

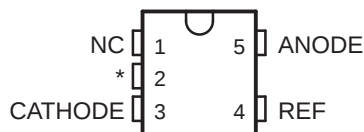
LOW-VOLTAGE ADJUSTABLE PRECISION SHUNT REGULATORS

Check for Samples: [TLVH431](#) [TLVH431A](#) [TLVH431B](#) [TLVH432](#) [TLVH432A](#) [TLVH432B](#)

FEATURES

- Low-Voltage Operation: Down to 1.24 V
- Reference Voltage Tolerances at 25°C
 - 0.5% for B Grade
 - 1% for A Grade
 - 1.5% for Standard Grade
- Adjustable Output Voltage, $V_O = V_{REF}$ to 18 V
- Wide Operating Cathode Current Range: 100 μ A to 70 mA
- 0.25- Ω Typical Output Impedance
- –40°C to 125°C Specifications
- TLVH432 Provides Alternative Pinouts for SOT-23-3 and SOT-89 Packages
- Ultra-Small SC-70 Package Offers 40% Smaller Footprint Than SOT-23-3
- ESD Performance Tested Per JESD 22
 - 2500-V Human-Body Model (A114-B, Class II)
 - 1000-V Charged-Device Model (C101)

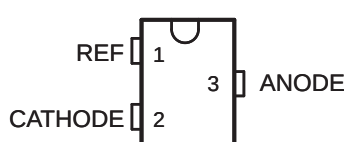
TLVH431
DBV (SOT-23-5) PACKAGE
(TOP VIEW)



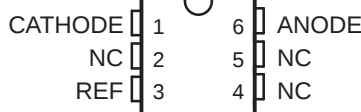
NC – No internal connection

* Pin 2 is attached to Substrate and must be connected to ANODE or left open.

TLVH431
DBZ (SOT-23-3) PACKAGE
(TOP VIEW)

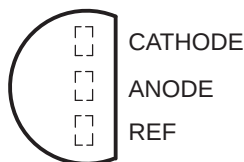


TLVH431
DCK (SC-70) PACKAGE
(TOP VIEW)

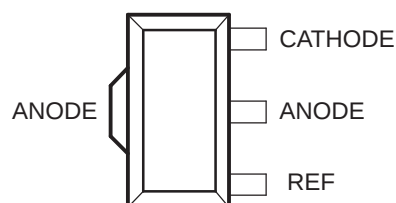


NC – No internal connection

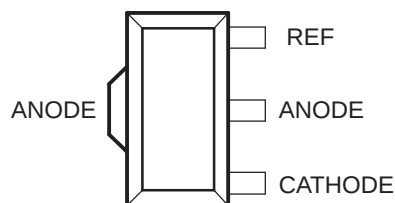
TLVH431
LP (TO-92/TO-226) PACKAGE
(TOP VIEW)



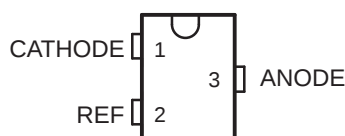
TLVH431
PK (SOT-89) PACKAGE
(TOP VIEW)



TLVH432
PK (SOT-89) PACKAGE
(TOP VIEW)



TLVH432
DBZ (SOT-23-3) PACKAGE
(TOP VIEW)



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.

DESCRIPTION/ORDERING INFORMATION

The TLVH431 and TLVH432 are low-voltage 3-terminal adjustable voltage references, with specified thermal stability over applicable industrial and commercial temperature ranges. Output voltage can be set to any value between V_{REF} (1.24 V) and 18 V with two external resistors (see [Figure 2](#)). These devices operate from a lower voltage (1.24 V) than the widely used TL431 and TL1431 shunt-regulator references.

When used with an optocoupler, the TLVH431 and TLVH432 are ideal voltage references in isolated feedback circuits for 3-V to 3.3-V switching-mode power supplies. They have a typical output impedance of 0.25 Ω . Active output circuitry provides a very sharp turn-on characteristic, making the TLVH431 and TLVH432 excellent replacements for low-voltage Zener diodes in many applications, including on-board regulation and adjustable power supplies.

The TLVH432 is identical to the TLVH431, but is offered with different pinouts for the SOT-23-3 and SOT-89 packages.

Table 1. ORDERING INFORMATION ⁽¹⁾

T_A	V_{REF} TOLERANCE	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽³⁾
0°C to 70°C	0.5%	SC-70 – DCK	Reel of 3000	TLVH431BCDCKR	YH_
			Reel of 250	TLVH431BCDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431BCDBVR	Y3J_
			Reel of 250	TLVH431BCDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431BCDBZR	Y3J_
				TLVH432BCDBZR	Y2H_
			Reel of 250	TLVH431BCDBZT	Y3J_
				TLVH432BCDBZT	Y2H_
		SOT-89 – PK	Reel of 1000	TLVH431BCPK	V7
				TLVH432BCPK	VN
		TO-92 – LP	Bulk of 1000	TLVH431BCLP	ZA431B
			Reel of 2000	TLVH431BCLPR	
	1%	SC-70 – DCK	Reel of 3000	TLVH431ACDCKR	YP_
			Reel of 250	TLVH431ACDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431ACDBVR	Y3P_
			Reel of 250	TLVH431ACDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431ACDBZR	Y3P_
				TLVH432ACDBZR	Y2E_
			Reel of 250	TLVH431ACDBZT	Y3P_
				TLVH432ACDBZT	Y2E_
		SOT-89 – PK	Reel of 1000	TLVH431ACPK	W2
				TLVH432ACPK	VK
		TO-92 – LP	Bulk of 1000	TLVH431ACLP	ZA431A
			Reel of 2000	TLVH431ACLPR	
	1.5%	SC-70 – DCK	Reel of 3000	TLVH431CDCKR	YU_
			Reel of 250	TLVH431CDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431CDBVR	Y3U_
			Reel of 250	TLVH431CDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431CDBZR	Y3U_
				TLVH432CDBZR	Y2A_
			Reel of 250	TLVH431CDBZT	Y3U_
				TLVH432CDBZT	Y2A_
		SOT-89 – PK	Reel of 1000	TLVH431CPK	W4
				TLVH432CPK	VG
		TO-92 – LP	Bulk of 1000	TLVH431CLP	ZA431
			Reel of 2000	TLVH431CLPR	

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

(3) DBV/DCK: The actual top-side marking has one additional character that designates the wafer fab/assembly site.

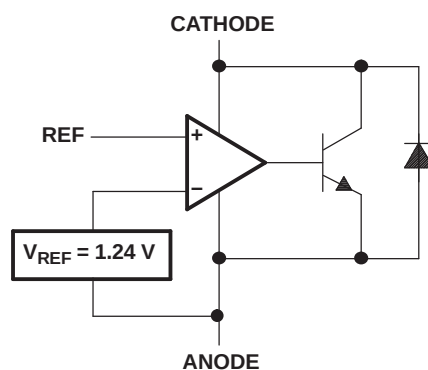
Table 1. ORDERING INFORMATION ⁽¹⁾ (continued)

T_A	V_{REF} TOLERANCE	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽³⁾
–40°C to 85°C	0.5%	SC-70 – DCK	Reel of 3000	TLVH431BIDCKR	YJ_
			Reel of 250	TLVH431BIDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431BIDBVR	Y3K_
			Reel of 250	TLVH431BIDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431BIDBZR	Y3K_
				TLVH432BIDBZR	Y2J_
			Reel of 250	TLVH431BIDBZT	Y3K_
				TLVH432BIDBZT	Y2J_
		SOT-89 – PK	Reel of 1000	TLVH431BIPK	V8
				TLVH432BIPK	VP
		TO-92 – LP	Bulk of 1000	TLVH431BILP	ZB431B
			Reel of 2000	TLVH431BILPR	
	1%	SC-70 – DCK	Reel of 3000	TLVH431AIDCKR	YT_
			Reel of 250	TLVH431AIDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431AIDBVR	Y3T_
			Reel of 250	TLVH431AIDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431AIDBZR	Y3T_
				TLVH432AIDBZR	Y2F_
			Reel of 250	TLVH431AIDBZT	Y3T_
				TLVH432AIDBZT	Y2F_
		SOT-89 – PK	Reel of 1000	TLVH431AIPK	W3
				TLVH432AIPK	VL
		TO-92 – LP	Bulk of 1000	TLVH431AILP	ZB431A
			Reel of 2000	TLVH431AILPR	
	1.5%	SC-70 – DCK	Reel of 3000	TLVH431IDCKR	YV_
			Reel of 250	TLVH431IDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431IDBVR	Y3V_
			Reel of 250	TLVH431IDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431IDBZR	Y3V_
				TLVH432IDBZR	Y2B_
			Reel of 250	TLVH431IDBZT	Y3V_
				TLVH432IDBZT	Y2B_
		SOT-89 – PK	Reel of 1000	TLVH431IPK	W5
				TLVH432IPK	VH
		TO-92 – LP	Bulk of 1000	TLVH431ILP	ZB431
			Reel of 2000	TLVH431ILPR	

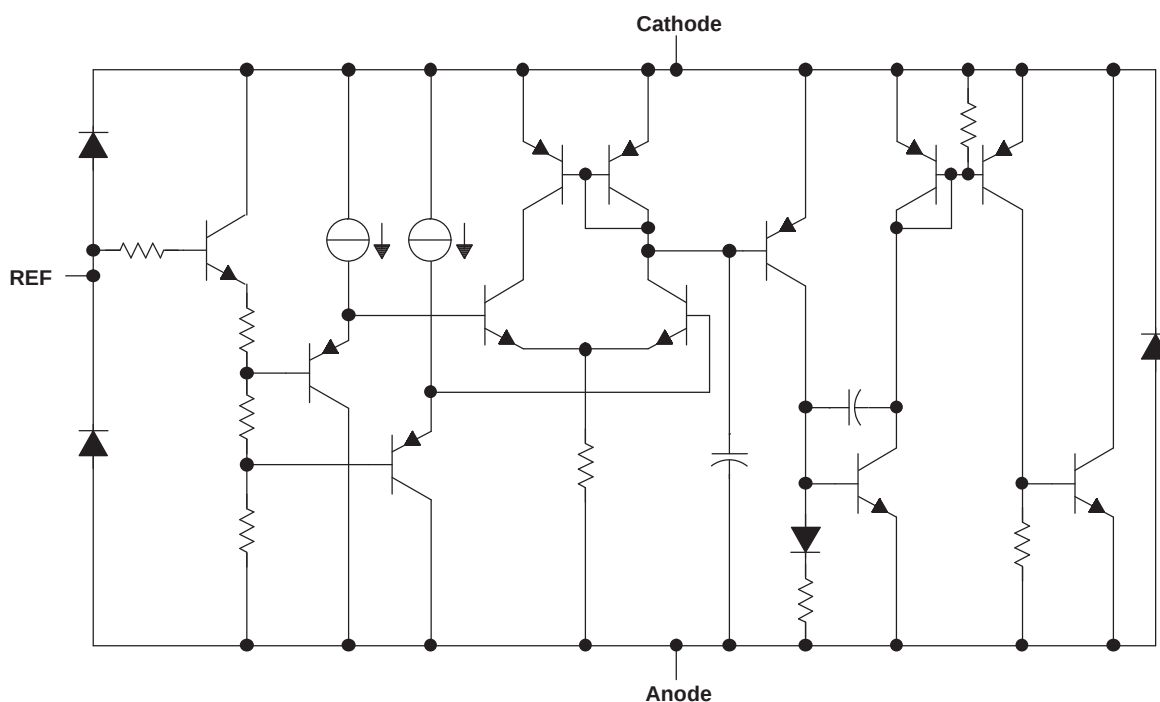
Table 1. ORDERING INFORMATION ⁽¹⁾ (continued)

T_A	V_{REF} TOLERANCE	PACKAGE ⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING ⁽³⁾
–40°C to 125°C	0.5%	SC-70 – DCK	Reel of 3000	TLVH431BQDCKR	YK_
			Reel of 250	TLVH431BQDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431BQDBVR	Y3L_
			Reel of 250	TLVH431BQDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431BQDBZR	Y3L_
				TLVH432BQDBZR	Y2K_
			Reel of 250	TLVH431BQDBZT	Y3L_
				TLVH432BQDBZT	Y2K_
		SOT-89 – PK	Reel of 1000	TLVH431BQPK	V9
				TLVH432BQPK	VQ
		TO-92 – LP	Bulk of 1000	TLVH431BQLP	ZD431B
			Reel of 2000	TLVH431BQLPR	
	1%	SC-70 – DCK	Reel of 3000	TLVH431AQDCKR	YN_
			Reel of 250	TLVH431AQDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431AQDBVR	Y3N_
			Reel of 250	TLVH431AQDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431AQDBZR	Y3N_
				TLVH432AQDBZR	Y2G_
			Reel of 250	TLVH431AQDBZT	Y3N_
				TLVH432AQDBZT	Y2G_
		SOT-89 – PK	Reel of 1000	TLVH431AQPK	VD
				TLVH432AQPK	VM
		TO-92 – LP	Bulk of 1000	TLVH431AQLP	ZD431A
			Reel of 2000	TLVH431AQLPR	
	1.5%	SC-70 – DCK	Reel of 3000	TLVH431QDCKR	YM_
			Reel of 250	TLVH431QDCKT	
		SOT-23-5 – DBV	Reel of 3000	TLVH431QDBVR	Y3M_
			Reel of 250	TLVH431QDBVT	
		SOT-23-3 – DBZ	Reel of 3000	TLVH431QDBZR	Y3M_
				TLVH432QDBZR	Y2D_
			Reel of 250	TLVH431QDBZT	Y3M_
				TLVH432QDBZT	Y2D_
		SOT-89 – PK	Reel of 1000	TLVH431QPK	VC
				TLVH432QPK	VJ
		TO-92 – LP	Bulk of 1000	TLVH431QLP	ZD431
			Reel of 2000	TLVH431QLPR	

