Operational Amplifier, Rail-to-Rail Output, 3 MHz BW

TLV271, TLV272, NCV272, TLV274, NCV274

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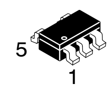
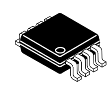
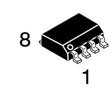


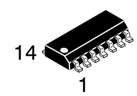
TSOP−5
CASE 483



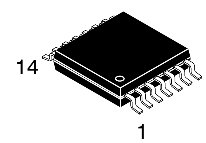
Micro8™
CASE 846A



SOIC−8
CASE 751



SOIC−14 NB
CASE 751A



TSSOP−14
CASE 948G

The TLV/NCV27x operational amplifiers provide rail−to−rail output operation. The output can swing within 320 mV to the positive rail and 50 mV to the negative rail. This rail−to−rail operation enables the user to make optimal use of the entire supply voltage range while taking advantage of 3 MHz bandwidth. The opamp can operate on supply voltage as low as 2.7 V over the temperature range of −40°C to 125°C. The high bandwidth provides a slew rate of 2.4 V/μs while only consuming 550 μA of quiescent current. Likewise the opamp can run on a supply voltage as high as 16 V (single) and 36 V (dual quad) making it ideal for a broad range of battery−operated applications. Since this is a CMOS device it has high input impedance and low bias currents making it ideal for interfacing to a wide variety of signal sensors. In addition it comes in a variety of compact packages with different pinout styles allowing for use in high−density PCB's.

Features

- Rail−To−Rail Output
- Wide Bandwidth: 3 MHz
- High Slew Rate: 2.4 V/μs
- Wide Power−Supply Range: 2.7 V to 16 V (TLV271), 36 V (TLV/NCV272/274)
- Low Supply Current: 550 μA
- Low Input Bias Current: 45 pA
- Wide Temperature Range: −40°C to 125°C
- TSOP−5, Micro−8, SOIC−8, SOIC−14, TSSOP−14 Packages
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

- Notebook Computers
- Portable Instruments
- Signal Conditioning
- Automotive
- Power Supplies
- Current Sensing

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 2 of this data sheet.

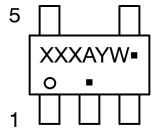
ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

This document contains information on some products that are still under development. ON Semiconductor reserves the right to change or discontinue these products without notice.

MARKING DIAGRAMS

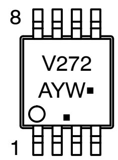
Single Channel Configuration
TLV271



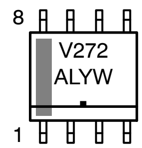
TSOP−5
CASE 483

XXX = ADG (TLV271SN1T1G)
= ADH (TLV271SN2T1G)
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

Dual Channel Configuration
TLV272, NCV272

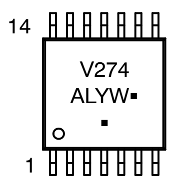


Micro8
CASE 846A

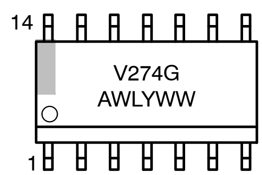


SOIC−8
CASE 751

Quad Channel Configuration
TLV274, NCV274



TSSOP−14
CASE 948G

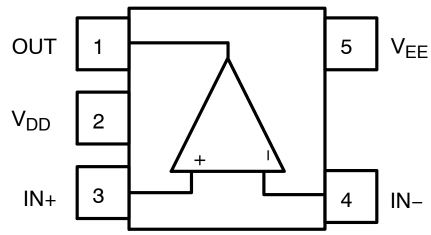


SOIC−14 NB
CASE 751A

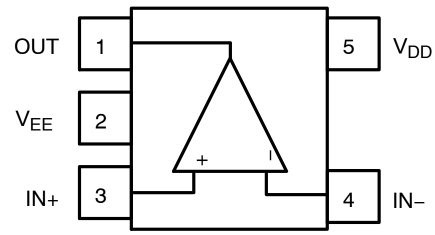
XXXXX = Specific Device Code
A = Assembly Location
WL, L = Wafer Lot
Y = Year
WW, W = Work Week
G or ▪ = Pb−Free Package
(Note: Microdot may be in either location)

PIN CONNECTIONS

Single Channel Configuration
TLV271

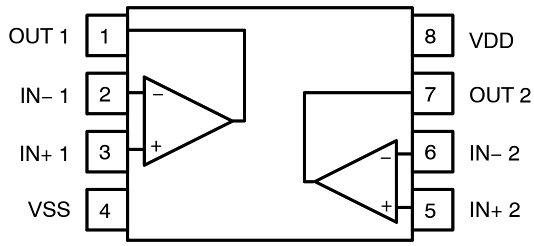


Style 1 Pinout (SN1T1)
(Top View)

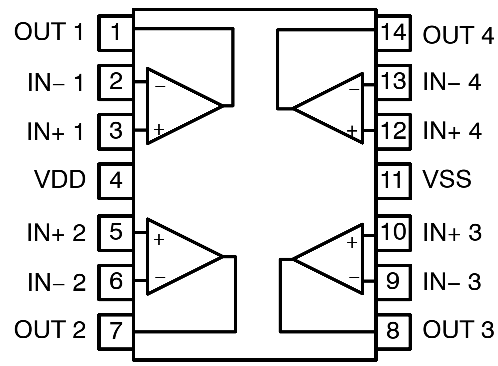


Style 2 Pinout (SN2T1)
(Top View)

Dual Channel Configuration
TLV272, NCV272



Quadruple Channel Configuration
TLV274, NCV274



ORDERING INFORMATION

Device	Configuration	Automotive	Marking	Package	Shipping†
TLV271SN1T1G (Style 1 Pinout)	Single	No	ADG	TSOP−5	3000 / Tape and Reel
TLV271SN2T1G (Style 2 Pinout)			ADH		3000 / Tape and Reel
TLV272DR2G (In Development)	Dual		V272	SOIC−8	2500 / Tape and Reel
TLV272DMR2G			V272	Micro−8/MSOP−8	4000 / Tape and Reel
TLV274DR2G (In Development)	Quad		V274	SOIC−14	2500 / Tape and Reel
TLV274DTBR2G (In Development)			V274	TSSOP−14	2500 / Tape and Reel
NCV272DR2G* (In Development)	Dual	Yes	V272	SOIC−8	2500 / Tape and Reel
NCV272DMR2G*			V272	Micro−8/MSOP−8	4000 / Tape and Reel
NCV274DR2G* (In Development)	Quad		V274	SOIC−14	2500 / Tape and Reel
NCV274DTBR2G* (In Development)			V274	TSSOP−14	2500 / Tape and Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
*NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

MAXIMUM RATINGS

Symbol	Rating		Value	Unit
V_{DD}	Supply Voltage (Note 1)	TLV271 TLV/NCV272/274	16.5 36	V V
V_{ID}	Input Differential Voltage		± Supply Voltage	V
V_I	Input Common Mode Voltage Range (Note 1)		−0.2 V to (V_{DD} + 0.2 V)	V
I_I	Maximum Input Current		± 10	mA
I_O	Output Current Range		± 100	mA
	Continuous Total Power Dissipation (Note 1)		200	mW
T_J	Maximum Junction Temperature		150	°C
T_A	Operating Ambient Temperature Range (free−air)		−40 to 125	°C
T_{STG}	Storage Temperature Range		−65 to 150	°C
ESD_{HBM}	ESD Capability, Human Body Model		2	kV
ESD_{CDM}	ESD Capability, Charged Device Model	TLV271 TLV/NCV272 TLV/NCV274	TBD 2 1	kV kV kV
	Mounting Temperature (Infrared or Convection − 20 sec)		260	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Continuous short−circuit operation to ground 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. Shorting output to either V+ or V− will adversely affect reliability.

THERMAL INFORMATION

Parameter	Symbol	Package	Single Layer Board (Note 2)	Multi−Layer Board (Note 3)	Unit
Junction−to−Ambient	θ_{JA}	TSOP−5	333	195	°C/W
		Micro−8 / MSOP−8	236	167	
		SOIC−8	190	131	
		SOIC−14	142	101	
		TSSOP−14	179	128	

2. Values based on a 1S standard PCB according to JEDEC51−3 with 1.0 oz copper and a 300 mm^2 copper area
3. Values based on a 1S2P standard PCB according to JEDEC51−7 with 1.0 oz copper and a 100 mm^2 copper area

TLV271 DC ELECTRICAL CHARACTERISTICS

(V_{DD} = 2.7V, 3.3V, 5V & ±5 V (Note 4), T_A = 25°C, R_L ≥ 10 kΩ unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Input Offset Voltage	V_{IO}	VIC = V_{DD}/2, V_O = V_{DD}/2, R_L = 10 kΩ, R_S = 50 Ω			0.5	5	mV
		T_A = −40°C to +105°C				7	
Offset Voltage Drift	ICV_{OS}	VIC = V_{DD}/2, V_O = V_{DD}/2, R_L = 10 kΩ, R_S = 50 Ω			2		μV/°C
Common Mode Rejection Ratio	CMRR	0 V ≤ VIC ≤ V_{DD} − 1.35 V, R_S = 50 Ω	V_{DD} = 2.7 V	58	70		dB
		T_A = −40°C to +105°C		55			
		0 V ≤ VIC ≤ V_{DD} − 1.35 V, R_S = 50 Ω	V_{DD} = 5 V	65	130		
		T_A = −40°C to +105°C		62			
		0 V ≤ VIC ≤ V_{DD} − 1.35 V, R_S = 50 Ω	V_{DD} = ±5 V	69	140		
		T_A = −40°C to +105°C		66			
Power Supply Rejection Ratio	PSRR	V_{DD} = 2.7 V to 16 V, VIC = V_{DD}/2, No Load		70	135		dB
		T_A = −40°C to +105°C		65			
Large Signal Voltage Gain	A_{VD}	$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = 2.7 V	97	106		dB
		T_A = −40°C to +105°C		76			
		$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = 3.3 V	97	123		
		T_A = −40°C to +105°C		76			
		$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = 5 V	100	127		
		T_A = −40°C to +105°C		86			
		$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = ±5 V	100	130		
		T_A = −40°C to +105°C		90			
Input Bias Current	I_B	V_{DD} = 5 V, VIC = V_{DD}/2, V_O = V_{DD}/2, R_S = 50 Ω	T_A = 25°C		45	150	pA
			T_A = 105°C			1000	
Input Offset Current	I_{IO}	V_{DD} = 5 V, VIC = V_{DD}/2, V_O = V_{DD}/2, R_S = 50 Ω	T_A = 25°C		45	150	pA
			T_A = 105°C			1000	
Differential Input Resistance	$r_{i(d)}$				1000		GΩ
Common−mode Input Capacitance	C_{IC}	f = 21 kHz			8		pF

