MAX6639 Evaluation Kit

Evaluates: MAX6639/MAX6639F

General Description

The MAX6639 evaluation kit (EV kit) is an assembled and tested PCB used to evaluate the MAX6639 dual temperature sensor/fan controller. The MAX6639 monitors its own die temperature and the junction temperature of one external diode-connected transistor, or the junction temperatures of two external diode-connected transistors. It converts the temperature to 8-bit or 11-bit 2-wire serial data that can be accessed over a 2-wire serial bus.

The MAX6639 EV kit includes both external diode-connected transistors (2N3906) soldered to the board, which can be bypassed to connect the board through a twisted pair to remote diodes close to your system.

The temperature data is also used by the internal dual PWM fan-speed controller to adjust the speed of up to two cooling fans. Speed control is accomplished by tachometer feedback from the fan.

The EV kit also includes Windows® 2000/XP- and Windows Vista®-compatible software, which provides a simple user interface for exercising the features of the MAX6639. The program is menu-driven and offers a graphical user interface (GUI) complete with control buttons. The EV kit comes with the MAX6639AEE+ installed. Contact the factory for free samples of the pin-compatible MAX6639FAEE+ and MAX6640AEE+.

The MAX6639 EV kit also evaluates the MAX6640. The MAX6640 is not recommended for new designs.

Features

♦ **Two Thermal-Diode Inputs**
♦ **Local Temperature Sensor**
♦ **Programmable Temperature Alarms**
♦ **Two PWM Outputs for Fan Drive**
♦ **Up to 25kHz PWM Output Frequency**
♦ **Programmable Fan-Control Characteristics**
♦ **3-Wire and 4-Wire Fan Configurations**
♦ **On-Board Microcontroller to Generate SMBus™/I2C Commands**
♦ **USB-PC Connection (Cable Included)**
♦ **Windows 2000/XP- and Windows Vista (32-Bit)-Compatible Software**
♦ **Easy-to-Use, Menu-Driven Software**
♦ **Lead(Pb)-Free and RoHS Compliant**
♦ **Fully Assembled and Tested**

Ordering Information

PART	TYPE
MAX6639EVKIT+	EV Kit

+Denotes lead(Pb)-free and RoHS compliant.

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SMBus is a trademark of Intel Corp.

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C12, C14	3	10µF ±10%, 16V X5R ceramic capacitors (0805) Murata GRM21BR61C106K
C2, C3	2	22pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H220J
C4	1	0.033µF ±10%, 25V X7R ceramic capacitor (0603) TDK C1608X7R1E333K
C5–C10 , C17, C18, C19	9	0.1µF ±10%, 16V X7R ceramic capacitors (0603) TDK C1608X7R1C104K
C11, C13, C22	3	1µF ±10%, 16V X5R ceramic capacitors (0603) TDK C1608X5R1C105K
C15, C16	2	10pF ±5%, 50V C0G ceramic capacitors (0603) Murata GRM1885C1H100J

DESIGNATION	QTY	DESCRIPTION
C20, C21	2	2200pF ±10%, 50V X7R ceramic capacitors (0603) Murata GRM188R71H222K
D1, D2, D3	3	Red LEDs (0603)
D4	1	Green LED (0603)
H1	0	Not installed, dual-row (2 x 5) 10-pin JTAG header
J1, J2	2	3-pin headers, 0.1in pitch, vertical, friction lock
J3, J4	2	4-pin headers, 0.1in pitch, vertical, friction lock
JU1–JU7	7	3-pin headers
JU8–JU13	0	Not installed, 2-pin headers—shorted by PCB trace
L1	1	Ferrite bead (0603) TDK MMZ1608R301A

Maxim Integrated Products **1**

Component List (continued)

DESIGNATION	QTY	DESCRIPTION
N1, N2	2	n-channel MOSFET, 1.4A, 30V (3 SOT23) Fairchild NDS351AN
P1	1	USB type-B right-angle PC-mount receptacle
Q1, Q2	2	2N3906-type pnp transistors (SOT23) Central Semi CMPT3906
R1, R2	2	27Ω ±5% resistors (0603)
R3, R19, R20, R21	4	1.5kΩ ±5% resistors (0603)
R4	1	470Ω ±5% resistor (0603)
R5	1	2.2kΩ ±5% resistor (0603)
R6, R16, R18	3	10kΩ ±5% resistors (0603)
R7	1	169kΩ ±1% resistor (0603)
R8	1	100kΩ ±1% resistor (0603)
R9–R13	0	Not installed, resistors—shorted by PCB trace (0402)
R14	1	47Ω ±5% resistor (0603)
R15, R17, R22, R23, R24	5	4.7kΩ ±5% resistors (0603)
R25, R26, R27	0	Not installed, resistors (0603)

DESIGNATION	QTY	DESCRIPTION
R28	1	220Ω ±5% resistor (0603)
U1	1	Temp sensor fan controller (16 QSOP) Maxim MAX6639AEE+
U2	1	Microcontroller (68 QFN-EP*) Maxim MAXQ2000-RAX+
U3	1	LDO regulator (5 SC70) Maxim MAX8511EXK25+
U4	1	Adjustable output LDO regulator (5 SC70) Maxim MAX8512EXK+
U5	1	UART-to-USB converter (32 TQFP)
U6	1	93C46 EEPROM (8 SO)
Y1	1	16MHz crystal (HCM49) Hong Kong X'tals SSM1600000E18FAF
Y2	1	6MHz crystal (HCM49) Hong Kong X'tals SSL600000E18FAF
—	7	Shunts
—	1	USB high-speed A-to-B cable, 6ft
—	1	PCB: MAX6639 Evaluation Kit+

EP = Exposed pad.

Component Suppliers

SUPPLIER	PHONE	WEBSITE
Central Semiconductor Corp.	631-435-1110	www.centralsemi.com
Fairchild Semiconductor	888-522-5372	www.fairchildsemi.com
Hong Kong X'tals Ltd.	852-35112388	www.hongkongcrystal.com
Murata Electronics North America, Inc.	770-436-1300	www.murata-northamerica.com
TDK Corp.	847-803-6100	www.component.tdk.com

Note: *Indicate that you are using the MAX6639 when contacting these component suppliers.*

MAX6639 EV Kit Files

FILE	DESCRIPTION
INSTALL.EXE	Installs the EV kit files on your computer
MAX6639.EXE	Application program
FTD2XX.INF	USB driver file
UNINST.INI	Uninstalls the EV kit software
USB_Driver_Help.PDF	USB driver installation help file

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Quick Start

Recommended Equipment

- A MAX6639 EV kit (USB cable included)
- A user-supplied Windows 2000/XP- or Windows Vista-compatible PC with a spare USB port
- A power supply to power the fans (the voltage and current depend on the fans used, but the voltage must not exceed 30V)
- One or two 3-pin DC fans with tachometer outputs (each fan must not draw more than 1.4A continuous)

Note: In the following sections, software-related items are identified by bolding. Text in **bold** refers to items directly from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

Procedure

The MAX6639 EV kit is fully assembled and tested. Follow the steps below to verify board operation. **Caution: Do not turn on power supply until all connections are completed.**

1) Visit **www.maxim-ic.com/evkitsoftware** to download the latest version of the EV kit software, 6639Rxx.ZIP. Save the EV kit software to a temporary folder and uncompress the ZIP file.

2) Install the EV kit software on your computer by running the INSTALL.EXE program inside the temporary folder. The program files are copied and icons are created in the Windows **Start | Programs** menu.

3) Verify that all jumpers (JU1–JU7) are in their default positions, as shown in Table 1.

4) Connect the fan(s) to J1 and J2 on the EV kit board.

5) Connect the fan power supply to the pads labeled VFAN and FAN_GND.

6) Connect the USB cable from the PC to the EV kit board. A **New Hardware Found** window pops up when installing the USB driver for the first time. If a window is not seen that is similar to the one described above after 30s, remove the USB cable from the board and reconnect it. Administrator privileges are required to install the USB device driver on Windows.

Table 1. MAX6639 EV Kit Jumper Description Table (JU1–JU7)

JUMPER	SHUNT POSITION	DESCRIPTION
JU1	1-2*	Connects the MAX6639 to the on-board 3.3V supply
	2-3	Connects the MAX6639 to the user-supplied 3.0V to 3.6V supply
JU2	1-2*	Connects the MAX6639 to the on-board SCL
	2-3	Connects the MAX6639 to the user-supplied SCL
JU3	1-2*	Connects the MAX6639 to the on-board SDA
	2-3	Connects the MAX6639 to the user-supplied SDA
JU4	1-2*	Connects the MAX6639 to the on-board $\overline{ALERT}$
	2-3	Connects the MAX6639 to the user-supplied $\overline{ALERT}$
JU5	1-2*	Connects pin ADD of the MAX6639 to VCC. Address = 0x5E. If the MAX6640 is used, always use this jumper in the 1-2 position.
	Open	Pin ADD of the MAX6639 left unconnected. Address = 0x5C.
	2-3	Connects pin ADD of the MAX6639 to ground. Address = 0x58. Not allowed on the MAX6640.
JU6	1-2*	Connects the pullup resistor for the TACH1 signal to the voltage VFAN, which is used for 3-wire fans
	2-3	Connects the pullup resistor for the TACH1 signal of the MAX6639 to the voltage VIN, which is used for 4-wire fans
JU7	1-2*	Connects the pullup resistor for the TACH2 signal of the MAX6639 to the voltage VFAN, which is used for 3-wire fans
	2-3	Connects the pullup resistor for the TACH2 signal of the MAX6639 to the voltage VIN, which is used for 4-wire fans

*Default position.

