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VDR Metal Oxide Varistors Ultra Surge High Operating Temperature 125 °C





LINKS TO ADDITIONAL RESOURCES



SPICE ign Tools Models

QUICK REFERENCE DATA						
PARAMETER	VALUE	UNIT				
Maximum continuous voltage in						
operating temperature range:						
RMS	115 to 680	V				
DC	150 to 895	V				
Maximum non-repetitive transient current I _{NRP} (8 x 20 µs)	1800 to 13 000	А				
Maximum energy (10/1000 μs)	19 to 720	J				
Detailed specification	Based on					
	IEC 61051-1					
	IEC 61051-2					
	IEC 61051-2-2					
Storage temperature	-40 to +150	°C				
Operating temperature	-40 to +125	°C				

ORDERING INFORMATION

The varistors are available in a number of packaging options:

- Bulk
- On tape on reel
- On tape in ammopack

The basic ordering code for each option is given in tables titled Varistors on Tape on Reel, Varistors on Tape in Ammopack, and Varistors in Bulk. To complete the catalog number and to determine the required operating parameters, see Electrical Data and Ordering Information table.

Note

Special lead-configuration as inside or outside crimped leads available upon request

AGENCY APPROVALS

- cUL certificate
- ULus certificate
- VDE certificate

Note

Agency approval documents, please see: www.vishay.com/ppg?29185&documents

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FEATURES

- Low β high purity zinc oxide disc
- · Halogen free high temperature resistant silicone coated
- Straight or kinked leads
- Ultra high current surge/size ratio capability up to 13 kA for US20 types HALOGEN
- Certified for operation up to 125 °C according to FREE UL 1449 edition 4, VDE/IEC 61051-1/2
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATION

Overvoltage and transient voltage protection

DESCRIPTION

The varistors consist of a disc of low-ß ceramic material with two solid copper leads (US20 types only) or copper clad steel wire. The wires have a matte tin plating. They are coated with UL 94 V-0 approved silicone lacquer, which provides electrical, mechanical and climatic protection.

MOUNTING

The varistors are suitable for hand-mounting (bulk) or automatic pick and place mounting (T and R). The parts can be connected by wave soldering and pin-in-paste reflow soldering under defined process conditions. Bending of the leads for different angle placement is not recommended.

Typical Soldering

235 °C, duration: 5 s (Pb-bearing)

245 °C, duration: 5 s (lead (Pb)-free)

Resistance to Soldering Heat

260 °C, duration: 10 s max.

MARKING

The varistors are marked with the following information:

- Maximum continuous RMS voltage with U suffix
- Series numbers
 - 572 for VDRUS07
 - 573 for VDRUS10
 - 575 for VDRUS14
 - 576 for VDRUS20
- Manufacture logo
- Date of manufacture (YYWW)
- Safety marks on VDRUS10-14-20 types

INFLAMMABILITY

The varistors are passive non-flammable. The encapsulation is made of flame resistant silicone in accordance with UL 94 V-0.





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For technical questions, contact: nlr@vishay.com

