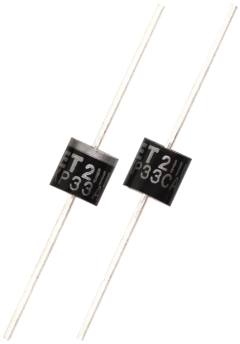
Transient Voltage Suppression Diodes

Description

The 20KPxxx Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

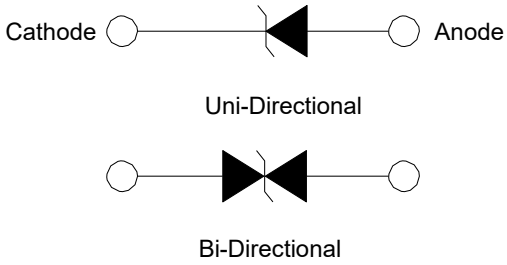


P600

Features

- 20 kW peak pulse capability at 10/1000 μS waveform, repetition rate (duty cycles):0.01%
- Glass passivated chip junction in P600 Package
- Fast response time: typically less than 1.0 PS from 0 Volts to BV min
- Excellent clamping capability
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC 61000-4-2 ESD 30 kV (Air), 30 kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Low incremental surge resistance
- High temperature to reflow soldering guaranteed: 260 °C/40 sec / 0.375”, (9.5 mm) lead length, 5 lbs., (2.3 kg) tension
- V_{BR} @ T_J= V_{BR}@25 °C x (1+αT x (T_J - 25)) (αT:Temperature Coefficient, typical value is 0.1%)

Functional Diagram



Uni-Directional

Bi-Directional

Applications

- Communication Equipment
- Security & Protection
- Industrial Control Equipment
- Power Supply
- Automotive Electronics
- New Energy
- Lightning Protection

Maximum Ratings and Characteristics

(Ratings at 25 °C ambient temperature unless otherwise specified.)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 μS Test Waveform (Fig.2)(Note 1)	P_{PPM}	20	kW
Steady State Power Dissipation on Infinite Heat Sink at TL=75 °C	P_D	8.0	W
Peak Forward Surge Current, 8.3 ms single half sinewave unidirectional only(Note 2)	I_{FSM}	400	A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	8.0	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	40	°C/W

Notes

1. Non-repetitive current pulse, per Fig. 4 and derated above T_J(initial)=25 °C per Fig. 3.
2. Measured of 8.3 ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum.

Electrical Characteristics (T_A=25 °C unless otherwise noted)Table 1

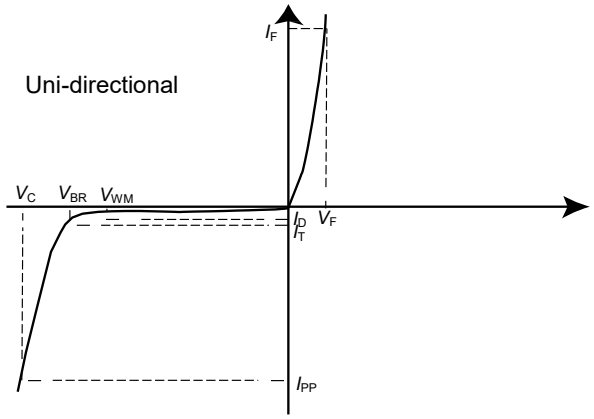
Part Number		Breakdown Voltage $V_{BR}@I_T$		Test Current I_T	Reverse Stand-off Voltage V_R	Max. Reverse Leakage $I_R@V_R$	Max. Peak Pulse Current I_{PPM}	Max. Clamping Voltage $V_C@I_{PPM}$
		Min	Max					
Uni	Bi	(V)		(mA)	(V)	(μA)	(A)	(V)
20KP20V	20KP20B	22.34	24.57	50	20	5000	548.9	36.8
20KP24V	20KP24B	26.81	29.49	50	24	5000	490.3	41.2
20KP26V	20KP26B	29.04	31.94	50	26	2000	451.9	44.7
20KP28V	20KP28B	31.28	34.41	50	28	1000	420.8	48.0
20KP30V	20KP30B	33.51	36.86	5	30	250	392.2	51.5
20KP32V	20KP32B	35.74	39.31	5	32	150	372.0	54.3
20KP34V	20KP34B	38.00	41.80	5	34	50	351.3	57.5
20KP36V	20KP36B	40.20	44.22	5	36	20	328.5	61.5
20KP40V	20KP40B	44.70	49.17	5	40	15	297.9	67.8
20KP44V	20KP44B	49.10	54.01	5	44	2	277.9	72.7
20KP48V	20KP48B	53.60	58.96	5	48	2	254.4	79.4
20KP52V	20KP52B	58.10	63.91	5	52	2	235.4	85.8
20KP56V	20KP56B	62.60	68.86	5	56	2	218.1	92.6
20KP60V	20KP60B	67.00	73.70	5	60	2	207.0	97.6
20KP64V	20KP64B	71.50	78.65	5	64	2	194.2	104.0
20KP68V	20KP68B	76.00	83.60	5	68	2	183.6	110.0
20KP72V	20KP72B	80.40	88.44	5	72	2	174.1	116.0
20KP80V	20KP80B	89.40	98.34	5	80	2	155.4	130.0
20KP88V	20KP88B	98.30	108.13	5	88	2	142.3	142.0
20KP96V	20KP96B	107.20	117.92	5	96.00	2	130.3	155.0
20KP104V	20KP104B	116.20	127.82	5	104.00	2	120.2	168.0
20KP112V	20KP112B	125.10	137.61	5	112.00	2	111.0	182.0
20KP120V	20KP120B	134.00	147.40	5	120.00	2	104.1	194.0
20KP132V	20KP132B	147.40	162.14	5	132.00	2	94.8	213.0
20KP144V	20KP144B	160.80	176.88	5	144.00	2	87.1	232.0

