



**THE DATASHEET OF
VS-12TQ045PBF**





Packaging Information

| PACKAGING ORDERING CODE | | |
|--------------------------|------------------------|--|
| ANTI-STATIC PACKAGE CODE | PREFERRED PACKAGE CODE | PACKAGING DESCRIPTION |
| 51, A | | Bulk |
| 52, 52T | P | SMB (DO-214AA) /SMBG (DO-215AA), 12 mm tape, 7" diameter plastic reel |
| 2D | P | SM5-8A (DO-218AB), 24 mm tape, 13" diameter plastic reel, anode towards sprocket hole |
| 2E, K | | SM5-8A (DO-218AB), 24 mm tape, 13" diameter plastic reel, cathode towards sprocket hole |
| 2M, P | | Tube packaging for 5KP/6KA type lead formed components |
| 53, B | | 26 mm horizontal taping and ammo box packaging |
| 54, C | P | 52.4 mm horizontal tape, 13" diameter paper reel |
| 5A, 5AT | P | SMA (DO-214AC), 12 mm tape, 13" diameter plastic reel |
| 5B, 5BT | P | SMB (DO-214AA) / SMBG (DO-215AA), 12 mm tape, 13" diameter plastic reel |
| 5CA | P | GF1 (DO-214BA), 12 mm tape, 13" diameter plastic reel |
| 57, 57T | P | SMC (DO-214AB) / SMCG (DO-215AB), 16 mm tape, 7" diameter plastic reel |
| 6A | P | SlimSMA (DO-221AC), 12 mm tape, 7" diameter plastic reel |
| 6B | P | SlimSMA (DO-221AC), 12 mm tape, 13" diameter plastic reel |
| 9A, 9AT | P | SMC (DO-214AB) / SMCG (DO-215AB), 16 mm tape, 13" diameter plastic reel |
| 61, 61T | P | SMA (DO-214AC), 12 mm tape, 7" diameter plastic reel |
| 67A | P | GF1 (DO-214BA), 12 mm tape, 7" diameter plastic reel |
| 72, E | P | Bulk pack for bridge and special axial-leaded formed devices |
| 73, D | | 52.4 mm horizontal tape and ammo box packaging |
| 77 | P | DFS bridge, 16 mm tape, 13" diameter paper reel |
| 80 | P | MB-S (TO-269AA) bridge, 12 mm tape, 13" diameter paper reel |
| 81 | P | D ² PAK (TO-263AB) 24 mm tape, 13" diameter reinforced hub plastic reel |
| 8W | P | D ² PAK (TO-263AB) (wire bond) 24 mm tape, 13" diameter reinforced hub plastic reel |
| 83 | P | GL34 (DO-213AA) 8 mm tape, 13" diameter plastic reel |
| 84A | P | SMP (DO-220AA) 12 mm tape, 7" diameter plastic reel |
| 85A | P | SMP (DO-220AA) 12 mm tape, 13" diameter plastic reel |
| 86A | P | SMPC (TO-277A), 12 mm tape, 7" diameter plastic reel |
| 87A | P | SMPC (TO-277A), 12 mm tape, 13" diameter plastic reel |
| 89A | P | MicroSMP (DO-219AD), 8 mm tape, 7" diameter plastic reel |
| 45, P | P | Anti-static tube packaging for Bridge and Power Pack |
| 4W, P | P | Anti-static tube packaging for wire bond TO-220, ITO-220, TO-262 and TO-263 |
| 96 | P | GL41 (DO-213AB), 12 mm tape, 7" diameter plastic reel |
| 97 | P | GL41 (DO-213AB), 12 mm tape, 13" diameter plastic reel |
| 98 | P | GL34 (DO-213AA), 8 mm tape, 7" diameter plastic reel |
| 100, V | | MPG06 pseudo radial tape, cathode first out of ammo pack |
| H | P | Tape in 7" diameter plastic reel |
| I | P | Tape in 13" diameter plastic reel |
| TR | P | SMA (DO-214AC), 12 mm tape, 7" diameter plastic reel ⁽¹⁾ |
| TR3 | P | SMA (DO-214AC), 12 mm tape, 13" diameter plastic reel ⁽¹⁾ |

