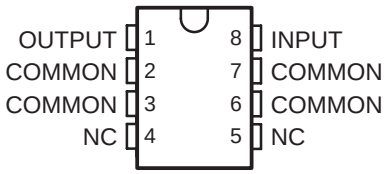
SLVS010S − JANUARY 1976 − REVISED FEBRUARY 2004

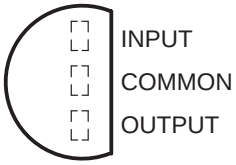
- **3-Terminal Regulators**
- **Output Current Up To 100 mA**
- **No External Components**
- **Internal Thermal-Overload Protection**
- **Internal Short-Circuit Current Limiting**

**D PACKAGE**
**(TOP VIEW)**

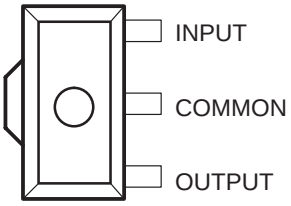



NC − No internal connection

**LP PACKAGE**
**(TO-92, TO-226AA)**
**(TOP VIEW)**




**PK PACKAGE**
**(TOP VIEW)**




## description/ordering information

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass elements to make high-current voltage regulators. One of these regulators can deliver up to 100 mA of output current. The internal limiting and thermal-shutdown features of these regulators essentially make them immune to overload. When used as a replacement for a Zener diode-resistor combination, an effective improvement in output impedance can be obtained, together with lower bias current.

The μA78L00C and μA78L00AC series are characterized for operation over the virtual junction temperature range of 0°C to 125°C. The μA78L05AI is characterized for operation over the virtual junction temperature range of −40°C to 125°C.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

**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.**

Copyright © 2004, Texas Instruments Incorporated

## description/ordering information (continued)

**ORDERING INFORMATION**

| $T_J$ | $V_{O(NOM)}$ (V) | OUTPUT VOLTAGE TOLERANCE | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---|---|---|---|---|---|---|
| 0°C to 125°C | 2.6 V | 5% | SOIC (D) | Tube of 75 | μA78L02ACD | 78L02A |
| | | | TO-226/TO-92 (LP) | Bulk of 1000 | μA78L02ACLP | 78L02AC |
| | 5 V | 5% | SOIC (D) | Tube of 75 | μA78L05ACD | 78L05A |
| | | | | Reel of 2500 | μA78L05ACDR | |
| | | | SOT-89 (PK) | Reel of 1000 | μA78L05ACPK | F5 |
| | | | TO-92 (LP) TO-226AA (LP) | Bulk of 1000 | μA78L05ACLP | 78L05AC |
| | | | | Pack of 2000 | μA78L05ACLPM | |
| | | | | Reel of 2000 | μA78L05ACLPR | |
| | | 10% | SOIC (D) | Tube of 75 | μA78L05CD | 78L05C |
| | | | | Reel of 2500 | μA78L05CDR | |
| | | | SOT-89 (PK) | Tube of | μA78L05CPK | B5 |
| | | | TO-92 (LP) TO-226AA (LP) | Bulk of 1000 | μA78L05CLP | 78L05C |
| | | | | Reel of 2000 | μA78L05CLPR | |
| | 6.2 V | 5% | SOT-89 (PK) | Reel of 1000 | μA78L06ACPK | F6 |
| | | | TO-92 (LP) TO-226AA (LP) | Bulk of 1000 | μA78L06ACLP | 78L06AC |
| | | | | Reel of 2000 | μA78L06ACLPR | |
| | 8 V | 5% | SOIC (D) | Tube of 75 | μA78L08ACD | 78L08A |
| | | | | Reel of 2500 | μA78L08ACDR | 78L08A |
| | | | SOT-89 (PK) | Reel of 1000 | μA78L08ACPK | F8 |
| | | | TO-92 (LP) TO-226AA (LP) | Bulk of 1000 | μA78L08ACLP | 78L08AC |
| | | | | Reel of 2000 | μA78L08ACLPR | |
| | | 10% | SOIC (D) | Tube of 75 | μA78L08CD | 78L08C |
| | | | | Reel of 2500 | μA78L08CDR | |
| | 9 V | 5% | SOIC (D) | Tube of 75 | μA78L09ACD | 78L09A |
| | | | | Reel of 2500 | μA78L09ACDR | |
| | | | SOT-89 (PK) | Reel of 1000 | μA78L09ACPK | F9 |
| | | | TO-92 (LP) TO-226AA (LP) | Bulk of 1000 | μA78L09ACLP | 78L09AC |
| | | | | Reel of 2000 | μA78L09ACLPR | |
| | 10 V | 5% | SOIC (D) | Tube of 75 | μA78L10ACD | 78L10A |
| | | | | Reel of 2500 | μA78L10ACDR | |
| | | | SOT-89 (PK) | Reel of 1000 | μA78L10ACPK | FA |
| | | | TO-92 (LP) TO-226AA (LP) | Bulk of 1000 | μA78L10ACLP | 78L10AC |
| | | | | Reel of 2000 | μA78L10ACLPR | |
| | 12 V | 5% | SOIC (D) | Tube of 75 | μA78L12ACD | 78L12A |
| | | | | Reel of 2500 | μA78L12ACDR | |
| | | | SOT-89 (PK) | Reel of 1000 | μA78L12ACPK | FC |
| | | | TO-92 (LP) TO-226AA (LP) | Bulk of 1000 | μA78L12ACLP | 78L12AC |
| | | | | Pack of 2000 | μA78L12ACLPM | |
| | | | | Reel of 2000 | μA78L12ACLPR | |

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

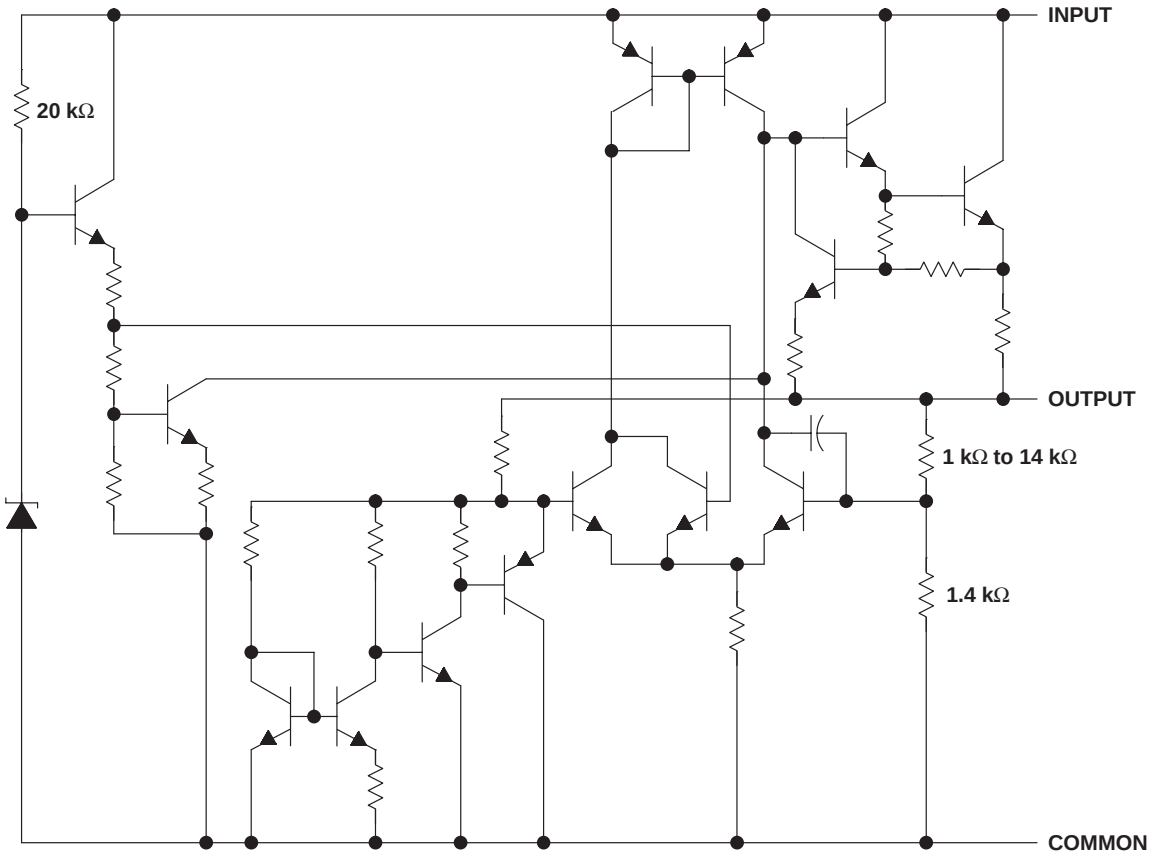
## description/ordering information (continued)

