

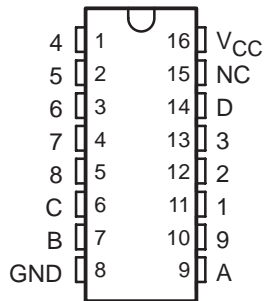
# SN54147, SN54148, SN54LS147, SN54LS148 SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148 10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

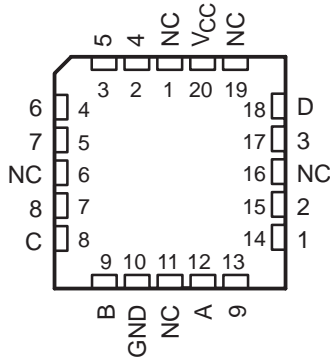
## '147, 'LS147

- Encode 10-Line Decimal to 4-Line BCD
- Applications Include:
  - Keyboard Encoding
  - Range Selection

SN54147, SN54LS147 ... J OR W PACKAGE  
SN74147, SN74LS147 ... D OR N PACKAGE  
(TOP VIEW)



SN54LS147 ... FK PACKAGE  
(TOP VIEW)

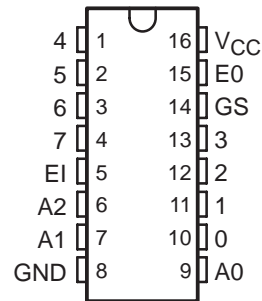


NC – No internal connection

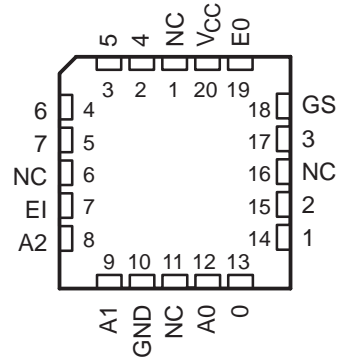
## '148, 'LS148

- Encode 8 Data Lines to 3-Line Binary (Octal)
- Applications Include:
  - n-Bit Encoding
  - Code Converters and Generators

SN54148, SN54LS148 ... J OR W PACKAGE  
SN74148, SN74LS148 ... D, N, OR NS PACKAGE  
(TOP VIEW)



SN54LS148 ... FK PACKAGE  
(TOP VIEW)



TYPE	TYPICAL DATA DELAY	TYPICAL POWER DISSIPATION
'147	10 ns	225 mW
'148	10 ns	190 mW
'LS147	15 ns	60 mW
'LS148	15 ns	60 mW

NOTE: The SN54147, SN54LS147, SN54148, SN74147, SN74LS147, and SN74148 are obsolete and are no longer supplied.



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2004, Texas Instruments Incorporated  
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**description/ordering information**

These TTL encoders feature priority decoding of the inputs to ensure that only the highest-order data line is encoded. The '147 and 'LS147 devices encode nine data lines to four-line (8-4-2-1) BCD. The implied decimal zero condition requires no input condition, as zero is encoded when all nine data lines are at a high logic level. The '148 and 'LS148 devices encode eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input EI and enable output EO) has been provided to allow octal expansion without the need for external circuitry. For all types, data inputs and outputs are active at the low logic level. All inputs are buffered to represent one normalized Series 54/74 or 54/74LS load, respectively.

**ORDERING INFORMATION**

T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74LS148N	SN74LS148N
	SOIC – D	Tube	SN74LS148D	LS148
		Tape and reel	SN74LS148DR	
	SOP – NS	Tape and reel	SN74LS148NSR	74LS148
–55°C to 125°C	CDIP – J	Tube	SNJ54LS148J	SNJ54LS148J
	CFP – W	Tube	SNJ54LS148W	SNJ54LS148W
	LCCC – FK	Tube	SNJ54LS148FK	SNJ54LS148FK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

**FUNCTION TABLE – '147, 'LS147**

INPUTS									OUTPUTS			
1	2	3	4	5	6	7	8	9	D	C	B	A
H	H	H	H	H	H	H	H	H	H	H	H	H
X	X	X	X	X	X	X	X	L	L	H	H	L
X	X	X	X	X	X	X	L	H	L	H	H	H
X	X	X	X	X	X	L	H	H	H	L	L	L
X	X	X	X	X	L	H	H	H	H	L	L	H
X	X	X	X	L	H	H	H	H	H	L	H	L
X	X	X	L	H	H	H	H	H	H	L	H	H
X	X	L	H	H	H	H	H	H	H	H	L	L
X	L	H	H	H	H	H	H	H	H	H	L	H
L	H	H	H	H	H	H	H	H	H	H	H	L

H = high logic level, L = low logic level, X = irrelevant



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

FUNCTION TABLE – '148, 'LS148

INPUTS									OUTPUTS				
EI	0	1	2	3	4	5	6	7	A2	A1	A0	GS	EO
H	X	X	X	X	X	X	X	X	H	H	H	H	H
L	H	H	H	H	H	H	H	H	H	H	H	H	L
L	X	X	X	X	X	X	X	L	L	L	L	L	H
L	X	X	X	X	X	X	L	H	L	L	H	L	H
L	X	X	X	X	X	L	H	H	L	H	L	L	H
L	X	X	X	X	L	H	H	H	L	H	H	L	H
L	X	X	X	L	H	H	H	H	H	L	L	L	H
L	X	X	L	H	H	H	H	H	H	L	H	L	H
L	X	L	H	H	H	H	H	H	H	H	L	L	H
L	L	H	H	H	H	H	H	H	H	H	H	L	H

