SGM3711
11Ω, High Voltage, Rail-to-Rail Negative Signal Passing, Dual, SPDT Analog Switch

GENERAL DESCRIPTION

The SGM3711 is a high voltage, $-V_{CC}$ to $+V_{CC}$ wide range positive and negative signal passing, dual single-pole/double-throw (SPDT) analog switch that is designed to operate from a single 2.7V to 12V power supply. Targeted applications include battery powered equipment that benefit from the SGM3711's low 11Ω (TYP) on-resistance, high off-isolation, very low crosstalk and fast switching speeds.

The SGM3711 is a committed dual single-pole/double-throw (SPDT) switches that consist of two normally open (NO) and two normally closed (NC) switches. This configuration can be used as a dual 2-to-1 multiplexer.

The SGM3711 can pass $-V_{CC}$ to $+V_{CC}$ wide range positive and negative signals with very low distortion.

The SGM3711 is available in Green TQFN-2.6×1.8-16L and SOIC-16 packages. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Wide Supply Range: 2.7V to 12V**
- **On-Resistance for Switches: 11Ω (TYP)**
- **$-V_{CC}$ to $+V_{CC}$ Rail-to-Rail Low Distortion**
- **Positive and Negative Signal Passing**
- **Fast Switching Times**
- **High Off-Isolation**
- **Very Low Crosstalk**
- **1.8V Logic Compatible Control Pin**
- **Break-Before-Make Switching**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green TQFN-2.6×1.8-16L and SOIC-16 Packages**

APPLICATIONS

Portable Instrumentation
Battery-Operated Equipment

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3711	TQFN-2.6×1.8-16L	-40℃ to +85℃	SGM3711YTQA16G/TR	3711 XXXXX	Tape and Reel, 3000
	SOIC-16	-40℃ to +85℃	SGM3711YS16G/TR	SGM3711YS16 XXXXX	Tape and Reel, 2500

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

V_{CC} to GND ..... 0V to 13.2V
IN1, IN2, EN to GND ..... 0V to 6V
Analog Voltage Range (1) ..... ($-V_{CC}$ - 0.3V) to (V_{CC} + 0.3V)
Continuous Current from NO to COM ..... ±50mA
Continuous Current from NC to COM ..... ±50mA
Peak Current from NO to COM ..... ±80mA
Peak Current from NC to COM ..... ±80mA
I/O Clamp Current (V_I < 0) ..... -30mA
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 7000V
MM 300V
CDM 1000V

NOTE:
1. Signals on NC, NO, or COM exceeding V_{CC} will be clamped by internal diodes. Limit forward diode current to maximum current ratings.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 2.7V to 12V
Operating Temperature Range ..... -40℃ to +85℃

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

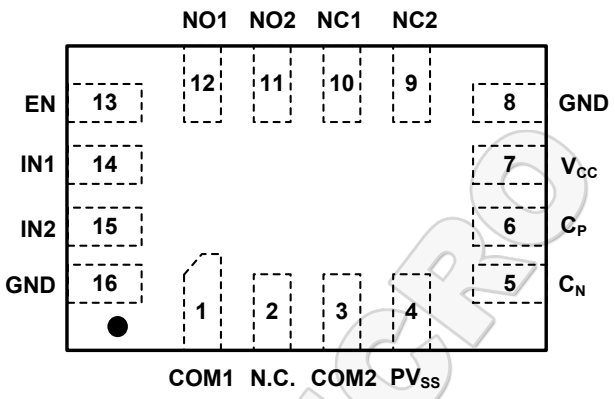
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

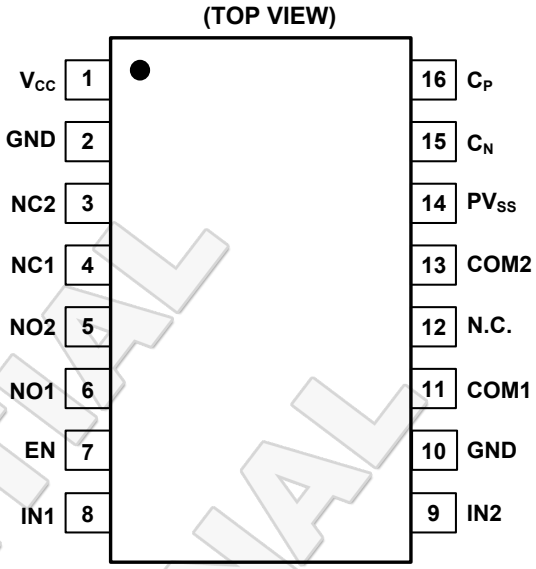
PIN CONFIGURATIONS

(TOP VIEW)



TQFN-2.6×1.8-16L

(TOP VIEW)



SOIC-16

PIN DESCRIPTION

PIN		NAME	FUNCTION
TQFN-2.6×1.8-16L	SOIC-16		
1	11	COM1	Common Terminal.
2	12	N.C.	No Connection.
3	13	COM2	Common Terminal.
4	14	PV_{SS}	Negative Supply Voltage Output. Connect one 0.1μF ceramic capacitor from PV_{SS} to GND.
5	15	C_N	Charge Pump Flying Capacitor Negative Terminal.
6	16	C_P	Charge Pump Flying Capacitor Positive Terminal.
7	1	V_{CC}	Power Supply.
8, 16	2, 10	GND	Ground.
9	3	NC2	Normally-Closed Terminal.
10	4	NC1	Normally-Closed Terminal.
11	5	NO2	Normally-Open Terminal.
12	6	NO1	Normally-Open Terminal.
13	7	EN	Enable Control. When EN = “Low”, both NC and NO will be disconnected with COM, negative charge pump doesn’t work and the SGM3711 will be in shutdown state. When EN = “High”, negative charge pump will work, and the SGM3711 will be in working state, and NC or NO will be connected with COM depending on the logical state of IN.
14	8	IN1	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminal.
15	9	IN2	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminal.

NOTE: NO, NC and COM terminals may be an input or output.

