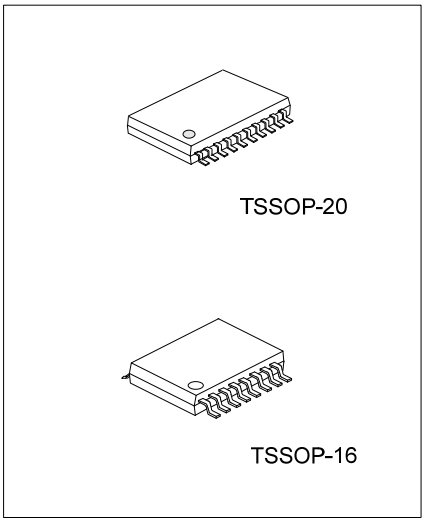
HIGH EFFICIENT DIRECT PWM DRIVE IC



■ DESCRIPTION

The UTC **F2962** is a high efficient, single phase and bipolar drive direct PWM drive motor driver IC. It is suitable for variable speed control FAN of personal computer's power supply radiation and CPU cooler with over temperature protection.

■ FEATURES

* Single phase bipolar drive (16V,2A output transistor built in.)
* Built in variable speed function with thermistor input signal (External excitations direct PWM of upper side transistor control, low noise and low vibration.)
* Include re-circulation Diode and external parts are few
* Include Hall bias circuit and thermal shut down circuit
* Minimum speed settable
* Full drive at open thermistor
* Lock protect and auto restart function
* FG output and RD output signal available

■ ORDERING INFORMATION

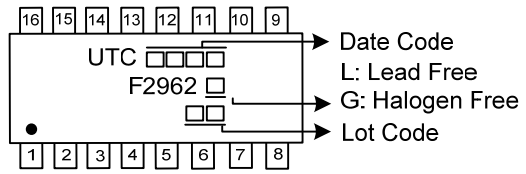
Ordering Number		Package	Packing
Lead Free	Halogen Free		
F2962L-P16-R	F2962G-P16-R	TSSOP-16	Tape Reel
F2962L-P20-R	F2962G-P20-R	TSSOP-20	Tape Reel

F2962G-P16-R
(1) Packing Type
(2) Package Type
(3) Green Package

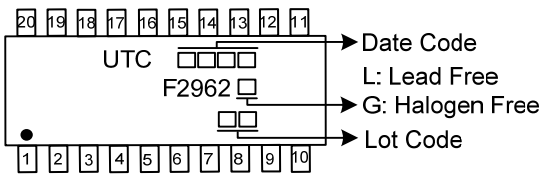
(1) R: Tape Reel
(2) P16: TSSOP-16, P20: TSSOP-20
(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING

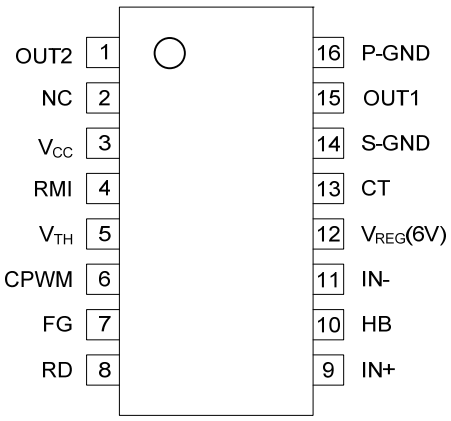
TSSOP-16



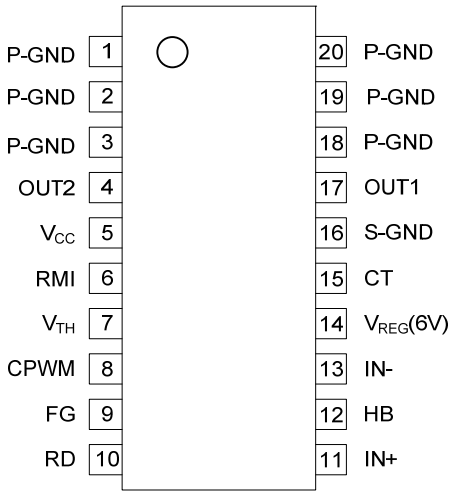
TSSOP-20



■ PIN CONFIGURATION

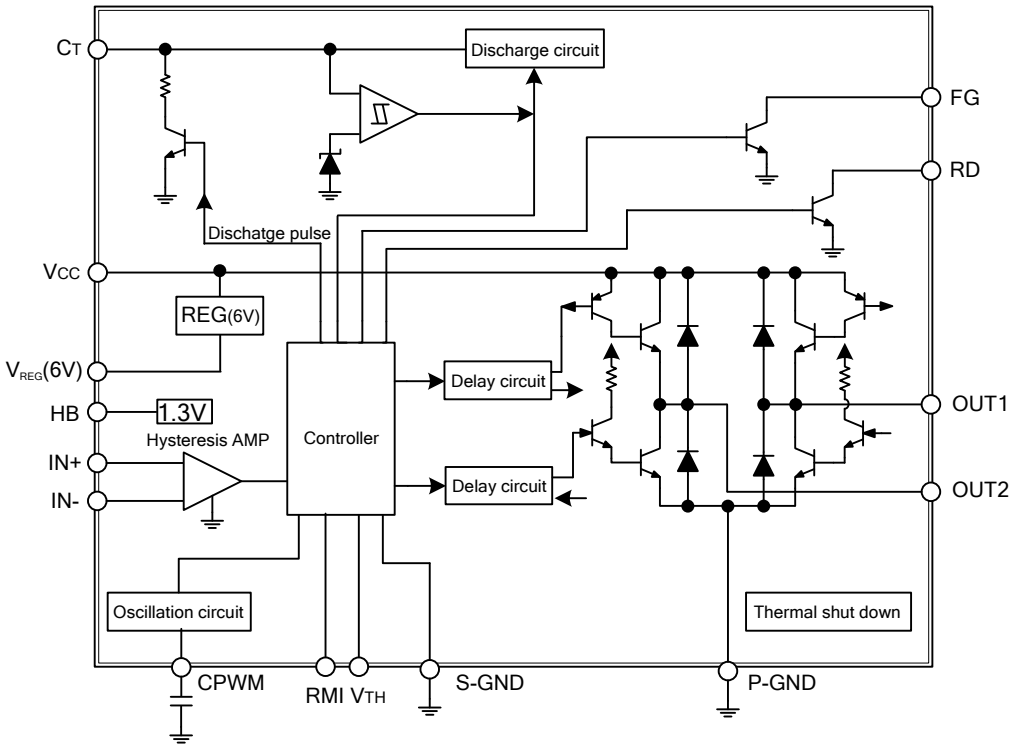


TSSOP-16



TSSOP-20

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC}	18	V
Output Current		I_{OUT}	2	A
Output Supply Voltage		V_{OUT}	18	V
HB Output Current		I_{HB}	10	mA
V_{TH} Input Voltage		V_{IH}	6	V
RD/FG Output Supply		$V_{RD/FG}$	18	V
RD/FG Output Current		$I_{RD/FG}$	10	mA
Allowable Power Dissipation (Note 2)	TSSOP-16	P_D	1.1	W
	TSSOP-20		1.15	W
Junction Temperature		T_J	+150	°C
Operating Temperature		T_{OPR}	-30 ~ +90	°C
Storage Temperature		T_{STG}	-40 ~ +150	°C

Notes: 1.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.
2. Mounted on a specified board (114.3mm×76.1mm×1.6mm, Glass epoxy).

■ RECOMMENDED OPERATING CONDITION (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	4.5 ~ 16	V
V Threshold Input Voltage Range	V_{TH}	0 ~ 9	V
Common- mode Hall Input Voltage Range	V_{ICM}	0.2 ~ 3	V

