



Test Plan Header

Test Plan Number: 6136

Objective: Mini50 capacity tool

Product Description: Mini50 Gen I 4ckt RCPT capacity tool

Customer: General market

Customer Approval:

DVP&R Prepared By: Leo Li

Test Plan Level: PV - Production Validation/PTV

Product (Vehicle(s)):

Engineering Manager Approval: Wang Wolfian

DVP&R Date (Original):

Year of Introduction (Model Year(s)):

Reliability Engineering Lab Manager: Yan Will

Reporting Engineer: Leo Li

Phone #:

Test Engineer: Li Gang

UUT Table

	Unit Under Test Type	Test Sample Description	Manufacturer	Part Number	Part Rev.	Customer Part #
	Units Under Test	MINI50 Gen I 4ckt RCPT copy mold without CPA	Molex Chengdu	347910040	/	/
	Other Parts for Test	MINI50 Gen I 4ckt RCPT old mold without CPA	Molex Chengdu	347910040	/	/
	Other Parts for Test	MINI50 4CKT Right Angle Through Hole Header	Molex Chengdu	347930040	/	/
	Other Parts for Test	CTX50 Unsealed RCPT Terminal L-Grip	Molex Chengdu	5600230748	/	/



Test Plan and Report

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Test Description	Test Item	Factor-Level	Item Description	Test Type	Test Sequence	Test Requirement	¶	Test Remarks	Test Sample Description	Quantity of Samples	Quantity of Results	Date	Test Results				Met/Not met	Other Measurements	Results Notes
													Min	Max	Avg	Acceptance Criteria			
Connector Mechanical USCAR-2 REV6, February 2013 + Change Letters 5.9.5G / Connector to Connector Mating/ Unmating - Non-Assist	CM1a CM1b				Test Item BoM				MINI50 Gen I 4ckt RCPT copy mold W/O CPA										
									MINI50 Gen I 4ckt RCPT old mold W/O CPA										
									MINI50 4CKT Right Angle Through Hole Header										
									CTX50 Unsealed RCPT Terminal L-Grip										
					General Notes	Refer to the General Notes for Pre-Test Information.	5.1R									Refer to the General Notes for Pre-Test Information.			
					Visual Inspection - Pre-Test	Refer to the General Notes for Pre-Test Visual Inspections.	5.1.8R									Refer to the General Notes for Pre-Test Visual Inspections.			
Conn to Conn (non-assist) - Mating Force					- Completely assemble (but do not mate) all connector halves (both male and female) using all applicable components such as terminals, wedges, and seals. - Adjust the force tester to insert the Male Connector straight into the Female Connector. Straight-in engagement is critical to avoid side loads and binding which can affect force measurements. - Increase the Mating Force at a uniform rate of 50+/- 10mm/min. until complete mating occurs. Record the force required to completely mate each set of connector halves into their locked position. The mating (engage) force of all tested samples shall meet the requirements of SAE/USCAR-25 for the connector in its intended application. (The USCAR-25 value depends on connector push surface area, grasp area, and the ergonomic conditions of the assembly operation involved). If tested values are reported in summary format, the highest reading shall be reported. NOTE: Updated with USCAR Change Letter # 2.	5.4.2-A						13.65	18.91	16.33	mating (engage) force < 75N.	Met		Capacity tool	
												12.25	16.70	14.11		Met		Current tool	



