SGM89112
Capless 3Vrms Line Driver with 8MHz 5th-Order Video Driver

GENERAL DESCRIPTION

The SGM89112 is a 3Vrms pop/click-free stereo line driver. The device is ideal for single supply applications. Capless design can eliminate output DC-blocking capacitors for less-component count and low-cost. The SGM89112 also has a single rail-to-rail 5th-order video filter with a slew rate of 33V/μs and a -3dB bandwidth of 8MHz. It can operate from 3.0V to 5.5V power supply.

The SGM89112 has single input and is capable of driving 3Vrms into a 2.5kΩ load with 5V supply voltage. Build-in shutdown control also helps for pop/click-free on/off control. The gain can be set by users from ±1V/V to ±10V/V through external gain setting resistors that also allows the implementation of a 2nd-order low pass filter to compliment SOC and DAC's converters. The video driver of the SGM89112 uses an internal level shift circuit to allow DC-coupled output and avoid synchronous pulse clipping.

SGM89112 does not require a power supply. An integrated charge pump generates a 3Vrms output negative power rail that provides a clean, pop/click-free ground offset.

The SGM89112 is available in a Green TSSOP-16 package. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Supply Voltage Range: 3V to 5.5V**
- **Output Voltage into 2.5kΩ Load**
  - **3Vrms at 5V Supply Voltage**
- **Input Voltage Range Includes Ground**
- **Capless Structure**
  - **Pop/Click-Free**
  - **Eliminates Output DC-Blocking Capacitors**
  - **Provides Flat Frequency Response**
- **Video Driver Gain: 6dB**
- **5th-Order Video Filter**
- **Video Driver can Drive Two Video Loads**
- **Support Single Audio Signal Input**
- **Excellent SD Video Performance**
- **Low Noise and THD**
  - **SNR = 107dB (TYP)**
  - **V_N = 9μVrms (TYP)**
  - **THD+N = 0.001% (f = 1kHz)**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in a Green TSSOP-16 Package**

APPLICATIONS

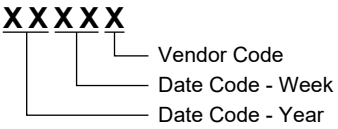
LCD TV
Set-Top Box
Communication Devices
Home Theater
Blue-Ray DVD-Players

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM89112	TSSOP-16	-40℃ to +85℃	SGM89112YTS16G/TR	SGM89112 YTS16 XXXXX	Tape and Reel, 3000

MARKING INFORMATION

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 ..... -0.3V to 6V
Input Voltage (Audio) ..... PV_{SS} - 0.3V to PV_{DD} + 0.3V
Input Voltage (Video) ..... GND - 0.3V to V_{CC} + 0.3V
Minimum Load Impedance (Audio R_L) ..... > 600Ω
EN to GND ..... -0.3V to V_{DD} + 0.3V
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 2500V
MM 250V

RECOMMENDED OPERATING CONDITIONS

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

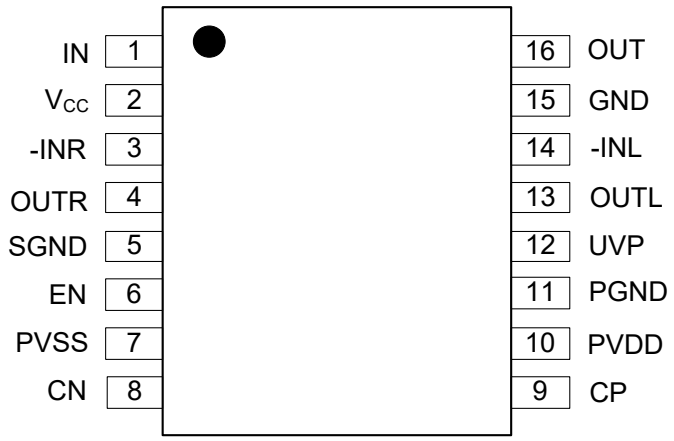
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the 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)

