

NORTHWEST EMC

Texas Instruments

TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)
TIDM-CAPTOUCHEMCREP (CSM-SELF REVB; PSM-UACTO3.3VDC REVA)

Report # TEXI0035



NVLAP Lab Code: 201049-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: October 29, 2015

Texas Instruments

Models: TIDM-CAPTOUCHEMCREF (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)
TIDM-CAPTOUCHEMCREF (CSM-SELF REVB; PSM-UACTO3.3VDC REVA)

Immunity

Standards

Specification	Method
EN 55024:2010	IEC 61000-4-2:2008
	IEC 61000-4-3:2010
	IEC 61000-4-4:2012
	IEC 61000-4-5:2014
	IEC 61000-4-6:2013
	IEC 61000-4-8:2009
	IEC 61000-4-11:2004

Results

Test Description	Performance Criteria			Comments
	Applied	Standard Specified	Observed Criteria	
Electrostatic Discharge (ESD)	Yes	B	A	
Radiated Immunity	No	A	N/A	Not Requested.
Electrical Fast Transients and Bursts (EFT)	Yes	B	A	
Surge	No	B	N/A	Not Requested.
Conducted Immunity	Yes	A	A	
Magnetic Field Immunity	No	A	N/A	Not Requested.
Voltage Interruptions	No	C	N/A	Not Requested.
Voltage Dips	No	B/C	N/A	Not Requested.

Details on the application of the performance criteria, as well as any manufacturer provided performance criteria or acceptable degradation of performance, are all contained within the report.

Deviations From Test Standards

None

Approved By:



Jeremiah Darden, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>
<http://gsi.nist.gov/global/docs/cabs/designations.html>

EXPLANATION OF NWEMC PERFORMANCE CRITERIA

How Important Is It To Understand Performance Criteria?

It is the responsibility of the test laboratory to observe the performance of the equipment under test (EUT) and to accurately report those results. The manufacturer has the obligation to express the performance criteria in terms which relate to the performance of his specific product when used as intended. As the responsible party (manufacturer, importer, etc) one must take those results, compare them against the specifications and standards, then, if appropriate make a declaration of conformity.

Examples of functions defined by the manufacturer to be evaluated during testing include, but are not limited to, the following:

- ❖ essential operational modes and states;
- ❖ tests of all peripheral access (hard disks, floppy disks, printers, keyboard, mouse, etc.);
- ❖ quality of software execution;
- ❖ quality of data display and transmission;
- ❖ quality of speech transmission.

The variety and the diversity of the apparatus within the scope of the EMC Directive make it difficult to define precise criteria for the evaluation of the immunity test results for every product. If we are not provided a test plan documenting the expected performance criteria and acceptable degradation of performance, we will use the following:

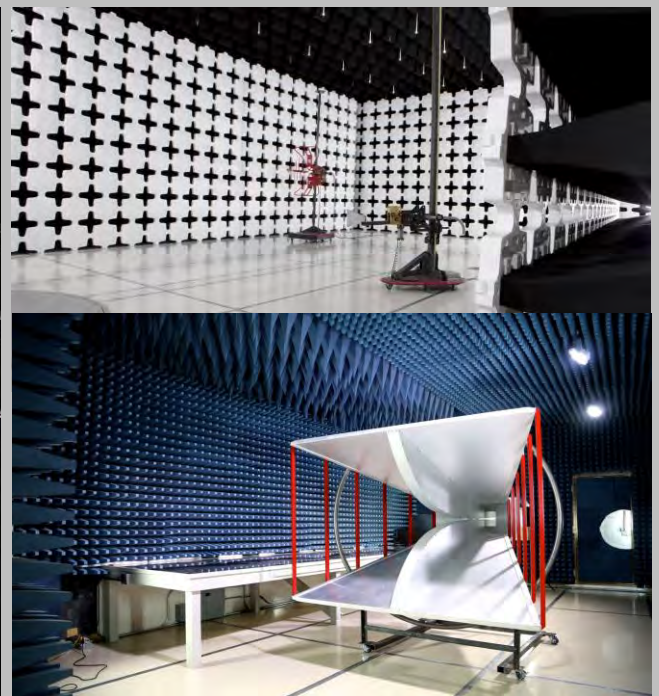
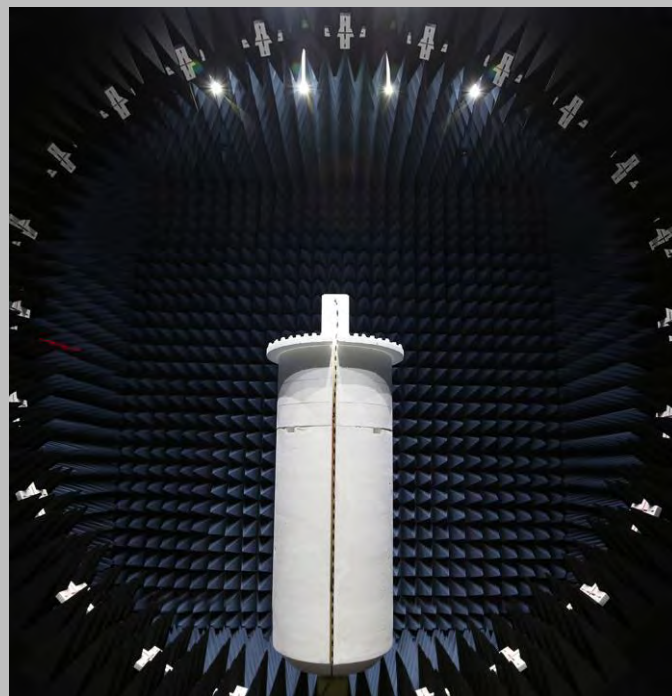
- ❖ Performance Criteria A
 - The EUT exhibited no change in performance when operating as specified by the manufacturer. In this case no changes were observed during the test.
- ❖ Performance Criteria B
 - The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment returned to previous operation without any operator intervention, once the test stimulus was removed.
- ❖ Performance Criteria C
 - The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment required some operator intervention in order to return to previous operation.
- ❖ Performance Criteria D
 - The EUT exhibited a change in performance when operating as specified by the manufacturer. In this case the equipment appears to have been damaged and would not recover.

If we are provided a test plan or information detailing the precise criteria for evaluating the test results, we will use that information and reference it as part of the test data.

