



SGM4782

0.5Ω, High Speed, Low Voltage Analog Switch/Multiplexer

GENERAL DESCRIPTION

The SGM4782 is a TTL/CMOS compatible analog multiplexer which consists of two 4-channel multiplexers. It operates from 1.8V to 4.2V single power supply that can handle rail-to-rail analog signals.

The SGM4782 features low voltage, low on-resistance and fast switching times. The high performances make it very suitable for multiple applications, such as cellular phones, audio and video signal routing, etc.

The SGM4782 can and is available in Green TQFN-3×3-16L and TSSOP-16 packages. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- **Single Supply Voltage Range: 1.8V to 4.2V**
- **Low On-Resistance: 0.5Ω (TYP) at 4.2V**
- **Low On-Resistance Flatness**
- **High Off-Isolation: -55dB ($R_L = 50\Omega$, $f = 1\text{MHz}$)**
- **-3dB Bandwidth: 30MHz**
- **Fast Switching Times ($V_+ = 4.2\text{V}$)**
 - t_{ON} : 20ns
 - t_{OFF} : 20ns
- **Low Crosstalk: -108dB ($R_L = 50\Omega$, $f = 1\text{MHz}$)**
- **Low Power Consumption**
- **Break-Before-Make Switching**
- **TTL/CMOS Compatible**
- **Rail-to-Rail Input and Output Operation**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green TQFN-3×3-16L and TSSOP-16 Packages**

APPLICATIONS

Cellular Phones
Computer Peripherals
Portable Equipment
Sample-and-Hold Circuits
Data Acquisition Systems
Battery-Powered Systems
Audio and Video Signal Routing

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM4782	TQFN-3×3-16L	-40°C to +85°C	SGM4782YTQ16/TR	4782TQ XXXXX	Tape and Reel, 3000
	TSSOP-16	-40°C to +85°C	SGM4782YTS/TR	SGM4782 YTS XXXXX	Tape and Reel, 3000

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₊ to GND0V to 4.6V
 Analog, Digital Voltage Range-0.3V to (V₊) + 0.3V
 Continuous Current X₋, Y₋, X or Y±250mA
 Peak Current X₋, Y₋, X or Y±400mA
 Junction Temperature+150°C
 Storage Temperature Range-65°C to +150°C
 Lead Temperature (Soldering, 10s)+260°C
 ESD Susceptibility
 HBM 4000V
 MM 400V

NOTE: 1. Voltages exceeding V_{CC} or V_{EE} on any signal terminal are clamped by internal diodes. Limit forward-diode current to maximum current rating.

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.

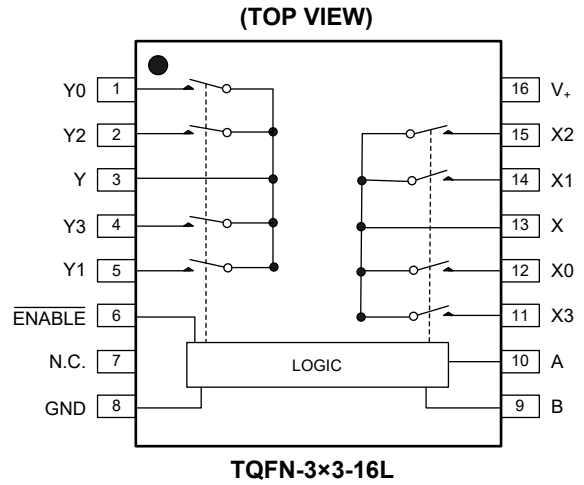
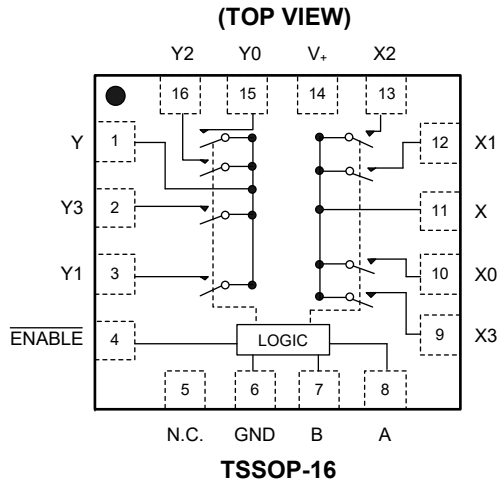
DISCLAIMER

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.

