

Disc Ceramic Capacitors



Professional Ceramic Capacitors - Class I, II and III

MIL-STD-202F

The professional ceramic disc capacitors were specially developed for applications in severe environmental conditions, high humidity, temperature, gas, vapor and solvents.

The capacitors are flame retardant epoxy coated, meeting UL 94-V0 flammability specifications. The capacitors are 100% screened on following electrical parameters:

Capacitance, loss factor, test voltage. After the 100% test, the capacitors are audited on its electrical and mechanical parameters with following AQL:

Electrical parameters: 0.065% level II

Mechanical parameters: 0.65% level II

The capacitors withstand the following reliability essays:

Terminal strength: method 211 – condition A

Resistance to solvents: method 215

Resistance to soldering heat: method 210 – condition B

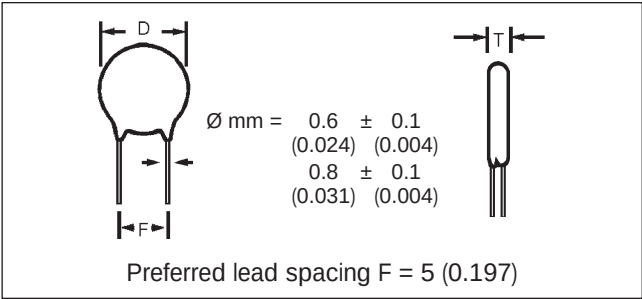
Solderability: method 208

Thermal shock: method 107 – condition A

Humidity (steady state): method 103 – condition D

Life (at elevated ambient temperature): method 108 – condition D

Operating temperature and storage: -55... +125° C



millimeters (inches)

Lead Spacing	Digit 8	
F		
2.5 (0.100)	D	—
5 (0.200)	A	O
6 (0.250)	E	X
7.5 (0.300)	B	R
10 (0.400)	C	W

DIMENSIONS

millimeters (inches)

Digit 9 (ø)	D ± 2 (0.079)	T max.	Available Lead Spacing
A ^{NPO} _{1pF... 2.7 pF}	4.0 (0.157)	3.0 (0.118)	A,B,D,E,O,R
A ^{N1500} _{5.6pF... 8.2 pF}	4.0 (0.157)	3.0 (0.118)	A,B,D,E,O,R
A Others	4.0 (0.157)	3.0 (0.118)	A,B,D,E,O,R
B	5.0 (0.197)	3.0 (0.118)	A,B,D,E,O,R,X
C	6.0 (0.236)	3.0 (0.118)	A,B,C,D,E,O,R,X
D	7.0 (0.276)	3.0 (0.118)	A,B,C,D,E,O,R,X
E	8.0 (0.315)	3.0 (0.118)	A,B,C,D,E,O,R,X
F	9.0 (0.354)	3.0 (0.118)	A,B,C,E,O,R,X
G	10.0 (0.394)	3.0 (0.118)	A,B,C,E,O,R,X
H	11.0 (0.433)	3.0 (0.118)	A,B,C,E,O,R,W
J	13.0 (0.512)	3.5 (0.138)	B,C,R,W
K	15.0 (0.591)	3.5 (0.138)	B,C,R,W
M	19.0 (0.748)	4.0 (0.157)	B,C

(E), (X), (W): upon request

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General Specifications - Class III Professional

DIELECTRIC - CLASS III

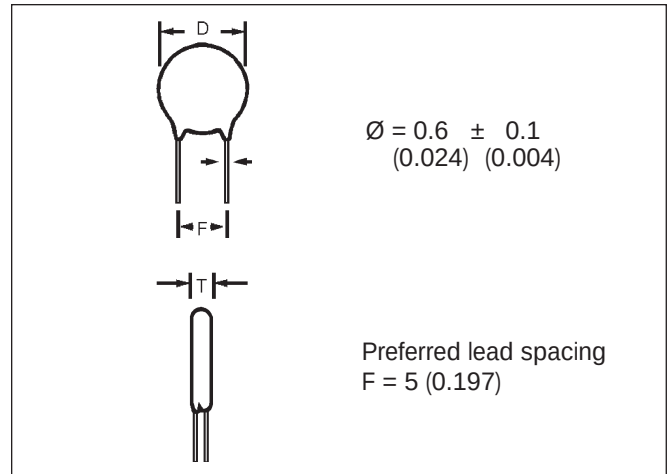
A thin dielectric layer is grown on a disc of conductive ceramic. Very large capacitances can be obtained due to reduced thickness of this barrier layer and its inherently high dielectric constant. Due its small dimensions, they are a less expensive replacement of multilayer ceramic or polyester capacitors.

