



# SGM4996

## 1.3W Fully Differential Audio Power Amplifier with Selectable Shutdown

### GENERAL DESCRIPTION

The SGM4996 is a fully differential audio power amplifier that is designed for portable communication device applications and demanding applications in mobile phones. It is capable of delivering 1.3W of continuous average power into an 8Ω load with typically 1% distortion (THD+N) from a 5V battery voltage. It operates from 2.5V to 5.5V power supply.

The SGM4996 features a low power consumption shutdown mode. To be flexible, shutdown may be enabled by either a logic high or low depending on the voltage applied on the SD MODE pin. Additionally, the SGM4996 features an internal thermal shutdown protection mechanism.

The SGM4996 contains advanced pop/click circuitry, with a minimal amount of external components. All these features make SGM4996 ideal for wireless handsets and other low voltage applications where minimal power consumption is a primary requirement.

The SGM4996 is available in Green MSOP-10, TDFN-3x3-10L and MSOP-8 packages. It operates over an ambient temperature range of -40°C to +85°C.

### FEATURES

- Fully Differential Amplifier
- Excellent PSRR: Direct Connection to Battery
- 1.3W into 8Ω Load from 5V Supply at THD+N = 1% (TYP)
- 2.5V to 5.5V Operation
- Low Shutdown Current
- Improved Pop/Click Circuitry
- Support Single-Ended or Differential Input
- Thermal Overload Protection Circuitry
- No Output Coupling Capacitors, Bootstrap Capacitors Required
- External Gain Configuration Capability
- -40°C to +85°C Operating Temperature Range
- Available in Green MSOP-10, TDFN-3x3-10L and MSOP-8 Packages

### APPLICATIONS

Portable Systems  
Wireless Handsets  
Mobile Phone  
Handheld Computers  
PDAs  
GPS

**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4996	MSOP-10	-40°C to +85°C	SGM4996YMS10G/TR	SGM4996 YMS10 XXXXX	Tape and Reel, 4000
	TDFN-3x3-10L	-40°C to +85°C	SGM4996YD10G/TR	SGM 4996D XXXXX	Tape and Reel, 3000
	MSOP-8	-40°C to +85°C	SGM4996YMS8G/TR	SGM4996 YMS8 XXXXX	Tape and Reel, 4000

NOTE: XXXXX = Date Code and Vendor Code.

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.....6V  
 Input Voltage..... -0.3V to (V<sub>CC</sub>) + 0.3V  
 Storage Temperature Range .....-65°C to +150°C  
 Junction Temperature.....150°C  
 Lead Temperature (Soldering, 10s) .....+260°C  
 ESD Susceptibility  
 HBM.....4000V  
 MM.....400V

**RECOMMENDED OPERATING CONDITIONS**

Operating Temperature Range .....-40°C to +85°C

**OVERSTRESS CAUTION**

Stresses beyond those listed may cause permanent damage to the device. Functional operation of the device at these or any other conditions beyond those indicated in the operational section of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

**ESD SENSITIVITY CAUTION**

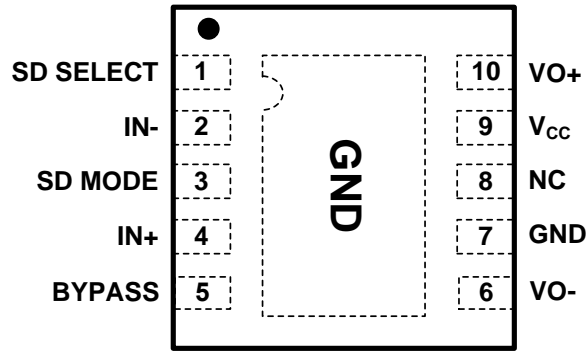
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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, specification or other related things if necessary without notice at any time.

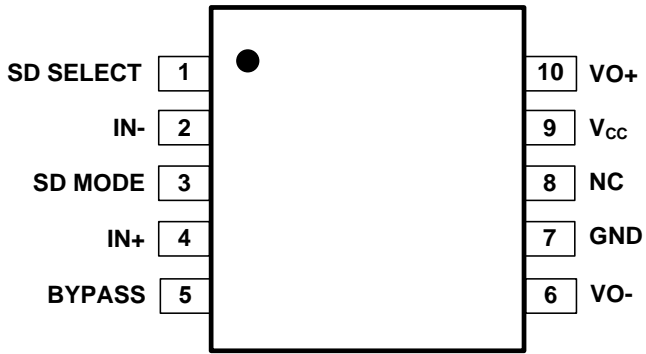
PIN CONFIGURATIONS

(TOP VIEW)



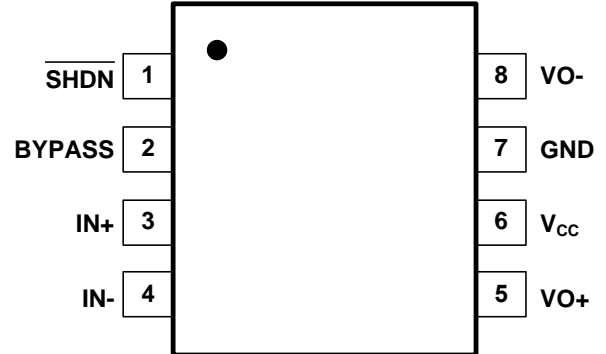
TDFN-3x3-10L

(TOP VIEW)



MSOP-10

(TOP VIEW)



MSOP-8

## ELECTRICAL CHARACTERISTICS

(The following AC specifications apply for 8Ω load,  $A_V = 1V/V$ ,  $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

