1. INTRODUCTION

To fill the function gap of carbon film resistors, metal oxide film resistors or wirewound resistors SYNTON-TECH mages metal film resistors. The resistive element is a high contests of AL203 ceramic rod on which a thin film of Ni/Cr alloy is deposited by vacuum sputtering system. Then contact caps are pressed onto the ends of the rod and a helical grove cut through the film to give the required resistance value. Connecting copper wire are welded to the end caps. Finally the resistors are coated with multiple layers of insula- tion lacquer. **SYNTON-TECH's** MF series are suitable for all circuit applications especially tighter tolerance and low temperature coefficient are required.

2. FEATURES

- Meet American military specification MIL-R-10509F!
- Very low current noise!
- Major applications are switching power supplies, communications equipment, monoitors, testing meters.

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3. EXPLANATIONS OF ORDERING CODE

DESCRIPTION : MF 1/4W 1% 100Ω

SYNTON CODE : MF 025 F 1000 T

SERIES	POWER	TOLERANCE	RESISTANCE	PACKAGE
METAL FILM FIXED RESISTOR	012 : 1/8W 025 : 1/4W 040S : 0.4W 033S : 1/3W 050S : 1/2W 060S : 0.6W 050 : 1/2W 100 : 1W 200 : 2W 300S : 3W 500SS:5W 100[S] : 1W small Size 200[B] : 2W big Size (Please see detail of Figure1)	F : ±1% D : ±0.5% C : ±0.25% B : ±0.1% A : ±0.05% AA : ±0.01% J : ±5%	VALUE E96 Series 1% 4 Digits : 2R20 : 2.2Ω 1000 : 100Ω 1002 : 10K 1004 : 1M E24 Series 5% 3 Digits : 2R2 : 2.2Ω 101 : 100Ω 103 : 10K 105 : 1M (Please see detail of Figure7)	T=Tape Box S=Tape 26mm TR=Tape Reel B=Bulk M / MK / MB= Forming horizontal type F / FK / FKK= Forming vertical type (Please see detail of Figure4&5.6)

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4. ELECTRICAL CHARACTERISTICS

TYPE	MF-12	MF-25S	MF-40S	MF-33S	MF-25	MF-50S	MF-60S	MF-50	MF-100S	MF-100	MF-200S	MF-200	MF-300S	MF-500SS
Power Rating at 70℃	1/16W 1/8W 1/6W	1/4W	0.4W	1/3W	1/4W	1/2W	0.6W	1/2W	1W	1W	2W	2W	3W	5W
Operating Temp. Range	—55℃～+155℃													
Maximun Working Volt.	200V	250V	350V	250V	250V	350V	350V	350V	500V	500V	500V	500V	500V	500V
Maximun Overload Volt.	400V	500V	700V	500V	500V	700V	700V	700V	1000V	1000V	1000V	1000V	1000V	1000V
Dielectric withstanding Volt.	400V	500V	700V	500V	500V	700V	700V	700V	1000V	1000V	1000V	1000V	1000V	1000V
Value Range ±0.5%. ±1%	STANDARD 10Ω~1MΩ													
	SPECIAL Low to 0.1Ω high to 30MegΩ													
±0.25%	100Ω~100KΩ													
±0.1%	100Ω~47KΩ													
	SPECIAL VALUES AVAILABLE UPON REQUEST													
Temp. Coefficient	±10ppm/℃、±15ppm/℃、±25ppm/℃、±50ppm/℃、±100ppm/℃													

Figure 1

5. POWER RATING

(1)Power Derating : The rated power at the temperature in excess of 70℃ shall be derated in accordance with figure2

