

September 1997 - Revised May 2000

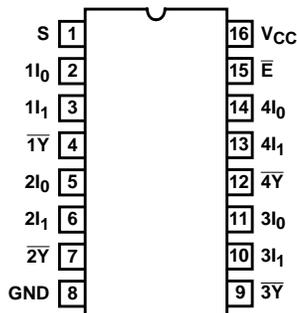
## High Speed CMOS Logic Quad 2-Input Multiplexers

### Features

- Common Select Inputs
- Separate Enable Inputs
- Buffered inputs and Outputs
- Fanout (Over Temperature Range)
  - Standard Outputs . . . . . 10 LSTTL Loads
  - Bus Driver Outputs . . . . . 15 LSTTL Loads
- Wide Operating Temperature Range . . . -55°C to 125°C
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- HC Types
  - 2V to 6V Operation
  - High Noise Immunity:  $N_{IL} = 30\%$ ,  $N_{IH} = 30\%$  of  $V_{CC}$  at  $V_{CC} = 5V$
- HCT Types
  - 4.5V to 5.5V Operation
  - Direct LSTTL Input Logic Compatibility,  $V_{IL} = 0.8V$  (Max),  $V_{IH} = 2V$  (Min)
  - CMOS Input Compatibility,  $I_I \leq 1\mu A$  at  $V_{OL}$ ,  $V_{OH}$

### Pinout

 CD54HC157, CD54HCT157, CD54HC158, CD54HCT158  
 (CERDIP)

 CD74HC157, CD74HCT157, CD74HC158, CD74HCT158  
 (PDIP, SOIC)  
 TOP VIEW


### Description

The 'HC157, 'HCT157, 'HC158, and 'HCT158 are quad 2-input multiplexers which select four bits of data from two sources under the control of a common Select input (S). The Enable input ( $\bar{E}$ ) is active Low. When ( $\bar{E}$ ) is High, all of the outputs in the 158, the inverting type, ( $\overline{1Y-4Y}$ ) are forced High and in the 157, the non-inverting type, all of the outputs ( $\overline{1Y-4Y}$ ) are forced Low, regardless of all other input conditions.

Moving data from two groups of registers to four common output busses is a common use of these devices. The state of the Select input determines the particular register from which the data comes. They can also be used as function generators.

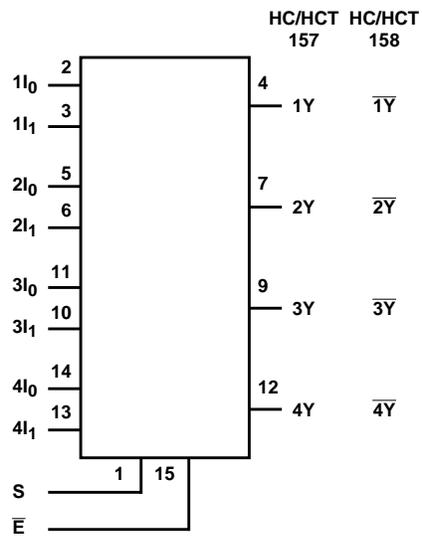
### Ordering Information

PART NUMBER	TEMP. RANGE (°C)	PACKAGE
CD54HC157F	-55 to 125	16 Ld CERDIP
CD54HC157F3A	-55 to 125	16 Ld CERDIP
CD74HC157E	-55 to 125	16 Ld PDIP
CD74HC157M	-55 to 125	16 Ld SOIC
CD54HCT157F3A	-55 to 125	16 Ld CERDIP
CD74HCT157E	-55 to 125	16 Ld PDIP
CD74HCT157M	-55 to 125	16 Ld SOIC
CD54HC158F3A	-55 to 125	16 Ld CERDIP
CD74HC158E	-55 to 125	16 Ld PDIP
CD74HC158M	-55 to 125	16 Ld SOIC
CD54HCT158F3A	-55 to 125	16 Ld CERDIP
CD74HCT158E	-55 to 125	16 Ld PDIP

#### NOTES:

1. When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.
2. Wafer or die for this part number is available which meets all electrical specifications. Please contact your local TI sales office or customer service for ordering information.

