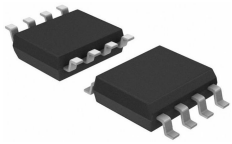
Low Power Dissipation, Low Noise, CMOS, Rail-to-Rail Input and Output Operational Amplifier

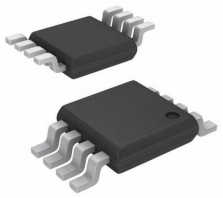
PRODUCT DESCRIPTION

The MS8613/8617/8619 is featured by ultra power dissipation, rail-to-rail input and output, low input voltage and low current noise. The specific characteristics could be expressed as follows: The MS8613/8617/8619 can operates in single power supply from 1.8V to 5V or dual power supply; Low power dissipation and low noise feature make the MS8613/8617/8619 used in mobile devices; Rail-to-rail feature makes it used in the buffer of CMOS, ADCs, DACs, ASICs or the system with low power dissipation and wide output swing.

SOT23-5

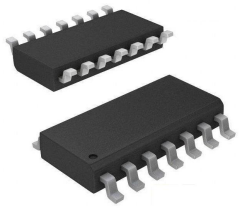


SOP8



MSOP8

TSSOP14



SOP14

FEATURES

- Low Offset Voltage: 2.2mV (Max)
- Low Input Bias Current: 1pA (Max)
- Single Power Supply: 1.8V to 5V
- Low Noise: 24nV/√Hz
- Micro Power Dissipation (1.8V): 40uA (single amp)
- No Phase Reversal
- Stable Unit Gain

APPLICATIONS

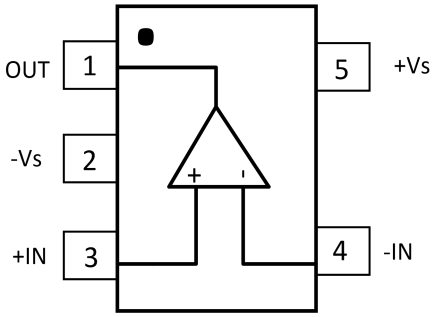
- Battery-powered Device
- Multi-order Filter
- ADC Front Driving
- DAC Driving/Level Shift
- Low Power Dissipation, ASIC Input and Output Amplifier

PRODUCT SPECIFICATION

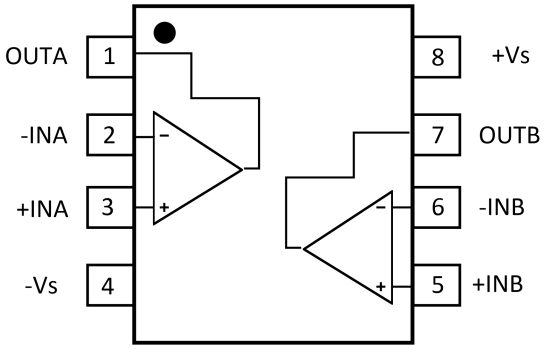
Part Number	Package	Marking
MS8613	SOT23-5	8613S
MS8617	SOP8	MS8617
MS8617M	MSOP8	MS8617M
MS8619	TSSOP14	MS8619
MS8619S	SOP14	MS8619S

