

Ultrafast Rectifier, 8 A FRED Pt®

VS-MURB1520PbF



Base
cathode
○ 2
○ 1
N/C
○ 3
Anode

D²PAK

VS-MURB1520-1PbF



○ 2
○ 1
N/C
○ 3
Anode

TO-262

FEATURES

- Ultrafast 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 260 °C
- Halogen-free according to IEC 61249-2-21 definition
- Compliant to RoHS directive 2002/95/EC
- AEC-Q101 qualified



RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION/APPLICATIONS

MUR.. series are the state of the art ultrafast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultrafast 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-to-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

t_{rr}	35 ns
$I_{F(AV)}$	15 A
V_R	200 V

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Peak repetitive reverse voltage	V_{RRM}		200	V
Average rectified forward current	$I_{F(AV)}$	Total device, rated V_R , $T_C = 150$ °C	15	A
Non-repetitive peak surge current	I_{FSM}		200	
Peak repetitive forward current	I_{FM}	Rated V_R , square wave, 20 kHz, $T_C = 150$ °C	30	
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					
Reverse leakage current	I_R	$I_F = 15$ A	-	-	1.05	μA
		$I_F = 15$ A, $T_J = 150$ °C	-	-	0.85	
Junction capacitance	C_T	$V_R = V_R$ rated	-	-	10	pF
		$T_J = 150$ °C, $V_R = V_R$ rated	-	-	500	
Series inductance	L_S	$V_R = 200$ V	-	55	-	pF
		Measured lead to lead 5 mm from package body	-	8.0	-	nH

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$I_F = 1.0 \text{ A}$, $dI_F/dt = 50 \text{ A}/\mu\text{s}$, $V_R = 30 \text{ V}$	-	-	35	ns
		$T_J = 25^\circ\text{C}$	-	22	-	
		$T_J = 125^\circ\text{C}$	-	39	-	
Peak recovery current	I_{RRM}	$T_J = 25^\circ\text{C}$	-	1.6	-	A
		$T_J = 125^\circ\text{C}$	-	4.1	-	
		$I_F = 15 \text{ A}$ $dI_F/dt = 200 \text{ A}/\mu\text{s}$ $V_R = 160 \text{ V}$	-	19	-	
Reverse recovery charge	Q_{rr}	$T_J = 25^\circ\text{C}$	-	90	-	nC
		$T_J = 125^\circ\text{C}$	-	-	-	

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	R_{thJC}	Mounting surface, flat, smooth and greased	-	-	1.5	°C/W
Thermal resistance, junction to ambient	R_{thJA}		-	-	50	
Thermal resistance, case to heatsink	R_{thCS}		-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6.0 (5.0)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D ² PAK	MURB1520			
		Case style TO-262	MURB1520-1			

