SGM3718
0.6Ω Ultra Low On-Resistance, Negative Signal Passing, Dual SPDT Analog Switch

GENERAL DESCRIPTION

The SGM3718 is a negative signal passing dual single-pole/double-throw (SPDT) analog switch that is designed to operate from a single +2.5V to +5V power supply. Targeted applications include battery powered equipment that benefit from SGM3718's ultra low on-resistance (0.6Ω) and fast switching speeds (t_{ON} = 17ns, t_{OFF} = 24ns).

The SGM3718 has excellent on-resistance matching (0.22Ω MAX) between switches and guarantees excellent on-resistance flatness over all signal range (0.22Ω MAX). This ensures excellent linearity and low distortion when switching audio signals.

The SGM3718 is a committed dual single-pole/double-throw (SPDT) 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 SGM3718 can pass -2V ground referenced signal with very low distortion.

The SGM3718 is available in Green TQFN-1.8×1.4-10L package. It operates over an ambient temperature range of -40℃ to +85℃.

FEATURES

- **Supply Voltage Range: 2.5V to 5V**
- **Ultra Low On-Resistance: 0.6Ω (TYP) at 4.5V**
- **-2V Low Distortion Negative Signal Passing**
- **Fast Switching Times**
  - **t_{ON} = 17ns (TYP)**
  - **t_{OFF} = 24ns (TYP)**
- **High Off-Isolation: -57dB at 1MHz**
- **Low Crosstalk: -61dB at 1MHz**
- **Rail-to-Rail Input and Output Operation**
- **1.8V Logic Compatible Control Pin**
- **Break-Before-Make Switching**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in Green TQFN-1.8×1.4-10L Package**

APPLICATIONS

Portable Instrumentation
Battery-Operated Equipment

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3718	TQFN-1.8×1.4-10L	-40℃ to +85℃	SGM3718YUWQ10G/TR	TBXX	Tape and Reel, 3000

NOTE: XX = Date 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.

MARKING INFORMATION

TB X X

Date code - Month ("A" = Jan. "B" = Feb. ⋯ "L" = Dec.)
Date code - Year ("A" = 2010, "B" = 2011 ⋯)
Chip I.D.

For example: TBDJ (2013, October)

ABSOLUTE MAXIMUM RATINGS

V_+, IN to GND ..... 0V to 6.0V
Analog Voltage Range (1) ..... -2V to (V_+) + 0.3V
Digital Voltage Range (1) ..... -0.3V to (V_+) + 0.3V
Continuous Current NO, NC, or COM ..... ±250mA
Peak Current NO, NC, or COM ..... ±350mA
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 8000V
MM 400V

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

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 2.5V to 5V
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

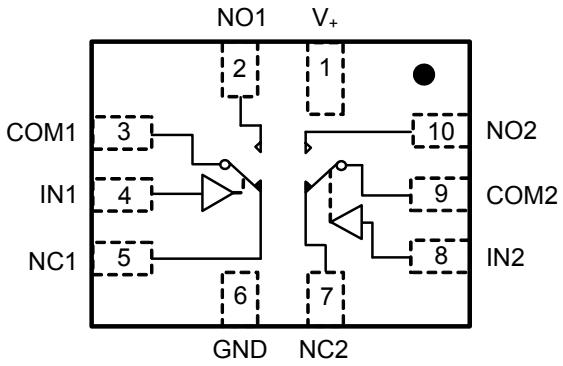
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

SGM3718 (TOP VIEW)



TQFN-1.8×1.4-10L

PIN DESCRIPTION

PIN	NAME	FUNCTION
1	V_+	Power Supply.
2, 10	NO1, NO2	Normally-Open Terminal.
3, 9	COM1, COM2	Common Terminal.
4, 8	IN1, IN2	Digital Control Pin to Connect the COM Terminal to the NO or NC Terminals.
5, 7	NC1, NC2	Normally-Closed Terminal.
6	GND	Ground.

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

FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

Switches Shown for Logic “0” Input.