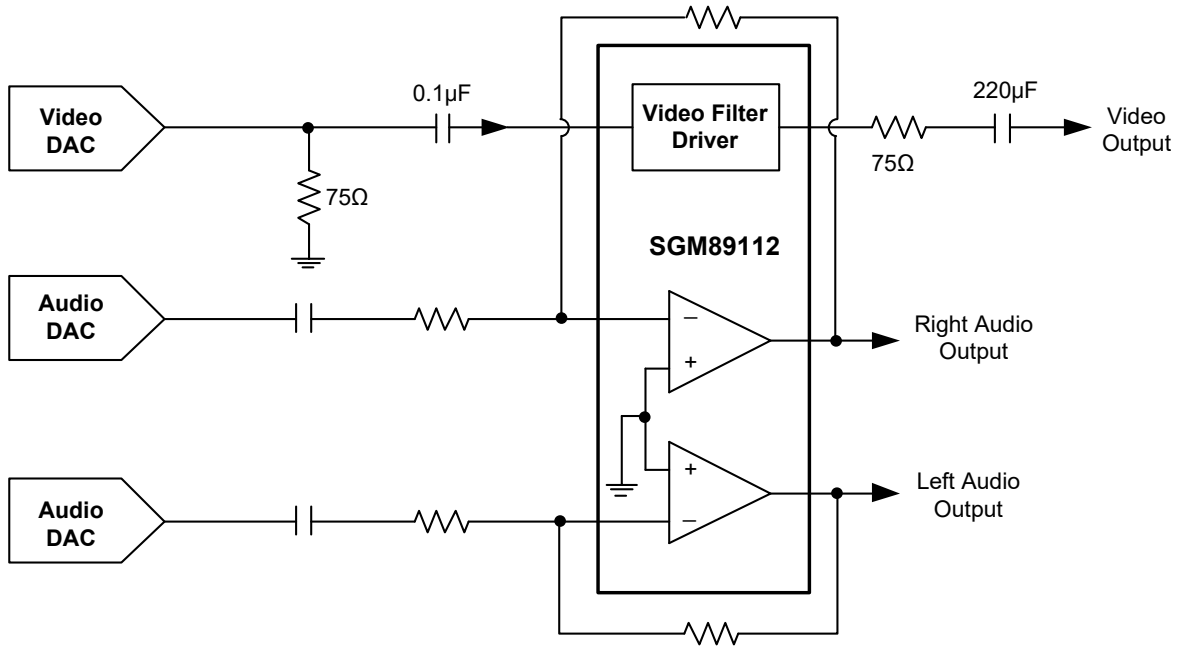


TSSOP-16

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	IN	SD Video Signal Input.
2	V_{CC}	Power Supply of Video Driver.
3	-INR	Negative Input for Right Channel OPAMP.
4	OUTR	Output for Right Channel OPAMP.
5	SGND	Audio Signal Ground.
6	EN	Enable Input for Audio Channel. Active High.
7	PVSS	Negative Supply Voltage Output.
8	CN	Negative Terminal for Charge Pump Flying Capacitor.
9	CP	Positive Terminal for Charge Pump Flying Capacitor.
10	PVDD	Positive Supply of Audio Driver.
11	PGND	Power Ground of Audio Driver.
12	UVP	Under-Voltage Protection Input of Audio Channel.
13	OUTL	Output for Left Channel OPAMP.
14	-INL	Negative Input for Left Channel OPAMP.
15	GND	Ground of Video Signal.
16	OUT	SD Driver Video Signal Output.

