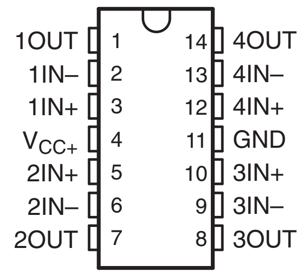
# LOW-VOLTAGE RAIL-TO-RAIL OUTPUT OPERATIONAL AMPLIFIERS

**Check for Samples: LMV321 SINGLE, LMV358 DUAL, LMV324 QUAD, LMV324S QUAD WITH SHUTDOWN**

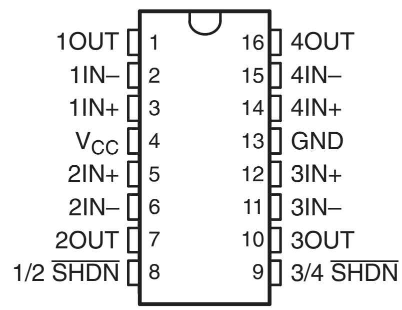
## FEATURES

- **2.7-V and 5-V Performance**
- **–40°C to 125°C Operation**
- **Low-Power Shutdown Mode (LMV324S)**
- **No Crossover Distortion**
- **Low Supply Current**
  - **LMV321 . . . 130 µA Typ**
  - **LMV358 . . . 210 µA Typ**
  - **LMV324 . . . 410 µA Typ**
  - **LMV324S . . . 410 µA Typ**
- **Rail-to-Rail Output Swing**
- **ESD Protection Exceeds JESD 22**
  - **2000-V Human-Body Model (A114-A)**
  - **1000-V Charged-Device Model (C101)**

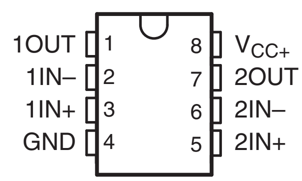
**LMV324 . . . D (SOIC) OR PW (TSSOP) PACKAGE**
**(TOP VIEW)**



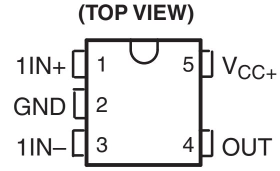

**LMV324S . . . D (SOIC) OR PW (TSSOP) PACKAGE**
**(TOP VIEW)**




**LMV358 . . . D (SOIC), DDU (VSSOP), DGK (MSOP), OR PW (TSSOP) PACKAGE**
**(TOP VIEW)**




**LMV321 . . . DBV (SOT-23) OR DCK (SC-70) PACKAGE**
**(TOP VIEW)**




## DESCRIPTION/ ORDERING INFORMATION

The LMV321, LMV358, and LMV324/LMV324S are single, dual, and quad low-voltage (2.7 V to 5.5 V) operational amplifiers with rail-to-rail output swing. The LMV324S, which is a variation of the standard LMV324, includes a power-saving shutdown feature that reduces supply current to a maximum of 5 µA per channel when the amplifiers are not needed. Channels 1 and 2 together are put in shutdown, as are channels 3 and 4. While in shutdown, the outputs actively are pulled low.

The LMV321, LMV358, LMV324, and LMV324S are the most cost-effective solutions for applications where low-voltage operation, space saving, and low cost are needed. These amplifiers are designed specifically for low-voltage (2.7 V to 5 V) operation, with performance specifications meeting or exceeding the LM358 and LM324 devices that operate from 5 V to 30 V. Additional features of the LMV3xx devices are a common-mode input voltage range that includes ground, 1-MHz unity-gain bandwidth, and 1-V/µs slew rate.

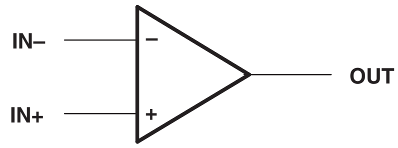
The LMV321 is available in the ultra-small DCK (SC-70) package, which is approximately one-half the size of the DBV (SOT-23) package. This package saves space on printed circuit boards and enables the design of small portable electronic devices. It also allows the designer to place the device closer to the signal source to reduce noise pickup and increase signal integrity.

## ORDERING INFORMATION(1)

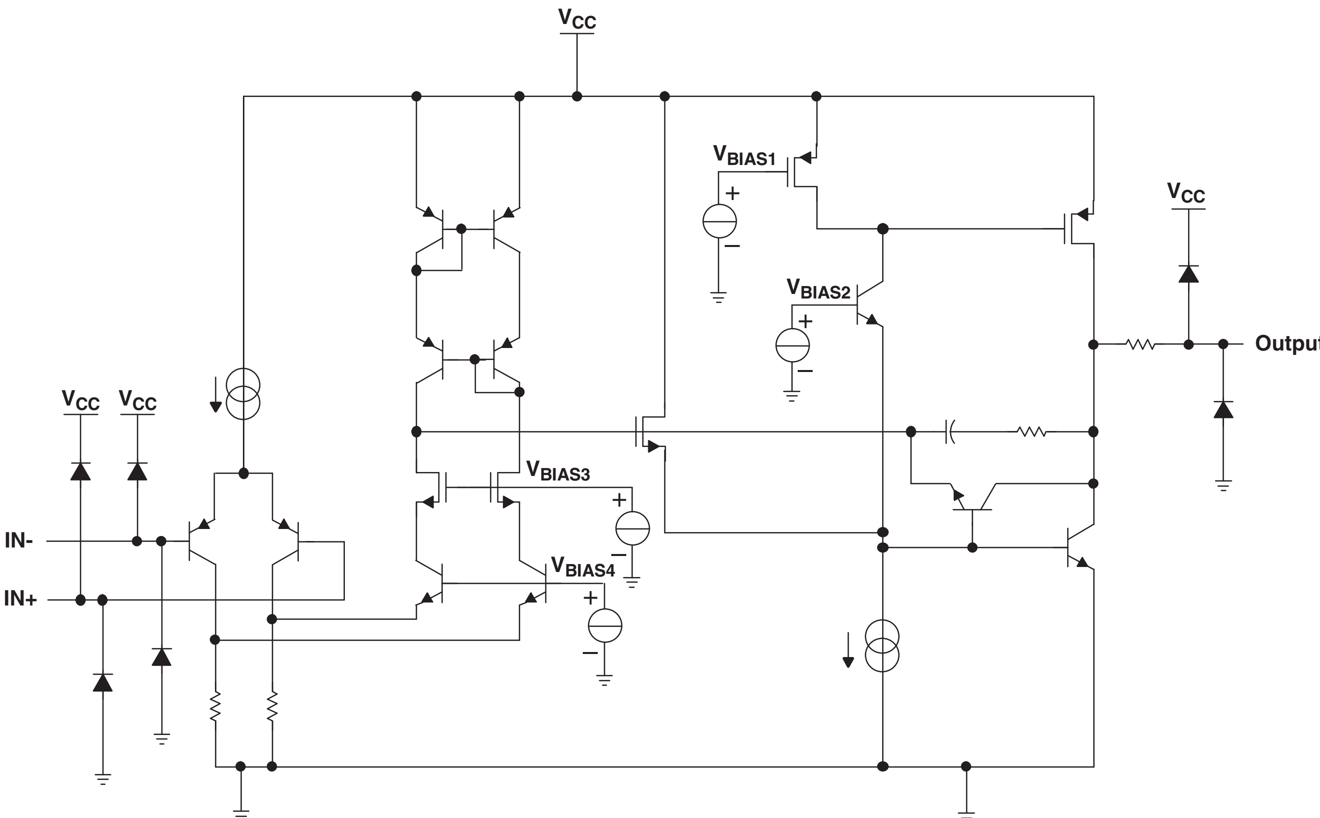
| $T_A$ | PACKAGE(2) | | | ORDERABLE PART NUMBER | TOP-SIDE MARKING(3) |
|---|---|---|---|---|---|
| –40°C to 85°C | Single | SC-70 – DCK | Reel of 3000 | LMV321IDCKR | R3_ |
| | | | Reel of 250 | LMV321IDCKT | |
| –40°C to 125°C | Single | SOT-23 – DBV | Reel of 3000 | LMV321IDBVR | RC1_ |
| | | | Reel of 250 | LMV321IDBVT | |
| –40°C to 125°C | Dual | MSOP/VSSOP – DGK | Reel of 2500 | LMV358IDGKR | R5_ |
| | | | Reel of 250 | LMV358IDGKT | PREVIEW |
| | | SOIC – D | Tube of 75 | LMV358ID | MV358I |
| | | | Reel of 2500 | LMV358IDR | |
| | | TSSOP – PW | Tube of 150 | LMV358IPW | MV358I |
| | | | Reel of 2000 | LMV358IPWR | |
| | | VSSOP – DDU | Reel of 3000 | LMV358IDDUR | RA5_ |
| –40°C to 125°C | Quad | SOIC – D | Tube of 50 | LMV324ID | LMV324I |
| | | | Reel of 2500 | LMV324IDR | |
| –40°C to 85°C | Quad | SOIC – D | Tube of 50 | LMV324SID | LMV324SI |
| | | | Reel of 2500 | LMV324SIDR | |
| –40°C to 125°C | Quad | TSSOP – PW | Reel of 2000 | LMV324IPWR | MV324I |
| | | | Reel of 2000 | LMV324SIPWR | MV324SI |
| –40°C to 125°C | Dual | MSOP/VSSOP – DGK | Reel of 2500 | LMV358QDGKR | RH_ |
| | | | Reel of 250 | LMV358QDGKT | |
| | | SOIC – D | Tube of 75 | LMV358QD | MV358Q |
| | | | Reel of 2500 | LMV358QDR | |
| | | TSSOP – PW | Tube of 150 | LMV358QPW | MV358Q |
| | | | Reel of 2000 | LMV358QPWR | |
| | | VSSOP – DDU | Reel of 3000 | LMV358QDDUR | RAH_ |
| | Quad | SOIC – D | Tube of 50 | LMV324QD | LMV324Q |
| | | | Reel of 2500 | LMV324QDR | |
| | | TSSOP – PW | Tube of 90 | LMV324QPW | MV324Q |
| | | | Reel of 2000 | LMV324QPWR | |

(1) 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.
(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.
(3) DBV/DCK/DDU/DGK: The actual top-side marking has one additional character that designates the wafer fab/assembly site.

## SYMBOL (EACH AMPLIFIER)




## LMV324 SIMPLIFIED SCHEMATIC



## Absolute Maximum Ratings(1)

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

| | | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage(2) | | | | 5.5 | V |
| $V_{ID}$ | Differential input voltage(3) | | | | ±5.5 | V |
| $V_I$ | Input voltage range (either input) | | | –0.2 | 5.5 | V |
| | Duration of output short circuit (one amplifier) to ground(4) | At or below $T_A$ = 25°C, $V_{CC}$ ≤ 5.5 V | | | Unlimited | |
| $θ_{JA}$ | Package thermal impedance(5) (6) | D package | 8 pin | | 97 | °C/W |
| | | | 14 pin | | 86 | |
| | | | 16 pin | | 73 | |
| | | DBV package | 5 pin | | 206 | |
| | | DCK package | 5 pin | | 252 | |
| | | DDU package | 8 pin | | 210 | |
| | | DGK package | 8 pin | | 172 | |
| | | PW package | 8 pin | | 149 | |
| | | | 14 pin | | 113 | |
| | | | 16 pin | | 108 | |
| $T_J$ | Operating virtual junction temperature | | | | 150 | °C |
| $T_{stg}$ | Storage temperature range | | | –65 | 150 | °C |

(1) 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.
(2) All voltage values (except differential voltages and $V_{CC}$ specified for the measurement of $I_{OS}$) are with respect to the network GND.
(3) Differential voltages are at IN+ with respect to IN–.
(4) Short circuits from outputs to $V_{CC}$ can cause excessive heating and eventual destruction.
(5) Maximum power dissipation is a function of $T_J$(max), $θ_{JA}$, and $T_A$. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/θ_{JA}$. Operating at the absolute maximum $T_J$ of 150°C can affect reliability.
(6) The package thermal impedance is calculated in accordance with JESD 51-7.

## Recommended Operating Conditions(1)

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage (single-supply operation) | | 2.7 | 5.5 | V |
| $V_{IH}$ | Amplifier turn-on voltage level (LMV324S)(2) | $V_{CC}$ = 2.7 V | 1.7 | | V |
| | | $V_{CC}$ = 5 V | 3.5 | | |
| $V_{IL}$ | Amplifier turn-off voltage level (LMV324S) | $V_{CC}$ = 2.7 V | | 0.7 | V |
| | | $V_{CC}$ = 5 V | | 1.5 | |
| $T_A$ | Operating free-air temperature | I temperature (LMV321, LMV358, LMV324) | –40 | 125 | °C |
| | | I temperature (LMV324S, LMV321IDCK) | -40 | 85 | |
| | | Q temperature | –40 | 125 | |

(1) All unused control inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation. See the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.
(2) $V_{IH}$ should not be allowed to exceed $V_{CC}$.

## Electrical Characteristics

$V_{CC+}$ = 2.7 V, $T_A$ = 25°C (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | MIN | TYP(1) | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | | | | 1.7 | 7 | mV |
| $\alpha_{VIO}$ | Average temperature coefficient of input offset voltage | | | | 5 | | μV/°C |
| $I_{IB}$ | Input bias current | | | | 11 | 250 | nA |
| $I_{IO}$ | Input offset current | | | | 5 | 50 | nA |
| CMRR | Common-mode rejection ratio | $V_{CM}$ = 0 to 1.7 V | | 50 | 63 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio | $V_{CC}$ = 2.7 V to 5 V, $V_O$ = 1 V | | 50 | 60 | | dB |
| $V_{ICR}$ | Common-mode input voltage range | CMRR ≥ 50 dB | | 0 | –0.2 | | V |
| | | | | | 1.9 | 1.7 | |
| $V_O$ | Output swing | $R_L$ = 10 kΩ to 1.35 V | High level | $V_{CC}$ – 100 | $V_{CC}$ – 10 | | mV |
| | | | Low level | | 60 | 180 | |
| $I_{CC}$ | Supply current | LMV321I | | | 80 | 170 | μA |
| | | LMV358I (both amplifiers) | | | 140 | 340 | |
| | | LMV324I/LMV324SI (all four amplifiers) | | | 260 | 680 | |
| $B_1$ | Unity-gain bandwidth | $C_L$ = 200 pF | | | 1 | | MHz |
| $\Phi_m$ | Phase margin | | | | 60 | | deg |
| $G_m$ | Gain margin | | | | 10 | | dB |
| $V_n$ | Equivalent input noise voltage | f = 1 kHz | | | 46 | | nV/√Hz |
| $I_n$ | Equivalent input noise current | f = 1 kHz | | | 0.17 | | pA/√Hz |

(1) Typical values represent the likely parametric nominal values determined at the time of characterization. Typical values depend on the application and configuration and may vary over time. Typical values are not ensured on production material.

## Shutdown Characteristics (LMV324S)

$V_{CC+}$ = 2.7 V, $T_A$ = 25°C (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP(1) | MAX | UNIT |
|---|---|---|---|---|---|---|
| $I_{CC(SHDN)}$ | Supply current in shutdown mode (per channel) | $\overline{SHDN}$ ≤ 0.6 V | | | 5 | μA |
| $t_{(on)}$ | Amplifier turn-on time | $A_V$ = 1, $R_L$ = Open (measured at 50% point) | | 2 | | μs |
| $t_{(off)}$ | Amplifier turn-off time | $A_V$ = 1, $R_L$ = Open (measured at 50% point) | | 40 | | ns |

(1) Typical values represent the likely parametric nominal values determined at the time of characterization. Typical values depend on the application and configuration and may vary over time. Typical values are not ensured on production material.

## Electrical Characteristics

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

| PARAMETER | | TEST CONDITIONS | | $T_A$ (1) | MIN | TYP (2) | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_{IO}$ | Input offset voltage | | | 25°C | | 1.7 | 7 | mV |
| | | | | Full range | | | 9 | |
| $\alpha_{VIO}$ | Average temperature coefficient of input offset voltage | | | 25°C | | 5 | | μV/°C |
| $I_{IB}$ | Input bias current | | | 25°C | | 15 | 250 | nA |
| | | | | Full range | | | 500 | |
| $I_{IO}$ | Input offset current | | | 25°C | | 5 | 50 | nA |
| | | | | Full range | | | 150 | |
| CMRR | Common-mode rejection ratio | $V_{CM}$ = 0 to 4 V | | 25°C | 50 | 65 | | dB |
| $k_{SVR}$ | Supply-voltage rejection ratio | $V_{CC}$ = 2.7 V to 5 V, $V_O$ = 1 V, $V_{CM}$ = 1 V | | 25°C | 50 | 60 | | dB |
| $V_{ICR}$ | Common-mode input voltage range | CMRR ≥ 50 dB | | 25°C | 0 | –0.2 | | V |
| | | | | | | 4.2 | 4 | |
| $V_O$ | Output swing | $R_L$ = 2 kΩ to 2.5 V | High level | 25°C | $V_{CC}$ – 300 | $V_{CC}$ – 40 | | mV |
| | | | | Full range | $V_{CC}$ – 400 | | | |
| | | | Low level | 25°C | | 120 | 300 | |
| | | | | Full range | | | 400 | |
| | | $R_L$ = 10 kΩ to 2.5 V | High level | 25°C | $V_{CC}$ – 100 | $V_{CC}$ – 10 | | |
| | | | | Full range | $V_{CC}$ – 200 | | | |
| | | | Low level | 25°C | | 65 | 180 | |
| | | | | Full range | | | 280 | |
| $A_{VD}$ | Large-signal differential voltage gain | $R_L$ = 2 kΩ | | 25°C | 15 | 100 | | V/mV |
| | | | | Full range | 10 | | | |
| $I_{OS}$ | Output short-circuit current | Sourcing, $V_O$ = 0 V | | 25°C | 5 | 60 | | mA |
| | | Sinking, $V_O$ = 5 V | | | 10 | 160 | | |
| $I_{CC}$ | Supply current | LMV321I | | 25°C | | 130 | 250 | μA |
| | | | | Full range | | | 350 | |
| | | LMV358I (both amplifiers) | | 25°C | | 210 | 440 | |
| | | | | Full range | | | 615 | |
| | | LMV324I/LMV324SI (all four amplifiers) | | 25°C | | 410 | 830 | |
| | | | | Full range | | | 1160 | |
| $B_1$ | Unity-gain bandwidth | $C_L$ = 200 pF | | 25°C | | 1 | | MHz |
| $\Phi_m$ | Phase margin | | | 25°C | | 60 | | deg |
| $G_m$ | Gain margin | | | 25°C | | 10 | | dB |
| $V_n$ | Equivalent input noise voltage | f = 1 kHz | | 25°C | | 39 | | $nV/\sqrt{Hz}$ |
| $I_n$ | Equivalent input noise current | f = 1 kHz | | 25°C | | 0.21 | | $pA/\sqrt{Hz}$ |
| SR | Slew rate | | | 25°C | | 1 | | V/μs |

(1) Full range $T_A$ = –40°C to 125°C for I temperature(LMV321, LMV358, LMV324), –40°C to 85°C for (LMV324S, LMV321IDCK) and –40°C to 125°C for Q temperature.
(2) Typical values represent the likely parametric nominal values determined at the time of characterization. Typical values depend on the application and configuration and may vary over time. Typical values are not ensured on production material.

