## SN54HCT139, SN74HCT139 DUAL 2-LINE TO 4-LINE DECODERS/DEMULTIPLEXERS

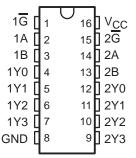
SCLS066D - MARCH 1982 - REVISED SEPTEMBER 2003

- Operating Voltage Range of 4.5 V to 5.5 V
- Outputs Can Drive Up To 10 LSTTL Loads
- Low Power Consumption, 80-μA Max I<sub>CC</sub>
- Typical t<sub>pd</sub> = 10 ns
- ±4-mA Output Drive at 5 V
- Low Input Current of 1 μA Max
- Inputs Are TTL-Voltage Compatible
- Designed Specifically for High-Speed Memory Decoders and Data-Transmission Systems
- Incorporate Two Enable Inputs to Simplify Cascading and/or Data Reception

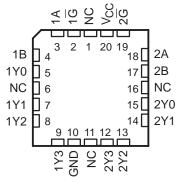
#### description/ordering information

The 'HCT139 devices are designed for high-performance memory-decoding or data-routing applications requiring very short propagation delay times. In high-performance memory systems, these decoders can minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay time of these decoders and the enable time of the memory usually are less than the typical access time of the memory. This means that the effective system delay introduced by the decoders is negligible.

#### SN54HCT139...J OR W PACKAGE SN74HCT139...D, DB, N, OR PW PACKAGE (TOP VIEW)



# SN54HCT139 . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

#### ORDERING INFORMATION

TA	PACKAG	GE†	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube of 25	SN74HCT139N	SN74HCT139N
		Tube of 40	SN74HCT139D	
	SOIC - D	Reel of 2500	SN74HCT139DR	HCT139
-40°C to 85°C		Reel of 250	SN74HCT139DT	
	SSOP – DB	Reel of 2000	SN74HCT139DBR	HT139
		Reel of 2000	SN74HCT139PWR	LITAGO
	TSSOP – PW	Reel of 250	SN74HCT139PWT	HT139
	CDIP – J	Tube of 25	SNJ54HCT139J	SNJ54HCT139J
-55°C to 125°C	CFP – W	Tube of 150	SNJ54HCT139W	SNJ54HCT139W
	LCCC - FK	Tube of 55	SNJ54HCT139FK	SNJ54HCT139FK

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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.



SCLS066D - MARCH 1982 - REVISED SEPTEMBER 2003

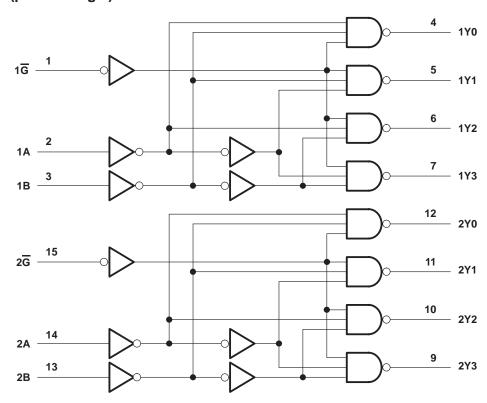
#### description/ordering information (continued)

The 'HCT139 devices comprise two individual 2-line to 4-line decoders in a single package. The active-low enable  $(\overline{G})$  input can be used as a data line in demultiplexing applications. These decoders/demultiplexers feature fully buffered inputs, each of which represents only one normalized load to its driving circuit.

**FUNCTION TABLE** 

	INPUTS			OUTPUTS							
G	SEL	ECT	OUTPUIS								
G	В	Α	Y0	Y1	Y2	Y3					
Н	Х	Χ	Н	Н	Н	Н					
L	L	L	L	Н	Н	Н					
L	L	Н	Н	L	Н	Н					
L	Н	L	Н	Н	L	Н					
L	Н	Н	Н	Н	Н	L					

## logic diagram (positive logic)



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



SCLS066D - MARCH 1982 - REVISED SEPTEMBER 2003

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

Supply voltage range, V <sub>CC</sub>		 ).5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$	) (see Note 1)	 ±20 mA
Output clamp current, I <sub>OK</sub> (V <sub>O</sub> < 0 or V <sub>O</sub> >	V <sub>CC</sub> ) (see Note 1)	 ±20 mA
Continuous output current, $I_O(V_O = 0 \text{ to } V_O$	cc)	 ±25 mA
Continuous current through V <sub>CC</sub> or GND.		 ±50 mA
Package thermal impedance, θ <sub>JA</sub> (see Note	e 2): D package	 73°C/W
	DB package	 82°C/W
	N package	 67°C/W
	PW package	 . 108°C/W
Storage temperature range, T <sub>stg</sub>		 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.

