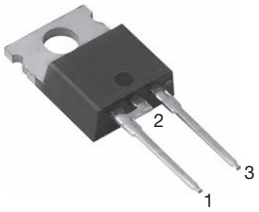
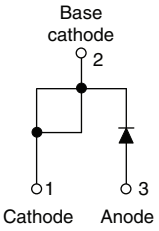
Fast Soft Recovery Rectifier Diode, 10 A



TO-220AC



FEATURES

- 150 °C max operating junction temperature
- Low forward voltage drop and short reverse recovery time
- Designed and qualified according to JEDEC-JESD47
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

These devices are intended for use in output rectification and freewheeling in inverters, choppers and converters as well as in input rectification where severe restrictions on conducted EMI should be met.

DESCRIPTION

The VS-10ETF1... fast soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.

The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

PRODUCT SUMMARY	
Package	TO-220AC
$I_{F(AV)}$	10 A
V_R	1000 V, 1200 V
V_F at I_F	1.33 V
I_{FSM}	140 A
t_{rr}	80 ns
T_J max.	150 °C
Diode variation	Single die
Snap factor	0.6

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
V_{RRM}		1000 to 1200	V
$I_{F(AV)}$	Sinusoidal waveform	10	A
I_{FSM}		140	
t_{rr}	1 A, 100 A/µs	80	ns
V_F	10 A, T_J = 25 °C	1.33	V
T_J		- 40 to 150	°C

VOLTAGE RATINGS			
PART NUMBER	V_{RRM}, MAXIMUM PEAK REVERSE VOLTAGE V	V_{RSM}, MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	I_{RRM} AT 150 °C mA
VS-10ETF10PbF, VS-10ETF10-M3	1000	1100	4
VS-10ETF12PbF, VS-10ETF12-M3	1200	1200	

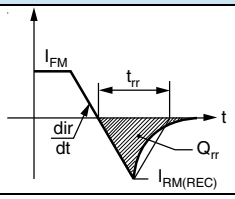
ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	T_C = 125 °C, 180° conduction half sine wave	10	A
Maximum peak one cycle non-repetitive surge current	I_{FSM}	10 ms sine pulse, rated V_{RRM} applied	115	
		10 ms sine pulse, no voltage reapplied	140	
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied	66	A^2s
		10 ms sine pulse, no voltage reapplied	94	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 to 10 ms, no voltage reapplied	940	$A^2\sqrt{s}$

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ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	V_{FM}	10 A, T_J = 25 °C		1.33	V
Forward slope resistance	r_t	T_J = 150 °C		22.9	mΩ
Threshold voltage	$V_{F(TO)}$			0.96	V
Maximum reverse leakage current	I_{RM}	T_J = 25 °C	V_R = Rated V_{RRM}	0.1	mA
		T_J = 150 °C		4	

RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Reverse recovery time	t_{rr}	I_F at 10 Apk 25 A/µs 25 °C	310	ns	
Reverse recovery current	I_{rr}		4.7	A	
Reverse recovery charge	Q_{rr}		1.05	µC	
Typical snap factor	S		0.6		

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range		T_J, T_{Stg}		- 40 to 150	°C
Maximum thermal resistance junction to case		R_{thJC}	DC operation	1.5	°C/W
Maximum thermal resistance junction to ambient		R_{thJA}		62	
Typical thermal resistance, case to heatsink		R_{thCS}	Mounting surface, smooth and greased	0.5	
Approximate weight				2	g
				0.07	oz.
Mounting torque	minimum			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device			Case style TO-220AC (JEDEC)	10ETF10 10ETF12	

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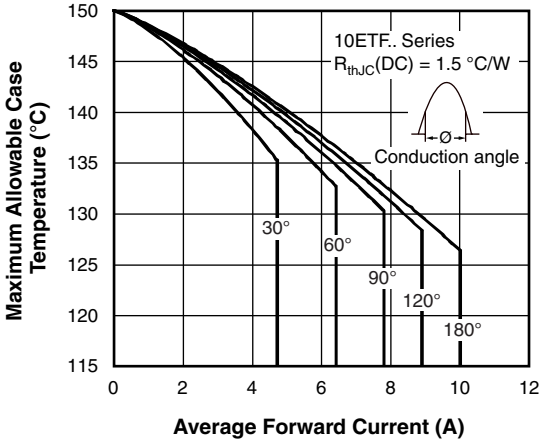