**ORDERING INFORMATION (continued)**

| $T_J$ | $V_{O(NOM)}$ (V) | OUTPUT VOLTAGE TOLERANCE | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---|---|---|---|---|---|---|
| 0°C to 125°C | 15 V | 5% | SOIC (D) | Tube of 75 | μA78L15ACD | 78L15A |
| | | | | Reel of 2500 | μA78L15ACDR | |
| | | | SOT-89 (PK) | Reel of 1000 | μA78L15ACPK | FF |
| | | | TO-92 (LP)<br>TO-226AA (LP) | Bulk of 1000 | μA78L15ACLP | 78L15AC |
| | | | | Reel of 2000 | μA78L15ACLPR | |
| −40°C to 125°C | 5 V | 5% | SOIC (D) | Tube of 75 | μA78L05AID | 78L15AI |
| | | | | Reel of 2500 | μA78L05AIDR | |
| | | | SOT-89 (PK) | Reel of 1000 | μA78L05AIPK | J5 |
| | | | TO-92 (LP)<br>TO-226AA (LP) | Bulk of 1000 | μA78L05AILP | 78L05AI |
| | | | | Reel of 2000 | μA78L05AILPR | |

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

## schematic




NOTE A: Resistor values shown are nominal.

## absolute maximum ratings over virtual junction temperature range (unless otherwise noted)†

Input voltage, $V_I$: μA78L02AC, μA78L05C−μA78L09C, μA78L10AC . . . . . 30 V
μA78L12C, μA78L12AC, μA78L15C, μA78L15AC . . . . . 35 V
Virtual junction temperature, $T_J$ . . . . . 150°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.

## package thermal data (see Note 1)

| PACKAGE | BOARD | $\theta_{JC}$ | $\theta_{JA}$ |
|---|---|---|---|
| SOIC (D) | High K, JESD 51-7 | 39°C/W | 97°C/W |
| TO-92/TO-226AA (LP) | High K, JESD 51-7 | 55°C/W | 140°C/W |
| SOT-89 (PK) | High K, JESD 51-7 | 9°C/W | 52°C/W |

NOTE 1: Maximum power dissipation is a function of $T_J(max)$, $\theta_{JA}$, 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. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal-overload protection may be activated at power levels slightly above or below the rated dissipation.

## recommended operating conditions

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_I$ | Input voltage | μA78L02AC | 4.75 | 20 | V |
| | | μA78L05C, μA78L05AC | 7 | 20 | |
| | | μA78L06C, μA78L06AC | 8.5 | 20 | |
| | | μA78L08C, μA78L08AC | 10.5 | 23 | |
| | | μA78L09C, μA78L09AC | 11.5 | 24 | |
| | | μA78L10AC | 12.5 | 25 | |
| | | μA78L12C, μA78L12AC | 14.5 | 27 | |
| | | μA78L15C, μA78L15AC | 17.5 | 30 | |
| $I_O$ | Output current | | | 100 | mA |
| $T_J$ | Operating virtual junction temperature range | μA78LxxC and μA78LxxAC series | 0 | 125 | °C |
| | | μA78L05AI | −40 | 125 | |

## electrical characteristics at specified virtual junction temperature, $V_I$ = 9 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$† | μA78L02AC | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 4.75 V to 20 V, $I_O$ = 1 mA to 40 mA | 25°C | 2.5 | 2.6 | 2.7 | V |
| | | 0°C to 125°C | 2.45 | | 2.75 | |
| | $I_O$ = 1 mA to 70 mA | 0°C to 125°C | 2.45 | | 2.75 | |
| Input voltage regulation | $V_I$ = 4.75 V to 20 V | 25°C | | 20 | 100 | mV |
| | $V_I$ = 5 V to 20 V | | | 16 | 75 | |
| Ripple rejection | $V_I$ = 6 V to 20 V, f = 120 Hz | 25°C | 43 | 51 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 12 | 50 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 6 | 25 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 30 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | V |
| Bias current | | 25°C | | 3.6 | 6 | mA |
| | | 125°C | | | 5.5 | |
| Bias current change | $V_I$ = 5 V to 20 V | 0°C to 125°C | | | 2.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.1 | |

† Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

## electrical characteristics at specified virtual junction temperature, $V_I$ = 10 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$‡ | μA78L05C | | | μA78L05AC μA78L05AI | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 7 V to 20 V, $I_O$ = 1 mA to 40 mA | 25°C | 4.6 | 5 | 5.4 | 4.8 | 5 | 5.2 | V |
| | | Full range | 4.5 | | 5.5 | 4.75 | | 5.25 | |
| | $I_O$ = 1 mA to 70 mA | Full range | 4.5 | | 5.5 | 4.75 | | 5.25 | |
| Input voltage regulation | $V_I$ = 7 V to 20 V | 25°C | | 32 | 200 | | 32 | 150 | mV |
| | $V_I$ = 8 V to 20 V | | | 26 | 150 | | 26 | 100 | |
| Ripple rejection | $V_I$ = 8 V to 18 V, f = 120 Hz | 25°C | 40 | 49 | | 41 | 49 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 15 | 60 | | 15 | 60 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 8 | 30 | | 8 | 30 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 42 | | | 42 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | | 1.7 | | V |
| Bias current | | 25°C | | 3.8 | 6 | | 3.8 | 6 | mA |
| | | 125°C | | | 5.5 | | | 5.5 | |
| Bias current change | $V_I$ = 8 V to 20 V | Full range | | | 1.5 | | | 1.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.2 | | | 0.1 | |

‡ Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Full range for the μA78L05AC is $T_J$ = 0°C to 125°C, and full range for the μA78L05AI is $T_J$ = −40°C to 125°C.

