

# LOW POWER SCHOTTKY INTEGRATED CIRCUITS

**SS** T54LS640/641/645  
T74LS640/641/645

67C 16526 D 7-52-31

## PRELIMINARY DATA

### OCTAL BUS TRANSCEIVERS

#### DESCRIPTION

The T54LS/T74LS640/641/645 are octal bus transceivers designed for asynchronous two-way communication between data buses. Control function implementation reduces to a minimum external timing requirements. This circuit permits transmission of data from the A bus to B or from the B bus to A bus depending upon the logic level of the direction control (DIR) input. The device can be disabled by the Enable input ( $\bar{G}$ ) causing the buses to be effectively isolated.

**B1**  
Plastic Package

**D1/D2**  
Ceramic Package

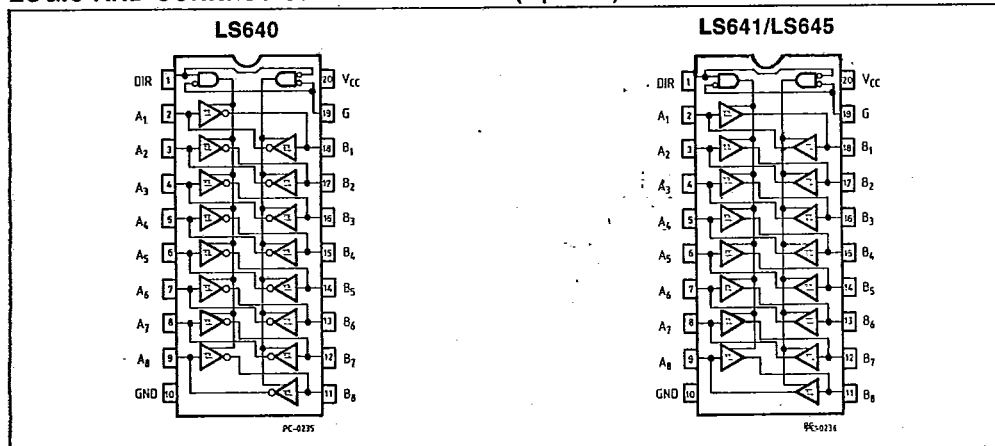
**M1**  
Micro Package

**C1**  
Plastic Chip Carrier

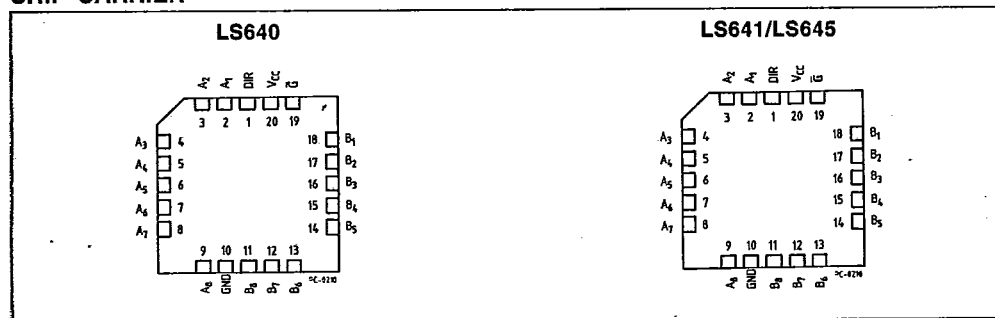
**ORDERING NUMBERS:**  
T54LSXXX D2      T74LSXXX C1  
T74LSXXX D1      T74LSXXX M1  
T74LSXXX B1

DEVICE	OUTPUT	LOGIC
LS640	3-State	Inverting
LS641	Open-Collector	True
LS645	3-State	True

### LOGIC AND CONNECTION DIAGRAMS DIP (top view)



### CHIP CARRIER



T54LS640/641/645

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T74LS640/641/645

## TRUTH TABLE

CONTROL INPUTS		OPERATION	
		LS640	LS641 LS645
$\bar{G}$	DIR		
L	L	$\bar{B}$ data to A bus	B data to A bus
L	H	$\bar{A}$ data to B bus	A data to B bus
H	X	Isolation	Isolation

