Ultrafast Soft Recovery Diode, 80 A FRED Pt®

PowerTab®

Cathode ──▷|── Anode

FEATURES
- Ultrafast recovery time
- 175 °C max. operating junction temperature
- Screw mounting only
- Designed and qualified according to JEDEC®-JESD 47
- PowerTab® package
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e4

RoHS COMPLIANT

BENEFITS
- Reduced RFI and EMI
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

DESCRIPTION / APPLICATIONS

These diodes are optimized to reduce losses and EMI/RFI in high frequency power conditioning systems.

The softness of the recovery eliminates the need for a snubber in most applications. These devices are ideally suited for HF welding, power converters and other applications where switching losses are not significant portion of the total losses.

PRODUCT SUMMARY

Package	PowerTab®
$I_{F(AV)}$	80 A
V_R	200 V
V_F at I_F	0.79 V
t_{rr} (typ.)	See recovery table
T_J max.	175 °C
Diode variation	Single die

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Cathode to anode voltage	V_R		200	V
Continuous forward current	$I_{F(AV)}$	T_C = 112 °C	80	
Single pulse forward current	I_{FSM}	T_C = 25 °C	800	A
Maximum repetitive forward current	I_{FRM}	Square wave, 20 kHz	160	
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 = 50 μA	200	-	-	V
Forward voltage	V_F	I_F = 80 A	-	0.98	1.13	
		I_F = 80 A, T_J = 175 °C	-	0.79	0.92	
Reverse leakage current	I_R	V_R = V_R rated	-	-	50	μA
		T_J = 150 °C, V_R = V_R rated	-	-	2	mA
Junction capacitance	C_T	V_R = 200 V	-	89	-	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body	-	3.5	-	nH

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	I_F = 1.0 A, dI_F/dt = 200 A/µs, V_R = 30 V		-	-	35	ns
		T_J = 25 °C	I_F = 80 A V_R = 160 V dI_F/dt = 200 A/µs	-	32	-	
		T_J = 125 °C		-	52	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	4.4	-	A
		T_J = 125 °C		-	8.8	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	70	-	nC
		T_J = 125 °C		-	240	-	

THERMAL - MECHANICAL SPECIFICATIONS

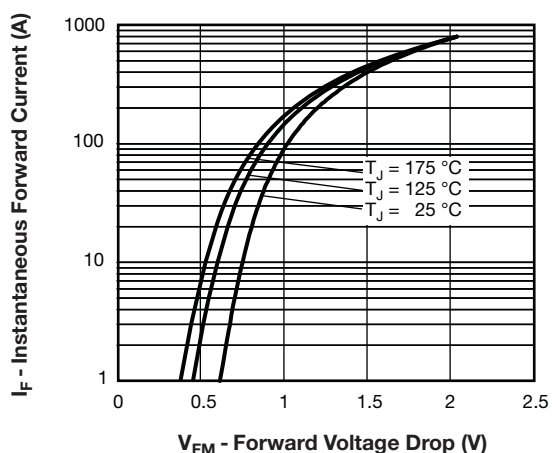| PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction to case	R_{thJC}		-	-	0.70	°C/W
Thermal resistance, junction to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.2	-	
Weight			-	-	5.02	g
			-	0.18	-	oz.
Mounting torque			1.2 (10)	-	2.4 (20)	N · m (lbf · in)
Marking device		Case style PowerTab®		80EBU02		

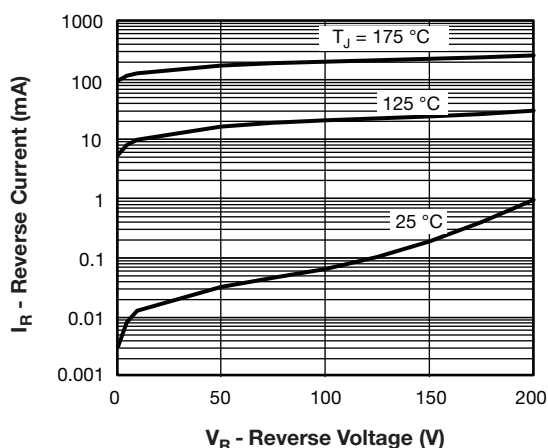Fig. 1 - Maximum Forward Voltage Drop Characteristics

