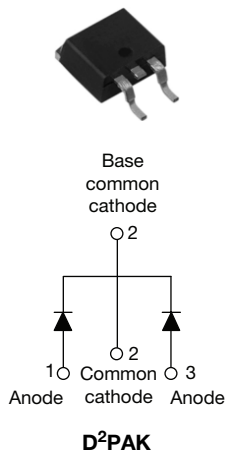
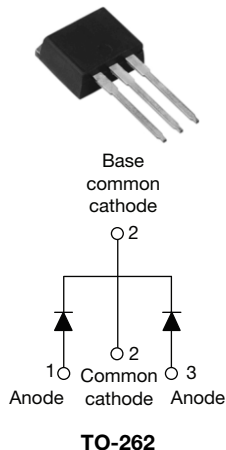


## Schottky Rectifier, 2 x 10 A

VS-20CTQ...SPbF



VS-20CTQ...-1PbF



### FEATURES

- 175 °C  $T_J$  operation
- Center tap TO-220 package
- Low forward voltage drop
- High frequency operation
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Guard ring for enhanced ruggedness and long term reliability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Halogen-free according to IEC 61249-2-21 definition
- Compliant to RoHS directive 2002/95/EC
- AEC-Q101 qualified



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### PRODUCT SUMMARY

$I_{F(AV)}$	2 x 10 A
$V_R$	35 V to 45 V

### DESCRIPTION

The VS-20CTQ... center tap Schottky rectifier series has been optimized for low reverse leakage at high temperature. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Rectangular waveform	20	A
$V_{RRM}$	Range	35 to 45	V
$I_{FSM}$	$t_p = 5 \mu s$ sine	1060	A
$V_F$	10 Apk, $T_J = 125^\circ C$ (per leg)	0.57	V
$T_J$	Range	- 55 to 175	°C

### VOLTAGE RATINGS

PARAMETER	SYMBOL	VS-20CTQ035SPbF VS-20CTQ035-1PbF	VS-20CTQ040SPbF VS-20CTQ040-1PbF	VS-20CTQ045SPbF VS-20CTQ045-1PbF	UNITS
Maximum DC reverse voltage	$V_R$	35	40	45	V
Maximum working peak reverse voltage	$V_{RWM}$				

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current See fig. 5	$I_{F(AV)}$	50 % duty cycle at $T_C = 145^\circ C$ , rectangular waveform	20	A
Maximum peak one cycle non-repetitive surge current per leg See fig. 7	$I_{FSM}$	5 $\mu s$ sine or 3 $\mu s$ rect. pulse	1060	
		10 ms sine or 6 ms rect. pulse	265	
Non-repetitive avalanche energy per leg	$E_{AS}$	$T_J = 25^\circ C$ , $I_{AS} = 2.0$ A, $L = 6.5$ mH	13	mJ
Repetitive avalanche current per leg	$I_{AR}$	Current decaying linearly to zero in 1 $\mu s$ Frequency limited by $T_J$ maximum $V_A = 1.5 \times V_R$ typical	2.0	A

# VS-20CTQ...SPbF, VS-20CTQ...-1PbF Series

Vishay High Power Products

Schottky Rectifier,  
2 x 10 A



ELECTRICAL SPECIFICATIONS					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop per leg See fig. 1	V <sub>FM</sub> <sup>(1)</sup>	10 A	T <sub>J</sub> = 25 °C	0.64	V
		20 A		0.76	
		10 A	T <sub>J</sub> = 125 °C	0.57	
		20 A		0.68	
Maximum reverse leakage current per leg See fig. 2	I <sub>RM</sub> <sup>(1)</sup>	T <sub>J</sub> = 25 °C	V <sub>R</sub> = Rated V <sub>R</sub>	2	mA
		T <sub>J</sub> = 125 °C		15	
Maximum junction capacitance per leg	C <sub>T</sub>	V <sub>R</sub> = 5 V <sub>DC</sub> (test signal range 100 kHz to 1 MHz), 25 °C		900	pF
Typical series inductance per leg	L <sub>S</sub>	Measured lead to lead 5 mm from package body		8.0	nH
Maximum voltage rate of change	dV/dt	Rated V <sub>R</sub>		10 000	V/μs