L = LOW Voltage Level,  
H = HIGH Voltage Level  
X = Don't Care

## ABSOLUTE MAXIMUM RATINGS

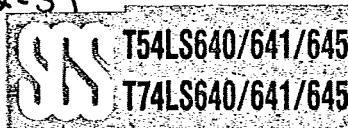
Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.5 to 7	V
$V_I$	Input Voltage, Applied to Input	-0.5 to 15	V
$V_O$	Output Voltage, Applied to Output	0 to 10	V
$I_I$	Input Current, Into Inputs	-30 to 5	mA
$I_O$	Output Current, Into Outputs	50	mA

Stresses in excess of 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 in excess of those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## GUARANTEED OPERATING RANGES

Part Numbers	Supply Voltage			Temperature
	Min	Typ	Max	
T54LS640/641/645D2	4.5 V	5.0 V	5.5 V	-55°C to +125°C
T74LS640/641/645XX	4.75 V	5.0 V	5.25 V	0°C to +70°C

XX = package type.



**DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (T54LS/T74LS640/645)**

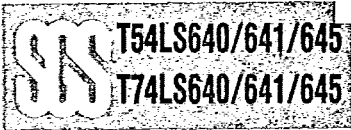
Symbol	Parameter	Limits			Test Conditions (Note 1)	Units	
		Min.	Typ.	Max.			
V <sub>IH</sub>	Input HIGH Voltage	2.0			Guaranteed input HIGH Voltage for all Inputs	V	
V <sub>IL</sub>	Input LOW Voltage	54		0.5	Guaranteed input LOW Voltage for all Inputs	V	
		74		0.6			
V <sub>CD</sub>	Input Clamp Diode Voltage		-0.65	-1.5	V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18mA	V	
V <sub>OH</sub>	Output HIGH Voltage	54,74	2.4	3.4	V <sub>CC</sub> = MIN, I <sub>OH</sub> = -3.0mA	V	
		54	2.0		I <sub>OH</sub> = -12mA	V <sub>CC</sub> = MIN	V
		74	2.0		I <sub>OH</sub> = -15mA		
V <sub>OL</sub>	Output LOW Voltage	54,74		0.25	I <sub>OL</sub> = 12mA	V <sub>CC</sub> = MIN, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> per Truth Table	V
		74		0.35	0.5		
I <sub>OZH</sub>	Output Off Current HIGH			20	V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 2.4V	μA	
I <sub>OZL</sub>	Output Off Current LOW			-400	V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0.4V	μA	
I <sub>IH</sub>	Input HIGH Current A or B DIR or $\bar{G}$ DIR or $\bar{G}$ A or B			20	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7V	μA mA	
				0.1	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0V		
				0.1	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 5.5V		
I <sub>IL</sub>	Input LOW Current			-0.4	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4V	mA	
I <sub>OS</sub>	Output Short Circuit Current (Note 2)	-40		-225	V <sub>CC</sub> = MAX	mA	
I <sub>CC</sub>	Power Supply Current Total, Output HIGH Total, Output LOW Total at HIGH Z			70	V <sub>CC</sub> = MAX	mA	
				90			
				95			

**AC CHARACTERISTICS: T<sub>A</sub> = 25°C (T54LS/T74LS640/645)**

Symbol	Parameter	Limits						Test Conditions	Units
		LS640			LS645				
		Min.	Typ.	Max.	Min.	Typ.	Max.		
t <sub>PLH</sub>	Propagation Delay, A to B		6.0	10		8.0	15	C <sub>L</sub> = 45pF R <sub>L</sub> = 667Ω	ns
t <sub>PHL</sub>			8.0	15		11	15		
t <sub>PLH</sub>	Propagation Delay, B to A		6.0	10		8.0	15		ns
t <sub>PHL</sub>			8.0	15		11	15		
t <sub>pZL</sub>	Output Enable Time, $\bar{G}$ DIR to A		31	40		31	40		ns
t <sub>pZH</sub>			23	40		26	40		
t <sub>pZL</sub>	Output Enable Time, $\bar{G}$ DIR to B		31	40		31	40	ns	
t <sub>pZH</sub>			23	40		26	40		
t <sub>PLZ</sub>	Output Disable Time, $\bar{G}$ DIR to A		15	25		15	25	C <sub>L</sub> = 5.0pF	ns
t <sub>PHZ</sub>			15	25		15	25		
t <sub>PLZ</sub>	Output Disable Time, $\bar{G}$ DIR to B		15	25		15	25		ns
t <sub>PHZ</sub>			15	25		15	25		

