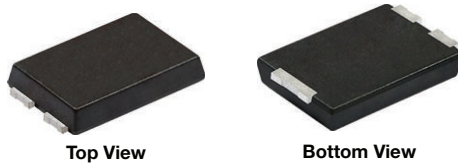
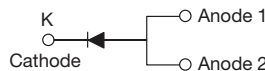


Hyperfast Rectifier, 1 A FRED Pt[®]

eSMP[®] Series



SMPC HV



LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	1 A
V_R	1200 V
V_F at I_F	1.45 V
t_{rr}	50 ns
T_J max.	175 °C
Package	SMPC HV
Circuit configuration	Single

FEATURES

- Minimum creepage distance 5.4 mm
- Comparative tracking index: CTI \geq 600
- Hyperfast recovery time, reduced Q_{rr} , and soft recovery
- 175 °C maximum operating junction temperature
- Low junction capacitance
- Specified for output and snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Meets JESD 201 class 1A whisker test
- Footprint compatible with TO-277A
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers specifically 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 as clamp, snubber and freewheeling diode in a flyback aux power supplies, bootstrap and desaturate for HV MOSFET and IGBT driver, high frequency rectifiers in a cuk and sepic circuit for LED lighting.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce power dissipation in the switching element.

MECHANICAL DATA

Case: SMPC HV

Molding compound meets UL 94 V-0 flammability rating, halogen-free, RoHS-compliant

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

Polarity: color band denotes cathode end

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	V_{RRM}		1200	V
Average rectified forward current	$I_{F(AV)}$	$T_{sp} = 147$ °C, DC conduction	1	A
Non-repetitive peak surge current	I_{FSM}	$T_J = 25$ °C, 8.3 ms sine pulse	19	
Operating junction and storage temperatures	T_J, T_{Stg}		-55 to +175	°C



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	$I_R = 100\text{ }\mu\text{A}$	1200	-	-	V
Forward voltage drop	V_F	$I_F = 1\text{ A}$	-	1.85	2.30	
		$I_F = 1\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	1.55	1.75	
Reverse leakage current	I_R	$V_R = V_R\text{ rated}$	-	-	2	μA
		$T_J = 125\text{ }^\circ\text{C}, V_R = V_R\text{ rated}$	-	-	20	
Junction capacitance	C_T	$V_R = 1200\text{ V}, 1\text{ MHz}$	-	4.25	-	pF
		$V_R = 4\text{ V}, 1\text{ MHz}$	-	7.25	-	

DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$I_F = 0.5\text{ A}, I_R = 1\text{ A}, I_{rr} = 0.25\text{ A}$	-	40	50	ns
		$T_J = 25\text{ }^\circ\text{C}$	-	91	-	
		$T_J = 125\text{ }^\circ\text{C}$	-	120	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^\circ\text{C}$	-	3.0	-	A
		$T_J = 125\text{ }^\circ\text{C}$	-	4.0	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^\circ\text{C}$	-	105	-	nC
		$T_J = 125\text{ }^\circ\text{C}$	-	200	-	

THERMAL AND 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 mount	$R_{thJM}^{(1)}$	Device mounted on PCB with recommended pad size	-	15	18	$^\circ\text{C/W}$
Thermal resistance, junction to ambient	R_{thJA}	Device mounted on PCB with recommended pad size	-	100	-	$^\circ\text{C/W}$
Approximate weight				0.1		g
Marking device		Case style SMPC HV			DEX12	

Note

(1) Thermal resistance junction to mount follows JEDEC® 51-14 transient dual interface test method (TDIM)

