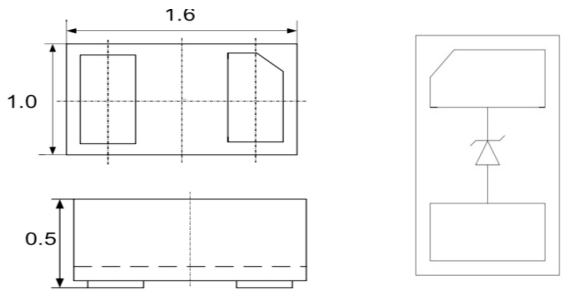
Description

The WPEXX91WP6 is an uni-directional TVS diode, utilizing leading monolithic silicon technology to provide fast re-sponse time and low ESD clamping voltage, making this device an ideal solution for protecting voltage sensitive data and power line. The WPEXX91WP6 complies with the IEC 61000-4-2 (ESD) standard with ±30kV air and ±30kV contact discharge. It is assembled into an ultra-small 1.6x1.0x0.5mm lead-free DFN package. The small size and high ESD surge protection make WPEXX91WP6 an ideal choice to protect cell phone, digital cameras, audio play-ers and many other portable applications.

Features

- Small package: 1.6x1.0x0.5mm
- Protects one data or power line
- Working Voltage: 3.3V, 5V, 7V, 12V, 15V, 18V, 24V, 36V
- High peak pulse current capability
- 2-pin leadless package
- Complies with following standards:
  - – IEC 61000-4-2 (ESD) immunity test
    - Air discharge: ±30kV
    - Contact discharge: ±30kV
  - – IEC61000-4-5 (Lightning) 20A - 90A (8/20μs)
- RoHS Compliant

Dimensions & Symbol（Unit: mm Max）



Mechanical Characteristics

- Package: DFN1610-2
- Lead Finish: Matte Tin
- Case Material: “Green” Molding Compound.
- Moisture Sensitivity: Level 3 per J-STD-020
- Terminal Connections: See Diagram Below
- Marking Information: See Below

Applications

- Mobile Phones and Accessories
- Battery Protection
- USB VBus
- Power Line Protection
- Hand Held Portable Applications

Marking Information

Bar denotes cathode

Details marking code reference customer approval list

Ordering Information

Part Number	Packaging	Reel Size
WPE3391WP6	3000/Tape & Reel	7 inch
WPE0591WP6	3000/Tape & Reel	7 inch
WPE0791WP6	3000/Tape & Reel	7 inch
WPE0991WP6	3000/Tape & Reel	7 inch
WPE1291WP6	3000/Tape & Reel	7 inch
WPE1591WP6	3000/Tape & Reel	7 inch
WPE1891WP6	3000/Tape & Reel	7 inch
WPE2491WP6	3000/Tape & Reel	7 inch
WPE3691WP6	3000/Tape & Reel	7 inch

Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Peak Pulse Power (8/20μs)	Ppk	1875	W
ESD per IEC 61000−4−2 (Air) ESD per IEC 61000−4−2 (Contact)	V_{ESD}	±30 ±30	kV
Operating Temperature Range	T_J	−55 to +125	°C
Storage Temperature Range	Tstg	−55 to +150	°C

Electrical Characteristics (T_A=25°C unless otherwise specified)

WPE3391WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			3.3	V	
Breakdown Voltage	V_{BR}	3.5			V	I_T = 1mA
Reverse Leakage Current	I_R			1.0	μA	V_{RWM} = 3.3V
Forward Voltage	V_F		1.0	1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			90	A	tp = 8/20μs
Clamping Voltage	V_C			5.5	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			12.5	V	I_{PP} = 150A (8 x 20μs pulse)
Junction Capacitance	C_J			750	pF	VR = 0V, f = 1MHz