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.

PIN CONFIGURATIONS



PIN DESCRIPTION

PIN		NAME	FUNCTION
TSSOP-16	TQFN-3x3-16L		
1, 5, 2, 4	15, 3, 16, 2	Y0-Y3	Analog Switch Y Inputs Y0-Y3.
3	1	Y	Analog Switch Y Output Pin.
6	4	ENABLE	Digital Enable Control Pin. Normally connect to GND. Drive to logic high to set all switches off.
7	5	N.C.	Not Internally Connected.
8	6	GND	Ground.
9	7	B	Digital Address B Input Pin.
10	8	A	Digital Address A Input Pin.
12, 14, 15, 11	10, 12, 13, 9	X0-X3	Analog Switch X Inputs X0-X3.
13	11	X	Analog Switch X Output Pin.
16	14	V+	Positive Analog and Digital Supply Voltage Input Pin.
—	Exposed Pad	GND	Exposed Pad. Connect exposed pad to GND.

FUNCTION TABLE

CONTROL INPUTS			ON SWITCHES
Enable	Select		
	B	A	
L	L	L	X-X0 Y-Y0
L	L	H	X-X1 Y-Y1
L	H	L	X-X2 Y-Y2
L	H	H	X-X3 Y-Y3
H	√	√	All Switches Open

NOTE: √ = Don't Care.

ELECTRICAL CHARACTERISTICS

($V_+ = 4.2V$, $GND = 0V$, $V_{IH} = 1.6V$, $V_{IL} = 0.6V$, Full = $-40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = 4.2V$, $T_A = +25^\circ C$, unless otherwise noted.)