4. V_{DD} = ±5 V is shorthand for V_{DD} = +5 V and V_{EE} = −5 V.

TLV271 DC ELECTRICAL CHARACTERISTICS
(V_{DD} = 2.7V, 3.3V, 5V & ±5 V (Note 4), T_A = 25°C, R_L ≥ 10 kΩ unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Output Swing (High−level)	V_{OH}	VIC = V_{DD}/2, I_{OH} = −1 mA	V_{DD} = 2.7 V	2.55	2.58		V
		T_A = −40°C to +105°C		2.48			
		VIC = V_{DD}/2, I_{OH} = −1 mA	V_{DD} = 3.3 V	3.15	3.21		
		T_A = −40°C to +105°C		3.00			
		VIC = V_{DD}/2, I_{OH} = −1 mA	V_{DD} = 5 V	4.8	4.93		
		T_A = −40°C to +105°C		4.75			
		VIC = V_{DD}/2, I_{OH} = −1 mA	V_{DD} = ±5 V	4.92	4.96		
		T_A = −40°C to +105°C		4.9			
		VIC = V_{DD}/2, I_{OH} = −5 mA	V_{DD} = 2.7 V	1.9	2.1		V
		T_A = −40°C to +105°C		1.5			
		VIC = V_{DD}/2, I_{OH} = −5 mA	V_{DD} = 3.3 V	2.5	2.89		
		T_A = −40°C to +105°C		2.1			
		VIC = V_{DD}/2, I_{OH} = −5 mA	V_{DD} = 5 V	4.5	4.68		
		T_A = −40°C to +105°C		4.35			
		VIC = V_{DD}/2, I_{OH} = −5 mA	V_{DD} = ±5 V	4.7	4.78		
		T_A = −40°C to +105°C		4.65			
Output Swing (Low−level)	V_{OL}	VIC = V_{DD}/2, I_{OL} = −1 mA	V_{DD} = 2.7 V		0.1	0.15	V
		T_A = −40°C to +105°C				0.22	
		VIC = V_{DD}/2, I_{OL} = −1 mA	V_{DD} = 3.3 V		0.03	0.15	
		T_A = −40°C to +105°C				0.22	
		VIC = V_{DD}/2, I_{OL} = −1 mA	V_{DD} = 5 V		0.03	0.1	
		T_A = −40°C to +105°C				0.15	
		VIC = V_{DD}/2, I_{OL} = −1 mA	V_{DD} = ±5 V		0.05	0.08	
		T_A = −40°C to +105°C				0.1	
		VIC = V_{DD}/2, I_{OL} = −5 mA	V_{DD} = 2.7 V		0.5	0.7	V
		T_A = −40°C to +105°C				1.1	
		VIC = V_{DD}/2, I_{OL} = −5 mA	V_{DD} = 3.3 V		0.13	0.7	
		T_A = −40°C to +105°C				1.1	
		VIC = V_{DD}/2, I_{OL} = −5 mA	V_{DD} = 5 V		0.13	0.4	
		T_A = −40°C to +105°C				0.5	
		VIC = V_{DD}/2, I_{OL} = −5 mA	V_{DD} = ±5 V		0.16	0.3	
		T_A = −40°C to +105°C				0.35	
Output Current	I_O	V_O = 0.5 V from rail, V_{DD} = 2.7 V	Positive rail		4.0		mA
			Negative rail		5.0		
		V_O = 0.5 V from rail, V_{DD} = 5 V	Positive rail		7.0		
			Negative rail		8.0		
		V_O = 0.5 V from rail, V_{DD} = 10 V	Positive rail		13		
			Negative rail		12		

4. V_{DD} = ±5 V is shorthand for V_{DD} = +5 V and V_{EE} = −5 V.

TLV271 DC ELECTRICAL CHARACTERISTICS

(V_{DD} = 2.7V, 3.3V, 5V & ±5 V (Note 4), T_A = 25°C, R_L ≥ 10 kΩ unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Power Supply Quiescent Current	I_{DD}	$V_O = V_{DD}/2$	V_{DD} = 2.7 V		380	560	μA
			V_{DD} = 3.3 V		385	620	
			V_{DD} = 5 V		390	660	
			V_{DD} = 10 V		400	800	
		T_A = −40°C to +105°C				1000	

4. V_{DD} = ±5 V is shorthand for V_{DD} = +5 V and V_{EE} = −5 V.

TLV271 AC ELECTRICAL CHARACTERISTICS

(V_{DD} = 2.7 V, 5 V, & ±5 V (Note 5), T_A = 25°C, and R_L ≥ 10 kΩ unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Unity Gain Bandwidth	UGBW	R_L = 2 kΩ, C_L = 10 pF	V_{DD} = 2.7 V		3.2		MHz
			V_{DD} = 5 V to 10 V		3.5		
Slew Rate at Unity Gain	SR	$V_{O(pp)} = V_{DD}/2$, R_L = 10 kΩ, C_L = 50 pF	V_{DD} = 2.7 V	1.35	2.1		V/μS
		T_A = −40°C to +105°C		1			
		$V_{O(pp)} = V_{DD}/2$, R_L = 10 kΩ, C_L = 50 pF	V_{DD} = 5 V	1.45	2.3		
		T_A = −40°C to +105°C		1.2			
		$V_{O(pp)} = V_{DD}/2$, R_L = 10 kΩ, C_L = 50 pF	V_{DD} = ±5 V	1.8	2.6		
		T_A = −40°C to +105°C		1.3			
Phase Margin	θ_m	R_L = 2 kΩ, C_L = 10 pF			45		°
Gain Margin		R_L = 2 kΩ, C_L = 10 pF			14		dB
Settling Time to 0.1%	t_S	V−step(pp) = 1 V, AV = −1, R_L = 2 kΩ, C_L = 10 pF	V_{DD} = 2.7 V		2.9		μS
		V−step(pp) = 1 V, AV = −1, R_L = 2 kΩ, C_L = 47 pF	V_{DD} = 5 V, ±5 V		2.0		
Total Harmonic Distortion plus Noise	THD+N	V_{DD} = 2.7 V, $V_{O(pp)} = V_{DD}/2$, R_L = 2 kΩ, f = 10 kHz	AV = 1		0.004		%
			AV = 10		0.04		
			AV = 100		0.3		
		V_{DD} = 5 V, ± 5 V, $V_{O(pp)} = V_{DD}/2$, R_L = 2 kΩ, f = 10 kHz	AV = 1		0.004		
			AV = 10		0.04		
			AV = 100		0.03		
Input−Referred Voltage Noise	e_n	f = 1 kHz			30		nV/√Hz
		f = 10 kHz			20		
Input−Referred Current Noise	i_n	f = 1 kHz			0.6		fA/√Hz

5. V_{DD} = ±5 V is shorthand for V_{DD} = +5 V and V_{EE} = −5 V.

TLV/NCV 272/274 DC ELECTRICAL CHARACTERISTICS

((V_{DD} = 2.7 V, 5 V, 10 V, 36 V), T_A = 25°C, $R_L \geq$ 10 kΩ unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Input Offset Voltage	V_{IO}	VIC = V_{DD}/2, V_O = V_{DD}/2, R_L = 10 kΩ			1.3	±3	mV
		T_A = −40°C to +125°C				±4	
Offset Voltage Drift	ICV_{OS}	VIC = V_{DD}/2, V_O = V_{DD}/2, R_L = 10 kΩ			2		μV/°C
Common Mode Rejection Ratio	CMRR	V_{CM} = V_{SS} + 0.2 V to V_{DD} − 1.35 V	V_{DD} = 2.7 V	90	110		dB
		T_A = −40°C to +125°C		69			
		V_{CM} = V_{SS} + 0.2 V to V_{DD} − 1.35 V	V_{DD} = 5 V	102	125		
		T_A = −40°C to +125°C		80			
		V_{CM} = V_{SS} + 0.2 V to V_{DD} − 1.35 V	V_{DD} = 10 V	110	130		
		T_A = −40°C to +125°C		87			
		V_{CM} = V_{SS} + 0.2 V to V_{DD} − 1.35 V	V_{DD} = 36 V	120	145		
		T_A = −40°C to +125°C (TLV/NCV272) (TLV/NCV274)		95 85			
Power Supply Rejection Ratio	PSRR	V_{DD} = 2.7 V to 36 V, VIC = V_{DD}/2, No Load		114	135		dB
		T_A = −40°C to +125°C		100			
Large Signal Voltage Gain	A_{VD}	$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = 2.7 V	96	118		dB
		T_A = −40°C to +125°C		86			
		$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = 5 V	96	120		
		T_A = −40°C to +125°C		86			
		$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = 10 V	98	120		
		T_A = −40°C to +125°C		88			
		$V_{O(pp)}$ = V_{DD}/2, R_L = 10 kΩ	V_{DD} = 36 V	98	120		
		T_A = −40°C to +125°C		88			
Input Bias Current	I_B	V_{DD} = 5 V, VIC = V_{DD}/2, V_O = V_{DD}/2	T_A = 25°C		5	200	pA
		V_{DD} = 2.7 to 36 V, T_A = −40°C to +125°C	TLV/NCV272			**2000**	
			TLV/NCV274			**1500**	
Input Offset Current	I_{IO}	V_{DD} = 5 V, VIC = V_{DD}/2, V_O = V_{DD}/2, R_S = 50 Ω	T_A = 25°C		2	75	pA
		V_{DD} = 2.7 to 36 V, T_A = −40°C to +125°C	TLV/NCV272			**500**	
			TLV/NCV274			**200**	
Channel Separation	XTLK	DC	TLV/NCV272		100		dB
			TLV/NCV274		115		dB
Differential Input Resistance	$R_{i(d)}$				5		GΩ
Common−mode Input Capacitance	C_{IC}				3.5		pF