DIMENSIONS

millimeters (inches)

Digit 9 of P.N. (ø)	D ± 2 (0.079)	T max.	Available Lead Spacing
A	4.0 (0.157)	3.0 (0.118)	A,B,D,E,O,R
B	5.0 (0.197)	3.0 (0.118)	A,B,D,E,O,R,X
C	6.0 (0.236)	3.0 (0.118)	A,B,C,D,E,O,R,X
D	7.0 (0.276)	3.0 (0.118)	A,B,C,D,E,O,R,X
E	8.0 (0.315)	3.0 (0.118)	A,B,C,D,E,O,R,X
F	9.0 (0.354)	3.0 (0.118)	A,B,C,E,O,R,X
G	10.0 (0.394)	3.0 (0.118)	A,B,C,E,O,R,X
H	11.0 (0.433)	3.0 (0.118)	A,B,C,E,O,R,W
J	13.0 (0.512)	3.5 (0.138)	B,C,R,W
K	15.0 (0.591)	4.0 (0.157)	B,C,R,W

(E), (X), (W): upon request



millimeters (inches)

Lead Spacing	Digit 8 of P.N.	
F		
2.5 (0.100)	D	—
5 (0.200)	A	O
6 (0.250)	E	X
7.5 (0.300)	B	R
10 (0.400)	C	W

PERFORMANCE CHARACTERISTICS CLASS III

Measured at	1.0 kHz / 0.1 Vrms / 25°C	
Dissipation Factor	$C_R \leq 22 \text{ nF} \rightarrow Y5V, Y5U \leq 7.5\%$ $C_R > 22 \text{ nF} \rightarrow Y5V, Y5P \leq 5.0\%$	
Capacitance Tolerance	Y5P $\rightarrow \pm 20\% / -20 +50\%$ Y5U $\rightarrow \pm 20\% / -20 +80\%$ Y5V $\rightarrow \pm 20\% / -20 +80\%$	
Climatic Category	55 / 085 / 56	
Insulation Resistance @ V_R	Y5P	$\geq 12 \text{ M}\Omega$
	Y5U	$4.7 \text{ nF} \dots 100 \text{ nF} \rightarrow \geq 10 \text{ M}\Omega$ $200 \text{ nF} \rightarrow \geq 1 \text{ M}\Omega$
	Y5V	$\geq 100 \text{ M}\Omega$
Dielectric Strength NOTE: Charging current limited to 50 mA	Between leads	$V_t = 1.25 V_R$
	Body insulation	$V_R = 25V \quad V_t = 100V \text{ (DC)}$ $V_R = 50V \quad V_t = 150V \text{ (DC)}$
Operating Temperature Range (°C)	-55... +125 Epoxy Coated	

Note: Damp Heat Steady State: 90... 95% R.H. 40°C / 21 days. No voltage to be applied.

Disc Ceramic Capacitors

Dimension Table

Barrier Layer Capacitors - Class III Professional



EPOXY COATED – CAPACITANCE VS. DISC DIAMETER

millimeters (inches)

Class III	Δ C/C (max.) ±12% Range -30... +85°C		Δ C/C (max.) +30 -65% Range -30... +85°C		Δ C/C (max.) +22 -85% Range -30... +85°C	
Temp. Coefficient	Y5P		Y5U		Y5V	
Digits 1,2,3 of P.N.	6WF	6WH	6YF	6YH	6ZH	
Rated Voltage (V _R)	25	50	25	50	50	
C _R (pF)						
4,700	4.0 (0.157)	4.0 (0.157)	4.0 (0.157)	4.0 (0.157)	4.0 (0.157)	
10,000	6.0 (0.236)	6.0 (0.236)				
22,000	7.0 (0.276)	8.0 (0.315)	5.0 (0.197)	6.0 (0.236)		
33,000	8.0 (0.315)	9.0 (0.354)	6.0 (0.236)	7.0 (0.276)		
47,000	10.0 (0.394)	11.0 (0.433)	7.0 (0.276)	8.0 (0.315)	5.0 (0.197)	
50,000		—				
68,000	11.0 (0.433)	13.0 (0.512)				
100,000	13.0 (0.512)	15.0 (0.591)			7.0 (0.276)	
200,000	—	—	13.0 (0.512)	—		