7) Follow the directions of the **Add New Hardware Wizard** to install the USB device driver. Choose the **Search for the best driver for your device** option. Specify the location of the device driver to be **C:\Program Files\MAX6639** (default installation directory) using the **Browse** button. During device driver installation, Windows may show a warning message indicating that the device driver provided by Maxim does not contain a digital signature. This is not an error condition and it is safe to proceed with installation. Refer to the USB_Driver_Help.PDF document included with the software for additional information.

8) Turn on fan power supply.

9) Start the EV kit software by opening its icon in the **Start | Programs** menu. The EV kit software main window should appear as shown in Figure 1. Observe as the program automatically detects the address of the MAX6639 and starts the main program.

Detailed Description of Software

User Interface
The user interface is easy to operate. Each button corresponds to bits in the command and configuration byte. By pressing them, the correct I^2C-compatible write operation is generated to update the internal registers of the MAX6639.

Automatic Read
The program polls the device for the new temperature and status data a maximum of two times per second (2Hz). To disable the polling of data, uncheck the **Auto Read** checkbox located at the top of the program.

Data Logging
Check the **Data Logging** checkbox located at the top of the program to activate data logging. Data logging saves temperature, voltage, and status data to a text file that includes a time/date stamp next to each data point. If the **Auto Read** checkbox is checked, data is sampled at 2Hz. When the **Auto Read** checkbox is unchecked, the
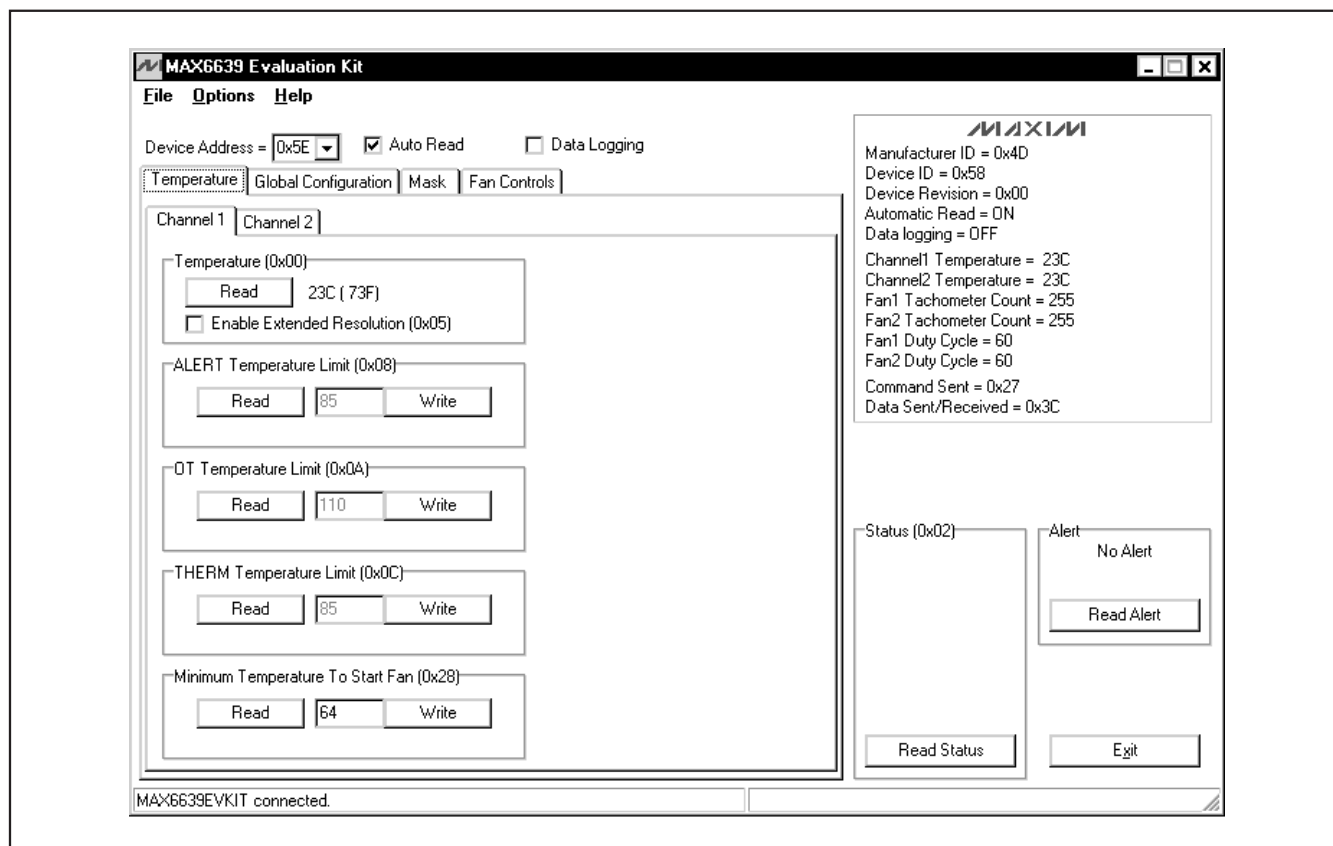

Figure 1. MAX6639 EV Kit Software Main Window (Temperature Tab)

data is logged each time **Read All** is selected from the **Options** menu bar. To stop data logging, uncheck the **Data Logging** checkbox.

Temperature

The MAX6639 monitors its own die temperature and the junction temperature of one external diode-connected transistor, or the junction temperature of two external diode-connected transistors. The temperature measurements are capable of either 8-bit or 11-bit (extended) resolution; 8-bit resolution results in a temperature resolution of 1°C/LSB. Extended resolution results in a temperature resolution of 0.125°C/LSB and is enabled by checking the **Enable Extended Resolution (0x05)** checkbox (Figure 1).

Read the temperatures by pressing the **Read** buttons within the **Temperature** tab sheet (Figure 1). The temperature is shown to the right of the buttons.

External Diodes

The MAX6639AEE remote temperature sensor is optimized for use with a diode-connected transistor whose

ideality factor is equal to 1.008. Transistors with different ideality factors produce different remote temperature readings. Some typical discrete transistors may produce readings that vary approximately 3°C from the correct value. Refer to Application Note 1057: *Compensating for Ideality Factor and Series Resistance Differences Between Thermal Sense Diodes* for additional information.

$\overline{ALERT}$, $\overline{THERM}$, and $\overline{OT}$ Temperature Limits

The MAX6639 has $\overline{ALERT}$, $\overline{THERM}$, and overtemperature ($\overline{OT}$) limit registers. Temperatures exceeding the $\overline{ALERT}$ limit register generate an alert interrupt.

Exceeding the $\overline{THERM}$ or $\overline{OT}$ limits sets the $\overline{THERM}$ or overtemperature bit in the status register and asserts the $\overline{THERM}$ or $\overline{OT}$ output pin.

