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- 8-Bit Resolution
- Easy Microprocessor Interface or Stand-Alone Operation
- Operates Ratiometrically or With 5-V Reference
- 4- or 8-Channel Multiplexer Options With Address Logic
- Input Range 0 to 5 V With Single 5-V Supply
- Remote Operation With Serial Data Link

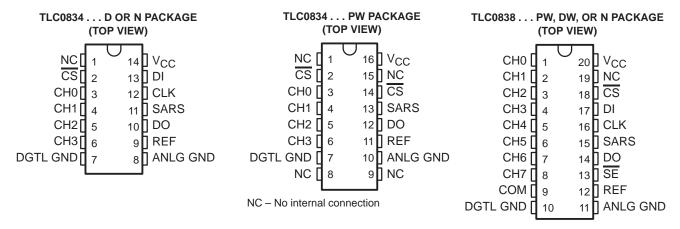
- Inputs and Outputs Are Compatible With TTL and MOS
- Conversion Time of 32 μs at f<sub>clock</sub> = 250 kHz
- Functionally Equivalent to the ADC0834 and ADC0838 Without the Internal Zener Regulator Network
- Total Unadjusted Error . . . ±1 LSB

## description

These devices are 8-bit successive- approximation analog-to-digital converters, each with an input-configurable multichannel multiplexer and serial input/output. The serial input/ output is configured to interface with standard shift registers or microprocessors. Detailed information on interfacing with most popular microprocessors is readily available from the factory.

The TLC0834 (4-channel) and TLC0838 (8-channel) multiplexer is software-configured for single-ended or differential inputs as well as pseudodifferential input assignments. The differential analog voltage input allows for common-mode rejection or offset of the analog zero input voltage value. In addition, the voltage reference input can be adjusted to allow encoding of any smaller analog voltage span to the full 8 bits of resolution.

The TLC0834C and TLC0838C are characterized for operation from  $0^{\circ}$ C to  $70^{\circ}$ C. The TLC0834I and TLC0838I are characterized for operation from  $-40^{\circ}$ C to  $85^{\circ}$ C. The TLC0834Q is characterized for operation from  $-40^{\circ}$ C to  $125^{\circ}$ C.



## **AVAILABLE OPTIONS**

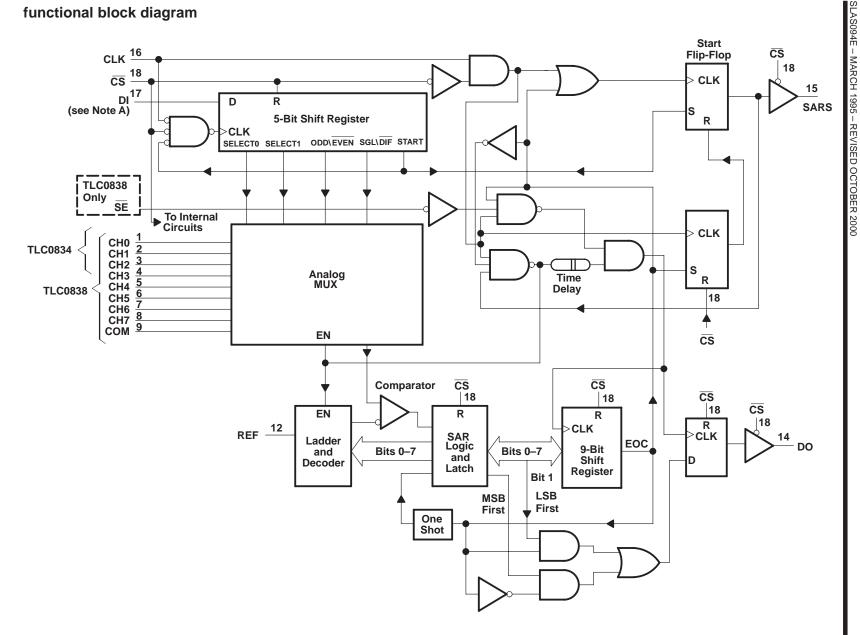
			PACKAGE			
TA	TA SMALL SMALL OUTLINE (D) (DW)		PLASTIC DIP (N)	TSSOP (PW)		
0°C to 70°C	TLC0834CD	TLC0838CDW	TLC0834CN TLC0838CN	TLC0834CPW TLC0838CPW		
-40°C to 85°C	TLC0834ID	TLC0838IDW	TLC0834IN TLC0838IN	TLC0834IPW TLC0838IPW		
-40°C to 125°C	_	_	TLC0834QN —	_		



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.