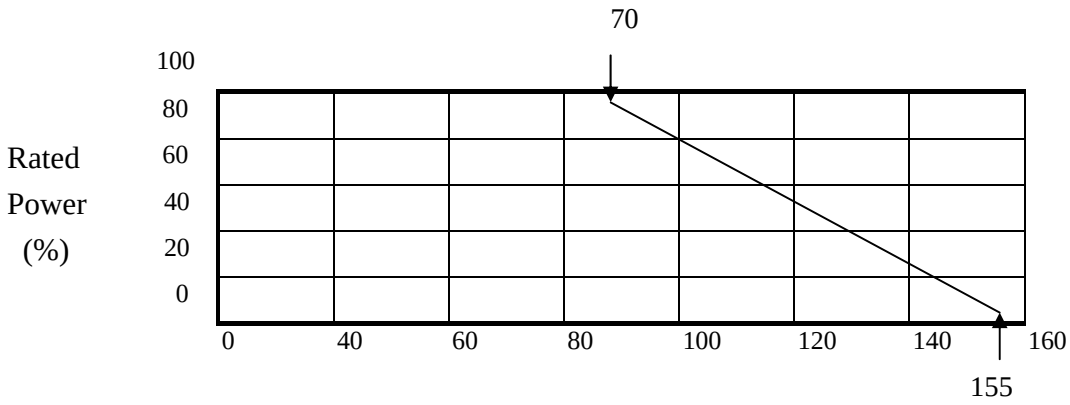
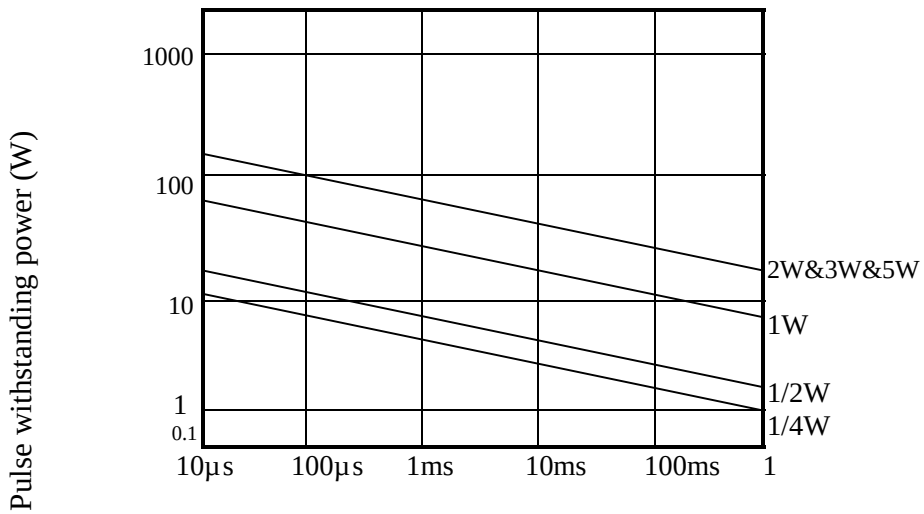


Figure2

(2)Pulse Loading Characteristics



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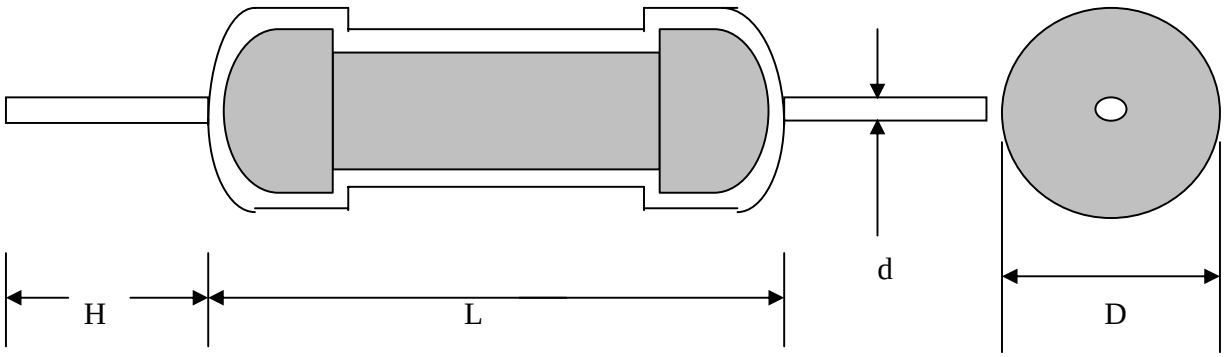
(2)Rated Voltage : The DC or AC(rms) continuous working voltage corresponding to the rated power is determined by the following formula:

$$E = \sqrt{R \times P}$$

Where E : Continuous rated DC or AC (rms) working voltage (v)
P : Rated power (w)
R : Resistance value (Ω)

6. DIMENSIONS



Unit: m/m

TYPE	POWER	L	D	H	d
MF-12	1/16W 1/6W 1/8W	3.5 ± 0.3	1.8 ± 0.3	25 ± 3	0.43 ± 0.05
MF-25S	1/4W				
MF-40S	0.4W				
MF-33S	1/3W	6.0 ± 0.5	2.3 ± 0.3	25 ± 3	0.54 ± 0.1
MF-25	1/4W				
MF-50S	1/2W				
MF-60S	0.6W				
MF-50	1/2W	9.0 ± 0.5	3.2 ± 0.5	25 ± 3	0.58 ± 0.1
MF-100S	1W				
MF-100	1W	11 ± 1.0	4.5 ± 0.5	35 ± 3	0.75 ± 0.1
MF-200S	2W				
MF-200	2W	15 ± 1.0	5.0 ± 0.5	35 ± 3	0.75 ± 0.1
MF-300S	3W				
MF-500SS	5W				