Notes

- "P" and bold letter denotes preferred package code
- A "T" suffix added to the packaging codes for SMA, SMB and SMC products indicates that the patented folded-frame construction is used. This does not apply to TR and TR3 codes or TRANSZORB[®] TVS in SMA and SMB
- ⁽¹⁾ Formerly sold by Vishay Telefunken[®] (Telefunken[®] is a registered trademark of Electro Holding GmbH)



| BULK PACKAGING | | | | | |
|---|------------------------|---------------------------|-------------------|-------------------|----------|
| CASE TYPES | PREFERRED PACKAGE CODE | PACKAGING | BOX SIZE | | QUANTITY |
| | | | INCHES | cm | EA. |
| DF-M, DF-S, DFL-S | 45 | Anti-static plastic tubes | 17.4 length | 44.1 length | 50 |
| GSIB-5S, PB | 45 | Anti-static plastic tubes | 24.2 length | 61.5 length | 20 |
| GBU, BU | 45 | Anti-static plastic tubes | 18.5 length | 47 length | 20 |
| GBL | 45 | Anti-static plastic tubes | 17.5 length | 44.5 length | 20 |
| TO-220AB / AC, ITO-220AC / AB, TO-262AA | 45, 4W | Anti-static plastic tubes | 21.0 length | 53.7 length | 50 |
| TO-247AD | 45 | Anti-static plastic tubes | 20.0 length | 50.8 length | 30 |
| MBS (TO-269AA) | 45 | Anti-static plastic tubes | 20.3 x 0.41 | 51.5 x 1.04 | 100 |
| GBL | 51 | Anti-static PVC tray | 12.5 x 6.1 x 1.0 | 31.7 x 15.5 x 2.5 | 400 |
| GBPC12-35W | 51 | Paper box | 12.5 x 12.5 x 1.7 | 31.7 x 31.7 x 4.3 | 100 |
| GBPC6 | 51 | Paper box | 7.5 x 7.5 x 1.43 | 19.0 x 19.0 x 3.6 | 100 |
| KBL | 51 | Anti-static PVC tray | 12.2 x 6.1 x 1.5 | 30.9 x 15.5 x 3.8 | 300 |
| GBPC12-35 | 51 | Paper box | 12.5 x 12.5 x 1.7 | 31.7 x 31.7 x 4.3 | 100 |
| KBU4, 6, 8 | 51 | Anti-static PVC tray | 12.2 x 6.1 x 1.5 | 30.9 x 15.5 x 3.8 | 250 |
| WOG, 2WOG | 51 | Plastic bags | - | - | 100 |
| GBU / BU | 51 | Paper tray | 13.1 x 6.6 x 1.2 | 33.2 x 16.8 x 3.0 | 250 |

AXIAL-LEADED TAPE AND REEL PACKAGING



All axial-leaded devices are packed in accordance with EIA standard RS-296-E. The diagrams given below refer to these specifications.

| TABLE 1 - AMMO PACK PACKAGING | | | | | | |
|----------------------------------|--|----------------------------------|-------------------|------------------|-------------------|------------------------------|
| PACKAGING | AVAILABLE PRODUCT OUTLINES | PREFERRED PACKAGE CODE | DIMENSION A | DIMENSION B | DIMENSION C | QUANTITY BOX |
| 26 mm horizontal tape, ammo pack | DO-41(DO-204AL), MPG06 DO-15 (DO-204AC) P300 | 53, B 53, B 53, B | 9.7" (247 mm) | 1.7" (44 mm) | 3.7" (95 mm) | 3.0K 1.5K 0.75K |
| 52 mm horizontal tape, ammo pack | DO-41(DO-204AL), MPG06 DO-15 (DO-204AC) DO-201AD, GP20 P600 | 73, D 73, D 73, D 73, D | 10.0" (255 mm) | 3.15" (80 mm) | 4.53" (115 mm) | 3.0K 2.0K 1.0K 0.3K |
| Pseudo / radial tape, ammo pack | MPG06 | 100, V | 13.4" (340 mm) | 1.8" (47 mm) | 7.9" (200 mm) | 2.0K |



Dimensions in millimeters (inches)

| Description | Symbol | |
|---------------------------|---------|------|
| Component Pitch | A | 2, 3 |
| Inside Tape Spacing | B | 2, 3 |
| Lead to Lead Eccentricity | D1 - D2 | - |
| Lead Extension | K | - |
| Lead Bending | E | 2 |
| Cumulative Pitch | P | 3 |
| Exposed Adhesive | S | - |
| Tape Width | T | - |

All polarized components shall be oriented in the same direction

Fig. 1



The "C" dimension of Fig. 2 is between flanges of the component reel and shall be 1.5 mm (0.059") to 8.00 mm (0.315") greater than the overall taped component width "W" (Fig. 1). Where "W" dimension is 68.2 mm (2.68") max.

