# DC MOTOR SPEED CONTROLLER

The KA2404 is a monolithic integrated circuit designed for DC motor speed controllers.

FEATURES

- Suitable for DC motor speed controllers of cassette tape recorders and radio cassettes.
- Excellent stability of each characteristics against ambient temperature.
- High output current.
- Low quiescent current (1.3mA: typ).
- Low reference voltage.
- Wide operating supply voltage range ($V_{CC} = 4V \sim 12V$)
- KA2404A: To-126 PKG type
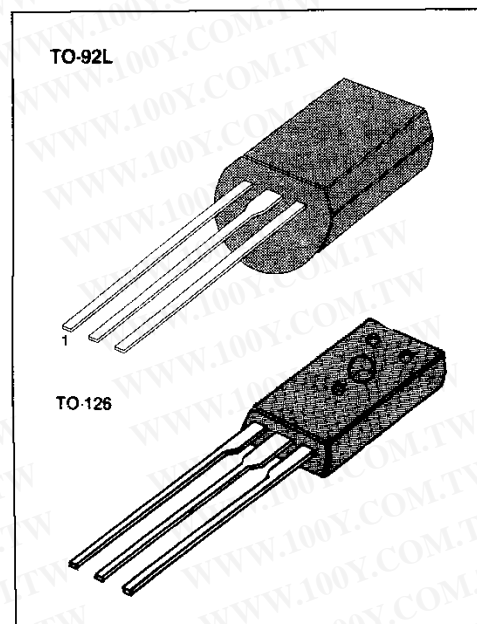
EQUIVALENT CIRCUIT BLOCK DIAGRAM

ORDERING INFORMATION

Device	Package	Operating Temperature
KA2404	TO-92L	$-20°C \sim +70°C$
KA2404A	TO-126	
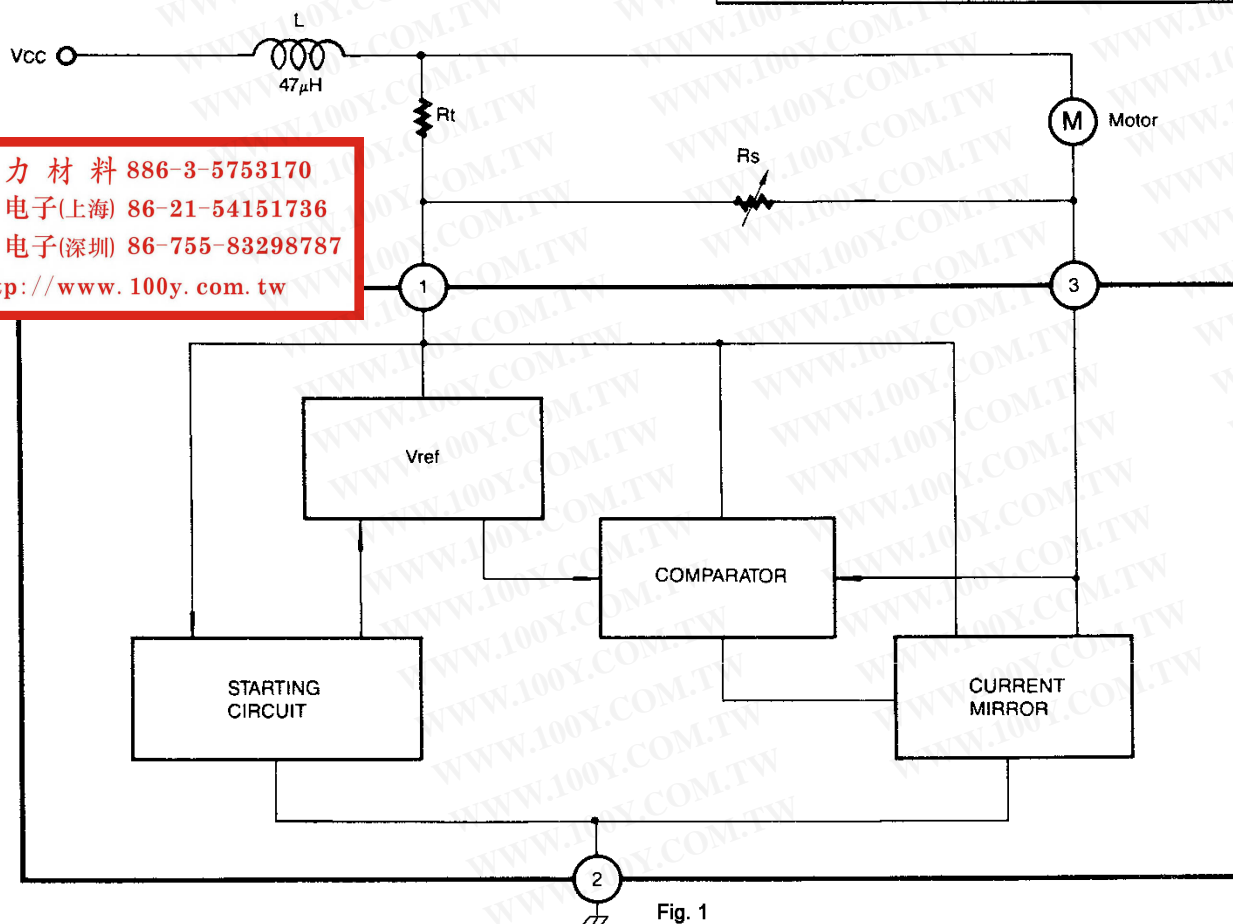
勝 特 力 材 料 886-3-5753170
胜特力电子(上海) 86-21-54151736
胜特力电子(深圳) 86-755-83298787
Http://www.100y.com.tw

