TEST PRODUCT QUALIFICATION REPORT

TITLE:

LTM4620A Test Site Transfer from Analog Devices Singapore to Analog Devices Penang

PCN Number:

REVISION:

A

DATE:

JANUARY 17, 2020

CONTENTS:

PROJECT BACKGROUND:

The LTM4620A is currently undergoing production testing at the Analog Devices Singapore (ADSG). It was a strategic decision from business standpoint to qualify Analog Devices Penang (ADPG) to become as new test site to ensure a continuity in the supply chain due to ADSG plant shutdown. ADPG is situated in Bayan Lepas, Penang, Malaysia.

After qualification and replication of necessary test capability, ADPG will serve as the primary test site facility to serve for micromodule future demands.

SUMMARY:

The LTM4620A is a complete dual 13A output switching mode DC/DC power supply. Included in the package are the switching controller, power FETs, inductors, and all supporting components. Operating from an input voltage range of 4.5V to 16V, the LTM4620A supports two outputs each with an output voltage range of 0.6V to 2.5V, set by a single external resistor. Its high efficiency design delivers up to 13A continuous current for each output. Only a few input and output capacitors are needed.

TEST AND PRODUCT INFORMATION:

Device:	LTM4620A
Package:	BGA
Leads:	144L
FG Part Name:	LTM4620AIY#PBF
Tester Platform:	ETS-364B
Handler:	Multitest MT9510

The LTM4620A is planned to be tested in Analog Devices Penang (ADPG) using the following as shown in the Table 1 below:

***Table 1**: LTM4620A Test Details*

Parameters	ADSG	ADPG	Remarks
Tester Platform	ETS364B	ETS364B	No change
Handler	MT9510	MT9510	No Change
Test Flow	Tested in FT room and QA room, hot, cold temp per setup specification.	Tested in FT room and QA room, hot, cold temp per setup specification.	No Change
Contactor	144 Lds Gemini Kelvin	144 Lds Gemini Kelvin	No Change
Performance Board	LTM4620 Dualsite	LTM4620 Dualsite	No change (Apply ADI Hardware naming standard)
Test Program	LTM4620A_06	LTM4620A_06	No change (Apply ADI Program Filename Standard)

There is no change to the form, fit and function of the product.

This report documents the successful completion of the product test transfer requirements of LTM4620A at ADPG.

DESCRIPTION AND TEST RESULTS:

Below tables provide description of the qualification tests conducted and corresponding test results for LTM4620A. All the units have undergone electrical tests on both the sending and receiving sites on the same test platform. Any device that will not meet the electrical qualification requirements will mean failure of the qualification and require solid corrective actions and a repeat of the qualification process. Qualification activities performed, and acceptance criteria is shown on Table 2 below:

Table 2: *Qualification Activities and Acceptance Criteria*

Qualification Activity	Sample Quantity	Accept Criteria
Correlation device run	5 correlation device units	*100% Passing correlation devices
Correlation Lot Run	Minimum of 300 known Bin1 units tested in full product test flow (ALL temperature passes). Test lot in Sending site (ADSG) and Receiving site (ADGT).	*CpK≥1.67 * For tightened limits, Mean Shift Criteria and sigma-spread criteria to apply * Mean Shift Criteria (ABS (SS_mean - RS_Mean) / Limit Range) x 100 ≤ 5% * Sigma-spread criteria * (RS_Sigma / SS_Sigma) ≤ 1.3
GR&R	10 Bin 1 units tested on 1 board and 2 testers	R&R % =<10%

- *SS = Sending Site*
- *RS = Receiving Site*

To validate full set-up functionality such as hardware, software, test paraphernalia and tester platform, 5 correlation devices of LTM4620A were tested both in ADSG and ADPG. Data between sites were analyzed and summarized in Table 3.

Table 3: *Correlation Device Run result*

Generic	Package	No. of correlation device	ALL correlation devices passed?
LTM4620	BGA 144 Leads	5 units	YES

The LTM4620A was qualified by testing a correlation lot with minimum 300 units both in ADSG and ADPG. This is to capture variation in hardware, tester and set-up condition thru mean shift and sigma spread. This is to ensure the parameter measurement are still within the accepted range of variations. Data between sites were analyzed and summarized in Table 4.

