# LM4040-N/-Q1 高精度マイクロパワー・シャント型基準電圧

## 1 特長

- **車載アプリケーション向けにLM4040-N-Q1 AEC Q-100認定済み**
  - 拡張温度グレード1: -40°C～+125°C、$T_A$
  - 工業用温度グレード3: -40°C～+85°C、$T_A$
- **小型パッケージ**: SOT-23、TO-92、SC70
- **出力コンデンサ不要**
- **容量性負荷に対して安定**
- **逆方向降伏電圧に関して**2.048V、2.5V、3V、4.096V、5V、8.192V、10V**の固定電圧バージョンを用意**
- **主な仕様**(2.5V LM4040-N)
  - 出力電圧の許容誤差(Aグレード、25℃): ±0.1% (最大)
  - 低出力ノイズ(10Hz～10kHz): 35μ$V_{rms}$ (標準値)
  - 幅広い動作電流範囲: 60μA～15mA
  - 工業用温度範囲: −40℃～+85℃
  - 拡張温度範囲: −40℃～+125℃
  - 低温度ドリフト係数: 100ppm/℃ (最大)

## 2 アプリケーション

- バッテリ駆動のポータブル機器
- データ・アクイジション・システム
- 計測機器
- プロセス制御
- エネルギー管理
- 製品テスト
- 自動車
- 高精度のオーディオ・コンポーネント

## 3 概要

LM4040-N高精度基準電圧は、小型のSC70およびSOT-23表面実装パッケージで供給され、スペースの制約が厳しいアプリケーションに理想的です。LM4040-Nは先進の設計により、安定化コンデンサを外付けする必要がなく、容量性負荷に対して安定性が保証されるため、使いやすい製品です。逆方向降伏電圧として、2.048V、2.5V、3V、4.096V、5V、8.192V、10Vの固定電圧を選択できるため、設計の労力がさらに削減されます。最小動作電流は2.5VのLM4040-Nでは60μAで、10VのLM4040-Nでは100μAです。最大動作電流は、いずれのバージョンも15mAです。

LM4040-Nは、ウェハー・ソート時にヒューズとツェナーザップを使用して逆方向降伏電圧の微調整を行うことで、最高グレード・パーツの誤差を25℃で±0.1%(Aグレード)以内に抑えています。バンドギャップ基準電圧の温度ドリフト曲線補正、低ダイナミック・インピーダンスによって、広範囲にわたる動作温度や電流に対して安定した逆方向降伏電圧精度を確保しています。

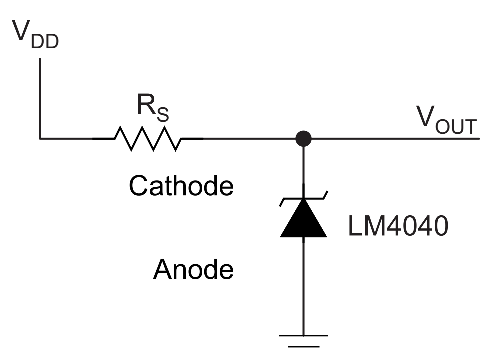
可変型と1.2Vの2種類の逆方向降伏電圧バージョンからなるLM4041-Nも利用可能です。LM4041-Nデータシート(SNOS641)を参照してください。

**製品情報(1)**

| 型番 | パッケージ | 本体サイズ(公称) |
|---|---|---|
| LM4040-N | TO-92 (3) | 4.30mm×4.30mm |
| | SC70 (5) | 2.00mm×1.25mm |
| | SOT-23 (3) | 2.92mm×1.30mm |

(1) 提供されているすべてのパッケージについては、このデータシートの末尾にある注文情報を参照してください。

**シャント基準電圧アプリケーションの回路図**



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## 4 改訂履歴

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

**Revision K (June 2016)** から **Revision L** に変更 **Page**

- Removed soldering information from the *Absolute Maximum Ratings* table ........ 5
- 「*ドキュメントの更新通知を受け取る方法*」セクションを追加 ........ 42

**Revision J (August 2015)** から **Revision K** に変更 **Page**

- Updated pinout diagrams ........ 4

**Revision I (April 2015)** から **Revision J** に変更 **Page**

- 「*ESD定格*」の表、「*機能説明*」セクション、「*デバイスの機能モード*」セクション、「*アプリケーションおよび実装*」セクション、「*電源に関する推奨事項*」セクション、「*レイアウト*」セクション、「*デバイスおよびドキュメントのサポート*」セクション、「*メカニカル、パッケージ、および注文情報*」セクション 追加 ........ 1

**Revision H (April 2013)** から **Revision I** に変更 **Page**

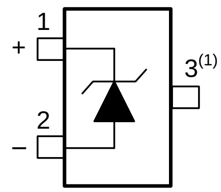
- 車載グレードをSOT-23パッケージで提供、新しいTIフォーマットから最新情報を 追加 ........ 1

**Revision G (July 2012)** から **Revision H** に変更 **Page**

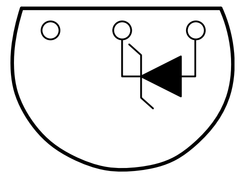
- ナショナル セミコンダクターのデータシートのレイアウトをTIフォーマットへ 変更 ........ 1

# 5 Pin Configuration and Functions

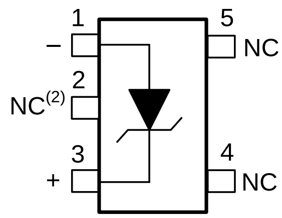
**DBZ Package**
**3-Pin SOT-23**
**Top View**




**LP Package**
**3-Pin TO-92**
**Bottom View**




**DCK Package**
**5-Pin SC70**
**Top View**




**Pin Functions**

| PIN | | | | I/O | DESCRIPTION |
|---|---|---|---|---|---|
| NAME | SOT-23 | TO-92 | SC70 | | |
| Anode | 2 | 1 | 1 | O | Anode pin, normally grounded |
| Cathode | 1 | 2 | 3 | I/O | Shunt Current/Output Voltage |
| NC | 3 (1) | — | 2 (2) | — | Must float or connect to anode |
| NC | — | 3 | 4, 5 | — | No connect |

(1) This pin must be left floating or connected to pin 2.
(2) This pin must be left floating or connected to pin 1.

# 6 Specifications

## 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)[(1)(2)]

| | | MIN | MAX | UNIT |
|---|---|---|---|---|
| Reverse current | | | 20 | mA |
| Forward current | | | 10 | mA |
| Power dissipation ($T_A$ = 25°C)[(3)] | SOT-23 (M3) package | | 306 | mW |
| | TO-92 (Z) package | | 550 | mW |
| | SC70 (M7) package | | 241 | mW |
| Storage temperature, $T_{stg}$ | | –65 | 150 | °C |

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.
(3) The maximum power dissipation must be derated at elevated temperatures and is dictated by $T_{Jmax}$ (maximum junction temperature), $R_{\theta JA}$ (junction to ambient thermal resistance), and $T_A$ (ambient temperature). The maximum allowable power dissipation at any temperature is $PD_{max} = (T_{Jmax} - T_A)/R_{\theta JA}$ or the number given in the *Absolute Maximum Ratings*, whichever is lower. For the LM4040-N, $T_{Jmax}$ = 125°C, and the typical thermal resistance ($R_{\theta JA}$), when board mounted, is 326°C/W for the SOT-23 package, and 180°C/W with 0.4″ lead length and 170°C/W with 0.125″ lead length for the TO-92 package and 415°C/W for the SC70 Package.

## 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 JEDEC specification JESD22-C101[(2)] | ±200 | |

(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 free-air temperature range (unless otherwise noted)[(1)(2)]

| | | MIN | MAX | UNIT |
|---|---|---|---|---|
| Temperature ($T_{min} \leq T_A \leq T_{max}$) | Industrial Temperature | $-40°C \leq T_A \leq 85$ | | °C |
| | Extended Temperature | $-40 \leq T_A \leq 125°C$ | | °C |
| Reverse Current | LM4040-N-2.0 | 60 | 15 | µA to mA |
| | LM4040-N-2.5 | 60 | 15 | µA to mA |
| | LM4040-N-3.0 | 62 | 15 | µA to mA |
| | LM4040-N-4.1 | 68 | 15 | µA to mA |
| | LM4040-N-5.0 | 74 | 15 | µA to mA |
| | LM4040-N-8.2 | 91 | 15 | µA to mA |
| | LM4040-N-10.0 | 100 | 15 | µA to mA |

(1) *Absolute Maximum Ratings* indicate limits beyond which damage to the device may occur. *Recommended Operating Conditions* indicate conditions for which the device is functional, but do not ensure specific performance limits. For ensured specifications and test conditions, see the *Electrical Characteristics*. The ensured specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
(2) The maximum power dissipation must be derated at elevated temperatures and is dictated by $T_{Jmax}$ (maximum junction temperature), $R_{\theta JA}$ (junction to ambient thermal resistance), and $T_A$ (ambient temperature). The maximum allowable power dissipation at any temperature is $PD_{max} = (T_{Jmax} - T_A)/R_{\theta JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower. For the LM4040-N, $T_{Jmax}$ = 125°C, and the typical thermal resistance ($R_{\theta JA}$), when board mounted, is 326°C/W for the SOT-23 package, and 180°C/W with 0.4″ lead length and 170°C/W with 0.125″ lead length for the TO-92 package and 415°C/W for the SC70 package.

## 6.4 Thermal Information

| THERMAL METRIC[(1)] | | LM4040-N | | | UNIT |
|---|---|---|---|---|---|
| | | DBZ (SOT-23) | LP (TO-92) | DCK (SC70) | |
| | | 3 PINS | 3 PINS | 5 PINS | |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | 291.9 | 166 | 267 | °C/W |
| $R_{\theta JC(top)}$ | Junction-to-case (top) thermal resistance | 114.3 | 88.2 | 95.6 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 62.3 | 145.2 | 48.1 | °C/W |
| $\psi_{JT}$ | Junction-to-top characterization parameter | 7.4 | 32.5 | 2.4 | °C/W |
| $\psi_{JB}$ | Junction-to-board characterization parameter | 61 | N/A | 47.3 | °C/W |
| $R_{\theta JC(bot)}$ | Junction-to-case (bottom) thermal resistance | N/A | N/A | N/A | °C/W |

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report (SPRA953).

## 6.5 Electrical Characteristics: 2-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 2.048 | | V |
| | Reverse Breakdown Voltage Tolerance[(2)] | $I_R$ = 100 µA | LM4040AIM3<br>LM4040AIZ | | | | ±2 | mV |
| | | | LM4040BIM3<br>LM4040BIZ<br>LM4040BIM7 | | | | ±4.1 | |
| | | | LM4040AIM3<br>LM4040AIZ | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±15 | mV |
| | | | LM4040BIM3<br>LM4040BIZ<br>LM4040BIM7 | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±17 | |
| $I_{RMIN}$ | Minimum Operating Current | | $T_A = T_J = 25°C$ | | | 45 | 60 | µA |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 65 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(2)] | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | $T_A = T_J = 25°C$ | | | ±15 | | ppm/°C |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | ±100 | |
| | | $I_R$ = 100 µA | | | | ±15 | | ppm/°C |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[(3)] | $I_{RMIN} \le I_R \le$ 1 mA | $T_A = T_J = 25°C$ | | | 0.3 | 0.8 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 1 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | $T_A = T_J = 25°C$ | | | 2.5 | 6 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 8 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz,<br>$I_{AC} = 0.1\ I_R$ | | | | 0.3 | 0.8 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 35 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[(4)] | ΔT = –40°C to 125°C | | | | 0.08% | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, $\max\Delta T$ is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5 V × 0.75% = ±19 mV.
(3) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(4) Thermal hysteresis is defined as the difference in voltage measured at 25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.6 Electrical Characteristics: 2-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN(1) | TYP(2) | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 2.048 | | V |
| | Reverse Breakdown Voltage Tolerance(3) | $I_R$ = 100 µA | LM4040CIM3 LM4040CIZ LM4040CIM7 | $T_A = T_J = 25°C$ | | | ±10 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±23 | |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | $T_A = T_J = 25°C$ | | | ±20 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±40 | |
| | | | LM4040EIZ LM4040EIM7 | $T_A = T_J = 25°C$ | | | ±41 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±60 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CIM3 LM4040CIZ LM4040CIM7 | $T_A = T_J = 25°C$ | | 45 | 60 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 65 | |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 70 | |
| | | | LM4040EIZ LM4040EIM7 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 70 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient(3) | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CIM3 LM4040CIZ LM4040CIM7 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | | LM4040EIZ LM4040EIM7 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 µA | | | | ±15 | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, max$\Delta$T is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where max$\Delta$T = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

## Electrical Characteristics: 2-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'I' (continued)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[(4)] | $I_{RMIN} \le I_R \le 1$ mA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | 0.3 | 0.8 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | | LM4040EIZ<br>LM4040EIM7 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | 1 mA $\le I_R \le$ 15 mA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | 2.5 | 6 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 8 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |
| | | | LM4040EIZ<br>LM4040EIM7 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R = 1$ mA, f = 120 Hz<br>$I_{AC} = 0.1\ I_R$ | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | | | 0.3 | 0.9 | Ω |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | | | 0.3 | 1.1 | |
| | | | LM4040EIZ<br>LM4040EIM7 | | | 0.3 | 1.1 | |
| $e_N$ | Wideband Noise | $I_R = 100\ \mu A$<br>10 Hz ≤ f ≤ 10 kHz | | | | 35 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R = 100\ \mu A$ | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[(5)] | ΔT = −40°C to 125°C | | | | 0.08% | | |

(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at 25°C after cycling to temperature –40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.7 Electrical Characteristics: 2-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'E'

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 2.048 | | V |
| | Reverse Breakdown Voltage Tolerance[(3)] | $I_R$ = 100 µA | LM4040CEM3 | $T_A = T_J = 25°C$ | | | ±10 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±30 | |
| | | | LM4040DEM3 | $T_A = T_J = 25°C$ | | | ±20 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±50 | |
| | | | LM4040EEM3 | $T_A = T_J = 25°C$ | | | ±41 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±70 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CEM3 | $T_A = T_J = 25°C$ | | 45 | 60 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 68 | |
| | | | LM4040DEM3 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 73 | |
| | | | LM4040EEM3 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 73 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(3)] | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CEM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DEM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | | LM4040EEM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 µA | | | | ±15 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[(4)] | $I_{RMIN} \le I_R \le$ 1 mA | LM4040CEM3 | $T_A = T_J = 25°C$ | | 0.3 | 0.8 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1 | |
| | | | LM4040DEM3 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | | LM4040EEM3 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | 1 mA $\le I_R \le$ 15 mA | LM4040CEM3 | $T_A = T_J = 25°C$ | | 2.5 | 6 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 8 | |
| | | | LM4040DEM3 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |
| | | | LM4040EEM3 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, $\max\Delta T$ is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where $\max\Delta T$ = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max $\Delta T$ = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.