TLV/NCV 272/274 DC ELECTRICAL CHARACTERISTICS
((V_{DD} = 2.7 V, 5 V, 10 V, 36 V), T_A = 25°C, R_L ≥ 10 kΩ unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Output Swing (High−level)	V_{OH}	VIC = V_{DD}/2	V_{DD} = 2.7 V		0.006	0.15	V
		T_A = −40°C to +125°C				**0.22**	
		VIC = V_{DD}/2	V_{DD} = 5 V		0.013	0.20	
		T_A = −40°C to +125°C				**0.25**	
		VIC = V_{DD}/2	V_{DD} = 10 V		0.023	0.08	
		T_A = −40°C to +125°C				**0.10**	
		VIC = V_{DD}/2	V_{DD} = 36 V		0.074	0.10	
		T_A = −40°C to +125°C				**0.15**	
Output Swing (Low−level)	V_{OL}	VIC = V_{DD}/2	V_{DD} = 2.7 V		0.005	0.15	V
		T_A = −40°C to +125°C				**0.22**	
		VIC = V_{DD}/2	V_{DD} = 5 V		0.01	0.10	
		T_A = −40°C to +125°C				**0.15**	
		VIC = V_{DD}/2	V_{DD} = 10 V		0.022	0.3	
		T_A = −40°C to +125°C				**0.35**	
		VIC = V_{DD}/2	V_{DD} = 36 V		0.065	0.3	
		T_A = −40°C to +125°C				**0.35**	
Output Current	I_O	V_{DD} = 2.7 V	Positive rail		50		mA
			Negative rail		70		
		V_{DD} = 5 V	Positive rail		60		
			Negative rail		50		
		V_{DD} = 10 V	Positive rail		65		
			Negative rail		50		
		V_{DD} = 36 V	Positive rail		65		
			Negative rail		50		
Power Supply Quiescent Current	I_{DD}	V_O = V_{DD}/2, Per channel, no load	V_{DD} = 2.7 V		405	525	μA
			V_{DD} = 5 V		410	530	
			V_{DD} = 10 V		416	540	
			V_{DD} = 36 V		465	600	
		T_A = −40°C to +105°C				**700**	

NOTE: Power dissipation must be limited to prevent junction temperature from exceeding 150°C. See Absolute Maximum Ratings for more information.

TLV/NCV 272/274 AC ELECTRICAL CHARACTERISTICS
((V_{DD} = 2.7 V, 5 V, 10 V, 36 V), T_A = 25°C, and R_L ≥ 10 kΩ unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Unity Gain Bandwidth	UGBW	C_L = 25 pF	V_{DD} = 2.7 V		3		MHz
Slew Rate at Unity Gain	SR	C_L = 20 pF, R_L = 2 kΩ	V_{DD} = 2.7 V		2.8		V/μS
			V_{DD} = 5 V		2.7		
			V_{DD} = 10 V		2.6		
			V_{DD} = 36 V		2.4		
Phase Margin	θ_m	C_L = 25 pF			50		°
Gain Margin		C_L = 25 pF			14		dB
Settling Time to 0.1%	t_S	V_O = 1 V_{pp}, Gain = 1, C_L = 20 pF	V_{DD} = 2.7 V		0.6		μS
		V_O = 3 V_{pp}, Gain = 1, C_L = 20 pF	V_{DD} = 5 V		1.2		
		V_O = 8.5 V_{pp}, Gain = 1, C_L = 20 pF	V_{DD} = 10 V		3.4		
		V_O = 10 V_{pp}, Gain = 1, C_L = 20 pF	V_{DD} = 36 V		3.2		
Total Harmonic Distortion plus Noise	THD+N	V_{IN} = 0.5 V_{pp}, f = 1 kHz, Av = 1	V_{DD} = 2.7 V		0.05		%
		V_{IN} = 2.5 V_{pp}, f = 1 kHz, Av = 1	V_{DD} = 5 V		0.009		
		V_{IN} = 7.5 V_{pp}, f = 1 kHz, Av = 1	V_{DD} = 10 V		0.004		
		V_{IN} = 28.5 V_{pp}, f = 1 kHz, Av = 1	V_{DD} = 36 V		0.001		
Input−Referred Voltage Noise	e_n	f = 1 kHz			30		nV/$\sqrt{Hz}$
		f = 10 kHz			20		
Input−Referred Current Noise	i_n	f = 1 kHz			90		fA/$\sqrt{Hz}$