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ELECTRICAL DATA AND ORDERING INFORMATION											
MAXIMUN CONTINU VOLTAGE	OUS	VOLTAGE AT 1 mA ⁽³⁾	VOL [®] AT ST	IMUM TAGE FATED RENT	MAXIMUM ENERGY ⁽⁴⁾ (10 x 1000 µs)	MAXIMUM NON-REP. TRANSIENT CURRENT ⁽⁵⁾ I _{NRP} (8 x 20 µs)	NOMINAL DISCHARGE CURRENT ⁽⁷⁾	TYPICAL CAPACITANCE AT 1 kHz	T (MAX.)	E	CATALOG NUMBERS ⁽¹⁾
RMS ⁽²⁾ (V)	DC (V)	(V)	V (V)	 (A)	(J)	(A)	(kA)	(pF)	(mm)	(mm)	SAP ⁽⁶⁾
			300	10.0	19	1800	1	390	3.6	0.9 ± 0.3	VDRUS07M115xyE
115	150	100	300	25.0	47	4500	2	680	4.0	1.1 ± 0.3	VDRUS10T115xyE
115	150	180	300	50.0	65	8000	3	1320	4.0	1.1 ± 0.3	VDRUS14X115xyE
			300	100.0	152	13 000	5	2640	4.4	1.3 ± 0.3	VDRUS20Z115By
			340	10.0	21	1800	1	320	3.8	1.0 ± 0.3	VDRUS07M130xy
130	170	205	340	25.0	52	4500	2	580	4.3	1.2 ± 0.3	VDRUS10T130xyE
130	170	205	340	50.0	82	8000	3	1050	4.3	1.2 ± 0.3	VDRUS14X130xyE
			340	100.0	175	13 000	5	2100	4.8	1.4 ± 0.3	VDRUS20Z130By
			360	10.0	23	1800	1	290	3.9	1.0 ± 0.3	VDRUS07M140xyl
140	180	220	360	25.0	58	4500	2	540	4.3	1.2 ± 0.3	,
140	100	220	360	50.0	90	8000	3	950	4.3	1.2 ± 0.3	VDRUS14X140xyE
			360	100.0	185	13 000	5	1900	4.8	1.5 ± 0.3	VDRUS20Z140By
			395	10.0	25	1800	1	270	4.1		VDRUS07M150xy
150	200	240	395	25.0	64	4500	2	490	4.3	1.3 ± 0.3	
100	200	240	395	50.0	98	8000	3	850	4.3	1.3 ± 0.3	,
			395	100.0	198	13 000	5	1700	4.8	1.5 ± 0.3	VDRUS20Z150By
		275	455	10.0	28	1800	1	230	4.1	1.3 ± 0.3	VDRUS07M175xyl
175	225		455	25.0	67	4500	2	430	4.9	1.5 ± 0.3	VDRUS10T175xy
175	225		455	50.0	116	8000	3	750	4.9	1.5 ± 0.3	VDRUS14X175xy
			455	100.0	220	13 000	5	1500	4.9	1.7 ± 0.3	VDRUS20Z175Byl
			505	10.0	32	1800	1	210	4.3	1.4 ± 0.8	VDRUS07M195xyl
195	250	300	505	25.0	70	4500	2	380	5.1	1.6 ± 0.8	VDRUS10T195xyE
195	200		505	50.0	128	8000	3	690	5.1	1.6 ± 0.8	VDRUS14X195xy
			505	100.0	245	13 000	5	1350	5.1	1.9 ± 0.8	VDRUS20Z195By
			550	10.0	34	1800	1	190	4.4	1.6 ± 0.8	VDRUS07M210xy
010	075	000	550	25.0	72	4500	2	350	5.3	1.8 ± 0.8	VDRUS10T210xyl
210	275	330	550	50.0	140	8000	3	610	5.3	1.8 ± 0.8	VDRUS14X210xyl
			550	100.0	268	13 000	5	1250	5.3	2.0 ± 0.8	VDRUS20Z210By
			595	10.0	37	1800	1	170	4.6	1.7 ± 0.8	VDRUS07M230xy
000	000	000	595	25.0	76	4500	2	320	5.4	1.9 ± 0.8	VDRUS10T230xyl
230	300	360	595	50.0	158	8000	3	540	5.4	1.9 ± 0.8	VDRUS14X230xyl
			595	100.0	315	13 000	5	1100	5.4	2.2 ± 0.8	VDRUS20Z230By
			650	10.0	40	1800	1	160	4.8	1.9 ± 0.8	VDRUS07M250xy
			650	25.0	82	4500	2	300	5.5	2.1 ± 0.8	VDRUS10T250xy
250	320	390	650	50.0	170	8000	3	480	5.5		VDRUS14X250xy
			650	100.0	350	13 000	5	960	5.5		VDRUS20Z250By
			710	10.0	46	1800	1	140	4.9	2.0 ± 0.8	VDRUS07M275xyl
			710	25.0	93	4500	2	270	6.3		VDRUS10T275xyE
275 350	350	430	710	50.0	185	8000	3	440	5.3		VDRUS14X275xyE
			710	100.0	380	13 000	5	900	5.8		VDRUS20Z275By
	+		775	10.0	49	1800	1	130	5.1		VDRUS07M300xyl
			775	25.0	99	4500	2	240	6.5		VDRUS10T300xyE
300	385	470	775	50.0	205	8000	3	400	5.5		VDRUS14X300xyE
			775	100.0	405	13 000	5	810	5.9		VDRUS20Z300Byl
	+		842	100.0	54	1800	1	120	5.5		VDRUS07M320xyl
			842	25.0	107	4500	2	220	7.0	2.4 ± 0.0 2.6 ± 0.8	,
320	420	510	842	50.0	220	8000	3	370	6.0	2.0 ± 0.0 2.6 ± 0.8	
			842	100.0		13 000	5	750	6.3		VDRUS20Z320ByE