LOGIC BLOCK DIAGRAM



EQUIVALENT SCHEMATIC



ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

		MIN	MAX	UNIT
V_{KA}	Cathode voltage ⁽²⁾		20	V
I_K	Cathode current range	–25	80	mA
I_{ref}	Reference current range	–0.05	3	mA
θ_{JA}	Package thermal impedance ^{(3) (4)}	DBV package		206
		DBZ package		206
		DCK package		252
		LP package		140
		PK package		52
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) Voltage values are with respect to the anode terminal, unless otherwise noted.
- (3) Maximum power dissipation is a function of $T_J(\text{max})$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

RECOMMENDED OPERATING CONDITIONS

		MIN	MAX	UNIT
V_{KA}	Cathode voltage	V_{REF}	18	V
I_K	Cathode current (continuous)	0.1	70	mA
T_A	Operating free-air temperature	TLVH43x_C	0	70
		TLVH43x_I	–40	85
		TLVH43x_Q	–40	125

TLVH43x ELECTRICAL CHARACTERISTICS

at 25°C free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS		TLVH431 TLVH432			UNIT
			MIN	TYP	MAX	
V_{REF} Reference voltage	$V_{KA} = V_{REF}$, $I_K = 10 \text{ mA}$	$T_A = 25^\circ\text{C}$	1.222	1.24	1.258	V
		$T_A = \text{full range,}$ See Figure 1 ⁽¹⁾	TLVH431C		1.21	
			TLVH431I		1.202	
			TLVH431Q		1.194	
$V_{REF(dev)}$ V_{REF} deviation over full temperature range ⁽²⁾	$V_{KA} = V_{REF}$, $I_K = 10 \text{ mA}$, See Figure 1 ⁽¹⁾	TLVH431C	4		12	mV
		TLVH431I	6		20	
		TLVH431Q	11		31	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$ Ratio of V_{REF} change to cathode voltage change	$I_K = 10 \text{ mA}$, $V_K = V_{REF}$ to 18 V, See Figure 2		–1.5		–2.7	mV/V
I_{ref} Reference terminal current	$I_K = 10 \text{ mA}$, $R1 = 10 \text{ k}\Omega$, $R2 = \text{open}$, See Figure 2		0.1		0.5	μA
$I_{ref(dev)}$ I_{ref} deviation over full temperature range ⁽²⁾	$I_K = 10 \text{ mA}$, $R1 = 10 \text{ k}\Omega$, $R2 = \text{open}$, See Figure 2 ⁽¹⁾	TLVH431C	0.05		0.3	μA
		TLVH431I	0.1		0.4	
		TLVH431Q	0.15		0.5	
$I_{K(min)}$ Minimum cathode current for regulation	$V_{KA} = V_{REF}$, See Figure 1		60		100	μA
$I_{K(off)}$ Off-state cathode current	$V_{REF} = 0$, $V_{KA} = 18 \text{ V}$, See Figure 3		0.02		0.1	μA
$ z_{KA} $ Dynamic impedance ⁽³⁾	$V_{KA} = V_{REF}$, $f \leq 1 \text{ kHz}$, $I_K = 0.1 \text{ mA}$ to 70 mA, See Figure 1		0.25		0.4	Ω

(1) Full temperature ranges are -40°C to 125°C for TLVH431Q, -40°C to 85°C for TLVH431I, and 0°C to 70°C for TLVH431C.

(2) The deviation parameters $V_{REF(dev)}$ and $I_{ref(dev)}$ are defined as the differences between the maximum and minimum values obtained over the rated temperature range. The average full-range temperature coefficient of the reference input voltage, αV_{REF} , is defined as:

$$|\alpha V_{REF}| \left(\frac{\text{ppm}}{^\circ\text{C}} \right) = \frac{\left(\frac{V_{REF(dev)}}{V_{REF}(T_A = 25^\circ\text{C})} \right)}{\Delta T_A} \times 10^6$$

where ΔT_A is the rated operating free-air temperature range of the device.

αV_{REF} can be positive or negative, depending on whether minimum V_{REF} or maximum V_{REF} , respectively, occurs at the lower temperature.

(3) The dynamic impedance is defined as:

$$|z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_K}$$

When the device is operating with two external resistors (see [Figure 2](#)), the total dynamic impedance of the circuit is defined as:

$$|z_{KA}| = \frac{\Delta V}{\Delta I} \approx |z_{KA}| \times \left(1 + \frac{R1}{R2} \right)$$

TLVH43xA ELECTRICAL CHARACTERISTICS

at 25°C free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS		TLVH431A TLVH432A			UNIT
			MIN	TYP	MAX	
V_{REF} Reference voltage	$V_{KA} = V_{REF}$, $I_K = 10\text{ mA}$	$T_A = 25^\circ\text{C}$	1.228	1.24	1.252	V
		$T_A = \text{full range,}$ See Figure 1 ⁽¹⁾	TLVH431AC	1.221	1.259	
			TLVH431AI	1.215	1.265	
			TLVH431AQ	1.209	1.271	
$V_{REF(dev)}$ V_{REF} deviation over full temperature range ⁽²⁾	$V_{KA} = V_{REF}$, $I_K = 10\text{ mA}$, See Figure 1 ⁽¹⁾	TLVH431AC		4	12	mV
		TLVH431AI		6	20	
		TLVH431AQ		11	31	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$ Ratio of V_{REF} change to cathode voltage change	$V_K = V_{REF}$ to 18 V, $I_K = 10\text{ mA}$, See Figure 2			–1.5	–2.7	mV/V
I_{ref} Reference terminal current	$I_K = 10\text{ mA}$, $R_1 = 10\text{ k}\Omega$, $R_2 = \text{open}$, See Figure 2			0.1	0.5	μA
$I_{ref(dev)}$ I_{ref} deviation over full temperature range ⁽²⁾	$I_K = 10\text{ mA}$, $R_1 = 10\text{ k}\Omega$, $R_2 = \text{open}$, See Figure 2 ⁽¹⁾	TLVH431AC		0.05	0.3	μA
		TLVH431AI		0.1	0.4	
		TLVH431AQ		0.15	0.5	
$I_{K(min)}$ Minimum cathode current for regulation	$V_{KA} = V_{REF}$, See Figure 1			60	100	μA
$I_{K(off)}$ Off-state cathode current	$V_{REF} = 0$, $V_{KA} = 18\text{ V}$, See Figure 3			0.02	0.1	μA
$ z_{KA} $ Dynamic impedance ⁽³⁾	$V_{KA} = V_{REF}$, $f \leq 1\text{ kHz}$, $I_K = 0.1\text{ mA}$ to 70 mA, See Figure 1			0.25	0.4	Ω

(1) Full temperature ranges are -40°C to 125°C for TLVH431Q, -40°C to 85°C for TLVH431I, and 0°C to 70°C for TLVH431C.

(2) The deviation parameters $V_{REF(dev)}$ and $I_{ref(dev)}$ are defined as the differences between the maximum and minimum values obtained over the rated temperature range. The average full-range temperature coefficient of the reference input voltage, αV_{REF} , is defined as:

$$|\alpha V_{REF}| \left(\frac{\text{ppm}}{^\circ\text{C}} \right) = \frac{\left(\frac{V_{REF(dev)}}{V_{REF}(T_A = 25^\circ\text{C})} \right)}{\Delta T_A} \times 10^6$$

where ΔT_A is the rated operating free-air temperature range of the device.

 αV_{REF} can be positive or negative, depending on whether minimum V_{REF} or maximum V_{REF} , respectively, occurs at the lower temperature.

(3) The dynamic impedance is defined as:

$$|z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_K}$$

When the device is operating with two external resistors (see Figure 2), the total dynamic impedance of the circuit is defined as:

$$|z_{KA}| = \frac{\Delta V}{\Delta I} \approx |z_{KA}| \times \left(1 + \frac{R_1}{R_2} \right)$$

TLVH43xB ELECTRICAL CHARACTERISTICS

at 25°C free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS		TLVH431B TLVH432B			UNIT
			MIN	TYP	MAX	
V_{REF} Reference voltage	$V_{KA} = V_{REF}$, $I_K = 10$ mA	$T_A = 25^\circ\text{C}$	1.234	1.24	1.246	V
		$T_A = \text{full range,}$ See Figure 1 ⁽¹⁾	TLVH431BC	1.227	1.253	
			TLVH431BI	1.224	1.259	
			TLVH431BQ	1.221	1.265	
$V_{REF(\text{dev})}$ V_{REF} deviation over full temperature range ⁽²⁾	$V_{KA} = V_{REF}$, $I_K = 10$ mA, See Figure 1 ⁽¹⁾	TLVH431BC		4	12	mV
		TLVH431BI		6	20	
		TLVH431BQ		11	31	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$ Ratio of V_{REF} change to cathode voltage change	$I_K = 10$ mA, $V_K = V_{REF}$ to 18 V, See Figure 2			–1.5	–2.7	mV/V
I_{ref} Reference terminal current	$I_K = 10$ mA, $R_1 = 10$ k Ω , $R_2 = \text{open}$, See Figure 2			0.1	0.5	μA
$I_{ref(\text{dev})}$ I_{ref} deviation over full temperature range ⁽²⁾	$I_K = 10$ mA, $R_1 = 10$ k Ω , $R_2 = \text{open}$, See Figure 2 ⁽¹⁾	TLVH431BC		0.05	0.3	μA
		TLVH431BI		0.1	0.4	
		TLVH431BQ		0.15	0.5	
$I_{K(\text{min})}$ Minimum cathode current for regulation	$V_{KA} = V_{REF}$, See Figure 1			60	100	μA
$I_{K(\text{off})}$ Off-state cathode current	$V_{REF} = 0$, $V_{KA} = 18$ V, See Figure 3			0.02	0.1	μA
$ z_{KA} $ Dynamic impedance ⁽³⁾	$V_{KA} = V_{REF}$, $f \leq 1$ kHz, $I_K = 0.1$ mA to 70 mA, See Figure 1			0.25	0.4	Ω

(1) Full temperature ranges are –40°C to 125°C for TLVH431Q, –40°C to 85°C for TLVH431I, and 0°C to 70°C for TLVH431C.

(2) The deviation parameters $V_{REF(\text{dev})}$ and $I_{ref(\text{dev})}$ are defined as the differences between the maximum and minimum values obtained over the rated temperature range. The average full-range temperature coefficient of the reference input voltage, αV_{REF} , is defined as:

$$|\alpha V_{REF}| \left(\frac{\text{ppm}}{^\circ\text{C}} \right) = \frac{\left(\frac{V_{REF(\text{dev})}}{V_{REF}(T_A = 25^\circ\text{C})} \right)}{\Delta T_A} \times 10^6$$

where ΔT_A is the rated operating free-air temperature range of the device.

αV_{REF} can be positive or negative, depending on whether minimum V_{REF} or maximum V_{REF} , respectively, occurs at the lower temperature.

(3) The dynamic impedance is defined as:

$$|z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_K}$$

When the device is operating with two external resistors (see [Figure 2](#)), the total dynamic impedance of the circuit is defined as:

$$|z_{KA}| = \frac{\Delta V}{\Delta I} \approx |z_{KA}| \times \left(1 + \frac{R_1}{R_2} \right)$$

PARAMETER MEASUREMENT INFORMATION

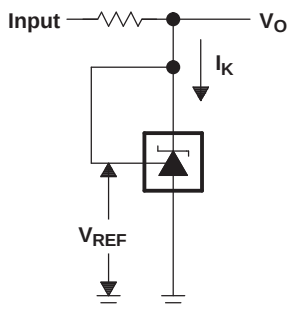


Figure 1. Test Circuit for $V_{KA} = V_{REF}$, $V_O = V_{KA} = V_{REF}$

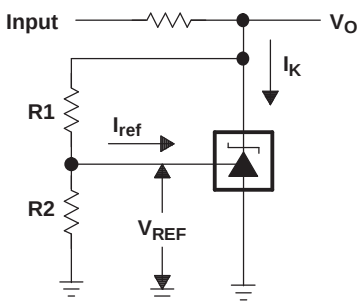


Figure 2. Test Circuit for $V_{KA} > V_{REF}$, $V_O = V_{KA} = V_{REF} \times (1 + R1/R2) + I_{ref} \times R1$

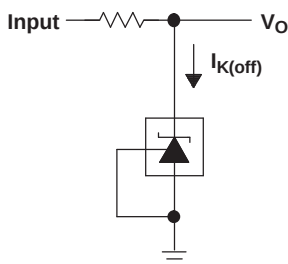


Figure 3. Test Circuit for $I_{K(off)}$

PARAMETER MEASUREMENT INFORMATION (continued)

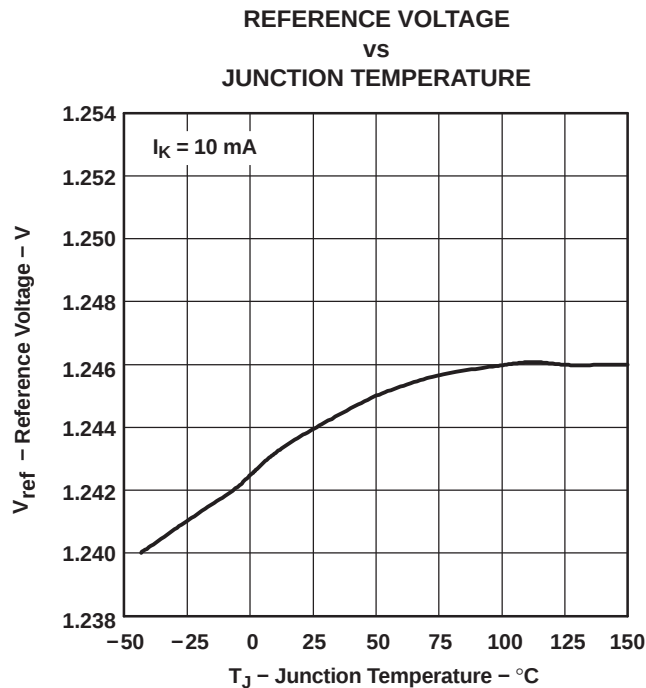


Figure 4.