**Notes:**

- 1) For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating ranges.
- 2) Not more than one output should be shorted at a time.
- 3) Typical values are at V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C



**DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (T54LS/T74LS641)**

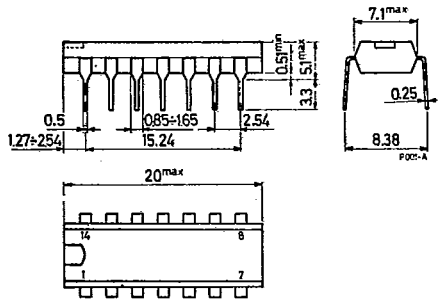
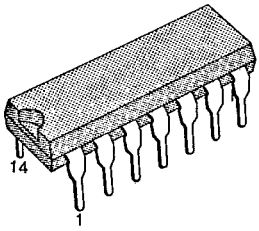
Symbol	Parameter	Limits			Test Conditions (Note 1)	Units
		Min.	Typ.	Max.		
V <sub>IH</sub>	Input HIGH Voltage	2.0			Guaranteed Input HIGH Voltage for all Inputs	V
V <sub>IL</sub>	Input LOW Voltage	54		0.5	Guaranteed input LOW Voltage for all Inputs	V
		74		0.6		
V <sub>CD</sub>	Input Clamp Diode Voltage		-0.65	-1.5	V <sub>CC</sub> = MIN, I <sub>IN</sub> = -18mA	V
I <sub>OH</sub>	Output HIGH Current			100	V <sub>CC</sub> = MIN, V <sub>OH</sub> = 5.5V	μA
V <sub>OL</sub>	Output LOW Voltage	54,74	0.25	0.4	I <sub>OL</sub> = 12mA : V <sub>CC</sub> = MIN, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> per Truth Table I <sub>OL</sub> = 24mA	V
		74	0.35	0.5		
I <sub>IH</sub>	Input HIGH Current			20	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7V V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0V	μA mA
				0.1		
I <sub>IL</sub>	Input LOW Current			-0.4	V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.4V	mA
I <sub>CC</sub>	Power Supply Current Total, Output HIGH Total, Output LOW Total at HIGH Z			70	V <sub>CC</sub> = MAX	mA
				90		
				95		

**AC CHARACTERISTICS: T<sub>A</sub> = 25°C (T54LS/T74LS641)**

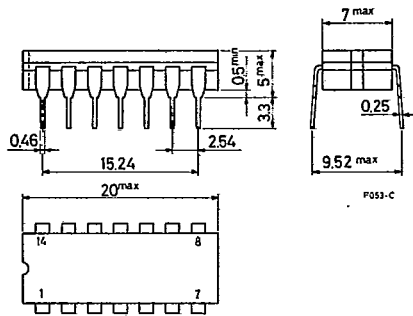
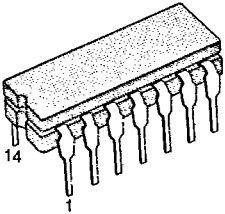
Symbol	Parameter	Limits			Test Conditions	Units
		Min.	Typ.	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, A to B		17 16	25 25	V <sub>CC</sub> = 5.0V C <sub>L</sub> = 45pF R <sub>L</sub> = 667Ω	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, B to A		17 16	25 25		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, G, DIR to A		23 34	40 50		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay, G, DIR to B		25 37	40 50		