## functional block diagram



NOTES A: For the TLC0834, DI is input directly to the D input of SELECT1; SELECT0 is forced to a high. B: Terminal numbers shown are for the DW or N package.

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## functional description

The TLC0834 and TLC0838 use a sample-data-comparator structure that converts differential analog inputs by a successive-approximation routine. Operation of both devices is similar with the exception of  $\overline{SE}$ , an analog common input, and multiplexer addressing. The input voltage to be converted is applied to a channel terminal and is compared to ground (single ended), to an adjacent input (differential), or to a common terminal (pseudo differential) that can be an arbitrary voltage. The input terminals are assigned a positive (+) or negative (–) polarity. When the signal input applied to the assigned positive terminal is less than the signal on the negative terminal, the converter output is all zeros.

Channel selection and input configuration are under software control using a serial-data link from the controlling processor. A serial-communication format allows more functions to be included in a converter package with no increase in size. In addition, it eliminates the transmission of low-level analog signals by locating the converter at the analog sensor and communicating serially with the controlling processor. This process returns noise-free digital data to the processor.

A particular input configuration is assigned during the multiplexer-addressing sequence. The multiplexer address shifts into the converter through the data input (DI) line. The multiplexer address selects the analog inputs to be enabled and determines whether the input is single ended or differential. When the input is differential, the polarity of the channel input is assigned. Differential inputs are assigned to adjacent channel pairs. For example, channel 0 and channel 1 may be selected as a differential pair. These channels cannot act differentially with any other channel. In addition to selecting the differential mode, the polarity may also be selected. Either channel of the channel pair may be designated as the negative or positive input.

The common input on the TLC0838 can be used for a pseudodifferential input. In this mode, the voltage on the common input is considered to be the negative differential input for all channel inputs. This voltage can be any reference potential common to all channel inputs. Each channel input can then be selected as the positive differential input. This feature is useful when all analog circuits are biased to a potential other than ground.

A conversion is initiated by setting  $\overline{CS}$  low, which enables all logic circuits.  $\overline{CS}$  must be held low for the complete conversion process. A clock input is then received from the processor. On each low-to-high transition of the clock input, the data on DI is clocked into the multiplexer-address shift register. The first logic high on the input is the start bit. A 3- to 4-bit assignment word follows the start bit. On each successive low-to-high transition of the clock input, the start bit and assignment word are shifted through the shift register. When the start bit is shifted into the start location of the multiplexer register, the input channel is selected and conversion starts. The SAR status output (SARS) goes high to indicate that a conversion is in progress, and DI to the multiplexer shift register is disabled for the duration of the conversion.

An interval of one clock period is automatically inserted to allow the selected multiplexed channel to settle. DO comes out of the high-impedance state and provides a leading low for one clock period of multiplexer settling time. The SAR comparator compares successive outputs from the resistive ladder with the incoming analog signal. The comparator output indicates whether the analog input is greater than or less than the resistive-ladder output. As the conversion proceeds, conversion data is simultaneously output from DO, with the most significant bit (MSB) first. After eight clock periods, the conversion is complete and SARS goes low.

