Vitramon MLCC Qualification History

July 1999 — QS 9000

May 2002 — ISO 9001

Jan 2003 — ISO 14001

June 2004 — ISO/TS 16949 (IATF 16949)

Dec 2008 — OHSAS 18001

June 2010 — MIL-PRF-55681, MIL-STD-790, DSCC QPL

May 2012 — VDE for SMD Safety MLCC

Sep 2013 — ISO 13485

April 2015 — MIL-PRF-123

Increasing Levels of Certifications

Automotive
↓
Military / Hi-Rel
↓
Medical

Hi-Reliability PME MLCCs "Performance is Paramount"

MIL-123

Certified MIL PRF 123 Supplier

Highest Quality Level Established: 4,000 h Qualification

Competitive pricing, short lead times; cage code 2770A

MIL-123 Equivalent

Same Build, Screening, Qualification, and QCI as MIL PRF 123

Sizes down to 0402; Voltages 6.3V – 500V; Selected ESR available

No SCD required: ESC technical support can create a unique PN

CDR Series

CDR (MIL-PRF-55681)

Vishay is only source for 0402 and 0603 body sizes

DSCC Drawings

Broader Product Offering

7 different DSCC drawings including 3 new RF MLCCs (05001, 05002, 05003)

Hi-Reliability Series

Robust Designs / High Reliability

Widest Product Offering

Customer Specific Products

Lead (Pb) Bearing Automotive MLCC's

Commercial Space, LEO, Military, Avionics Applications

Vitramon VJ.32 Series

AEC-Q200 Certification with Sn-Pb Termination Finish

Whisker Prevention

Reliable Performance

Rev: 2.0 Jan 27, 2023

VISHAY

The DNA of tech.™

Vishay MLCC Hi-Rel Product Offering Per Case Sizes

	402	603	805	1206	1210	1805	1808	1812	1825	2220	2225	3640
MIL-PRF-123			■	■	■		■	■	■		■	
MIL-123 Equivalent	■	■	■	■	■		■	■	■	■	■	■
CDR Series	■	■	■	■	■	■	■	■	■	■	■	
DSCC	■	■	■	■								
DSCC RF	■	■	■									
Hi-Rel / SCD	■	■	■	■	■		■	■	■	■	■	■
Pb Finish Automotive	■	■	■	■	■							

★ UNIQUE TO VISHAY - Efficient Hi-Rel solution for applications requiring miniaturization.

Rev: 2.0 Jan 27, 2023

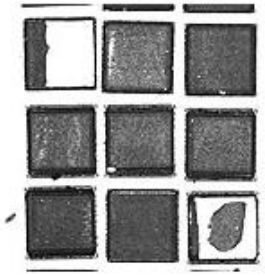
VISHAY

The DNA of tech.™

MIL-PRF-123

Intense qualification and processing

- 4,000 hour life test to qualify @ 125°C and twice rated voltage
- Each production lot must pass 1,000 hour life test
- Each piece must pass Hot IR with IR measured at 125°C
- Each piece must pass an internal structure examination
  - Acoustic scanning: allows image of internal construction
  - Identifies parts with defects that are removed and scrapped.



- Vishay very competitive and short lead time vs. competition

MIL-PRF-123 : http://www.vishay.com/doc?45229

Up-Screening to MIL PRF 123 equivalent

- Today's Mil / Space designs often require MLCCs that fall outside the current CDR and MIL PRF 123 specification (MLCCs having certified reliability)
    - Smaller than 0805 (0402 and 0603 available)
    - Larger than 1825 (Mil 55681) or 2225 (Mil 123)
    - Higher cap values
    - Voltages other than 50 & 100 (6.3V – 500V)
- The requested capacitors must be up-screened to verify conformance to MIL-PRF-55681 or MIL-PRF-123 requirements …such as:
    - Group A, B, and/or C testing
    - 2000 hr life certified capability (internal qual data)
    - 100% Voltage conditioning to sort out infant mortality failures
    - 100% CSAM (non-destructive) internal inspection for construction defects
    - 100% Hot I_R testing at 125°C
- Vishay will support up-screening requests, including selected ESR and 4000 hour Qual testing
    - ***Contact ES Components for FAE technical support!***
    - ***No SCD required: we can create a unique PN specific to your application!***

CDR Series

Processing and Testing

- Process & tested to MIL-PRF-55681
- Designs have established reliability – QPL
- DLA specified drawings / offering
- Maintenance testing required every lot
- Federal stock control number CAGE CODE 2770A
- Sizes **0402, 0603**, 0805, 1206, 1210, 1805, 1808, 1812, 1825 and 2225
- ★ *0402 and 0603 only from Vishay*
- BP and BR / BX dielectrics offered
- Tin / lead termination codes “W”, “Z”, and “U”
- Lead (Pb)-free termination codes “Y” and “M”