Y5U, Y5V - Preferences

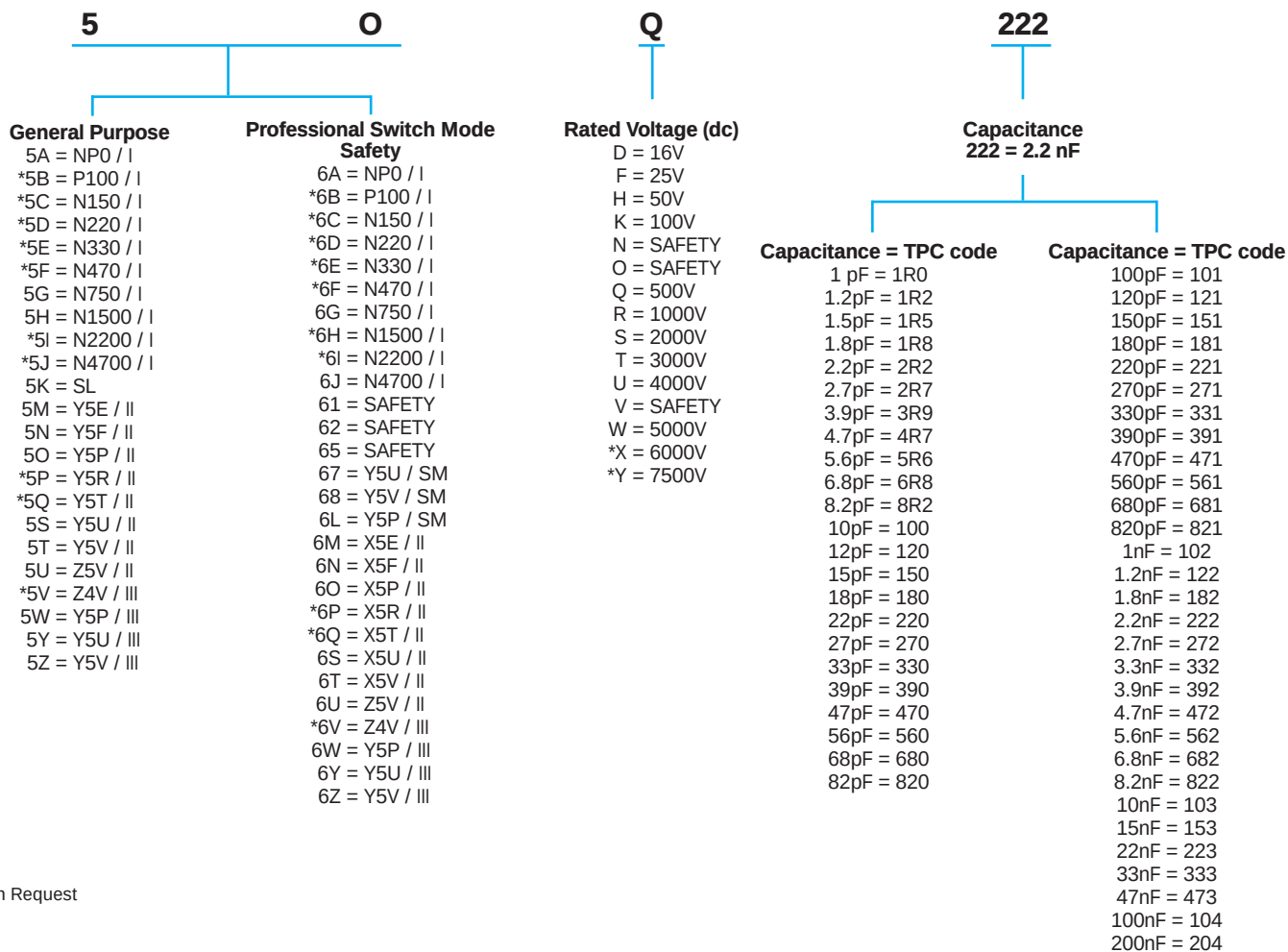
Diameter (ϕ) = 9th Part Number Digit

Disc Ceramic Capacitors



Ordering Code

HOW TO ORDER



*Upon Request

Disc Ceramic Capacitors

Ordering Code



M

Tolerance

C = ± 0.25 pF
D = ± 0.50 pF
J = $\pm 5\%$
K = $\pm 10\%$
M = $\pm 20\%$
S = -20+50%
Z = -20+80%
P = 0+100%