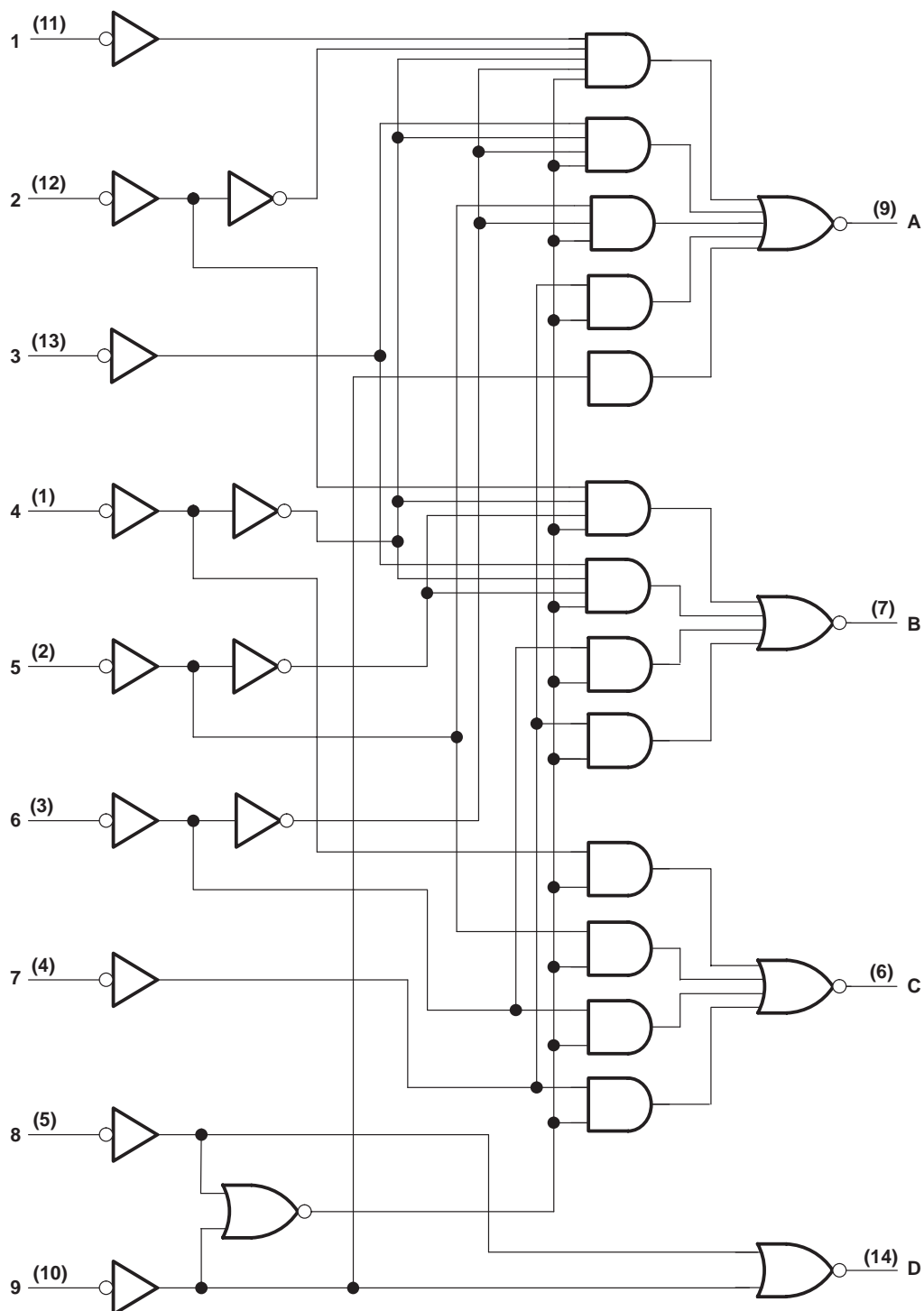
H = high logic level, L = low logic level, X = irrelevant



**SN54147, SN54148, SN54LS147, SN54LS148  
SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148  
10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