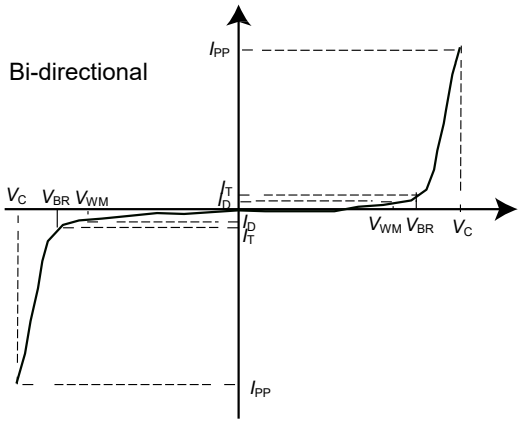
Part Number		Breakdown Voltage $V_{BR}@I_T$		Test Current I_T	Reverse Stand-off Voltage V_R	Max. Reverse Leakage $I_R@V_R$	Max. Peak Pulse Current I_{PPM}	Max. Clamping Voltage $V_C@I_{PPM}$
		Min	Max					
Uni	Bi	(V)		(mA)	(V)	(μA)	(A)	(V)
20KP160V	20KP160B	178.70	196.57	5	160.00	2	78.3	258.0
20KP172V	20KP172B	192.10	211.31	5	172.00	2	72.9	277.0
20KP180V	20KP180B	201.10	221.21	5	180.00	2	69.4	291.0
20KP192V	20KP192B	214.50	235.95	5	192.00	2	65.4	309.0
20KP204V	20KP204B	227.90	250.69	5	204.00	2	61.4	329.0
20KP216V	20KP216B	241.30	265.43	5	216.00	2	58.0	348.0
20KP232V	20KP232B	259.10	285.01	5	232.00	2	54.0	374.0
20KP240V	20KP240B	268.10	294.91	5	240.00	2	52.2	387.0
20KP256V	20KP256B	286.00	314.60	5	256.00	2	49.0	412.0
20KP280V	20KP280B	312.80	344.08	5	280.00	2	44.8	451.0
20KP300V	20KP300B	335.10	368.61	5	300.00	2	41.8	483.0

Notes:

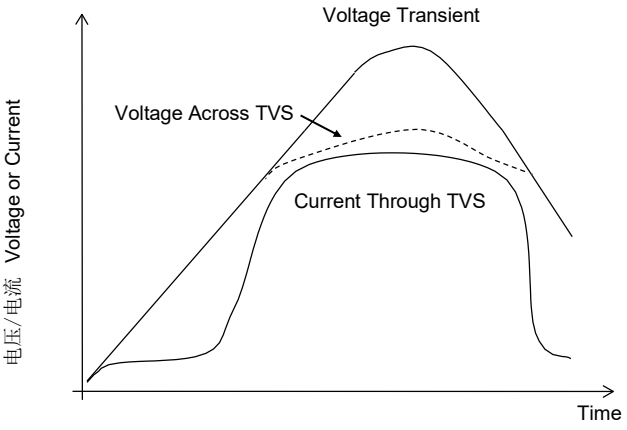
1. Measured of 8.3 ms single half sine-wave or equivalent square wave, duty cycle=4 pulses per minute maximum.
2. V_F < 3.5 V for single die parts and V_F < 5.0 V for stacked-die parts.
3. For bidirectional type having V_R of 40 volts and less, the I_R should be doubled.

