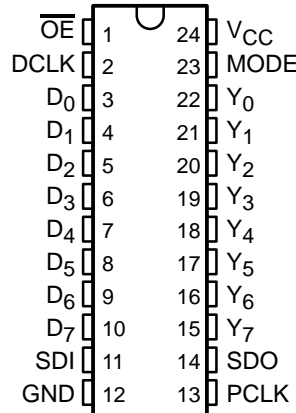


# CY29FCT818T DIAGNOSTIC SCAN REGISTER WITH 3-STATE OUTPUTS

SCCS012B – MAY 1994 – REVISED NOVEMBER 2001

- **Function, Pinout, and Drive Compatible With FCT, F Logic, and AM29818**
- **Reduced  $V_{OH}$  (Typically = 3.3 V) Version 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**
- **Fully Compatible With TTL Input and Output Logic Levels**
- **8-Bit Pipeline and Shadow Register**
- **ESD Protection Exceeds JESD 22**
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)
- **CY29FCT818CT**
  - 64-mA Output Sink Current
  - 32-mA Output Source Current
- **CY29FCT818ATDMB**
  - 20-mA Output Sink Current
  - 3-mA Output Source Current
- **3-State Outputs**

D, P, Q, OR SO PACKAGE  
(TOP VIEW)



## description

The CY29FCT818T contains a high-speed 8-bit general-purpose data pipeline register and a high-speed 8-bit shadow register. The general-purpose register can be used in an 8-bit-wide data path for a normal system application. The shadow register is designed for applications such as diagnostics in sequential circuits, where it is desirable to load known data at a specific location in the circuit and to read the data at that location.

The shadow register can load data from the output of the device, and can be used as a right-shift register with bit-serial input (SDI) and output (SDO), using DCLK. The data register input is multiplexed to enable loading from the shadow register or from the data input pins, using PCLK. Data can be loaded simultaneously from the shadow register to the pipeline register, and from the pipeline register to the shadow register, provided setup-time and hold-time requirements are satisfied, with respect to the two independent clock inputs.

In a typical application, the general-purpose register in this device replaces an 8-bit data register in the normal data path of a system. The shadow register is placed in an auxiliary bit-serial loop that is used for diagnostics. During diagnostic operation, data is shifted serially into the shadow register, then transferred to the general-purpose register to load a known value into the data path. To read the contents at that point in the data path, the data is transferred from the data register into the shadow register, then shifted serially in the auxiliary diagnostic loop to make it accessible to the diagnostics controller. This data then is compared with the expected value to diagnose faulty operation of the sequential circuit.

This device is 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.

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.

**TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2001, Texas Instruments Incorporated  
On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

# CY29FCT818T DIAGNOSTIC SCAN REGISTER WITH 3-STATE OUTPUTS

SCCS012B – MAY 1994 – REVISED NOVEMBER 2001

## ORDERING INFORMATION

TA	PACKAGE†		SPEED (ns)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	DIP – P	Tube	6	CY29FCT818CTPC	CY29FCT818CTPC
	QSOP – Q	Tape and reel	6	CY29FCT818CTQCT	29FCT818C
	SOIC – SO	Tube	6	CY29FCT818CTSOC	29FCT818C
		Tape and reel	6	CY29FCT818CTSOCT	
-55°C to 125°C	CDIP – D	Tube	12	CY29FCT818ATDMB	