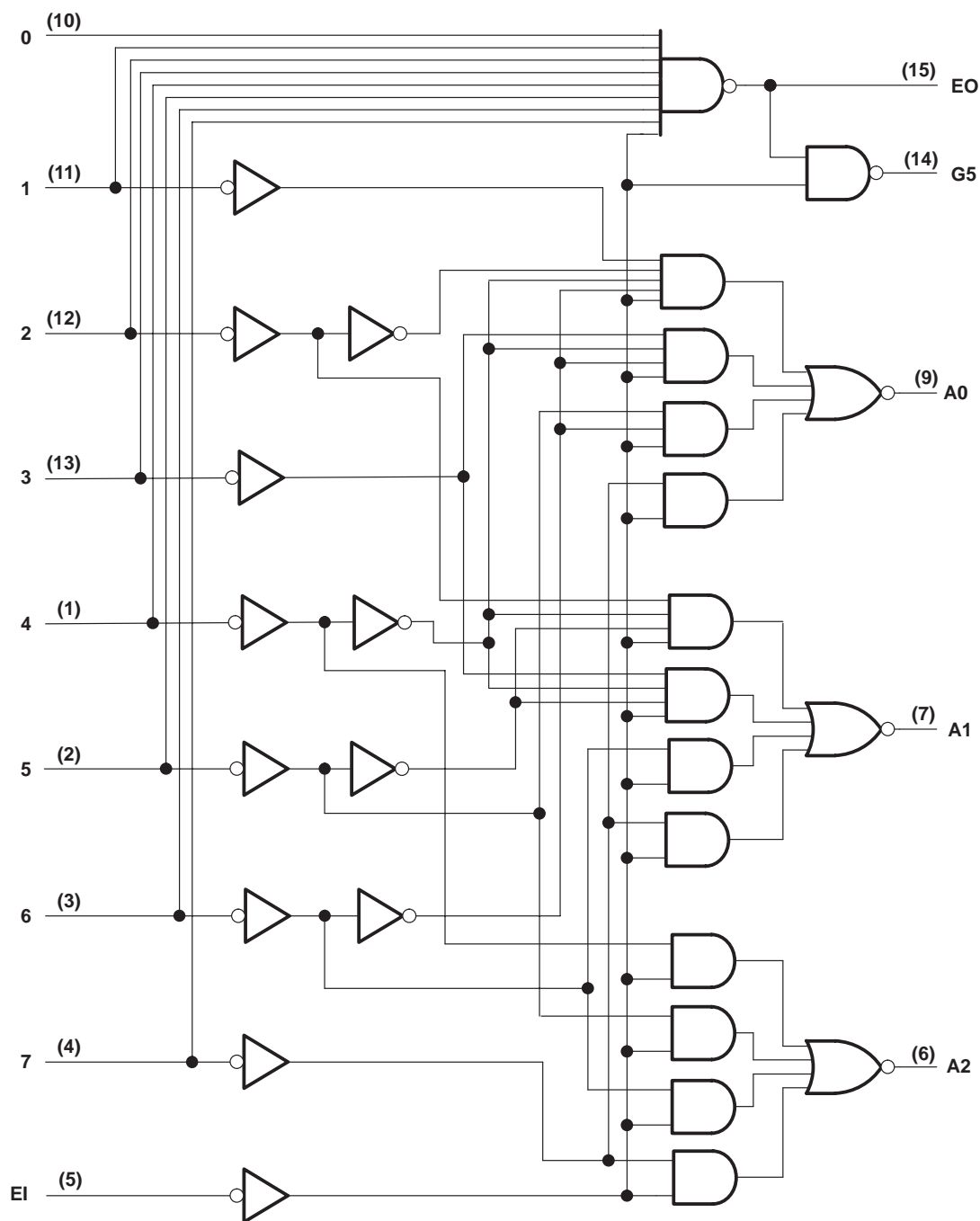
**'147, 'LS147 logic diagram (positive logic)**



Pin numbers shown are for D, J, N, and W packages.

**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**  
SDLS053B – OCTOBER 1976 – REVISED MAY 2004

'148, 'LS148 logic diagram (positive logic)



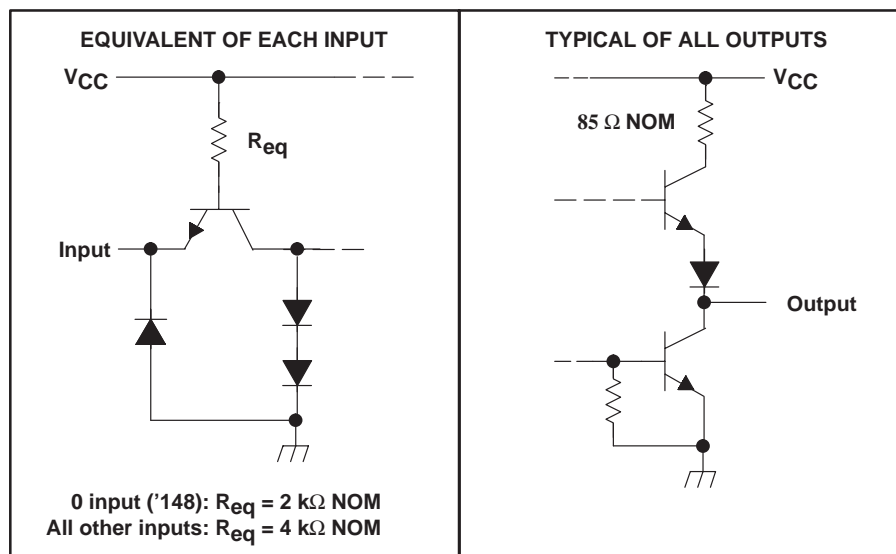
Pin numbers shown are for D, J, N, NS, and W packages.

