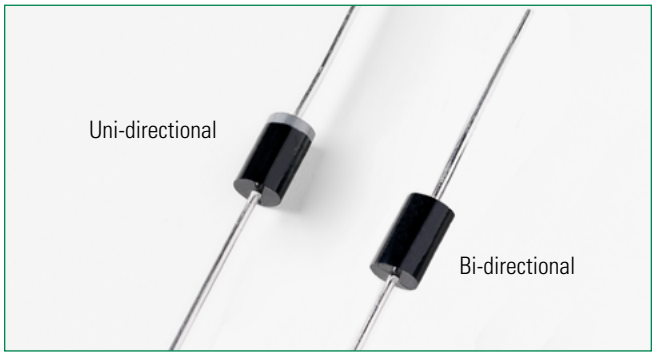
TVS Diodes

Axial Leaded – 1500W > 1.5KE series

1.5KE Series



Agency Approvals

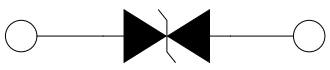
Agency	Agency File Number
	E230531

Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

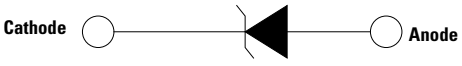
Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation (Fig.2) by 10/1000µs Test Waveform (Fig.4) (Note 1) -Single Die Parts	P_{PPM}	1500	W
Peak Pulse Power Dissipation(Fig.2) by 10/1000µs Test Waveform(Fig.4)(Note 1) -Stacked Die Parts (Note 4)	P_{PPM}	2000	W
Steady State Power Dissipation on Infinite Heat Sink at T_L=75°C	P_D	6.5	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2)	I_{FSM}	200	A
Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 3)	V_F	3.5/5.0	V
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 175	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	15	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	°C/W

Notes:
1. Non-repetitive current pulse , per Fig. 4 and derated above T_J (initial) =25°C per Fig. 3.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.
3. V_F < 3.5V for single die parts and V_F< 5.0V for stacked-die parts.
4. For stacked die component details, please refer to part numbers labeled by * in Electrical Characteristics.

Functional Diagram



Bi-directional



Uni-directional

Description

The 1.5KE Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- 1500W peak pulse capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- Glass passivated chip junction in DO-201 Package
- Fast response time: typically less than 1.0ps 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 30kV(Air), 30kV (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
- Typical I_R less than 1µA when V_{BR} min>12V
- High temperature to reflow soldering guaranteed: 260°C/30sec / 0.375",(9.5mm) lead length, 5 lbs., (2.3kg) tension
- V_{BR} @ T_J= V_{BR}@25°C x (1+αT x (T_J - 25)) (αT:Temperature Coefficient, typical value is 0.1%)
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Matte tin lead–free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

Applications

TVS devices are ideal for the protection of I/O interfaces, V_{CC} bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

Additional Infomarion

Datasheet | Resources | Samples

© 2020 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: JC.10/30/20

TVS Diodes

Axial Leaded – 1500W > 1.5KE series

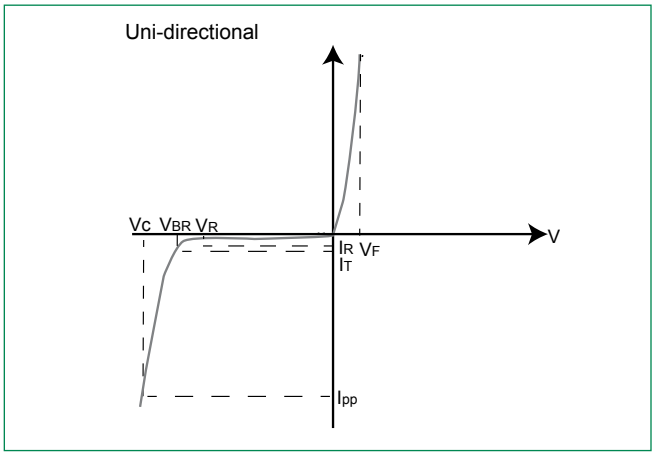
Electrical Characteristics (T_A=25°C unless otherwise noted)

