



F2970

Preliminary

LINEAR INTEGRATED CIRCUIT

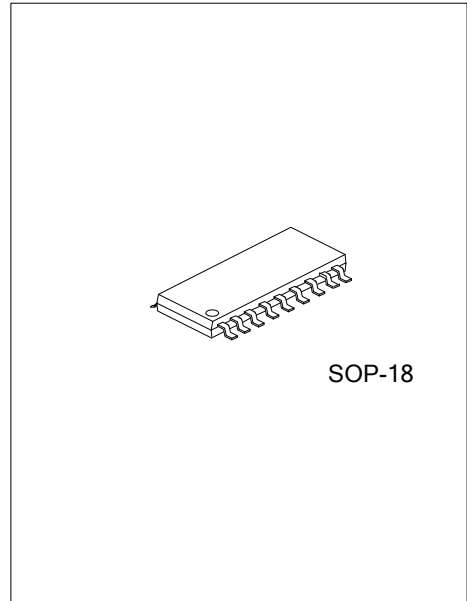
FOR FAN MOTOR SINGLE-PHASE FULL-WAVE DRIVER

DESCRIPTION

The UTC **F2970** is a single-phase full-wave bipolar driver control IC with excellent efficiency for fan motor.

FEATURES

- * Single-phase full-wave drive (16V to 1.2A transistors are built in)
- * Speed adjustment function by thermistor input and external signal incorporated
→Enables silent and low-vibration variable speed control through direct PWM control with separately-excited upper t_R
- * Kick-back absorption circuit are built in
- * Current limiter function (The limiter value determined with R_i , limit at $I_o=480mA$ with $R_L=1\Omega$ connection,)
- * Low-consumption, low-loss, and low-noise drive enabled by the soft switching circuit during phase shift
- * HB incorporated
- * Lock protection and automatic reset functions incorporated
- * FG (rotation detection) output
- * Regeneration Di incorporated with less external parts
- * Thermal shutdown circuit incorporated



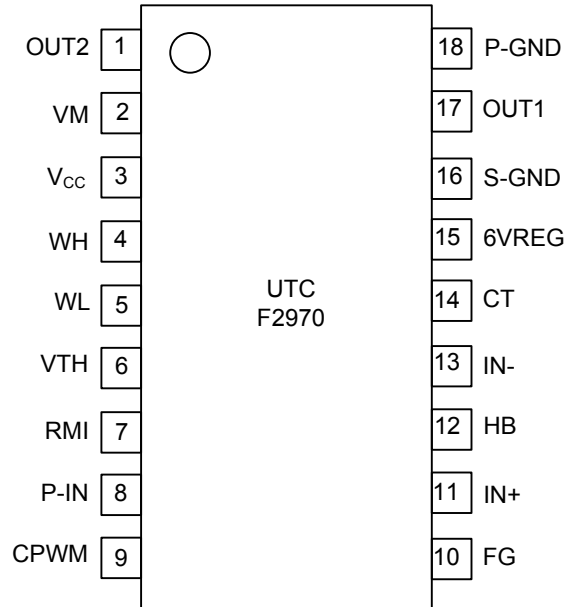
ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
F2970L-S18-T	F2970G-S18-T	SOP-18	Tube
F2970L-S18-R	F2970G-S18-R	SOP-18	Tape Reel

Note: xx: Output Voltage, refer to Marking Information.

<p>F2970G-xx-S18-R</p> <p>(1)Packing Type (2)Package Type (3)Output Voltage Code (4)Halogen Free</p>	<p>(1) R: Tape Reel, T: Tube (2) S18: SOP-18 (3) xx: Refer to Marking Information (4) G: Halogen Free, L: Lead Free</p>
--	---