Table 4: *Product Site Transfer Correlation*

Temperature	Generic	Package	Lot Number	Lot Size	Sending Site	Receiving Site	Total No. of Correlation Parameters	Result
Ambient	LTM4620	BGA 144 Leads	1040166.4	357	ADSG	ADPG	328	ALL PASSED
Hot	LTM4620	BGA 144 Leads	1040166.4	349	ADSG	ADPG	329	ALL PASSED
Cold	LTM4620	BGA 144 Leads	1040166.4	352	ADSG	ADPG	311	ALL PASSED

To gather test performance data to allow estimation of the overall test repeatability and reproducibility from the production test solution, GR&R was performed on 10 serialized units tested on 1 test board and 2 test systems. GR&R result was analyzed and summarized in Table 7.

Table 5: *GR&R Result*

Generic	Package	Lot Number	No. of Units	No. of Test Boards	No. of Testers	All parameters passed R&R % =<10%?
LTM4620	BGA 144 Leads	1040166.4	10	1	2	Yes – ALL PASSED (Justification provided for the test exceeding 10%)

APPROVALS:

Technical Review Board No. 62174- ADSG to ADPG Test Transfer

ADDITIONAL INFORMATION:

Homepage: https://www.analog.com/en/index.html

Customer Service: https://www.analog.com/en/support/technical-support.html

TEST PRODUCT QUALIFICATION REPORT

TITLE:

LTM4622 Test Site Transfer from Analog Devices Singapore to Analog Devices Penang

PCN Number:

REVISION:

A

DATE:

JANUARY 17, 2020

CONTENTS:

PROJECT BACKGROUND:

The LTM4622 is currently undergoing production testing at the Analog Devices Singapore (ADSG). It was a strategic decision from business standpoint to qualify Analog Devices Penang (ADPG) to become as new test site to ensure a continuity in the supply chain due to ADSG plant shutdown. ADPG is situated in Bayan Lepas, Penang, Malaysia.

After qualification and replication of necessary test capability, ADPG will serve as the primary test site facility to serve for micromodule future demands.

SUMMARY:

The LTM4622 is a complete dual 2.5A step-down switching mode µModule® (power module) regulator in a tiny ultrathin 6.25mm × 6.25mm × 1.82mm LGA and 6.25mm × 6.25mm × 2.42mm BGA packages. Included in the package are the switching controller, power FETs, inductor and support components. Operating over an input voltage range of 3.6V to 20V, the LTM4622 supports an output voltage range of 0.6V to 5.5V, set by a single external resistor. Its high efficiency design delivers dual 2.5A continuous, 3A peak, output current. Only a few ceramic input and output capacitors are needed.

TEST AND PRODUCT INFORMATION:

Device:	LTM4622
Package:	BGA
Leads:	25L
FG Partname:	LTM4622IY#PBF
Tester Platform:	ETS-364B
Handler:	Multitest MT9510

The LTM4622 is planned to be tested in Analog Devices Penang (ADPG) using the following as shown in the Table 1 below:

***Table 1**: LTM4622 Test Details*

Parameters	ADSG	ADPG	Remarks
Tester Platform	ETS364B	ETS364B	No change
Handler	MT9510	MT9510	No Change
Test Flow	Tested in FT room and QA room, hot, cold temp per setup specification.	Tested in FT room and QA room, hot, cold temp per setup specification.	No Change
Contactor	25 Lds Gemini Kelvin	25 Lds Gemini Kelvin	No Change
Performance Board	LTM4622	LTM4622	No change (Apply ADI Hardware naming standard)
Test Program	LTM4622_01	LTM4622_01	No change (Apply ADI Program Filename Standard)

There is no change to the form, fit and function of the product.

This report documents the successful completion of the product test transfer requirements of LTM4622 at ADPG.

DESCRIPTION AND TEST RESULTS:

Below tables provide description of the qualification tests conducted and corresponding test results for LTM4622. All the units have undergone electrical tests on both the sending and receiving sites on the same test platform. Any device that will not meet the electrical qualification requirements will mean failure of the qualification and require solid corrective actions and a repeat of the qualification process. Qualification activities performed, and acceptance criteria is shown on Table 2 below:

Table 2: *Qualification Activities and Acceptance Criteria*

Qualification Activity	Sample Quantity	Accept Criteria
Correlation device run	5 correlation device units	*100% Passing correlation devices
Correlation Lot Run	Minimum of 300 known Bin1 units tested in full product test flow (ALL temperature passes). Test lot in Sending site (ADSG) and Receiving site (ADGT).	*CpK≥1.67 * For tightened limits, Mean Shift Criteria and sigma-spread criteria to apply * Mean Shift Criteria (ABS (SS_mean - RS_Mean) / Limit Range) x 100 ≤ 5% * Sigma-spread criteria * (RS_Sigma / SS_Sigma) ≤ 1.3
GR&R	10 Bin 1 units tested on 1 board and 2 testers	R&R % =<10%

- *SS = Sending Site*
- *RS = Receiving Site*

To validate full set-up functionality such as hardware, software, test paraphernalia and tester platform, 5 correlation devices of LTM4622 were tested both in ADSG and ADPG. Data between sites were analyzed and summarized in Table 3.