Fig. 1

ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristics	Symbol	Value	Unit
Supply Voltage	V_{CC}	16	V
Circuit Current	I_3	2 (Note 1)	A
Power Dissipation	P_D (TO-92L)	800	mW
(TO-126)	1.3 (Note 2)	W	
Operating Temperature	T_{OPR}	−20 ~ +70	°C
Storage Temperature	T_{STG}	−40 ~ +125	°C

Note 1: 5 > 5 sec
Note 2: Ta = 25°C, with a 100 × 100mm bakelite printed circuit board (35µ Cu leaf)

ELECTRICAL CHARACTERISTICS

(Ta = 25°C, V_{CC} = 9V, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	Fig
Reference Voltage	V_{REF}	I_3 = 10mA	1.10	1.27	1.40	V	2
Quiescent Circuit Current	I_{CCa}	Rm = 180Ω	0.8	1.3	1.8	mA	4
Current Coefficient	K	Rm_1 = 44Ω Rm_2 = 33Ω	16	18	20		3
Voltage Characteristic of Current Coefficient	$\frac{\Delta K}{K} / \Delta V_{CC}$	I_3 = 100mA V_{CC} = 4 ~ 12V		0.4		%/V	3
Voltage Characteristic of Reference Voltage	$\frac{\Delta V_{REF}}{V_{REF}} / \Delta V_{CC}$	I_3 = 100mA V_{CC} = 4 ~ 12V		0.06		%/V	2
Current Characteristic of Current Coefficient	$\frac{\Delta K}{K} / \Delta I_3$	I_3 = 30 ~ 200mA		−0.02		%/mA	3
Current Characteristic of Reference Voltage	$\frac{\Delta V_{REF}}{V_{REF}} / \Delta I_3$	I_3 = 30 ~ 200mA		−0.02		%/mA	2
Temperature Characteristics of Current Coefficient	$\frac{\Delta K}{K} / \Delta T_a$	I_3 = 100mA T_a = −20 ~ +75°C		0.01		%/°C	3
Temperature Characteristics of Reference Voltage	$\frac{\Delta V_{REF}}{V_{REF}} / \Delta T_a$	I_3 = 100mA T_a = −20 ~ +75°C		0.01		%/°C	2