FUNCTION TABLE

Table 1. Function Table of Switch 1:

EN	IN1	COM1	NEGATIVE CHARGE PUMP
0	X	COM1 is disconnected with NO1 and NC1	Turn off
1	0	COM1 = NC1	Turn on
1	1	COM1 = NO1	Turn on

Table 2. Function Table of Switch 2:

EN	IN2	COM2	NEGATIVE CHARGE PUMP
0	X	COM2 is disconnected with NO2 and NC2	Turn off
1	0	COM2 = NC2	Turn on
1	1	COM2 = NO2	Turn on

ELECTRICAL CHARACTERISTICS

(V_{CC} = 5.0V, Full = -40℃ to +85℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	$-V_{CC}$		$+V_{CC}$	V
On-Resistance	R_{ON}	$-V_{CC}$ + 3V ≤ V_{NO}, V_{NC} ≤ V_{CC} - 3V, I_{COM} = -10mA, Test Circuit 1	+25℃		11	13	Ω
			Full			18	
On-Resistance Match Between Channels	ΔR_{ON}	$-V_{CC}$ + 3V ≤ V_{NO} or V_{NC} ≤ V_{CC} - 3V, I_{COM} = -10mA, Test Circuit 1	+25℃		0.3	0.6	Ω
			Full			0.65	
On-Resistance Flatness	$R_{FLAT(ON)}$	$-V_{CC}$ + 3V ≤ V_{NO} or V_{NC} ≤ V_{CC} - 3V, I_{COM} = -10mA, Test Circuit 1	+25℃		0.15	0.5	Ω
			Full			0.55	
Source OFF Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{NO} or V_{NC} = -4.5V, 4.5V, V_{COM} = 4.5V, -4.5V	+25℃		0.01	0.4	μA
			Full			1	
Channel ON Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_{NO} or V_{NC} = -4.5V, 4.5V, V_{COM} = floating, or V_{NO} or V_{NC} = floating, V_{COM} = -4.5V, 4.5V	+25℃		0.01	0.4	μA
			Full			1	
DIGITAL INPUTS							
Input High Voltage	V_{INH}	V_{CC} = 2.7V to 12V	Full	1.4			V
Input Low Voltage	V_{INL}	V_{CC} = 2.7V to 12V	Full			0.4	V
Pull Down Resistor	$R_{PULL\ DOWN}$		+25℃		600		kΩ
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2	+25℃		200		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 1.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2	+25℃		60		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 1.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 3	+25℃		100		ns
Off Isolation	O_{ISO}	f = 1kHz, R_L = 32Ω, Signal = 0dBm, Test Circuit 4	+25℃		-130		dB
		f = 1MHz, R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 4			-90		
Channel-to-Channel Crosstalk	X_{TALK}	f = 1kHz, R_L = 32Ω, Signal = 0dBm, Test Circuit 5	+25℃		-110		dB
		f = 1MHz, R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5			-75		
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	+25℃		300		MHz
Channel ON Capacitance	C_{ON}		+25℃		30		pF
Charge Injection	Q	V_G = GND, R_G = 0Ω, C_L = 1.0nF, Test Circuit 7	+25℃		80		pC
Total Harmonic Distortion	THD	A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $2V_{PP}$, R_L = 600Ω	+25℃		-113		dB
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $2V_{PP}$, R_L = 32Ω			-93		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $1V_{PP}$, R_L = 600Ω			-110		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $1V_{PP}$, R_L = 32Ω			-103		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $0.5V_{PP}$, R_L = 600Ω			-106		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $0.5V_{PP}$, R_L = 32Ω			-102		
Start Up Time	t_{START}	Switch V_{EN} = 0V to V_{EN} = 1.4V	+25℃		0.2		ms

ELECTRICAL CHARACTERISTICS (continued)

(V_{CC} = 5.0V, Full = -40℃ to +85℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
POWER REQUIREMENTS							
Power Supply Current	I_{CC}	V_{IN} = 0V or 1.4V, V_{EN} = 1.4V	+25℃		300	410	μA
			Full			415	
Power Supply Current in Shutdown State	I_{CC}	V_{IN} = 0V or 1.4V, V_{EN} = 0V	+25℃		0.3	0.8	μA
			Full			1.2	

ELECTRICAL CHARACTERISTICS (continued)

(V_{CC} = 12V, Full = -40℃ to +85℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		Full	$-V_{CC}$		$+V_{CC}$	V
On-Resistance	R_{ON}	$-V_{CC}$ + 3V ≤V_{NO}, V_{NC} ≤ V_{CC} - 3V, I_{COM} = -10mA, Test Circuit 1	+25℃		11	13	Ω
			Full			18	
On-Resistance Match Between Channels	ΔR_{ON}	$-V_{CC}$ + 3V ≤V_{NO} or V_{NC} ≤ V_{CC} - 3V, I_{COM} = -10mA, Test Circuit 1	+25℃		0.3	0.6	Ω
			Full			0.65	
On-Resistance Flatness	$R_{FLAT(ON)}$	$-V_{CC}$ + 3V ≤V_{NO} or V_{NC} ≤ V_{CC} - 3V, I_{COM} = -10mA, Test Circuit 1	+25℃		0.15	0.5	Ω
			Full			0.55	
Source OFF Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{NO} or V_{NC} = -11.5V, 11.5V, V_{COM} = 11.5V, -11.5V	+25℃		0.05	1	μA
			Full			3	
Channel ON Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_{NO} or V_{NC} = -11.5V, 11.5V, V_{COM} = floating, or V_{NO} or V_{NC} = floating, V_{COM} = -11.5V, 11.5V	+25℃		0.05	1	μA
			Full			3	
DIGITAL INPUTS							
Input High Voltage	V_{INH}	V_{CC} = 2.7V to 12V	Full	1.4			V
Input Low Voltage	V_{INL}	V_{CC} = 2.7V to 12V	Full			0.4	V
Pull Down Resistor	$R_{PULL\ DOWN}$		+25℃		600		kΩ
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2	+25℃		200		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 1.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2	+25℃		60		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 1.0V, R_L = 50Ω, C_L = 35pF, Test Circuit 3	+25℃		100		ns
Off Isolation	O_{ISO}	f = 1kHz, R_L = 32Ω, Signal = 0dBm, Test Circuit 4	+25℃		-130		dB
		f = 1MHz, R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 4			-90		
Channel-to-Channel Crosstalk	X_{TALK}	f = 1kHz, R_L = 32Ω, Signal = 0dBm, Test Circuit 5	+25℃		-110		dB
		f = 1MHz, R_L = 50Ω, C_L = 5pF, Signal = 0dBm, Test Circuit 5			-75		
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	+25℃		300		MHz
Channel ON Capacitance	C_{ON}		+25℃		30		pF
Charge Injection	Q	V_G = GND, R_G = 0Ω, C_L = 1.0nF, Test Circuit 7	+25℃		100		pC
Total Harmonic Distortion	THD	A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $2V_{PP}$, R_L = 600Ω	+25℃		-113		dB
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $2V_{PP}$, R_L = 32Ω			-93		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $1V_{PP}$, R_L = 600Ω			-110		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $1V_{PP}$, R_L = 32Ω			-103		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $0.5V_{PP}$, R_L = 600Ω			-106		
		A-Weighting, Test Circuit 8; V_{NO}, V_{NC} = $0.5V_{PP}$, R_L = 32Ω			-102		
Start Up Time	t_{START}	Switch V_{EN} = 0V to V_{EN} = 1.4V	+25℃		0.2		ms