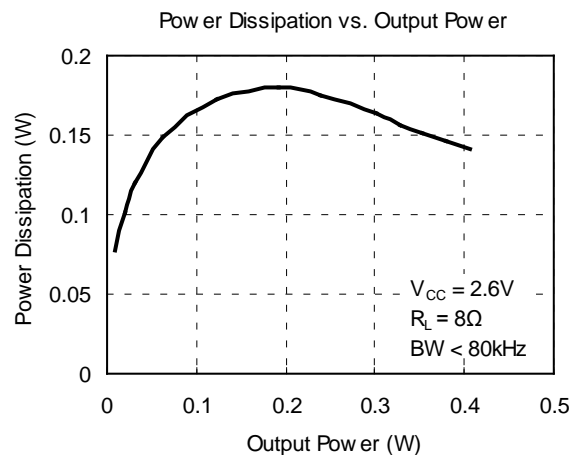
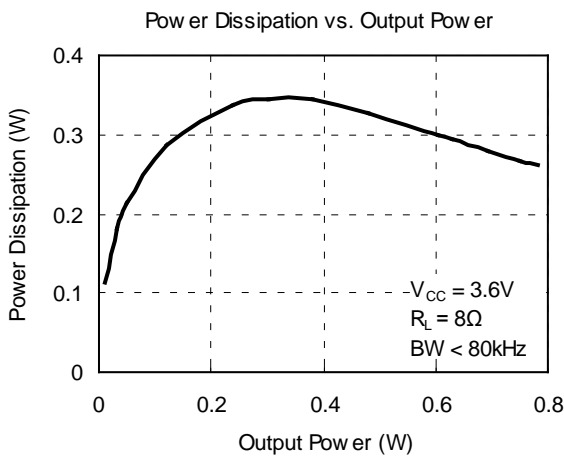
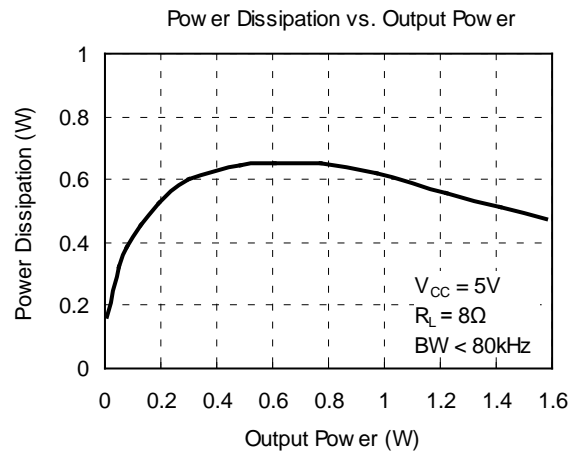
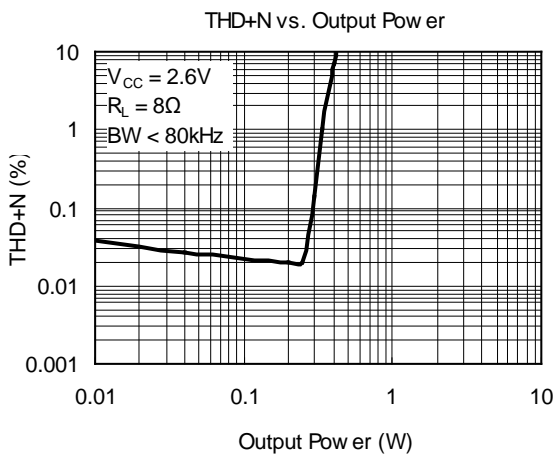
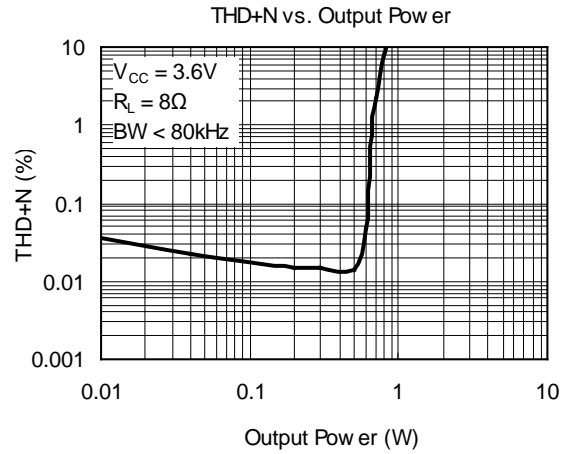
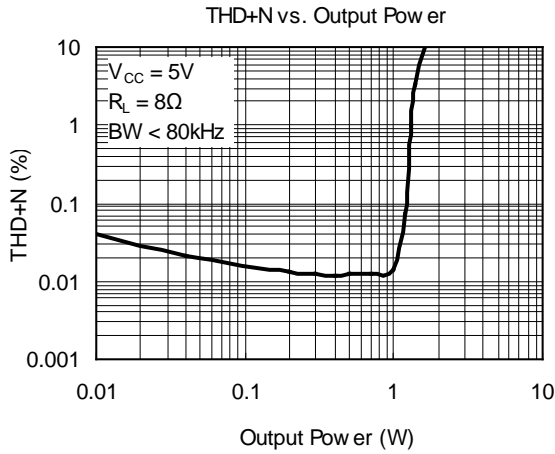
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Supply Voltage	$V_{CC}$			2.5		5.5	V
Shutdown Current	$I_{SD}$	SDM = SDS = GND or SDM = SDS = $V_{CC}$	$V_{CC} = 5.0V$		0.01	2	μA
			$V_{CC} = 3.6V$		0.01		
			$V_{CC} = 2.6V$		0.01		
Output Offset Voltage	$V_{OS}$	$V_{IN} = 0V, I_O = 0A$		-10	2	10	mV
Quiescent Power Supply Current	$I_Q$	$V_{IN} = 0V$	$V_{CC} = 5.0V, \text{No Load}$		4.70	7.5	mA
			$V_{CC} = 5.0V, 8\Omega \text{ Load}$		4.73	8	
			$V_{CC} = 3.6V, \text{No Load}$		3.85	6	
			$V_{CC} = 3.6V, 8\Omega \text{ Load}$		3.87		
			$V_{CC} = 2.6V, \text{No Load}$		3.20		
			$V_{CC} = 2.6V, 8\Omega \text{ Load}$		3.21		
SD SELECT Threshold High	$V_{SDSIH}$			1.2			V
SD SELECT Threshold Low	$V_{SDSIL}$					0.4	
SD MODE Threshold High	$V_{SDMIH}$			1.2			
SD MODE Threshold Low	$V_{SDMIL}$					0.4	
