# Preferred Parts
# *Technology to the Warfighter*

**Parts Standardization & Management Committee**
**Tysons Corner, VA**
**April 28, 2015**

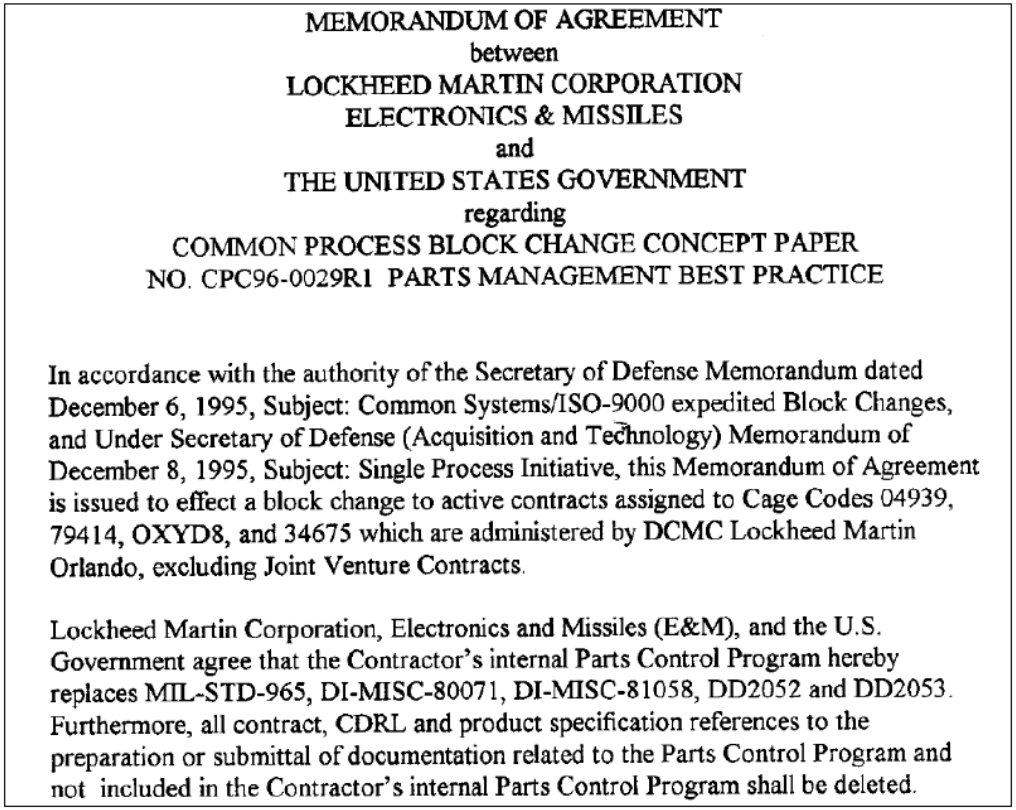

**Senior Staff Components Engineer**
**Lockheed Martin Missiles and Fire Control**
**Orlando, FL**

# Agenda

- History
- Lockheed Martin Missiles and Fire Control (LMMFC) Preferred (PRF) Part Development
- LMMFC Preferred Part Selection
  - Mechanical Fastener PRF Tool - Example
  - New Component Request – Circuit Card Assembly (CCA) Designs
- New Component Technologies
  - Lead Free Ball Grid Arrays (BGAs)
- Path Forward

# History

- ***'94: Fed Acquisition Reform & Streamlining Act – Secretary of Defense directive***
  - **Maximize Use of COTS Parts and Industry Standards**
  - **Many Military Specifications/Standards Cancelled/Not maintained**
- ***'96: Lockheed Martin Components Engineering Best Practices***
- ***'97: Approved Block Change: Use of LMMFC Parts Control Program***



MEMORANDUM OF AGREEMENT
between
LOCKHEED MARTIN CORPORATION
ELECTRONICS & MISSILES
and
THE UNITED STATES GOVERNMENT
regarding
COMMON PROCESS BLOCK CHANGE CONCEPT PAPER
NO. CPC96-0029R1 PARTS MANAGEMENT BEST PRACTICE

In accordance with the authority of the Secretary of Defense Memorandum dated December 6, 1995, Subject: Common Systems/ISO-9000 expedited Block Changes, and Under Secretary of Defense (Acquisition and Technology) Memorandum of December 8, 1995, Subject: Single Process Initiative, this Memorandum of Agreement is issued to effect a block change to active contracts assigned to Cage Codes 04939, 79414, OXYD8, and 34675 which are administered by DCMC Lockheed Martin Orlando, excluding Joint Venture Contracts.

