SGM8751
64ns, Low-Power, Rail-to-Rail Output Single-Supply Comparator

GENERAL DESCRIPTION

The SGM8751 is a single high-speed comparator optimized for systems powered by a 3V to 5V supply. The device features high-speed response, low-power consumption, and rail-to-rail output. Propagation delay is 64ns, while supply current is only 150μA.

The output pulls to within 0.1V of either supply rail without external pull-up circuitry, making the device ideal for interface with both CMOS and TTL logics. All input and output pins can tolerate a continuous short-circuit fault condition to either rail.

The SGM8751 is available in a Green SOT-23-5 package. It is rated over the -40℃ to +85℃ temperature range.

FEATURES

- **Fast, 64ns Propagation Delay (10mV Overdrive)**
- **Low Power Consumption:**
  150μA (TYP) at V_S = 3V
- **Wide Supply Voltage Range: 2.7V to 5.5V**
- **Optimized for 3V and 5V Applications**
- **Rail-to-Rail Output**
- **Low Offset Voltage: 0.8mV (TYP)**
- **Output Swing to within 215mV from Rails with 4mA Output Current**
- **CMOS/TTL-Compatible Output**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in a Green SOT-23-5 Package**

APPLICATIONS

Line Receivers
Battery-Powered Systems
Threshold Detectors/Discriminators
3.3V or 5V Systems
Zero-Crossing Detectors
Sampling Circuits

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8751	SOT-23-5	-40℃ to +85℃	SGM8751YN5G/TR	G07XX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date Code.

YYY X X

Date Code - Month
Date Code - Year
Serial Number

Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, $+V_S$ to $-V_S$ 6V
V_{IN} Differential ..... ±2.5V
Voltage at Input/Output Pins ..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 6000V
MM 400V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 2.7V to 5.5V
Operating Temperature Range ..... -40℃ to +85℃

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

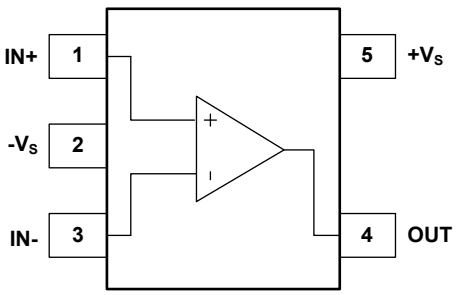
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATION

(TOP VIEW)



SOT-23-5

ELECTRICAL CHARACTERISTICS

(V_S = 5V, V_{CM} = 0V, C_L = 15pF, typical values are at T_A = +25℃, unless otherwise noted.)

