

## Standard Recovery Diodes, 400 A



TO-244

### FEATURES

- Standard rectifier
- Popular series for rough service
- Cathode and anode to base available
- UL approved file E222165
- Designed and qualified for industrial level
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### TYPICAL APPLICATIONS

- Welders
- Power supplies
- Motor controls
- Battery chargers
- General industrial current rectification

### PRODUCT SUMMARY

$I_{F(AV)}$ per module	400 A
Type	Modules - Diode, High Voltage
Package	TO-244
Circuit	Two diodes common anode, two diodes common cathode

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	133 °C	400	A
$I_{F(RMS)}$		628	
$I_{FSM}$	50 Hz	2500	
	60 Hz	2620	
$I^2t$	50 Hz	31	kA <sup>2</sup> s
	60 Hz	28	
$I^2\sqrt{t}$		312	kA <sup>2</sup> √s
$V_{RRM}$		600	V
$T_J$		-40 to +175	°C
$T_{Stg}$			

### ELECTRICAL SPECIFICATIONS

#### VOLTAGE RATINGS

TYPE NUMBER	VOLTAGE CODE	$V_{RRM}$ : MAXIMUM REPETITIVE PEAK REVERSE VOLTAGE V	$V_{RSM}$ : MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ MAXIMUM AT $T_J = 175$ °C mA
VS-VSMD400.W60	60	600	700	12



FORWARD CONDUCTION					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum average forward current at case temperature per leg	$I_{F(AV)}$	180° conduction, half sine wave, 133 °C		200	A
Maximum RMS forward current per leg	$I_{F(RMS)}$	DC at 137 °C case temperature		314	A
Maximum peak, one-cycle forward, non-repetitive surge current per leg	$I_{FSM}$	t = 10 ms	No voltage reappplied	2500	
		t = 8.3 ms	No voltage reappplied	2620	
		t = 10 ms	100 % $V_{RRM}$ reappplied	2100	
		t = 8.3 ms	100 % $V_{RRM}$ reappplied	2200	
Maximum $I^2t$ for fusing per leg	$I^2t$	t = 10 ms	No voltage reappplied	32	kA <sup>2</sup> s
		t = 8.3 ms	No voltage reappplied	29	
		t = 10 ms	100 % $V_{RRM}$ reappplied	22	
		t = 8.3 ms	100 % $V_{RRM}$ reappplied	20	
Maximum $I^2\sqrt{t}$ for fusing per leg	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reappplied		311	kA <sup>2</sup> √s
Low level value of threshold voltage per leg	$V_{F(TO)1}$	(16.7 % $\times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), $T_J = T_J$ maximum		0.73	V
High level value of threshold voltage per leg	$V_{F(TO)2}$	(I > $\pi \times I_{F(AV)}$ ), $T_J = T_J$ maximum		0.85	
Low level value of forward slope resistance per leg	$r_{f1}$	(16.7 % $\times \pi \times I_{F(AV)} < I < \pi \times I_{F(AV)}$ ), $T_J = T_J$ maximum		1.52	mΩ
High level value of forward slope resistance per leg	$r_{f2}$	(I > $\pi \times I_{F(AV)}$ ), $T_J = T_J$ maximum		1.36	
Maximum forward voltage drop per leg	$V_{FM}$	$I_{FM} = 200$ A, $T_J = 25$ °C, $t_p = 400$ μs square wave		1.31	V

BLOCKING					
PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum peak reverse leakage current per leg	$I_{RRM}$	$T_J = 175$ °C		12	mA
		$T_J = 25$ °C		200	μA

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	VALUES			UNITS
		MIN.	TYP.	MAX.	
Thermal resistance, per leg junction to case	$R_{thJC}$	-	-	0.10	°C/W
		-	-	0.05	
Thermal resistance, case to heatsink per module	$R_{thCS}$	-	0.10	-	
Weight		-	68	-	g
		-	2.4	-	oz.
Mounting torque		30 (3.4)	-	40 (4.6)	lbf · in (N · m)
Mounting torque center hole		12 (1.4)	-	18 (2.1)	
Terminal torque		30 (3.4)	-	40 (4.6)	
Vertical pull		-	-	80	lbf · in
2" lever pull		-	-	35	
Case style		TO-244			

ΔR CONDUCTION PER JUNCTION											
DEVICES	SINE HALF WAVE CONDUCTION					RECTANGULAR WAVE CONDUCTION					UNITS
	180°	120°	90°	60°	30°	180°	120°	90°	60°	30°	
VSMD400.W60	0.041	0.047	0.060	0.084	0.131	0.029	0.049	0.064	0.087	0.132	°C/W

