

**SKY2000**  
**Data Sheet**

**DUAL-TRACK  
MAGNETIC STRIPE  
F2F DECODER IC**

***For More Information***

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## 1 DESCRIPTION

SKY2000 is a CMOS Integrated Circuit device, which is providing high functional F2F Decoding and Encoding for Magnetic Card Reader. SKY2000 provides decoding function for magnetic stripe storage system, with all the analog and digital circuits in a single chip. The analog block contains preamplifier, peak detector, comparator and reference generator. The digital block includes reference window signal generator, up/down counter for F2F signal measurement, bit-error detection and control logic.

## 2 FEATURES

- 2.1. Mixed signal, Application Specific IC
- 2.2. Compact, standard IC package, TSSOP-24 pin & QFN 24 LD.
- 2.3. Pin compatible with SMR200
- 2.4. Low cost solution by reduced external components
- 2.5. Easily decodes standard 75 & 210 BPI decoding for used cards
- 2.6. Wide range of card swipe speed : 300 ~12600 BPS
- 2.7. Automatic Gain Control for wide magnetic signal ranges
- 2.8. 25% bit to bit jitter compensation
- 2.9. Automatic resetting against noise
- 2.10. Built in Power-on-Reset & Oscillator
- 2.11. Low power consumption (Operating: 2mA , Standby: under 1mA )
- 2.12. Wide operating voltage: VDD =3.0V~5.5V
- 2.13. Operating temperature range: Ta = -35°C ~ +75°C
- 2.14. High immunity to ambient noise including TDMA noise
- 2.15 ± 2000V Electro-Static Discharge (ESD) protection