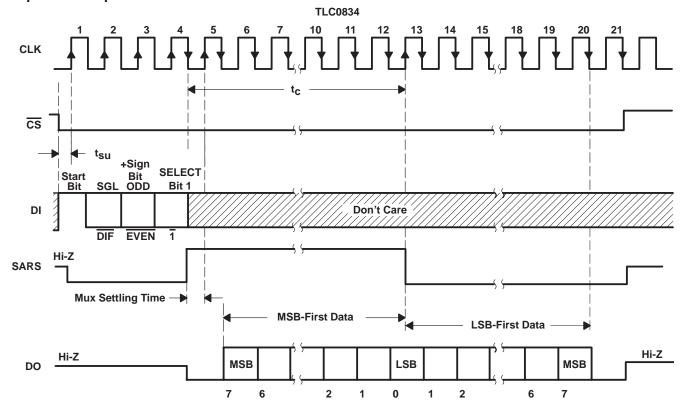
The TLC0834 outputs the least-significant-bit (LSB) first data after the MSB-first data stream. When  $\overline{SE}$  is held high on the TLC0838, the value of the LSB remains on the data line. When  $\overline{SE}$  is forced low, the data is then clocked out as LSB-first data. (To output LSB first,  $\overline{SE}$  must first go low, then the data stored in the 9-bit shift register outputs LSB first.) When  $\overline{CS}$  goes high, all internal registers are cleared. At this time, the output circuits go to the high-impedance state. If another conversion is desired,  $\overline{CS}$  must make a high-to-low transition followed by address information.

DI and DO can be tied together and controlled by a bidirectional processor I/O bit received on a single wire. This is possible because DI is only examined during the multiplexer-addressing interval and DO is still in the high-impedance state.



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## sequence of operation



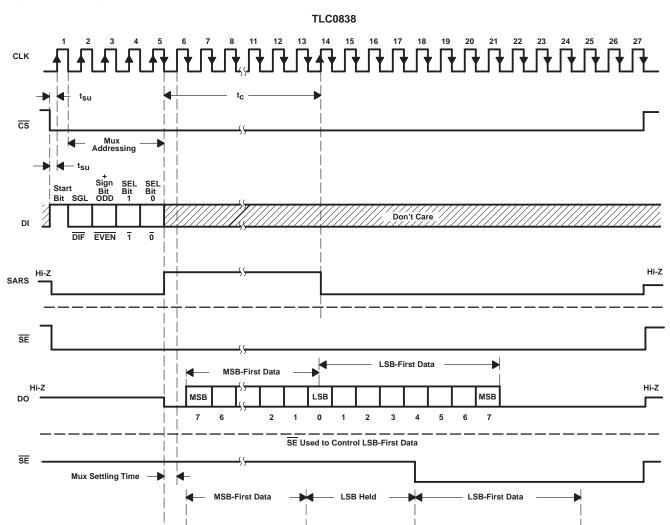
TLC0834 MUX-ADDRESS CONTROL LOGIC TABLE

	MUX ADDRE	ss	CHANNEL NUMBER					
SGL/DIF	ODD/EVEN	SELECT BIT 1	CH0	CH1	CH2	CH3		
L	L	L	+	_				
L	L	Н			+	-		
L	Н	L	_	+				
L	Н	Н			-	+		
Н	L	L	+					
Н	L	Н			+			
Н	Н	L		+				
Н	Н	Н				+		

H = high level, L = low level, - or + = terminal polarity for the selected input channel

мѕв

## sequence of operation



LSB

MSB



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#### TLC0838 MUX-ADDRESS CONTROL LOGIC TABLE

	MUX ADDRESS				SE	LECTE	D CHA	NNEL	NUMB	ER		
SGL/DIF	ODD/EVEN	SEL	ECT		0		1		2		3	СОМ
3GL/DIF	ODD/EVEN	1	0	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7	
L	L	L	L	+	-							
L	L	L	Н			+	_					
L	L	Н	L					+	_			
L	L	Н	Н							+	_	
L	Н	L	L	-	+							
L	Н	L	Н			-	+					
L	Н	Н	L					_	+			
L	Н	Н	Н							_	+	
Н	L	L	L	+								-
Н	L	L	Н			+						-
Н	L	Н	L					+				-
Н	L	Н	Н							+		_
Н	Н	L	L		+							_
Н	Н	L	Н				+					_
Н	Н	Н	L						+			_
Н	Н	Н	Н								+	_