## Shutdown Characteristics (LMV324S)

$V_{CC+}$ = 5 V, $T_A$ = 25°C (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP(1) | MAX | UNIT |
|---|---|---|---|---|---|---|
| $I_{CC(SHDN)}$ | Supply current in shutdown mode (per channel) | $\overline{SHDN}$ ≤ 0.6 V, $T_A$ = Full Temperature Range | | | 5 | μA |
| $t_{(on)}$ | Amplifier turn-on time | $A_V$ = 1, $R_L$ = Open (measured at 50% point) | | 2 | | μs |
| $t_{(off)}$ | Amplifier turn-off time | $A_V$ = 1, $R_L$ = Open (measured at 50% point) | | 40 | | ns |

(1) Typical values represent the likely parametric nominal values determined at the time of characterization. Typical values depend on the application and configuration and may vary over time. Typical values are not ensured on production material.

## TYPICAL CHARACTERISTICS

**LMV321 FREQUENCY RESPONSE vs RESISTIVE LOAD**

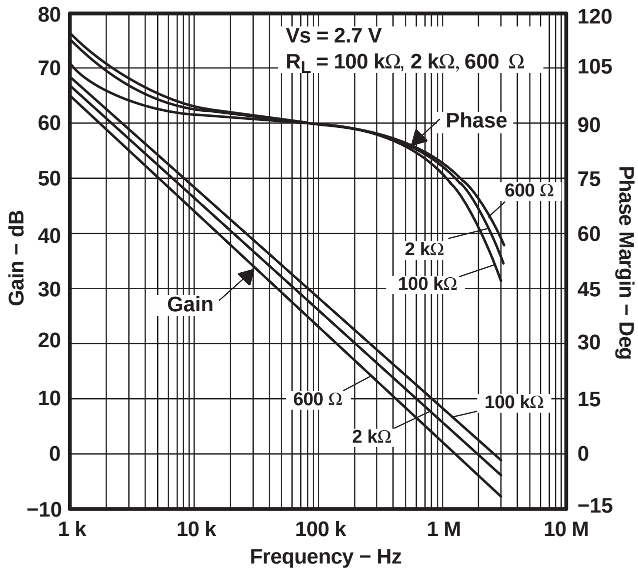



Figure 1.

**LMV321 FREQUENCY RESPONSE vs RESISTIVE LOAD**

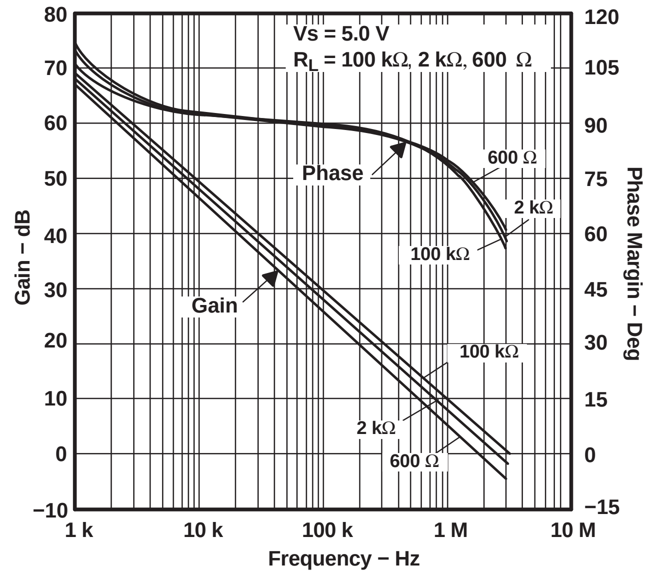



Figure 2.

**LMV321 FREQUENCY RESPONSE vs CAPACITIVE LOAD**

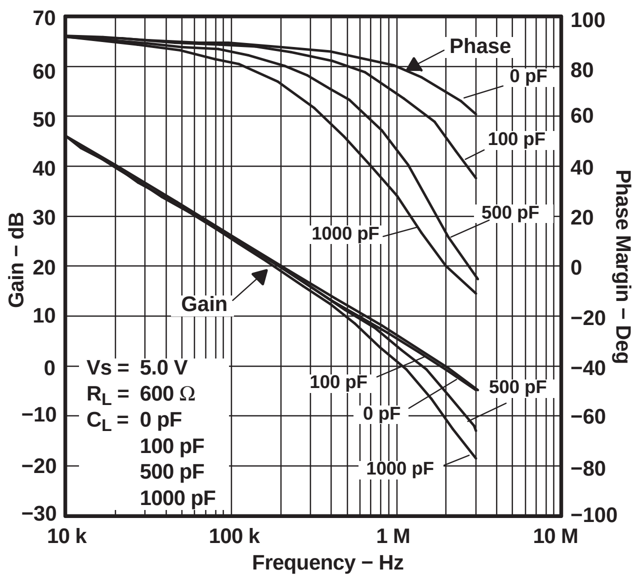



Figure 3.

**LMV321 FREQUENCY RESPONSE vs CAPACITIVE LOAD**

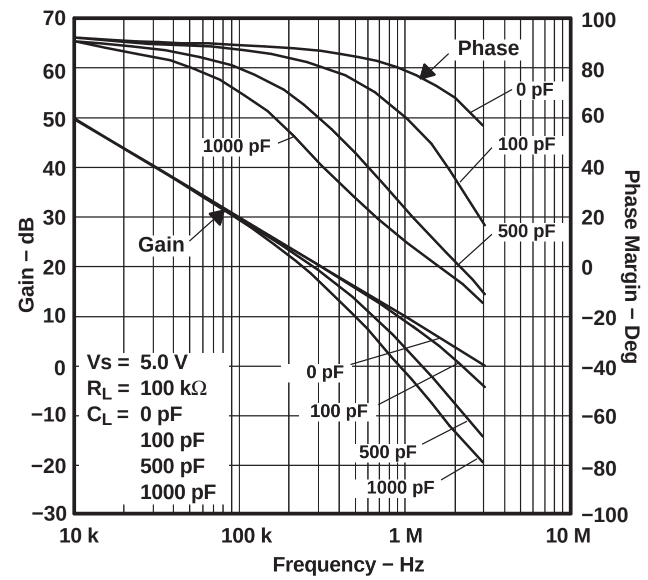



Figure 4.

## TYPICAL CHARACTERISTICS (continued)

**LMV321 FREQUENCY RESPONSE vs TEMPERATURE**

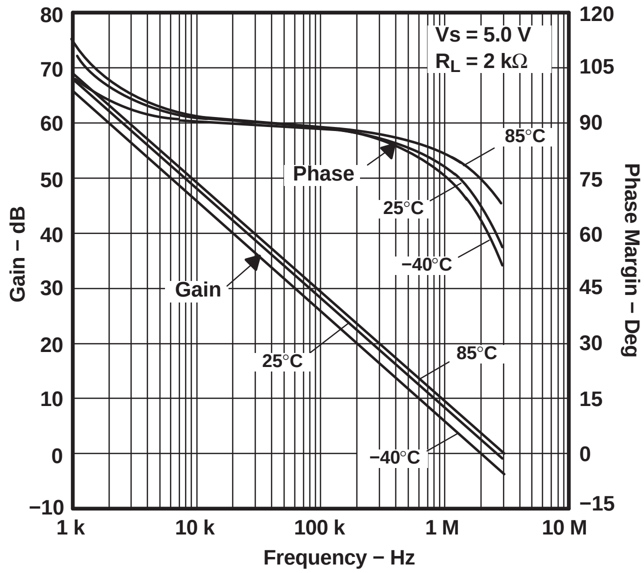



**Figure 5.**

**STABILITY vs CAPACITIVE LOAD**

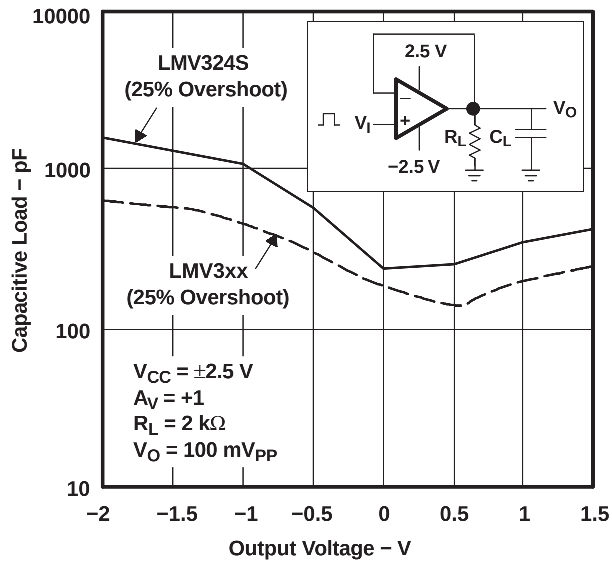



**Figure 6.**

**STABILITY vs CAPACITIVE LOAD**

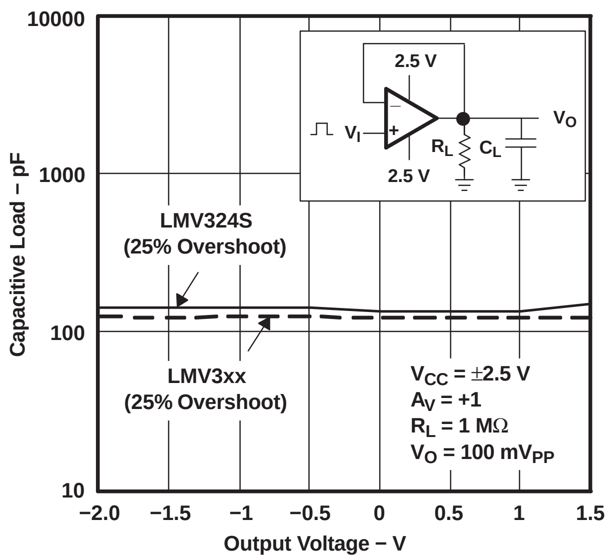



**Figure 7.**

**STABILITY vs CAPACITIVE LOAD**

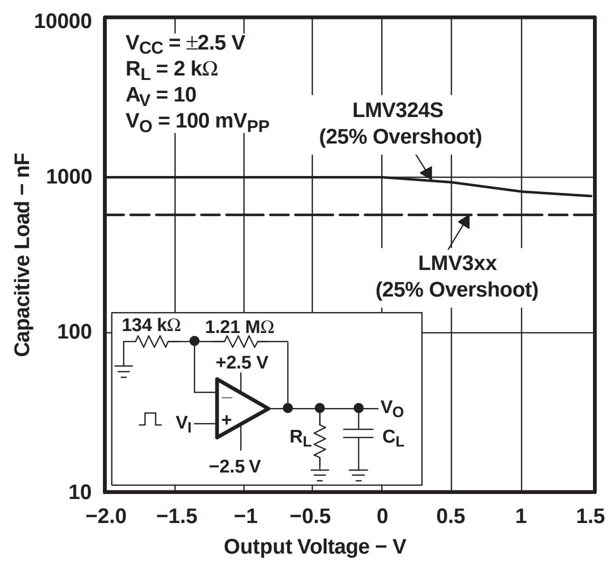



**Figure 8.**

## TYPICAL CHARACTERISTICS (continued)

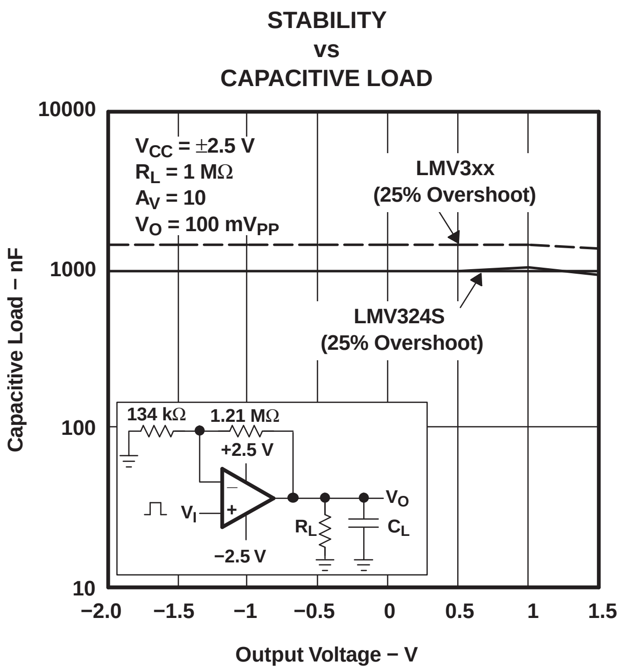



Figure 9.

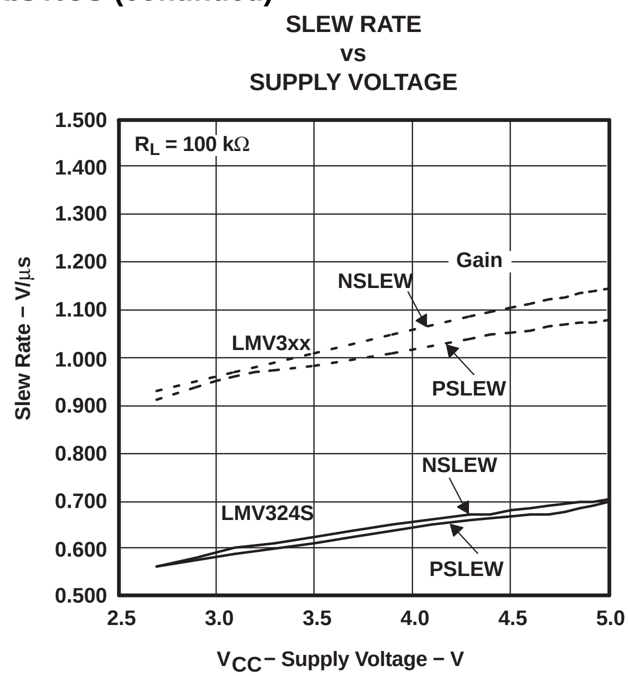



Figure 10.

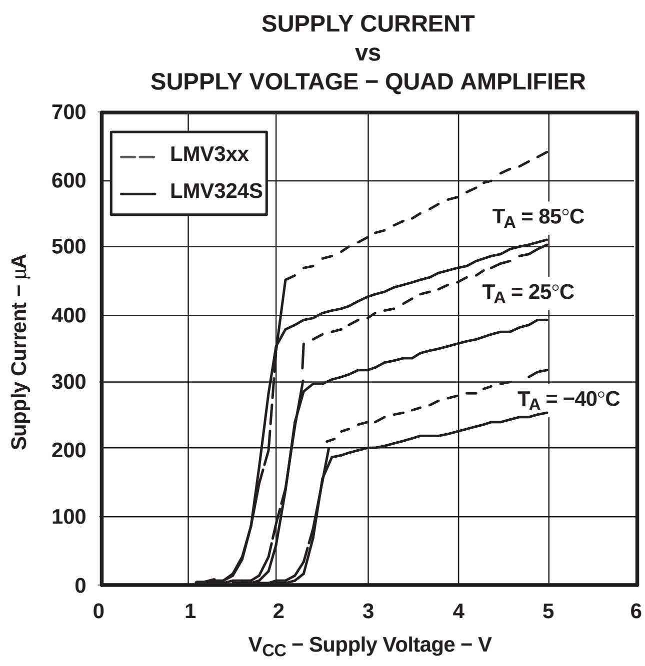



Figure 11.

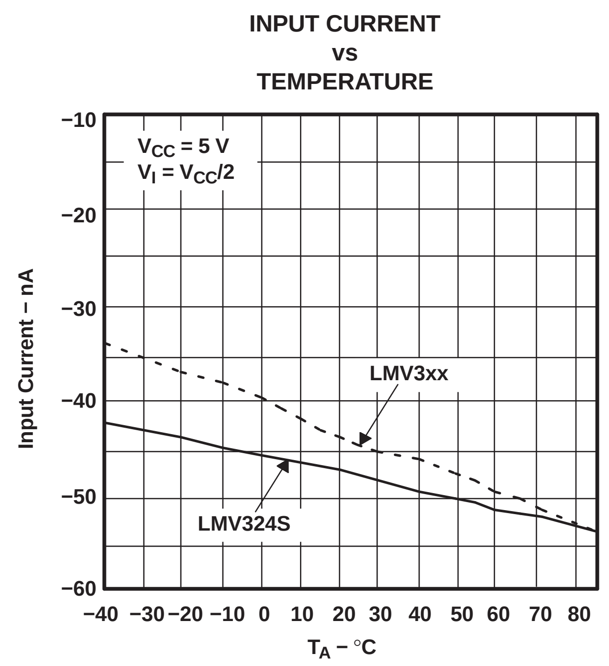



Figure 12.

## TYPICAL CHARACTERISTICS (continued)

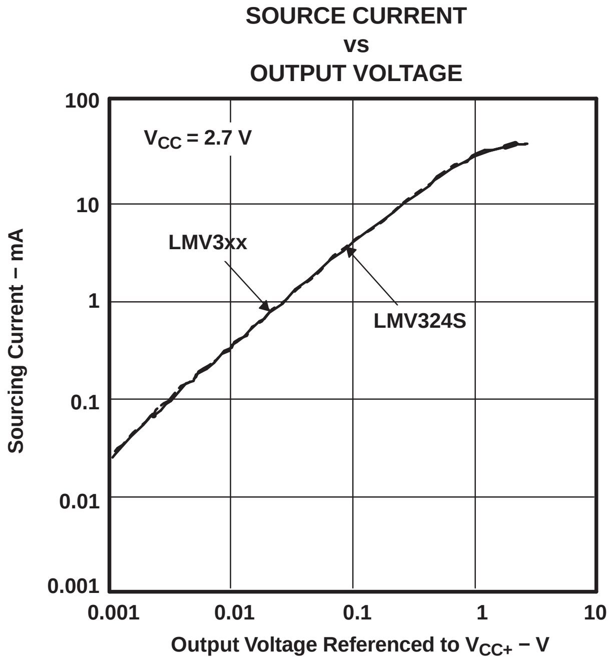



Figure 13.

