TLV431x Low-Voltage Adjustable Precision Shunt Regulator

Check for Samples: TLV431, TLV431A, TLV431B

FEATURES

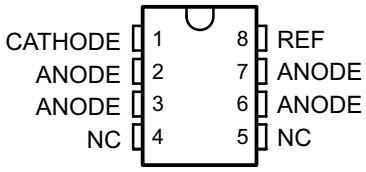
- **Low-Voltage Operation, V_{REF} = 1.24 V**
- **Adjustable Output Voltage, V_O = V_{REF} to 6 V**
- **Reference Voltage Tolerances at 25°C**
  - **0.5% for TLV431B**
  - **1% for TLV431A**
  - **1.5% for TLV431**
- **Typical Temperature Drift**
  - **4 mV (0°C to 70°C)**
  - **6 mV (–40°C to 85°C)**
  - **11 mV (–40°C to 125°C)**
- **Low Operational Cathode Current, 80 µA Typ**
- **0.25-Ω Typical Output Impedance**
- **Ultra-Small SC-70 Package Offers 40% Smaller Footprint Than SOT-23-3**
- **See TLVH431 and TLVH432 for:**
  - **Wider V_{KA} (1.24 V to 18 V) and I_K (80 mA)**
  - **Additional SOT-89 Package**
  - **Multiple Pinouts for SOT-23-3 and SOT-89 Packages**
- **On Products Compliant to MIL-PRF-38535, All Parameters Are Tested Unless Otherwise Noted. On All Other Products, Production Processing Does Not Necessarily Include Testing of All Parameters.**

DESCRIPTION

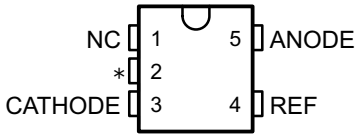
The TLV431 device is a low-voltage 3-terminal adjustable voltage reference with specified thermal stability over applicable industrial and commercial temperature ranges. Output voltage can be set to any value between V_{REF} (1.24 V) and 6 V with two external resistors (see Figure 2). These devices operate from a lower voltage (1.24 V) than the widely used TL431 and TL1431 shunt-regulator references.

When used with an optocoupler, the TLV431 device is an ideal voltage reference in isolated feedback circuits for 3-V to 3.3-V switching-mode power supplies. These devices have a typical output impedance of 0.25Ω. Active output circuitry provides a very sharp turn-on characteristic, making them excellent replacements for low-voltage Zener diodes in many applications, including on-board regulation and adjustable power supplies.

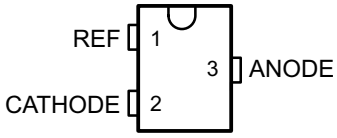
D (SOIC) PACKAGE
(TOP VIEW)



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

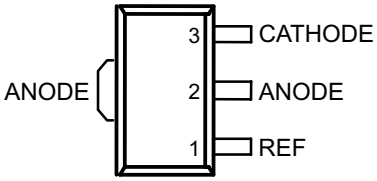


DBZ (SOT-23-3) PACKAGE
(TOP VIEW)

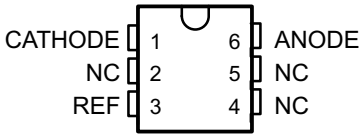


NC − No internal connection
* For TLV431, TLV431A: NC − No internal connection
* For TLV431B: Pin 2 is attached to Substrate and must be connected to ANODE or left open.

PK (SOT-89) PACKAGE
(TOP VIEW)

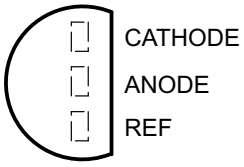


DCK (SC-70) PACKAGE
(TOP VIEW)



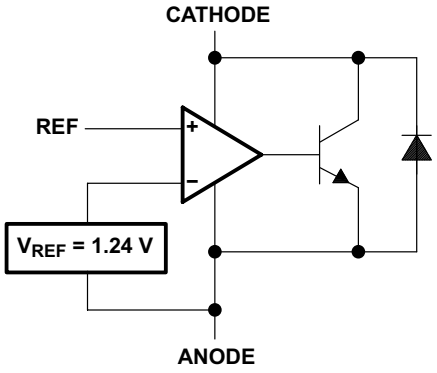
NC − No internal connection

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

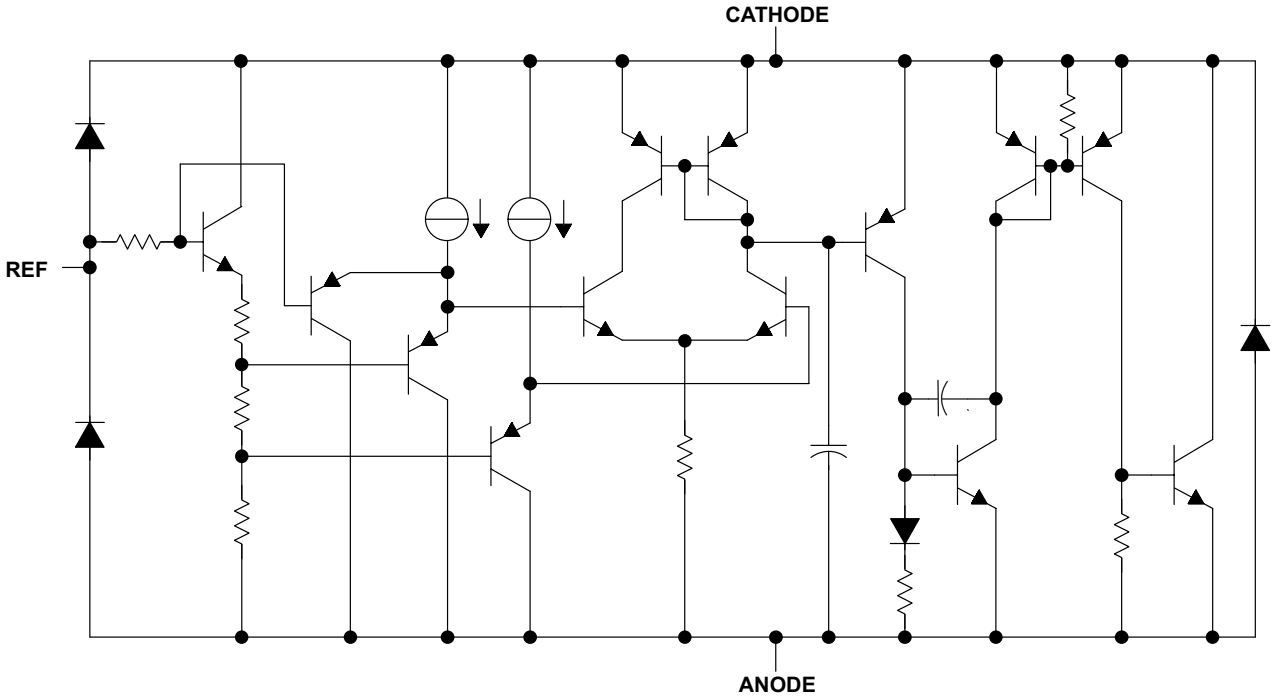


Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

Logic Block Diagram



Equivalent Schematic



Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V_{KA}	Cathode voltage(2)			7	V
I_K	Continuous cathode current range		–20	20	mA
I_{ref}	Reference current range		–0.05	3	mA
θ_{JA}	Package thermal impedance(3)(4)	D package		97	°C/W
		DBV package		206	°C/W
		DBZ package		206	°C/W
		DCK package		252	°C/W
		LP package		140	°C/W
		PK package		52	°C/W
	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 $T_J(max)$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/\theta J_A$. 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

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

			MIN	MAX	UNIT
V_{KA}	Cathode voltage		V_{REF}	6	V
I_K	Cathode current		0.1	15	mA
T_A	Operating free-air temperature range	TLV431_C	0	70	°C
		TLV431_I	–40	85	
		TLV431_Q	–40	125	

Electrical Characteristics for TLV431

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

PARAMETER		TEST CONDITIONS			TLV431 MIN	TLV431 TYP	TLV431 MAX	UNIT
V_{REF}	Reference voltage	$V_{KA} = V_{REF}$, I_K = 10 mA	T_A = 25°C		1.222	1.24	1.258	V
			T_A = full range[1] (see Figure 1)	TLV431C	1.21		1.27	
				TLV431I	1.202		1.278	
				TLV431Q	1.194		1.286	
$V_{REF(dev)}$	V_{REF} deviation over full temperature range[2]	$V_{KA} = V_{REF}$, I_K = 10 mA[1] (see Figure 1)		TLV431C		4	12	mV
				TLV431I		6	20	
				TLV431Q		11	31	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of V_{REF} change in cathode voltage change	$V_{KA} = V_{REF}$ to 6 V, I_K = 10 mA (see Figure 2)				–1.5	–2.7	mV/V
I_{ref}	Reference terminal current	I_K = 10 mA, R1 = 10 kΩ, R2 = open (see Figure 2)				0.15	0.5	µA
$I_{ref(dev)}$	I_{ref} deviation over full temperature range[2]	I_K = 10 mA, R1 = 10 kΩ, R2 = open[1] (see Figure 2)		TLV431C		0.05	0.3	µA
				TLV431I		0.1	0.4	
				TLV431Q		0.15	0.5	
$I_{K(min)}$	Minimum cathode current for regulation	$V_{KA} = V_{REF}$ (see Figure 1)		TLV431C/I		55	80	µA
				TLV431Q		55	100	
$I_{K(off)}$	Off-state cathode current	V_{REF} = 0, V_{KA} = 6 V (see Figure 3)				0.001	0.1	µA
$\lvert z_{KA} \rvert$	Dynamic impedance[3]	$V_{KA} = V_{REF}$, f ≤ 1 kHz, I_K = 0.1 mA to 15 mA (see Figure 1)				0.25	0.4	Ω

(1) Full temperature ranges are –40°C to 125°C for TLV431Q, –40°C to 85°C for TLV431I, and 0°C to 70°C for TLV431C.

(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:

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

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

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

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

Electrical Characteristics for TLV431A

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

PARAMETER		TEST CONDITIONS			TLV431A			UNIT
					MIN	TYP	MAX	
V_{REF}	Reference voltage	$V_{KA} = V_{REF}$, I_K = 10 mA	T_A = 25°C		1.228	1.24	1.252	V
			T_A = full range[1] (see Figure 1)	TLV431AC	1.221		1.259	
				TLV431AI	1.215		1.265	
				TLV431AQ	1.209		1.271	
$V_{REF(dev)}$	V_{REF} deviation over full temperature range[2]	$V_{KA} = V_{REF}$, I_K = 10 mA[1] (see Figure 1)		TLV431AC		4	12	mV
				TLV431AI		6	20	
				TLV431AQ		11	31	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of V_{REF} change in cathode voltage change	$V_{KA} = V_{REF}$ to 6 V, I_K = 10 mA (see Figure 2)				–1.5	–2.7	mV/V
I_{ref}	Reference terminal current	I_K = 10 mA, R1 = 10 kΩ, R2 = open (see Figure 2)				0.15	0.5	µA
$I_{ref(dev)}$	I_{ref} deviation over full temperature range[2]	I_K = 10 mA, R1 = 10 kΩ, R2 = open[1] (see Figure 2)		TLV431AC		0.05	0.3	µA
				TLV431AI		0.1	0.4	
				TLV431AQ		0.15	0.5	
$I_{K(min)}$	Minimum cathode current for regulation	$V_{KA} = V_{REF}$ (see Figure 1)		TLV431AC/AI		55	80	µA
				TLV431AQ		55	100	
$I_{K(off)}$	Off-state cathode current	V_{REF} = 0, V_{KA} = 6 V (see Figure 3)				0.001	0.1	µA
$\|z_{KA}\|$	Dynamic impedance[3]	$V_{KA} = V_{REF}$, f ≤ 1 kHz, I_K = 0.1 mA to 15 mA (see Figure 1)				0.25	0.4	Ω

(1) Full temperature ranges are –40°C to 125°C for TLV431Q, –40°C to 85°C for TLV431I, and 0°C to 70°C for TLV431C.