## Electrical Characteristics: 2-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'E' (continued)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | MIN(1) | TYP(2) | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC}$ = 0.1 $I_R$ | LM4040CEM3 | | 0.3 | 0.9 | Ω |
| | | | LM4040DEM3 | | 0.3 | 1.1 | |
| | | | LM4040EEM3 | | 0.3 | 1.1 | |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | 35 | | µ$V_{rms}$ |
| $ΔV_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis(5) | ΔT = −40°C to 125°C | | | 0.08% | | |

(5) Thermal hysteresis is defined as the difference in voltage measured at 25°C after cycling to temperature –40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.8 Electrical Characteristics: 2.5-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I' (AEC Grade 3)

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN(1) | TYP(2) | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 2.5 | | V |
| | Reverse Breakdown Voltage Tolerance(3) | $I_R$ = 100 µA | LM4040AIM3<br>LM4040AIZ<br>LM4040AIM3 | $T_A = T_J = 25°C$ | | | ±2.5 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±19 | |
| | | | LM4040BIM3<br>LM4040BIZ<br>LM4040BIM7<br>LM4040QBIM3 | $T_A = T_J = 25°C$ | | | ±5 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±21 | |
| $I_{RMIN}$ | Minimum Operating Current | | $T_A = T_J = 25°C$ | | | 45 | 60 | µA |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 65 | |
| $ΔV_R/ΔT$ | Average Reverse Breakdown Voltage Temperature Coefficient(3) | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | $T_A = T_J = 25°C$ | | | ±15 | | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | ±100 | |
| | | $I_R$ = 100 µA | | | | ±15 | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J = 25°C$ and represent most likely parametric norm.
(3) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[($ΔV_R/ΔT$)(maxΔT)($V_R$)]. Where, $ΔV_R/ΔT$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

## Electrical Characteristics: 2.5-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I' (AEC Grade 3) (continued)

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | MIN(1) | TYP(2) | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change(4) | $I_{RMIN} \le I_R \le 1$ mA | $T_A = T_J = 25°C$ | | 0.3 | 0.8 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | $T_A = T_J = 25°C$ | | 2.5 | 6 | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 8 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC} = 0.1\ I_R$ | | | 0.3 | 0.8 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | 35 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis(5) | ΔT = −40°C to 125°C | | | 0.08% | | |

(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at 25°C after cycling to temperature –40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.9 Electrical Characteristics: 2.5-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', and 'E'; Temperature Grade 'I' (AEC Grade 3)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 μA | | | | 2.5 | | V |
| | Reverse Breakdown Voltage Tolerance[(3)] | $I_R$ = 100 μA | LM4040CIZ LM4040CIM3 LM4040CIM7 LM4040QCIM3 | $T_A = T_J = 25°C$ | | | ±12 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±29 | |
| | | | LM4040DIZ LM4040DIM3 LM4040DIM7 LM4040QDIM3 | $T_A = T_J = 25°C$ | | | ±25 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±49 | |
| | | | LM4040EIZ LM4040EIM3 LM4040EIM7 LM4040QEIM3 | $T_A = T_J = 25°C$ | | | ±50 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±74 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CIZ LM4040CIM3 LM4040CIM7 LM4040QCIM3 | $T_A = T_J = 25°C$ | | 45 | 60 | μA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 65 | |
| | | | LM4040DIZ LM4040DIM3 LM4040DIM7 LM4040QDIM3 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 70 | |
| | | | LM4040EIZ LM4040EIM3 LM4040EIM7 LM4040QEIM3 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 70 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(3)] | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CIZ LM4040CIM3 LM4040CIM7 LM4040QCIM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DIZ LM4040DIM3 LM4040DIM7 LM4040QDIM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | | LM4040EIZ LM4040EIM3 LM4040EIM7 LM4040QEIM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 μA | | | | ±15 | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, max$\Delta$T is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where max$\Delta$T = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

## Electrical Characteristics: 2.5-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', and 'E'; Temperature Grade 'I' (AEC Grade 3) (continued)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[1] | TYP[2] | MAX[1] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[4] | $I_{RMIN} \le I_R \le 1$ mA | LM4040CIZ LM4040CIM3 LM4040CIM7 LM4040QCIM3 | $T_A = T_J = 25°C$ | | 0.3 | 0.8 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1 | |
| | | | LM4040DIZ LM4040DIM3 LM4040DIM7 LM4040QDIM3 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | | LM4040EIZ LM4040EIM3 LM4040EIM7 LM4040QEIM3 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | LM4040CIZ LM4040CIM3 LM4040CIM7 LM4040QCIM3 | $T_A = T_J = 25°C$ | | 2.5 | 6 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 8 | |
| | | | LM4040DIZ LM4040DIM3 LM4040DIM7 LM4040QDIM3 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |
| | | | LM4040EIZ LM4040EIM3 LM4040EIM7 LM4040QEIM3 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz $I_{AC} = 0.1\ I_R$ | LM4040CIZ LM4040CIM3 LM4040CIM7 LM4040QCIM3 | | | 0.3 | 0.9 | Ω |
| | | | LM4040DIZ LM4040DIM3 LM4040DIM7 LM4040QDIM3 | | | 0.3 | 1.1 | |
| | | | LM4040EIZ LM4040EIM3 LM4040EIM7 LM4040QEIM3 | | | 0.3 | 1.1 | |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA 10 Hz ≤ f ≤ 10 kHz | | | | 35 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs T = 25°C ±0.1°C $I_R$ = 100 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[5] | ΔT= −40°C to 125°C | | | | 0.08% | | |

(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at 25°C after cycling to temperature –40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.10 Electrical Characteristics: 2.5-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'E' (AEC Grade 1)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 2.5 | | V |
| | Reverse Breakdown Voltage Tolerance[(3)] | $I_R$ = 100 µA | LM4040CEM3<br>LM4040QCEM3 | $T_A = T_J = 25°C$ | | | ±12 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±38 | |
| | | | LM4040DEM3<br>LM4040QDEM3 | $T_A = T_J = 25°C$ | | | ±25 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±63 | |
| | | | LM4040EEM3<br>LM4040QEEM3 | $T_A = T_J = 25°C$ | | | ±50 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±88 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CEM3<br>LM4040QCEM3 | $T_A = T_J = 25°C$ | | 45 | 60 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 68 | |
| | | | LM4040DEM3<br>LM4040QDEM3 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 73 | |
| | | | LM4040EEM3<br>LM4040QEEM3 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 73 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(3)] | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CEM3<br>LM4040QCEM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DEM3<br>LM4040QDEM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | | LM4040EEM3<br>LM4040QEEM3 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 µA | | | | ±15 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[(4)] | $I_{RMIN} \le I_R \le 1$ mA | LM4040CEM3<br>LM4040QCEM3 | $T_A = T_J = 25°C$ | | 0.3 | 0.8 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1 | |
| | | | LM4040DEM3<br>LM4040QDEM3 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | | LM4040EEM3<br>LM4040QEEM3 | $T_A = T_J = 25°C$ | | 0.3 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | LM4040CEM3<br>LM4040QCEM3 | $T_A = T_J = 25°C$ | | 2.5 | 6 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 8 | |
| | | | LM4040DEM3<br>LM4040QDEM3 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |
| | | | LM4040EEM3<br>LM4040QEEM3 | $T_A = T_J = 25°C$ | | 2.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.

## Electrical Characteristics: 2.5-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'E' (AEC Grade 1) (continued)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | MIN[1] | TYP[2] | MAX[1] | UNIT |
|---|---|---|---|---|---|---|---|
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC}$ = 0.1 $I_R$ | LM4040CEM3<br>LM4040QCEM3 | | 0.3 | 0.9 | Ω |
| | | | LM4040DEM3<br>LM4040QDEM3 | | 0.3 | 1.1 | |
| | | | LM4040EEM3<br>LM4040QEEM3 | | 0.3 | 1.1 | |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | 35 | | µ$V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[5] | ΔT= −40°C to 125°C | | | 0.08% | | |

(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.11 Electrical Characteristics: 3-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[1] | TYP[2] | MAX[1] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 3 | | V |
| | Reverse Breakdown Voltage Tolerance[3] | $I_R$ = 100 µA | LM4040AIM3<br>LM4040AIZ | $T_A = T_J = 25°C$ | | | ±3 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±22 | |
| | | | LM4040BIM3<br>LM4040BIZ<br>LM4040BIM7 | $T_A = T_J = 25°C$ | | | ±6 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±26 | |
| $I_{RMIN}$ | Minimum Operating Current | | $T_A = T_J = 25°C$ | | | 47 | 62 | µA |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 67 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[3] | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | $T_A = T_J = 25°C$ | | | ±15 | | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | ±100 | |
| | | $I_R$ = 100 µA | | | | ±15 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[4] | $I_{RMIN} \le I_R \le 1$ mA | $T_A = T_J = 25°C$ | | | 0.6 | 0.8 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 1.1 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | $T_A = T_J = 25°C$ | | | 2.7 | 6 | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 9 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC} = 0.1\ I_R$ | | | | 0.4 | 0.9 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 35 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[5] | ΔT = −40°C to 125°C | | | | 0.08% | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.12 Electrical Characteristics: 3-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN(1) | TYP(2) | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 3 | | V |
| | Reverse Breakdown Voltage Tolerance(3) | $I_R$ = 100 µA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | | ±15 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±34 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | | ±30 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±59 | |
| | | | LM4040EIM7<br>LM4040EIZ | $T_A = T_J = 25°C$ | | | ±60 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±89 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | 45 | 60 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 65 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 70 | |
| | | | LM4040EIM7<br>LM4040EIZ | $T_A = T_J = 25°C$ | | 45 | 65 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 70 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient(3) | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | | LM4040EIM7<br>LM4040EIZ | $T_A = T_J = 25°C$ | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 µA | | | | ±15 | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The overtemperature limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, max$\Delta$T is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where max$\Delta$T = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max $\Delta$T = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

## Electrical Characteristics: 3-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'I' (continued)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN(1) | TYP(2) | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change(4) | $I_{RMIN} \le I_R \le 1$ mA | LM4040CIM3 LM4040CIZ LM4040CIM7 | $T_A = T_J = 25°C$ | | 0.4 | 0.8 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.1 | |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | $T_A = T_J = 25°C$ | | 0.4 | 1.1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.3 | |
| | | | LM4040EIM7 LM4040EIZ | $T_A = T_J = 25°C$ | | 0.4 | 1.1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.3 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | LM4040CIM3 LM4040CIZ LM4040CIM7 | $T_A = T_J = 25°C$ | | 2.7 | 6 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 9 | |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | $T_A = T_J = 25°C$ | | 2.7 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 11 | |
| | | | LM4040EIM7 LM4040EIZ | $T_A = T_J = 25°C$ | | 2.7 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 11 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R = 1$ mA, f = 120 Hz $I_{AC} = 0.1\ I_R$ | LM4040CIM3 LM4040CIZ LM4040CIM7 | | | 0.4 | 0.9 | Ω |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | | | 0.4 | 1.2 | |
| | | | LM4040EIM7 LM4040EIZ | | | 0.4 | 1.2 | |
| $e_N$ | Wideband Noise | $I_R = 100\ \mu A$ 10 Hz ≤ f ≤ 10 kHz | | | | 35 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs T = 25°C ±0.1°C $I_R = 100\ \mu A$ | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis(5) | ΔT = −40°C to 125°C | | | | 0.08% | | |

(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.13 Electrical Characteristics: 3-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'E'

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN (1) | TYP (2) | MAX (1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 3 | | V |
| | Reverse Breakdown Voltage Tolerance (3) | $I_R$ = 100 µA | LM4040CEM3 | $T_A = T_J$ = 25°C | | | ±15 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±45 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | | ±30 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±75 | |
| | | | LM4040EEM3 | $T_A = T_J$ = 25°C | | | ±60 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±105 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CEM3 | $T_A = T_J$ = 25°C | | 47 | 62 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 70 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | 47 | 67 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 75 | |
| | | | LM4040EEM3 | $T_A = T_J$ = 25°C | | 47 | 67 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 75 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient (3) | $I_R$ = 10 mA | | | | ±20 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CEM3 | $T_A = T_J$ = 25°C | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | | LM4040EEM3 | $T_A = T_J$ = 25°C | | ±15 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 µA | | | | ±15 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change (4) | $I_{RMIN} \le I_R \le$ 1 mA | LM4040CEM3 | $T_A = T_J$ = 25°C | | 0.4 | 0.8 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.1 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | 0.4 | 1.1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.3 | |
| | | | LM4040EEM3 | $T_A = T_J$ = 25°C | | 0.4 | 1.1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.3 | |
| | | 1 mA $\le I_R \le$ 15 mA | LM4040CEM3 | $T_A = T_J$ = 25°C | | 2.7 | 6.0 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 9 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | 2.7 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 11.0 | |
| | | | LM4040EEM3 | $T_A = T_J$ = 25°C | | 2.7 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 11.0 | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[($\Delta V_R/\Delta T$)(max$\Delta T$)($V_R$)]. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, max$\Delta T$ is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where max$\Delta T$ = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max $\Delta T$ = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.

## Electrical Characteristics: 3-V LM4040-N $V_R$ Tolerance Grades 'C', 'D', And 'E'; Temperature Grade 'E' (continued)

all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1% and ±2%, respectively.

| PARAMETER | | TEST CONDITIONS | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC}$ = 0.1 $I_R$ | LM4040CEM3 | | 0.4 | 0.9 | Ω |
| | | | LM4040DEM3 | | 0.4 | 1.2 | |
| | | | LM4040EEM3 | | 0.4 | 1.2 | |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | 35 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[(5)] | ΔT = −40°C to 125°C | | | 0.08% | | |

(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.14 Electrical Characteristics: 4.1-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 4.096 | | V |
| | Reverse Breakdown Voltage Tolerance[(3)] | $I_R$ = 100 µA | LM4040AIM3<br>LM4040AIZ | $T_A = T_J = 25°C$ | | | ±4.1 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±31 | |
| | | | LM4040BIM3<br>LM4040BIZ<br>LM4040BIM7 | $T_A = T_J = 25°C$ | | | ±8.2 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±35 | |
| $I_{RMIN}$ | Minimum Operating Current | | $T_A = T_J = 25°C$ | | | 50 | 68 | µA |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 73 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(3)] | $I_R$ = 10 mA | | | | ±30 | | ppm/°C |
| | | $I_R$ = 1 mA | $T_A = T_J = 25°C$ | | | ±20 | | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | ±100 | |
| | | $I_R$ = 100 µA | | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[(4)] | $I_{RMIN} \le I_R \le$ 1 mA | $T_A = T_J = 25°C$ | | | 0.5 | 0.9 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 1.2 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | $T_A = T_J = 25°C$ | | | 3 | 7 | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 10 | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.

