

Solid Tantalum SMD Capacitors TANTAMOUNT™, Hi-Rel COTS, Low ESR, Metal Case



PERFORMANCE CHARACTERISTICS

Operating Temperature: -55 °C to +125 °C
(above 85 °C, voltage derating is required)

Capacitance Range: 22 µF to 330 µF

Capacitance Tolerance: ± 10 %, ± 20 %

Voltage Rating: 16 V_{DC} to 50 V_{DC}

FEATURES

- High reliability; burn-in at a minimum of rated DC voltage for a minimum of 40 h
- Surge current testing per MIL-PRF-55365 option available
- Low ESR
- Lead (Pb)-free terminations available (tin / lead terminations are under development)
- Mounting: surface mount
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS*
Available

HALOGEN
FREE

GREEN
(5-2008)
Available

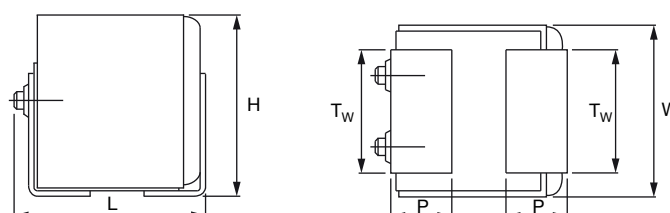
Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non-RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details.

ORDERING INFORMATION

| T25 | D | 226 | K | 050 | E | S | A |
|------|----------------------------------|--|--------------------------|--|---|--------------------------------|---|
| TYPE | CASE CODE | CAPACITANCE | CAPACITANCE TOLERANCE | DC VOLTAGE RATING AT +85 °C | TERMINATION / PACKAGING (available options are series dependent) | RELIABILITY GRADE | SURGE CURRENT OPTION |
| | See Ratings and Case Codes table | This is expressed in pF. The first two digits are the significant figures. The third is the number of zeros to follow. | K = ± 10 % M = ± 20 % | This is expressed in volts. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 V). | C = 100 % tin / 7" (178 mm), reel H = 100 % tin / 7" (178 mm), 1/2 reel E = Sn / Pb solder / 7" (178 mm) reel L = Sn / Pb solder / 7" (178 mm), 1/2 reel | S = 40 h burn-in Z = non ER | A = 10 cycles at +25 °C B = 10 cycles at -55 °C / +85 °C C = 10 cycles at -55 °C / +85 °C (before burn-in) S = 3 cycles at 25 °C Z = no surge current |

DIMENSIONS in inches [millimeters]

|  | | | | | |
|--|----------------|------------------------------|------------------------------|------------------------------|------------------------------|
| CASE CODE | L (MAX.) | W | H | P | Tw |
| D | 0.326 [8.5] | 0.275 ± 0.008 [7.0 ± 0.2] | 0.291 ± 0.008 [7.4 ± 0.2] | 0.098 ± 0.008 [2.5 ± 0.2] | 0.197 ± 0.008 [5.0 ± 0.2] |

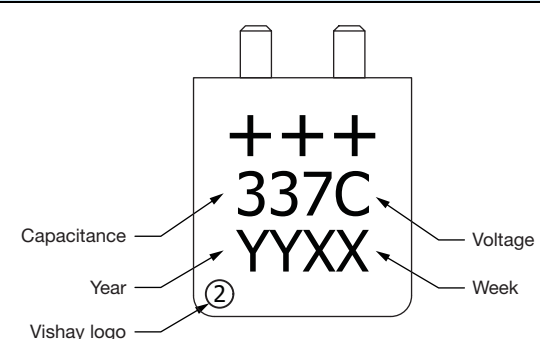
RATINGS AND CASE CODES

| μF | 16 V | 20 V | 25 V | 35 V | 50 V |
|---------------|------|------------------|------------------|------------------|------|
| 22 | | | | | D |
| 33 | | | | | |
| 47 | | | | | |
| 68 | | | | D ⁽¹⁾ | |
| 100 | | | D ⁽¹⁾ | | |
| 150 | | | | | |
| 220 | | D ⁽¹⁾ | | | |
| 330 | D | | | | |

Note

⁽¹⁾ Preliminary values, contact factory for availability.

