LM4041-N/LM4041-N-Q1 Precision Micropower Shunt Voltage Reference

Check for Samples: LM4041-N, LM4041-N-Q1

FEATURES

- **Available in Standard, AEC Q-100 Grade 1 (Extended Temp. Range) and Grade 3 (Industrial Temp. Range) Qualified Versions (SOT-23 only)**
- **Small Packages: SOT-23, TO-92, and SC70**
- **No Output Capacitor Required**
- **Tolerates Capacitive Loads**
- **Reverse Breakdown Voltage Options of 1.225V and Adjustable**

APPLICATIONS

- **Portable, Battery-Powered Equipment**
- **Data Acquisition Systems**
- **Instrumentation**
- **Process Control**
- **Energy Management**
- **Automotive**
- **Precision Audio Components**

DESCRIPTION

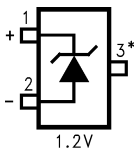
Ideal for space critical applications, the LM4041-N precision voltage reference is available in the sub-miniature SC70 and SOT-23 surface-mount packages. The LM4041-N's advanced design eliminates the need for an external stabilizing capacitor while ensuring stability with any capacitive load, thus making the LM4041-N easy to use. Further reducing design effort is the availability of a fixed (1.225V) and adjustable reverse breakdown voltage. The minimum operating current is 60 µA for the LM4041-N 1.2 and the LM4041-N ADJ. Both versions have a maximum operating current of 12 mA.

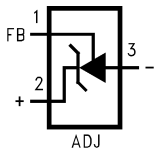
The LM4041-N utilizes fuse and zener-zap reverse breakdown or reference voltage trim during wafer sort to ensure that the prime parts have an accuracy of better than ±0.1% (A grade) at 25°C. Bandgap reference temperature drift curvature correction and low dynamic impedance ensure stable reverse breakdown voltage accuracy over a wide range of operating temperatures and currents.

Key Specifications (LM4041-N/LM4041-N-Q1 1.2)

Output voltage tolerance (A grade, 25°C)	±0.1%(max)
Low output noise (10 Hz to 10kHz)	20µV_{rms}
Wide operating current range	60µA to 12mA
Industrial temperature range (LM4041A/B-N, LM4041-N-Q1A/Q1B)	−40°C to +85°C
Extended temperature range (LM4041C/D/E-N, LM4041-N-Q1C/Q1D/Q1E)	−40°C to +125°C
Low temperature coefficient	100 ppm/°C (max)

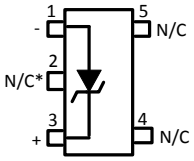
Connection Diagrams

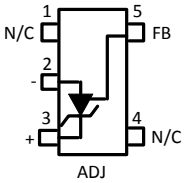




*This pin must be left floating or connected to pin 2.

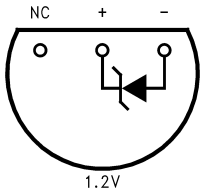
Figure 1. SOT-23 - Top View
See Package Number DBZ0003A
(JEDEC Registration TO-236AB)





*This pin must be left floating or connected to pin 1.

Figure 2. SC70 - Top View
See Package Number DCK0005A



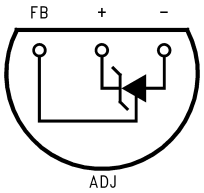


Figure 3. TO-92
Bottom View
See Package Number LP0003A

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Absolute Maximum Ratings(1)(2)

Reverse Current			20 mA
Forward Current			10 mA
Maximum Output Voltage (LM4041-N ADJ, LM4041-N-Q1 ADJ)			15V
Power Dissipation (T_A = 25°C)(3)		DBZ Package	306 mW
		LP Package	550 mW
		DCK Package	241mW
Storage Temperature			−65°C to +150°C
Lead Temperature	DBZ Packages	Vapor phase (60 seconds)	+215°C
		Infrared (15 seconds)	+220°C
	LP Package	Soldering (10 seconds)	+260°C
ESD Susceptibility		Human Body Model(4)	2 kV
		Machine Model(4)	200V
See AN-450 “Surface Mounting Methods and Their Effect on Product Reliability” for other methods of soldering surface mount devices SNOA472.			

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings 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) If Military/Aerospace specified devices are required, please contact the TI 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), θ_{JA} (junction to ambient thermal resistance), and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is $PD_{max} = (T_{Jmax} - T_A)/\theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower. For the LM4041-N, T_{Jmax} = 125°C, and the typical thermal resistance (θ_{JA}), when board mounted, is 326°C/W for the SOT-23 package, 415°C/W for the SC70 package and 180°C/W with 0.4″ lead length and 170°C/W with 0.125″ lead length for the TO-92 package.
(4) The human body model is a 100 pF capacitor discharged through a 1.5 kΩ resistor into each pin. The machine model is a 200 pF capacitor discharged directly into each pin. All pins are rated at 2kV for Human Body Model, but the feedback pin which is rated at 1kV.

Operating Ratings[1][2]

Temperature Range		($T_{min} \le T_A \le T_{max}$)
Industrial Temperature Range		−40°C ≤ T_A ≤ +85°C
Extended Temperature Range		−40°C ≤ T_A ≤ +125°C
Reverse Current	LM4041-N 1.2, LM4041-N-Q1 1.2	60 µA to 12 mA
	LM4041-N ADJ, LM4041-N-Q1 ADJ	60 µA to 12 mA
Output Voltage Range	LM4041-N ADJ, LM4041-N-Q1 ADJ	1.24V to 10V

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings 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), θ_{JA} (junction to ambient thermal resistance), and T_A (ambient temperature). The maximum allowable power dissipation at any temperature is $PD_{max} = (T_{Jmax} - T_A)/\theta_{JA}$ or the number given in the Absolute Maximum Ratings, whichever is lower. For the LM4041-N, T_{Jmax} = 125°C, and the typical thermal resistance (θ_{JA}), when board mounted, is 326°C/W for the SOT-23 package, 415°C/W for the SC70 package and 180°C/W with 0.4″ lead length and 170°C/W with 0.125″ lead length for the TO-92 package.

LM4041-N/LM4041-N-Q1 1.2 Electrical Characteristics (Industrial Temperature Range)

Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX}; 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.

Symbol	Parameter	Conditions	Typical[1]	LM4041AIM3 LM4041QAIM3 LM4041AIM3 LM4041AIZ Limits[2]	LM4041BIM3 LM4041QBIM3 LM4041BIZ LM4041BIM7 Limits[2]	Units (Limit)
V_R	Reverse Breakdown Voltage	I_R = 100 µA	1.225			V
	Reverse Breakdown Voltage Tolerance[3]	I_R = 100 µA		±1.2 **±9.2**	±2.4 **±10.4**	mV (max) mV (max)
I_{RMIN}	Minimum Operating Current		45	 60 **65**	 60 **65**	µA µA (max) µA (max)
$\Delta V_R/\Delta T$	Average Reverse Breakdown Voltage Temperature Coefficient[3]	I_R= 10 mA I_R = 1 mA I_R = 100 µA	±20 ±15 ±15	 **±100**	 **±100**	ppm/°C ppm/°C (max) ppm/°C

(1) Typicals are at T_J = 25°C and represent most likely parametric norm.

(2) 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.

(3) The boldface (over-temperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[(ΔV_R/ΔT)(max ΔT)(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_{MAX} or T_{MIN}, and V_R is the reverse breakdown voltage. The total over-temperature 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 over-temperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:
B-grade: ±1.2% = ±0.2% ±100 ppm/°C × 100°C
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±4.5% = ±2.0% ±150 ppm/°C × 100°C
Therefore, as an example, the A-grade LM4041-N 1.2 has an over-temperature Reverse Breakdown Voltage tolerance of ±1.2V × 0.75% = ±9.2 mV.

LM4041-N/LM4041-N-Q1 1.2 Electrical Characteristics (Industrial Temperature Range) (continued)

Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX}; 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.

Symbol	Parameter	Conditions	Typical (1)	LM4041AIM3 LM4041QAIM3 LM4041AIM3 LM4041AIZ Limits (2)	LM4041BIM3 LM4041QBIM3 LM4041BIZ LM4041BIM7 Limits (2)	Units (Limit)
$\Delta V_R/\Delta I_R$	Reverse Breakdown Voltage Change with Operating Current Change (4)	$I_{RMIN} \le I_R \le 1$ mA	0.7			mV
				1.5	1.5	mV (max)
				2.0	**2.0**	mV (max)
		1 mA ≤ I_R ≤ 12 mA	4.0			mV
				6.0	6.0	mV (max)
				8.0	**8.0**	mV (max)
Z_R	Reverse Dynamic Impedance	I_R = 1 mA, f = 120 Hz, I_{AC}= 0.1 I_R	0.5			Ω
				1.5	1.5	Ω (max)
e_N	Wideband Noise	I_R = 100 µA 10 Hz ≤ f ≤ 10 kHz	20			μV_{rms}
ΔV_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. Ouput 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.

LM4041-N/LM4041-N-Q1 1.2 Electrical Characteristics (Industrial Temperature Range)

Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX}; all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerances of ±0.5%, ±1.0% and ±2.0%, respectively.

Symbol	Parameter	Conditions	Typical[1]	LM4041CIM3 LM4041QCIM3 LM4041CIZ LM4041CIM7 Limits[2]	LM4041DIM3 LM4041QDIM3 LM4041DIZ LM4041DIM7 Limits[2]	LM4041EIM3 LM4041QEIM3 LM4041EIZ LM4041EIM7 Limits[2]	Units (Limit)
V_R	Reverse Breakdown Voltage	I_R = 100 µA	1.225				V
	Reverse Breakdown Voltage Tolerance[3]	I_R = 100 µA		±6 **±14**	±12 **±24**	±25 **±36**	mV (max) mV (max)
I_{RMIN}	Minimum Operating Current		45	 60 **65**	 65 **70**	 65 **70**	µA µA (max) µA (max)
$\Delta V_R/\Delta T$	V_R Temperature Coefficient[3]	I_R = 10 mA I_R = 1 mA I_R= 100 µA	±20 ±15 ±15	 **±100**	 **±150**	 **±150**	ppm/°C ppm/°C (max) ppm/°C
$\Delta V_R/\Delta I_R$	Reverse Breakdown Voltage Change with Operating Current Change[4]	$I_{RMIN} \le I_R \le$ 1 mA	0.7	 1.5 **2.0**	 2.0 **2.5**	 2.0 **2.5**	mV mV (max) mV (max)
		1 mA ≤ $I_R \le$ 12 mA	2.5	 6.0 **8.0**	 8.0 **10.0**	 8.0 **10.0**	mV mV (max) mV (max)
Z_R	Reverse Dynamic Impedance	I_R = 1 mA, f = 120 Hz I_{AC} = 0.1 I_R	0.5	 1.5	 2.0	 2.0	Ω Ω(max)
e_N	Wideband Noise	I_R = 100 µA 10 Hz ≤ f ≤ 10 kHz	20				μV_{rms}
ΔV_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				%

(1) Typicals are at T_J = 25°C and represent most likely parametric norm.