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ELECT	ELECTRICAL DATA AND ORDERING INFORMATION										
MAXIMUI CONTINU VOLTAGE	IOUS	VOLTAGE AT 1 mA ⁽³⁾	VOL ⁻ AT ST	IMUM TAGE TATED RENT	MAXIMUM ENERGY ⁽⁴⁾ (10 x 1000 μs)	MAXIMUM NON-REP. TRANSIENT CURRENT ⁽⁵⁾ I _{NRP} (8 x 20 µs)	NOMINAL DISCHARGE CURRENT ⁽⁷⁾	TYPICAL CAPACITANCE AT 1 kHz	T (MAX.)	E	CATALOG NUMBERS ⁽¹⁾
RMS ⁽²⁾ (V)	DC (V)	(V)	V (V)	I (A)	(J)	(A)	(kA)	(pF)	(mm)	(mm)	SAP ⁽⁶⁾
			920	10.0	55	1800	1	110	5.8	2.7 ± 0.8	VDRUS07M350xyE
050	400	500	920	25.0	113	4500	2	200	7.1	2.9 ± 0.8	VDRUS10T350xyE
350	460	560	920	50.0	240	8000	3	320	6.1	2.9 ± 0.8	VDRUS14X350xyE
			920	100.0	475	13 000	5	650	6.5	3.2 ± 0.8	VDRUS20Z350ByE
			1025	10.0	59	1800	1	95	6.0	3.0 ± 0.8	VDRUS07M385xyE
005	505	000	1025	25.0	125	4500	2	180	7.5	3.2 ± 0.8	VDRUS10T385xyE
385	505	620	1025	50.0	250	8000	3	280	6.5	3.2 ± 0.8	VDRUS14X385xyE
			1025	100.0	490	13 000	5	570	6.8	3.5 ± 0.8	VDRUS20Z385ByE
		680	1120	10.0	62	1800	1	85	6.3	3.2 ± 0.8	VDRUS07M420xyE
400	500		1120	25.0	128	4500	2	165	7.7	3.4 ± 0.8	VDRUS10T420xyE
420	560		1120	50.0	260	8000	3	250	6.7	3.4 ± 0.8	VDRUS14X420xyE
			1120	100.0	500	13 000	5	510	7.1	3.7 ± 0.8	
			1290	5.0	66	1800	1	30	6.6	3.6 ± 0.8	
100	045	750	1240	25.0	134	4500	2	150	8.0	3.8 ± 0.8	-
460	615	750	1240	50.0	270	8000	3	225	7.0	3.8 ± 0.8	VDRUS14X460xyE
			1240	100.0	525	13 000	5	450	7.5		VDRUS20Z460ByE
			1290	10.0	68	1800	1	65	6.8	3.7 ± 0.8	VDRUS07M485xyE
		780	1290	25.0	139	4500	2	145	8.3	3.9 ± 0.8	VDRUS10T485xyE
485	640		1290	50.0	274	8000	3	220	7.3	3.9 ± 0.8	VDRUS14X485xyE
			1290	100.0	530	13 000	5	400	7.6	4.2 ± 0.8	VDRUS20Z485ByE
			1355	10.0	71	1800	1	62	7.0	3.9 ± 0.8	VDRUS07M510xyE
=			1355	25.0	146	4500	2	135	8.5	4.1 ± 0.8	
510	670	820	1355	50.0	280	8000	3	220	7.5	4.1 ± 0.8	
			1355	100.0	545	13 000	5	400	7.9		VDRUS20Z510ByE
			1500	25.0	152	4500	2	120	8.9	4.5 ± 0.8	
550	745	910	1500	50.0	295	8000	3	180	7.9	4.5 ± 0.8	
			1500	100.0	595	13 000	5	320	8.3	4.9 ± 0.8	
	1		1650	25.0	170	4500	2	105	9.4		VDRUS10T625ByE
625	825	1000	1650	50.0	335	8000	3	165	8.4	5.0 ± 0.8	,
			1650	100.0	650	13 000	5	280	8.8	5.3 ± 0.8	
	1		1815	25.0	180	4500	2	80	10.8	5.4 ± 0.8	
680	895	1100	1815	50.0	360	8000	3	150	9.8		VDRUS14X680ByE
			1815	100.0	720	13 000	5	250	10.2		VDRUS20Z680ByE