ELECTRICAL CHARACTERISTICS (continued)

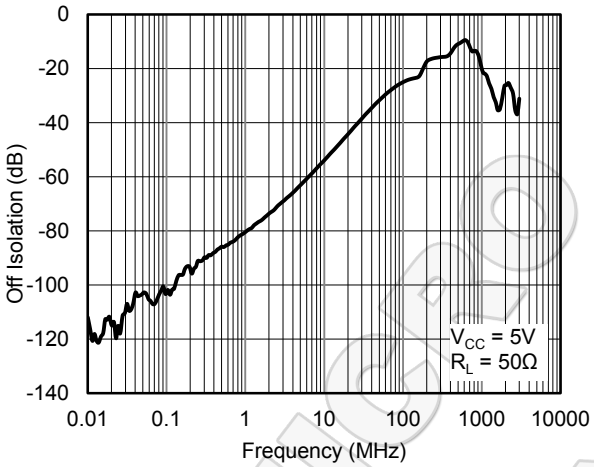
(V_{CC} = 12V, Full = -40℃ to +85℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
POWER REQUIREMENTS							
Power Supply Current	I_{CC}	V_{IN} = 0V or 1.4V, V_{EN} = 1.4V	+25℃		400	540	μA
			Full			550	
Power Supply Current in Shutdown State	I_{CC}	V_{IN} = 0V or 1.4V, V_{EN} = 0V	+25℃		0.5	1.2	μA
			Full			1.5	

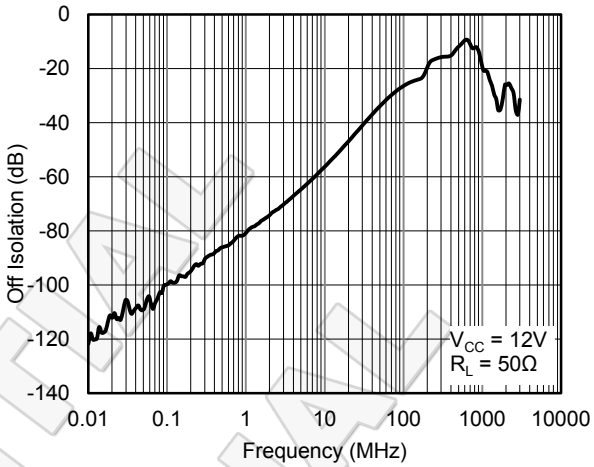
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, unless otherwise noted.

