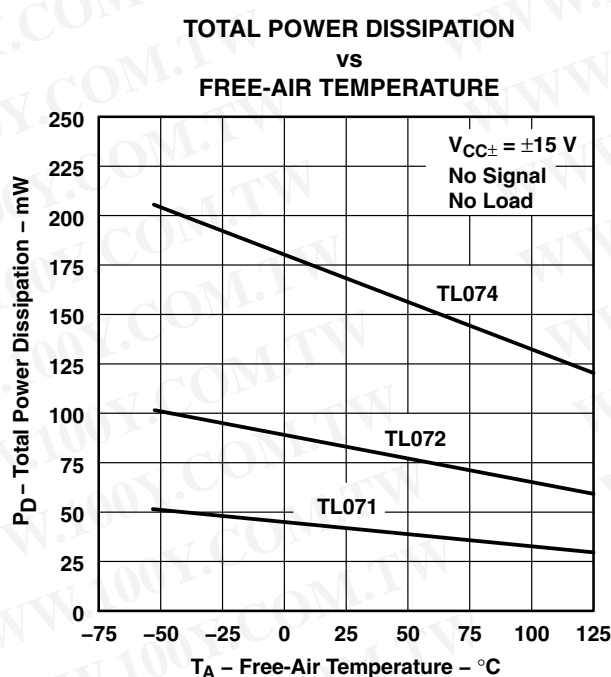


Figure 17

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



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TL071, TL071A, TL071B, TL072
 TL072A, TL072B, TL074, TL074A, TL074B
 LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

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TYPICAL CHARACTERISTICS

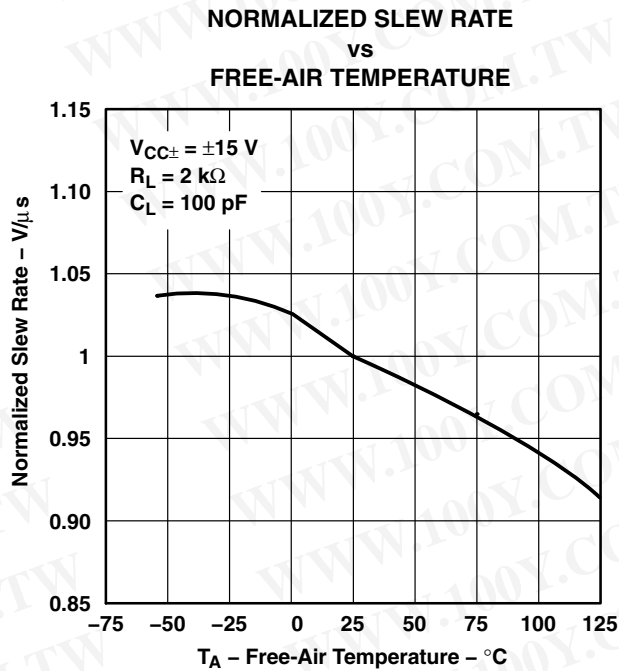


Figure 18

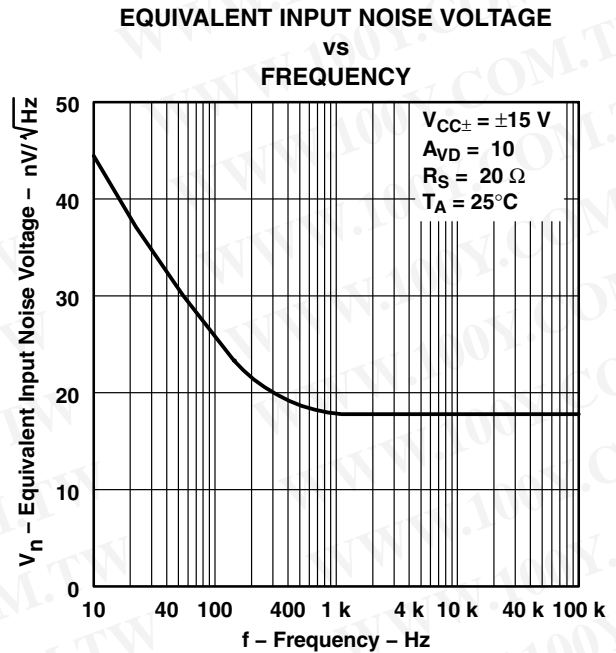


Figure 19

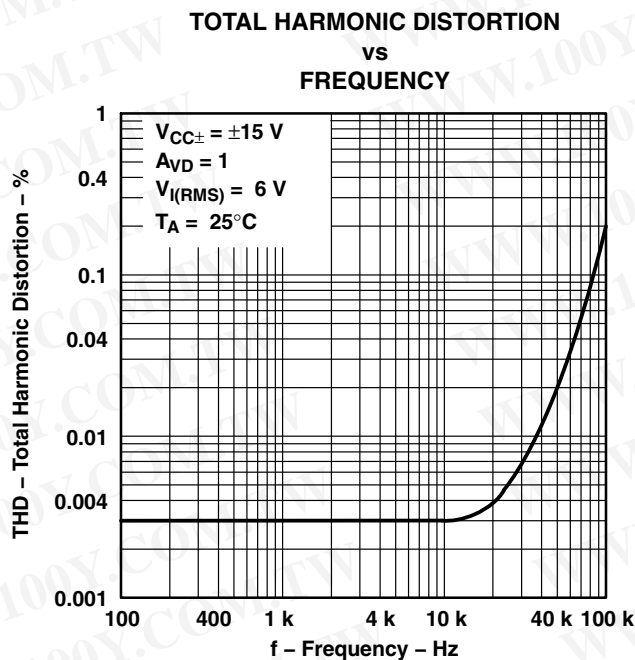


Figure 20

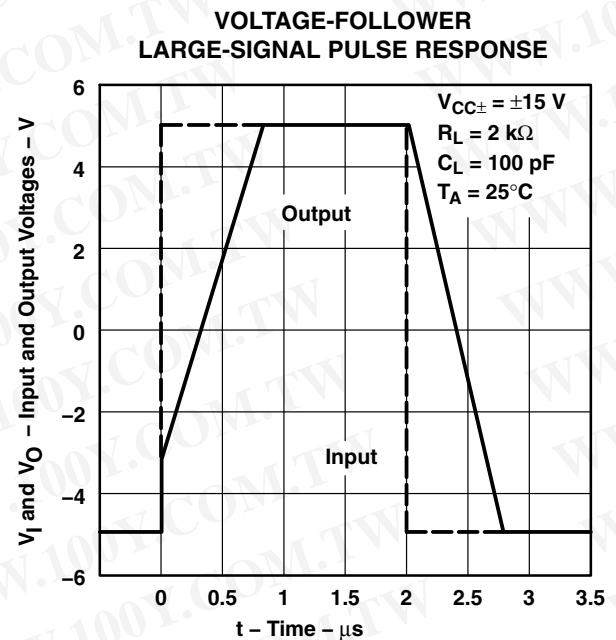


Figure 21

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TYPICAL CHARACTERISTICS

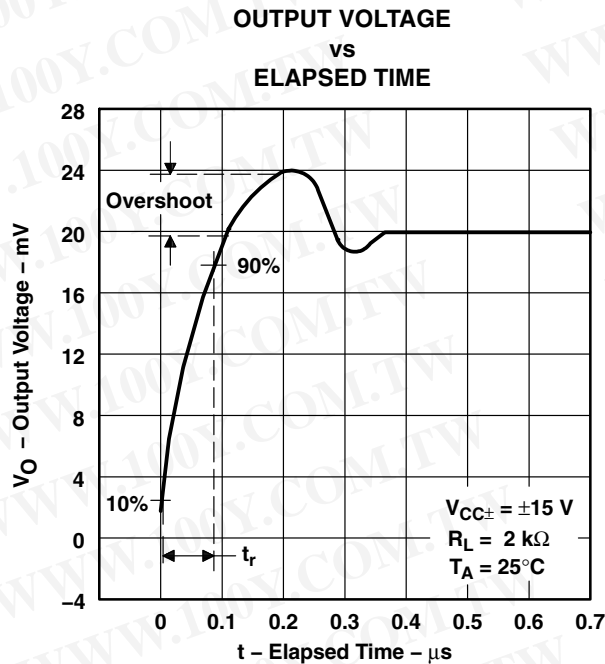


Figure 22

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TL071, TL071A, TL071B, TL072 TL072A, TL072B, TL074, TL074A, TL074B LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080J – SEPTEMBER 1978 – REVISED MARCH 2005

APPLICATION INFORMATION

Table of Application Diagrams

| APPLICATION DIAGRAM | PART NUMBER | FIGURE |
|-------------------------------|-------------|--------|
| 0.5-Hz square-wave oscillator | TL071 | 23 |
| High-Q notch filter | TL071 | 24 |
| Audio-distribution amplifier | TL074 | 25 |
| 100-kHz quadrature oscillator | TL072 | 26 |
| AC amplifier | TL071 | 27 |

