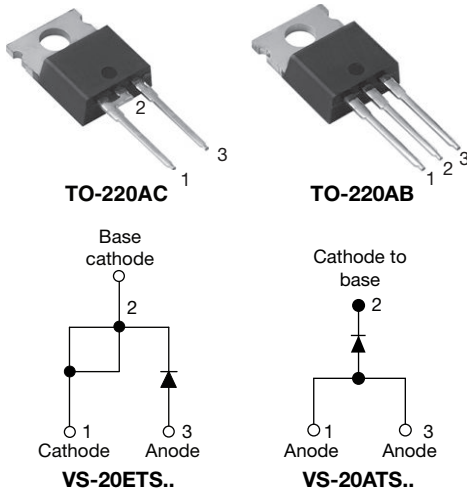




## High Voltage, Input Rectifier Diode, 20 A



### FEATURES

- Very low forward voltage drop
- 150 °C max. operating junction temperature
- Glass passivated pellet chip junction
- Designed and qualified according to JEDEC®-JESD 47
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### APPLICATIONS

- Input rectification
- Vishay Semiconductors switches and output rectifiers which are available in identical package outlines

### DESCRIPTION

High voltage rectifiers optimized for very low forward voltage drop with moderate leakage.

These devices are intended for use in main rectification (single or three phase bridge).

PRODUCT SUMMARY	
Package	TO-220AC, TO-220AB
$I_{F(AV)}$	20 A
$V_R$	800 V to 1200 V
$V_F$ at $I_F$	1.1 V
$I_{FSM}$	300 A
$T_J$ max.	150 °C
Diode variation	Single die, common anode

OUTPUT CURRENT IN TYPICAL APPLICATIONS			
APPLICATIONS	SINGLE-PHASE BRIDGE	THREE-PHASE BRIDGE	UNITS
Capacitive input filter $T_A = 55$ °C, $T_J = 125$ °C common heatsink of 1 °C/W	16.3	21	A

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Sinusoidal waveform	20	A
$V_{RRM}$		800/1200	V
$I_{FSM}$		300	A
$V_F$	10 A, $T_J = 25$ °C	1.0	V
$T_J$		-40 to +150	°C

VOLTAGE RATINGS			
PART NUMBER	$V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ AT 150 °C mA
VS-20ETS08PbF, VS-20ETS08-M3 VS-20ATS08PbF, VS-20ATS08-M3	800	900	1
VS-20ETS12PbF, VS-20ETS12-M3 VS-20ATS12PbF, VS-20ATS12-M3	1200	1300	



<b>ABSOLUTE MAXIMUM RATINGS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 105\text{ }^\circ\text{C}$ , 180° conduction half sine wave	20	A
Maximum peak one cycle non-repetitive surge current	$I_{FSM}$	10 ms sine pulse, rated $V_{RRM}$ applied	250	
		10 ms sine pulse, no voltage reapplied	300	
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	316	$A^2s$
		10 ms sine pulse, no voltage reapplied	442	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to }10\text{ ms}$ , no voltage reapplied	4420	$A^2\sqrt{s}$

<b>ELECTRICAL SPECIFICATIONS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum forward voltage drop	$V_{FM}$	20 A, $T_J = 25\text{ }^\circ\text{C}$	1.1	V
Forward slope resistance	$r_t$	$T_J = 150\text{ }^\circ\text{C}$	10.4	$m\Omega$
Threshold voltage	$V_{F(TO)}$		0.85	V
Maximum reverse leakage current	$I_{RM}$	$T_J = 25\text{ }^\circ\text{C}$	0.1	$mA$
		$T_J = 150\text{ }^\circ\text{C}$		