H = high level, L = low level, - or + = polarity of external input

## absolute maximum ratings over recommended operating free-air temperature range (unless otherwise noted) $^{\dagger}$

Supply voltage, V <sub>CC</sub> (see Note 1)	6.5 V
Input voltage range: Logic	
Analog	0.3 V to V <sub>CC</sub> + 0.3 V
Input current, I <sub>1</sub>	
Total input current	±20 mA
Operating free-air temperature range, T <sub>A</sub> : C suffix	0°C to 70°C
I suffix	–40°C to 85°C
Storage temperature range, T <sub>Stq</sub>	–65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: N package	260°C

<sup>†</sup> 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: All voltage values, except differential voltages, are with respect to the network ground terminal.



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## recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V <sub>CC</sub>		4.5	5	5.5	V
High-level input voltage, VIH	High-level input voltage, V <sub>IH</sub>				V
Low-level input voltage, V <sub>IL</sub>				0.8	V
Clock frequency, f <sub>(clock)</sub>				600	kHz
Clock duty cycle (see Note 2)				60%	
Pulse duration, CS high, t <sub>W</sub>		220			ns
Setup time, CS low, SE low, or data valid before	e CLK↑, t <sub>SU</sub> (see Figures 1 and 2)	350			ns
Hold time, data valid after CLK↑, th (see Figure 1)					ns
Operating free-air temperature, Тд	C suffix	0		70	°C
Operating nee-air temperature, 14	I suffix	-40		85	

NOTE 2: The clock-duty-cycle range ensures proper operation at all clock frequencies. When a clock frequency is used outside the recommended duty-cycle range, the minimum pulse duration (high or low) is 1 μs.

# electrical characteristics over recommended range of operating free-air temperature, $V_{CC}$ = 5 V, $f_{(clock)}$ = 250 kHz (unless otherwise noted)

## digital section

	DADAMETER			(	SUFFIX		ı	SUFFIX		UNIT
	PARAMETER	TEST CON	TEST CONDITIONS†			MAX	MIN	TYP‡	MAX	UNII
V	High-level output voltage	$V_{CC} = 4.75 \text{ V},$	I <sub>OH</sub> = -360 μA	2.8			2.4			V
VOH	High-level output voltage	$V_{CC} = 4.75 \text{ V},$	$I_{OH} = -10 \mu\text{A}$	4.6			4.5			V
VOL	Low-level output voltage	$V_{CC} = 5.25 \text{ V},$	I <sub>OL</sub> = 1.6 mA			0.34			0.4	V
lіН	High-level input current	V <sub>IH</sub> = 5 V,	V <sub>IH</sub> = 5 V		0.005	1		0.005	1	μΑ
I <sub>I</sub> L	Low-level input current	V <sub>IL</sub> = 0,	V <sub>IL</sub> = 0		-0.005	-1		-0.005	-1	μΑ
Іон	High-level output (source) current	$V_{OH} = 0$ ,	T <sub>A</sub> = 25°C	-6.5	-24		-6.5	-24		mA
l <sub>OL</sub>	Low-level output (sink) current	$V_{OL} = V_{CC}$	T <sub>A</sub> = 25°C	8	26		8	26		mA
1	High-impedance-state output	V <sub>O</sub> = 5 V,	T <sub>A</sub> = 25°C		0.01	3		0.01	3	^
loz	current (DO or SARS)	$V_{O} = 0,$	T <sub>A</sub> = 25°C		-0.01	-3		-0.01	-3	μΑ
Ci	Input capacitance							5		pF
Со	Output capacitance							5		pF

<sup>†</sup> All parameters are measured under open-loop conditions with zero common-mode input voltage (unless otherwise specified).