CDR-MIL-PRF-55681 : http://www.vishay.com/doc?45026

DSCC / DLA Series

Processing and Testing

- Process & tested to MIL-PRF-55681
- DLA specified drawings / offering
- ★ Federal stock control number CAGE CODE 2770A
- Designs are not established reliability
- Size 0402, 0603, 0805 and 1206
  - BP and BR / BX dielectrics offered
- ★ Hi Frequency BP size 0402, 0603 and 0805
- Customized testing is available
  - Full group C, 2000H life test only, 1000H life test only, Low voltage humidity test only

DSCC / DLA Series

DSCC 03028 (size 0603) : http://www.vishay.com/doc?45043

DSCC 03029 (size 0402) : http://www.vishay.com/doc?45042

DSCC 05006 (size 0805) : http://www.vishay.com/doc?45048

DSCC 05007 (size 1206) : http://www.vishay.com/doc?45049

High Frequency :

DSCC 05001 (size 0805) : http://www.vishay.com/doc?45068

DSCC 05002 (size 0603) : http://www.vishay.com/doc?45069

DSCC 05003 (size 0402) : http://www.vishay.com/doc?45070

Vishay Hi-Rel Product Offering

- Product is manufactured with the same equipment used for Military & Medical capacitors
  - Hi-Rel product is qualified to MIL-PRF-55681

- Available Terminations:
  - Ni barrier with Tin/Lead terminations
  - Ni barrier with 100% Tin
  - Non-Magnetic (AgPd) for conductive epoxy assembly

- Applications:
  - Mission critical for military and aerospace
  - System critical for medical

Lead (Pb)-Bearing AEC-Q200 Qualified MLCCs

VJ....32 Lead-Bearing Finish MLCCs

FEATURES

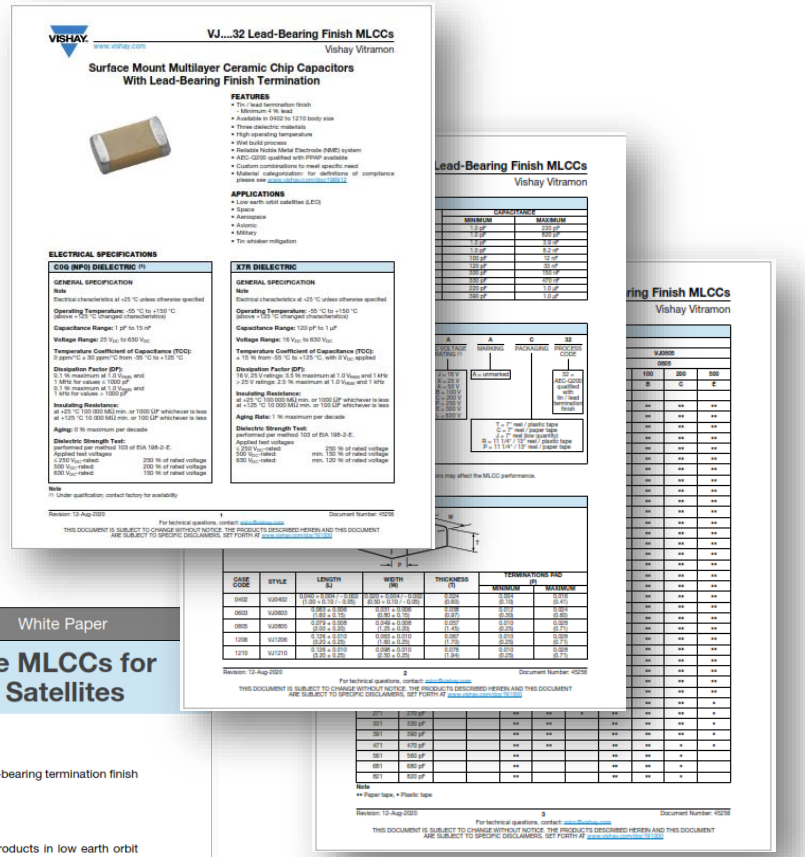
- AEC-Q200 qualified with PPAP available
  - IATF 16949 & MIL-STD-790 certified facilities
- Vishay reliable PME system and WET build
  - Same as Vishay MIL PRF 123 devices
- **Tin / Lead termination finish (≥4% Pb)**
  - **Tin Whisker Mitigation!!**
- Available in 0402 to 1210 body size