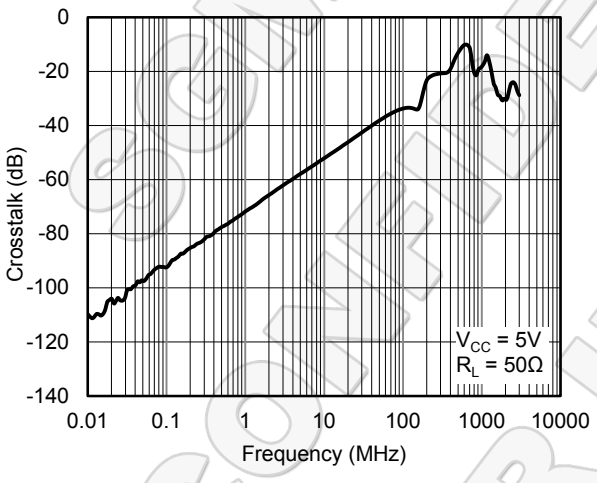
Off Isolation vs. Frequency



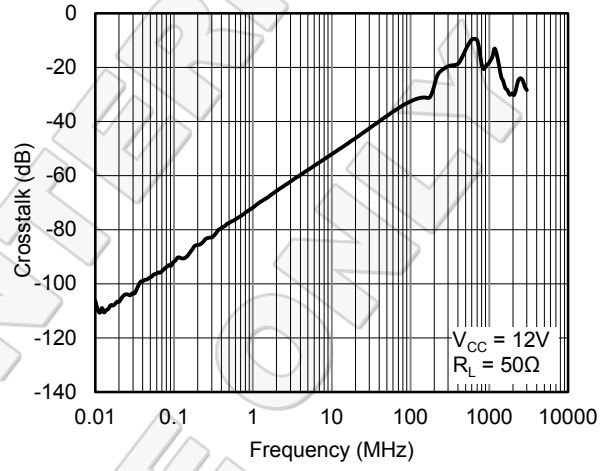
Off Isolation vs. Frequency



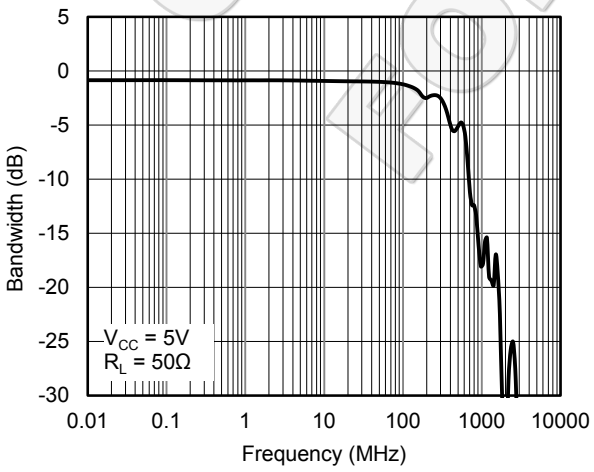
Crosstalk vs. Frequency



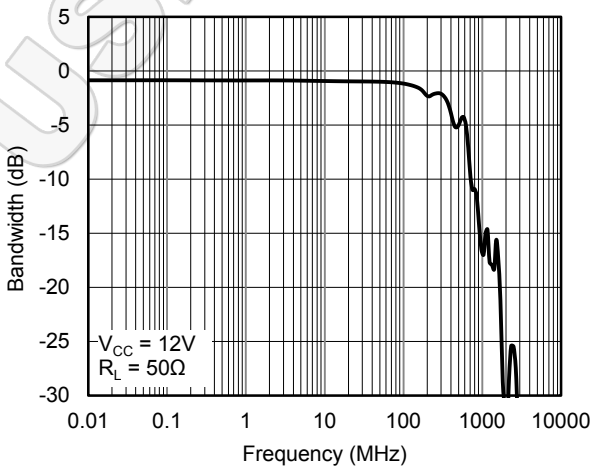
Crosstalk vs. Frequency



Bandwidth vs. Frequency



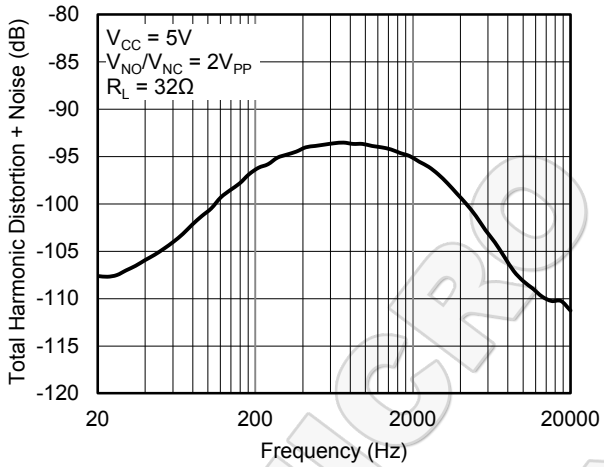
Bandwidth vs. Frequency



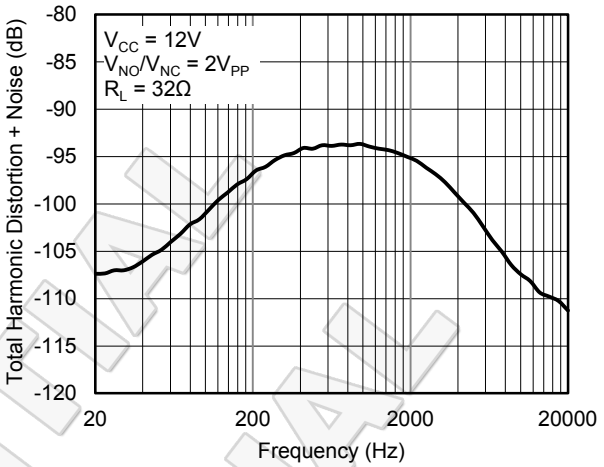
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, unless otherwise noted.

