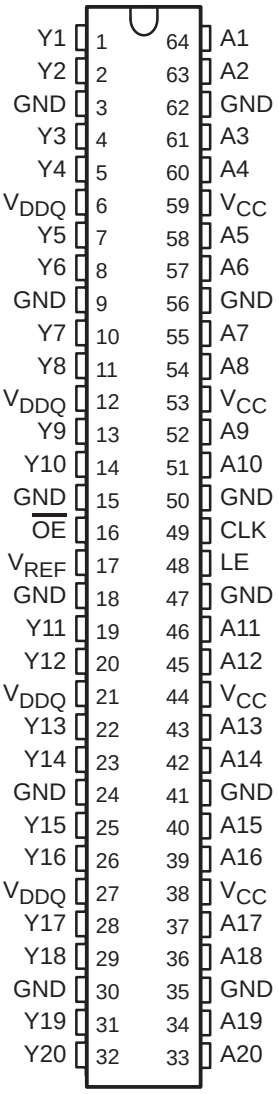
- **Member of the Texas Instruments *Widebus*™ Family**
- **Supports SSTL_3 Signal Inputs and Outputs**
- **Flow-Through Architecture Optimizes PCB Layout**
- **Meets SSTL_3 Class I and Class II Specifications**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **Packaged in Plastic Thin Shrink Small-Outline Package**

DGG PACKAGE
(TOP VIEW)



description

This 20-bit universal bus driver is designed for 3-V to 3.6-V V_{CC} operation and SSTL_3 or LVTTL I/O levels.

Data flow from A to Y is controlled by the output-enable ($\overline{OE}$) input. The device operates in the transparent mode when latch enable (LE) is high. The A data is latched if LE is low and clock (CLK) is held at a high or low logic level. If LE is low, the A data is stored in the latch/flip-flop on the low-to-high transition of CLK. When $\overline{OE}$ is high, the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN74SSTL16837A is characterized for operation from 0°C to 70°C.

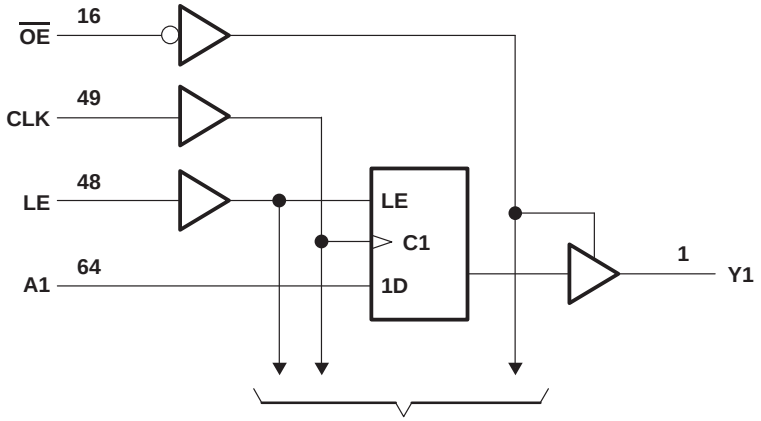
FUNCTION TABLE

INPUTS				OUTPUT
$\overline{OE}$	LE	CLK	A	Y
L	H	X	H	H
L	H	X	L	L
L	L	↑	H	H
L	L	↑	L	L
L	L	H	X	Y_0†
L	L	L	X	Y_0‡
H	X	X	X	Z

† Output level before the indicated steady-state input conditions were established, provided that CLK was high before LE went low

‡ Output level before the indicated steady-state input conditions were established

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)§

Supply voltage range, V_{CC} or V_{DDQ} . . . . . –0.5 V to 4.6 V
Input voltage range, V_I (see Note 1) . . . . . –0.5 V to V_{CC} + 0.5 V
Output voltage range, V_O (see Notes 1 and 2) . . . . . –0.5 V to V_{DDQ} + 0.5 V
Input clamp current, I_{IK} (V_I < 0) . . . . . –50 mA
Output clamp current, I_{OK} (V_O < 0) . . . . . –50 mA
Continuous output current, I_O (V_O = 0 to V_{DDQ}) . . . . . ±50 mA
Continuous current through each V_{CC}, V_{DDQ}, or GND . . . . . ±100 mA
Package thermal impedance, θ_{JA} (see Note 3) . . . . . 73°C/W
Storage temperature range, T_{stg} . . . . . –65°C to 150°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.

