



a YAGEO company

R53B X2 Sales Presentation

R53B X2

EMI Suppression Capacitor

- Rated 350 VAC / 800 VDC
- Parallel Construction
- High Temperature
- Harsh Environment



Overview



Key Benefits



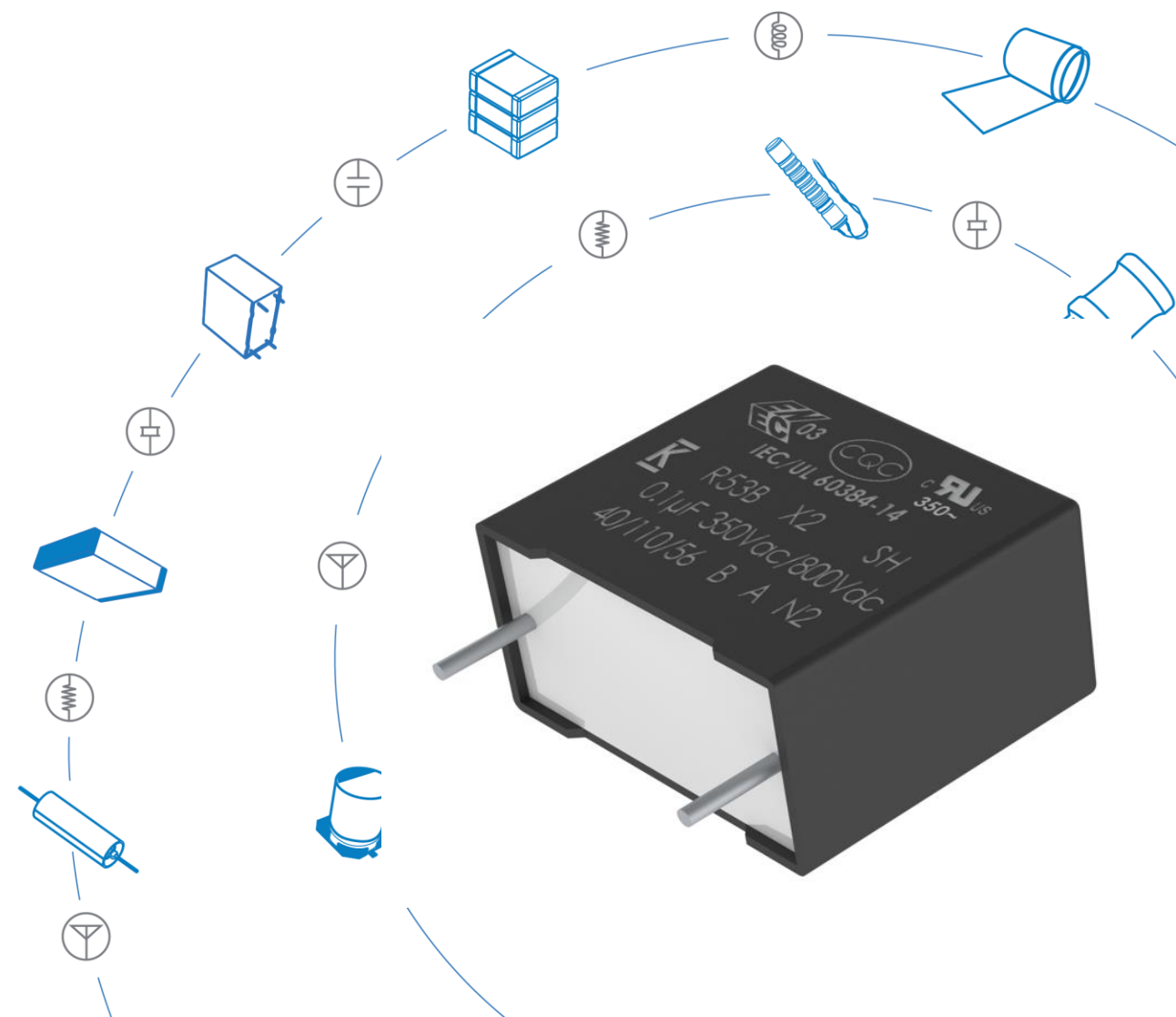
Applications



Versus Competition



Resources



R53B Overview

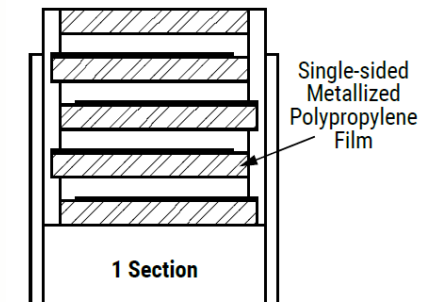
- First to Market X2 MKP technology in terms of combined:



- Harsh environment performance
- High DC voltage capability
- **High operating temperature (125 °C)**
- **Rated 350 VAC / 800 VDC**

- Cap. Range: 0.068 μF – **20 μF**
- Voltage Nominal: 350 V AC | 800 V DC
- Automotive Grade (AEC-Q200)
- Low Halogen Content (JS709C)
- Max. Operational Temperature and Extended Life: 125 °C | 1,000 h (rated voltage)
- Harsh Environment Capability (Temp.|Humidity|Bias Accel. Life Test):
 - 85°C | 85% R.H. | 1,000 h | 350 VAC | 800 VDC (Grade IIIB per IEC)

Internal parallel construction



| Lead Space (mm) | Min. C (μF) | Max. C (μF) |
|-----------------|--------------------------|--------------------------|
| 15 | 0.068 | 0.47 |
| 22.5 | 0.22 | 1.0 |
| 27.5 | 0.82 | 3.9 |
| 37.5 | 4.7 | 10 |
| 52.5 | 15 | 20 |



