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

GENERAL DESCRIPTION

The SGM3718 is a dual SPDT (single-pole/double-throw) analog switch. It operates from a 2.5V to 5V single power supply and allows a -2V negative signal passing with low distortion.

The SGM3718 features ultra-low on-resistance, low voltage and fast switching times. The high performances make it very suitable for multiple applications, such as portable equipment, battery-powered systems, etc. In addition, the SGM3718 can be used as a dual 2-to-1 multiplexer because it has two normally open and two normally close switches. Low power consumption is also one of the important reasons that make it a good choice.

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

FEATURES

- **Single Supply Voltage Range: 2.5V to 5V**
- **Negative Signal Swing Capability: -2V to V_+**
- **Ultra Low On-Resistance: 0.6Ω (TYP) at V_+ = 4.5V**
- **Fast Switching Times:**
  - **t_{ON}: 17ns (TYP)**
  - **t_{OFF}: 24ns (TYP)**
- **Low On-Resistance Flatness**
- **-3dB Bandwidth: 400MHz**
- **High Off-Isolation: -57dB at 1MHz**
- **Low Crosstalk: -61dB at 1MHz**
- **1.8V Logic Control**
- **Rail-to-Rail Input and Output Operation**
- **Break-Before-Make Switching**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in a Green UTQFN-1.8×1.4-10L Package**

APPLICATIONS

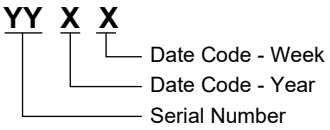
Cellular Phones
Portable Equipment
Sample-and-Hold Circuits
Battery-Powered Systems

PACKAGE/ORDERING INFORMATION

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

MARKING INFORMATION

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.

ABSOLUTE MAXIMUM RATINGS

V_+, IN to GND ..... 0V to 6V
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. Internal diodes will clamp voltages on NC, NO, or COM that exceed V_+. Limit the current through the forward diode to the maximum ratings.

RECOMMENDED OPERATING CONDITIONS

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

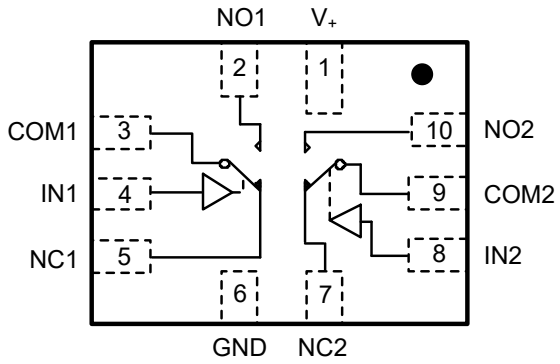
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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)



UTQFN-1.8×1.4-10L

PIN DESCRIPTION

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

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

FUNCTION TABLE

LOGIC	NO	NC
0	OFF	ON
1	ON	OFF

NOTE: Switches shown for logic "0" input.

ELECTRICAL CHARACTERISTICS

(V_+ = 4.5V to 5V, Full = -40℃ to +85℃. Typical values are at V_+ = 5V, 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_+ ≤ 5V			(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_+ = 5V, V_{NO} or V_{NC} = 1V, 4.5V, V_{COM} = 4.5V, 1V		Full			1	μA
Channel On Leakage Current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_+ = 5V, V_{COM} = 1V, 4.5V, V_{NO} or V_{NC} = 1V, 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_+ = 5V, V_{IN} = 0V or 5V		Full			1	μA
Dynamic Characteristics								
Turn-On Time	t_{ON}	V_{NO} or V_{NC} = 3V, 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} = 3V, 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 = 1nF, Test Circuit 7		+25℃		85		pC
Power Requirements								
Power Supply Current	I_+	V_+ = 5V, V_{IN} = 0V or 5V		Full			3.5	μA

ELECTRICAL CHARACTERISTICS (continued)