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

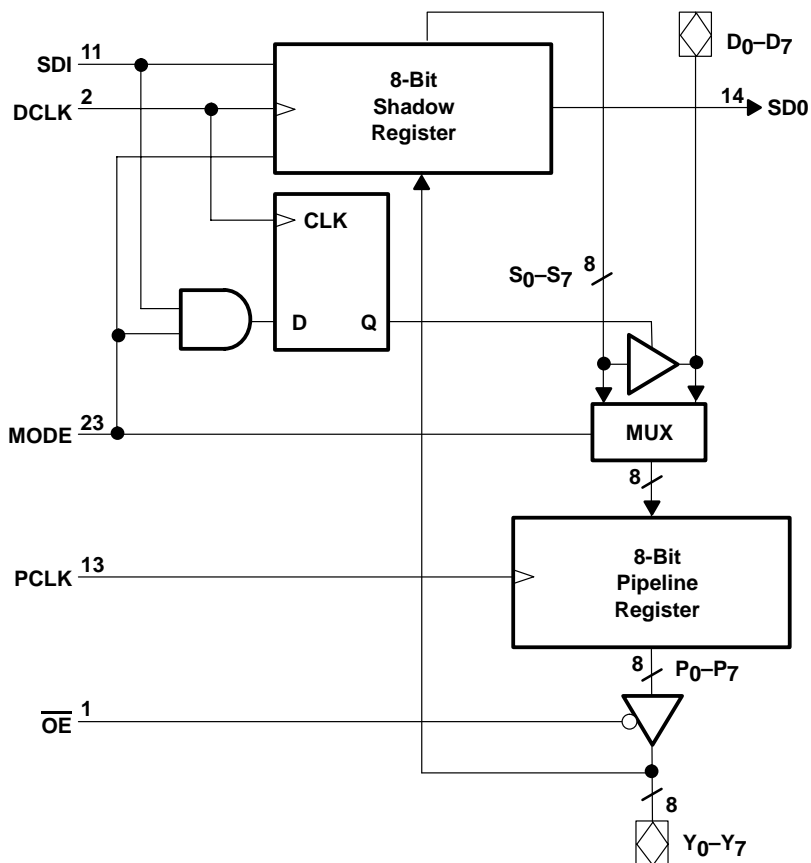
## FUNCTION TABLE

INPUTS				OUTPUT SDO	SHADOW REGISTER	PIPELINE REGISTER	OPERATION
MODE	SDI	DCLK	PCLK				
L	X	↑	X	S <sub>7</sub>	S <sub>0</sub> ←SDI S <sub>i</sub> ←S <sub>i-1</sub>	NA	Serial shift; D <sub>7</sub> –D <sub>0</sub> output disabled
L	X	X	↑	S <sub>7</sub>	NA	P <sub>i</sub> ←D <sub>i</sub>	Load pipeline register from data input
H	L	↑	X	L	S <sub>i</sub> ←Y <sub>i</sub>	NA	Load shadow register from Y output
H	H	↑	X	H	Hold	NA	Hold shadow register; D <sub>7</sub> –D <sub>0</sub> output enabled
H	X	X	↑	SDI	NA	P <sub>i</sub> ←S <sub>i</sub>	Load pipeline register from shadow register

H = High logic level, L = Low logic level, X = Don't care, ↑ Low-to-high transition, ← = Transfer direction, NA = Not applicable



**logic diagram**



**absolute maximum rating 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, $\theta_{JA}$ (see Note 1): P package .....	67°C/W
(see Note 2): Q package .....	61°C/W
(see Note 2): SO package .....	46°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.

NOTES: 1. The package thermal impedance is calculated in accordance with JESD 51-3.  
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

# CY29FCT818T DIAGNOSTIC SCAN REGISTER WITH 3-STATE OUTPUTS

SCCS012B – MAY 1994 – REVISED NOVEMBER 2001

## recommended operating conditions (see Note 3)

		CY29FCT818ATDMB			CY29FCT818T			UNIT
		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			0.8			0.8	V
$I_{OH}$	High-level output current			-3			-32	mA
$I_{OL}$	Low-level output current			20			64	mA
$T_A$	Operating free-air temperature	-55		125	-40		85	°C