ELECTRICAL CHARACTERISTICS

(V_+ = +4.5V to +5.0V, Full = -40℃ to +85℃. Typical values are at V_+ = +5.0V, 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}	2.5V ≤ V_+ ≤ 3.5V		Full	-2		V_+	V
		3.5V ≤ V_+ ≤ 5.0V			(V_+) - 5.5		V_+	
On-Resistance	R_{ON}	V_+ = 4.5V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		0.6	0.85	Ω
				Full			1	
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 4.5V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		0.15	0.22	Ω
				Full			0.26	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 4.5V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1		+25℃		0.15	0.22	Ω
				Full			0.26	
Source OFF Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_+ = 5.0V, V_{NO} or V_{NC} = 1.0V, 4.5V, V_{COM} = 4.5V, 1.0V		Full			1	μA
Channel ON Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_+ = 5.0V, V_{COM} = 1.0V, 4.5V, V_{NO} or V_{NC} = 1.0V, 4.5V, or floating		Full			1.5	μA
DIGITAL INPUTS								
Input High Voltage	V_{INH}			Full	1.5			V
Input Low Voltage	V_{INL}			Full			0.6	V
Input Leakage Current	I_{IN}	V_+ = 5.0V, V_{IN} = 0V or 5.0V		Full			1	μA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 3.0V, V_{IH} = 1.8V, V_{IL} = 0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2		+25℃		17		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 3.0V, V_{IH} = 1.8V, V_{IL} = 0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2		+25℃		24		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 3V, R_L = 50Ω, C_L = 35pF, Test Circuit 3		+25℃		32		ns
Off Isolation	O_{ISO}	R_L = 50Ω, Signal = 0dBm, C_L = 5pF, Test Circuit 4	f = 100kHz	+25℃		-77		dB
			f = 1MHz	+25℃		-57		dB
Channel-to-Channel Crosstalk	X_{TALK}	R_L = 50Ω, C_L = 5pF, Test Circuit 5	f = 100kHz	+25℃		-81		dB
			f = 1MHz	+25℃		-61		dB
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6		+25℃		80		MHz
Channel ON Capacitance	C_{ON}	f = 1MHz		+25℃		88		pF
Charge Injection Select Input to Common I/O	Q	V_G = GND, R_G = 0Ω, C_L = 1.0nF, Test Circuit 7		+25℃		85		pC
POWER REQUIREMENTS								
Power Supply Current	I_+	V_+ = 5.0V, V_{IN} = 0V or 5.0V		Full			3.5	μA