Automotive

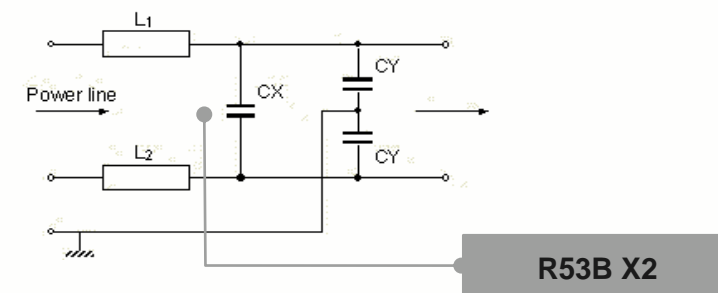


Industrial



Energy

Across-the-Line EMI X2

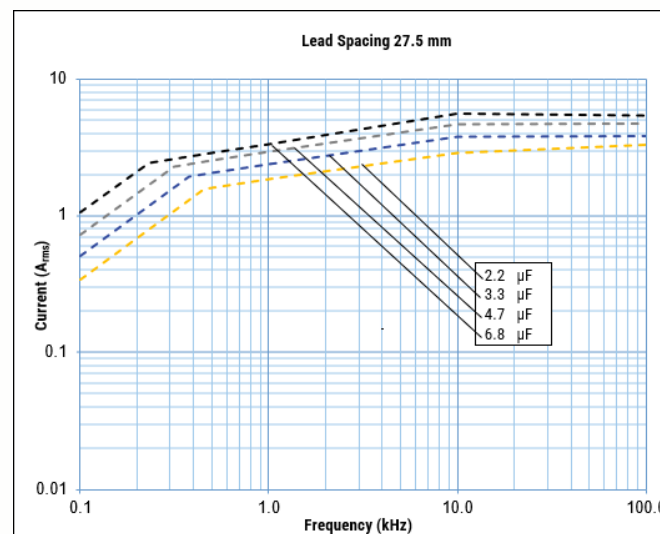


R53B Overview

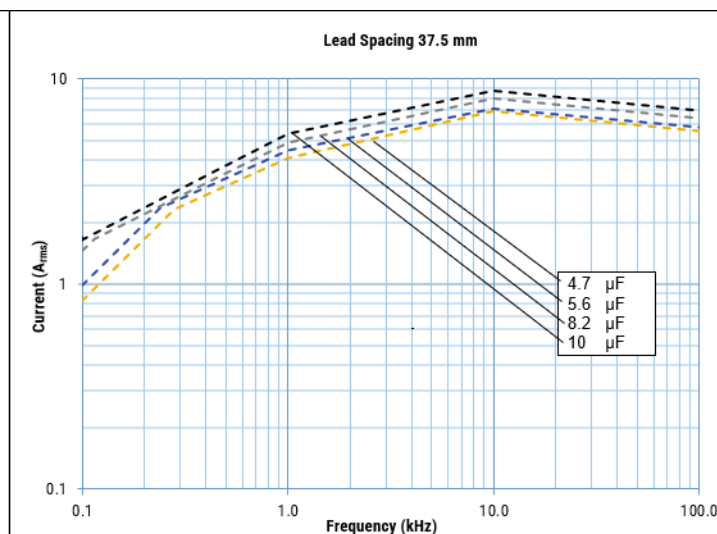
- Comparison between R53B and R53, Class X2, Grade-IIIB series

| Series Name | R53 | R53B |
|--------------------------------|-------------------|-------------------|
| AC DC Voltage (V) | 310 630 | 350 800 |
| EMI Class Type | X2 | |
| Harsh Environment | 85 °C 85% R.H. | |
| (THB Accel. Life Test) | 310 VAC 1000 h | 350 VAC 1,000 h |
| | 560 VDC 1,000 h | 800 VDC 1,000 h |
| Cap Range | 0.1 µF – 22 µF | 0.068 µF – 20 µF |
| Lead Space (pitch) (mm) | 15 to 37.5 | 15.0 to 52.5 |
| Dielectric | MKP | |
| AEC-Q200 | Yes | |
| Max. Temp (°C) | 110 | 125 |
| Life at 125 °C | - | 1,000 h |
| Dimensions (mm) (4.7 µF) | 16 x 30 x 32 | 20 x 40 x 42 |
| Current Capability (4.7 µF) | 4.62 A at 10 kHz | 6.94 A at 10 kHz |

R53 Current Capability



R53B Current Capability



R53B Key Benefits

Harsh Environment Performance At Rated Voltage and Smallest Lead Space

R53B is the unique and best solution for applications where the smallest lead spacing, volume (mm³), and best THB Performance are vital for the electronics designs at the rated voltage.

Example of dimensions and performance of R53B versus the competition for a 0.47 µF X2 EMI solution

| Brand Series | Lead Space | Dimensions T,H,L (mm) | Volume (mm ³) | Volume Diff. (%) | Rated Voltage (AC/DC) | Harsh Environment |
|---------------|------------|-----------------------|---------------------------|------------------|-----------------------|-------------------|
| KEMET R53B | 15 | 11 x 19 x 18 | 3,762 | -- | 350 / 800 | Yes |
| TDK B32924 | 27.5 | 11 x 19 x 31.5 | 6,583 | + 75% | 350 / 650 | Yes |
| FARA C4B(W/V) | 22.5 | 9 x 18.5 x 26.5 | 4,412 | + 17% | 350 / 630 | Yes* |