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-40 to +150	$^\circ\text{C}$
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation	1.3	$^\circ\text{C/W}$
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth, and greased	0.5	
Approximate weight			2	g
			0.07	oz.
Mounting torque	minimum		6 (5)	$\text{kgf} \cdot \text{cm}$ $(\text{lb} \cdot \text{in})$
	maximum		12 (10)	
Marking device		Case style TO-220AC	20ETS08	
			20ETS12	
		Case style TO-220AB	20ATS08	
			20ATS12	

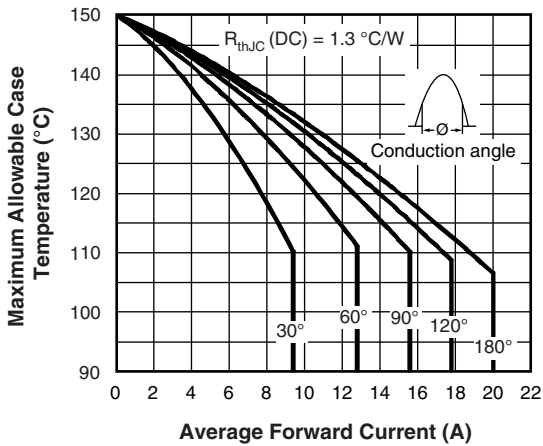


Fig. 1 - Current Rating Characteristics

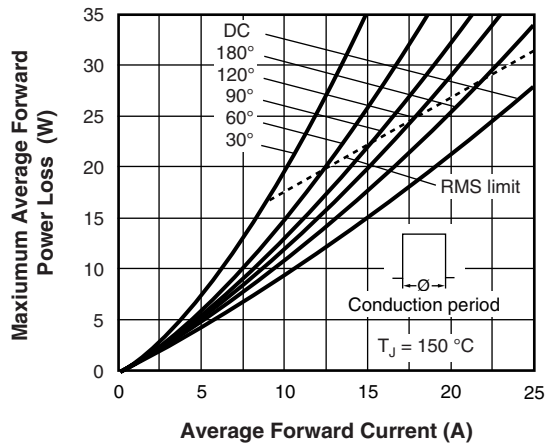


