

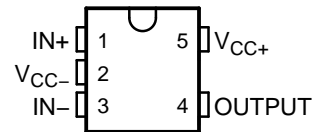
## FEATURES

- 1.8-V, 2.7-V, and 5-V Specifications
- Rail-to-Rail Output Swing
  - 600-Ω Load . . . 80 mV From Rail
  - 2-kΩ Load . . . 30 mV From Rail
- $V_{ICR}$  . . . 200 mV Beyond Rails
- Gain Bandwidth . . . 1.4 MHz
- Supply Current . . . 100 μA/Amplifier
- Max  $V_{IO}$  . . . 4 mV
- Space-Saving Packages
  - LMV931: SOT-23 and SC-70
  - LMV932: MSOP and SOIC
  - LMV934: SOIC and TSSOP

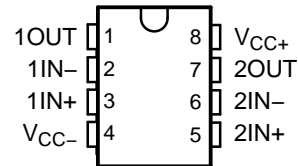
## APPLICATIONS

- Industrial (Utility/Energy Metering)
- Automotive
- Communications (Optical Telecom, Data/Voice Cable Modems)
- Consumer Electronics (PDAs, PCs, CDR/W, Portable Audio)
- Supply-Current Monitoring
- Battery Monitoring

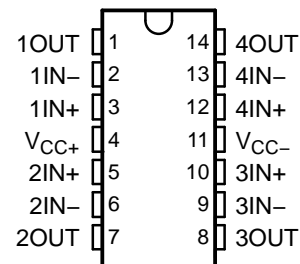
LMV931 . . . DBV (SOT-23-5) OR DCK (SC-70) PACKAGE  
(TOP VIEW)



LMV932 . . . D (SOIC) OR  
DGK (VSSOP/MSOP) PACKAGE  
(TOP VIEW)



LMV934 . . . D (SOIC) OR PW (TSSOP) PACKAGE  
(TOP VIEW)



## DESCRIPTION/ORDERING INFORMATION

### ORDERING INFORMATION

$T_A$	PACKAGE <sup>(1)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING <sup>(2)</sup>	
–40°C to 125°C	Single	SOT-23 – DBV	Reel of 3000	LMV931IDBVR	RBB_
			Reel of 250	LMV931IDBVT	PREVIEW
		SC-70 – DCK	Reel of 3000	LMV931IDCKR	RB_
			Reel of 250	LMV931IDCKT	PREVIEW
	Dual	MSOP/VSSOP – DGK	Reel of 2500	LMV932IDGKR	RD_
			Reel of 250	LMV932IDGKT	PREVIEW
		SOIC – D	Tube of 75	LMV932ID	MV932I
			Reel of 2500	LMV932IDR	
	Quad	SOIC – D	Tube of 50	LMV934ID	LMV934I
			Reel of 2500	LMV934IDR	
		TSSOP – PW	Tube of 90	LMV934IPW	MV934I
			Reel of 2000	LMV934IPWR	

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

(2) DBV/DCK/DGK: The actual top-side marking has one additional character that designates the assembly/test site.



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.



### Absolute Maximum Ratings<sup>(1)</sup>

over free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
$V_{CC+} - V_{CC-}$	Supply voltage <sup>(2)</sup>		5.5	V
$V_{ID}$	Differential input voltage <sup>(3)</sup>	Supply voltage		
$V_I$	Input voltage range, either input	$V_{CC-} - 0.2$	$V_{CC+} + 0.2$	V
Duration of output short circuit (one amplifier) to $V_{CC\pm}$ <sup>(4)(5)</sup>		Unlimited		
$\theta_{JA}$	Package thermal impedance <sup>(5)(6)</sup>	D package (8 pin)		°C/W
		D package (14 pin)		
		DBV package		
		DCK package		
		DGK package		
PW package		113		
$T_J$	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) All voltage values (except differential voltages and  $V_{CC}$  specified for the measurement of  $I_{OQ}$ ) are with respect to the network GND.
- (3) Differential voltages are at IN+ with respect to IN-.
- (4) Applies to both single-supply and split-supply operation. Continuous short-circuit operation at elevated ambient temperature can result in exceeding the maximum allowed junction temperature of 150°C. Output currents in excess of 45 mA over long term may adversely affect reliability.
- (5) Maximum power dissipation is a function of  $T_J(\text{max})$ ,  $\theta_{JA}$ , 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.
- (6) The package thermal impedance is calculated in accordance with JESD 51-7.

### Recommended Operating Conditions

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage ( $V_{CC+} - V_{CC-}$ )	1.8	5	V
$T_A$	Operating free-air temperature	-40	125	°C

### ESD Protection

		TYP	UNIT
Human-Body Model		2000	V
Machine Model		200	V

# LMV931 SINGLE, LMV932 DUAL, LMV934 QUAD 1.8-V OPERATIONAL AMPLIFIERS WITH RAIL-TO-RAIL INPUT AND OUTPUT

SLOS441G–AUGUST 2004–REVISED FEBRUARY 2006

## Electrical Characteristics

$V_{CC+} = 1.8\text{ V}$ ,  $V_{CC-} = 0\text{ V}$ ,  $V_{IC} = V_{CC+}/2$ ,  $V_O = V_{CC+}/2$ , and  $R_L > 1\text{ M}\Omega$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS		$T_A$	MIN	TYP	MAX	UNIT
$V_{IO}$	Input offset voltage	LMV931 (single)		25°C		1	4	mV
				Full range			6	
		LMV932 (dual), LMV934 (quad)		25°C		1	5.5	
				Full range			7.5	
$\alpha_{V_{IO}}$	Average temperature coefficient of input offset voltage			25°C		5.5		$\mu\text{V}/^\circ\text{C}$
$I_{IB}$	Input bias current	$V_{IC} = V_{CC+} - 0.8\text{ V}$		25°C		15	35	nA
				25°C			65	
				Full range			75	
$I_{IO}$	Input offset current			25°C		13	25	nA
				Full range			40	
$I_{CC}$	Supply current (per channel)			25°C		103	185	$\mu\text{A}$
				Full range			205	
CMRR	Common-mode rejection ratio	$0 \leq V_{IC} \leq 0.6\text{ V}$ , $1.4\text{ V} \leq V_{IC} \leq 1.8\text{ V}$		25°C	60	78		dB
		$0.2 \leq V_{IC} \leq 0.6\text{ V}$ , $1.4\text{ V} \leq V_{IC} \leq 1.6\text{ V}$		-40°C to 85°C	55			
		$-0.2 \leq V_{IC} \leq 0\text{ V}$ , $1.8\text{ V} \leq V_{IC} \leq 2\text{ V}$		25°C	50	72		
$k_{SVR}$	Supply-voltage rejection ratio	$1.8\text{ V} \leq V_{CC+} \leq 5\text{ V}$ , $V_{IC} = 0.5\text{ V}$		25°C	75	100		dB
				Full range	70			
$V_{ICR}$	Common-mode input voltage range	CMRR $\geq 50\text{ dB}$		25°C	$V_{CC-} - 0.2$	-0.2 to 2.1	$V_{CC+} + 0.2$	V
				-40°C to 85°C	$V_{CC-}$		$V_{CC+}$	
				-40°C to 125°C	$V_{CC-} + 0.2$		$V_{CC+} - 0.2$	
$A_V$	Large-signal voltage gain	LMV931	$V_O = 0.2\text{ V to }1.6\text{ V}$ , $V_{IC} = 0.5\text{ V}$	$R_L = 600\ \Omega$ to 0.9 V	25°C	77	101	dB
					Full range	73		
				$R_L = 2\text{ k}\Omega$ to 0.9 V	25°C	80	105	
		Full range			75			
		LMV932, LMV934		$R_L = 600\ \Omega$ to 0.9 V	25°C	75	90	
					Full range	72		
$R_L = 2\text{ k}\Omega$ to 0.9 V	25°C		78	100				
	Full range	75						
$V_O$	Output swing	$R_L = 600\ \Omega$ to 0.9 V, $V_{ID} = \pm 100\text{ mV}$	High level	25°C	1.65	1.72	V	
				Full range	1.63			
			Low level	25°C		0.077		0.105
		Full range				0.120		
		$R_L = 2\text{ k}\Omega$ to 0.9 V, $V_{ID} = \pm 100\text{ mV}$	High level	25°C	1.75	1.77		
				Full range	1.74			
Low level	25°C			0.024	0.035			
	Full range			0.040				
$I_{OS}$	Output short-circuit current	$V_O = 0\text{ V}$ , $V_{ID} = 100\text{ mV}$	Sourcing	25°C	4	8	mA	
				Full range	3.3			
		$V_O = 1.8\text{ V}$ , $V_{ID} = -100\text{ mV}$	Sinking	25°C	7	9		
				Full range	5			

**Electrical Characteristics (continued)**
 $V_{CC+} = 1.8\text{ V}$ ,  $V_{CC-} = 0\text{ V}$ ,  $V_{IC} = V_{CC+}/2$ ,  $V_O = V_{CC+}/2$ , and  $R_L > 1\text{ M}\Omega$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS	$T_A$	MIN	TYP	MAX	UNIT
GBW	Gain bandwidth product		25°C		1.4		MHz
SR	Slew rate <sup>(1)</sup>		25°C		0.35		V/ $\mu$ S
$\Phi_m$	Phase margin		25°C		67		°
	Gain margin		25°C		7		dB
$V_n$	Equivalent input noise voltage	$f = 1\text{ kHz}$ , $V_{IC} = 0.5\text{ V}$	25°C		60		nV/ $\sqrt{\text{Hz}}$
$I_n$	Equivalent input noise current	$f = 1\text{ kHz}$	25°C		0.06		pA/ $\sqrt{\text{Hz}}$
THD	Total harmonic distortion	$f = 1\text{ kHz}$ , $A_V = 1$ , $R_L = 600\ \Omega$ , $V_{ID} = 1\text{ V}_{p-p}$	25°C		0.023		%
	Amplifier-to-amplifier isolation <sup>(2)</sup>		25°C		123		dB

(1) Number specified is the slower of the positive and negative slew rates.