NOTES: 1. The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This current flows only when the output is in the high state and $V_O > V_{DDQ}$.
3. The package thermal impedance is calculated in accordance with JESD 51.

recommended operating conditions (see Note 4)

			MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage		V_{DDQ}		3.6	V
V_{DDQ}	Output supply voltage		3		3.6	V
V_{REF}	Reference voltage ($V_{REF} = 0.45 \times V_{DDQ}$)		1.3	1.5	1.7	V
V_{TT}	Termination voltage ($V_{REF} = V_{TT} = 0.45 \times V_{DDQ}$)		V_{REF}–50mV	V_{REF}	V_{REF}+50mV	V
V_I	Input voltage		0		V_{CC}	V
V_{IH}	AC high-level input voltage	All inputs	V_{REF}+400mV			V
V_{IL}	AC low-level input voltage	All inputs			V_{REF}–400mV	V
V_{IH}	DC high-level input voltage	All inputs	V_{REF}+200mV			V
V_{IL}	DC low-level input voltage	All inputs			V_{REF}–200mV	V
I_{OH}	High-level output current				–20	mA
I_{OL}	Low-level output current				20	mA
T_A	Operating free-air temperature		0		70	°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER		TEST CONDITIONS		V_{CC}	MIN	TYP†	MAX	UNIT
V_{IK}		I_I = –18 mA		3 V			–1.2	V
V_{OH}		I_{OH} = –100 μA		3 V to 3.6 V	V_{CC}–0.2			V
		I_{OH} = –16 mA		3 V	2.2			
		I_{OH} = –20 mA			2.1			
V_{OL}		I_{OL} = 100 μA		3 V to 3.6 V			0.2	V
		I_{OL} = 16 mA		3 V			0.5	
		I_{OL} = 20 mA					0.55	
I_I	LE	V_I = 2.1 V or 0.9 V	V_{REF} = 1.3 V or 1.7 V	3.6 V			±40	μA
		V_I = 3.6 V or 0					±1.2	mA
	Data inputs, $\overline{OE}$	V_I = 2.1 V or 0.9 V	V_{REF} = 1.3 V or 1.7 V	3.6 V			±5	μA
		V_I = 3.6 V or 0					±5	
	CLK	V_I = 2.1 V or 0.9 V	V_{REF} = 1.3 V or 1.7 V	3.6 V			±150	μA
		V_I = 3.6 V or 0					±4	mA
	V_{REF}	V_{REF} = 1.3 V or 1.7 V		3.6 V			±150	μA
I_{OZ}		V_O = 0.9 V or 2.1 V		3.6 V			±10	μA
		V_O = 0 or 3.6 V					±10	
I_{CC}		V_I = 2.1 V or 0.9 V	I_O = 0	3.6 V			90	mA
		V_I = 3.6 V or 0					90	
C_i	Control inputs	V_I = 2.1 V or 0.9 V		3.3 V		2.5		pF
	A port					2		
C_o	Y port	V_O = 2.1 V or 0.9 V		3.3 V		3		pF

† All typical values are at V_{CC} = 3.3 V, T_A = 25°C.

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

				V_{CC} = 3.3 V ± 0.3 V		UNIT
				MIN	MAX	
f_{clock}	Clock frequency				200	MHz
t_w	Pulse duration	LE high		2.5		ns
		CLK high or low		2.5		
t_{su}	Setup time	A before CLK↑	LE low	1.5		ns
		A before LE↓	CLK high	1.5		
			CLK low	2		
t_h	Hold time	A after CLK↑	LE low	1		ns
		A after LE↓		1		

