

- **1/2 V_I Virtual Ground for Analog Systems**
- **Self-Contained 3-terminal TO-226AA Package**
- **Micropower Operation . . . 170 μ A Typ, $V_I = 5$ V**
- **Wide V_I Range . . . 4 V to 40 V**
- **High Output-Current Capability**
 - Source . . . 20 mA Typ
 - Sink . . . 20 mA Typ

- **Excellent Output Regulation**
 - -45μ V Typ at $I_O = 0$ to -10 mA
 - $+15 \mu$ V Typ at $I_O = 0$ to $+10$ mA
- **Low-Impedance Output . . . 0.0075Ω Typ**
- **Noise Reduction Pin (D, JG, and P Packages Only)**

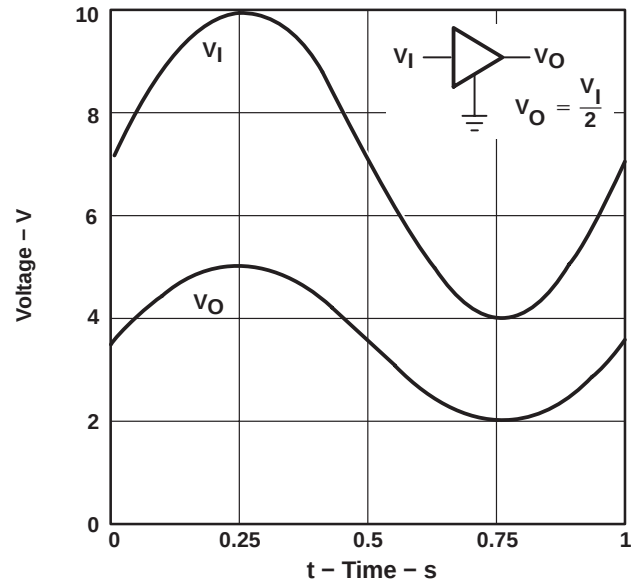
description

In signal-conditioning applications utilizing a single power source, a reference voltage equal to one-half the supply voltage is required for termination of all analog signal grounds. Texas Instruments presents a precision virtual ground whose output voltage is always equal to one-half the input voltage, the TLE2426 "rail splitter."

The unique combination of a high-performance, micropower operational amplifier and a precision-trimmed divider on a single silicon chip results in a precise V_O/V_I ratio of 0.5 while sinking and sourcing current. The TLE2426 provides a low-impedance output with 20 mA of sink and source capability while drawing less than 280 μ A of supply current over the full input range of 4 V to 40 V. A designer need not pay the price in terms of board space for a conventional signal ground consisting of resistors, capacitors, operational amplifiers, and voltage references. The performance and precision of the TLE2426 is available in an easy-to-use, space saving, 3-terminal LP package. For increased performance, the optional 8-pin packages provide a noise-reduction pin. With the addition of an external capacitor (C_{NR}), peak-to-peak noise is reduced while line ripple rejection is improved.

Initial output tolerance for a single 5-V or 12-V system is better than 1% with 3.6% over the full 40-V input range. Ripple rejection exceeds 12 bits of accuracy. Whether the application is for a data acquisition front end, analog signal termination, or simply a precision voltage reference, the TLE2426 eliminates a major source of system error.

INPUT/OUTPUT TRANSFER CHARACTERISTICS



AVAILABLE OPTIONS

PACKAGED DEVICES					CHIP FORM (Y)
T_A	SMALL OUTLINE (D)	CERAMIC DIP (JG)	PLASTIC (LP)	PLASTIC DIP (P)	
0°C to 70°C	TLE2426CD	—	TLE2426CLP	TLE2426CP	



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.

TLE2426, TLE2426Y THE “RAIL SPLITTER” PRECISION VIRTUAL GROUND

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–40°C to 85°C	TLE2426ID	—	TLE2426ILP	TLE2426IP	TLE2426Y
–55°C to 125°C	TLE2426MD	TLE2426MJG	TLE2426MLP	TLE2426MP	

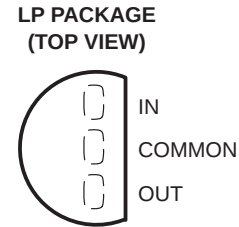
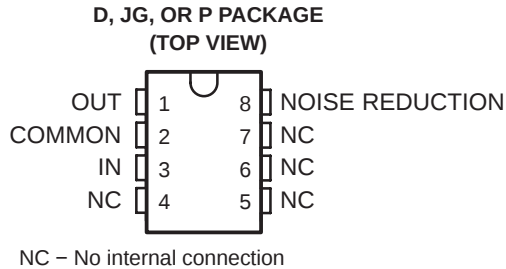
The D and LP packages are available taped and reeled in the commercial temperature range only. Add R suffix to the device type (e. g., TLC2426CDR). Chips are tested at 25°C.



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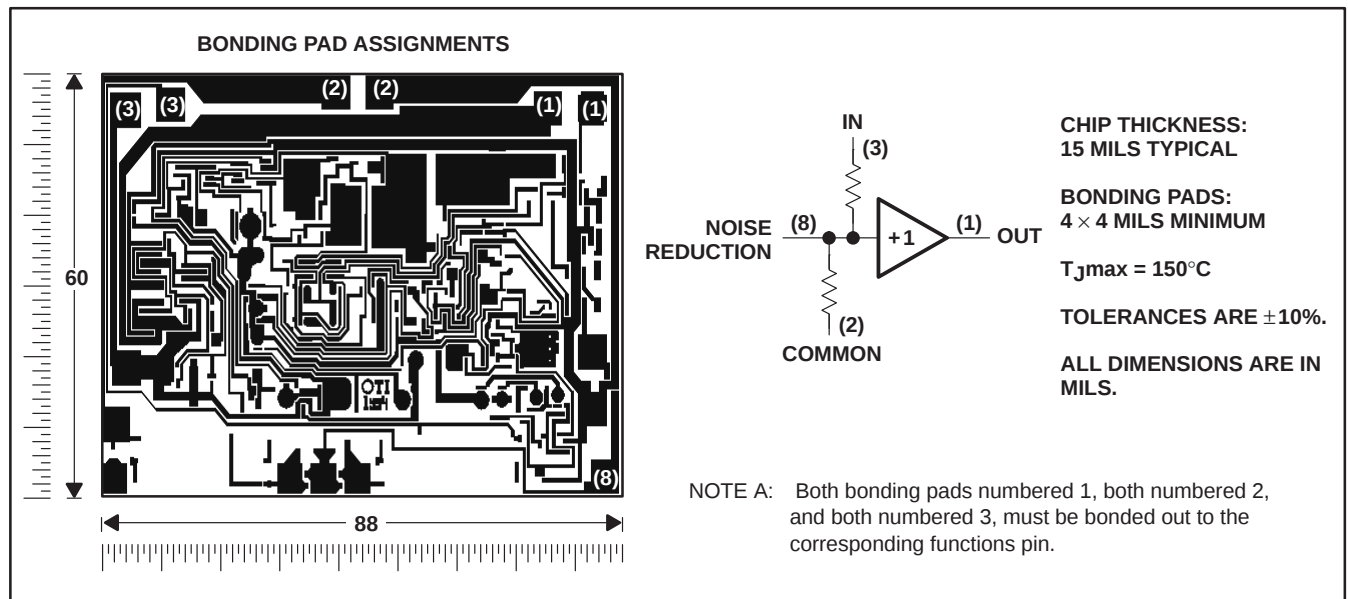
description (continued)

The C-suffix devices are characterized for operation from 0°C to 70°C. The I suffix devices are characterized for operation from –40°C to 85°C. The M suffix devices are characterized over the full military temperature range of –55°C to 125°C.



TLE2426Y chip information

This chip, properly assembled, displays characteristics similar to the TLE2426C. Thermal compression or ultrasonic bonding may be used on the doped aluminum bonding pads. The chips may be mounted with conductive epoxy or a gold-silicon preform.



