

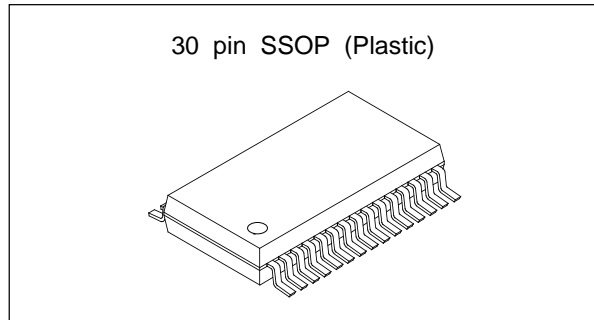
8 mm VCR ATF

Description

The CXA1814N is an IC developed for ATF (Automatic Track Finding) in 8 mm VCRs, and integrates the major functions necessary for ATF onto a single chip.

Features

- Built-in pilot signal detector and BPF
- Adopts a high-precision analog filter with no switching noise
- Built-in SP/LP identification circuit and clog detection circuit
- Low noise, high-precision bipolar process



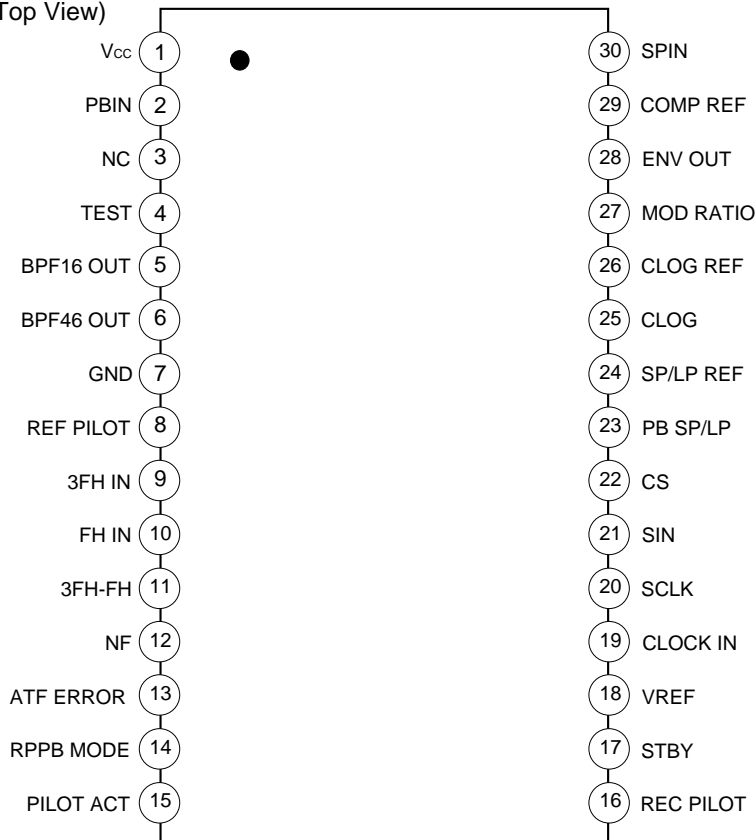
Applications

ATF for 8 mm VCRs

Structure

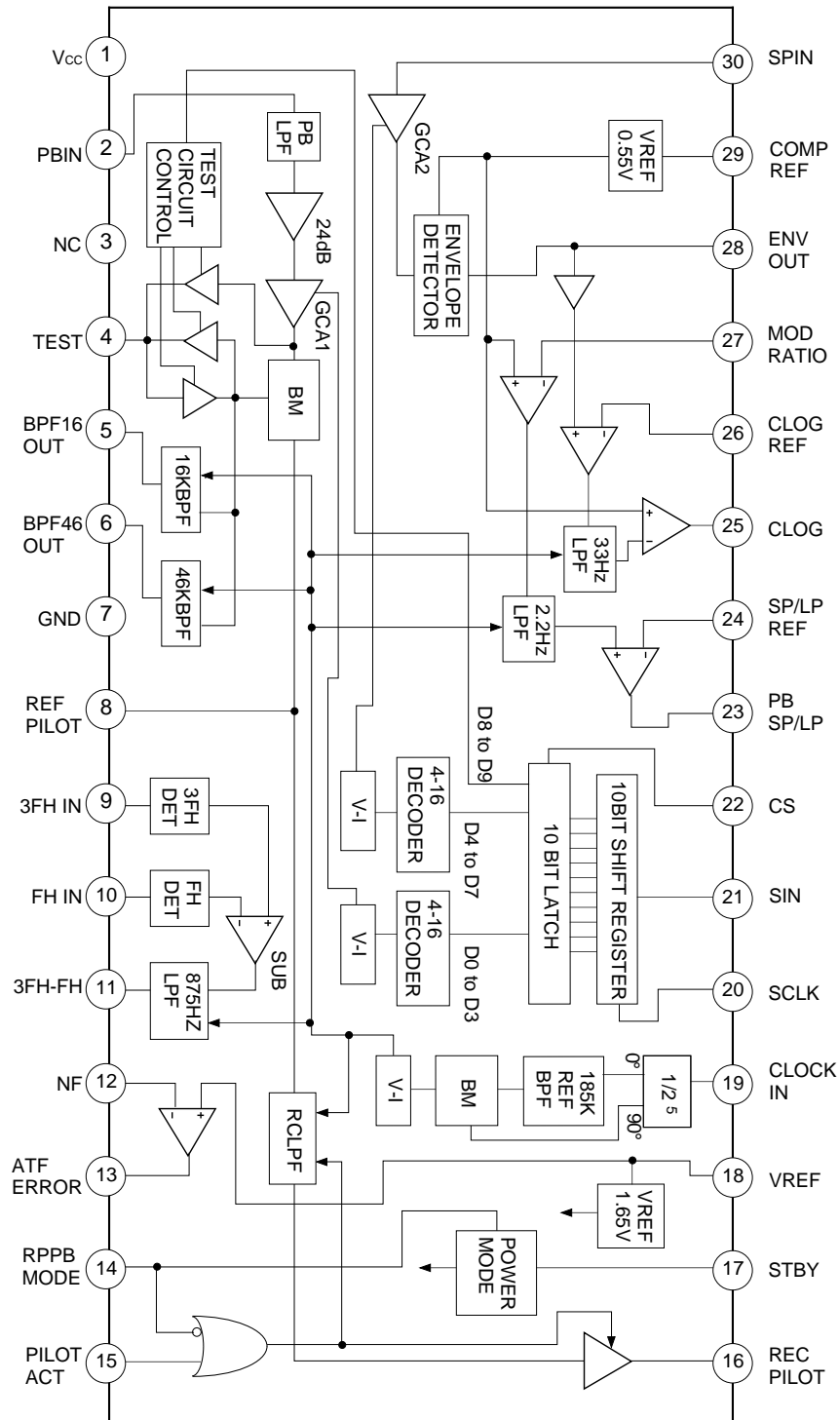
Bipolar silicon monolithic IC

Pin Configuration (Top View)



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Block Diagram



Pin Description

Pin No.	Symbol	Pin voltage		Equivalent circuit	I/O impedance	Description
		DC	AC			
1	Vcc	3.15 V	—		—	Power supply for all circuits.
2	PBIN	1.77 V typ	0.1 to 1.0 Vp-p		50 kΩ	Playback RF signal input.
3	NC		—		—	Unconnected.
4	TEST	1.77 V for output 1.58 V for input	Approx. 0.5 Vp-p Typ. for output 0.5 Vp-p or less for input		100 kΩ	GCA1, BMIN and BMOU test I/O. Pull up to Vcc with a 100 kΩ resistor during signal input.
5	BPF16 OUT	1.77 V	Approx. 0.5 Vp-p Typ.			BPF16K output.
6	BPF46 OUT	1.77 V	Approx. 0.5 Vp-p Typ.			BPF46K output.
7	GND	0 V	—		—	GND for all circuits.
8	REF PILOT	1.77 V	1.0 Vp-p or less		130 kΩ	Input for reference pilot signal. Maximum input level is 1 Vp-p.