A

Capacitor Diameter ± 2 (0.079)

A = 4 (0.157)
B = 5 (0.197)
C = 6 (0.236)
D = 7 (0.276)
E = 8 (0.315)
F = 9 (0.354)
G = 10 (0.394)
H = 11 (0.433)
J = 13 (0.512)
K = 15 (0.591)
M* = 19 (0.748)

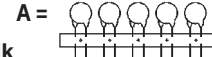
*Wire 0.8 (0.031) recommended

A

A

Packaging

Cardboard Strips



Bulk

E = 5 (0.197) ± 1 (0.039) free wire length
C = 10 (0.394) ± 1 (0.039) free wire length
D = 25 (0.984) ± 1 (0.039) free wire length

Taping

Reel



Avisert			Panaset		
H	L	L	J	L	L

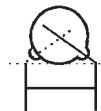


Avisert			Panaset		
I	M	M	K	M	M

Lead Forming				
mm	inches			
2.5 ± 0.5	.1 $\pm .025$	D	—	—
5 $\begin{smallmatrix} +0.6 \\ -0.2 \end{smallmatrix}$	.2 $\pm .025$	A	O	N
6 $\begin{smallmatrix} +0.6 \\ -0.2 \end{smallmatrix}$	.25 $\pm .025$	E	X	—
7.5 $\begin{smallmatrix} +1 \\ -0.5 \end{smallmatrix}$	.3 $\pm .05$	B	R	Q
10 $\begin{smallmatrix} +0.5 \\ -1.0 \end{smallmatrix}$	.4 $\pm .05$	C	W	—
12.5 $\begin{smallmatrix} +1 \\ -0.5 \end{smallmatrix}$	.5 $\pm .05$	P	—	—

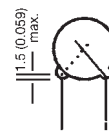
Finishing

Diam ≤ 9 (0.354) and
F = 5.00 (0.197)



Coating does not
surpass the bend

For every other:



Low Voltage

A = Phenolic (General Purpose) Q = Waxed phenolic

S = Epoxy (Professional) cap. diameter
 ≤ 8 (0.315)

D = Epoxy (Professional) cap. diameter
 > 8 (0.315)

High Voltage



F = Measured
from the
center of
leads

C = Epoxy wire diameter $\begin{smallmatrix} 0.6 \\ (0.024) \end{smallmatrix} \pm \begin{smallmatrix} 0.1 \\ (0.004) \end{smallmatrix}$

I = Epoxy wire diameter $\begin{smallmatrix} 0.8 \\ (0.031) \end{smallmatrix} \pm \begin{smallmatrix} 0.1 \\ (0.004) \end{smallmatrix}$

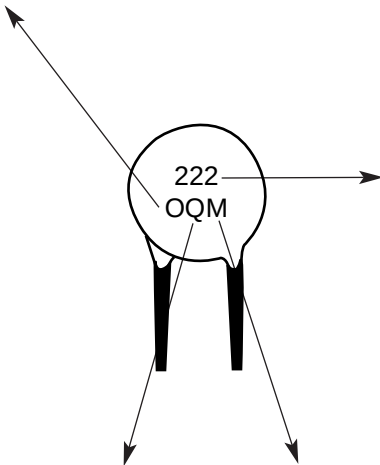
L = Phenolic wire diameter $\begin{smallmatrix} 0.6 \\ (0.024) \end{smallmatrix} \pm \begin{smallmatrix} 0.1 \\ (0.004) \end{smallmatrix}$

Please note that not all code combinations
are either possible or available.