ELECTRICAL CHARACTERISTICS

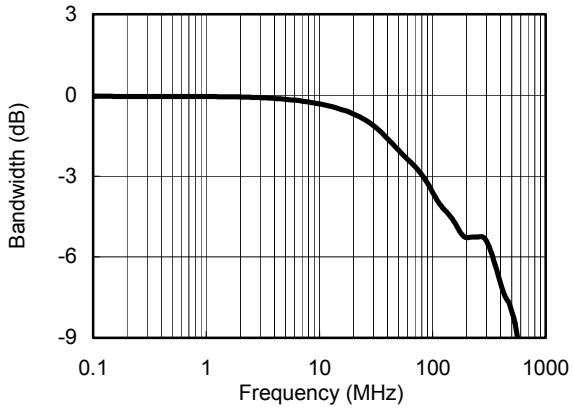
(V_+ = +2.7V to +3.6V, Full = -40℃ to +85℃. Typical values are at V_+ = +3.0V, T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}	2.5V ≤ V_+ ≤ 3.5V	Full	-2		V_+	V
		3.5V ≤ V_+ ≤ 5.0V		(V_+) - 5.5		V_+	
On-Resistance	R_{ON}	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1	+25℃		1	1.3	Ω
			Full			1.4	
On-Resistance Match Between Channels	ΔR_{ON}	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1	+25℃		0.15	0.25	Ω
			Full			0.3	
On-Resistance Flatness	$R_{FLAT(ON)}$	V_+ = 2.7V, 0V ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = -100mA, Test Circuit 1	+25℃		0.4	0.55	Ω
			Full			0.6	
Source OFF Leakage Current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_+ = 3.6V, V_{NO} or V_{NC} = 0.3V, 3.3V, V_{COM} = 3.3V, 0.3V	Full			1	μA
Channel ON Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_+ = 3.6V, V_{COM} = 0.3V, 3.3V, V_{NO} or V_{NC} = 0.3V, 3.3V, or floating	Full			1.5	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		Full	1.3			V
Input Low Voltage	V_{INL}		Full			0.4	V
Input Leakage Current	I_{IN}	V_+ = 3.6V, V_{IN} = 0V or 3.6V	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 1.5V, V_{IH} = 1.8V, V_{IL} = 0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2	+25℃		23		ns
Turn-Off Time	t_{OFF}	V_{NO} or V_{NC} = 1.5V, V_{IH} = 1.8V, V_{IL} = 0V, R_L = 50Ω, C_L = 35pF, Test Circuit 2	+25℃		24		ns
Break-Before-Make Time Delay	t_D	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 1.5V, R_L = 50Ω, C_L = 35pF, Test Circuit 3	+25℃		33		ns
Off Isolation	O_{ISO}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 4, f = 100kHz	+25℃		-77		dB
		Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 4, f = 1MHz	+25℃		-57		dB
Channel-to-Channel Crosstalk	X_{TALK}	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 5, f = 100kHz	+25℃		-81		dB
		Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 5, f = 1MHz	+25℃		-61		dB
-3dB Bandwidth	BW	Signal = 0dBm, R_L = 50Ω, C_L = 5pF, Test Circuit 6	+25℃		80		MHz
Charge Injection Select Input to Common I/O	Q	V_G = GND, R_G = 0Ω, C_L = 1.0nF, Test Circuit 7	+25℃		74		pC
Channel ON Capacitance	C_{ON}	f = 1MHz	+25℃		88		pF
Total Harmonic Distortion	THD	V_+ = 3.3V, $V_{NC/NO}$ = $2V_{PP}$, R_L = 600Ω, f = 20Hz to 20kHz, Test Circuit 8	+25℃		0.03		%
		V_+ = 3.3V, $V_{NC/NO}$ = $2V_{PP}$, R_L = 32Ω, f = 20Hz to 20kHz, Test Circuit 8	+25℃		0.1		
		V_+ = 3.3V, $V_{NC/NO}$ = $1V_{PP}$, R_L = 32Ω, f = 20Hz to 20kHz, Test Circuit 8	+25℃		0.035		
		V_+ = 3.3V, $V_{NC/NO}$ = $0.5V_{PP}$, R_L = 32Ω, f = 20Hz to 20kHz, Test Circuit 8	+25℃		0.027		
POWER REQUIREMENTS							
Power Supply Current	I_+	V_+ = 3.0V, V_{IN} = 0V or 3.0V	Full			1	μA

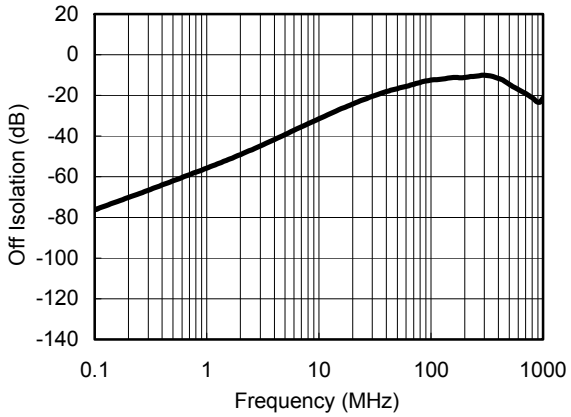
TYPICAL PERFORMANCE CHARACTERISTICS

V_+ = 5.0V, T_A = +25℃, unless otherwise specified.