Read a limit by pressing the **Read** button (Figure 1). The value (in Celsius) is shown to the right of the button. Change a limit by entering the value (in Celsius) into the appropriate edit field and pressing the **Write** button.
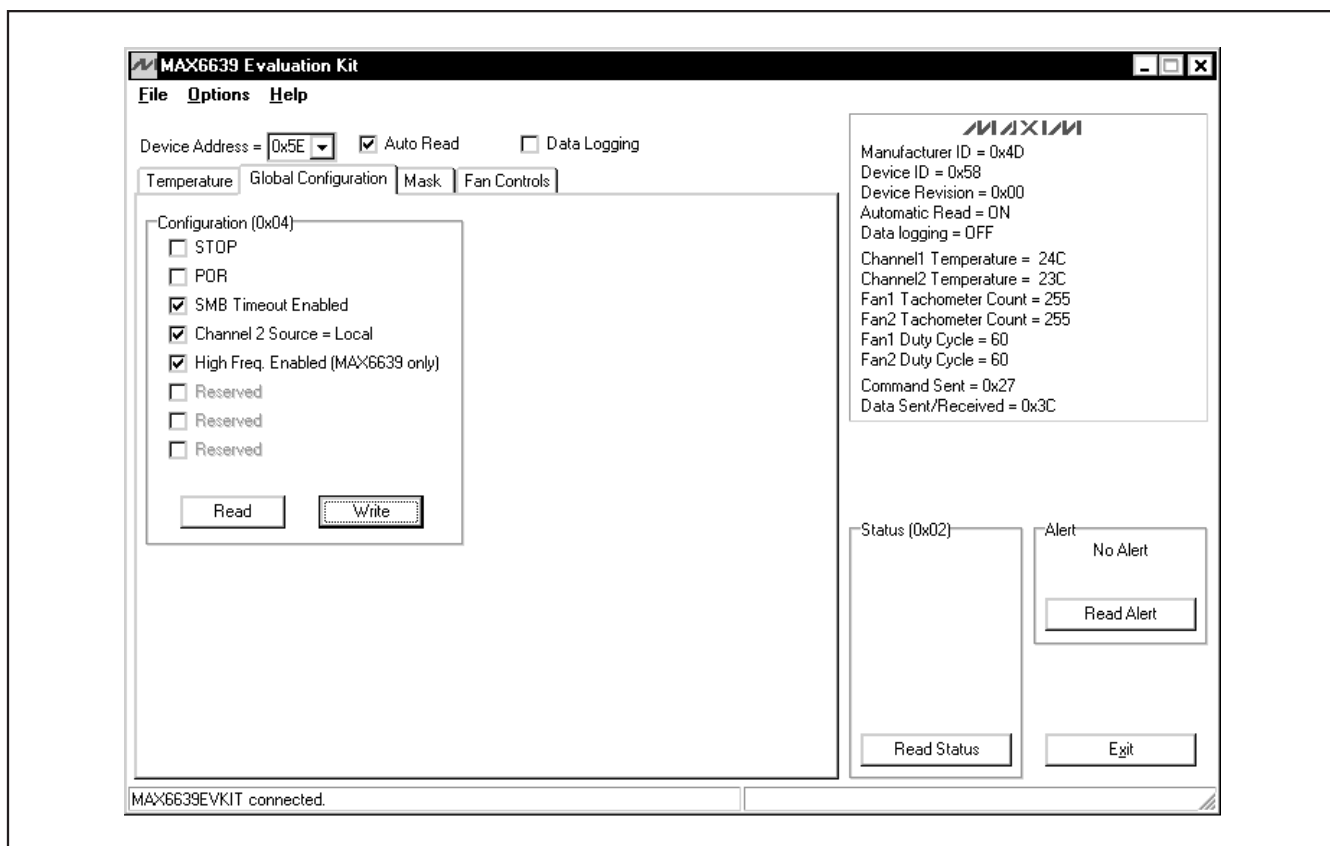

Figure 2. MAX6639 EV Kit Software Main Window (Global Configuration Tab)

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Table 2. Global Configuration Register Checkboxes

BIT	NAME	STATE	DESCRIPTION
7	**STOP**	Checked	Places the MAX6639 in software standby mode
		Unchecked*	Places the MAX6639 in operational mode
6	**POR**	Checked	Resets all registers to their default values, including the global configuration register. After selecting the POR checkbox, the checkbox returns to the unchecked state.
		Unchecked*	Normal operation
5	**SMB Timeout Enabled**	Checked*	Enables the SMBus timeout
		Unchecked	Disables the SMBus timeout, as well as the alert response, thus providing true I^{2}C compatibility
4	**Channel 2 Source = Local**	Checked*	The local sensor on the MAX6639 is the source for channel 2
		Unchecked	The remote sensor connected to DXP2 and DXN is the source for channel 2
3	**High-Freq Enabled (MAX6639 only)**	Checked	Enables high-frequency PWM output on the MAX6639
		Unchecked*	Enables low-frequency PWM output
2	**Reserved**	N/A	Not used
1	**Reserved**	N/A	Not used
0	**Reserved**	N/A	Not used

*Power-on-reset (POR) state.

Fan-Start Temperature

The minimum fan-start temperature register contains the temperature at which fan control begins. **Note:** This applies only to automatic RPM mode. Refer to the MAX6639 IC data sheet for more information on automatic RPM mode operation.

Read the minimum fan-start temperature by pressing the **Read** button (Figure 1). The value (in Celsius) is shown to the right of the button. Change the minimum fan-start temperature by entering the values (in Celsius) into the edit boxes and pressing the **Write** buttons.

Global Configuration

The global configuration register has several functions. Figure 2 displays the checkboxes that configure the register. Each checkbox corresponds to a bit in the register. Table 2 describes the function of each checkbox. Read the global configuration register by pressing the **Read** button. Change the global configuration register by checking or unchecking the desired function checkbox and pressing the **Write** button.

Mask

The mask register enables or disables the $\overline{\text{ALERT}}$, $\overline{\text{OT}}$, $\overline{\text{THERM}}$, or $\overline{\text{FANFAIL}}$ outputs. Figure 3 displays the checkboxes that configure the register. Each checkbox corresponds to a bit in the register. Table 3 describes the function of each checkbox. Read the mask register by pressing the **Read** button. Change the mask by selecting or deselecting the desired masks and pressing the **Write** button.

Status

The **Status (0x02)** group box displays the critical and fault conditions that occur. Each line corresponds to a bit in the registers. See Table 4 for a list of the status conditions.

Read the status by pressing the **Read Status** button within the **Status (0x02)** group box.

Fan 1 and Fan 2 Configuration 1

The fan 1 **Configuration 1 (0x10)** and fan 2 **Configuration 1 (0x14)** group boxes control the modes of operation of the fans (Figure 4). The **Configuration 1 (0x14)** group box is not shown, but can be accessed by navigating to the **Fan 2** tab sheet from Figure 4. These group boxes contain four items: **Mode**, **Rate of Change**, **Control**, and **RPM Range**.

The **Mode** drop-down list has two options: **PWM mode** or **RPM mode**. Select **PWM mode** to control the PWM duty cycle manually. **RPM mode** allows for either manual or automatic control of the fan's RPM.

The **Rate of Change** drop-down list sets the time between adjustments of the duty cycle. Each adjustment is 1/120 of the PWM period. By adjusting the **Rate**
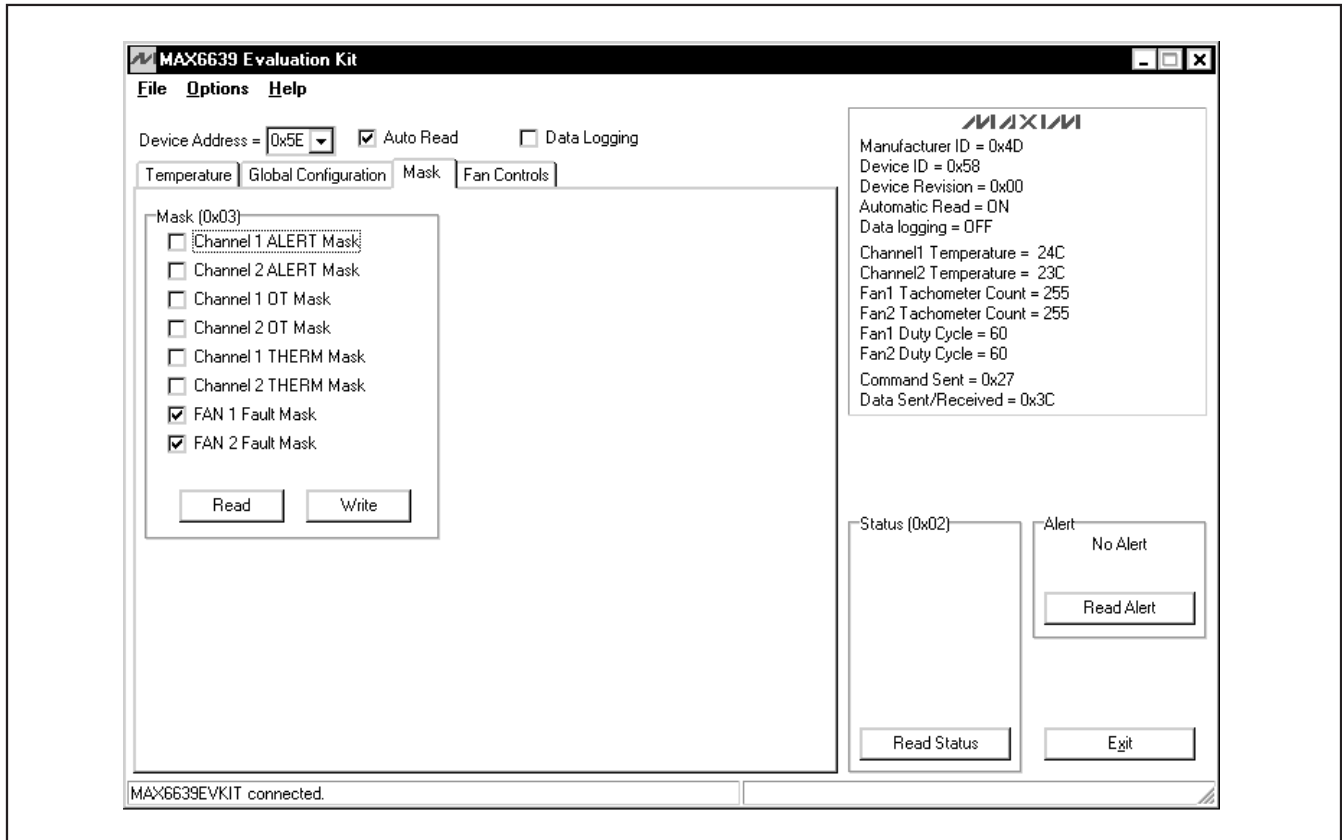
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Figure 3. MAX6639 EV Kit Software Main Window (Mask Tab)

of Change drop-down list, audibility of fan-speed changes can be traded for response time. There are eight possible options: **0s**, **0.0625s**, **0.125s**, **0.25s**, **0.5s**, **1s**, **2s**, or **4s**.

