

**DESCRIPTION**

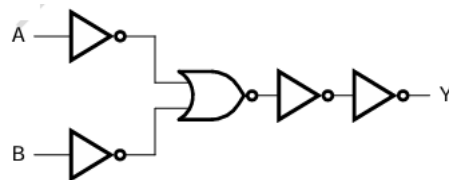
The AL74LS08 quadruple 2-input positive-AND gate is designed for 2.0V to 6.0V operation. The AL74LS08 device performs the Boolean function $Y = A \cdot B$ or $Y = \overline{A + B}$ in positive logic. The device is fully specified for partial-power-down applications using I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down. It operates over an ambient temperature range of -40°C to +125°C. The AL74SL08 is available in DIP14, SOP14 and TSSOP14 packages.

FEATURES

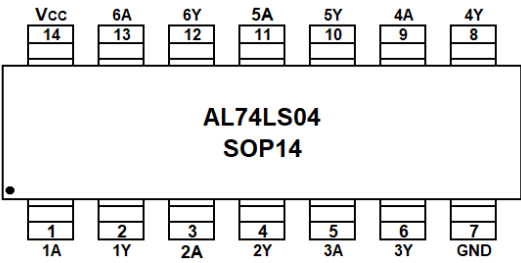
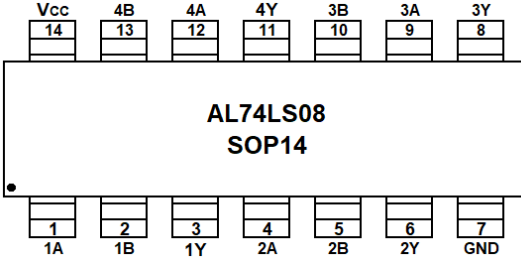
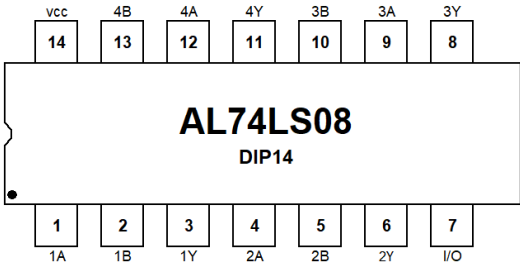
- Operating Temperature : -40°C ~ +125°C
- Available in DIP14, SOP14 and TSSOP14 Packages

ORDERING INFORMATION

Package Type	Part Number	
DIP14 SPQ: 40pcs/Tube	P14	AL74SL08P14R
SOP14 SPQ:200pcs/Tube	M14	AL74SL08M14R
TSSOP14 SPQ:200pcs/Tube	TMX14	AL74SL08TMX14R
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

SIMPLIFIED SCHEMATIC

**PIN DESCRIPTION**

 AL74LS04 SOP14 SOP14, M14 Top View				 AL74LS08 SOP14 TSSOP14, TMX14 Top View			
 AL74LS08 DIP14 DIP14, P14 Top View							
PIN#			Symbol	Function			
SOP14	TSSOP14	DIP14					
1	1	1	1A	Channel 1 logic input			
2	2	2	1B	Channel 1 logic input			
3	3	3	1Y	Logic level output1			
4	4	4	2A	Channel 2 logic input			
5	5	5	2B	Channel 2 logic input			
6	6	6	2Y	Logic level output 2			
7	7	7	GND	Ground			
8	8	8	3Y	Channel 3 logic input			
9	9	9	3A	Channel 3 logic input			
10	10	10	3B	Logic level output 3			
11	11	11	4Y	Channel 4 logic input			
12	12	12	4A	Channel 4 logic input			
13	13	13	4B	Logic level output 4			
14	14	14	V _{CC}	Power Pin			



FUNCTION TABLE

INPUTS		OUTPUT
nA	nB	nY
L	L	L
L	H	L
H	L	L
H	H	H

H=High Voltage Level L=Low Voltage Level $Y = A \cdot B$

ABSOLUTE MAXIMUM RATINGS

$T_{amb}=25^{\circ}\text{C}$, GND=0V (unless otherwise noted)