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



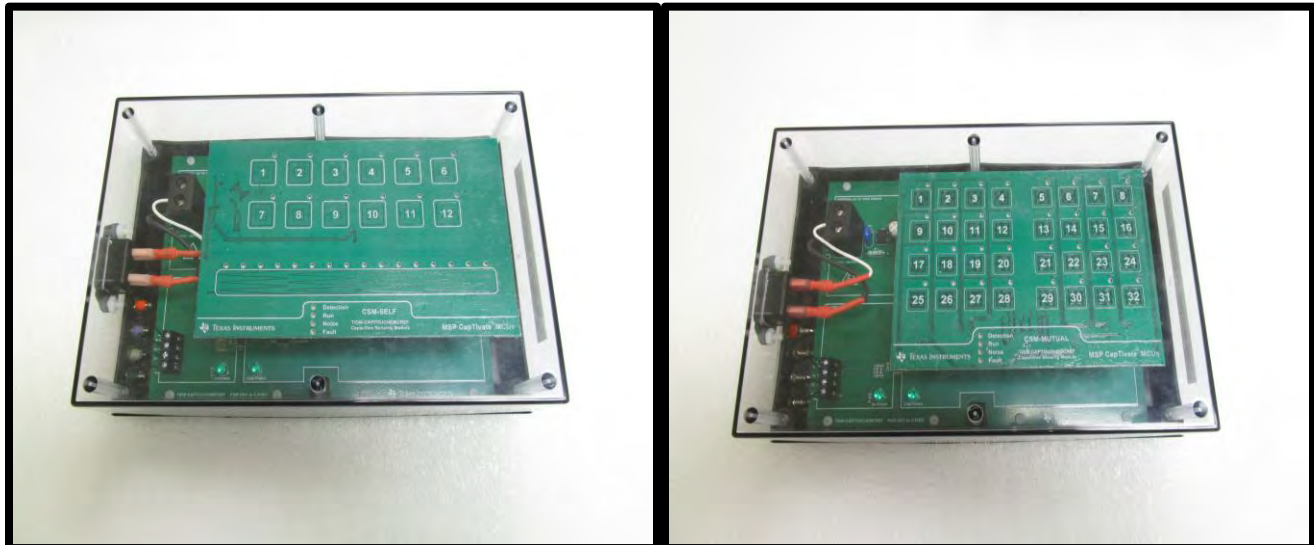
PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Texas Instruments
Address:	12500 TI Blvd.
City, State, Zip:	Dallas, TX 75002
Test Requested By:	Daniel Torres
Models:	TIDM-CAPTOUCHEMCREP(CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA) TIDM-CAPTOUCHEMCREP(CSM-SELF REVB; PSM-UACTO3.3VDC REVA)
First Date of Test:	October 29, 2015
Last Date of Test:	October 29, 2015
Receipt Date of Samples:	October 29, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Touchpad
Highest frequency generated or used in the device:
Assumes < 108 MHz
Testing Objective:
These tests were selected to satisfy the EMC requirements requested by the client.
EUT Photo



CONFIGURATIONS

Configuration TEXI0035- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Touch Sensing Panel	Texas Instruments	TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	1.8m	No	Touch Sensing Panel	AC Mains

Configuration TEXI0035- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Touch Sensing Panel	Texas Instruments	TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Artificial Finger Probe	Texas Instruments	None	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	1.8m	No	Touch Sensing Panel	AC Mains

Configuration TEXI0035- 3

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Touch Sensing Panel	Texas Instruments	TIDM-CAPTOUCHEMCREP (CSM-SELF REVB; PSM-UACTO3.3VDC REVA)	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Artificial Finger Probe	Texas Instruments	None	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	1.8m	No	Touch Sensing Panel	AC Mains

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	10/29/2015	Conducted Immunity	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	10/29/2015	Electrical Fast Transients	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	10/29/2015	ESD	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

ELECTROSTATIC DISCHARGE (ESD)

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, the ESD Immunity test was performed according to the test method and the product related standard(s) listed on the data sheets. If called out, contact discharges were applied to the conductive accessible surfaces of the EUT and the coupling plane(s). If called out, air discharges were applied to accessible insulating surfaces and conductive non-accessible portions of accessible parts of the EUT as required by the product related standard. The number of discharges specified on the data sheets applies to each test voltage, preselected point, and each polarity (ie 25 at +4 kV and 25 at -4 kV). If the EUT was tested with a vertical coupling plane, testing on all four sides (front, back, left, right) was performed unless otherwise noted. The pictures depict one of those orientations. If a response was detected after discharge, the type of response, discharge level, and location were noted.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
ESD Gun	Teseq	30N	IGS	6/16/2015	12/16/2015

CONFIGURATIONS INVESTIGATED

TEXI0035-1

MODES INVESTIGATED

Typical operation mode

ELECTROSTATIC DISCHARGE (ESD)

EUT:	TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)	Work Order:	TEXI0035
Serial Number:	None	Date:	10/29/2015
Customer:	Texas Instruments	Temperature:	23.9°C
Attendees:	Walter Schnoor	Relative Humidity:	39.9%
Customer Project:	None	Bar. Pressure:	995 mbar
Tested By:	Frank Sun	Job Site:	TX04
Power:	230VAC/50Hz		

TEST SPECIFICATIONS

Specification:	Method:
EN 55024:2010	IEC 61000-4-2:2008

TEST PARAMETERS

Energy Storage Capacitor:	150pf	Discharge Resistance:	330 ohms
Polarity of Output Voltage:	Positive and Negative	Time Between Successive Discharges:	>= 1 sec

COMMENTS

Tested to higher levels per customer request

EUT OPERATING MODES

Typical operation mode

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

EUT status LED's were monitored to verify that no false touch detections or fault conditions occurred during the test. In addition, an event data log was read out of the EUT post-test to ensure that no undesired IC reset conditions, faults, or false detections occurred.

TEST RESULT

See the following data sheets.

CONCLUSION

Meets NWEMC Performance Criteria	A
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The EUT exhibited no change in performance when operating as specified by the manufacturer.



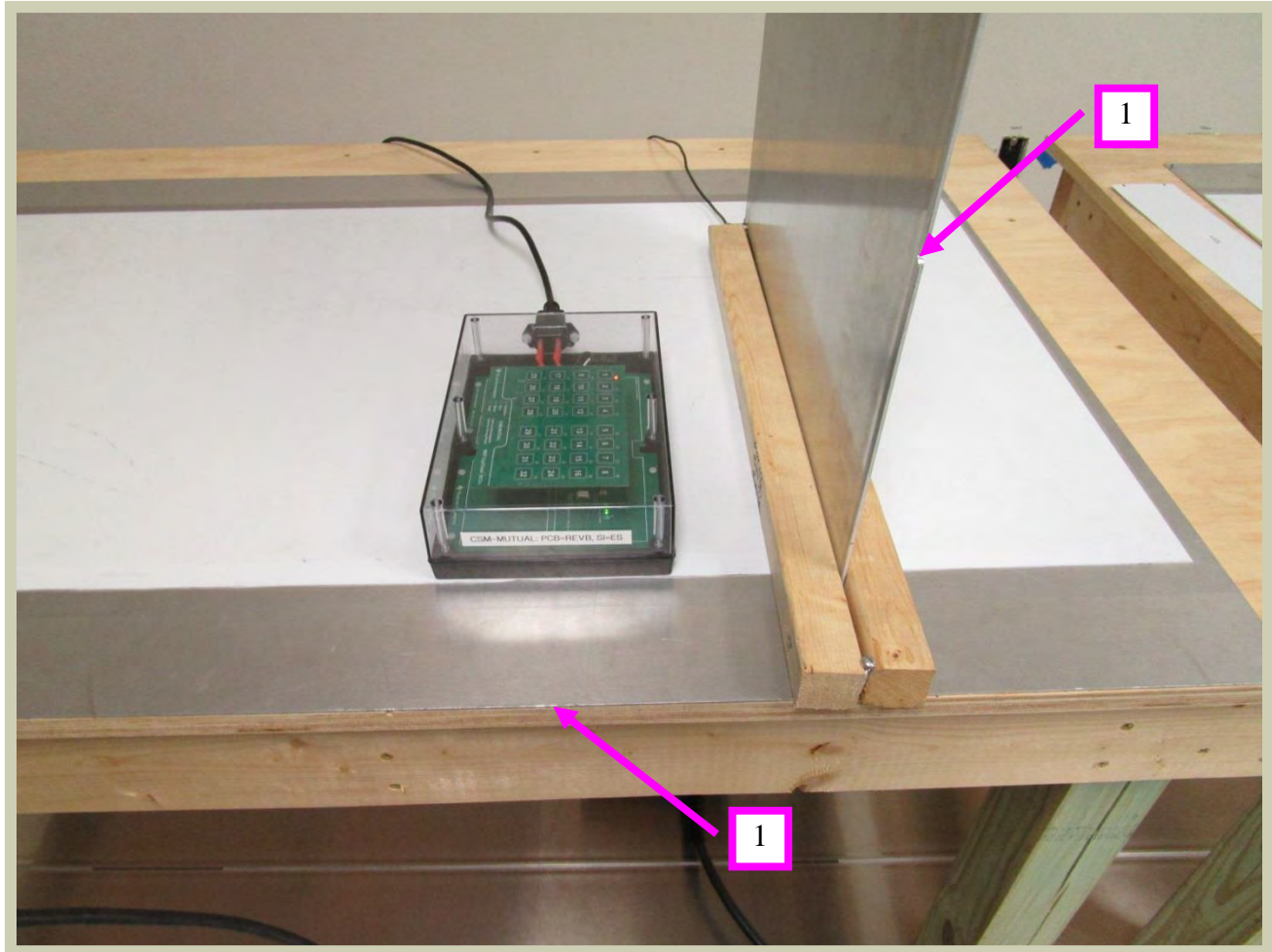
Tested By

ELECTROSTATIC DISCHARGE (ESD)