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absolute maximum ratings over operating free-air temperature (unless otherwise noted)[†]

Continuous input voltage, V_I	40 V
Continuous filter trap voltage	40 V
Output current, I_O	±80 mA
Duration of short-circuit current at (or below) 25°C (see Note 1)	unlimited
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : C suffix	0°C to 70°C
I suffix	–40°C to 85°C
M suffix	–55°C to 125°C
Storage temperature range, T_{stg}	–65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or P package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: JG or LP package	300°C

[†] 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.

NOTE 1: The output may be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW	377 mW	145 mW
JG	1050 mW	8.4 mW/°C	672 mW	546 mW	210 mW
LP	775 mW	6.2 mW/°C	496 mW	403 mW	155 mW
P	1000 mW	8.0 mW/°C	640 mW	520 mW	200 mW

recommended operating conditions

	C SUFFIX		I SUFFIX		M SUFFIX		UNIT
	MIN	MAX	MIN	MAX	MIN	MAX	
Input voltage, V_I	4	40	4	40	4	40	V
Operating free-air temperature, T_A	0	70	–40	85	–55	125	°C



electrical characteristics at specified free-air temperature, $V_I = 5\text{ V}$, $I_O = 0$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		T _A [†]	TLE2426C			UNIT
				MIN	TYP	MAX	
Output voltage	V _I = 4 V		25°C	1.98	2	2.02	V
	V _I = 5 V			2.48	2.5	2.52	
	V _I = 40 V			19.8	20	20.2	
	V _I = 5 V		Full range		2.475	2.525	
Temperature coefficient of output voltage			Full range	25			ppm/°C
Supply current	No load	V _I = 5 V	25°C	170 300			μA
		V _I = 4 to 40 V	Full range	400			
Output voltage regulation (sourcing current) [‡]	I _O = 0 to –10 mA		25°C	–45 ±160			μV
			Full range	±250			
	I _O = 0 to –20 mA		25°C	–150 ±450			
Output voltage regulation (sinking current) [‡]	I _O = 0 to 10 mA		25°C	15 ±160			μV
			Full range	±250			
	I _O = 0 to 20 mA		25°C	65 ±235			
Output impedance			25°C	7.5 22.5			mΩ
Noise-reduction impedance			25°C	110			kΩ
Short-circuit current	Sinking current, V _O = 5 V		25°C	26			mA
	Sourcing current, V _O = 0			–47			
Output noise voltage, rms	f = 10 Hz to 10 kHz	C _{NR} = 0	25°C	120			μV
		C _{NR} = 1 μF		30			
Output voltage current step response	V _O to 0.1%, I _O = ±10 mA	C _L = 0	25°C	290			μs
		C _L = 100 pF		275			
	V _O to 0.01%, I _O = ±10 mA	C _L = 0	25°C	400			
		C _L = 100 pF		390			
Step response	V _I = 0 to 5 V, V _O to 0.1%	C _L = 100 pF	25°C	20			μs
	V _I = 0 to 5 V, V _O to 0.01%			160			

† Full range is 0°C to 70°C .

‡ The listed values are not production tested.

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electrical characteristics at specified free-air temperature, $V_I = 12\text{ V}$, $I_O = 0$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		T _A [†]	TLE2426C			UNIT
				MIN	TYP	MAX	
Output voltage	V _I = 4 V		25°C	1.98	2	2.02	V
	V _I = 12 V			5.95	6	6.05	
	V _I = 40 V			19.8	20	20.2	
	V _I = 12 V		Full range		5.945	6.055	
Temperature coefficient of output voltage			Full range	35			ppm/°C
Supply current	No load	V _I = 12 V	25°C	195	300	μA	
		V _I = 4 to 40 V	Full range	400			
Output voltage regulation (sourcing current) [‡]	I _O = 0 to −10 mA		25°C	−45	±160	μV	
			Full range	±250			
	I _O = 0 to −20 mA		25°C	−150	±450		
Output voltage regulation (sinking current) [‡]	I _O = 0 to 10 mA		25°C	15	±160	μV	
			Full range	±250			
	I _O = 0 to 20 mA		25°C	65	±235		
Output impedance			25°C	7.5	22.5	mΩ	
Noise-reduction impedance			25°C	110		kΩ	
Short-circuit current	Sinking current, V _O = 12 V		25°C	31		mA	
	Sourcing current, V _O = 0			−70			
Output noise voltage, rms	f = 10 Hz to 10 kHz	C _{NR} = 0	25°C	120		μV	
		C _{NR} = 1 μF		30			
Output voltage current step response	V _O to 0.1%, I _O = ±10 mA	C _L = 0	25°C	290		μs	
		C _L = 100 pF		275			
	V _O to 0.01%, I _O = ±10 mA	C _L = 0	25°C	400			
		C _L = 100 pF		390			
Step response	V _I = 0 to 12 V, V _O to 0.1%	C _L = 100 pF	25°C	20		μs	
	V _I = 0 to 12 V, V _O to 0.01%			120			

[†] Full range is 0°C to 70°C.

[‡] The listed values are not production tested.

electrical characteristics at specified free-air temperature, $V_I = 5\text{ V}$, $I_O = 0$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		$T_A^\dagger$	TLE2426I			UNIT
				MIN	TYP	MAX	
Output voltage	$V_I = 4\text{ V}$		25°C	1.98	2	2.02	V
	$V_I = 5\text{ V}$			2.48	2.5	2.52	
	$V_I = 40\text{ V}$			19.8	20	20.2	
	$V_I = 5\text{ V}$		Full range	2.47		2.53	
Temperature coefficient of output voltage			Full range		25		ppm/°C
Supply current	No load	$V_I = 5\text{ V}$	25°C		170	300	μA
		$V_I = 4\text{ to }40\text{ V}$	Full range			400	
Output voltage regulation (sourcing current) ‡	$I_O = 0\text{ to }-10\text{ mA}$		25°C	-45	±160		μV
			Full range			±250	
	$I_O = 0\text{ to }-20\text{ mA}$		25°C	-150	±450		
Output voltage regulation (sinking current) ‡	$I_O = 0\text{ to }10\text{ mA}$		25°C		15	±160	μV
	$I_O = 0\text{ to }8\text{ mA}$		Full range			±250	
	$I_O = 0\text{ to }20\text{ mA}$		25°C		65	±235	
Output impedance			25°C		7.5	22.5	mΩ
Noise-reduction impedance			25°C		110		kΩ
Short-circuit current	Sinking current,	$V_O = 5\text{ V}$	25°C		26		mA
	Sourcing current,	$V_O = 0$			-47		
Output noise voltage, rms	$f = 10\text{ Hz to }10\text{ kHz}$	$C_{NR} = 0$	25°C		120		μV
		$C_{NR} = 1\text{ μF}$			30		
Output voltage current step response	$V_O\text{ to }0.1\%, I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		290		μs
		$C_L = 100\text{ pF}$			275		
	$V_O\text{ to }0.01\%, I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		400		
		$C_L = 100\text{ pF}$			390		
Step response	$V_I = 0\text{ to }5\text{ V}, V_O\text{ to }0.1\%$	$C_L = 100\text{ pF}$	25°C		20		μs
	$V_I = 0\text{ to }5\text{ V}, V_O\text{ to }0.01\%$				160		

† Full range is -40°C to 85°C.

‡ The listed values are not production tested.

