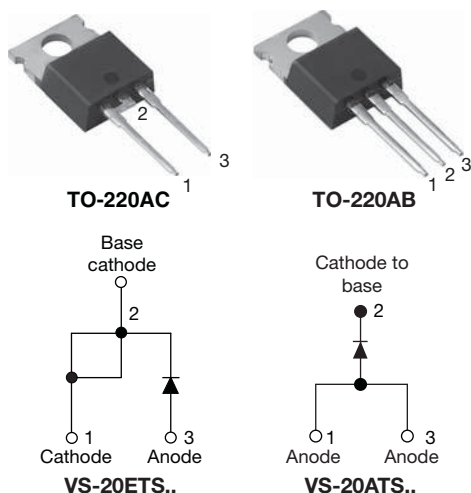




High Voltage, Input Rectifier Diode, 20 A



FEATURES

- Very low forward voltage drop
- 150 °C max. operating junction temperature
- Designed and qualified according to JEDEC-JESD47
- Material categorization: For definitions of compliance please see 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	

**ABSOLUTE MAXIMUM RATINGS**

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	$A^2\sqrt{s}$

ELECTRICAL SPECIFICATIONS

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 Ω
Threshold voltage	$V_{F(TO)}$		0.85	V
Maximum reverse leakage current	I_{RM}	$T_J = 25\text{ }^{\circ}\text{C}$	0.1	mA
		$T_J = 150\text{ }^{\circ}\text{C}$	1.0	

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	T _J , T _{Stg}		- 40 to 150	°C
Maximum thermal resistance, junction to case	R _{thJC}	DC operation	1.3	°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)	kgf · cm (lbf · in)
	maximum		12 (10)	
Marking device		Case style TO-220AC	20ETS08	
			20ETS12	
		Case style TO-220AB	20ATS08	
			20ATS12	