CONTACT DISCHARGE – OBSERVATIONS

ESD Test Level (kV)	+/- 2	+/- 4	+/- 6	+/- 8
Number of Discharges, Each Polarity	25	25	25	25

Configuration:	TEXI0035-1
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OBSERVATIONS (See Arrows)

Arrow No.	Voltage	Observation
1	All	No Phenomena Observed

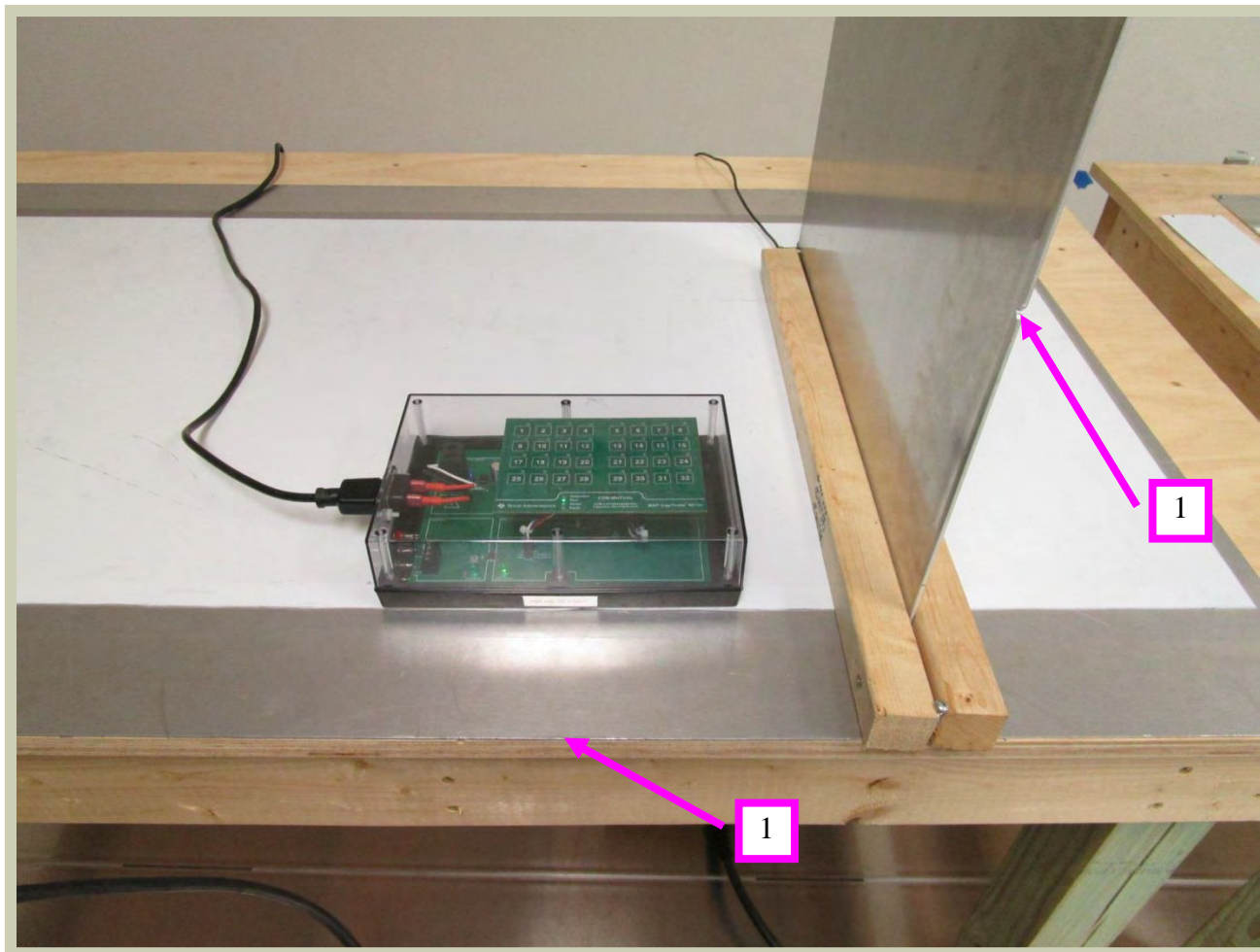
Notes: The arrow colors have no meaning. For test points with observation notes, it is implied that no phenomena were observed at all other test levels (voltages, polarities) except what is noted.

ELECTROSTATIC DISCHARGE (ESD)

CONTACT DISCHARGE – OBSERVATIONS

ESD Test Level (kV)	+/- 2	+/- 4	+/- 6	+/- 8
Number of Discharges, Each Polarity	25	25	25	25

Configuration:	TEXI0035-1
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OBSERVATIONS (See Arrows)

Arrow No.	Voltage	Observation
1	All	No Phenomena Observed

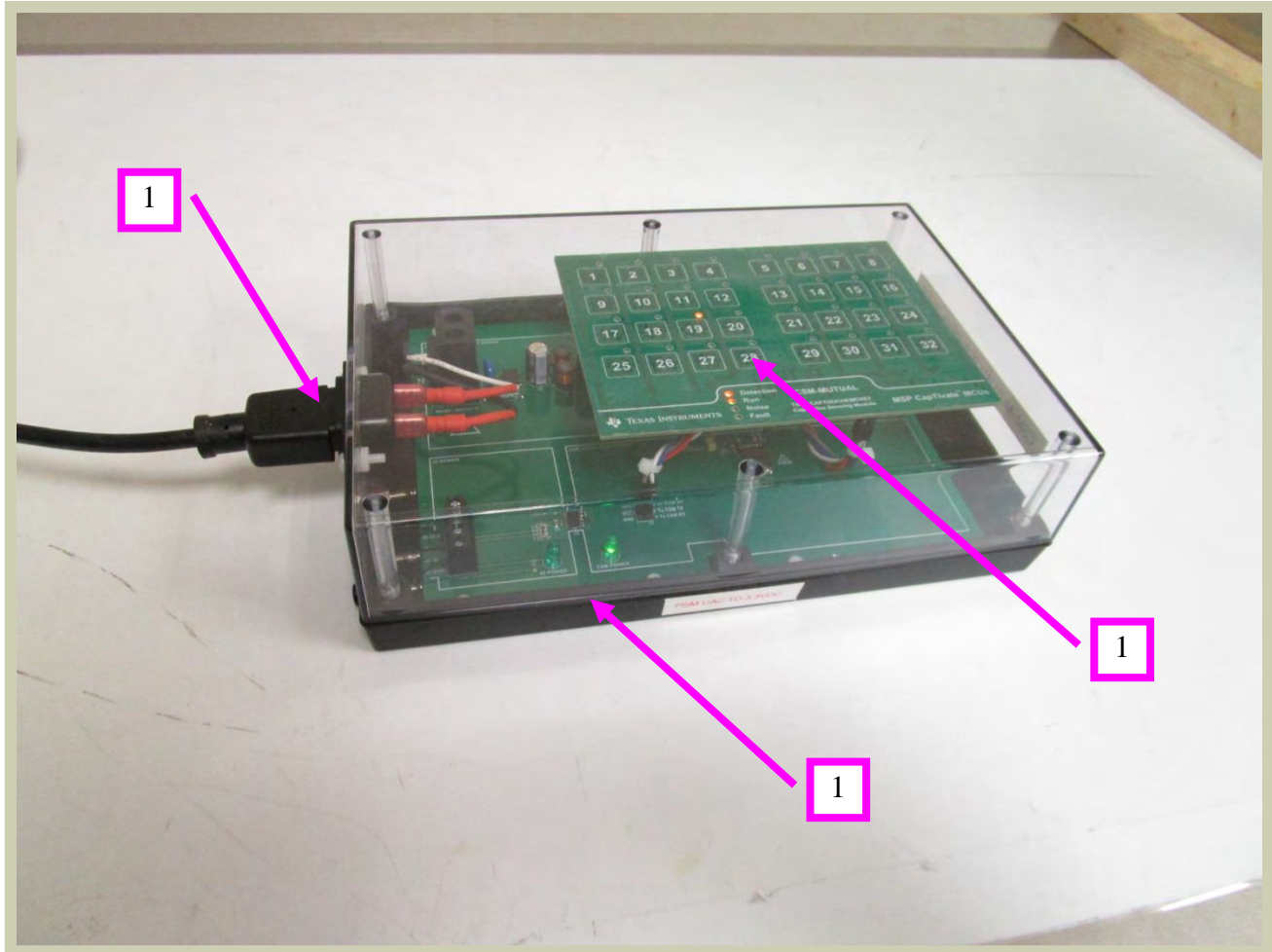
Notes: The arrow colors have no meaning. For test points with observation notes, it is implied that no phenomena were observed at all other test levels (voltages, polarities) except what is noted.