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electrical characteristics at specified free-air temperature, $V_I = 12\text{ V}$, $I_O = 0$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		$T_A^\dagger$	TLE2426I			UNIT
				MIN	TYP	MAX	
Output voltage	$V_I = 4\text{ V}$		25°C	1.98	2	2.02	V
	$V_I = 12\text{ V}$			5.95	6	6.05	
	$V_I = 40\text{ V}$			19.8	20	20.2	
	$V_I = 12\text{ V}$		Full range	5.935		6.065	
Temperature coefficient of output voltage			Full range		35		ppm/ $^\circ\text{C}$
Supply current	No load	$V_I = 12\text{ V}$	25°C		195	300	μA
		$V_I = 4\text{ to }40\text{ V}$	Full range			400	
Output voltage regulation (sourcing current) ‡	$I_O = 0\text{ to }-10\text{ mA}$		25°C		-45	± 160	μV
			Full range			± 250	
	$I_O = 0\text{ to }-20\text{ mA}$		25°C		-150	± 450	
Output voltage regulation (sinking current) ‡	$I_O = 0\text{ to }10\text{ mA}$		25°C		15	± 160	μV
	$I_O = 0\text{ to }8\text{ mA}$		Full range			± 250	
	$I_O = 0\text{ to }20\text{ mA}$		25°C		65	± 235	
Output impedance			25°C		7.5	22.5	$\text{m}\Omega$
Noise-reduction impedance			25°C		110		$\text{k}\Omega$
Short-circuit current	Sinking current,	$V_O = 12\text{ V}$	25°C		31		mA
	Sourcing current,	$V_O = 0$			-70		
Output noise voltage, rms	$f = 10\text{ Hz to }10\text{ kHz}$	$\text{CNR} = 0$	25°C		120		μV
		$\text{CNR} = 1\text{ }\mu\text{F}$			30		
Output voltage current step response	$V_O\text{ to }0.1\%, I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		290		μs
		$C_L = 100\text{ pF}$			275		
	$V_O\text{ to }0.01\%, I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		400		
		$C_L = 100\text{ pF}$			390		
Step response	$V_I = 0\text{ to }12\text{ V}, V_O\text{ to }0.1\%$	$C_L = 100\text{ pF}$	25°C		20		μs
	$V_I = 0\text{ to }12\text{ V}, V_O\text{ to }0.01\%$				120		

† Full range is -40°C to 85°C .

‡ The listed values are not production tested.

electrical characteristics at specified free-air temperature, $V_I = 5\text{ V}$, $I_O = 0$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		$T_A^\dagger$	TLE2426M			UNIT
				MIN	TYP	MAX	
Output voltage	$V_I = 4\text{ V}$		25°C	1.98	2	2.02	V
	$V_I = 5\text{ V}$			2.48	2.5	2.52	
	$V_I = 40\text{ V}$			19.8	20	20.2	
	$V_I = 5\text{ V}$		Full range	2.465		2.535	
Temperature coefficient of output voltage			Full range		25		ppm/ $^\circ\text{C}$
Supply current	No load	$V_I = 5\text{ V}$	25°C		170	300	μA
		$V_I = 4\text{ to }40\text{ V}$	Full range			400	
Output voltage regulation (sourcing current) ‡	$I_O = 0\text{ to }-10\text{ mA}$		25°C		-45	± 160	μV
			Full range			± 250	
	$I_O = 0\text{ to }-20\text{ mA}$		25°C		-150	± 450	
Output voltage regulation (sinking current) ‡	$I_O = 0\text{ to }10\text{ mA}$		25°C		15	± 160	μV
	$I_O = 0\text{ to }3\text{ mA}$		Full range			± 250	
	$I_O = 0\text{ to }20\text{ mA}$		25°C		65	± 235	
Output impedance			25°C		7.5	22.5	$\text{m}\Omega$
Noise-reduction impedance			25°C		110		$\text{k}\Omega$
Short-circuit current	Sinking current,	$V_O = 5\text{ V}$	25°C		26		mA
	Sourcing current,	$V_O = 0$			-47		
Output noise voltage, rms	$f = 10\text{ Hz to }10\text{ kHz}$	$C_{NR} = 0$	25°C		120		μV
		$C_{NR} = 1\text{ }\mu\text{F}$			30		
Output voltage current step response	$V_O\text{ to }0.1\%,\ I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		290		μs
		$C_L = 100\text{ pF}$			275		
	$V_O\text{ to }0.01\%,\ I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		400		
		$C_L = 100\text{ pF}$			390		
Step response	$V_I = 0\text{ to }5\text{ V},\ V_O\text{ to }0.1\%$	$C_L = 100\text{ pF}$	25°C		20		μs
	$V_I = 0\text{ to }5\text{ V},\ V_O\text{ to }0.01\%$				120		

† Full range is -55°C to 125°C .

‡ The listed values are not production tested.

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electrical characteristics at specified free-air temperature, $V_I = 12\text{ V}$, $I_O = 0$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS		$T_A^\dagger$	TLE2426M			UNIT
				MIN	TYP	MAX	
Output voltage	$V_I = 4\text{ V}$		25°C	1.98	2	2.02	V
	$V_I = 12\text{ V}$			5.95	6	6.05	
	$V_I = 40\text{ V}$			19.8	20	20.2	
	$V_I = 12\text{ V}$		Full range	5.925		6.075	
Temperature coefficient of output voltage			Full range		35		ppm/°C
Supply current	No load	$V_I = 12\text{ V}$	25°C		195	250	μA
		$V_I = 4\text{ to }40\text{ V}$	Full range			350	
Output voltage regulation (sourcing current) [‡]	$I_O = 0\text{ to }-10\text{ mA}$		25°C		-45	±160	μV
			Full range			±250	
	$I_O = 0\text{ to }-20\text{ mA}$		25°C		-150	±450	
Output voltage regulation (sinking current) [‡]	$I_O = 0\text{ to }10\text{ mA}$		25°C		15	±160	μV
	$I_O = 0\text{ to }8\text{ mA}$		Full range			±250	
	$I_O = 0\text{ to }20\text{ mA}$		25°C		65	±235	
Output impedance			25°C		7.5	22.5	mΩ
Noise-reduction impedance			25°C		110		kΩ
Short-circuit current	Sinking current,	$V_O = 12\text{ V}$	25°C		31		mA
	Sourcing current,	$V_O = 0$			-70		
Output noise voltage, rms	$f = 10\text{ Hz to }10\text{ kHz}$	$C_{NR} = 0$	25°C		120		μV
		$C_{NR} = 1\text{ μF}$			30		
Output voltage current step response	$V_O\text{ to }0.1\%, I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		290		μs
		$C_L = 100\text{ pF}$			275		
	$V_O\text{ to }0.01\%, I_O = \pm 10\text{ mA}$	$C_L = 0$	25°C		400		
		$C_L = 100\text{ pF}$			390		
Step response	$V_I = 0\text{ to }12\text{ V}, V_O\text{ to }0.1\%$	$C_L = 100\text{ pF}$	25°C		12		μs
	$V_I = 0\text{ to }12\text{ V}, V_O\text{ to }0.01\%$				120		

[†] Full range is -55°C to 125°C.

[‡] The listed values are not production tested.

electrical characteristics at specified free-air temperature, $V_I = 5\text{ V}$, $I_O = 0$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	TLE2426Y			UNIT
		MIN	TYP	MAX	
Output voltage	$V_I = 5\text{ V}$		2.5		V
Supply current	No load		170		μA
Output voltage regulation (sourcing current) [†]	$I_O = 0$ to -10 mA		-45		μV
	$I_O = 0$ to -20 mA		-150		
Output voltage regulation (sinking current) [†]	$I_O = 0$ to 10 mA		15		μV
	$I_O = 0$ to 20 mA		65		
Output impedance			7.5		$\text{m}\Omega$
Noise-reduction impedance			110		$\text{k}\Omega$
Short-circuit current	Sinking current, $V_O = 5\text{ V}$		26		mA
	Sourcing current, $V_O = 0$		-47		
Output noise voltage, rms	$f = 10\text{ Hz}$ to 10 kHz	$\text{CNR} = 0$	120		μV
		$\text{CNR} = 1\text{ }\mu\text{F}$	30		
Output voltage current step response	V_O to 0.1%, $I_O = \pm 10\text{ mA}$	$C_L = 0$	290		μs
		$C_L = 100\text{ pF}$	275		
	V_O to 0.01%, $I_O = \pm 10\text{ mA}$	$C_L = 0$	400		
		$C_L = 100\text{ pF}$	390		
Step response	$V_I = 0$ to 5 V , V_O to 0.1%	$C_L = 100\text{ pF}$	20		μs
	$V_I = 0$ to 5 V , V_O to 0.01%		160		

[†] The listed values are not production tested.

electrical characteristics at specified free-air temperature, $V_I = 12\text{ V}$, $I_O = 0$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	TLE2426Y			UNIT
		MIN	TYP	MAX	
Output voltage	$V_I = 12\text{ V}$		6		V
Supply current	No load		195		μA
Output voltage regulation (sourcing current) [†]	$I_O = 0$ to -10 mA		-45		μV
	$I_O = 0$ to -20 mA		-150		
Output voltage regulation (sinking current) [†]	$I_O = 0$ to 3 mA		15		μV
	$I_O = 0$ to 20 mA		65		
Output impedance			7.5		$\text{m}\Omega$
Noise-reduction impedance			110		$\text{k}\Omega$
Short-circuit current	Sinking current, $V_O = 12\text{ V}$		31		mA
	Sourcing current, $V_O = 0$		-70		
Output noise voltage, rms	$f = 10\text{ Hz}$ to 10 kHz	$\text{CNR} = 0$	120		μV
		$\text{CNR} = 1\text{ }\mu\text{F}$	30		
Output voltage current, step response	V_O to 0.1%, $I_O = \pm 10\text{ mA}$	$C_L = 0$	290		μs
		$C_L = 100\text{ pF}$	275		
	V_O to 0.01%, $I_O = \pm 10\text{ mA}$	$C_L = 0$	400		
		$C_L = 100\text{ pF}$	390		
Step response	$V_I = 0$ to 12 V , V_O to 0.1%	$C_L = 100\text{ pF}$	12		μs
	$V_I = 0$ to 12 V , V_O to 0.01%		120		

[†] The listed values are not production tested.