PIN CONFIGURATION

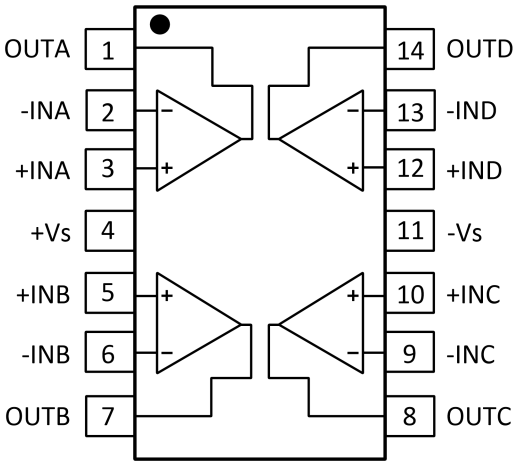
MS8613



MS8617/MS8617M



MS8619/MS8619S



PIN DESCRIPTION

Pin	Name	Type	Description
MS8613			
1	OUT	O	Channel Output
2	-Vs	-	Negative Power Supply
3	+IN	I	Positive Input
4	-IN	I	Negative Input
5	+Vs	-	Positive Power Supply
MS8617/MS8617M			
1	OUTA	O	Channel A Output
2	-INA	I	Negative Input (Channel A)
3	+INA	I	Positive Input (Channel A)
4	-Vs	-	Negative Power Supply
5	+INB	I	Positive Input (Channel B)
6	-INB	I	Negative Input (Channel B)
7	OUTB	O	Channel B Output
8	+Vs	-	Positive Power Supply
MS8619/MS8619S			
1	OUTA	O	Channel A Output
2	-INA	I	Negative Input (Channel A)
3	+INA	I	Positive Input (Channel A)
4	+Vs	-	Positive Power Supply
5	+INB	I	Positive Input (Channel B)
6	-INB	I	Negative Input (Channel B)
7	OUTB	O	Channel B Output
8	OUTC	O	Channel C Output
9	-INC	I	Negative Input (Channel C)
10	+INC	I	Positive Input (Channel C)
11	-Vs	-	Negative Power Supply
12	+IND	I	Positive Input (Channel D)
13	-IND	I	Negative Input (Channel D)
14	OUTD	O	Channel D Output

ABSOLUTE MAXIMUM RATINGS

Any exceeding absolute maximum rating application causes permanent damage to device. Because long-time absolute operation state affects device reliability. Absolute ratings just conclude from a series of extreme tests. It doesn't represent chip can operate normally in these extreme conditions.

Parameter	Symbol	Ratings	Unit
Power Supply	Vs	6	V
Input Voltage		$-V_S$-0.3 ~ +Vs+0.3	V
Differential Input Voltage		±6	V
Junction Temperature		-65 ~ 150	°C
Operating Temperature	TA	-40 ~ 125	°C
Storage Temperature	Tstg	-60 ~ 150	°C
Lead Temperature (10s)		260	°C

ELECTRICAL CHARACTERISTICS (5V)

Unless otherwise noted, +Vs=5V, V_{CM}=2.5V, T_A=25°C.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input Characteristics						
Input Offset Voltage	V_{OS}	-0.3V < V_{CM} < +5.3V		0.4	2.2	mV
		-40°C ≤ TA ≤ 120°C			2.2	
Input Bias Current	I_B			0.2	1	pA
		-40°C ≤ TA ≤ 85°C			110	pA
		-40°C ≤ TA ≤ 120°C			780	pA
Input Offset Current	I_{OS}			0.1	0.5	pA
		-40°C ≤ TA ≤ 85°C			50	pA
		-40°C ≤ TA ≤ 120°C			250	pA
Common-mode Rejection Ratio	CMRR	0V < V_{CM} < 5V		75		dB
		-40°C ≤ TA ≤ 120°C	68			
Large Signal Gain	A_{VO}	R_L=10kΩ,V_O=0.5V ~ 4.5V	100	105		dB
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta_T$	-40°C ≤ TA ≤ 120°C		5	10	μV/°C
Input Capacitance	C_{DIFF}			1.9		pF
	C_{CM}			2.5		pF
Output Characteristics						
Output High Voltage	V_{OH}	I_L=1mA	4.95	4.98		V
		-40°C ≤ TA ≤ 120°C	4.9			
		I_L=10mA		4.7		V
		-40°C ≤ TA ≤ 120°C	4.50			
Output Low Voltage	V_{OL}	I_L=1mA		20	30	mV
		-40°C ≤ TA ≤ 120°C			50	
		I_L=10mA		190	275	mV
		-40°C ≤ TA ≤ 120°C			335	
Short-circuit Current	I_{SC}			±80		mA
Closed-loop Output Impedance	Z_{OUT}	f=10kHz,A_V=1		15		Ω