### 3 BLOCK DIAGRAM

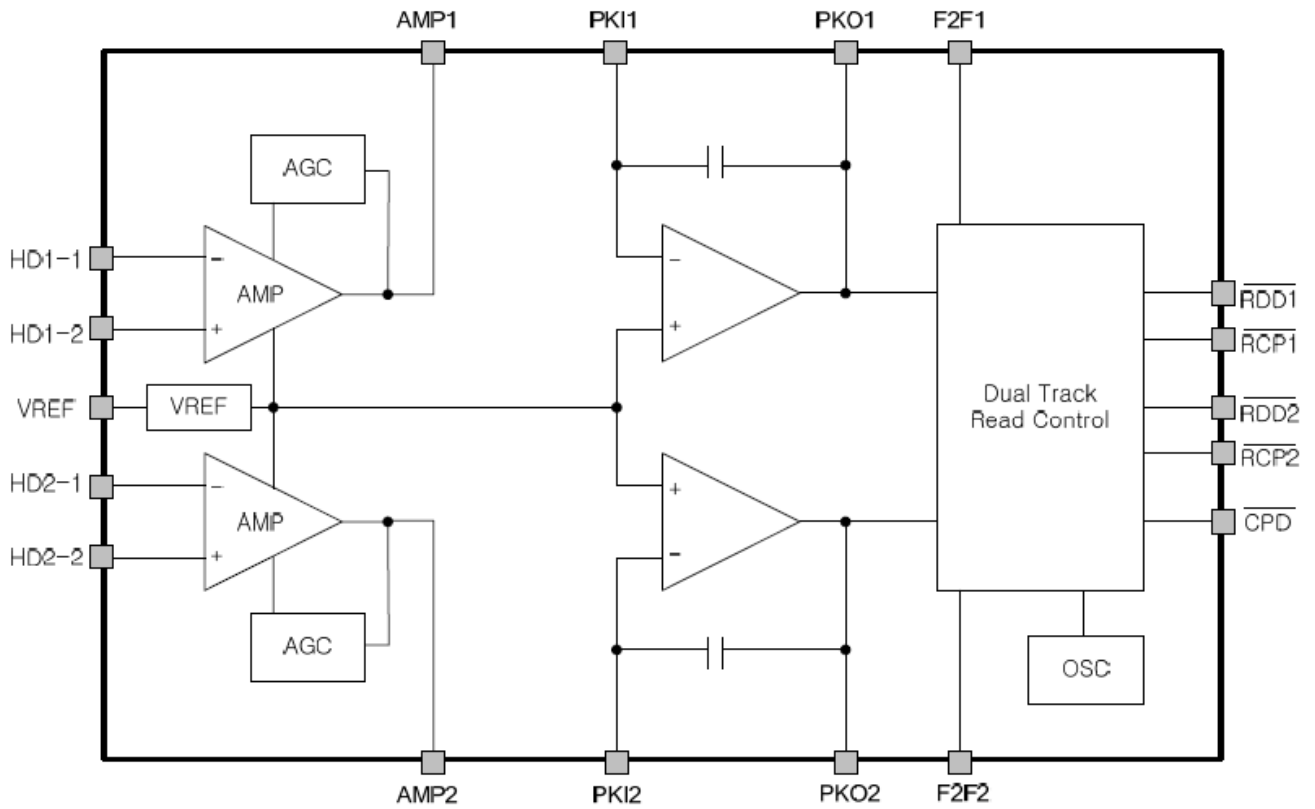


Figure - 1 Architectural Block Diagram

## 4 PIN CONFIGURATION

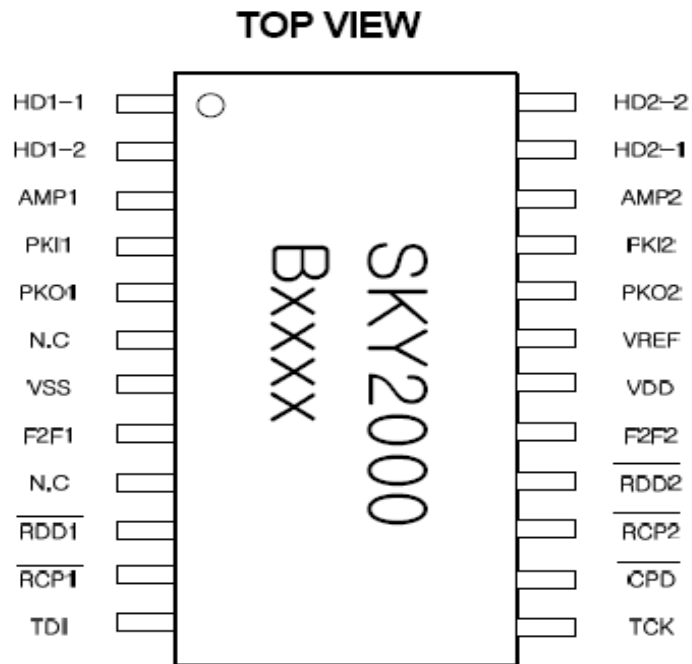


Figure – 2.1 Pin Configuration (24 TSSOP)

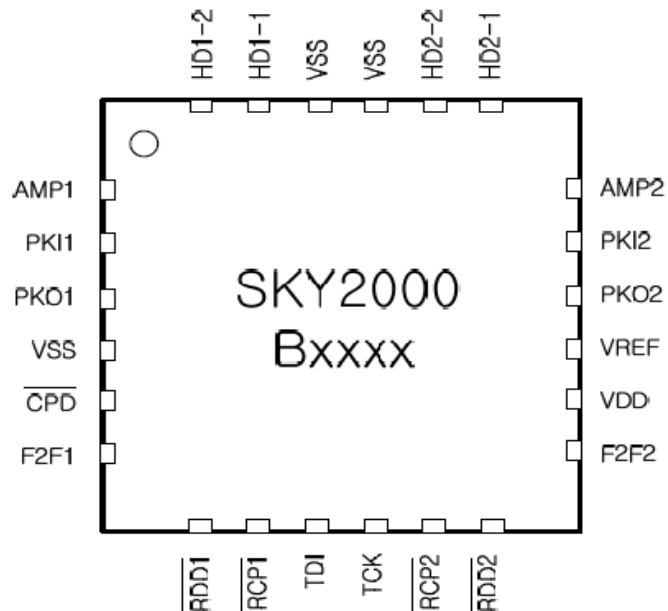


Figure – 2.2 Pin Configuration (24 QFN)