ELECTROSTATIC DISCHARGE (ESD)

AIR DISCHARGE – OBSERVATIONS

ESD Test Level (kV)	+/- 2	+/- 4	+/- 8	+/- 15
Number of Discharges, Each Polarity	10	10	10	10

Configuration:	TEXI0035-1
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OBSERVATIONS (See Arrows)

Arrow No.	Voltage	Observation
1	All	No Phenomena Observed

Notes: The arrow colors have no meaning. For test points with observation notes, it is implied that no phenomena were observed at all other test levels (voltages, polarities) except what is noted.

CONDUCTED IMMUNITY

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a Conducted RF Immunity test was performed. The source of disturbance covered by the standard is basically an electromagnetic field, coming from intended RF transmitters, that may act on the whole length of cables connected to installed equipment. The dimensions of the disturbed equipment, mostly a sub-part of a larger system, are assumed to be small compared with the wavelengths involved. The ingoing and outgoing leads: e.g. mains, communication lines, and interface cables, behave as passive receiving antenna networks because they can be several wavelengths long. The use of coupling and decoupling devices to apply the disturbing signal to one cable at a time, while keeping all other cables non-excited, can only approximate the real situation where disturbing sources act on all cables simultaneously, with a range of different amplitudes and phases. Coupling and decoupling devices are defined by their characteristics. Any coupling and decoupling device fulfilling these characteristics can be used. Unless permanently attached, the power cable between the coupling and decoupling devices and the EUT shall be as short as possible and shall not be bundled or wrapped. Their height above the ground reference plane shall be between 30 mm and 50 mm.

During testing, if anomalies are observed, the current is monitored by inserting an additional current probe in between the injection clamp and the EUT. If the current, exceeds the nominal circuit current value, then the test generator output level is reduced until the current equals the nominal circuit current level. The reduced test generator output value is recorded.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Amplifier	Amplifier Research	200A400	TTO	NCR	NCR
Generator - Signal	Agilent	N5171B	TGE	5/16/2014	5/16/2017
Meter - Power	Amplifier Research	PM2003	SOX	6/9/2015	6/9/2016
Power Sensor	Amplifier Research	PH2000A	SRH	6/9/2015	6/9/2016
Attenuator	Fairview Microwave	SA8N150-06	TQV	NCR	NCR
Directional Coupler	Amplifier Research	DC3400A	RHA	NCR	NCR
CDN	Teseq	CDN M016S	IQA	9/25/2015	9/25/2016
Adapter	Teseq	CAL U100B	IQAA	9/25/2015	9/25/2016
Adapter	Teseq	CAL U100B	IQAB	9/25/2015	9/25/2016
Power Sensor	Amplifier Research	PH2000A	SRI	6/9/2015	6/9/2016
Terminator	Fairview Microwave	ST3B-C	TNT	8/24/2015	8/24/2016
Terminator	Fairview Microwave	ST3B-C	TNQ	8/24/2015	8/24/2016

CONFIGURATIONS INVESTIGATED

TEXI0035-1
TEXI0035-2
TEXI0035-3

MODES INVESTIGATED

Typical operation mode

CONDUCTED IMMUNITY

EUT:	TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)	Work Order:	TEXI0035
Serial Number:	None	Date:	10/29/2015
Customer:	Texas Instruments	Temperature:	23.6°C
Attendees:	Walter Schnoor	Relative Humidity:	40.3%
Customer Project:	None	Bar. Pressure:	993 mbar
Tested By:	Frank Sun	Job Site:	TX06
Power:	230VAC/50Hz	Configuration:	TEXI0035-1

TEST SPECIFICATIONS

Specification:	Method:
EN 55024:2010	IEC 61000-4-6:2013

TEST PARAMETERS

Test Level:	>= 10 VRMS	Spec. Level:	3 VRMS	Mod. Type:	AM
Start Frequency:	150kHz	Stop Frequency:	80MHz	Mod. Frequency:	1kHz
Mod. Depth:	80%	Step Size:	1%	Dwell Time:	1sec.

CABLES TESTED

AC Cable

COMMENTS

10 VRMS tested

EUT OPERATING MODES

Typical operation mode

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

EUT status LED's were monitored to verify that no false touch detections or fault conditions occurred during the test. In addition, an event data long was read out of the EUT post-test to ensure that no undesired IC reset conditions, faults, or false detections occurred.

CLOCKS AND OSCILLATORS

No Clocks or Oscillators were provided by the customer.

OBSERVATIONS

Frequency (MHz)	Test Level (VRMS)	Cable Tested	Observation
0.15-80	10	AC Cable	No phenomena observed

CONCLUSION

Meets NWEMC Performance Criteria	A
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The EUT exhibited no change in performance when operating as specified by the manufacturer.



Tested By

CONDUCTED IMMUNITY

EUT:	TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)	Work Order:	TEXI0035
Serial Number:	None	Date:	10/29/2015
Customer:	Texas Instruments	Temperature:	23.6°C
Attendees:	Walter Schnoor	Relative Humidity:	40.3%
Customer Project:	None	Bar. Pressure:	993 mbar
Tested By:	Frank Sun	Job Site:	TX06
Power:	230VAC/50Hz	Configuration:	TEXI0035-2

TEST SPECIFICATIONS

Specification:	Method:
EN 55024:2010	IEC 61000-4-6:2013

TEST PARAMETERS

Test Level:	>= 3 VRMS	Spec. Level:	3 VRMS	Mod. Type:	AM
Start Frequency:	150kHz	Stop Frequency:	80MHz	Mod. Frequency:	1kHz
Mod. Depth:	80%	Step Size:	1%	Dwell Time:	40sec.

CABLES TESTED

AC Cable

COMMENTS

The EUT was stressed at eight test frequencies for 40 seconds at each frequency. During the 40 second dwell time at each specific frequency, all touch sensors were pressed with the finger probe and verified to be fully functional. The test frequencies that were selected are based on the four capacitive measurement conversion frequencies and four areas of harmonic overlap. These are points at which the EUT is the most susceptible to conducted noise.
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EUT OPERATING MODES

Typical operation mode

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

EUT status LED's were monitored to verify that no false touch detections or fault conditions occurred during the test. Valid touch detections were verified visually via the touch sensor state LED's.
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CLOCKS AND OSCILLATORS

No Clocks or Oscillators were provided by the customer.