WPE0591WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			5	V	
Breakdown Voltage	V_{BR}	6			V	I_T = 1mA
Reverse Leakage Current	I_R			1.0	μA	V_{RWM} = 5V
Forward Voltage	V_F		1.0	1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			125	A	tp = 8/20μs
Clamping Voltage	V_C			9	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			15	V	I_{PP} = 125A (8 x 20μs pulse)
Junction Capacitance	C_J			650	pF	VR = 0V, f = 1MHz

WPE0791WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			7	V	
Breakdown Voltage	V_{BR}	7.5			V	I_T = 1mA
Reverse Leakage Current	I_R			0.5	μA	V_{RWM} = 7V
Forward Voltage	V_F		1.0	1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			115	A	tp = 8/20μs
Clamping Voltage	V_C			12	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			16.5	V	I_{PP} = 115A (8 x 20μs pulse)
Junction Capacitance	C_J			550	pF	VR = 0V, f = 1MHz

WPE0991WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			9	V	
Breakdown Voltage	V_{BR}	10			V	I_T = 1mA
Reverse Leakage Current	I_R			0.5	μA	V_{RWM} = 9V
Forward Voltage	V_F		1.0	1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			90	A	tp = 8/20μs
Clamping Voltage	V_C			15	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			23	V	I_{PP} = 90A (8 x 20μs pulse)
Junction Capacitance	C_J			525	pF	VR = 0V, f = 1MHz

WPE1291WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			12	V	
Breakdown Voltage	V_{BR}	12.6			V	I_T = 1mA
Reverse Leakage Current	I_R			0.1	μA	V_{RWM} = 12V
Forward Voltage	V_F			1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			75	A	tp = 8/20μs
Clamping Voltage	V_C			18	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			25	V	I_{PP} = 75A (8 x 20μs pulse)
Junction Capacitance	C_J			500	pF	VR = 0V, f = 1MHz

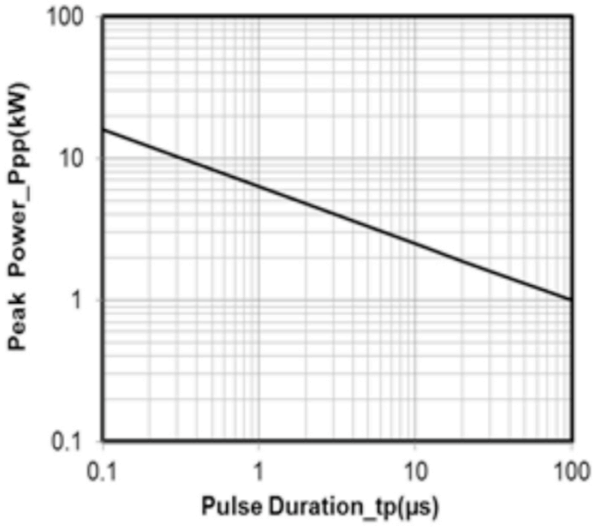
WPE1591WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			15	V	
Breakdown Voltage	V_{BR}	16.5			V	I_T = 1mA
Reverse Leakage Current	I_R			0.1	μA	V_{RWM} = 15V
Forward Voltage	V_F			1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			60	A	tp = 8/20μs
Clamping Voltage	V_C			22	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			31.25	V	I_{PP} = 60A (8 x 20μs pulse)
Junction Capacitance	C_J			450	pF	VR = 0V, f = 1MHz

WPE1891WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			18	V	
Breakdown Voltage	V_{BR}	19.6			V	I_T = 1mA
Reverse Leakage Current	I_R			0.1	μA	V_{RWM} = 18V
Forward Voltage	V_F		1.0	1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			50	A	tp = 8/20μs
Clamping Voltage	V_C			26	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			37.5	V	I_{PP} = 50A (8 x 20μs pulse)
Junction Capacitance	C_J			350	pF	VR = 0V, f = 1MHz

