

# Panasonic

Reduce external components and improve reliability

## For 3.5inch HDD Motor Comb IC / AN8428GAK

### ■ Overview

AN8428GAK is motor comb IC for 3.5inch HDD.

By new retract circuit ,reduce external components and shorten the brake time of the disk to improve reliability of HDD .

Spindle motor sensor less linear drive.

VCM linear drive , PWM-DAC control .

Built-in Retract , 12 V/5 V/3.3 V power monitor, 3.3 V-Regulator.

80-pin TQFP package with exposed heat think .

### ■ Features

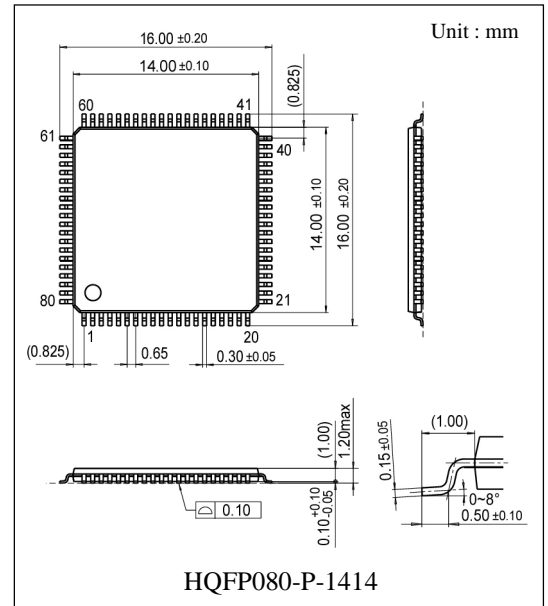
- By new retract circuit ,reduce external components and shorten the brake time 1/2 of the disk to improve reliability of HDD .
  - Built-in shock sensor amplifier for mechanical shock protection and 3.3 V regulator for logic semiconductor .
  - 10 dB acoustic noise reduction by trapezoidal current on spindle motor drive .
  - 80- pin TQFP package with the smallest thermal resistance in the industry .
- Meet to increase speed of HDD higher 30 % than previous.

### ■ Principle functions

- (1) Spindle motor sensor less linear drive : 2.7 A peak current drivers ,  $R_{on}=1.1 \Omega$
- (2) VCM linear drive : 1.8 A peak current ,  $R_{on}=1.5 \Omega$
- (3) Retract function exists
- (4) Built in 12 V/5 V/3.3 V power monitor
- (5) Built in shock sensor amplifier
- (6) Built in 3.3 V regulator