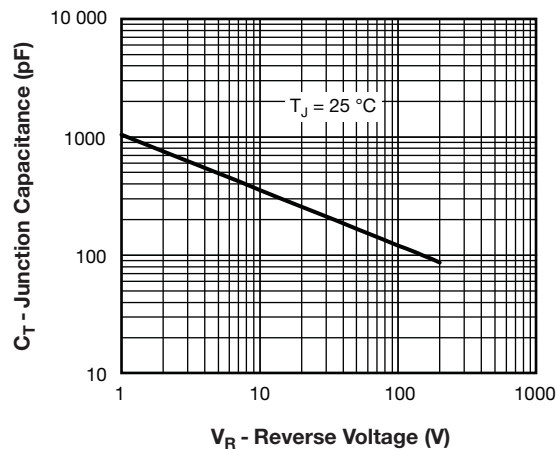Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

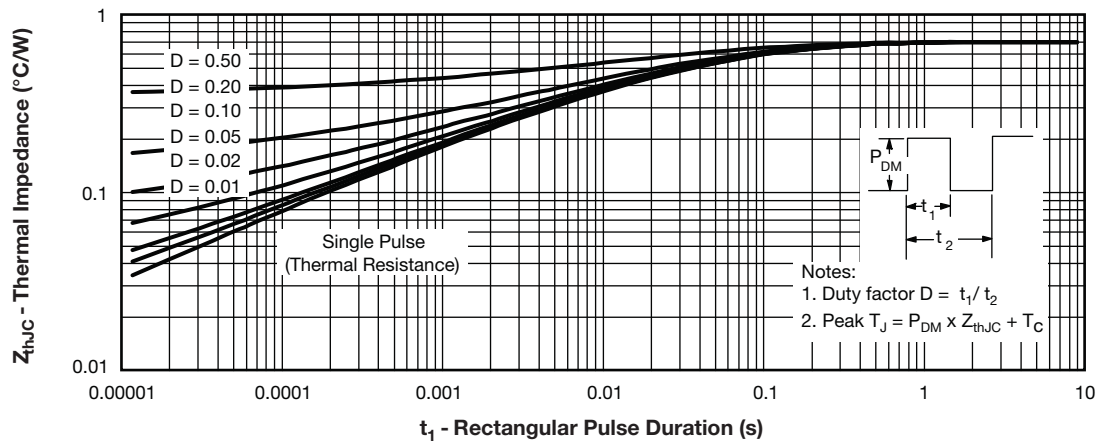Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

$T_J = 25\ °C$

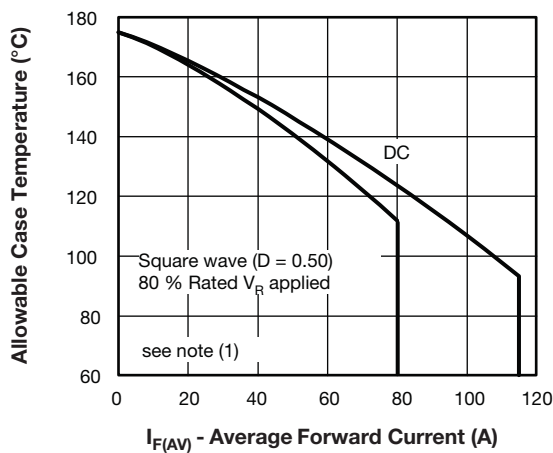C_T - Junction Capacitance (pF)

V_R - Reverse Voltage (V)

Z_{thJC} - Thermal Impedance (°C/W)

D = 0.50
D = 0.20
D = 0.10
D = 0.05
D = 0.02
D = 0.01

Single Pulse
(Thermal Resistance)

P_{DM}

t_1

t_2

Notes:
1. Duty factor D = t_1/t_2
2. Peak $T_J = P_{DM} \times Z_{thJC} + T_C$

t_1 - Rectangular Pulse Duration (s)

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

Allowable Case Temperature (°C)

DC

Square wave (D = 0.50)
80 % Rated V_R applied

see note (1)

$I_{F(AV)}$ - Average Forward Current (A)

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

Average Power Loss (W)

RMS Limit

D = 0.01
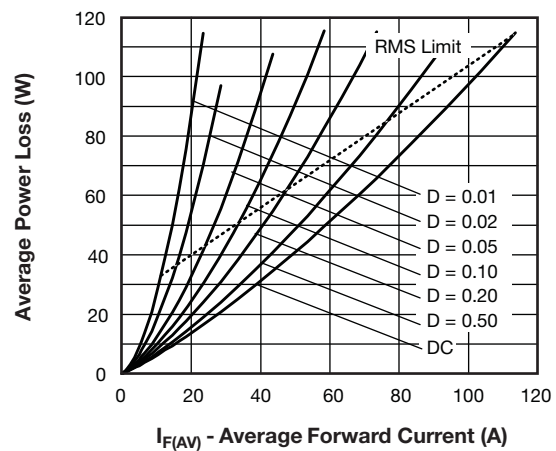D = 0.02
D = 0.05
D = 0.10
D = 0.20
D = 0.50
DC

