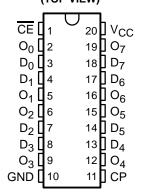
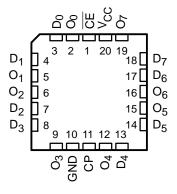
- Function, Pinout, and Drive Compatible With FCT and F Logic
- Reduced V_{OH} (Typically = 3.3 V) Versions of Equivalent FCT Functions
- Edge-Rate Control Circuitry for Significantly Improved Noise Characteristics
- I_{off} Supports Partial-Power-Down Mode Operation
- Matched Rise and Fall Times
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)
- Fully Compatible With TTL Input and Output Logic Levels
- Clock Enable for Address and Data Synchronization Application
- Eight Edge-Triggered D-Type Flip-Flops
- CY54FCT377T
 - 32-mA Output Sink Current
 - 12-mA Output Source Current
- CY74FCT377T
 - 64-mA Output Sink Current
 - 32-mA Output Source Current

SN74FCT377T . . . Q OR SO PACKAGE (TOP VIEW)



SN54FCT377T . . . L PACKAGE (TOP VIEW)



description

The 'FCT377T devices have eight triggered D-type flip-flops with individual data (D) inputs. The common buffered clock (CP) inputs load all flip-flops simultaneously when the clock-enable ($\overline{\text{CE}}$) input is low. The register is fully edge triggered. The state of each D input at one setup time before the low-to-high clock transition is transferred to the corresponding flip-flop output (O). $\overline{\text{CE}}$ must be stable only one setup time prior to the low-to-high clock transition for predictable operation.

These devices are 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.



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.



ORDERING INFORMATION

TA	PAC	KAGE [†]	SPEED (ns)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	QSOP – Q	Tape and reel	5.2	CY74FCT377CTQCT	FCT377C
–40°C to 85°C	SOIC - SO	Tube		CY74FCT377CTSOC	FCT377C
	3010 = 30	Tape and reel	5.2	CY74FCT377CTSOCT	1013/70
	QSOP – Q	Tape and reel	7.2	CY74FCT377ATQCT	FCT377A
	SOIC - SO	Tube	7.2	CY74FCT377ATSOC	FCT377A
	3010 - 30	Tape and reel	7.2	CY74FCT377ATSOCT	FCISTIA
	QSOP – Q	Tape and reel	13	CY74FCT377TQCT	FCT377
–55°C to 125°C	LCC – L	Tube	5.5	CY54FCT377CTLMB	
-55 C to 125°C	LCC - L	Tube	8.3	CY54FCT377ATLMB	

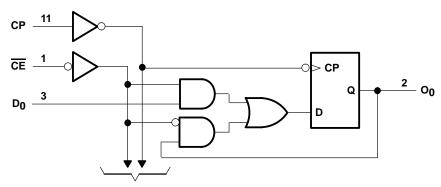
[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE

	INPUTS		OUTPUT	OPERATING
СР	CE	D	0	MODE
1	I	h	Н	Load 1
1	1	1	L	Load 0
↑ X	h H	X	No change	Hold

 $H=High\,logic\,level,\,h=High\,logic\,level\,one$ setup time prior to the low-to-high clock transition, $L=Low\,logic\,level,\,l=Low\,logic\,level$ one setup time prior to the low-to-high clock transition, $X=Don't\,care,\,\uparrow=Low-to-high\,clock\,transition$

logic diagram



To Seven Other Channels



SCCS023A - MAY 1994 - REVISED OCTOBER 2001

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

Supply voltage range to ground potential	0.5 V to 7 V
DC input voltage range	0.5 V to 7 V
DC output voltage range	0.5 V to 7 V
DC output current (maximum sink current/pin)	120 mA
Package thermal impedance, θ _{JA} (see Note 1): Q package	68°C/W
SO package	58°C/W
Ambient temperature range with power applied, T _A	65°C to 135°C
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.

recommended operating conditions (see Note 2)

		CY54FCT377T			CY7	7T	UNIT	
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Vcc	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
VIH	High-level input voltage	2			2			V
VIL	Low-level input voltage			8.0			0.8	V
ІОН	High-level output current			-12			-32	mA
loL	Low-level output current			32			64	mA
TA	Operating free-air temperature	-55		125	-40		85	°C

NOTE 2: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.



NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

SCCS023A - MAY 1994 - REVISED OCTOBER 2001

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

BARAMETER		CY	54FCT37	7T	CY	74FCT37	7T	UNIT		
PARAMETER		TEST CONDITIO	JN5	MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	UNII
V	$V_{CC} = 4.5 \text{ V},$	$I_{1N} = -18 \text{ mA}$			-0.7	-1.2				V
VIK	$V_{CC} = 4.75 \text{ V},$	$I_{IN} = -18 \text{ mA}$						-0.7	-1.2	V
	$V_{CC} = 4.5 \text{ V},$	I _{OH} = -12 mA		2.4	3.3					
Voн	V _{CC} = 4.75 V	I _{OH} = -32 mA					2			V
	VCC = 4.75 V	I _{OH} = -15 mA					2.4	3.3		
V	$V_{CC} = 4.5 \text{ V},$	I _{OL} = 32 mA			0.3	0.55				V
VOL	$V_{CC} = 4.75 \text{ V},$	I _{OL} = 64 mA						0.3	0.55	V
V _{hys}	All inputs				0.2			0.2		V
1.	$V_{CC} = 5.5 \text{ V},$	$V_{IN} = V_{CC}$				5				^
ΙΙ	$V_{CC} = 5.25 \text{ V},$	$V_{IN} = V_{CC}$							5	μΑ
1	$V_{CC} = 5.5 \text{ V},$	$V_{1N} = 2.7 \text{ V}$				±1				μА
lіН	$V_{CC} = 5.25 \text{ V},$	$V_{IN} = 2.7 \text{ V}$							±1	μΑ
1	$V_{CC} = 5.5 \text{ V},$	$V_{IN} = 0.5 V$				±1				^
IIL	$V_{CC} = 5.25 \text{ V},$	$V_{IN} = 0.5 V$							±1	μΑ
1+	$V_{CC} = 5.5 \text{ V},$	$V_{OUT} = 0 V$		-60	-120	-225				mA
los‡	$V_{CC} = 5.25 \text{ V},$	$V_{OUT} = 0 V$					-60	-120	-225	IIIA
l _{off}	$V_{CC} = 0 V$	V _{OUT} = 4.5 V				±1			±1	μΑ
loo	$V_{CC} = 5.5 \text{ V},$	$V_{IN} \leq 0.2 V$	$V_{IN} \ge V_{CC} - 0.2 \text{ V}$		0.1	0.2				mA
Icc			$V_{IN} \ge V_{CC} - 0.2 \text{ V}$					0.1	0.2	IIIA
Aloo	$V_{CC} = 5.5 \text{ V}, V_{II}$	$CC = 5.5 \text{ V}, V_{1N} = 3.4 \text{ V}$, $f_1 = 0$, Outputs open				2				mA
ΔlCC	V _{CC} = 5.25 V, V	$I_{1N} = 3.4 \text{ V}$, $f_1 = 0$, Outputs open					0.5	2	IIIA

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



Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high-speed test apparatus and/or sample-and-hold techniques are preferable to minimize internal chip heating and more accurately reflect operational values. Otherwise, prolonged shorting of a high output can raise the chip temperature well above normal and cause invalid readings in other parametric tests. In any sequence of parameter tests, IOS tests should be performed last.

[§] Per TTL-driven input (V_{IN} = 3.4 V); all other inputs at V_{CC} or GND

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

DADAMETED		TEST CONDITIO	.10	CY	54FCT37	7T	CY	74FCT37	7T	
PARAMETER		MIN	TYP†	MAX	MIN	TYP [†]	MAX	UNIT		
loon¶		itputs open, g at 50% duty cycle IN ≥ V _{CC} – 0.2 V	, CE = GND,		0.06	0.12				mA/
ICCD [¶]	$V_{CC} = 5.25 \text{ V, C}$ One bit switching $V_{IN} \le 0.2 \text{ V or V}$					0.06	0.12	MHz		
		One bit switching at f ₁ = 5 MHz at	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$		0.7	1.4				
	V _{CC} = 5.5 V, Outputs open,	50% duty cycle	V _{IN} = 3.4 V or GND		1.2	3.4				
	f ₀ = 10 MHz, CE = GND	Eight bits switching at	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$		1.6	3.2				
IC#		$f_1 = 2.5 \text{ MHz at}$ 50% duty cycle	V _{IN} = 3.4 V or GND		3.9	12.2				A
IC"		One bit switching at	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$					0.7	1.4	mA
	V _{CC} = 5.25 V, Outputs open,	f ₁ = 5 MHz at 50% duty cycle	V _{IN} = 3.4 V or GND					1.2	3.4	
	f ₀ = 10 MHz, CE = GND	Eight bits switching at	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$					1.6	3.2	
		f ₁ = 2.5 MHz at 50% duty cycle	V _{IN} = 3.4 V or GND					3.9	12.2	
Ci					5	10		5	10	pF
Co					9	12		9	12	pF

[†] Typical values are at V_{CC} = 5 V, T_A = 25°C.

