Powerking Electronics (ShenZhen) Co., LTD.
深圳市柏健電子有限公司
地址：深圳市福虹路世贸广场C座2604-2605室 电话：86-755-83003169 、83003189 传真：86 755 83003179

受控

承认书

SPCEIFICATION FOR APPROVER

客户名称 (Customer Name) 迈科科技有限公司

日 期 (Date) 2008-04-18

品 牌(Brand) BCD

型 号(Parts No) AS358M-E1

客户签章(Customer' s Signature)

全部承认(Pull Approved) ______

日 期(Date) ______

General Description

The AS358/358A consist of two independent, high gain and internally frequency compensated operational amplifiers, they are specifically designed to operate from a single power supply. Operation from split power supply is also possible and the low power supply current drain is independent of the magnitude of the power supply voltages. Typical applications include transducer amplifiers, DC gain blocks and most conventional operational amplifier circuits.

The AS358/358A series are compatible with industry standard 358. AS358A has more stringent input offset voltage than AS358.

The AS358 is available in DIP-8, SOIC-8, TSSOP-8 and MSOP-8 packages. AS358A is available in DIP-8 and SOIC-8 packages.

Features

- Internally Frequency Compensated for Unity Gain
- Large Voltage Gain: 100dB (Typical)
- Low Input Bias Current: 20nA (Typical)
- Low Input Offset Voltage: 2mV (Typical)
- Low Supply Current: 0.5mA (Typical)
- Wide Power Supply Voltage:
  - Single Supply: 3V to 36V
  - Dual Supplies: ±1.5V to ±18V
- Input Common Mode Voltage Range Includes Ground
- Large Output Voltage Swing: 0V to V_{CC} -1.5V

Applications

- Battery Charger
- Cordless Telephone
- Switching Power Supply

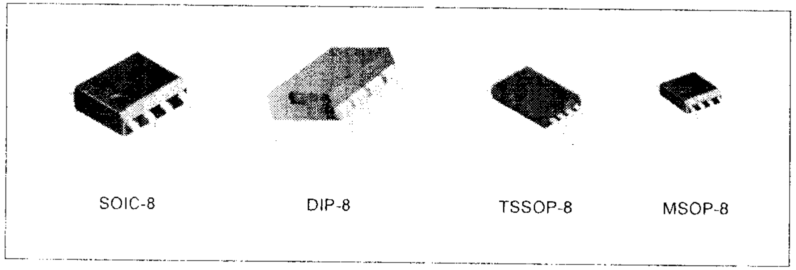


Figure 1. Package Types of AS358/358A

Pin Configuration

M/P/G/MM Package
(SOIC-8/DIP-8/TSSOP-8/MSOP-8)

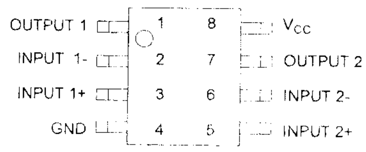


Figure 2. Pin Configuration of AS358/358A (Top View)

Functional Block Diagram

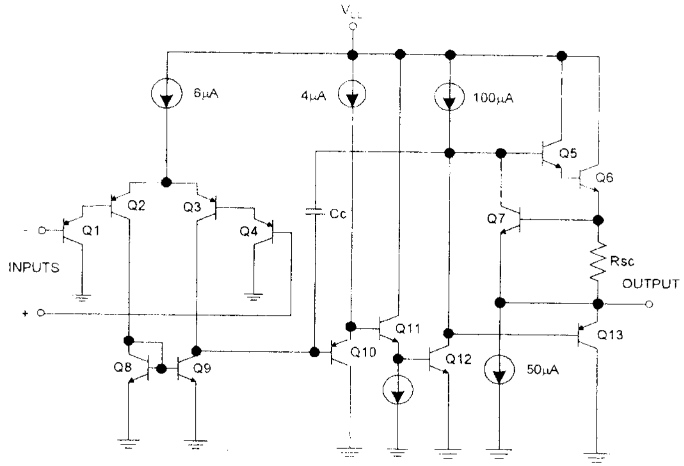


Figure 3. Functional Block Diagram of AS358/358A
(Each Amplifier)

