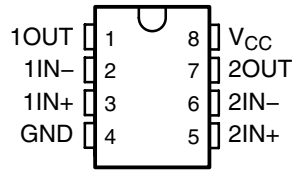
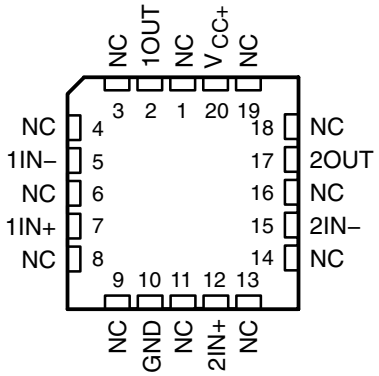
- **Wide Supply Range:**
  - **Single Supply . . . 3 V to 32 V (26 V for LM2904)**
  - **or Dual Supplies . . . ±1.5 V to ±16 V (±13 V for LM2904)**
- **Low Supply-Current Drain, Independent of Supply Voltage . . . 0.7 mA Typ**
- **Common-Mode Input Voltage Range Includes Ground, Allowing Direct Sensing Near Ground**
- **Low Input Bias and Offset Parameters:**
  - **Input Offset Voltage . . . 3 mV Typ**
    **A Versions . . . 2 mV Typ**
  - **Input Offset Current . . . 2 nA Typ**
  - **Input Bias Current . . . 20 nA Typ**
    **A Versions . . . 15 nA Typ**
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . 32 V (26 V for LM2904)**
- **Open-Loop Differential Voltage Amplification . . . 100 V/mV Typ**
- **Internal Frequency Compensation**

**LM158, LM158A . . . JG PACKAGE**
**LM258, LM258A . . . D, DGK, OR P PACKAGE**
**LM358 . . . D, DGK, P, PS, OR PW PACKAGE**
**LM358A . . . D, DGK, P, OR PW PACKAGE**
**LM2904 . . . D, DGK, P, PS, OR PW PACKAGE**
**(TOP VIEW)**




**LM158, LM158A . . . FK PACKAGE**
**(TOP VIEW)**




NC – No internal connection

## description/ordering information

These devices consist of two independent, high-gain frequency-compensated operational amplifiers designed to operate from a single supply over a wide range of voltages. Operation from split supplies also is possible if the difference between the two supplies is 3 V to 32 V (3 V to 26 V for the LM2904), and $V_{CC}$ is at least 1.5 V more positive than the input common-mode voltage. The low supply-current drain is independent of the magnitude of the supply voltage.

Applications include transducer amplifiers, dc amplification blocks, and all the conventional operational amplifier circuits that now can be implemented more easily in single-supply-voltage systems. For example, these devices can be operated directly from the standard 5-V supply used in digital systems and easily can provide the required interface electronics without additional ±5-V supplies.

## ORDERING INFORMATION†

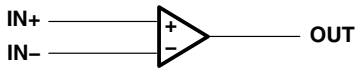
| $T_A$ | $V_{IO}$max AT 25°C | MAX TESTED $V_{CC}$ | PACKAGE‡ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---|---|---|---|---|---|---|
| 0°C to 70°C | 7 mV | 30 V | PDIP (P) | Tube of 50 | LM358P | LM358P |
| | | | SOIC (D) | Tube of 75 | LM358D | LM358 |
| | | | | Reel of 2500 | LM358DR | |
| | | | | Reel of 2500 | LM358DRG3 | |
| | | | SOP (PS) | Reel of 2000 | LM358PSR | L358 |
| | | | TSSOP (PW) | Tube of 150 | LM358PW | L358 |
| | | | | Reel of 2000 | LM358PWR | |
| | | | | Reel of 2000 | LM358PWRG3 | |
| | | | MSOP/VSSOP (DGK) | Reel of 2500 | LM358DGKR | M5_§ |
| | 3 mV | 30 V | PDIP (P) | Tube of 50 | LM358AP | LM358AP |
| | | | SOIC (D) | Tube of 75 | LM358AD | LM358A |
| | | | | Reel of 2500 | LM358ADR | |
| | | | TSSOP (PW) | Tube of 150 | LM358APW | L358A |
| | | | | Reel of 2000 | LM358APWR | |
| | | | MSOP/VSSOP (DGK) | Reel of 2500 | LM358ADGKR | M6_§ |
| –25°C to 85°C | 5 mV | 30 V | PDIP (P) | Tube of 50 | LM258P | LM258P |
| | | | SOIC (D) | Tube of 75 | LM258D | LM258 |
| | | | | Reel of 2500 | LM258DR | |
| | | | | Reel of 2500 | LM258DRG3 | |
| | | | MSOP/VSSOP (DGK) | Reel of 2500 | LM258DGKR | M2_§ |
| | 3 mV | 30 V | PDIP (P) | Tube of 50 | LM258AP | LM258AP |
| | | | SOIC (D) | Tube of 75 | LM258AD | LM258A |
| | | | | Reel of 2500 | LM258ADR | |
| | | | MSOP/VSSOP (DGK) | Reel of 2500 | LM258ADGKR | M3_§ |
| –40°C to 125°C | 7 mV | 26 V | PDIP (P) | Tube of 50 | LM2904P | LM2904P |
| | | | SOIC (D) | Tube of 75 | LM2904D | LM2904 |
| | | | | Reel of 2500 | LM2904DR | |
| | | | | Reel of 2500 | LM2904DRG3 | |
| | | | SOP (PS) | Reel of 2000 | LM2904PSR | L2904 |
| | | | TSSOP (PW) | Tube of 150 | LM2904PW | L2904 |
| | | | | Reel of 2000 | LM2904PWR | |
| | | | | Reel of 2000 | LM2904PWRG3 | |
| | | | MSOP/VSSOP (DGK) | Reel of 2500 | LM2904DGKR | MB_§ |
| | 7 mV | 32 V | SOIC (D) | Reel of 2500 | LM2904VQDR | L2904V |
| | | | TSSOP (PW) | Reel of 2000 | LM2904VQPWR | L2904V |
| | 2 mV | 32 V | SOIC (D) | Reel of 2500 | LM2904AVQDR | L2904AV |
| | | | TSSOP (PW) | Reel of 2000 | LM2904AVQPWR | L2904AV |
| –55°C to 125°C | 5 mV | 30 V | CDIP (JG) | Tube of 50 | LM158JG | LM158JG |
| | | | LCCC (FK) | Tube of 55 | LM158FK | LM158FK |
| | 2 mV | 30 V | CDIP (JG) | Tube of 50 | LM158AJG | LM158AJG |
| | | | LCCC (FK) | Tube of 55 | LM158AFK | LM158AFK |

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

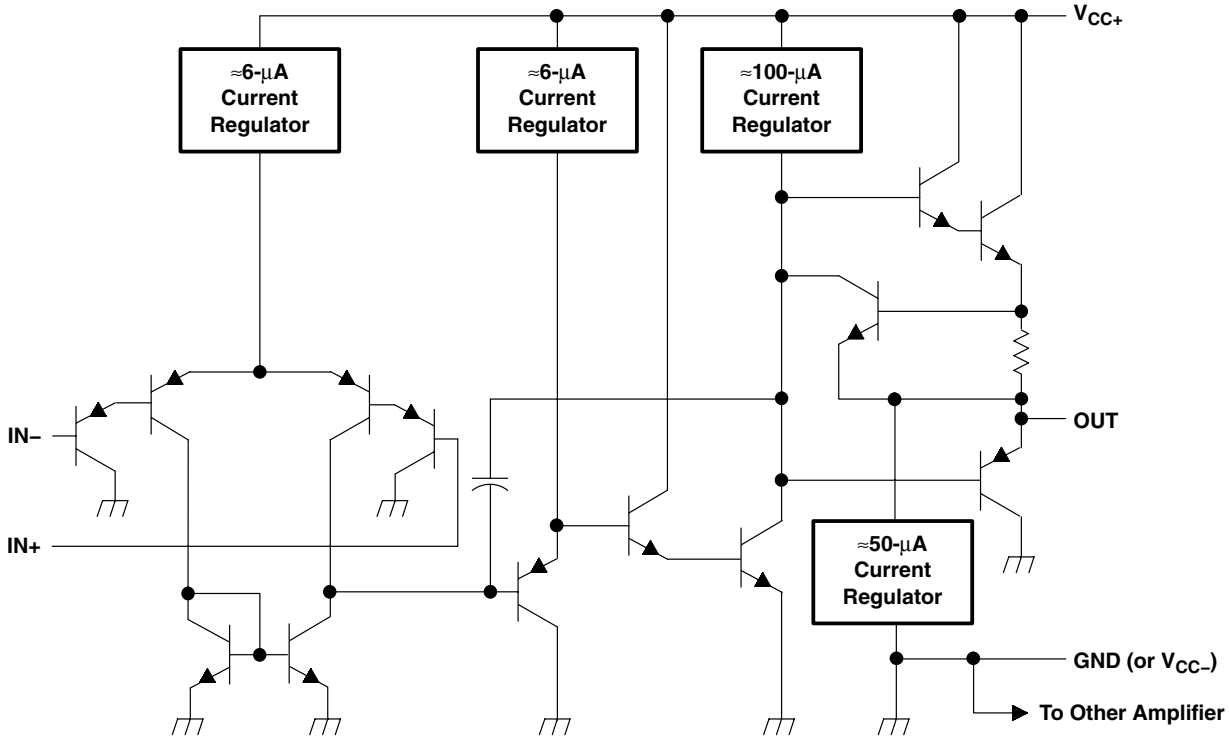
‡ Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

§ The actual top-side marking has one additional character that designates the wafer fab/assembly site.