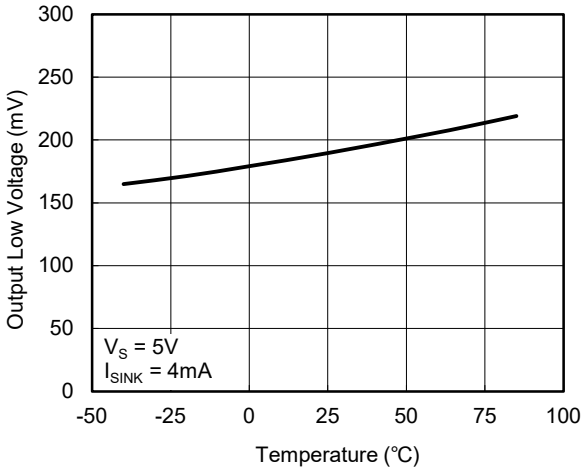
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Operating Supply Voltage (1)	V_S		2.7		5.5	V
Input Common Mode Voltage Range (2)	V_{CM}		-0.1		V_S - 1.2	V
Input Offset Voltage	V_{OS}	V_S = 5V, V_{CM} = 0V		0.8	5	mV
		-40℃ ≤ T_A ≤ +85℃			5.2	
Output Short-Circuit Current	I_{SOURCE}	V_S = 5V, Out to V_S/2	23	32		mA
		-40℃ ≤ T_A ≤ +85℃	20			
	I_{SINK}	V_S = 5V, Out to V_S/2		-32	-26	
		-40℃ ≤ T_A ≤ +85℃			-22	
Common Mode Rejection Ratio (3)	CMRR	V_S = 5V, V_{CM} = 0V to 3.8V	67	81		dB
		-40℃ ≤ T_A ≤ +85℃	65			
Power Supply Rejection Ratio	PSRR	V_{CM} = 0V, V_S = 2.7V to 5.5V	67	81		dB
		-40℃ ≤ T_A ≤ +85℃	64			
Output Voltage Swing from Rail	V_{OH}	V_S = 5V, I_{OUT} = 4mA		215	340	mV
		-40℃ ≤ T_A ≤ +85℃			375	
	V_{OL}	V_S = 5V, I_{OUT} = -4mA		193	265	
		-40℃ ≤ T_A ≤ +85℃			295	
Supply Current	I_S	V_S = 3V, I_{OUT} = 0		150	210	μA
		-40℃ ≤ T_A ≤ +85℃			235	
		V_S = 5V, I_{OUT} = 0		155	220	
		-40℃ ≤ T_A ≤ +85℃			245	
Propagation Delay (High to Low)		V_S = 3V, Overdrive = 10mV, V_{CM} = 0V		64		ns
		V_S = 3V, Overdrive = 100mV, V_{CM} = 0V		30		
Propagation Delay (Low to High)		V_S = 3V, Overdrive = 10mV, V_{CM} = 0V		48		ns
		V_S = 3V, Overdrive = 100mV, V_{CM} = 0V		22		
Rise Time	t_{RISE}	V_S = 3V, Overdrive = 10mV, V_{CM} = 0V		12		ns
		V_S = 3V, Overdrive = 100mV, V_{CM} = 0V		11		
Fall Time	t_{FALL}	V_S = 3V, Overdrive = 10mV, V_{CM} = 0V		11		ns
		V_S = 3V, Overdrive = 100mV, V_{CM} = 0V		8		

NOTES:

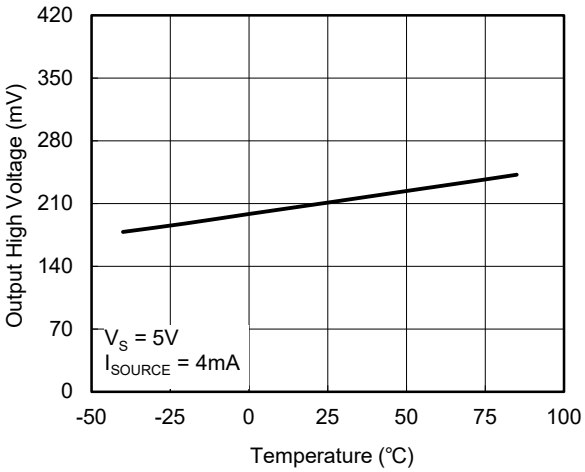
1. Inferred from PSRR test.
2. Inferred from PD test. Note also that either or both inputs can be driven to the absolute maximum limit (0.1V beyond either supply rail) without damage or false output inversion.
3. Specified over the full input common mode voltage range (V_{CM}).