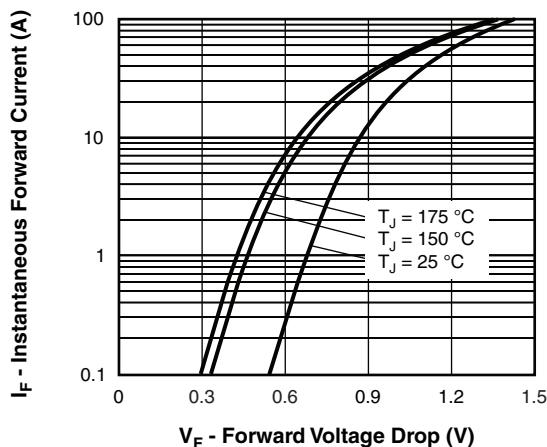


Fig. 1 - Typical Forward Voltage Drop Characteristics

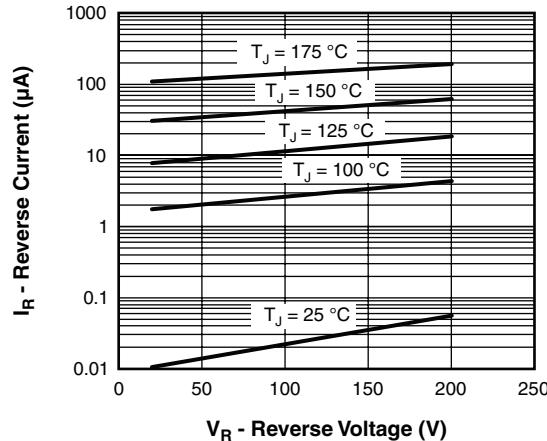


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

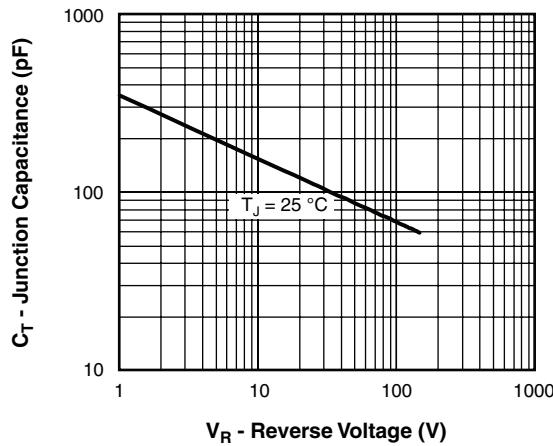


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

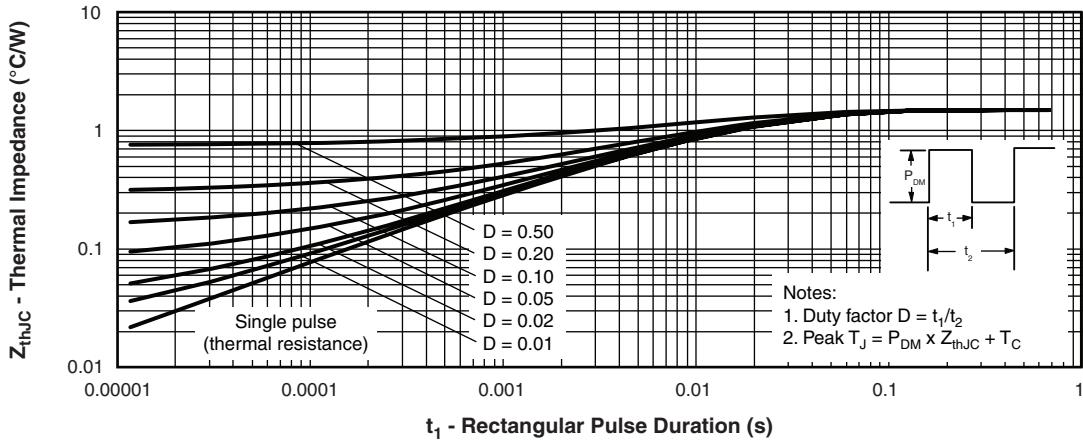


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

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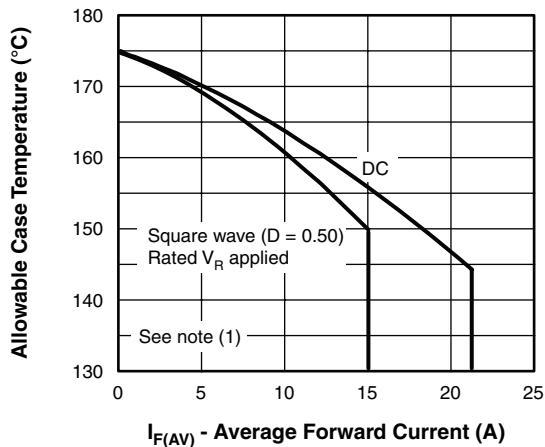