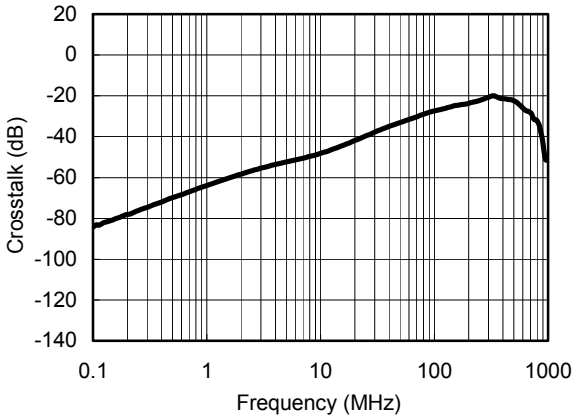
Bandwidth vs. Frequency



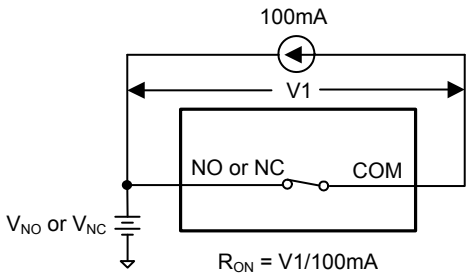
Off Isolation vs. Frequency



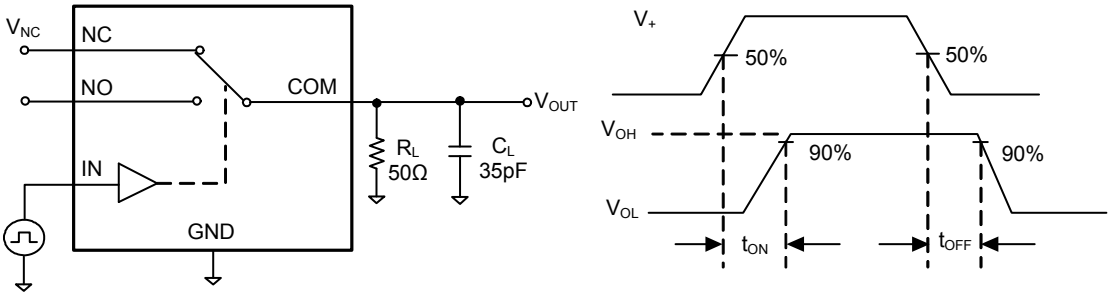
Crosstalk vs. Frequency



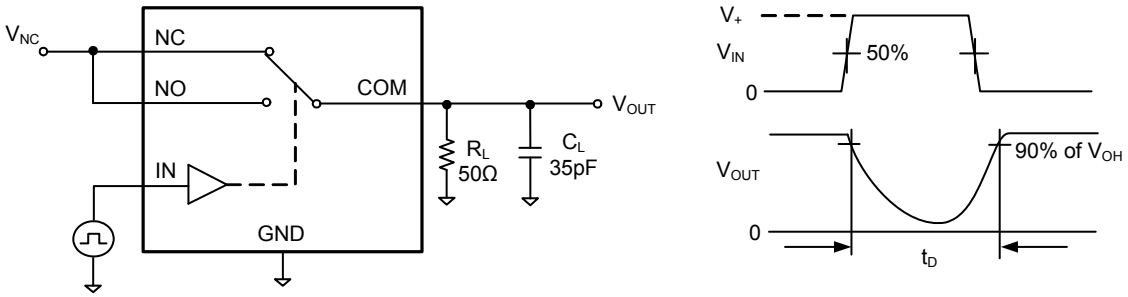
TEST CIRCUITS



Test Circuit 1. On Resistance

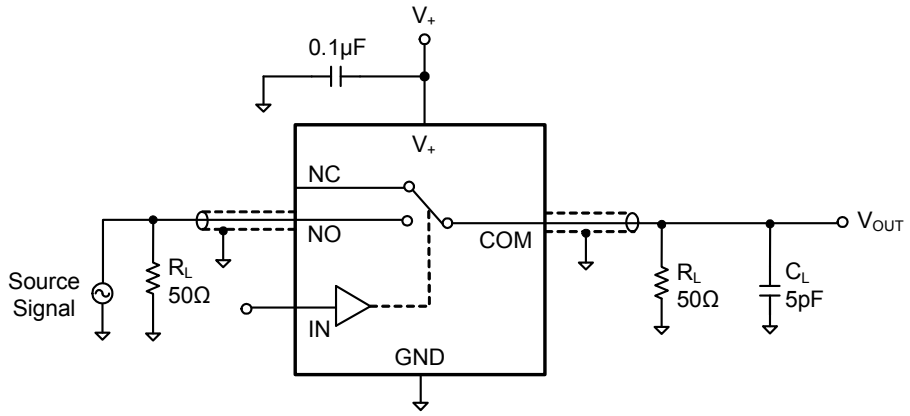


Test Circuit 2. Switching Times (t_{ON}, t_{OFF})

