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Electronics

Product
Specification

108-47010
10-January 2005 Rev F

Touch Control Technology (TCT) Microcontrollers

1. SCOPE

1.1. Content

This document specifies performance, test, and quality requirements for the Tyco Touch Control Technology (TCT) microcontrollers. Part numbers for various quantities of keys and output formats are listed in Table 1 below. Table 2 identifies the basic microcontroller operating parameters. TCT microcontrollers use a patented touch recognition technology as the basis for switching. Patent number US 5,760,715 (June 2, 1998) applies to TCT products.

Part Number	Package	Maximum Number of Keys	Output Format	Notes
1710094-1	SOIC-20	10	Binary or 2x5 Matrix	See dwg.1710094
1710094-2	SOIC-20	10	Binary or 2x5 Matrix	Rated for 105°C
1710084-1	SOIC-20	15	Binary or 3x5 Matrix	See dwg.1710084
1710084-2	SOIC-20	15	Binary or 3x5 Matrix	Rated for 105°C
1710324-1	SOIC-20	15	Binary or 3x5 Matrix	See dwg. 1710324
1710098-1	TQFP-32	24	Binary or 4x6 Matrix	See dwg.1710098
1710098-2	TQFP-32	24	Binary or 4x6 Matrix	Rated for 105°C
1710095-1	TQFP-32	36	Binary or 6x6 Matrix	See dwg.1710095
1710095-2	TQFP-32	36	Binary or 6x6 Matrix	Rated for 105°C
1710085-1	TQFP-32	56	Binary or 7x8 Matrix	See dwg.1710085
1710085-2	TQFP-32	56	Binary or 7x8 Matrix	Rated for 105°C

Table 1: TCT Microcontroller Part Numbers

Note: All parts are JEDEC standard compliant

1.2. Qualification

Procedures specified in Table 3 shall be used when tests are performed on the subject product line. All inspections shall be performed using the applicable inspection plan(s) and product drawing(s).

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. Tyco Electronics Documents

    A. 109 Series: Test Specifications
    B. 109-197:   AMP Test Specifications vs. EIA 364-18
    C. 114-47010:   Application Specification
    D. 501-47018:   Qualification Test Report

2.2. Non-Tyco Documents

    A. Federal Communications Commission (FCC) CFR47, Part 15, Subpart B, Class B Computing Devices
    B. IEC 1000-4-3:   Radiated RF Immunity

3. REQUIREMENTS

3.1. Design and Construction

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Electrical Characteristics

Absolute Maximum Ratings*

		*NOTICE:
Operating Temperature	-40°C to +125°C	Stresses beyond those listed under "Absolute
Voltage on Any Pin	-1.0V to VCC + 0.5V	Maximum Ratings" may cause permanent
Maximum Operating Voltage	6.0V	damage to the device. This is a stress rating
DC Current per I/O Pin	40.0 mA	only and functional operation of the device at

these or other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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Symbol	Parameter	Min	Typ	Max
VCC	Supply Voltage	-	5.0V	-
VOH	Output High Voltage (VCC = 5V, IOL = 20 mA)	4.2V	-	-
VOL	Output Low Voltage (**V**CC = 5V, **I**OL = 20 mA)	-	-	0.6V
ICC	Supply current (VCC = 5V)	-	15 mA	-
Top	Operating Temperature	-40°C	-	85 °C (105 °C for high temperature version)

Table 2 : Operating Ratings

3.5   Test Requirements and Procedures Summary

The TCT output signals represent the following key touch states: no touch, touch and error if more than one key is activated in the same time. In the case of touch, the TCT microcontroller generates the binary or matrix code of the key number being touched. Refer to output tables specified in Tyco Application Specification 114-47010. TCT microcontrollers are designed to meet the electrical, mechanical and environmental performance requirements specified in Table 3. Unless otherwise specified, all tests shall be performed at ambient environmental conditions per EIA-364.

Test Description	Requirement	Procedure
Initial/ Final Examination of Product	Meets visual and functional requirements. Ensure the output signals match those stated in Tyco Application Specification 114-47010 for both binary and matrix modes.	EIA 364-18 Visual and dimensional (C of C) inspection per product drawing. 1000 input pulses shall be applied to each key input to ensure functionality.
ELECTRICAL		
Current Consumption	Current consumption shall be less than 25 mA	Connect power to the unit and allow it to reach a steady state temperature. Measure current consumption.
Brown Out Circuit Enabled	Brown out circuit must be activated at 4 VDC or less	Decrease supply voltage from +5VDC to less than 4 VDC. Check any key for functionality.
Switch Cycling - Electrical	> 5,000,000 steady state cycles without two consecutive activation failures.	Activate one of keyboard keys using the GO gauge over a 0.25" thick polycarbonate dielectric.
Key ON Response Time	Less than 100 ms	Use a dual channel oscilloscope. Calculate the response time as the time difference between input signal and output signal.