APPLICATIONS

- Low earth orbit satellites (LEO)
- Space
- Aerospace
- Avionic
- Military

WHITE PAPER SUPPORT

- Applications
- Reliability



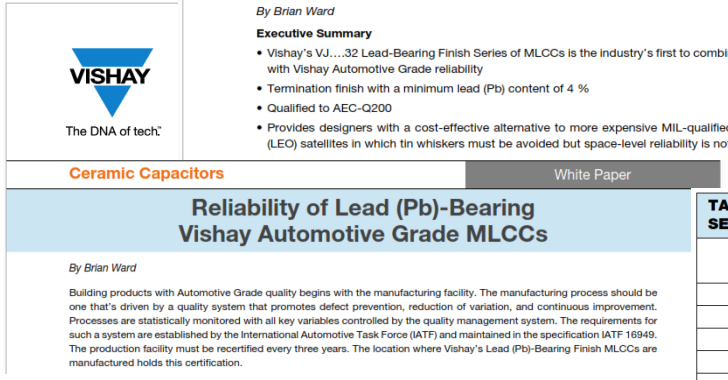


TABLE 2 - SUMMARIZED FIT / MTTF VALUES FOR VISHAY'S LEAD (Pb)-BEARING FINISH SERIES OF MLCCS

BODY SIZE	NP0		X7R	
	FIT (1)	MTTF (1) (YEARS)	FIT (1)	MTTF (1) (YEARS)
0402	0.0122	9 360 731	0.013	8 618 721
0603	0.0308	3 710 046	0.101	1 130 137
0805			0.072	1 575 342
1206			0.130	877 854
1210			0.092	1 244 292

Note
(1) 25 °C and 50 % rated voltage

[vj32leadbearingfinishmlccs.pdf (vishay.com)]