TEST CIRCUIT 1

Reference Voltage

$$V_{REF}, \quad \frac{\Delta V_{REF}}{V_{REF}}\bigg/ \Delta V_{CC}, \quad \frac{\Delta V_{REF}}{V_{REF}}\bigg/ \Delta I_3$$
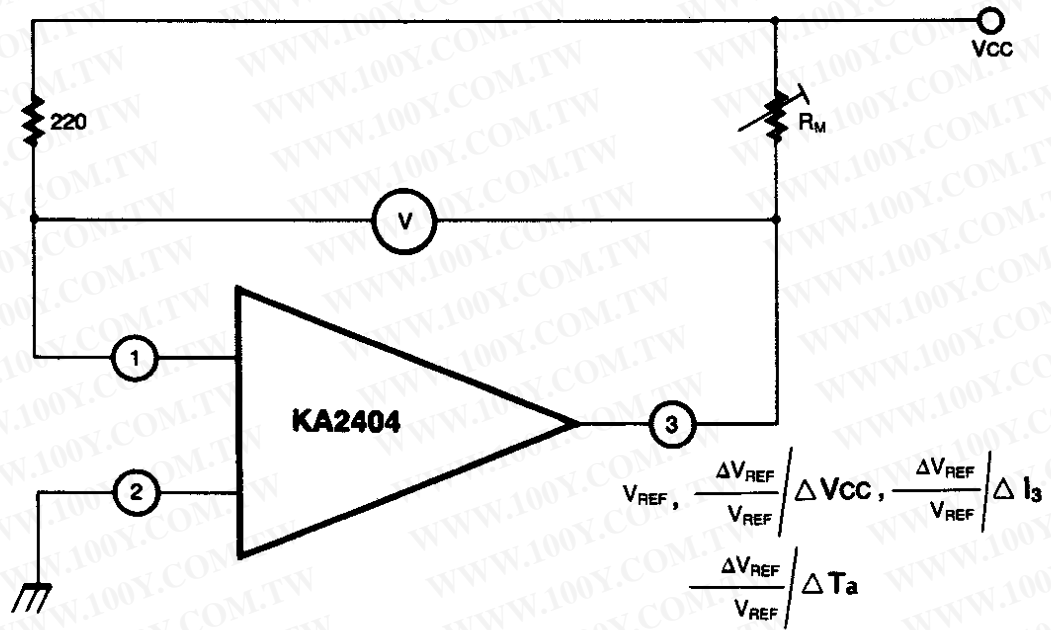
$$\frac{\Delta V_{REF}}{V_{REF}}\bigg/ \Delta T_a$$

Fig. 2

TEST CIRCUIT 2

Current Coefficient

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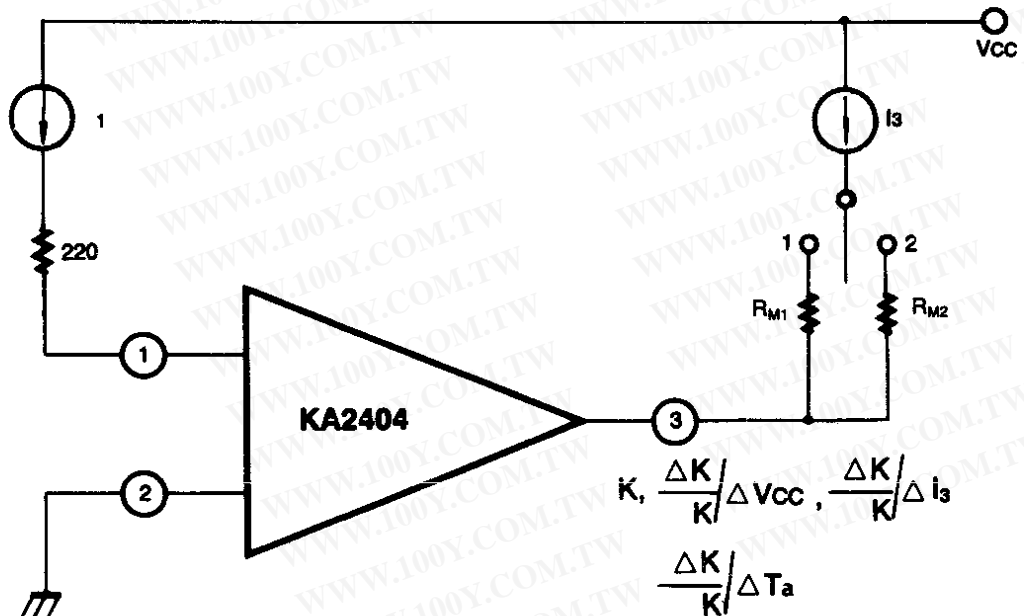$$K, \quad \frac{\Delta K}{K}\bigg/ \Delta V_{CC}, \quad \frac{\Delta K}{K}\bigg/ \Delta i_3$$