Fig. 1 - Current Rating Characteristics

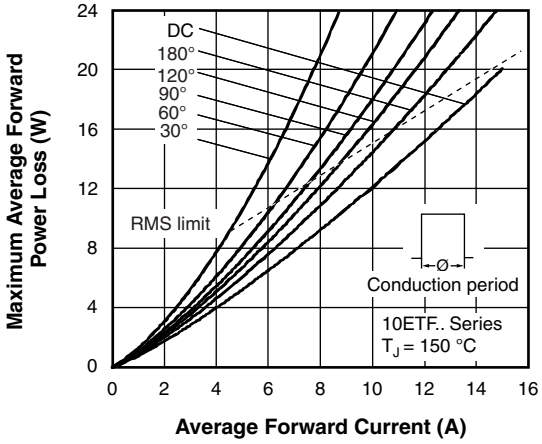


Fig. 4 - Forward Power Loss Characteristics

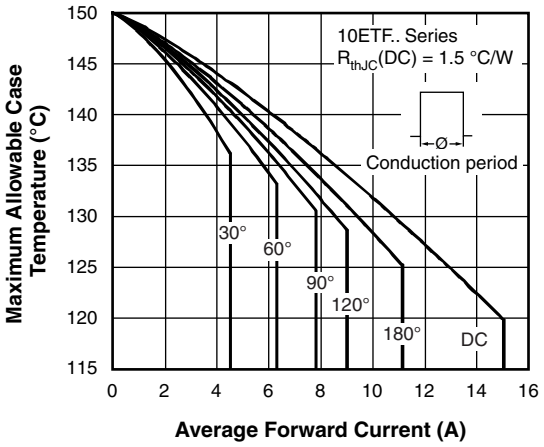


Fig. 2 - Current Rating Characteristics

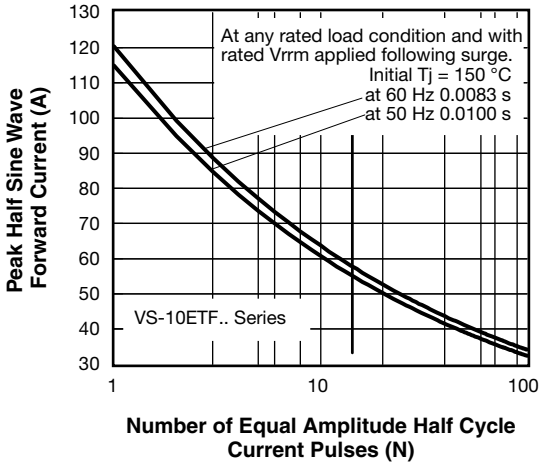


Fig. 5 - Maximum Non-Repetitive Surge Current

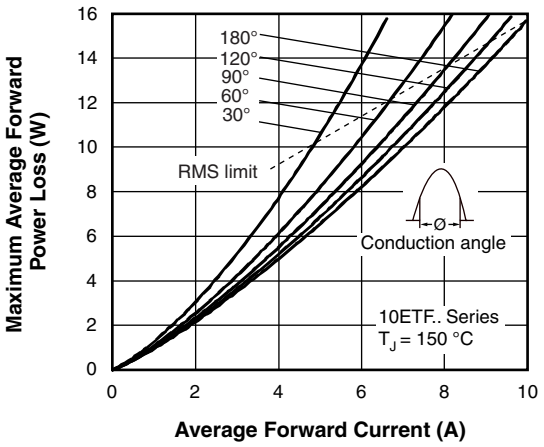


Fig. 3 - Forward Power Loss Characteristics

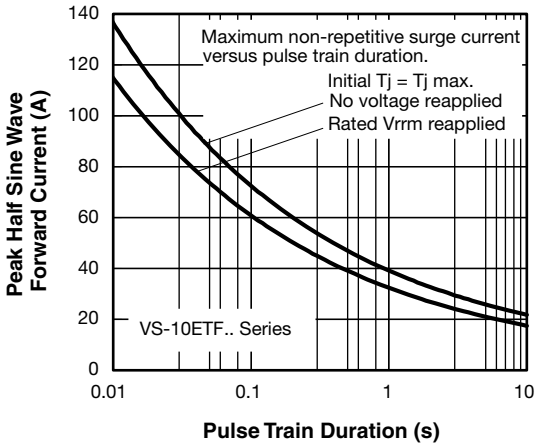


Fig. 6 - Maximum Non-Repetitive Surge Current

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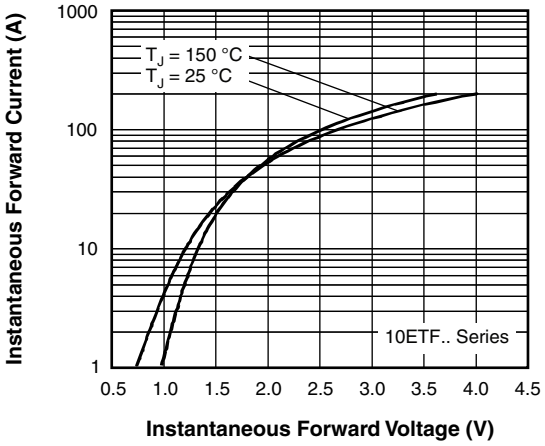