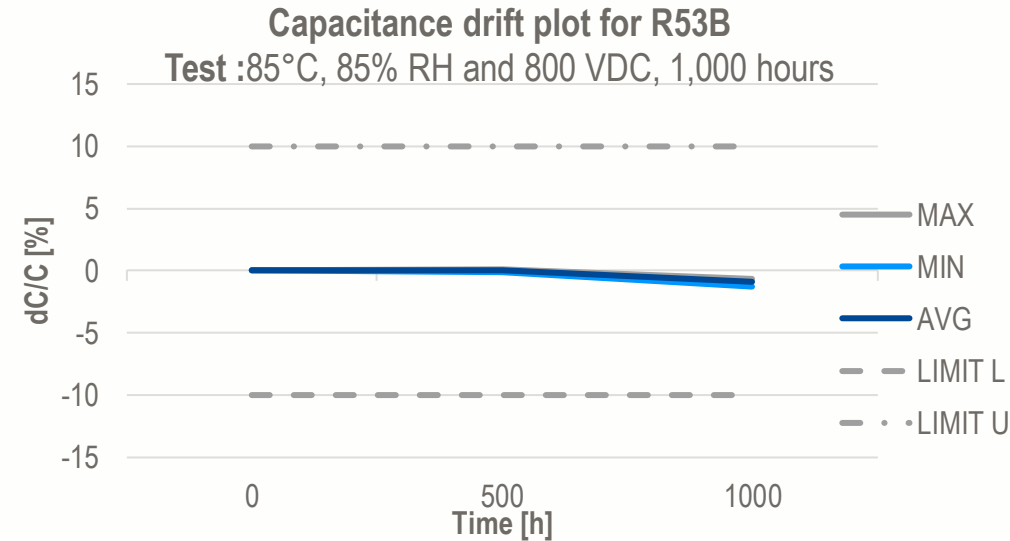
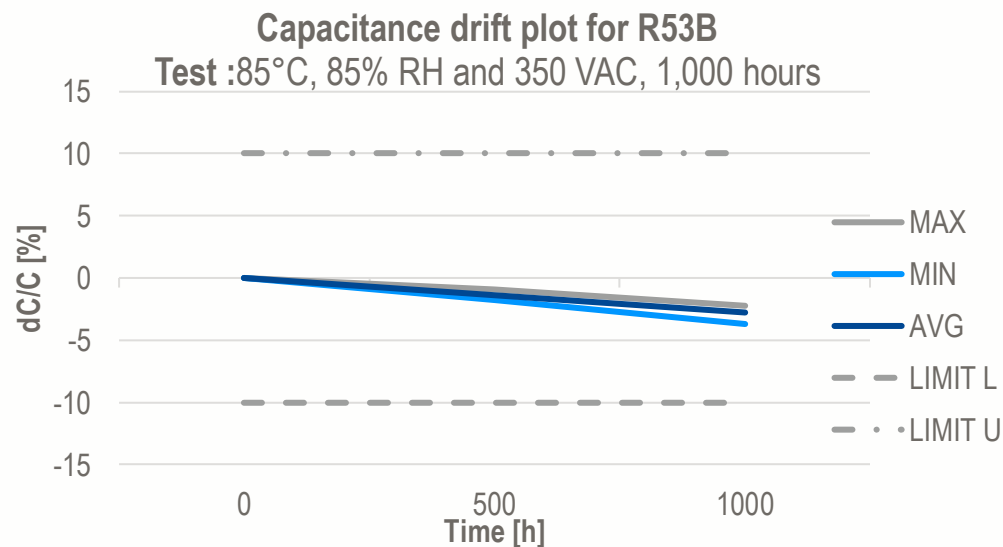
* The FARA series is only for C>0.47 µF

R53B Key Benefits



Harsh environment Capability - Accelerated Life Test Under Temperature | Humidity | Bias

- 85°C | 85% R.H. | AC Bias: 350 V | DC Bias: 800 V | 1,000 h | Capacitance Drift ($\Delta C/C$) Limits: $\pm 10\%$

