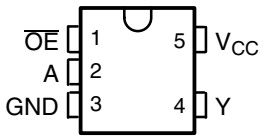
- **Qualified for Automotive Applications**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **Operating Range of 3 V to 5.5 V**
- **Max t_{pd} of 6 ns at 5 V**
- **Low Power Consumption, 10-μA Max I_{CC}**
- **±8-mA Output Drive at 5 V**
- **Inputs Are TTL-Voltage Compatible**

DCK PACKAGE
(TOP VIEW)



description/ordering information

The SN74AHCT1G125 is a single bus buffer gate/line driver with 3-state output. The output is disabled when the output-enable ($\overline{OE}$) input is high. When $\overline{OE}$ is low, true data is passed from the A input to the Y output.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

ORDERING INFORMATION†

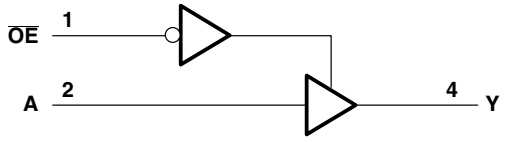
T_A	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING§
–40°C to 125°C	SOT (SC-70) – DCK	Reel of 3000	CAHCT1G125QDCKRQ1	BM_

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at http://www.ti.com.
‡ Package drawings, thermal data, and symbolization are available at http://www.ti.com/packaging.
§ The actual top-side marking has one additional character that designates the wafer fab/assembly site.

FUNCTION TABLE

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	H
L	L	L
H	X	Z

logic diagram (positive logic)



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

Supply voltage range, V_{CC} . . . . . –0.5 V to 7 V
Input voltage range, V_I (see Note 1) . . . . . –0.5 V to 7 V
Output voltage range, V_O (see Note 1) . . . . . –0.5 V to V_{CC} + 0.5 V
Input clamp current, I_{IK} (V_I < 0) . . . . . –20 mA
Output clamp current, I_{OK} (V_O < 0 or V_O > V_{CC}) . . . . . ±20 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . . ±25 mA
Continuous current through V_{CC} or GND . . . . . ±50 mA
Package thermal impedance, θ_{JA} (see Note 2) . . . . . 252°C/W
Storage temperature range, T_{stg} . . . . . –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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

			MIN	MAX	UNIT
V_{CC}	Supply voltage		3	5.5	V
V_{IH}	High-level input voltage	V_{CC} = 3.0 V	1.4		V
		V_{CC} = 4.5 V to 5.5 V	2		
V_{IL}	Low-level input voltage	V_{CC} = 3.0 V		0.53	V
		V_{CC} = 4.5 V to 5.5 V		0.8	
V_I	Input voltage		0	5.5	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current			–8	mA
I_{OL}	Low-level output current			8	mA
$\Delta t/\Delta v$	Input transition rise or fall rate			20	ns/V
T_A	Operating free-air temperature		–40	125	°C

NOTE 3: 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.

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

PARAMETER	TEST CONDITIONS	V_{CC}	T_A = 25°C			MIN	MAX	UNIT
			MIN	TYP	MAX			
V_{OH}	I_{OH} = –50 μA	3 V	2.9	3		2.9		V
		4.5 V	4.4	4.5		4.4		
	I_{OH} = –4 mA	3 V	2.58			2.34		
	I_{OH} = –8 mA	4.5 V	3.94			3.66		
V_{OL}	I_{OL} = 50 μA	3 V and 4.5 V			0.1		0.1	V
	I_{OL} = 4 mA	3 V			0.36		0.52	
	I_{OL} = 8 mA	4.5 V			0.36		0.52	
I_I	V_I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1	μA
I_{OZ}	$V_O = V_{CC}$ or GND	5.5 V			±0.25		±2.5	μA
I_{CC}	$V_I = V_{CC}$ or GND, I_O = 0, $\overline{OE}$ high or low	3 V and 5.5 V			1		10	μA
ΔI_{CC}†	One input at 3.4 V, Other input at V_{CC} or GND	5.5 V			1.35		1.5	mA
C_i	$V_I = V_{CC}$ or GND	5 V		4	10		10	pF
C_o	$V_O = V_{CC}$ or GND	5 V		10				pF