**Functional Diagram**



**TRUTH TABLE**

ENABLE	SELECT INPUT	DATA INPUTS		OUTPUT	
				157	158
$\bar{E}$	S	I0	I1	Y	$\bar{Y}$
H	X	X	X	L	H
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

NOTE: H = High Voltage Level, L = Low Voltage Level, X = Don't Care

## CD54/74HC157, CD54/74HCT157, CD54/74HC158, CD54/74HCT158

### Absolute Maximum Ratings

DC Supply Voltage, $V_{CC}$ .....	-0.5V to 7V
DC Input Diode Current, $I_{IK}$	
For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$ .....	$\pm 20mA$
DC Output Diode Current, $I_{OK}$	
For $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$ .....	$\pm 20mA$
DC Output Source or Sink Current per Output Pin, $I_O$	
For $V_O > -0.5V$ or $V_O < V_{CC} + 0.5V$ .....	$\pm 25mA$
DC $V_{CC}$ or Ground Current, $I_{CC}$ or $I_{GND}$ .....	$\pm 50mA$

### Thermal Information

Thermal Resistance (Typical, Note 3)	$\theta_{JA}$ (°C/W)
PDIP Package .....	90
SOIC Package .....	115
Maximum Junction Temperature .....	150°C
Maximum Storage Temperature Range .....	-65°C to 150°C
Maximum Lead Temperature (Soldering 10s) .....	300°C (SOIC - Lead Tips Only)

### Operating Conditions

Temperature Range ( $T_A$ ) .....	-55°C to 125°C
Supply Voltage Range, $V_{CC}$	
HC Types .....	.2V to 6V
HCT Types .....	.4.5V to 5.5V
DC Input or Output Voltage, $V_I, V_O$ .....	0V to $V_{CC}$
Input Rise and Fall Time	
2V .....	1000ns (Max)
4.5V .....	500ns (Max)
6V .....	400ns (Max)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

#### NOTE:

- $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

### DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS		$V_{CC}$ (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		$V_I$ (V)	$I_O$ (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HC TYPES</b>												
High Level Input Voltage	$V_{IH}$	-	-	2	1.5	-	-	1.5	-	1.5	-	V
				4.5	3.15	-	-	3.15	-	3.15	-	V
				6	4.2	-	-	4.2	-	4.2	-	V
Low Level Input Voltage	$V_{IL}$	-	-	2	-	-	0.5	-	0.5	-	0.5	V
				4.5	-	-	1.35	-	1.35	-	1.35	V
				6	-	-	1.8	-	1.8	-	1.8	V
High Level Output Voltage CMOS Loads	$V_{OH}$	$V_{IH}$ or $V_{IL}$	-0.02	2	1.9	-	-	1.9	-	1.9	-	V
			-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
			-0.02	6	5.9	-	-	5.9	-	5.9	-	V
High Level Output Voltage TTL Loads	$V_{OH}$	$V_{IH}$ or $V_{IL}$	-	-	-	-	-	-	-	-	-	V
			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
			-5.2	6	5.48	-	-	5.34	-	5.2	-	V
Low Level Output Voltage CMOS Loads	$V_{OL}$	$V_{IH}$ or $V_{IL}$	0.02	2	-	-	0.1	-	0.1	-	0.1	V
			0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
			0.02	6	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads	$V_{OL}$	$V_{IH}$ or $V_{IL}$	-	-	-	-	-	-	-	-	-	V
			4	4.5	-	-	0.26	-	0.33	-	0.4	V
			5.2	6	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	$I_I$	$V_{CC}$ or GND	-	6	-	-	$\pm 0.1$	-	$\pm 1$	-	$\pm 1$	$\mu A$
Quiescent Device Current	$I_{CC}$	$V_{CC}$ or GND	0	6	-	-	8	-	80	-	160	$\mu A$

