

P3002AB Datasheet



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| | |
|------------------------------|----------------------------------------------------|
| DiGi Electronics Part Number | P3002AB-DG |
| Manufacturer | Littelfuse Inc. |
| Manufacturer Product Number | P3002AB |
| Description | THYRISTOR 140V/280V 250A TO220-3 |
| Detailed Description | 140V, 280V Off-State 250 A Ipp TVS Thyristor 3-SIP |

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Purchase and inquiry

Manufacturer Product Number:

P3002AB

Series:

SIDACtor®

Voltage - Breakover:

180V, 360V

Voltage - On State:

4 V

Current - Peak Pulse (10/1000µs):

80 A

Number of Elements:

2

Mounting Type:

Through Hole

Supplier Device Package:

TO-220 Modified

Manufacturer:

Littelfuse Inc.

Product Status:

Obsolete

Voltage - Off State:

140V, 280V

Current - Peak Pulse (8/20µs):

250 A

Current - Hold (Ih):

150 mA

Capacitance:

55pF, 95pF

Package / Case:

3-SIP

Environmental & Export classification

RoHS Status:

RoHS non-compliant

ECCN:

EAR99

Moisture Sensitivity Level (MSL):

1 (Unlimited)

HTSUS:

8541.30.0080

Pxxx2AxL Series

Two-Chip SIDACtor® - Modified TO-220



Description

The Pxxx2AxL Series Modified TO-220 Two-Chip SIDACtor® are designed to protect baseband equipment from damaging overvoltage transients.

The series provides a robust peak surge current capability that enables voice through DS-1 equipment to comply with various global regulatory standards.

Features & Benefits

- Low voltage overshoot
- Low on-state voltage
- Does not degrade surge capability after multiple surge events within limit.
- Modified TO-220 Package
- Fails short circuit when surged in excess of ratings
- Single-port protection
- Lead forms available
- RoHS Compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

Additional Information



Resources

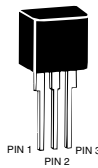


Accessories

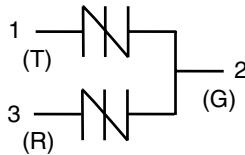


Samples

Pinout Designation



Schematic Symbol



Applicable Global Standards

- TIA-968-A
- TIA-968-B
- ITU K.20/21 Enhanced Level*
- ITU K.20/21 Basic Level
- GR 1089 Inter-building*
- GR 1089 Intra-building
- IEC 61000-4-5 2nd edition
- YD/T 1082
- YD/T 993
- YD/T 950

*A/B-rated parts require series resistance

Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
| | E133083 |

Electrical Characteristics

| Part Number | Marking | V_{DRM} | V_s | V_{DRM} | V_s | V_T | I_H | I_s | I_T | Capacitance | | |
|-------------|---------|--------------------|-----------------|--------------------|-----------------|---------------|-------|--------|--------|------------------------------|--------|--|
| | | @ $I_{DRM}=5\mu A$ | @ 100V/ μs | @ $I_{DRM}=5\mu A$ | @ 100V/ μs | @ $I_T=2.2 A$ | | | | @ 1MHz, 2V bias | | |
| | | V min | V max | V min | V max | V max | | | | pF min | pf max | |
| | | Pins 1-2, 3-2 | | Pins 1-3 | | Pins 1-2, 3-2 | | mA min | mA max | A max | | |
| P0602AALxx | P0602AA | 25 | 40 | 50 | 80 | 4 | 50 | 800 | 2.2 | See Capacitance Values Table | | |
| P1402AALxx | P1402AA | 58 | 77 | 116 | 154 | 4 | 150 | 800 | 2.2 | | | |
| P1602AALxx | P1602AA | 65 | 95 | 130 | 190 | 4 | 150 | 800 | 2.2 | | | |
| P2202AALxx | P2202AA | 90 | 130 | 180 | 260 | 4 | 150 | 800 | 2.2 | | | |
| P2702AALxx | P2702AA | 120 | 160 | 240 | 320 | 4 | 150 | 800 | 2.2 | | | |
| P3002AALxx | P3002AA | 140 | 180 | 280 | 360 | 4 | 150 | 800 | 2.2 | | | |
| P3602AALxx | P3602AA | 170 | 220 | 340 | 440 | 4 | 150 | 800 | 2.2 | | | |
| P4202AALxx | P4202AA | 190 | 250 | 380 | 500 | 4 | 150 | 800 | 2.2 | | | |
| P4802AALxx | P4802AA | 220 | 300 | 440 | 600 | 4 | 150 | 800 | 2.2 | | | |
| P6002AALxx | P6002AA | 275 | 350 | 550 | 700 | 4 | 150 | 800 | 2.2 | | | |

