



3.3V CMOS 18-BIT TRANSCEIVER WITH 3-STATE OUTPUTS AND BUS-HOLD

IDT74ALVCH16863

FEATURES:

- 0.5 MICRON CMOS Technology
- Typical $t_{sk(o)}$ (Output Skew) < 250ps
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- 0.635mm pitch SSOP, 0.50mm pitch TSSOP, and 0.40mm pitch TVSOP packages
- Extended commercial range of -40°C to $+85^{\circ}\text{C}$
- $V_{cc} = 3.3\text{V} \pm 0.3\text{V}$, Normal Range
- $V_{cc} = 2.7\text{V}$ to 3.6V , Extended Range
- $V_{cc} = 2.5\text{V} \pm 0.2\text{V}$
- CMOS power levels ($0.4\mu\text{W}$ typ. static)
- Rail-to-Rail output swing for increased noise margin

Drive Features for ALVCH16863:

- High Output Drivers: $\pm 24\text{mA}$
- Suitable for heavy loads

APPLICATIONS:

- 3.3V High Speed Systems
- 3.3V and lower voltage computing systems

DESCRIPTION:

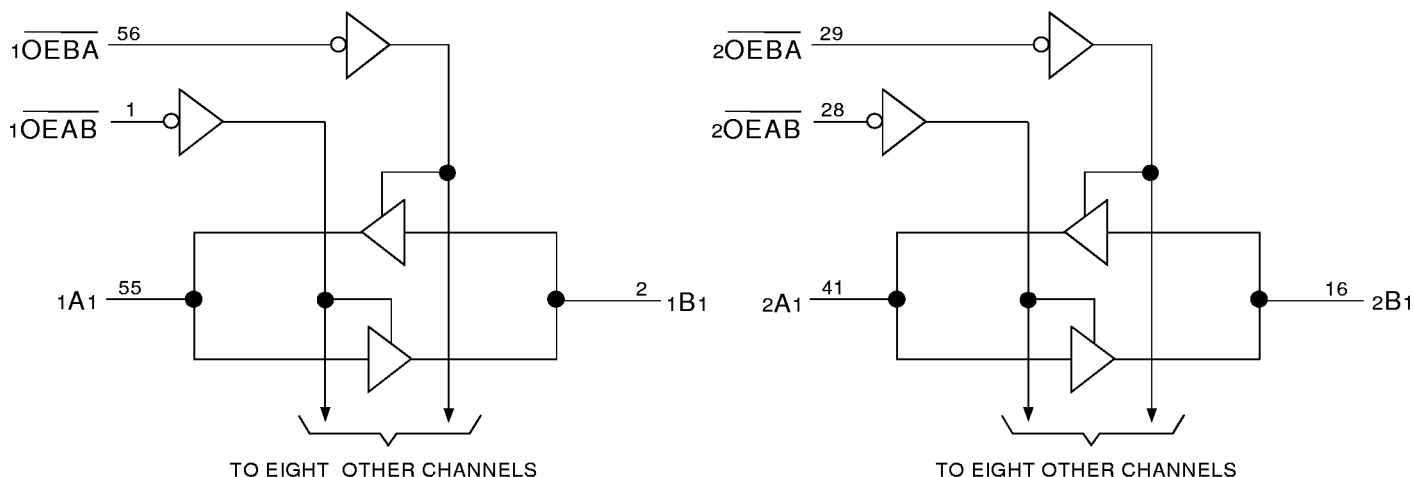
This 18-bit transceiver is built using advanced dual metal CMOS technology. The ALVCH16863 is a noninverting transceiver designed for asynchronous communication between data buses. The control-function implementation minimizes external timing requirements.

This high speed device can be used as two independent 9-bit transceivers or one 18-bit transceiver. It allows data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the output-enable ($\overline{\text{OEAB}}$ or $\overline{\text{OEBA}}$) inputs.