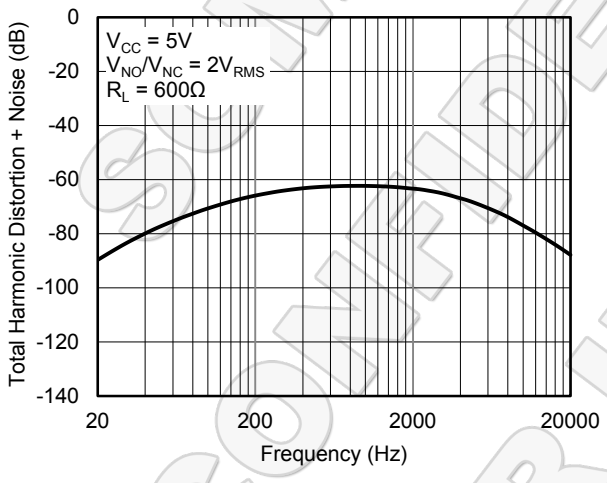
Total Harmonic Distortion vs. Frequency



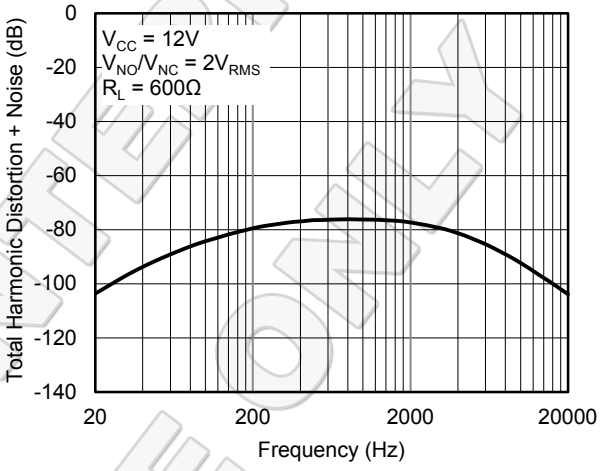
Total Harmonic Distortion vs. Frequency



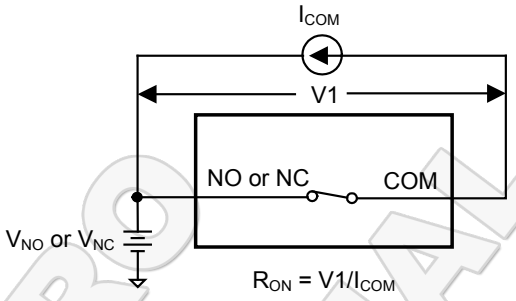
Total Harmonic Distortion vs. Frequency



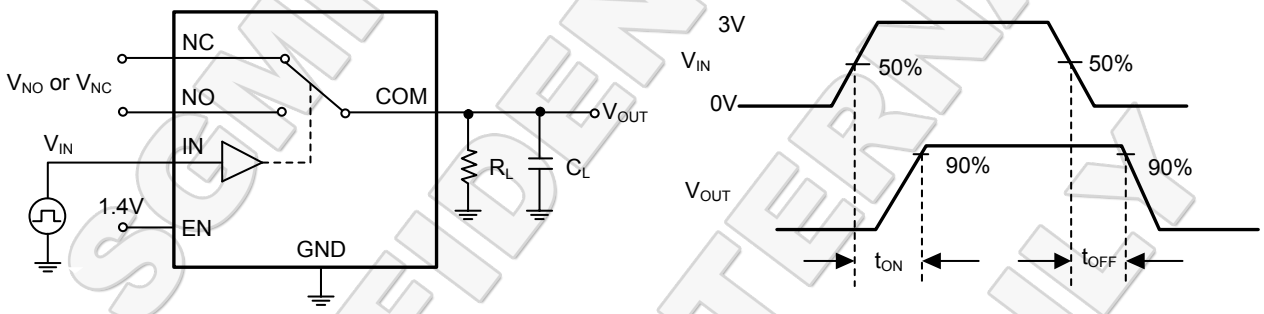
Total Harmonic Distortion vs. Frequency



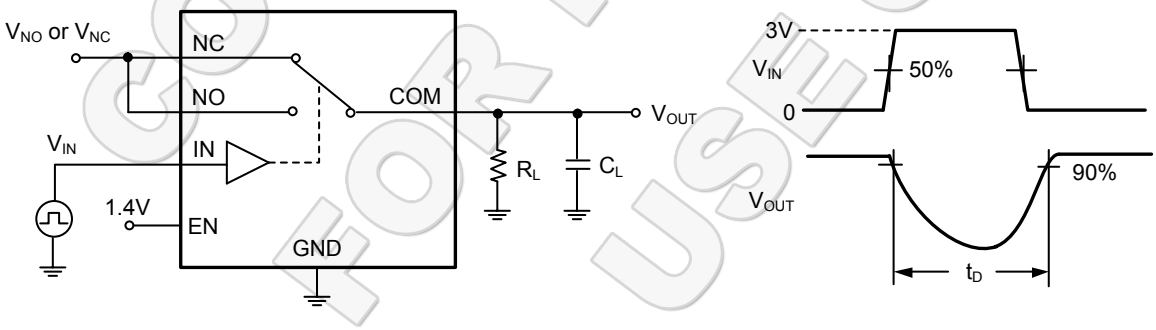
TEST CIRCUITS



Test Circuit 1. On Resistance

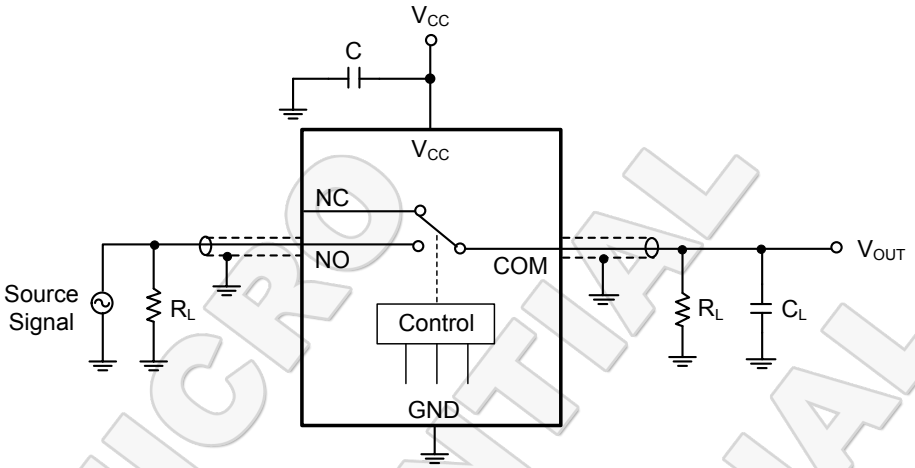


Test Circuit 2. Switching Times (t_{ON}, t_{OFF})

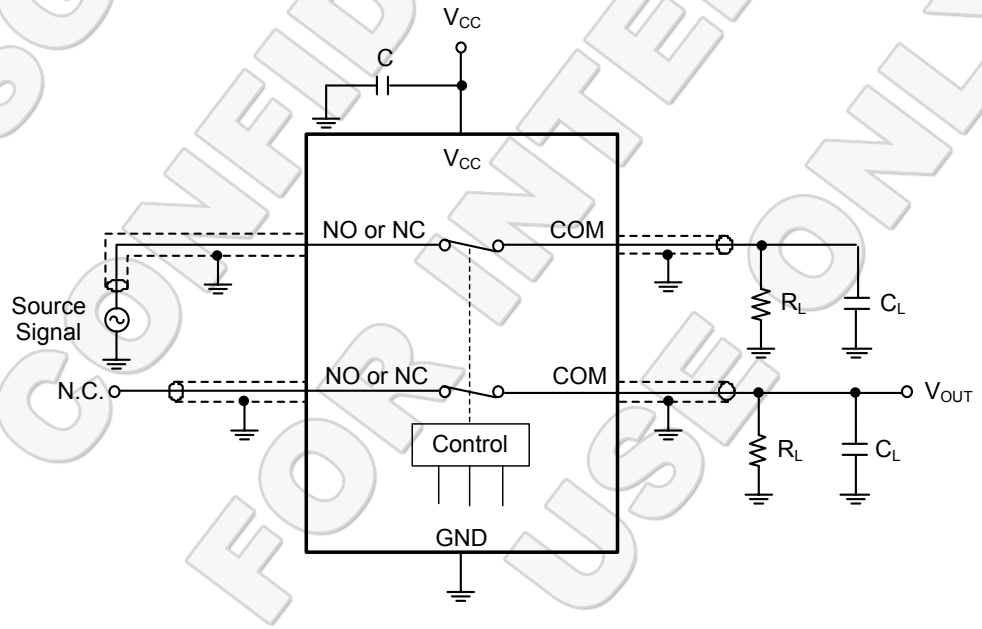


Test Circuit 3. Break-Before-Make Time Delay (t_D)