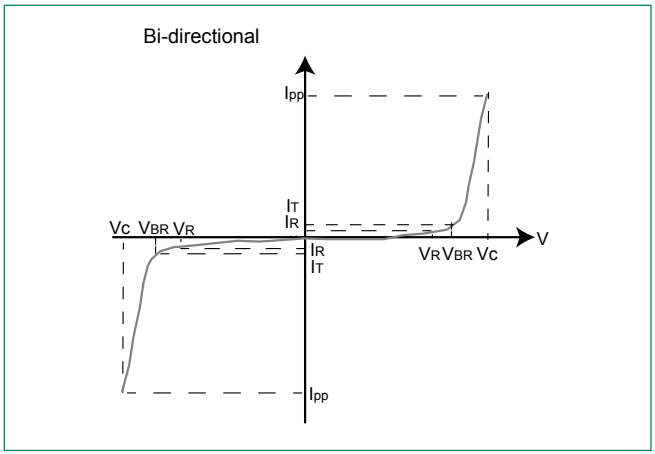
Part Number (Uni)	Part Number (Bi)	Reverse Stand off Voltage V_R (Volts)	Breakdown Voltage V_{BR} (Volts) @ I_T		Test Current I_T (mA)	Maximum Clamping Voltage V_C @ I_{PP} (Volts)	Maximum Peak Pulse Current I_{PP} (A)	Maximum Reverse Leakage I_R @ V_R (µA)	Agency Approval
			Min.	Max.					
1.5KE6.8A	1.5KE6.8CA	5.80	6.45	7.14	10	10.5	144.8	1000	X
1.5KE7.5A	1.5KE7.5CA	6.40	7.13	7.88	10	11.3	134.5	500	X
1.5KE8.2A	1.5KE8.2CA	7.02	7.79	8.61	10	12.1	125.6	200	X
1.5KE9.1A	1.5KE9.1CA	7.78	8.65	9.50	1	13.4	113.4	50	X
1.5KE10A	1.5KE10CA	8.55	9.50	10.50	1	14.5	104.8	10	X
1.5KE11A	1.5KE11CA	9.40	10.50	11.60	1	15.6	97.4	5	X
1.5KE12A	1.5KE12CA	10.20	11.40	12.60	1	16.7	91.0	5	X
1.5KE13A	1.5KE13CA	11.10	12.40	13.70	1	18.2	83.5	1	X
1.5KE15A	1.5KE15CA	12.80	14.30	15.80	1	21.2	71.7	1	X
1.5KE16A	1.5KE16CA	13.60	15.20	16.80	1	22.5	67.6	1	X
1.5KE18A	1.5KE18CA	15.30	17.10	18.90	1	25.2	60.3	1	X
1.5KE20A	1.5KE20CA	17.10	19.00	21.00	1	27.7	54.9	1	X
1.5KE22A	1.5KE22CA	18.80	20.90	23.10	1	30.6	49.7	1	X
1.5KE24A	1.5KE24CA	20.50	22.80	25.20	1	33.2	45.8	1	X
1.5KE27A	1.5KE27CA	23.10	25.70	28.40	1	37.5	40.5	1	X
1.5KE30A	1.5KE30CA	25.60	28.50	31.50	1	41.4	36.7	1	X
1.5KE33A	1.5KE33CA	28.20	31.40	34.70	1	45.7	33.3	1	X
1.5KE36A	1.5KE36CA	30.80	34.20	37.80	1	49.9	30.5	1	X
1.5KE39A	1.5KE39CA	33.30	37.10	41.00	1	53.9	28.2	1	X
1.5KE43A	1.5KE43CA	36.80	40.90	45.20	1	59.3	25.6	1	X
1.5KE47A	1.5KE47CA	40.20	44.70	49.40	1	64.8	23.5	1	X
1.5KE51A	1.5KE51CA	43.60	48.50	53.60	1	70.1	21.7	1	X
1.5KE56A	1.5KE56CA	47.80	53.20	58.80	1	77.0	19.7	1	X