(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:

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

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:

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

Electrical Characteristics for TLV431B

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

PARAMETER		TEST CONDITIONS			TLV431B MIN	TLV431B TYP	TLV431B MAX	UNIT
V_{REF}	Reference voltage	$V_{KA} = V_{REF}$, I_K = 10 mA	T_A = 25°C		1.234	1.24	1.246	V
			T_A = full range[1] (see Figure 1)	TLV431BC	1.227		1.253	
				TLV431BI	1.224		1.259	
				TLV431BQ	1.221		1.265	
$V_{REF(dev)}$	V_{REF} deviation over full temperature range[2]	$V_{KA} = V_{REF}$, I_K = 10 mA[1] (see Figure 1)		TLV431BC		4	12	mV
				TLV431BI		6	20	
				TLV431BQ		11	31	
$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	Ratio of V_{REF} change in cathode voltage change	$V_{KA} = V_{REF}$ to 6 V, I_K = 10 mA (see Figure 2)				–1.5	–2.7	mV/V
I_{ref}	Reference terminal current	I_K = 10 mA, R1 = 10 kΩ, R2 = open (see Figure 2)				0.1	0.5	µA
$I_{ref(dev)}$	I_{ref} deviation over full temperature range[2]	I_K = 10 mA, R1 = 10 kΩ, R2 = open[3] (see Figure 2)		TLV431BC		0.05	0.3	µA
				TLV431BI		0.1	0.4	
				TLV431BQ		0.15	0.5	
$I_{K(min)}$	Minimum cathode current for regulation	$V_{KA} = V_{REF}$ (see Figure 1)				55	100	µA
$I_{K(off)}$	Off-state cathode current	V_{REF} = 0, V_{KA} = 6 V (see Figure 3)				0.001	0.1	µA
$\lvert z_{KA} \rvert$	Dynamic impedance[4]	$V_{KA} = V_{REF}$, f ≤ 1 kHz, I_K = 0.1 mA to 15 mA (see Figure 1)				0.25	0.4	Ω

(1) Full temperature ranges are –40°C to 125°C for TLV431Q, –40°C to 85°C for TLV431I, and 0°C to 70°C for TLV431C.

(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:

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

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) Full temperature ranges are –40°C to 125°C for TLV431Q, –40°C to 85°C for TLV431I, and 0°C to 70°C for TLV431C.

(4) The dynamic impedance is defined as $\left|z_{ka}\right| = \frac{\Delta V_{KA}}{\Delta I_K}$

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

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

Parameter Measurement Information

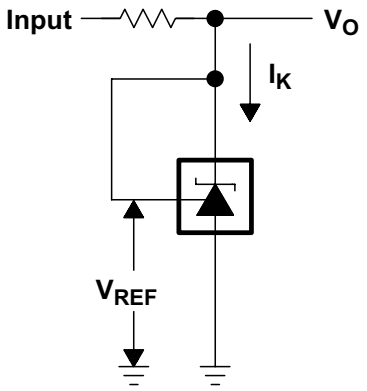


Figure 1. Test Circuit for $V_{KA} = V_{REF}$, $V_O = V_{KA} = V_{REF}$

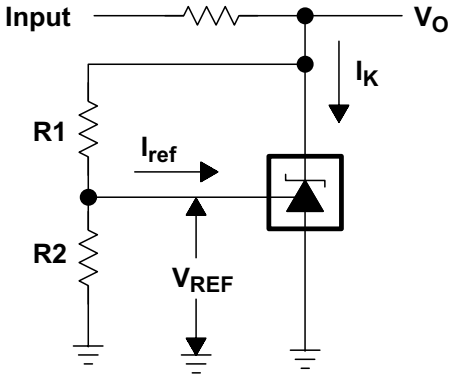


Figure 2. Test Circuit for $V_{KA} > V_{REF}$, $V_O = V_{KA} = V_{REF} \times (1 + R1/R2) + I_{ref} \times R1$

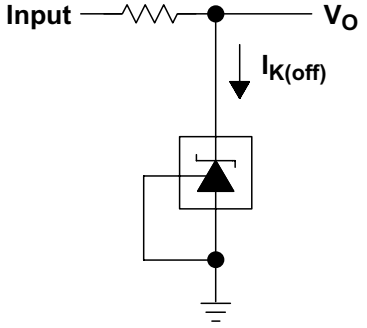


Figure 3. Test Circuit for $I_{K(off)}$

Typical Characteristics

Operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied.

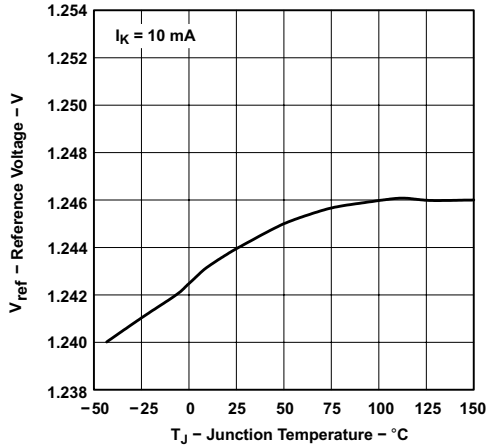


Figure 4. Reference Voltage vs Junction Temperature

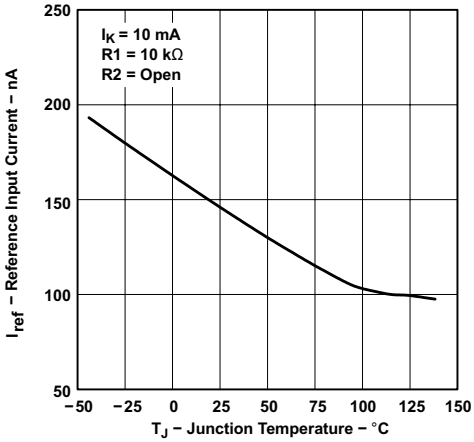


Figure 5. Reference Input Current vs Junction Temperature (for TLV431 and TLV431A)

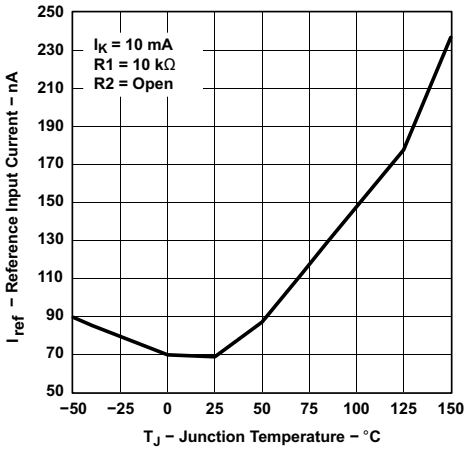


Figure 6. Reference Input Current vs Junction Temperature (for TLV431B)

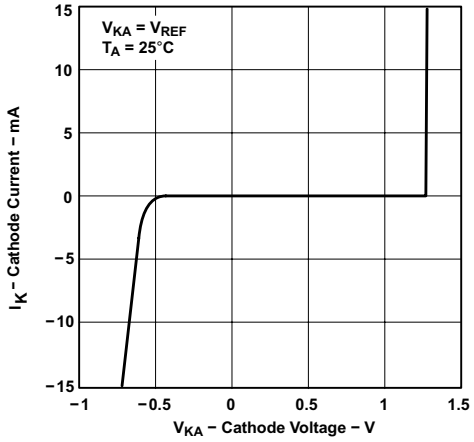


Figure 7. Cathode Current vs Cathode Voltage

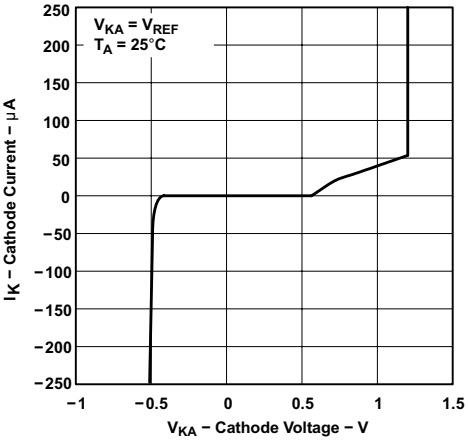


Figure 8. Cathode Current vs Cathode Voltage

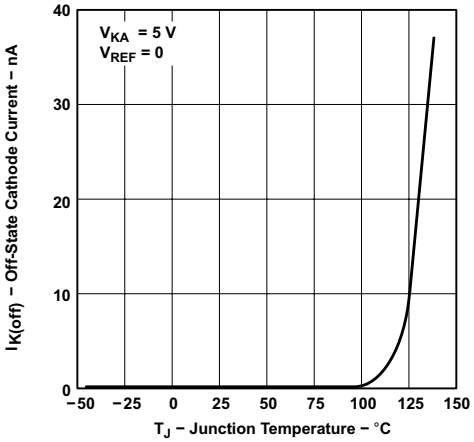


Figure 9. Off-State Cathode Current vs Junction Temperature (for TLV431 and TLV431A)

Typical Characteristics (continued)

Operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied.

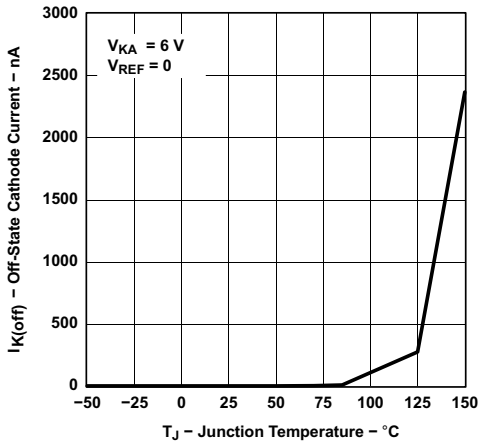


Figure 10. Off-State Cathode Current vs Junction Temperature (for TLV431B)

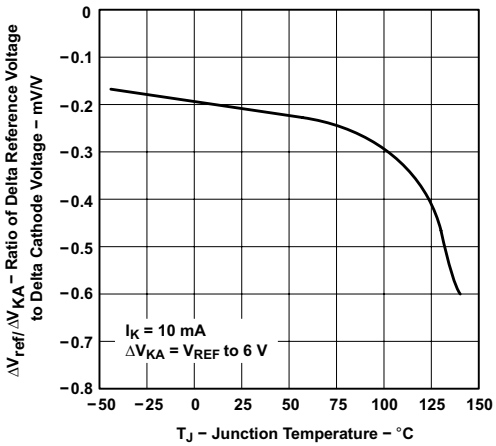


Figure 11. Ratio of Delta Reference Voltage to Delta Cathode Voltage vs Junction Temperature (for TLV431 and TLV431A)