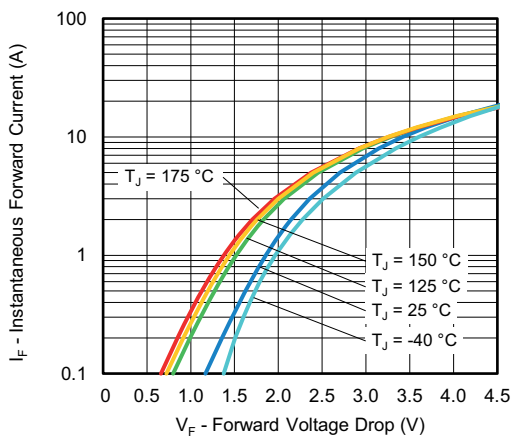


Fig. 1 - Typical Forward Voltage Drop Characteristics

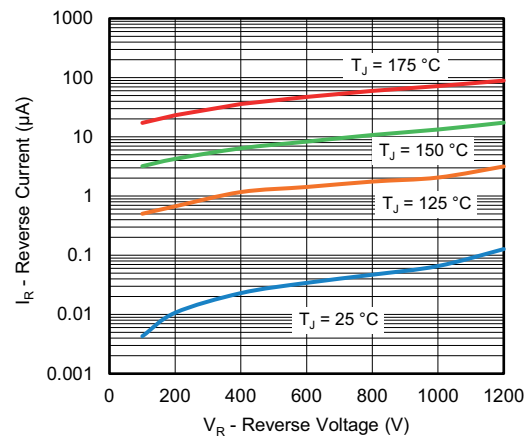


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

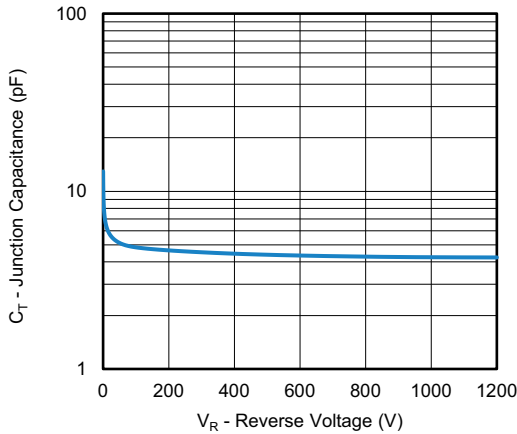


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

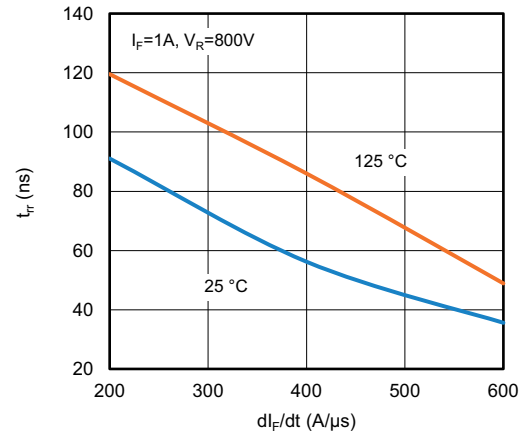


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

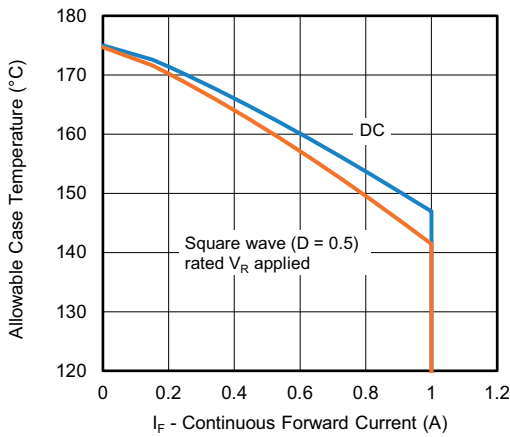


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

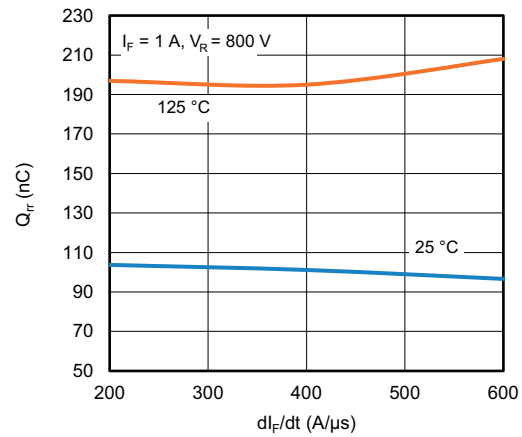


Fig. 7 - Typical Stored Charge vs. dI_F/dt

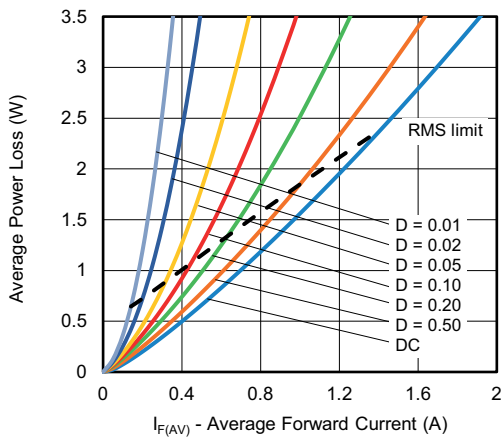


Fig. 5 - Forward Power Loss Characteristics

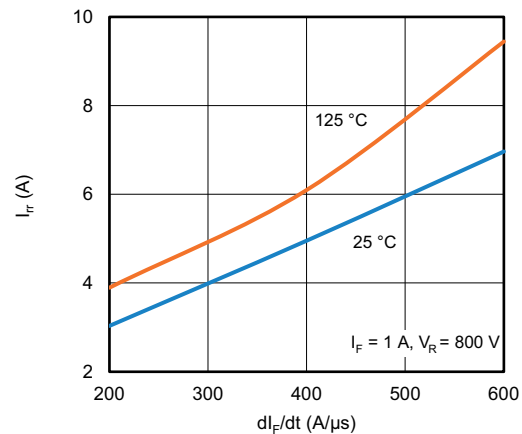


Fig. 8 - I_{rr} (A) vs. dI_F/dt

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. 5);
 Pd_{REV} = inverse power loss = $V_{R1} \times I_{R1} (1 - D)$; I_{R1} at V_{R1} = rated V_R