TYPICAL PERFORMANCE CHARACTERISTICS

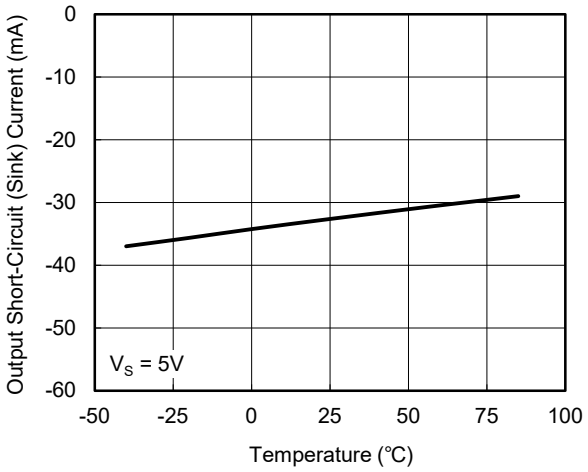
Output Low Voltage vs. Temperature



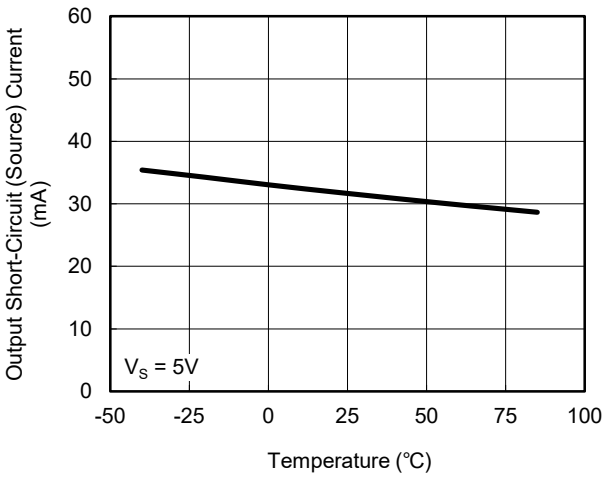
Output High Voltage vs. Temperature



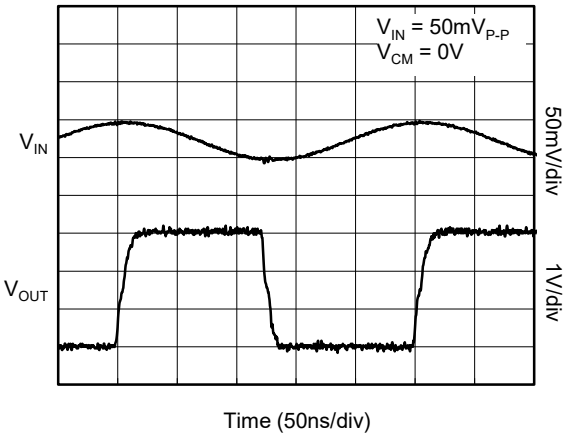
Output Short-Circuit (Sink) Current vs. Temperature



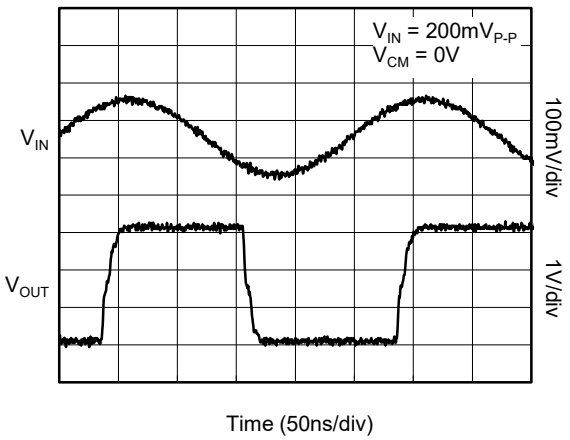
Output Short-Circuit (Source) Current vs. Temperature