## Electrical Characteristics: 4.1-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I' (continued)

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC}$ = 0.1 $I_R$ | | | 0.5 | 1 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | 80 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[(5)] | ΔT = −40°C to 125°C | | | 0.08% | | |

(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.15 Electrical Characteristics: 4.1-V LM4040-N $V_R$ Tolerance Grades 'C' and 'D'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades C and D designate initial Reverse Breakdown Voltage tolerances of ±0.5% and ±1%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 4.096 | | V |
| | Reverse Breakdown Voltage Tolerance[(3)] | $I_R$ = 100 µA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | | ±20 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±47 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | | ±41 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±81 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | 50 | 68 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 73 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | 50 | 73 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 78 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(3)] | $I_R$ = 10 mA | | | | ±30 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 µA | | | | ±20 | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[($\Delta V_R/\Delta T$)(maxΔT)($V_R$)]. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

## Electrical Characteristics: 4.1-V LM4040-N $V_R$ Tolerance Grades 'C' and 'D'; Temperature Grade 'I' (continued)

all other limits $T_A = T_J = 25°C$. The grades C and D designate initial Reverse Breakdown Voltage tolerances of ±0.5% and ±1%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[1] | TYP[2] | MAX[1] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[4] | $I_{RMIN} \le I_R \le 1$ mA | LM4040CIM3 LM4040CIZ LM4040CIM7 | $T_A = T_J = 25°C$ | | 0.5 | 0.9 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.2 | |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | $T_A = T_J = 25°C$ | | 0.5 | 1.2 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.5 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | LM4040CIM3 LM4040CIZ LM4040CIM7 | $T_A = T_J = 25°C$ | | 3 | 7 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 10 | |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | $T_A = T_J = 25°C$ | | 3 | 9 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 13 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC} = 0.1 I_R$ | LM4040CIM3 LM4040CIZ LM4040CIM7 | | | 0.5 | 1 | Ω |
| | | | LM4040DIM3 LM4040DIZ LM4040DIM7 | | | 0.5 | 1.3 | |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 80 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[5] | ΔT = −40°C to 125°C | | | | 0.08% | | |

(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.16 Electrical Characteristics: 5-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[1] | TYP[2] | MAX[1] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 5 | | V |
| | Reverse Breakdown Voltage Tolerance[3] | $I_R$ = 100 µA | LM4040AIM3 LM4040AIZ | $T_A = T_J = 25°C$ | | | ±5 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±38 | |
| | | | LM4040BIM3 LM4040BIZ LM4040BIM7 | $T_A = T_J = 25°C$ | | | ±10 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±43 | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

## Electrical Characteristics: 5-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I' (continued)

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|
| $I_{RMIN}$ | Minimum Operating Current | | $T_A = T_J = 25°C$ | | 54 | 74 | μA |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 80 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(3)] | $I_R$ = 10 mA | | | ±30 | | ppm/°C |
| | | $I_R$ = 1 mA | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | $I_R$ = 100 μA | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[(4)] | $I_{RMIN} \leq I_R \leq$ 1 mA | $T_A = T_J = 25°C$ | | 0.5 | 1 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.4 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | $T_A = T_J = 25°C$ | | 3.5 | 8 | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 12 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC} = 0.1\ I_R$ | | | 0.5 | 1.1 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 100 μA<br>10 Hz ≤ f ≤ 10 kHz | | | 80 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 μA | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[(5)] | ΔT = −40°C to 125°C | | | 0.08% | | |

(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.17 Electrical Characteristics: 5-V LM4040-N $V_R$ Tolerance Grades 'C' And 'D'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades C and D designate initial Reverse Breakdown Voltage tolerances of ±0.5% and ±1%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 μA | | | | 5 | | V |
| | Reverse Breakdown Voltage Tolerance[(3)] | $I_R$ = 100 μA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | | ±25 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±58 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | | ±50 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±99 | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J = 25°C$ and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

## Electrical Characteristics: 5-V LM4040-N $V_R$ Tolerance Grades 'C' And 'D'; Temperature Grade 'I' (continued)

all other limits $T_A = T_J = 25°C$. The grades C and D designate initial Reverse Breakdown Voltage tolerances of ±0.5% and ±1%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[1] | TYP[2] | MAX[1] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | 54 | 74 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 80 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | 54 | 79 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 85 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[3] | $I_R = 10$ mA | | | | ±30 | | ppm/°C |
| | | $I_R = 1$ mA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R = 100$ µA | | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[4] | $I_{RMIN} \leq I_R \leq 1$ mA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | 0.5 | 1 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.4 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | 0.5 | 1.3 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.8 | |
| | | 1 mA $\leq I_R \leq$ 15 mA | LM4040CIM3<br>LM4040CIZ<br>LM4040CIM7 | $T_A = T_J = 25°C$ | | 3.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 12 | |
| | | | LM4040DIM3<br>LM4040DIZ<br>LM4040DIM7 | $T_A = T_J = 25°C$ | | 3.5 | 10 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 15 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R = 1$ mA, f = 120 Hz,<br>$I_{AC} = 0.1\ I_R$ | $T_A = T_J = 25°C$ | | | 0.5 | 1.1 | Ω |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 1.5 | |
| $e_N$ | Wideband Noise | $I_R = 100$ µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 80 | | µ$V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R = 100$ µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[5] | ΔT = −40°C to 125°C | | | | 0.08% | | |

(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.18 Electrical Characteristics: 5-V LM4040-N $V_R$ Tolerance Grades 'C' And 'D'; Temperature Grade 'E'

all other limits $T_A = T_J = 25°C$. The grades C and D designate initial Reverse Breakdown Voltage tolerances of ±0.5% and ±1%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN(1) | TYP | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 100 µA | | | | 5 | | V |
| | Reverse Breakdown Voltage Tolerance(2) | $I_R$ = 100 µA | LM4040CEM3 | $T_A = T_J$ = 25°C | | | ±25 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±75 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | | ±50 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±125 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CEM3 | $T_A = T_J$ = 25°C | | 54 | 74 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 83 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | 54 | 79 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 88 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient(2) | $I_R$ = 10 mA | | | | ±30 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CEM3 | $T_A = T_J$ = 25°C | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 100 µA | | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change(3) | $I_{RMIN} \leq I_R \leq$ 1 mA | LM4040CEM3 | $T_A = T_J$ = 25°C | | 0.5 | 1 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.4 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | 0.5 | 1 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 1.8 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | LM4040CEM3 | $T_A = T_J$ = 25°C | | 3.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 12 | |
| | | | LM4040DEM3 | $T_A = T_J$ = 25°C | | 3.5 | 8 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 15 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC}$ = 0.1 $I_R$ | | | | 0.5 | 1.1 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 100 µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 80 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 100 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis(4) | ΔT = −40°C to 125°C | | | | 0.08% | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.

(2) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.

(3) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.

(4) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.19 Electrical Characteristics: 8.2-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[(1)] | TYP[(2)] | MAX[(1)] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 150 µA | | | | 8.192 | | V |
| | Reverse Breakdown Voltage Tolerance[(3)] | $I_R$ = 150 µA | LM4040AIM3 LM4040AIZ | $T_A = T_J = 25°C$ | | | ±8.2 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±61 | |
| | | | LM4040BIM3 LM4040BIZ | $T_A = T_J = 25°C$ | | | ±16 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±70 | |
| $I_{RMIN}$ | Minimum Operating Current | | $T_A = T_J = 25°C$ | | | 67 | 91 | µA |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 95 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[(3)] | $I_R$ = 10 mA | | | | ±40 | | ppm/°C |
| | | $I_R$ = 1 mA | $T_A = T_J = 25°C$ | | | ±20 | | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | ±100 | |
| | | $I_R$ = 150 µA | | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[(4)] | $I_{RMIN} \le I_R \le 1$ mA | $T_A = T_J = 25°C$ | | | 0.6 | 1.3 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 2.5 | |
| | | 1 mA ≤ $I_R$ ≤ 15 mA | $T_A = T_J = 25°C$ | | | 7 | 10 | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 18 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC} = 0.1\ I_R$ | | | | 0.6 | 1.5 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 150 µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 130 | | $µV_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 150 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[(5)] | ΔT = −40°C to 125°C | | | | 0.08% | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance $\pm[(\Delta V_R/\Delta T)(\max\Delta T)(V_R)]$. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.20 Electrical Characteristics: 8.2-V Lm4040-N $V_R$ Tolerance Grades 'C' And 'D'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades C and D designate initial Reverse Breakdown Voltage tolerances of ±0.5% and ±1%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN(1) | TYP(2) | MAX(1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 150 µA | | | | 8.192 | | V |
| $V_R$ | Reverse Breakdown Voltage Tolerance(3) | $I_R$ = 150 µA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | | ±41 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±94 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | | ±82 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±162 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | 67 | 91 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 95 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | 67 | 96 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 100 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient(3) | $I_R$ = 10 mA | | | | ±40 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 150 µA | | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change(4) | $I_{RMIN} \le I_R \le 1$ mA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | 0.6 | 1.3 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 2.5 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | 0.6 | 1.7 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 3 | |
| | | 1 mA $\le I_R \le$ 15 mA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | 7 | 10 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 18 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | 7 | 15 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 24 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC} = 0.1\ I_R$ | LM4040CIM3 LM4040CIZ | | | 0.6 | 1.5 | Ω |
| | | | LM4040DIM3 LM4040DIZ | | | 0.6 | 1.9 | |
| $e_N$ | Wideband Noise | $I_R$ = 150 µA, 10 Hz ≤ f ≤ 10 kHz | | | | 130 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs, T = 25°C ±0.1°C, $I_R$ = 150 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis(5) | ΔT = −40°C to 125°C | | | | 0.08% | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[($\Delta V_R/\Delta T$)(maxΔT)($V_R$)]. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.21 Electrical Characteristics: 10-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades A and B designate initial Reverse Breakdown Voltage tolerances of ±0.1% and ±0.2%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN[1] | TYP[2] | MAX[1] | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 150 µA | | | | 10 | | V |
| | Reverse Breakdown Voltage Tolerance[3] | $I_R$ = 150 µA | LM4040AIM3<br>LM4040AIZ | $T_A = T_J = 25°C$ | | | ±10 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±75 | |
| | | | LM4040BIM3<br>LM4040BIZ | $T_A = T_J = 25°C$ | | | ±20 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±85 | |
| $I_{RMIN}$ | Minimum Operating Current | | $T_A = T_J = 25°C$ | | | 75 | 100 | µA |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 103 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient[3] | $I_R$ = 10 mA | | | | ±40 | | ppm/°C |
| | | $I_R$ = 1 mA | $T_A = T_J = 25°C$ | | | ±20 | | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | ±100 | |
| | | $I_R$ = 150 µA | | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change[4] | $I_{RMIN} \le I_R \le 1$ mA | $T_A = T_J = 25°C$ | | | 0.8 | 1.5 | mV |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 3.5 | |
| | | 1 mA $\le I_R \le$ 15 mA | $T_A = T_J = 25°C$ | | | 8 | 12 | |
| | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | | 23 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz,<br>$I_{AC} = 0.1\ I_R$ | | | | 0.7 | 1.7 | Ω |
| $e_N$ | Wideband Noise | $I_R$ = 150 µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 180 | | µ$V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 150 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis[5] | ΔT = −40°C to 125°C | | | | 0.08% | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[($\Delta V_R/\Delta T$)(max$\Delta T$)($V_R$)]. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, max$\Delta T$ is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where max$\Delta T$ = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.22 Electrical Characteristics: 10-V LM4040-N $V_R$ Tolerance Grades 'C' And 'D'; Temperature Grade 'I'

all other limits $T_A = T_J = 25°C$. The grades C and D designate initial Reverse Breakdown Voltage tolerances of ±0.5% and ±1%, respectively.

| PARAMETER | | TEST CONDITIONS | | | MIN (1) | TYP (2) | MAX (1) | UNIT |
|---|---|---|---|---|---|---|---|---|
| $V_R$ | Reverse Breakdown Voltage | $I_R$ = 150 µA | | | | 10 | | V |
| | Reverse Breakdown Voltage Tolerance (3) | $I_R$ = 150 µA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | | ±50 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±115 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | | ±100 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±198 | |
| $I_{RMIN}$ | Minimum Operating Current | | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | 75 | 100 | µA |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 103 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | 75 | 110 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 113 | |
| $\Delta V_R/\Delta T$ | Average Reverse Breakdown Voltage Temperature Coefficient (3) | $I_R$ = 10 mA | | | | ±40 | | ppm/°C |
| | | $I_R$ = 1 mA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±100 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | ±20 | | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | ±150 | |
| | | $I_R$ = 150 µA | | | | ±20 | | |
| $\Delta V_R/\Delta I_R$ | Reverse Breakdown Voltage Change with Operating Current Change (4) | $I_{RMIN} \le I_R \le 1$ mA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | 0.8 | 1.5 | mV |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 3.5 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | 0.8 | 2 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 4 | |
| | | 1 mA $\le I_R \le$ 15 mA | LM4040CIM3 LM4040CIZ | $T_A = T_J = 25°C$ | | 8 | 12 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 23 | |
| | | | LM4040DIM3 LM4040DIZ | $T_A = T_J = 25°C$ | | 8 | 18 | |
| | | | | $T_A = T_J = T_{MIN}$ to $T_{MAX}$ | | | 29 | |
| $Z_R$ | Reverse Dynamic Impedance | $I_R$ = 1 mA, f = 120 Hz, $I_{AC} = 0.1\ I_R$ | LM4040CIM3 LM4040CIZ | | | 0.7 | 1.7 | Ω |
| | | | LM4040DIM3 LM4040DIZ | | | | 2.3 | |
| $e_N$ | Wideband Noise | $I_R$ = 150 µA<br>10 Hz ≤ f ≤ 10 kHz | | | | 180 | | $\mu V_{rms}$ |
| $\Delta V_R$ | Reverse Breakdown Voltage Long Term Stability | t = 1000 hrs<br>T = 25°C ±0.1°C<br>$I_R$ = 150 µA | | | | 120 | | ppm |
| $V_{HYST}$ | Thermal Hysteresis (5) | ΔT = −40°C to 125°C | | | | 0.08% | | |

(1) Limits are 100% production tested at 25°C. Limits over temperature are ensured through correlation using Statistical Quality Control (SQC) methods. The limits are used to calculate AOQL.
(2) Typicals are at $T_J$ = 25°C and represent most likely parametric norm.
(3) The (overtemperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[($\Delta V_R/\Delta T$)(maxΔT)($V_R$)]. Where, $\Delta V_R/\Delta T$ is the $V_R$ temperature coefficient, maxΔT is the maximum difference in temperature from the reference point of 25°C to $T_{MIN}$ or $T_{MAX}$, and $V_R$ is the reverse breakdown voltage. The total overtemperature tolerance for the different grades in the industrial temperature range where maxΔT = 65°C is shown below:
A-grade: ±0.75% = ±0.1% ±100 ppm/°C × 65°C
B-grade: ±0.85% = ±0.2% ±100 ppm/°C × 65°C
C-grade: ±1.15% = ±0.5% ±100 ppm/°C × 65°C
D-grade: ±1.98% = ±1.0% ±150 ppm/°C × 65°C
E-grade: ±2.98% = ±2.0% ±150 ppm/°C × 65°C
The total overtemperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±3.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade 2.5-V LM4040-N has an overtemperature Reverse Breakdown Voltage tolerance of ±2.5V × 0.75% = ±19 mV.
(4) Load regulation is measured on pulse basis from no load to the specified load current. Output changes due to die temperature change must be taken into account separately.
(5) Thermal hysteresis is defined as the difference in voltage measured at +25°C after cycling to temperature -40°C and the 25°C measurement after cycling to temperature 125°C.