Pin No.	Symbol	Pin voltage		Equivalent circuit	I/O impedance	Description
		DC	AC			
9	3FHIN	1.58 V	1.0 Vp-p or less		60 kΩ	3FH signal input. Connect it to Pin 6 with capacitor coupled.
10	FHIN					FH signal input. Connect it to Pin 5 with capacitor coupled.
11	3FH -FH	1.58 V	—			FH detection circuit output.
12	NF	1.58 V	—			Operational amplifier inverted input for the FH detection circuit output amplifier.
13	ATF ERROR	1.58 V	—			Operational amplifier output for the FH detection circuit output amplifier.
14	RPPB MODE	LOW ≤ 0.8 V HIGH ≥ 2.1 V	—			Mode control. High: Playback mode Low: Recording mode
15	PILOT ACT					Pilot signal output control. High: ENABLE Low: DISABLE

Pin No.	Symbol	Pin voltage		Equivalent circuit	I/O impedance	Description
		DC	AC			
16	REC PILOT	1.10 V	Approx. 0.5 Vp-p			Pilot signal output.
17	STBY	LOW ≤ 0.8 V HIGH ≥ 2.1 V	—			Power save mode control. High: STBY
18	VREF	1.58 V	—			Electric potential for FH detection operating point.
19	CLOCK IN	$V_{CC} - 0.7 V$	Approx. 0.3 Vp-p Typ.		150 kΩ	External clock input.
20	SCLK	LOW ≤ 0.8 V HIGH ≥ 2.1 V	—			Serial input clock for GCA1 and GCA2 gain and TEST mode control.
21	SIN					Serial data input for GCA1 and GCA2 gain and TEST mode control.
22	CS					Chip select input for GCA1 and GCA2 gain and TEST mode control.

Pin No.	Symbol	Pin voltage		Equivalent circuit	I/O impedance	Description
		DC	AC			
23	PB SP/LP	HIGH $\geq V_{CC}$ -0.8 V LOW $\leq 0.4V$	—			This pin is as follows during variable speed playback. During SP mode: High During LP mode: Low “Low” during normal playback.
24	SP/LP REF	0 V to V_{CC} -1.4 V	—			Threshold level setting for LP/SP identification during special playback.
25	CLOG	HIGH $\geq V_{CC}$ -0.8 V LOW $\leq 0.4 V$	—			Clog detection output. Clogged state: High Normal state: Low
26	CLOG REF	0 V to V_{CC} -1.4 V	—			Threshold level setting for clog detection.
27	MOD RATIO					Input for DC shifted envelope signal.
28	ENV OUT	0.53 V	—			Envelope detector output.

Pin No.	Symbol	Pin voltage		Equivalent circuit	I/O impedance	Description
		DC	AC			
29	COMP REF	0.53 V	—			Reference voltage output for comparator.
30	SPIN	2.1 V	0.1 to 1.0 Vp-p		133 kΩ	Playback RF signal input.

Electrical Characteristics

Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply voltage (Note 1)	V _{CC}	-0.4 to 7.0	V
Input voltage (Note 1)	V _I	-0.4 to V _{CC}	V
Total power dissipation Ta ≤ 25 °C (Note 2)	P _D	1025	mW
Operating temperature range	T _{opr}	-10 to 75	°C
Storage temperature range	T _{stg}	-40 to 125	°C

Note 1) The circuit GND pin is used as the reference for all voltages.

Note 2) Substrate mounting (Sony's standard pattern on a 50 mm × 50 mm, 1.6 mm thick glass fabric base epoxy substrate) and no-wind conditions.

Total power dissipation follows a load reduction ratio of 8.2 mW/°C at temperatures above Ta = 25 °C.

Recommended Operating Conditions

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	V _{CC}	3.0		5.5	V
Operating temperature range	T _{OPR}	-10		75	°C

Electrical Characteristics

(DC characteristics 1)

(Unless otherwise specified, Ta = 25 °C, Vcc = 3.15 V)

Item	Symbol	Conditions	Rating values			Unit	Remarks
			Min.	Typ.	Max.		
Playback mode supply current	Icc1	14 = H 15 = H 17 = L		7	10	mA	
		14 = H 15 = L 17 = L		6	9		
Recording mode supply current	Icc2	14 = L 15 = H 17 = L		3.5	5		
		14 = L 15 = L 17 = L		3.5	5		
Power mode supply current	Icc3	14 = L 15 = L 17 = H		1	2		
		14 = H 15 = L 17 = H		1	2		
		14 = L 15 = H 17 = H		1	2		
		14 = H 15 = H 17 = H		1	2		
Reference voltage	Vref	Vcc = 3.15 V, entire operating temperature range	1.545	1.575	1.605	V	
Power supply fluctuation characteristics	D Vr1	Vcc = 3.0 V, Vref fluctuation range	-80	-75	-70	mV	
	D Vr2	Vcc = 4.0 V, Vref fluctuation range	-445		-405		
REF PILOT input resistance	Rpi	REFPILOT Vin/lin	100	137	180	kΩ	
FH detection offset voltage	D Ver1	FHIN and 3FHIN = AC GND, difference between Vref and 3FH-FH	-40	0	40	mV	
Error output voltage	D Ver2	FHIN and 3FHIN = AC GND, difference between Vref and ATFError	-200	0	200		
Subtractor output voltage	Vsub0	FHIN: 16.46 kHz, 20 mVp-p 3FHIN: 46.20 kHz, 20 mVp-p 3FH-FH pin voltage	1.505	1.575	1.645	V	
	Vsub1	FHIN: 16.46 kHz, 60 mVp-p 3FHIN: 46.20 kHz, 20 mVp-p 3FH-FH pin voltage, Vsub0 reference	-60	-40	-20		
	Vsub2	FHIN: 16.46 kHz, 20 mVp-p 3FHIN: 46.20 kHz, 60 mVp-p 3FH-FH pin voltage, Vsub0 reference	20	40	60		
	Vsub3	FHIN: 16.46 kHz, 400 mVp-p 3FHIN: 46.20 kHz, 20 mVp-p 3FH-FH pin voltage, Vsub0 reference	-430	-370	-310		
	Vsub4	FHIN: 16.46 kHz, 20 mVp-p 3FHIN: 46.20 kHz, 400 mVp-p 3FH-FH pin voltage, Vsub0 reference	310	370	430		
	Vsub5	FHIN: 16.46 kHz, 1000 mVp-p 3FHIN: 46.20 kHz, 20 mVp-p 3FH-FH pin voltage, Vsub0 reference	-1060	-930	-800		
	Vsub6	FHIN: 16.46 kHz, 20 mVp-p 3FHIN: 46.20 kHz, 1000 mVp-p 3FH-FH pin voltage, Vsub0 reference	800	930	1060		
	Vsub7	FHIN: 16.46 kHz, 440 mVp-p 3FHIN: 46.20 kHz, 400 mVp-p 3FH-FH pin voltage, Vsub0 reference	-60	-40	-20		
	Vsub8	FHIN: 16.46 kHz, 400 mVp-p 3FHIN: 46.20 kHz, 440 mVp-p 3FH-FH pin voltage, Vsub0 reference	20	40	60		
Error "High" level voltage	Vher1	NF = Vref -20 mV ATF Error I _{oer} = 10 μA	2.95	3.05		V	
	Vher2	NF = Vref -20 mV ATF Error I _{oer} = 10 μA Vcc = 3 V	2.8	2.9			
Error "Low" level voltage	Vler1	NF = Vref +20 mV ATF Error I _{oer} = -10 μA		0.1	0.2		
LPF 2 linearity	Rlpf2	REFPILOT = 100 kHz, 0.4orl Vp-p in RPPBMODE = H PILOTACT = H RECPILLOT voltage ratio	0.95	0.99	1.05		
CLOCK IN input resistance	Rck	CLOCKIN Vin/lin	80	150		kΩ	