Table continues on next page.

Pxxx2AxL Series

Two-Chip SIDACtor® - Modified TO-220

Electrical Characteristics (continued)

| Part Number | Marking | V_{DRM} @ $I_{DRM}=5\mu A$ | V_S @ 100V/ μs | V_{DRM} @ $I_{DRM}=5\mu A$ | V_S @ 100V/ μs | V_T @ $I_T=2.2 A$ | I_H | I_S | I_T | Capacitance |
|-------------|---------|---------------------------------|--------------------------|---------------------------------|--------------------------|------------------------|--------|--------|-------|------------------------------------|
| | | V min | V max | V min | V max | V max | mA min | mA max | A max | |
| | | Pins 1-2, 3-2 | | Pins 1-3 | | Pins 1-2, 3-2 | | | | |
| P0602ABLxx | P0602AB | 25 | 40 | 50 | 80 | 4 | 50 | 800 | 2.2 | See Capacitance Values Table |
| P1402ABLxx | P1402AB | 58 | 77 | 116 | 154 | 4 | 150 | 800 | 2.2 | |
| P1602ABLxx | P1602AB | 65 | 95 | 130 | 190 | 4 | 150 | 800 | 2.2 | |
| P2202ABLxx | P2202AB | 90 | 130 | 180 | 260 | 4 | 150 | 800 | 2.2 | |
| P2702ABLxx | P2702AB | 120 | 160 | 240 | 320 | 4 | 150 | 800 | 2.2 | |
| P3002ABLxx | P3002AB | 140 | 180 | 280 | 360 | 4 | 150 | 800 | 2.2 | |
| P3602ABLxx | P3602AB | 170 | 220 | 340 | 440 | 4 | 150 | 800 | 2.2 | |
| P4202ABLxx | P4202AB | 190 | 250 | 380 | 500 | 4 | 150 | 800 | 2.2 | |
| P4802ABLxx | P4802AB | 220 | 300 | 440 | 600 | 4 | 150 | 800 | 2.2 | |
| P6002ABLxx | P6002AB | 275 | 350 | 550 | 700 | 4 | 150 | 800 | 2.2 | |
| P0602ACLxx | P0602AC | 25 | 40 | 50 | 80 | 4 | 50 | 800 | 2.2 | |
| P1402ACLxx | P1402AC | 58 | 77 | 116 | 154 | 4 | 150 | 800 | 2.2 | |
| P1602ACLxx | P1602AC | 65 | 95 | 130 | 190 | 4 | 150 | 800 | 2.2 | |
| P2202ACLxx | P2202AC | 90 | 130 | 180 | 260 | 4 | 150 | 800 | 2.2 | |
| P2702ACLxx | P2702AC | 120 | 160 | 240 | 320 | 4 | 150 | 800 | 2.2 | |
| P3002ACLxx | P3002AC | 140 | 180 | 280 | 360 | 4 | 150 | 800 | 2.2 | |
| P3602ACLxx | P3602AC | 170 | 220 | 340 | 440 | 4 | 150 | 800 | 2.2 | |
| P4202ACLxx | P4202AC | 190 | 250 | 380 | 500 | 4 | 150 | 800 | 2.2 | |
| P4802ACLxx | P4802AC | 220 | 300 | 440 | 600 | 4 | 150 | 800 | 2.2 | |
| P6002ACLxx | P6002AC | 275 | 350 | 550 | 700 | 4 | 150 | 800 | 2.2 | |