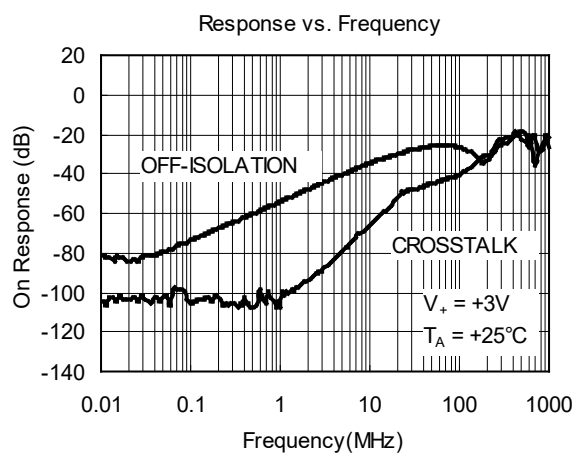
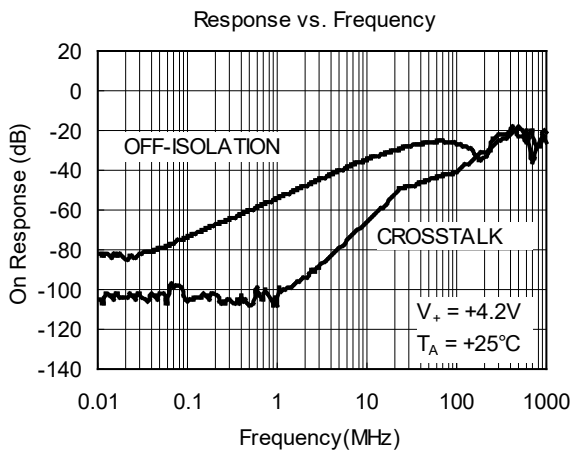
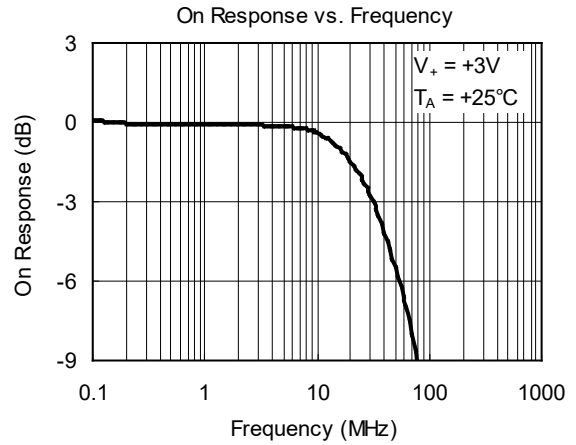
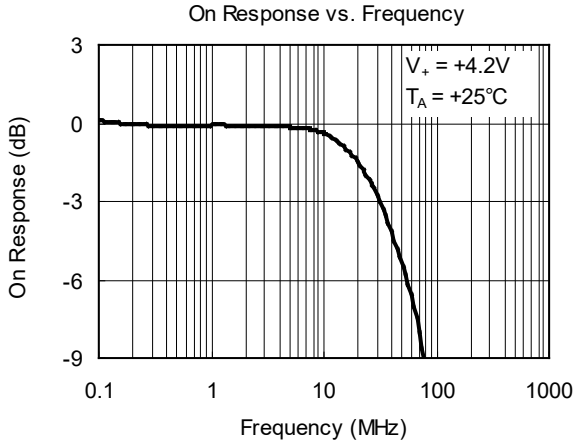
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	$V_{X-}, V_{Y-}, V_{X+}, V_{Y+}$		Full	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 4.2V, I_{X-}, I_{Y-} = -100mA, V_X, V_Y = 1V,$ Test Circuit 1	$+25^\circ C$		0.5	0.85	Ω
			Full			0.95	
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 4.2V, I_{X-}, I_{Y-} = -100mA, V_X, V_Y = 1V,$ Test Circuit 1	$+25^\circ C$		0.05	0.2	Ω
			Full			0.24	
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 4.2V, I_{X-}, I_{Y-} = -100mA,$ $V_X, V_Y = 1V, 2.5V,$ Test Circuit 1	$+25^\circ C$		0.1	0.2	Ω
			Full			0.24	
Source Off Leakage Current	$I_{X(OFF)}, I_{Y(OFF)}$	$V_+ = 4.2V, V_X, V_Y = 3.3V, 0.3V,$ $V_X, V_Y = 0.3V, 3.3V$	Full			1	μA
Channel On Leakage Current	$I_{X(ON)}, I_{Y(ON)}, I_{X(OFF)}, I_{Y(OFF)}$	$V_+ = 4.2V, V_X, V_Y = 0.3V, 3.3V,$ $V_{X-}, V_{Y-} = 0.3V, 3.3V$ or floating	Full			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		Full	1.6			V
Input Low Voltage	V_{INL}		Full			0.5	V
Input Leakage Current	I_{IN-}	$V_A, V_B = V_{ENABLE} = 0V$ or $4.2V$	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{IN} = 1.5V$ to $0.5V, V_X$ or $V_Y = 2.1V$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 2	$+25^\circ C$		20		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		20		
Address Transition Time	t_{TRANS}	$V_{IN} = 4.2V$ to $0V, V_X$ or $V_Y = 2.1V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 3	$+25^\circ C$		30		ns
Break-Before-Make Time Delay	t_D	$V_{IN} = 4.2V$ to $0V, V_X$ or $V_Y = 2.1V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 4	$+25^\circ C$		20		ns
Charge Injection	Q	$C_L = 1nF,$ Test Circuit 5	$+25^\circ C$		-18		pC
Off Isolation	O_{ISO}	Signal = $0dBm, V_{BIAS} = 2.1V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 6	100kHz	$+25^\circ C$		-75	dB
			1MHz	$+25^\circ C$		-55	
Channel-to-Channel Crosstalk	X_{TALK}	Signal = $0dBm, V_{BIAS} = 2.1V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 6	100kHz	$+25^\circ C$		-106	dB
			1MHz	$+25^\circ C$		-108	
-3dB Bandwidth	BW	Signal = $0dBm, V_{BIAS} = 2.1V, R_L = 50\Omega,$ Test Circuit 6	$+25^\circ C$		30		MHz
Channel On Capacitance	$C_{X(ON)}, C_{Y(ON)}, C_{X(OFF)}, C_{Y(OFF)}$		$+25^\circ C$		146		pF
POWER REQUIREMENTS							
Power Supply Range	V_+		Full	1.8		4.2	V
Power Supply Current	I_+	$V_+ = 4.2V, V_A, V_B, V_{ENABLE} = 4.2V$ or $0V$	Full			1	μA