## electrical characteristics at specified virtual junction temperature, $V_I$ = 12 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$† | μA78L06C | | | μA78L06AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 8.5 V to 20 V, $I_O$ = 1 mA to 40 mA | 25°C | 5.7 | 6.2 | 6.7 | 5.95 | 6.2 | 6.45 | V |
| | | 0°C to 125°C | 5.6 | | 6.8 | 5.9 | | 6.5 | |
| | $I_O$ = 1 mA to 70 mA | 0°C to 125°C | 5.6 | | 6.8 | 5.9 | | 6.5 | |
| Input voltage regulation | $V_I$ = 8.5 V to 20 V | 25°C | | 35 | 200 | | 35 | 175 | mV |
| | $V_I$ = 9 V to 20 V | | | 29 | 150 | | 29 | 125 | |
| Ripple rejection | $V_I$ = 10 V to 20 V, f = 120 Hz | 25°C | 39 | 48 | | 40 | 48 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 16 | 80 | | 16 | 80 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 9 | 40 | | 9 | 40 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 46 | | | 46 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | | 1.7 | | V |
| Bias current | | 25°C | | 3.9 | 6 | | 3.9 | 6 | mA |
| | | 125°C | | | 5.5 | | | 5.5 | |
| Bias current change | $V_I$ = 9 V to 20 V | 0°C to 125°C | | | 1.5 | | | 1.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.2 | | | 0.1 | |

† Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

## electrical characteristics at specified virtual junction temperature, $V_I$ = 14 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$† | μA78L08C | | | μA78L08AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 10.5 V to 23 V, $I_O$ = 1 mA to 40 mA | 25°C | 7.36 | 8 | 8.64 | 7.7 | 8 | 8.3 | V |
| | | 0°C to 125°C | 7.2 | | 8.8 | 7.6 | | 8.4 | |
| | $I_O$ = 1 mA to 70 mA | 0°C to 125°C | 7.2 | | 8.8 | 7.6 | | 8.4 | |
| Input voltage regulation | $V_I$ = 10.5 V to 23 V | 25°C | | 42 | 200 | | 42 | 175 | mV |
| | $V_I$ = 11 V to 23 V | | | 36 | 150 | | 36 | 125 | |
| Ripple rejection | $V_I$ = 13 V to 23 V, f = 120 Hz | 25°C | 36 | 46 | | 37 | 46 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 18 | 80 | | 18 | 80 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 10 | 40 | | 10 | 40 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 54 | | | 54 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | | 1.7 | | V |
| Bias current | | 25°C | | 4 | 6 | | 4 | 6 | mA |
| | | 125°C | | | 5.5 | | | 5.5 | |
| Bias current change | $V_I$ = 11 V to 23 V | 0°C to 125°C | | | 1.5 | | | 1.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.2 | | | 0.1 | |

† Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

## electrical characteristics at specified virtual junction temperature, $V_I$ = 16 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$† | μA78L09C | | | μA78L09AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 12 V to 24 V, $I_O$ = 1 mA to 40 mA | 25°C | 8.3 | 9 | 9.7 | 8.6 | 9 | 9.4 | V |
| | | 0°C to 125°C | 8.1 | | 9.9 | 8.55 | | 9.45 | |
| | $I_O$ = 1 mA to 70 mA | 0°C to 125°C | 8.1 | | 9.9 | 8.55 | | 9.45 | |
| Input voltage regulation | $V_I$ = 12 V to 24 V | 25°C | | 45 | 225 | | 45 | 175 | mV |
| | $V_I$ = 13 V to 24 V | | | 40 | 175 | | 40 | 125 | |
| Ripple rejection | $V_I$ = 15 V to 25 V, f = 120 Hz | 25°C | 36 | 45 | | 38 | 45 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 19 | 90 | | 19 | 90 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 11 | 40 | | 11 | 40 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 58 | | | 58 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | | 1.7 | | V |
| Bias current | | 25°C | | 4.1 | 6 | | 4.1 | 6 | mA |
| | | 125°C | | | 5.5 | | | 5.5 | |
| Bias current change | $V_I$ = 13 V to 24 V | 0°C to 125°C | | | 1.5 | | | 1.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.2 | | | 0.1 | |

† Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

## electrical characteristics at specified virtual junction temperature, $V_I$ = 14 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$† | μA78L10AC | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 13 V to 25 V, $I_O$ = 1 mA to 40 mA | 25°C | 9.6 | 10 | 10.4 | V |
| | | 0°C to 125°C | 9.5 | | 10.5 | |
| | $I_O$ = 1 mA to 70 mA | 0°C to 125°C | 9.5 | | 10.5 | |
| Input voltage regulation | $V_I$ = 13 V to 25 V | 25°C | | 51 | 175 | mV |
| | $V_I$ = 14 V to 25 V | | | 42 | 125 | |
| Ripple rejection | $V_I$ = 15 V to 25 V, f = 120 Hz | 25°C | 37 | 44 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 20 | 90 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 11 | 40 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 62 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | V |
| Bias current | | 25°C | | 4.2 | 6 | mA |
| | | 125°C | | | 5.5 | |
| Bias current change | $V_I$ = 14 V to 25 V | 0°C to 125°C | | | 1.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.1 | |

† Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

## electrical characteristics at specified virtual junction temperature, $V_I$ = 19 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$† | μA78L12C | | | μA78L12AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 14 V to 27 V, $I_O$ = 1 mA to 40 mA | 25°C | 11.1 | 12 | 12.9 | 11.5 | 12 | 12.5 | V |
| | | 0°C to 125°C | 10.8 | | 13.2 | 11.4 | | 12.6 | |
| | $I_O$ = 1 mA to 70 mA | 0°C to 125°C | 10.8 | | 13.2 | 11.4 | | 12.6 | |
| Input voltage regulation | $V_I$ = 14.5 V to 27 V | 25°C | | 55 | 250 | | 55 | 250 | mV |
| | $V_I$ = 16 V to 27 V | | | 49 | 200 | | 49 | 200 | |
| Ripple rejection | $V_I$ = 15 V to 25 V, f = 120 Hz | 25°C | 36 | 42 | | 37 | 42 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 22 | 100 | | 22 | 100 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 13 | 50 | | 13 | 50 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 70 | | | 70 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | | 1.7 | | V |
| Bias current | | 25°C | | 4.3 | 6.5 | | 4.3 | 6.5 | mA |
| | | 125°C | | | 6 | | | 6 | |
| Bias current change | $V_I$ = 16 V to 27 V | 0°C to 125°C | | | 1.5 | | | 1.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.2 | | | 0.1 | |

† Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

## electrical characteristics at specified virtual junction temperature, $V_I$ = 23 V, $I_O$ = 40 mA (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | $T_J$† | μA78L15C | | | μA78L15AC | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 17.5 V to 30 V, $I_O$ = 1 mA to 40 mA | 25°C | 13.8 | 15 | 16.2 | 14.4 | 15 | 15.6 | V |
| | | 0°C to 125°C | 13.5 | | 16.5 | 14.25 | | 15.75 | |
| | $I_O$ = 1 mA to 70 mA | 0°C to 125°C | 13.5 | | 16.5 | 14.25 | | 15.75 | |
| Input voltage regulation | $V_I$ = 17.5 V to 30 V | 25°C | | 65 | 300 | | 65 | 300 | mV |
| | $V_I$ = 20 V to 30 V | | | 58 | 250 | | 58 | 250 | |
| Ripple rejection | $V_I$ = 18.5 V to 28.5 V, f = 120 Hz | 25°C | 33 | 39 | | 34 | 39 | | dB |
| Output voltage regulation | $I_O$ = 1 mA to 100 mA | 25°C | | 25 | 150 | | 25 | 150 | mV |
| | $I_O$ = 1 mA to 40 mA | | | 15 | 75 | | 15 | 75 | |
| Output noise voltage | f = 10 Hz to 100 kHz | 25°C | | 82 | | | 82 | | μV |
| Dropout voltage | | 25°C | | 1.7 | | | 1.7 | | V |
| Bias current | | 25°C | | 4.6 | 6.5 | | 4.6 | 6.5 | mA |
| | | 125°C | | | 6 | | | 6 | |
| Bias current change | $V_I$ = 10 V to 30 V | 0°C to 125°C | | | 1.5 | | | 1.5 | mA |
| | $I_O$ = 1 mA to 40 mA | | | | 0.2 | | | 0.1 | |

