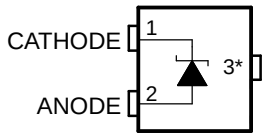
FEATURES

- **Fixed Output Voltages of 2.048 V, 2.5 V, 3 V, 4.096 V, 5 V, and 10 V**
- **Tight Output Tolerances and Low Temperature Coefficient**
  - **Max 0.1%, 100 ppm/°C – A Grade**
  - **Max 0.2%, 100 ppm/°C – B Grade**
  - **Max 0.5%, 100 ppm/°C – C Grade**
  - **Max 1.0%, 150 ppm/°C – D Grade**
- **Low Output Noise…35 μV_{RMS} Typ**
- **Wide Operating Current Range…45 μA Typ to 15 mA**
- **Stable With All Capacitive Loads; No Output Capacitor Required**
- **Available in Extended Temperature Range…–40°C to 125°C**

APPLICATIONS

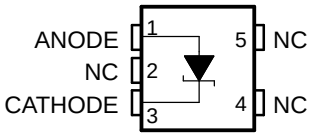
- **Data-Acquisition Systems**
- **Power Supplies and Power-Supply Monitors**
- **Instrumentation and Test Equipment**
- **Process Controls**
- **Precision Audio**
- **Automotive Electronics**
- **Energy Management**
- **Battery-Powered Equipment**

DBZ (SOT-23) PACKAGE
(TOP VIEW)



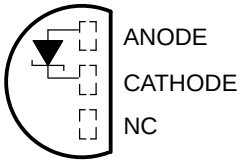
* Pin 3 is attached to substrate and must be connected to ANODE or left open.

DCK (SC-70) PACKAGE
(TOP VIEW)



NC – No internal connection

LP (TO-92/TO-226) PACKAGE
(TOP VIEW)



NC – No internal connection

DESCRIPTION/ORDERING INFORMATION

The LM4040 series of shunt voltage references are versatile, easy-to-use references that cater to a vast array of applications. The 2-pin fixed-output device requires no external capacitors for operation and is stable with all capacitive loads. Additionally, the reference offers low dynamic impedance, low noise, and low temperature coefficient to ensure a stable output voltage over a wide range of operating currents and temperatures. The LM4040 uses fuse and Zener-zap reverse breakdown voltage trim during wafer sort to offer four output voltage tolerances, ranging from 0.1% (max) for the A grade to 1% (max) for the D grade. Thus, a great deal of flexibility is offered to designers in choosing the best cost-to-performance ratio for their applications.

Packaged in space-saving SC-70 and SOT-23-3 packages and requiring a minimum current of 45 μA (typ), the LM4040 also is ideal for portable applications. The LM4040xI is characterized for operation over an ambient temperature range of –40°C to 85°C The LM4040xQ is characterized for operation over an ambient temperature range of –40°C to 125°C.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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ORDERING INFORMATION

T_A	DEVICE GRADE	V_{KA}	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING(2)
–40°C to 85°C	A grade: 0.1% initial accuracy and 100 ppm/°C temperature coefficient	2.048 V	SC-70 (DCK)	Reel of 3000	LM4040A20IDCKR	MS_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040A20IDBZR	4MC_
				Reel of 250	LM4040A20IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040A20ILP	PREVIEW
				Reel of 2000	LM4040A20ILPR	
		2.5 V	SC-70 (DCK)	Reel of 3000	LM4040A25IDCKR	P2_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040A25IDBZR	4NG_
				Reel of 250	LM4040A25IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040A25ILP	PREVIEW
				Reel of 2000	LM4040A25ILPR	
		3 V	SC-70 (DCK)	Reel of 3000	LM4040A30IDCKR	P9_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040A30IDBZR	4M6_
				Reel of 250	LM4040A30IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040A30ILP	PREVIEW
				Reel of 2000	LM4040A30ILPR	
		4.096 V	SC-70 (DCK)	Reel of 3000	LM4040A41IDCKR	P4_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040A41IDBZR	4M2_
				Reel of 250	LM4040A41IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040A41ILP	PREVIEW
				Reel of 2000	LM4040A41ILPR	
		5 V	SC-70 (DCK)	Reel of 3000	LM4040A50IDCKR	N5_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040A50IDBZR	4NA_
				Reel of 250	LM4040A50IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040A50ILP	PREVIEW
				Reel of 2000	LM4040A50ILPR	
		10 V	SC-70 (DCK)	Reel of 3000	LM4040A10IDCKR	PREVIEW
			SOT-23-3 (DBZ)	Reel of 3000	LM4040A10IDBZR	PREVIEW
				Reel of 250	LM4040A10IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040A10ILP	PREVIEW
				Reel of 2000	LM4040A10ILPR	

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.
(2) DBZ/DCK: The actual top-side marking has one additional character that designates the assembly/test site.

ORDERING INFORMATION (continued)

T_A	DEVICE GRADE	V_{KA}	PACKAGE[1]		ORDERABLE PART NUMBER	TOP-SIDE MARKING[2]
–40°C to 85°C	B grade: 0.2% initial accuracy and 100 ppm/°C temperature coefficient	2.048 V	SC-70 (DCK)	Reel of 3000	LM4040B20IDCKR	MT_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040B20IDBZR	4MD_
				Reel of 250	LM4040B20IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040B20ILP	PREVIEW
				Reel of 2000	LM4040B20ILPR	
		2.5 V	SC-70 (DCK)	Reel of 3000	LM4040B25IDCKR	P3_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040B25IDBZR	4NH_
				Reel of 250	LM4040B25IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040B25ILP	PREVIEW
				Reel of 2000	LM4040B25ILPR	
		3 V	SC-70 (DCK)	Reel of 3000	LM4040B30IDCKR	PA_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040B30IDBZR	4M7_
				Reel of 250	LM4040B30IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040B30ILP	PREVIEW
				Reel of 2000	LM4040B30ILPR	
		4.096 V	SC-70 (DCK)	Reel of 3000	LM4040B41IDCKR	P5_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040B41IDBZR	4M3_
				Reel of 250	LM4040B41IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040B41ILP	PREVIEW
				Reel of 2000	LM4040B41ILPR	
		5 V	SC-70 (DCK)	Reel of 3000	LM4040B50IDCKR	MX_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040B50IDBZR	4NB_
				Reel of 250	LM4040B50IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040B50ILP	PREVIEW
				Reel of 2000	LM4040B50ILPR	
		10 V	SC-70 (DCK)	Reel of 3000	LM4040B10IDCKR	PREVIEW
			SOT-23-3 (DBZ)	Reel of 3000	LM4040B10IDBZR	PREVIEW
				Reel of 250	LM4040B10IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040B10ILP	PREVIEW
				Reel of 2000	LM4040B10ILPR	

ORDERING INFORMATION (continued)