Notes

(1) The products are certified according to cULus (E332800), and VDE (40051495). See Agency Approval section on page1 for certificate download section

(2) The sinusoidal voltage is assumed as the normal operating condition. If a non-sinusoidal voltage is present, type selection should be based on multiplying the peak voltage by a factor of 0.707

(3)The voltage measured at 1 mA meets the requirements of IEC 61051.

The tolerance on the voltage at 1 mA is \pm 10 %

(4) High energy surges are generally of longer duration. The maximum energy for one pulse of 10 x 1000 µs is given as a reference for longer duration pulses. This pulse can be characterized by peak current (I_p) and pulse width t₂ (virtual time of half I_p value). If Vp is the clamping voltage corresponding to Ip, the energy absorbed in the varistor is determined by the formula:

E = K x V_p x I_p x I_p x t₂ where K is dependent on the value of t₂ (see Peak Current as a Function of Pulse Width drawing)

A current wave of 8 x 20 µs is used as a standard for pulse current and clamping voltage ratings. The maximum non-repetitive transient current is given for one pulse applied during the life of the component

(6) For composition of the SAP part number: т

Replace "x" by B for bulk type for tape and reel Replace "y" by S Κ

A for tape and ammopack

for straight leads for kinked leads (bulk only)

- for kinked leads with H0 = 16 mm (tape and reel/ammo) L
- for kinked leads with H0 = 18.25 mm (tape and reel/ammo) Μ
- (7) All varistors are UL1449 edition 4 recognized as SPD type 5 (component level) for operating temperatures up to 125 °C. The varistors may be used in other SPD types as 2, 3, or 4 depending on the indicated nominal discharge current ratings. The final acceptance of the component is dependent upon its installation and use in complete equipment submitted to Underwriters Laboratories Inc.

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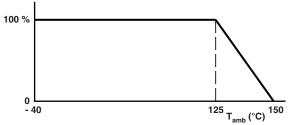


ELECTRICAL CHARACTERISTICS

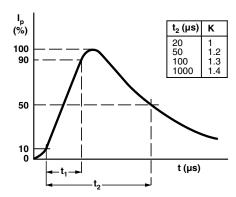
PARAMETER	VALUE	UNIT	
Maximum continuous voltage:			
RMS	115 to 680	V	
DC	150 to 895	V	
Maximum non-repetitive transient current (I _{NRP}) (8 x 20 µs)			
VDRUS07	1800	A	
VDRUS10	4500	A	
VDRUS14	8000	А	
VDRUS20	13 000	A	
Thermal resistance:			
VDRUS07	≈ 70	K/W	
VDRUS10	≈ 60	K/W	
VDRUS14	≈ 50	K/W	
VDRUS20	≈ 40	K/W	
Maximum dissipation:			
VDRUS07	250	mW	
VDRUS10	400	mW	
VDRUS14	600	mW	
VDRUS20	1000	mW	
Temperature coefficient of voltage at 1 mA maximum	± 0.05	%/K	
Voltage proof between interconnected leads and case	1000	V	
Storage temperature	-40 to +150	°C	
Operating temperature	-40 to +125	°C	