The **Control** drop-down list sets the temperature channels that control the fan in RPM mode. There are four options under the control drop-down list: **None**, **Channel1**, **Channel2**, or **Both**. Selecting **None** allows for manual control of the fan's RPM. Selecting **Channel1**, **Channel2**, or **Both**, allows the fan's RPM to be controlled by the temperature of the selected channel(s).

The **RPM Range** drop-down list scales the tachometer counter by setting the maximum (full-scale) value of the RPM range. There are four possible selections: **2000 RPM**, **4000 RPM**, **8000 RPM**, or **16000 RPM**. Select the closest value that is greater than the fan's full-speed RPM.

Read the configuration 1 register by pressing the **Read** button. Change the configuration by selecting the desired options and pressing the **Write** button.

Fan 1 and Fan 2 Configuration 2A

The fan 1 **Configuration 2A (0x11)** and fan 2 **Configuration 2A (0x15)** group boxes apply to the automatic RPM mode (Figure 4). The **Configuration 2A (0x15)** group box is not shown, but can be accessed by navigating to the **Fan 2** tab sheet from Figure 4. These group boxes contain four items: **RPM step-size A**, **Temp step-size**, **Positive PWM Polarity**, and **Min. speed**.

The **RPM step-size A** drop-down list selects the number of tachometer counts that the target value decreases for each temperature-step increase above the fan-start temperature. The value can be set between 1 and 16.

The **Temp step-size** drop-down list selects the temperature adjustment for fan control. For each temperature-step increase, the target tachometer count decreases by the value of RPM step-size A. The temperature step-size value can be set to **1 C**, **2 C**, **4 C**, or **8 C**.

The **Positive PWM Polarity** checkbox sets the PWM output polarity. Checking the **Positive PWM Polarity**

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Table 3. Mask Register Checkboxes

BIT	NAME	STATE	DESCRIPTION
7	Channel 1 ALERT Mask	Checked	Disables the channel 1 $\overline{ALERT}$ interrupts
		Unchecked*	Enables the channel 1 $\overline{ALERT}$ interrupts
6	Channel 2 ALERT Mask	Checked	Disables the channel 2 $\overline{ALERT}$ interrupts
		Unchecked*	Enables the channel 2 $\overline{ALERT}$ interrupts
5	Channel 1 OT Mask	Checked	Prevents $\overline{OT}$ from being asserted by channel 1 fault
		Unchecked*	Allows $\overline{OT}$ to be asserted by channel 1 fault
4	Channel 2 OT Mask	Checked	Prevents $\overline{OT}$ from being asserted by channel 2 fault
		Unchecked*	Allows $\overline{OT}$ to be asserted by channel 2 fault
3	Channel 1 THERM Mask	Checked	Prevents $\overline{THERM}$ from being asserted by channel 1 fault
		Unchecked*	Allows $\overline{THERM}$ to be asserted by channel 1 fault
2	Channel 2 THERM Mask	Checked	Prevents $\overline{THERM}$ from being asserted by channel 2 fault
		Unchecked*	Allows $\overline{THERM}$ to be asserted by channel 2 fault
1	FAN 1 Fault Mask	Checked*	Prevents $\overline{FANFAIL}$ from being asserted by channel 1 fault
		Unchecked	Allows $\overline{FANFAIL}$ to be asserted by channel 1 fault
0	FAN 2 Fault Mask	Checked*	Prevents $\overline{FANFAIL}$ from being asserted by channel 2 fault
		Unchecked	Allows $\overline{FANFAIL}$ to be asserted by channel 2 fault

*Power-on-reset (POR) state.

checkbox results in the PWM output being high at 100% duty cycle. Unchecking the **Positive PWM Polarity** checkbox results in the PWM output being low at 100% duty cycle.

The **Min. speed** drop-down list selects the value of the minimum fan speed (when the temperature is below the fan-start temperature in the automatic RPM mode). There are two possible selections: **0% duty cycle** or **Set by Start TACH**. Selecting **0% duty cycle** results in the fan being off when the temperature is below the fan-start temperature value. Selecting **Set by Start TACH (0x22)** or **Set by Start TACH (0x23)** results in the fan operating at the minimum speed set for fan 1 or fan 2.

Read the configuration 2A register by pressing the **Read** button. Change the configuration by selecting the desired options and pressing the **Write** button.

Fan 1 and Fan 2 Configuration 2B
The fan 1 **Configuration 2B (0x12)** and fan 2 **Configuration 2B (0x16)** group boxes also apply to the automatic RPM mode (Figure 4). The **Configuration 2B (0x16)** group box is not shown, but can be accessed by navigating to the **Fan 2** tab sheet from Figure 4. These group boxes set the tachometer step sizes and number of steps for step-size A to step-size B slope changes.

The **RPM step-size B** drop-down list selects the number of tachometer counts that the target value decreases for each temperature-step increase above the fan-start temperature. The value can be set between 1 and 16.

The **Number of steps** drop-down list sets the number of temperature/tachometer steps above the fan-start temperature at which step-size B begins. The number of steps can be set between 1 and 16. Read the configuration 2B register by pressing the **Read** button. Change the configuration by selecting the desired options and pressing the **Write** button.

Fan 1 and Fan 2 Configuration 3
The fan 1 **Configuration 3 (0x13)** and fan 2 **Configuration 3 (0x17)** group boxes control fan spin-up, $\overline{THERM}$ to fan full speed, pulse stretching, and PWM output frequency (Figure 4). The **Configuration 3 (0x17)** group box is not shown, but can be accessed by navigating to the **Fan 2** tab sheet from Figure 4.

The fan spin-up feature ensures that the fan starts. Whenever the fan starts up from zero drive, it is driven with 100% duty cycle for 2s to ensure that it starts. Fan spin-up is enabled by default. To disable this feature, check the **Fan Spin Up Disable** checkbox.

When the **THERM to Fan Full Speed** checkbox is checked, $\overline{THERM}$ going low—either by being pulled low
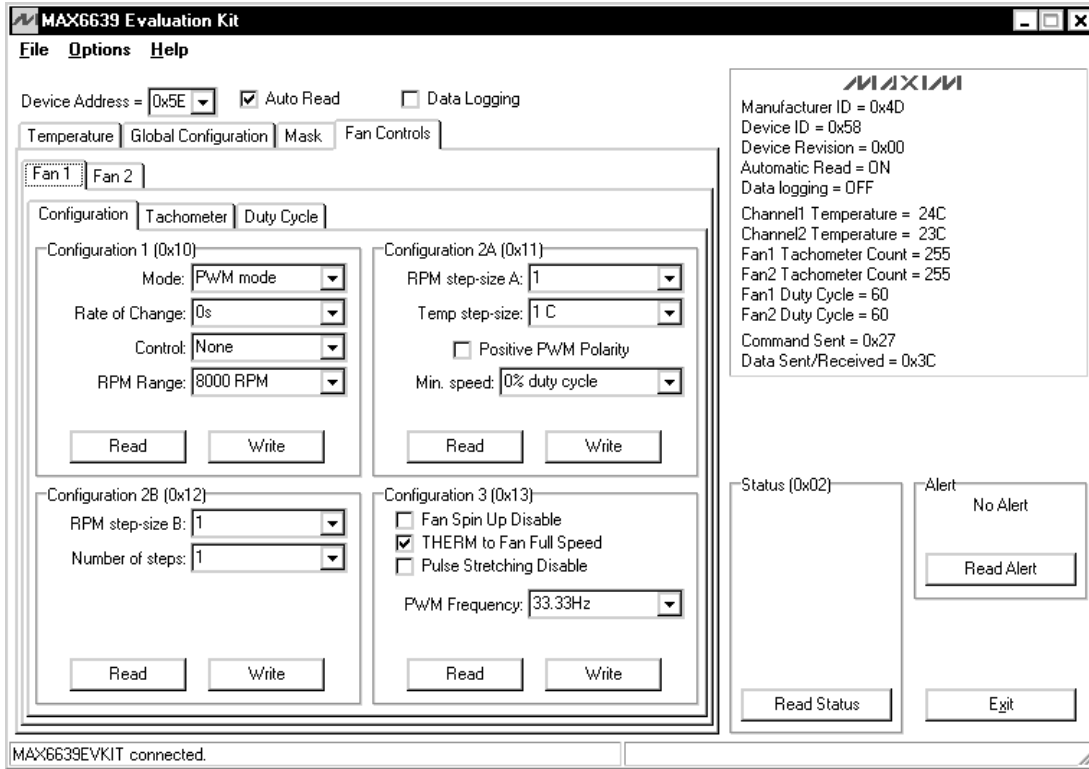
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Figure 4. MAX6639 EV Kit Software Main Window (Fan Controls | Fan 1 | Configuration Tab)