(2) 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.

(3) The boldface (over-temperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[(ΔV_R/ΔT)(max ΔT)(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_{MAX} or T_{MIN}, and V_R is the reverse breakdown voltage. The total over-temperature 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 over-temperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:

B-grade: ±1.2% = ±0.2% ±100 ppm/°C × 100°C
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±4.5% = ±2.0% ±150 ppm/°C × 100°C

Therefore, as an example, the A-grade LM4041-N 1.2 has an over-temperature Reverse Breakdown Voltage tolerance of ±1.2V × 0.75% = ±9.2 mV.

(4) Load regulation is measured on pulse basis from no load to the specified load current. Ouput 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.

LM4041-N/LM4041-N-Q1 1.2 Electrical Characteristics (Extended Temperature Range)

Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX}; all other limits $T_A = T_J = 25°C$. The grades C, D and E designate initial Reverse Breakdown Voltage tolerance of ±0.5%, ±1.0% and ±2.0% respectively.

Symbol	Parameter	Conditions	Typical (1)	LM4041CEM3 LM4041QCEM3 Limits (2)	LM4041DEM3 LM4041QDEM3 Limits (2)	LM4041EEM3 LM4041QEEM3 Limits (2)	Units (Limit)
V_R	Reverse Breakdown Voltage	I_R = 100 µA	1.225				V
	Reverse Breakdown Voltage Error (3)	I_R = 100 µA		±6 **±18.4**	±12 **±31**	±25 **±43**	mV (max) mV (max)
I_{RMIN}	Minimum Operating Current		45	 60 **68**	 65 **73**	 65 **73**	µA µA (max) µA (max)
$\Delta V_R/\Delta T$	VR Temperature Coefficient (3)	I_R= 10 mA I_R = 1 mA I_R = 100 µA	±20 ±15 ±15	**±100**	**±150**	**±150**	ppm/°C ppm/°C (max) ppm/°C
$\Delta V_R/\Delta I_R$	Reverse Breakdown Change with Current (4)	$I_{RMIN} \le I_R \le$ 1.0 mA	0.7	 1.5 **2.0**	 2.0 **2.5**	 2.0 **2.5**	mV mV (max) mV (max)
		1 mA ≤ $I_R \le$ 12 mA	2.5	 6.0 **8.0**	 8.0 **10.0**	 8.0 **10.0**	mV mV (max) mV (max)
Z_R	Reverse Dynamic Impedance	I_R = 1 mA, f = 120 Hz, I_{AC}= 0.1 I_R	0.5	 **1.5**	 **2.0**	 **2.0**	Ω Ω (max)
e_N	Noise Voltage	I_R = 100 µA 10 Hz ≤ f ≤ 10 kHz	20				μV_{rms}
ΔV_R	Long Term Stability (Non-Cumulative)	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				%

(1) Typicals are at T_J = 25°C and represent most likely parametric norm.

(2) 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.

(3) The boldface (over-temperature) limit for Reverse Breakdown Voltage Tolerance is defined as the room temperature Reverse Breakdown Voltage Tolerance ±[(ΔV_R/ΔT)(max ΔT)(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_{MAX} or T_{MIN}, and V_R is the reverse breakdown voltage. The total over-temperature 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 over-temperature tolerance for the different grades in the extended temperature range where max ΔT = 100 °C is shown below:

B-grade: ±1.2% = ±0.2% ±100 ppm/°C × 100°C
C-grade: ±1.5% = ±0.5% ±100 ppm/°C × 100°C
D-grade: ±2.5% = ±1.0% ±150 ppm/°C × 100°C
E-grade: ±4.5% = ±2.0% ±150 ppm/°C × 100°C

Therefore, as an example, the A-grade LM4041-N 1.2 has an over-temperature Reverse Breakdown Voltage tolerance of ±1.2V × 0.75% = ±9.2 mV.

(4) Load regulation is measured on pulse basis from no load to the specified load current. Ouput 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.

LM4041-N/LM4041-N-Q1 ADJ (Adjustable) Electrical Characteristics (Industrial Temperature Range)

Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX}; all other limits T_J = 25°C unless otherwise specified (SOT-23, see(1)), $I_{RMIN} \le I_R \le 12$ mA, $V_{REF} \le V_{OUT} \le 10$V. The grades C and D designate initial Reference Voltage Tolerances of ±0.5% and ±1%, respectively for V_{OUT} = 5V.

Symbol	Parameter	Conditions	Typical(2)	LM4041CIM3 LM4041QCIM3 LM4041CIZ LM4041CIM7 (3)	LM4041DIM3 LM4041QDIM3 LM4041DIZ LM4041DIM7 (3)	Units (Limit)
V_{REF}	Reference Voltage	I_R = 100 µA, V_{OUT} = 5V	1.233			V
	Reference Voltage Tolerance(4)	I_R = 100 µA, V_{OUT} = 5V		±6.2 **±14**	±12 **±24**	mV (max) mV (max)
I_{RMIN}	Minimum Operating Current		45	 60 **65**	 65 **70**	µA µA (max) µA (max)
$\Delta V_{REF}/\Delta I_R$	Reference Voltage Change with Operating Current Change(5)	$I_{RMIN} \le I_R \le 1$ mA SOT-23: $V_{OUT} \ge 1.6$V(6)	0.7	 1.5 **2.0**	 2.0 **2.5**	mV mV (max) mV (max)
		1 mA ≤ I_R ≤ 12 mA SOT-23: $V_{OUT} \ge 1.6$V(6)	2	 4 **6**	 6 **8**	mV mV (max) mV (max)
$\Delta V_{REF}/\Delta V_O$	Reference Voltage Change with Output Voltage Change	I_R = 1 mA	−1.55	 −2.0 **−2.5**	 −2.5 **−3.0**	mV/V mV/V (max) mV/V (max)
I_{FB}	Feedback Current		60	 100 **120**	 150 **200**	nA nA (max) nA (max)
$\Delta V_{REF}/\Delta T$	Average Reference Voltage Temperature Coefficient(4)	V_{OUT} = 5V, I_R = 10 mA I_R = 1 mA I_R = 100 µA	20 15 15	 **±100**	 **±150**	ppm/°C ppm/°C (max) ppm/°C
Z_{OUT}	Dynamic Output Impedance	I_R = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_R $V_{OUT} = V_{REF}$ V_{OUT} = 10V	 0.3 2			 Ω Ω
e_N	Wideband Noise	I_R = 100 µA $V_{OUT} = V_{REF}$ 10 Hz ≤ f ≤ 10 kHz	20			μV_{rms}
ΔV_{REF}	Reference Voltage Long Term Stability	t = 1000 hrs, I_R = 100 µA, T = 25°C ±0.1°C	120			ppm
V_{HYST}	Thermal Hysteresis(7)	ΔT = −40°C to +125°C	0.08			%

(1) When $V_{OUT} \le 1.6$V, the LM4041-N ADJ in the SOT-23 package must operate at reduced I_R. This is caused by the series resistance of the die attach between the die (-) output and the package (-) output pin. See the Output Saturation (SOT-23 only) curve in the Typical Performance Characteristics section.
(2) Typicals are at T_J = 25°C and represent most likely parametric norm.
(3) 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.
(4) Reference voltage and temperature coefficient will change with output voltage. See Typical Performance Characteristics curves.
(5) Load regulation is measured on pulse basis from no load to the specified load current. Ouput changes due to die temperature change must be taken into account separately.-
(6) When $V_{OUT} \le 1.6$V, the LM4041-N ADJ in the SOT-23 package must operate at reduced I_R. This is caused by the series resistance of the die attach between the die (-) output and the package (-) output pin. See the Output Saturation (SOT-23 only) curve in the Typical Performance Characteristics section.
(7) 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.

LM4041-N/LM4041-N-Q1 ADJ (Adjustable) Electrical Characteristics (Extended Temperature Range)

Boldface limits apply for $T_A = T_J = T_{MIN}$ to T_{MAX}; all other limits T_J = 25°C unless otherwise specified (SOT-23, see (1)), $I_{RMIN} \le I_R \le 12$ mA, $V_{REF} \le V_{OUT} \le 10$V. The grades C and D designate initial Reference Voltage Tolerances of ±0.5% and ±1%, respectively for V_{OUT} = 5V.

Symbol	Parameter	Conditions	Typical (2)	LM4041CEM3 LM4041QCEM3 (3)	LM4041DEM3 LM4041QDEM3 (3)	Units (Limit)
V_{REF}	Reference Voltage	I_R = 100 µA, V_{OUT} = 5V	1.233			V
	Reference Voltage Tolerance (4)	I_R = 100 µA, V_{OUT} = 5V		±6.2 **±18**	±12 **±30**	mV (max) mV (max)
I_{RMIN}	Minimum Operating Current		45	 60 **68**	 65 **73**	µA µA (max) µA (max)
$\Delta V_{REF}/\Delta I_R$	Reference Voltage Change with Operating Current Change (5)	$I_{RMIN} \le I_R \le 1$ mA SOT-23: $V_{OUT} \ge 1.6V$ (1)	0.7	 1.5 **2.0**	 2.0 **2.5**	mV mV (max) mV (max)
		1 mA ≤ I_R ≤ 12 mA SOT-23: $V_{OUT} \ge 1.6V$ (1)	2	 8 **6**	 10 **8**	mV mV (max) mV (max)
$\Delta V_{REF}/\Delta V_O$	Reference Voltage Change with Output Voltage Change	I_R = 1 mA	−1.55	 −2.0 **−3.0**	 −2.5 **−4.0**	mV/V mV/V (max) mV/V (max)
I_{FB}	Feedback Current		60	 100 **120**	 150 **200**	nA nA (max) nA (max)
$\Delta V_{REF}/\Delta T$	Average Reference Voltage Temperature Coefficient (4)	V_{OUT} = 5V, I_R = 10 mA I_R = 1 mA I_R = 100 µA	20 15 15	 **±100** 	 **±150** 	ppm/°C ppm/°C (max) ppm/°C
Z_{OUT}	Dynamic Output Impedance	I_R = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_R V_{OUT} = V_{REF} V_{OUT} = 10V	 0.3 2			 Ω Ω
e_N	Wideband Noise	I_R = 100 µA, V_{OUT} = V_{REF} 10 Hz ≤ f ≤ 10 kHz	20			μV_{rms}
ΔV_{REF}	Reference Voltage Long Term Stability	t = 1000 hrs, I_R = 100 µA, T = 25°C ±0.1°C	120			ppm
V_{HYST}	Thermal Hysteresis (6)	ΔT = −40°C to +125°C	0.08			%

(1) When $V_{OUT} \le 1.6$V, the LM4041-N ADJ in the SOT-23 package must operate at reduced I_R. This is caused by the series resistance of the die attach between the die (-) output and the package (-) output pin. See the Output Saturation (SOT-23 only) curve in the Typical Performance Characteristics section.
(2) Typicals are at T_J = 25°C and represent most likely parametric norm.
(3) 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.
(4) Reference voltage and temperature coefficient will change with output voltage. See Typical Performance Characteristics curves.
(5) Load regulation is measured on pulse basis from no load to the specified load current. Ouput changes due to die temperature change must be taken into account separately.-
(6) 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.

