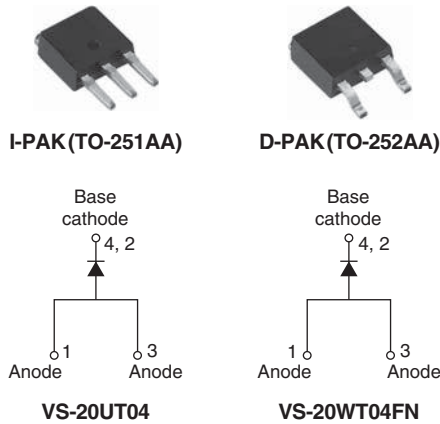


## High Performance Schottky Generation 5.0, 20 A



### 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 $\mu\text{s}$ sine or 3 $\mu\text{s}$ rect. pulse	Following any rated load condition and with rated $V_{RRM}$ applied <sup>(1)</sup>	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	$V_{FM}$ <sup>(1)(2)</sup>	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	$I_{RM}$ <sup>(1)</sup>	$T_J = 25\text{ }^\circ\text{C}$	$V_R = \text{Rated } V_R$	-	100	$\mu\text{A}$
		$T_J = 125\text{ }^\circ\text{C}$		-	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/ $\mu\text{s}$

**Notes**(1) Pulse width < 300  $\mu\text{s}$ , 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	

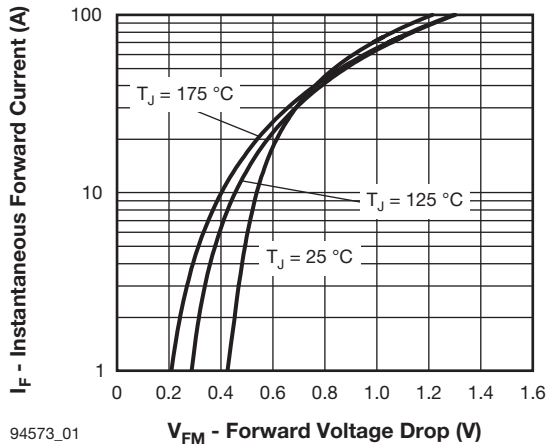