Output Power (8Ω)	$P_O$	$f = 1\text{kHz},$ $\text{THD+N} = 1\%$	$V_{CC} = 5.0V$		1.30		W
			$V_{CC} = 3.6V$		0.66		
			$V_{CC} = 3.0V$		0.46		
			$V_{CC} = 2.6V$		0.33		
		$f = 1\text{kHz},$ $\text{THD+N} = 10\%$	$V_{CC} = 5.0V$		1.60		
			$V_{CC} = 3.6V$		0.82		
			$V_{CC} = 3.0V$		0.57		
			$V_{CC} = 2.6V$		0.41		
Total Harmonic Distortion + Noise	THD+N	$P_O = 0.6W_{rms}, f = 1\text{kHz}, V_{CC} = 5.0V$			0.013		%
Power Supply Rejection Ratio <sup>(1) (2)</sup>	PSRR	$V_{RIPPLE} = 200mV_{P-P}$ $C_B = 1\mu F, f = 217\text{Hz}$	$V_{CC} = 5.0V$		-85		dB
			$V_{CC} = 3.6V$		-81		
			$V_{CC} = 3.0V$		-64		
			$V_{CC} = 2.6V$		-54		
		$V_{RIPPLE} = 200mV_{P-P}$ $C_B = 1\mu F, f = 1\text{kHz}$	$V_{CC} = 5.0V$		-83		
			$V_{CC} = 3.6V$		-80		
			$V_{CC} = 3.0V$		-64		
			$V_{CC} = 2.6V$		-54		
Common Mode Rejection Ratio <sup>(2)</sup>	CMRR	$f = 217\text{Hz}, V_{CM} = 200mV_{P-P}, V_{CC} = 5.0V$			-81		dB
Wake-Up Time	$T_{WU}$	$C_B = 1\mu F$	$V_{CC} = 5.0V$		68		ms
			$V_{CC} = 3.6V$		53		
			$V_{CC} = 3.0V$		45		
			$V_{CC} = 2.6V$		40		

