1.SCOPE

This Specification Shall be Applied to Multilayer Ceramic Chip Capacitors; ATOM XR Series.

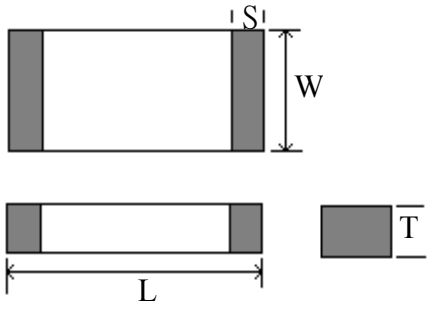
2.PART NUMBER SYSTEM

Example: CMK 3225 XR 2E 104K-G

CMK	3225	XR	2E	104	K	-	G
Product Type CMK HI.K SERIES	EIA CODE 1608 2012 3216 3225 4520 4532 5628	Dielectric XR=X7R HI.K SERIES	Voltage 2A=100V 2E=250V 2H=500V 2J=630V 3A=1KV 3D=2KV 3F=3KV	Capacitance Value in Pico farads Two significant figures followed by Number of Zeros 104=0.22uF	Capacitance Tolerance C=± 0.25PF D=±0.5PF J =±5% K=±10% M=±20%		Green Parts

3.DIMENSIONS m/m

SIZE CODE	L (Tolerance)	W (Tolerance)	T(MAX)	S(MIN)
1608(0603)	1.60±0.10	0.80±0.10	0.90	0.20
2012(0805)	2.00±0.20	1.25±0.20	1.30	0.50
3216(1206)	3.20±0.20	1.60±0.20	1.80	0.50
3225(1210)	4.50±0.25	2.00±0.20	1.80	0.50
4520(1808)	4.50±0.25	3.20±0.20	2.20	0.50
4532(1812)	4.50±0.25	3.20±0.20	1.80	0.50
5628(2211)	5.60±0.25	2.80±0.20	2.20	0.50



4.TMPERATURE CHARACTERISTICS

ΔC±15% MAX

5. OPERATING TEMPERTURE RANGE

T.C.	Min. Operating Temperature	Max. Operating Temperature	Reference Temperature
X7R	－ 55℃	125℃	25℃

6. STORING CONDITION AND TERM

5 to 40℃ at 20 to 70% RH. 6 months Max.

7. SPECIFICATIONS AND TEST METHOD Table 1

<table>
<tr><th>No.</th><th>Item</th><th>Specification</th><th>Test Method</th></tr>
<tr><td>1</td><td>Operation Temperature</td><td>-55℃~125℃</td><td></td></tr>
<tr><td>2</td><td>Appearance</td><td>No defects which may affect performance.</td><td>Inspect with magnifying glass (10×)</td></tr>
<tr><td>3</td><td>Dimension</td><td>The relevant detail specification Shall apply</td><td rowspan="2">Calipers and visually check</td></tr>
<tr><td>4</td><td>Capacitance</td><td>within specified tolerances</td></tr>
<tr><td>5</td><td>Dissipation Factor</td><td>Less than 2.5%</td><td>The capacitance Q D.F. shall be measured at 20℃, the frequency and Voltage shown as follows.
High dielectric constant type:
Measuring frequency: 1.0±0.2KHz
Measuring voltage:1.0±0.2 Vrms</td></tr>
<tr><td>6</td><td>Dielectric Strength</td><td>No defects or abnormalities after the test voltage is applied</td><td>Charge with the test voltage for 1 to 5 sec and the charging and discharging current must be under 50mA.
For rated voltage more than 1kv
test voltage: 120% of rated voltage
For rated voltage less than 1kv
test voltage:150% of rated voltage</td></tr>
<tr><td>7</td><td>Insulation Resistance</td><td>10,000 MΩ or 500 MΩ • u.F. Whichever is less</td><td>The insulation resistance shall be measured with Rated Voltage max 500V and within 60± 5 seconds of charging.</td></tr>
<tr><td>8</td><td>Temperature Characteristic of Capacitance</td><td>Capacitance chang(%) : ±15%</td><td>(1)Temperature Compensating Type:
The temperature coefficient is determined by using the capacitance measuring step3 as reference. When the temperature sequentially raise from step 1 through 5(-55 to 125℃), the Capacitance change shall be within the specified toleran
(2)High Dielectric Constant Type
The range of capacitance change compare to 25℃ value within –55 to 125℃ shall be within the specified range.
<table>
<tr><th>STEP</th><th>Temperaturre (℃)</th></tr>
<tr><td>1</td><td>25±2</td></tr>
<tr><td>2</td><td>Min. Operating Temp ±3</td></tr>
<tr><td>3</td><td>25±2</td></tr>
<tr><td>4</td><td>Max. Operating Temp ±2</td></tr>
<tr><td>5</td><td>25±2</td></tr>
</table>
</td></tr>
</table>