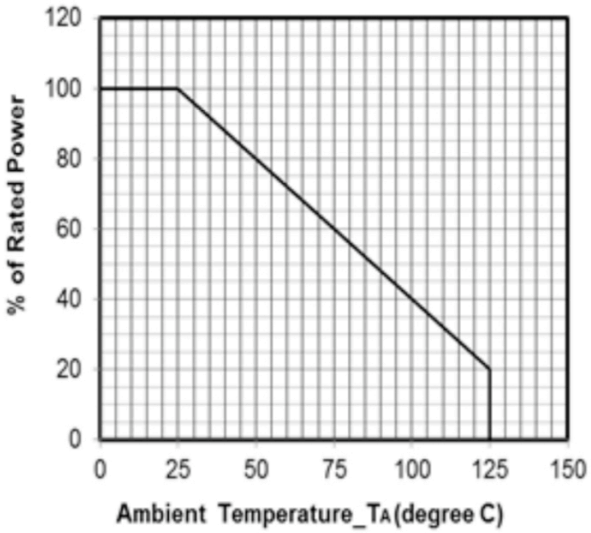
WPE2491WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			24	V	
Breakdown Voltage	V_{BR}	26.7			V	I_T = 1mA
Reverse Leakage Current	I_R			0.1	μA	V_{RWM} = 24V
Forward Voltage	V_F			1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			35	A	tp = 8/20μs
Clamping Voltage	V_C			42	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			53.5	V	I_{PP} = 35A (8 x 20μs pulse)
Junction Capacitance	C_J			200	pF	VR = 0V, f = 1MHz

WPE3691WP6						
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**	**Test Condition**
Reverse Working Voltage	V_{RWM}			36	V	
Breakdown Voltage	V_{BR}	37			V	I_T = 1mA
Reverse Leakage Current	I_R			0.1	μA	V_{RWM} = 36V
Forward Voltage	V_F			1.2	V	I_F = 10mA
Peak Pulse Current	I_{PP}			25	A	tp = 8/20μs
Clamping Voltage	V_C			60	V	I_{PP} = 10A (8 x 20μs pulse)
Clamping Voltage	V_C			75	V	I_{PP} = 25A (8 x 20μs pulse)
Junction Capacitance	C_J			150	pF	VR = 0V, f = 1MHz

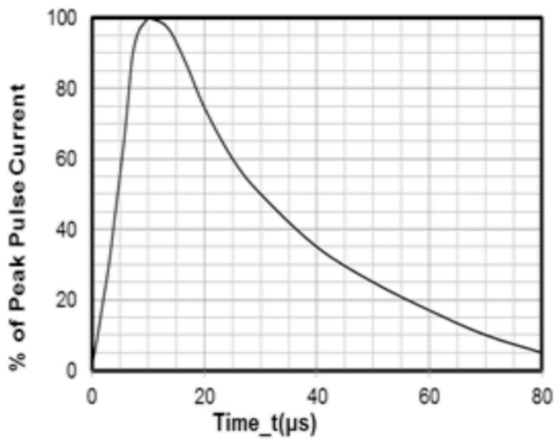
Typical Performance Characteristics (T_A=25°C unless otherwise Specified)