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Marking

DIG. 2		Logo: Only in diam. ≥ 6mm	Capacitance		EIA
O					
TC / Class					
General Purpose	Professional				
A = NP0 / I	A = NP0 / I		1pF = 109	100pF = 101	
*B = P100 / I	B = P100 / I		1.2pF = 129	120pF = 121	
*C = N150 / I	C = N150 / I		1.5pF = 159	150pF = 151	
*D = N220 / I	D = N220 / I		1.8pF = 189	180pF = 181	
*E = N330 / I	E = N330 / I		2.2pF = 229	220pF = 221	
*F = N470 / I	F = N470 / I		2.7pF = 279	270pF = 271	
G = N750 / I	G = N750 / I		3.9pF = 399	390pF = 391	
H = N1500 / I	H = N1500 / I		4.7pF = 479	470pF = 471	
*I = N2200 / I	I = N2200 / I		5.6pF = 569	560pF = 561	
*J = N4700 / I	J = N4700 / I		6.8pF = 689	680pF = 681	
K = SL	7 = Y5U / SM		8.2pF = 829	820pF = 821	
M = Y5E / II	8 = Y5V / SM		10pF = 100	1nF = 102	
N = Y5F / II	L = Y5P / SM		12pF = 120	1.2nF = 122	
O = Y5P / II	M = X5E / II		15pF = 150	1.8nF = 182	
P = Y5R / II	N = X5F / II		18pF = 180	2.2nF = 222	
Q = Y5T / II	O = X5P / II		22pF = 220	2.7nF = 272	
S = Y5U / II	P = X5R / II		27pF = 270	3.9nF = 392	
T = Y5V / II	Q = X5T / II		39pF = 390	4.7nF = 472	
U = Z5V / II	S = X5U / II		47pF = 470	5.6nF = 562	
V = Z4V / III	T = X5V / II	56pF = 560	6.8nF = 682		
*W = Y5P / II	U = Z5V / II	68pF = 680	8.2nF = 822		
*X = Y5R / II	V = Z4V / III	82pF = 820	10nF = 103		
Y = Y5U / II	W = Y5P / III		15nF = 153		
Z = Y5V / II	X = Y5R / III		22nF = 223		
	Y = Y5U / III		33nF = 333		
	Z = Y5V / III		47nF = 473		
			100nF = 104		
			200nF = 204		

DIG. 3	DIG. 7
Q	M
Rated Voltage	Tolerance
D = 16V	C = ±0.25pF
F = 25V	D = ±0.5pF
H = 50V	J = ±5%
K = 100V	K = ±10%
Q = 500V	M = ±20%
R = 1000V	S = -20 +50%
S = 2000V	Z = -20 +80%
T = 3000V	P = 0 +100%

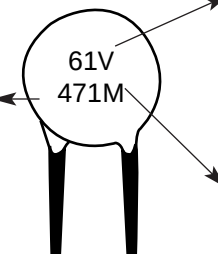
*Upon Request

TC – Temperature coefficient.

DIG – for better understanding, check pages 3 and 4.

Safety Front

Capacitance
As above



Type
61V
620
65N

Tolerance
As above

Back: (Approval marks)

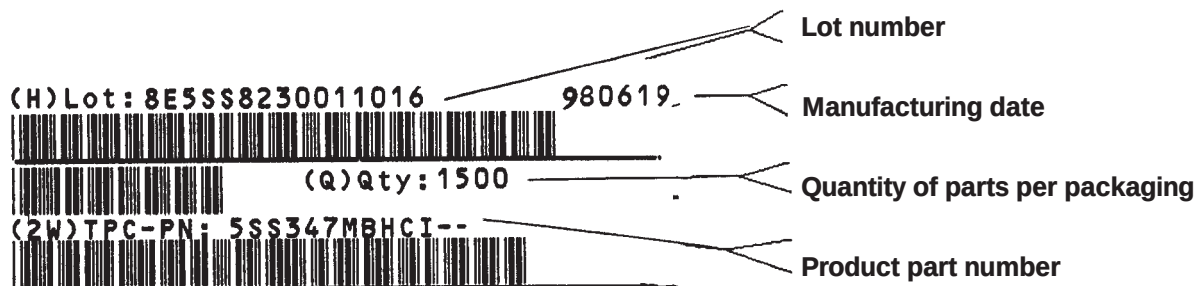
Disc Ceramic Capacitors



Packaging

IDENTIFICATION AND TRACEABILITY

On all TPC ceramic capacitors packages, you will find a bar code label with the following information:



TAPED PARTS QUANTITY TABLE

millimeters (inches)

Rated Voltage	Diameter	Quantities	
(Vr)	D	Ammopack	Reel
Vr ≤ 500V	D ≤ 7 (0.276)	2000	2500
	7 < D ≤ 11 (0.433)	2000	2000
500V < Vr ≤ 2KV	D ≤ 11 (0.433)	1500	2000
2KV < Vr ≤ 5KV	D ≤ 11 (0.433)	1000	1500

CARDBOARD STRIPS QUANTITY TABLE

millimeters (inches)