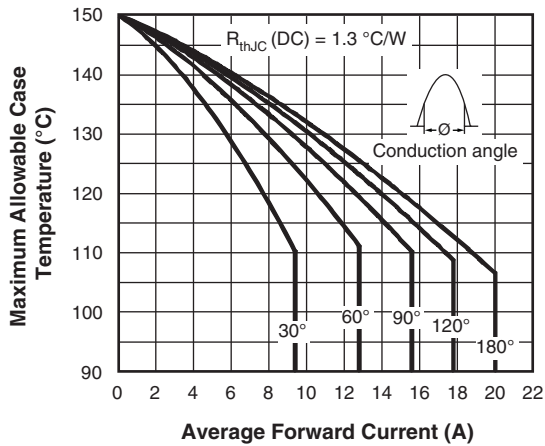


Fig. 1 - Current Rating Characteristics

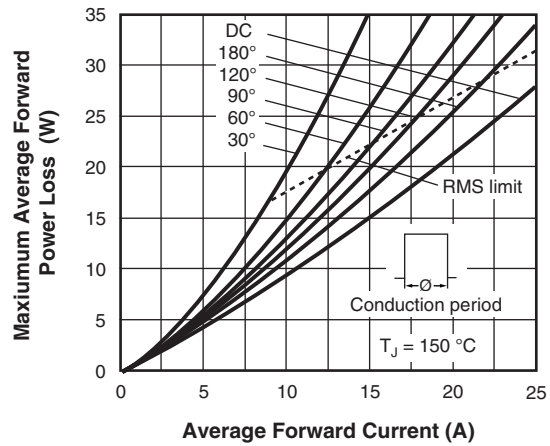


Fig. 4 - Forward Power Loss Characteristics

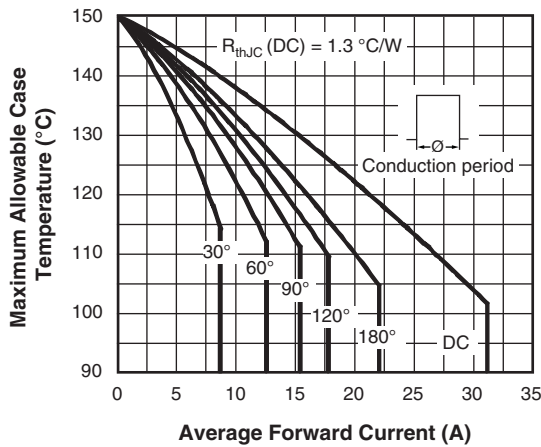


Fig. 2 - Current Rating Characteristics

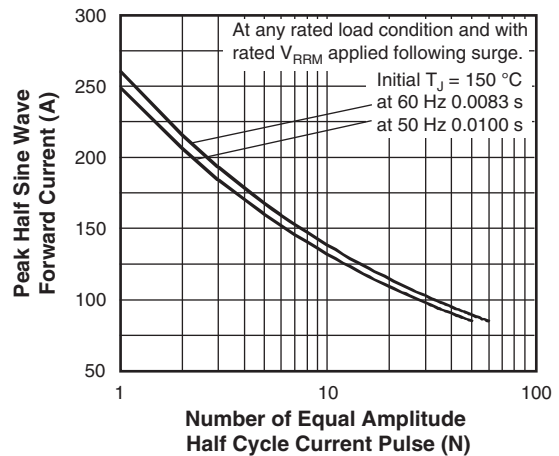


Fig. 5 - Maximum Non-Repetitive Surge Current

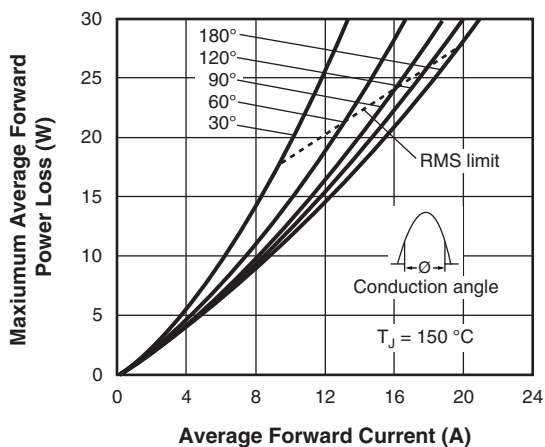


Fig. 3 - Forward Power Loss Characteristics

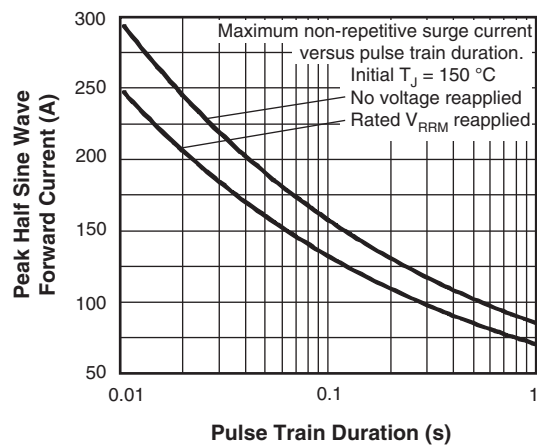


Fig. 6 - Maximum Non-Repetitive Surge Current

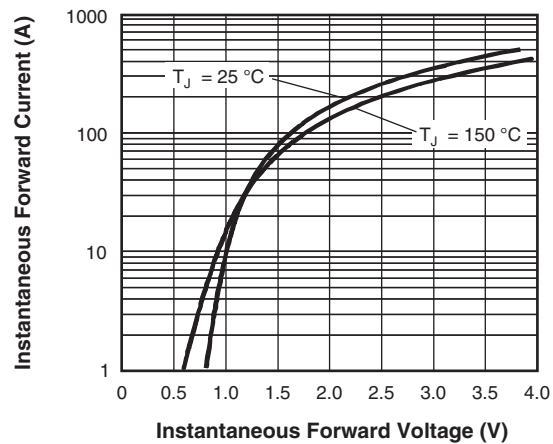