### symbol (each amplifier)




### schematic (each amplifier)




| COMPONENT COUNT | |
|---|---|
| Epi-FET | 1 |
| Diodes | 2 |
| Resistors | 7 |
| Transistors | 51 |
| Capacitors | 2 |

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

| | | LM158, LM158A LM258, LM258A LM358, LM358A LM2904V | LM2904 | UNIT |
|---|---|---|---|---|
| Supply voltage, $V_{CC}$ (see Note 1) | | ±16 or 32 | ±13 or 26 | V |
| Differential input voltage, $V_{ID}$ (see Note 2) | | ±32 | ±26 | V |
| Input voltage, $V_I$ (either input) | | –0.3 to 32 | –0.3 to 26 | V |
| Duration of output short circuit (one amplifier) to ground at (or below) 25°C free-air temperature ($V_{CC} \le 15$ V) (see Note 3) | | Unlimited | Unlimited | |
| Package thermal impedance, $\theta_{JA}$ (see Notes 4 and 5) | D package | 97 | 97 | °C/W |
| | DGK package | 172 | 172 | |
| | P package | 85 | 85 | |
| | PS package | 95 | 95 | |
| | PW package | 149 | 149 | |
| Package thermal impedance, $\theta_{JC}$ (see Notes 6 and 7) | FK package | 5.61 | | °C/W |
| | JG package | 14.5 | | |
| Operating free-air temperature range, $T_A$ | LM158, LM158A | –55 to 125 | | °C |
| | LM258, LM258A | –25 to 85 | | |
| | LM358, LM358A | 0 to 70 | | |
| | LM2904 | –40 to 125 | –40 to 125 | |
| Operating virtual junction temperature, $T_J$ | | 150 | 150 | °C |
| Case temperature for 60 seconds | FK package | 260 | | °C |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds | JG package | 300 | 300 | °C |
| Storage temperature range, $T_{stg}$ | | –65 to 150 | –65 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 and $V_{CC}$ specified for measurement of $I_{OS}$, are with respect to the network ground terminal.
2. Differential voltages are at IN+ with respect to IN–.
3. Short circuits from outputs to $V_{CC}$ can cause excessive heating and eventual destruction.
4. 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.
5. The package thermal impedance is calculated in accordance with JESD 51-7.
6. Maximum power dissipation is a function of $T_J(max)$, $\theta_{JC}$, 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.
7. The package thermal impedance is calculated in accordance with MIL-STD-883.

## electrical characteristics at specified free-air temperature, $V_{CC}$ = 5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | $T_A$‡ | LM158 LM258 | | | LM358 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP§ | MAX | MIN | TYP§ | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{CC}$ = 5 V to MAX, $V_{IC} = V_{ICR(min)}$, $V_O$ = 1.4 V | | 25°C | | 3 | 5 | | 3 | 7 | mV |
| | | | | Full range | | | 7 | | | 9 | |
| $\alpha_{V_{IO}}$ | Average temperature coefficient of input offset voltage | | | Full range | | 7 | | | 7 | | μV/°C |
| $I_{IO}$ | Input offset current | $V_O$ = 1.4 V | | 25°C | | 2 | 30 | | 2 | 50 | nA |
| | | | | Full range | | | 100 | | | 150 | |
| $\alpha_{I_{IO}}$ | Average temperature coefficient of input offset current | | | Full range | | 10 | | | 10 | | pA/°C |
| $I_{IB}$ | Input bias current | $V_O$ = 1.4 V | | 25°C | | –20 | –150 | | –20 | –250 | nA |
| | | | | Full range | | | –300 | | | –500 | |
| $V_{ICR}$ | Common-mode input voltage range | $V_{CC}$ = 5 V to MAX | | 25°C | 0 to $V_{CC}$ – 1.5 | | | 0 to $V_{CC}$ – 1.5 | | | V |
| | | | | Full range | 0 to $V_{CC}$ – 2 | | | 0 to $V_{CC}$ – 2 | | | |
| $V_{OH}$ | High-level output voltage | $R_L \geq 2$ kΩ | | 25°C | $V_{CC}$ – 1.5 | | | $V_{CC}$ – 1.5 | | | V |
| | | $R_L \geq 10$ kΩ | | 25°C | | | | | | | |
| | | $V_{CC}$ = MAX | $R_L$ = 2 kΩ | Full range | 26 | | | 26 | | | |
| | | | $R_L \geq 10$ kΩ | Full range | 27 | 28 | | 27 | 28 | | |
| $V_{OL}$ | Low-level output voltage | $R_L \leq 10$ kΩ | | Full range | | 5 | 20 | | 5 | 20 | mV |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_{CC}$ = 15 V, $V_O$ = 1 V to 11 V, $R_L \geq 2$ kΩ | | 25°C | 50 | 100 | | 25 | 100 | | V/mV |
| | | | | Full range | 25 | | | 15 | | | |
| CMRR | Common-mode rejection ratio | $V_{CC}$ = 5 V to MAX, $V_{IC} = V_{ICR(min)}$ | | 25°C | 70 | 80 | | 65 | 80 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{DD}/\Delta V_{IO}$) | $V_{CC}$ = 5 V to MAX | | 25°C | 65 | 100 | | 65 | 100 | | dB |
| $V_{O1}/V_{O2}$ | Crosstalk attenuation | f = 1 kHz to 20 kHz | | 25°C | | 120 | | | 120 | | dB |
| $I_O$ | Output current | $V_{CC}$ = 15 V, $V_{ID}$ = 1 V, $V_O$ = 0 | Source | 25°C | –20 | –30 | | –20 | –30 | | mA |
| | | | | Full range | –10 | | | –10 | | | |
| | | $V_{CC}$ = 15 V, $V_{ID}$ = –1 V, $V_O$ = 15 V | Sink | 25°C | 10 | 20 | | 10 | 20 | | |
| | | | | Full range | 5 | | | 5 | | | |
| $I_O$ | Output current | $V_{ID}$ = –1 V, $V_O$ = 200 mV | | 25°C | 12 | 30 | | 12 | 30 | | μA |
| $I_{OS}$ | Short-circuit output current | $V_{CC}$ at 5 V, GND at –5 V, $V_O$ = 0 | | 25°C | | ±40 | ±60 | | ±40 | ±60 | mA |
| $I_{CC}$ | Supply current (two amplifiers) | $V_O$ = 2.5 V, No load | | Full range | | 0.7 | 1.2 | | 0.7 | 1.2 | mA |
| | | $V_{CC}$ = MAX, $V_O$ = 0.5 V, No load | | Full range | | 1 | 2 | | 1 | 2 | |

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified. MAX $V_{CC}$ for testing purposes is 26 V for the LM2904 and 30 V for others.
‡ Full range is –55°C to 125°C for LM158, –25°C to 85°C for LM258, 0°C to 70°C for LM358, and –40°C to 125°C for LM2904.
§ All typical values are at $T_A$ = 25°C.

## electrical characteristics at specified free-air temperature, $V_{CC}$ = 5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | $T_A$‡ | LM2904 | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP§ | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{CC}$ = 5 V to MAX, $V_{IC} = V_{ICR(min)}$, $V_O$ = 1.4 V | Non-A devices | 25°C | | 3 | 7 | mV |
| | | | | Full range | | | 10 | |
| | | | A-suffix devices | 25°C | | 1 | 2 | |
| | | | | Full range | | | 4 | |
| $\alpha_{V_{IO}}$ | Average temperature coefficient of input offset voltage | | | Full range | | 7 | | µV/°C |
| $I_{IO}$ | Input offset current | $V_O$ = 1.4 V | Non-V device | 25°C | | 2 | 50 | nA |
| | | | | Full range | | | 300 | |
| | | | V-suffix device | 25°C | | 2 | 50 | |
| | | | | Full range | | | 150 | |
| $\alpha_{I_{IO}}$ | Average temperature coefficient of input offset current | | | Full range | | 10 | | pA/°C |
| $I_{IB}$ | Input bias current | $V_O$ = 1.4 V | | 25°C | | –20 | –250 | nA |
| | | | | Full range | | | –500 | |
| $V_{ICR}$ | Common-mode input voltage range | $V_{CC}$ = 5 V to MAX | | 25°C | 0 to $V_{CC}$ – 1.5 | | | V |
| | | | | Full range | 0 to $V_{CC}$ – 2 | | | |
| $V_{OH}$ | High-level output voltage | $R_L \geq 10\ k\Omega$ | | 25°C | $V_{CC}$ – 1.5 | | | V |
| | | $V_{CC}$ = MAX, Non-V device | $R_L$ = 2 kΩ | Full range | 22 | | | |
| | | | $R_L \geq 10\ k\Omega$ | Full range | 23 | 24 | | |
| | | $V_{CC}$ = MAX, V-suffix device | $R_L$ = 2 kΩ | Full range | 26 | | | |
| | | | $R_L \geq 10\ k\Omega$ | Full range | 27 | 28 | | |
| $V_{OL}$ | Low-level output voltage | $R_L \leq 10\ k\Omega$ | | Full range | | 5 | 20 | mV |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_{CC}$ = 15 V, $V_O$ = 1 V to 11 V, $R_L \geq 2\ k\Omega$ | | 25°C | 25 | 100 | | V/mV |
| | | | | Full range | 15 | | | |
| CMRR | Common-mode rejection ratio | $V_{CC}$ = 5 V to MAX, $V_{IC} = V_{ICR(min)}$ | Non-V device | 25°C | 50 | 80 | | dB |
| | | | V-suffix device | 25°C | 65 | 80 | | |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{DD}/\Delta V_{IO}$) | $V_{CC}$ = 5 V to MAX | | 25°C | 65 | 100 | | dB |
| $V_{O1}/V_{O2}$ | Crosstalk attenuation | f = 1 kHz to 20 kHz | | 25°C | | 120 | | dB |
| $I_O$ | Output current | $V_{CC}$ = 15 V, $V_{ID}$ = 1 V, $V_O$ = 0 | Source | 25°C | –20 | –30 | | mA |
| | | | | Full range | –10 | | | mA |
| | | $V_{CC}$ = 15 V, $V_{ID}$ = –1 V, $V_O$ = 15 V | Sink | 25°C | 10 | 20 | | mA |
| | | | | Full range | 5 | | | mA |
| | | $V_{ID}$ = –1 V, $V_O$ = 200 mV | Non-V device | 25°C | | 30 | | µA |
| | | | V-suffix device | 25°C | 12 | 40 | | |
| $I_{OS}$ | Short-circuit output current | $V_{CC}$ at 5 V, GND at –5 V, $V_O$ = 0 | | 25°C | | ±40 | ±60 | mA |
| $I_{CC}$ | Supply current (two amplifiers) | $V_O$ = 2.5 V, No load | | Full range | | 0.7 | 1.2 | mA |
| | | $V_{CC}$ = MAX, $V_O$ = 0.5 V, No load | | Full range | | 1 | 2 | |

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified. MAX $V_{CC}$ for testing purposes is 26 V for the LM2904, 32 V for the LM2904V, and 30 V for others.
‡ Full range is –55°C to 125°C for LM158, –25°C to 85°C for LM258, 0°C to 70°C for LM358, and –40°C to 125°C for LM2904.
§ All typical values are at $T_A$ = 25°C.

