

RoHS SIDACTor® Balanced Series - MS-013



Description

The SIDACTor® Balanced Series MS-013 are designed to protect baseband equipment from overvoltage transients. The patented "Y" configuration ensures balanced overvoltage protection.

The series provides a single port surface mount solution that enables voice through DS-1 equipment to comply with various global regulatory standards.

Features and Benefits

- Balanced overvoltage protection
- Low voltage overshoot
- Low on-state voltage
- Does not degrade with use
- Fails short circuit when surged in excess of ratings
- Replaces three discrete devices
- Meets UL/IEC 60950-1 creepage and clearance

Agency Approvals

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

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
- YD/T 1082
- YD/T 993
- YD/T 950

Electrical Characteristics

| Part Number | Part Marking | V_{DRM} | V_S | V_{DRM} | V_S | V_T | I_S | I_T | I_H | Capacitance |
|-------------|--------------|--------------------|-----------------|--------------------|-----------------|-------|--------|-------|--------|------------------------------|
| | | @ $I_{DRM}=5\mu A$ | @ 100V/ μs | @ $I_{DRM}=5\mu A$ | @ 100V/ μs | | | | | |
| | | V min | V max | V min | V max | V max | mA max | A max | mA min | |
| P1553UALxx | P1553UA | 130 | 180 | 130 | 180 | 8 | 800 | 2.2 | 150 | See Capacitance Values table |
| P1803UALxx | P1803UA | 150 | 210 | 150 | 210 | 8 | 800 | 2.2 | 150 | |
| P2103UALxx | P2103UA | 170 | 250 | 170 | 250 | 8 | 800 | 2.2 | 150 | |
| P2353UALxx | P2353UA | 200 | 270 | 200 | 270 | 8 | 800 | 2.2 | 150 | |
| P2703UALxx | P2703UA | 230 | 300 | 230 | 300 | 8 | 800 | 2.2 | 150 | |
| P3203UALxx | P3203UA | 270 | 350 | 270 | 350 | 8 | 800 | 2.2 | 150 | |
| P3403UALxx | P3403UA | 300 | 400 | 300 | 400 | 8 | 800 | 2.2 | 150 | |
| P5103UALxx | P5103UA | 420 | 600 | 420 | 600 | 8 | 800 | 2.2 | 150 | |

Table continues on next page.

Notes:
 - Absolute maximum ratings measured at $T_A = +25^\circ C$ (unless otherwise noted).
 - Devices are bi-directional.
 - **XX** = Part Number Suffix: 'TP' (Tube Pack) or 'RP' (Reel Pack).
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Electrical Characteristics (continued)

| Part Number | Part 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_S | I_T | I_H | Capacitance |
|-------------|--------------|---------------------------------|--------------------------|---------------------------------|--------------------------|-------|--------|-------|--------|------------------------------------|
| | | V min | V max | V min | V max | V max | mA max | A max | mA min | |
| | | Pins 1 & 6-3, 1 & 6-4 | | Pins 3-4 | | | | | | |
| P1553UBLxx | P1553UB | 130 | 180 | 130 | 180 | 8 | 800 | 2.2 | 150 | See Capacitance Values table |
| P1803UBLxx | P1803UB | 150 | 210 | 150 | 210 | 8 | 800 | 2.2 | 150 | |
| P2103UBLxx | P2103UB | 170 | 250 | 170 | 250 | 8 | 800 | 2.2 | 150 | |
| P2353UBLxx | P2353UB | 200 | 270 | 200 | 270 | 8 | 800 | 2.2 | 150 | |
| P2703UBLxx | P2703UB | 230 | 300 | 230 | 300 | 8 | 800 | 2.2 | 150 | |
| P3203UBLxx | P3203UB | 270 | 350 | 270 | 350 | 8 | 800 | 2.2 | 150 | |
| P3403UBLxx | P3403UB | 300 | 400 | 300 | 400 | 8 | 800 | 2.2 | 150 | |
| P5103UBLxx | P5103UB | 420 | 600 | 420 | 600 | 8 | 800 | 2.2 | 150 | |
| P1553UCLxx | P1553UC | 130 | 180 | 130 | 180 | 8 | 800 | 2.2 | 150 | |
| P1803UCLxx | P1803UC | 150 | 210 | 150 | 210 | 8 | 800 | 2.2 | 150 | |
| P2103UCLxx | P2103UC | 170 | 250 | 170 | 250 | 8 | 800 | 2.2 | 150 | |
| P2353UCLxx | P2353UC | 200 | 270 | 200 | 270 | 8 | 800 | 2.2 | 150 | |
| P2703UCLxx | P2703UC | 230 | 300 | 230 | 300 | 8 | 800 | 2.2 | 150 | |
| P3203UCLxx | P3203UC | 270 | 350 | 270 | 350 | 8 | 800 | 2.2 | 150 | |
| P3403UCLxx | P3403UC | 300 | 400 | 300 | 400 | 8 | 800 | 2.2 | 150 | |
| P5103UCLxx | P5103UC | 420 | 600 | 420 | 600 | 8 | 800 | 2.2 | 150 | |