TYPICAL CHARACTERISTICS

Table Of Graphs

		FIGURE
Output voltage	Distribution	1,2
Output voltage change	vs Free-air temperature	3
Output voltage error	vs Input voltage	4
Input bias current	vs Input voltage	5
	vs Free-air temperature	6
Output voltage regulation	vs Output current	7
Output impedance	vs Frequency	8
Short-circuit output current	vs Input voltage	9,10
	vs Free-air temperature	11,12
Ripple rejection	vs Frequency	13
Spectral noise voltage density	vs Frequency	14
Output voltage response to output current step	vs Time	15
Output voltage power-up response	vs Time	16
Output current	vs Load capacitance	17

TYPICAL CHARACTERISTICS†

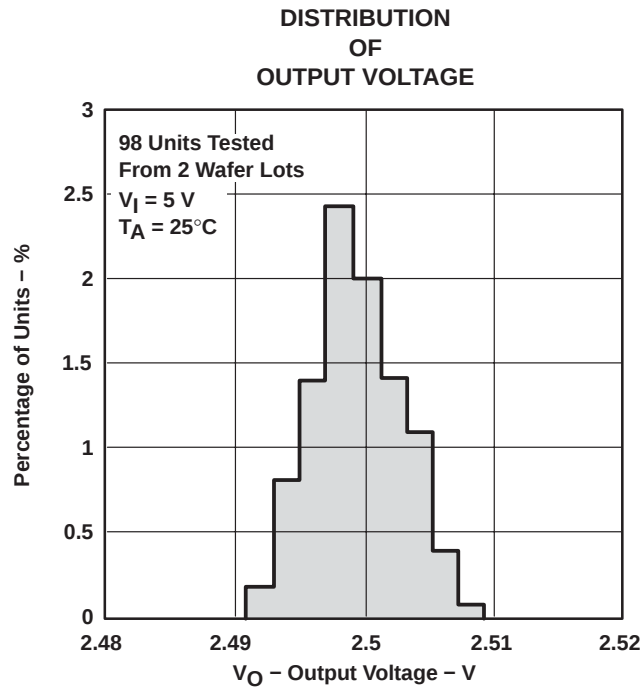


Figure 1

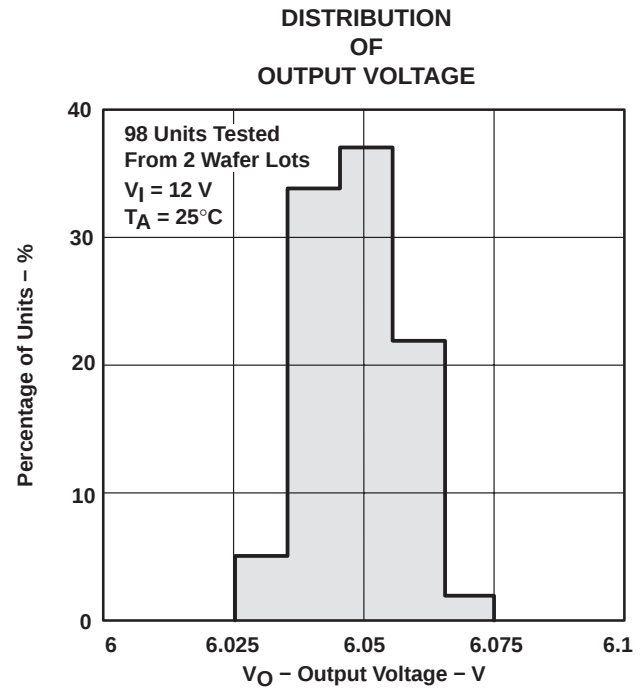


Figure 2

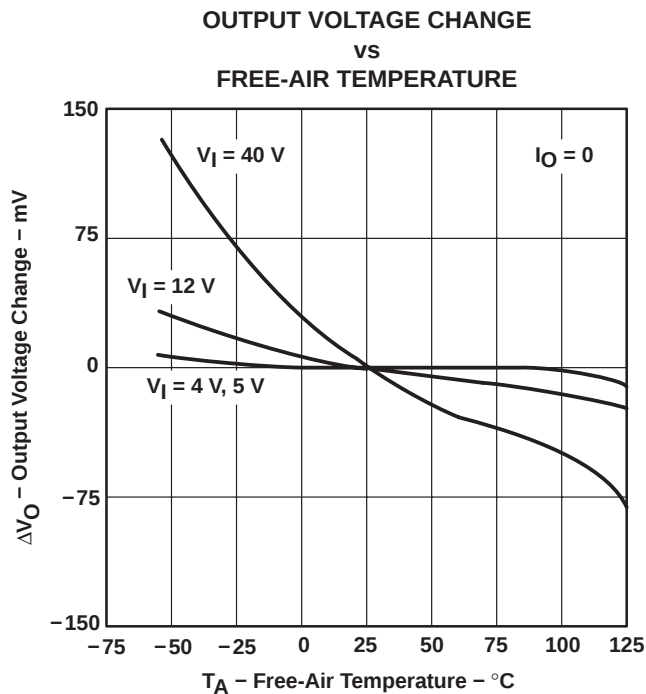


Figure 3

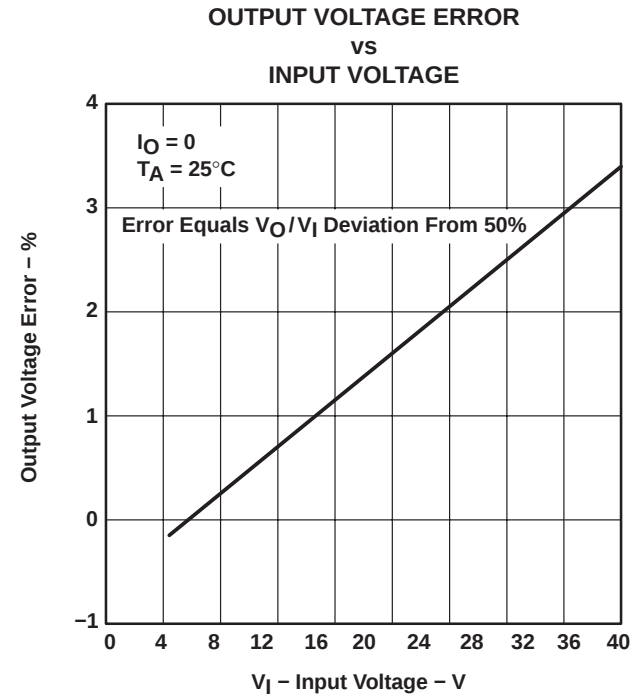
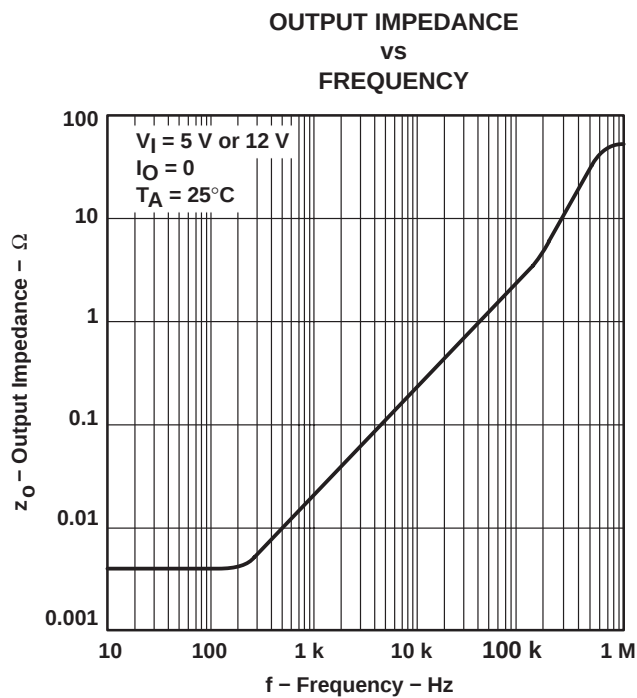
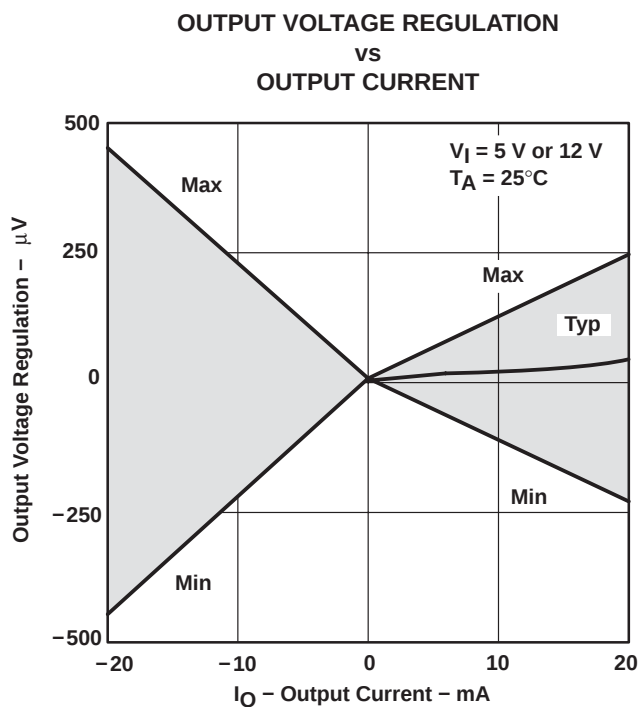
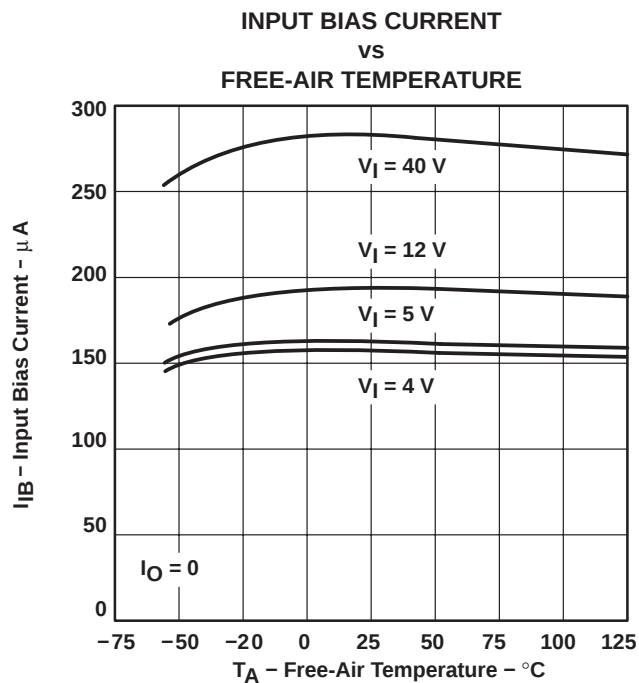
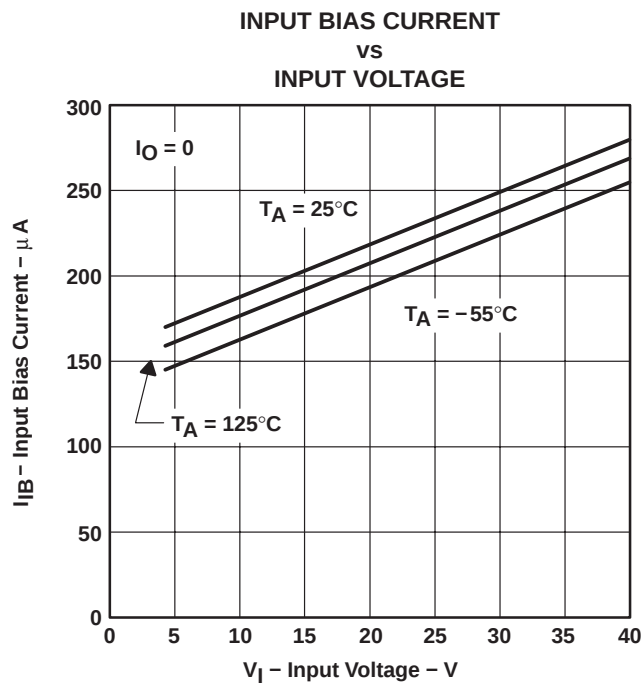


Figure 4

† Data at high and low temperatures are applicable within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†



† Data at high and low temperatures are applicable within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