## electrical characteristics at specified free-air temperature, $V_{CC}$ = 5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | $T_A$‡ | LM158A | | | LM258A | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP§ | MAX | MIN | TYP§ | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{CC}$ = 5 V to 30 V, $V_{IC} = V_{ICR(min)}$, $V_O$ = 1.4 V | | 25°C | | | 2 | | 2 | 3 | mV |
| | | | | Full range | | | 4 | | | 4 | |
| $\alpha_{V_{IO}}$ | Average temperature coefficient of input offset voltage | | | Full range | | 7 | 15* | | 7 | 15 | μV/°C |
| $I_{IO}$ | Input offset current | $V_O$ = 1.4 V | | 25°C | | 2 | 10 | | 2 | 15 | nA |
| | | | | Full range | | | 30 | | | 30 | |
| $\alpha_{I_{IO}}$ | Average temperature coefficient of input offset current | | | Full range | | 10 | 200 | | 10 | 200 | pA/°C |
| $I_{IB}$ | Input bias current | $V_O$ = 1.4 V | | 25°C | | –15 | –50 | | –15 | –80 | nA |
| | | | | Full range | | | –100 | | | –100 | |
| $V_{ICR}$ | Common-mode input voltage range | $V_{CC}$ = 30 V | | 25°C | 0 to $V_{CC}$ – 1.5 | | | 0 to $V_{CC}$ – 1.5 | | | V |
| | | | | Full range | 0 to $V_{CC}$ – 2 | | | 0 to $V_{CC}$ – 2 | | | |
| $V_{OH}$ | High-level output voltage | $R_L \geq 2$ kΩ | | 25°C | $V_{CC}$ – 1.5 | | | $V_{CC}$ – 1.5 | | | V |
| | | $V_{CC}$ = 30 V | $R_L$ = 2 kΩ | Full range | 26 | | | 26 | | | |
| | | | $R_L \geq 10$ kΩ | Full range | 27 | 28 | | 27 | 28 | | |
| $V_{OL}$ | Low-level output voltage | $R_L \leq 10$ kΩ | | Full range | | 5 | 20 | | 5 | 20 | mV |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_{CC}$ = 15 V, $V_O$ = 1 V to 11 V, $R_L \geq 2$ kΩ | | 25°C | 50 | 100 | | 50 | 100 | | V/mV |
| | | | | Full range | 25 | | | 25 | | | |
| CMRR | Common-mode rejection ratio | | | 25°C | 70 | 80 | | 70 | 80 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{DD}/\Delta V_{IO}$) | | | 25°C | 65 | 100 | | 65 | 100 | | dB |
| $V_{O1}/V_{O2}$ | Crosstalk attenuation | f = 1 kHz to 20 kHz | | 25°C | | 120 | | | 120 | | dB |
| $I_O$ | Output current | $V_{CC}$ = 15 V, $V_{ID}$ = 1 V, $V_O$ = 0 | Source | 25°C | –20 | –30 | –60 | –20 | –30 | –60 | mA |
| | | | | Full range | –10 | | | –10 | | | |
| | | $V_{CC}$ = 15 V, $V_{ID}$ = –1 V, $V_O$ = 15 | Sink | 25°C | 10 | 20 | | 10 | 20 | | |
| | | | | Full range | 5 | | | 5 | | | |
| | | $V_{ID}$ = –1 V, $V_O$ = 200 mV | | 25°C | 12 | 30 | | 12 | 30 | | μA |
| $I_{OS}$ | Short-circuit output current | $V_{CC}$ at 5 V, GND at –5 V, $V_O$ = 0 | | 25°C | | ±40 | ±60 | | ±40 | ±60 | mA |
| $I_{CC}$ | Supply current (two amplifiers) | $V_O$ = 2.5 V, No load | | Full range | | 0.7 | 1.2 | | 0.7 | 1.2 | mA |
| | | $V_{CC}$ = MAX, $V_O$ = 0.5 V, No load | | Full range | | 1 | 2 | | 1 | 2 | |

*On products compliant to MIL-PRF-38535, this parameter is not production tested.
† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified. MAX $V_{CC}$ for testing purposes is 26 V for LM2904 and 30 V for others.
‡ Full range is –55°C to 125°C for LM158A, –25°C to 85°C for LM258A, and 0°C to 70°C for LM358A.
§ All typical values are at $T_A$ = 25°C.

## electrical characteristics at specified free-air temperature, $V_{CC}$ = 5 V (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS† | | $T_A$‡ | LM358A | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | TYP§ | MAX | |
| $V_{IO}$ | Input offset voltage | $V_{CC}$ = 5 V to 30 V, $V_{IC} = V_{ICR(min)}$, $V_O$ = 1.4 V | | 25°C | | 2 | 3 | mV |
| | | | | Full range | | | 5 | |
| $\alpha_{V_{IO}}$ | Average temperature coefficient of input offset voltage | | | Full range | | 7 | 20 | µV/°C |
| $I_{IO}$ | Input offset current | $V_O$ = 1.4 V | | 25°C | | 2 | 30 | nA |
| | | | | Full range | | | 75 | |
| $\alpha_{I_{IO}}$ | Average temperature coefficient of input offset current | | | Full range | | 10 | 300 | pA/°C |
| $I_{IB}$ | Input bias current | $V_O$ = 1.4 V | | 25°C | | –15 | –100 | nA |
| | | | | Full range | | | –200 | |
| $V_{ICR}$ | Common-mode input voltage range | $V_{CC}$ = 30 V | | 25°C | 0 to $V_{CC}$ – 1.5 | | | V |
| | | | | Full range | 0 to $V_{CC}$ – 2 | | | |
| $V_{OH}$ | High-level output voltage | $R_L \geq 2$ kΩ | | 25°C | $V_{CC}$ – 1.5 | | | V |
| | | $V_{CC}$ = 30 V | $R_L$ = 2 kΩ | Full range | 26 | | | |
| | | | $R_L \geq 10$ kΩ | Full range | 27 | 28 | | |
| $V_{OL}$ | Low-level output voltage | $R_L \leq 10$ kΩ | | Full range | | 5 | 20 | mV |
| $A_{VD}$ | Large-signal differential voltage amplification | $V_{CC}$ = 15 V, $V_O$ = 1 V to 11 V, $R_L \geq 2$ kΩ | | 25°C | 25 | 100 | | V/mV |
| | | | | Full range | 15 | | | |
| CMRR | Common-mode rejection ratio | | | 25°C | 65 | 80 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio ($\Delta V_{DD}/\Delta V_{IO}$) | | | 25°C | 65 | 100 | | dB |
| $V_{O1}/V_{O2}$ | Crosstalk attenuation | f = 1 kHz to 20 kHz | | 25°C | | 120 | | dB |
| $I_O$ | Output current | $V_{CC}$ = 15 V, $V_{ID}$ = 1 V, $V_O$ = 0 | Source | 25°C | –20 | –30 | –60 | mA |
| | | | | Full range | –10 | | | |
| | | $V_{CC}$ = 15 V, $V_{ID}$ = –1 V, $V_O$ = 15 V | Sink | 25°C | 10 | 20 | | |
| | | | | Full range | 5 | | | |
| | | $V_{ID}$ = –1 V, $V_O$ = 200 mV | | 25°C | | 30 | | µA |
| $I_{OS}$ | Short-circuit output current | $V_{CC}$ at 5 V, GND at –5 V, $V_O$ = 0 | | 25°C | | ±40 | ±60 | mA |
| $I_{CC}$ | Supply current (two amplifiers) | $V_O$ = 2.5 V, No load | | Full range | | 0.7 | 1.2 | mA |
| | | $V_{CC}$ = MAX, $V_O$ = 0.5 V, No load | | Full range | | 1 | 2 | |

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified. MAX $V_{CC}$ for testing purposes is 26 V for LM2904 and 30 V for others.
‡ Full range is –55°C to 125°C for LM158A, –25°C to 85°C for LM258A, and 0°C to 70°C for LM358A.
§ All typical values are at $T_A$ = 25°C.