DERATING CURVE





PEAK CURRENT AS A FUNCTION OF PULSE WIDTH



COMP	COMPONENT DIMENSIONS (BULK TYPE) in millimeters AND CATALOG NUMBERS											
DN	MAX. A MAX.		IAX.	A ₀ MAX.			T ⁽¹⁾	- (1)	<i>(</i>)		CATALOG	MARKING
$V \le 320 V$	V > 320 V	$V \le 300 V$	V > 300 V	$V \le 320 V$	V > 320 V	L MIN. MAX	E ⁽¹⁾	d	F	NUMBER	NUMBER	
9	.0	11	.0	13	3.0	24.0	7.0	0.7 to 3.9	0.6 ± 0.05	5 ± 1.0	VDRUS07	572
12.0	12.5	14.5	15.5	16.5	17.0	24.0	10.8	0.9 to 5.4	0.8 ± 0.05	7.5 ± 1.0	VDRUS10	573
16.0	16.5	19	9.0	21.0	21.5	24.0	9.8	0.9 to 5.4	0.8 ± 0.05	7.5 ± 1.0	VDRUS14	575
22.5	23.0	25	5.5	27.5	28.0	24.0	10.2	1.1 to 5.8	1.0 ± 0.05	10 ± 1.0	VDRUS20	576

Note

 $^{(1)}$ T_{max.} and E values per size and voltage level can be found back in the Electrical Data table

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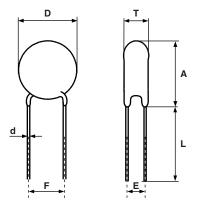
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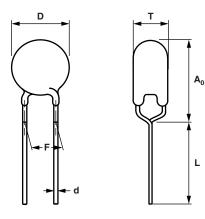
VARISTORS IN BULK						
ТҮРЕ	VDRUS07 Ø 7 mm 115 V to 510 V	VDRUS10 Ø 10 mm 115 V to 680 V	VDRUS14 Ø 14 mm 115 V to 680 V	VDRUS20 Ø 20 mm 115 V to 680 V		
Straight leads; see outline of components with straight leads drawing	BSE	BSE	BSE	BSE		
Kinked leads; see outline of components with kinked leads drawing	BKE	BKE	BKE	BKE		
Packaging quantities						
115 V to 300 V	250	200	100	50		
320 V to max. V	250	100	100	50		

DIMENSIONS in millimeters: see Component Dimensions and Electrical Data table

OUTLINE of Component with Straight Leads

OUTLINE of Component with Kinked Leads



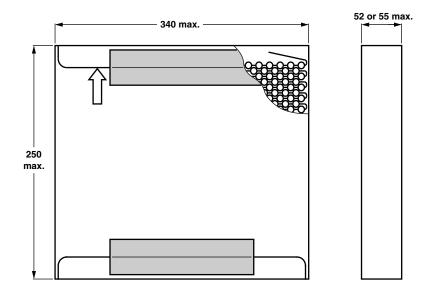






VARISTORS ON TAPE IN AMMOPACK						
ТҮРЕ	VDRUS07 Ø 7 mm 115 V to 510 V	VDRUS10 Ø 10 mm 115 V to 550 V	VDRUS14 Ø 14 mm 115 V to 550 V			
Straight leads						
H = 18 mm	-	-	ASE			
H = 20 mm	ASE	ASE	-			
See drawing: taped version with straight leads						
Kinked leads						
H ₀ = 18.25 mm	AME	AME	AME			
H ₀ = 16 mm	ALE	ALE	ALE			
See drawing: taped version with kinked leads						
Packaging quantities						
115 V to 210 V	1500	500	500			
230 V to 510 V	1000	500	500			
550 V	-	400	400			

DIMENSIONS OF AMMOPACK in millimeters

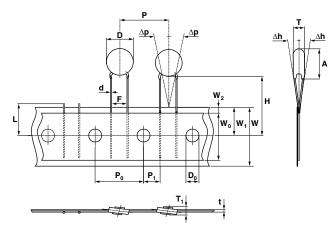




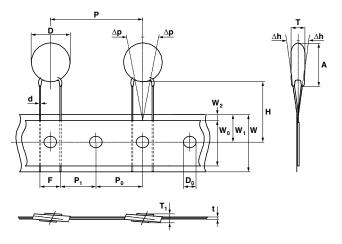
VARISTORS ON TAPE AND REEL						
ТҮРЕ	VDRUS07 Ø 7 mm 115 V to 510 V	VDRUS10 Ø 10 mm 115 V to 550 V	VDRUS14 Ø 14 mm 115 V to 550 V			
Straight leads						
H = 18 mm	-	-	TSE			
H = 20 mm	TSE	TSE	-			
See drawing: taped version with straight leads						
Kinked leads						
H ₀ = 18.25 mm	TME	TME	TME			
H ₀ = 16 mm	TLE	TLE	TLE			
See drawing: taped version with kinked leads						
Packaging quantities			·			
115 V to 250 V	1500	1000	750			
275 V to 300 V	1500	500	750			
320 V to max. V	1000	500	500			