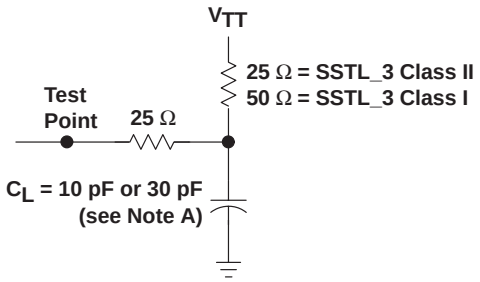
switching characteristics over recommended operating free-air temperature range, Class I, $V_{REF} = V_{TT} = V_{DDQ}$ X 0.45 and C_L = 10 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 3.3 V ± 0.3 V		UNIT
			MIN	MAX	
f_{max}			200		MHz
t_{pd}	A	Y	1.1	4	ns
	LE		1.5	4.1	
	CLK		1	3	
t_{en}	$\overline{OE}$	Y	1.8	5.5	ns
t_{dis}	$\overline{OE}$	Y	1.8	6	ns

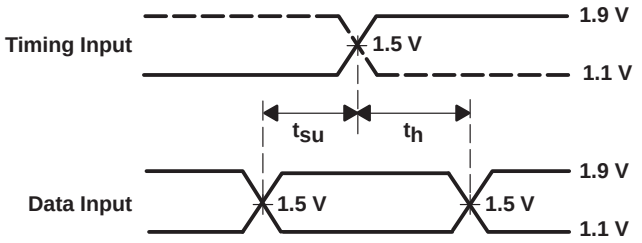
switching characteristics over recommended operating free-air temperature range, Class II, $V_{REF} = V_{TT} = V_{DDQ}$ X 0.45 and C_L = 30 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 3.3 V ± 0.3 V		UNIT
			MIN	MAX	
f_{max}			200		MHz
t_{pd}	A	Y	1.1	4.2	ns
	LE		1.5	4.3	
	CLK		1	3.2	
t_{en}	$\overline{OE}$	Y	1.8	5.5	ns
t_{dis}	$\overline{OE}$	Y	1.8	6	ns

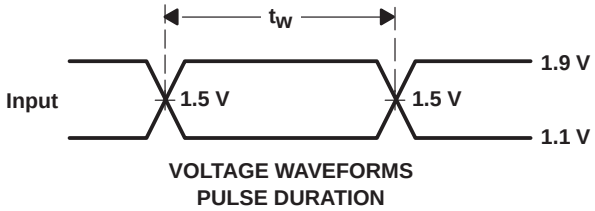
PARAMETER MEASUREMENT INFORMATION



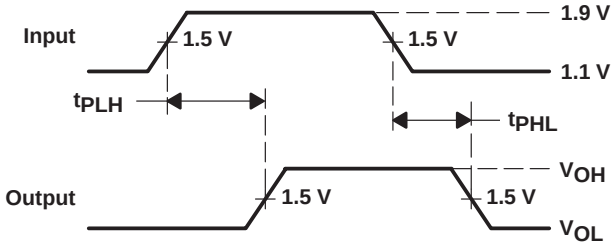
LOAD CIRCUIT



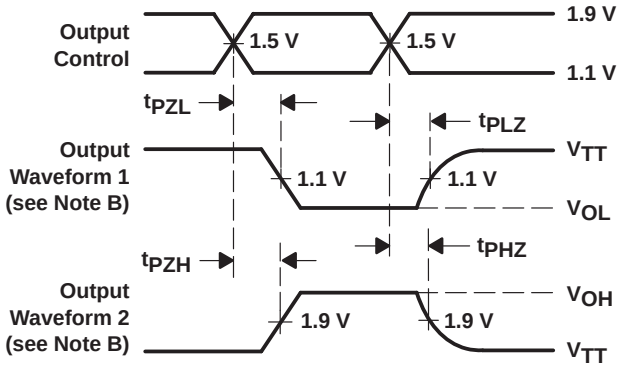
VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

NOTES: A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r ≤ 1 ns, t_f ≤ 1 ns.
D. The outputs are measured one at a time with one transition per measurement.
E. $V_{TT} = V_{REF} = V_{CC} \times 0.45$
F. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
G. t_{PZL} and t_{PZH} are the same as t_{en}.
H. t_{PHL} and t_{PLH} are the same as t_{pd}.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
74SSTL16837ADGGRE4	ACTIVE	TSSOP	DGG	64	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74SSTL16837ADGGRG4	ACTIVE	TSSOP	DGG	64	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74SSTL16837ADGGR	ACTIVE	TSSOP	DGG	64	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