## Note

<sup>(1)</sup> Pulse width < 300  $\mu$ s, duty cycle < 2 %

THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	T <sub>J</sub> , T <sub>Stg</sub>		- 55 to 175	°C
Maximum thermal resistance, junction to case per leg	R <sub>thJC</sub>	DC operation See fig. 4	3.25	°C/W
Maximum thermal resistance, junction to case per package		DC operation	1.63	
Typical thermal resistance, case to heatsink	R <sub>thCS</sub>	Mounting surface, smooth and greased	0.50	
Approximate weight			2	g
			0.07	oz.
Mounting torque	minimum		6 (5)	kgf · cm (lbf · in)
	maximum		12 (10)	
Marking device		Case style D <sup>2</sup> PAK	20CTQ045S	
		Case style TO-262	20CTQ045-1	



# VS-20CTQ...SPbF, VS-20CTQ...-1PbF Series

Schottky Rectifier,  
2 x 10 A

Vishay High Power Products

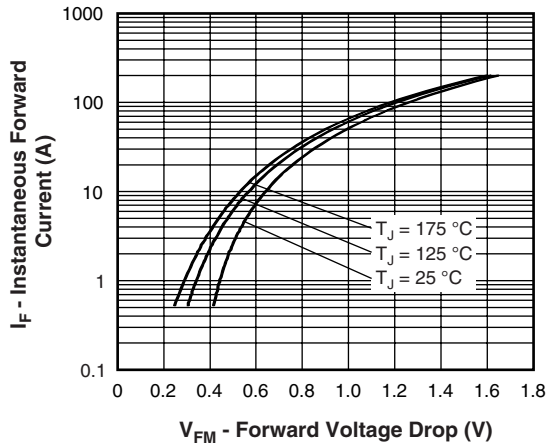


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

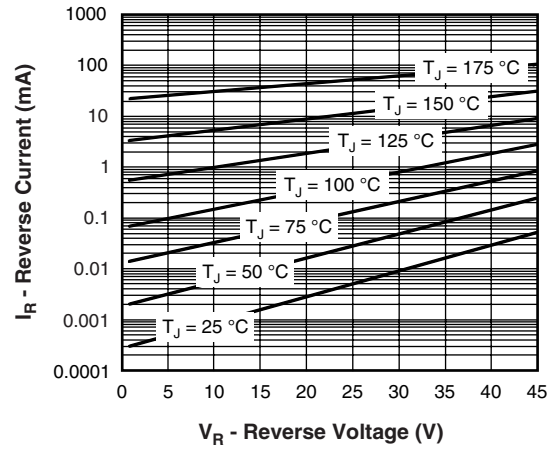


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

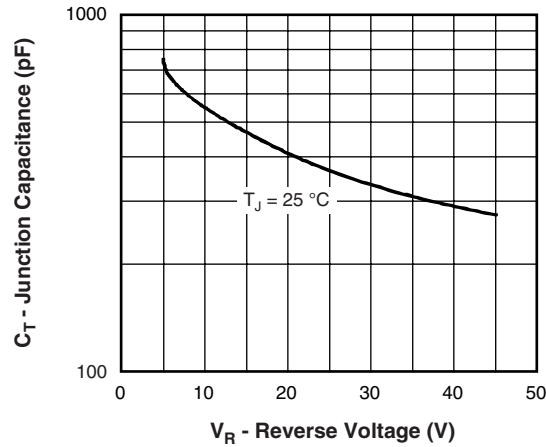


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

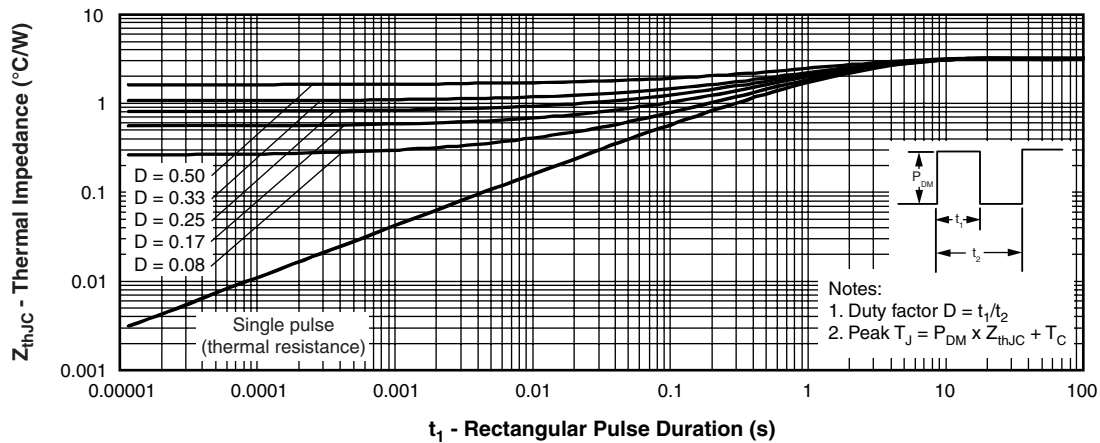


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

# VS-20CTQ...SPbF, VS-20CTQ...-1PbF Series

Vishay High Power Products

Schottky Rectifier,  
2 x 10 A

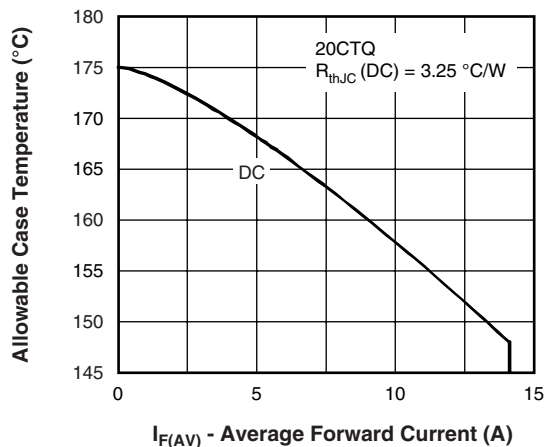


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

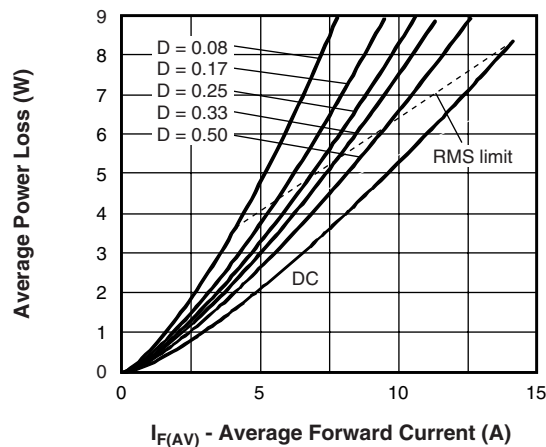


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

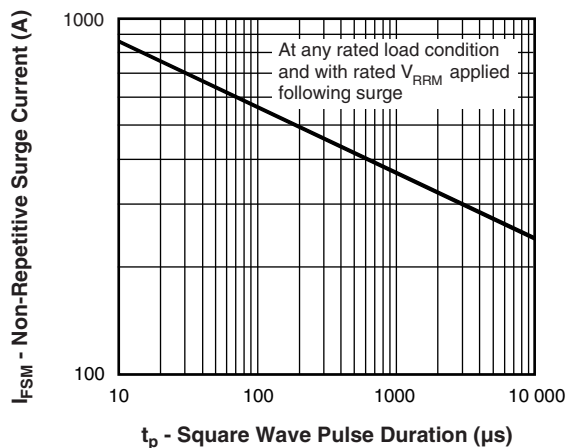


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

