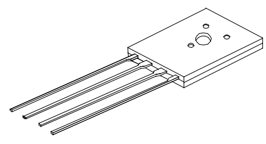
BIPOLAR ANALOG INTEGRATED CIRCUIT

DESCRIPTION

The UTC 1470 is a monolithic integrated circuit intended as speed regulators for DC motors of record players, tape and cassette recorders etc .

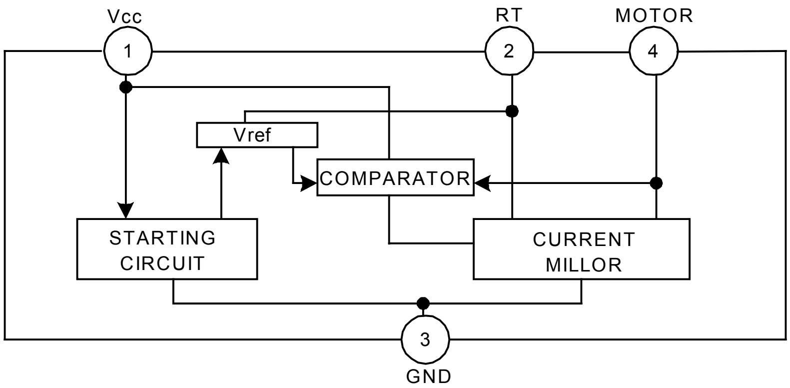
FEATURES

*Excellent Versatility in use.
*High Output current.
*Low Quiescent current.
*Low Reference voltage.
*Excellent parameters stability versus temperature.
*Excellent characteristic at low supply voltage.



1: Vcc 2: RT 3: GND 4: MOTOR

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	VCC	18	V
Circuit Current	I_4	2*	A
Package Dissipation	PD	1.2	W
Operating Temperature	Topt	-20 ~ +75	℃
Storage Temperature	TSTG	-40 ~ +150	℃
		*t≤5s	

RECOMMENDED OPERATING CONDITION

PARAMETER	SYMBOL	PATING	UNIT
Supply Voltage Range	Vcc	3.5 ~ 16	V

ELECTRICAL CHARACTERISTICS (Ta=25°C,Vcc=12V)

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Reference Voltage	Vref	I_4=10mA (Fig.1)	1.10	1.27	1.40	V
Quiescent Current	Id	RM=180Ω (Fig.4)	0.5	0.8	1.2	mA
Reflection Coefficient	k	RM1=44Ω,Rm2=33Ω (Fig.2)	18	20	22	
Saturation Voltage	V4(sat)	Vcc=4.2V,Rm=4.4Ω (Fig.3)		1.5	2.0	V
	$\frac{\triangle k}{k} / \triangle Vcc$	I_4=100mA,Vcc=6.3～16V (Fig.2)		0.4		%/V
Line Regulation	$\frac{\triangle Vref}{Vref} / \triangle Vcc$	I_4=100mA,Vcc=6.3～16V (Fig.1)		0.06		%/V
	$\frac{\triangle k}{k} / \triangle I_M$	I_4=30～200mA (Fig.2)		-0.02		%/mA
Load Regulation	$\frac{\triangle Vref}{Vref} / \triangle I_M$	I_4=30～200mA (Fig.1)		-0.02		%/mA
	$\frac{\triangle k}{k} / \triangle Ta$	I_4=100mA,Ta=-20～+75℃ (Fig.2)		0.01		%/℃
Temperature Coefficient	$\frac{\triangle Vref}{Vref} / \triangle Ta$	I_4=100mA,Ta=-20～+75℃ (Fig.1)		0.01		%/℃

*Pulse Test::PW≤10ms,Duty cycle≤2%

TEST CIRCUIT

Fig.1

$$\left(Vref,\ \frac{\triangle Vref}{Vref} / \triangle Vcc,\ \frac{\triangle Vref}{Vref} / \triangle I_4,\ \frac{\triangle Vref}{Vref} / \triangle Ta \right)$$

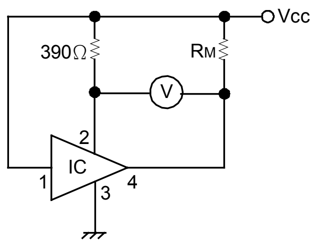
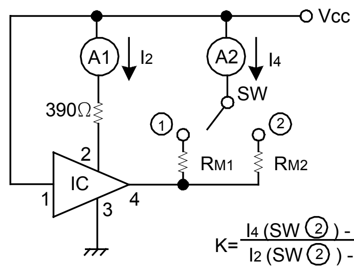


Fig.2

$$\left(k,\ \frac{\triangle k}{k} / \triangle Vcc,\ \frac{\triangle k}{k} / \triangle I_4,\ \frac{\triangle k}{k} / \triangle Ta \right)$$



$$K=\frac{I_4 (SW②) - I_4 (SW①)}{I_2 (SW②) - I_2 (SW①)}$$

Fig.3 (V4(sat))