Junction Capacitance vs. Reverse Voltage



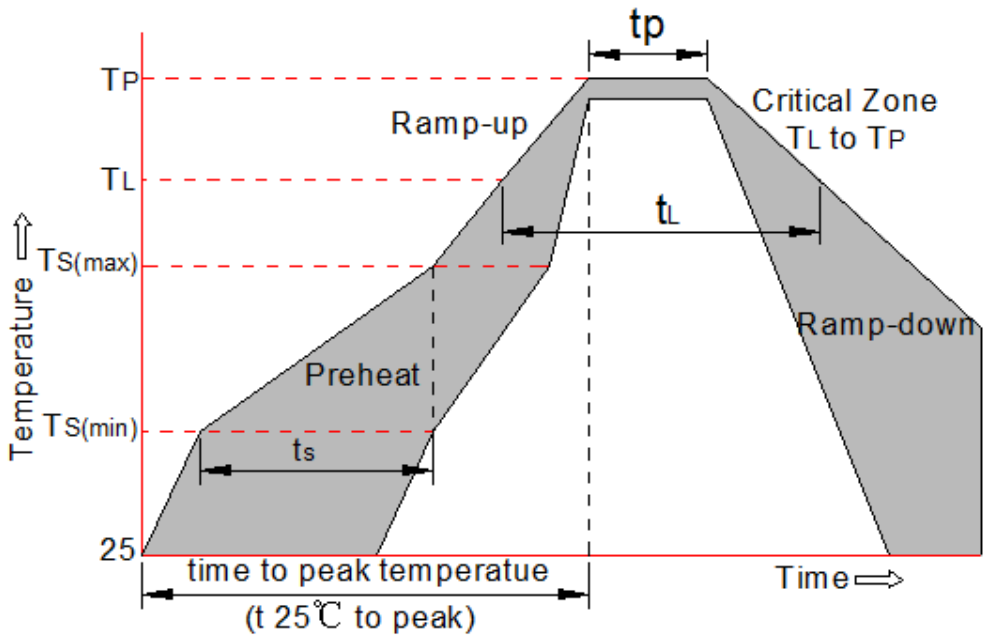
Power Derating Curve



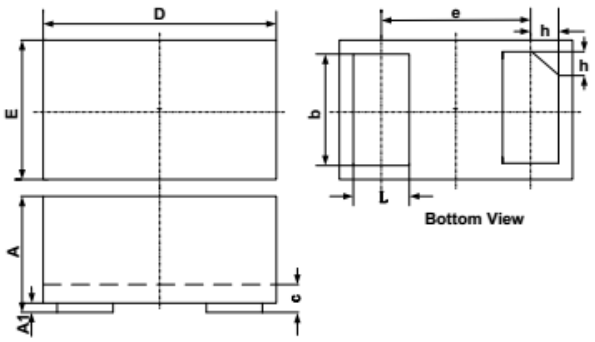
8 X 20μs Pulse Waveform

Soldering Parameters

Reflow Condition		Pb-Free assembly
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150℃
	-Temperature Max($T_{s(max)}$)	+200℃
	-Time (Min to Max) (ts)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3℃/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3℃/sec. Max
Reflow	-Temperature(T_L) (Liquid us)	+217℃
	-Temperature(t_L)	60-150 secs.
Peak Temp (T_p)		+260(+0/-5)℃
Time within 5℃ of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6℃/sec. Max
Time 25℃ to Peak Temp (T_P)		8 min. Max
Do not exceed		+260℃

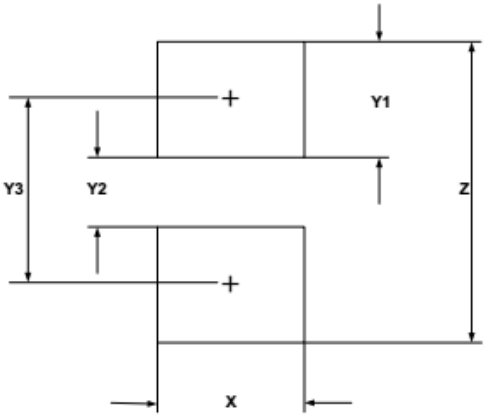


Package Mechanical Data



SYM	DIMENSIONS					
	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.45	0.50	0.55	0.018	0.020	0.022
A1	0.00	0.02	0.05	0.000	0.001	0.002
b	0.75	0.80	0.85	0.030	0.032	0.034
c	0.10	0.15	0.20	0.004	0.006	0.008
D	1.55	1.60	1.65	0.062	0.064	0.066
e	1.10 BSC			0.044 BSC		
E	0.95	1.00	1.05	0.038	0.040	0.042
L	0.35	0.40	0.45	0.014	0.016	0.018
h	0.15	0.20	0.25	0.006	0.008	0.010

Suggested Land Pattern



SYM	DIMENSIONS	
	MILLIMETERS	INCHES
X	1.00	0.040
Y1	0.62	0.025
Y2	0.60	0.024
Y3	1.22	0.049
Z	1.85	0.074

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