† Pulse-testing techniques maintain $T_J$ as close to $T_A$ as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

## APPLICATION INFORMATION

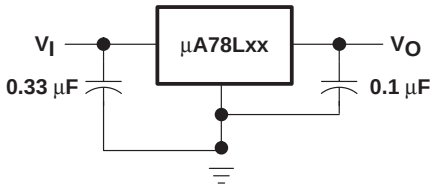



**Figure 1. Fixed-Output Regulator**

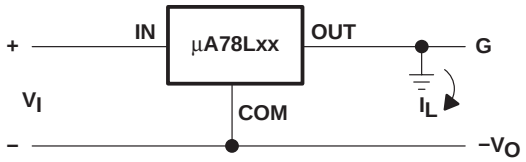



**Figure 2. Positive Regulator in Negative Configuration ($V_I$ Must Float)**

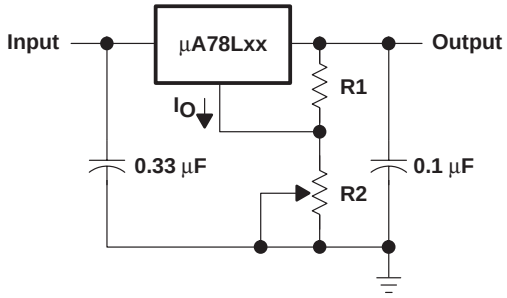
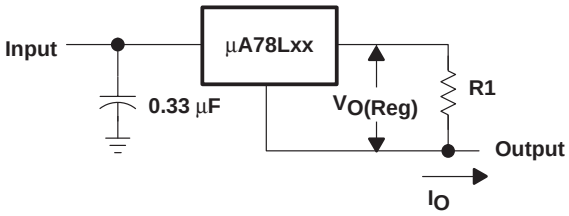



**Figure 3. Adjustable-Output Regulator**




$I_O = (V_O/R1) + I_O$ Bias Current

**Figure 4. Current Regulator**

## APPLICATION INFORMATION

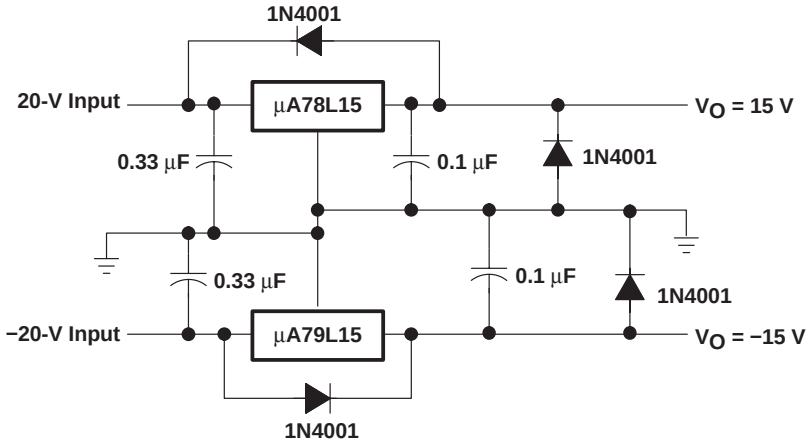



**Figure 5. Regulated Dual Supply**

### operation with a load common to a voltage of opposite polarity

In many cases, a regulator powers a load that is not connected to ground, but instead, is connected to a voltage source of opposite polarity (e.g., operational amplifiers, level-shifting circuits, etc.). In these cases, a clamp diode should be connected to the regulator output as shown in Figure 6. This protects the regulator from output polarity reversals during startup and short-circuit operation.

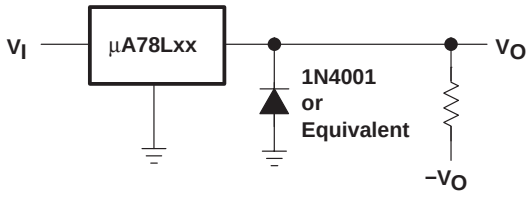



**Figure 6. Output Polarity-Reversal-Protection Circuit**

### reverse-bias protection

Occasionally, the input voltage to the regulator can collapse faster than the output voltage. This can occur, for example, when the input supply is crowbarred during an output overvoltage condition. If the output voltage is greater than approximately 7 V, the emitter-base junction of the series-pass element (internal or external) could break down and be damaged. To prevent this, a diode shunt can be employed as shown in Figure 7.

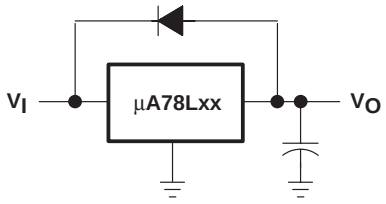



**Figure 7. Reverse-Bias-Protection Circuit**

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) |
|---|---|---|---|---|---|---|---|---|
| UA78L02ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L02ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L02ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L02ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L02ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05ACLPM | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05ACLPME3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05ACLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05ACLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05ACPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L05ACPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L05AID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05AIDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05AIDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05AIDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05AIDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05AIDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) |
|---|---|---|---|---|---|---|---|---|
| UA78L05AILP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05AILPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05AILPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05AILPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05AIPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L05AIPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L05AQD | OBSOLETE | SOIC | D | 8 | | TBD | Call TI | Call TI |
| UA78L05AQDR | OBSOLETE | SOIC | D | 8 | | TBD | Call TI | Call TI |
| UA78L05CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05CDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05CDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L05CLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05CLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05CLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05CLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L05CPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L05QLP | OBSOLETE | TO-92 | LP | 3 | | TBD | Call TI | Call TI |
| UA78L05QLPR | OBSOLETE | TO-92 | LP | 3 | | TBD | Call TI | Call TI |
| UA78L06ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L06ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L06ACLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L06ACLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L06ACPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L06ACPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L08ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | no Sb/Br) | | |
| UA78L08ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L08ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L08ACLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L08ACLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L08ACPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L08ACPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L08AILP | OBSOLETE | TO-92 | LP | 3 | | TBD | Call TI | Call TI |
| UA78L08AQDR | OBSOLETE | SOIC | D | 8 | | TBD | Call TI | Call TI |
| UA78L08CD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08CDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08CDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08CDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08CDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L08CLP | OBSOLETE | TO-92 | LP | 3 | | TBD | Call TI | Call TI |
| UA78L08CPK | OBSOLETE | SOT-89 | PK | 3 | | TBD | Call TI | Call TI |
| UA78L09ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L09ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L09ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L09ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L09ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L09ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) |
|---|---|---|---|---|---|---|---|---|
| UA78L09ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L09ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L09ACLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L09ACLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L09ACPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L09ACPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L10ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L10ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L10ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L10ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L10ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L10ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L10ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L10ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L10ACLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L10ACLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L10ACPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L10ACPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L12ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L12ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L12ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L12ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L12ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L12ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L12ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L12ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| UA78L12ACLPM | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L12ACLPME3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L12ACLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L12ACLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L12ACPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L12ACPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L12AQDR | OBSOLETE | SOIC | D | 8 | | TBD | Call TI | Call TI |
| UA78L12AQLPR | OBSOLETE | TO-92 | LP | 3 | | TBD | Call TI | Call TI |
| UA78L15ACD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L15ACDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L15ACDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L15ACDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L15ACDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L15ACDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| UA78L15ACLP | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L15ACLPE3 | ACTIVE | TO-92 | LP | 3 | 1000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L15ACLPR | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L15ACLPRE3 | ACTIVE | TO-92 | LP | 3 | 2000 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type |
| UA78L15ACPK | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |
| UA78L15ACPKG3 | ACTIVE | SOT-89 | PK | 3 | 1000 | Green (RoHS & no Sb/Br) | CU SN | Level-2-260C-1 YEAR |

[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.