**CD54/74HC157, CD54/74HCT157, CD54/74HC158, CD54/74HCT158**

**DC Electrical Specifications (Continued)**

PARAMETER	SYMBOL	TEST CONDITIONS		V <sub>CC</sub> (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
		V <sub>I</sub> (V)	I <sub>O</sub> (mA)		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HCT TYPES</b>												
High Level Input Voltage	V <sub>IH</sub>	-	-	4.5 to 5.5	2	-	-	2	-	2	-	V
Low Level Input Voltage	V <sub>IL</sub>	-	-	4.5 to 5.5	-	-	0.8	-	0.8	-	0.8	V
High Level Output Voltage CMOS Loads	V <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub>	-0.02	4.5	4.4	-	-	4.4	-	4.4	-	V
High Level Output Voltage TTL Loads			-4	4.5	3.98	-	-	3.84	-	3.7	-	V
Low Level Output Voltage CMOS Loads	V <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub>	0.02	4.5	-	-	0.1	-	0.1	-	0.1	V
Low Level Output Voltage TTL Loads			4	4.5	-	-	0.26	-	0.33	-	0.4	V
Input Leakage Current	I <sub>I</sub>	V <sub>CC</sub> and GND	0	5.5	-	-	±0.1	-	±1	-	±1	μA
Quiescent Device Current	I <sub>CC</sub>	V <sub>CC</sub> or GND	0	5.5	-	-	8	-	80	-	160	μA
Additional Quiescent Device Current Per Input Pin: 1 Unit Load	ΔI <sub>CC</sub>	V <sub>CC</sub> -2.1	-	4.5 to 5.5	-	100	360	-	450	-	490	μA

NOTE: For dual-supply systems theoretical worst case (V<sub>I</sub> = 2.4V, V<sub>CC</sub> = 5.5V) specification is 1.8mA.

**HCT Input Loading Table**

INPUT	UNIT LOADS	
	HCT157	HCT158
I (All)	0.95	0.4
$\bar{E}$	0.6	0.6
S	3	2.8

NOTE: Unit Load is ΔI<sub>CC</sub> limit specified in DC Electrical Table, e.g., 360μA max at 25°C.

**Switching Specifications** Input t<sub>r</sub>, t<sub>f</sub> = 6ns

PARAMETER	SYMBOL	TEST CONDITIONS	V <sub>CC</sub> (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
<b>HC/HCT157 TYPES</b>											
Propagation Delay (Figure 1) Data to Output	t <sub>PLH</sub> , t <sub>PHL</sub>	C <sub>L</sub> = 50pF	2	-	-	125	-	155	-	190	ns
			4.5	-	-	25	-	31	-	38	ns
HC157		C <sub>L</sub> = 15pF	5	-	10	-	-	-	-	-	ns
			-	-	12	-	-	-	-	-	ns
HCT157		C <sub>L</sub> = 50pF	6	-	-	21	-	26	-	32	ns
			-	-	-	-	-	-	-	-	-