Ordering Information

AS358□ □ □ - □

- Circuit Type: Blank: AS358; A: AS358A
- Package: M: SOIC-8; P: DIP-8; G: TSSOP-8; MM: MSOP-8
- TR: Tape and Reel; Blank: Tube
- E1: Lead Free; Blank: Tin Lead

Package	Temperature Range	Part Number		Marking ID		Packing Type
		Tin Lead	Lead Free	Tin Lead	Lead Free	
SOIC-8	-40 to 85°C	AS358M	AS358M-E1	AS358M	AS358M-E1	Tube
		AS358MTR	AS358MTR-E1	AS358M	AS358M-E1	Tape & Reel
			AS358AM-E1		AS358AM-E1	Tube
			AS358AMTR-E1		AS358AM-E1	Tape & Reel
DIP-8	-40 to 85°C	AS358P	AS358P-E1	AS358P	AS358P-E1	Tube
			AS358AP-E1		AS358AP-E1	Tube
TSSOP-8	-40 to 85°C		AS358G-E1		EG3A	Tube
			AS358GTR-E1		EG3A	Tape & Reel
MSOP-8	-40 to 85°C		AS358MM-E1		AS358MM-E1	Tube
			AS358MMTR-E1		AS358MM-E1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value		Unit
Power Supply Voltage	V_{CC}	40		V
Differential Input Voltage	V_{ID}	40		V
Input Voltage	V_{IC}	-0.3 to 40		V
Power Dissipation (T_A=25°C)	P_D	DIP-8	830	mW
		SOIC-8	550	
		TSSOP-8	500	
		MSOP-8	470	
Operating Junction Temperature	T_J	150		°C
Storage Temperature Range	T_{STG}	-65 to 150		°C
Lead Temperature (Soldering, 10 Seconds)	T_{LEAD}	260		°C

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{CC}	3	36	V
Ambient Operating Temperature Range	T_A	-40	85	°C

Electrical Characteristics

Limits in standard typeface are for T_A=25°C, **bold** typeface applies over -40°C to 85°C (Note 2). V_{CC}=5V, GND=0V, unless otherwise specified.

Parameter		Symbol	Test Conditions		Min	Typ	Max	Unit
Input Offset Voltage		V_{IO}	V_O=1.4V, R_S=0Ω, V_{CC}=5V to 30V	AS358		2	5	mV
							7	
				AS358A		2	3	
							5	
Average Temperature Coefficient of Input Offset Voltage		$\Delta V_{IO}/\Delta T$	T_A=-40 to 85°C			7		μV/°C
Input Bias Current		I_{BIAS}	$I_{IN}+$ or $I_{IN}-$, V_{CM}=0V			20	200	nA
							200	
Input Offset Current		I_{IO}	$I_{IN}+$ - $I_{IN}-$, V_{CM}=0V			5	30	nA
							100	
Input Common Mode Voltage Range (Note 3)		V_{IR}	V_{CC}=30V		0		V_{CC}-1.5	V
Supply Current		I_{CC}	T_A=-40 to 85°C, R_L=∞, V_{CC}=30V			0.7	2	mA
			T_A=-40 to 85°C, R_L=∞, V_{CC}=5V			0.5	1.2	
Large Signal Voltage Gain		G_V	V_{CC}=15V, V_O=1V to 11V, R_L ≥ 2kΩ		85	100		dB
					80			
Common Mode Rejection Ratio		CMRR	DC, V_{CM}=0V to (V_{CC}-1.5)V		60	70		dB
					60			
Power Supply Rejection Ratio		PSRR	V_{CC}=5V to 30V		70	100		dB
					60			
Channel Separation		CS	f=1kHz to 20kHz			-120		dB
Output Current	Source	I_{SOURCE}	$V_{IN}+$=1V, $V_{IN}-$=0V, V_{CC}=15V, V_O=2V		20	40		mA
					20			
	Sink	I_{SINK}	$V_{IN}+$=0V, $V_{IN}-$=1V, V_{CC}=15V, V_O=2V		10	15		mA
					5			
			$V_{IN}+$=0V, $V_{IN}-$=1V, V_{CC}=15V, V_O=0.2V		12	50		μA
Output Short Circuit Current to Ground		I_{SC}	V_{CC}=15V			40	60	mA
Output Voltage Swing		V_{OH}	V_{CC}=30V, R_L=2kΩ		26			V
					26			
			V_{CC}=30V, R_L=10kΩ		27	28		
					27			
		V_{OL}	V_{CC}=5V, R_L=10kΩ			5	20	mV
							30	

