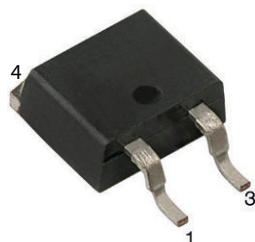
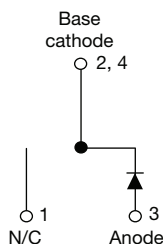


# Ultrafast Rectifier, 20 A FRED Pt®



D²PAK 2L (TO-263AB 2L)



## FEATURES

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



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## DESCRIPTION

State of the art, ultralow  $V_F$ , soft-switching ultrafast rectifiers optimized for Discontinuous (Critical) Mode (DCM) Power Factor Correction (PFC)

The minimized conduction loss, optimized stored charge and low recovery current minimized the switching losses and reduce over dissipation in the switching element and snubbers.

The device is also intended for use as a freewheeling diode in power supplies and other switching applications

## APPLICATIONS

AC/DC SMPS 70 W to 400 W

e.g. laptop and printer AC adapters, desktop PC, TV and monitor, games units, and DVD AC/DC power supplies.

## MECHANICAL DATA

**Case:** D²PAK 2L (TO-263AB 2L)

Molding compound meets UL 94 V-0 flammability rating

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

## PRIMARY CHARACTERISTICS

$I_{F(AV)}$	20 A
$V_R$	600 V
$V_F$ at $I_F$	1.2 V
$t_{rr}$ (typ.)	ns
$T_J$ max.	175 °C
Package	D²PAK 2L (TO-263AB 2L)
Circuit configuration	Single

## ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Repetitive peak reverse voltage	$V_{RRM}$		600	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 129\text{ °C}$	20	A
Non-repetitive peak surge current	$I_{FSM}$	$T_C = 25\text{ °C}$	180	
Operating junction and storage temperatures	$T_J, T_{Stg}$		-55 to +175	°C

## ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ °C}$ unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	$V_{BR}, V_R$	$I_R = 100\text{ }\mu\text{A}$	600	-	-	V
Forward voltage	$V_F$	$I_F = 20\text{ A}$	-	1.35	1.7	
		$I_F = 20\text{ A}, T_J = 150\text{ °C}$	-	1.2	1.4	
Reverse leakage current	$I_R$	$V_R = V_R$ rated	-	0.02	5	$\mu\text{A}$
		$T_J = 150\text{ °C}, V_R = V_R$ rated	-	20	200	
Junction capacitance	$C_T$	$V_R = 600\text{ V}$	-	12	-	pF
Series inductance	$L_S$	Measured lead to lead 5 mm from package body	-	8.0	-	nH

<b>DYNAMIC RECOVERY CHARACTERISTICS</b> ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	$t_{rr}$	$I_F = 1\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$ , $V_R = 30\text{ V}$	-	26	-	ns
		$T_J = 25\text{ }^{\circ}\text{C}$	-	42	-	
		$T_J = 125\text{ }^{\circ}\text{C}$	-	89	-	
Peak recovery current	$I_{RRM}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	4.9	-	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	8.4	-	
		$T_J = 25\text{ }^{\circ}\text{C}$	-	110	-	C
Reverse recovery charge	$Q_{rr}$	$T_J = 125\text{ }^{\circ}\text{C}$	-	440	-	

<b>THERMAL - MECHANICAL SPECIFICATIONS</b>						
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	$R_{thJC}$		-	-	1.51	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction to ambient	$R_{thJA}$	Typical socket mount	-	-	70	
Thermal resistance, case to heat sink	$R_{thCS}$	Mounting surface, flat, smooth, and greased	-	0.5	-	
Weight			-	2.0	-	g
			-	0.07	-	oz.
Mounting torque			6 (5)	-	12 (10)	kgf · cm (lbf · in)
Marking device		Case style D <sup>2</sup> PAK 2L (TO-263AB 2L)	ETU2006SH			