$$\frac{\Delta K}{K}\bigg/ \Delta T_a$$

Fig. 3

$$K = \frac{i_3 (SW\ 2)-(SW\ 1)}{i_1 (SW\ 2)-(SW\ 1)}$$

TEST CIRCUIT 3
Quiescent Circuit Current

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$$I_{ccq} = I_l - \frac{I_3}{K}$$
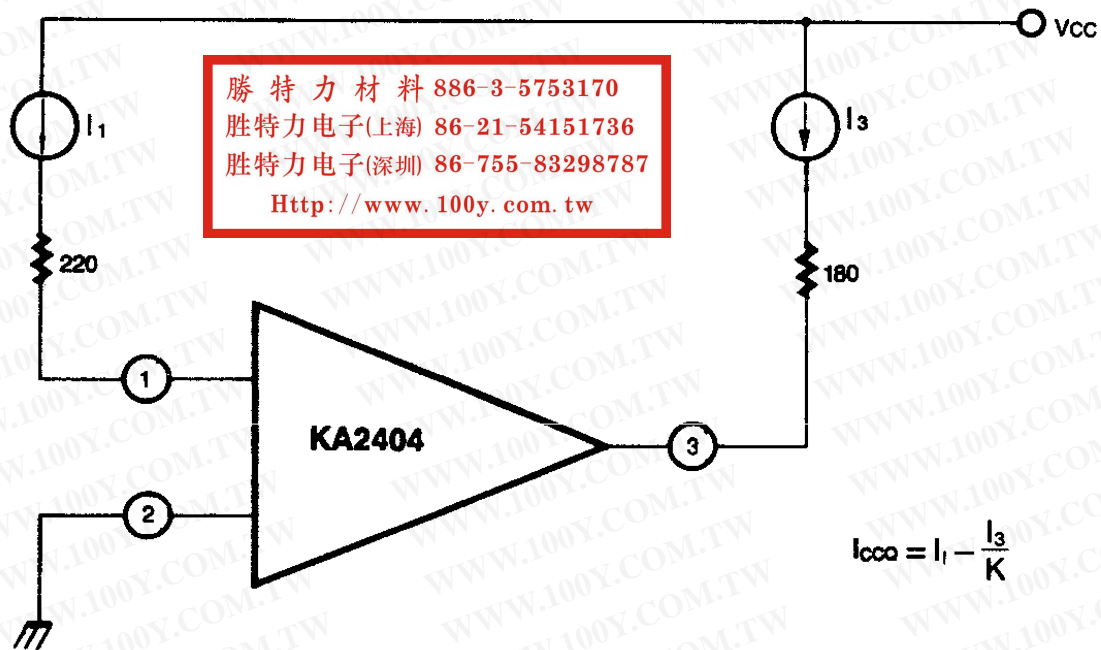
Fig. 4