Table 2

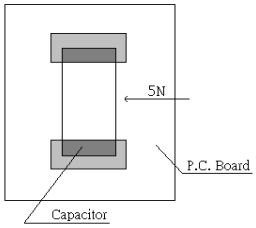
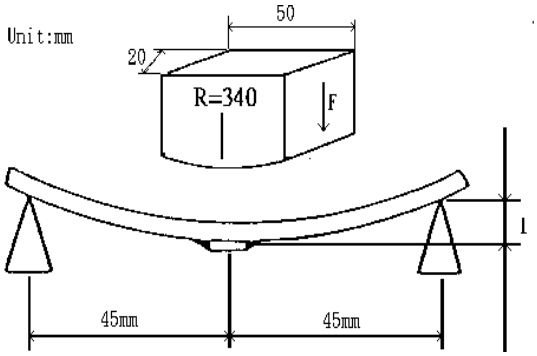
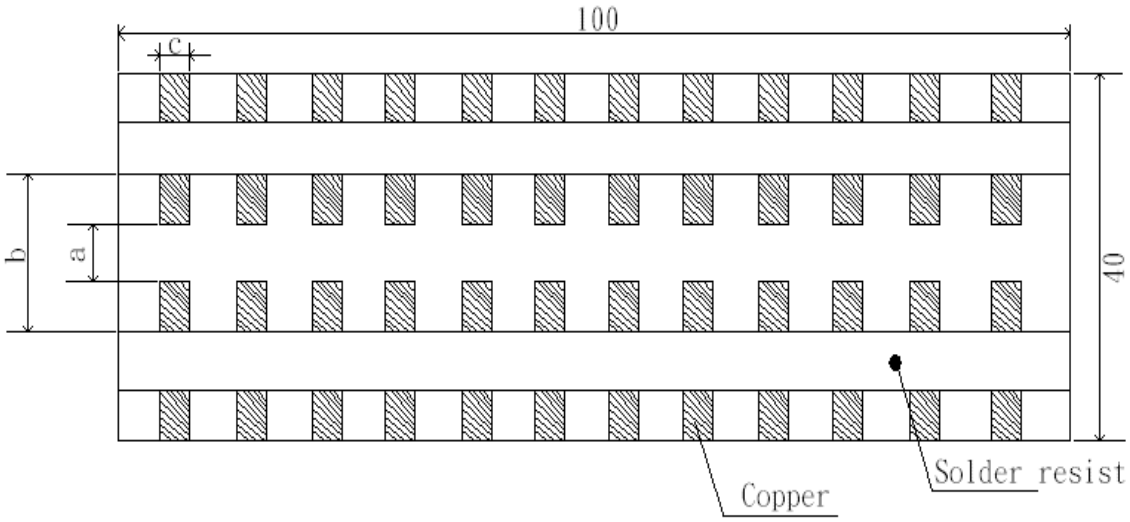
No.	Item	Specification	Test Method
9	Adhesive Strength of termination	No sign of termination coming off, breaking of ceramic, or other abormal signs.	Solder a specimen on the testing jig shown on the left and apply a force of 5N(0.51kgF) for 10±1s in the direction indicated by the arrow. 
10	Deflection	No mechanical damage.	Add load at a speed of about 0.5mm per second until flexion amount reaches 1mm. Have a capacitance meter connected to both ends of sample during testing 
11	Solderability of Termination	At least 95% of electrode on each surface of terminal is covered by new solder	Preheating temperature :80 to 120℃ Preheating duration : 10 to 30 sec Completely soak both terminal electrodes in solder at 235± 5℃ for 2±0.5 s. Solder : PF-350B(Lead Free) Flux : A-226L9
12	Resistance to solder heat	Appearance : No Serious defects Capacitance change Within±7.5% D.F.:2.5% or less IR:10,000 MΩ or 500 MΩ • u.F. Whichever is less Dielectric strength: No problem observed	After heated at 150℃+0℃/-10℃ for 1 hrs and keep at room temperature with normal humidity for 24±2houre measure the initial value. Then immerse the part in 260℃±5℃ Solder for 10±0.5 seconds and keep at room temperature with normal humidity for 24±2 hours The capacitance value. Note: Preheating before immersion Continuous for 5628 size 1st:100~120℃ for 1~2min. 2nd:170~200℃ for 1~2min