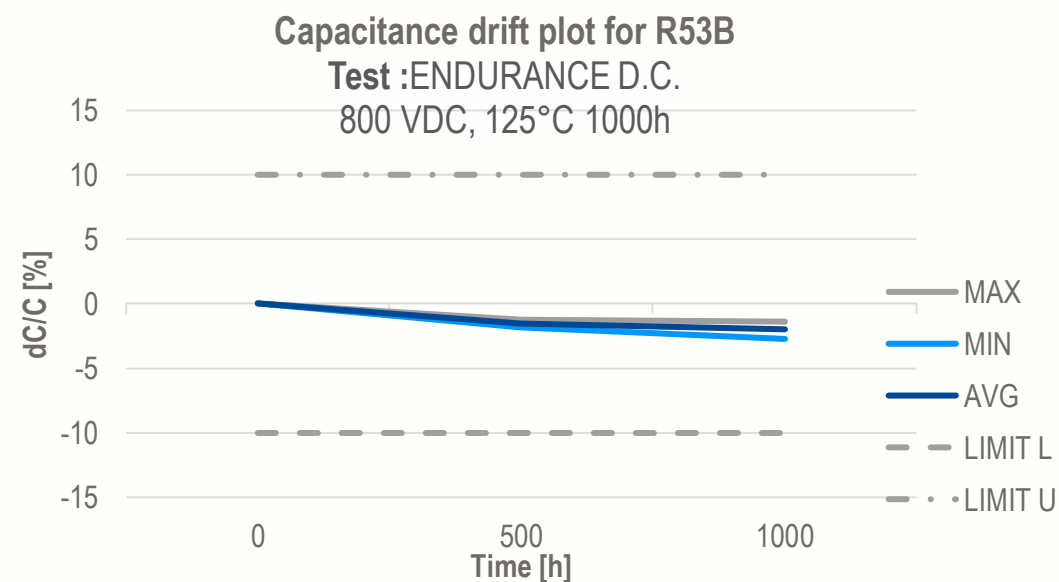
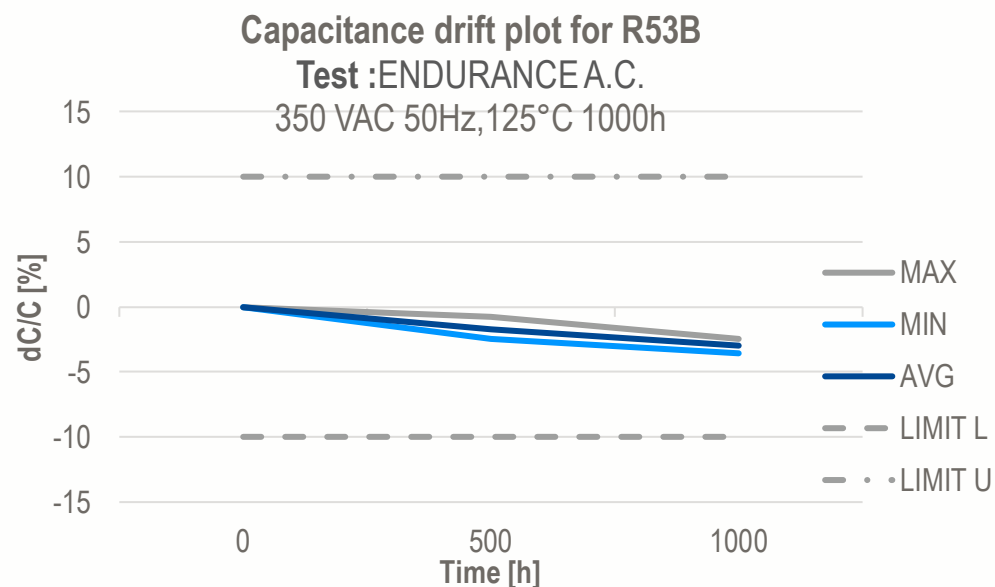


R53B is the only robust EMI X2 technology in the market that offers the smallest lead spacing solution combined with an excellent harsh environment capability in rated AC and DC voltages

R53B Key Benefits

High Temperature Capability

- VAC: 350 V | VDC: 800 V | Temperature: 125 °C | 1,000 h | Capacitance Drift Limits: $\pm 10\%$



R53B Series is the first to market X2 EMI Suppression solution capable of reaching an extended service life up to 1,000 hours when exposed to an operating temperature of up to 125 °C.