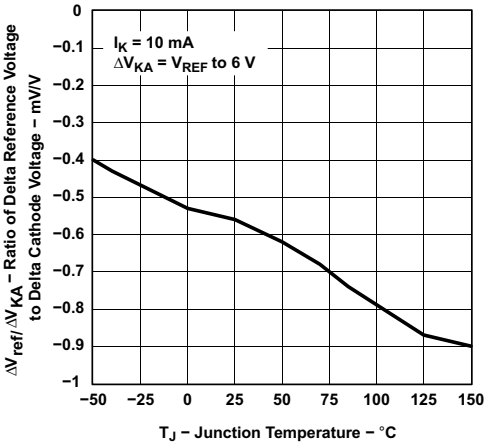
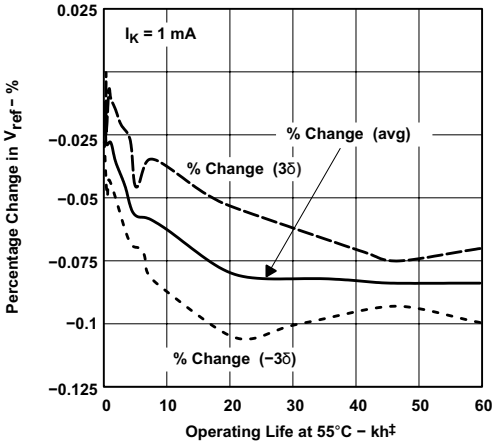
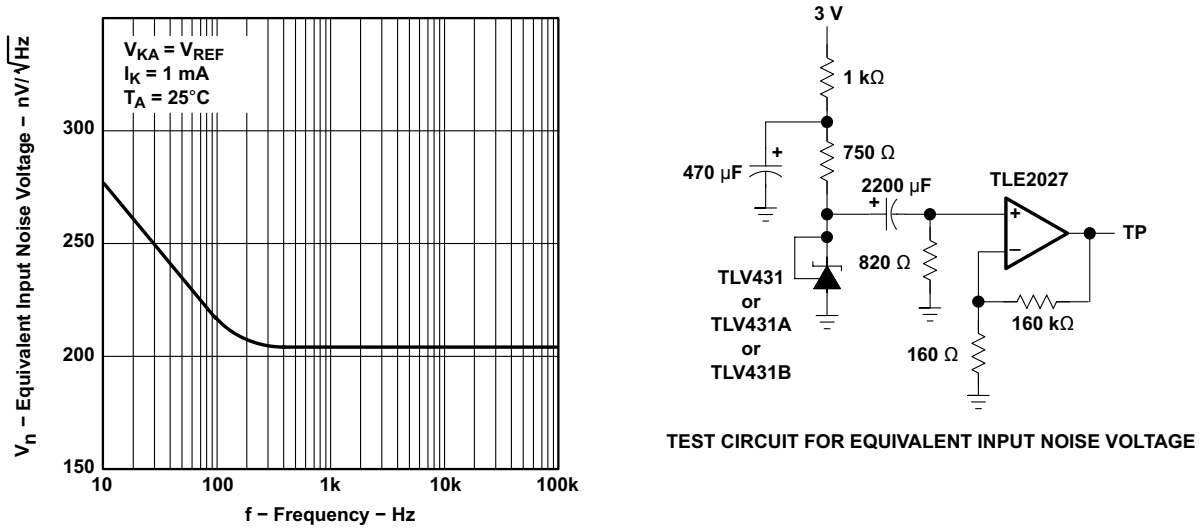


Figure 12. Ratio of Delta Reference Voltage to Delta Cathode Voltage vs Junction Temperature (for TLV431B)



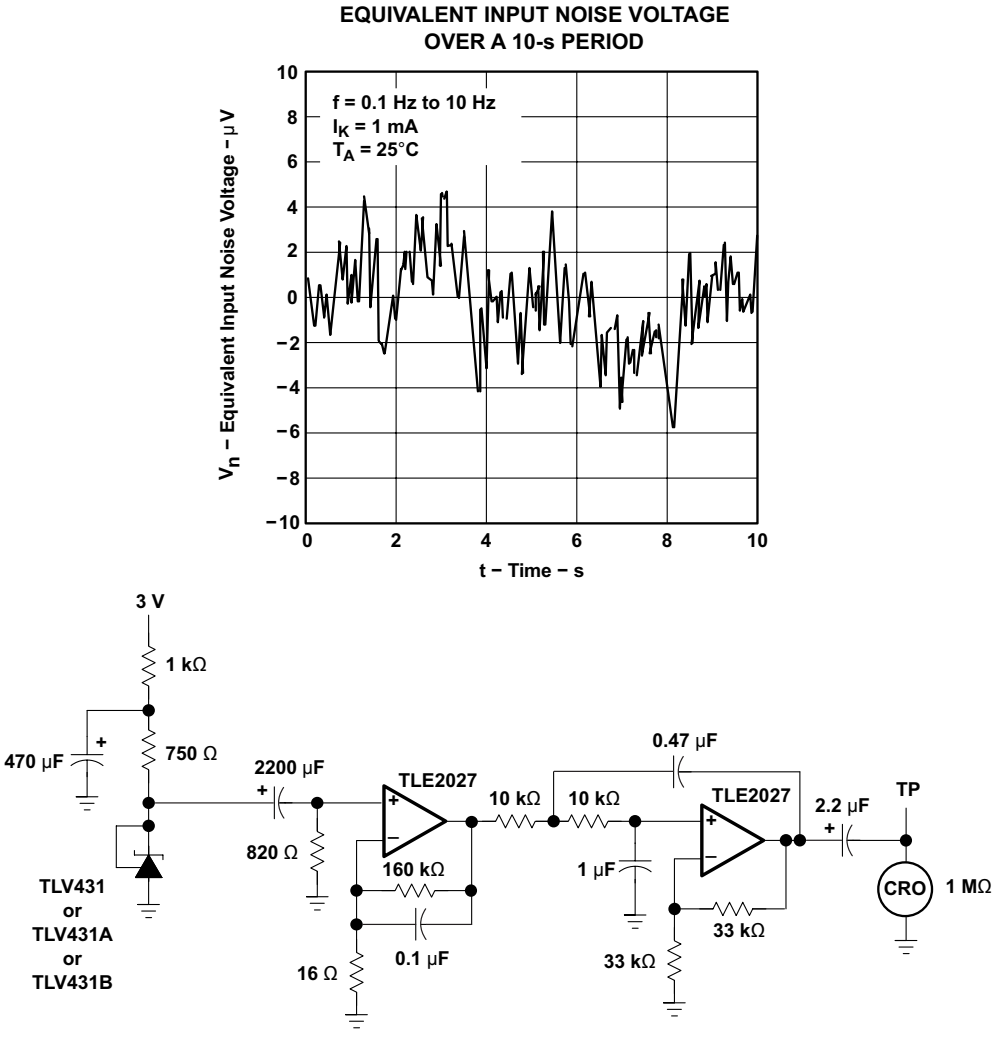
‡ Extrapolated from life-test data taken at 125°C; the activation energy assumed is 0.7 eV.

Figure 13. Percentage Change in V_{REF} vs Operating Life at 55°C



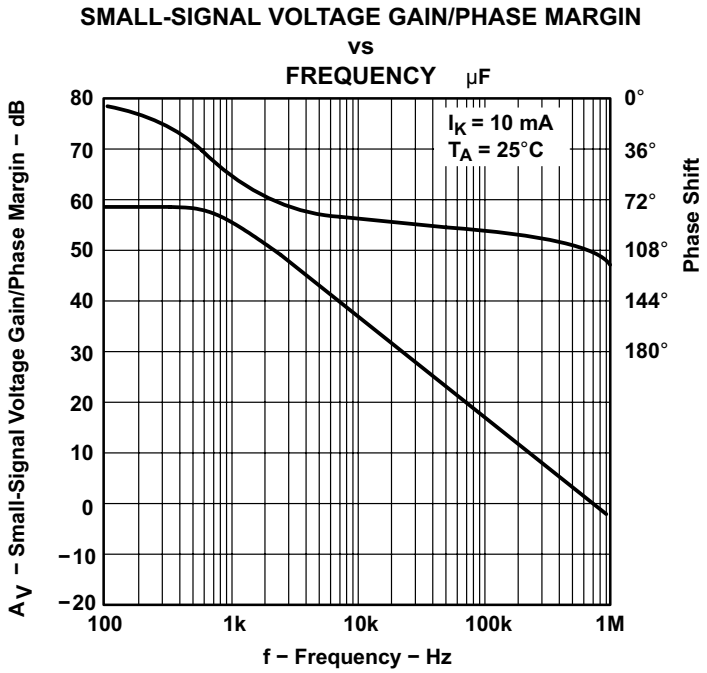
TEST CIRCUIT FOR EQUIVALENT INPUT NOISE VOLTAGE

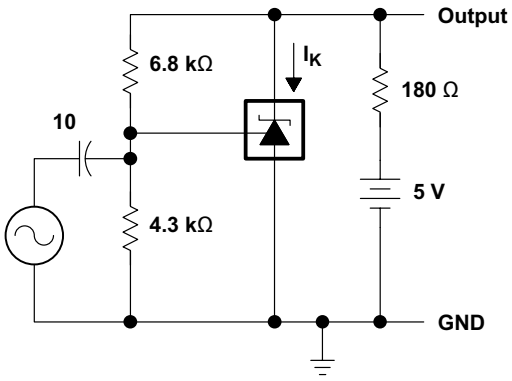
Figure 14.



TEST CIRCUIT FOR 0.1-Hz TO 10-Hz EQUIVALENT NOISE VOLTAGE

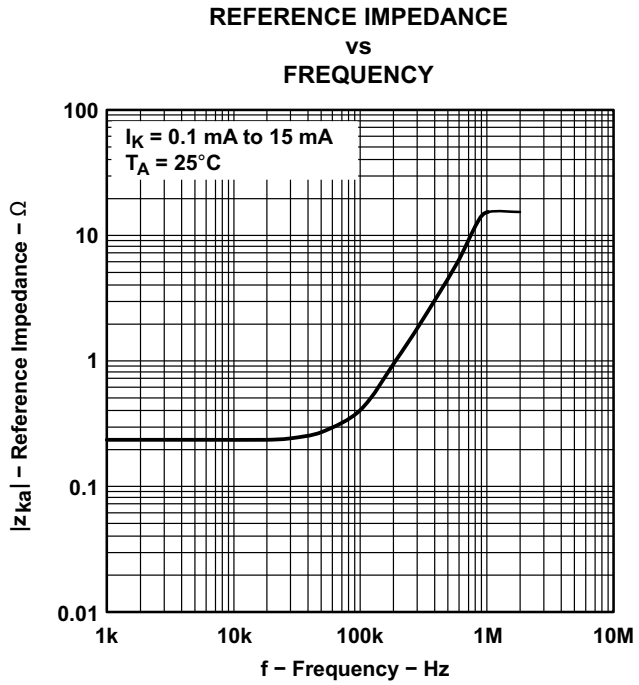
Figure 15.

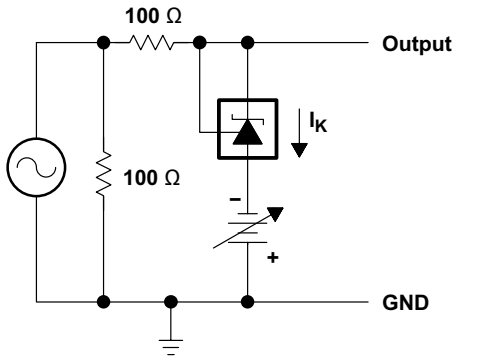




TEST CIRCUIT FOR VOLTAGE GAIN AND PHASE MARGIN

Figure 16.





TEST CIRCUIT FOR REFERENCE IMPEDANCE

Figure 17.