ELECTRICAL CHARACTERISTICS (continued)

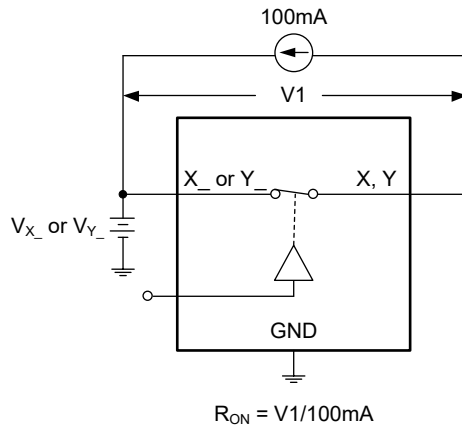
($V_+ = 2.7V$ to $3.6V$, $GND = 0V$, $V_{IH} = 1.6V$, $V_{IL} = 0.4V$, Full = $-40^\circ C$ to $+85^\circ C$. Typical values are at $V_+ = 3V$, $T_A = +25^\circ C$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	$V_{X-}, V_{Y-}, V_{X+}, V_{Y+}$		Full	0		V_+	V
On-Resistance	R_{ON}	$V_+ = 2.7V, I_{X-}, I_{Y-} = -100mA, V_X, V_Y = 1V,$ Test Circuit 1	$+25^\circ C$		0.6	0.95	Ω
			Full			1.05	
On-Resistance Match Between Channels	ΔR_{ON}	$V_+ = 2.7V, I_{X-}, I_{Y-} = -100mA, V_X, V_Y = 1V,$ Test Circuit 1	$+25^\circ C$		0.05	0.2	Ω
			Full			0.24	
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_+ = 2.7V, I_{X-}, I_{Y-} = -100mA,$ $V_X, V_Y = 1V, 2.5V,$ Test Circuit 1	$+25^\circ C$		0.1	0.2	Ω
			Full			0.24	
Source Off Leakage Current	$I_{X(OFF)}, I_{Y(OFF)}$	$V_+ = 3.6V, V_{X-}, V_{Y-} = 3.3V, 0.3V,$ $V_X, V_Y = 0.3V, 3.3V$	Full			1	μA
Channel On Leakage Current	$I_{X(ON)}, I_{Y(ON)}, I_{X(OH)}, I_{Y(OH)}$	$V_+ = 3.6V, V_X, V_Y = 0.3V, 3.3V,$ $V_{X-}, V_{Y-} = 0.3V, 3.3V$ or floating	Full			1	μA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		Full	1.5			V
Input Low Voltage	V_{INL}		Full			0.4	V
Input Leakage Current	I_{IN-}	$V_A, V_B = V_{ENABLE} = 0V$ or $2.7V$	Full			1	μA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	$V_{IN} = 1.5V$ to $0.5V, V_X$ or $V_Y = 1.5V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 2	$+25^\circ C$		33		ns
Turn-Off Time	t_{OFF}		$+25^\circ C$		20		
Address Transition Time	t_{TRANS}	$V_{IN} = 1.5V$ to $0V, V_X$ or $V_Y = 1.5V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 3	$+25^\circ C$		36		ns
Break-Before-Make Time Delay	t_D	$V_{IN} = 1.5V$ to $0V, V_X$ or $V_Y = 1.5V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 4	$+25^\circ C$		18		ns
Charge Injection	Q	$C_L = 1nF,$ Test Circuit 5	$+25^\circ C$		-18		pC
Off Isolation	O_{ISO}	Signal = $0dBm, V_{BIAS} = 1.5V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 6	100kHz	$+25^\circ C$		-75	dB
			1MHz	$+25^\circ C$		-55	
Channel-to-Channel Crosstalk	X_{TALK}	Signal = $0dBm, V_{BIAS} = 1.5V,$ $R_L = 50\Omega, C_L = 35pF,$ Test Circuit 6	100kHz	$+25^\circ C$		-106	dB
			1MHz	$+25^\circ C$		-108	
-3dB Bandwidth	BW	Signal = $0dBm, V_{BIAS} = 1.5V, R_L = 50\Omega,$ Test Circuit 6	$+25^\circ C$		30		MHz
Channel On Capacitance	$C_{X(ON)}, C_{Y(ON)}, C_{X(OH)}, C_{Y(OH)}$		$+25^\circ C$		146		pF

