



F2961

LINEAR INTEGRATED CIRCUIT

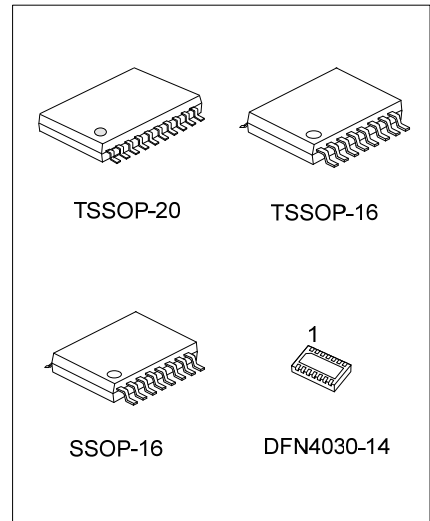
HIGH EFFICIENT DIRECT PWM DRIVE IC

DESCRIPTION

The UTC **F2961** 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, 1A 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.

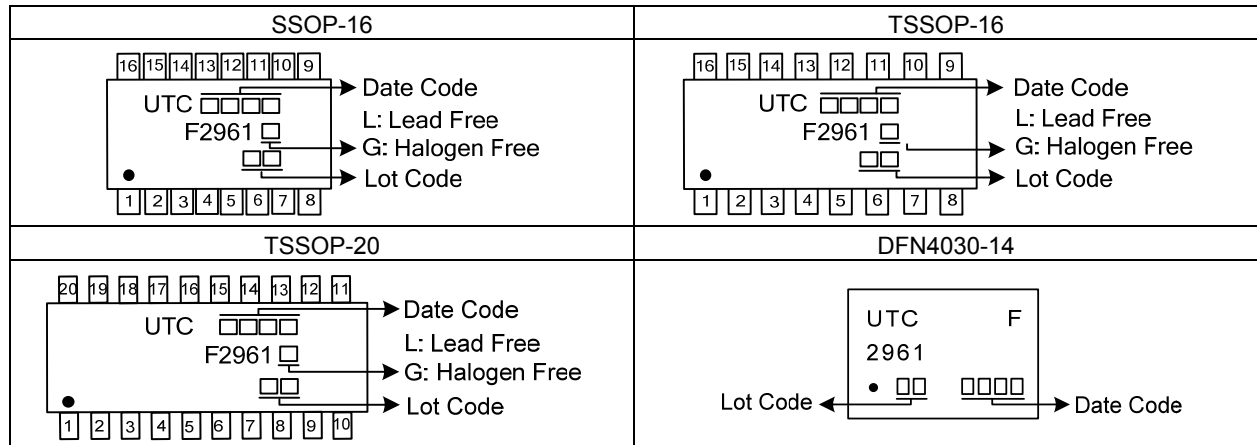


ORDERING INFORMATION

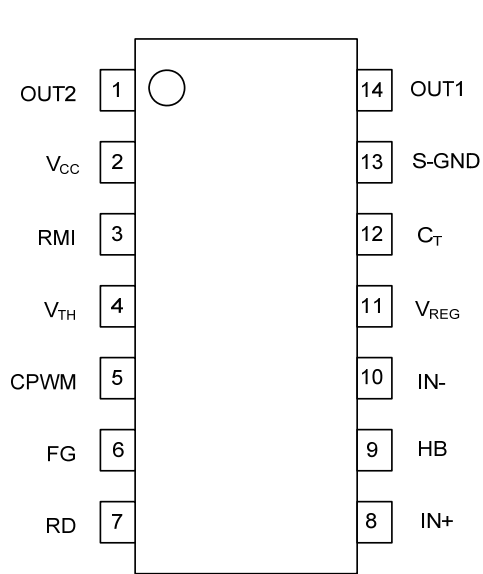
Ordering Number		Package	Packing
Lead Free	Halogen Free		
F2961L-R16-R	F2961G-R16-R	SSOP-16	Tape Reel
F2961L-P16-R	F2961G-P16-R	TSSOP-16	Tape Reel
F2961L-P20-R	F2961G-P20-R	TSSOP-20	Tape Reel
F2961L-K14-4030-R	F2961G-K14-4030-R	DFN4030-14	Tape Reel

