



# SGM8709

## Micro-Power, CMOS Input, RRIO, 1.4V, Open Drain Output Comparator

### GENERAL DESCRIPTION

The SGM8709 is an ultra low power comparator with a typical power supply current of 318nA. It has the best-in-class power supply current versus propagation delay performance. The propagation delay is as low as 6μs with 100mV overdrive at 1.4V supply.

Designed to operate over a wide range of supply voltages, from 1.4V to 5.5V, with guaranteed operation at 1.4V, 2.5V and 5.0V, the SGM8709 is ideal for use in a variety of battery-powered applications. With rail-to-rail input common mode voltage range, the SGM8709 is well suited for single-supply operation. Its small packages make this device ideal for use in handheld electronics and mobile phone applications.

Featuring an open drain output stage, the SGM8709 allows for operation with absolute minimum power consumption when driving any capacitive or resistive load.

SGM8709 is available in Green SOT-23-5 and SC70-5 space-saving packages. It is rated over the -40°C to +85°C temperature range.

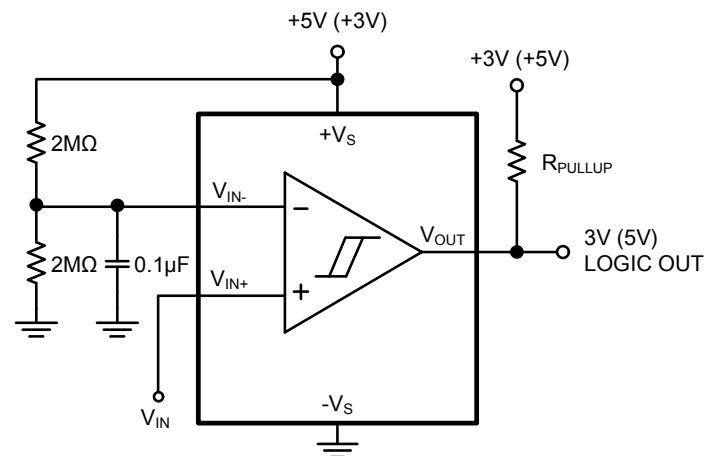
### APPLICATIONS

RC Timers  
Window Detectors  
IR Receiver  
Multivibrators  
Alarm and Monitoring Circuits

### FEATURES

- **Ultra Low Power Consumption:**  
318nA (TYP) at  $V_S = 1.4V$
- **Wide Supply Voltage Range: 1.4V to 5.5V**
- **Propagation Delay: 6μs (TYP) at  $V_S = 1.4V$**
- **Open Drain Output Current Drive:**  
18.7mA (TYP) at  $V_S = 5V$
- **Rail-to-Rail Input**
- **N-MOSFET Open Drain Output Structure**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green SOT-23-5 and SC70-5 Packages**

### TYPICAL APPLICATION



# SGM8709

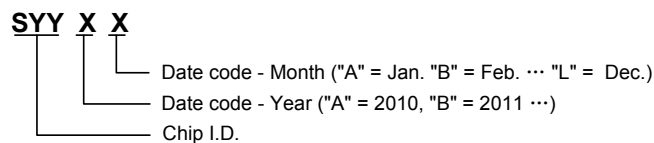
# Micro-Power, CMOS Input, RRIO, 1.4V, Open Drain Output Comparator

## PACKAGE/ORDERING INFORMATION

MODEL	PIN-PACKAGE	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
SGM8709	SOT-23-5	-40°C to +85°C	SGM8709YN5G/TR	SBBXX	Tape and Reel, 3000
	SC70-5	-40°C to +85°C	SGM8709YC5G/TR	SA5XX	Tape and Reel, 3000

NOTE: XX = Date Code.

### MARKING INFORMATION



For example: SBBCA (2012, January)

## ABSOLUTE MAXIMUM RATINGS

Supply Voltage, +V <sub>S</sub> to -V <sub>S</sub> .....	6V
V <sub>IN</sub> Differential.....	±2.5V
Voltage at Input Pins.....(-V <sub>S</sub> ) - 0.3V to (+V <sub>S</sub> ) + 0.3V	
Voltage at Output Pin.....	6V
Operating Temperature Range.....	-40°C to +85°C
Junction Temperature.....	150°C
Storage Temperature.....	-65°C to +150°C
Lead Temperature (Soldering, 10s) .....	260°C
ESD Susceptibility	
HBM.....	2000V
MM.....	400V

### NOTE:

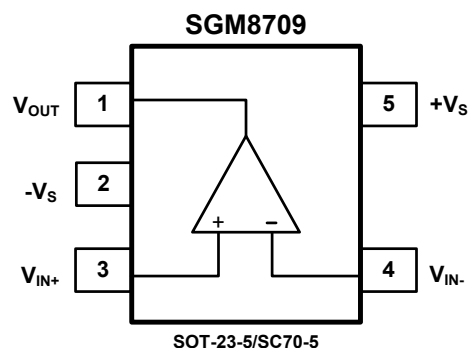
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

## PIN CONFIGURATIONS (TOP VIEW)



**ELECTRICAL CHARACTERISTICS:  $V_S = 1.4V$** (At  $T_A = 25^\circ C$ ,  $+V_S = 1.4V$ ,  $-V_S = 0V$ ,  $V_{CM} = +V_S/2$ ,  $V_O = -V_S$  and  $R_L = 20k\Omega$  connected to  $+V_S$ , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	$I_S$	$V_{CM} = 0.3V$		318	1000	nA
		$V_{CM} = 1.1V$		263	1000	
Input Offset Voltage	$V_{OS}$	$V_{CM} = 0V$		0.6	3	mV
		$V_{CM} = 1.4V$		0.4	3	
Input Offset Average Drift				2		$\mu V/^\circ C$
Common Mode Rejection Ratio	CMRR	$V_{CM}$ stepped from 0V to 0.3V		61		dB
		$V_{CM}$ stepped from 0.8V to 1.4V		59		
		$V_{CM}$ stepped from 0V to 1.4V		67		
Power Supply Rejection Ratio	PSRR	$V_S = 1.8V$ to $5.5V$ , $V_{CM} = 0V$		87		dB
Open-Loop Voltage Gain	$A_{OL}$			81		dB
Output Voltage Swing from Rail	$V_{OL}$	$V_S = 1.8V$ , $I_O = 500\mu A$		81	106	mV
		$-40^\circ C \leq T_A \leq +85^\circ C$			137	
		$V_S = 1.8V$ , $I_O = 1mA$		165	213	
		$-40^\circ C \leq T_A \leq +85^\circ C$			290	
Output Current	$I_{OUT}$	Sink	0.7	1.8		mA
		$-40^\circ C \leq T_A \leq +85^\circ C$	0.5			
Leakage Current	$I_{Leakage}$	$V_O = +V_S$		1		nA
Propagation Delay (High to Low)		Overdrive = 10mV		12		$\mu s$
		Overdrive = 100mV		6		
Fall Time	$t_{Fall}$	Overdrive = 10mV, $C_L = 30pF$ , $R_L = 1M\Omega$		156		ns
		Overdrive = 100mV, $C_L = 30pF$ , $R_L = 1M\Omega$		155		

**ELECTRICAL CHARACTERISTICS:  $V_S = 2.5V$** (At  $T_A = 25^\circ C$ ,  $+V_S = 2.5V$ ,  $-V_S = 0V$ ,  $V_{CM} = +V_S/2$ ,  $V_O = -V_S$  and  $R_L = 20k\Omega$  connected to  $+V_S$ , unless otherwise noted.)

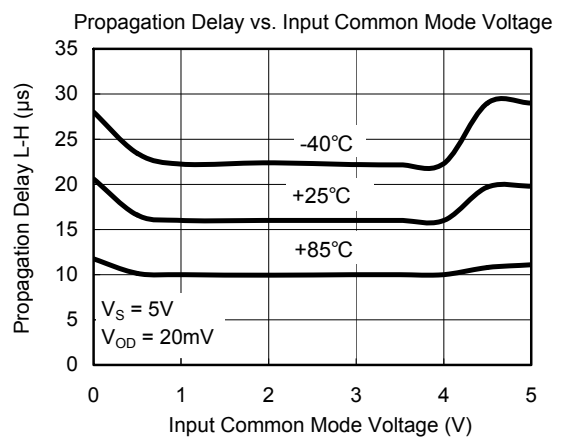
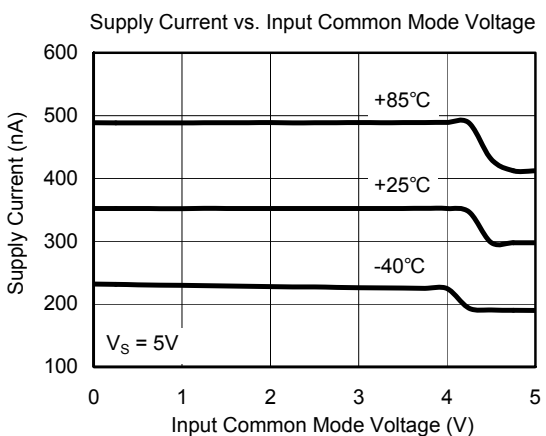
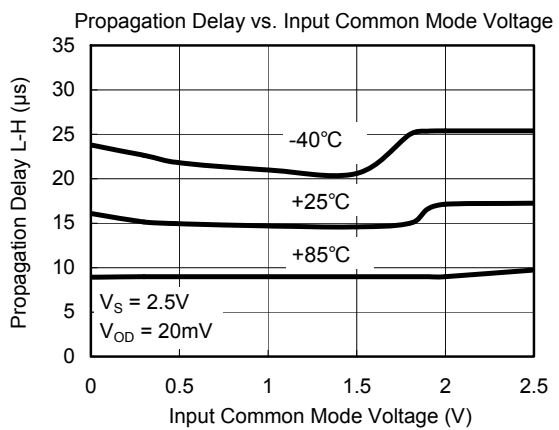
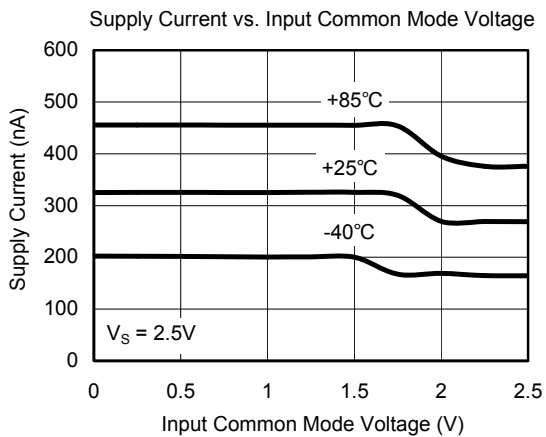
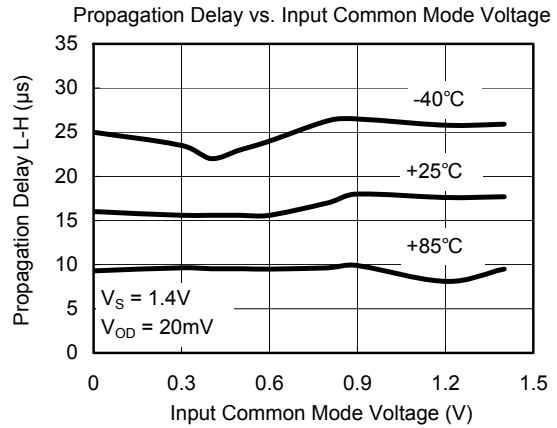
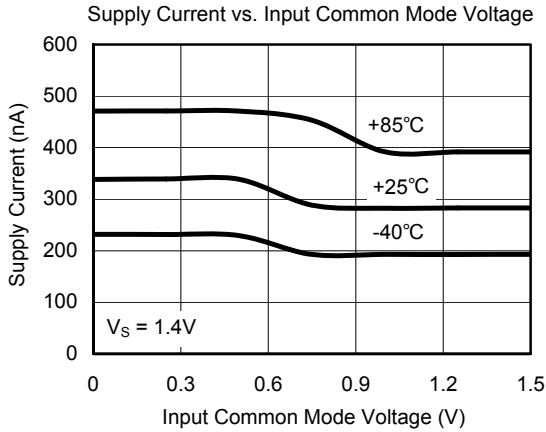
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	$I_S$	$V_{CM} = 0.3V$		330		nA
		$V_{CM} = 2.2V$		275		
Input Offset Voltage	$V_{OS}$	$V_{CM} = 0V$		0.6		mV
		$V_{CM} = 2.5V$		0.4		
Input Offset Average Drift				2		$\mu V/^\circ C$
Common Mode Rejection Ratio	CMRR	$V_{CM}$ stepped from 0V to 1.4V		69		dB
		$V_{CM}$ stepped from 1.9V to 2.5V		68		
		$V_{CM}$ stepped from 0V to 2.5V		72		
Power Supply Rejection Ratio	PSRR	$V_S = 1.8V$ to $5.5V$ , $V_{CM} = 0V$		87		dB
Open-Loop Voltage Gain	$A_{OL}$			80		dB
Output Voltage Swing from Rail	$V_{OL}$	$I_O = 500\mu A$		66		mV
		$I_O = 1mA$		131		
Output Current	$I_{OUT}$	Sink		7.1		mA
Leakage Current	$I_{Leakage}$	$V_O = +V_S$		2		nA
Propagation Delay (High to Low)		Overdrive = 10mV		11		$\mu s$
		Overdrive = 100mV		5		
Fall Time	$t_{Fall}$	Overdrive = 10mV, $C_L = 30pF$ , $R_L = 1M\Omega$		64		ns
		Overdrive = 100mV, $C_L = 30pF$ , $R_L = 1M\Omega$		48		

**ELECTRICAL CHARACTERISTICS:  $V_S = 5.0V$** (At  $T_A = 25^\circ C$ ,  $+V_S = 5.0V$ ,  $-V_S = 0V$ ,  $V_{CM} = +V_S/2$ ,  $V_O = -V_S$  and  $R_L = 20k\Omega$  connected to  $+V_S$ , unless otherwise noted.)

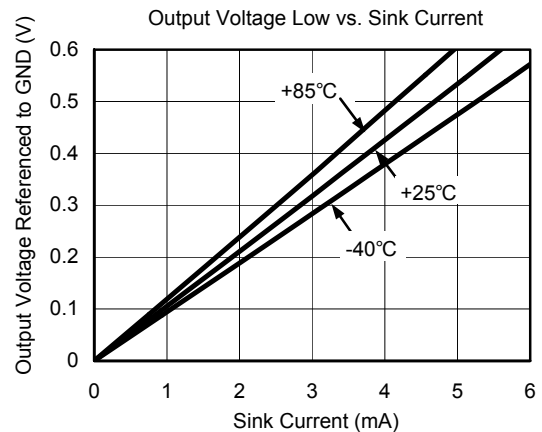
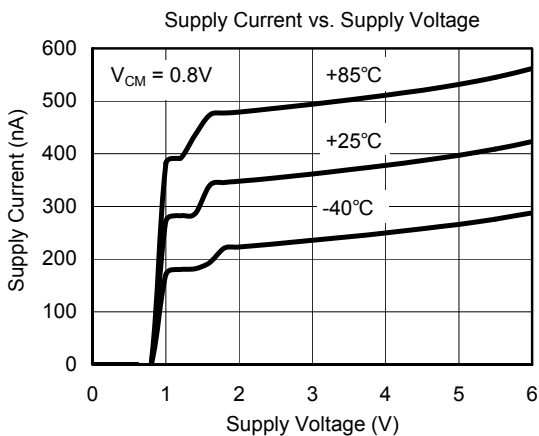
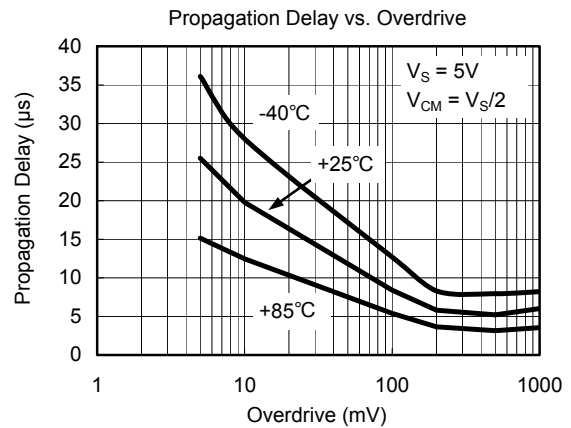
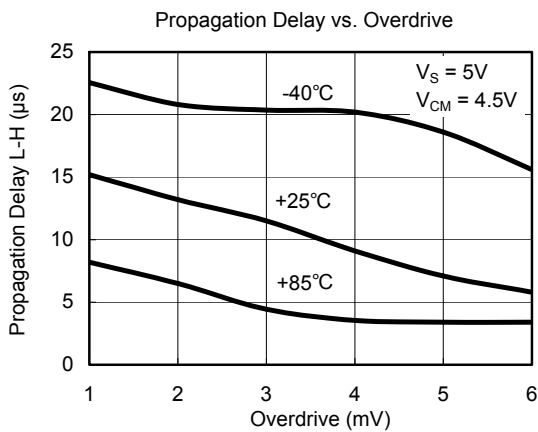
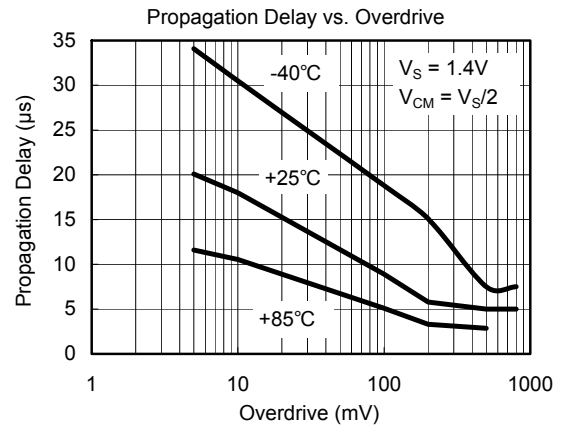
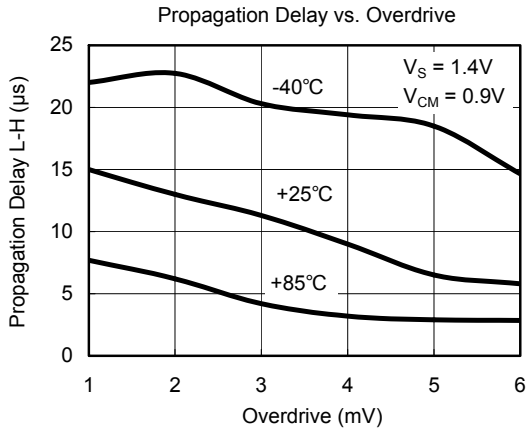
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	$I_S$	$V_{CM} = 0.3V$		366	2000	nA
		$V_{CM} = 4.7V$		311	2000	
Input Offset Voltage	$V_{OS}$	$V_{CM} = 0V$		0.6	3	mV
		$V_{CM} = 5V$		0.4	3	
Input Offset Average Drift				2		$\mu V/^\circ C$
Common Mode Rejection Ratio	CMRR	$V_{CM}$ stepped from 0V to 3.9V		69		dB
		$V_{CM}$ stepped from 4.4V to 5.0V		75		
		$V_{CM}$ stepped from 0V to 5.0V		77		
Power Supply Rejection Ratio	PSRR	$V_S = 1.8V$ to $5.5V$ , $V_{CM} = 0V$		87		dB
Open-Loop Voltage Gain	$A_{OL}$			81		dB
Output Voltage Swing from Rail	$V_{OL}$	$I_O = 500\mu A$		53	72	mV
		$-40^\circ C \leq T_A \leq +85^\circ C$			92	
		$I_O = 1mA$		104	124	
		$-40^\circ C \leq T_A \leq +85^\circ C$			152	
Output Current	$I_{OUT}$	Sink	15.3	18.7		mA
		$-40^\circ C \leq T_A \leq +85^\circ C$	12.1			
Leakage Current	$I_{Leakage}$	$V_O = +V_S$		5		nA
Propagation Delay (High to Low)		Overdrive = 10mV		13		$\mu s$
		Overdrive = 100mV		5		
Fall Time	$t_{Fall}$	Overdrive = 10mV, $C_L = 30pF$ , $R_L = 1M\Omega$		40		ns
		Overdrive = 100mV, $C_L = 30pF$ , $R_L = 1M\Omega$		36		



TYPICAL PERFORMANCE CHARACTERISTICS

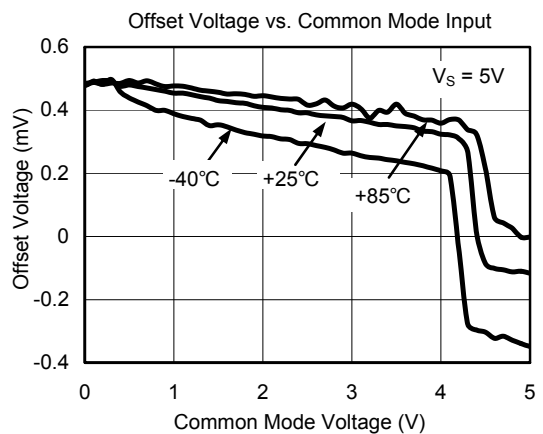
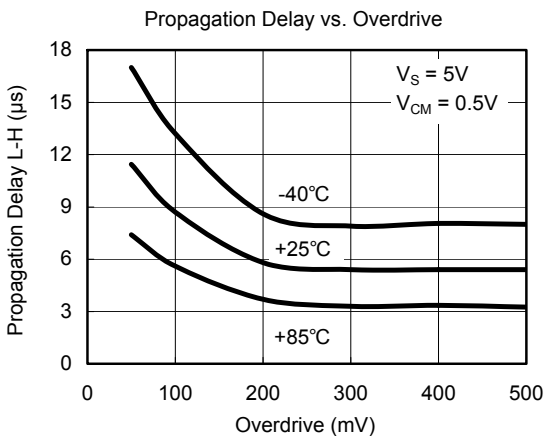
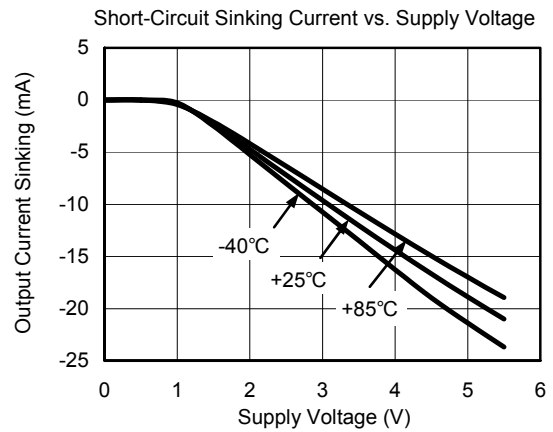
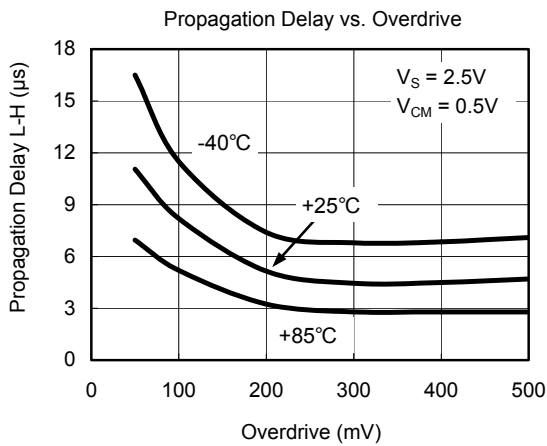
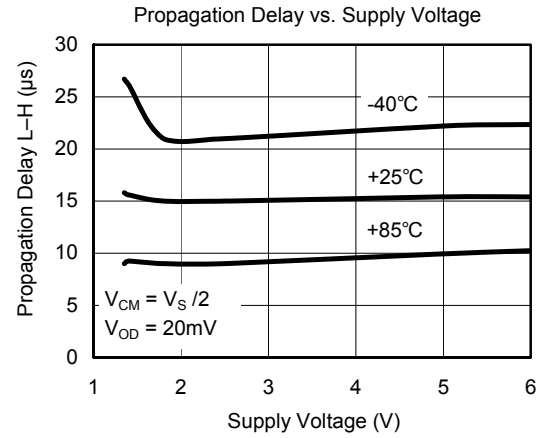
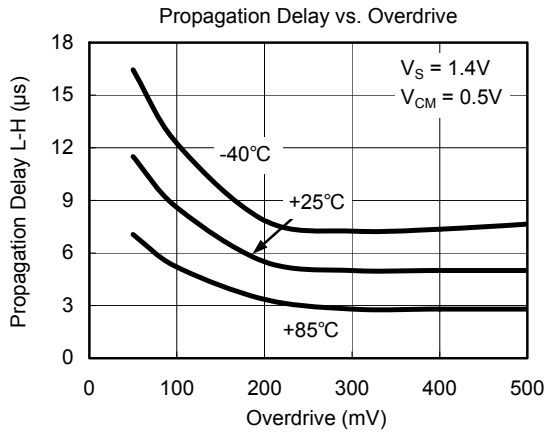