Typical Performance Characteristics

Temperature Drift for Different Average Temperature Coefficient

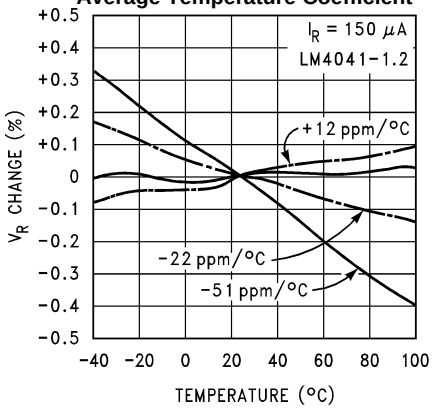


Figure 4.

Output Impedance vs Frequency

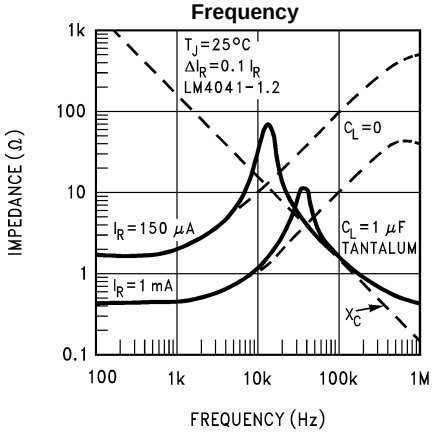


Figure 5.

Noise Voltage

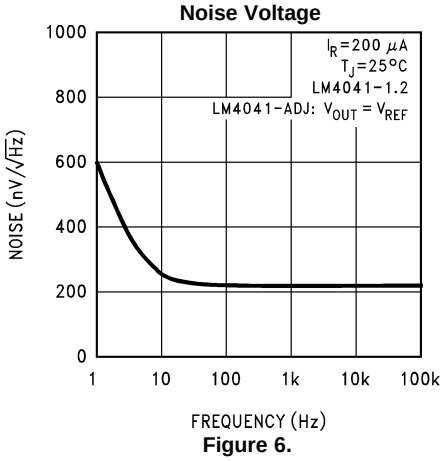


Figure 6.

Reverse Characteristics and Minimum Operating Current

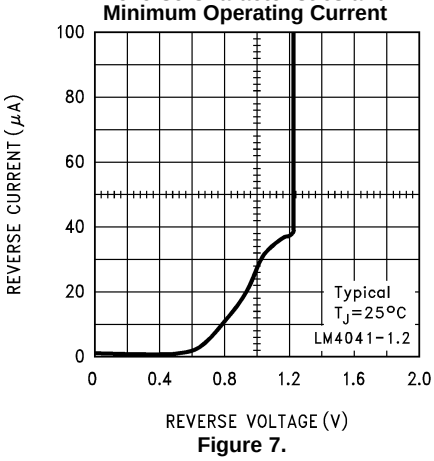


Figure 7.

Start-Up Characteristics

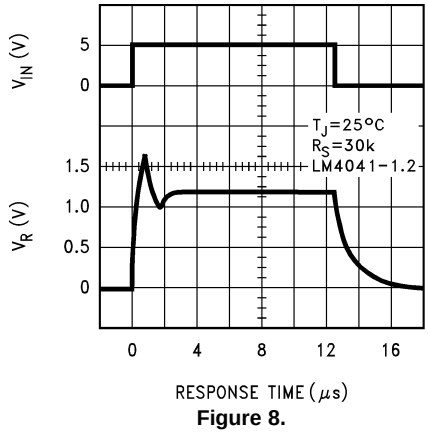


Figure 8.

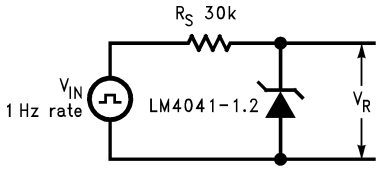


Figure 9.

Typical Performance Characteristics (continued)

Reference Voltage vs Output Voltage and Temperature

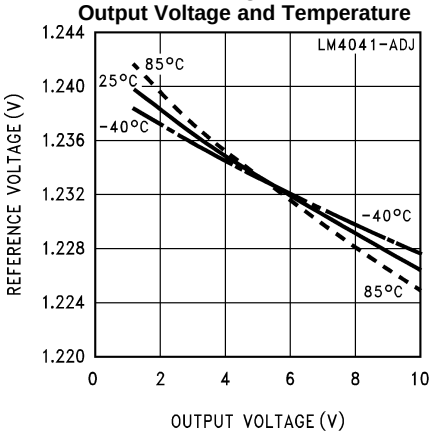


Figure 10.

Reference Voltage vs Temperature and Output Voltage

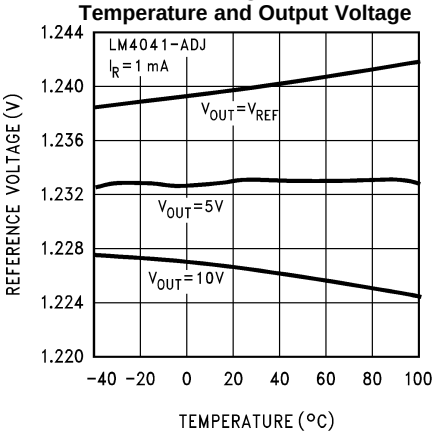


Figure 11.

Feedback Current vs Output Voltage and Temperature

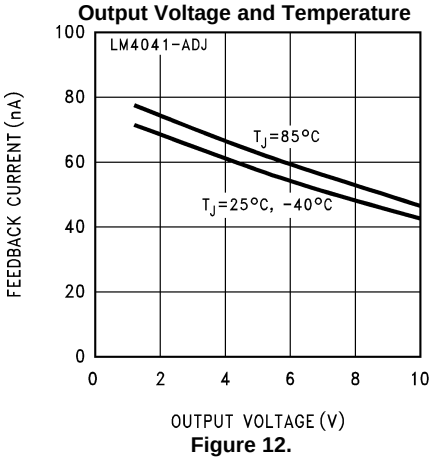


Figure 12.

Output Saturation (SOT-23 Only)

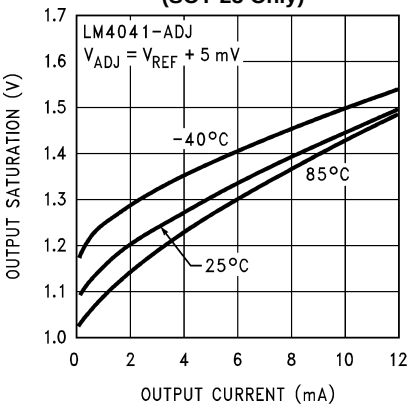


Figure 13.

Output Impedance vs Frequency

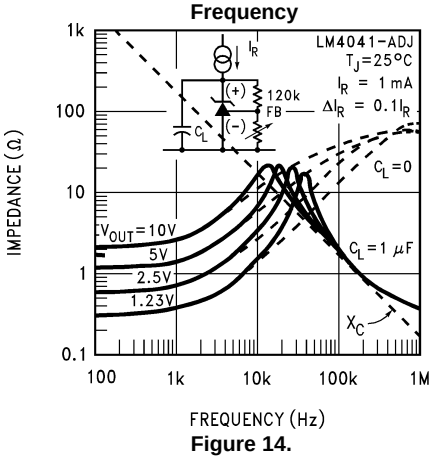


Figure 14.

Output Impedance vs Frequency

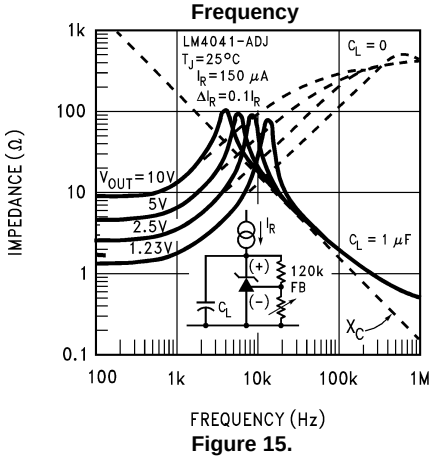


Figure 15.

Typical Performance Characteristics (continued)

Reverse Characteristics

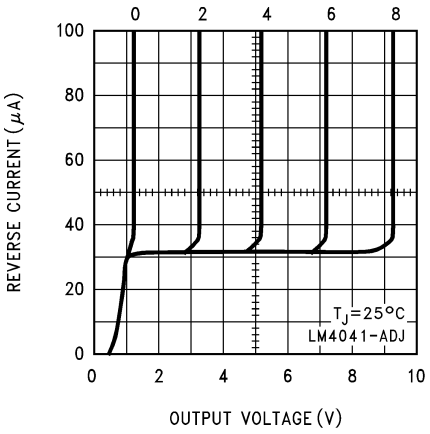


Figure 16.

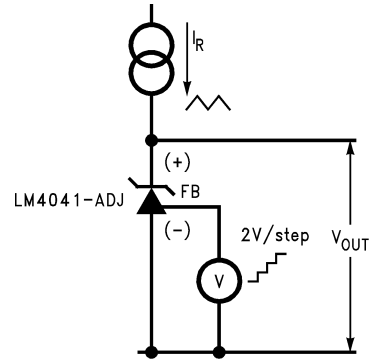


Figure 17.

Large Signal Response

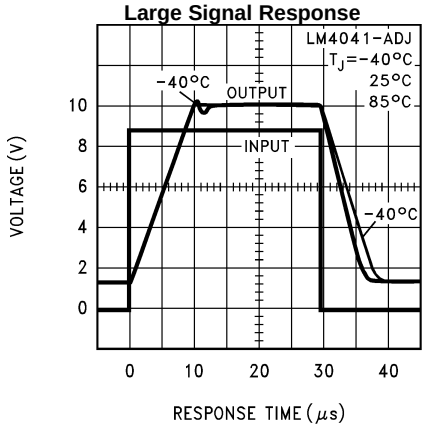


Figure 18.