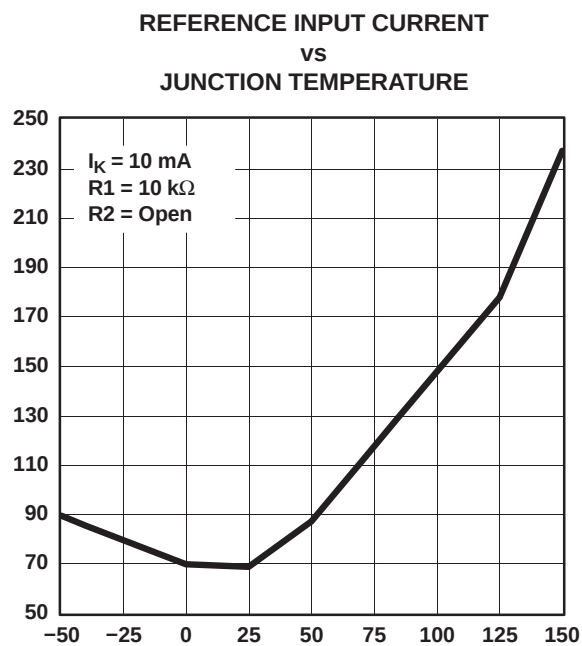


Figure 5.

PARAMETER MEASUREMENT INFORMATION (continued)

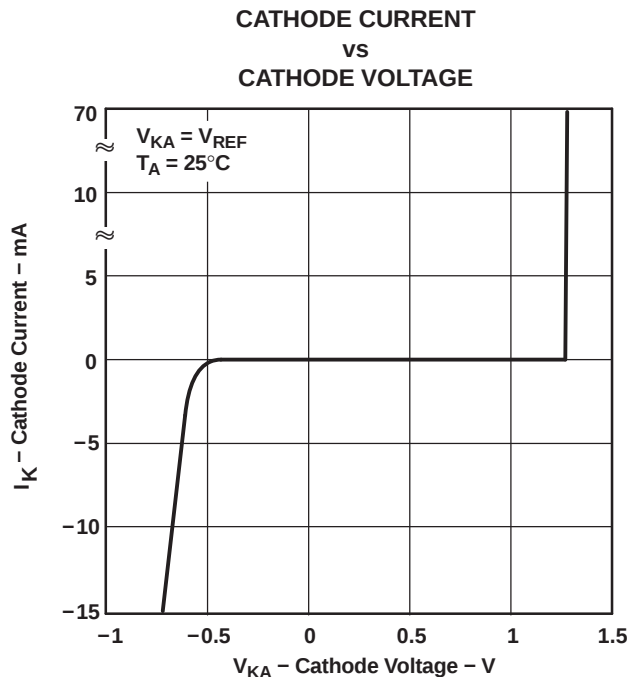


Figure 6.

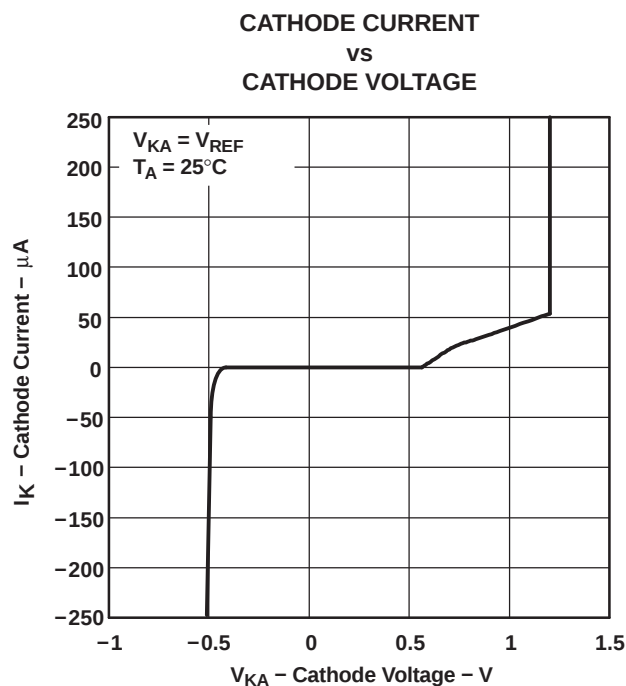


Figure 7.

PARAMETER MEASUREMENT INFORMATION (continued)

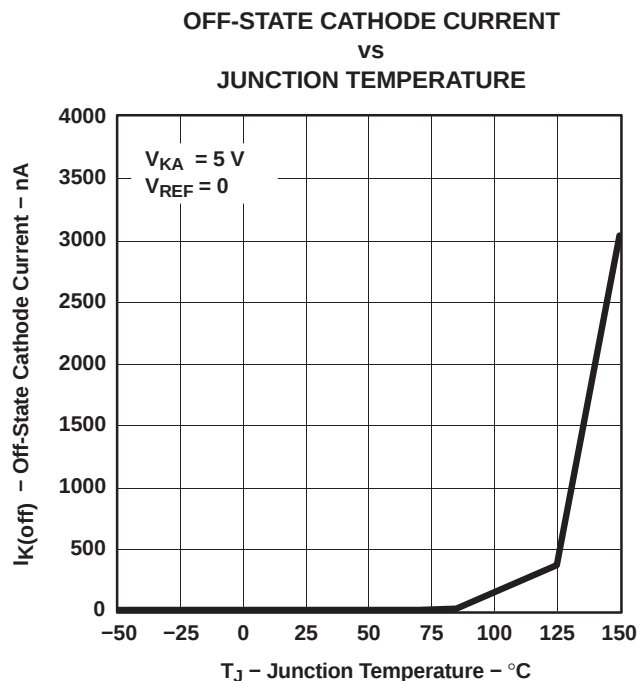


Figure 8.

PARAMETER MEASUREMENT INFORMATION (continued)

Operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied.

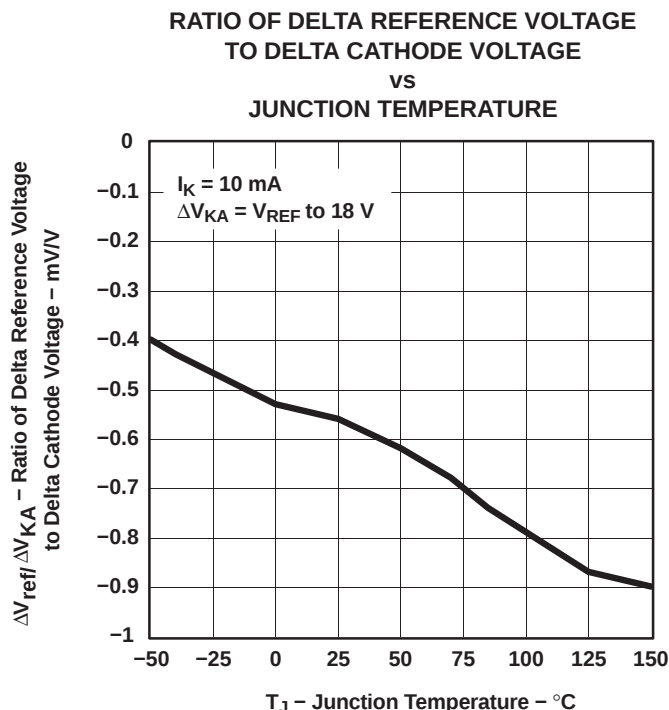
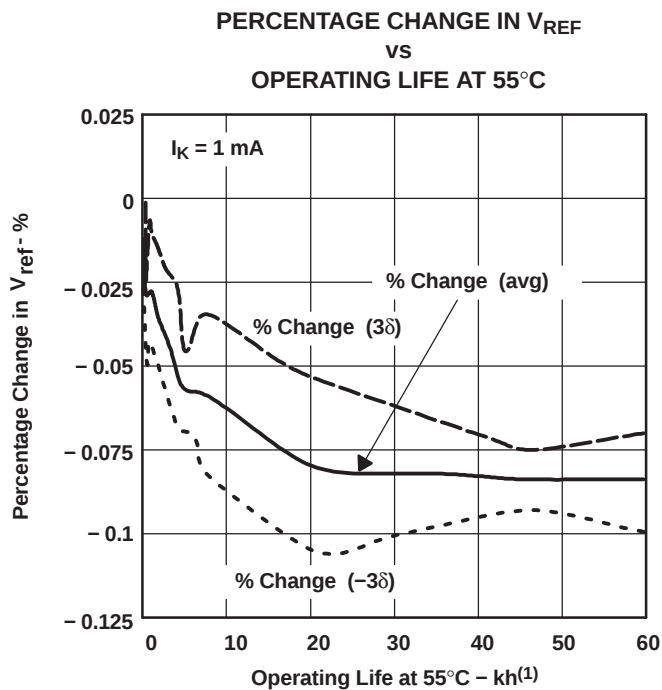


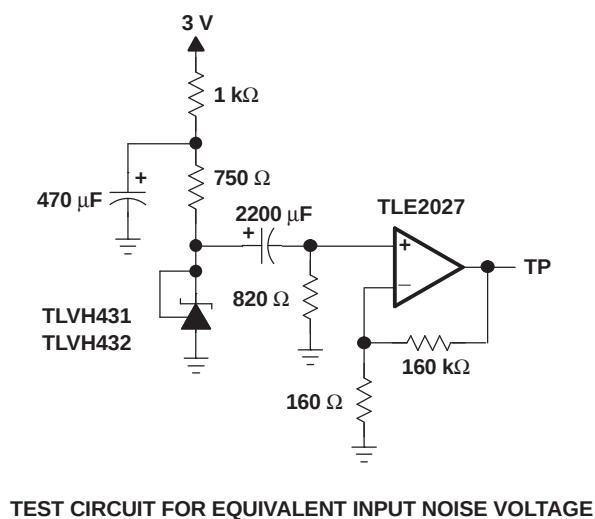
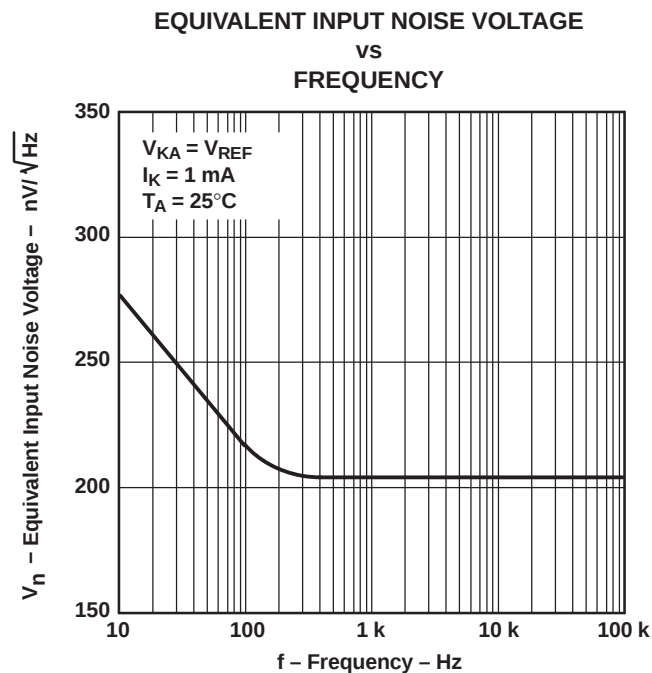
Figure 9.



(1) Extrapolated from life-test data taken at 125°C; the activation energy assumed is 0.7 eV.

Figure 10.

PARAMETER MEASUREMENT INFORMATION (continued)



TEST CIRCUIT FOR EQUIVALENT INPUT NOISE VOLTAGE

Figure 11.

PARAMETER MEASUREMENT INFORMATION (continued)

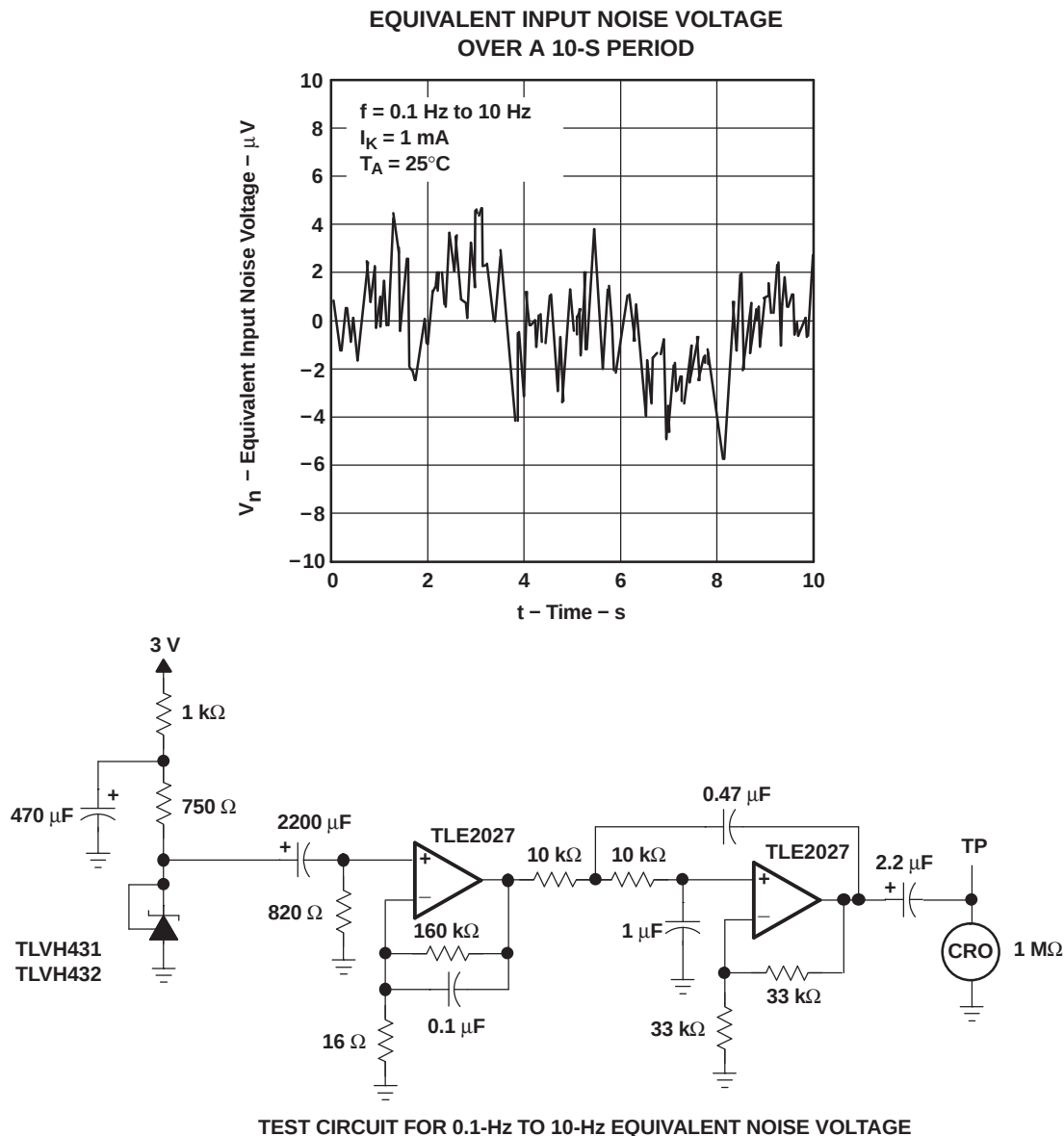


Figure 12.

PARAMETER MEASUREMENT INFORMATION (continued)

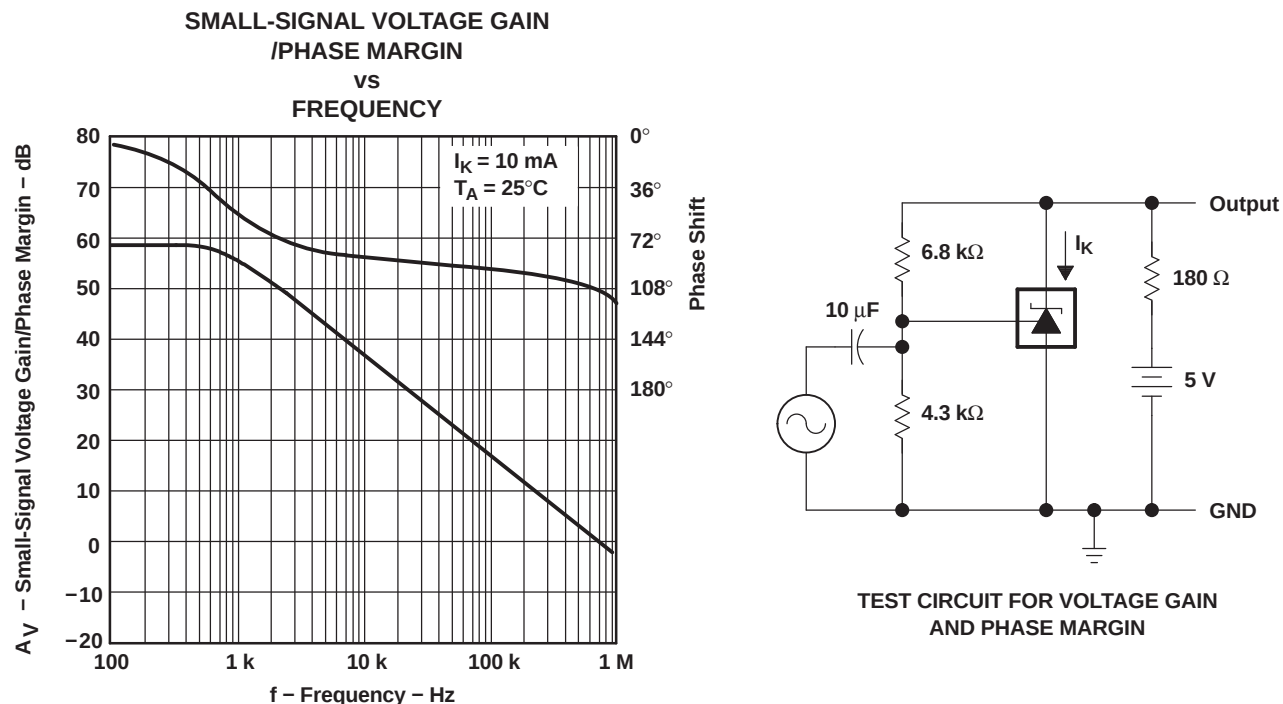


Figure 13.

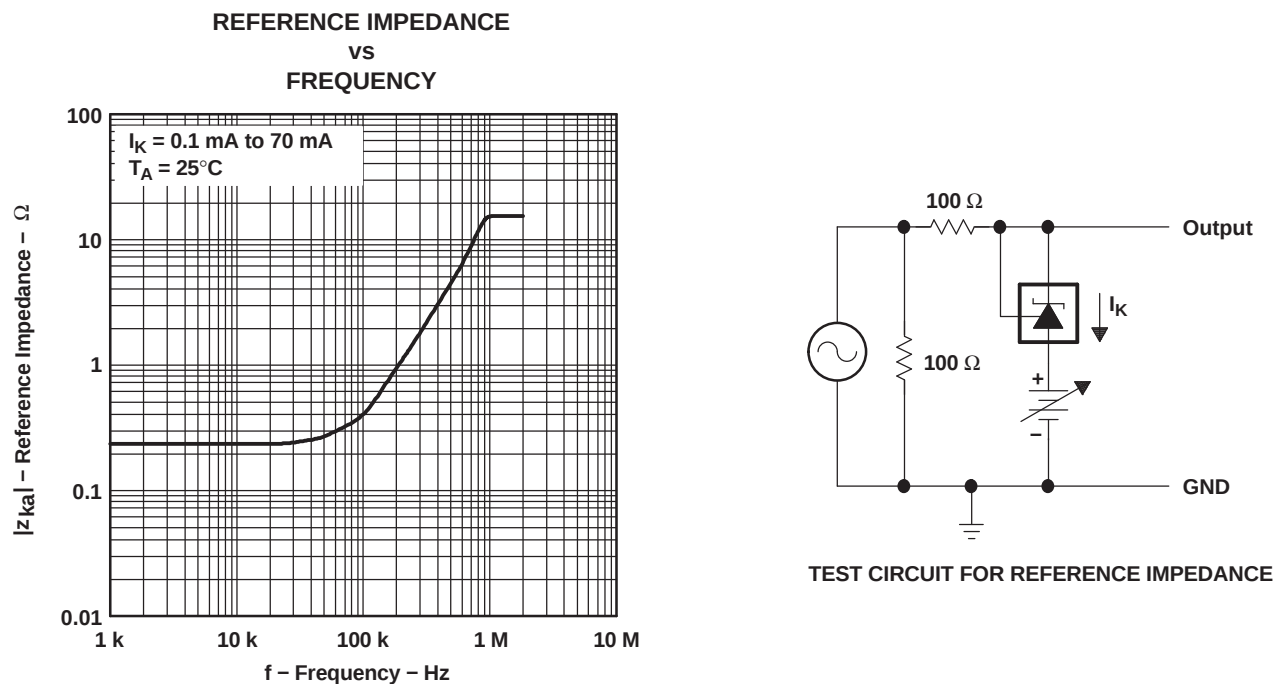


Figure 14.

PARAMETER MEASUREMENT INFORMATION (continued)

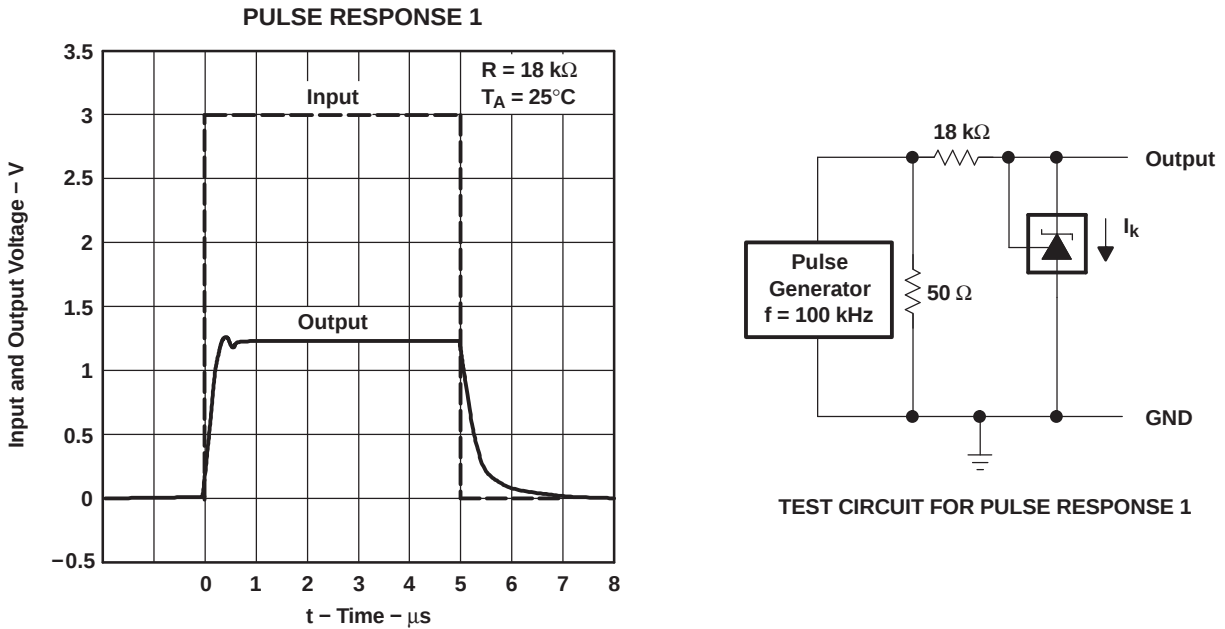


Figure 15.

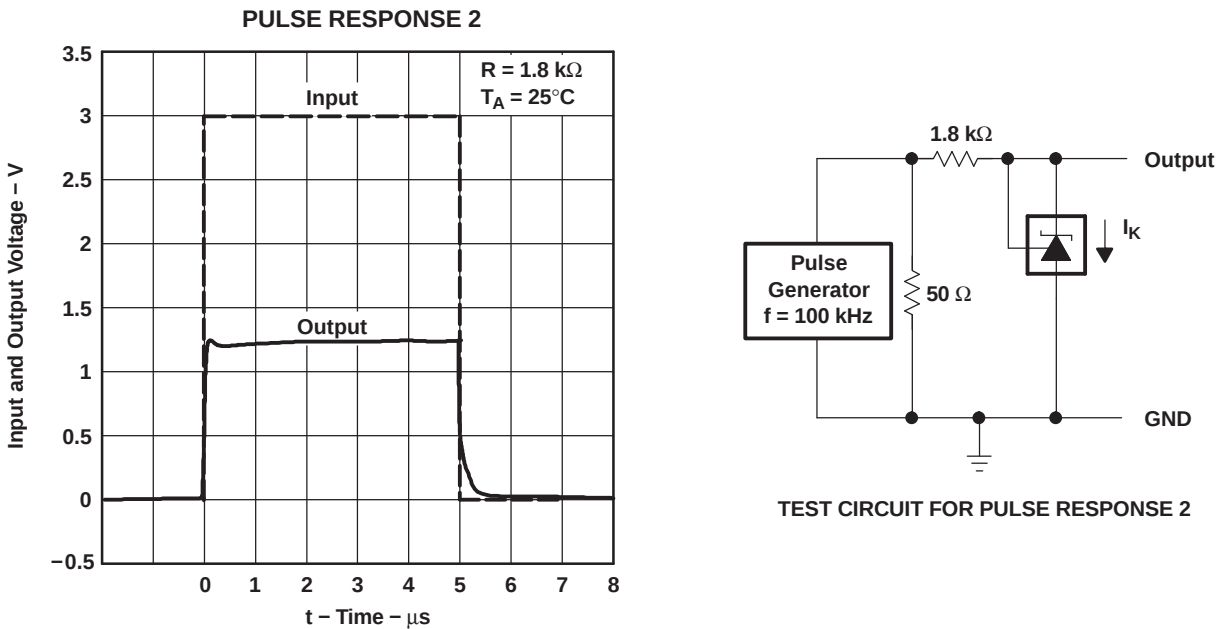


Figure 16.

