

# SN54ALS137A, SN74ALS137A, SN74AS137 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

SDAS203C – APRIL 1982 – REVISED JANUARY 1995

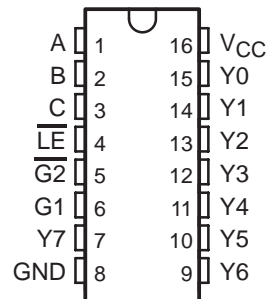
- Combines Decoder and 3-Bit Address Latch
- Incorporates Two Output Enables to Simplify Cascading
- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

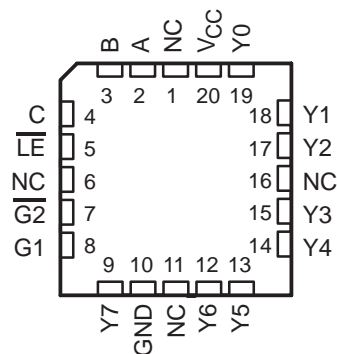
The SN54ALS137A, SN74ALS137A, and SN74AS137 are 3-line to 8-line decoders/demultiplexers with latches on the three address inputs. When the latch-enable ( $\overline{LE}$ ) input is low, the devices act as decoders/demultiplexers. When  $\overline{LE}$  goes from low to high, the address present at the select (A, B, and C) inputs is stored in the latches. Further address changes are ignored as long as  $\overline{LE}$  remains high. The output-enable controls (G1 and  $\overline{G2}$ ) control the outputs independently of the select or latch-enable inputs. All of the outputs are forced high if G1 is low or  $\overline{G2}$  is high. These devices are ideally suited for implementing glitch-free decoders in strobed (stored-address) applications in bus-oriented systems.

The SN54ALS137A is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS137A and SN74AS137 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS137A . . . J PACKAGE  
SN74ALS137A, SN74AS137 . . . D OR N PACKAGE  
(TOP VIEW)



SN54ALS137A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

INPUTS			OUTPUTS												
ENABLE		SELECT													
$\overline{LE}$	G1	$\overline{G2}$	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7		
X	X	H	X	X	X	H	H	H	H	H	H	H	H		
X	L	X	X	X	X	H	H	H	H	H	H	H	H		
L	H	L	L	L	L	L	H	H	H	H	H	H	H		
L	H	L	L	L	H	H	L	H	H	H	H	H	H		
L	H	L	L	H	L	H	H	L	H	H	H	H	H		
L	H	L	L	H	H	H	H	H	H	H	L	H	H		
L	H	L	H	H	L	H	H	H	H	H	H	L	H		
L	H	L	H	H	H	H	H	H	H	H	H	H	L		
H	H	L	X	X	X	Outputs corresponding to stored address = L; all others = H									

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.