Fig. 4 - Forward Power Loss Characteristics

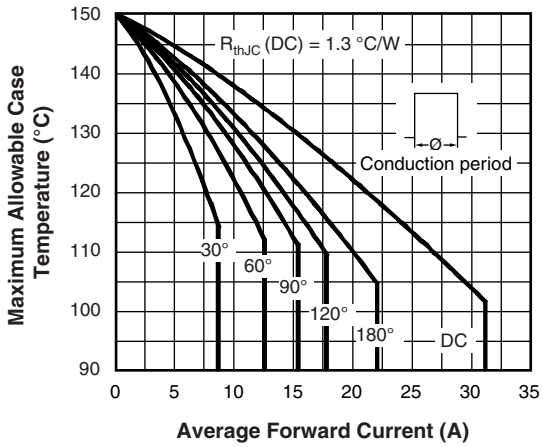


Fig. 2 - Current Rating Characteristics

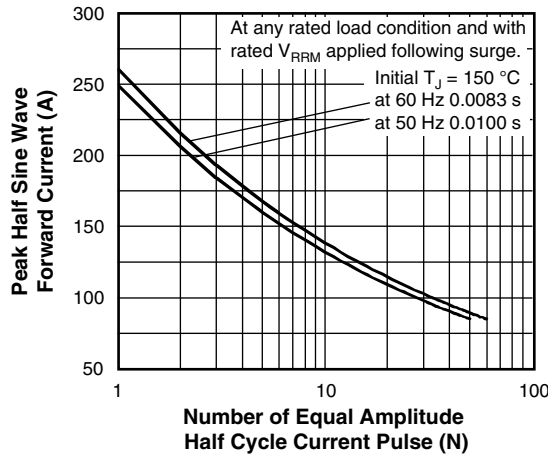


Fig. 5 - Maximum Non-Repetitive Surge Current

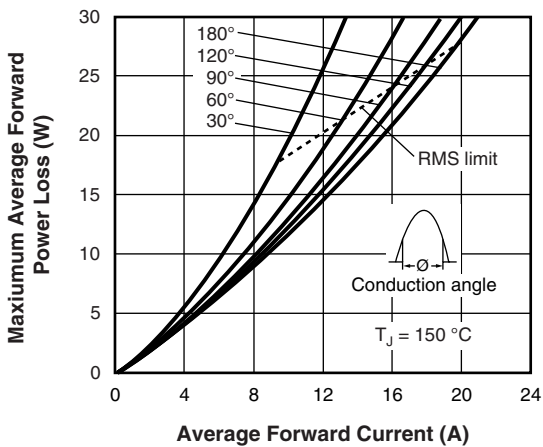


Fig. 3 - Forward Power Loss Characteristics

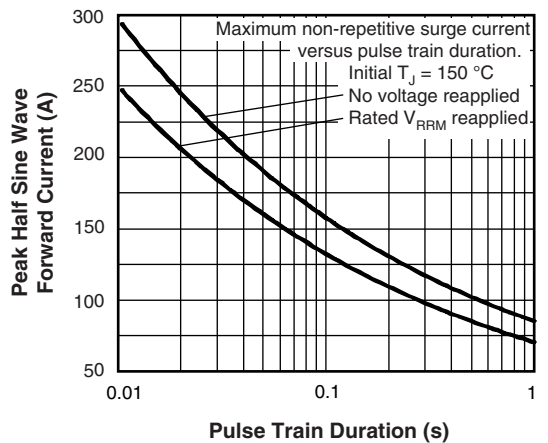


Fig. 6 - Maximum Non-Repetitive Surge Current

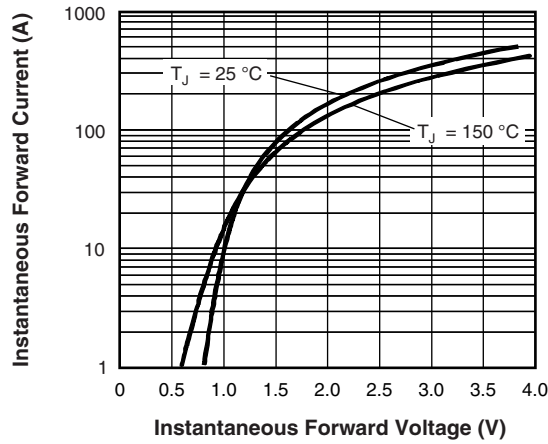


Fig. 7 - Forward Voltage Drop Characteristics

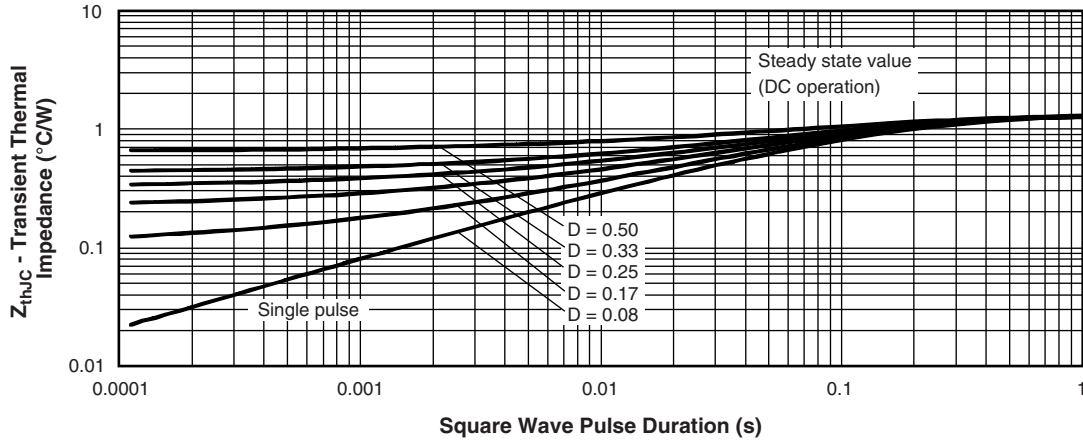
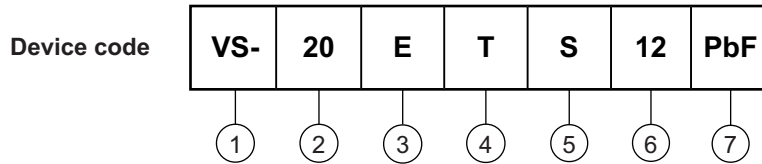