REFERENCE VOLTAGE-SUPPLY VOLTAGE

$I_m = 100mA$

V_{REF}, REFERENCE VOLTAGE

$V_{cc}(V)$, SUPPLY VOLTAGE
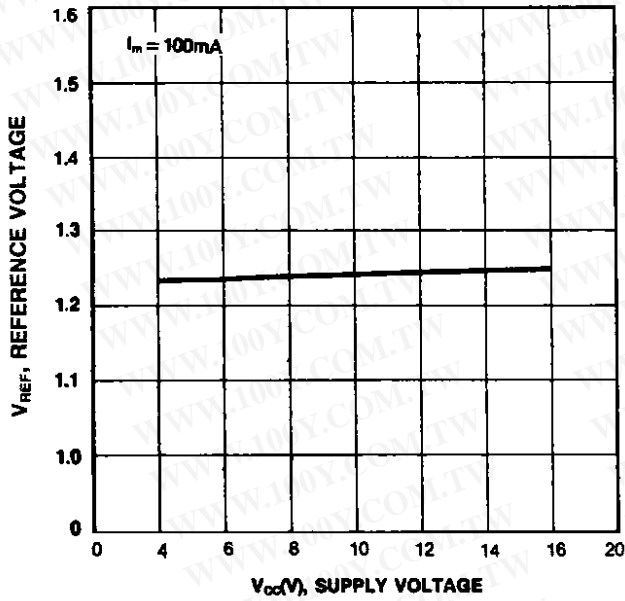
MOTOR CURRENT-SUPPLY VOLTAGE
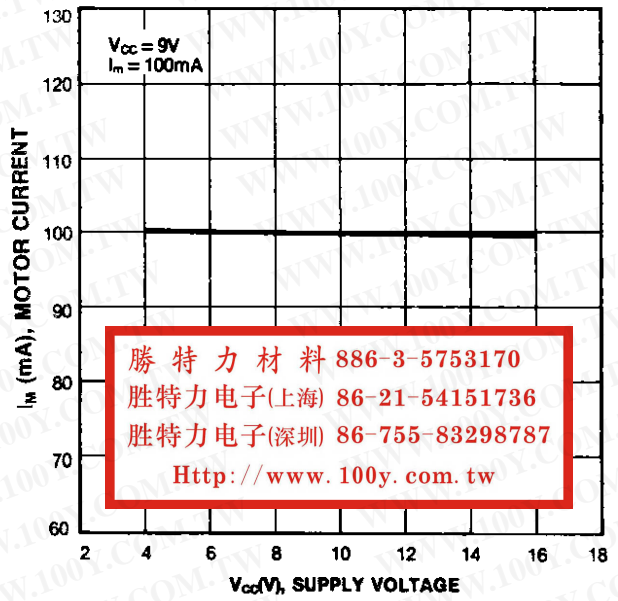
$V_{cc} = 9V$
$I_m = 100mA$

I_M (mA), MOTOR CURRENT

$V_{cc}(V)$, SUPPLY VOLTAGE

CURRENT COEFFICIENT-SUPPLY VOLTAGE

$R_{m1} = 44$
$R_{m2} = 33$

CURRENT COEFFICIENT

$V_{cc}(V)$, SUPPLY VOLTAGE
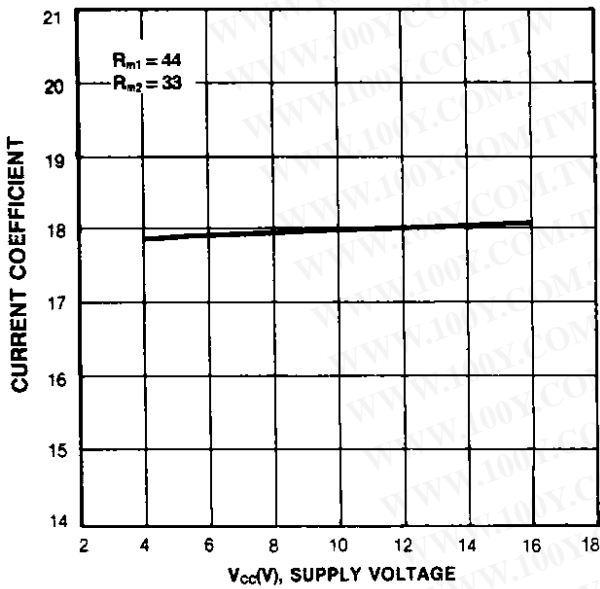
REFERENCE VOLTAGE-MOTOR CURRENT