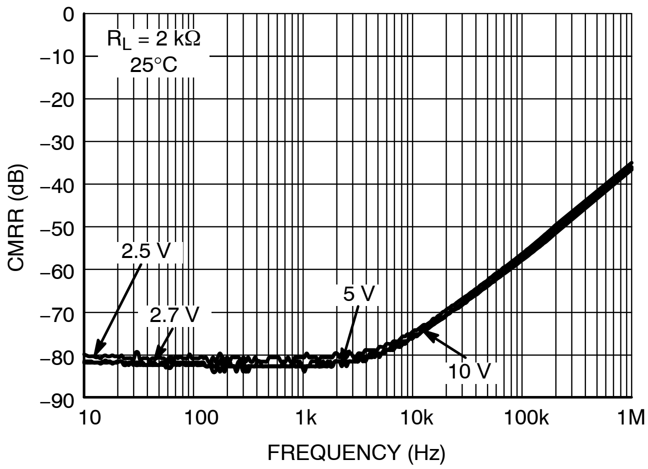


Figure 1. CMRR vs. Frequency for TLV271

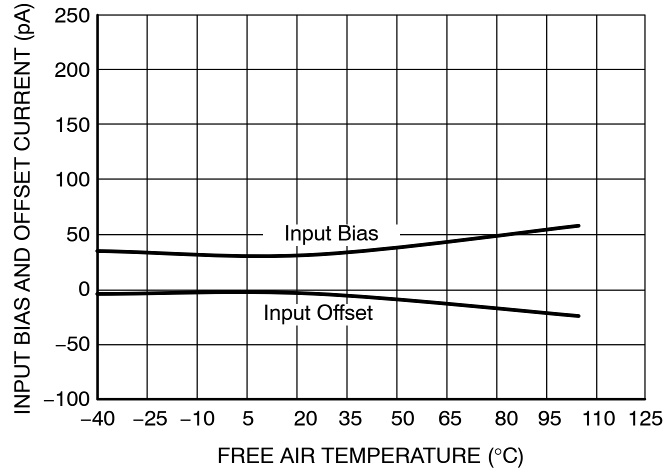


Figure 2. Input Bias and Offset Current vs. Temperature for TLV271

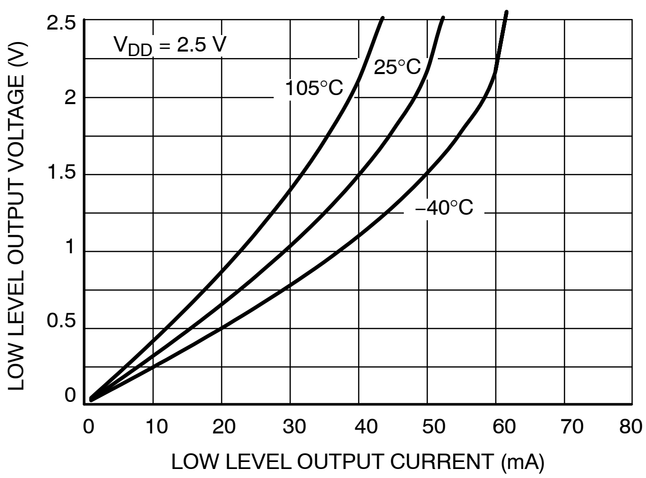


Figure 3. 2.5 V V_{OL} vs. I_{out}

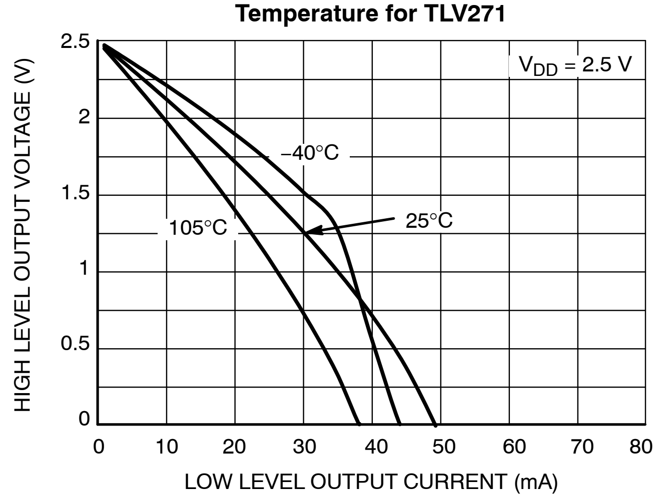


Figure 4. 2.5 V V_{OH} vs. I_{out}

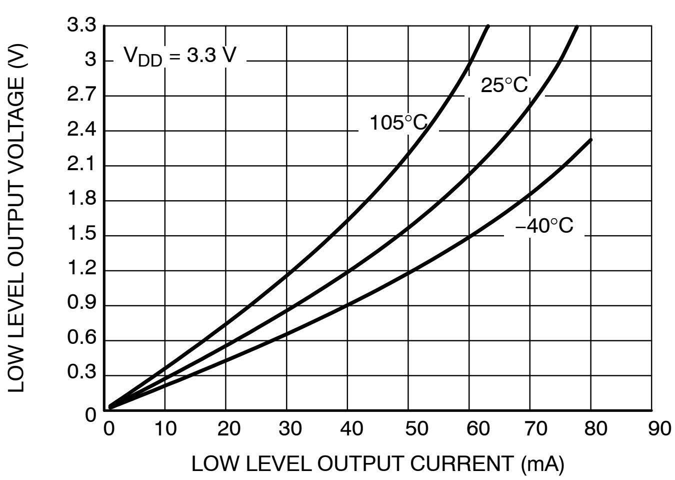


Figure 5. 3.3 V V_{OL} vs. I_{out}

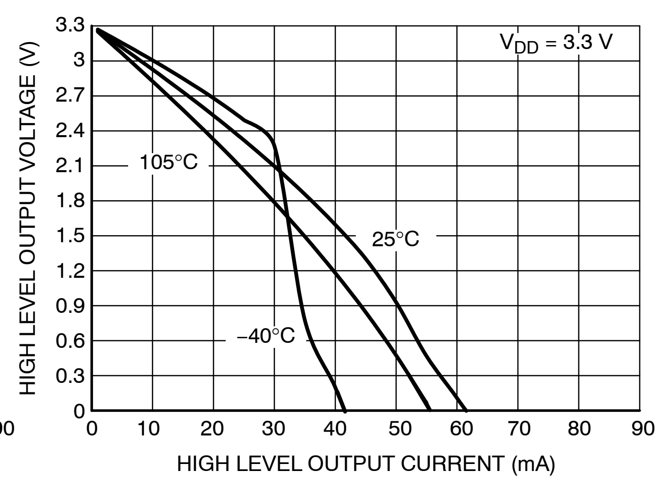


Figure 6. 3.3 V V_{OH} vs. I_{out}

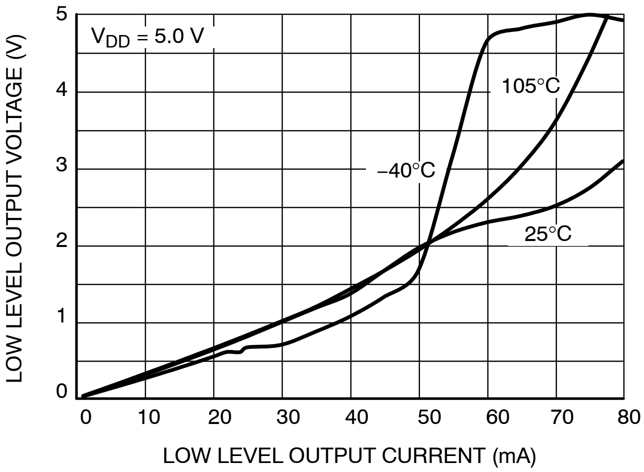


Figure 7. V_{OL} vs. I_{out}

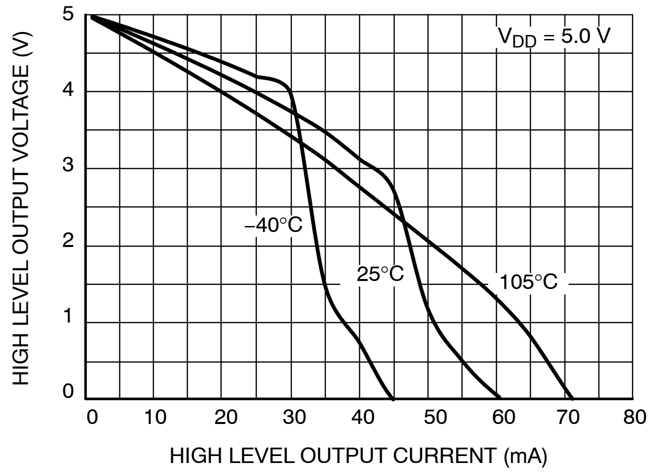


Figure 8. V_{OH} vs. I_{out}

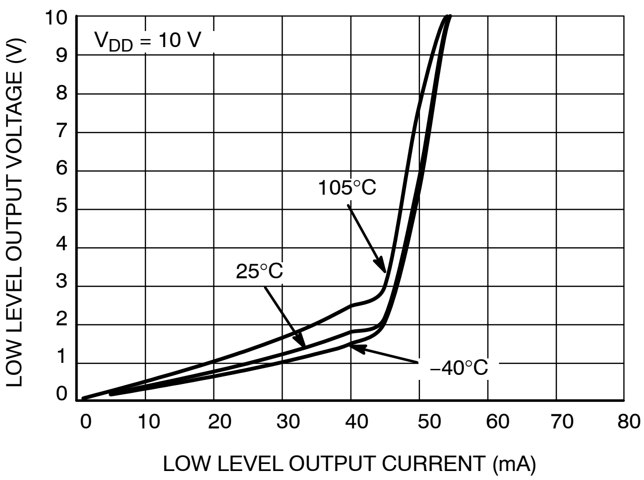


Figure 9. 10 V V_{OL} vs. I_{out}

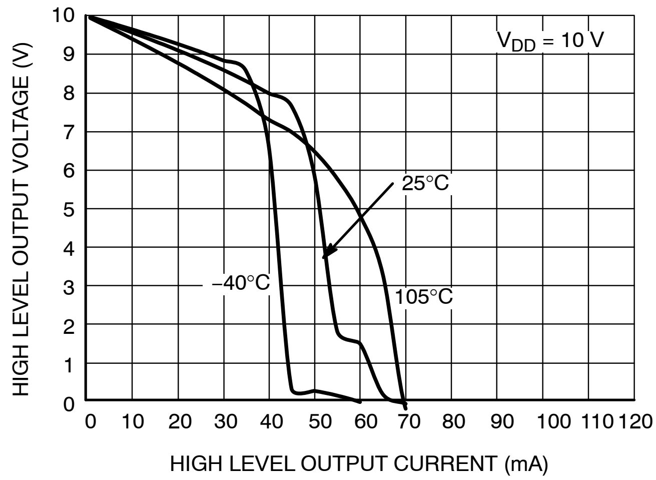


Figure 10. 10 V V_{OH} vs. I_{out}

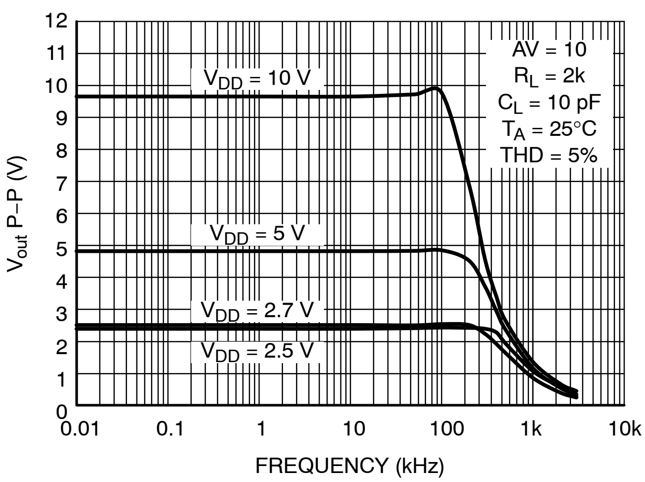


Figure 11. Peak−to−Peak Output vs. Supply vs. Frequency

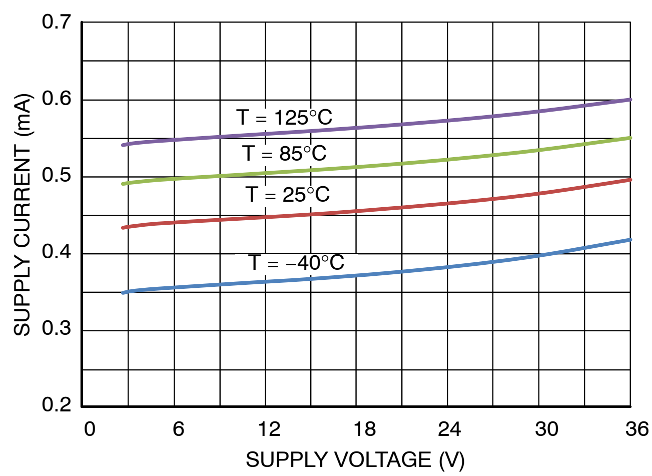


Figure 12. Quiescent Current Per Channel vs. Supply Voltage for TLV/NCV272/274

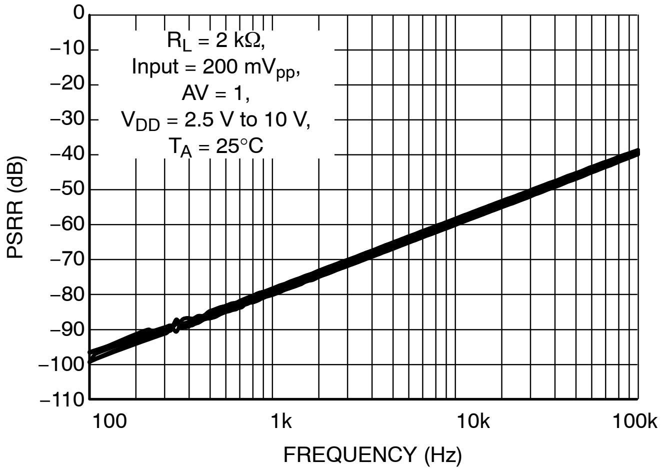


Figure 13. PSRR vs. Frequency for TLV271

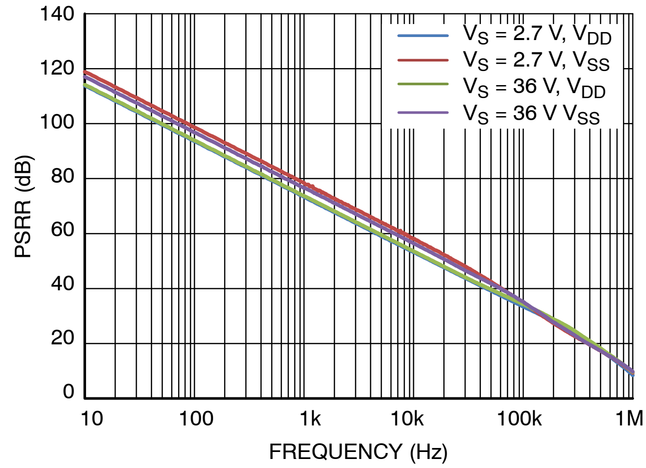