**Note**

- Table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC

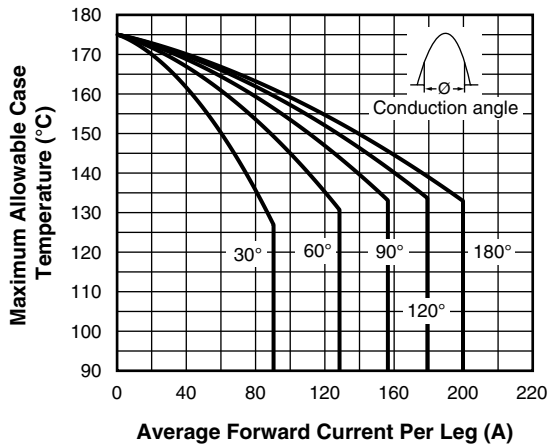


Fig. 1 - Current Ratings Characteristics Per Leg

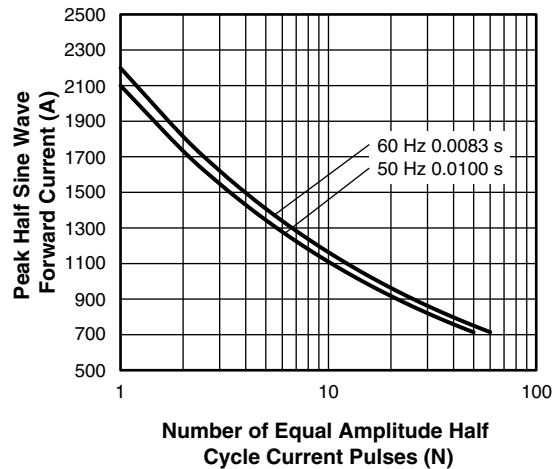


Fig. 3 - Maximum Non-Repetitive Surge Current Per Leg

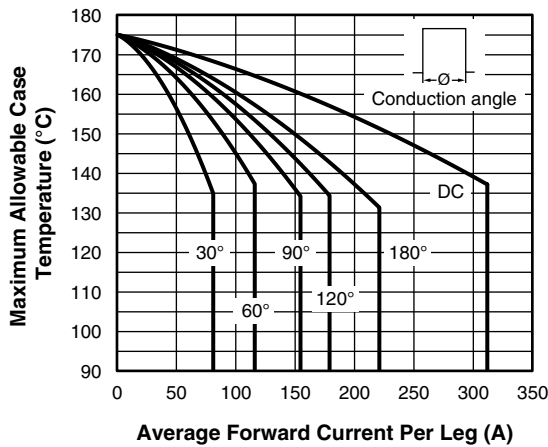


Fig. 2 - Current Ratings Characteristics Per Leg

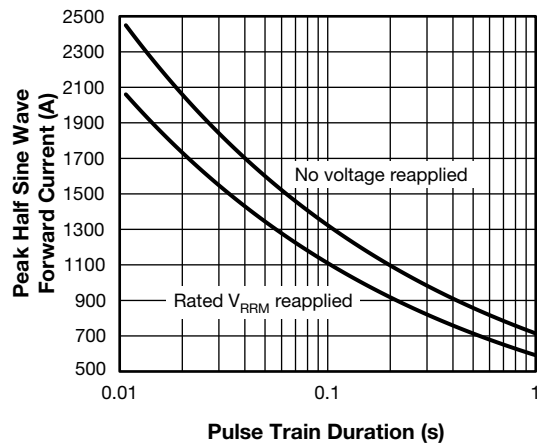


Fig. 4 - Maximum Non-Repetitive Surge Current Per Leg

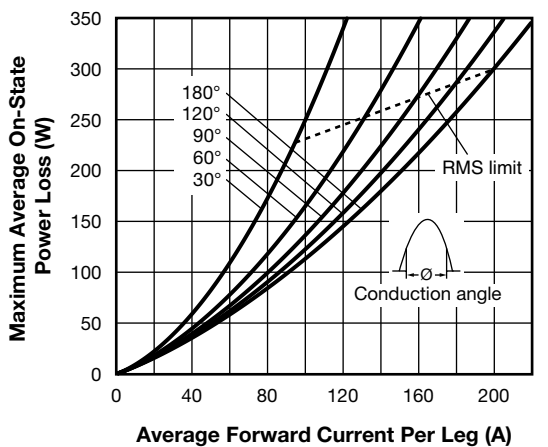
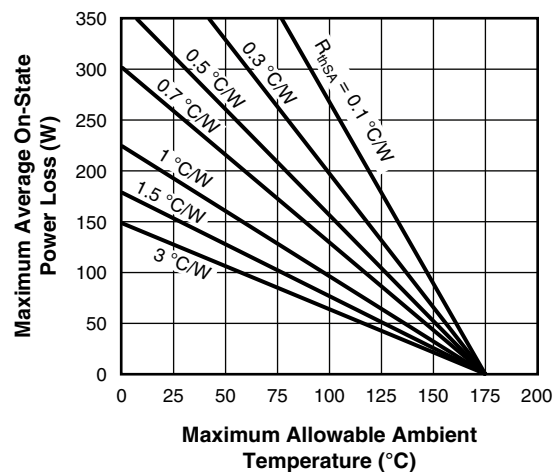