(2) Input referred,  $V_{CC+} = 5\text{ V}$  and  $R_L = 100\text{ k}\Omega$  connected to 2.5 V. Each amplifier is excited, in turn, with a 1-kHz signal to produce  $V_O = 3\text{ V}_{p-p}$ .

# LMV931 SINGLE, LMV932 DUAL, LMV934 QUAD 1.8-V OPERATIONAL AMPLIFIERS WITH RAIL-TO-RAIL INPUT AND OUTPUT

SLOS441G–AUGUST 2004–REVISED FEBRUARY 2006

## Electrical Characteristics

$V_{CC+} = 2.7\text{ V}$ ,  $V_{CC-} = 0\text{ V}$ ,  $V_{IC} = V_{CC+}/2$ ,  $V_O = V_{CC+}/2$ , and  $R_L > 1\text{ M}\Omega$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS		$T_A$	MIN	TYP	MAX	UNIT	
$V_{IO}$	Input offset voltage	LMV931 (single)		25°C		1	4	mV	
				Full range			6		
		LMV932 (dual), LMV934 (quad)		25°C		1	5.5		
				Full range			7.5		
$\alpha_{V_{IO}}$	Average temperature coefficient of input offset voltage			25°C		5.5		$\mu\text{V}/^\circ\text{C}$	
$I_{IB}$	Input bias current			25°C		15	35	nA	
				25°C			65		
				Full range			75		
$I_{IO}$	Input offset current			25°C		8	25	nA	
				Full range			40		
$I_{CC}$	Supply current (per channel)			25°C		105	190	$\mu\text{A}$	
				Full range			210		
CMRR	Common-mode rejection ratio			25°C	60	81		dB	
				–40°C to 85°C	55				
				–40°C to 125°C	55				
$k_{SVR}$	Supply-voltage rejection ratio			25°C	75	100		dB	
				Full range	70				
$V_{ICR}$	Common-mode input voltage range		CMRR $\geq 50\text{ dB}$	25°C	$V_{CC-} - 0.2$	–0.2 to 3	$V_{CC+} + 0.2$	V	
				–40°C to 85°C	$V_{CC-}$		$V_{CC+}$		
				–40°C to 125°C	$V_{CC-} + 0.2$		$V_{CC+} - 0.2$		
$A_V$	Large-signal voltage gain	LMV931	$V_O = 0.2\text{ V to }2.5\text{ V}$	$R_L = 600\ \Omega$ to 1.35 V	25°C	87	104	dB	
				Full range	86				
				$R_L = 2\text{ k}\Omega$ to 1.35 V	25°C	92	110		
				Full range	91				
		LMV932, LMV934	$R_L = 600\ \Omega$ to 1.35 V	25°C	78	90			
				Full range	75				
				$R_L = 2\text{ k}\Omega$ to 1.35 V	25°C	81	100		
				Full range	78				
$V_O$	Output swing	$R_L = 600\ \Omega$ to 1.35 V, $V_{ID} = \pm 100\text{ mV}$		High level	25°C	2.55	2.62	V	
				Full range	2.53				
				Low level	25°C		0.083		0.11
				Full range			0.13		
		$R_L = 2\text{ k}\Omega$ to 1.35 V, $V_{ID} = \pm 100\text{ mV}$		High level	25°C	2.65	2.675		
				Full range	2.64				
				Low level	25°C		0.025		0.04
				Full range			0.045		
$I_{OS}$	Output short-circuit current	$V_O = 0\text{ V}$ , $V_{ID} = 100\text{ mV}$	Sourcing	25°C	20	30	mA		
				Full range	15				
		$V_O = 2.7\text{ V}$ , $V_{ID} = -100\text{ mV}$	Sinking	25°C	18	25			
				Full range	12				
GBW	Gain bandwidth product			25°C		1.4		MHz	

**Electrical Characteristics (continued)**
 $V_{CC+} = 2.7\text{ V}$ ,  $V_{CC-} = 0\text{ V}$ ,  $V_{IC} = V_{CC+}/2$ ,  $V_O = V_{CC+}/2$ , and  $R_L > 1\text{ M}\Omega$  (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	$T_A$	MIN	TYP	MAX	UNIT
SR	Slew rate <sup>(1)</sup>		25°C		0.4		V/ $\mu$ S
$\Phi_m$	Phase margin		25°C		70		°
	Gain margin		25°C		7.5		dB
$V_n$	Equivalent input noise voltage	$f = 1\text{ kHz}$ , $V_{IC} = 0.5\text{ V}$	25°C		57		nV/ $\sqrt{\text{Hz}}$
$I_n$	Equivalent input noise current	$f = 1\text{ kHz}$	25°C		0.082		pA/ $\sqrt{\text{Hz}}$
THD	Total harmonic distortion	$f = 1\text{ kHz}$ , $A_V = 1$ , $R_L = 600\ \Omega$ , $V_{ID} = 1\text{ V}_{p-p}$	25°C		0.022		%
	Amplifier-to-amplifier isolation <sup>(2)</sup>		25°C		123		dB

(1) Number specified is the slower of the positive and negative slew rates.

(2) Input referred,  $V_{CC+} = 5\text{ V}$  and  $R_L = 100\text{ k}\Omega$  connected to 2.5 V. Each amplifier is excited, in turn, with a 1-kHz signal to produce  $V_O = 3\text{ V}_{p-p}$ .

# LMV931 SINGLE, LMV932 DUAL, LMV934 QUAD 1.8-V OPERATIONAL AMPLIFIERS WITH RAIL-TO-RAIL INPUT AND OUTPUT

SLOS441G–AUGUST 2004–REVISED FEBRUARY 2006

## Electrical Characteristics

$V_{CC+} = 5\text{ V}$ ,  $V_{CC-} = 0\text{ V}$ ,  $V_{IC} = V_{CC+}/2$ ,  $V_O = V_{CC+}/2$ , and  $R_L > 1\text{ M}\Omega$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS		$T_A$	MIN	TYP	MAX	UNIT	
$V_{IO}$	Input offset voltage	LMV931 (single)		25°C		1	4	mV	
				Full range			6		
		LMV932 (dual), LMV934 (quad)		25°C		1	5.5		
				Full range			7.5		
$\alpha_{V_{IO}}$	Average temperature coefficient of input offset voltage			25°C		5.5		$\mu\text{V}/^\circ\text{C}$	
$I_{IB}$	Input bias current	$V_{IC} = V_{CC+} - 0.8\text{ V}$		25°C		15	35	nA	
				25°C			65		
				Full range			75		
$I_{IO}$	Input offset current			25°C		9	25	nA	
				Full range			40		
$I_{CC}$	Supply current (per channel)			25°C		116	210	$\mu\text{A}$	
				Full range			230		
CMRR	Common-mode rejection ratio			25°C	60	86		dB	
				-40°C to 85°C	55				
				-40°C to 125°C	55				
$k_{SVR}$	Supply-voltage rejection ratio	$1.8\text{ V} \leq V_{CC+} \leq 5\text{ V}$ , $V_{IC} = 0.5\text{ V}$		25°C	75	100		dB	
				Full range	70				
$V_{ICR}$	Common-mode input voltage range	CMRR $\geq 50\text{ dB}$		25°C	$V_{CC-} - 0.2$	-0.2 to 5.3	$V_{CC+} + 0.2$	V	
				-40°C to 85°C	$V_{CC-}$		$V_{CC+}$		
				-40°C to 125°C	$V_{CC-} + 0.3$		$V_{CC+} - 0.3$		
$A_V$	Large-signal voltage gain	$V_O = 0.2\text{ V to }4.8\text{ V}$		$R_L = 600\ \Omega$ to 2.5 V	25°C	88	102	dB	
					Full range	87			
				$R_L = 2\text{ k}\Omega$ to 2.5 V	25°C	94	113		
					Full range	93			
				$R_L = 600\ \Omega$ to 2.5 V	25°C	81	90		
					Full range	78			
$R_L = 2\text{ k}\Omega$ to 2.5 V	25°C	85	100						
	Full range	82							
$V_O$	Output swing	$R_L = 600\ \Omega$ to 2.5 V, $V_{ID} = \pm 100\text{ mV}$	High level	25°C	4.855	4.89		V	
				Full range	4.835				
			Low level	25°C		0.12	0.16		
				Full range			0.18		
			$R_L = 2\text{ k}\Omega$ to 2.5 V, $V_{ID} = \pm 100\text{ mV}$	High level	25°C	4.945	4.967		
				Full range	4.935				
Low level	25°C		0.037	0.065					
	Full range			0.075					
$I_{OS}$	Output short-circuit current	$V_O = 0\text{ V}$ , $V_{ID} = 100\text{ mV}$	Sourcing	25°C	80	100		mA	
				Full range	68				
		$V_O = 5\text{ V}$ , $V_{ID} = -100\text{ mV}$	Sinking	25°C	58	65			
				Full range	45				