Table 4. Status Register

BIT	NAME	DESCRIPTION
7	Channel 1 ALERT	The temperature of channel 1 is above the value set in the channel 1 $\overline{\text{ALERT}}$ limit register.
6	Channel 2 ALERT	The temperature of channel 2 is above the value set in the channel 2 $\overline{\text{ALERT}}$ limit register.
5	Channel 1 OT	The temperature of channel 1 has exceeded the value set in the channel 1 $\overline{\text{OT}}$ limit register. This bit returns to zero when the temperature of channel 1 drops 5°C below the channel 1 $\overline{\text{OT}}$ limit.
4	Channel 2 OT	The temperature of channel 2 has exceeded the value set in the channel 2 $\overline{\text{OT}}$ limit register. This bit returns to zero when the temperature of channel 2 drops 5°C below the channel 2 $\overline{\text{OT}}$ limit.
3	Channel 1 THERM	The temperature of channel 1 has exceeded the value set in the channel 1 $\overline{\text{THERM}}$ limit register. This bit returns to zero when the temperature of channel 1 drops 5°C below the channel 1 $\overline{\text{THERM}}$ limit.
2	Channel 2 THERM	The temperature of channel 2 has exceeded the value set in the channel 2 $\overline{\text{THERM}}$ limit register. This bit returns to zero when the temperature of channel 2 drops 5°C below the channel 2 $\overline{\text{THERM}}$ limit.
1	Fan 1 Fault	A fault has been detected on fan 1. Refer to the MAX6639 IC data sheet for a detailed description.
0	Fan 2 Fault	A fault has been detected on fan 2. Refer to the MAX6639 IC data sheet for a detailed description.

externally or by the temperature exceeding the $\overline{\text{THERM}}$ limit—forces the fan to full speed at the rate determined by the rate-of-change setting in configuration 1.

Pulse stretching is used with a pulse-modulated power supply powering the fan. When modulating the fan's power supply with the PWM signal, the PWM pulses are periodically stretched to keep the tachometer's signal available for one full revolution. Check the **Pulse Stretching Disable** checkbox to disable this feature. Always disable pulse stretching when using 4-wire fans.

The **PWM Frequency** drop-down list sets the frequency that drives the pulse-modulated power supply. The frequency can be set to **20Hz**, **33.33Hz**, **50Hz**, or **100Hz**. If the **High Freq. Enabled (MAX6639 only)** checkbox is checked within the **Global Configuration** tab sheet, then the frequency can be set to **5kHz**, **8.33kHz**, **12.5kHz**, or **25kHz**.

Read the configuration 3 register by pressing the **Read** button. Change the configuration by selecting the desired options and pressing the **Write** button.

Fan 1 and Fan 2 Tachometer Count

The fan 1 **Tachometer Count (0x20)** and fan 2 **Tachometer Count (0x21)** group boxes control the different tachometer counts (Figure 5). The **Tachometer Count (0x21)** group box is not shown, but can be accessed by navigating to the **Fan 2** tab sheet from Figure 5. The tachometer count value is inversely proportional to the fans' speed.

Read the tachometer count by pressing the **Read** button.

Fan 1 and Fan 2 Start or Target Tachometer Count

The fan 1 **Start or Target Tachometer Count (0x22)** and fan 2 **Start or Target Tachometer Count (0x23)** group boxes set either the starting tachometer count for the fan when operating in automatic RPM mode, or the target tachometer count when operating in manual RPM mode (Figure 5). The **Start or Target Tachometer Count (0x23)** group box is not shown, but can be accessed by navigating to the **Fan 2** tab sheet from Figure 5. Read the count by pressing the **Read** button.
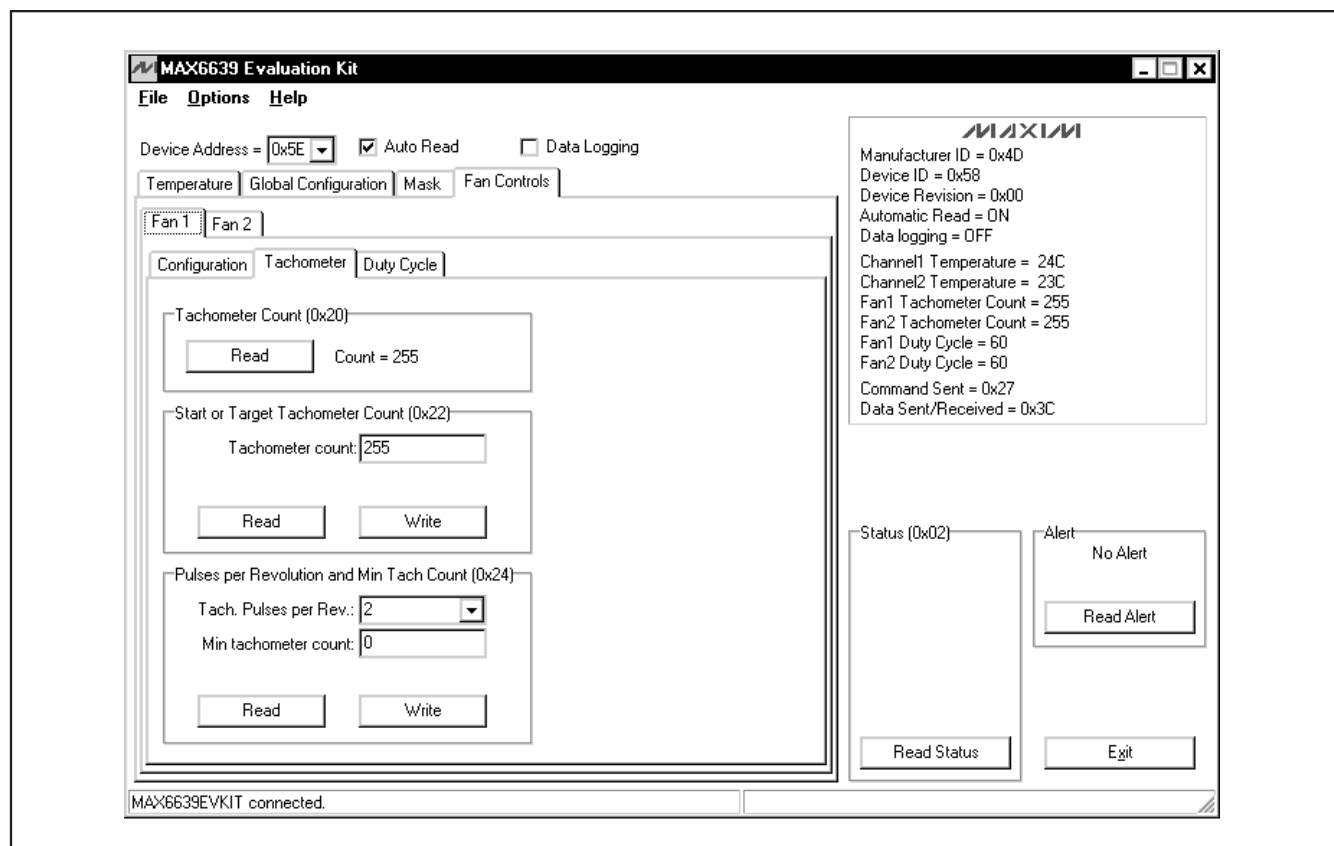

Figure 5. MAX6639 EV Kit Software Main Window (Fan Controls l Fan 1 l Tachometer Tab)

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Change the count by entering the value into the **Tachometer count** edit box and pressing the **Write** button.

Fan 1 and Fan 2 Pulses per Revolution and Min Tach Count

The fan 1 **Pulses per Revolution and Min Tach Count (0x24)** and fan 2 **Pulses per Revolution and Min Tach Count (0x25)** group boxes set the number of tachometer pulses per revolution of the fan and the minimum allowable tachometer count (maximum speed) for the fan (Figure 5). The **Pulses per Revolution and Min Tach Count (0x25)** group box is not shown, but can be accessed by navigating to the **Fan 2** tab sheet from Figure 5.