T_A	DEVICE GRADE	V_{KA}	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING(2)
–40°C to 85°C	C grade: 0.5% initial accuracy and 100 ppm/°C temperature coefficient	2.048 V	SC-70 (DCK)	Reel of 3000	LM4040C20IDCKR	MV_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040C20IDBZR	4MQ_
				Reel of 250	LM4040C20IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040C20ILP	PREVIEW
				Reel of 2000	LM4040C20ILPR	
		2.5 V	SC-70 (DCK)	Reel of 3000	LM4040C25IDCKR	M4_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040C25IDBZR	4MU_
				Reel of 250	LM4040C25IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040C25ILP	PREVIEW
				Reel of 2000	LM4040C25ILPR	
		3 V	SC-70 (DCK)	Reel of 3000	LM4040C30IDCKR	PB_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040C30IDBZR	4M8_
				Reel of 250	LM4040C30IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040C30ILP	PREVIEW
				Reel of 2000	LM4040C30ILPR	
		4.096 V	SC-70 (DCK)	Reel of 3000	LM4040C41IDCKR	P6_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040C41IDBZR	4M4_
				Reel of 250	LM4040C41IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040C41ILP	PREVIEW
				Reel of 2000	LM4040C41ILPR	
		5 V	SC-70 (DCK)	Reel of 3000	LM4040C50IDCKR	MZ_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040C50IDBZR	4NC_
				Reel of 250	LM4040C50IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040C50ILP	PREVIEW
				Reel of 2000	LM4040C50ILPR	
		10 V	SC-70 (DCK)	Reel of 3000	LM4040C10IDCKR	PREVIEW
			SOT-23-3 (DBZ)	Reel of 3000	LM4040C10IDBZR	PREVIEW
				Reel of 250	LM4040C10IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040C10ILP	PREVIEW
				Reel of 2000	LM4040C10ILPR	

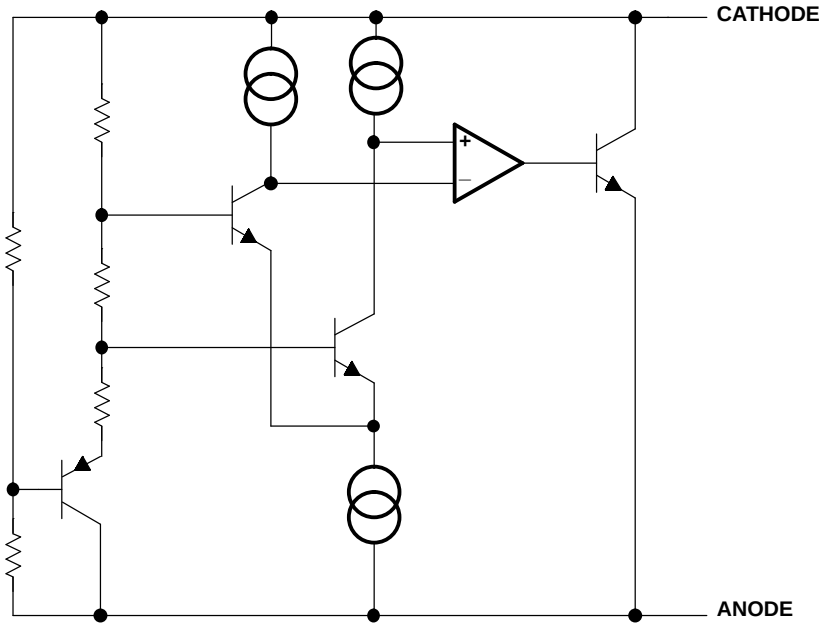
ORDERING INFORMATION (continued)

T_A	DEVICE GRADE	V_{KA}	PACKAGE[1]		ORDERABLE PART NUMBER	TOP-SIDE MARKING[2]
–40°C to 85°C	D grade: 1.0% initial accuracy and 150 ppm/°C temperature coefficient	2.048 V	SC-70 (DCK)	Reel of 3000	LM4040D20IDCKR	MW_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040D20IDBZR	4MV_
				Reel of 250	LM4040D20IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040D20ILP	PREVIEW
				Reel of 2000	LM4040D20ILPR	
		2.5 V	SC-70 (DCK)	Reel of 3000	LM4040D25IDCKR	ME_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040D25IDBZR	4ME_
				Reel of 250	LM4040D25IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040D25ILP	PREVIEW
				Reel of 2000	LM4040D25ILPR	
		3 V	SC-70 (DCK)	Reel of 3000	LM4040D30IDCKR	PC_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040D30IDBZR	4M9_
				Reel of 250	LM4040D30IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040D30ILP	PREVIEW
				Reel of 2000	LM4040D30ILPR	
		4.096 V	SC-70 (DCK)	Reel of 3000	LM4040D41IDCKR	P7_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040D41IDBZR	4M5_
				Reel of 250	LM4040D41IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040D41ILP	PREVIEW
				Reel of 2000	LM4040D41ILPR	
		5 V	SC-70 (DCK)	Reel of 3000	LM4040D50IDCKR	M4_
			SOT-23-3 (DBZ)	Reel of 3000	LM4040D50IDBZR	4ND_
				Reel of 250	LM4040D50IDBZT	
			TO-92/TO-226 (LP)	Bulk of 1000	LM4040D50ILP	PREVIEW
				Reel of 2000	LM4040D50ILPR	

ORDERING INFORMATION (continued)

T_A	DEVICE GRADE	V_{KA}	PACKAGE[1]		ORDERABLE PART NUMBER	TOP-SIDE MARKING[2]
–40°C to 125°C	C grade: 0.5% initial accuracy and 100 ppm/°C temperature coefficient	2.048 V	SOT-23-3 (DBZ)	Reel of 3000	LM4040C20QDBZR	4MW_
				Reel of 250	LM4040C20QDBZT	
		2.5 V		Reel of 3000	LM4040C25QDBZR	4MA_
				Reel of 250	LM4040C25QDBZT	
		3 V		Reel of 3000	LM4040C30QDBZR	4NJ_
				Reel of 250	LM4040C30QDBZT	
		5 V		Reel of 3000	LM4040C50QDBZR	4NE_
				Reel of 250	LM4040C50QDBZT	
	D grade: 1.0% initial accuracy and 150 ppm/°C temperature coefficient	2.048 V	SOT-23-3 (DBZ)	Reel of 3000	LM4040D20QDBZR	4MY_
				Reel of 250	LM4040D20QDBZT	
		2.5 V		Reel of 3000	LM4040D25QDBZR	4MB_
				Reel of 250	LM4040D25QDBZT	
		3 V		Reel of 3000	LM4040D30QDBZR	4NK_
				Reel of 250	LM4040D30QDBZT	
		5 V		Reel of 3000	LM4040D50QDBZR	4NF_
				Reel of 250	LM4040D50QDBZT	

FUNCTIONAL BLOCK DIAGRAM



Absolute Maximum Ratings(1)

over free-air temperature range (unless otherwise noted)

			MIN	MAX	UNIT
I_Z	Continuous cathode current		–10	25	mA
θ_{JA}	Package thermal impedance(2)(3)	DBZ package		206	°C/W
		DCK package		252	
		LP package		156	
T_J	Operating virtual junction temperature			150	°C
T_{stg}	Storage temperature range		–65	150	°C

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) Maximum power dissipation is a function of $T_J(max)$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
(3) The package thermal impedance is calculated in accordance with JESD 51-7.

