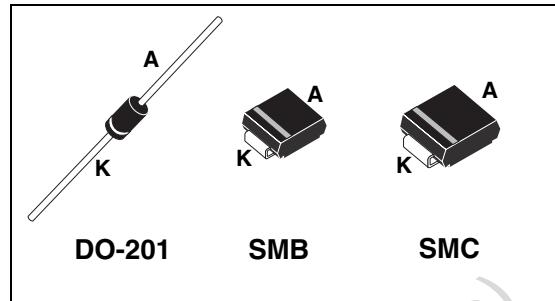


Lightning protection for LNB power supply

Features

- 3 kV, 4 kV and 6 kV protection (8/20 μ s)
- Axial & SMD package
- Unidirectional and low V_F
($V_F = 1.2$ V at $I_F = 3$ A)
- Low clamping factor
- Fast response time



Description

The LNBTVSx-22xx is a dedicated lightning and electrical overstress surge protection for LNB voltage regulators in satellite set top box applications.

This device provides the lightning protection required to pass the IEC and FCC regulations.

Available in axial, SMB and SMC packages, this device is compatible with industry standard mounting processes.

Order Code

| Part number | Marking |
|--------------|-------------|
| LNBTVS3-220 | LNBTVS3-220 |
| LNBTVS3-220U | LC |
| LNBTVS4-220 | LNBTVS4-220 |
| LNBTVS4-220S | LAA |
| LNBTVS4-221 | LNBTVS4-221 |
| LNBTVS4-221S | LAB |
| LNBTVS4-222S | LAC |
| LNBTVS6-220S | LBA |
| LNBTVS6-221S | LBB |

Table 1. Absolute maximum ratings ($T_{amb} = 25^\circ$ C)

| Symbol | Parameter | Value | Unit |
|-----------|--|---|------------|
| P_{PP} | Peak pulse power dissipation ⁽¹⁾ | T_j initial = T_{amb} up to 3 kW | W |
| P | Peak dissipation on infinite heatsink | $T_{amb} = 75^\circ$ C 5 | W |
| I_{FSM} | Non repetitive surge peak forward current for unidirectional types | $T_p = 10$ ms T_j initial = T_{amb} 200 | A |
| T_{stg} | Storage temperature range | -65 to + 175 | $^\circ$ C |
| T_j | Maximum junction temperature | 150 | $^\circ$ C |
| T_L | Maximum lead temperature for soldering during 10 s at 5 mm from case | 230 | $^\circ$ C |

1. For a surge greater than the maximum values, the diode will fail in short-circuit.

1 Characteristics

Table 2. Thermal resistance

| Symbol | Parameter | Package | Value | Unit |
|---------------|--|---------|-------|-------|
| $R_{th(j-l)}$ | Junction to leads | DO-201 | 20 | ° C/W |
| $R_{th(j-a)}$ | Junction to ambient on printed circuit $L_{lead} = 10\text{ mm}$ | DO-201 | 75 | ° C/W |
| $R_{th(j-l)}$ | Junction to case | SMB | 20 | ° C/W |
| $R_{th(j-a)}$ | Junction to ambient on printed circuit | SMB | 100 | ° C/W |
| $R_{th(j-l)}$ | Junction to case | SMC | 20 | ° C/W |
| $R_{th(j-a)}$ | Junction to ambient on printed circuit | SMC | 75 | ° C/W |

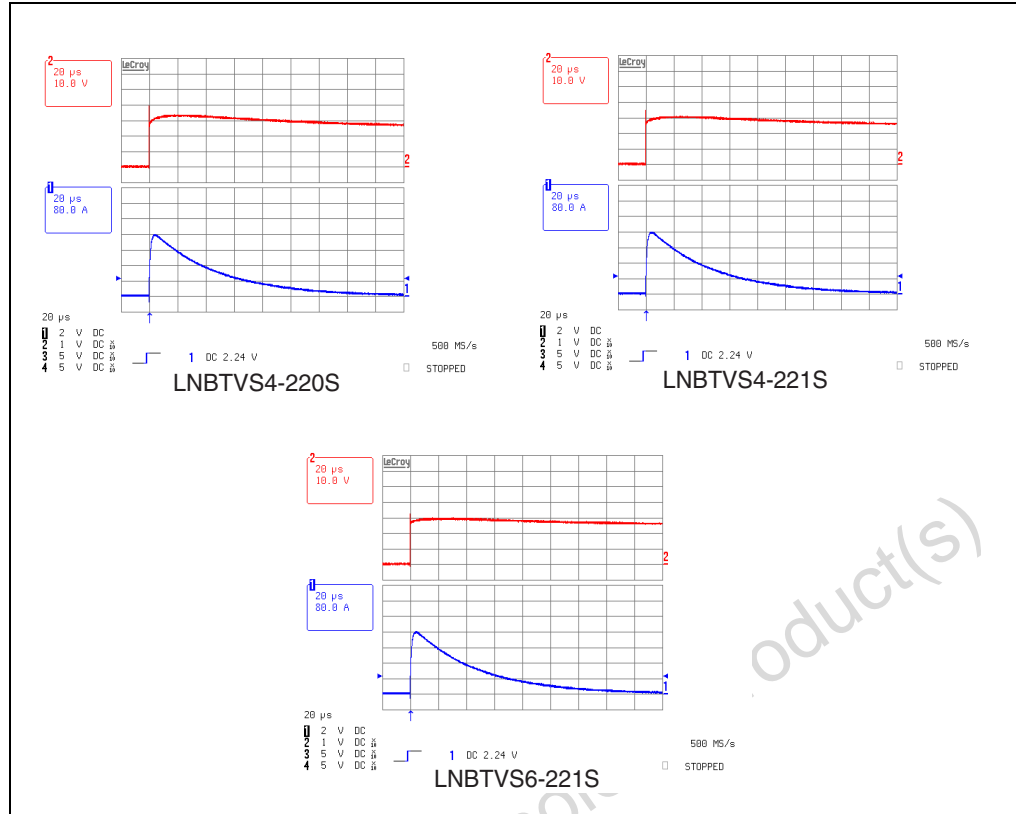
Table 3. Electrical characteristics ($T_{amb} = 25^\circ\text{C}$)

| Symbol | Parameter |
|------------|--|
| V_{BR} | Breakdown voltage |
| I_{RM} | Leakage current @ V_{RM} |
| V_{RM} | Stand-off voltage |
| V_{CL} | Clamping voltage |
| I_{PP} | Peak pulse current |
| $R_{I/O}$ | Series resistance between Input & Output |
| C_{line} | Input capacitance per line |
| I_F | Forward current |
| V_F | Forward voltage |

| Type | $I_{RM} @ V_{RM}$ | | $V_{BR} @ I_R$ | | | | P_{PP} 10/1000 μs | $V_{CL} @ I_{pp}$ 10/1000 μs | | $V_{CL} @ I_{pp}$ 8/20 μs (1) | | αT | C |
|----------------|-------------------|----|----------------|------|------|----|-----------------------------------|--|----|---|-----|--------------------------|------|
| | Max | | Min | Typ | Max | | | Max | | Max | | | |
| Unidirectional | μA | V | V | V | V | mA | W | V | A | V | A | $10^{-4}/^\circ\text{C}$ | pF |
| LNBTVS3-220 | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 1500 | 33.2 | 45 | 35 | 250 | 9.6 | 3000 |
| LNBTVS3-220U | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 1500 | 33.2 | 45 | 35 | 250 | 9.6 | 3000 |
| LNBTVS4-220 | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 1800 | 33.2 | 55 | 35 | 331 | 9.6 | 3500 |
| LNBTVS4-220S | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 1800 | 33.2 | 55 | 35 | 331 | 9.6 | 3500 |
| LNBTVS4-221 | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 2000 | 33.2 | 60 | 32 | 331 | 9.6 | 5500 |
| LNBTVS4-221S | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 2000 | 33.2 | 60 | 32 | 331 | 9.6 | 5500 |
| LNBTVS4-222S | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 3000 | 33.2 | 90 | 30 | 331 | 9.6 | 6000 |
| LNBTVS6-220S | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 3000 | 33.2 | 90 | 35 | 500 | 9.6 | 6000 |
| LNBTVS6-221S | 1 | 20 | 22 | 23.1 | 24.2 | 1 | 3000 | 33.2 | 90 | 32 | 500 | 9.6 | 6000 |