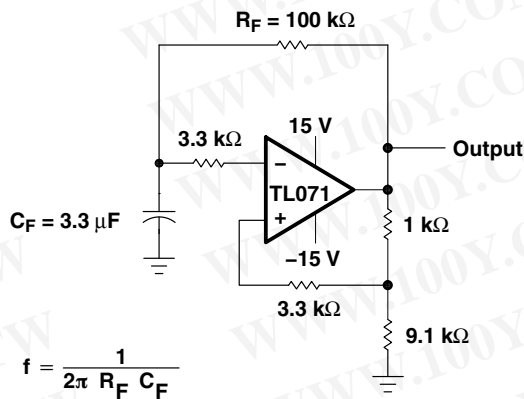


Figure 23. 0.5-Hz Square-Wave Oscillator

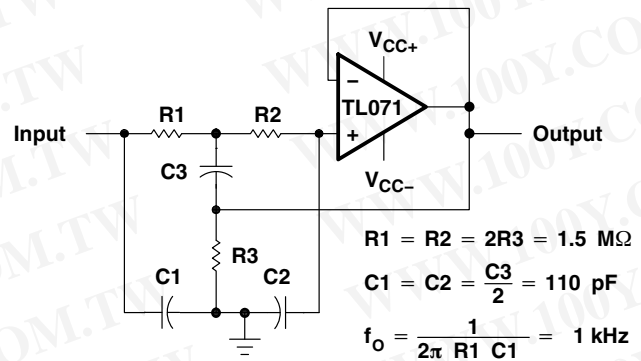


Figure 24. High-Q Notch Filter

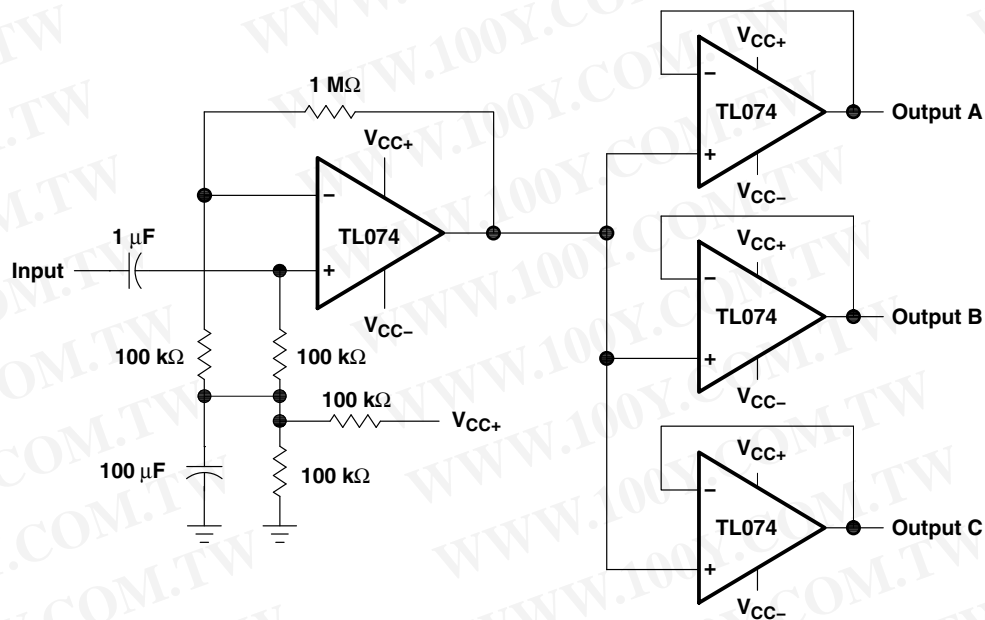


Figure 25. Audio-Distribution Amplifier

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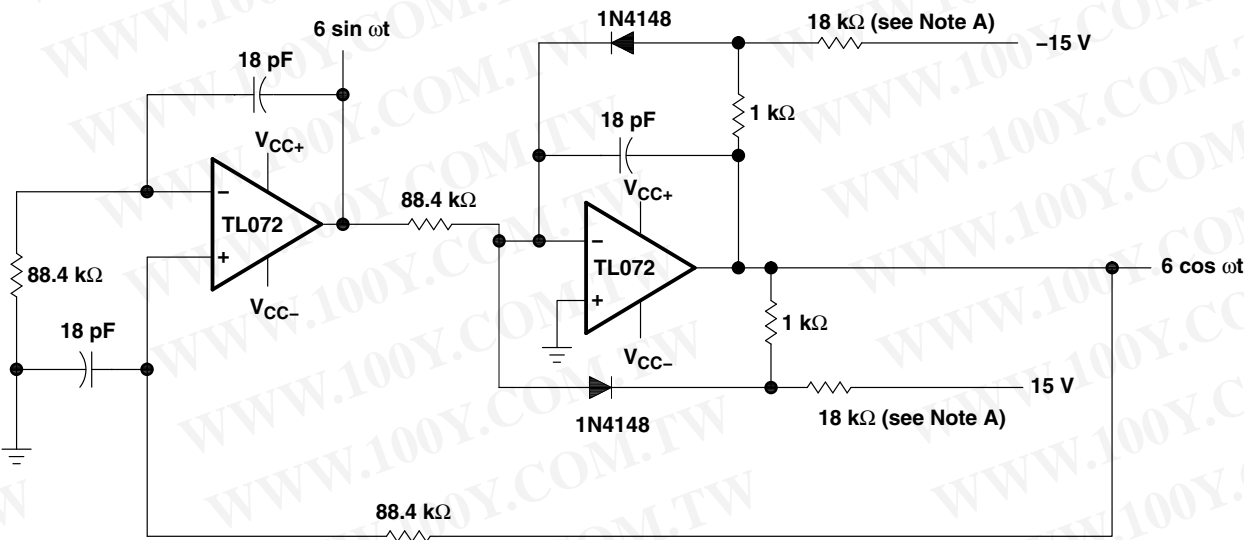
 **TEXAS
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**TL071, TL071A, TL071B, TL072
TL072A, TL072B, TL074, TL074A, TL074B
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APPLICATION INFORMATION



NOTE A: These resistor values may be adjusted for a symmetrical output.

Figure 26. 100-kHz Quadrature Oscillator

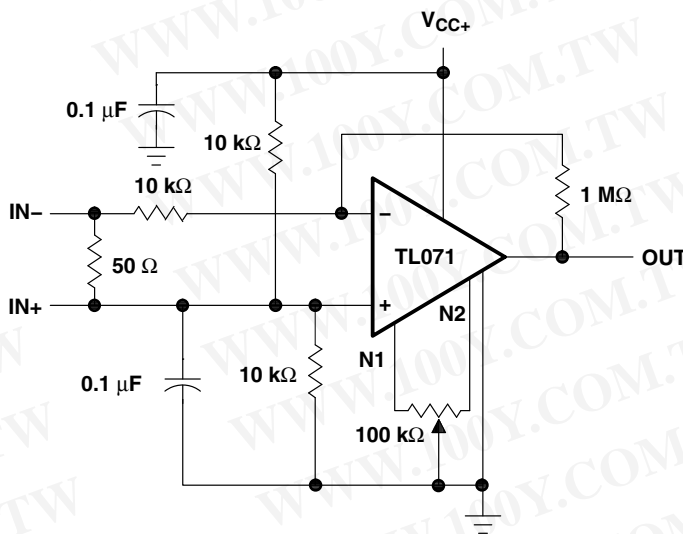


Figure 27. AC Amplifier

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PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|---------|
| 8102304HA | OBSOLETE | | | 10 | | TBD | Call TI | Call TI | -55 to 125 | | |
| 81023052A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 81023052A TL072MFKB | Samples |
| 8102305HA | ACTIVE | CFP | U | 10 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102305HA TL072M | Samples |
| 8102305PA | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102305PA TL072M | Samples |
| 81023062A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 81023062A TL074MFKB | Samples |
| 8102306CA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102306CA TL074MJB | Samples |
| 8102306DA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102306DA TL074MWB | Samples |
| JM38510/11905BPA | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510 /11905BPA | Samples |
| JM38510/11906BCA | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | -55 to 125 | | |
| M38510/11905BPA | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | JM38510 /11905BPA | Samples |
| TL071-W | ACTIVE | WAFERSALE | YS | 0 | | TBD | Call TI | Call TI | | | Samples |
| TL071ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071AC | Samples |
| TL071ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071AC | Samples |
| TL071ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071AC | Samples |
| TL071ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071AC | Samples |
| TL071ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071AC | Samples |
| TL071ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071AC | Samples |
| TL071ACP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL071ACP | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL071ACPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL071ACP | Samples |
| TL071BCD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071BC | Samples |
| TL071BCDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071BC | Samples |
| TL071BCDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071BC | Samples |
| TL071BCDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071BC | Samples |
| TL071BCDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071BC | Samples |
| TL071BCDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 071BC | Samples |
| TL071BCP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL071BCP | Samples |
| TL071BCPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL071BCP | Samples |
| TL071CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL071C | Samples |
| TL071CDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL071C | Samples |
| TL071CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL071C | Samples |
| TL071CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL071C | Samples |
| TL071CDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL071C | Samples |
| TL071CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL071C | Samples |
| TL071CP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL071CP | Samples |
| TL071CPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL071CP | Samples |
| TL071CPSR | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T071 | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL071CPSRE4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T071 | Samples |
| TL071CPSRG4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T071 | Samples |
| TL071CPWLE | OBSOLETE | TSSOP | PW | 8 | | TBD | Call TI | Call TI | 0 to 70 | | |
| TL071ID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL071I | Samples |
| TL071IDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL071I | Samples |
| TL071IDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL071I | Samples |
| TL071IDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL071I | Samples |
| TL071IDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL071I | Samples |
| TL071IDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL071I | Samples |
| TL071IJG | OBSOLETE | CDIP | JG | 8 | | TBD | Call TI | Call TI | -40 to 85 | | |
| TL071IP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TL071IP | Samples |
| TL071IPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TL071IP | Samples |
| TL071MFKB | OBSOLETE | LCCC | FK | 20 | | TBD | Call TI | Call TI | -55 to 125 | | |
| TL071MJG | OBSOLETE | CDIP | JG | 8 | | TBD | Call TI | Call TI | -55 to 125 | | |
| TL071MJGB | OBSOLETE | CDIP | JG | 8 | | TBD | Call TI | Call TI | -55 to 125 | | |
| TL072ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072AC | Samples |
| TL072ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072AC | Samples |
| TL072ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072AC | Samples |
| TL072ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072AC | Samples |
| TL072ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072AC | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL072ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072AC | Samples |
| TL072ACJG | OBSOLETE | CDIP | JG | 8 | | TBD | Call TI | Call TI | 0 to 70 | | |
| TL072ACP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL072ACP | Samples |
| TL072ACPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL072ACP | Samples |
| TL072ACPSR | OBSOLETE | SO | PS | 8 | | TBD | Call TI | Call TI | 0 to 70 | T072A | |
| TL072ACPSRE4 | OBSOLETE | SO | PS | 8 | | TBD | Call TI | Call TI | 0 to 70 | | |
| TL072ACPSRG4 | OBSOLETE | SO | PS | 8 | | TBD | Call TI | Call TI | 0 to 70 | | |
| TL072BCD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072BC | Samples |
| TL072BCDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072BC | Samples |
| TL072BCDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072BC | Samples |
| TL072BCDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072BC | Samples |
| TL072BCDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072BC | Samples |
| TL072BCDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 072BC | Samples |
| TL072BCP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL072BCP | Samples |
| TL072BCPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL072BCP | Samples |
| TL072CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL072C | Samples |
| TL072CDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL072C | Samples |
| TL072CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL072C | Samples |
| TL072CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL072C | Samples |
| TL072CDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL072C | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL072CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL072C | Samples |
| TL072CP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL072CP | Samples |
| TL072CPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL072CP | Samples |
| TL072CPSLE | OBSOLETE | SO | PS | 8 | | TBD | Call TI | Call TI | 0 to 70 | | |
| TL072CPSR | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T072 | Samples |
| TL072CPSRE4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T072 | Samples |
| TL072CPSRG4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T072 | Samples |
| TL072CPWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T072 | Samples |
| TL072CPWRE4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T072 | Samples |
| TL072CPWRG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T072 | Samples |
| TL072ID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL072I | Samples |
| TL072IDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL072I | Samples |
| TL072IDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL072I | Samples |
| TL072IDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL072I | Samples |
| TL072IDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL072I | Samples |
| TL072IDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL072I | Samples |
| TL072IP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TL072IP | Samples |
| TL072IPE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TL072IP | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL072MFKB | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 81023052A TL072MFKB | Samples |
| TL072MJG | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | TL072MJG | Samples |
| TL072MJGB | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102305PA TL072M | Samples |
| TL072MUB | ACTIVE | CFP | U | 10 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102305HA TL072M | Samples |
| TL074ACD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074AC | Samples |
| TL074ACDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074AC | Samples |
| TL074ACDG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074AC | Samples |
| TL074ACDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074AC | Samples |
| TL074ACDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074AC | Samples |
| TL074ACDRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074AC | Samples |
| TL074ACJ | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| TL074ACN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL074ACN | Samples |
| TL074ACNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL074ACN | Samples |
| TL074ACNSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074A | Samples |
| TL074ACNSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074A | Samples |
| TL074ACNSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074A | Samples |
| TL074BCD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074BC | Samples |
| TL074BCDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074BC | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL074BCDG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074BC | Samples |
| TL074BCDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074BC | Samples |
| TL074BCDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074BC | Samples |
| TL074BCDRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074BC | Samples |
| TL074BCN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL074BCN | Samples |
| TL074BCNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL074BCN | Samples |
| TL074CD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074C | Samples |
| TL074CDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074C | Samples |
| TL074CDG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074C | Samples |
| TL074CDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU CU SN | Level-1-260C-UNLIM | 0 to 70 | TL074C | Samples |
| TL074CDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074C | Samples |
| TL074CDRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074C | Samples |
| TL074CN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL074CN | Samples |
| TL074CNE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | TL074CN | Samples |
| TL074CNSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074 | Samples |
| TL074CNSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074 | Samples |
| TL074CNSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | TL074 | Samples |
| TL074CPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T074 | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| TL074CPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T074 | Samples |
| TL074CPWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T074 | Samples |
| TL074CPWLE | OBSOLETE | TSSOP | PW | 14 | | TBD | Call TI | Call TI | 0 to 70 | | |
| TL074CPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T074 | Samples |
| TL074CPWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T074 | Samples |
| TL074CPWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | T074 | Samples |
| TL074ID | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL074I | Samples |
| TL074IDE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL074I | Samples |
| TL074IDG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL074I | Samples |
| TL074IDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL074I | Samples |
| TL074IDRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL074I | Samples |
| TL074IDRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | TL074I | Samples |
| TL074IJ | OBSOLETE | CDIP | J | 14 | | TBD | Call TI | Call TI | -40 to 85 | | |
| TL074IN | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TL074IN | Samples |
| TL074INE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 85 | TL074IN | Samples |
| TL074MFK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | TL074MFK | Samples |
| TL074MFKB | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 81023062A TL074MFKB | Samples |
| TL074MJ | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | TL074MJ | Samples |
| TL074MJB | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102306CA TL074MJB | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|-----------------|-------------------------|----------------------|--------------|-------------------------|---------|
| TL074MWB | ACTIVE | CFP | W | 14 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8102306DA TL074MWB | Samples |
| TL081-W | ACTIVE | WAFERSALE | YS | 0 | | TBD | Call TI | Call TI | | | Samples |

(1) 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.