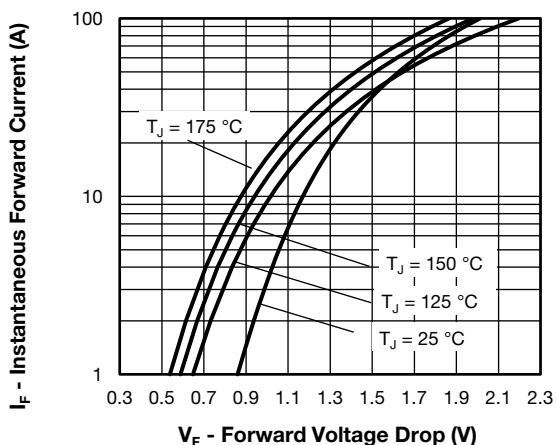


Fig. 1 - Typical Forward Voltage Drop Characteristics

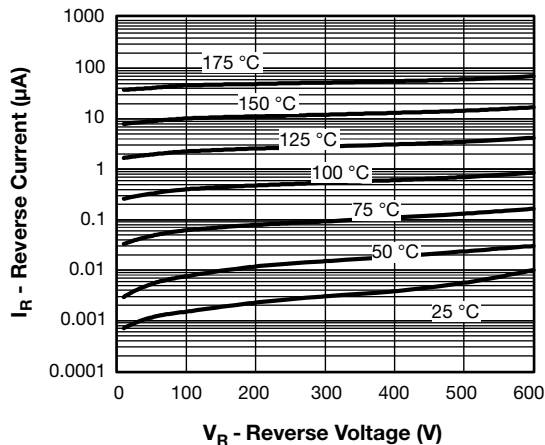


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

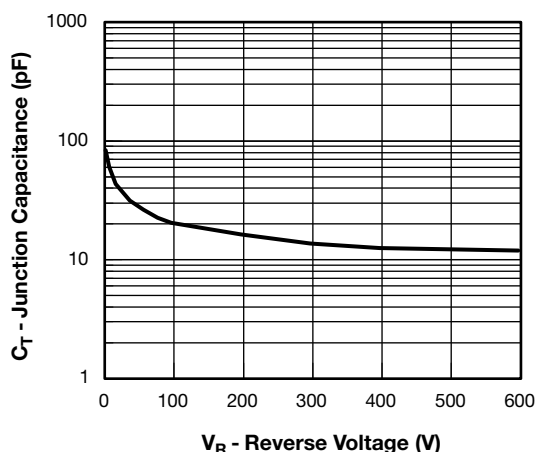


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

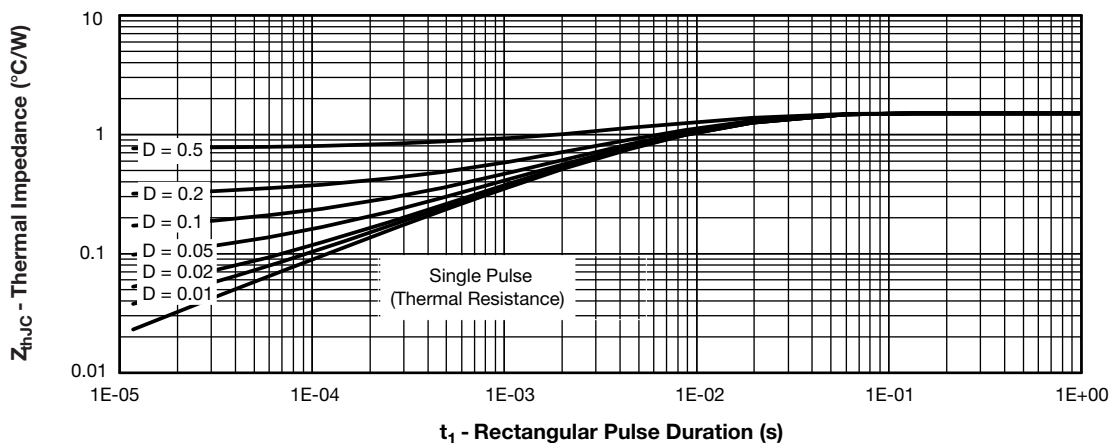
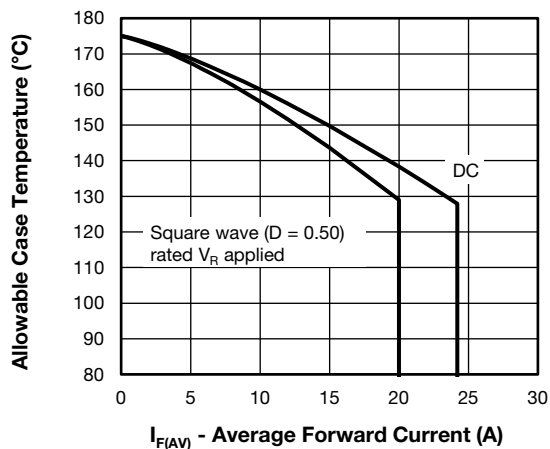