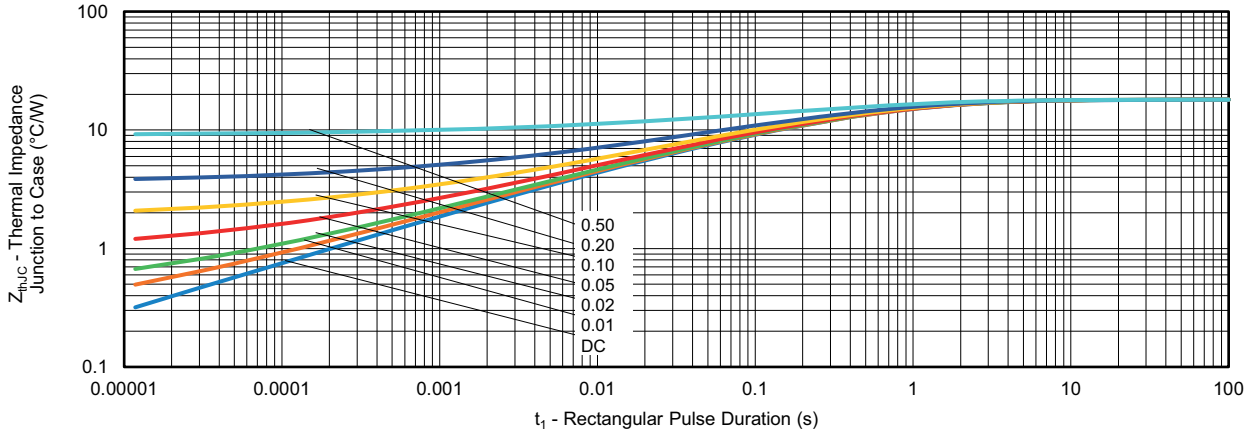


Fig. 9 - Transient Thermal Impedance, Junction to Case

ORDERING INFORMATION TABLE

Device code	VS-	E	7	S	X	01	12	-M3	V
	①	②	③	④	⑤	⑥	⑦	⑧	⑨

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:
E = single diode
- 3** - 7 = FRED generation 7
- 4** - S = SMPC HV package
- 5** - Process type,
X = hyperfast recovery
- 6** - Current rating (01 = 1 A)
- 7** - Voltage code (12 = 1200 V)
- 8** - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free
- 9** - Package type: V = high voltage

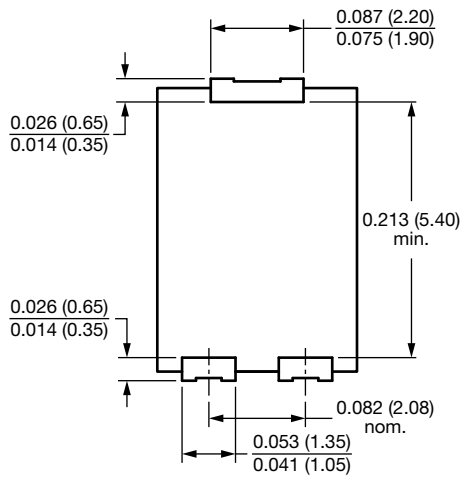
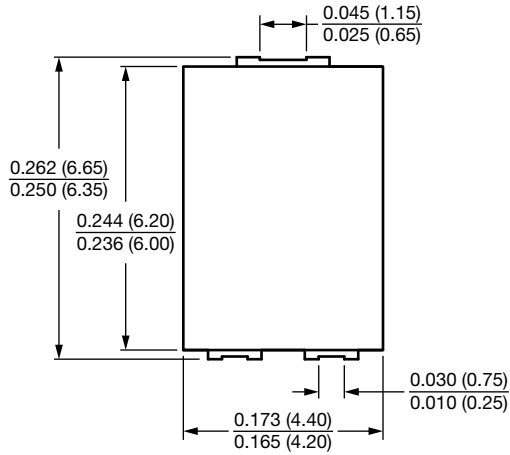
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER REEL	BASE QUANTITY	PACKAGING DESCRIPTION
VS-E7SX0112-M3V/I	6500	6500	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?97324
Part marking information	www.vishay.com/doc?95565
Packaging information	www.vishay.com/doc?98884
SPICE model	www.vishay.com/doc?97501

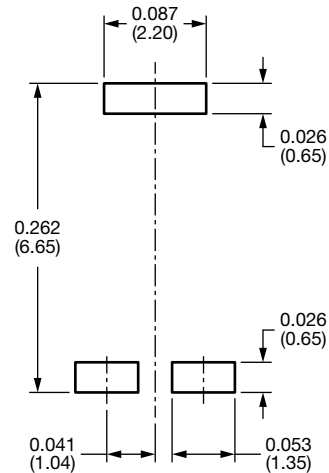


SMPC HV

DIMENSIONS in inches (millimeters)



Mounting Pad Layout





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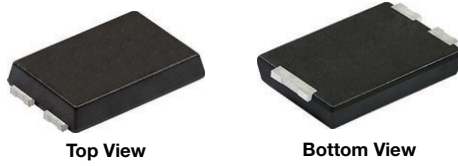
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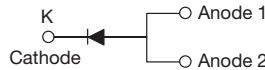
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Hyperfast Rectifier, 2 A FRED Pt[®]

eSMP[®] Series



SMPC HV



LINKS TO ADDITIONAL RESOURCES



PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	2 A
V_R	1200 V
V_F at I_F	1.6 V
t_{rr}	50 ns
T_J max.	175 °C
Package	SMPC HV
Circuit configuration	Single

FEATURES

- Minimum creepage distance 5.4 mm
- Comparative tracking index: CTI \geq 600
- Hyperfast recovery time, reduced Q_{rr} , and soft recovery
- 175 °C maximum operating junction temperature
- Low junction capacitance
- Specified for output and snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Meets JESD 201 class 1A whisker test
- Footprint compatible with TO-277A
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers specifically 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 as clamp, snubber and freewheeling diode in a flyback aux power supplies, bootstrap and desaturate for HV MOSFET and IGBT driver, high frequency rectifiers in a cuk and sepic circuit for LED lighting.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce power dissipation in the switching element.