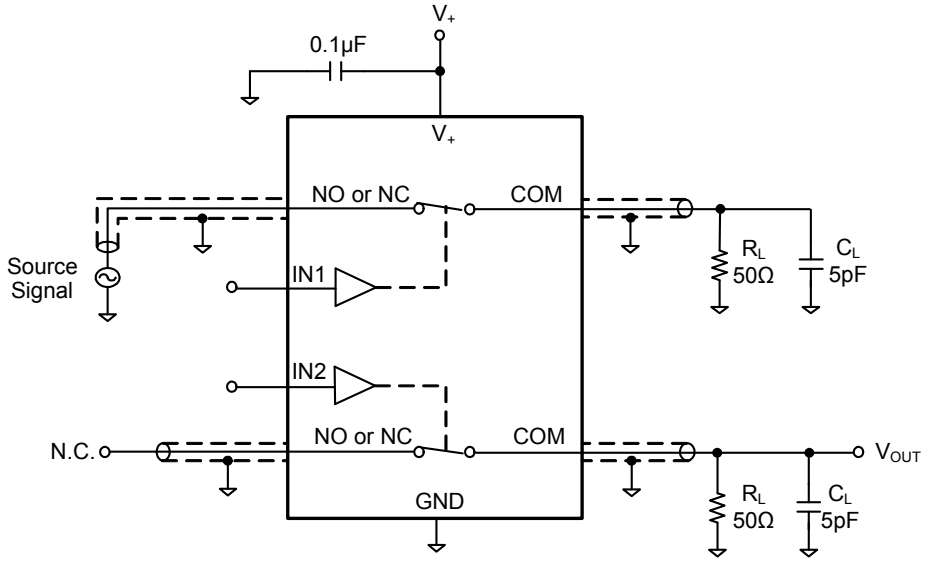


Test Circuit 3. Break-Before-Make Time Delay (t_D)

TEST CIRCUITS



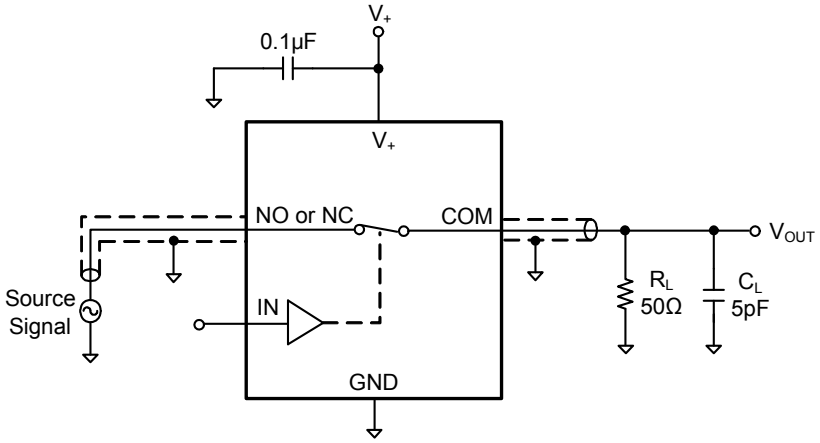
Test Circuit 4. Off Isolation



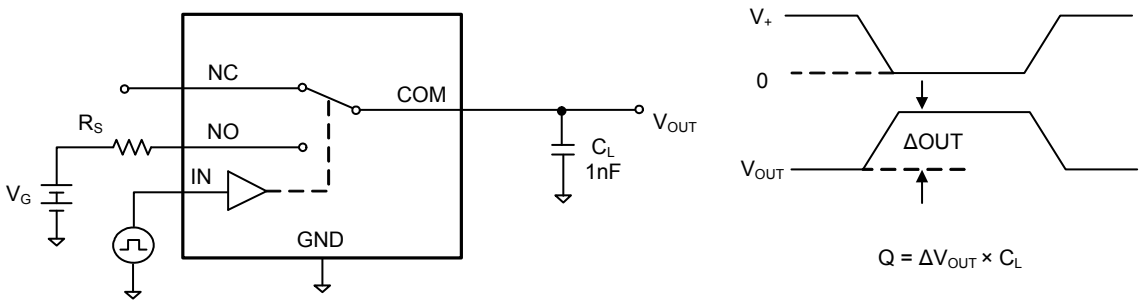
$$\text{Channel-to-Channel Crosstalk} = -20 \times \log \frac{V_{NO} \text{ or } V_{NC}}{V_{OUT}}$$