Table 3: *Correlation Device Run result*

Generic	Package	No. of correlation device	ALL correlation devices passed?
LTM4622	BGA 25 Leads	5 units	YES

The LTM4622 was qualified by testing a correlation lot with minimum 300 units both in ADSG and ADPG. This is to capture variation in hardware, tester and set-up condition thru mean shift and sigma spread. This is to ensure the parameter measurement are still within the accepted range of variations. Data between sites were analyzed and summarized in Table 4.

Table 4: *Product Site Transfer Correlation*

Temperature	Generic	Package	Lot Number	Lot Size	Sending Site	Receiving Site	Total No. of Correlation Parameters	Result
Ambient	LTM4622	BGA 25 Leads	1040166.4	514	ADSG	ADPG	180	ALL PASSED
Hot	LTM4622	BGA 25 Leads	1040166.4	507	ADSG	ADPG	194	ALL PASSED
Cold	LTM4622	BGA 25 Leads	1040166.4	507	ADSG	ADPG	185	ALL PASSED

To gather test performance data to allow estimation of the overall test repeatability and reproducibility from the production test solution, GR&R was performed on 10 serialized units tested on 1 test board and 2 test systems. GR&R result was analyzed and summarized in Table 7.

Table 5: *GR&R Result*

Generic	Package	Lot Number	No. of Units	No. of Test Boards	No. of Testers	All parameters passed R&R % =<10%?
LTM4622	BGA 25 Leads	1040166.4	10	1	2	Yes – ALL PASSED (Justification provided for the test exceeding 10%)

APPROVALS:

Technical Review Board No. 62174- ADSG to ADPG Test Transfer

ADDITIONAL INFORMATION:

Homepage: https://www.analog.com/en/index.html

Customer Service: https://www.analog.com/en/support/technical-support.html

TEST PRODUCT* QUALIFICATION REPORT

TITLE:

LTM4644 Test Site Transfer from Analog Devices Singapore to Analog Devices Penang

PCN Number:

REVISION:

A

DATE:

JAN 17, 2020

CONTENTS:

PROJECT BACKGROUND:

The LTM4644 is currently undergoing production testing at the Analog Devices Singapore (ADSG). It was a strategic decision from business standpoint to qualify Analog Devices Penang (ADPG) to become as new test site to ensure a continuity in the supply chain due to ADSG plant shutdown. ADPG is situated in Bayan Lepas, Penang, Malaysia.

After qualification of necessary test capability, ADPG will serve as the primary test site facility to serve for micromodule future demands.

SUMMARY:

The LTM4644/LTM4644-1 is a quad DC/DC step-down µModule (micromodule) regulator with 4A per output. Outputs can be paralleled in an array for up to 16A capability. Included in the package are the switching controllers, power FETs, inductors and support components. Operating over an input voltage range of 4V to 14V or 2.375V to 14V with an external bias supply, the LTM4644/LTM4644-1 supports an output voltage range of 0.6V to 5.5V

TEST AND PRODUCT INFORMATION:

Device:	LTM4644
Package:	BGA
Leads:	77 leads
FG Partname:	LTM4644IY#PBF
Tester Platform:	ETS364B
Handler:	Multitest MT9510

The LTM4644 is planned to be tested in Analog Devices Penang (ADPG) using the following as shown in the Table 1 below:

***Table 1**: LTM4644 Test Details*

Parameters	ADSG	ADPG	Remarks
Tester Platform	ETS364B	ETS364B	No change
Handler	MT9510	MT9510	No Change
Test Flow	Tested in FT room and QA room, hot, cold temp per setup specification.	Tested in FT room and QA room, hot, cold temp per setup specification.	No Change
Contactor	77 Lds Gemini Kelvin	77 Lds Gemini Kelvin	No Change
Performance Board	LTM4644 Test Board	LTM4644 Test Board	No change
Test Program	LTM4644_04	LTM4644_04	No change

There is no change to the form, fit and function of the product.