Note 2: Limits over the full temperature are guaranteed by design, but not tested in production

Electrical Characteristics (Continued)

Note 3: The input common-mode voltage of either input signal voltage should not be allowed to go negatively by more than 0.3V (at 25°C). The upper end of the common-mode voltage range is V_{CC}-1.5V (at 25°C), but either or both inputs can go to +36V without damages, independent of the magnitude of the V_{CC}.

Typical Performance Characteristics

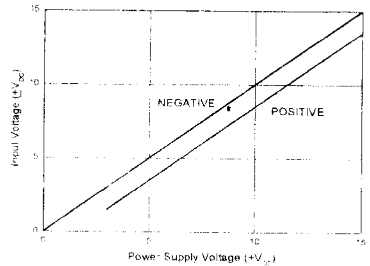


Figure 4. Input Voltage Range

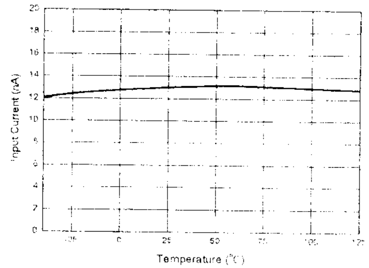


Figure 5. Input Current

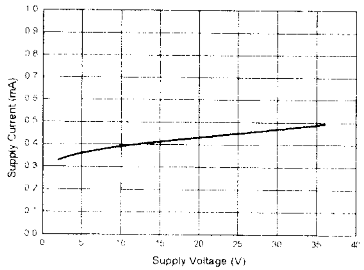


Figure 6. Supply Current

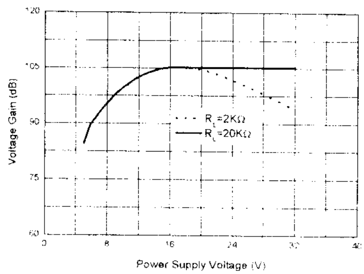


Figure 7. Voltage Gain

Typical Performance Characteristics (Continued)

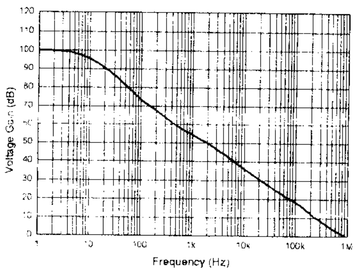


Figure 8. Open Loop Frequency Response

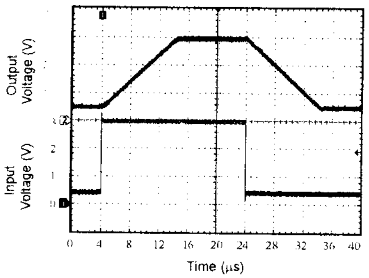


Figure 9. Voltage Follower Pulse Response

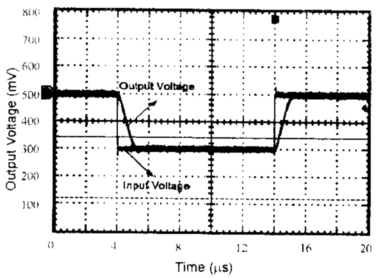


Figure 10. Voltage Follower Pulse Response (Small Signal)

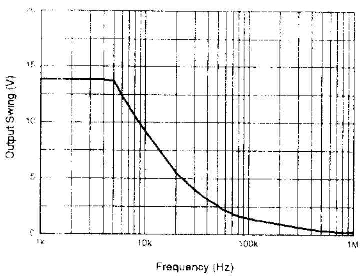


Figure 11. Large Signal Frequency Response

Typical Performance Characteristics (Continued)