Recommended Operating Conditions

			MIN	MAX	UNIT
I_Z	Cathode current		(1)	12	mA
T_A	Free-air temperature	LM4040xxxI	–40	85	°C
		LM4040xxxQ	–40	125	

(1) See parametric tables

LM4040x20I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040A20I			LM4040B20I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		2.048			2.048		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–2		2	–4.1		4.1	mV
			Full range	–15		15	–17		17	
$I_{Z,min}$	Minimum cathode current		25°C		45	75		45	75	µA
			Full range			80			80	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±100	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.3	0.8		0.3	0.8	mV
			Full range			1			1	
		1 mA < I_Z < 15 mA	25°C		2.5	6		2.5	6	
			Full range			8			8	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.3	0.8		0.3	0.8	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x20I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C20I			LM4040D20I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		2.048			2.048		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–10		10	–20		20	mV
			Full range	–23		23	–40		40	
$I_{Z,min}$	Minimum cathode current		25°C		45	75		45	75	µA
			Full range			80			80	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.3	0.8		0.3	1	mV
			Full range			1			1.2	
		1 mA < I_Z < 15 mA	25°C		2.5	6		2.5	8	
			Full range			8			10	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.3	0.9		0.3	1.1	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x20Q Electrical Characteristics

at extended temperature range, full-range T_A = –40°C to 125°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C20Q			LM4040D20Q			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		2.048			2.048		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–10		10	–20		20	mV
			Full range	–30		30	–50		50	
$I_{Z,min}$	Minimum cathode current		25°C		45	75		45	75	µA
			Full range			80			80	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.3	0.8		0.3	1	mV
			Full range			1			1.2	
		1 mA < I_Z < 15 mA	25°C		2.5	6		2.5	8	
			Full range			8			10	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.3	0.9		0.3	1.1	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x25I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040A25I			LM4040B25I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		2.5			2.5		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–2.5		2.5	–5		5	mV
			Full range	–19		19	–21		21	
$I_{Z,min}$	Minimum cathode current		25°C		45	75		45	75	µA
			Full range			80			80	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±100	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.3	0.8		0.3	0.8	mV
			Full range			1			1	
		1 mA < I_Z < 15 mA	25°C		2.5	6		2.5	6	
			Full range			8			8	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.3	0.8		0.3	0.8	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x25I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C25I			LM4040D25I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		2.5			2.5		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–12		12	–25		25	mV
			Full range	–29		29	–49		49	
$I_{Z,min}$	Minimum cathode current		25°C		45	75		45	75	µA
			Full range			80			80	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.3	0.8		0.3	1	mV
			Full range			1			1.2	
		1 mA < I_Z < 15 mA	25°C		2.5	6		2.5	8	
			Full range			8			10	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.3	0.9		0.3	1.1	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x25Q Electrical Characteristics

at extended temperature range, full-range T_A = –40°C to 125°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C25Q			LM4040D25Q			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		2.5			2.5		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–12		12	–25		25	mV
			Full range	–38		38	–63		63	
$I_{Z,min}$	Minimum cathode current		25°C		45	75		45	75	µA
			Full range			80			80	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.3	0.8		0.3	1	mV
			Full range			1			1.2	
		1 mA < I_Z < 15 mA	25°C		2.5	6		2.5	8	
			Full range			8			10	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.3	0.9		0.3	1.1	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x30I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040A30I			LM4040B30I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		3			3		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–3		3	–6		6	mV
			Full range	–22		22	–26		26	
$I_{Z,min}$	Minimum cathode current		25°C		47	77		47	77	µA
			Full range			82			82	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±100	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.6	0.8		0.6	0.8	mV
			Full range			1.1			1.1	
		1 mA < I_Z < 15 mA	25°C		2.7	6		2.7	6	
			Full range			9			9	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.4	0.9		0.4	0.9	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x30I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C30I			LM4040D30I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		3			3		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–15		15	–30		30	mV
			Full range	–34		34	–59		59	
$I_{Z,min}$	Minimum cathode current		25°C		45	77		45	77	µA
			Full range			82			82	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.4	0.8		1.4	1	mV
			Full range			1.1			1.3	
		1 mA < I_Z < 15 mA	25°C		2.7	6		2.7	8	
			Full range			9			11	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.4	0.9		0.4	1.2	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x30Q Electrical Characteristics

at extended temperature range, full-range T_A = –40°C to 125°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C30Q			LM4040D30Q			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		3			3		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–15		15	–30		30	mV
			Full range	–45		45	–75		75	
$I_{Z,min}$	Minimum cathode current		25°C		47	77		47	77	µA
			Full range			82			82	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±20			±20		ppm/°C
		I_Z = 1 mA	25°C		±15			±15		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±15			±15		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.4	0.8		0.4	1.1	mV
			Full range			1.1			1.3	
		1 mA < I_Z < 15 mA	25°C		2.7	6		2.7	8	
			Full range			9			11	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.4	0.9		0.4	1.2	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		35			35		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x41I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040A41I			LM4040B41I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		4.096			4.096		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–4.1		4.1	–8.2		8.2	mV
			Full range	–31		31	–35		35	
$I_{Z,min}$	Minimum cathode current		25°C		50	83		50	83	µA
			Full range			88			88	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±30			±30		ppm/°C
		I_Z = 1 mA	25°C		±20			±20		
			Full range			±100			±100	
		I_Z = 100 µA	25°C		±20			±20		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.5	0.9		0.5	0.9	mV
			Full range			1.2			1.2	
		1 mA < I_Z < 15 mA	25°C		3	7		3	7	
			Full range			10			10	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.5	1		0.5	1	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		80			80		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x41I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C41I			LM4040D41I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		4.096			4.096		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–20		20	–41		41	mV
			Full range	–47		47	–81		81	
$I_{Z,min}$	Minimum cathode current		25°C		50	83		50	83	µA
			Full range			88			88	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±30			±30		ppm/°C
		I_Z = 1 mA	25°C		±20			±20		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±20			±20		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.5	0.9		0.5	1.2	mV
			Full range			1.2			1.5	
		1 mA < I_Z < 15 mA	25°C		3	7		3	9	
			Full range			10			13	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.5	1		0.5	1.3	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		80			80		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x50I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040A50I			LM4040B50I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		5			5		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–5		5	–10		10	mV
			Full range	–38		38	–43		43	
$I_{Z,min}$	Minimum cathode current		25°C		65	89		65	89	µA
			Full range			95			95	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±30			±30		ppm/°C
		I_Z = 1 mA	25°C		±20			±20		
			Full range			±100			±100	
		I_Z = 100 µA	25°C		±20			±20		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.5	1		0.5	1	mV
			Full range			1.4			1.4	
		1 mA < I_Z < 15 mA	25°C		3.5	8		3.5	8	
			Full range			12			12	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.5	1.1		0.5	1.1	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		80			80		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x50I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C50I			LM4040D50I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		5			5		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–25		25	–50		50	mV
			Full range	–58		58	–99		99	
$I_{Z,min}$	Minimum cathode current		25°C		65	89		65	89	µA
			Full range			95			95	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±30			±30		ppm/°C
		I_Z = 1 mA	25°C		±20			±20		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±20			±20		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.5	1		0.5	1.3	mV
			Full range			1.4			1.8	
		1 mA < I_Z < 15 mA	25°C		3.5	8		3.5	10	
			Full range			12			15	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.5	1.1		0.5	1.5	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		80			80		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x50Q Electrical Characteristics