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

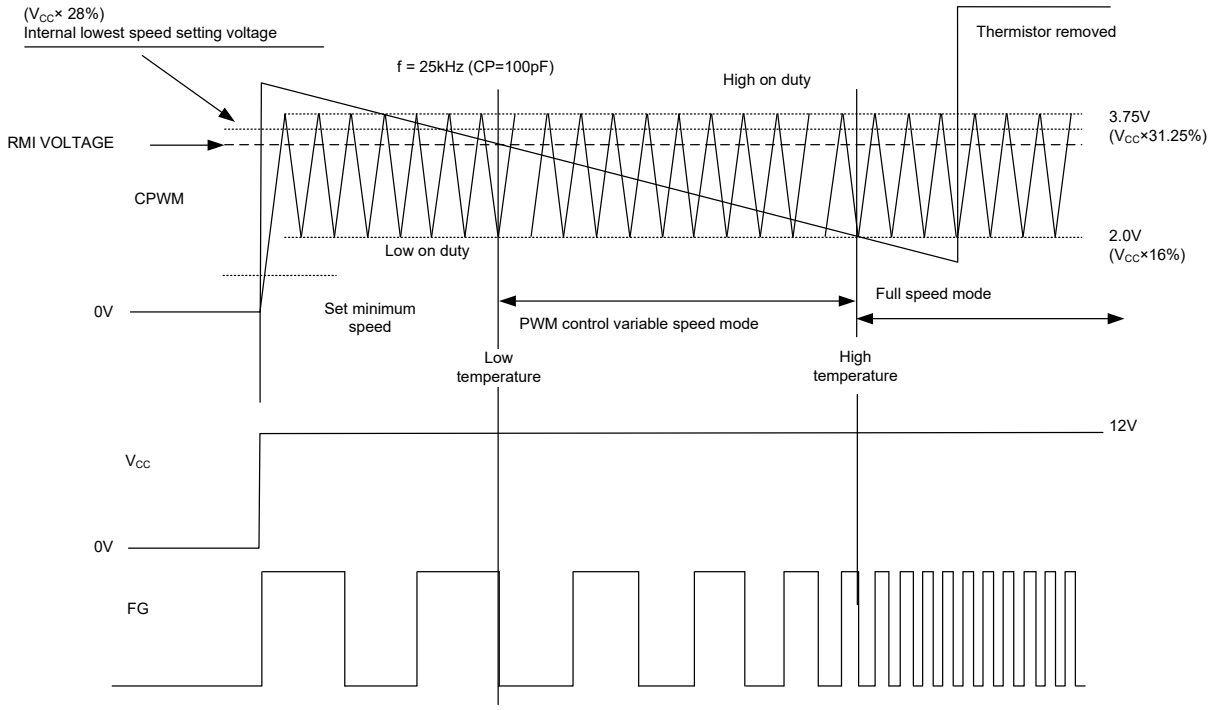
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current Drain		$I_{CC\,1}$	Rotation mode	12	32	40	mA
		$I_{CC\,2}$	Lock protect mode	8	11	16	mA
6V Regulator		$V_{REG(6V)}$	I_{REG}=5mA	5.8	6	6.2	V
CPWM Voltage	High	V_{CRH}		3.5	3.75	4.0	V
	Low	V_{CRL}		1.95	2.0	2.15	V
CPWM Oscillation Frequency		FPWM	C=100pF	18	25	32	KHz
C_T pin Voltage	High	V_{CTH}		3.4	3.6	3.75	V
	Low	V_{CTL}		1.5	1.6	1.85	V
C_T Current	Charge	I_{CT1}	V_{CT}=1V	1.5	2.2	2.9	μA
	Discharge	I_{CT2}	V_{CT}=4.2V	0.1	0.2	0.3	μA
C_T Charge/Discharge Current Ratio		R_{CT}	$R_{CD}=I_{CT1}/I_{CT2}$	8.5	10.0	11.5	
Output Saturation	Lower side	V_{OL}	I_{OUT}=400mA		0.2	0.3	V
	upper side	V_{OH}	I_{OUT}=400mA		0.9	1.1	V
HB Voltage		V_{HB}	I_{HB}=5mA	1.1	1.25	1.4	V
Hall input sensitivity		V_{HN}	Zero to peak including offset and hysteresis		15	25	mV
RD/FG pin Low Voltage		V_{FG}	I_{FG}=5mA		0.1	0.3	V
RD/FG pin Leak Current		I_{FGL}	V_{FG}=7V			30	μA

■ TRUTH TABLE

IN-	IN+	CPWM	CT	OUT1	OUT2	FG	RO	MODE
H	L	L	L	H	L	L		ROTATION(DRIVE)
L	H			L	H	OFF		PWM OFF
H	L	H	L	OFF	L	L		ROTATION(RECIRCULATION)
L	H			L	OFF	OFF		PWM OFF
H	L		H	H	OFF	L		ROCK PROTECT
L	H			OFF	H	OFF		