Lockheed Martin Corporation, Electronics and Missiles (E&M), and the U.S. Government agree that the Contractor's internal Parts Control Program hereby replaces MIL-STD-965, DI-MISC-80071, DI-MISC-81058, DD2052 and DD2053. Furthermore, all contract, CDRL and product specification references to the preparation or submittal of documentation related to the Parts Control Program and not included in the Contractor's internal Parts Control Program shall be deleted.

# History (cont)

- **No longer under MIL-STD-965 Parts Control**
- **Use of Nonstandard Part Approval Request (NSPAR) DD2052 and Program Parts Selection List (PPSL) DD2053 Discontinued**

**PROGRAM PARTS SELECTION LIST (PPSL) WORKSHEET**

The public reporting burden for this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.
PLEASE DO NOT RETURN YOUR FORM TO THIS ADDRESS. SEND YOUR COMPLETED FORM TO THE ACTIVITIES DESIGNATED IN THE CONTRACT OR PURCHASE ORDER.

*Form Approved OMB No. 0704-0188*

| A. PRIME CONTRACT NUMBER | B. EQUIPMENT/SYSTEM/SUBSYSTEM | C. CONTRACTOR | D. REPRESENTATIVE | E. DATE | F. TELEPHONE NO. (Incl. area code) |
|---|---|---|---|---|---|

| CODE | | FSC | | PRE-FIX | SEQUENCE NO. | SUF | NOUN CODE | SVC | QUANTITY | PART PROCUREMENT DOCUMENT NUMBER | CAGE | BLANK | TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 2 3 4 5 | 6 | 7 8 9 10 | 11 | 12 13 | 14 15 16 17 | 18 | 19 20 21 22 23 24 25 26 27 28 29 30 31 | 32 | 33 34 35 36 37 | 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 | 70 71 72 73 74 | 75 76 77 78 79 | 80 |
| | - | | - | | | | | | | | | | 1 |

| PROCUREMENT DOCUMENT PART NUMBER OR VENDOR PART NUMBER | CAGE | VENDOR PART NUMBER | CAGE | BLANK | |
|---|---|---|---|---|---|
| | | | | | 2 |

| ALTERNATE OR SUPPLEMENTAL DESCRIPTION | |
|---|---|
| | 3 |

INPUT 2

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

# NONSTANDARD PART APPROVAL REQUEST

1. LOG NUMBER

| CONTRACT CODE | | | | | | FSC | | | | | INDEX NUMBER: FMS | SEQUENCE NO. | | | | | | SUF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | - | | | | | - | | | | | | | | |

*Form Approved OMB No. 0704-0188*



**PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION. SEND YOUR COMPLETED FORM TO THE ACTIVITIES DESIGNATED IN THE CONTRACT OR PURCHASE ORDER.**

## PART I - CONTRACTOR INPUT

| 2. PRIME CONTRACT NUMBER | 3. CONTRACTOR |
|---|---|
| 4. EQUIPMENT/SYSTEM/SUBSYSTEM | 5. DATE OF INVITATION FOR BID *(YYYYMMDD)* *(RFP, RFQ)* |

| 6. PART PROCUREMENT DOCUMENT NUMBER *(if applicable)* | 7. CAGE | 8. PART NUMBER | 9. CAGE | 10. QUANTITY |
|---|---|---|---|---|
| | | | | |

| 11. VENDOR | 12. VENDOR PART NUMBER | 13. CAGE |
|---|---|---|
| | | |
| | | |
| | | |

14. EVALUATION REQUESTED *(X one)*

| | a. Part | | b. Part and Document | | c. Document Only |
|---|---|---|---|---|---|
| | | | | | |

