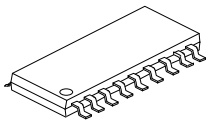
FOR FAN MOTOR SINGLE-PHASE FULL-WAVE DRIVER



SOP-18

■ 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_f, limit at I_O=480mA with R_L=1Ω 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

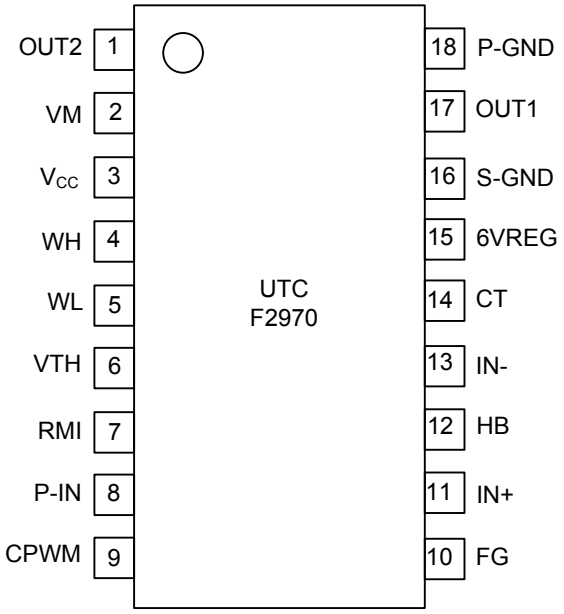
Ordering Number		Package	Packing
Lead Free	Halogen Free		
F2970L-S18-T	F2970G-S18-T	SOP-18	Tube
F2970L-S18-R	F2970G-S18-R	SOP-18	Tape Reel

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

F2970G-xx-S18-R
- (1)Packing Type
- (2)Package Type
- (3)Output Voltage Code
- (4)Halogen Free

(1) R: Tape Reel, T: Tube
(2) S18: SOP-18
(3) xx: Refer to Marking Information
(4) G: Halogen Free, L: Lead Free

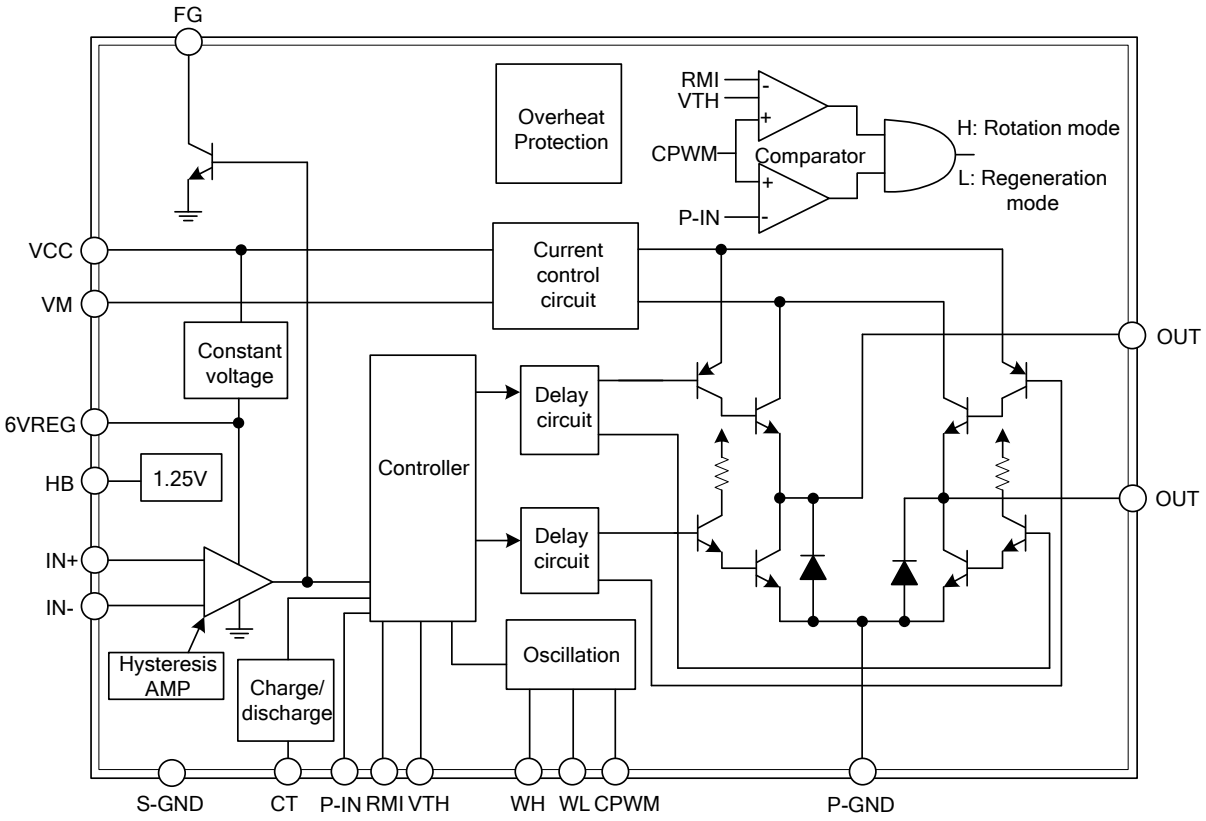
■ PIN CONFIGURATION



■ 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 frenquency 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		IHB	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.

1. 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