MECHANICAL DATA

Case: SMPC HV

Molding compound meets UL 94 V-0 flammability rating, halogen-free, RoHS-compliant

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

Polarity: color band denotes cathode end

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	V_{RRM}		1200	V
Average rectified forward current	$I_{F(AV)}$	$T_{sp} = 147$ °C, DC conduction	2	A
Non-repetitive peak surge current	I_{FSM}	$T_J = 25$ °C, 8.3 ms sine pulse	21	
Operating junction and storage temperatures	T_J, T_{Stg}		-55 to +175	°C



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	$I_R = 100\text{ }\mu\text{A}$	1200	-	-	V
Forward voltage drop	V_F	$I_F = 2\text{ A}$	-	2.0	2.50	
		$I_F = 2\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	1.7	1.95	
Reverse leakage current	I_R	$V_R = V_R\text{ rated}$	-	-	3	μA
		$T_J = 125\text{ }^\circ\text{C}, V_R = V_R\text{ rated}$	-	-	30	
Junction capacitance	C_T	$V_R = 1200\text{ V}, 1\text{ MHz}$	-	4.75	-	pF
		$V_R = 4\text{ V}, 1\text{ MHz}$	-	9.0	-	

DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Reverse recovery time	t_{rr}	$I_F = 0.5\text{ A}, I_R = 1\text{ A}, I_{rr} = 0.25\text{ A}$	-	35	45	ns
		$T_J = 25\text{ }^\circ\text{C}$	-	105	-	
		$T_J = 125\text{ }^\circ\text{C}$	-	145	-	
Peak recovery current	I_{RRM}	$T_J = 25\text{ }^\circ\text{C}$	-	4	-	A
		$T_J = 125\text{ }^\circ\text{C}$	-	5	-	
Reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^\circ\text{C}$	-	165	-	nC
		$T_J = 125\text{ }^\circ\text{C}$	-	315	-	

THERMAL AND 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 mount	$R_{thJM}^{(1)}$	Device mounted on PCB with recommended pad size	-	15	18	$^\circ\text{C/W}$
Thermal resistance, junction to ambient	R_{thJA}	Device mounted on PCB with recommended pad size	-	100	-	$^\circ\text{C/W}$
Approximate weight			0.1			g
Marking device		Case style SMPC HV	FEX12			

Note

(1) Thermal resistance junction to mount follows JEDEC® 51-14 transient dual interface test method (TDIM)