1.5KE62A	1.5KE62CA	53.00	58.90	65.10	1	85.0	17.9	1	X
1.5KE68A	1.5KE68CA	58.10	64.60	71.40	1	92.0	16.5	1	X
1.5KE75A	1.5KE75CA	64.10	71.30	78.80	1	103.0	14.8	1	X
1.5KE82A	1.5KE82CA	70.10	77.90	86.10	1	113.0	13.5	1	X
1.5KE91A	1.5KE91CA	77.80	86.50	95.50	1	125.0	12.2	1	X
1.5KE100A	1.5KE100CA	85.50	95.00	105.00	1	137.0	11.1	1	X
1.5KE110A	1.5KE110CA	94.00	105.00	116.00	1	152.0	10.0	1	X
1.5KE120A	1.5KE120CA	102.00	114.00	126.00	1	165.0	9.2	1	X
1.5KE130A	1.5KE130CA	111.00	124.00	137.00	1	179.0	8.5	1	X
1.5KE150A	1.5KE150CA	128.00	143.00	158.00	1	207.0	7.3	1	X
1.5KE160A	1.5KE160CA	136.00	152.00	168.00	1	219.0	6.9	1	X
1.5KE170A	1.5KE170CA	145.00	162.00	179.00	1	234.0	6.5	1	X
1.5KE180A	1.5KE180CA	154.00	171.00	189.00	1	246.0	6.2	1	X
1.5KE200A	1.5KE200CA	171.00	190.00	210.00	1	274.0	5.5	1	X
1.5KE220A	1.5KE220CA	185.00	209.00	231.00	1	328.0	4.6	1	X
1.5KE250A	-	214.00	237.00	263.00	1	344.0	4.4	1	X
-	1.5KE250CA*	214.00	237.00	263.00	1	344.0	5.9	1	X
1.5KE300A*	1.5KE300CA*	256.00	285.00	315.00	1	414.0	4.9	1	X
1.5KE320A*	1.5KE320CA*	273.00	304.00	336.00	1	441.0	4.6	1	X
1.5KE350A*	1.5KE350CA*	300.00	332.00	368.00	1	482.0	4.2	1	X
1.5KE400A*	1.5KE400CA*	342.00	380.00	420.00	1	548.0	3.7	1	X
1.5KE440A*	1.5KE440CA*	376.00	418.00	462.00	1	602.0	3.1	1	X
1.5KE480A*	1.5KE480CA*	408.00	456.00	504.00	1	658.0	3.1	1	-
1.5KE510A*	1.5KE510CA*	434.00	485.00	535.00	1	698.0	2.9	1	-
1.5KE530A*	1.5KE530CA*	451.00	503.50	556.50	1	725.0	2.8	1	-
1.5KE540A*	1.5KE540CA*	460.00	513.00	567.00	1	740.0	2.8	1	-
1.5KE550A*	1.5KE550CA*	468.00	522.50	577.50	1	760.0	2.7	1	-
1.5KE600A*	1.5KE600CA*	512.00	570.00	630.00	1	828.0	2.5	1	-