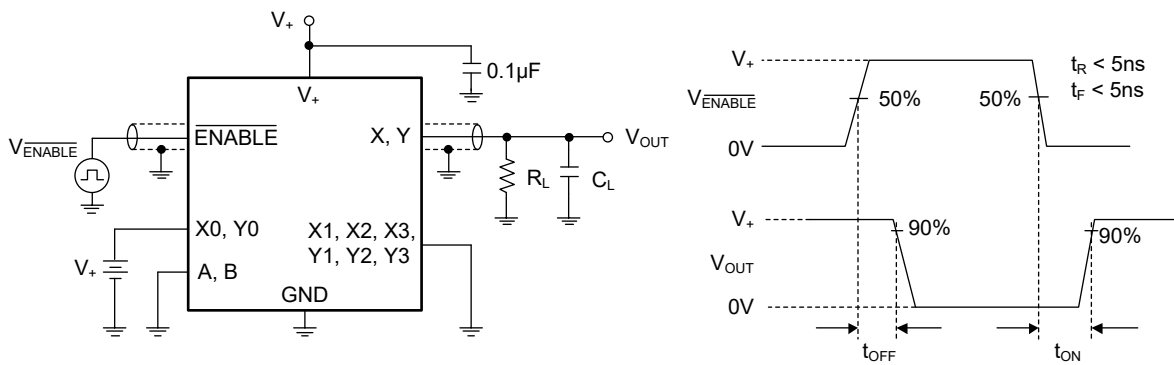
TYPICAL PERFORMANCE CHARACTERISTICS



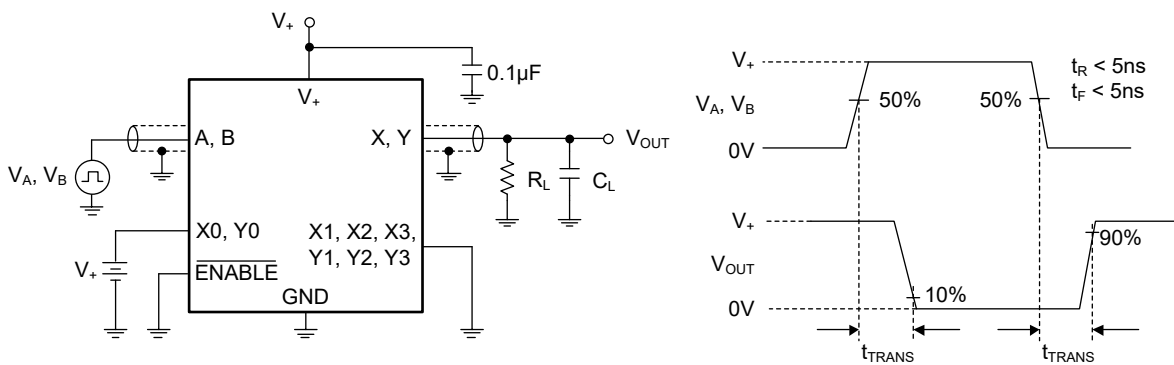
TEST CIRCUITS



Test Circuit 1. On-Resistance

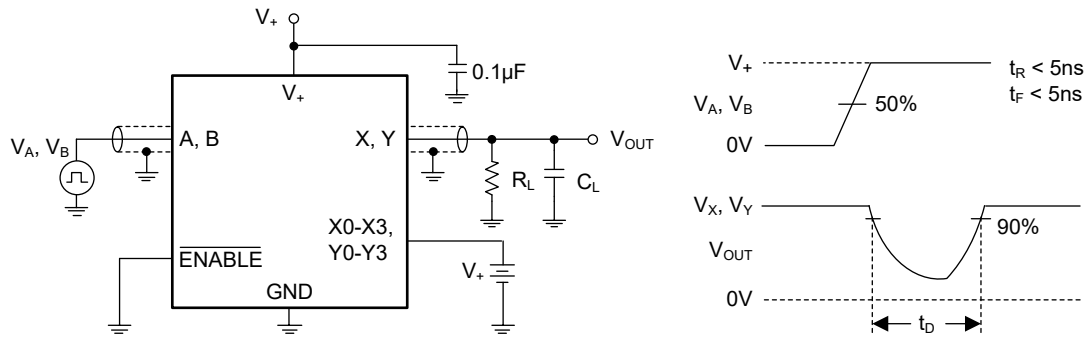