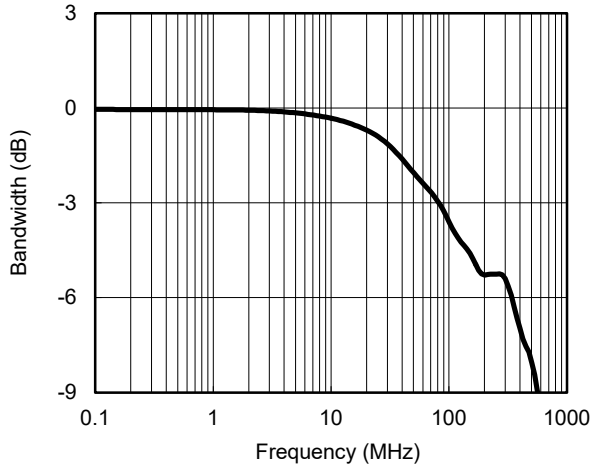
(V_+ = 2.7V to 3.6V, Full = -40℃ to +85℃. Typical values are at V_+ = 3V, T_A = +25℃, unless otherwise noted.)

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_+ ≤ 5V			(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
			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
			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 = 1nF, 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_+ = 3V, V_{IN} = 0V or 3V		Full			1	μA

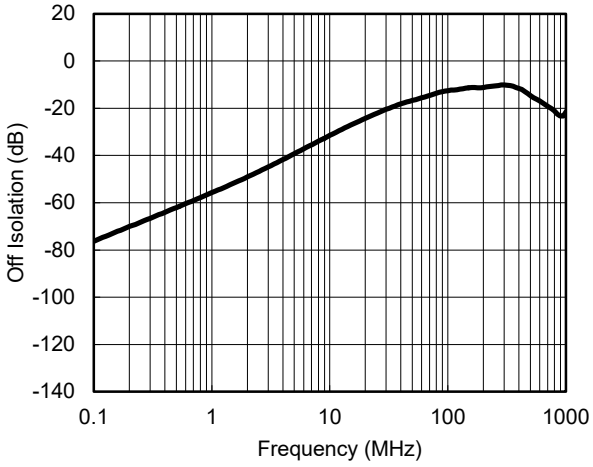
TYPICAL PERFORMANCE CHARACTERISTICS

V_+ = 5V, T_A = +25℃, unless otherwise specified.