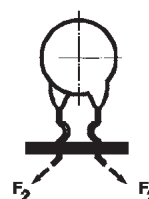
Rated Voltage	Diameter	Lead Space	
(Vr)	D	≤ 5 (0.197)	> 5 (0.197)
Vr ≤ 500V	D ≤ 8 (0.315)	2500	1500
	8 (0.315) ≤ D ≤ 11 (0.433)	1500	-
	8 (0.315) ≤ D ≤ 13 (0.512)	-	1000
	11 (0.433) ≤ D ≤ 15 (0.591)	1000	-
	13 (0.512) ≤ D ≤ 19 (0.748)	-	500
	D ≤ 19 (0.748)	500	-
500V < Vr ≤ 2KV	D ≤ 9 (0.354)	1500	1000
	9 (0.354) ≤ D ≤ 11 (0.433)	-	1000
	9 (0.354) ≤ D ≤ 13 (0.512)	1000	-
	11 (0.433) ≤ D ≤ 19 (0.748)	-	500
	13 (0.512) ≤ D ≤ 19 (0.748)	500	-
2KV < Vr ≤ 5KV	D ≤ 9 (0.354)	1500	-
Safety 65N 62O	D ≤ 11 (0.433)	-	1000
	D ≤ 13 (0.512)	500	500
Safety	D ≤ 6 (0.236)	1500	1500
61V	7 (0.275) ≤ D ≤ 9 (0.354)	1000	1000
	9 (0.354) ≤ D	500	500

Quantities for other package alternative, upon request.

Both types can be shipped on reels or ammopack. The standard packaging quantities are shown bellow:



Crimped leads



Maximum pull force during insertion and lead cut

	F₁	F₂
4 (0.157) ≤ D < 6 (0.236)	12N	20N
D ≥ 6 (0.236)	20N	25N

TPC Code Digit 11

Figure 2: Inside Crimp 100V... 1000V
Figure 3: Outside Crimp 1000V

Disc Ceramic Capacitors

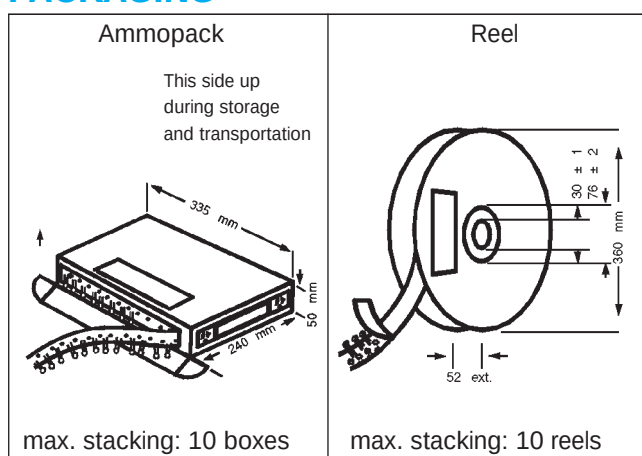


Tape and Reel Specifications

millimeters (inches)

Description of Symbols		Straight Leads		Crimped
		Figure 1		Figure 2 & 3
		A (Avisert)	P (Panaset)	Avisert & Panaset
Crimp angle	∞	—	—	20°...45°
Crimp length	C	—	—	1.7 min.
Lead diameter	d	0.60 ± 0.1		
Disc diameter	D	11 max.		
Lead hole diameter	Do	4.0 ± 0.2		
Disc thickness	T	See Catalog		
Lead spacing	F	5.0 $^{+0.6}_{-0.2}$		
Component alignment, front-rear	Δh	0 ± 1		
Height of component from tape center	H	19.5 ± 0.5	16.5 ± 0.5 - 0	—
Height from tape center to crimp	Ho	—	—	16 + 0.5 - 0
Component height	H1	32.25 max.	$\begin{matrix} >23.5 \\ <32.25 \end{matrix}$	32.25 max.
Distance from component leads to tape bottom	ℓ_1	12 max.		
Tape width	W	18 $^{+1}_{-0.5}$		
Bonding tape width	W_3	5.5 min.		
Feed hole position	W_1	9.0 ± 0.5		
Pitch between discs	P	12.7 ± 1		
Feed hole pitch	Po	12.7 ± 0.3		
Hole center to lead	P1	3.85 ± 0.7		
Feed hole center to component center	P2	6.35 ± 1		
Tape + bonding tape thickness	t	0.7 ± 0.2		
Total tape thickness. including lead	t_2	1.5 max.		

PACKAGING



SHIPPING CONTAINER