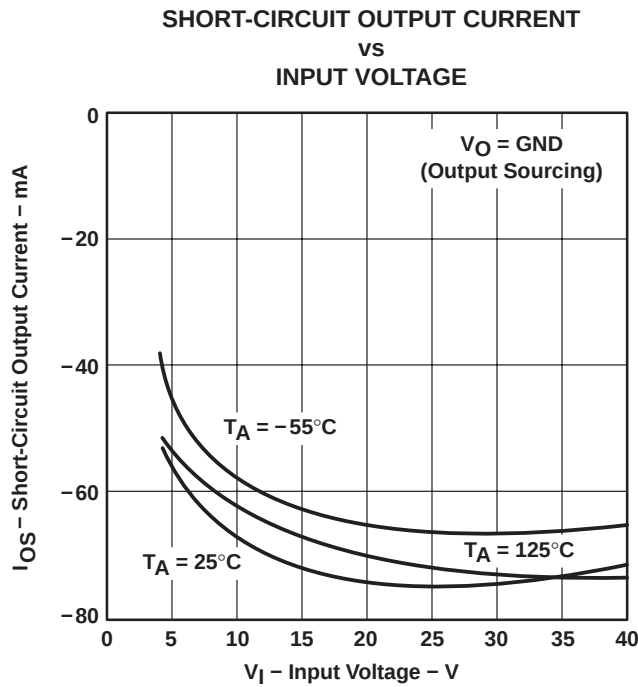


Figure 9

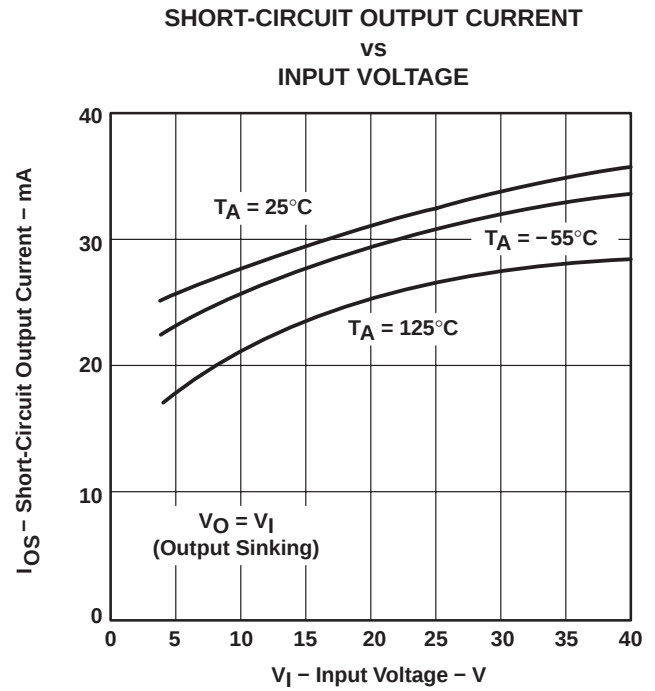


Figure 10

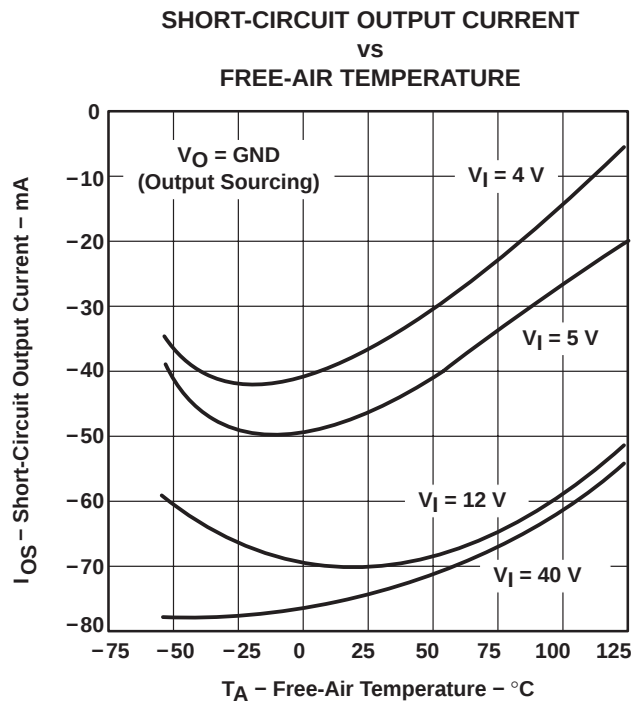


Figure 11

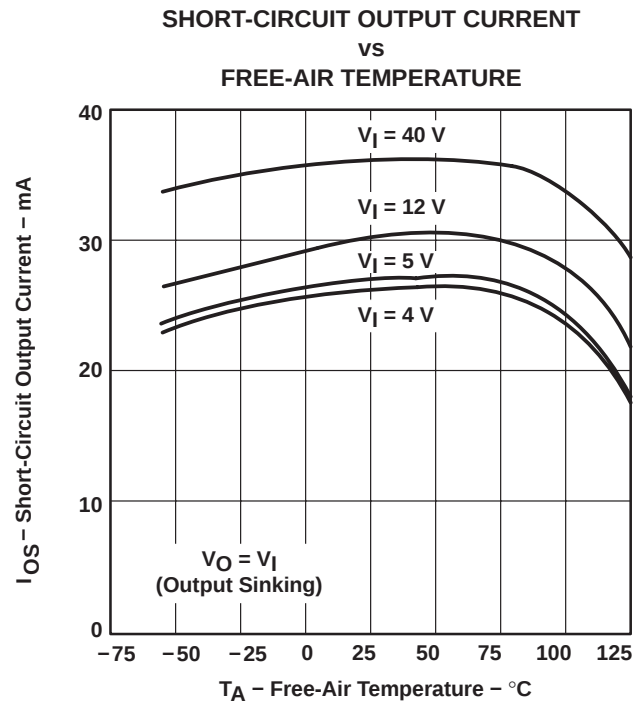


Figure 12

† Data at high and low temperatures are applicable within the rated operating free-air temperature ranges of the various devices.

TLE2426, TLE2426Y

THE "RAIL SPLITTER"

