

# Fan Speed Controller and Fan Fault Detector Family

The **TC642**, **TC646**, **TC647**, **TC648** and **TC649** are fan speed controller products that support external temperature input.

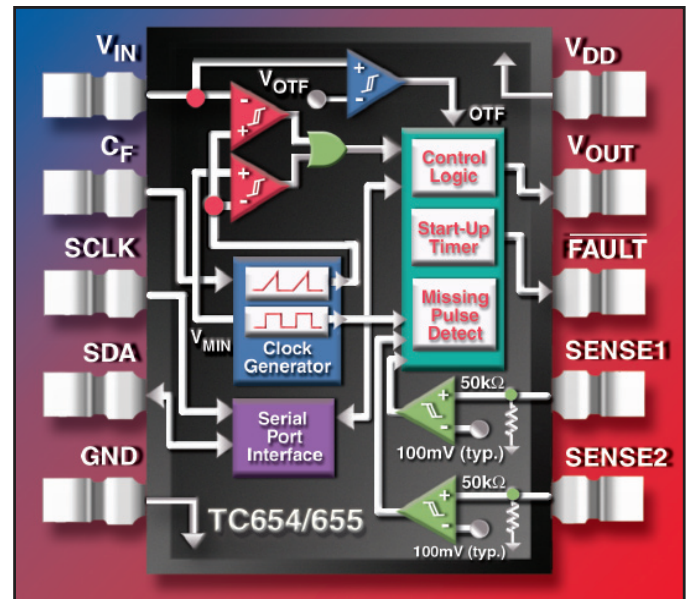
The **TC642B**, **TC646B**, **TC647B**, **TC648B** and **TC649B** are fan speed controller products that support external temperature input and incorporate a fan auto-restart function.

The **TC654**, **TC655**, **TC664** and **TC665** are fan speed controller products that support external temperature input and two-wire serial communication.

The **TC64X**, **TC64XB**, **TC65X**, and **TC66X** devices are pulse width modulation (PWM) fan speed controllers for DC brushless fans. These devices adjust the speed of the fan according to the temperature level, thereby reducing acoustic noise, minimizing power consumption, and extending fan life. A thermistor or other temperature dependent voltage output device can be used to supply the  $V_{IN}$  voltage, which sets the required duty cycle drive signal on  $V_{OUT}$ . The TC654/TC655 and TC664/TC665 products allow the user to control fan speed and communicate data via a Standard Management Bus (SMBus) interface. These devices also enable the user to read fan RPM data and implement predictive fan failure detection. The entire family features a pulse width modulation (PWM) frequency of 30 Hz ( $C_F = 1 \mu\text{F}$ ) and an operating current of less than 0.5 mA.

This family is fully specified from 3.0V to 5.5V over a  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$  temperature range. Numerous features address a broad spectrum of applications, such as, shutdown mode for further power savings, FanSense™ technology for fan fault detection, auto-shutdown for automatic fan shut-off, minimum fan speed for constant cooling and over temperature alert for overheating detection. The TC64X and TC64XB devices are available in 8-pin PDIP, MSOP and SOIC packages. The TC65X and TC66X are available in a 10-pin MSOP package.

These products are ideal for every application utilizing DC fans, especially where acoustic noise and fan reliability are critical. Suitable applications include computers, projectors, servers, datacom equipment, telecom equipment, power supplies, set-top boxes, fan racks and test equipment.



## Features:

- Temperature proportional fan speed control
- FanSense™ technology protects against fan and system failure
- 3.0V to 5.5V supply voltage range
- Low operating current
- 30 Hz pulse width modulation (PWM) frequency ( $C_F = 1 \mu\text{F}$ )
- Support low cost NTC/PTC thermistors
- Shutdown mode
- Fan auto-restart (TC64XB devices only)
- Read RPM data (TC654/TC655, TC664/TC665)
- SMBus interface (TC654/TC655, TC664/TC665)
- Temperature range:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$
- Available in PDIP, MSOP and SOIC packages

## Application Notes:

- AN764 Implementing Temperature-based Variable Fan Speed Control in NLX Power Supplies
- AN768 Redundant Fan Systems using the TC642 Fan Manager
- AN770 Linear Voltage Fan Speed Control using Microchip's TC64X family
- AN771 Suppressing Acoustic Noise in Pulse Width Modulation Fan Speed Control Systems
- AN772 Speed Error in Pulse Width Modulation Fan Control Systems

## Additional Information:

- Microchip's web site: [www.microchip.com](http://www.microchip.com)
- *Analog & Interface Families Data Book 2002*, Order No. DS00207
- *Stand-Alone Analog and Interface Solutions Flyer*, DS21060
- *Product Line Card*, Order No. DS00148
- *TC642 Data Sheet*, DS21444
- *TC646 Data Sheet*, DS21446
- *TC647 Data Sheet*, DS21447
- *TC648 Data Sheet*, DS21448
- *TC649 Data Sheet*, DS21449
- *TC642B Data Sheet*, DS21756
- *TC646B Data Sheet*, DS21755
- *TC647B Data Sheet*, DS21756
- *TC648B Data Sheet*, DS21755
- *TC649B Data Sheet*, DS21755
- *TC654/TC655 Data Sheet*, DS21374
- *TC664/TC665 Data Sheet*, DS21737

## Development Tools Support:

TC642 Fan Control Demo Board User's Guide (DS21401): This Fan Control circuit board allows the user to quickly evaluate and prototype Microchip's TC64X and TC64XB pulse width modulation (PWM) Fan Control ICs.

TC642 Fan Control Evaluation Board User's Guide (DS21403): This fully assembled 4 inch by 6 inch circuit board allows the user to evaluate and prototype fan control circuits based on Microchip's TC64X and TC64XB DC brushless fan controllers.

**Fan Speed Controller and Fan Fault Detector Specifications**

Product <sup>1</sup>	V <sub>CC</sub> Range	Temperature Range	Over-Temp Alert	Typical I <sub>Q</sub>	SMBus Interface	Min Fan Speed	Temp Auto-Shutdown	# of Fans Monitored	RPM Data	Predictive Fan Fault Detection	Fan Auto-Restart	# of Pins/Package
TC642	+3.0V to +5.5V	-40°C to +85°C	X	500 μA	—	X	—	1	—	—	—	8P, 8SN, 8MS
TC646	+3.0V to +5.5V	-40°C to +85°C	X	500 μA	—	—	X	1	—	—	—	8P, 8SN, 8MS
TC647	+3.0V to +5.5V	-40°C to +85°C	—	500 μA	—	X	—	1	—	—	—	8P, 8SN, 8MS
TC648	+3.0V to +5.5V	-40°C to +85°C	X	500 μA	—	—	X	0	—	—	—	8P, 8SN, 8MS
TC649	+3.0V to +5.5V	-40°C to +85°C	—	500 μA	—	—	X	1	—	—	—	8P, 8SN, 8MS
TC642B	+3.0V to +5.5V	-40°C to +85°C	X	200 μA	—	X	—	1	—	—	X	8P, 8SN, 8MS
TC646B	+3.0V to +5.5V	-40°C to +85°C	X	200 μA	—	—	X	1	—	—	X	8P, 8SN, 8MS
TC647B	+3.0V to +5.5V	-40°C to +85°C	—	200 μA	—	X	—	1	—	—	X	8P, 8SN, 8MS
TC648B	+3.0V to +5.5V	-40°C to +85°C	X	200 μA	—	—	X	0	—	—	X	8P, 8SN, 8MS
TC649B	+3.0V to +5.5V	-40°C to +85°C	—	200 μA	—	—	X	1	—	—	X	8P, 8SN, 8MS
TC654	+3.0V to +5.5V	-40°C to +85°C	—	150 μA	X	X	—	2	X	X	—	10UN
TC655	+3.0V to +5.5V	-40°C to +85°C	X	150 μA	X	X	—	2	X	X	—	10UN
TC664	+3.0V to +5.5V	-40°C to +85°C	—	150 μA	X	X	—	1	X	X	—	10UN
TC665	+3.0V to +5.5V	-40°C to +85°C	X	150 μA	X	X	—	1	X	X	—	10UN

**Note 1.** These devices use an external sensor. Accuracy of the total solution is a function of the accuracy of the external sensor.

**Package Key:** P = PDIP    SN = SOIC    MS = MSOP    UN = MSOP

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