(DC characteristics 2)

(Unless otherwise specified, Ta = 25 °C, Vcc = 3.15 V)

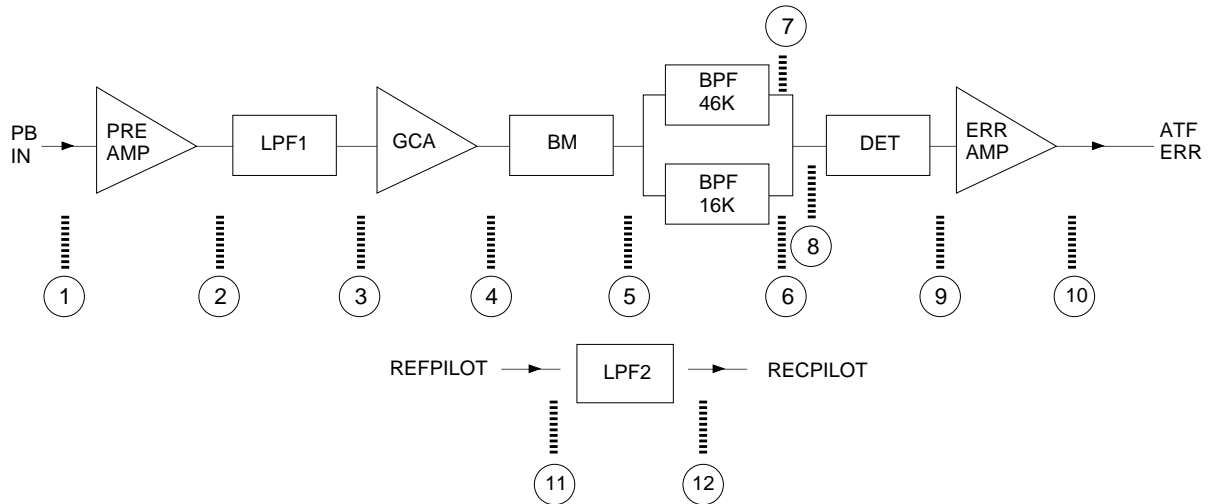
Item	Symbol	Conditions	Rating values			Unit	Remarks
			Min.	Typ.	Max.		
CLOG REF input voltage	Vcc1		0		Vcc	V	
SP/LP REF input voltage	Vsc2		0		Vcc		
CLOG detection high check		SPIN = 50 mVp-p, 5 MHz/GCA2 = 1000/CLOGREF = 0.39 V	2.4				
CLOG detection low check		SPIN = 150 mVp-p, 5 MHz/GCA2 = 1000/CLOGREF = 0.39 V			0.4		
CLOG output voltage	Vclgl	SPIN = 500 mVp-p, 5 MHz/GCA2 = 1000/CLOGREF = COMPREF Vcc = 3.0...4.0 V		0.01	0.4	V	Note 1
	Vclgh	SPIN = AC GND/GCA2=1000/CLOGREF = COMPREF Vcc = 3.0...4.0 V	2.5	3.0			
PB SP/LP output voltage	Vspl	SPIN = AC GND/MODRATIO: See fig1 SPLPREF = Vref/Vcc=3...4 V/GCA2 = 1000	2.5	3.0			
	Vsph	SPIN = 500 mVp-p, 5 MHz/MODRATIO: See fig1 SPLPREF = Vref/Vcc=3...4 V/GCA2 = 1000		0.01	0.4		
"High" level input voltage	Vih	Pins 14, 15 and 17; Vcc = 3 to 4 V	2.1		Vcc		
"Low" level input voltage	Vil	Pins 14, 15 and 17; Vcc = 3 to 4 V	-0.4		0.8		
"High" level input current	Iih	Pins 14, 15 and 17; Vcc = 3 to 4 V		0	1	µA	Note 1
"Low" level input current	Iil	Pins 14, 15 and 17; Vcc = 3 to 4 V	-1	-0.5			
CLOG identification time	Tcl1	SPIN = 500 mVp-p, 5 MHz/Burst = 0.5 Hz/GCA2 = 1000	0.7	1.3	2.6	mS	
	Tcl2	CLOGREF = COMPREF (See: fig2)	4	7.5	10.6		
SPLP identification time	Tsp1	SPIN = 500 mVp-p, 5 MHz/Burst = 0.5 Hz/GCA2 = 1000	30	50	70		
	Tsp2	SPLPREF = Vref/MODRATIO = See: fig1 (See: fig3)	30	50	70		
ENV OUT DC voltage	VEnv0	SPIN = AC GND, GCA2 = 0000; ENVOUT pin voltage	0.425	0.525	0.625	V	
RF detection offset voltage	Denv	SPIN = AC GND, GCA2 = 0000; ENVOUT – COMPREF voltage	-80	0	80	mV	
RF detection output voltage	Venv1	ENVOUT voltage difference when SPIN = 0 V and 0.5 Vp-p, 5 MHz, GCA2 = 1111 and Vcc = 3.15 V	2.3	2.5		V	
	Venv2	ENVOUT voltage difference when SPIN = 0 V and 0.5 Vp-p, 5 MHz, GCA2 = 1111 and Vcc = 3.0 V	2.2	2.4			
CLOG REF input current	Icc1h	Pin current value when CLOG REF = 3.15 V		0	1	µA	
	Icc1l	Pin current value when CLOG REF = 0 V	-1	-0.1			
MOD RATIO input current	Icc1h	Pin current value when MOD RATIO = 3.15 V		0	1		
		Pin current value when MOD RATIO = 0 V	-1	-0.1			
SP/LP REF input current	Icc1h	Pin current value when SPLPREF = 3.15 V		0	1		
		Pin current value when SPLPREF = 0 V	-1	-0.1			
Switching time between playback and recording mode		Time until RECATF stabilizes when RPPBMODE goes from high to low			20	µS	
Switching time between standby and playback mode		Time until PBATF Error stabilizes when STBY goes from high to low			25	mS	

Note 1) The Typ. value is Vcc = 3.15 V

Electrical Characteristics

(AC characteristics 1)

(Unless otherwise specified, Ta = 25 °C, Vcc = 3.15 V)