Test Circuit 2. Enable Switching Times (t_{OFF} , t_{ON})

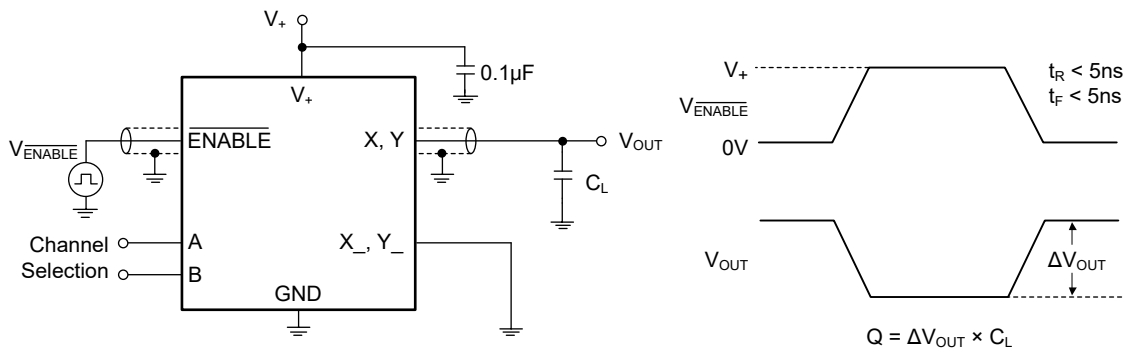


Test Circuit 3. Address Transition Times (t_{TRANS})

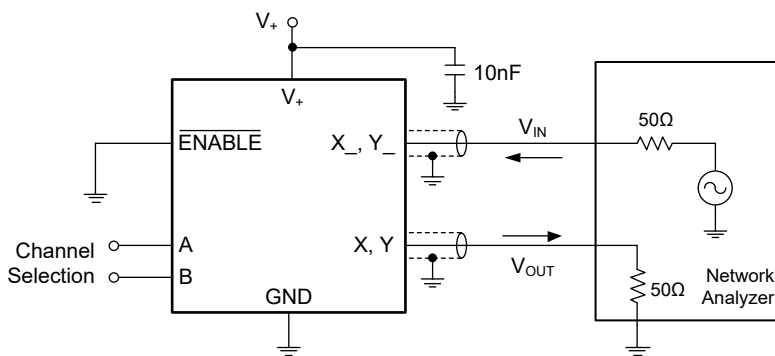
TEST CIRCUITS (continued)