### operating conditions, $V_{CC} = \pm 15$ V, $T_A = 25°C$

| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|---|---|---|---|---|
| SR | Slew rate at unity gain | $R_L$ = 1 MΩ, $C_L$ = 30 pF, $V_I$ = ±10 V (see Figure 1) | 0.3 | V/μs |
| $B_1$ | Unity-gain bandwidth | $R_L$ = 1 MΩ, $C_L$ = 20 pF (see Figure 1) | 0.7 | MHz |
| $V_n$ | Equivalent input noise voltage | $R_S$ = 100 Ω, $V_I$ = 0 V, f = 1 kHz (see Figure 2) | 40 | nV/√Hz |

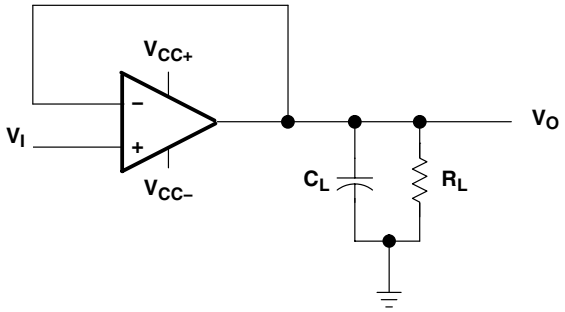



**Figure 1. Unity-Gain Amplifier**

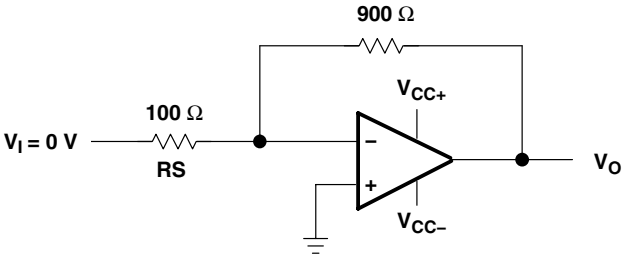



**Figure 2. Noise-Test Circuit**

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5962-87710012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 5962-87710012A LM158FKB | Samples |
| 5962-8771001PA | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8771001PA LM158 | Samples |
| 5962-87710022A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 5962-87710022A LM158AFKB | Samples |
| 5962-8771002PA | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8771002PA LM158A | Samples |
| LM158AFKB | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 5962-87710022A LM158AFKB | Samples |
| LM158AJG | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | LM158AJG | Samples |
| LM158AJGB | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8771002PA LM158A | Samples |
| LM158FKB | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | -55 to 125 | 5962-87710012A LM158FKB | Samples |
| LM158JG | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | LM158JG | Samples |
| LM158JGB | ACTIVE | CDIP | JG | 8 | 1 | TBD | A42 | N / A for Pkg Type | -55 to 125 | 8771001PA LM158 | Samples |
| LM258AD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258A | Samples |
| LM258ADE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258A | Samples |
| LM258ADG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258A | Samples |
| LM258ADGKR | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | (M3L ~ M3P ~ M3S ~ M3U) | Samples |
| LM258ADGKRG4 | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | (M3L ~ M3P ~ M3S ~ M3U) | Samples |
| LM258ADR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258A | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LM258ADRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258A | Samples |
| LM258ADRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258A | Samples |
| LM258AP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -25 to 85 | LM258AP | Samples |
| LM258APE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -25 to 85 | LM258AP | Samples |
| LM258D | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258 | Samples |
| LM258DE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258 | Samples |
| LM258DG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258 | Samples |
| LM258DGKR | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | (M2L ~ M2P ~ M2S ~ M2U) | Samples |
| LM258DGKRG4 | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | (M2L ~ M2P ~ M2S ~ M2U) | Samples |
| LM258DR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258 | Samples |
| LM258DRE4 | ACTIVE | SOIC | D | 8 | | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258 | Samples |
| LM258DRG3 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | -25 to 85 | LM258 | Samples |
| LM258DRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -25 to 85 | LM258 | Samples |
| LM258P | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -25 to 85 | LM258P | Samples |
| LM258PE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -25 to 85 | LM258P | Samples |
| LM2904AVQDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904AV | Samples |
| LM2904AVQDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904AV | Samples |
| LM2904AVQPWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904AV | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LM2904AVQPWRG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904AV | Samples |
| LM2904D | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LM2904 | Samples |
| LM2904DE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LM2904 | Samples |
| LM2904DG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LM2904 | Samples |
| LM2904DGKR | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (MBL ~ MBP ~ MBS ~ MBU) | Samples |
| LM2904DGKRG4 | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (MBL ~ MBP ~ MBS ~ MBU) | Samples |
| LM2904DR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LM2904 | Samples |
| LM2904DRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LM2904 | Samples |
| LM2904DRG3 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | -40 to 125 | LM2904 | Samples |
| LM2904DRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LM2904 | Samples |
| LM2904P | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 125 | LM2904P | Samples |
| LM2904PE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | -40 to 125 | LM2904P | Samples |
| LM2904PSR | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |
| LM2904PSRE4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |
| LM2904PSRG4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |
| LM2904PW | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |
| LM2904PWE4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |
| LM2904PWG4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LM2904PWLE | OBSOLETE | TSSOP | PW | 8 | | TBD | Call TI | Call TI | -40 to 125 | | |
| LM2904PWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |
| LM2904PWRG3 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | -40 to 125 | L2904 | Samples |
| LM2904QD | OBSOLETE | SOIC | D | 8 | | TBD | Call TI | Call TI | -40 to 125 | | |
| LM2904QDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 2904Q1 | Samples |
| LM2904QDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | 2904Q1 | Samples |
| LM2904QP | OBSOLETE | PDIP | P | 8 | | TBD | Call TI | Call TI | -40 to 125 | | |
| LM2904VQDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904V | Samples |
| LM2904VQDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904V | Samples |
| LM2904VQPWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904V | Samples |
| LM2904VQPWRG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | L2904V | Samples |
| LM358AD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358A | Samples |
| LM358ADE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358A | Samples |
| LM358ADG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358A | Samples |
| LM358ADGKR | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | (M6L ~ M6P ~ M6S ~ M6U) | Samples |
| LM358ADGKRG4 | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | (M6L ~ M6P ~ M6S ~ M6U) | Samples |
| LM358ADR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358A | Samples |
| LM358ADRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358A | Samples |
| LM358ADRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358A | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LM358AP | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | LM358AP | Samples |
| LM358APE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | LM358AP | Samples |
| LM358APW | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358A | Samples |
| LM358APWE4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358A | Samples |
| LM358APWG4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358A | Samples |
| LM358APWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358A | Samples |
| LM358APWRE4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358A | Samples |
| LM358APWRG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358A | Samples |
| LM358D | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358 | Samples |
| LM358DE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358 | Samples |
| LM358DG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358 | Samples |
| LM358DGKR | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | (M5L ~ M5P ~ M5S ~ M5U) | Samples |
| LM358DGKRG4 | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | (M5L ~ M5P ~ M5S ~ M5U) | Samples |
| LM358DR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358 | Samples |
| LM358DRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358 | Samples |
| LM358DRG3 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | 0 to 70 | LM358 | Samples |
| LM358DRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | LM358 | Samples |
| LM358P | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | LM358P | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LM358PE3 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU SN | N / A for Pkg Type | 0 to 70 | LM358P | Samples |
| LM358PE4 | ACTIVE | PDIP | P | 8 | 50 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | LM358P | Samples |
| LM358PSLE | OBSOLETE | SO | PS | 8 | | TBD | Call TI | Call TI | 0 to 70 | | |
| LM358PSR | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PSRE4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PSRG4 | ACTIVE | SO | PS | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PW | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PWE4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PWG4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PWLE | OBSOLETE | TSSOP | PW | 8 | | TBD | Call TI | Call TI | 0 to 70 | | |
| LM358PWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PWRE4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PWRG3 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU SN | Level-1-260C-UNLIM | 0 to 70 | L358 | Samples |
| LM358PWRG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | L358 | 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.

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**OTHER QUALIFIED VERSIONS OF LM258A, LM2904 :**

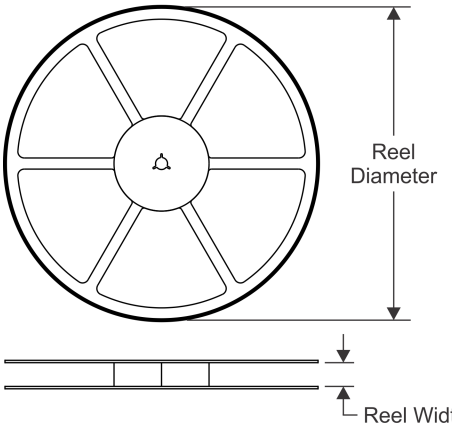
- Automotive: LM2904-Q1
- Enhanced Product: LM258A-EP

NOTE: Qualified Version Definitions:

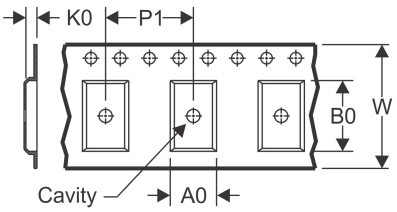
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

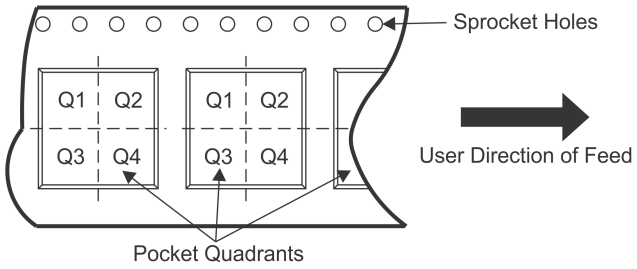



**TAPE DIMENSIONS**




| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**

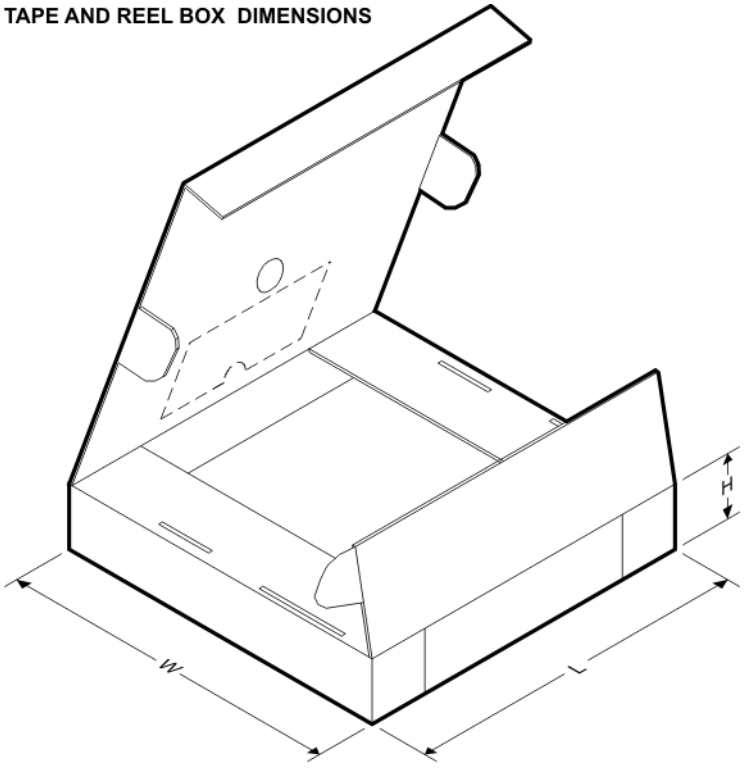



*All dimensions are nominal

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LM258ADGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM258ADGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM258ADR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM258ADR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM258ADRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM258DGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM258DGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM258DR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM258DRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM258DRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM2904DGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM2904DGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM2904DR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM2904DR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM2904DRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM2904DRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM2904PSR | SO | PS | 8 | 2000 | 330.0 | 16.4 | 8.2 | 6.6 | 2.5 | 12.0 | 16.0 | Q1 |
| LM2904PWR | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LM2904PWRG3 | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LM2904QDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM358ADGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM358ADGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM358ADR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM358ADRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM358ADRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM358APWR | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LM358APWR | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LM358DGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM358DGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LM358DR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 4.0 | 12.0 | Q1 |
| LM358DR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM358DR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM358DRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LM358PSR | SO | PS | 8 | 2000 | 330.0 | 16.4 | 8.2 | 6.6 | 2.5 | 12.0 | 16.0 | Q1 |
| LM358PWR | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LM358PWRG3 | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |

**TAPE AND REEL BOX DIMENSIONS**

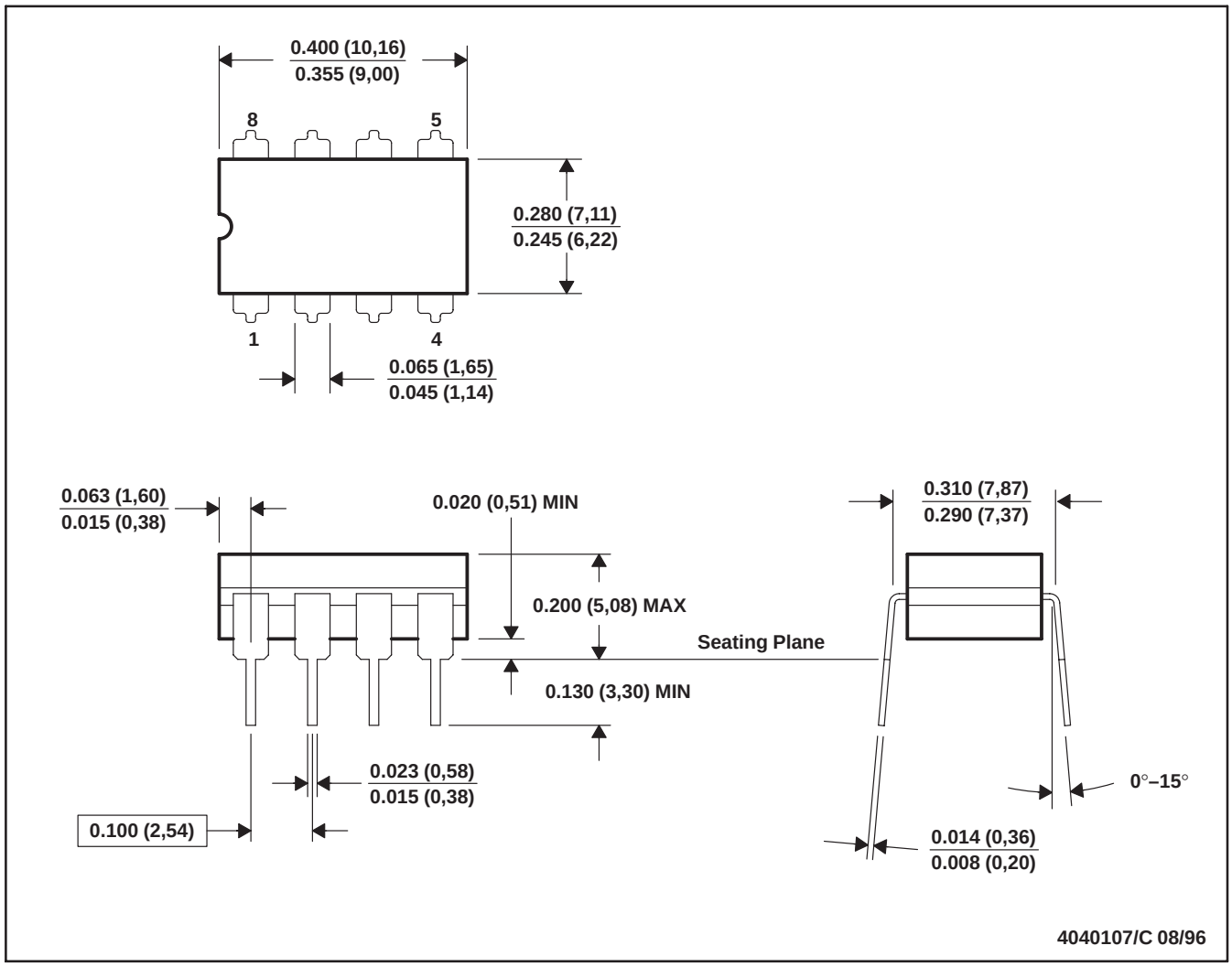



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| LM258ADGKR | VSSOP | DGK | 8 | 2500 | 332.0 | 358.0 | 35.0 |
| LM258ADGKR | VSSOP | DGK | 8 | 2500 | 364.0 | 364.0 | 27.0 |
| LM258ADR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM258ADR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM258ADRG4 | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM258DGKR | VSSOP | DGK | 8 | 2500 | 364.0 | 364.0 | 27.0 |
| LM258DGKR | VSSOP | DGK | 8 | 2500 | 332.0 | 358.0 | 35.0 |
| LM258DR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM258DRG4 | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM258DRG4 | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM2904DGKR | VSSOP | DGK | 8 | 2500 | 364.0 | 364.0 | 27.0 |
| LM2904DGKR | VSSOP | DGK | 8 | 2500 | 332.0 | 358.0 | 35.0 |
| LM2904DR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM2904DR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM2904DRG4 | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM2904DRG4 | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM2904PSR | SO | PS | 8 | 2000 | 367.0 | 367.0 | 38.0 |
| LM2904PWR | TSSOP | PW | 8 | 2000 | 364.0 | 364.0 | 27.0 |
| LM2904PWRG3 | TSSOP | PW | 8 | 2000 | 364.0 | 364.0 | 27.0 |
| LM2904QDR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM358ADGKR | VSSOP | DGK | 8 | 2500 | 332.0 | 358.0 | 35.0 |
| LM358ADGKR | VSSOP | DGK | 8 | 2500 | 364.0 | 364.0 | 27.0 |
| LM358ADR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM358ADRG4 | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM358ADRG4 | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM358APWR | TSSOP | PW | 8 | 2000 | 367.0 | 367.0 | 35.0 |
| LM358APWR | TSSOP | PW | 8 | 2000 | 364.0 | 364.0 | 27.0 |
| LM358DGKR | VSSOP | DGK | 8 | 2500 | 332.0 | 358.0 | 35.0 |
| LM358DGKR | VSSOP | DGK | 8 | 2500 | 364.0 | 364.0 | 27.0 |
| LM358DR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM358DR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LM358DR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM358DRG4 | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LM358PSR | SO | PS | 8 | 2000 | 367.0 | 367.0 | 38.0 |
| LM358PWR | TSSOP | PW | 8 | 2000 | 364.0 | 364.0 | 27.0 |
| LM358PWRG3 | TSSOP | PW | 8 | 2000 | 364.0 | 364.0 | 27.0 |

MCER001A – JANUARY 1995 – REVISED JANUARY 1997

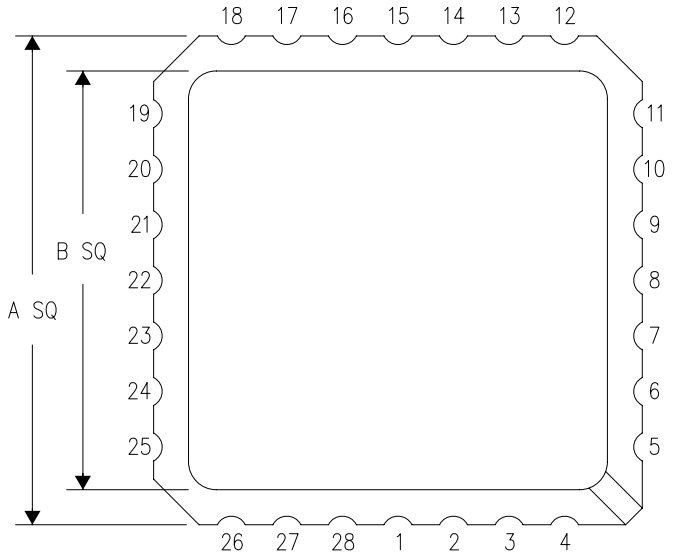
**JG (R-GDIP-T8)** **CERAMIC DUAL-IN-LINE**