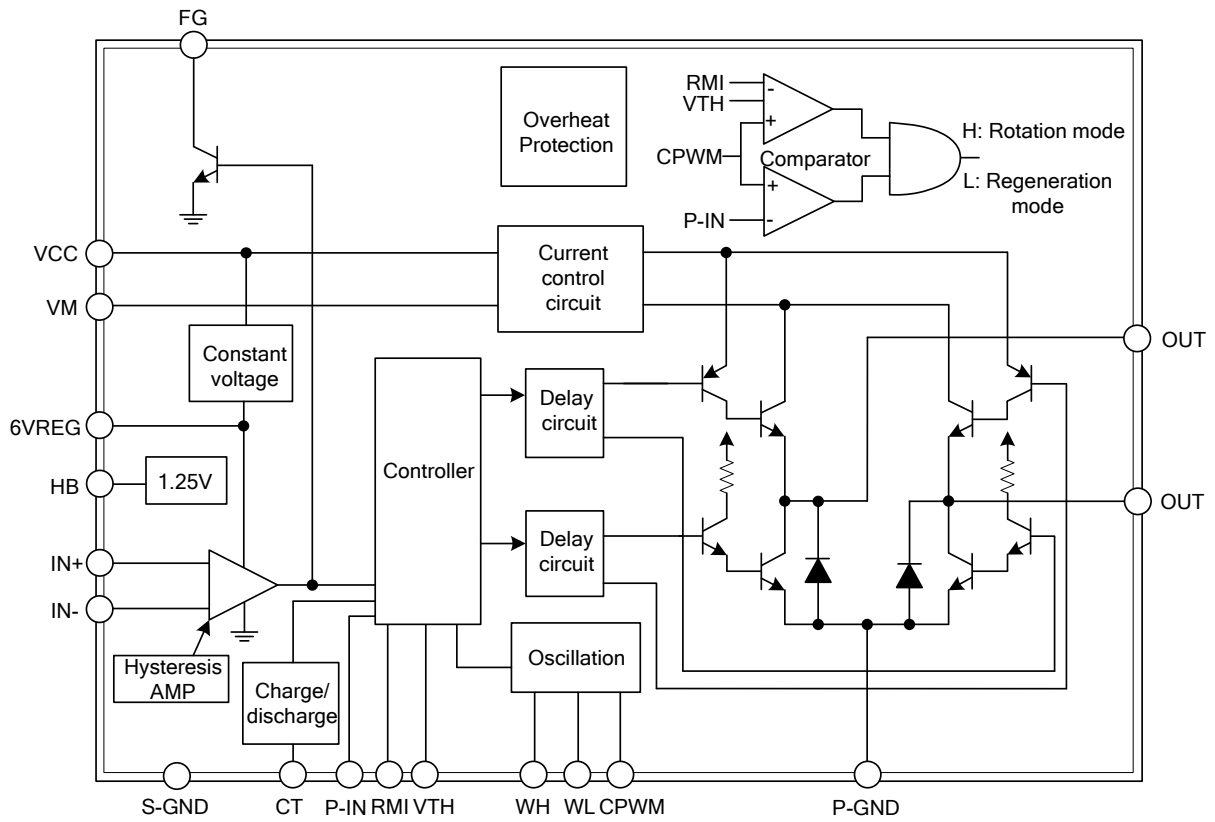
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT2	Output2
2	VM	Sense pin of current limiter
3	VCC	Power supply
4	WH	OSC input
5	WL	OSC output
6	VTH	Variable speed function input
7	RMI	Lowest speed setting voltage
8	P-IN	Dricte PWM speed control pin
9	CPWM	PWM oscillator frequency setting capacitor
10	FG	Speed detection output
11	IN+	The hall sensor input
12	HB	Power the hall sensor 1.25V
13	IN-	The hall sensor input
14	CT	Setting lock protection time
15	6VREG	V _{REF} 6V
16	S-GND	Control system GND
17	OUT1	Output1
18	P-GND	Motor system GND

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T_A=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Maximum supply Voltage V _{CC}	V _{CC}	17	V
Maximum supply Voltage VM	VM	17	V
OUT Pin Maximum Output Current	I _{OUT}	1.2	A
OUT Pin Output Withstand Voltage	V _{OUT}	18	V
Maximum Output Current of HB	I _{HB}	10	mA
VTH, RMI Input Pin Withstand Voltage	VTH, RMI	7	V
P-IN Input Pin Withstand Voltage	V _{P-IN}	V _{CC}	V
FG Output Pin Output Withstand Voltage	V _{FG}	18	V
FG Output Current	I _{FG}	10	mA
Allowable Power Dissipation	Specified substrate (Note 1) P _D	0.8	W
Operating Temperature	T _{OPR}	-30~90	°C
Storage Temperature	T _{STG}	-55~150	°C

Notes: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

- Specified substrate: 30mm×30mm×0.8mm, paper phenol.

■ RECOMMENDED OPERATING RANGES (T_A=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
V _{CC} Supply Voltage	V _{CC}	4.5~16	V
VM Supply Voltage	V _M	3.5~16	V
VTH, RMI Input Level Voltage Range	VTH, RMI	0~6	V
P-IN Input Level Voltage Range	V _{P-IN}	0~V _{CC}	V
Triangular Wave Input Range	VRM	0.5~4	V
Hall Input Common Phase Input Voltage Range	V _{ICM}	0.2~3	V

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, V_{CC}=12V, R_f=0Ω, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Circuit Current	I _{CC1}	During Drive	12	15	18	mA
	I _{CC2}	During Lock Protection	11	14	17	mA
HB Voltage	V _{HB}	I _{HB} =5mA	1.12	1.22	1.32	V
6VREG Voltage	V _{6VREG}	I _{6VREG} =5mA	5.85	5.95	6.10	V
Pin-CT H Level Voltage	V _{CTH}		3.4	3.6	3.8	V
Pin-CT L Level Voltage	V _{CTL}		1.4	1.6	1.8	V
Pin-CT Charge Current	I _{CT1}			2.2		μA
Pin-CT Discharge Current	I _{CT2}			0.22		μA
CT Charge/Discharge Current Ratio	R _{CT}			6.8		
OUT Output L Saturation Voltage	V _{OL}	I _O =200mA		0.1	0.2	V
OUT Output H Saturation Voltage	V _{OH}	I _O =200mA, R _f =1Ω		0.6	0.8	V
Current Limiter	V _{Rf}			480		mV
Sensitivity of Hall Input	V _{HN}	Zero Peak Value (Including Offset and Hysteresis)		10	20	mV
FG Output Pin L Voltage	V _{FG}	I _{FG} =5mA		0.2	0.3	V
FG Output Pin Leak Current	I _{FGL}	V _{FG} =7V			30	μA
Overheat Protection	THD	Design Guarantee Value (Note 1)		180		°C

Note: 1. Design target value and no measurement was made.