Fig. 2



AXIAL-LEADED TAPE AND REEL PACKAGING

| TABLE 2 - REEL AND AMMO PACK TAPING SPECIFICATIONS | | | | | | | | | | |
|---|----------------------------------|----------------|----------------------------|--------|--------------------------------|--------|---------------------------|-----------|-------------------------|--------|
| COMPONENT CASE TYPE | PREFERRED PACKAGE CODE | UNITS PER REEL | COMPONENT PITCH "A" Fig. 1 | | INSIDE TAPE SPACING "B" Fig. 1 | | REEL DIMENSION "D" Fig. 2 | | LEAD BENDING "E" Fig. 1 | |
| | | | EA. | INCHES | mm | INCHES | mm | INCHES | mm | INCHES |
| DO-15 (DO-204AC) | 54, C | 4000 | 0.200 | 5.0 | 2.06 | 52.4 | 13.0 | 330 | 0.047 | 1.2 |
| DO-201AD | 54, C | 1400 | 0.395 | 10.0 | 2.06 | 52.4 | 13.0 | 330 | 0.047 | 1.2 |
| DO-41 (DO-204AL) | 54, C | 5500 | 0.200 | 5.0 | 2.06 | 52.4 | 13.0 | 330 | 0.047 | 1.2 |
| DFS Surface-Mount | 77 | 1500 | Fig. 8 | | - | - | 13.0 | 330 | Fig. 8 | - |
| GF1 (DO-214BA) | 67A, H / 5CA, I | 1500 / 6500 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| GL34 (DO-213AA) | 98, H / 83, I | 2500 / 9000 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| GL41 (DO-213AB) | 96, H / 97, I | 1500 / 5000 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| GP10E Radial | Fig. 5 and Fig. 6 | 2500 | 0.500 | 12.7 | - | - | 13.0 | 330 | 0.079 | 2.0 |
| GP10E | 54, C | 5500 | 0.200 | 5.0 | 2.06 | 52.4 | 13.0 | 330 | 0.047 | 1.2 |
| GP20/1.5KE | 54, C | 1400 | 0.395 | 10.0 | 2.06 | 52.4 | 13.0 | 330 | 0.047 | 1.2 |
| MPG06 | 54, C | 5500 | 0.200 | 5.0 | 2.06 | 52.4 | 13.0 | 330 | 0.047 | 1.2 |
| P600 | 54, C | 800 | 0.395 | 10.0 | 2.06 | 52.4 | 13.0 | 330 | 0.047 | 1.2 |
| SMP (DO-220AA) | 84A, H / 85A, I | 3000 / 10 000 | Fig. 8 | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| SMF (DO-219AB) | H / I | 3000 / 10 000 | | | - | - | 7.0 / 13.0 | 178 / 300 | Fig. 8 | - |
| SMPD (TO-263AC) / SMPA (DO-221BC) | I | 2000 / 14 000 | | | - | - | 13.0 | 330 | Fig. 8 | - |
| MicroSMP (DO-219AD) / MicroSMF (DO-219AC) | 89A / H | 4500 | | | - | - | 7.0 | 178 | Fig. 8 | - |
| SMPC (TO-277A) | 86A, H / 87A, I | 1500 / 6500 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| SMA (DO-214AC) | 61, 61T, TR, H / 5A, 5AT, TR3, I | 1800 / 7500 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| SMB (DO-214AA) / SMBG (DO-215AA) | 52, 52T, H / 5B, 5BT, I | 750 / 3200 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| SMC (DO-214AB) / SMCG (DO-215AB) | 57, 57T, H / 9A, 9AT, I | 850 / 3500 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| DO-218AB / AC | 2D / I | 750 | | | - | - | 13.0 | 330 | Fig. 8 | - |
| D ² PAK (TO-263AB) | 81, 8W, I | 800 | | | - | - | 13.0 | 330 | Fig. 8 | - |
| MBS (TO-269AA) | 80, I | 3000 | | | - | - | 13.0 | 330 | Fig. 8 | - |
| SlimSMA (DO-221AC) | 6A, H / 6B, I | 3500 / 14 000 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| SlimSMAW (DO-221AD) | H, I | 3500 / 14 000 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |
| SlimDPAK (TO-252AE) | I | 4500 | | | - | - | 13.0 | 330 | Fig. 8 | - |
| FlatPAK 5 x 6 | H / I | 1500 / 6000 | | | - | - | 7.0 / 13.0 | 178 / 330 | Fig. 8 | - |