I-V Curve Characteristics





Performance Curve for Reference(T_A=25 °C unless otherwise noted)



TVS Transients Clamping Waveform

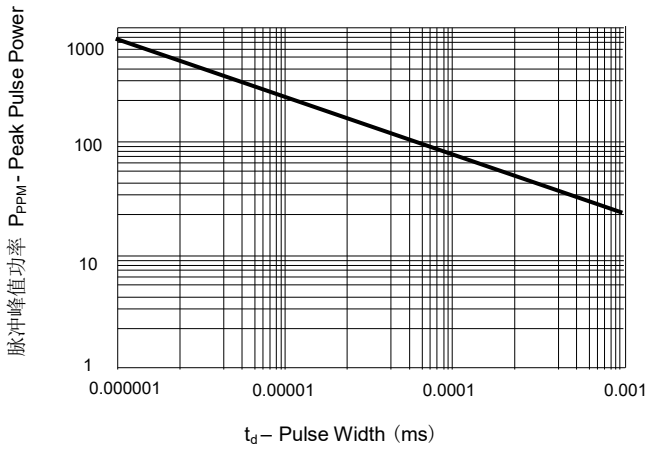


FIGURE 2 Peak Pulse Power Rating Curve

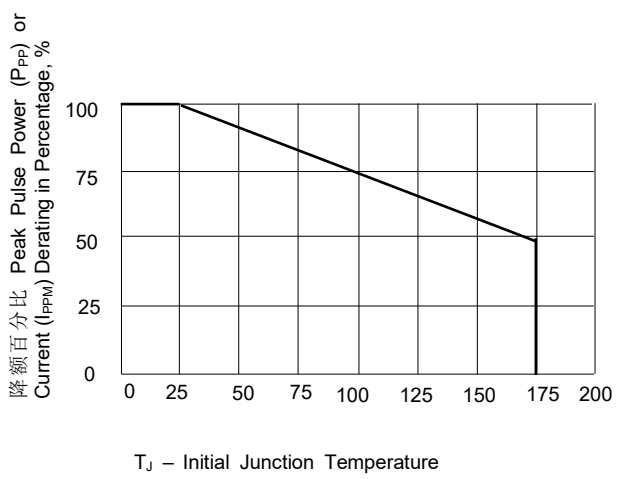


FIGURE 3 Peak Pulse Power Derating Curve

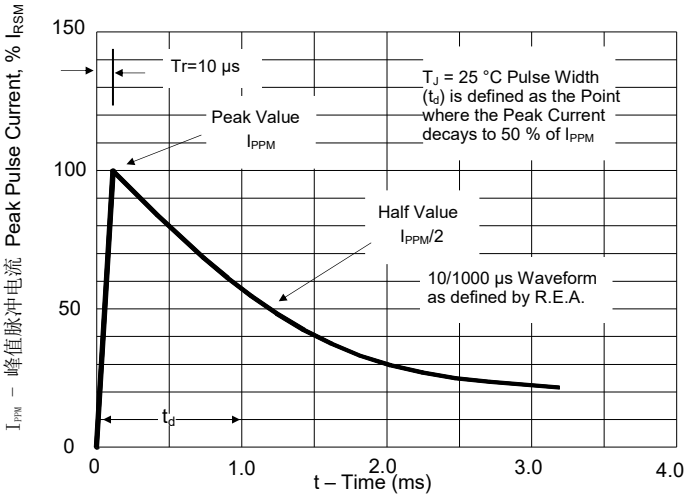


FIGURE 4 Pulse Waveform

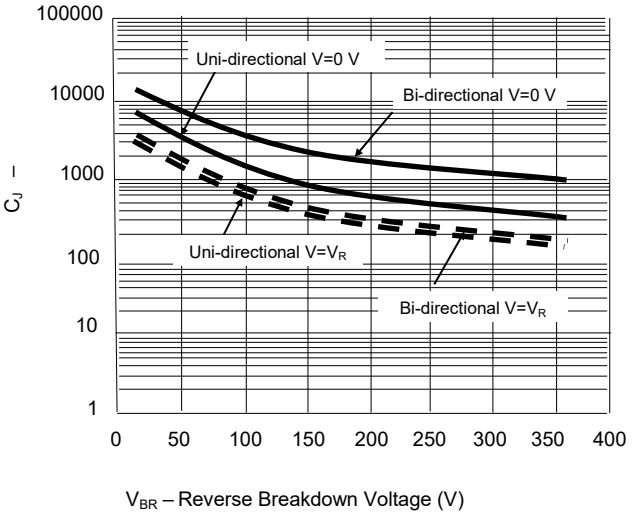


FIGURE 5 Typical Junction Capacitance

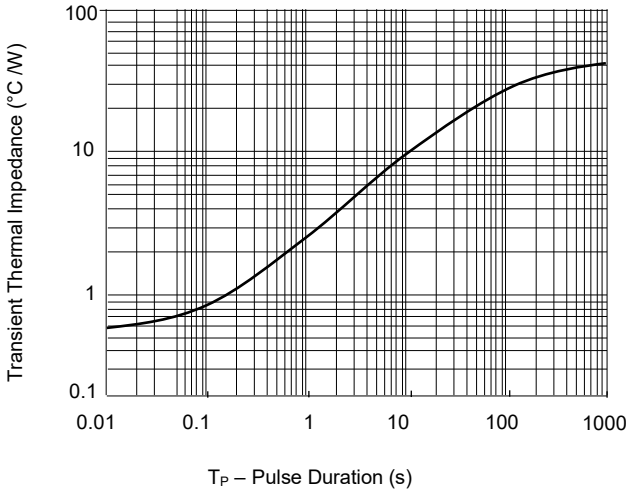


FIGURE 6 Typical Transient Thermal Impedance