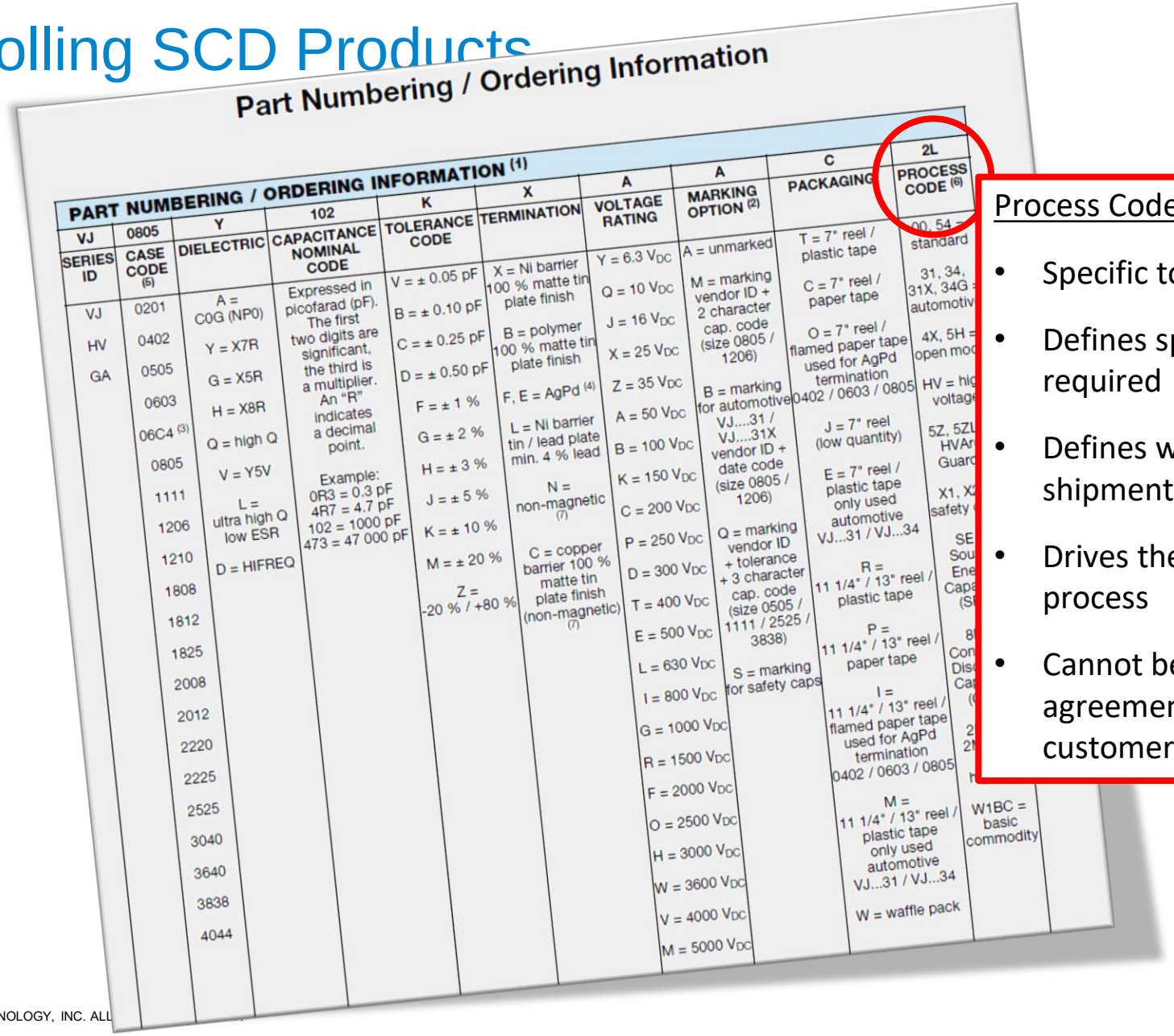
Vishay Hi-Rel Catalog Custom Testing

Hi-Rel MLCCs tested to specific requirements
Controlled by 2 or 3 digit process code at end of PN

Example: VJ0603Y104JXXAC68 or VJ0603Y104JXXAC2MP

Process Code	5G	68	2L	2M	2MP
MIL-PRF-55681 SCREENING			X	X	X
100% voltage conditioning	X	X	X	X	X
Group A		X	X	X	X
Group C			X	X	X
Life Test			X	X	X
Group C results before shipping				X	X
Group C data pack, extra cost					X
C of I		X	X	X	X
C of C	X	X	X	X	X

Controlling SCD Products



Part Numbering / Ordering Information

PART NUMBERING / ORDERING INFORMATION (1)

VJ	0805	Y	102	K	X	A	A	C	2L
SERIES ID	CASE CODE (5)	DIELECTRIC	CAPACITANCE NOMINAL CODE	TOLERANCE CODE	TERMINATION	VOLTAGE RATING	MARKING OPTION (2)	PACKAGING	PROCESS CODE (6)
VJ HV GA	0201 0402 0505 0603 06C4 (3) 0805 1111 1206 1210 1808 1812 1825 2008 2012 2220 2225 2525 3040 3640 3838 4044	A = C0G (NP0) Y = X7R G = X5R H = X8R Q = high Q V = Y5V L = ultra high Q low ESR D = HIFREQ	Expressed in picofarad (pF). The first two digits are significant, the third is a multiplier. An "R" indicates a decimal point. Example: 0R3 = 0.3 pF 4R7 = 4.7 pF 102 = 1000 pF 473 = 47 000 pF	V = ± 0.05 pF B = ± 0.10 pF C = ± 0.25 pF D = ± 0.50 pF F = ± 1 % G = ± 2 % H = ± 3 % J = ± 5 % K = ± 10 % M = ± 20 % Z = -20 % / +80 %	X = Ni barrier 100 % matte tin plate finish B = polymer 100 % matte tin plate finish F, E = AgPd (4) L = Ni barrier tin / lead plate min. 4 % lead N = non-magnetic (7) C = copper barrier 100 % matte tin plate finish (non-magnetic) (7)	Y = 6.3 VDC Q = 10 VDC J = 16 VDC X = 25 VDC Z = 35 VDC A = 50 VDC B = 100 VDC K = 150 VDC C = 200 VDC P = 250 VDC D = 300 VDC T = 400 VDC E = 500 VDC L = 630 VDC I = 800 VDC G = 1000 VDC R = 1500 VDC F = 2000 VDC O = 2500 VDC H = 3000 VDC W = 3600 VDC V = 4000 VDC M = 5000 VDC	A = unmarked M = marking vendor ID + 2 character cap. code (size 0805 / 1206) B = marking for automotive VJ....31 / VJ....31X vendor ID + date code (size 0805 / 1206) Q = marking vendor ID + tolerance + 3 character cap. code (size 0505 / 1111 / 2525 / 3838) S = marking for safety caps	T = 7" reel / plastic tape C = 7" reel / paper tape O = 7" reel / flamed paper tape used for AgPd termination 0402 / 0603 / 0805 J = 7" reel (low quantity) E = 7" reel / plastic tape only used automotive VJ...31 / VJ...34 R = 11 1/4" / 13" reel / plastic tape P = 11 1/4" / 13" reel / paper tape I = 11 1/4" / 13" reel / flamed paper tape used for AgPd termination 0402 / 0603 / 0805 M = 11 1/4" / 13" reel / plastic tape only used automotive VJ...31 / VJ...34 W = waffle pack	00, 54 = standard 31, 34, 31X, 34G = automotiv 4X, 5H = open moc HV = hig voltage 5Z, 5ZU HVAr Guarc X1, X2 safety SE Sou Ene Capa (St 8 Con Dis Cap 2 2M H W1BC = basic commodity

Process Code

- Specific to a customer
- Defines special testing required
- Defines what is reported with shipment
- Drives the manufacturing process
- Cannot be changed without agreement between customer and Vishay