Fig. 5 - Maximum Allowable Case Temperature vs.
Average Forward Current

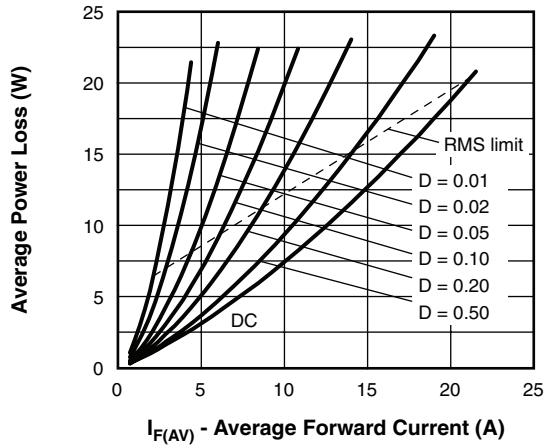


Fig. 6 - Forward Power Loss Characteristics

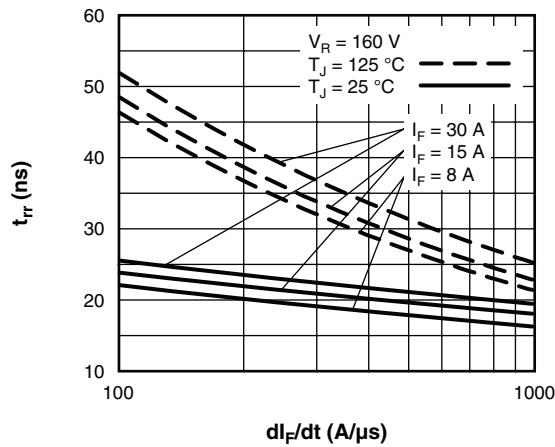


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

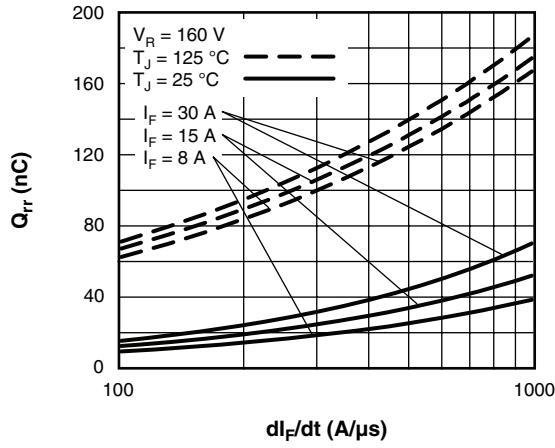


Fig. 8 - Typical Stored Charge vs. dI_F/dt

Note

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

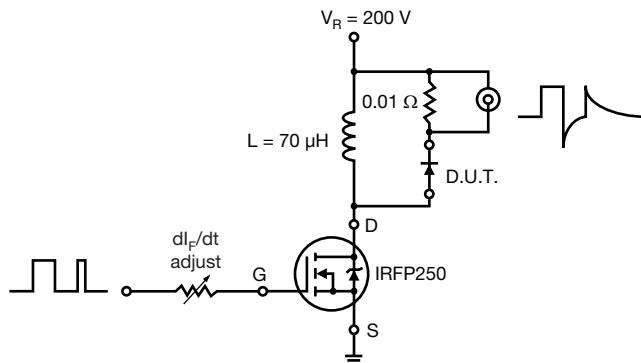
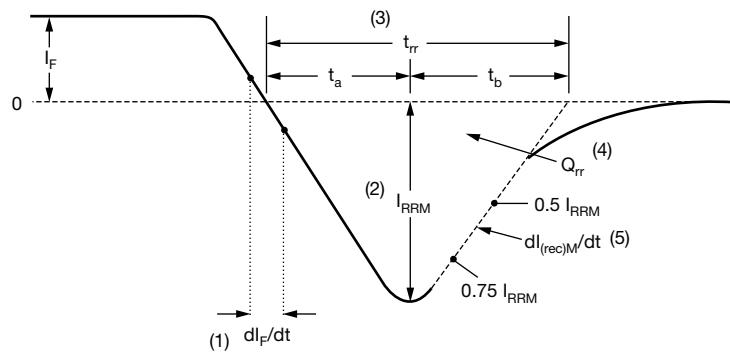


Fig. 9 - Reverse Recovery Parameter Test Circuit



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

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

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

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

(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.

(5) $dl_{(rec)M}/dt$ - 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-	MUR	B	15	20	-1	TRL	PbF
	1	2	3	4	5	6	7	8