(2) 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)

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF TL072, TL072M, TL074, TL074M :

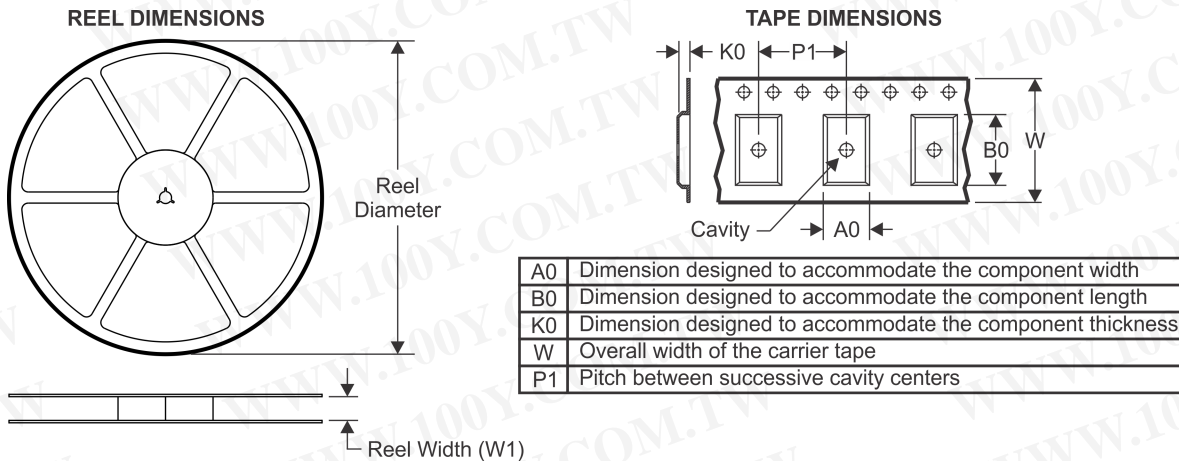
- Catalog: [TL072](#), [TL074](#)
- Enhanced Product: [TL072-EP](#), [TL072-EP](#), [TL074-EP](#), [TL074-EP](#)
- Military: [TL072M](#), [TL074M](#)

NOTE: Qualified Version Definitions:

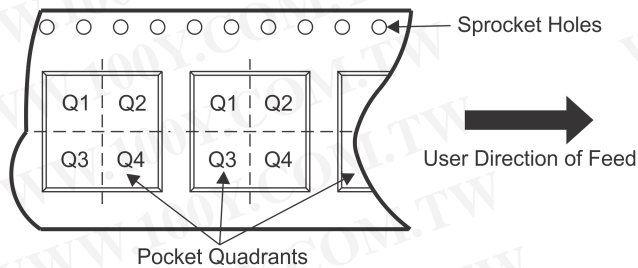
- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

勝特力材料 886-3-5753170
勝特力电子(上海) 86-21-34970699
勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

TAPE AND REEL INFORMATION



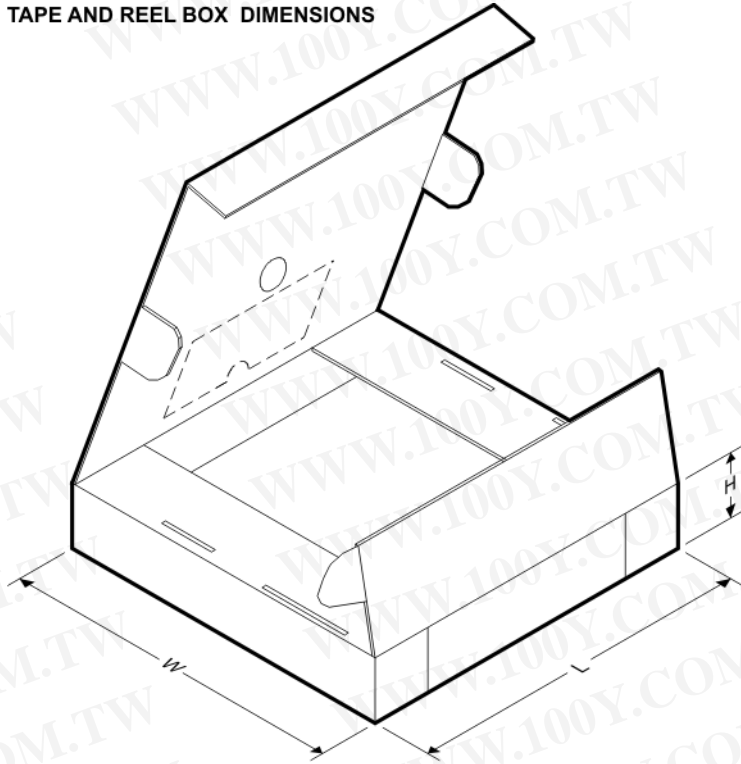
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-34970699
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

*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 |
|------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TL071ACDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL071BCDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL071CDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL071CDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL071CPSR | SO | PS | 8 | 2000 | 330.0 | 16.4 | 8.2 | 6.6 | 2.5 | 12.0 | 16.0 | Q1 |
| TL071IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL072ACDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL072BCDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL072CDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL072CPWR | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| TL072IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| TL074ACDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| TL074ACNSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| TL074BCDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| TL074CDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| TL074CDRG4 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| TL074CPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| TL074IDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


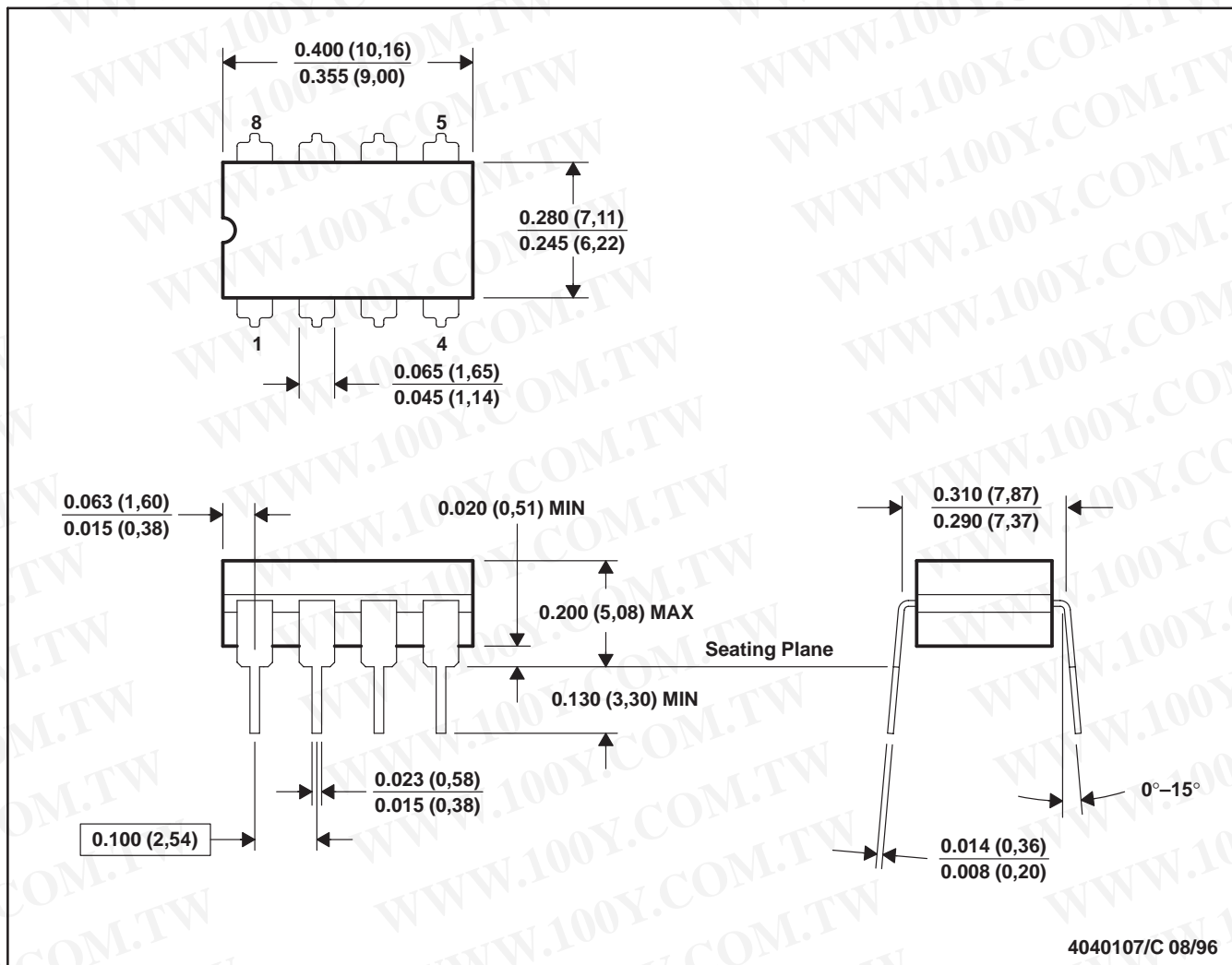
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勝特力电子(上海) 86-21-34970699
勝特力电子(深圳) 86-755-83298787
Http://www.100y.com.tw

*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TL071ACDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TL071BCDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TL071CDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TL071CDR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| TL071CPSR | SO | PS | 8 | 2000 | 367.0 | 367.0 | 38.0 |
| TL071IDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TL072ACDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TL072BCDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TL072CDR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| TL072CPWR | TSSOP | PW | 8 | 2000 | 367.0 | 367.0 | 35.0 |
| TL072IDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| TL074ACDR | SOIC | D | 14 | 2500 | 333.2 | 345.9 | 28.6 |
| TL074ACNSR | SO | NS | 14 | 2000 | 367.0 | 367.0 | 38.0 |
| TL074BCDR | SOIC | D | 14 | 2500 | 333.2 | 345.9 | 28.6 |
| TL074CDR | SOIC | D | 14 | 2500 | 333.2 | 345.9 | 28.6 |
| TL074CDRG4 | SOIC | D | 14 | 2500 | 333.2 | 345.9 | 28.6 |
| TL074CPWR | TSSOP | PW | 14 | 2000 | 367.0 | 367.0 | 35.0 |
| TL074IDR | SOIC | D | 14 | 2500 | 333.2 | 345.9 | 28.6 |

JG (R-GDIP-T8)