**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

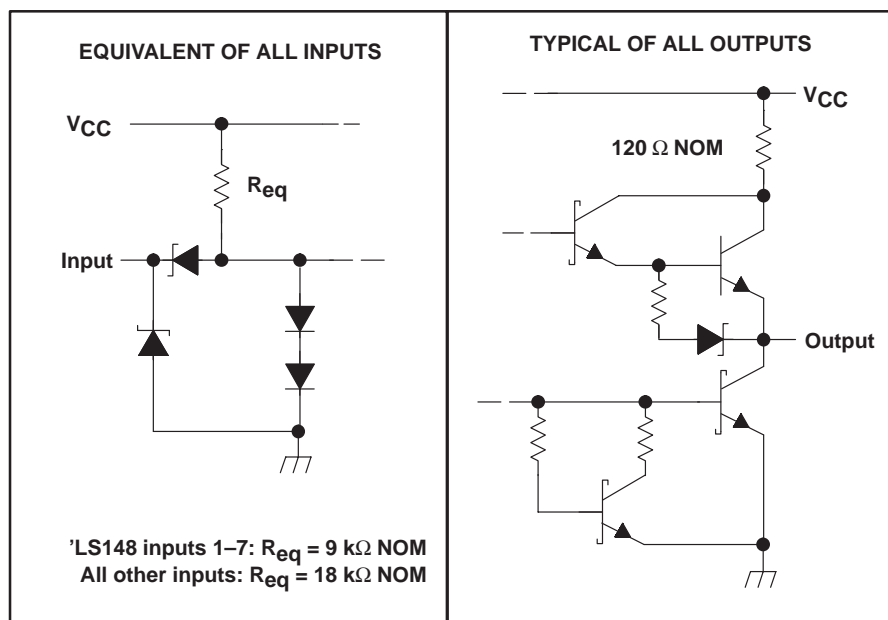
SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**schematics of inputs and outputs**

'147, '148



'LS147, 'LS148



**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**absolute maximum ratings over operating free-air temperature (unless otherwise noted)<sup>†</sup>**

Supply voltage, $V_{CC}$ (see Note 1)	7 V
Input voltage, $V_I$ : '147, '148	5.5 V
'LS147, 'LS148	7 V
Inter-emitter voltage: '148 only (see Note 2)	5.5 V
Package thermal impedance $\theta_{JA}$ (see Note 3): D package	73°C/W
N package	67°C/W
NS package	64°C/W
Storage temperature range, $T_{stg}$	–65°C to 150°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.

- NOTES: 1. Voltage values, except inter-emitter voltage, are with respect to the network ground terminal.  
2. This is the voltage between two emitters of a multiple-emitter transistor. For '148 circuits, this rating applies between any two of the eight data lines, 0 through 7.  
3. The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions (see Note 4)**

	SN54'			SN74'			SN54LS'			SN74LS'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$ Supply voltage	4.5	5	5.5	4.75	5	5.25	4.5	5	5.5	4.75	5	5.25	V
$I_{OH}$ High-level output current			–800			–800			–400			–400	μA
$I_{OL}$ Low-level output current			16			16			4			8	mA
$T_A$ Operating free-air temperature	–55		125	0		70	–55		125	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.



**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

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

PARAMETER			TEST CONDITIONS†		'147			'148			UNIT
					MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V <sub>IH</sub>	High-level input voltage				2			2			V
V <sub>IL</sub>	Low-level input voltage				0.8			0.8			V
V <sub>IK</sub>	Input clamp voltage		V <sub>CC</sub> = MIN, I <sub>I</sub> = –12 mA		–1.5			–1.5			V
V <sub>OH</sub>	High-level output voltage		V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, V <sub>IH</sub> = 2 V, I <sub>OH</sub> = –800 μA		2.4	3.3		2.4	3.3		V
V <sub>OL</sub>	Low-level output voltage		V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 16 mA			0.2	0.4		0.2	0.4	V
I <sub>I</sub>	Input current at maximum input voltage		V <sub>CC</sub> = MIN, V <sub>I</sub> = 5.5 V		1			1			mA
I <sub>IH</sub>	High-level input current	0 input	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V					40			μA
		Any input except 0			40			80			
I <sub>IL</sub>	Low-level input current	0 input	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V					–1.6			mA
		Any input except 0			–1.6			–3.2			
I <sub>OS</sub>	Short-circuit output current§		V <sub>CC</sub> = MAX		–35		–85	–35		–85	mA
I <sub>CC</sub>	Supply current		V <sub>CC</sub> = MAX (See Note 5)	Condition 1	50	70		40	60	mA	
				Condition 2	42	62		35	55		

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

§ Not more than one output should be shorted at a time.

NOTE 5: For '147, I<sub>CC</sub> (Condition 1) is measured with input 7 grounded, other inputs and outputs open; I<sub>CC</sub> (Condition 2) is measured with all inputs and outputs open. For '148, I<sub>CC</sub> (Condition 1) is measured with inputs 7 and EI grounded, other inputs and outputs open; I<sub>CC</sub> (Condition 2) is measured with all inputs and outputs open.