R53B Applications



Automotive

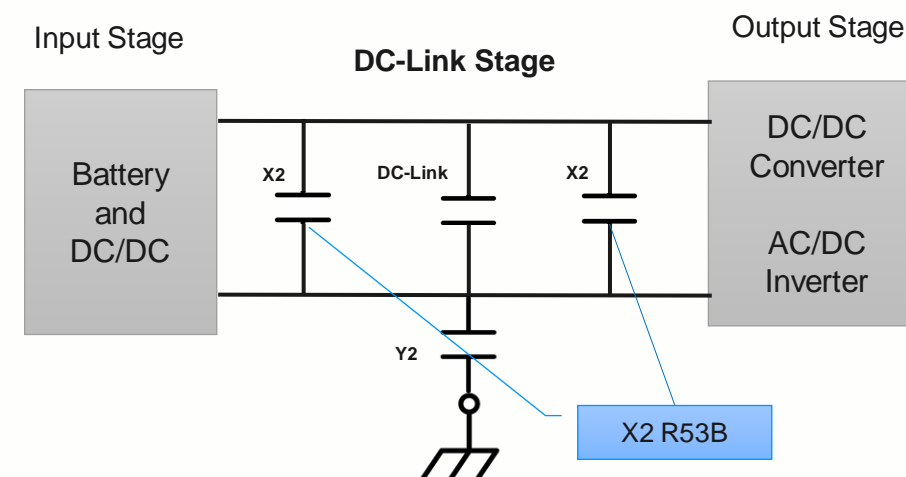


HV DC/DC and DC/AC Converters - 800 VDC

Automotive application in the HV filter and HV bus has the rated voltage of 800V, max. will be 1000V.

R53B is an AEC-Q200 qualified capacitor with up to 1,000 VDC capability under extremely high temperature and humidity conditions, and its Hipot test qualifications are up to 2 kV peak.

These features perfectly fit the demanding HV automotive battery systems and traction Inverters for Hybrid and Electric Vehicles.



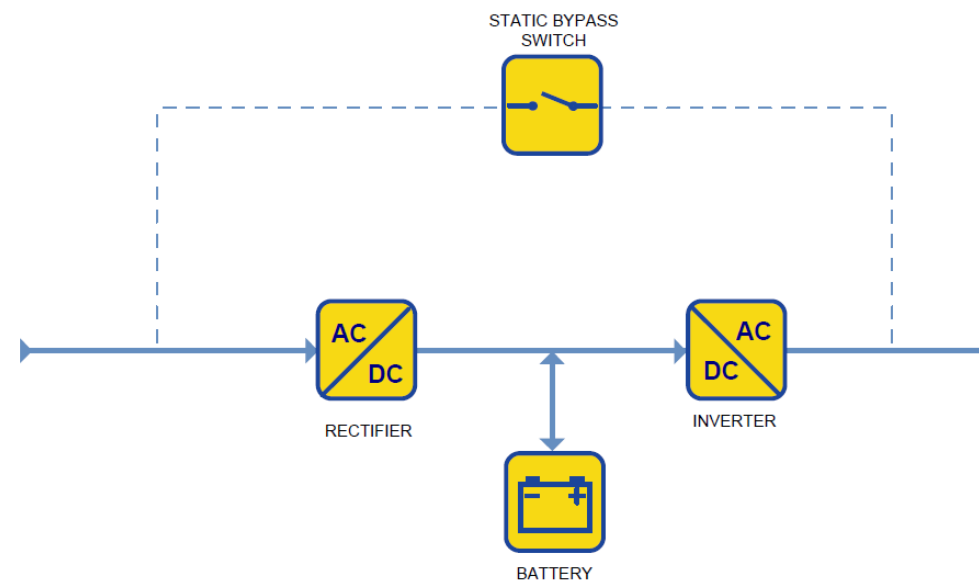
R53B Applications

Industrial



3-Phase UPS

R53B high temperature 125 °C, Rated voltage 350 VAC/800 VDC, and high reliability perfectly match the high demanding specifications of the industrial UPS required for the Industrial process, Datacenter and Critical infrastructure.