1. IEC 61000-4-5 R = 12 Ω

Figure 1. Surge test examples at +4 kV - IEC 61000-4-5 - with series resistor of 12 Ω



2 Application

Figure 2. Application diagram

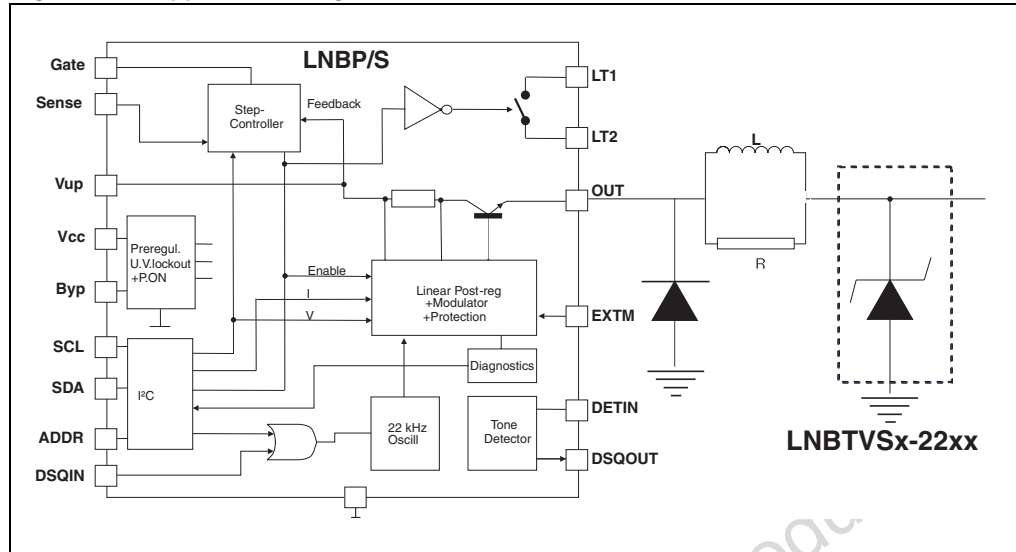
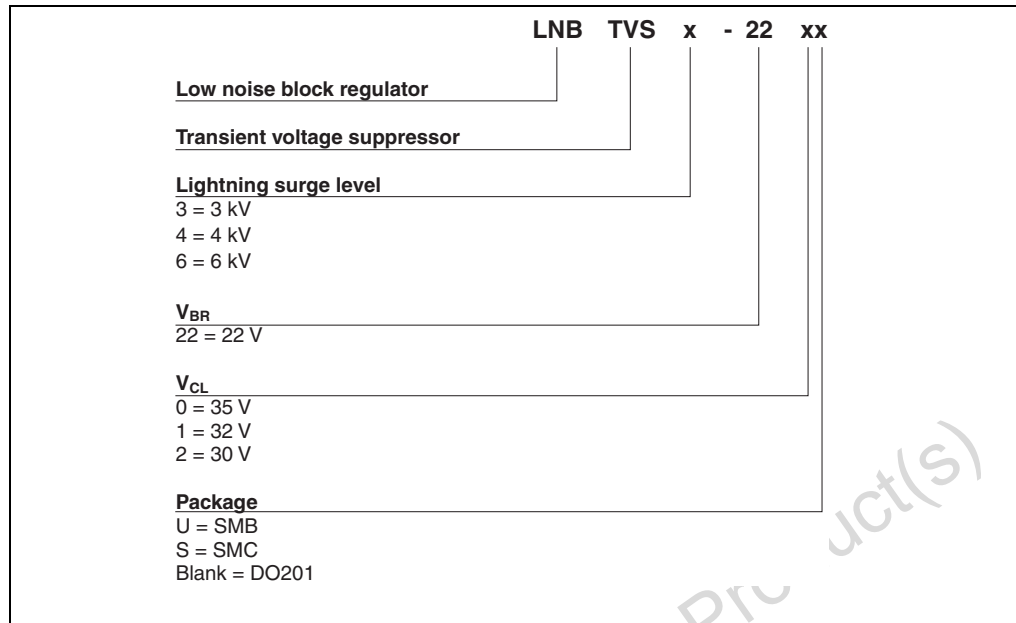


Table 4. Optimized fit to ST voltage regulators

| LNB voltage regulators | Recommended lightning protections |
|--|--|
| LNBP20, LNBP11x, LNBP8/9 | LNBTVS3-220/x, LNBTVS4-220/x, LNBTVS6-220S, LNBTVS6-221S |
| LNBS21, LNBP21 | LNBTVS4-222S, LNBTVS6-221S |
| LNBH21, LNBH221, LNBH22, LNBEH21, LNBEH221 | LNBTVS4-220/x, LNBTVS4-221/x, LNBTVS6-221S |
| LNBH23, LNBH24 | LNBTVS4-221/x, LNBTVS4-222S, LNBTVS6-221S |

3 Ordering information scheme



4 Package information

- Epoxy meets UL 94, V0

Table 5. SMC package dimensions

| REF. | DIMENSIONS | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A1 | 1.90 | 2.45 | 0.075 | 0.096 |
| A2 | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 2.90 | 3.2 | 0.114 | 0.126 |
| c | 0.15 | 0.41 | 0.006 | 0.016 |
| E | 7.75 | 8.15 | 0.305 | 0.321 |
| E1 | 6.60 | 7.15 | 0.260 | 0.281 |
| E2 | 4.40 | 4.70 | 0.173 | 0.185 |
| D | 5.55 | 6.25 | 0.218 | 0.246 |
| L | 0.75 | 1.60 | 0.030 | 0.063 |

Figure 3. SMC footprint (dimensions in mm)