PARAMETER MEASUREMENT INFORMATION (continued)

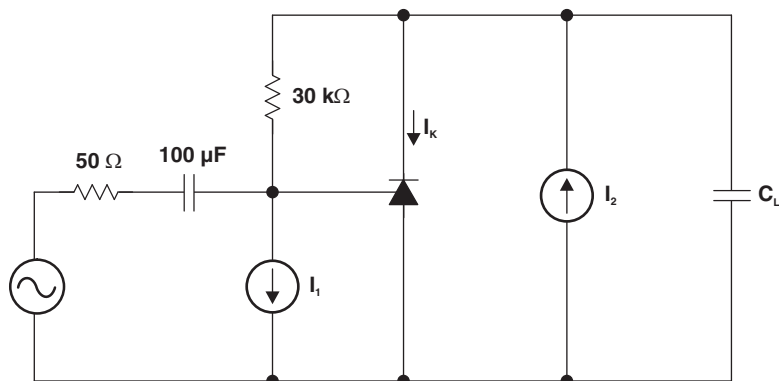


Figure 17. Phase Margin Test Circuit

PHASE MARGIN vs CAPACITIVE LOAD

$V_{ka} = V_{REF} (1.25 \text{ V}), T_A = 25^\circ\text{C}$

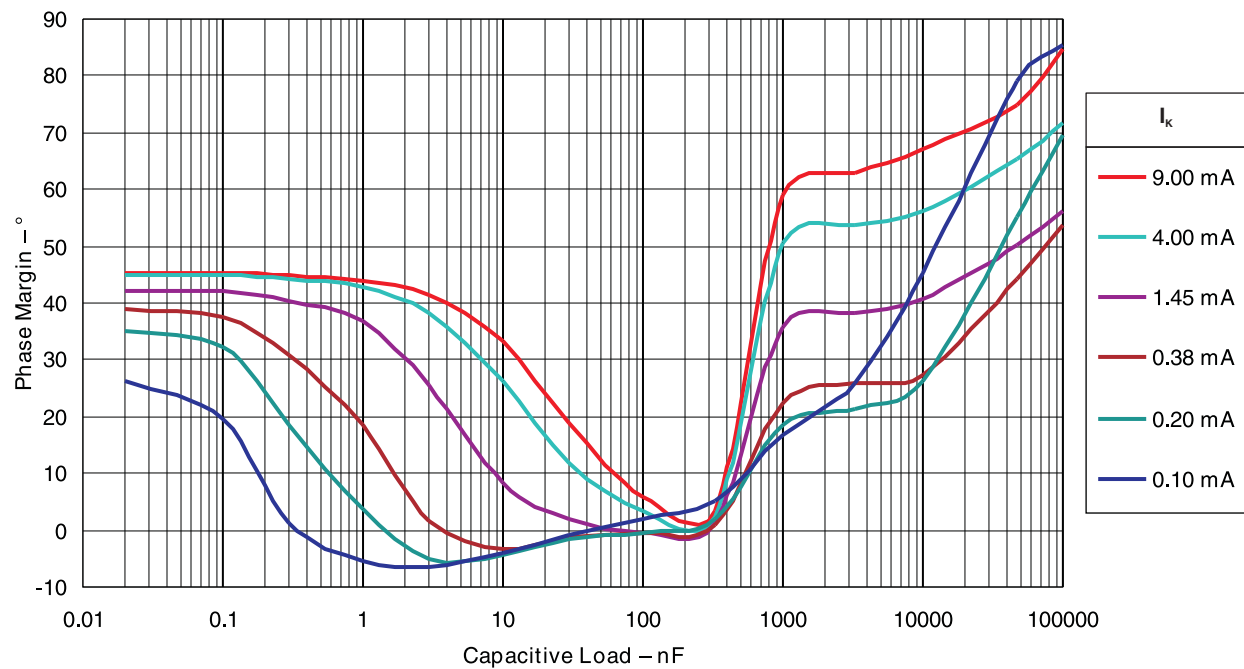


Figure 18.

PARAMETER MEASUREMENT INFORMATION (continued)

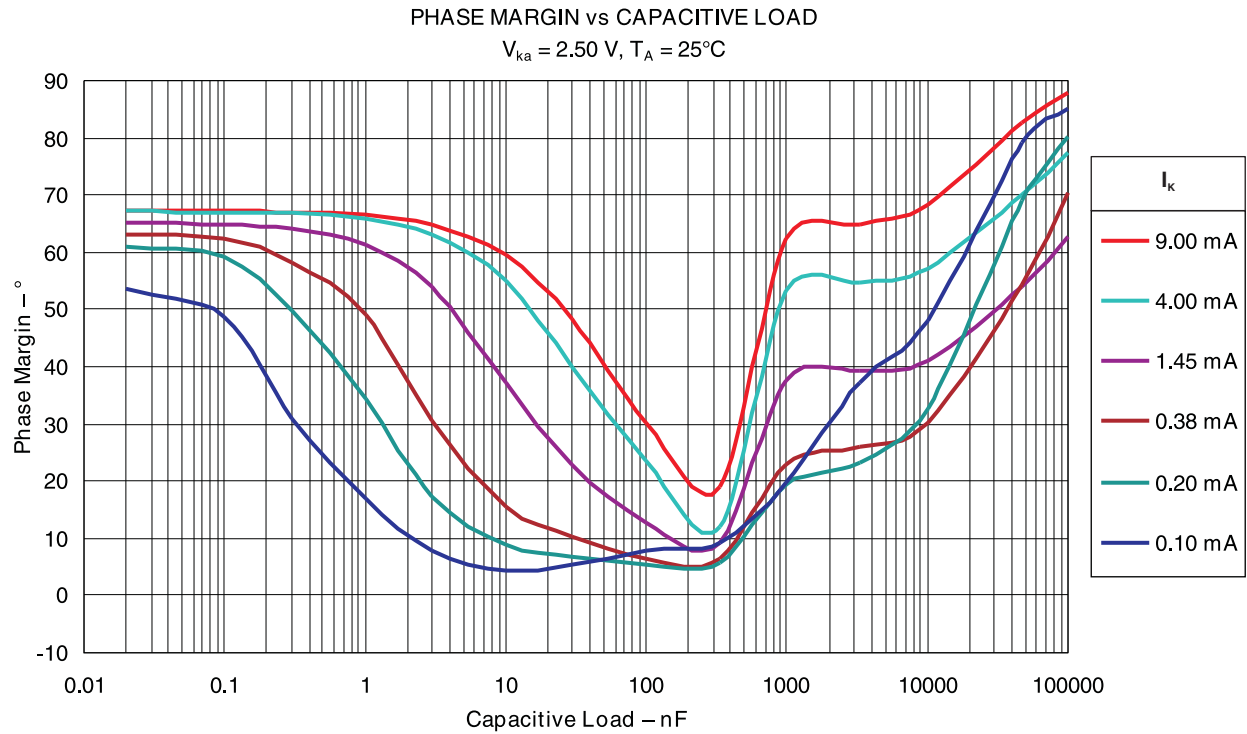


Figure 19.

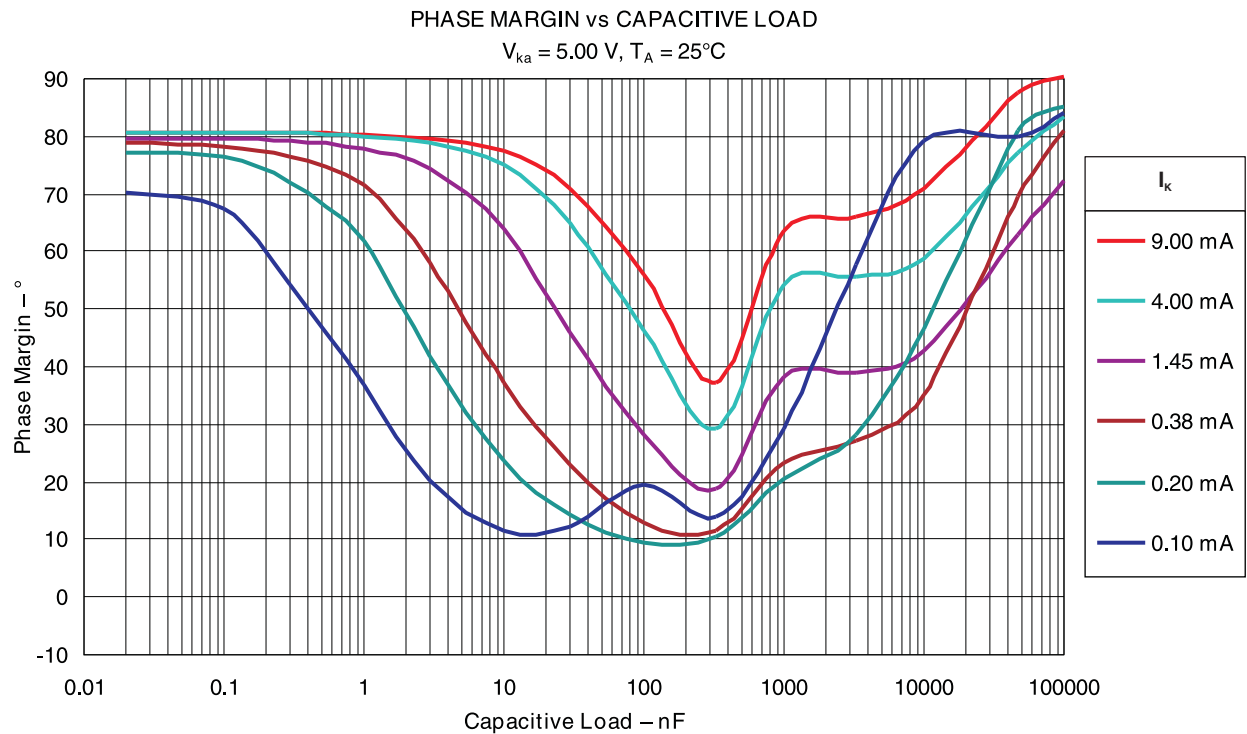


Figure 20.

Figure 21 shows the TLVH431 used in a 3.3-V isolated flyback supply. Output voltage V_O can be as low as reference voltage V_{REF} (1.24 V). The output of the regulator plus the forward voltage drop of the optocoupler LED ($1.24 + 1.4 = 2.64$ V) determine the minimum voltage that can be regulated in an isolated supply configuration. Regulated voltage as low as 2.7 Vdc is possible in the topology shown in Figure 21.

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
TLVH431ACDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU CU SN	Level-1-260C-UNLIM	0 to 70	(Y3PG ~ Y3PU)	Samples
TLVH431ACDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3PG	Samples
TLVH431ACDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU CU SN	Level-1-260C-UNLIM	0 to 70	(Y3PG ~ Y3PU)	Samples
TLVH431ACDBVTE4	ACTIVE	SOT-23	DBV	5		TBD	Call TI	Call TI	0 to 70		Samples
TLVH431ACDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3PS ~ Y3PU)	Samples
TLVH431ACDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3PS ~ Y3PU)	Samples
TLVH431ACDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3PS ~ Y3PU)	Samples
TLVH431ACDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YPU	Samples
TLVH431ACDCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YPU	Samples
TLVH431ACDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YPU	Samples
TLVH431ACDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YPU	Samples
TLVH431ACLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	ZA431A	Samples
TLVH431ACLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	ZA431A	Samples
TLVH431ACPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	W2	Samples
TLVH431AIDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3TU	Samples
TLVH431AIDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3TU	Samples
TLVH431AIDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3TU	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
TLVH431AIDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3TU	Samples
TLVH431AIDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3T3 ~ Y3TS ~ Y3TU)	Samples
TLVH431AIDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3T3 ~ Y3TS ~ Y3TU)	Samples
TLVH431AIDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3TS ~ Y3TU)	Samples
TLVH431AIDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3TS ~ Y3TU)	Samples
TLVH431AIDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YTU	Samples
TLVH431AIDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YTU	Samples
TLVH431AILP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	ZB431A	Samples
TLVH431AILPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	ZB431A	Samples
TLVH431AIPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	W3	Samples
TLVH431AIPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	W3	Samples
TLVH431AQDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3NU	Samples
TLVH431AQDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3NU	Samples
TLVH431AQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3NS ~ Y3NU)	Samples
TLVH431AQDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3NS ~ Y3NU)	Samples
TLVH431AQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3NS ~ Y3NU)	Samples
TLVH431AQDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3NS ~ Y3NU)	Samples
TLVH431AQDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YNU	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
TLVH431AQDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YNU	Samples
TLVH431AQLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431A	Samples
TLVH431AQLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431A	Samples
TLVH431AQLPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431A	Samples
TLVH431AQPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VD	Samples
TLVH431AQPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VD	Samples
TLVH431BCDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3JU	Samples
TLVH431BCDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3JU	Samples
TLVH431BCDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3JU	Samples
TLVH431BCDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3JU	Samples
TLVH431BCDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3JU	Samples
TLVH431BCDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3J3 ~ Y3JS ~ Y3JU)	Samples
TLVH431BCDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3J3 ~ Y3JS ~ Y3JU)	Samples
TLVH431BCDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3JS ~ Y3JU)	Samples
TLVH431BCDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3JS ~ Y3JU)	Samples
TLVH431BCDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YHU	Samples
TLVH431BCDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YHU	Samples
TLVH431BCDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YHU	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
TLVH431BCLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	ZA431B	Samples
TLVH431BCLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	ZA431B	Samples
TLVH431BCPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	V7	Samples
TLVH431BIDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3KU	Samples
TLVH431BIDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3KU	Samples
TLVH431BIDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3KU	Samples
TLVH431BIDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3KS ~ Y3KU)	Samples
TLVH431BIDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3KS ~ Y3KU)	Samples
TLVH431BIDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3KS ~ Y3KU)	Samples
TLVH431BIDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3KS ~ Y3KU)	Samples
TLVH431BIDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YJU	Samples
TLVH431BIDCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YJU	Samples
TLVH431BIDCKRG4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YJU	Samples
TLVH431BIDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YJU	Samples
TLVH431BIDCKTE4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YJU	Samples
TLVH431BIDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YJU	Samples
TLVH431BILP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	ZB431B	Samples
TLVH431BILPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	ZB431B	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
TLVH431BIPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	V8	Samples
TLVH431BIPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	V8	Samples
TLVH431BQDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3LU	Samples
TLVH431BQDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3LU	Samples
TLVH431BQDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3LU	Samples
TLVH431BQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3LS ~ Y3LU)	Samples
TLVH431BQDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3LS ~ Y3LU)	Samples
TLVH431BQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3LS ~ Y3LU)	Samples
TLVH431BQDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3LS ~ Y3LU)	Samples
TLVH431BQDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YKU	Samples
TLVH431BQDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YKU	Samples
TLVH431BQLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431B	Samples
TLVH431BQLPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431B	Samples
TLVH431BQLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431B	Samples
TLVH431BQPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	V9	Samples
TLVH431BQPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	V9	Samples
TLVH431CDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3UU	Samples
TLVH431CDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	Y3UU	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
TLVH431CDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3US ~ Y3UU)	Samples
TLVH431CDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3US ~ Y3UU)	Samples
TLVH431CDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3US ~ Y3UU)	Samples
TLVH431CDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3US ~ Y3UU)	Samples
TLVH431CDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YUU	Samples
TLVH431CDCKRG4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YUU	Samples
TLVH431CDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YUU	Samples
TLVH431CDCKTE4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YUU	Samples
TLVH431CDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YUU	Samples
TLVH431CLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	ZA431	Samples
TLVH431CLPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	ZA431	Samples
TLVH431CLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	ZA431	Samples
TLVH431CPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	W4	Samples
TLVH431CPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	W4	Samples
TLVH431IBQDBZR	PREVIEW	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125		
TLVH431IDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3VU	Samples
TLVH431IDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3VU	Samples
TLVH431IDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3VU	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
TLVH431IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3VS ~ Y3VU)	Samples
TLVH431IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3VS ~ Y3VU)	Samples
TLVH431IDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3VS ~ Y3VU)	Samples
TLVH431IDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YVU	Samples
TLVH431IDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YVU	Samples
TLVH431IDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YVU	Samples
TLVH431ILP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	ZB431	Samples
TLVH431ILPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	ZB431	Samples
TLVH431ILPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	ZB431	Samples
TLVH431IPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	W5	Samples
TLVH431QDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3MU	Samples
TLVH431QDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3MU	Samples
TLVH431QDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3MU	Samples
TLVH431QDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3MU	Samples
TLVH431QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3MS ~ Y3MU)	Samples
TLVH431QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3MS ~ Y3MU)	Samples
TLVH431QDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3MS ~ Y3MU)	Samples
TLVH431QDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YMU	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
TLVH431QDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YMU	Samples
TLVH431QLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431	Samples
TLVH431QLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	ZD431	Samples
TLVH431QPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VC	Samples
TLVH432ACDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y2ES ~ Y2EU)	Samples
TLVH432ACDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y2ES ~ Y2EU)	Samples
TLVH432ACDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y2ES ~ Y2EU)	Samples
TLVH432AIDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y2FS ~ Y2FU)	Samples
TLVH432AIPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	VL	Samples
TLVH432AQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y2GS ~ Y2GU)	Samples
TLVH432AQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y2GS ~ Y2GU)	Samples
TLVH432BCDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y2HS ~ Y2HU)	Samples
TLVH432BCDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y2HS ~ Y2HU)	Samples
TLVH432BCPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	VN	Samples
TLVH432BIDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y2JS ~ Y2JU)	Samples
TLVH432BQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y2KS ~ Y2KU)	Samples
TLVH432BQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y2KS ~ Y2KU)	Samples
TLVH432BQDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y2KS ~ Y2KU)	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
TLVH432CDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y2AS ~ Y2AU)	Samples
TLVH432CDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y2AS ~ Y2AU)	Samples
TLVH432CPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	VG	Samples
TLVH432IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y2BS ~ Y2BU)	Samples
TLVH432QDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y2DS ~ Y2DU)	Samples
TLVH432QDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y2DS ~ Y2DU)	Samples
TLVH432QPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VJ	Samples
TLVH432QPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VJ	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.

OBSELETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

(4) 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.

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

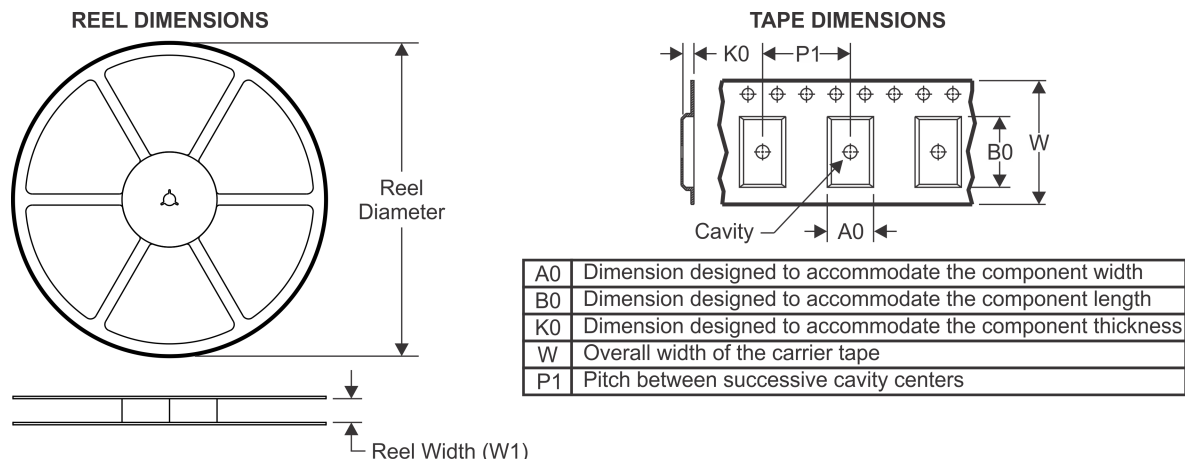
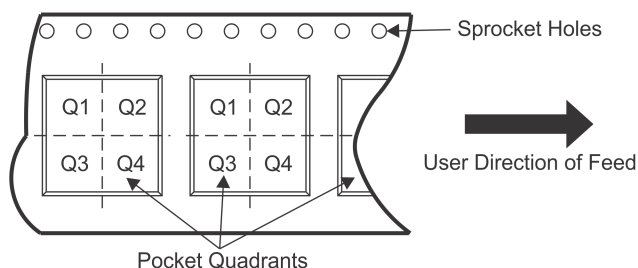
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF TLVH431A, TLVH431B :

- Automotive: [TLVH431A-Q1](#), [TLVH431B-Q1](#)

NOTE: Qualified Version Definitions:

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

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


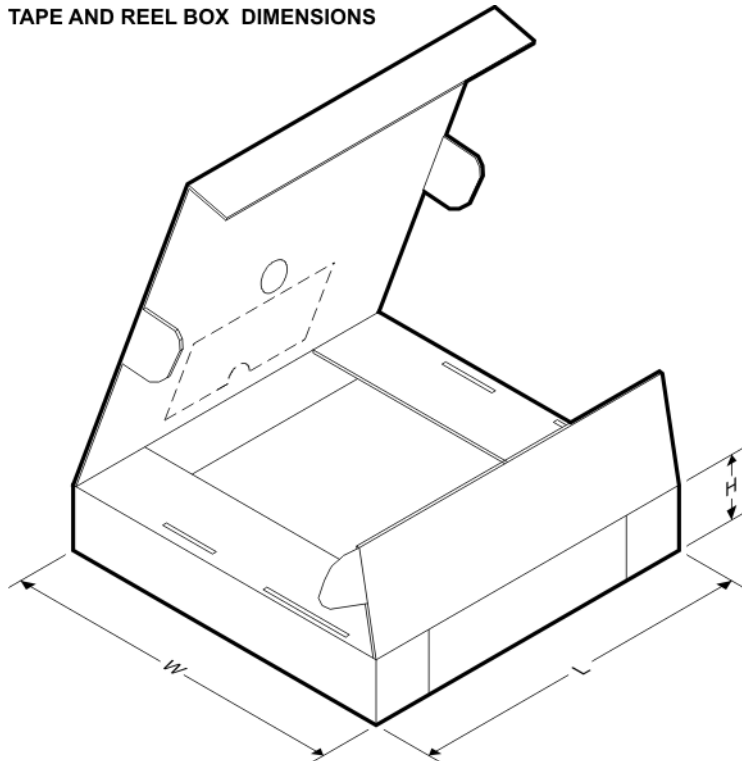
*All dimensions are nominal

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
TLVH431ACDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431ACDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431ACDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431ACDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431ACDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431ACDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431ACPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431AIDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431AIDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431AIDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431AIDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431AIDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431AIDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431AIPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431AQDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431AQDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431AQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431AQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	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
TLVH431AQDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431AQDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431AQPCK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431BCDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431BCDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431BCDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431BCDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431BCDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431BCDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431BCPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431BIDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431BIDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431BIDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431BIDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431BIDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431BIDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431BIPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431BQDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431BQDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431BQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431BQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431BQDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431BQDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431BQPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431CDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431CDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431CDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431CDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431CDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431CDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431CPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431IDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431IDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431IDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431IDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431IDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431IDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431IPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH431QDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431QDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLVH431QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431QDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH431QDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	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
TLVH431QDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLVH431QPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH432ACDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432ACDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432AIDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432AIPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH432AQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432AQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432BCDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432BCPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH432BIDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432BQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432BQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432CDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432CDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432CPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLVH432IDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432QDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLVH432QPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3

TAPE AND REEL BOX DIMENSIONS



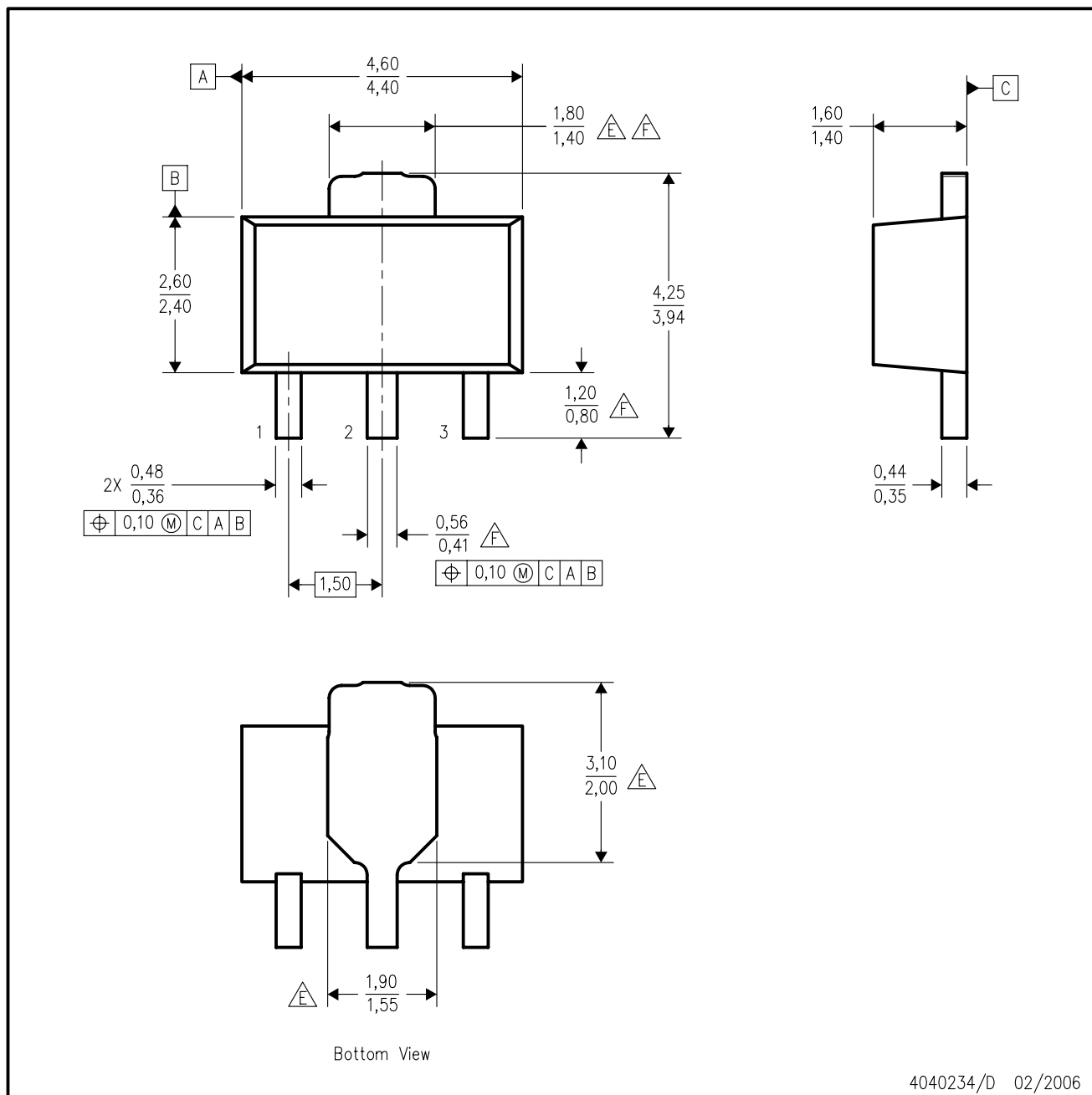
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLVH431ACDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431ACDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431ACDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431ACDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431ACDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431ACDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431ACPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH431AIDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431AIDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431AIDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431AIDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431AIDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431AIDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431AIPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH431AQDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431AQDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431AQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431AQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431AQDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431AQDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431AQPCK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH431BCDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431BCDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431BCDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431BCDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431BCDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431BCDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431BCPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH431BIDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431BIDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431BIDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431BIDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431BIDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431BIDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431BIPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH431BQDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431BQDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431BQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431BQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431BQDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431BQDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431BQPK	SOT-89	PK	3	1000	340.0	340.0	38.0

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLVH431CDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431CDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431CDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431CDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431CDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431CDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431CPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH431IDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431IDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431IDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431IDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431IDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431IDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431IPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH431QDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLVH431QDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLVH431QDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH431QDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH431QDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLVH431QDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLVH431QPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH432ACDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432ACDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH432AIDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432AIPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH432AQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432AQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH432BCDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432BCPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH432BIDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432BQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432BQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH432CDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432CDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH432CPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLVH432IDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432QDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLVH432QDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLVH432QPK	SOT-89	PK	3	1000	340.0	340.0	38.0

PK (R-PSSO-F3)