- Notes:**  
 1) For conditions shown as MIN or MAX, use the appropriate value specified under guaranteed operating ranges.  
 2) Typical values are at V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C

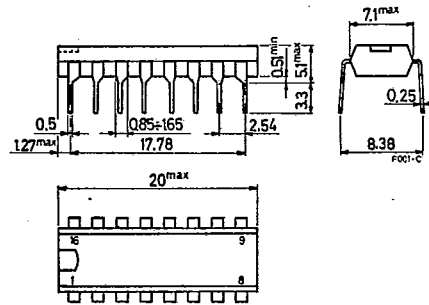
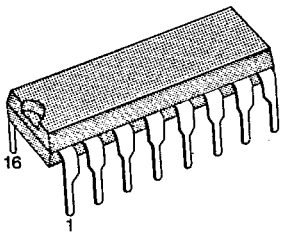
14-LEAD PLASTIC DIP



14-LEAD CERAMIC DIP



16-LEAD PLASTIC DIP



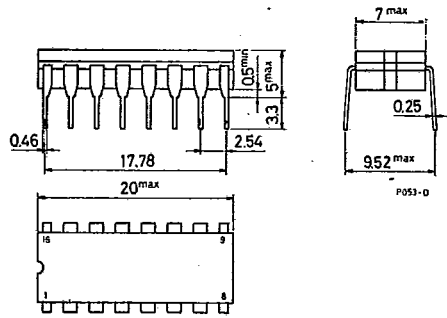
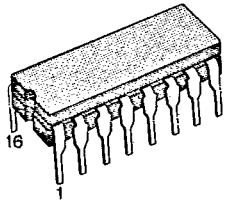
# Packages

67C 16545

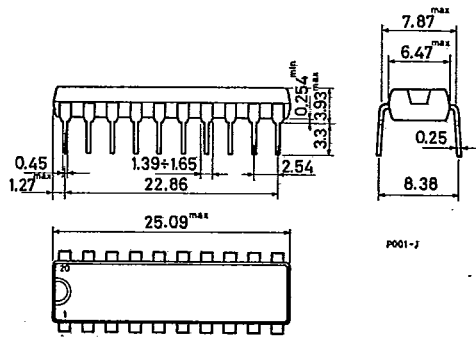
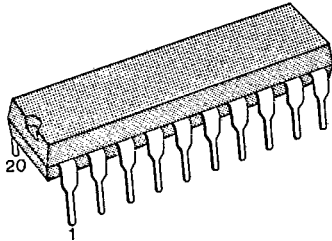
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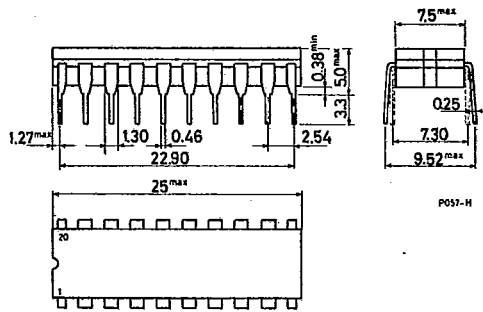
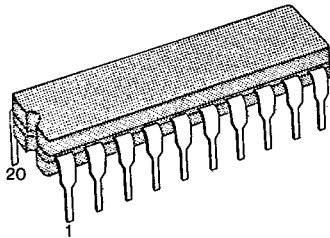
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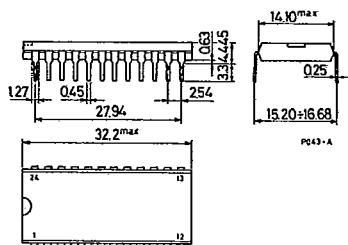
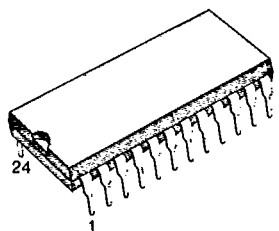
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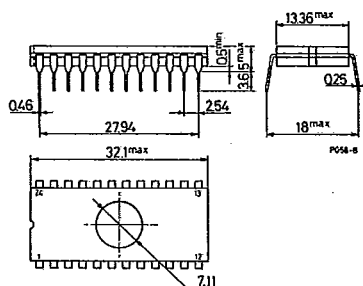
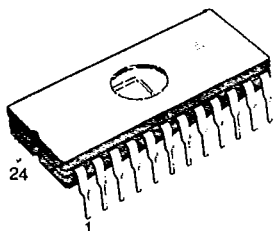
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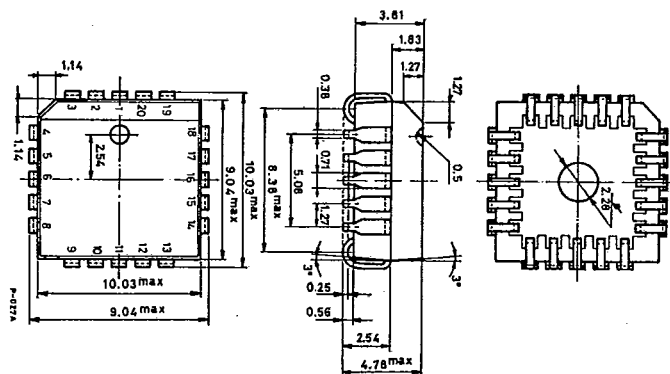
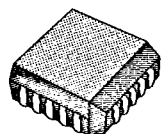
### 24-LEAD PLASTIC DIP



