

54LS257,54LS258,DM54LS257B,DM54LS258B, DM74LS257B,DM74LS258B

54LS257A DM54LS257B DM74LS257B 54LS258A DM54LS258B DM74LS258B

TRI-STATE(RM) Quad 2-Data Selectors/Multiplexers



Literature Number: SNOS295A

54LS257A/DM54LS257B/DM74LS257B, 54LS258A/DM54LS258B/DM74LS258B **TRI-STATE® Quad 2-Data Selectors/Multiplexers**

General Description

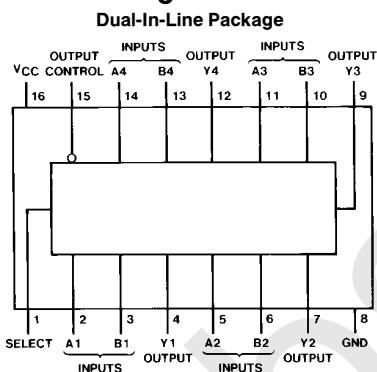
These Schottky-clamped high-performance multiplexers feature TRI-STATE outputs that can interface directly with data lines of bus-organized systems. With all but one of the common outputs disabled (at a high impedance state), the low impedance of the single enabled output will drive the bus line to a high or low logic level. To minimize the possibility that two outputs will attempt to take a common bus to opposite logic levels, the output enable circuitry is designed such that the output disable times are shorter than the output enable times.

This TRI-STATE output feature means that n-bit (paralleled) data selectors with up to 258 sources can be implemented for data buses. It also permits the use of standard TTL registers for data retention throughout the system.

Features

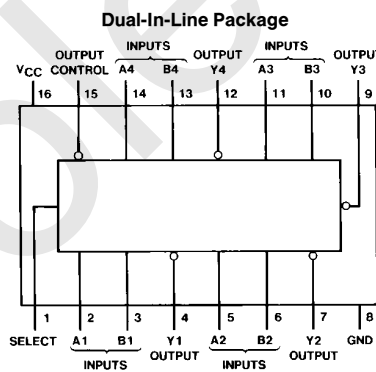
- TRI-STATE versions LS157 and LS158 with same pin-outs
- Schottky-clamped for significant improvement in A-C performance
- Provides bus interface from multiple sources in high-performance systems
- Average propagation delay from data input 12 ns
- Typical power dissipation
 - LS257B 50 mW
 - LS258B 35 mW
- Alternate military/aerospace devices (54LS257A/54LS258A) are available. Contact a National Semiconductor Sales Office/Distributor for specifications.

Connection Diagrams



TL/F/6417-1

Order Number 54LS257ADMQB, 54LS257AFMQB,
 54LS257ALMQB, DM54LS257BJ, DM54LS257BW,
 DM74LS257BM or DM74LS257BN
 See NS Package Number E20A, J16A,
 M16A, N16E or W16A



TL/F/6417-2

Order Number 54LS258ADMQB, 54LS258AFMQB,
 54LS258ALMQB, DM54LS258BJ, DM54LS258BW,
 DM74LS258BM or DM74LS258BN
 See NS Package Number E20A, J16A,
 M16A, N16E or W16A

Function Table

Output Control	Inputs		Output Y	
	Select	A B	LS257	LS258
H	X	X X	Z	Z
L	L	L X	L	H
L	L	H X	H	L
L	H	X L	L	H
L	H	X H	H	L

H = High Level, L = Low Level, X = Don't Care,
 Z = High Impedance (off)

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54LS and 54LS	−55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	DM54LS257B			DM74LS257B			Units
		Min	Nom	Max	Min	Nom	Max	
V _{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High Level Input Voltage	2			2			V
V _{IL}	Low Level Input Voltage			0.7			0.8	V
I _{OH}	High Level Output Current			−1			−2.6	mA
I _{OL}	Low Level Output Current			12			24	mA
T _A	Free Air Operating Temperature	−55		125	0		70	°C