**Electrical Characteristics (continued)**
 $V_{CC+} = 5\text{ V}$ ,  $V_{CC-} = 0\text{ V}$ ,  $V_{IC} = V_{CC+}/2$ ,  $V_O = V_{CC+}/2$ , and  $R_L > 1\text{ M}\Omega$  (unless otherwise noted)

PARAMETER		TEST CONDITIONS	$T_A$	MIN	TYP	MAX	UNIT
GBW	Gain bandwidth product		25°C		1.5		MHz
SR	Slew rate <sup>(1)</sup>		25°C		0.42		V/ $\mu$ S
$\Phi_m$	Phase margin		25°C		71		°
	Gain margin		25°C		8		dB
$V_n$	Equivalent input noise voltage	$f = 1\text{ kHz}$ , $V_{IC} = 0.5\text{ V}$	25°C		50		nV/ $\sqrt{\text{Hz}}$
$I_n$	Equivalent input noise current	$f = 1\text{ kHz}$	25°C		0.07		pA/ $\sqrt{\text{Hz}}$
THD	Total harmonic distortion	$f = 1\text{ kHz}$ , $A_V = 1$ , $R_L = 600\ \Omega$ , $V_{ID} = 1\text{ V}_{p-p}$	25°C		0.022		%
	Amplifier-to-amplifier isolation <sup>(2)</sup>		25°C		123		dB

(1) Number specified is the slower of the positive and negative slew rates.

(2) Input referred,  $V_{CC+} = 5\text{ V}$  and  $R_L = 100\text{ k}\Omega$  connected to 2.5 V. Each amplifier is excited, in turn, with a 1-kHz signal to produce  $V_O = 3\text{ V}_{p-p}$ .

TYPICAL CHARACTERISTICS

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

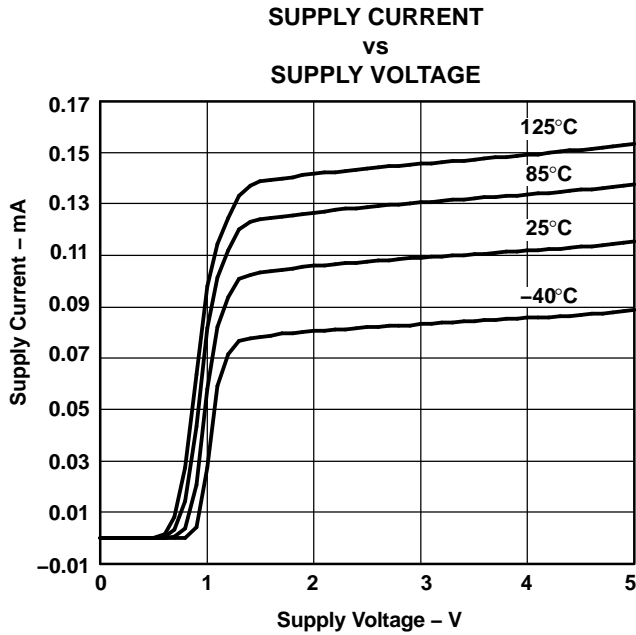


Figure 1.

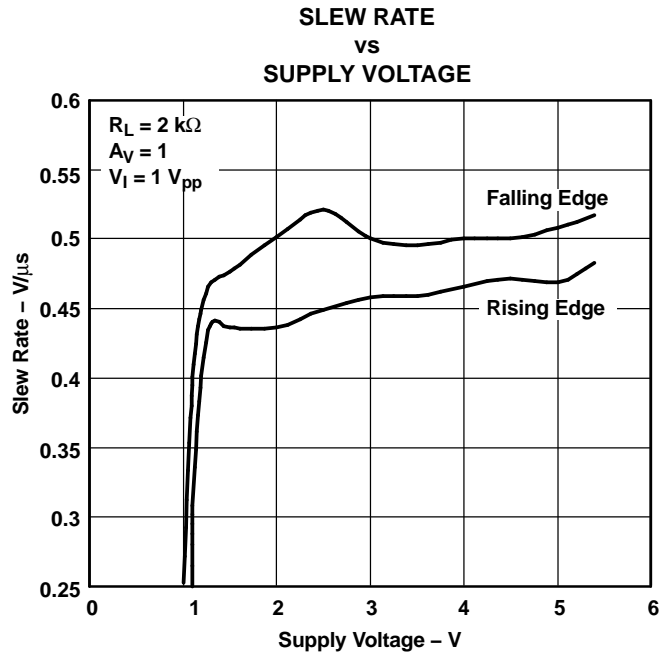


Figure 2.

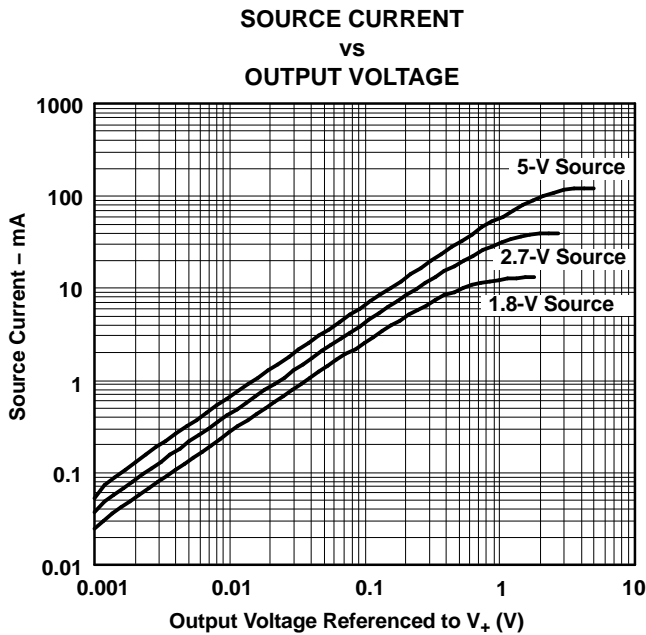


Figure 3.

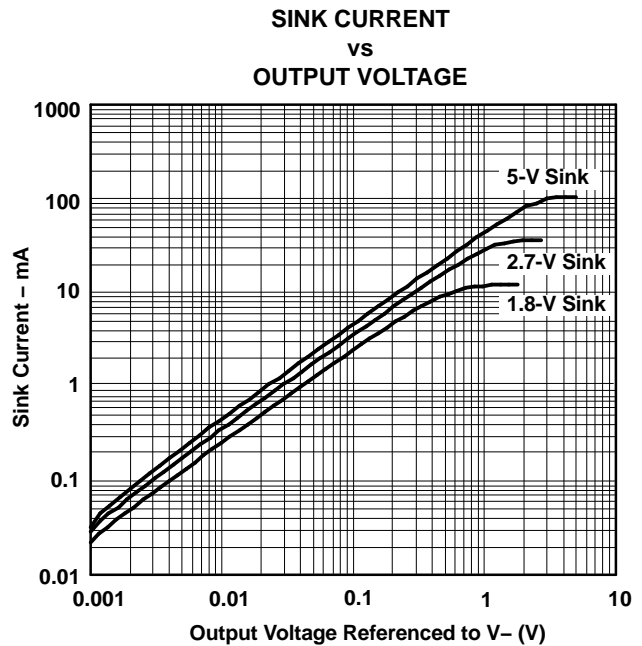


Figure 4.

**TYPICAL CHARACTERISTICS (continued)**

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

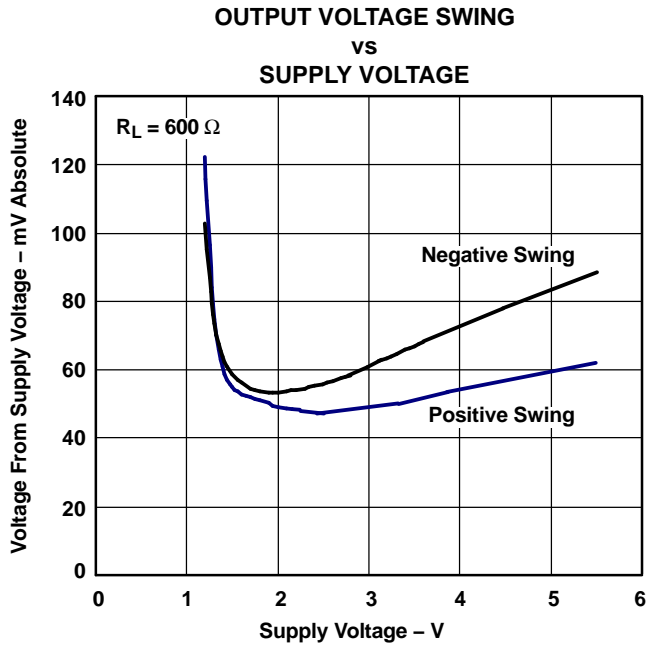


Figure 5.