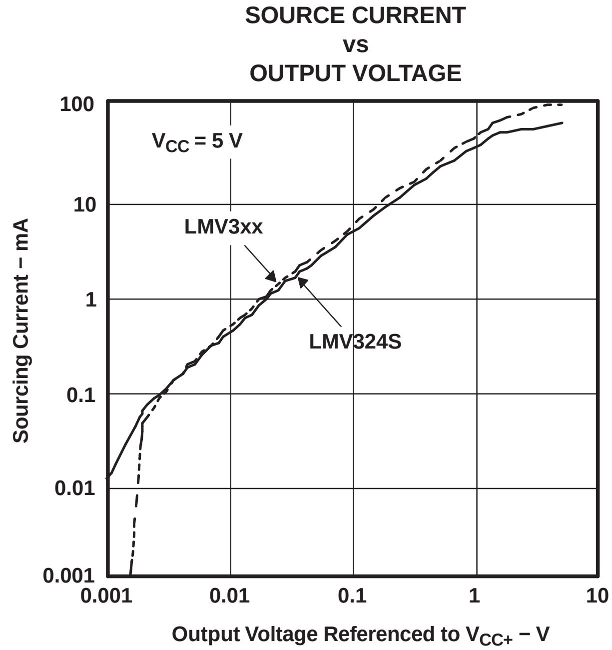



Figure 14.

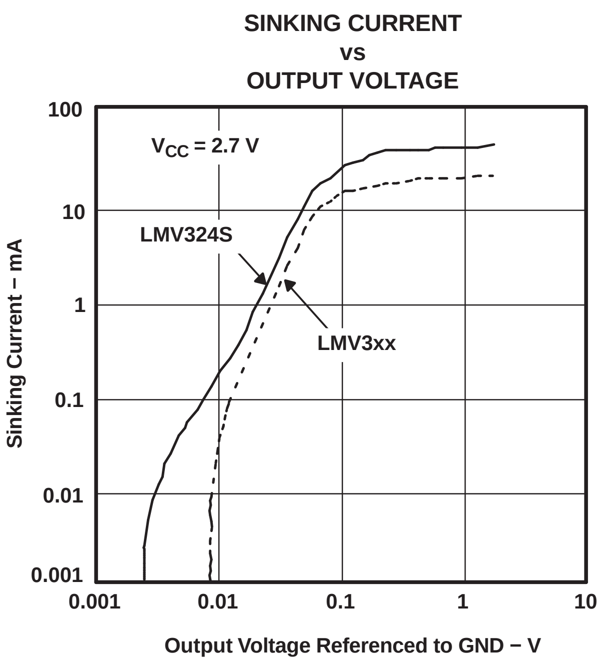



Figure 15.

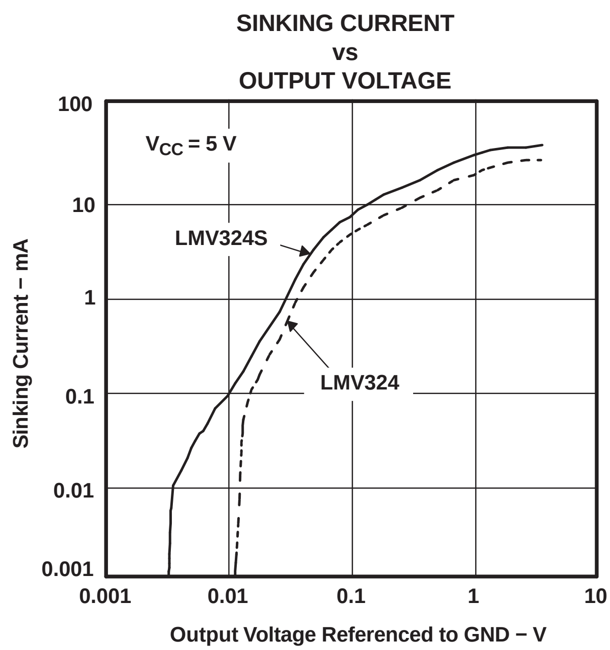



Figure 16.

## TYPICAL CHARACTERISTICS (continued)

**SHORT-CIRCUIT CURRENT vs TEMPERATURE**

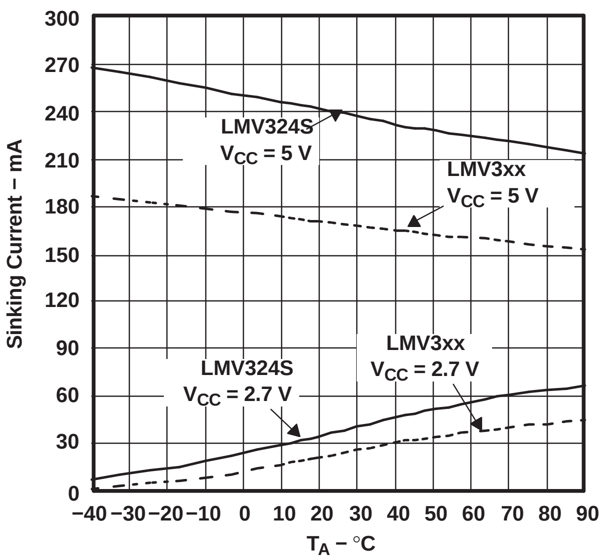



Figure 17.

**SHORT-CIRCUIT CURRENT vs TEMPERATURE**

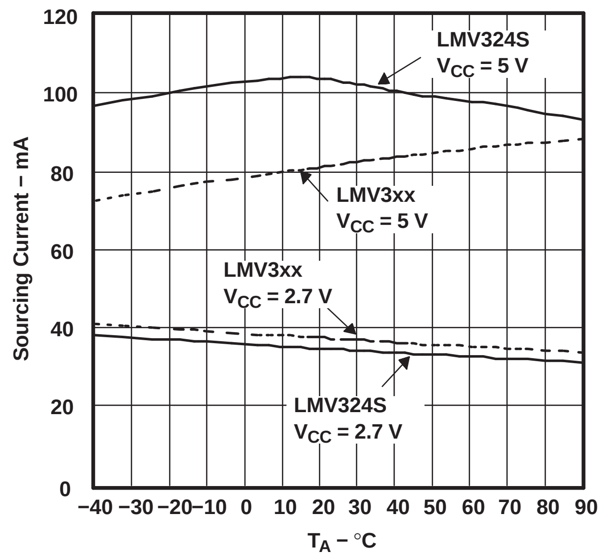



Figure 18.

**$-k_{SVR}$ vs FREQUENCY**

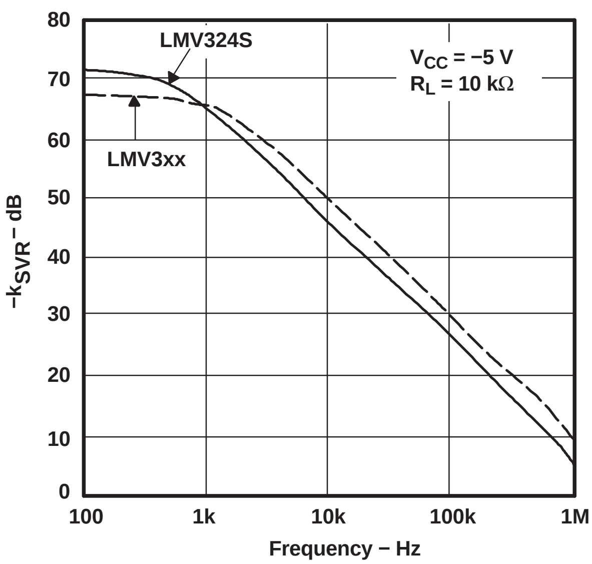



Figure 19.

**$+k_{SVR}$ vs FREQUENCY**

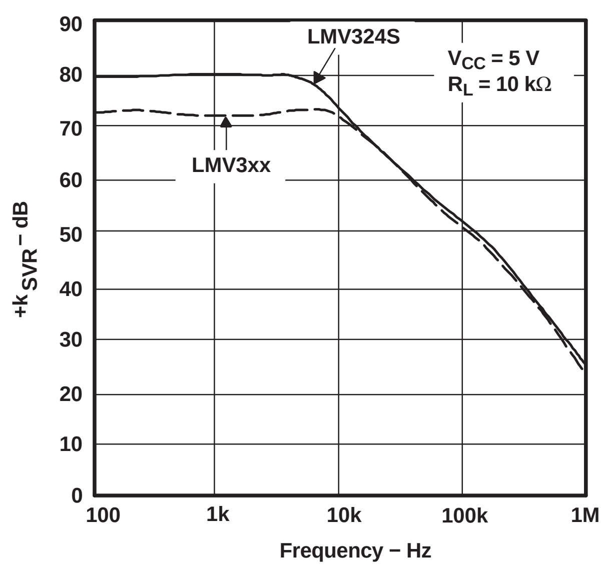



Figure 20.

## TYPICAL CHARACTERISTICS (continued)

−$k_{SVR}$
vs
FREQUENCY

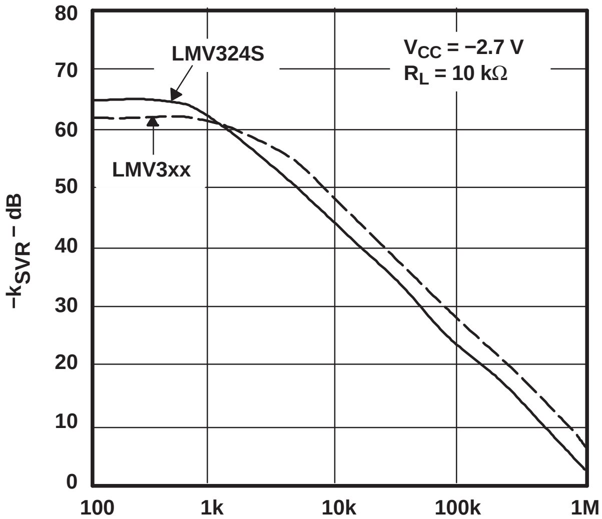



Figure 21.

+$k_{SVR}$
vs
FREQUENCY

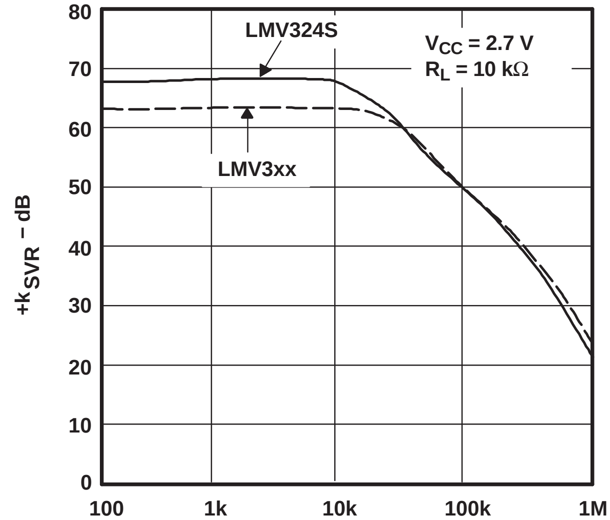



Figure 22.

OUTPUT VOLTAGE SWING FROM RAILS
vs
SUPPLY VOLTAGE

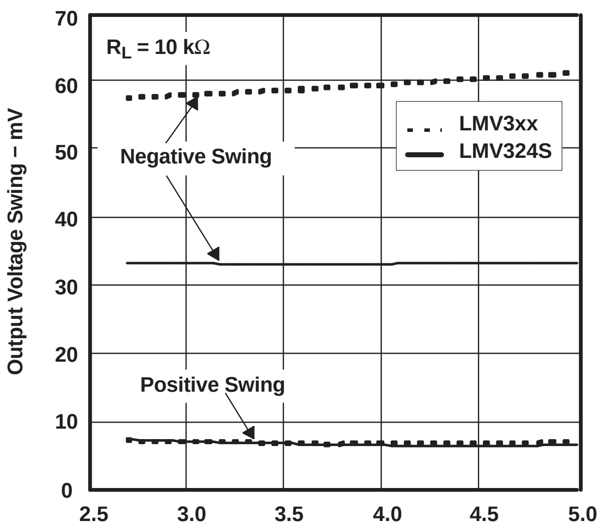



Figure 23.

OUTPUT VOLTAGE
vs
FREQUENCY

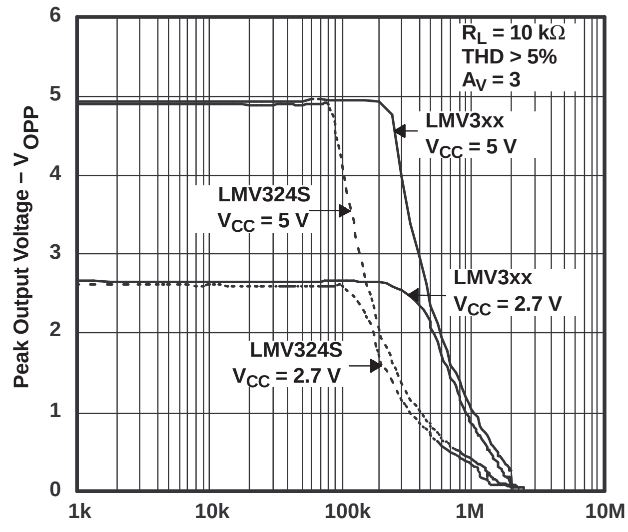



Figure 24.

## TYPICAL CHARACTERISTICS (continued)

OPEN-LOOP OUTPUT IMPEDANCE vs FREQUENCY

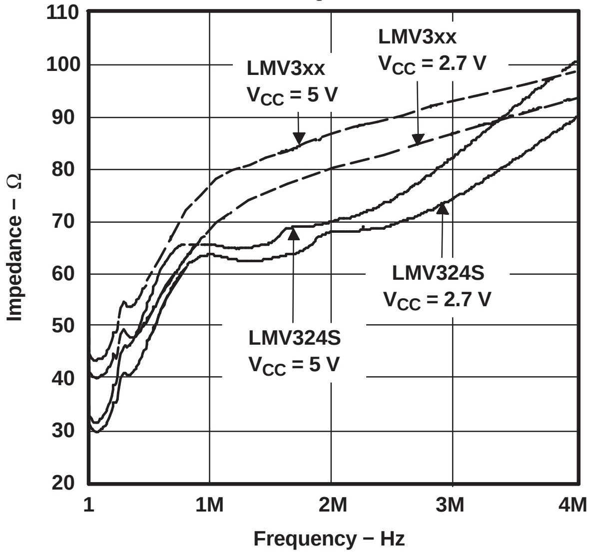



Figure 25.

CROSSTALK REJECTION vs FREQUENCY

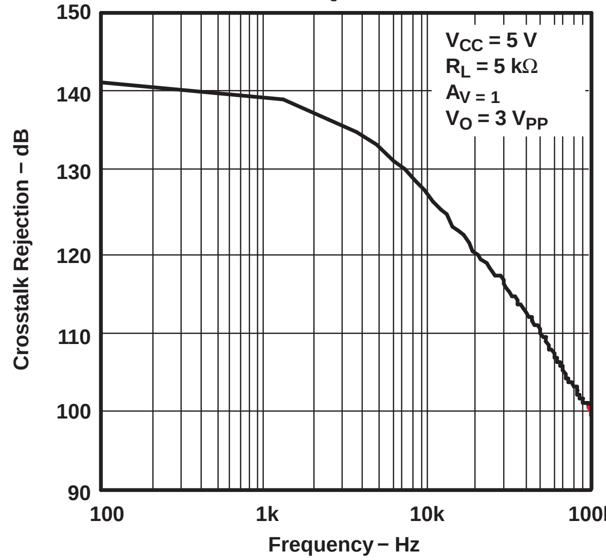



Figure 26.

NONINVERTING LARGE-SIGNAL PULSE RESPONSE

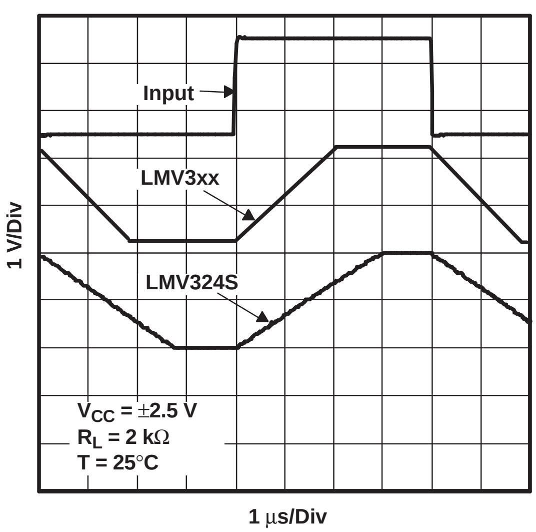



Figure 27.

NONINVERTING LARGE-SIGNAL PULSE RESPONSE

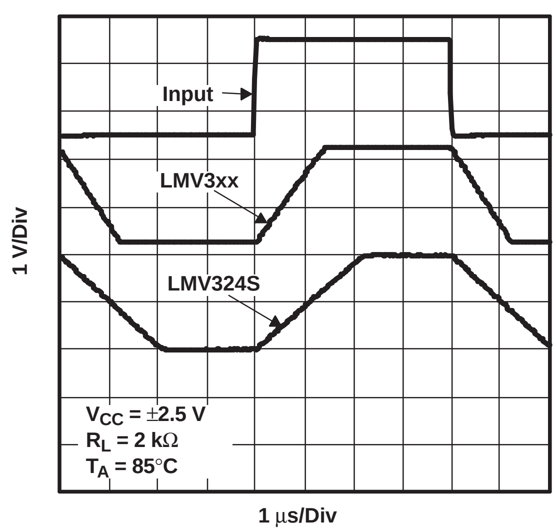



Figure 28.

## TYPICAL CHARACTERISTICS (continued)

NONINVERTING LARGE-SIGNAL PULSE RESPONSE

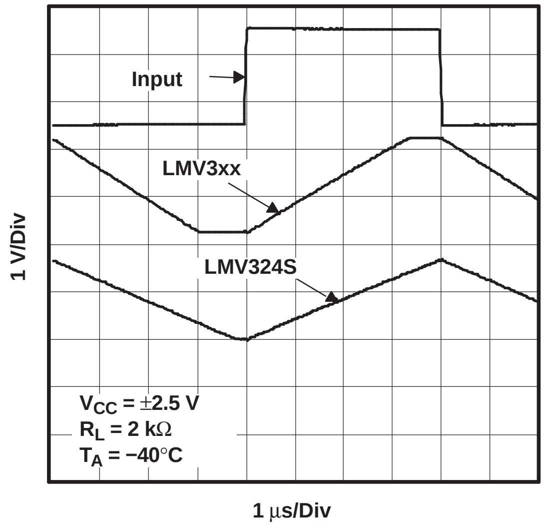



Figure 29.

NONINVERTING SMALL-SIGNAL PULSE RESPONSE

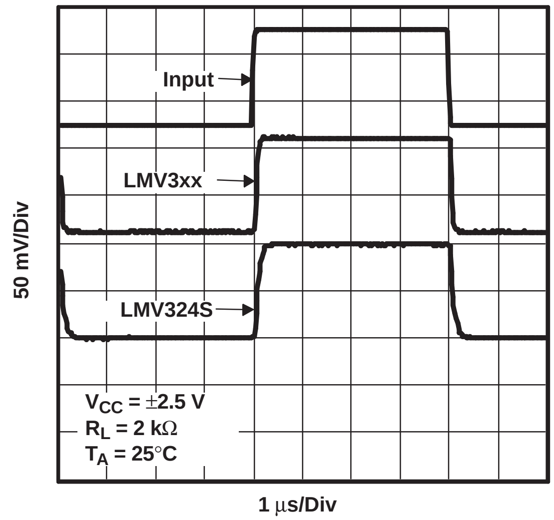



Figure 30.

NONINVERTING SMALL-SIGNAL PULSE RESPONSE

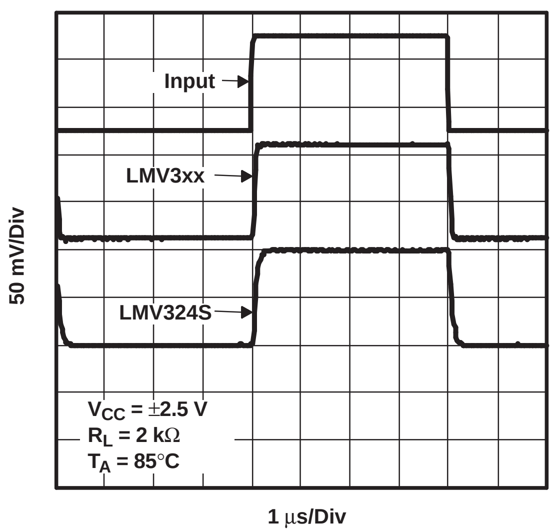



Figure 31.

NONINVERTING SMALL-SIGNAL PULSE RESPONSE

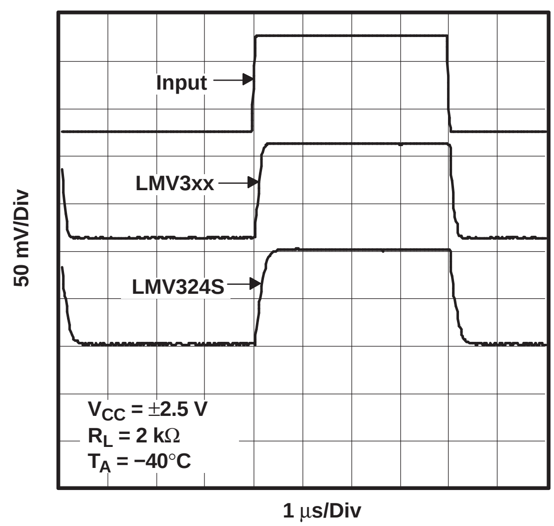



Figure 32.

## TYPICAL CHARACTERISTICS (continued)

INVERTING LARGE-SIGNAL PULSE RESPONSE

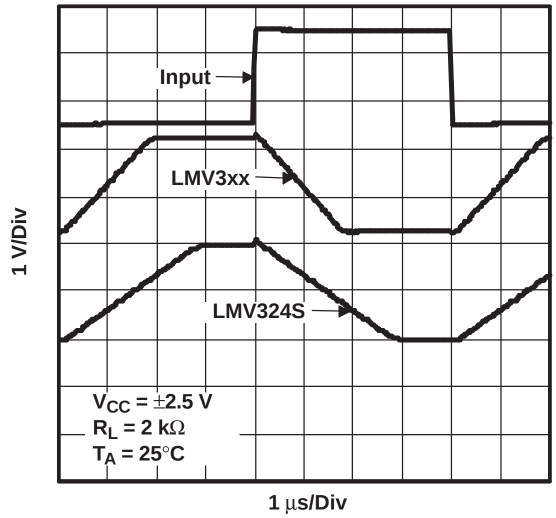



Figure 33.

INVERTING LARGE-SIGNAL PULSE RESPONSE

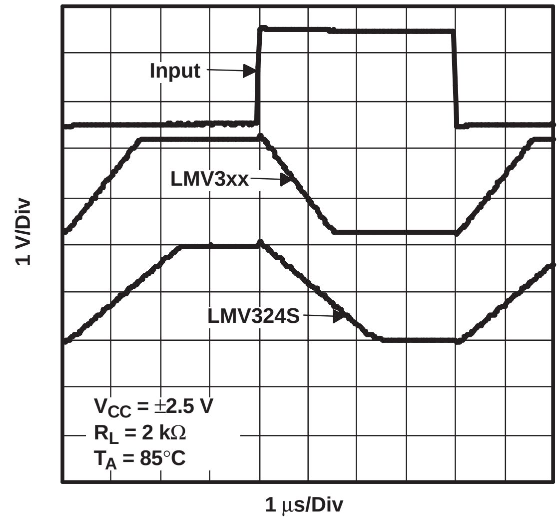



Figure 34.

INVERTING LARGE-SIGNAL PULSE RESPONSE

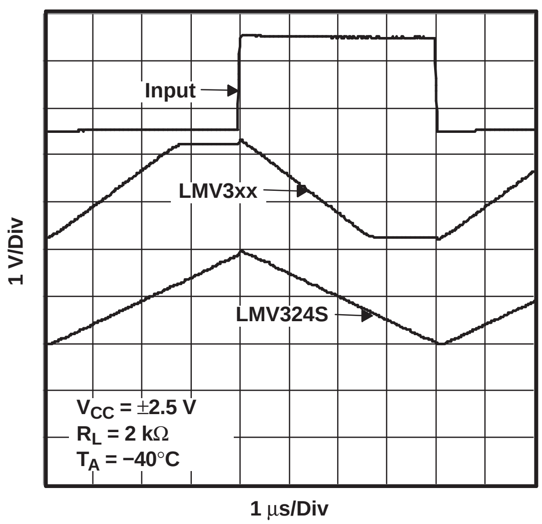



Figure 35.

INVERTING SMALL-SIGNAL PULSE RESPONSE

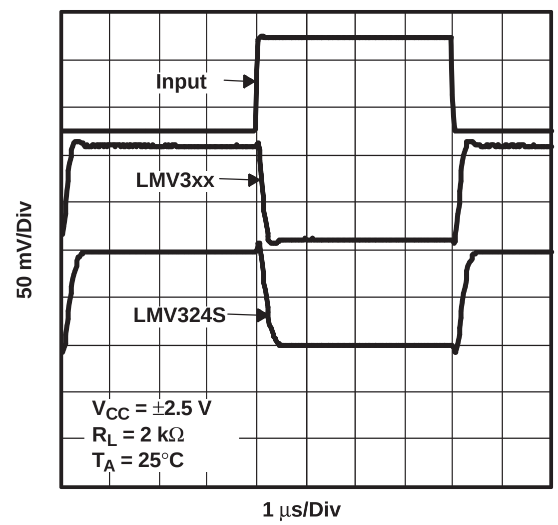



Figure 36.

## TYPICAL CHARACTERISTICS (continued)

INVERTING SMALL-SIGNAL
PULSE RESPONSE

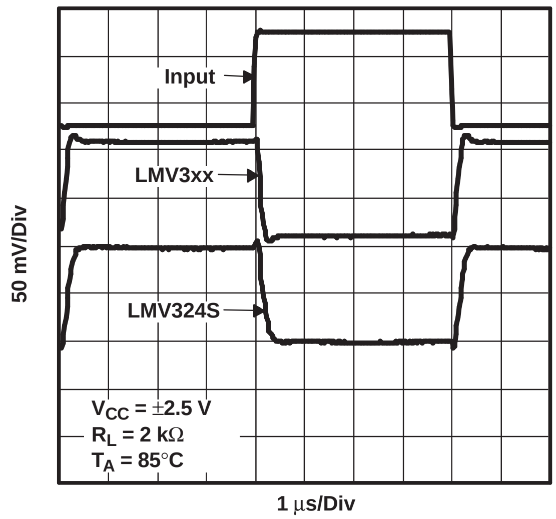



Figure 37.

INVERTING SMALL-SIGNAL
PULSE RESPONSE

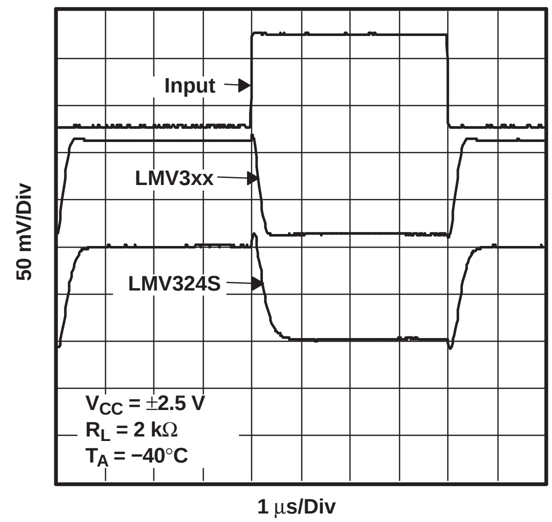



Figure 38.

INPUT CURRENT NOISE
vs
FREQUENCY

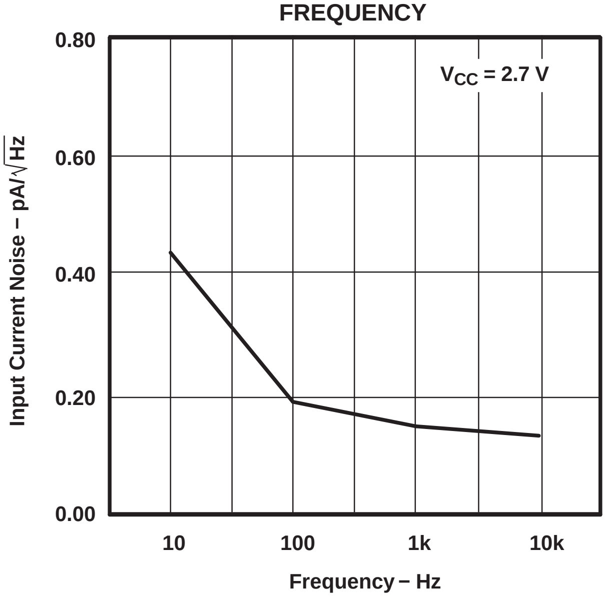



Figure 39.

INPUT CURRENT NOISE
vs
FREQUENCY

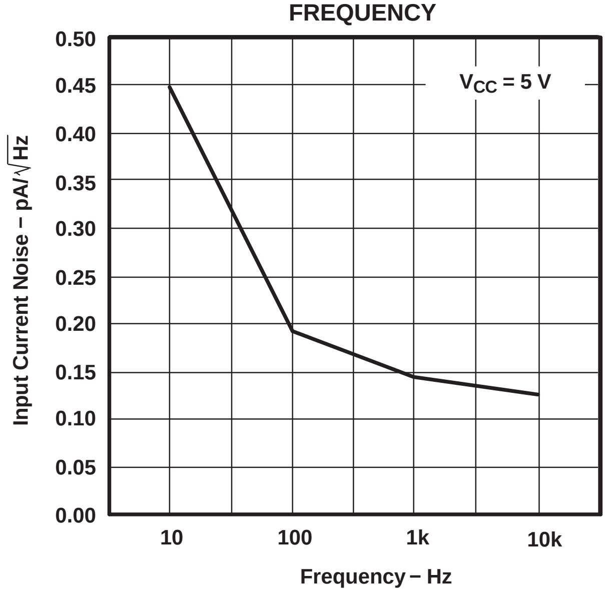



Figure 40.

## TYPICAL CHARACTERISTICS (continued)

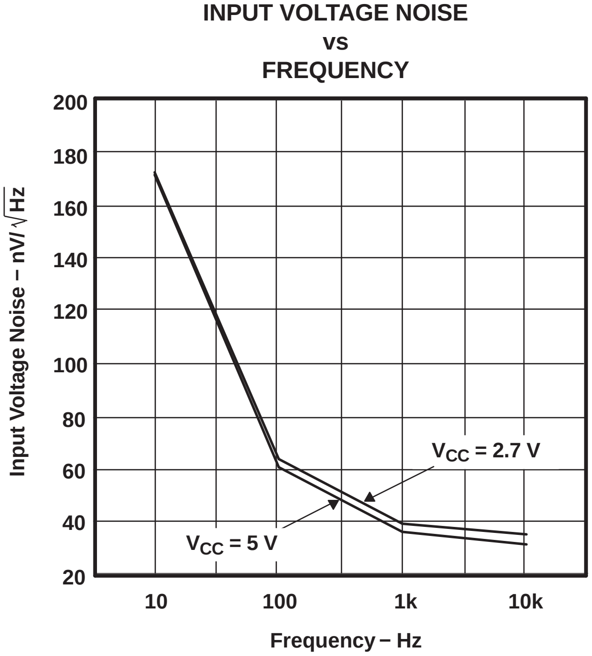



Figure 41.

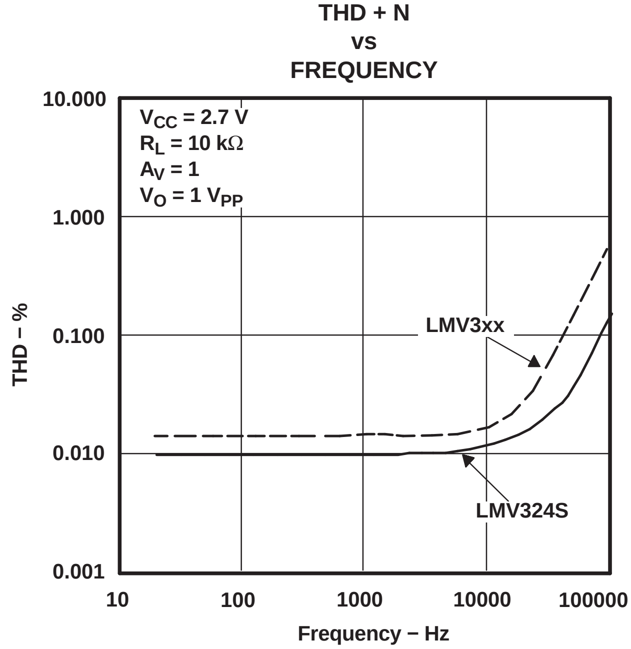



Figure 42.

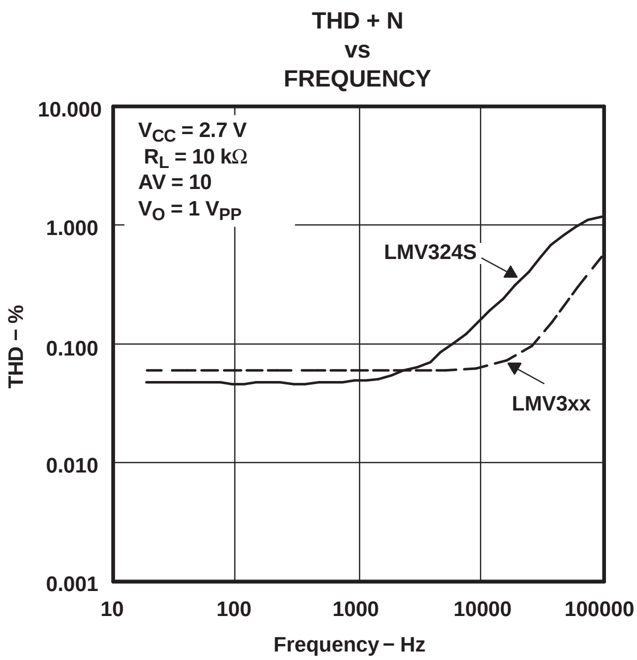



Figure 43.

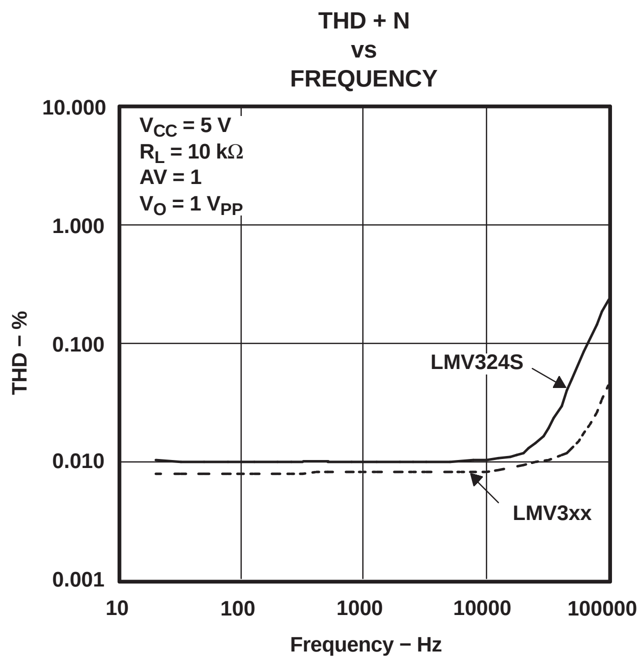



Figure 44.

## TYPICAL CHARACTERISTICS (continued)

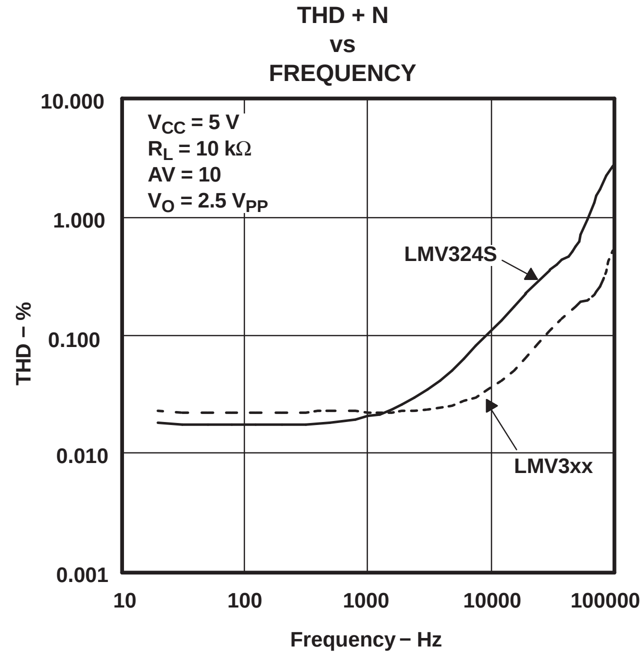



**Figure 45.**

## REVISION HISTORY

| Changes from Revision T (September 2007) to Revision U | Page |
|---|---|
| • Updated $\theta_{JA}$ value for DDU package. | 4 |

## 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) | Top-Side Markings (4) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LMV321IDBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (RC1F ~ RC1K) | Samples |
| LMV321IDBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (RC1F ~ RC1K) | Samples |
| LMV321IDBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (RC1F ~ RC1K) | Samples |
| LMV321IDBVTE4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (RC1F ~ RC1K) | Samples |
| LMV321IDBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (RC1F ~ RC1K) | Samples |
| LMV321IDCKR | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | (R3C ~ R3I ~ R3O ~ R3R ~ R3Z) | Samples |
| LMV321IDCKRG4 | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | (R3C ~ R3I ~ R3O ~ R3R ~ R3Z) | Samples |
| LMV321IDCKT | ACTIVE | SC70 | DCK | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | (R3C ~ R3I ~ R3R) | Samples |
| LMV321IDCKTE4 | ACTIVE | SC70 | DCK | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | (R3C ~ R3I ~ R3R) | Samples |
| LMV321IDCKTG4 | ACTIVE | SC70 | DCK | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 85 | (R3C ~ R3I ~ R3R) | Samples |
| LMV324ID | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324I | Samples |
| LMV324IDG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324I | Samples |
| LMV324IDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324I | Samples |
| LMV324IDRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324I | Samples |
| LMV324IPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324I | Samples |
| LMV324IPWRE | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324I | Samples |
| LMV324IPWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324I | 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) | Top-Side Markings (4) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LMV324QD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324Q | Samples |
| LMV324QDG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324Q | Samples |
| LMV324QDR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324Q | Samples |
| LMV324QDRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | LMV324Q | Samples |
| LMV324QPW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324Q | Samples |
| LMV324QPWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324Q | Samples |
| LMV324QPWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324Q | Samples |
| LMV324QPWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324Q | Samples |
| LMV324QPWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV324Q | Samples |
| LMV324SID | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI | -40 to 85 | LMV324SI | |
| LMV324SIDE4 | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| LMV324SIDG4 | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| LMV324SIDR | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI | -40 to 85 | LMV324SI | |
| LMV324SIDRE4 | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| LMV324SIDRG4 | OBSOLETE | SOIC | D | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| LMV324SIPWR | OBSOLETE | TSSOP | PW | 16 | | TBD | Call TI | Call TI | -40 to 85 | MV324SI | |
| LMV324SIPWRE4 | OBSOLETE | TSSOP | PW | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| LMV324SIPWRG4 | OBSOLETE | TSSOP | PW | 16 | | TBD | Call TI | Call TI | -40 to 85 | | |
| LMV358ID | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IDDUR | ACTIVE | VSSOP | DDU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | RA5R | Samples |
| LMV358IDDURE4 | ACTIVE | VSSOP | DDU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | RA5R | Samples |
| LMV358IDDURG4 | ACTIVE | VSSOP | DDU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | RA5R | 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) | Top-Side Markings (4) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LMV358IDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IDGKR | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (R5B ~ R5Q ~ R5R) | Samples |
| LMV358IDGKRG4 | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (R5B ~ R5Q ~ R5R) | Samples |
| LMV358IDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IPW | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IPWE4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IPWG4 | ACTIVE | TSSOP | PW | 8 | 150 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IPWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IPWRE4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358IPWRG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358I | Samples |
| LMV358QD | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | Samples |
| LMV358QDDUR | ACTIVE | VSSOP | DDU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | RAHR | Samples |
| LMV358QDDURE4 | ACTIVE | VSSOP | DDU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | RAHR | Samples |
| LMV358QDDURG4 | ACTIVE | VSSOP | DDU | 8 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | RAHR | Samples |
| LMV358QDE4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | 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) | Top-Side Markings (4) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LMV358QDG4 | ACTIVE | SOIC | D | 8 | 75 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | Samples |
| LMV358QDGKR | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (RHO ~ RHR) | Samples |
| LMV358QDGKRG4 | ACTIVE | VSSOP | DGK | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | (RHO ~ RHR) | Samples |
| LMV358QDR | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | Samples |
| LMV358QDRE4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | Samples |
| LMV358QDRG4 | ACTIVE | SOIC | D | 8 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | Samples |
| LMV358QPWR | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | Samples |
| LMV358QPWRE4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | Samples |
| LMV358QPWRG4 | ACTIVE | TSSOP | PW | 8 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | MV358Q | 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) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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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.

**OTHER QUALIFIED VERSIONS OF LMV324, LMV358 :**

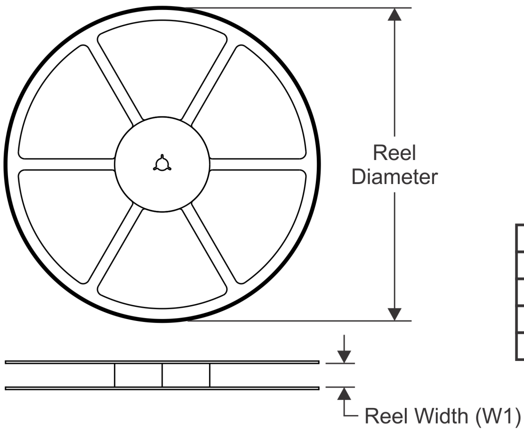
- Automotive: LMV324-Q1, LMV358-Q1

NOTE: Qualified Version Definitions:

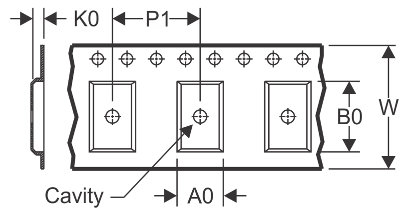
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS

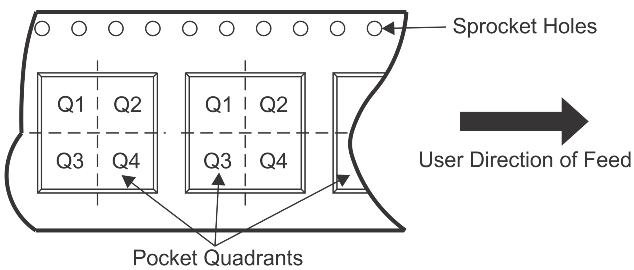



### TAPE DIMENSIONS




| | |
|---|---|
| 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

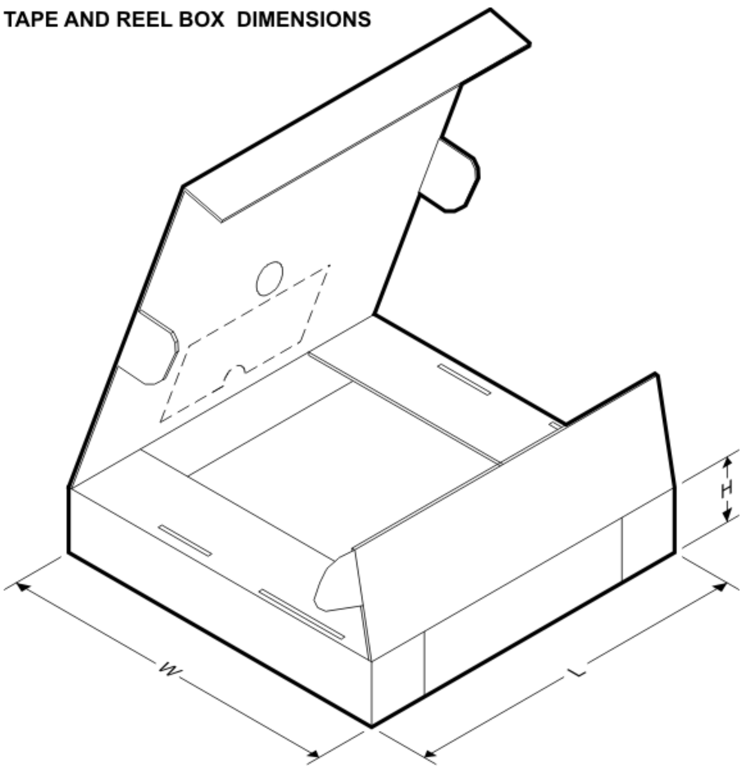



*All dimensions are nominal

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LMV321IDBVR | SOT-23 | DBV | 5 | 3000 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| LMV321IDBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.2 | 3.17 | 3.23 | 1.37 | 4.0 | 8.0 | Q3 |
| LMV321IDBVT | SOT-23 | DBV | 5 | 250 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| LMV321IDBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 9.2 | 3.17 | 3.23 | 1.37 | 4.0 | 8.0 | Q3 |
| LMV321IDCKR | SC70 | DCK | 5 | 3000 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LMV321IDCKR | SC70 | DCK | 5 | 3000 | 180.0 | 9.2 | 2.3 | 2.55 | 1.2 | 4.0 | 8.0 | Q3 |
| LMV321IDCKT | SC70 | DCK | 5 | 250 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LMV321IDCKT | SC70 | DCK | 5 | 250 | 180.0 | 9.2 | 2.3 | 2.55 | 1.2 | 4.0 | 8.0 | Q3 |
| LMV324IDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| LMV324IDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| LMV324IDRG4 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| LMV324IDRG4 | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| LMV324IPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LMV324IPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 7.0 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LMV324IPWRG4 | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LMV324QDR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| LMV324QPWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LMV358IDDUR | VSSOP | DDU | 8 | 3000 | 180.0 | 8.4 | 2.25 | 3.35 | 1.05 | 4.0 | 8.0 | Q3 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LMV358IDGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LMV358IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LMV358IDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LMV358IDRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LMV358IDRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| LMV358IPWR | TSSOP | PW | 8 | 2000 | 330.0 | 12.4 | 7.0 | 3.6 | 1.6 | 8.0 | 12.0 | Q1 |
| LMV358QDDUR | VSSOP | DDU | 8 | 3000 | 180.0 | 8.4 | 2.25 | 3.35 | 1.05 | 4.0 | 8.0 | Q3 |
| LMV358QDGKR | VSSOP | DGK | 8 | 2500 | 330.0 | 12.4 | 5.3 | 3.4 | 1.4 | 8.0 | 12.0 | Q1 |
| LMV358QDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |

## TAPE AND REEL BOX DIMENSIONS

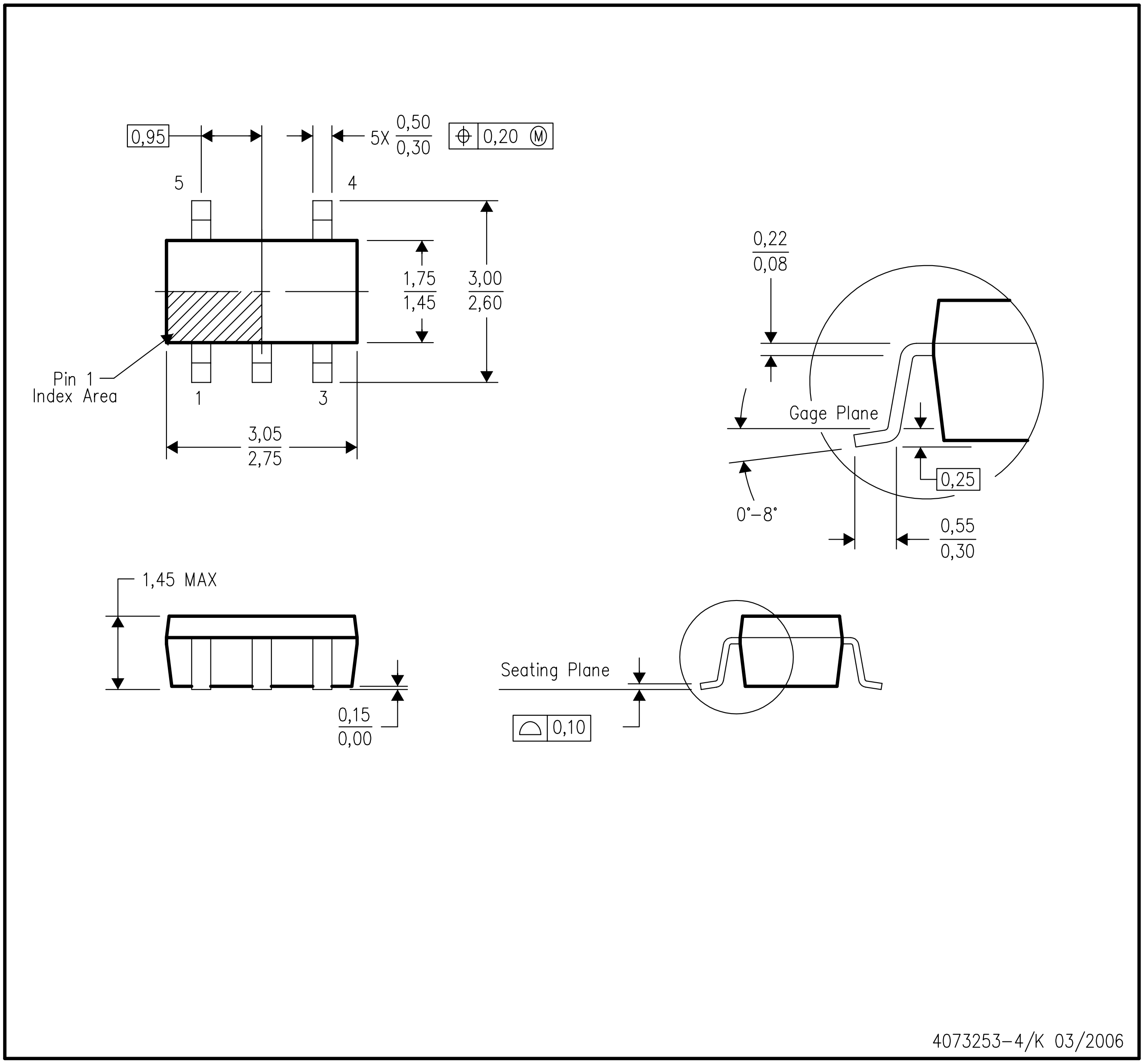



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| LMV321IDBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| LMV321IDBVR | SOT-23 | DBV | 5 | 3000 | 205.0 | 200.0 | 33.0 |
| LMV321IDBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 180.0 | 18.0 |
| LMV321IDBVT | SOT-23 | DBV | 5 | 250 | 205.0 | 200.0 | 33.0 |
| LMV321IDCKR | SC70 | DCK | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| LMV321IDCKR | SC70 | DCK | 5 | 3000 | 205.0 | 200.0 | 33.0 |
| LMV321IDCKT | SC70 | DCK | 5 | 250 | 180.0 | 180.0 | 18.0 |
| LMV321IDCKT | SC70 | DCK | 5 | 250 | 205.0 | 200.0 | 33.0 |

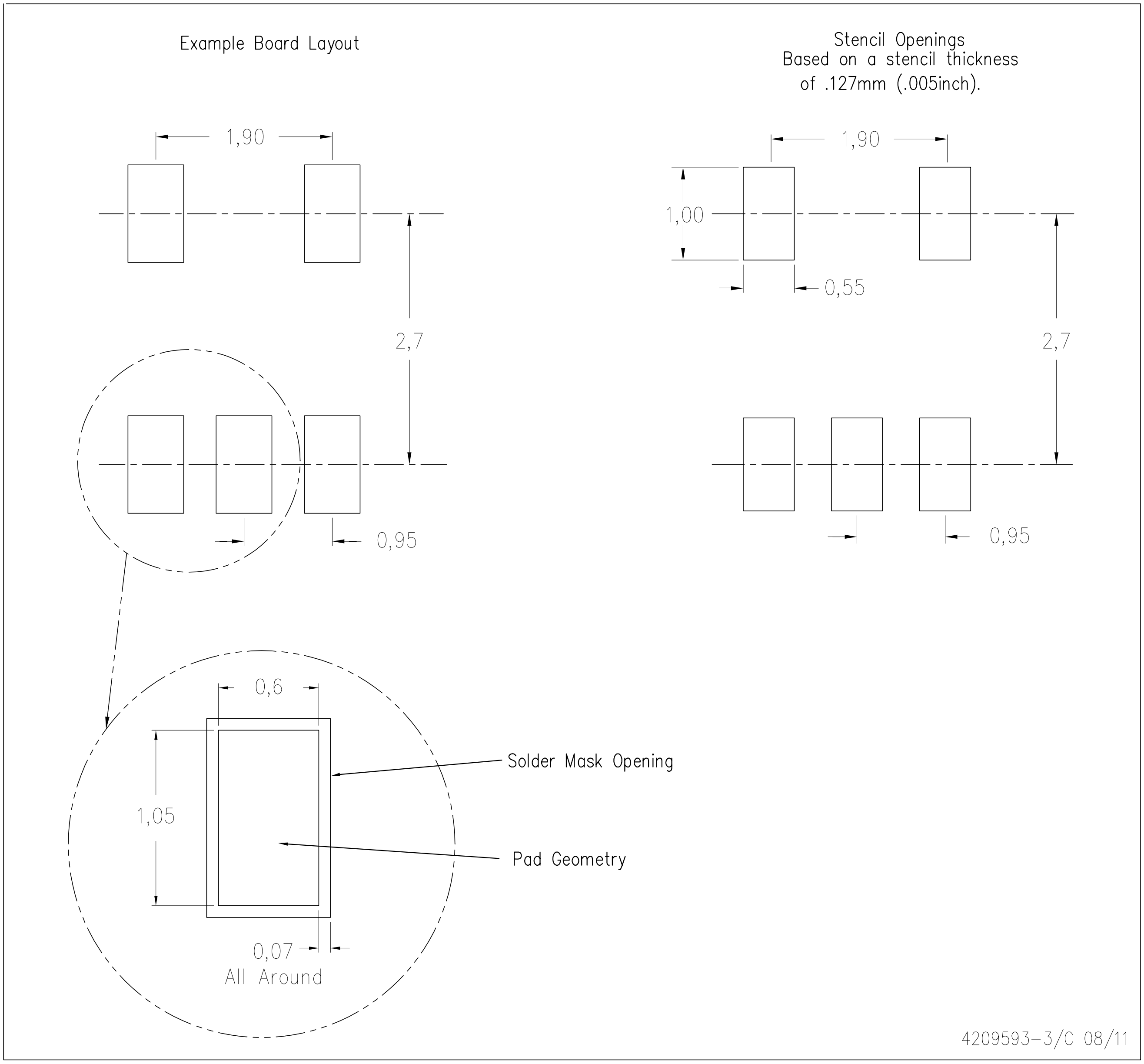
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| LMV324IDR | SOIC | D | 14 | 2500 | 367.0 | 367.0 | 38.0 |
| LMV324IDR | SOIC | D | 14 | 2500 | 333.2 | 345.9 | 28.6 |
| LMV324IDRG4 | SOIC | D | 14 | 2500 | 333.2 | 345.9 | 28.6 |
| LMV324IDRG4 | SOIC | D | 14 | 2500 | 367.0 | 367.0 | 38.0 |
| LMV324IPWR | TSSOP | PW | 14 | 2000 | 367.0 | 367.0 | 35.0 |
| LMV324IPWR | TSSOP | PW | 14 | 2000 | 364.0 | 364.0 | 27.0 |
| LMV324IPWRG4 | TSSOP | PW | 14 | 2000 | 367.0 | 367.0 | 35.0 |
| LMV324QDR | SOIC | D | 14 | 2500 | 367.0 | 367.0 | 38.0 |
| LMV324QPWR | TSSOP | PW | 14 | 2000 | 367.0 | 367.0 | 35.0 |
| LMV358IDDUR | VSSOP | DDU | 8 | 3000 | 202.0 | 201.0 | 28.0 |
| LMV358IDGKR | VSSOP | DGK | 8 | 2500 | 358.0 | 335.0 | 35.0 |
| LMV358IDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LMV358IDR | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LMV358IDRG4 | SOIC | D | 8 | 2500 | 367.0 | 367.0 | 35.0 |
| LMV358IDRG4 | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |
| LMV358IPWR | TSSOP | PW | 8 | 2000 | 364.0 | 364.0 | 27.0 |
| LMV358QDDUR | VSSOP | DDU | 8 | 3000 | 202.0 | 201.0 | 28.0 |
| LMV358QDGKR | VSSOP | DGK | 8 | 2500 | 358.0 | 335.0 | 35.0 |
| LMV358QDR | SOIC | D | 8 | 2500 | 340.5 | 338.1 | 20.6 |

