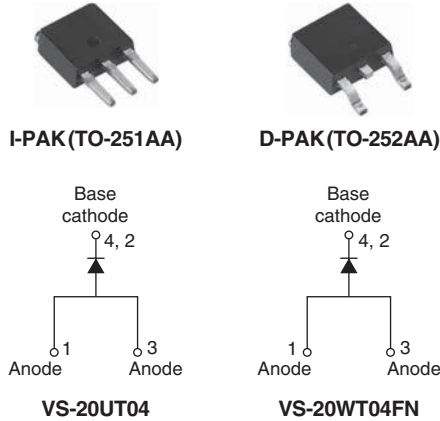




THE DATASHEET OF VS-20UT04



High Performance Schottky Generation 5.0, 20 A



FEATURES

- 175 °C high performance Schottky diode
- Very low forward voltage drop
- Extremely low reverse leakage
- Optimized V_F vs. I_F trade off for high efficiency
- Increased ruggedness for reverse avalanche capability
- RBSOA available
- Negligible switching losses
- Submicron trench technology
- Compliant to RoHS Directive 2002/95/EC


RoHS
COMPLIANT

| PRODUCT SUMMARY | |
|-----------------|---------------------------------------|
| Package | D-PAK (TO-252AA), I-PAK (TO-251AA) |
| $I_{F(AV)}$ | 20 A |
| V_R | 45 V |
| V_F at I_F | 0.53 V |
| I_{RM} max. | 7 mA at 125 °C |
| T_J max. | 175 °C |
| Diode variation | Single die |
| E_{AS} | 108 mJ |

Note

- V_F measured at 125 °C, connecting 2 anode pins

APPLICATIONS

- Specific for PV cells bypass diode
- High efficiency SMPS
- High frequency switching
- Output rectification
- Reverse battery protection
- Freewheeling
- DC/DC systems
- Increased power density systems

| MAJOR RATINGS AND CHARACTERISTICS | | | |
|-----------------------------------|---|-------------|-------|
| SYMBOL | CHARACTERISTICS | VALUES | UNITS |
| V_{RRM} | | 45 | V |
| V_F | 20 Apk, $T_J = 125$ °C (typical, measured connecting 2 anode pins) | 0.480 | V |
| T_J | Range | - 55 to 175 | °C |

| VOLTAGE RATINGS | | | | |
|----------------------------|--------|-----------------|--------------------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | VS-20UT04 VS-20WT04FN | UNITS |
| Maximum DC reverse voltage | V_R | $T_J = 25$ °C | 45 | V |



| ABSOLUTE MAXIMUM RATINGS | | | | | |
|---|-------------|---|--|----------------------------------|-------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum average forward current | $I_{F(AV)}$ | 50 % duty cycle at $T_C = 153\text{ }^\circ\text{C}$, rectangular waveform | | 20 | A |
| Maximum peak one cycle non-repetitive surge current | I_{FSM} | 5 μs sine or 3 μs rect. pulse | Following any rated load condition and with rated V_{RRM} applied ⁽¹⁾ | 900 | A |
| | | 10 ms sine or 6 ms rect. pulse | | 220 | |
| Non-repetitive avalanche energy | E_{AS} | $T_J = 25\text{ }^\circ\text{C}$, $I_{AS} = 7\text{ A}$, $L = 4.4\text{ mH}$ | | 108 | mJ |
| Repetitive avalanche current | I_{AR} | Limited by frequency of operation and time pulse duration so that $T_J < T_{J\text{ max}}$. I_{AS} at $T_{J\text{ max}}$. as a function of time pulse | | I_{AS} at $T_{J\text{ max}}$. | A |