Fig. 5 - Forward Power Loss Characteristics



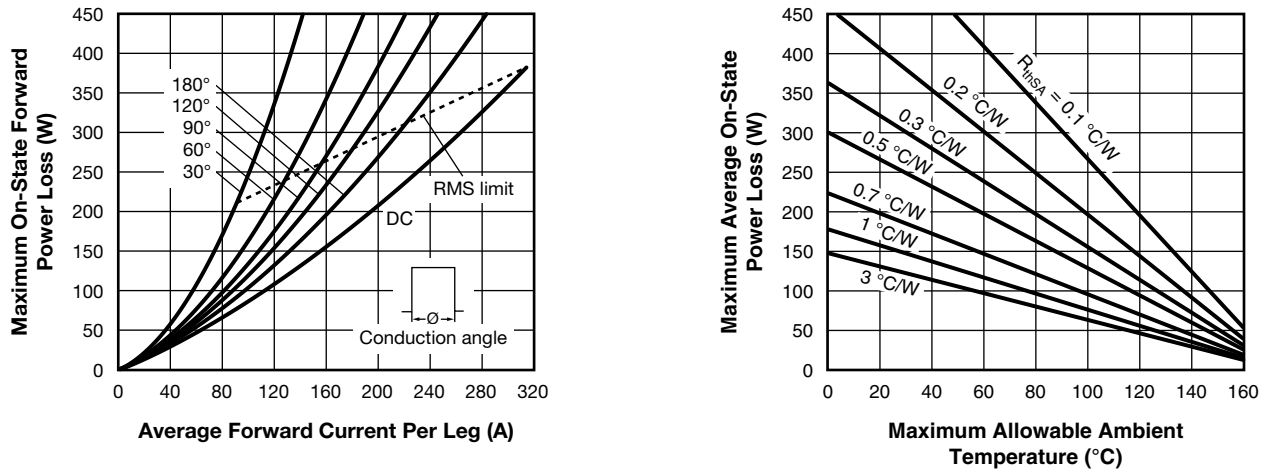


Fig. 6 - Forward Power Loss Characteristics

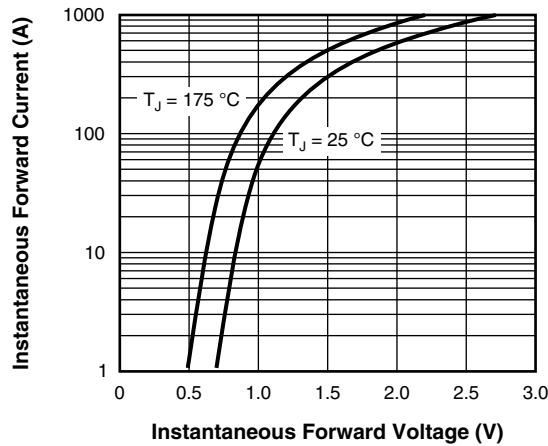


Fig. 7 - Forward Voltage Drop Characteristics Per Leg

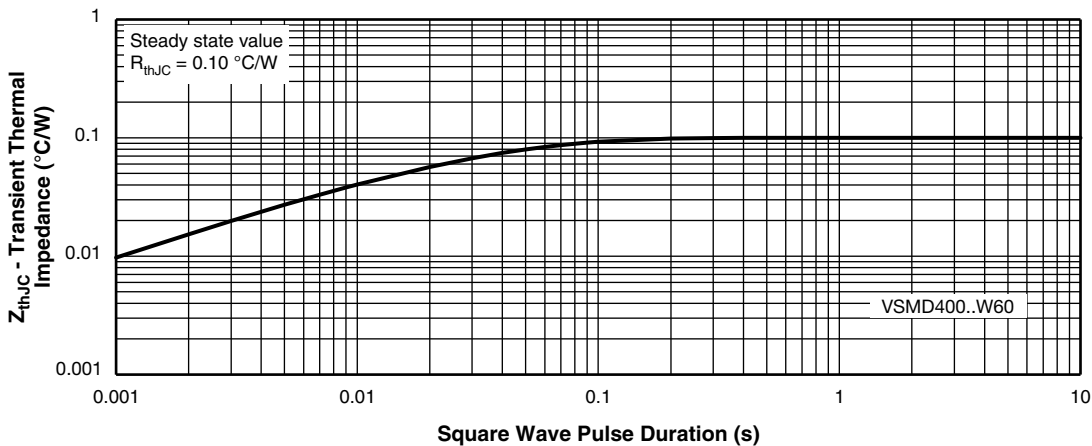


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics Per Leg



## ORDERING INFORMATION TABLE

Device code	<b>VS-VS</b>	<b>MD</b>	<b>400</b>	<b>C</b>	<b>W</b>	<b>60</b>
	①	②	③	④	⑤	⑥

- 1** - Vishay Semiconductors product
- 2** - MD = Standard recovery diode
- 3** - Current rating (400 = 400 A)
- 4** - Circuit configuration:
  - C = Common cathode
  - A = Common anode
- 5** - Type of device:
  - W = TO-244 not isolated
- 6** - Voltage rating (60 = 600 V)

CIRCUIT CONFIGURATION		
CIRCUIT DESCRIPTION	CIRCUIT CONFIGURATION CODE	CIRCUIT DRAWING
Two diodes common anode	A	
Two diodes common cathode	C	

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95021">www.vishay.com/doc?95021</a>



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