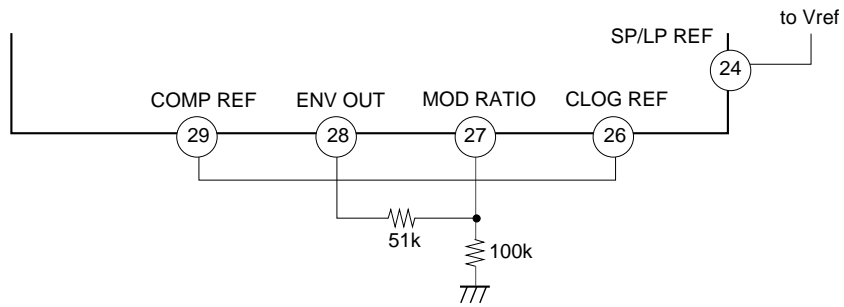
Item	Symbol	Conditions	Rating values			Unit	Remarks
			Min.	Typ.	Max.		
LPF1 Gain	Glp1M	PBIN – GCA1OUT Vin=30 mVp-p, 100 kHz, GCA1: 0000	23	25	27	dB	Measurement points 1 to 4
	Glp11	PBIN = 30 mVp-p, 120 kHz, GCA1: 0000	-1.5	0.5	1.5		
	Glp12	PBIN = 30 mVp-p, 150 kHz, GCA1: 0000	-1.5	0.5	1.5		
	Glp13	PBIN = 30 mVp-p, 170 kHz, GCA1: 0000	-1.5	0	1.5		
	Glp14	PBIN = 100 mVp-p, 250 kHz, GCA1: 0000		-10	-6.5		
	Glp15	PBIN = 300 mVp-p, 400 kHz, GCA1: 0000		-27	-17.5		
	Glp16	PBIN = 800 mVp-p, 750 kHz, GCA1: 0000		-50	-35		
Glp17	PBIN = 800 mVp-p, 3 MHz, GCA1: 0000		-65	-50			
GCA1 S/N ratio	Vgca11	PBIN = 10 mVp-p, 100 kHz; Measure GCA1OUT. RBW = 300 Hz, VBW = 100 Hz; Maximum value from 50 to 250 kHz	40	50		mVp-p	
GCA1 folded noise	Vgca	PBIN = 0.6 Vp-p, 6 MHz; Measure GCA1OUT. RBW = 300 Hz, VBW = 100 Hz; Maximum value from 50 to 250 kHz		1	50		
BPF16K reference gain	Gbp1M	BPFIn = 0.5 Vp-p, 16.46 kHz	1	4	7	dB	Measurement points 5 to 6
BPF16K Gain	Gbp11	BPFIn = 0.5 Vp-p, 9 kHz; Gbp1M reference		-24	-20		
	Gbp12	BPFIn = 0.5 Vp-p, 28 kHz; Gbp1M reference		-22	-20		
BPF46K reference gain	Gbp13	BPFIn = 0.5 Vp-p, 150 kHz; Gbp1M reference		-35	-26	dB	Measurement points 5 to 7
	Gbp2M	BPFIn = 0.5 Vp-p, 46.2 kHz	1	4	7		
BPF46K Gain	Gbp21	BPFIn = 0.5 Vp-p, 16 kHz; Gbp2M reference		-31	-26		
	Gbp22	BPFIn = 0.5 Vp-p, 33 kHz; Gbp2M reference		-26	-20		
	Gbp23	BPFIn = 0.5 Vp-p, 60 kHz; Gbp2M reference		-24	-20		
BPF Gain Diff	D Gbp	Difference between Gbp1M and Gbp2M	-2	0	2	dB	Measurement point 4
Cross Talk	Gcap	REFPILOT = 0.5 Vp-p, 200 kHz; PILOTACT = Low PBIN = AC GND; Measure GCA1OUT		-60	-46		
LPF2 reference gain	Glp2M	500 mVp-p, 100 kHz	-1	0	1	dB	Measurement points 1 to 4
	Glp21	500 mVp-p, 120 kHz; Glp2M reference	-1.5	0.5	1.5		
	Glp22	500 mVp-p, 150 kHz; Glp2M reference	-1.5	0.4	1.5		
	Glp23	500 mVp-p, 170 kHz; Glp2M reference	-1.5	-0.5	1.5		
	Glp24	500 mVp-p, 300 kHz; Glp2M reference		-16	-12		
	Glp25	500 mVp-p, 500 kHz; Glp2M reference		-37	-33		
Glp26	500 mVp-p, 1.5 MHz; Glp2M reference		-80	-40			

(AC characteristics 2)

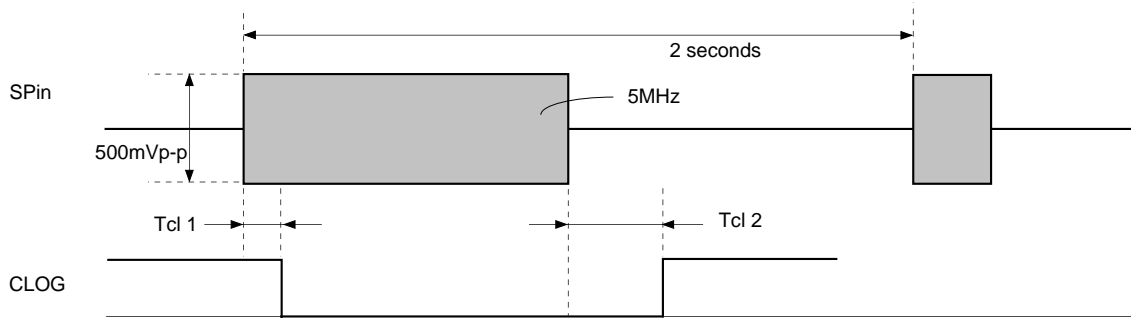
(Unless otherwise specified, Ta = 25 °C, Vcc = 3.15 V)