at extended temperature range, full-range T_A = –40°C to 125°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C50Q			LM4040D50Q			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 100 µA	25°C		5			5		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 100 µA	25°C	–25		25	–50		50	mV
			Full range	–75		75	–125		125	
$I_{Z,min}$	Minimum cathode current		25°C		65	89		65	89	µA
			Full range			95			95	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±30			±30		ppm/°C
		I_Z = 1 mA	25°C		±20			±20		
			Full range			±100			±150	
		I_Z = 100 µA	25°C		±20			±20		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.5	1		0.5	1	mV
			Full range			1.4			1.8	
		1 mA < I_Z < 15 mA	25°C		3.5	8		3.5	8	
			Full range			12			12	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.5	1.1		0.5	1.1	Ω
e_N	Wideband noise	I_Z = 100 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		80			80		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 100 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x10I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040A10I			LM4040B10I			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 150 µA	25°C		10			10		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 150 µA	25°C	–10		10	–20		20	mV
			Full range	–75		75	–85		85	
$I_{Z,min}$	Minimum cathode current		25°C		75	100		75	100	µA
			Full range			103			103	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±40			±40		ppm/°C
		I_Z = 1 mA	25°C		±20			±20		
			Full range			±100			±100	
		I_Z = 150 µA	25°C		±20			±20		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.8	1.5		0.8	1.5	mV
			Full range			3.5			3.5	
		1 mA < I_Z < 15 mA	25°C		8	12		8	12	
			Full range			23			23	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.7	1.7		0.7	1.7	Ω
e_N	Wideband noise	I_Z = 150 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		180			180		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 150 µA			120			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

LM4040x10I Electrical Characteristics

at industrial temperature range, full-range T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	LM4040C10I			UNIT
				MIN	TYP	MAX	
V_Z	Reverse breakdown voltage	I_Z = 150 µA	25°C		10		V
ΔV_Z	Reverse breakdown voltage tolerance	I_Z = 150 µA	25°C	–50		50	mV
			Full range	–115		115	
$I_{Z,min}$	Minimum cathode current		25°C		75	100	µA
			Full range			103	
α_{VZ}	Average temperature coefficient of reverse breakdown voltage	I_Z = 10 mA	25°C		±40		ppm/°C
		I_Z = 1 mA	25°C		±20		
			Full range			±100	
		I_Z = 150 µA	25°C		±20		
$\frac{\Delta V_Z}{\Delta I_Z}$	Reverse breakdown voltage change with cathode current change	$I_{Z,min} < I_Z < 1$ mA	25°C		0.8	1.5	mV
			Full range			3.5	
		1 mA < I_Z < 15 mA	25°C		8	12	
			Full range			23	
Z_Z	Reverse dynamic impedance	I_Z = 1 mA, f = 120 Hz, I_{AC} = 0.1 I_Z	25°C		0.7	1.7	Ω
e_N	Wideband noise	I_Z = 150 µA, 10 Hz ≤ f ≤ 10 kHz	25°C		180		μV_{RMS}
	Long-term stability of reverse breakdown voltage	t = 1000 h, T_A = 25°C ± 0.1°C, I_Z = 150 µA			120		ppm
V_{HYST}	Thermal hysteresis (1)	ΔT_A = –40°C to 125°C			0.08		%

(1) Thermal hysteresis is defined as $V_{Z,25°C}$ (after cycling to –40°C) – $V_{Z,25°C}$ (after cycling to 125°C).