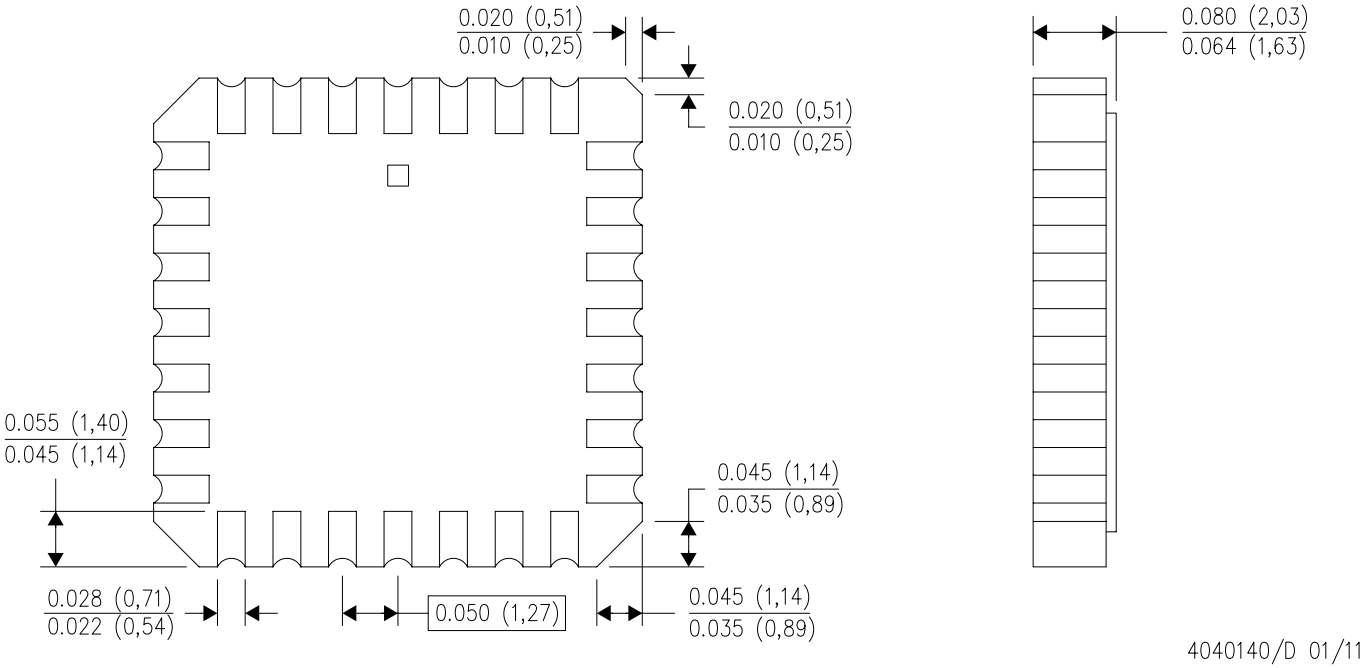

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification.
E. Falls within MIL STD 1835 GDIP1-T8

FK (S–CQCC–N**) LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



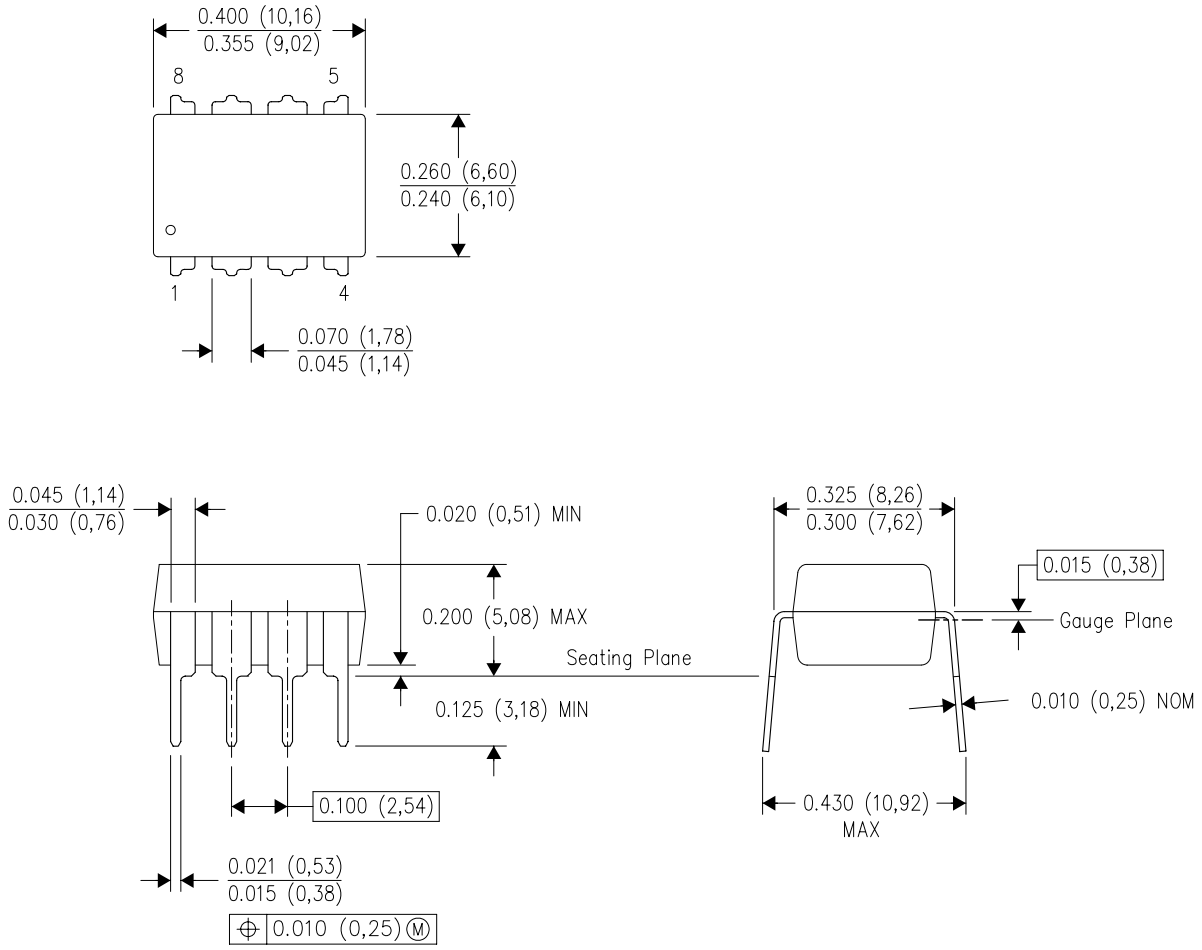

| NO. OF TERMINALS ** | A | | B | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 | 0.740 (18,78) | 0.761 (19,32) | 0.495 (12,58) | 0.560 (14,22) |
| 68 | 0.938 (23,83) | 0.962 (24,43) | 0.850 (21,6) | 0.858 (21,8) |
| 84 | 1.141 (28,99) | 1.165 (29,59) | 1.047 (26,6) | 1.063 (27,0) |




4040140/D 01/11

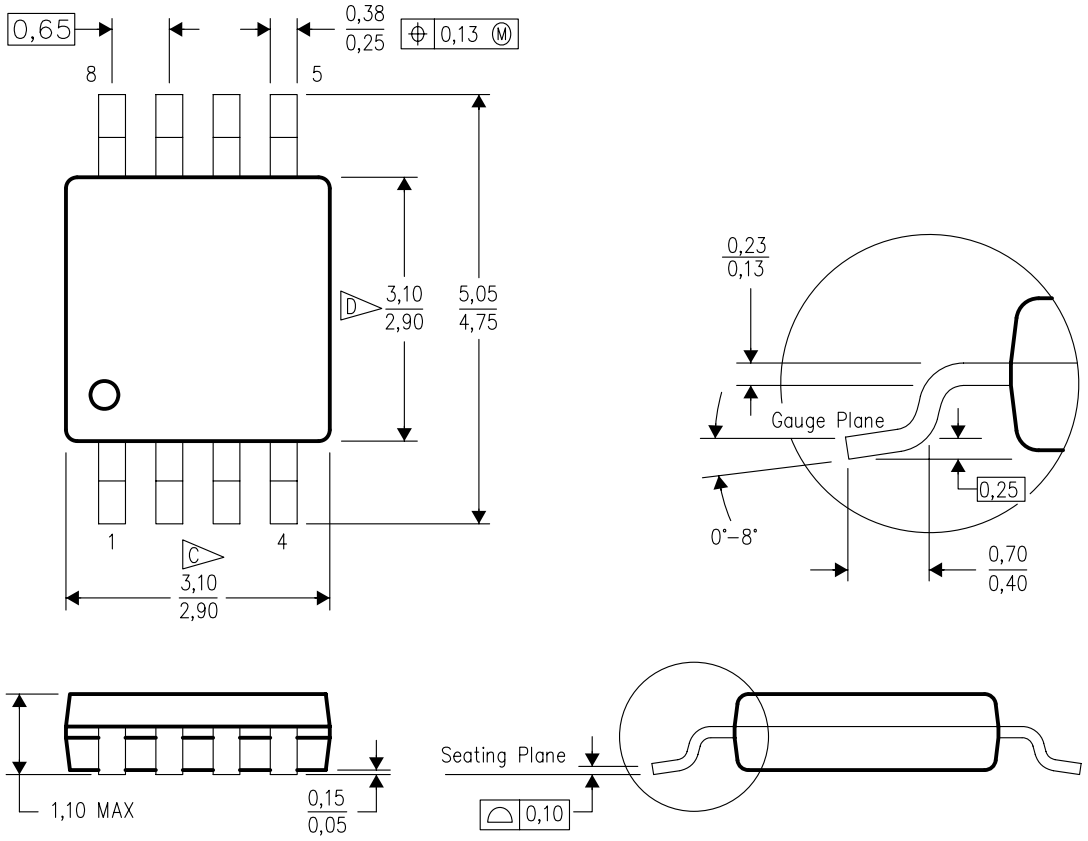
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a metal lid.
D. Falls within JEDEC MS–004

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.