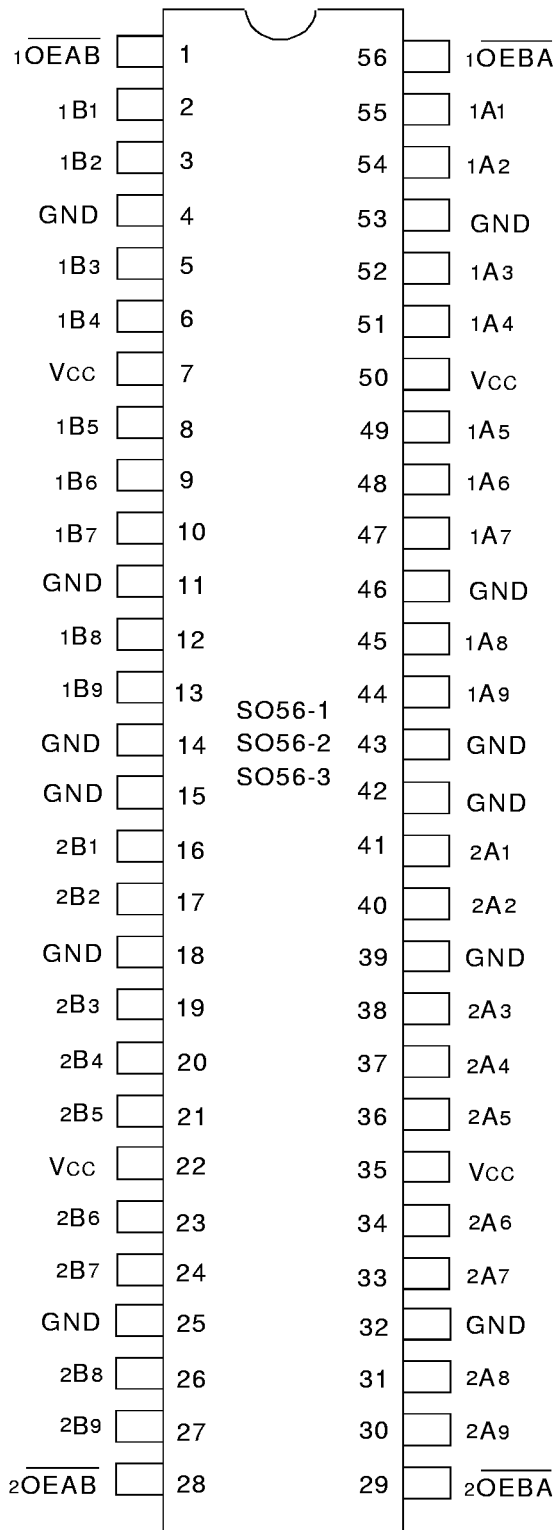
The ALVCH16863 has been designed with a $\pm 24\text{mA}$ output driver. This driver is capable of driving a moderate to heavy load while maintaining speed performance.

The ALVCH16863 has "bus-hold" which retains the inputs' last state whenever the input bus goes to a high impedance. This prevents floating inputs and eliminates the need for pull-up/down resistors.

Functional Block Diagram



PIN CONFIGURATION



**SSOP/
TSSOP/TVSOP
TOP VIEW**

ABSOLUTE MAXIMUM RATING (1)

Symbol	Description	Max.	Unit
VTERM ⁽²⁾	Terminal Voltage with Respect to GND	- 0.5 to + 4.6	V
VTERM ⁽³⁾	Terminal Voltage with Respect to GND	- 0.5 to V _{CC} + 0.5	V
TSTG	Storage Temperature	- 65 to + 150	°C
IOUT	DC Output Current	- 50 to + 50	mA
I _{IK}	Continuous Clamp Current, V _I < 0 or V _I > V _{CC}	± 50	mA
I _{OK}	Continuous Clamp Current, V _O < 0	- 50	mA
I _{CC}	Continuous Current through each V _{CC} or GND	± 100	mA

NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- V_{CC} terminals.
- All terminals except V_{CC}.

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
C _{IN}	Input Capacitance	V _{IN} = 0V	5	7	pF
C _{OUT}	Output Capacitance	V _{OUT} = 0V	7	9	pF
C _{I/O}	I/O Port Capacitance	V _{IN} = 0V	7	9	pF

NOTE:

- As applicable to the device type.

PIN DESCRIPTION

Pin Names	Description
xOEAB	A-to-B Output Enable Input (Active LOW)
xOEBA	B-to-A Output Enable Input (Active LOW)
xAx	A-to-B Data Inputs or B-to-A 3-State Outputs ⁽¹⁾
xBx	B-to-A Data Inputs or A-to-B 3-State Outputs ⁽¹⁾

NOTE:

- These pins have "Bus-Hold." All other pins are standard inputs, outputs, or I/Os.

FUNCTION TABLE (each 9-bit section) ⁽¹⁾

Inputs		Operation
xOEAB	xOEBA	
H	L	B data to A bus
L	H	A data to B bus
H	H	Isolation

NOTES:

- H = HIGH Voltage Level
L = LOW Voltage Level

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: TA = -40°C to +85°C

Symbol	Parameter	Test Conditions		Min.	Typ. ⁽¹⁾	Max.	Unit
V _{IH}	Input HIGH Voltage Level	V _{CC} = 2.3V to 2.7V		1.7	—	—	V
		V _{CC} = 2.7V to 3.6V		2	—	—	
V _{IL}	Input LOW Voltage Level	V _{CC} = 2.3V to 2.7V		—	—	0.7	V
		V _{CC} = 2.7V to 3.6V		—	—	0.8	
I _{IH}	Input HIGH Current	V _{CC} = 3.6V	V _I = V _{CC}	—	—	± 5	μA
I _{IL}	Input LOW Current	V _{CC} = 3.6V	V _I = GND	—	—	± 5	
I _{OZH}	High Impedance Output Current (3-State Output pins)	V _{CC} = 3.6V	V _O = V _{CC}	—	—	± 10	μA
I _{OZL}			V _O = GND	—	—	± 10	μA
V _{IK}	Clamp Diode Voltage	V _{CC} = 2.3V, I _{IN} = -18mA		—	-0.7	-1.2	V
V _H	Input Hysteresis	V _{CC} = 3.3V		—	100	—	mV
I _{CCL}	Quiescent Power Supply Current	V _{CC} = 3.6V		—	0.1	40	μA
I _{CCH}		V _{IN} = GND or V _{CC}		—			
I _{CCZ}				—			
ΔI _{CC}	Quiescent Power Supply Current Variation	One input at V _{CC} - 0.6V, other inputs at V _{CC} or GND		—	—	750	μA

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NOTE:

1. Typical values are at V_{CC} = 3.3V, +25°C ambient.

BUS-HOLD CHARACTERISTICS

Symbol	Parameter ⁽¹⁾	Test Conditions		Min.	Typ. ⁽²⁾	Max.	Unit
I _{BHH}	Bus-Hold Input Sustain Current	V _{CC} = 3.0V	V _I = 2.0V	-75	—	—	μA
			V _I = 0.8V	75	—	—	
I _{BHL}	Bus-Hold Input Sustain Current	V _{CC} = 2.3V	V _I = 1.7V	-45	—	—	μA
			V _I = 0.7V	45	—	—	
I _{BHNO}	Bus-Hold Input Overdrive Current	V _{CC} = 3.6V	V _I = 0 to 3.6V	—	—	± 500	μA
I _{BHLO}							

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NOTES:

1. Pins with Bus-hold are identified in the pin description.
2. Typical values are at V_{CC} = 3.3V, +25°C ambient.

OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Max.	Unit
		V _{CC}	I _{OH}			
V _{OH}	Output HIGH Voltage	V _{CC} = 2.3V to 3.6V	I _{OH} = -0.1mA	V _{CC} - 0.2	—	V
		V _{CC} = 2.3V	I _{OH} = -6mA	2	—	
		V _{CC} = 2.3V	I _{OH} = -12mA	1.7	—	
		V _{CC} = 2.7V		2.2	—	
		V _{CC} = 3.0V		2.4	—	
		V _{CC} = 3.0V	I _{OH} = -24mA	2	—	
V _{OL}	Output LOW Voltage	V _{CC} = 2.3V to 3.6V	I _{OL} = 0.1mA	—	0.2	V
		V _{CC} = 2.3V	I _{OL} = 6mA	—	0.4	
			I _{OL} = 12mA	—	0.7	
		V _{CC} = 2.7V	I _{OL} = 12mA	—	0.4	
		V _{CC} = 3.0V	I _{OL} = 24mA	—	0.55	

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NOTE:

- V_{IH} and V_{IL} must be within the min. or max. range shown in the DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE table for the appropriate V_{CC} range. T_A = -40°C to +85°C.

OPERATING CHARACTERISTICS, T_A = 25°C

Symbol	Parameter	Test Conditions	V _{CC} = 2.5V ± 0.2V	V _{CC} = 3.3V ± 0.3V	Unit
			Typical	Typical	
CPD	Power Dissipation Capacitance Outputs enabled	C _L = 0pF, f = 10MHz	21	30	pF
CPD	Power Dissipation Capacitance Outputs disabled		2	3	pF

SWITCHING CHARACTERISTICS⁽¹⁾

Symbol	Parameter	V _{CC} = 2.5V ± 0.2V		V _{CC} = 2.7V		V _{CC} = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
t _{PLH}	Propagation Delay xAx to xBx or xBx to xAx	1	4.1	—	4	1	3.4	ns
t _{PHL}								
t _{PZH}	Output Enable Time xOEBA to xAx or xOEAB to xBx	1	5.7	—	5.8	1	4.7	ns
t _{PZL}								
t _{PHZ}	Output Disable Time xOEBA to xAx or xOEAB to xBx	1.3	5.5	—	4.7	1.4	4.2	ns
t _{PLZ}								
t _{SK(0)}	Output Skew ⁽²⁾	—	—	—	—	—	500	ps

NOTES:

- See test circuits and waveforms. T_A = -40°C to +85°C.
- Skew between any two outputs of the same package and switching in the same direction.

