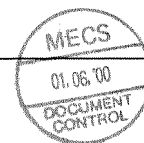




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Structure	Silicon Monolithic Bipolar IC
Appearance	SIL-12 Pins Plastic Package (Power Type With Fin)
Application	Voltage Supply for Car Audio Systems
Function	7 Outputs Voltage Regulator Peak Current Protection Circuit, ASO Protection Circuit, Thermal Protection Circuit



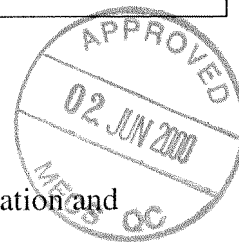
A Absolute Maximum Ratings					
No.	Item	Symbol	Ratings	Unit	Note
1	Storage Temperature	Tstg	-55 ~ +150	° C	1
2	Operating Ambient Temperature	Topr	-30 ~ +85	° C	1
3	Operating Ambient Pressure	Popr	$1.013 \times 10^5 \pm 0.61 \times 10^5$ ( $1.0 \pm 0.6$ )	Pa (atm)	
4	Operating Constant Acceleration	Gopr	9,810 (1,000)	m / s <sup>2</sup> (G)	
5	Operating Shock	Sopr	4,900 (500)	m / s <sup>2</sup> (G)	
6	Power Supply Voltage	Vcc	26.0	V	
7	Power Supply Current	Icc	3.8	A	2
8	Power Dissipation	PD	2.70	W	3

Operating Supply Voltage Range	Vcc	6.6 V ~ 24.0 V
--------------------------------	-----	----------------

Note : 1) Except these items, all other measurements are taken at Ta = 25°C.

2) Over current limiting circuit built-in.

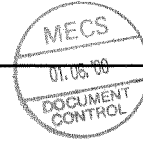
3) Ta = 75°C without heat sink. The relationship between power dissipation and ambient temperature follows that of derating curve.



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Recommended Operating Condition							
No.	Item	Symbol	Limit			Unit	Note
			Min	Typ	Max		
1	Recommended Power Supply Voltage	VCC	10.0	13.2	16.0	V	
			11.0	13.2	16.0	V	1



Note : 1) This range is applicable to Illumination Output which is  $V_{(Out)ILL}=10V$ .

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No.	Item	Symbol	Test Cct.	Condition	Limit			Unit	Note
					Min	Typ	Max		
(Unless otherwise specified, ambient temperature is 25°C±2°C, V <sub>cc</sub> =13.2V.)									
	<V <sub>ILL</sub> Output 1>								
1	Output Voltage Vo1	V <sub>ILL</sub>		I <sub>O1</sub> =-240mA	9.5	10	10.5	V	
2	Line Regulation	REG <sub>IN(ILL)</sub>		V <sub>O1</sub> =10V, I <sub>O1</sub> =-240mA V <sub>CC</sub> =11~16V	-	20	60	mV	
3	Load Regulation	REG <sub>L(ILL)</sub>		V <sub>O1</sub> =10V, I <sub>O1</sub> =0~-240mA	-	60	120	mV	
4	Min. Input/Output Voltage Difference	V <sub>DIF1(min)</sub>		V <sub>O1</sub> =10V, V <sub>CC</sub> =9V I <sub>O1</sub> =-240mA	-	0.4	0.7	V	
5	Peak Output Current	I <sub>O1(peak)</sub>		V <sub>O1</sub> ≥9.5V	300	550	-	mA	
6	Ripple Rejection Ratio	RR1		V <sub>O1</sub> =10V, f=100Hz V <sub>CC</sub> =12~14V	40	55	-	dB	
	<V <sub>DD</sub> Output 2>								
7	Output Voltage Vo2	V <sub>DD</sub>		I <sub>O2</sub> =-80mA	5.3	5.6	5.9	V	
8	Line Regulation	REG <sub>IN(VDD)</sub>		V <sub>O2</sub> =5.6V, I <sub>O2</sub> =-80mA V <sub>CC</sub> =10~16V	-	5	15	mV	
9	Load Regulation	REG <sub>L(VDD)</sub>		V <sub>O2</sub> =5.6V, I <sub>O2</sub> =0~-80mA	-	50	120	mV	
10	Min. Input/Output Voltage Difference	V <sub>DIF2(min)</sub>		V <sub>O2</sub> =5.6V, V <sub>CC</sub> =5V I <sub>O2</sub> =-80mA	-	0.4	0.7	V	
11	Peak Output Current	I <sub>O2(peak)</sub>		V <sub>O2</sub> ≥5.3V	100	200	-	mA	
12	Ripple Rejection Ratio	RR2		V <sub>O2</sub> =5.6V, f=100Hz V <sub>CC</sub> =12~14V	50	60	-	dB	
	<AMP Output 3>								
13	Min. Input/Output Voltage Difference	V <sub>DIF3(min)</sub>		I <sub>O3</sub> =-400mA	-	1	1.5	V	
14	Load Regulation	REG <sub>L(AMP)</sub>		I <sub>O3</sub> =0~-400mA	-	350	600	mV	
15	Peak Output Current	I <sub>O3(peak)</sub>		V <sub>O3</sub> ≥11.7V	500	800	-	mA	