This report documents the successful completion of the product test transfer requirements of LTM4644 at ADPG.

DESCRIPTION AND TEST RESULTS:

Below tables provide description of the qualification tests conducted and corresponding test results for LTM4644. All the units have undergone electrical tests on both the sending and receiving sites on the same test platform. Any device that will not meet the electrical qualification requirements will mean failure of the qualification and require solid corrective actions and a repeat of the qualification process. Qualification activities performed, and acceptance criteria is shown on Table 2 below:

Table 2: *Qualification Activities and Acceptance Criteria*

Qualification Activity	Sample Quantity	Accept Criteria
Correlation device run	5 correlation device units	*100% Passing correlation devices
Correlation Lot Run	Minimum of 300 known Bin1 units tested in full product test flow (ALL temperature passes). Test lot in Sending site (ADSG) and Receiving site (ADPG).	*CpK≥1.67 * For tightened limits, Mean Shift Criteria and sigma-spread criteria to apply * Mean Shift Criteria (ABS (SS_mean - RS_Mean) / Limit Range) x 100 ≤ 5% * Sigma-spread criteria * (RS_Sigma / SS_Sigma) ≤ 1.3
GR&R	10 Bin 1 units tested on 1 board and 2 testers	R&R % =<10%

- *SS = Sending Site*
- *RS = Receiving Site*

To validate full set-up functionality such as hardware, software and tester platform, 5 correlation devices of LTM4644 were tested both in ADSG and ADPG. Data between sites were analyzed and summarized in Table 3.

Table 3: *Correlation Device Run result*

Generic	Package	No. of correlation device	ALL correlation devices passed?
LTM4644	BGA 77 Leads	5 units	YES

The LTM4644 was qualified by testing a correlation lot with minimum 300 units both in ADSG and ADPG. This is to capture variation in hardware, tester and set-up condition thru mean shift and sigma spread. This is to ensure the parameter measurement are still within the accepted range of variations. Data between sites were analyzed and summarized in Table 4.

Table 4: *Product Site Transfer Correlation*

Temperature	Generic	Package	Lot Number	Lot Size	Sending Site	Receiving Site	Total No. of Correlation Parameters	Result
Ambient	LTM4644	BGA 77 Leads	1039147.7	1151	ADSG	ADPG	420	ALL PASSED
Hot	LTM4644	BGA 77 Leads	1039147.7	1000	ADSG	ADPG	505	ALL PASSED
Cold	LTM4644	BGA 77 Leads	1039147.7	1000	ADSG	ADPG	466	ALL PASSED

To gather test performance data to allow estimation of the overall test repeatability and reproducibility from the production test solution, GR&R was performed on 10 serialized units tested on 1 test board and 2 test systems. GR&R result was analyzed and summarized in Table 5.

Table 5: *GR&R Result*

Generic	Package	Lot Number	No. of Units	No. of Test Boards	No. of Testers	All parameters passed R&R % =<10%?
LTM4644	BGA 77 Leads	1039147.7	10	1	2	Yes – ALL PASSED (Justification provided for the tests exceeding 10%)

APPROVALS:

Technical Review Board No. 60579 - ADSG to ADPG Test Transfer

ADDITIONAL INFORMATION:

Homepage: https://www.analog.com/en/index.html

Customer Service: https://www.analog.com/en/support/technical-support.html

TEST PRODUCT QUALIFICATION REPORT

TITLE:

LTM8008 Test Site Transfer from Analog Devices Singapore to Analog Devices Penang

PCN Number:

REVISION:

A

DATE:

JAN 17, 2020

CONTENTS:

PROJECT BACKGROUND:

The LTM8008 is currently undergoing production testing at the Analog Devices Singapore (ADSG). It was a strategic decision from business standpoint to qualify Analog Devices Penang (ADPG) to become as new test site to ensure a continuity in the supply chain due to ADSG plant shutdown. ADPG is situated in Bayan Lepas, Penang, Malaysia.

After qualification of necessary test capability, ADPG will serve as the primary test site facility to serve for micromodule future demands.

SUMMARY:

The LTM8008 is a 72VIN, µModule® SEPIC converter with six post regulators. The SEPIC controller's fixed frequency, current-mode architecture results in stable operation over a wide range of supply and output voltages and features soft-start and frequency foldback functions to limit inductor current during start-up and output short-circuit.