NOTE 3: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

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

PARAMETER	TEST CONDITIONS	CY29FCT818ATDMB			CY29FCT818T			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_{IN} = -18\text{ mA}$		-0.7	-1.2				V
	$V_{CC} = 4.75\text{ V}$ , $I_{IN} = -18\text{ mA}$				-0.7	-1.2		
$V_{OH}$	$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -3\text{ mA}$	2.4	3.3					V
	$V_{CC} = 4.75\text{ V}$	$I_{OH} = -32\text{ mA}$			2			
		$I_{OH} = -15\text{ mA}$			2.4	3.3		
$V_{OL}$	$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 20\text{ mA}$		0.3	0.55				V
	$V_{CC} = 4.75\text{ V}$ , $I_{OL} = 64\text{ mA}$				0.3	0.55		
$V_{hys}$	All inputs		0.2		0.2			V
$I_I$	$V_{CC} = 5.5\text{ V}$ , $V_{IN} = V_{CC}$			5				$\mu\text{A}$
	$V_{CC} = 5.25\text{ V}$ , $V_{IN} = V_{CC}$					5		
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ , $V_{IN} = 2.7\text{ V}$			$\pm 1$				$\mu\text{A}$
	$V_{CC} = 5.25\text{ V}$ , $V_{IN} = 2.7\text{ V}$					$\pm 1$		
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ , $V_{IN} = 0.5\text{ V}$			$\pm 1$				$\mu\text{A}$
	$V_{CC} = 5.25\text{ V}$ , $V_{IN} = 0.5\text{ V}$					$\pm 1$		
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ , $V_{OUT} = 2.7\text{ V}$			10				$\mu\text{A}$
	$V_{CC} = 5.25\text{ V}$ , $V_{OUT} = 2.7\text{ V}$					10		
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ , $V_{OUT} = 0.5\text{ V}$			-10				$\mu\text{A}$
	$V_{CC} = 5.25\text{ V}$ , $V_{OUT} = 0.5\text{ V}$					-10		
$I_{OS}^\ddagger$	$V_{CC} = 5.5\text{ V}$ , $V_{OUT} = 0\text{ V}$	-60	-120	-225				mA
	$V_{CC} = 5.25\text{ V}$ , $V_{OUT} = 0\text{ V}$				-60	-120	-225	
$I_{off}$	$V_{CC} = 0\text{ V}$ , $V_{OUT} = 4.5\text{ V}$			$\pm 1$			$\pm 1$	$\mu\text{A}$
$I_{CC}$	$V_{CC} = 5.5\text{ V}$ , $V_{IN} \leq 0.2\text{ V}$ , $V_{IN} \geq V_{CC} - 0.2\text{ V}$		0.2	1.5				mA
	$V_{CC} = 5.25\text{ V}$ , $V_{IN} \leq 0.2\text{ V}$ , $V_{IN} \geq V_{CC} - 0.2\text{ V}$				0.2	1.5		
$\Delta I_{CC}$	$V_{CC} = 5.5\text{ V}$ , $V_{IN} = 3.4\text{ V}^\S$ , $f_1 = 0$ , Outputs open		0.5	2				mA
	$V_{CC} = 5.25\text{ V}$ , $V_{IN} = 3.4\text{ V}^\S$ , $f_1 = 0$ , Outputs open				0.5	2		

† 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,  $I_{OS}$  tests should be performed last.

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



**CY29FCT818T**  
**DIAGNOSTIC SCAN REGISTER**  
**WITH 3-STATE OUTPUTS**

SCCS012B – MAY 1994 – REVISED NOVEMBER 2001

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

PARAMETER	TEST CONDITIONS		CY29FCT818ATDMB			CY29FCT818T			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
I <sub>CCD</sub> ¶	V <sub>CC</sub> = 5.5 V, Outputs open, One input switching at 50% duty cycle, OE = GND, V <sub>IN</sub> ≤ 0.2 V or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V		0.25						mA/ MHz
	V <sub>CC</sub> = 5.25 V, Outputs open, One input switching at 50% duty cycle, OE = GND, V <sub>IN</sub> ≤ 0.2 V or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V					0.25			
I <sub>C</sub> #	V <sub>CC</sub> = 5.5 V, Outputs open, f <sub>0</sub> = 10 MHz, OE = GND	One bit switching at f <sub>1</sub> = 5 MHz at 50% duty cycle	V <sub>IN</sub> ≤ 0.2 V or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V	5.3					mA
			V <sub>IN</sub> = 3.4 V or GND	7.3					
		Eight bits and four controls switching at f <sub>1</sub> = 5 MHz at 50% duty cycle	V <sub>IN</sub> ≤ 0.2 V or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V	17.8					
			V <sub>IN</sub> = 3.4 V or GND	30.8					
	V <sub>CC</sub> = 5.25 V, Outputs open, f <sub>0</sub> = 10 MHz, OE = GND	One bit switching at f <sub>1</sub> = 5 MHz at 50% duty cycle	V <sub>IN</sub> ≤ 0.2 V or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V			5.3			
			V <sub>IN</sub> = 3.4 V or GND			7.3			
		Eight bits and four controls switching at f <sub>1</sub> = 5 MHz at 50% duty cycle	V <sub>IN</sub> ≤ 0.2 V or V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V			17.8			
			V <sub>IN</sub> = 3.4 V or GND			30.8			
C <sub>i</sub>			5	10	5	10	pF		
C <sub>o</sub>			9	12	9	12	pF		

† Typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

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

$$\# I_C = I_{CC} + \Delta I_{CC} \times D_H \times N_T + I_{CCD} (f_0/2 + f_1 \times N_1)$$

Where:

I<sub>C</sub> = Total supply current

I<sub>CC</sub> = Power-supply current with CMOS input levels

ΔI<sub>CC</sub> = Power-supply current for a TTL high input (V<sub>IN</sub> = 3.4 V)

D<sub>H</sub> = Duty cycle for TTL inputs high

N<sub>T</sub> = Number of TTL inputs at D<sub>H</sub>

I<sub>CCD</sub> = Dynamic current caused by an input transition pair (HLH or LHL)

f<sub>0</sub> = Clock frequency for registered devices, otherwise zero

f<sub>1</sub> = Input signal frequency

N<sub>1</sub> = Number of inputs changing at f<sub>1</sub>

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

|| Values for these conditions are examples of the I<sub>CC</sub> formula.



**CY29FCT818T**  
**DIAGNOSTIC SCAN REGISTER**  
**WITH 3-STATE OUTPUTS**

SCCS012B – MAY 1994 – REVISED NOVEMBER 2001

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

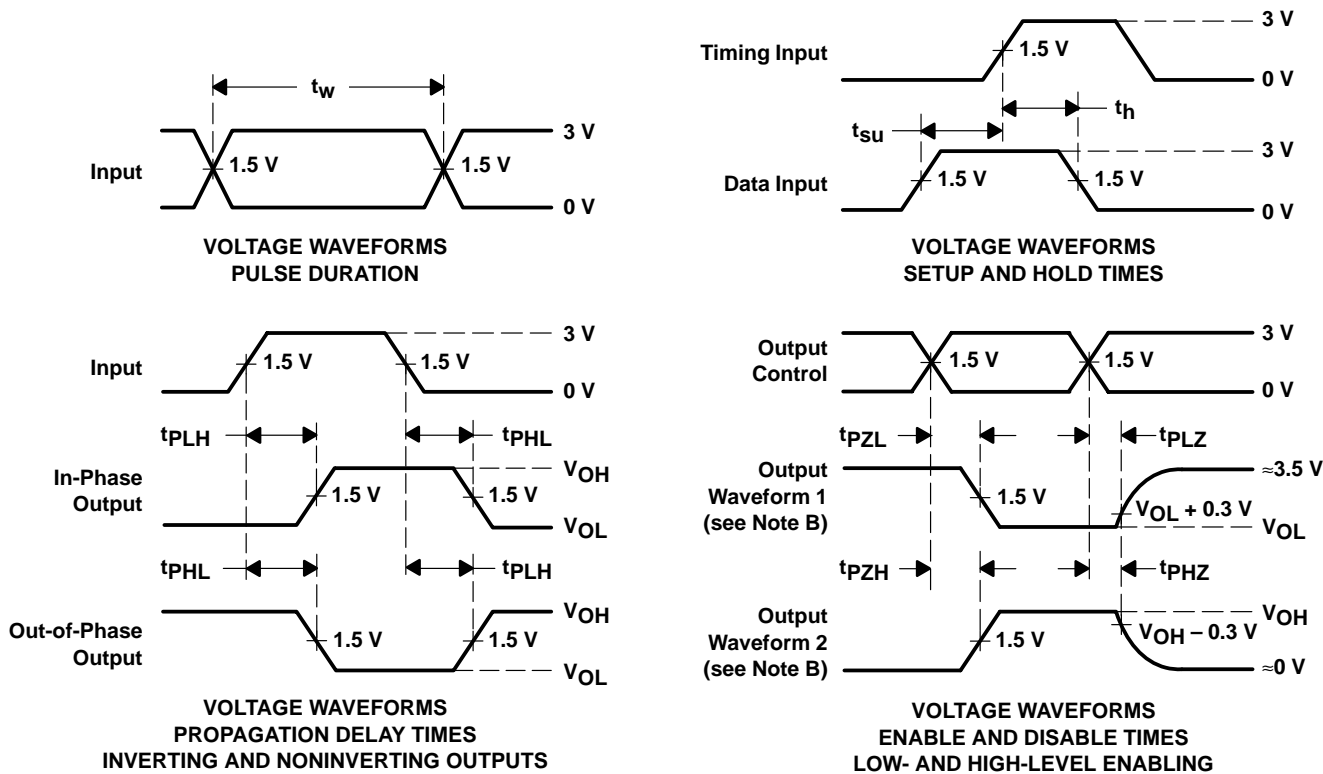
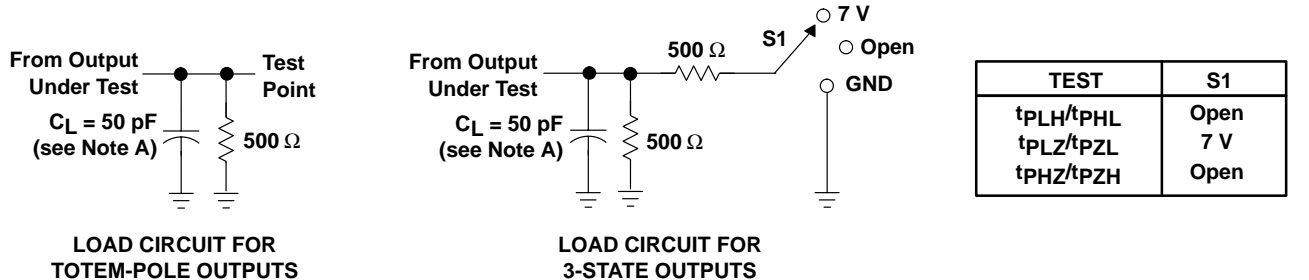
PARAMETER		CY29FCT818AT		CY29FCT818CT		UNIT
		MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse width	PCLK high and low	15		5	ns
		DCLK high and low	25		5	
t <sub>su</sub>	Setup time	D before PCLK↑	6		2	ns
		MODE before PCLK↑	15		3.5	
		Y before DCLK↑	5		2	
		MODE before DCLK↑	12		3.5	
		SDI before DCLK↑	10		3.5	
		DCLK before PCLK↑	15		3.5	
t <sub>h</sub>	Hold time	D after PCLK↑	2		1.5	ns
		MODE after PCLK↑	0		0	
		Y after DCLK↑	5		1.5	
		MODE after DCLK↑	5		1.5	
		SDI after DCLK↑	0		0	