V_{CC} , Supply Voltage Range		-0.5V ~ +6.5V
I_{IK} , Input Clamp Current	$V_I < -0.5\text{V}$ or $V_I > V_{CC} + 0.5\text{V}$	$\pm 20\text{mA}$
I_{OK} , Output Clamp Current	$V_O < -0.5\text{V}$ or $V_O > V_{CC} + 0.5\text{V}$	$\pm 20\text{mA}$
I_O , Continuous Output Current	$-0.5\text{V} < V_O < V_{CC} + 0.5\text{V}$	$\pm 25\text{mA}$
I_{CC} , Power Supply Current		50mA
I_{GND} , Ground Current		-50mA
P_{tot} Total Power Consumption		500mW
T_L , Soldering Temperature (10s)	DIP14	245°C
	SOP14, TSSOP14	260°C
T_{STG} , Storage Temperature		-65°C ~ +150°C

Stresses above 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 in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Supply Voltage	V_{CC}	-	2	5	6	V
Input Voltage Range	V_I	-	0	-	V_{CC}	V
Output Voltage	V_O	-	0	-	V_{CC}	V
Input Rise and Fall Slew Rate	$\Delta t / \Delta V$	$V_{CC}=2\text{V}$	-	-	625	ns/V
		$V_{CC}=4.5\text{V}$	-	1.67	139	
		$V_{CC}=6\text{V}$	-	-	83	
Operating temperature	T_{amb}	-	-40	-	+125	°C



ELECTRICAL CHARACTERISTICS

T_A=25°C, GND=0V, unless otherwise noted.

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
High Level Input Voltage	V _{IH}	V _{CC} =2V		1.50	1.20	-	V
		V _{CC} =4.5V		3.15	2.40	-	
		V _{CC} =6V		4.20	3.20	-	
Low Level Input Voltage	V _{IL}	V _{CC} =2V		-	0.80	0.50	V
		V _{CC} =4.5V		-	2.10	1.35	
		V _{CC} =6V		-	2.80	1.80	
High Level Output Voltage	V _{OH}	V _I =V _{IH} or V _{IL}	I _O = -20uA, V _{CC} =2.0V	1.90	2	-	V
			I _O = -20uA, V _{CC} =4.5V	4.40	4.50	-	
			I _O = -20uA, V _{CC} =6.0V	5.90	6	-	
			I _O = -4.0mA, V _{CC} =4.5V	3.98	4.32	-	
			I _O = -5.2mA, V _{CC} =6.0V	5.48	5.81	-	
Low Level Output Voltage	V _{OL}	V _I =V _{IH} or V _{IL}	I _O =20uA, V _{CC} =2.0V	-	0	0.10	V
			I _O =20uA, V _{CC} =4.5V	-	0	0.10	
			I _O =20uA, V _{CC} =6.0V	-	0	0.10	
			I _O =4.0mA, V _{CC} =4.5V	-	0.15	0.26	
			I _O =5.2mA, V _{CC} =6.0V	-	0.16	0.26	
Input Leakage Current	I _I	V _I = V _{CC} or GND, V _{CC} =6.0V		-	-	±1	uA
Quiescent Current	I _{CC}	V _I = V _{CC} or GND, I _O =0A, V _{CC} =6.0V		-	-	2	uA
Input Capacitor	C _I			-	3.50	-	pF