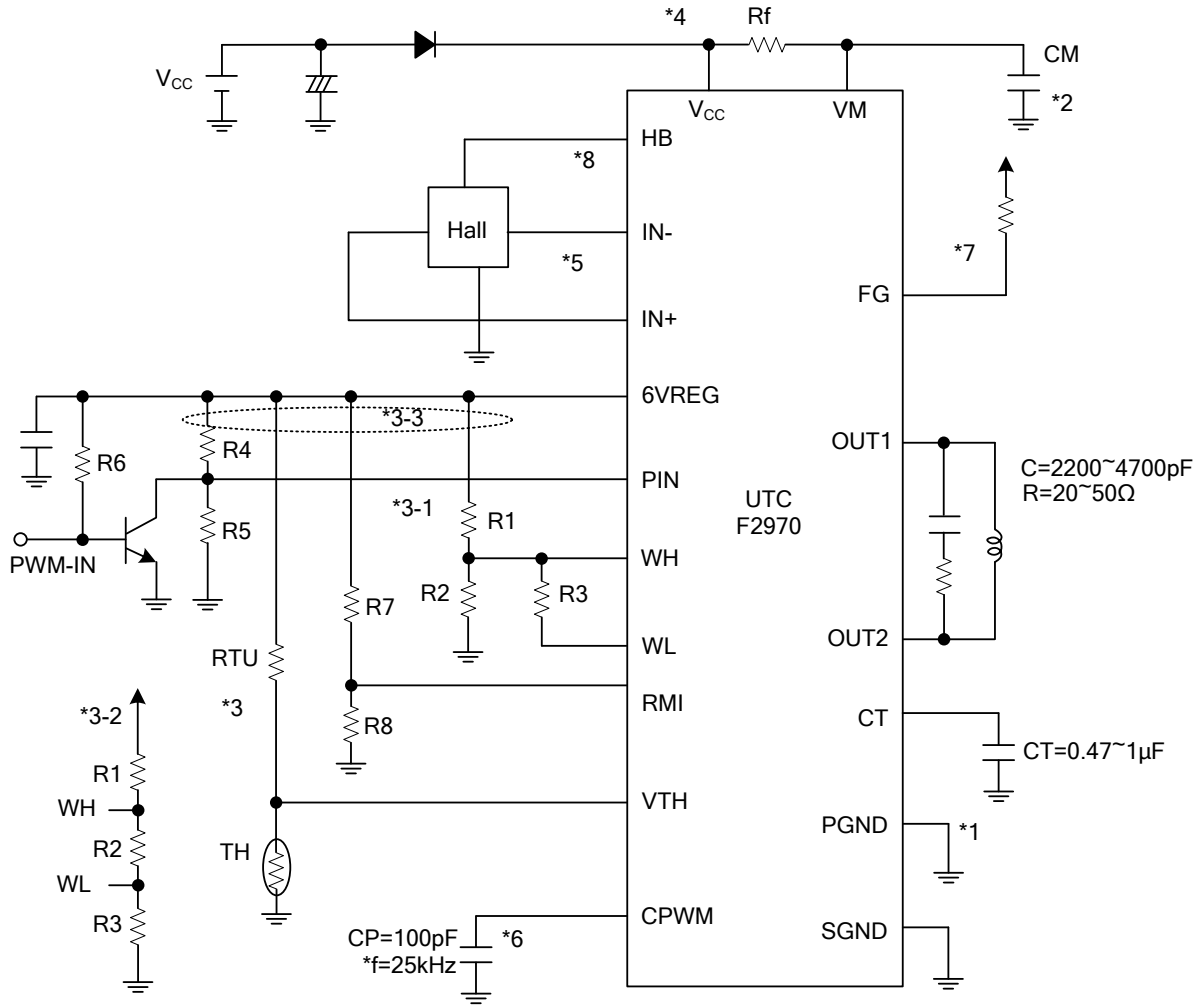
■ TRUTH TABLE

VTH	PIN	IN-	IN+	CT	OUT1	OUT2	FG	Mode
L (OPEN)	L	H	L	L	H	L	L	Running-Drive
	L	L	H		L	H	OFF	
H	L	H	L		OFF	L	L	Running-Regeneration
	L	L	H		L	OFF	OFF	
-	H	H	L	L	OFF	L	L	Output Regeneration Mode with External Signal
-	H	L	H		L	OFF	OFF	
-	-	H	L	H	OFF	L	L	Lock Protection
-	-	L	H	H	L	OFF	OFF	

Notes: 1.VTH, P-IN=L means VTH, P-IN<CPWM

2.VTH, P-IN=H means VTH, P-IN>CPWM

■ TYPICAL APPLICATION CIRCUIT



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.