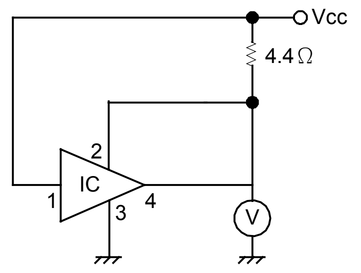
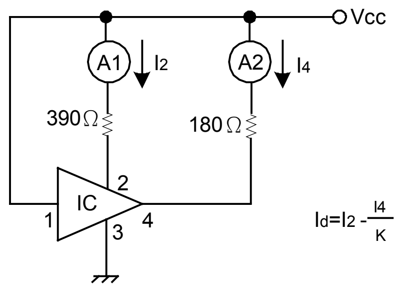
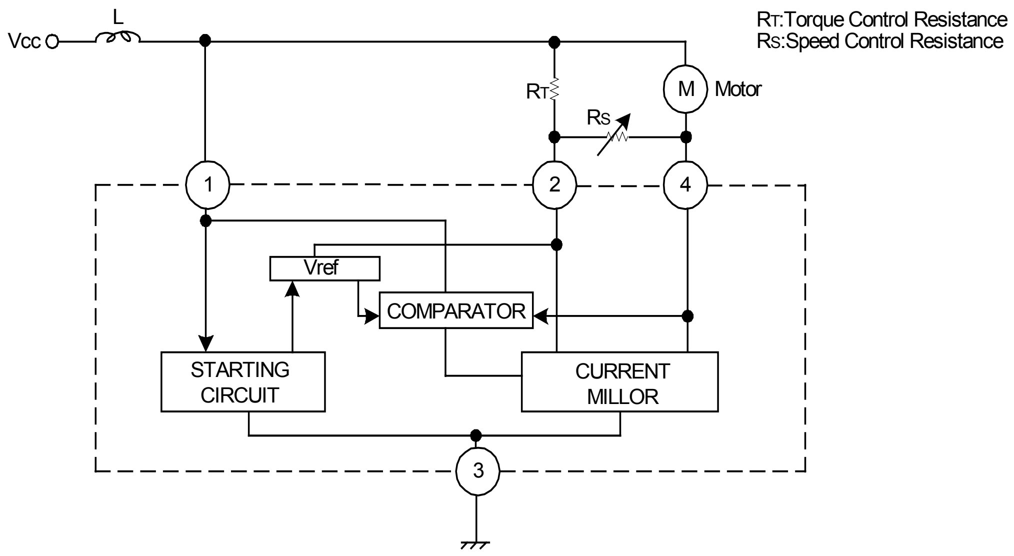


Fig.4 (Id)



APPLICATION INFORMATION



BASIC EQUATION FOR MOTOR

$$\begin{cases} E_t = V_{ref} + R_T\left(i_2 + \dfrac{V_{ref}}{R_s}\right) \\ i_2 = \dfrac{1}{K} i_4 + i_q \\ i_4 = i_m + \dfrac{V_{ref}}{R_s} \end{cases}$$

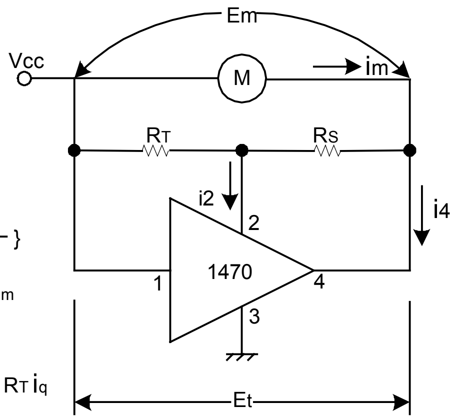
$$E_t = V_{ref} + R_T\left(\frac{1}{K} i_4 + i_q + \frac{V_{ref}}{R_s}\right)$$

$$E_t = V_{ref} + R_T\left\{\frac{1}{K}\left(i_m + \frac{V_{ref}}{R_s}\right) + i_q + \frac{V_{ref}}{R_s}\right\}$$

$$E_t = V_{ref}\left\{1 + \frac{R_T}{R_s}\left(1 + \frac{1}{K}\right)\right\} + R_T i_q + \frac{R_T}{K} i_m$$

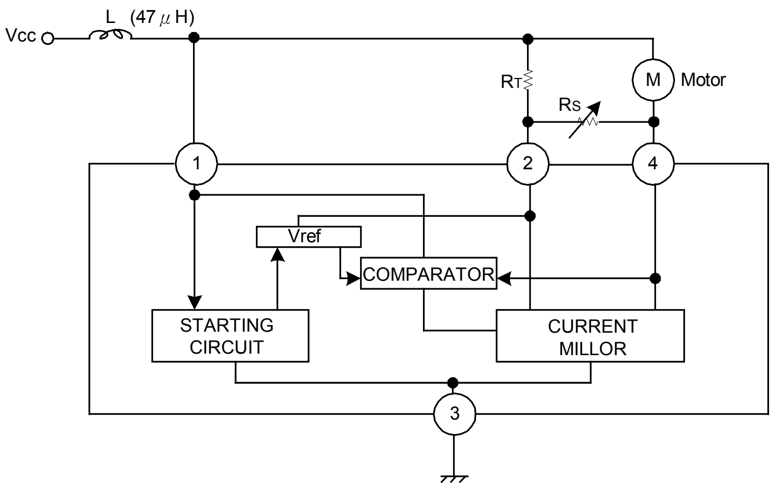
They also give : $E_m = E_o + R_m i_m$

$$\begin{cases} E_o = V_{ref}\left\{1 + \dfrac{R_T}{R_s}\left(1 + \dfrac{1}{K}\right)\right\} + R_T i_q \\ R_m = \dfrac{R_T}{K} \end{cases}$$



Eo : Back Electromotive Force
Rm: internal Resistance(of the Motor)
K : Reflection Confficient = (i_4 / i_2)

APPLICATION CIRCUIT



Vcc = 12V
Rm = 19.5Ω
RT = 330Ω
Rs = 1kΩ
Eo = 2.3V
K = 20

Note 1.The motor speed can be adjusted by the varisble resistor RS.

$$R_{S\,min.} = \frac{V_{ref} * R_T}{E_o - V_{ref} - I_q * R_T}$$

Note 2. If $R_{T\,max.} > k * R_m$ min,instabilicy of the motor may occur.