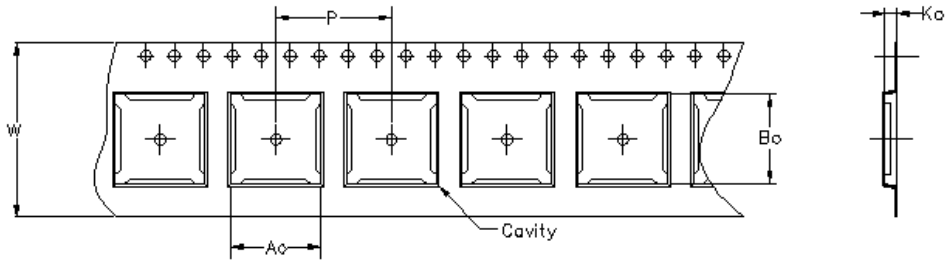
[2] Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
**TBD:** The Pb-Free/Green conversion plan has not 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.

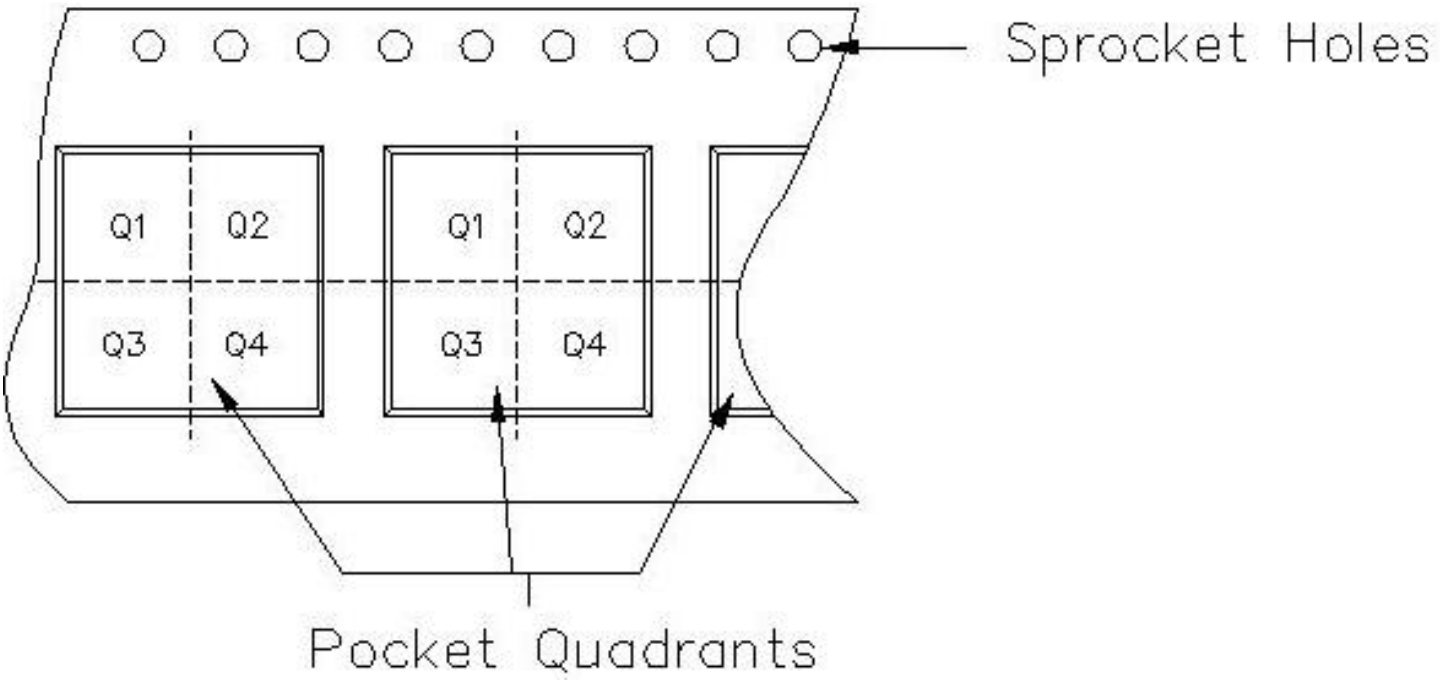
**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.




Carrier tape design is defined largely by the component lentgh, width, and thickness.

| |
|---|
| Ao = Dimension designed to accommodate the component width. |
| Bo = Dimension designed to accommodate the component length. |
| Ko = Dimension designed to accommodate the component thickness. |
| W = Overall width of the carrier tape. |
| P = Pitch between successive cavity centers. |

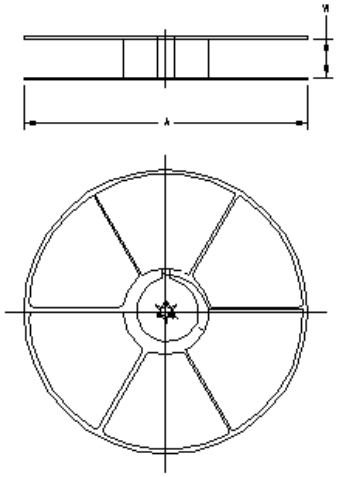



**TAPE AND REEL INFORMATION**

# PACKAGE MATERIALS INFORMATION

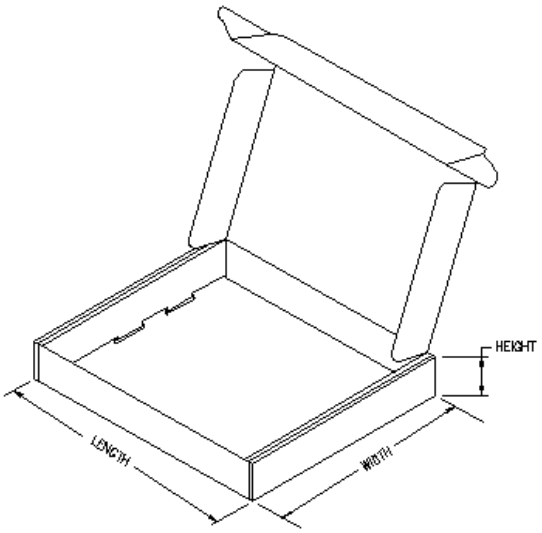


| Device | Package | Pins | Site | Reel Diameter (mm) | Reel Width (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| UA78L05ACDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L05ACPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L05ACPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L05AIDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L05AIPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L05AIPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L05CDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L05CPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L06ACPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L06ACPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L08ACDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L08ACPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L08ACPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L08CDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L09ACDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L09ACPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L09ACPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L10ACDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L10ACPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L10ACPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L12ACDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L12ACPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L12ACPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L15ACDR | D | 8 | FMX | 330 | 12 | 6.4 | 5.2 | 2.1 | 8 | 12 | Q1 |
| UA78L15ACPK | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |
| UA78L15ACPKG3 | PK | 3 | NFME | 0 | 12 | 4.91 | 4.52 | 1.9 | 8 | 12 | Q3 |