Item	Symbol	Conditions	Rating values			Unit	Remarks
			Min.	Typ.	Max.		
Clock input	Vck	CLOCKIN = 6 MHz, C = 5Pf	0.1	0.3	1.5	Vp-p	
Clock Duty	Vdk		30	50	70	%	
PBIN input	Vpd		0.1	0.4	1.0	Vp-p	
SPIN input	Vsp		0.1	0.4	1.0		
REF PILOT input	Vpi		0.1	0.5	1.0		
REF PILOT output	Vrec	REFPILOT = 0.5 Vp-p input		0.5		V	
GCA1 gain fluctuation	D Gpd	Vcc = 3.0...3.6 V Gpd (Vcc = 3.6 V) – Gpd (Vcc = 3.0 V)	-1.5	0	1.5	dB	
GCA2 gain fluctuation	D Grf	Vcc = 3.0...3.6 V Gpd (Vcc = 3.6 V) – Gpd (Vcc = 3.0 V)	-1.0	0	1.0		
GCA2 Gain	Grf1	Value obtained by dividing the ENVOUT electric potential difference when SPIN = 5 MHz, 0.4 Vp-p and 0 Vp-p by 0.2 V; GCA2 = 0000	2.0	5.0	8.0		
	Grf2	Value obtained by dividing the ENVOUT electric potential difference when SPIN = 5 MHz, 0.2 Vp-p and 0 Vp-p by 0.1 V; GCA2 = 1000	10.0	13.0	16.0		
	Grf3	Value obtained by dividing the ENVOUT electric potential difference when SPIN = 5 MHz, 0.1 Vp-p and 0 Vp-p by 0.05 V; GCA2 = 1111	17.0	20.0	23.0		
GCA2 frequency response	fw	Frequency -3 dB from SPIN = 0.2 Vp-p, 3 MHz; GCA2 = 1000	10	14		MHz	
GCA1 gain difference	Gdif1	PBIN = 10 mVp-p, 100 kHz; Gain difference between GCA1 = n-1 → n (n = 1 to 15)	0.2	1.0	1.8	dB	
GCA2 gain difference	Gdif2	SPIN = 200 mVp-p, 5 MHz; Gain difference between GCA1 = n - 1 → n (n = 1 to 15)	0.2	1.0	1.8		
ATF total gain	Gerr1	PBIN = 30 mVp-p. 116.46 kHz/GCA1 = 0000 REFPILOT=100 kHz/PBIN → BPF16OUT Gain	22	25	28		
	Gerr2	PBIN = 30 mVp-p. 146.2 kHz/GCA1 = 0000 REFPILOT = 100 kHz/PBIN → BPF46OUT Gain	22	25	28		
ATF total gain difference		Gerr1 – Gerr2	-2	0	2		
ENV OUT output Tr/Tf time	Trenv	SPIN = 5 MHz, 1 Vp-p/Burst = 10 Hz GCA2 = 1000 (Fig-4)	50	100	150	μS	
	Tfenv		50	100	150		
Subtractor output Tr/Tf time	Trsub1	FHIN = 1 Vp-p, 16 kHz/Burst = 10 Hz/3FHIN = AC GND	320	400	600		
	Tfsub1	Measure 3FH-FH (fig. 5)	320	400	600		
	Trsub2	3FHIN = 1 Vp-p, 46 kHz/Burst = 10 Hz/FHIN = AC GND	320	400	600		
	Tfsub2	Measure 3FH-FH (fig. 6)	320	400	600		

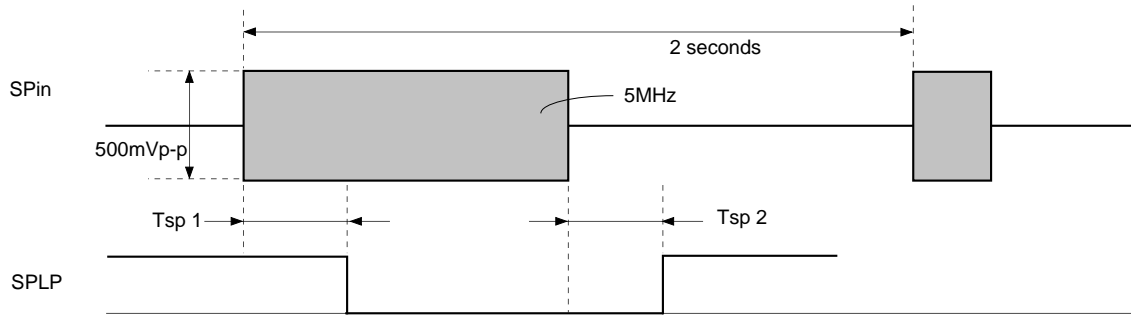
(fig 1)



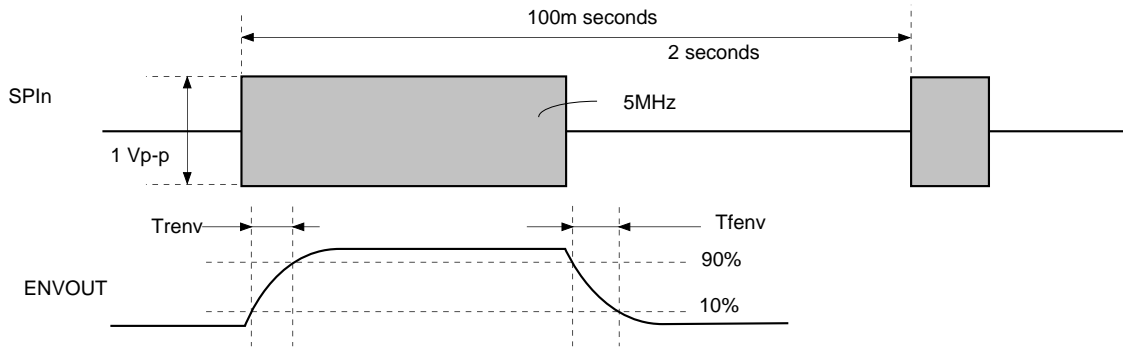
(fig 2)



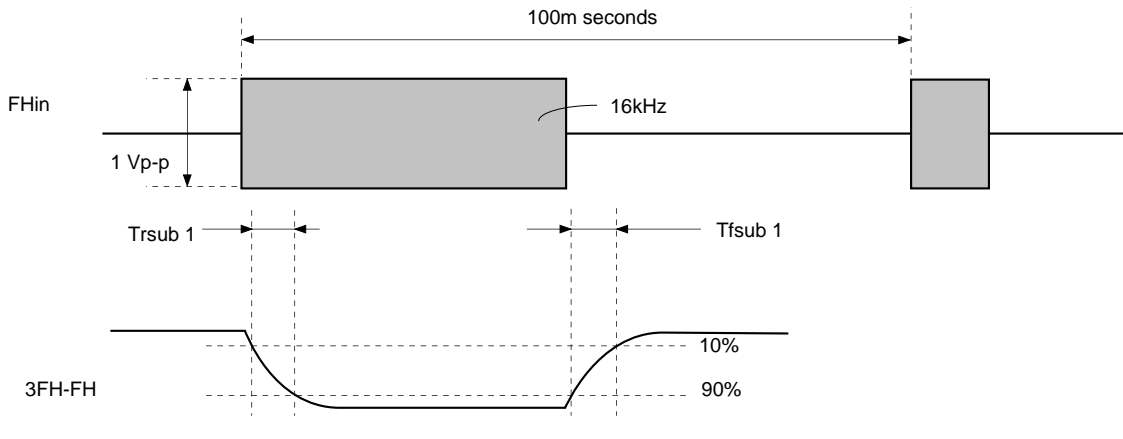
(fig 3)



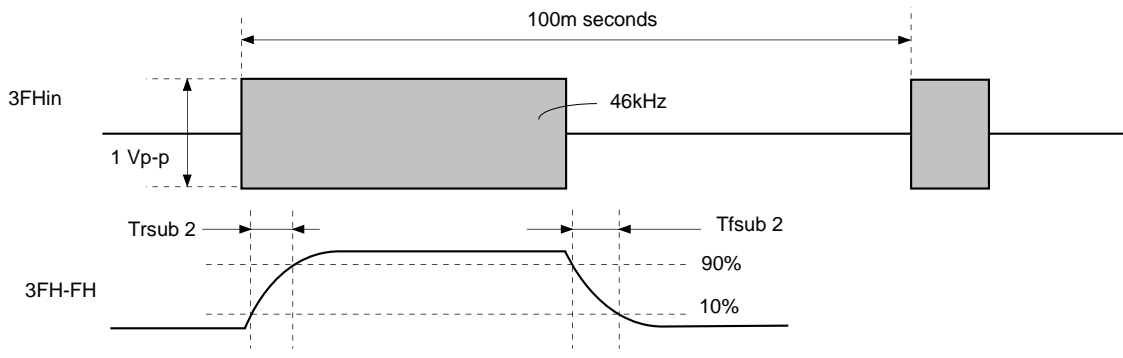
(fig 4)