### ■ Applications

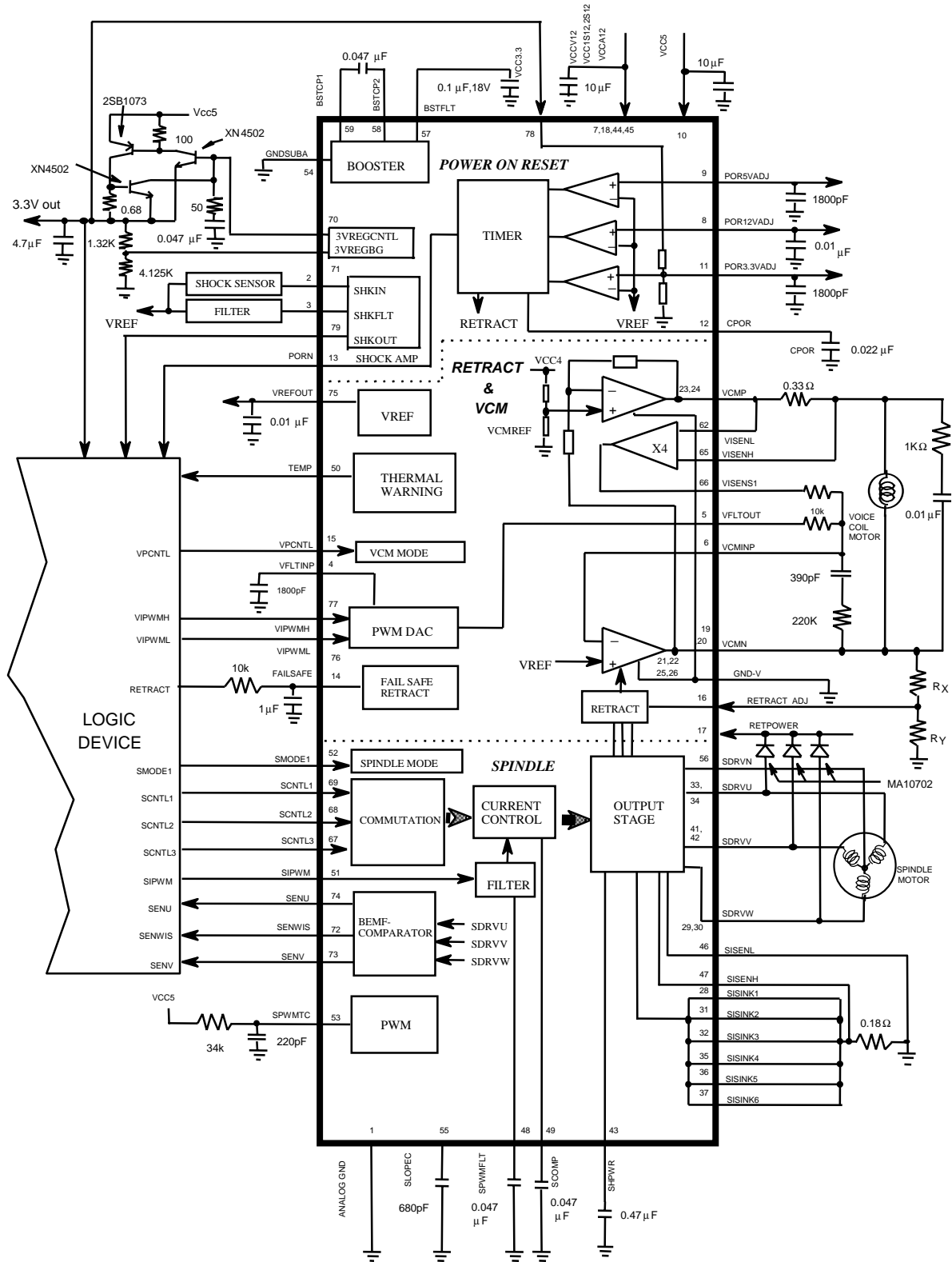
3.5 inch HDD



The products and specification are subject to change without any notice. Please ask for the latest Product Standards to guarantee the satisfaction of your product requirements.

Semiconductor Company, Matsushita Electronics Corporation

# Standard application



## ■ Maximum Ratings

PARAMETER	SYMBOL	Ratings	unit
Supply voltage +3.3 V	V <sub>cc3.3</sub>	- 0.3 ~ 6.0	V
Supply voltage +5V	V <sub>cc5</sub>	- 0.3 ~ 6.0	V
Supply voltage +12V	V <sub>cc12</sub>	- 0.3 ~ 13.5	V
Output voltage (Spindle)	V <sub>SDRV</sub>	- 0.3 ~ 15	V
Output voltage (VCM)	V <sub>CMN,VCMP</sub>	- 0.3 ~ 15	V
Spindle Motor Peak Output Current	I <sub>Ospeak</sub>	3.0	A
Voice coil Motor Peak Output Current	I <sub>Ovpeak</sub>	2.0	A

