Title: Components Engineering Procedures and Flow Diagrams
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Date of Issue:
Process Owner: Components Engineering
Author: Douglas Alexander

APPROVALS

Director, Engineering Services: (Typical) __________________________

Vice President, Engineering: (Typical) __________________________

I put these title positions in as a reference only. Modify these for your company...Also Note, L-Codes in Flows are matched to MRP system. These are not relevant for all MRP programs. They correspond to command input keys and are different with every system.

Douglas

DOCUMENT HISTORY

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1.0 PURPOSE:

To define the required processes for Components Engineering activities.

2.0 SCOPE:

This document diagrams and details the individual tasks associated in the day-to-day activities of the Components Engineering Department. Instructions for completing the Components Engineering Request Form (CER) are on the www.componentsengineering.com pages.

3.0 RESPONSIBILITIES:

3.1 It is the responsibility of Component Engineering to administer all processes and ensure compliance with these procedures.

3.2 It is also the responsibility of Component Engineering to review all request forms for completeness of information, including any attachments required for the activities related to the request.

3.3 It is the responsibility of Component Engineering to determine the need and extent of the Evaluation by Specification Documentation, Design and/or Evaluation by Test.

3.4 It is the responsibility of the requesting Design Engineer to perform the Evaluation by Design.

3.5 It is the responsibility of the sustaining group within Manufacturing Engineering to perform the Evaluation by Test.

3.6 It is the responsibility of Component Engineering to determine Critical Parts and coordinate the performance of electrical, mechanical, or other tests.

3.7 It is the responsibility of Supplier Quality Assurance to perform source approval for sources that have not been previously approved.
4.0 DEFINITIONS:

4.1 **AVL** - Approved Vendor List, (Manufacturer’s Cross Reference) a CE generated list of purchased parts and assemblies that indicates their approved source(s).

4.2 **FITS** - One FIT is a failure rate probability of $10^{-9}$ in the next hour given survival up to the time in question. (1 FIT = $10^{-9}$ / hour, hazard rate). Military specifications define failure probability for a 1000 hours ($10^{-9} / 1000$ hr.). DMC follows the Bellcore definition of $10^{-9} / hour$.

4.3 **CER** - Component Engineering Request, a form that is used to input and track requests for action to Component Engineering by other organizations and individuals.

4.4 **CS** - Component Specification, a control document that specifies electrical and mechanical requirements, as well as any other requirements for acceptance.

4.5 **CIR** - Component Information Request, Request for Component Review, a form used to record electrical, mechanical, and procurement information on new parts being introduced. The form is also used to track part qualifications with reference to resources and schedules.

4.6 **Component** - A purchased electrical or mechanical piece part.

4.7 **Functional Evaluation** - A evaluation performed that may include documentation review and analysis, functional testing in the intended product, and comparison analysis of similar parts.

4.8 **Qualified** - An item has gone through a series of evaluations that indicates that it is capable of meeting the Reliability, Mechanical, Electrical, and other Functional requirements for its intended use at Digital Microwave Corporation. Before a part can be classified as Qualified, a Part Qualification Record form must be completed indicating passing results.

4.9 **Approved** - An item has been selected for use at Digital Microwave Corporation as indicated by its addition to the AVL. A part must be QUALIFIED as described in section 4.8 above, prerequisite for Approval.

5.0 PROCESS FLOWS:

Assignment of New Part Number  Appendix A-1
New Part Request Flow Diagram  Appendix A-2
Request to Find Alternate Source  Appendix A-3
Part Qualification  Appendix A-4
Part Disqualification  Appendix A-5

The following processes are not necessarily stand-alone flow diagrams. One or more flow diagrams may be followed to complete a CER used as a request to find an alternate source,
(Appendix A-1) leads into the Part Qualification process, (Appendix A-4). In this event, an individual task represented on both flow charts need not be repeated.

PROCESS INSTRUCTION: Appendix A-1, Assignment of New Part number

1.1 Initiator completes CER form: The section of the CER form for “New Part Number” must be filled in. A copy of the Part Qualification Record showing passing test results and the Supplier Request for Component Review form along with pertinent drawings and data sheets must be attached.