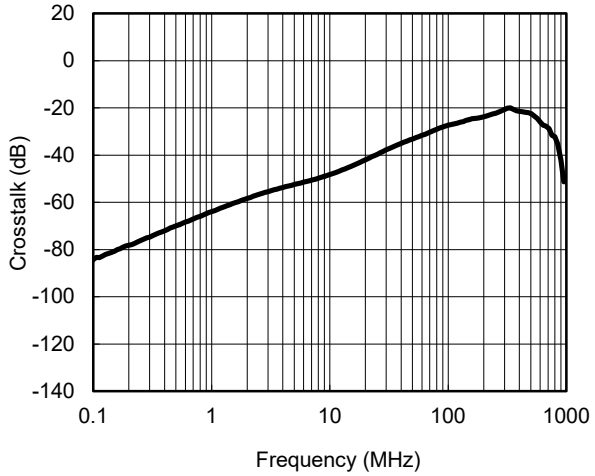
Bandwidth vs. Frequency



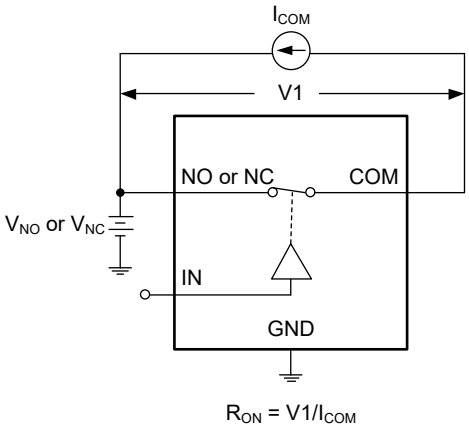
Off Isolation vs. Frequency



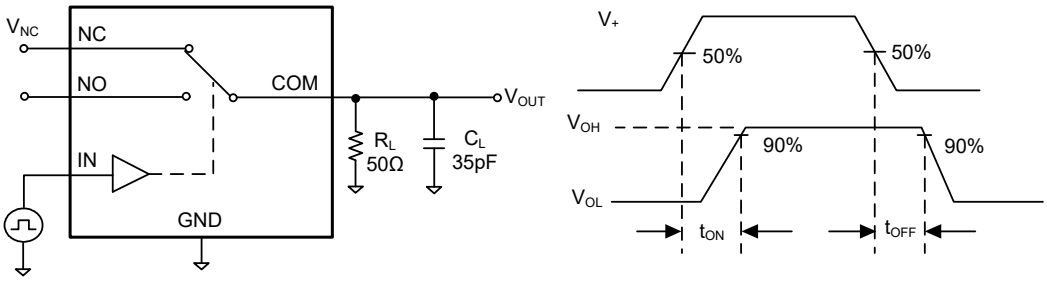
Crosstalk vs. Frequency



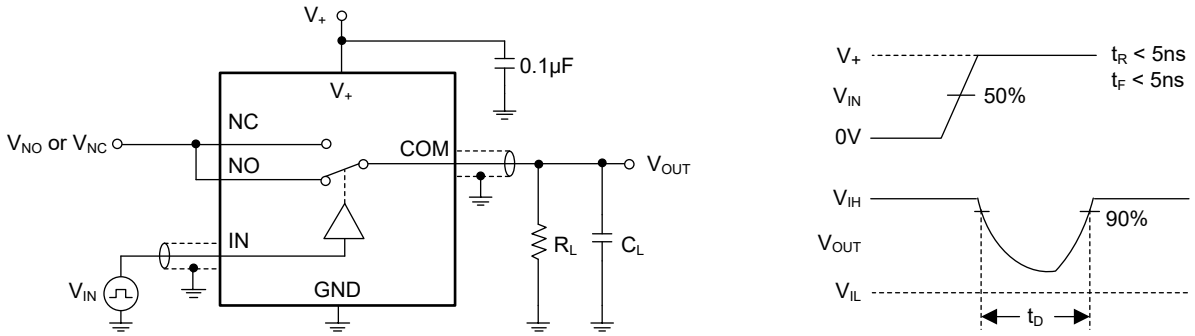
TEST CIRCUITS



Test Circuit 1. On-Resistance

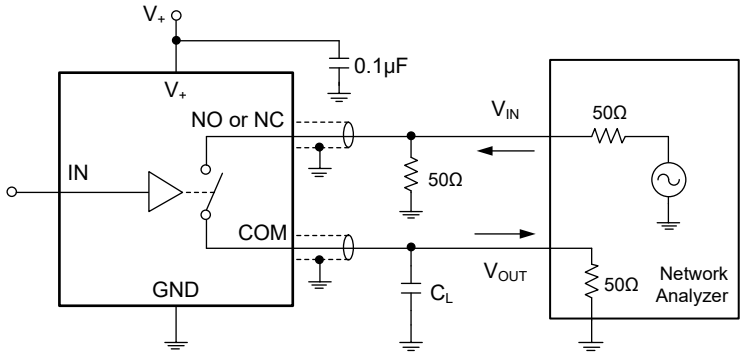


Test Circuit 2. Switching Times (t_{ON}, t_{OFF})

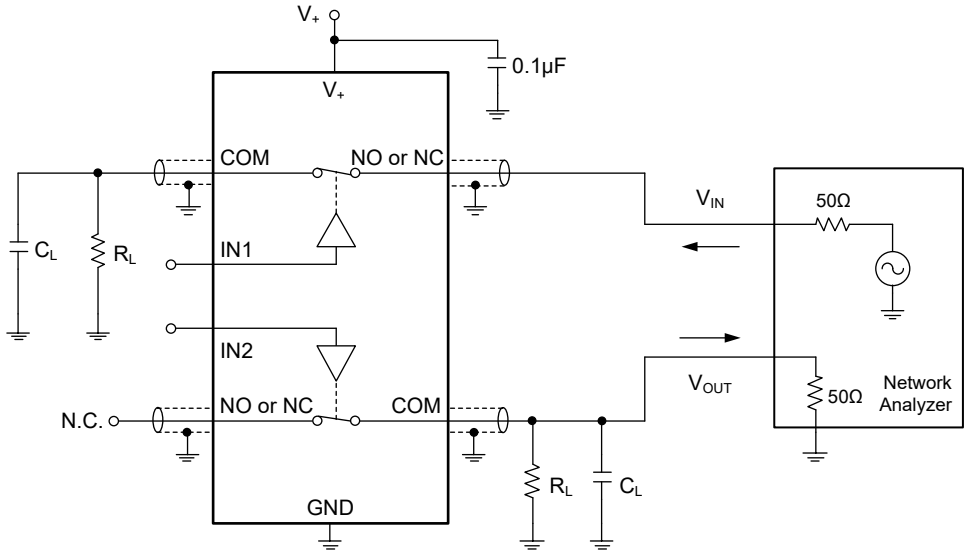


Test Circuit 3. Break-Before-Make Time Delay (t_D)