**SN54147, SN74147 switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see Figure 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	WAVEFORM	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Any	In-phase output	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 400 Ω		9	14	ns
t <sub>PHL</sub>						7	11	
t <sub>PLH</sub>	Any	Any	Out-of-phase output			13	19	ns
t <sub>PHL</sub>						12	19	



**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**SN54148, SN74148 switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 1)**

PARAMETER†	FROM (INPUT)	TO (OUTPUT)	WAVEFORM	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	1–7	A0, A1, or A2	In-phase output	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 400 Ω	10	15	ns	
tPHL					9	14		
tPLH	1–7	A0, A1, or A2	Out-of-phase output		13	19	ns	
tPHL					12	19		
tPLH	0–7	EO	Out-of-phase output		6	10	ns	
tPHL					14	25		
tPLH	0–7	GS	In-phase output		18	30	ns	
tPHL					14	25		
tPLH	EI	A0, A1, or A2	In-phase output		10	15	ns	
tPHL					10	15		
tPLH	EI	GS	In-phase output		8	12	ns	
tPHL					10	15		
tPLH	EI	EO	In-phase output		10	15	ns	
tPHL					17	30		

†  $t_{PLH}$  = propagation delay time, low-to-high-level output.

$t_{PHL}$  = propagation delay time, high-to-low-level output.

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

PARAMETER			TEST CONDITIONS†		SN54LS'			SN74LS'			UNIT
					MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V <sub>IH</sub>	High-level input voltage				2			2			V
V <sub>IL</sub>	Low-level input voltage				0.7			0.8			V
V <sub>IK</sub>	Input clamp voltage		V <sub>CC</sub> = MIN, I <sub>I</sub> = −18 mA		−1.5			−1.5			V
V <sub>OH</sub>	High-level output voltage		V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OH</sub> = −400 μA		2.5 3.4			2.7 3.4			V
V <sub>OL</sub>	Low-level output voltage		V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> MAX	I <sub>OL</sub> = 4 mA	0.25 0.4			0.25 0.4			V
				I <sub>OL</sub> = 8 mA				0.35 0.5			
I <sub>I</sub>	Input current at maximum input voltage	'LS148 inputs 1–7	V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V		0.2			0.2			mA
		All other inputs			0.1			0.1			
I <sub>IH</sub>	High-level input current	'LS148 inputs 1–7	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V		40			40			μA
		All other inputs			20			20			
I <sub>IL</sub>	Low-level input current	'LS148 inputs 1–7	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V		−0.8			−0.8			mA
		All other inputs			−0.4			−0.4			
I <sub>OS</sub>	Short-circuit output current§		V <sub>CC</sub> = MAX		−20 −100			−20 −100			mA
I <sub>CC</sub>	Supply current		V <sub>CC</sub> = MAX (See Note 6)	Condition 1	12 20			12 20			mA
				Condition 2	10 17			10 17			

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

§ Not more than one output should be shorted at a time.

NOTE 6: For 'LS147,  $I_{CC}$  (Condition 1) is measured with input 7 grounded, other inputs and outputs open;  $I_{CC}$  (Condition 2) is measured with all inputs and outputs open. For 'LS148,  $I_{CC}$  (Condition 1) is measured with inputs 7 and EI grounded, other inputs and outputs open;  $I_{CC}$  (Condition 2) is measured with all inputs and outputs open.



**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**SN54LS147, SN74LS147 switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 2)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	WAVEFORM	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t <sub>PLH</sub>	Any	Any	In-phase output	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ	12	18	ns	
t <sub>PHL</sub>					12	18		
t <sub>PLH</sub>	Any	Any	Out-of-phase output		21	33	ns	
t <sub>PHL</sub>					15	23		