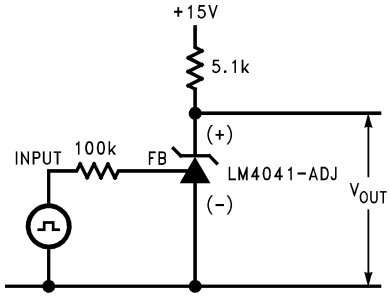
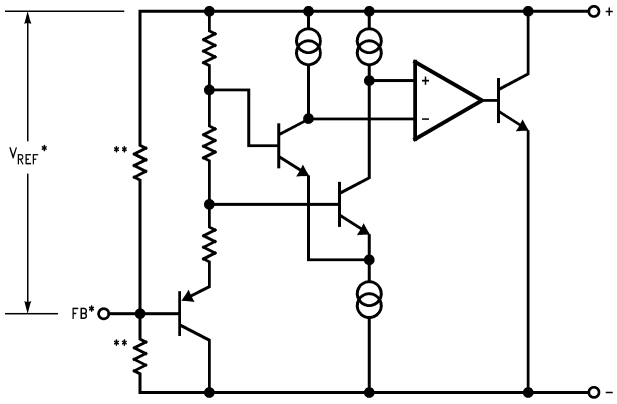


Figure 19.

Functional Block Diagram



*LM4041-N ADJ only
**LM4041-N 1.2 only

APPLICATIONS INFORMATION

The LM4041-N is a precision micro-power curvature-corrected bandgap shunt voltage reference. For space critical applications, the LM4041-N is available in the sub-miniature SOT-23 and SC70 surface-mount package. The LM4041-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 LM4041-N remains stable. Design effort is further reduced with the choice of either a fixed 1.2V or an adjustable reverse breakdown voltage. The minimum operating current is 60 µA for the LM4041-N 1.2 and the LM4041-N ADJ. Both versions have a maximum operating current of 12 mA.

LM4041-Ns using the SOT-23 package have pin 3 connected as the (-) output through the package's die attach interface. Therefore, the LM4041-N 1.2's pin 3 must be left floating or connected to pin 2 and the LM4041-N ADJ's pin 3 is the (-) output.

LM4041-Ns using the SC70 package have pin 2 connected as the (−) output through the packages' die attach interface. Therefore, the LM4041-N 1.2's pin 2 must be left floating or connected to pin 1, and the LM4041-N ADJ's pin 2 is the (−) output.

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 20)*, an external series resistor (R_S) is connected between the supply voltage and the LM4041-N. R_S determines the current that flows through the load (I_L) and the LM4041-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 LM4041-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 LM4041-N is less than 12 mA.

R_S should be selected based on the supply voltage, (V_S), the desired load and operating current, (I_L and I_Q), and the LM4041-N's reverse breakdown voltage, V_R.

$$R_S = \frac{V_S - V_R}{I_L + I_Q}$$

The LM4041-N ADJ's output voltage can be adjusted to any value in the range of 1.24V through 10V. It is a function of the internal reference voltage (V_{REF}) and the ratio of the external feedback resistors as shown in *Figure 21* . The output voltage is found using the equation

$$V_O = V_{REF}[(R2/R1) + 1]$$

where

- V_O is the output voltage. The actual value of the internal V_{REF} is a function of V_O. The "corrected" V_{REF} is determined by (1)

$$V_{REF} = \Delta V_O \, (\Delta V_{REF}/\Delta V_O) + V_Y$$

where

- V_Y = 1.240 V

and

- $\Delta V_O = (V_O - V_Y)$ (2)

$\Delta V_{REF}/\Delta V_O$ is found in the Electrical Characteristics and is typically −1.55 mV/V. You can get a more accurate indication of the output voltage by replacing the value of V_{REF} in Equation 1 with the value found using Equation 2.

Note that the actual output voltage can deviate from that predicted using the typical value of $\Delta V_{REF}/\Delta V_O$ in Equation 2: for C-grade parts, the worst-case $\Delta V_{REF}/\Delta V_O$ is −2.5 mV/V. For D-grade parts, the worst-case $\Delta V_{REF}/\Delta V_O$ is −3.0 mV/V.

Typical Applications

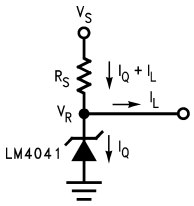
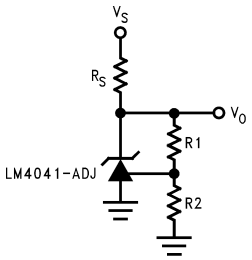


Figure 20. Shunt Regulator



$$V_O = V_{REF}[(R2/R1) + 1]$$

Figure 21. Adjustable Shunt Regulator

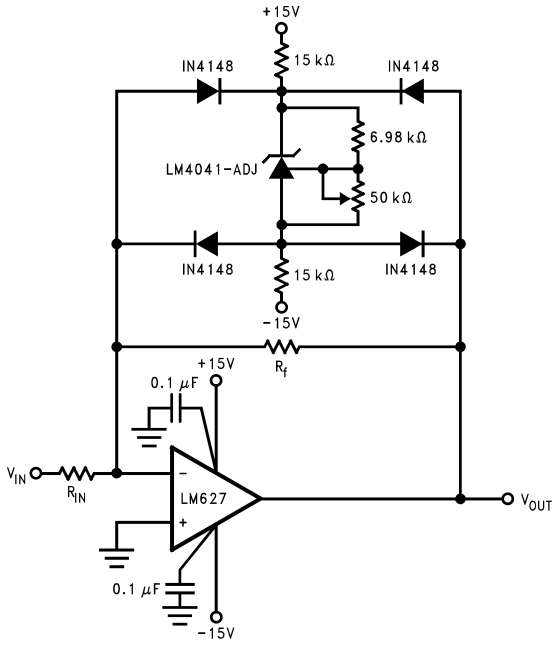


Figure 22. Bounded amplifier reduces saturation-induced delays and can prevent succeeding stage damage. Nominal clamping voltage is ±V_O (LM4041-N's reverse breakdown voltage) +2 diode V_F.

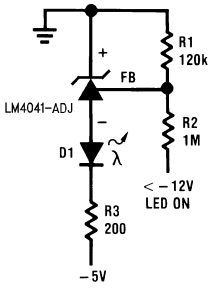


Figure 23. Voltage Level Detector

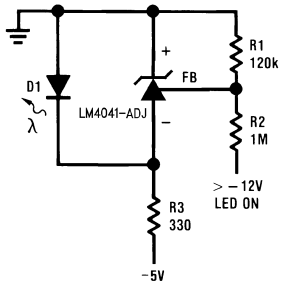


Figure 24. Voltage Level Detector

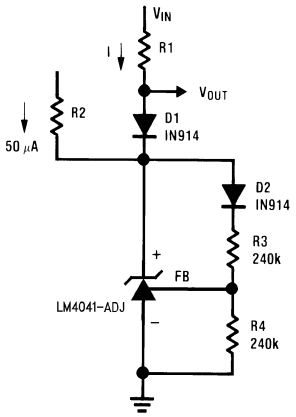


Figure 25. Fast Positive Clamp
2.4V + V_{D1}

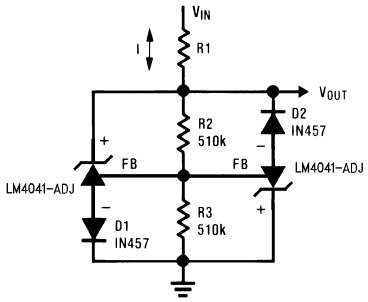


Figure 26. Bidirectional Clamp ±2.4V

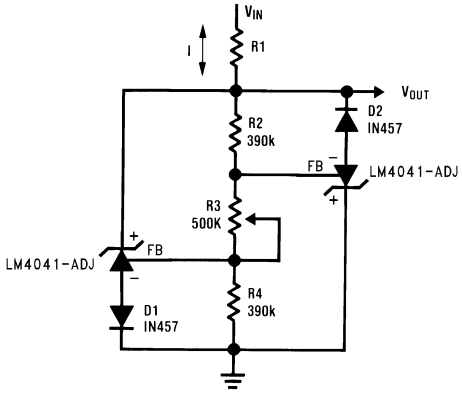


Figure 27. Bidirectional Adjustable Clamp ±18V to ±2.4V

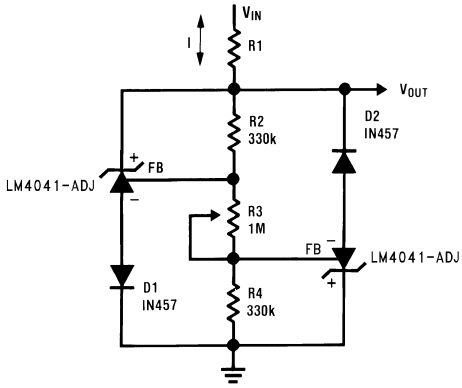


Figure 28. Bidirectional Adjustable Clamp ±2.4V to ±6V

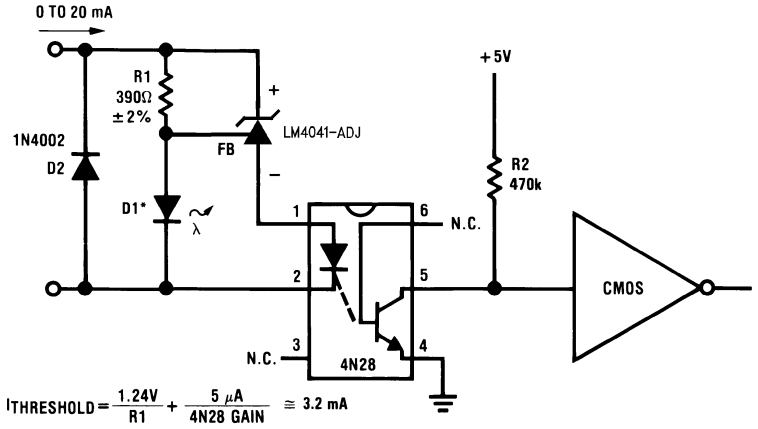
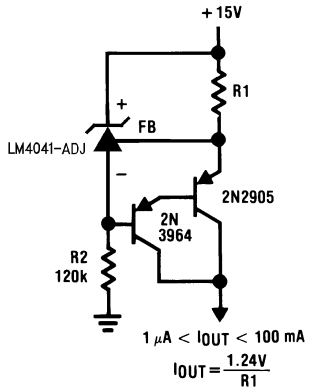


Figure 29. Simple Floating Current Detector



*D1 can be any LED, V_F = 1.5V to 2.2V at 3 mA. D1 may act as an indicator. D1 will be on if $I_{THRESHOLD}$ falls below the threshold current, except with I = 0.