15. LOG NO. FOR PART PREVIOUSLY SUBMITTED ON THIS CONTRACT

| 16. DESCRIPTION CODE | 17. ALTERNATE OR SUPPLEMENTAL DESCRIPTION |
|---|---|
| | |

18. REASON FOR USE OF NONSTANDARD PART *(Compare part with nearest equivalent standard)(Continue on reverse side, if necessary)*

| 19. REPLY NEEDED *(YYYYMMDD)* | 20. PRINTED OR TYPED NAME OF CONTRACTOR REPRESENTATIVE | 21. DATE | 22. PHONE NO. *(Include Area Code)* |
|---|---|---|---|
| | | | |

## PART II - EVALUATOR RECOMMENDATION

| 23. DATE IN | 24. DUE DATE | 25. EVAL OPI | 26. MPCAG MANAGER | 27. SERVICE ACTY | 28. ENGINEERING ITEM CODE |
|---|---|---|---|---|---|
| | | | | | |

| 29. APPROVAL | | 30. DISAPPROVAL | | 31. NO RECOMENDATION | | 32. DOCUMENT EVALUATION | |
|---|---|---|---|---|---|---|---|
| | A0 WITHOUT LIMITATION | | D0 REPLACE WITH MIL PART *(Complete Item 33a)* | | N0 INSUFFICIENT INFO *(See comments, Item 36)* | | TA ADEQUATE |
| | A1 LIMITED APPLICATION *(Complete Item 33)* | | D1 SPEC. BEING PREPARED *(Complete Item 33a)* | | N1 NOT UNDER THIS REVIEW AGENCY | | T I INADEQUATE *(See comments, Item 33)* |
| | A2 OTHER LIMITATIONS *(See comments, Item 36)* | | D2 COMMERCIAL REPLACEMENT *(Complete Item 33b)* | | N2 PROBLEM PART *(See comments, Item 36)* | | TN NO DOCUMENT |

| 33a. REPLACE WITH MIL/FED SPEC. OR DOD ADOPTED INDUSTRY STD. | | 33b. REPLACE WITH COMMERCIAL ITEM | |
|---|---|---|---|
| (1) Document No. | | (1) Manufacturer's Part/Type/Style No. | (2) CAGE |
| (2) Mil Part/Type/Style No. | (3) CAGE | | |

| (4) QPL Available *(X one)* | | | | | | (5) Date Mil Spec Available | 34. REPLACEMENT DESCRIPTION CODE *(As applicable to Item 33a(1) or 33b)* |
|---|---|---|---|---|---|---|---|
| | (a) Yes | | (b) No | | (c) N.A. | | |

| 35. PART RECOMMENDED IN BLOCK 33a OR 33b IS *(x one)* ⟶ | | a. INTERCHANGEABLE | | b. SUBSTITUTE | | c. REPLACEMENT |
|---|---|---|---|---|---|---|
| | | | | | | |