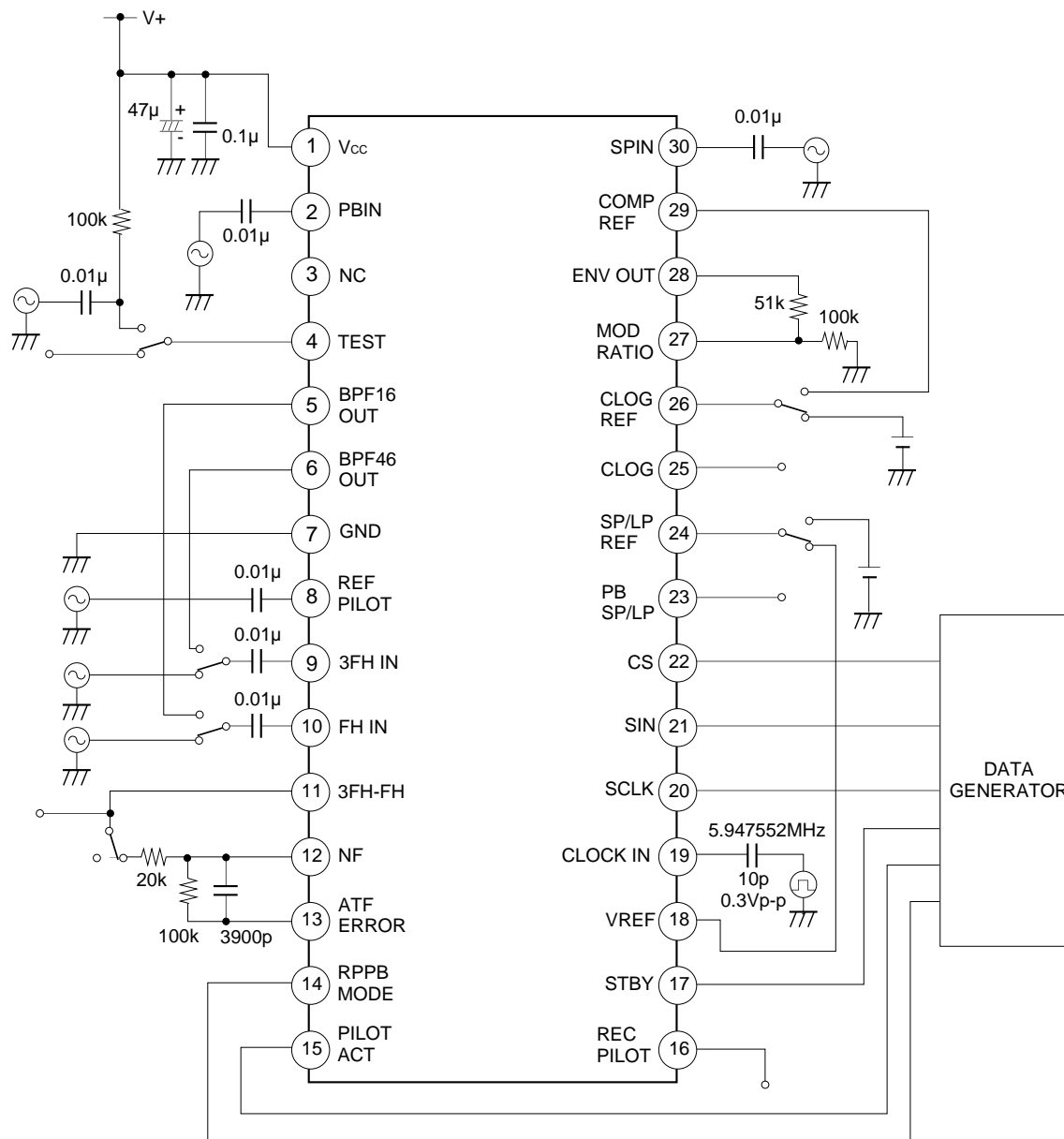
(fig 5)



(fig 6)

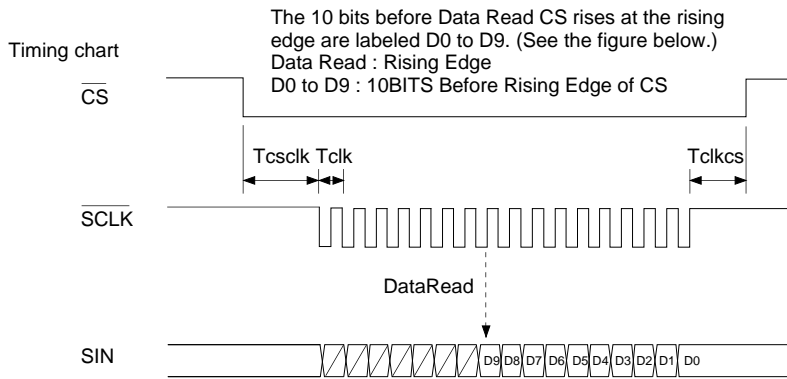
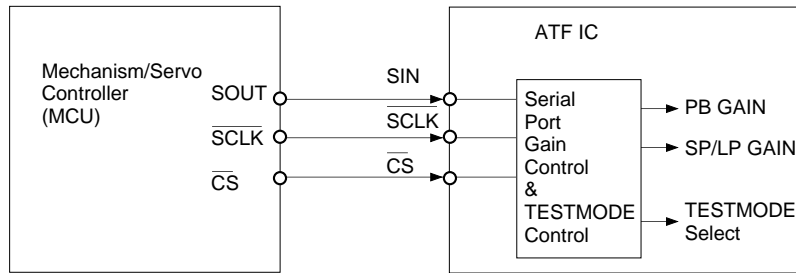


Electrical Characteristics Measurement Circuit



Serial Control Block

Block connection



	NIN	MAX
Tcsclk	5 μsec	
Tclk	1 μsec	
Tclkcs	5 μsec	

Serial Data Contents (SERIAL DATA)

GCA1

D0	D1	D2	D3	PBAMP GAIN (dB)
0	0	0	0	0 ± 0.5
0	0	0	1	1 ± 0.5
0	0	1	0	2 ± 0.5
0	0	1	1	3 ± 0.5
0	1	0	0	4 ± 0.5
0	1	0	1	5 ± 0.5
0	1	1	0	6 ± 0.5
0	1	1	1	7 ± 0.5
1	0	0	0	8 ± 0.5
1	0	0	1	9 ± 0.5
1	0	1	0	10 ± 0.5
1	0	1	1	11 ± 0.5
1	1	0	0	12 ± 0.5
1	1	0	1	13 ± 0.5
1	1	1	0	14 ± 0.5
1	1	1	1	15 ± 0.5

*Glp1M REF
(Glp1M = 25 ± 2 dB)

GCA2

D4	D5	D6	D7	SPAMP GAIN (dB)
0	0	0	0	0 ± 0.5
0	0	0	1	1 ± 0.5
0	0	1	0	2 ± 0.5
0	0	1	1	3 ± 0.5
0	1	0	0	4 ± 0.5
0	1	0	1	5 ± 0.5
0	1	1	0	6 ± 0.5
0	1	1	1	7 ± 0.5
1	0	0	0	8 ± 0.5
1	0	0	1	9 ± 0.5
1	0	1	0	10 ± 0.5
1	0	1	1	11 ± 0.5
1	1	0	0	12 ± 0.5
1	1	0	1	13 ± 0.5
1	1	1	0	14 ± 0.5
1	1	1	1	15 ± 0.5