CERAMIC DUAL-IN-LINE



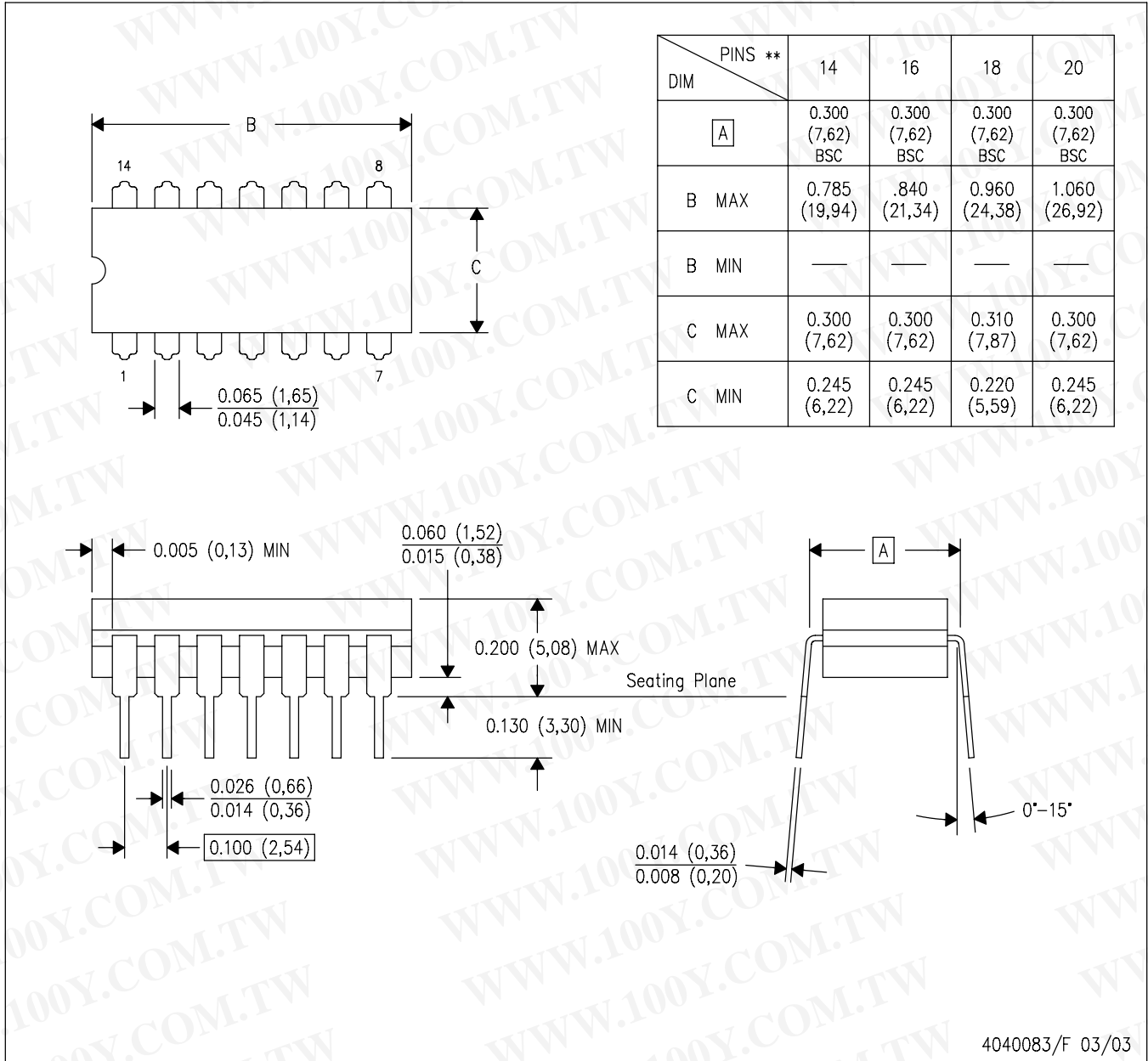
- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. This package can be hermetically sealed with a ceramic lid using glass frit.
 D. Index point is provided on cap for terminal identification.
 E. Falls within MIL STD 1835 GDIP1-T8

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J (R-GDIP-T**)
 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE

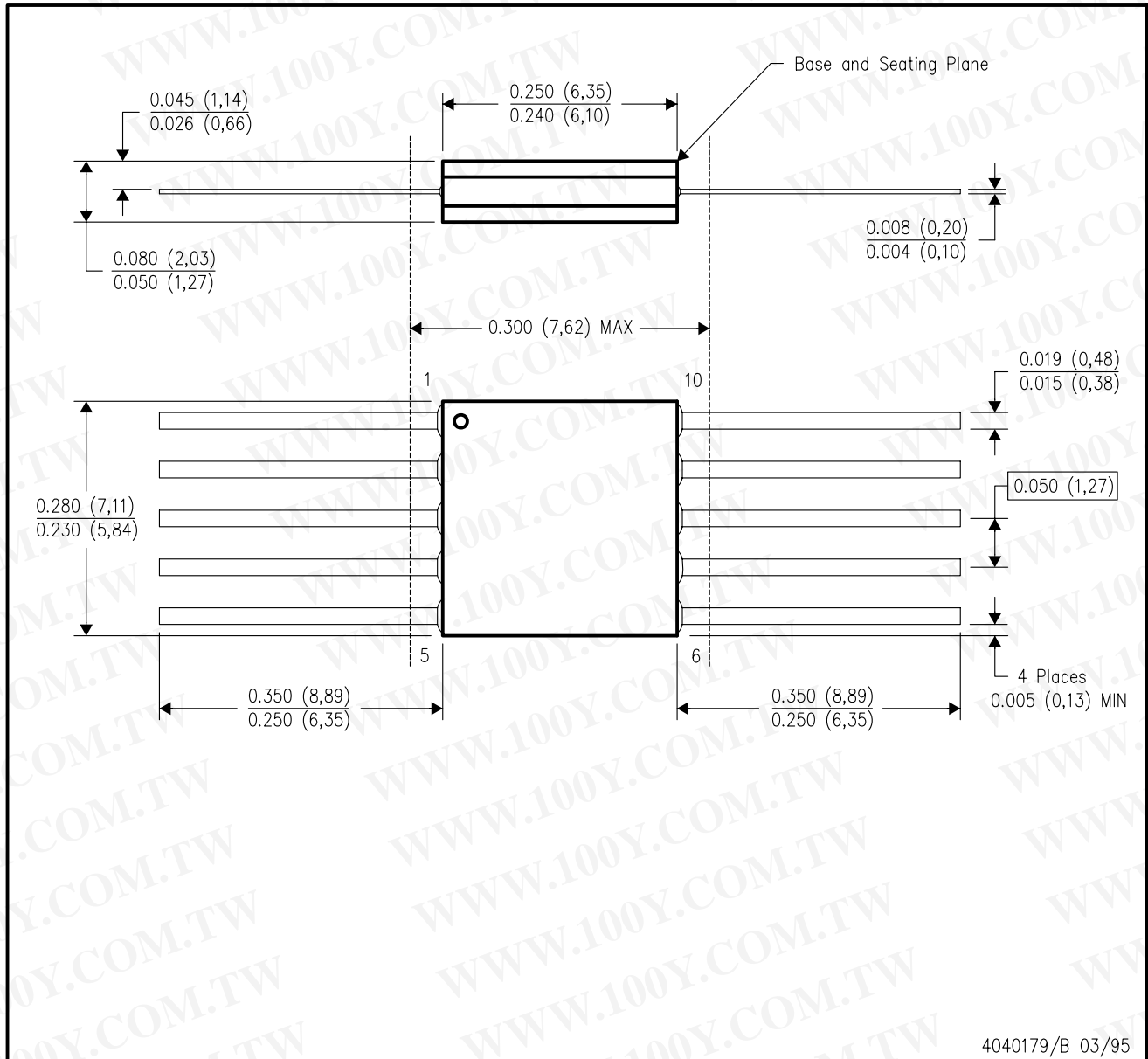


- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls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

4040083/F 03/03

U (S-GDFP-F10)

CERAMIC DUAL FLATPACK

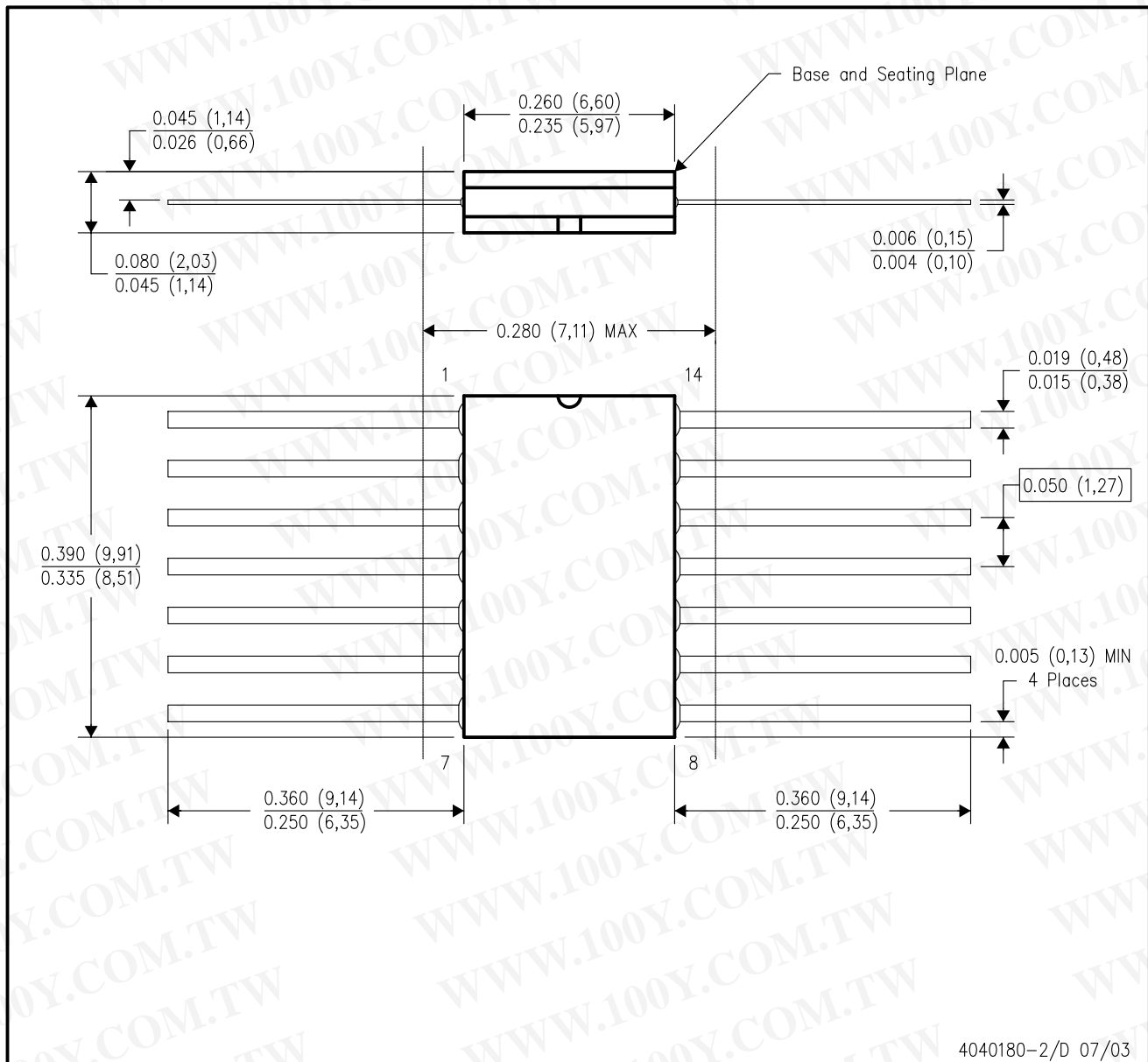


- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only.
 - Falls within MIL STD 1835 GDFP1-F10 and JEDEC MO-092AA

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W (R-GDFP-F14)