The **Tach. Pulses per Rev.** drop-down list setting has four options: **1**, **2**, **3**, or **4**.

The **Min tachometer count** edit box can be set to any value between 0 and 63. Read the pulses per revolution and minimum tachometer count by pressing the **Read** button. Change the pulses per revolution by selecting the desired number from the drop-down list.

Change the minimum tachometer count by entering the value into the edit box. Press the **Write** button to apply the changes.

Fan 1 and Fan 2 Duty Cycle

The **Duty Cycle** tab sheet (Figure 6) contains the PWM duty cycle value. When operating in RPM mode, this value is controlled by the MAX6639. In PWM mode, this is the desired (target) PWM duty-cycle value. The value can be set between 0 and 120. Any number above 120 is changed to 120.

Read the duty-cycle value by pressing the **Read** button. Change the duty cycle by entering the value into the edit box and pressing the **Write** button.

Alert

The message **ALERT** appears in the alert box when an interrupt condition occurs, unless the configuration register is set to mask the alert. The cause of the interrupt is shown in the **Status (0x02)** group box. To clear the interrupt, first eliminate the condition that caused it and then press the **Read Alert** button.
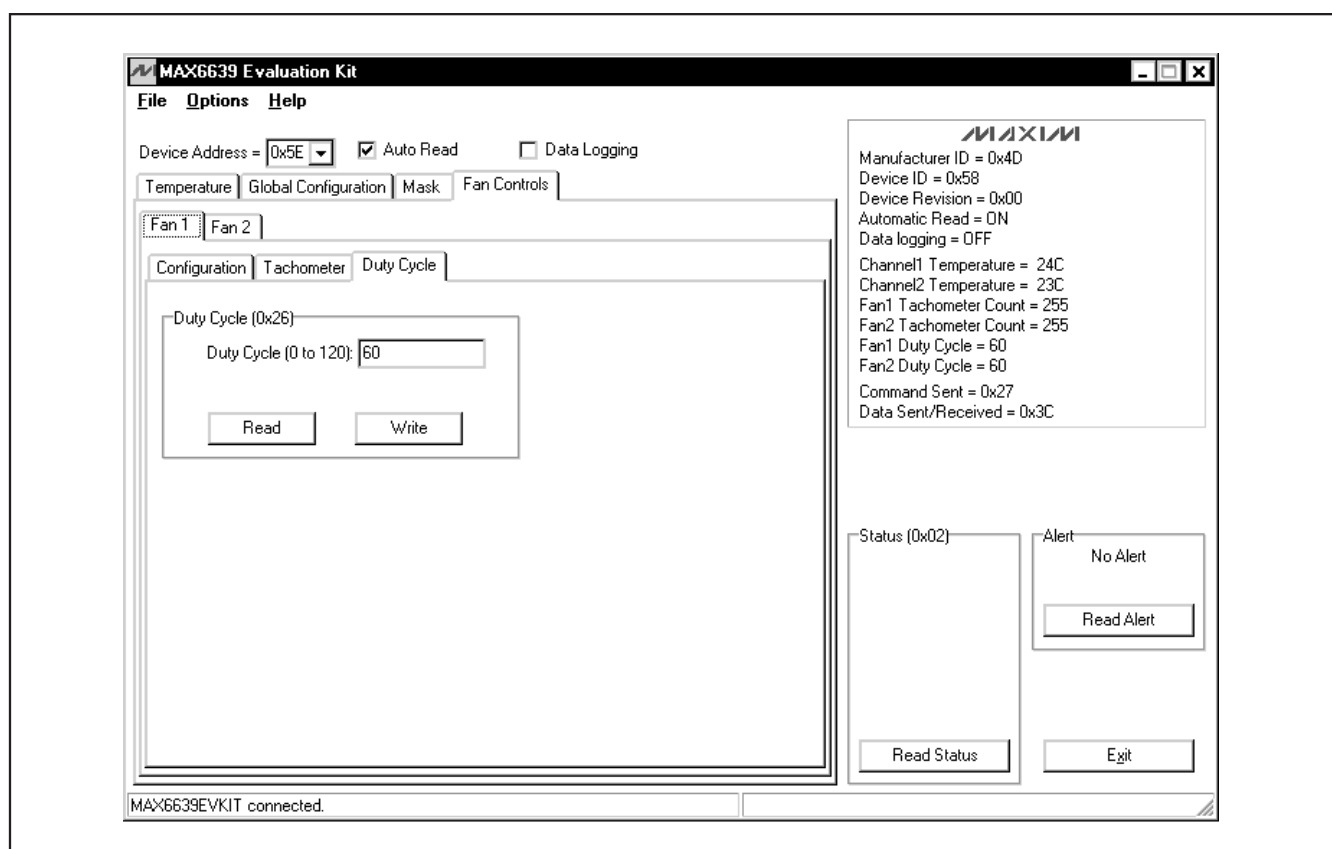

Figure 6. MAX6639 EV Kit Software Main Window (Fan Controls | Fan 1 | Duty Cycle Tab)

MAX6639 Evaluation Kit

Save Settings

The MAX6639 EV kit software allows the user to save desired GUI settings by selecting **File | Save Settings** from the menu bar. GUI setting files can be saved only as .INI files.

Load Settings

To restore a saved GUI setting, select **File | Load Settings** from the menu bar. Next, select the .INI file with the desired GUI settings and observe as the GUI reconfigures appropriately.

Advanced User Interface

There are two methods for communicating with the MAX6639, through the normal user-interface main window or through the SMBus/I2C commands available by selecting **Options | Interface (Advanced Users)** from the menu bar. An **Advanced User Interface** window pops up with the **2-wire interface** tab selected, which allows the SMBus/I2C-compatible protocols, such as read byte and write byte, to be executed. The only SMBus/I2C-compatible protocols used by the MAX6639 are:

1 - SMBusWriteByte(addr,cmd,data8)

4 - SMBusReadByte(addr,cmd) -> data8

The combo and edit boxes accept numeric data in hexadecimal and should be prefixed by 0x. See Figure 7 for an example of this tool.

In this example, the software is reading from **Device Address 0101111 r/w** (binary), and register address 0x00.
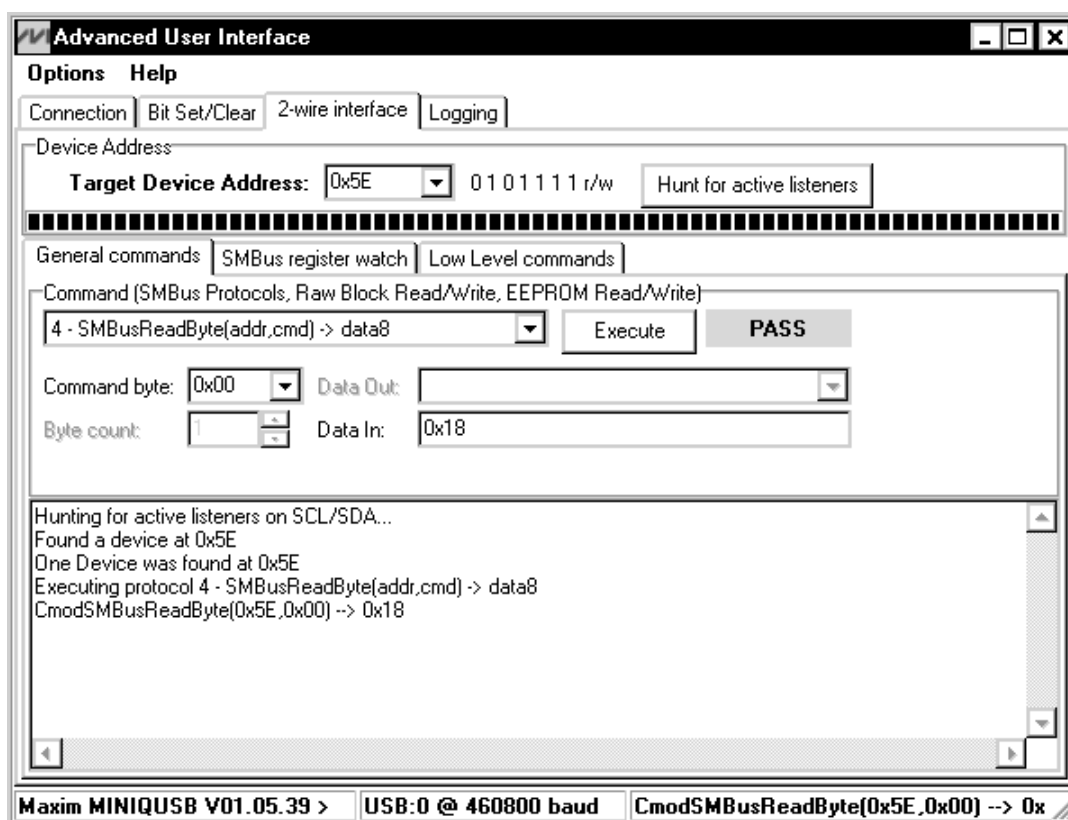

Figure 7. Simple SMBusReadByte Operation Using the Advanced User Interface

_Detailed Description of Hardware

The MAX6639 EV kit is an assembled and tested PCB used to evaluate the MAX6639 dual-temperature sensor/fan controller. The MAX6639 monitors its own die temperature and the junction temperature of one external diode-connected transistor, or the junction temperatures of two external diode-connected transistors. It converts the temperature to 8-bit or 11-bit 2-wire serial data that can be accessed over a 2-wire serial bus.