#### recommended operating conditions (see Note 3)

			SN54HCT139 SN74HCT139			39			
			MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage		4.5	5	5.5	4.5	5	5.5	V
$\vee_{IH}$	High-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2		12	2			V
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V		PA.	0.8			8.0	V
VI	Input voltage		0	7	VCC	0		VCC	V
Vo	Output voltage		0	5	VCC	0		VCC	V
t <sub>t</sub>	Input transition (rise and fall) time		Ó	7	500			500	ns
TA	Operating free-air temperature		-55		125	-40		85	°C

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> 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)

24244555	7507.00	TEST CONDITIONS			A = 25°C	;	SN54H	CT139	SN74H	CT139	UNIT	
PARAMETER	TEST CO	NDITIONS	vcc	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNII	
V V 27V		I <sub>OH</sub> = -20 μA	45.77	4.4	4.499		4.4		4.4		.,	
Voн	VI = VIH or VIL	$I_{OH} = -4 \text{ mA}$	4.5 V	3.98	4.3		3.7	7	3.84		V	
.,	V VV		4.5 V		0.001	0.1		0.1		0.1	٧	
Vol	$V_I = V_{IH}$ or $V_{IL}$	I <sub>OL</sub> = 4 mA	4.5 V		0.17	0.26		0.4		0.33	V	
lį	VI = VCC or 0		5.5 V		±0.1	±100		±1000		±1000	nA	
ICC	$V_I = V_{CC}$ or 0,	IO = 0	5.5 V			8	2	160		80	μΑ	
ΔI <sub>CC</sub> ‡	One input at 0.5 V of Other inputs at 0 or	·	5.5 V		1.4	2.4	704d	3		2.9	mA	
C <sub>i</sub>			4.5 V to 5.5 V		3	10		10		10	pF	

<sup>‡</sup>This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or VCC.



NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

<sup>2.</sup> The package thermal impedance is calculated in accordance with JESD 51-7.

SCLS066D - MARCH 1982 - REVISED SEPTEMBER 2003

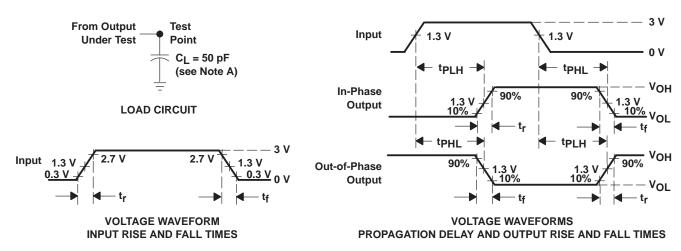
# switching characteristics over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Figure 1)

FROM		то		T <sub>A</sub> = 25°C			SN54HCT139		SN74HCT139			
PARAMETER	(INPUT)	(OUTPUT)	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT	
	A == D	V	4.5 V		14	34		51		43		
	A or B	Y	5.5 V		12	30		50		40		
<sup>t</sup> pd	G	Υ	4.5 V		11	34	1	51		43	ns	
	G		5.5 V		10	30	25	50		40		
		V	4.5 V		8	15	90	22		19		
tt		Y	5.5 V		6	14	Q	21		17	ns	

## operating characteristics, T<sub>A</sub> = 25°C

	PARAMETER	TEST CONDITIONS	TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance per decoder	No load	25	pF

#### PARAMETER MEASUREMENT INFORMATION



- NOTES: A. C<sub>L</sub> includes probe and test-fixture capacitance.
  - B. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  1 MHz,  $Z_Q = 50 \Omega$ ,  $t_f = 6$  ns,  $t_f = 6$  ns.
  - C. The outputs are measured one at a time with one input transition per measurement.
  - D. tpLH and tpHL are the same as tpd.