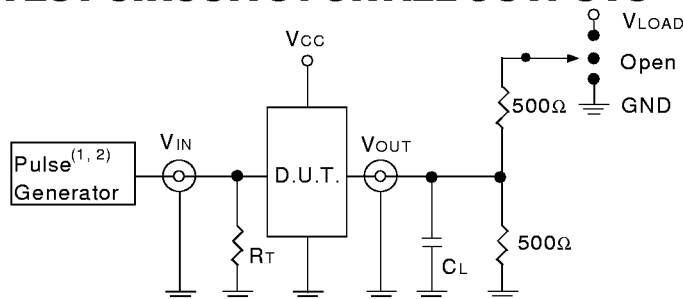
TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

Symbol	V _{CC} (1)= 3.3V±0.3V	V _{CC} (1)= 2.7V	V _{CC} (2)= 2.5V±0.2V	Unit
V _{LOAD}	6	6	2 x V _{CC}	V
V _{IH}	2.7	2.7	V _{CC}	V
V _T	1.5	1.5	V _{CC} /2	V
V _{LZ}	300	300	150	mV
V _{HZ}	300	300	150	mV
C _L	50	50	30	pF

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TEST CIRCUITS FOR ALL OUTPUTS



ALVC Link

DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

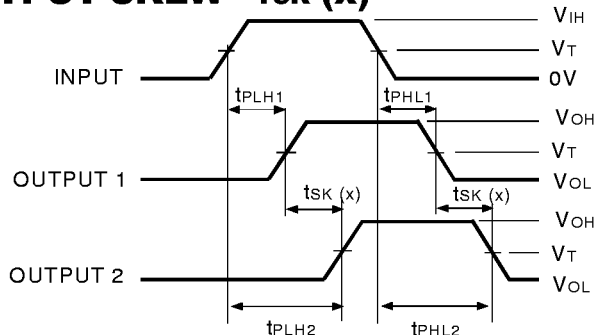
1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t_F ≤ 2ns; t_R ≤ 2ns.

SWITCH POSITION

Test	Switch
Open Drain Disable Low Enable Low	V _{LOAD}
Disable High Enable High	GND
All Other tests	Open

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OUTPUT SKEW - t_{SK}(x)



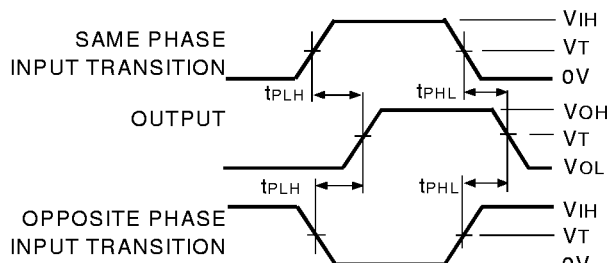
$$t_{SK}(x) = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

ALVC Link

NOTES:

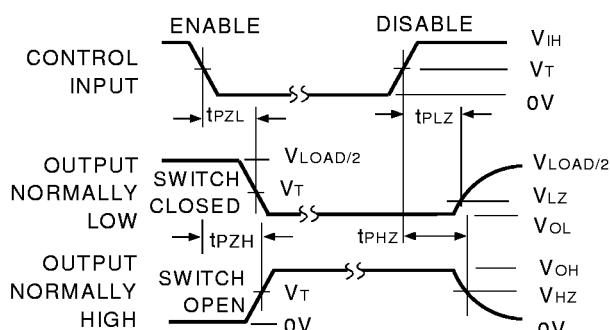
1. For t_{SK}(o) OUTPUT1 and OUTPUT2 are any two outputs.
2. For t_{SK}(b) OUTPUT1 and OUTPUT2 are in the same bank.

PROPAGATION DELAY



ALVC Link

ENABLE AND DISABLE TIMES

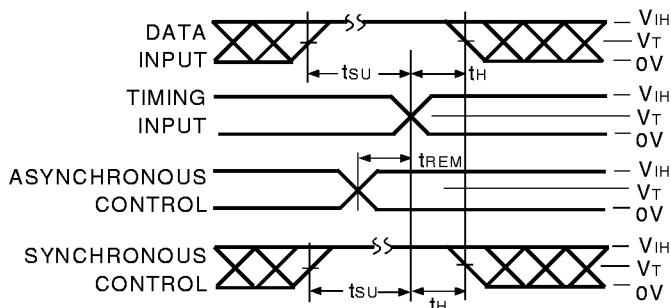


ALVC Link

NOTE:

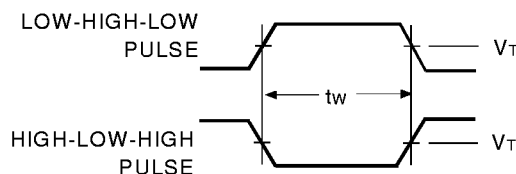
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