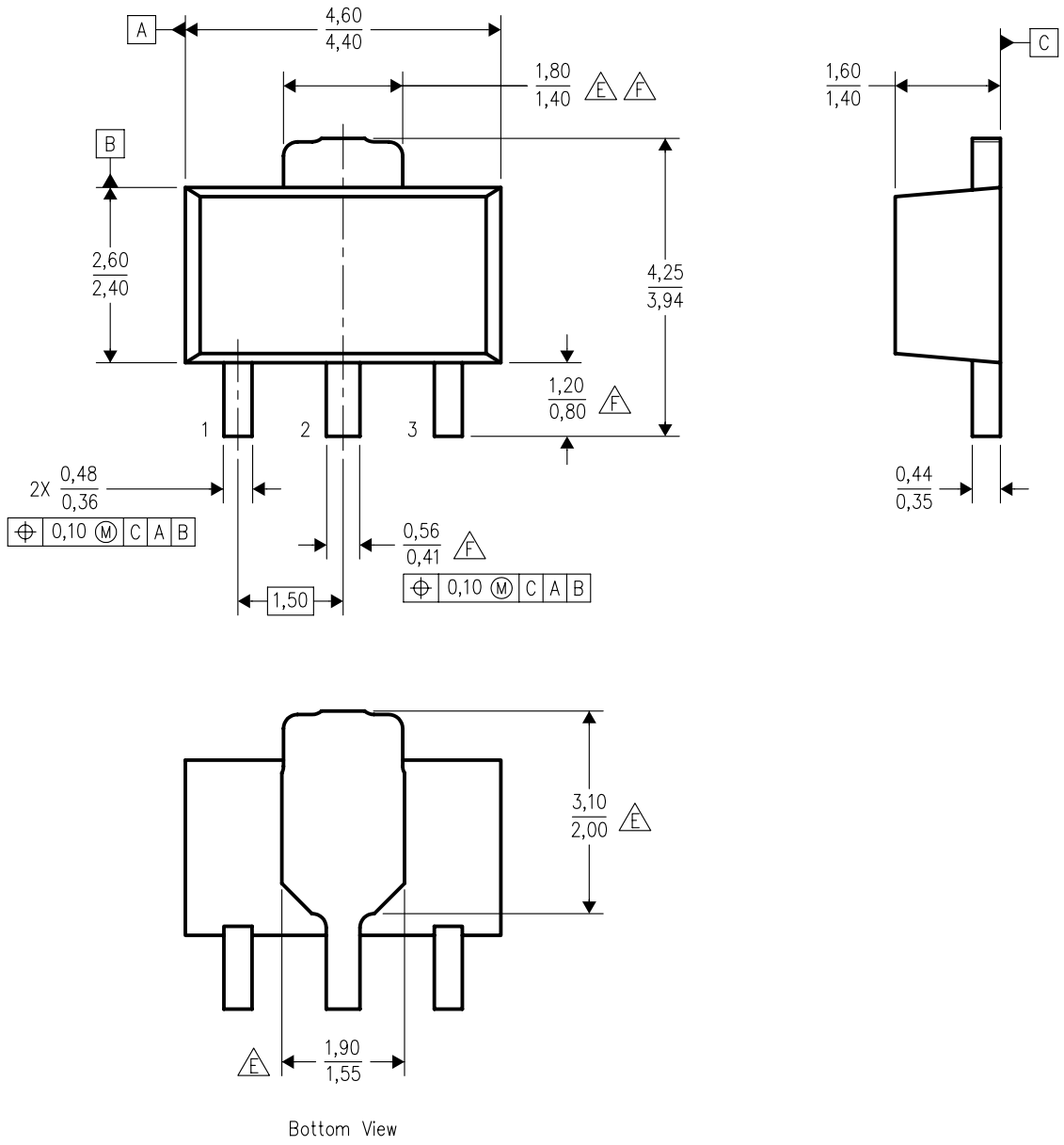


## TAPE AND REEL BOX INFORMATION

| Device | Package | Pins | Site | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|
| UA78L05ACDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L05ACPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L05ACPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L05AIDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L05AIPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L05AIPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L05CDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L05CPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L06ACPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L06ACPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L08ACDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L08ACPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L08ACPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L08CDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L09ACDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L09ACPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L09ACPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L10ACDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L10ACPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L10ACPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L12ACDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L12ACPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L12ACPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L15ACDR | D | 8 | FMX | 342.9 | 336.6 | 20.64 |
| UA78L15ACPK | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |
| UA78L15ACPKG3 | PK | 3 | NFME | 340.0 | 340.0 | 38.0 |


HEIGHT
LENGTH
WIDTH

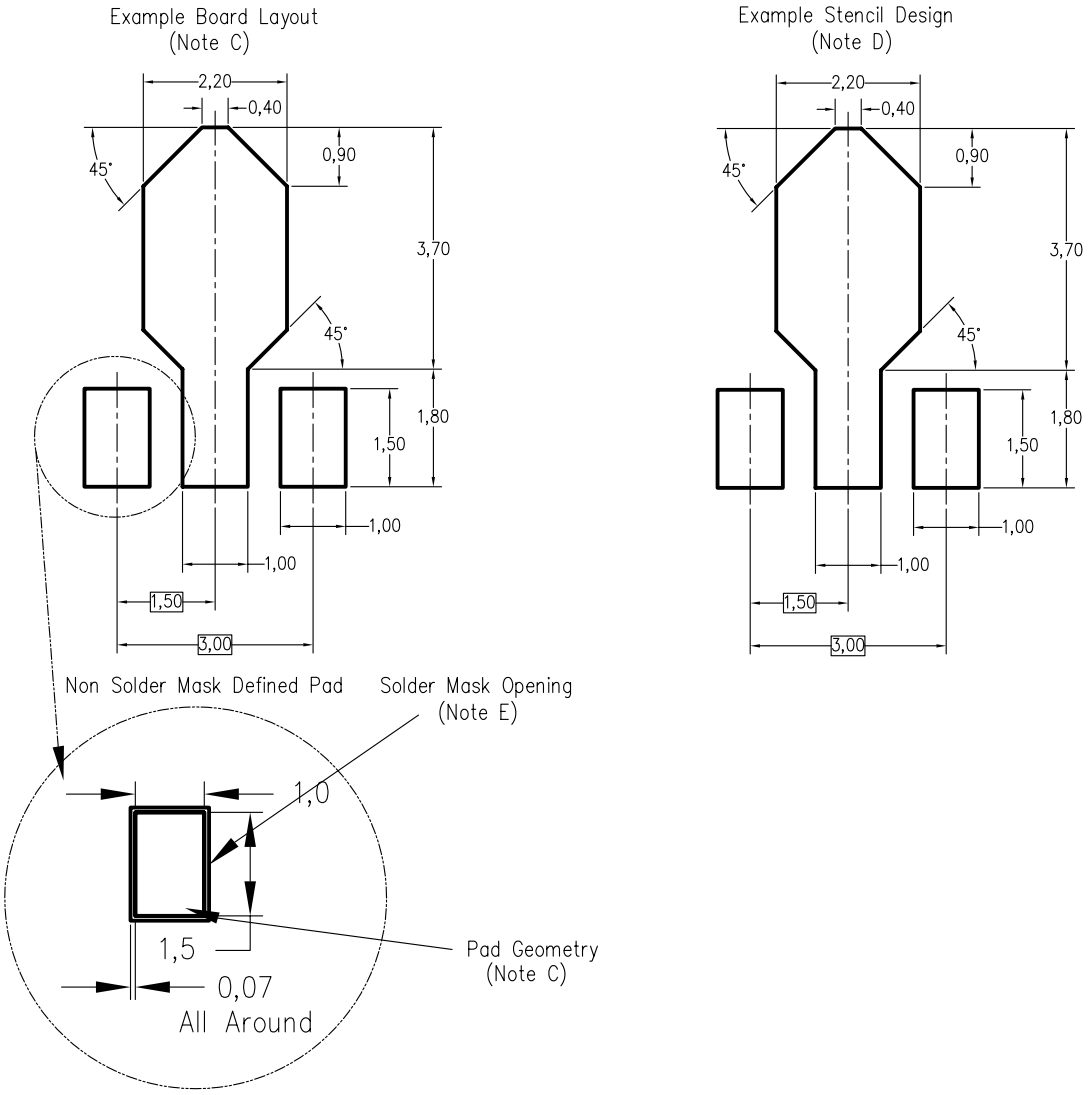
## PK (R–PSSO–F3) PLASTIC SINGLE–IN–LINE PACKAGE