## 6.23 Typical Characteristics

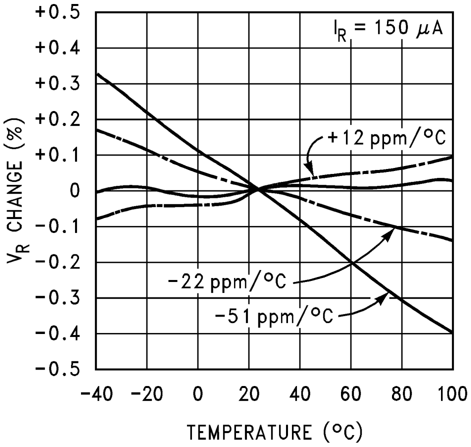



Figure 1. Temperature Drift For Different Average Temperature Coefficient

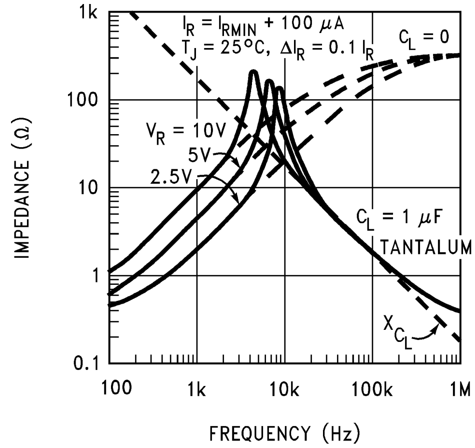



Figure 2. Output Impedance vs Frequency

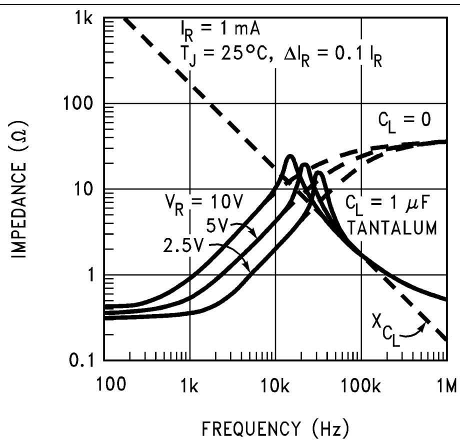



Figure 3. Output Impedance vs Frequency

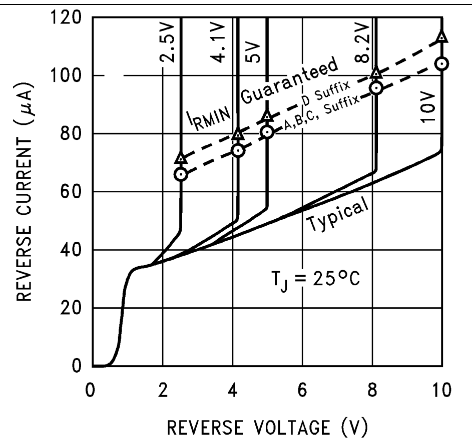



Figure 4. Reverse Characteristics And Minimum Operating Current

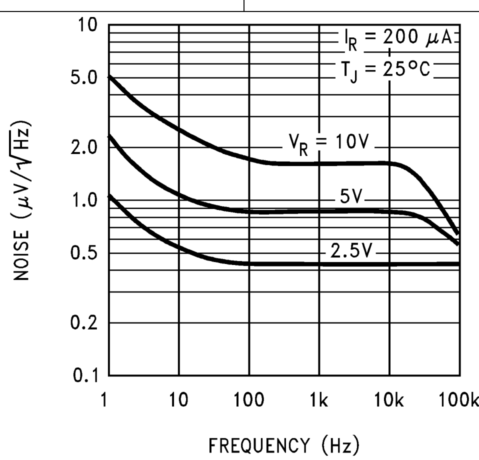
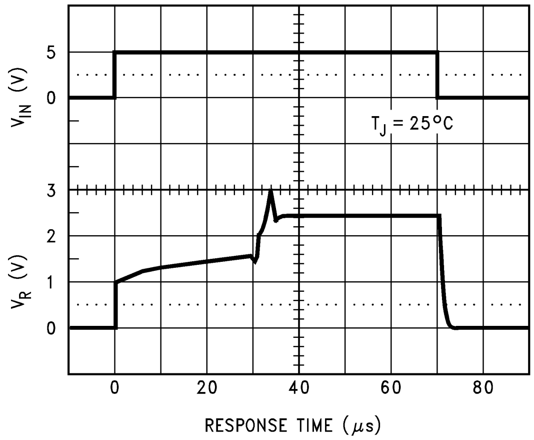


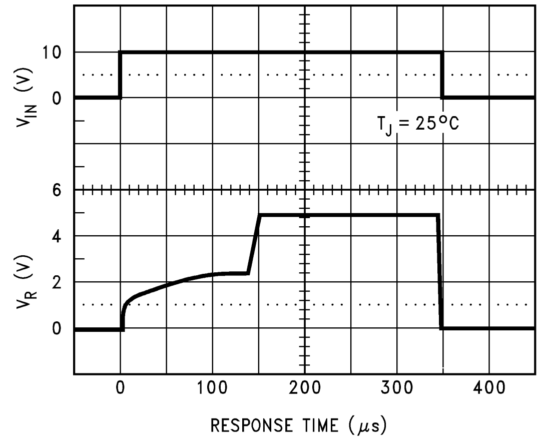

Figure 5. Noise Voltage vs Frequency

### 6.23.1 Start-Up Characteristics



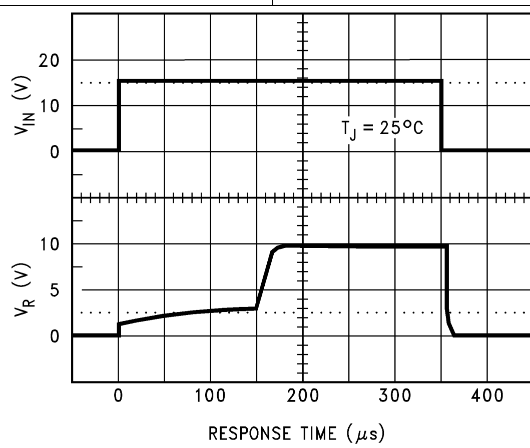

$R_S$ = 30k

**Figure 6. Input Voltage Step Response LM4040-N-2.5**




$R_S$ = 30k

**Figure 7. Input Voltage Step Response LM4040-N-5**




$R_S$ = 30k

**Figure 8. Input Voltage Step Response LM4040-N-10**

# 7 Parameter Measurement Information

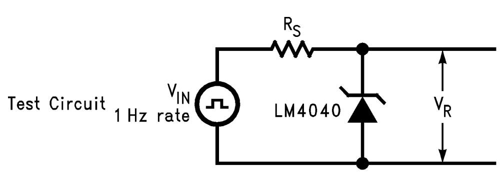


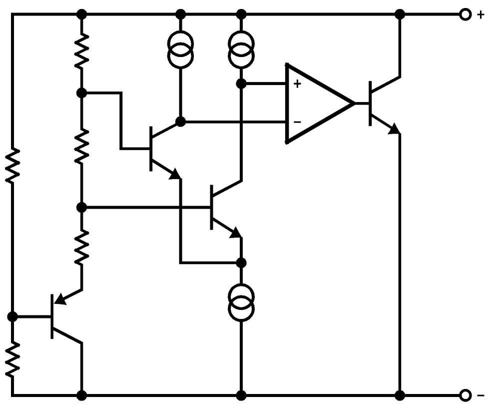

**Figure 9. Test Circuit**

# 8 Detailed Description

## 8.1 Overview

The LM4040 device is a precision micropower shunt voltage reference available in 7 different fixed-output voltage options and three different packages to meet small footprint requirements. The part is also available in five different tolerance grades.

## 8.2 Functional Block Diagram




## 8.3 Feature Description

The LM4040 device is effectively a precision Zener diode. The part requires a small quiescent current for regulation, and regulates the output voltage by shunting more or less current to ground, depending on input voltage and load. The only external component requirement is a resistor between the cathode and the input voltage to set the input current. An external capacitor can be used on the input or output, but is not required.

## 8.4 Device Functional Modes

The LM4040 device is a fixed output voltage part, where the feedback is internal. Therefore, the part can only operate is a closed loop mode and the output voltage cannot be adjusted. The output voltage will remain in regulation as long as $I_R$ is between $I_{RMIN}$, see *Electrical Characteristics: 2-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'*, and $I_{RMAX}$, 15 mA. Proper selection of the external resistor for input voltage range and load current range will ensure these conditions are met.

# 9 Application and Implementation

**NOTE**

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

## 9.1 Application Information

The LM4040-N is a precision micropower curvature-corrected bandgap shunt voltage reference. For space critical applications, the LM4040-N is available in SOT-23 and SC70 surface-mount packages. The LM4040-N has been designed for stable operation without the need of an external capacitor connected between the + pin and the − pin. If, however, a bypass capacitor is used, the LM4040-N remains stable. Reducing design effort is the availability of several fixed reverse breakdown voltages: 2.048 V, 2.5 V, 3 V, 4.096 V, 5 V, 8.192 V, and 10 V. The minimum operating current increases from 60 µA for the LM4040-N-2.048 and LM4040-N-2.5 to 100 µA for the 10-V LM4040-N. All versions have a maximum operating current of 15 mA.

LM4040-Ns in the SOT-23 packages have a parasitic Schottky diode between pin 2 (−) and pin 3 (Die attach interface contact). Therefore, pin 3 of the SOT-23 package must be left floating or connected to pin 2.

LM4040-Ns in the SC70 have a parasitic Schottky diode between pin 1 (−) and pin 2 (Die attach interface contact). Therefore, pin 2 must be left floating or connected to pin1.

The 4.096-V version allows single 5-V 12-bit ADCs or DACs to operate with an LSB equal to 1 mV. For 12-bit ADCs or DACs that operate on supplies of 10 V or greater, the 8.192-V version gives 2 mV per LSB.

The typical thermal hysteresis specification is defined as the change in 25°C voltage measured after thermal cycling. The device is thermal cycled to temperature –40°C and then measured at 25°C. Next the device is thermal cycled to temperature 125°C and again measured at 25°C. The resulting $V_{OUT}$ delta shift between the 25°C measurements is thermal hysteresis. Thermal hysteresis is common in precision references and is induced by thermal-mechanical package stress. Changes in environmental storage temperature, operating temperature and board mounting temperature are all factors that can contribute to thermal hysteresis.

In a conventional shunt regulator application (Figure 10) , an external series resistor ($R_S$) is connected between the supply voltage and the LM4040-N. $R_S$ determines the current that flows through the load ($I_L$) and the LM4040-N ($I_Q$). Since load current and supply voltage may vary, $R_S$ should be small enough to supply at least the minimum acceptable $I_Q$ to the LM4040-N even when the supply voltage is at its minimum and the load current is at its maximum value. When the supply voltage is at its maximum and $I_L$ is at its minimum, $R_S$ should be large enough so that the current flowing through the LM4040-N is less than 15 mA.

$R_S$ is determined by the supply voltage, ($V_S$), the load and operating current, ($I_L$ and $I_Q$), and the LM4040-N's reverse breakdown voltage, $V_R$.

$$R_S = \frac{V_S - V_R}{I_L + I_Q} \quad (1)$$

## 9.2 Typical Applications

### 9.2.1 Shunt Regulator

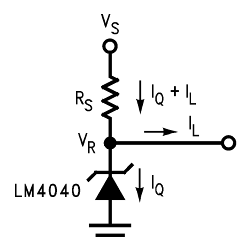



**Figure 10. Shunt Regulator Schematic**

## Typical Applications (continued)

#### *9.2.1.1 Design Requirements*

$V_{IN} > V_{OUT}$

Select $R_S$ such that:

$I_{RMIN} < I_R < I_{RMAX}$ where $I_{RMAX}$ = 15 mA

See *Electrical Characteristics: 2-V LM4040-N $V_R$ Tolerance Grades 'A' And 'B'; Temperature Grade 'I'* for minimum operating current for each voltage option and grade.

#### *9.2.1.2 Detailed Design Procedure*

The resistor $R_S$ must be selected such that current IR will remain in the operational region of the part for the entire $V_{IN}$ range and load current range. The two extremes to consider are $V_{IN}$ at its minimum, and the load at its maximum, where $R_S$ must be small enough for $I_R$ to remain above $I_{RMIN}$. The other extreme is $V_{IN}$ at its maximum, and the load at its minimum, where $R_S$ must be large enough to maintain $I_R < I_{RMAX}$. For most designs, 0.1 mA ≤ $I_R$ ≤ 1 mA is a good starting point.

Use Equation 2 and Equation 3 to set $R_S$ between $R_{S\_MIN}$ and $R_{S\_MAX}$.

$$R_{S\_MIN} = \frac{V_{IN\_MAX} - V_{OUT}}{I_{LOAD\_MIN} + I_{R\_MAX}} \quad (2)$$

$$R_{S\_MAX} = \frac{V_{IN\_MIN} - V_{OUT}}{I_{LOAD\_MAX} + I_{R\_MIN}} \quad (3)$$

#### *9.2.1.3 Application Curve*

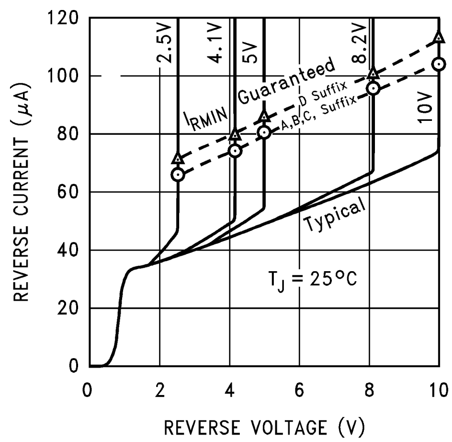
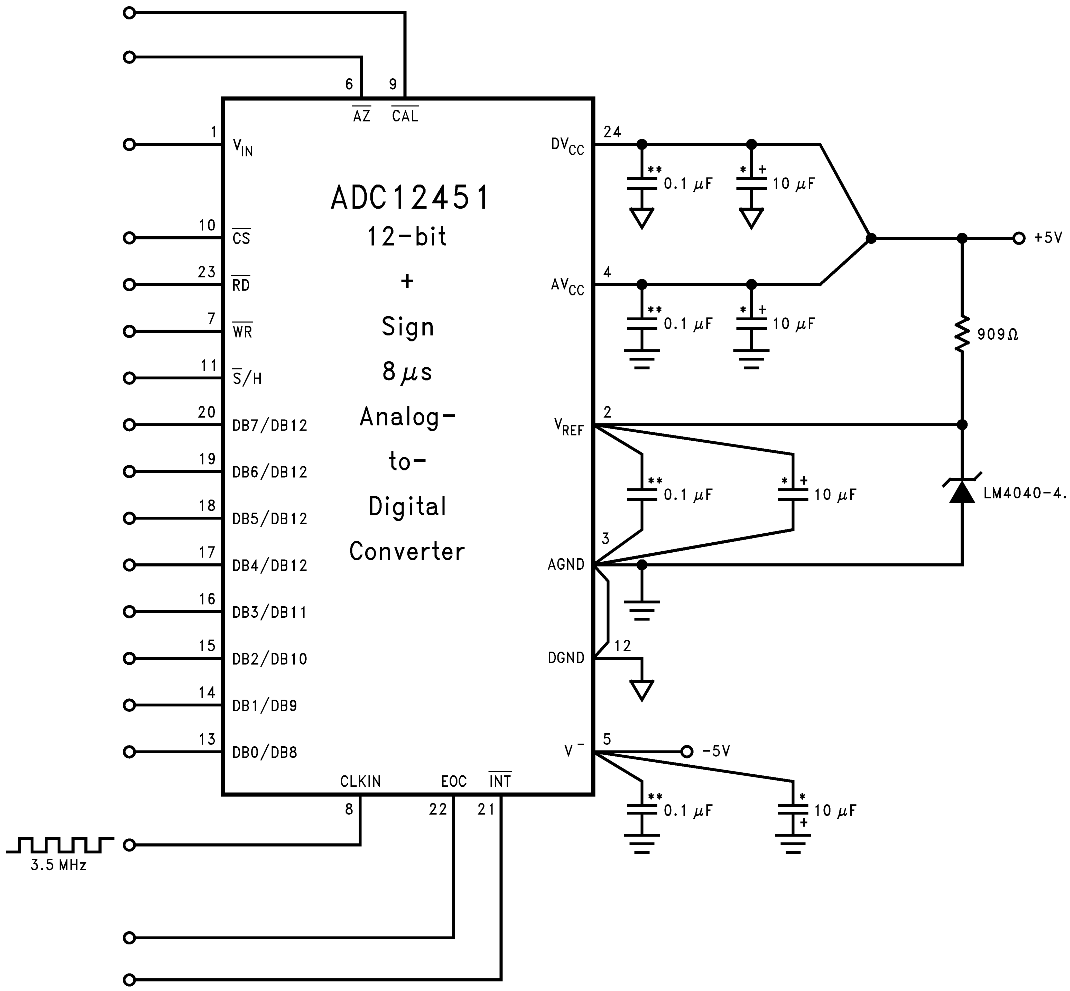