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Power Supply						
Power Supply Rejection Ratio	PSRR	2.2V < V_{CM} < 5V	67	80		dB
		-40°C ≤ T_A ≤ 120°C	64			dB
Static Current	I_{SY}	V_O=V_{CC}/2		40		μA
		-40°C ≤ T_A ≤ 120°C			50	
Dynamic Characteristics						
Gain Bandwidth Product	GBP	R_L=100kΩ		1.2		MHz
		R_L=10kΩ		1		MHz
Slew Rate	SR	R_L=10kΩ		0.3		V/μs
Setting Time 0.1%	t_s	G=±1,2Vstep C_L=20pF,R_L=1kΩ		23		us
Phase Margin	Φ_o	R_L=100kΩ,R_L=10kΩ C_L=20pF		65		Deg
Noise Characteristics						
Peak-to-Peak Noise				2.3	3.5	uV
Voltage Noise Density	e_n	f=1kHz		26		$nV/\sqrt{Hz}$
		f=10kHz		24		$nV/\sqrt{Hz}$
Current Noise Density	i_n	f=1kHz		0.05		$pA/\sqrt{Hz}$

ELECTRICAL CHARACTERISTICS (1.8V)

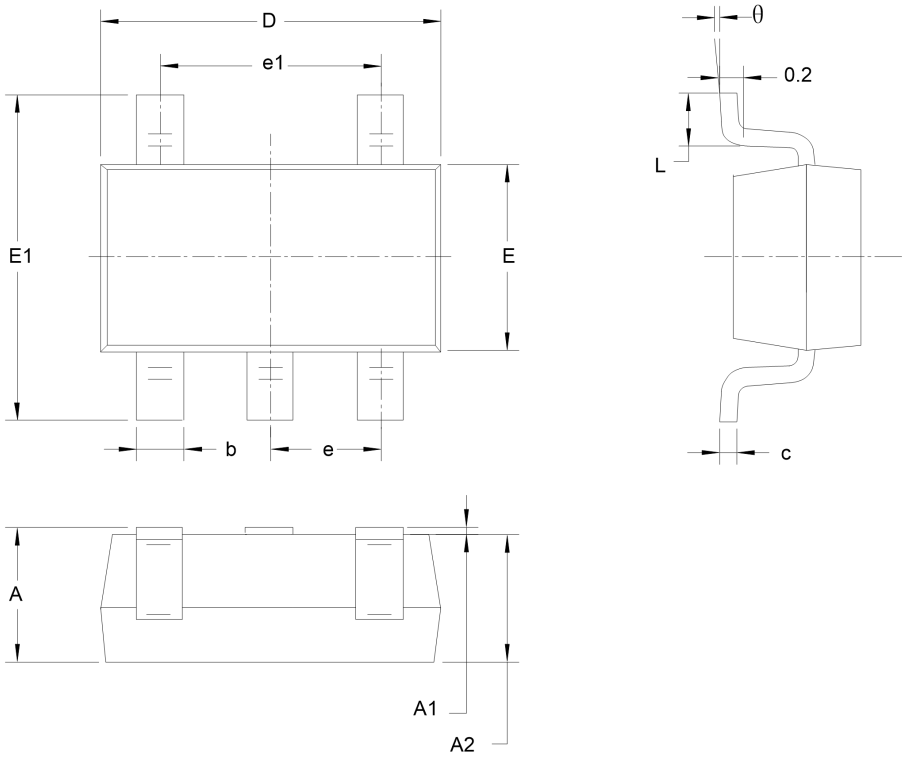
Unless otherwise noted, +VS=1.8V, V_{CM}=0.9V, T_A=25°C.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input Characteristics						
Input Offset Voltage	V_{OS}	-0.3V < V_{CM} < +1.9V		0.4	2.2	mV
		-40°C ≤ TA ≤ 120°C			2.2	
Input Bias Current	I_B			0.2	1	pA
		-40°C ≤ TA ≤85°C			110	pA
		-40°C ≤ TA ≤ 120°C			780	pA
Input Offset Current	I_{OS}			0.1	0.5	pA
		-40°C ≤ TA ≤ 85°C			50	pA
		-40°C≤ TA ≤ 120°C			250	pA
Common-mode Rejection Ratio	CMRR	0V < V_{CM} < 2.2V	58	75		dB
		-40°C ≤TA ≤ 120°C	55			
Large Signal Gain	A_{VO}	R_L=10kΩ,V_O=0.5V ~ 1.3V	95	100		dB
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta_T$	-40°C ≤ TA ≤ 120°C		5	10	μV/°C
Input Capacitance	C_{DIFF}			2.1		pF
	C_{CM}			3.8		pF
Output Characteristics						
Output High Voltage	V_{OH}	I_L=1mA	1.65	1.73		V
		-40°C ≤ TA≤ 120°C	1.6			
Output Low Voltage	V_{OL}	I_L=1mA		44	60	mV
		-40°C ≤ TA ≤ 120°C			80	
Short-circuit Current	I_{SC}			±80		mA
Closed-loop Output Impedance	Z_{OUT}	f=10kHz,A_V=1		15		Ω

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Power Supply						
Power Supply Rejection Ratio	PSRR	1.8V < V_{CM} < 5V	67	90		dB
		-40°C ≤ T_A ≤ 120°C	64			dB
Static Current	I_{SY}	V_O=V_{CC}/2		40		μA
		-40°C ≤ T_A ≤ 120°C			50	
Dynamic Characteristics						
Gain Bandwidth Product	GBP	R_L=100kΩ		0.4		MHz
		R_L=10kΩ		0.4		MHz
Slew Rate	SR	R_L=10kΩ		0.35		V/μs
Setting Time 0.1%	t_s	G=±1,2Vstep C_L=20pF,R_L=1kΩ		6.5		us
Phase Margin	Φ_o	R_L=100kΩ,R_L=10kΩ C_L=20pF		65		Deg
Noise Characteristics						
Peak-to-Peak Noise				2.3	3.5	uV
Voltage Noise Density	e_n	f=1kHz		26		$nV/\sqrt{Hz}$
		f=10kHz		24		$nV/\sqrt{Hz}$
Current Noise Density	i_n	f=1kHz		0.05		$pA/\sqrt{Hz}$

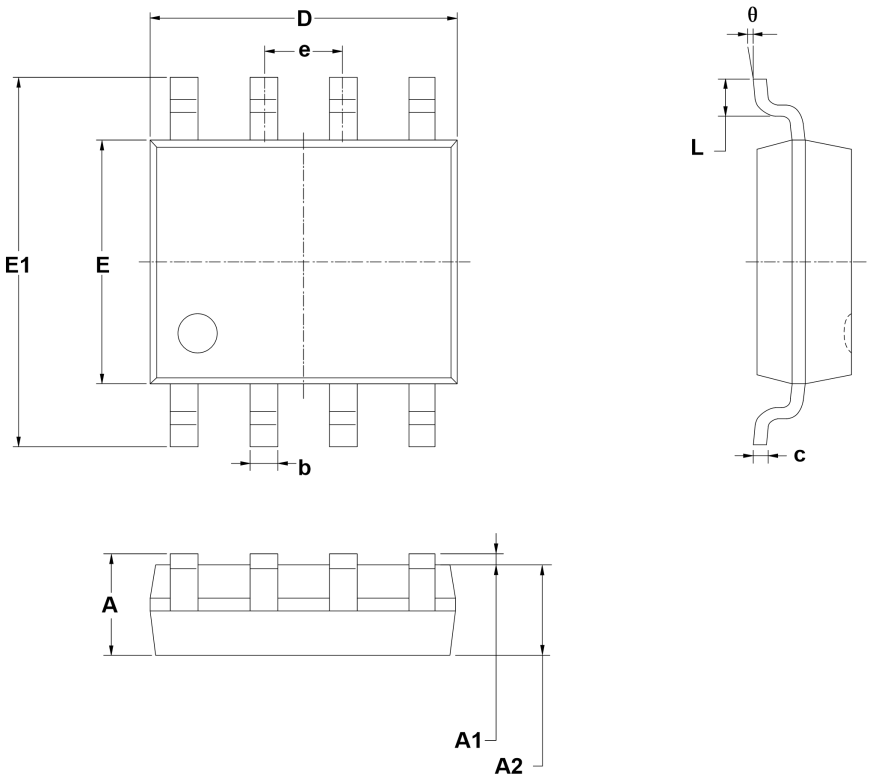
PACKAGE OUTLINE DIMENSIONS

SOT23-5



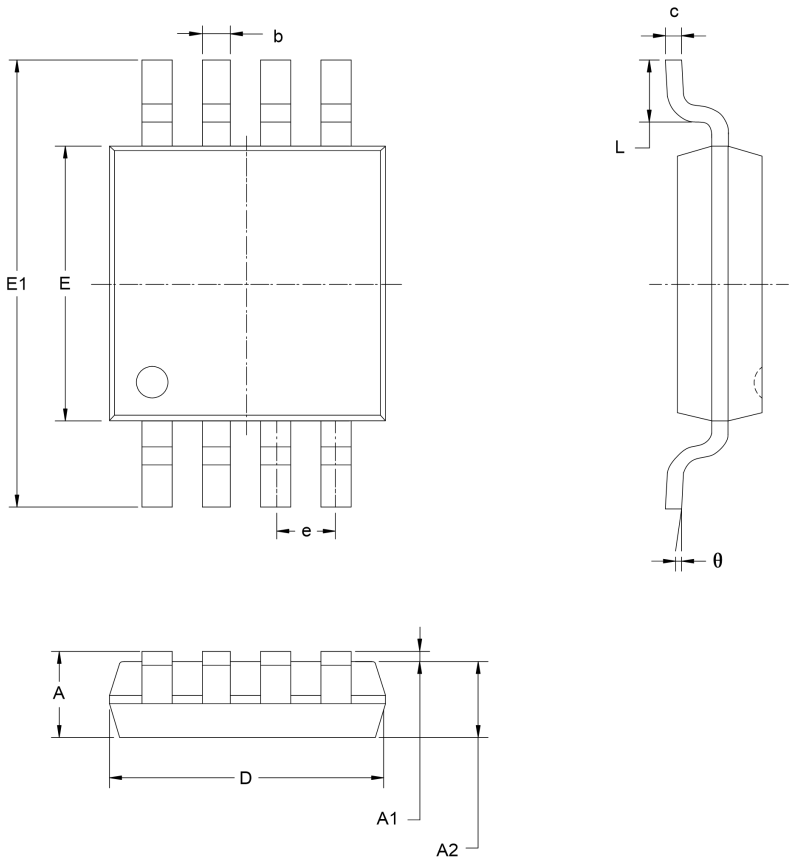
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037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

SOP8



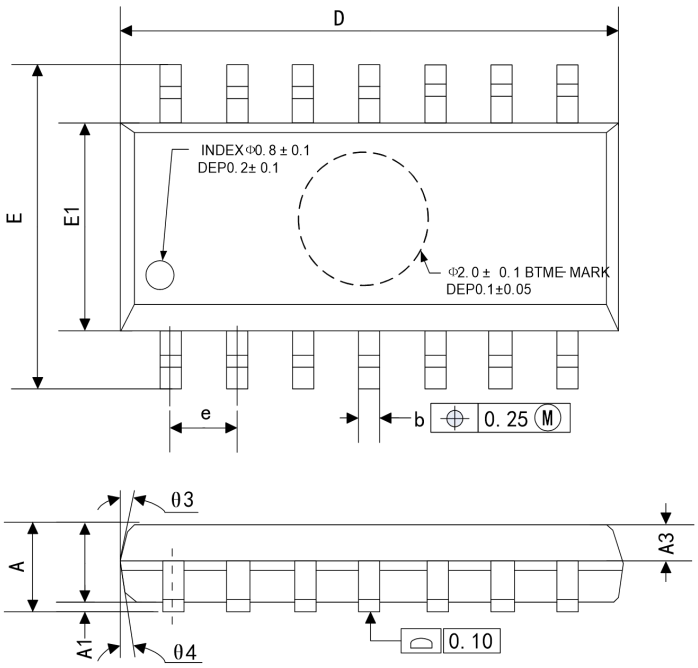
Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	--	--	1.75
A1	0.10	--	0.225
A2	1.30	1.40	1.50
b	0.39	--	0.47
c	0.20	--	0.24
D	4.80	4.90	5.00
E	3.80	3.90	4.00
E1	5.80	6.00	6.20
e	1.27BSC		
L	0.50	--	0.80
θ	0	--	8º