Figure3

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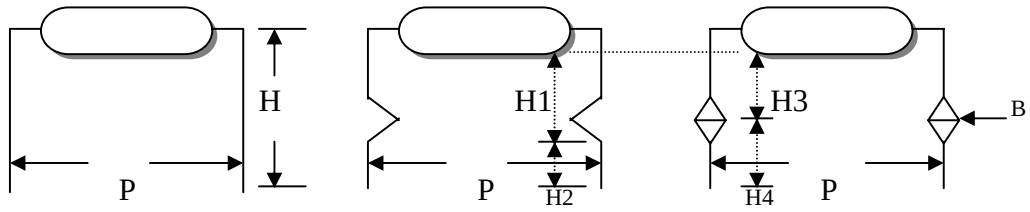
(1) FORMING PACKING

M / MK / MB= Forming horizontal type



M TYPE **MK TYPE** **MB TYPE**

Unit : m/m

TYPE	POWER	FORMING Type	P ± 1 (Min.)	H ±2.5 (Min.)	H1 ± 1 (Min.)	H2 ± 1 (Min.)	H3 ± 1 (Min.)	H4 ± 1 (Min.)
MF-12 MF-25S MF-40S	1/8W 1/4W 0.4W	M	5~	10~	—	—	—	—
MF-33S MF-25 MF-50S MF-60S	1/3W 1/4W 1/2W 0.6W	M	10~	10~	—	—	—	8~
		MK		—	8~	3~	—	—
MF-50 MF-100S	1/2W 1W	M	12.5~	10~	—	—	—	—
		MK.MB		—	8~	3~	8~	5~
MF-100 MF-200S	1W 2W	M	15~	10~	—	—	—	—
		MK.MB		—	8~	3~	8~	5~
MF-200 MF-300S	2W 3W	M	20~	10~	—	—	—	—
		MK MB		—	8~	3~	8~	5~

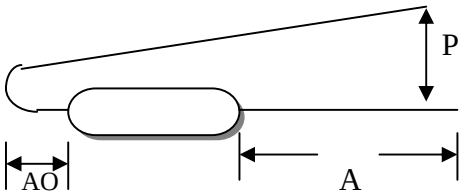
Remark : 1. B = 1.15 ~

2. ***ALTERNATE MARKING METHOD ALSO AVAILABLE ON REQUEST.***

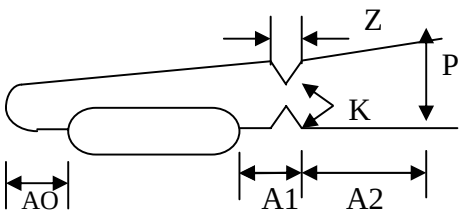
Figure4

(2) FORMING PACKING

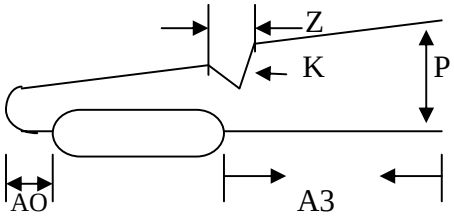
F / FK / FKK=Forming vertical type



F TYPE



FKK TYPE



FK TYPE

Unit : m/m

TYPE	POWER	FORMING Type	P ± 1 (Min.)	A ± 1 (Min.)	A1 ± 1 (Min.)	A2 ± 1 (Min.)	A3 ± 1 (Min.)	A0 ± 1 (Min.)
MF-12 MF-25S MF-40S	1/8W 1/4W 0.4W	F		25±3				3
MF-33S	1/3W	F	5~10	—	—	—	25±3	3
MF-25 MF-50S MF-60S	1/4W 1/2W 0.6W	FK FKK	5~10	—	4	3	5~	3
MF-50 MF-100S	1/2W 1W	F	5~10	5~	—	—		3
		FK	5~10				25±3	
		FK FKK	5~10		4	3	5~	3
MF-100 MF-200S	1W 2W	F	5~10	5~	—	—	—	3
		FK FKK	5~10	—	4	3	5~	3
MF-200 MF-300S	2W 3W	F	5~10	5~	—	—	—	3
		FK FKK	5~10	—	4	3	5~	3