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY29FCT818AT		CY29FCT818CT		UNIT
			MIN	MAX	MIN	MAX	
t <sub>pd</sub>	PCLK	Y		12		6	ns
	MODE	SDO		18		7.2	
	SDI	SDO		18		7.1	
	DCLK	SDO		30		7.2	
t <sub>pZL</sub>	$\overline{\text{OE}}$	Y		20		8	ns
	DCLK	D		35		9	
t <sub>pZH</sub>	$\overline{\text{OE}}$	Y		20		8.5	ns
	DCLK	D		30		9	
t <sub>PLZ</sub>	$\overline{\text{OE}}$	Y		20		5.5	ns
	DCLK	D		45		5.5	
t <sub>PHZ</sub>	$\overline{\text{OE}}$	Y		30		8	ns
	DCLK	D		90		8	



**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**

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
5962-9682701Q3A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	Contact TI Distributor or Sales Office
5962-9682701QLA	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	<a href="#">Purchase Samples</a>
CY29FCT818ATDMB	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	Contact TI Distributor or Sales Office
CY29FCT818CTQC	PREVIEW	SSOP/QSOP	DBQ	24	55	TBD	Call TI	Call TI	Samples Not Available
CY29FCT818CTSOCT	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	<a href="#">Purchase Samples</a>
CY29FCT818CTSOCTE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	<a href="#">Purchase Samples</a>
CY29FCT818CTSOCTG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	<a href="#">Purchase Samples</a>

<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.