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B Electrical Characteristics		(Unless otherwise specified, ambient temperature is 25°C±2°C, Vcc=13.2V.)							
No.	Item	Symbol	Test Cct.	Condition	Limit			Unit	Note
					Min	Typ	Max		
	<ANT Output 4>								
16	Min. Input/Output Voltage Difference	VDIF4(min)		IO4=-400mA	-	1	1.5	V	
17	Load Regulation	REGL(ANT)		IO4=0~-400mA	-	350	600	mV	
18	Peak Output Current	IO4(peak)		VO4≥11.7V	500	800	-	mA	
	<VCOM Output 5>								
19	Output Voltage VO5	VCOM		IO5=-120mA	8.25	8.70	9.15	V	
20	Line Regulation	REGIN(COM)		VO5=8.7V, IO5=-120mA VCC=10~16V	-	10	30	mV	
21	Load Regulation	REGL(COM)		VO5=8.7V, IO5=0~-120mA	-	60	120	mV	
22	Min. Input/Output Voltage Difference	VDIF5(min)		VO5=8.7V, VCC=7.8V IO5=-120mA	-	0.4	0.7	V	
23	Peak Output Current	IO5(peak)		VO5≥8.25V	150	300	-	mA	
24	Ripple Rejection Ratio	RR5		VO5=8.7V, f=100Hz VCC=12~14V	50	60	-	dB	
	<AM Output 6>								
25	Output Voltage VO6	VAM		IO6=-120mA	8.25	8.70	9.15	V	
26	Line Regulation	REGIN(AM)		VO6=8.7V, IO6=-120mA VCC=10~16V	-	10	30	mV	
27	Load Regulation	REGL(AM)		VO6=8.7V, IO6=0~-120mA	-	60	120	mV	
28	Min. Input/Output Voltage Difference	VDIF6(min)		VO6=8.7V, VCC=7.8V IO6=-120mA	-	0.4	0.7	V	
29	Peak Output Current	IO6(peak)		VO6≥8.25V	150	300	-	mA	
30	Ripple Rejection Ratio	RR6		VO6=8.7V, f=100Hz VCC=12~14V	50	60	-	dB	