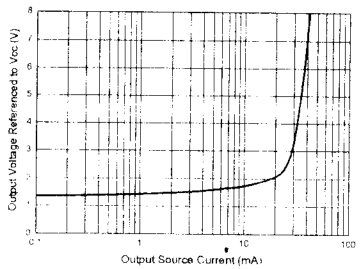


Figure 12. Output Characteristics: Current Sourcing

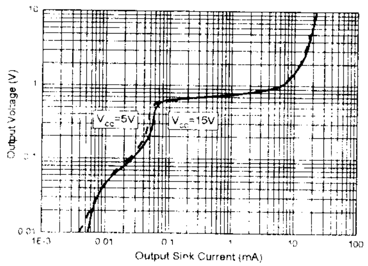


Figure 13. Output Characteristics: Current Sinking

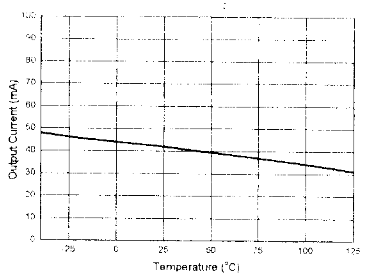


Figure 14. Current Limiting

Typical Application

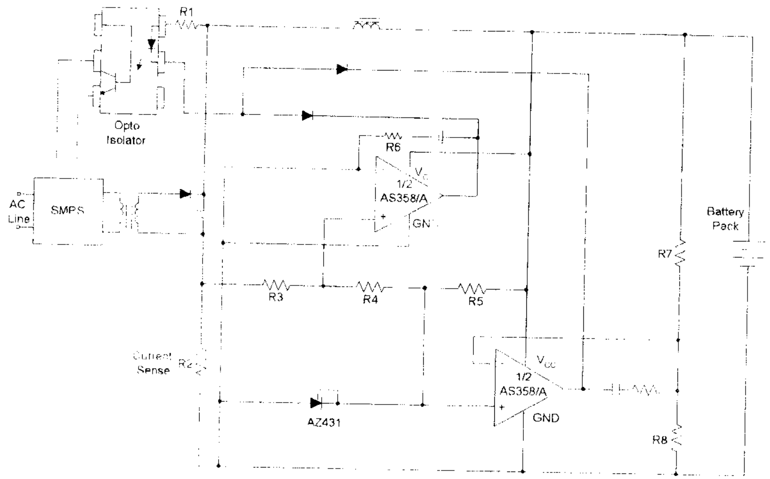


Figure 15. Battery Charger

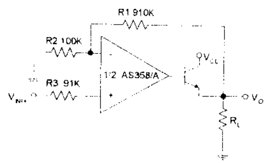


Figure 16. Power Amplifier

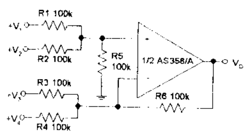


Figure 17. DC Summing Amplifier

Typical Application (Continued)