† This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T_A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t_{PLH}	A	Y	C_L = 15 pF		5.6	8		12	ns
t_{PHL}					5.6	8		12	
t_{PZH}	$\overline{OE}$	Y	C_L = 15 pF		5.4	8		11.5	ns
t_{PZL}					5.4	8		11.5	
t_{PHZ}	$\overline{OE}$	Y	C_L = 15 pF		6.5	9.7		14.5	ns
t_{PLZ}					6.5	9.7		14.5	
t_{PLH}	A	Y	C_L = 50 pF		8.1	11.5		16	ns
t_{PHL}					8.1	11.5		16	
t_{PZH}	$\overline{OE}$	Y	C_L = 50 pF		7.9	11.5		15	ns
t_{PZL}					7.9	11.5		15	
t_{PHZ}	$\overline{OE}$	Y	C_L = 50 pF		8	13.2		18	ns
t_{PLZ}					8	13.2		18	

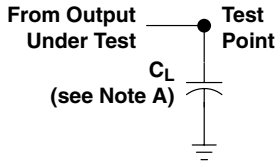
switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T_A = 25°C			MIN	MAX	UNIT
				MIN	TYP	MAX			
t_{PLH}	A	Y	C_L = 15 pF		3.8	5.5		8.5	ns
t_{PHL}					3.8	5.5		8.5	
t_{PZH}	$\overline{OE}$	Y	C_L = 15 pF		3.6	5.1		7.5	ns
t_{PZL}					3.6	5.1		7.5	
t_{PHZ}	$\overline{OE}$	Y	C_L = 15 pF		4.8	6.8		10	ns
t_{PLZ}					4.8	6.8		10	
t_{PLH}	A	Y	C_L = 50 pF		5.3	7.5		10.5	ns
t_{PHL}					5.3	7.5		10.5	
t_{PZH}	$\overline{OE}$	Y	C_L = 50 pF		5.1	7.1		9.5	ns
t_{PZL}					5.1	7.1		9.5	
t_{PHZ}	$\overline{OE}$	Y	C_L = 50 pF		7	8.8		12	ns
t_{PLZ}					7	8.8		12	

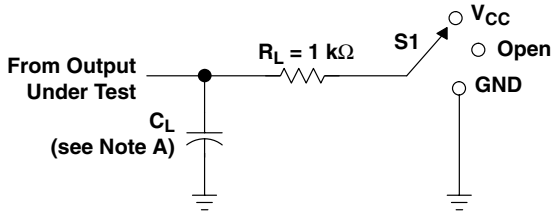
operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance	No load,	f = 1 MHz	14	pF

PARAMETER MEASUREMENT INFORMATION

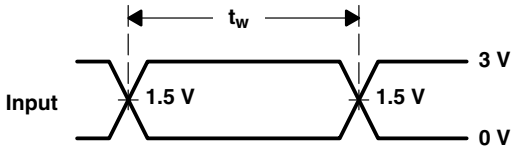


LOAD CIRCUIT FOR
TOTEM-POLE OUTPUTS

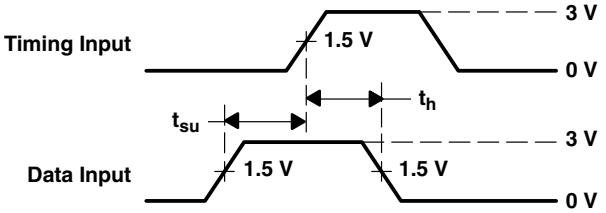


LOAD CIRCUIT FOR
3-STATE AND OPEN-DRAIN OUTPUTS

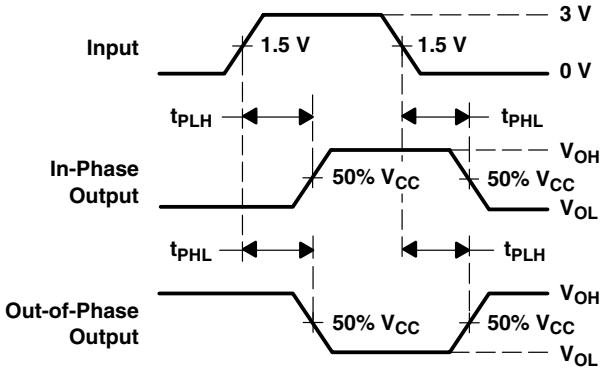
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	V_{CC}
t_{PHZ}/t_{PZH}	GND
Open Drain	V_{CC}