T_A= 40°C ~ +85°C, GND=0V



Parameter	Symbol	Conditions		Min	Typ	Max	Unit
High Level Input Voltage	V_{IH}	$V_{CC}=2V$		1.50	-	-	V
		$V_{CC}=4.5V$		3.15	-	-	
		$V_{CC}=6V$		4.20	-	-	
Low Level Input Voltage	V_{IL}	$V_{CC}=2V$		-	-	0.50	V
		$V_{CC}=4.5V$		-	-	1.35	
		$V_{CC}=6V$		-	-	1.80	
High Level Output Voltage	V_{OH}	$V_I=V_{IH} \text{ or } V_{IL}$	$I_O = -20\mu A, V_{CC}=2.0V$	1.90	-	-	V
			$I_O = -20\mu A, V_{CC}=4.5V$	4.40	-	-	
			$I_O = -20\mu A, V_{CC}=6.0V$	5.90	-	-	
			$I_O = -4.0mA, V_{CC}=4.5V$	3.84	-	-	
			$I_O = -5.2mA, V_{CC}=6.0V$	5.34	-	-	
Low Level Output Voltage	V_{OL}	$V_I=V_{IH} \text{ or } V_{IL}$	$I_O=20\mu A, V_{CC}=2.0V$	-	-	0.10	V
			$I_O=20\mu A, V_{CC}=4.5V$	-	-	0.10	
			$I_O=20\mu A, V_{CC}=6.0V$	-	-	0.10	
			$I_O=4.0mA, V_{CC}=4.5V$	-	-	0.33	
			$I_O=5.2mA, V_{CC}=6.0V$	-	-	0.33	
Input Leakage Current	I_I	$V_I = V_{CC} \text{ or } GND, V_{CC}=6.0V$		-	-	± 1	μA
Quiescent Current	I_{CC}	$V_I = V_{CC} \text{ or } GND, I_O=0A, V_{CC}=6.0V$		-	-	20	μA



T_A= 40°C ~ +125°C, GND=0V

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
High Level Input Voltage	V _{IH}	V _{CC} =2V		1.50	-	-	V
		V _{CC} =4.5V		3.15	-	-	
		V _{CC} =6V		4.20	-	-	
Low Level Input Voltage	V _{IL}	V _{CC} =2V		-	-	0.50	V
		V _{CC} =4.5V		-	-	1.35	
		V _{CC} =6V		-	-	1.80	
High Level Output Voltage	V _{OH}	V _I =V _{IH} or V _{IL}	I _O = -20uA, V _{CC} =2.0V	1.90	-	-	V
			I _O = -20uA, V _{CC} =4.5V	4.40	-	-	
			I _O = -20uA, V _{CC} =6.0V	5.90	-	-	
			I _O = -4.0mA, V _{CC} =4.5V	3.70	-	-	
			I _O = -5.2mA, V _{CC} =6.0V	5.20	-	-	
Low Level Output Voltage	V _{OL}	V _I =V _{IH} or V _{IL}	I _O =20uA, V _{CC} =2.0V	-	-	0.10	V
			I _O =20uA, V _{CC} =4.5V	-	-	0.10	
			I _O =20uA, V _{CC} =6.0V	-	-	0.10	
			I _O =4.0mA, V _{CC} =4.5V	-	-	0.40	
			I _O =5.2mA, V _{CC} =6.0V	-	-	0.40	
Input Leakage Current	I _I	V _I = V _{CC} or GND, V _{CC} =6.0V		-	-	±1	uA
Quiescent Current	I _{CC}	V _I = V _{CC} or GND, I _O =0A, V _{CC} =6.0V		-	-	40	uA



AC CHARACTERISTICS

 $T_A=25^{\circ}\text{C}$, GND=0V

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
nA/nB-to-nY Propagation Delay	t_{pd}	Fig.2	$V_{CC}=2\text{V}$	-	25	ns
			$V_{CC}=4.5\text{V}$	-	9	
			$V_{CC}=5.0\text{V}$, $C_L=15\text{pF}$	-	7	
			$V_{CC}=6\text{V}$	-	7	
Rise/Fall Transition Time	t_t	Fig.2	$V_{CC}=2\text{V}$	-	19	ns
			$V_{CC}=4.5\text{V}$	-	7	
			$V_{CC}=6\text{V}$	-	6	
Power Dissipation Capacitance	C_{PD}	Each Package, $V_I=\text{GND} \sim V_{CC}^{(1)}$	-	10	-	pF

1. C_{PD} is used to calculate the dynamic power dissipation (P_D), expressed in μW , $P_D=(C_{PD}\times V_{CC}^2\times f_i\times N)+\sum(C_L\times V_{CC}^2\times f_o)$,
 f_i =Input frequency (MHz) ; f_o = Output frequency (MHz) ; C_L =Output load capacitance(pF) ; V_{CC} =supply Voltage (V) ; N=Switching frequency ; $\sum(C_L\times V_{CC}^2\times f_o)$ =Total output amount.