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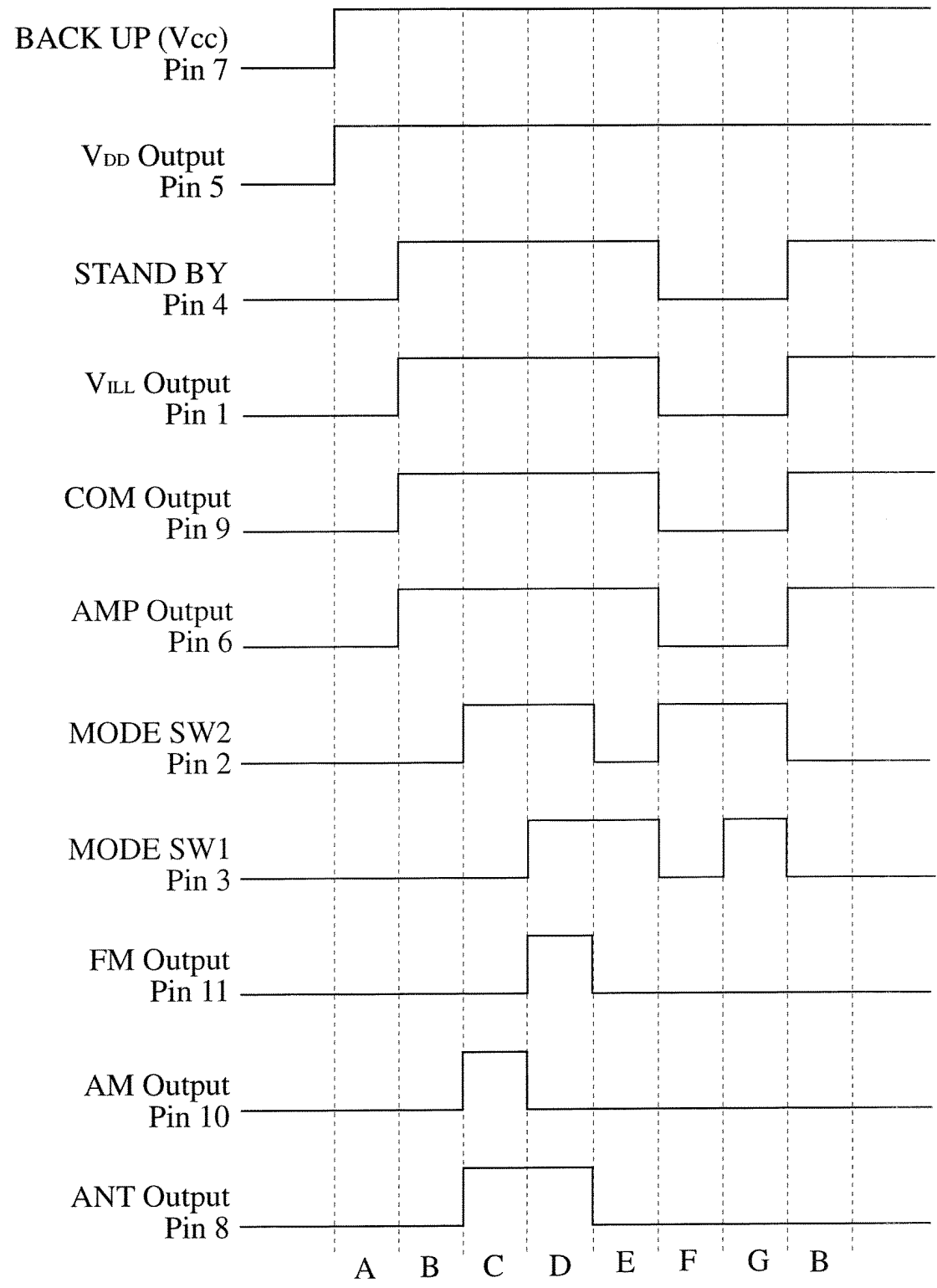
No.	Item	Symbol	Test Cct.	Condition	Limit			Unit	Note
					Min	Typ	Max		
	<FM Output 7>								
31	Output Voltage Vo7	V <sub>FM</sub>		I <sub>O7</sub> =-200mA	8.25	8.70	9.15	V	
32	Line Regulation	REG <sub>IN</sub> (FM)		V <sub>O7</sub> =8.7V, I <sub>O7</sub> =-200mA V <sub>CC</sub> =10~16V	-	20	60	mV	
33	Load Regulation	REG <sub>L</sub> (FM)		V <sub>O7</sub> =8.7V, I <sub>O7</sub> =0~-200mA	-	60	120	mV	
34	Min. Input/Output Voltage Difference	V <sub>DIF7</sub> (min)		V <sub>O7</sub> =8.7V, V <sub>CC</sub> =7.8V I <sub>O7</sub> =-200mA	-	0.4	0.7	V	
35	Peak Output Current	I <sub>O7</sub> (peak)		V <sub>O7</sub> ≥8.25V	250	450	-	mA	
36	Ripple Rejection Ratio	RR7		V <sub>O7</sub> =8.7V, f=100Hz V <sub>CC</sub> =12~14V	45	55	-	dB	
37	Standby Circuit Current	ISTB		Standby Pin=0V	-	0.55	0.80	mA	
	Input (Standby)								
38	Standby Level	V <sub>TH1-1</sub>			-	-	1.1	V	
39	Active Level	V <sub>TH1-2</sub>			1.7	-	-	V	
40	Input Current when High	I <sub>in1</sub>		V <sub>th1</sub> =5V	100	175	250	μA	
	Input (Mode 2 SW)								
41	Standby Level	V <sub>TH2-1</sub>			-	-	1.6	V	
42	Active Level	V <sub>TH2-2</sub>			2.4	-	-	V	
43	Input Current when High	I <sub>in2</sub>		V <sub>th2</sub> =5V	13	25	37	μA	
	Input (Mode 1 SW)								
44	Voltage when AM ON	V <sub>TH3-1</sub>			-	-	1.1	V	
45	Voltage when FM ON	V <sub>TH3-2</sub>			2.7	-	-	V	
46	Input Current when High	I <sub>in3</sub>		V <sub>th3</sub> =5V	13	25	37	μA	