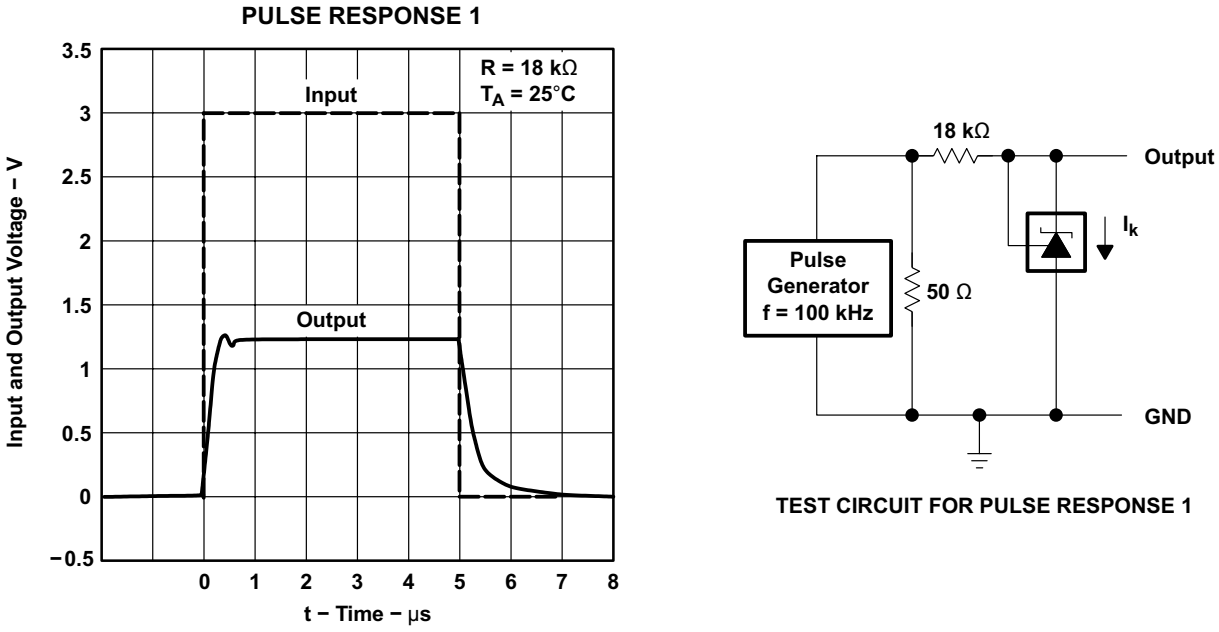


Figure 18.

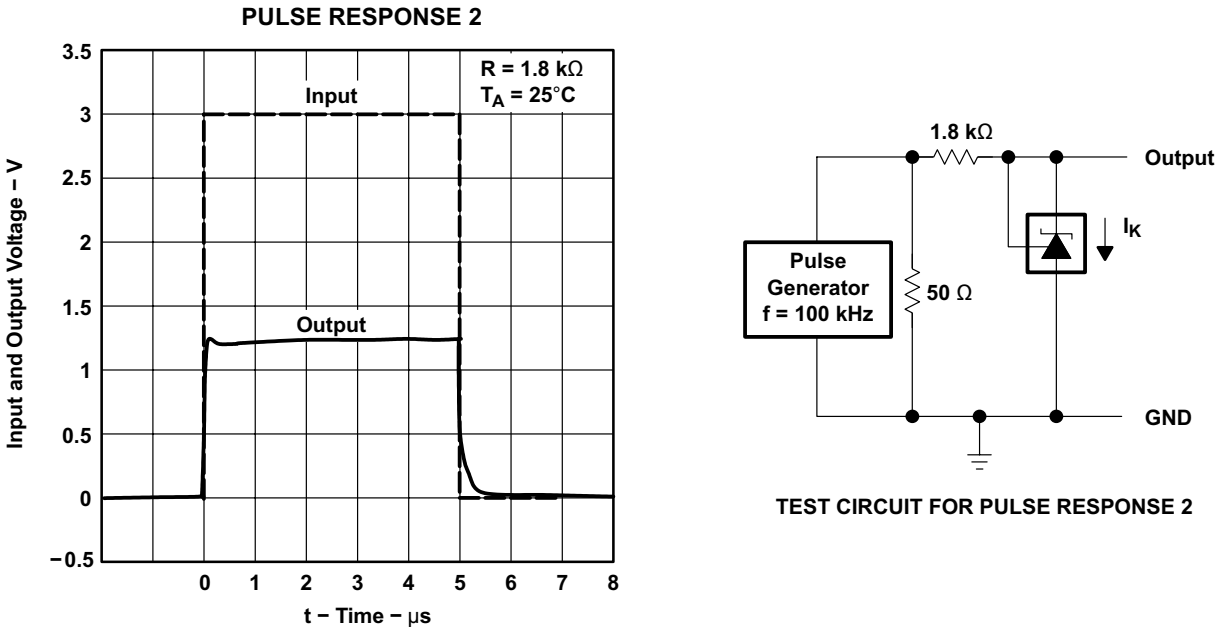
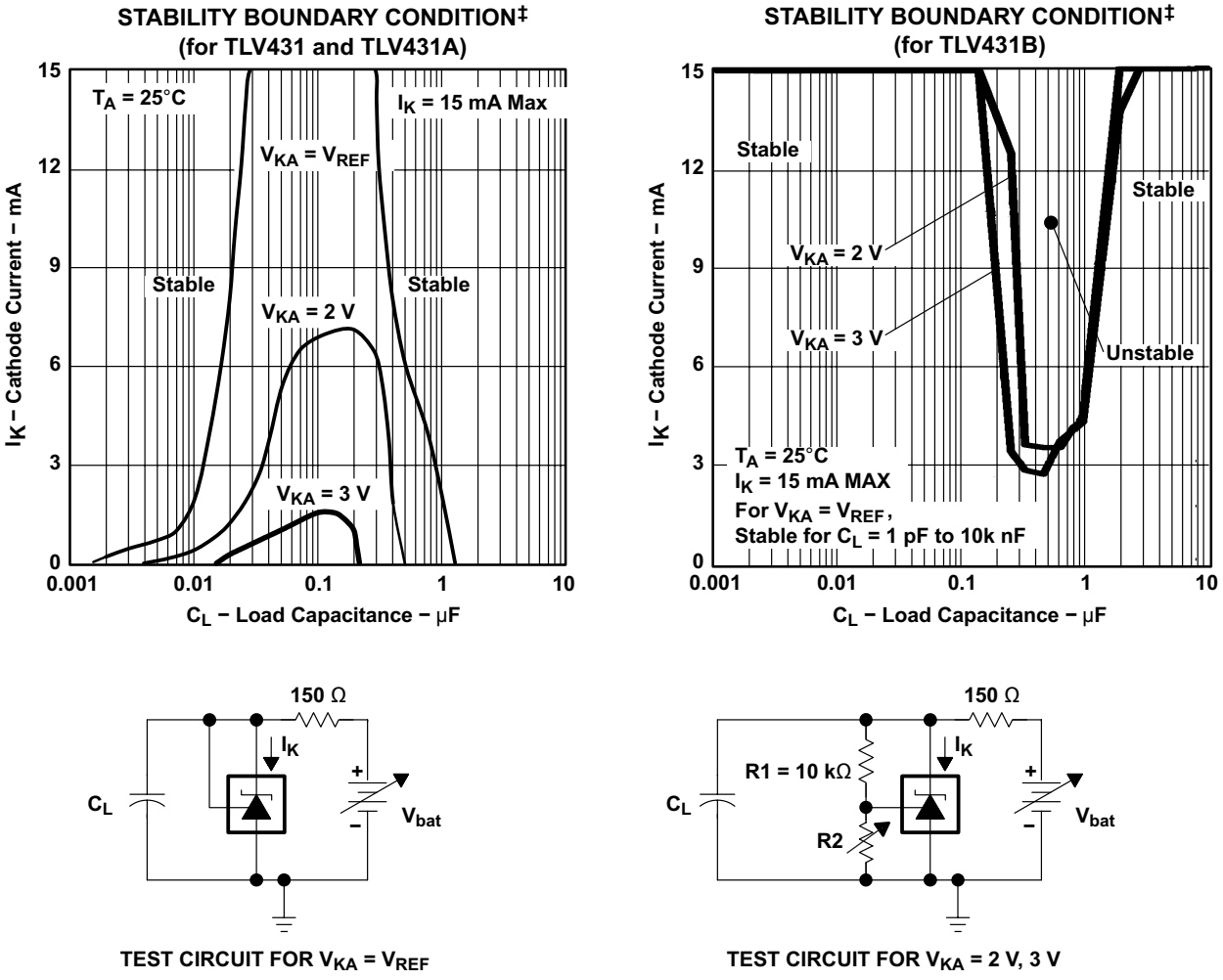


Figure 19.



‡ The areas under the curves represent conditions that may cause the device to oscillate. For V_{KA} = 2-V and 3-V curves, R2 and V_{bat} were adjusted to establish the initial V_{KA} and I_K conditions with C_L = 0. V_{bat} and C_L then were adjusted to determine the ranges of stability.

Figure 20.

APPLICATION INFORMATION

Figure 21 shows the TLV431, TLV431A, or TLV431B 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 ± 1%). 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.

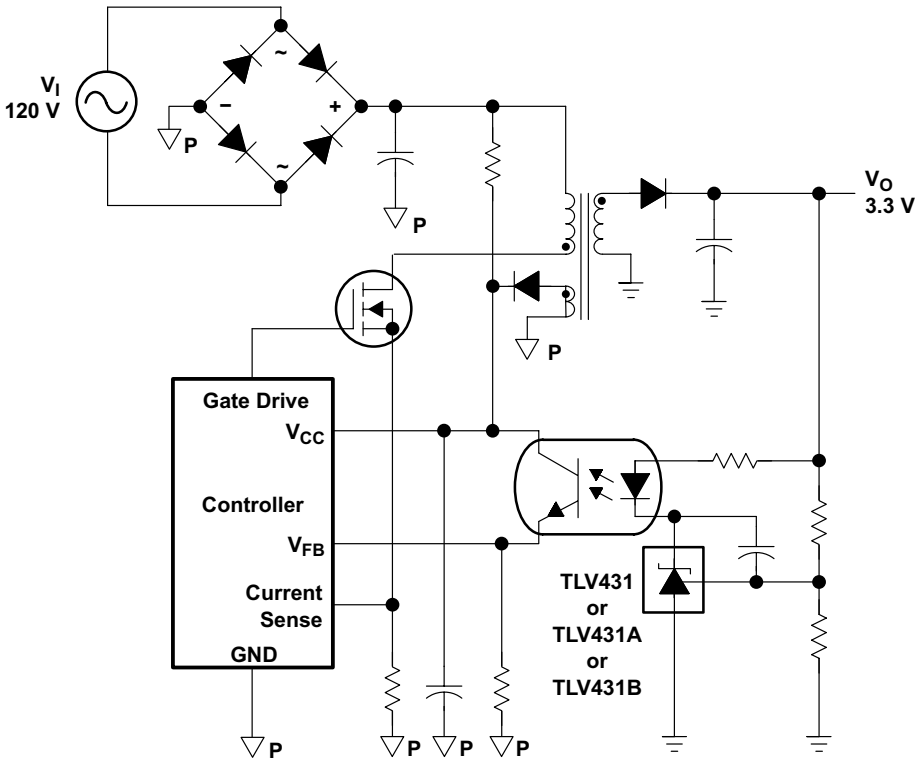


Figure 21. Flyback With Isolation Using TLV431, TLV431A, or TLV431B as Voltage Reference and Error Amplifier

REVISION HISTORY

Changes from Revision T (June 2007) to Revision U **Page**

- Updated document to new TI data sheet format. 1
- Deleted Ordering Information table. 1
- Updated Features. 1