Figure 30. Current Source

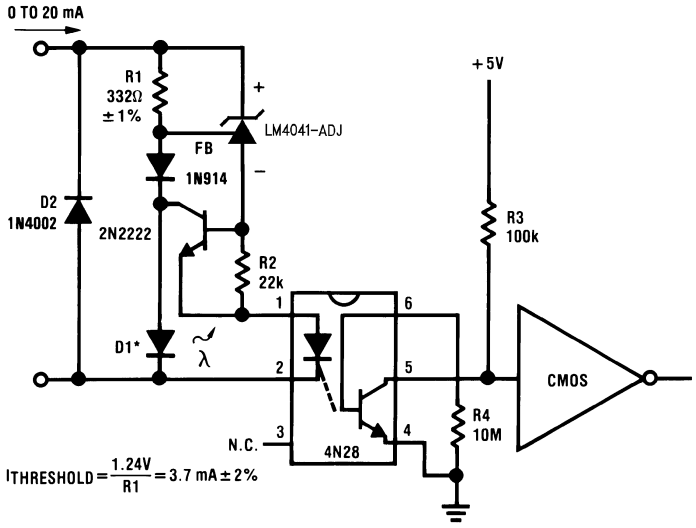
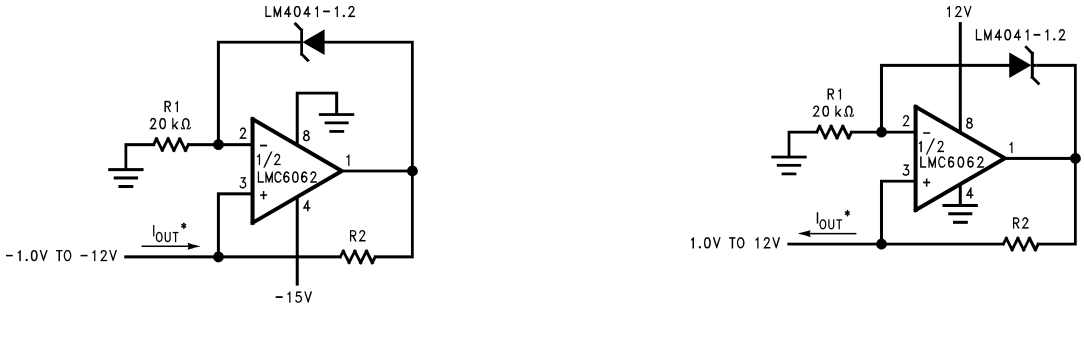


Figure 31. Precision Floating Current Detector



*$I_{OUT} = \frac{1.2V}{R2}$

Figure 32. Precision 1 µA to 1 mA Current Sources

REVISION HISTORY

Changes from Revision D (April 2013) to Revision E	Page
• Changed layout of National Data Sheet to TI format	16

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM4041AIM3-1.2	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 85	R1A	
LM4041AIM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1A	Samples
LM4041AIM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1A	Samples
LM4041AIZ-1.2/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 85	4041A IZ1.2	Samples
LM4041BIM3-1.2	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 85	R1B	
LM4041BIM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1B	Samples
LM4041BIM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1B	Samples
LM4041BIM7-1.2	NRND	SC70	DCK	5	1000	TBD	Call TI	Call TI	-40 to 85	R1B	
LM4041BIM7-1.2/NOPB	ACTIVE	SC70	DCK	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1B	Samples
LM4041BIM7X-1.2/NOPB	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1B	Samples
LM4041BIZ-1.2/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 85	4041B IZ1.2	Samples
LM4041CEM3-1.2	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	R1C	
LM4041CEM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	R1C	Samples
LM4041CEM3-ADJ	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	RAC	
LM4041CEM3-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RAC	Samples
LM4041CEM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	R1C	Samples
LM4041CEM3X-ADJ	NRND	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 125	RAC	
LM4041CEM3X-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RAC	Samples
LM4041CIM3-1.2	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 85	R1C	
LM4041CIM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1C	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM4041CIM3-ADJ	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 85	RAC	
LM4041CIM3-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAC	Samples
LM4041CIM3X-1.2	NRND	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 85	R1C	
LM4041CIM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1C	Samples
LM4041CIM3X-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAC	Samples
LM4041CIM7-1.2/NOPB	ACTIVE	SC70	DCK	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1C	Samples
LM4041CIM7-ADJ	NRND	SC70	DCK	5	1000	TBD	Call TI	Call TI	-40 to 85	RAC	
LM4041CIM7-ADJ/NOPB	ACTIVE	SC70	DCK	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAC	Samples
LM4041CIM7X-1.2/NOPB	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1C	Samples
LM4041CIM7X-ADJ/NOPB	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAC	Samples
LM4041CIZ-1.2/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 85	4041C IZ1.2	Samples
LM4041CIZ-ADJ/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 85	4041C IZADJ	Samples
LM4041DEM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	R1D	Samples
LM4041DEM3-ADJ	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	RAD	
LM4041DEM3-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RAD	Samples
LM4041DEM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	R1D	Samples
LM4041DEM3X-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RAD	Samples
LM4041DIM3-1.2	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 85	R1D	
LM4041DIM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1D	Samples
LM4041DIM3-ADJ	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 85	RAD	

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM4041DIM3-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAD	Samples
LM4041DIM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1D	Samples
LM4041DIM3X-ADJ	NRND	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 85	RAD	
LM4041DIM3X-ADJ/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAD	Samples
LM4041DIM7-1.2/NOPB	ACTIVE	SC70	DCK	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1D	Samples
LM4041DIM7-ADJ/NOPB	ACTIVE	SC70	DCK	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAD	Samples
LM4041DIM7X-1.2/NOPB	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1D	Samples
LM4041DIM7X-ADJ/NOPB	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RAD	Samples
LM4041DIZ-1.2/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 85	4041D IZ1.2	Samples
LM4041DIZ-ADJ/LFT1	ACTIVE	TO-92	LP	3	2000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type		4041D IZADJ	Samples
LM4041DIZ-ADJ/NOPB	ACTIVE	TO-92	LP	3	1800	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 85	4041D IZADJ	Samples
LM4041EEM3-1.2	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 125	R1E	
LM4041EEM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	R1E	Samples
LM4041EEM3X-1.2	NRND	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI	-40 to 125	R1E	
LM4041EEM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	R1E	Samples
LM4041EIM3-1.2	NRND	SOT-23	DBZ	3	1000	TBD	Call TI	Call TI	-40 to 85	R1E	
LM4041EIM3-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1E	Samples
LM4041EIM3X-1.2/NOPB	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1E	Samples
LM4041EIM7-1.2/NOPB	ACTIVE	SC70	DCK	5	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1E	Samples
LM4041EIM7X-1.2/NOPB	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	R1E	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM4041QAIM3-1.2/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RQA	Samples
LM4041QBIM3-1.2/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	RQB	Samples
LM4041QCEM3-1.2NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQC	Samples
LM4041QCEM3-ADJ/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RZC	Samples
LM4041QCEM3X-1.2NO	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQC	Samples
LM4041QCIM3-1.2/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQC	Samples
LM4041QCIM3-ADJ/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RZC	Samples
LM4041QDEM3-1.2/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQD	Samples
LM4041QDEM3-ADJ/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RZD	Samples
LM4041QDIM3-1.2/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQD	Samples
LM4041QDIM3-ADJ/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RZD	Samples
LM4041QEEM3-1.2/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQE	Samples
LM4041QEEM3X-1.2NO	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQE	Samples
LM4041QEIM3-1.2/NO	ACTIVE	SOT-23	DBZ	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 125	RQE	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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

OTHER QUALIFIED VERSIONS OF LM4041-N, LM4041-N-Q1 :

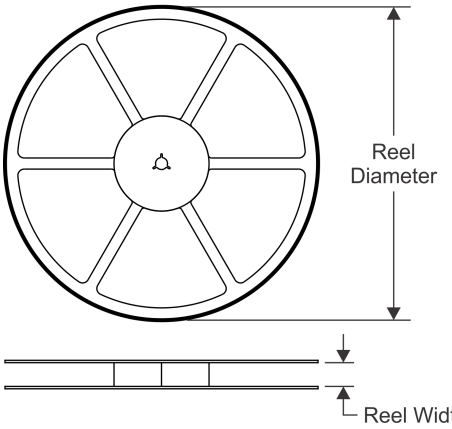
- Catalog: LM4041-N
- Automotive: LM4041-N-Q1

NOTE: Qualified Version Definitions:

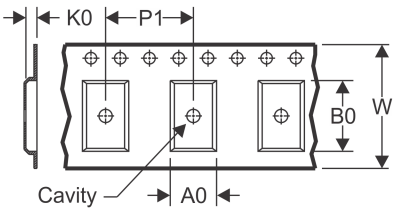
- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