4040234/D 02/2006

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. The center lead is in electrical contact with the tab.
D. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion not to exceed 0.15 per side.
E. Thermal pad contour optional within these dimensions.
F. Falls within JEDEC TO–243 variation AA, except minimum lead length, pin 2 minimum lead width, minimum tab width.

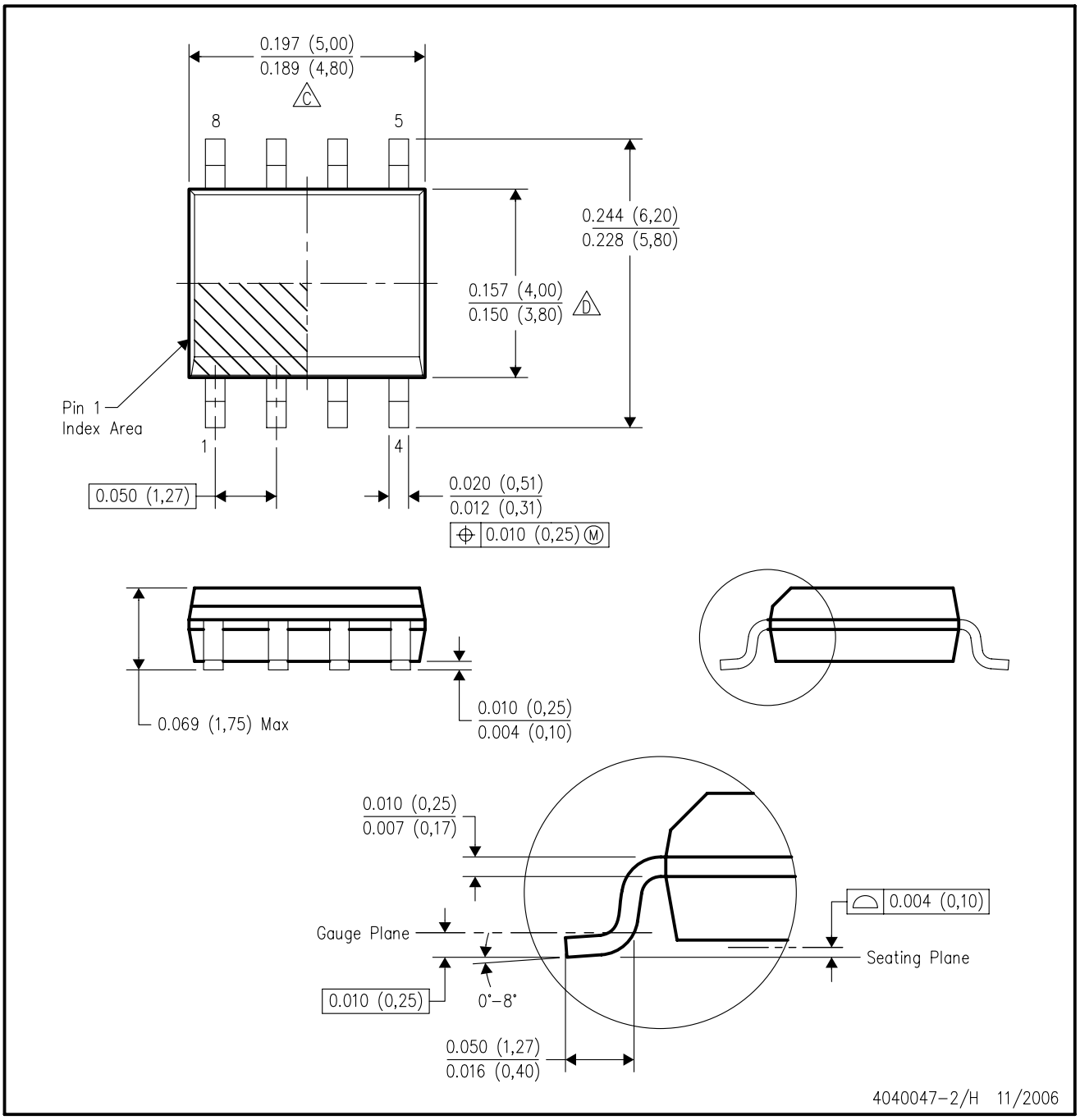
# PK (R–PDSO–G3)