'LS257B Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = −18 mA			−1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	DM54 2.4 DM74 2.4	3.4 3.1		V
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IL} = Max, V _{IH} = Min	DM54 DM74	0.25 0.35	0.4 0.5	V
		I _{OL} = 12 mA, V _{CC} = Min	DM74	0.25	0.4	
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 7V	Select Other		0.2 0.1	mA
I _{IH}	High Level Input Current	V _{CC} = Max, V _I = 2.7V	Select Other		40 20	μA
I _{IL}	Low Level Input Current	V _{CC} = Max, V _I = 0.4V	Select Other		−0.8 −0.4	mA
I _{OZH}	Off-State Output Current with High Level Output Voltage Applied	V _{CC} = Max, V _O = 2.7V V _{IH} = Min, V _{IL} = Max			20	μA
I _{OZL}	Off-State Output Current with Low Level Output Voltage Applied	V _{CC} = Max, V _O = 0.4V V _{IH} = Min, V _{IL} = Max			−20	μA
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 2)	DM54 DM74	−20 −20	−100 −100	mA
I _{CCH}	Supply Current with Outputs High	V _{CC} = Max (Note 3)		5.9	10	mA
I _{CCL}	Supply Current with Outputs Low	V _{CC} = Max (Note 3)		9.2	16	mA
I _{CCZ}	Supply Current with Outputs Disabled	V _{CC} = Max (Note 3)		12	19	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 3: I_{CC} is measured with all outputs open and all possible inputs grounded, while achieving the stated output conditions.

'LS257B Switching Characteristics

at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	R _L = 667Ω				Units
			C _L = 45 pF		C _L = 150 pF		
			Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output	Data to Output		18		27	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Data to Output		18		27	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	Select to Output		28		35	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Select to Output		35		42	ns
t _{PZH}	Output Enable Time to High Level Output	Output Control to Y		15		27	ns
t _{PZL}	Output Enable Time to Low Level Output	Output Control to Y		28		38	ns
t _{PHZ}	Output Disable Time from High Level Output (Note 1)	Output Control to Y		26			ns
t _{PLZ}	Output Disable Time from Low Level Output (Note 1)	Output Control to Y		25			ns

Note 1: $C_L = 5\text{ pF}$.

Recommended Operating Conditions

Symbol	Parameter	DM54LS258B			DM74LS258B			Units
		Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage	2			2			V
V_{IL}	Low Level Input Voltage			0.7			0.8	V
I_{OH}	High Level Output Current			-1			-2.6	mA
I_{OL}	Low Level Output Current			12			24	mA
T_A	Free Air Operating Temperature	-55		125	0		70	$^\circ C$

'LS258B Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -18\text{ mA}$			-1.5	V
V_{OH}	High Level Output Voltage	$V_{CC} = \text{Min}, I_{OH} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$	DM54	2.4	3.4	V
			DM74	2.4	3.1	
V_{OL}	Low Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$	DM54		0.25	V
			DM74		0.35	
		$I_{OL} = 12\text{ mA}, V_{CC} = \text{Min}$	DM74		0.25	
I_I	Input Current @ Max Input Voltage	$V_{CC} = \text{Max},$ $V_I = 7V$	Select		0.2	mA
			Other		0.1	
I_{IH}	High Level Input Current	$V_{CC} = \text{Max},$ $V_I = 2.7V$	Select		40	μA
			Other		20	

'LS258B Electrical Characteristics

over recommended operating free air temperature range (unless otherwise noted) (Continued)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
I_{IL}	Low Level Input Current	$V_{CC} = \text{Max}$, $V_I = 0.4V$	Select		-0.8	mA
			Other		-0.4	
I_{OZH}	Off-State Output Current with High Level Output Voltage Applied	$V_{CC} = \text{Max}$, $V_O = 2.7V$ $V_{IH} = \text{Min}$, $V_{IL} = \text{Max}$			20	μA
I_{OZL}	Off-State Output Current with Low Level Output Voltage Applied	$V_{CC} = \text{Max}$, $V_O = 0.4V$ $V_{IH} = \text{Min}$, $V_{IL} = \text{Max}$			-20	μA
I_{OS}	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 2)	DM54	-20	-100	mA
			DM74	-20	-100	
I_{CCH}	Supply Current with Outputs High	$V_{CC} = \text{Max}$ (Note 3)		4.1	7	mA
I_{CCL}	Supply Current with Outputs Low	$V_{CC} = \text{Max}$ (Note 3)		9	14	mA
I_{CCZ}	Supply Current with Outputs Disabled	$V_{CC} = \text{Max}$ (Note 3)		12	19	mA

Note 1: All typicals are at $V_{CC} = 5V$, $T_A = 25^\circ C$.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 3: I_{CC} is measured with all outputs open and all possible inputs grounded, while achieving the stated output conditions.