 $T_A=40^{\circ}\text{C} \sim +85^{\circ}\text{C}$, GND=0V

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
nA/nB-to-nY Propagation Delay	t_{pd}	Fig.2	$V_{CC}=2\text{V}$	-	-	ns
			$V_{CC}=4.5\text{V}$	-	-	
			$V_{CC}=6\text{V}$	-	-	
Rise/Fall Transition Time	t_t	Fig.2	$V_{CC}=2\text{V}$	-	-	ns
			$V_{CC}=4.5\text{V}$	-	-	
			$V_{CC}=6\text{V}$	-	-	

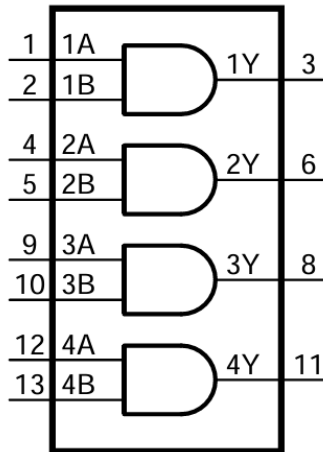
 $T_A=40^{\circ}\text{C} \sim +125^{\circ}\text{C}$, GND=0V

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
nA/nB-to-nY Propagation Delay	t_{pd}	Fig 2	$V_{CC}=2\text{V}$	-	-	ns
			$V_{CC}=4.5\text{V}$	-	-	
			$V_{CC}=6\text{V}$	-	-	
Rise/Fall Transition Time	t_t	Fig 2	$V_{CC}=2\text{V}$	-	-	ns
			$V_{CC}=4.5\text{V}$	-	-	
			$V_{CC}=6\text{V}$	-	-	

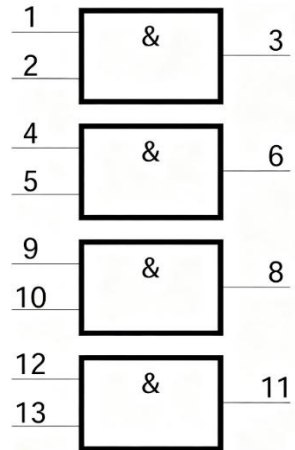


BLOCK DIAGRAM

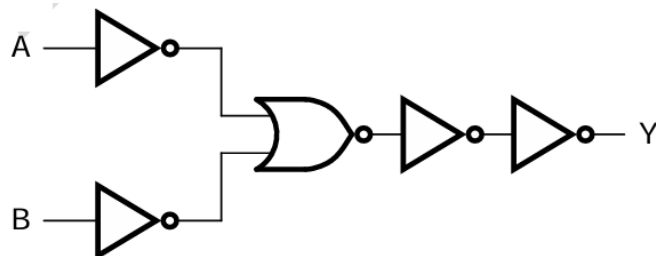
a. Logic Symbol



b. IEC Logic Symbol



C. Logic Block Diagram





PARAMETER MEASUREMENT INFORMATION

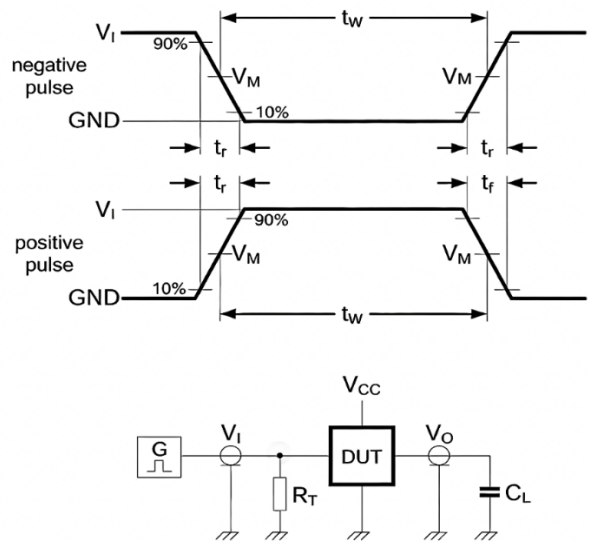


Fig 1. Switching Time Test Circuit

Note: C_L : Load capacitance, including the capacitance of the probe and clips.
 R_T : The termination resistor should match the signal generator's output impedance (Z_o).