Test Circuit 5. Channel-to-Channel Crosstalk

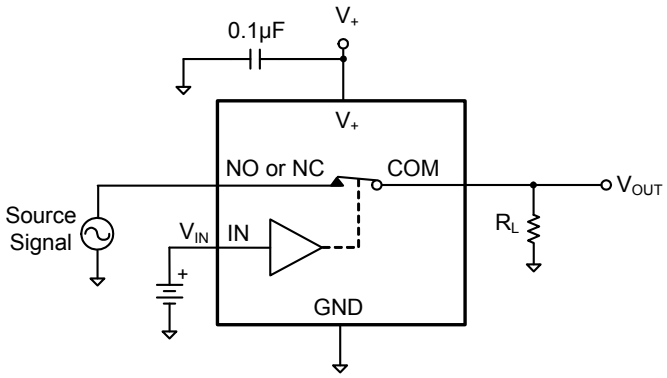
TEST CIRCUITS



Test Circuit 6. -3dB Bandwidth



Test Circuit 7. Charge Injection (Q)



Test Circuit 8. Total Harmonic Distortion (THD)

APPLICATION

In order to enhance the negative signal swing capability of SGM3718, the circuit in Figure 1 is recommended. R1 and R4 will prevent the device from entering into latch-up state when passing negative signal.