<sup>‡</sup> All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

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# electrical characteristics over recommended range of operating free-air temperature, $V_{CC} = 5 \text{ V}$ , $f_{(clock)} = 250 \text{ kHz}$ (unless otherwise noted) (continued)

#### analog and converter section

	PARAMETER		TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT
VIC	Common-mode input voltage		See Note 3	-0.05 to V <sub>CC</sub> +0.05			٧
		On channel	V <sub>I</sub> = 5 V			1	
lar an s	Ctandley input augment (and Nate 4)	Off channel	V <sub>I</sub> = 0			-1	
<sup>I</sup> I(stdby)	Standby input current (see Note 4)	On channel	V <sub>I</sub> = 0			-1	μΑ
		Off channel	V <sub>I</sub> = 5 V			1	
ri(REF)	Input resistance to REF			1.3	2.4	5.9	kΩ

<sup>†</sup> All parameters are measured under open-loop conditions with zero common-mode input voltage.

NOTES: 3. When channel IN – is more positive than channel IN+, the digital output code is 0000 0000. Connected to each analog input are two on-chip diodes that conduct forward current for analog input voltages one diode drop above V<sub>CC</sub>. Care must be taken during testing at low V<sub>CC</sub> levels (4.5 V) because high-level analog input voltage (5 V) can, especially at high temperatures, cause the input diode to conduct and cause errors for analog inputs that are near full scale. As long as the analog voltage does not exceed the supply voltage by more than 50 mV, the output code is correct. To achieve an absolute 0- to 5-V input range requires a minimum V<sub>CC</sub> of 4.950 V for all variations of temperature and load.

4. Standby input currents go in or out of the on or off channels when the A/D converter is not performing conversion and the clock is in a high or low steady-state condition.

#### total device

	PARAMETER	MIN	TYP <sup>‡</sup>	MAX	UNIT
ICC	Supply current		0.6	1.25	mA

<sup>‡</sup> All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

# operating characteristics, $V_{CC}$ = 5 V, $f_{(clock)}$ = 250 kHz, $t_r$ = $t_f$ = 20 ns, $T_A$ = 25°C (unless otherwise noted)

	PARAMETER		TEST C	CONDITIONS§	MIN	TYP	MAX	UNIT
	Supply-voltage variation error		V <sub>CC</sub> = 4.75 \	√ to 5.25 V		±1/16	±1/4	LSB
	Total unadjusted error (see Note 5)		$V_{ref} = 5 V$ ,	$T_A = MIN \text{ to } MAX$			±1	LSB
	Common-mode error		Differential m	iode		±1/16	±1/4	LSB
	Propagation delay time, output		C: -100 pE			-	1500	no
<sup>t</sup> pd	data after CLK↓ (see Note 6 and Figure 2)	LSB-first data	C <sub>L</sub> = 100 pF			600	ns	
<b>.</b>	Output disable time DO or CARC offer CCA	(aaa Firman 2)	$C_L = 10 pF$ ,	R <sub>L</sub> = 10 kΩ			250	ns
<sup>t</sup> dis	Output disable time, DO or SARS after CS1	$C_L = 100 pF$ ,	$R_L = 2 k\Omega$			500	115	
t <sub>C</sub>	Conversion time (multiplexer-addressing time	e not included)					8	clock periods

<sup>§</sup> All parameters are measured under open-loop conditions with zero common-mode input voltage. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTES: 5. Total unadjusted error includes offset, full-scale, linearity, and multiplexer errors.

6. The MSB-first data is output directly from the comparator and, therefore, requires additional delay to allow for comparator response