TEST CIRCUITS (continued)



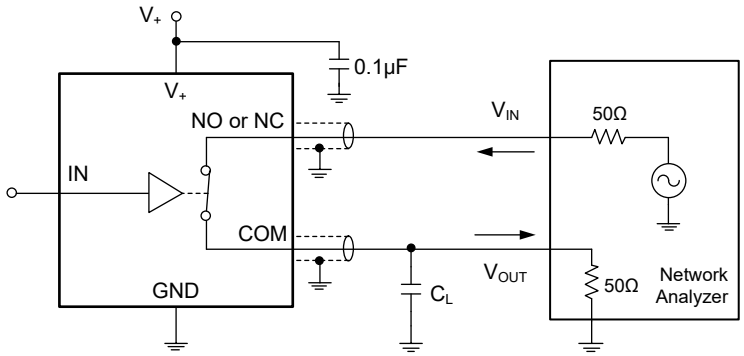
Test Circuit 4. Off-Isolation



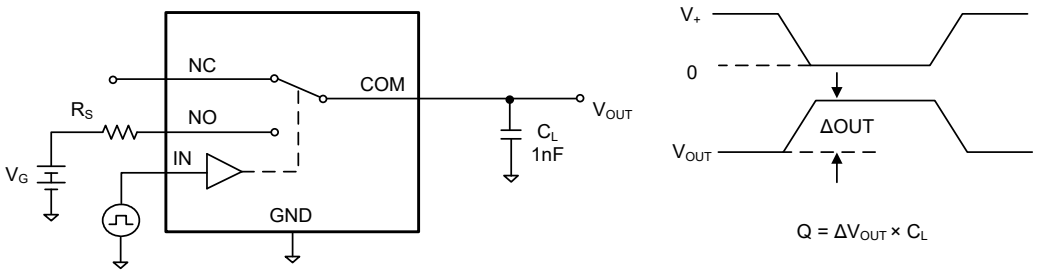
Channel-to-Channel Crosstalk = -20 log (V_{NO} or V_{NC}/V_{OUT})

Test Circuit 5. Channel-to-Channel Crosstalk

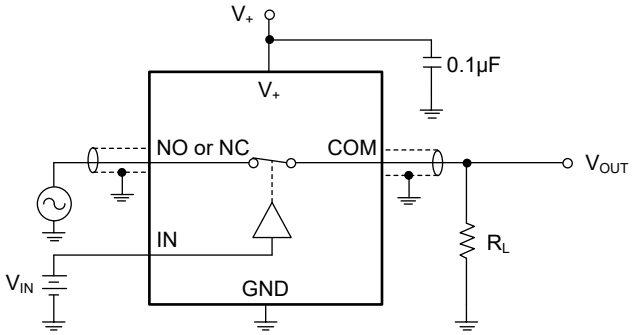
TEST CIRCUITS (continued)



Test Circuit 6. -3dB Bandwidth



Test Circuit 7. Charge Injection (Q)



Test Circuit 8. Total Harmonic Distortion (THD)

APPLICATION INFORMATION

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.