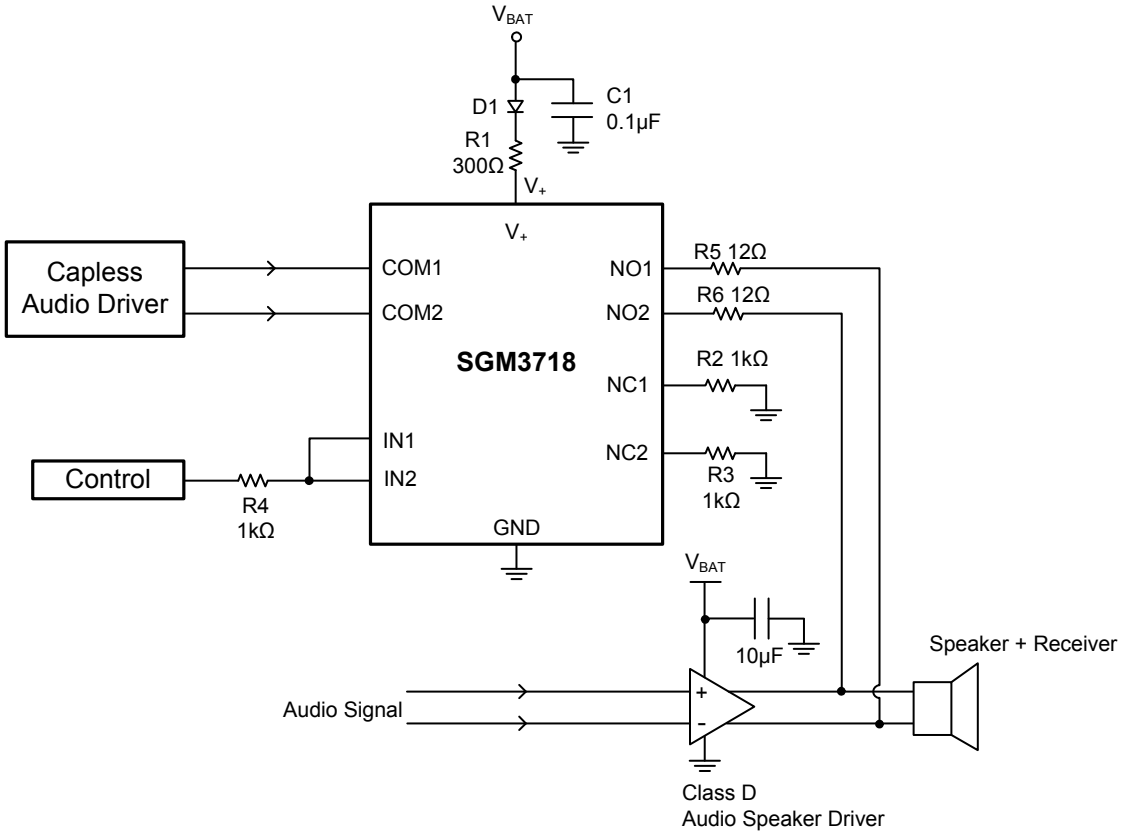
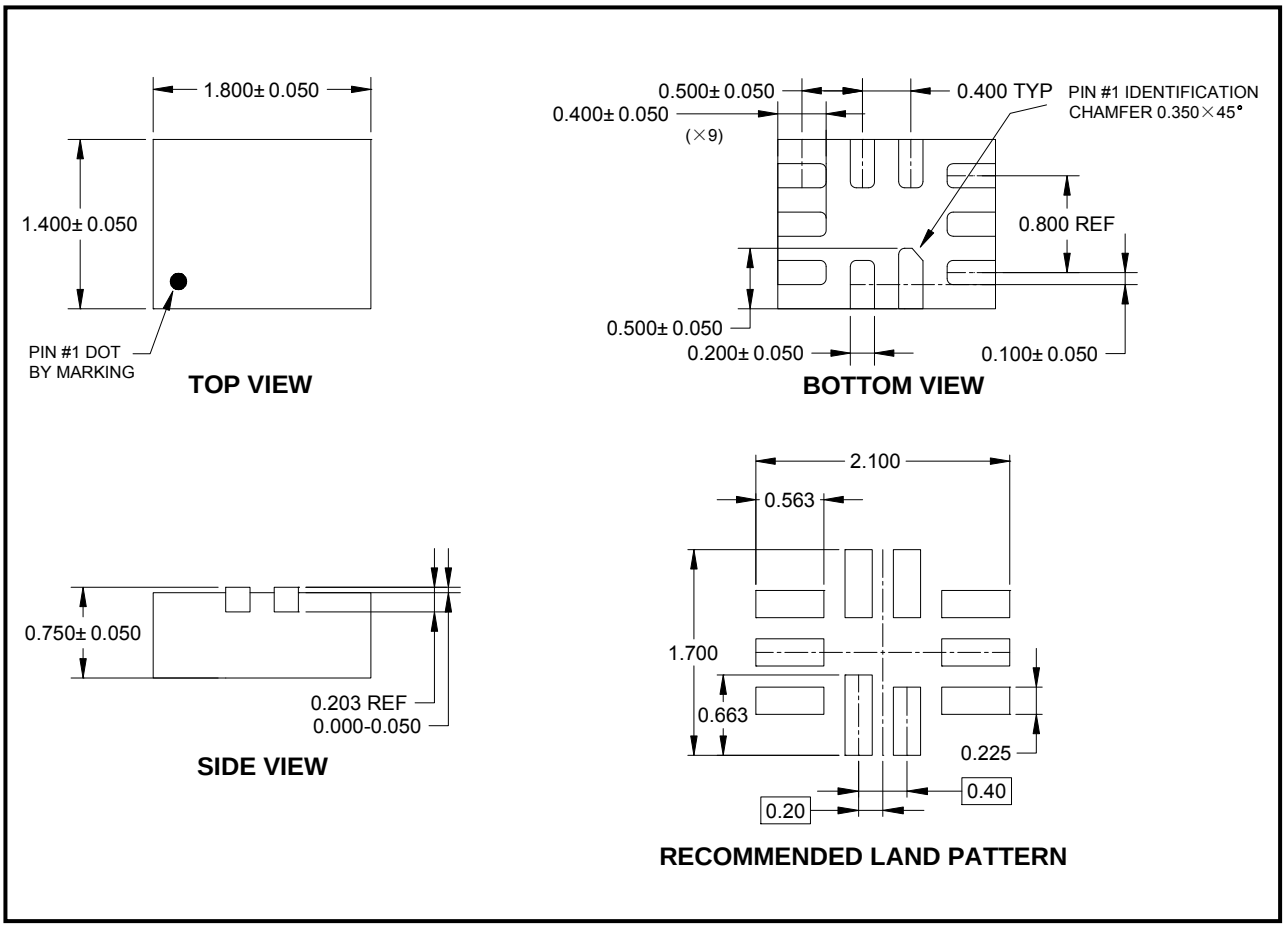