The LTM8008 also includes six high performance, fixed output LDOs for post-regulation: one 5V at 500mA, one 3.3V at 300mA, and four 5V at 150mA. The output of the SEPIC controller is internally set to 5.6V for optimal efficiency. In addition to providing these outputs, the SEPIC converter can supply up to an additional 500mA to the system load.

TEST AND PRODUCT INFORMATION:

Device:	LTM8008
Package:	LGA
Leads:	121 leads
FG Partname:	LTM8008HV#3GSPBF
Tester Platform:	ETS364B
Handler:	Multitest MT9510

The LTM8008 is planned to be tested in Analog Devices Penang (ADPG) using the following as shown in the Table 1 below:

***Table 1**: LTM8008 Test Details*

Parameters	ADSG	ADPG	Remarks
Tester Platform	ETS364B	ETS364B	No change
Handler	MT9510	MT9510	No Change
Test Flow	Tested in FT room and QA room, hot, cold temp per setup specification.	Tested in FT room and QA room, hot, cold temp per setup specification.	No Change
Contactor	121 Lds ECT	77 Lds ECT	No Change
Performance Board	LTM8008 QUADSITE	LTM8008 QUADSITE	No change
Test Program	LTM8008_00	LTM8008_00	No change

There is no change to the form, fit and function of the product.

This report documents the successful completion of the product test transfer requirements of LTM8008 at ADPG.

DESCRIPTION AND TEST RESULTS:

Below tables provide description of the qualification tests conducted and corresponding test results for LTM8008. All the units have undergone electrical tests on both the sending and receiving sites on the same test platform. Any device that will not meet the electrical qualification requirements will mean failure of the qualification and require solid corrective actions and a repeat of the qualification process. Qualification activities performed, and acceptance criteria is shown on Table 2 below:

Table 2: *Qualification Activities and Acceptance Criteria*

Qualification Activity	Sample Quantity	Accept Criteria
Correlation device run	5 correlation device units	*100% Passing correlation devices
Correlation Lot Run	Minimum of 300 known Bin1 units tested in full product test flow (ALL temperature passes). Test lot in Sending site (ADSG) and Receiving site (ADPG).	*CpK≥1.67 * For tightened limits, Mean Shift Criteria and sigma-spread criteria to apply * Mean Shift Criteria (ABS (SS_mean - RS_Mean) / Limit Range) x 100 ≤ 5% * Sigma-spread criteria * (RS_Sigma / SS_Sigma) ≤ 1.3
GR&R	10 Bin 1 units tested on 1 board and 2 testers	R&R % =<10%

- *SS = Sending Site*
- *RS = Receiving Site*

To validate full set-up functionality such as hardware, software and tester platform, 5 correlation devices of LTM8008 were tested both in ADSG and ADPG. Data between sites were analyzed and summarized in Table 3.

Table 3: *Correlation Device Run result*

Generic	Package	No. of correlation device	ALL correlation devices passed?
LTM8008	LGA 121 Leads	5 units	YES

The LTM8008 was qualified by testing a correlation lot with minimum 300 units both in ADSG and ADPG. This is to capture variation in hardware, tester and set-up condition thru mean shift and sigma spread. This is to ensure the parameter measurement are still within the accepted range of variations. Data between sites were analyzed and summarized in Table 4.

Table 4: *Product Site Transfer Correlation*

Temperature	Generic	Package	Lot Number	Lot Size	Sending Site	Receiving Site	Total No. of Correlation Parameters	Result
Ambient	LTM8008	LGA 121 Leads	Z48258.10	1190	ADSG	ADPG	97	ALL PASSED
Hot	LTM8008	LGA 121 Leads	Z48258.10	1153	ADSG	ADPG	104	ALL PASSED
Cold	LTM8008	LGA 121 Leads	Z48258.10	1155	ADSG	ADPG	98	ALL PASSED

To gather test performance data to allow estimation of the overall test repeatability and reproducibility from the production test solution, GR&R was performed on 10 serialized units tested on 1 test board and 2 test systems. GR&R result was analyzed and summarized in Table 5.

Table 5: *GR&R Result*

Generic	Package	Lot Number	No. of Units	No. of Test Boards	No. of Testers	All parameters passed R&R % =<10%?
LTM8008	LGA 121 Leads	Z48258.10	10	1	2	Yes – ALL PASSED (Justification provided for the tests exceeding 10%)

APPROVALS:

Technical Review Board No 62174- ADSG to ADPG Test Transfer

ADDITIONAL INFORMATION:

Homepage: https://www.analog.com/en/index.html

Customer Service: https://www.analog.com/en/support/technical-support.html