Fig. 1 - Maximum Forward Voltage Drop Characteristics

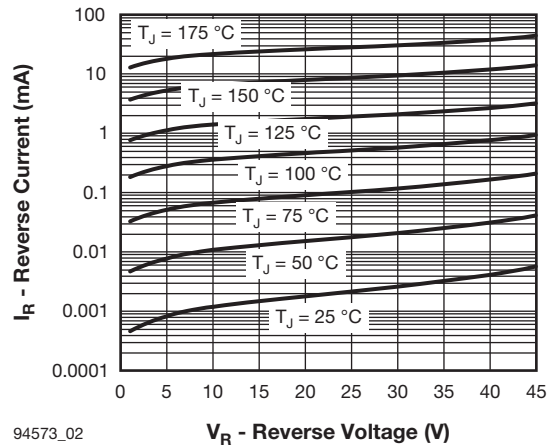


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

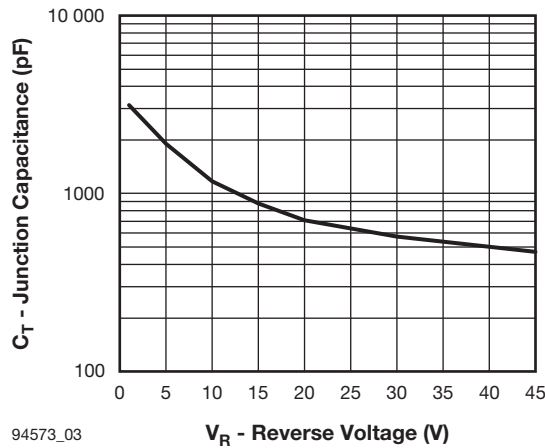


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

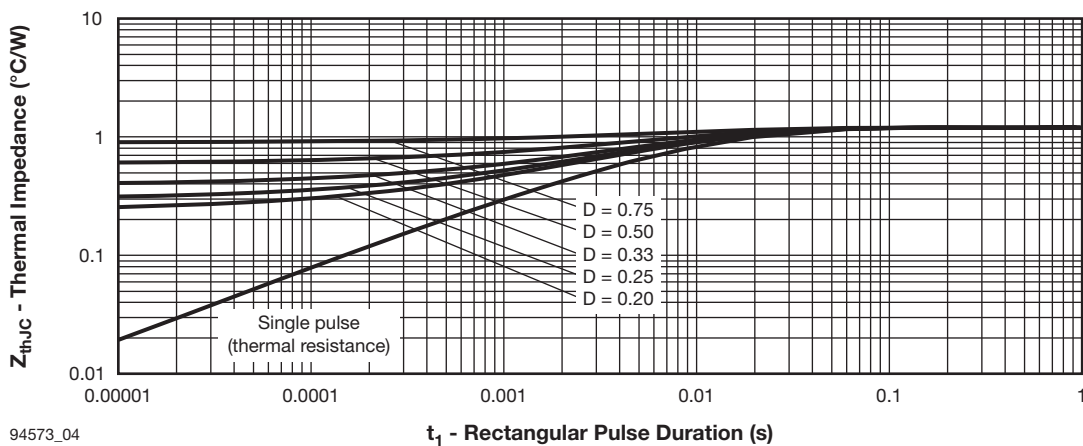
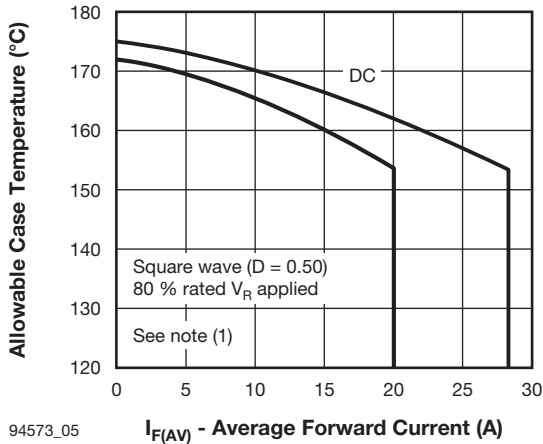
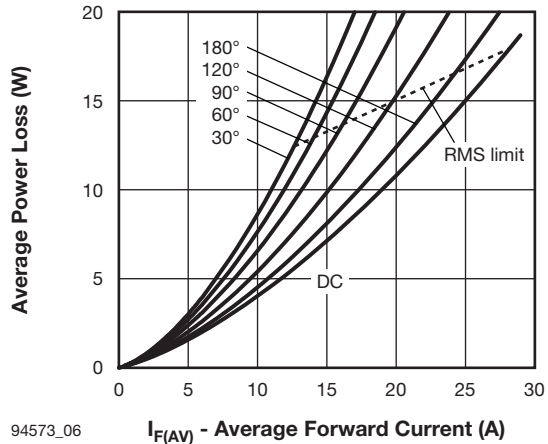


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics



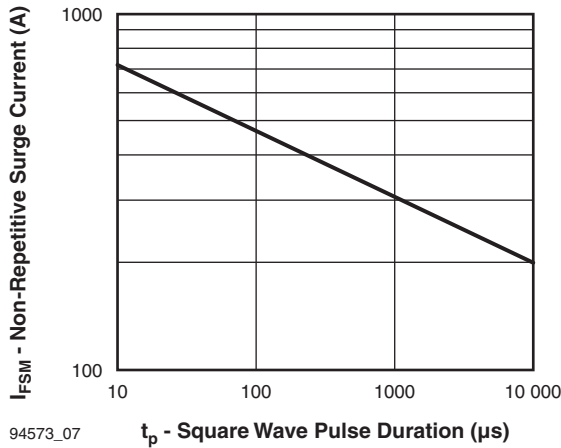
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Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current



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Fig. 6 - Forward Power Loss Characteristics

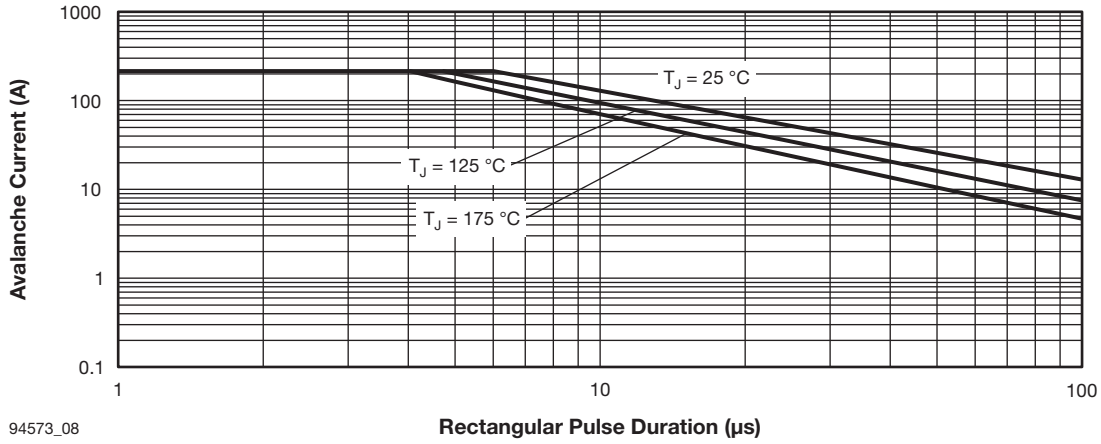


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Fig. 7 - Maximum Non-Repetitive Surge Current