Slave Address

The slave address can be changed by moving jumper JU5. See Table 1 for address selection.

3-Wire and 4-Wire Fan Configurations

The MAX6639 EV kit is configured for a 3-wire fan by default when the shunts are placed in the 1-2 position of jumpers JU6 and JU7.

For 4-wire fan configuration, the user must move the shunts to the 2-3 position of jumpers JU6 and JU7.

Replacing Diodes

Jumpers JU11 and JU12 connect the 2N3906 transistor as the external diodes. To use different diodes, cut the trace, short the two pins of JU11 and JU12, and connect the diodes (through twisted-pair wire) to the DXP1, DXN, and DXP2 pads.

User-Supplied I^{2}C Interface

To use the MAX6639 with a user-supplied I^{2}C interface, first move JU2, JU3, and JU4 to the 2-3 position. Then, connect SCL, SDA, and $\overline{ALERT}$ to the corresponding pads on the MAX6639 EV kit.

User-Supplied Power Supply

The MAX6639 EV kit is powered completely from the USB port by default. Move the shunt of JU1 to the 2-3 position and apply a user-supplied 3.0V to 3.6V power supply at the EXT_VIN and GND pads.

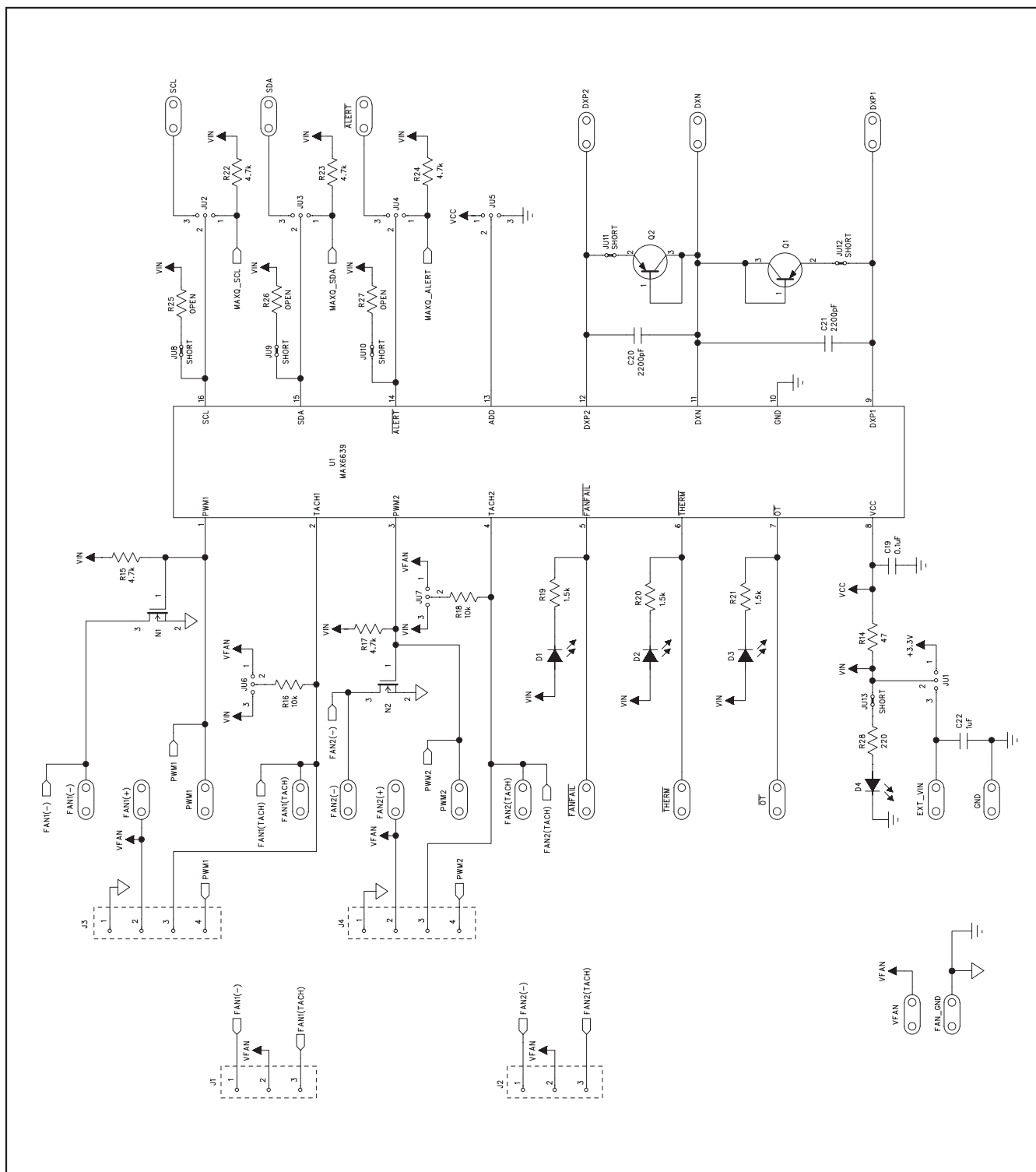The fan supply is provided by the user and varies depending on different fans.

Evaluates: MAX6639/MAX6639F

Figure 8a. MAX6639 EV Kit Schematic (Sheet 1 of 2)

Figure 8b. MAX6639 EV Kit Schematic (Sheet 2 of 2)