**Figure 11. Reverse Characteristics And Minimum Operating Current**

## Typical Applications (continued)

### 9.2.2 4.1-V ADC Application




**Ceramic monolithic
*Tantalum

**Figure 12. 4.1-V LM4040-N'S Nominal 4.096 Breakdown Voltage Gives ADC12451 1 MV/LSB**

#### *9.2.2.1 Design Requirements*

The only design requirement is for an output voltage of 4.096 V.

#### *9.2.2.2 Detailed Design Procedure*

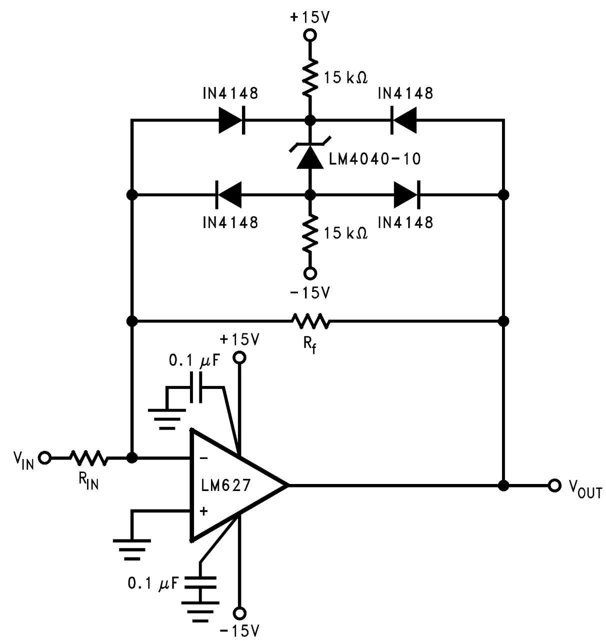
Using an LM4040-4.1, select an appropriate $R_S$ to sufficiently power the device. Set the target $I_R$ for 1 mA. With an input voltage of 5 V, the resistor can be calculated:

$$R = \frac{5\ V - 4.096\ V}{1 mA} = 904\ \Omega \quad (4)$$

The closest available resistance of 909 Ω is used here, which in turn yields an $I_R$ of 994 µA.

## Typical Applications (continued)

### 9.2.3 Bounded Amplifier




Nominal clamping voltage is ±11.5 V (LM4040-N's reverse breakdown voltage +2 diode $V_F$).

**Figure 13. Bounded Amplifier Reduces Saturation-Induced Delays and Can Prevent Succeeding Stage Damage**

#### *9.2.3.1 Design Requirements*

Design an amplifier with output clamped at ±11.5 V.

#### *9.2.3.2 Detailed Design Procedure*

With amplifier rails of ±15 V, the output can be bound to ±11.5 V with the LM4040-10 and two nominal diode voltage drops of 0.7 V.

$$V_{OUTBound} = 2 \times VFWD + VZ \quad (5)$$

$$V_{OUTBound} = 1.4\text{ V} + 10\text{ V} \quad (6)$$

Select $R_S$ = 15 kΩ to keep $I_R$ low. Calculate $I_R$ to confirm RS selection.

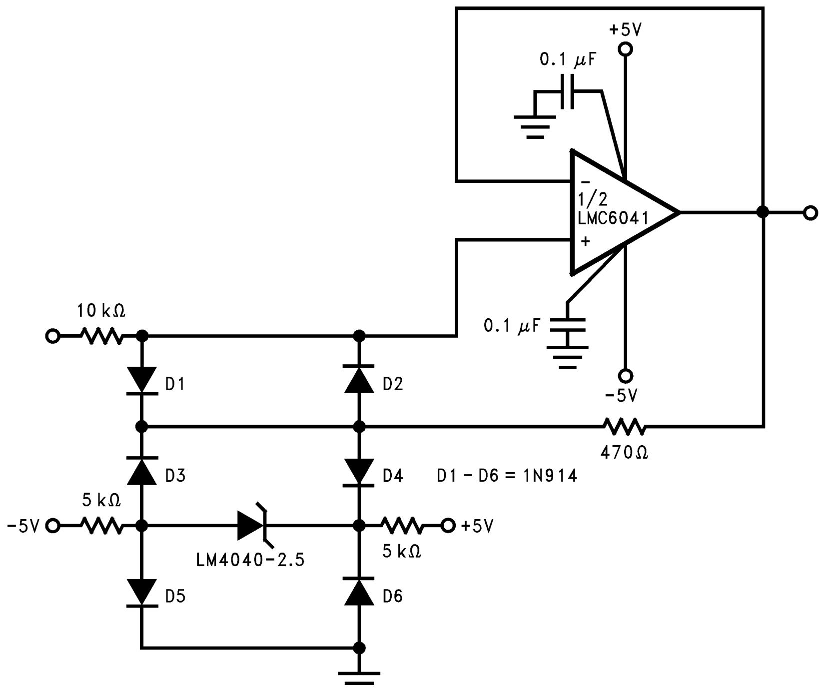
$I_R = (V_{IN} – V_{OUT}) / R$, however in this case, the negative supply must be taken into account. (7)

$$I_R = (V_{IN+} – V_{IN-} – V_{OUT})/R = (30\text{ V} – 10\text{ V}) / (R_{S1}+R_{S2}) = 20\text{ V} / 30\text{ k}\Omega = 0.667\text{ mA} \quad (8)$$

This is an acceptable value for $I_R$ that will not draw excessive current, but prevents the part from being starved for current.

## Typical Applications (continued)

### 9.2.4 Protecting Op-Amp Input




The bounding voltage is ±4 V with the 2.5-V LM4040-N (LM4040-N's reverse breakdown voltage + 3 diode $V_F$).

**Figure 14. Protecting Op Amp Input**

#### *9.2.4.1 Design Requirements*

Limit the input voltage to the op-amp to ±4 V.

#### *9.2.4.2 Detailed Design Procedure*

Similar to *Bounded Amplifier*, this design uses a LM4040-2.5 and three forward diode voltage drops to create a voltage clamp. The procedure for selecting the $R_S$ resistors, in this case 5 kΩ, is the same as *Detailed Design Procedure*.

$$I_R = (V_{IN+} – V_{IN-} – V_{OUT}) / R = (10\ V – 2.5\ V) / (R_{S1} + R_{S2}) = 7.5\ V / 10\ k\Omega = 0.750\ mA \quad (9)$$

## Typical Applications (continued)

### 9.2.5 Precision ±4.096-V Reference

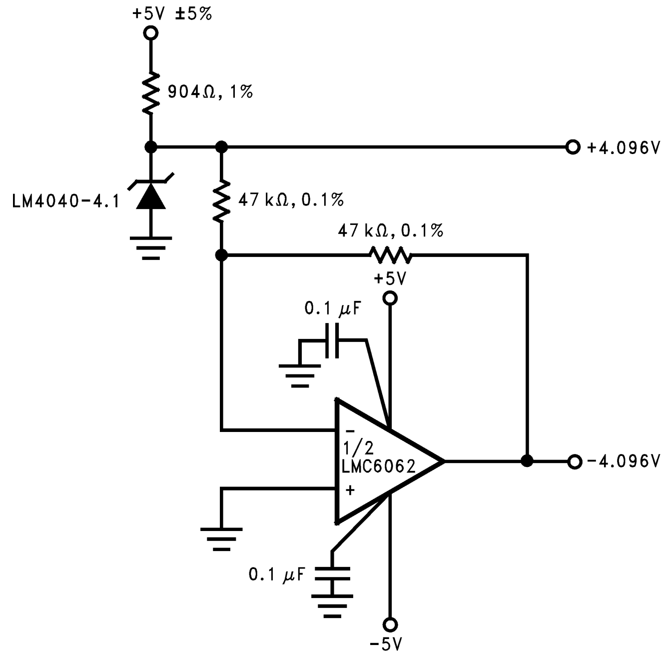



**Figure 15. Precision ±4.096-V Reference**

#### *9.2.5.1 Design Requirements*

Use a single voltage reference to create positive and negative reference rails, ±4.096 V.

#### *9.2.5.2 Detailed Design Procedure*

The procedure for selecting the $R_S$ resistor is same as detailed in *Detailed Design Procedure*. The output of the voltage reference is used as the inverting input to the op-amp, with unity gain.

## Typical Applications (continued)

### 9.2.6 Precision Current Sink/Source

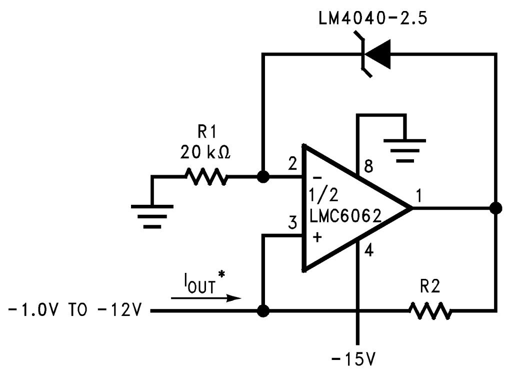



**Figure 16. Precision 1-mA Current Sink**

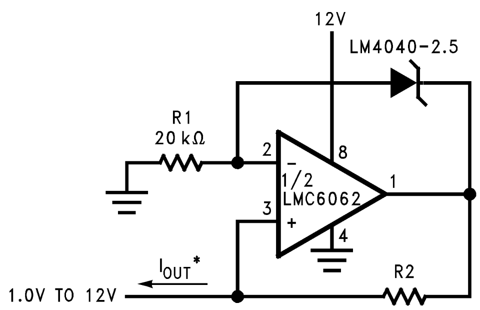



**Figure 17. Precision 1-mA Current Source**

#### *9.2.6.1 Design Requirements*

Create precision 1-mA current sink and/or 1-mA current source.

#### *9.2.6.2 Detailed Design Procedure*

Set R1 such that the current through the shunt reference, $I_R$, is greater than $I_{RMIN}$.

$I_{OUT} = V_{OUT} / R_2$ where $V_{OUT}$ is the voltage drop across the shunt reference. In this case,

$I_{OUT} = 2.5 / R_2$

## 10 Power Supply Recommendations

While a bypass capacitor is not required on the input voltage line, TI recommends reducing noise on the input which could affect the output. A 0.1-µF ceramic capacitor or larger is recommended.

## 11 Layout

### 11.1 Layout Guidelines

Place external components as close to the device as possible. Place RS close the cathode, as well as the input bypass capacitor, if used.

### 11.2 Layout Example

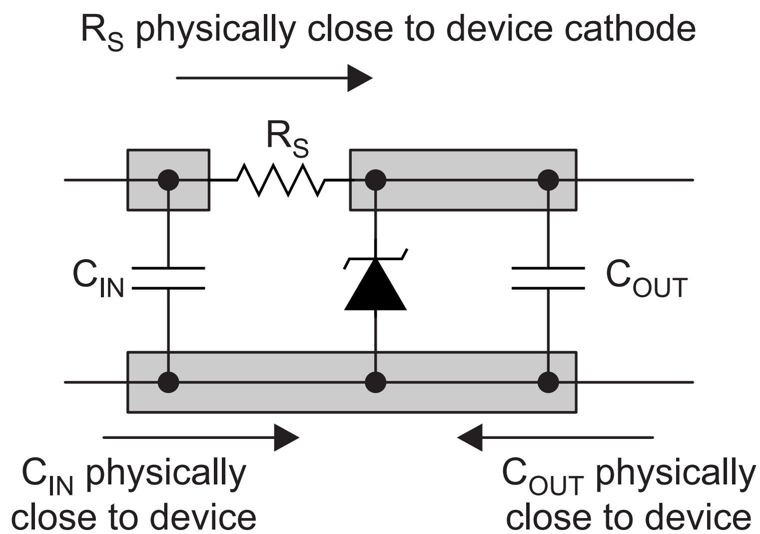



**Figure 18. Layout Diagram**

# 12 デバイスおよびドキュメントのサポート

## 12.1 ドキュメントのサポート

### 12.1.1 関連資料

関連資料については、以下を参照してください。

- *『ハンダ付けの絶対最大定格』アプリケーション・レポート*(SNOA549)
- *『LM4040-N/-Q1高精度マイクロパワー・シャント型基準電圧』* (SNOS641)

## 12.2 関連リンク

次の表に、クイック・アクセス・リンクを示します。カテゴリには、技術資料、サポートおよびコミュニティ・リソース、ツールとソフトウェア、およびご注文へのクイック・アクセスが含まれます。

**表 1. 関連リンク**

| 製品 | プロダクト・フォルダ | ご注文はこちら | 技術資料 | ツールとソフトウェア | サポートとコミュニティ |
|---|---|---|---|---|---|
| LM4040-N | ここをクリック | ここをクリック | ここをクリック | ここをクリック | ここをクリック |
| LM4040-N-Q1 | ここをクリック | ここをクリック | ここをクリック | ここをクリック | ここをクリック |

## 12.3 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、ti.comのデバイス製品フォルダを開いてください。右上の隅にある「*通知を受け取る*」をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取れます。変更の詳細については、修正されたドキュメントに含まれている改訂履歴をご覧ください。

## 12.4 コミュニティ・リソース

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

**TI E2E™オンライン・コミュニティ** ***TIのE2E(Engineer-to-Engineer)コミュニティ。*** エンジニア間の共同作業を促進するために開設されたものです。e2e.ti.comでは、他のエンジニアに質問し、知識を共有し、アイディアを検討して、問題解決に役立てることができます。

**設計サポート** ***TIの設計サポート*** 役に立つE2Eフォーラムや、設計サポート・ツールをすばやく見つけることができます。技術サポート用の連絡先情報も参照できます。

## 12.5 商標

E2E is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

## 12.6 静電気放電に関する注意事項

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## 12.7 Glossary

SLYZ022 — *TI Glossary*.
This glossary lists and explains terms, acronyms, and definitions.