Notes:

- Absolute maximum ratings measured at $T_A=25^\circ C$ (unless otherwise noted).
- Devices are bi-directional (unless otherwise noted).
- **XX** Part Number Suffix: '**RP**' (Reel Pack), '**Blank**' (Bulk Pack), or '**60**' (Type 60 lead form bulk pack)

Capacitance Values

| Part Number | pF Pin 1-2, 3-2 Tip-Ground, Ring-Ground | | pF Pin 1-3 Tip-Ring | |
|-------------|-----------------------------------------------|-----|---------------------------|-----|
| | MIN | MAX | MIN | MAX |
| P0602AALxx | 15 | 145 | 10 | 90 |
| P1402AALxx | 40 | 60 | 20 | 35 |
| P1602AALxx | 35 | 60 | 20 | 35 |
| P2202AALxx | 30 | 50 | 15 | 30 |
| P2702AALxx | 25 | 45 | 15 | 25 |
| P3002AALxx | 25 | 40 | 15 | 25 |
| P3602AALxx | 25 | 35 | 10 | 20 |
| P4202AALxx | 25 | 35 | 10 | 20 |
| P4802AALxx | 20 | 35 | 10 | 20 |
| P6002AALxx | 20 | 35 | 10 | 20 |
| P0602ABLxx | 15 | 250 | 10 | 145 |
| P1402ABLxx | 40 | 155 | 20 | 90 |
| P1602ABLxx | 35 | 145 | 20 | 85 |
| P2202ABLxx | 30 | 115 | 15 | 65 |
| P2702ABLxx | 25 | 105 | 15 | 60 |
| P3002ABLxx | 25 | 95 | 15 | 55 |
| P3602ABLxx | 25 | 90 | 10 | 50 |
| P4202ABLxx | 25 | 85 | 10 | 50 |
| P4802ABLxx | 20 | 85 | 10 | 50 |
| P6002ABLxx | 20 | 80 | 10 | 45 |

| Part Number | pF Pin 1-2, 3-2 Tip-Ground, Ring-Ground | | pF Pin 1-3 Tip-Ring | |
|-------------|-----------------------------------------------|-----|---------------------------|-----|
| | MIN | MAX | MIN | MAX |
| P0602ACLxx | 25 | 250 | 10 | 145 |
| P1402ACLxx | 55 | 155 | 30 | 90 |
| P1602ACLxx | 45 | 145 | 25 | 85 |
| P2202ACLxx | 45 | 115 | 25 | 65 |
| P2702ACLxx | 40 | 105 | 20 | 60 |
| P3002ACLxx | 35 | 95 | 20 | 55 |
| P3602ACLxx | 35 | 90 | 15 | 50 |
| P4202ACLxx | 30 | 85 | 15 | 50 |
| P4802ACLxx | 30 | 85 | 15 | 50 |
| P6002ACLxx | 30 | 80 | 15 | 45 |

Note: Off-state capacitance (C_o) is measured at 1 MHz with a 2 V bias.

Pxxx2AxL Series

Two-Chip SIDACtor® - Modified TO-220

Surge Ratings

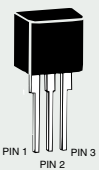
| Series | I_{PP} | | | | | | | | | I_{TSM} 50/60 Hz | di/dt |
|--------|----------------------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------------------------|-------------------------------------------|-----------------------|-------|
| | 0.2x310 ¹ 0.5x700 ² | 2x10 ¹ 2x10 ² | 8x20 ¹ 1.2x50 ² | 10x160 ¹ 10x160 ² | 10x560 ¹ 10x560 ² | 5x320 ¹ 9x720 ² | 10x360 ¹ 10x360 ² | 10x1000 ¹ 10x1000 ² | 5x310 ¹ 10x700 ² | | |
| | A min | A min | A min | A min | A min | A min | A min | A min | A min | | |
| A | 20 | 150 | 150 | 90 | 50 | 75 | 75 | 45 | 75 | 20 | 500 |
| B | 25 | 250 | 250 | 150 | 100 | 100 | 125 | 80 | 100 | 25 | 500 |
| C | 50 | 500 | 400 | 200 | 150 | 200 | 175 | 100 | 200 | 50 | 500 |