**CD54/74HC157, CD54/74HCT157, CD54/74HC158, CD54/74HCT158**

**Switching Specifications** Input  $t_r, t_f = 6\text{ns}$  (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS	V <sub>CC</sub> (V)	25°C			-40°C TO 85°C		-55°C TO 125°C		UNITS
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
Enable to Output	t <sub>PLH</sub> , t <sub>PHL</sub>	C <sub>L</sub> = 50pF	2	-	-	135	-	170	-	205	ns
			4.5	-	-	27	-	34	-	41	ns
HC157		C <sub>L</sub> = 15pF	5	-	11	-	-	-	-	-	ns
			HCT157	-	12	-	-	-	-	-	ns
Select to Output		C <sub>L</sub> = 50pF	6	-	-	23	-	29	-	35	ns
			C <sub>L</sub> = 50pF	2	-	-	145	-	180	-	220
HC157	C <sub>L</sub> = 15pF	5	-	12	-	-	-	-	-	ns	
		HCT157	-	15	-	-	-	-	-	ns	
C <sub>L</sub> = 50pF	6	-	-	25	-	31	-	38	ns		
	C <sub>L</sub> = 50pF	6	-	-	25	-	31	-	38	ns	
Power Dissipation Capacitance (Notes 4, 5)	C <sub>PD</sub>	-	5	-	-	-	-	-	-	-	
HC157				-	62	-	-	-	-	-	pF
HCT157				-	70	-	-	-	-	-	pF
<b>HC/HCT158 TYPES</b>											
Data to Output	t <sub>PLH</sub> , t <sub>PHL</sub>	C <sub>L</sub> = 50pF	2	-	-	140	-	175	-	210	ns
			4.5	-	-	28	-	35	-	42	
HC158		C <sub>L</sub> = 15pF	5	-	11	-	-	-	-	-	ns
			HCT158	-	13	-	-	-	-	-	ns
Enable to Output		C <sub>L</sub> = 50pF	6	-	-	24	-	30	-	36	ns
			C <sub>L</sub> = 50pF	2	-	-	160	-	200	-	240
HC158	C <sub>L</sub> = 15pF	5	-	13	-	-	-	-	-	ns	
		HCT158	-	15	-	-	-	-	-	ns	
C <sub>L</sub> = 50pF	6	-	-	27	-	34	-	41	ns		
	C <sub>L</sub> = 50pF	2	-	-	150	-	190	-	225	ns	
Select to Output	C <sub>L</sub> = 50pF	4.5	-	-	30	-	38	-	45	ns	
		HC158	C <sub>L</sub> = 15pF	5	-	12	-	-	-	-	ns
HCT158	-	14		-	-	-	-	-	ns		
C <sub>L</sub> = 50pF	6	-	-	26	-	33	-	38	ns		
	C <sub>L</sub> = 50pF	2	-	-	75	-	95	-	110	ns	
Output Transition Time	t <sub>TLH</sub> , t <sub>THL</sub>	C <sub>L</sub> = 50pF	4.5	-	-	15	-	19	-	22	ns
			6	-	-	13	-	16	-	19	ns
Power Dissipation Capacitance (Notes 4, 5)			C <sub>PD</sub>	-	5	-	-	-	-	-	-
HC158	-	35				-	-	-	-	pF	
HCT158	-	35				-	-	-	-	pF	
Input Capacitance	C <sub>IN</sub>	C <sub>L</sub> = 50pF	-	-	-	10	-	10	-	10	pF

NOTES:

- C<sub>PD</sub> is used to determine the dynamic power consumption, per multiplexer.
- $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$  where  $f_i$  = input frequency,  $C_L$  = output load capacitance,  $V_{CC}$  = supply voltage.

**Test Circuits and Waveforms**

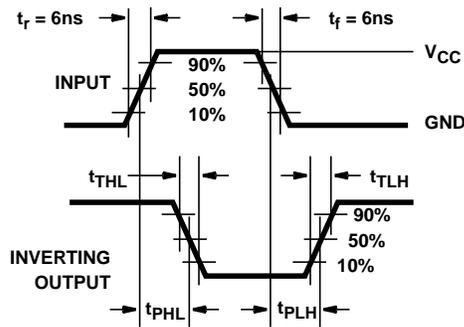


FIGURE 1. HC AND HCU TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

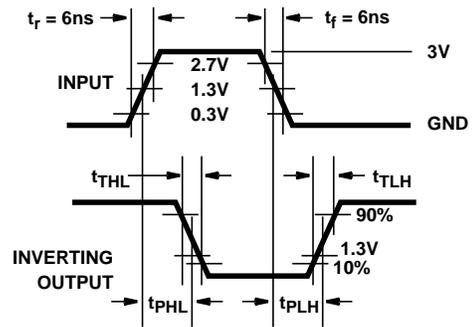


FIGURE 2. HCT TRANSITION TIMES AND PROPAGATION DELAY TIMES, COMBINATION LOGIC

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PRODUCT SUPPORT: [TRAINING](#)