PLASTIC SINGLE-IN-LINE PACKAGE

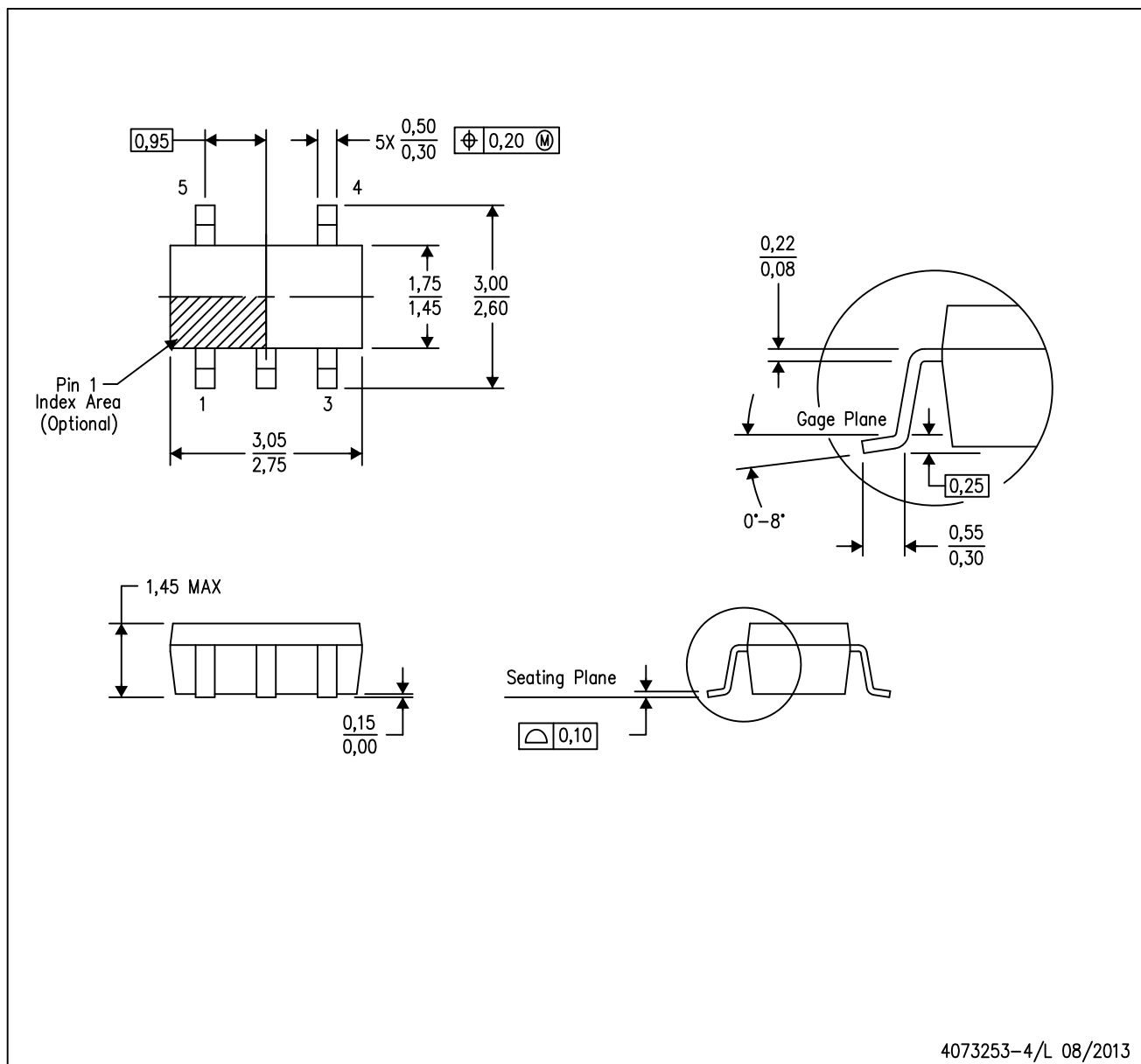


4040234/D 02/2006

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - This drawing is subject to change without notice.
 - The center lead is in electrical contact with the tab.
 - Body dimensions do not include mold flash or protrusion. Mold flash and protrusion not to exceed 0.15 per side.
- △E Thermal pad contour optional within these dimensions.
- △F Falls within JEDEC TO-243 variation AA, except minimum lead length, pin 2 minimum lead width, minimum tab width.

DBV (R-PDSO-G5)

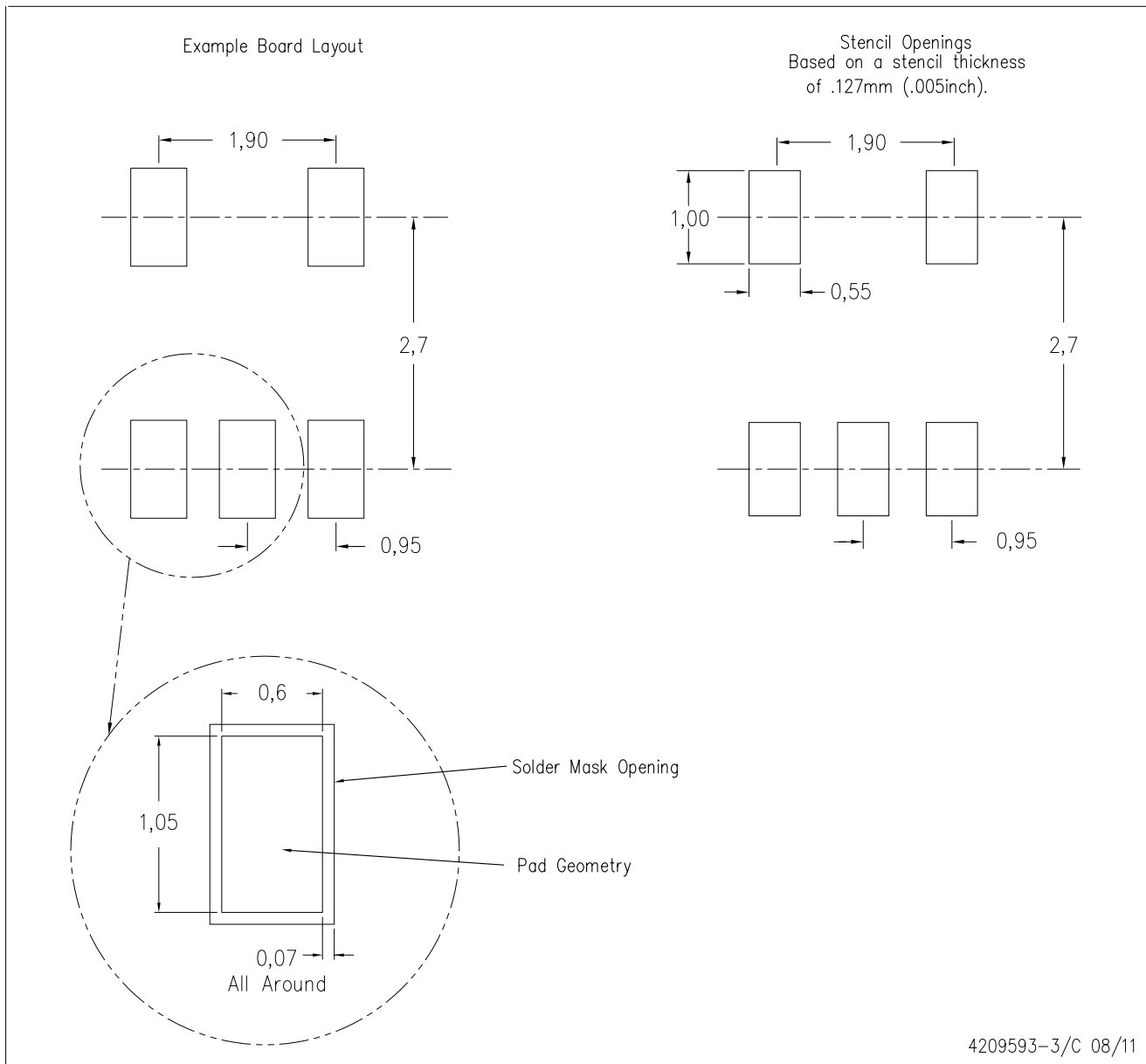
PLASTIC SMALL-OUTLINE PACKAGE



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

DBV (R-PDSO-G5)

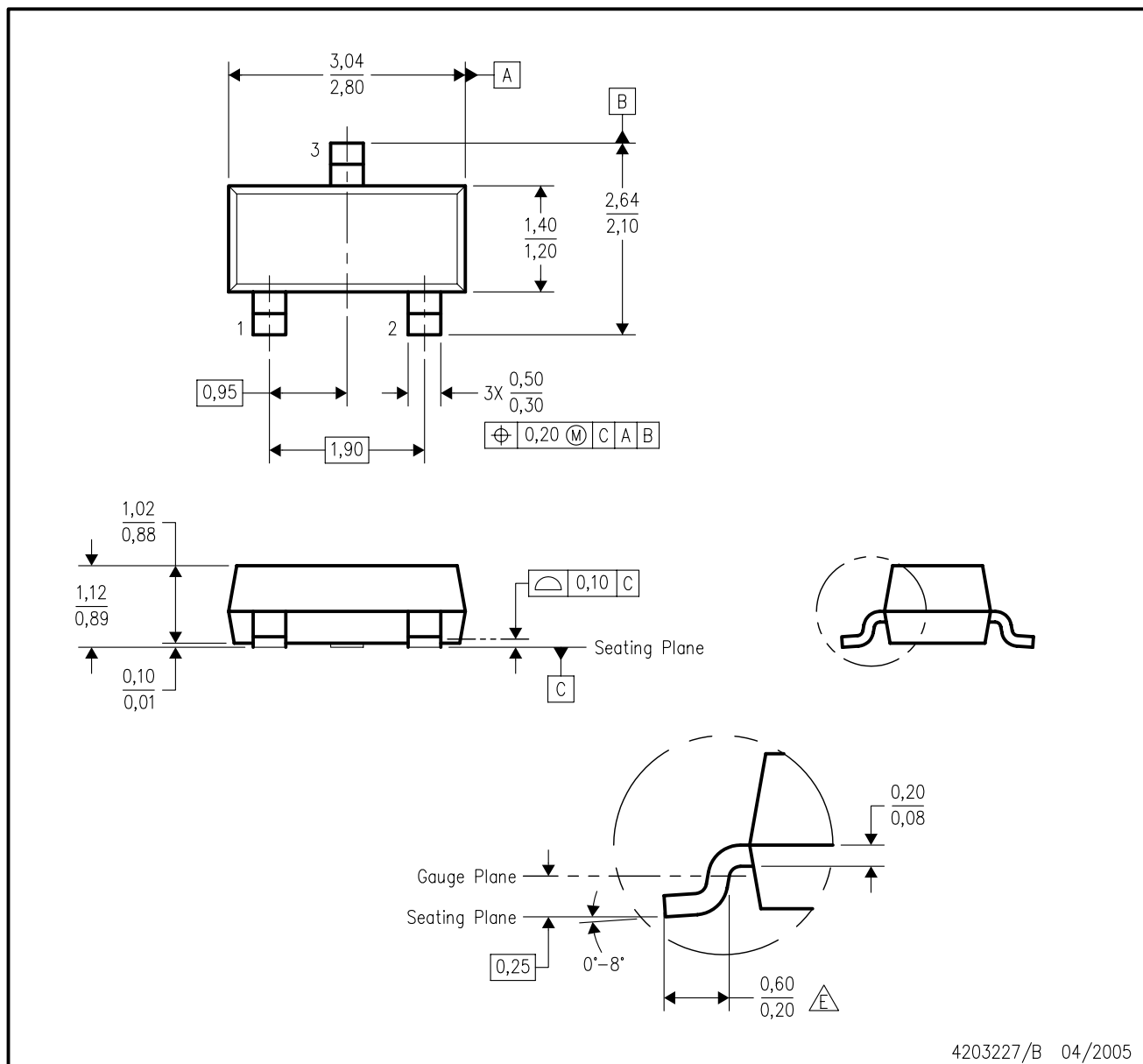
PLASTIC SMALL OUTLINE



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

DBZ (R-PDSO-G3)

