Cypress Semiconductor
Qualification Report

QTP# 99175 VERSION 1.0
October, 1999

Military Clocked FIFOs – R28 Technology – Fab2	
CY7C441/443	512/2K x 9 Clocked FIFO
CY7C451/453/454	512/2K/4K x 9 Cascadable Clocked FIFO With Programmable Flags

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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Reliability Manager
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PRODUCT DESCRIPTION (for qualification)			
Qualification Purpose: to qualify CY7C454 (Rev. B) and the options for military, R28 technology, Fab2. The commercial products QTP 98312.			
Marketing Part #:	CY7C454		
Package:	32L Ceramic Leadless Chip Carrierd		
Device Description:	4K x 9 Cascadaable Clocked FIFO		
Cypress Division:	Cypress Semiconductor Corporation – DCD Division		
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. B	
Die Size (stepping):	112 mils x 159 mils	What ID markings on Die:	7C453A

TECHNOLOGY/FAB PROCESS DESCRIPTION - R28			
Number of Metal Layers:	2	Metal Composition:	Metal 1: Ti/TiW/Al-Si/TiW, 500Å/1.2KÅ/6KÅ/1.2K Å Metal 2: TiW/Al-Si/TiW, 1.2KÅ/10KÅ/150Å
Passivation Type and Materials:	7000A TEOS + 6000A Si_2N_4		
Free Phosphorus contents in top glass layer(%):	N/A		
Die Coating(s), if used:	None		
Generic Process Technology/Design Rule (µ-drawn):	CMOS, Double Poly, Double Metal /0.65 µm		
Gate Oxide Material/Thickness (MOS):	SiO_2 / 165 Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	Fab2/R28		

HERMETIC PACKAGE/ASSEMBLY DESCRIPTION			
Package Outline, Type, or Name:	32L Ceramic Leadless Chip Carriers		
Lid Seal Method / Material:	Solder Gold Eutectic		
Lead Finish, composition:	Solder Dip, 63%Sn, 37%Pb		
Die Attach Method:	Ag Glass	Die Attach Material:	Silver Glass
Wire Bond Method:	Ultrasonic	Wire Material/Size:	Al / 1.25 mil
Assembly Line ID and Process ID:	Alphatec, Thailand		

Note: Please contact a Cypress Representative for other packages availability.

RELIABILITY TESTS PERFORMED

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
Group C, Military Life Test	Mil-Std-883, Method 1005.4, Vcc = 5.75V, 150°C	P
Temp Cycle, Hermetic	Mil-Std-883, Method 1001, Condition C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	MIL-STD-883, Method 3015.7	2200V
Electrostatic Discharge Charge Device Model (ESD-CDM)	Cypress Spec. 25-00020	1000V
Latchup Sensitivity	In accordance with JEDEC 17. Cypress Spec. 01-00081	P 12.0V ± 200 mA

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF[3]	Failure Rate[4]
High Temperature Operating Life Early Failure Rate[5]	2610 Devices (Com. & Mil. Quals)	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	68,832 DHRs (Com. & Mil. Quals)	0	0.7	170	78 FIT

[1] Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.
[2] Chi-squared 60% estimations used to calculate the failure rate.
[3] Thermal Acceleration Factor is calculated from the Arrhenius equation

$$AF = \exp\left[\frac{E_A}{k}\left[\frac{1}{T_2} - \frac{1}{T_1}\right]\right]$$

where:

E_A =The Activation Energy of the defect mechanism.
k = Boltzmann's constant = 8.62×10^{-5} eV/Kelvin.
T_1 is the junction temperature of the device under stress and T_2 is the junction temperature of the device at use conditions.

[4] The Clocked FIFO, R28 Technology was qualified in Fab3 with a Fit rate of 28, QTP 96154.

[5] Production burn-in of 80 hours, 150C, 6.5V is required for the product.

RELIABILITY TEST DATA

QTP#: 99175

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY7C454-LMB	ALPHA-X	2907136	619911754	48	175	0	
CY7C454-LMB	ALPHA-X	2907136	619911754	48	660	0	
CY7C454-LMB	ALPHA-X	2907136	619911754	48	180	0	
STRESS: ESD-CHARGE DEVICE MODEL (1000V)							
CY7C454-LMB	ALPHA-X	2907136	619911754	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2200V)							
CY7C454-LMB	ALPHA-X	2907136	619911754	COMP	3	0	
STRESS: GROUP C, SUBGROUP 1 LIFE TEST MIL-STD-883, METHOD 1005.4 (150C, 5.75V)							
CY7C454-LMB	ALPHA-X	2907136	619911754	184	48	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY7C454-LMB	ALPHA-X	2907136	619911754	80	120	0	
CY7C454-LMB	ALPHA-X	2907136	619911754	500	120	0	
STRESS: TC COND. C, -65 TO 150C, HERMETIC DEVICES							
CY7C454-LMB	ALPHA-X	2907136	619911754	100	48	0	
CY7C454-LMB	ALPHA-X	2907136	619911754	1000	48	0	

RELIABILITY TEST DATA

QTP#: 98312[1]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY7C457-JC	INDNS-O	2823136	519809904S1	48	889	0	
CY7C457-JC	INDNS-O	2823136	519809904S1	48	111	0	
STRESS: ESD-CHARGE DEVICE MODEL (750V)							
CY7C457-JC	INDNS-O	2823136	519809904S1	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY7C457-JC	INDNS-O	2823136	519809904S1	COMP	3	0	

[1] QTP 98312, Commercial Clocked FIFO, R28 Technology, Fab2 qualification.