36. COMMENTS *(Continue on reverse side, if necessary)*

# LMMFC PRF Development

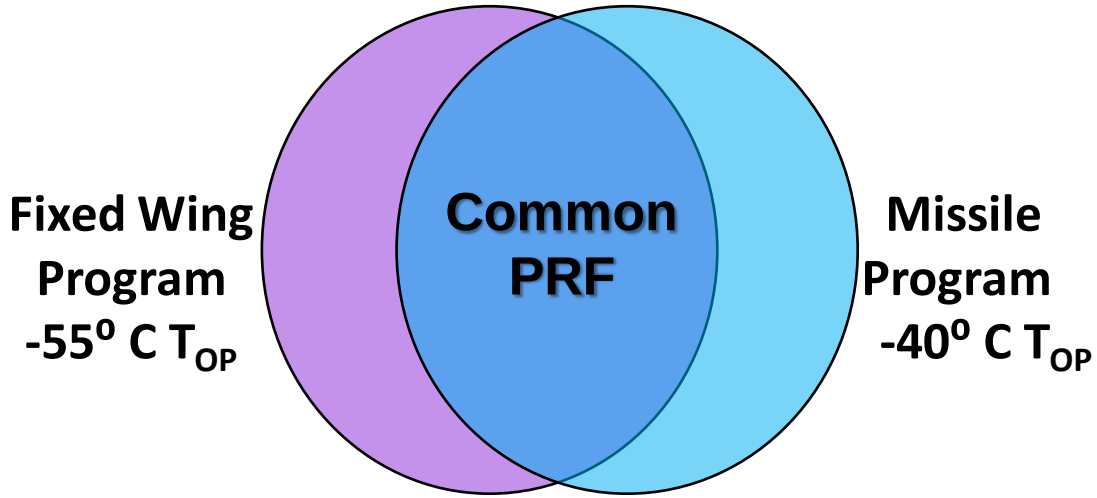
- **Post-Acquisition Reform Developed Preferred Parts**
  - **Evaluation of Manufacturer Part Qualification, and Ongoing Reliability Monitoring –** *Obtained Actual Data*
    - **Military Pedigree used during initial Selections**
      - **Same Facility and Production Lines in Many Cases**
    - **Selected High Volume and High Reliability Use Parts**
    - **Industry Standard Focus in Mechanical Components**
    - **Preferred Manufacturers Identified by Commodity Types**
    - **Standardization Implemented (e.g. Subset of Resistance Values, Temperature Coefficient and Tolerance)**
  - **Extensive Focus on Plastic Encapsulated Electronic Parts**
    - **ManTech Die Coating Initiatives**
    - **Understand Failure Modes**
      - **Minimum Reliability/Qualification Requirements Established**
      - **Circuit Card Thermal Profiling – Control Of Moisture Sensitive Parts**
      - **Part & CCA Level Testing Performed (Army and Air Force Missiles)**
      - **FRACAS – Resolution of Problem Part Issues**

# LMMFC PRF Development (cont)

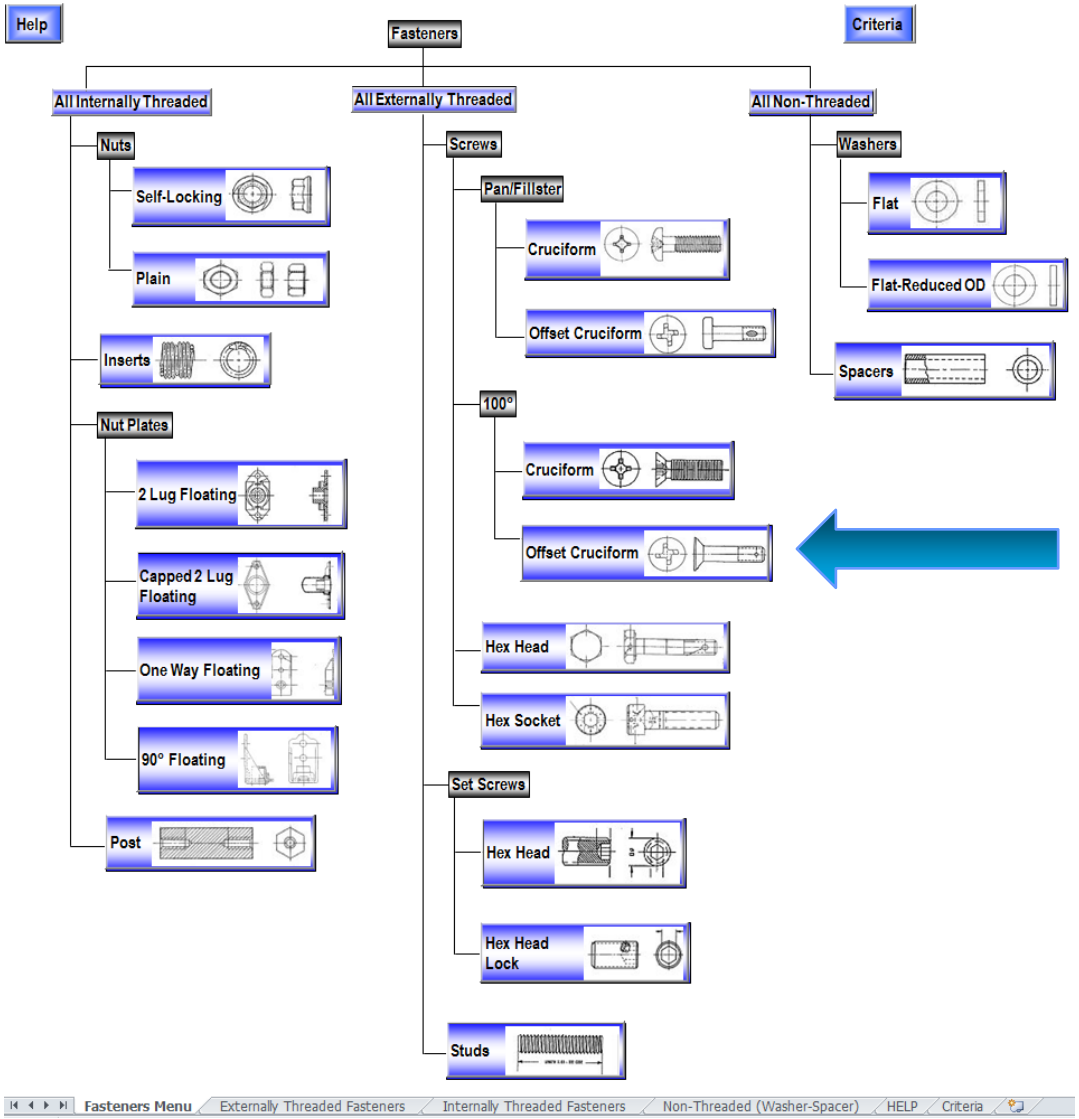
- **Parts Management Plans Tailored to Program Requirements**
  - **Platform: Missile, Ground Vehicle, Fixed Wing, Rotary Wing**
  - **Product/Application Centric:**
    - **Requirements: CIDS, SOW, Performance Spec's**
    - **Operating Temperature: -55° C vs -40° C**
    - **Transportation, Storage, Field Handling, Tactical Use**
    - **Lead Free and Tin Whisker Mitigation Requirements**
  - **Non-Repairable?**