## 5 PIN DESCRIPTION

Pin No.	Pin No.	Symbol	I/O	Description	Note
<b>QSOP</b>	<b>QFN</b>				
1	23	HD <sub>1-1</sub>	I	Head Input 1(-)	Track-1
2	24	HD <sub>1-2</sub>	I	Head Input 1(+)	Track-1
3	1	AMP1	O	Amplifier Output 1	Track-1
4	2	PKI1	I	Peak Detect Input 1	Track-1
5	3	PKO1	O	Peak Detect Input 1	Track-1
6	-	N.C	-	(External Bias)	Not Connect
7	4	VSS	G	Negative Power Supply	Ground
-	5	$\overline{\text{CPD}}$	O	Card Present Detect	Internally Pulled-up
8	6	F2F1	O	F2F Output 1	Track-1
9	-	N.C	-	(Reset)	Not Connect
10	7	$\overline{\text{RDD1}}$	O	Read Data 1	Track-1
11	8	$\overline{\text{RCP1}}$	O	Read Clock Pulse 1	Track-1
12	9	TDI	I	Test Data In	F2F external input
13	10	TCK	I/O	Test Clock In/Out	Test Clock
14	-	$\overline{\text{CPD}}$	O	Card Present Detect	Internally Pulled-up
15	11	$\overline{\text{RCP2}}$	O	Read Clock Pulse 2	Track-2
16	12	$\overline{\text{RDD2}}$	O	Read Data 2	Track-2
17	13	F2F2	O	F2F Output 2	Track-2
18	14	VDD	P	Positive Power Supply	3.3V~5.0VDD
19	15	VREF	I	Reference Voltage	VDD/2
20	16	PKO2	O	Peak Detect Input 2	Track-2
21	17	PKI2	I	Peak Detect Input 2	Track-2
22	18	AMP2	O	Amplifier Output 2	Track-2
23	19	HD <sub>2-1</sub>	I	Head Input 2(-)	Track-2
24	20	HD <sub>2-2</sub>	I	Head Input 2(+)	Track-2
-	21	VSS	G	Negative Power Supply	Ground
-	22	VSS	G	Negative Power Supply	Ground

## 6 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings (Non-Operating)

DC Supply Voltage	0 to 7 Volt
Voltage Input Range	0 to VDD
Input Current	20 mA
Output Current	10 mA
Storage Temperature Range	-55°C ~ +150°C
Lead Temperature	260°C

### Recommended Operating Conditions

Characteristics	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	V <sub>DD</sub>		3.0		5.5	V
Operating Temperature	T <sub>OPR</sub>		-35		+75	°C
Reference Voltage	V <sub>REF</sub>			VDD/2		V
Oscillator Frequency	Osc	VDD=5.0V	1.6	2.0	2.5	MHz
Output Voltage /RDD,/RCP,/CPD	V <sub>OH</sub>	VDD =5.0V IOH=10mA	4.5			V
		VDD =3.3V IOH =8mA	2.5			V
	V <sub>OL</sub>	VDD =5.0V IOL =10mA			0.4	V
		VDD =3.3V IOL =6mA			0.4	V
Operating Current	I <sub>DD</sub>	VDD =5.0V		1.8		mA
		VDD =3.3V		1.2		mA
Standby Current	I <sub>STBY</sub>	VDD =5.0V		1.0		mA
		VDD =3.3V		0.8		mA

## 7 FUNCTIONAL DESCRIPTION

SKY2000 provides decoding function for magnetic stripe storage system, with all the analog and digital circuits in a single chip. F2F pattern signal is generated by analog signal processing through an amplifier OP1, peak detector OP2 and comparator. The operation of digital logic for data generation is activated by triggering oscillation circuit as soon as detecting F2F pattern transition. Card Present Detect ( $\overline{\text{CPD}}$ ) signal becomes active state after null 8 bits from the first bit reading. And also proper RDD and RCP signals are generated.

### SIGNAL DESCRIPTION

- READ DATA ( $\overline{\text{RDD}}$ )

The Data signal is valid while the  $\overline{\text{RCP}}$  is low. If  $\overline{\text{RDD}}$  signal is high, the logical value of the bit is zero(0). If low, then the logical value of the bit is high(1). Data output is a serial stream of digital bits, the level of which, with the corresponding clock, represents each data bit that was recorded on the magnetic stripe track. No data filtering is required, as the first 8 to 9 bits (after wake-up) from the leading edge of a magnetic stripe are not provided as output, as these bits are used for circuit synchronization.