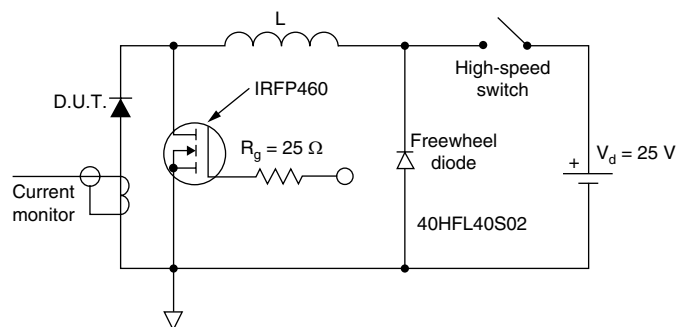


Fig. 8 - Unclamped Inductive Test Circuit



## VS-20CTQ...SPbF, VS-20CTQ...-1PbF Series

Schottky Rectifier,  
2 x 10 A

Vishay High Power Products

### ORDERING INFORMATION TABLE

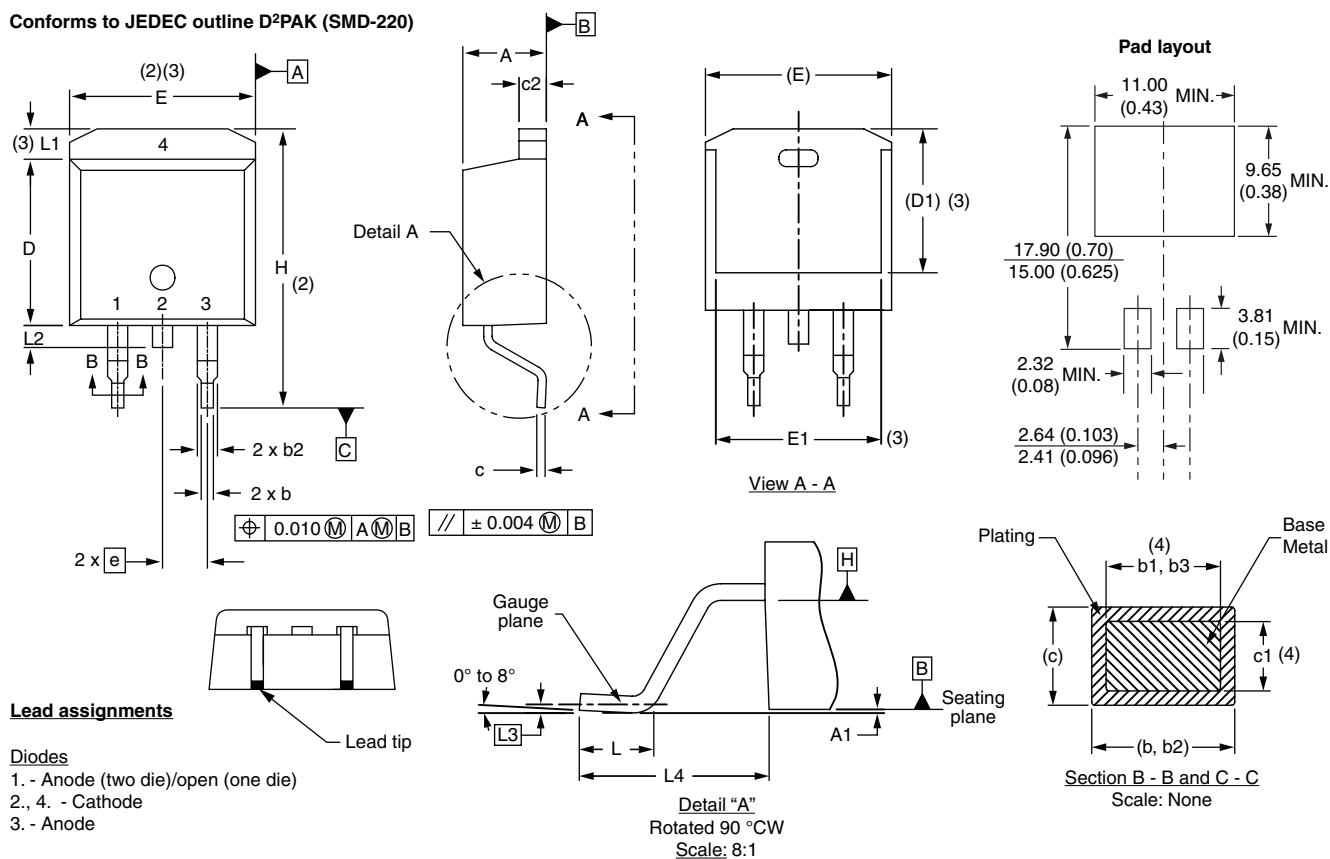
Device code	VS-	20	C	T	Q	045	S	TRL	PbF
	1	2	3	4	5	6	7	8	9
1	-	HPP product suffix							
2	-	Current rating (20 A)							
3	-	Circuit configuration: C = Common cathode							
4	-	T = TO-220							
5	-	Schottky "Q" series							
6	-	Voltage ratings							
7	-	• S = D <sup>2</sup> PAK							
		• -1 = TO-262							
8	-	• None = Tube (50 pieces)							
		• TRL = Tape and reel (left oriented - for D <sup>2</sup> PAK only)							
		• TRR = Tape and reel (right oriented - for D <sup>2</sup> PAK only)							
9	-	PbF = Lead (Pb)-free							