Note: CPWM-H = CPWM>V_{TH}, CPWM-L = CPWM<V_{TH}

■ CONTROL TIMING CHART



1. Set minimum speed mode

A V_{TH} voltage level is generated when the thermistor detects the set temperature. At low temperatures, the fan motor turns at the lowest speed, which is set with the RMI pin. The **F2962** compares the CPWM oscillator voltage with the RMI pin voltage and sets the duty for the lowest drive state.

2. High speed ◄► low speed mode

The PWM signal is controlled by comparing the CPWM oscillation voltage that cycles between 1.2V and 3.8V and the V_{TH} voltage.

When the V_{TH} voltage is lower, the high and low side transistors are turned on, and when the V_{TH} voltage is higher, the high side transistor is turned off and the coil current is regenerated through the low side transistor. Thus the output on duty increases as the V_{TH} voltage becomes lower, the coil current increases, and the motor speed increases.

Rotation speed feedback is provided by the FG output.

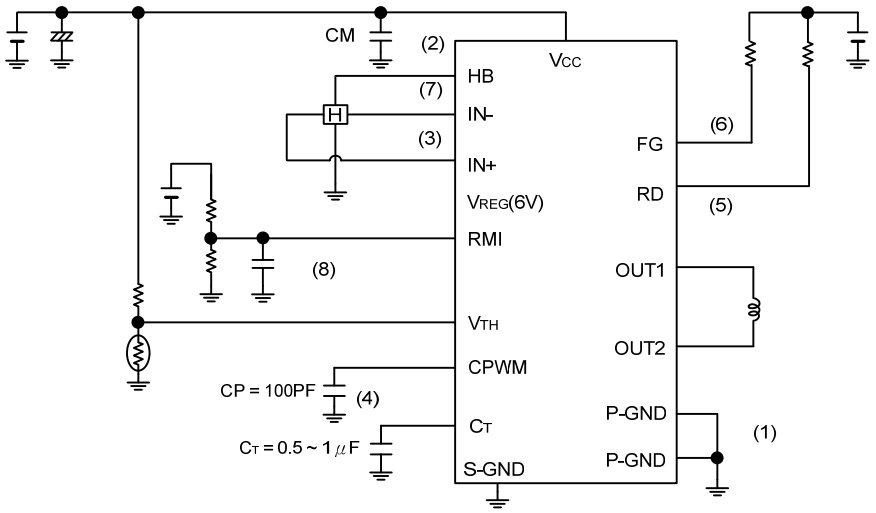
3. Full-speed mode

The **F2962** switches to full-speed mode above a certain temperature.

4. Thermistor removed mode

If the thermistor is removed, the V_{TH} input voltage will rise. However, the output will go to full drive at 100% and the motor will run at full speed.

■ TYPICAL APPLICATION CIRCUIT



1. Voltage source-GND line layout

P-GND is connected to motor supply stage and S-GND is connected to control stage. Divides each line and external parts of control stage are connect to S-GND.

2. Capacitor of re-circulation stability

CM capacitor that is for PWM drive and kick back absorption to be 0.1 ~ 1μF for restrain V_{CC} rising by kick back voltage. This IC is upper side transistor switching type then re-circulation current through lower side transistor. CM capacitor connects between V_{CC}(VM) and P-GND with shortest and wide line.

3. Hall input

To be short lines for avoid noise. Hall input amplifier has 20mV hysteresis. Then we recommend the hall input revel to be 60mV or over.

4. PWM oscillation frequency setting capacitor

PWM basic frequency becomes 25KHz when put on CP=100pF.

5. RD output

Terminal is open corrector output. Low at rotation mode and High at stop mode. Open the terminal at no use.

6. FG output

Output is open corrector. FG output according to rotation speed by phase change. Open the terminal at no use.

7. HB pin

1.25V voltage reference for hall element bias.

8. RMI pin

The pin must be connected to V_{TH} pin if no use. Lowest speed voltage is settled 10% duty inside.
If you set full speed mode when fan will start, capacitor is required.