**SN54LS148, SN74LS148 switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 2)**

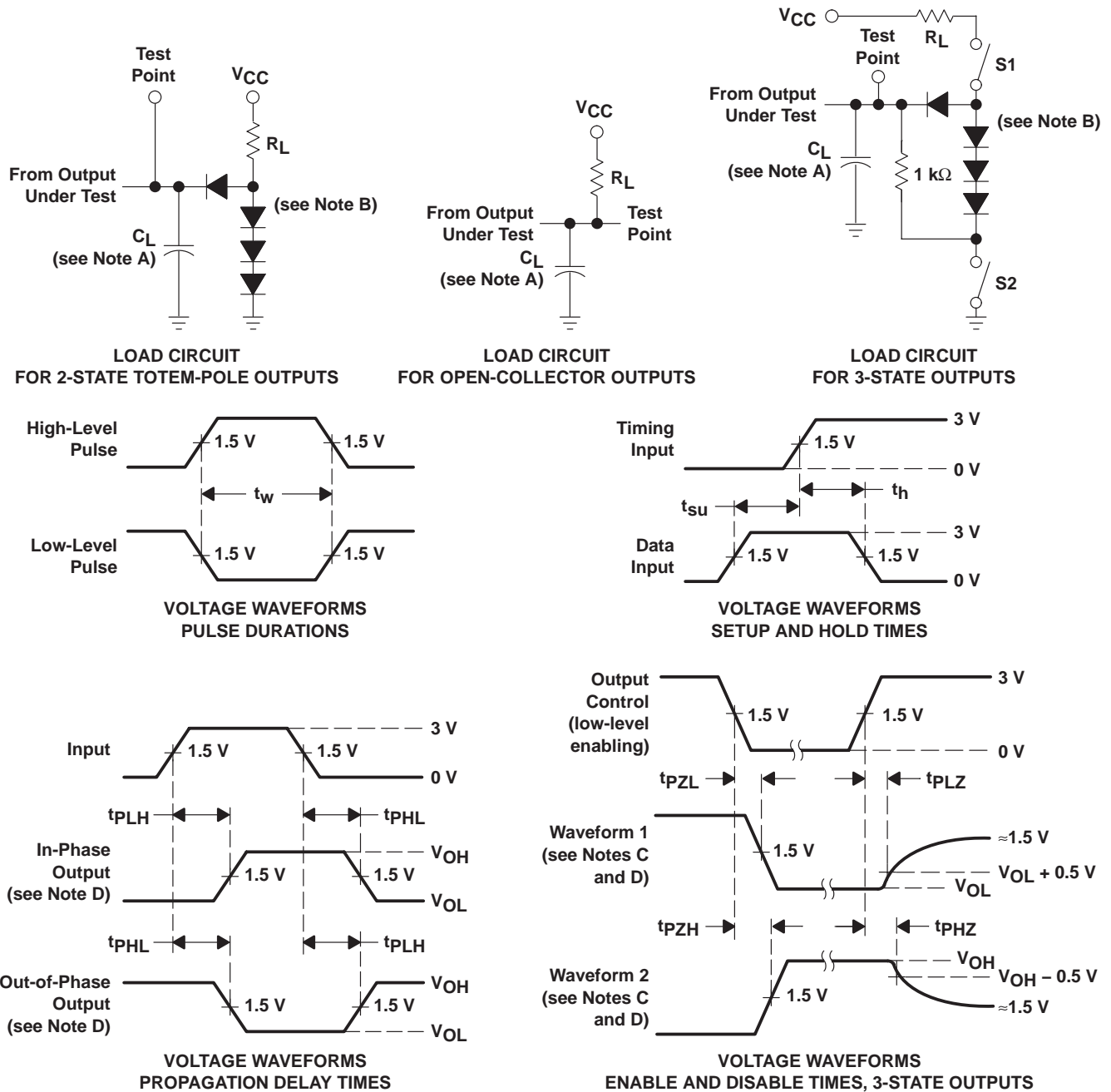
PARAMETER†	FROM (INPUT)	TO (OUTPUT)	WAVEFORM	TEST CONDITIONS	MIN	TYP	MAX	UNIT
tPLH	1–7	A0, A1, or A2	In-phase output	C <sub>L</sub> = 15 pF, R <sub>L</sub> = 2 kΩ	14	18	ns	
tPHL					15	25		
tPLH	1–7	A0, A1, or A2	Out-of-phase output		20	36	ns	
tPHL					16	29		
tPLH	0–7	EO	Out-of-phase output		7	18	ns	
tPHL					25	40		
tPLH	0–7	GS	In-phase output		35	55	ns	
tPHL					9	21		
tPLH	EI	A0, A1, or A2	In-phase output		16	25	ns	
tPHL					12	25		
tPLH	EI	GS	In-phase output		12	17	ns	
tPHL					14	36		
tPLH	EI	EO	In-phase output		12	21	ns	
tPHL					23	35		