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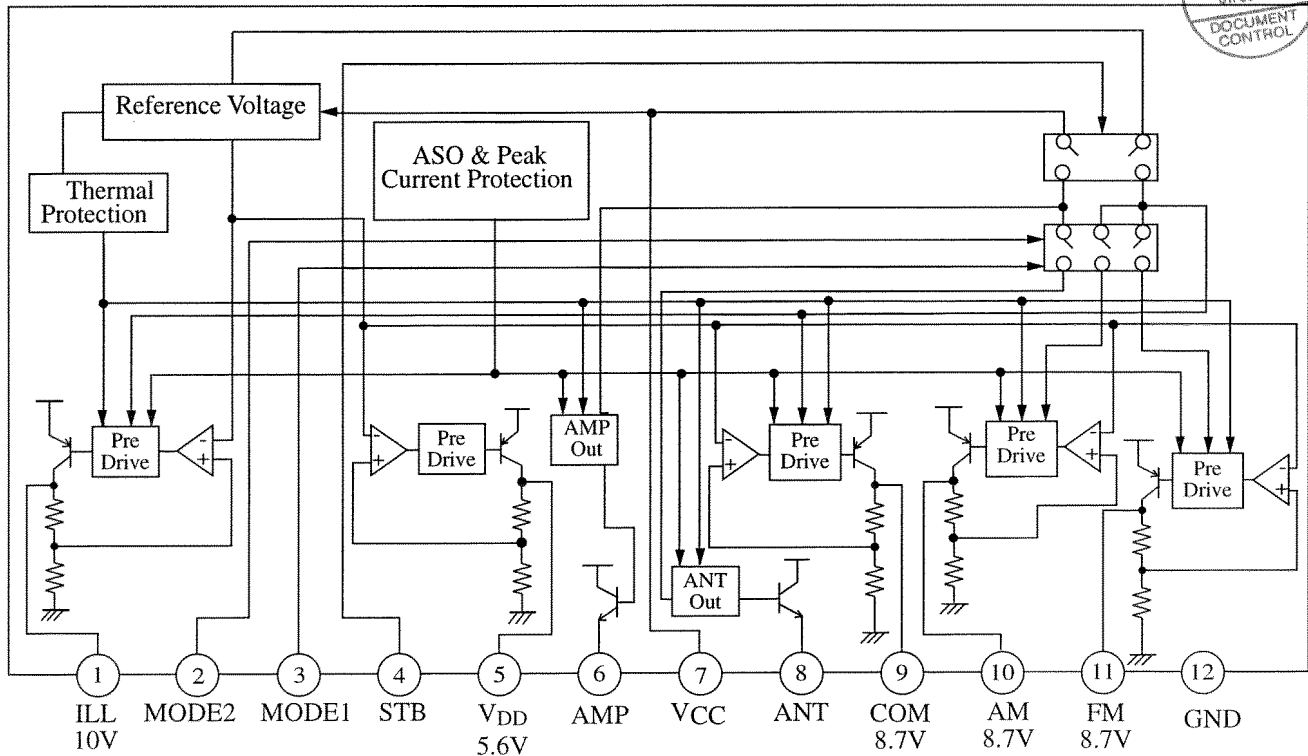
**\* Input/Output Timing Chart**



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## Circuit Function Block Diagram