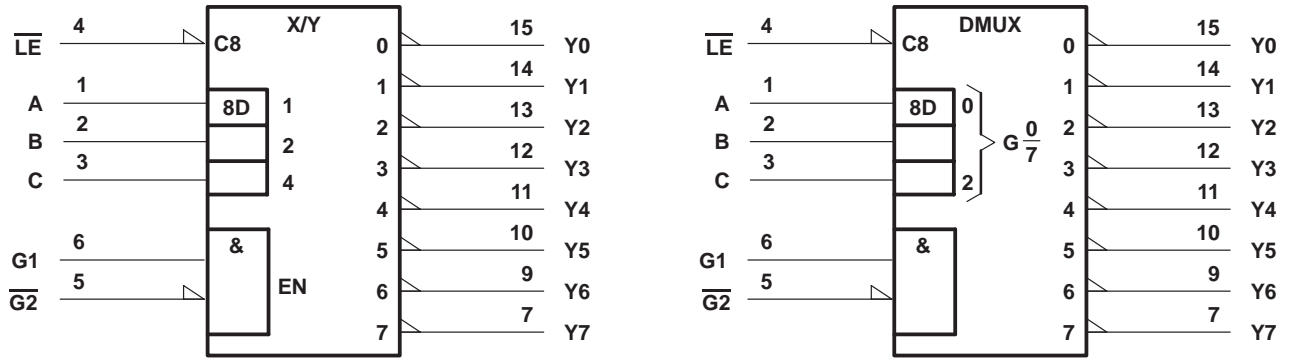


Copyright © 1995, Texas Instruments Incorporated

# SN54ALS137A, SN74ALS137A, SN74AS137 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

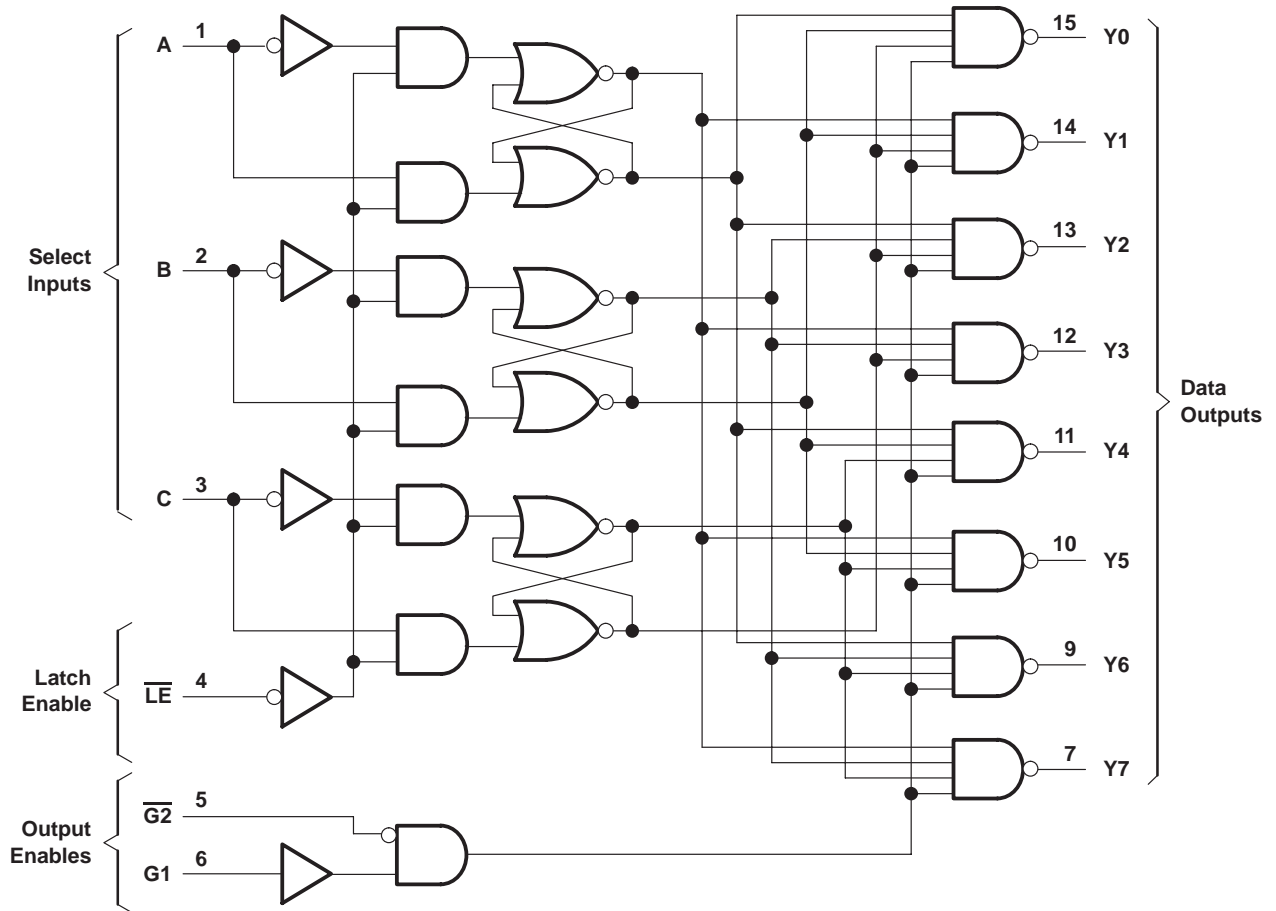
SDAS203C – APRIL 1982 – REVISED JANUARY 1995

## logic symbols (alternatives)†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the D, J, and N packages.

## logic diagram (positive logic)



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



# SN54ALS137A, SN74ALS137A, SN74AS137 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

SDAS203C – APRIL 1982 – REVISED JANUARY 1995

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, $V_{CC}$ .....	7 V
Input voltage, $V_I$ .....	7 V
Operating free-air temperature range, $T_A$ : SN54ALS137A .....	–55°C to 125°C
SN74ALS137A .....	0°C to 70°C
Storage temperature range .....	–65°C to 150°C

† 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.