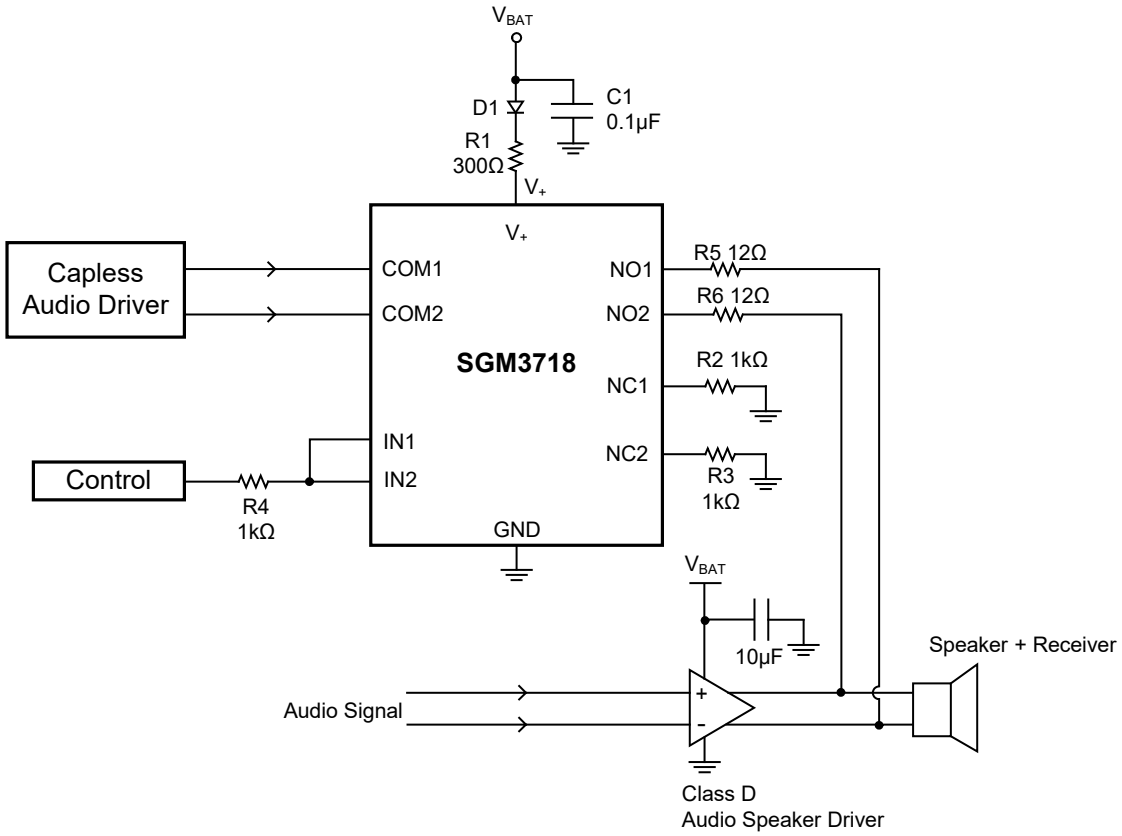


Figure 1. Typical Application Circuit

REVISION HISTORY

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

APRIL 2019 – REV.A.2 to REV.A.3	Page
Changed Package/Ordering Information section	2

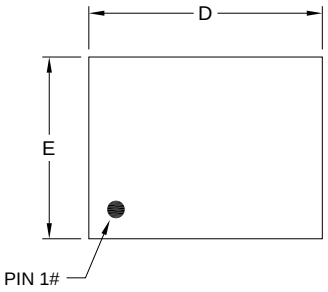
APRIL 2016 – REV.A.1 to REV.A.2	Page
Updated Package Description	All

FEBRUARY 2016– REV.A to REV.A.1	Page
Changed Typical Application Circuit	10

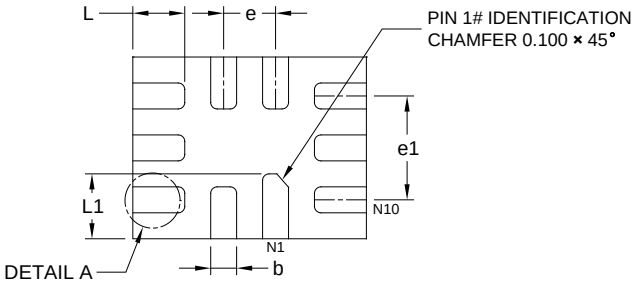
Changes from Original (DECEMBER 2014) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