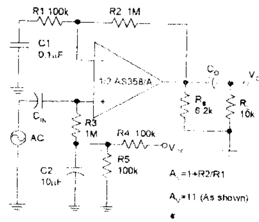


Figure 18. AC Coupled Non-Inverting Amplifier

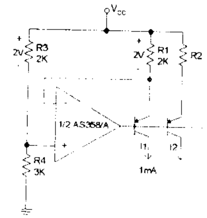


Figure 19. Fixed Current Sources

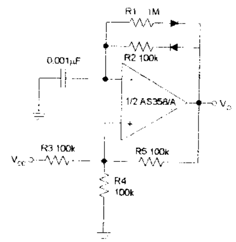


Figure 20. Pulse Generator

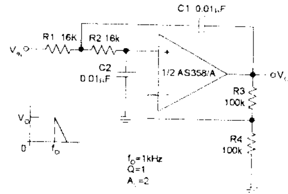
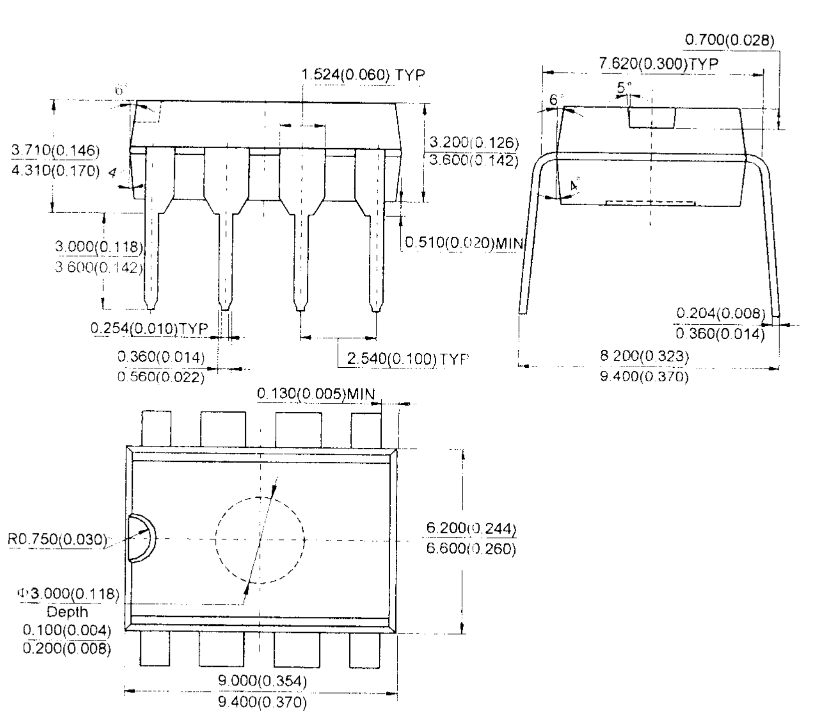


Figure 21. DC Coupled Low-Pass Active Filter

Mechanical Dimensions

DIP-8

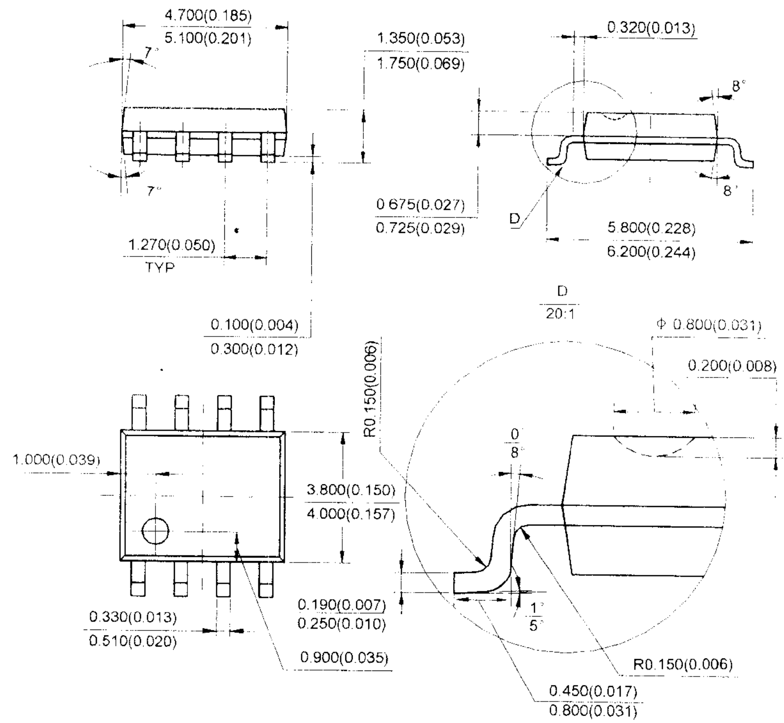
Unit: mm(inch)



Mechanical Dimensions (Continued)