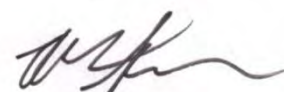
OBSERVATIONS

Frequency (MHz)	Test Level (VRMS)	Cable Tested	Observation
1.4	3	AC Cable	No phenomena observed
1.6375	3	AC Cable	No phenomena observed
1.8375	3	AC Cable	No phenomena observed
2	3	AC Cable	No phenomena observed
9.87	3	AC Cable	No phenomena observed
14.77	3	AC Cable	No phenomena observed
18.055	3	AC Cable	No phenomena observed
28.05	3	AC Cable	No phenomena observed

CONCLUSION

Meets NWEMC Performance Criteria	A
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The EUT exhibited no change in performance when operating as specified by the manufacturer.



Tested By

CONDUCTED IMMUNITY

EUT:	TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)	Work Order:	TEXI0035
Serial Number:	None	Date:	10/29/2015
Customer:	Texas Instruments	Temperature:	23.6°C
Attendees:	Walter Schnoor	Relative Humidity:	40.3%
Customer Project:	None	Bar. Pressure:	993 mbar
Tested By:	Frank Sun	Job Site:	TX06
Power:	230VAC/50Hz	Configuration:	TEXI0035-2

TEST SPECIFICATIONS

Specification:	Method:
EN 55024:2010	IEC 61000-4-6:2013

TEST PARAMETERS

Test Level:	>= 3 VRMS	Spec. Level:	3 VRMS	Mod. Type:	AM
Start Frequency:	150kHz	Stop Frequency:	80MHz	Mod. Frequency:	1kHz
Mod. Depth:	80%	Step Size:	1%	Dwell Time:	1sec.

CABLES TESTED

AC Cable

COMMENTS

Sweep with finger probe on single touch button.

EUT OPERATING MODES

Typical operation mode

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

EUT status LED's were monitored to verify that no false touch detections or fault conditions occurred during the test. The button tested with the affixed finger probe was verified to remain in touch detection throughout the duration of the test. An event data log was read out of the EUT post-test to ensure that no undesired IC reset conditions; fault conditions, false touch detections, or missed touch detections occurred during the test.

CLOCKS AND OSCILLATORS

No Clocks or Oscillators were provided by the customer.

OBSERVATIONS

Frequency (MHz)	Test Level (VRMS)	Cable Tested	Observation
0.15-80	3	AC Cable	No phenomena observed

CONCLUSION

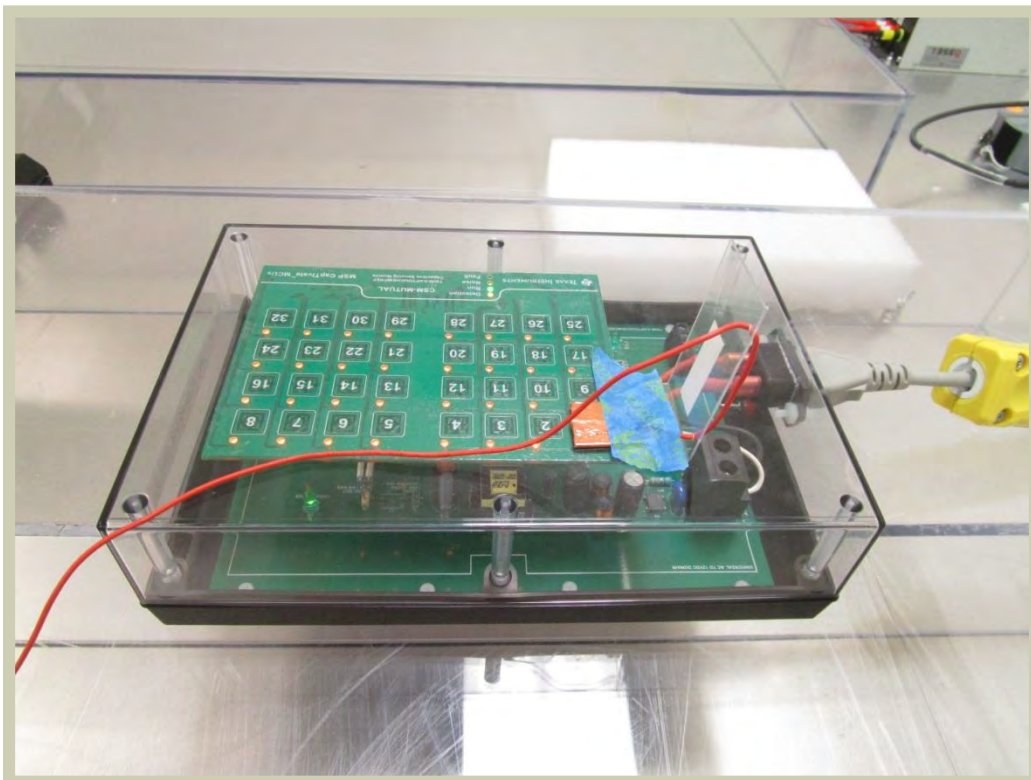
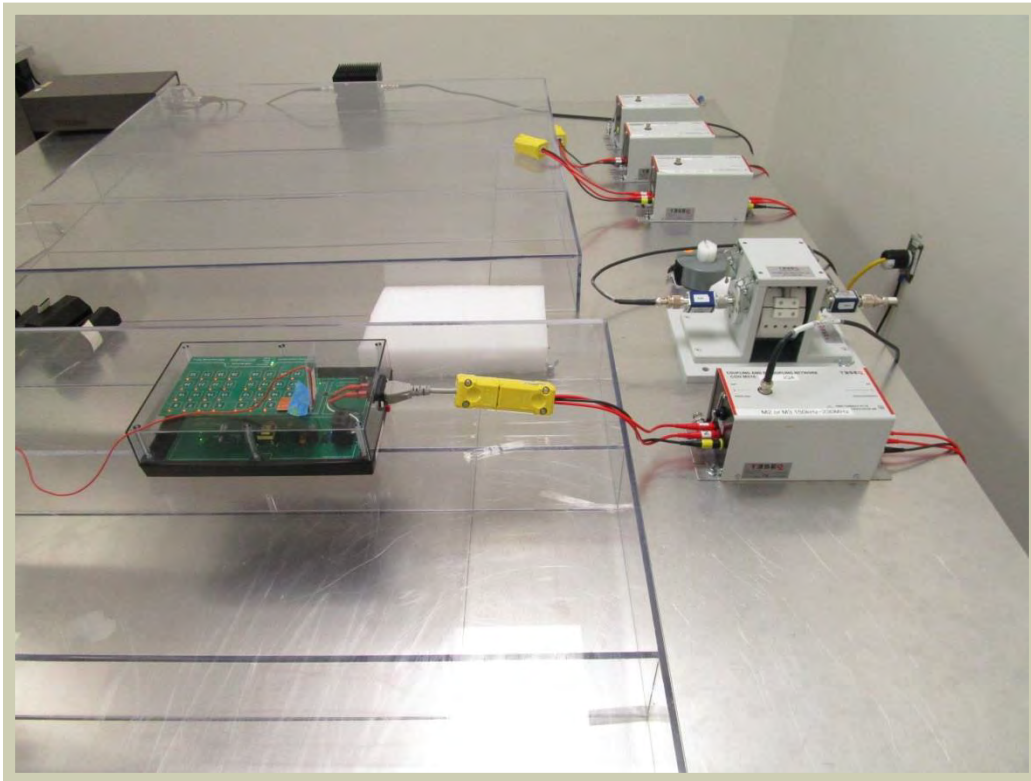
Meets NWEMC Performance Criteria	A
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The EUT exhibited no change in performance when operating as specified by the manufacturer.