Test Circuit 4. Break-Before-Make Interval (t_d)



Test Circuit 5. Charge Injection (Q)



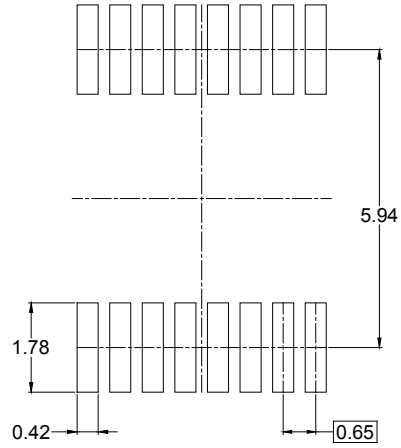
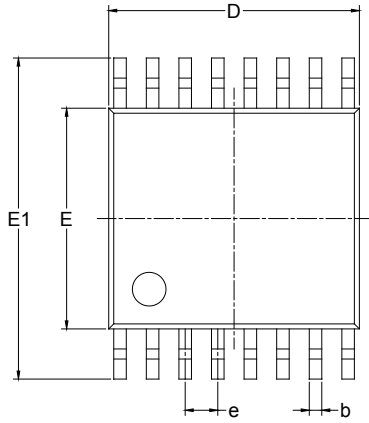
Off Isolation = $20\log(V_{OUT}/V_{IN})$ (Measured between X and "OFF" X_ Terminal on Each Switch)

Channel-to-Channel Crosstalk = $20\log(V_{OUT}/V_{IN})$ (Measured from One Channel (X, Y) to All other Channels)

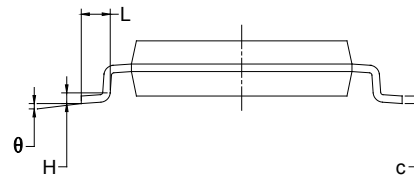
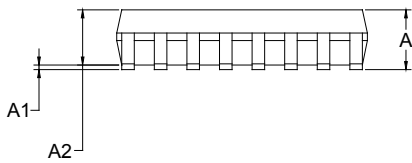
Test Circuit 6. -3dB Bandwidth, Off-Isolation and Crosstalk

PACKAGE OUTLINE DIMENSIONS

TSSOP-16



RECOMMENDED LAND PATTERN (Unit: mm)

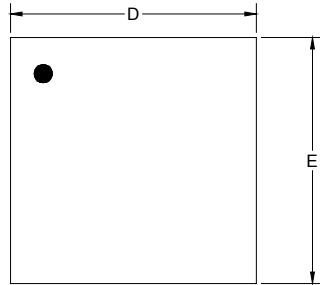


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650 BSC		0.026 BSC	
L	0.500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

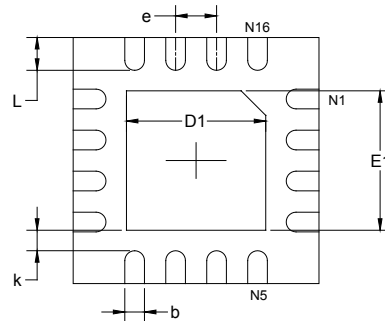
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

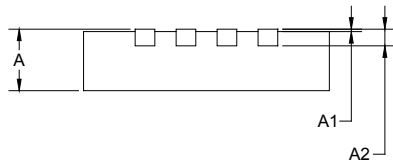
TQFN-3×3-16L



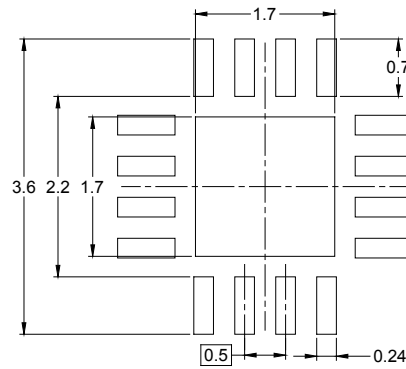
TOP VIEW



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	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	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

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
TQFN-3×3-16L	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