## NOTES:

- 10Ω terminated input.
- PSRR and CMRR are affected by the matching between gain-setting resistor ratios.

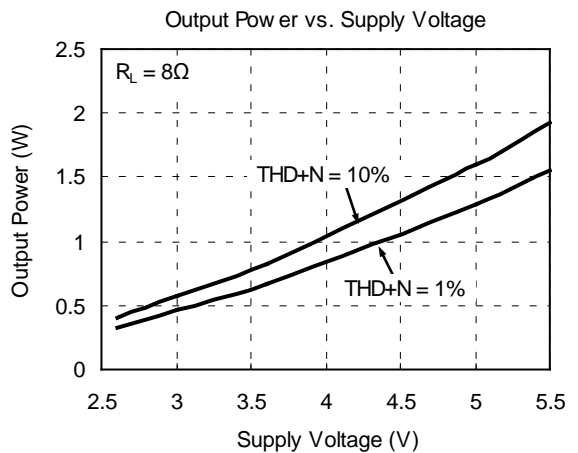
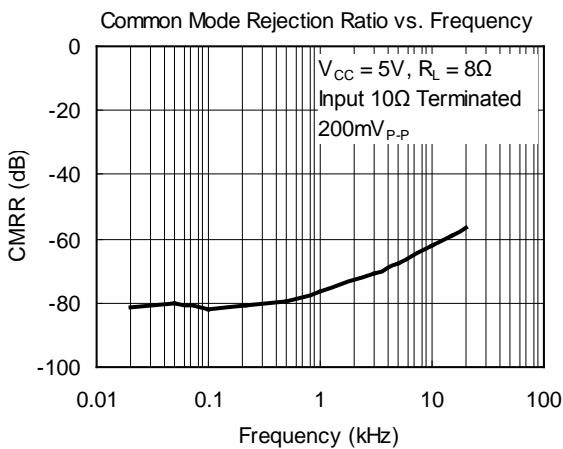
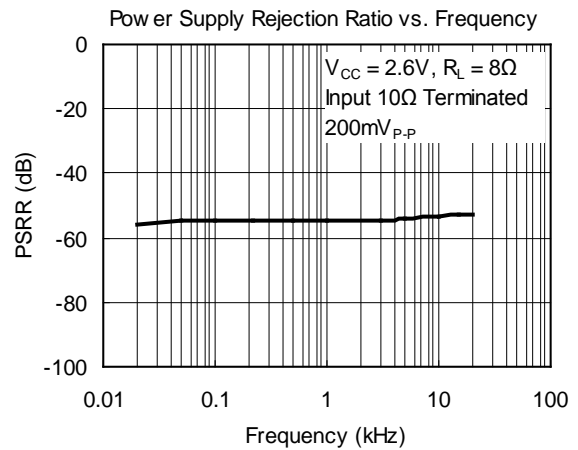
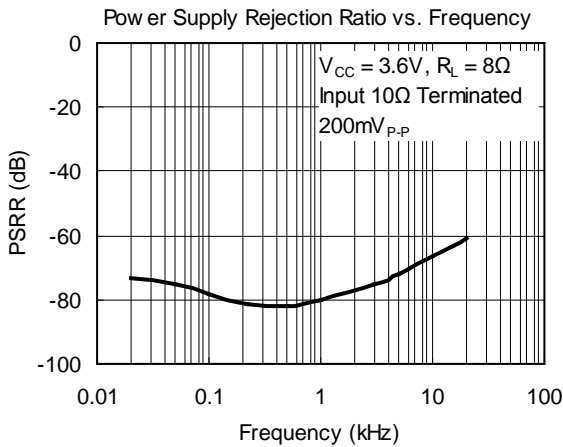
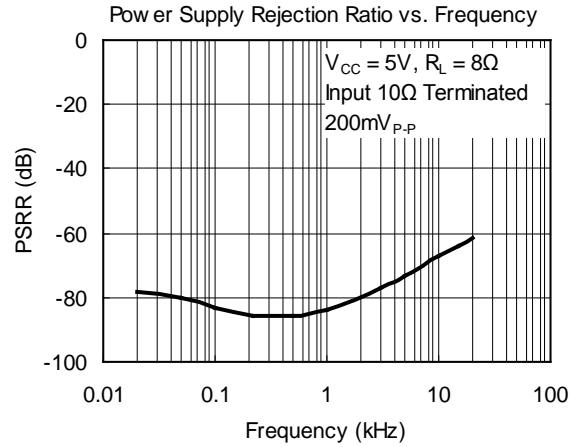
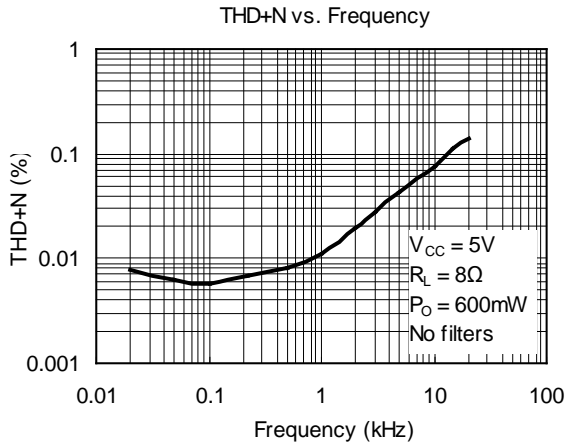
TYPICAL PERFORMANCE CHARACTERISTICS

At  $T_A = +25^\circ\text{C}$ ,  $A_V = 1$ ,  $f = 1\text{kHz}$ ,  $C_B = 1\mu\text{F}$ , unless otherwise noted.



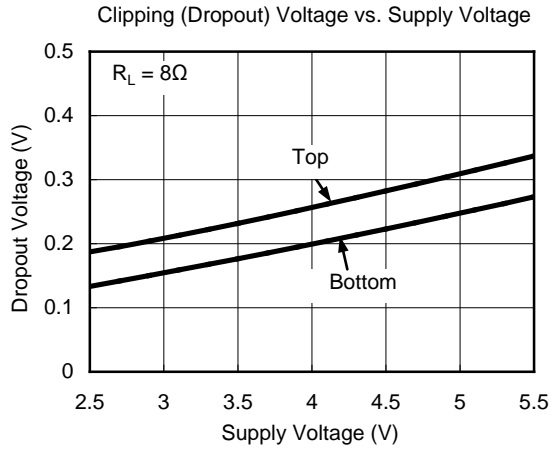
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At  $T_A = +25^\circ\text{C}$ ,  $A_V = 1$ ,  $f = 1\text{kHz}$ ,  $C_B = 1\mu\text{F}$ , unless otherwise noted.