$I_{F(AV)}$ - Average Forward Current (A)

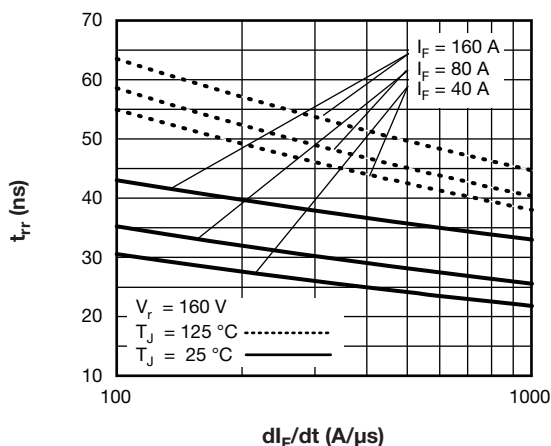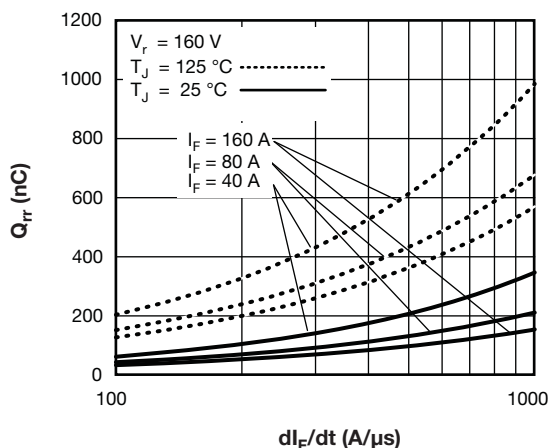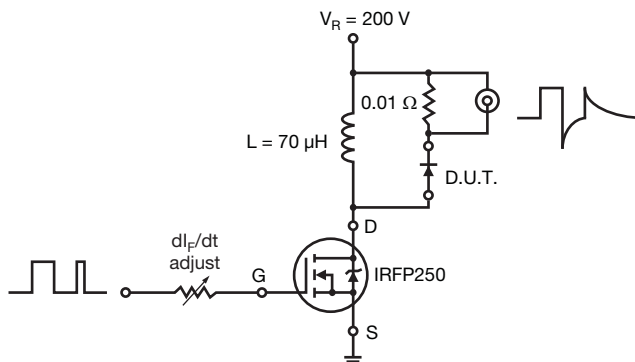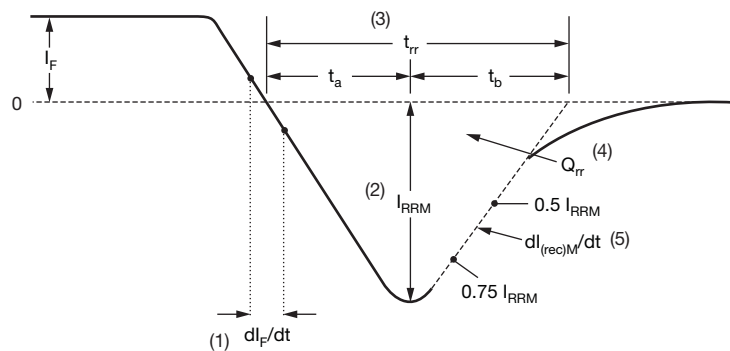Fig. 6 - Forward Power Loss Characteristics

Fig. 7 - Typical Reverse Recovery Time vs. dI$_F$/dt

Fig. 8 - Typical Stored Charge vs. dI$_F$/dt

Fig. 9 - Reverse Recovery Parameter Test Circuit

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. 6);
Pd_{REV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = 80 % rated V_R

(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. 10 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	80	E	B	U	02
	①	②	③	④	⑤	⑥