CERAMIC DUAL FLATPACK

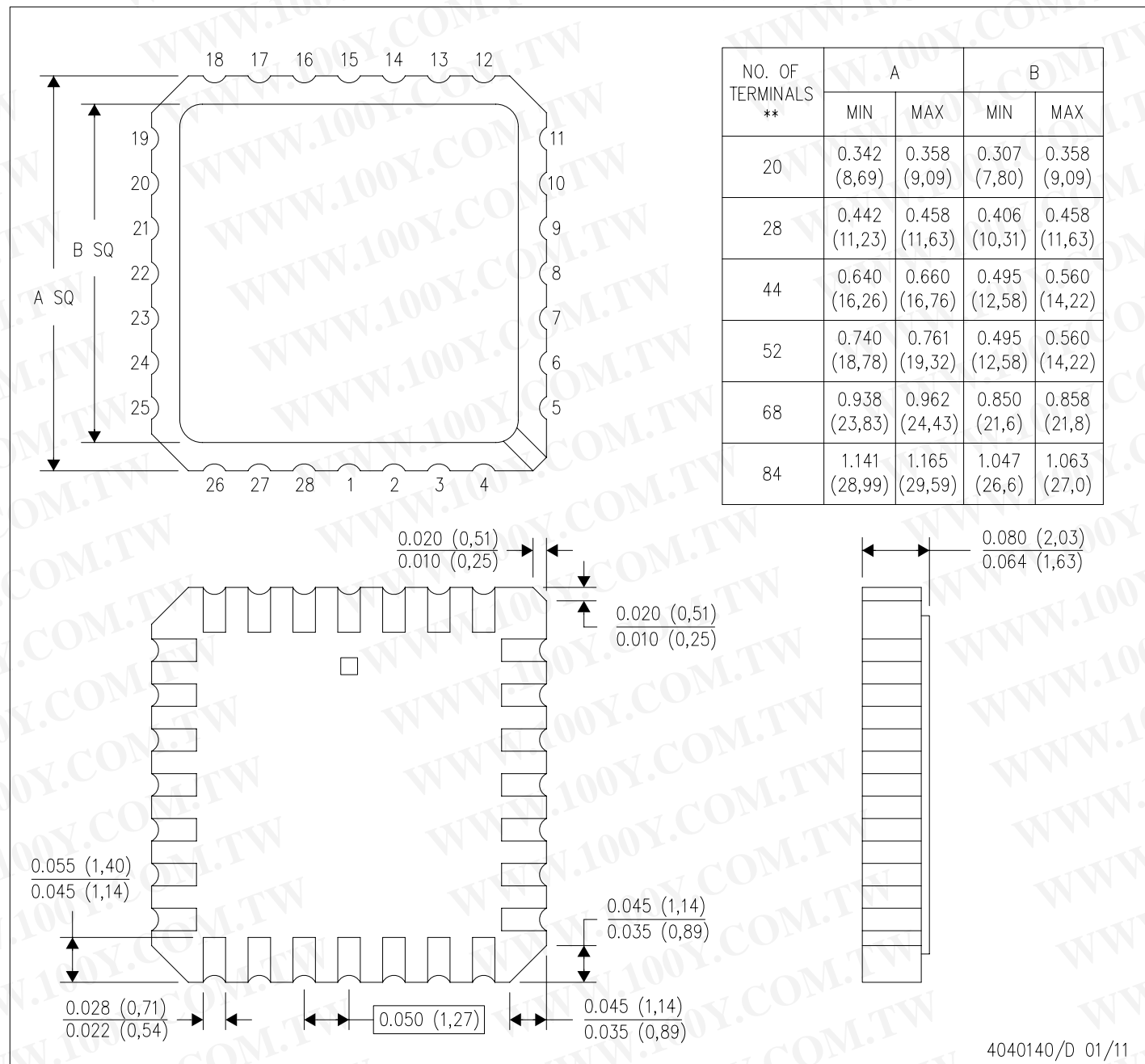


- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package can be hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only.
 - Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



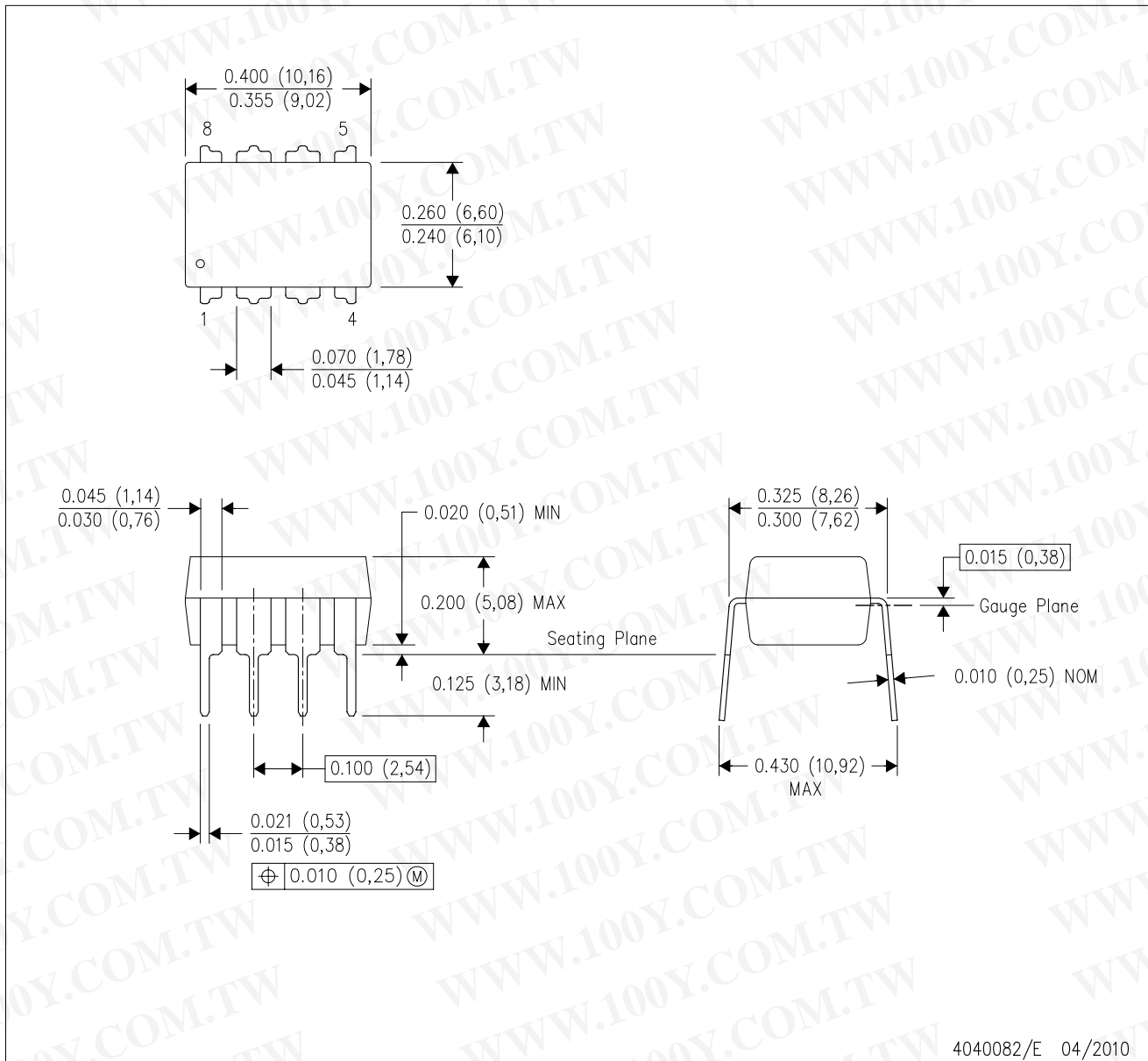
4040140/D 01/11

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. Falls within JEDEC MS-004

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P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



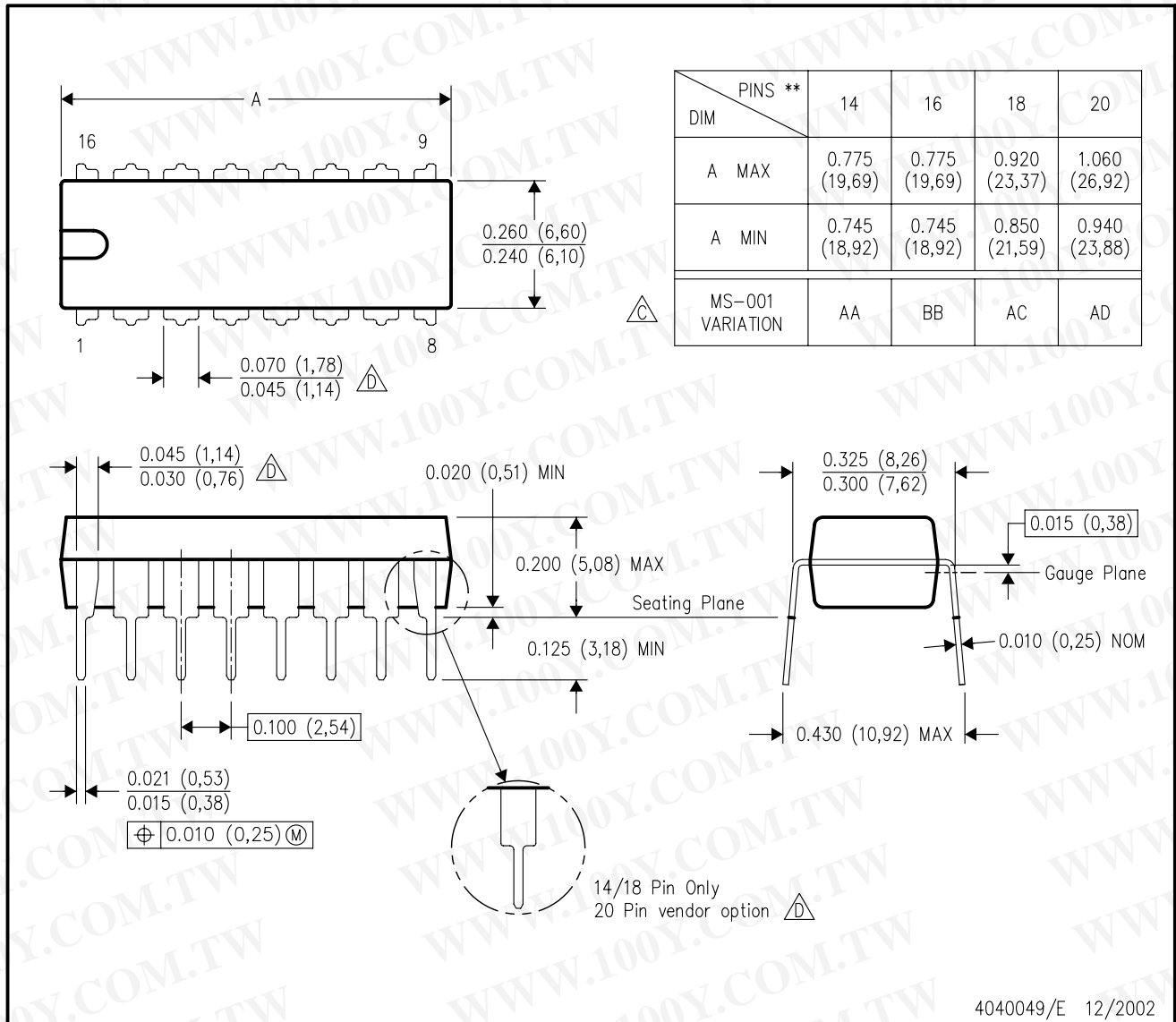
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Falls within JEDEC MS-001 variation BA.

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N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.

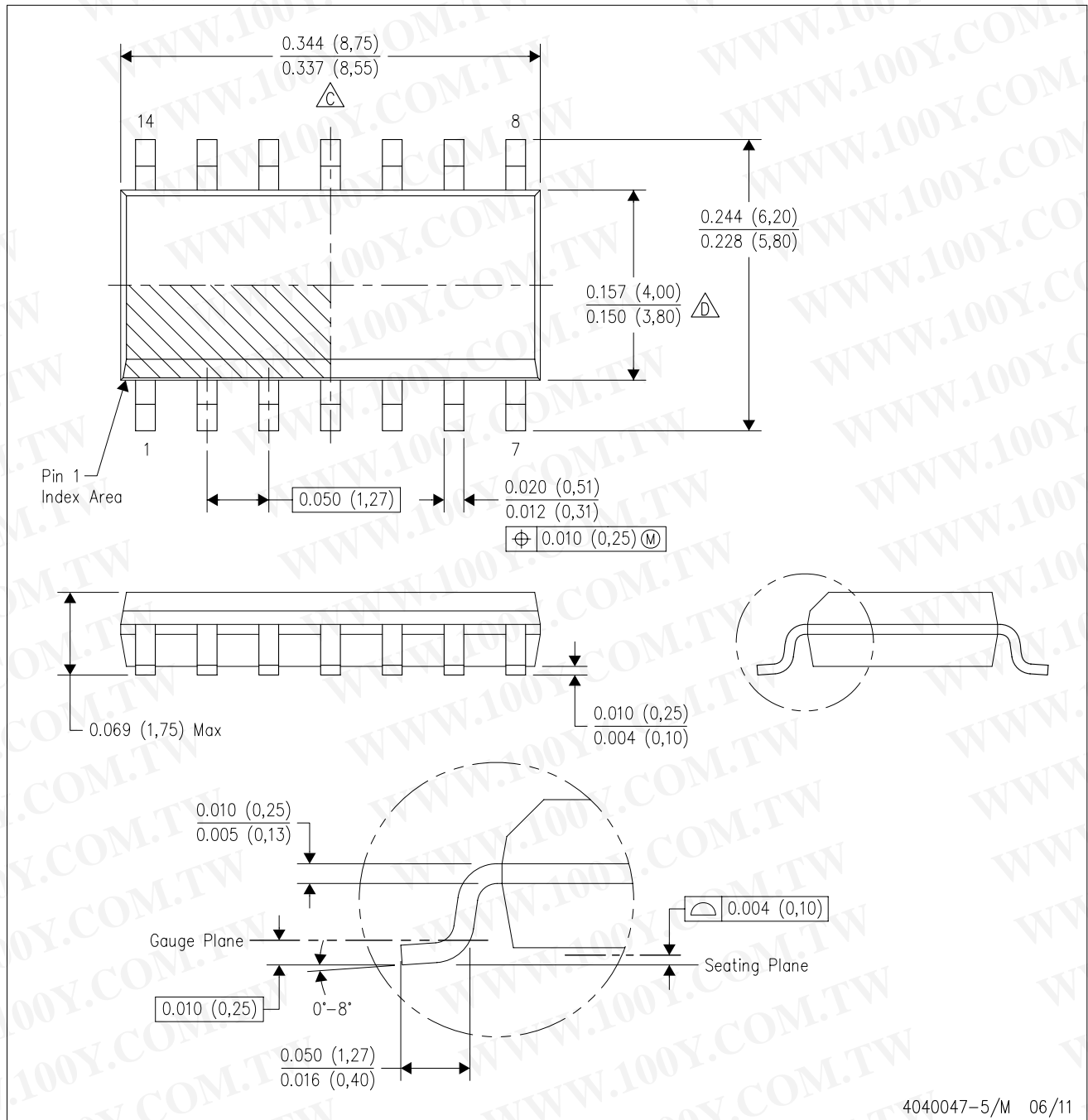
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MECHANICAL DATA