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													Min	Max	Avg	Acceptance Criteria			
					Conn to Conn (non-assist) - Retention Force, w/o Terminals	Retention Force must be ≥ 110 N with the primary connector lock fully engaged. A CPA device, if applicable, must NOT be engaged during this test. - With the connector primary locking mechanism(s) fully engaged , but with the <u>CPA fully disengaged</u> . Completely un-mate the connector halves by applying a uniform force parallel to the centerlines of the fully mated connector halves. - Increase the Retention Force at a uniform rate not to exceed 50 mm/min. until complete separation occurs. Record the force required to completely separate the connector halves. NOTE: This test will be conducted without terminals or wires.	5.4.2-B3						121.1	125.7	123.2	Retention Force must be ≥ 90 N with the primary connector lock fully engaged. A CPA device, if applicable, must NOT be engaged during this test.	Met		Capacity tool
													122.0	125.7	123.4		Met		Current tool
					Conn to Conn (non-assist) - Unmating Force	Unmating Force must be ≤ 75 N with the primary connector lock (and CPA) completely disengaged/ disabled. - With the connector primary locking mechanism(s) fully disengaged , and with the CPA disengaged. Completely un-mate the connector halves by applying a uniform force parallel to the centerlines of the fully mated connector halves. - Increase the Retention Force at a uniform rate not to exceed 50 mm/min. until complete separation occurs. NOTE: The samples will be loaded with the appropriate wires and terminals for this test.	5.4.2-B5						5.90	6.97	6.31	Unmating Force must be ≤ 75 N with the primary connector lock (and CPA) completely disengaged/ disabled.	Met		Capacity tool
													5.77	7.68	6.80		Met		Current tool
					Conn to Conn (non-assist) - Lock Deflection Force	Gradually apply a force of up to 51N to the lock mechanism until the lock mechanism clears the lock feature on the mating part and attempt to unmate the connection. This force is applied at the appropriate point such that the mated connector halves (or a connector mated to a device) could be unmated in the intended manner with no damage to any component and shall be the furthest from the fulcrum on the latch mechanism where persons could reasonably be expected to depress the latch mechanism. It shall also include any auxiliary pieces attached to the lever such as CPAs, and shall take into account the	5.4.2-C						2.95	3.21	3.08	The force (F) to release the connector lock must be less than 30N	Met		Capacity tool



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													Min	Max	Avg	Acceptance Criteria											
						possibility of any accidental or inadvertent actuation. Note whether the connection can be successfully unmated. NOTE: This test will be conducted without terminals or wires. The force (F) to release the connector lock must be between 6 N and 51 N. Note that the customer's ergonomics experts may have additional requirements based on release button size and other ergonomic factors. NOTE: Updated with USCAR Change Letter # 7.								2.97	3.17	3.08		Met		Current tool							
					Visual Inspection - Post Test	Refer to the General Notes for Post-Test Visual Inspections.	5.1.8R											Refer to the General Notes for Post-Test Visual Inspections.									
Connector Mechanical USCAR-2 REV6, February 2013 + Change Letters 5.9.5D / Terminal - Connector Insertion - Unsealed and Cable Seal, Large Wire	CM3a CM3b				Test Item BoM				MINI50 Gen I 4ckt RCPT copy mold W/O CPA																		
									MINI50 Gen I 4ckt RCPT old mold W/O CPA																		
									CTX50 Unsealed RCPT Terminal L-Grip																		
										General Notes	Refer to the General Notes for Pre-Test Information.		5.1R										Refer to the General Notes for Pre-Test Information.				
										Visual Inspection - Pre-Test	Refer to the General Notes for Pre-Test Visual Inspections.		5.1.8R											Refer to the General Notes for Pre-Test Visual Inspections.			
										Term to Conn Insertion Force - Unsealed/ Cable Seal	Adjust the force tester to insert the terminal straight into the connector at a uniform rate not to exceed 50 mm per minute until fully seated at the forward stop position and immediately continue to the next step in the test sequence. Record the force required to insert the terminal into the connector. NOTE: Where wire is buckling and operator sensitivity cause problems in obtaining test repeatability, one of two alternatives are acceptable. A) Terminals may be crimped to a gage pin, solid core wire or other metal dowel material and used to measure terminal insertion or forward stop push through or;		5.4.1AU/ C-I									1.23	1.43	1.34	The maximum Insertion Force for a terminal is 5 N.	Met	