MARKING

|  | | VOLTAGE CODE | |
|--|--|--------------|------|
| | | V | CODE |
| | | 16 | C |
| | | 20 | D |
| | | 25 | E |
| | | 35 | V |
| | | 50 | T |

STANDARD RATINGS

| CAPACITANCE (μF) | CASE CODE | PART NUMBER | MAX. DCL AT +25 °C (μA) | MAX. DF AT +25 °C (%) | MAX. ESR AT +25 °C 100 kHz (m Ω) | MAX. RIPPLE 100 kHz I _{RMS} (A) |
|--|------------------|------------------------|--|-----------------------------|---|---|
| 16 V_{DC} AT +85 °C; 10 V_{DC} AT +125 °C | | | | | | |
| 330 | D | T25D337(1)016(2)(3)(4) | 52.8 | 14 | 180 | 1.5 |
| 20 V_{DC} AT +85 °C; 13 V_{DC} AT +125 °C | | | | | | |
| 220 | D ⁽¹⁾ | T25D227(1)020(2)(3)(4) | | In development | | |
| 25 V_{DC} AT +85 °C; 17 V_{DC} AT +125 °C | | | | | | |
| 100 | D ⁽¹⁾ | T25D107(1)025(2)(3)(4) | | In development | | |
| 35 V_{DC} AT +85 °C; 23 V_{DC} AT +125 °C | | | | | | |
| 68 | D ⁽¹⁾ | T25D686(1)035(2)(3)(4) | | In development | | |
| 50 V_{DC} AT +85 °C; 33 V_{DC} AT +125 °C | | | | | | |
| 22 | D | T25D226(1)050(2)(3)(4) | 11 | 6 | 500 | 0.9 |

Notes

- Part number definitions:
 - Capacitance tolerance: K, M
 - Termination and packaging: C, H, E, L
 - Reliability level: S, Z
 - Surge current: A, B, S, C, Z
- Rating in development, contact factory for availability

**RECOMMENDED VOLTAGE DERATING GUIDELINES** (for temperatures below +85 °C)**STANDARD CONDITIONS. FOR EXAMPLE: OUTPUT FILTERS**

| Capacitor Voltage Rating | Operating Voltage |
|--------------------------|-------------------|
| 16 | 10 |
| 20 | 12 |
| 25 | 15 |
| 35 | 24 |
| 50 | 28 |

SEVERE CONDITIONS. FOR EXAMPLE: INPUT FILTERS

| Capacitor Voltage Rating | Operating Voltage |
|--------------------------|-------------------|
| 16 | 8.0 |
| 20 | 10 |
| 25 | 12 |
| 35 | 15 |
| 50 | 24 |

CARRIER TAPE DIMENSIONS in inches [millimeters]

| TYPE | CASE CODE | TAPE WIDTH W (mm) | P ₁ | K ₀ MAX. | B ₁ MAX. |
|------|-----------|----------------------|-------------------------------|---------------------|---------------------|
| T25 | D | 16 | 0.476 ± 0.004 [12.0 ± 0.1] | 0.3 [7.86] | 0.45 [11.3] |

POWER DISSIPATION

| CASE CODE | MAXIMUM PERMISSIBLE POWER DISSIPATION AT +25 °C (W) IN FREE AIR |
|-----------|---|
| D | 0.408 |

STANDARD PACKAGING QUANTITY

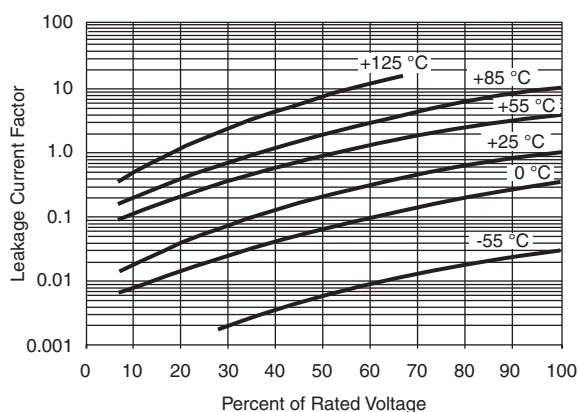
| CASE CODE | UNITS PER REEL | |
|-----------|----------------|--------------|
| | 7" FULL REEL | 7" HALF REEL |
| D | 100 | 50 |