Table 3

<table>
<tr><th>No.</th><th>Item</th><th>Specification</th><th colspan="3">Test Method</th></tr>
<tr><td rowspan="7">13</td><td rowspan="7">Temperature cycle</td><td rowspan="2">Appearance : No Serious defects Capacitance change</td><td>Step</td><td>Temperature</td><td>Time</td></tr>
<tr><td rowspan="5">Within±7.5%
D.F.:2.5% or less</td><td>1</td><td>Lower limit temp</td><td>30min</td></tr>
<tr><td>2</td><td>Room temp</td><td>3min</td></tr>
<tr><td>3</td><td>Upper limit temp</td><td>30min</td></tr>
<tr><td>4</td><td>Room temp</td><td>3min</td></tr>
<tr><td rowspan="2">IR:10,000 MΩ or 500 MΩ・u.F.
Whichever is less
Dielectric strength: No problem observed</td><td colspan="3" rowspan="2">One cycle is formed from these four temperatures in the above order. The cycle is repeated t times.
Lower limit temp :(-25℃)
Upper limit temp :(+85℃)
Solder the capacitors on a P.C. Board shown in Fig.1 before testing.
Leave the capacitors in ambient condition for 48±4hrs before measurement.</td></tr>
<tr><td rowspan="3">14</td><td rowspan="3">Humidity</td><td>Appearance : No Serious defects Capacitance change</td></tr>
<tr><td>Within±12.5%
D.F.:5% or less</td><td colspan="3" rowspan="2">Test temperture:65±2℃ Relative humidity:90~95%
Testing time:1000+48/-0 hours 100% of rated voltage is applied.</td></tr>
<tr><td>IR:10,000 MΩ or 500 MΩ・u.F.
Whichever is less
Dielectric strength: No problem observed</td></tr>
<tr><td rowspan="3">15</td><td rowspan="3">Life</td><td>Appearance : No Serious defects Capacitance change</td><td colspan="3" rowspan="3">After charged with 120% of rated voltage at the maximum operating temperature for 1000+48/-0 hors,and kept at room temperature and normal humidity for 48±4 hours the part will satisfy the specifications.</td></tr>
<tr><td>Within±12.5%
D.F.:4% or less</td></tr>
<tr><td>IR:10,000 MΩ or 500 MΩ・u.F.
Whichever is less
Dielectric strength: No problem observed</td></tr>
</table>

Fig.1: Temperature cycle and Humidity test.



The a ,b and c is depedent on product size.

Material: Glass Epoxy (JIS C6484 GE4)
Thickness: 1.6mm

8.Capactance Range and Weight per pc

CMK 1608(0603) SERIES

Thickness (mm)	Rated Voltage(V)	CAPACITANCE (pF)	Weight g/pc Typical
0.80±0.10	100	220 ~ 10000	0.0058
0.80±0.10	250	220 ~ 4700	0.0058

CMK 2012(0805) SERIES

Thickness (mm)	Rated Voltage(V)	CAPACITANCE (pF)	Weight g/pc Typical
0.60±0.10	100	220 ~ 270	0.0084
0.80±0.10	100	330 ~ 4700	0.0099
1.00±0.15	100	5600 ~ 6800	0.0159
0.80±0.10	100	8200 ~ 18000	0.0099
1.00±0.15	100	22000 ~ 27000	0.0159
1.20±0.15	100	33000 ~ 47000	0.0193
0.60±0.10	250	220 ~ 270	0.0084
0.80±0.10	250	330 ~ 18000	0.0099
1.20±0.15	250	22000	0.0193
0.60±0.10	500	220 ~ 270	0.0084
0.80±0.10	500	330 ~ 1200	0.0099
1.00±0.15	500	1500 ~ 1800	0.0159
1.20±0.15	500	2200 ~ 4700	0.0193
0.80±0.10	1000	220 ~ 330	0.0099
1.00±0.15	1000	390 ~ 470	0.0159
1.20±0.15	1000	560 ~ 1500	0.0193