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE

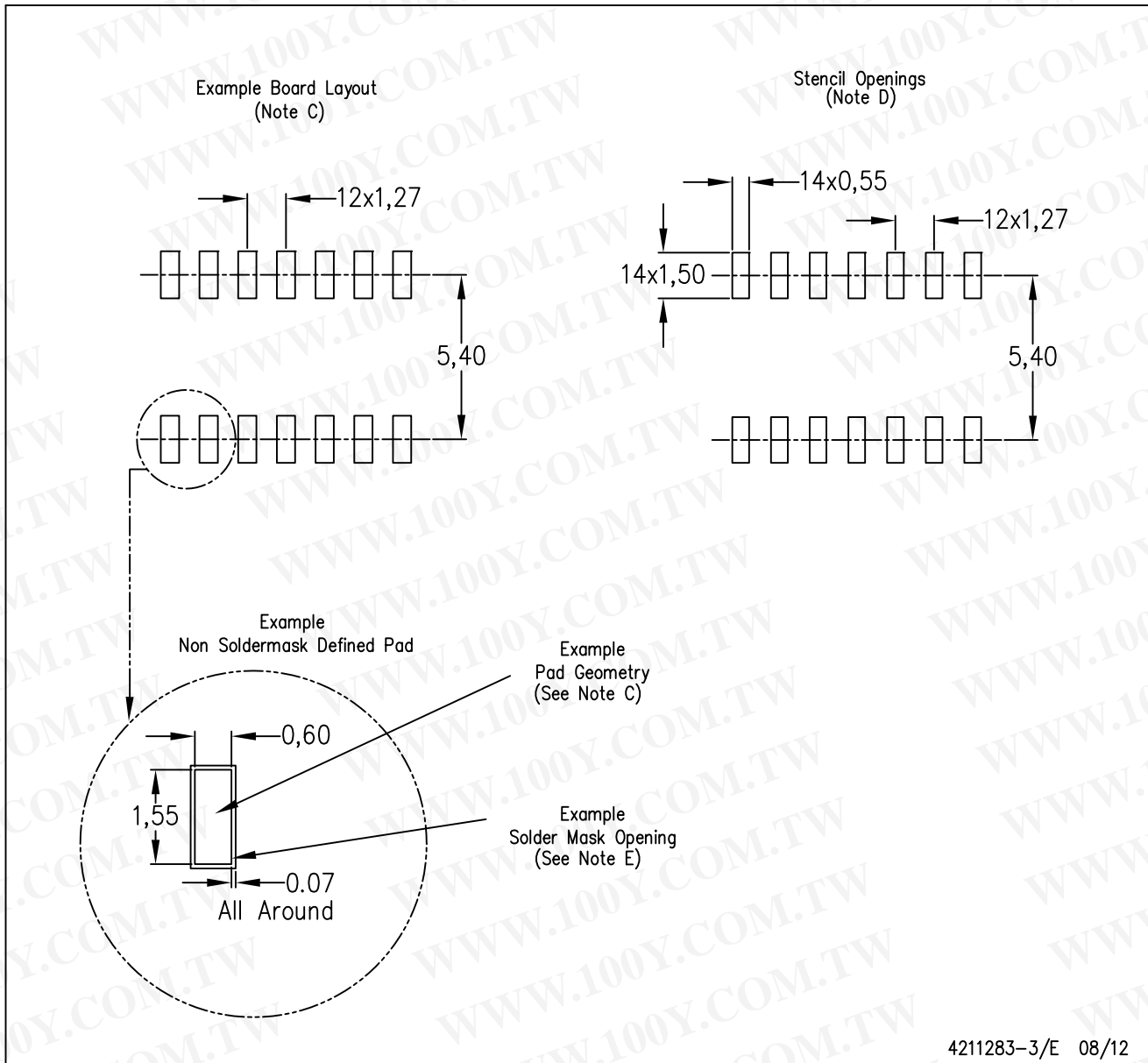


4040047-5/M 06/11

- 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 0.006 (0,15) each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



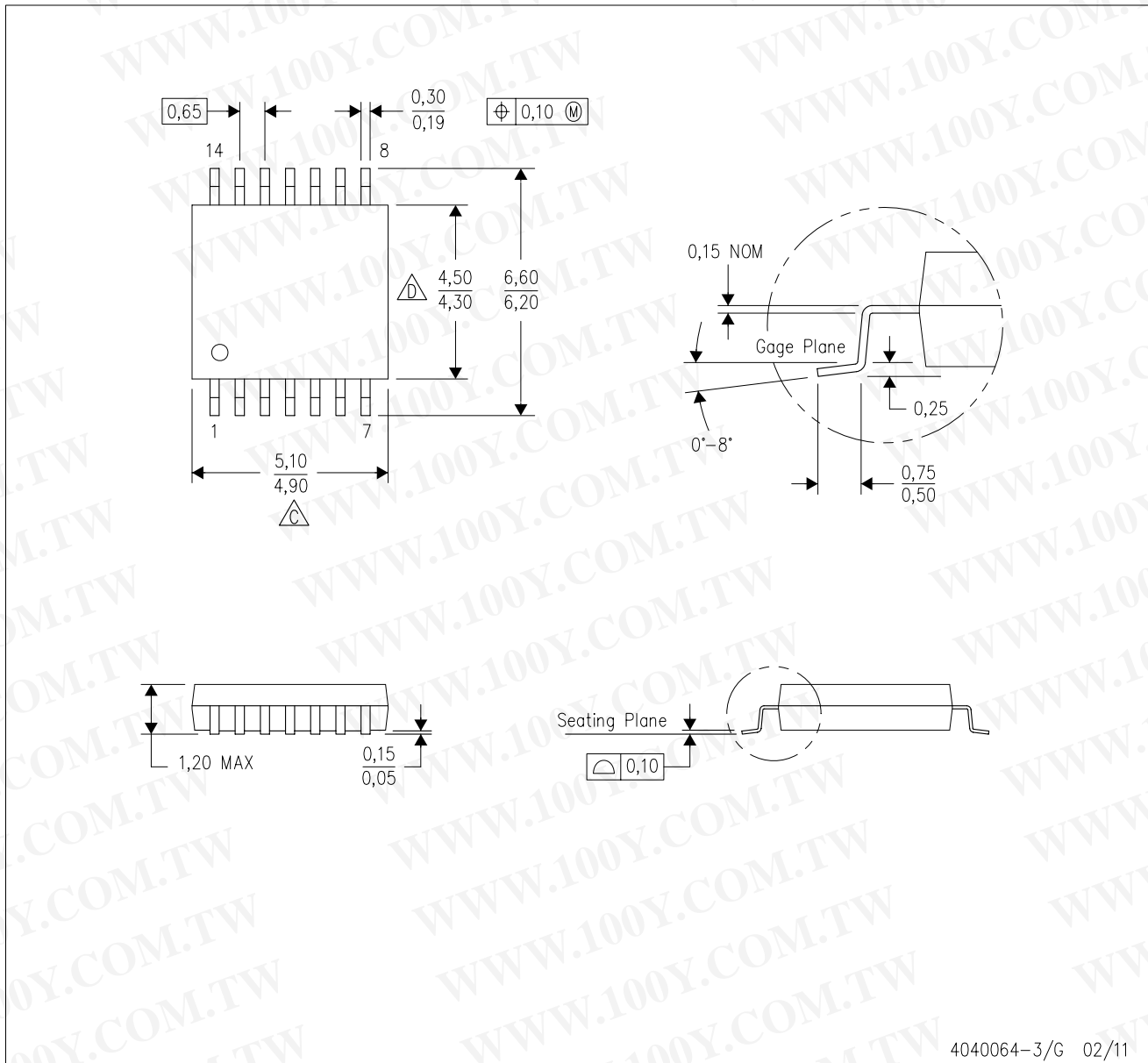
4211283-3/E 08/12

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - 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 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

MECHANICAL DATA

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



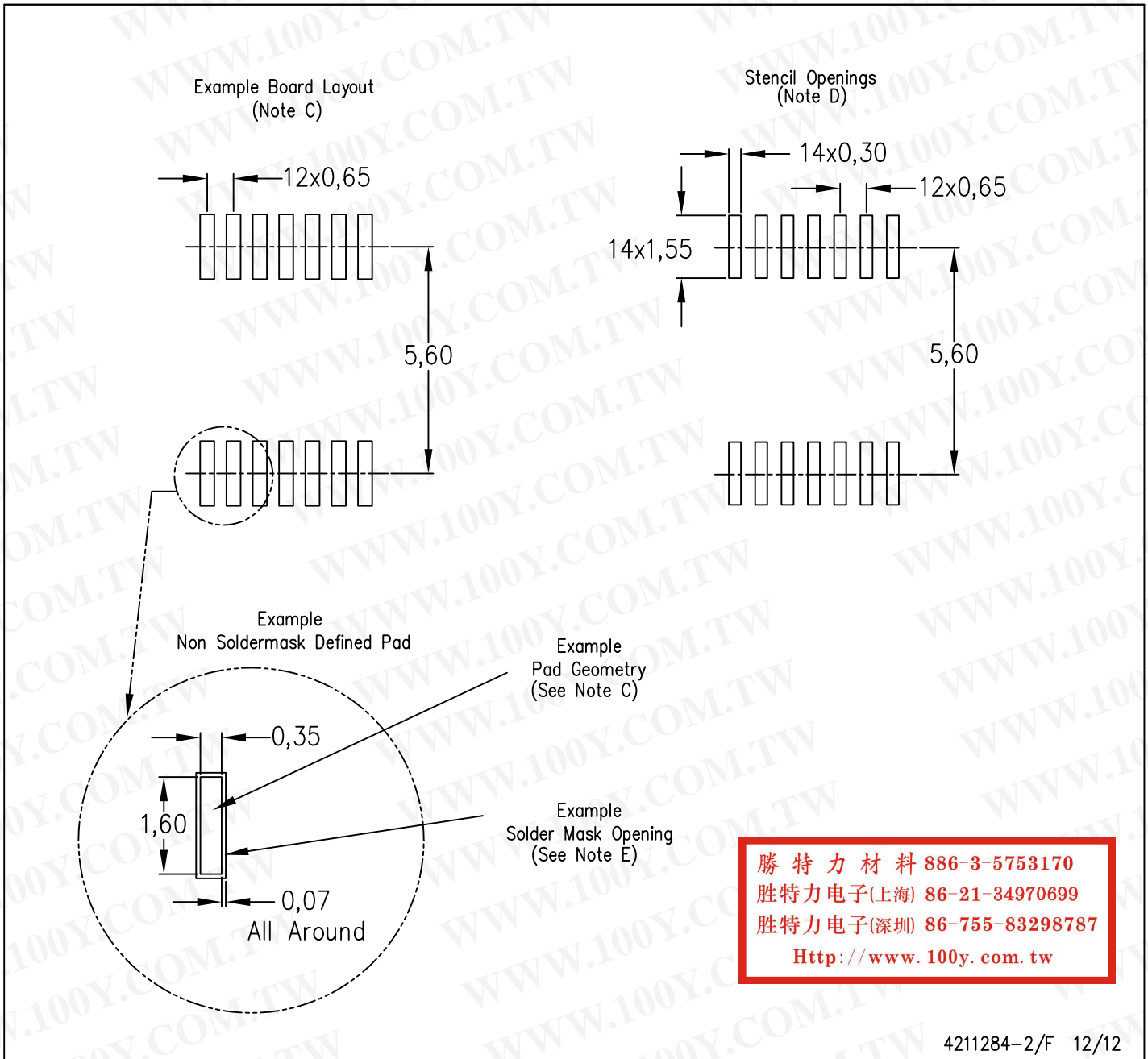
4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