For bidirectional type having V_R of 10 volts and less, the I_R limit is double.
For parts without A, the V_{BR} is ± 10% and V_C is 5% higher than with A parts, the parts without A are currently available, but not recommended for new designs. The parts with A are preferred.
For stack-die parts, use * to label the part number.

© 2020 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: JC.10/30/20

I-V Curve Characteristics





P_{PPM} Peak Pulse Power Dissipation -- Max power dissipation
V_R Stand-off Voltage -- Maximum voltage that can be applied to the TVS without operation
V_{BR} Breakdown Voltage -- Maximum voltage that flows though the TVS at a specified test current (I_T)
V_C Clamping Voltage -- Peak voltage measured across the TVS at a specified Ippm (peak impulse current)
I_R Reverse Leakage Current -- Current measured at V_R
V_F Forward Voltage Drop for Uni-directional

Ratings and Characteristic Curves (T_A=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

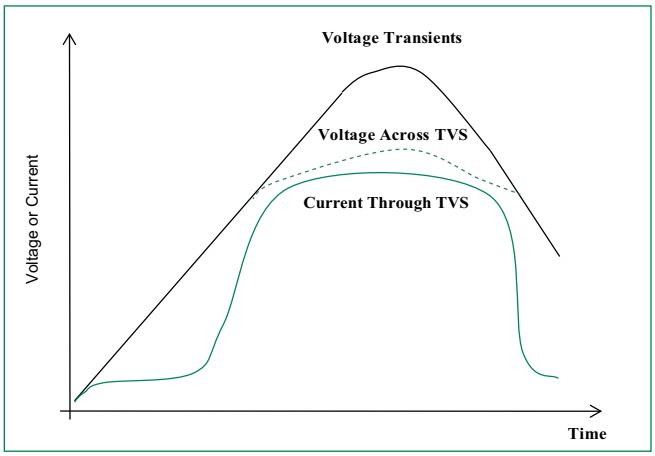
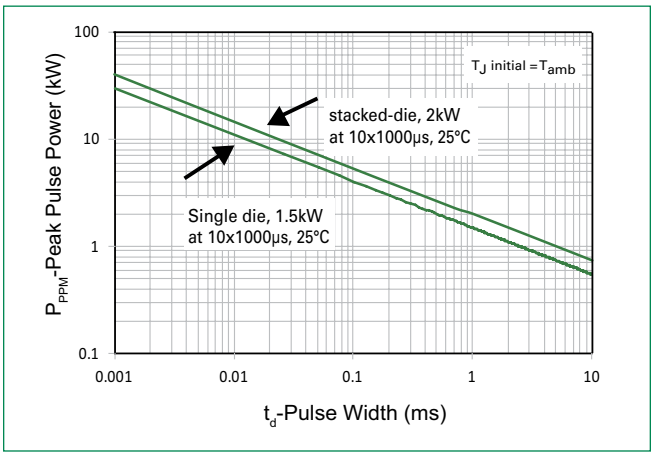


Figure 2 - Peak Pulse Power Rating



© 2020 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: JC.10/30/20

Ratings and Characteristic Curves (T_A=25°C unless otherwise noted) (Continued)

