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

SCCS012B - MAY 1994 - REVISED NOVEMBER 2001

24 VCC

22 Y₀

21 Y₁

20 Y₂

19 Y₃

18 Y₄

17 Y₅

16 Y₆

15 Y₇

14 SDO

13 PCLK

23 MODE

D, P, Q, OR SO PACKAGE

(TOP VIEW)

OE [

DCLK [2

D₀ [] 3

D₁ ∏ 4

 $D_2 \begin{bmatrix} 1 \\ 5 \end{bmatrix}$ $D_3 [] 6$

D₄ ∏ 7

D₅ [] 8

 $D_6 \square 9$

D₇ [] 10

SDI 11

GND [] 12

- **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

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.



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ORDERING INFORMATION

TA	PAC	KAGE [†]	SPEED (ns)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	DIP – P	Tube	6	CY29FCT818CTPC	CY29FCT818CTPC
–40°C to 85°C	QSOP – Q	Tape and reel	6	CY29FCT818CTQCT	29FCT818C
-40 C to 65 C	SOIC - SO	Tube	6	CY29FCT818CTSOC	29FCT818C
	3010 - 30	Tape and reel	6	CY29FCT818CTSOCT	295010100
−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.

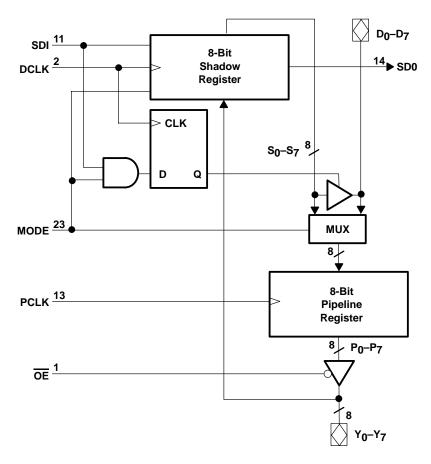
FUNCTION TABLE

	INF	PUTS		OUTPUT	SHADOW	PIPELINE	OPERATION			
MODE	SDI	DCLK	PCLK	SDO	REGISTER	REGISTER	OPERATION			
L	Х	1	Х	S ₇	S ₀ ←SDI S _i ←S _{i–1}	NA	Serial shift; D ₇ –D ₀ output disabled			
L	Χ	Х	1	S ₇	NA	P _i ←D _i	Load pipeline register from data input			
Н	L	\uparrow	Χ	L	S _i ←Y _i	NA	Load shadow register from Y output			
Н	Н	\uparrow	Χ	Н	Hold	NA	Hold shadow register; D7-D0 output enabled			
Н	Χ	Χ	\uparrow	SDI	NA	P _i ←S _i	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	
DC output voltage range	
DC output current (maximum sink current/pin)	120 mA
Package thermal impedance, θ _{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 _{stq}	–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.



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recommended operating conditions (see Note 3)

		CY29F	CT818A	ТОМВ	CY	29FCT81	8T	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			-3			-32	mA
loL	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)