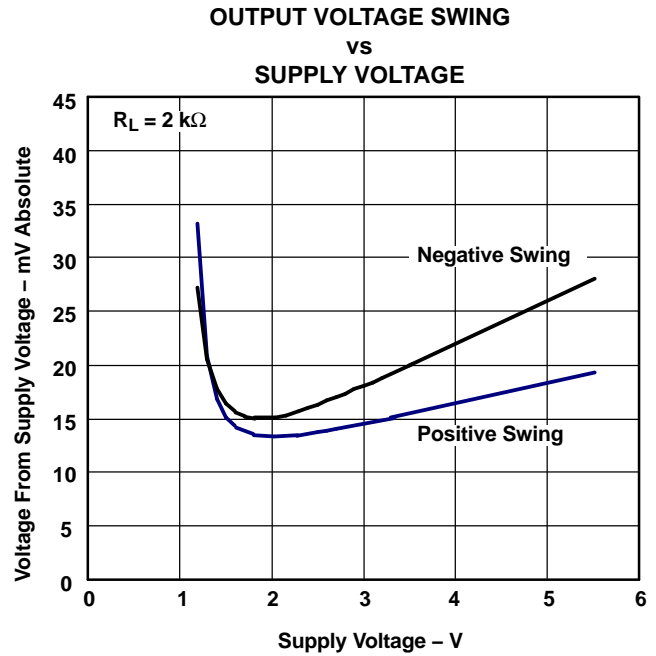


Figure 6.

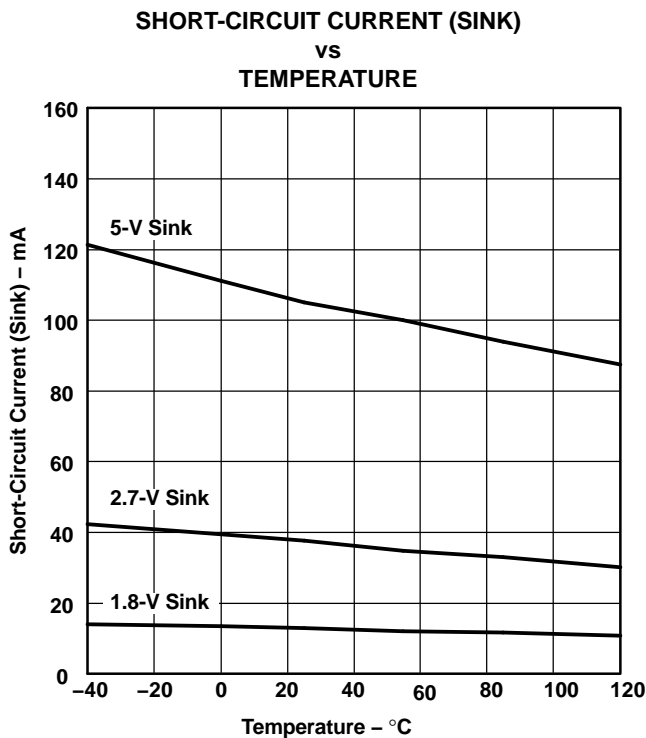


Figure 7.

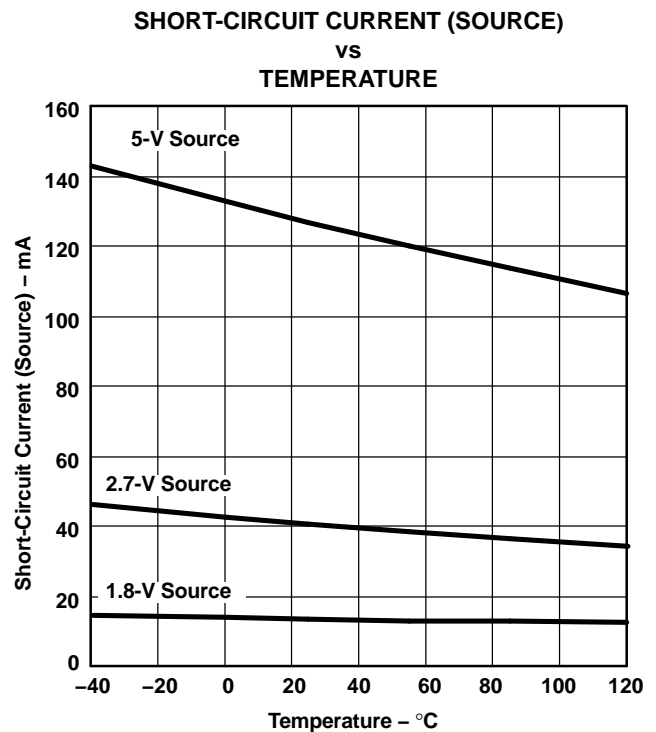


Figure 8.

TYPICAL CHARACTERISTICS (continued)

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

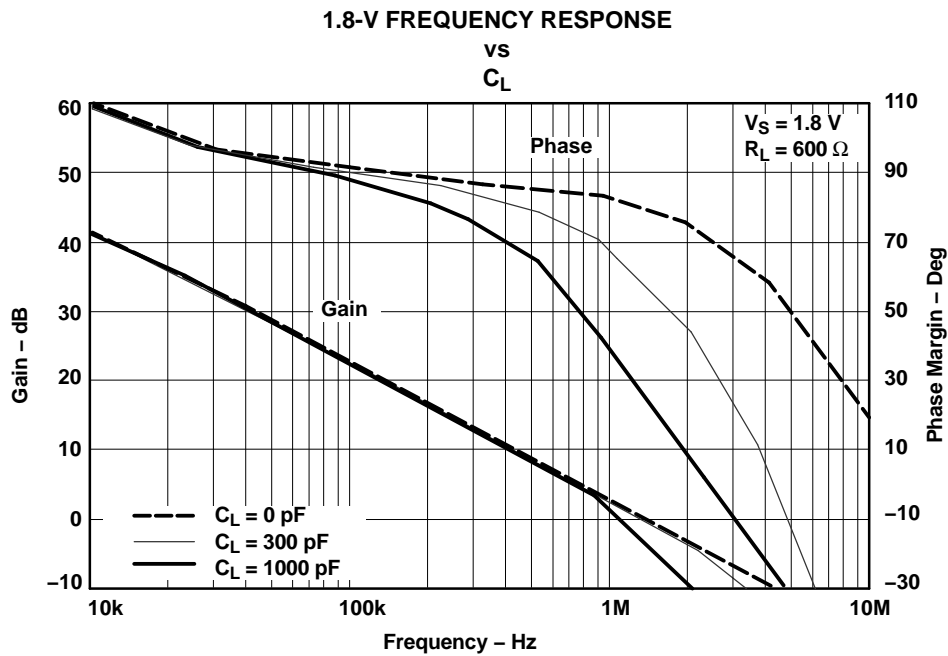


Figure 9.