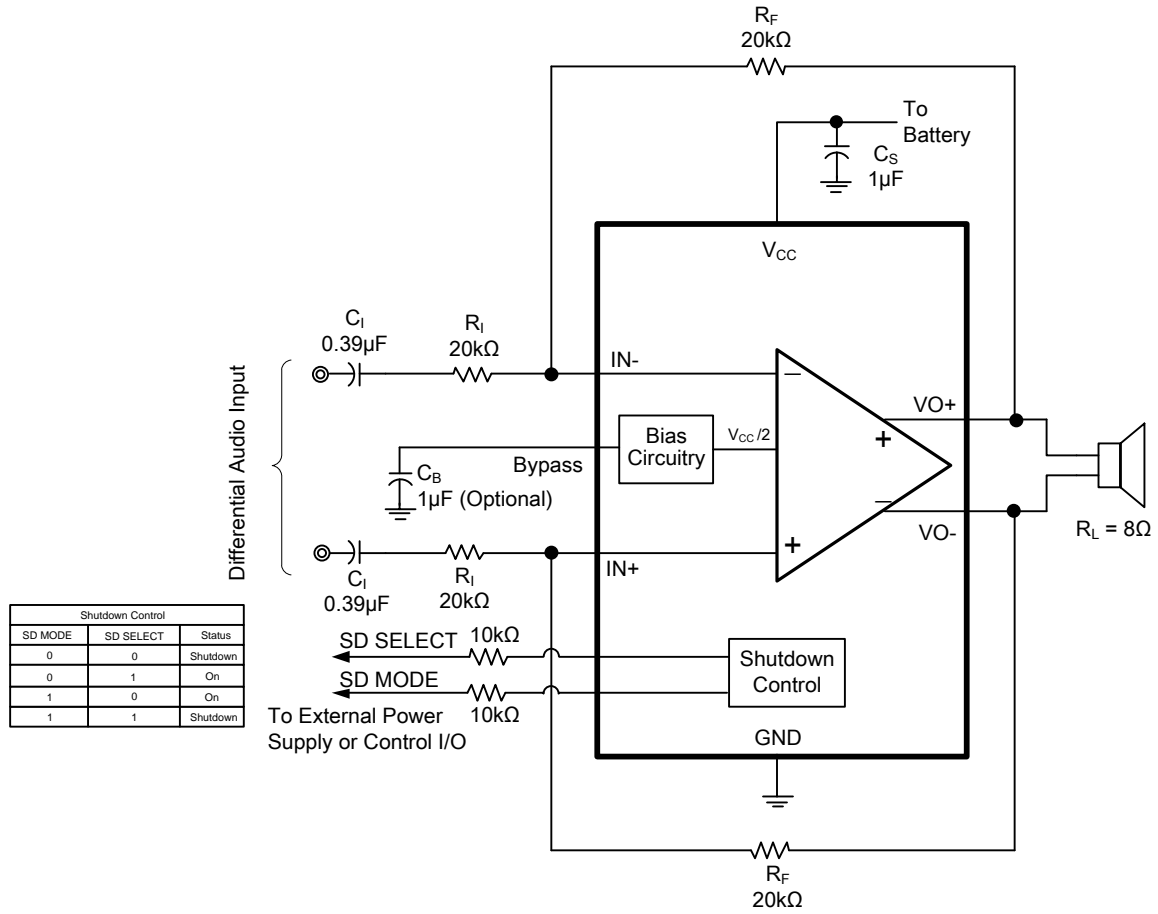


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At  $T_A = +25^\circ\text{C}$ ,  $A_V = 1$ ,  $f = 1\text{kHz}$ ,  $C_B = 1\mu\text{F}$ , unless otherwise noted.



APPLICATION CIRCUITS

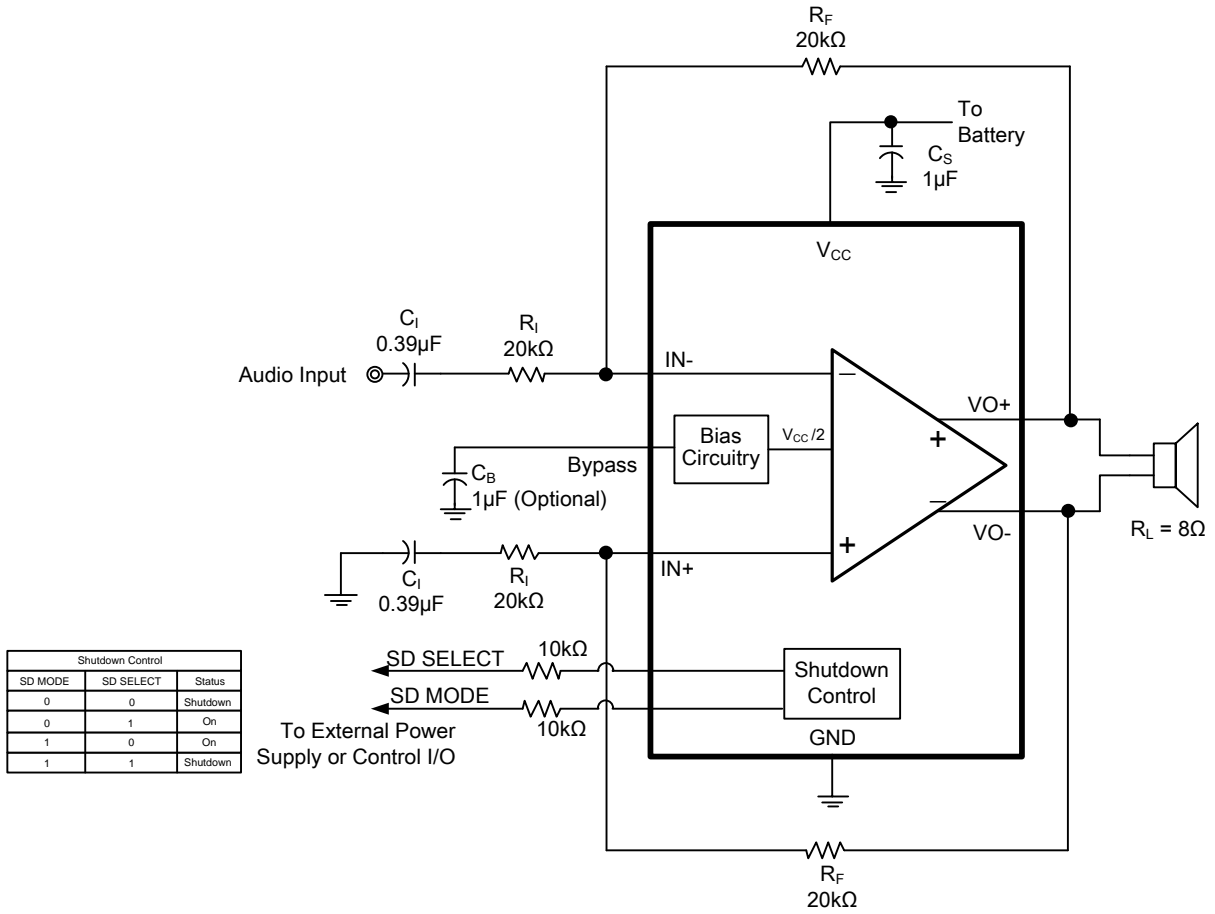


NOTE: A 10kΩ resistor must be serially connected to SD SELECT or SD MODE pin.