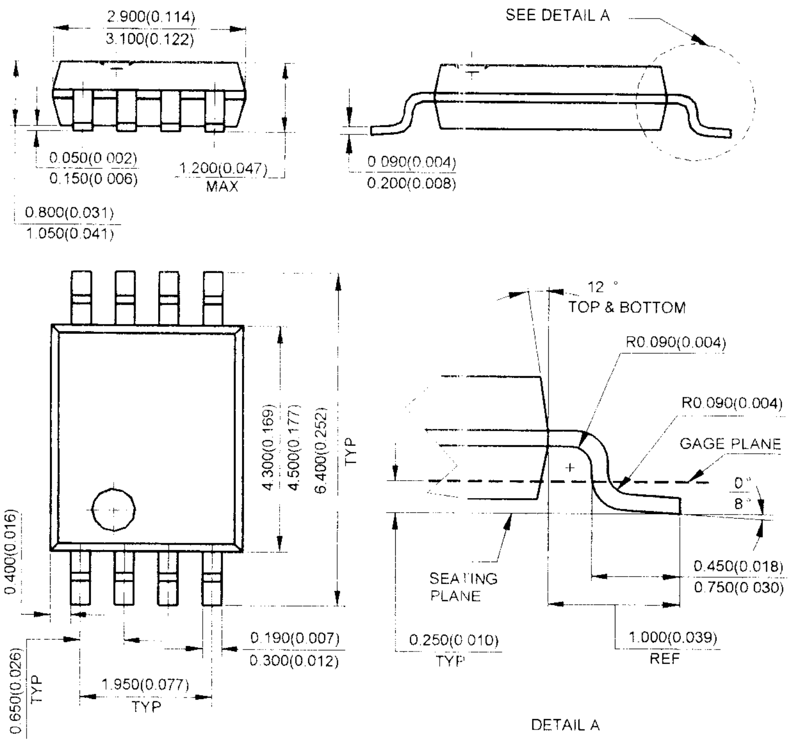
SOIC-8

Unit: mm(inch)



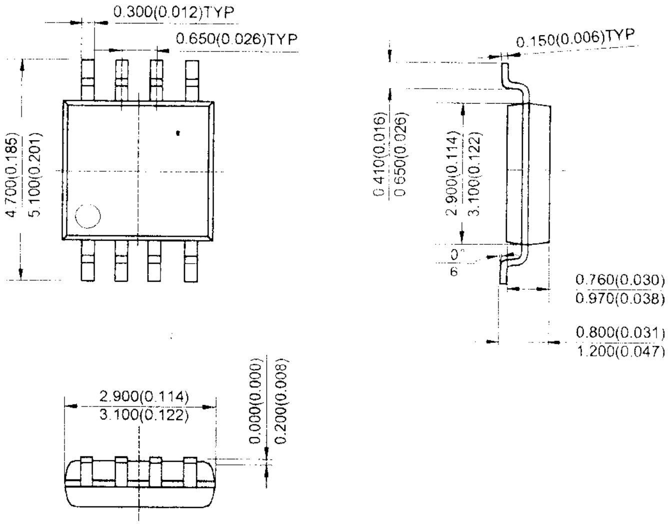
Mechanical Dimensions (Continued)

TSSOP-8 **Unit: mm(inch)**



Mechanical Dimensions

MSOP-8 **Unit: mm(inch)**



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Test Report

No. SH7042948/CHEM Date: Apr. 27, 2007

JIANGSU CHANGJIANG ELECTRONIC TECHNOLOGY CO., LTD
78, CHANGSHAN RD, JIANGYIN, JIANGSU CHINA

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

Sample Name : SOP PACKAGE PART (INCLUDE SOP8/20/24/30 HSOP28/34/38 SOP8/PP)
SGS Ref No. : 10333677-9
Model : SOP (INCLUDE SOP8/20/24/30 HSOP28/34/38 SOP8/PP)

Sample Receiving Date : Apr.24, 2007
Testing Period : Apr.24 – Apr.27, 2007

Test Requested : (1) In accordance with the RoHS Directive 2002/95/EC, and its amendment directives
(2) To determine the PCBs (Polychlorinated Biphenyls) content of the submitted sample.
(3) To determine the Polychlorinated Naphthalene content of the submitted sample.
(4) To determine the Short Chain Chlorinated Paraffin content of the submitted sample.