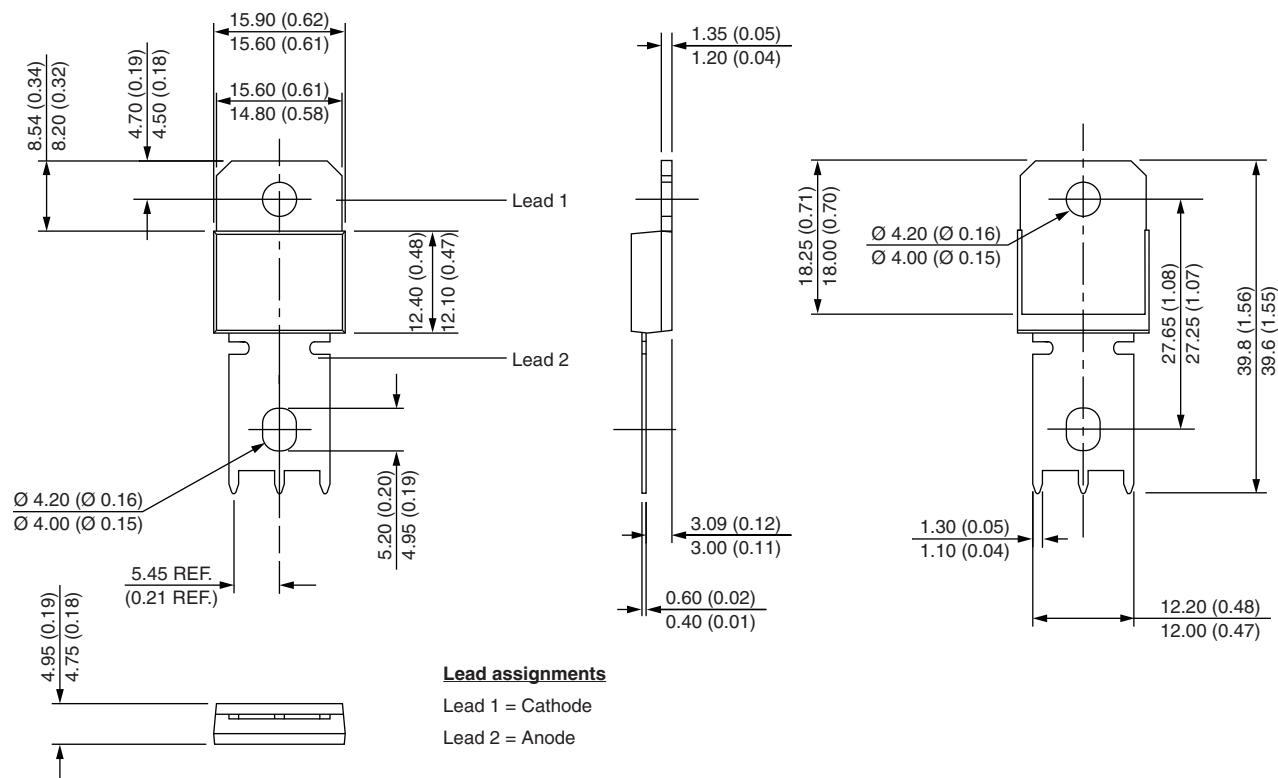| 1	-	Vishay Semiconductors product
2	-	Current rating (80 = 80 A)
3	-	Single diode
4	-	PowerTab® (ultrafast/hyperfast only)
5	-	Ultrafast recovery
6	-	Voltage rating (02 = 200 V)

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95240
Part marking information	www.vishay.com/doc?95370
Application note	www.vishay.com/doc?95179

PowerTab®

DIMENSIONS in millimeters (inches)

15.90 (0.62)
15.60 (0.61)

15.60 (0.61)
14.80 (0.58)

8.54 (0.34)
8.20 (0.32)

4.70 (0.19)
4.50 (0.18)

Lead 1

12.40 (0.48)
12.10 (0.47)

Lead 2

Ø 4.20 (Ø 0.16)
Ø 4.00 (Ø 0.15)

5.20 (0.20)
4.95 (0.19)

5.45 REF.
(0.21 REF.)

4.95 (0.19)
4.75 (0.18)

1.35 (0.05)
1.20 (0.04)

3.09 (0.12)
3.00 (0.11)

0.60 (0.02)
0.40 (0.01)

18.25 (0.71)
18.00 (0.70)

Ø 4.20 (Ø 0.16)
Ø 4.00 (Ø 0.15)

27.65 (1.08)
27.25 (1.07)

39.8 (1.56)
39.6 (1.55)

1.30 (0.05)
1.10 (0.04)

12.20 (0.48)
12.00 (0.47)

Lead assignments

Lead 1 = Cathode

Lead 2 = Anode

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