## CD54HCT157, High Speed CMOS Logic Quad 2-Input Multiplexers

DEVICE STATUS: ACTIVE

PARAMETER NAME	CD54HCT157
Voltage Nodes (V)	5

### FEATURES

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- Common Select Inputs
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  - Standard Outputs . . . . . 10 LSTTL Loads
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### DESCRIPTION

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The 'HC157, 'HCT157, 'HC158, and 'HCT158 are quad 2-input multiplexers which select four bits of data from two sources under the control of a common Select input (S). The Enable input (E) is active Low. When (E) is High, all of the outputs in the 158, the inverting type, (1Y\–4Y\ ) are forced High and in the 157, the non-inverting type, all of the outputs (1Y\–4Y\ ) are forced Low, regardless of all other input conditions.

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### TECHNICAL DOCUMENTS

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### DATASHEET

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Full datasheet in Acrobat PDF: [cd54hct157.pdf](#) (34 KB,Rev.A) (Updated: 05/19/2000)

### APPLICATION NOTES

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View Application Notes for [Digital Logic](#)

- [CMOS Power Consumption and CPD Calculation \(Rev. B\)](#) (SCAA035B - Updated: 06/01/1997)
- [Designing With Logic \(Rev. C\)](#) (SDYA009C - Updated: 06/01/1997)
- [Evaluation of Nickel/Palladium/Gold-Finished Surface-Mount Integrated Circuits](#) (SZZA026 - Updated: 06/20/2001)

- [Implications of Slow or Floating CMOS Inputs \(Rev. C\)](#) (SCBA004C - Updated: 02/01/1998)
- [SN54/74HCT CMOS Logic Family Applications and Restrictions](#) (SCLA011 - Updated: 05/01/1996)
- [TI IBIS File Creation, Validation, and Distribution Processes](#) (SZZA034 - Updated: 08/29/2002)
- [Understanding and Interpreting Texas Instruments Standard-Logic Products Data Sheet \(Rev. A\)](#) (SZZA036A - Updated: 02/27/2003)
- [Using High Speed CMOS and Advanced CMOS in Systems With Multiple Vcc](#) (SCLA008 - Updated: 04/01/1996)

**MORE LITERATURE**

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- [Enhanced Plastic Portfolio Brochure](#) (SGZB004, 387 KB - Updated: 08/19/2002)
- [Logic Reference Guide](#) (SCYB004, 1032 KB - Updated: 10/23/2001)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 167 KB - Updated: 07/28/2000)
- [Military Brief](#) (SGYN138, 803 KB - Updated: 10/10/2000)
- [Overview of IEEE Std 91-1984, Explanation of Logic Symbols Training Booklet \(Rev. A\)](#) (SDYZ001A, 138 KB - Updated: 07/01/1996)
- [Palladium Lead Finish User's Manual](#) (SDYV001, 2041 KB - Updated: 11/01/1996)
- [QML Class V Space Products Military Brief \(Rev. A\)](#) (SGZN001A, 257 KB - Updated: 10/07/2002)

**USER GUIDES**

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- [LOGIC Pocket Data Book](#) (SCYD013, 4837 KB - Updated: 12/05/2002)
- [Signal Switch Data Book](#) (SCDD003, 10259 KB - Updated: 03/19/2001)

**PRICING/AVAILABILITY/PKG**

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DEVICE INFORMATION							
Updated Daily							
ORDERABLE DEVICE	STATUS	PACKAGE TYPE   PINS	TEMP (°C)	DSCC NUMBER	PRODUCT CONTENT	BUDGETARY PRICING QTY   SUS	STD PACK QTY
5962-9070201MEA	ACTIVE	<a href="#">CDIP (J)</a>   16	-55 TO 125		<a href="#">View Contents</a>	1KU   3.83	1
CD54HCT157F3A	ACTIVE	<a href="#">CDIP (J)</a>   16	-55 TO 125	5962-9070201MEA	<a href="#">View Contents</a>	1KU   3.82	1