<sup>‡</sup> All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

## PARAMETER MEASUREMENT INFORMATION

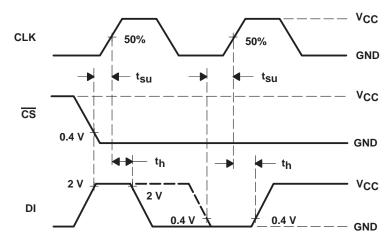


Figure 1. Data-Input Timing

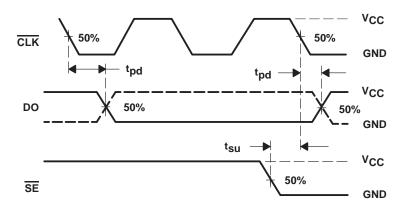
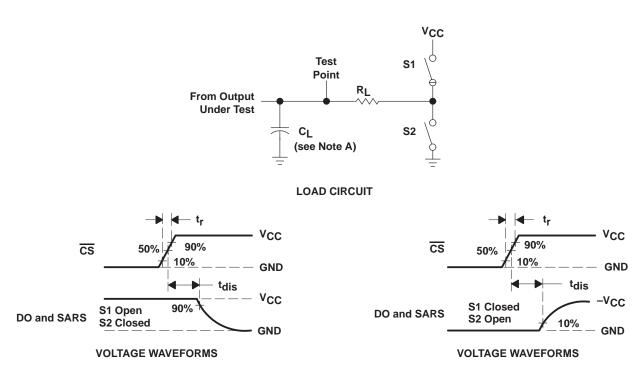


Figure 2. Data-Output Timing

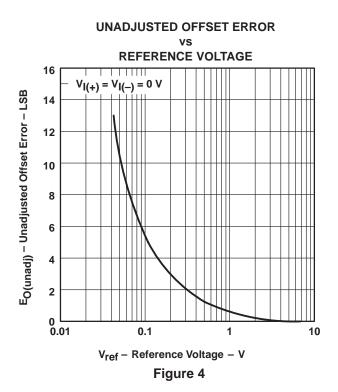
## PARAMETER MEASUREMENT INFORMATION

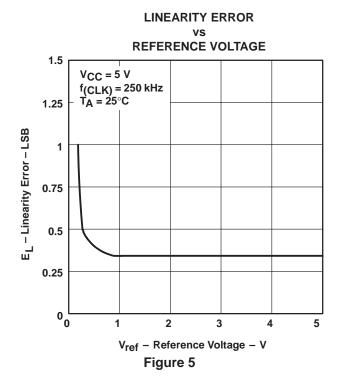


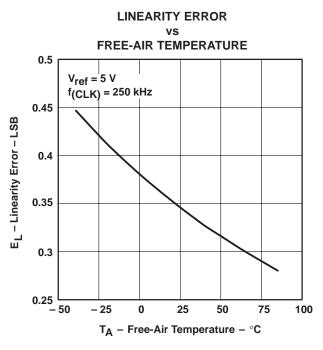
NOTE A: C<sub>I</sub> includes probe and jig capacitance.

Figure 3. Output Disable Time Test Circuit and Voltage Waveforms

### TYPICAL CHARACTERISTICS







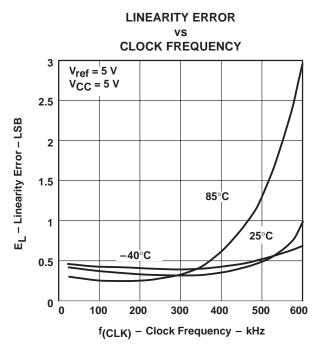
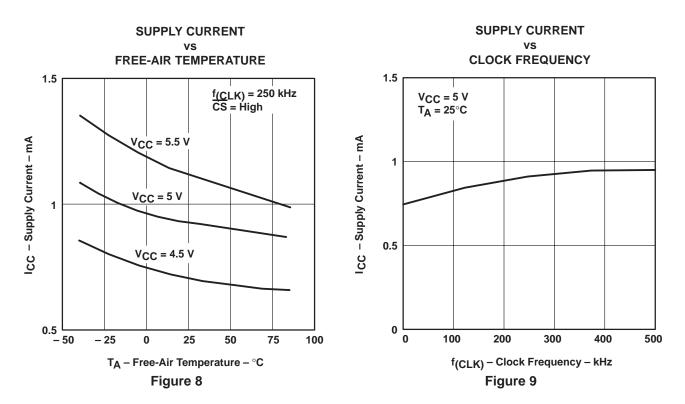
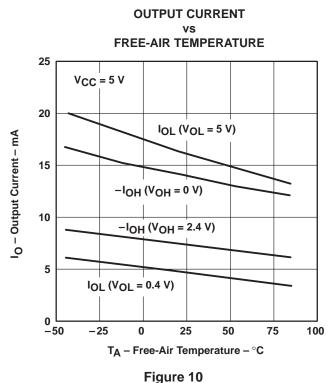