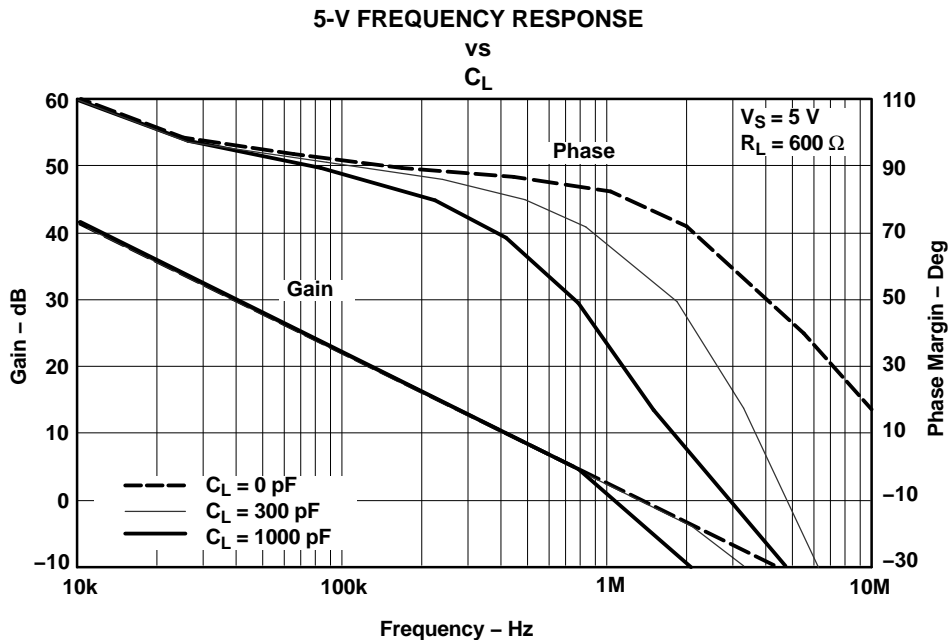
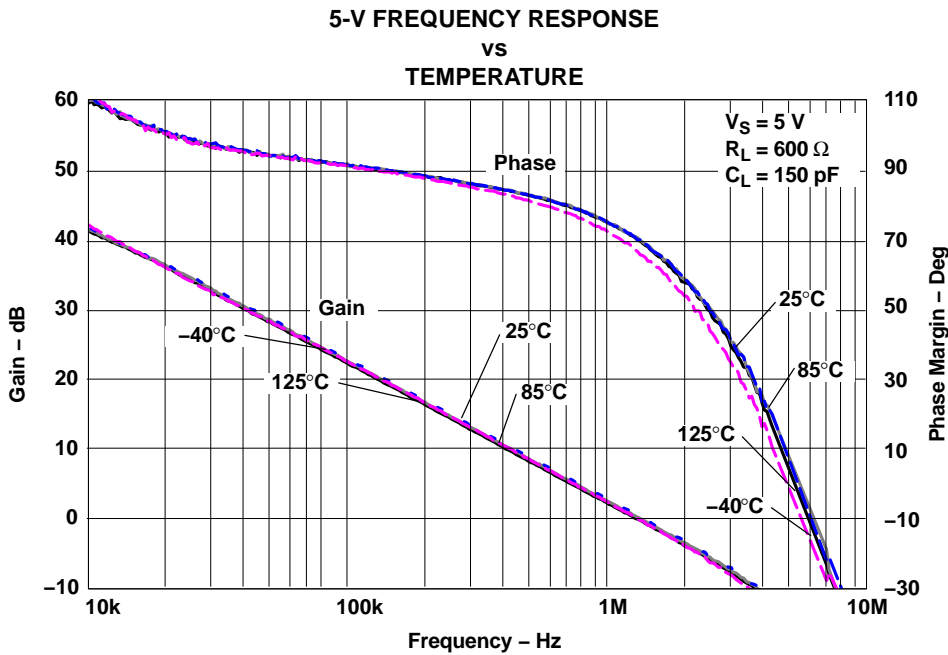
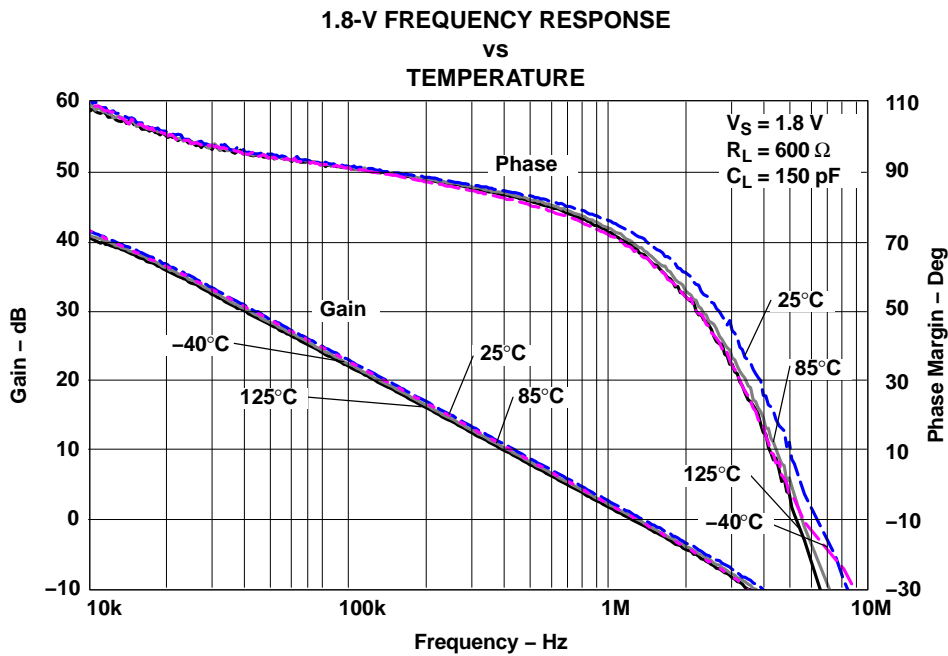


Figure 10.

**TYPICAL CHARACTERISTICS (continued)**

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)



TYPICAL CHARACTERISTICS (continued)

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

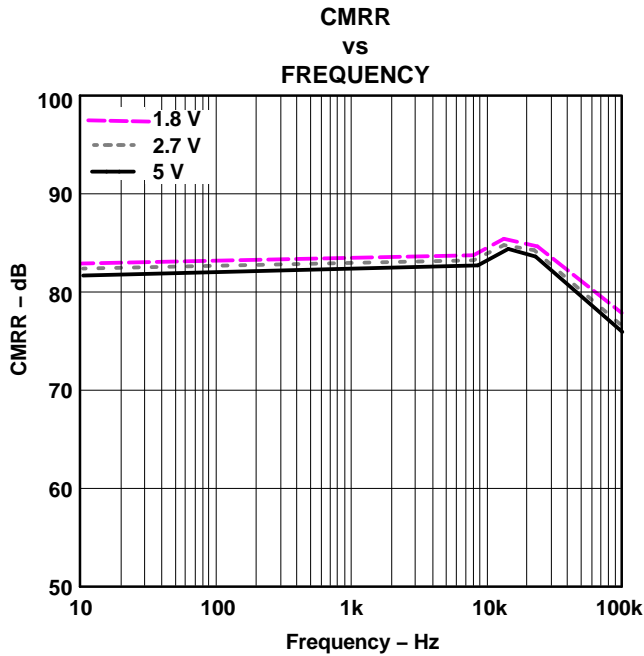


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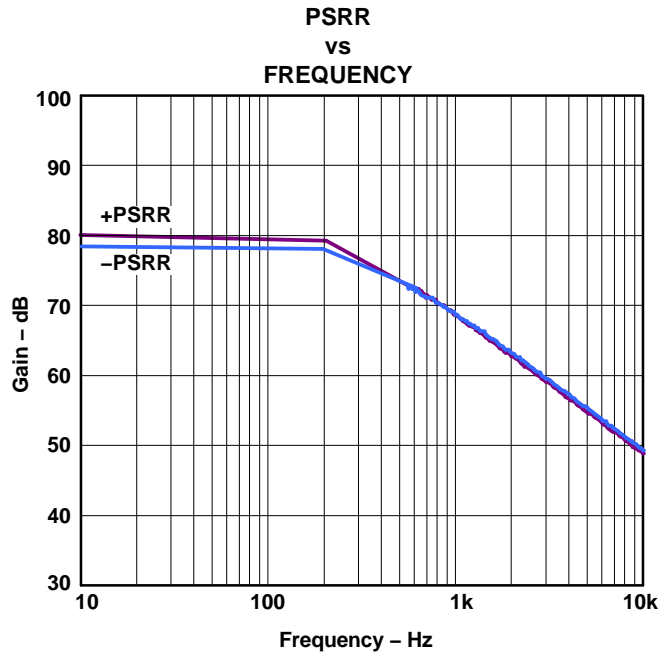


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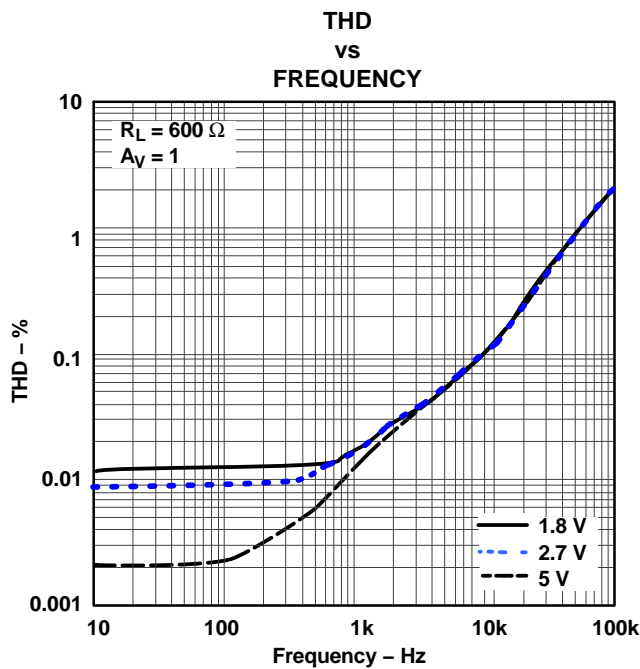


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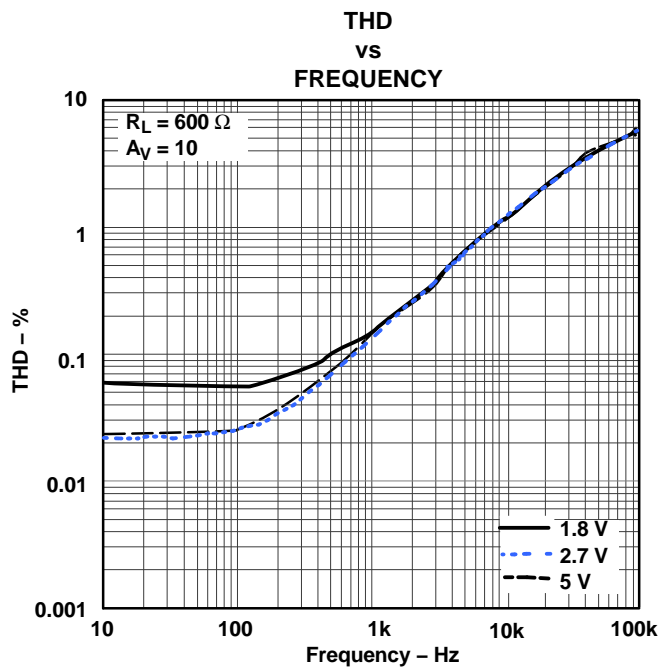


Figure 16.