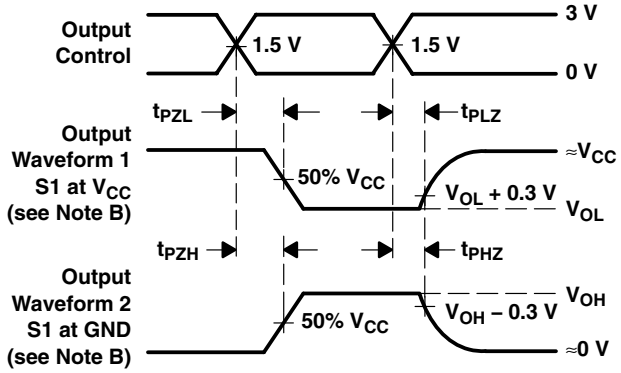
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

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. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 3 ns, t_f ≤ 3 ns.
D. The outputs are measured one at a time with one input transition per measurement.
E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

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
CAHCT1G125QDCKRG4Q	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	Call TI | NIPDAU	Level-1-260C-UNLIM	-40 to 125	BMS	Samples
CAHCT1G125QDCKRQ1	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	NIPDAU	Level-1-260C-UNLIM	-40 to 125	BMS	Samples

(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/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.

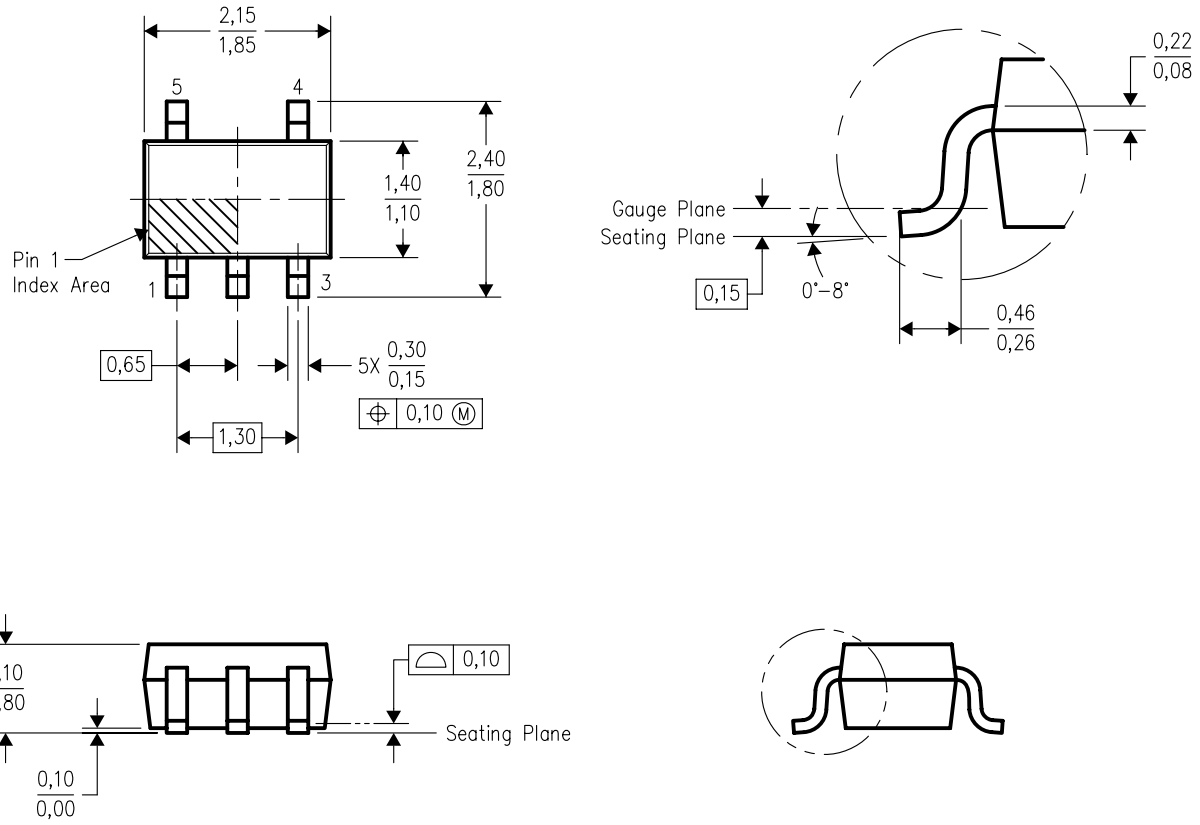
OTHER QUALIFIED VERSIONS OF SN74AHCT1G125-Q1 :