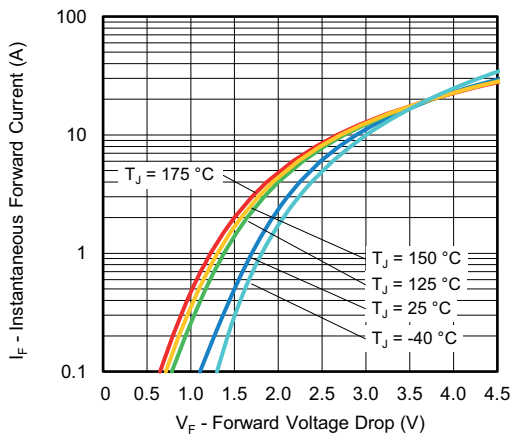


Fig. 1 - Typical Forward Voltage Drop Characteristics

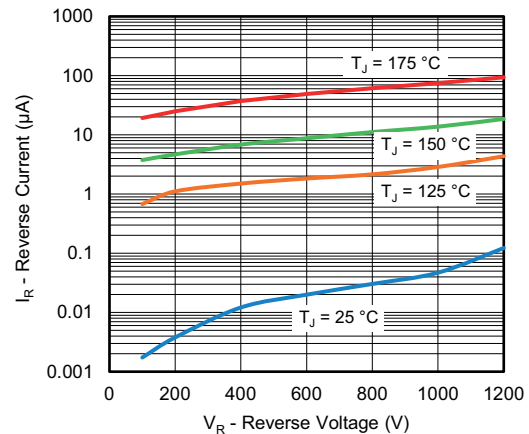


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

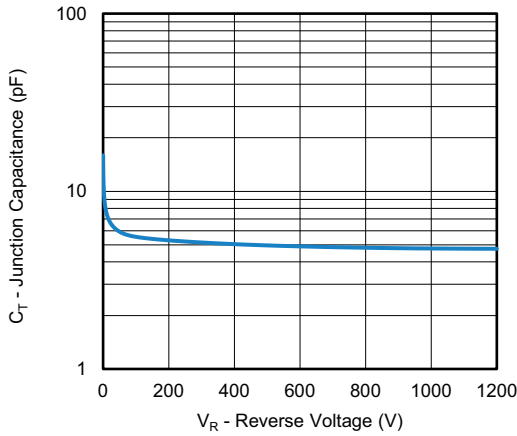


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

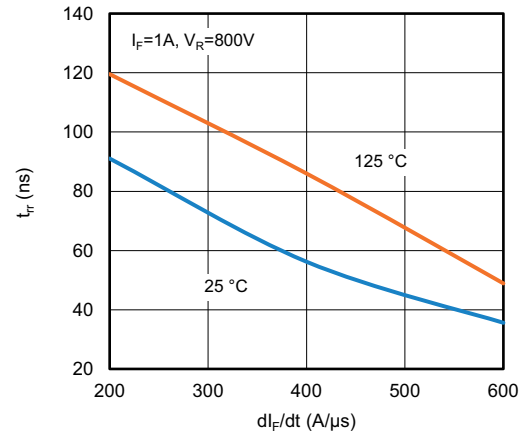


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

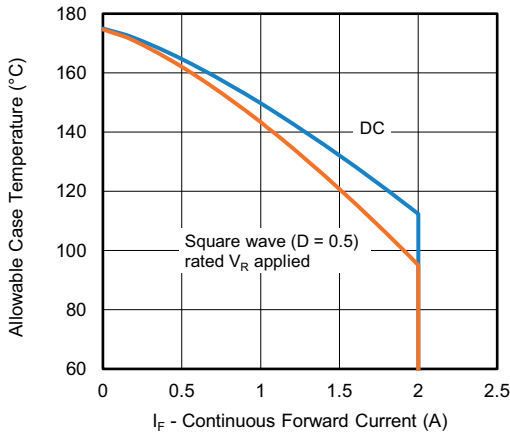


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

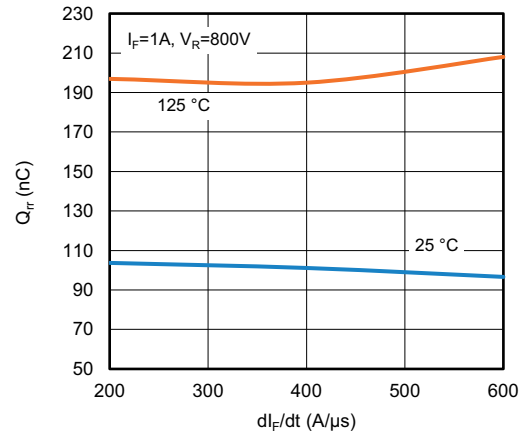


Fig. 7 - Typical Stored Charge vs. dI_F/dt

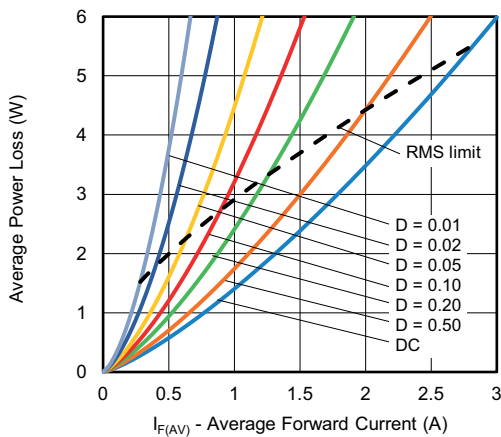


Fig. 5 - Forward Power Loss Characteristics

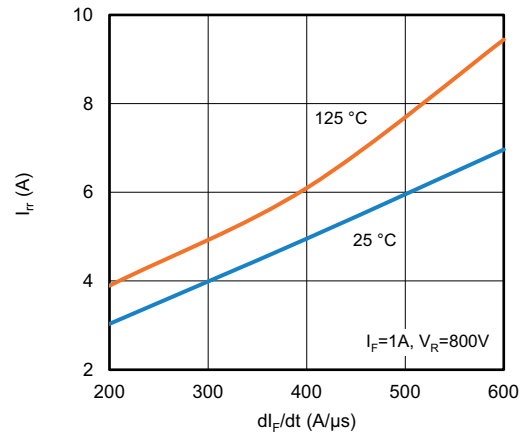


Fig. 8 - I_{rr} (A) vs. dI_F/dt

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. 5);
 Pd_{REV} = inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = rated V_R

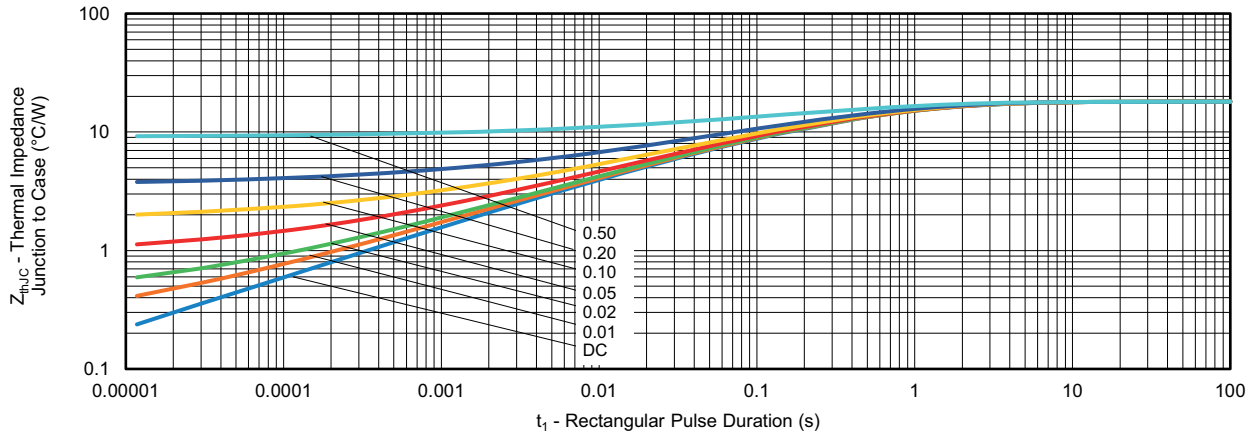


Fig. 9 - Transient Thermal Impedance, Junction to Case

ORDERING INFORMATION TABLE

Device code	VS-	E	7	S	X	02	12	-M3	V
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:
E = single diode
- 3** - 7 = FRED generation 7
- 4** - S = SMPC HV package
- 5** - Process type,
X = hyperfast recovery
- 6** - Current rating (02 = 2 A)
- 7** - Voltage code (12 = 1200 V)
- 8** - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free
- 9** - Package type: V = high voltage