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
TLV431ACDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC5 ~ YAC6 ~ YACC ~ YACI ~ YACN)	Samples
TLV431ACDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC5 ~ YAC6 ~ YACC ~ YACI ~ YACN)	Samples
TLV431ACDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC5 ~ YAC6 ~ YACC ~ YACI ~ YACN)	Samples
TLV431ACDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC5 ~ YAC6 ~ YACC ~ YACI)	Samples
TLV431ACDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC5 ~ YAC6 ~ YACC ~ YACI)	Samples
TLV431ACDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC5 ~ YAC6 ~ YACC ~ YACI)	Samples
TLV431ACDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC6 ~ YAC8 ~ YACB)	Samples
TLV431ACDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(YAC6 ~ YAC8 ~ YACB)	Samples
TLV431ACLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431AC	Samples
TLV431ACLPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431AC	Samples
TLV431ACLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431AC	Samples
TLV431ACLPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431AC	Samples
TLV431AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TY431A	Samples
TLV431AIDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI5 ~ YAI6 ~ YAIC ~ YAII ~ YAIN)	Samples
TLV431AIDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI5 ~ YAI6 ~ YAIC ~ YAII ~ YAIN)	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
TLV431AIDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI5 ~ YAI6 ~ YAIC ~ YAII ~ YAIN)	Samples
TLV431AIDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI5 ~ YAI6 ~ YAIC ~ YAII)	Samples
TLV431AIDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI5 ~ YAI6 ~ YAIC ~ YAII)	Samples
TLV431AIDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI5 ~ YAI6 ~ YAIC ~ YAII)	Samples
TLV431AIDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI6 ~ YAI8 ~ YAIB)	Samples
TLV431AIDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(YAI6 ~ YAI8 ~ YAIB)	Samples
TLV431AIDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TY431A	Samples
TLV431AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TY431A	Samples
TLV431AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TY431A	Samples
TLV431AIDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TY431A	Samples
TLV431AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	TY431A	Samples
TLV431AILP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431AI	Samples
TLV431AILPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431AI	Samples
TLV431AILPM	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431AI	Samples
TLV431AILPME3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431AI	Samples
TLV431AILPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431AI	Samples
TLV431AILPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431AI	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
TLV431AQPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VA	Samples
TLV431AQPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VA	Samples
TLV431BCDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GG ~ Y3GU)	Samples
TLV431BCDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GG ~ Y3GU)	Samples
TLV431BCDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GG ~ Y3GU)	Samples
TLV431BCDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GG ~ Y3GU)	Samples
TLV431BCDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GG ~ Y3GU)	Samples
TLV431BCDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GG ~ Y3GU)	Samples
TLV431BCDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3G3 ~ Y3GS ~ Y3GU)	Samples
TLV431BCDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3G3 ~ Y3GS ~ Y3GU)	Samples
TLV431BCDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GS ~ Y3GU)	Samples
TLV431BCDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3GS ~ Y3GU)	Samples
TLV431BCDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YEU	Samples
TLV431BCDCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YEU	Samples
TLV431BCDCKRG4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YEU	Samples
TLV431BCDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YEU	Samples
TLV431BCDCKTE4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YEU	Samples
TLV431BCDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	YEU	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
TLV431BCLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	TV431B	Samples
TLV431BCLPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	TV431B	Samples
TLV431BCLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	TV431B	Samples
TLV431BCLPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	TV431B	Samples
TLV431BCPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	VE	Samples
TLV431BCPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	VE	Samples
TLV431BIDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3FU	Samples
TLV431BIDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3FU	Samples
TLV431BIDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3FU	Samples
TLV431BIDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3FU	Samples
TLV431BIDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3FU	Samples
TLV431BIDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	Y3FU	Samples
TLV431BIDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3F3 ~ Y3FS ~ Y3FU)	Samples
TLV431BIDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3F3 ~ Y3FS ~ Y3FU)	Samples
TLV431BIDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3FS ~ Y3FU)	Samples
TLV431BIDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3FS ~ Y3FU)	Samples
TLV431BIDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YFU	Samples
TLV431BIDCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YFU	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
TLV431BIDCKRG4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YFU	Samples
TLV431BIDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YFU	Samples
TLV431BIDCKTE4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YFU	Samples
TLV431BIDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	YFU	Samples
TLV431BILP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	TY431B	Samples
TLV431BILPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	TY431B	Samples
TLV431BILPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	TY431B	Samples
TLV431BILPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	TY431B	Samples
TLV431BIPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	VF	Samples
TLV431BIPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	VF	Samples
TLV431BQDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3HU	Samples
TLV431BQDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3HU	Samples
TLV431BQDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3HU	Samples
TLV431BQDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3HU	Samples
TLV431BQDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3HU	Samples
TLV431BQDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	Y3HU	Samples
TLV431BQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3H3 ~ Y3HS ~ Y3HU)	Samples
TLV431BQDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3H3 ~ Y3HS ~ Y3HU)	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
TLV431BQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3HS ~ Y3HU)	Samples
TLV431BQDBZTG4	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	(Y3HS ~ Y3HU)	Samples
TLV431BQDCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YGU	Samples
TLV431BQDCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YGU	Samples
TLV431BQDCKRG4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YGU	Samples
TLV431BQDCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YGU	Samples
TLV431BQDCKTE4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YGU	Samples
TLV431BQDCKTG4	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	YGU	Samples
TLV431BQLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	TQ431B	Samples
TLV431BQLPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	TQ431B	Samples
TLV431BQLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	TQ431B	Samples
TLV431BQLPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 125	TQ431B	Samples
TLV431BQPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	V6	Samples
TLV431BQPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	V6	Samples
TLV431CDBV	OBSOLETE	SOT-23	DBV	5		TBD	Call TI	Call TI	0 to 70		
TLV431CDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C5 ~ Y3C6 ~ Y3CI)	Samples
TLV431CDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C5 ~ Y3C6 ~ Y3CI)	Samples
TLV431CDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C5 ~ Y3C6 ~ Y3CI)	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
TLV431CDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C5 ~ Y3C6 ~ Y3CI)	Samples
TLV431CDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C5 ~ Y3C6 ~ Y3CI)	Samples
TLV431CDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C5 ~ Y3C6 ~ Y3CI)	Samples
TLV431CDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C6 ~ Y3C8 ~ Y3CB)	Samples
TLV431CDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	(Y3C6 ~ Y3C8 ~ Y3CB)	Samples
TLV431CLP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431C	Samples
TLV431CLPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431C	Samples
TLV431CLPM	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431C	Samples
TLV431CLPME3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431C	Samples
TLV431CLPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431C	Samples
TLV431CLPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 70	V431C	Samples
TLV431IDBV	OBSOLETE	SOT-23	DBV	5		TBD	Call TI	Call TI	-40 to 85		
TLV431IDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I5 ~ Y3I6 ~ Y3II)	Samples
TLV431IDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I5 ~ Y3I6 ~ Y3II)	Samples
TLV431IDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I5 ~ Y3I6 ~ Y3II)	Samples
TLV431IDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I5 ~ Y3I6 ~ Y3II)	Samples
TLV431IDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I5 ~ Y3I6 ~ Y3II)	Samples
TLV431IDBVTG4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I5 ~ Y3I6 ~ Y3II)	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
TLV431IDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I6 ~ Y3IB)	Samples
TLV431IDBZRG4	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	(Y3I6 ~ Y3IB)	Samples
TLV431ILP	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431I	Samples
TLV431ILPE3	ACTIVE	TO-92	LP	3	1000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431I	Samples
TLV431ILPR	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431I	Samples
TLV431ILPRE3	ACTIVE	TO-92	LP	3	2000	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	-40 to 85	V431I	Samples
TLV431QPK	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VB	Samples
TLV431QPKG3	ACTIVE	SOT-89	PK	3	1000	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 125	VB	Samples

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

(2) 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.

OTHER QUALIFIED VERSIONS OF TLV431A, TLV431B :

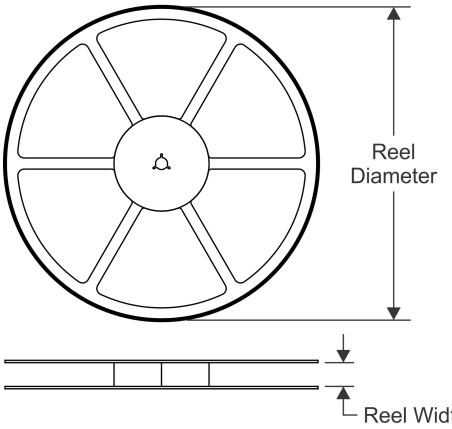
- Automotive: TLV431A-Q1, TLV431B-Q1

NOTE: Qualified Version Definitions:

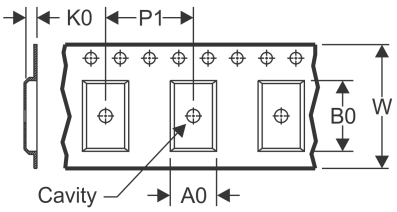
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

REEL DIMENSIONS

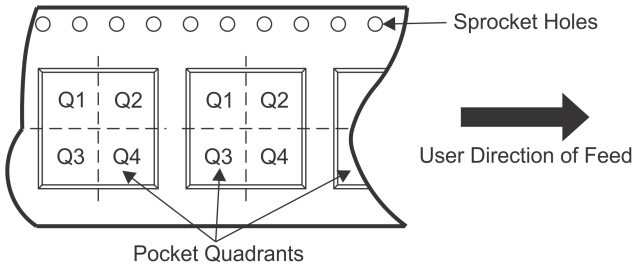


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

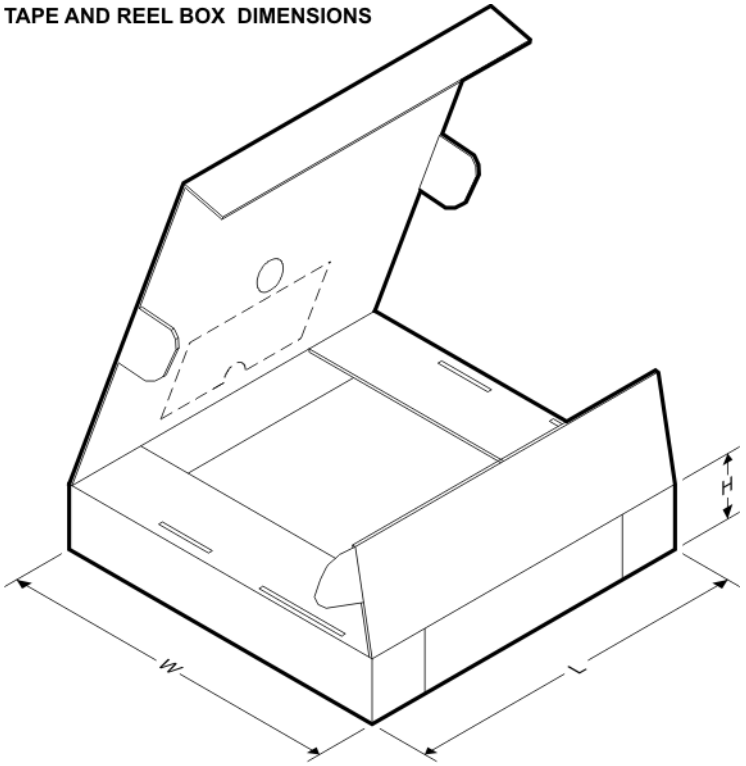


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLV431ACDBVR	SOT-23	DBV	5	3000	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
TLV431ACDBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TLV431ACDBVT	SOT-23	DBV	5	250	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
TLV431ACDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431AIDBVR	SOT-23	DBV	5	3000	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
TLV431AIDBVT	SOT-23	DBV	5	250	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
TLV431AIDBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TLV431AIDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431AIDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLV431AQPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLV431BCDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TLV431BCDBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TLV431BCDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431BCDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431BCDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLV431BCDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLV431BCPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLV431BIDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	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
TLV431BIDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLV431BIDBZR	SOT-23	DBZ	3	3000	178.0	9.2	3.08	2.8	1.27	4.0	8.0	Q3
TLV431BIDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431BIDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLV431BIDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLV431BIPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLV431BQDBVR	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLV431BQDBVT	SOT-23	DBV	5	250	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TLV431BQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431BQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431BQDCKR	SC70	DCK	6	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLV431BQDCKT	SC70	DCK	6	250	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3
TLV431BQPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3
TLV431CDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TLV431CDBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TLV431CDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431IDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
TLV431IDBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TLV431IDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
TLV431QPK	SOT-89	PK	3	1000	180.0	12.4	4.91	4.52	1.9	8.0	12.0	Q3