## ■ Supply voltage range

+3.3 V Supply voltage range	V <sub>CC3.3</sub>	3.0 V ~ 5.5 V	V
+5V Supply voltage range	V <sub>CC5</sub>	4.5 V ~ 5.5 V	V
+12V Supply voltage range	V <sub>CCS12</sub>	10.8 V ~ 13.2 V	V
+12V Supply voltage range	V <sub>CCV12</sub>	10.8 V ~ 13.2 V	V
+12V Supply voltage range	V <sub>CCA12</sub>	10.8 V ~ 13.2 V	V

## ■ Electrical Characteristics (Ta=25 °C ± 2 °C unless otherwise specified )

PARAMETER	SYMBOL	Conditions	min	typ	max	unit
+3.3 V Supply Current	I <sub>CC3.3</sub>	Linear mode	—	1.1	3.0	mA
	I <sub>CC3.3 S</sub>	Sleep mode	—	1.1	3.0	
+5V Supply Current	I <sub>CC5</sub>	Linear mode	—	16.0	20.0	mA
	I <sub>CC5S</sub>	Sleep mode	—	14.0	—	
+12V Supply Current	I <sub>CC12</sub>	Linear mode	—	35.0	55.0	mA
	I <sub>CC12S</sub>	Sleep mode	—	10.0	—	
[Power Monitor Comparators]						
12V Threshold voltage	V <sub>I12</sub>		8.7	9.0	9.3	V
5V Threshold voltage	V <sub>I5</sub>		4.2	4.3	4.4	V

■ Electrical Characteristics (Ta=25 °C±2 °C unless otherwise specified )

PARAMETER	SYMBOL	Conditions	min	typ	max	unit
<b>[SPM block]</b>						
Total Output on Resistance	Rds(on)	Iout =2.7 A	—	0.65	1.1	Ω
Voltage Ratio SPWMFLT/SISENH	KSP		4.8	5.1	5.4	V/V
Voltage at pin SISENH for 100% duty cycle	V100		0.33	0.348	0.376	V
Voltage at pin SISENH for 50% duty cycle	V50		0.160	0.18	0.200	V
Voltage at pin SISENH for 5% duty cycle	V5		—	0.018	0.026	V
Voltage at pin SISENH for 0% duty cycle	V0		—	0.0	2.0	mV
<b>[VCM block]</b>						
Vretract Regulation	VRET2	Supply OFF	0.55	0.87	1.15	V
Irrct2	Irrct2	VBEMF=2V VCM=10.5 Ω	15	80	130	mA
Current Ratio between MSB/LSB	Ratio		31.5	32	32.7	
Time of Crossover Distortion	TCRO	Ramp Input VCMINP 20 μs	—	2	5	μs
Symmetry VCM Drivers VCMP , VCMN	Ratio $\frac{I_2}{I_1}$	I2=IRVCM at Duty Cycle =10% I1=IRVCM at Duty Cycle=90% RS=0.33,R1=10k,R2=6.6k, RL =10 Ω	0.93	1	1.07	mA/mA
Linearity VCM Drivers VCMP , VCMN	Ratio $= \frac{I_2-I_0}{I_1-I_0}$	I2=IRVCM at Duty Cycle =30% I1=IRVCM at Duty Cycle=70% I0=IRVCM at Duty Cycle=50% RS=0.33,R1=10k,R2=6.6k, RL =10 Ω	0.97	1.0	1.03	mA/mA
Total Resistance (Source + Sink + Isolation)	RDS0N25		—	1.0	1.5	Ω
VCM Output Drivers Offset Current	Ios	MPWMH& WPWNL at 50% Duty Cycle RS=0.33, R1=10K, R2 =6.6 K, RL=10 Ω	-28	0	28	mA
<b>[Shock sensor]</b>						
Input Current of Shock Sensor Amplifier	ISHKIN		-1	—	1	nA
Gm of Shock Sensor Amplifier	Gmshk		-	5.9	-	mS
<b>[3.3 V—Regulator]</b>						
Output voltage Regulation	VCC3V3		3.168	3.33	3.49	V
Load Regulation	Δ VLDR	ILOAD=0~4mA	-	33	-	mV