**TYPICAL CHARACTERISTICS (continued)**

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

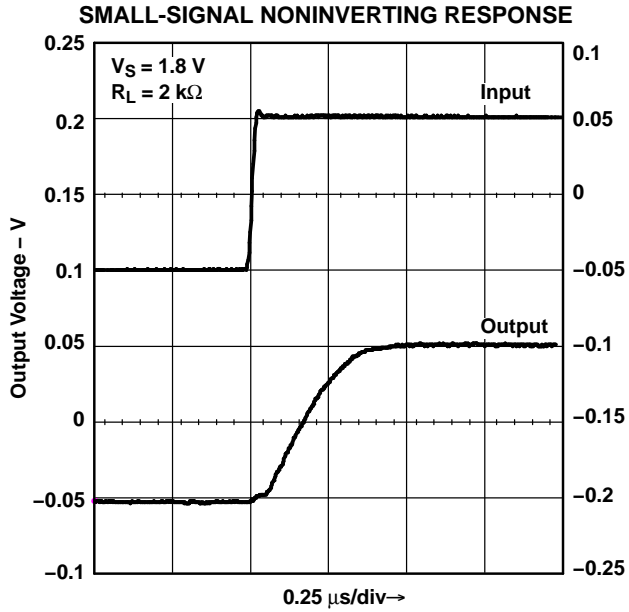


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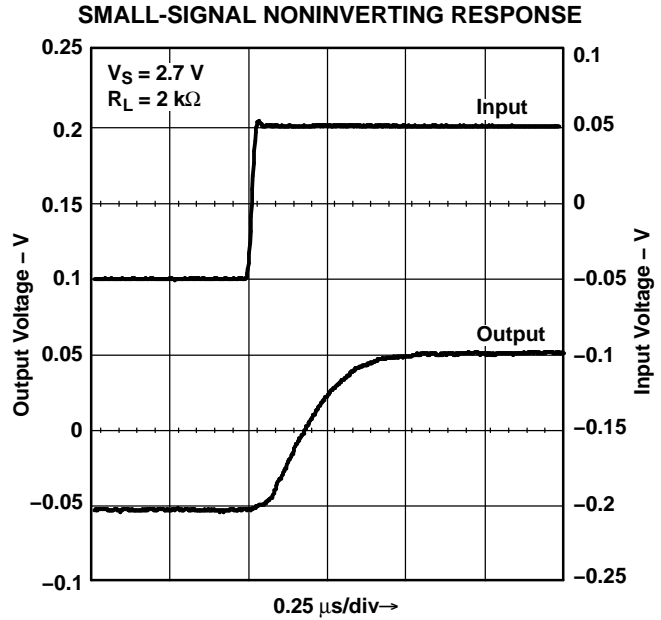


Figure 18.

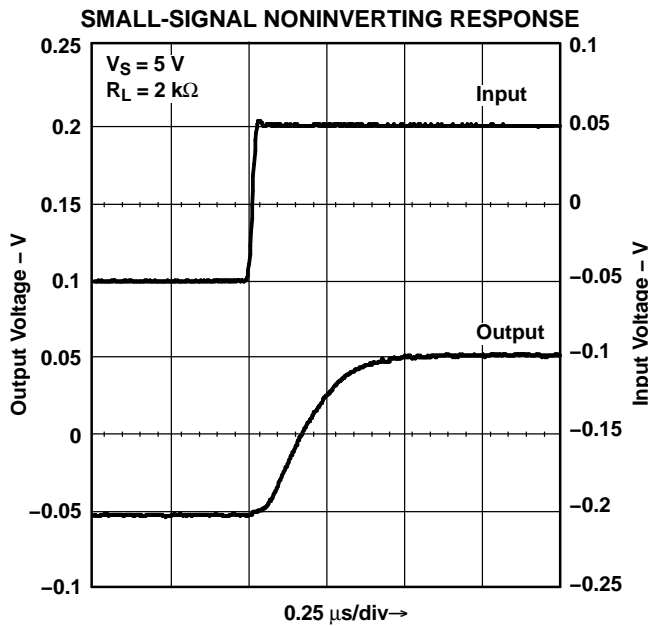


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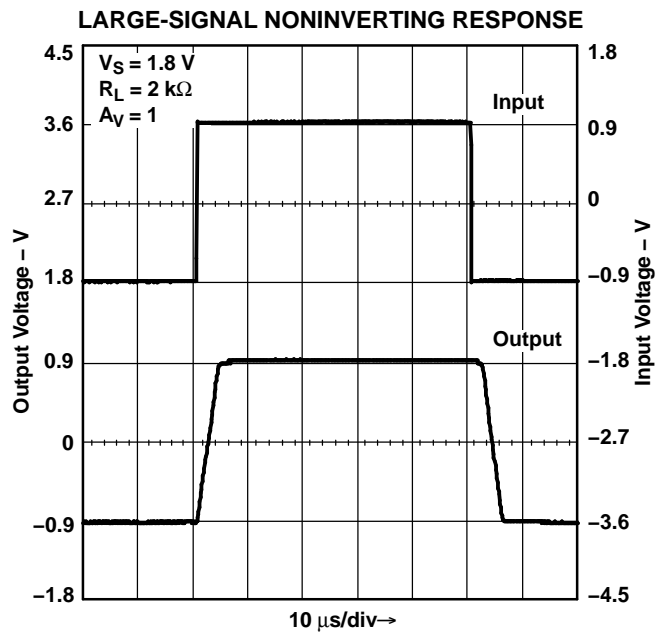


Figure 20.

**TYPICAL CHARACTERISTICS (continued)**

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

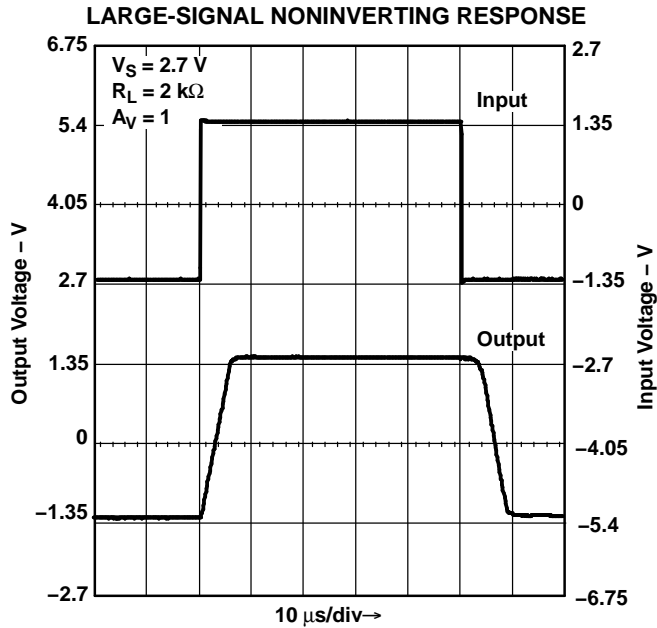


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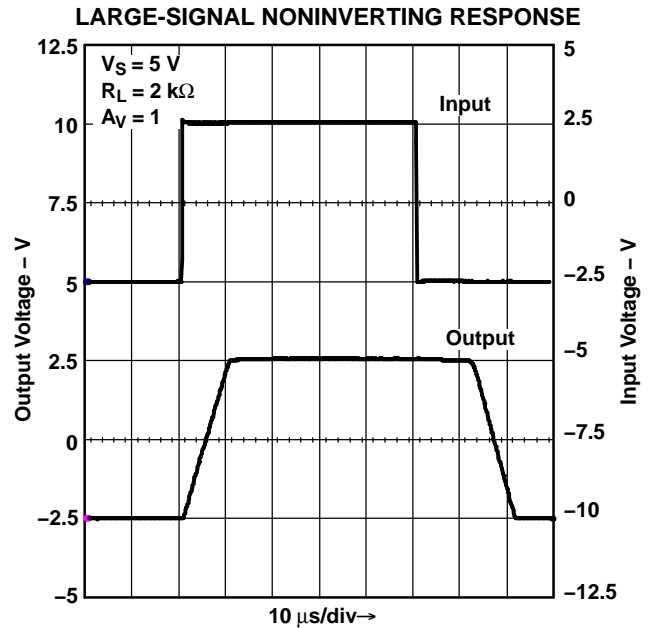


Figure 22.