Figure 6

Figure 7

### **TYPICAL CHARACTERISTICS**







## TYPICAL CHARACTERISTICS

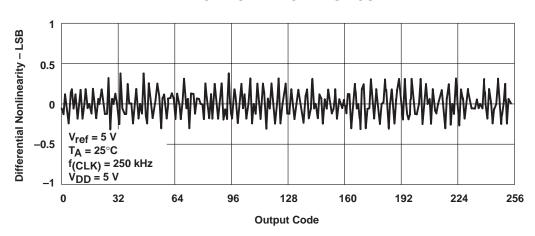


Figure 11. Differential Nonlinearity With Output Code

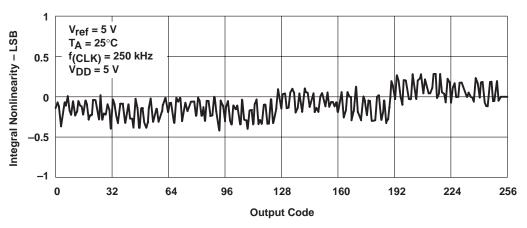


Figure 12. Integral Nonlinearity With Output Code

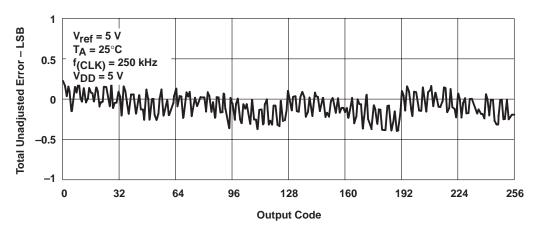


Figure 13. Total Unadjusted Error With Output Code

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## **PACKAGING INFORMATION**

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	<b>RoHS</b> (3)	Lead finish/ Ball material	MSL rating/ Peak reflow	Op temp (°C)	Part marking (6)
TLC0834CD	Active	Production	SOIC (D)   14	50   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0834C
TLC0834CD.A	Active	Production	SOIC (D)   14	50   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0834C
TLC0834CDR	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	TLC0834C
TLC0834CDR.A	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0834C
TLC0834CN	Active	Production	PDIP (N)   14	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-	TLC0834CN
TLC0834CN.A	Active	Production	PDIP (N)   14	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC0834CN
TLC0834ID	Active	Production	SOIC (D)   14	50   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	TLC0834I
TLC0834ID.A	Active	Production	SOIC (D)   14	50   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0834I
TLC0834IDR	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	TLC0834I
TLC0834IDR.A	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0834I
TLC0834IN	Active	Production	PDIP (N)   14	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-	TLC0834IN
TLC0834IN.A	Active	Production	PDIP (N)   14	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC0834IN
TLC0838CDW	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	TLC0838C
TLC0838CDW.A	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838C
TLC0838CDWG4	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	See TLC0838CDW	TLC0838C
TLC0838CDWR	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	TLC0838C
TLC0838CDWR.A	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838C
TLC0838CDWRG4	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	See TLC0838CDWR	TLC0838C
TLC0838CN	Active	Production	PDIP (N)   20	20   TUBE	Yes	NIPDAU	N/A for Pkg Type	-	TLC0838CN
TLC0838CN.A	Active	Production	PDIP (N)   20	20   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC0838CN
TLC0838CPW	Active	Production	TSSOP (PW)   20	70   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	TLC0838C
TLC0838CPW.A	Active	Production	TSSOP (PW)   20	70   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	TLC0838C
TLC0838CPWR	Active	Production	TSSOP (PW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	TLC0838C
TLC0838CPWR.A	Active	Production	TSSOP (PW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	0 to 70	TLC0838C
TLC0838IDW	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	TLC0838I
TLC0838IDW.A	Active	Production	SOIC (DW)   20	25   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838I
TLC0838IDWR	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-	TLC0838I
TLC0838IDWR.A	Active	Production	SOIC (DW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838I
TLC0838IN	Active	Production	PDIP (N)   20	20   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC0838IN