Figure 1. Load Circuit and Voltage Waveforms







24-Sep-2015

#### **PACKAGING INFORMATION**

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
SN74HCT139D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT139	Samples
SN74HCT139DBLE	OBSOLETE	SSOP	DB	16		TBD	Call TI	Call TI	-40 to 85		
SN74HCT139DBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM -40 to 85		HT139	Samples
SN74HCT139DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT139	Samples
SN74HCT139DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT139	Samples
SN74HCT139DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT139	Samples
SN74HCT139DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT139	Samples
SN74HCT139DRG4	ACTIVE	SOIC	D	16		TBD	Call TI	Call TI	-40 to 85		Samples
SN74HCT139N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT139N	Samples
SN74HCT139PWLE	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85		
SN74HCT139PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT139	Samples
SN74HCT139PWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT139	Samples
SN74HCT139PWRG4	ACTIVE	TSSOP	PW	16		TBD	Call TI	Call TI	-40 to 85		Samples
SN74HCT139PWT	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT139	Samples

<sup>(1)</sup> 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.

<sup>(2)</sup> 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.



## PACKAGE OPTION ADDENDUM

24-Sep-2015

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.

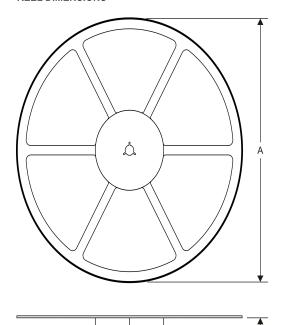
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## PACKAGE MATERIALS INFORMATION

14-Jul-2012 www.ti.com

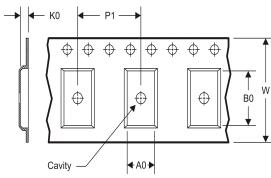
## TAPE AND REEL INFORMATION

#### **REEL DIMENSIONS**



# - K0

**TAPE DIMENSIONS** 



A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

#### TAPE AND REEL INFORMATION

#### \*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCT139DBR	SSOP	DB	16	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74HCT139DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74HCT139PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HCT139PWT	TSSOP	PW	16	250	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

**PACKAGE MATERIALS INFORMATION** 

www.ti.com 14-Jul-2012



\*All dimensions are nominal

7 III GITTIOTIOTOTIO GITO TIOTITITICI							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT139DBR	SSOP	DB	16	2000	367.0	367.0	38.0
SN74HCT139DR	SOIC	D	16	2500	333.2	345.9	28.6
SN74HCT139PWR	TSSOP	PW	16	2000	367.0	367.0	35.0
SN74HCT139PWT	TSSOP	PW	16	250	367.0	367.0	35.0

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

## PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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-PDS0-G16)

## PLASTIC SMALL OUTLINE



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



- 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.



PW (R-PDSO-G16)

## PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153



# PW (R-PDSO-G16)

# PLASTIC SMALL OUTLINE



- 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.



## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

#### **28 PINS SHOWN**



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.

D. Falls within JEDEC MO-150

#### 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 Applications

Audio www.ti.com/audio Automotive and Transportation www.ti.com/automotive **Amplifiers** amplifier.ti.com Communications and Telecom www.ti.com/communications **Data Converters** dataconverter.ti.com Computers and Peripherals www.ti.com/computers **DLP® Products** www.dlp.com Consumer Electronics www.ti.com/consumer-apps DSP dsp.ti.com **Energy and Lighting** www.ti.com/energy Clocks and Timers www.ti.com/clocks Industrial www.ti.com/industrial Interface interface.ti.com Medical www.ti.com/medical Logic Security www.ti.com/security logic.ti.com

Power Mgmt power.ti.com Space, Avionics and Defense www.ti.com/space-avionics-defense

Microcontrollers microcontroller.ti.com Video and Imaging www.ti.com/video

RFID www.ti-rfid.com

OMAP Applications Processors www.ti.com/omap TI E2E Community e2e.ti.com

Wireless Connectivity www.ti.com/wirelessconnectivity