Figure 3 - Peak Pulse Power Derating Curve

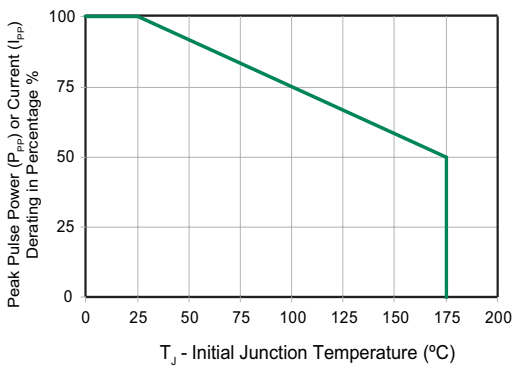


Figure 4 - Pulse Waveform

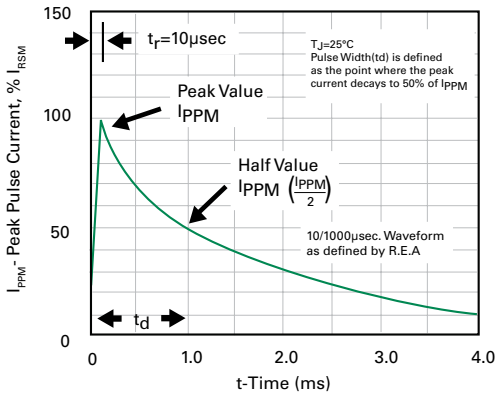


Figure 5 - Typical Junction Capacitance

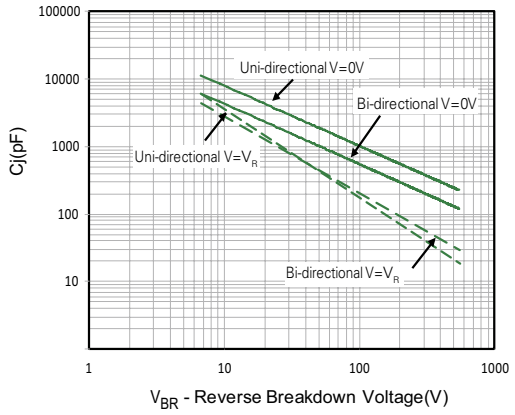


Figure 6 - Typical Transient Thermal Impedance

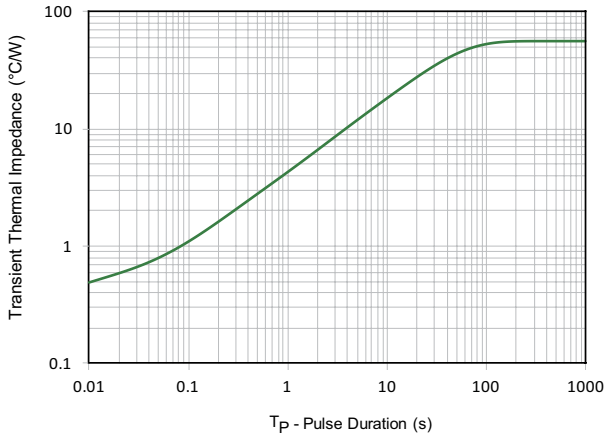


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

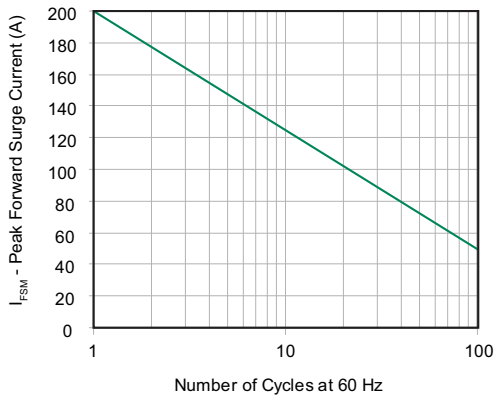
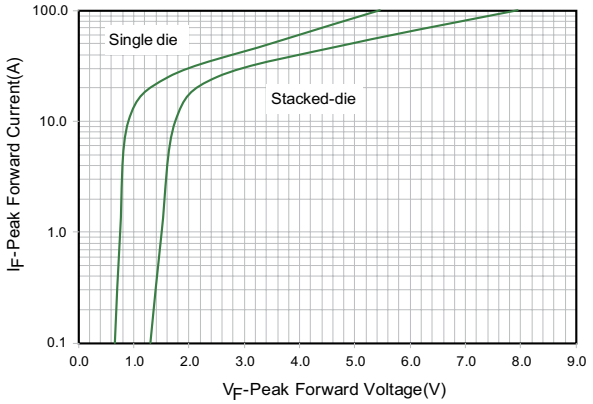


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



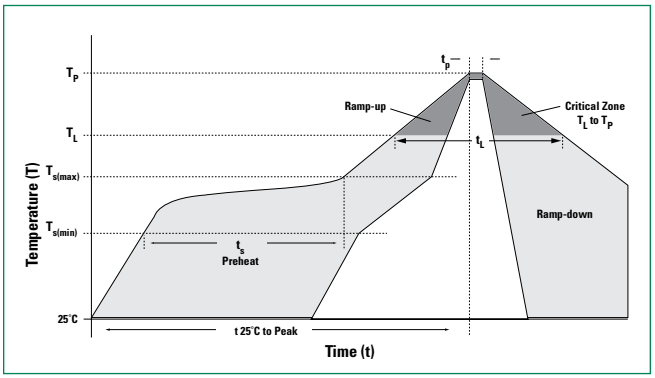
© 2020 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: JC.10/30/20

TVS Diodes

Axial Leaded – 1500W > 1.5KE series

Soldering Parameters

Reflow Condition		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 secs
Average ramp up rate (Liquidus Temp (T_L) to peak		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 within 5°C of actual peak Temperature (t_p)		30 seconds max
Ramp-down Rate		6°C/second max
Time 25°C to peak Temperature (T_P)		8 minutes Max.
Do not exceed		260°C



Flow/Wave Soldering (Solder Dipping)

Peak Temperature :	265°C
Dipping Time :	10 seconds
Soldering :	1 time

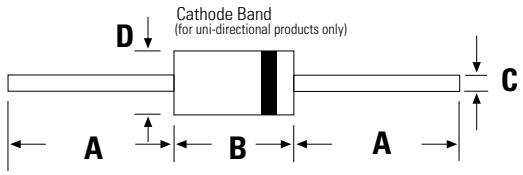
Physical Specifications

Weight	0.045oz., 1.2g
Case	JEDEC DO-201 molded plastic body over passivated junction.
Polarity	Color band denotes the cathode except Bipolar.
Terminal	Matte Tin axial leads, solderable per JESD22-B102.

Environmental Specifications

High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
H3TRB	JESD22-A101
RSH	JESD22-B106

Dimensions



DO-201

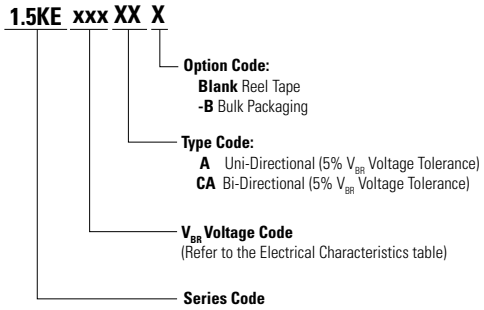
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	1.000	-	25.40	-
B	0.285	0.375	7.20	9.50
C	0.038	0.042	0.96	1.07
D	0.190	0.210	4.80	5.30

© 2020 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: JC.10/30/20

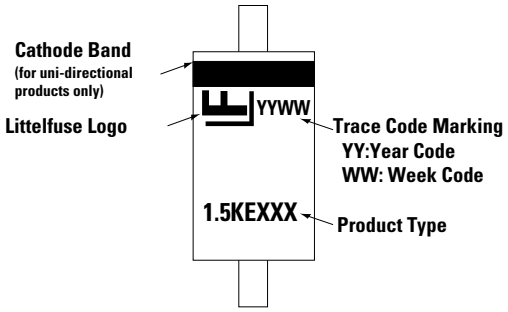
TVS Diodes

Axial Leaded – 1500W > 1.5KE series

Part Numbering System



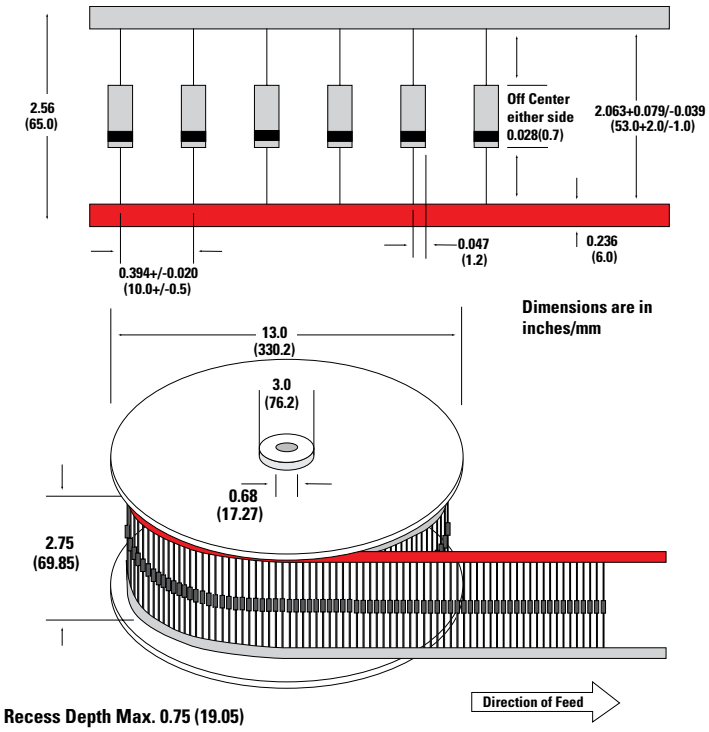
Part Marking System



Packaging

Part Number	Component Package	Quantity	Packaging Option	Packaging Specification
1.5KExxxXX	DO-201	1200	Tape & Reel	EIA STD RS-296
1.5KExxxXX-B	DO-201	500	BULK	Littelfuse Spec.

Tape and Reel Specification



Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.

© 2020 Littelfuse, Inc.
Specifications are subject to change without notice.
Revised: JC.10/30/20