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													Min	Max	Avg	Acceptance Criteria			
													1.20	1.39	1.31		Met		Current tool
					Term to Conn - Forward Stop Force - Unsealed/ Cable Seal	B) Terminals may be pushed by cutting the wire off the CUT near the insulation grip and use a rod with a diameter similar to the cut off wire. Push directly on the wire stub. Samples prepared in this manner require additional connector samples and cannot be used for terminal to connector retention tests. NOTE: For the correct sample size based on the style of connector, refer to Table 5.4.1.3.1: SAMPLE SIZES AND CAVITY REQUIREMENTS. The maximum Insertion Force for a terminal is 30 N.							53.58	60.91	57.20	The forward stop push-through force must be ≥ 35 N for 0.50 mm terminals	Met		Capacity tool
													47.14	58.30	52.81		Met		Current tool
																Refer to the General Notes for Post-Test Visual Inspections.			
					Visual Inspection - Post Test	Refer to the General Notes for Post-Test Visual Inspections.	5.1.8R												



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													Min	Max	Avg	Acceptance Criteria			
Connector Mechanical USCAR-2 REV6, February 2013 + Change Letters 5.9.5D / Terminal - Connector Retention	CM4a CM4b				Test Item BoM				MINI50 Gen I 4ckt RCPT copy mold W/O CPA										
					General Notes	Refer to the General Notes for Pre-Test Information.	5.1R									Refer to the General Notes for Pre-Test Information.			
					Visual Inspection - Pre-Test	Refer to the General Notes for Pre-Test Visual Inspections.	5.1.8R									Refer to the General Notes for Pre-Test Visual Inspections.			
					Term to Conn - Retention Force	Adjust the force tester to pull the terminal straight back from the connector. Straight back force is critical to avoid side loads and binding which can affect force measurements. Increase the pullout force at a uniform rate not to exceed 50mm/min, until pullout occurs. Record the force required to pull the terminal out of each terminal cavity along with the cavity number and the connector number. If the conductor breaks or pulls out of the terminal grip before the terminal is pulled from the connector, record this force together with a note as to what happened. NOTE: Do not install the terminal lock (PLR, TPA, Wedge, etc.). NOTE: For the correct sample size based on the style of connector, refer to Table 5.4.1.3.1: SAMPLE SIZES AND CAVITY REQUIREMENTS. The minimum Retention Force of a terminal from its cavity must meet the values shown in Table 5.4.1.4.	5.4.1B						15.41	18.86	17.83	The minimum Retention Force of a terminal from its cavity must be higher than 10N	Met		Capacity tool
													16.59	18.37	17.14		Met		Current tool
Term to Conn - Retention, Moisture Conditioning, Seven Hours	None - Using an additional set of new connectors, moisture condition by bringing them to the practical limit of moisture content by exposing “dry as molded parts” to 95-98% Relative Humidity at 40°C for 6 hours, followed by one hour at room ambient temperature and humidity. - Install the terminal lock (PLR, TPA, Wedge, etc.). - Begin the retention test after conditioning the samples at one hour at ambient temperature and humidity. Complete the retention testing within eight hours of beginning the test.	5.4.1BRH																	