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics



**ORDERING INFORMATION TABLE**



- 1** - Vishay Semiconductors product
- 2** - Current rating (20 = 20 A)
- 3** - Circuit configuration:  
E = TO-220AC  
A = TO-220AB
- 4** - Package:  
T = TO-220
- 5** - Type of silicon:  
S = standard recovery rectifier
- 6** - Voltage code x 100 =  $V_{RRM}$  08 = 800 V  
12 = 1200 V
- 7** - Environmental digit:  
PbF = lead (Pb)-free and RoHS-compliant  
-M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

<b>ORDERING INFORMATION (Example)</b>			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-20ETS08PbF	50	1000	Antistatic plastic tubes
VS-20ETS08-M3	50	1000	Antistatic plastic tubes
VS-20ATS08PbF	50	1000	Antistatic plastic tubes
VS-20ATS08-M3	50	1000	Antistatic plastic tubes
VS-20ETS12PbF	50	1000	Antistatic plastic tubes
VS-20ETS12-M3	50	1000	Antistatic plastic tubes
VS-20ATS12PbF	50	1000	Antistatic plastic tubes
VS-20ATS12-M3	50	1000	Antistatic plastic tubes

<b>LINKS TO RELATED DOCUMENTS</b>		
Dimensions	TO-220AC	<a href="http://www.vishay.com/doc?95221">www.vishay.com/doc?95221</a>
	TO-220AB	<a href="http://www.vishay.com/doc?95222">www.vishay.com/doc?95222</a>
Part marking information	TO-220AC PbF	<a href="http://www.vishay.com/doc?95224">www.vishay.com/doc?95224</a>
	TO-220AB PbF	<a href="http://www.vishay.com/doc?95225">www.vishay.com/doc?95225</a>
	TO-220AC -M3	<a href="http://www.vishay.com/doc?95068">www.vishay.com/doc?95068</a>
	TO-220AB -M3	<a href="http://www.vishay.com/doc?95028">www.vishay.com/doc?95028</a>
SPICE model		<a href="http://www.vishay.com/doc?96046">www.vishay.com/doc?96046</a>

