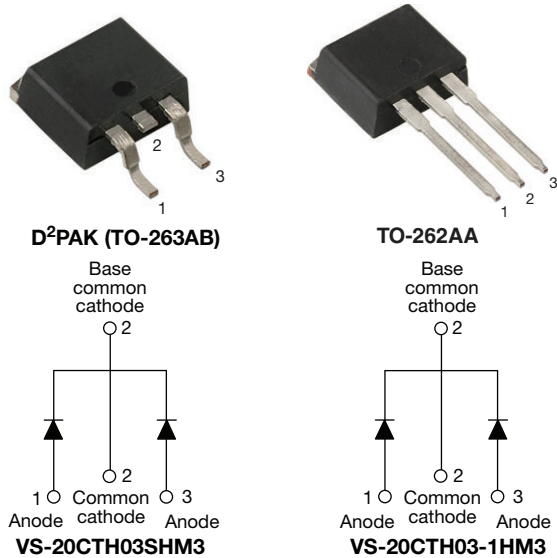


Hyperfast Rectifier, 2 x 10 A FRED Pt®



RoHS
COMPLIANT
HALOGEN
FREE

FEATURES

- Hyperfast recovery time
- Low forward voltage drop
- Low leakage current
- 175 °C operating junction temperature
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- AEC-Q101 qualified, meets JESD 201, class 2 whisker test
- Material categorization: for definitions of compliance please see www.vishay.com/doc?999912

DESCRIPTION / APPLICATIONS

Vishay Semiconductors 300 V series are the state of the art hyperfast recovery rectifiers 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.

MECHANICAL DATA

Case: D²PAK (TO-263AB), TO-262AA

Molding compound meets UL 94 V-0 flammability rating

Terminal: matte tin plated leads, solderable per J-STD-002

LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	2 x 10 A
V_R	300 V
V_F at I_F	0.85 V
t_{rr} typ.	23 ns
T_J max.	175 °C
Package	D ² PAK (TO-263AB), TO-262AA
Circuit configuration	Common cathode

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Peak repetitive reverse voltage	V_{RRM}		300	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 160 °C$	10	A
			20	
Non-repetitive peak surge current	I_{FSM}	$T_J = 25 °C$	120	
Operating junction and storage temperatures	T_J, T_{Stg}		-55 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	$I_R = 100 \mu A$	300	-	-	V
Forward voltage	V_F	$I_F = 10 A$	-	1.05	1.25	
		$I_F = 10 A, T_J = 125 °C$	-	0.85	0.95	
Reverse leakage current	I_R	$V_R = V_R$ rated	-	-	20	μA
		$T_J = 125 °C, V_R = V_R$ rated	-	6	200	
Junction capacitance	C_T	$V_R = 300 V$	-	30	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	8	-	nH

**DYNAMIC RECOVERY CHARACTERISTICS** ($T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$I_F = 1.0\text{ A}$, $di_F/dt = 100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$	-	23	-	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	31	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	42	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^{\circ}\text{C}$	-	2.4	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	5.6	-	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	36	-	nC
Reverse recovery charge	Q_{rr}	$T_J = 125\text{ }^{\circ}\text{C}$	-	120	-	

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T_J, T_{Stg}		-55	-	175	$^{\circ}\text{C}$
Thermal resistance, junction to case per diode	R_{thJC}		-	-	1.5	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient	R_{thJA}		-	-	70	$^{\circ}\text{C}/\text{W}$
Weight			-	2.0	-	g
			-	0.07	-	oz.
Marking device		Case style D ² PAK (TO-263AB)	20CTH03SH			
		Case style TO-262AA	20CTH03-1H			

