

Wire Common Mode Choke Rating Voltage

1. Scope

The purpose of this document is to explain how Laird defines and verifies rating voltage of wire common mode chokes.

2. General Definition

Rating Voltage: The maximum voltage to be applied in service.

Breakdown Voltage: The failure line-to-line voltage.

Withstand Voltage: 75% of the breakdown voltage. It is the non-destructive voltage that the coils should be tested at.

3. Rating Voltage Determination

- 3.1. Collect minimum line-to-line breakdown voltage value by sampling test, and use 90% of this value as a safety breakdown voltage spec.
- 3.2. Multiply the breakdown voltage spec by 75% to get withstand voltage spec.
- 3.3. Refer to UL1283 standard to calculate a maximum constant line-to-line voltage the parts can be applied to. If withstand voltage spec is between 1000V and 1500V, maximum constant voltage is 250V. If withstand voltage spec is more than 1500V, $V_{\text{constant}} = 250V + (V_{\text{withstand}} - 1500V) / 2$.
- 3.4. As all parts will be soldered on customer's PCBA, rating voltage must comply with IPC2221 standard which specify maximum constant voltage applied to the parts base on different termination spacing. Termination spacing multiplied with related grads can get related maximum constant voltage according to below table.

Termination spacing(mm)	Maximum Constant Voltage(V) DC or AC peak	Grads(V/mm)
0.13	0-15	115
0.25	16-30	120
0.40	31-50	125
0.50	51-100	200
0.80	101-300	375
1.50	301-500	333
>1.50	-	328

Note: Use line-to-line spacing in Land Pattern specified in product prints as termination spacing.

- 3.5. When V_{constant} is less than the voltage IPC2221 permits we use V_{constant} as rating voltage spec, otherwise rating voltage should be specified as the maximum voltage IPC2221 permits. Rating voltage is specified as the minimum value of maximum constant voltage IPC2221 and UL1283 permit.

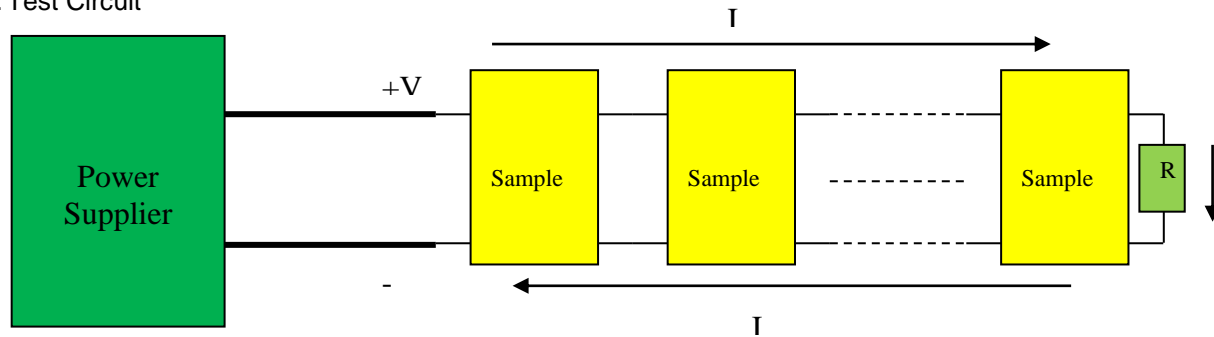
4. Rating Voltage Testing Methods

4.1. Test Methods

Test Item	Test Methods	Test Requirement	Test Equipment
Rating Voltage	1. 1000hr at 85°C ambient. 2. Load both rating voltage and rating current. 3. Measurement at 24±2 hours after test conclusion.	1. No visible mechanical damage. 2. Impedance Change < ±10%. 3. IR@75V Change < ±30%.	1. Temperature Chamber. 2. DC power supplier (500V /100A /2.4KW)

Note: If testing power is out of rating power of the power supplier, keep test voltage as rated voltage and decrease current to ensure testing power meets test equipment capability.

4.2. Test Circuit



5. Parts list with Rating Voltage Specification

Part Number	Breakdown Voltage (VDC)	Withstand Voltage (VDC)	V _{constant} by UL1283 (VDC)	Land Pattern spacing (mm)	V _{constant} by ICP2221 (VDC)	Rating Voltage (VDC)
CM2021Y330R-10	2490	1681	340	0.76	285	285
CM2545X171B-10	2490	1681	340	1.27	423	340
CM2545X171B-15	2490	1681	340	1.27	423	340
CM2545X171R-10	2490	1681	340	0.76	285	285
CM2722R151R-10	1290	871	145	0.25	30	30
CM2722R201R-10	1290	871	145	0.25	30	30
CM2722R800R-10	1290	871	145	0.25	30	30
CM2722R800R-15	1290	871	145	0.25	30	30
CM3032V121R-10	1690	1141	250	0.25	30	30
CM3032V201R-10	1690	1141	250	0.25	30	30
CM3032V301R-10	1690	1141	250	0.25	30	30
CM3421Y600R-10	2490	1681	340	0.76	285	285
CM3440Z171B-10	1720	1161	250	1.00	333	250
CM3440Z171R-10	1800	1215	250	0.51	100	100
CM3440Z171R-15	1800	1215	250	0.51	100	100
CM3822R151R-10	1290	871	145	0.25	30	30
CM3822R201R-10	1290	871	145	0.25	30	30
CM3822R800R-10	1290	871	145	0.25	30	30
CM4440Z121R-10	1800	1215	250	0.51	100	100
CM4545Z131B-10	2490	1681	340	1.27	423	340
CM4545Z131R-10	2490	1681	340	0.76	285	285
CM4732V201R-10	1690	1141	250	0.25	30	30

Part Number	Breakdown Voltage (VDC)	Withstand Voltage (VDC)	V _{constant} by UL1283 (VDC)	Land Pattern spacing (mm)	V _{constant} by ICP2221 (VDC)	Rating Voltage (VDC)
CM4732V301R-10	1690	1141	250	0.25	30	30
CM5022R151R-10	1290	871	145	0.25	30	30
CM5022R201R-10	1290	871	145	0.25	30	30
CM5022R800R-10	1290	871	145	0.25	30	30
CM5441Z101B-10	2500	1688	344	2.03	665	340
CM5441Z101B-13	2500	1688	344	2.03	665	340
CM5441Z161B-10	2500	1688	344	2.03	665	340
CM5441Z161B-13	2500	1688	344	2.03	665	340
CM5441Z161B-15	2500	1688	344	2.03	665	340
CM5441Z161R-10	2500	1688	344	2.03	665	340
CM5441Z161R-13	2500	1688	344	2.03	665	340
CM5740Z171B-10	1720	1161	250	1.00	333	250
CM5740Z241B-10	1720	1161	250	1.00	333	250
CM5740Z171R-10	1800	1215	250	0.51	100	100
CM5942V301B-15	1900	1283	250	0.60	225	225
CM6032V201R-10	1690	1141	250	0.25	30	30
CM6032V301R-10	1690	1141	250	0.25	30	30
CM8663Z161B-10	3000	2025	512	3.00	984	512