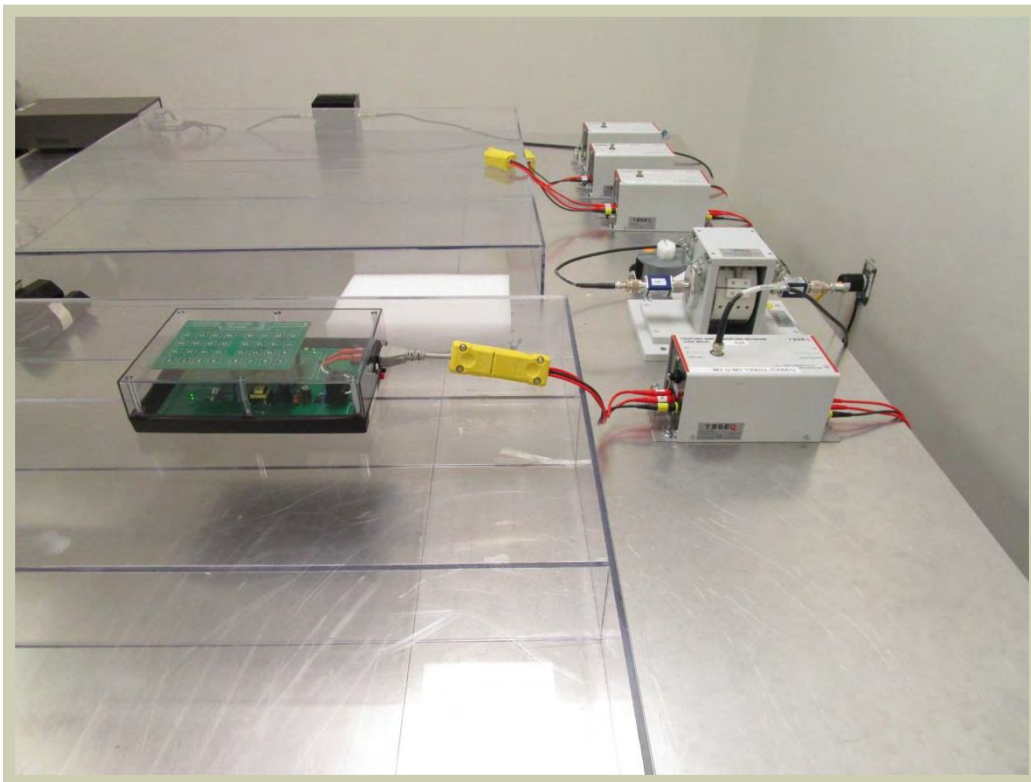
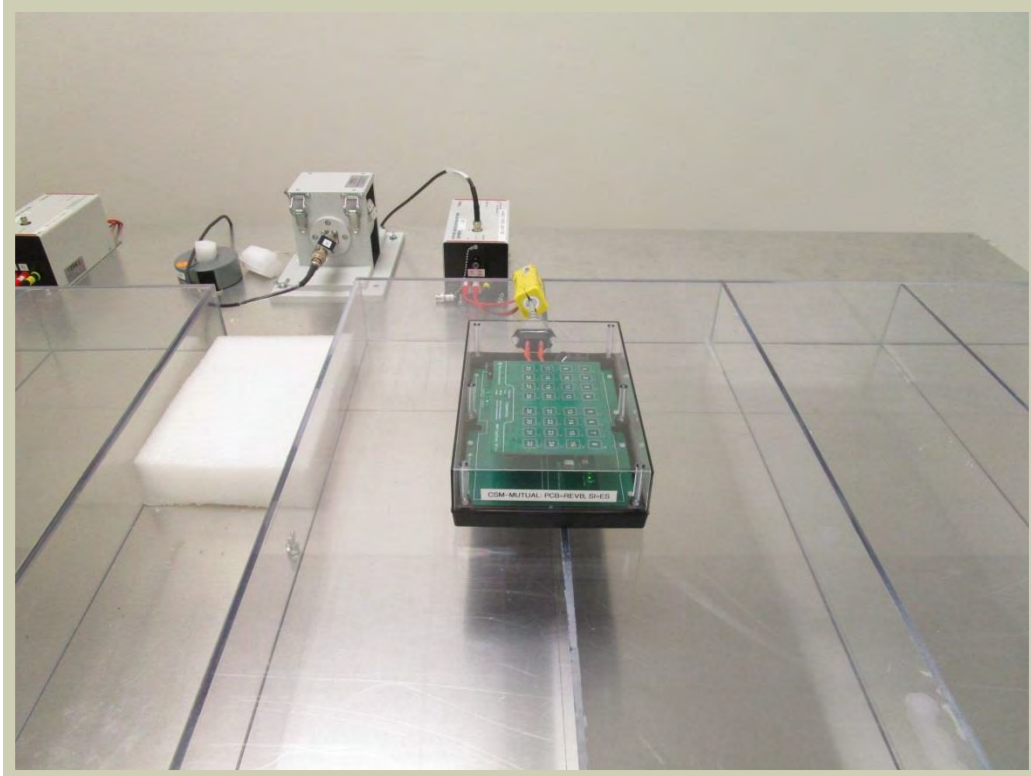


Tested By

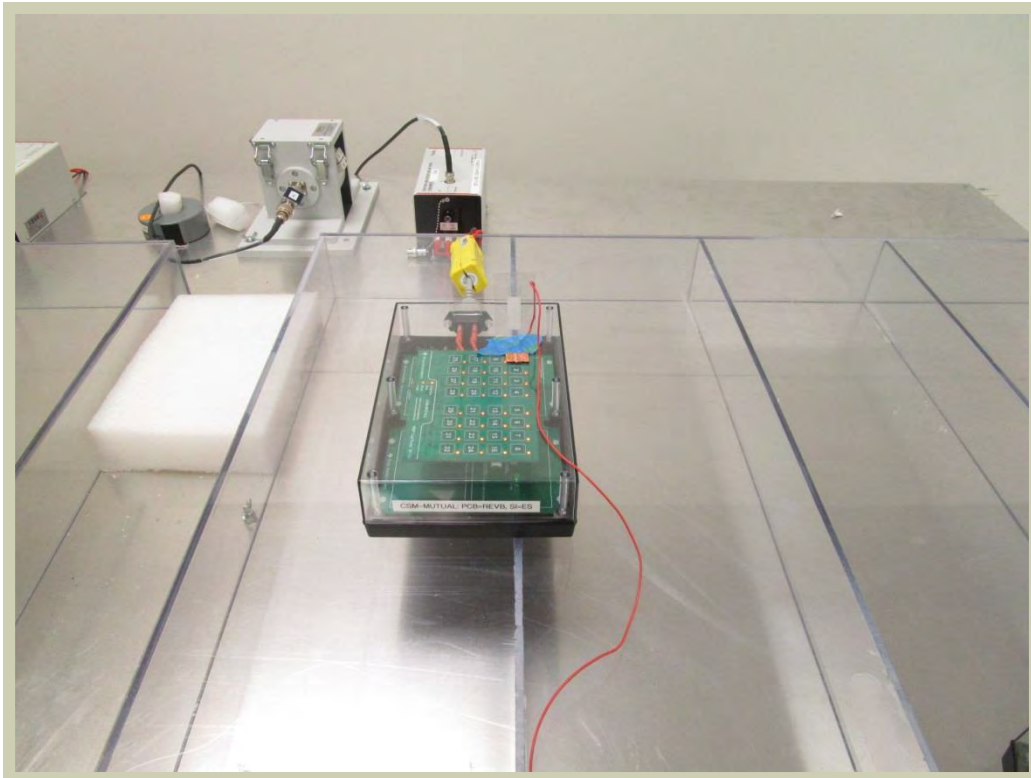
CONDUCTED IMMUNITY



CONDUCTED IMMUNITY



CONDUCTED IMMUNITY



CONDUCTED IMMUNITY

EUT:	TIDM-CAPTOUCHEMCREP (CSM-SELF REV B; PSM-UACTO3.3VDC REVA)	Work Order:	TEXI0035
Serial Number:	None	Date:	10/29/2015
Customer:	Texas Instruments	Temperature:	23.6°C
Attendees:	Walter Schnoor	Relative Humidity:	40.3%
Customer Project:	None	Bar. Pressure:	993 mbar
Tested By:	Frank Sun	Job Site:	TX06
Power:	230VAC/50Hz	Configuration:	TEXI0035-3