REEL DIMENSIONS

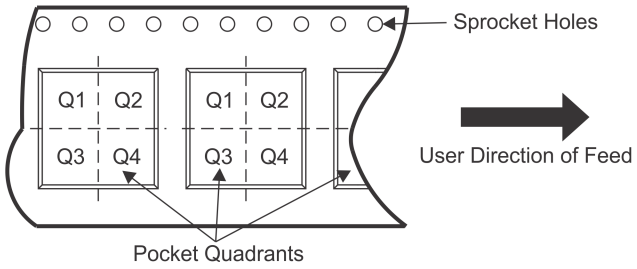


TAPE DIMENSIONS



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



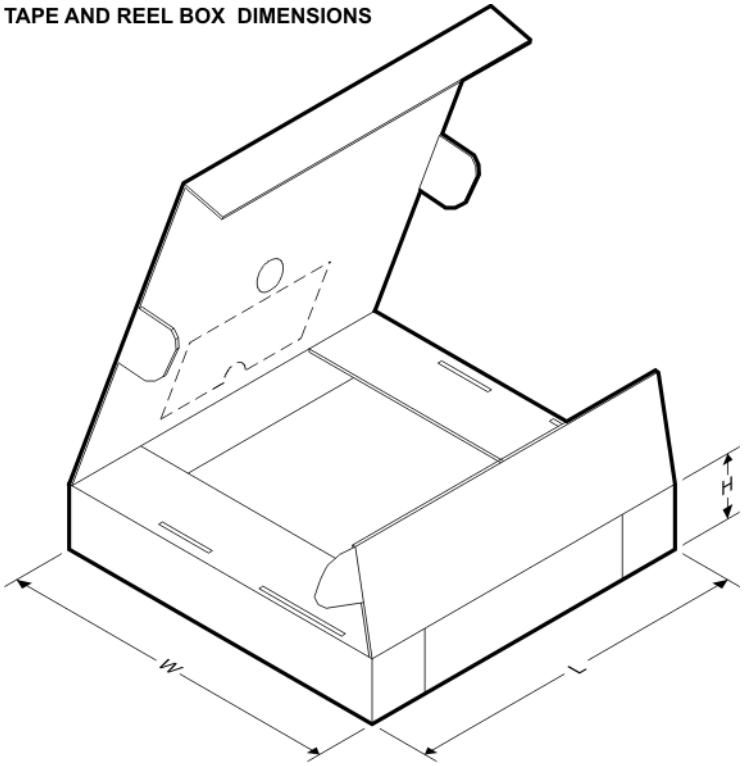
*All dimensions are nominal

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
LM4041AIM3-1.2	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041AIM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041AIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041BIM3-1.2	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041BIM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041BIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041BIM7-1.2	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041BIM7-1.2/NOPB	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041BIM7X-1.2/NOPB	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041CEM3-1.2	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CEM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CEM3-ADJ	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CEM3-ADJ/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CEM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CEM3X-ADJ	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CEM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CIM3-1.2	SOT-23	DBZ	3	1000	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
LM4041CIM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CIM3-ADJ	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CIM3-ADJ/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CIM3X-1.2	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CIM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041CIM7-1.2/NOPB	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041CIM7-ADJ	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041CIM7-ADJ/NOPB	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041CIM7X-1.2/NOPB	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041CIM7X-ADJ/NOPB	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041DEM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DEM3-ADJ	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DEM3-ADJ/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DEM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DEM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM3-1.2	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM3-ADJ	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM3-ADJ/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM3X-ADJ	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041DIM7-1.2/NOPB	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041DIM7-ADJ/NOPB	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041DIM7X-1.2/NOPB	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041DIM7X-ADJ/NOPB	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041EEM3-1.2	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041EEM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041EEM3X-1.2	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041EEM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041EIM3-1.2	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041EIM3-1.2/NOPB	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041EIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041EIM7-1.2/NOPB	SC70	DCK	5	1000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041EIM7X-1.2/NOPB	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
LM4041QAIM3-1.2/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QBIM3-1.2/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QCEM3-1.2NO	SOT-23	DBZ	3	1000	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
LM4041QCEM3-ADJ/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QCEM3X-1.2NO	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QCIM3-1.2/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QCIM3-ADJ/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QDEM3-1.2/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QDEM3-ADJ/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QDIM3-1.2/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QDIM3-ADJ/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QEEM3-1.2/NO	SOT-23	DBZ	3	1000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QEEM3X-1.2NO	SOT-23	DBZ	3	3000	178.0	8.4	3.3	2.9	1.22	4.0	8.0	Q3
LM4041QEIM3-1.2/NO	SOT-23	DBZ	3	1000	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)
LM4041AIM3-1.2	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041AIM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041AIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041BIM3-1.2	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041BIM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041BIM3X-1.2/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)
LM4041BIM7-1.2	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041BIM7-1.2/NOPB	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041BIM7X-1.2/NOPB	SC70	DCK	5	3000	210.0	185.0	35.0
LM4041CEM3-1.2	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CEM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CEM3-ADJ	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CEM3-ADJ/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CEM3X-1.2/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041CEM3X-ADJ	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041CEM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041CIM3-1.2	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CIM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CIM3-ADJ	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CIM3-ADJ/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041CIM3X-1.2	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041CIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041CIM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041CIM7-1.2/NOPB	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041CIM7-ADJ	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041CIM7-ADJ/NOPB	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041CIM7X-1.2/NOPB	SC70	DCK	5	3000	210.0	185.0	35.0
LM4041CIM7X-ADJ/NOPB	SC70	DCK	5	3000	210.0	185.0	35.0
LM4041DEM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041DEM3-ADJ	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041DEM3-ADJ/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041DEM3X-1.2/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041DEM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041DIM3-1.2	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041DIM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041DIM3-ADJ	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041DIM3-ADJ/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041DIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041DIM3X-ADJ	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041DIM3X-ADJ/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041DIM7-1.2/NOPB	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041DIM7-ADJ/NOPB	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041DIM7X-1.2/NOPB	SC70	DCK	5	3000	210.0	185.0	35.0
LM4041DIM7X-ADJ/NOPB	SC70	DCK	5	3000	210.0	185.0	35.0
LM4041EEM3-1.2	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041EEM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041EEM3X-1.2	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041EEM3X-1.2/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)
LM4041EIM3-1.2	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041EIM3-1.2/NOPB	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041EIM3X-1.2/NOPB	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041EIM7-1.2/NOPB	SC70	DCK	5	1000	210.0	185.0	35.0
LM4041EIM7X-1.2/NOPB	SC70	DCK	5	3000	210.0	185.0	35.0
LM4041QAIM3-1.2/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QBIM3-1.2/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QCEM3-1.2NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QCEM3-ADJ/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QCEM3X-1.2NO	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041QCIM3-1.2/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QCIM3-ADJ/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QDEM3-1.2/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QDEM3-ADJ/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QDIM3-1.2/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QDIM3-ADJ/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QEEM3-1.2/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0
LM4041QEEM3X-1.2NO	SOT-23	DBZ	3	3000	210.0	185.0	35.0
LM4041QEIM3-1.2/NO	SOT-23	DBZ	3	1000	210.0	185.0	35.0

GENERIC PACKAGE VIEW

LP 3 TO-92 - 5.34 mm max height

TRANSISTOR OUTLINE

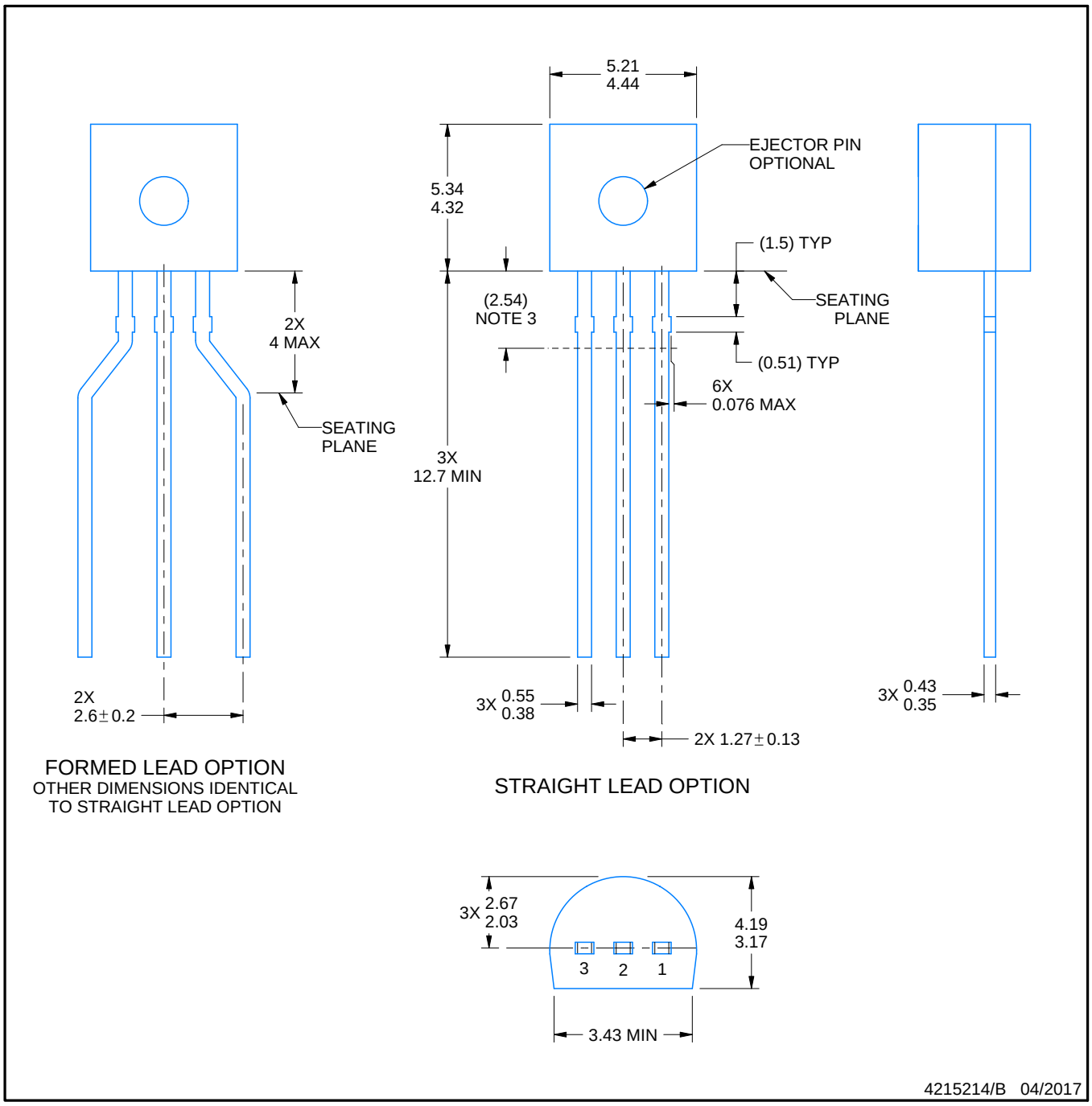
Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