4208221/A 09/06

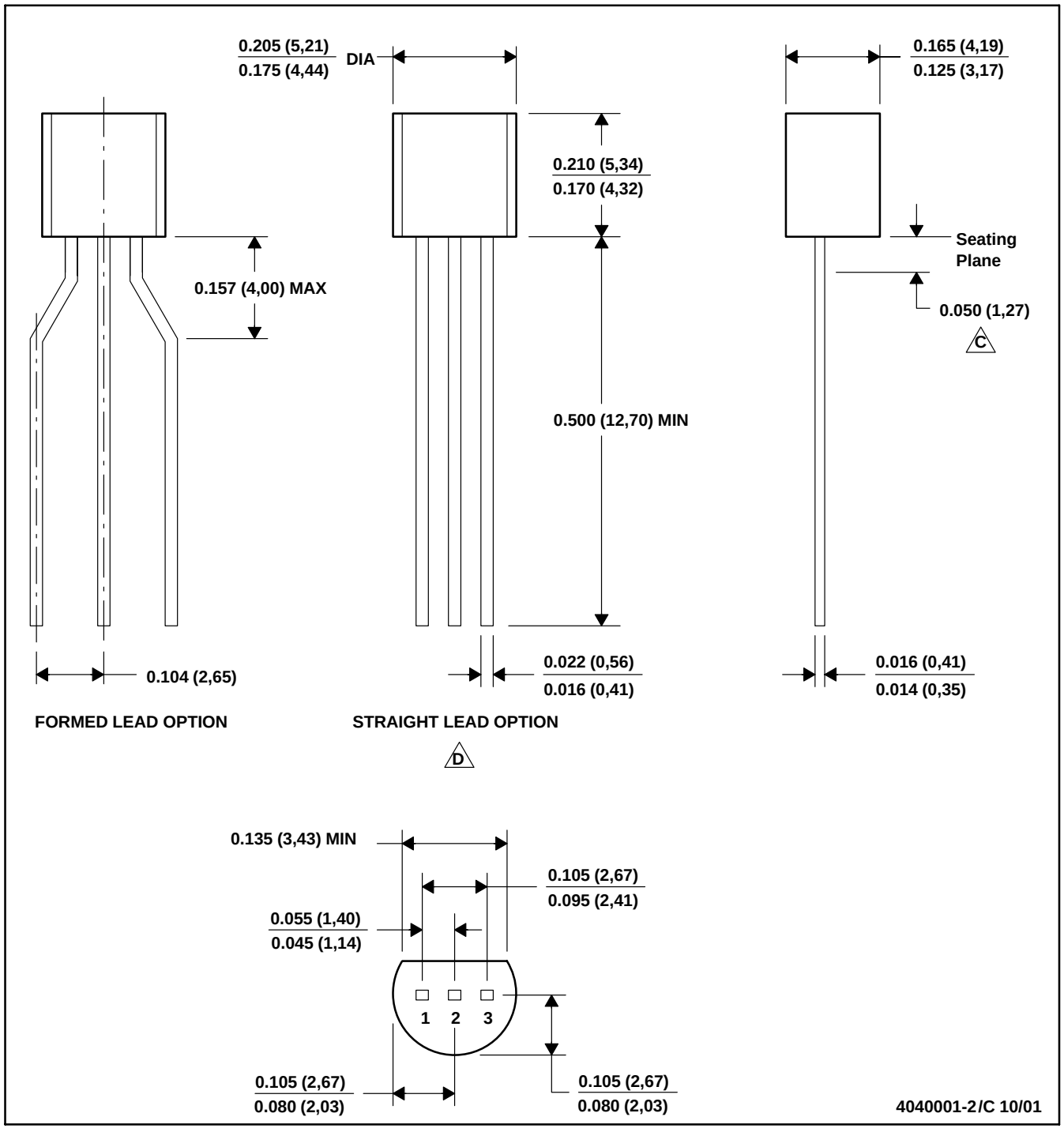
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact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

## D (R–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE



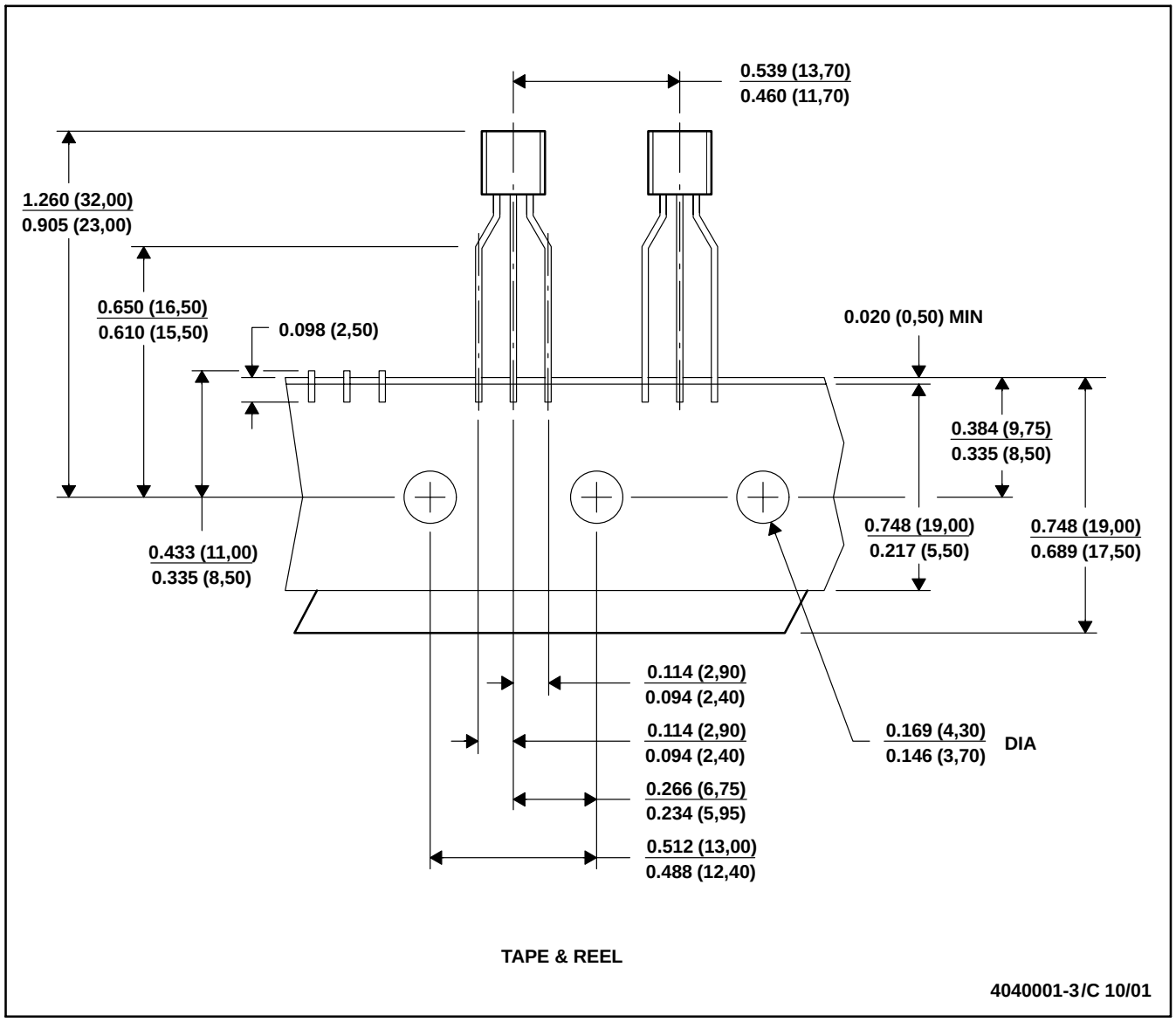

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
D. Body width does not include interlead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

**LP (O-PBCY-W3)** **PLASTIC CYLINDRICAL PACKAGE**




NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Lead dimensions are not controlled within this area
D. FAlls within JEDEC TO -226 Variation AA (TO-226 replaces TO-92)
E. Shipping Method:
Straight lead option available in bulk pack only.
Formed lead option available in tape & reel or ammo pack.

**LP (O-PBCY-W3)** **PLASTIC CYLINDRICAL PACKAGE**




NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Tape and Reel information for the Format Lead Option package.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

| **Products** | | **Applications** | |
|---|---|---|---|
| Amplifiers | amplifier.ti.com | Audio | www.ti.com/audio |
| Data Converters | dataconverter.ti.com | Automotive | www.ti.com/automotive |
| DSP | dsp.ti.com | Broadband | www.ti.com/broadband |
| Interface | interface.ti.com | Digital Control | www.ti.com/digitalcontrol |
| Logic | logic.ti.com | Military | www.ti.com/military |
| Power Mgmt | power.ti.com | Optical Networking | www.ti.com/opticalnetwork |
| Microcontrollers | microcontroller.ti.com | Security | www.ti.com/security |
| RFID | www.ti-rfid.com | Telephony | www.ti.com/telephony |
| Low Power Wireless | www.ti.com/lpw | Video & Imaging | www.ti.com/video |
| | | Wireless | www.ti.com/wireless |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated