

AMC1302 精密、 $\pm 50\text{mV}$ 输入、增强型隔离放大器

1 特性

- $\pm 50\text{mV}$ 输入电压范围，针对基于分流器的电流测量进行了优化
- 固定增益：41
- 低直流误差：
 - 失调电压误差： $\pm 50\mu\text{V}$ （最大值）
 - 温漂： $\pm 0.8\mu\text{V}/^\circ\text{C}$ （最大值）
 - 增益误差： $\pm 0.2\%$ （最大值）
 - 增益漂移： $\pm 35\text{ppm}/^\circ\text{C}$ （最大值）
 - 非线性度：0.03%（最大值）
- 高侧和低侧以 3.3V 或 5V 电压运行
- 失效防护输出
- 高 CMTI：100kV/ μs （最小值）
- 低 EMI，符合 CISPR-11 和 CISPR-25 标准
- 安全相关认证：
 - 7071-V_{PK} 增强型隔离，符合 DIN VDE V 0884-11 : 2017-01
 - 符合 UL1577 标准且长达 1 分钟的 5000V_{RMS} 隔离
- 可在工业级工作温度范围内正常工作：-40°C 至 +125°C

2 应用

- 可用于以下应用的隔离式电流感应：
 - 保护继电器
 - 电机驱动器
 - 电源
 - 光电逆变器

3 说明

AMC1302 是一款隔离式精密放大器，此放大器的输出与输入电路由抗电磁干扰性能极强的隔离层隔开。该隔离栅经认证可提供高达 5kV_{RMS} 的增强型电隔离，符合 VDE V 0884-11 和 UL1577 标准，并且可支持最高 1.5kV_{RMS} 的工作电压。

该隔离栅可将系统中以不同共模电压电平运行的各器件隔开，并保护电压较低的器件免受高电压冲击。

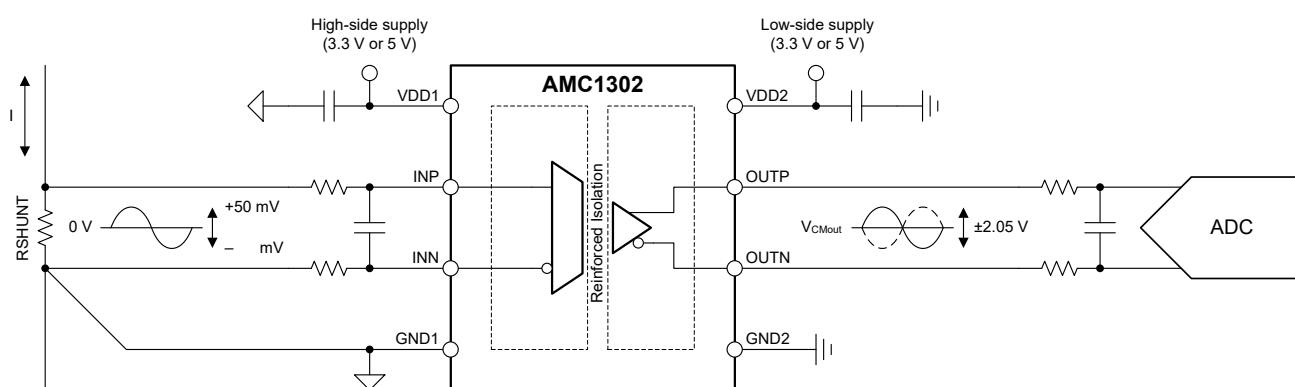
AMC1302 的输入针对直接连接低阻抗分流电阻器或其他具有低信号电平的低阻抗电压源的情况进行了优化。出色的直流精度和低温漂支持在 -40°C 至 +125°C 的工业级工作温度范围内，在 PFC 级、直流/直流转换器、交流电机和伺服驱动器中进行精确的电流控制。

集成的无分流器和无高侧电源检测功能可简化系统级设计和诊断。

器件信息⁽¹⁾

| 器件型号 | 封装 | 封装尺寸（标称值） |
|---------|----------|-----------------|
| AMC1302 | SOIC (8) | 5.85mm × 7.50mm |

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品目录。



典型应用



本文档旨在为方便起见，提供有关 TI 产品中文版本的信息，以确认产品的概要。有关适用的官方英文版本的最新信息，请访问 www.ti.com，其内容始终优先。TI 不保证翻译的准确性和有效性。在实际设计之前，请务必参考最新版本的英文版本。

English Data Sheet: **SBAS812**

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4 Revision History

注：以前版本的页码可能与当前版本的页码不同

| Changes from Revision C (October 2019) to Revision D (June 2021) | Page |
|--|------|
| • 更新了整个文档中的表格、图和交叉参考的编号格式 | 1 |
| • Changed C_{IO} from ~1 pF to ~1.5 pF..... | 6 |
| • Changed V_{OS} from - 100 μ V / \pm 10 μ V / 100 μ V to - 50 μ V / \pm 2.5 μ V / 50 μ V (min / typ / max)..... | 8 |
| • Changed E_G from - 0.3% / \pm 0.05% / 0.3% to - 0.2% / \pm 0.04% / 0.2% (min / typ / max) | 8 |
| • Changed TCE_G from - 50 ppm/ $^{\circ}$ C / \pm 15 ppm/ $^{\circ}$ C / 50 ppm/ $^{\circ}$ C to - 35 ppm/ $^{\circ}$ C / \pm 3 ppm/ $^{\circ}$ C / 35 ppm/ $^{\circ}$ C (min / typ / max) | 8 |
| • Changed $V_{Failsafe}$ from - 2.6 V / - 2.5 V (typ / max) to - 2.63 V / - 2.57 V / - 2.53 V (min / typ / max)..... | 8 |
| • Changed CMTI from 55 kV/ μ s / 80 kV/ μ s to 100 kV/ μ s / 150 kV/ μ s (min / typ) | 8 |
| • Changed $VDD1_{POR}$ from 1.75 V / 2.15 V / 2.7 V to 2.4 V / 2.6 V / 2.8 V (min / typ / max)..... | 8 |
| • Changed <i>Rise, Fall, and Delay Time Waveforms</i> image..... | 9 |

| Changes from Revision B (November 2018) to Revision C (October 2019) | Page |
|---|------|
| • 将安全相关认证特性项目符号中的 VDE 认证从“DIN V VDE V 0884-11 (VDE V 0884-11)”更改为 DIN VDE V 0884-11 | 1 |

5 Pin Configuration and Functions

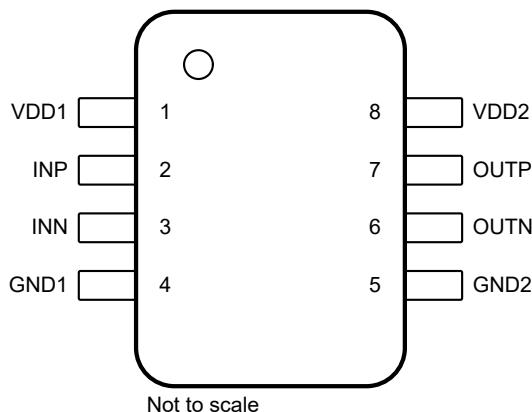


图 5-1. DWV Package, 8-Pin SOIC, Top View

表 5-1. Pin Functions

| PIN | | TYPE | DESCRIPTION |
|-----|------|------------------|--|
| NO. | NAME | | |
| 1 | VDD1 | High-side power | High-side power supply. ⁽¹⁾ |
| 2 | INP | Analog input | Noninverting analog input. Either INP or INN must have a DC current path to GND1 to define the common-mode input voltage. ⁽²⁾ |
| 3 | INN | Analog input | Inverting analog input. Either INP or INN must have a DC current path to GND1 to define the common-mode input voltage. ⁽²⁾ |
| 4 | GND1 | High-side ground | High-side analog ground. |
| 5 | GND2 | Low-side ground | Low-side analog ground. |
| 6 | OUTN | Analog output | Inverting analog output. |
| 7 | OUTP | Analog output | Noninverting analog output. |
| 8 | VDD2 | Low-side power | Low-side power supply. ⁽¹⁾ |

(1) See the [Power Supply Recommendations](#) section for power-supply decoupling recommendations.

(2) See the [Layout](#) section for details.

6 Specifications

6.1 Absolute Maximum Ratings

over operating ambient temperature range (unless otherwise noted)⁽¹⁾

| | | | MIN | MAX | UNIT |
|----------------------|--|------------|------------|-----|------|
| Power-supply voltage | High-side VDD1 to GND1 | | - 0.3 | 6.5 | V |
| | Low-side VDD2 to GND2 | | - 0.3 | 6.5 | V |
| Analog input voltage | INP, INN | GND1 – 6 | VDD1 + 0.5 | | V |
| Output voltage | OUTP, OUTN | GND2 – 0.5 | VDD2 + 0.5 | | V |
| Input current | Continuous, any pin except power-supply pins | - 10 | 10 | | mA |
| Temperature | Junction, T _J | | 150 | | °C |
| | Storage, T _{stg} | - 65 | 150 | | |

- (1) Operation outside the *Absolute Maximum Ratings* may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under *Recommended Operating Conditions*. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime

6.2 ESD Ratings

| | | | VALUE | UNIT |
|--------------------|-------------------------|---|-------|------|
| V _(ESD) | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ | ±2000 | V |
| | | Charged device model (CDM), per JESD22-C101 ⁽²⁾ | ±1000 | |

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

over operating ambient temperature range (unless otherwise noted)

| | | | MIN | NOM | MAX | UNIT |
|--------------------------|---|---|---------|------------|-----|------|
| POWER SUPPLY | | | | | | |
| | High-side power supply | VDD1 to GND1 | 3 | 5 | 5.5 | V |
| | Low-side power supply | VDD2 to GND2 | 3 | 3.3 | 5.5 | V |
| ANALOG INPUT | | | | | | |
| V _{Clipping} | Differential input voltage before clipping output | V _{IN} = V _{INP} – V _{INN} | | ±64 | | mV |
| V _{FSR} | Specified linear differential full-scale voltage | V _{IN} = V _{INP} – V _{INN} | - 50 | 50 | | mV |
| V _{CM} | Operating common-mode input voltage | (V _{INP} + V _{INN}) / 2 to GND1 | - 0.032 | VDD1 – 2.2 | | V |
| TEMPERATURE RANGE | | | | | | |
| T _A | Specified ambient temperature | | - 55 | 125 | | °C |

6.4 Thermal Information

| THERMAL METRIC⁽¹⁾ | | AMC1302 | UNIT |
|-------------------------------------|--|-------------------|-------------|
| | | DWV (SOIC) | |
| | | 8 PINS | |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | 85.4 | °C/W |
| $R_{\theta JC(\text{top})}$ | Junction-to-case (top) thermal resistance | 26.8 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 43.5 | °C/W |
| ψ_{JT} | Junction-to-top characterization parameter | 4.8 | °C/W |
| ψ_{JB} | Junction-to-board characterization parameter | 41.2 | °C/W |
| $R_{\theta JC(\text{bot})}$ | Junction-to-case (bottom) thermal resistance | n/a | °C/W |

(1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics application report](#).

6.5 Power Ratings

| PARAMETER | | TEST CONDITIONS | VALUE | UNIT |
|------------------|--|------------------------|--------------|-------------|
| P_D | Maximum power dissipation (both sides) | VDD1 = VDD2 = 5.5 V | 99 | mW |
| P_{D1} | Maximum power dissipation (high-side) | VDD1 = 3.6 V | 31 | mW |
| | | VDD1 = 5.5 V | 54 | |
| P_{D2} | Maximum power dissipation (low-side) | VDD2 = 3.6 V | 26 | mW |
| | | VDD2 = 5.5 V | 45 | |

6.6 Insulation Specification

over operating ambient temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | VALUE | UNIT |
|---|---|---|--------------|-------------------------------------|
| GENERAL | | | | |
| CLR | External clearance ⁽¹⁾ | Shortest terminal-to-terminal distance through air | ≥ 8.5 | mm |
| CPG | External creepage ⁽¹⁾ | Shortest terminal-to-terminal distance across the package surface | ≥ 8.5 | mm |
| DTI | Distance through the insulation | Minimum internal gap (internal clearance) of the double isolation (2×0.0105 mm) | ≥ 0.021 | mm |
| CTI | Comparative tracking index | DIN EN 60112 (VDE 0303-11); IEC 60112 | ≥ 600 | V |
| | Material group | According to IEC 60664-1 | I | |
| Overvoltage category | | Rated mains voltage ≤ 600 V _{RMS} | I - IV | |
| | | Rated mains voltage ≤ 1000 V _{RMS} | I-III | |
| DIN V VDE 0884-11 (VDE V 0884-11): 2017-01⁽²⁾ | | | | |
| V _{IORM} | Maximum repetitive peak isolation voltage | AC voltage | 2121 | V _{PK} |
| V _{IOWM} | Maximum isolation working voltage | AC voltage (sine wave) DC voltage | 1500 2121 | V _{RMS} V _{DC} |
| V _{IOTM} | Maximum transient isolation voltage | V _{TEST} = V _{IOTM} , t = 60 s (qualification test) | 7071 | V _{PK} |
| | | V _{TEST} = V _{IOTM} , t = 1 s (100% production test) | 8485 | V _{PK} |
| V _{IOSM} | Maximum surge isolation voltage ⁽¹⁾ | Test method per IEC 60065, 1.2/50 µs waveform, V _{TEST} = 1.6 × V _{IOSM} = 12800 V _{PK} (qualification) | 8000 | V _{PK} |
| q _{pd} | Apparent charge ⁽³⁾ | Method a: After I/O safety test subgroup 2/3, V _{ini} = V _{IOTM} , t _{ini} = 60 s; V _{pd(m)} = 1.2 × V _{IORM} = 2545 V _{PK} , t _m = 10 s | ≤ 5 | pC |
| | | Method a: After environmental tests subgroup 1, V _{ini} = V _{IOTM} , t _{ini} = 60 s; V _{pd(m)} = 1.6 × V _{IORM} = 3394 V _{PK} , t _m = 10 s | ≤ 5 | |
| | | Method b1: At routine test (100% production) and preconditioning (type test), V _{ini} = V _{IOTM} , t _{ini} = 1 s; V _{pd(m)} = 1.875 × V _{IORM} = 3977 V _{PK} , t _m = 1 s | ≤ 5 | |
| C _{IO} | Barrier capacitance, input to output ⁽⁴⁾ | V _{IO} = 0.4 × sin (2 π ft), f = 1 MHz | ~ 1.5 | pF |
| R _{IO} | Insulation resistance, input to output ⁽⁴⁾ | V _{IO} = 500 V, T _A = 25°C | $> 10^{12}$ | Ω |
| | | V _{IO} = 500 V, 100°C $\leq T_A \leq 125^\circ C$ | $> 10^{11}$ | |
| | | V _{IO} = 500 V at T _S = 150°C | $> 10^9$ | |
| | Pollution degree | | 2 | |
| | Climatic category | | 55/125/21 | |
| UL 1577 | | | | |
| V _{ISO} | Withstand isolation voltage | V _{TEST} = V _{ISO} = 5000 V _{RMS} , t = 60 s (qualification), V _{TEST} = 1.2 × V _{ISO} = 6000 V _{RMS} , t = 1 s (100% production) | 5000 | V _{RMS} |

- (1) Creepage and clearance requirements should be applied according to the specific equipment isolation standards of an application. Care must be taken to maintain the creepage and clearance distance of a board design to ensure that the mounting pads of the isolator on the printed-circuit board do not reduce this distance. Creepage and clearance on a printed-circuit board become equal in certain cases. Techniques such as inserting grooves, ribs, or both on a printed-circuit board are used to help increase these specifications.
- (2) This coupler is suitable for *safe electrical insulation* only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.
- (3) Apparent charge is electrical discharge caused by a partial discharge (pd).
- (4) All pins on each side of the barrier tied together creating a two-pin device.

6.7 Safety-Related Certifications

| VDE | UL |
|--|--|
| Certified according to DIN VDE V 0884-11 (VDE V 0884-11): 2017-01, DIN EN 60950-1 (VDE 0805 Teil 1): 2014-08, and DIN EN 60065 (VDE 0860): 2005-11 | Recognized under 1577 component recognition and CSA component acceptance NO 5 programs |
| Reinforced insulation | Single protection |
| Certificate number: 40040142 | Certificate number: E181974 |

6.8 Safety Limiting Values

Safety limiting⁽¹⁾ intends to minimize potential damage to the isolation barrier upon failure of input or output circuitry. A failure of the I/O can allow low resistance to ground or the supply and, without current limiting, dissipate sufficient power to overheat the die and damage the isolation barrier potentially leading to secondary system failures.

| PARAMETER | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------|--|-----|-----|------|------|
| I _S | Safety input, output, or supply current $R_{\theta JA} = 85.4^{\circ}\text{C}/\text{W}$, VDDx = 5.5 V, $T_J = 150^{\circ}\text{C}$, $T_A = 25^{\circ}\text{C}$ | | | 266 | mA |
| I _S | Safety input, output, or supply current $R_{\theta JA} = 85.4^{\circ}\text{C}/\text{W}$, VDDx = 3.6 V, $T_J = 150^{\circ}\text{C}$, $T_A = 25^{\circ}\text{C}$ | | | 407 | mA |
| P _S | Safety input, output, or total power $R_{\theta JA} = 85.4^{\circ}\text{C}/\text{W}$, $T_J = 150^{\circ}\text{C}$, $T_A = 25^{\circ}\text{C}$ | | | 1464 | mW |
| T _S | Maximum safety temperature | | | 150 | °C |

- (1) The maximum safety temperature, T_S , has the same value as the maximum junction temperature, T_J , specified for the device. The I_S and P_S parameters represent the safety current and safety power, respectively. Do not exceed the maximum limits of I_S and P_S . These limits vary with the ambient temperature, T_A .
 The junction-to-air thermal resistance, $R_{\theta JA}$, in the Thermal Information table is that of a device installed on a high-K test board for leaded surface-mount packages. Use these equations to calculate the value for each parameter:
 $T_J = T_A + R_{\theta JA} \times P$, where P is the power dissipated in the device.
 $T_{J(max)} = T_S = T_A + R_{\theta JA} \times P_S$, where $T_{J(max)}$ is the maximum junction temperature.
 $P_S = I_S \times VDD_{max}$, where VDD_{max} is the maximum supply voltage for high-side and low-side.

6.9 Electrical Characteristics

minimum and maximum specifications apply from $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$, $VDD1 = 3.0\text{ V}$ to 5.5 V , $VDD2 = 3.0\text{ V}$ to 5.5 V , $\text{INP} = -50\text{ mV}$ to $+50\text{ mV}$, and $\text{INN} = \text{GND1}$; typical specifications are at $T_A = 25^\circ\text{C}$, $VDD1 = 5\text{ V}$, and $VDD2 = 3.3\text{ V}$ (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------|---|---|------------|--------------|-------|------------------------------|
| ANALOG INPUT | | | | | | |
| V_{CMov} | Common-mode overvoltage detection level | $(V_{INP} + V_{INN}) / 2$ to GND1 | $VDD1 - 2$ | | | V |
| | Hysteresis of common-mode overvoltage detection level | | | 60 | | mV |
| V_{OS} | Input offset voltage ^{(1) (2)} | $T_A = 25^\circ\text{C}$, $V_{INP} = V_{INN} = \text{GND1}$ | -50 | ± 2.5 | 50 | μV |
| TCV_{OS} | Input offset drift ^{(1) (2) (3)} | | -0.8 | ± 0.15 | 0.8 | $\mu\text{V}/^\circ\text{C}$ |
| CMRR | Common-mode rejection ratio | $f_{IN} = 0\text{ Hz}$, $V_{CM\ min} \leqslant V_{CM} \leqslant V_{CM\ max}$ | | -100 | | dB |
| | | $f_{IN} = 10\text{ kHz}$, $V_{CM\ min} \leqslant V_{CM} \leqslant V_{CM\ max}$ | | -98 | | |
| C_{IN} | Single-ended input capacitance | $\text{INN} = \text{GND1}$, $f_{IN} = 300\text{ kHz}$ | | 4 | | pF |
| C_{IND} | Differential input capacitance | $f_{IN} = 300\text{ kHz}$ | | 2 | | |
| R_{IN} | Single-ended input resistance | $\text{INN} = \text{GND1}$ | | 4.75 | | $\text{k}\ \Omega$ |
| R_{IND} | Differential input resistance | | | 4.9 | | |
| I_{IB} | Input bias current | $\text{INP} = \text{INN} = \text{GND1}$; $I_{IB} = (I_{IBP} + I_{IBN}) / 2$ | -48.5 | -36 | -28.5 | nA |
| TCI_{IB} | Input bias current drift | | | ± 1.5 | | $\text{nA}/^\circ\text{C}$ |
| I_{IO} | Input offset current | $I_{IO} = I_{IBP} - I_{IBN}$ | | ± 10 | | nA |
| ANALOG OUTPUT | | | | | | |
| | Nominal gain | | | 41 | | |
| E_G | Gain error ⁽¹⁾ | $T_A = 25^\circ\text{C}$ | -0.2% | $\pm 0.04\%$ | 0.2% | |
| TCE_G | Gain error drift ^{(1) (4)} | | -35 | ± 3 | 35 | $\text{ppm}/^\circ\text{C}$ |
| | Nonlinearity ⁽¹⁾ | | -0.03% | $\pm 0.01\%$ | 0.03% | |
| | Nonlinearity drift | | | 1 | | $\text{ppm}/^\circ\text{C}$ |
| THD | Total harmonic distortion | $f_{IN} = 10\text{ kHz}$ | | -85 | | dB |
| | Output noise | $\text{INP} = \text{INN} = \text{GND1}$, $f_{IN} = 0\text{ Hz}$, $\text{BW} = 100\text{ kHz}$ brickwall filter | | 260 | | μVRMS |
| SNR | Signal-to-noise ratio | $f_{IN} = 1\text{ kHz}$, $\text{BW} = 10\text{ kHz}$ | 80 | 84 | | dB |
| | | $f_{IN} = 10\text{ kHz}$, $\text{BW} = 100\text{ kHz}$ | | 70 | | |
| PSRR | Power-supply rejection ratio ⁽²⁾ | PSRR vs $VDD1$, at DC | | -113 | | dB |
| | | PSRR vs $VDD1$, 100-mV and 10-kHz ripple | | -108 | | |
| | | PSRR vs $VDD2$, at DC | | -116 | | |
| | | PSRR vs $VDD2$, 100-mV and 10-kHz ripple | | -87 | | |
| V_{CMout} | Common-mode output voltage | | 1.39 | 1.44 | 1.49 | V |
| $V_{CLIPout}$ | Clipping differential output voltage | $V_{OUT} = (V_{OUTP} - V_{OUTN})$; $ V_{IN} = V_{INP} - V_{INN} > V_{Clipping} $ | -2.52 | ± 2.49 | 2.52 | V |
| $V_{failsafe}$ | Failsafe differential output voltage | $V_{CM} \geqslant V_{CMov}$, or $VDD1$ missing | -2.63 | -2.57 | -2.53 | V |
| BW | Output bandwidth | | 220 | 280 | | kHz |
| R_{OUT} | Output resistance | On OUTP or OUTN | | < 0.2 | | Ω |
| | Output short-circuit current | On OUTP or OUTN, sourcing or sinking, $\text{INN} = \text{INP} = \text{GND1}$, outputs shorted to either GND2 or $VDD2$ | | ± 14 | | mA |
| CMTI | Common-mode transient immunity | $ \text{GND1} - \text{GND2} = 1\text{ kV}$ | 100 | 150 | | $\text{kV}/\mu\text{s}$ |

6.9 Electrical Characteristics (continued)

minimum and maximum specifications apply from $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$, $\text{VDD1} = 3.0 \text{ V}$ to 5.5 V , $\text{VDD2} = 3.0 \text{ V}$ to 5.5 V , $\text{INP} = -50 \text{ mV}$ to $+50 \text{ mV}$, and $\text{INN} = \text{GND1}$; typical specifications are at $T_A = 25^\circ\text{C}$, $\text{VDD1} = 5 \text{ V}$, and $\text{VDD2} = 3.3 \text{ V}$ (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------|---------------------------------------|---|-----|-----|-----|------|
| POWER SUPPLY | | | | | | |
| VDD1_{POR} | VDD1 power-on-reset threshold voltage | VDD1 falling | 2.4 | 2.6 | 2.8 | V |
| IDD1 | High-side supply current | $3.0 \text{ V} \leq \text{VDD1} \leq 3.6 \text{ V}$ | | 6.2 | 8.5 | mA |
| | | $4.5 \text{ V} \leq \text{VDD1} \leq 5.5 \text{ V}$ | | 7.2 | 9.8 | |
| IDD2 | Low-side supply current | $3.0 \text{ V} \leq \text{VDD2} \leq 3.6 \text{ V}$ | | 5.3 | 7.2 | |
| | | $4.5 \text{ V} \leq \text{VDD2} \leq 5.5 \text{ V}$ | | 5.9 | 8.1 | |

- (1) The typical value includes one standard deviation ("sigma") at nominal operating conditions.
- (2) This parameter is input referred.
- (3) Offset error temperature drift is calculated using the box method, as described by the following equation:

$$\text{TCV}_{\text{OS}} = (\text{Value}_{\text{MAX}} - \text{Value}_{\text{MIN}}) / \text{TempRange}$$
- (4) Gain error temperature drift is calculated using the box method, as described by the following equation:

$$\text{TCE}_G (\text{ppm}) = (\text{Value}_{\text{MAX}} - \text{Value}_{\text{MIN}}) / (\text{Value}_{(T=25^\circ\text{C})} \times \text{TempRange}) \times 10^6$$

6.10 Switching Characteristics

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------------|--|---|-----|-----|-----|---------------|
| t_r | Output signal rise time | | | 1.5 | | μs |
| t_f | Output signal fall time | | | 1.5 | | μs |
| | V_{INx} to V_{OUTx} signal delay (50% - 10%) | unfiltered output | | 1 | 1.5 | μs |
| | V_{INx} to V_{OUTx} signal delay (50% - 50%) | unfiltered output | | 1.6 | 2.1 | μs |
| | V_{INx} to V_{OUTx} signal delay (50% - 90%) | unfiltered output | | 2.5 | 3 | μs |
| t_{AS} | Analog settling time | VDD1 step to 3.0 V with $\text{VDD2} \geq 3.0 \text{ V}$, to OUTP and OUTN valid, 0.1% settling | | 500 | | μs |

6.11 Timing Diagram

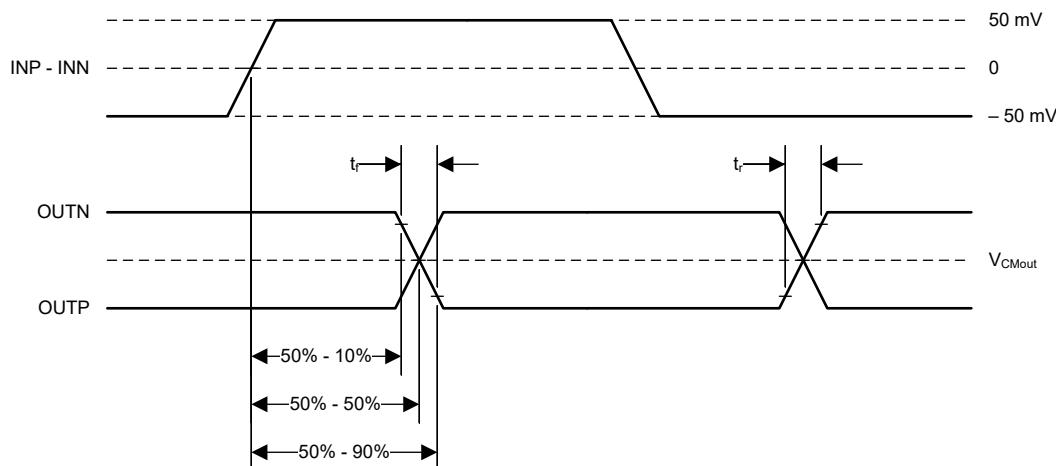
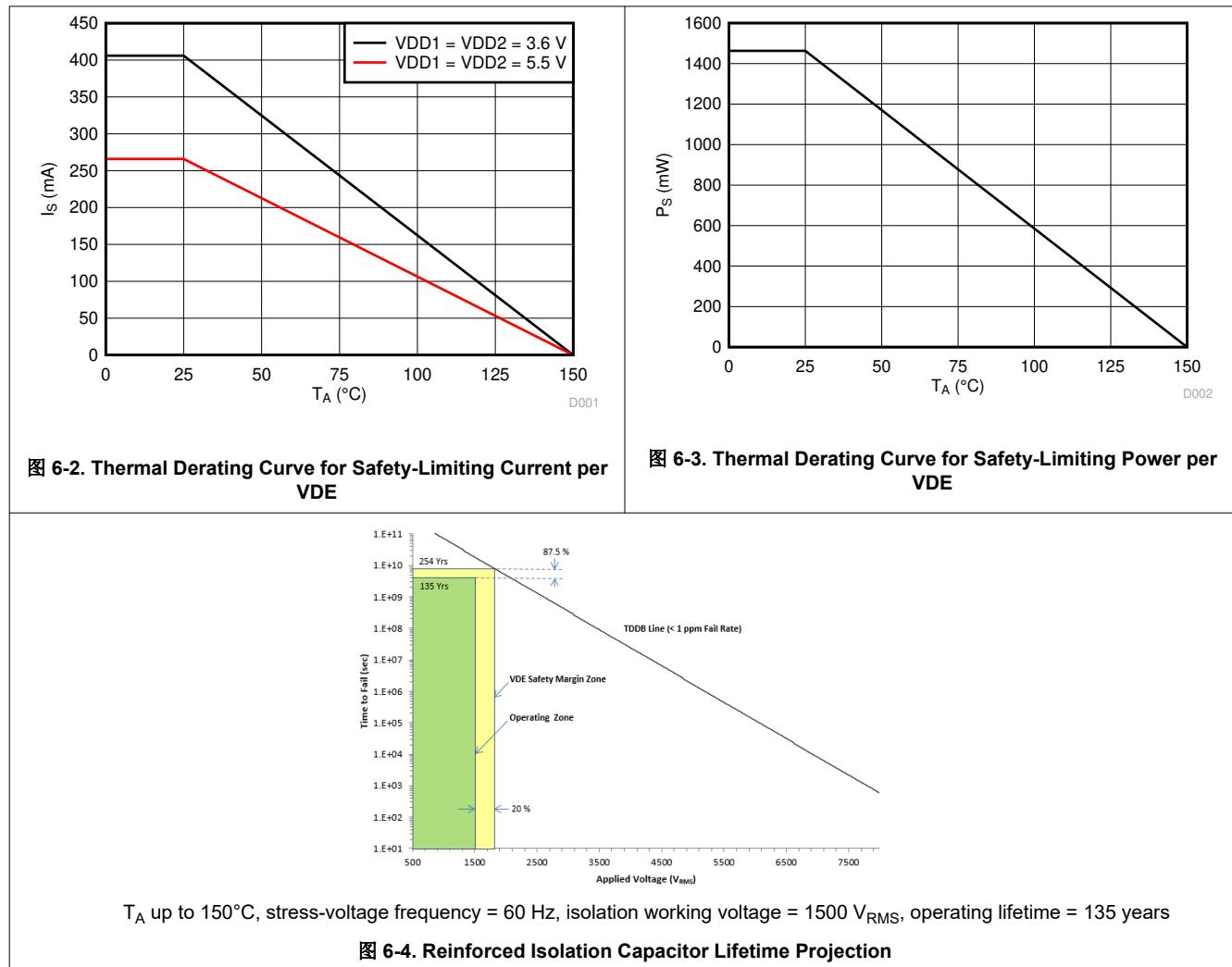


图 6-1. Rise, Fall, and Delay Time Waveforms

6.12 Insulation Characteristics Curves



6.13 Typical Characteristics

at $T_A = 25^\circ\text{C}$, $\text{VDD1} = 5 \text{ V}$, $\text{VDD2} = 3.3 \text{ V}$, $\text{INP} = -50 \text{ mV}$ to 50 mV , $\text{INN} = \text{GND1}$, and $f_{\text{IN}} = 10 \text{ kHz}$ (unless otherwise noted)

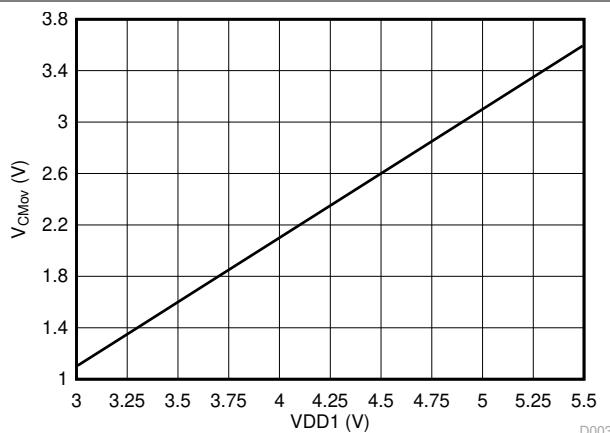


图 6-5. Common-Mode Overvoltage Detection Level vs High-Side Supply Voltage

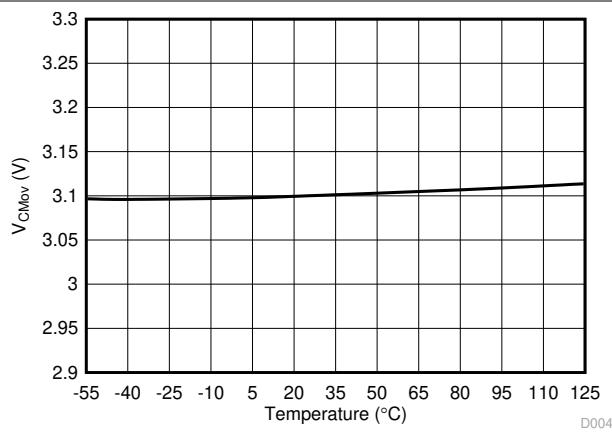


图 6-6. Common-Mode Overvoltage Detection Level vs Temperature

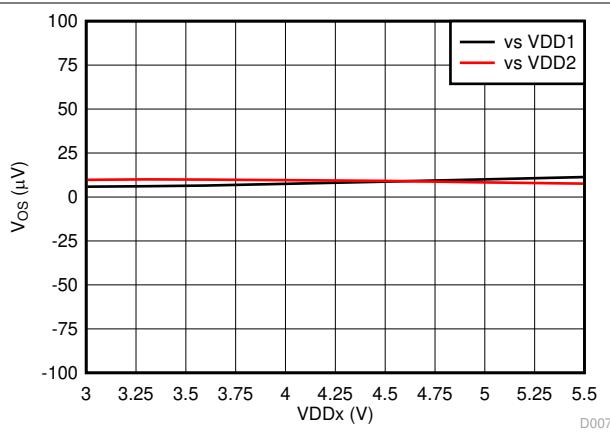


图 6-7. Input Offset Voltage vs Supply Voltage

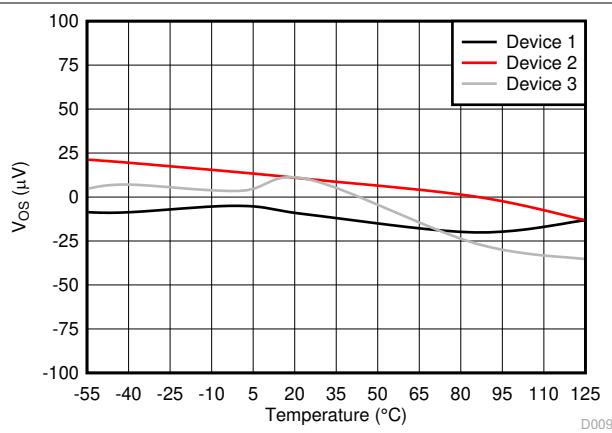


图 6-8. Input Offset Voltage vs Temperature

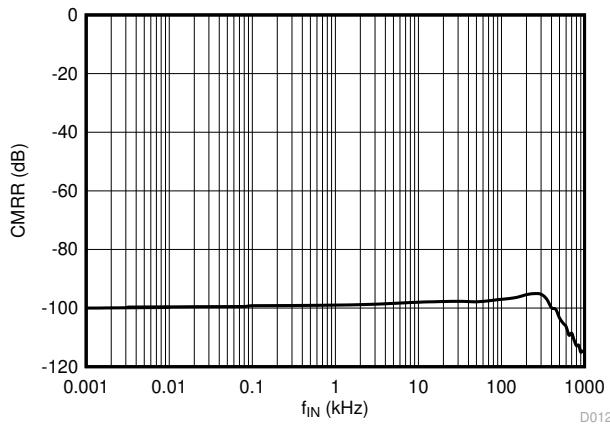


图 6-9. Common-Mode Rejection Ratio vs Input Frequency

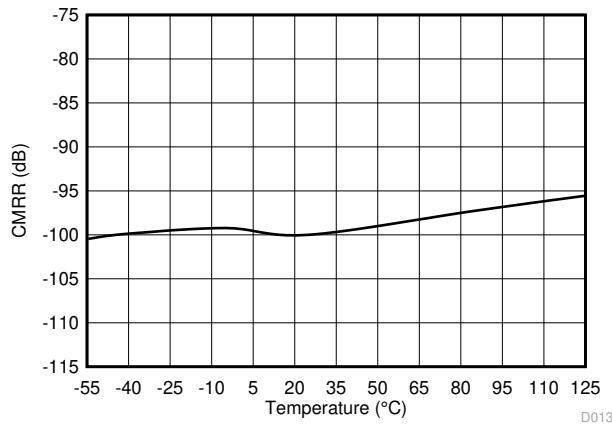


图 6-10. Common-Mode Rejection Ratio vs Temperature

6.13 Typical Characteristics (continued)

at $T_A = 25^\circ\text{C}$, $\text{VDD1} = 5 \text{ V}$, $\text{VDD2} = 3.3 \text{ V}$, $\text{INP} = -50 \text{ mV}$ to 50 mV , $\text{INN} = \text{GND1}$, and $f_{\text{IN}} = 10 \text{ kHz}$ (unless otherwise noted)

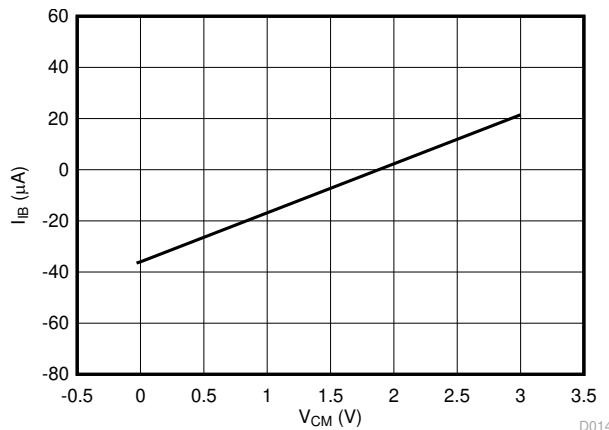


图 6-11. Input Bias Current vs Common-Mode Input Voltage

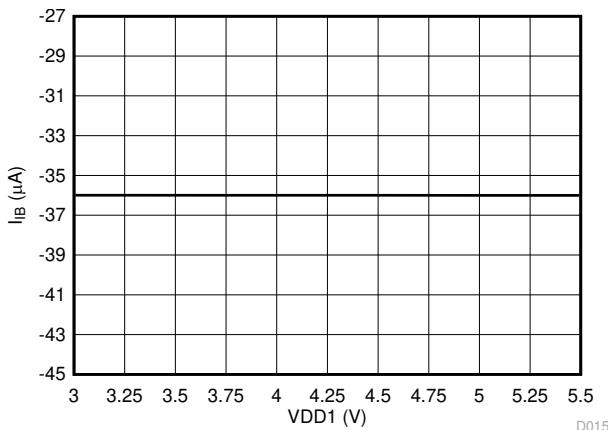


图 6-12. Input Bias Current vs High-Side Supply Voltage

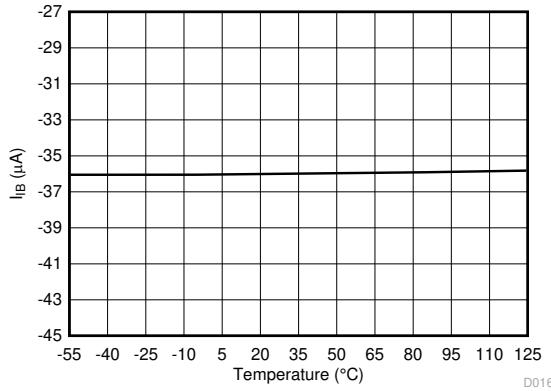


图 6-13. Input Bias Current vs Temperature

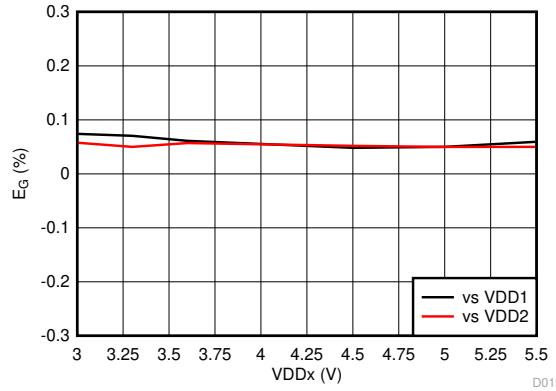


图 6-14. Gain Error vs Supply Voltage

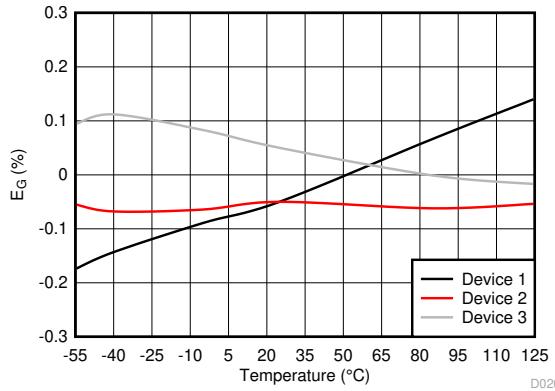


图 6-15. Gain Error vs Temperature

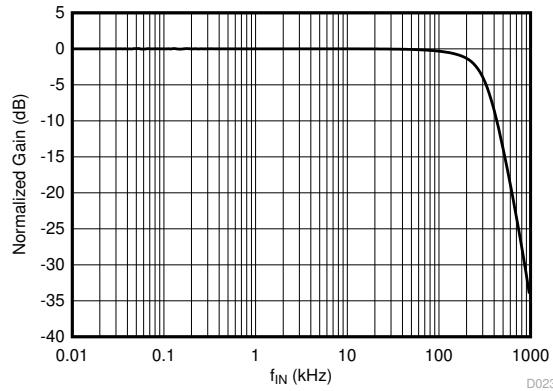


图 6-16. Normalized Gain vs Input Frequency

6.13 Typical Characteristics (continued)

at $T_A = 25^\circ\text{C}$, $\text{VDD1} = 5 \text{ V}$, $\text{VDD2} = 3.3 \text{ V}$, $\text{INP} = -50 \text{ mV}$ to 50 mV , $\text{INN} = \text{GND1}$, and $f_{\text{IN}} = 10 \text{ kHz}$ (unless otherwise noted)

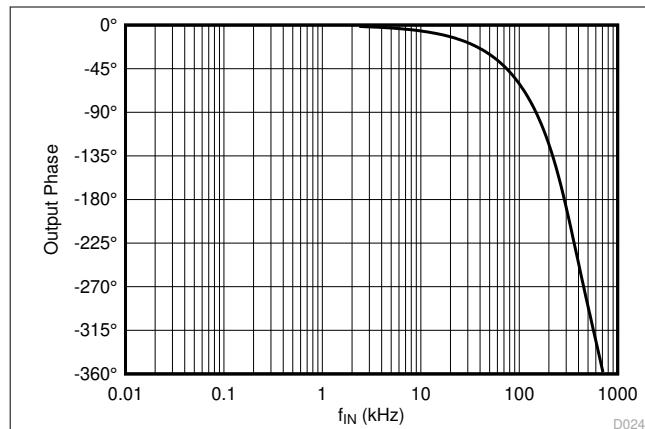


图 6-17. Output Phase vs Input Frequency

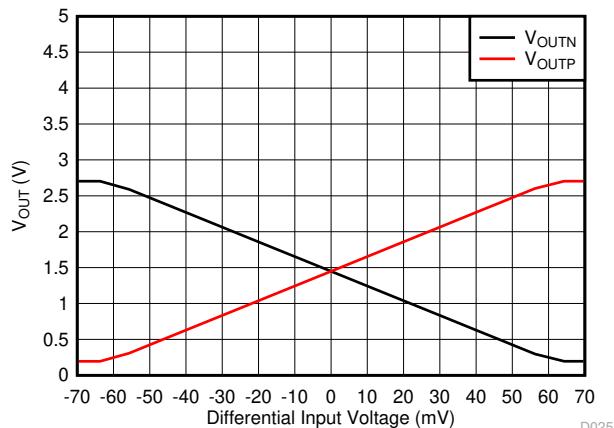


图 6-18. Output Voltage vs Input Voltage

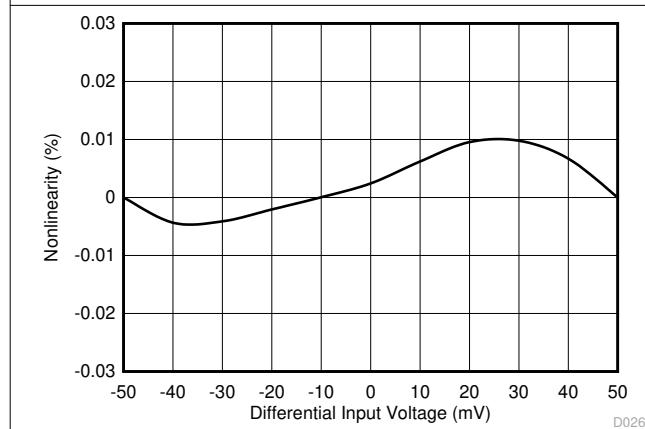


图 6-19. Nonlinearity vs Input Voltage

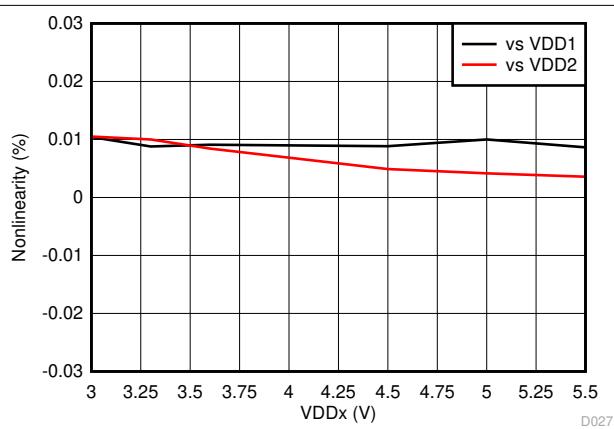


图 6-20. Nonlinearity vs Supply Voltage

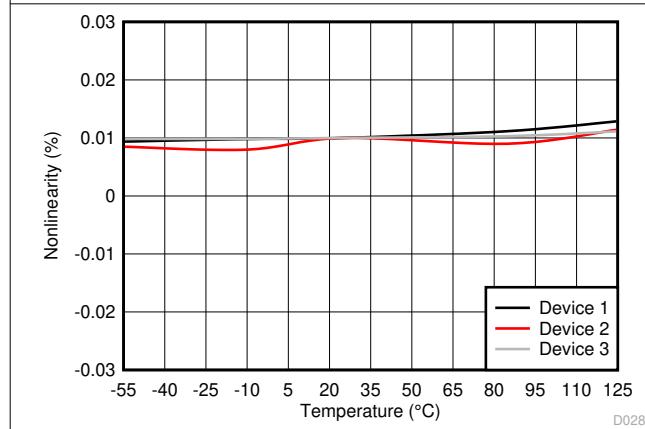


图 6-21. Nonlinearity vs Temperature

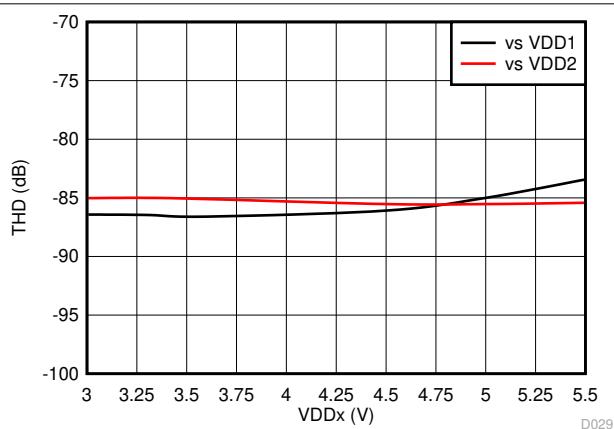


图 6-22. Total Harmonic Distortion vs Supply Voltage

6.13 Typical Characteristics (continued)

at $T_A = 25^\circ\text{C}$, $\text{VDD1} = 5 \text{ V}$, $\text{VDD2} = 3.3 \text{ V}$, $\text{INP} = -50 \text{ mV}$ to 50 mV , $\text{INN} = \text{GND1}$, and $f_{\text{IN}} = 10 \text{ kHz}$ (unless otherwise noted)

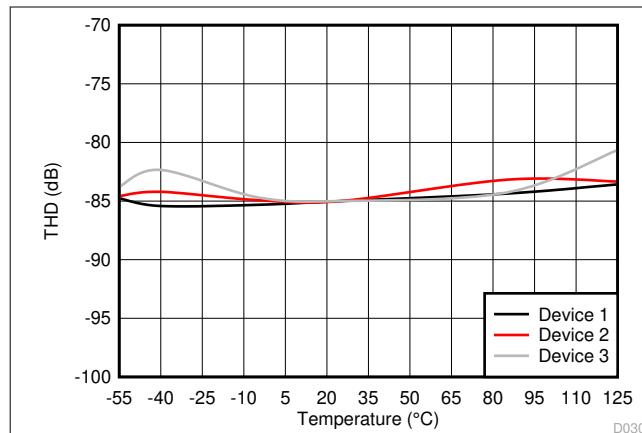


图 6-23. Total Harmonic Distortion vs Temperature

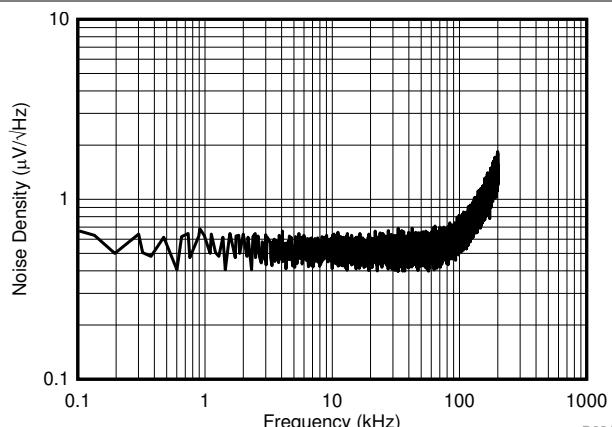


图 6-24. Output Noise Density vs Frequency

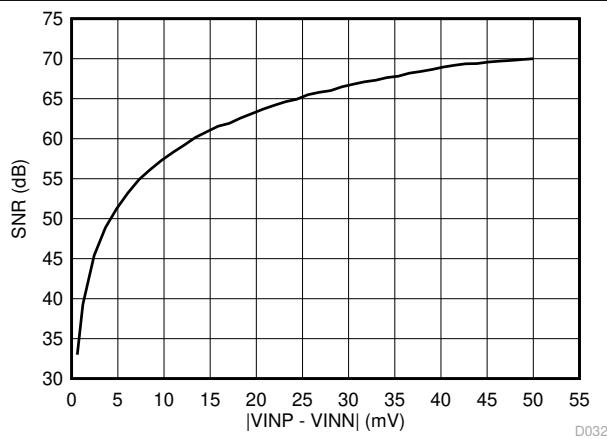


图 6-25. Signal-to-Noise Ratio vs Input Voltage

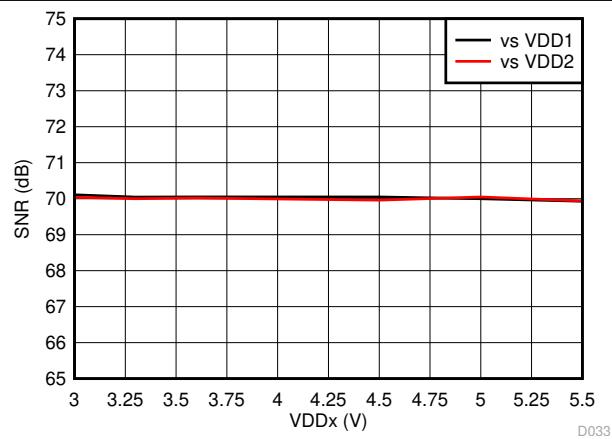


图 6-26. Signal-to-Noise Ratio vs Supply Voltage

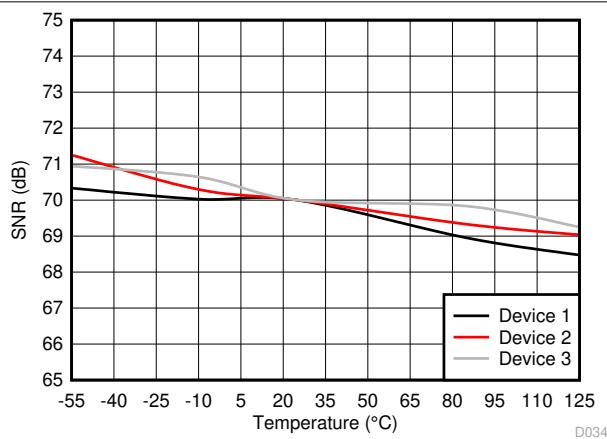


图 6-27. Signal-to-Noise Ratio vs Temperature

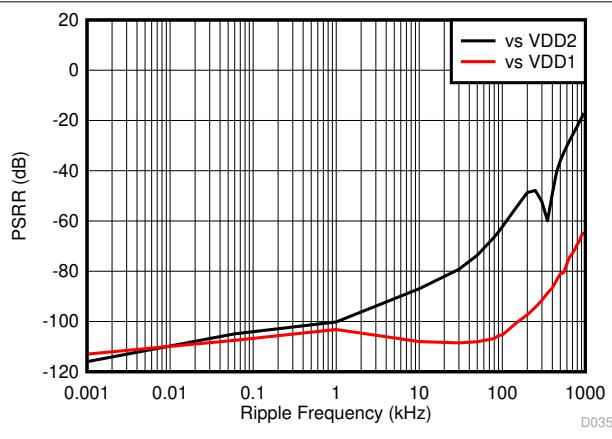


图 6-28. Power-Supply Rejection Ratio vs Ripple Frequency

6.13 Typical Characteristics (continued)

at $T_A = 25^\circ\text{C}$, $\text{VDD1} = 5 \text{ V}$, $\text{VDD2} = 3.3 \text{ V}$, $\text{INP} = -50 \text{ mV}$ to 50 mV , $\text{INN} = \text{GND1}$, and $f_{\text{IN}} = 10 \text{ kHz}$ (unless otherwise noted)

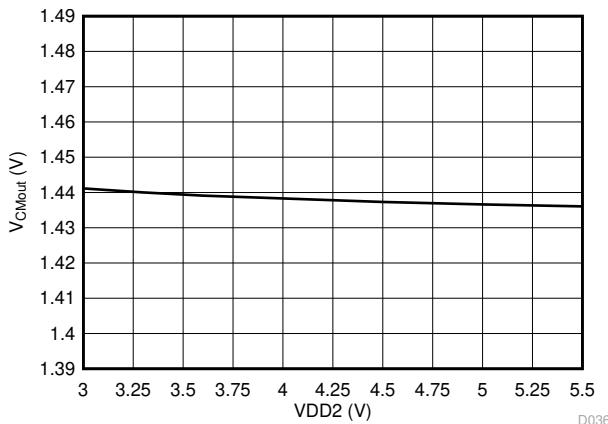


图 6-29. Output Common-Mode Voltage vs Low-Side Supply Voltage

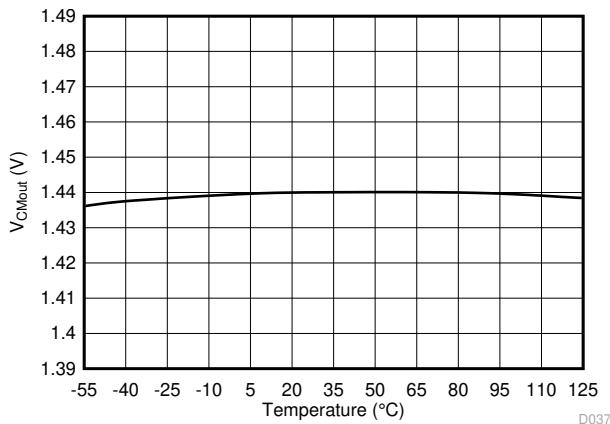


图 6-30. Output Common-Mode Voltage vs Temperature

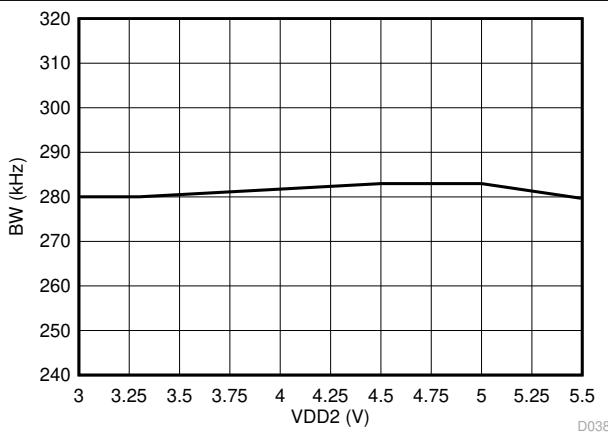


图 6-31. Output Bandwidth vs Low-Side Supply Voltage

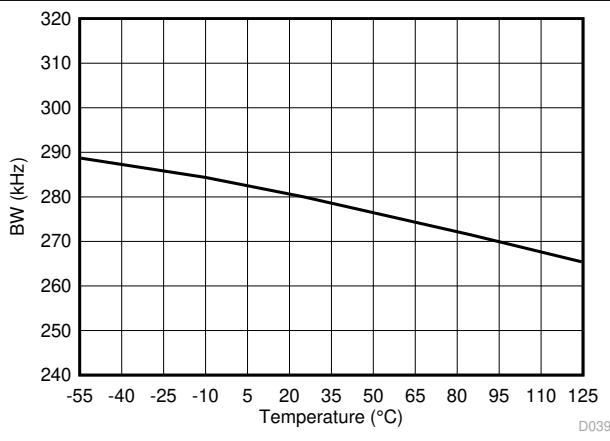


图 6-32. Output Bandwidth vs Temperature

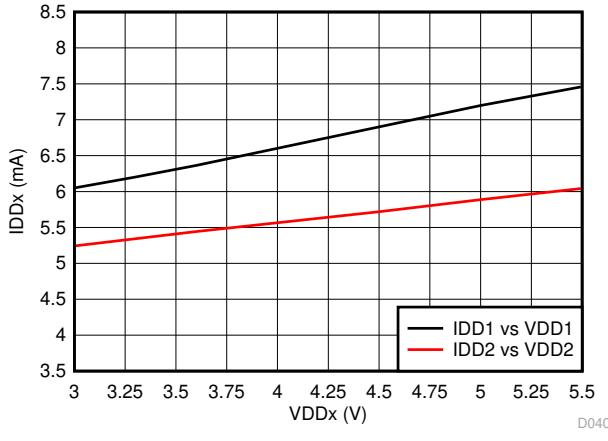


图 6-33. Supply Current vs Supply Voltage

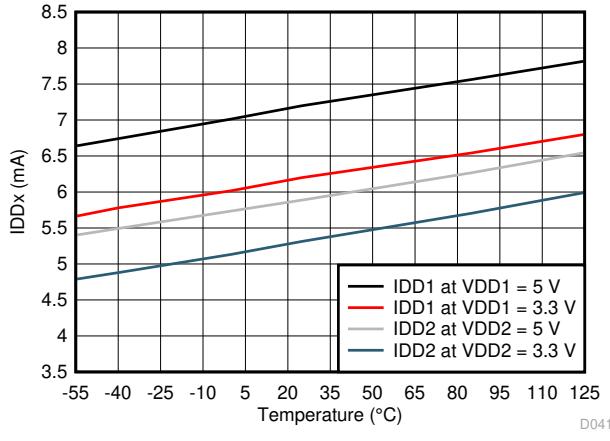


图 6-34. Supply Current vs Temperature

6.13 Typical Characteristics (continued)

at $T_A = 25^\circ\text{C}$, $\text{VDD1} = 5 \text{ V}$, $\text{VDD2} = 3.3 \text{ V}$, $\text{INP} = -50 \text{ mV}$ to 50 mV , $\text{INN} = \text{GND1}$, and $f_{\text{IN}} = 10 \text{ kHz}$ (unless otherwise noted)

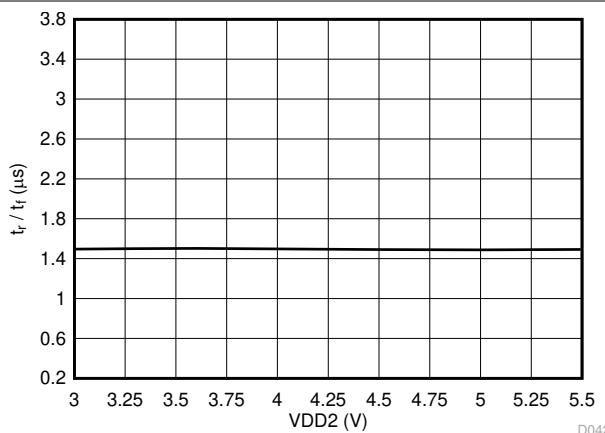


图 6-35. Output Rise and Fall Time vs Low-Side Supply Voltage

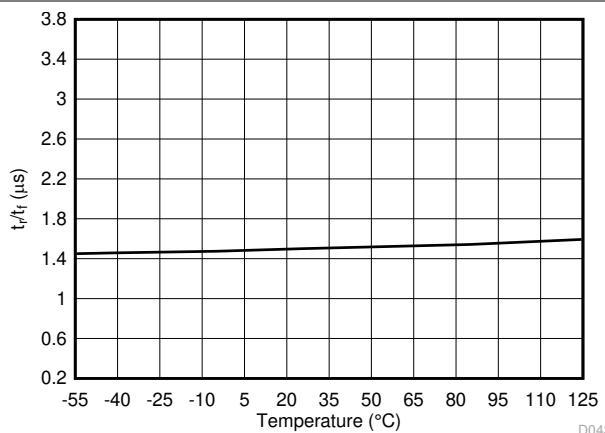


图 6-36. Output Rise and Fall Time vs Temperature

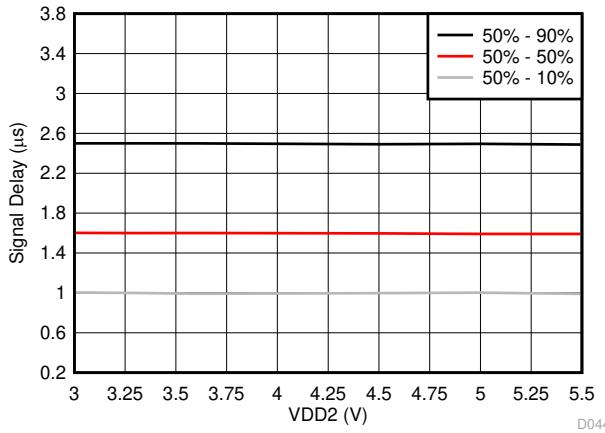


图 6-37. V_{IN} to V_{OUT} Signal Delay vs Low-Side Supply Voltage

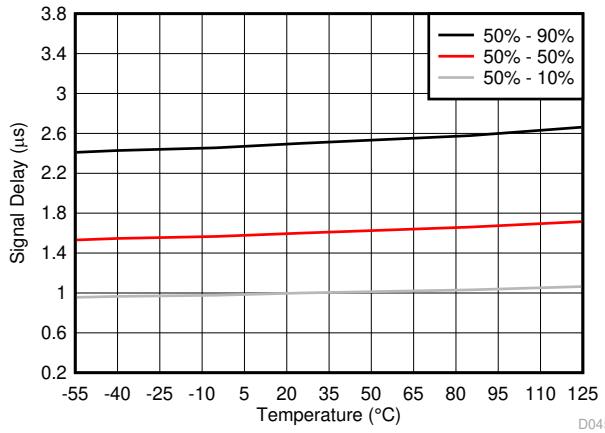


图 6-38. V_{IN} to V_{OUT} Signal Delay vs Temperature

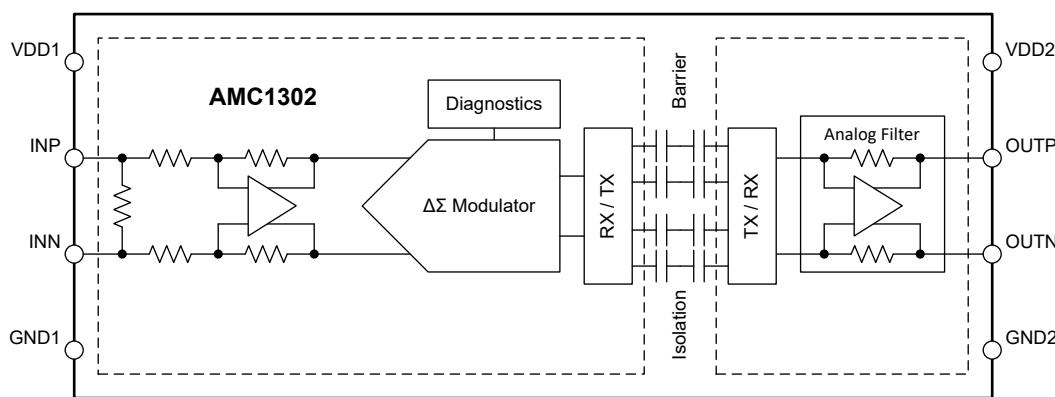
7 Detailed Description

7.1 Overview

The AMC1302 is a fully differential, precision, isolated amplifier. The input stage of the device consists of a fully differential amplifier that drives a second-order, delta-sigma ($\Delta \Sigma$) modulator. The modulator converts the analog input signal into a digital bitstream that is transferred across the isolation barrier that separates the high-side from the low-side. On the low-side, the received bitstream is processed by a fourth-order analog filter that outputs a differential signal at the OUTP and OUTN pins that is proportional to the input signal.

The SiO₂-based, capacitive isolation barrier supports a high level of magnetic field immunity, as described in the [ISO72x Digital Isolator Magnetic-Field Immunity application report](#). The digital modulation used in the AMC1302 to transmit data across the isolation barrier, and the isolation barrier characteristics itself, result in high reliability and common-mode transient immunity.

7.2 Functional Block Diagram



7.3 Feature Description

7.3.1 Analog Input

The differential amplifier input stage of the AMC1302 feeds a second-order, switched-capacitor, feed-forward $\Delta \Sigma$ modulator. The gain of the differential amplifier is set by internal precision resistors with a differential input impedance of R_{IND} . The modulator converts the analog input signal into a bitstream that is transferred across the isolation barrier, as described in the [Isolation Channel Signal Transmission](#) section.

There are two restrictions on the analog input signals INP and INN. First, if the input voltages V_{INP} or V_{INN} exceed the range specified in the [Absolute Maximum Ratings](#) table, the input currents must be limited to the absolute maximum value, because the electrostatic discharge (ESD) protection turns on. In addition, the linearity and parametric performance of the device are ensured only when the analog input voltage remains within the linear full-scale range (V_{FSR}) and within the common-mode input voltage range (V_{CM}) as specified in the [Recommended Operating Conditions](#) table.

7.3.2 Isolation Channel Signal Transmission

The AMC1302 uses an on-off keying (OOK) modulation scheme, as shown in [图 7-1](#), to transmit the modulator output bitstream across the SiO₂-based isolation barrier. The transmit driver (TX) shown in the [Functional Block Diagram](#) transmits an internally-generated, high-frequency carrier across the isolation barrier to represent a digital *one* and does not send a signal to represent a digital *zero*. The nominal frequency of the carrier used inside the AMC1302 is 480 MHz.

The receiver (RX) on the other side of the isolation barrier recovers and demodulates the signal and provides the input to the 4th-order analog filter. The AMC1302 transmission channel is optimized to achieve the highest level of common-mode transient immunity (CMTI) and lowest level of radiated emissions caused by the high-frequency carrier and RX/TX buffer switching.

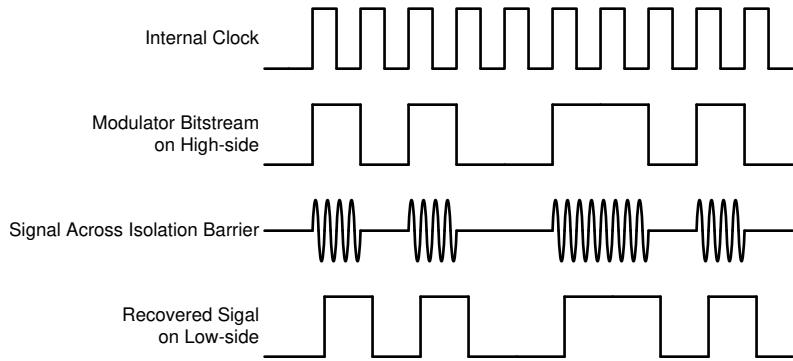


图 7-1. OOK-Based Modulation Scheme

7.3.3 Analog Output

The AMC1302 offers a differential analog output comprised of the OUTP and OUTN pins. For differential input voltages ($V_{INP} - V_{INN}$) in the range from -50 mV to 50 mV , the device provides a linear response with a nominal gain of 41. For example, for a differential input voltage of 50 mV , the differential output voltage ($V_{OUTP} - V_{OUTN}$) is 2.05 V . At zero input (INP shorted to INN), both pins output the same common-mode output voltage V_{CMout} , as specified in the *Electrical Characteristics* table. For absolute differential input voltages greater than 50 mV but less than 64 mV , the differential output voltage continues to increase in magnitude but with reduced linearity performance. The outputs saturate at a differential output voltage of $V_{CLIPout}$, as shown in [图 7-2](#), if the differential input voltage exceeds the $V_{Clipping}$ value.

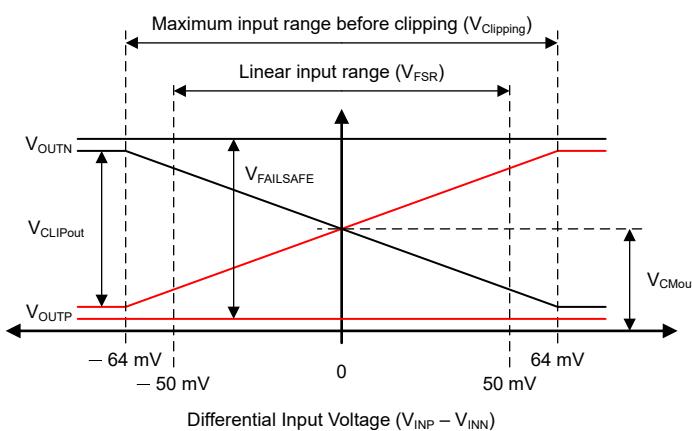


图 7-2. Output Behavior of the AMC1302

The AMC1302 offers a fail-safe feature that simplifies diagnostics on system level. [图 7-2](#) shows the fail-safe mode, in which the AMC1302 outputs a negative differential output voltage that does not occur under normal operating conditions. The fail-safe output is active in two cases:

- When the high-side supply is missing or below the V_{DD1UV} threshold
- When the common-mode input voltage, that is $V_{CM} = (V_{INP} + V_{INN}) / 2$, exceeds the common-mode overvoltage detection level V_{CMov}

Use the maximum $V_{FAILSAFE}$ voltage specified in the *Electrical Characteristics* table as a reference value for fail-safe detection on system level.

7.4 Device Functional Modes

The AMC1302 is operational when the power supplies V_{DD1} and V_{DD2} are applied, as specified in the *Recommended Operating Conditions* table.

8 Application and Implementation

Note

以下应用部分中的信息不属TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

8.1 Application Information

The low analog input voltage range, excellent accuracy, and low temperature drift make the a high-performance solution for industrial applications where shunt-based current sensing in the presence of high common-mode voltage levels is required.

8.2 Typical Application

The AMC1302 is ideally suited for shunt-based current sensing applications where accurate current monitoring is required in the presence of high common-mode voltages.

图 8-1 shows the AMC1302 in a typical application. The load current flowing through an external shunt resistor RSHUNT produces a voltage drop that is sensed by the AMC1302. The AMC1302 digitizes the analog input signal on the high-side, transfers the data across the isolation barrier to the low-side, reconstructs the analog signal, and presents that signal as a differential voltage on the output pins.

The differential input, differential output, and the high common-mode transient immunity (CMTI) of the AMC1302 ensure reliable and accurate operation even in high-noise environments.

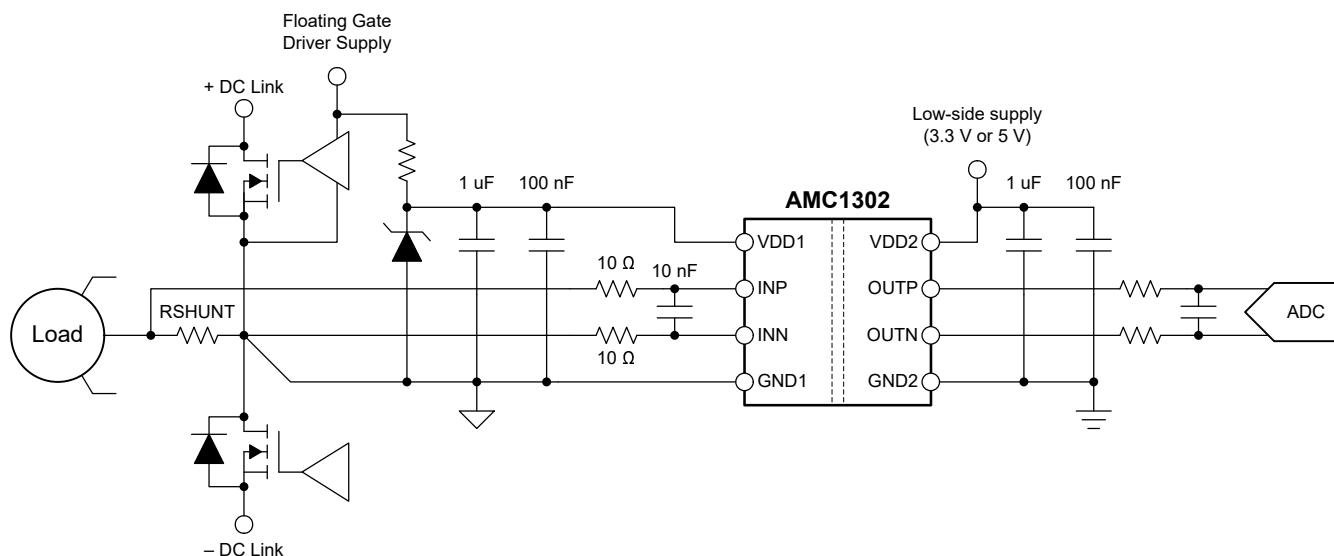


图 8-1. Using the AMC1302 for Current Sensing in a Typical Application

8.2.1 Design Requirements

表 8-1 lists the parameters for this typical application.

表 8-1. Design Requirements

| PARAMETER | VALUE |
|--|-------------------------------|
| High-side supply voltage | 3.3 V or 5 V |
| Low-side supply voltage | 3.3 V or 5 V |
| Voltage drop across RSHUNT for a linear response | $\pm 50 \text{ mV}$ (maximum) |
| Signal delay (50% V_{IN} to 90% OUTP, OUTN) | 3 μs (maximum) |

8.2.2 Detailed Design Procedure

In 图 8-1, the high-side power supply (VDD1) for the AMC1302 is derived from the floating power supply of the upper gate driver.

The floating ground reference (GND1) is derived from the end of the shunt resistor that is connected to the negative input of the AMC1302 (INN). If a four-pin shunt is used, the inputs of the AMC1302 are connected to the inner leads and GND1 is connected to the outer lead on the INN-side of the shunt. To minimize offset and improve accuracy, route the ground connection as a separate trace that connects directly to the shunt resistor rather than shorting GND1 to INN directly at the input to the device. See the [Layout](#) section for more details.

8.2.2.1 Shunt Resistor Sizing

Use Ohm's Law to calculate the voltage drop across the shunt resistor (V_{SHUNT}) for the desired measured current: $V_{SHUNT} = I \times R_{SHUNT}$.

Consider the following two restrictions when selecting the value of the shunt resistor, RSHUNT:

- The voltage drop caused by the nominal current range must not exceed the recommended differential input voltage range for a linear response: $|V_{SHUNT}| \leq |V_{FSR}|$
- The voltage drop caused by the maximum allowed overcurrent must not exceed the input voltage that causes a clipping output: $|V_{SHUNT}| \leq |V_{Clipping}|$

8.2.2.2 Input Filter Design

TI recommends placing an RC-filter in front of the isolated amplifier to improve signal-to-noise performance of the signal path. Design the input filter such that:

- The cutoff frequency of the filter is at least one order of magnitude lower than the sampling frequency (20 MHz) of the $\Delta \Sigma$ modulator
- The input bias current does not generate significant voltage drop across the DC impedance of the input filter
- The impedances measured from the analog inputs are equal

For most applications, the structure shown in 图 8-2 achieves excellent performance.

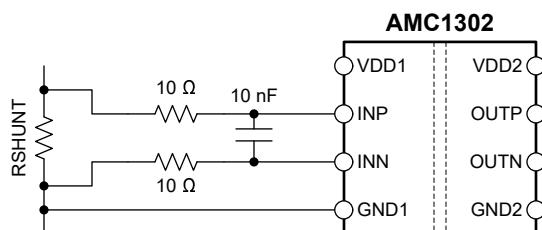


图 8-2. Differential Input Filter

8.2.2.3 Differential to Single-Ended Output Conversion

图 8-3 shows an example of a [TLV6001](#)-based signal conversion and filter circuit for systems using single-ended-input ADCs to convert the analog output voltage into digital. With $R_1 = R_2 = R_3 = R_4$, the output voltage equals $(V_{OUTP} - V_{OUTN}) + V_{REF}$. Tailor the bandwidth of this filter stage to the bandwidth requirement of the system. For most applications, $R_1 = R_2 = R_3 = R_4 = 3.3 \text{ k}\Omega$ and $C_1 = C_2 = 330 \text{ pF}$ yields good performance.

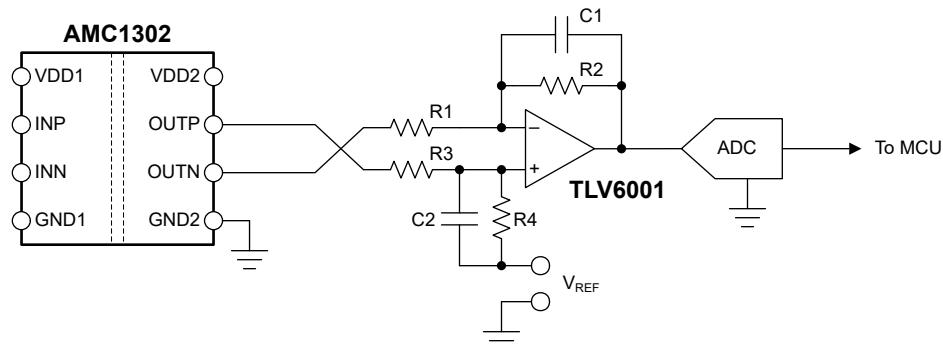


图 8-3. Connecting the AMC1302 Output to a Single-Ended Input ADC

For more information on the general procedure to design the filtering and driving stages of SAR ADCs, see the [18-Bit, 1MSPS Data Acquisition Block \(DAQ\) Optimized for Lowest Distortion and Noise](#) and [18-Bit Data Acquisition Block \(DAQ\) Optimized for Lowest Power](#) reference guides, available for download at www.ti.com.

8.2.3 Application Curve

One important aspect of power-stage design is the effective detection of an overcurrent condition to protect the switching devices and passive components from damage. To power off the system quickly in the event of an overcurrent condition, a low delay caused by the isolated amplifier is required. 图 8-4 shows the typical full-scale step response of the AMC1302.



图 8-4. Step Response of the AMC1302

8.3 What to Do and What Not to Do

Do not leave the inputs of the AMC1302 unconnected (floating) when the device is powered up. If the device inputs are left floating, the input bias current may drive the inputs to a positive value that exceeds the operating common-mode input voltage and the device outputs the fail-safe voltage as described in the [Analog Output](#) section.

Connect the high-side ground (GND1) to INN, either by a hard short or through a resistive path. A DC current path between INN and GND1 is required to define the input common-mode voltage. Do not exceed the input common-mode range as specified in the [Recommended Operating Conditions](#) table. For best accuracy, route the ground connection as a separate trace that connects directly to the shunt resistor rather than shorting GND1 to INN directly at the input to the device. See the [Layout](#) section for more details.

9 Power Supply Recommendations

The AMC1302 does not require any specific power up sequencing. The high-side power-supply (VDD1) is decoupled with a low-ESR 100-nF capacitor (C1) parallel to a low-ESR 1- μ F capacitor (C2). The low-side power supply (VDD2) is equally decoupled with a low-ESR 100-nF capacitor (C3) parallel to a low-ESR 1- μ F capacitor (C4). Place all four capacitors (C1, C2, C3, and C4) as close to the device as possible.

The ground reference for the high-side (GND1) is derived from the end of the shunt resistor, which is connected to the negative input (INN) of the device. For best DC accuracy, use a separate trace (as shown in [图 9-1](#)) to make this connection instead of shorting GND1 to INN directly at the device input. If a four-terminal shunt is used, the device inputs are connected to the inner leads and GND1 is connected to the outer lead on the INN-side of the shunt.

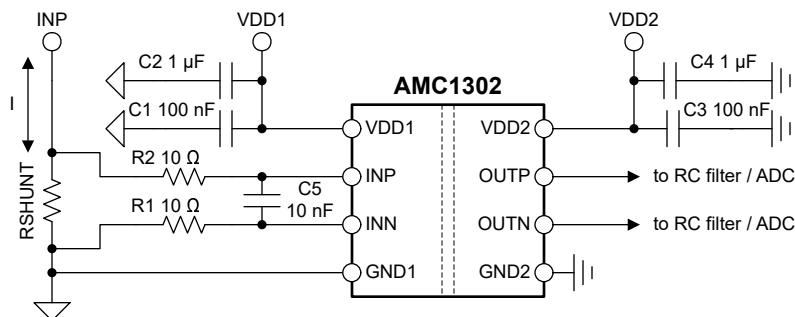


图 9-1. Decoupling of the AMC1302

Capacitors must provide adequate effective capacitance under the applicable DC bias conditions they experience in the application. Multilayer ceramic capacitors (MLCCs) typically exhibit only a fraction of their nominal capacitance under real-world conditions and this factor must be taken into consideration when selecting these capacitors. This problem is especially acute in low-profile capacitors, in which the dielectric field strength is higher than in taller components. Reputable capacitor manufacturers provide capacitance versus DC bias curves that greatly simplify component selection.

10 Layout

10.1 Layout Guidelines

图 10-1 shows a layout recommendation with the critical placement of the decoupling capacitors (as close as possible to the AMC1302 supply pins) and placement of the other components required by the device. For best performance, place the shunt resistor close to the INP and INN inputs of the AMC1302 and keep the layout of both connections symmetrical.

10.2 Layout Example

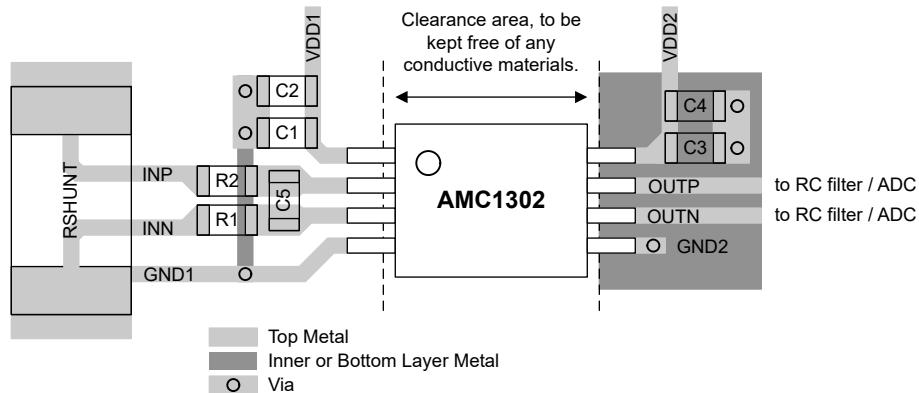


图 10-1. Recommended Layout of the AMC1302

11 Device and Documentation Support

11.1 Documentation Support

11.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, *Isolation Glossary* application report
- Texas Instruments, *Semiconductor and IC Package Thermal Metrics* application report
- Texas Instruments, *ISO72x Digital Isolator Magnetic-Field Immunity* application report
- Texas Instruments, *TLV600x Low-Power, Rail-to-Rail In/Out, 1-MHz Operational Amplifier for Cost-Sensitive Systems* data sheet
- Texas Instruments, *18-Bit, 1-MSPS Data Acquisition Block (DAQ) Optimized for Lowest Distortion and Noise* reference guide
- Texas Instruments, *18-Bit, 1-MSPS Data Acquisition Block (DAQ) Optimized for Lowest Power* reference guide
- Texas Instruments, *Isolated Amplifier Voltage Sensing Excel Calculator* design tool

11.2 Trademarks

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11.3 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

11.4 术语表

TI 术语表

本术语表列出并解释了术语、首字母缩略词和定义。

12 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

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PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|-----------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| AMC1302DWV | Active | Production | SOIC (DWV) 8 | 64 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -55 to 125 | AMC1302 |
| AMC1302DWV.A | Active | Production | SOIC (DWV) 8 | 64 TUBE | Yes | NIPDAU | Level-3-260C-168 HR | -55 to 125 | AMC1302 |
| AMC1302DWV.B | Active | Production | SOIC (DWV) 8 | 64 TUBE | - | Call TI | Call TI | -55 to 125 | |
| AMC1302DWVR | Active | Production | SOIC (DWV) 8 | 1000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -55 to 125 | AMC1302 |
| AMC1302DWVR.A | Active | Production | SOIC (DWV) 8 | 1000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -55 to 125 | AMC1302 |
| AMC1302DWVR.B | Active | Production | SOIC (DWV) 8 | 1000 LARGE T&R | - | Call TI | Call TI | -55 to 125 | |
| AMC1302DWVRG4.A | Active | Production | SOIC (DWV) 8 | 1000 LARGE T&R | Yes | NIPDAU | Level-3-260C-168 HR | -55 to 125 | AMC1302 |
| AMC1302DWVRG4.B | Active | Production | SOIC (DWV) 8 | 1000 LARGE T&R | - | Call TI | Call TI | -55 to 125 | |

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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

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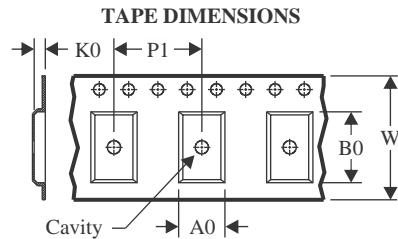
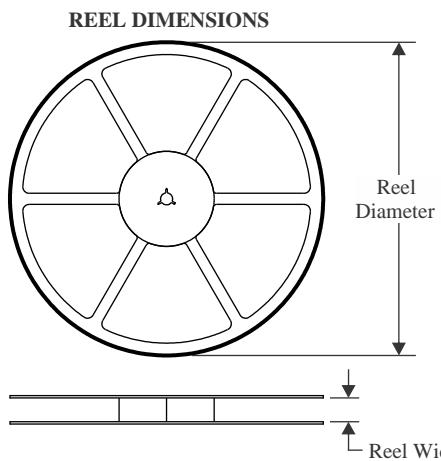
OTHER QUALIFIED VERSIONS OF AMC1302 :