LP0003A

PACKAGE OUTLINE

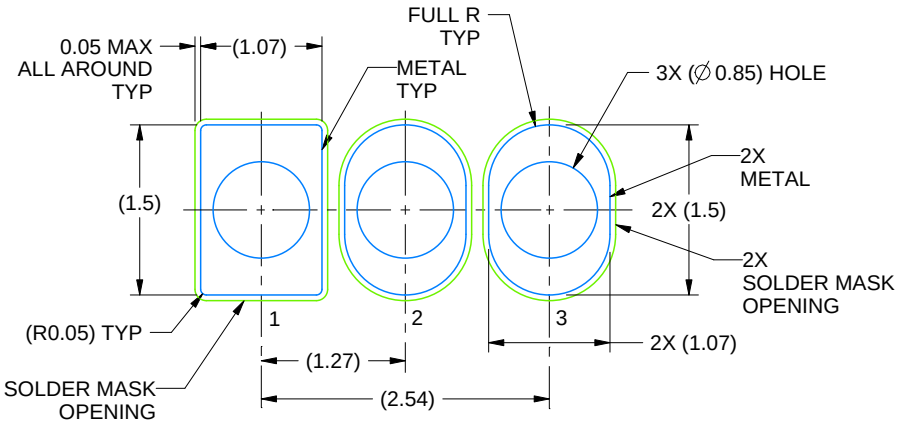
TO-92 - 5.34 mm max height

TO-92

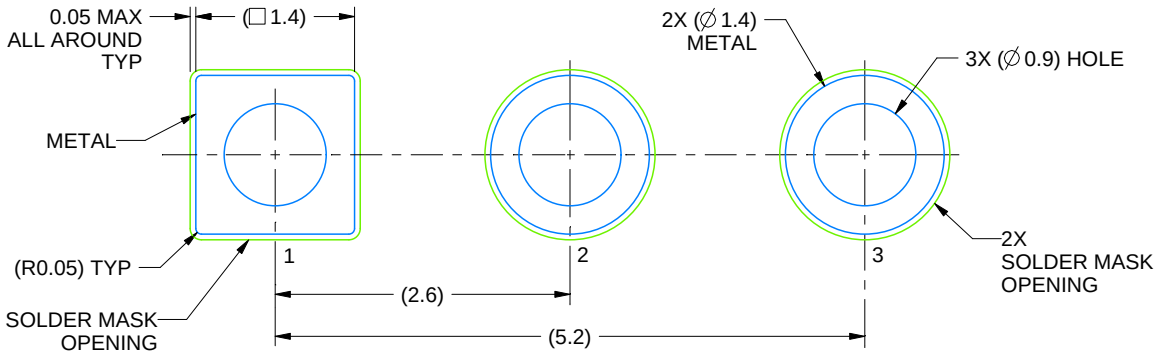


NOTES:

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



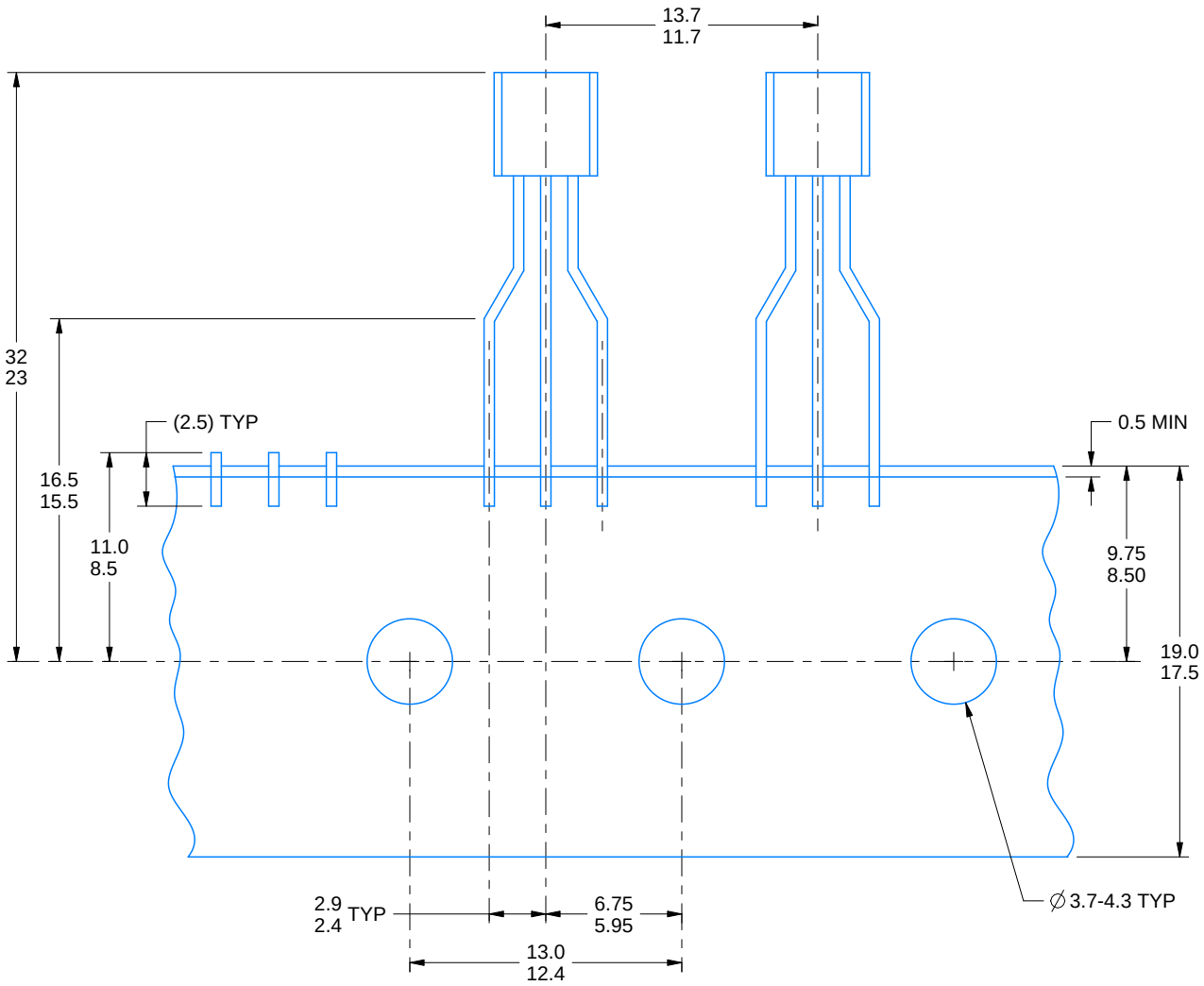
LAND PATTERN EXAMPLE
FORMED LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X