Fig. 7 - Forward Voltage Drop Characteristics

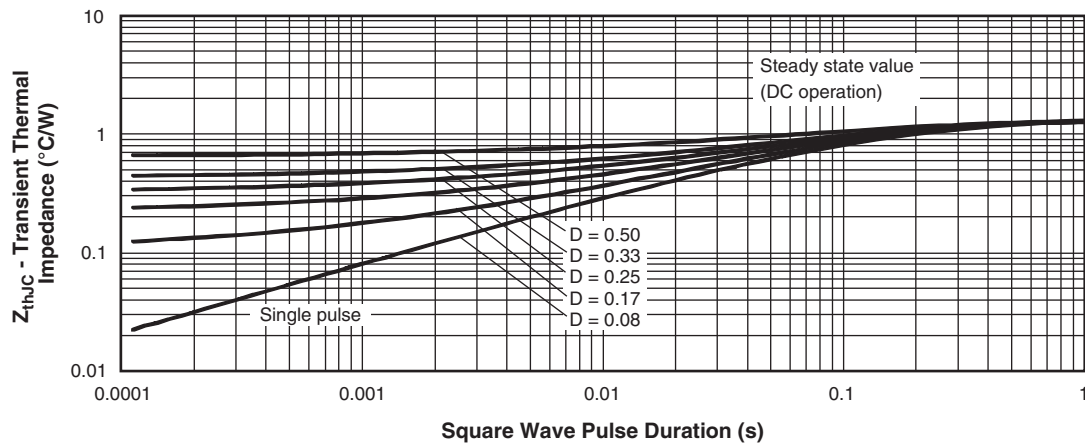


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics



ORDERING INFORMATION TABLE

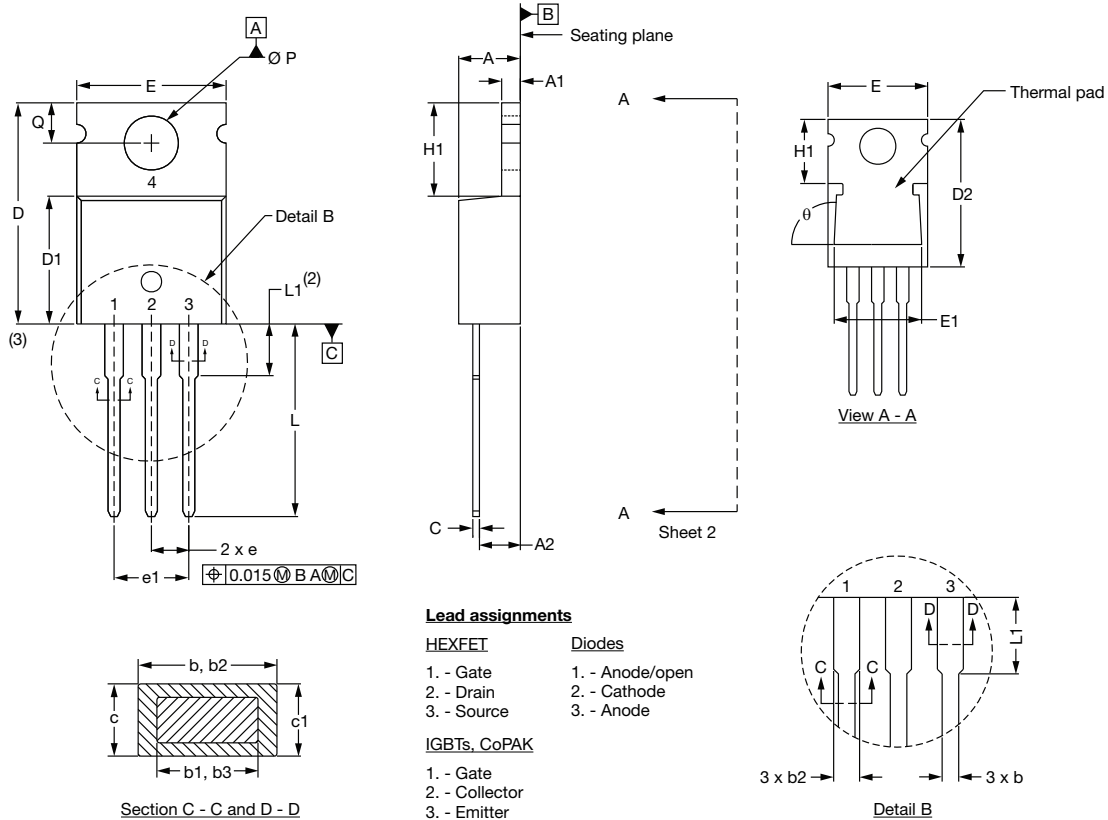
Device code	VS-	20	E	T	S	12	PbF
	1	2	3	4	5	6	7
1	-	Vishay Semiconductors product					
2	-	Current rating (20 = 20 A)					
3	-	Circuit configuration:					
		E = TO-220AC					
		A = TO-220AB					
4	-	Package:					
		T = TO-220					
5	-	Type of silicon:					
		S = Standard recovery rectifier					
6	-	Voltage 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					

ORDERING INFORMATION (Example)			
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

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-220AC	www.vishay.com/doc?95221
	TO-220AB	www.vishay.com/doc?95222
Part marking information	TO-220AC PbF	www.vishay.com/doc?95224
	TO-220AB PbF	www.vishay.com/doc?95225
	TO-220AC -M3	www.vishay.com/doc?95068
	TO-220AB -M3	www.vishay.com/doc?95028

TO-220AB, TO-220AC

DIMENSIONS FOR TO-220AB in millimeters and inches



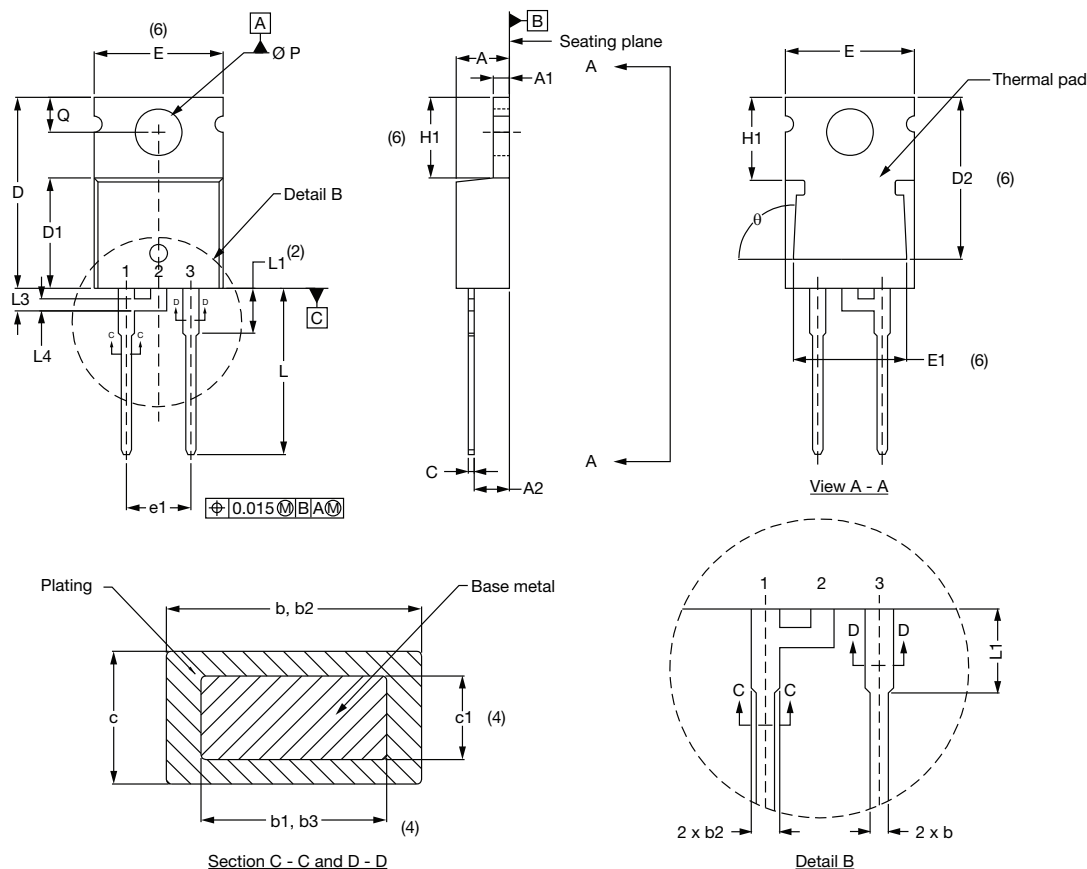
SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.96	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.15	1.73	0.045	0.068	
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
c2	0.31	1.14	0.012	0.045	
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	12.19	12.88	0.480	0.507	
E	10.11	10.51	0.398	0.414	3
E1	8.38	8.89	0.330	0.350	
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	
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 per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) 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 outermost extremes of the plastic body
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimensions: inches

DIMENSIONS FOR TO-220AC in millimeters and inches



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	0.96	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.15	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	12.19	12.88	0.480	0.507	6

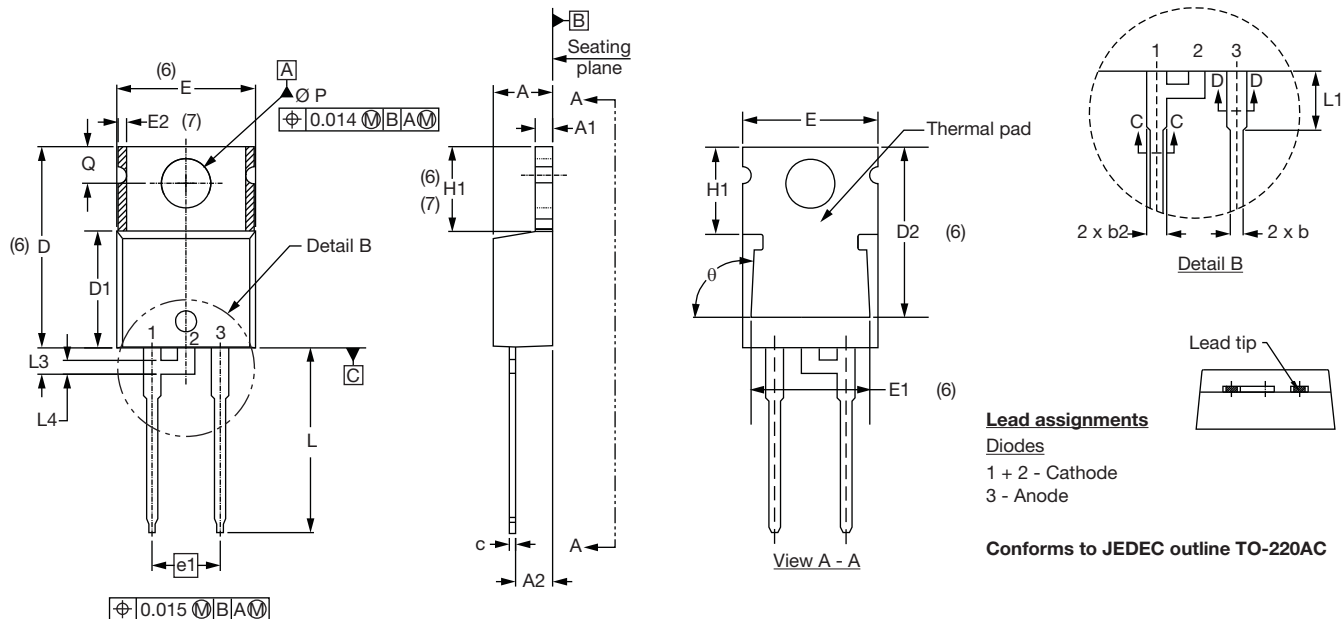
SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	10.11	10.51	0.398	0.414	3, 6
E1	8.38	8.89	0.330	0.350	6
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
L3	1.78	2.13	0.070	0.084	
L4	0.76	1.27	0.030	0.050	
$\varnothing P$	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.188	
θ	90° to 93°		90° to 93°		

Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) 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 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) Outline conforms are derived from the actual package outline

TO-220AC

DIMENSIONS in millimeters and inches



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
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
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
L3	1.78	2.13	0.070	0.084	
L4	0.76	1.27	0.030	0.050	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 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



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