- READ CLOCK ( $\overline{\text{RCP}}$ )

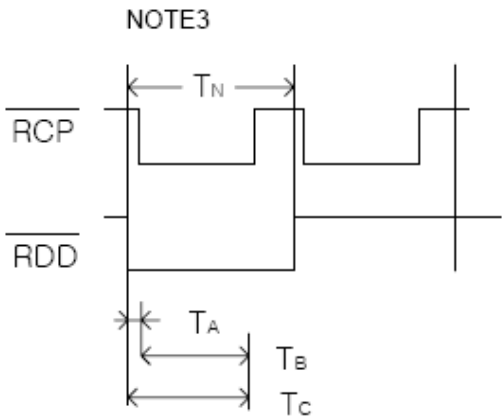
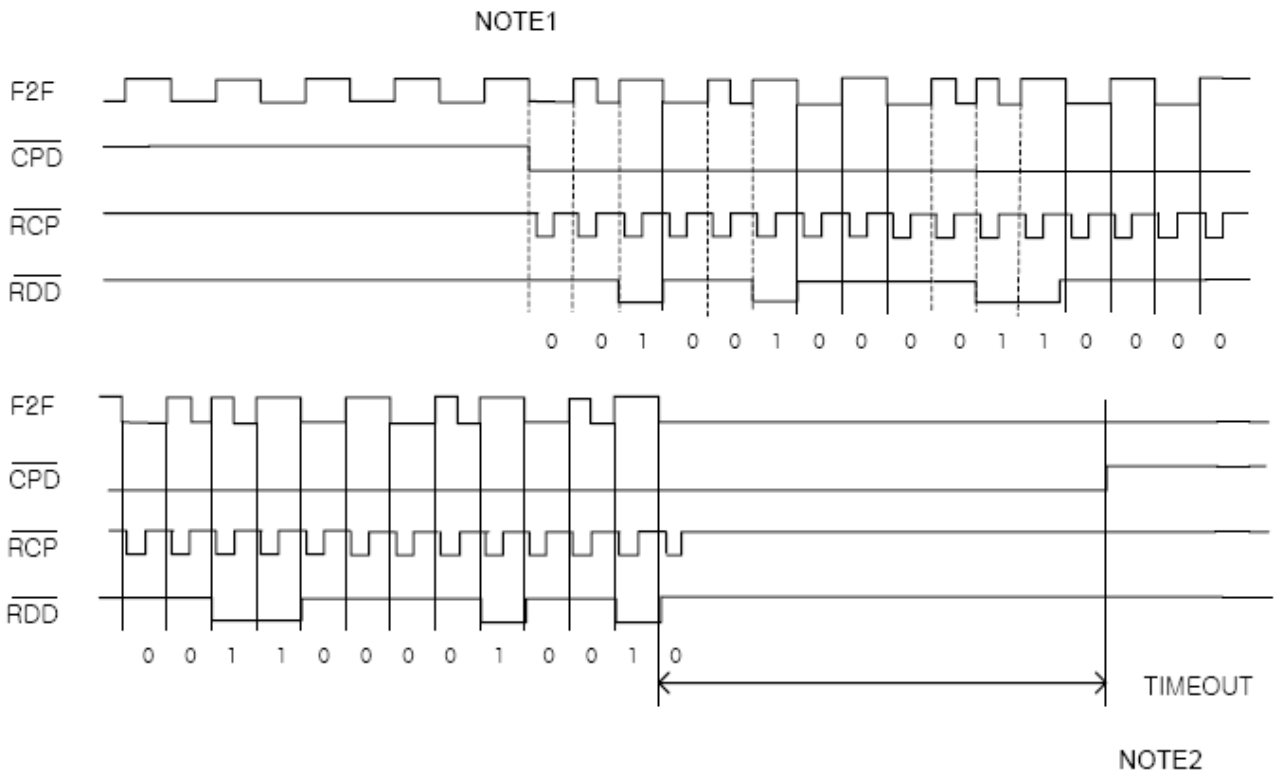
The  $\overline{\text{RCP}}$  signal indicates that  $\overline{\text{RDD}}$  is valid. The  $\overline{\text{RDD}}$  should be loaded and stable before the  $\overline{\text{RCP}}$  signal goes low (negative edge). Clocking output is normally high, and goes low to indicate a data sample time. The data output is stable and may be sampled on the falling or rising edge of clock, or at any time while the clock is low. The  $\overline{\text{RCP}}$  goes low approximately 3.2 $\mu\text{sec}$  after the data output is valid. The receiving interface for data must sense the high-to-low clock transition and acquire the data bit level during clock pulse. The clock width changes with speed.