## Pin Descriptions

Pin No.	Pin Descriptions	Function
1	Illumination Output	10V power supply with a maximum output current of 300mA for a Illumination.
2	MODE2 SW	AM and ANT output are turned ON when this pin is 5V.
3	MODE1 SW	AM and FM output are switched when this pin is 5V.
4	STAND BY	Only VDD output during the 0V standby state; ILL, COM and AMP outputs are turned ON when this pin is 5V.
5	VDD Output	5.6V Power supply with a maximum output current of 100mA for a micro-controller. Output is always available if BACKUP power supply is connected.
6	AMP Output	Power supply to activate a remote amplifier; a voltage of about 1V (Typ) lower than Vcc voltage is provided with a maximum output current of 500mA.
7	VCC	Connected to car BACKUP and ACC Power supplies.
8	ANT Output	Power supply to drive an antenna voltage of about 1V (Typ) lower than the Vcc voltage is provided with a maximum output current of 500mA.
9	COM Output	8.7V power supply with a maximum output current of 150mA; this can be used as a system common power supply.
10	AM Output	8.7V power supply with a maximum output current of 150mA for AM receiver.
11	FM Output	8.7V power supply with a maximum output current of 250mA for FM receiver.
12	GND	Connected to the IC substrate.

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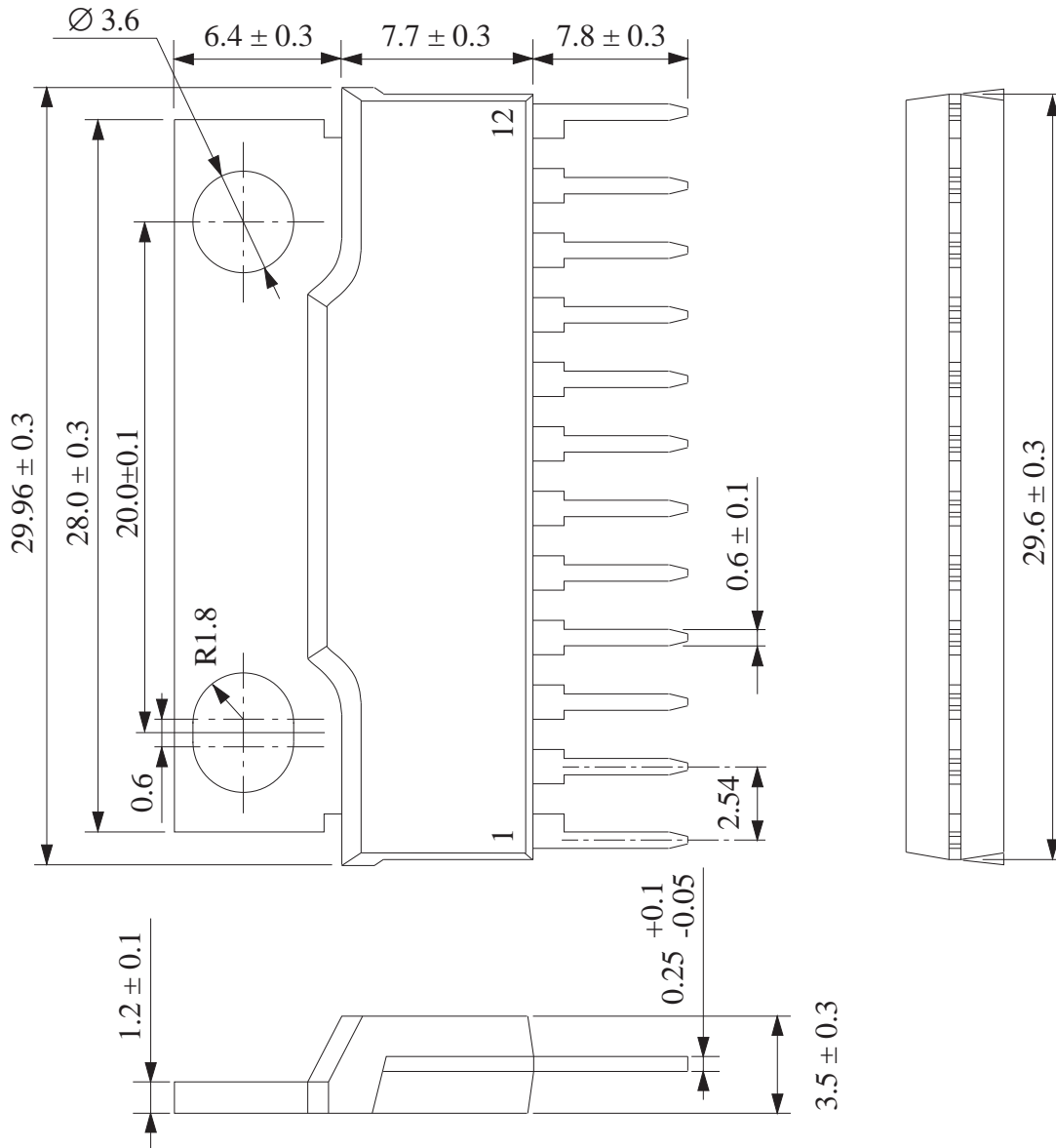
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**12-SIL(FP)**