TEST CIRCUITS (continued)



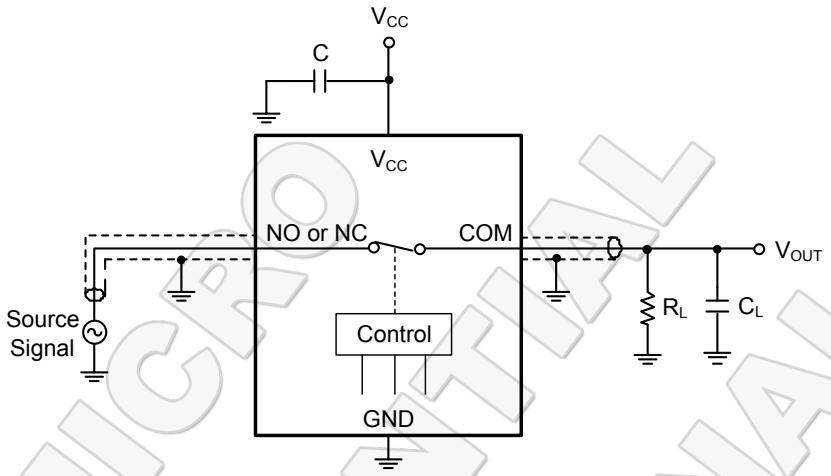
Test Circuit 4. Off Isolation



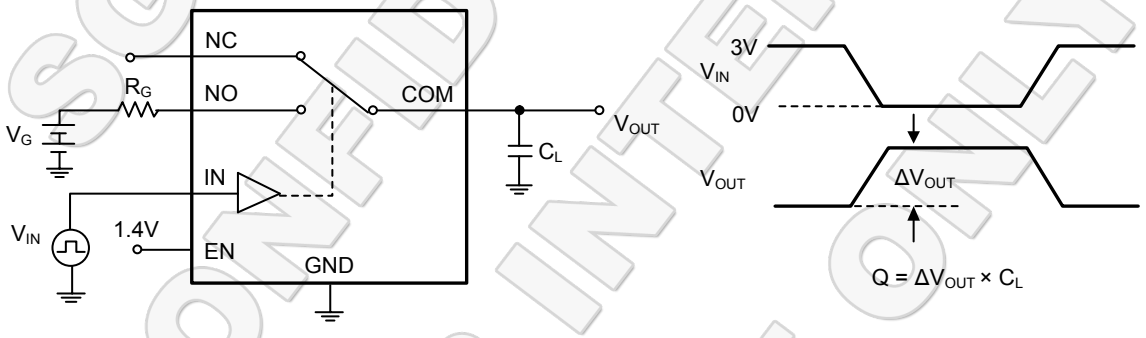
$$\text{Channel-to-Channel Crosstalk} = -20 \times \log \frac{V_{NO} \text{ or } V_{NC}}{V_{OUT}}$$

Test Circuit 5. Channel-to-Channel Crosstalk

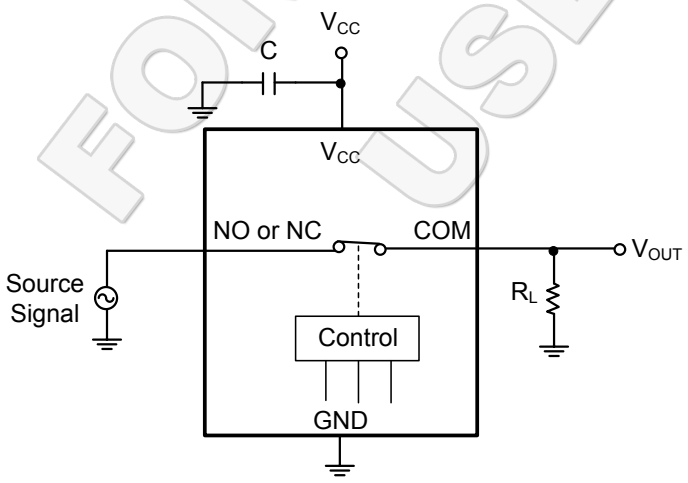
TEST CIRCUITS (continued)



Test Circuit 6. -3dB Bandwidth



Test Circuit 7. Charge Injection (Q)



Test Circuit 8. Total Harmonic Distortion (THD)

APPLICATION INFORMATION

Speaker + Receiver is always used in portable devices, and high voltage class D speaker driver is used to drive speaker in order to provide high audio volume. But the high output voltage of class D speaker driver will damage the receiver driver. The SGM3711 provides the safe isolation between receiver driver and high voltage class D speaker driver. The SGM3711 provides low R_{ON} channels to pass the positive and negative signals from capless receiver driver. The circuit is shown in Figure 1.