SET-UP, HOLD, AND RELEASE TIMES



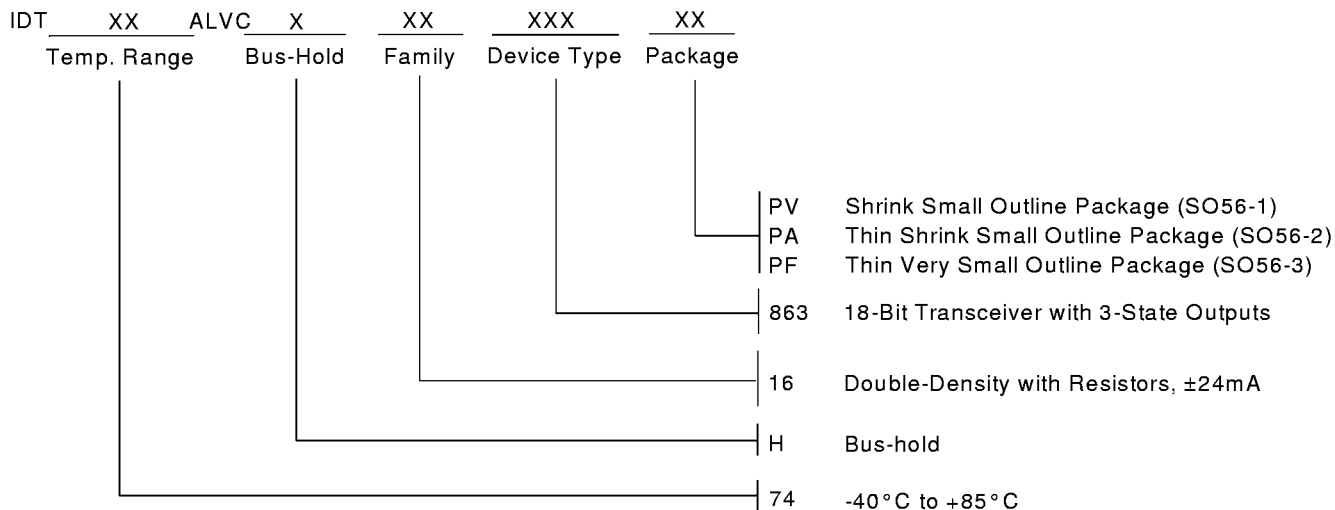
ALVC Link

PULSE WIDTH



ALVC Link

ORDERING INFORMATION



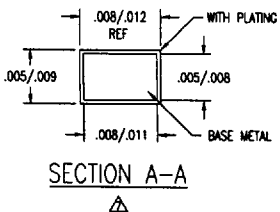
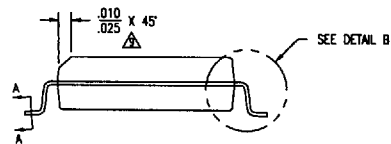
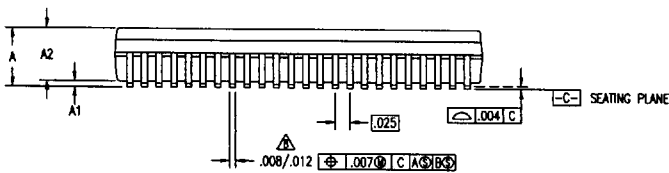
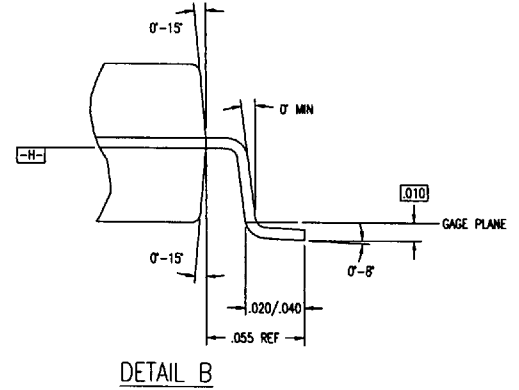
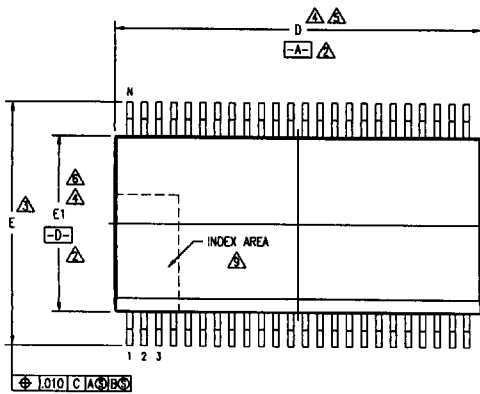
CORPORATE HEADQUARTERS
 2975 Stender Way
 Santa Clara, CA 95054

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PACKAGE DIAGRAM OUTLINES
SSOP

REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
17893	00	INITIAL RELEASE	07/15/90	A. FUNCELL
22377	01	REMOVE CHAMFER FROM PACKAGE	04/15/92	T. WJ
27492	02	REDRAW TO JEDEC FORMAT	02/01/95	