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													Min	Max	Avg	Acceptance Criteria			
						[Samples may be sealed in non-moisture transferable plastic (Zip-lock type food storage) bags after moisture conditioning if the testing cannot be completed within 8 hours. In any case testing must be completed within 24 hours of moisture conditioning.] NOTE: Samples may be sealed in non-moisture transferable plastic zip-lock type bags after moisture conditioning if the testing cannot be completed within 8 hours. In any case testing must be completed within 24 hours after moisture conditioning.													
					Term to Conn - Retention Force - Post Conditioning	Adjust the force tester to pull the terminal straight back from the connector. Straight back force is critical to avoid side loads and binding which can affect force measurements. Increase the pullout force at a uniform rate not to exceed 50mm/min, until pullout occurs. Record the force required to pull the terminal out of each terminal cavity along with the cavity number and the connector number. If the conductor breaks or pulls out of the terminal grip before the terminal is pulled from the connector, record this force together with a note as to what happened. NOTE: For the correct sample size based on the style of connector, refer to Table 5.4.1.3.1: SAMPLE SIZES AND CAVITY REQUIREMENTS. The minimum Retention Force of a terminal from its cavity must meet the values shown in Table 5.4.1.4.	5.4.1B						58.94	65.24	61.86	The minimum Retention Force of a terminal from its cavity must be higher than 40N	Met		Capacity tool
													48.27	60.63	54.44		Met		Current tool
					Visual Inspection - Post Test	Refer to the General Notes for Post-Test Visual Inspections.	5.1.8R									Refer to the General Notes for Post-Test Visual Inspections.			
Connector Mechanical USCAR-2 REV6, February 2013 + Change Letters 5.9.5E / Misc. Comp. Engage / Disengage - Pre-Stage Terminal Position Assurance (TPA)/ Positive Lock Reinforcement (PLR)/	CM2a CM2b				Test Item BoM				MINI50 Gen I 4ckt RCPT copy mold W/O CPA										
									MINI50 Gen I 4ckt RCPT old mold W/O CPA										
									CTX50 Unsealed RCPT Terminal L-Grip										
					General Notes	Refer to the General Notes for Pre-Test Information.	5.1R									Refer to the General Notes for Pre-Test Information.			
					Visual Inspection - Pre-Test	Refer to the General Notes for Pre-Test Visual Inspections.	5.1.8R									Refer to the General Notes for Pre-Test Visual Inspections.			



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Independent Secondary Lock (ISL)					Miscellaneous Component - Pre-Stage TPA/PLR/ISL, Engage Pre-Stage to Lock w/ Terminals in all Cavities	Engage each component to be tested, with its retaining mechanism(s) in place, at a rate not to exceed 50mm/min. Straight-in engagement and extraction is critical to avoid side loads and binding which can affect force measurements. With terminals in all cavities. Engage TPA/PLR/ISL forces with terminals in all cavities, from Pre-Stage to Locked, must meet 60 N maximum, see Table 5.4.5.2.4. NOTE: Updated with USCAR-2 Change Letter #11.	5.4.5.2.3 TE						17.46	20.05	18.98	Engage TPA/PLR/ISL forces with terminals < 60N	Met		Capacity tool
													19.22	25.95	23.00		Met		Current tool
					Miscellaneous Component - Pre-Stage TPA/PLR/ISL, Engage Pre-Stage to Lock w/o Terminals	Engage each component to be tested, with its retaining mechanism(s) in place, at a rate not to exceed 50mm/min. Straight-in engagement and extraction is critical to avoid side loads and binding which can affect force measurements. Without terminals. Engaging TPA/PLR/ISL Forces without terminals, from Pre-Stage to Locked, must meet 15 N minimum, see Table 5.4.5.2.4. NOTE: Updated with USCAR-2 Change Letter #11.	5.4.5.2.3 TE						18.05	20.10	19.38	Engaging TPA/PLR/ISL Forces without terminals> 5N	Met		Capacity tool
													19.67	24.27	22.86		Met		Current tool
					Miscellaneous Component - Pre-Stage TPA/PLR/ISL, Disengage Lock to Pre-Stage w/ Terminals in all Cavities	Disengaging TPA/PLR/ISL Forces must meet 60 N maximum, with terminals in all cavities, see Table 5.4.5.2.4. NOTE: Updated with USCAR-2 Change Letter #11. With the component TPA/PLR/ISL fully locked, disengage in reverse axis from Locked to Pre-Stage, With terminals in all cavities.	5.4.5.2.3 TD						67.58	69.84	68.66	Disengaging TPA/PLR/ISL Forces, with terminals in all cavities, no accept criteria, only need to record the test value.	Met		Capacity tool
													67.30	71.25	69.35		Met		Current tool
					Visual Inspection - Post Test	Refer to the General Notes for Post-Test Visual Inspections.	5.1.8R									Refer to the General Notes for Post-Test Visual Inspections.			

Test Plan Revision Log

Test Plan Number: 6136

Revision Number	Change	By	Date
1	Initial released	Leo Li	2025-03-12