TEST SPECIFICATIONS

Specification:	Method:
EN 55024:2010	IEC 61000-4-6:2013

TEST PARAMETERS

Test Level:	>= 3 VRMS	Spec. Level:	3 VRMS	Mod. Type:	AM
Start Frequency:	150kHz	Stop Frequency:	80MHz	Mod. Frequency:	1kHz
Mod. Depth:	80%	Step Size:	1%	Dwell Time:	40sec.

CABLES TESTED

AC Cable

COMMENTS

The EUT was stressed at eight test frequencies for 40 seconds at each frequency. During the 40 second dwell time at each specific frequency, all touch sensors were pressed with the finger probe and verified to be fully functional. The test frequencies that were selected are based on the four capacitive measurement conversion frequencies and four areas of harmonic overlap. These are points at which the EUT is the most susceptible to conducted noise.

EUT OPERATING MODES

Typical operation mode

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

EUT status LED's were monitored to verify that no false touch detections or fault conditions occurred during the test. Valid touch detections were verified visually via the touch sensor state LED's.

CLOCKS AND OSCILLATORS

No Clocks or Oscillators were provided by the customer.

OBSERVATIONS

Frequency (MHz)	Test Level (VRMS)	Cable Tested	Observation
1.4	3	AC Cable	No phenomena observed
1.6375	3	AC Cable	No phenomena observed
1.8375	3	AC Cable	No phenomena observed
2	3	AC Cable	No phenomena observed
9.87	3	AC Cable	No phenomena observed
14.77	3	AC Cable	No phenomena observed
18.055	3	AC Cable	No phenomena observed
28.05	3	AC Cable	No phenomena observed

CONCLUSION

Meets NWEMC Performance Criteria	A
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The EUT exhibited no change in performance when operating as specified by the manufacturer.



Tested By

CONDUCTED IMMUNITY

EUT:	TIDM-CAPTOUCHEMCREP (CSM-SELF REV B; PSM-UACTO3.3VDC REVA)	Work Order:	TEXI0035
Serial Number:	None	Date:	10/29/2015
Customer:	Texas Instruments	Temperature:	23.6°C
Attendees:	Walter Schnoor	Relative Humidity:	40.3%
Customer Project:	None	Bar. Pressure:	993 mbar
Tested By:	Frank Sun	Job Site:	TX06
Power:	230VAC/50Hz	Configuration:	TEXI0035-3

TEST SPECIFICATIONS

Specification:	Method:
EN 55024:2010	IEC 61000-4-6:2013

TEST PARAMETERS

Test Level:	>= 3 VRMS	Spec. Level:	3 VRMS	Mod. Type:	AM
Start Frequency:	150kHz	Stop Frequency:	80MHz	Mod. Frequency:	1kHz
Mod. Depth:	80%	Step Size:	1%	Dwell Time:	1sec.

CABLES TESTED

AC Cable

COMMENTS

Sweep with finger probe on single touch button.

EUT OPERATING MODES

Typical operation mode

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

EUT status LED's were monitored to verify that no false touch detections or fault conditions occurred during the test. The button tested with the affixed finger probe was verified to remain in touch detection throughout the duration of the test. An event data log was read out of the EUT post-test to ensure that no undesired IC reset conditions, fault conditions, false touch detections, or missed touch detections occurred during the test.

CLOCKS AND OSCILLATORS

No Clocks or Oscillators were provided by the customer.

OBSERVATIONS

Frequency (MHz)	Test Level (VRMS)	Cable Tested	Observation
0.15-80	3	AC Cable	No phenomena observed

CONCLUSION

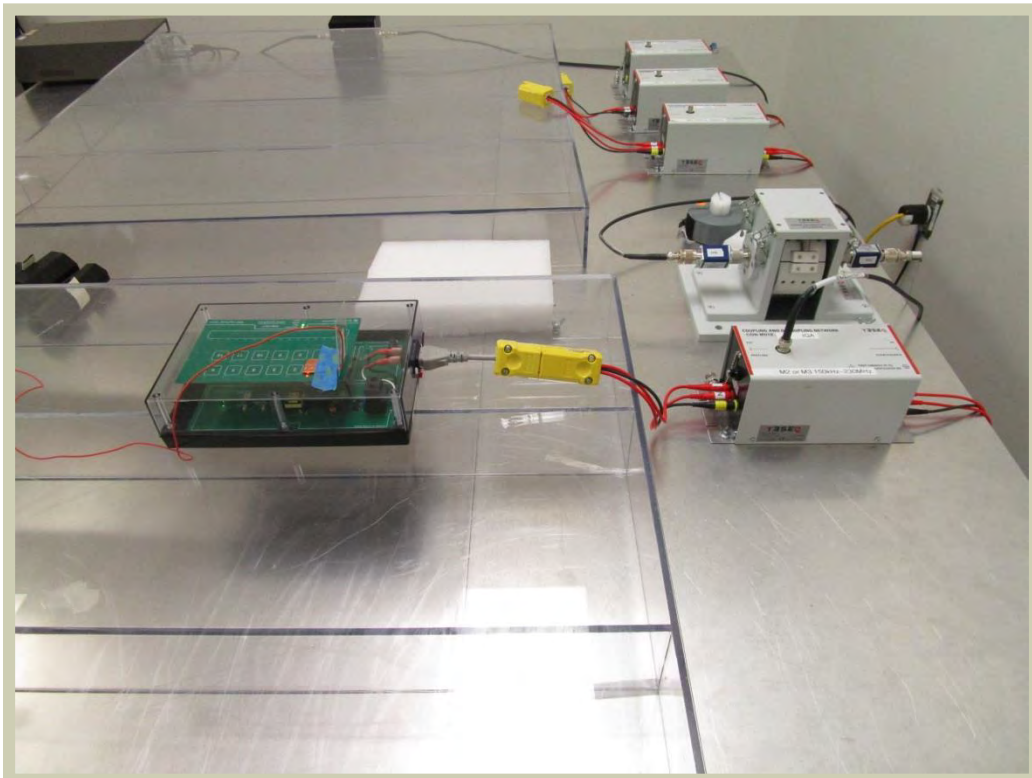
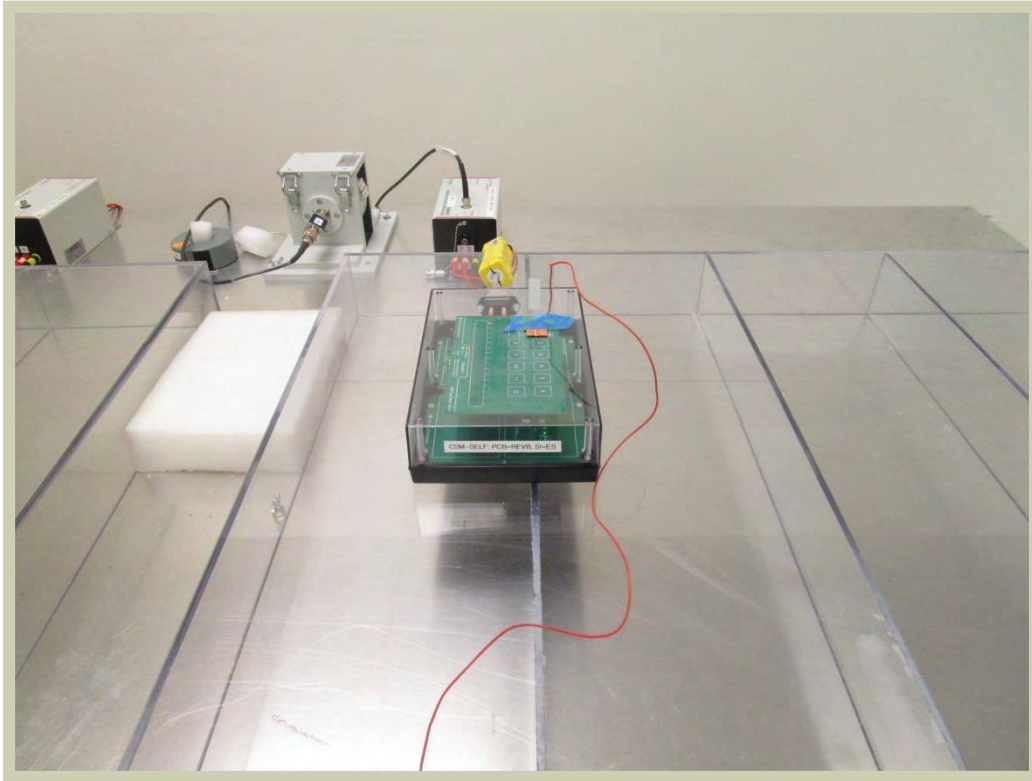
Meets NWEMC Performance Criteria	A
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The EUT exhibited no change in performance when operating as specified by the manufacturer.