<p>F2961G-R14-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) R16: SSOP-16, P16: TSSOP-16, P20: TSSOP-20 K14-4030: DFN4030-14 (3) G: Halogen Free and Lead Free, L: Lead Free</p>
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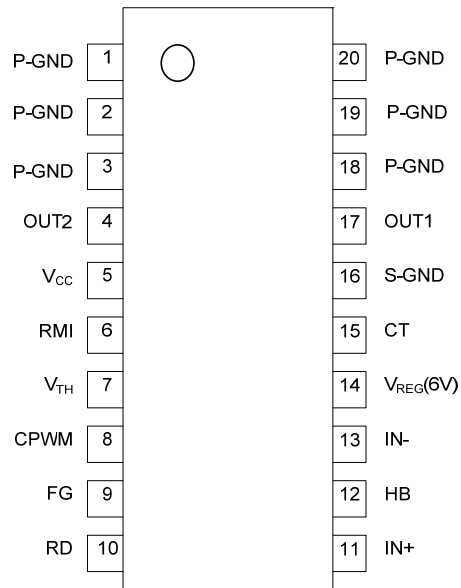
■ MARKING



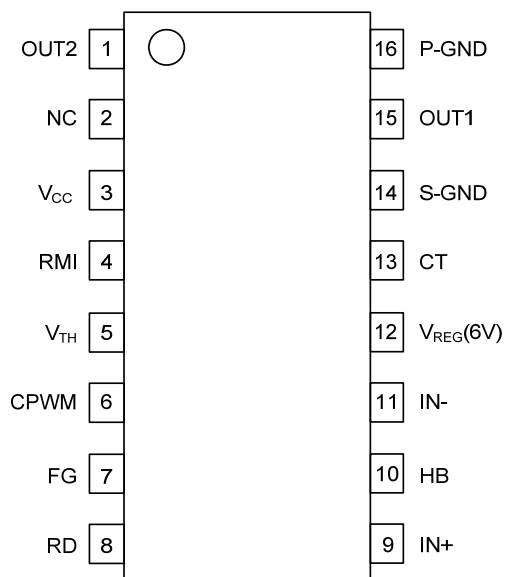
■ PIN CONFIGURATIONS



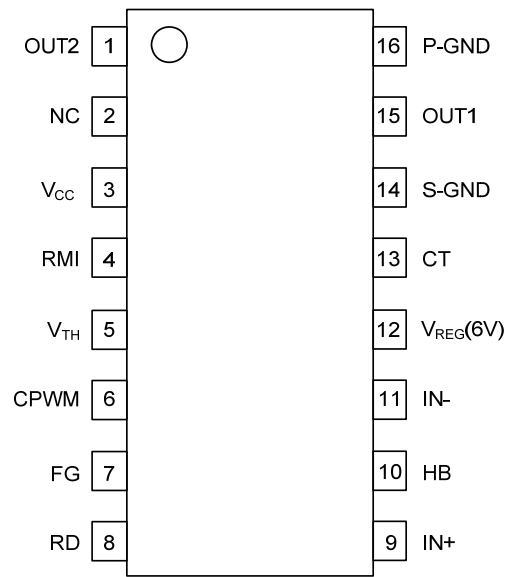
DFN4030-14



TSSOP-20

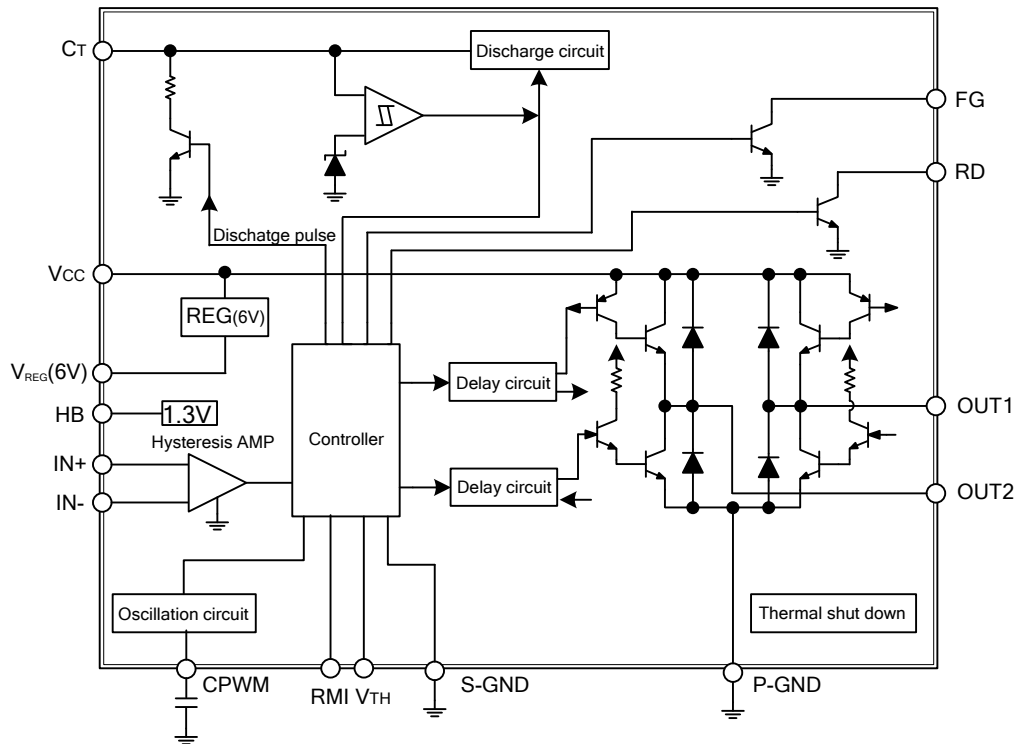


SSOP-16



TSSOP-16

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{CC}	18	V
Output Current	I_{OUT}	1	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
Operating Temperature	T_{OPR}	-30 ~ +90	°C
Storage Temperature	T_{STG}	-40 ~ +150	°C

Note: 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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	DFN4030-14	θ_{JA}	53	°C/W
	SSOP-16/TSSOP-16		160	°C/W
	TSSOP-20		148	°C/W
Junction to Case	DFN4030-14	θ_{Jc}	10	°C/W
	SSOP-16		42	°C/W
	TSSOP-16		39	°C/W
	TSSOP-20		35	°C/W