DADAMETER	_	FOT CONDITION	10	CY29F	CT818A	TDMB	CY	29FCT81	8T	LINUT
PARAMETER	ľ	EST CONDITION	5	MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	UNIT
Voice	V _{CC} = 4.5 V,	$I_{IN} = -18 \text{ mA}$			-0.7	-1.2				V
VIK	V _{CC} = 4.75 V,	I _{IN} = -18 mA						-0.7	-1.2	V
	V _{CC} = 4.5 V,	I _{OH} = –3 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 V,	I _{OL} = 20 mA			0.3	0.55				V
VOL	V _{CC} = 4.75 V,	I _{OL} = 64 mA						0.3	0.55	V
V _{hys}	All inputs				0.2			0.2		V
1.	V _{CC} = 5.5 V,	VIN = VCC				5				4
Ι	V _{CC} = 5.25 V,	VIN = VCC							5	μΑ
l	V _{CC} = 5.5 V,	V _{IN} = 2.7 V				±1				
ήΗ	V _{CC} = 5.25 V,	V _{IN} = 2.7 V							±1	μΑ
l	$V_{CC} = 5.5 \text{ V},$	V _{IN} = 0.5 V				±1				
IL	V _{CC} = 5.25 V,	V _{IN} = 0.5 V							±1	μΑ
1	V _{CC} = 5.5 V,	V _{OUT} = 2.7 V				10				
lozh	V _{CC} = 5.25 V,	V _{OUT} = 2.7 V							10	μΑ
1	V _{CC} = 5.5 V,	V _{OUT} = 0.5 V				-10				
IOZL	V _{CC} = 5.25 V,	V _{OUT} = 0.5 V							-10	μΑ
. +	V _{CC} = 5.5 V,	V _{OUT} = 0 V		-60	-120	-225				mA
los [‡]	$V_{CC} = 5.25 \text{ V},$						-60	-120	-225	IIIA
l _{off}	$V_{CC} = 0 V$,	V _{OUT} = 4.5 V				±1			±1	μΑ
loo	$V_{CC} = 5.5 \text{ V},$	$V_{IN} \le 0.2 V$,	$V_{IN} \ge V_{CC} - 0.2 \text{ V}$		0.2	1.5				mA
lcc	$V_{CC} = 5.25 \text{ V},$							0.2	1.5	ША
ΔlCC	$V_{CC} = 5.5 \text{ V}, V_{IN} = 3$		0.5	2				mA		
۵۱,00	V_{CC} = 5.25 V, V_{IN} =	3.4 V§, f ₁ = 0, Ou	itputs open					0.5	2	ША

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

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



[‡] 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, $\ensuremath{\text{IOS}}$ tests should be performed last.

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

DADAMETER		TEST COMPLETION	ue.	CY29F	CT818A	TDMB	CY	29FCT81	8T	LIAUT
PARAMETER		TEST CONDITION	MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	UNIT	
		utputs open, One input D, $V_{IN} \le 0.2 \text{ V or } V_{IN}$	switching at 50% duty ≥ V _{CC} – 0.2 V			0.25				mA/
ICCD [¶]	$V_{CC} = 5.25 \frac{V_{c}}{OE}$ duty cycle, \overline{OE}	Outputs open, One inpersion of $V_{IN} \le 0.2 \text{ V}$ or	ut switching at 50% V _{IN} ≥ V _{CC} – 0.2 V						0.25	MHz
		One bit switching at f ₁ = 5 MHz	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$			5.3				
	V _{CC} = 5.5 V, Outputs open,	at 50% duty cycle	$V_{IN} = 3.4 \text{ V or GND}$			7.3				
	$f_0 = 10 \text{ MHz},$ OE = GND	f ₀ = 10 MHz, Eight bits and four	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$			17.8				
l _C #		at 50% duty cycle	V _{IN} = 3.4 V or GND			30.8				A
I IC		One bit switching at f ₁ = 5 MHz	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$						5.3	mA
	V _{CC} = 5.25 V, Outputs open,	at 50% duty cycle	$V_{IN} = 3.4 \text{ V or GND}$						7.3	
	$f_0 = 10 \text{ MHz},$ OE = GND	Eight bits and four controls switching at f ₁ = 5 MHz	$V_{IN} \le 0.2 \text{ V or}$ $V_{IN} \ge V_{CC} - 0.2 \text{ V}$						17.8	
		at 50% duty cycle	V _{IN} = 3.4 V or GND						30.8	
C _i					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

I_{CCD} = Dynamic current caused by an input transition pair (HLH or LHL)

f₀ = Clock frequency for registered devices, otherwise zero

f₁ = Input signal frequency

N₁ = Number of inputs changing at f₁

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 × D_H × N_T + ICCD (f₀/2 + f₁ × N₁)