TYPICAL CHARACTERISTICS

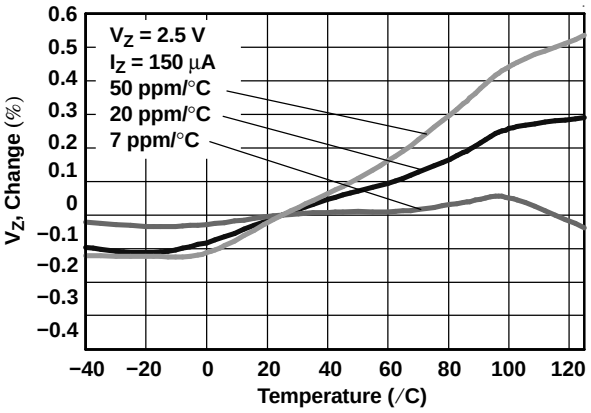


Figure 1. Temperature Drift for Different Average Temperature Coefficients

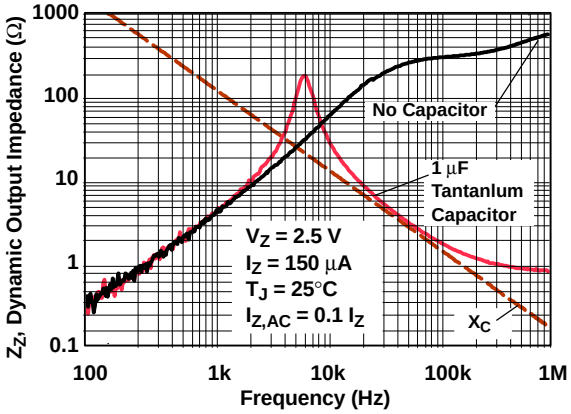


Figure 2. Output Impedance vs Frequency

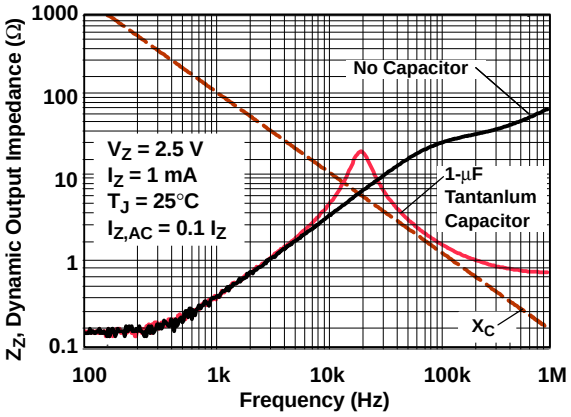


Figure 3. Output Impedance vs Frequency

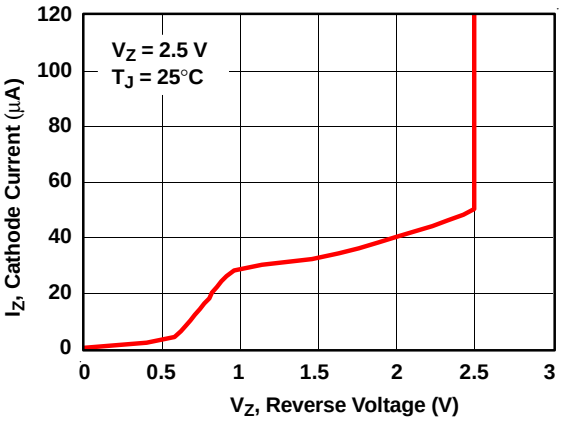


Figure 4. Temperature Drift for Different Average Temperature Coefficient

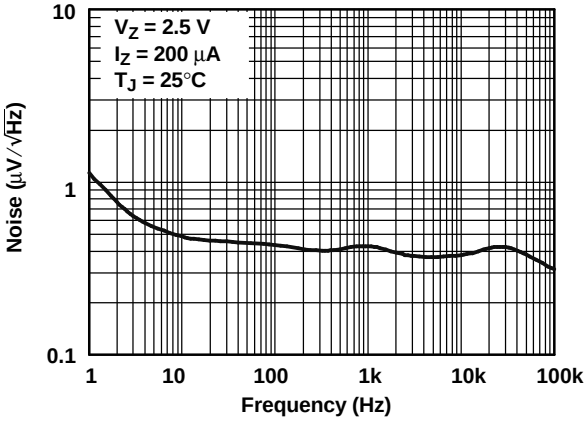


Figure 5. Noise Voltage vs Frequency

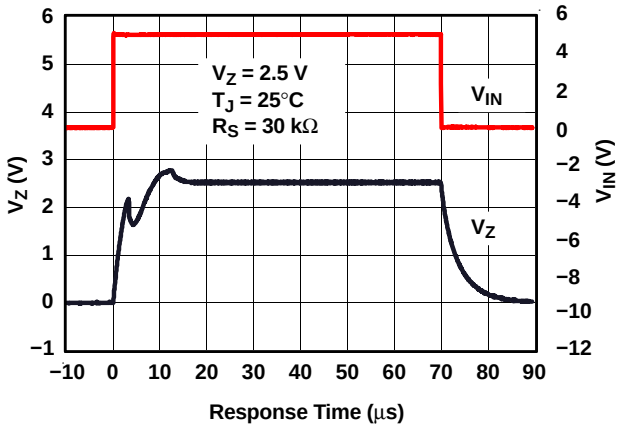


Figure 6. Start-Up Characteristics

APPLICATION INFORMATION

Start-Up Characteristics

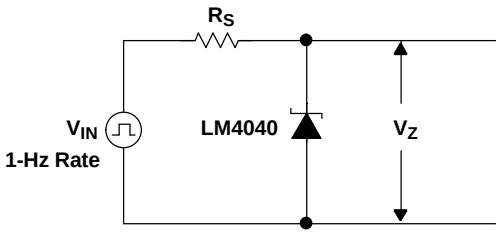


Figure 7. Test Circuit

Output Capacitor

The LM4040 does not require an output capacitor across cathode and anode for stability. However, if an output bypass capacitor is desired, the LM4040 is designed to be stable with all capacitive loads.

SOT-23 Connections

There is a parasitic Schottky diode connected between pins 2 and 3 of the SOT-23 packaged device. Thus, pin 3 of the SOT-23 package must be left floating or connected to pin 2.

Use With ADCs or DACs

The LM4040x-41 is designed to be a cost-effective voltage reference as required in 12-bit data-acquisition systems. For 12-bit systems operating from 5-V supplies such as the ADS7842 (see Figure 8), the LM4040x-41 (4.096 V) permits operation with an LSB of 1 mV.

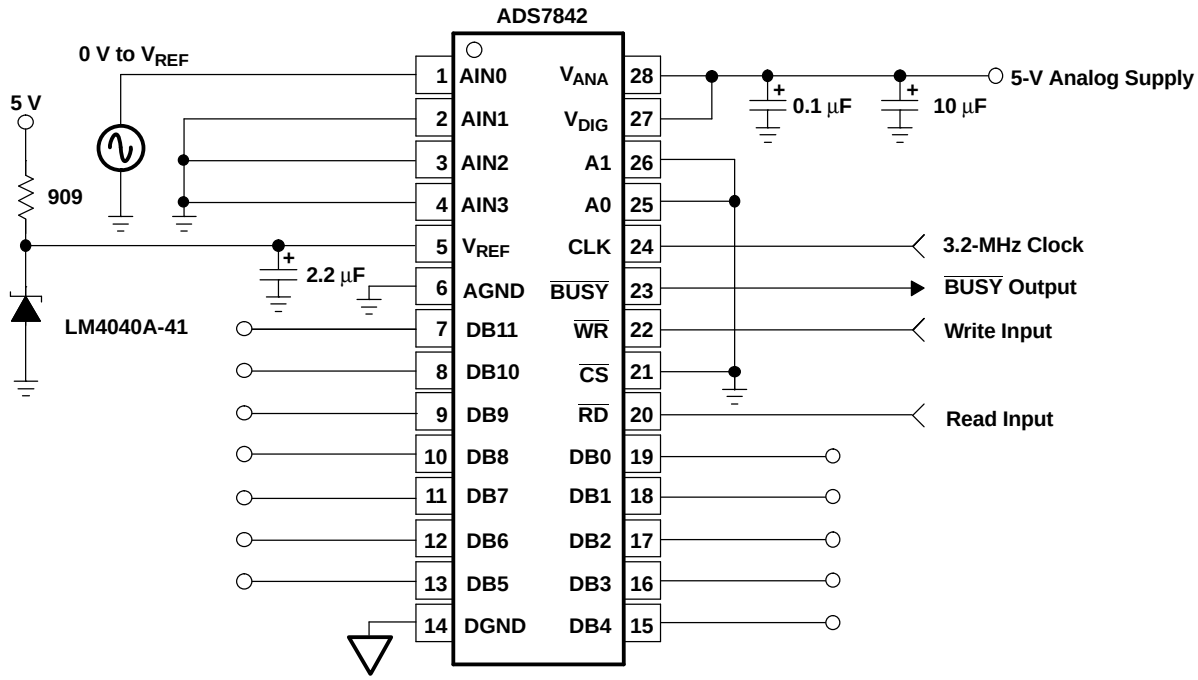


Figure 8. Data-Acquisition Circuit With LM4040x-41

APPLICATION INFORMATION (continued)

Cathode and Load Currents

In a typical shunt-regulator configuration (see Figure 9), an external resistor, R_S, is connected between the supply and the cathode of the LM4040. R_S must be set properly, as it sets the total current available to supply the load (I_L) and bias the LM4040 (I_Z). In all cases, I_Z must stay within a specified range for proper operation of the reference. Taking into consideration one extreme in the variation of the load and supply voltage (maximum I_L and minimum V_S), R_S must be small enough to supply the minimum I_Z required for operation of the regulator, as given by data-sheet parameters. At the other extreme, maximum V_S and minimum I_L, R_S must be large enough to limit I_Z to less than its maximum-rated value of 15 mA.