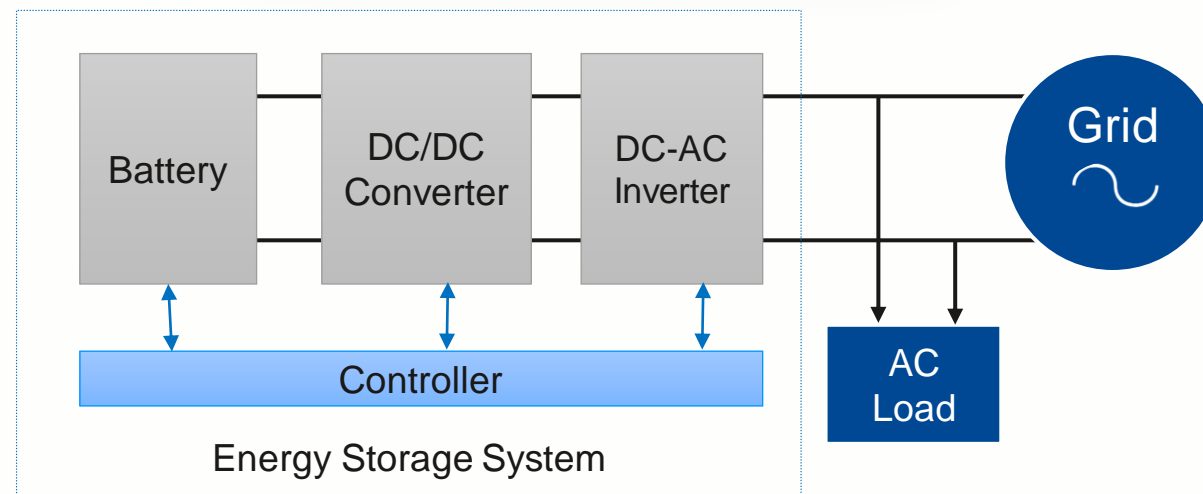


R53B Applications

Energy

Battery Energy Systems for Solar Inverters and DC/DC Charging Systems

Thanks to its small lead spacing, Rated 800 VDC and 350 VAC voltage, and its extended reliability in harsh environmental conditions, R53B is the perfect EMI solution for energy storage systems that require multiple X2 capacitors on their DC/DC and DC/AC converters boards.

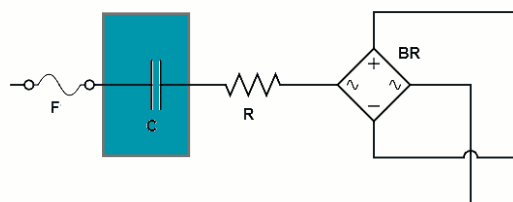


R53B Applications



Smart Utility Meter

- Capacitive PS on E-Meter
- THB with Grade IIIB compliance for long life stability and reliability under harsh environments.
- High Reliability/Lifetime



In Series with the Main

Industrial  & Energy 



Reliability at AC Voltage

| Temperature(°C) | Voltage Ratio (Vac) | Lifetime Khrs [DeltaC=-20%] |
|-----------------|---------------------|--------------------------------|
| 85 | 250 | 150 |
| | 305 | 150 |
| | 330 | 115 |
| | 350 | 70 |