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

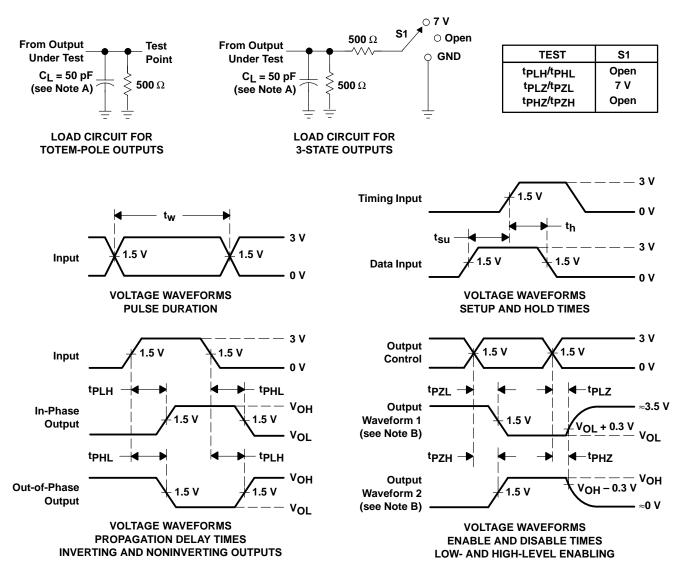
	DADAMETE	CY29FC1	818AT	CY29FCT	818CT		
	PARAMETE	:R	MIN	MAX	MIN	MAX	UNIT
	Duloo width	PCLK high and low	15		5		
t _W	Pulse width	DCLK high and low	25		5		ns
		D before PCLK↑	6		2		
		MODE before PCLK↑	15		3.5		
t _{SU} Setup time		Y before DCLK↑	5		2		
	Setup time	MODE before DCLK↑	12		3.5		ns
		SDI before DCLK↑	10		3.5		
		DCLK before PCLK↑	15		3.5		
		PCLK before DCLK↑	45		8.5		
		D after PCLK↑	2		1.5		
		MODE after PCLK↑	0		0		
th	Hold time	Y after DCLK↑	5		1.5		ns
		MODE after DCLK↑	5		1.5		
		SDI after DCLK↑	0		0		

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

PARAMETER	FROM	ТО	CY29FCT818AT	CY29FCT818CT	UNIT	
PARAMETER	(INPUT)	(OUTPUT)	MIN MAX	MIN MAX	UNII	
	PCLK	Υ	12	6		
	MODE	SDO	18	7.2	20	
^t pd	SDI	SDO	18	7.1	ns	
	DCLK	SDO	30	7.2		
t	ŌE	Υ	20	8	ns	
^t PZL	DCLK	D	35	9	115	
tom	OE	Υ	20	8.5	20	
^t PZH	DCLK	D	30	9	ns	
t	ŌE	Υ	20	5.5	20	
^t PLZ	DCLK	D	45	5.5	ns	
t	ŌE	Υ	30	8	no	
^t PHZ	DCLK	D	90	8	ns	



PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_I 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





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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
5962-9682701Q3A	ACTIVE	LCCC	FK	28	1	TBD	POST-PLATE	N / A for Pkg Type	
5962-9682701QLA	ACTIVE	CDIP	JT	24	1	TBD	Call TI	Call TI	
CY29FCT818ATDMB	ACTIVE	CDIP	JT	24	1	TBD	A42	N / A for Pkg Type	
CY29FCT818CTQC	PREVIEW	SSOP	DBQ	24	55	TBD	Call TI	Call TI	
CY29FCT818CTSOCT	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
CY29FCT818CTSOCTE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
CY29FCT818CTSOCTG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	

(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.

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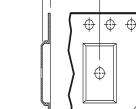
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TAPE AND REEL INFORMATION

REEL DIMENSIONS

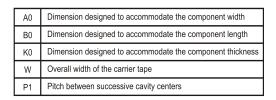




Cavity

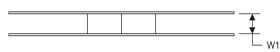
TAPE DIMENSIONS

- K0



◆ A0 **→**

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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
CY29FCT818CTSOCT	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1

PACKAGE MATERIALS INFORMATION

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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CY29FCT818CTSOCT	SOIC	DW	24	2000	367.0	367.0	45.0

JT (R-GDIP-T**)

24 LEADS SHOWN

CERAMIC DUAL-IN-LINE



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

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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 metal lid.
- D. Falls within JEDEC MS-004



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.



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roducts		Applications
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Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

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Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию.

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С нами вы становитесь еще успешнее!

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