**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)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

**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.

## TAPE AND REEL INFORMATION



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CY29FCT818CTSOCT	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CY29FCT818CTSOCT	SOIC	DW	24	2000	346.0	346.0	41.0

JT (R-GDIP-T\*\*)

CERAMIC DUAL-IN-LINE

24 LEADS SHOWN



4040110/C 08/96

- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. This package can be hermetically sealed with a ceramic lid using glass frit.  
 D. Index point is provided on cap for terminal identification.  
 E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

DW (R-PDSO-G24)

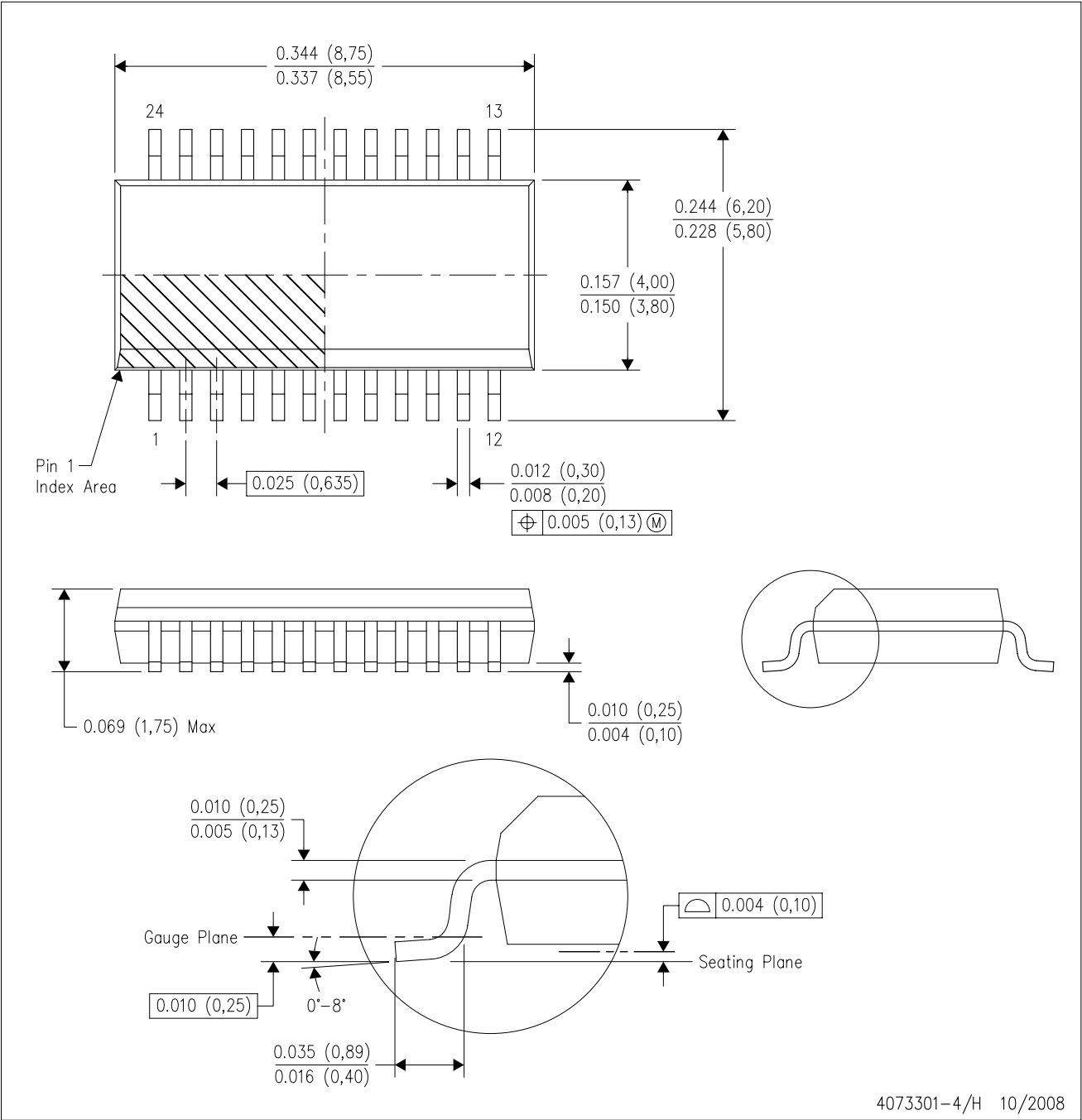
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AD.

DBQ (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15) per side.
  - D. Falls within JEDEC MO-137 variation AE.

## 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	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
RF/IF and ZigBee® Solutions	<a href="http://www.ti.com/lprf">www.ti.com/lprf</a>

### Applications

Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Transportation and Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
Wireless	<a href="http://www.ti.com/wireless-apps">www.ti.com/wireless-apps</a>

TI E2E Community Home Page

[e2e.ti.com](http://e2e.ti.com)

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