Figure 1. Typical Application Circuit

PACKAGE OUTLINE DIMENSIONS

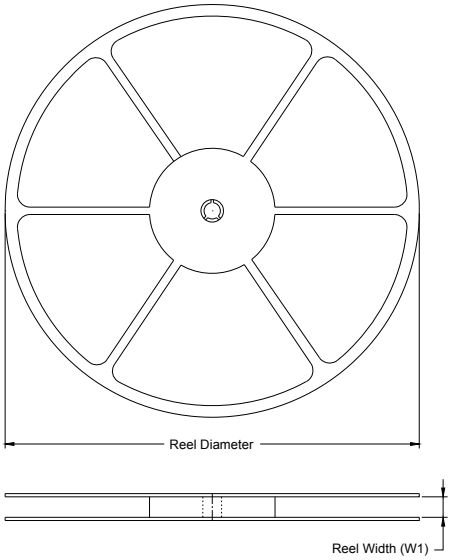
TQFN-1.8×1.4-10L



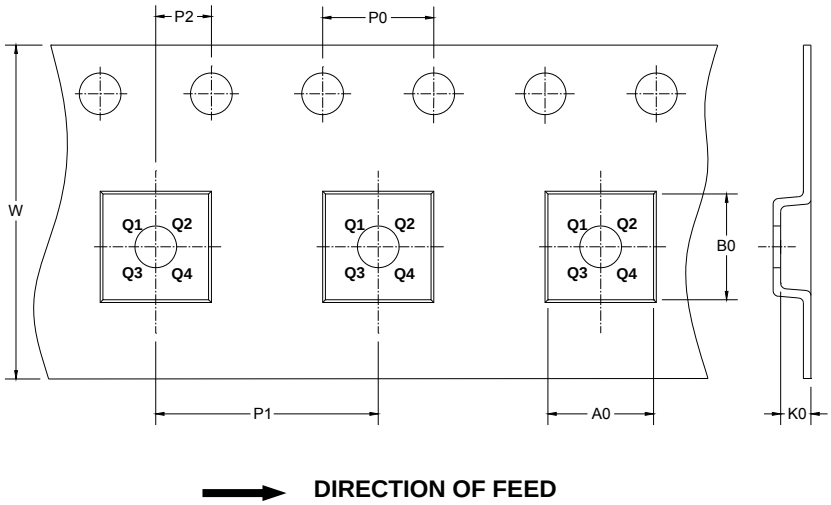
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



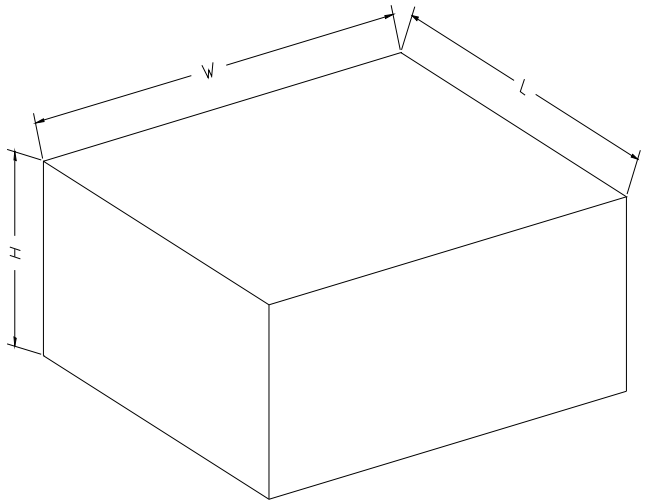
NOTE: The picture is only for reference. Please make the object as the standard.

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-1.8×1.4-10L	7″	9.0	1.75	2.10	1.00	4.00	4.00	2.00	8.00	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

DD0002

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