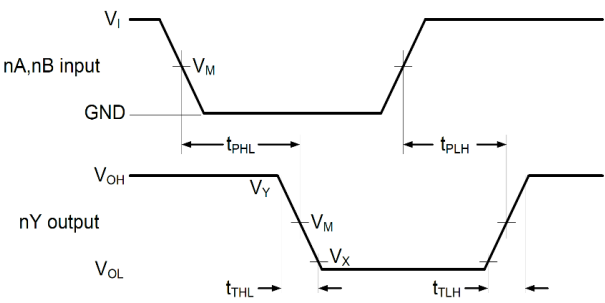


Fig 2. Input (nA) to Output (nB) Propagation Delay and Output Transition Time

Test Point

INPUTS	OUTPUT		
V_M	V_M	V_X	V_Y
$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$

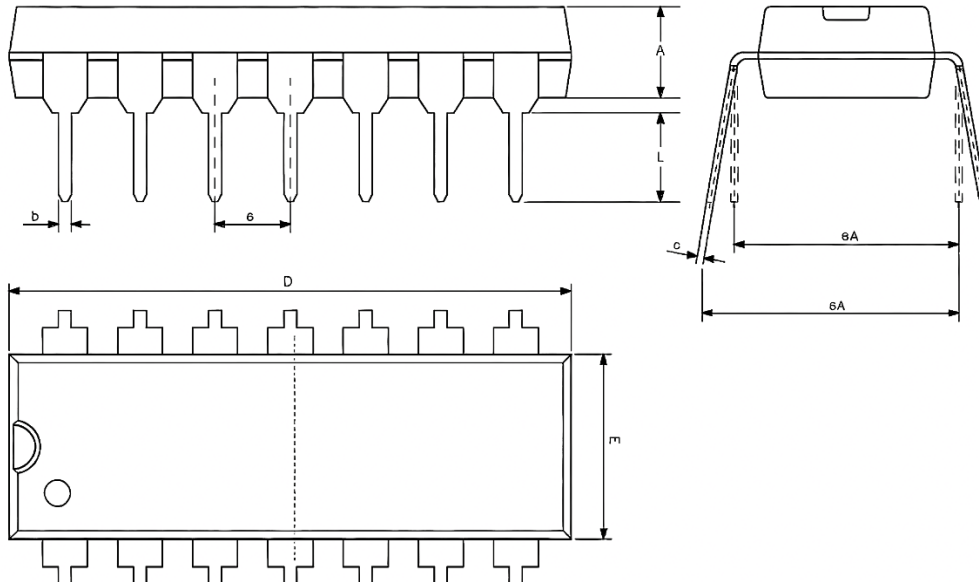
Test Data

INPUTS		LOAD	TEST
V_I	t_r, t_f	C_L	
VCC	6ns	15pF, 50pF	t_{PLH}, t_{PHL}



PACKAGE INFORMATION

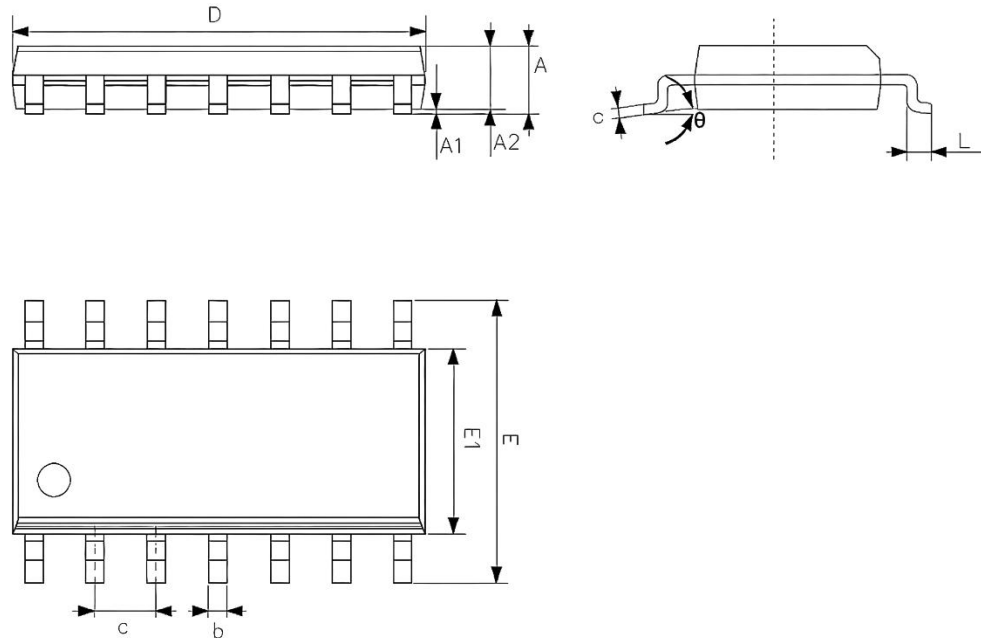
Dimension in DIP14 (Unit: mm)