Figure 14. PSRR vs. Frequency for TLV/NCV272/274

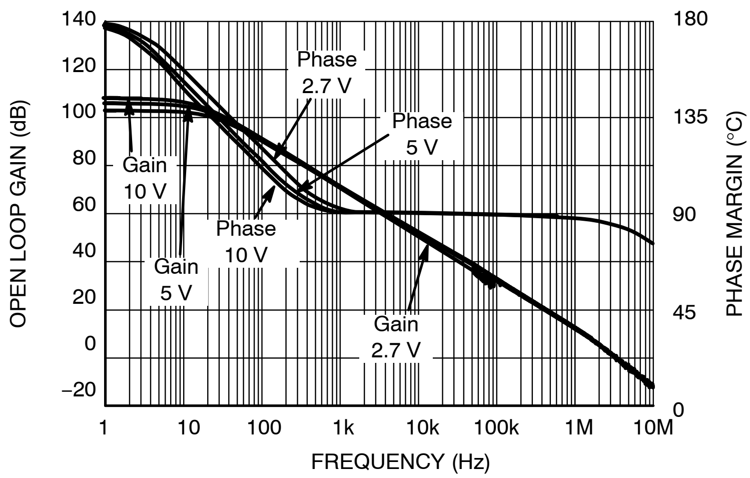


Figure 15. Open Loop Gain and Phase vs. Frequency

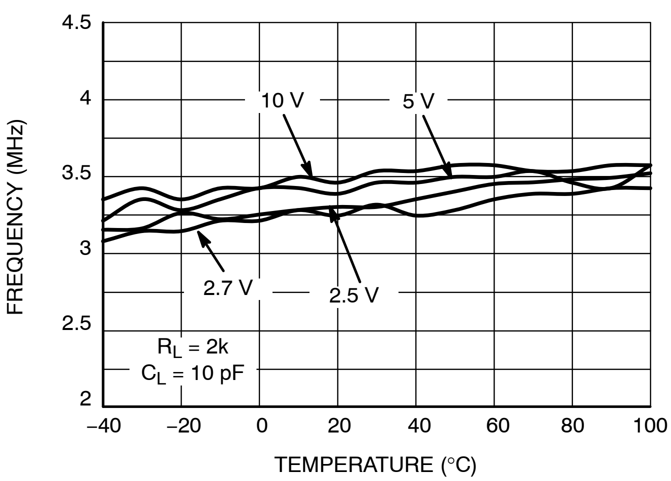


Figure 16. Gain Bandwidth Product vs. Temperature

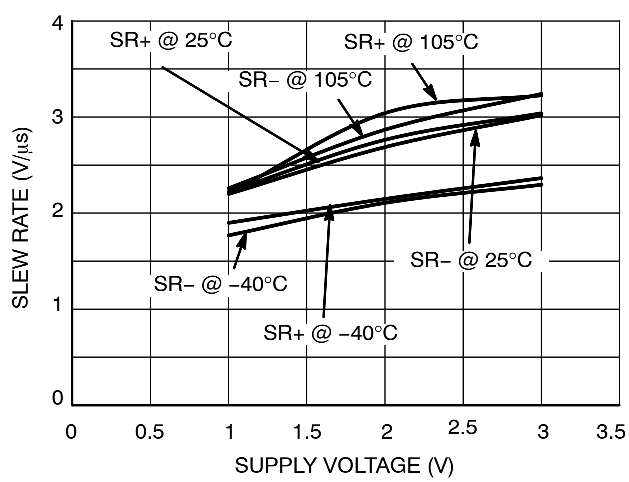


Figure 17. Slew Rate vs. Supply Voltage

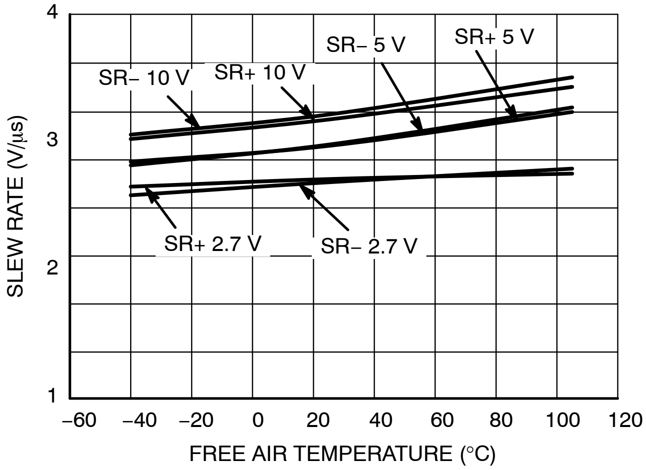


Figure 18. Slew Rate vs. Temperature

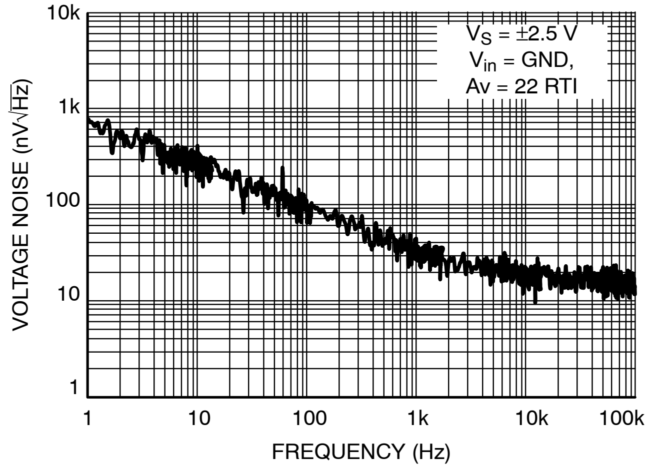


Figure 19. Voltage Noise vs. Frequency

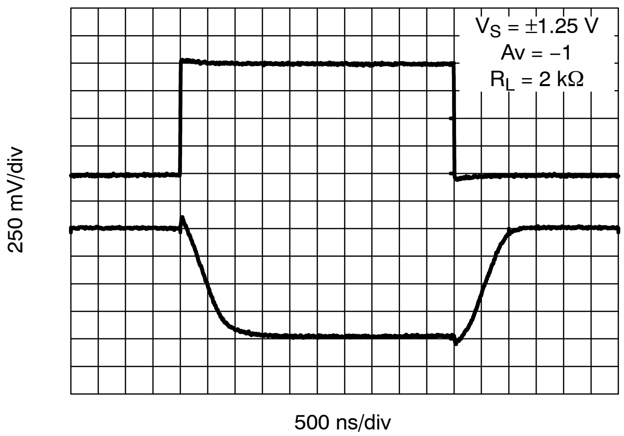


Figure 20. 2.5 V Inverting Large Signal Pulse Response

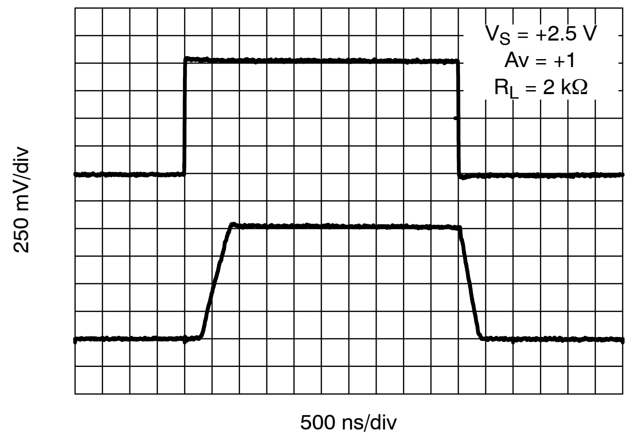


Figure 21. 2.5 V Non−Inverting Large Signal Pulse Response

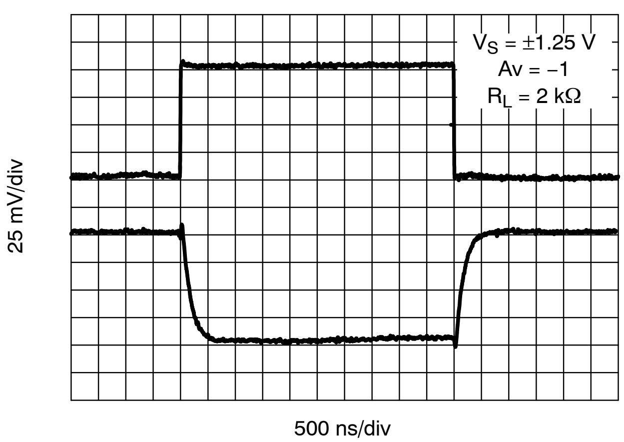


Figure 22. 2.5 V Inverting Small Signal Pulse Response

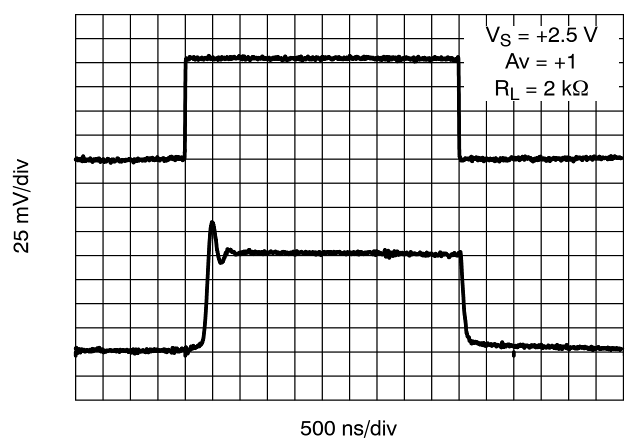


Figure 23. 2.5 V Non−Inverting Small Signal Pulse Response

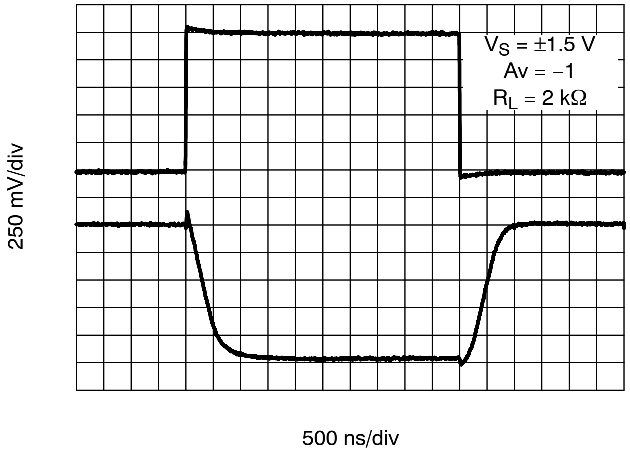


Figure 24. 3 V Inverting Large Signal Pulse Response

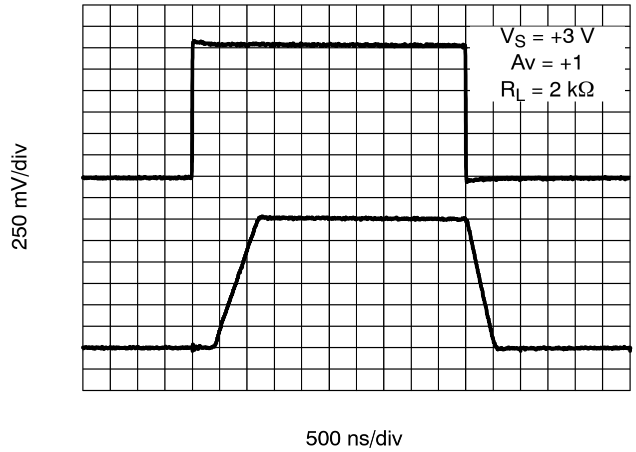


Figure 25. 3 V Non−Inverting Large Signal Pulse Response

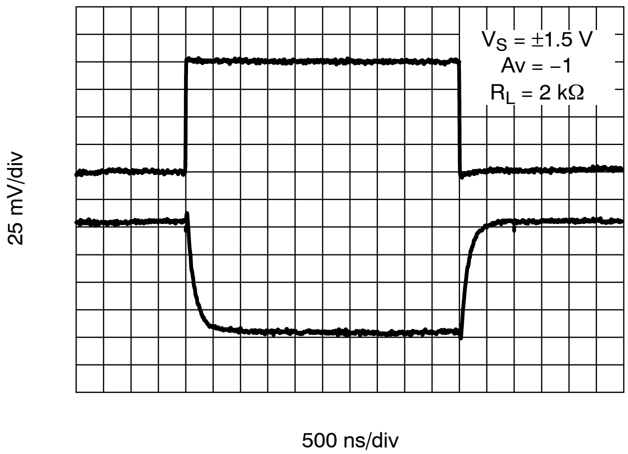


Figure 26. 3 V Inverting Small Signal Pulse Response