PLASTIC SMALL-OUTLINE



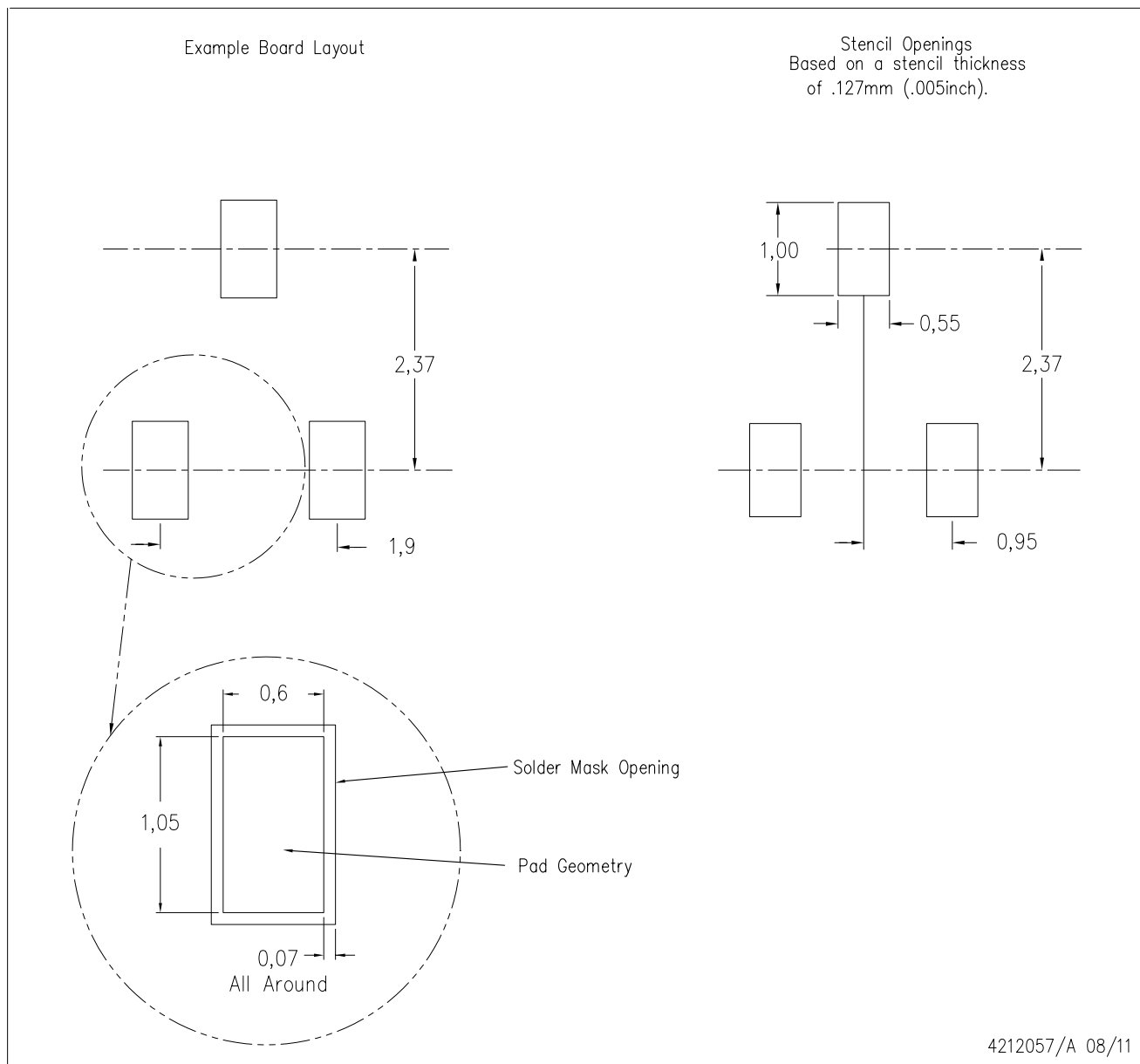
4203227/B 04/2005

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.

DBZ (R-PDSO-G3)

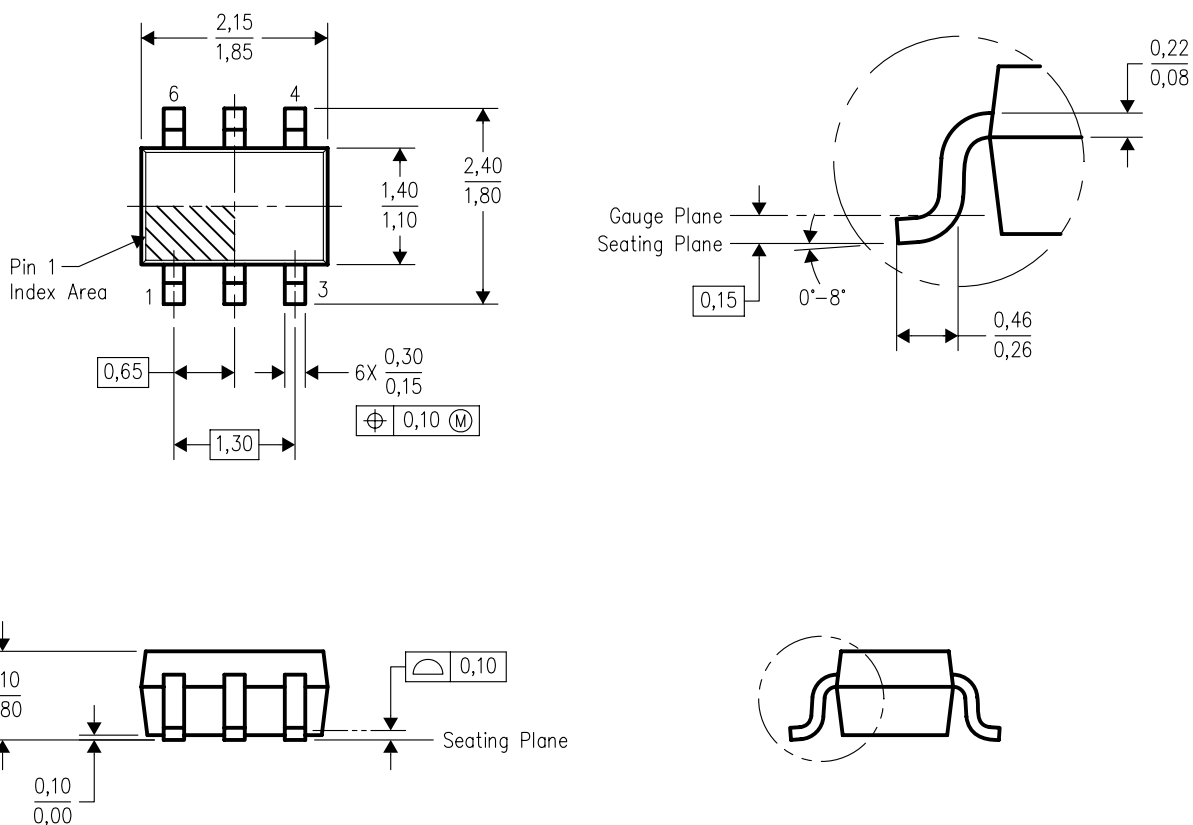
PLASTIC SMALL OUTLINE



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

DCK (R-PDSO-G6)

PLASTIC SMALL-OUTLINE PACKAGE



4093553-4/G 01/2007

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

DCK (R-PDSO-G6)

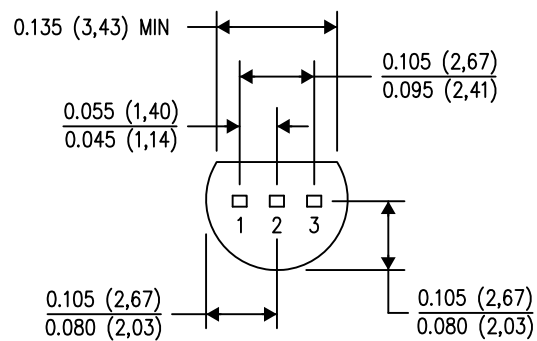
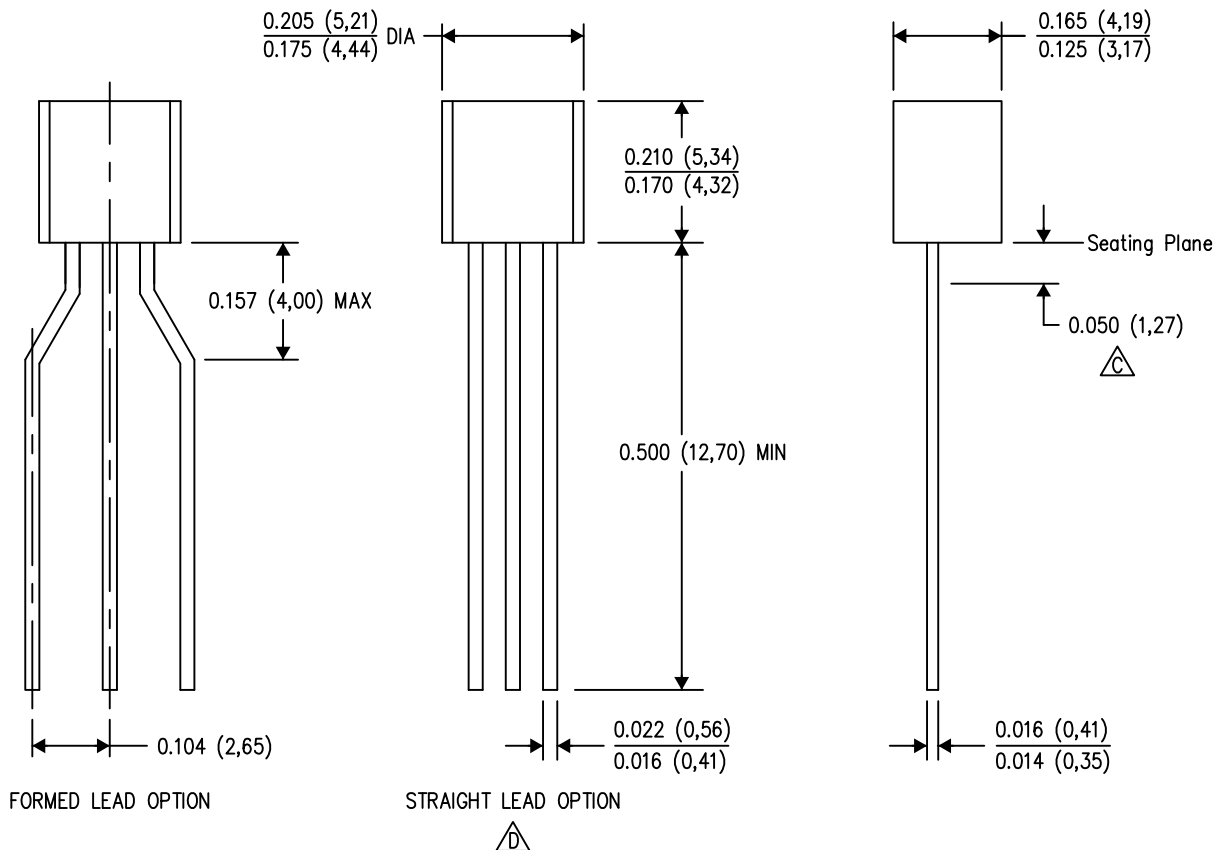
PLASTIC SMALL OUTLINE



- 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.

LP (O-PBCY-W3)

PLASTIC CYLINDRICAL PACKAGE

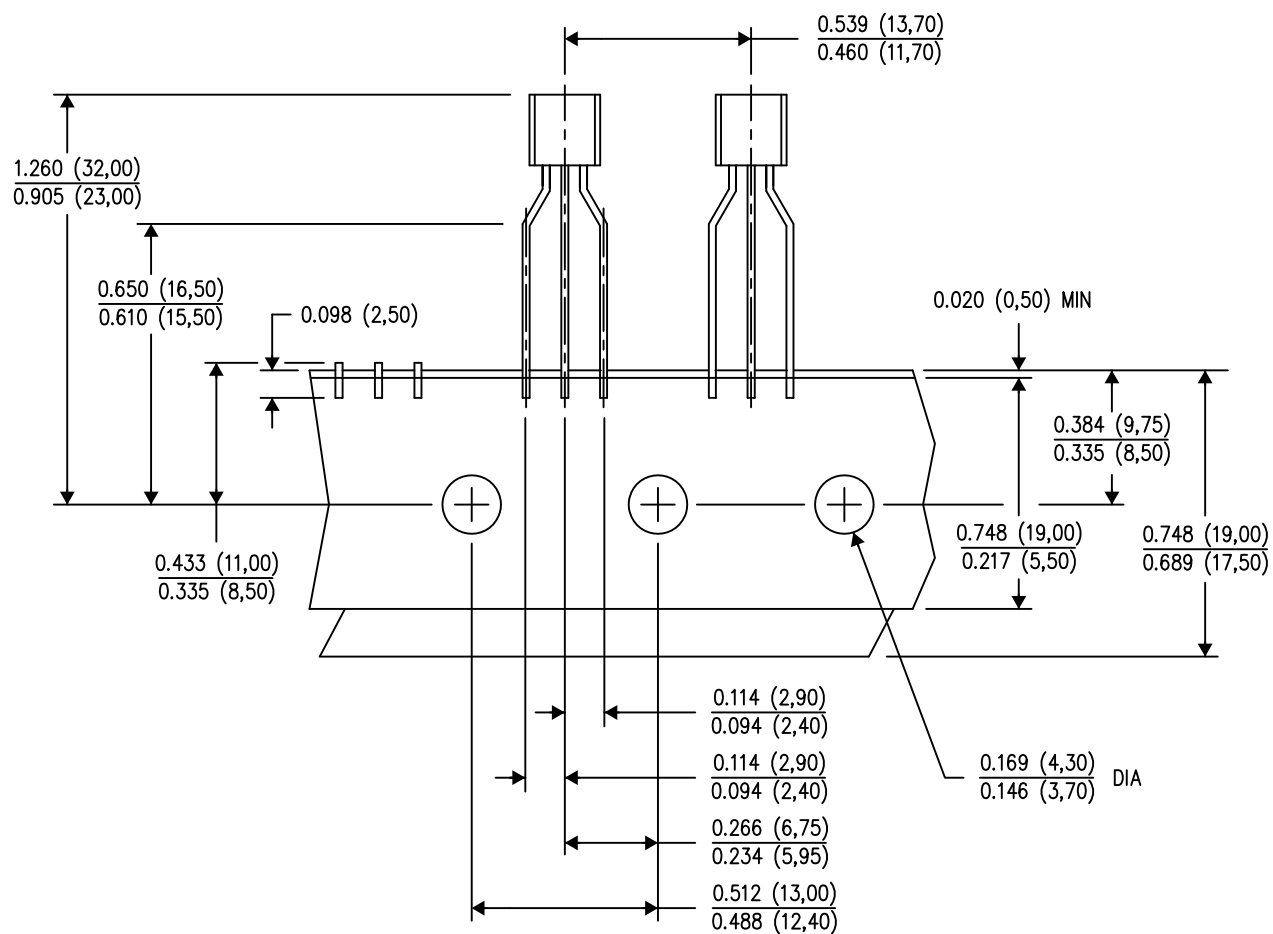


4040001-2/E 08/13

- 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.
 Specific products can be offered in limited combinations of shipping mediums and lead options.
 Consult product folder for more information on available options.

LP (O-PBCY-W3)

PLASTIC CYLINDRICAL PACKAGE



TAPE & REEL

4040001-3/E 08/13

- 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 Formed Lead Option package.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com