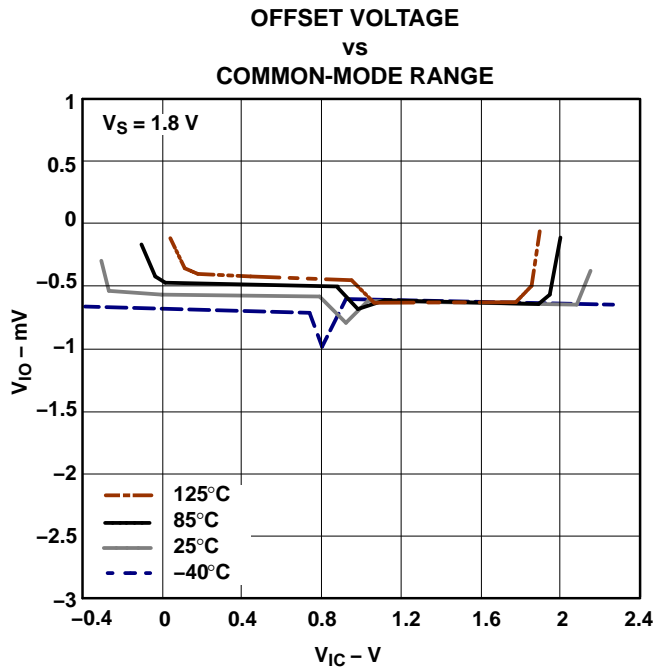


Figure 23.

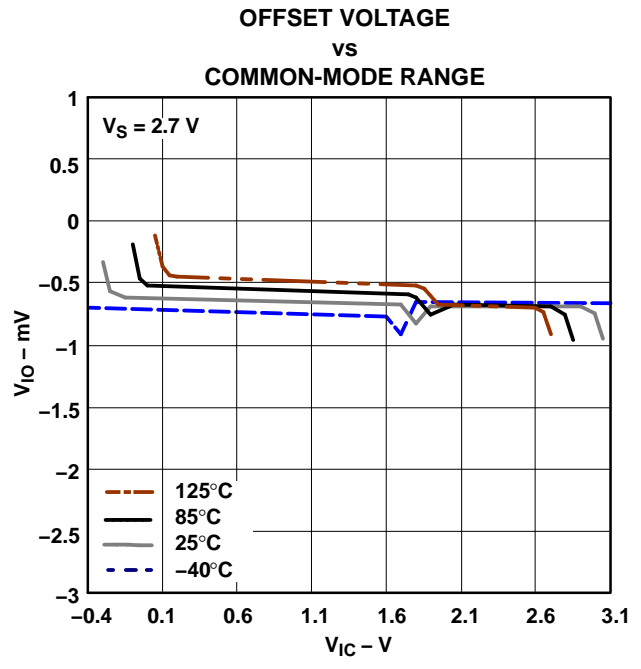


Figure 24.



**TYPICAL CHARACTERISTICS (continued)**

$V_{CC+} = 5\text{ V}$ , Single Supply,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

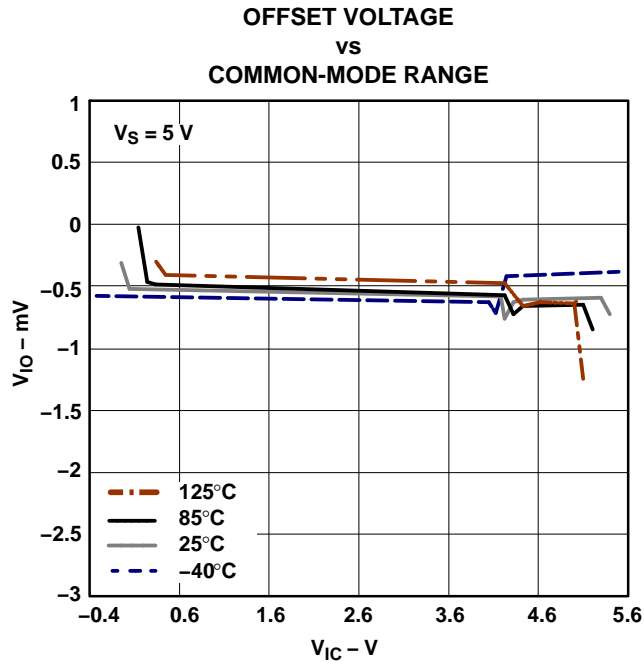


Figure 25.

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
LMV931IDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV931IDBvre4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV931IDBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV931IDCKR	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV931IDCKRE4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV931IDCKRG4	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932IDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932IDGKR	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932IDGKRG4	ACTIVE	MSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932IDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV932IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934ID	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IDE4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IDG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IDR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IDRE4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IDRG4	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IPW	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IPWE4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IPWG4	ACTIVE	TSSOP	PW	14	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IPWR	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
LMV934IPWRE4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
LMV934IPWRG4	ACTIVE	TSSOP	PW	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

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

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**OTHER QUALIFIED VERSIONS OF LMV931 :**

- Automotive: [LMV931-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
LMV931IDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
LMV931IDBVR	SOT-23	DBV	5	3000	180.0	9.2	3.23	3.17	1.37	4.0	8.0	Q3
LMV931IDCKR	SC70	DCK	5	3000	180.0	9.2	2.24	2.34	1.22	4.0	8.0	Q3
LMV931IDCKR	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
LMV932IDGKR	MSOP	DGK	8	2500	330.0	13.0	5.3	3.4	1.4	8.0	12.0	Q1
LMV932IDGKR	MSOP	DGK	8	2500	330.0	12.4	5.3	3.3	1.3	8.0	12.0	Q1
LMV932IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
LMV934IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
LMV934IPWR	TSSOP	PW	14	2000	330.0	12.4	7.0	5.6	1.6	8.0	12.0	Q1

**TAPE AND REEL BOX DIMENSIONS**



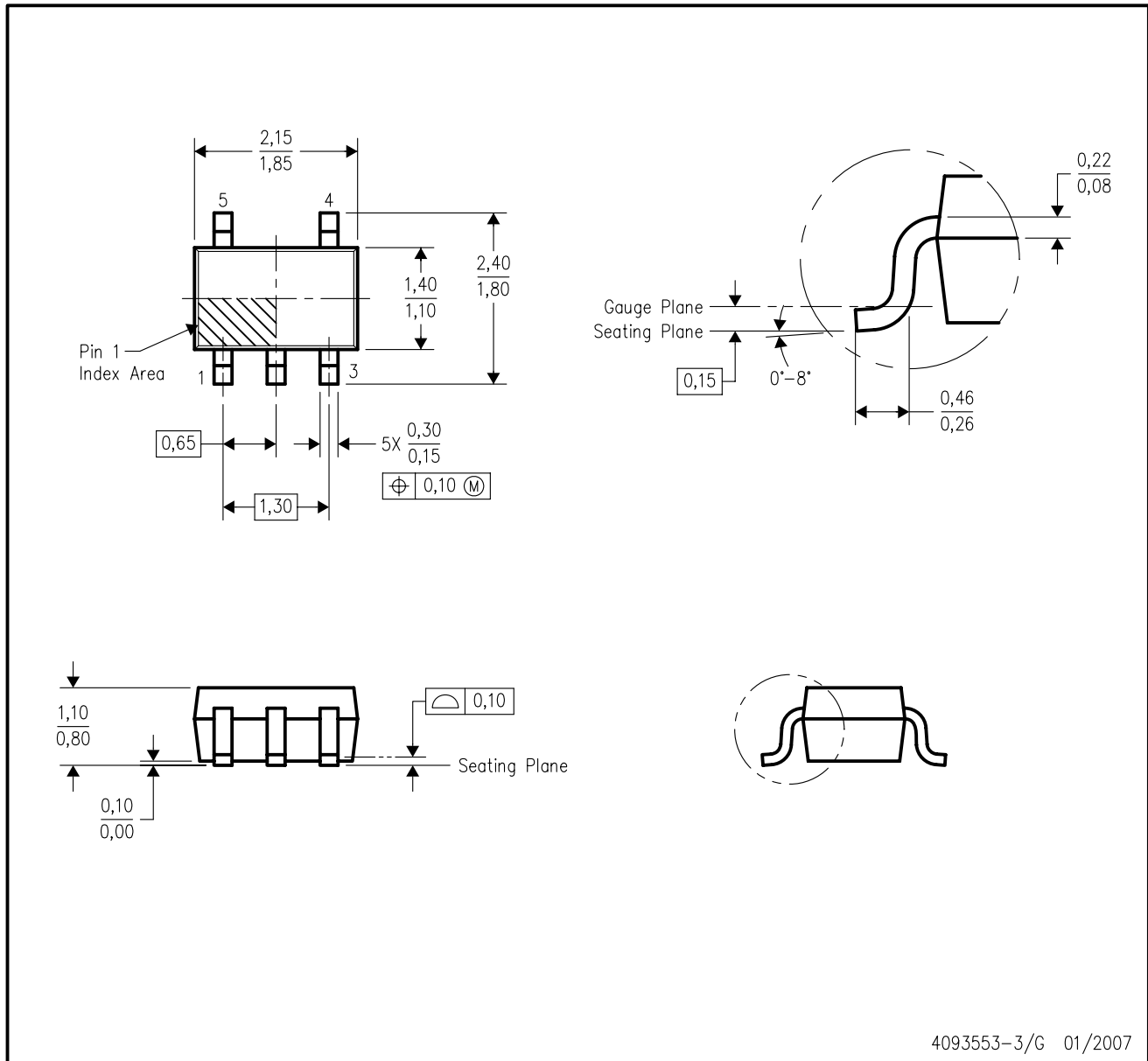
\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LMV931IDBVR	SOT-23	DBV	5	3000	565.0	140.0	75.0
LMV931IDBVR	SOT-23	DBV	5	3000	205.0	200.0	33.0
LMV931IDCKR	SC70	DCK	5	3000	205.0	200.0	33.0
LMV931IDCKR	SC70	DCK	5	3000	565.0	140.0	75.0
LMV932IDGKR	MSOP	DGK	8	2500	358.0	335.0	35.0
LMV932IDGKR	MSOP	DGK	8	2500	370.0	355.0	55.0
LMV932IDR	SOIC	D	8	2500	340.5	338.1	20.6
LMV934IDR	SOIC	D	14	2500	346.0	346.0	33.0
LMV934IPWR	TSSOP	PW	14	2000	346.0	346.0	29.0



DCK (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-203 variation AA.