DBV (R-PDSO-G5) PLASTIC SMALL-OUTLINE PACKAGE



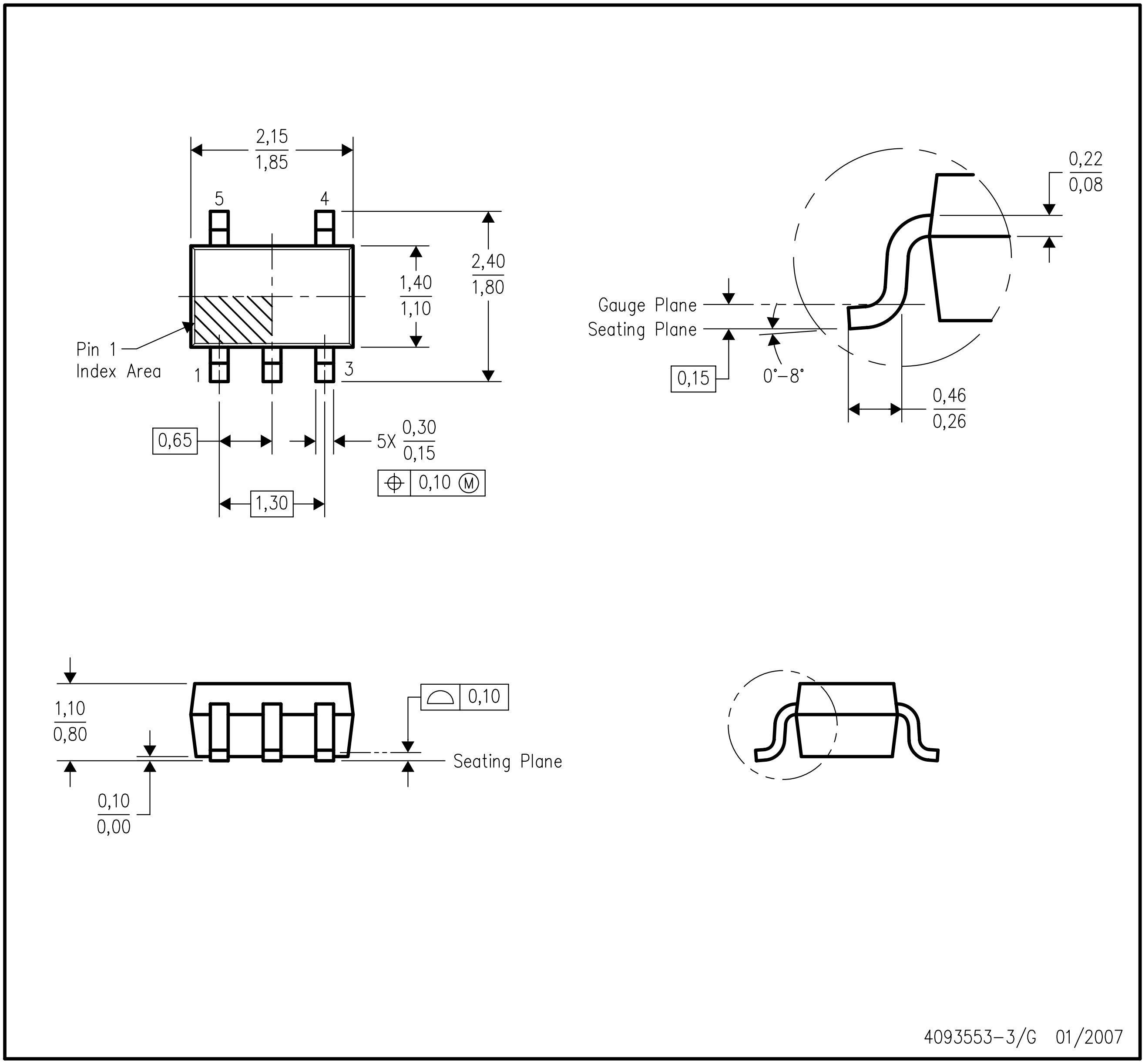

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO-178 Variation AA.

DBV (R-PDSO-G5) PLASTIC SMALL OUTLINE



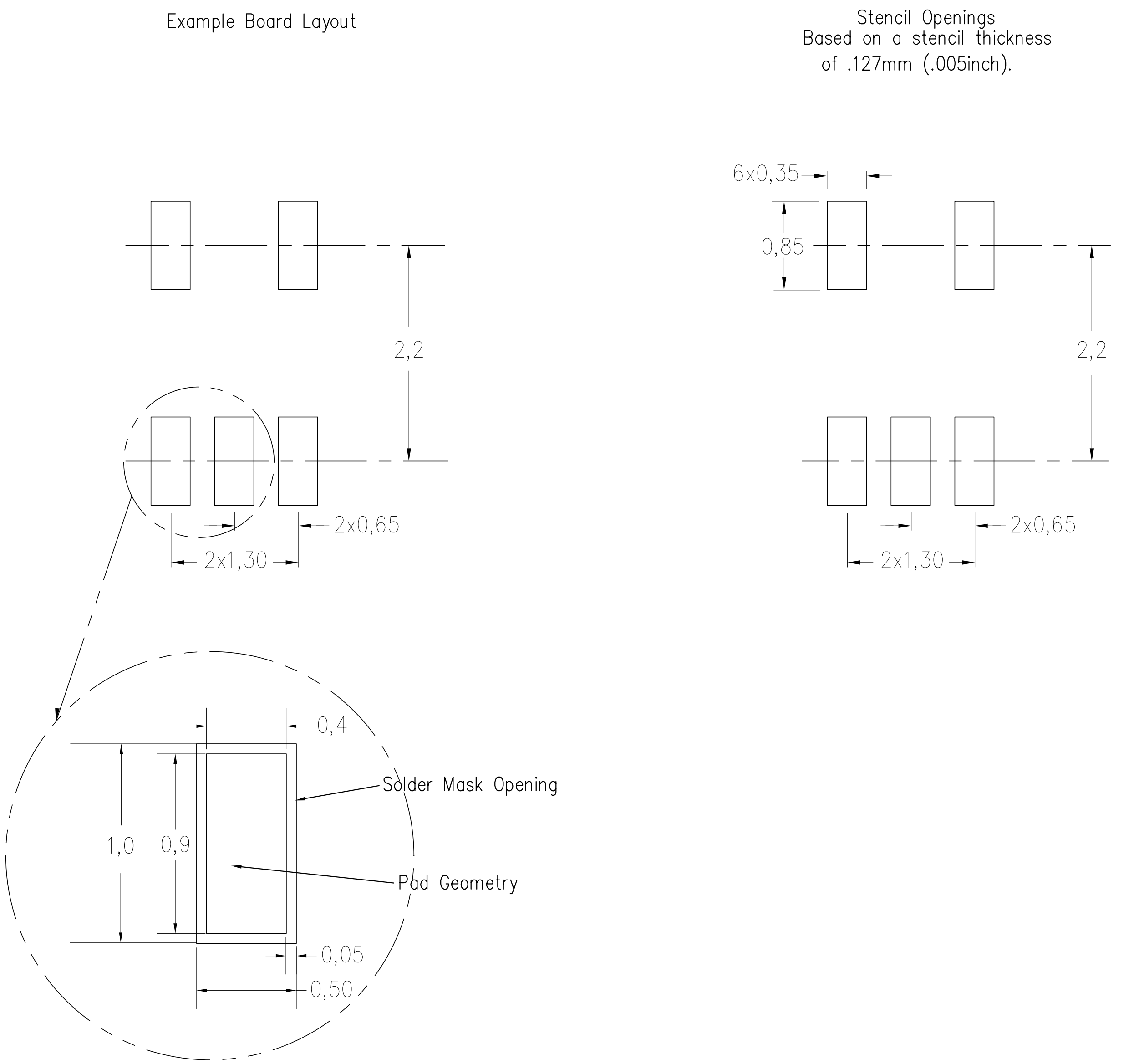

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. Publication IPC-7351 is recommended for alternate designs.
E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

DCK (R-PDSO-G5) PLASTIC SMALL-OUTLINE PACKAGE




NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO-203 variation AA.

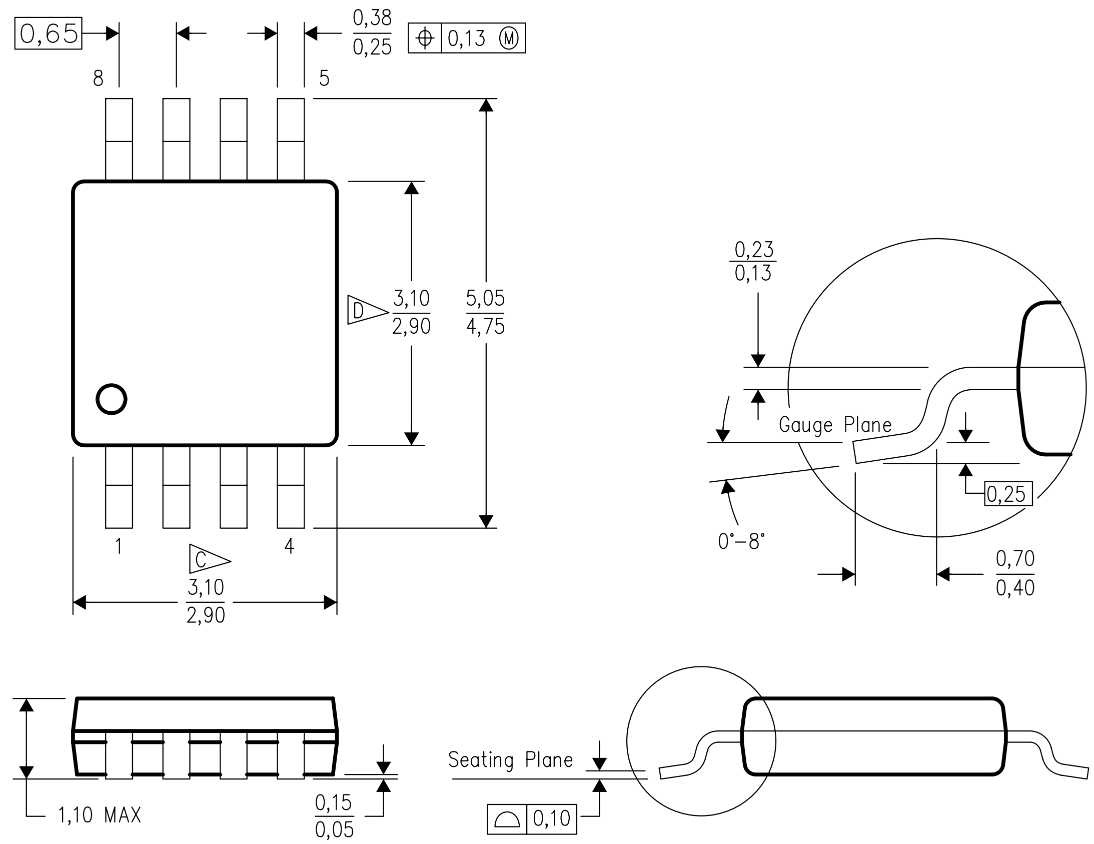
DCK (R–PDSO–G5) PLASTIC SMALL OUTLINE




4210356–2/C 07/11

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. Publication IPC–7351 is recommended for alternate designs.
E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC–7525 for other stencil recommendations.

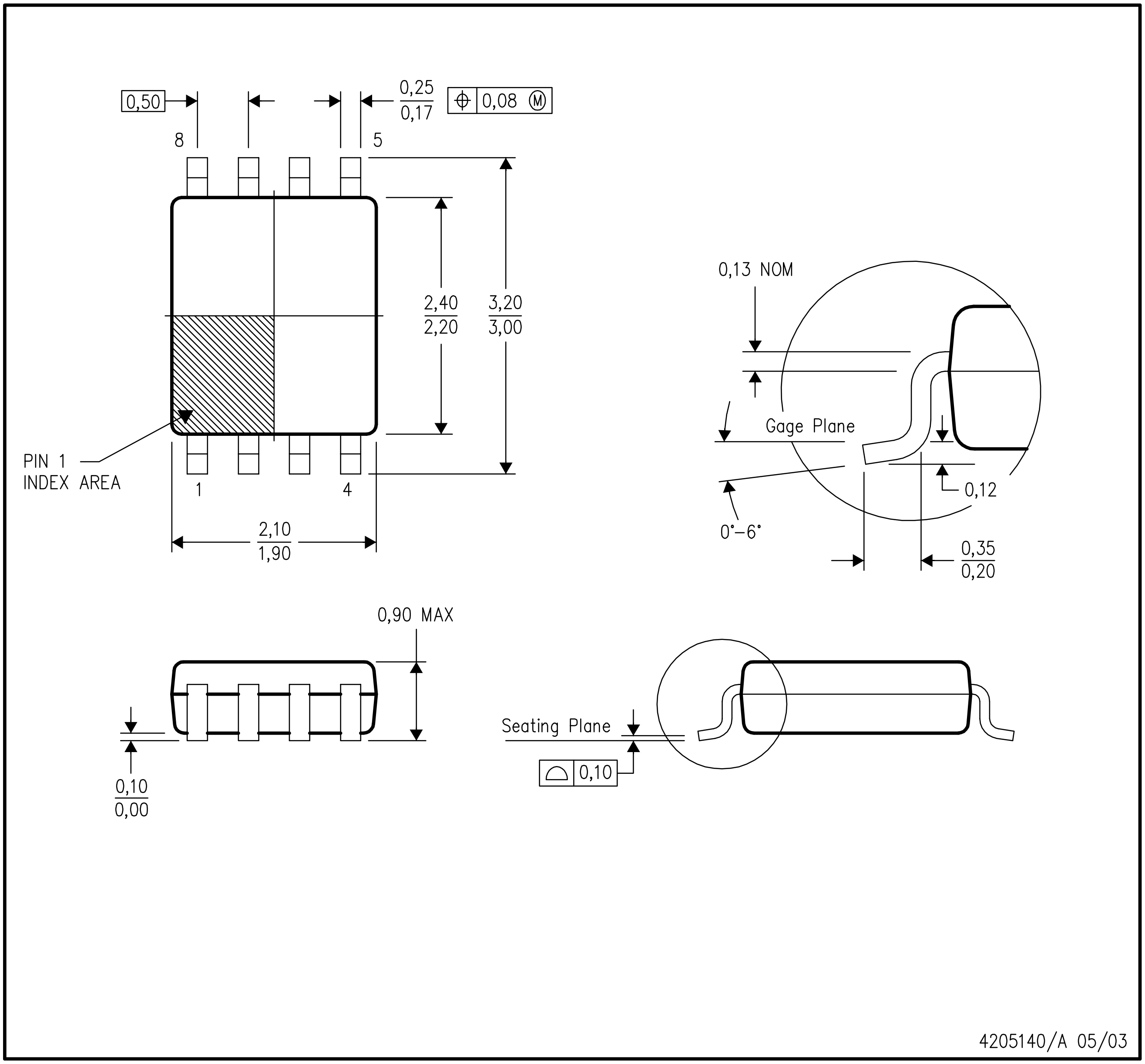
## DGK (S-PDSO-G8) PLASTIC SMALL-OUTLINE PACKAGE