Package Name

FP-12S

Unit : mm



\*4

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21-MAR-05			

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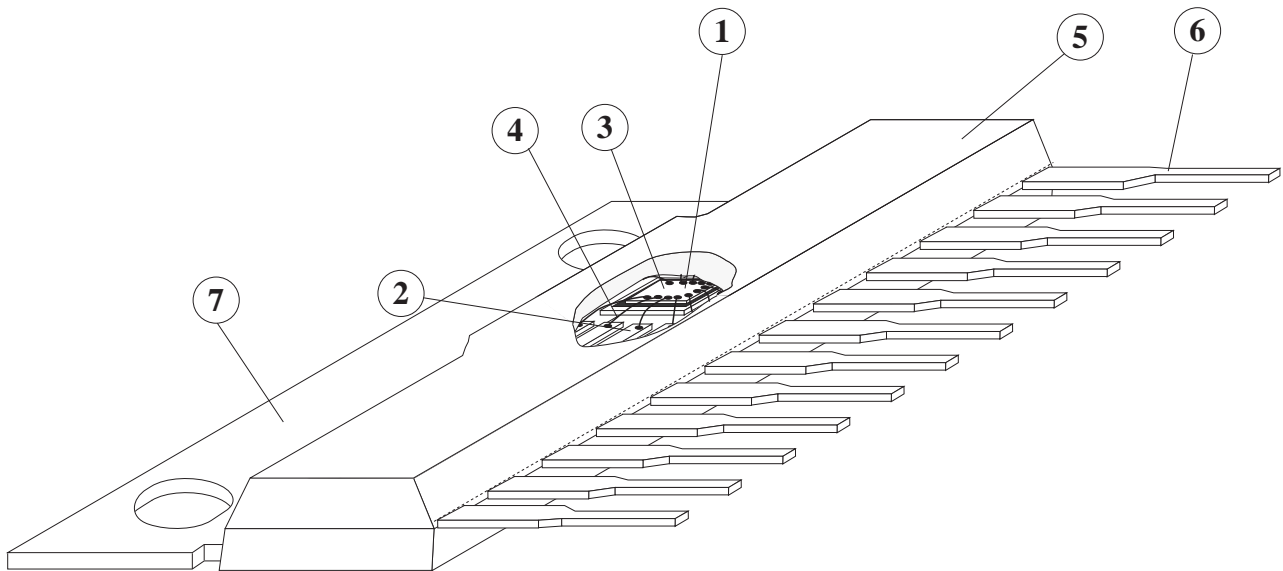
**(Structure Description)**

Chip surface passivation	SiN, PSG, Others ( )	①
Lead frame material	Fe group, Cu group, Others ( )	②, ⑥
Inner lead surface process	Ag plating, Au plating, Others ( )	②
Outer lead surface process	Solder plating (98Sn-2Bi), Solder dip, Others ( )	⑥
Chip mounting method	Ag paste, Au-Si alloy, Solder (95.5Pb-2.5Ag-2Sn)**	③
Wire bonding method	Thermalsonic bonding, Others ( )	④
Wire material	Au, Others ( )	④
Mold material	Epoxy, Others ( )	⑤
Molding method	Transfer mold, Multiplunger mold, Others ( )	⑤
Fin material	Cu group, Others ( )	⑦

\*3  
\*3

**Package FP-12S**

\*\*Under RoHS exemption clause, Lead (Pb) in high melting temperature type solder (i.e. tin-lead solder alloys containing more than 85% of lead), is exempted until 2010.