- Catalog: SN74AHCT1G125

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

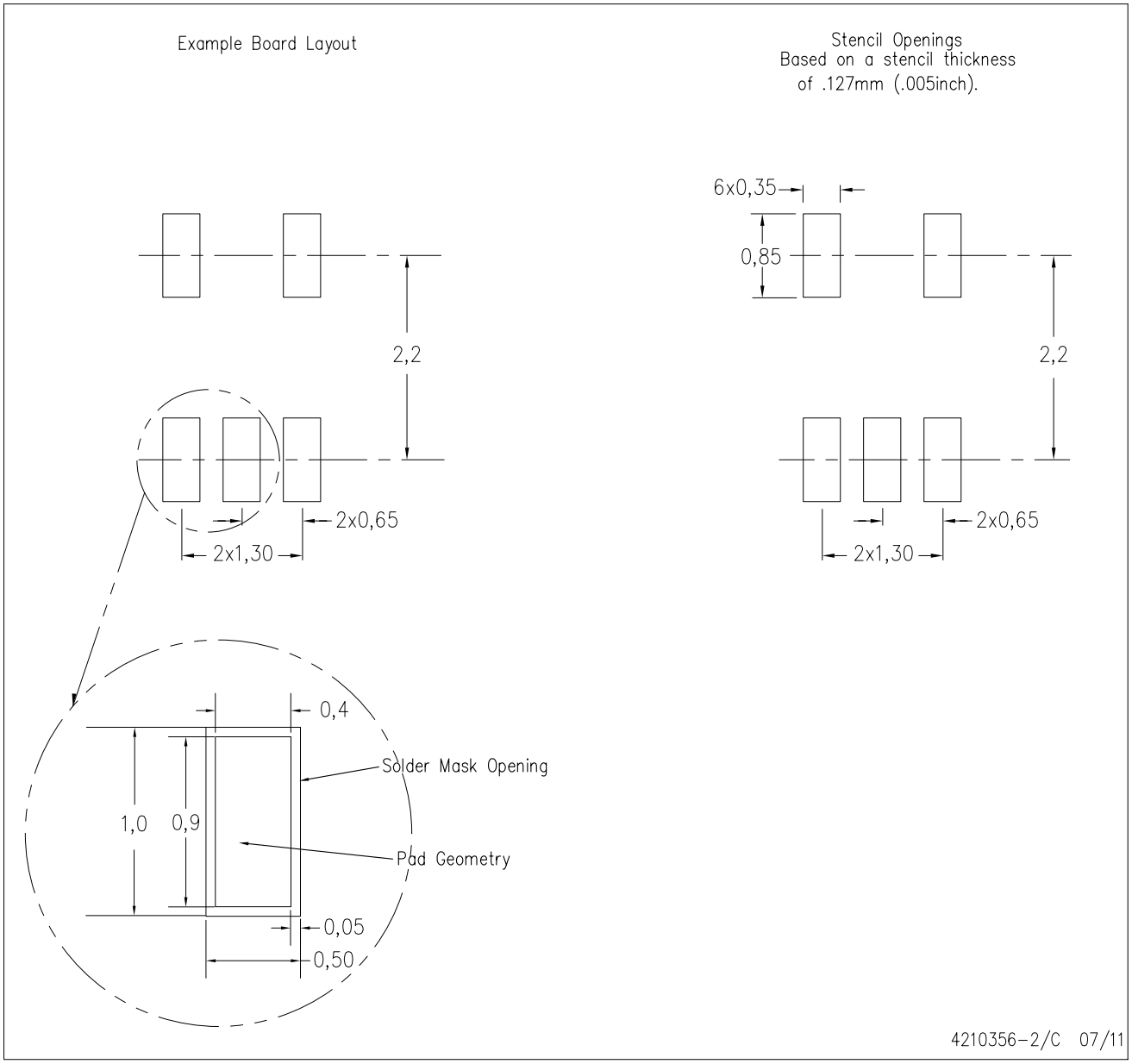
DCK (R–PDSO–G5) PLASTIC SMALL–OUTLINE PACKAGE



4093553–3/G 01/2007

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. Mold flash and protrusion shall not exceed 0.15 per side.
D. Falls within JEDEC MO–203 variation AA.

DCK (R–PDSO–G5) PLASTIC SMALL OUTLINE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
D. Publication IPC–7351 is recommended for alternate designs.
E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC–7525 for other stencil recommendations.

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) or other applicable terms available either on 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