TYPICAL PERFORMANCE CHARACTERISTICS



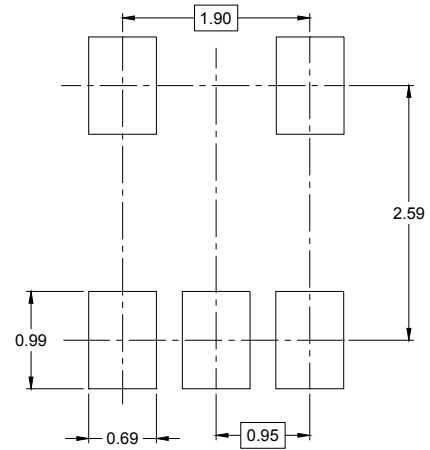
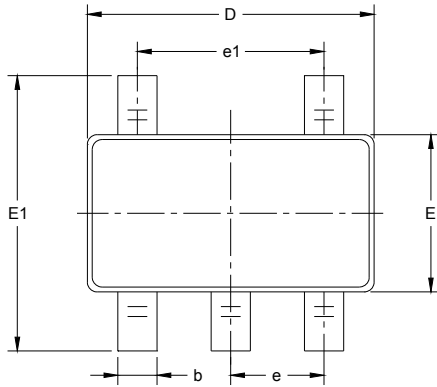


TYPICAL PERFORMANCE CHARACTERISTICS

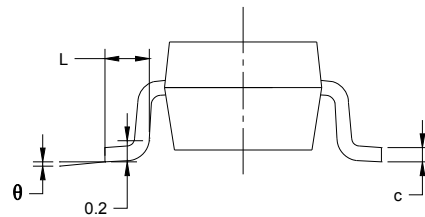
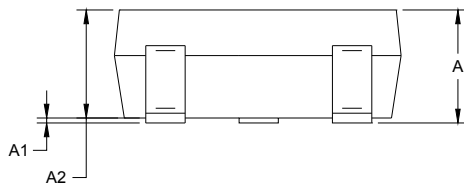


PACKAGE OUTLINE DIMENSIONS

SOT-23-5



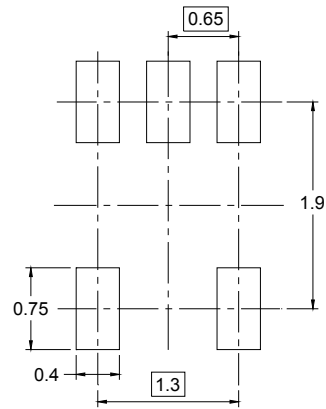
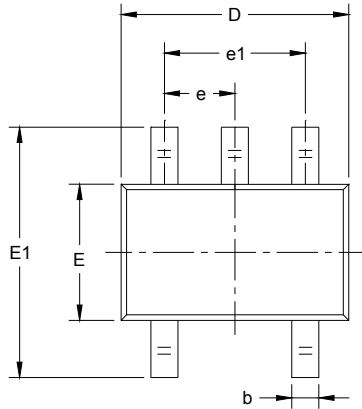
RECOMMENDED LAND PATTERN (Unit: mm)



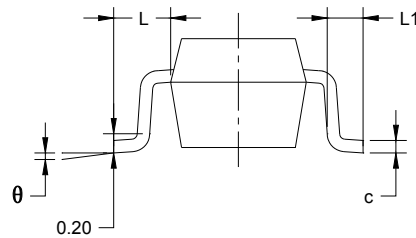
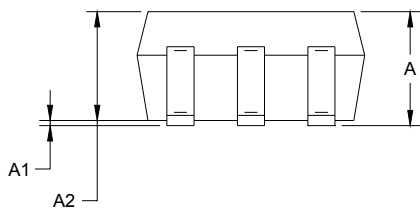
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
$\theta$	0°	8°	0°	8°