TYPICAL OPERATION CIRCUIT



ELECTRICAL CHARACTERISTICS OF STEREO LINE DRIVER

(T_A = +25℃, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Electrical Characteristics					
Output Offset Voltage ($\|V_{OS}\|$)	V_{DD} = 3V to 5V		1.2	6	mV
Power Supply Rejection Ratio (PSRR)	V_{DD} = 3V to 5V		100		dB
High-Level Output Voltage (V_{OH})	V_{DD} = 3.3V, R_L = 2.5kΩ	3.18			V
Low-Level Output Voltage (V_{OL})	V_{DD} = 3.3V, R_L = 2.5kΩ			-3.05	V
High-Level Input Current (EN) ($\|I_{IH}\|$)	V_{DD} = 5V, V_I = V_{DD}			1	μA
Low-Level Input Current (EN) ($\|I_{IL}\|$)	V_{DD} = 5V, V_I = 0V			1	μA
Supply Current (I_{DD})	V_{DD} = 3.3V, no load, EN = V_{DD}		11	16	mA
	V_{DD} = 5V, no load, EN = V_{DD}		11.3	16.5	
	Shutdown mode, V_{DD} = 3V to 5V		0.1	0.16	
Operating Characteristics (V_{DD} = 3.3V, R_L = 2.5kΩ, C_{PUMP} = 1μF, C_{PVSS} = 1μF, C_{IN2} = 10μF, R_{IN} = 10kΩ, R_{FB} = 20kΩ.)					
Output Voltage (Outputs In Phase) (V_O)	THD = 1%, V_{DD} = 3.3V, f = 1kHz	2.05			Vrms
	THD = 1%, V_{DD} = 5V, f = 1kHz	3.05			
	THD = 1%, V_{DD} = 5V, f = 1kHz, R_L = 100kΩ	3.1			
Total Harmonic Distortion Plus Noise (THD+N)	V_O = 2Vrms, f = 1kHz		0.001		%
Crosstalk	V_O = 2Vrms, f = 1kHz		115		dB
Output Current Limit (I_O)	V_{DD} = 3.3V		20		mA
Input Resistor Range (R_{IN})			10		kΩ
Feedback Resistor Range (R_{FB})			20		kΩ
Slew Rate			9		V/μs
Maximum Capacitive Load			220		pF
Noise Output Voltage (V_N)	A-weighted, BW = 22kHz		9		μVrms
Signal to Noise Ratio (SNR)	A-weighted, V_O = 2Vrms, THD+N = 0.1%, BW = 22kHz		107		dB
Unity Gain Bandwidth (G_{BW})			6.6		MHz
Open-Loop Voltage Gain (A_{VO})			120		dB
Charge Pump Frequency (F_{CP})		300	410	535	kHz
External Under-Voltage Detection (V_{UVP})		1.03	1.13	1.23	V
External Under-Voltage Detection Hysteresis Current (I_{Hys})			4.5		μA
Shutdown Pin					
Input High Voltage (V_{INH})		1.2			V
Input Low Voltage (V_{INL})				0.6	V
Recommended Operating Conditions					
DC Supply Voltage (V_{DD})		3		5.5	V

ELECTRICAL CHARACTERISTICS OF VIDEO DRIVER

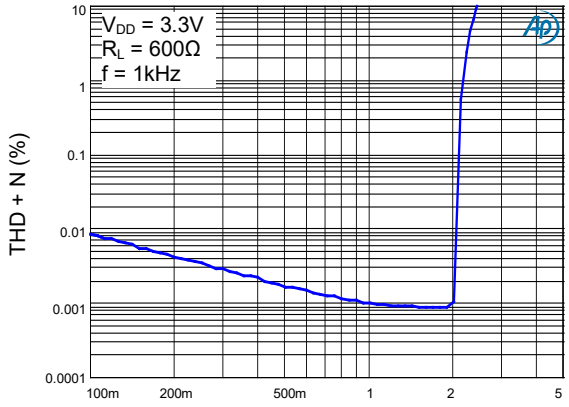
(V_{CC} = 5.0V, at R_L = 150Ω connected to GND, V_{IN} = $1V_{PP}$, and C_{IN1} = 0.1μF , all outputs AC-coupled with 220μF, referenced to 400kHz, T_A = +25℃, unless otherwise noted.)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Characteristics					
Output Level Shift Voltage (V_{OLS})	V_{IN} = 0V, no load		350	500	mV
Voltage Gain (A_V)	R_L = 150Ω	5.6	6	6.4	dB
Output Characteristics					
Output Voltage High Swing	V_{IN} = 3.0V, R_L = 150Ω to GND		4.82		V
Output Short-Circuit Current (I_{SC})	V_{IN} = 0.4V, OUT shorted to GND through 10Ω		115		mA
	V_{IN} = 1.7V, OUT shorted to V_{CC} through 10Ω		-120		
Power Supply					
Operating Voltage Range (V_{CC})		3.0		5.5	V
Power Supply Rejection Ratio (PSRR)	V_{CC} = 3.5V to 5.0V		50		dB
Quiescent Current (I_Q)	V_{IN} = 0.5V		7	9.5	mA
Dynamic Performance					
-0.1dB Bandwidth			5.4		MHz
-1dB Bandwidth			6.5		MHz
-3dB Bandwidth			7.56		MHz
Filter Response (Normalized Gain)	f_{IN} = 27MHz		42		dB
Slew Rate	2V output step, 80% to 20%		33		V/μs
Group Delay Variation (D/DT)	Difference between 400kHz and 6.5MHz		31		ns
Fall Time	2V output step, 80% to 20%		37		ns
Rise Time	2V output step, 80% to 20%		36		ns