R53B versus Competition



| Series Name | R53B | B32924*4...B32928*4 | C4B (W/V) |
|---|----------------------------|---------------------------|--------------------------|
| AC DC Voltage (V) | 350 800 | 350 650 | 350 630 |
| EMI Class Type | X2 | X2 | X2 |
| | 85 °C 85% R.H. | 85 °C 85% R.H. | 85 °C 85% R.H. |
| Harsh Environment (THB Accel. Life Test) | 350 VAC 1,000 h | 330 VAC 1000 h | 300 VAC 1000 h |
| | 800 VDC 1,000 h | Not VDC tested | Not VDC tested |
| Cap Range | 0.068 μ F – 20 μ F | 0.47 μ F – 20 μ F | 0.1 μ F – 20 μ F |
| Lead Space (pitch) (mm) | 15.0 to 52.5 | 27.5 to 52.5 | 15.0 to 52.5 |
| Dielectric | MKP | MKP | MKP |
| AEC-Q200 | Yes | Yes | No |
| Max. Temp (°C) | 125 | 110 | 110 |
| Life at 125 °C | 1,000 h | N/A | N/A |

R53B X2 capacitors offer the best combined performance in terms of **Lead Space**, **harsh environment**, **high-temperature** and **reliability** in the electronic marketplace.

Frequently Asked Questions

Q: What is the R53B series?

A: The R53B is an X2 Suppression capacitor series constructed of metallized polypropylene film encapsulated with self-extinguishing resin in a box of material that meets the requirements of UL 94 V-0. The R53B series is ideal for harsh environmental conditions and meets the demanding Automotive Electronics Council's AEC-Q200 qualification requirements. And it is THB Grade-IIIB series with high operating temperature (125 °C) and high rated voltage (350 VAC/800 VDC).

Q: What capacitance range is available?

A: 0.068 μ F – 20 μ F.

Q: What is the part number system of R53B?

A: The structure of the R53B is as follows:

| R53 | B | I | 3100 | 00 | 0 | 0 | M | C-Spec |
|------------------------------|---------------------|--|---|----------------------------|------------------------------------|------------------|--------------------------------|--|
| Series | Rated Voltage (VAC) | Lead Spacing (mm) | Capacitance Code (pF) | Packaging | Internal Use | Internal Use | Capacitance Tolerance | (optional) |
| X2, Metallized Polypropylene | B = 350 | I = 15.0 N = 22.5 R = 27.5 W = 37.5 Y = 52.5 | The last three digits represent significant figures. The first digit specifies number of zeros to be added. | See Ordering Options Table | 0 = Internal Parallel Construction | 0 = Internal Use | K = \pm 10% M = \pm 20% | blank = standard V103 = 4 pins, S = 37.5mm, S1 = 10.2mm V104 = 4 pins, S = 37.5mm, S1 = 20.3mm |

Frequently Asked Questions

Q: What are typical applications associated with the R53B series?

A: Typical applications are the EMI filter stage (across the main/series with the main) in the 3-phase UPS, Smart Meter, Energy Storage and inverters, which needs high THB performance (Grade-IIIB); R53B can also be used in automotive applications such as the HVDC EMI filters where 800 VDC required.

Q: What are typical Lifetime estimated for different application conditions with the R53B series?

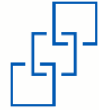
A: Here we summarize in the table for this Lifetime estimated in AC and DC voltage applications.

- Reliability at AC Voltages

| Temperature(°C) | Voltage Ratio (Vac) | Lifetime Khrs [DeltaC=-20%] |
|-----------------|---------------------|--------------------------------|
| 85 | 250 | 150 |
| | 305 | 150 |
| | 330 | 115 |
| | 350 | 70 |

- Reliability at DC Voltage VR - Operation life 100,000 hours at 85°C , 1,000 hours at 125°C in parallel construction

R53B Resources



- Datasheet: https://content.kemet.com/datasheets/KEM_F3131_R53B_X2_350.pdf
- Film Sales Hub: [EMI Suppression Capacitors](#) – [R53B](#)
 - Datasheet
 - Sales Presentation and FAQ
 - Product Brief
 - EMI Selection Guideline
 - EMI Family Chart
- Simulation Tools:
 - K-SIM: <https://ksim3.kemet.com/capacitor-simulation>
 - KLEM: <https://ksim3.kemet.com/film-lifetime>

For More Information and Support, Contact:

- Your Local Technical Product Manager, Film Capacitors.
- Technical Product Manager (EMI Film Technology):
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