## recommended operating conditions

		SN54ALS137A			SN74ALS137A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	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			–0.4			–0.4	mA
$I_{OL}$	Low-level output current			4			8	mA
$t_w$	Pulse duration, $\overline{LE}$ low	15			10			ns
$t_{su}$	Setup time at A, B, and C before $\overline{LE}\uparrow$	15			10			ns
$t_h$	Hold time at A, B, and C after $\overline{LE}\uparrow$	5			5			ns
$T_A$	Operating free-air temperature	–55		125	0		70	°C

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

PARAMETER	TEST CONDITIONS	SN54ALS137A			SN74ALS137A			UNIT
		MIN	TYP‡	MAX	MIN	TYP‡	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$			–1.5			–1.5	V
$V_{OH}$	$V_{CC} = 4.5\text{ V to }5.5\text{ V}$ , $I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
$V_{OL}$	$V_{CC} = 4.5\text{ V}$		$I_{OL} = 4\text{ mA}$	0.25	0.4		$I_{OL} = 4\text{ mA}$	V
			$I_{OL} = 8\text{ mA}$				$I_{OL} = 8\text{ mA}$	
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$			20			20	μA
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$			–0.1			–0.1	mA
$I_{O\text{§}}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	–20		–112	–30		–112	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$		5	11		5	11	mA

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

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .



# SN54ALS137A, SN74ALS137A, SN74AS137 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

SDAS203C – APRIL 1982 – REVISED JANUARY 1995

## switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω, T <sub>A</sub> = MIN to MAX†				UNIT
			SN54ALS137A		SN74ALS137A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A, B, C	Y	5	25	5	20	ns
t <sub>PHL</sub>			6	25	6	20	
t <sub>PLH</sub>	$\overline{G2}$	Y	4	15	3	12	ns
t <sub>PHL</sub>			5	18	4	15	
t <sub>PLH</sub>	G1	Y	5	21	4	17	ns
t <sub>PHL</sub>			5	19	4	15	
t <sub>PLH</sub>	$\overline{LE}$	Y	7	27	6	22	ns
t <sub>PHL</sub>			7	25	7	20	

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

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage, V <sub>CC</sub>	7 V
Input voltage, V <sub>I</sub>	7 V
Operating free-air temperature range, T <sub>A</sub> : SN74AS137	0°C to 70°C
Storage temperature range	-65°C to 150°C

‡ 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.

## recommended operating conditions

		SN74AS137			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5	5.5	V
V <sub>IH</sub>	High-level input voltage	2			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
I <sub>OH</sub>	High-level output current			-2	mA
I <sub>OL</sub>	Low-level output current			20	mA
t <sub>w</sub>	Pulse duration, $\overline{LE}$ low	6.5			ns
t <sub>su</sub>	Setup time at A, B, and C before $\overline{LE}$ ↑	4			ns
t <sub>h</sub>	Hold time at A, B, and C after $\overline{LE}$ ↑	1			ns
T <sub>A</sub>	Operating free-air temperature	0		70	°C



# SN54ALS137A, SN74ALS137A, SN74AS137 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

SDAS203C – APRIL 1982 – REVISED JANUARY 1995

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

PARAMETER	TEST CONDITIONS	SN74AS137			UNIT
		MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$			-1.2	V
$V_{OH}$	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $I_{OH} = -2\text{ mA}$	$V_{CC} - 2$			V
$V_{OL}$	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 20\text{ mA}$		0.35	0.5	V
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$			20	$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$			-1	mA
$I_{O\ddagger}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	-30		-112	mA
$I_{CC}$	$V_{CC} = 5.5\text{ V}$		15	24	mA

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

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

## switching characteristics (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ , $C_L = 50\text{ pF}$ , $R_L = 500\ \Omega$ , $T_A = \text{MIN to MAX}\S$		UNIT
			SN74AS137		
			MIN	MAX	
$t_{PLH}$	A, B, C	Y	2	12.5	ns
$t_{PHL}$			2	12.5	
$t_{PLH}$	$\overline{G2}$	Y	2	8	ns
$t_{PHL}$			2	8.5	
$t_{PLH}$	G1	Y	2	10	ns
$t_{PHL}$			2	9	
$t_{PLH}$	$\overline{LE}$	Y	3	13.5	ns
$t_{PHL}$			3	14	

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



# SN54ALS137A, SN74ALS137A, SN74AS137 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS WITH ADDRESS LATCHES

SDAS203C – APRIL 1982 – REVISED JANUARY 1995

## PARAMETER MEASUREMENT INFORMATION SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. 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.  
 C. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
 D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms



**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN74ALS137AD	ACTIVE	SOIC	D	16	40	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	ALS137A	<a href="#">Samples</a>
SN74ALS137AN	ACTIVE	PDIP	N	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74ALS137AN	<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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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 finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material 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.





D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040047-6/M 06/11

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - 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.
  - 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.

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale ([www.ti.com/legal/termsofsale.html](http://www.ti.com/legal/termsofsale.html)) or other applicable terms available either on [ti.com](http://ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2020, Texas Instruments Incorporated