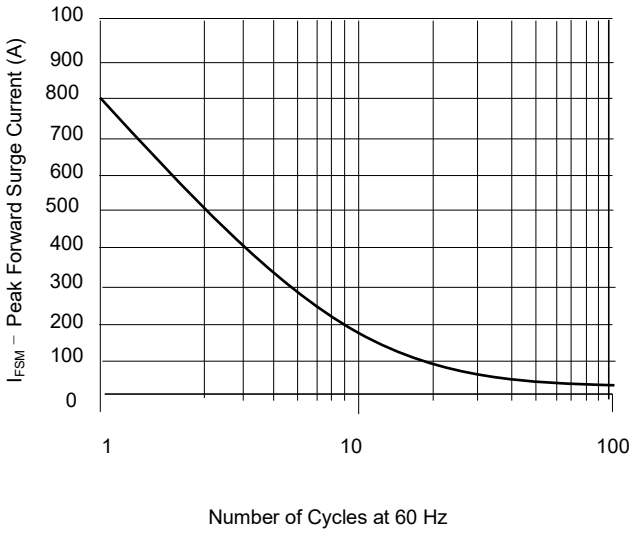


FIGURE 7 Maximum Non-Repetitive Forward Surge Current Uni-Directional only

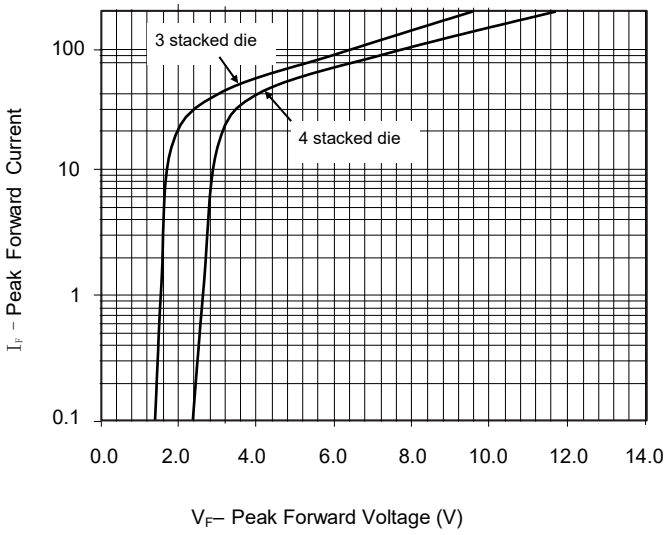
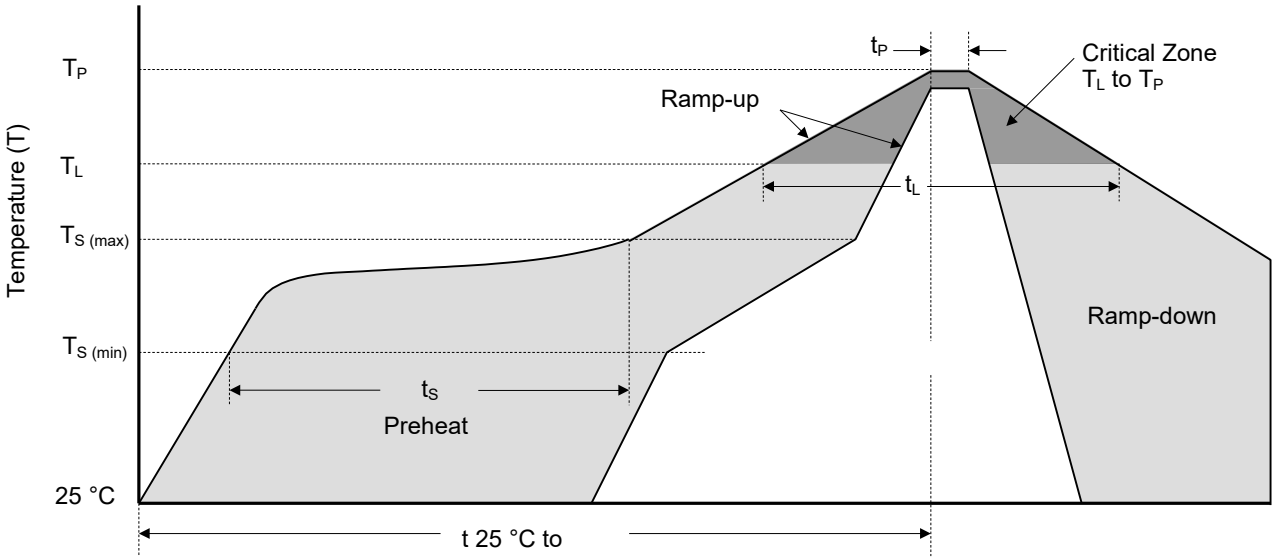


FIGURE 8 Peak Forward Drop vs Peak Forward Current (Typical Values)

Soldering Parameters



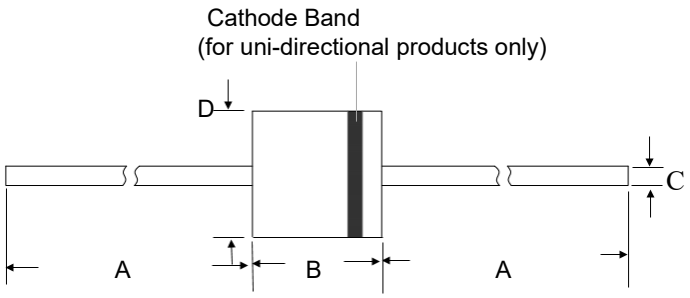
Reflowing Condition

Reflow Soldering Parameters		Lead-Free Assembly
Pre-heat	Temperature Min ($T_{S\ (min)}$)	150 °C
	Temperature Max ($T_{S\ (max)}$)	200 °C
	Time (min to max) (t_s)	60 ~ 120 seconds
Average Ramp-up Rate (Liquidus Temp (T_L) to Peak Temp (T_P))		3 °C / second max.
T_S (max) to T_L Ramp-up Rate		3 °C / second max.
Reflow	Temperature (T_L) (Liquidus)	217 °C
	Time (min to max) (t_L)	60 ~ 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time of within 5 °C of Actual Peak Temperature (t_P)		20 ~ 40 seconds
Ramp-down Rate		6 °C / second max.
Time from 25 °C to Peak Temperature		8 Minutes max.
Do Not Exceed		260 °C

Flow/Wave Soldering (Solder Dipping)

Peak Temperature	260 °C+0 /- 5 °C
Dipping Time	10 seconds
Soldering Number	1 time

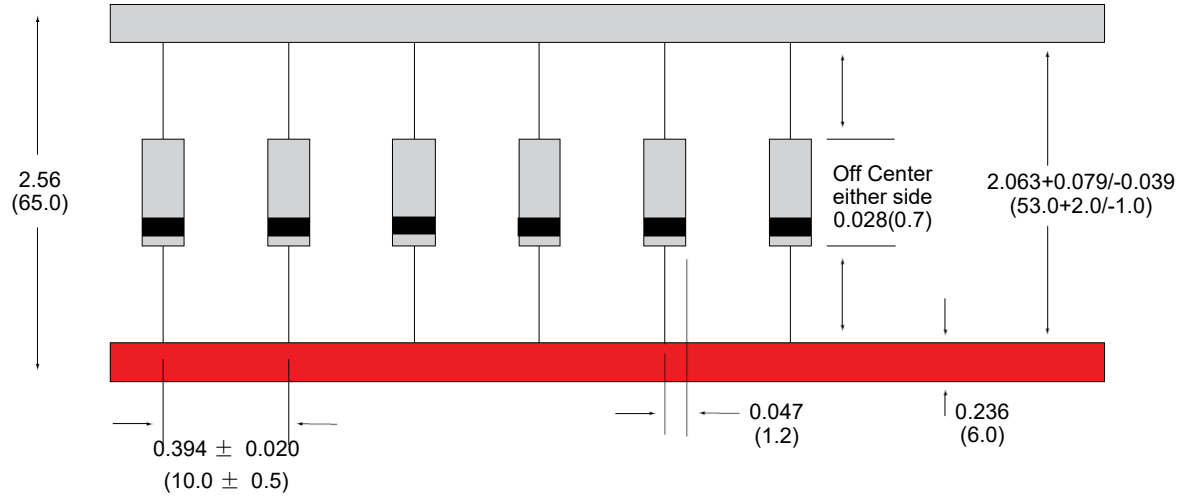
Package Outline Dimensions (P600)

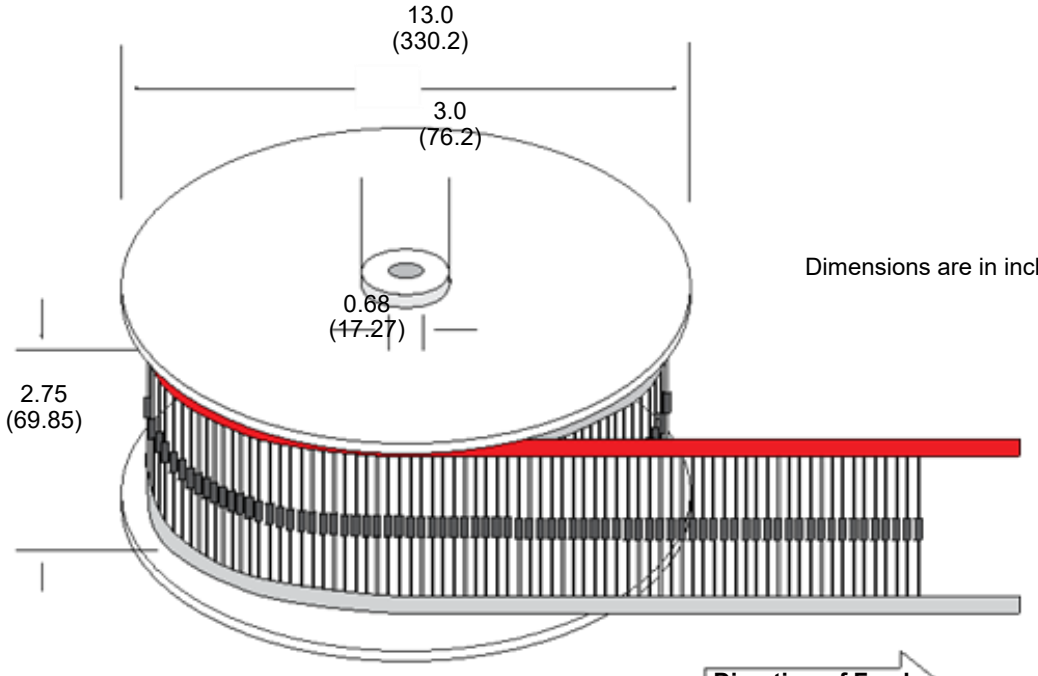


P600

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	25.40	-	1.000	-
B	8.60	9.10	0.340	0.360
C	1.22	1.36	0.048	0.054
D	8.60	9.10	0.340	0.360

Packaging Information





Dimensions are in inches / mm

Part Number	Component Package	QTY's (Reel)	Package Option
20KPxxxXX	P600	800 PCS	Tape & Reel