Notes:

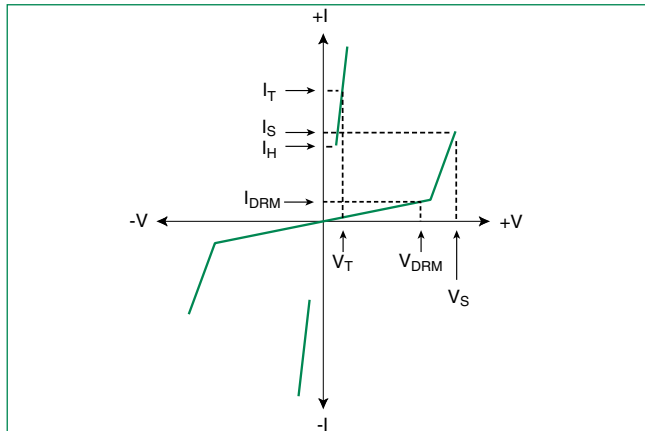
1. Current waveform in μs
2. Voltage waveform in μs

- Peak pulse current rating (I_{pp}) is repetitive and guaranteed for the life of the product.
- I_{pp} ratings applicable over temperature range of $-40^{\circ}C$ to $+85^{\circ}C$
- The device must initially be in thermal equilibrium with $-40^{\circ}C \leq T_j \leq +150^{\circ}C$

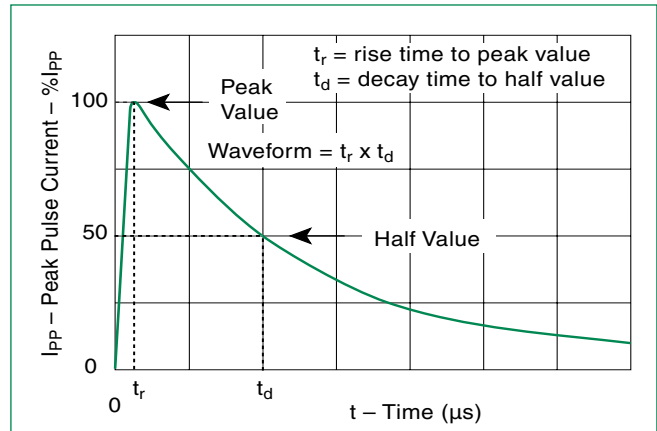
Thermal Considerations

| Package | Symbol | Parameter | Value | Unit |
|------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|---------------|
| Modified TO-220  | T_J | Operating Junction Temperature Range | -40 to +150 | $^{\circ}C$ |
| | T_S | Storage Temperature Range | -65 to +150 | $^{\circ}C$ |
| | $R_{\theta JA}$ | Thermal Resistance: Junction to Ambient | 60 | $^{\circ}C/W$ |