PRECISION VIRTUAL GROUND

SLOS098D – AUGUST 1991 – REVISED MAY 1998

TYPICAL CHARACTERISTICS

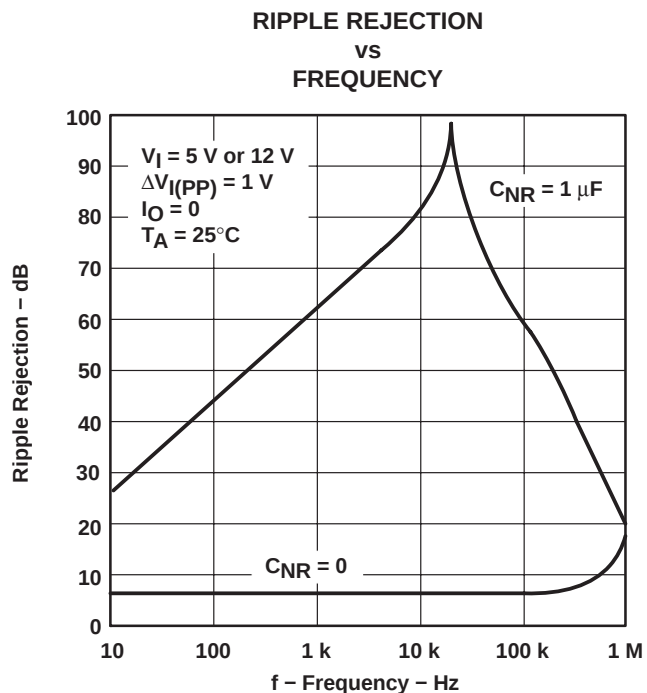


Figure 13

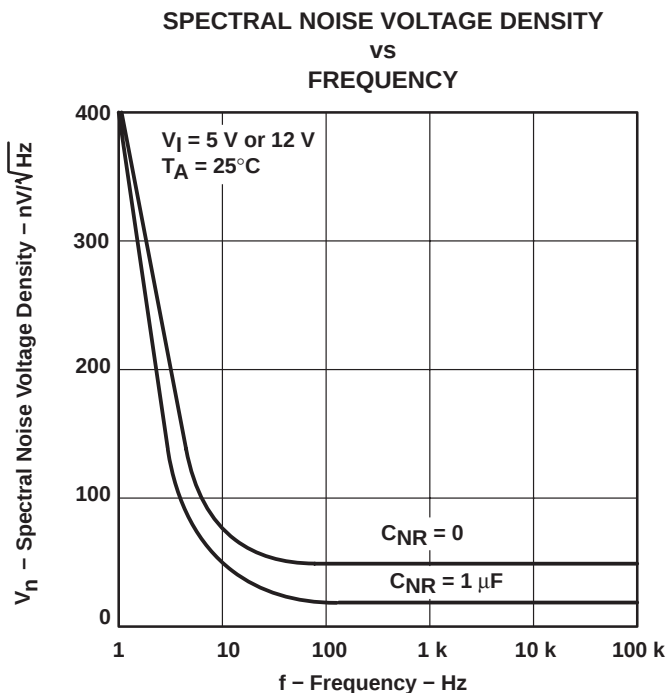


Figure 14

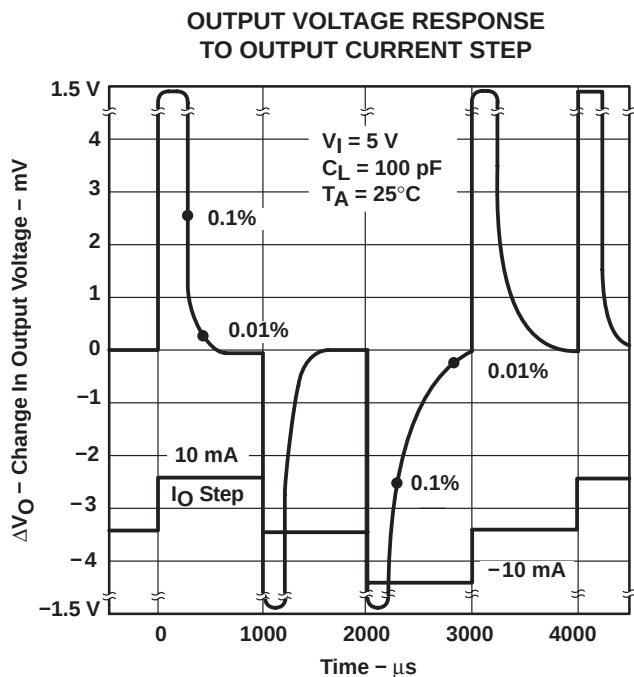


Figure 15

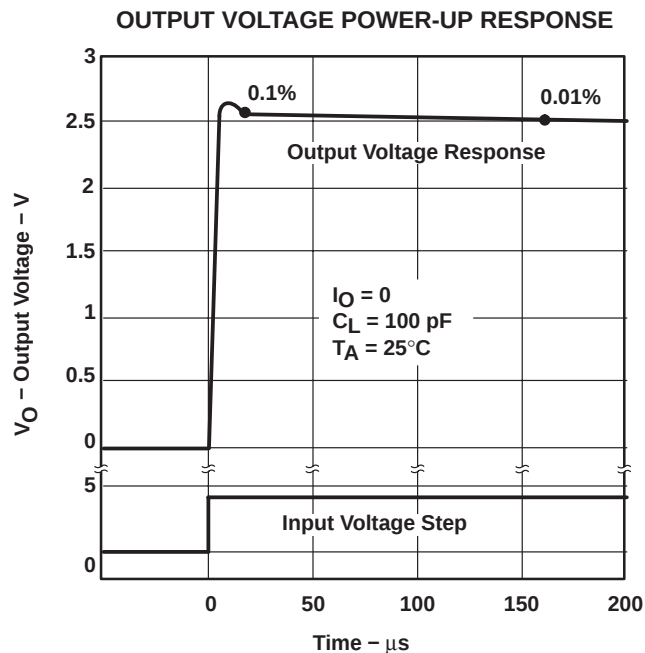


Figure 16

TYPICAL CHARACTERISTICS

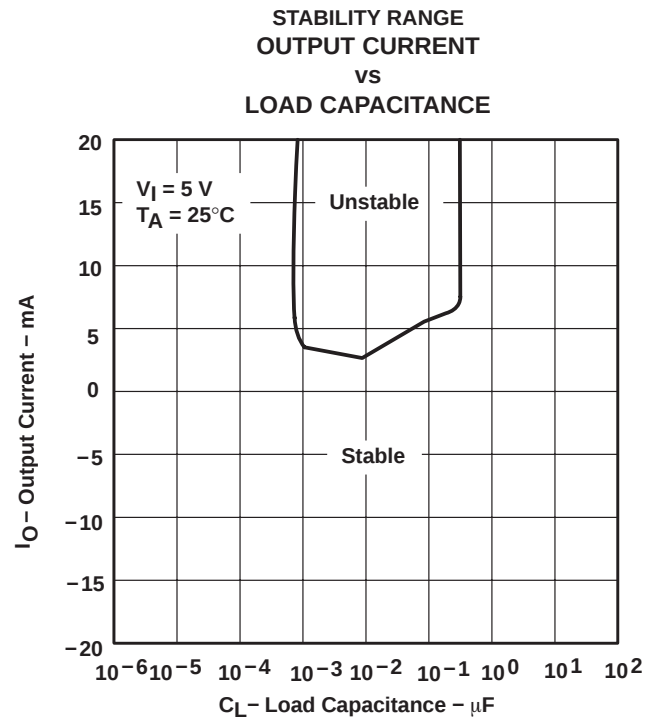


Figure 17

TLE2426, TLE2426Y THE "RAIL SPLITTER" PRECISION VIRTUAL GROUND

SLOS098D - AUGUST 1991 - REVISED MAY 1998

MACROMODEL INFORMATION

* TLE2426 OPERATIONAL AMPLIFIER "MACROMODEL" SUBCIRCUIT
* CREATED USING PARTS RELEASE 4.03 ON 08/21/90 AT 13:51
* REV (N/A) SUPPLY VOLTAGE: 5 V
* CONNECTIONS:

			FILTER		
			INPUT		
			COMMON		
			OUTPUT		
.SUBCKT TLE2426	1	3	4	5	

```

C1      11 12 21.66E-12
C2      6  7 30.00E-12
C3      87  0 10.64E-9
CPSR    85 86 15.9E-9
DCM+    81 82 DX
DCM-    83 81 DX
DC       5 53 DX
DE      54  5 DX
DLP     90 91 DX
DLN     92 90 DX
DP       4  3 DX
ECMR    84 99 (2,99) 1
EGND    99  0 POLY(2) (3,0) (4,0) 0 .5 .5
EPSR    85  0 POLY(1) (3,4) -16.22E-6 3.24E-6
ENSE    89  2 POLY(1) (88,0) 120E-6 1
FB       7 99 POLY(6) VB VC VE VLP VLN VPSR 0 74.8E6 -10E6 10E6 10E6 -10E6 74E6
GA       6  0 11 12 320.4E-6
GCM      0  6 10 99 1.013E-9
GPSR    85 86 (85,86) 100E-6
GRC1     4 11 (4,11) 3.204E-4
GRC2     4 12 (4,12) 3.204E-4
GRE1    13 10 (13,10) 1.038E-3
GRE2    14 10 (14,10) 1.038E-3
HLIM    90  0 VLIM 1K
HCMR    80  1 POLY(2) VCM+ VCM- 0 1E2 1E2
IRP      3  4 146E-6
IEE      3 10 DC 24.05E-6
IIO      2  0 .2E-9
I1      88  0 1E-21
Q1      11 89 13 QX
Q2      12 80 14 QX
R2       6  9 100.0E3
RCM     84 81 1K
REE     10 99 8.316E6
RN1     87  0 2.55E8
RN2     87 88 11.67E3
RO1      8  5 63
RO2      7 99 62
VCM+    82 99 1.0
VCM-    83 99 -2.3
VB       9  0 DC 0
VC      3 53 DC 1.400
VE      54  4 DC 1.400
VLIM     7  8 DC 0
VLP     91  0 DC 30
VLN      0 92 DC 30
VPSR     0 86 DC 0
RFB      5  2 1K
RIN1     3  1 220K
RIN2     1  4 220K
.MODEL DX D(IS=800.OE-18)
.MODEL QX PNP(IS=800.OE-18 BF=480)
.ENDS

```



PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TLE2426CD	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	2426C
TLE2426CDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	2426C