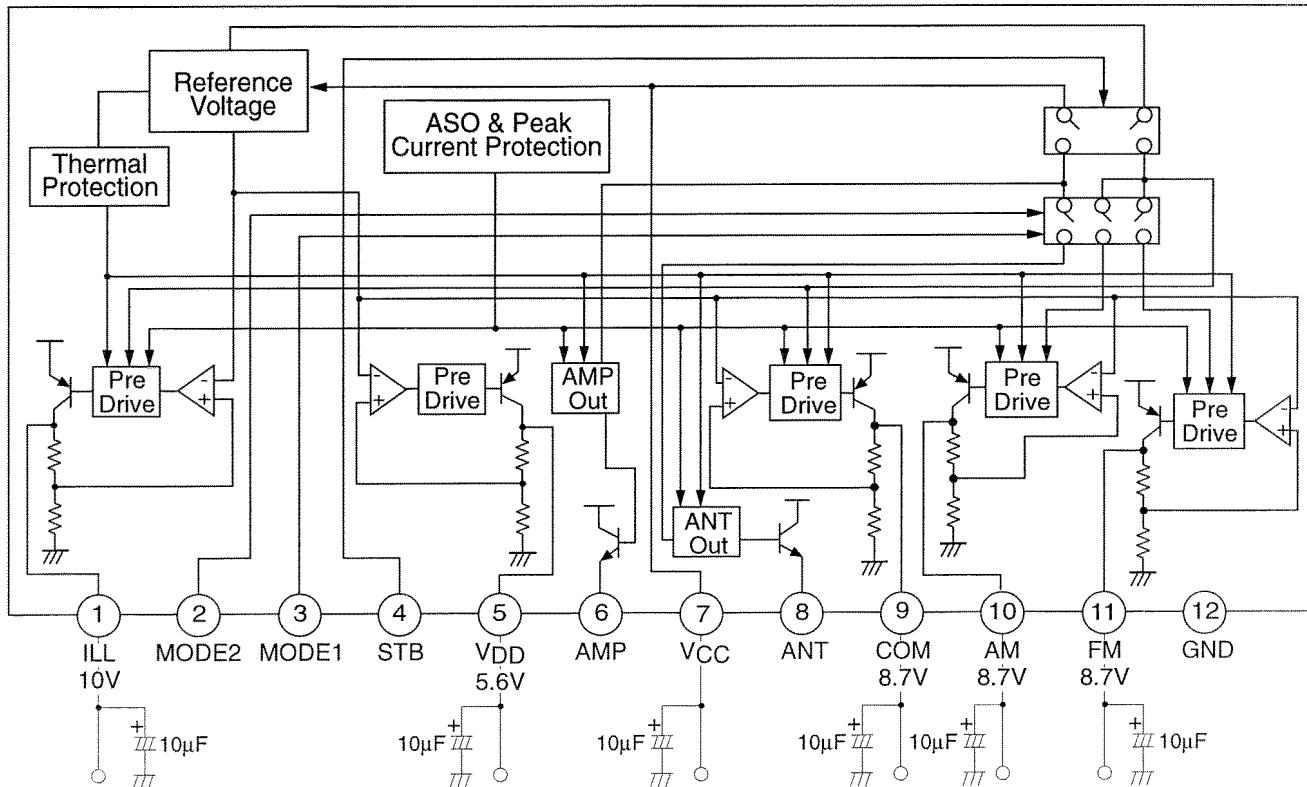
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-	-	-	16-DEC-04

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### Application Circuit

Doc No. SDSC-PSE-AN80T05



STB 'OFF'	GND
STB 'ON'	5V

Note : To prevent oscillation at each output, make sure to connect a capacitor having a capacitance of 10µF or greater between GND and each of the ILL (pin 1), VDD (pin 5), VCC (pin7), COM (pin 9), AM (pin 10), and FM (pin 11) pins. We recommend using a tantalum electrolytic capacitor whose capacitance is unsusceptible to temperature.