## TO-220AC

**DIMENSIONS** in millimeters and inches



**Lead assignments**

Diodes  
1 + 2 - Cathode  
3 - Anode

Conforms to JEDEC outline TO-220AC

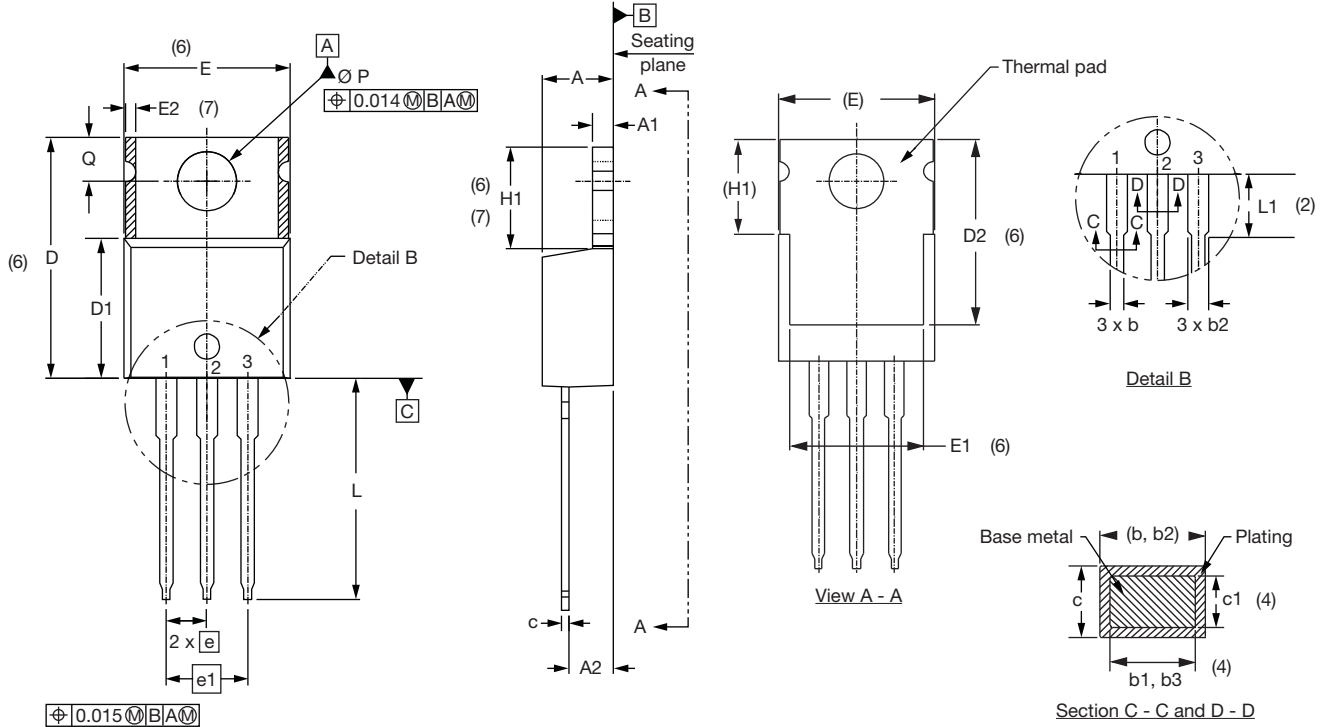
SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183		E1	6.86	8.89	0.270	0.350	6
A1	1.14	1.40	0.045	0.055		E2	-	0.76	-	0.030	7
A2	2.56	2.92	0.101	0.115		e	2.41	2.67	0.095	0.105	
b	0.69	1.01	0.027	0.040		e1	4.88	5.28	0.192	0.208	
b1	0.38	0.97	0.015	0.038	4	H1	6.09	6.48	0.240	0.255	6, 7
b2	1.20	1.73	0.047	0.068		L	13.52	14.02	0.532	0.552	
b3	1.14	1.73	0.045	0.068	4	L1	3.32	3.82	0.131	0.150	2
c	0.36	0.61	0.014	0.024		L3	1.78	2.13	0.070	0.084	
c1	0.36	0.56	0.014	0.022	4	L4	0.76	1.27	0.030	0.050	2
D	14.85	15.25	0.585	0.600	3	Ø P	3.54	3.73	0.139	0.147	
D1	8.38	9.02	0.330	0.355		Q	2.60	3.00	0.102	0.118	
D2	11.68	12.88	0.460	0.507	6	θ	90° to 93°		90° to 93°		
E	10.11	10.51	0.398	0.414	3, 6						

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 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 outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline

## TO-220AB

### DIMENSIONS in millimeters and inches



#### Lead assignments

#### Diodes

1. - Anode/open
2. - Cathode
3. - Anode

Conforms to JEDEC outline TO-220AB

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	10.11	10.51	0.398	0.414	3, 6
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	
θ	90° to 93°		90° to 93°		

#### Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 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 outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimensions: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimensions E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, except A2 (maximum) and D2 (minimum) where dimensions are derived from the actual package outline



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