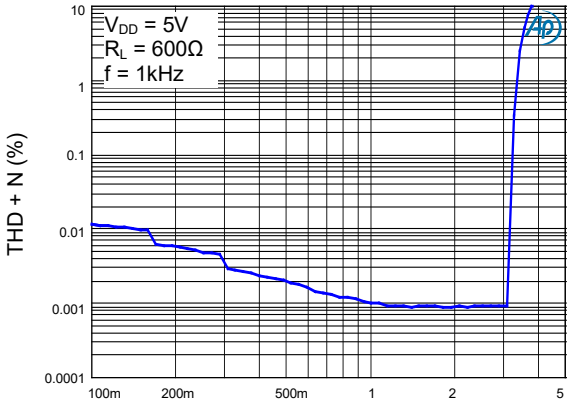
TYPICAL PERFORMANCE CHARACTERISTICS OF STEREO LINE DRIVER

T_A = +25℃, R_L = 2.5kΩ, C_{PUMP} = 1μF, C_{PVSS} = 1μF, C_{IN2} = 10μF, R_{IN} = 10kΩ, R_{FB} = 20kΩ, unless otherwise noted.

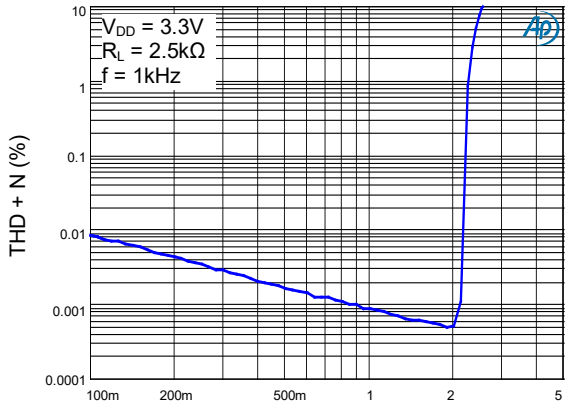
THD+N vs. Output Voltage



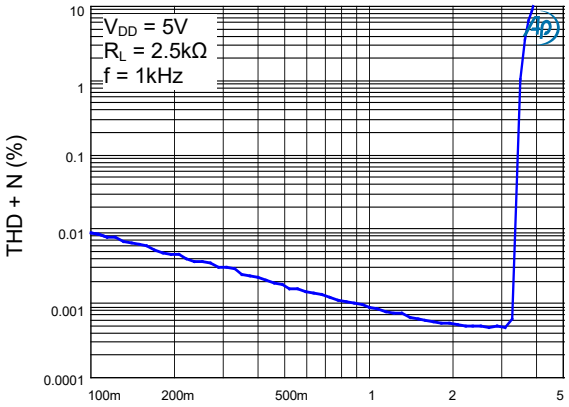
THD+N vs. Output Voltage



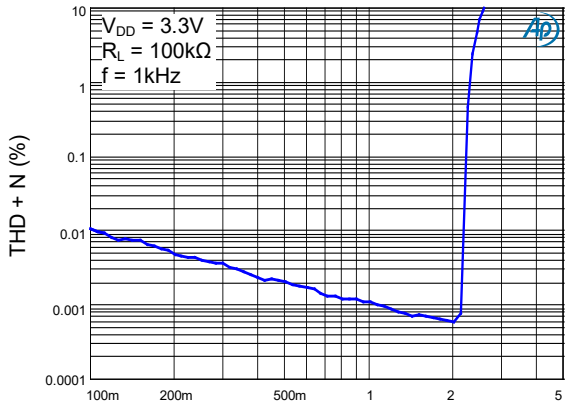