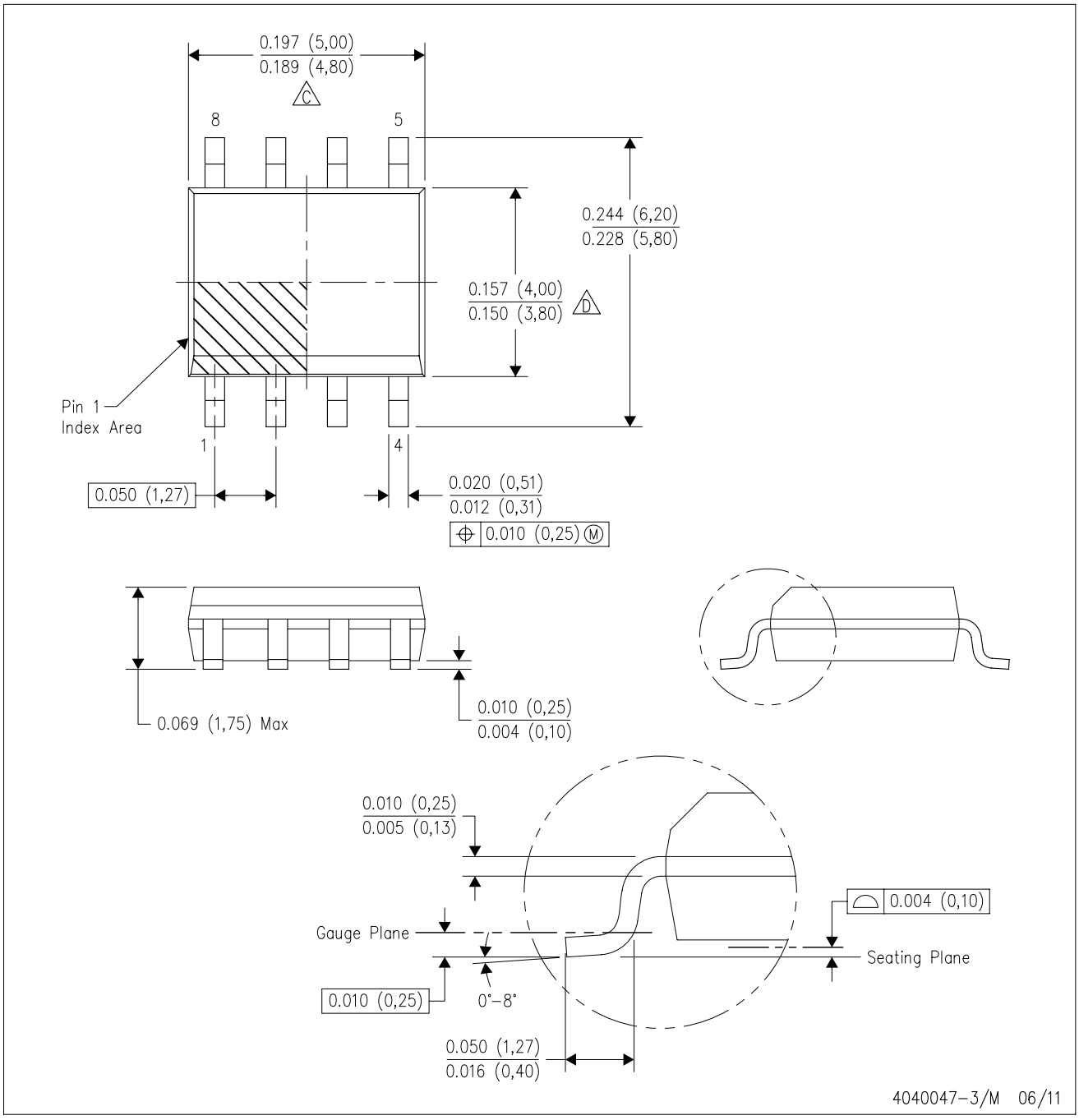
## DGK (S–PDSO–G8) PLASTIC SMALL–OUTLINE PACKAGE




4073329/E 05/06

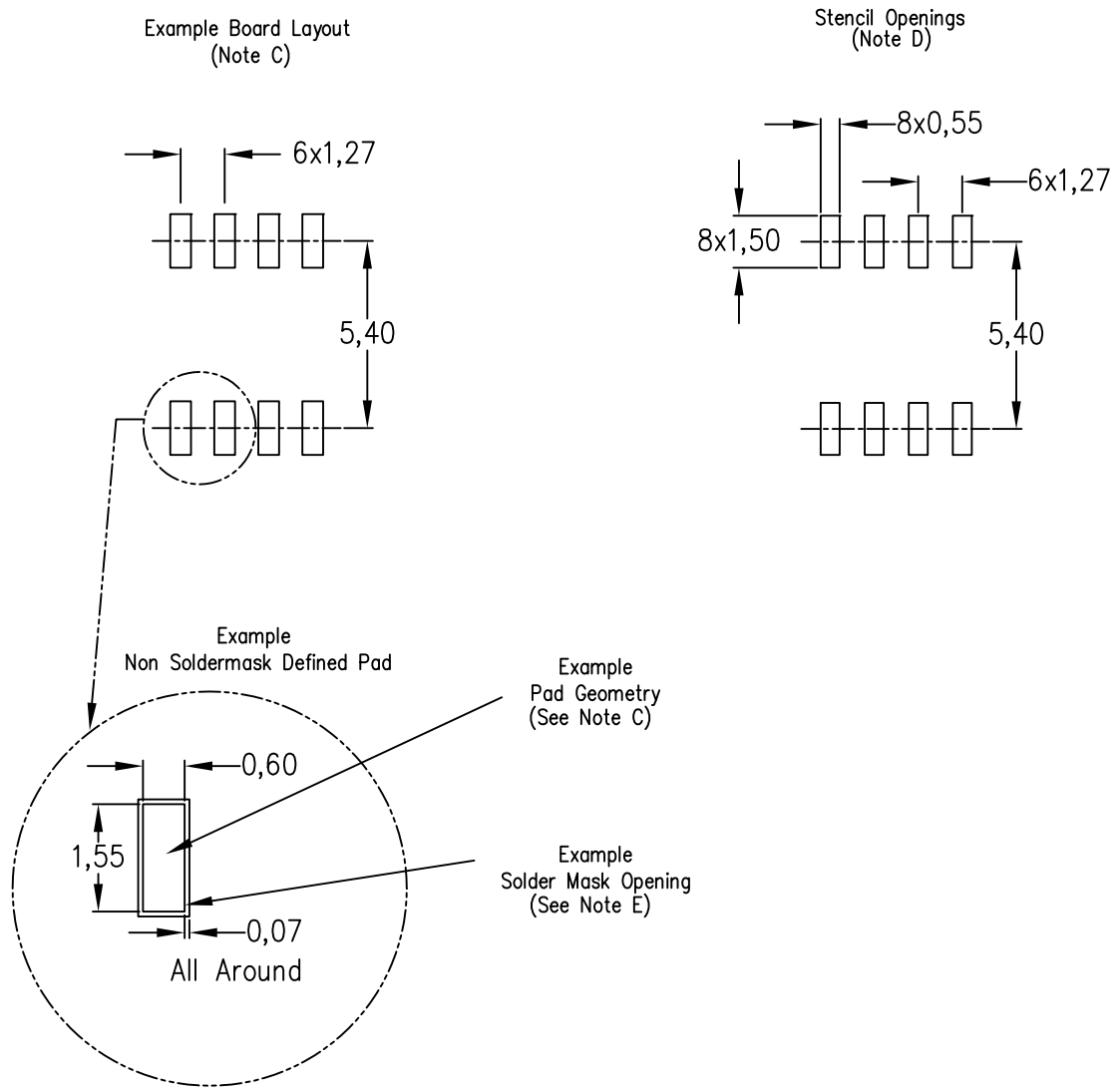
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per end.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
E. Falls within JEDEC MO–187 variation AA, except interlead flash.

D (R–PDSO–G8) PLASTIC SMALL OUTLINE




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 AA.