Fig. 4 - Max. Thermal Impedance  $Z_{thJC}$  Characteristics


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

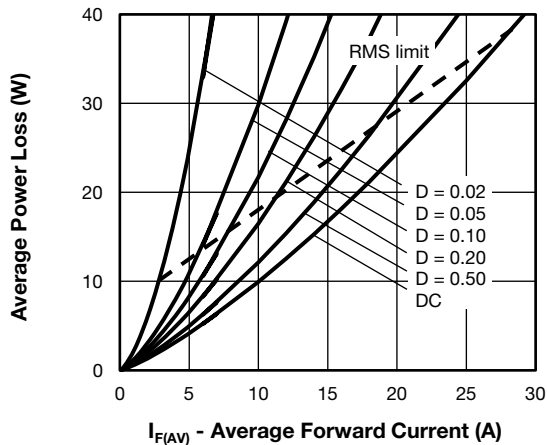


Fig. 6 - Forward Power Loss Characteristics

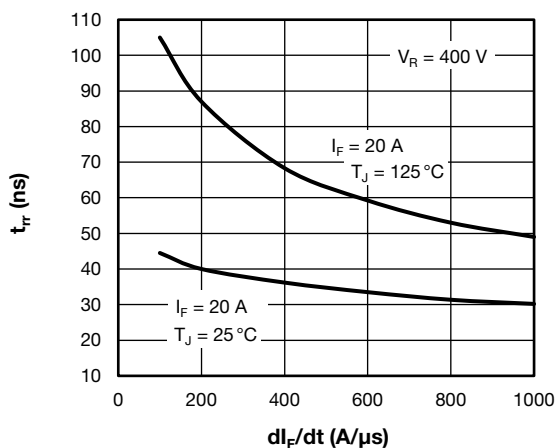
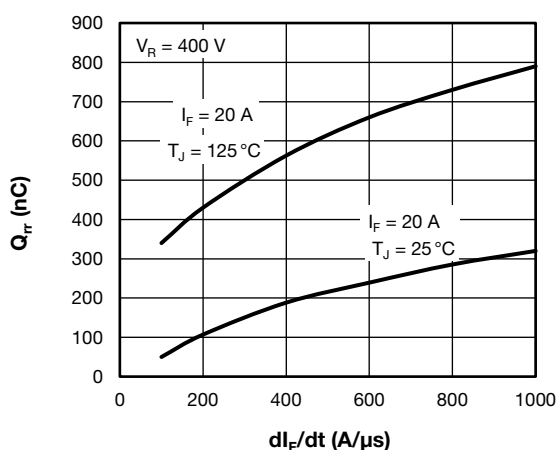
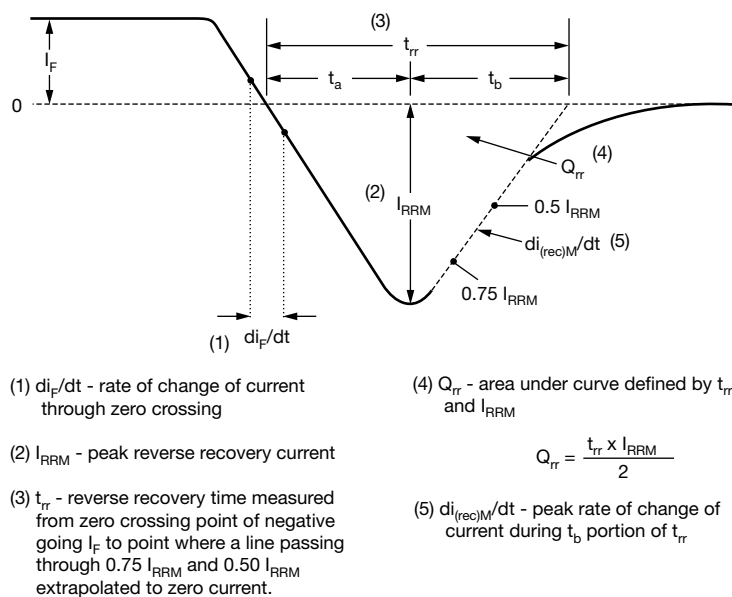

Fig. 7 - Typical Reverse Recovery Time vs.  $di_F/dt$ 

Fig. 8 - Typical Stored Charge vs.  $di_F/dt$ 


Fig. 9 - Reverse Recovery Waveform and Definitions



## ORDERING INFORMATION TABLE

Device code	VS-	E	T	U	20	06	S2	L	H	M3
	1	2	3	4	5	6	7	8	9	10

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration  
E = single diode
- 3** - T = D<sup>2</sup>PAK (TO-263) package
- 4** - U = ultrafast recovery time
- 5** - Current code (20 = 20 A)
- 6** - Voltage code (06 = 600 V)
- 7** - • S2 = true 2 pin D<sup>2</sup>PAK
- 8** - • None = tube (50 pieces)  
• L = tape and reel (left oriented, for D<sup>2</sup>PAK package)  
If needed different orientation / packaging, please contact factory
- 9** - H = AEC-Q101 qualified
- 10** - Environmental digit:  
M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION (Example)		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-ETU2006S2LHM3	800	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96683">www.vishay.com/doc?96683</a>
Part marking information	<a href="http://www.vishay.com/doc?96693">www.vishay.com/doc?96693</a>
Packaging information	<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>



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