CMK 3216(1206) SERIES

Thickness (mm)	Rated Voltage(V)	CAPACITANCE (pF)	Weight g/pc Typical
0.80±0.10	100	33000 ~ 100000	0.0246
0.80±0.10	250	10000 ~ 47000	0.0246
0.80±0.10	500	220 ~ 2700	0.0246
1.00±0.15	500	3300 ~ 4700	0.0328
1.20±0.15	500	5600 ~ 8200	0.0353
1.60±0.20	500	10000 ~ 22000	0.0484
0.80±0.10	1000	100	0.0246
0.80±0.10	1000	220 ~ 1500	0.0246
1.20±0.15	1000	1800 ~ 10000	0.0353
1.20±0.15	2000	220 ~ 1500	0.0353
1.60±0.20	2000	1800 ~ 2200	0.0484

CMK 3225(1210) SERIES

Thickness (mm)	Rated Voltage(V)	CAPACITANCE (pF)	Weight g/pc Typical
0.80±0.10	100	100000	0.0387
1.00±0.15	100	120000 ~ 150000	0.0484
1.20±0.15	100	180000 ~ 220000	0.0602
0.80±0.10	250	68000 ~ 100000	0.0387
1.00±0.15	250	120000 ~ 150000	0.0484
1.20±0.15	250	220000	0.0602
1.20±0.15	500	22000 ~ 27000	0.0602
1.60±0.20	500	33000 ~ 39000	0.0849
2.00±0.20	500	47000	0.1038
1.20±0.15	1000	10000 ~ 22000	0.0602
1.20±0.15	2000	2700 ~ 4700	0.0602

CMK 4520(1808) SERIES

Thickness (mm)	Rated Voltage(V)	CAPACITANCE (pF)	Weight g/pc Typical
1.20±0.15	1000	220 ~ 6800	0.0780
1.60±0.20	1000	8200 ~ 18000	0.0909
1.20±0.20	2000	220 ~ 3300	0.0780
1.60±0.20	3000	220 ~ 1000	0.0909

CMK 4532(1812) SERIES

Thickness (mm)	Rated Voltage(V)	CAPACITANCE (pF)	Weight g/pc Typical
1.20±0.15	100	100000 ~ 470000	0.1224
1.60±0.20	100	680000	0.1353
1.20±0.15	250	47000 ~ 120000	0.1224
1.60±0.20	250	150000 ~ 330000	0.1353
1.20±0.15	500	4700 ~ 27000	0.1224
1.60±0.20	500	33000 ~ 82000	0.1353
1.20±0.15	1000	100 ~ 12000	0.1224
1.60±0.20	1000	15000 ~ 22000	0.1353
1.20±0.15	2000	100 ~ 4700	0.1224
1.60±0.20	3000	100 ~ 1800	0.1353

CMK 5628(2211) SERIES

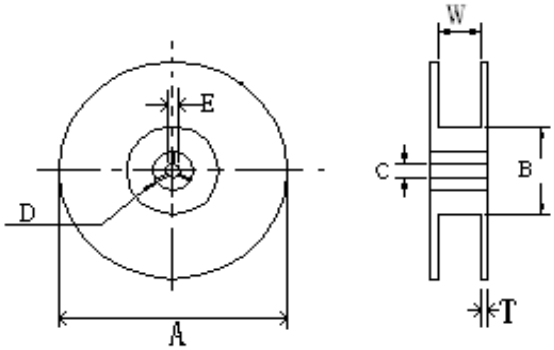
Thickness (mm)	Rated Voltage(V)	CAPACITANCE (pF)	Weight g/pc Typical
2.00±0.20	3000	220 ~ 2700	0.1869