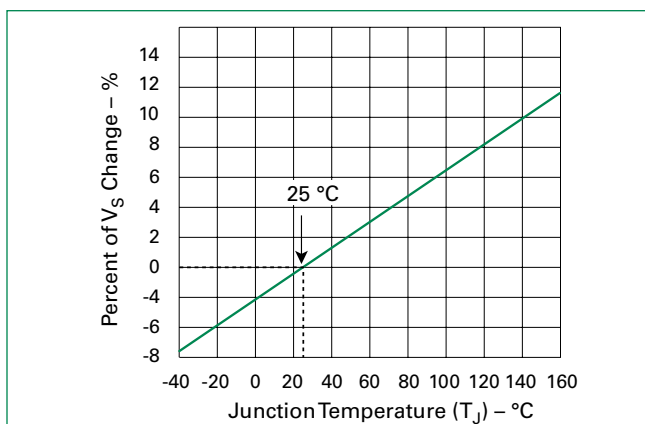
V-I Characteristics



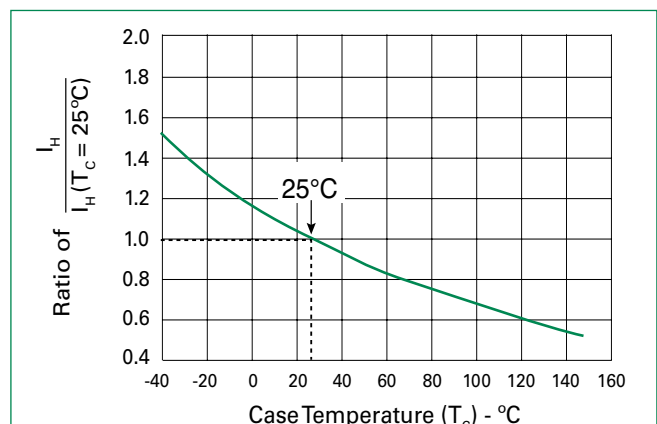
tr x td Pulse Waveform



Normalized VS Change vs. Junction Temperature



Normalized DC Holding Current vs. Case Temperature

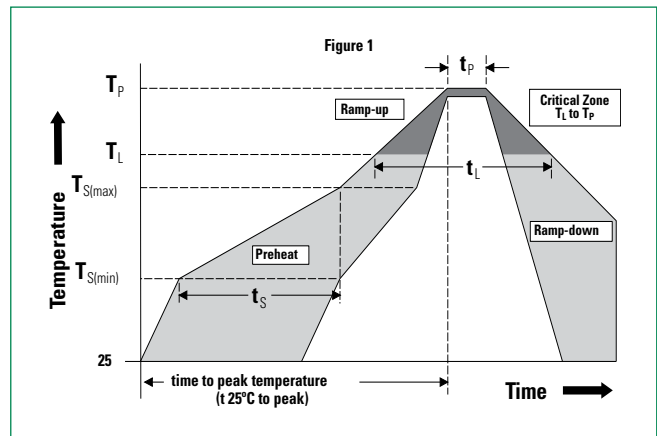


Pxxx2AxL Series

Two-Chip SIDACtor® - Modified TO-220

Soldering Parameters

| | | |
|------------------------------------------------------------------------|------------------------------------|-------------------------------|
| Reflow Condition | | Pb-Free assembly (see Fig. 1) |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | +150°C |
| | - Temperature Max ($T_{s(max)}$) | +200°C |
| | - Time (Min to Max) (t_s) | 60-180 secs. |
| Average ramp up rate (Liquidus Temp (T_L) to peak) | | 3°C/sec. Max. |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/sec. Max. |
| Reflow | - Temperature (T_L) (Liquidus) | +217°C |
| | - Temperature (t_L) | 60-150 secs. |
| Peak Temp (T_p) | | +260(+0/-5)°C |
| Time within 5°C of actual Peak Temp (t_p) | | 30 secs. Max. |
| Ramp-down Rate | | 6°C/sec. Max. |
| Time 25°C to Peak Temp (T_p) | | 8 min. Max. |
| Do not exceed | | +260°C |



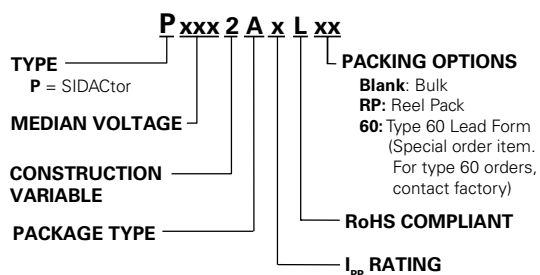
Physical Specifications

| | |
|------------------------|-------------------------------------------------------------|
| Lead Material | Copper Alloy |
| Terminal Finish | 100% Matte-Tin Plated |
| Body Material | UL Recognized epoxy meeting flammability classification V-0 |