***Example***

**Preferred Part Types in CCA Design > 65%**



# Mechanical Fastener PRF Tool



Goto Fasteners Menu

# Preferred Thread-Based Fasteners (Externally Threaded)

| Part Number | Fastener | Head Type | Drive style | SIZE | Length (in) | Ult. Ten. Str. | Material / Finish | Preferred Nut 125K UTS | Perferred Nut 160K UTS | Preferred Washer |
|---|---|---|---|---|---|---|---|---|---|---|
| MS51958-116 | Screw | Pan / Fillister | Cruciform (Philips) | 0.375 - 24 (3/8) | 2.250 | 80 KSI | CRES / Passivate | MS21043-6 | NA | NAS1149C0632R |
| MS51958-117 | Screw | Pan / Fillister | Cruciform (Philips) | 0.375 - 24 (3/8) | 2.500 | 80 KSI | CRES / Passivate | MS21043-6 | NA | NAS1149C0632R |
| MS51958-118 | Screw | Pan / Fillister | Cruciform (Philips) | 0.375 - 24 (3/8) | 2.750 | 80 KSI | CRES / Passivate | MS21043-6 | NA | NAS1149C0632R |
| MS51958-119 | Screw | Pan / Fillister | Cruciform (Philips) | 0.375 - 24 (3/8) | 3.000 | 80 KSI | CRES / Passivate | MS21043-6 | NA | NAS1149C0632R |
| NAS1101E02-3 | Screw | Pan / Fillister | Offset Cruciform (Torq-Set) | 0.086 - 56 (#2) | 0.188 | 160 KSI | CRES / Passivate | NAS1291C02 | MS21042-02 | NAS620C2 |
| NAS1101E02-4 | Screw | Pan / Fillister | Offset Cruciform (Torq-Set) | 0.086 - 56 (#2) | 0.250 | 160 KSI | CRES / Passivate | NAS1291C02 | MS21042-02 | NAS620C2 |
| NAS1101E02-5 | Screw | Pan / Fillister | Offset Cruciform (Torq-Set) | 0.086 - 56 (#2) | 0.313 | 160 KSI | CRES / Passivate | NAS1291C02 | MS21042-02 | NAS620C2 |
| NAS1101E02-6 | Screw | Pan / Fillister | Offset Cruciform (Torq-Set) | 0.086 - 56 (#2) | 0.375 | 160 KSI | CRES / Passivate | NAS1291C02 | MS21042-02 | NAS620C2 |