Figure 1. Typical Differential Input Application Schematic



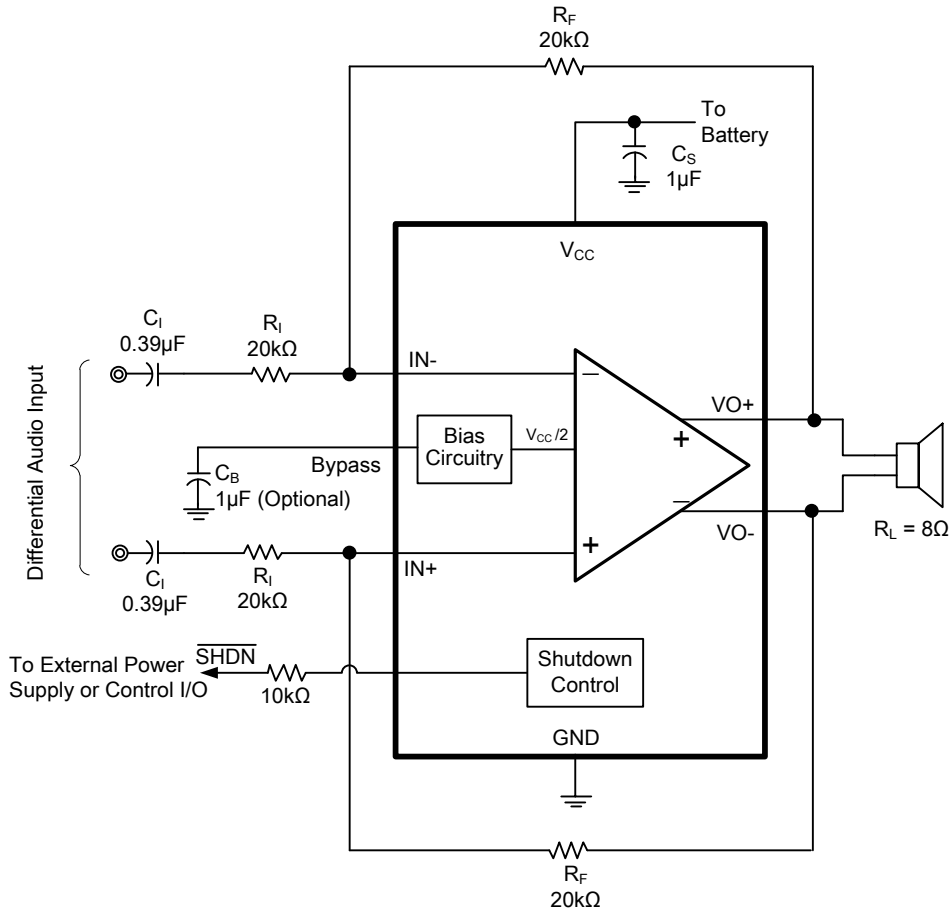
APPLICATION CIRCUITS (continued)



NOTE: A 10kΩ resistor must be serially connected to SD SELECT or SD MODE pin.

Figure 2. Single-Ended Input Application Schematic

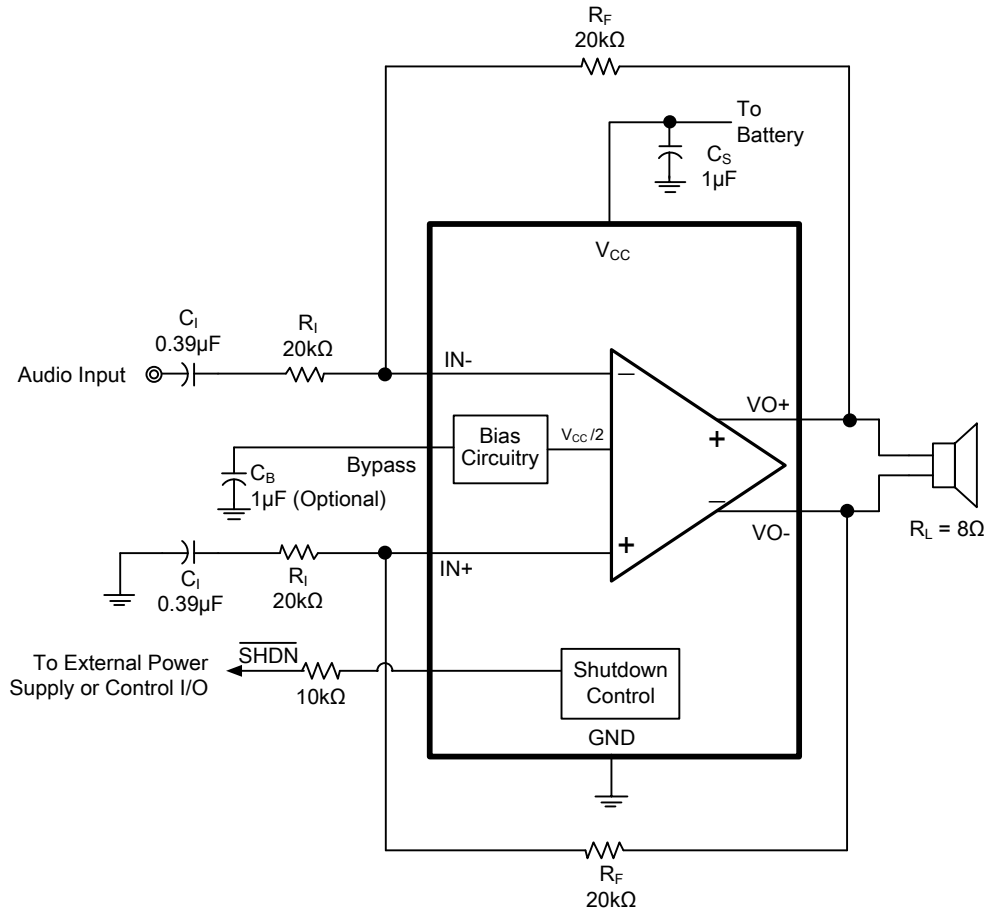
APPLICATION CIRCUITS (continued)