# 13 メカニカル、パッケージ、および注文情報

以降のページには、メカニカル、パッケージ、および注文に関する情報が記載されています。この情報は、そのデバイスについて利用可能な最新のデータです。このデータは予告なく変更されることがあり、ドキュメントが改訂される場合もあります。本データシートのブラウザ版を使用されている場合は、画面左側の説明をご覧ください。

### 13.1 SOT-23、SC70パッケージ・マーキング情報

SOT-23、SC70で可能なパッケージ・マーキングの文字数は3文字です。3文字の意味を表中に示します。

第1フィールド
- R = 基準電圧

第2フィールド: 電圧オプション
- J = 2.048V電圧オプション
- 2 = 2.5V電圧オプション
- K = 3V電圧オプション
- 4 = 4.096V電圧オプション
- 5 = 5V電圧オプション
- 8 = 8.129V電圧オプション
- 0 = 10V電圧オプション

第3フィールド: 逆方向降伏電圧または基準電圧の初期公差
- A = ±0.1%
- B = ±0.2%
- C = ±0.5%
- D = ±1.0%
- E = ±2.0%

| 部品マーキング | フィールドの定義 |
|---|---|
| RJA (SOT-23のみ) | 基準電圧、2.048V、±0.1% |
| R2A (SOT-23のみ) | 基準電圧、2.5V、±0.1% |
| RKA (SOT-23のみ) | 基準電圧、3V、±0.1% |
| R4A (SOT-23のみ) | 基準電圧、4.096V、±0.1% |
| R5A (SOT-23のみ) | 基準電圧、5V、±0.1% |
| R8A (SOT-23のみ) | 基準電圧、8.192V、±0.1% |
| R0A (SOT-23のみ) | 基準電圧、10V、±0.1% |
| RJB | 基準電圧、2.048V、±0.2% |
| R2B | 基準電圧、2.5V、±0.2% |
| RKB | 基準電圧、3V、±0.2% |
| R4B | 基準電圧、4.096V、±0.2% |
| R5B | 基準電圧、5V、±0.2% |
| R8B (SOT-23のみ) | 基準電圧、8.192V、±0.2% |
| R0B (SOT-23のみ) | 基準電圧、10V、±0.2% |
| RJC | 基準電圧、2.048V、±0.5% |
| R2C | 基準電圧、2.5V、±0.5% |
| RKC | 基準電圧、3V、±0.5% |
| R4C | 基準電圧、4.096V、±0.5% |
| R5C | 基準電圧、5V、±0.5% |
| R8C (SOT-23のみ) | 基準電圧、8.192V、±0.5% |
| R0C (SOT-23のみ) | 基準電圧、10V、±0.5% |
| RJD | 基準電圧、2.048V、±1.0% |
| R2D | 基準電圧、2.5V、±1.0% |
| RKD | 基準電圧、3V、±1.0% |
| R4D | 基準電圧、4.096V、±1.0% |
| R5D | 基準電圧、5V、±1.0% |
| R8D (SOT-23のみ) | 基準電圧、8.192V、±1.0% |
| R0D (SOT-23のみ) | 基準電圧、10V、±1.0% |

## SOT-23、SC70パッケージ・マーキング情報 (continued)

| 部品マーキング | フィールドの定義 |
|---|---|
| RJE | 基準電圧、2.048V、±2.0% |
| R2E | 基準電圧、2.5V、±2.0% |
| RKE | 基準電圧、3V、±2.0% |

## 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) |
|---|---|---|---|---|---|---|---|---|---|
| LM4040AIM3-10.0/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0A |
| LM4040AIM3-10.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0A |
| LM4040AIM3-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | RJA |
| LM4040AIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R2A |
| LM4040AIM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKA |
| LM4040AIM3-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R4A |
| LM4040AIM3-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R5A |
| LM4040AIM3X-10/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0A |
| LM4040AIM3X-10/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R0A |
| LM4040AIM3X-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | RJA |
| LM4040AIM3X-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R2A |
| LM4040AIM3X-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | RKA |
| LM4040AIM3X-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R4A |
| LM4040AIM3X-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R5A |
| LM4040AIZ-10.0/NO.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | -40 to 85 | 4040A IZ10 |
| LM4040AIZ-10.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | - | 4040A IZ10 |
| LM4040AIZ-2.5/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040A IZ2.5 |
| LM4040AIZ-2.5/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040A IZ2.5 |
| LM4040AIZ-4.1/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040A IZ4.1 |
| LM4040AIZ-4.1/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040A IZ4.1 |
| LM4040AIZ-5.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040A IZ5.0 |
| LM4040AIZ-5.0/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040A IZ5.0 |
| LM4040BIM3-10.0/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0B |

| 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) |
|---|---|---|---|---|---|---|---|---|---|
| LM4040BIM3-10.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R0B |
| LM4040BIM3-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RJB |
| LM4040BIM3-2.5 | Obsolete | Production | SOT-23 (DBZ) \| 3 | - | - | Call TI | Call TI | - | R2B |
| LM4040BIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R2B |
| LM4040BIM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKB |
| LM4040BIM3-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R4B |
| LM4040BIM3-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5B |
| LM4040BIM3-8.2/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R8B |
| LM4040BIM3-8.2/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R8B |
| LM4040BIM3X-10/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0B |
| LM4040BIM3X-10/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R0B |
| LM4040BIM3X-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RJB |
| LM4040BIM3X-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R2B |
| LM4040BIM3X-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKB |
| LM4040BIM3X-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R4B |
| LM4040BIM3X-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5B |
| LM4040BIM7-2.0/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | RJB |
| LM4040BIM7-2.0/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | RJB |
| LM4040BIM7-2.5/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R2B |
| LM4040BIM7-2.5/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | - | R2B |
| LM4040BIM7-5.0/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R5B |
| LM4040BIM7-5.0/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R5B |
| LM4040BIM7X-2.5/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R2B |
| LM4040BIM7X-2.5/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R2B |
| LM4040BIZ-10.0/NO.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | -40 to 85 | 4040B IZ10 |
| LM4040BIZ-10.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | - | 4040B IZ10 |
| LM4040BIZ-2.5/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040B IZ2.5 |
| LM4040BIZ-2.5/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040B IZ2.5 |

| 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) |
|---|---|---|---|---|---|---|---|---|---|
| LM4040BIZ-4.1/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040B IZ4.1 |
| LM4040BIZ-4.1/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040B IZ4.1 |
| LM4040BIZ-5.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040B IZ5.0 |
| LM4040BIZ-5.0/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040B IZ5.0 |
| LM4040CEM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R2C |
| LM4040CEM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKC |
| LM4040CEM3-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5C |
| LM4040CEM3X-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKC |
| LM4040CEM3X-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5C |
| LM4040CIM3-10.0/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0C |
| LM4040CIM3-10.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R0C |
| LM4040CIM3-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RJC |
| LM4040CIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R2C |
| LM4040CIM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKC |
| LM4040CIM3-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R4C |
| LM4040CIM3-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5C |
| LM4040CIM3-8.2/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R8C |
| LM4040CIM3-8.2/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R8C |
| LM4040CIM3X-10/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0C |
| LM4040CIM3X-10/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R0C |
| LM4040CIM3X-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RJC |
| LM4040CIM3X-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R2C |
| LM4040CIM3X-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKC |
| LM4040CIM3X-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R4C |
| LM4040CIM3X-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5C |
| LM4040CIM7-2.0/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | RJC |
| LM4040CIM7-2.0/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | RJC |
| LM4040CIM7-2.5/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R2C |

| 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) |
|---|---|---|---|---|---|---|---|---|---|
| LM4040CIM7-2.5/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | - | R2C |
| LM4040CIM7X-2.5/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R2C |
| LM4040CIM7X-2.5/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R2C |
| LM4040CIZ-10.0/NO.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | -40 to 85 | 4040C IZ10 |
| LM4040CIZ-10.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | - | 4040C IZ10 |
| LM4040CIZ-2.5/LFT8 | Active | Production | TO-92 (LP) \| 3 | 2000 \| LARGE T&R | Yes | Call TI | N/A for Pkg Type | - | 4040C IZ2.5 |
| LM4040CIZ-2.5/LFT8.Z | Active | Production | TO-92 (LP) \| 3 | 2000 \| LARGE T&R | Yes | Call TI | N/A for Pkg Type | -40 to 85 | 4040C IZ2.5 |
| LM4040CIZ-2.5/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040C IZ2.5 |
| LM4040CIZ-2.5/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040C IZ2.5 |
| LM4040CIZ-4.1/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040C IZ4.1 |
| LM4040CIZ-4.1/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040C IZ4.1 |
| LM4040CIZ-5.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040C IZ5.0 |
| LM4040CIZ-5.0/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040C IZ5.0 |
| LM4040DEM3-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RJD |
| LM4040DEM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R2D |
| LM4040DEM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKD |
| LM4040DEM3-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5D |
| LM4040DEM3X-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R2D |
| LM4040DEM3X-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5D |
| LM4040DIM3-10.0/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0D |
| LM4040DIM3-10.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R0D |
| LM4040DIM3-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RJD |
| LM4040DIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R2D |

| 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) |
|---|---|---|---|---|---|---|---|---|---|
| LM4040DIM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKD |
| LM4040DIM3-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R4D |
| LM4040DIM3-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5D |
| LM4040DIM3-8.2/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R8D |
| LM4040DIM3-8.2/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R8D |
| LM4040DIM3X-10/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R0D |
| LM4040DIM3X-10/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R0D |
| LM4040DIM3X-2.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RJD |
| LM4040DIM3X-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R2D |
| LM4040DIM3X-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKD |
| LM4040DIM3X-4.1/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R4D |
| LM4040DIM3X-5.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R5D |
| LM4040DIM7-2.0/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | RJD |
| LM4040DIM7-2.0/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | RJD |
| LM4040DIM7-2.5/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R2D |
| LM4040DIM7-2.5/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R2D |
| LM4040DIM7-5.0/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | R5D |
| LM4040DIM7-5.0/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R5D |
| LM4040DIZ-10.0/NO.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | -40 to 85 | 4040D IZ10 |
| LM4040DIZ-10.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | - | 4040D IZ10 |
| LM4040DIZ-2.5/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040D IZ2.5 |
| LM4040DIZ-2.5/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | -40 to 85 | 4040D IZ2.5 |
| LM4040DIZ-4.1/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040D IZ4.1 |
| LM4040DIZ-4.1/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040D IZ4.1 |
| LM4040DIZ-5.0/LFT1 | Active | Production | TO-92 (LP) \| 3 | 2000 \| LARGE T&R | Yes | SN | N/A for Pkg Type | - | 4040D IZ5.0 |

| 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) |
|---|---|---|---|---|---|---|---|---|---|
| LM4040DIZ-5.0/LFT1.Z | Active | Production | TO-92 (LP) \| 3 | 2000 \| LARGE T&R | Yes | SN | N/A for Pkg Type | -40 to 85 | 4040D IZ5.0 |
| LM4040DIZ-5.0/NOPB | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI \| Sn | N/A for Pkg Type | - | 4040D IZ5.0 |
| LM4040DIZ-5.0/NOPB.Z | Active | Production | TO-92 (LP) \| 3 | 1800 \| BULK | Yes | Call TI | N/A for Pkg Type | -40 to 85 | 4040D IZ5.0 |
| LM4040EEM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R2E |
| LM4040EIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | R2E |
| LM4040EIM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| SMALL T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKE |
| LM4040EIM3X-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU \| SN | Level-1-260C-UNLIM | - | R2E |
| LM4040EIM3X-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | - | RKE |
| LM4040EIM7-2.0/NO.Z | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | RJE |
| LM4040EIM7-2.0/NOPB | Active | Production | SC70 (DCK) \| 5 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | RJE |
| LM4040QAIM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6A |
| LM4040QAIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | - | R6A |
| LM4040QAIM3X2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6A |
| LM4040QAIM3X2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R6A |
| LM4040QBIM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6B |
| LM4040QBIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | - | R6B |
| LM4040QBIM3X2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6B |
| LM4040QBIM3X2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R6B |
| LM4040QCEM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R2C |
| LM4040QCEM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R2C |
| LM4040QCEM3-3.0/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R3C |
| LM4040QCEM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R3C |
| LM4040QCIM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6C |
| LM4040QCIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | - | R6C |
| LM4040QCIM3X2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6C |
| LM4040QCIM3X2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R6C |
| LM4040QDEM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R2D |
| LM4040QDEM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R2D |

| 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) |
|---|---|---|---|---|---|---|---|---|---|
| LM4040QDEM3-3.0/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R3D |
| LM4040QDEM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R3D |
| LM4040QDIM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6D |
| LM4040QDIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | - | R6D |
| LM4040QDIM3X2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6D |
| LM4040QDIM3X2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R6D |
| LM4040QEEM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R2E |
| LM4040QEEM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R2E |
| LM4040QEEM3-3.0/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R3E |
| LM4040QEEM3-3.0/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R3E |
| LM4040QEIM3-2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6E |
| LM4040QEIM3-2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 1000 \| SMALL T&R | Yes | SN | Level-1-260C-UNLIM | - | R6E |
| LM4040QEIM3X2.5/NO.Z | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 125 | R6E |
| LM4040QEIM3X2.5/NOPB | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | - | R6E |

(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.