# New Component Request

- **PRF & Limited (LTD) Parts in CAD Database** *Schematic Symbol/PWB Footprint*
  - **Obsolete & Not Recommended New Design (NRND) Parts Coded to Prevent Reuse**
- **When Unable to Select a Part for Specific Design Requirement**
  - **Design Team selects Candidate Part**
  - **Process a New Part Request (Generic Function, package not defined)**
  - **Team Components Engineer + Commodity Subject Matter Expert Review**
    - **Assign Approval Code: "PRF" or "LTD"**
    - **Approved Part Number – Manufacturer with Part Design Authority**
    - **Auto Email: Review by Multiple Departments (Manufacturing Engineering)**
  - **Request Processed – Work Started in CAD Database**

LOCKHEED MARTIN

**NEW COMPONENT REQUEST FORM**

Rev 6

**Required Inputs**

EMAIL

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Request Date: | 04/28/15 | Electrical Engineer: | James | Component Engineer: | Philip | Packaging Engineer: | Andrew |
| Program/Project: | Example | CCA Number/ Name | 7777777777 | Intended Use: Prod/Eng/Lab | Eng | Charge Number: | XXXXXXXX |
| Program Operating Temp. Range (-/+°C) | -40C to 85C | | | Storage Temp. Range Requirement (-/+°C) | -55C to 85C | | |
| | Scheduled DATE for Design HAND-OFF to EPCAD: | | | Prod Ops Engineer: | | Quality Assurance Engineer: | |

| Item | Requested VENDOR Part Number | Approved Part Number (CE USE ONLY) | Appr. Code (LTD / PRF) (CE USE) | Description | Package / Notes |
|---|---|---|---|---|---|
| 1 | ExampleFlash | LMPARTNUMBER-01 | PRF | Flash Memory, 1Gbit | Reballed SAC BGA, 0.8 mm pitch |

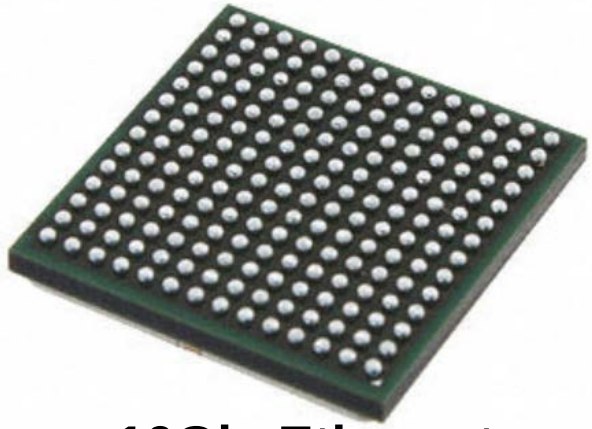
# New Component Technologies

- **Technology Refresh in Existing Platforms – same space:**
  - **More Processing Power and Speed (Throughput)**
  - **Increase in Memory Density and Bandwidth**
  - **Advanced Capability**
  - **Engineers “Pushing the Envelope”**

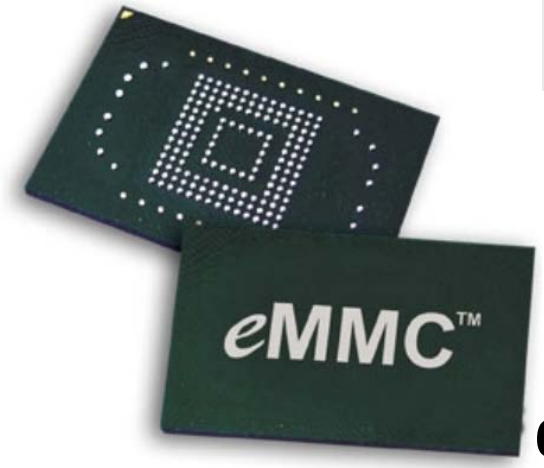
- **Risk Reduction Focus Areas:**
  - **Thermal (Power Dissipation/Heat)**
  - **Noise**
  - **Associated Networks with High Speed Interconnect**
  - **Signal Integrity**
  - **Existing cable volumes**