9.PACKING INFORMATION

Standard Packing Quantity

Chip Size	Thickness (mm)	Max Carrier Thickness (In 7" Reel)	Quantity of Cardboard Tape(In 7" Reel)	Quantity of Embossed Tape
1608(0603)	0.80±0.10	0.95mm	4000	—
2012(0805)	0.60±0.10	0.75mm	4000	—
	0.80±0.10	0.90mm	4000	—
	1.00±0.15	1.20mm	4000	—
	1.20±0.15	1.35mm	4000	2000
3216(1206)	0.60±0.10	0.85mm	—	4000
	0.80±0.10	1.04mm	—	4000
	1.00±0.15	1.25mm	—	3000
	1.20±0.15	1.25mm	—	3000
	1.60±0.20	1.85mm	—	2000
3225(1210)	0.80±0.10	1.07mm	—	3000
	1.00±0.15	1.27mm	—	3000
	1.20±0.15	1.55mm	—	2500
	1.60±0.20	1.74mm	—	2000
4520(1808)	1.20±0.15	1.85mm	—	2000
	1.60±0.20	2.20mm	—	2000
4532(1812)	1.20±0.15	1.40mm	—	1000
	1.60±0.20	1.85mm	—	1000
	2.00±0.20	2.20mm	—	1000
5628(2211)	2.00±0.20	2.20mm	—	500

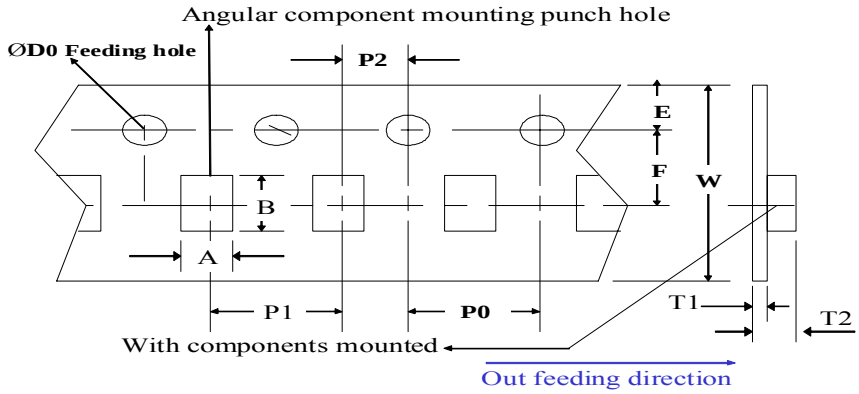
Reel for Taping



Dimension(mm)

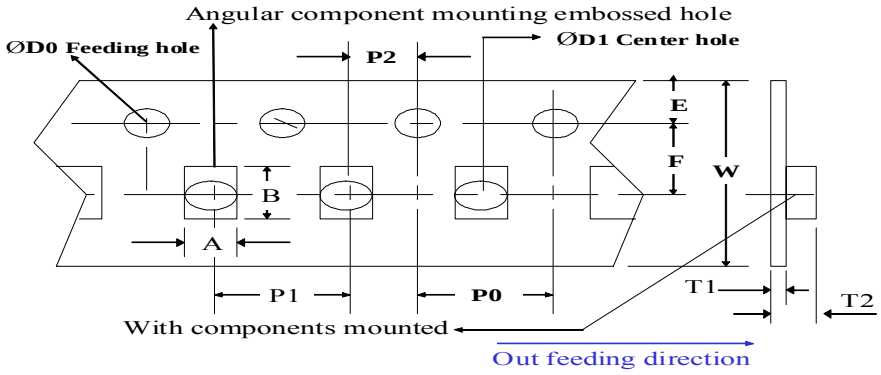
TAPE WIDTH	A	B	C	D	E	W	T
8	178±2.0	50min	13.0±0.2	20min	1.5min	10.0±1.5	0.8±0.2
12	329±2.0	50min	13.0±0.2	20min	1.5min	13.5±1.5	2.5±0.5
8	329±2.0	50min	13.0±0.2	20min	1.5min	17.5±1.5	2.5±0.5

Paper Taping



Symbol		A	B	W	F	E	P1	P2	P0	ψD0	T1	T2
Size Code	1608(0603)	1.00 ±0.2	1.80 ±0.2	8.00 ±0.2	3.50 ± 0.05	1.80 ±0.1	4.00 ±0.1	2.00 ± 0.05	4.00 ±0.1	1.50 +0.1 -0	1.1 max	1.4 max
Dim(mm)	2012(0805)	1.65 ±0.2	2.40 ±0.2									
	3216(1206)	2.00 ±0.2	3.60 ±0.2									