'LS258B Switching Characteristics

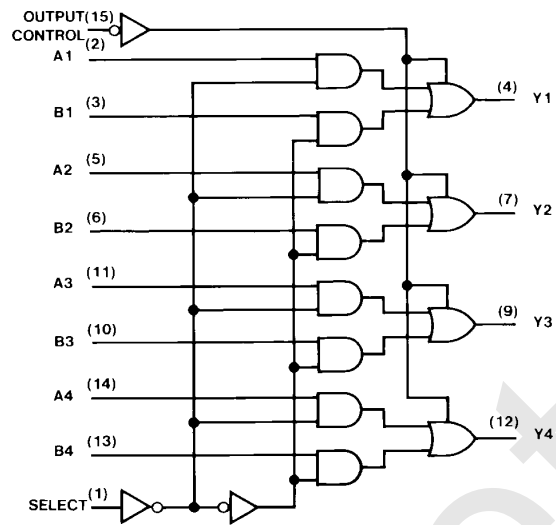
at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	R _L = 667Ω				Units
			C _L = 45 pF		C _L = 150 pF		
			Min	Max	Min	Max	
t _{PLH}	Propagation Delay Time Low to High Level Output	Data to Output		18		27	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Data to Output		18		27	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	Select to Output		28		35	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Select to Output		35		42	ns
t _{PZH}	Output Enable Time to High Level Output	Output Control to Y		15		27	ns
t _{PZL}	Output Enable Time to Low Level Output	Output Control to Y		28		38	ns
t _{PHZ}	Output Disable Time from High Level Output (Note 4)	Output Control to Y		26			ns
t _{PLZ}	Output Disable Time from Low Level Output (Note 4)	Output Control to Y		25			ns

Note 4: $C_L = 5\text{ pF}$.

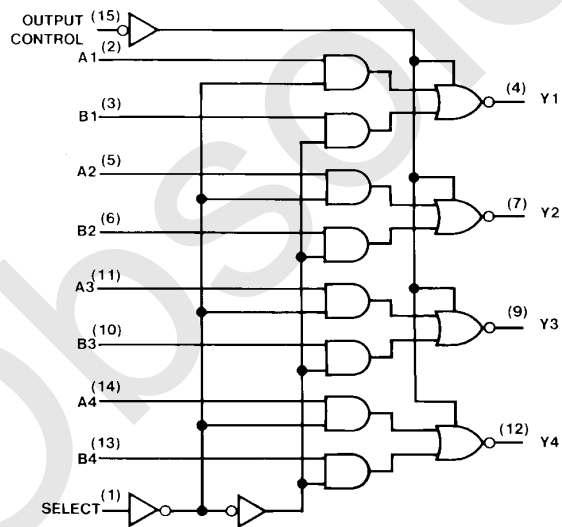
Logic Diagrams

LS257B



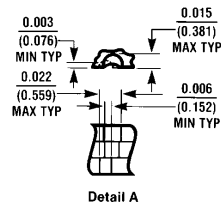
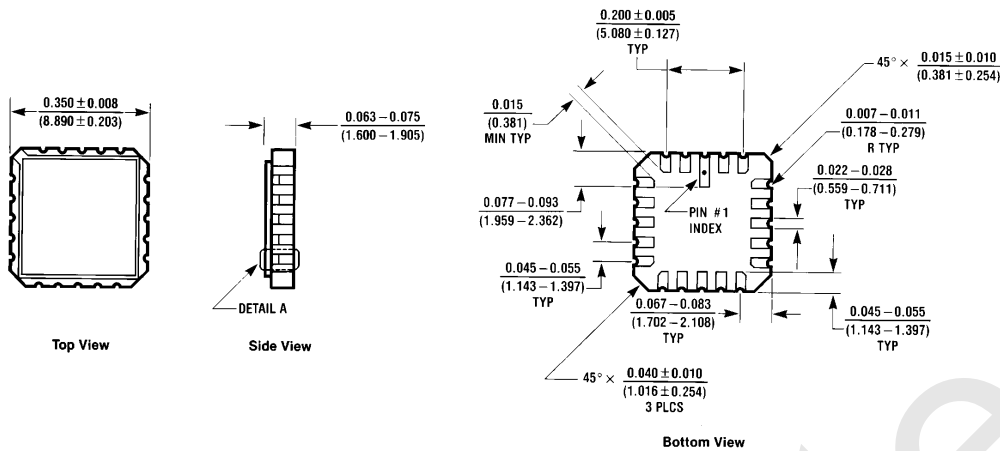
TL/F/6417-3