- CARD PRESENT ( $\overline{\text{CPD}}$ )

Card Present Detect signal goes low after the 8 or 9th flux reversal, and it returns to high when approx. 10ms was elapsed. When no card is being inserted through magnetic reader system, the  $\overline{\text{RDD}}$ ,  $\overline{\text{RCP}}$ , and  $\overline{\text{CPD}}$  signals stay high. This signal is normally high; a low output indicates encoded media. The output is an open drain type with internal pull-up resistor; the outputs of several circuits can be connected together. An external pull-up resistor is not needed.



**TIMING DIAGRAM**



NOTE4

$T_A$	$8 T_{osc}$
$T_B$	$(5/7 \times T_N) - T_A$
$T_C$	$5/7 \times T_N$

**Figure – 3 Data Read Timing**

**NOTE:**

1. 8 or 9 head flux reversal for low density configuration.
2. TIMEOUT of the  $\overline{CPD}$  signal occurs approx. 10 ms after last Head Signal transition.
3. The low pulse width of  $\overline{RCP}$  is approx. 70% of bit time.
4. The  $\overline{RDD}$  is valid at  $8 T_{OSC}$ (3.2 $\mu$ s min.) before the negative edge of the  $\overline{RCP}$ .

## 8 APPLICATION INFORMATION

The Magnetic head should be used to be in accordance with SKY2000. Each best suggested circuitry is shown in below. We can also provide other best-suggested circuitry according to different magnetic head.