TLE2426CLP	Active	Production	TO-92 (LP) 3	1000 BULK	Yes	SN	N/A for Pkg Type	-	2426C
TLE2426CLPR	Active	Production	TO-92 (LP) 3	2000 LARGE T&R	Yes	SN	N/A for Pkg Type	-	2426C
TLE2426CP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-	TLE2426CP
TLE2426ID	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	2426I
TLE2426IDR	Active	Production	SOIC (D) 8	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	2426I
TLE2426ILP	Active	Production	TO-92 (LP) 3	1000 BULK	Yes	SN	N/A for Pkg Type	-	2426I
TLE2426ILPR	Active	Production	TO-92 (LP) 3	2000 LARGE T&R	Yes	SN	N/A for Pkg Type	-	2426I
TLE2426IP	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-	TLE2426IP
TLE2426MD	Active	Production	SOIC (D) 8	75 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-55 to 125	2426M

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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OTHER QUALIFIED VERSIONS OF TLE2426 :

- Automotive : [TLE2426-Q1](#)
- Enhanced Product : [TLE2426-EP](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications

TAPE AND REEL INFORMATION



*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
TLE2426CDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2426IDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	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)
TLE2426CDR	SOIC	D	8	2500	350.0	350.0	43.0
TLE2426IDR	SOIC	D	8	2500	350.0	350.0	43.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
TLE2426CD	D	SOIC	8	75	505.46	6.76	3810	4
TLE2426CDG4	D	SOIC	8	75	505.46	6.76	3810	4
TLE2426CP	P	PDIP	8	50	506	13.97	11230	4.32
TLE2426ID	D	SOIC	8	75	505.46	6.76	3810	4
TLE2426IDG4	D	SOIC	8	75	505.46	6.76	3810	4
TLE2426IP	P	PDIP	8	50	506	13.97	11230	4.32
TLE2426IPE4	P	PDIP	8	50	506	13.97	11230	4.32
TLE2426MD	D	SOIC	8	75	505.46	6.76	3810	4



PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

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



TO-92 - 5.34 mm max height

Technical drawing of a 12-pin connector showing two views: a side view on the left and a top view on the right.

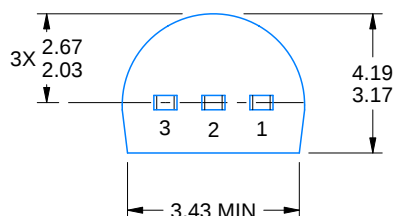
Side View Dimensions:

- Width: $2 \times \frac{2.9}{2.4}$
- Height: $2 \times 4 \text{ MAX}$
- Seating Plane: Indicated by a horizontal line.