LS258B



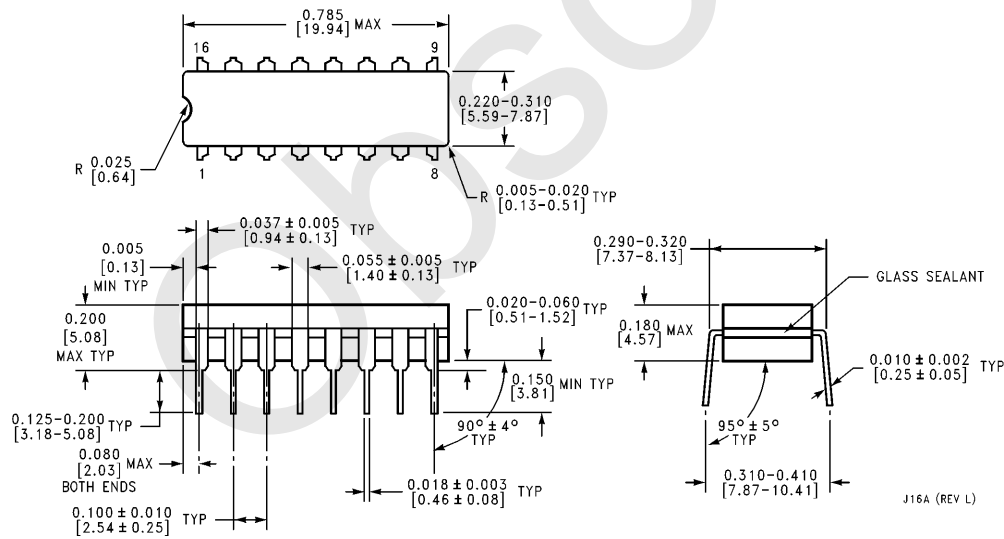
TL/F/6417-4

Physical Dimensions inches (millimeters)



Ceramic Leadless Chip Carrier Package (E)
Order Number 54LS257ALMQB or 54LS258ALMQB
NS Package Number E20A

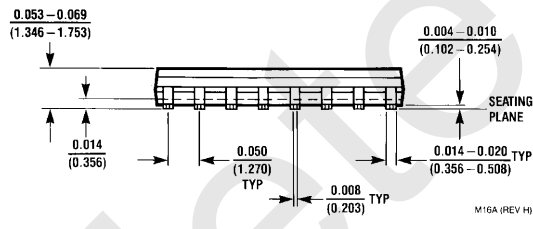
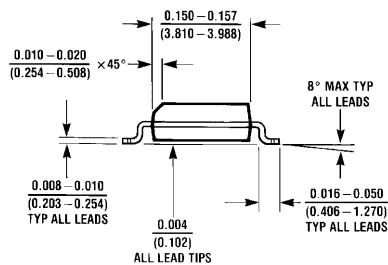
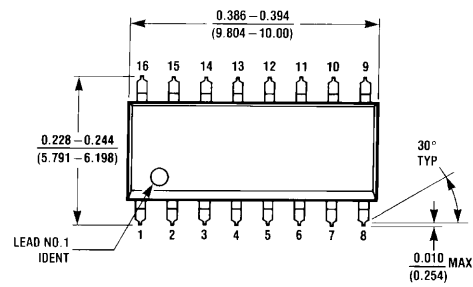
E20A (REV D)