Remark : 1. Z = 3 ±1. K = 2 ±0.5,

2. ***ALTERNATE MARKING METHOD ALSO AVAILABLE ON REQUEST.***

Figure5

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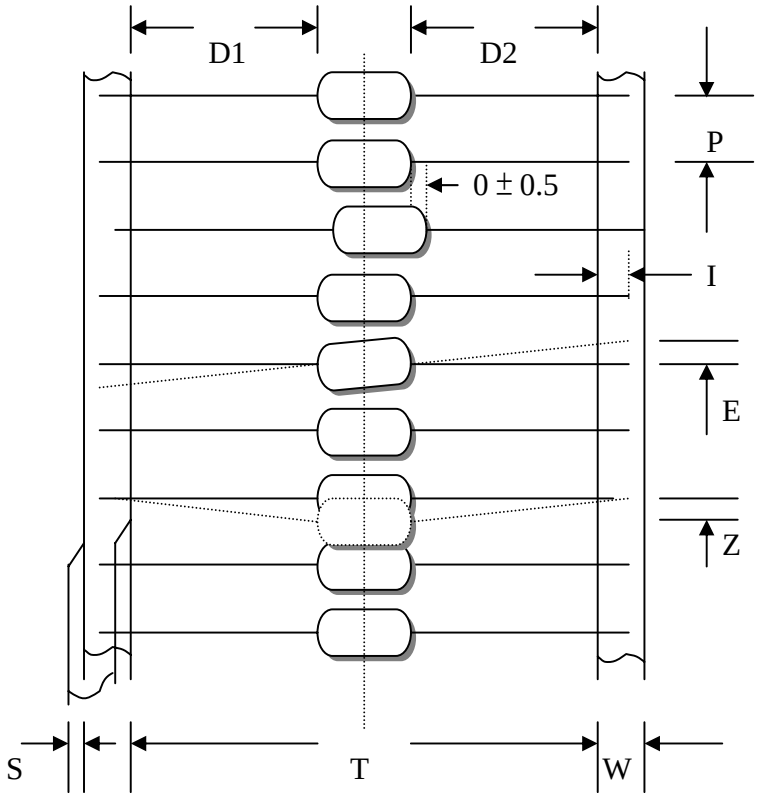
(3) TAPE PACKING (T-TYPE)



Unit:m/m

TYPE	SIZE	T	P ±0.5	W ±0.5	D_1-D_2 Max.	E Max.	Z Max.	S Max.	I Min.
MF-12 MF-25S MF-40S	T-26	26±1.0	5	6	0.8	1	1.2	1	3
	T-52	52±2.0	5	6	0.8	1	1.2	1	3
MF-33S MF-25 MF-50S MF-60S	T-26	26±1.0	5	6	1.0	1	1.2	1	3
	T-52	52±2.0	5	6	1.0	1	1.2	1	3
MF-50 MF-100S	T-52	52±2.0	5	6	1.2	1	1.2	1	3
MF-100 MF-200S	T-74	74±2.0	5	6	1.4	1	1.2	1	3
MF-200 MF-300S MF-500SS	T-74	74±2.0	10	6	1.4	1	1.2	1	3

Figure6

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7. CHARACTERISTICS

(1) Insulation Resistance

Test Method : Resistors shall be clamped in the trough of a 90 degree metallic V-block, apply DC 100V between this electrode and another lead wire for 1 minute.

Acceptance Standard : 1,000 M ohm above

(2) Terminal Strength

Test Method : Pull a resistor with a weight of 1 kg for 30 seconds. Bend the terminal lead wire with 500gs weight for 90 degree and bend it for 90 degree oppositely and return to normal.

Acceptance Standard : Resistance shall not change more than ±0.2%. No evidence of mechanical damage.

(3) Vibration

Test Method : Total amplitude of 1.5mm. The frequency shall vary from 10 HZ to 55 HZ, for approximate 1 second. Make this test in the direction parallel to the resistor axis, and up/down for 2 hours respectively. (altogether 6 hours.)

Acceptance Standard : Resistance shall not change more than ±0.25%. No evidence of mechanical damage.

(4) Short Time Overload

Test Method : Resistors shall be tested 2.5 times rated voltage for 5 seconde at ambient room temperature.

Acceptance Standard : Resistance shall not change more than ±0.5%. No evidence of mechanical damage.

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(5) Load Life

Test Method : Thermostatic chamber at a temperature of 70±5℃ under a rated DC voltage for 1.5 hours on and 1/2 hour off repeat this cycle for 1000±12 hours.

Acceptance Standard : Resistance shall not change more than ±1.5%.
No evidence of mechanical damage.

(6) Moisture Resistance

Test Method : At temperature of 40±2℃ and a relative humidity of 90-95% for 1000±12 hours, under a rating DC voltage for hours on and 1/2 hour off.

Acceptance Standard : Resistance shall not change more than ±1%.
No evidence of mechanical damage.

(7) Temperature Cycling

Test Method :

STEP	1	2	3	4
TEMP	-55±3℃	20±5℃	85±2℃	20±5℃
TIME	30min.	10~15min.	30min.	10~15min.

Form 1 to 4 is a cycle as shown above, repeat 5 cycles
Measure resistance after 1 hour in normal temperature.

Acceptance Standard : Resistance shall not change more than ±0.5%.
No evidence of mechanical damage.

(8) Resistance to Soldering Heat

Test Method : Immerse each terminal wire of a resistor up to 4±0.8mm away from the resistor body in the solder tank at 350±10℃ for 3±0.5 seconds.
Measure resistance in 3 hours.