PACKAGING

TAPED VERSION WITH STRAIGHT LEADS (only for VDRUS07)



TAPED VERSION WITH STRAIGHT LEADS (only for VDRUS10 and VDRUS14)



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7 For technical questions, contact: <u>nlr@vishay.com</u> Document Number: 29185

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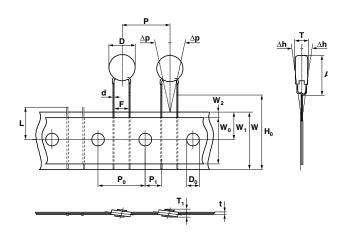


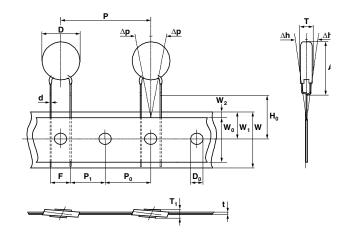
TAPED VERSION WITH KINKED LEADS

(only for VDRUS07)

TAPED VERSION WITH KINKED LEADS

(only for VDRUS10 and VDRUS14)





TAPING DATA (based on IEC 60286-2) DIMENSIONS/TOLERANCE									
SYMBOL	PARAM	IETER	VDRUS07						
		$V \le 300 V$		14.5	VDRUS14				
A max.	Max. mounting height	V > 300 V	11.0	15.5	19.0				
•		$V \le 320 V$	40.0	16.5	21.0				
A_0 max.	Max. mounting height	V > 320 V	13.0	17.0	21.5				
	Max bady diamatar	$V \le 320 V$	0.0	12.0	16.0				
D max.	Max. body diameter	V > 320 V	9.0	12.5	16.5				
d	Lead wire	diameter	0.6 ± 0.05	0.8 ± 0.05					
F	Lead to lead	distance (1)	5.0 + 0.8/- 0.2	7.5 ± 0.8					
н	Distance componen	t to tape center ⁽²⁾	20.0 + 2.0/- 0.0	18.0 + 2.0/- 0.0					
H ₀	Lead wire cl	inch height	16.0 or 18.25 ± 0.5						
Ρ	Pitch of compo	nents on tape	12.7 ± 1.0	25.4 ± 1.0					
Т	Total thi	ckness	See Electrical Data table						

Notes

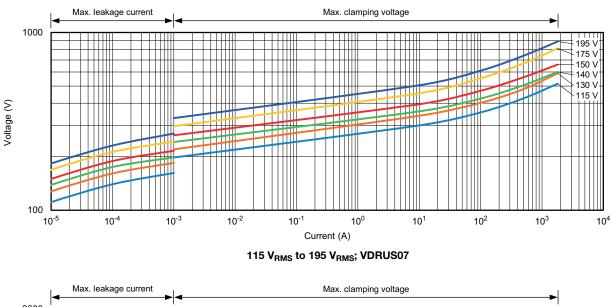
⁽¹⁾ Guaranteed between component and tape

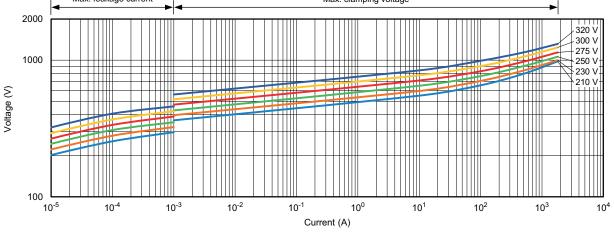
⁽²⁾ For VDRUS14X510xSE and VDRUS14X550xSE: $H = 20 \text{ mm} \pm 1 \text{ mm}$