Evaluates: MAX6639/MAX6639F
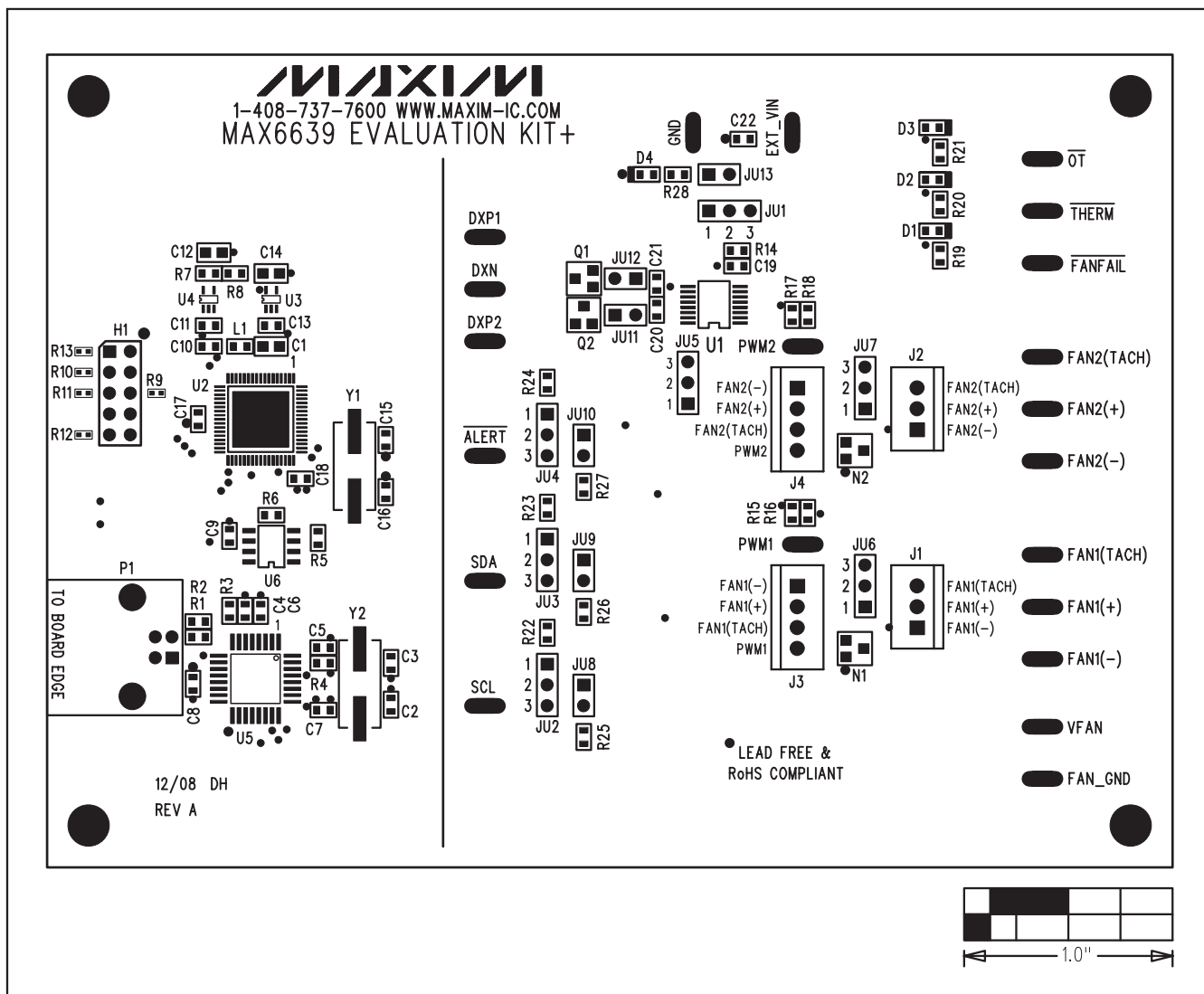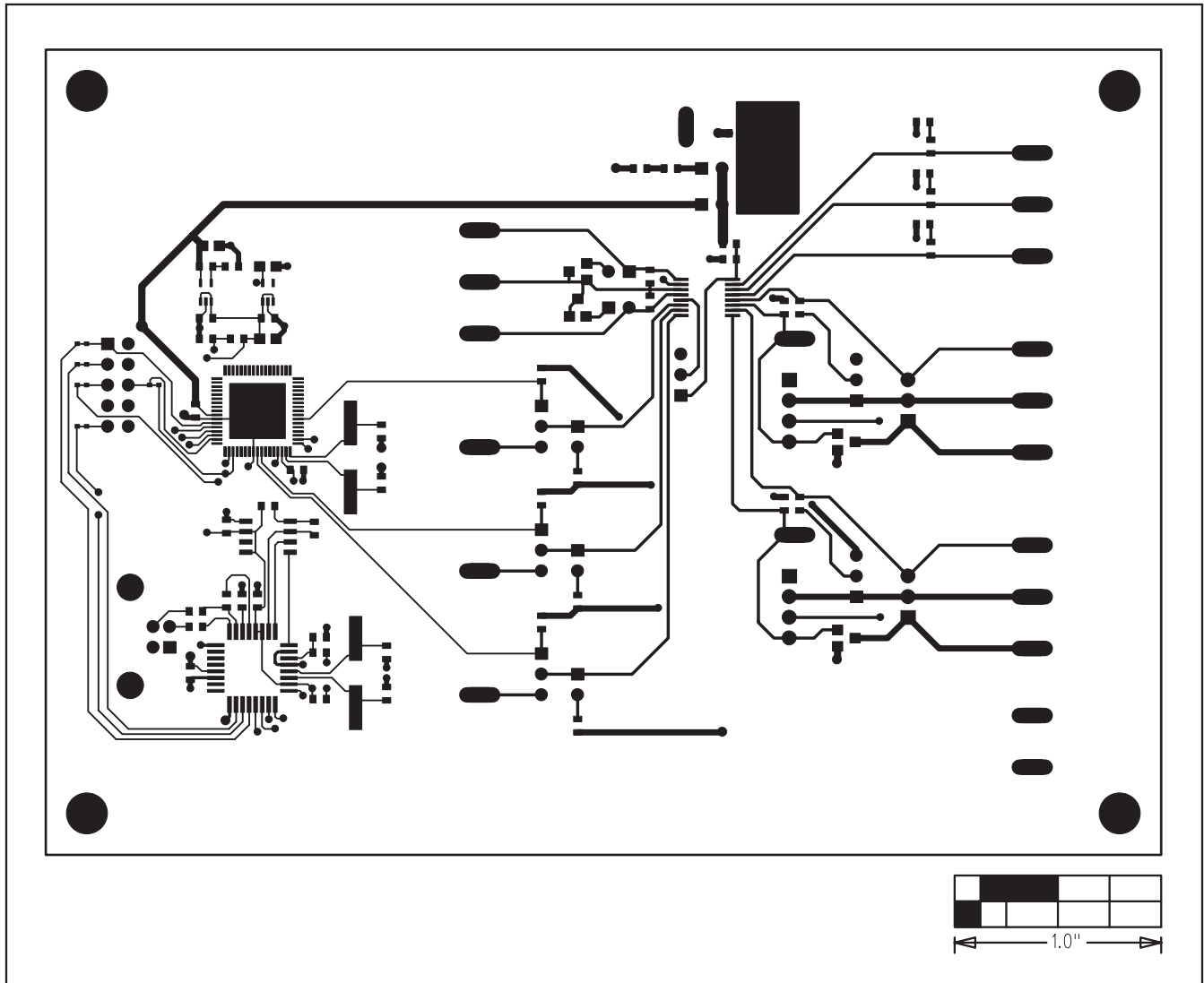

Figure 9. MAX6639 EV Kit Component Placement Guide—Component Side

Figure 10. MAX6639 EV Kit PCB Layout—Component Side

MAX6639 Evaluation Kit
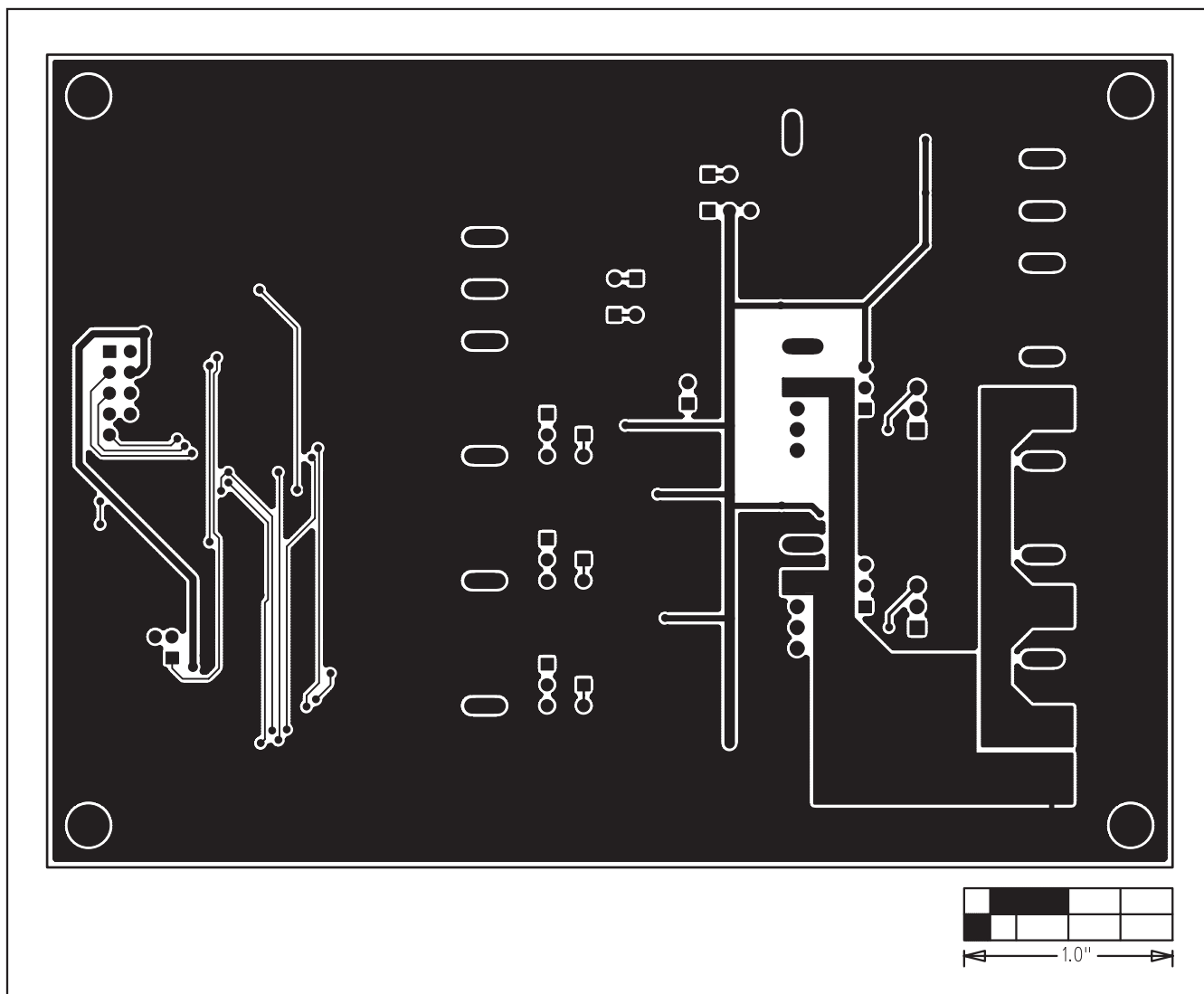
Figure 11. MAX6639 EV Kit PCB Layout—Solder Side

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