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FINAL SPECS

Package Name

FP-12S

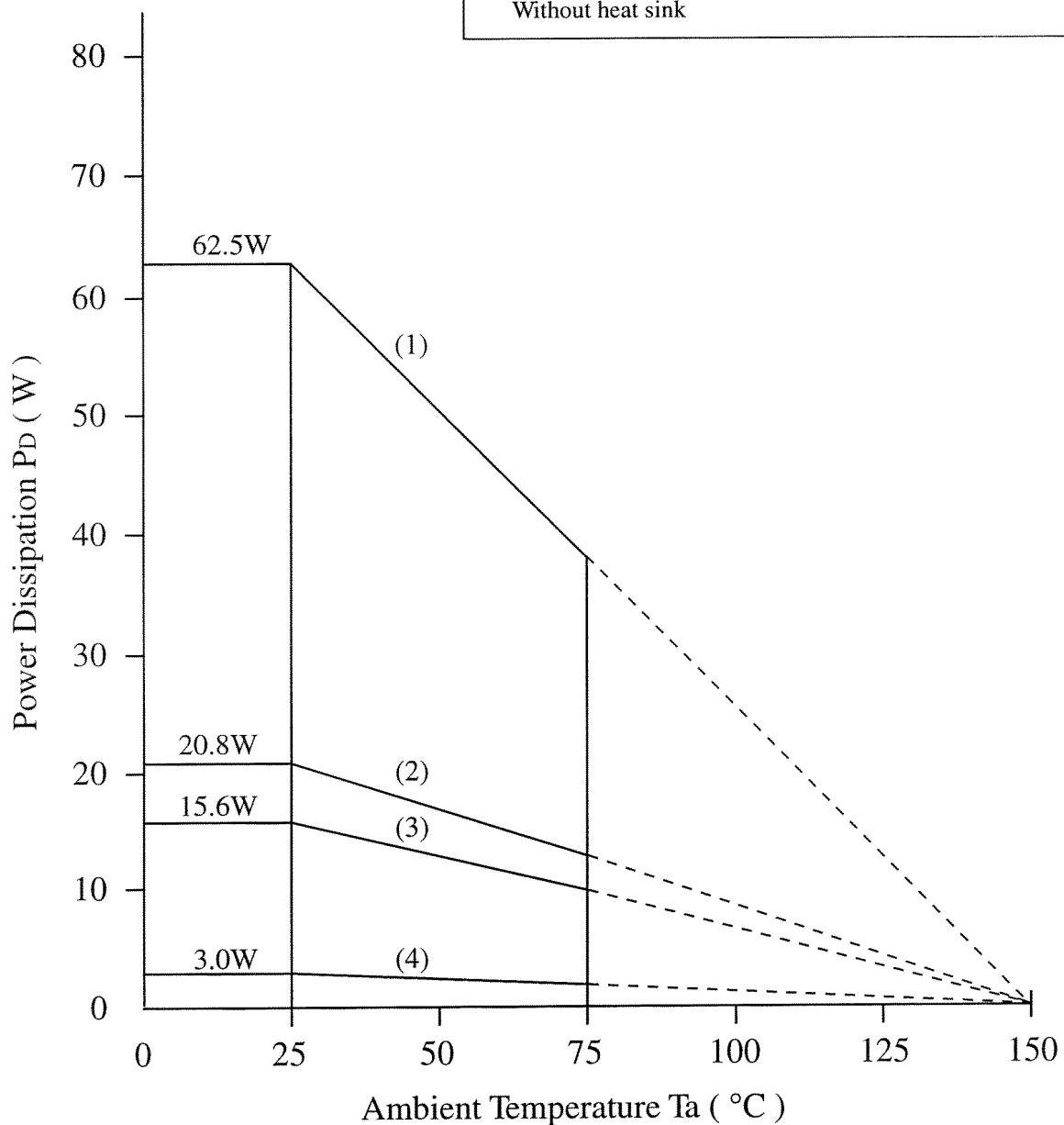
**PD - Ta Curves**

Doc No. SDSC-PSE-AN80T05

ISS | REV  
7 | 2



- (1)  $T_c = T_a$ , 62.5W ( $\theta_{j-c} = 2 \text{ }^\circ\text{C/W}$ )  
 With a 100cm<sup>2</sup> X 3mm Al heat sink (black colour coated)  
 or a 200cm<sup>2</sup> X 2mm Al heat sink (not lacquered)
- (3) 15.63W ( $\theta_f = 6.0 \text{ }^\circ\text{C/W}$ )  
 With a 100cm<sup>2</sup> X 2mm Al heat sink (not lacquered)
- (4) 3.0W at  $T_a = 25 \text{ }^\circ\text{C}$  ( $\theta_{j-a} = 42 \text{ }^\circ\text{C/W}$ )  
 Without heat sink



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