Sinusoid Response at 4MHz

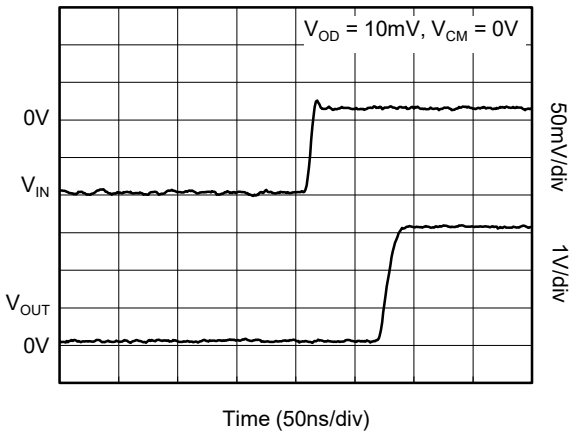


Sinusoid Response at 4MHz

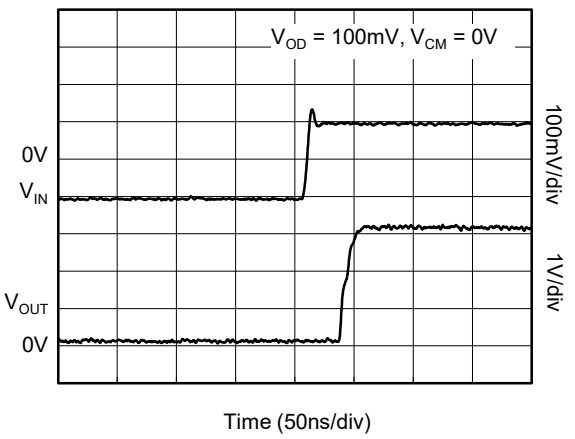


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

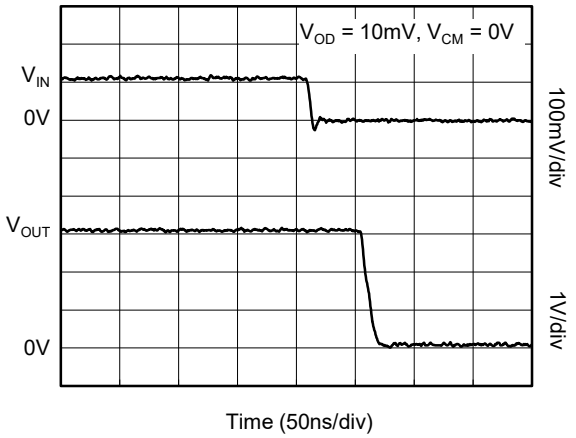
Propagation Delay (L-H)



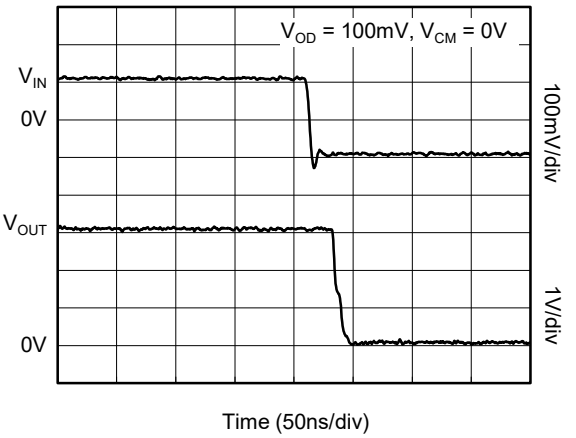
Propagation Delay (L-H)



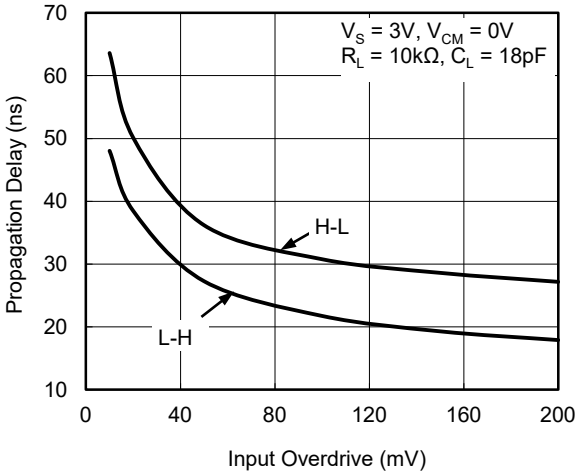
Propagation Delay (H-L)



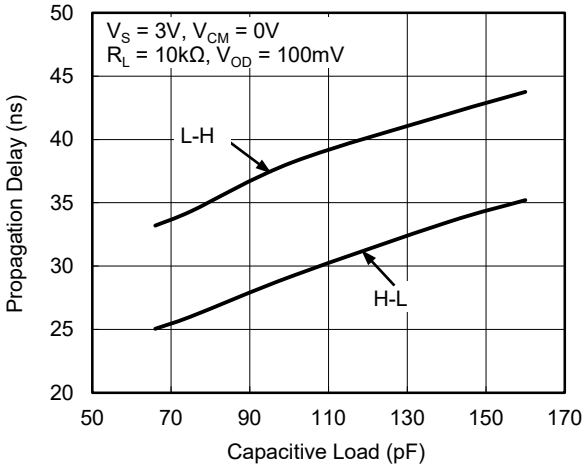
Propagation Delay (H-L)