# New Component Technologies (cont)

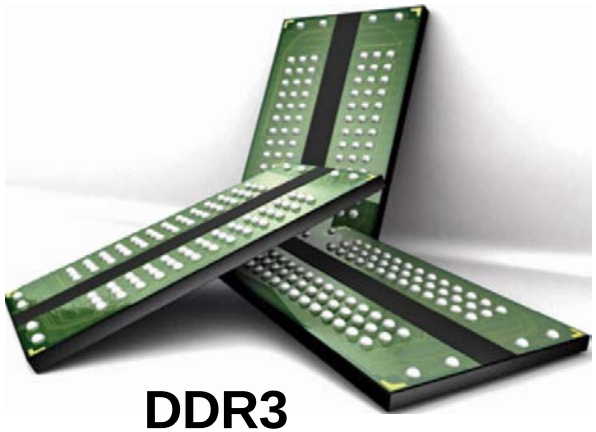

20 nm



10Gig Ethernet




64Gb Nand Flash



DDR3

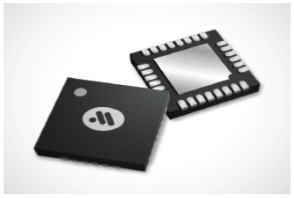
# New Component Technologies - Hurdles

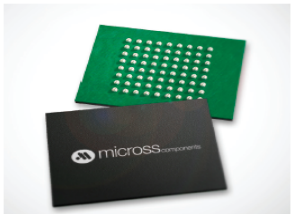
## PRF SnPb Reballed Lead Free SnAgCu BGA's

micross components
transforming specialty electronics

**Retail+™ Product Line**
Lockheed Martin MFC Custom Requirements

**Retail+™** Reballed or Lead-Solder Exchanged and Screened






Micross Components' Retail+™ product line enables Lockheed Martin to use industry leading components that were not previously available for their hi-rel, long life applications. Micross purchases COTS components and enhances them for use in military, aerospace, transportation, industrial and medical applications.

Retail+™ products are converted from RoHS Pb-free solder metallurgies to tin-lead (SnPb 63/37) based metallurgies. Pb-free BGA packages are reballed and Pb-free leaded and non-leaded packages go through a solder dip exchange using our established processes that brings them up to standards for use in hi-rel applications.

**Lockheed Martin MFC CSP000002**

All product purchased with the MFC part # suffix will be compliant to Lockheed Martin MFC CSP000002.

MICROSS COMPONENTS

**Revisions**

| LTR | Description | DATE (YY-MM-DD) | Approved by |
|---|---|---|---|
| A | Customer print created for Lockheed Martin | 04-28-15 | Engineer |

Product Sensitivity:
- ESD Sensitive
- Moisture Sensitive (MSL Level 3)

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rev Sheets | | | | | | | | | | | | | | | | |
| Rev Sheets | | | | | | | | | | | | | | | | |
| Rev Status Of Sheets | Rev Sheets | A 1 | A 2 | A 3 | | | | | | | | | | | | |

| | |
|---|---|
| **Official Use Only** | Customer: **Lockheed Martin** |
| | Customer Print Number: EVS EXAMPLE<br>Customer Orderable Part Number: EVS EXAMPLE |
| Prepared by | |
| Checked by | |
| Date Drawing Approved | Manufacturer: **e2v aerospace & defense, inc.** e2v<br>Manufacturer Part Number: EVS MPN EXAMPLE<br>Title: EVS EXAMPLE Customer Print Created for Lockheed |
| Revision Level: A | Sheet 1 of 3 |

- **Extensive Thermal Profiling of Deball and Ball Attachment**
  - **Ensure within manufacturer's Recommended Ramp Rates and Peak Temp**
- **Conversion to SnPb Balls insures Reliability with Proven Tin Lead Solder Process**

**Dual Sources Using LMMMC BGA Reballing Standard**

# Path Forward

- **Manage Selection of Tactically Proven PRF Parts**
  - **Monitor Candidate Parts**
  - **Stay Educated in Industry Roadmaps and Technology**
  - **Encourage Design Reuse**
  - **Focus Designers to New Proven Technologies**
    - **Lunch and Learns**
    - **Preferred Parts Web Site**
  - **Metrics in Design Assurance Reviews**

- **Pruning:**
  - **Close Obsolete and NRND PRF Parts**

**Technology Refresh Starts with Parts**