Test Method : (1-1) With reference to IEC 62321 Ed.1 111/54/CDV for Cadmium content. Analysis was performed by ICP.
(1-2) With reference to IEC 62321 Ed.1 111/54/CDV for Lead content. Analysis was performed by ICP and AAS.
(1-3) With reference to IEC 62321 Ed.1 111/54/CDV for Mercury content. Analysis was performed by ICP.
(1-4) With reference to IEC 62321 Ed.1 111/54/CDV for Hexavalent Chromium by Colorimetric Method.
(1-5) With reference to IEC 62321 Ed.1 111/54/CDV for PBBs / PBDEs content. Analysis was performed by GC/MS.
(2) With reference to US EPA 8082, Analysis was performed by GC-MS.
(3) With reference to US EPA 8081, Analysis was performed by GC-MS.
(4) With reference to US EPA 8081, Analysis was performed by GC/MS.

Test Results : Please refer to next pages

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Ella Zhang
Sr. Section Head

Signed for and on behalf of
SGS-CSTC Chemical Laboratory

Sandy Hao

Sandy Hao
Lab Manager

SGS

Test results by chemical method

(1) Cadmium, Lead, Mercury, Hexavalent Chromium, PBBs(Polybrominated biphenyls) PBBEs(PBDEs) (Polybrominated biphenyl ethers) content(Unit: mg/kg)

Test Item(s):	Method (refer to)	1*	MDL	RoHS Limit
Cadmium(Cd)	(1-1)	ND	2	100
Lead (Pb)	(1-2)	ND	2	1000
Mercury (Hg)	(1-3)	ND	2	1000
Hexavalent Chromium (CrVI)	(1-4)	ND	2	1000
Sum of PBBs	(1-5)	ND	-	1000
Monobromobiphenyl		ND	5	-
Dibromobiphenyl		ND	5	-
Tribromobiphenyl		ND	5	-
Tetrabromobiphenyl		ND	5	-
Hexabromobiphenyl		ND	5	-
Pentabromobiphenyl		ND	5	-
Heptabromobiphenyl		ND	5	-
Octabromobiphenyl		ND	5	-
Nonabromobiphenyl		ND	5	-
Decabromobiphenyl		ND	5	-
Sum of PBDEs (Note 4)		ND	-	1000
Monobromodiphenyl ether		ND	5	-
Dibromodiphenyl ether		ND	5	-
Tribromodiphenyl ether		ND	5	-
Tetrabromodiphenyl ether		ND	5	-
Pentabromodiphenyl ether		ND	5	-
Hexabromodiphenyl ether		ND	5	-
Heptabromodiphenyl ether		ND	5	-
Octabromodiphenyl ether		ND	5	-
Nonabromodiphenyl ether		ND	5	-
Decabromodiphenyl ether		ND	5	-
Sum of PBDEs (Mono to Deca)		ND	-	-

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(2)~(4) PCBs (Polychlorinated Biphenyls) content ,Polychlorinated Naphthalene content and Short Chain Chlorinated Paraffin content (Unit: mg/kg)

Test Item(s):	Method (refer to)	1*	MDL
PCBs (Polychlorinated Biphenyls) content		-	-
2.4.4'-Trichlorobiphenyl (PCB 28) CAS 7012-37-5		ND	0.5
2.2'.5.5'-Tetrachloro-biphenyl (PCB 52) CAS 35693-99-3		ND	0.5
2.2'.4.5.5'-Pentachloro-biphenyl (PCB 101) CAS 37680-73-2		ND	0.5
2.3'.4.4'.5-Pentachlorobiphenyl (PCB 118) CAS 31508-00-6	(2)	ND	0.5
2.2'3.4.4'.5'-Hexachloro-biphenyl (PCB 138) CAS 35065-28-2		ND	0.5
2.2'.4.4'.5.5'-Hexachloro-biphenyl (PCB 153) CAS 35065-27-1		ND	0.5
2.2'.3.4.4'.5.5'-Heptachlorobiphenyl (PCB 180) CAS 35065-29-3		ND	0.5
Polychlorinated Naphthalene content		-	-
2-Chlorinated Naphthalene		ND	5
1,4-Dichlorinated Naphthalene		ND	5
1,5-Dichlorinated Naphthalene		ND	5
1,2-Dichlorinated Naphthalene	(3)	ND	5
1,8-Dichlorinated Naphthalene		ND	5
1,2,3,4-Tetrachlorinated Naphthalene		ND	5
Octa-chlorinaed Naphthalene		ND	5
Short Chain Chlorinated Paraffin	(4)	ND	30