1.2 The Components Engineer reviews the attachments and upon acceptance, assigns a new part number.

1.3 The Components Engineer completes the New Part Number Request Form, and submits the form along with the CER form and attachments to Documentation Control for data entry into the MRP Item Master and the AVL.

1.4 Documentation Control enters the new part number into the Item Master and AVL.

1.5 Components Engineering reviews the entry for accuracy and if corrections are required, the documentation is resubmitted to Documentation Control.

1.6 The original CER, with all attachments, is filed by Component Engineering

PROCESS INSTRUCTION: Appendix A-2, New Part Request

2.1 The initiator submits the CER form along with the required attachments: The CER form must have the project number and at least one additional supplier or manufacturer for suggested alternate source. In the event that the part is a single source, then the Project Manager must authorize its use. The attachments include drawings, data sheets, the completed Supplier Request for Component Review, a minimum of five sample parts for evaluation, any critical specifications listed, and application notes if required.

2.2 The Component Engineer reviews the submitted documents to determined if all information needed is present. A Part Qualification form is attached to the CER. If any information is missing, the C.E. returns the request to the initiator for completion.

2.3 After the submitted form is accepted as complete, the C.E. examines the AVL to determine if the manufacturer’s part number already exists under another part number.
2.4 If the part already exists in the AVL, the CER form is returned to the initiator, noting the duplication and the respective part number.

2.5 If the part is new to, Purchasing is sent a copy of the request. Purchasing will advise upon the acceptability of the part based upon their assessment of availability, supplier performance, cost, source status, and any other special considerations that would effect the part’s usability. If Purchasing “approves” the part as a candidate for purchase, they will indicate so by signing the Part Qualification form attached to the CER.

2.6 If Purchasing does not recommend the part for use, the Engineer has the option of arbitration to use the part. The arbitration team consists of the individual challenging the use of the part, a Component Engineer, the petitioning Design Engineer, and if required, the Program Manager or Project Director responsible for the product development. If the result of the arbitration is that the part will not be used, the Design Engineer may suggest another part or choose to alter the design to use an acceptable part.

2.7 If the part is acceptable to Purchasing, the Component Engineer will generate a preliminary specification and status the part for the qualification process.

2.8 If the part passes the required qualification tests, then it is assigned a new part number or added to the AVL, per Appendix A-1. If it does not pass the qualification tests, then the Design Engineer is notified and a copy of the test report and CER is sent to the initiator.

PROCESS INSTRUCTION: Appendix A-3, Request to Find Alternate Source

3.1 The Component Engineer reviews the CER form for the necessary information; including the date the alternate source is required.

3.2 The Components Engineer will retrieve and reference the current specifications against the requirements for the alternate source.

3.3 The Component Engineer queries the MRP system for all of the “where used” information for the part to be alternate sourced. Every application for the existing part must be viable with the alternate source.

3.4 After a complete review of the existing applications, the Components Engineer determines what Engineering resources may be required and develops a project plan for qualifying the alternate source. If the potential alternate source has to be tested in circuit, a technician may be assigned by the Project Engineer or Manufacturing Engineer of concern. A Part Qualification form is attached to the CER by the Component Engineer.

3.5 The Components Engineer and the Manufacturing Engineer determine critical application needs so the potential alternate source can be tested specifically with these special requirements in mind.
3.6 After the selection of a potential alternate part, Purchasing and Manufacturing Engineering are sent a copy of the request. Both departments will advise upon the acceptability of the part based upon their assessment of availability, supplier performance, cost, source status, electrical and mechanical specifications, and any other special considerations that would effect the part’s usability. If all concerned departments “approve” the part as a candidate for purchase based upon business and functional reasons, they will indicate so by signing the Part Qualification form attached to the CER.

3.7 If any reviewing department representative does not accept the use of the potential alternate source, then the procedure for arbitration, as cited in 2.6, is followed. If all departments approve, and the supplier is registered as an “approved” supplier, then at least five parts are cycled through the qualification process before full acceptance.

3.8 If the part meets all requirements, then the part is added to the AVL, using the AVL Change Notice form, and the revision of DMC part number referenced on the AVL is adjusted accordingly.