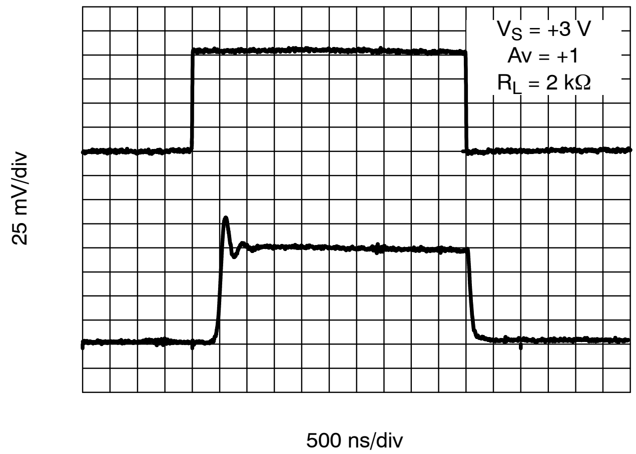


Figure 27. 3 V Non−Inverting Small Signal Pulse Response

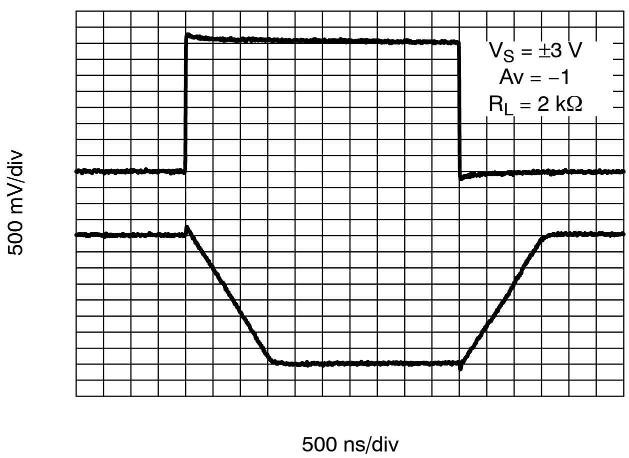


Figure 28. 6 V Inverting Large Signal Pulse Response

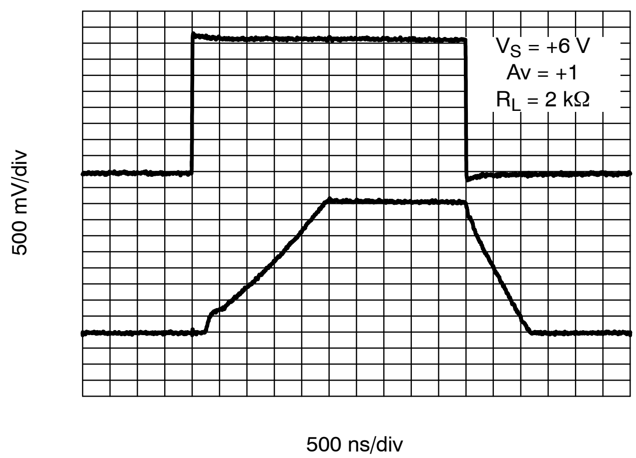


Figure 29. 6 V Non−Inverting Large Signal Pulse Response

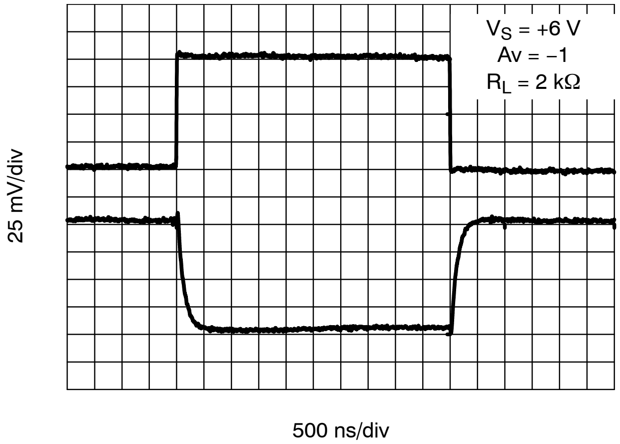


Figure 30. 6 V Inverting Small Signal Pulse Response

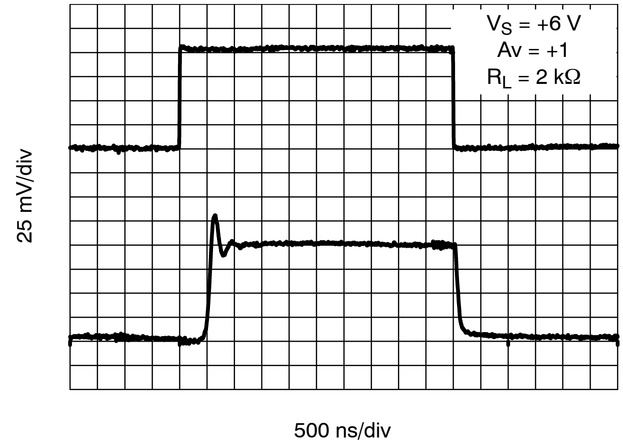


Figure 31. 6 V Non−Inverting Small Signal Pulse Response

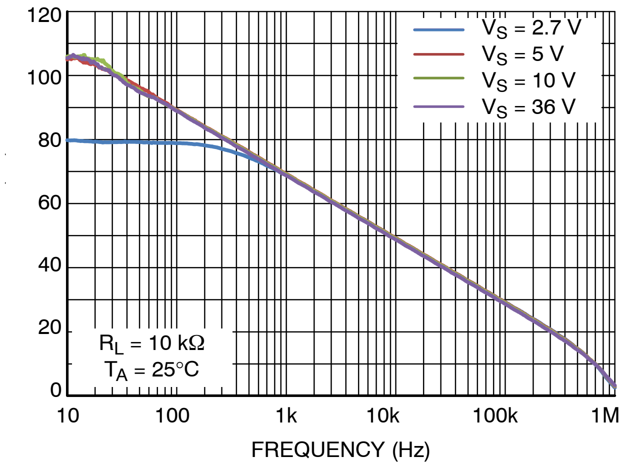


Figure 32. CMRR vs. Frequency for TLV/NCV272/274

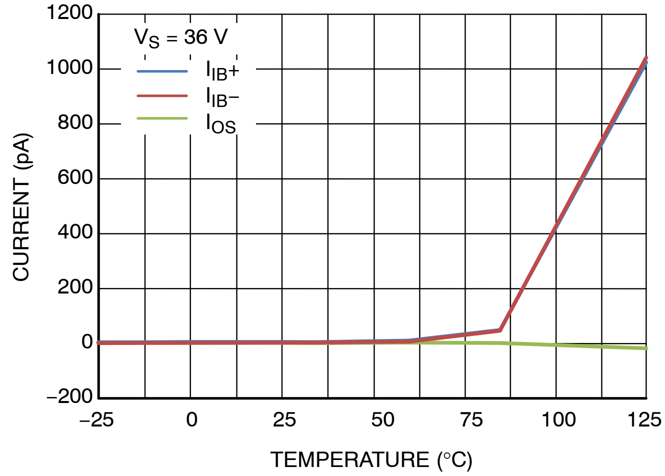


Figure 33. Input Bias and Offset Current vs. Temperature for TLV/NCV272/274

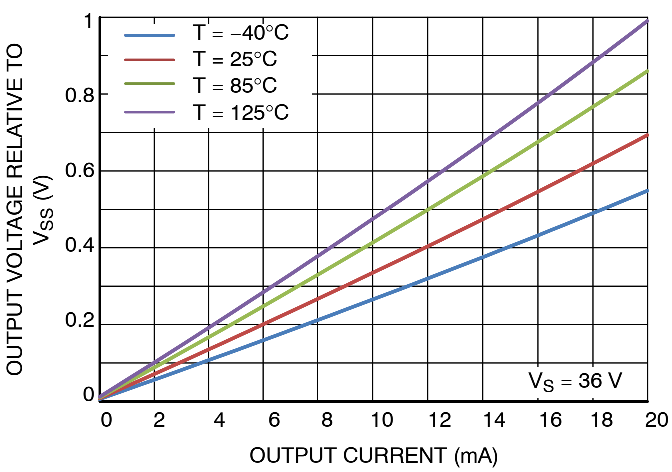


Figure 34. Low Level Output vs. Output Current for TLV/NCV272/274

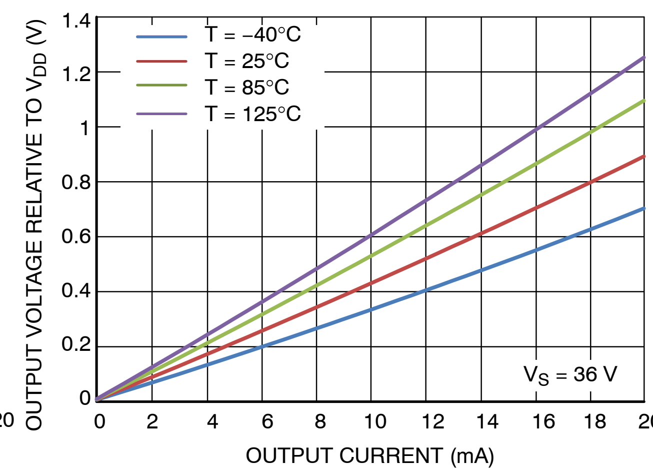


Figure 35. High Level Output vs. Output Current for TLV/NCV272/274

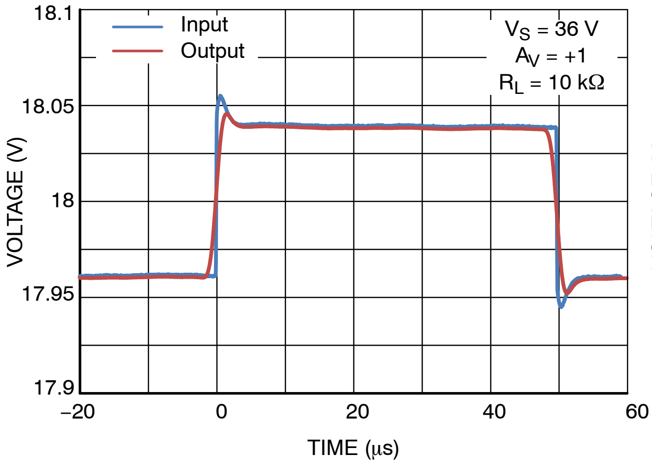


Figure 36. Non−inverting Small Signal Transient Response for TLV/NCV272/274

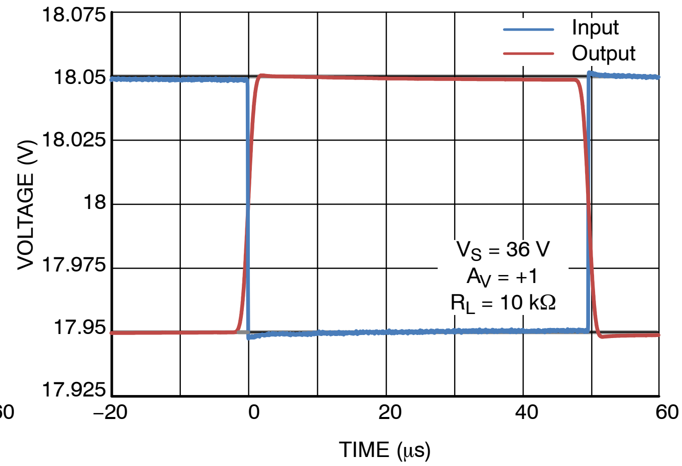


Figure 37. Inverting Small Signal Transient Response for TLV/NCV272/274

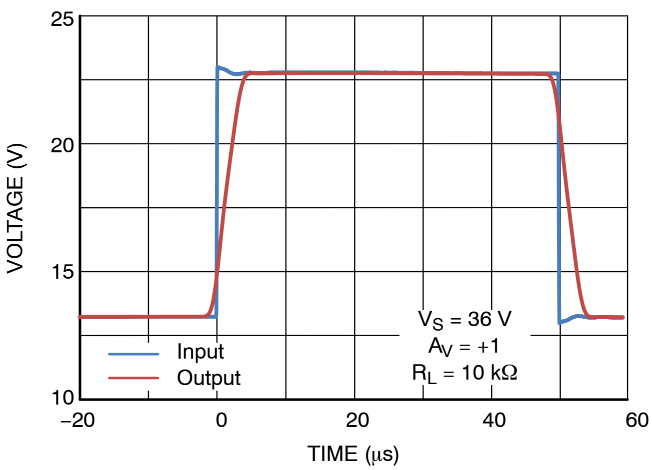