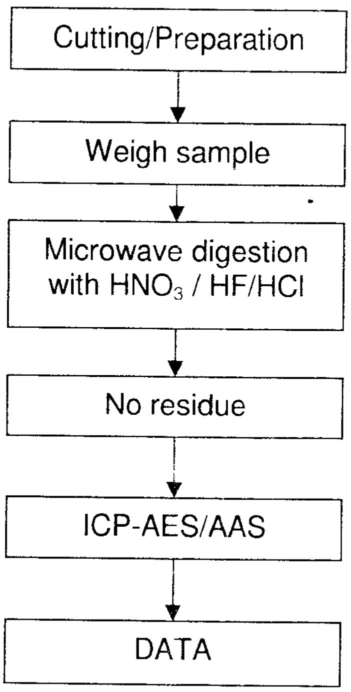
Test Part Description:
1. Black body part (mix all)

Note:

(1) mg/kg = ppm
(2) ND = Not Detected
(3) MDL = Method Detection Limit
(4) Sum of Mono to NonaBDE & according to 2005/717/EC DecaBDE is exempt.
(5) "-" = Not Regulated
(6) The maximum permissible limit is quoted from the document 2005/618/EC amending RoHS directive 2002/95/EC
(7) * The sample(s) was analyzed on behalf of the applicant as mixing whole/part sample in one testing. The result(s) in report means average of whole sample. The result(s) will be different obviously if the sample(s) was tested as requirement of RoHS, and result(s) may be higher than that of report. The applicant will take the responsibility of all discrepancy and risk.

ATTACHMENTS

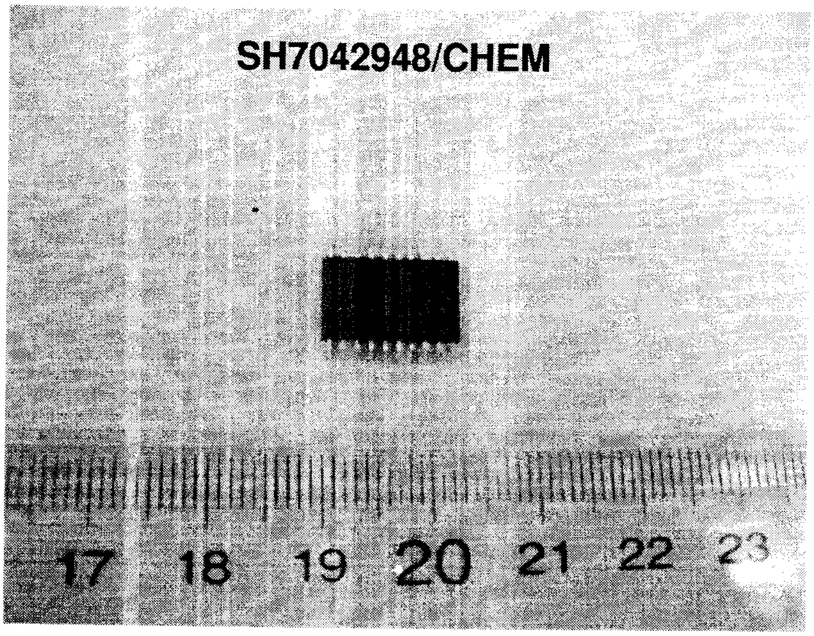
Cd and Pb Measurement Flowchart



The samples were dissolved totally by pre-conditioning method according to above flow chart.

Tested by : Chaven Lian
Checked by : Terry Wang

Sample photo:



SGS authenticate the photo on original report only

*** End of Report ***