- Automotive : [AMC1302-Q1](#)

NOTE: Qualified Version Definitions:

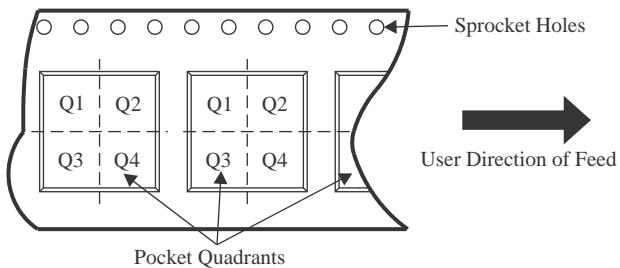
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION



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

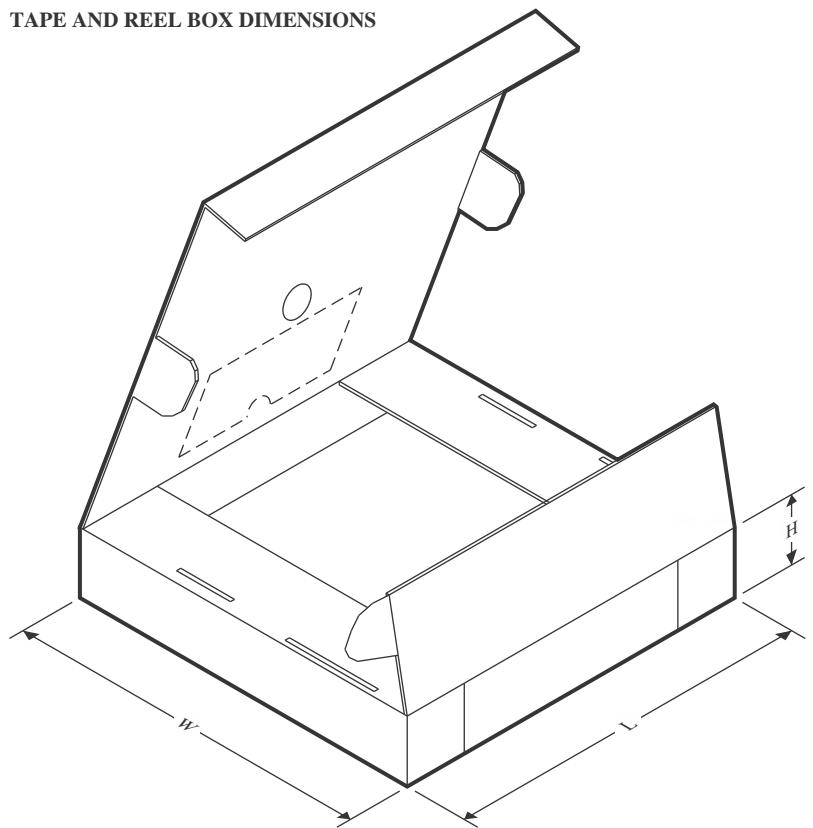
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

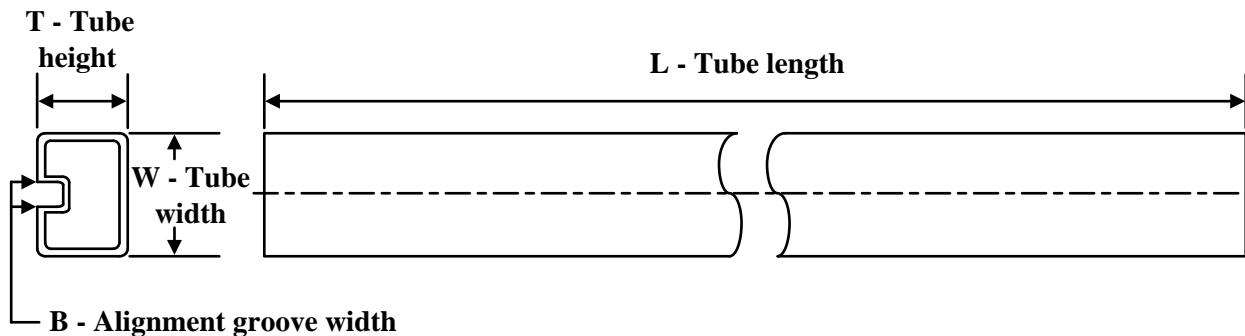
| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| AMC1302DWVR | SOIC | DWV | 8 | 1000 | 330.0 | 16.4 | 12.15 | 6.2 | 3.05 | 16.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| AMC1302DWVR | SOIC | DWV | 8 | 1000 | 353.0 | 353.0 | 32.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μ m) | B (mm) |
|--------------|--------------|--------------|------|-----|--------|--------|--------------|--------|
| AMC1302DWV | DWV | SOIC | 8 | 64 | 505.46 | 13.94 | 4826 | 6.6 |
| AMC1302DWV.A | DWV | SOIC | 8 | 64 | 505.46 | 13.94 | 4826 | 6.6 |

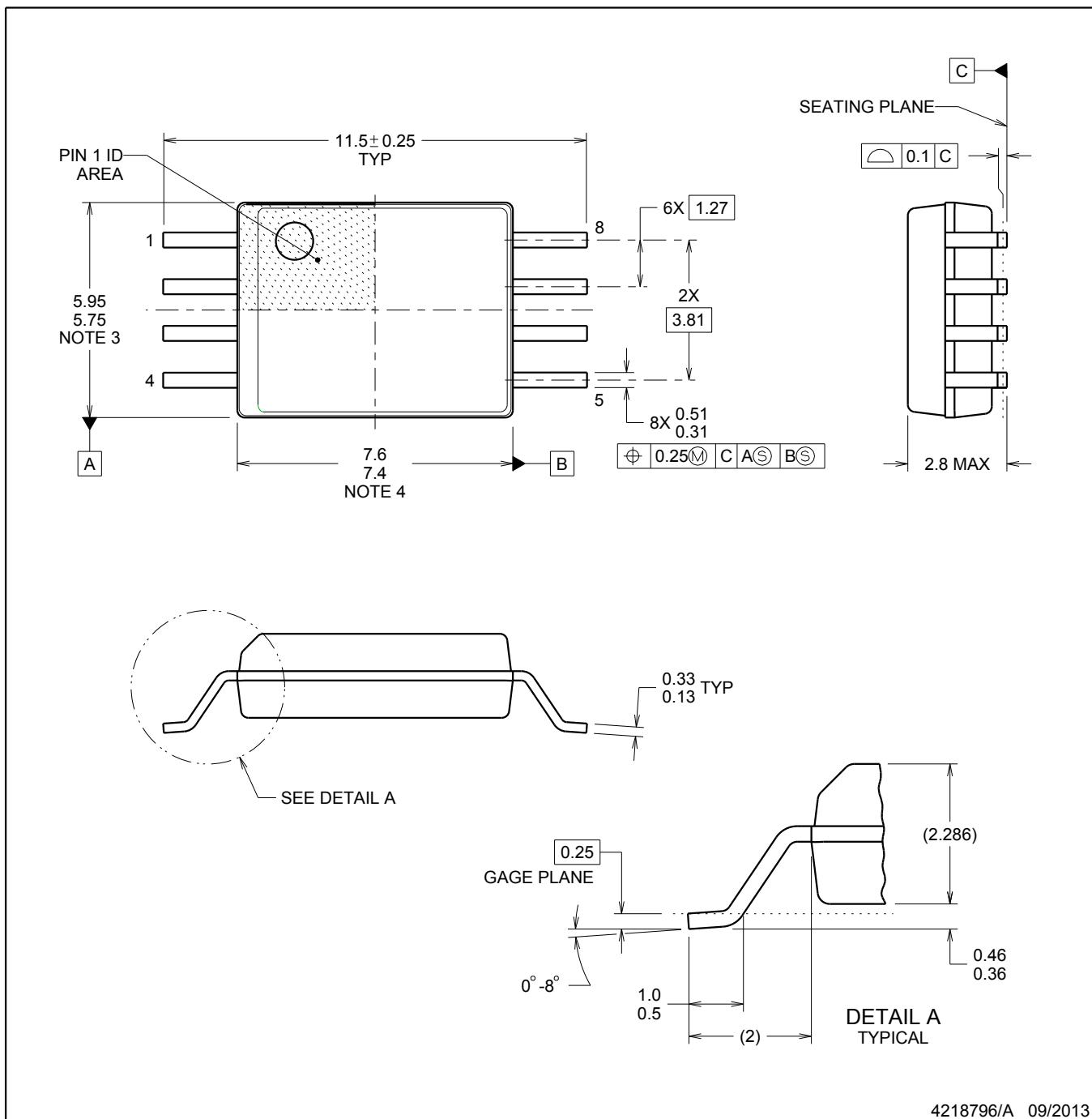
PACKAGE OUTLINE

DWV0008A



SOIC - 2.8 mm max height

SOIC



4218796/A 09/2013

NOTES:

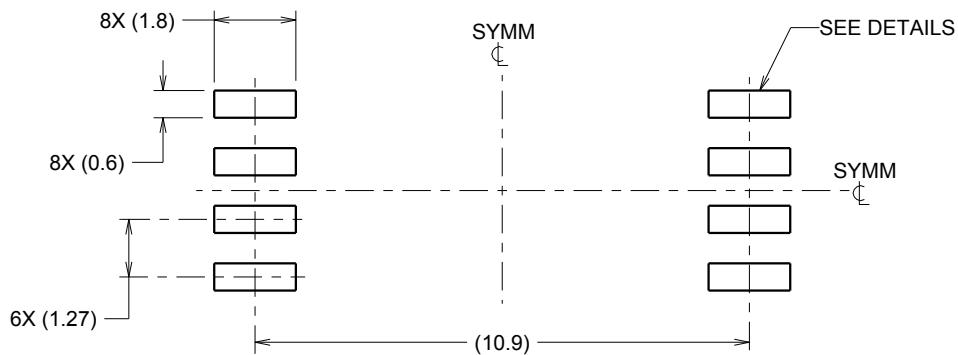
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

EXAMPLE BOARD LAYOUT

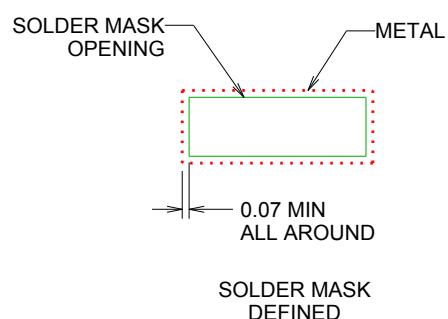
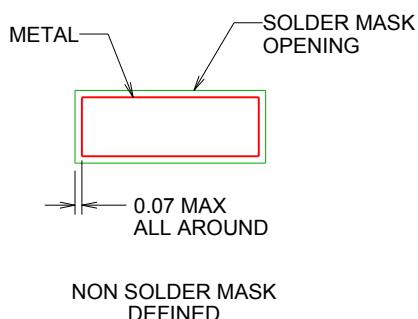
DWV0008A

SOIC - 2.8 mm max height

SOIC



LAND PATTERN EXAMPLE
9.1 mm NOMINAL CLEARANCE/CREEPAGE
SCALE:6X



SOLDER MASK DETAILS

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NOTES: (continued)

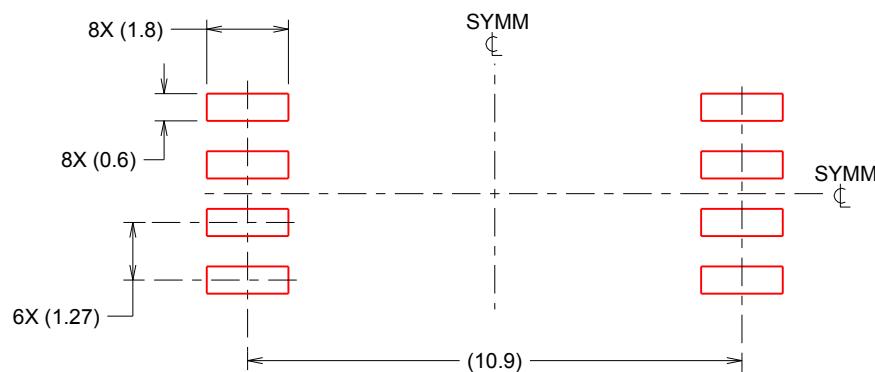
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DWV0008A

SOIC - 2.8 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

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NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

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