MSOP8



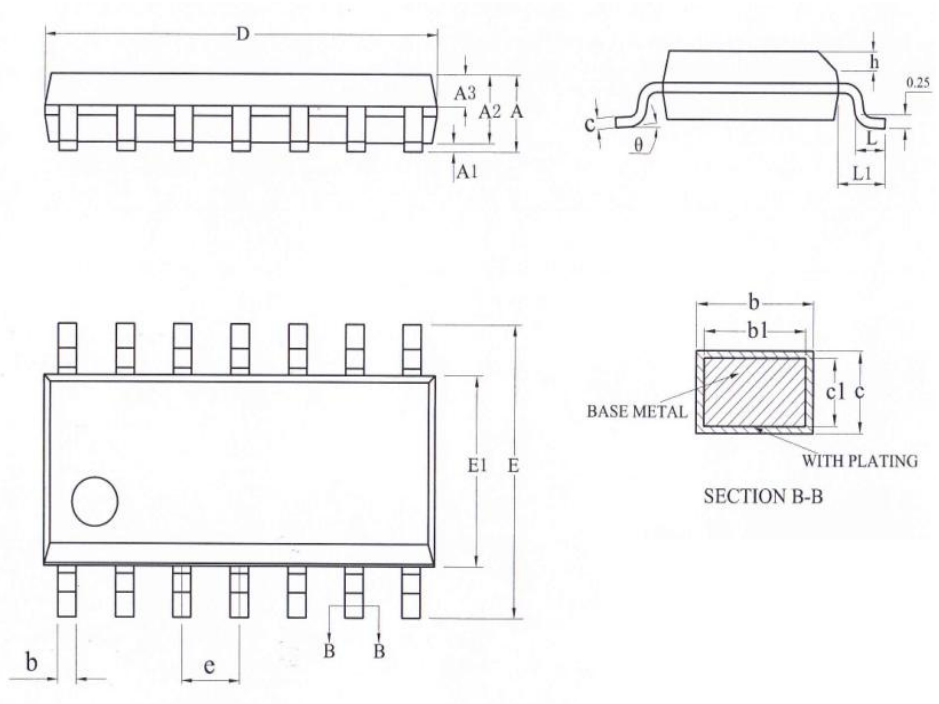
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650BSC		0.026BSC	
L	0.400	0.800	0.016	0.031
θ	0º	6º	0º	6º

TSSOP14



Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A			1.20
A1	0.05		0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20		0.30
b1	0.19	0.22	0.25
c	0.13		0.19
c1	0.12	0.13	0.14
D	4.86	4.96	5.06
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65BSC		
L	0.45		0.75
L1	1.00BSC		
θ	0		8°

SOP14



Symbol	Dimensions In Millimeters		
	Min	Typ	Max
A	--	--	1.75
A1	0.05	--	0.25
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	--	0.47
b1	0.38	0.41	0.44
c	0.20	--	0.24
c1	0.19	0.20	0.21
D	8.55	8.65	8.75
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
h	0.25	--	0.50
L	0.50	--	0.80
L1	1.05REF		
θ	0 º	--	8 º

MARKING and PACKAGING SPECIFICATIONS

1. Marking Drawing Description

Product Name : 8613S, MS8617, MS8617M, MS8619, MS8619S

Product Code: XXXX, XXXXXX

2. Marking Drawing Demand

Laser printing, contents in the middle, font type Arial.

3. Packaging Specifications

Device	Package	Piece/Reel	Reel/Box	Piece /Box	Box/Carton	Piece/Carton
MS8613	SOT23-5	3000	10	30000	4	120000
MS8617	SOP8	2500	1	2500	8	20000
MS8617M	MSOP8	3000	1	3000	8	24000
MS8619	TSSOP14	3000	1	3000	8	24000
MS8619S	SOP14	2500	1	2500	8	20000

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- The process of improving product is endless. And our company would sincerely provide more excellent product for customer.

MOS CIRCUIT OPERATION PRECAUTIONS

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.

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