Symbol	Min.	Max.
A	3.050	3.600
b	0.330	0.560
c	0.200	0.360
D	18.800	19.400
E	6.200	6.600
e	2.540	
eA	7.620	10.900
L	2.920	-



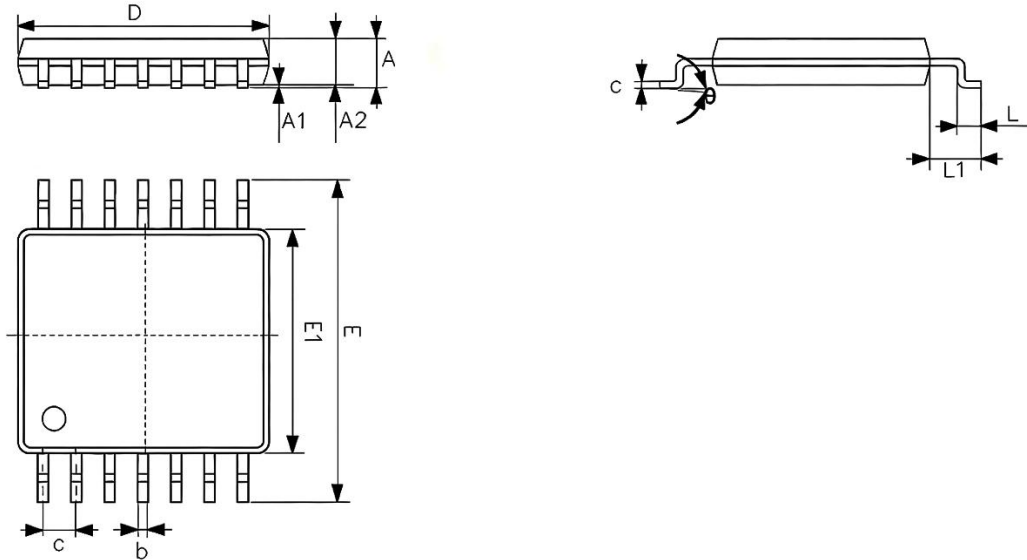
Dimension in SOP14 (Unit: mm)



Symbol	Millimeters	
	Min	Max
A	1.500	1.750
A1	0.050	0.250
A2	1.300	-
b	0.330	0.500
c	0.190	0.250
D	8.430	8.760
e	1.270 BSC	
E	5.800	6.250
E1	3.750	4.000
L	0.400	0.890
θ	0°	8°



Dimension in TSSOP14 (Unit: mm)



Symbol	Millimeters	
	Min	Max
A	-	1.200
A1	0.500	0.150
A2	0.800	1.050
b	0.190	0.300
c	0.090	0.200
D	4.900	5.100
E	6.200	4.500
E1	4.300	6.600
e	0.650 BSC	
L	0.450	0.750
L1	1.000	
θ	0°	8°



IMPORTANT NOTICE

AiT Semiconductor Inc. (AiT) reserves the right to make changes to any its product, specifications, to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

AiT Semiconductor Inc.'s integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life support applications, devices or systems or other critical applications. Use of AiT products in such applications is understood to be fully at the risk of the customer. As used herein may involve potential risks of death, personal injury, or severe property, or environmental damage. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

AiT Semiconductor Inc. assumes to no liability to customer product design or application support. AiT warrants the performance of its products of the specifications applicable at the time of sale.