TOLERANCES UNLESS SPECIFIED		Integrated Device Technology, Inc. 2975 Slender Way, Santa Clara, CA 95054 PHONE: (408) 727-8118 FAX: (408) 462-8874 TWC: 910-338-2070	
DECIMAL	ANGULAR	APPROVALS DATE TITLE PV PACKAGE OUTLINE .300" BODY WIDTH SSOP .025" PITCH	
DRWN	CHKD	SIZE C DRAWING No. PSC-4029	REV 02
CHECKED		DO NOT SCALE DRAWING	

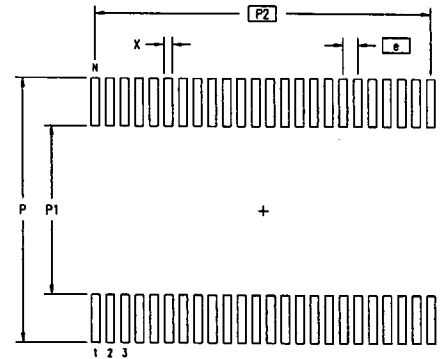
PACKAGE DIAGRAM OUTLINES

SSOP (Continued)

REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
17893	00	INITIAL RELEASE	07/15/90	A. FUNCELL
22377	01	REMOVE CHAMFER FROM PACKAGE	04/15/92	T. WU
27492	02	REDRAW TO JEDEC FORMAT	02/01/95	

SYMBOL	DWG # S048-1				DWG # S056-1			
	JEDEC VARIATION			NOTE	JEDEC VARIATION			NOTE
	AA				AB			
	MIN	NOM	MAX		MIN	NOM	MAX	
A	.095	.102	.110		.095	.102	.110	
A1	.008	.012	.016		.008	.012	.016	
A2	.088	.090	.092		.088	.090	.092	
D	.620	.625	.630	4,5	.720	.725	.730	4,5
E	.395	.405	.420	3	.395	.405	.420	3
E1	.291	.295	.299	4,6	.291	.295	.299	4,6
N	48				56			

LAND PATTERN DIMENSIONS



	MIN	MAX	MIN	MAX
P	.450	.458	.450	.458
P1	.282	.290	.282	.290
P2	.575 BSC		.675 BSC	
X	.010	.018	.010	.018
e	.025 BSC		.025 BSC	
N	48		56	

NOTES:

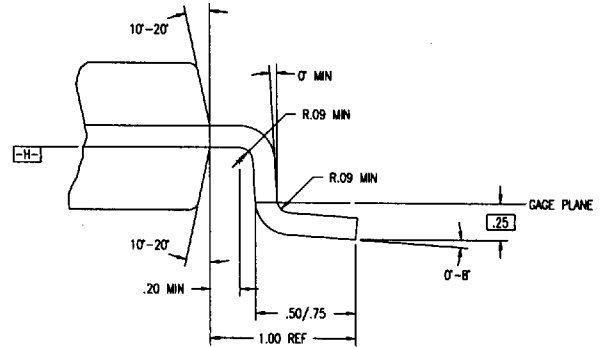
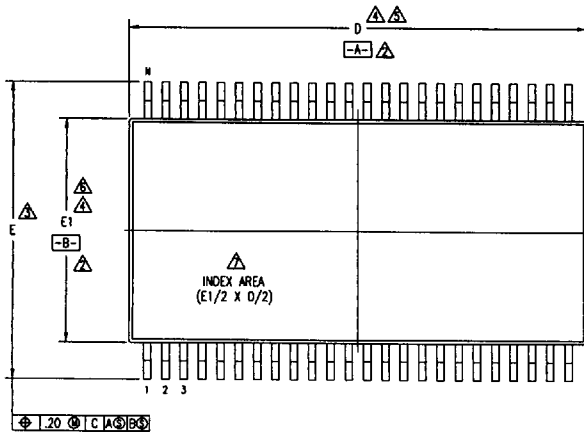
- ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
- DATUMS **-A-** AND **-B-** TO BE DETERMINED AT DATUM PLANE **-H-**
- DIMENSION E TO BE DETERMINED AT SEATING PLANE **-C-**
- DIMENSIONS D AND E1 ARE TO BE DETERMINED AT DATUM PLANE **-H-**
- DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .006 PER SIDE
- DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS. INTERLEAD FLASH OR PROTRUSIONS SHALL NOT EXCEED .015 PER SIDE
- THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND .010 FROM LEAD TIP
- LEAD WIDTH DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS .004 IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT
- THE CHAMFER ON THE PACKAGE BODY IS OPTIONAL. IF IT IS NOT PRESENT, A VISUAL INDEX FEATURE MUST BE LOCATED WITHIN THE ZONE INDICATED
- ALL DIMENSIONS ARE IN INCHES
- THIS OUTLINE CONFORMS TO JEDEC PUBLICATION 95 REGISTRATION MO-118, VARIATION AA & AB