4215214/B 04/2017

LP0003A

TO-92 - 5.34 mm max height

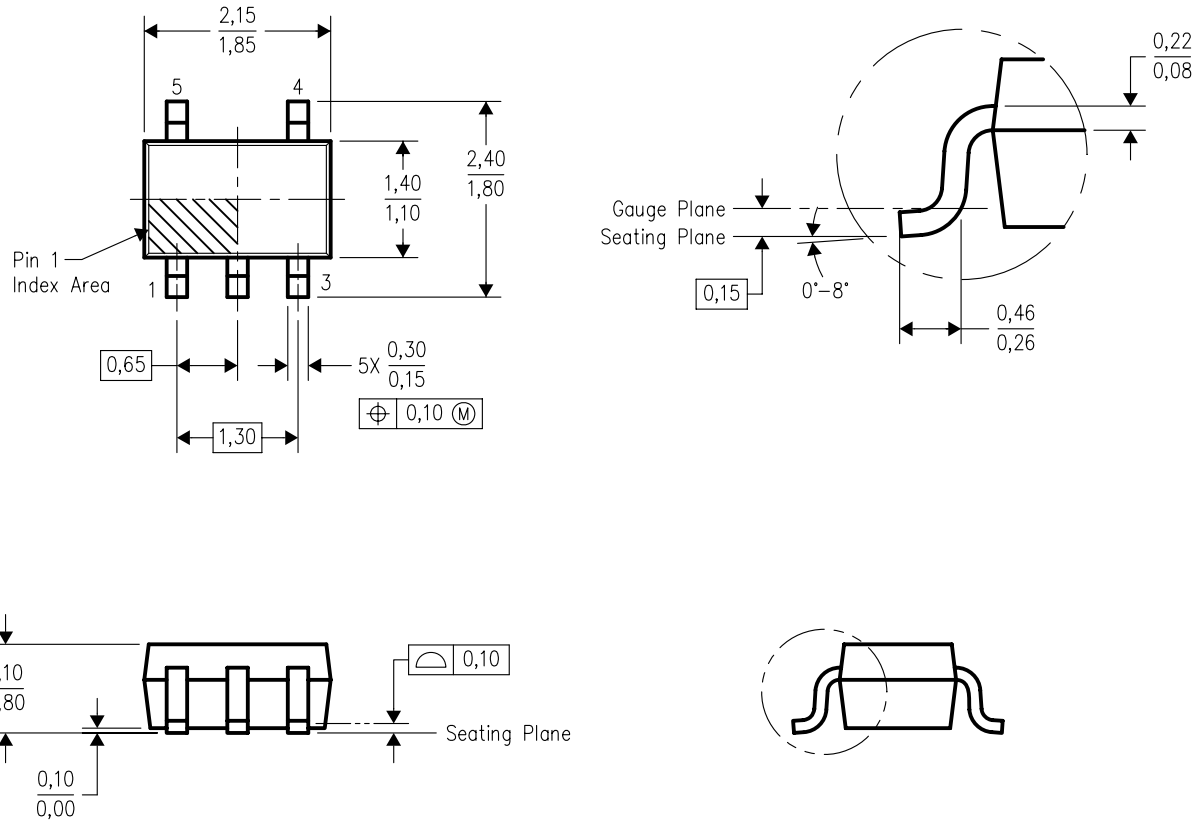
TO-92



FOR FORMED LEAD OPTION PACKAGE

4215214/B 04/2017

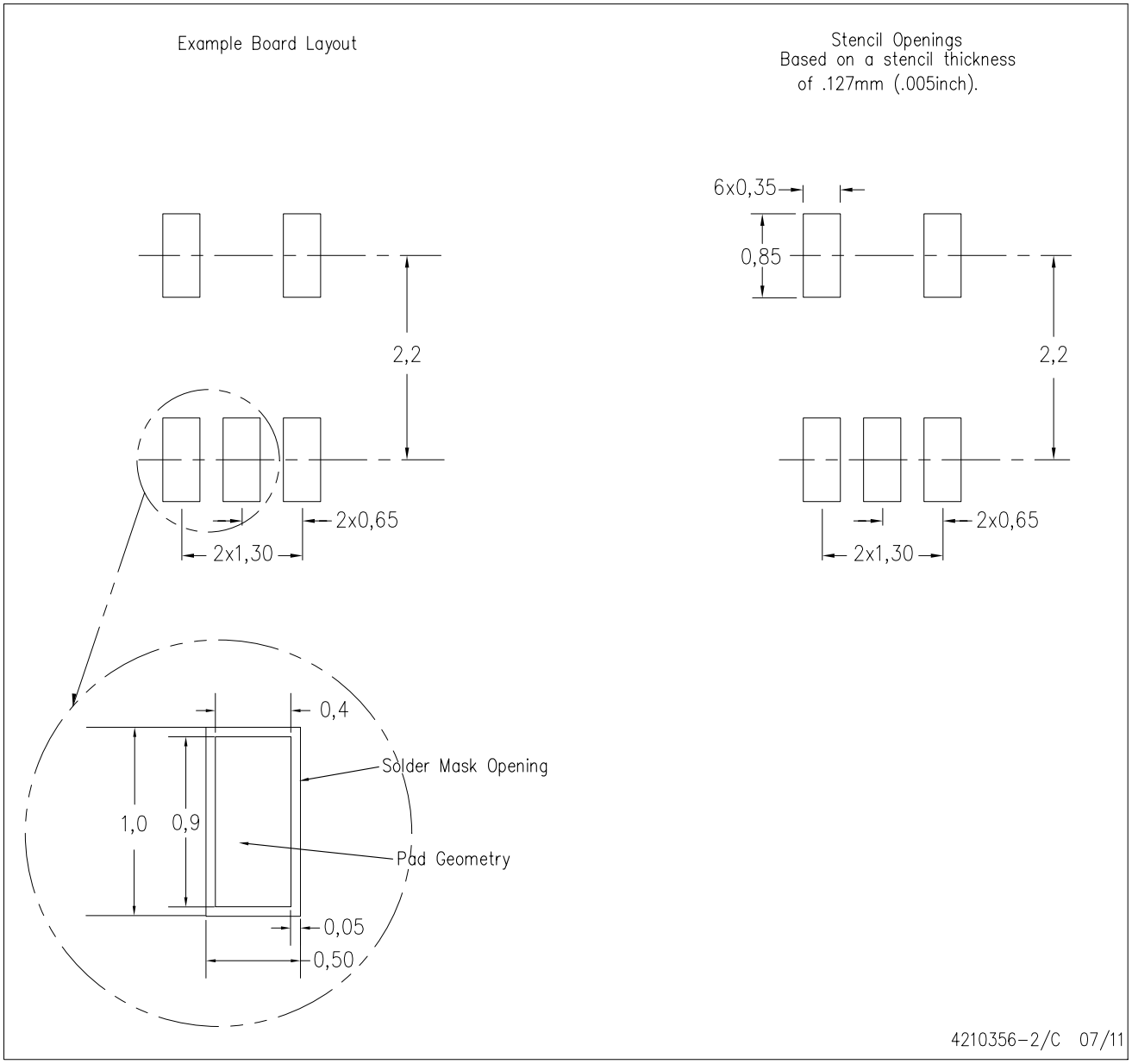
DCK (R–PDSO–G5) PLASTIC SMALL–OUTLINE PACKAGE



4093553–3/G 01/2007

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

DCK (R–PDSO–G5) PLASTIC SMALL OUTLINE

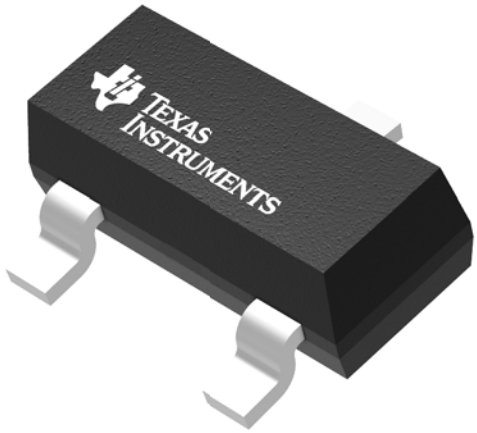


NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. Publication IPC–7351 is recommended for alternate designs.
E. Laser cutting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

GENERIC PACKAGE VIEW

DBZ 3 SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



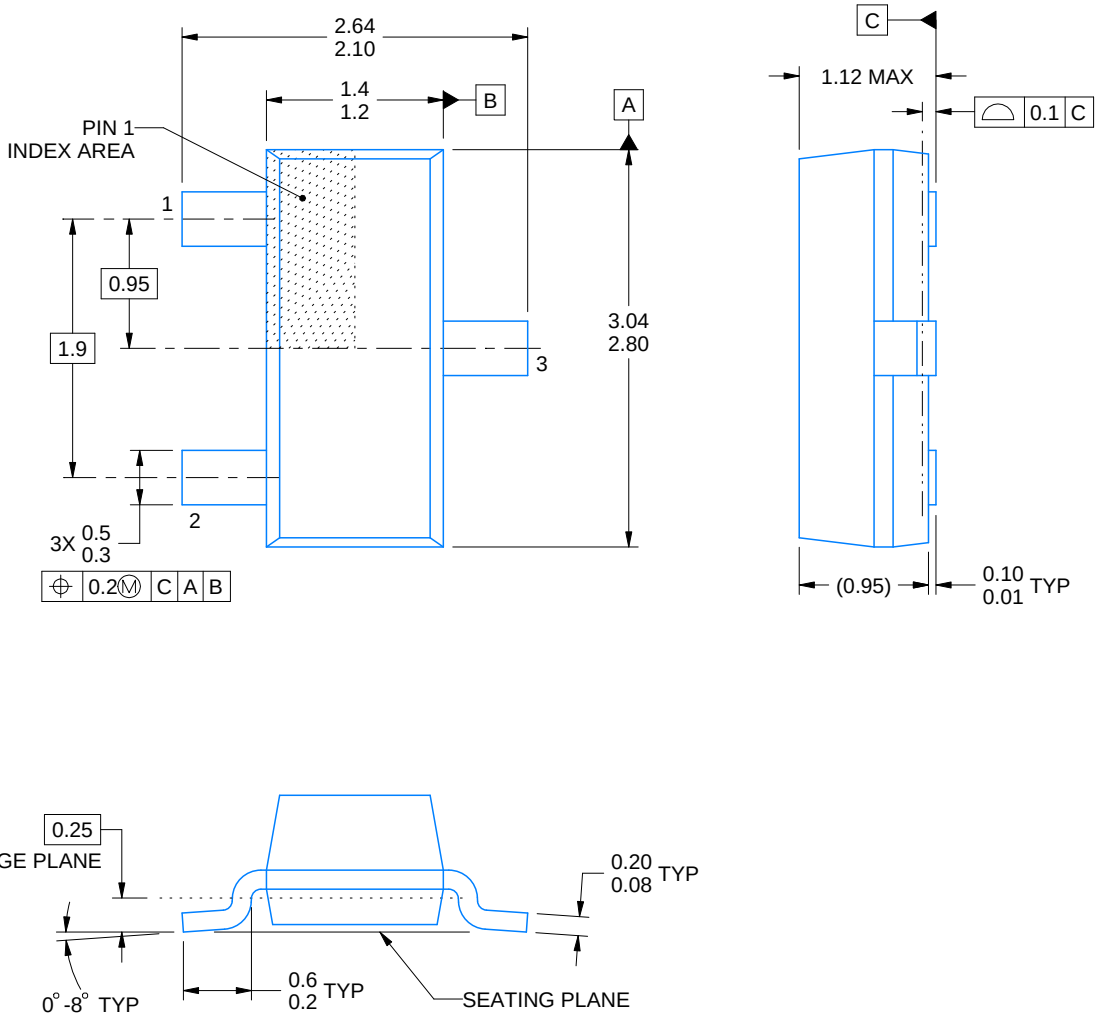
Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

PACKAGE OUTLINE

DBZ0003A

SOT-23 - 1.12 mm max height

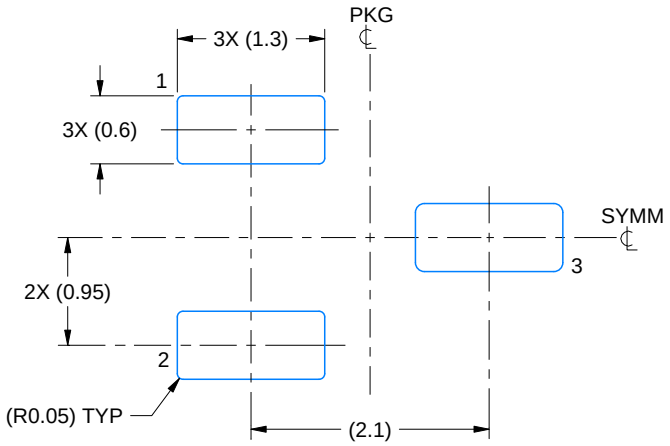
SMALL OUTLINE TRANSISTOR



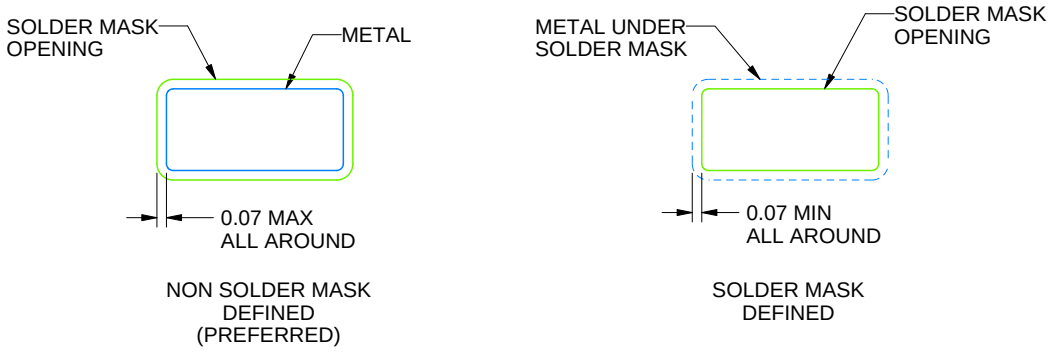
4214838/C 04/2017

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.



LAND PATTERN EXAMPLE
SCALE:15X

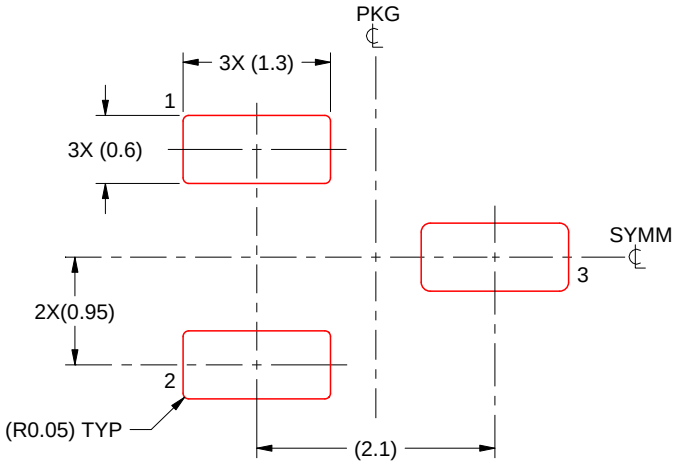


SOLDER MASK DETAILS

4214838/C 04/2017

NOTES: (continued)

4. Publication IPC-7351 may have alternate designs.
5. 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

4214838/C 04/2017

NOTES: (continued)

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

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