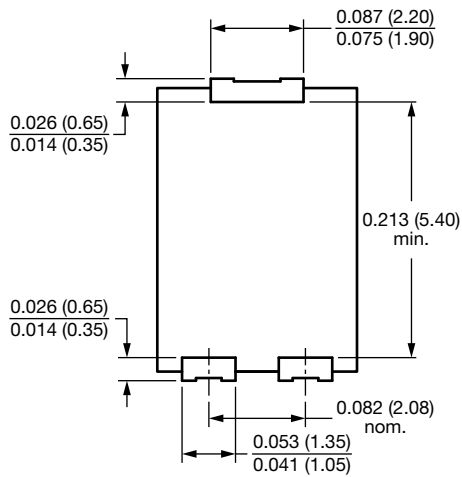
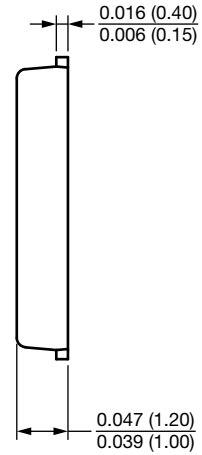
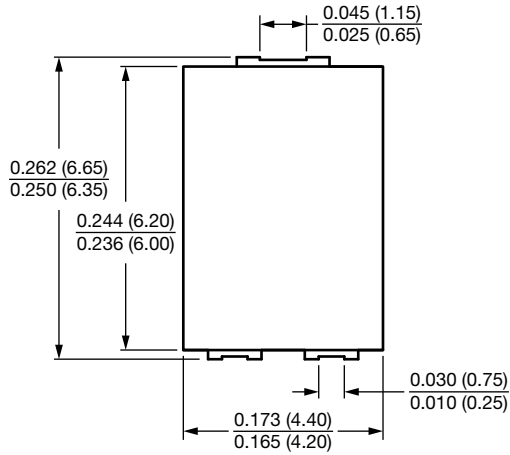
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER REEL	BASE QUANTITY	PACKAGING DESCRIPTION
VS-E7SX0212-M3V/I	6500	6500	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?97324
Part marking information	www.vishay.com/doc?95565
Packaging information	www.vishay.com/doc?98884
SPIICE model	www.vishay.com/doc?97528

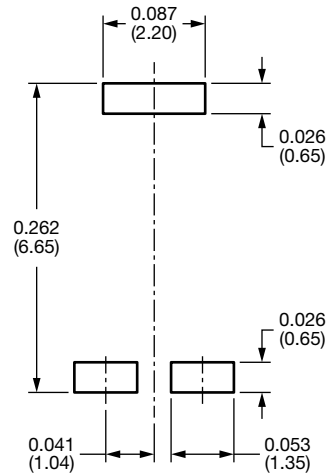


SMPC HV

DIMENSIONS in inches (millimeters)



Mounting Pad Layout





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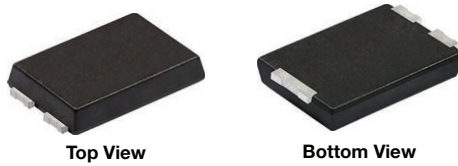
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Hyperfast Rectifier, 3 A FRED Pt[®]

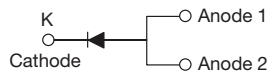
eSMP[®] Series



Top View

Bottom View

SMPC HV



LINKS TO ADDITIONAL RESOURCES


[3D Models](#)

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	3 A
V_R	1200 V
V_F at I_F	1.45 V
t_{rr}	50 ns
T_J max.	175 °C
Package	SMPC HV
Circuit configuration	Single

FEATURES

- Minimum creepage distance 5.4 mm
- Comparative tracking index: CTI \geq 600
- Hyperfast recovery time, reduced Q_{rr} , and soft recovery
- 175 °C maximum operating junction temperature
- Low junction capacitance
- Specified for output and snubber operation
- Low forward voltage drop
- Low leakage current
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Meets JESD 201 class 1A whisker test
- Footprint compatible with TO-277A
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
 COMPLIANT
 HALOGEN
FREE

DESCRIPTION / APPLICATIONS

State of the art hyperfast recovery rectifiers specifically 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 as clamp, snubber and freewheeling diode in a flyback aux power supplies, bootstrap and desaturate for HV MOSFET and IGBT driver, high frequency rectifiers in a cuk and sepic circuit for LED lighting.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce power dissipation in the switching element.

MECHANICAL DATA

Case: SMPC HV

Molding compound meets UL 94 V-0 flammability rating, halogen-free, RoHS-compliant

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

Polarity: color band denotes cathode end

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	V_{RRM}		1200	V
Average rectified forward current	$I_{F(AV)}$	$T_{sp} = 105$ °C, DC conduction	3	A
Non-repetitive peak surge current	I_{FSM}	$T_J = 25$ °C, 8.3 ms sine pulse	70	
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 μA	1200	-	-	V
Forward voltage drop	V _F	I _F = 3 A	-	1.85	2.30	
		I _F = 3 A, T _J = 125 °C	-	1.55	1.75	
Reverse leakage current	I _R	V _R = V _R rated	-	-	5	μA
		T _J = 125 °C, V _R = V _R rated	-	-	50	
Junction capacitance	C _T	V _R = 1200 V, 1 MHz	-	6.7	-	pF
		V _R = 4 V, 1 MHz	-	20	-	

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 = 0.5 A, I _R = 1 A, I _{rr} = 0.25 A	-	40	50	ns
		T _J = 25 °C	-	100	-	
		T _J = 125 °C	-	125	-	
Peak recovery current	I _{RRM}	T _J = 25 °C	-	5	-	A
		T _J = 125 °C	-	7.5	-	
Reverse recovery charge	Q _{rr}	T _J = 25 °C	-	240	-	nC
		T _J = 125 °C	-	510	-	

THERMAL AND MECHANICAL SPECIFICATIONS						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Maximum junction and storage temperature range	T _J , T _{Stg}		-55	-	175	°C
Thermal resistance, junction to mount	R _{thJM} ⁽¹⁾	Device mounted on PCB with recommended pad size	-	12	15	°C/W
Thermal resistance, junction to ambient	R _{thJA}	Device mounted on PCB with recommended pad size	-	95	-	°C/W
Approximate weight				0.1		g
Marking device		Case style SMPC HV			GEX12	

Note

(1) Thermal resistance junction to mount follows JEDEC® 51-14 transient dual interface test method (TDIM)