Capacitance Values

| Part Number | Pin 3-4 Tip-Ring | | Pins 1 & 6-3, 1 & 6-4 Tip-Ground, Ring-Ground | |
|-------------|---------------------|--------|--|--------|
| | pF min | pF max | pF min | pF max |
| P1553UALxx | 20 | 95 | 10 | 60 |
| P1803UALxx | 20 | 85 | 10 | 55 |
| P2103UALxx | 15 | 85 | 10 | 55 |
| P2353UALxx | 15 | 75 | 10 | 50 |
| P2703UALxx | 15 | 75 | 10 | 50 |
| P3203UALxx | 15 | 70 | 10 | 45 |
| P3403UALxx | 15 | 65 | 10 | 45 |
| P5103UALxx | 10 | 60 | 10 | 40 |
| P1553UBLxx | 25 | 95 | 15 | 60 |
| P1803UBLxx | 25 | 85 | 15 | 55 |
| P2103UBLxx | 20 | 85 | 15 | 55 |
| P2353UBLxx | 20 | 75 | 15 | 50 |
| P2703UBLxx | 20 | 75 | 10 | 50 |
| P3203UBLxx | 20 | 70 | 10 | 45 |
| P3403UBLxx | 15 | 65 | 10 | 45 |
| P5103UBLxx | 15 | 60 | 10 | 40 |
| P1553UCLxx | 30 | 95 | 20 | 60 |
| P1803UCLxx | 30 | 85 | 15 | 55 |
| P2103UCLxx | 30 | 85 | 15 | 55 |
| P2353UCLxx | 25 | 75 | 15 | 50 |
| P2703UCLxx | 25 | 75 | 15 | 50 |
| P3203UCLxx | 25 | 70 | 15 | 45 |
| P3403UCLxx | 20 | 65 | 15 | 45 |
| P5103UCLxx | 20 | 60 | 10 | 40 |

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

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 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 μ s
 2 Voltage waveform in μ s
 - 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 to +85°C
 - The device must initially be in thermal equilibrium with -40°C \leq T_J \leq +150°C

Thermal Considerations

| Package | Symbol | Parameter | Value | Unit |
|--|------------------|---|-------------|------|
| Modified MS-013  | T _J | Operating Junction Temperature Range | -40 to +150 | °C |
| | T _S | Storage Temperature Range | -65 to +150 | °C |
| | R _{θJA} | Thermal Resistance: Junction to Ambient | 60 | °C/W |

V-I Characteristics



t_r x t_d Pulse Waveform



Normalized V_S Change vs. Junction Temperature



Normalized DC Holding Current vs. Case Temperature



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 94V-0 |

Part Marking



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-A104 |
| 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 |
| Autoclave (Pressure Cooker Test) | +121°C, 100%RH, 2atm, 24 up to 168 hrs. EIA/JEDEC, JESD22-A-102 |
| Resistance to Solder Heat | +260°C, 30 secs. MIL-STD-750 (Method 2031) |
| Moisture Sensitivity Level | 85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C Peak). JEDEC-J-STD-020, Level 1 |

Part Numbering



Packing Options

| Package Type | Description | Quantity | Added Suffix | Industry Standard |
|--------------|--|-------------------|--------------|-------------------|
| U | Modified MS-013 6-pin Tape and Reel Pack | 1500 | RP | EIA-481-D |
| | Modified MS-013 6-pin Tube Pack | 500 (50 per tube) | TP | N/A |

Dimensions — MS-013



| Dimensions | Inches | | Millimeters | |
|-------------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.360 | 0.364 | 9.14 | 9.25 |
| B | 0.352 | 0.356 | 8.94 | 9.04 |
| C | 0.400 | 0.412 | 10.16 | 10.46 |
| D | 0.043 | 0.045 | 1.09 | 1.13 |
| E | 0.047 | 0.055 | 1.19 | 1.40 |
| F | 0.293 | 0.297 | 7.44 | 7.54 |
| G | 0.289 | 0.293 | 7.34 | 7.44 |
| H | 0.089 | 0.093 | 2.26 | 2.36 |
| J | 0.041 | 0.049 | 1.04 | 1.24 |
| K | 0.020 | | 0.51 | |
| BSC* | 0.133 | 0.143 | 3.38 | 3.63 |

* BSC = Basic Spacing between Centers

Tape and Reel Specification — MS-013



Tube Pack Specification — MS-013



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Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru