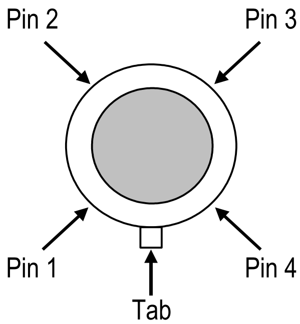
1. Pin Assignments

Figure 2. TO-39 (TO4) Pin Assignments for SGAS707 – Top View



2. Pin Descriptions

Table 1. TO-39 (TO4) Pin Descriptions

Note: See Figure 2 for the connections described below.

Pin Number	Name	Description
1	Heater +	Positive input for the V_H heater voltage supply
2	Sensor +	High-side of the resistive sensor element; positive input for sensing voltage V_C
3	Heater –	Negative (ground) input for the V_H heater voltage supply
4	Sensor –	Low-side of the resistive sensor element; connects to the middle of the resistor divider circuit and produces sensing voltage output (V_{OUT})

3. Sensor Specifications

Note: All measurements were made in dry gas at room temperature. Specifications are subject to change.

Table 2. Electrical Characteristics

Symbol	Parameter	Conditions	Minimum	Typical	Maximum	Units
P_H	Heater power consumption	V_H = 3.5V		400		mW
V_H	Recommended heater voltage	T_{SENSOR} = 150ºC		3.5		VDC
R_H	Heater resistance	At room temperature	28	30	32	Ω
V_C	Recommended sensing voltage		2.5		5.0	VDC
R_{500}	Resistance in 500ppm ethanol		5		500	kΩ
R_{100}/R_{900}	Resolution: Resistance in 100 ppm Ethanol / Resistance in 900 ppm		3.8			

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Table 3. Temperature Specifications

Symbol	Parameter	Conditions	Minimum	Typical	Maximum	Units
T_{OP}	Sensor Operation Temperature	$V_H = 3.5V$		150		°C
T_{AMB}	Recommended Environmental Temperature Range		0		40	°C
T_{STOR}	Maximum Storage Temperature Range		-50		125	°C

The sensor is not intended for continuous operation above or below the environmental temperature specification, but exposure for short durations will not will not harm the sensor.

4. Sensor Characteristics

IDT's solid-state chemiresistive sensors are an advanced type of gas-sensitive resistor; i.e. they sense the presence of a target gas through a change in resistance of the sensing element. Most sensors exhibit reduced resistance as gas concentration increases, typically over several orders of magnitude across the sensing range.

Solid-state chemiresistive sensors show a reduced resistance with increasing gas concentration according to Equation 1:

$$R_S = A * C^{-\alpha} \qquad \textbf{Equation 1}$$

where R_S is resistance, C is concentration, and A and α are constants. Although several refined versions of this equation are available for specific sensors or sensing materials, the fundamental resistance versus concentration relationship for all of IDT's n-type sensors follows Equation 1. Taking the log of both sides of the equation results in Equation 2:

$$log\ (R_S) = log(A) - \alpha * log(C) \qquad \textbf{Equation 2}$$

This shows that log resistance versus log concentration is linear.

An immediately observable consequence of Equation 1 is that sensor resistance will change rapidly at low concentrations and much less at high concentrations. This is illustrated in the following example:

$R_{GAS\_10ppm} = 20k\Omega$

$R_{GAS\_100ppm} = 5k\Omega$

$A_{GAS} = 8.0 * 10^4$

$\alpha_{air} = 0.602$

The non-logarithmic response plot shown in Figure 3 illustrates the fundamental challenge that must be addressed when measuring the resistance of chemiresistor sensors and relating these measurements to gas concentrations. Additional non-linear effects from the measurement circuitry exacerbate these challenges and must be understood in order to account for or eliminate these effects.

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