†  $t_{PLH}$  = propagation delay time, low-to-high-level output

$t_{PHL}$  = propagation delay time, high-to-low-level output

## PARAMETER MEASUREMENT INFORMATION

### SERIES 54/74 DEVICES



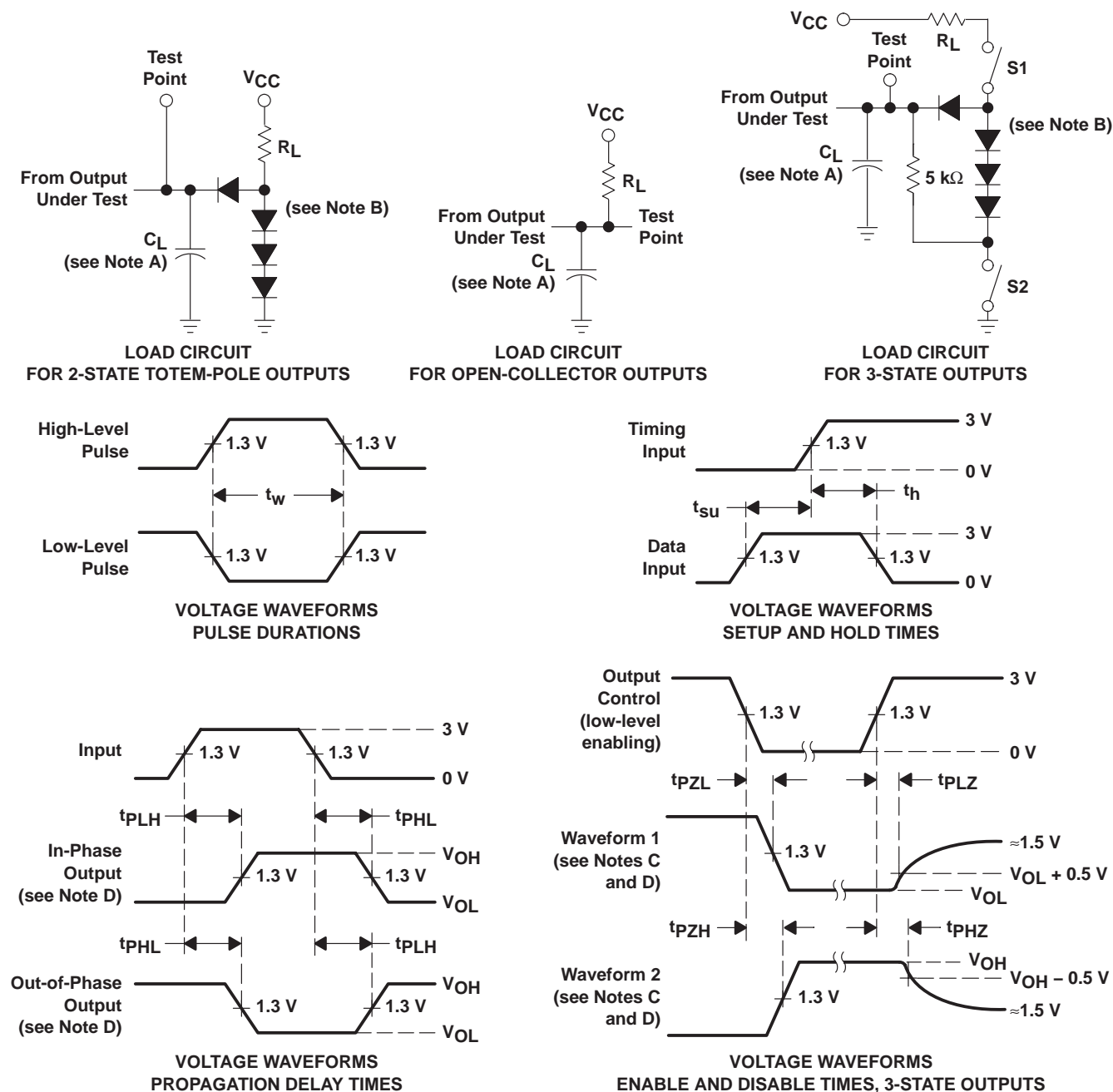
- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. All diodes are 1N3064 or equivalent.  
C. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.  
D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PLZ}$ ; S1 is open, and S2 is closed for  $t_{pZH}$ ; S1 is closed, and S2 is open for  $t_{pZL}$ .  
E. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O \approx 50 \Omega$ ;  $t_r$  and  $t_f \leq 7$  ns for Series 54/74 devices and  $t_r$  and  $t_f \leq 2.5$  ns for Series 54S/74S devices.  
F. The outputs are measured one at a time, with one input transition per measurement.

**Figure 1. Load Circuits and Voltage Waveforms**

**SN54147, SN54148, SN54LS147, SN54LS148  
SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148  
10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