Note

(1) Measured connecting 2 anode pins

| ELECTRICAL SPECIFICATIONS | | | | | | |
|--------------------------------|----------------------------|--|-----------------------------------|-------|--------|------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | TYP. | MAX. | UNITS |
| Forward voltage drop | V_{FM} ⁽¹⁾⁽²⁾ | 10 A | $T_J = 25\text{ }^\circ\text{C}$ | 0.505 | 0.540 | V |
| | | 20 A | | 0.570 | 0.610 | |
| | | 10 A | $T_J = 125\text{ }^\circ\text{C}$ | 0.415 | 0.450 | |
| | | 20 A | | 0.520 | 0.580 | |
| Reverse leakage current | I_{RM} ⁽¹⁾ | $T_J = 25\text{ }^\circ\text{C}$ | $V_R = \text{Rated } V_R$ | - | 100 | μA |
| | | $T_J = 125\text{ }^\circ\text{C}$ | | - | 7 | mA |
| Junction capacitance | C_T | $V_R = 5\text{ V}_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^\circ\text{C}$ | | 1900 | - | pF |
| Series inductance | L_S | Measured lead to lead 5 mm from package body | | - | - | nH |
| Maximum voltage rate of change | dV/dt | Rated V_R | | - | 10 000 | V/ μs |

Notes(1) Pulse width < 300 μs , duty cycle < 2 %

(2) Only 1 anode pin connected

| THERMAL - MECHANICAL SPECIFICATIONS | | | | | |
|--|----------------|------------------|--|-------------|--------------------|
| PARAMETER | SYMBOL | TEST CONDITIONS | | VALUES | UNITS |
| Maximum junction and storage temperature range | T_J, T_{Stg} | | | - 55 to 175 | $^\circ\text{C}$ |
| Maximum thermal resistance, junction to case | R_{thJC} | DC operation | | 1.2 | $^\circ\text{C/W}$ |
| Typical thermal resistance, case to heatsink | R_{thCS} | | | 0.3 | |
| Approximate weight | | | | 2 | g |
| | | | | 0.07 | oz. |
| Marking device | | Case style I-PAK | | 20UT04 | |
| | | Case style D-PAK | | 20WT04FN | |