TOLERANCES UNLESS SPECIFIED		Integrated Device Technology, Inc. 2975 Stander Way, Santa Clara, CA 95054 PHONE: (408) 727-8116 FAX: (408) 482-8874 TWC: 810-338-2070	
DECIMAL	ANGULAR		
X.XX	±		
X.XXX	±		
X.XXX	±		
APPROVALS	DATE	TITLE	
DRAWN <i>Ad</i>	08/15/90	PV PACKAGE OUTLINE .300" BODY WIDTH SSOP .025" PITCH	
CHECKED		SIZE	REV
		C	02
		DRAWING No.	
		PSC-4029	
DO NOT SCALE DRAWING			

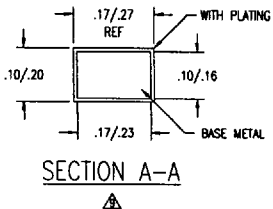
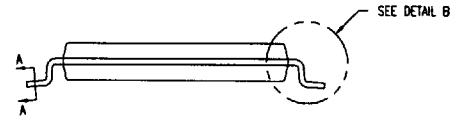
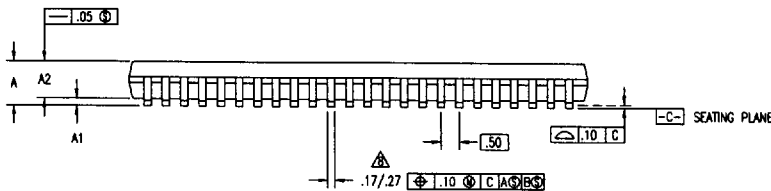
PACKAGE DIAGRAM OUTLINES

TSSOP

REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
23757	00	INITIAL RELEASE	02/15/93	T. VJ
26315	01	CHANGE DIMS A1 & A2	05/18/94	DG
26490	02	CHANGE DIM A1	07/21/94	T. VJ
27494	03	REDRAW TO JEDEC FORMAT	03/06/95	



DETAIL B



SECTION A-A

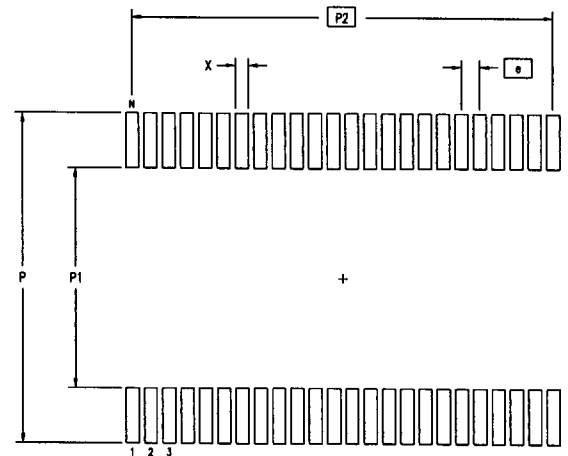
TOLERANCES UNLESS SPECIFIED		Integrated Device Technology, Inc. 2975 Slender Way, Santa Clara, CA 95054 PHONE: (408) 727-8118 FAX: (408) 492-8674 TWC: 910-338-2070
DECIMAL	ANGULAR	
±	±	
APPROVALS DRAWN: [Signature] 01/15/93 CHECKED:		TITLE: PA PACKAGE OUTLINE 6.10 mm BODY WIDTH TSSOP .50 mm PITCH
SIZE	DRAWING No.	REV
C	PSC-4039	03
DO NOT SCALE DRAWING		

PACKAGE DIAGRAM OUTLINES
TSSOP (Continued)

REVISIONS				
DCN	REV	DESCRIPTION	DATE	APPROVED
23757	00	INITIAL RELEASE	02/15/93	T. WU
26315	01	CHANGE DIMS A1 & A2	05/18/94	DG
26490	02	CHANGE DIM A1	07/21/94	T. WU
27494	03	REDRAW TO JEDEC FORMAT	03/08/95	

SYMBOL	DWG # S048-2			NOTE	DWG # S056-2			NOTE		
	JEDEC VARIATION				JEDEC VARIATION					
	ED	EE			ED	EE				
MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX		
A	-	-	1.10	-	-	1.10	-	-	1.10	
A1	.05	-	.15	.05	-	.15				
A2	.85	1.00	1.05	.85	1.00	1.05				
D	12.40	12.50	12.60	4,5	13.90	14.00	14.10	4,5		
E	7.95	8.10	8.25	3	7.95	8.10	8.25	3		
E1	6.00	6.10	6.20	4,6	6.00	6.10	6.20	4,6		
N	48				56					