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 LM4040-N, LM4040-N-Q1 :**

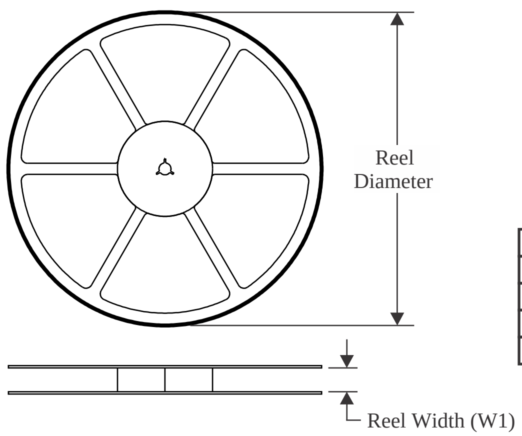
- Catalog : LM4040-N
- Automotive : LM4040-N-Q1

NOTE: Qualified Version Definitions:

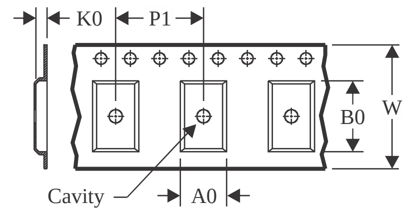
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS

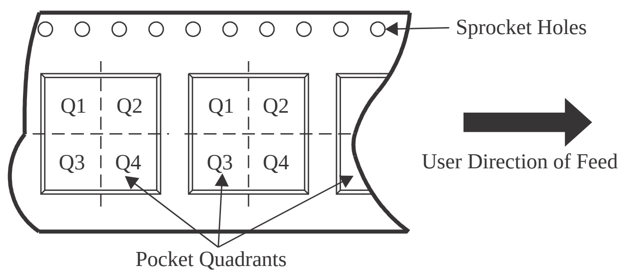



### TAPE DIMENSIONS




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

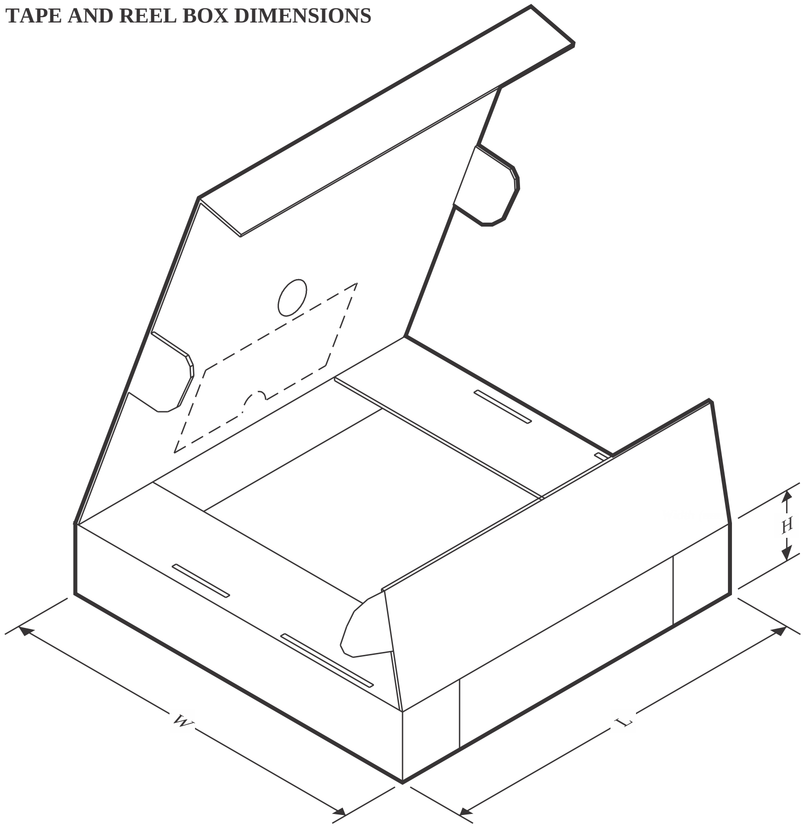
| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LM4040AIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040AIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040AIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040AIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040BIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LM4040BIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3-8.2/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040BIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040BIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040BIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040BIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040BIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040BIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040BIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040BIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040BIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040BIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040CEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CEM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CEM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CEM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040CIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3-8.2/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040CIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040CIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040CIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040CIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040CIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040CIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040CIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040CIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040DEM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LM4040DEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DEM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DEM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DEM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040DIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3-8.2/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040DIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040DIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040DIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040DIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040DIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040DIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040DIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040DIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040EEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040EIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040EIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 1000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040EIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040EIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| LM4040EIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 178.0 | 8.4 | 2.25 | 2.45 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040EIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| LM4040QAIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QAIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QBIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 1000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QBIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QCEM3-2.5/ NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QCEM3-3.0/ NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QCIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QCIM3X2.5/ NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LM4040QDEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QDEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QDIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QDIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QEEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 1000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QEEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 1000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QEIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 1000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |
| LM4040QEIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 178.0 | 8.4 | 3.3 | 2.9 | 1.22 | 4.0 | 8.0 | Q3 |

TAPE AND REEL BOX DIMENSIONS

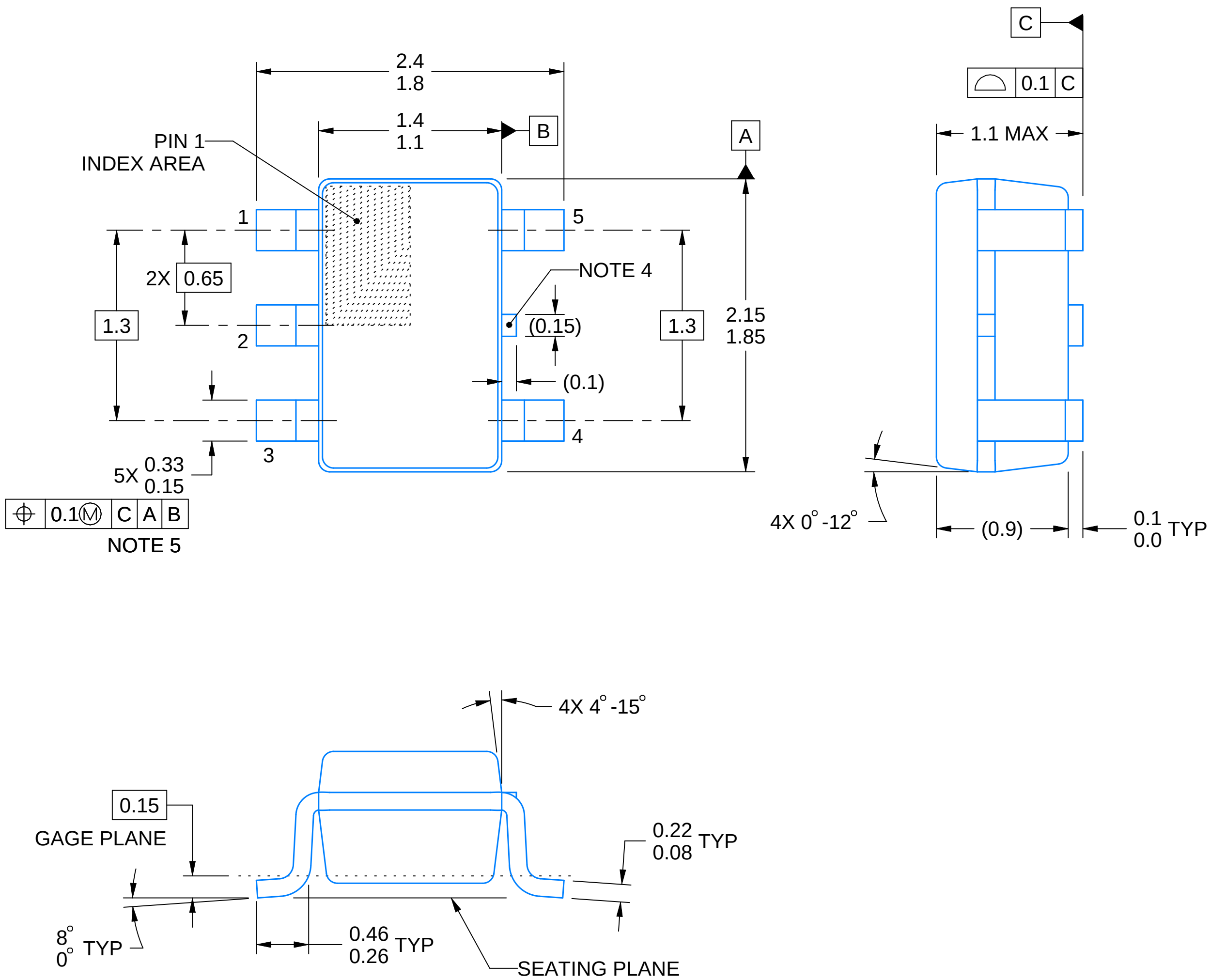



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| LM4040AIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040AIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040AIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040AIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040BIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3-8.2/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| LM4040BIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040BIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040BIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040BIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040BIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040BIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040BIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CEM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CEM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CEM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040CIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3-8.2/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040CIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040CIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040CIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040CIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040CIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040CIM7X-2.5/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DEM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DEM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DEM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |

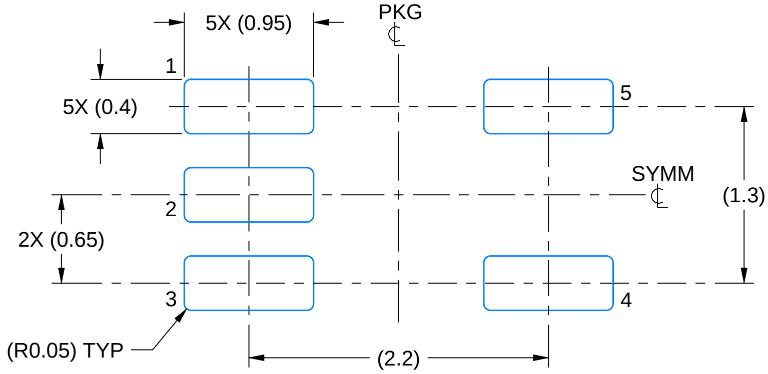
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| LM4040DEM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3-10.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040DIM3-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3-8.2/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040DIM3X-10/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040DIM3X-2.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3X-4.1/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM3X-5.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040DIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040DIM7-2.5/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040DIM7-5.0/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040EEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040EIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040EIM3-3.0/NOPB | SOT-23 | DBZ | 3 | 1000 | 210.0 | 185.0 | 35.0 |
| LM4040EIM3X-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040EIM3X-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040EIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040EIM7-2.0/NOPB | SC70 | DCK | 5 | 3000 | 210.0 | 185.0 | 35.0 |
| LM4040QAIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QAIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QBIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 1000 | 208.0 | 191.0 | 35.0 |
| LM4040QBIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QCEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QCEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QCIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QCIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QDEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QDEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QDIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QDIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |
| LM4040QEEM3-2.5/NOPB | SOT-23 | DBZ | 3 | 1000 | 208.0 | 191.0 | 35.0 |
| LM4040QEEM3-3.0/NOPB | SOT-23 | DBZ | 3 | 1000 | 208.0 | 191.0 | 35.0 |
| LM4040QEIM3-2.5/NOPB | SOT-23 | DBZ | 3 | 1000 | 208.0 | 191.0 | 35.0 |
| LM4040QEIM3X2.5/NOPB | SOT-23 | DBZ | 3 | 3000 | 208.0 | 191.0 | 35.0 |



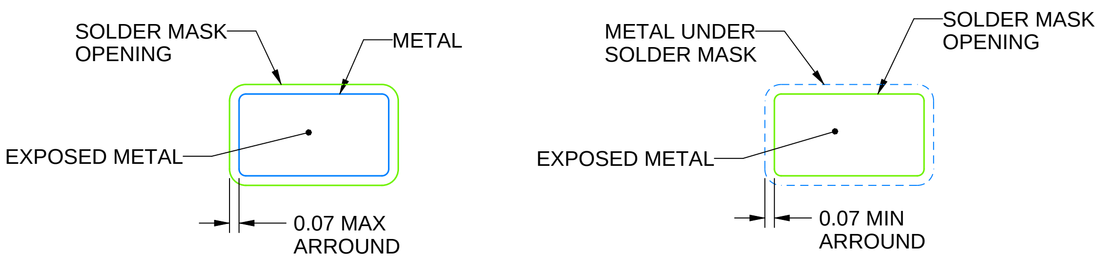

4214834/G 11/2024

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Refernce JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.
6. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side




LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X




SOLDER MASK DETAILS

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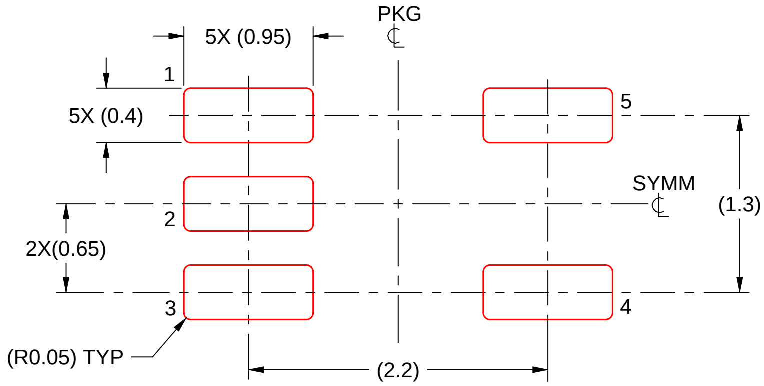
NOTES: (continued)

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




SOLDER PASTE EXAMPLE
BASED ON 0.125 THICK STENCIL
SCALE:18X

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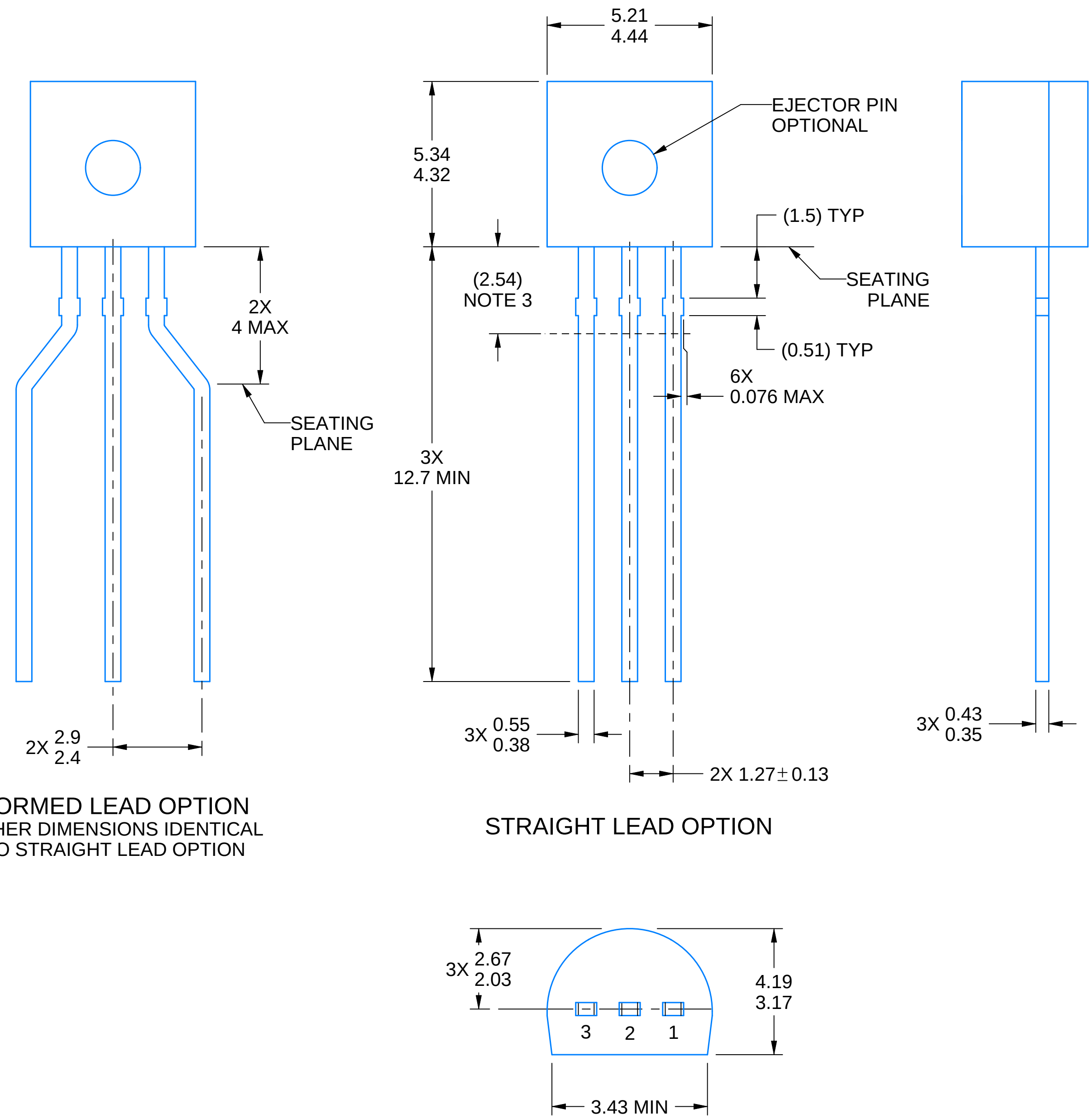
NOTES: (continued)