Fig. 7 - Forward Voltage Drop Characteristics

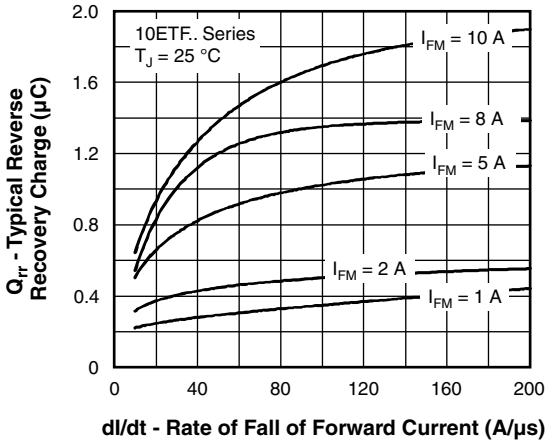


Fig. 10 - Recovery Charge Characteristics, T_J = 25 °C

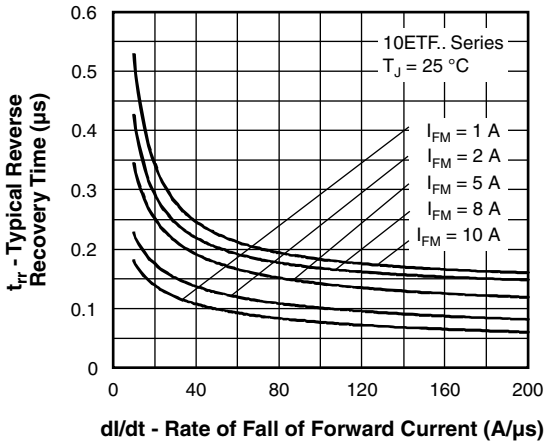


Fig. 8 - Recovery Time Characteristics, T_J = 25 °C

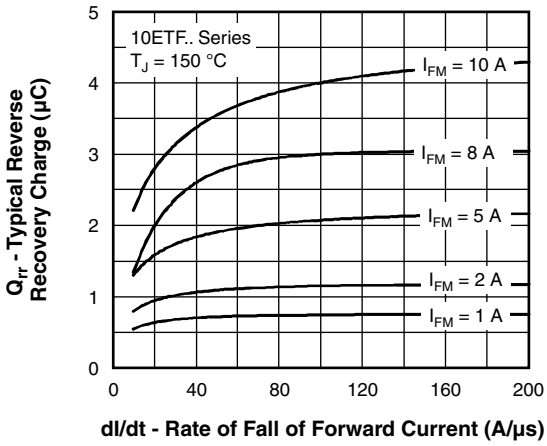


Fig. 11 - Recovery Charge Characteristics, T_J = 150 °C

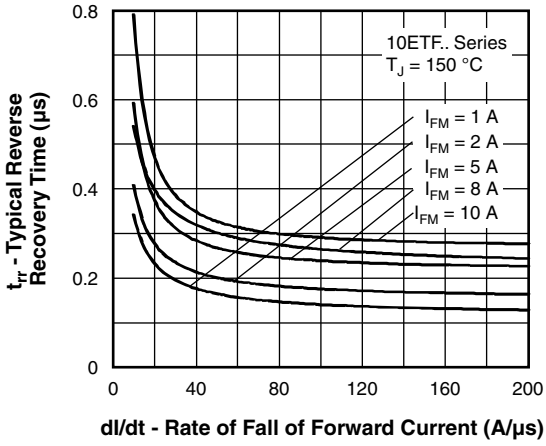


Fig. 9 - Recovery Time Characteristics, T_J = 150 °C

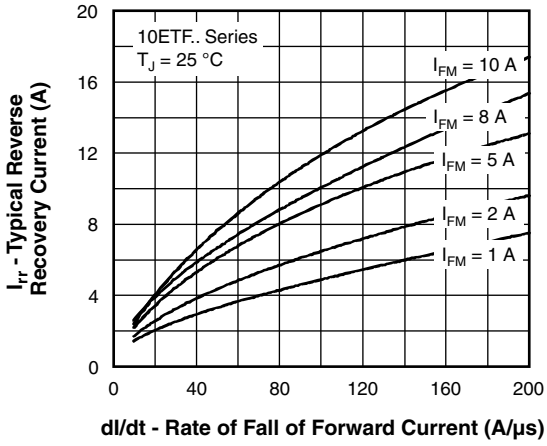