### 24-LEAD CERAMIC DIP



### CHIP CARRIER 20 LEAD PLASTIC



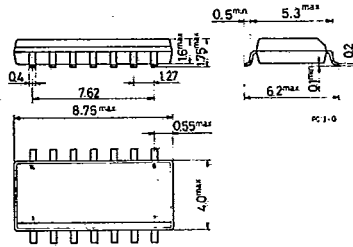
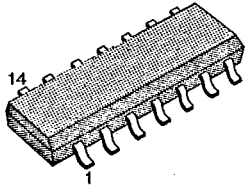
# Packages

67C 16547

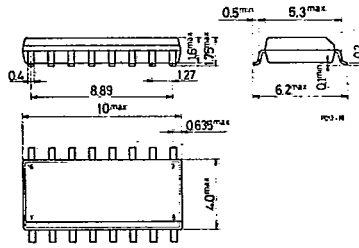
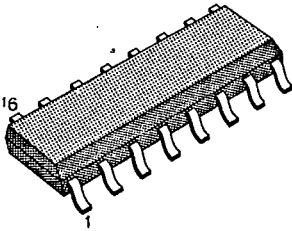
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## 14-LEAD PLASTIC DIP MICROPACKAGE



## 16-LEAD PLASTIC DIP MICROPACKAGE



NOTE: FOR 20-LEAD PLASTIC DIP MICROPACKAGE CONTACT SGS



# Surface Mounted

67C 16548

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T-90-20

One possible solution to the important problem of PWB minimization, is that of using surface mounted components. Integrated circuits in SO (Small Outline) packages are made up of standard chips mounted in very small plastic packages. The advantages given by using these devices are:

### PWB Reduction

This is by far the most important advantage since the reduction of PWB size varies from 40 to 60% in comparison with standard board types. (See page 584 for package dimensions.)

### Assembly Cost Reduction

SO Devices require no preliminary operation prior to mounting and can therefore be easily utilized in fully automatic equipment.

### Increasing Reliability

The following characteristics lead to a higher level of reliability with respect to their standard packaged counter parts:

- The mounting system is fully automatic
- PWB number and the interconnections between them are reduced when the same number of devices are used.
- The high density of components on the board makes it thermally much more stable.

### Noise Reduction and Improved Frequency Response

The reduction of the length of the connecting wires between the leads and the silicon guarantees a more homogeneous propagation delay between the external pins, with respect to the standard type.

### Assembly Without Board Holes

The devices are placed on the board and soldered. This technology permits a higher level of tolerance in the positioning (automatic) of the device. For the standard DIP types this must be done with great accuracy due to the insertion of the leads into their holes.