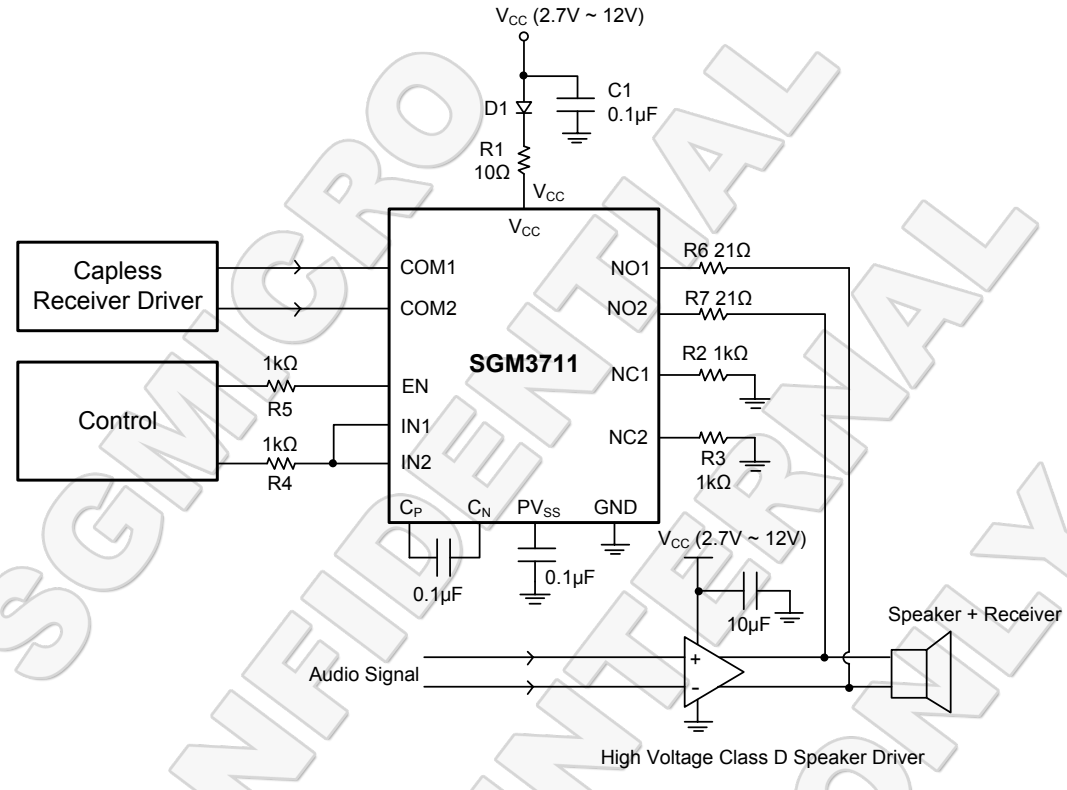


Figure 1. Typical Application Circuit

REVISION HISTORY

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

FEBRUARY 2017 – REV.A.1 to REV.A.2

Added Application Information section	14

NOVEMBER 2016 – REV.A to REV.A.1

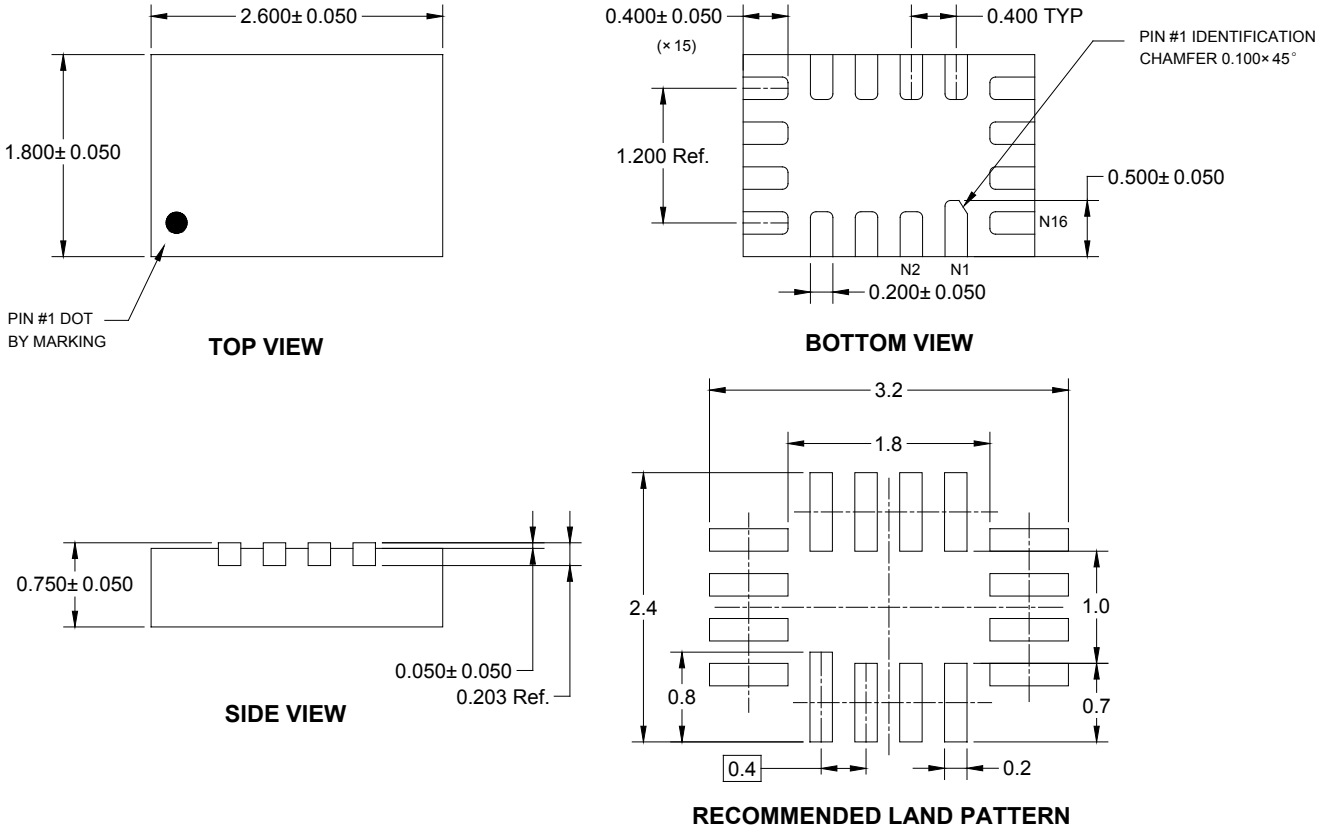
Changed Electrical Characteristics section	5~8
Changed Test Circuits section	12~13