Where:

I_C = Total supply current

ICC = Power-supply current with CMOS input levels

 ΔI_{CC} = Power-supply current for a TTL high input (V_{IN} = 3.4 V)

D_H = Duty cycle for TTL inputs high N_T = Number of TTL inputs at D_H

ICCD = Dynamic current caused by an input transition pair (HLH or LHL)

f₀ = Clock frequency for registered devices, otherwise zero

f₁ = Input signal frequency

 \dot{N}_1 = Number of inputs changing at f_1

All currents are in milliamperes and all frequencies are in megahertz.

|| Values for these conditions are examples of the I_{CC} formula.



This parameter is derived for use in total power-supply calculations.

 $^{^{\#}}$ IC = ICC + \triangle ICC \times DH \times NT + ICCD (f₀/2 + f₁ \times N₁)

CY54FCT377T, CY74FCT377T 8-BIT REGISTERS

SCCS023A - MAY 1994 - REVISED OCTOBER 2001

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

			CY54FC1 CY54FC1	-	CY74FCT CY74FCT CY74FCT	377AT	UNIT
			MIN	MAX	MIN	MAX	
t _W	Pulse duration, CP high or low [†]		7		6		ns
	Setup time, high or low	Data before CP↑			2		no
t _{su}	Setup time, high or low	CE before CP↑	3.5		3.5		ns
Ţ.,	Hold time, high or low	Data after CP↑	1.5		1.5		no
th	Hold time, high or low	CE after CP↑	1.5		1.5		ns

[†] With one data channel switching, $t_{W(L)} = t_{W(H)} = 4$ ns and $t_{\Gamma} = t_f = 1$ ns.

switching characteristics over operating free-air temperature range (see Figure 1)

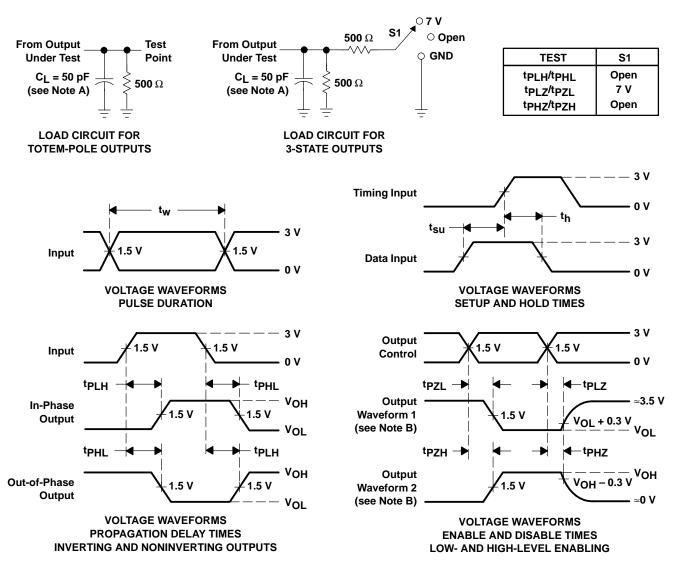
PARAMETER	FROM	то	CY54FC	Г377АТ	CY54FC1	T377CT	UNIT
PARAMETER	(INPUT)	(OUTPUT)	MIN	MAX	MIN	MAX	CIVIT
^t PLH	СР	0	2	8.3	2	5.5	no
t _{PHL}	CF	U	2	8.3	2	5.5	ns

switching characteristics over operating free-air temperature range (see Figure 1)

PARAMETER	FROM	то	CY74FC	T377T	CY74FC	Г377AT	CY74FC1	T377CT	UNIT	
	PARAMETER	(INPUT)	(OUTPUT)	MIN	MAX	MIN	MAX	MIN	MAX	
I	^t PLH	СР	0	2	13	2	7.2	2	5.2	
Γ	^t PHL	CF	O	2	13	2	7.2	2	5.2	ns



PARAMETER MEASUREMENT INFORMATION



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. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms





25-Oct-2016

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package	Pins	Package	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
5962-9221902M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221902M2A	Samples
5962-9221903M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221903M2A CY54FCT 377CTLMB	Samples
CY54FCT377CTLMB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221903M2A CY54FCT 377CTLMB	Samples
CY74FCT377ATQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT377A	Samples
CY74FCT377ATSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT377A	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) 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.

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.



PACKAGE OPTION ADDENDUM

25-Oct-2016

(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

www.ti.com 18-Aug-2014

TAPE AND REEL INFORMATION





	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

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
CY74FCT377ATQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

www.ti.com 18-Aug-2014



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CY74FCT377ATQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0

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