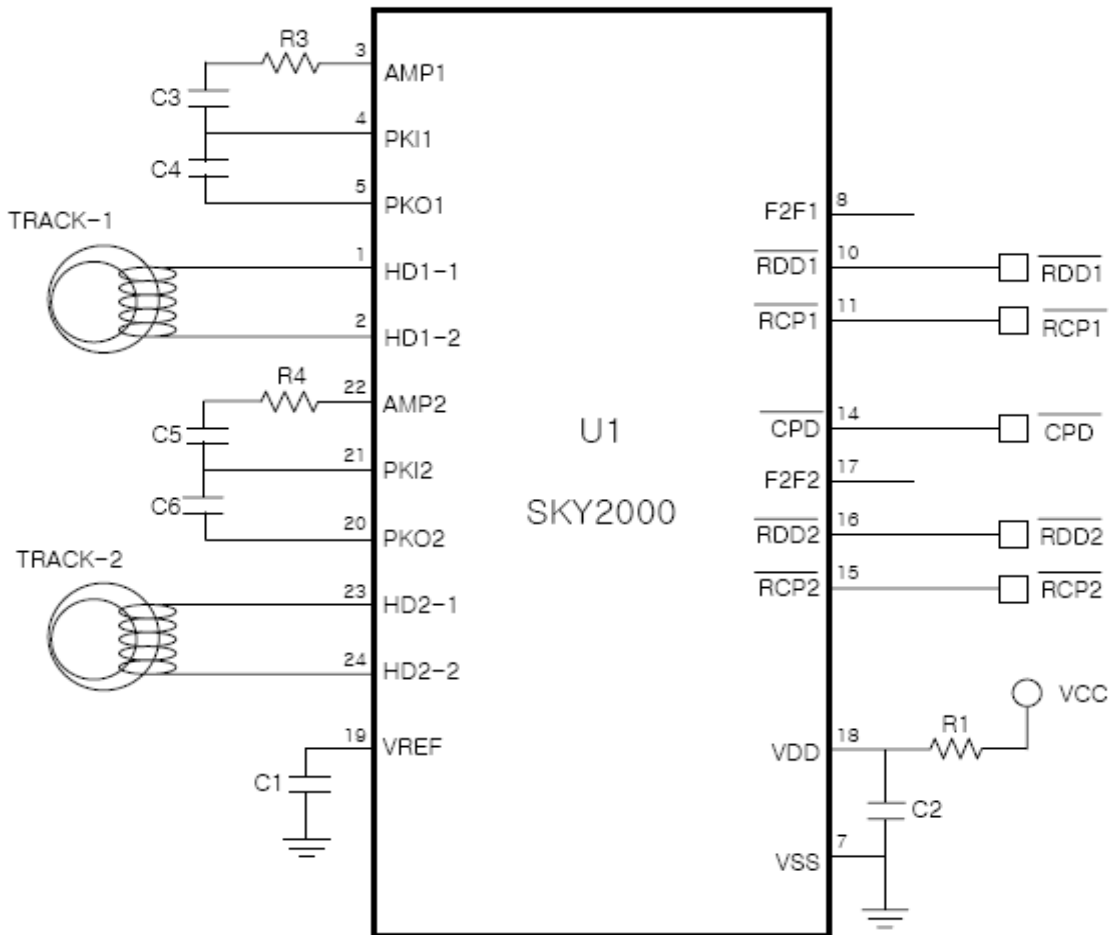


Figure – 4 Dual Track

### Recommended component values

#### 140Ω/28mH Magnetic Head

75BPI			210BPI					
R4	C5	C6	R3	C3	C4	C1	R1	C2
47K	1.5nF	-	1.3K	27nF	300pF	0.1uF	4.7	0.1uF

#### 110Ω/28mH Magnetic Head

75BPI			210BPI					
R4	C5	C6	R3	C3	C4	C1	R1	C2
33K	1.5nF	-	1.5K	10nF	120pF	0.1uF	4.7	0.1uF

The above schematics and part values are provided only for reference.

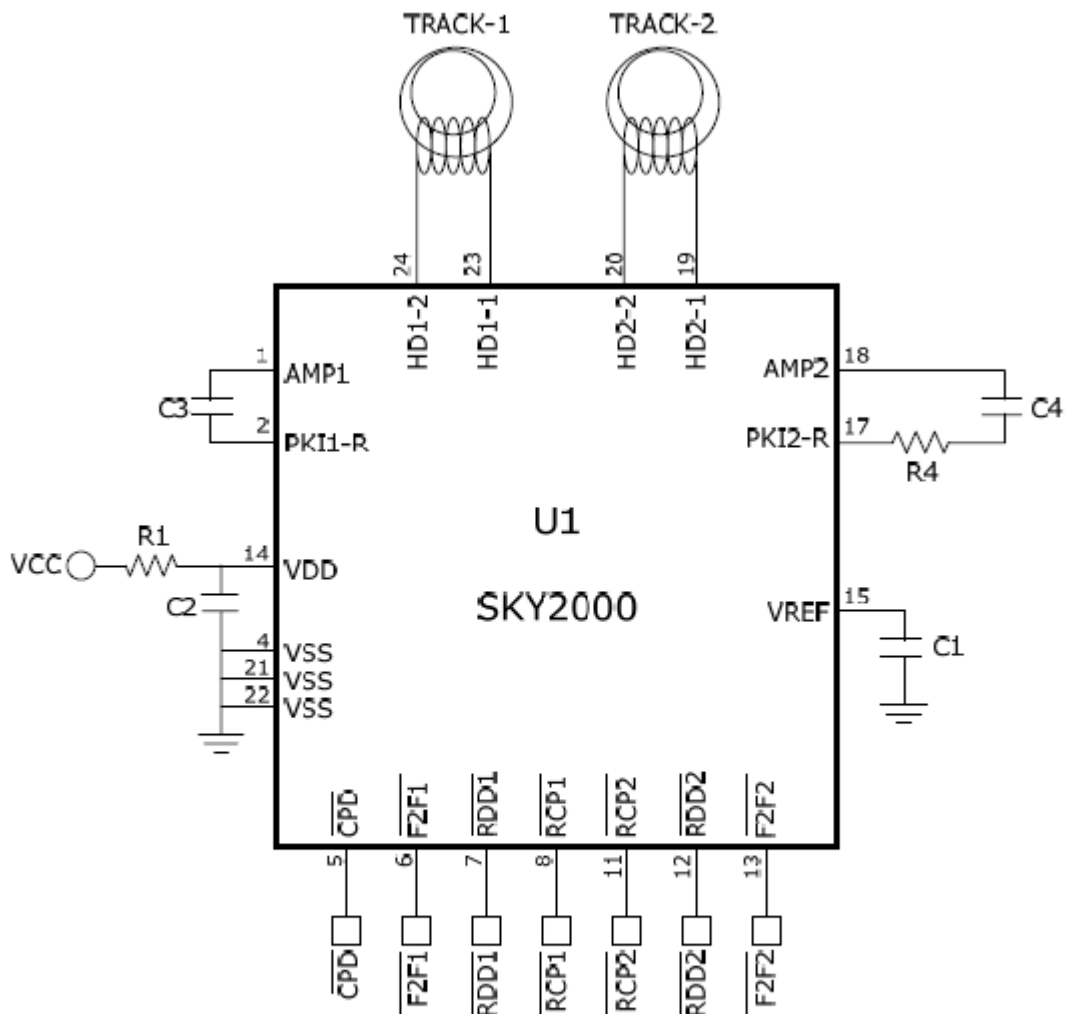


Figure – 4 Dual Track

**Recommended component values**

PART	75BPI(ISO-1/3)	210BPI(ISO-2)	REMARK
C3	-	2.7nF	
C4	1.5nF	-	
R4	24 KΩ	-	
C1		0.1 μF	V <sub>REF</sub>
C2		0.1 μF	
R1		4.7Ω	