4073329/E 05/06

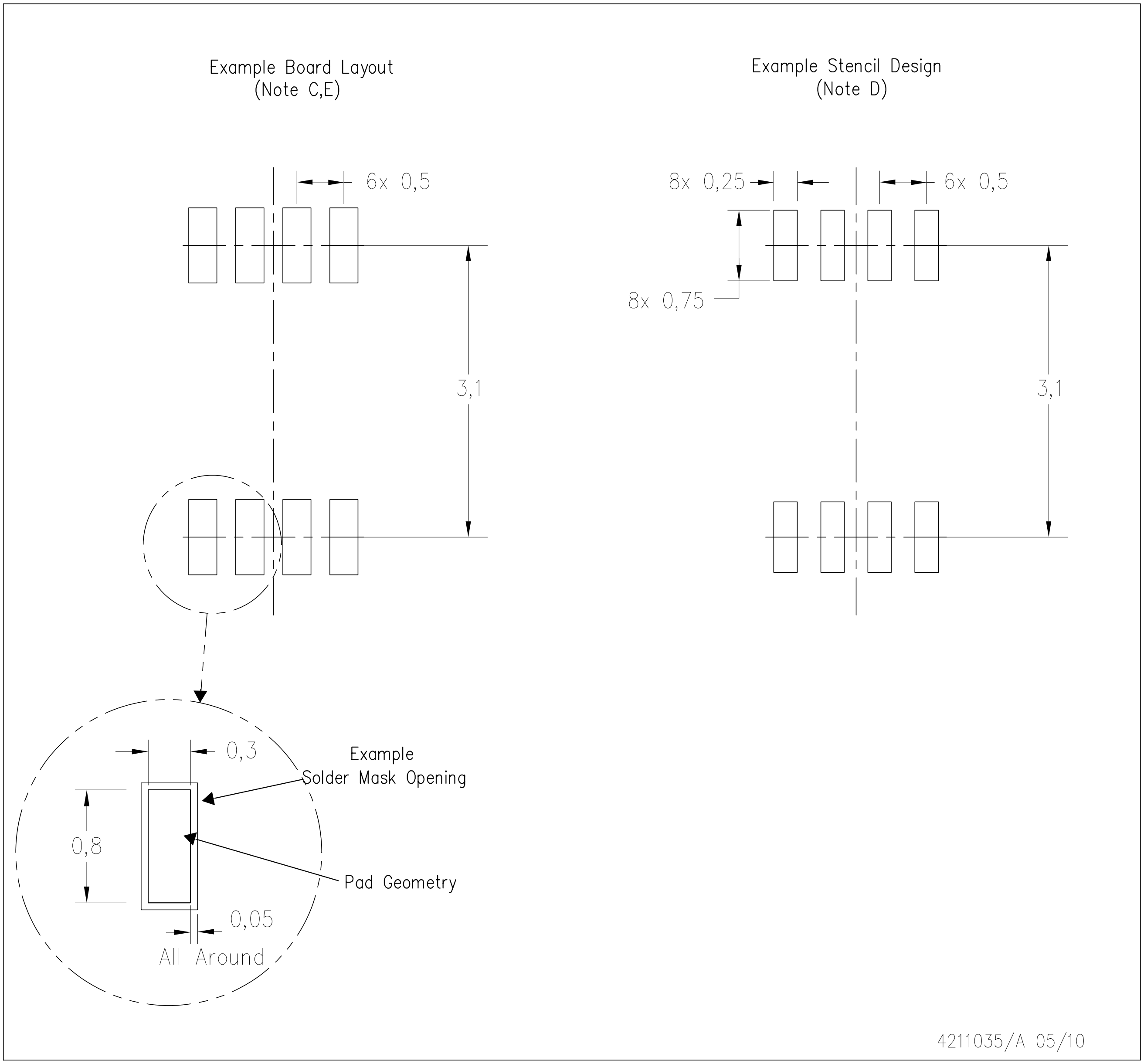
NOTES:
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per end.
- D. Body width does not include interlead flash.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

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



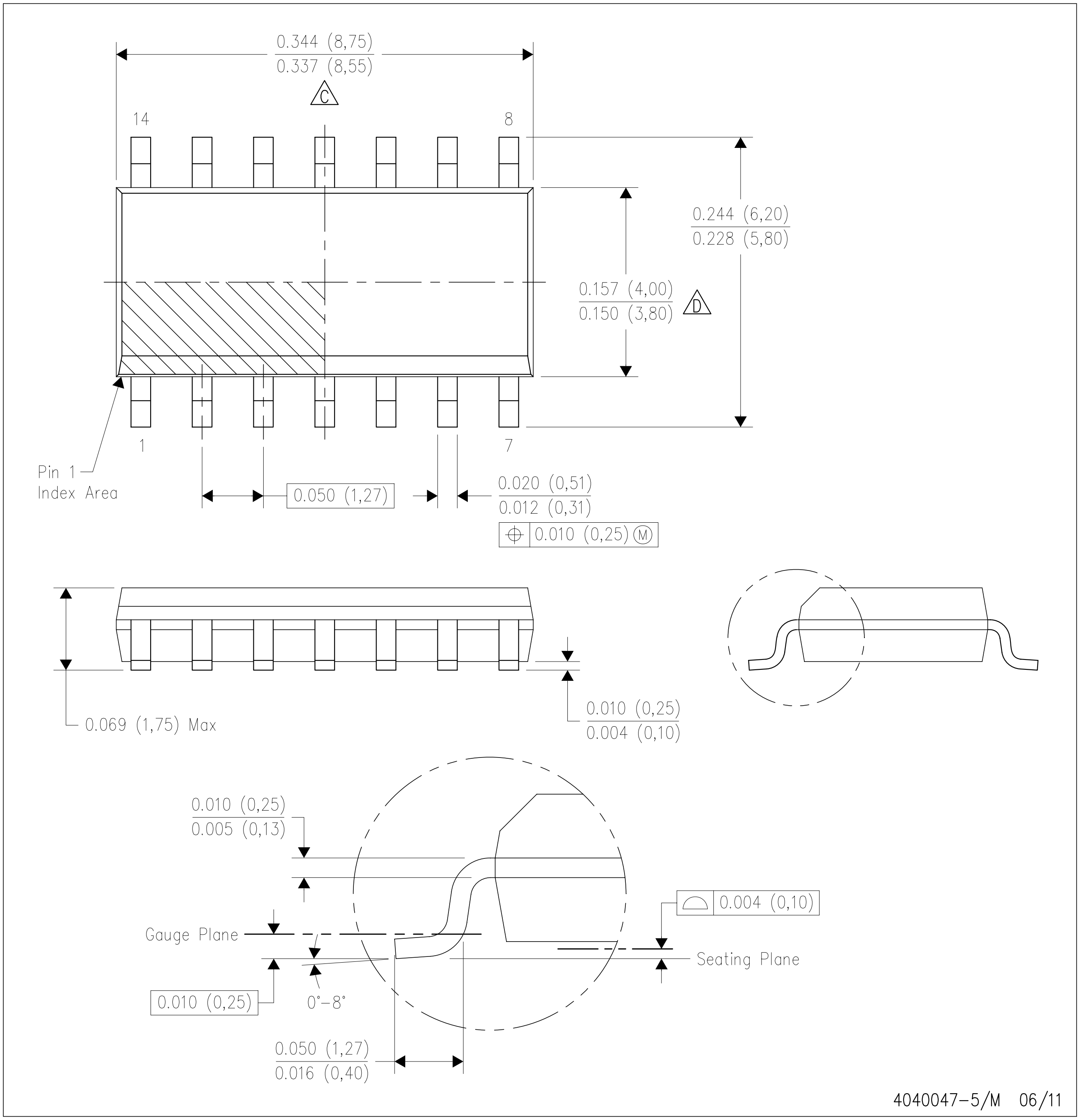

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion.
D. Falls within JEDEC MO–187 variation CA.

DDU (S–PDSO–G8) PLASTIC SMALL OUTLINE PACKAGE (DIE UP)



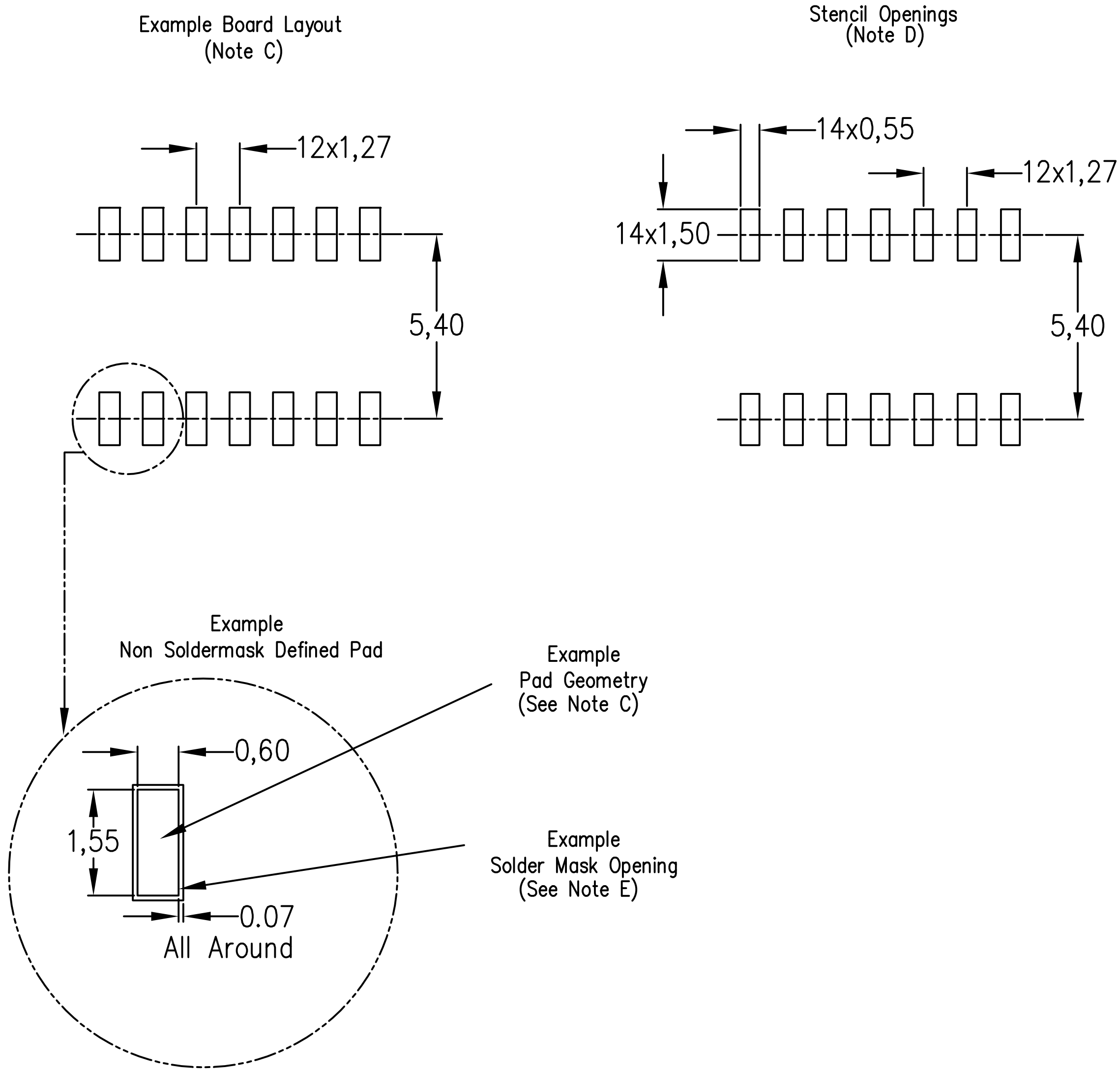

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact 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–G14) 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 AB.

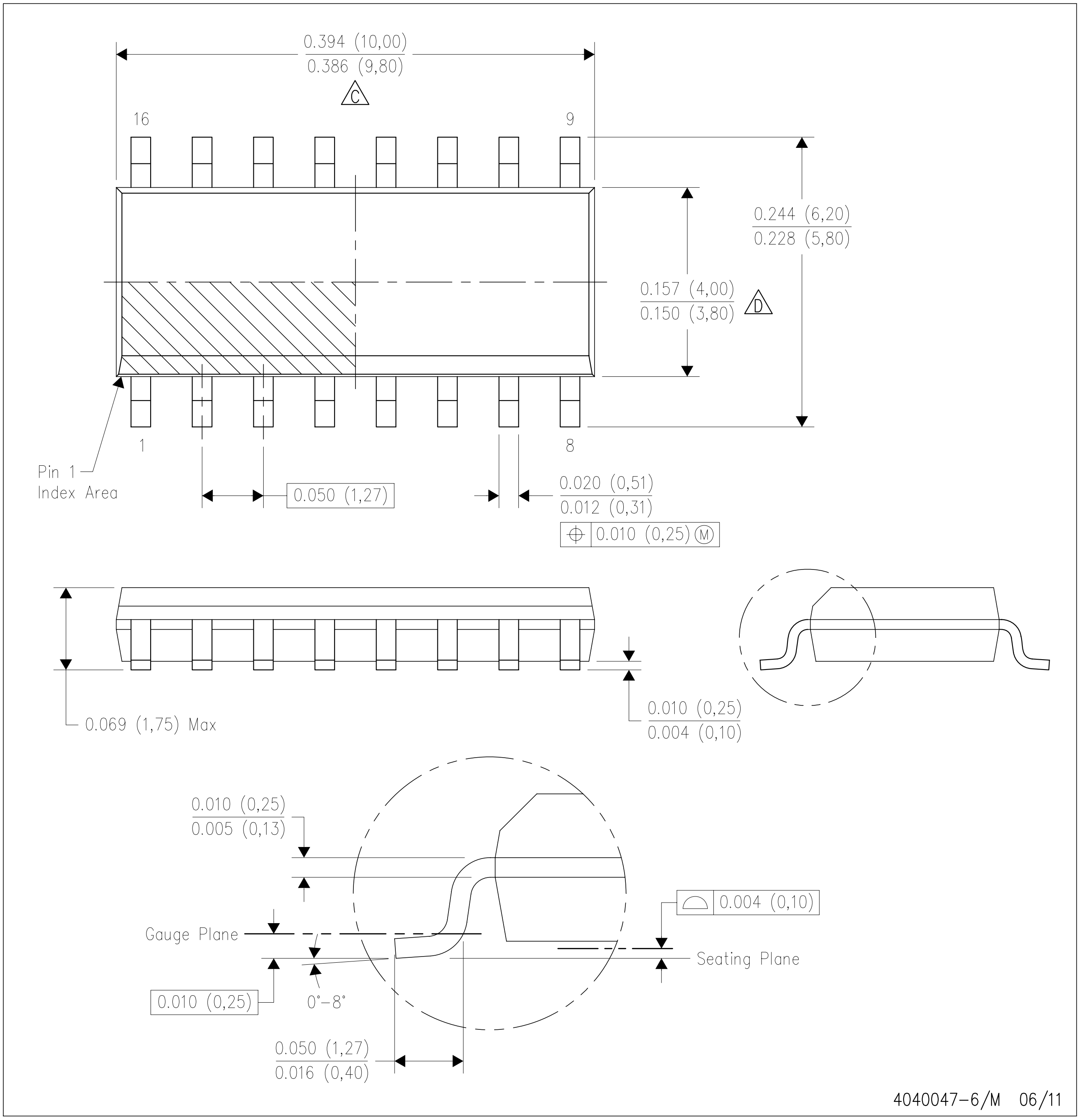
D (R–PDSO–G14) PLASTIC SMALL OUTLINE




4211283–3/E 08/12

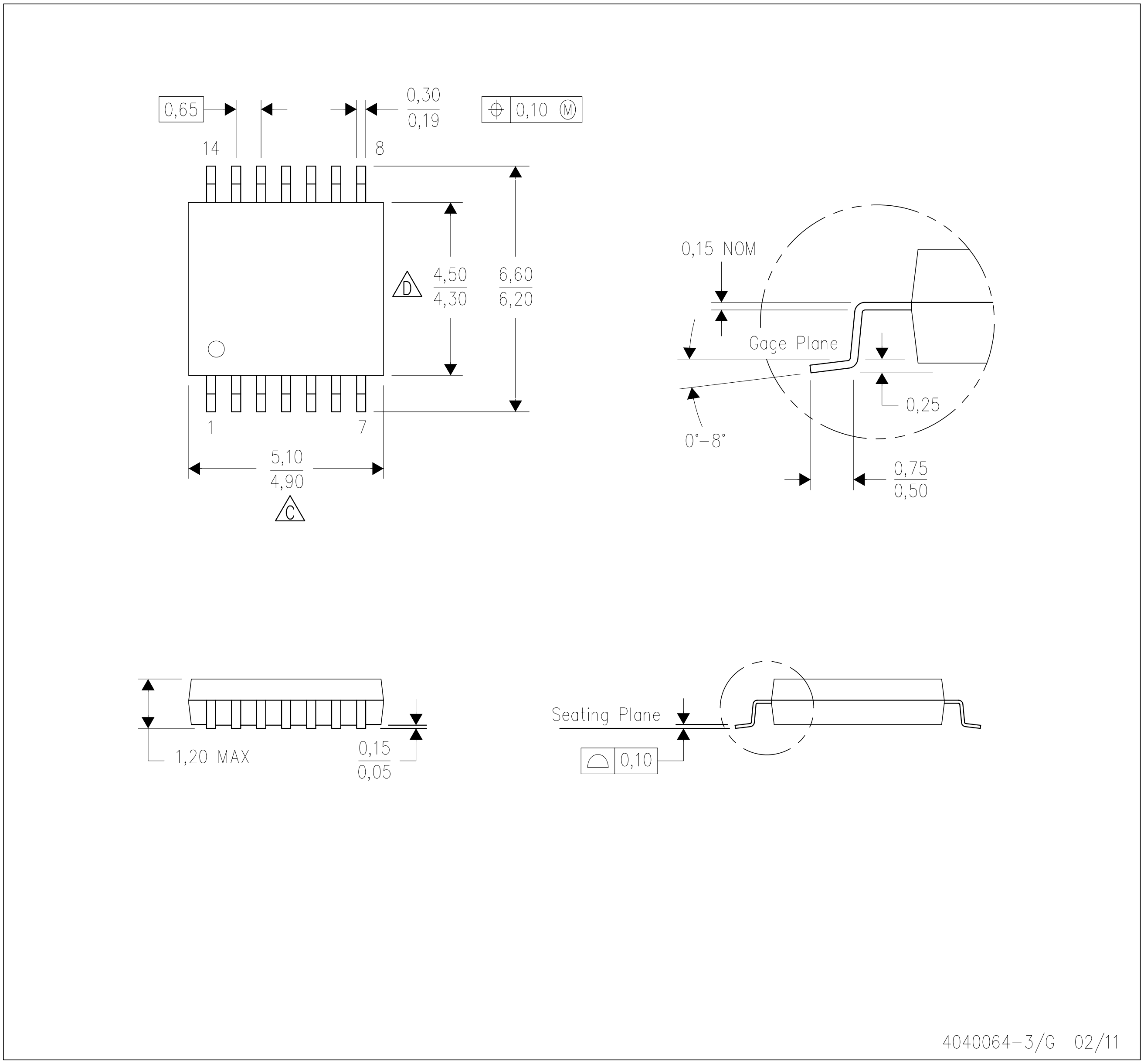
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact 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.

