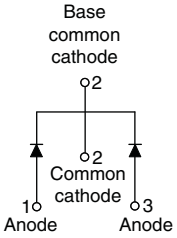
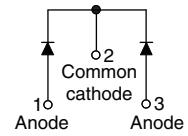
Hyperfast Rectifier, 2 x 10 A FRED Pt®

TO-220AB

TO-220 FULL-PAK



VS-30CTH02PbF



VS-30CTH02FPPbF

FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Low leakage current
- Fully isolated package (V_{INS} = 2500 V_{RMS})
- UL E78996 pending
- Compliant to RoHS Directive 2002/95/EC
- AEC-Q101 qualified (TO-220)
- Designed and qualified for industrial level (TO-220FP)

Pb-free

e3

RoHS COMPLIANT

DESCRIPTION/APPLICATIONS

200 V series are the state of the art hyperfast recovery rectifiers specifically designed with optimized performance of forward voltage drop and hyperfast recovery time.

The planar structure and the platinum doped life time control, guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in the output rectification stage of SMPS, UPS, DC/DC converters as well as freewheeling diode in low voltage inverters and chopper motor drives.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

PRODUCT SUMMARY	
Package	TO-220AB, TO-220FP
$I_{F(AV)}$	2 x 15 A
V_R	200 V
V_F at I_F	1.05 V
t_{rr} typ.	See Recovery table
T_J max.	175 °C
Diode variation	Common cathode

ABSOLUTE MAXIMUM RATINGS					
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage		V_{RRM}		200	V
Average rectified forward current	per diode	$I_{F(AV)}$	T_C = 159 °C	15	A
	(FULL-PAK) per diode		T_C = 125 °C		
	per device			30	
Non-repetitive peak surge current		I_{FSM}	T_J = 25 °C	200	
Operating junction and storage temperatures		T_J, T_{Stg}		- 65 to 175	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 µA	200	-	-	V
Forward voltage	V_F	I_F = 15 A	-	0.92	1.05	
		I_F = 15 A, T_J = 125 °C	-	0.78	0.85	
Reverse leakage current	I_R	V_R = V_R rated	-	-	10	µA
		T_J = 125 °C, V_R = V_R rated	-	5	300	
Junction capacitance	C_T	V_R = 200 V	-	57	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	nH

For technical questions within your region, please contact one of the following:
DiodesAmericas@vishay.com, DiodesAsia@vishay.com, DiodesEurope@vishay.com

DYNAMIC RECOVERY CHARACTERISTICS (T_C = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1 A, dI_F/dt = 50 A/µs, V_R = 30 V		-	-	35	ns
		I_F = 1 A, dI_F/dt = 100 A/µs, V_R = 30 V		-	-	30	
		T_J = 25 °C	I_F = 15 A dI_F/dt = 200 A/µs V_R = 160 V	-	26	-	
		T_J = 125 °C		-	40	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	2.8	-	A
		T_J = 125 °C		-	6.0	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	37	-	nC
		T_J = 125 °C		-	120	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range	T_J, T_{Stg}		- 65	-	175	°C
Thermal resistance, junction to case, per diode	R_{thJC}	Mounting surface, flat, smooth and greased	-	-	1.1	°C/W
Thermal resistance, junction to case, (FULL-PAK) per diode			-	-	3.5	
Marking device		Case style TO-220AB	30CTH02			
		Case style TO-220 FULL-PAK	30CTH02FP			

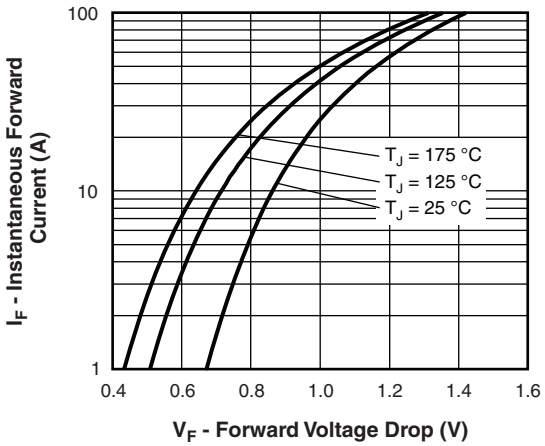


Fig. 1 - Typical Forward Voltage Drop Characteristics

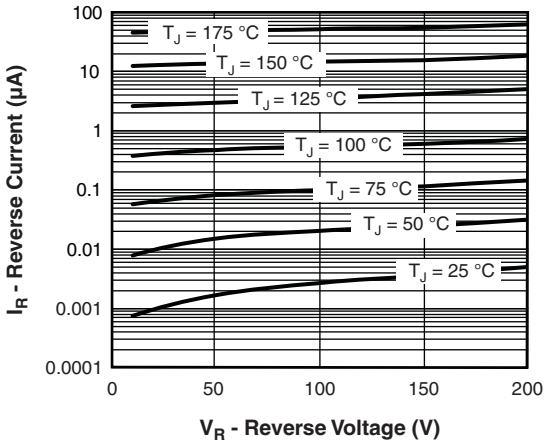


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

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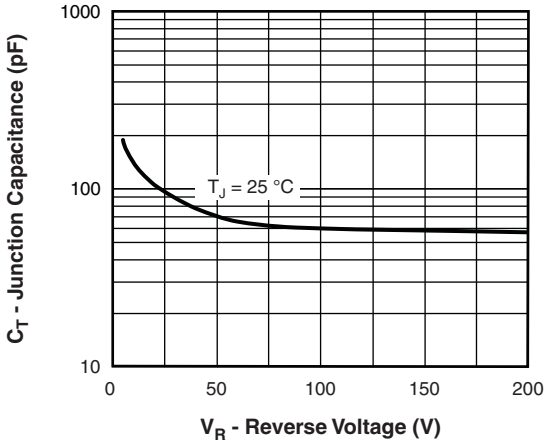

Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

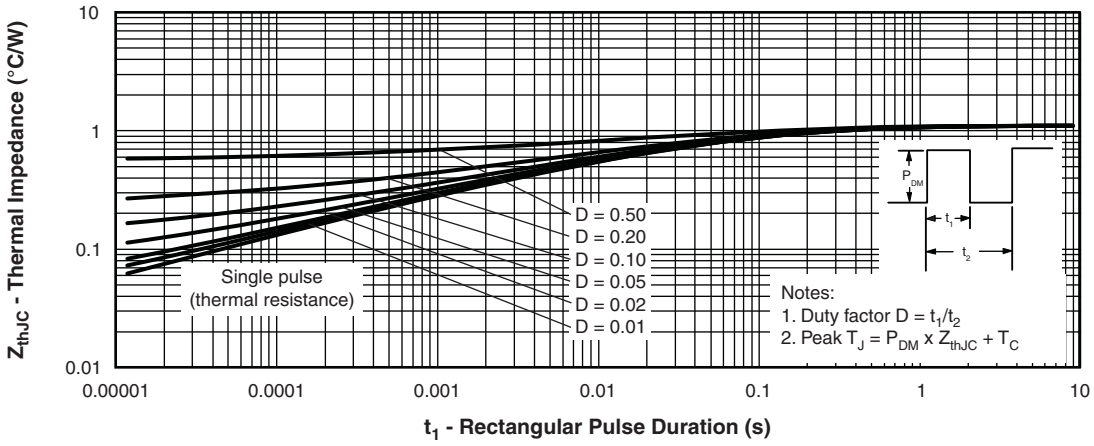

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

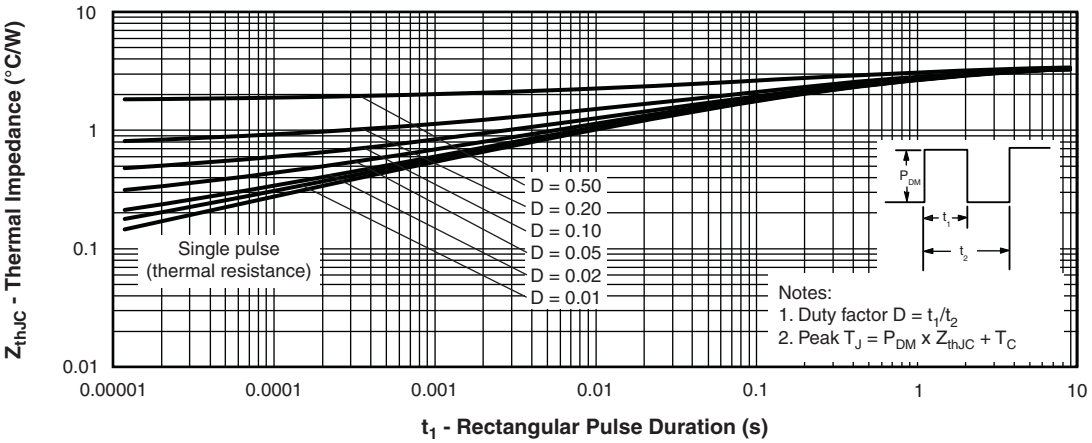

Fig. 5 - Maximum Thermal Impedance Z_{thJC} Characteristics (FULL-PAK)

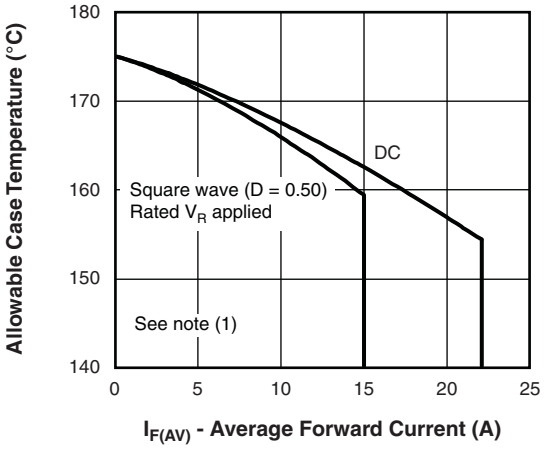

Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

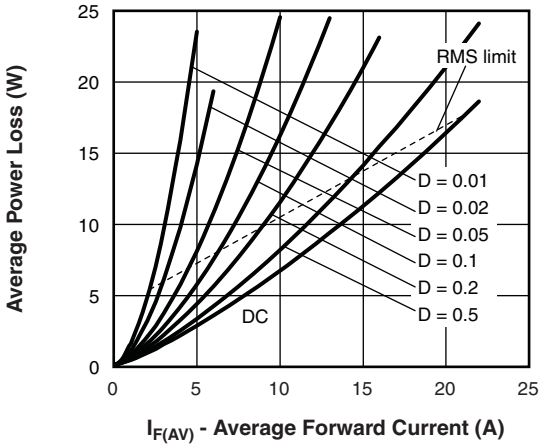

Fig. 8 - Forward Power Loss Characteristics

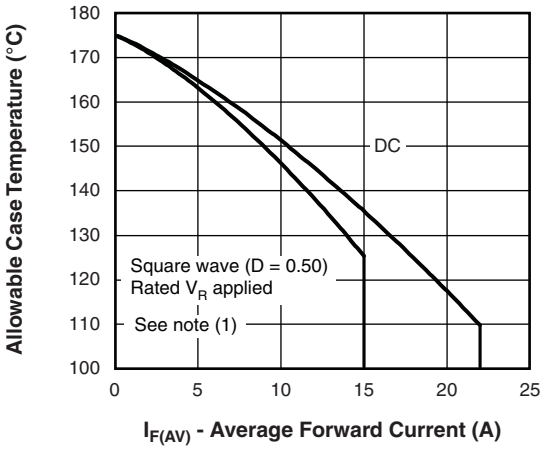

Fig. 7 - Maximum Allowable Case Temperature vs. Average Forward Current (FULL-PAK)

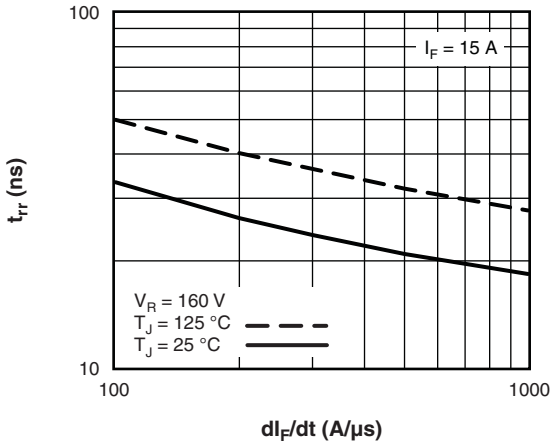

Fig. 9 - Typical Reverse Recovery Time vs. dI_F/dt

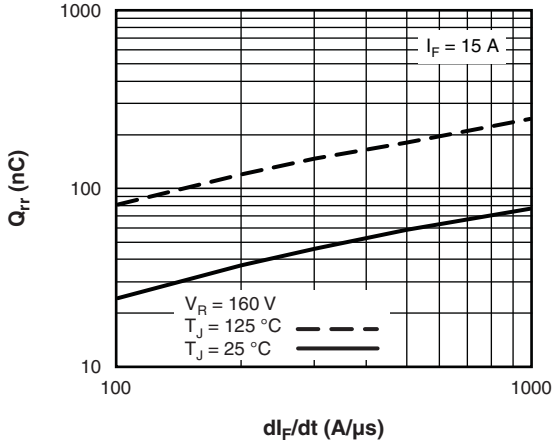

Fig. 10 - Typical Stored Charge vs. dI_F/dt

Note

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = Forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 8); Pd_{REV} = Inverse power loss = $V_{R1} \times I_R$ (1 - D); I_R at V_{R1} = Rated V_R

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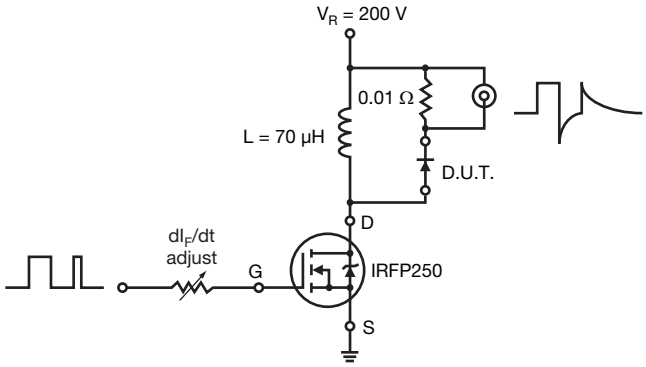
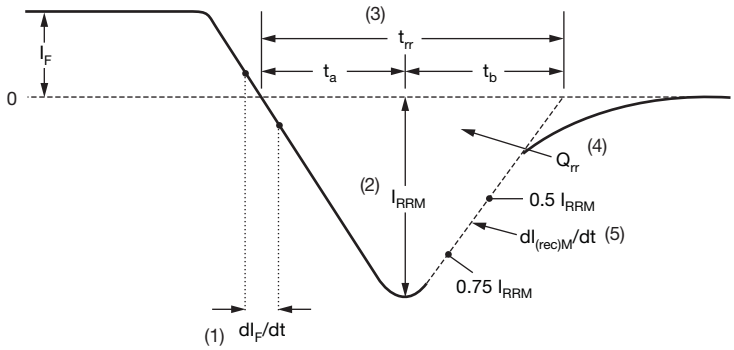


Fig. 11 - Reverse Recovery Parameter Test Circuit



(1) dI_F/dt - rate of change of current through zero crossing

(2) I_{RRM} - peak reverse recovery current

(3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current.

(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

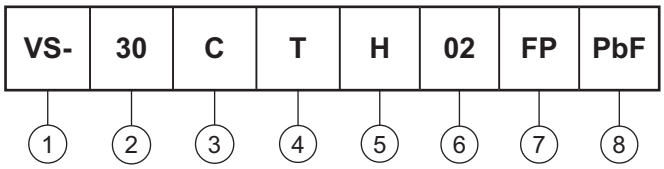
$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5) $dI_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

Fig. 12 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code

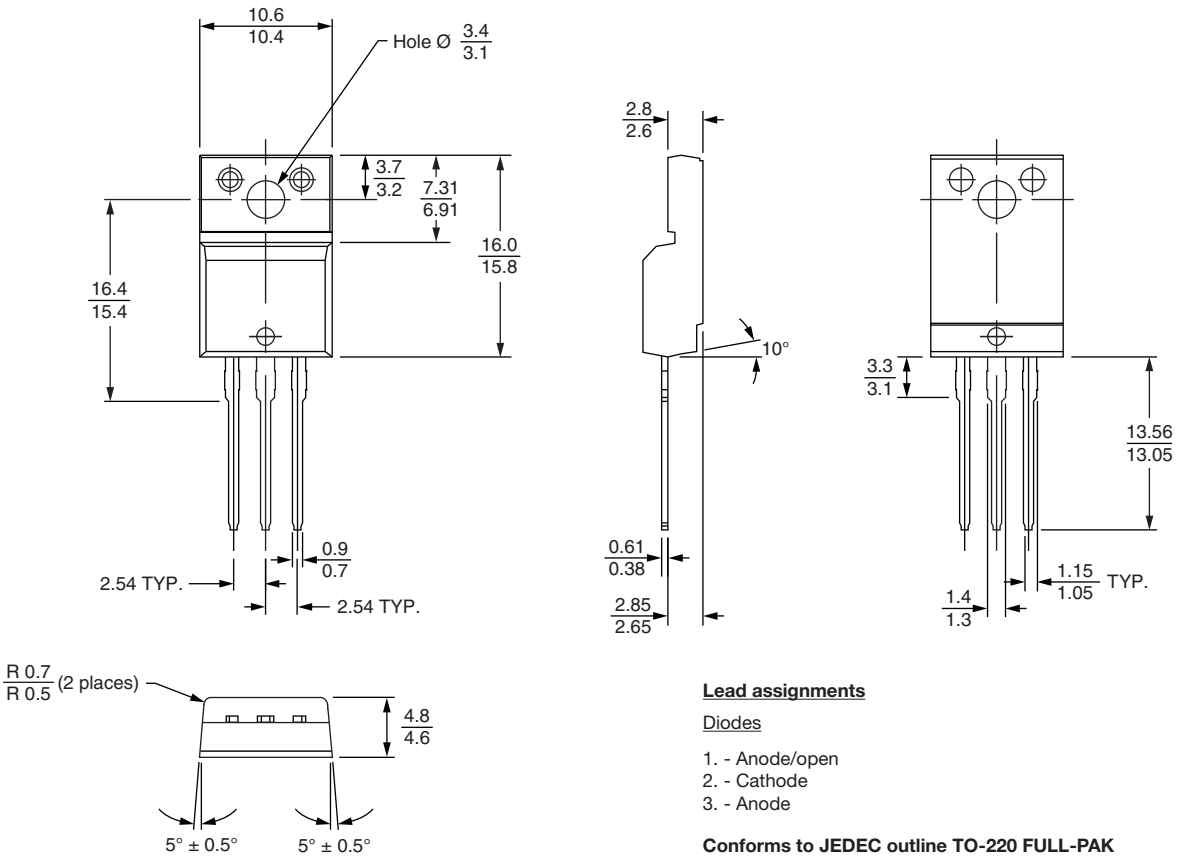


1 - Vishay Semiconductors product
2 - Current rating (30 = 30 A)
3 - C = Common cathode
4 - T = TO-220
5 - H = Hyperfast recovery
6 - Voltage rating (02 = 200 V)
7 - • None = TO-220AB
    • FP = TO-220 FULL-PAK
8 - PbF = Lead (Pb)-free

Tube standard pack quantity: 50 pieces

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-220AB	www.vishay.com/doc?95222
	TO-220AB FULL-PAK	www.vishay.com/doc?95072
Part marking information	TO-220AB	www.vishay.com/doc?95225
	TO-220AB FULL-PAK	www.vishay.com/doc?95069

DIMENSIONS in millimeters



Lead assignments

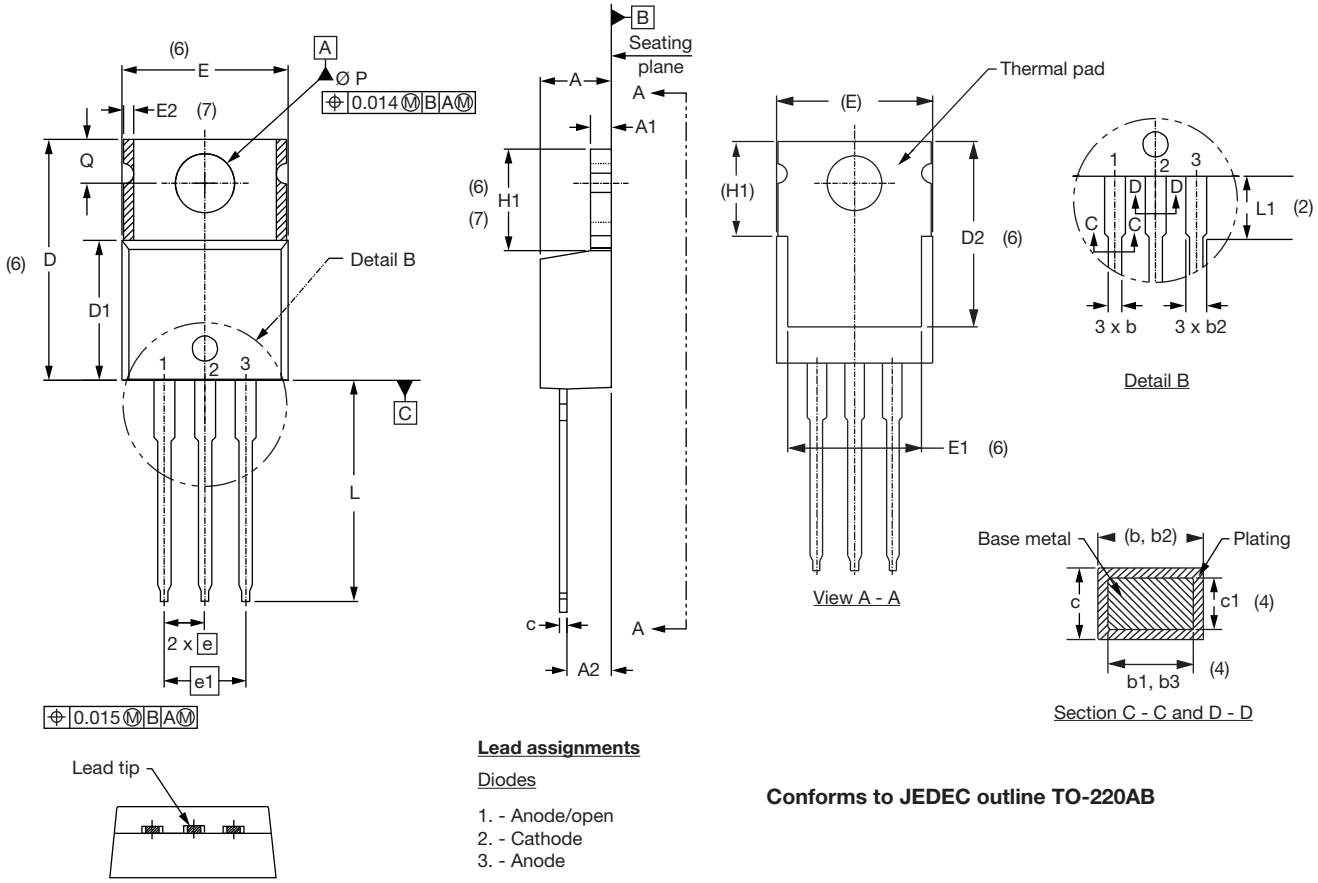
Diodes

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

Conforms to JEDEC outline TO-220 FULL-PAK

TO-220AB

DIMENSIONS in millimeters and inches



Lead tip

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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