16-Lead Ceramic Dual-In-Line Package (J)
Order Number 54LS257ADMQB, 54LS258ADMQB, DM54LS257BJ or DM54LS258BJ
NS Package Number J16A

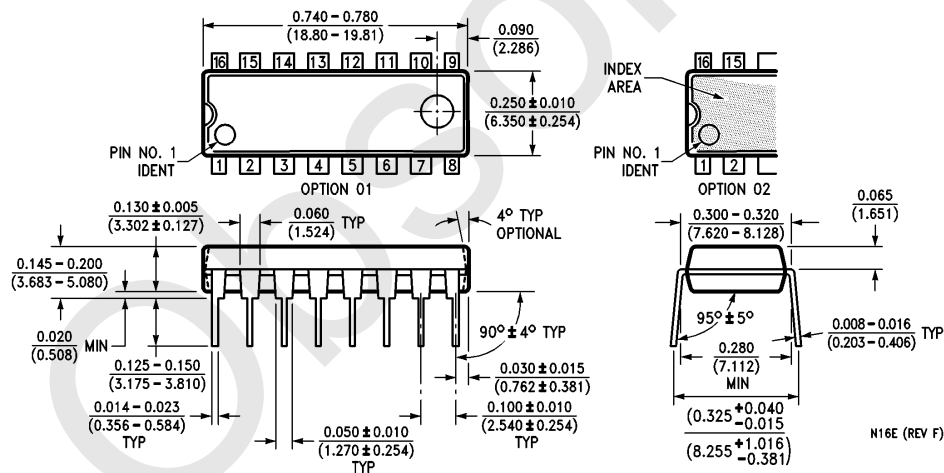
J16A (REV L)

Physical Dimensions inches (millimeters) (Continued)



M16A (REV H)

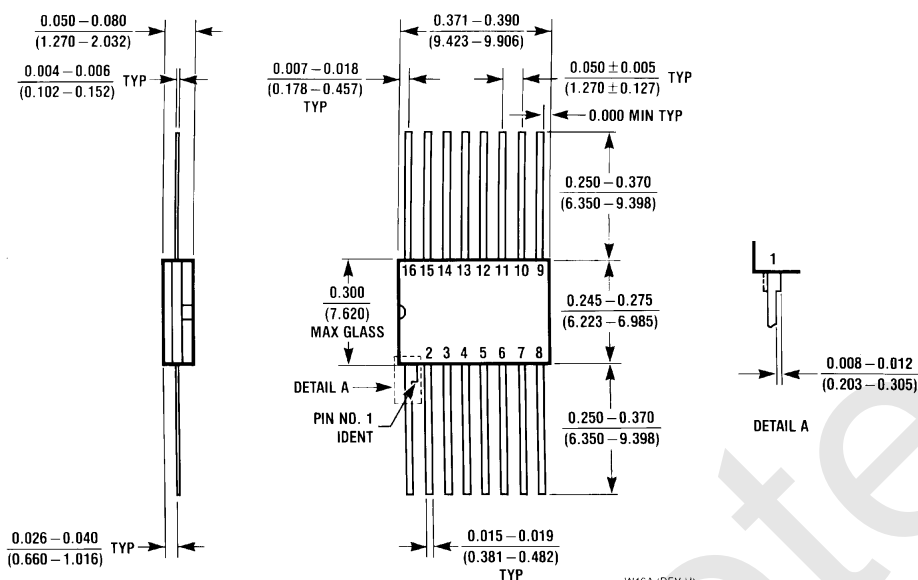
16-Lead Small Outline Molded Package (M)
Order Number DM74LS257BM or DM74LS258BM
NS Package Number M16A



N16E (REV F)

16-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS257BN or DM74LS258BN
NS Package Number N16E

Physical Dimensions inches (millimeters) (Continued)



16-Lead Ceramic Flat Package (W)
Order Number 54LS257AFMQB or 54LS258AFMQB
NS Package Number W16A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

National Semiconductor Europe
Fax: (+49) 0-180-530 85 86
Email: onjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
19th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
Tel: 81-043-299-2309
Fax: 81-043-299-2408

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI 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 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. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

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

Applications

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

TI E2E Community Home Page

e2e.ti.com

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2011, Texas Instruments Incorporated