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95014">www.vishay.com/doc?95014</a>
Part marking information	<a href="http://www.vishay.com/doc?95008">www.vishay.com/doc?95008</a>
Packaging information	<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>

## D<sup>2</sup>PAK, TO-262

### DIMENSIONS FOR D<sup>2</sup>PAK in millimeters and inches

**Conforms to JEDEC outline D<sup>2</sup>PAK (SMD-220)**

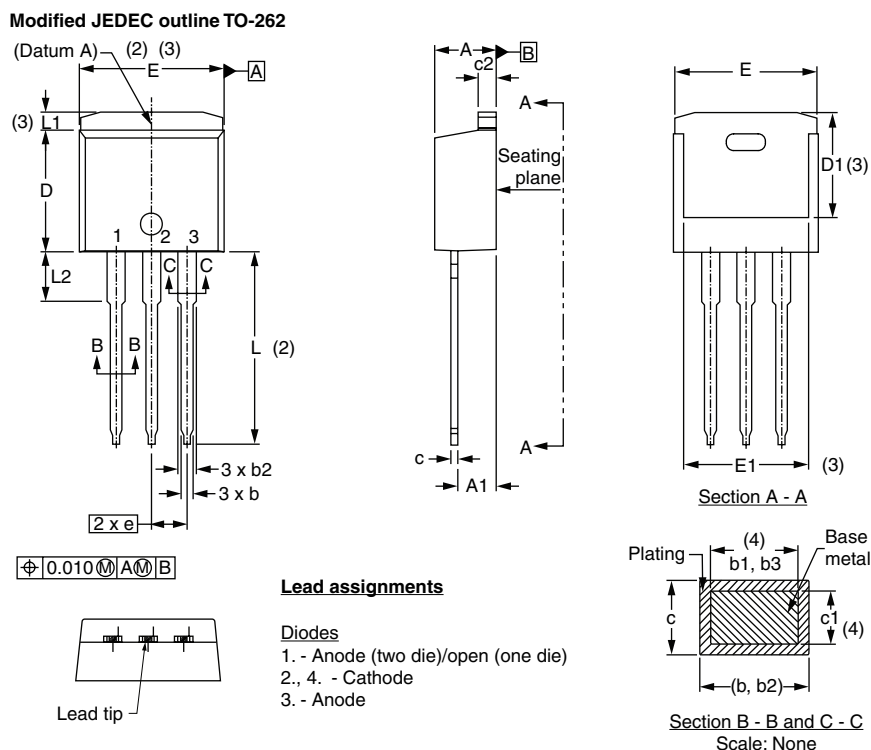


SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190		D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010		E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039		E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4	e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070		H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4	L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029		L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4	L2	1.27	1.78	0.050	0.070	
c2	1.14	1.65	0.045	0.065		L3	0.25 BSC		0.010 BSC		
D	8.51	9.65	0.335	0.380	2	L4	4.78	5.28	0.188	0.208	

## Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch
- (7) Outline conforms to JEDEC outline TO-263AB

## DIMENSIONS FOR TO-262 in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	2.03	3.02	0.080	0.119	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
L	13.46	14.10	0.530	0.555	
L1	-	1.65	-	0.065	3
L2	3.56	3.71	0.140	0.146	

### Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches

- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum) and D1 (minimum) where dimensions derived the actual package outline



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