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PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

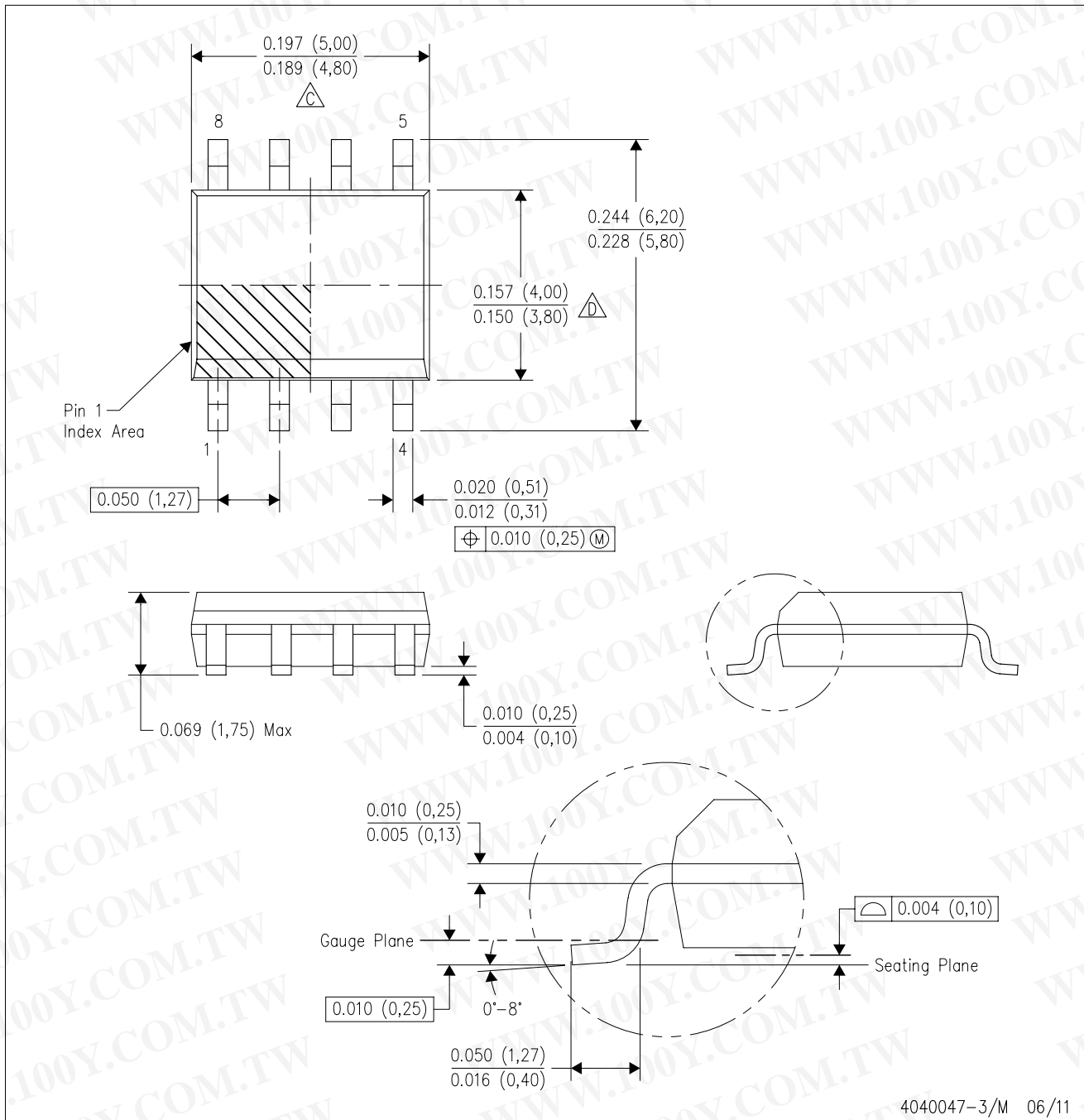


- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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D (R-PDSO-G8)

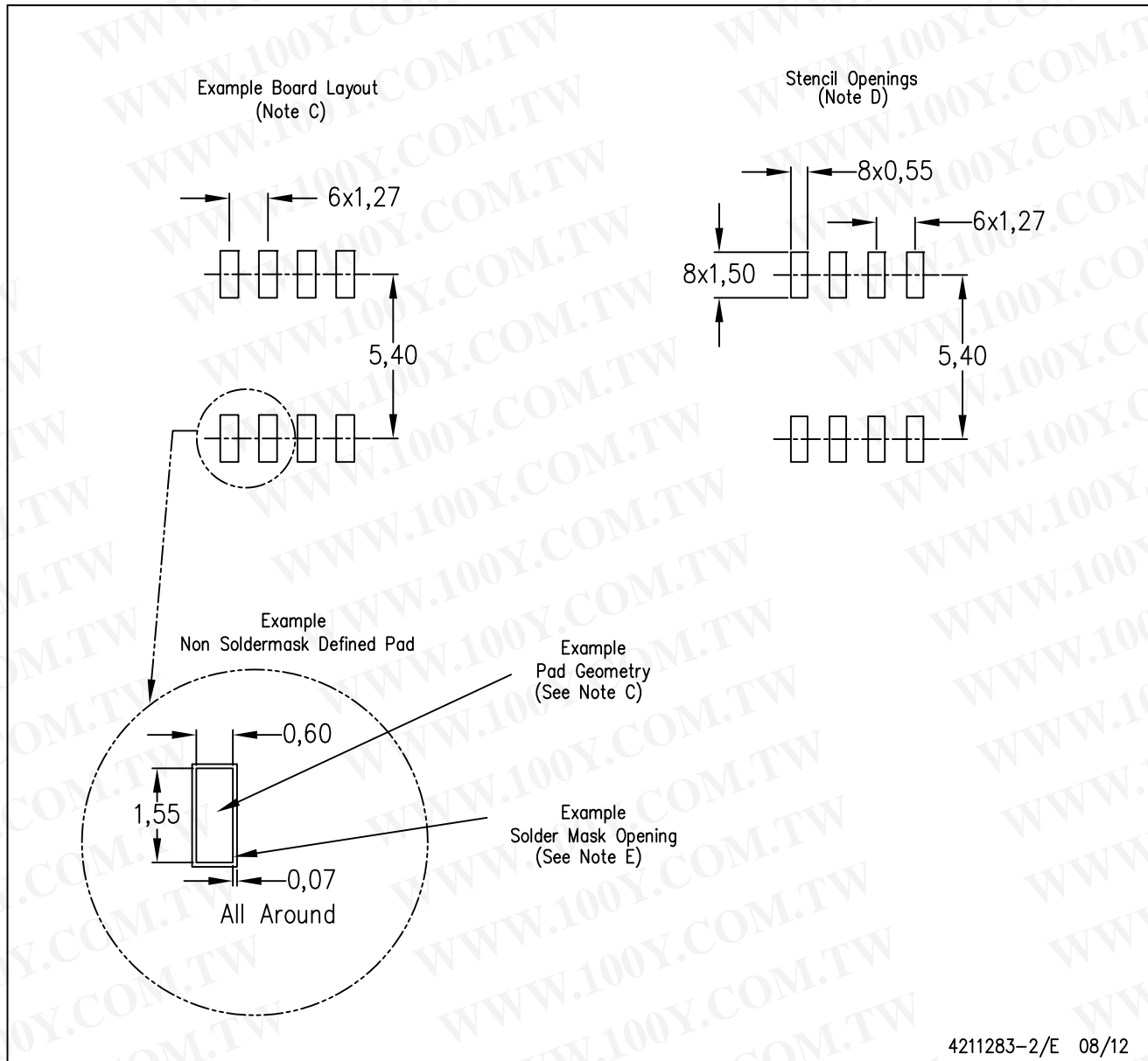
PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - Reference JEDEC MS-012 variation AA.

D (R-PDSO-G8)