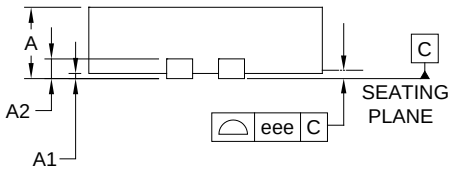
UTQFN-1.8×1.4-10L



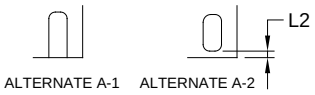
TOP VIEW



BOTTOM VIEW

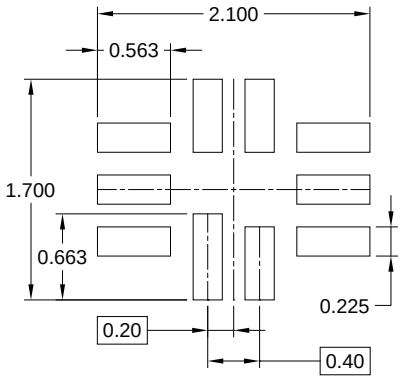


SIDE VIEW



DETAIL A

ALTERNATE TERMINAL CONSTRUCTION



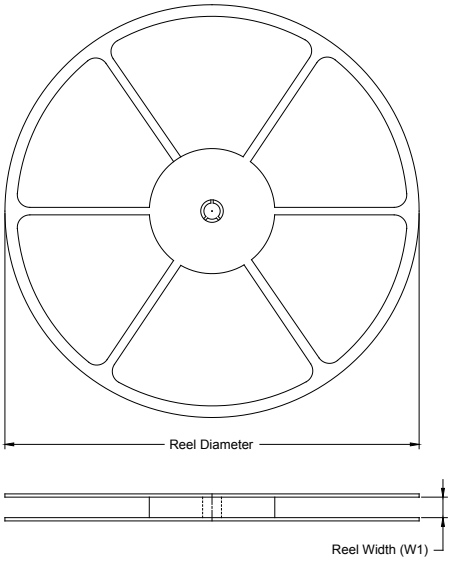
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.450	-	0.600
A1	0.000	-	0.050
A2	0.152 REF		
b	0.150	0.200	0.250
D	1.750	1.800	1.850
E	1.350	1.400	1.450
e	0.400 TYP		
e1	0.800 REF		
L	0.350	0.400	0.450
L1	0.450	0.500	0.550
L2	0.000	-	0.100
eee	-	0.080	-

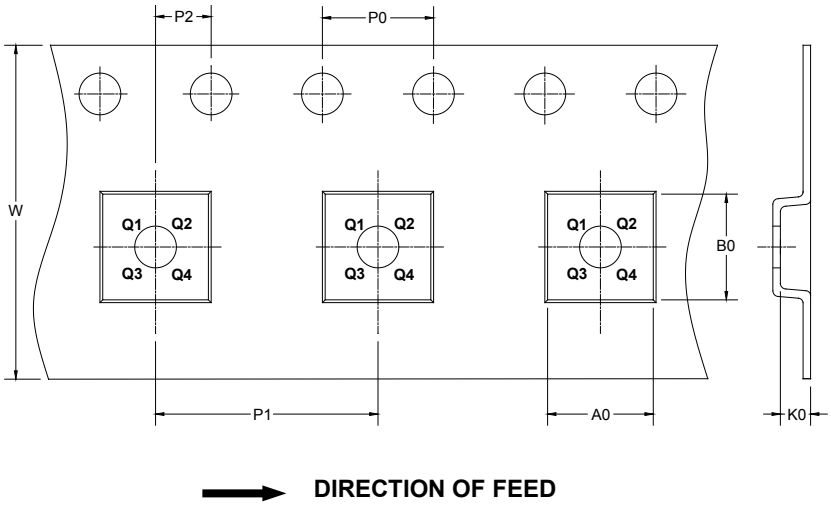
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



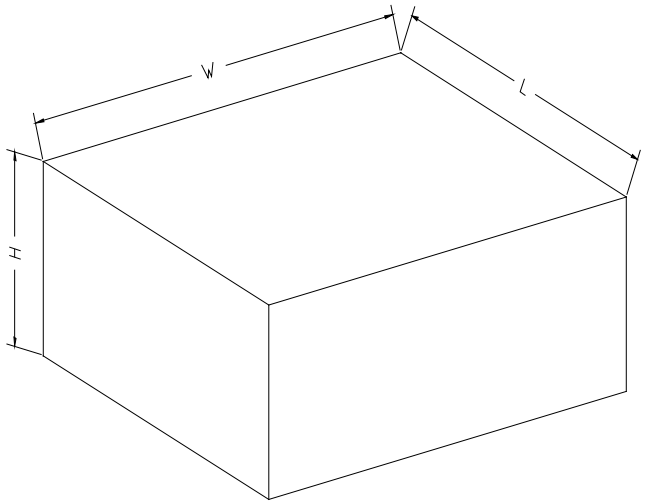
NOTE: The picture is only for reference. Please make the object as the standard.

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
UTQFN-1.8×1.4-10L	7″	9.0	1.75	2.10	0.70	4.0	4.0	2.0	8.0	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

DD0002