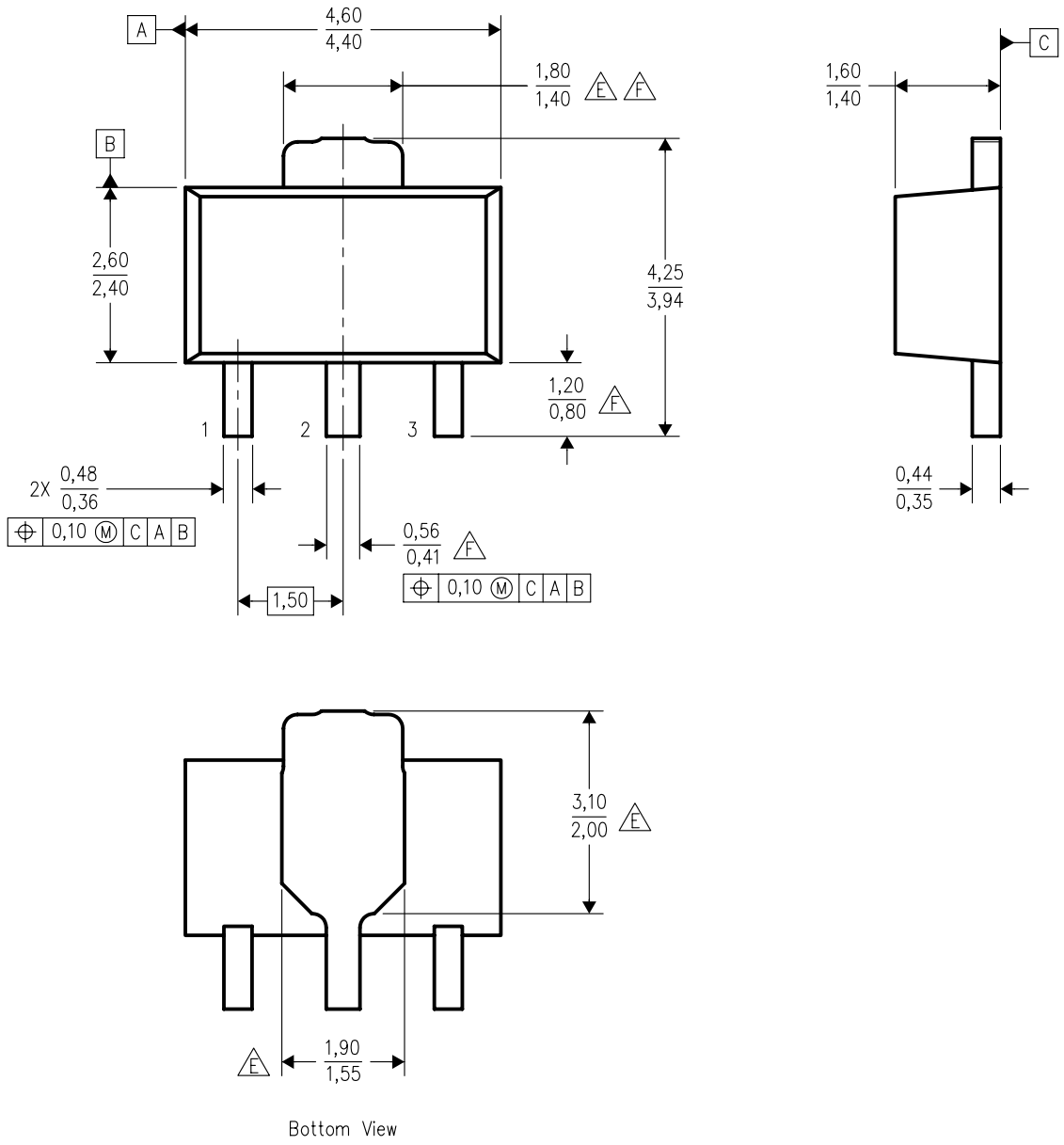
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLV431ACDBVR	SOT-23	DBV	5	3000	205.0	200.0	33.0
TLV431ACDBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TLV431ACDBVT	SOT-23	DBV	5	250	205.0	200.0	33.0
TLV431ACDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLV431AIDBVR	SOT-23	DBV	5	3000	205.0	200.0	33.0
TLV431AIDBVT	SOT-23	DBV	5	250	205.0	200.0	33.0
TLV431AIDBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TLV431AIDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLV431AIDR	SOIC	D	8	2500	340.5	338.1	20.6
TLV431AQPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLV431BCDBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TLV431BCDBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TLV431BCDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLV431BCDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLV431BCDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLV431BCDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLV431BCPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLV431BIDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLV431BIDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLV431BIDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
TLV431BIDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLV431BIDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLV431BIDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLV431BIPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLV431BQDBVR	SOT-23	DBV	5	3000	203.0	203.0	35.0
TLV431BQDBVT	SOT-23	DBV	5	250	203.0	203.0	35.0
TLV431BQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLV431BQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
TLV431BQDCKR	SC70	DCK	6	3000	203.0	203.0	35.0
TLV431BQDCKT	SC70	DCK	6	250	203.0	203.0	35.0
TLV431BQPK	SOT-89	PK	3	1000	340.0	340.0	38.0
TLV431CDBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TLV431CDBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TLV431CDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLV431IDBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TLV431IDBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TLV431IDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
TLV431QPK	SOT-89	PK	3	1000	340.0	340.0	38.0

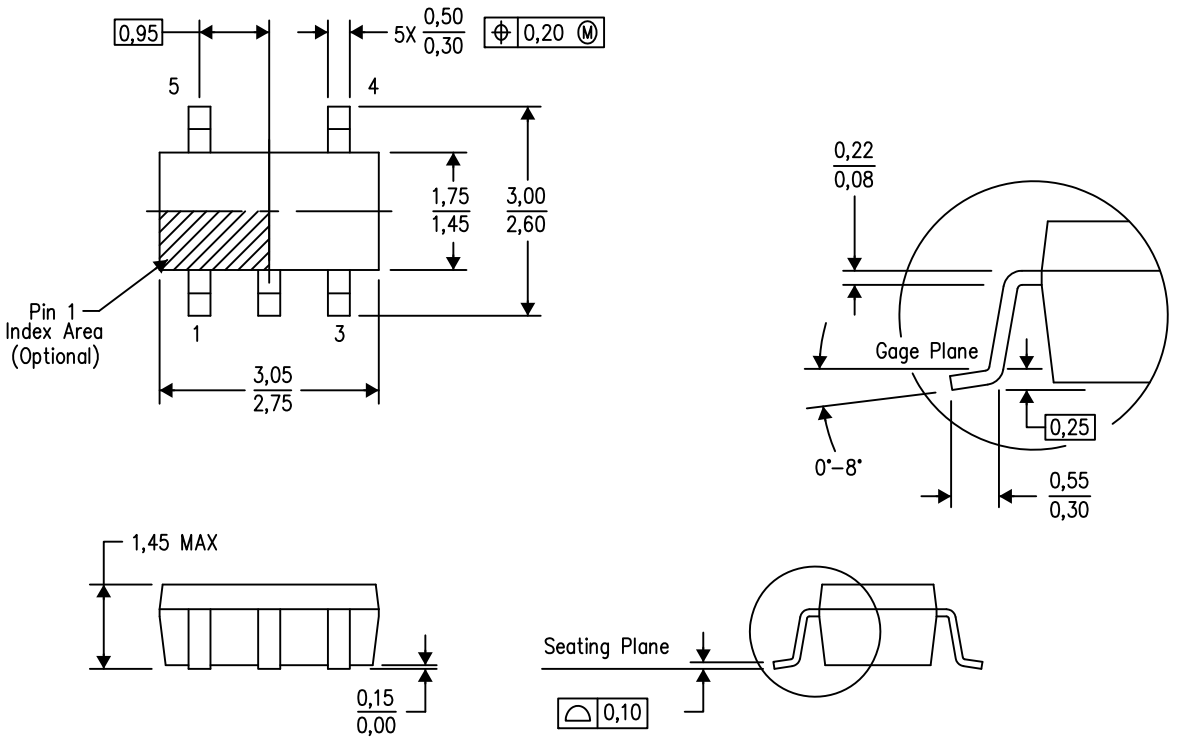
PK (R–PSSO–F3) PLASTIC SINGLE–IN–LINE PACKAGE



4040234/D 02/2006

NOTES:
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. The center lead is in electrical contact with the tab.
D. 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.

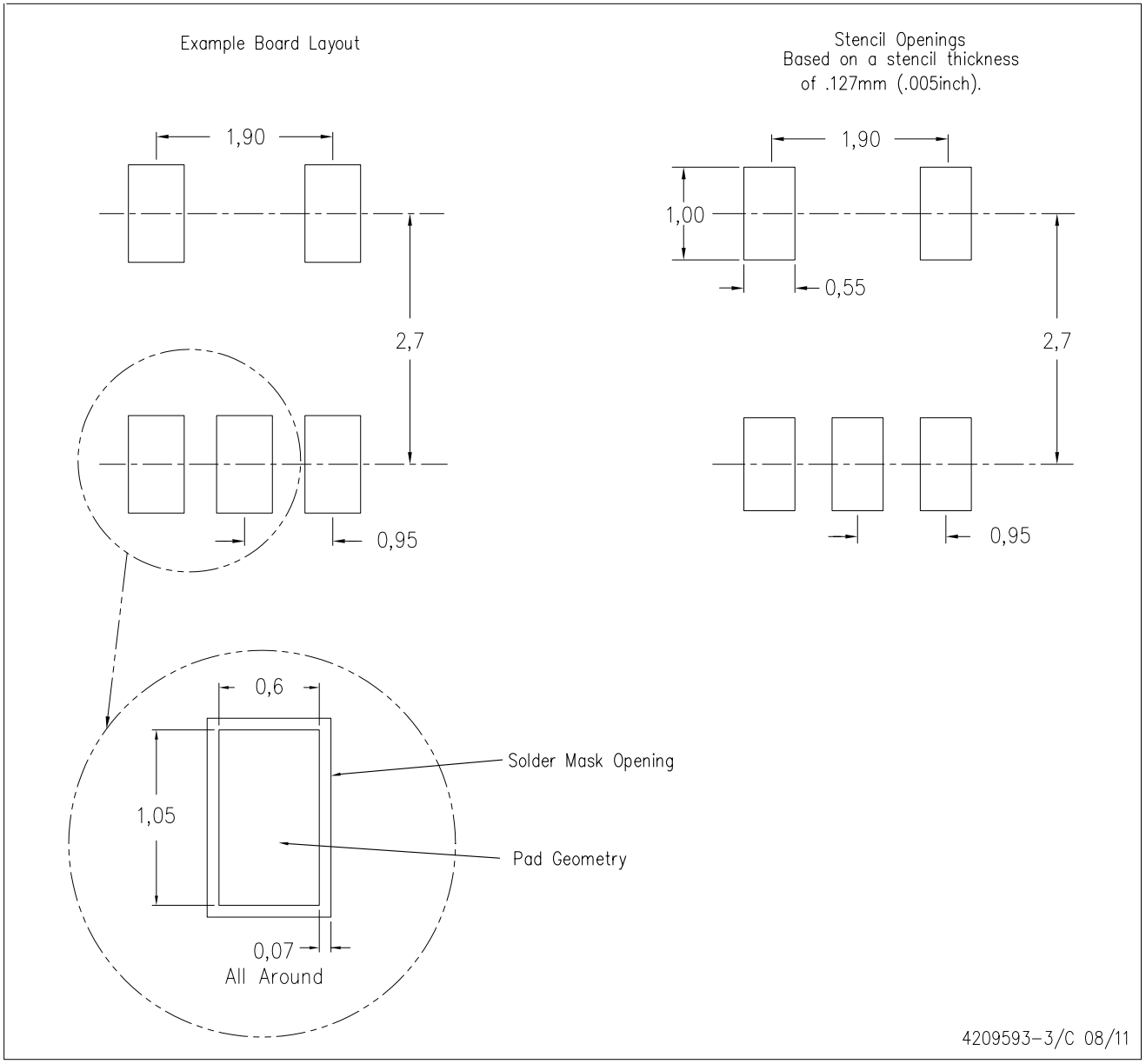
DBV (R–PDSO–G5) PLASTIC SMALL–OUTLINE PACKAGE