CAPACITOR ELECTRICAL PERFORMANCE CHARACTERISTICS

| ITEM | PERFORMANCE CHARACTERISTICS | | | |
|---|---|-------------------|---|-------------------|
| Category temperature range | -55 °C to +85 °C (to +125 °C with voltage derating) | | | |
| Capacitance tolerance | ± 20 %, ± 10 %, tested via bridge method, at +25 °C, 120 Hz | | | |
| Dissipation factor | Limit per Standard Ratings table. Tested via bridge method, at 25 °C, 120 Hz. | | | |
| ESR | Limit per Standard Ratings table. Tested via bridge method, at 25 °C, 100 kHz. | | | |
| Leakage current | After application of rated voltage applied to capacitors for 5 min using a steady source of power with 1 kΩ resistor in series with the capacitor under test, leakage current at 25 °C is not more than described in Standard Ratings table. <i>Note that the leakage current varies with temperature and applied voltage. See graph below for the appropriate adjustment factor.</i> | | | |
| Capacitance change by temperature | +12 % max. (at +125 °C) +10 % max. (at +85 °C) -10 % max. (at -55 °C) | | For capacitance value > 300 μF +20 % max. (at +125 °C) +15 % max. (at +85 °C) -15 % max. (at -55 °C) | |
| Reverse voltage | Capacitors are capable of withstanding peak voltages in the reverse direction equal to: 10 % of the DC rating at +25 °C 5 % of the DC rating at +85 °C Vishay does not recommend intentional or repetitive application of reverse voltage. | | | |
| Ripple current and temperature derating | For maximum permissible ripple current (I _{RMS}) or / and voltage (V _{RMS}) please refer to product datasheet and Guide to Application. If capacitors are to be used at temperatures above +25 °C, the permissible RMS ripple current or voltage shall be calculated using the derating factors: 1.0 at +25 °C 0.9 at +85 °C 0.4 at +125 °C | | | |
| Maximum operating voltage | OPERATING TEMPERATURE | | | |
| | +85 °C | | +125 °C | |
| | RATED VOLTAGE (V) | SURGE VOLTAGE (V) | RATED VOLTAGE (V) | SURGE VOLTAGE (V) |
| | 16 | 20 | 10 | 12 |
| | 20 | 26 | 13 | 16 |
| | 25 | 32 | 17 | 20 |
| | 35 | 46 | 23 | 28 |
| | 50 | 65 | 33 | 40 |

Note

- All information presented in this document reflects typical performance characteristics.

TYPICAL LEAKAGE CURRENT FACTOR RANGE

Notes

- At +25 °C, the leakage current shall not exceed the value listed in the Standard Ratings table.
- At +85 °C, the leakage current shall not exceed 10 times the value listed in the Standard Ratings table.
- At +125 °C, the leakage current shall not exceed 12 times the value listed in the Standard Ratings table.

**CAPACITOR PERFORMANCE CHARACTERISTICS**

| ITEM | CONDITION | POST TEST PERFORMANCE | |
|----------------------|---|---|--|
| Surge voltage | 85 °C, 1000 successive test cycles at 1.3 of rated voltage in series with a 1 kΩ resistor at the rate of 30 s ON, 30 s OFF, MIL-PRF-55365 | Capacitance change Dissipation factor Leakage current | Within ± 10 % of initial Not to exceed initial Not to exceed initial |
| Life test at +85 °C | 2000 h application of rated voltage at 85 °C, MIL-STD-202 method 108 | Capacitance change Leakage current | Within ± 10 % of initial Not to exceed 125 % of initial |
| Life test at +125 °C | 1000 h application of 2/3 rated voltage at 125 °C, MIL-STD-202 method 108 | Capacitance change Leakage current | Within ± 20 % of initial Not to exceed 125 % of initial |

CAPACITOR ENVIRONMENTAL CHARACTERISTICS

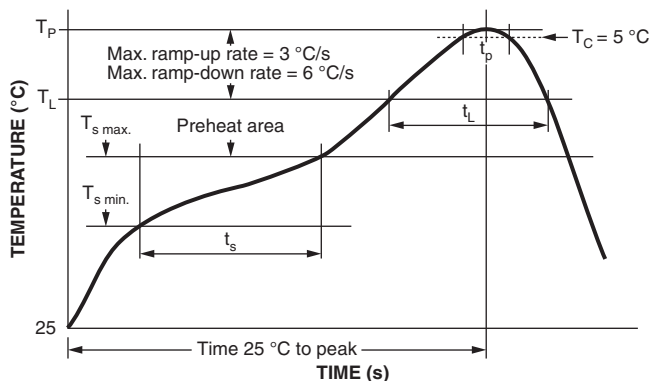
| ITEM | CONDITION | POST TEST PERFORMANCE | |
|-----------------------------|--|---|--|
| Moisture resistance | MIL-STD-202, method 106, at rated voltage. | Capacitance change Cap. ≤ 600 μF Cap. > 600 μF Dissipation factor Leakage current | Within ± 10 % of initial value Within ± 20 % of initial value Initial specified value or less Initial specified value or less |
| Thermal shock | Capacitors are subjected to 6 cycles per MIL-STD-202 method 107 of the following: -55 °C (+0 °C, -6 °C) for 30 min, then +25 °C (+3 °C, -3 °C) for 5 min, then +85 °C (+4 °C, -5 °C) for 40 min, then +125 °C (+4 °C, -0 °C) for 30 min, then +25 °C (+3 °C, -3 °C) for 5 min | Capacitance change Cap. Dissipation factor Leakage current | Within ± 15 % of initial Initial specified value or less Initial specified value multiplied by 12 or less |
| Salt atmosphere (corrosion) | Test per MIL-202, method 101, condition B (48 h). 5 % salt solution applying. | No harmful or extensive corrosion, = 90 % protection of exposed metallic surfaces by finish, markings legible, = 10 % corrosion of the terminal hardware or mounting. | |