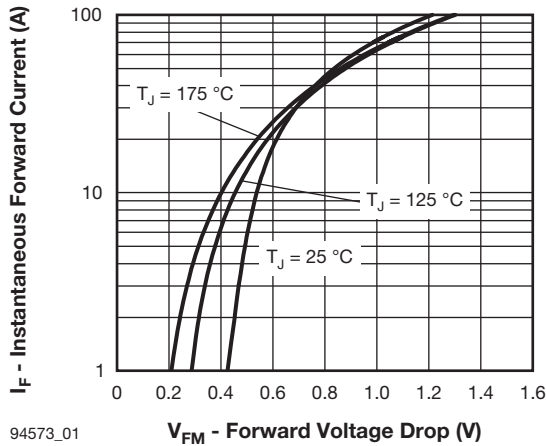


Fig. 1 - Maximum Forward Voltage Drop Characteristics

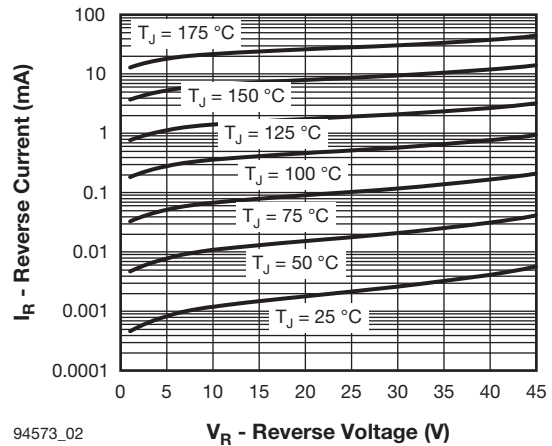


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

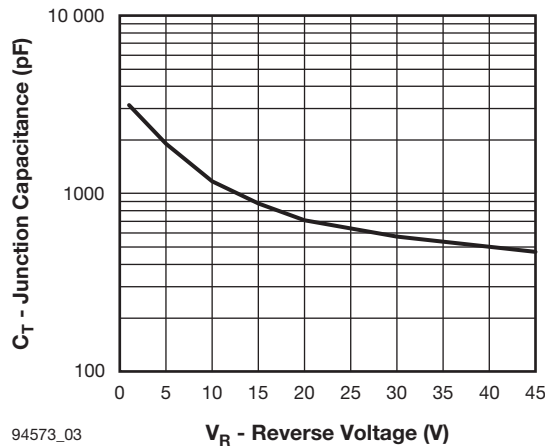


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

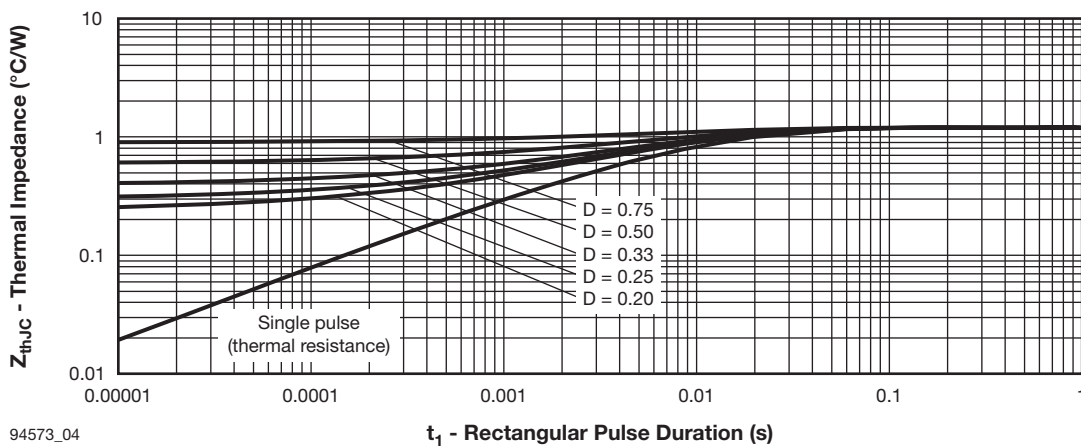
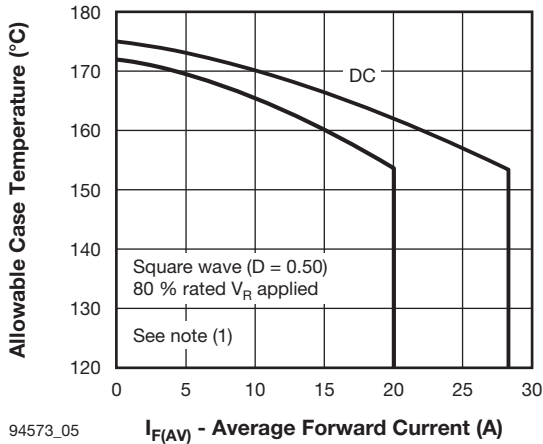
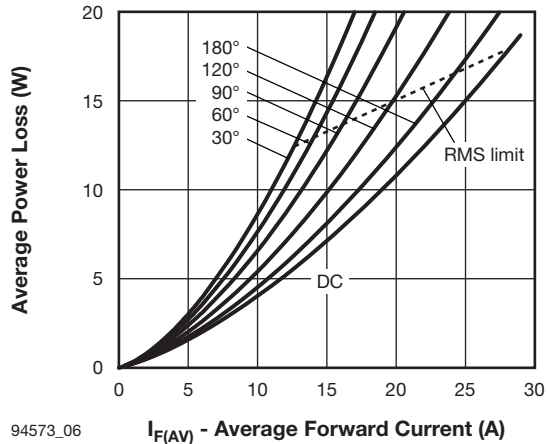


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics



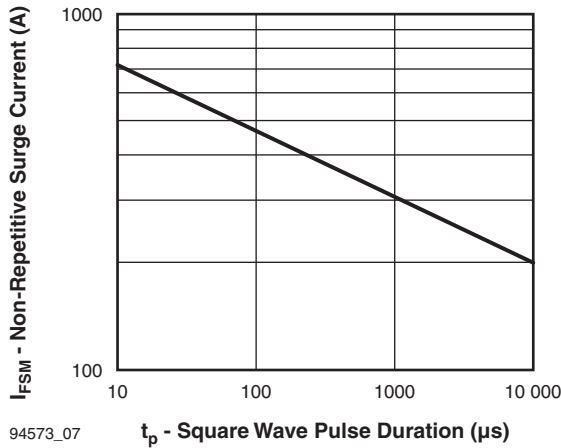
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Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current