R_S is calculated according to Equation 1:

$$R_S = \frac{(V_S - V_Z)}{(I_L + I_Z)} \quad (1)$$

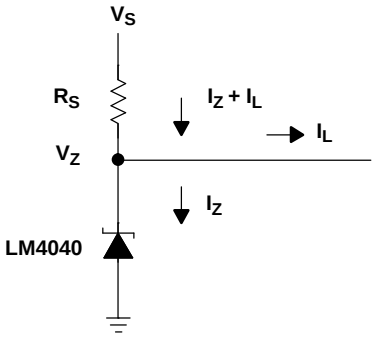


Figure 9. Shunt Regulator

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
LM4040A10IDBZR	PREVIEW	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI
LM4040A10IDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI
LM4040A10IDCKR	PREVIEW	SC70	DCK	5	3000	TBD	Call TI	Call TI
LM4040A10ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040A10ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040A20IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A20IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A20IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A20IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A20IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A20IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A25IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A25IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A25IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A25IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A25IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A25IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A25ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040A25ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040A30IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A30IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A30IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A30IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A30IDCKT	PREVIEW	SC70	DCK	5	250	TBD	Call TI	Call TI
LM4040A30ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040A30ILPM	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040A30ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040A41IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A41IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
LM4040A41IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A41IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A41IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A41IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A41ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040A41ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040A50IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A50IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A50IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A50IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A50IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A50IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040A50ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040B10IDBZR	PREVIEW	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI
LM4040B10IDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI
LM4040B10IDCKR	PREVIEW	SC70	DCK	5	3000	TBD	Call TI	Call TI
LM4040B10ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040B10ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040B20IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B20IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B20IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B20IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B20IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B20IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B25IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B25IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B25IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B25IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B25IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
LM4040B25IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B25ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040B25ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040B30IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B30IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B30IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B30IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B30IDCKT	PREVIEW	SC70	DCK	5	250	TBD	Call TI	Call TI
LM4040B30ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040B30ILPM	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040B30ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040B41IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B41IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B41IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B41IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B41IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B41IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B41ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040B41ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040B50IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B50IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B50IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B50IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B50IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B50IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040B50ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040B50ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040C10IDBZR	PREVIEW	SOT-23	DBZ	3	3000	TBD	Call TI	Call TI
LM4040C10IDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI
LM4040C10IDCKR	PREVIEW	SC70	DCK	5	3000	TBD	Call TI	Call TI
LM4040C10ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040C10ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
LM4040C20IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20QDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C20QDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDCKT	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25IDCKTE4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040C25ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040C25QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25QDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C25QDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C30IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C30IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C30IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS &	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
						no Sb/Br)		
LM4040C30IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C30IDCKT	PREVIEW	SC70	DCK	5	250	TBD	Call TI	Call TI
LM4040C30ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040C30ILPM	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040C30ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040C30QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C30QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C41IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C41IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C41IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C41IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C41IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C41IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C41ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040C41ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040C50IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040C50ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040C50QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50QDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040C50QDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS &	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
						no Sb/Br)		
LM4040D20IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20QDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D20QDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDCKT	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25IDCKTE4	ACTIVE	SC70	DCK	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040D25ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040D25QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25QDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D25QDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D30IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D30IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D30IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D30IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
LM4040D30IDCKT	PREVIEW	SC70	DCK	5	250	TBD	Call TI	Call TI
LM4040D30ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040D30ILPM	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040D30ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040D30QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D30QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D41IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D41IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D41IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D41IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D41IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D41IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D41ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040D41ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040D50IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50IDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50ILP	PREVIEW	TO-92	LP	3	1000	TBD	Call TI	Call TI
LM4040D50ILPR	PREVIEW	TO-92	LP	3	2000	TBD	Call TI	Call TI
LM4040D50QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50QDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LM4040D50QDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