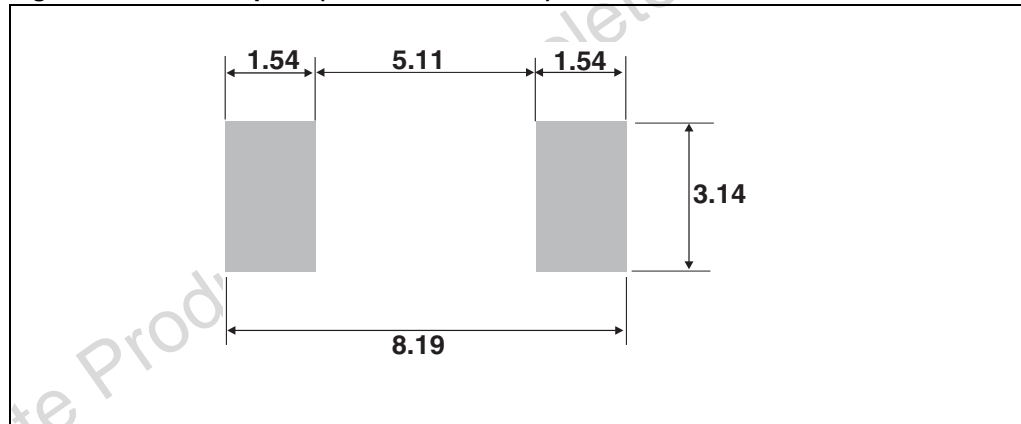


Table 6. SMB package dimensions

| REF. | DIMENSIONS | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A1 | 1.90 | 2.45 | 0.075 | 0.096 |
| A2 | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 1.95 | 2.20 | 0.077 | 0.087 |
| c | 0.15 | 0.41 | 0.006 | 0.016 |
| E | 5.10 | 5.60 | 0.201 | 0.220 |
| E1 | 4.05 | 4.60 | 0.159 | 0.181 |
| D | 3.30 | 3.95 | 0.130 | 0.156 |
| L | 0.75 | 1.60 | 0.030 | 0.063 |

Figure 4. SMB footprint (dimensions in mm)

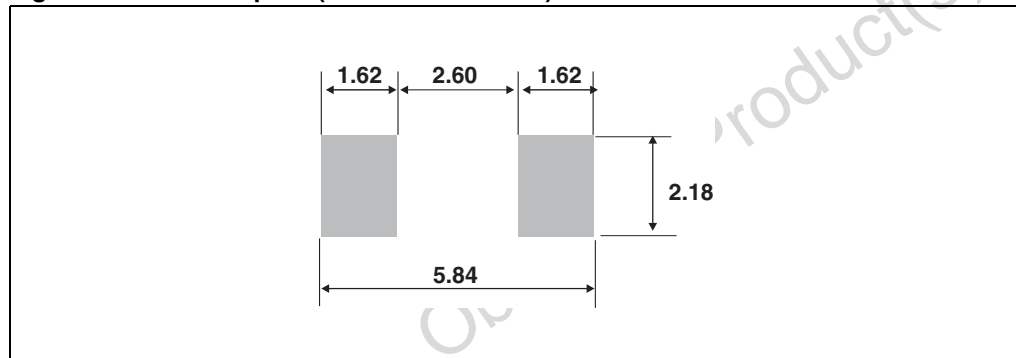


Table 7. DO-201 package dimensions

| REF. | DIMENSIONS | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 8.5 | 9.5 | 0.335 | 0.374 |
| B | 25.4 | | 1 | |
| Ø C | 4.8 | 5.3 | 0.189 | 0.209 |
| Ø D | 0.96 | 1.06 | 0.038 | 0.042 |

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

5 Ordering information

| Part number | Marking | Package | Weight | Base qty | Delivery mode |
|--------------|-------------|---------|--------|----------|---------------|
| LNBTVS3-220 | LNBTVS3-220 | DO-201 | 0.83 | 600 | Amopack |
| LNBTVS3-220U | LC | SMB | 0.107 | 2500 | Tape and reel |
| LNBTVS4-220 | LNBTVS4-220 | DO-201 | 0.83 | 600 | Amopack |
| LNBTVS4-220S | LAA | SMC | 0.245 | 2500 | Tape and reel |
| LNBTVS4-221 | LNBTVS4-221 | DO-201 | 0.83 | 600 | Amopack |
| LNBTVS4-221S | LAB | SMC | 0.245 | 2500 | Tape and reel |
| LNBTVS4-222S | LAC | SMC | 0.245 | 2500 | Tape and reel |
| LNBTVS6-220S | LBA | SMC | 0.245 | 2500 | Tape and reel |
| LNBTVS6-221S | LBB | SMC | 0.245 | 2500 | Tape and reel |

6 Revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 30-Sep-2005 | 1 | First release |
| 10-Apr-2006 | 2 | Reformatted to current standard. Corrected peak pulse power dissipation for LNBTVS6-220S in Table 2. Corrected footprint dimensions for SMC and SMB packages. |
| 29-Jan-2007 | 3 | Added surge test examples in Figure 1. Added Table 4. Optimized fit to ST voltage regulators. Added cathode bar indicators in package illustrations on page 1. |

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