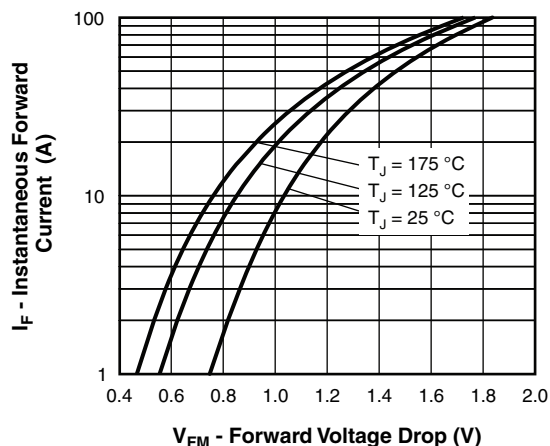


Fig. 1 - Maximum Forward Voltage Drop Characteristics

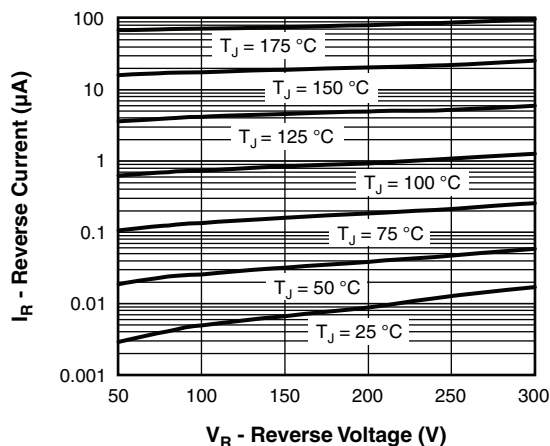


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

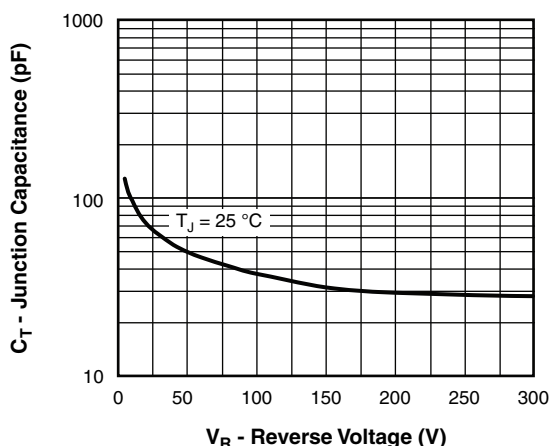


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

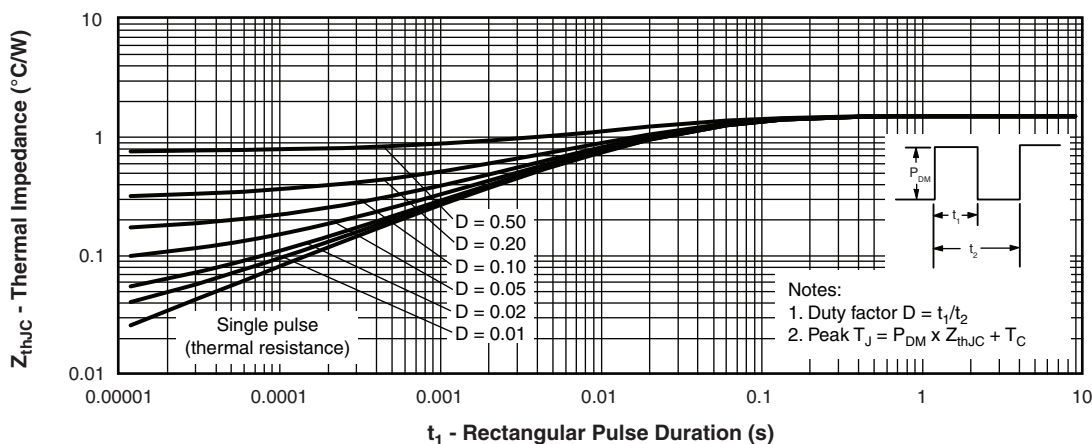
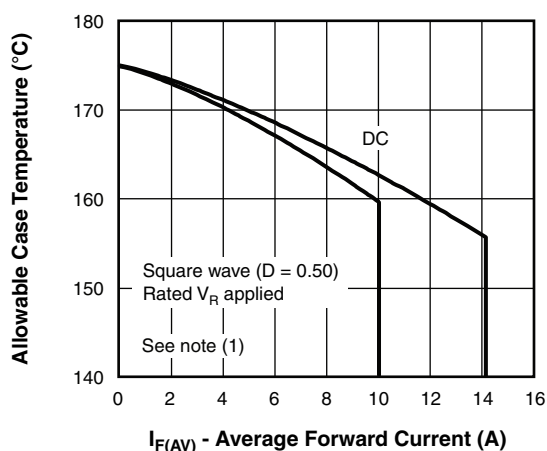

Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics


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

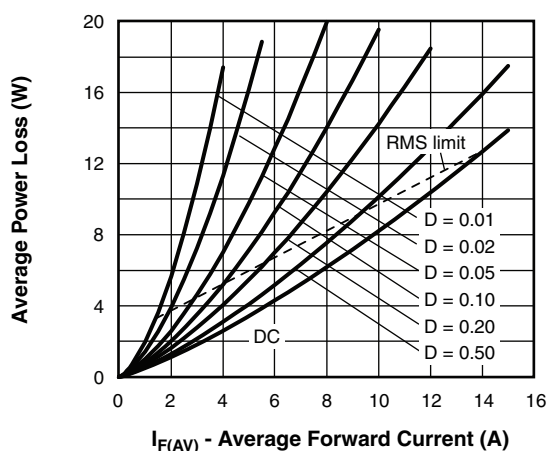


Fig. 6 - Forward Power Loss Characteristics

Note

- (1) Formula used: $T_C = T_J - (P_d + P_{dREV}) \times R_{thJC}$;
 P_d = forward power loss = $I_{F(AV)} \times V_{FM}$ at $(I_{F(AV)}/D)$ (see fig. 6);
 P_{dREV} = inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = rated V_R

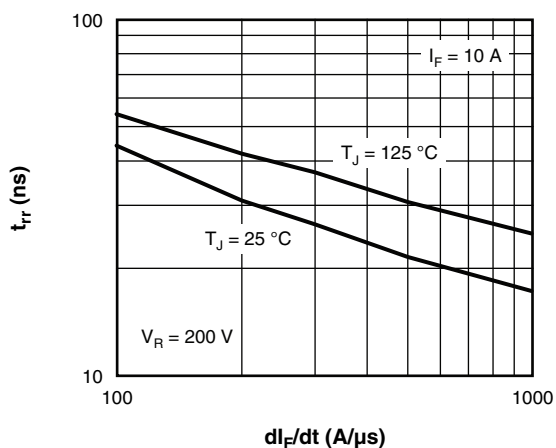
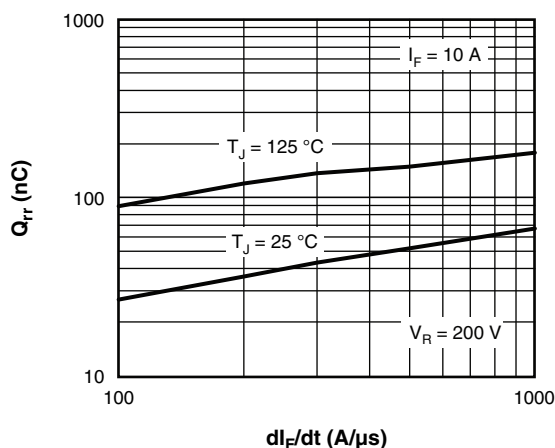
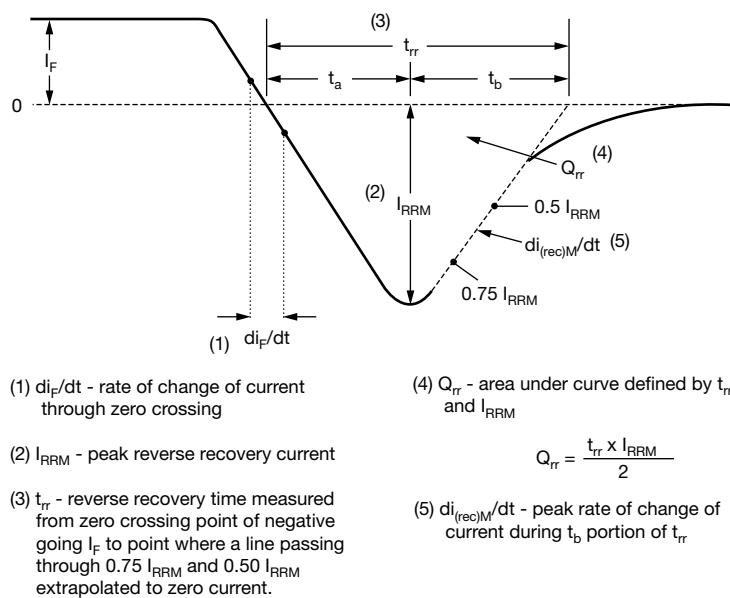

Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

Fig. 8 - Typical Stored Charge vs. dI_F/dt


Fig. 9 - Reverse Recovery Waveform and Definitions

**ORDERING INFORMATION TABLE**

Device code	VS-	20	C	T	H	03	S	TRL	H	M3
	1	2	3	4	5	6	7	8	9	10

- | | | |
|-----------|---|--|
| 1 | - | Vishay Semiconductors product |
| 2 | - | Current rating (20 A) |
| 3 | - | C = common cathode |
| 4 | - | T = TO-220, D ² PAK |
| 5 | - | H = hyperfast rectifier |
| 6 | - | Voltage rating (03 = 300 V) |
| 7 | - | • S = D ² PAK
• -1 = TO-262 |
| 8 | - | • None = tube (50 pieces)
• TRL = tape and reel (left oriented, for D ² PAK package)
• TRR = tape and reel (right oriented, for D ² PAK package) |
| 9 | - | H = AEC-Q101 qualified |
| 10 | - | M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free |

ORDERING INFORMATION (Example)

PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-20CTH03SHM3	50	Antistatic plastic tubes
VS-20CTH03STRLHM3	800	13" diameter plastic tape and reel
VS-20CTH03STRRHM3	800	13" diameter plastic tape and reel
VS-20CTH03-1HM3	50	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS

Dimensions	D ² PAK (TO-263AB)	www.vishay.com/doc?95046
	TO-262AA	www.vishay.com/doc?95419
Part marking information	D ² PAK (TO-263AB)	www.vishay.com/doc?95444
	TO-262AA	www.vishay.com/doc?95443
Packaging information	D ² PAK (TO-263AB)	www.vishay.com/doc?95032
SPIICE model		www.vishay.com/doc?96583



D²PAK

DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D²PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
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

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
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		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L2	1.27	1.78	0.050	0.070	
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

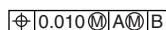
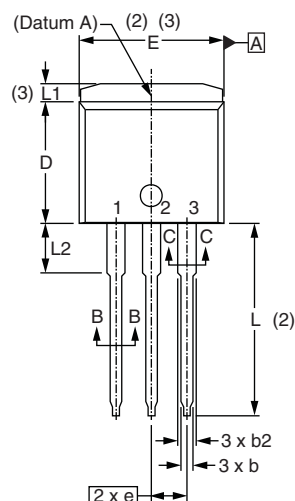
Notes

- (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

TO-262

DIMENSIONS in millimeters and inches

Modified JEDEC® outline TO-262

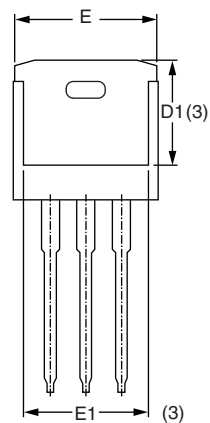
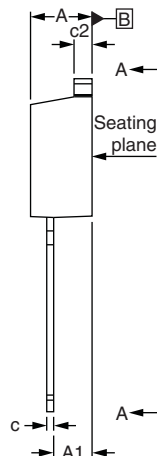


Lead tip –

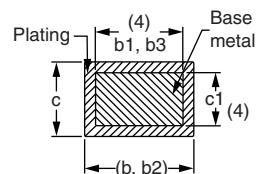
Lead assignments

Diodes

1. - Anode (two die)/open (one die)
- 2., 4. - Cathode
3. - Anode



Section A - A



Section B - B and C - C
Scale: None

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	3.36	3.71	0.132	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), D1 (minimum) and L2 where dimensions derived the actual package outline



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