NOTE: A  $10\text{k}\Omega$  resistor must be serially connected to  $\overline{\text{SHDN}}$  pin.

Figure 3. Typical Differential Input Application Schematic for SGM4996YMS8G

APPLICATION CIRCUITS (continued)



NOTE: A 10kΩ resistor must be serially connected to  $\overline{\text{SHDN}}$  pin.

Figure 4. Single-Ended Input Application Schematic for SGM4996YMS8G

REVISION HISTORY

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

MARCH 2017 – REV.A.2 to REV.A.3

Changed Packing Option..... 2

NOVEMBER 2012 – REV.A.1 to REV.A.2

Added notes of Typical Application Circuits ..... 8, 9, 10, 11

MAY 2011 – REV.A to REV.A.1

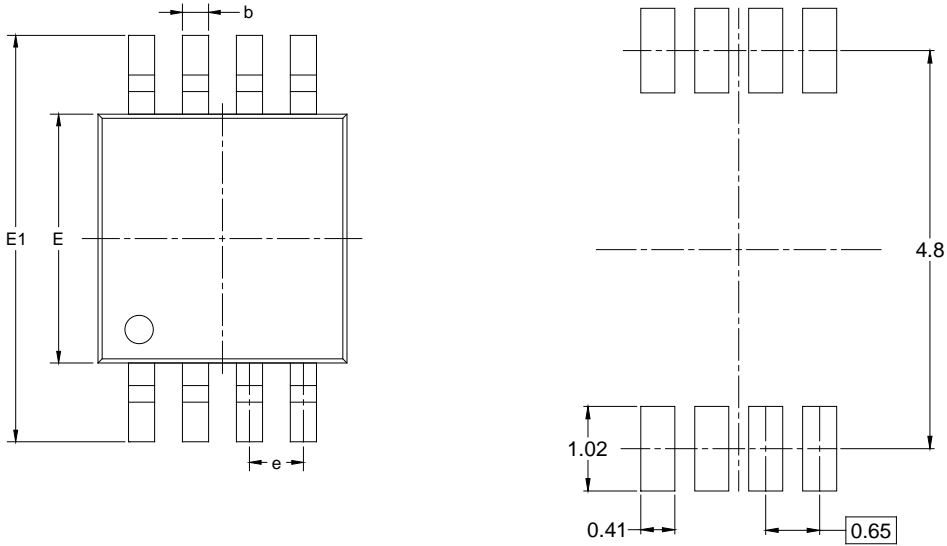
Updated Package Description ..... All

Changes from Original (MARCH 2010) to REV.A

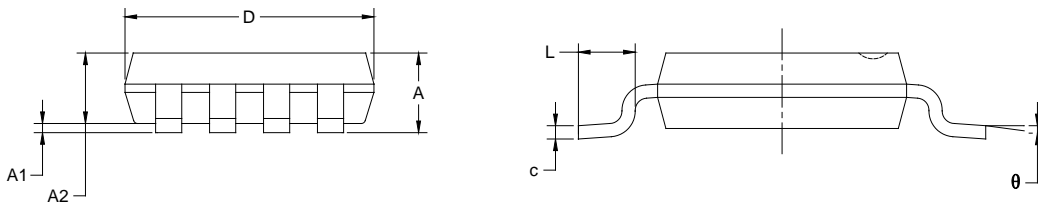
Changed from product preview to production data..... All

PACKAGE OUTLINE DIMENSIONS

MSOP-8



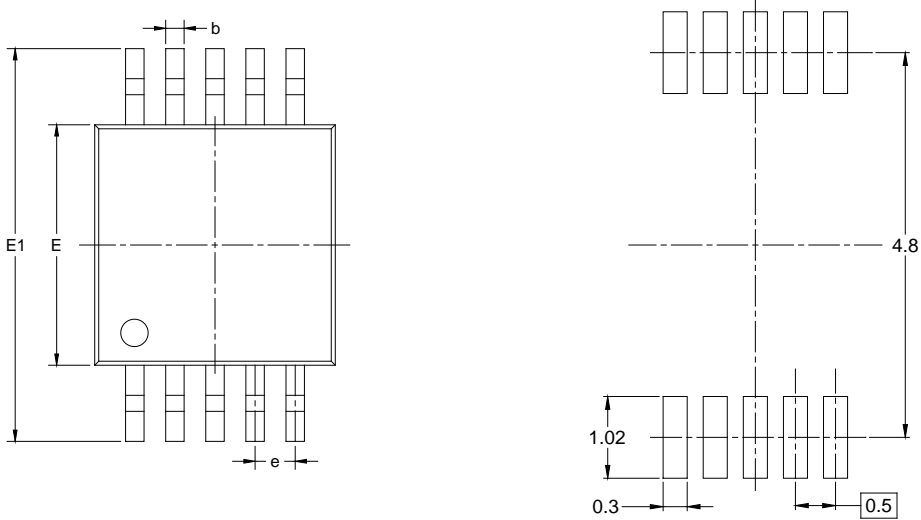
RECOMMENDED LAND PATTERN (Unit: mm)