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Test Description	Requirement	Procedure
Key OFF Response Time	Less than 100 ms	Use a dual channel oscilloscope. Calculate the response time as the time difference between input signal and output signal.
Touch sensitivity	For the given qualification jig (see Note A) all keys shall be functional at the two dielectric thickness extremes; 0.020 and 0.750 inches.	Adjust the sensitivity potentiometer to achieve a solid touch signal for each of the two material thickness extremes using the Go gauge for touch simulation.
Multiple key press	When two or more keys are activated simultaneously, output will be an error condition for binary mode and a no key touch condition (no output signal) for matrix mode.	Activate two keys simultaneously and read the output signal in both matrix and binary modes. Ensure the output signal match those stated in Tyco Application Specification 114-47010.
Output code signals	The output signals are binary coded when the Mode pin is connected to circuit ground. The output signals are matrix coded when the Mode pin is connected to Vcc.	Enable both Binary and Matrix modes and ensure the output signals match those stated in Tyco Application Specification 114-47010.
ENVIRONMENTAL		
Temperature Cycling	Remains functional after 10 complete cycles in the range of -40°C to + 85°C (-40°C to + 105°C for -2 parts)	Tested per section 16 of UL specification UL 858A. Temperature range modified to -40°C to + 85°C (-40°C to + 105°C for -2 parts)
Operating Temperature	Functional over -40°C to + 85°C range (-40°C to + 105°C for -2 parts)	100 input pulses should be applied and checked to each input pin for functionality test at the two temperature extremes
EMI (FCC) Test	Certified to FCC CFR47, Part 15, Subpart B, Class B Computing Devices	Per FCC specification.
Radiated RF Immunity	Pass the requirements of IEC specification IEC 1000-4-3	Per IEC 1000-4-3

Table 3: Test Summary

Note A: The dimensions of the test fixture key used for testing are shown in figure 1. A touch condition is simulated with a metal cylinder of 0.40" diameter (Go gauge). The dielectric material is polycarbonate of the two thickness extremes.
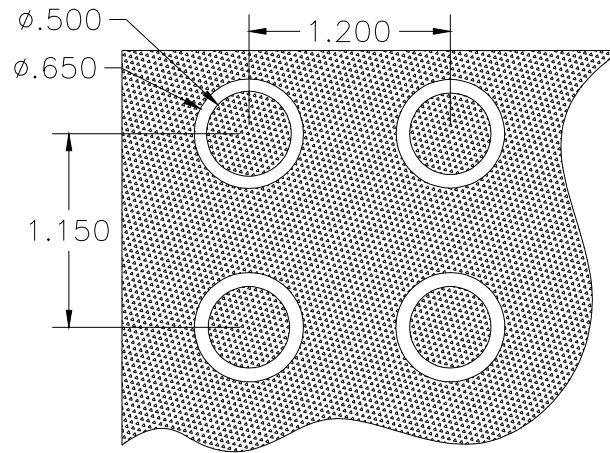
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Figure 1: Key Dimensions (inches)

3.6.   Product Qualification and Re-qualification Test Sequence

TEST or EXAMINATION	Test Group (a)		
	1	2	3
	Test Sequence (a)		
Initial/Final Examination of Product	1,10	1,4	1,4
Current Consumption	2		
Brown Out Circuit Enabled	3		
Switch Cycling – Electrical	9		
Key ON Response Time	4		
Key OFF Response Time	5		
Touch sensitivity	6		
Multiple key press	7		
Output code signals	8		
Temperature Cycling		2	
Operating Temperature		3	
EMI (FCC)			2
Radiated RF Immunity			3

Table 4 Test Sequence

NOTE B: (a) See paragraph 4.1.A for specimen selection.
(b) Numbers indicate sequence in which tests are performed.

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4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Specimen Selection

Specimens shall be prepared in accordance with applicable Instruction Sheets and shall be selected at random from current production. Groups one and two shall each consist of a minimum of three specimens. Group three consists of one specimen.

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Table 3.

4.2. Re-qualification Testing

If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate re-qualification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

Test groups one and three shall be re-qualified for changes to the microcontroller software. Test group two shall be re-qualified for changes to the base microcontroller.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of Table 3. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before re-submittal.

4.4. Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.