Fig. 12 - Recovery Current Characteristics, T_J = 25 °C

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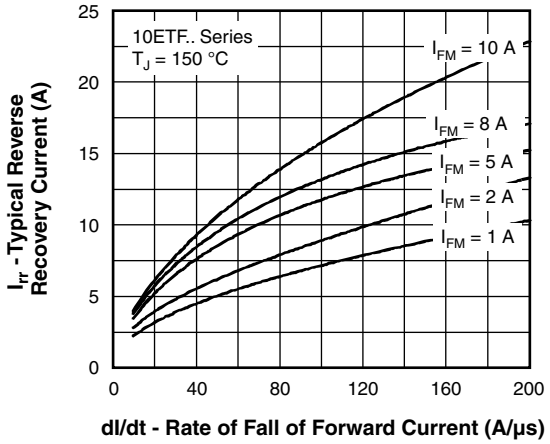


Fig. 13 - Recovery Current Characteristics, T_J = 150 °C

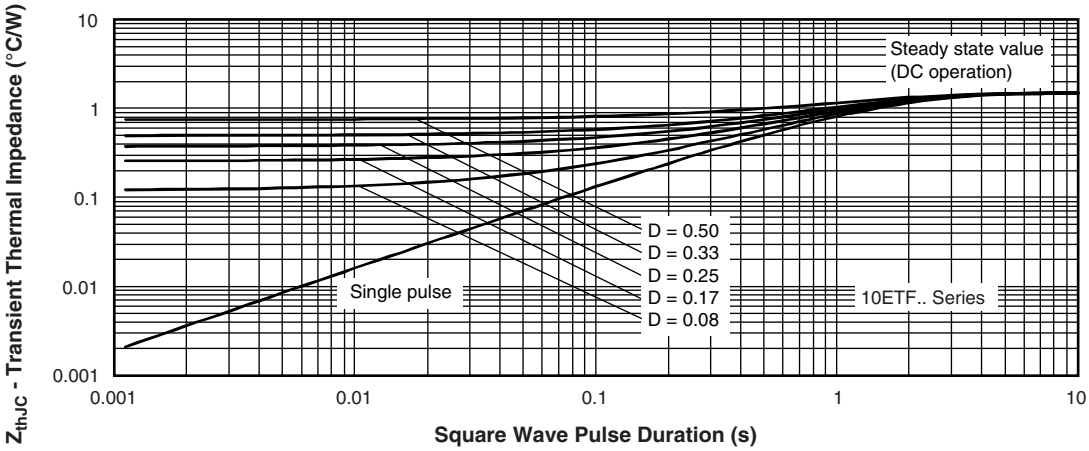
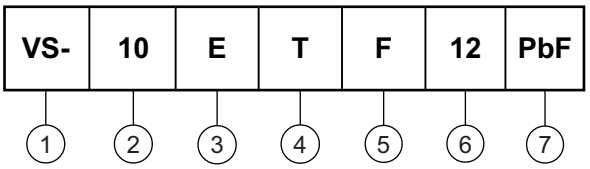


Fig. 14 - Thermal Impedance Z_{thJC} Characteristics

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ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Current rating (10 = 10 A)