The above schematics and part values are provided only for reference.  
(140Ω/28mH Magnetic Head)

**External Component Parameters**

<b>Component</b>	<b>Function</b>	<b>Value</b>	<b>Tolerance</b>	<b>Unit</b>
Capacitor	Required Decoupling capacitance	0.1	± 20 %	uF
Head Inductance	Head Inductance(per track)	28 80	± 10%	mH
Head Resistance	Head Inductance(per track)	140 200	± 10%	Ohm

# 9 PACKAGE DIMENSION

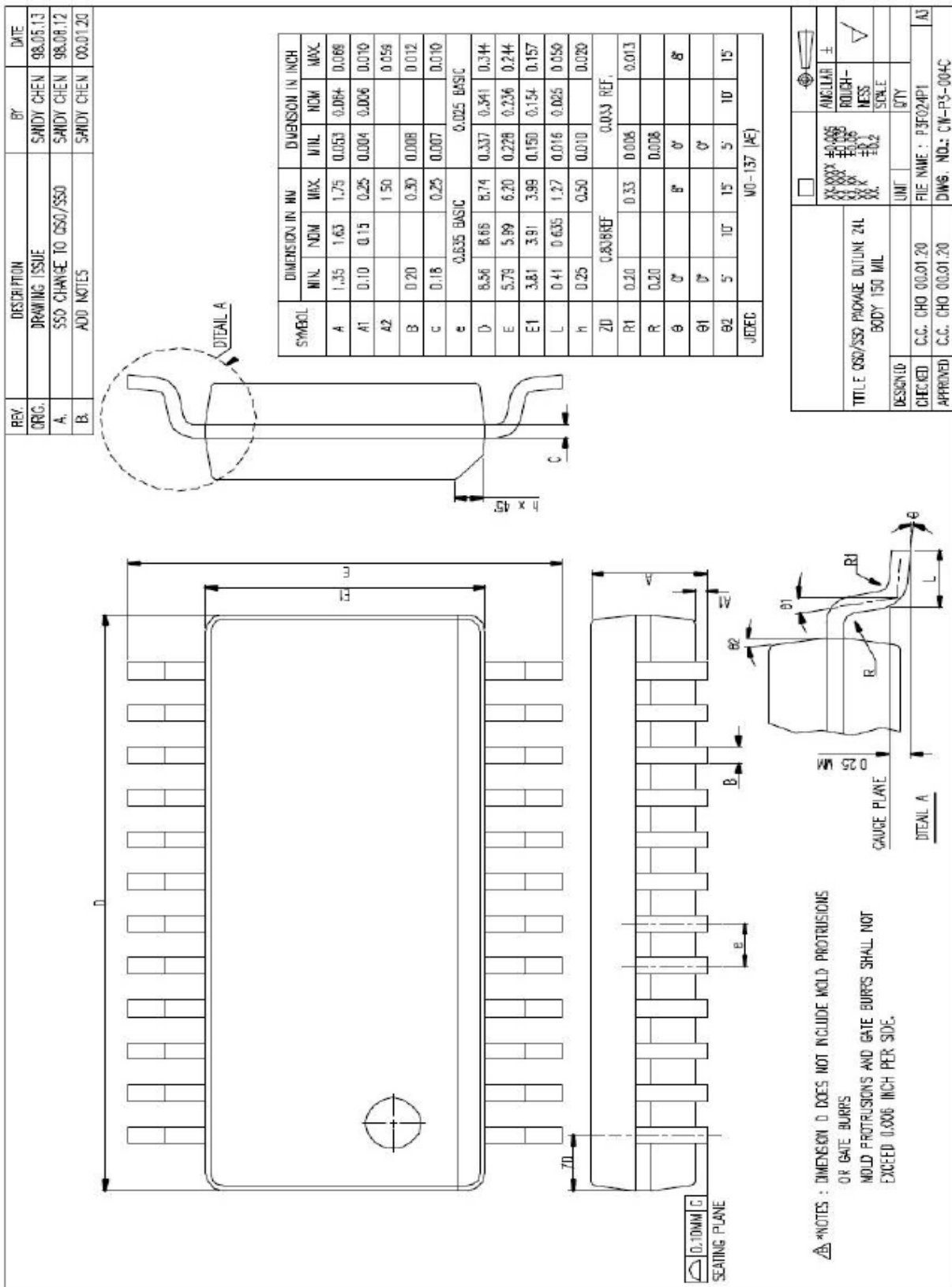
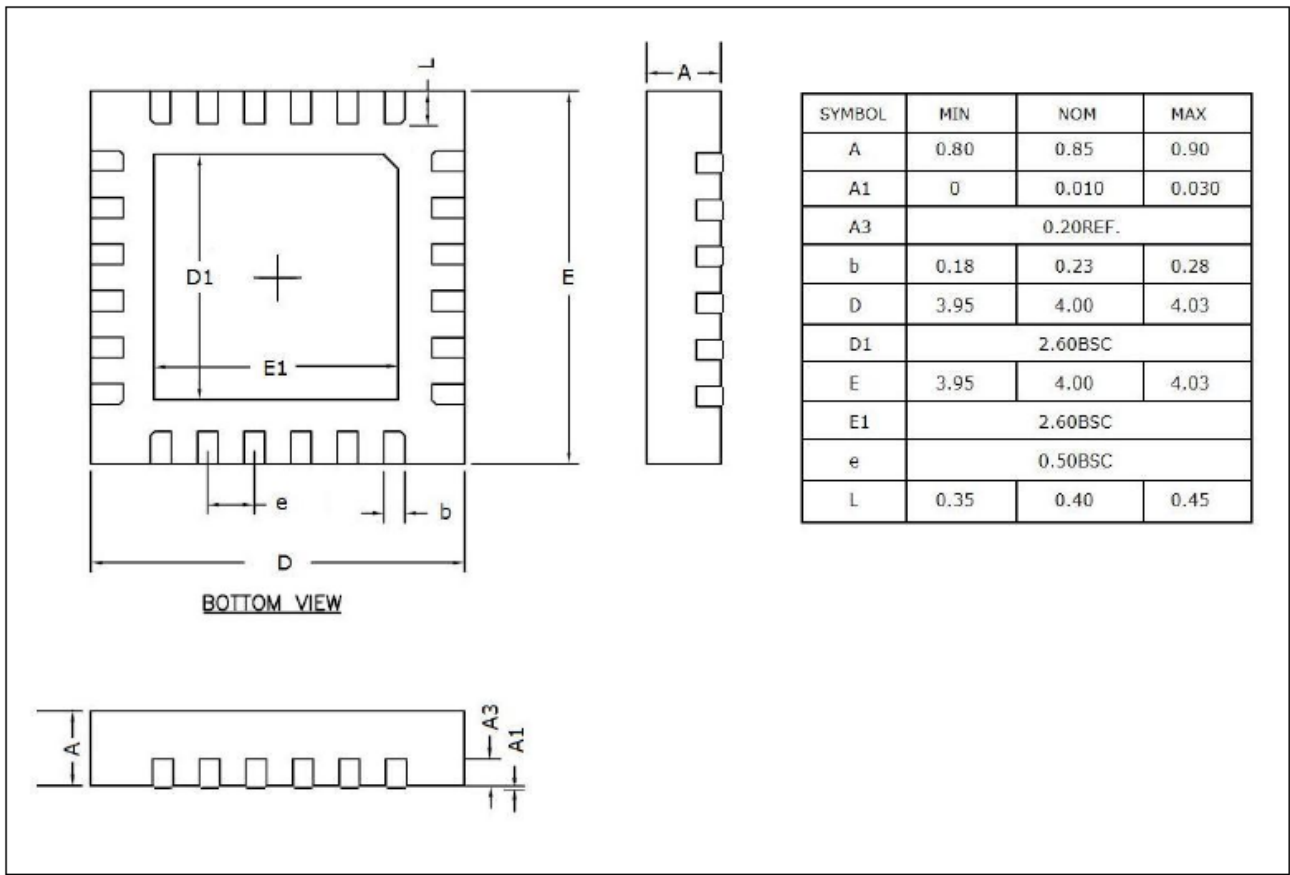


Figure – 5 QSOP24 Dimension



ALL DIMENSION ARE IN MILLIMETERS

Figure – 6 QFN24 Dimension