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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 not to exceed 0,15.  
 D. Falls within JEDEC MO-153



DGK (S-PDSO-G8)

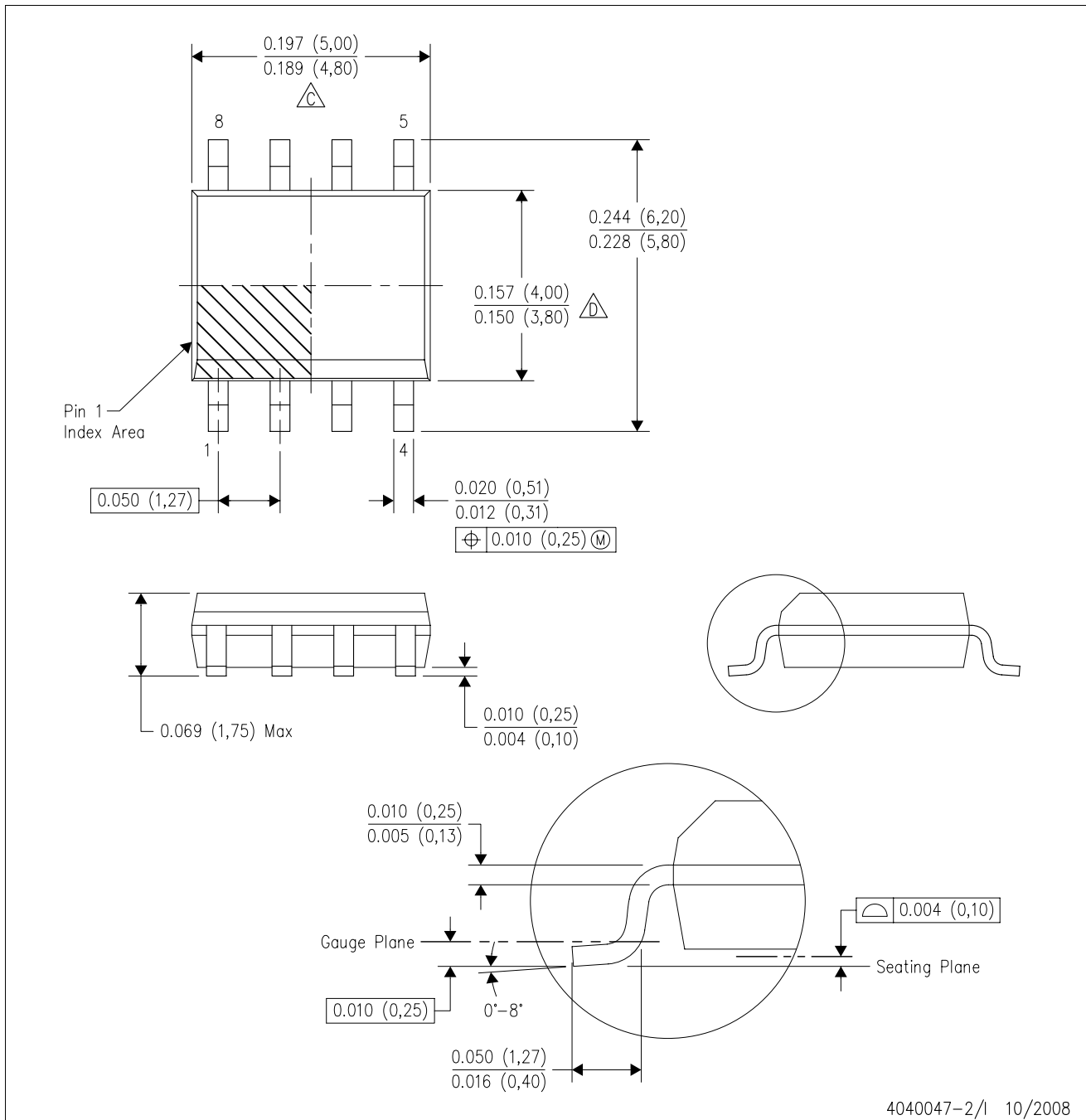
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in 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 0.15 per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
  - E. Falls within JEDEC MO-187 variation AA, except interlead flash.

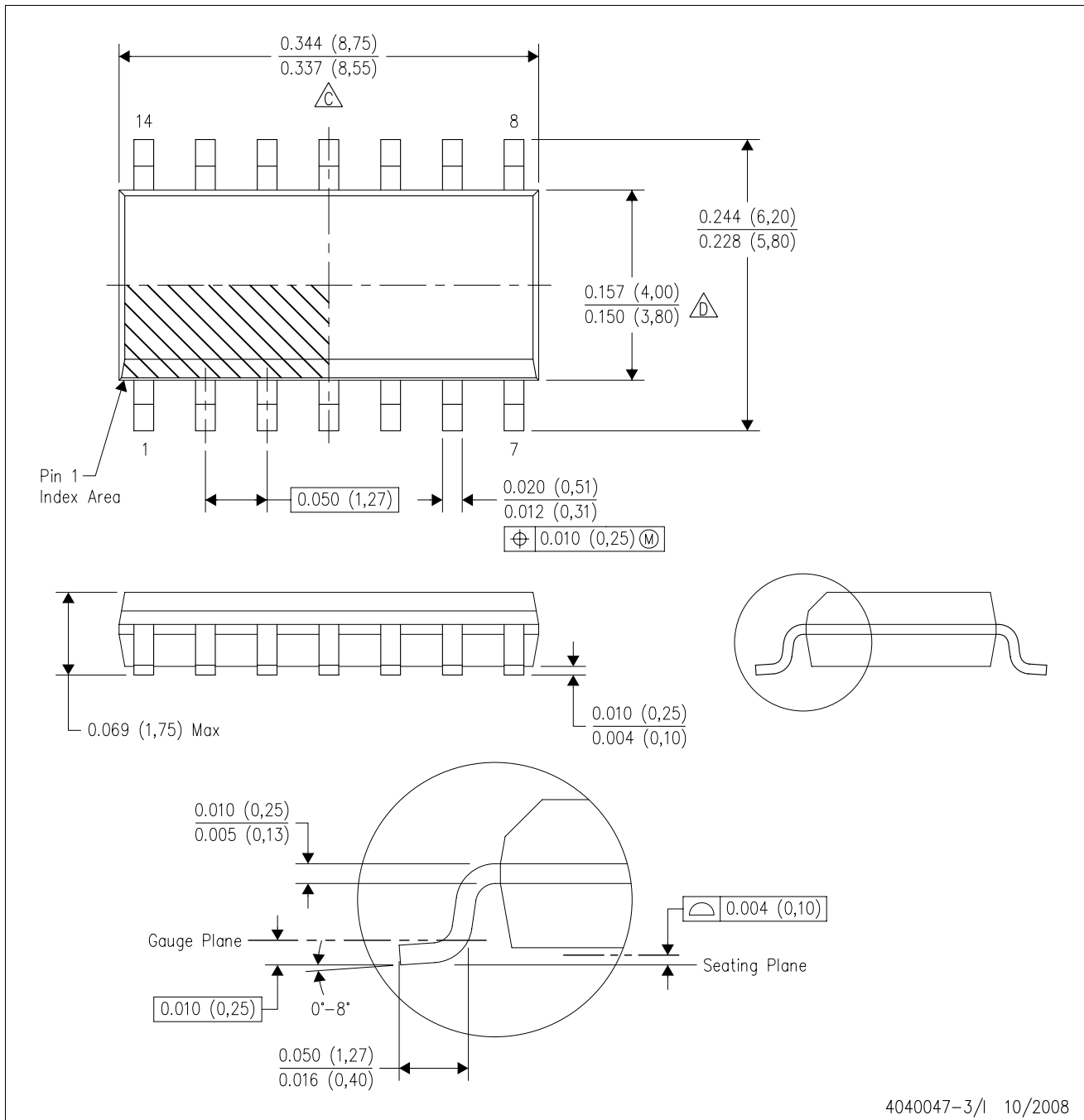
D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



- 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 .006 (0,15) per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AB.

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