Figure 38. Non−inverting Large Signal Transient Response for TLV/NCV272/274

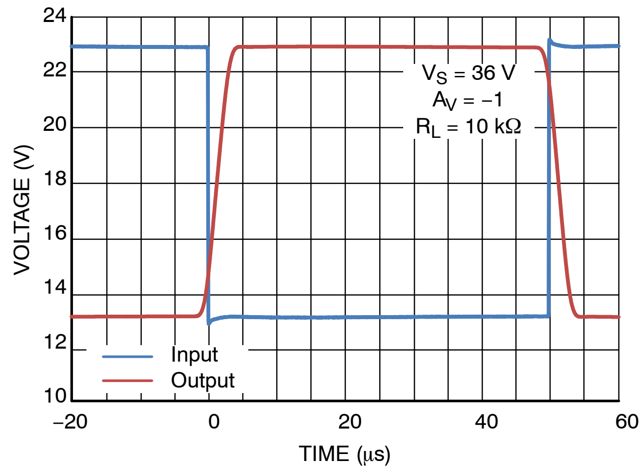
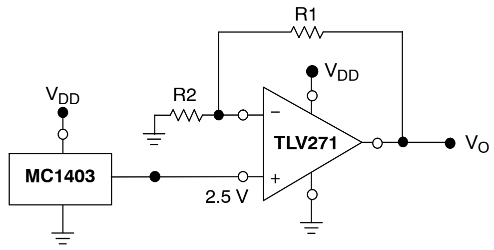


Figure 39. Inverting Large Signal Transient Response for TLV/NCV272/274

APPLICATIONS



$$V_O = 2.5\ V\left(1 + \frac{R1}{R2}\right)$$

Figure 40. Voltage Reference

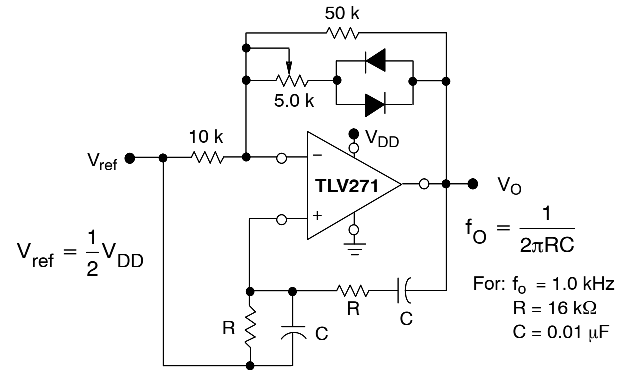
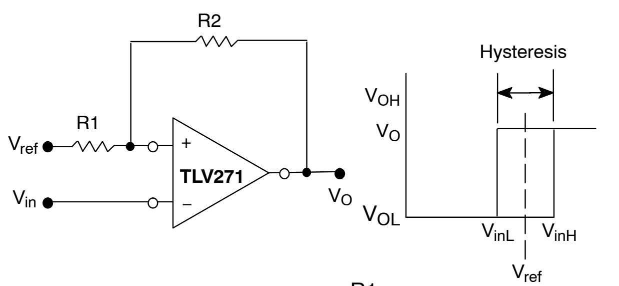


Figure 41. Wien Bridge Oscillator

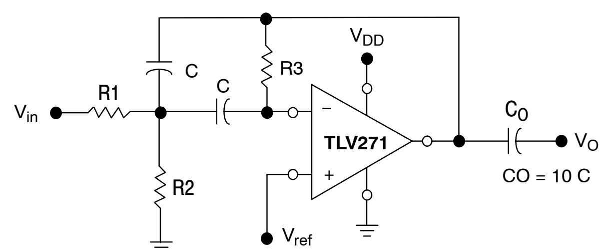


$$V_{in}L = \frac{R1}{R1 + R2}(V_{OL} - V_{ref}) + V_{ref}$$

$$V_{in}H = \frac{R1}{R1 + R2}(V_{OH} - V_{ref}) + V_{ref}$$

$$H = \frac{R1}{R1 + R2}(V_{OH} - V_{OL})$$

Figure 42. Comparator with Hysteresis



Given: f_o = center frequency
$A(f_o)$ = gain at center frequency

Choose value f_o, C

Then : $R3 = \frac{Q}{\pi f_O C}$

$$R1 = \frac{R3}{2\,A(f_O)}$$

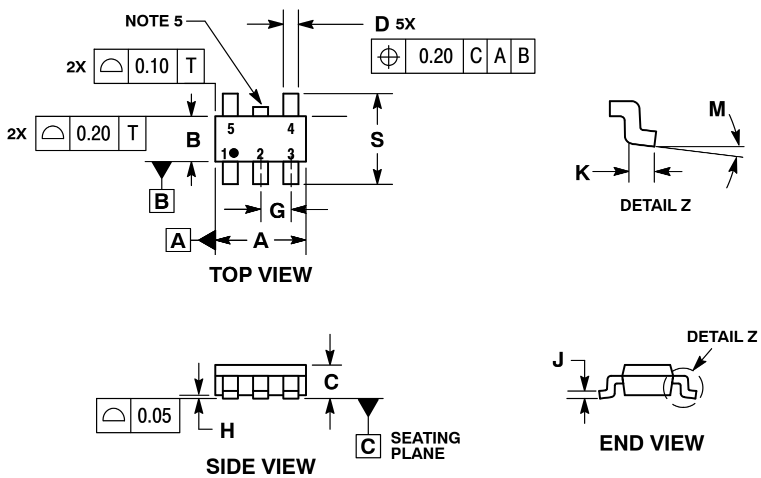
$$R2 = \frac{R1\ R3}{4Q^2\,R1 - R3}$$

For less than 10% error from operational amplifier, $((Q_O\, f_O)/BW) < 0.1$ where f_o and BW are expressed in Hz. If source impedance varies, filter may be preceded with voltage follower buffer to stabilize filter parameters.