3.9 A copy of the C.E. Request form showing the new alternate part is given to the initiator.

PROCESS INSTRUCTION: Appendix A-4, Part Qualification

4.1 If not previously submitted in another process request, a CER form is completed with all relevant attachments. Attachments must include data sheets and where used information.

4.2 The Components Engineer determines the nature and degree of the qualification required. For clarification purposes, we will use the terms “Minimal” and “Full”. “Minimal” meaning non-electrical examination required; based upon existing “family” part type and historical data already resident in the MRP System. “Full” meaning electrical and physical testing required for acceptance. The Component Engineer attaches a Part Qualification form to the CER.

4.3 For minimal testing, the Components Engineer must verify all specifications match the family specifications; with the exception of exact part values.

4.3.1 If the part does not meet the basic “family” specifications, then the supplier is notified and the parts, if sampled, are either scrapped or returned to the supplier. The Part Qualification form is completed indicating a “fail” status and filed with Component Engineering.

4.3.2 If the part does meet all of the requirements, then the Components Engineer completes a Part Qualification form indicating the “pass” status.

4.4 The Component Engineer then follows the process “Assignment of New Part Number”.
4.5 The sample parts are either filed for reference, returned to the supplier, or scrapped. This is the Components Engineer’s discretion.

4.6 For a “full” qualification, a qualification team, consisting of a Design Engineer, Manufacturing Engineer, Quality Engineer, Purchasing, and Components Engineer, determine the testing required to qualify the part.

4.7 The Components Engineer will develop a Qualification Plan and Schedule with input from the other team members. The team will determine the nature of the tests required and assign resources for the testing process. If the part is to be tested by the supplier, the team will define what test are to be performed before acceptance of the part can be considered.

4.7.1 If the part passes all qualifications, then a team member will be selected to compile and submit a test report, which will be reviewed by the other team members for final qualification. The Part Qualification form is completed indicating a “pass” status.

4.7.2 If the part does not pass all requirements, then it is scrapped or returned to the supplier with notification of non-qualification status. The supplier may be given a copy of the test results. The test results need not be formalized into a test report in the event of a non-qualification. The Part Qualification form is completed indicating a “fail” status.

4.8 If the part is acceptable to the team, the Component Engineer then follows the process “Assignment of New Part Number”, ref. Appendix A-1.

PROCESS INSTRUCTION: Appendix A-5, Part Disqualification

5.1 All disqualification request must be submitted on a CER form. The Components Engineer reviews the form for proper completion, including the listing of “reason for disqualification”.

5.2 The Component Engineer validates the reason for disqualification by checking back with the initiator for more details if required.

5.3 The Component Engineer then prints a “where used” report for the part to determine product impact and assembly’s Manufacturing Engineers affected by the disqualification.

5.4 The Component Engineer next examines the MRP System for OPEN purchase orders for the part.

5.4.1 If there are OPEN orders, the Components Engineer will contact Purchasing to cancel existing orders.
5.5 The Components Engineer prints the existing AVL and indicate thereon, the part to be disqualified by changing the status code to and writing “DISQUALIFIED” by the manufacturer’s part number on the AVL.

5.6 The Component Engineer completes an AVL Change Notice form, circulates the form for approval signatures, and copies all Manufacturing and Supplier Engineers concerned of the disqualification.

5.7 After the AVL Change Notice has been approved, disqualified materials will be dispositioned via the ECO process in order to ensure changes are made to Bills of Material. Stock purges are effected where required.

6.0 RECORDS

6.1 The CER File is a file maintained by Component Engineering that contains the white copy of the original CER for archival purposes. This file is maintained in accordance with procedures.

6.2 Component History File is a file containing relevant data concerning an individual part and is maintained by Component Engineering. CERs, qualification records, including test plans, memos, and/or test data are included in this file. This file is in part number order. This file is maintained until the part is obsolete.

6.3 In the event that the qualification is applicable to a group of parts covered by an SC D, qualification data will also be filed in the SC file for future reference.