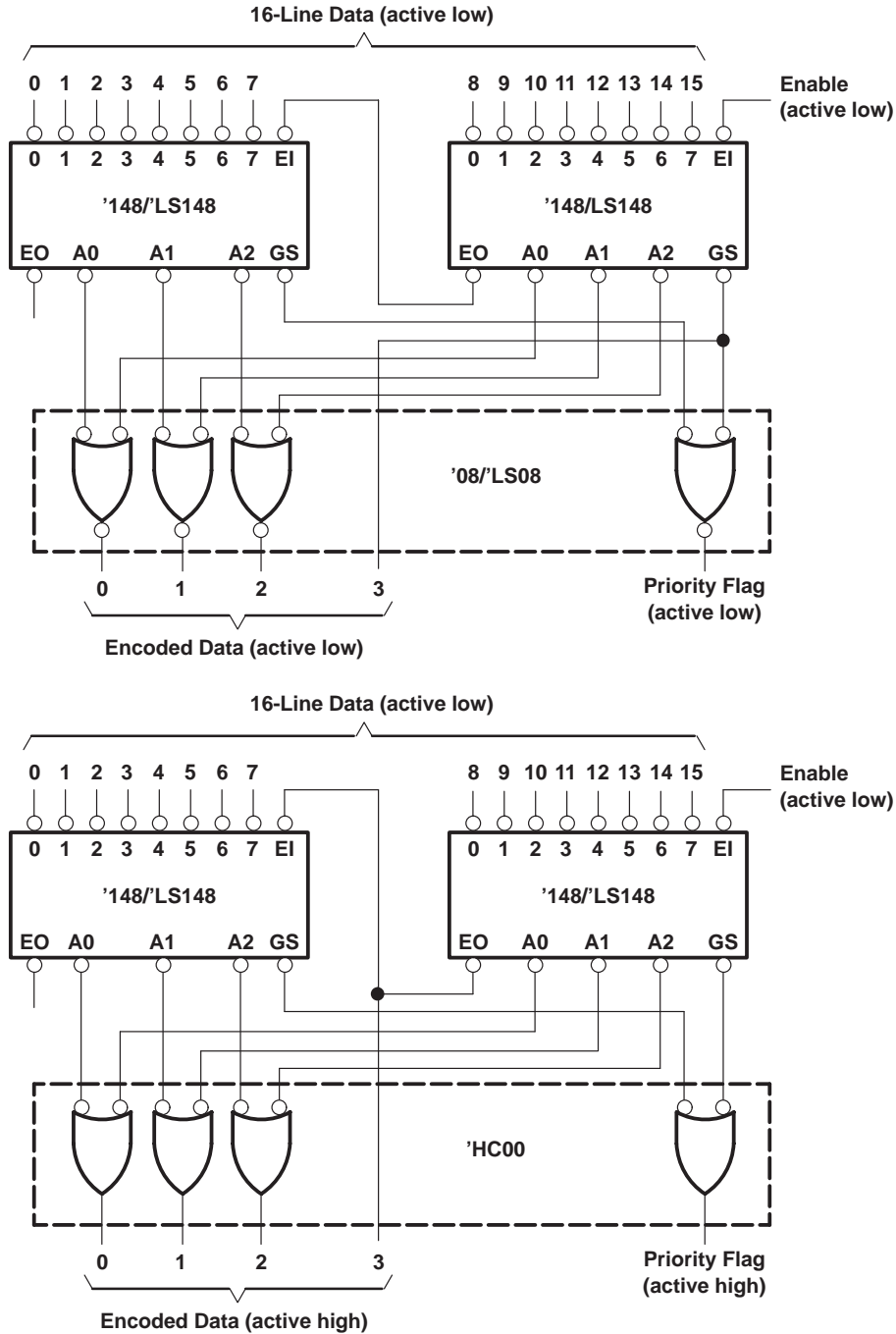
**PARAMETER MEASUREMENT INFORMATION  
SERIES 54LS/74LS DEVICES**



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. All diodes are 1N3064 or equivalent.  
C. 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.  
D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PZL}$ ; S1 is open, and S2 is closed for  $t_{PZH}$ ; S1 is closed, and S2 is open for  $t_{PZL}$ .  
E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.  
F. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O \approx 50 \Omega$ ,  $t_r \leq 1.5 \text{ ns}$ ,  $t_f \leq 2.6 \text{ ns}$ .  
G. The outputs are measured one at a time, with one input transition per measurement.

**Figure 2. Load Circuits and Voltage Waveforms**

## APPLICATION INFORMATION



**Figure 3. Priority Encoder for 16 Bits**

Because the '147/LS147 and '148/LS148 devices are combinational logic circuits, wrong addresses can appear during input transients. Moreover, for the '148/LS148 devices, a change from high to low at EI can cause a transient low on GS when all inputs are high. This must be considered when strobing the outputs.

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
78027012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	78027012A SNJ54LS 148FK	<a href="#">Samples</a>
7802701EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7802701EA SNJ54LS148J	<a href="#">Samples</a>
7802701FA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7802701FA SNJ54LS148W	<a href="#">Samples</a>
JM38510/36001B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 36001B2A	<a href="#">Samples</a>
JM38510/36001BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 36001BEA	<a href="#">Samples</a>
JM38510/36001BFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 36001BFA	<a href="#">Samples</a>
M38510/36001B2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	JM38510/ 36001B2A	<a href="#">Samples</a>
M38510/36001BEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 36001BEA	<a href="#">Samples</a>
M38510/36001BFA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	JM38510/ 36001BFA	<a href="#">Samples</a>
SN54148J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI	-55 to 125		
SN54LS148J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54LS148J	<a href="#">Samples</a>
SN74147N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74148J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI	0 to 70		
SN74148N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74148N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS147DR	OBSOLETE	SOIC	D	16		TBD	Call TI	Call TI	0 to 70		
SN74LS147N	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS148D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS148	<a href="#">Samples</a>
SN74LS148DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS148	<a href="#">Samples</a>
SN74LS148DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	LS148	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74LS148J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI	0 to 70		
SN74LS148N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS148N	<a href="#">Samples</a>
SN74LS148N3	OBSOLETE	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS148NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS148N	<a href="#">Samples</a>
SN74LS148NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS148	<a href="#">Samples</a>
SNJ54148J	OBSOLETE	CDIP	J	16		TBD	Call TI	Call TI	-55 to 125		
SNJ54148W	OBSOLETE	CFP	W	16		TBD	Call TI	Call TI	-55 to 125		
SNJ54LS148FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	78027012A SNJ54LS 148FK	<a href="#">Samples</a>
SNJ54LS148J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7802701EA SNJ54LS148J	<a href="#">Samples</a>
SNJ54LS148W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	7802701FA SNJ54LS148W	<a href="#">Samples</a>

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN54147, SN54148, SN54LS147, SN54LS148, SN74147, SN74148, SN74LS147, SN74LS148 :**

- Catalog: [SN74147](#), [SN74148](#), [SN74LS147](#), [SN74LS148](#)

- Military: [SN54147](#), [SN54148](#), [SN54LS147](#), [SN54LS148](#)

**NOTE: Qualified Version Definitions:**

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications



**TAPE AND REEL INFORMATION**


\*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
SN74LS148DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS148DR	SOIC	D	16	2500	333.2	345.9	28.6

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP2-F16

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).  
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



## NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)