Note

- Package codes, 61/5A, 52/5B are matrix-frame constructions for TRANSZORB[®] TVS in SMA and SMB only

| TABLE 3 - COMPONENT AND INSIDE HORIZONTAL TAPE SPACING | | | |
|---|-------------------------------------|--|---|
| COMPONENT BODY DIAMETER | COMPONENTS SPACING A (LEAD TO LEAD) | INSIDE TAPE SPACING "B" | CUMULATIVE PITCH TOLERANCE |
| 0 mm to 5 mm (0.0" to 0.197") | 5.0 mm ± 0.5 mm (0.197" ± 0.020") | 26 mm + 1.5 mm / - 0.0 mm (1.024" + 0.059" / - 0.0") | Not to exceed 1.5 mm (0.059") over 6 consecutive components |
| 0 mm to 5 mm (0.0" to 0.197") | 5.0 mm ± 0.5 mm (0.197" ± 0.020") | 52.4 mm + 1.5 mm / - 0.4 mm (2.062" + 0.059" / - 0.016") | |
| 5.01 mm to 10 mm (0.197" to 0.394") | 10 mm ± 0.5 mm (0.394" ± 0.020") | 52.4 mm + 1.5 mm / - 0.4 mm (2.062" + 0.059" / - 0.016") | |

DIMENSIONS in millimeters (inches)



Note:
(1) Component Alignment

Available only for MPG06 Product in Ammo Pack in Accordance with EIA Standard RS-468-A Utilizing 0.61 mm (0.024") Diameter Leads. Maximum Cumulative Pitch Tolerance: 1.0 mm (0.039")/20 Pitch.

Fig. 3 - Pseudo Radial

RADIAL TAPE PACKAGING



Fig. 4 - Reel Dimensions

Notes

- "C" dimension between the reel flanges shall be governed by the overall width of the taped components and shall be 1.5 mm (0.057") to 8.0 mm (0.315") greater than the overall width
- All leaded devices are packaged in accordance with EIA standard RS-468-A specification and are available on reel or in fan fold box (ammo pack)
- All dimensions are in millimeters and (inches)

SURFACE MOUNT TAPE AND REEL PACKAGING



Fig. 5



Fig. 6



Fig. 7

| DIMENSIONS in millimeters (inches) | | | | | | | |
|------------------------------------|---|-------------|-------------------------------|--------------|-----------|--------------|--------------|
| TAPE SIZE | A MAX. | B MIN. | C | D MIN. | N MIN. | G MAX. | T MAX. |
| 8 mm (0.315) | 330 ± 2.0 (13.0 ± 0.079) 178 ± 2.0 (7.0 ± 0.079) | 1.5 (0.059) | 13.0 ± 0.20 (0.51 ± 0.008) | 20.2 (0.795) | 50 (1.97) | 9.9 (0.389) | 14.4 (0.567) |
| 12 mm (0.472) | 330 ± 2.0 (13.0 ± 0.079) 178 ± 2.0 (7.0 ± 0.079) | 1.5 (0.059) | 13.0 ± 0.20 (0.51 ± 0.008) | 20.2 (0.795) | 50 (1.97) | 14.4 (0.567) | 18.4 (0.724) |
| 16 mm (0.630) | 330 ± 2.0 (13.0 ± 0.079) 178 ± 2.0 (7.0 ± 0.079) | 1.5 (0.059) | 13.0 ± 0.20 (0.51 ± 0.008) | 20.2 (0.795) | 50 (1.97) | 18.4 (0.724) | 22.4 (0.802) |
| 24 mm (0.945) | 330 ± 2.0 (13.0 ± 0.079) 178 ± 2.0 (7.0 ± 0.079) | 1.5 (0.059) | 13.0 ± 0.20 (0.51 ± 0.008) | 20.2 (0.795) | 50 (1.97) | 26.4 (1.039) | 30.4 (1.197) |