PACKAGE OUTLINE DIMENSIONS

SC70-5



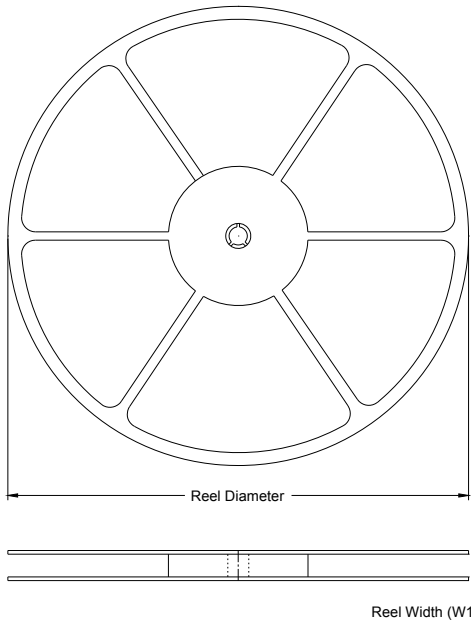
RECOMMENDED LAND PATTERN (Unit: mm)



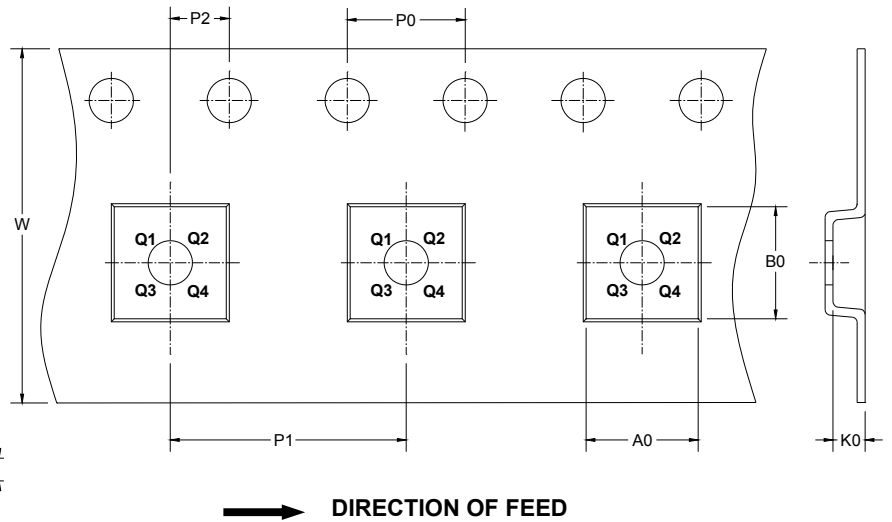
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.65 TYP		0.026 TYP	
e1	1.300 BSC		0.051 BSC	
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
$\theta$	0°	8°	0°	8°

**TAPE AND REEL INFORMATION**

**REEL DIMENSIONS**



**TAPE DIMENSIONS**



NOTE: The picture is only for reference. Please make the object as the standard.

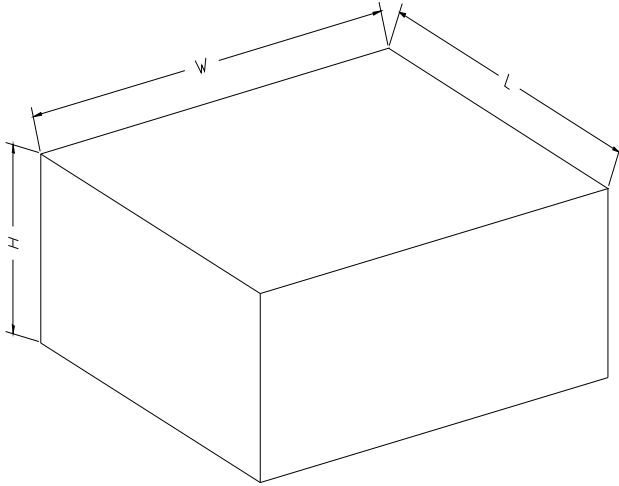
**KEY PARAMETER LIST OF TAPE AND REEL**

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-5	7"	9.5	3.2	3.2	1.4	4.0	4.0	2.0	8.0	Q3
SC70-5	7"	9.5	2.25	2.55	1.20	4.0	4.0	2.0	8.0	Q3

# SGM8709

# Micro-Power, CMOS Input, RRIO, 1.4V, Open Drain Output Comparator

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18