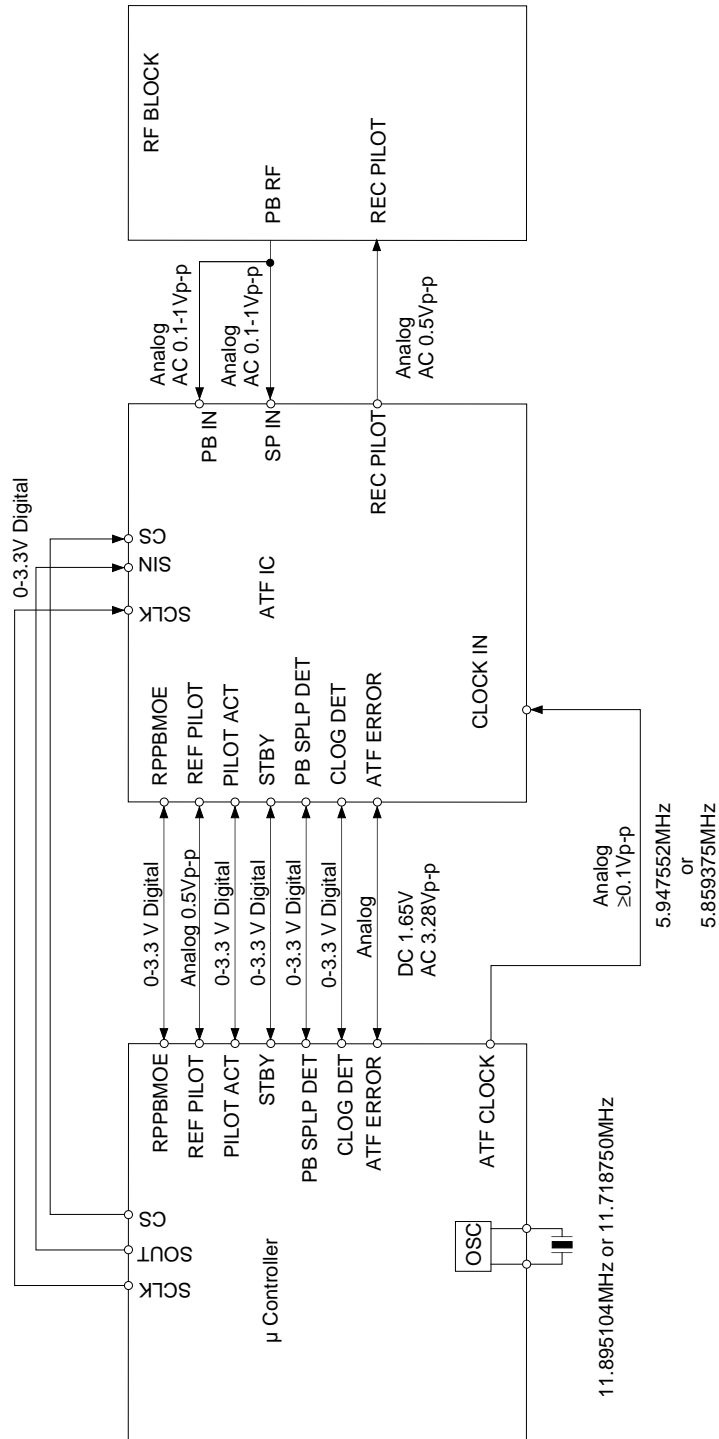
*Grf1 REF
(Grf1 = 5 ± 2 dB)

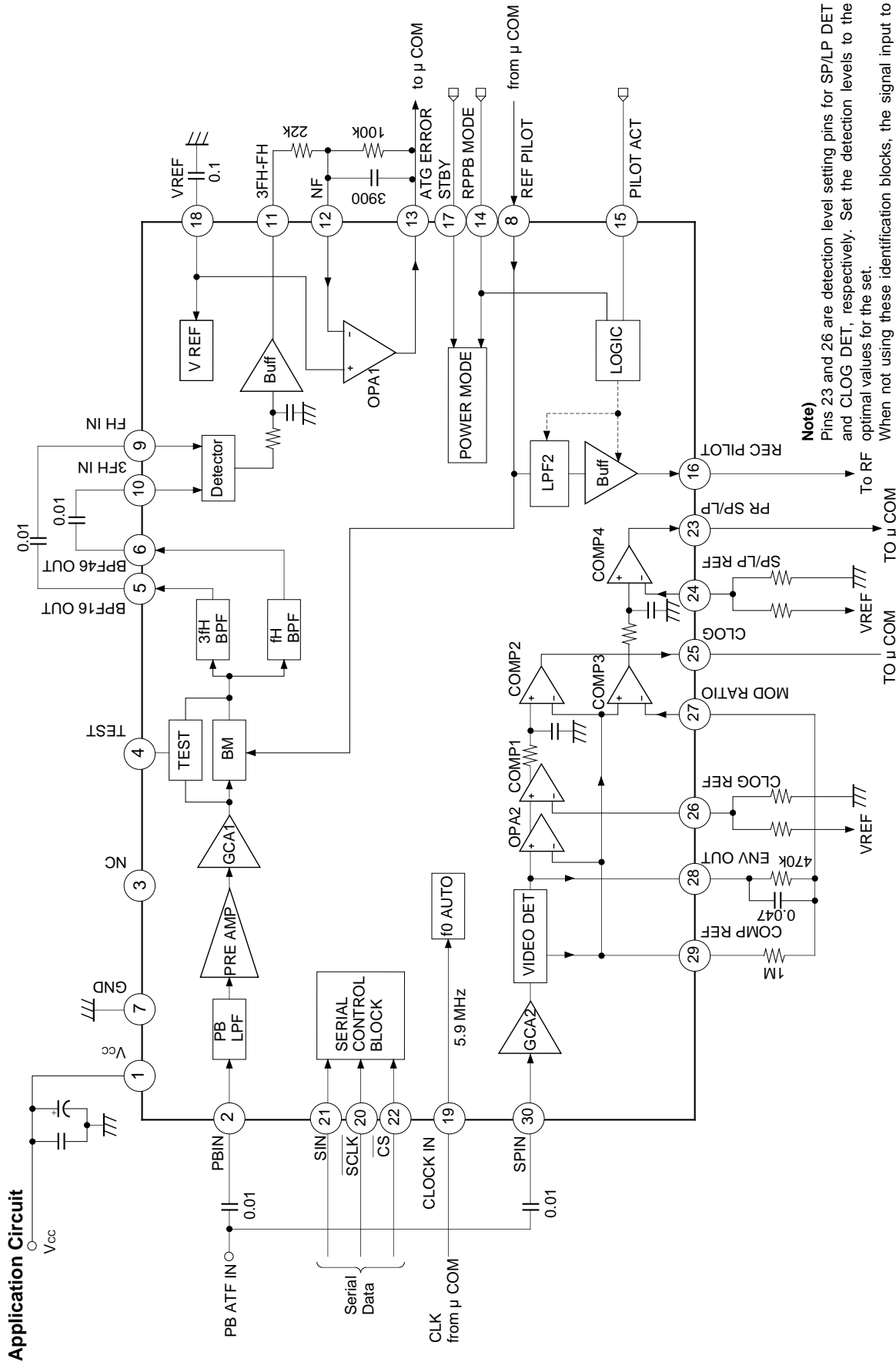
TEST

D8	D9	TESTMODE
0	0	OUTPUT OF GCA
0	1	OUTPUT OF B.M
1	0	INPUT OF BPF16 k, 46 k
1	1	NOT USED

Note) For input mode, pull up to Vcc with a 100 kΩ resistor. Input voltage is 0.5 Vp-p or less.