Acceptance Standard : .Resistance shall not change more than ±0.25%.
No evidence of mechanical damage.

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(9) Resistance to Solvent

Test Method : immerse a resistor completely in reagent at a temperature of 20~25℃ for 30±5 seconds.

Acceptance Standard : No evidence of mechanical damage.

(10) Dielectric Withstanding Voltage

Test Method : Resistors shall be clamped in the trough of a 90 degree metallic V-black, apply AC between this electrode and another lead wire for 1 minute.

Acceptance Standard : Resistance shall not change more than ±0.5%. No evidence of mechanical damage.

(11) Solderability

Test Method : apply flux to the terminal wire of a resistor up to 4±0.8mm away from the resistor body and immerse the flux applied portion in the solder tank at 260±5℃ for 3±0.5 seconds

Acceptance Standard : more than 95% of a circumference of the immersed portion shall be completely covered with new solder.

(12) Discontinuous Overload

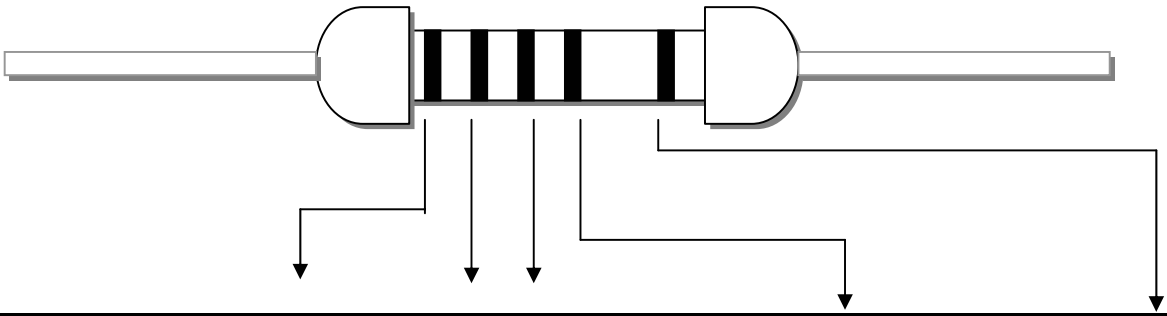
Test Method : 3 times power rating . 1 second on 25 seconds off cycles 1000 $^{+100}_{0}$.

Acceptance Standard : Resistance shall not change more than ±(0.5%.+0.05Ω).

- **Rated continuous Working Voltage (RCWV)**

= $\sqrt{\textbf{power rating} \times \textbf{resistance value}}$

8. COLOR CODING



Color	1st, 2nd 3rd (Significant Figure)			(Multiplier)	(Tolerance)
Black	0	0	0	10^0	—
Brown	1	1	1	10^1	F (±1%)
Red	2	2	2	10^2	G (±2%)
Orange	3	3	3	10^3	—
Yellow	4	4	4	10^4	—
Green	5	5	5	10^5	D (±0.5%)
Blue	6	6	6	10^6	C (±0.25%)
Violet	7	7	7	10^7	B (±0.1%)
Gray	8	8	8	10^8	A (±0.05%)
White	9	9	9	10^9	AA (±0.01%)
Gold	—	—	—	10^{-1}	J (±5%)
Silver	—	—	—	10^{-2}	—

Figure7

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Test Report

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SYNTON-TECH CORPORATION
16F-3, NO. 79, FAR EAST WORLD CENTER SEC. 1, HSIN TAI WU ROAD, HSI-CHIH, TAIPEI COUNTY, TAIWAN, R. O. C.
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

The following sample(s) was/were submitted and identified by/on behalf of the client as :

Sample Description	:	METAL FILM FIXED RESISTORS (EPOXY COATING)
Style/Item No.	:	MF, FMF TYPE
Sample Receiving Date	:	2008/07/30
Testing Period	:	2008/07/30 TO 2008/08/06

Test Requested : In accordance with the RoHS Directive 2002/95/EC, and its amendment directives.

Test Method : With reference to IEC 62321/2nd CDV (111/95/CDV) Procedures for the Determination of Levels of Regulated Substances in Electrotechnical Products.

(1) Determination of Cadmium by ICP-AES.
(2) Determination of Lead by ICP-AES.
(3) Determination of Mercury by ICP-AES.
(4) Determination of Hexavalent Chromium for non-metallic samples by UV/Vis Spectrometry.
(5) Determination of PBB and PBDE by GC/MS.

Test Result(s) : Please refer to next page(s).