THD+N vs. Output Voltage



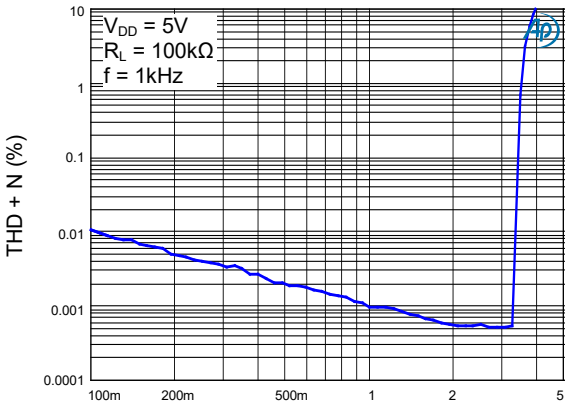
THD+N vs. Output Voltage



THD+N vs. Output Voltage



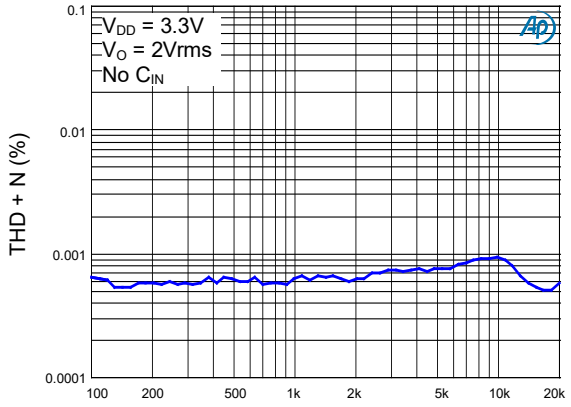
THD+N vs. Output Voltage



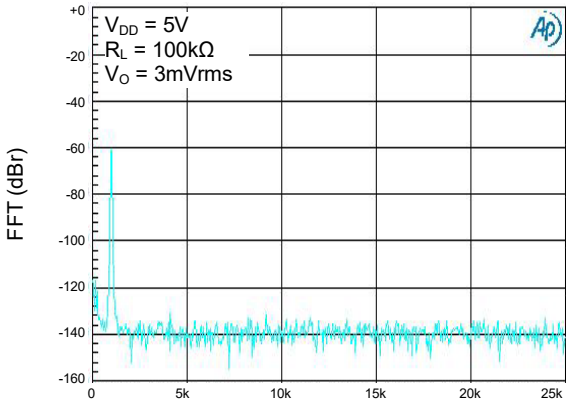
TYPICAL PERFORMANCE CHARACTERISTICS OF STEREO LINE DRIVER

T_A = +25℃, R_L = 2.5kΩ, C_{PUMP} = 1μF, C_{PVSS} = 1μF, C_{IN2} = 10μF, R_{IN} = 10kΩ, R_{FB} = 20kΩ, unless otherwise noted.

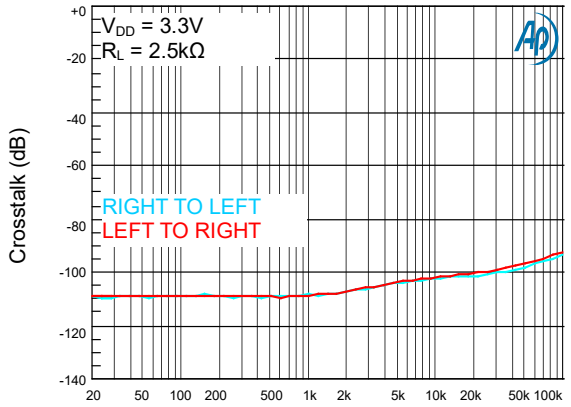
THD+N vs. Frequency



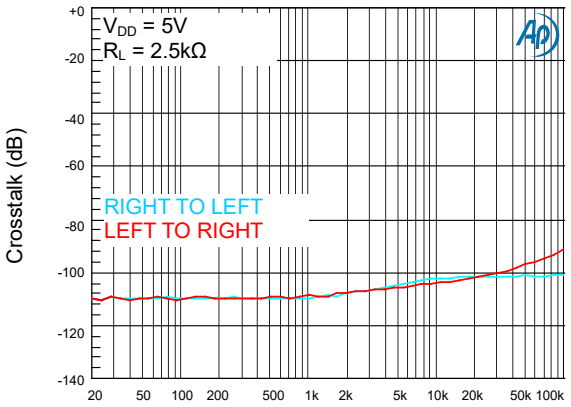
FFT vs. Frequency



Crosstalk vs. Frequency



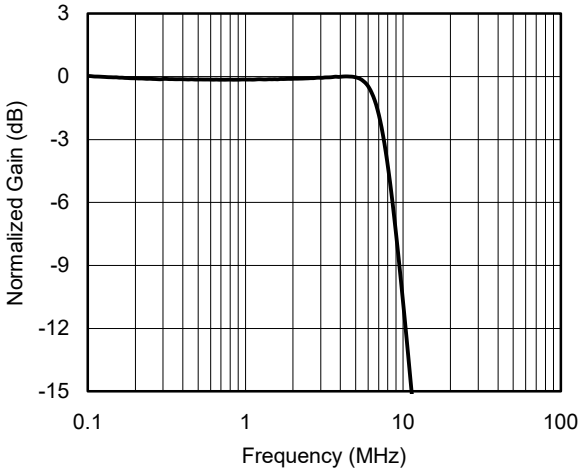
Crosstalk vs. Frequency



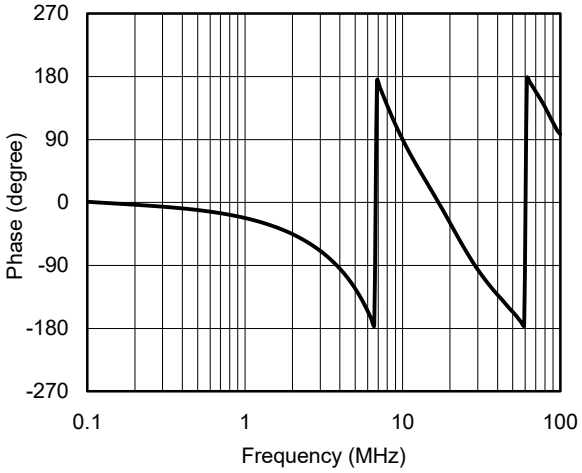
TYPICAL PERFORMANCE CHARACTERISTICS OF VIDEO DRIVER

T_A = +25℃, V_{CC} = 5V, R_L = 150Ω, all outputs AC-coupled with 220μF, unless otherwise noted.