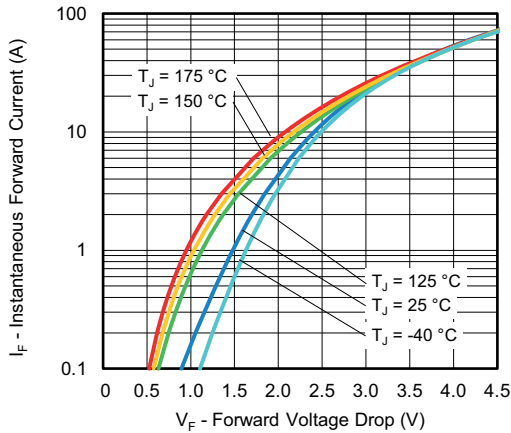


Fig. 1 - Typical Forward Voltage Drop Characteristics

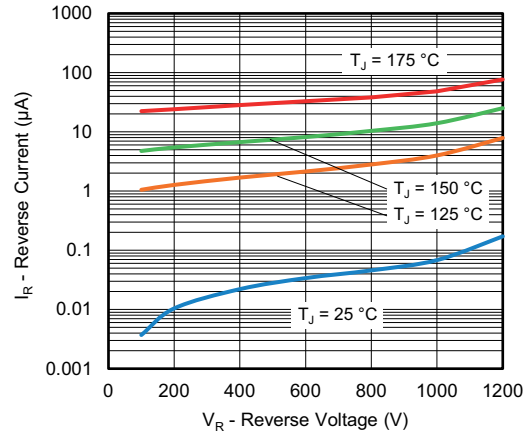


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

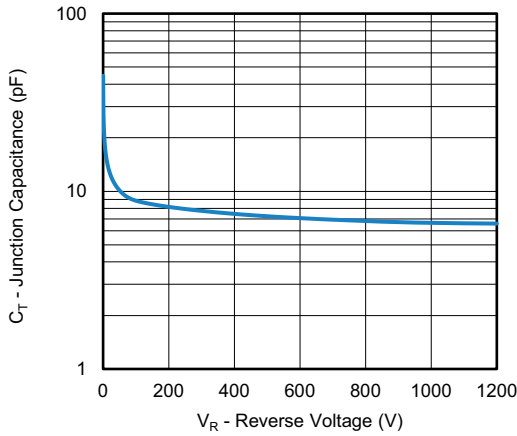


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

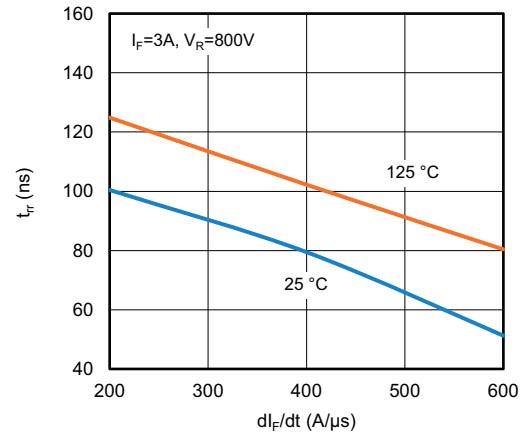


Fig. 6 - Typical Reverse Recovery Time vs. dI_F/dt

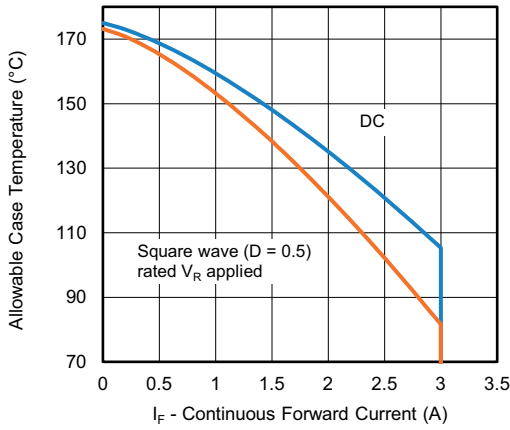


Fig. 4 - Maximum Allowable Case Temperature vs. Average Forward Current

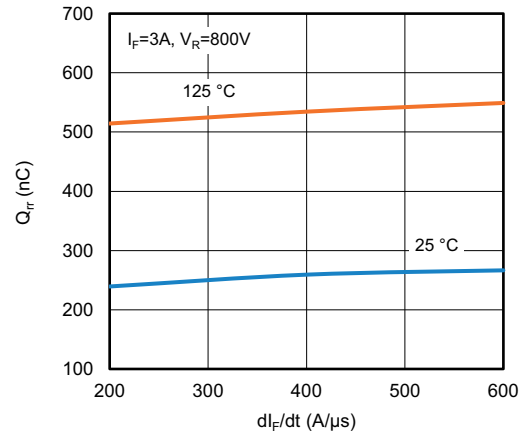


Fig. 7 - Typical Stored Charge vs. dI_F/dt

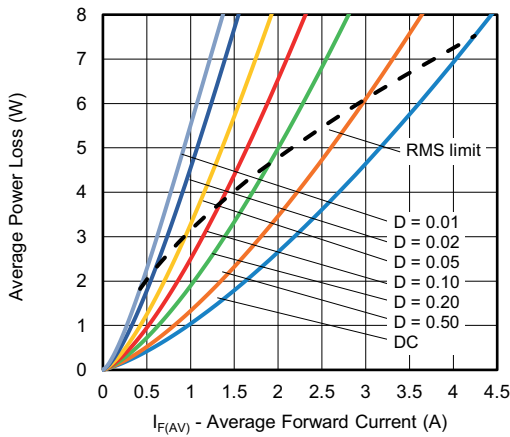


Fig. 5 - Forward Power Loss Characteristics

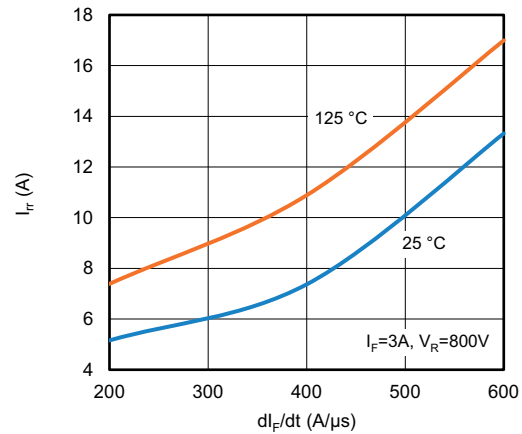


Fig. 8 - I_{rr} (A) vs. dI_F/dt

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. 5);
 Pd_{REV} = inverse power loss = $V_{R1} \times I_{rr} (1 - D)$; I_{rr} at V_{R1} = rated V_R