3 - Circuit configuration:
E = Single diode

4 - Package:
T = TO-220AC

5 - Type of silicon:
F = Fast soft recovery rectifier

6 - Voltage code x 100 = V_{RRM}
10 = 1000 V
12 = 1200 V

7 - Environmental digit
- PbF = Lead (Pb)-free and RoHS compliant
- -M3 = Halogen-free, RoHS compliant, and terminations lead (Pb)-free

ORDERING INFORMATION (Example)

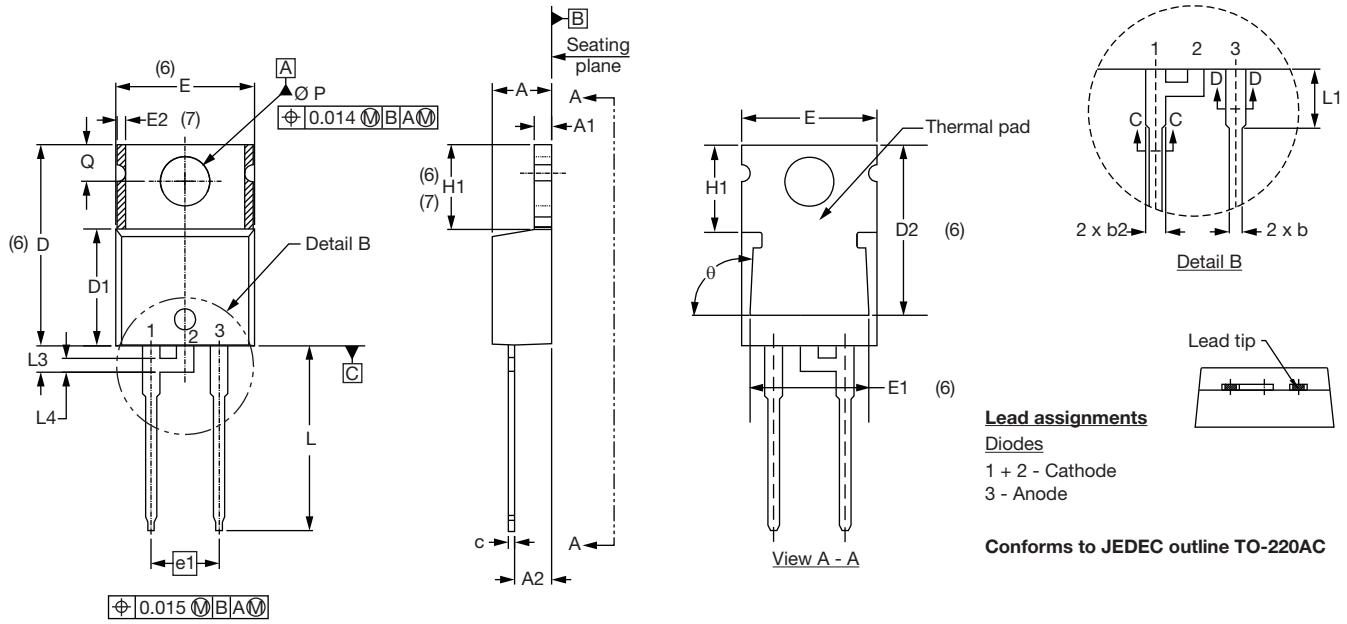
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-10ETF10PbF	50	1000	Antistatic plastic tube
VS-10ETF10-M3	50	1000	Antistatic plastic tube
VS-10ETF12PbF	50	1000	Antistatic plastic tube
VS-10ETF12-M3	50	1000	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions		www.vishay.com/doc?95221
Part marking information	TO-220AC PbF	www.vishay.com/doc?95224
	TO-220AC -M3	www.vishay.com/doc?95068

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TO-220AC

DIMENSIONS in millimeters and inches



Lead assignments
Diodes
1 + 2 - Cathode
3 - Anode

Conforms to JEDEC outline TO-220AC

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
L3	1.78	2.13	0.070	0.084	
L4	0.76	1.27	0.030	0.050	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	
θ	90° to 93°		90° to 93°		

Notes

(1) Dimensioning and tolerancing as per ASME Y14.5M-1994
(2) Lead dimension and finish uncontrolled in L1
(3) Dimension D, D1 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 outermost extremes of the plastic body
(4) Dimension b1, b3 and c1 apply to base metal only
(5) Controlling dimension: inches
(6) Thermal pad contour optional within dimensions E, H1, D2 and E1
(7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
(8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline

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Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.

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