Figure 43. Multiple Feedback Bandpass Filter

PACKAGE DIMENSIONS

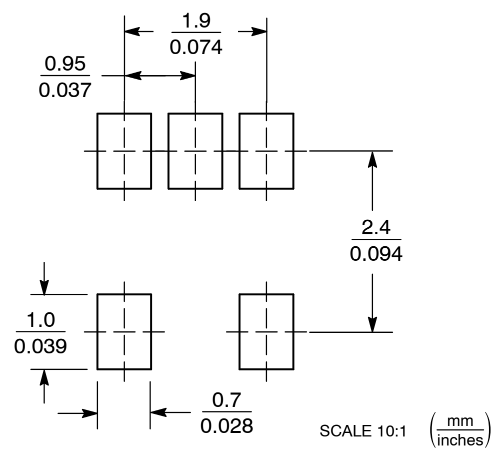
TSOP−5
CASE 483
ISSUE M



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSION A.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

	MILLIMETERS	
DIM	MIN	MAX
A	2.85	3.15
B	1.35	1.65
C	0.90	1.10
D	0.25	0.50
G	0.95 BSC	
H	0.01	0.10
J	0.10	0.26
K	0.20	0.60
M	0 °	10 °
S	2.50	3.00

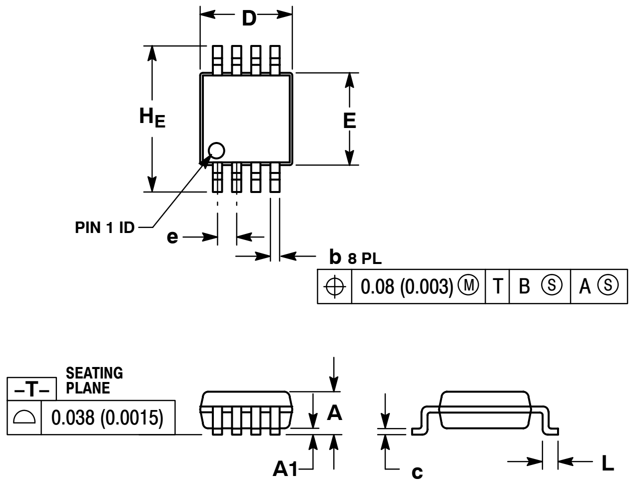
SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

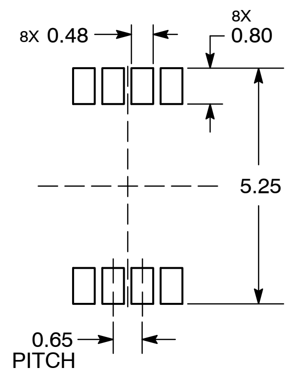
Micro8™
CASE 846A−02
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. 846A-01 OBSOLETE, NEW STANDARD 846A-02.

	MILLIMETERS			INCHES		
DIM	**MIN**	**NOM**	**MAX**	**MIN**	**NOM**	**MAX**
A	−−	−−	1.10	−−	−−	0.043
A1	0.05	0.08	0.15	0.002	0.003	0.006
b	0.25	0.33	0.40	0.010	0.013	0.016
c	0.13	0.18	0.23	0.005	0.007	0.009
D	2.90	3.00	3.10	0.114	0.118	0.122
E	2.90	3.00	3.10	0.114	0.118	0.122
e	0.65 BSC			0.026 BSC		
L	0.40	0.55	0.70	0.016	0.021	0.028
HE	4.75	4.90	5.05	0.187	0.193	0.199

RECOMMENDED SOLDERING FOOTPRINT*

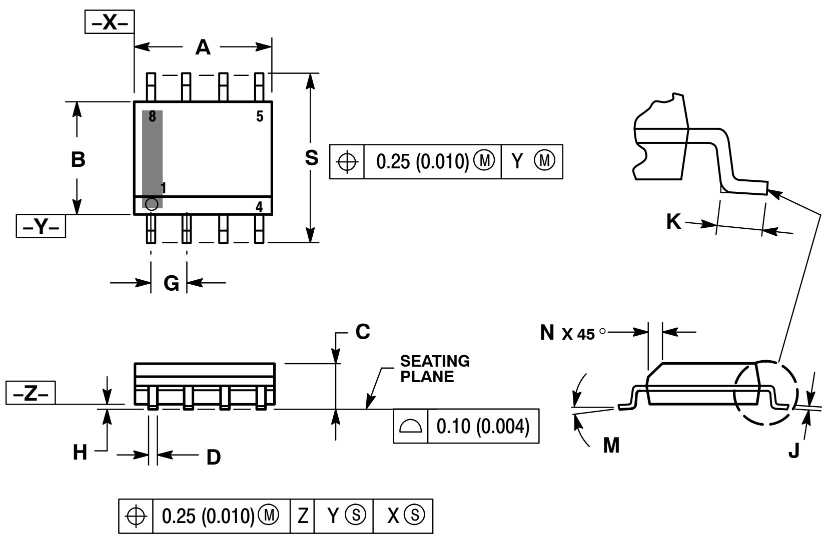


DIMENSION: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

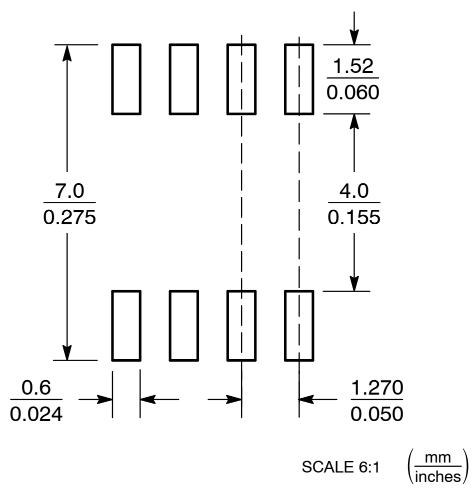
SOIC−8 NB
CASE 751−07
ISSUE AK



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

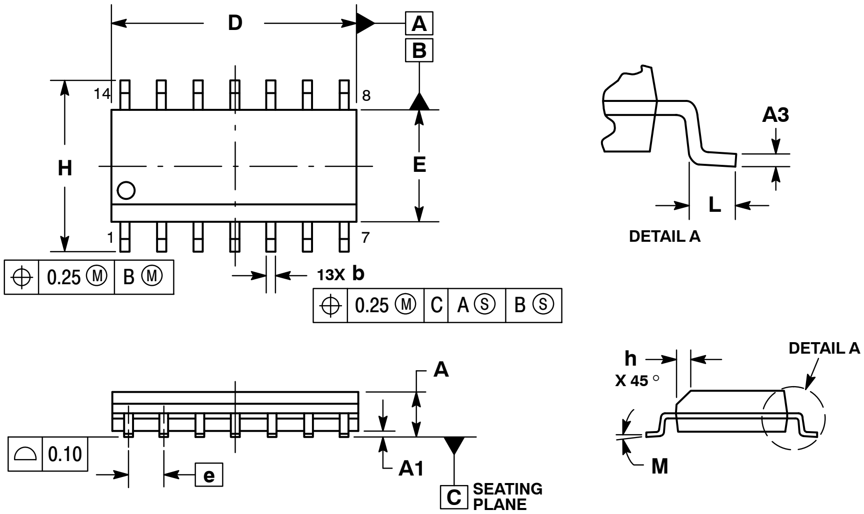
SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

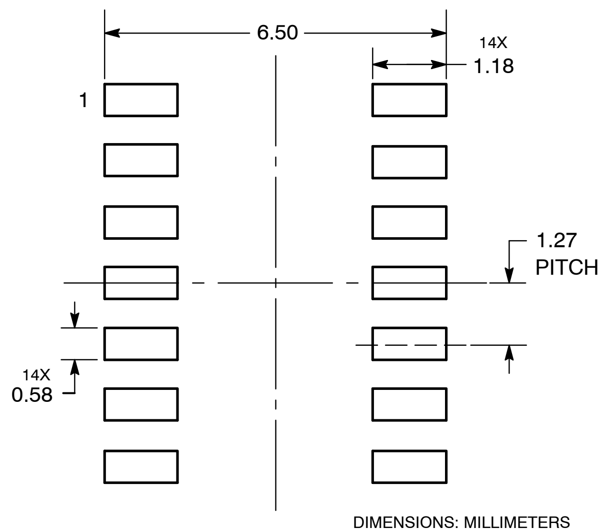
SOIC−14 NB
CASE 751A−03
ISSUE L



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

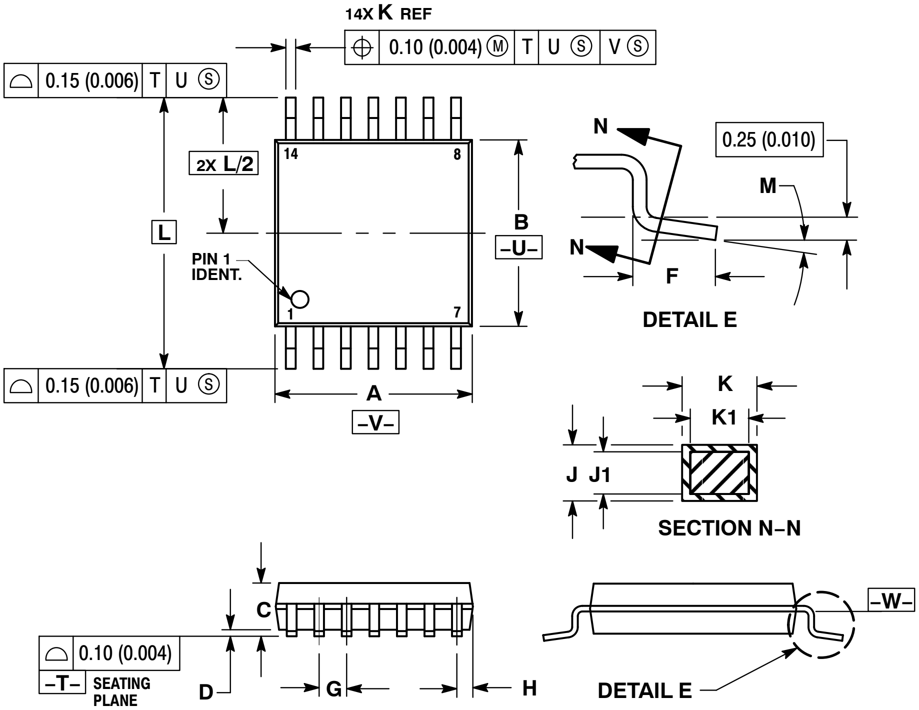
SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

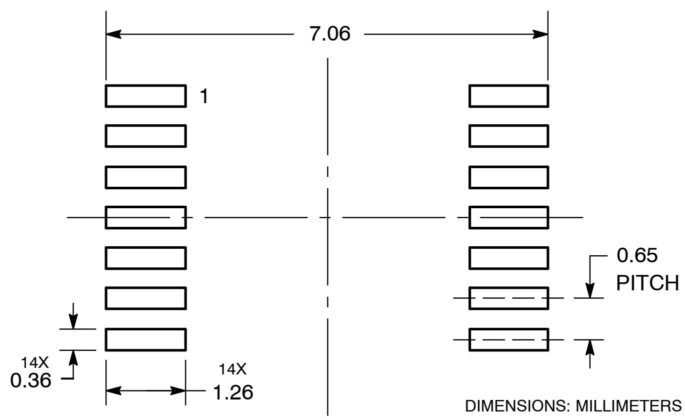
TSSOP−14
CASE 948G
ISSUE C



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE −W−.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.50	0.60	0.020	0.024
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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