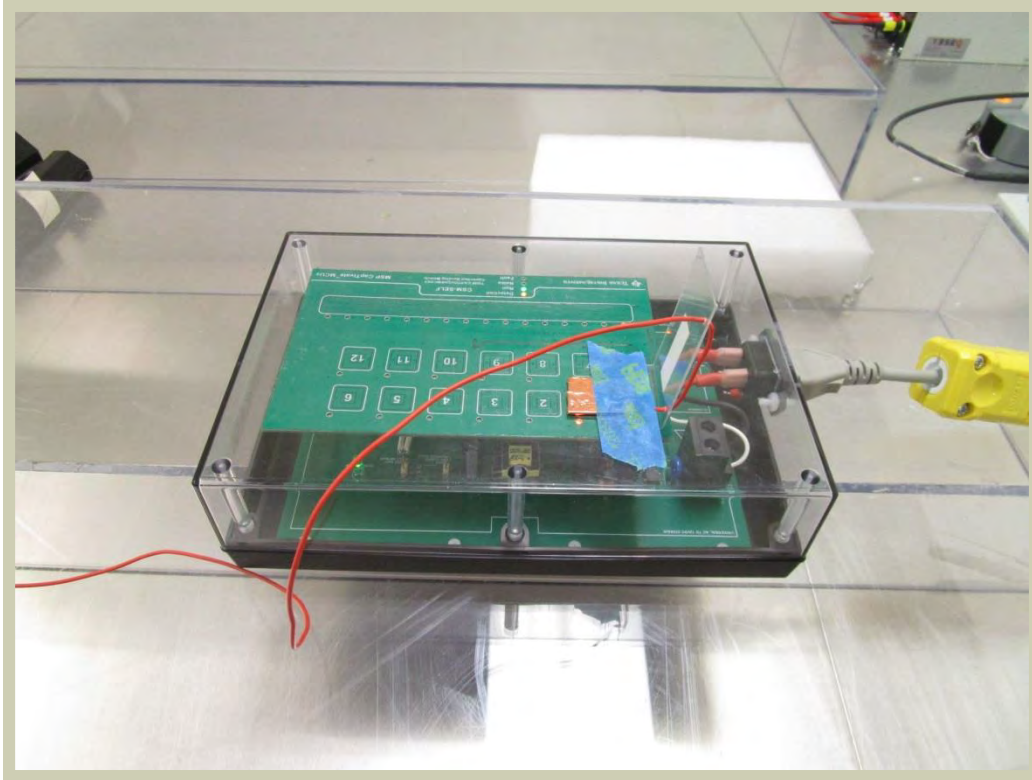


Tested By

CONDUCTED IMMUNITY



CONDUCTED IMMUNITY



ELECTRICAL FAST TRANSIENTS AND BURSTS (EFT)

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, an EFT/Burst Immunity test was performed. The test is intended to demonstrate the immunity of electrical and electronic equipment when subjected to types of transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce, etc.). The repetitive fast transient test is a test with bursts consisting of a number of fast transients, coupled into power supply, control and signal ports of electrical and electronic equipment. Significant for the test is short rise time, the repetition rate and the low energy of the transients. Unless noted, AC Terminals are tested using common mode coupling (simultaneous coupling to all lines versus the ground reference plane). The cable between the EUT and the coupling device, if detachable, shall be as short as possible to comply with the requirements. If the manufacturer provides a cable exceeding the distance between the coupling device end the point of entry of the EUT, the excess length of this cable shall be bundled and situated at a distance of 0.1m above the ground plane.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Transient Generator	Teseq	NSG 3040	TIQ	11/20/2014	11/20/2015
Transformer	Teseq	INA 6502	TIQA	11/20/2014	11/20/2015

CONFIGURATIONS INVESTIGATED

TEXI0035-1

MODES INVESTIGATED

Typical operation mode

ELECTRICAL FAST TRANSIENTS AND BURSTS (EFT)

EUT:	TIDM-CAPTOUCHEMCREP (CSM-MUTUAL REVB; PSM-UACTO3.3VDC REVA)	Work Order:	TEXI0035
Serial Number:	None	Date:	10/29/2015
Customer:	Texas Instruments	Temperature:	23.6°C
Attendees:	Walter Schnoor	Relative Humidity:	40.2%
Customer Project:	None	Bar. Pressure:	995 mbar
Tested By:	Frank Sun	Job Site:	TX07
Power:	230VAC/50Hz	Configuration:	TEXI0035-1

TEST SPECIFICATIONS

Specification:	Method:
EN 55024:2010	IEC 61000-4-4:2012

TEST PARAMETERS

Period Time:	300mS \pm 20%	Duration of Burst:	15mS \pm 20%, 0.75mS \pm 20%
Relation of Power Supply:	Asynchronous	Risetime of One Pulse:	5nS \pm 30%
Frequency of Burst:	5kHz, 100kHz	Impulse Duration:	50nS \pm 30%
Test Duration per Port:	60 sec.		

COMMENTS

4kV tested at customer's request

EUT OPERATING MODES

Typical operation mode

DEVIATIONS FROM TEST STANDARD

None

EUT FUNCTIONS MONITORED

EUT status LED's were monitored to verify that no false touch detections or fault conditions occurred during the test. In addition, an event data long was read out of the EUT post-test to ensure that no undesired IC reset conditions, faults, or false detections occurred.

OBSERVATIONS

Line	Voltage	Observation (5kHz)	Observation (100kHz)
AC Terminals (L1,N,Gnd)	+4kV	No Phenomena Observed	No Phenomena Observed
AC Terminals (L1,N,Gnd)	-4kV	No Phenomena Observed	No Phenomena Observed

CONCLUSION

Meets NWEMC Performance Criteria	A
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The EUT exhibited no change in performance when operating as specified by the manufacturer.



Tested By

ELECTRICAL FAST TRANSIENTS AND BURSTS (EFT)