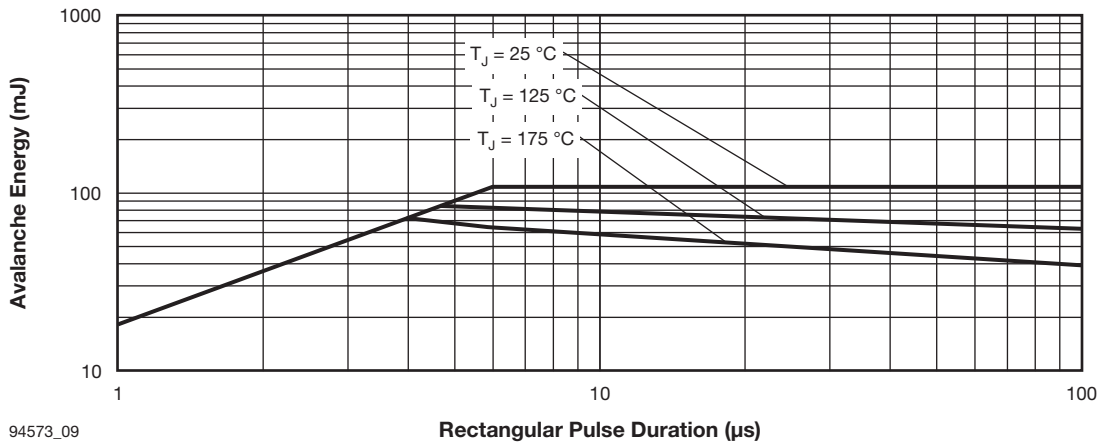
**Note**

- (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)

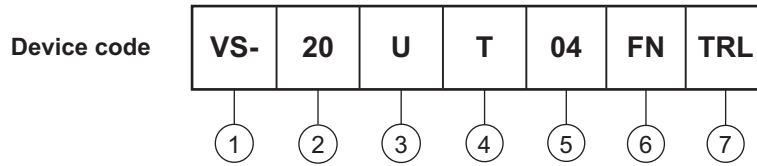


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Fig. 9 - Reverse Bias Safe Operating Area (Avalanche Energy vs. Rectangular Pulse Duration)



## ORDERING INFORMATION TABLE

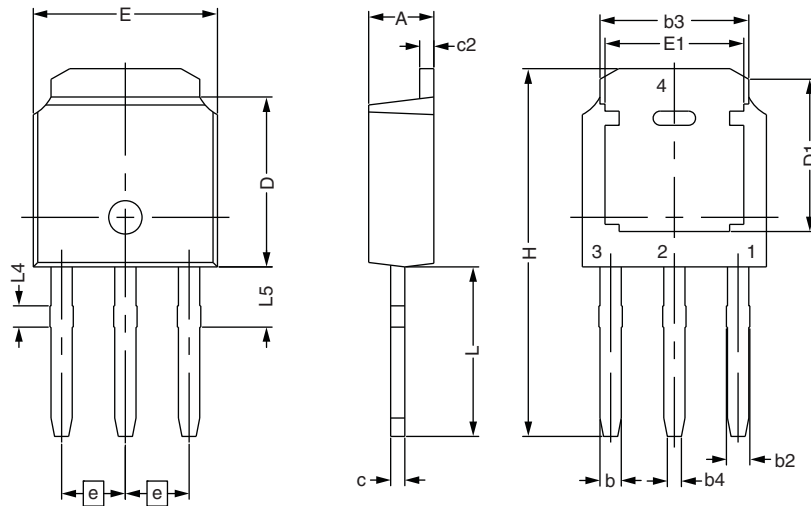


- 1** - Vishay Semiconductors product
- 2** - Current rating (20 A)
- 3** - Package:
  - U = I-PAK
  - W = D-PAK
- 4** - T = Trench
- 5** - Voltage code (45 V)
- 6** - TO-252AA (D-PAK)
- 7** - D-PAK, I-PAK:
  - None = Tube (75 pieces)
  - D-PAK only:
    - TR = Tape and reel
    - TRL = Tape and reel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

LINKS TO RELATED DOCUMENTS		
Dimensions	I-PAK (TO-251AA)	<a href="http://www.vishay.com/doc?95024">www.vishay.com/doc?95024</a>
	D-PAK (TO-252AA)	<a href="http://www.vishay.com/doc?95448">www.vishay.com/doc?95448</a>
Part marking information	I-PAK (TO-251AA)	<a href="http://www.vishay.com/doc?95025">www.vishay.com/doc?95025</a>
	D-PAK (TO-252AA)	<a href="http://www.vishay.com/doc?95059">www.vishay.com/doc?95059</a>
Packaging information		<a href="http://www.vishay.com/doc?95033">www.vishay.com/doc?95033</a>
SPIICE model		<a href="http://www.vishay.com/doc?95027">www.vishay.com/doc?95027</a>

## 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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