LAND PATTERN DIMENSIONS



NOTES:

- 1 ALL DIMENSIONING AND TOLERANCING CONFORM TO ANSI Y14.5M-1982
- △ DATUMS \square -A- AND \square -B- TO BE DETERMINED AT DATUM PLANE \square -H-
- △ DIMENSION E TO BE DETERMINED AT SEATING PLANE \square -C-
- △ DIMENSIONS D AND E1 ARE TO BE DETERMINED AT DATUM PLANE \square -H-
- △ DIMENSION D DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED .15 mm PER SIDE
- △ DIMENSION E1 DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSIONS. INTERLEAD FLASH OR PROTRUSIONS SHALL NOT EXCEED .25 mm PER SIDE
- △ DETAIL OF PIN 1 IDENTIFIER IS OPTIONAL BUT MUST BE LOCATED WITHIN THE ZONE INDICATED
- △ LEAD WIDTH DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS .08 mm IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT
- △ THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .10 AND .25 mm FROM THE LEAD TIP
- 10 ALL DIMENSIONS ARE IN MILLIMETERS
- 11 THIS OUTLINE CONFORMS TO JEDEC PUBLICATION 95 REGISTRATION MQ-153, VARIATION ED & EE

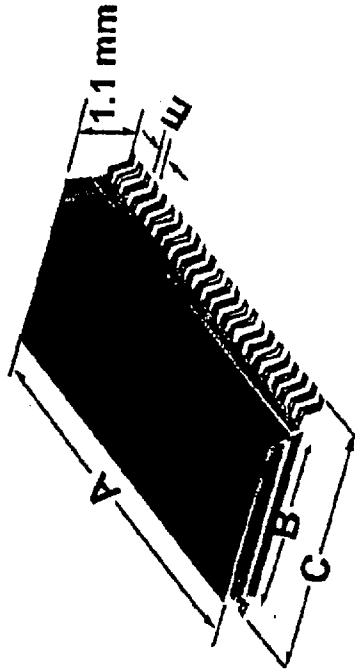
	MIN	MAX	MIN	MAX
P	8.90	9.10	8.90	9.10
P1	5.90	6.10	5.90	6.10
P2	11.50	BSC	13.50	BSC
X	.30	.40	.30	.40
e	.50	BSC	.50	BSC
N	48		56	

TOLERANCES UNLESS SPECIFIED		Integrated Device Technology, Inc.	
DECIMAL	ANGULAR	2975 Slender Way, Santa Clara, CA 95054	
±	±	PHONE: (408) 727-8118	
±	±	FAK: (408) 482-8874	TWC: 910-338-2070
±	±		
APPROVALS	DATE	TITLE PA PACKAGE OUTLINE	
DRAWN	01/19/93	6.10 mm BODY WIDTH TSSOP	
CHECKED		.50 mm PITCH	
		SIZE C	DRAWING No. PSC-4039
			REV 03
DO NOT SCALE DRAWING			



TVSOP

The Most Compact Double Density Package

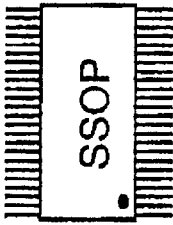


TVSOP Package	Typical Dimensions (in mm)				Area (mm ²)
	A	B	C	E	
48 Pin	9.80	4.40	6.40	0.40	63.00
56 Pin	11.30	4.40	6.40	0.40	72.30
80 Pin	17.00	6.10	8.10	0.40	137.80
100 Pin	20.80	6.10	8.10	0.40	168.50

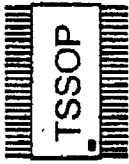


Double Density Packaging

48-Pin



16.0 x 10.3 x 2.6 mm
pin pitch = 0.635 mm
Area = 164.8 mm²

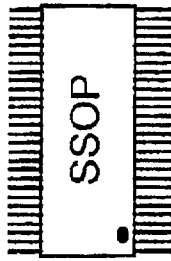


12.5 x 8.1 x 1.1 mm
pin-pitch = 0.5 mm
Area = 101.3 mm²



9.8 x 6.4 x 1.1 mm
pin-pitch = 0.4 mm
Area = 62.7 mm²

56-Pin



18.4 x 10.3 x 2.6 mm
pin-pitch = 0.635 mm
Area = 189.5 mm²



14.0 x 8.1 x 1.1 mm
pin-pitch = 0.5 mm
Area = 113.4 mm²



11.3 x 6.4 x 1.1 mm
pin-pitch = 0.4 mm
Area = 72.3 mm²

TVSOP	Area (mm ²)	%Smaller Than SSOP	%Smaller Than TSSOP
48 pin	63.00	61.9	38.0
56 pin	72.30	62.2	36.0