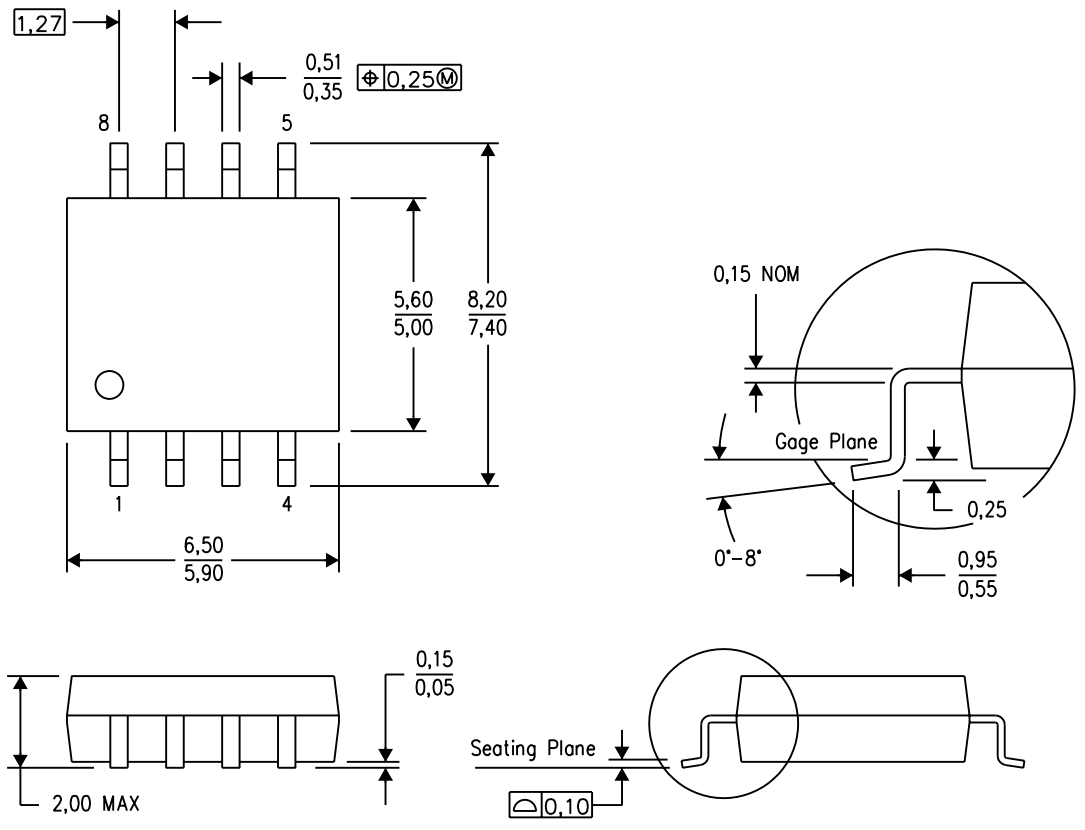
D (R–PDSO–G8) PLASTIC SMALL OUTLINE




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

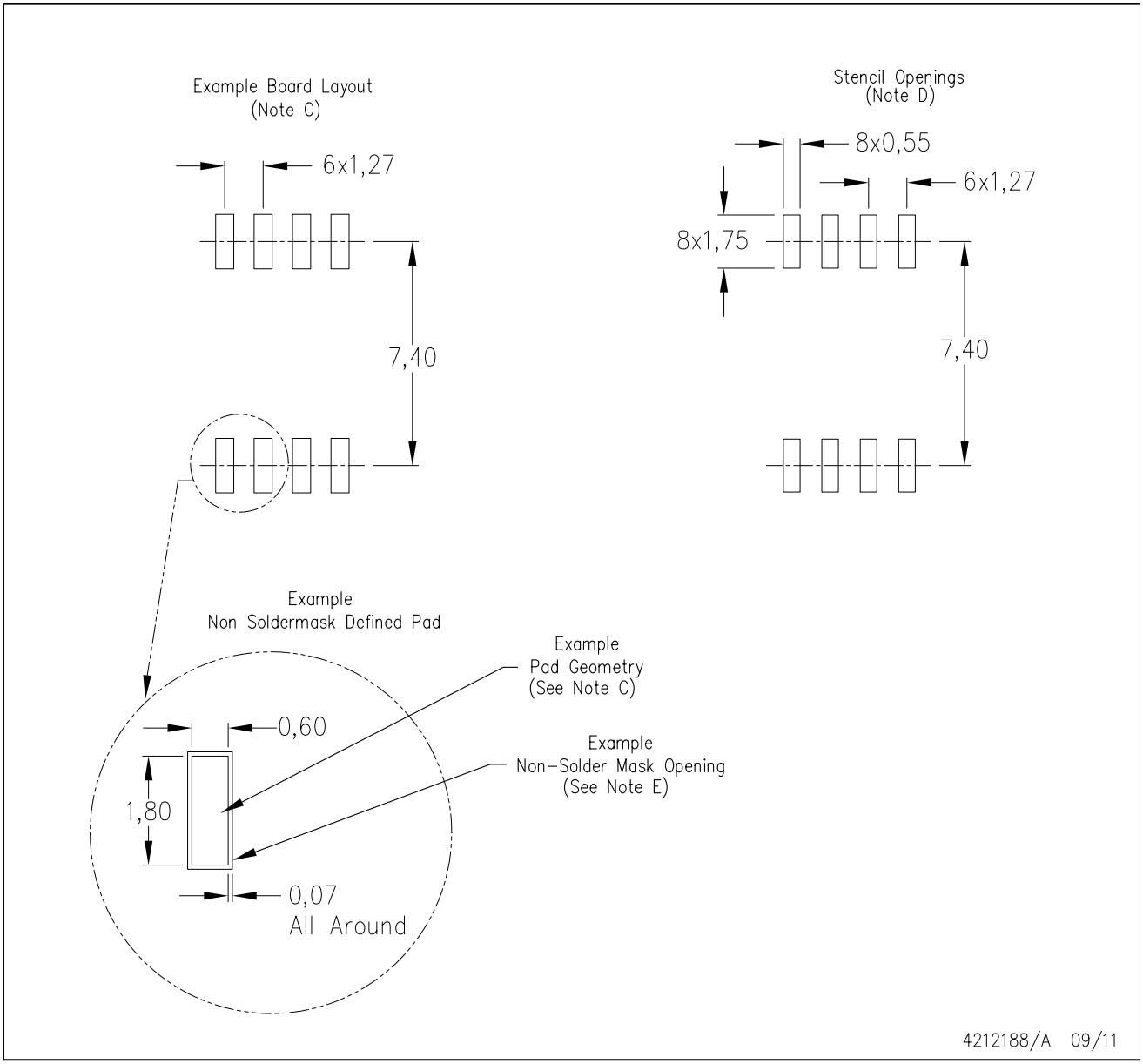
**PS (R-PDSO-G8)** **PLASTIC SMALL-OUTLINE PACKAGE**




4040063/C 03/03

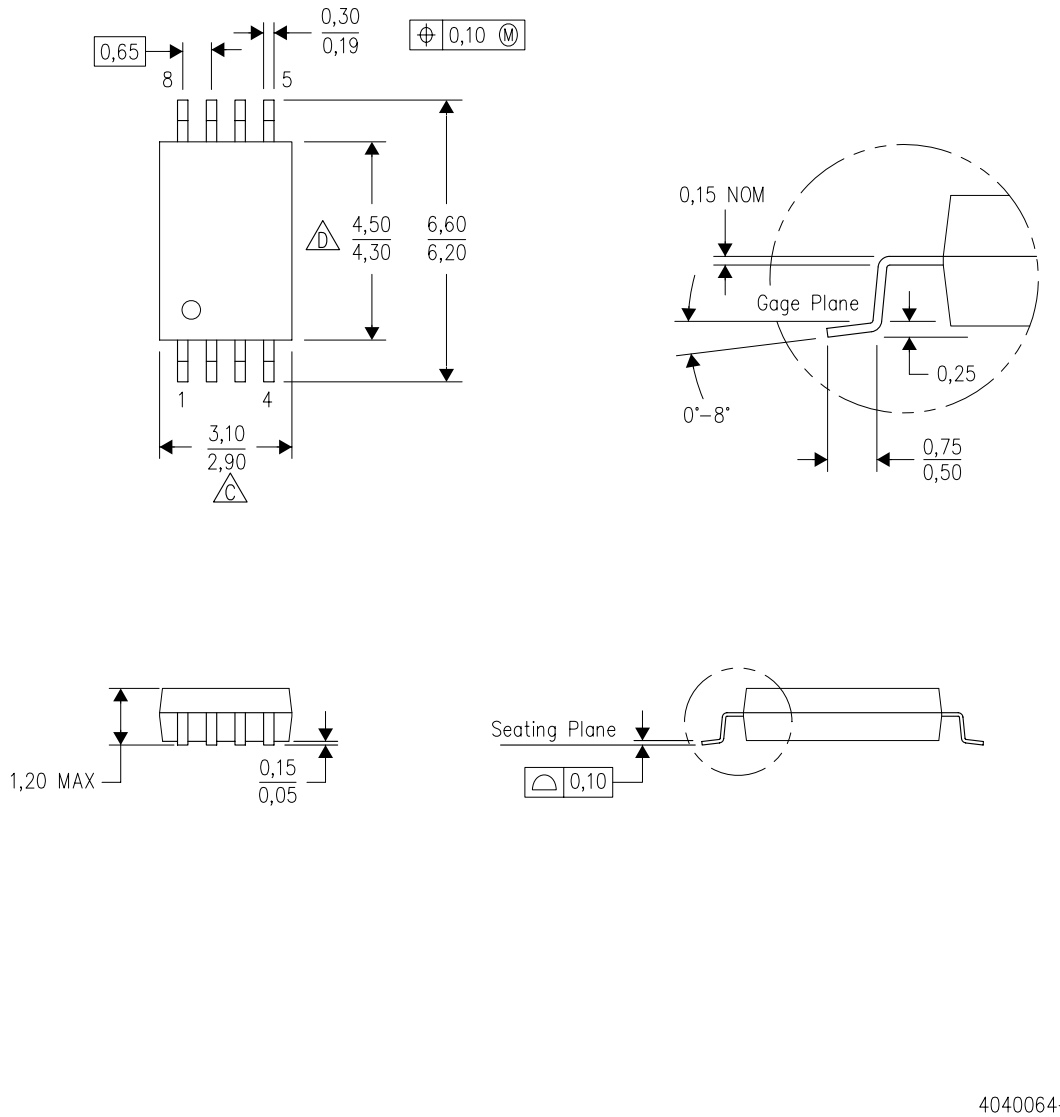
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

PS (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.

PW (R–PDSO–G8) PLASTIC SMALL OUTLINE




4040064–2/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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