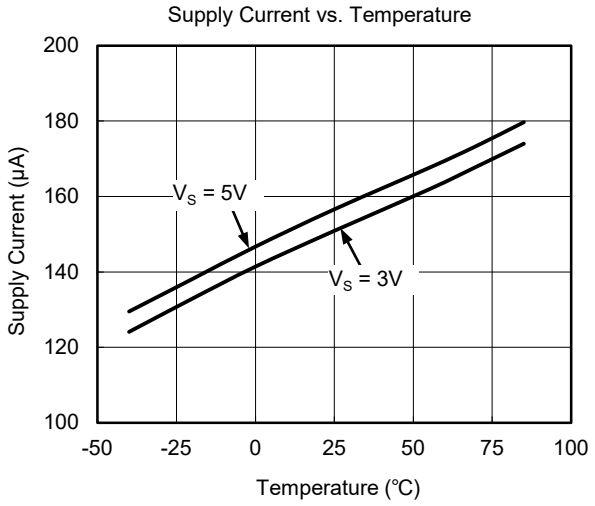
Propagation Delay vs. Input Overdrive

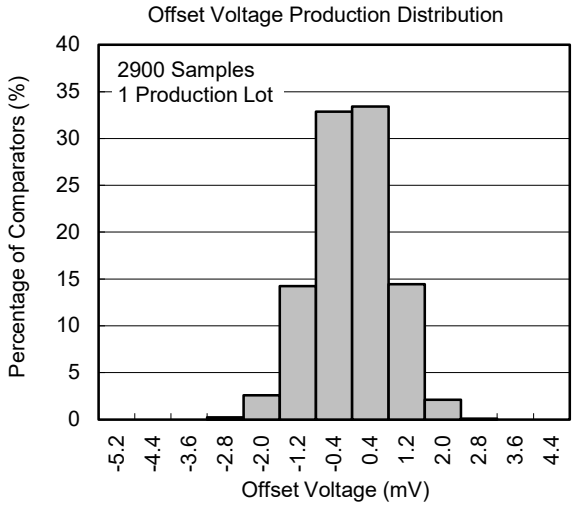


Propagation Delay vs. Capacitive Load



TYPICAL PERFORMANCE CHARACTERISTICS (continued)





DETAILED DESCRIPTION

The SGM8751 is a single-supply comparator that features high speed, and low power. With 4mA output current, its output is pulled to within 215mV of either supply rail without external pull-up or pull-down circuitry. Low-voltage single-supply operation makes the device ideal for portable equipment. The SGM8751 interfaces directly to CMOS and TTL logics.

Output Stage Circuitry

The SGM8751 contains a current-driven output stage as shown in Figure 1. During an output transition, I_{SOURCE} or I_{SINK} is pushed or pulled to the output pin. The output source or sink current is high during the transition, creating a rapid slew rate. Once the output voltage reaches V_{OH} or V_{OL}, the source or sink current decreases to a small value, capable of maintaining the V_{OH} or V_{OL} static condition. This significant decrease in current conserves power after an output transition has occurred.

One consequence of a current-driven output stage is a linear dependence between the slew rate and the load capacitance. A heavy capacitive load will slow down a voltage output transition. This can be useful in noise-sensitive applications where fast edges may cause interference.

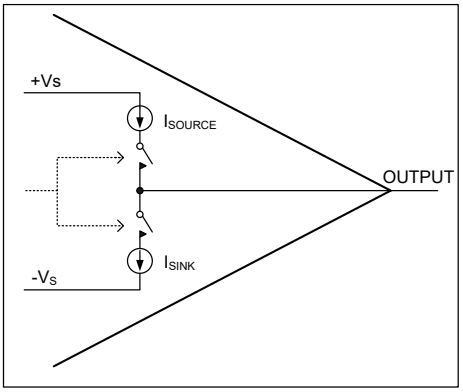


Figure 1. Output Stage Circuitry

APPLICATION INFORMATION

Circuit Layout and Bypassing

The high gain-bandwidth product of the SGM8751 requires design precautions to realize the full high-speed capabilities of the comparator. The recommended precautions are:

1) Use a PCB with a good, unbroken, low-inductance ground plane.
2) Place a decoupling capacitor (a 0.1μF ceramic capacitor is a good choice) as close to $+V_S$ as possible.
3) Pay close attention to the decoupling capacitor's bandwidth, keeping leads short.
4) On the inputs and output, keep lead lengths short to avoid unwanted parasitic feedback around the comparator.
5) Solder the device directly to the PCB instead of using a socket.