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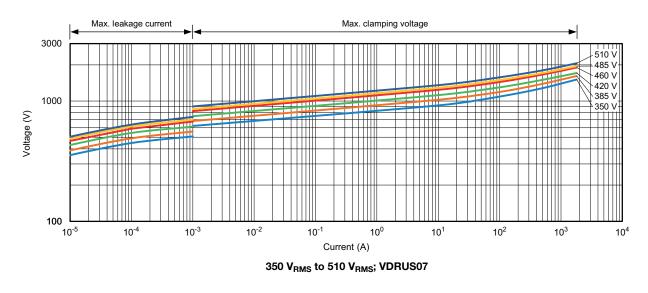


V/I CHARACTERISTICS





210 V_{RMS} to 300 $V_{\text{RMS}};$ VDRUS07



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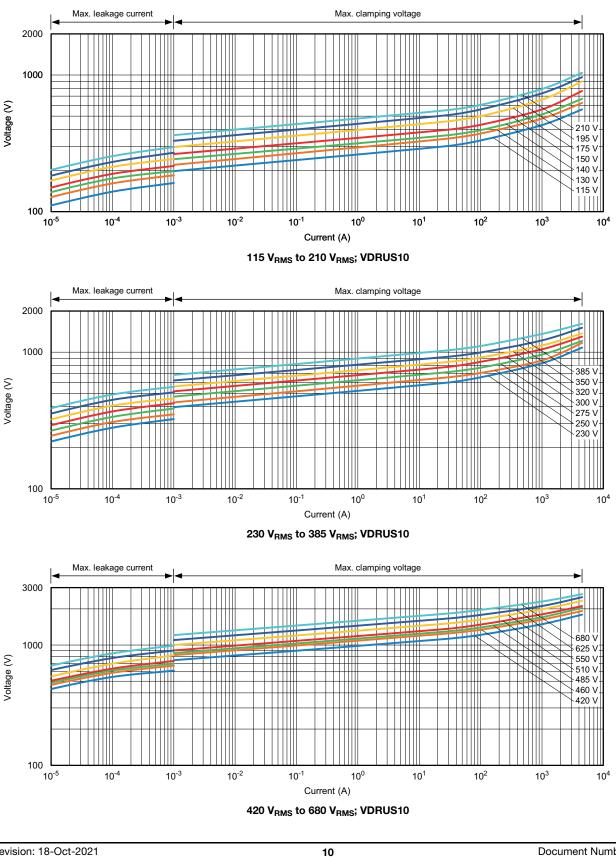
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V/I CHARACTERISTICS



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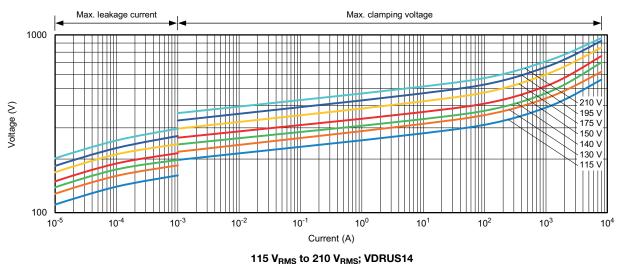
For technical questions, contact: nlr@vishay.com

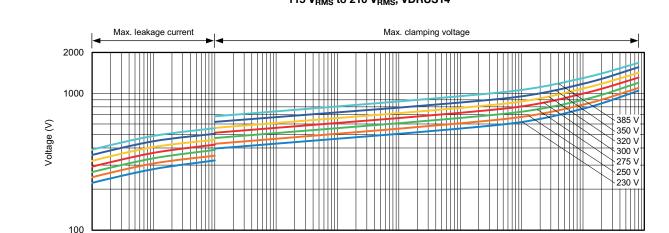
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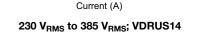


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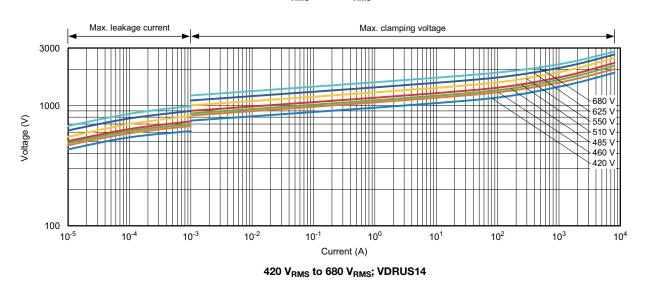