Chenyu Kung / Operation Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory – Taipei

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(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

Test results by chemical method (Unit: mg/kg)

Test Item (s):	Method (Refer to)	Result No.1	MDL
Cadmium (Cd)	(1)	n.d.	2
Lead (Pb)	(2)	n.d.	2
Mercury (Hg)	(3)	n.d.	2
Hexavalent Chromium Cr(VI) by alkaline extraction	(4)	n.d.	2
Sum of PBBs	(5)	n.d.	-
Monobromobiphenyl		n.d.	5
Dibromobiphenyl		n.d.	5
Tribromobiphenyl		n.d.	5
Tetrabromobiphenyl		n.d.	5
Pentabromobiphenyl		n.d.	5
Hexabromobiphenyl		n.d.	5
Heptabromobiphenyl		n.d.	5
Octabromobiphenyl		n.d.	5
Nonabromobiphenyl		n.d.	5
Decabromobiphenyl		n.d.	5
Sum of PBDEs		n.d.	-
Monobromodiphenyl ether		n.d.	5
Dibromodiphenyl ether		n.d.	5
Tribromodiphenyl ether		n.d.	5
Tetrabromodiphenyl ether		n.d.	5
Pentabromodiphenyl ether		n.d.	5
Hexabromodiphenyl ether		n.d.	5
Heptabromodiphenyl ether		n.d.	5
Octabromodiphenyl ether		n.d.	5
Nonabromodiphenyl ether		n.d.	5
Decabromodiphenyl ether		n.d.	5

TEST PART DESCRIPTION:
NO.1 : MIXED ALL PARTS

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(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

Note : 1. mg/kg = ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit
4. "-" = Not Regulated
5. The sample(s) was/were analyzed on behalf of the applicant as mixing sample in one testing. The above result(s) was/were only given as the informality value.

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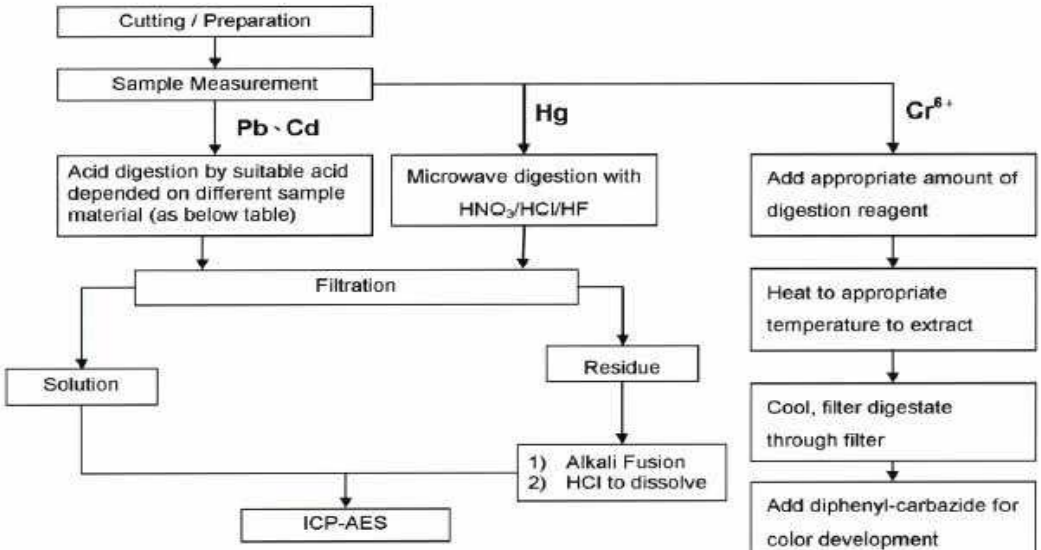
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

1) These samples were dissolved totally by pre-conditioning method according to below flow chart. (Cr^{6+} test method excluded)
2) Name of the person who made measurement: Climbgreat Yang
3) Name of the person in charge of measurement: Troy Chang



Sample Material	Digestion Acid
Steel, copper, aluminum, solder	Aqua regia, HNO_3, HCl, HF, H_2O_2
Glass	HNO_3/HF
Gold, platinum, palladium, ceramic	Aqua regia
Silver	HNO_3
Plastic	H_2SO_4, H_2O_2, HNO_3, HCl
Others	Any acid to total digestion

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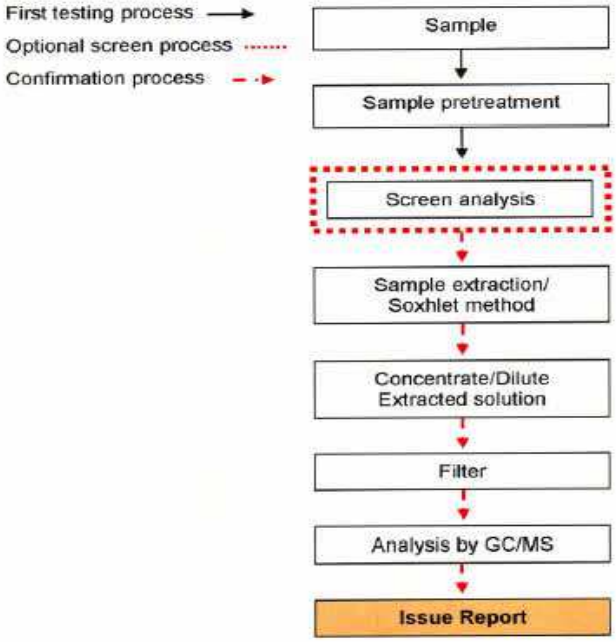
Test Report No. : CE/2008/78479 Date : 2008/08/06 Page : 5 of 6