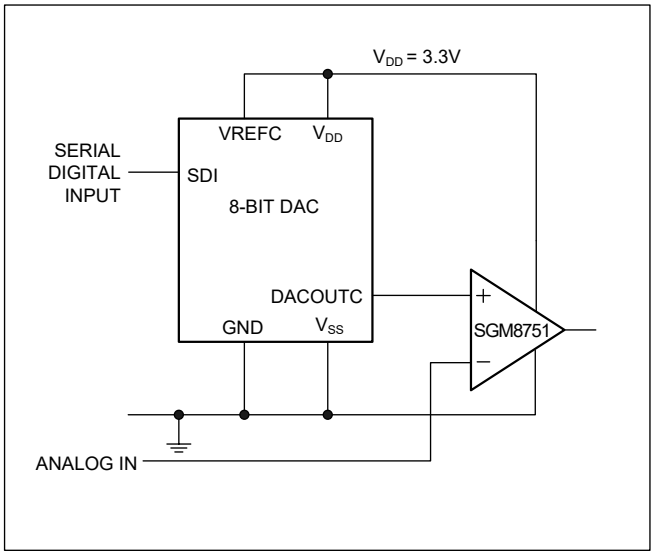


Figure 2. 3.3V Digitally Controlled Threshold Detector

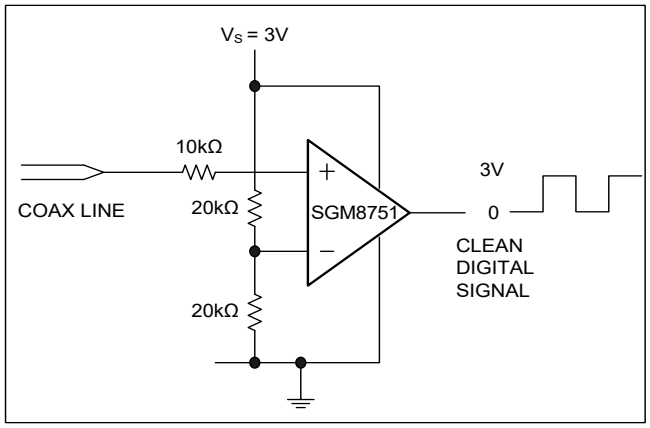


Figure 3. Line Receiver Application

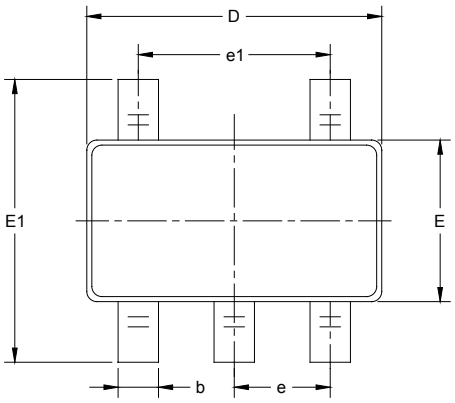
REVISION HISTORY

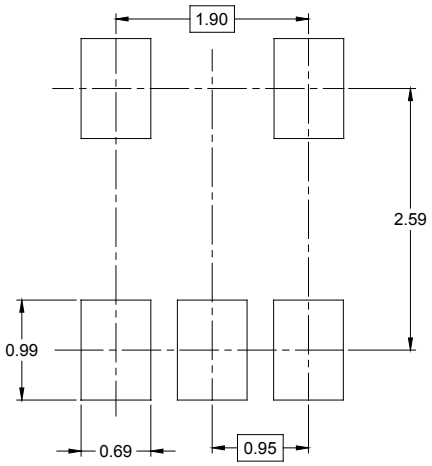
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (FEBRUARY 2015) to REV.A	Page
Changed from product preview to production data	All