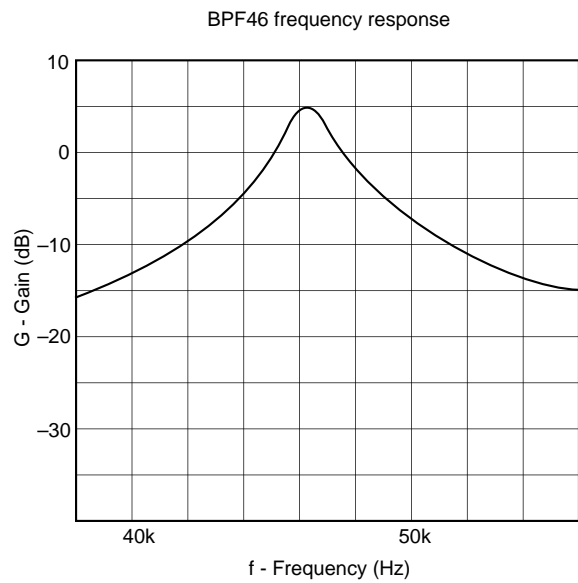
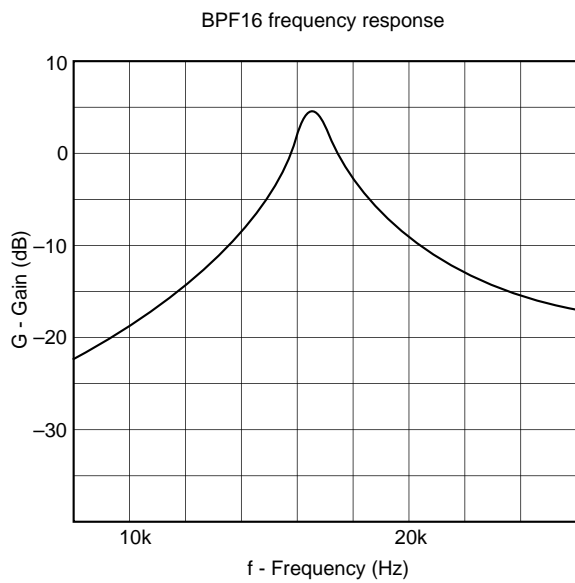
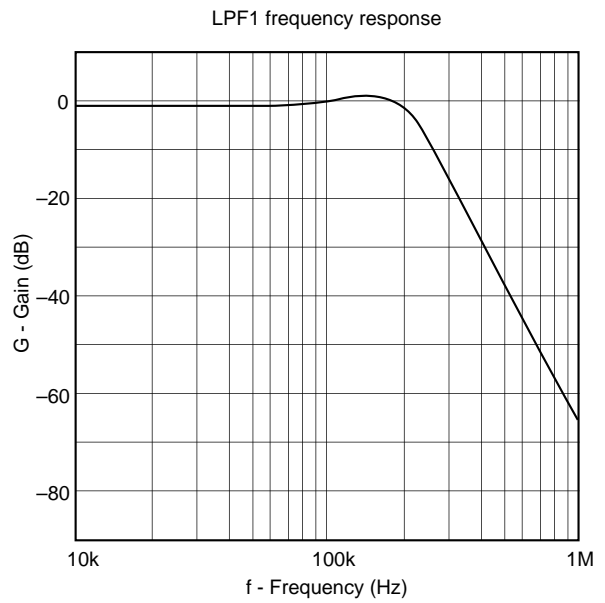
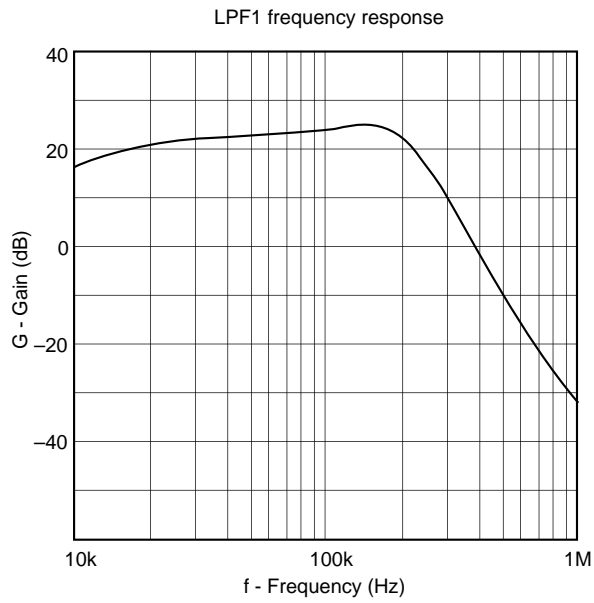
Example of External Connections





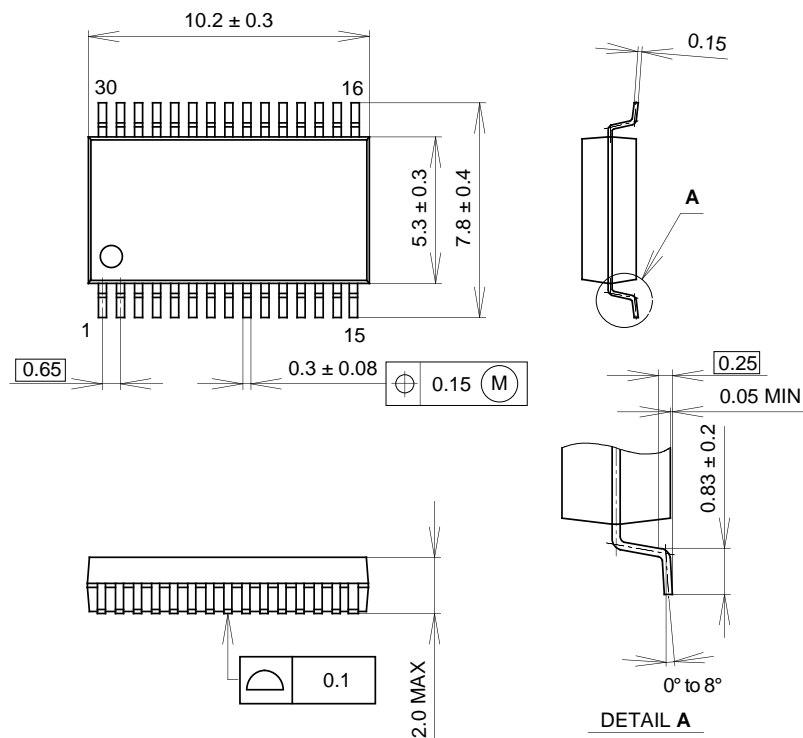
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Example of Representative Characteristics (TA = 25 °C, V_{CC} = 3.15 V)



Package Outline Unit: mm

30PIN SSOP (PLASTIC)



PACKAGE STRUCTURE

SONY CODE	SSOP-30P-L123
EIAJ CODE	SSOP030-P-0300
JEDEC CODE	_____

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	COPPER ALLOY
PACKAGE WEIGHT	0.21g