Changes from Original (AUGUST 2016) to REV.A

Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

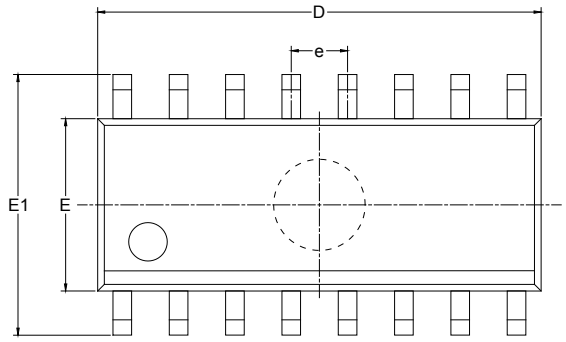
TQFN-2.6×1.8-16L

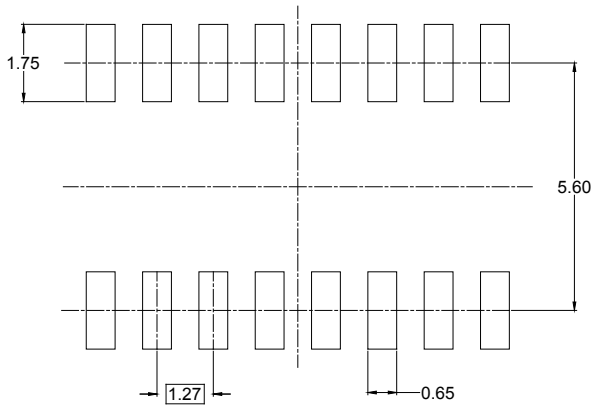


NOTE: All linear dimensions are in millimeters.

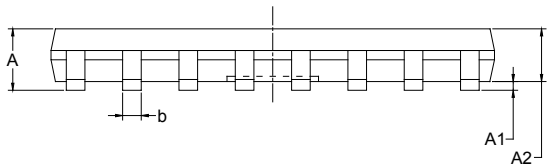
PACKAGE OUTLINE DIMENSIONS

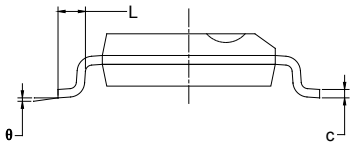
SOIC-16





RECOMMENDED LAND PATTERN (Unit: mm)

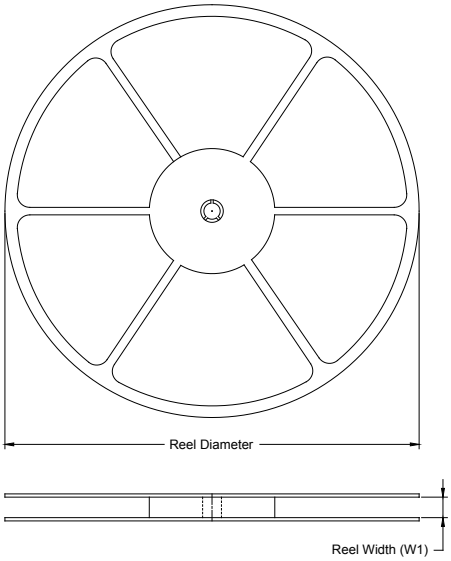




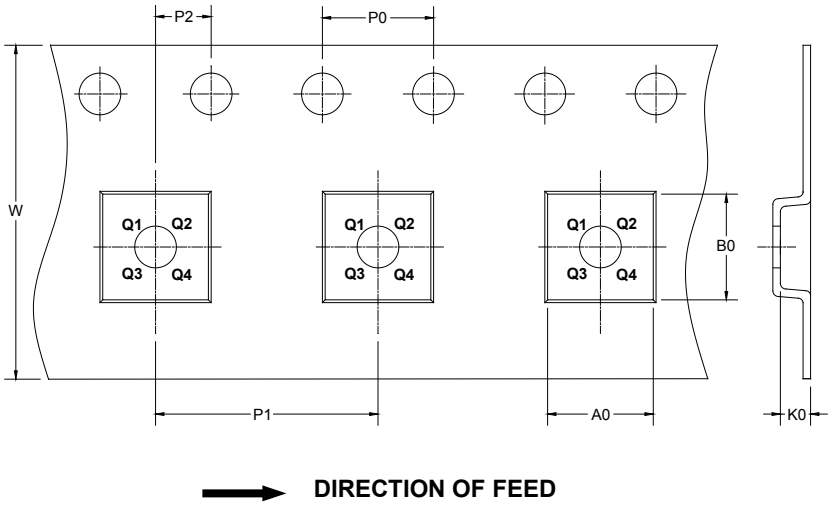
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



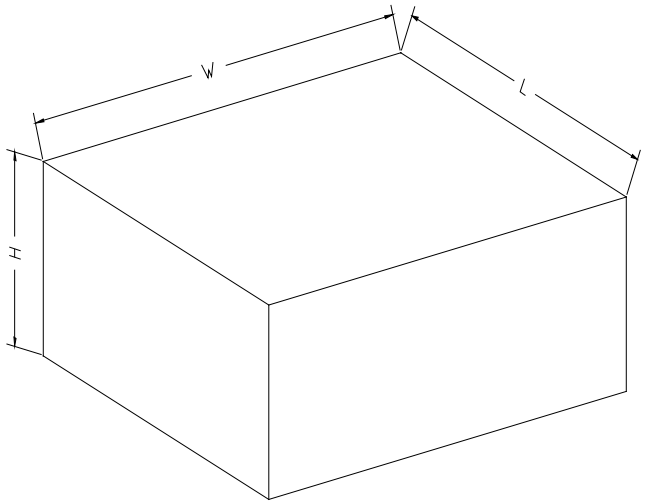
NOTE: The picture is only for reference. Please make the object as the standard.

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
TQFN-2.6×1.8-16L	7″	9.0	2.01	2.81	0.93	4.0	4.0	2.0	8.0	Q1
SOIC-16	13″	16.4	6.50	10.30	2.10	4.0	8.0	2.0	16.0	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
7″ (Option)	368	227	224	8
7″	442	410	224	18
13″	386	280	370	5

DD0002