SYNTON-TECH CORPORATION
16F-3, NO. 79, FAR EAST WORLD CENTER SEC. 1, HSIN TAI WU ROAD, HSI-CHIH, TAIPEI COUNTY, TAIWAN, R. O. C.
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

PBB/PBDE analytical FLOW CHART

1) Name of the person who made measurement: Roman Wong
2) Name of the person in charge of measurement: Shinjyh Chen



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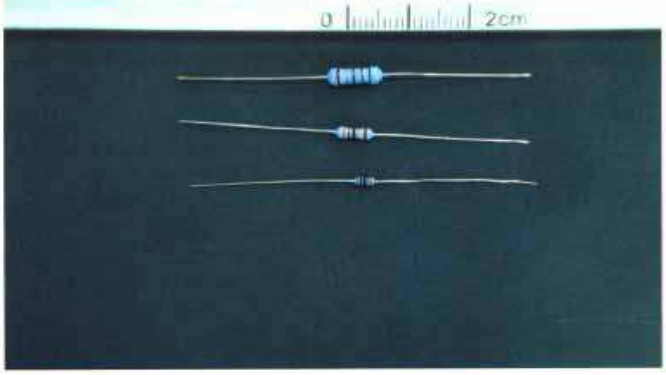
Test Report No. : CE/2008/78479 Date : 2008/08/06 Page : 6 of 6

SYNTON-TECH CORPORATION
16F-3, NO. 79, FAR EAST WORLD CENTER SEC. 1, HSIN TAI WU ROAD, HSI-CHIH, TAIPEI COUNTY, TAIWAN, R. O. C.
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

CE / 2008 / 78479



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Test Report

No. : CE/2008/60108 Date : 2008/06/09 Page : 1 of 5

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(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

The following sample(s) was/were submitted and identified by/on behalf of the client as :

Sample Description	:	METAL FILM FIXED RESISTORS (EPOXY COATING)
Style/Item No.	:	MF, FMF TYPE
Sample Receiving Date	:	2008/6/2
Testing Period	:	2008/6/2 TO 2008/6/9

==========

Test Result(s) : Please refer to next page(s).

Shin-Jyh Chen
Shinjyh Chen / Asst. Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory - Taipei

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TAIPEI COUNTY, TAIWAN, R. O. C.
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

Test Result(s)

PART NAME NO.1 : MIXED ALL PARTS OF BODY (2 SAMPLES)

Test Item (s):	Unit	Method	MDL	Result No.1
Tetrabromobisphenol A (TBBP-A) (CAS No.: 000079-94-7)	mg/kg	With reference to DIN 53313. Analysis was performed by GC/MS.	10	n.d.
Halogen	---	With reference to BS EN 14582:2007. Analysis was performed by IC method for F , Cl , Br, I content.	---	---
Halogen-Fluorine (F) (CAS No.: 007782-41-4)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Fluorine content.	50	n.d.
Halogen-Chlorine (Cl) (CAS No.: 007782-50-5)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Chlorine content.	50	78
Halogen-Bromine (Br) (CAS No.: 007726-95-6)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Bromine content.	50	n.d.
Halogen-Iodine (I) (CAS No.: 007553-56-2)	mg/kg	With reference to BS EN 14582:2007. Analysis was performed by IC method for Iodine content.	50	n.d.

Note : 1. mg/kg = ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit
4. "---" = Not Conducted
5. The sample(s) was/were analyzed on behalf of the applicant as mixing sample in one testing. The above result(s) was/were only given as the informality value.