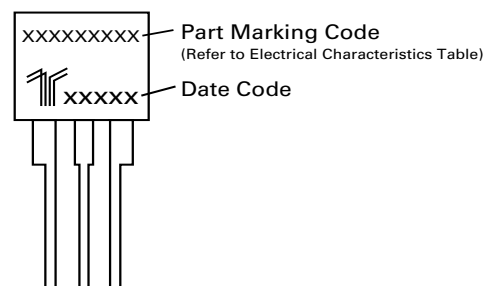
Environmental Specifications

| | |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| High Temp Voltage Blocking | 80% Rated V_{DRM} (V_{AC} Peak) +125°C or +150°C, 504 or 1008 hrs. MIL-STD-750 (Method 1040) JEDEC, JESD22-A-101 |
| Temp Cycling | -65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/JEDEC, JESD22-A-104 |
| Biased Temp & Humidity | 52 V_{DC} (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101 |
| High Temp Storage | +150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101 |
| Low Temp Storage | -65°C, 1008 hrs. |
| Thermal Shock | 0°C to +100°C, 5 min. dwell, 10 sec. transfer, 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106 |
| Unbiased Highly Accelerated Stress Test | +130°C, 85%RH, 2atm, 168hrs. JESD22-A-118 |
| Resistance to Solder Heat | +260°C, 30 secs. MIL-STD-750 (Method 2031) |

Part Numbering



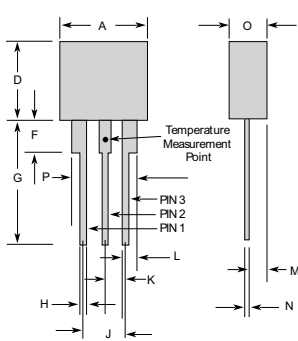
Part Marking



Pxxx2AxL Series

Two-Chip SIDACtor® - Modified TO-220

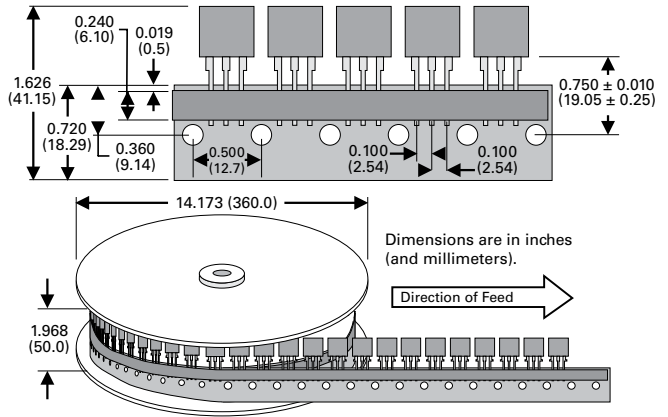
Dimensions - Modified TO-220



The modified TO-220 package is designed to meet mechanical standards as set forth in JEDEC publication number 95.

| | Inches | | Millimeters | |
|---|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.400 | 0.410 | 10.16 | 10.42 |
| D | 0.360 | 0.375 | 9.14 | 9.53 |
| F | 0.110 | 0.130 | 2.80 | 3.30 |
| G | 0.540 | 0.575 | 13.71 | 14.61 |
| H | 0.025 | 0.035 | 0.63 | 0.89 |
| J | 0.195 | 0.205 | 4.95 | 5.21 |
| K | 0.095 | 0.105 | 2.41 | 2.67 |
| L | 0.060 | 0.075 | 1.52 | 1.90 |
| M | 0.070 | 0.085 | 1.78 | 2.16 |
| N | 0.018 | 0.024 | 0.46 | 0.61 |
| O | 0.178 | 0.188 | 4.52 | 4.78 |
| P | 0.290 | 0.310 | 7.37 | 7.87 |

Tape and Reel Specification – Modified TO-220



Packing Options

| Package Type | Description | Quantity | Added Suffix | Industry Standard |
|--------------|---------------------------------------------|----------|---------------------------------------------------------|-------------------|
| A | Modified TO-220 Tape and Reel Pack | 700 | RP | EIA-468-B |
| | Modified TO-220 Bulk Pack | 500 | N/A | N/A |
| | Modified TO-220 Type 60 Lead Form Bulk Pack | 500 | 60 (special order item, contact factory for details) | N/A |

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