MECHANICAL PERFORMANCE CHARACTERISTICS

| TEST CONDITION | CONDITION | POST TEST PERFORMANCE | |
|------------------------------|---|---|--|
| Shear test | Apply a pressure load of 5 N for 10 s ± 1 s horizontally to the center of capacitor side body. AEC-Q200-006 | There shall be no visual damage when viewed at 20 x magnification and the component shall meet the original electrical requirements. | |
| Vibration | MIL-STD-202, method 204, condition D, 10 Hz to 2000 Hz, 20 g peak | There shall be no mechanical or visual damage to capacitors post-conditioning. | |
| Shock (specified pulse) | MIL-STD-202, method 213, condition I, 100 g peak | Capacitance change Dissipation factor Leakage current | Within ± 10 % of initial Initial specified value or less Initial specified value or less |
| Resistance to soldering heat | MIL-STD-202, method 210, condition J, except with only one heat cycle. | Capacitance change Dissipation factor Leakage current | Within ± 10 % of initial Initial specified value or less Initial specified value or less |
| Solderability | MIL-STD-202, method 208, ANSI/J-STD-002, test B. Applies only to solder and tin plated terminations. Does not apply to gold terminations. | There shall be no mechanical or visual damage to capacitors post-conditioning. | |
| Resistance to solvent | MIL-STD-202, method 215 | All terminations shall exhibit a continuous solder coating free from defects for a minimum of 95 % of the critical area of any individual lead. | |
| Sleeving | MIL-PRF-39003, paragraph 3.22: apply a DC potential of 2000 V. | Marking has to remain legible, no degradation of the can material. | |
| Seal | MIL-STD-202, method 112, condition A or D | Maximum leakage of 20 μA is allowed between the capacitor case and the fixture. | |
| | | There shall be no visual leakage. | |

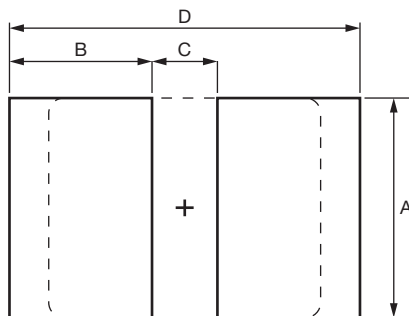
RECOMMENDED REFLOW PROFILES

Capacitors should withstand reflow profile as per J-STD-020 standard



| PROFILE FEATURE | SnPb EUTECTIC ASSEMBLY | LEAD (Pb)-FREE ASSEMBLY |
|--|------------------------|-------------------------|
| Preheat / soak | | |
| Temperature min. ($T_{s \text{ min.}}$) | 100 °C | 150 °C |
| Temperature max. ($T_{s \text{ max.}}$) | 150 °C | 200 °C |
| Time (t_s) from ($T_{s \text{ min.}}$ to $T_{s \text{ max.}}$) | 60 s to 120 s | 60 s to 120 s |
| Ramp-up | | |
| Ramp-up rate (T_L to T_P) | 3 °C/s max. | 3 °C/s max. |
| Liquidus temperature (T_L) | 183 °C | 217 °C |
| Time (t_L) maintained above T_L | 60 s to 150 s | 60 s to 150 s |
| Peak package body temperature (T_P) | 220 | 250 |
| Time (t_P) within 5 °C of the specified classification temperature (T_C) | 20 s | 30 s |
| Time 25 °C to peak temperature | 6 min max. | 8 min max. |
| Ramp-down | | |
| Ramp-down rate (T_P to T_L) | 6 °C/s max. | 6 °C/s max. |
| Time 25 °C to peak temperature | 6 min max. | 8 min max. |

PAD DIMENSIONS in inches [millimeters]



| CASE CODE | A (MIN.) | B (NOM.) | C (NOM.) | D (NOM.) |
|-----------|-------------|-------------|-------------|-------------|
| D | 0.276 [7] | 0.178 [4.5] | 0.079 [2] | 0.433 [11] |



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