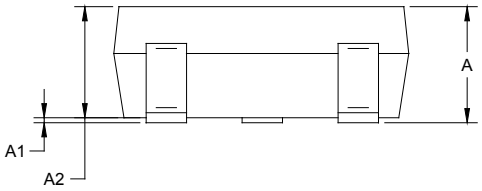
PACKAGE OUTLINE DIMENSIONS

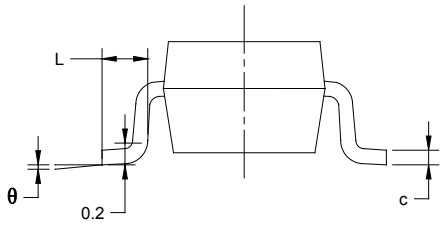
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)

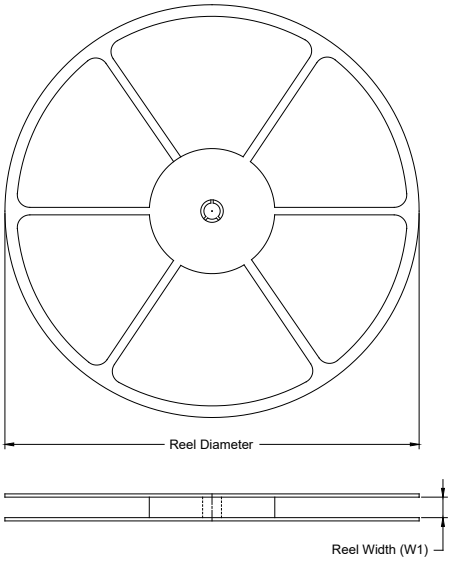




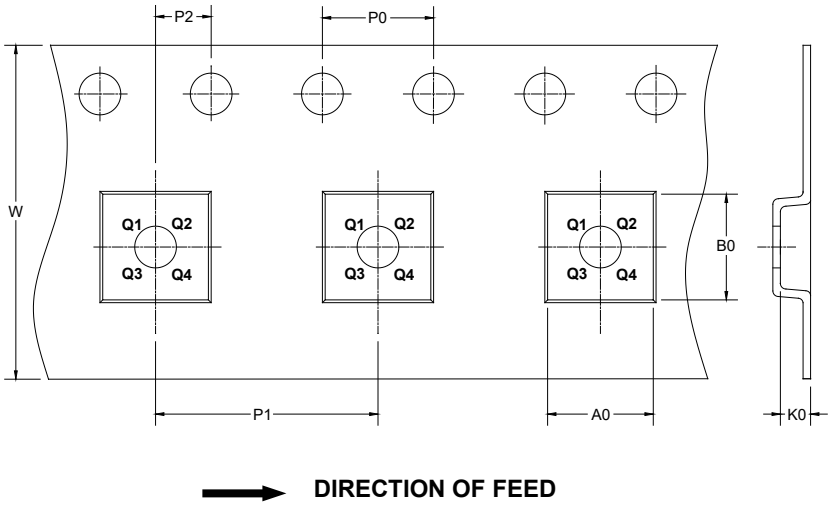
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



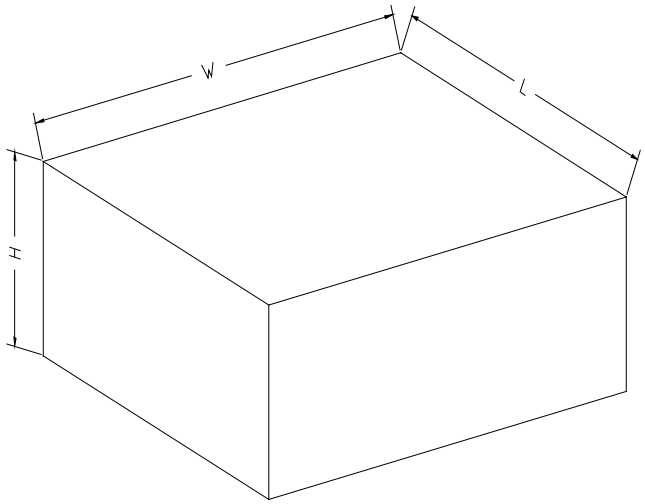
NOTE: The picture is only for reference. Please make the object as the standard.

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	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3

DD0001

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

DD0002