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Test Report

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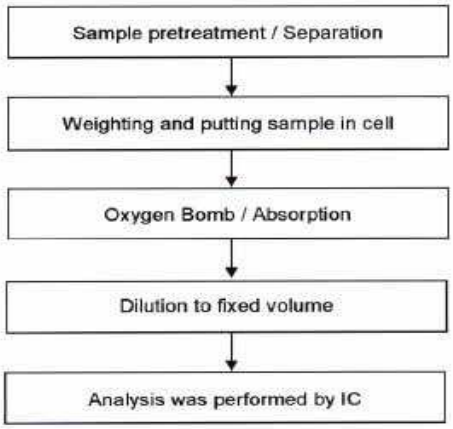
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

Analytical flow chart of halogen content

1) Name of the person who made measurement: Tin Lan
2) Name of the person in charge of measurement: Troy Chang



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Test Report No. : CE/2008/60108 Date : 2008/06/09 Page : 4 of 5

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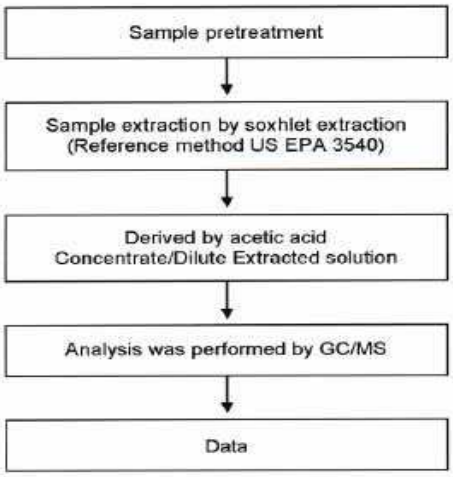
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG, CHINA)

TBBP-A analytical flow chart

1) Name of the person who made measurement: Amanda Fu
2) Name of the person in charge of measurement: Shinjyh Chen



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Test Report No. : CE/2008/60108 Date : 2008/06/09 Page : 5 of 5

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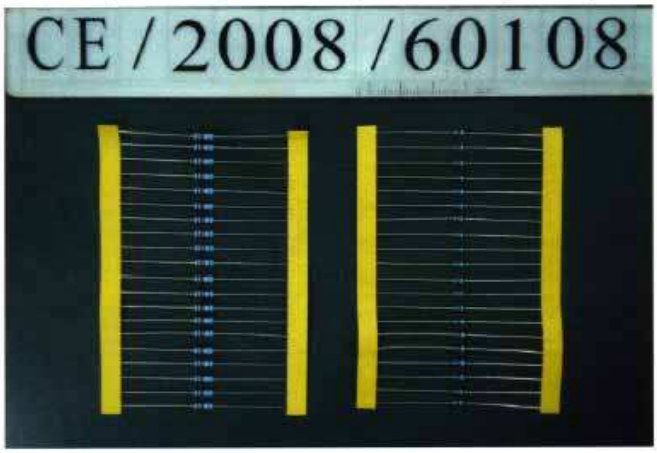

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Test Report

No. : CE/2008/35041A Date : 2008/05/16 Page : 1 of 4

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(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG,
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The following sample(s) was/were submitted and identified by/on behalf of the client as :

Sample Description	:	COLOR INK
Style/Item No.	:	BROWN
Sample Receiving Date	:	2008/03/14
Testing Period	:	2008/03/14 TO 2008/03/25

==========

Test Result(s) : Please refer to next page(s).

Shin-Jyh Chen
Shinjyh Chen / Asst. Manager
Signed for and on behalf of
SGS TAIWAN LTD.
Chemical Laboratory - Taipei

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Test Report

No. : CE/2008/35041A Date : 2008/05/16 Page : 2 of 4

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(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG,
CHINA)

Test Result(s)

PART NAME NO.1 : BROWN INK

Test Item (s):	Unit	Method	MDL	Result No.1
PFOS	mg/kg	With reference to US EPA 3540C : 1996 method for PFOS Content. Analysis was performed by LC/MS.	1	n.d.
PFOA	mg/kg	With reference to US EPA 3540C : 1996 method for PFOA Content. Analysis was performed by LC/MS.	1	n.d.

Note : 1. mg/kg = ppm
2. n.d. = Not Detected
3. MDL = Method Detection Limit

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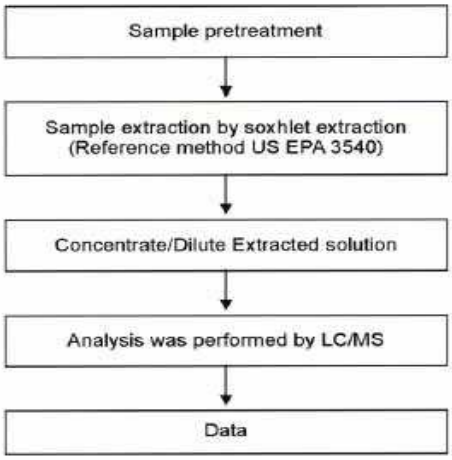
(DONG GUAN PLANT)
(SHUI KOU INDUSTRIAL ZONE, DA LANG, DONG GUAN, GUANG DONG,
CHINA)

Analytical flow chart of PFOA/PFOS content

1) Name of the person who made measurement: Carrie Liu
2) Name of the person in charge of measurement: Shinjyh Chen



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Test Report No. : CE/2008/35041A Date : 2008/05/16 Page : 4 of 4

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