TI INVENTORY STATUS		
As Of 08:00 AM GMT, 17 Apr 2003		
IN STOCK	IN PROGRESS QTY   DATE	LEAD TIME
<a href="#">118*</a>	>10k   20 May	8 WKS
<a href="#">22*</a>	276   06 May	8 WKS
	>10k   20 May	

REPORTED DISTRIBUTOR INVENTORY		
As Of 08:00 AM GMT, 17 Apr 2003		
DISTRIBUTOR COMPANY   REGION	IN STOCK	PURCHASE
<a href="#">Avnet</a>   Americas	364	<a href="#">BUY NOW</a>
None Reported <a href="#">View Distributors</a>		

Table Data Updated on: 4/17/2003

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PRODUCT SUPPORT: [TRAINING](#)

## CD54HC157, High Speed CMOS Logic Quad 2-Input Multiplexers

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### DATASHEET

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### APPLICATION NOTES

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- [CMOS Power Consumption and CPD Calculation \(Rev. B\)](#) (SCAA035B - Updated: 06/01/1997)
- [Designing With Logic \(Rev. C\)](#) (SDYA009C - Updated: 06/01/1997)
- [Evaluation of Nickel/Palladium/Gold-Finished Surface-Mount Integrated Circuits](#) (SZZA026 - Updated: 06/20/2001)

- [Implications of Slow or Floating CMOS Inputs \(Rev. C\)](#) (SCBA004C - Updated: 02/01/1998)
- [Input and Output Characteristics of Digital Integrated Circuits](#) (SDYA010 - Updated: 10/01/1996)
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- [SN54/74HCT CMOS Logic Family Applications and Restrictions](#) (SCLA011 - Updated: 05/01/1996)
- [Selecting the Right Texas Instruments Signal Switch](#) (SZZA030 - Updated: 09/07/2001)
- [TI IBIS File Creation, Validation, and Distribution Processes](#) (SZZA034 - Updated: 08/29/2002)
- [Understanding and Interpreting Texas Instruments Standard-Logic Products Data Sh \(Rev. A\)](#) (SZZA036A - Updated: 02/27/2003)
- [Using High Speed CMOS and Advanced CMOS in Systems With Multiple Vcc](#) (SCLA008 - Updated: 04/01/1996)

**MORE LITERATURE**

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- [Enhanced Plastic Portfolio Brochure](#) (SGZB004, 387 KB - Updated: 08/19/2002)
- [Logic Reference Guide](#) (SCYB004, 1032 KB - Updated: 10/23/2001)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 167 KB - Updated: 07/28/2000)
- [Military Brief](#) (SGYN138, 803 KB - Updated: 10/10/2000)
- [Overview of IEEE Std 91-1984, Explanation of Logic Symbols Training Booklet \(Rev. A\)](#) (SDYZ001A, 138 KB - Updated: 07/01/1996)
- [Palladium Lead Finish User's Manual](#) (SDYV001, 2041 KB - Updated: 11/01/1996)
- [QML Class V Space Products Military Brief \(Rev. A\)](#) (SGZN001A, 257 KB - Updated: 10/07/2002)

**USER GUIDES**

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- [LOGIC Pocket Data Book](#) (SCYD013, 4837 KB - Updated: 12/05/2002)
- [Signal Switch Data Book](#) (SCDD003, 10259 KB - Updated: 03/19/2001)

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ORDERABLE DEVICE	STATUS	PACKAGE TYPE   PINS	TEMP (°C)	DSCC NUMBER	PRODUCT CONTENT	BUDGETARY PRICING QTY   SUS	STD PACK QTY	IN STOCK	IN PROGRESS QTY   DATE	LEAD TIME	DISTRIBUTOR COMPANY   REGION	IN STOCK	PURCHASE
5962-8606101EA	ACTIVE	<a href="#">CDIP (J)</a>   16	-55 TO 125		<a href="#">View Contents</a>	1KU   2.16	1	542*	>10k   20 May	8 WKS	<a href="#">EBV Elektronik</a>   Europe	64	<a href="#">BUY NOW</a>
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