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

OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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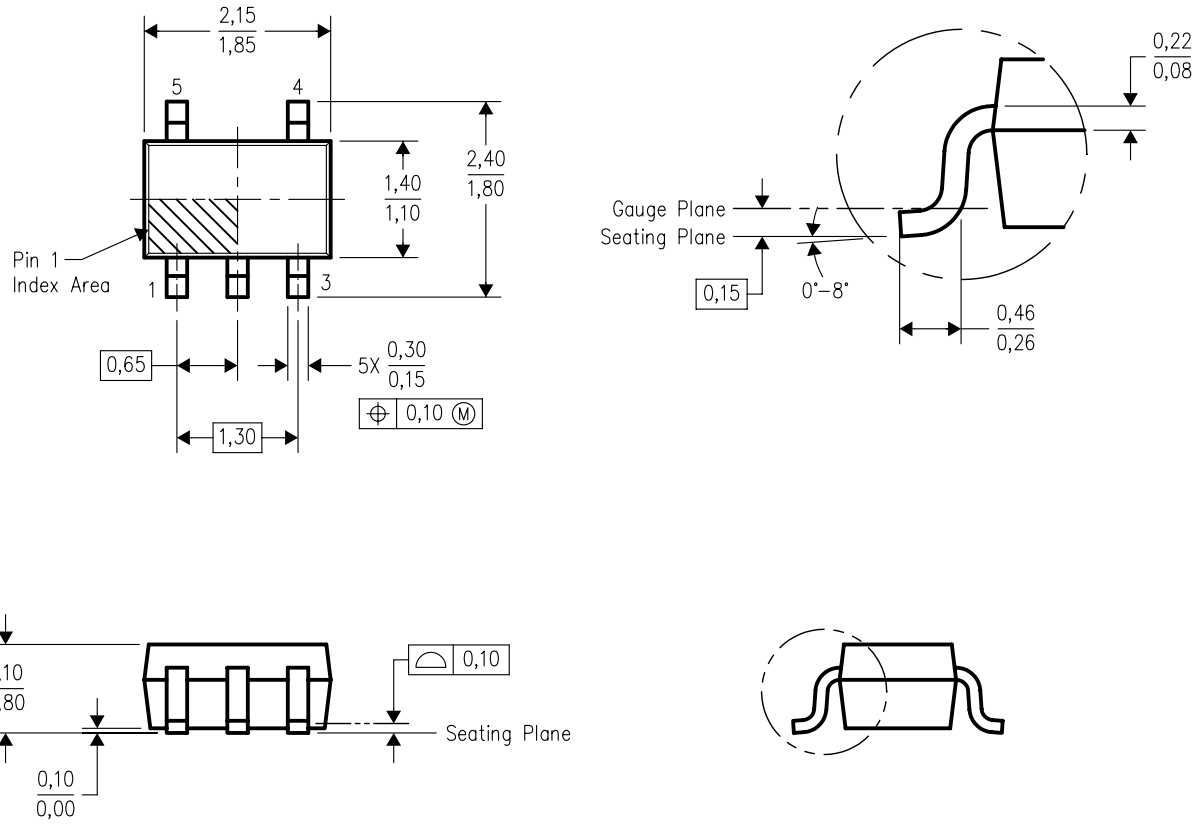
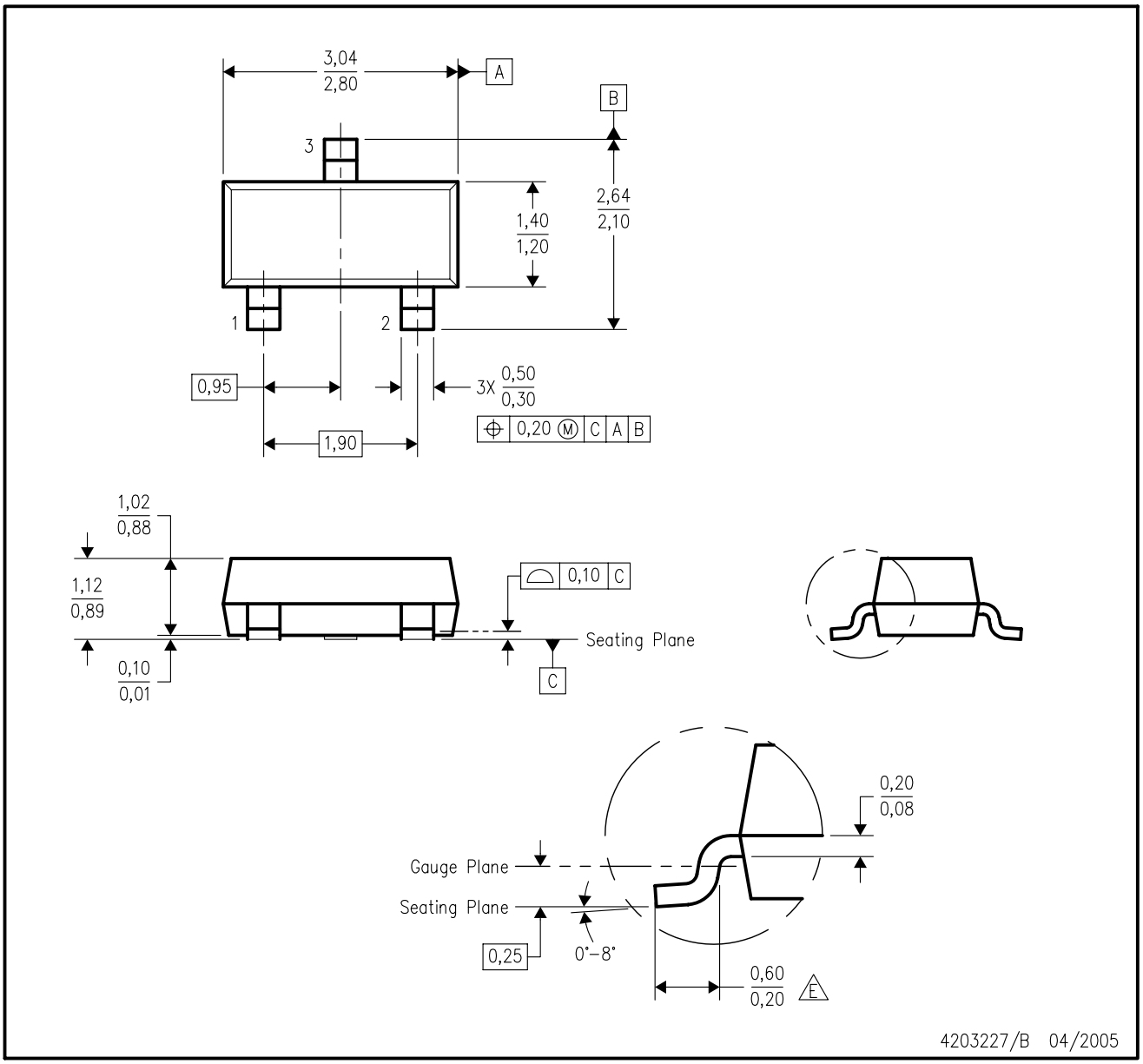
DCK (R–PDSO–G5) PLASTIC SMALL–OUTLINE PACKAGE