PLASTIC SMALL OUTLINE

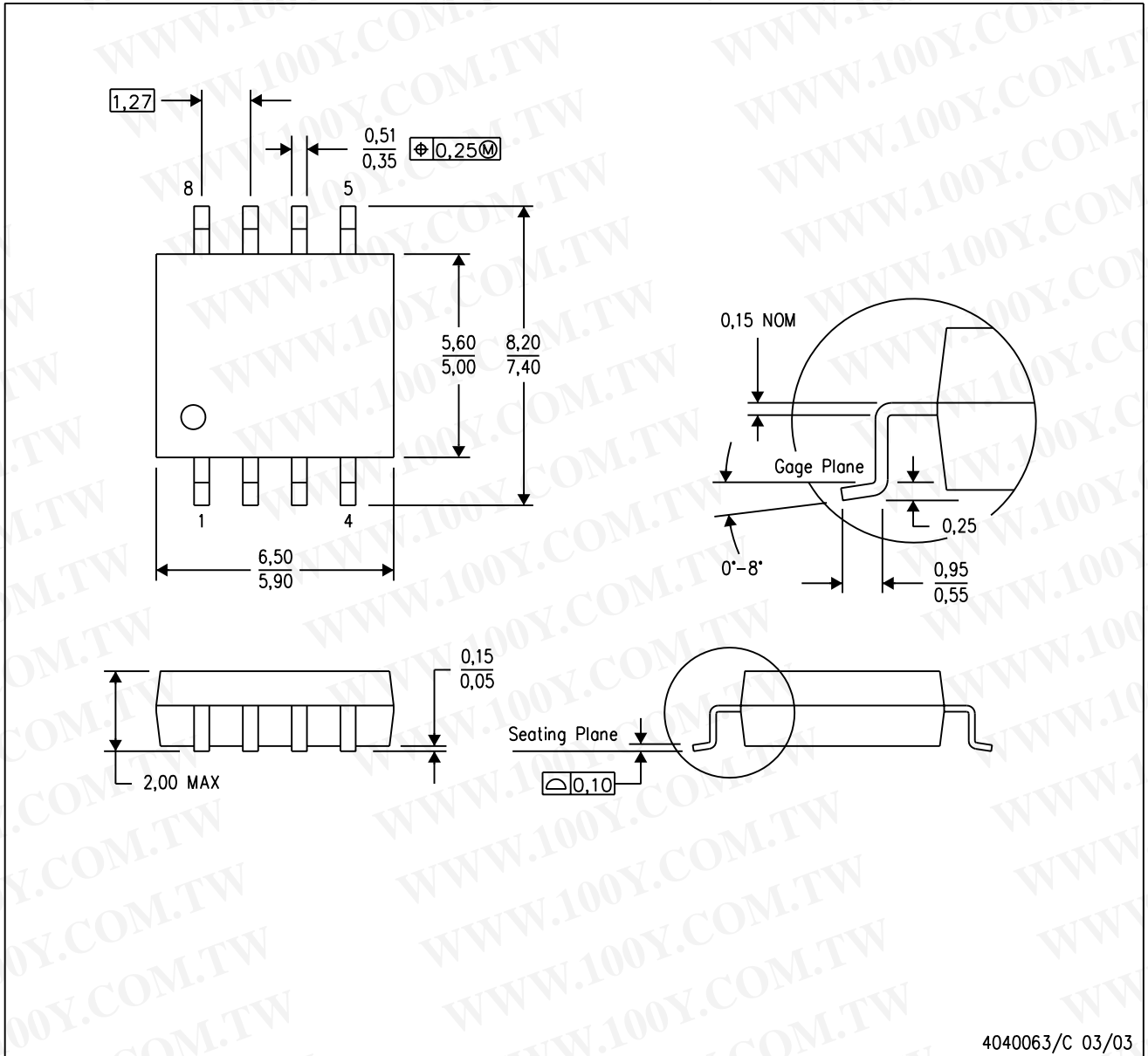


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

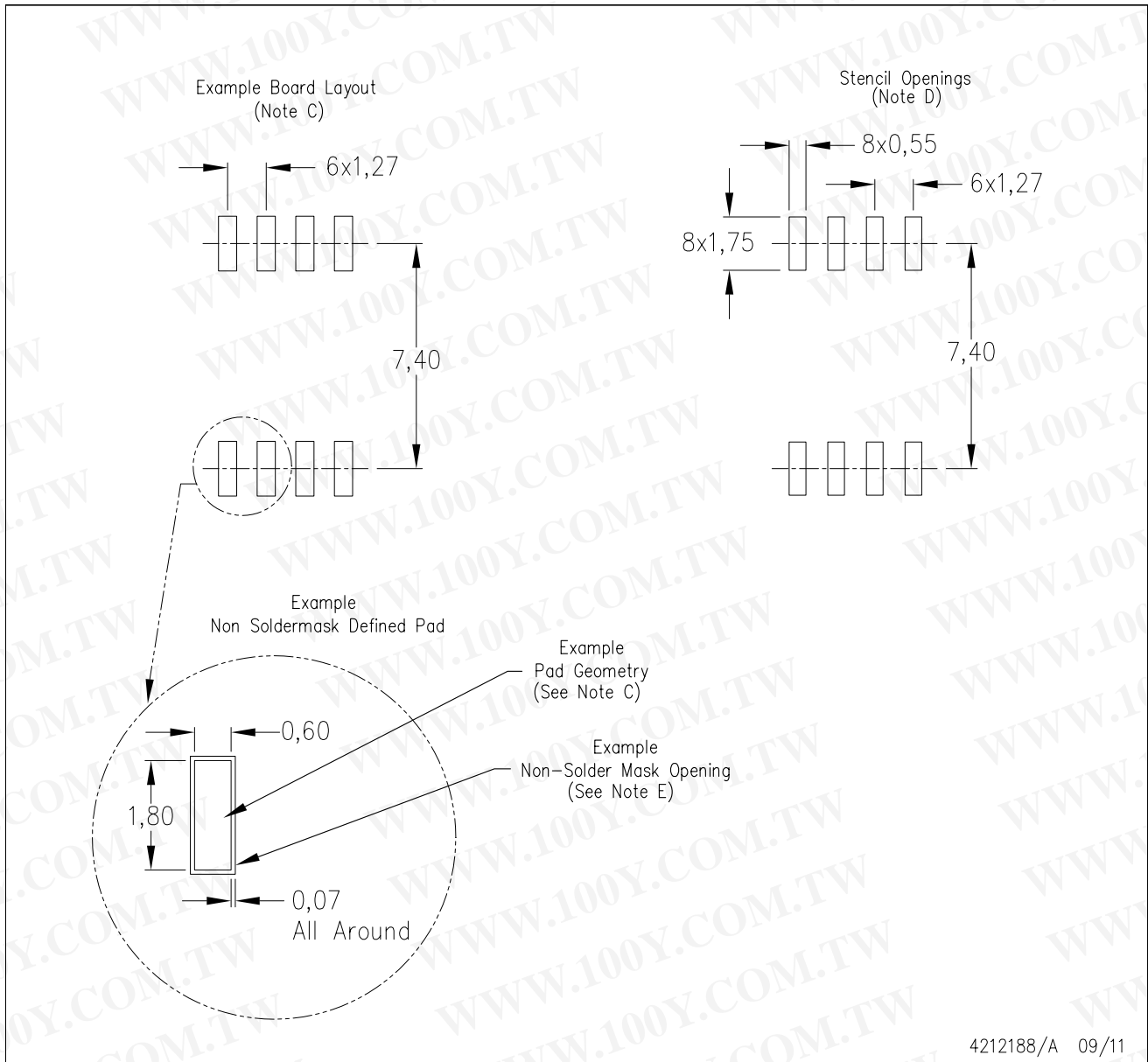


- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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PS (R-PDSO-G8)

PLASTIC SMALL OUTLINE



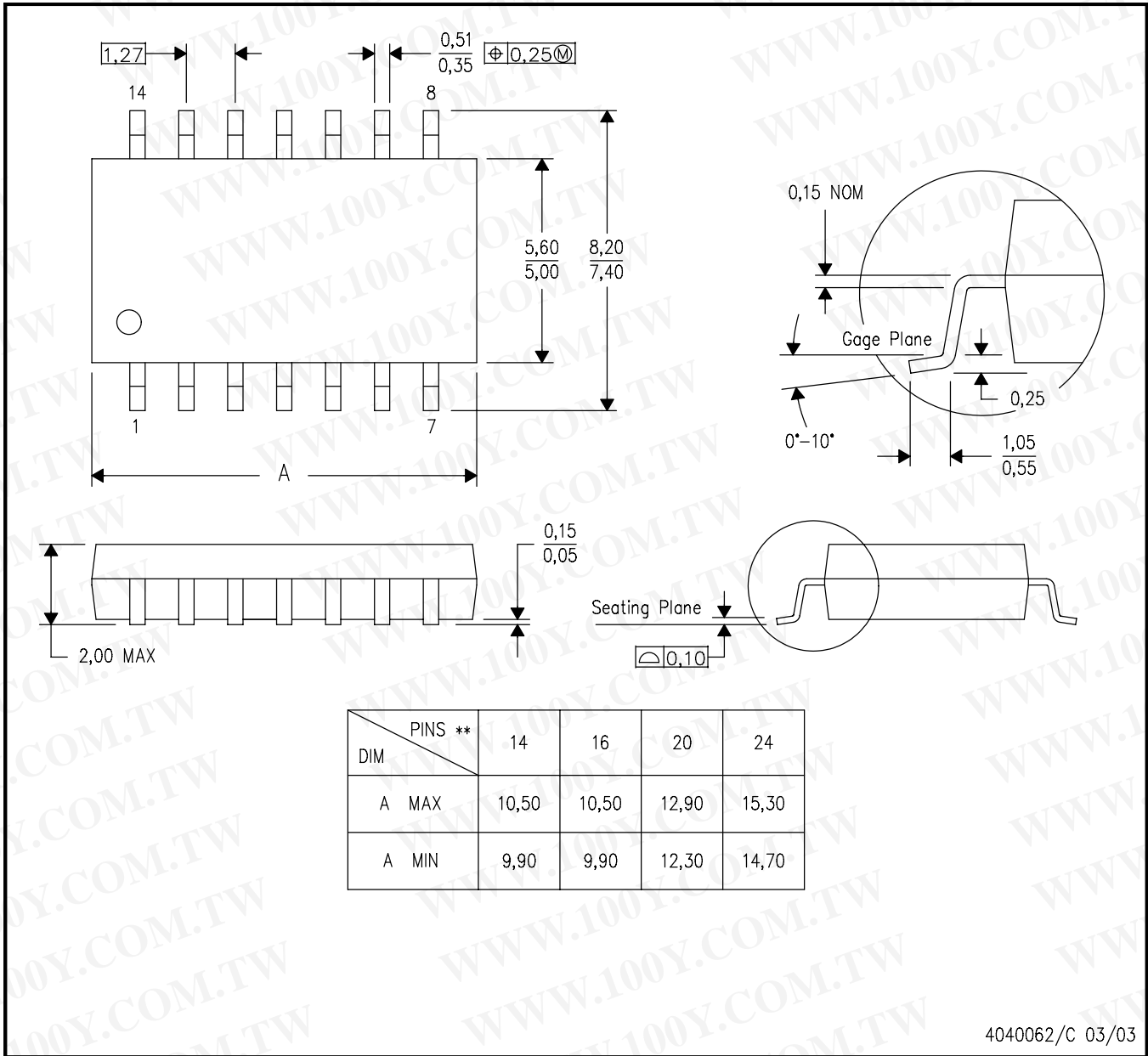
- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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MECHANICAL DATA

NS (R-PDSO-G**)
14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



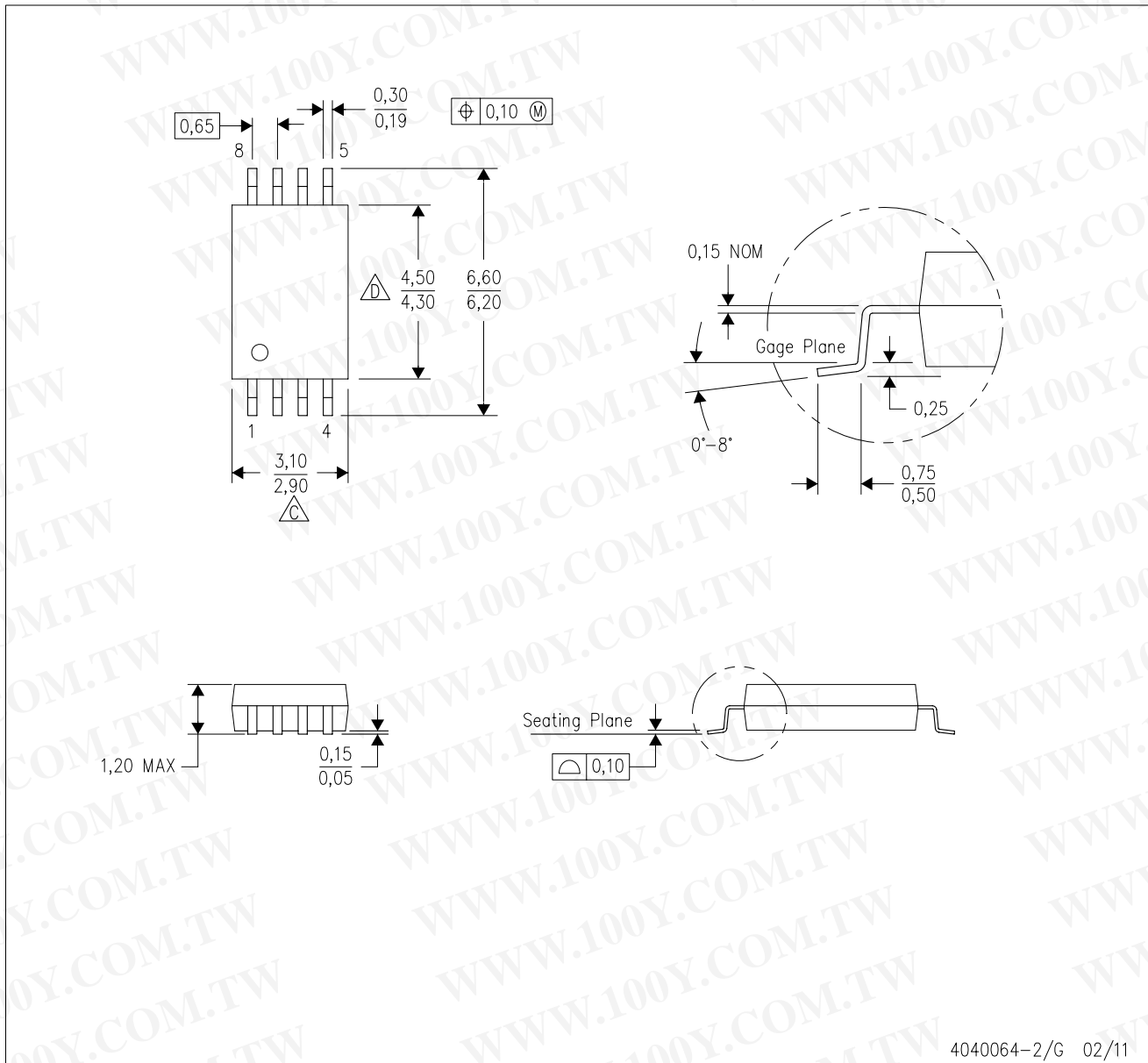
- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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MECHANICAL DATA

PW (R-PDSO-G8)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

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