$V_{cc} = 9V$

V_{REF}, REFERENCE VOLTAGE

$I_m(mA)$, MOTOR CURRENT
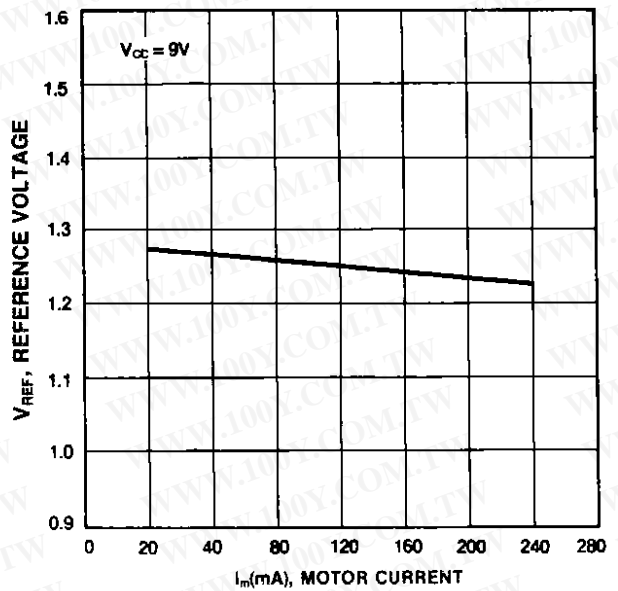
CURRENT COEFFICIENT-AMBIENT TEMPERATURE

$V_{cc} = 9V$
$R_{m1} = 44$
$R_{m2} = 33$

CURRENT COEFFICIENT

$I_m = 100mA$

$Ta(°C)$, AMBIENT TEMPERATURE
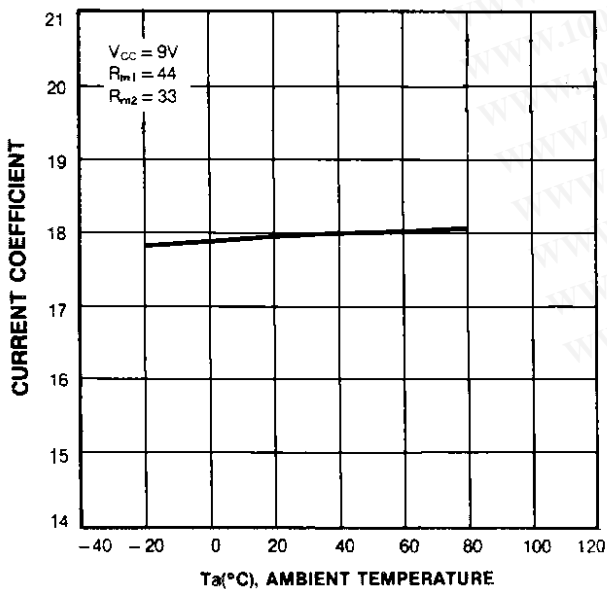
REFERENCE VOLTAGE-AMBIENT TEMPERATURE

$V_{cc} = 9V$
$I_m = 100mA$

V_{REF}, REFERENCE VOLTAGE

$Ta(°C)$, AMBIENT TEMPERATURE
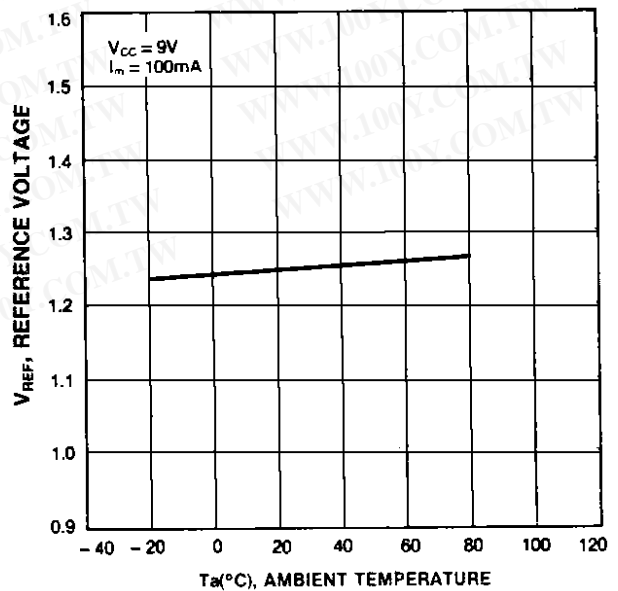
(APPLICATION CHARACTERISTICS)

FREQUENCY(TAPE SPEED)-SUPPLY VOLTAGE

9V DC MOTOR
TEST TAPE: MTT-111 (3KHz)

f(Hz), FREQUENCY (TAPE SPEED) vs Vcc(V), SUPPLY VOLTAGE

FREQUENCY (TAPE SPEED) SUPPLY VOLTAGE

6V DC MOTOR
TEST TAPE: MTT-111 (3KHz)

f(Hz), FREQUENCY (TAPE SPEED) vs Vcc(V), SUPPLY VOLTAGE

APPLICATION CIRCUIT

Rt: Torque control resistance
Rs: Speed control resistance

Fig. 5