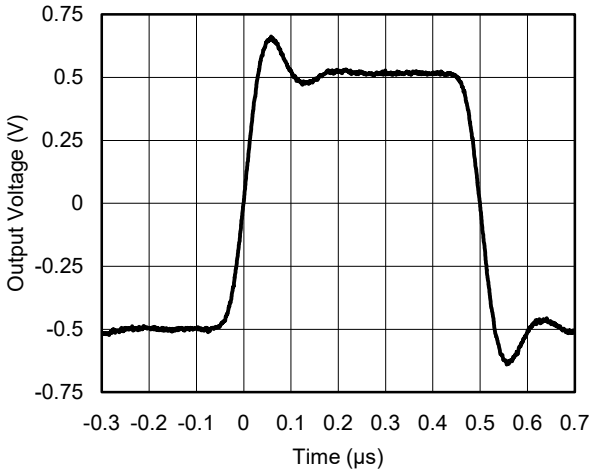
Frequency Response



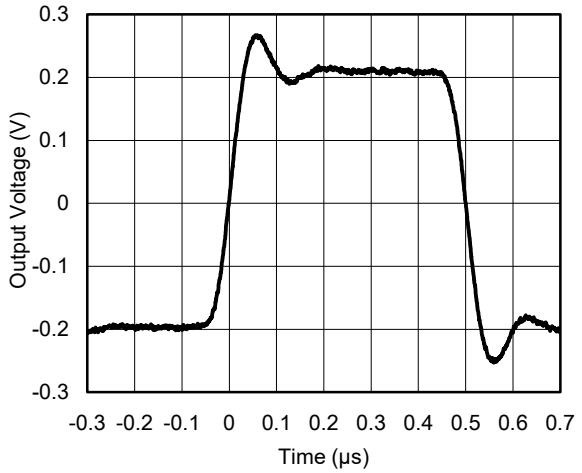
Phase vs. Frequency



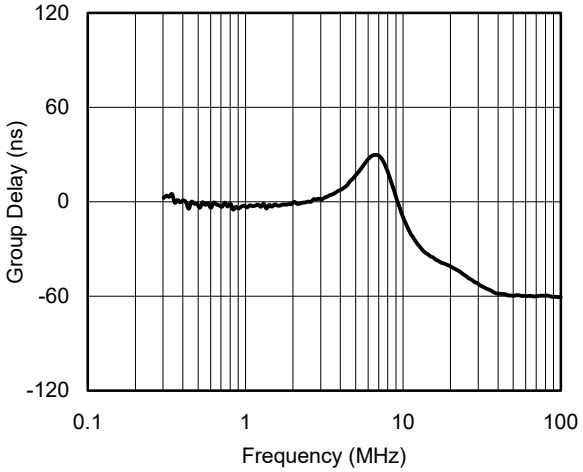
Large Signal Step Response



Small Signal Step Response



Group Delay vs. Frequency



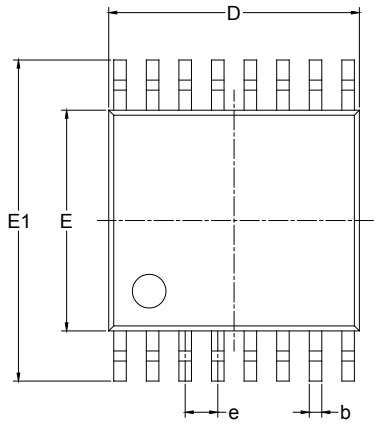
REVISION HISTORY

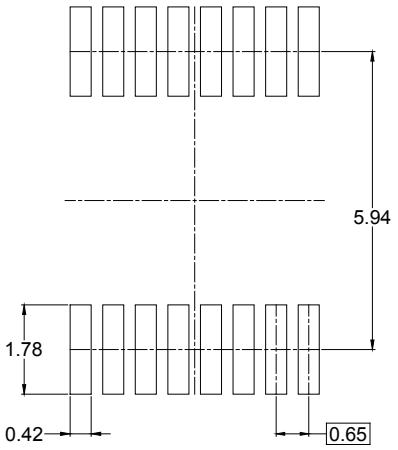
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (SEPTEMBER 2014) to REV.A	Page
Changed from product preview to production data	All