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

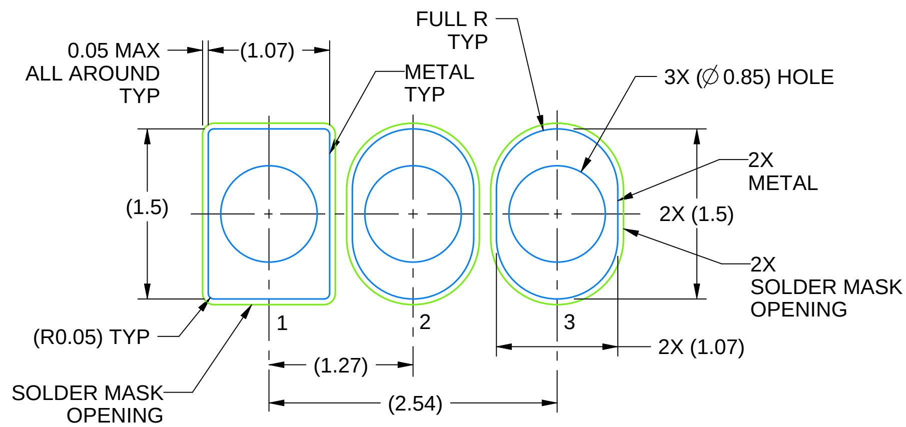




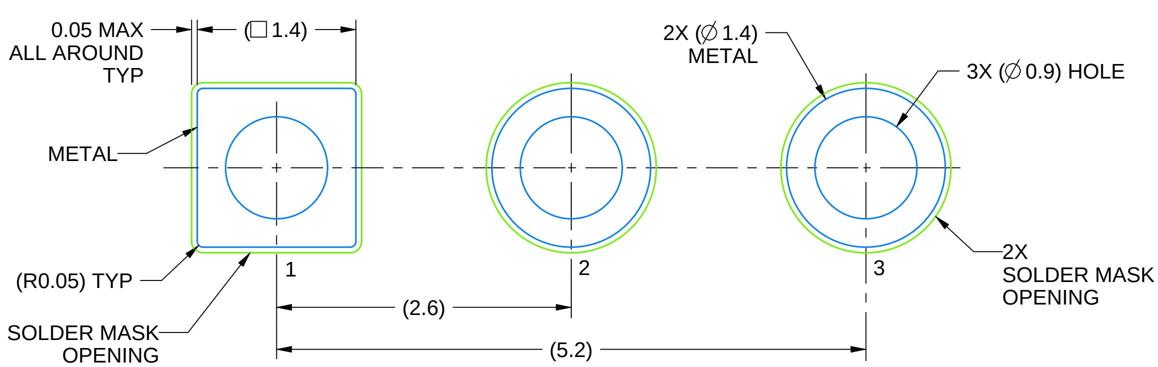

4215214/C 04/2025

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Lead dimensions are not controlled within this area.
4. Reference JEDEC TO-226, variation AA.
5. Shipping method:
    a. Straight lead option available in bulk pack only.
    b. Formed lead option available in tape and reel or ammo pack.
    c. Specific products can be offered in limited combinations of shipping medium and lead options.
    d. Consult product folder for more information on available options.

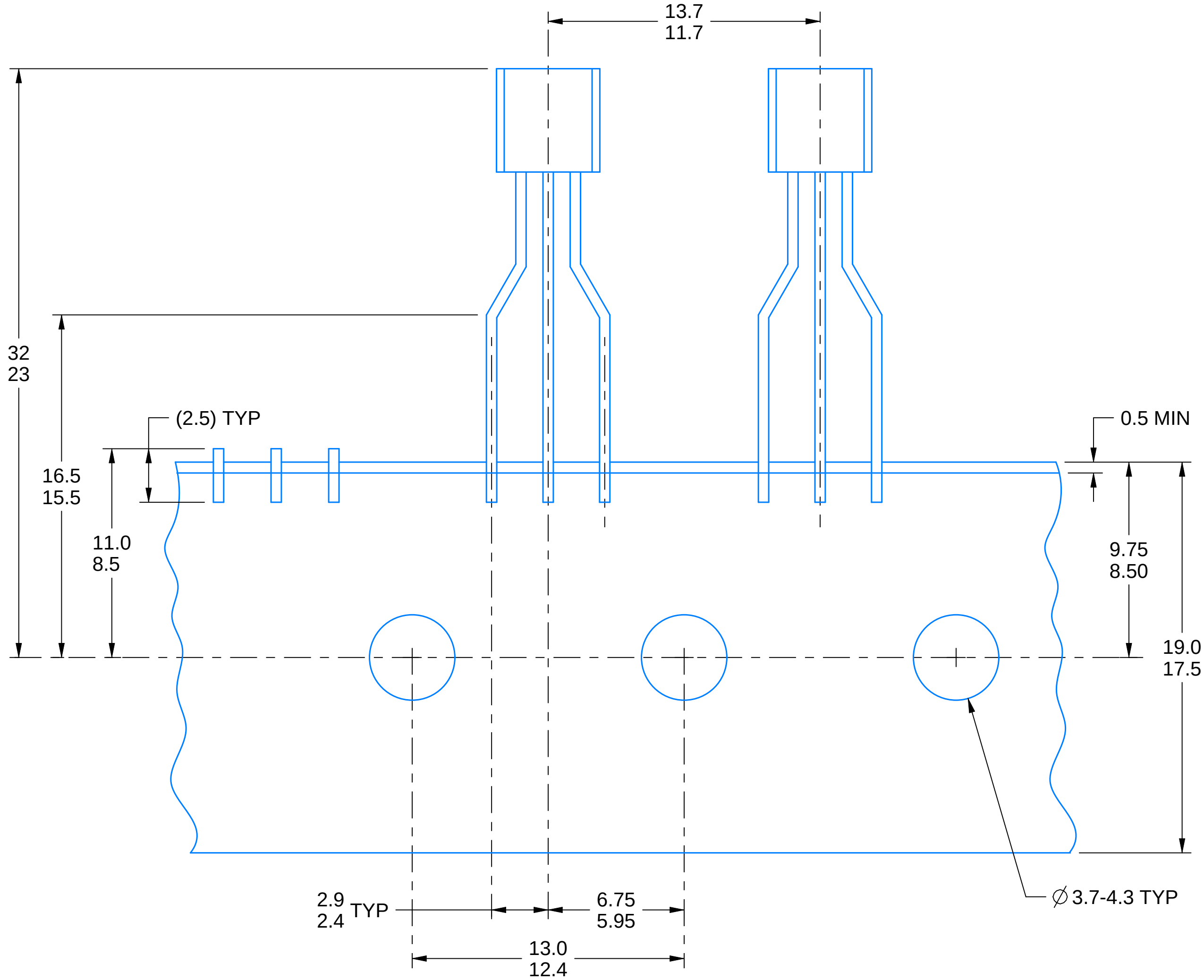



LAND PATTERN EXAMPLE
STRAIGHT LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X



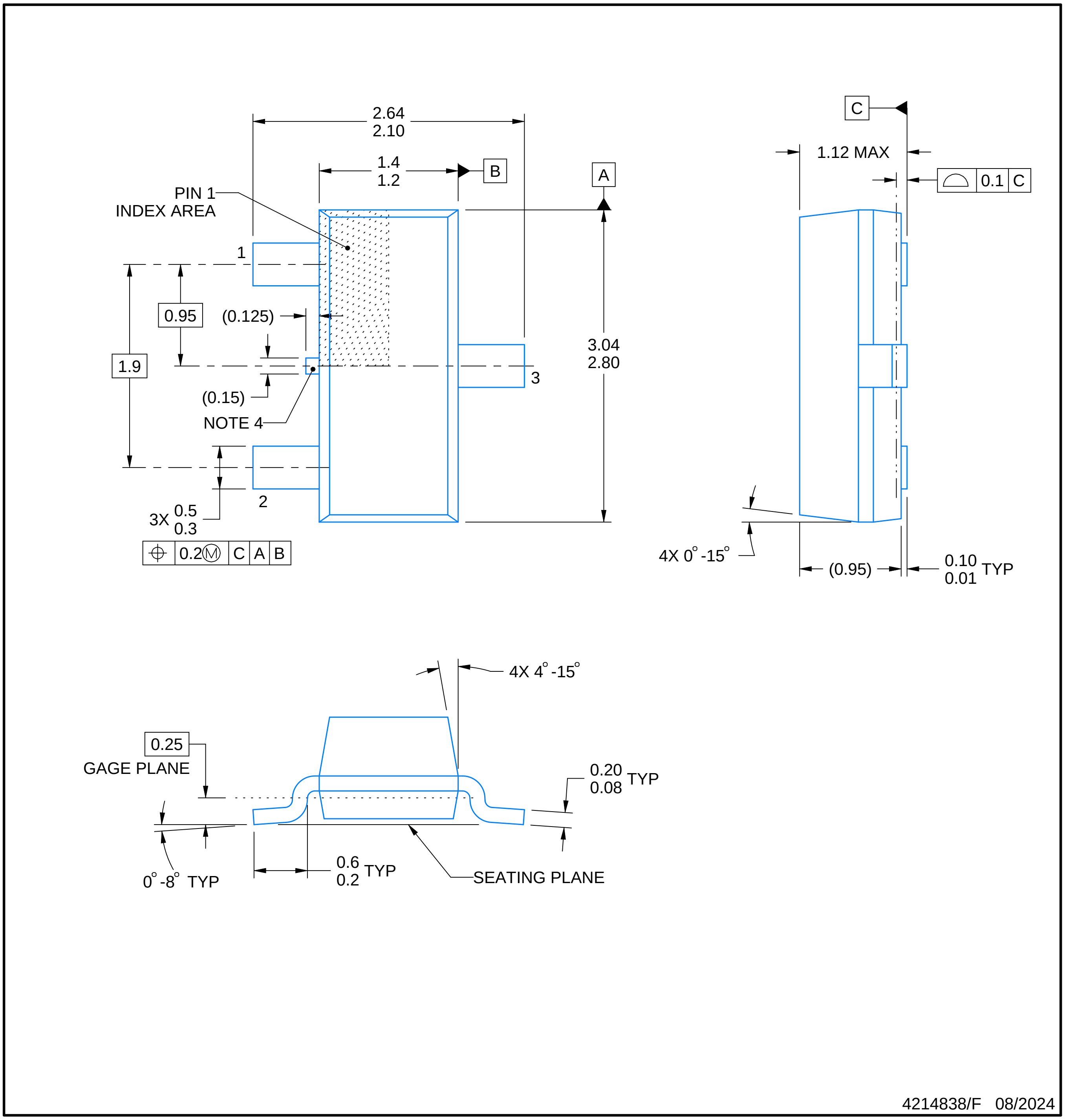

LAND PATTERN EXAMPLE
FORMED LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X

4215214/C 04/2025




FOR FORMED LEAD OPTION PACKAGE

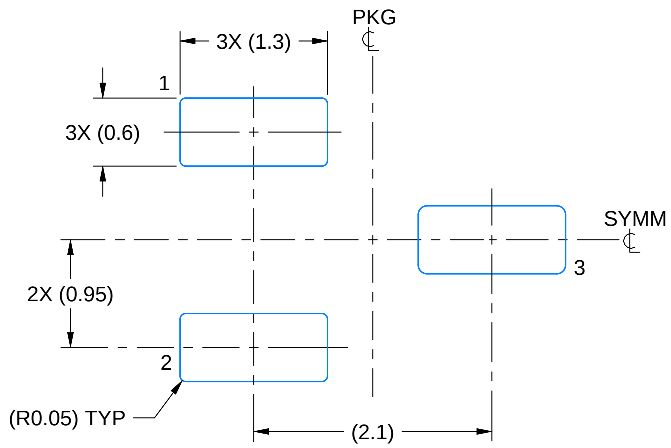
4215214/C 04/2025



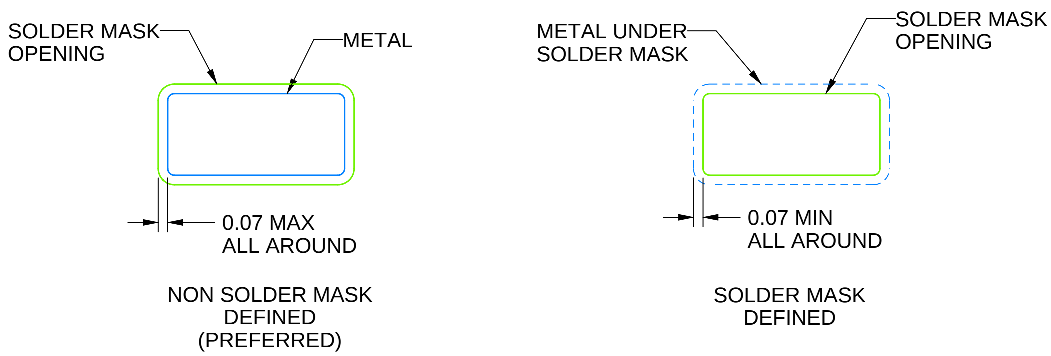

4214838/F 08/2024

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.
4. Support pin may differ or may not be present.
5. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side




LAND PATTERN EXAMPLE
SCALE:15X




SOLDER MASK DETAILS

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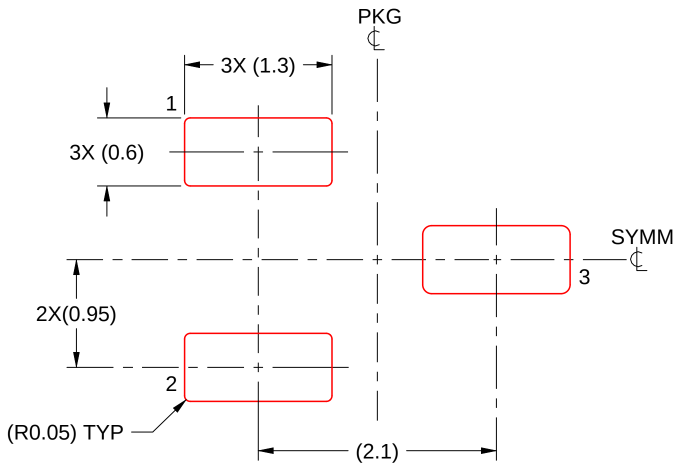
NOTES: (continued)

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




SOLDER PASTE EXAMPLE
BASED ON 0.125 THICK STENCIL
SCALE:15X

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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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