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Fig. 6 - Forward Power Loss Characteristics

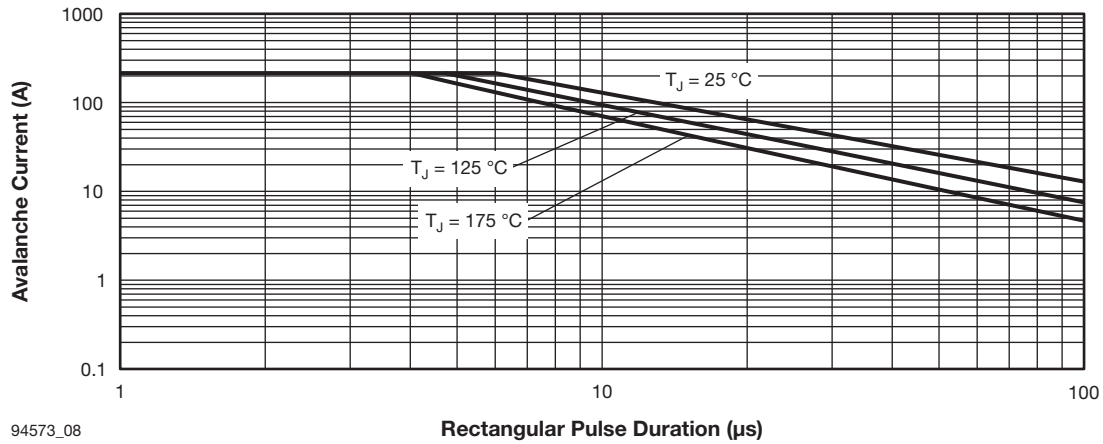


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Fig. 7 - Maximum Non-Repetitive Surge Current

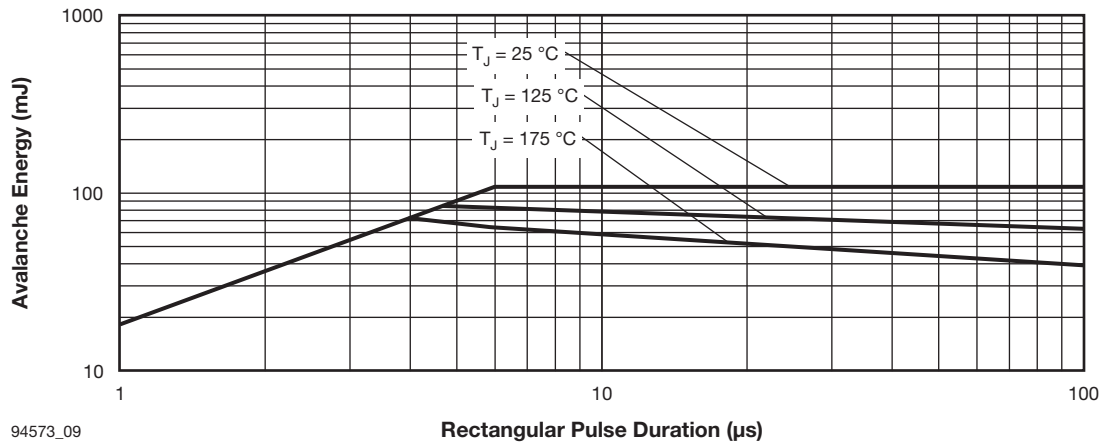
Note

- (1) Formula used: $T_C = T_J - (P_d + P_{d_{REV}}) \times R_{thJC}$;
- P_d = Forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
- $P_{d_{REV}}$ = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at $V_{R1} = 80\%$ rated V_R



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Fig. 8 - Reverse Bias Safe Operating Area (Avalanche Current vs. Rectangular Pulse Duration)