4073253–4/L 08/2013

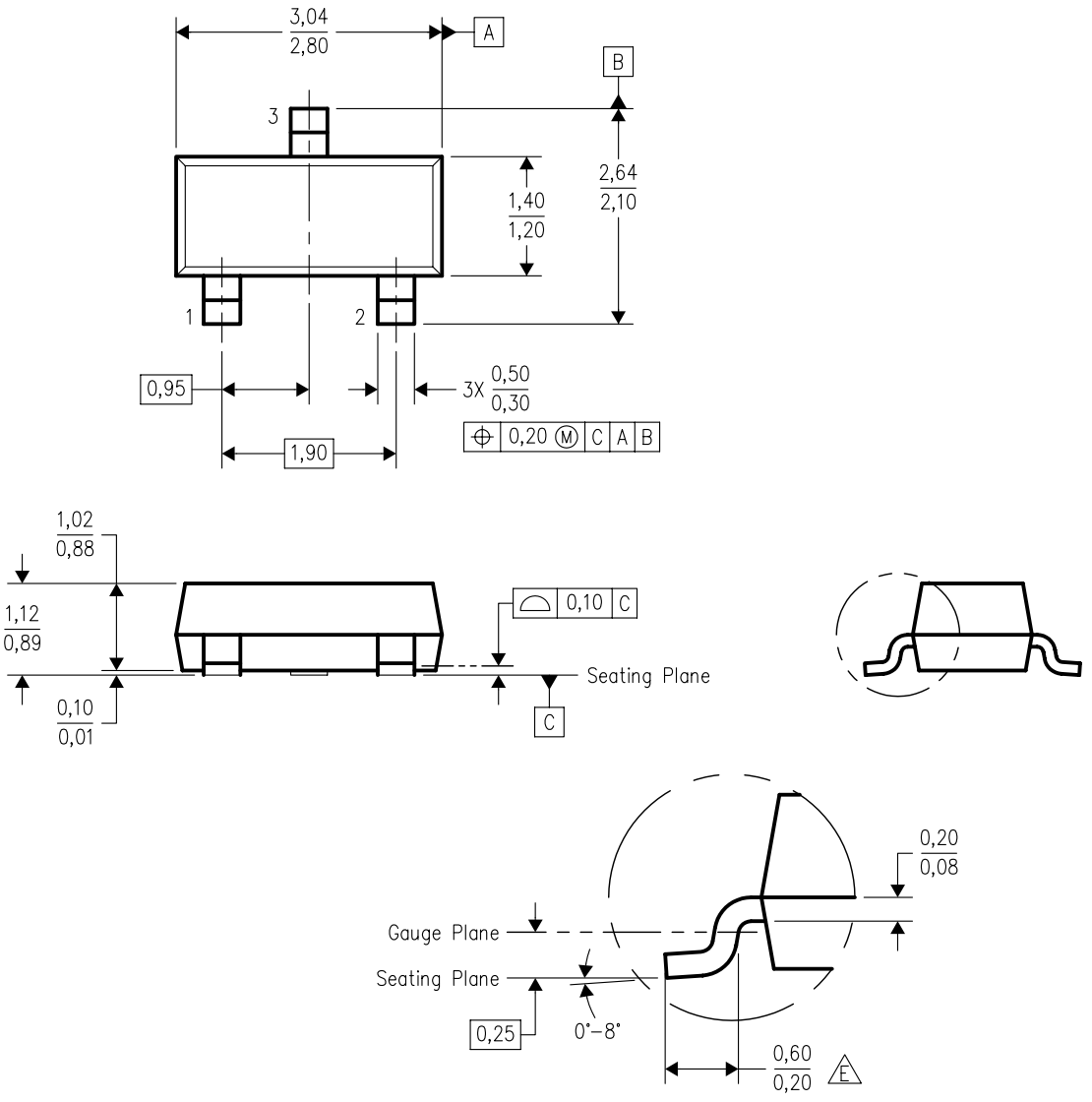
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO–178 Variation AA.

DBV (R–PDSO–G5) PLASTIC SMALL OUTLINE



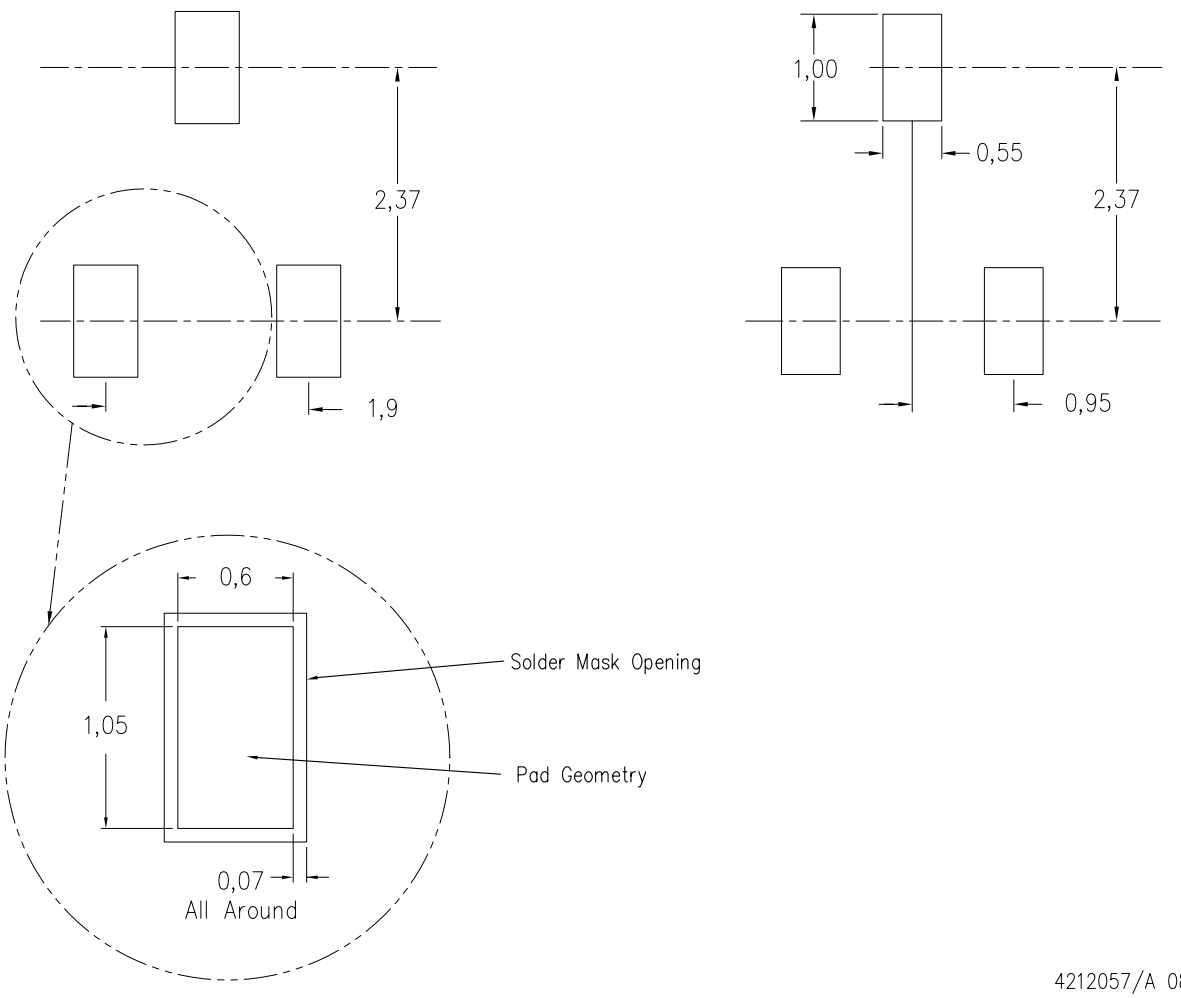
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. Publication IPC–7351 is recommended for alternate designs.
E. Laser cutting 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



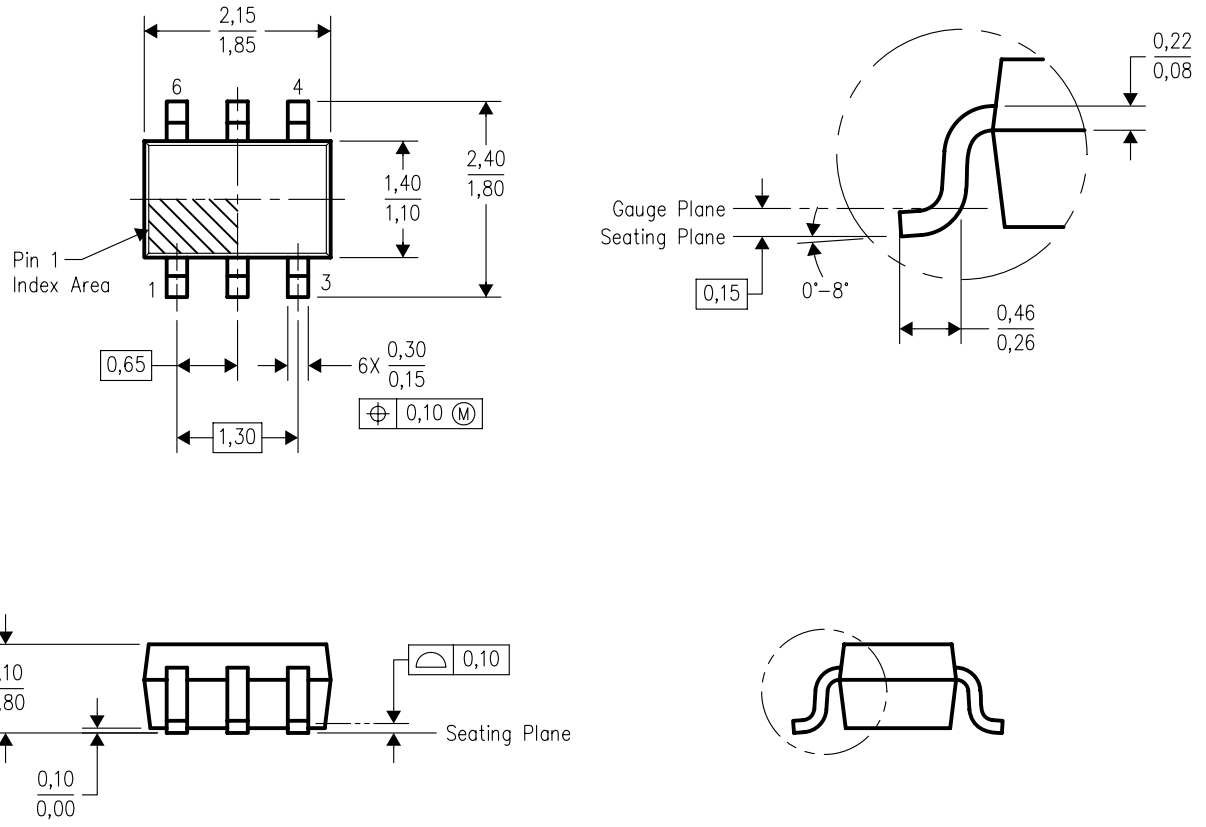
NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Lead dimensions are inclusive of plating.
D. Body dimensions are exclusive of mold flash and protrusion. Mold flash and protrusion not to exceed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

DBZ (R–PDSO–G3) PLASTIC SMALL OUTLINE



NOTES:
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.