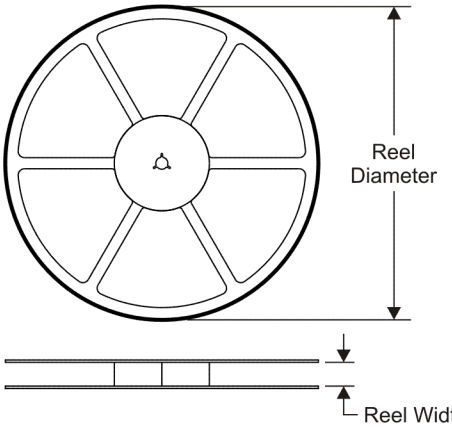
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers,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

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

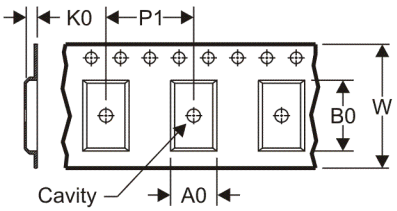
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

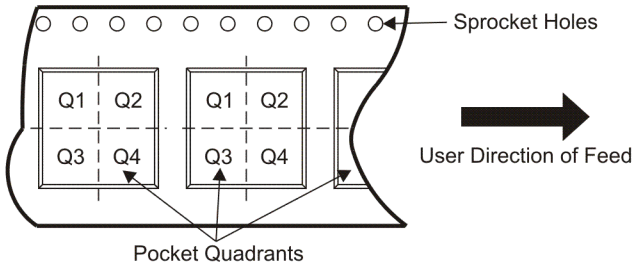


TAPE DIMENSIONS



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

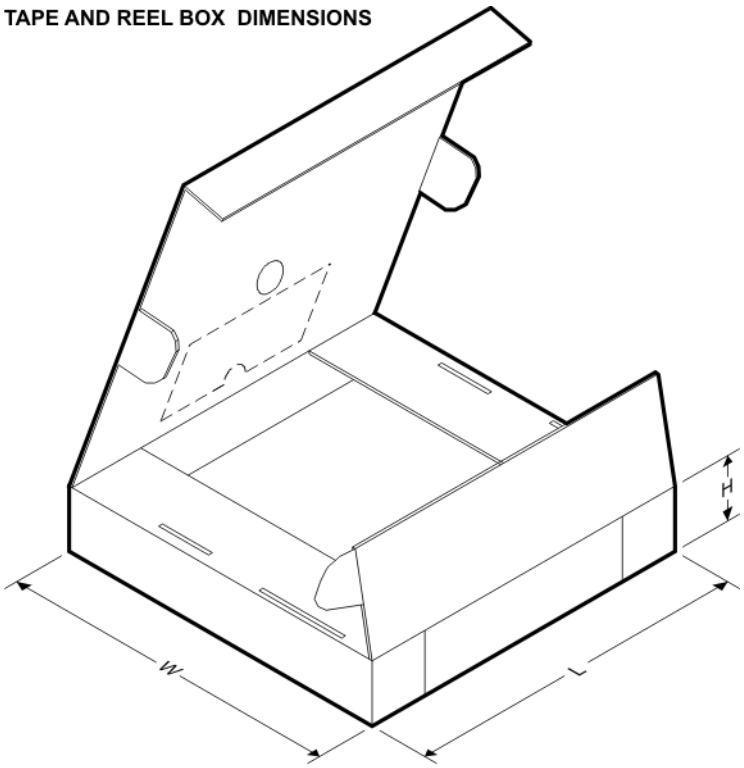
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74SSTL16837ADGGR	TSSOP	DGG	64	2000	330.0	24.4	8.4	17.3	1.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS

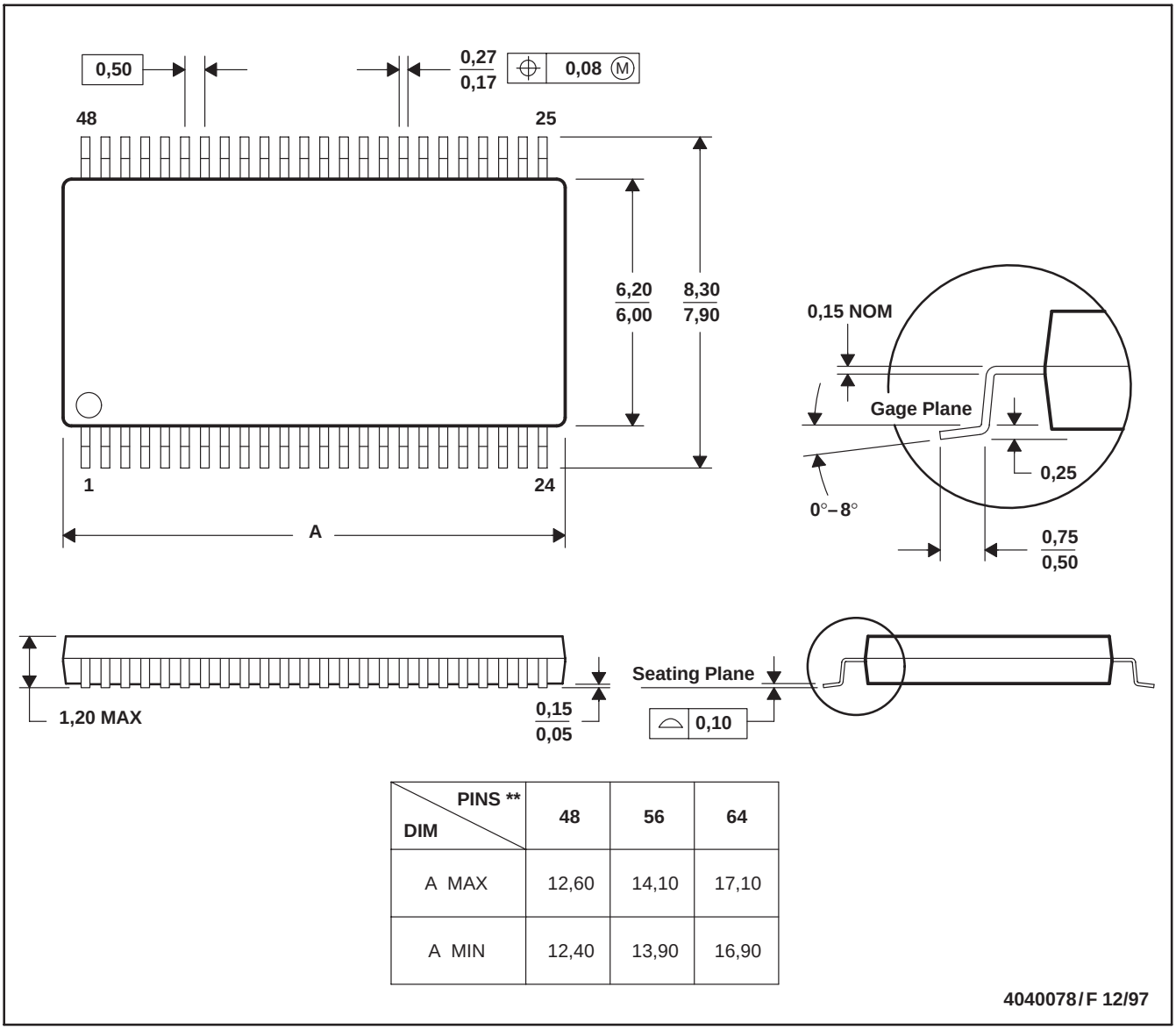


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74SSTL16837ADGGR	TSSOP	DGG	64	2000	346.0	346.0	41.0

DGG (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

48 PINS SHOWN



DIM \ PINS **	48	56	64
A MAX	12,60	14,10	17,10
A MIN	12,40	13,90	16,90

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold protrusion not to exceed 0,15.
D. Falls within JEDEC MO-153

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