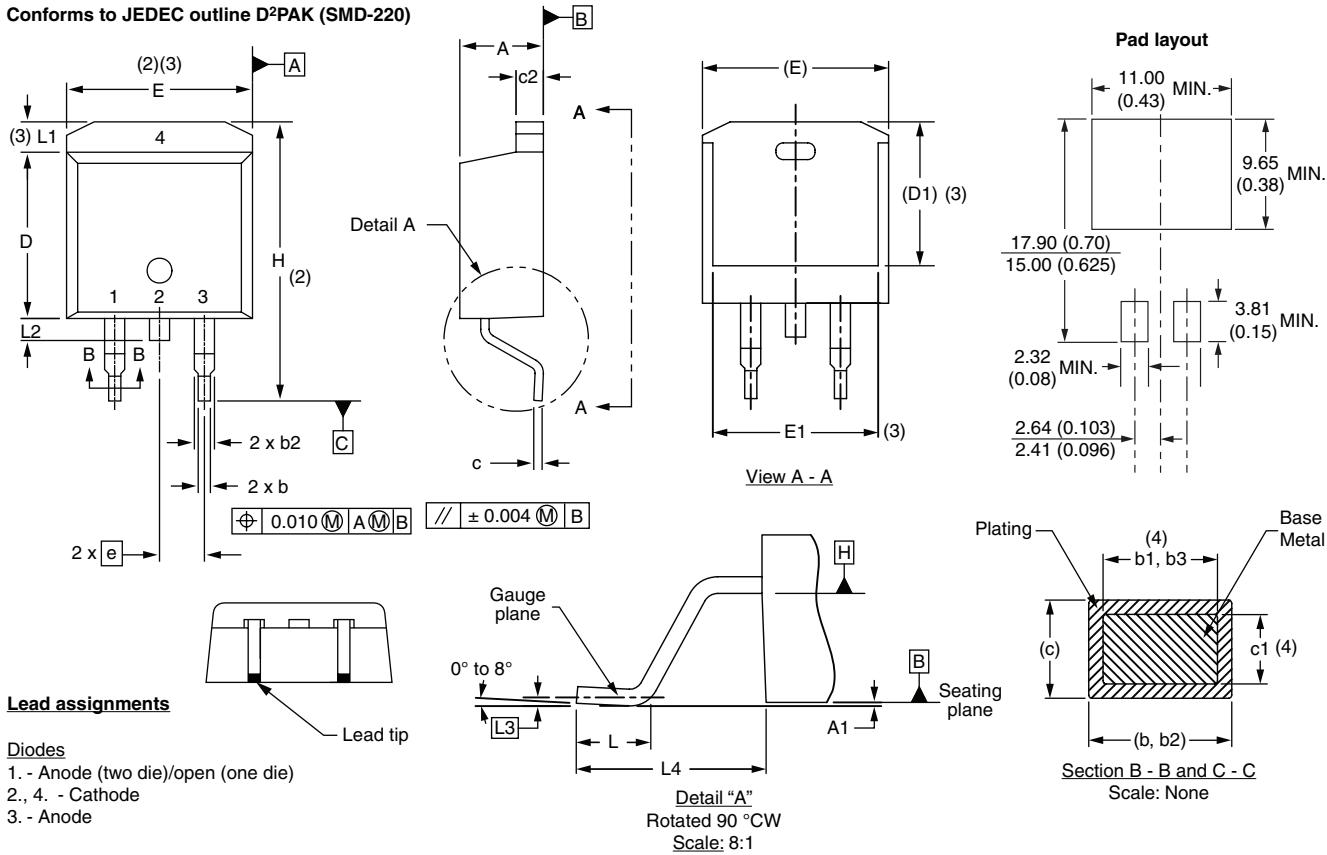
1	- HPP product suffix
2	- Ultrafast MUR series
3	- B = D ² PAK/TO-262
4	- Current rating (15 = 15 A)
5	- Voltage rating (20 = 200 V)
6	<ul style="list-style-type: none">• None = D²PAK• -1 = TO-262
7	<ul style="list-style-type: none">• None = Tube (50 pieces)• TRL = Tape and reel (left oriented, for D²PAK package)• TRR = Tape and reel (right oriented, for D²PAK package)
8	- PbF = Lead (Pb)-free

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95014
Part marking information	www.vishay.com/doc?95008
Packaging information	www.vishay.com/doc?95032
SPICE model	www.vishay.com/doc?95271

D²PAK, TO-262

DIMENSIONS FOR D²PAK in millimeters and inches

Conforms to JEDEC outline D²PAK (SMD-220)



Symbol	Millimeters		Inches		Notes		Symbol	Millimeters		Inches		Notes
	Min.	Max.	Min.	Max.				Min.	Max.	Min.	Max.	
A	4.06	4.83	0.160	0.190			D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010			E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039			E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4		e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070			H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4		L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029			L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4		L2	1.27	1.78	0.050	0.070	
c2	1.14	1.65	0.045	0.065			L3	0.25 BSC		0.010 BSC		
D	8.51	9.65	0.335	0.380	2		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

Outline Dimensions

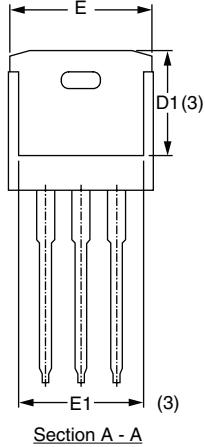
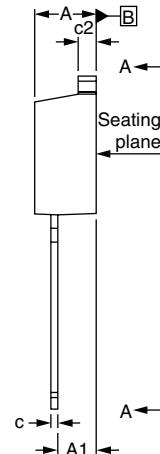
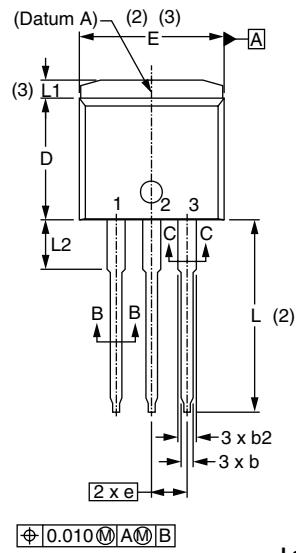
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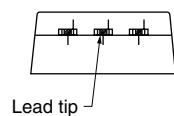


DIMENSIONS FOR TO-262 in millimeters and inches

Modified JEDEC outline TO-262



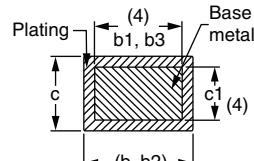
Section A - A



Lead assignments

Diodes

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



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	3.56	3.71	0.140	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) and D1 (minimum) where dimensions derived the actual package outline

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