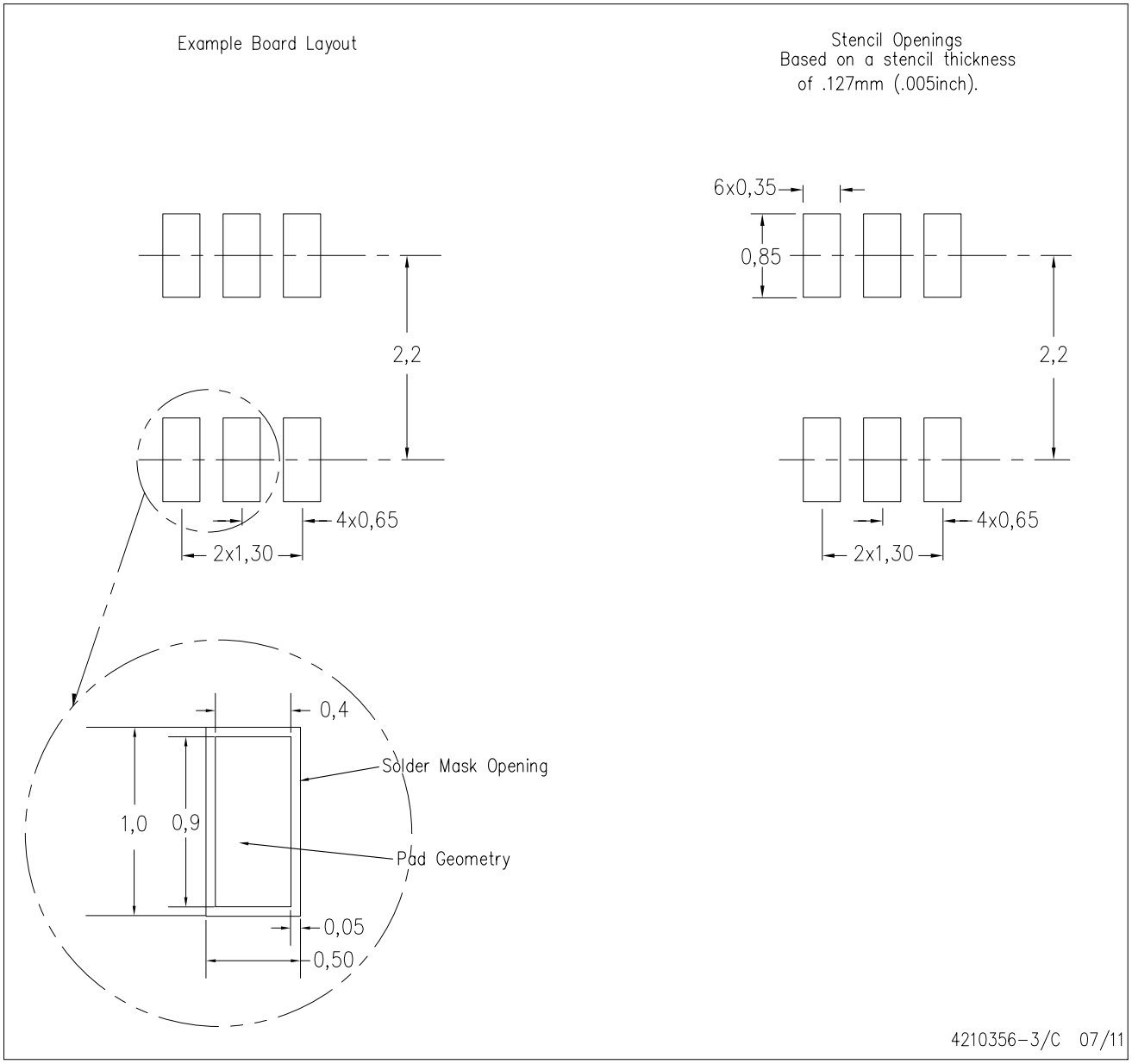
DCK (R–PDSO–G6) PLASTIC SMALL–OUTLINE PACKAGE



4093553–4/G 01/2007

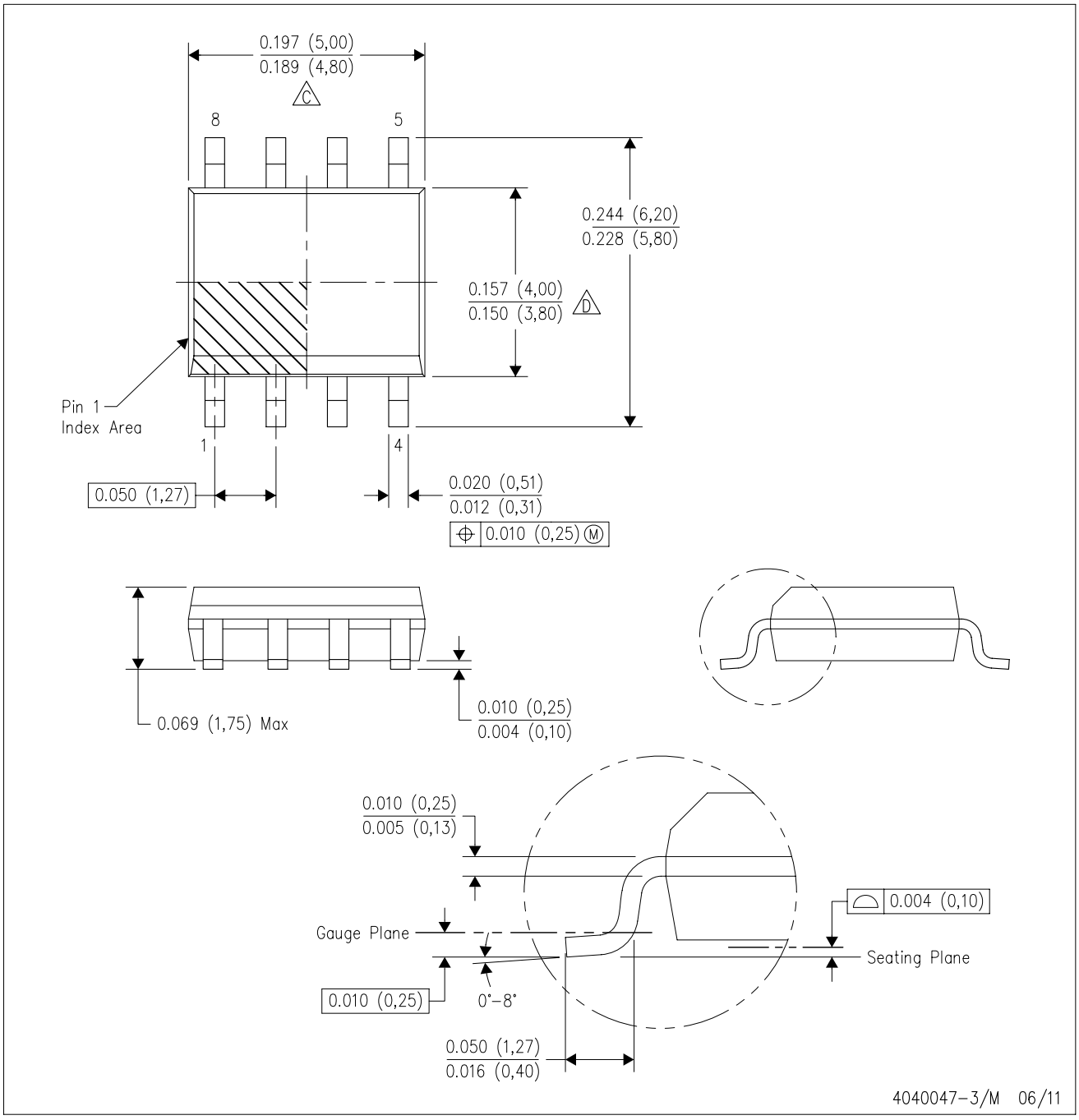
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO–203 variation AB.

DCK (R–PDSO–G6) PLASTIC SMALL OUTLINE



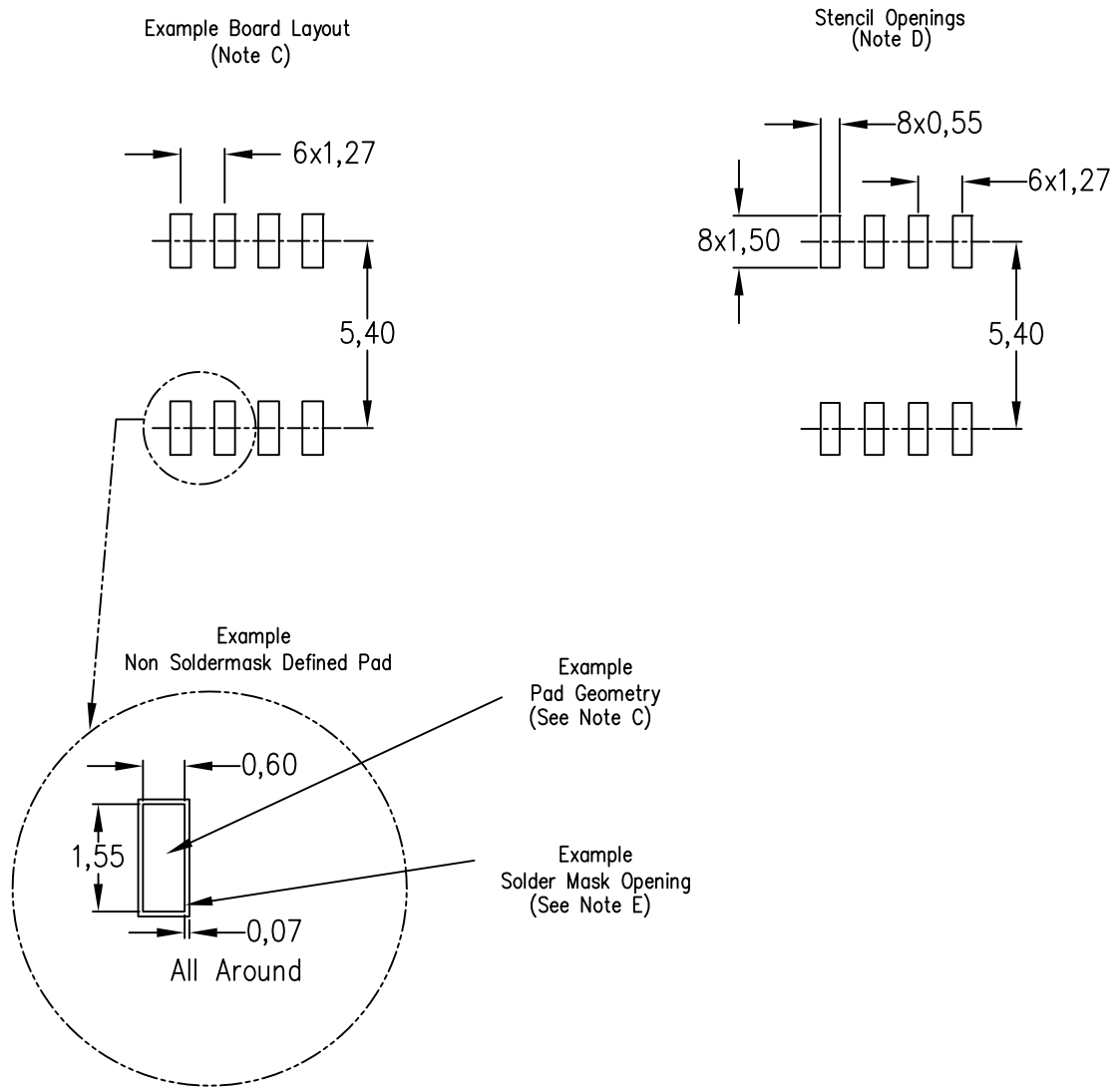
NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. Publication IPC–7351 is recommended for alternate designs.
E. Laser cutting 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.

D (R–PDSO–G8) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
E. Reference JEDEC MS–012 variation AA.

D (R–PDSO–G8) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. 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. Refer to IPC–7525 for other stencil recommendations.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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