Top View Dimensions:

- Body Width: $5.21 / 4.44$
- Body Height: $5.34 / 4.32$
- Pin Pitch: $3 \times 12.7 \text{ MIN}$
- Pin Width: $6 \times 0.076 \text{ MAX}$
- Pin Spacing: $3 \times \frac{0.55}{0.38}$
- Pin Length: $2 \times 1.27 \pm 0.13$
- Seating Plane: Indicated by a horizontal line.
- Optional Ejector Pin: Indicated by a circle.
- Note 3: (2.54)
- Typical Dimensions: $(1.5) \text{ TYP}$, $(0.51) \text{ TYP}$

STRAIGHT LEAD OPTION



NOTES:

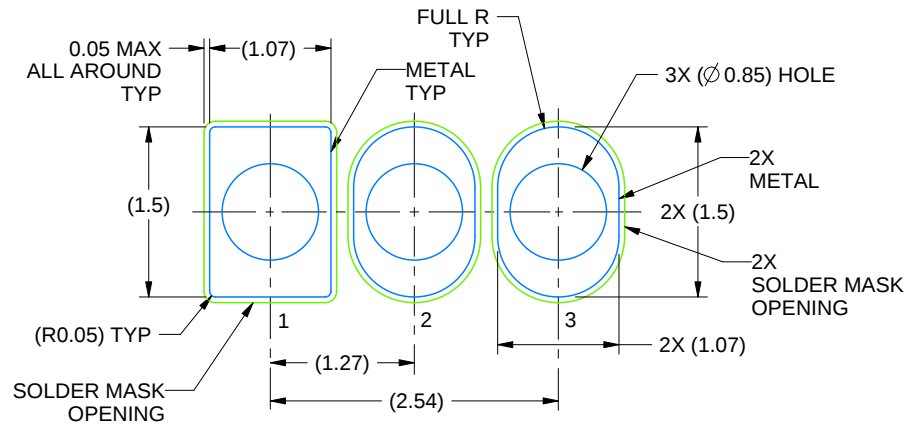
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Lead dimensions are not controlled within this area.
4. Reference JEDEC TO-226, variation AA.
5. Shipping method:
 - a. Straight lead option available in bulk pack only.
 - b. Formed lead option available in tape and reel or ammo pack.
 - c. Specific products can be offered in limited combinations of shipping medium and lead options.
 - d. Consult product folder for more information on available options.

EXAMPLE BOARD LAYOUT

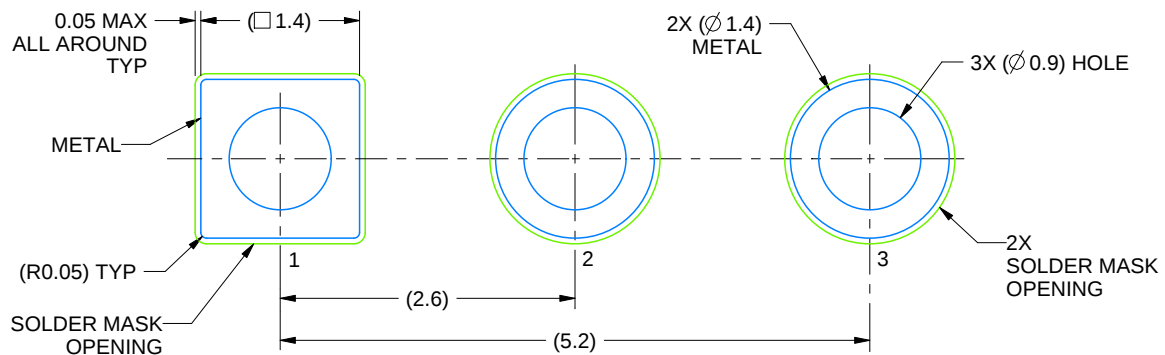
LP0003A

TO-92 - 5.34 mm max height

TO-92



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



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

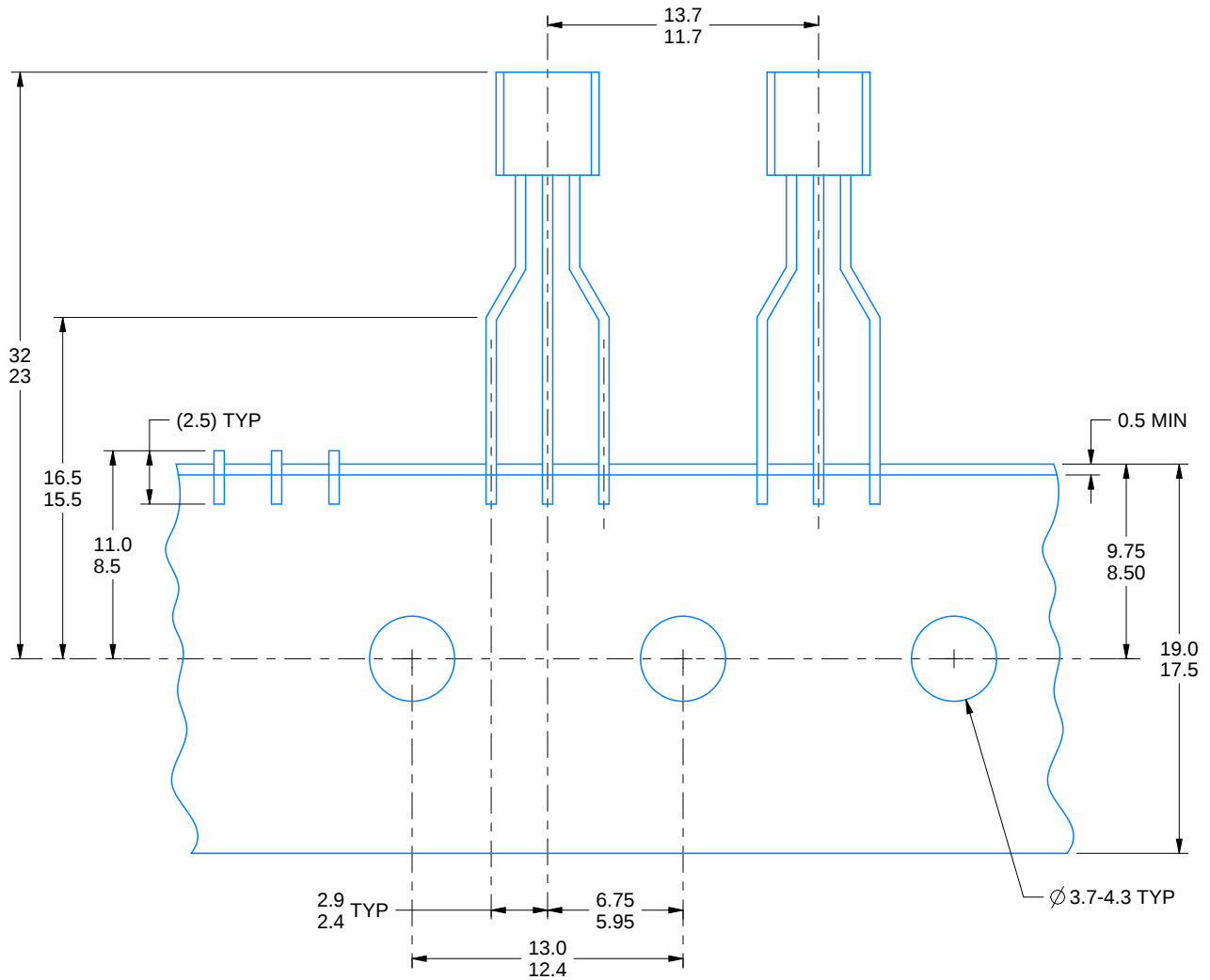
4215214/C 04/2025

TAPE SPECIFICATIONS

LP0003A

TO-92 - 5.34 mm max height

TO-92



FOR FORMED LEAD OPTION PACKAGE

4215214/C 04/2025

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Falls within JEDEC MS-001 variation BA.

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