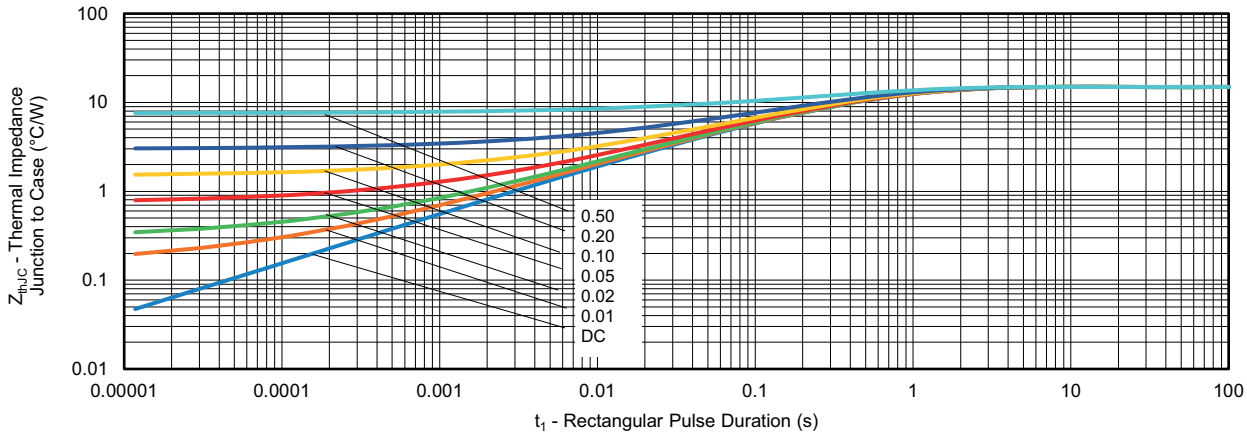


Fig. 9 - Transient Thermal Impedance, Junction to Case

ORDERING INFORMATION TABLE

Device code	VS-	E	7	S	X	03	12	-M3	V
	1	2	3	4	5	6	7	8	9

- 1** - Vishay Semiconductors product
- 2** - Circuit configuration:
E = single diode
- 3** - 7 = FRED generation 7
- 4** - S = SMPC HV package
- 5** - Process type,
X = hyperfast recovery
- 6** - Current rating (03 = 3 A)
- 7** - Voltage code (12 = 1200 V)
- 8** - -M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free
- 9** - Package type: V = high voltage

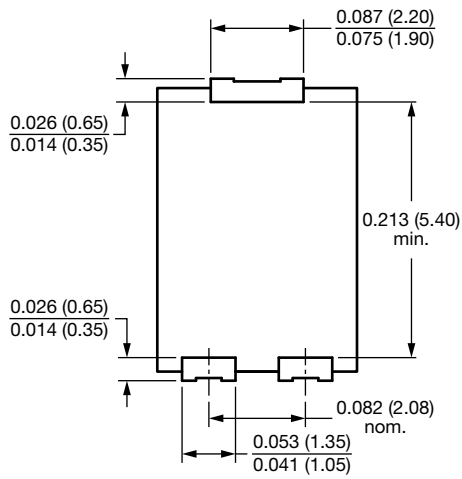
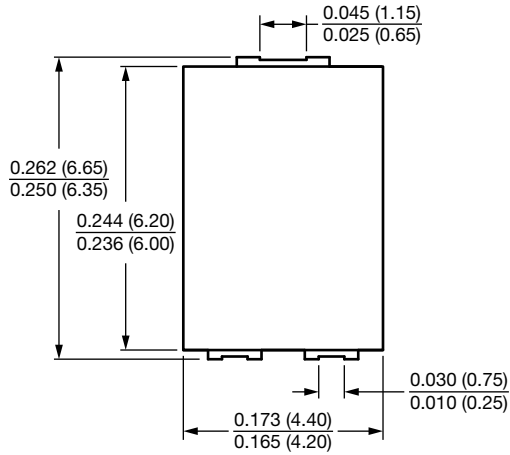
ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER REEL	BASE QUANTITY	PACKAGING DESCRIPTION
VS-E7SX0312-M3V/I	6500	6500	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?97324
Part marking information	www.vishay.com/doc?95565
Packaging information	www.vishay.com/doc?98884
SPIICE model	www.vishay.com/doc?97529

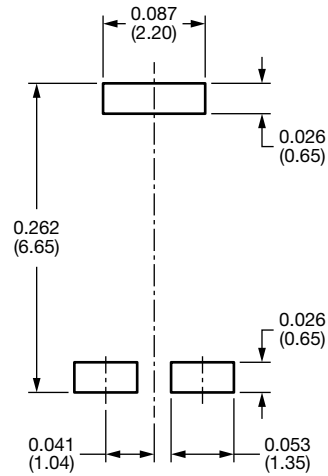


SMPC HV

DIMENSIONS in inches (millimeters)



Mounting Pad Layout





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