7.0 REFERENCE DOCUMENTS

7.1 Supplier Quality Assurance Procedure, Supplier Qualification

7.2 Component Engineering Operating Procedure

7.3 MIL-STD-202 and MIL-HDBK-217E

7.4 Bellcore TR-TSY-000332

7.5 Reliability Design Handbook RAC/RADC

7.6 AVL Change Notice

7.7 Supplier Request for Component Review, CIR

7.8 Part Qualification Record

7.9 Component Engineering Request, (CER), CE-FM002
APPENDIX A-1 ASSIGNMENT OF NEW DMC PART NUMBER

1.1 Complete CER Form

1.2 C.E. reviews data and Assign new Part Number

1.3 C.E. completes Item Master Entry Request Form

1.4 Data entry I.M. and AVL
   - Yes
   - No

1.5 C.E. review data entry
   - Yes
   - No

1.6 C.E. creates AVL Change Notice

1.7 Copy of CER to initiator

CER Form with following attachments:
1. Part Qualification Record completed showing passing test results
2. Supplier Request for Component Review complete
3. Drawings, specifications, and data sheets

Submit Item Master Entry Request Form to Doc Services with:
1. All CER Form attachments
2. AVL Change Notice
APPENDIX A - 2 NEW PART REQUEST FLOW DIAGRAM

2.1 Initiator submits CER form

2.2 Form completed
  - No
  - Yes

2.3 Dup. part exist in AVL
  - No
  - Yes

2.4 C.E. checks with Purchasing for part use viability

2.5 Purchasing & Supplier QA approved
  - No
  - Yes

2.6 Arbitrate use Eng-Purch
  - No
  - Yes

2.7 C.E. generates preliminary spec.

2.8 Go to Part Qualification
  - No
  - Yes

2.8 Qualified
  - No
  - Yes

2.8 Go to Assign New Part Number and add to AVL

CER should have the following attachments and basic information completed on the form:
1. Project Number
2. Suggested Alternate Source
3. Any Drawings Required
4. Supplier Request for Component Review
5. Applicable Data Sheets
6. Critical Specifications Identified
7. Application Notes

Purchasing will perform a preliminary evaluation by checking the following information on the part:
1. Availability
2. Standard part vs. Non-Standard
3. Vendor/Supplier performance critique
4. Price/ Cost review
5. Single/ Sole source analysis
APPENDIX A - 3 REQUEST TO FIND ALTERNATE SOURCE

3.1 Verify CER Form is complete

3.2 Review existing specification

3.3 Determine Where Used

3.4 Develop project plan for qualification

3.5 Determine critical application needs

3.6 Request Purchasing's assistance

3.7 Go to New Part Process

3.7 Go to Part Qualification Process

3.8 If part passes, add to AVL

3.9 Return copy of C.E. Request to initiator

Includes:
1. Date alternate source is required
2. Alternate source section complete

Determine Engineering resources
4.1 CER form reviewed for completion

4.2 Determine qualification level

- Full
  - Minimum

4.3 Verify all specs match family specifications

4.4,4.8 Go to Assign New Part Number Flow

4.5 File or scrap sample parts

4.6 Decide nature of test: extensive or doc review only

4.7 Develop qualification requirements

4.7.1 Pass qualification test

4.7.1 Create Qualification Test Report

4.7.2 Scrap or return parts to supplier and notify initiator

- Yes
  - No

Decision and Qualification Team
1. Design Engineer
2. Manufacturing Engineer
3. Quality Engineer
4. Purchasing
5. Components Engineer

Includes schedule for qualification process and selection of test team member(s).

APPENDIX A - 4 PART QUALIFICATION FLOW DIAGRAM
APPENDIX A - 5 PART DISQUALIFICATION FLOW DIAGRAM

5.1 Verify CER Form is complete

Check for details of reason for disqualification

5.2 Validate reason for disqualification

5.3 Determine Where Used L.401

5.4 Look for existing POs L.402

Yes

5.4.1 Contact Purchasing to cancel existing orders

No

5.5 Print and mark-up existing AVL reference L.470

5.6 Notify users of pending disqualification

AVL Change Notice, CER form Copy, and Where Used to all Manufacturing and Supplier Engineers.

5.7 Initiate ECO to disqualify part

ECO Coordinator should receive the following:
1. ECO form
2. Marked up L.470
3. Copy of CER form
4. Where Used
5. AVL Change Notice

5.7 To ECO coordinator to process

Notify Doc. Services of data input correction error

Copy of CER Form to initiator

Yes

AVL data entry correct

No