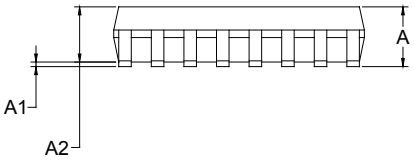
PACKAGE OUTLINE DIMENSIONS

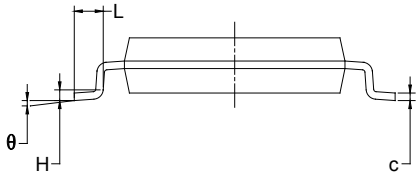
TSSOP-16





RECOMMENDED LAND PATTERN (Unit: mm)

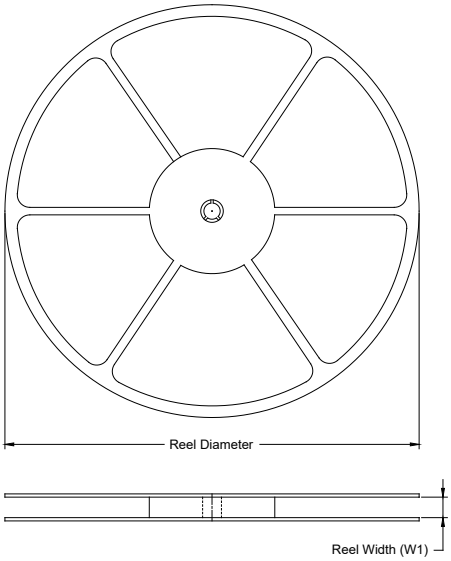




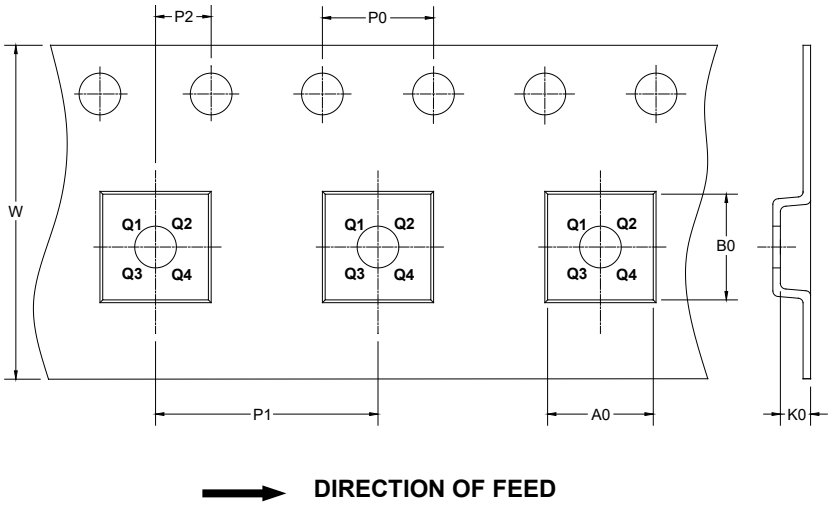
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



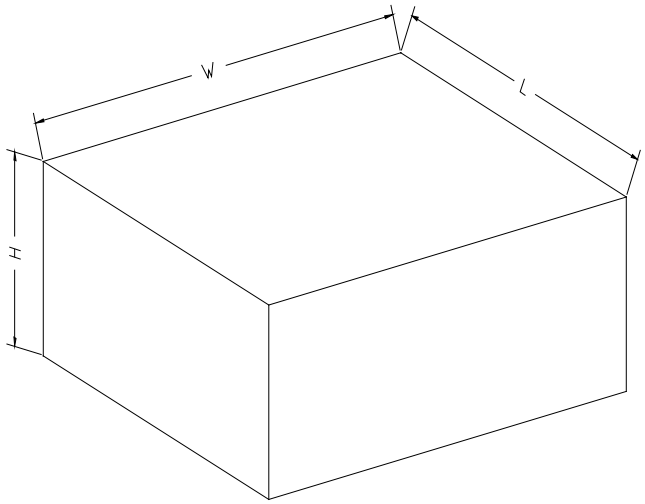
NOTE: The picture is only for reference. Please make the object as the standard.

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
TSSOP-16	13″	12.4	6.90	5.60	1.20	4.0	8.0	2.0	12.0	Q1

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
13″	386	280	370	5

DD0002