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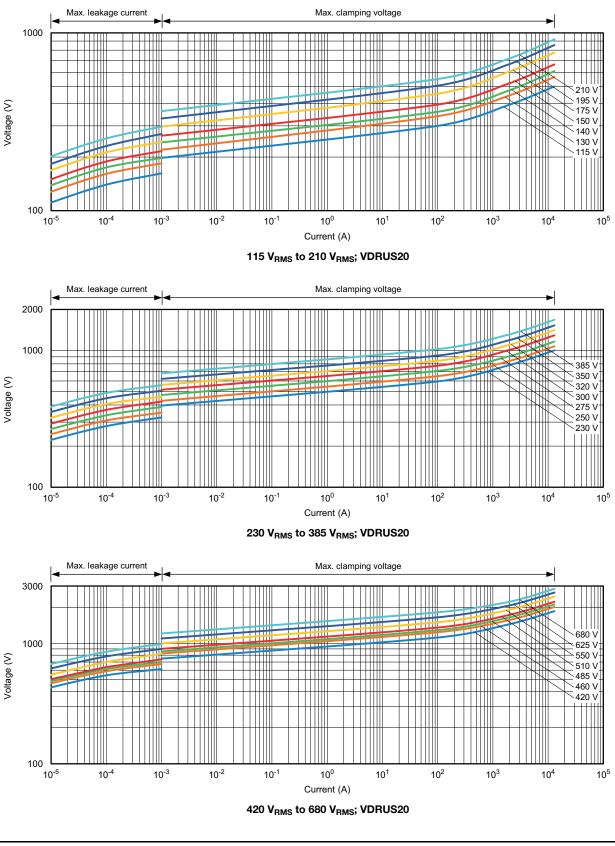
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V/I CHARACTERISTICS

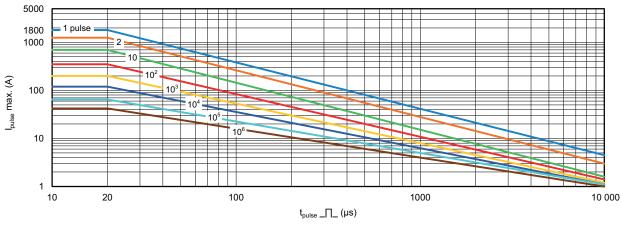


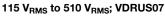
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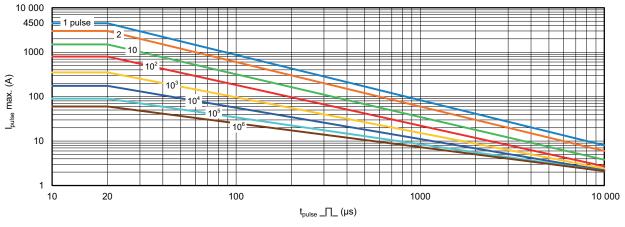
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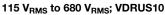


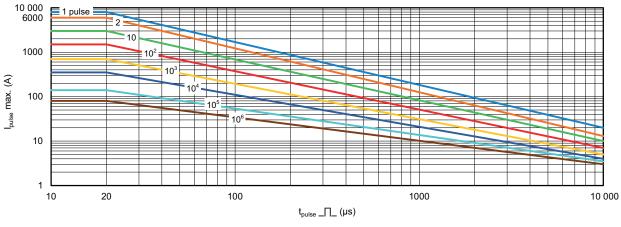
PULSE DERATING









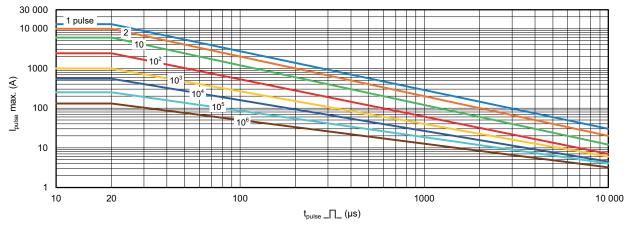


115 V_{RMS} to 680 V_{RMS} ; VDRUS14

Document Number: 29185



PULSE DERATING



115 V_{RMS} to 680 V_{RMS}; VDRUS20



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