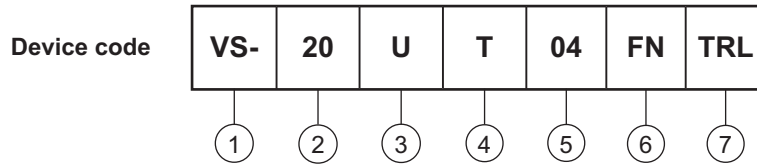


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Fig. 9 - Reverse Bias Safe Operating Area (Avalanche Energy vs. Rectangular Pulse Duration)



ORDERING INFORMATION TABLE

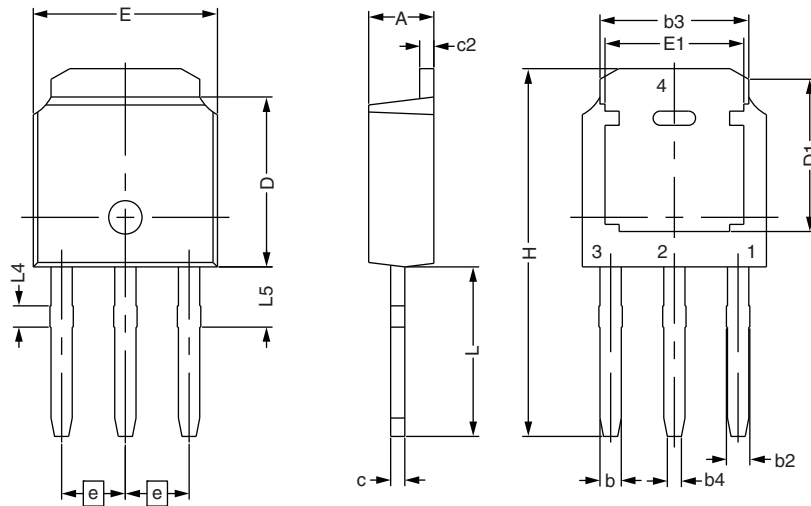


- 1** - Vishay Semiconductors product
- 2** - Current rating (20 A)
- 3** - Package:
 - U = I-PAK
 - W = D-PAK
- 4** - T = Trench
- 5** - Voltage code (45 V)
- 6** - TO-252AA (D-PAK)
- 7** - D-PAK, I-PAK:
 - None = Tube (75 pieces)
 - D-PAK only:
 - TR = Tape and reel
 - TRL = Tape and reel (left oriented)
 - TRR = Tape and reel (right oriented)

| LINKS TO RELATED DOCUMENTS | | |
|----------------------------|------------------|--|
| Dimensions | I-PAK (TO-251AA) | www.vishay.com/doc?95024 |
| | D-PAK (TO-252AA) | www.vishay.com/doc?95448 |
| Part marking information | I-PAK (TO-251AA) | www.vishay.com/doc?95025 |
| | D-PAK (TO-252AA) | www.vishay.com/doc?95059 |
| Packaging information | | www.vishay.com/doc?95033 |
| SPIICE model | | www.vishay.com/doc?95027 |

I-PAK - S

DIMENSIONS FOR I-PAK - S in millimeters



| SYMBOL | DIMENSIONAL REQUIREMENTS | | |
|--------|--------------------------|-------|-------|
| | MIN. | NOM. | MAX. |
| E | 6.40 | 6.60 | 6.70 |
| L | 3.98 | 4.13 | 4.28 |
| L4 | 0.66 | 0.76 | 0.86 |
| L5 | 1.96 | 2.16 | 2.36 |
| D | 6.00 | 6.10 | 6.20 |
| H | 11.05 | 11.25 | 11.45 |
| b | 0.64 | 0.76 | 0.88 |
| b2 | 0.77 | 0.84 | 1.14 |
| b3 | 5.21 | 5.34 | 5.46 |
| b4 | 0.41 | 0.51 | 0.61 |
| e | 2.286 BSC | | |
| A | 2.20 | 2.30 | 2.38 |
| c | 0.40 | 0.50 | 0.60 |
| c2 | 0.40 | 0.50 | 0.60 |
| D1 | 5.30 | - | - |
| E1 | 4.40 | - | - |



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