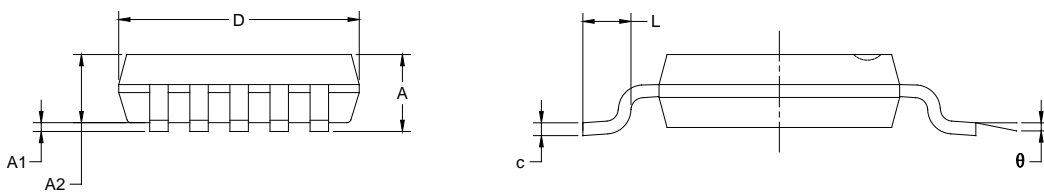
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

PACKAGE OUTLINE DIMENSIONS

MSOP-10



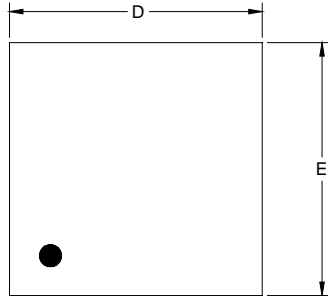
RECOMMENDED LAND PATTERN (Unit: mm)



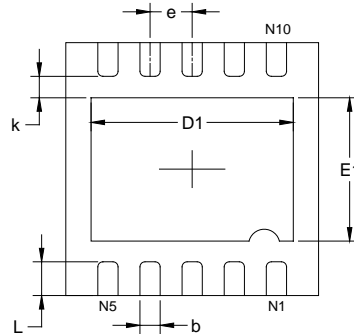
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.280	0.007	0.011
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.500 BSC		0.020 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

PACKAGE OUTLINE DIMENSIONS

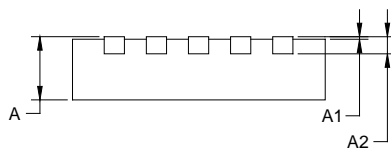
TDFN-3x3-10L



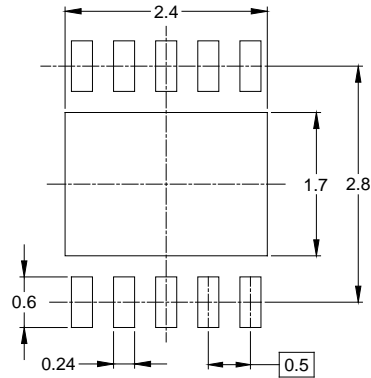
TOP VIEW



BOTTOM VIEW



SIDE VIEW



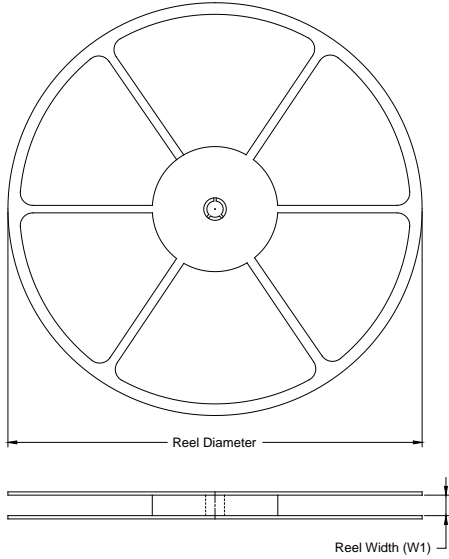
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.300	2.600	0.091	0.103
E	2.900	3.100	0.114	0.122
E1	1.500	1.800	0.059	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

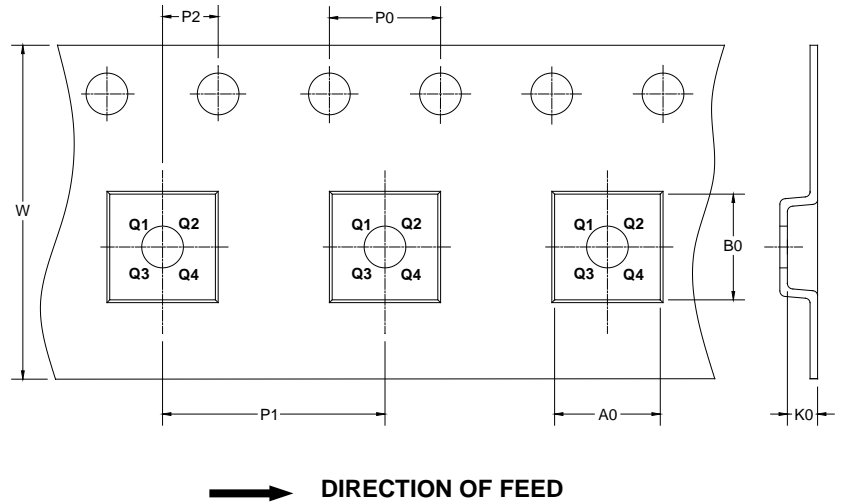
# PACKAGE INFORMATION

## 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
MSOP-8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1
MSOP-10	13"	12.4	5.20	3.30	1.20	4.0	8.0	2.0	12.0	Q1
TDFN-3x3-10L	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

DD0001

# PACKAGE INFORMATION

## 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
13"	386	280	370	5

DD0002