4093553–2/E 10/2005

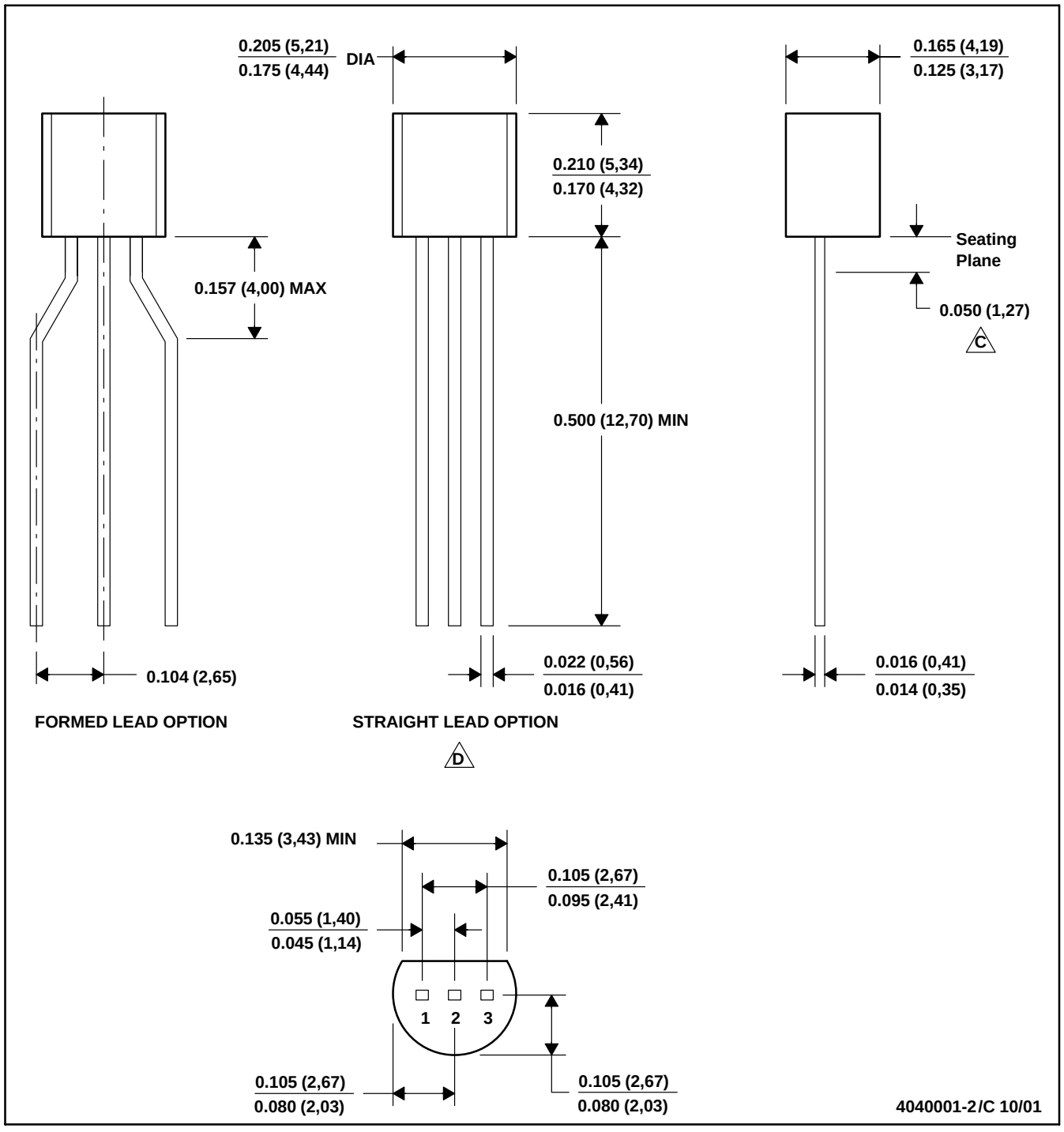
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO–203 variation AA.

DBZ (R–PDSO–G3) PLASTIC SMALL–OUTLINE



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Lead dimensions are inclusive of plating.
D. Body dimensions are exclusive of mold flash and protrusion. Mold flash and protrusion not to exceed 0.25 per side.
E. Falls within JEDEC TO–236 variation AB, except minimum foot length.

LP (O-PBCY-W3) **PLASTIC CYLINDRICAL PACKAGE**



NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Lead dimensions are not controlled within this area
D. FAlls within JEDEC TO -226 Variation AA (TO-226 replaces TO-92)
E. Shipping Method:
Straight lead option available in bulk pack only.
Formed lead option available in tape & reel or ammo pack.

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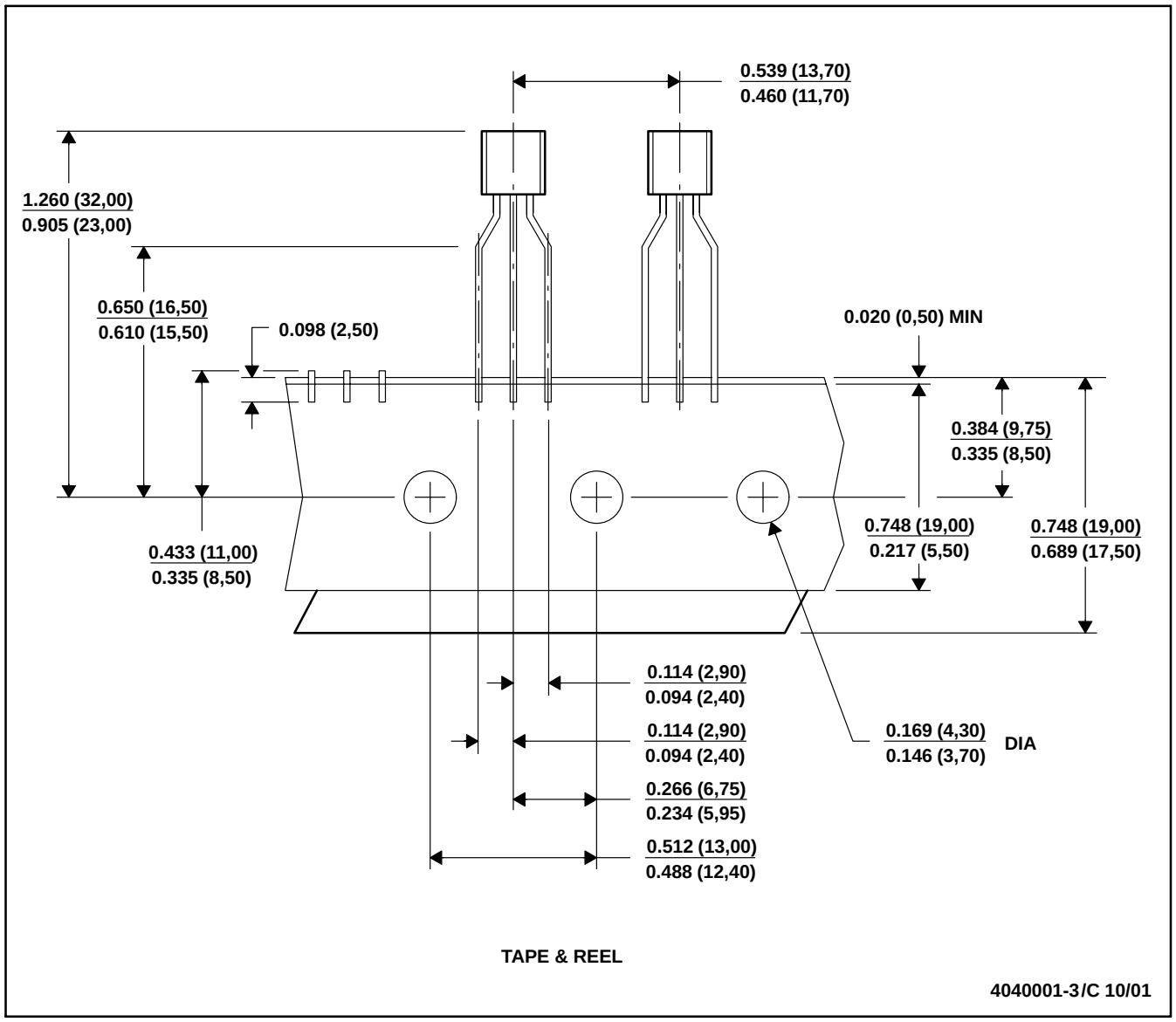
LP (O-PBCY-W3) **PLASTIC CYLINDRICAL PACKAGE**



NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Tape and Reel information for the Format Lead Option package.

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Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265

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