SURFACE MOUNT TAPE AND REEL PACKAGING



Fig. 8

| 8 mm, 12 mm, 16 mm, AND 24 mm EMBOSSED TAPE in millimeters (inches) | | | | | | | | | |
|---|------------------------------|-------------------------------|------------------------------|-------------------------------|-----------------|----------------|------------------|----------------|--|
| TAPE SIZE | D_0 | E_1 | P_0 | P_2 | A_0, B_0, K_0 | S_1 MIN. | T MAX. | T_1 MAX. | |
| 8 mm, 12 mm | 1.5 ± 0.1 (0.059 ± 0.004) | 1.75 ± 0.1 (0.069 ± 0.004) | 4.0 ± 0.1 (0.157 ± 0.004) | 2.0 ± 0.05 (0.079 ± 0.002) | (1) | 0.6 (0.024) | 0.600 (0.024) | 0.1 (0.004) | |
| 16 mm, 24 mm | | | | 2.0 ± 0.1 (0.079 ± 0.004) | | | | | |



| DIMENSIONS in millimeters (inches) | | | | | | | | | |
|--|------------|---------------------|---------------------|-------------------------------|--------------------------------|-------------------------------|---------------|--------------------------------|-----------------|
| CASE TYPE | TAPE SIZE | B ₁ MAX. | D ₁ MIN. | E ₂ MIN. | F | P ₁ | R REF. | T ₂ MAX. | W MAX. |
| GL34 (DO-213AA) | 8 (0.315) | 4.2 (0.165) | 1.0 (0.039) | 6.25 (0.246) | 3.5 ± 0.05 (0.138 ± 0.002) | 4.0 ± 0.10 (0.157 ± 0.004) | 20 (0.787) | 2.4 (0.094) | 8.3 (0.327) |
| MicroSMP (DO-219AB) / MicroSMF (DO-219AD) | | 3.28 (0.129) | | 6.05 (0.238) | | | | 1.919 (0.076) | |
| SMF (DO-219AB) | | - | | | | | | 1.8 (0.07) | 8.2 (0.322) |
| GL34 (DO-213AA) | 12 (0.472) | 8.2 (0.323) | 1.5 (0.059) | 10.25 (0.404) | 5.5 ± 0.05 (0.217 ± 0.002) | 8.0 ± 0.10 (0.315 ± 0.004) | 25 (0.984) | 4.5 (0.177) | 12.3 (0.484) |
| GF1 (DO-214BA) | | | | | | | | 3.25 (0.128) | |
| SMA (DO-214AC) | | | | | | | | 2.64 (0.104) | |
| SMP (DO-220AA) | | | | | | | | 1.84 (0.072) | |
| SMPC (TO-277A) | | 7.0 (0.276) | | | | | | 1.43 (0.056) | |
| SMB (DO-214AA) / SMBG (DO-215AA) | | 8.2 (0.323) | | | | | | 2.77 (0.109) | |
| SMC (DO-214AB) / SMCG (DO-215AB) | 16 (0.630) | 12.1 (0.476) | 14.25 (0.561) | 7.5 ± 0.1 (0.295 ± 0.004) | 12.0 ± 0.10 (0.472 ± 0.004) | 25 (0.984) | 25 (0.984) | 2.64 (0.104) | 16.3 (0.642) |
| SlimDPAK (TO-252AE) | | | | | | | | 2.0 (0.079) | |
| DFS | | | | | | | | 3.91 (0.154) | |
| D ² PAK (TO-263AB) DO-218AB / AC | 24 (0.945) | 20.1 (0.791) | 22.25 (0.876) | 11.5 ± 0.1 (0.453 ± 0.004) | 16.0 ± 0.10 (0.630 ± 0.004) | 25 (0.984) | 25 (0.984) | 5.31 (0.209) | 24.3 (0.957) |
| SMPD (TO-263AC) | | | | | | | | 12.0 ± 0.10 (0.472 ± 0.004) | |
| SlimSMA (DO-221AC) / SMPA (DO-221BC) | 12 (0.472) | 6.2 (0.244) | 10.25 (0.404) | 5.5 ± 0.05 (0.217 ± 0.002) | 4.0 ± 0.10 (0.157 ± 0.004) | 25 (0.984) | 25 (0.984) | 1.53 (0.060) | 12.3 (0.484) |
| SlimSMAW (DO-221AD) | | | | | | | | 1.61 (0.063) | |
| FlatPAK 5 x 6 | | | | | | | | 6.4 (0.252) | |

Notes

- (1) A₀, B₀, and K₀ are determined by the maximum dimensions of the component size. The clearance between the component and the cavity must be within 0.05 mm (0.002") min. to 0.5 mm (0.02") max. for 8 mm tape and 12 mm tape, 0.15 mm (0.066") min. to 0.90 mm (0.035") max. for 16 mm tape and 0.15 mm (0.006") min. to 1.0 mm (0.59") max. for 24 mm tape
- (2) All surface mount components are packed in accordance with EIA standard 481-E

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