Embossed Taping



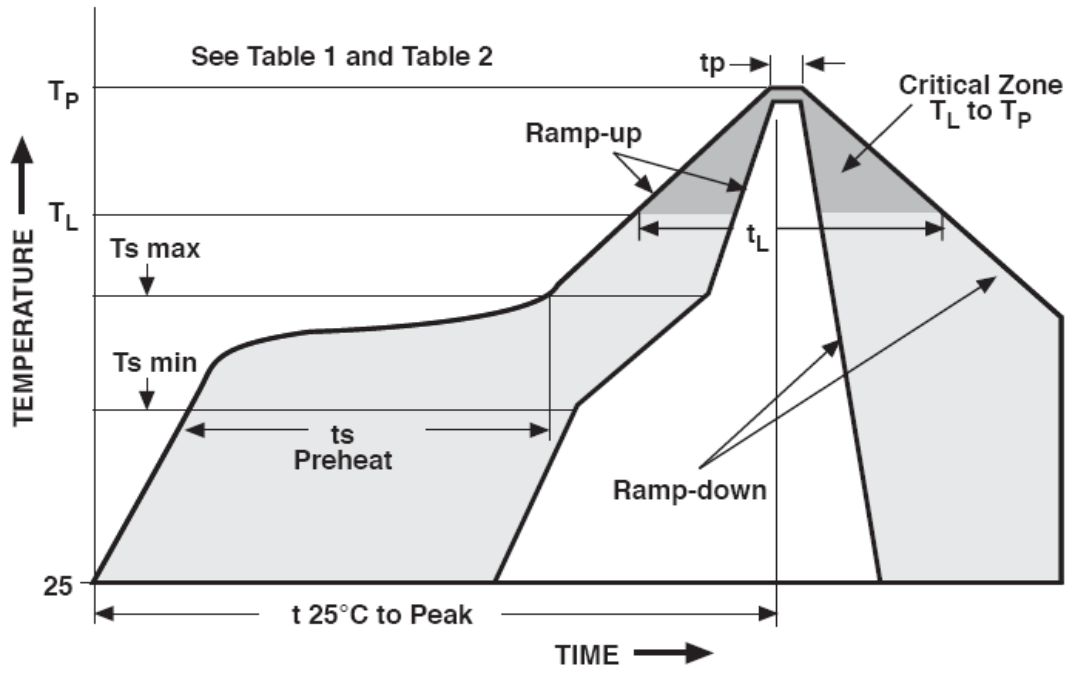
Symbol		A	B	W	F	E	P1	P2	P0	ψD0	T1	T2
Size Code	2012(0805)	1.65 ±0.2	2.40 ±0.2	8.00 ±0.2	3.50 ± 0.05	1.75 ±0.1	4.00 ±0.1	2.00 ± 0.05	4.00 ±0.1	1.50 +0.1 -0	0.6 max	3.0 max
Dim(mm)	3216(1206)	1.95 ±0.2	3.60 ±0.2									
	3225(1210)	2.80 ±0.2	3.60 ±0.2									
	4520(1808)	2.40 ±0.2	4.90 ±0.2	12.0 ±0.3	5.50 ± 0.10	1.75 ±0.1	8.00 ±0.1	2.00 ± 0.10	4.00 ±0.1	1.50 +0.1 -0	0.6 max	6.5 max
	4532(1812)	3.60 ±0.2	4.90 ±0.2									
	5628(2211)	3.20 ±0.2	6.00 ±0.2	12.0 ±0.3	5.50 ± 0.10	1.75 ±0.1	8.00 ±0.1	2.00 ± 0.10	4.00 ±0.1	1.50 +0.1 -0	0.6 max	6.5 max

Sordering Application

IR Reflow Profile

Profile Feature		Lead-free Assembly
Average ramp-up rate (Ts max to TP)		1°C/sec~4°C/sec
Preheat：		
	Temperature Minimum (Tsmin)	150
	Temperature Maximum (Tsmax)	200
	Time (min to max) (ts)	60~180 sec
T_{smax} to T_L		ND
Time maintained above:		
	Temperature (TL)	220°C
	Time (tL)	Above 100 seconds
Peak Temperature		260°C+0/-5°C
Time within 5°C of actual peak temperature (tp)		10 seconds
Ramp-down rate		6°C/sec
Time 25°C to peak temperature		8 minutes

Note:"ND" means "not defined by client".
Test Method:Reference to MIL-STD-202G Method 10F Condition K



15-Jan-05