D (R-PDSO-G16) PLASTIC SMALL OUTLINE



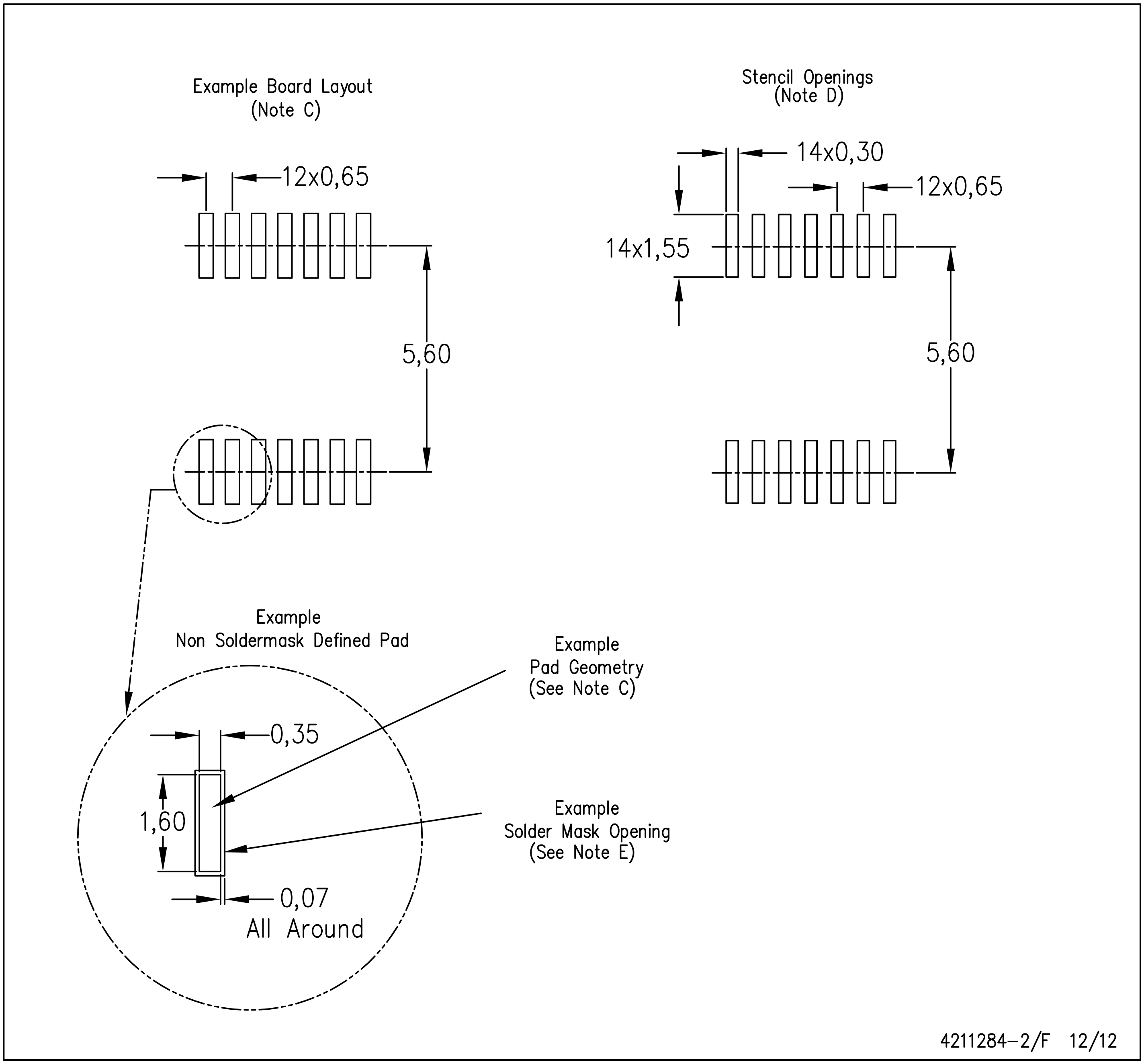

NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- D. Body width does not include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

PW (R–PDSO–G14) PLASTIC SMALL OUTLINE



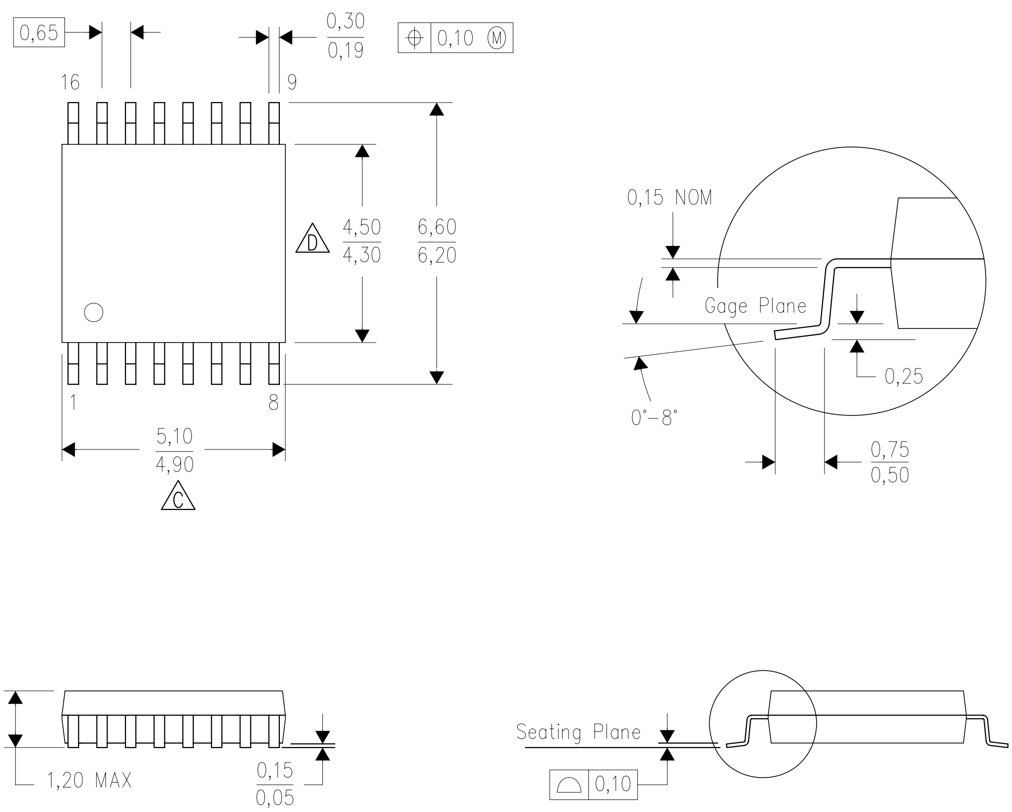

NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
E. Falls within JEDEC MO-153

PW (R–PDSO–G14) 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.

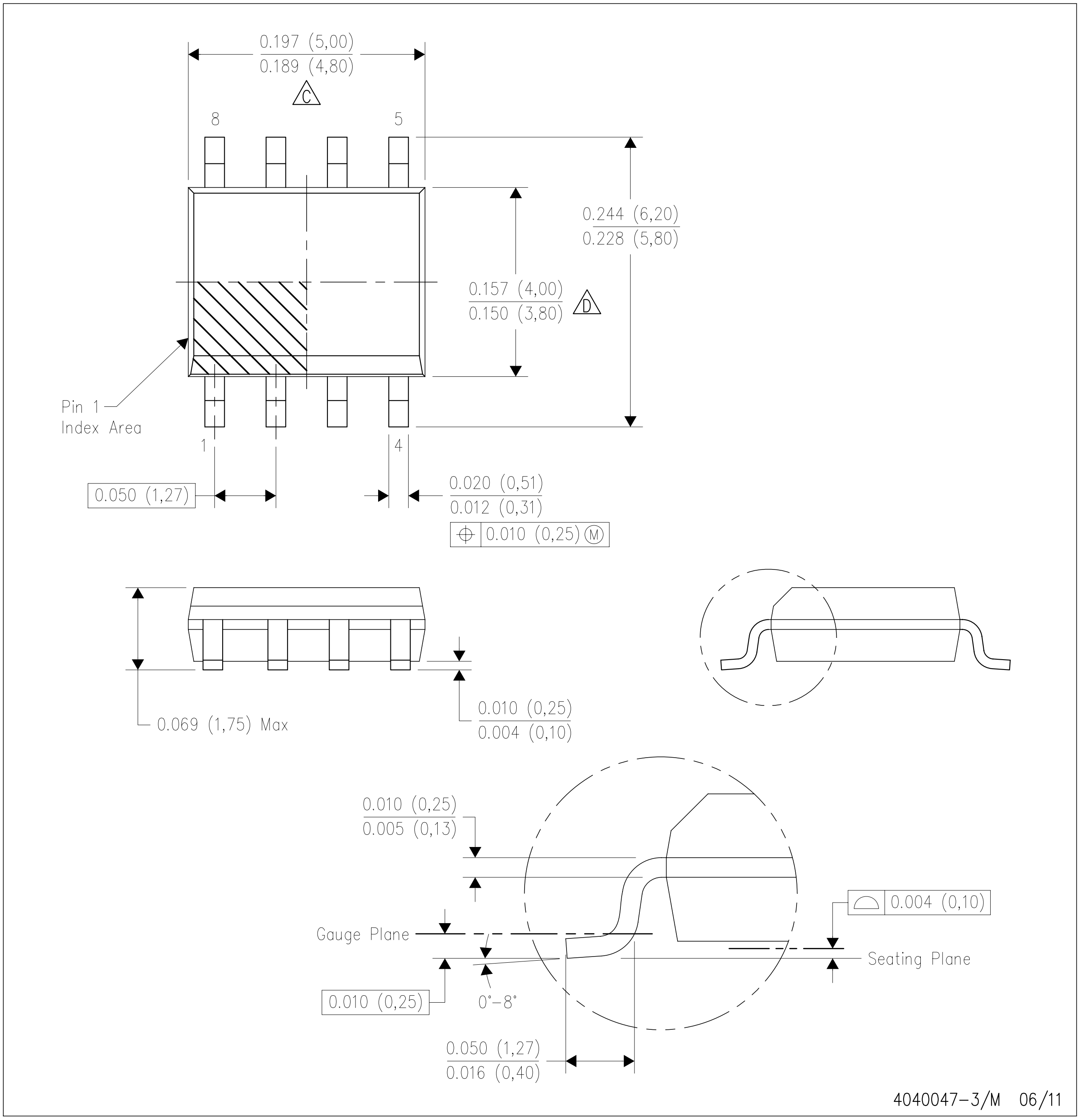
PW (R-PDSO-G16) PLASTIC SMALL OUTLINE




4040064-4/G 02/11

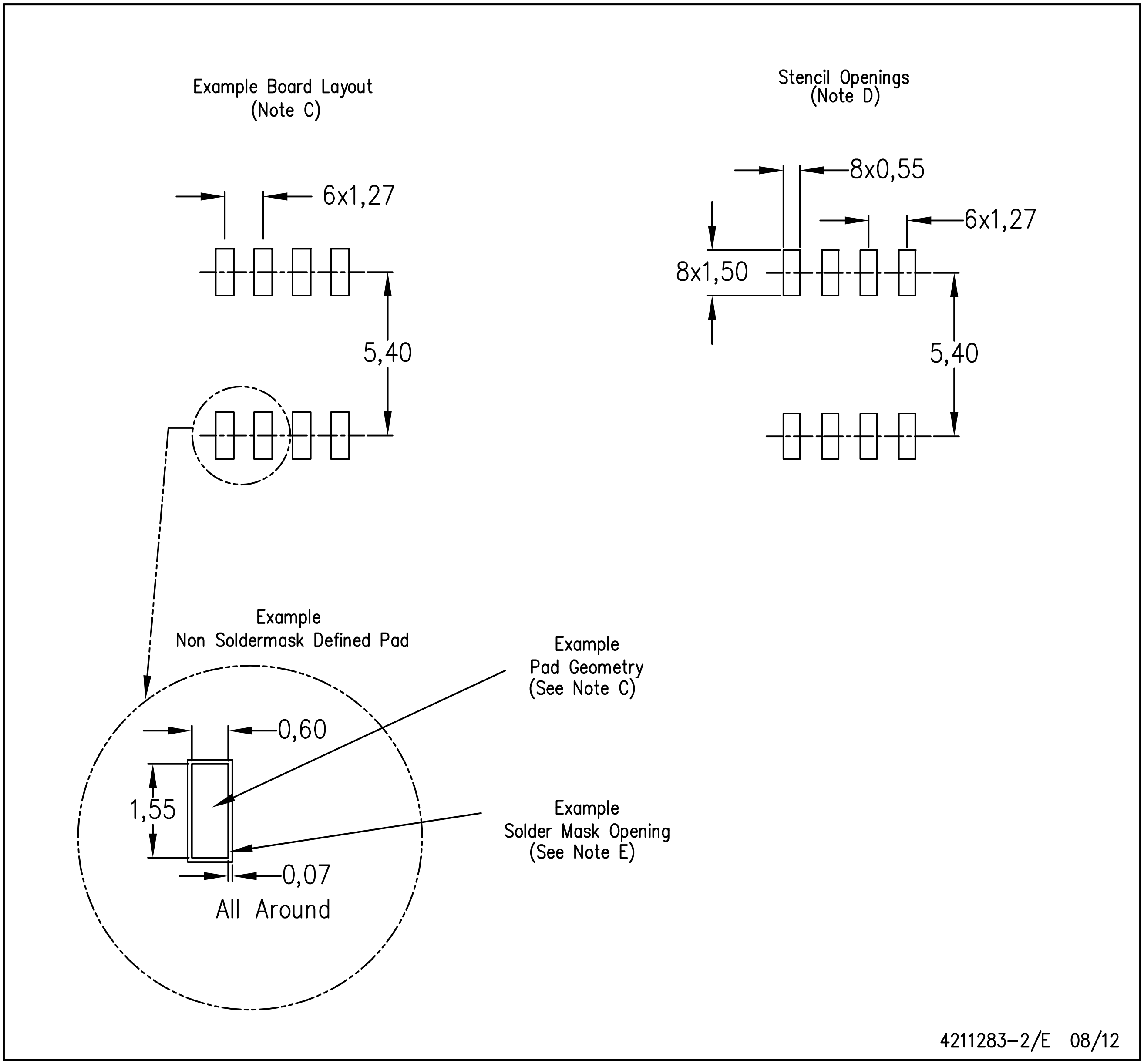
NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
E. Falls within JEDEC MO-153

D (R-PDSO-G8) PLASTIC SMALL OUTLINE



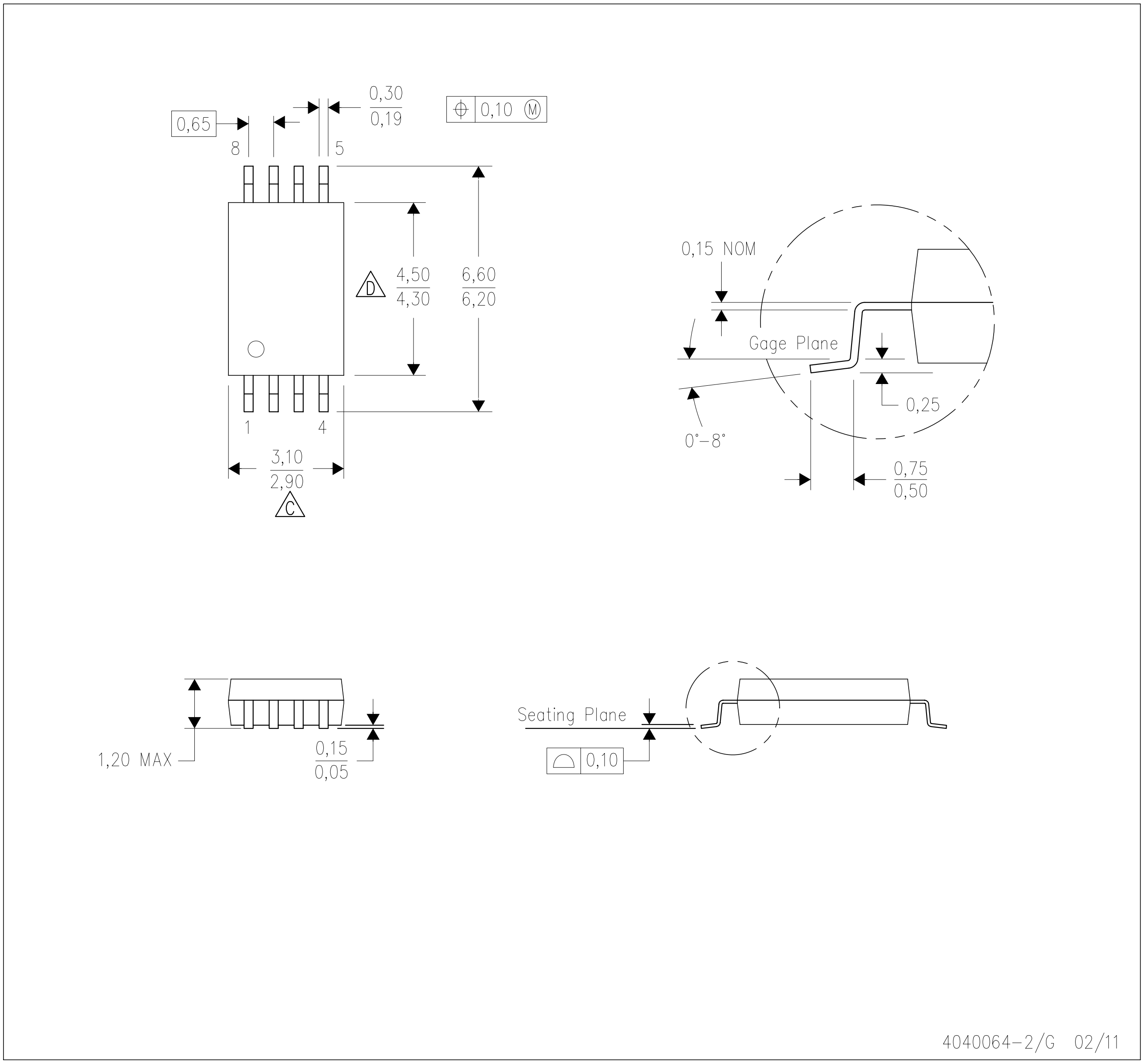

NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- D. Body width does not include 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.

PW (R–PDSO–G8) PLASTIC SMALL OUTLINE




NOTES:

A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.

B. This drawing is subject to change without notice.

C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.

D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO–153


**Как с нами связаться**

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**Факс:** 8 (812) 320-02-42
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**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.