■ RECOMMENDED OPERATING CONDITION ($T_A=25^\circ\text{C}$, 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 ($V_{CC}=12\text{V}$, $T_A=25^\circ\text{C}$, unless otherwise specified)

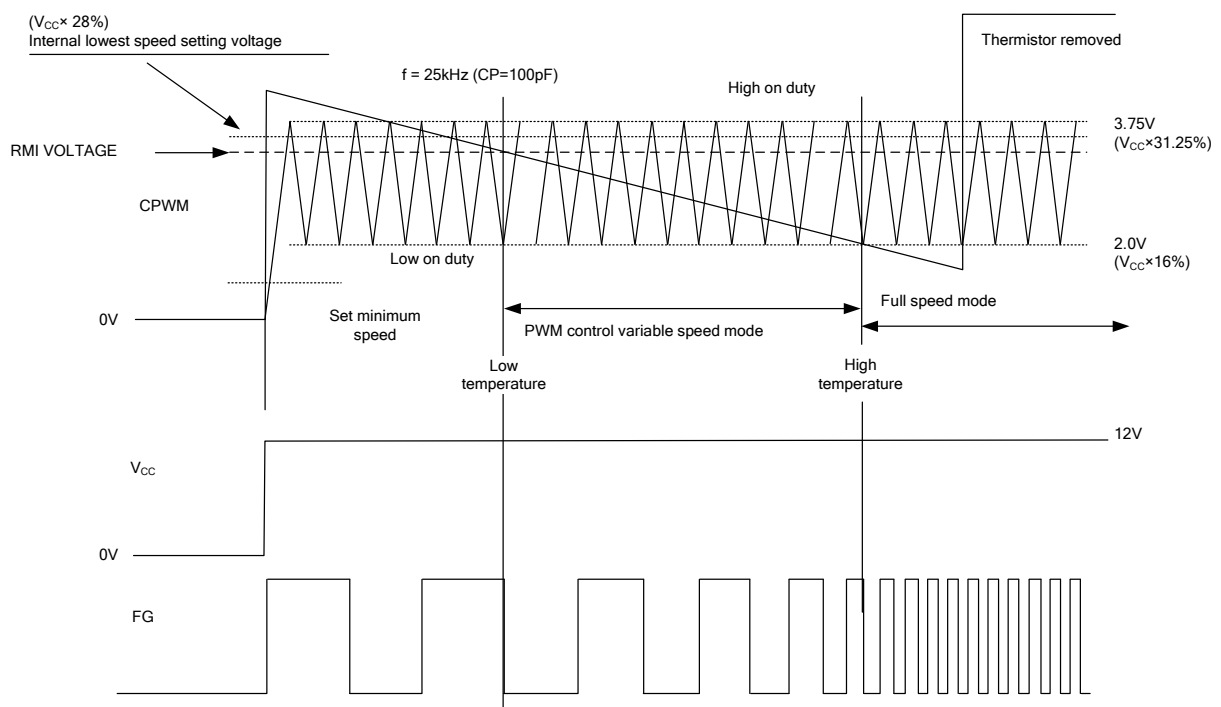
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current Drain		I_{CC1}	Rotation mode	12	18	24	mA
		I_{CC2}	Lock protect mode	8	11	16	mA
6V Regulator		$V_{REG(6V)}$	$I_{REG}=5\text{mA}$	5.8	6	6.2	V
CPWM Voltage	High	V_{CRH}		3.5	3.75	4.0	V
	Low	V_{CRL}		1.95	2.0	2.15	V
CPWM Oscillation Frequency		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}	$V_{CT}=1\text{V}$	1.5	2.0	2.5	μA
	Discharge	I_{CT2}	$V_{CT}=4.2\text{V}$	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}	$I_{OUT}=200\text{mA}$		0.2	0.3	V
	upper side	V_{OH}	$I_{OUT}=200\text{mA}$		0.9	1.1	V
HB Voltage		V_{HB}	$I_{HB}=5\text{mA}$	1.1	1.25	1.4	V
Hall input sensitivity		V_{HN}	Zero to peak including offset and hysteresis		10	20	mV
RD/FG pin Low Voltage		V_{FG}	$I_{FG}=5\text{mA}$		0.1	0.3	V
RD/FG pin Leak Current		I_{FGL}	$V_{FG}=7\text{V}$			30	μA

TRUTH TABLE

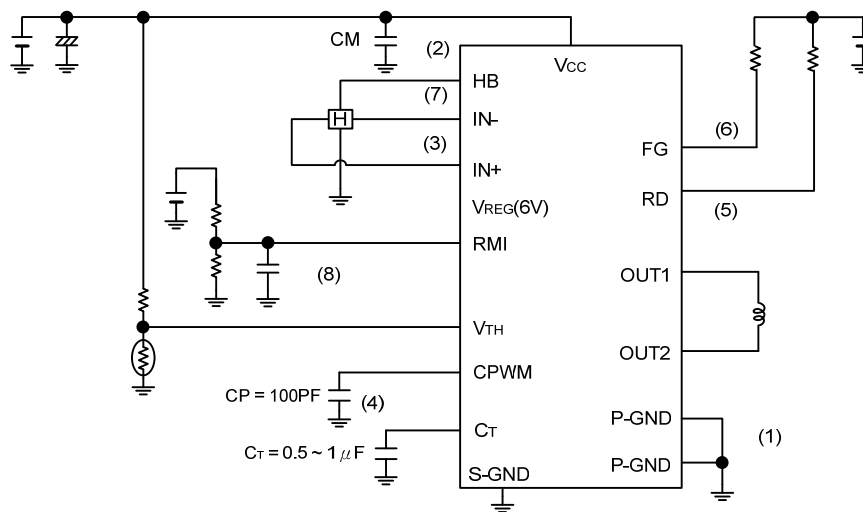
IN-	IN+	CPWM	CT	OUT1	OUT2	FG	RO	MODE
H	L	L	L	H	L	L		ROTATION(DRIVE) PWM OFF
L	H			L	H	OFF		
H	L	H	L	OFF	L	L		ROTATION(RECIRCULATION) PWM OFF
L	H			L	OFF	OFF		
H	L		H	H	OFF	L		ROCK PROTECT
L	H			OFF	H	OFF		

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

CONTROL TIMING CHART



■ 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 $0.1 \sim 1\mu\text{F}$ 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 level to be 60mV or over.

(4) PWM oscillation frequency setting capacitor

PWM basic frequency becomes 25 KHz when put on $CP=100\text{pF}$.

(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.

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