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Orderable part number	Status	Material type	Package   Pins	Package qty   Carrier	RoHS	Lead finish/ Ball material	MSL rating/ Peak reflow	Op temp (°C)	Part marking (6)
	(.,	(=)			(0)	(4)	(5)		(0)
TLC0838IN.A	Active	Production	PDIP (N)   20	20   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	TLC0838IN
TLC0838IPW	Active	Production	TSSOP (PW)   20	70   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838I
TLC0838IPW.A	Active	Production	TSSOP (PW)   20	70   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838I
TLC0838IPWR	Active	Production	TSSOP (PW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838I
TLC0838IPWR.A	Active	Production	TSSOP (PW)   20	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TLC0838I

<sup>(1)</sup> Status: For more details on status, see our product life cycle.

- (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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## **PACKAGE MATERIALS INFORMATION**

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## TAPE AND REEL INFORMATION



# TAPE DIMENSIONS KO P1 BO W Cavity A0

A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

## QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



#### \*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TLC0834CDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLC0834IDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
TLC0838CDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
TLC0838CPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
TLC0838IDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
TLC0838IPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1



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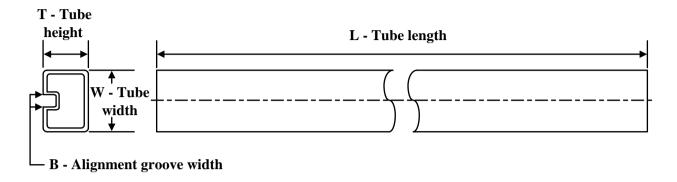
## \*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLC0834CDR	SOIC	D	14	2500	350.0	350.0	43.0
TLC0834IDR	SOIC	D	14	2500	350.0	350.0	43.0
TLC0838CDWR	SOIC	DW	20	2000	356.0	356.0	45.0
TLC0838CPWR	TSSOP	PW	20	2000	350.0	350.0	43.0
TLC0838IDWR	SOIC	DW	20	2000	356.0	356.0	45.0
TLC0838IPWR	TSSOP	PW	20	2000	350.0	350.0	43.0



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## **TUBE**



## \*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
TLC0834CD	D	SOIC	14	50	505.46	6.76	3810	4
TLC0834CD.A	D	SOIC	14	50	505.46	6.76	3810	4
TLC0834CN	N	PDIP	14	25	506	13.97	11230	4.32
TLC0834CN.A	N	PDIP	14	25	506	13.97	11230	4.32
TLC0834ID	D	SOIC	14	50	505.46	6.76	3810	4
TLC0834ID.A	D	SOIC	14	50	505.46	6.76	3810	4
TLC0834IN	N	PDIP	14	25	506	13.97	11230	4.32
TLC0834IN.A	N	PDIP	14	25	506	13.97	11230	4.32
TLC0838CDW	DW	SOIC	20	25	507	12.83	5080	6.6
TLC0838CDW.A	DW	SOIC	20	25	507	12.83	5080	6.6
TLC0838CDWG4	DW	SOIC	20	25	507	12.83	5080	6.6
TLC0838CN	N	PDIP	20	20	506	13.97	11230	4.32
TLC0838CN.A	N	PDIP	20	20	506	13.97	11230	4.32
TLC0838CPW	PW	TSSOP	20	70	530	10.2	3600	3.5
TLC0838CPW.A	PW	TSSOP	20	70	530	10.2	3600	3.5
TLC0838IDW	DW	SOIC	20	25	507	12.83	5080	6.6
TLC0838IDW	DW	SOIC	20	25	506.98	12.7	4826	6.6
TLC0838IDW.A	DW	SOIC	20	25	507	12.83	5080	6.6
TLC0838IDW.A	DW	SOIC	20	25	506.98	12.7	4826	6.6
TLC0838IN	N	PDIP	20	20	506	13.97	11230	4.32
TLC0838IN.A	N	PDIP	20	20	506	13.97	11230	4.32
TLC0838IPW	PW	TSSOP	20	70	530	10.2	3600	3.5
TLC0838IPW.A	PW	TSSOP	20	70	530	10.2	3600	3.5

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